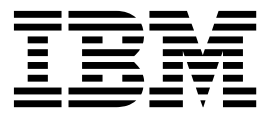


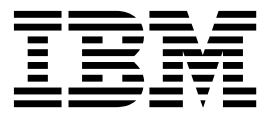
IBM Tivoli Storage FlashCopy Manager for VMware
Version 4.1.4

Installation and User's Guide



IBM Tivoli Storage FlashCopy Manager for VMware
Version 4.1.4

Installation and User's Guide



Note:

Before you use this information and the product it supports, read the information in “Notices” on page 179.

Fourth edition (December 2015)

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

© Copyright IBM Corporation 2011, 2015.

US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

Contents

Figures	v
--------------------------	----------

Tables	vii
-------------------------	------------

About this publication	ix
---	-----------

Who should read this publication	ix
--	----

Publications	ix
------------------------	----

New for Tivoli Storage FlashCopy Manager Version 4.1.4	xi
---	-----------

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

Backups in virtual environments.	3
--	---

Backup types in virtualized environments	4
--	---

Virtual machine and datastore backup operations	4
---	---

Virtual machine and datastore restore operations	5
--	---

Storage systems	7
---------------------------	---

SAN Volume Controller, DS8000, and Storwize family systems.	7
---	---

XIV Storage System	9
------------------------------	---

Software components	10
-------------------------------	----

Additional information	12
----------------------------------	----

Chapter 2. Preparing your Tivoli Storage FlashCopy Manager for VMware environment	13
--	-----------

Capacity planning	13
-----------------------------	----

Required communication ports	14
--	----

Installation options and requirements.	15
--	----

Storage solutions	16
-----------------------------	----

XIV system	16
----------------------	----

N series and NetApp storage systems	17
---	----

DS8000 series.	18
------------------------	----

Storwize family and SAN Volume Controller	18
---	----

Reconciliation of backups.	22
------------------------------------	----

Data replication between sites	23
--	----

Integration with VMware vCenter Site Recovery Manager	23
---	----

Remote mirroring	24
----------------------------	----

Raw device mapping	29
------------------------------	----

Virtual machine template and vApp	31
---	----

Interoperability	32
----------------------------	----

Planning to install both products	33
---	----

Chapter 3. Installing and upgrading	37
--	-----------

VMware vCenter Server user privilege requirements	37
---	----

Installation components and directories	40
---	----

Installing by using the installation wizard	41
---	----

Installing in console mode	43
--------------------------------------	----

Installing in silent mode	44
-------------------------------------	----

Upgrading.	45
--------------------	----

Upgrading Tivoli Storage FlashCopy Manager for VMware	45
---	----

Upgrading Tivoli Storage FlashCopy Manager for VMware and Data Protection for VMware	46
--	----

Uninstalling Tivoli Storage FlashCopy Manager for VMware	48
--	----

Chapter 4. Configuring Tivoli Storage FlashCopy Manager for VMware	49
---	-----------

Tivoli Storage FlashCopy Manager for VMware profile	49
---	----

Configuring storage environments.	51
---	----

Configuring to use the Storwize family and SAN Volume Controller with dynamic target allocation (SVCDTA).	51
---	----

Configuring the CIM adapter for SP 800-131A compliant encryption	53
--	----

Target sets and volumes	54
-----------------------------------	----

Selecting the FLASHCOPY_TYPE	62
--	----

Configuring the system by using the configuration wizard	64
--	----

Configuring the system by using the setup script..	66
--	----

Starting and stopping services for Tivoli Storage FlashCopy Manager for VMware	67
--	----

Protecting the vmcli database and repository files to support a HADR solution	68
---	----

Password administration	69
-----------------------------------	----

GSKit configuration	70
-------------------------------	----

GSKit Commands	71
--------------------------	----

CA Certificate	71
--------------------------	----

Configuring for takeover and failback operations..	73
--	----

Configuring for takeover on the secondary site	73
--	----

Configuring after a VMware vCenter Site Recovery Manager failover operation.	76
--	----

Configuring Tivoli Storage FlashCopy Manager for VMware after a failback operation	78
--	----

Chapter 5. Backing up and restoring virtual machines from the GUI	79
--	-----------

Starting the GUI from a web browser.	80
--	----

Starting the GUI from the Solutions and Applications pane	80
---	----

Backing up virtual machines.	82
--------------------------------------	----

Backing up virtual machines on a primary site or secondary site	83
---	----

Backing up virtual machines protected by VMware vCenter Site Recovery Manager.	84
--	----

Restoring virtual machines	85
--------------------------------------	----

Restoring VMware datastores	86
---------------------------------------	----

Restoring virtual machines with IBM Data Protection	87
---	----

Restoring a virtual machine protected by VMware vCenter Site Recovery Manager.	87
--	----

Checking managed capacity and licensing reports	88
---	----

Chapter 6. Operating the Data Protection for VMware command-line interface	89
Using the command-line interface	89
Creating a backup	90
Viewing the status and details of a backup	93
Attaching and detaching the virtual disks of a backup to a target virtual machine	95
Restoring a backup	97
Restoring single disks of a virtual machine	99
Restoring VMware datastores	99
Deleting a backup	101
The vmcli database	103
Backing up the vmcli database	103
Chapter 7. Tivoli Storage FlashCopy Manager for VMware configuration files	105
GLOBAL section	105
ACSD section	107
VMWARE section	107
VMCLI section	112
DEVICE_CLASS section	115
DEVICE_CLASS DS8000 Storage System parameters	115
DEVICE_CLASS Storwize family and SAN Volume Controller Storage System parameters	119
DEVICE_CLASS XIV Storage System parameters	126
DEVICE_CLASS System Storage N series and NetApp parameters	127
DEVICE_CLASS mirroring parameters	128
DEVICE_CLASS storage adapter parameters	129
Tivoli Storage FlashCopy Manager for VMware password file	132
Tivoli Storage FlashCopy Manager for VMware target volumes file.	132
Target volume parameter settings for DS8000	136
Target volume parameter settings for SAN Volume Controller and Storwize family.	137
Chapter 8. Integrating with Tivoli Storage Manager for Virtual Environments	141
LAN-free backup to Tivoli Storage Manager	143

Getting started	145
Preparing storage systems	145
Configuring storage pool and policy for LAN-free operations	146
Configuring the storage agent	147
Configuring the client	148
Verifying the LAN-free configuration	149

Appendix A. The Data Protection for VMware command-line interface	151
VMCLI attach	152
VMCLI backup	153
VMCLI delete	159
VMCLI detach	160
VMCLI inquire	161
VMCLI inquire_config	166
VMCLI inquire_detail	169
VMCLI instant_restore	170
VMCLI restore	171
VMCLI set_domain	173
VMCLI tape_backup	174
VMCLI managed_capacity	174
VMCLI db_backup	175
VMCLI db_restore	176
VMCLI db_inquire	176
VMCLI db_compact	176

Appendix B. Accessibility features for the Tivoli Storage Manager product family.	177
--	------------

Notices	179
--------------------------	------------

Glossary	183
---------------------------	------------

Index	185
------------------------	------------

Figures

1. Tivoli Storage FlashCopy Manager for VMware system components and user environment .. 2
2. Distributed virtual machine 6
3. Tivoli Storage FlashCopy Manager for VMware in a VMware vCenter Site Recovery Manager environment 24
4. Remote mirroring between sites. 25
5. Tivoli Storage FlashCopy Manager for VMware remote mirroring between sites 28
6. Tivoli Storage FlashCopy Manager for VMware VM installation in a VMware vCenter Site Recovery Manager environment. 29
7. Tivoli Storage FlashCopy Manager for VMware target volumes files example 1 56
8. Tivoli Storage FlashCopy Manager for VMware target volumes files example 2 57
9. Tivoli Storage FlashCopy Manager for VMware target volumes files example 3 58
10. Tivoli Storage FlashCopy Manager for VMware target naming example 1 60
11. Tivoli Storage FlashCopy Manager for VMware target naming example 2 61
12. Tivoli Storage FlashCopy Manager for VMware target naming example 3 62
13. LAN-free backup to Tivoli Storage Manager with Tivoli Storage FlashCopy Manager for VMware 144

Tables

1.	FlashCopy types by storage systems	7	11.	Tivoli Storage FlashCopy Manager for VMware profile parameters - GLOBAL section	106
2.	Space requirements for a global product installation of Tivoli Storage FlashCopy Manager for VMware	14	12.	Tivoli Storage FlashCopy Manager for VMware profile parameters - ACSD section	107
3.	Tivoli Storage FlashCopy Manager for VMware port numbers	15	13.	Tivoli Storage FlashCopy Manager for VMware profile parameters - VMWARE section	107
4.	Dynamic target volumes and predefined target volumes feature comparison	19	14.	Tivoli Storage FlashCopy Manager for VMware profile parameters - VMCLI section	112
5.	Scenarios and products to use	33	15.	Managing target volume LUNs by storage system	134
6.	Links to hardware and software requirements	34	16.	Parameters of the 'VOLUMES_SET_x' Topic (DS8000)	137
7.	Version compatibility	34	17.	Parameters of the 'VOLUMES_SET_x' SAN Volume Controller and Storwize family	138
8.	Links to installation and configuration topics	35	18.	Sample table for LAN-free capable storage	149
9.	Privileges that are required for the role assigned to the Tivoli Storage FlashCopy Manager for VMware user ID	38	19.	Sample output	150
10.	Selecting the FLASHCOPY_TYPE for SAN Volume Controller, DS8000, and Storwize family	63			

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 storage systems:

- IBM System Storage® Disk Storage Model DS8000®
- IBM System Storage SAN Volume Controller
- IBM XIV® Storage Systems
- IBM Storwize® family
- 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.

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.

Publications

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.

To view IBM product documentation, see IBM Knowledge Center.

New for Tivoli Storage FlashCopy Manager Version 4.1.4

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

| New and changed information is indicated by a vertical bar to the left of the
| change.

| **Managed capacity reports**

| View managed capacity values and licensing reports from the Tivoli
| Storage FlashCopy Manager for VMware GUI.

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 and restore virtual machines, and VMware datastores.

Tivoli Storage FlashCopy Manager for VMware combines with the VMware vSphere API and the snapshot capabilities of storage devices to protect your environment. 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 virtual machines at the VMware datastore level. Datastores represent the combination of underlying physical storage resources in the VMware datacenter. A datastore is physically a Virtual Machine File System (VMFS) volume or a directory on a network-attached storage (NAS) device. A datastore can span multiple physical storage systems.

When you use this solution with Tivoli Storage Manager for Virtual Environments, you can offload and store VMware image backups on Tivoli Storage Manager server storage for long-term retention.

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 capabilities:

- A number of ways for you to manage back up and restore operations:
 - You can use one of the following user interfaces:
 - A stand-alone web browser GUI. Access this interface through a URL bookmark to the web server. For example:
`https://guihost.mycompany.com:9081/TsmVMwareUI/`
 - An IBM Data Protection extension that you access from the VMware vSphere Web Client. The client connects to the web server in the vSphere environment.

You can use this extension to restore snapshot backups from the storage device or from stored images on Tivoli Storage Manager. The content is a subset of what is provided in the plug-in and web browser GUI.
 - A plug-in that you access from the Solutions and Applications pane or the Classic Solution pane of the VMware vSphere Client.

Restriction: You cannot use this plug-in, in a VMware vSphere 6 environment.
 - A Data Protection for VMware command-line interface.
- A way to schedule backup operations.
- A way to offload backups to Tivoli Storage Manager when you use Tivoli Storage FlashCopy Manager for VMware with Tivoli Storage Manager for Virtual

Environments. You can start block-level incremental backups when you enable the VMware Change Block Tracking (CBT) feature.

The following figure illustrates an example where Tivoli Storage FlashCopy Manager for VMware is installed on the vStorage backup server. Optional software applications that are required to offload images to Tivoli Storage Manager also are installed on the server. The various ways to access the GUI, the connections to the VMware vCenter Server, and the associated virtual environment are displayed.

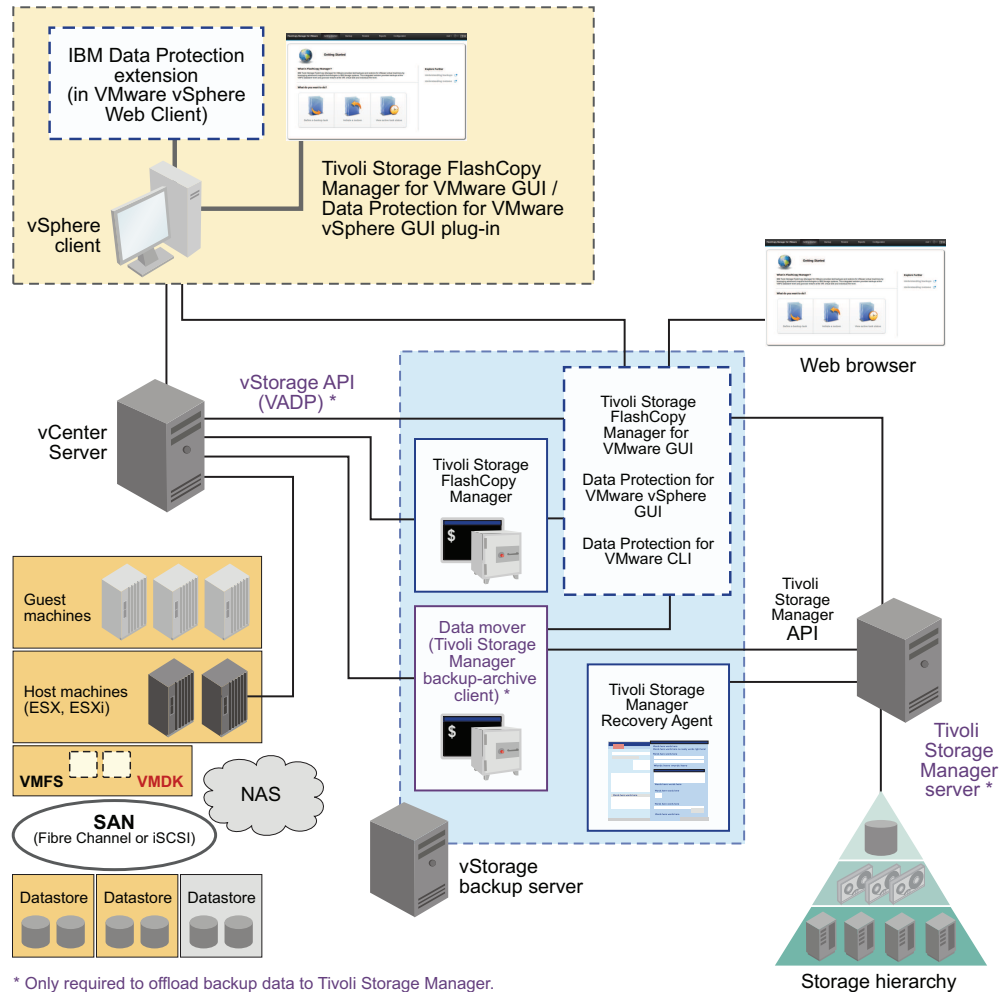


Figure 1. Tivoli Storage FlashCopy Manager for VMware system components and user environment

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. When you are planning the storage management of a virtual environment, you must consider the mobility of the data.

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. A *virtual machine* is a software implementation of a machine that executes programs like a real machine. 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 VMware datacenters in a vCenter environment. In a default configuration, a domain consists of all the datacenters in a vCenter.

Using the Tivoli Storage FlashCopy Manager for VMware GUI, you can limit the number of datacenters in a domain to protect.

Restriction: You can add the same datacenter to multiple backup domains. However, a backup operation can be unsuccessful, when two backup operations that contain the same datacenter are started simultaneously.

Tip: Also, if you reassign a datacenter to another domain, the metadata about previous backup tasks is not automatically migrated. You must manually migrate this data to ensure that the data can be restored.

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

Within a domain, you can use VMware Storage vMotion to migrate virtual disks within and across storage arrays, without the need to schedule downtime. 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 occurs during a hardware snapshot, a file or files of the virtual machine can be moved to another datastore. This movement can cause the virtual machine backup to be unusable. In this case, 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. 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.

Backup types in virtualized environments

Backup operations in virtualized environments can use in-guest backup, on-host backup, or off-host backup methods.

With the *in-guest* backup method, the virtual machine is treated as a physical system. You install the backup application on the guest operating system and start the backup operation on the virtual machine. You can create file-level, or block-level image backup operations. However, you cannot use central backup and restore processing for multiple guests. There are also extra resource requirements on the ESX host.

With the *on-host* backup method, you install the backup application on the host operating system. You start the backup operation on the ESX host and not on the virtual machine. Do not use this method when you protect data in a virtual environment with Tivoli Storage FlashCopy Manager for VMware.

With the *off-host* backup method, you install the backup application on a dedicated virtual machine or a physical Linux system, the *vStorage backup server*. You start the backup operation on the server. Through the VMware vStorage API and *snapshot* capabilities of the storage system, you can create file-level, guest-level, and file system backup snapshots. The snapshot represents a point-in-time copy of the data.

The backup snapshots can be offloaded from the production ESX host to a secondary ESX host. The use of a secondary ESX host removes the load from the production ESX host and requires less production server resources. Use this method to protect your virtual environment with Tivoli Storage FlashCopy Manager for VMware.

The off-host approach facilitates faster backup operations and is non-disruptive to production applications.

You can use the following features when you use an off-host backup method:

- File-level and guest-level backup images can be created and recovered.
- Centralized management of backup data is provided.
- Backups can be offloaded to a secondary host that requires less production server resources.
- File system backup images can be created and recovered by using snapshots.

Virtual machine and datastore backup operations

You can use Tivoli Storage FlashCopy Manager for VMware to back up virtual machines and VMware datastores to protect your virtual environment.

When you back up data with Tivoli Storage FlashCopy Manager for VMware, the following tasks are completed:

- Identify the logical unit numbers (LUNs) that are associated with the virtual machines. A *LUN* is a unique identifier that is used to differentiate devices, each of which is a logical unit (LU).

- Start a software snapshot of virtual guest volumes through the VMware vSphere API.
- Start a hardware snapshot that uses the storage system capabilities. This snapshot is persistent and is a copy of the LUNs that host the virtual disk files and the software snapshot.

You can select virtual machines in a VMware datastore to exclude from a datastore backup. The excluded virtual machines are included in the hardware snapshot but you cannot offload to Tivoli Storage Manager server or restore any excluded virtual machines.

You can protect datastores on Virtual Machine File System (VMFS) or Network File System (NFS) file systems.

Restriction: You cannot back up VMware virtual volume (VV01) datastores and their associated virtual machines. A *VV01* is a new type of storage management framework that shows virtual disks as storage containers and enables array-based operations at the virtual disk granular level.

Virtual machine and datastore restore operations

You can restore a virtual machine, a single virtual disk, individual files, or a VMware datastore with its stored virtual machines from a 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.

Tip: If a virtual machine was renamed or deleted after the backup was taken, Tivoli Storage FlashCopy Manager for VMware restores the virtual machine 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*. For example, a virtual machine contains one or more disks on a datastore, the third disk that contains the configuration files are stored on a different datastore. The following figure shows a typical distributed virtual machine.

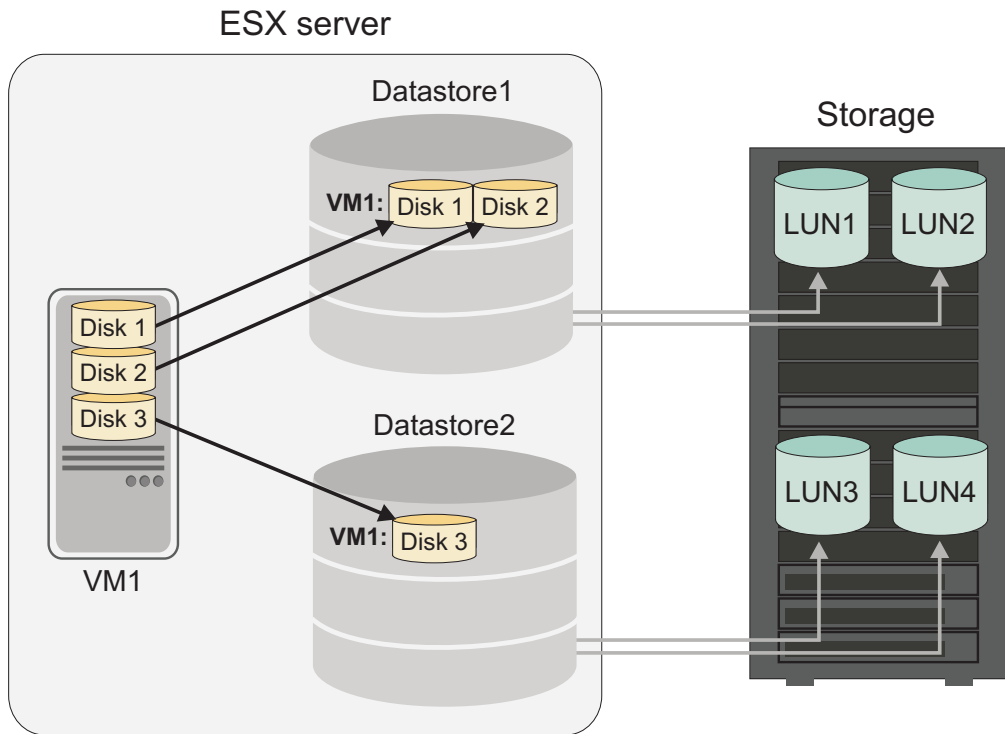


Figure 2. Distributed virtual machine

When you are restoring a distributed virtual machine, the following limitations apply:

- A distributed virtual machine must be restored to 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 virtual machine.

Datastore restore operations

You can restore one or more datastores by using either the Data Protection for VMware **instant_restore** command or from the GUI. Unlike a virtual machine restore operation, this method restores the whole Virtual Machine File System (VMFS) or Network File System (NFS) datastore and its stored virtual machines. 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.

Storage systems

Tivoli Storage FlashCopy Manager for VMware can operate with several storage systems and uses the copy capabilities of the storage system in use.

Based on the storage system you use, the copy method can be a *FlashCopy* or *snapshot*. IBM System Storage DS8000, IBM System Storage SAN Volume Controller, and IBM Storwize family storage systems use the FlashCopy copy function. A FlashCopy creates a point-in-time copy in which a target volume represents an exact copy of the data on a source volume at the time the FlashCopy starts. Data that exists on the target volume is replaced by the copied data. The source and target volumes must also be on the same storage system.

IBM XIV Storage System, IBM System Storage N series, NetApp, use the *snapshot* copy function. A snapshot represents a point-in-time copy of a volume or set of volumes without having to define a specific target volume. The source volumes and snapshots are on the same storage system. The space that is required for the snapshot is allocated automatically within the same storage system and can increase over time.

The Tivoli Storage FlashCopy Manager profile file lists the parameters and options that you use to back up and restores data in your environment. In the `DEVICE_CLASS` section of the profile, you specify the storage system in use.

SAN Volume Controller, DS8000, and Storwize family systems

Tivoli Storage FlashCopy Manager for VMware uses the FlashCopy capabilities of the storage system to protect your virtual environment.

VMware datastore is physically a Virtual Machine File System (VMFS) file system volume or a directory on a network-attached storage (NAS) system. When you back up a datastore the FlashCopy capabilities of the storage system are used. A FlashCopy is a logical volume whose contents are identical to that of a selected source volume at a specific point in time. You can specify how the storage solution does a bit-level copy of the data from one logical volume to another, by specifying the FlashCopy type.

To determine the FlashCopy type to use for a backup operation and storage system, see the following table.

Important: The new SVC adapter with dynamic target allocation implicitly uses type `NOCOPY`; it does not yet support different FlashCopy types.

Table 1. FlashCopy types by storage systems.

FlashCopy type	Description	Storage system
COPY	A COPY type FlashCopy is a point-in-time copy of a volume, followed by a subsequent background copy that creates a physical copy of the source volume.	DS8000 ¹ SAN Volume Controller ² Storwize family ²

Table 1. FlashCopy types by storage systems (continued).

FlashCopy type	Description	Storage system
INCR	An INCR type FlashCopy is similar to a COPY type. However, in this type of backup operation, after the first FlashCopy, only the changed blocks are copied to the target volume.	DS8000 ¹ SAN Volume Controller ² Storwize family ²
NOCOPY	A NOCOPY type FlashCopy is a copy-on-write from the source volume to the target volume. The copy occurs when a data block is initially changed on the source volume. Data is not copied in the background. Only changed data blocks are present on the target volume. Any unchanged data blocks are referenced from the source volume.	DS8000 ¹ SAN Volume Controller ² Storwize family ²
<p>Notes:</p> <p>1 For DS8000 storage, the following restrictions apply:</p> <ul style="list-style-type: none"> • You can use only one incremental FlashCopy mapping per source volume. • When you specify an incremental FlashCopy, you can have only one target set only in the target volumes file (.fct file name extension). A <i>target set</i> represents the mapping from the ESX host to the target volume on the storage system. The target volumes file contains a list of target volumes that are organized into target sets, where each target set represents one backup generation on the target volume. If you specify more than one target set, Common Information Model (CIM) errors can occur. • You cannot run a FlashCopy to a space efficient volume. <p>2 For SAN Volume Controller and Storwize family storage, when the source and target volumes are both space efficient volumes, there is no restriction on the type of copy operation.</p> <p>However, when the source volume is a fully allocated volume that is not space efficient and the target volume is space efficient, you must use the NOCOPY FlashCopy type only.</p> <p>For a space efficient FlashCopy operation, the amount of physical space that is used by the target volume is limited to the minimum amount of space that is required to maintain the copy.</p>		

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 that you make to the image are reflected in the backup copy.

XIV Storage System

IBM XIV Storage System snapshots differ from FlashCopy copy services.

Tivoli Storage FlashCopy Manager for VMware creates snapshot backups on the XIV system, the snapshot is a space-efficient read-only copy of the application data.

By using the **USE_WRITABLE_SNAPSHOTS** parameter, you can decide to create a read-only or writable snapshot backup. You can select a value for the parameter, when you use the console-based wizard during configuration.

To create a read-only snapshot backup, set the **USE_WRITABLE_SNAPSHOTS** parameter to NO. The snapshot image is not attached directly to a host. However, Tivoli Storage FlashCopy Manager for VMware creates a space-efficient logical copy of the snapshot that is attached to a host. The copy is removed after the snapshot backup is unattached.

Alternatively, you can set the **USE_WRITABLE_SNAPSHOTS** parameter to YES to create a writable snapshot. The snapshot is attached to a host and the host views the snapshot as a read and write volume rather than a read only volume. Any changes to the snapshot are preserved, and a subsequent attach, or backup operation, includes all changes that occurred to the snapshot while attached.

For information about how to configure the **USE_WRITABLE_SNAPSHOTS** parameter, see the “DEVICE_CLASS section” on page 115 of the Tivoli Storage FlashCopy Manager for VMware profile file.

Best practices for Tivoli Storage FlashCopy Manager with IBM XIV 11.6 Real-time Compression

You can use IBM XIV 11.6 Real-time Compression with Tivoli Storage FlashCopy Manager. The usage of Tivoli Storage FlashCopy Manager with compressed volumes does not change. However, when you transform volumes managed by Tivoli Storage FlashCopy Manager from the uncompressed state to the compressed state (or if you transform from compressed to uncompressed), use the following list of behaviors as a guide:

1. When source volume transformation is in progress (from uncompressed to compressed, or compressed to uncompressed), most Tivoli Storage FlashCopy Manager operations (for example, back up, restore, and mount) fail. The XIV adapter returns the **FMM18137E** message. Perform the volume transformation at a time that does not overlap with scheduled backups or other Tivoli Storage FlashCopy Manager actions running on the volume that is being transformed.
2. With the XIV system, you can transform a volume from uncompressed to compressed state (or compressed to uncompressed state) using one of the following options:
 - With the `delete_source=yes` option, delete all volume backups. If you do not delete the volume backups, the transform is unsuccessful. You can use the Tivoli Storage FlashCopy Manager GUI or CLI to manually delete the backups before the transform operation runs.
 - With the `delete_source=no` option, the volume backups are retained. After the transform completes, the original (source) volume is hidden from the host system. The original volume is replaced by the transformed volume. Any instant restore operation completed with the backups made before the transformation are restored to the hidden volume on the storage device. The

restore is not made to the volume seen by the host. Note that the restore to the volume seen by the host appears to be successful, but the source volume visible to the host system is unchanged.

When using Tivoli Storage FlashCopy Manager to protect volumes to be transformed, delete the existing snapshot backups, regardless of the `delete_source` option setting.

Software components

Tivoli Storage FlashCopy Manager for VMware contains several components.

The components provide services to communicate with the VMware vSphere application programming interface (API) and storage systems to protect data in a virtual environment.

The following components communicate with 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 agent, `acsgen`

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

Application agent

The application agent, `fccli`, enables snapshot-based protection of the vSphere environment. The agent identifies the objects that can be protected and processes the various virtual machine states when you run a backup operation.

Management agent

The management agent, `acsd`, coordinates all the components that are involved in backup and restore operations. The agent controls the flow of information between the virtual machines and device agents. The agent provides access to the snapshot backup repository. This repository contains information about the snapshot backups and their relationships to storage systems.

Device agent

The `acsgen` device agent is a generic agent that interacts with storage device-specific adapters when you back up or restore virtual machines. The storage-specific adapter sends storage-related commands to the storage system and receives progress updates from the storage system.

The following storage device-specific adapters communicate with the device agent, `acsgen`:

- The CIM adapter, `fmcima`, communicates with the `acsgen` agent and issues commands to DS8000, Storwize family, and SAN Volume Controller storage systems. All commands are issued through the Common Information Model (CIM) interface.

Note: For Storwize family and SAN Volume Controller storage systems, this communication using the CIM interface applies only in the case of static target allocation (type `SVC`); the new `SVC` adapter with dynamic target allocation (type `SVCDTA`) uses the CLI interface via Secure Shell (SSH) rather than the CIM interface.

- The XIV storage adapter communicates with the `acsgen` agent and issues commands to the XIV system through the XCLI command-line interface.

- The N series and NetApp storage adapter fmna communicates with the acsngen agent and issues commands to both storage systems through the ONTAPI interface.

Tivoli Storage FlashCopy Manager for VMware GUI

The graphical user interface (GUI) is integrated with the VMware vSphere Client and you can use the GUI to complete the following tasks:

- Schedule or initiate a backup of your virtual machines
- Start a full recovery of your virtual machines, virtual machine disks, or VMware datastores
- Attach and detach single virtual machine disks of a Tivoli Storage FlashCopy Manager for VMware backup to virtual machines
- Manage machines in the vCenter
- Issue reports concerning backup, restore, and configuration activity
- Obtain information about existing backups

You can use one of the following user interfaces:

- A stand-alone web browser GUI. Access this interface through a URL bookmark to the web server. For example:
<https://guihost.mycompany.com:9081/TsmVMwareUI/>
- An IBM Data Protection extension that you access from the VMware vSphere Web Client. The client connects to the web server in the vSphere environment.

You can use this extension to restore snapshot backups from the storage device or from stored images on Tivoli Storage Manager. The content is a subset of what is provided in the plug-in and web browser GUI.

- A plug-in that you access from the Solutions and Applications pane or the Classic Solution pane of the VMware vSphere Client.

Restriction: You cannot use this plug-in, in a VMware vSphere 6 environment.

- A Data Protection for VMware command-line interface.

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 the command-line interface to complete the following tasks:

- Start a backup of virtual machines or schedule a backup for a later time.
- Start a full restore operation of virtual machines, virtual machine files, or virtual machine disks. You can also restore VMware datastores and their associated virtual machines.
- View configuration information about the backup database and environment.
- Run a query to retrieve information about existing backups.
- Attach and detach single virtual machine disks of a Tivoli Storage FlashCopy Manager for VMware backup to virtual machines.

The GUI is the primary method to use. 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 GUI.

Additional information

Additional 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 Tivoli Storage FlashCopy Manager wiki (<https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/Tivoli%20Storage%20FlashCopy%20Manager>).
- Service Management Connect site at Storage Management community on Service Management Connect (<https://www.ibm.com/developerworks/servicemanagement/sm/index.html>).

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 you install 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: Tivoli Storage FlashCopy® Manager - All Requirements Doc (<http://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.

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 2. 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/	2 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.
- The value that is entered for the configuration parameter MAX_VERSIONS.

For remote mirroring on XIV system, a snapshot backup is created locally, which is then replicated on the remote site storage, consuming space in both locations. When the backup is deleted, either explicitly or due to MAX_VERSIONS, the snapshot is deleted on both sites.

On SAN Volume Controller, Storwize family, and DS8000, full snapshot copies require the same amount of space as the corresponding source volumes.

Space-efficient copies on SAN Volume Controller, Storwize family and XIV 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.

Required communication ports

Tivoli Storage FlashCopy Manager for VMware uses ports for communication with vCenter Server, vSphere clients, and storage systems. Ports numbers are defined during the installation of Tivoli Storage FlashCopy Manager for VMware.

To determine the port number for the ports that are used for Tivoli Storage FlashCopy Manager for VMware see the following table.

Table 3. Tivoli Storage FlashCopy Manager for VMware port numbers.

TCP Port	Initiator: Out-Bound (From Host)	Target: In-Bound (To Host)
443	vStorage backup server	vCenter Server (HTTPS port)
902	vCenter Server	ESXi hosts
443		
9080	vSphere Client	vStorage backup server (HTTP port for access to the vCenter through a plug-in)
9081	vSphere Client	vStorage backup server (secure HTTPS port for access to vCenter through a web browser)
5989 (HTTPS port) ^[1] 5988 (HTTP port) ^[1] Note: Not applicable if using the new SVC storage adapter, in which case port 22 must be accessible on SAN Volume Controller storage for SSH access.	vStorage backup server	SAN Volume Controller Storwize family cluster CIM agent
6989 (HTTPS port) ^[1] 6988 (HTTP port) ^[1]	vStorage backup server	DS8000 DS8000 CIM Agent
7778	vStorage backup server	XIV system XIV system CLI
<p>Note:</p> <p>[1]</p> <p>Where COPYSERVICES_COMMPROTOCOL is the corresponding parameter name in the profile.</p>		

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 with a Red Hat or SUSE Linux operating system.
- A virtual machine with a Red Hat or SUSE Linux operating system. The virtual machine is assigned to an ESX or ESXi host in the VMware datacenter.

You can install the software application on an existing virtual machine or physical server. However, do not install on a virtual machine that is stored on a datastore

that you intend to back up or restore at a later stage. The server or virtual machine where you install Tivoli Storage FlashCopy Manager for VMware is referred to as the vStorage backup server.

Tip: Create a dedicated datastore for the virtual machine where you intend to install the application software.

Optionally, you can install both Tivoli Storage FlashCopy Manager for VMware and IBM Tivoli Storage Manager for Virtual Environments, on a dedicated vStorage backup server. The server can be a physical server or a virtual machine. You can install both products on an existing server or virtual machine but the preferred method is to install on a dedicated server. If you install both products you can store VMware image backups on IBM Tivoli Storage Manager server.

Tivoli Storage FlashCopy Manager for VMware integrates with the VMware vSphere API and storage systems to back up and restore your virtual environment from the vStorage backup server. The vStorage backup server must have an IP connection to the VMware vCenter Server. There is a one-to-one relationship between the vCenter and the application installation.

Related concepts:

“VMware vCenter Server user privilege requirements” on page 37

Storage solutions

Before you install and configure 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.

You can have multiple device class sections in the profile configuration file. Each device class configures Tivoli Storage FlashCopy Manager for VMware for use with a particular storage device.

XIV system

An auxiliary host, is an ESX host that is used by 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 XIV 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 storage system. The following example shows a typical XIV system device class section from a sample 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
<<<
```

If you use the console-based wizard to 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 interval, in hours, between two subsequent reconciliation operations. Reconciliation is the process where Tivoli Storage FlashCopy Manager for VMware periodically verifies that backups on the storage system are valid. Snapshot backup images can be deleted, withdrawn, or stopped by certain operations on the storage system. When these events occur, it invalidates the snapshot backup. During the reconciliation process, snapshot backups that are either no longer present 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.

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 profile. You can specify the interval, when you use the console-based wizard to configure Tivoli Storage FlashCopy Manager for VMware.

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 series

Tivoli Storage FlashCopy Manager for VMware uses a Common Information Model (CIM) interface to communicate with the storage system. The CIM server and target volumes must be configured when you use, DS8000 storage in your environment.

For DS8000 R4.1 and later, the CIM interface is embedded into the storage device. You do not have to install and configure the CIM server 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 a proxy CIM server and an embedded CIM server.

You must create backup target volumes in advance on a DS8000 storage system. In addition, you must organize the target volumes into target sets and create a target set definition file. A *target set* represents the mapping from the ESX host to the target volume on the storage system. Each target set represents one backup generation and must contain at least one target volume. Tivoli Storage FlashCopy Manager for VMware automatically matches source volumes to qualified target volumes.

Storwize family and SAN Volume Controller

Tivoli Storage FlashCopy Manager for VMware offers two backup solutions with Storwize family and SAN Volume Controller storage systems.

When you configure Tivoli Storage FlashCopy Manager, you have a choice of Storwize family and SAN Volume Controller device types.

From the configuration wizard, you can select one of the following:

Storwize family and SAN Volume Controller: dynamic target allocation

Tivoli Storage FlashCopy Manager dynamically allocates target volumes on the storage system during the backup process.

Storwize family and SAN Volume Controller: static target allocation

You must manually create target volumes on the storage system.

Alternatively, specify SVCDDTA or SVC when prompted by the setup script with a choice of storage system types.

| Choose SVC for Storwize family and SAN Volume Controller static target
| allocation.

| Choose SVCDDTA for Storwize family and SAN Volume Controller dynamic target
| allocation.

The device type (**COPYSERVICES_HARDWARE_TYPE**) that you select is added to the device class section of the profile. The **COPYSERVICES_SERVERNAME** parameter stores the TCP/IP host name of the physical disk storage system.

Restriction: Both SVC and SVCDDTA values are considered as different hardware types so there are limitations when they are used on the same storage system. For more information, see the 'Restriction' section in "Configuring the system by using the configuration wizard" on page 64

For a predefined target solution, before you start a backup operation you must ensure that the following tasks are completed:

- Target volumes are created on the storage system
- Target sets for the volumes on the storage system are created

A *target set* represents the mapping from the ESX host to the target volume on the storage system. You must specify a new target set for each backup generation to be retained on the storage system.

The following table provides a feature comparison between dynamic target volumes and predefined target volumes.

Table 4. Dynamic target volumes and predefined target volumes feature comparison.

Feature	Dynamic target volumes	Static target volumes
Configuration interface	Storwize family or SAN Volume Controller command-line interface (CLI)	Common Information Model (CIM) interface
Number of FlashCopy snapshot images retained	No limit	Limited by the number of target sets defined
Selectively restore a single FlashCopy snapshot image	Yes	Yes, however any FlashCopy image in the target set that is newer than the FlashCopy restored is deleted

Dynamic target allocation

This solution creates dynamic target volumes on the storage system during a backup operation.

During the backup process, target volumes are created dynamically and allocated on demand. Tivoli Storage FlashCopy Manager for VMware uses the Storwize family or SAN Volume Controller command line interface (CLI) to communicate with the storage system. You do not need to install a Common Information Model (CIM) server.

Tip: Ensure that OpenSSH is installed on the vStorage backup server. During the configuration process, you are prompted for the location of the OpenSSH binary.

When you configure Tivoli Storage FlashCopy Manager for VMware, you can specify the number of backup generations to retain on the storage system. The number of backup generations applies to individual VMware datastore groups. A datastore group is the set of datastores that you select when you run a backup from the GUI or from the command line interface.

Important: You must set a specific number of backup generations to retain because of the space calculations for dynamic target allocation. The configuration wizard prevents you from using the ADAPTIVE option if at least one **DEVICE_CLASS** is of type SVCDDTA.

Static target allocation

This solution uses predefined target volumes on the storage device before you run a backup operation.

You must create backup target volumes in advance on SAN Volume Controller and Storwize family storage systems.

In addition, you must organize target volumes into target sets. A *target set* represents the mapping from the ESX host to the target volume on the storage system. Each target set represents one backup generation and must contain at least one target volume.

When you configure Tivoli Storage FlashCopy Manager for VMware, you define target sets for the storage system. You have two options for defining target sets. You can use a target naming pattern or a target set definition file. Tivoli Storage FlashCopy Manager for VMware automatically matches source volumes to qualified target volumes.

Tivoli Storage FlashCopy Manager for VMware uses a Common Information Model (CIM) interface to communicate with a storage system. For SAN Volume Controller V5.1 and later, and Storwize family storage systems, the CIM interface is embedded into the storage device. You do not have to install and configure the CIM server separately.

SAN Volume Controller and Storwize family features

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

The FlashCopy cascading feature 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.

For a space efficient FlashCopy operation, the amount of physical space that is used by the target volume is limited to the minimum amount of space that is required to maintain the copy.

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 family 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 family AUTOEXPAND option to create “auto-expandable” target volumes. In this case, extra storage is assigned to the target whenever storage capacity decreases and sufficient virtual storage capacity is available. The limit of the autoexpand is the capacity of the defined virtual storage.

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 displayed when a target volume in one mapping is a source volume in another mapping but is not the last mapping in the cascade.

Tip: This does not apply if you select SAN Volume Controller and Storwize family dynamic target allocation.

Space-efficient targets

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 family 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.

Tip: This does not apply if you select SAN Volume Controller and Storwize family dynamic target allocation.

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.

Complete parameter descriptions are available in Chapter 7, “Tivoli Storage FlashCopy Manager for VMware configuration files,” on page 105.

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 selected 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
...
<<<

```

Reconciliation of backups

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

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

The reconciliation process removes Tivoli Storage FlashCopy Manager backups when the following events take place on storage systems:

All storage systems

Manual intervention causes the following events to occur:

- The source and target volume relationship is withdrawn
- The backup image is deleted

Storwize family and SAN Volume Controller

During a backup if you specify the **FLASHCOPY_TYPE** parameter as *NOCOPY* or *INCR* type, the source and target volume relationship is validated as part of the backup operation. If the source and target volume relationship is withdrawn, this process might result in the target volume to go offline and the corresponding backup becomes invalid.

During a backup if you specify 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.

Note: The new SVC adapter with dynamic target allocation supports the *NOCOPY* type only.

DS8000

During a backup if you specify the **FLASHCOPY_TYPE** parameter as *NOCOPY* or *INCR* type, the source and target volume relationship is validated as part of the backup operation. If the source and target volume relationship is withdrawn, this process might result in the target volume to go offline and the corresponding backup becomes invalid.

During a backup if you specify 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.

Use the **RECON_INTERVAL** parameter to specify the interval, in hours, between two subsequent reconciliation operations.

Related concepts:

“Selecting the FLASHCOPY_TYPE” on page 62

Related reference:

“DEVICE_CLASS section” on page 115

Data replication between sites

You must prepare Tivoli Storage FlashCopy Manager for VMware for backup and restore operations, when you use storage solutions that use mirror replication or use VMware vCenter Site Recovery Manager for array-based replication between sites.

Integration with VMware vCenter Site Recovery Manager

Tivoli Storage FlashCopy Manager for VMware can protect VMware datastores and virtual machines 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 primary (protected) site and the secondary (recovery) site. Tivoli Storage FlashCopy Manager for VMware can protect data at the primary site. For datastores that are replicated by using array-based replication, Tivoli Storage FlashCopy Manager for VMware can also back up datastores on the secondary site, see “Planning for installation with VMware SRM and array-based replication” on page 28 for details.

At a minimum, you must install Tivoli Storage FlashCopy Manager for VMware at the primary site. However, to be fully prepared for disaster recovery or failover, install Tivoli Storage FlashCopy Manager for VMware also at the secondary site.

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

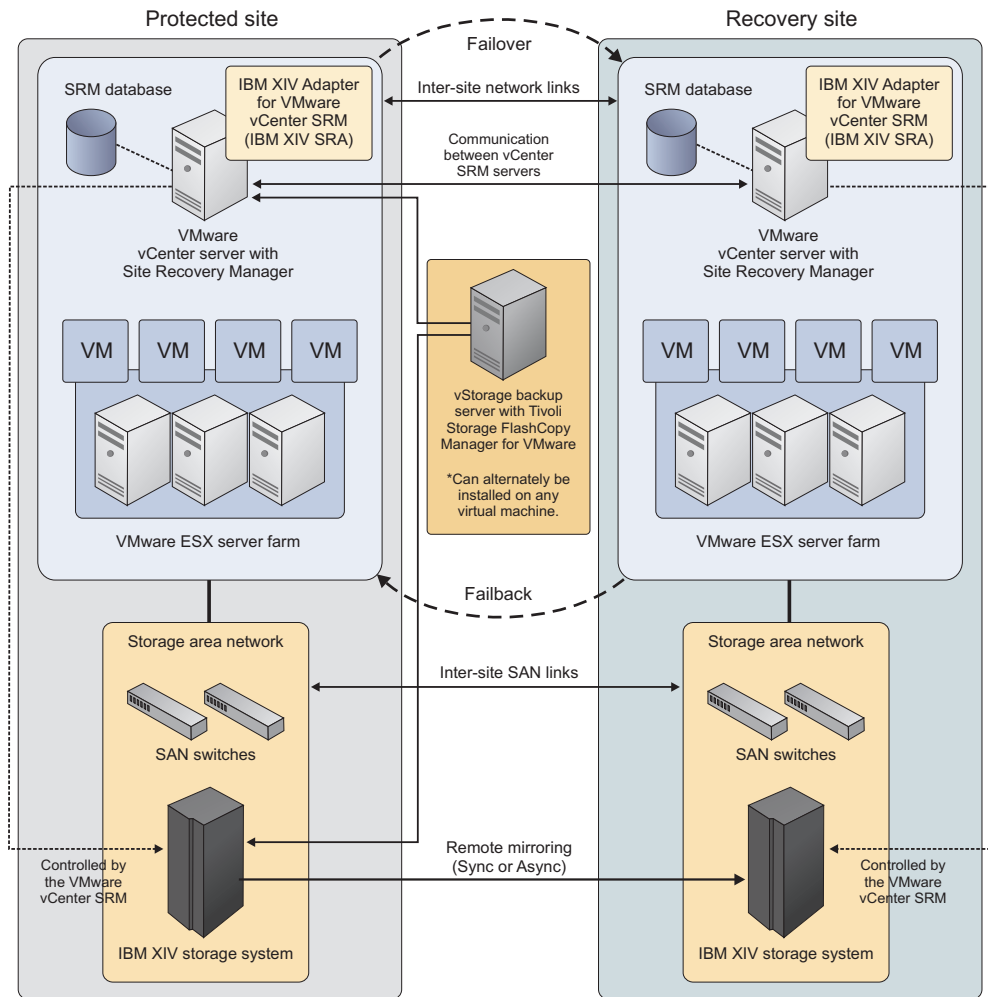


Figure 3. Tivoli Storage FlashCopy Manager for VMware in a VMware vCenter Site Recovery Manager environment

Related concepts:

“Planning for installation with VMware SRM and array-based replication” on page 28

Remote mirroring

Tivoli Storage FlashCopy Manager for VMware backs up virtual machines and VMware datastores on IBM System Storage SAN Volume Controller, IBM Storwize family, and IBM XIV Storage System systems that use mirroring functions.

Metro Mirror and Global Mirror are two types of remote-copy operations that you can use to set up a relationship between two volumes. The updates made to one volume are mirrored on the other volume.

Metro Mirror is a method of synchronous remote data replication that operates between two sites. Metro Mirror replication maintains identical data in both the source and target. When a write is issued to the source copy, the changes that are made to the source data are propagated to the target before the write finishes posting.

Global Mirror is a method of asynchronous remote data replication that operates between two sites. It maintains identical data in both the source and target, where the source is located in one storage system and the target is located in another storage system. The data on the target is typically written a few seconds after the data is written to the source volumes. When a write is issued to the source copy, the change is propagated to the target copy. However, subsequent changes are allowed to the source before the target verifies that it has received the change.

SAN Volume Controller and Storwize storage systems provide Metro Mirror and Global Mirror functions. Similarly, XIV systems provide synchronous or asynchronous mirror functions. Tivoli Storage FlashCopy Manager for VMware can back up the source or the target volumes on Metro Mirror, Global Mirror, synchronous or asynchronous mirrors.

Restriction: The new SVC adapter with dynamic target allocation does not support remote mirroring.

The following figure illustrates a typical configuration at both the primary and secondary sites.

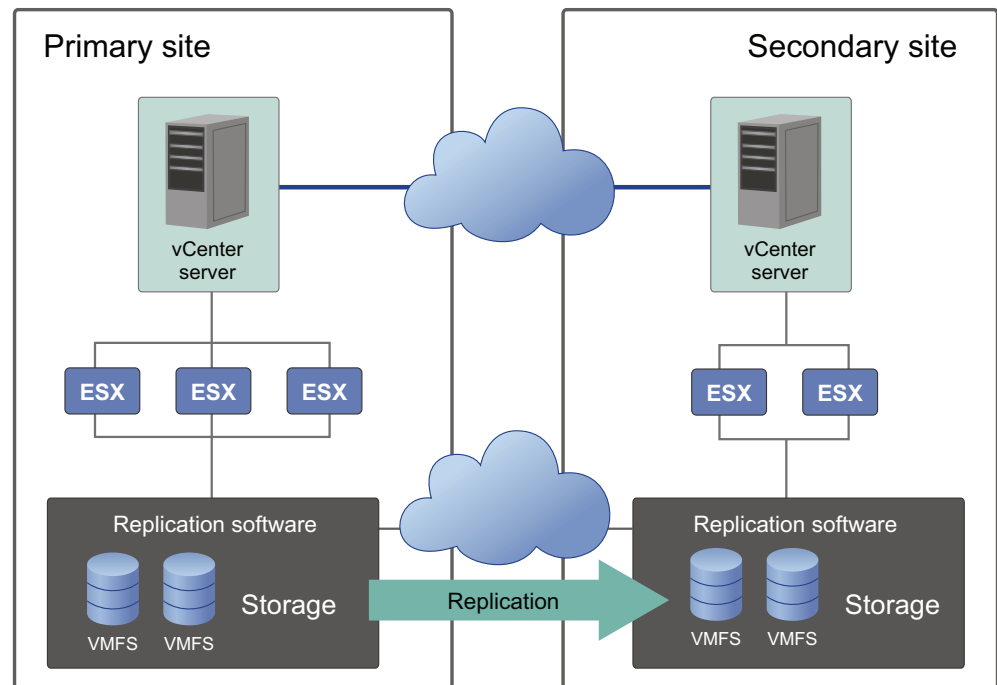


Figure 4. Remote mirroring between sites

Planning for remote mirroring and consistency groups

You must verify the configuration of the consistency group on SAN Volume Controller and XIV system systems that use mirroring functions before you run Tivoli Storage FlashCopy Manager for VMware backup operations.

A *consistency group* is a group of copy relationships. You can group relationships into a consistency group that manages the consistency of dependent writes by creating a consistent point-in-time copy across multiple volumes or storage systems.

You must ensure that connectivity state is online and configured for a SAN connection between the primary and secondary storage systems. The primary site contains the primary storage volumes for the production site. The volumes are then replicated to target volumes on the secondary site. Tivoli Storage FlashCopy Manager for VMware requires the following configuration:

- For SAN Volume Controller, you must configure the consistency group:
 - For Metro Mirrors, ensure that the state of the consistency group is consistently synchronized.
 - For Global Mirrors, you must configure a *Global Mirror with Change Volumes* relationship:
 - Ensure that you select the Global Mirror with Change volumes option when you create the relationship between the volumes. Global Mirror with Change Volumes is the name for a point-in-time asynchronous volume replication. You can create change volumes either when you create the Global Mirror relationships or you can add them to an existing relationship.
 - Ensure that the consistency group for this relationship, has cycling mode set to *multiple*. When you select a multiple cycling mode, changes are tracked and copied to intermediate change volumes. An internal FlashCopy operation occurs between the source volume and the source change volume. The changes are then transmitted to the secondary site periodically to lower the bandwidth requirements.

The cycle period time set for the cycling mode and the number of I/O operations can influence the Tivoli Storage FlashCopy Manager for VMware FlashCopy backup time. Tivoli Storage FlashCopy Manager for VMware waits until the volumes at both sites are synchronized before a backup operation is completed. The cycle period is defined in seconds. The higher the cycle period the longer the time potentially that is required for synchronization and therefore to complete a FlashCopy backup. The factors that can influence the time are the number of I/O operations and the spread of the block-level changes across the storage system. The default value is 300 seconds.

Restriction: When you set the cycle period, the initial replication from the primary site change volume to the secondary change volume can take several hours before the volumes are synchronized. If you start a Tivoli Storage FlashCopy Manager for VMware backup operation during this initial replication, the backup operation can fail due to the amount of time that is taken to complete the synchronization operation. Therefore, wait until the initial replication of change volumes is completed before you start a backup operation.

- For XIV systems, you must configure the consistency groups:
 - The consistency group must contain a list of mirrors.

- The consistency group must contain a list of all of the remote copy target-volumes and this list must exist before you start the snapshot on the remote system.
- The mirror relationship between the master (source) and slave (target) volumes must be defined in the consistency group. The master is located on the source volume. The slave is located on the target volume.
- For synchronous mirroring, the state of the consistency group must be consistently synchronized.
- For asynchronous mirroring, the state of the consistency group must be RPO_OK.

Planning for installation with remote mirroring replication

Tivoli Storage FlashCopy Manager for VMware can be installed in more than one location when you use storage systems that use mirroring functions.

Before you begin

See the *Pre-installation Checklist* before you install Tivoli Storage FlashCopy Manager for VMware when you use storage systems that use mirroring functions. 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 Tivoli Storage FlashCopy® Manager - All Requirements Doc (<http://www.ibm.com/support/docview.wss?uid=swg21427692>). Follow the link to the requirements technote for your specific release or update level.

Procedure

1. At the primary site, install Tivoli Storage FlashCopy Manager for VMware on the vStorage backup server. The vStorage backup server can be a physical server or a virtual machine.

Tip: If the Tivoli Storage FlashCopy Manager for VMware repository and the vmcli database are on a mirrored volume, the files are automatically replicated to the secondary site for disaster recovery or failover. If you do not use this method, you must ensure that this data is replicated to the secondary site regularly.

2. At the secondary site, you can install Tivoli Storage FlashCopy Manager for VMware on the vStorage backup server. This installation is not required in advance and if a failover occurs you can then install at the secondary site. However, to be prepared for disaster recovery or failover, install Tivoli Storage FlashCopy Manager for VMware on the vStorage backup server at the secondary site.
3. Optional: Install Tivoli Storage Manager for Virtual Environments and Tivoli Storage Manager backup-archive client on the vStorage backup server at the primary site if you want to offload backups to Tivoli Storage Manager.

Example

The following figure illustrates one method of how to install Tivoli Storage FlashCopy Manager for VMware both at the primary and the secondary sites.

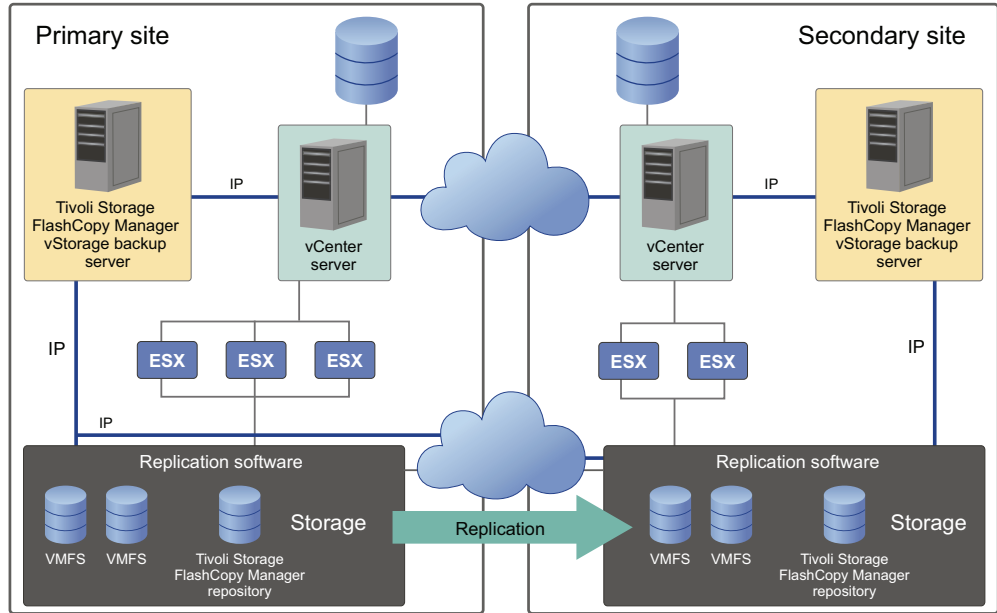


Figure 5. Tivoli Storage FlashCopy Manager for VMware remote mirroring between sites

Planning for installation with VMware SRM and array-based replication

Tivoli Storage FlashCopy Manager for VMware can protect VMware datastores and virtual machines both at the primary site and secondary site, when you use VMware vCenter Site Recovery Manager (SRM) installation and array-based replication.

When you use array-based replication, one or more storage arrays at the primary site replicate data to similar arrays at the secondary site. To back up and restore these datastores at the primary site or secondary site, at a minimum you must install Tivoli Storage FlashCopy Manager for VMware on the vStorage backup server at the primary site. To ensure immediate availability in the event of a failover operation, install Tivoli Storage FlashCopy Manager for VMware on a virtual machine that is protected by VMware SRM. This setup ensures that the Tivoli Storage FlashCopy Manager for VMware application, repository, and vmcli database are automatically replicated to the secondary site, see the following figure for details of this scenario.

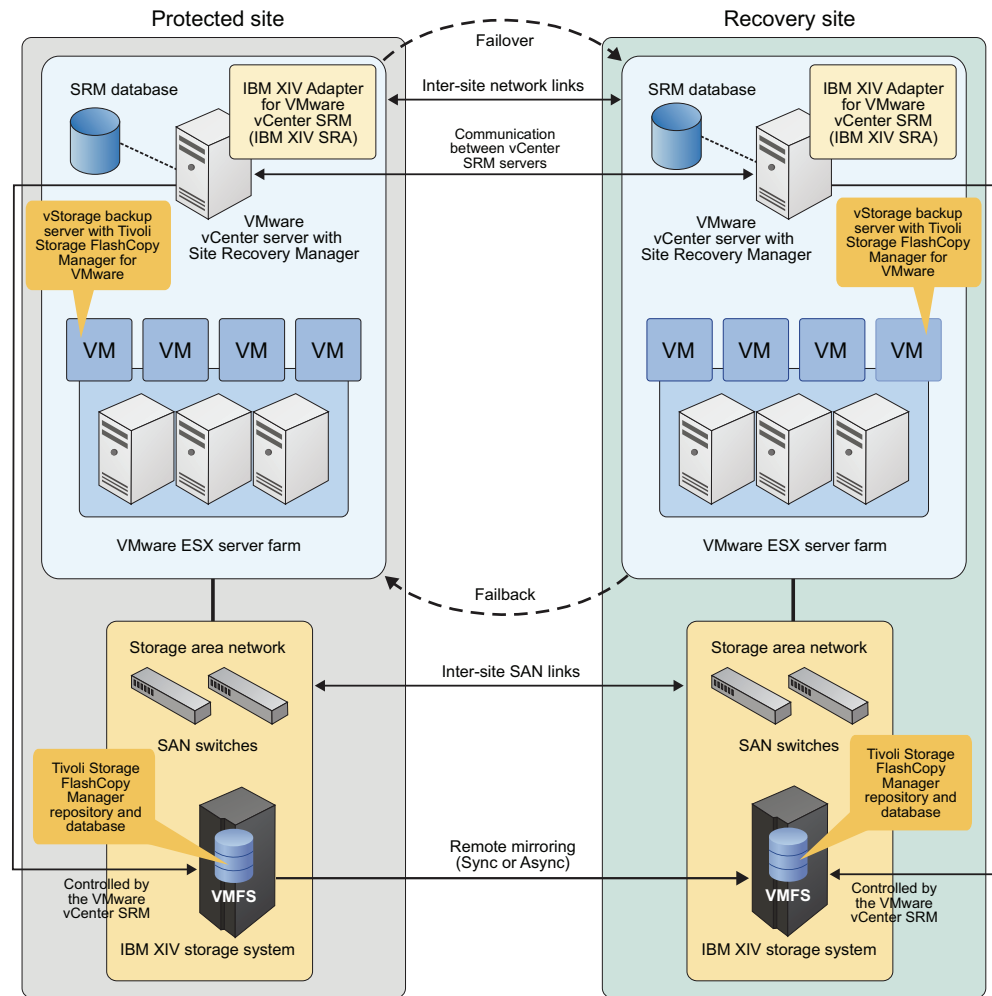


Figure 6. Tivoli Storage FlashCopy Manager for VMware VM installation in a VMware vCenter Site Recovery Manager environment

Alternatively, you can install Tivoli Storage FlashCopy Manager for VMware on a physical or non-protected virtualized vStorage backup server.

Related concepts:

“Integration with VMware vCenter Site Recovery Manager” on page 23

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 operation 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 back up 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.
- When you use Tivoli Storage FlashCopy Manager for VMware with Tivoli Storage Manager for Virtual Environments, you can offload virtual machine backups to Tivoli Storage Manager. However, the raw device mapping disks are not included in the offload. Also, you must ensure that the VMCLI section of the profile file that relates to Tivoli Storage Manager for Virtual Environments is 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

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 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. A vApp, can include all components of a multitier application and also includes the operational policies and associated service levels of the application that is contained within 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 is different, 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.

Interoperability

When you use Tivoli Storage FlashCopy Manager for VMware with Tivoli Storage Manager for Virtual Environments: Data Protection for VMware, you can store VMware image backups on Tivoli Storage Manager server storage. Installing both applications provides efficient long-term backup storage with progressive incremental and deduplication features.

Data protection in a virtualized environment

Tivoli Storage FlashCopy Manager for VMware enables a policy where fast restores can be made from local storage arrays and Data Protection for VMware enables the longer retention of backups on Tivoli Storage Manager storage.

The following backup strategies can be used in a virtual environment:

- In-guest backups are started on the virtual machine and treat virtual machines similar to physical systems. The backup agent is installed on the guest operating system. A file level backup or block level backup image can be created and used for recovery. There is an extra ESX resource load. The in-guest backup approach can be used together with Tivoli Storage FlashCopy Manager for VMware and Data Protection for VMware.
- On-host backups start on the ESX host and not on the virtual machine. The backup agent is installed on the host operating system. Similar to in-guest backups there is an ESX resource load. This approach is not recommended for Tivoli Storage FlashCopy Manager for VMware.
- Off-host backups are started on a dedicated vStorage backup server. The backup agent is installed on the dedicated server and uses the vStorage API to create file level and guest level image backups. The 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 Data Protection for VMware are an off-host backup solution.

Install both products on a dedicated server, the vStorage backup server. By using both products, you minimize the amount of time that backup snapshots are on the production system.

Before you decide on a data protection solution in a VMware vSphere environment, consider the following items:

- Recovery time objectives (RTO) - block-level recovery from an off-host backup solution can give shorter recovery times as compared to recovery times from an in-guest backup solution. In-guest backup solution requires that the backup and recovery agent are started in the virtual machine.
- Recovery point objectives (RPO) - in-guest backup allows recovery of transaction logs. Transaction logs can minimize the data loss in a recovery scenario.
- Type of storage - raw device mapping disks in physical compatibility mode cannot be the target of a VMware snapshot operation. Therefore, if you use this type of raw device mapping configuration an in-guest solution is the best option.
- Other considerations that you must consider are the storage vendor, data layout, Tivoli Storage Manager server configuration, and long-term recovery requirements.

The following table shows scenarios that you can consider before you choose a backup method and which solution or solutions to use.

Table 5. Scenarios and products to use.

Scenario	Tivoli Storage Manager for Virtual Environments	Tivoli Storage FlashCopy Manager for VMware
Virtual machine with no applications required to be protected or no specific requirements.	√	
Virtual machines with no applications required to be protected but you require aggressive recovery times and point objectives. For example, you must be able to do a quick restore.		√ A fast method to back up and recover virtual machines.
Item level recovery operations are required frequently. For example, file-level recovery and volume instant restore.	√	
Where multiple storage devices and their respective backup locations are linked by using consistency groups or backup time constraints exist between multiple virtual machines.		√ You can group these VMs within the same VMware datastore or set of VMware datastores.
Virtual machine backups do not need to be offloaded to an external storage device.		√
Virtual machine backups must be offloaded to an external storage device.	√	√
There is a space constraint to store virtual machine backups.	√ You can benefit from the Tivoli Storage Manager client or server deduplication feature.	

Planning to install both products

Before you install Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments: Data Protection for VMware, be familiar with your operating systems, storage devices, communication protocols, and system configurations.

Review the hardware and software requirements

Use the following table to find the requirement documents for both products.

Table 6. Links to hardware and software requirements.

Review	Product	Key topics
Hardware and software requirements	Tivoli Storage FlashCopy Manager for VMware	For the current requirements, review the <i>Hardware and Software Requirements</i> technote that is associated with the Tivoli Storage FlashCopy Manager release. This technote is available in the <i>Tivoli Storage FlashCopy Manager - All Requirement Documents</i> website at: Tivoli Storage FlashCopy® Manager - All Requirements Doc (http://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.
	Data Protection for VMware	For the current requirements, review the Linux Installation roadmap(http://www.ibm.com/support/knowledgecenter/SS8TDQ_7.1.4/ve.inst/c_ve_tasks_table.html).
	Storage requirements	For the current storage requirements, review "Storage solutions" on page 16.

Interoperability requirements

When you install both products, ensure that the versions are compatible. For example, Tivoli Storage FlashCopy Manager for VMware Version 4.1.1 is compatible with Data Protection for VMware Version 7.1.1. The following table describes the versions that are compatible.

Table 7. Version compatibility.

Tivoli Storage Manager for Virtual Environments version information	Tivoli Storage FlashCopy Manager for VMware version information
6.3	3.1
6.4	3.2
7.1.0	4.1.0
7.1.1	4.1.1
7.1.2	4.1.2
7.1.3	4.1.3
7.1.4	4.1.4

Topics for installing and configuring

Use the following table to identify the installation and configuration topics for Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments.

Table 8. Links to installation and configuration topics.

Product	Type	Key topics
Tivoli Storage FlashCopy Manager for VMware	Installation	Chapter 3, "Installing and upgrading," on page 37
	Configuration	Chapter 4, "Configuring Tivoli Storage FlashCopy Manager for VMware," on page 49
Tivoli Storage Manager for Virtual Environments	Installation and configuration	Installation roadmap(http://www.ibm.com/support/knowledgecenter/SS8TDQ_7.1.4/ve.inst/c_ve_tasks_table.html) and see the section <i>Installation of selected features on Linux with InstallAnywhere mode</i>
Tivoli Storage Manager backup-archive client	Installation	Follow the instructions in the <i>Installation of selected features on Linux with InstallAnywhere mode</i> topic and install the Tivoli Storage Manager backup-archive client data mover packages.
	Configuration Tivoli Storage Manager server	Configuring Tivoli Storage Manager server to work with the integrated products at http://www.ibm.com/support/knowledgecenter/SS8TDQ_7.1.4/ve.inst/t_ve_cfg_regtsmnodes.html?lang=en

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: 4.1.4.0-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: Tivoli Storage FlashCopy® Manager - All Requirements Doc (<http://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.

VMware vCenter Server user privilege requirements

The user ID that you use to register the VMware vCenter plug-in during the installation must be a VMware administrator that has privileges to register and unregister extensions. After the installation, the user credentials that you use to authenticate to the vCenter Server and log in to the Tivoli Storage FlashCopy Manager for VMware GUI must have privileges to view the VMware datacenters. You require a separate set of privileges to access the restore points when you use the IBM Data Protection extension.

vCenter Server privileges required for installation

To install the Tivoli Storage FlashCopy Manager for VMware GUI, the vSphere user requires the **Extension > Register extension, Unregister extension, Update extension** privileges. From the VMware vSphere client, you can create a role and add to the role the extension set of associated privileges. You must then assign this role to the vCenter object in the VMware vCenter Server hierarchy for the user ID that you plan to use during the installation process. You must enter this user ID when prompted for the vCenter user name on the Plug-in Registration vCenter page during the installation.

Tip: Alternatively, rather than creating a specific role for the installation, you can enter the administrator user name when prompted for the vCenter user name.

vCenter Server privileges required to protect VMware datacenters with the GUI

The vCenter Server credentials that you enter to log in to the Tivoli Storage FlashCopy Manager for VMware GUI must have the correct privileges to view the VMware datacenters. Similarly, when prompted by the GUI configuration wizard, to enter the vCenter Server credentials, the user ID must have the correct privileges assigned. The privileges are verified by the wizard and this value is saved to the profile file.

From the VMware vSphere web client, you must create a role with a set of privileges. See Table 9 for a list of all objects and associated privileges that must be selected. You must assign this role to a user ID for a specified vCenter Server or datacenter.

If you want to propagate the privileges to all datacenters within the vCenter, specify the vCenter Server and select the propagate to children check box. Otherwise, you can limit the permissions if you assign the role to the required datacenters only with the propagate to children check box selected. The Tivoli Storage FlashCopy Manager for VMware GUI enforces privileges at the datacenter level.

The following table shows the privileges for the role that is associated with the user ID that you plan to use to authenticate to the vCenter Server.

Table 9. Privileges that are required for the role assigned to the Tivoli Storage FlashCopy Manager for VMware user ID.

vCenter Server objects	Associated privileges that are required
Datastore	Allocate space, Browse datastore, Configure datastore, Low-level file operations, Move datastore, Remove datastore, Rename datastore, Update virtual machine files
Extension	Register extension, Unregister extension, Update extension
Folder	Create folder, Delete folder, Rename folder
Global	Log event
Host > Configuration	Storage partition configuration, System Management, System resources
Network	Assign network
Resource	Assign virtual machine to resource pool
Tasks	Create task, Update task
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, Swap file placement, Upgrade virtual machine compatibility ^[2]
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

Table 9. Privileges that are required for the role assigned to the Tivoli Storage FlashCopy Manager for VMware user ID (continued).

vCenter Server objects	Associated privileges that are required
Virtual machine > Provisioning	Allow disk access, Allow read-only disk access, Allow virtual machine download, Allow virtual machine files upload
Virtual machine > Snapshot management ^[1]	Create snapshot, Remove snapshot, Revert to snapshot
<p>Note:</p> <p>[1] For vSphere V5.0, this object is named Virtual machine > State.</p> <p>[2] For vSphere V5.0, this privilege is named Upgrade virtual hardware.</p>	

Tip: When you create a role, consider adding extra privileges to the role that you might need later to complete other tasks on objects.

The following example shows how to control access to datacenters for two VMware users. User 1 requires access to protect virtual machines for the NewYork_DC and Boston_DC datacenters. User 2 requires access to protect virtual machines for the LosAngeles_DC and SanFrancisco_DC datacenters.

From the VMware vSphere client, create for example the “FlashCopy Manager Administrator” role, assign the privileges that are listed in Table 9 on page 38.

For user 1, assign the “FlashCopy Manager Administrator” role to the NewYork_DC and Boston_DC datacenters. Ensure that propagate to children check box is selected. For user 2, assign the “FlashCopy Manager Administrator” role to the LosAngeles_DC and SanFrancisco_DC datacenters. Ensure that propagate to children check box is selected.

From the GUI, the users can view and protect virtual machines in their respective datacenters only.

vCenter Server privileges required to use the IBM Data Protection extension

You can install the IBM Data Protection extension, which is a vSphere web client extension that connects to a Data Protection for VMware GUI web server. You can use this extension to restore virtual machines from Tivoli Storage FlashCopy Manager for VMware hardware snapshot backups. To use the IBM Data Protection extension, you require a separate set of privileges from the privileges that are required to use the Tivoli Storage FlashCopy Manager for VMware GUI.

One IBM Data Protection extension is registered for each vCenter Server and is shared by all GUI hosts that are configured to support the vCenter Server. During the installation the following custom privileges are created for the IBM Data Protection extension:

- **Datacenter > IBM Data Protection**
- **Global > IBM Data Protection**

From the VMware vSphere client, grant to a specific administrator user ID the **Global > IBM Data Protection** role on the vCenter Server object. This administrator can then edit or delete the connections between the specified vCenter Server and the Data Protection for VMware web GUI host from the **IBM Data Protection > Connections** tab.

From the VMware vSphere web client, create for example the “IBMDDataProtectRestore” role, assign the standard virtual machine administrator role privileges and also the **Datacenter > IBM Data Protection** privilege. For each datacenter, assign this role for each user or user group where you want to grant permission for the user to restore virtual machines.

The following example shows how to control access to datacenters for two groups. Group 1 requires access to restore virtual machines for the NewYork_DC and Boston_DC datacenters. Group 2 requires access to restore virtual machines for the LosAngeles_DC and SanFrancisco_DC datacenters.

From the VMware vSphere client, create for example the “IBMDDataProtectRestore” role, assign the standard virtual machine administrator role privileges and also the **Datacenter > IBM Data Protection** privilege.

For Group 1, assign the “IBMDDataProtectRestore” role to the NewYork_DC and Boston_DC datacenters. For Group 2, assign the “IBMDDataProtectRestore” role to the LosAngeles_DC and SanFrancisco_DC datacenters.

The users in each group can use the IBM Data Protection extension in the vSphere web client to restore virtual machines in their respective datacenters only.

Installation components and directories

Tivoli Storage FlashCopy Manager for VMware installs several components during the installation. Some of these components are shared with IBM Tivoli Storage Manager for Virtual Environments: Data Protection for VMware. These components are not installed again if Data Protection for VMware is already installed before you begin.

The following daemons, components, and script are installed by Tivoli Storage FlashCopy Manager for VMware:

- The Tivoli Storage FlashCopy Manager for VMware daemons, for example, `acsd` management agent, `acsgen` device agent, `vmware`, and `fcmccli`
- The message catalogs
- The setup script
- The Tivoli Storage FlashCopy Manager for VMware license file
- IBM Global Security Kit

The following components are installed by Tivoli Storage FlashCopy Manager for VMware and are shared with Data Protection for VMware:

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

When Data Protection for VMware is already installed on the vStorage backup server or on a virtual machine, these common components are not installed again when you install Tivoli Storage FlashCopy Manager for VMware.

The following directories are created during the installation:

- Tivoli Storage FlashCopy Manager for VMware is installed into the `/opt/tivoli/tsm/tdpvmware/fcm` directory.
- All common components except WebSphere Application Server are installed into the `/opt/tivoli/tsm/tdpvmware/common` directory.
- WebSphere Application Server is installed in the `/opt/tivoli/tsm/tdpvmware/common/webserver` 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.

The GUI installation wizard requires a graphical X Window System installation. Make sure 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.

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. The `tdpvmware` user name ID is automatically assigned and after the installation you use the `tdpvmware` user name to log in to the vStorage backup server and configure Tivoli Storage FlashCopy Manager for VMware.
- **Advanced**, this method installs Tivoli Storage FlashCopy Manager for VMware with installation options that you can customize. For example, you can enter an alternative user name ID or accept the `tdpvmware` default user name.

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:
`./4.1.4.0-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 Tivoli Storage FlashCopy Manager for VMware 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 9.

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 Plug-in Registration vCenter page, specify the following options:
 - Web Server HTTP Port
 - Web Server HTTPS Port
 - Web Server keystore Password
 - SSL Certificate Expiration (years)

Click **Next**.

9. On the vSphere protection GUI information page, select one or more of the following methods to access the Tivoli Storage FlashCopy Manager for VMware GUI:
 - To access the GUI in a web browser, select the **Enable access to the GUI by web browser** check box.
 - To access the GUI as an extension accessible in the VMware vSphere Web Client, select the **Register the vSphere Web Client extension** check box. You can use this extension to restore virtual machines from a Tivoli Storage FlashCopy Manager for VMware hardware snapshot backup.
 - To access the GUI as an extension in the Solutions and Applications pane of your vCenter Server System, select the **Register GUI as vCenter plug-in** check box.

Tip: This option is not supported in a VMware vSphere 6 environment.

10. On the Plug-in Registration vCenter page, register the Tivoli Storage FlashCopy Manager for VMware GUI with the vCenter Server. Specify the following options:
 - The vCenter Server IP address or name.
 - The vCenter user name. This user must be a VMware administrator that has permission to register and unregister extensions.
 - The vCenter password.

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:

```
./4.1.4.0-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.

Related tasks:

“Installing by using the installation wizard” on page 41

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:

```
./4.1.4.0-TIV-TSFCM-VMware.bin [-i console] -DRECORDFILE=/tmp/installer.properties
```

Note: To create the properties file containing all the parameters, IBM Tivoli Storage Manager for Virtual Environments cannot be installed on the server when you create 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:

```
./4.1.4.0-TIV-TSFCM-VMware.bin -i silent -f installer.properties
```

Specify the full path name for the properties file.

Sample properties file

```
USERNAME=tdpvmware
VMCLI_DB_PORT=1527
WEBSERVER_PORT=9080
WEBSERVER_SECUREPORT=9081
KEYSTORE_PASSWORD=defaultpw
SSL_CERTIFICATE=10
WEBSERVER_HOSTNAME=hostname
WEBSERVER_ADDRESS=hostname.mycompany.com
VCENTER_HOSTNAME=my_vcenter_server
VCENTER_USERNAME=root
VCENTER_PASSWORD=password
DIRECT_START=yes
REGISTER_PLUGIN_VCENTER=yes
REGISTER_WEBCLIENT_EXTENSION=yes
LICENSE_ACCEPTED=TRUE
USER_INSTALL_DIR=/opt/tivoli/tsm/tdpvmware
```

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.

Upgrading

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 4.1.4. 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:

```
./4.1.4.0-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:

- Optional: To enforce SP 800-131A compliant encryption, during the configuration of Tivoli Storage FlashCopy Manager for VMware, you must set the **ENFORCE_TLS12** parameter to YES by running the setup script in advanced mode. This step requires that the certificate must meet the requirements as specified in SP 800-131A standard. You must delete any self-signed certificates that were created by Version 3.2 or earlier 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.*
```

To create new self-signed certificates, you can run the setup script. Alternatively, from the GUI start the configuration wizard and follow the instructions to

complete the entire configuration process 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. However, to set the **ENFORCE_TLS12** parameter to YES you must run the setup script in advanced mode `./setup.sh -advanced`. At any time, it is possible to delete the self-signed certificates and generate new certificates.

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 or from the GUI use the configuration wizard to configure the profile file.
- For Version 3.2 or earlier, if you do not configure the profile 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 either to run the `./setup.sh` script or from the GUI use the configuration wizard.

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 4.1.4. You must also upgrade Data Protection for VMware to version 7.1.4, 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:
`./4.1.4.0-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:

- Optional: To enforce SP 800-131A compliant encryption, during the configuration of Tivoli Storage FlashCopy Manager for VMware, you must set the **ENFORCE_TLS12** parameter to YES by running the setup script in advanced mode. This step requires that the certificate must meet the requirements as specified in SP 800-131A standard. You must delete any self-signed certificates that were created by Version 3.2 or earlier 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.*
```

To create new self-signed certificates, you can run the setup script. Alternatively, from the GUI start the configuration wizard and follow the instructions to complete the entire configuration process 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. However, to set the **ENFORCE_TLS12** parameter to YES you must run the setup script in advanced mode `./setup.sh -advanced`. At any time, it is possible to delete the self-signed certificates and generate new certificates.

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 or from the GUI use the configuration wizard to configure the profile file.
- For Version 3.2 or earlier, if you do not configure the profile 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 or from the GUI use the configuration wizard.
- If Data Protection for VMware V6.2, V6.3 or V6.4 is installed, upgrade to version 7.1.4. For information about how to upgrade, see Tivoli Storage Manager for Virtual Environments documentation (http://www.ibm.com/support/knowledgecenter/SS8TDQ_7.1.4/ve.user/r_readmes_ve71x.html).
- You must upgrade all data mover nodes to Tivoli Storage Manager Backup-Archive Client 7.1.4 level. For information about how to upgrade the data mover nodes, see Upgrading the data mover nodes on the vStorage Backup Server (http://www.ibm.com/support/knowledgecenter/SS8TDQ_7.1.4/ve.inst/t_ve_upgradingdms.html).

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/tdpvmware/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/tdpvmware/fcm/uninstall/uninstall-FCM-VMware
```

To uninstall in console mode, use the following command:

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

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

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

This application unregisters the Tivoli Storage FlashCopy Manager for VMware GUI 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 Tivoli Storage FlashCopy Manager for VMware GUI. The user name that you specify must have the privileges that are required to unregister extension privileges. If you use a silent uninstallation, the properties file must contain the following parameters that are needed to unregister the Tivoli Storage FlashCopy Manager for VMware GUI:

- 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
- IBM Data Protection extension
- The Tivoli Storage FlashCopy Manager for VMware GUI
- The vmcli database
- The Data Protection for VMware command-line interface
- IBM GSKit components

The Tivoli Storage FlashCopy Manager for VMware GUI 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 you install, you must configure IBM Tivoli Storage FlashCopy Manager for VMware for your environment. Tivoli Storage FlashCopy Manager for VMware requires a profile, target volumes (for certain configurations), and password configuration files. You can use the `setup.sh` setup script or the configuration wizard to create a Tivoli Storage FlashCopy Manager for VMware profile file.

About this task

To configure Tivoli Storage FlashCopy Manager for VMware you can use the setup script or configuration wizard to create or edit the profile and password files.

The profile file

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

The target volumes file

You must create a target volumes file for DS8000 systems. The target volumes file contains a list of target volumes that are organized into target sets, where each target set represents one backup generation on the target volume. For Storwize family and SAN Volume Controller storage systems, you can use either use a target volumes file or use the `TARGET_NAMING` parameter to specify a naming pattern for the target volumes. Creating the target volumes is not required for other storage systems.

Note: The new SVC adapter with dynamic target allocation does not require you to create any target volumes on Storwize family or SAN Volume Controller storage systems.

The password file

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

Tivoli Storage FlashCopy Manager for VMware profile

A profile configuration file includes parameters and options that determine how Tivoli Storage FlashCopy Manager for VMware backs up and restores data in your environment.

A profile file must be available on the server where the management agent, the `acsd` daemon, is running. You create or update the profile by using the setup script or the configuration wizard.

The profile is created in the `$HOME/tdpvmware/config/profile` directory where `$HOME` is the home directory of the user name that is created during the installation. Changes to the profile take effect immediately, except when the GLOBAL or ACS sections of the profile file are modified. To configure certain parameters, you must run the `./setup.sh` script. 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 profile file, the profile parameters are categorized into sections. The profile is structured into the following five sections:

- GLOBAL
- ACSD
- VMWARE
- VMCLI
- DEVICE_CLASS

You can have more than one DEVICE_CLASS section in the profile but each section must have a unique instance name. The device class section configures Tivoli Storage FlashCopy Manager for VMware for use with a particular storage system. The DEVICE_CLASS sections can be named and renamed by using the setup script or the configuration wizard. 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 and is evaluated when Tivoli Storage FlashCopy Manager for VMware starts. The path to the directory that contains the logging, tracing, and password files are specified in the global section of the profile.

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 the storage device that is in use.

You can specify multiple `DEVICE_CLASS` sections within one profile but each device class must have a unique name. 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. The setup script or GUI configuration wizard prompts you to enter parameter values that are specific to your storage system.

Each device class configures Tivoli Storage FlashCopy Manager for VMware for use with a particular storage type. The `COPYSERVICES_HARDWARE_TYPE` parameter identifies the type of storage system and the `COPYSERVICES_SERVERNAME` parameter identifies the TCP/IP host name of the storage system.

The setup script or GUI configuration wizard also prompts you for the storage device password. You are also prompted for the vCenter password, the acsd management agent password, and the device class passwords. The passwords can also be set by using the `fccli` command `fccli -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.

Note: The new SVC adapter with dynamic target allocation does not require a password because it uses SSH private key file.

Related tasks:

Configuring using the setup script

Configuring using the configuration wizard

Configuring storage environments

You must configure all storage devices but IBM System Storage DS8000 storage devices require more configuration to prepare for source and target volume relationships. Similarly, IBM System Storage SAN Volume Controller and IBM Storwize family must be configured when you use predefined target volumes.

Configuring to use the Storwize family and SAN Volume Controller with dynamic target allocation (SVCDTA)

To allow dynamic volume creation during backup operations, you must enable access to the storage system command-line interface (CLI) with Secure Shell (SSH) keys.

Before you begin

Verify that OpenSSH client is installed on the vStorage backup server where Tivoli Storage FlashCopy Manager is installed. The OpenSSH client is installed by default on most Linux distributions. If it is not installed on your system, consult your Linux installation documentation.

About this task

The following steps are required to enable CLI access with SSH keys:

- A public and a private key must be generated as a pair

- A public key must be uploaded to the storage system
- Tivoli Storage FlashCopy Manager must be configured to authenticate with the private key

Important: The method of connecting the SAN Volume Controller adapter for dynamic target allocation is not CIMOM based, but uses SSH keys for issuing the commands. The limit on the number of concurrent connections to the storage device is dependent on the Storwize family and SAN Volume Controller version.

Procedure

1. Generate an RSA key pair for the storage user name to access the storage system. On the vStorage backup server, issue a command that is similar to the following command:

```
ssh-keygen -t rsa
```

Tip: Issue the command from the `$HOME/.ssh` directory.

This process generates two files. You are prompted to name the files, if you select the name `svc_sshkey`, the files are named `svc_sshkey` and `svc_sshkey.pub`.

Where `svc_sshkey` is the name of the private key and `svc_sshkey.pub` is the name of the public key.

Note: You are prompted to enter a passphrase for the file. To ensure that this works with SVCDDTA dynamic target allocation, leave the passphrase empty.

2. Upload the public key to the storage system. For instructions about how to upload to the storage system, see the documentation that is provided for your storage system.

All online product documentation is now available in IBM Knowledge Center (<http://www.ibm.com/support/knowledgecenter>).

3. Run the Tivoli Storage FlashCopy Manager for VMware setup script in advanced mode by entering the following command:

```
./setup.sh -advanced
```

Alternatively, run the Tivoli Storage FlashCopy Manager for VMware GUI based configuration wizard.

Note: It is also sufficient to run the setup script in basic mode.

4. When prompted to specify a **SSH_DIR** path, enter the path where the Secure Shell protocols and executable files are installed. The default location is `/usr/bin`.
5. When prompted to specify a **SVC_SSHKEY_FULLPATH** path, enter the path and the file name to the private key file. For example:

```
SVC_SSHKEY_FULLPATH    $HOME/.ssh/svc_sshkey
```

, where `$HOME/.ssh/svc_sshkey` is the default.

6. Follow the setup script instructions to save the profile and restart the Tivoli Storage FlashCopy Manager for VMware daemons.

Configuring the CIM adapter for SP 800-131A compliant encryption

CIM agents are provided by IBM System Storage SAN Volume Controller, IBM Storwize family, and IBM System Storage DS8000 systems. Tivoli Storage FlashCopy Manager for VMware communicates with a CIM agent through the CIMOM interface. You can configure the CIM adapter to use the security standards, as defined in the National Institute of Standards and Technology (NIST) Special Publications (SP) 800-131A for encryption. For IBM System Storage SAN Volume Controller and IBM Storwize family, this configuration applies only in the case of static target allocation (type SVC); the new SVC adapter with dynamic target allocation (type SVCDTA) uses the CLI interface via Secure Shell (SSH) rather than the CIMOM interface.

Before you begin

Ensure that the storage system is enabled for SP 800-131A standard encryption. For instructions about how to identify if the system is enabled, see the documentation that is provided for your storage system. For the new SVC adapter with dynamic target allocation (type SVCDTA), compliance with SP 800-131A is provided by the OpenSSH client version that is installed on the same host as Tivoli Storage FlashCopy Manager for VMware.

Procedure

1. Extract the Secure Sockets Layer (SSL) certificate from the IBM storage system cluster. The certificate must be in the Privacy Enhanced Mail (PEM) format. From any Linux or UNIX system with a LAN connection to the storage system, run the following shell command:

```
echo | openssl s_client -connect ibm_storage_cluster_ip:5989 2>&1  
| sed -ne '/-BEGIN CERTIFICATE-/,/-END CERTIFICATE-/p'
```

where *ibm_storage_cluster_ip* specifies the IP address of the storage system and 5989 specifies the port number for the HTTPS connection.

2. Save the output to a text file and place the file in a secure location on the Tivoli Storage FlashCopy Manager for VMware vStorage backup server.
3. Run the Tivoli Storage FlashCopy Manager for VMware setup script in advanced mode by entering the following command:

```
./setup.sh -advanced
```

4. When prompted for the **COPYSERVICES_CERTIFICATEFILE** parameter for the storage system device class, enter the fully qualified path to the certificate file. For example:

```
COPYSERVICES_CERTIFICATEFILE ACS_DIR/truststore/svc_cluster.cert
```

5. Follow the setup script instructions to save the profile and restart the Tivoli Storage FlashCopy Manager for VMware daemons.

Target sets and volumes

For DS8000 storage systems, you must create target volumes and define target sets before you start a backup operation. A *target set* represents the mapping from the ESX host to the target volume on the storage system.

During a backup operation, data is copied from the source volume to one or more target volumes on the storage system. Similarly, for Storwize family and SAN Volume Controller storage systems, if you do not select dynamic target allocation, you must create target volumes and define target sets.

To schedule backup operations successfully for multiple target volumes 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.
- 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.

Target set definition with the target volumes file

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.

To define target sets for SAN Volume Controller and Storwize family storage systems, you can select either the Target Naming Pattern option or the Target Set Definition File option. For DS8000 storage systems, you can select the Target Set Definition File option only.

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 family, 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 family, 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 56

“Examples of target naming setup” on page 59

Target set definitions

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

You can define targets by using target set definition files for SAN Volume Controller, DS8000, and Storwize family.

Alternatively, for SAN Volume Controller and Storwize family only, you can use a naming convention. 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.

Tip: There is no requirement to define target volumes, if you select SAN Volume Controller and Storwize family dynamic target allocation.

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   SVC
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 configuration of the target volumes file and the profile and includes 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 configuration 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.

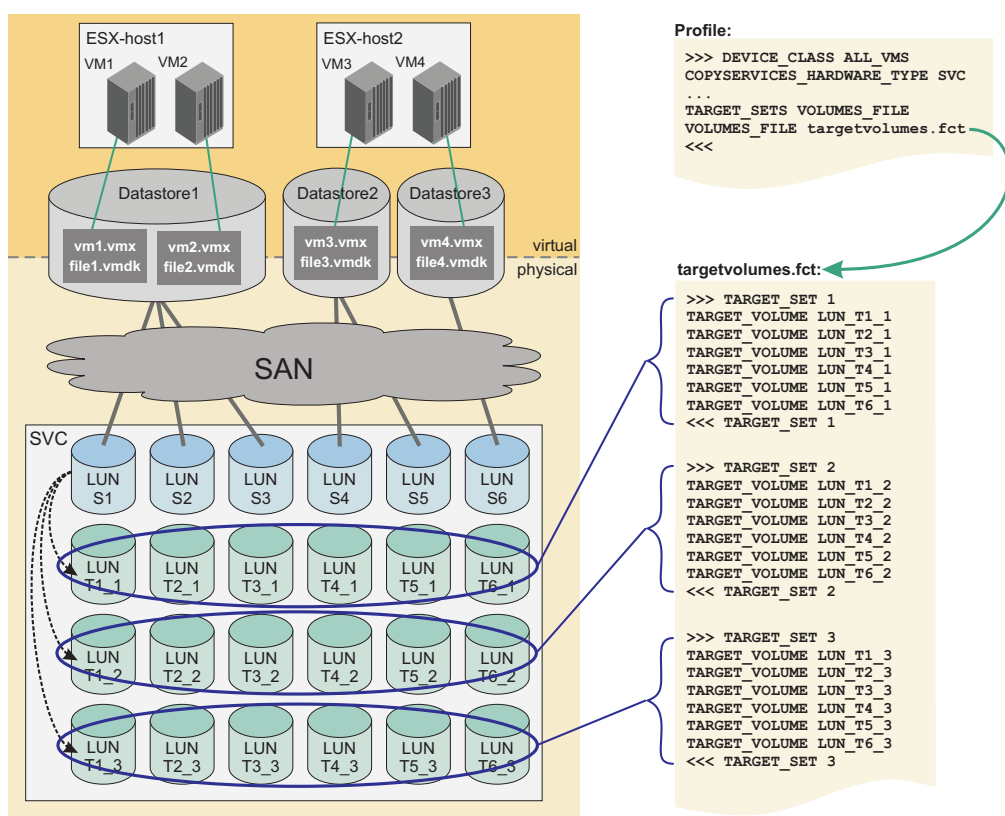


Figure 7. Tivoli Storage FlashCopy Manager for VMware target volumes files example 1

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 configuration results in a complex setup with three `DEVICE_CLASS` parameters that are 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.

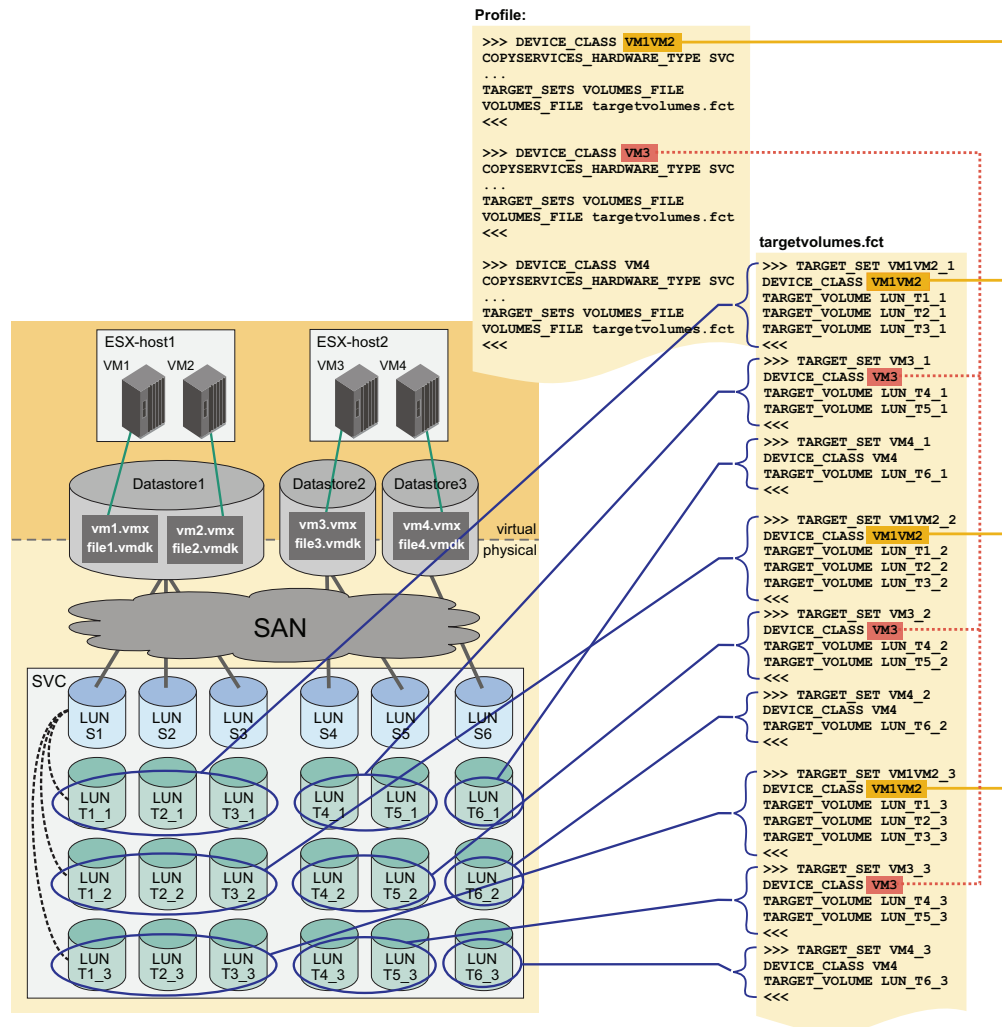


Figure 8. Tivoli Storage FlashCopy Manager for VMware target volumes files example 2

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 on a second storage system. The storage volume layout provides three target volumes for each of the source volumes. This configuration results in a complex setup with two `DEVICE_CLASS` parameters that are 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.

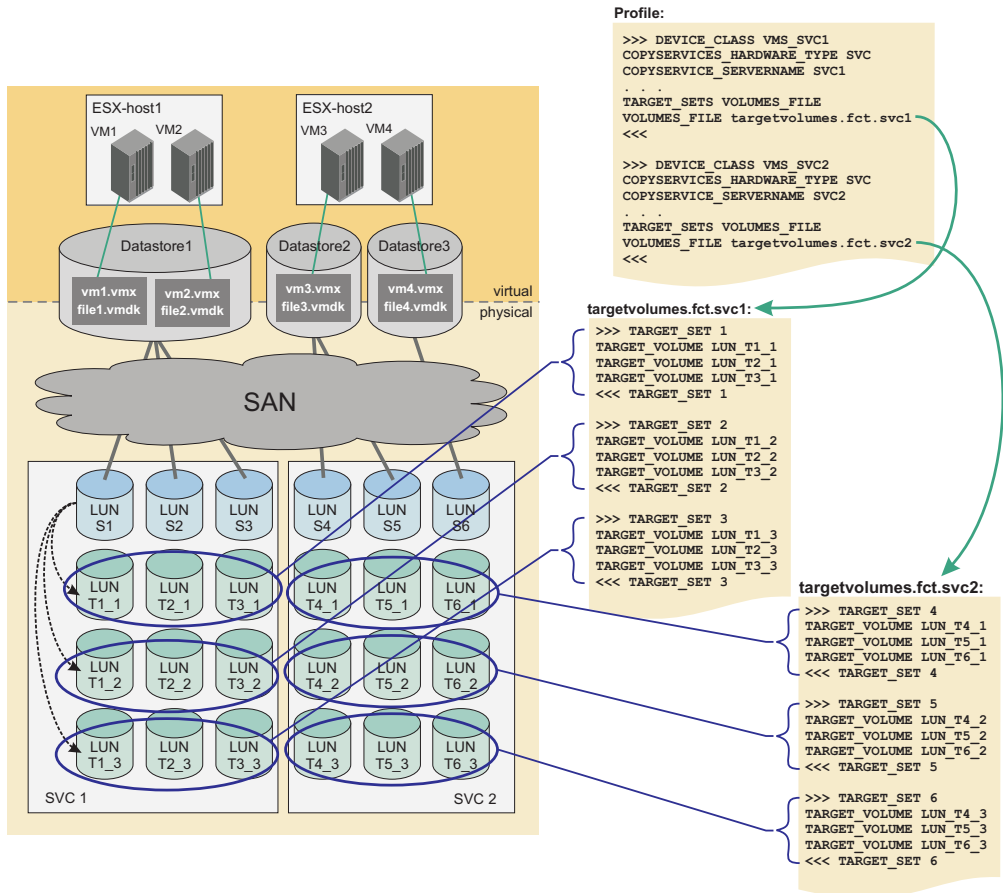


Figure 9. Tivoli Storage FlashCopy Manager for VMware target volumes files example 3

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 family.

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 family. 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 SVC
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:

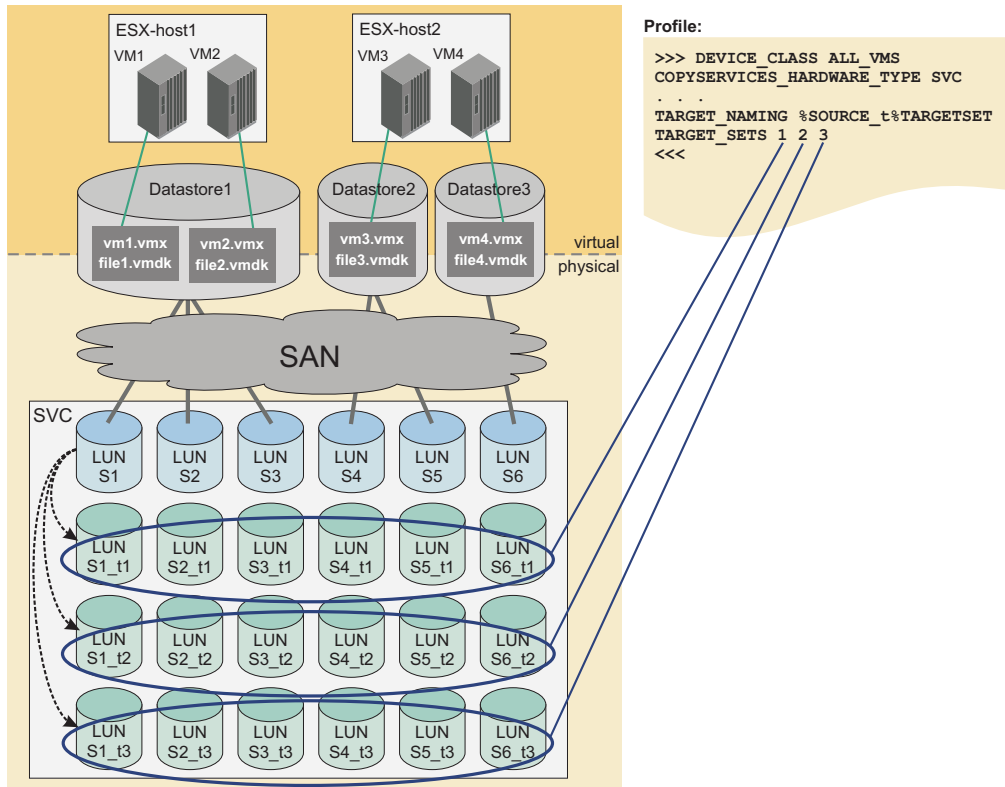


Figure 10. Tivoli Storage FlashCopy Manager for VMware target naming example 1

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:

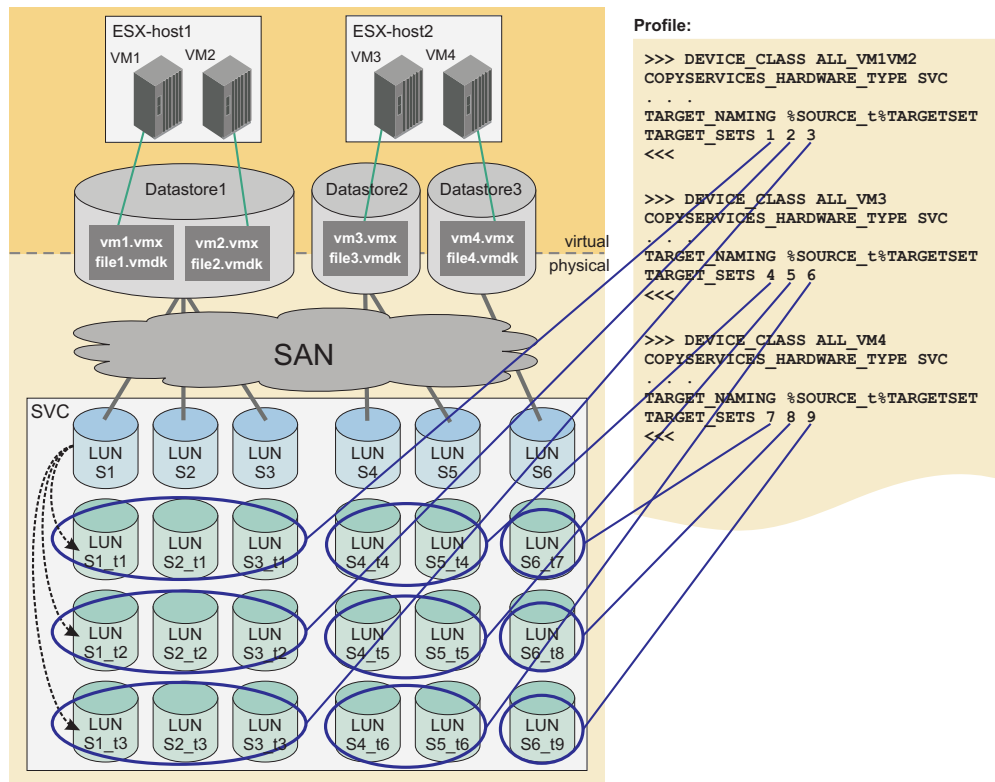


Figure 11. Tivoli Storage FlashCopy Manager for VMware target naming example 2

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.

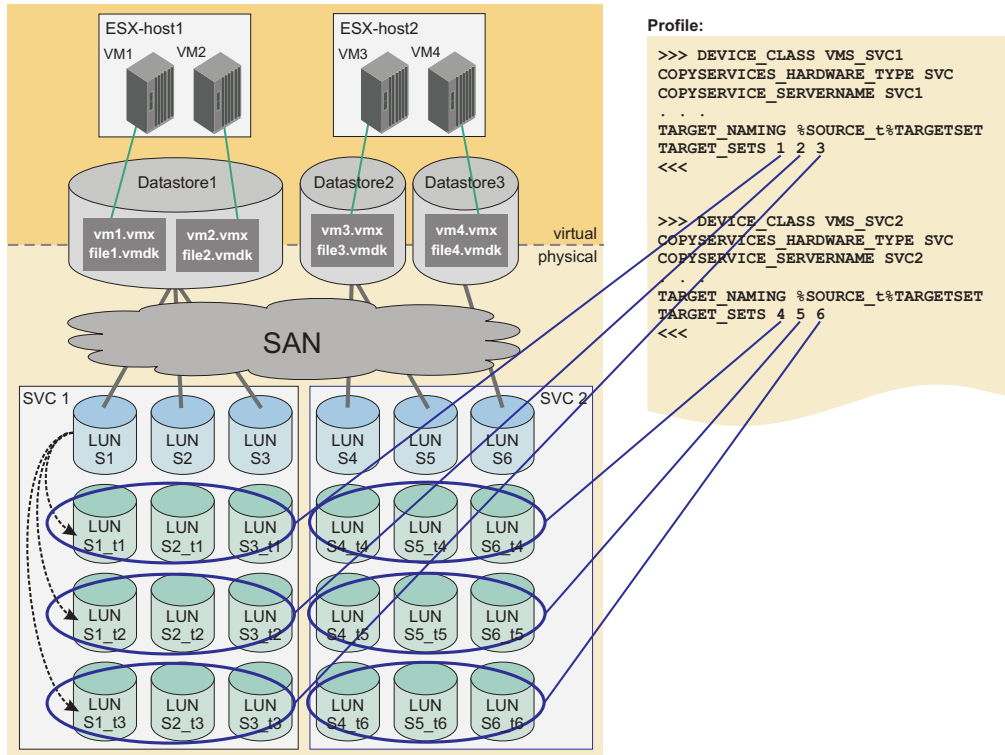


Figure 12. Tivoli Storage FlashCopy Manager for VMware target naming example 3

Selecting the FLASHCOPY_TYPE

SAN Volume Controller, DS8000, and Storwize family support various FlashCopy types. These types provide different capabilities for your backup strategy. Note that this does not apply to the new SVC adapter with dynamic target allocation (type SVCDTA), which implicitly supports FLASHCOPY_TYPE NOCOPY only.

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.

Note: If you use SAN Volume Controller and Storwize family dynamic target allocation then no deletion of old backups is required.

The FLASHCOPY_TYPE parameter values are explained in the following table.

Table 10. Selecting the FLASHCOPY_TYPE for SAN Volume Controller, DS8000, and Storwize family

FLASHCOPY_TYPE	DS8000	SAN Volume Controller and Storwize family
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. For more information see Note 2.
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. Note: 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.
<p>Note 1: See “SAN Volume Controller and Storwize family features” on page 20 for planning and configuration details when using SAN Volume Controller 5.1, or later.</p> <p>Note 2: If you use SAN Volume Controller and Storwize family dynamic target allocation then FLASHCOPY_TYPE INCR is not available.</p>		

Configuring the system by using the configuration wizard

You can use a wizard to configure Tivoli Storage FlashCopy Manager for VMware, or to change an existing configuration. The wizard helps you to specify parameters that are saved to the Tivoli Storage FlashCopy Manager profile file.

Before you begin

Verify the following items before you start the configuration process:

vCenter Server credentials

You require the credentials to access the vCenter Server.

All storage systems

For all storage systems, you require the host name or TCP/IP address of the storage management interface and the credentials to access the interface.

IBM XIV Storage Systems

You must have the XIV Storage Systems command-line interface (XCLI) installed on the vStorage backup server. This server is where Tivoli Storage FlashCopy Manager for VMware is running. The absolute path to the installation directory is required.

IBM System Storage DS8000

You must create target volumes. The target volumes must be organized into target sets, where each target set represents one backup generation on the target volume. This information is saved to a target set definition file on the vStorage backup server where Tivoli Storage FlashCopy Manager for VMware is running. The file name and path to the target set definition file are required.

IBM Storwize family or IBM System Storage SAN Volume Controller systems

If you intend to use predefined volumes on your storage system, you must create target volumes. Use one of the following options to create the target volumes:

- Specify the file name and path to the target set definition file on the vStorage backup server.
- Alternatively, create target volumes with a specified naming schema. You can specify this target name pattern when you run the wizard. In this case, you must ensure that the source and target volumes adhere to a naming schema so that the target volume name can be derived from the source volume.

The schema specifies that you use the %SOURCE_%TARGETSET rule, where the %SOURCE and the %TARGETSET variables are substituted by the actual source volume name and the name of the current active target set. For example, if you define the source volume name VolA, and the target sets 1 2, the derived target volumes names are VolA_1, VolA_2.

Tip: There is no requirement to define target volumes, if you select SAN Volume Controller and Storwize family dynamic target allocation.

Vendor storage adapter software

If you install vendor storage adapter software, the parameter values can vary depending on the selected adapter type. To enter the correct values, see the documentation that is provided by the storage adapter vendor.

Restriction:

If there are datastore backups to be attached and restored, which were created by using the old SVC adapter with static target allocation, the following limitations apply.

Do not delete an existing device class for **COPYSERVICES_HARDWARE_TYPE: SVC** until all backups that were created using this device class are expired and deleted from the IBM Tivoli Storage FlashCopy Manager repository and also from the storage system.

- If a configuration uses both 'SVC' and 'SVCDDTA' on the same IBM Storwize v7000/IBM System Storage SAN Volume Controller server, no new backups can be created for the DEVICE_CLASS sections of type 'SVC'.
- Existing backups that were created with these DEVICE_CLASS sections can be attached and restored on a file-copy basis only (individual VM or disk restore); you cannot restore them by using an instant restore (flashback of an entire datastore).
- When you configure a device class section for type 'SVCDDTA', the parameter MAX_VERSIONS on the VMWARE section must not be set to ADAPTIVE. For dynamic target allocation, there is no specific number of target volumes, therefore there must be a limit on the number of FlashCopy backups to retain to prevent the storage pool from running out of space.
- In a mixed 'SVC' / 'SVCDDTA' configuration, new backups and flashback restores must not be performed with DEVICE_CLASSES of type 'SVC' to avoid conflicts. Tivoli Storage FlashCopy Manager takes appropriate measures to prevent you from accidentally doing so; you will receive a clear error message when you try to perform a backup or instant restore operation.

Procedure

The wizard opens automatically after you install Tivoli Storage FlashCopy Manager for VMware. To configure Tivoli Storage FlashCopy Manager for VMware, start the configuration wizard from the GUI and complete the following steps:

1. Click the **Configuration** tab to open the Configuration pane.
2. Click **Run FCM Configuration wizard** to open the configuration wizard.
3. Click **Next**. Follow the instructions on each page of the wizard to specify the vCenter credentials, the GUI domain, the hosts, and the storage systems.

Tip: You can specify the maximum number of snapshot backups generations to retain on the storage system from the Storage Systems page.

4. On the Summary page, click **Finish**.

Results

The Tivoli Storage FlashCopy Manager for VMware parameters are saved to the Tivoli Storage FlashCopy Manager profile file. Certain parameters are not displayed in the wizard but are assigned default values. To configure parameters that are not displayed, run the `./setup.sh -advanced` script from the command line.

- The ACS_DIR directory, the path to this configuration directory is specified in the profile file.
- A profile within the `$HOME/tdpvmware/config` configuration directory.
- A link from the `/opt/tivoli/tsm/tdpvmware/fcm` installation directory, 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 daemon processes. For Red Hat Enterprise Linux 6, the daemon processes are started automatically with the Upstart program.
- The initialization scripts for WebSphere Application Server are copied from the /etc/init.d/webserver directory to the /etc/init.d directory.
- The initialization scripts for the Data Protection for VMware command-line interface are copied from the /etc/init.d/vmcli directory to the /etc/init.d directory.
- The vmcli database is created in the \$HOME/tdpvmware/VMCLIDB directory.

Configuring the system by using the setup script

You can run the setup.sh setup script after you complete an installation or upgrade Tivoli Storage FlashCopy Manager for VMware. The setup script is stored in the /opt/tivoli/tsm/tdpvmware/fcm directory.

About this task

The setup script configures the profile file, creates the password file, and starts the daemons processes such as acsd, acsgen -D, acsgen -D -M, and fcmcli -D. The setup script uses the following command syntax: setup.sh [-a *action*] [-advanced]

Where -a specifies an action and is optional. You can select one of the following actions: install_agents, start, stop, or uninstall_agents. When you specify the -advanced option, you can change parameter values that are not displayed when you run the configuration wizard in normal mode. You can also use the setup script to reconfigure Tivoli Storage FlashCopy Manager for VMware.

Procedure

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

1. Log in to the vStorage backup server with the user name ID that was specified during the installation. The default user name ID is tdpvmware.
2. Run the setup script, by entering one of the following commands:
 - a. ./setup.sh
 - b. ./setup.sh -advanced

Results

The following files, directories, and links are created:

- The ACS_DIR directory, the path to this configuration directory is specified in the profile file.
- A profile within the \$HOME/tdpvmware/config configuration directory.
- A link from the /opt/tivoli/tsm/tdpvmware/fcm installation directory, 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 daemon processes. For Red Hat Enterprise Linux 6, the daemon processes are started automatically with the Upstart program.

- The initialization scripts for WebSphere Application Server are copied from the `/etc/init.d/webserver` directory to the `/etc/init.d` directory.
- The initialization scripts for the Data Protection for VMware command-line interface are copied from the `/etc/init.d/vmcli` directory to the `/etc/init.d` directory.
- The vmcli database is created in the `$HOME/tdpvmware/VMCLIDB` directory.

Related reference:

Chapter 7, “Tivoli Storage FlashCopy Manager for VMware configuration files,” on page 105

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

The script stops the daemons and then removes the entries.

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/webserver 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/webserver start
```
- To stop the WebSphere Application Server service, enter the following command:  

```
/etc/init.d/webserver stop
```
  - To restart the WebSphere Application Server service, enter the following command:  

```
/etc/init.d/webserver restart
```

---

## Protecting the vmcli database and repository files to support a HADR solution

In a high availability disaster recovery (HADR) solution, you must back up the Data Protection for VMware command-line interface database (vmcli database) and the Tivoli Storage FlashCopy Manager for VMware repository files. One method to back up the database and repository files is to replicate the files to a secondary site by using the remote mirroring copy function of the storage system.

### Before you begin

A mirror relationship is established between the primary and secondary site.

### About this task

The 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 repository file contains information about all snapshot backups. The following task outlines one method of replicating the Data Protection for VMware command-line interface database and the repository files between sites however you can choose an alternative method.

### Procedure

1. Install Tivoli Storage FlashCopy Manager for VMware at the primary and secondary site on a vStorage backup server.
2. Verify that a mirror relationship exists between both sites.
3. Create a volume on the storage system at the primary site and configure this volume for remote mirroring at the secondary site. For information about how to create a volume, see the documentation that is provided for your storage system.
4. Map the volume to the vStorage backup server at the primary site where Tivoli Storage FlashCopy Manager for VMware is installed.
5. Create a volume group, logical volume, and file system on the volume.
6. Mount the file system that is created in Step 5 to a directory on the vStorage backup server. Configure the Tivoli Storage FlashCopy Manager for VMware profile to store the vmcli database and repository files in this directory.

**Tip:** The location of the vmcli database and repository files are specified by using the **DERBY\_HOME** and **ACS\_REPOSITORY** parameters when you configure Tivoli Storage FlashCopy Manager for VMware.

## Password administration

You can use the `setup.sh` script, GUI configuration wizard, 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. To use the interactive mode, do not enter the password when you issue the command and you are prompted to enter the following passwords:

- The master password, which is the password of the `acsd` management agent. By default, a 32 character password is automatically generated. However, you can enter an alternative password.
- The VMware vCenter password for the user that is specified by the profile `VCENTER_SERVER_USER` parameter.
- The passwords for the disk storage subsystems that are referenced by the `DEVICE_CLASS` sections in the specified profile file.

**Note:** There is no password when using SVCDTA dynamic target allocation.

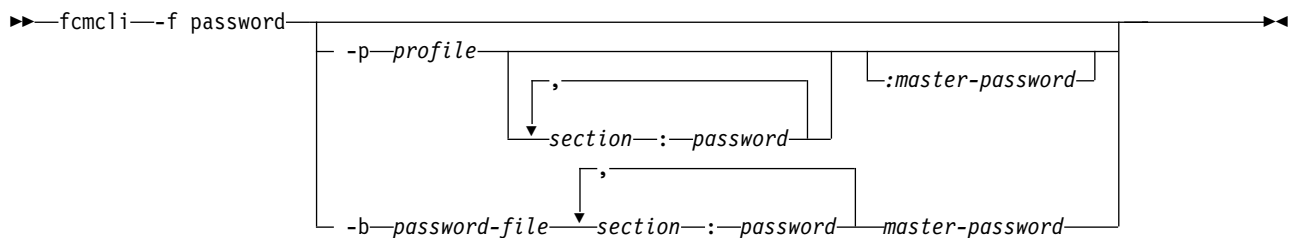
If the specified profile contains multiple `DEVICE_CLASS` sections that reference the same physical disk storage subsystem and user name, the password is queried one time by combining these `DEVICE_CLASS` sections.

The interactive mode or GUI configuration wizard is the preferred method for setting passwords. Using this method, the passwords are verified by testing the connections to the corresponding storage devices, management agent, or VMware vCenter. For the non-interactive mode, the command syntax is verified but no additional validations are performed.

**Tip:** The minimum length of the master password is 8 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



### Parameters

#### -p profile

Specify the full path and name of the profile that is used. If the path is not specified, the profile file in the current working path is used.

In interactive mode, the command searches the profile for the `VMWARE` and `DEVICE_CLASS` sections, and then requests you to enter the relevant passwords.

**-b password-file**

Specify the password file to be created or updated. By default, the shared/acsd.pwd password file is in the directory that is specified by the **ACS\_DIR** parameter. This parameter is included in the GLOBAL section of the profile file. This information is read from one of the following profiles:

- When the -p option is not specified, the profile file in the current working directory is used.
- When the -p option is specified, the profile file that is specified by this option is used.

**sectionname:password**

Specify the password for the user account that is referenced by the VMWARE and DEVICE\_CLASS sections of the profile. To specify the password for the DEVICE\_CLASS section, replace the *sectionname* variable with the **DEVICE\_CLASS:device class name** variable for example, **DEVICE\_CLASS:STANDARD**. Use this syntax when you specify the password: **DEVICE\_CLASS:device class name:password**.

No spaces are allowed within the *sectionname:password* syntax.

**:masterpassword**

Specify the master password that is used to authenticate a library or agent to the acsd management agent. Alternatively, enter the value *auto* to enable Tivoli Storage FlashCopy Manager for VMware to auto-generate a password. For example, issue the following command to auto-generate the master password:

```
./fcmcli -f password :auto
```

---

## GSKit configuration

IBM Global Security Kit (GSKit) supports Federal Information Processing Standards (FIPS140-2) and is also certified to provide SP800-131A compliant encryption. GSKit 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 SP800-131A compliant encryption and uses the SSL protocol TLS V1.2. To enforce SP800-131A 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, **fcncert.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) SP800-131A 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, `fcncert.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 fmservcertreq.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 fmservcertsigned.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)

---

## Configuring for takeover and failback operations

After a failover or failback operation, if you use VMware vCenter Site Recovery Manager or a remote mirroring copy function you must configure Tivoli Storage FlashCopy Manager for VMware to protect your environment.

### Configuring for takeover on the secondary site

When a failover occurs at the primary site, you must configure the Tivoli Storage FlashCopy Manager for VMware vmcli database and repository files that are replicated to the secondary site. You must also configure Tivoli Storage FlashCopy Manager for VMware application at the secondary site.

#### Configuring the vmcli database and repository files to support a HADR solution

In a high availability disaster recovery (HADR) solution, you must back up the Data Protection for VMware command-line interface database (vmcli database) and the Tivoli Storage FlashCopy Manager for VMware repository files. After a failover operation, you must configure Tivoli Storage FlashCopy Manager for VMware to use the replicated vmcli database and the repository files at the secondary site.

#### Before you begin

The Tivoli Storage FlashCopy Manager for VMware vmcli database and repository files are replicated at the secondary site.

#### About this task

The database and repository files must be present to restore datastores and their associated virtual machines that were included in any snapshots that were initiated at the primary site.

#### Procedure

To configure the mirrored vmcli database and repository files at the secondary site, complete the following steps:

1. Verify that the mirror relationship for Tivoli Storage FlashCopy Manager for VMware repository and vmcli database between the two sites no longer exists. If the relationship still exists, deactivate the mirrors at the primary site. For storage systems where the secondary site contains the slave (target) volume, promote the slave volume to become the new master (source) volume. For instructions about promoting slave volumes to master volumes, see the documentation that is provided for your storage system.
2. Map the original target volumes of the mirror relationship to the vStorage backup server at the secondary site where Tivoli Storage FlashCopy Manager for VMware is installed. For instruction about mapping the target volumes, see the documentation that is provided for your storage system.
3. On the vStorage backup server, import the volume group, logical volume, and file system from the mirrored volume of the vmcli database and repository files.
4. Verify that the owner of file system is the Tivoli Storage FlashCopy Manager for VMware user ID that was assigned during the installation. The default user ID is `tdpvmware`.
5. Mount the file system that is imported in Step 3 to the directory that is specified by the `DERBY_HOME` and `ACS_REPOSITORY` parameters in the Tivoli Storage FlashCopy Manager for VMware profile file. Alternatively, you can mount the file system in a new directory and when you configure the Tivoli Storage FlashCopy Manager for VMware profile file specify the new directory.

**Tip:** The location of the vmcli database and repository files are specified by using the `DERBY_HOME` and `ACS_REPOSITORY` parameters when you configure Tivoli Storage FlashCopy Manager for VMware.

**Related tasks:**

“Protecting the vmcli database and repository files to support a HADR solution” on page 68

## **Configuring Tivoli Storage FlashCopy Manager for VMware after a failover operation**

You must configure Tivoli Storage FlashCopy Manager for VMware, if the primary site fails and you switch to the secondary site when you use mirroring services. After you configure Tivoli Storage FlashCopy Manager for VMware, you can start new backups at the secondary site and restore previously created backups.

### **Before you begin**

Ensure that Tivoli Storage FlashCopy Manager for VMware is installed at the secondary site.

### **Procedure**

If the primary site becomes unavailable, complete the following steps to start new backups at the secondary site and restore previously created snapshot backups:

1. For storage systems where the secondary site contains the slave (target) volumes, promote the slave volumes to become the new master (source) volumes. For instructions about promoting a slave to master volumes, see the documentation that is provided for your storage system.
2. Verify that the mirror relationship no longer exists between the primary and secondary sites. If the relationship still exists, deactivate and delete the mirrors. For instructions about deactivating and deleting mirrors, see the documentation that is provided for your storage system.



**Tip:** This step is not necessary, if the primary storage systems are still active at the primary site and the TCP/IP connections are functioning correctly. If so, Tivoli Storage FlashCopy Manager for VMware deactivates and deletes the mirrors automatically.

3. Verify whether a remote mirror relationship for the Tivoli Storage FlashCopy Manager for VMware repository and the vmcli database exists between the two sites. If this relationship exists, ensure that the volume at the secondary site is configured as the new master volume. Then, deactivate and delete the mirror.
4. Start Tivoli Storage FlashCopy Manager for VMware at the secondary site.
5. Configure the Tivoli Storage FlashCopy Manager for VMware profile at the secondary site. Create a device class to perform local backups and ensure that the parameters are assigned the following values:
  - The **COPYSERVICES\_REMOTE** parameter is set to NO.
  - Specify the TCP/IP host name of the storage system at the secondary site for the **COPYSERVICES\_SERVERNAME** parameter.
  - Specify the host name or IP address of the vCenter Server at the secondary site for the **VCENTER\_SERVER** parameter.

To run the setup script, enter the following command from the `/opt/tivoli/tsm/tdpvmware/fcm` directory:

```
./setup.sh
```

**Restriction:** Do not reuse the primary site device class at the secondary site. This primary site device class has the **COPYSERVICES\_REMOTE** parameter set to YES and must be available when you restore snapshot backups that were initiated at the primary site.

6. Create a Tivoli Storage FlashCopy Manager backup schedule for the secondary site.

## What to do next

Before you restore a backup, that was initiated at the primary site, you must complete the following actions:

1. At the secondary site, map the target LUNs of the mirror relationship that are now the source LUNs for the backup on the secondary site to one or more ESX hosts.
2. Ensure that the original device class section that was used to initiate snapshot backups from the primary site is present to restore VMs, datastores, or files at the secondary site. Verify that the following parameters are assigned the correct values:
  - The **COPYSERVICES\_REMOTE** parameter is set to YES.
  - The host name or IP address of the vCenter Server at the secondary site is specified for the **VCENTER\_SERVER** parameter.
3. Ensure that the original datacenter name exists before you start the restore operation.
4. Restore a VM or datastores from the Tivoli Storage FlashCopy Manager for VMware GUI.

**Tip:** You can also perform restore operations by using the Data Protection for VMware command-line interface.

### Related concepts:

Backing up and restoring virtual machines from the GUI

Chapter 6, “Operating the Data Protection for VMware command-line interface,” on page 89

## Resolving remote mirror problems

Problems can occur in a remote mirrored environment when you attempt to restore or attach a virtual machine at the secondary site.

### vSphere API error is generated when you restore or attach a VM at the secondary site

#### Symptoms

After a failover occurs, when you restore or attach a VM at the secondary site, the operation is not successful and the vSphere API displays the following error message:

```
fault.VmfsAlreadyMounted
```

#### Causes

After a failover occurs, you manually mount the mirrored VMware datastores to an ESX host at the secondary site. However, a new signature is not automatically assigned to the datastores.

When you attempt to restore or attach a VM from a snapshot of this datastore, the error is displayed and the operation fails. The probable cause of this error is that the mounted datastore is considered a snapshot copy because the snapshot metadata points to the primary site LUNs.

#### Resolving the problem

If a failover occurs, ensure that you select **Assign a new signature** when you manually mount the datastore at the secondary site.

This step is not necessary when VMware vCenter Site Recovery Manager (SRM) is replicating the data between sites as both the mount and resignature operations occur automatically.

## Configuring after a VMware vCenter Site Recovery Manager failover operation

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

### Before you begin

The Data Protection for VMware command-line interface database (vmcli database) and the Tivoli Storage FlashCopy Manager for VMware repository files are replicated on the secondary site. This replication is automatically the case, if Tivoli Storage FlashCopy Manager for VMware is installed on a VM that is protected by SRM at the primary (protected) 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 secondary 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 secondary site.
    - Change the vCenter user name to the vCenter user name of the secondary site.
    - Change the auxiliary ESX host name or IP address to the auxiliary ESX host name or IP address of the secondary site.
  - b. Create a device class for the storage device at the secondary 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 secondary site.

**Tip:** Alternatively, from the GUI configuration wizard, you can change the parameters in the profile file.

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/veProfile/tsmVmGUI` directory. Open the `vmcliConfiguration.xml` file with an editor and replace the vCenter Server URL with the URL for the secondary site.

The following example shows `https://server1/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://server1/sdk</vcenter_url>
</vmcliAdaptor>
```

5. Register the Tivoli Storage FlashCopy Manager for VMware GUI. To run the register script, enter the following command from the `/opt/tivoli/tsm/tdpvmware/common/script#` directory:
 

```
./register.Plugin.sh
```

When prompted enter the following values:

**vCenter Server IP address and name**

Specify the name or IP address of the vCenter Server.

**vCenter user name**

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

**vCenter\_Password**

Specify the password.

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

Specify the port number of the GUI web server.

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 secondary site.

## What to do next

Before you start the backup operation, ensure that you attach the target volumes on the secondary storage device to the ESX host at the secondary site.

### Related tasks:

“Backing up virtual machines” on page 82

“Creating a backup” on page 90

“Attaching and detaching the virtual disks of a backup to a target virtual machine” on page 95

“Restoring a backup” on page 97

## Configuring Tivoli Storage FlashCopy Manager for VMware after a failback operation

When you use remote data replication between sites, after a failover followed by a failback operation, you must configure Tivoli Storage FlashCopy Manager for VMware at the primary site to resume backup operations. The failback process restarts the original designated primary site.

### Procedure

After a failover followed by a failback operation, complete the following steps to configure Tivoli Storage FlashCopy Manager for VMware:

1. Stop the Tivoli Storage FlashCopy Manager for VMware daemons at the secondary site. Issue the following command from the `/opt/tivoli/tsm/tdpvmware/fcm` directory:  

```
./setup.sh -a stop
```
2. Depending on the method you use to replicate data between the sites, complete one of the following steps:
  - In a remote mirroring environment, verify that the restored primary and secondary sites are configured for remote mirroring and that you switch the direction of the mirrored relationships.
  - In a VMware vCenter Site Recovery Manager (SRM) environment, you must protect the site again that was originally designated as the SRM primary site and initiate a manual failover. For instructions, see the SRM documentation.
3. Ensure that the source volume is present on the primary site and that the secondary volume is present on the secondary site. Before you perform a restore operation at the primary site, you must ensure that you exchange the roles between the primary and secondary site.

## What to do next

You can now start or schedule snapshot backups at the primary site.

**Restriction:** Snapshot backups that were created locally on the secondary site when the primary site was not operational cannot be restored.

### Related concepts:

Backing up and restoring virtual machines from the GUI

---

## Chapter 5. Backing up and restoring virtual machines from the GUI

You can use the Tivoli Storage FlashCopy Manager for VMware GUI to back up and restore virtual machines and VMware datastores. When installed with IBM Tivoli Storage Manager for Virtual Environments you can offload backups to Tivoli Storage Manager server.

You can use one of the following methods to access the GUI:

- 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/
```

where *guihost.mycompany.com* is the address of the vStorage backup server and *9081* is the default secure HTTPS port number.

- An IBM Data Protection extension that can be accessed from the VMware vSphere Web Client. The client connects to the GUI web server in the vSphere environment. You can use this extension to restore virtual machines from Tivoli Storage FlashCopy Manager for VMware hardware snapshots. Ensure that the following properties are set in the `webclient.properties` file:

```
scriptPlugin.enabled = true
```

- For Linux operating system, the `webclient.properties` is installed in `/var/lib/vmware/vsphere-client/webclient.properties` directory on the vCenter Server.
- For Windows Operating system, the `webclient.properties` is installed in `C:\ProgramData\VMware\vSphere Web Client\webclient.properties` folder on the vSphere Web Client.
- An extension in the **Solutions and Applications** pane or the **Classic Solutions** pane in the vSphere Client.

**Tip:** This option is not supported in a VMware vSphere 6 environment.

When you use a browser, the language that is displayed depends on the preferred language that is set for your browser. Depending on the options, which are selected during installation, registration keys are created for the Data Protection for VMware vSphere GUI plug-in and the IBM Data Protection extension.

The Data Protection for VMware vSphere GUI registration key is `com.ibm.tsm.tdpvmware@hostname`. This key is registered when you select the **Register GUI as vCenter plug-in** check box during the installation. A separate key is registered for each web GUI host.

The IBM Data Protection extension registration key is `com.ibm.tsm.tdpvmware.IBMDataProtection`. This key is registered when you select the **Register as an Extension in the Web Client** check box during the installation. A single instance of the IBM Data Protection extension is registered per vCenter Server.

To view the registration keys, use the VMware Managed Object Browser (MOB). After you log in to the MOB, go to **Content > Extension Manager** to view the registration keys.

---

## Starting the 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: Tivoli Storage FlashCopy® Manager - All Requirements Doc (<http://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.

Ensure that you have the correct privileges to access to at least one VMware datacenter before you start the GUI.

### Procedure

1. From your web browser, enter the following URL:

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

where *guihost.mycompany.com* is the address of the vStorage backup server and *9081* is the default secure HTTPS port number.

2. Enter the vCenter Server credentials to start the GUI.

### What to do next

If a required datacenter is not displayed in the GUI, verify with the system administrator that the required privileges are assigned.

#### Related tasks:

“Backing up virtual machines” on page 82

---

## Starting the GUI from the Solutions and Applications pane

You can access Tivoli Storage FlashCopy Manager for VMware GUI from an extension (plug-in) in the Solutions and Applications pane or the Classic Solutions pane of the VMware vSphere Client.

### Before you begin

The Tivoli Storage FlashCopy Manager for VMware GUI is installed on the vStorage backup server when either IBM Tivoli Storage FlashCopy Manager for VMware, IBM Tivoli Storage Manager for Virtual Environments, or both are installed. Each 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 GUI to limit a domain to one or more VMware datacenters.

Ensure that you have the correct privileges to access to at least one datacenter before you start the GUI.

**Tip:** The option to start the GUI from the **Solutions and Applications** pane or **Classic Solutions** pane of the VMware vSphere Client, is not supported in a VMware vSphere 6 environment.

Alternatively, you can access the GUI from a URL bookmark to the GUI web server. For example, <https://guihost.mycompany.com:9081/TsmVMwareUI/>.

## Procedure

To start the GUI, complete the following steps:

**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 that is included with the GUI.

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. From the Solutions and Applications pane of the vSphere Client, click the Tivoli Storage FlashCopy Manager for VMware icon.

**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 cannot find an entry for IBM Tivoli Data Protection for VMware or an error is displayed, complete the following steps:
  - 1) Use the ping command to verify the connectivity to the server where the Tivoli Storage FlashCopy Manager for VMware GUI is installed.
  - 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 on one line:

```
../jre/jre/bin/java -jar reg.jar vCenterServer vCenterUser
vCenterPassword new guiHostnameShort new guiHostnameFull https_port
```

For example:

```
../jre/jre/bin/java -jar reg.jar vctr.archive.mycompany.com administrator
pass4admin myguihost myguihost.mydomain.mycompany.com 9081
```

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/websvr 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.

## What to do next

If the required datacenter is not displayed in the GUI, verify with the system administrator that the required privileges are assigned.

---

## 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 specific 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 from the 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, and to select the virtual machine, snapshot type, and the location for the backup.

**Restriction:** Any virtual machines that are associated to a virtual volume (VVol) datastore or VMware vCenter Site Recovery Manager (SRM) placeholders are unavailable and you cannot select them.

4. On the Schedule page, you can choose to run the backup now or schedule the backup to run later.
  - To begin the backup, click **Execute immediately**.
  - To schedule the backup to run later, 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.

**Note:** Using some storage systems, the snapshot backup requires a certain amount of available space on the target storage pool, so that it can create the snapshot. If there is not enough storage space available, you can increase the capacity on the requested storage pool, or free up some items that are using existing capacity. Check the message for the exact amount of storage space that is required.



## What to do next

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

---

## Backing up virtual machines on a primary site or secondary site

If you use remote mirroring, from the primary site you can create snapshot backups at the primary or secondary site. For example, on the primary site you can create a snapshot backup on the storage system of the secondary site.

### Before you begin

Verify that remote mirroring is configured between the primary and secondary site.

**Note:** The new SVC adapter with dynamic target allocation does not support remote mirroring.

Complete the following steps when you are using Global Mirror replication for SAN Volume Controller:

- Ensure that SAN Volume Controller version 6.3.0, or later is used.
- For Global Mirrors only, verify that the consistency group for the Global Mirror relationship is configured for multiple cycling mode. From the command-line interface of the SAN Volume Controller, issue the **lsrcrelationship** command and verify that in the relationship table that `multi` is noted in the **cycling\_mode** column. For instructions about how to configure for multiple cycling mode, see the documentation that is provided for your storage system.

### About this task

On the primary site, before you start a local snapshot backup on the storage system, you verify that the profile contains a `DEVICE_CLASS` section for the primary site. To create a snapshot backup on the storage system at the secondary site, you must create and configure an extra `DEVICE_CLASS` section in the profile.

### Procedure

On the primary site, to create a snapshot backup on the storage system of the secondary site, complete the following steps:

1. Create a `DEVICE_CLASS` section for the secondary site in the Tivoli Storage FlashCopy Manager for VMware profile by running the setup script. To run the setup script from the primary site, issue the following command from the `/opt/tivoli/tsm/tdpvmware/fcm` directory:

```
./setup.sh
```

When you create the `DEVICE_CLASS` section with the setup script, ensure that the following parameters and values are defined:

- The **COPYSERVICES\_REMOTE** parameter is set to YES.
- Specify the IP address or host name of the server at the secondary site for the **COPYSERVICES\_REMOTE\_SERVERNAME** parameter.
- Specify the user name that is used to connect to the secondary site for the **COPYSERVICES\_REMOTE\_USERNAME** parameter.

**Tip:** You can also use the GUI configuration wizard to create the `DEVICE_CLASS` section for the secondary site.

2. From the primary site, start the snapshot from the Tivoli Storage FlashCopy Manager for VMware GUI or command line. Ensure that you specify the device class that is created for the secondary site. From the GUI Destination page, select the device class that was created for the secondary site.

**Tip:** From the command line, use the `-D deviceClass` option.

**Related tasks:**

“Backing up virtual machines” on page 82

“Creating a backup” on page 90

---

## Backing up virtual machines protected by VMware vCenter Site Recovery Manager

You can create Tivoli Storage FlashCopy Manager for VMware snapshot backups at either the primary (protected) site or secondary (recovery) site, from a VMware vCenter Site Recovery Manager (SRM) primary site. For example, on the primary site, you can create a snapshot backup on the storage system at the secondary site.

### Before you begin

Verify that SRM is configured for array-based replication. For instructions about array-based replication, see the VMware vCenter SRM documentation.

### About this task

On the primary site, before you start a local snapshot backup on the storage system, you verify that the profile contains a `DEVICE_CLASS` section for the primary site. To create a snapshot backup on the storage system at the secondary site, you must create and configure an extra `DEVICE_CLASS` section in the Tivoli Storage FlashCopy Manager for VMware profile.

### Procedure

On the primary site, to create a snapshot backup on the storage system at the secondary site, complete the following steps:

1. Create a `DEVICE_CLASS` section for the secondary site in the Tivoli Storage FlashCopy Manager for VMware profile by running the setup script at the primary site. To run the setup script, issue the following command from the `/opt/tivoli/tsm/tdpvmware/fcm` directory:  

```
./setup.sh
```

When you create the `DEVICE_CLASS` section with the setup script, ensure that the following parameters and values are defined:

- The `COPYSERVICES_REMOTE` parameter is set to YES.
- Specify the IP address or host name of the server at the secondary site for the `COPYSERVICES_REMOTE_SERVERNAME` parameter.
- Specify the user name that is used to connect to the secondary site for the `COPYSERVICES_REMOTE_USERNAME` parameter.

**Tip:** You can also use the GUI configuration wizard to create the `DEVICE_CLASS` section for the secondary site.

2. From the primary site, start the snapshot backup operation from the Tivoli Storage FlashCopy Manager for VMware GUI and ensure that you select the device class that is created for the secondary site.

**Tip:** From the command line, use the `-D deviceClass` option to select the device class.

**Related tasks:**

“Backing up virtual machines” on page 82

“Creating a backup” on page 90

---

## 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 VMware datastore, you must create the datastore and ensure that the original datacenter name exists before you start 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.

**Note:** Using some storage systems, the snapshot restore requires a certain amount of available space on the target storage pool, so that it can restore the necessary volume. If there is not enough storage space available, you can increase the capacity on the requested storage pool, or free up some items that are using existing capacity. Check the message for the exact amount of storage space that is required.

### What to do next

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

---

## Restoring VMware datastores

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

### Before you begin

To restore a VMware datastore, the original datacenter name must exist before you start the restore wizard.

### About this task

When you restore a datastore, it overwrites the existing datastore with the virtual machines and files from 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.

**Note:** Using some storage systems, the snapshot restore requires a certain amount of available space on the target storage pool, so that it can restore the necessary volume. If there is not enough storage space available, you can increase the capacity on the requested storage pool, or free up some items that are using existing capacity. Check the message for the exact amount of storage space that is required.

### What to do next

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

---

## Restoring virtual machines with IBM Data Protection

You can use the IBM Data Protection extension to restore a virtual machine from Tivoli Storage FlashCopy Manager for VMware hardware snapshots.

### Before you begin

From the VMware vSphere Web Client, select **IBM Data Protection** and click **Connections**. Verify that a connection status exists between the web GUI host and the vCenter.

### Procedure

To restore a virtual machine by using the IBM Data Protection extension, complete the following steps:

1. In the vSphere web client Navigator pane, click **Datacenters**.
2. Select the datacenter. In the datacenter pane, click the **Manage** tab and select **IBM Data Protection**.
3. Select the virtual machine that you want to restore, right-click, and select **Restore**.

**Tip:** Alternatively, you can select a virtual machine from the Navigator pane, right-click, and select **All IBM Data Protection Actions > Restore**.

4. Select one backup restore point from the list of restore points.
5. Click **Next**. Follow the instructions on each page of the wizard to restore the virtual machine.
6. On the Summary page, review your restore settings and click **Finish**.

### What to do next

To view the progress of the task, click the **Recent Tasks** tab from the GUI.

---

## Restoring a virtual machine protected by 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**.
  - d. Click **Next**. Follow the instructions on each page of the wizard to select the type of restore and to specify the restore location.
  - 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**.

---

## Checking managed capacity and licensing reports

Run and view a Tivoli Storage FlashCopy Manager managed capacity report from the GUI to check your licensing compliance. The report shows the back-end capacity, front-end capacity, and LUN capacity with total protected size and number of managed objects for each report type.

### About this task

For more information about front-end and back-end capacity and how to measure them, see the latest User's Guide at this site [ftp://public.dhe.ibm.com/storage/tivoli-storage-management/front\\_end\\_capacity\\_measurement\\_tools/](ftp://public.dhe.ibm.com/storage/tivoli-storage-management/front_end_capacity_measurement_tools/)

### Procedure

1. In the Reports window, click **Managed Capacity** to view managed capacity from the GUI.
2. Print the summary report for managed capacity and licensing to the default output directory with this command:

```
vmcli -f managed_capacity
```

The managed capacity report is stored here, *ACS\_DIR/capacity\_reports*.

### Results

The XML report summary is available to view in more detail from *ACS\_DIR/capacity\_reports*.

**Tip:** Ensure to regularly delete old copies of managed capacity reports from the output directory.

---

## Chapter 6. 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 IBM 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 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.
- VVol datastores and associated virtual machines are excluded from the backup process.
- VMware vCenter Site Recovery Manager (SRM) placeholders are excluded from the backup.

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.

#### 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:

#### Procedure

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

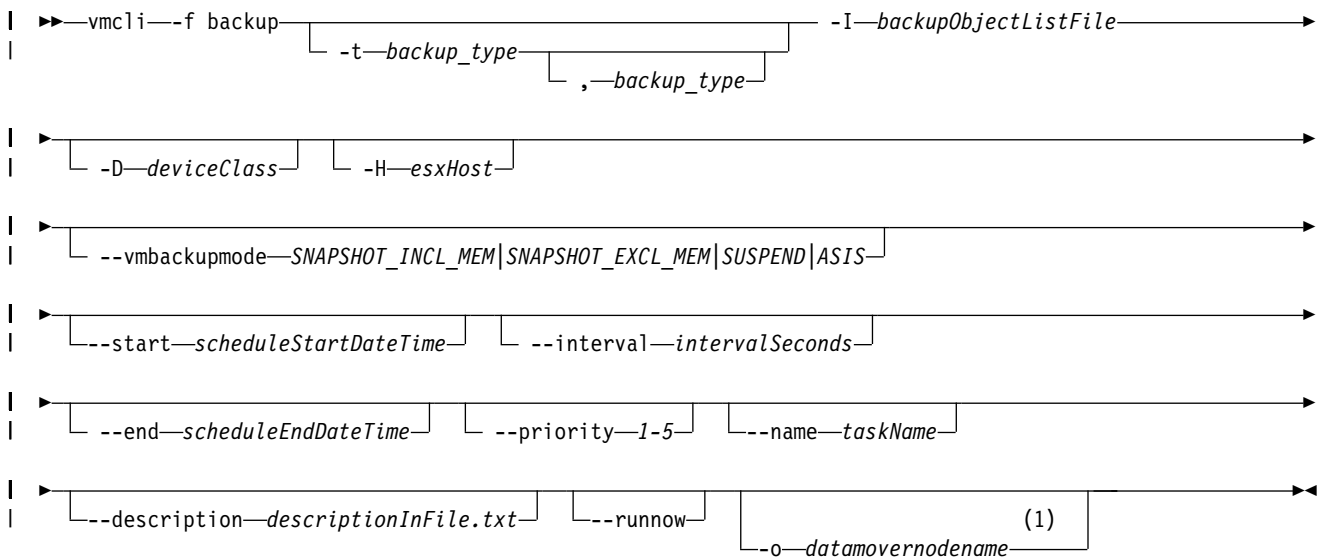
## Creating a backup

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 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.`

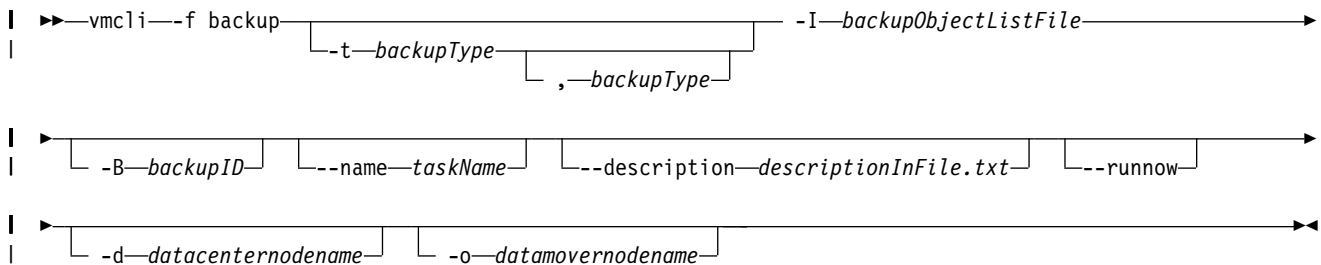


**Tip:** Before, running an offloaded incremental backup to Tivoli Storage Manager, on all virtual machines included in the backup, manually enable changed block tracking (CBT). Virtual machines in a powered off or suspended state are included in an incremental backup, so enable CBT on these systems too. If you cannot manually enable CBT, you can 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.
- Valid datastore identifiers are the datastore url: `datastoreurl` or the datastore name: `datastorename`.
- Include and exclude statements are optional. Exclude statements start with an exclamation point `!`. These statements can contain a `vminstanceuid`, `vmname`, `datastoreurl`, or `datastorename` option.
- Wildcard characters `?` and `*` are allowed for the `datastorename` or `vmname` option.

- 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.
- VVol datastores and associated virtual machines are excluded from the backup process.
- VMware vCenter Site Recovery Manager (SRM) placeholders are excluded from the backup.

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 8, “Integrating with Tivoli Storage Manager for Virtual Environments,” on page 141

**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.

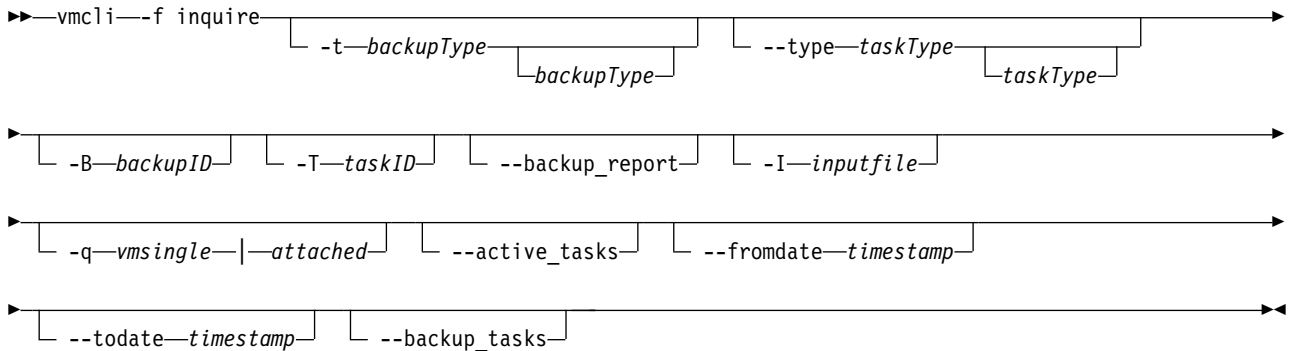
### About this task

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`.

### Procedure

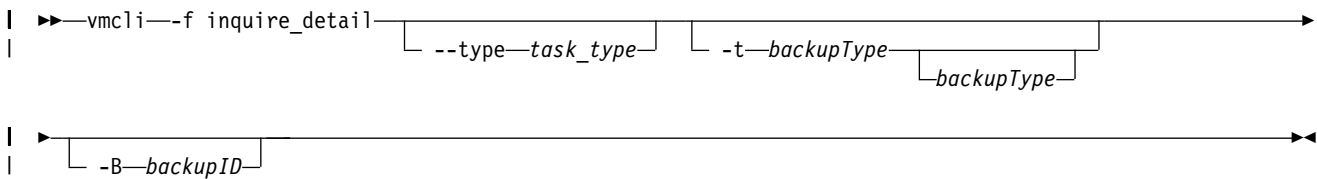
The following syntax diagram shows the **inquire** command:

**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 are 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.

## Example

The following examples show other ways to use the inquire command:

- `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 161

---

## 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 -H esxHost -I attachObjectListFile
```

Specify the target host with the **-H** option. If this option is not specified, the target host defaults to the auxiliary ESX host as specified by the **AUXILIARY\_ESX\_HOST** profile 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

```
vmcli -f detach -t backupType -B backupID -F -I detachObjectListFile
```

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:sourceVmInstanceId[:vminstanceuuid:targetVmInstanceId]
[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:vm4InstanceUuid 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 152

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:

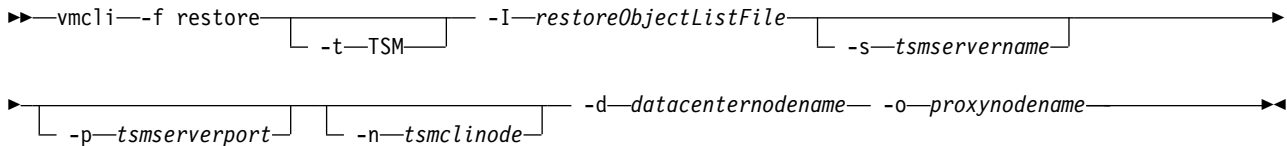
#### vmcli command

```
▶▶—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



## 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: BID7 vminstanceuuid: vm7InstanceUuid esxhostname: esxHost1Name

restore the disks with the specified keys of vm3InstanceUuid,
#original disk files are overwritten
backupid: BID8 vminstanceuuid: vm3InstanceUuid diskkey: 2000, 2001

restore the disks with the specified keys of vm3InstanceUuid to
#vm4InstanceUuid as new disks
backupid: BID9 vminstanceuuid: vm3InstanceUuid::vminstanceuuid: vm4InstanceUuid
diskkey: 2000, 2001
```

**Related reference:**

“VMCLI restore” on page 171

---

## 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.

### Procedure

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: BID8 vminstanceuuid: vm3InstanceUuid diskkey: 2000, 2001

restore the disks with the specified keys of vm3InstanceUuid to vm4InstanceUuid
as new disks backupid: BID9 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 VMware 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]
```

### **restoreObjectListFile**

Where the *restoreObjectListFile* specifies 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`.

### **-B backup\_ID**

You can specify the backup to restore by entering the `-B` option followed by the backup ID. This option is not mandatory and if not specified the most recent snapshot backup is restored.

For a virtual machine that spans a number of datastores, you must complete the following tasks:

- List all the datastores in the input text file.
- To exclude a virtual machine from the datastore, on a new 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`.

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. 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 family storage systems. A writeable snapshot can also exist on a XIV system when the profile **USE\_WRITABLE\_SNAPSHOTS** parameter is set to 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
!vminstanceuid:8a2d7ae7-02dd-c4be-63g5-c44a1desfb75
!vminstanceuid:6a2drae7-02d4-c4be-6g5-c44a1deseb78
vminstanceuid: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 170

---

## 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

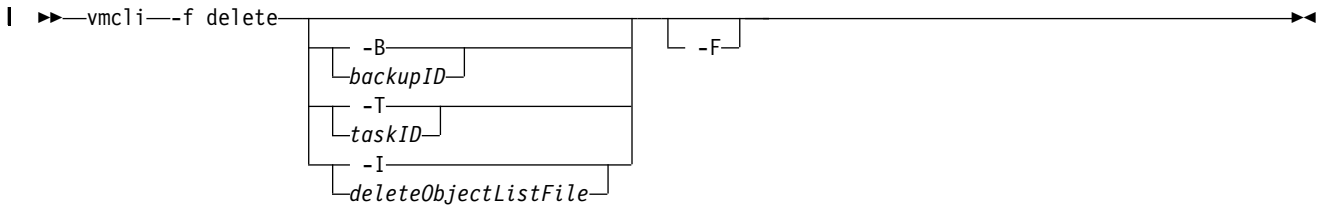
You can use the **vmcli -f delete** command to delete a backup or a task. Use one of the following options:

- 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.

### Procedure

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

#### 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 93

**Related reference:**

“VMCLI delete” on page 159

---

## 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 time between reconciliation operations. 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 time between reconciliation operations. 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 managed\_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 information about the virtual machine backups that are created by Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments. This information is required during a restore operation. You must regularly create a backup of this database and you can configure the backup interval by 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.

### Procedure

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 112. 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 175.

---

## Chapter 7. Tivoli Storage FlashCopy Manager for VMware configuration files

You must ensure the configuration files contain all the information IBM 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
- ACSD
- VMWARE
- VMCLI
- DEVICE\_CLASS

#### **Related concepts:**

Storage solutions

---

### 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 11. Tivoli Storage FlashCopy Manager for VMware profile parameters - GLOBAL section

Name	Description	Default value	Advanced mode
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
ACSD	<p><i>hostname port</i></p> <p>The host name and the port of the system on which the management agent acsd is running. Separate the values with a space.</p>	localhost 57328	No
ENFORCE_TLS12	<p>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 SP800-131A 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.</p>	No	Yes
TRACE	<p>Activates tracing. Wait for instructions from support before you set the values.</p> <p><b>YES</b> Enable tracing.</p> <p><b>NO</b> Disable tracing.</p>	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 12. Tivoli Storage FlashCopy Manager for VMware profile parameters - ACSD section

Name	Description	Default value	Advanced mode
ACS_REPOSITORY	<p>The path to the ACS repository directory. This parameter is required. The <b>ACS_REPOSITORY</b> parameter specifies the directory where the Tivoli Storage FlashCopy Manager for VMware repository is located.</p> <p><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.</p> <p>ACS_DIR/acsrepository</p>	None	No
REPOSITORY_LABEL	<p>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.</p>	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 13. Tivoli Storage FlashCopy Manager for VMware profile parameters - VMWARE section

Name	Description	Default value	Advanced mode
AUXILIARY_ESX_HOST	Auxiliary ESX host name.	None	No
FCM_VM_NAME	Virtual machine name where Tivoli Storage FlashCopy Manager for VMware is installed.	None	Yes
HOST_NAME_MAPPING	Mapping between the ESX host name and storage subsystem host name as specified by: <i>ESX host name: storage subsystem host name [USE_FOR device class names]</i> .	None	No
MAX_VERSIONS	Number of FlashCopy or snapshot backups to retain.	ADAPTIVE	No

Table 13. Tivoli Storage FlashCopy Manager for VMware profile parameters - VMWARE section (continued)

Name	Description	Default value	Advanced mode
NUMBER_CONCURRENT_VM_TASKS	Number of operations that can run concurrently at backup time.	1	Yes
TIMEOUT_FLASH	Maximum time in seconds that the application agent waits for a response to the management agent call during the <i>flash</i> phase.	300 (seconds)	Yes
TIMEOUT_PHASE <sup>[1]</sup>	Maximum time in seconds that the application agent waits for a response to the management agent call during a specific phase.	3600 (seconds)	YES
VM_BACKUP_MODE	Process method to use before the hardware snapshot process	SNAPSHOT_EXCL_MEM	No
VCENTER_SERVER	Host name or IP address of the vCenter server.	None	No
VCENTER_SERVER_USER	Log on user name.	Administrator	No
VCENTER_SERVER_VM_NAME	Name of the vCenter server virtual machine.	None	Yes
Note:			
[1]			
Where PHASE is one of the following processes: PARTITION, PREPARE, FLASH, VERIFY, or CLOSE			

## Parameter name definitions

### AUXILIARY\_ESX\_HOST

Represents the auxiliary ESX host name. The auxiliary ESX host is required whenever a snapshot backup is temporarily mounted. For example, during a restore operation or when offloading backups to Tivoli Storage Manager. You must specify the fully qualified ESX host name as defined in the vCenter Server. When you issue a command, the auxiliary ESX host is used as the default host 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. It is not a requirement to have a separate host as the auxiliary ESX host.

### FCM\_VM\_NAME

Represents the virtual machine name within the vSphere where the Tivoli Storage FlashCopy Manager for VMware application is installed. To avoid errors that are caused by attempting to back up this virtual machine, specify the name to ensure that this virtual machine is automatically excluded from any backup or restore operations.

Tivoli Storage FlashCopy Manager for VMware can be installed on a physical machine or a virtual machine in another vSphere environment. If not protected by this Tivoli Storage FlashCopy Manager for VMware instance, this parameter is optional and you can omit it.

## HOST\_NAME\_MAPPING

Represents how an ESX server host name in the vSphere environment is mapped to the host name as defined on the storage subsystem. Use the following format when you specify a value for this parameter:

*ESX host name:storage subsystem host name [USE\_FOR device class names]*

Where:

### *ESX host name*

The ESX host name as defined in the vCenter Server.

### *storage subsystem host name*

The storage system host name as defined on the storage system.

Depending on the storage system and configuration, it might be necessary to use one of the following values:

- For IBM System Storage N series and NetApp storage systems that are accessed by using network-attached storage (NAS), specify the IP address of the ESX hosts VMkernel port for NFS traffic.
- For N series and NetApp storage systems that are accessed by using a storage area network (SAN), specify the NetApp initiator group name. This requirement applies when the storage system is accessed through transport protocols such as Fibre Channel (FC) or iSCSI.
- For Storwize family or SAN Volume Controller storage systems, the optimum method is to use dynamic volume mapping to ESX hosts. Tivoli Storage FlashCopy Manager for VMware automatically assigns the FlashCopy target volumes to the ESX hosts when required. With this method, the backup time is decreased. Specify the host name that is used on the storage system.

However, if you use static volume mapping, you must specify `PREASSIGNED_VOLUMES` as the storage system host name.

- For configurations where there are hosts in a cluster on the storage system, specify the cluster name for all ESX hosts that are part of the cluster.
- For IBM XIV Storage Systems and other third-party storage systems, specify the storage system host name.

### *USE\_FOR device class names*

Specifies the device class name where this mapping is used. This attribute is optional, when you specify more than one device class separate them with a space character.

Use the `USE_FOR` option to apply different mappings on different storage systems. A mapping statement for a device class that uses the `USE_FOR` attribute overrides a general mapping statement that does not use the `USE_FOR` attribute.

The following example maps the fully qualified ESX host name on the vCenter Server `esxserv1.domain.com` to the ESX host name `esxserv1_SVC` as defined on the Storwize family storage:

```
HOST_NAME_MAPPING esxserv1.domain.com:esxserv1_SVC
```

**Restriction:** For DS8000 systems, do not use the `HOST_NAME_MAPPING` parameter as an internal mapping to `PREASSIGNED_VOLUMES[...]` is assigned for all ESX hosts.

If you do not specify the host name mapping parameter, Tivoli Storage FlashCopy Manager for VMware derives the storage subsystem host name from the ESX host name. The first segment of the fully qualified ESX host name is used.

For example, if the `esxserv1.domain.com` name is the ESX host name, the `esxserv1` is defined as the storage subsystem host name. In this case, the parameter is automatically set to the value `esxserv1.domain.com:esxserv1`.

You can specify the **HOST\_NAME\_MAPPING** parameter multiple times within the VMware section of the profile for each ESX host that is defined in the vCenter Server.

#### **MAX\_VERSIONS**

Represents the number of datastore backup generations to be retained on a storage device. The number of backup generations is applied to individual datastore groups. A datastore group is the set of datastores that you select when you run a backup from the GUI or from the command line. Where virtual machines are distributed between datastores, these additional datastores are automatically considered as part of the group, if they are not selected.

The following example demonstrates the number of backup generations that are retained. For example, the **MAX\_VERSIONS** parameter is set to three, and you define two backup tasks. For the first backup task, you select two datastores Datastore 1 and Datastore 2. Then, you create a second backup task and you select Datastore 1 only. If you run the backup tasks three times, a total of six backups are retained on the storage device, three for each group.

When you run the first backup task for the fourth time, the oldest backup for the group Datastore 1 and Datastore 2 is overwritten. Similarly, when you run the second backup task for a fourth time, only then is the oldest backup for the group overwritten.

Specify one of the following options:

#### **ADAPTIVE**

The maximum number varies depending on the available storage pool space that the volumes are assigned to. When there is insufficient space, the oldest target set is used as the target for the current backup.

**Tip:** If you specify static target sets for your storage device, the number of target sets for a device class overrides the adaptive setting. For example, if you create four target sets, the number of generations that are retained is four.

#### **Number (n)**

Specify the maximum number of snapshot versions to be retained. When this number is reached, the oldest version is deleted.

**Tip:** If you specify static target sets for your storage device, the minimum value from either the number that is specified or the number of static target sets is used.

**Note:** If you configure Tivoli Storage FlashCopy Manager for VMware to use the new SVC adapter with dynamic target allocation, do not set the **MAX\_VERSIONS** parameter to ADAPTIVE. For dynamic target allocation, there is no specific number of target volumes, therefore there must be a limit on the number of FlashCopy backups to retain to prevent the storage pool from running out of space.

### **NUMBER\_CONCURRENT\_VM\_TASKS**

Represents 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.

For example, if **VM\_BACKUP\_MODE** parameter is set to **SNAPSHOT\_EXCL\_MEM**, the **NUMBER\_CONCURRENT\_VM\_TASKS** parameter specifies the number of VMware snapshots that are run concurrently, to speed up the process.

### **TIMEOUT\_FLASH**

Represents 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 *flash* 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.

### **TIMEOUT\_PHASE**

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 a phase. The *PHASE* can be one of the following values:

- PARTITION
- PREPARE
- FLASH
- VERIFY
- CLOSE

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.

### **VM\_BACKUP\_MODE**

Represents how virtual machines selected for backup are processed before the actual hardware snapshot is taken. Specify one of the following options:

#### **SNAPSHOT\_INCL\_MEM**

Create a VMware snapshot that includes a working memory for each virtual machine included in the backup. Virtual machines in a powered off or suspended state are also included in the VMware snapshot. The virtual machine can be resumed after a restore. The achieved consistency level is *filesystem* consistency.

#### **SNAPSHOT\_EXCL\_MEM**

Create a VMware snapshot without a working memory image for every virtual machine included in the backup. Virtual machines in a powered off or suspended state are also included in the VMware snapshot. The virtual machine must be started after the restore. The achieved consistency level is *filesystem* 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:

- Install VMware tools file system sync driver
- Create appropriate freeze and thaw scripts
- Configure VSS for Windows operating system

#### **SUSPEND**

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 *filesystem* consistency.

**ASIS** No action is performed before the actual hardware snapshot. The virtual machine must be started after a restore. The achieved consistency level is *crash consistency*.

When you use the `SNAPSHOT_INCL_MEM` or `SNAPSHOT_EXCL_MEM` option a VMware snapshot is taken before the hardware snapshot. If the VMware snapshot is not successful, the VMware snapshot is automatically started again with quiescence disabled and when completed the hardware snapshot is run. If problems continue to occur, the VMware snapshot step is omitted and a hardware snapshot is taken. The files in this backup are crash consistent only and after a restore, the virtual machines require a manual restart.

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. Using this method, the value that is specified for the **VM\_BACKUP\_MODE** parameter in the profile is overwritten. When you use the Data Protection for VMware command-line interface to create backups, you can also overwrite the value of **VM\_BACKUP\_MODE** parameter by using a command-line option.

**VCENTER\_SERVER**

Represents the host name or IP address of the vCenter server that is managing the vSphere environment that is protected by this installation.

**VCENTER\_SERVER\_USER**

Represents the user name that is used to log on to the vCenter server.

**VCENTER\_SERVER\_VM\_NAME**

Represents the name of the vCenter server virtual machine. If you installed the vCenter server in a virtual machine, specify the virtual machine name to automatically exclude the virtual machine from any backup and restore operations.

If the vCenter server is running in a vSphere environment that is not protected by this Tivoli Storage FlashCopy Manager for VMware instance, this parameter is optional and you can omit it.

## 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.

The vmcli database stores metadata about all backup, restore, and delete tasks. The profile parameters that are listed in the following table and start with *VE\_* are only valid when Tivoli Storage Manager for Virtual Environments with Tivoli Storage FlashCopy Manager for VMware are used.

*Table 14. Tivoli Storage FlashCopy Manager for VMware profile parameters - VMCLI section*

Name	Value	Default value	Advanced mode
DERBY_HOME	Path to the vmcli database	None	No
VE_DATACENTER_NAME	<i>datacentername::datacenternodename</i>	None	No

Table 14. Tivoli Storage FlashCopy Manager for VMware profile parameters - VMCLI section (continued)

Name	Value	Default value	Advanced mode
VE_TSM_SERVER_NAME	Host name of the Tivoli Storage Manager for Virtual Environments server	None	No
VE_TSMCLI_NODE_NAME	Node name under which the backup-archive client GUI or CLI operations are issued	None	No
VE_VCENTER_NODE_NAME	Tivoli Storage Manager for Virtual Environments virtual vCenter node	None	No
VE_TSM_SERVER_PORT	Port number of the Tivoli Storage Manager for Virtual Environments server	1500	Yes
VMCLI_DB_BACKUP	Indicates when to back up the vmcli database.  The following options are valid: NO, AT [day[, day[,...]]] time_in_24_H, AFTER_BACKUP	AT 00:00	No
VMCLI_DB_BACKUP_VERSIONS	Maximum number of backup generations that are maintained for the vmcli database	3	No
VMCLI_LOG_DIR	Absolute or relative path location where Data Protection for VMware command-line interface log files are stored.	logs directory	No
VMCLI_SCHEDULER_INTERVAL	Time interval, in seconds, between scheduler checks for scheduled tasks that are due to start	60 seconds	No
VMCLI_RECON_INTERVAL_FCM	Time interval between reconciliation operations on the vmcli database with the Tivoli Storage FlashCopy Manager for VMware repository	600 seconds (10 minutes)	Yes
VMCLI_RECON_INTERVAL_TSM	Time interval between reconciliation operations on the vmcli database with the IBM Tivoli Storage Manager for Virtual Environments repository	1200 seconds (20 min)	Yes
VMCLI_RESTORE_TASK_EXPIRATION_TIME	Time period to retain restore task history in the vmcli database	2592000 seconds (30 days)	Yes
VMCLI_TASK_EXPIRATION_TIME	Time period to retain task history in the vmcli database	864000 seconds (10 days)	Yes
VMCLI_TRACE	YES No  Activate tracing only when instructed to do so by IBM Software Support	None	Yes

## Parameter name definitions

### DERBY\_HOME

The location of the vmcli database is specified by this parameter. The database stores metadata about all backup, restore, and delete tasks.

### VE\_DATACENTER\_NAME

Represents how the datacenter name in the vSphere server is mapped to the Tivoli Storage Manager for Virtual Environments node name. 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 *datacentername* and *datacenternodename*. For example,  
VE\_DATACENTER\_NAME datacenter1::datacenternodename1  
VE\_DATACENTER\_NAME datacenter2::datacenternodename2

**VE\_TSM\_SERVER\_NAME**

Represents the host name of the Tivoli Storage Manager for Virtual Environments server that is used for data backups.

**VE\_TSMCLI\_NODE\_NAME**

Represents the node name under which the backup-archive client GUI or CLI operations are issued.

**VE\_VCENTER\_NODE\_NAME**

Represents the Tivoli Storage Manager for Virtual Environments virtual node name. This node represents all the datacenters or a subset of datacenters, within a vCenter domain.

**VE\_TSM\_SERVER\_PORT**

Represents the port number of the Tivoli Storage Manager for Virtual Environments server.

**VMCLI\_DB\_BACKUP**

Defines the backup process for the vmcli database containing the metadata of the Data Protection for VMware command-line interface. Specify one of the following values:

**NO** No backup of the vmcli database is performed.

**AT** [*day*[, *day*[,...]]] *time\_in\_24\_H*

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.

**AFTER\_BACKUP**

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.

The default location for the backups of the vmcli database is *install\_dir/derby\_backups*. Specify the *T0 path* to set a custom path.

**VMCLI\_DB\_BACKUP\_VERSIONS**

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.

**VMCLI\_LOG\_DIR**

Represents the absolute or the relative location of the installation directory path where Data Protection for VMware command-line interface stores its log files.

**VMCLI\_SCHEDULER\_INTERVAL**

Defines the time interval, in seconds, between scheduler checks for scheduled tasks that are due to start.



| **VMCLI\_RECON\_INTERVAL\_FCM**

| Defines 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 sync with the Tivoli  
| Storage FlashCopy Manager for VMware repository.

| **VMCLI\_RECON\_INTERVAL\_TSM**

| Defines the time interval between reconciliation operations on vmcli database  
| with the IBM Tivoli Storage Manager for Virtual Environments repository.  
| Reconciliation operations delete metadata for backups that are no longer  
| available, ensuring vmcli database remains in sync with the Tivoli Storage  
| Manager for Virtual Environments repository.

| **VMCLI\_RESTORE\_TASK\_EXPIRATION\_TIME**

| Defines the time that a restore task history is stored in the vmcli database. This  
| parameter applies to restore tasks only.

| **VMCLI\_TASK\_EXPIRATION\_TIME**

| Defines 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 managed\_capacity.

| **VMCLI\_TRACE**

| Specifies that tracing files are activated. Activate tracing only when instructed  
| to do so by IBM Software Support.

---

## **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.

| When you rename or delete a DEVICE\_CLASS section from the profile be cautious,  
| as you cannot access backups that were taken with the original DEVICE\_CLASS  
| section. You must first remove backups that are associated with the  
| DEVICE\_CLASS before you rename or delete the DEVICE\_CLASS section.

| A *device* refers to supported IBM System Storage DS8000 series, IBM Storwize  
| family, IBM System Storage SAN Volume Controller, IBM XIV Storage System, IBM  
| System Storage N series, and NetApp storage systems.

## **DEVICE\_CLASS DS8000 Storage System parameters**

| The parameters that are defined in the device class section of the Tivoli Storage  
| FlashCopy Manager for VMware profile file, configure Tivoli Storage FlashCopy  
| Manager for VMware for use with the IBM System Storage DS8000.

| **COPYSERVICES\_HARDWARE\_TYPE**

| This parameter is required. Only one device can be specified.

| **DS8000**

| Specify the DS8000 option, when the storage system is DS8000.

| **Default**

| None

| **Advanced mode only**

| No

**COPYSERVICES\_SERVERNAME**

This parameter defines the TCP/IP host name of the storage system where the virtual machines to protect are located.

**Default**

None

**Advanced mode only**

No

**COPYSERVICES\_PRIMARY\_SERVERNAME**

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 or the embedded CIM agent.

**Default**

localhost

**Advanced mode only**

No

**COPYSERVICES\_SECONDARY\_SERVERNAME**

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.

**Default**

None

**Advanced mode only**

Yes

**COPYSERVICES\_USERNAME**

This parameter specifies the cim user name. The CIM agent for DS Open API, manages the primary and secondary copy services servers of the IBM System Storage DS8000 cluster.

**Default**

superuser

**Advanced mode only**

No

**COPYSERVICES\_SERVERPORT**

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 or embedded CIM agent.

**Default**

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	6989
	HTTP	6988

**Advanced mode only**

Yes

### **COPYSERVICES\_TIMEOUT**

This parameter identifies the maximum length of time, in minutes, that the CIM Client waits for a response to a call issued to the CIMOM (CIM Object Manager), the CIM Agent. If the CIM Client does not receive a response within this time, an error message is issued.

#### **Default**

6

#### **Advanced mode only**

Yes

### **COPYSERVICES\_COMMPROTOCOL**

This parameter identifies the protocol to be used for communication with the CIM Agent. The options are HTTP, for communication in a non-secure mode, and HTTPS, for communication in a secure mode.

#### **Default**

HTTPS

#### **Advanced mode only**

No

### **COPYSERVICES\_CERTIFICATEFILE**

When **COPYSERVICES\_COMMPROTOCOL** is set to HTTPS, you must specify this parameter. There are two options:

#### *certificate\_filename*

Name of a certificate file that is created for secure communication between the CIM Client and the CIM Agent.

#### **NO\_CERTIFICATE**

Select for null trust provider mode.

By default, the CIM Agent for DS8000, which is preinstalled on the HMC, requires communication in secure mode. For this scenario, clients such as Tivoli Storage FlashCopy Manager for VMware must connect by using HTTPS instead of HTTP. This connection requires that the CIM Client obtain the public key that is used for encryption from the *truststore* certificate in the CIM Agent. After the client obtains the public key, the CIM Client is authenticated 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. For this scenario, the **COPYSERVICES\_CERTIFICATEFILE** parameter 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 scenario, the CIM Agent does not verify that the certificate passed by the client matches a known certificate. Rather, 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 used only if the production and backup systems, and the storage system, are protected by a firewall. If **NO\_CERTIFICATE** is used, the `cimom.properties` parameter **DigestAuthentication** must be set to `false`.

#### **Default**

**NO\_CERTIFICATE**

#### **Advanced mode only**

Yes

## FLASHCOPY\_TYPE

This parameter specifies whether the storage solution does a bit-level copy of data from one logical volume to another. The following options are available:

**COPY** 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:

- A fast snapshot restore of backed-up data is required.
- A complete copy of the data on the target volume is available.

**INCR** This option is similar to the **COPY** option but the **INCR** option copies only those tracks that were modified since the previous incremental FlashCopy was created. Specify this option when you intend to schedule frequent backups of your datastore or you if you want Tivoli Storage Manager to back up data from disk copies.

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.

**NOCOPY** Directs the storage system to perform a bit-level copy of a track if the data is modified after the initial FlashCopy request. This technique is typically referred as copy-on-write. Specify this value when the following conditions are true:

- A complete copy of the source volumes that contain the datastore is not required on the target volumes.
- 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**.

### Default

COPY

### Advanced mode only

No

## TARGET\_SETS

This parameter specifies the target volumes to be used in the FlashCopy operation. Specify **VOLUMES\_FILE**.

### Default

None

### Advanced mode only

No

## VOLUMES\_FILE

This parameter specifies the name of the target volumes file (.fct). You must specify the name of the target volumes file when the **TARGET\_SETS** parameter is set to **VOLUMES\_FILE**. Enter the path to the target volumes file when prompted.

### Default

None

### Advanced mode only

No

See "Target sets and volumes" on page 54.

### RECON\_INTERVAL

This parameter specifies the interval, in hours, between two subsequent reconciliation operations. The options are whole numbers between 0 and 24 inclusive.

#### Default

12

#### Advanced mode only

Yes

## DEVICE\_CLASS Storwize family and SAN Volume Controller Storage System parameters

The parameters that are defined in the device class section of the profile file, configure Tivoli Storage FlashCopy Manager for VMware for use with the IBM Storwize family or IBM System Storage SAN Volume Controller storage systems.

When you configure, you have a choice of Storwize family and SAN Volume Controller device types. Depending on which device type you select, the parameter values that are required vary.

From the configuration wizard, you can select one of the following device types:

### Storwize family and SAN Volume Controller dynamic target allocation

Tivoli Storage FlashCopy Manager for VMware dynamically allocates target volumes on the storage system during the backup process.

### Storwize family and SAN Volume Controller static target allocation

Before you start the backup process, you must manually create target volumes on the storage system. Also, predefined volumes must be defined in a Tivoli Storage FlashCopy Manager for VMware configuration file or must match a specific naming pattern.

**Restriction:** If you use both options at the same time on the same storage system, there are limitations associated with the SVC adapter using static target allocation. For more information, see the 'Restriction' section in "Configuring the system by using the configuration wizard" on page 64

Alternatively, specify SVCDTA or SVC when prompted by the setup script with a choice of storage system types.

| Choose SVC for Storwize family and SAN Volume Controller static target  
| allocation.

| Choose SVCDTA for Storwize family and SAN Volume Controller dynamic target  
| allocation.

## DEVICE\_CLASS parameters for dynamic target allocation

The parameters that are defined in the device class section of the profile file, configure Tivoli Storage FlashCopy Manager for VMware for use with IBM Storwize family or IBM System Storage SAN Volume Controller storage systems.

### COPYSERVICES\_HARDWARE\_TYPE

This parameter is required. Only one device can be specified.

#### SVCDTA

Specify the SVCDTA option, when the storage system is SAN Volume Controller or Storwize family and you require the target volumes to be dynamically allocated during the backup process.

**Default**

None

**Advanced mode only**

No

**COPYSERVICES\_SERVERNAME**

Defines the TCP/IP host name of the storage system where the VMware datastores to protect are allocated.

**Default**

None

**Advanced mode only**

No

**COPYSERVICES\_USERNAME**

Specifies the user name. Specify the user name that is used to log on to the SAN Volume Controller cluster. For Storwize family, specify Storwize family user name.

**Default**

superuser

**Advanced mode only**

No

**SVC\_SSHKEY\_FULLPATH**

Specifies the path and the file name to the private SSH key file. The key file is used to authenticate to the storage system with the user name specified for the **COPYSERVICES\_USERNAME** parameter.

**Default***\$HOME/.ssh/svc\_sshkey***Advanced mode only**

Yes

**SSH\_DIR**

Specifies the path to the Secure Shell protocols and executable files.

**Default***/usr/bin***Advanced mode only**

Yes

**SVC\_COPY\_RATE**

Specifies the priority that the storage system gives to the FlashCopy background process for the current backup or restore operation. Enter a value from the range 0 - 100. A value of 0 suppresses the background copy process.

**Default**

0

**Advanced mode only**

Yes

**SVC\_CLEAN\_RATE**

Specifies the cleaning rate for the FlashCopy mapping. Enter a value from the range 1 - 100.

**Default**

50

**Advanced mode only**

Yes

**SVC\_GRAIN\_SIZE**

Specifies the grain size in KB, for the FlashCopy mapping. The grain size of the space-efficient virtual disk must match the grain size of the FlashCopy. Set to either 64 or 256.

After the parameter is set, the value cannot be changed until the backup is deleted with the -F option to remove the mapping and the corresponding target volume.

**Default**

256

**Advanced mode only**

Yes

**SVC\_POOLNAME**

Specifies the name of the storage pool that is used to create target volumes for the FlashCopy backups, and also to create consistency groups and the FlashCopy map for restore operations.

**Default**

Name of the storage pool on the source volume where the FlashCopy relationship is established.

**Advanced mode only**

Yes

**SVC\_IOGROUP**

Specifies the name of the input and output (IO) group, which is used to create target volumes for the FlashCopy backups.

**Default**

Name of the IO group on the source volume where the FlashCopy relationship is established.

**Advanced mode only**

Yes

**SVC\_MOUNT\_POOLNAME**

Specifies the name of the storage pool that is used to create temporary duplicates of the target volumes of a FlashCopy backup, which will then be mounted to a host.

**Default**

Name of the storage pool on the target volume that is used to create duplicate volumes for the mount operation.

**Advanced mode only**

Yes

**SVC\_MOUNT\_IOGROUP**

Specifies the name of the IO group, which is used to create duplicate volumes for the mount operation.

**Default**

Name of the IO group on the target volume that is used to create duplicate volume for the mount operation.

**Advanced mode only**

Yes

**SVC\_TARGET\_VOLUME\_REAL\_SIZE**

Specify the percentage of the source volume size to allocate, which is used to create the actual target volumes during the backup operation.

**Default**

10

**Advanced mode only**

Yes

**RECON\_INTERVAL**

This parameter specifies the interval, in hours, between two subsequent reconciliation operations. The options are whole numbers between 0 and 24 inclusive.

**Default**

12

**Advanced mode only**

Yes

**DEVICE\_CLASS parameters for static target allocation**

The parameters that are defined in the device class section of the profile file, configure Tivoli Storage FlashCopy Manager for VMware for use with IBM Storwize family or IBM System Storage SAN Volume Controller storage systems.

**COPYSERVICES\_HARDWARE\_TYPE**

This parameter is required. Only one device can be specified.

**SVC**

Specify the SVC option, when the storage system is SAN Volume Controller or Storwize family.

**Tip:** You must manually create backup target volumes in advance on the storage system.

**Default**

None

**Advanced mode only**

No

**COPYSERVICES\_SERVERNAME**

This parameter defines the TCP/IP host name of the storage system where the virtual machines to protect are located.

**Default**

None

**Advanced mode only**

No

**COPYSERVICES\_PRIMARY\_SERVERNAME**

This parameter defines the TCP/IP address of the host that is running the CIM Agent for DS Open API. The host manages the SAN Volume Controller master console or the Storwize family embedded CIM Agent. For SAN Volume Controller, the parameter, must point to the SAN Volume Controller cluster with the embedded CIM server.

For Storwize family, the parameter must point to the Storwize family cluster. Specify the server name or TCP/IP address.



**Default**  
localhost

**Advanced mode only**  
No

**COPYSERVICES\_USERNAME**

Specifies the user name. Specify the user name that is used to log on to the SAN Volume Controller cluster. For Storwize family, specify Storwize family user name.

**Default**  
superuser

**Advanced mode only**  
No

**COPYSERVICES\_SERVERPORT**

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 SAN Volume Controller master console, or embedded CIM agent on the Storwize family storage system.

**Default**  
The default port number depends on the settings of the **COPYSERVICES\_COMMPROTOCOL** parameters:

COPYSERVICES_COMMPROTOCOL	Default Port
HTTPS	5989
HTTP	5988

**Advanced mode only**  
Yes

**COPYSERVICES\_TIMEOUT**

This parameter identifies the maximum length of time, in minutes, that the CIM Client waits for a response to a call issued to the CIMOM (CIM Object Manager), the CIM Agent. If the CIM Client does not receive a response within this time, an error message is issued.

**Default**  
6

**Advanced mode only**  
Yes

**COPYSERVICES\_COMMPROTOCOL**

This parameter identifies the protocol to be used for communication with the CIM Agent. The options are HTTP, for communication in a non-secure mode, and HTTPS, for communication in a secure mode.

**Default**  
HTTPS

**Advanced mode only**  
No

**COPYSERVICES\_CERTIFICATEFILE**

When **COPYSERVICES\_COMMPROTOCOL** parameter is set to HTTPS, you must specify this parameter. There are two options:

*certificate\_filename*  
Name of a certificate file that is created for secure communication

between the CIM Client and the CIM Agent. Tivoli Storage FlashCopy Manager for VMware exports the certificate by using this file.

#### **NO\_CERTIFICATE**

Select for null trust provider mode.

The CIM Agent also provides another communication mode that is known as *null trust provider*. In this scenario, the CIM Agent does not verify that the certificate passed by the client matches a known certificate. Rather, 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 used only if the production and backup systems, and the storage system, are protected by a firewall. If **NO\_CERTIFICATE** is used, the `cimom.properties` parameter **DigestAuthentication** must be set to false.

#### **Default**

**NO\_CERTIFICATE**

#### **Advanced mode only**

Yes

#### **FLASHCOPY\_TYPE**

Specifies whether the storage solution does a bit-level copy of data from one logical volume to another. When you select the option **INCR** or **NOCOPY**, the **SVC\_COPY\_RATE** parameter is set to 0. The following options are available:

**COPY** Directs the storage system to perform a background bit-level copy of the data from the source to the target volumes that are defined by the FlashCopy relationship. Specify this value when a complete copy of the data on target volume is required. This process requires a background copy on the storage system to be completed.

**INCR** This option is similar to the **COPY** option but the **INCR** option copies only those tracks that were modified since the previous incremental FlashCopy was created. Specify this option when you intend to schedule frequent backups of your datastore or you if you want Tivoli Storage Manager to back up data from disk copies.

**NOCOPY** Directs the storage system to perform a bit-level copy of a track if the data is modified after the initial FlashCopy request. This technique is typically referred as copy-on-write. Specify this value when the following conditions are true:

- A complete copy of the source volumes that contain the datastore is not required on the target volumes.
- 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**.

#### **Default**

**COPY**

#### **Advanced mode only**

Yes

#### **TARGET\_SETS**

Specifies the target volumes to be used in the FlashCopy operation. The following list identifies the possible options:

**VOLUMES\_FILE**

A target volumes file is defined.

***list of target set names***

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.

**Default**

None

**Advanced mode only**

No

**VOLUMES\_FILE**

This parameter specifies the name of the target volumes file (.fct). You must specify the name of the target volumes file when the TARGET\_SETS parameter is set to VOLUMES\_FILE. Enter the path to the target volumes file when prompted.

**Default**

None

**Advanced mode only**

No

See "Target sets and volumes" on page 54.

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

This parameter specifies 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.

**Default**

None

**Advanced mode only**

No

**SVC\_COPY\_RATE**

Specifies the priority that the storage system gives to the FlashCopy background process for the current backup or restore operation. Enter a value from the range 0 - 100. A value of 0 suppresses the background copy process and forces the FLASHCOPY\_TYPE parameter to be set to NOCOPY.

**Default**

80

**Advanced mode only**

Yes

**SVC\_CLEAN\_RATE**

Specifies the cleaning rate for the FlashCopy mapping. Enter a value from the range 1 - 100.

**Default**

50

**Advanced mode only**

Yes

**SVC\_GRAIN\_SIZE**

Specifies the grain size in KB, for the FlashCopy mapping. The grain size of the space-efficient virtual disk must match the grain size of the FlashCopy. Set to either 64 or 256.

After the parameter is set, the value cannot be changed until the backup is deleted with the -F option to remove the mapping and the corresponding target volume.

**Default**

256

**Advanced mode only**

Yes

**RECON\_INTERVAL**

This parameter specifies the interval, in hours, between two subsequent reconciliation operations. The options are whole numbers between 0 and 24 inclusive.

**Default**

12

**Advanced mode only**

Yes

## **DEVICE\_CLASS XIV Storage System parameters**

The parameters that are defined in the device class section of the Tivoli Storage FlashCopy Manager for VMware profile file, configure Tivoli Storage FlashCopy Manager for VMware for use with the IBM XIV Storage System.

**COPYSERVICES\_HARDWARE\_TYPE**

This parameter is required. Only one device can be specified.

**XIV**

Specify the XIV option, when the storage system is XIV system.

**Default**

None

**Advanced mode only**

No

**COPYSERVICES\_SERVERNAME**

This parameter defines the TCP/IP host name of the storage system where the virtual machines to protect are located.

**Default**

None

**Advanced mode only**

No

**COPYSERVICES\_USERNAME**

This parameter specifies the XIV user name. The user name to log in to the XIV system.

**Default**

superuser

**Advanced mode only**

No

**PATH\_TO\_XCLI**

This parameter specifies the path where the XIV Storage Systems command-line interface, XCLI, is installed.

**Default**

None

**Advanced mode only**

No

**USE\_WRITABLE\_SNAPSHOTS**

This parameter specifies whether writable snapshots are used. The AUTO setting automatically selects the value that is based on your environment. Specify one of the following options YES, NO, or AUTO.

**Default**

AUTO

**Advanced mode only**

Yes

**RECON\_INTERVAL**

This parameter specifies the interval, in hours, between two subsequent reconciliation operations. The options are whole numbers between 0 and 24 inclusive.

**Default**

12

**Advanced mode only**

Yes

## **DEVICE\_CLASS System Storage N series and NetApp parameters**

The parameters that are defined in the device class section of the Tivoli Storage FlashCopy Manager for VMware profile file, configure Tivoli Storage FlashCopy Manager for VMware for use with the IBM System Storage N series or NetApp storage systems.

**COPYSERVICES\_HARDWARE\_TYPE**

This parameter is required. Only one device can be specified. The following list identifies the possible options:

**NAS\_NSERIES**

Specify the NAS\_NSERIES option, when the datastores are stored on NAS-attached storage systems.

**SAN\_NSERIES**

Specify the SAN\_NSERIES option, when the datastores are stored on SAN-attached or iSCSI attached storage systems.

**Default**

None

**Advanced mode only**

No

**COPYSERVICES\_SERVERNAME**

This parameter defines the TCP/IP host name of the storage system where the virtual machines to protect are located.

**Default**

None

**Advanced mode only**

No

**COPYSERVICES\_USERNAME**

This parameter specifies the user name. Specify the user name that is used to log on to the N series or NetApp storage system.

**Default**

superuser

**Advanced mode only**

No

**RECON\_INTERVAL**

This parameter specifies the interval, in hours, between two subsequent reconciliation operations. The options are whole numbers between 0 and 24 inclusive.

**Default**

12

**Advanced mode only**

Yes

## DEVICE\_CLASS mirroring parameters

When you configure a DEVICE\_CLASS section for a storage solution that uses mirroring functions, extra parameters are required in the profile file. These parameters and their associated values, enable Tivoli Storage FlashCopy Manager for VMware to connect to the secondary site from the primary site.

The parameters that are required to connect and send requests to the secondary site are identified in the following list:

**COPYSERVICES\_REMOTE**

This parameter specifies whether backup operations occur at a secondary site. The options are YES and NO. The default option is set to NO.

**COPYSERVICES\_REMOTE\_SERVERNAME**

This parameter specifies the IP address or host name of the storage system at the secondary site. If the **COPYSERVICES\_REMOTE** parameter is set to YES, this parameter is required. Otherwise, this parameter is not available.

**COPYSERVICES\_REMOTE\_USERNAME**

This parameter specifies the user name that is used to authenticate to the storage system at the secondary site. The default option is superuser. If the **COPYSERVICES\_REMOTE** parameter is set to YES, this parameter is required. Otherwise, this parameter is not available.

The following example shows a typical device class section in the profile for SAN Volume Controller storage device with remote mirroring enabled:

```
>>> DEVICE_CLASS FCM_REMOTE
COPYSERVICES_HARDWARE_TYPE SVC
COPYSERVICES_PRIMARY_SERVERNAME 192.168.1.104
COPYSERVICES_REMOTE_SERVERNAME 192.168.1.101
```

```
COPYSERVICES_REMOTE YES
COPYSERVICES_REMOTE_USERNAME superuser
FLASHCOPY_TYPE NOCOPY
BACKUP_HOST_NAME remote_backhost01
TARGET_SETS dc1
TARGET_NAMING %SOURCEx%TARGETSET
<<<
```

## **DEVICE\_CLASS storage adapter parameters**

You can configure the software for use with non-IBM storage when you install vendor storage adapter software to access different storage devices.

The values that you enter when you configure the storage adapter are saved in the device class section of the profile.

### **COPYSERVICES\_HARDWARE\_TYPE and COPYSERVICES\_ADAPTERNAME**

These parameters specify the storage adapter name and model type. After you select the device type when you use the GUI configuration wizard, the values are populated automatically.

Alternatively, if you run the setup script to configure the profile, enter the model name for the **COPYSERVICES\_HARDWARE\_TYPE** parameter. The **COPYSERVICES\_ADAPTERNAME** name is populated automatically.

The values for both parameters can vary depending on the adapter type. To enter the correct values, see the documentation that is provided by the storage adapter vendor.

#### **Default**

None

#### **Advanced mode only**

No

### **COPYSERVICES\_SERVERNAME**

This parameter specifies the host name or TCP/IP address of the storage system. The parameter values can vary depending on the selected adapter type. To enter the correct values, see the documentation that is provided by the storage adapter vendor.

#### **Default**

None

#### **Advanced mode only**

No

### **COPYSERVICES\_USERNAME**

This parameter specifies the user name that is used to authenticate to the storage system. The parameter values can vary depending on the selected adapter type. To enter the correct values, see the documentation that is provided by the storage adapter vendor.

#### **Default**

None

#### **Advanced mode only**

No

### **COPYSERVICES\_REMOTE**

This parameter specifies whether you want to create snapshots at a remote site. To create snapshots at the remote site, enter YES, or, from the GUI wizard, select the **Create snapshots on Remote site** check box.

**Default**

None

**Advanced mode only**

No

**COPYSERVICES\_REMOTE\_SERVERNAME**

This parameter specifies the host name or TCP/IP address of the storage system at the secondary site. This parameter is applicable when you are creating snapshots at a remote site.

The parameter values can vary depending on the selected adapter type. To enter the correct values, see the documentation that is provided by the storage adapter vendor.

**Default**

None

**Advanced mode only**

No

**COPYSERVICES\_REMOTE\_USERNAME**

This parameter specifies the user name that is used to authenticate to the storage system at the secondary site. If the **COPYSERVICES\_REMOTE** option is selected during configuration, this parameter is applicable. The parameter values can vary depending on the selected adapter type. To enter the correct values, see the documentation that is provided by the storage adapter vendor.

**Default**

None

**Advanced mode only**

None

**COPYSERVICES\_HARDWARE\_MODE**

This parameter specifies the hardware operation mode and is only available when the storage adapter supports both modes of operation. Depending on the storage system, enter **NAS** or **SAN** access protocol. When the storage system is accessed through transport protocols such as Fibre Channel or iSCSI, enter **SAN**. This parameter is optional. To determine whether this parameter is required, see the documentation that is provided by the storage adapter vendor.

**Default**

None

**Advanced mode only**

None

**USE\_WRITEABLE\_SNAPSHOTS**

This parameter specifies whether to create writable snapshots or read-only snapshots. In the latter case, writable duplicates are created when the snapshot is mounted. Specify one of the following options YES, NO, or AUTO. The AUTO option automatically selects the value that is based on your environment. In a VMware environment, selecting AUTO corresponds to NO. To enter the correct values, see the documentation that is provided by the storage adapter vendor.

**Default**

None

**Advanced mode only**

None



## TARGET\_SETS <sup>[1]</sup>

This parameter specifies the target volumes to be used in the FlashCopy operation. The following list identifies the possible options:

### VOLUMES\_FILE

A target volumes file is defined.

#### *list of target set names*

Specify a list of target set names, for example TARGET\_SETS 1 2 3. You must then define the naming schema for the target volumes with the TARGET\_NAMING parameter.

### Default

None

### Advanced mode only

No

## VOLUMES\_FILE <sup>[1]</sup>

This parameter specifies the name of the target volumes file (.fct). You must specify the name of the target volumes file when the TARGET\_SETS parameter is set to VOLUMES\_FILE. Enter the path to the target volumes file when prompted.

### Default

None

### Advanced mode only

No

See “Target sets and volumes” on page 54.

## TARGET\_NAMING %SOURCE\_%TARGETSET <sup>[1]</sup>

This parameter specifies the naming schema for the target volumes. You can edit the %SOURCE\_%TARGETSET pattern. You can replace the underscore (\_) with a schema. For example, %SOURCEvolA\_%TARGETSET. The schema that you enter can contain alphanumeric characters, hyphens (-), and underscores (\_). The maximum length is 15 characters.

Where:

- The %SOURCE variable represents the name of the source volume. At backup time, the variable name is replaced by the volume name. Do not change this value.
- The %TARGETSET variable represents the name of the current active target set. At backup time, the variable is replaced by the name of the current active target set. This information is retrieved from the Target Set list. Do not change this value.

### Default

None

### Advanced mode only

No

## [1]

The parameters are optional. If you do not enter a value, or, from the GUI wizard, if you select **Dynamic Targets** during the configuration, the parameters are disabled. To determine whether the parameters are required, see the documentation that is provided by the storage adapter vendor.

The following example shows the combination of parameters to use depending on the storage system:

```

TARGET_SETS VOLUMES_FILE
VOLUMES_FILE <name of target set definition file>
TARGET_SETS 123
TARGET_NAMING %SOURCE_%TARGETSET

```

#### Extra parameters and values

All other parameters are unique to the storage adapter. For a list of the parameters and associated values, see the documentation that is provided by the storage adapter vendor.

---

## 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.

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

The password file is created during the initial setup of Tivoli Storage FlashCopy Manager for VMware after you complete the entire configuration process by using the configuration wizard. The password file is stored in following directory:

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

where *ACS\_DIR* is the value of the **ACS\_DIR** parameter in the profile.

**Tip:** You can also create a password file if you run the setup script after the initial configuration.

---

## 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 backup operation on DS8000, requires a set of target volumes for each set of source volumes that are to be copied. A *target set* represents the mapping from the source volumes to the target volume on the storage system. Several target sets can be defined for use in different FlashCopy backups. The number of target sets you define determines the number of parallel backup generations that are stored on the storage system.

For Storwize family and SAN Volume Controller storage systems, you require a set of target volumes only if you do not select dynamic target allocation when you configure Tivoli Storage FlashCopy Manager for VMware.

The target volumes file, the *.fct* file contains a list of target volumes that are organized into target sets. Each target set represents one backup generation on the target volume. In the *.fct* file, the target set section begins with the prefix **TARGET\_SET** followed by the target set name, for example **TARGET\_SET 1**. The target set name can be any alphanumeric value. To add a comment, enter a *#* character at the start of a line.

Each target set, contains the following values:

- Name of the target set
- Name of the device class if multiple device classes are used
- **TARGET\_VOLUME** and associated LUN that is used on the target volume

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 .fct 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 ...
<<<
```

The following syntax example shows you how to restrict a target set to a specific device class:

```
>>> 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>]
[...]
```

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

## 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 15. Managing target volume LUNs by storage system

DS8000	SAN Volume Controller or Storwize family	XIV system	IBM System Storage N series or NetApp
Manual target LUN creation by using the target volumes file (.fct) with the <b>VOLUMES_FILE</b> parameter.	Based on the configuration, one of the following methods is used: <ul style="list-style-type: none"> <li>Manual target LUN creation by specifying the target volumes file (.fct) or a naming pattern</li> <li>Automatic target LUN creation without using the target volumes file (.fct)</li> </ul>	Automatic target LUN creation without using the target volumes file (.fct)	Automatic target LUN creation without using the target volumes file (.fct)

For DS8000, SAN Volume Controller or Storwize family storage systems, you can set the **TARGET\_SETS** parameter to **VOLUMES\_FILE**. Then, for the **VOLUMES\_FILE** parameter, you specify the name and path to the target volumes file, the .fct file. You can share a target volume file between multiple device classes by restricting a target set to a specific device class.

The following example shows a typical device class section of a profile when you specify a target volumes file:

Profile:

```
>>> DEVICE_CLASS VM1VM2
COPYSERVICES_HARDWARE_TYPE SVC
...
TARGET_SETS VOLUMES_FILE
VOLUMES_FILE targetvolumes.fct
<<<
```

For SAN Volume Controller and Storwize family, a naming convention can be specified for the target volumes when you use the **TARGET\_NAMING** parameter. This convention enables the application to map source volumes to suitable target volumes without requiring the storage administrator to manually list all targets in the target volumes file.

The following example shows a typical device class section of a profile when you specify a pattern:

Profile:

```
>>> DEVICE_CLASS VM3
COPYSERVICES_HARDWARE_TYPE SVC
...
TARGET_SETS 1 2 3 4
TARGET_NAMING %SOURCE_VoLA_%TARGETSET
...
<<<
```

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 belong to the same storage system.
- The source volume and target volume must have the same size.

The value that you set for the **TARGET\_SETS** parameter determines how a target volume is mapped to the source volume. You can select one of the following options:

- **TARGET\_SETS** parameter set to a list of the target set names

You can create a pattern for the source volume names for SAN Volume Controller or Storwize family systems only. To create a pattern, you must combine a naming pattern with a target set name that you want to create. Each target set represents one backup generation. To specify the pattern, update the following parameters:

#### **TARGET\_SETS**

Create a list of target set names, where each target set represents one backup generation. For example, to create four target sets enter:

```
1 2 3 4
```

**Restriction:** The target set name can contain alphanumeric characters but the characters are combined with the target name and the total number of characters cannot exceed 15 characters in length.

#### **TARGET\_NAMING**

Modify %SOURCE\_%TARGETSET pattern for the **TARGET\_NAMING** parameter. You can enter a name between the underscore (\_) and the %TARGETSET option, for example, %SOURCE\_Vo1A\_%TARGETSET.

**Restriction:** The target name can contain alphanumeric characters, hyphens (-), and underscores (\_). The characters are combined with the target set characters and the total number of characters cannot exceed 15 characters in length.

Where:

- The %SOURCE variable represents the name of the source volume and is determined by Tivoli Storage FlashCopy Manager for VMware at backup time. This variable must not be modified.
- The %TARGETSET variable represents the name of the current active target set and is taken from the list of backup generations that you enter in the Target Sets option. This variable must not be modified.

Where multiple device classes are specified, the target volume name must be unique. For example, you cannot have the target set name set to Vo1A\_1 for more than one device class.

Using the preceding example values, the following volumes must exist on the storage system:

```
source volume name_Vo1A_1
source volume name_Vo1A_2
source volume name_Vo1A_3
source volume name_Vo1A_4
```

- **TARTGET\_SETS** parameter set to VOLUMES\_FILE

To specify a target volumes file, set the **TARGET\_SETS** parameter to VOLUMES\_FILE.

#### **VOLUMES\_FILE**

For the **VOLUMES\_FILE** parameter, you must specify a target volumes file, the .fct file.

The target volumes file must contain a list of target volumes. You can also specify the source volume and volume size but both attributes are optional. If no source volume is specified, the application first checks each specified target volume to see whether a FlashCopy relationship exists between these target volumes and one of the source volumes. If a FlashCopy relationship exists, it is reused for the next FlashCopy backup. If no FlashCopy relationship exists to one of the source volumes, a new relationship between one source volume and this target is created with the next FlashCopy backup.

For new relationships, the source-target pairs that are created depend on:

- The order of the target volumes that are listed in the target volumes files
- The order of the source volumes that are listed 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. Alternatively, all FlashCopy relations must exist in the storage system before the start of the FlashCopy backup.

**Related reference:**

Chapter 7, “Tivoli Storage FlashCopy Manager for VMware configuration files,” on page 105

## **Target volume parameter settings for DS8000**

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 16. Parameters of the 'VOLUMES\_SET\_x' Topic (DS8000)

Parameter Name	Value
<p>TARGET_VOLUME &lt;target volume serial number&gt; &lt;source volume serial number&gt; &lt;source volume size&gt;</p>	<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 133 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 family. 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 159 section of *Tivoli Storage FlashCopy Manager for VMware command-line interface*.

## Target volume parameter settings for SAN Volume Controller and Storwize family

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.

**Tip:** If you are using the new SVC adapter with dynamic target allocation, Tivoli Storage FlashCopy Manager dynamically allocates target volumes on the storage system during the backup process.

Table 17. Parameters of the 'VOLUMES\_SET\_x' SAN Volume Controller and Storwize family

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 133 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 family. 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 159 section of "Tivoli Storage FlashCopy Manager for VMware command-line interface".

**Note:** (this applies to SVC adapter with static target allocation only)SAN Volume Controller 5.1 (or later) and Storwize family: 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 8. Integrating with Tivoli Storage Manager for Virtual Environments

Tivoli Storage FlashCopy Manager for VMware can be integrated with Tivoli Storage Manager for Virtual Environments: Data Protection for VMware to offload VMware image backups to Tivoli Storage Manager server storage.

### Backup overview

Tivoli Storage FlashCopy Manager hardware snapshots of VMware datastores protect your VMware environment. However, when Data Protection for VMware is installed, you can send the snapshots to Tivoli Storage Manager for long-term retention. This archive capability can be integrated with various disaster recovery strategies.

The following tasks are completed by Tivoli Storage FlashCopy Manager when you send snapshots to Tivoli Storage Manager:

- Attach the VMware datastores and register the VMs to the auxiliary ESX host

**Tip:** The auxiliary ESX host is specified when you install Tivoli Storage FlashCopy Manager for VMware and this ESX host is used to temporarily mount a snapshot backup when required.

- Run the backup
- Unregister the VMs and detach the VMware datastores

You can monitor the status of a backup task from the Tivoli Storage FlashCopy Manager for VMware GUI. After this task is complete, the movement of the snapshot to Tivoli Storage Manager occurs asynchronously.

Data Protection for VMware uses the data mover node to send the snapshots to Tivoli Storage Manager. 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.

You can monitor the status of Data Protection for VMware movement of snapshots to Tivoli Storage Manager by using one of the following operations:

- Data Protection for VMware vSphere GUI
- Tivoli Storage Manager backup command-line interface completion message and return code
- Tivoli Storage Manager data mover logs parsing
- Data Protection for VMware `vmcli inquire` command
- Tivoli Storage Manager server queries
- Tivoli Storage Manager Reporting and Monitoring
- Tivoli Storage Manager Operations Center Monitoring
- Centralized schedule monitoring by using success or fail return codes

By using both products, you minimize the amount of time that backup snapshots are on the production ESX host.

## Restore overview

You can restore backup snapshots from storage devices or from Tivoli Storage Manager after the offload process is completed. The following restore destinations are available:

- The original location, for snapshot backups this restore includes the option to restore a complete datastore
- The same VMware datastore but to a new virtual machine with a new name
- A different VMware datastore by using the same virtual machine name
- A different VMware datastore to a new virtual machine with a new name

## Common interfaces

Both products share the following interfaces:

### Data Protection for VMware + Tivoli Storage FlashCopy Manager for VMware GUI

When both products are installed, from the GUI you can complete the following extra 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

You can access the GUI from the following interfaces:

- A URL bookmark to the GUI web server. For example:

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

where *guihost.mycompany.com* is the address of the vStorage backup server and the port number *9081* is the default secure HTTPS port.

- The IBM Data Protection extension that connects to the GUI web server from the VMware Sphere Web Client. You can use the IBM Data Protection extension to restore snapshot backups from the storage device or from its offload variant on Tivoli Storage Manager. The content is a subset of what is provided in the plug-in and web browser GUI.

**Tip:** You must select Register as an Extension in the Web Client option during the installation.

- The **Solutions and Applications** pane or **Classic Solutions** pane of the VMware vSphere Client.

**Tip:** This option is not supported in a VMware vSphere 6 environment.

### Data Protection for VMware command-line interface

When both products are installed, you can issue extra commands to complete the following 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 GUI is the primary interface but the command line 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 command line is useful when you are evaluating automation results with scripts.

---

## LAN-free backup to Tivoli Storage Manager

When used with Tivoli Storage Manager for Virtual Environments: Data Protection for VMware, Tivoli Storage FlashCopy Manager for VMware can offload backups to Tivoli Storage Manager from storage devices that are attached to a storage area network (SAN) for local area network free (LAN-free) operations.

### Backup overview

Tivoli Storage Manager for Storage Area Networks storage agent is required and must be installed on the Tivoli Storage FlashCopy Manager for VMware vStorage backup server.

When Tivoli Storage FlashCopy Manager for VMware is used with Tivoli Storage Manager for Virtual Environments you can back up and restore virtual machines by using SAN-based data movement. This configuration is called LAN-free data movement and you can use it to offload backups to Tivoli Storage Manager.

There are two paths when you move data from datastores to Tivoli Storage Manager server when using LAN-free data movement. The first path is where data is moved from the VMware datastore to the vStorage backup server. The second path is where data is moved from the vStorage backup server to the Tivoli Storage Manager server. The first path is referred to as the transport path and the second is referred to as the backup data path. The backup data paths use Tivoli Storage Manager for storage area network agents. The following figure shows the two paths that are involved in LAN-free data movement.

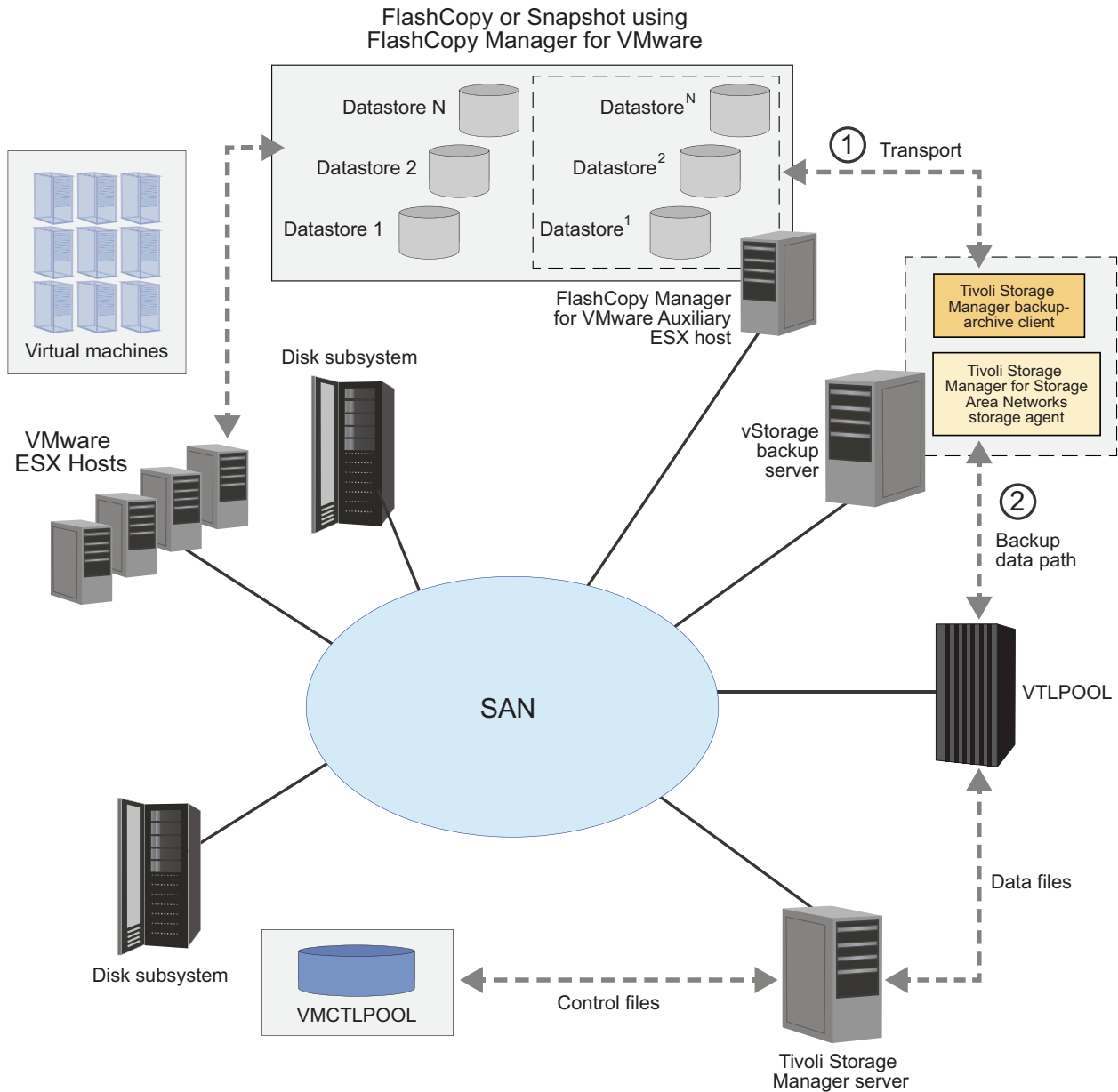


Figure 13. LAN-free backup to Tivoli Storage Manager with Tivoli Storage FlashCopy Manager for VMware

Tivoli Storage Manager for Virtual Environments stores virtual machine full backup images as a collection of control and data files. The data files store the contents of virtual machine disk files. The control files are metadata files that are used during a full VM restore operations or full VM incremental backup operations.

For best performance, the control files must be placed in disk-based Tivoli Storage Manager server storage pool, which cannot be migrated to a non-disk based storage pool. This restriction includes virtual tape libraries that use disks. A typical LAN-free configuration uses a physical tape or virtual tape-based storage pool. Tivoli Storage Manager also supports some configurations with LAN-free data movement to disk-based storage pools. With disk-based configurations, under certain condition the segregation of control and data files is not necessary. For example, where the storage pools are not configured to migrate data to a tape or a

virtual tape storage pool.

## Getting started

Tivoli Storage FlashCopy Manager for VMware, Tivoli Storage Manager for Virtual Environments, Tivoli Storage Manager storage agent, and Tivoli Storage Manager backup-archive client must be installed on a vStorage backup server. The Tivoli Storage Manager backup-archive client node is called the data mover node. The vStorage backup server must be a physical Linux computer and cannot be a virtual machine.

The following topics describe how LAN-free data transfer can be completed, you might want guidance about whether LAN-free is ideal for your environment. There is no one answer that applies to every environment. For example, with incremental forever backups and Tivoli Storage Manager deduplication, a dedicated 10Gb LAN might be a better option.

For full backups, LAN-free backups can provide better performance. However, for incremental forever (offloaded) backups, LAN-free data transfer might not provide much performance gain. In some scenarios, performance can decrease.

Take some time to figure out what works best before proceeding. You might find that you want to use virtual proxies with the hot add capability. Hot add can provide performance comparable to SAN transport. LAN-free data transfer is not possible here, but because a dedicated ESX auxiliary host can be used, the network can be dedicated to send backup traffic to the Tivoli Storage Manager server.

## Preparing storage systems

The vStorage backup server must have access to the disk LUNs that hold the VMware datastores. SAN Volume Controller and Storwize V7000 using the SVC adapter with static target allocation, and DS8000 storage systems require that target volumes are allocated before any backup operations are started. Therefore, you must map the target LUNs to the vStorage backup server (Tivoli Storage Manager backup-archive client) that carries out the LAN-free backup to Tivoli Storage Manager.

### About this task

For XIV Storage Systems, complete the following steps:

### Procedure

1. From the XIV Command Line Interface (XCLI), enter the following commands for each vStorage backup server that is used for LAN-free data movement:
  - a. To create an XIV cluster, enter the following command:

```
cluster_create cluster=ClusterName
```

Where *ClusterName* is the name of the cluster to be created.

- b. To add the vStorage backup server that contains the data mover node to the cluster, enter the following command:

```
cluster_add_host cluster=ClusterName host=HostName map=MapName
```

Where *ClusterName* is the name of the cluster, *HostName* is the name of the host to be added to the cluster, and *MapName* specifies the name of the map that overrides the mapping of the host or cluster.

2. Add the Tivoli Storage FlashCopy Manager for VMware auxiliary host to this cluster.
3. Configure the **AUXILIARY\_ESX\_HOST** parameter in the Tivoli Storage FlashCopy Manager for VMware profile file to point to the XIV cluster name and not the ESX host name.

## What to do next

Tivoli Storage FlashCopy Manager for VMware can then mount the snapshot backups and map dynamically created duplicates to all hosts in this cluster at the same time. Without mapping the snapshot duplicates created by Tivoli Storage FlashCopy Manager for VMware to the vStorage backup server, the data transfer to Tivoli Storage Manager is still LAN-free. However, the transfer from the VMware datastore on the auxiliary host to the vStorage backup server is over the LAN.

## Configuring storage pool and policy for LAN-free operations

Two storage pools are required on the Tivoli Storage Manager server. The first storage pool named *VTLPOOL* is the primary container of the virtual machine data files. The second *VMCTLPOOL* storage pool contains control files that are used during a VM incremental backup and VM restore operations. The amount of space that is used in each of these storage pools varies on the size of the virtual disks.

### About this task

All the following commands are issued to the server from the administrative command-line client **dsmadm**. It might not be necessary to complete all the steps in the following example, as the configuration might exist on Tivoli Storage Manager server.

To create the primary LAN-free storage pool, complete the following steps:

### Procedure

1. Specify the Tivoli Storage Manager server name and password. In the following example the server name is *server1* and the password is *pass4server*:

```
set servername server1
set password pass4server
```

2. Create a library definition on the Tivoli Storage Manager server:

```
define library VTLLIB LIBTYPE=scsi SHARED=yes AUTOLABEL=overwrite
RELABELSCRATCH=yes
```

3. Define a path from the server to the library:

```
define path server1 VTLLIB SRCT=server DESTT=library DEVICE=/dev/smc0 online=yes
```

4. Define each of the 10 tape drives in the virtual tape library:

```
define drive VTLLIB drivea ELEMENT=autodetect SERIAL=autodetect
define drive VTLLIB driveb ELEMENT=autodetect SERIAL=autodetect
...
define drive VTLLIB drivej ELEMENT=autodetect SERIAL=autodetect
```

5. Define paths from the server to each of the 10 tape drives:

```
define path server1 drivea SRCT=server DESTT=drive LIBR=vtllib DEVICE=/dev/rmt0
define path server1 driveb SRCT=server DESTT=drive LIBR=vtllib DEVICE=/dev/rmt1
...
define path server1 drivej SRCT=server DESTT=drive LIBR=vtllib DEVICE=/dev/rmt9
```

6. Define the device class and storage pool:

```
define devclass vt1_class DEVTYPE=lto LIBRARY=vtllib
define stgpool vtlpool vt1_class MAXSCRATCH=100
```



7. To create the control file storage pool, complete the following steps:
  - a. Create the file device class:
 

```
define devc vmctlfile DEVT=file MOUNTLIMIT=150 MAXCAP=1024m DIR=/tsmfile
```
  - b. Create the storage pool to contain the control files:
 

```
def stg VMCTLPOOL vmctlfile MAXSCRATCH=200
```

## What to do next

A policy domain with two management classes must be created to separate the VMware data and control files. The default management class is used for the data files and writes directly to the LAN-free capable tape storage pool. The second management class is used for the control files and writes to the storage pool created for this purpose.

To create a policy domain with two management classes, enter the following commands:

```
define domain vmfullbackup
define pol vmfullbackup policy1
define mgmt vmfullbackup policy1 lanfree
assign defmgmt vmfullbackup policy1 lanfree
define mgmt vmfullbackup policy1 control
define copy vmfullbackup policy1 lanfree TYPE=backup DEST=vtlpool
 VERE=3 VERD=1 RETE=30 RETO=10
define copy vmfullbackup policy1 control TYPE=backup DEST=vmctlpool
 VERE=3 VERD=1 RETE=30 RETO=10
activate pol vmfullbackup policy1
register node zergling password02 DOMAIN=vmfullbackup MAXNUMMP=8
```

## Configuring the storage agent

The Tivoli Storage Manager storage agent allows LAN-free data movement between the Tivoli Storage Manager backup-archive client and the Tivoli Storage Manager server.

### About this task

To install and configure the storage agent on the vStorage backup server, complete the following steps:

### Procedure

1. Install the Tivoli Storage Manager storage agent from the Tivoli Storage Manager installation package. You can obtain the installation package from the product DVD or from the IBM download site.
2. Set up the required definition on the Tivoli Storage Manager server for the storage agent. Use the administrative command-line client **dsmdmc** to issue the following commands:
  - a. Define a server definition on the Tivoli Storage Manager server for the storage agent. Issue the **DEFINE SERVER** command for example:
 

```
define server zergling_sta hla=zergling.acme.com lla=1500
 serverpa=password01
```
  - b. Define paths on the Tivoli Storage Manager server for the storage agent to all of the tape drives. This step requires the device addresses that were collected in the previous section. Issue the **define path** command. For example:

```

define path zergling_sta DRIVEA SRCT=server DESTT=drive LIBR=vtllib
device=\\.\tape0
define path zergling_sta DRIVEB SRCT=server DESTT=drive LIBR=vtllib
device=\\.\tape1
...
define path zergling_sta DRIVEJ SRCT=server DESTT=drive LIBR=vtllib
device=\\.\tape9

```

- c. Customize the storage agents options file `dsmsta.opt`. The device configuration file is in the `/opt/tivoli/tsm/StorageAgent/bin` directory.

```

DEVCONFIG devconfig.out
COMMMETHOD tcpip
TCPPORT 1500
COMMETHOD sharedmem
SHMPORT 1512

```

3. Initialize the storage agent and add communication information by issuing the **DSMSTA SETSTORAGESEVER** command. For example:

```

dsmsta setstorageserver myname=zergling_sta mypass=password01
myhla=zergling.acme.com
servername=scorpio2 serverpass=pass4server
hladdress=scorpio2.acme.com lladdress=1500

```

4. Start the storage agent by issuing the command:

```

dsmsta

```

In the output, look for information about initializing communication protocol for the shared library. For example:

```

ANR8920I Initialization and recovery has ended for shared library VTLIB.

```

5. Create a service that runs the storage agent as a background task. After you create the service, update the service properties from the service management console to allow the services to automatically start when the system is rebooted.

## Configuring the client

The client user-options file (`dsm.sys`) contains options that enable LAN-free communication and defines the communication parameters that are required to pair with the storage agent. The `enablelanfree`, `lanfreecommmethod`, and `lanfreeshmpport` options enable processing between the client and the SAN-attached storage device. The `vmmc` and `vmctlmc` options are required to force the separation of data and control files by using the two classes that were defined on the Tivoli Storage Manager server.

### Example

The following is an example of a backup-archive client system-options file, which contains the required options for one backup instance on the vStorage backup server:

```

* TSM server communication options
TCPSEVERADDRESS scorpio2.acme.com
TCPP 1500
NODENAME zergling
PASSWORDACCESS GENERATE

* VMware related options
VMCHOST vcenter.acme.com
VMCUSER administrator
VMCPW ****
VMBACKUPTYPE full
VMFULLTYPE vstor

```

```

* LAN-free options
enablelanfree yes
lanfreecomm sharedmem
lanfreeshmport 1512

* Management class control options
VMC lanfree
VMCTLMC control

* Transport control (optionally uncomment one of the following)
* CAUTION: use of non-default settings for the VMVSTORTRANSPORT
* option can result in undesirable backup failures.
* VMVSTORTRANSPORT san:nbd * prevent the use of NBDSSL
* VMVSTORTRANSPORT san * prevent the use of all LAN transports

```

Commenting out the VMVSTORTRANSPORT option in this example means that data is transferred through the SAN. If a failure occurs on the SAN path, the client uses its LAN connection to the Tivoli Storage Manager server and moves the data over the LAN. However, if this option is enabled, you can prevent the switch to LAN-based transport. Also, the VMCPW option is the result of generating the option from the preferences editor of the Tivoli Storage Manager client. Alternatively, you can use the following command:

```
dsmc set password -type=vm administrator adminPW
```

## Verifying the LAN-free configuration

To ensure LAN-free data movement, you must verify that the hardware and software components are configured correctly for the Tivoli Storage Manager node and storage agent combination.

Issue the **VALIDATE LANFREE** command and from the output verify that at least one LAN-free capable storage pool is available and that the ping test completes successfully. For example, issue the following command to validate the current server definitions and configuration for node *zergling* to use storage agent *zergling\_sta* for LAN-free data.

```
tsm: SCORPI02>validate lanfree zergling zergling_sta
```

The output shows that there is a LAN-free capable storage:

```
ANR0387I Evaluating node ZERGLING using storage agent ZERGLING_STA for LAN-free data movement.
```

Table 18. Sample table for LAN-free capable storage. Sample table for LAN-free capable storage

Node LAN-free name	Storage agent	Operation	Management class name	Destination name	LAN_Free name
ZERGLING	ZERGLIN-G_STA	BACKUP	CONTROL	VMCTLPOOL	No
ZERGLING	ZERGLIN-G_STA	BACKUP	LANFREE	VTLPOOL	Yes

```
ANR1706I Ping for server 'ZERGLING_STA' was able to establish a connection.
```

```
ANR0388I Node ZERGLING using storage agent ZERGLING_STA has 1 storage pools capable of LAN-free data movement and 1 storage pools not capable of LAN-free data movement.
```

## Determining whether the data movement was LAN-free

Messages indicate whether LAN-free operations are successful. After you run a test backup, check the output that is displayed for the following messages to ensure that LAN-free movement occurred:

san[sending]

If LAN-free data movement occurred, the number of LAN-free bytes that are transferred is greater than zero. For example:

LanFree data bytes: 12.00 GB

### Confirming separation of control and data files

From the Tivoli Storage Manager server, issue the query occupancy command to confirm that the backup files are stored in both of the storage pools that are configured. For example, issue the following command for information about the node *zergling* storage usage:

```
tsm: SCORPI02>q occ zergling
```

The following output shows one file in the control storage pool and one in the tape storage pool.

Table 19. Sample output. Sample output

Node name	Type	Filespace name	FSID	Storage pool name	Number of files	Physical space (MB)
ZERGLING	Bkup	\VMFULL-w-in2003x64 - host3	1	TAPEPOOL	110	12,782.30
ZERGLING	Bkup	\VMFULL-w-in2003x64 - host3	1	VMCTLPOOL	112	7.77

---

## 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 and view configuration information about IBM Tivoli Storage FlashCopy Manager for VMware backup operations.

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 command-line interface also includes a simple backup scheduler. Using this scheduler, you can configure recurring backup tasks. You can also use this interface for custom scripting or specialized external schedulers.

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

- “VMCLI attach” on page 152
- “VMCLI backup” on page 153
- “VMCLI delete” on page 159
- “VMCLI detach” on page 160
- “VMCLI inquire” on page 161
- “VMCLI inquire\_config” on page 166
- “VMCLI inquire\_detail” on page 169
- “VMCLI restore” on page 171
- “VMCLI set\_domain” on page 173
- “VMCLI tape\_backup” on page 174
- “VMCLI managed\_capacity” on page 174
- “VMCLI db\_backup” on page 175
- “VMCLI db\_restore” on page 176
- “VMCLI db\_inquire” on page 176
- “VMCLI db\_compact” on page 176

### Command output

The Data Protection for VMware command-line interface sends its output to the stdout stream 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 all warning messages to prevent issues that can occur later on. Code 2 indicates that the operation cannot be completed because an error occurred during the command execution. Alternatively, you can 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 , backup_type -I backupObjectListFile
-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 operations are also included.

### **TSM\_IFINCR**

Creates an incremental forever incremental backup of the specified backup object. Only data that was changed since last backup operation is copied.

### **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.
- Valid datastore identifiers are the datastore url: *datastoreurl* or the datastore name: *datastorename*.
- Include and exclude statements are optional. Exclude statements start with an exclamation point **!**. These statements can contain a *vminstanceuuid*, *vmname*, *datastoreurl*, or *datastorename* option.
- Wildcard characters **?** and **\*** are allowed for the *datastorename* or *vmname* option.
- 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.
- VVol datastores and associated virtual machines are excluded from the backup process.
- VMware vCenter Site Recovery Manager (SRM) placeholders are excluded from the backup.

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 name to be used in the backup operation. The device class name is required and the default value 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. If not specified, the default value, the **AUXILIARY\_ESX\_HOST** value in the Tivoli Storage FlashCopy Manager for VMware profile is used.

**--vmbackupmode** *vmsnapType*

Specifies whether 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 that 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=backupType
#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
```

---

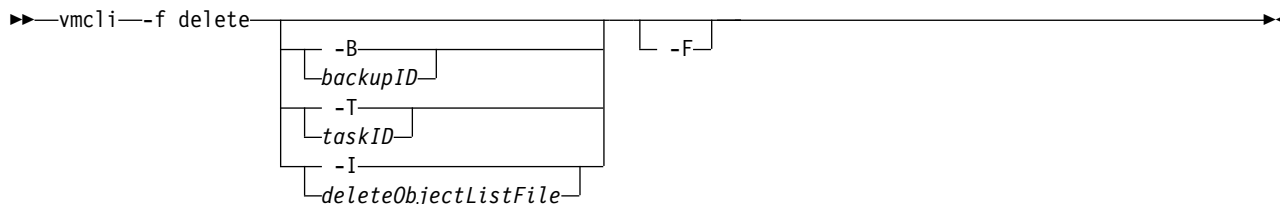
## VMCLI delete

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, which is 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 automatically unmounts 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.

## Examples

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 *vm* 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 yyyyMMddHHmmssS
#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/
#CHILD backupid:A0HA166YCQ
#PARENT datastoreurl:ds:///vmfs/volumes/50ec41cc-fbb2e5d1-6be8-5ef3fce02faf/
#CHILD backupdate:20121115151142408
#PARENT datastoreurl:ds:///vmfs/volumes/50ec41cc-fbb2e5d1-6be8-5ef3fce02faf/
#CHILD backupid:A0HA123KGA
#PARENT datastoreurl:ds:///vmfs/volumes/50ec41cc-fbb2e5d1-6be8-5ef3fce02faf/
#CHILD backupdate:20121115151142408
#PARENT datastoreurl:ds:///vmfs/volumes/50ec41cc-fbb2e5d1-6be8-5ef3fce02faf/
.
.
.
#PARAM STATUS=success
#END RUN 0 20130109125621806
#END TASK 0
#INFO FMM16014I The return code is 0.
#END

```

---

## VMCLI inquire\_config

Use this command to retrieve configuration information about the backup operation.

### Syntax

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

#### vmcli command

```

▶▶ vmcli -f inquire_config [-t backupType] [-v vcenternodename]
[-s tsmserverhostname] [-n vctrclinodename] [-p tsmserverport]

```

### Parameters

**-t** *backupType*

Specify the type of backup. You can choose from one of the following types:

**FCM** Select a backup that was created with Tivoli Storage FlashCopy Manager for VMware.

**TSM** Select a backup that was created with Tivoli Storage Manager for Virtual Environments.

**-v** *vcenternodename*

This parameter value overrides the value of the VE\_VCENTER\_NODE\_NAME profile parameter. This parameter specifies the virtual node and is only applicable when using Tivoli Storage Manager for Virtual Environments.

**-s** *tsmserverhostname*

This parameter value overrides the value of the VE\_TSM\_SERVER\_NAME profile parameter. This parameter specifies the server that is used for user data backups and is only applicable when using Tivoli Storage Manager for Virtual Environments.

**-n** *vctrclinodename*

This parameter value overrides the value of the VE\_TSMCLI\_NODE\_NAME profile parameter. This parameter specifies the node name under which the backup-archive client GUI or CLI operations are issued and is only applicable when using Tivoli Storage Manager for Virtual Environments.

**-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=vcenternodename
#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=tmsserverhostname
#PARAM COPYSERVICES_USERNAME=copyservices_username
#PARAM SVC_COPY_RATE=svc_copy_rate
#PARAM COPYSERVICES_COMMPROTOCOL=HTTPS
#PARAM COPYSERVICES_CERTIFICATEFILE=NO_CERTIFICATE
#PARAM COPYSERVICES_SERVERPORT=tmsserverport
#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=tmsserverhostname
#PARAM COPYSERVICES_USERNAME=copyservices_username
#PARAM SVC_COPY_RATE=svc_copy_rate
#PARAM COPYSERVICES_COMMPROTOCOL=HTTPS
#PARAM COPYSERVICES_CERTIFICATEFILE=NO_CERTIFICATE
#PARAM COPYSERVICES_SERVERPORT=tmsserverport
#PARAM FLASHCOPY_TYPE=INCR|COPY|NOCOPY
#PARAM TARGET_SETS=target_sets
#PARAM TARGET_NAMING=%SOURCE_%TARGETSET
#END SECTION DEVICE_CLASS SVC_61
#PARAM STATUS=success
#END RUN runID runDate in format yyyyMMddHHmmssS
#END TASK taskID
#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 OPERATION_TYPE operation_type
#PHASE_COUNT 4
#PHASE PREPARE
#PARAM BACKUP_TYPE=backup_type
#PARAM TSM_SERVER_NAME=tmsserverhostname
#PARAM TSMCLI_NODE_NAME=ve_tsmcli_node_name
#PARAM VCENTER_NODE_NAME=vcenternodename
#PARAM DATACENTER_NODE_NAME=
#PARAM OFFLOAD_HOST_NAME=
#PARAM TSM_OPTFILE=tsm_optfile
#PARAM INPUT_FILE=
#PARAM TRACEFILE=
#PARAM TRACEFLAGS=
#PHASE INITIALIZE
#PHASE INQUIRE_DATACENTER_NODES
#CHILD datacenternode:datacenternode
#PARENT vcenternode:vcenternode
#PHASE INQUIRE_PROXY_NODES
#CHILD targetnode:targetnode
#PARENT peernode:peernode
#CHILD hladdress:hladdress
#PARENT peernode:peernode
#CHILD lladdress:lladdress
#PARENT peernode:peernode
#PARAM STATUS=success
#END RUN runID endRunDate in format yyyyMMddHHmmssS
#END TASK taskID
#END

```

---

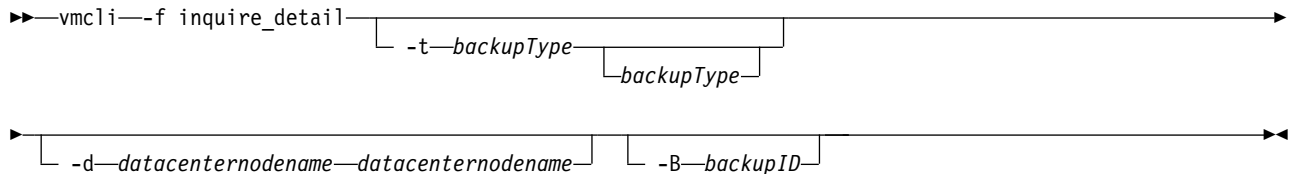
## VMCLI inquire\_detail

This command gathers information from the vmcli database and from the specified Tivoli Storage FlashCopy Manager for VMware or Tivoli Storage Manager for Virtual Environments repository. If no backup type is specified, the **inquire\_detail** command, queries all available product repositories.

### Syntax

The **vmcli -f inquire\_detail** command uses the following syntax:

#### vmcli command



The **-t** and **-B** options can be used to set filters for the information of interest.

### Parameters

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

- 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.
- d** When the **-t** parameter specifies the TSM option, specify the datacenter node name.

#### **-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
```



```
!vminstanceuid:8a2d7ae7-02dd-c4be-63g5-c44a1desfb75
!vminstanceuid:6a2drae7-02d4-c4be-6g5-c44a1deseb78
vminstanceuid: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: 4.1.1.0 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=vminstanceuid:50045b46-0d7f-3a32-e730-bcaa22c5ca2a:0N
#PARAM OBJECT=vminstanceuid: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 vminstanceuid:50045b46-0d7f-3a32-e730-bcaa22c5ca2a
#PARENT datastoreurl:ds:///vmfs/volumes/515eeeb9-b17ea4cc-7ffb-e41f136af7c8/
#CHILD vminstanceuid:5004a665-3432-9863-2582-bd2fe0e1fe75
#PARENT datastoreurl:ds:///vmfs/volumes/515eeeb9-b17ea4cc-7ffb-e41f136af7c8/
#CHILD vminstanceuid: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 "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: BID1 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: BID2 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 [NEWS] option is not allowed for distributed VMs
backupid: BID3 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 [NEWS] option is not allowed for distributed VMs
backupid: BID4 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: BID7 vminstanceuuid:vm7InstanceUuid esxhostname:esxHost1Name

restore the disks with the specified keys of vm3InstanceUuid,
#original disk files are overwritten
backupid: BID8 vminstanceuuid:vm3InstanceUuid diskkey:2000,2001

restore the disks with the specified keys of vm3InstanceUuid to
#vm4InstanceUuid as new disks
backupid: BID9 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_vmuid:<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 managed\_capacity

Use the `vmcli managed_capacity` command to display information about the Tivoli Storage FlashCopy Manager for VMware managed capacity for the different licensing options.

### Syntax

```
▶▶—vmcli—-f managed_capacity—-t—FCM—————▶▶
```

```
| ▶▶—vmcli—-f managed_capacity—-d—<output_directory>—————▶▶
|
```

### Parameter

#### -t FCM

Use the `-t` parameter with the `FCM` option to specify that the operation is for all Tivoli Storage FlashCopy Manager for VMware snapshot backups. This value is the default value if no option is specified.

#### -d <output\_directory>

Use the `-d` parameter with an `output_directory` to specify a directory to print your managed capacity and licensing report into an XML format.

### Output

The following example shows the output that is generated by the `vmcli -f managed_capacity` command. Use the report to obtain detailed information about the amount of data that is protected in your environment.

The following information is displayed when you run the managed capacity command:

- For IBM Tivoli Storage Manager Suite for Unified Recovery (TSM\_SUR), the used capacity within VMware datastores that are protected by Tivoli Storage FlashCopy Manager for VMware is reported. Each datastore is only counted once regardless of the number of backup generations that are present.
- For Tivoli Storage FlashCopy Manager for VMware back-end data (FCM\_BE), the used capacity of all datastores that are protected by Tivoli Storage FlashCopy Manager for VMware is reported. If a datastore is contained in multiple backup generations, each occurrence is added to the capacity number, but not to the number of objects.
- For source volumes, the source volume name and the managed capacity per volume is reported.
- For logical unit number (LUN) data, the total amount of LUN space that is taken on your source volumes is reported.
- For offload to Tivoli Storage Manager, the presence or absence of at least one offload backup operation is reported.

```
#TASK taskId managed_capacity dateCreated
#PARAM TASK_NAME=managed_capacity
#PARAM TASK_DESCRIPTION=managed_capacity
#PARAM BACKUP_TYPE=FCM
#RUN runId startRunDate
#LANG en-US
#PARAM BACKEND=FCM
#PARAM TOTAL_MANAGED_CAPACITY_TSM_SUR=size in TB
#PARAM NUMBER_OF_PROTECTED_OBJECTS_TSM_SUR=number of objects protected
#PARAM TOTAL_MANAGED_CAPACITY_FCM_BE=size in GB
#PARAM NUMBER_OF_PROTECTED_OBJECTS_FCM_BE=back-end number of objects protected
#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 TOTAL_MANAGED_CAPACITY_FCM_LUN=size in GB
#PARAM NUMBER_OF_PROTECTED_OBJECTS_FCM_LUN=number of LUNs
#PARAM AT_LEAST_ONE_TSM_BACKUP=YES|NO
#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. 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 Operations Center help system is enabled for accessibility. For more information, click the question mark icon on the help system menu bar.

### 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.





---

## Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:

*IBM Director of Licensing  
IBM Corporation  
North Castle Drive, MD-NC119  
Armonk, NY 10504-1785  
United States of America*

For license inquiries regarding double-byte character set (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

*Intellectual Property Licensing  
Legal and Intellectual Property Law  
IBM Japan Ltd.  
19-21, Nihonbashi-Hakozakicho, Chuo-ku  
Tokyo 103-8510, Japan*

**The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law:**

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM websites are provided for convenience only and do not in any manner serve as an endorsement of those websites. The materials at those websites are not part of the materials for this IBM product and use of those websites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Licensees of this program who want to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact:

*IBM Corporation  
2Z4A/101  
11400 Burnet Road  
Austin, TX 78758  
US*

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The licensed program described in this document and all licensed material available for it are provided by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement or any equivalent agreement between us.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

#### COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs. The sample programs are provided "AS IS", without warranty of any kind. IBM shall not be liable for any damages arising out of your use of the sample programs.

Each copy or any portion of these sample programs or any derivative work, must include a copyright notice as follows:

Portions of this code are derived from IBM® Corp. Sample Programs.

© Copyright IBM® Corp. \_enter the year or years\_. All rights reserved.

## **Trademarks**

IBM, the IBM logo, and [ibm.com](http://ibm.com)® are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the Web at "Copyright and trademark information" at [www.ibm.com/legal/copytrade.shtml](http://www.ibm.com/legal/copytrade.shtml).

Adobe is a registered trademark of Adobe Systems Incorporated in the United States, and/or other countries.

Linear Tape-Open, LTO, and Ultrium are trademarks of HP, IBM Corp. and Quantum in the U.S. and other countries.

Intel and Itanium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft, Windows, and Windows NT are trademarks of Microsoft Corporation in the United States, other countries, or both.

Java™ and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.

UNIX is a registered trademark of The Open Group in the United States and other countries.

## **Terms and conditions for product documentation**

Permissions for the use of these publications are granted subject to the following terms and conditions.

### **Applicability**

These terms and conditions are in addition to any terms of use for the IBM website.

### **Personal use**

You may reproduce these publications for your personal, noncommercial use provided that all proprietary notices are preserved. You may not distribute, display or make derivative work of these publications, or any portion thereof, without the express consent of IBM.

### **Commercial use**

You may reproduce, distribute and display these publications solely within your enterprise provided that all proprietary notices are preserved. You may not make derivative works of these publications, or reproduce, distribute or display these publications or any portion thereof outside your enterprise, without the express consent of IBM.

**Rights** Except as expressly granted in this permission, no other permissions,

licenses or rights are granted, either express or implied, to the publications or any information, data, software or other intellectual property contained therein.

IBM reserves the right to withdraw the permissions granted herein whenever, in its discretion, the use of the publications is detrimental to its interest or, as determined by IBM, the above instructions are not being properly followed.

You may not download, export or re-export this information except in full compliance with all applicable laws and regulations, including all United States export laws and regulations.

IBM MAKES NO GUARANTEE ABOUT THE CONTENT OF THESE PUBLICATIONS. THE PUBLICATIONS ARE PROVIDED "AS-IS" AND WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE.

## **Privacy policy considerations**

IBM Software products, including software as a service solutions, ("Software Offerings") may use cookies or other technologies to collect product usage information, to help improve the end user experience, to tailor interactions with the end user, or for other purposes. In many cases no personally identifiable information is collected by the Software Offerings. Some of our Software Offerings can help enable you to collect personally identifiable information. If this Software Offering uses cookies to collect personally identifiable information, specific information about this offering's use of cookies is set forth below.

This Software Offering does not use cookies or other technologies to collect personally identifiable information.

If the configurations deployed for this Software Offering provide you as customer the ability to collect personally identifiable information from end users via cookies and other technologies, you should seek your own legal advice about any laws applicable to such data collection, including any requirements for notice and consent.

For more information about the use of various technologies, including cookies, for these purposes, see IBM's Privacy Policy at <http://www.ibm.com/privacy> and IBM's Online Privacy Statement at <http://www.ibm.com/privacy/details> in the section entitled "Cookies, Web Beacons and Other Technologies," and the "IBM Software Products and Software-as-a-Service Privacy Statement" at <http://www.ibm.com/software/info/product-privacy>.

---

## Glossary

A glossary is available with terms and definitions for the IBM Tivoli Storage Manager family of products.

See Tivoli Storage Manager glossary.

To view glossaries for other IBM products, see <http://www.ibm.com/software/globalization/terminology/>.



---

# Index

## A

- accessibility features 177
- ACS\_DIR parameter
  - description 106
- ACS\_REPOSITORY parameter
  - description 107
- ACSD parameter
  - description 106
- ADMIN\_ASSISTANT parameter
  - description 107
- attaching and detaching virtual disks 95
- AUXILIARY\_ESX\_HOST
  - description 107

## B

- backing up virtual machine data
  - with Tivoli Storage FlashCopy Manager for VMware 82
- backup 31

## C

- CA certificate 71
- capacity planning 13
- configuration wizard
  - prerequisites 64
- consistency groups 26
- console
  - installation 43
- console mode
  - installation 44
- control files
  - password file
    - description 132
  - profile
    - parameter descriptions 105
  - target volumes file (.fct)
    - DS8000 parameter settings 136
    - SAN Volume Controller parameter settings 137
    - Storwize family parameter settings 137
- COPYSERVICES\_HARDWARE\_TYPE parameter
  - description 115, 119, 122, 127, 129
- COPYSERVICES\_ADAPTERNAME parameter
  - description 129
- COPYSERVICES\_CERTIFICATEFILE parameter
  - description 115, 119, 122
- COPYSERVICES\_COMMPROTOCOL parameter
  - description 115, 119, 122
- COPYSERVICES\_PRIMARY\_SERVERNAME parameter
  - description 115, 119, 122
- COPYSERVICES\_REMOTE\_SERVERNAME parameter
  - description 129
- COPYSERVICES\_REMOTE\_USERNAME parameter
  - description 129
- COPYSERVICES\_SECONDARY\_SERVERNAME parameter
  - description 115
- COPYSERVICES\_SERVERNAME parameter
  - description 115, 119, 122, 129
- COPYSERVICES\_SERVERPORT parameter
  - description 115, 119, 122

- COPYSERVICES\_TIMEOUT parameter
  - description 115, 119, 122
- COPYSERVICES\_USERNAME parameter
  - description 115, 119, 122, 129

## D

- data protection extension 87
- Data Protection for VMware
  - command-line interface scenarios 89
- datastore
  - restore 99, 170
- defining target sets 55
  - naming convention 58
- detach command 160
- devices
  - DS8000 18
  - FlashCopy 7
  - IBM XIV Storage System 16
  - SAN Volume Controller 18, 20
  - snapshot 9
  - storage
    - preparing 16
- disability 177
- DS8000
  - preparing 18
  - target volumes file (.fct)
    - parameter settings 136

## E

- encryption
  - SP 800-131A 53
- environment
  - preparing 13

## F

- FlashCopy
  - devices 7
  - type 62
- FlashCopy backup
  - reconciliation 22
- FLASHCOPY\_TYPE parameter
  - description 115, 119, 122

## G

- Global Mirror 24
- granularity
  - datastores 4
  - virtual volumes 4

## I

- IBM Knowledge Center ix
- inquire vmcli command 161
- installation
  - console mode 43, 44

- installation (*continued*)
  - graphical mode 41
  - overview 15, 37
  - preparing for 37
  - remote mirroring replication 27
  - silent mode 44
  - vCenter Server role 37
  - wizard 41
- installation directories 40
- installing GSKit 70
- integration
  - overview 32

## K

- keyboard 177
- Knowledge Center ix

## M

- managed capacity 88
- managed licensing 88
- Metro Mirror 24

## N

- naming convention 58
- New in Tivoli Storage FlashCopy Manager Version 4.1.4 for VMware xi

## O

- overview 1

## P

- parameter 105
- password 69
- password file
  - description 132
- PATH\_TO\_XCLI
  - description 115
- planning
  - capacity 13
- ports 14
- preparing for installation 37, 40
- profile
  - defining target sets 55
  - parameter descriptions 105
  - target set definitions 55
    - naming convention 58
- profile parameter sections
  - ACSD 107
  - DEVICE\_CLASS *device* 115, 119, 122, 127, 129
  - GLOBAL 106
  - VMCLI 112
  - VMWARE section 107
- publications ix

## R

- RDM 29
- RECON\_INTERVAL parameter
  - description 115, 119, 122, 127

- reconciliation
  - FlashCopy backup 22
  - Snapshot backup 22
- remote mirror
  - backing up virtual machines 83
- remote mirrors 68, 73, 74
- replicating 68
- REPOSITORY\_LABEL parameter
  - description 107
- restore 31
- RESTORE\_FORCE parameter
  - description 115
- restoring
  - single virtual machine with Tivoli Storage FlashCopy Manager for VMware 85

## S

- SAN Volume Controller
  - preparing 18
  - target volumes file (.fct)
    - parameter settings 137
- scheduling a backup
  - with Tivoli Storage FlashCopy Manager for VMware 82
- silent mode
  - installation 44
- site replication 74
- Snapshot backup
  - reconciliation 22
- snapshot devices 9
- SRM
  - disaster-recovery failover 76
  - failback operation 78
  - production site 23, 28
  - recovery plan 76
  - recovery site 23, 28
  - restoring 87
- SRM environment
  - backing up virtual machines 84
- storage subsystems
  - preparing 16
  - DS8000 18
  - IBM XIV Storage System 16
  - SAN Volume Controller 18, 20
- Storwize family
  - target volumes file (.fct)
    - parameter settings 137
- SVC\_CLEAN\_RATE parameter
  - description 115, 119, 122
- SVC\_COPY\_RATE parameter
  - description 115, 119, 122

## T

- target set definitions
  - defining target sets 55
  - definition files 55
  - naming convention 58
  - profile 55
- target volumes file (.fct)
  - parameter settings
    - DS8000 136
    - SAN Volume Controller 137
    - Storwize family 137
- TARGET\_NAMING parameter
  - description 115, 119, 122



- TARGET\_SETS parameter
  - description 115, 119, 122, 129
- template 31
- Tivoli Storage FlashCopy Manager for VMware device agent
  - components 10
- TRACE parameter
  - description 106

## U

- uninstalling 48
- upgrading 45, 46
- USE\_WRITABLE\_SNAPSHOTS parameter
  - description 115

## V

- version 45, 46
- virtual appliance 31
- VMCLI attach command 152
- VMCLI backup command 153
- vmcli database
  - repository files 68, 73
- VMCLI db\_backup command 175
- VMCLI db\_compact command 176
- VMCLI db\_inquire command 176
- VMCLI db\_restore command 176
- VMCLI delete command 159
- VMCLI instant restore command 99, 170
- VMCLI managed\_capacity command 174
- VMCLI restore command 171
- VMCLI set\_domain command 173
- VMCLI tape\_backup command 174
- VMWARE section
  - description 107
- VOLUMES\_FILE parameter
  - description 115, 119, 122, 129

## W

- web browser 80







Product Number: 5608-ACB  
5724-X94  
5641-A06

Printed in USA