

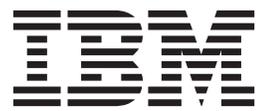
IBM Tivoli Storage FlashCopy Manager for VMware
Version 3.1

Installation and User's Guide



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Note:

Before using this information and the product it supports, read the information in "Notices" on page 93.

This edition applies to Version 3.1 of IBM Tivoli Storage FlashCopy Manager for VMware (5608-W07, 5724-X94 and 5641-A06) and to all subsequent releases and modifications until otherwise indicated in new editions or technical newsletters.

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About this publication

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

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

- IBM System Storage® Disk Storage Model DS8000®
- IBM System Storage SAN Volume Controller
- IBM XIV® Storage Systems
- IBM Storwize® v7000

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

Publications

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

To search all publications, go to the Tivoli Storage Manager information center at <http://publib.boulder.ibm.com/infocenter/tsminfo/v6r3>.

You can download PDF versions of publications from the Tivoli Storage Manager information center or from the IBM Publications Center at <http://www.ibm.com/shop/publications/order/>.

Go to Tivoli Documentation Central to find information centers that contain official product documentation for current and previous versions of Tivoli products, including the Tivoli Storage Manager product family. You can find Tivoli Documentation Central at <https://www.ibm.com/developerworks/wikis/display/tivolidoccentral/Home>.

You can also order some related publications from the IBM Publications Center website. The website provides information about ordering publications from countries other than the United States. In the United States, you can order publications by calling 1-800-879-2755.

Tivoli Storage FlashCopy Manager publications

The following table lists the publications that make up the Tivoli Storage FlashCopy Manager library.

Table 1. Tivoli Storage FlashCopy Manager publications

Publication title	Order number
<i>IBM Tivoli Storage FlashCopy Manager for UNIX and Linux Installation and User's Guide</i>	SC27-4005
<i>IBM Tivoli Storage FlashCopy Manager for Windows Installation and User's Guide</i>	SC27-4006
<i>IBM Tivoli Storage FlashCopy Manager for VMware Installation and User's Guide</i>	SC27-4007
<i>IBM Tivoli Storage FlashCopy Manager Messages</i>	GC27-4008

Tivoli Storage Manager publications

The following tables list the publications that make up the Tivoli Storage Manager library.

Table 2. Tivoli Storage Manager server publications

Publication title	Order number
<i>IBM Tivoli Storage Manager for AIX Installation Guide</i>	GC23-9781
<i>IBM Tivoli Storage Manager for AIX Administrator's Guide</i>	SC23-9769
<i>IBM Tivoli Storage Manager for AIX Administrator's Reference</i>	SC23-9775
<i>IBM Tivoli Storage Manager for HP-UX Installation Guide</i>	GC23-9782
<i>IBM Tivoli Storage Manager for HP-UX Administrator's Guide</i>	SC23-9770
<i>IBM Tivoli Storage Manager for HP-UX Administrator's Reference</i>	SC23-9776
<i>IBM Tivoli Storage Manager for Linux Installation Guide</i>	GC23-9783
<i>IBM Tivoli Storage Manager for Linux Administrator's Guide</i>	SC23-9771
<i>IBM Tivoli Storage Manager for Linux Administrator's Reference</i>	SC23-9777
<i>IBM Tivoli Storage Manager for Oracle Solaris Installation Guide</i>	GC23-9784
<i>IBM Tivoli Storage Manager for Oracle Solaris Administrator's Guide</i>	SC23-9772
<i>IBM Tivoli Storage Manager for Oracle Solaris Administrator's Reference</i>	SC23-9778
<i>IBM Tivoli Storage Manager for Windows Installation Guide</i>	GC23-9785
<i>IBM Tivoli Storage Manager for Windows Administrator's Guide</i>	SC23-9773
<i>IBM Tivoli Storage Manager for Windows Administrator's Reference</i>	SC23-9779
<i>IBM Tivoli Storage Manager for z/OS Media Installation and User's Guide</i>	SC27-4018
<i>IBM Tivoli Storage Manager Upgrade and Migration Guide for V5 Servers</i>	GC27-4017
<i>IBM Tivoli Storage Manager Integration Guide for Tivoli Storage Manager FastBack[®]</i>	SC27-2828

Table 3. Tivoli Storage Manager storage agent publications

Publication title	Order number
<i>IBM Tivoli Storage Manager for SAN for AIX Storage Agent User's Guide</i>	SC23-9797

Table 3. Tivoli Storage Manager storage agent publications (continued)

Publication title	Order number
<i>IBM Tivoli Storage Manager for SAN for HP-UX Storage Agent User's Guide</i>	SC23-9798
<i>IBM Tivoli Storage Manager for SAN for Linux Storage Agent User's Guide</i>	SC23-9799
<i>IBM Tivoli Storage Manager for SAN for Oracle Solaris Storage Agent User's Guide</i>	SC23-9800
<i>IBM Tivoli Storage Manager for SAN for Windows Storage Agent User's Guide</i>	SC23-9553

Table 4. Tivoli Storage Manager client publications

Publication title	Order number
<i>IBM Tivoli Storage Manager for UNIX and Linux: Backup-Archive Clients Installation and User's Guide</i>	SC23-9791
<i>IBM Tivoli Storage Manager for Windows: Backup-Archive Clients Installation and User's Guide</i>	SC23-9792
<i>IBM Tivoli Storage Manager Using the Application Programming Interface</i>	SC23-9793
<i>IBM Tivoli Storage Manager for Space Management for UNIX and Linux: User's Guide</i>	SC23-9794
<i>IBM Tivoli Storage Manager HSM for Windows Administration Guide</i>	SC23-9795

Table 5. Tivoli Storage Manager data protection publications

Publication title	Order number
<i>IBM Tivoli Storage Manager for Databases: Data Protection for Microsoft SQL Server Installation and User's Guide</i>	GC27-4010
<i>IBM Tivoli Storage Manager for Databases: Data Protection for Oracle for UNIX and Linux Installation and User's Guide</i>	SC27-4019
<i>IBM Tivoli Storage Manager for Databases: Data Protection for Oracle for Windows Installation and User's Guide</i>	SC27-4020
<i>IBM Tivoli Storage Manager for Mail: Data Protection for Microsoft Exchange Server Installation and User's Guide</i>	GC27-4009
<i>IBM Tivoli Storage Manager for Mail: Data Protection for Lotus Domino[®] UNIX and Linux Installation and User's Guide</i>	SC27-4021
<i>IBM Tivoli Storage Manager for Mail: Data Protection for Lotus Domino for Windows Installation and User's Guide</i>	SC27-4022
<i>IBM Tivoli Storage Manager for Enterprise Resource Planning: Data Protection for SAP Installation and User's Guide for DB2</i>	SC33-6341
<i>IBM Tivoli Storage Manager for Enterprise Resource Planning: Data Protection for SAP Installation and User's Guide for Oracle</i>	SC33-6340
<i>IBM Tivoli Storage Manager for Virtual Environments Installation and User's Guide</i>	SC27-2898
<i>IBM Tivoli Storage Manager for Microsoft SharePoint Guide</i>	N/A

Table 6. IBM Tivoli Storage Manager troubleshooting and tuning publications

Publication title	Order number
<i>IBM Tivoli Storage Manager Problem Determination Guide</i>	GC23-9789

Table 6. IBM Tivoli Storage Manager troubleshooting and tuning publications (continued)

Publication title	Order number
<i>IBM Tivoli Storage Manager Performance Tuning Guide</i>	GC23-9788
<i>IBM Tivoli Storage Manager Client Messages and Application Programming Interface Return Codes</i>	SC27-2878
<i>IBM Tivoli Storage Manager Server Messages and Error Codes</i>	SC27-2877
<i>IBM Tivoli Storage Manager for Mail: Data Protection for Microsoft Exchange Server Messages</i>	GC27-4011
<i>IBM Tivoli Storage Manager for Databases: Data Protection for Microsoft SQL Server Messages</i>	GC27-4012
<i>IBM Tivoli Storage Manager for Databases: Data Protection for Oracle Messages</i>	SC27-4014
<i>IBM Tivoli Storage Manager for Mail: Data Protection for Lotus Domino Messages</i>	SC27-4015
<i>IBM Tivoli Storage Manager for Enterprise Resource Planning: Data Protection for SAP Messages</i>	SC27-4016

Note: You can find information about IBM System Storage Archive Manager at http://publib.boulder.ibm.com/infocenter/tsminfo/v6r3/c_complydataretention_ovr.html.

Related publications

Table 7. Related storage system publications

Publication title	Order number
<i>IBM System Storage DS8000 Introduction and Planning Guide</i>	GC35-0515
<i>IBM System Storage DS8000 Messages Reference</i>	GC26-7914
<i>IBM System Storage DS8000 Installation Guide</i>	GC26-7910
<i>IBM XIV[®] Storage System: Concepts, Architecture, and Usage</i>	SG24-7659
<i>IBM XIV[®] Storage System (Type: 2810) Model A14 (Gen 2) Introduction and Planning Guide for Customer Configuration</i>	GA52-1327
<i>IBM XIV[®] Storage System Software Host System Attachment Guide for AIX 1.0.3.1</i>	GC27-2258
<i>IBM XIV[®] Storage System User Manual Version 10.1</i>	GC27-2213
<i>IBM System Storage SAN Volume Controller Planning Guide</i>	GA32-0551
<i>IBM System Storage SAN Volume Controller Hardware Installation Guide</i>	GC27-2132
<i>IBM System Storage SAN Volume Controller Software Installation and Configuration Guide</i>	SC23-6628
<i>IBM System Storage SAN Volume Controller Host Attachment Guide</i>	SC26-7905

Support information

You can find support information for IBM products from various sources.

Start at the IBM Support Portal: <http://www.ibm.com/support/entry/portal/>. You can select the products that you are interested in and search for a wide variety of relevant information.

Getting technical training

Information about Tivoli technical training courses is available online.

Go to the following websites to sign up for training, ask questions, and interact with others who use IBM storage products.

Tivoli software training and certification

Choose from instructor led, online classroom training, self-paced Web classes, Tivoli certification preparation, and other training options at <http://www.ibm.com/software/tivoli/education/>

Tivoli Support Technical Exchange

Technical experts share their knowledge and answer your questions in webcasts at http://www.ibm.com/software/sysmgmt/products/support/supp_tech_exch.html.

Storage Management community

Interact with others who use IBM storage management products at <http://www.ibm.com/developerworks/servicemanagement/sm/index.html>

Global Tivoli User Community

Share information and learn from other Tivoli users throughout the world at <http://www.tivoli-ug.org/>.

IBM Education Assistant

View short "how to" recordings designed to help you use IBM software products more effectively at <http://publib.boulder.ibm.com/infocenter/ieduasst/tivv1r0/index.jsp>

Searching knowledge bases

If you have a problem with your Tivoli Storage Manager family product, there are several knowledge bases that you can search.

Begin by searching the Tivoli Storage Manager Information Center at <http://publib.boulder.ibm.com/infocenter/tsminfo/v6r3>. From this website, you can search the current Tivoli Storage Manager documentation.

Searching the Internet

If you cannot find an answer to your question in the IBM Tivoli Storage Manager information center, search the Internet for the information that might help you resolve your problem.

To search multiple Internet resources, go to the IBM support website at <http://www.ibm.com/support/entry/portal/>.

You can search for information without signing in. Sign in using your IBM ID and password if you want to customize the site based on your product usage and

information needs. If you do not already have an IBM ID and password, click **Sign in** at the top of the page and follow the instructions to register.

From the support website, you can search various resources including:

- IBM technotes
- IBM downloads
- IBM Redbooks® publications
- IBM Authorized Program Analysis Reports (APARs)

Select the product and click **Downloads** to search the APAR list.

If you still cannot find a solution to the problem, you can search forums and newsgroups on the Internet for the latest information that might help you find problem resolution.

An independent user discussion list, ADSM-L, is hosted by Marist College. You can subscribe by sending an email to listserv@vm.marist.edu. The body of the message must contain the following text: `SUBSCRIBE ADSM-L your_first_name your_family_name`.

To share your experiences and learn from others in the Tivoli Storage Manager and Tivoli Storage FlashCopy Manager user communities, go to the following wikis:

Tivoli Storage Manager wiki

<http://www.ibm.com/developerworks/wikis/display/tivolistoragemanager>

Tivoli Storage FlashCopy Manager wiki

[https://www.ibm.com/developerworks/mydeveloperworks/wikis/home/wiki/Tivoli Storage FlashCopy Manager](https://www.ibm.com/developerworks/mydeveloperworks/wikis/home/wiki/Tivoli%20Storage%20FlashCopy%20Manager)

Using IBM Support Assistant

IBM Support Assistant is a complimentary software product that can help you with problem determination. It is available for some Tivoli Storage Manager and Tivoli Storage FlashCopy Manager products.

To learn about which products are supported, go to the IBM Support Assistant download web page at <http://www.ibm.com/software/support/isa/download.html>.

IBM Support Assistant helps you gather support information when you must open a problem management record (PMR), which you can then use to track the problem. The product-specific plug-in modules provide you with the following resources:

- Support links
- Education links
- Ability to submit problem management reports

You can find more information at the IBM Support Assistant website:

<http://www.ibm.com/software/support/isa/>

You can also install the stand-alone IBM Support Assistant application on any workstation. You can then enhance the application by installing product-specific plug-in modules for the IBM products that you use. Find add-ons for specific products at <http://www.ibm.com/support/docview.wss?uid=swg27012689>.

Finding product fixes

A product fix to resolve your problem might be available from the IBM software support website.

You can determine what fixes are available by checking the IBM software support website at <http://www.ibm.com/support/entry/portal/>.

- If you previously customized the site based on your product usage:
 1. Click the link for your product, or a component for which you want to find a fix.
 2. Click **Downloads**, and then click **Fixes by version**.
- If you have not customized the site based on your product usage, click **Downloads** and search for your product.

Receiving notification of product fixes

You can receive notifications about fixes, flashes, upgrades, and other news about IBM products.

To sign up to receive notifications about IBM products, follow these steps:

1. From the support page at <http://www.ibm.com/support/entry/portal/>, click **Sign in to create, manage, or view your subscriptions** in the **Notifications** pane.
2. Sign in using your IBM ID and password. If you do not have an ID and password, click **register now** and complete the registration process.
3. Click **Manage all my subscriptions** in the **Notifications** pane.
4. Click the **Subscribe** tab and then click **Tivoli**.
5. Select the products for which you want to receive notifications and click **Continue**.
6. Specify your notification preferences and click **Submit**.

Contacting IBM Software Support

You can contact IBM Software Support if you have an active IBM subscription and support contract and if you are authorized to submit problems to IBM.

To obtain help from IBM Software Support, complete the following steps:

1. Ensure that you have completed the following prerequisites:
 - a. Set up a subscription and support contract.
 - b. Determine the business impact of your problem.
 - c. Describe your problem and gather background information.
2. Follow the instructions in “Submitting the problem to IBM Software Support” on page xvii.

Setting up a subscription and support contract

Set up a subscription and support contract. The type of contract that you need depends on the type of product you have.

For IBM distributed software products (including, but not limited to, IBM Tivoli, Lotus®, and Rational® products, as well as IBM DB2® and IBM WebSphere® products that run on Microsoft Windows or on operating systems such as AIX or Linux), enroll in IBM Passport Advantage® in one of the following ways:

- **Online:** Go to the Passport Advantage website at <http://www.ibm.com/software/lotus/passportadvantage/>, click **How to enroll**, and follow the instructions.
- **By telephone:** You can call 1-800-IBMSERV (1-800-426-7378) in the United States. For the telephone number to call in your country, go to the IBM Software Support Handbook web page at <http://www14.software.ibm.com/webapp/set2/sas/f/handbook/home.html> and click **Contacts**.

Determining the business impact

When you report a problem to IBM, you are asked to supply a severity level. Therefore, you must understand and assess the business impact of the problem you are reporting.

Severity 1	Critical business impact: You are unable to use the program, resulting in a critical impact on operations. This condition requires an immediate solution.
Severity 2	Significant business impact: The program is usable but is severely limited.
Severity 3	Some business impact: The program is usable with less significant features (not critical to operations) unavailable.
Severity 4	Minimal business impact: The problem causes little impact on operations, or a reasonable circumvention to the problem has been implemented.

Describing the problem and gathering background information

When explaining a problem to IBM, it is helpful to be as specific as possible. Include all relevant background information so that IBM Software Support specialists can help you solve the problem efficiently.

To save time, know the answers to these questions:

- What software versions were you running when the problem occurred?
- Do you have logs, traces, and messages that are related to the problem symptoms? IBM Software Support is likely to ask for this information.
- Can the problem be re-created? If so, what steps led to the failure?
- Have any changes been made to the system? For example, hardware, operating system, networking software, and so on.
- Are you using a workaround for this problem? If so, be prepared to explain it when you report the problem.

Submitting the problem to IBM Software Support

You can submit the problem to IBM Software Support online or by telephone.

Online

Go to the IBM Software Support website at [http://www.ibm.com/support/entry/portal/Open_service_request/Software/Software_support_\(general\)](http://www.ibm.com/support/entry/portal/Open_service_request/Software/Software_support_(general)). Sign in to access IBM Service Requests and enter your information into the problem submission tool.

By telephone

For the telephone number to call in your country, go to the IBM Software Support Handbook at <http://www14.software.ibm.com/webapp/set2/sas/f/handbook/home.html> and click **Contacts**.

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. This application can back up VMware environments from Linux-based backup servers, by integrating with VMware vSphere APIs and hardware snapshot mechanisms. Tivoli Storage FlashCopy Manager for VMware optionally integrates with Tivoli Storage Manager for Virtual Environments to store VMware image backups on Tivoli Storage Manager server storage.

With Tivoli Storage FlashCopy Manager for VMware, you can create off-host backups for VMware virtual machines in a vSphere environment. Backups are generated at the VMware datastore level and restores are generated at virtual machine level and virtual disk level. A command-line interface, the Data Protection for VMware command-line interface, and a vCenter GUI plug-in, the Data Protection for VMware vCenter plug-in, are provided.

Tivoli Storage FlashCopy Manager for VMware protects the virtual infrastructure through automated data protection and recovery of your virtual machines. Tivoli Storage FlashCopy Manager for VMware offers an easy-to-use interface that provides a way for you to manage the backup and recovery of virtual machines in a multiple VMware ESX server environment. With Tivoli Storage FlashCopy Manager for VMware, you can create off-host storage hardware snapshot backups from VMware virtual machines.

The following features are provided by Tivoli Storage FlashCopy Manager for VMware:

- Backup, restore, and disaster recovery operations for virtual machines are streamlined and simplified.

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 datacenter names that use other language characters are not supported at this time.

- File system consistent backups are provided and the backup window of the virtual machine is reduced by using hardware snapshots of complete datastores in combination with offloaded backups to Tivoli Storage Manager.

Backups in virtual environments

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

VMware Storage Architecture

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

same time. Virtual machines that are managed by the VMware vCenter Server can also run on a cluster of hosts.

Backup domains

Large virtualized environments are divided into backup domains, each managed by a separate installation of Tivoli Storage FlashCopy Manager for VMware. A domain is comprised of one or more datacenters in a vCenter environment. In the default configuration, a domain is comprised of all the datacenters in a vCenter. You can change the vCenter configuration, by using the Data Protection for VMware vCenter plug-in, and limit the number of datacenters in a domain. For each domain, an individual Tivoli Storage FlashCopy Manager for VMware administration plug-in is displayed in the VMware vSphere Client.

Attention: You can add the same datacenter to multiple backup domains. However doing so will cause problems if backup runs are started simultaneously. If a datacenter is reassigned to another domain, the metadata about previous backups and tasks is not migrated.

Backup types in virtualized environments

Backups in virtualized environments can be separated into in-guest backup, on-host backup, and off-host backup types.

The backup types used in virtual environments include the following:

- In-guest backups are started in the virtual machine and provide the following features:
 - The backup agent is installed on the guest operating system.
 - A file-level backup or a block-level image backup can be created and recovered.
 - The backup model is similar to back ups on physical hosts.
 - For Tivoli Storage Manager backups the Backup-Archive client, the data protection clients, or Tivoli Storage Manager FastBack is used.
 - Protection is provided for databases and applications.
 - Central backup and restore processing cannot be used for multiple guests.
 - There is an additional ESX resource load.
- On-host backups are started on the same ESX-host but not on the virtual machine and provide the following features:
 - The backup agent is installed on the parent or hosting operating system and uses the VMware ESX service console backup.
 - A guest-level image backup can be created and recovered for disaster recovery purposes.
 - A file system consistent backup can be created by using snapshots.
 - There is an additional ESX resource load.
 - On-host backups are not available on ESXi, because there is no service console.
- Off-host backups are started on a dedicated vStorage backup server and provide the following features:
 - The backup agent is installed on the vStorage Backup Server and it uses the vStorage API.
 - File-level and guest-level image backups can be created and recovered.
 - Centralized management of backup data is provided.

- Backups are off-loaded from the ESX host, to another host to free the production server resources.
- File system consistent backups can be created by using snapshots.
- Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments backups use the VMware vStorage API for Data Protection.

Tivoli Storage FlashCopy Manager for VMware off-Host backup implementation

Tivoli Storage FlashCopy Manager for VMware supports virtualized environments by providing off-host storage hardware snapshot backups from VMware virtual machines. The Tivoli Storage FlashCopy Manager for VMware backup is off loaded to Tivoli Storage Manager for Virtual Environments, to free up the production server.

Tivoli Storage FlashCopy Manager for VMware can run on a dedicated virtual machine in a vCenter or on a physical machine outside the vCenter. When Tivoli Storage FlashCopy Manager for VMware runs inside a vCenter, this virtual machine must not be involved in backup operation triggered by this instance of the application.

Backup and restore granularity

Tivoli Storage FlashCopy Manager for VMware provides VMware datastore level backups and virtual machine or virtual disk level restores, to the original or alternative datastore locations.

To use hardware snapshots efficiently, Tivoli Storage FlashCopy Manager for VMware backups are at the VMware datastore level. VMware vSphere APIs and the hardware snapshot mechanism are used by Tivoli Storage FlashCopy Manager for VMware to provide backups of all virtual machines in a VMware datastore together, so they are captured by a single hardware snapshot.

Tivoli Storage FlashCopy Manager for VMware can restore at the virtual machine level, to the original datastore from which the backup was done or to a different datastore. You can select a different destination datastore for a restore, whether the original has moved since the backup was created or not.

Tivoli Storage FlashCopy Manager for VMware can restore a single virtual disk to the original or a different virtual machine. This restore is enabled by attaching a virtual disk from within a backup to a target virtual machine. Tivoli Storage FlashCopy Manager for VMware can attach single virtual disks in the backup to the original or a different virtual machine to enable file level restore operations.

Datastore backups

Selected virtual machines can be excluded from datastore backups.

Virtual machines in a datastore can be excluded from a Tivoli Storage FlashCopy Manager for VMware datastore backup. The excluded virtual machines are included in the hardware snapshot but they are not offloaded to the Tivoli Storage Manager for Virtual Environments server. A VMware software snapshot is not performed for the excluded virtual machines during the backup. The excluded virtual machines are not suspended, and are not restorable with Tivoli Storage FlashCopy Manager for VMware.

Virtual machine restore operations

Restore granularity is at the virtual machine level or single virtual disk level.

Tivoli Storage FlashCopy Manager for VMware runs a VM level restore to the original VM or alternative VM and datastore location. A VM level restore processing can be done by Tivoli Storage FlashCopy Manager for VMware or Tivoli Storage Manager for Virtual Environments and 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
- A different datastore and a new virtual machine with a new name

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

Single files or disks can be restored from a Tivoli Storage FlashCopy Manager for VMware backup. To restore single files, virtual disks from within the backup can be attached to a target virtual machine. Entire disks can be restored to their original virtual machine or be added to another target virtual machine.

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 datacenter names that use other language characters are not supported at this time.

Supported storage systems

Tivoli Storage FlashCopy Manager for VMware can operate with several different storage systems and employs the copy-services or snapshot capabilities of the storage system in use.

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

Table 8. Supported storage subsystems and FlashCopy Types

Device	COPY	INCR	NO COPY	Space-efficient snapshots	Changes made to a mounted snapshot backup
IBM System Storage DS8000	Yes	Yes	Yes	N/A	Remains persistent and alters the content of the backup.
IBM System Storage SAN Volume Controller 5.1, or later	Yes	Yes	Yes Includes space-efficient copies if configured accordingly.	N/A	Remains persistent and alters the content of the backup.
IBM System Storage SAN Volume Controller all releases of version 4.3	Yes	Yes	Yes	N/A	Remains persistent and alters the content of the backup
IBM XIV Storage Systems	N/A	N/A	N/A	Yes	Reverted during unmount and does not alter the backup, or remains persistent and alters the content of the backup.
IBM Storwize v7000	Yes	Yes	Yes Includes space-efficient copies if configured accordingly.	N/A	Remains persistent and alters the content of the backup

FlashCopy devices - SAN Volume Controller, DS8000 and Storwize V7000

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

Tivoli Storage FlashCopy Manager for VMware uses the following FlashCopy types:

Table 9. FlashCopy types and supported devices

FlashCopy Type	Description	Supported Devices
COPY	A COPY type FlashCopy is a point-in-time copy of a volume, followed by a subsequent background copy operation that creates a physical copy of the source volume.	DS8000, SAN Volume Controller, Storwize V7000
INCR	Similar to a COPY type FlashCopy except that a reduced amount of data is copied between two consecutive FlashCopy backups. Only the blocks that have changed since the previous FlashCopy are copied to the target.	DS8000, SAN Volume Controller, Storwize V7000 see note 1.

Table 9. FlashCopy types and supported devices (continued)

FlashCopy Type	Description	Supported Devices
NOCOPY	A FlashCopy image that contains only those changes that occurred after the original FlashCopy was created (no background copying). You must use a NOCOPY FlashCopy for a space-efficient FlashCopy to SAN Volume Controller.	DS8000, SAN Volume Controller, Storwize V7000 see note 2
FlashCopy to Space-Efficient Volumes	For SAN Volume Controller, a FlashCopy can be performed to a space-efficient target. To prevent the volume size from increasing because of background copying, run the FlashCopy to a space-efficient target with the option NOCOPY.	SAN Volume Controller, Storwize V7000
<p>Note:</p> <ol style="list-style-type: none"> 1. DS8000 creates one incremental FlashCopy per source volume. For DS8000, there must be only one target set specified in the target volumes file, the .fct file, for incremental snapshots. Common Information Model (CIM) errors might occur when more than one target set is specified. 2. FlashCopy to space-efficient volumes must be created with the NOCOPY parameter. 		

CIM server

Tivoli Storage FlashCopy Manager for VMware accesses FlashCopy services on DS8000, SAN Volume Controller or Storwize V7000 through a Common Information Model (CIM) server. The storage system microcode level determines whether this CIM server is embedded directly into the storage system or must be installed and configured as a proxy CIM server in the environment.

Remote access to FlashCopy images

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

XIV Storage System devices

The characteristics and requirement of the XIV system are explained.

When Tivoli Storage FlashCopy Manager for VMware creates a backup on the XIV system, it creates a snapshot. This snapshot is always a space-efficient read-only copy of the application data. When the **USE_WRITABLE_SNAPSHOTS** parameter value is NO, this image is not attached directly to another host. Tivoli Storage FlashCopy Manager for VMware creates a space-efficient logical copy of the snapshot from the snapshot as part of the attach procedure, which is removed after the backup is unattached. The copy of the snapshot is writable.

Dependent software packages

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 CIM server.

Remote access to snapshot backups

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

Use of writable snapshots

Tivoli Storage FlashCopy Manager for VMware can use the XIV system features to use writable snapshots. When you enable this option, the original snapshot is attached to another host. All changes to the snapshot are preserved, and a subsequent attach, or backup operation, presents all changes that might have occurred to the snapshot while attached.

See the `USE_WRITABLE_SNAPSHOTS` parameter in the “DEVICE_CLASS section” on page 53.

Component overview

Introductory information is provided about the components included in Tivoli Storage FlashCopy Manager for VMware, including the Tivoli Storage FlashCopy Manager for VMware application agent, management agent, and device agent and operating system agent.

Common Tivoli Storage FlashCopy Manager for VMware components

A description of the software components for Tivoli Storage FlashCopy Manager for VMware is provided.

Several components of the Tivoli Storage FlashCopy Manager for VMware product must use the VMware vSphere APIs:

- The Data Protection for VMware vCenter plug-in
- The Tivoli Storage FlashCopy Manager for VMware application agent, `fmcli`
- The Tivoli Storage FlashCopy Manager for VMware device and operating system agent, `acsgen`

This is an overview of the software components for Tivoli Storage FlashCopy Manager for VMware.

Tivoli Storage FlashCopy Manager for VMware application agent, `fmcli`

The application agent provides support for the snapshot-based protection

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

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

Management agent, `acsd`, and snapshot backup repository

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

Device agent for generic devices, `acsngen`

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

CIM adapter, `fmcima`

The CIM adapter, `fmcima`, is used with the generic device agent, `acsngen`. This component starts a snapshot command on a FlashCopy device (such as DS8000 and SAN Volume Controller) by using the CIM interface.

XIV adapter Oracle Java™ archive `XivAdapter.jar`

The XIV adapter `XivAdapter.jar` is used with the generic device agent `acsngen`. It communicates with `acsngen` agent and issues commands to the XIV® command-line interface XCLI.

Data Protection for VMware vCenter plug-in

This component is a new user interface that is integrated in the VMware vSphere Client. The interface is a vCenter Server extension in the Solutions and Applications window of your vCenter Server System. Use the Data Protection for VMware vCenter plug-in as the primary interface from which to complete these tasks:

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

Chapter 5, Chapter 5, “Operating the Data Protection for VMware command-line interface,” on page 39, provides requisite information, including detailed configuration and user tasks.

Data Protection for VMware command-line interface, VMCLI

This command-line interface is installed with the Data Protection for VMware vCenter plug-in. You can use Data Protection for VMware command-line interface commands to complete the following tasks:

- Initiate a backup of your virtual machines or schedule a backup for a later time.

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

The Data Protection for VMware vCenter plug-in is the primary task interface. The Data Protection for VMware command-line interface provides a useful secondary interface. Use the Data Protection for VMware command-line interface for tasks such as implementing a scheduling mechanism that is different from the one implemented by the Data Protection for VMware vCenter plug-in. You can use the Data Protection for VMware command-line interface to evaluate automation results with scripts. For detailed information regarding the available Data Protection for VMware command-line interface commands, see Chapter 5, “Operating the Data Protection for VMware command-line interface,” on page 39.

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.

These steps assist with validating the configuration of the environment. Review the Tivoli Storage FlashCopy Manager for VMware Pre-installation checklist attached to the tech note titled "Hardware and Software Requirements: FlashCopy® Manager for VMware". This tech note can be accessed from the FlashCopy Manager Support Portal by using the keywords: "3.1 Tivoli Storage FlashCopy Manager for VMware Requirements". The Pre-installation checklist contains the most current requirement information and provides quick validation of your environment. Tivoli Storage FlashCopy Manager for VMware depends on the correct setup of different system components. 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

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

Operating system	Default installation path	Space required (GB)
Linux	/opt/tivoli/tsm/tdpvmware/	1.5

Snapshot copies

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

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

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

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.

Preparation of the storage device

These guidelines describe various requirements and recommendations to consider when preparing the storage devices.

IBM XIV Storage System

These preparation guidelines assist when using Tivoli Storage FlashCopy Manager for VMware with IBM XIV Storage System in your environment.

The storage device and its storage volumes must be accessible from one or multiple ESX hosts in the environment which contains the auxiliary ESX host, used by Tivoli Storage FlashCopy Manager for VMware for temporary attach operations. The XIV system command-line interface, XCLI, must be installed on the vStorage Backup Server where Tivoli Storage FlashCopy Manager for VMware is installed. A typical XIV system profile entry is provided here:

```
>>>
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
GRACE_PERIOD 24
USE_WRITABLE_SNAPSHOTS AUTO
USE_CONSISTENCY_GROUPS YES
<<<
```

Policies can be defined that direct XIV system to delete snapshots created with Tivoli Storage FlashCopy Manager for VMware. To accomplish such a policy, Tivoli Storage FlashCopy Manager for VMware periodically checks whether backups on the storage subsystem are valid. This checking process is called reconciliation. The reconciliation interval is specified (in hours) by the profile parameter **RECON_INTERVAL**. During this reconciliation process, however, Tivoli Storage FlashCopy Manager for VMware also removes snapshots on the storage device it created and that are not reflected in the Tivoli Storage FlashCopy Manager for VMware repository. This action occurs even though they have not been deleted. This situation is unlikely and can only occur when the Tivoli Storage FlashCopy Manager for VMware repository is removed or restored to a prior point in time. To avoid accidentally deleting these snapshots, the reconciliation process bypasses snapshots created within the time interval specified with the **GRACE_PERIOD** parameter.

The `USE_WRITABLE_SNAPSHOTS` 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 applied to the snapshot are preserved.

The `USE_CONSISTENCY_GROUPS` parameter determines if all volumes are used concurrently in the FlashCopy operation by unifying them in one consistency group. This group is then used in the FlashCopy in one atomic operation. This option requires that within one backup run, all volumes managed by Tivoli Storage FlashCopy Manager for VMware are in the same storage pool. In addition, they must not belong to any consistency group. The use of consistency groups is highly recommended. If consistency groups are used, Tivoli Storage FlashCopy Manager for VMware requires that each datastore under protection comprises of exactly one volume.

SAN Volume Controller, DS8000, and Storwize V7000

These CIM server and target volume requirements assist when using Tivoli Storage FlashCopy Manager for VMware with SAN Volume Controller, DS8000, and Storwize V7000 in your environment.

Tivoli Storage FlashCopy Manager for VMware uses a CIM server to communicate with a storage cluster. In SAN Volume Controller 4.3.1, or later, DS8000 R4.1, or later, and Storwize V7000, this CIM server is embedded into the storage device. As a result, it does not need to be installed and configured separately. Earlier releases of SAN Volume Controller and DS8000 require a proxy CIM server that must be installed and configured separately in order to manage storage clusters. Refer to your storage device documentation for configuration details. Tivoli Storage FlashCopy Manager for VMware supports both configurations: SAN Volume Controller and DS8000 releases that support both a proxy CIM server or embedded CIM server.

Unlike the XIV system Tivoli Storage FlashCopy Manager for VMware requires that qualified FlashCopy backup target volumes be created in advance on SAN Volume Controller, DS8000, and Storwize V7000. In order to provide a target set definition to Tivoli Storage FlashCopy Manager for VMware, you must organize target volumes into target sets. Each target set represents one backup generation. Tivoli Storage FlashCopy Manager for VMware automatically matches source volumes to qualified target volumes. However, each target set must contain at least one qualified target volume in order for the source volume to be backed up. Although additional target volumes are allowed in a target set, they are ignored.

Reconciliation of FlashCopy backups

FlashCopy backups that are stored on disk storage subsystems require reconciliation in certain situations.

Situations might occur when the FlashCopy backups identified in the Tivoli Storage FlashCopy Manager for VMware repository become invalid. The following scenario describes the circumstances that cause FlashCopy backups to become invalid:

Withdrawal of a source volume and target volume relationship

During a backup that specifies `FLASHCOPY_TYPE NOCOPY` or `INCREMENTAL`, the source volume and target volume relationship is validated as part of the backup operation. Using these FlashCopy types, when a source and target volume relationship is withdrawn, the target volume goes offline or is left in an inconsistent state. However, for

FLASHCOPY_TYPE COPY backups, Tivoli Storage FlashCopy Manager for VMware is unable to distinguish if the relationship was withdrawn before or after the background copy process completed. This scenario might occur in environments using these storage devices:

- SAN Volume Controller
- DS8000
- Storwize V7000

Additional information regarding the FLASHCOPY_TYPE parameter is available in these locations:

- “Selecting the FLASHCOPY_TYPE” on page 23
- “DEVICE_CLASS section” on page 53

Space-efficient targets on SAN Volume Controller and Storwize V7000

Information regarding how space-efficient targets on SAN Volume Controller and Storwize V7000 might be deleted.

Space-efficient targets that belong to a multiple target FlashCopy cascade might be deleted if other targets, in the same cascade, are restored or overwritten by a new snapshot. In a SAN Volume Controller 5.1, or later, and Storwize V7000 environment, the following situations might cause space-efficient targets to be deleted:

Backup operations

A 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. When the FlashCopy backup that is available on the target set is not the oldest backup, then the older backups are destroyed during the backup operation.

Target volume storage space exceeded

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

See the “DEVICE_CLASS section” on page 53 for additional information.

SAN Volume Controller and Storwize V7000 features

SAN Volume Controller 5.1 (or later) and Storwize V7000 provide unique features for Tivoli Storage FlashCopy Manager for VMware.

SAN Volume Controller 5.1 (or later) and Storwize V7000 provide a FlashCopy cascading feature that can restore FlashCopy backups before completion of a background copy. This feature is essential in order to use space-efficient volumes as backup targets. It is essential because the background copy rate must be set to zero in order to prevent the FlashCopy target from becoming fully allocated.

Because of this FlashCopy cascading feature, consider these guidelines when planning Tivoli Storage FlashCopy Manager for VMware operations with SAN Volume Controller 5.1, or later, and Storwize V7000 storage devices:

Physical capacity

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

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

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

Target sets

Tivoli Storage FlashCopy Manager for VMware cannot reuse a target set 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 have been created before this point in time. This is always the case 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.

Recommendations

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

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

Complete parameter descriptions are available in Chapter 6, “Tivoli Storage FlashCopy Manager for VMware configuration files,” on page 47.

Examples

This is an extract of 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 used in the different backup runs can be configured in the backup wizard of the Data Protection for VMware vCenter plug-in.

```
>>> 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
...
<<<
```

Target set definitions

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

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

Target set definition files

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

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

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

Referring to target set definitions from the profile

The target set definition file must be specified in the `DEVICE_CLASS` section of the profile.

In the following example profile, the keywords `TARGET_SETS` and `VOLUMES_FILES` are shown within the context of the `DEVICE_CLASS` section:

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

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

Examples of target volume files setup

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

Example 1

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

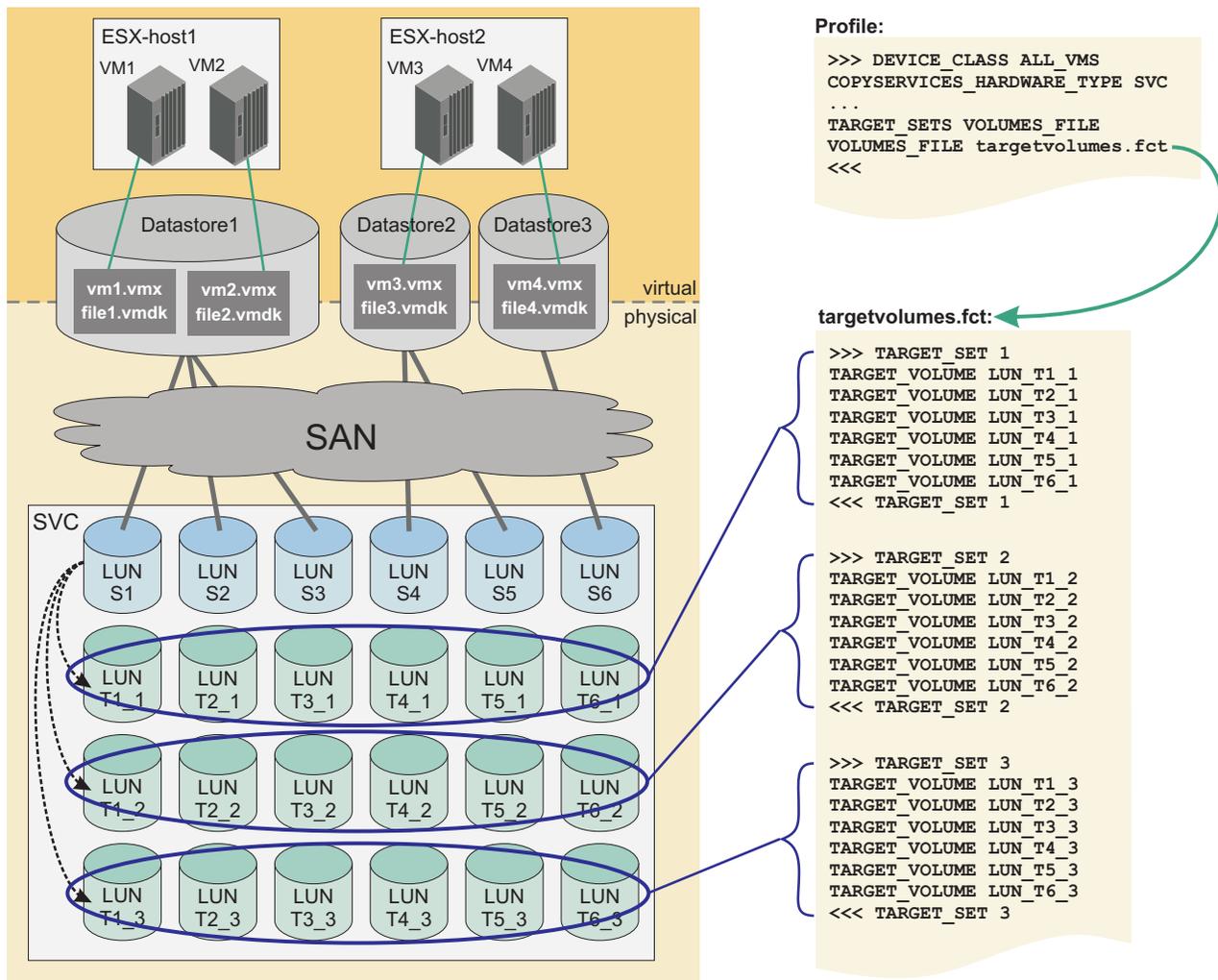


Figure 1. Tivoli Storage FlashCopy Manager for VMware target volumes files example 1

Example 2

The second example shows a setup where the three datastores are handled in three dedicated backup operations. The storage volume layout provides three target volumes for each of the source volumes. This results in a complex setup with three `DEVICE_CLASS` parameters specified in the profile. In each of the `DEVICE_CLASS` parameters, the parameter `VOLUMES_FILE` points to the target volumes file. In the

target volumes file, there are three target sets defined for each of the DEVICE_CLASS parameters. Each DEVICE_CLASS parameter represents one datastore:

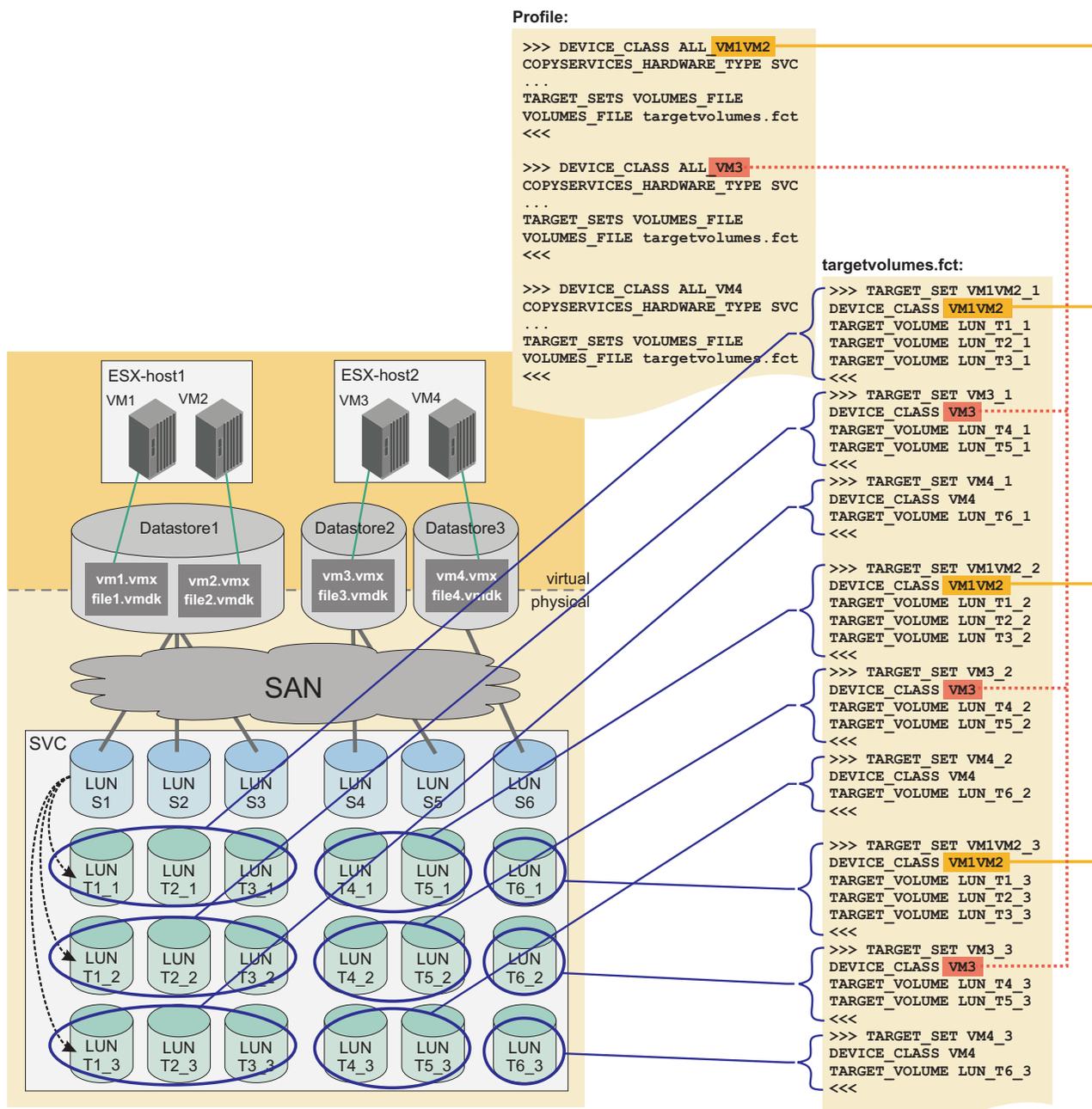


Figure 2. Tivoli Storage FlashCopy Manager for VMware target volumes files example 2

Example 3

The third example shows a setup where two of the datastores are handled in one backup operation and the third datastore is handled in a different backup operation. Two of the datastores are located on a second storage system. The storage volume layout provides three target volumes for each of the source volumes. This results in a complex setup with two DEVICE_CLASS parameters specified in the profile. Each of the DEVICE_CLASS parameters handles all the

storage volumes on one storage system. In each of the DEVICE_CLASS parameters, the parameter VOLUMES_FILE points to a dedicated target volumes file. In the target volumes file, there are three target sets defined for each of the storage source volumes:

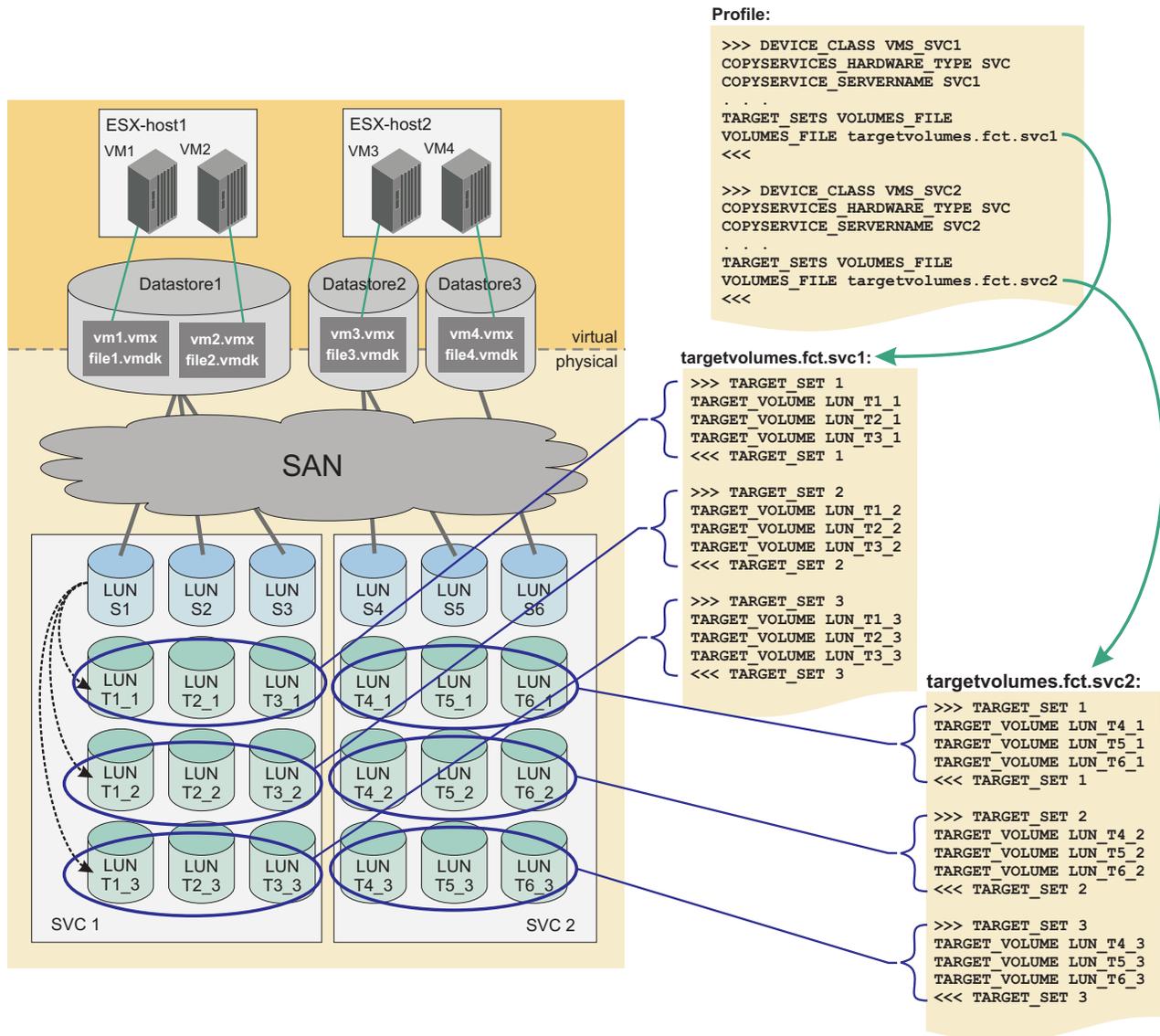


Figure 3. Tivoli Storage FlashCopy Manager for VMware target volumes files example 3

Providing target set definitions by using the naming convention

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

Tivoli Storage FlashCopy Manager for VMware uses a naming convention, instead of a definition file, for the target set definitions on SAN Volume Controller and Storwize V7000. Tivoli Storage FlashCopy Manager for VMware determines the target volume names from the name of the target set used for the current backup and the name of the source volume. Target sets are specified directly in the DEVICE_CLASS configuration section of the profile (TARGET_SETS 1 2 3) and the

names are generated from TARGET_SETS in a round-robin fashion, "1", "2", "3", "1", "2", A TARGET_NAMING rule is also specified that determines the name of the target volume from the name of the source. The following example of the DEVICE_CLASS configuration section of the profile demonstrates this naming convention:

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

The given TARGET_SETS or TARGET_NAMING definition results in the following target volume names:

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

Examples of target naming setup

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

Example 1

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

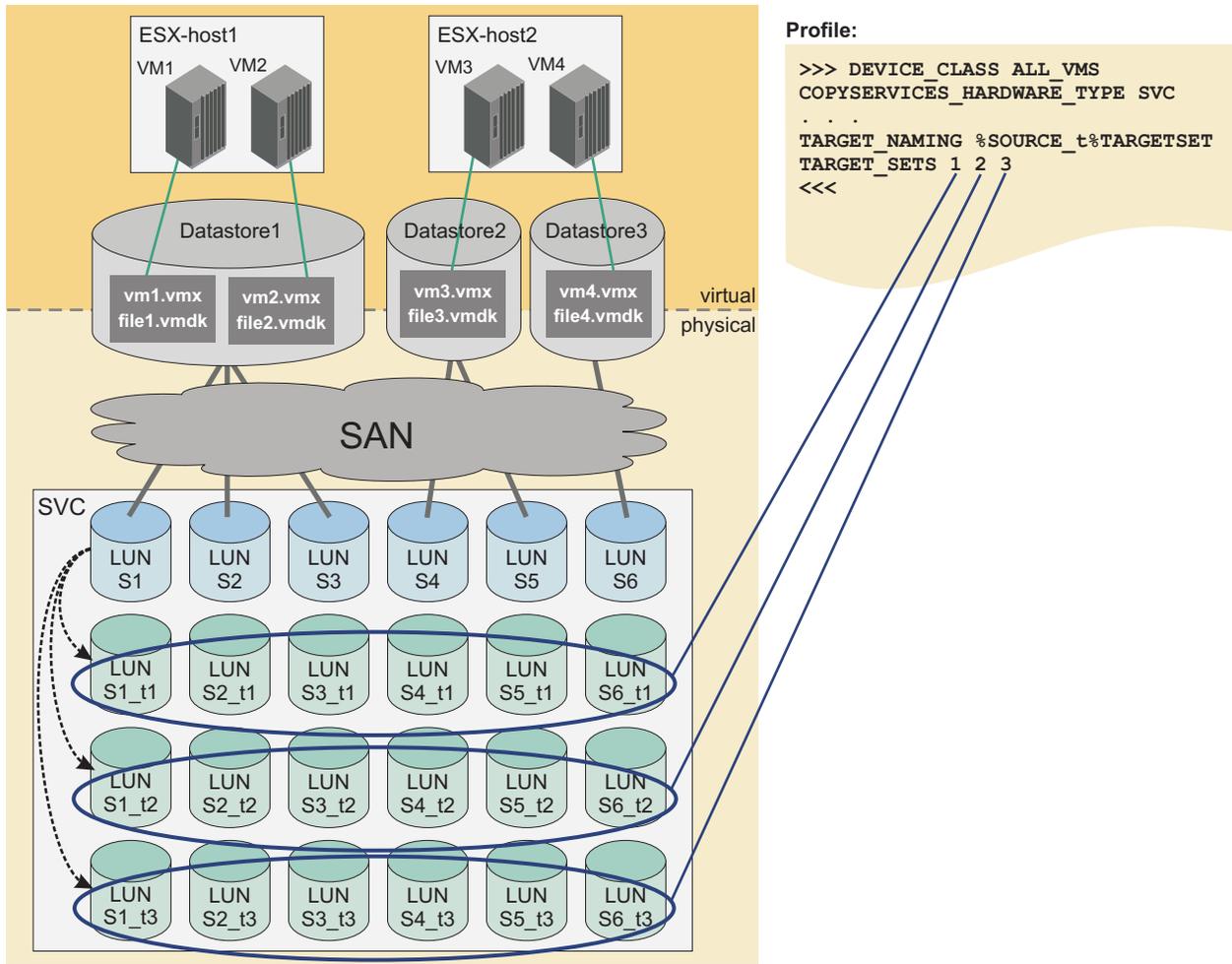


Figure 4. Tivoli Storage FlashCopy Manager for VMware target naming example 1

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:

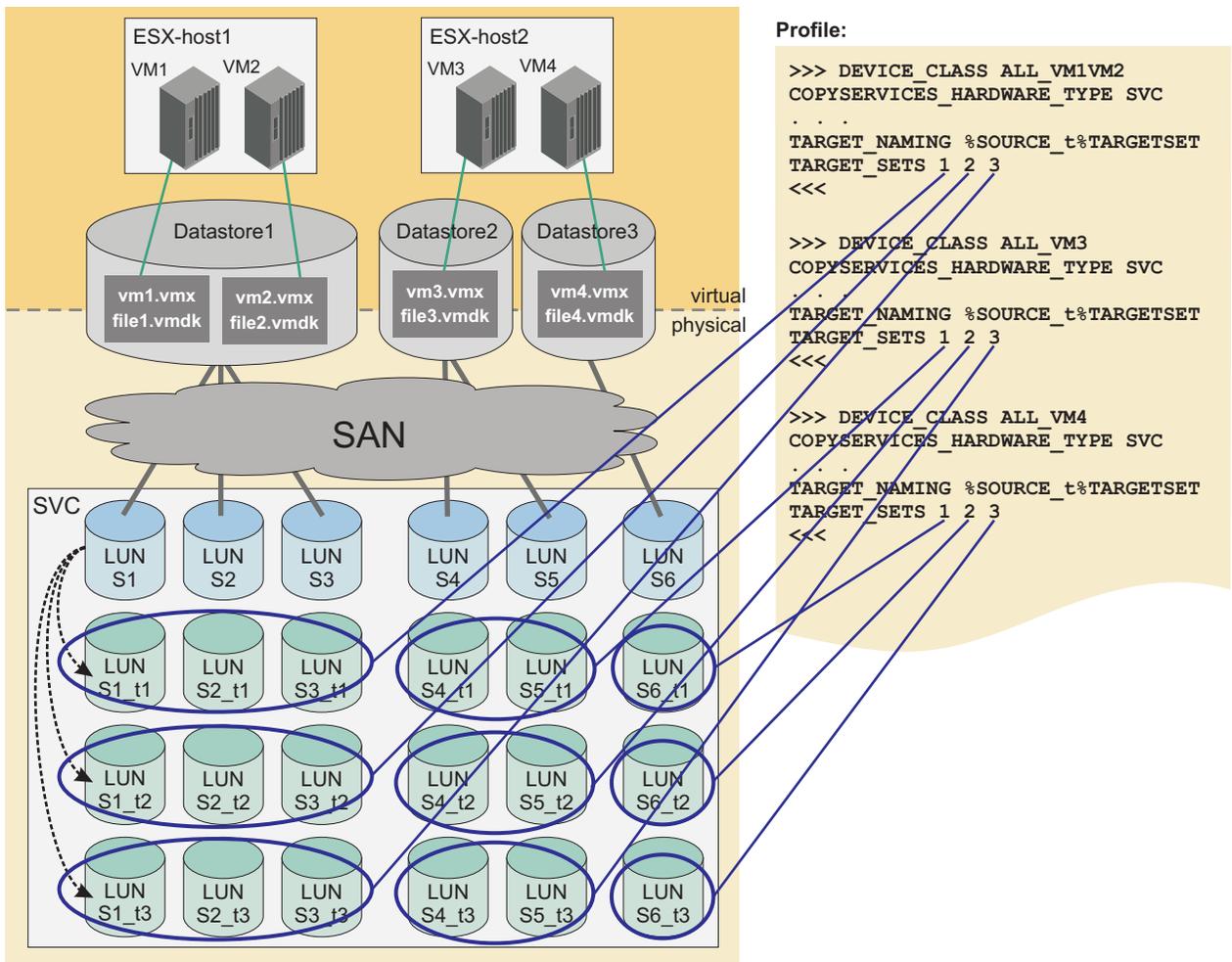


Figure 5. Tivoli Storage FlashCopy Manager for VMware target naming example 2

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.

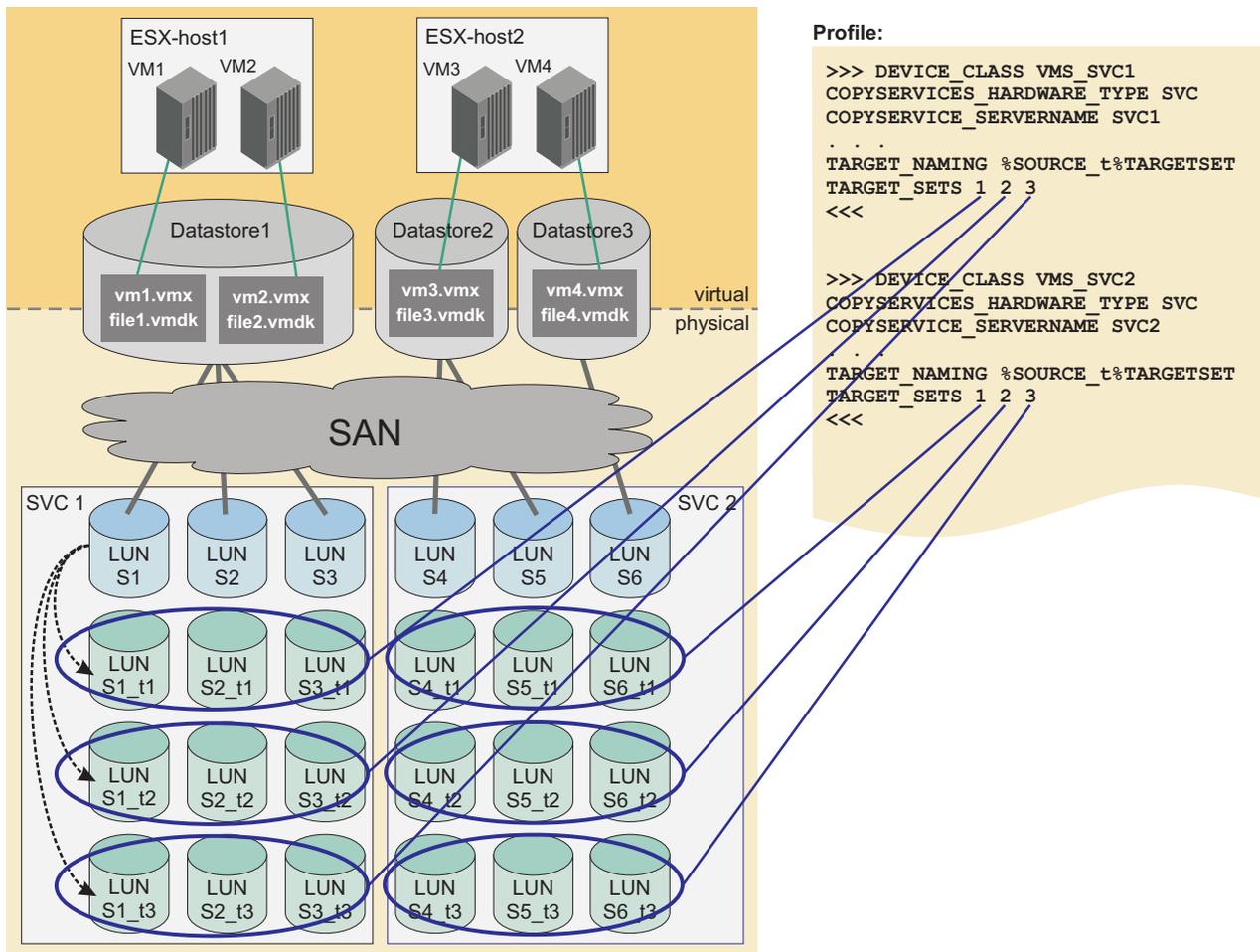


Figure 6. Tivoli Storage FlashCopy Manager for VMware target volumes files example 3

Selecting the FLASHCOPY_TYPE

SAN Volume Controller, DS8000, and Storwize V7000 support various FlashCopy[®] types. These types provide different capabilities for your backup strategy.

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

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

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

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

Table 11. Selecting the FLASHCOPY_TYPE for SAN Volume Controller, DS8000, and Storwize V7000

FLASHCOPY_TYPE	DS8000	SAN Volume Controller and Storwize V7000 see note1.
COPY	Protects from physical failures of the source volumes when the background copy has completed.	Protects from physical failures of the source volumes when the background copy has completed. Avoid creating a COPY FlashCopy to a space-efficient target because the target eventually becomes fully allocated due to background copying of data.
INCR	An option for DS8000. Same characteristics as COPY FLASHCOPY_TYPE but with less data being copied in the background. DS8000 allows at most one incremental FlashCopy® per source volume. For DS8000, there must be only one target set specified in the target volumes file (.fct) for incremental snapshots. CIM errors might occur when more than one target set is specified.	Same characteristics as COPY FlashCopy® but with less data being copied in the background. Avoid creating an incremental FlashCopy to a space-efficient target. The target eventually becomes fully allocated because the data is copied in the background.
NOCOPY		Can be used to create a FlashCopy® to a space-efficient target, but does not offer protection from physical failures to the source volume. 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 which have not yet reached FULL_COPY. You can choose to create space-efficient targets with the AUTOEXPAND option. In this case, the target is allocated more physical storage in order to prevent going offline.

Note:

1. See “SAN Volume Controller and Storwize V7000 features” on page 14 for planning and configuration details when using SAN Volume Controller 5.1, or later.

Integration with Metro Mirror and Global Mirror

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

Although DS8000 supports using FlashCopy targets as Metro Mirror and Global Mirror sources, it is not recommended when using Tivoli Storage FlashCopy Manager for VMware. Using FlashCopy targets as Metro Mirror and Global Mirror sources is not supported on SAN Volume Controller.

Chapter 3. Installing Tivoli Storage FlashCopy Manager for VMware

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

Before installing Tivoli Storage FlashCopy Manager for VMware you must review the installation requirements and considerations:

“Installation options and requirements ”

The installation procedure consists of the following tasks:

1. “Preparing the environment for the installation” on page 28
2. “Installing Tivoli Storage FlashCopy Manager for VMware” on page 30
3. “Uninstalling Tivoli Storage FlashCopy Manager for VMware” on page 31
4. “Upgrading Tivoli Storage FlashCopy Manager for VMware” on page 32

Installation options and requirements

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

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

- A physical server that is running Red Hat or SUSE Linux.
- A virtual machine (VM) on one of the ESX or ESXi hosts in the datacenter, with a guest Red Hat or SUSE Linux operating system. This virtual machine must not be part of any backup operation that is managed by Tivoli Storage FlashCopy Manager for VMware.

You can use an existing virtual machine, that is used for other purposes, for the Tivoli Storage FlashCopy Manager for VMware installation. A virtual machine can be created as a Linux vStorage Backup Server for the Tivoli Storage FlashCopy Manager for VMware installation. A *vStorage Backup Server* is a VM that is used only for Tivoli Storage FlashCopy Manager for VMware or Tivoli Storage Manager for Virtual Environments operations. The virtual machine that is used for the installation and the datastore on which this virtual machine is running cannot be a part of a Tivoli Storage FlashCopy Manager for VMware hardware snapshot operation. You can ensure the Tivoli Storage FlashCopy Manager for VMware virtual machine is not part of a hardware snapshot operation by creating a dedicated datastore for this virtual machine.

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

Tivoli Storage FlashCopy Manager for VMware only runs hardware snapshot operations. It works with IBM Tivoli Storage Manager for Virtual Environments to back up the hardware snapshots to a IBM Tivoli Storage Manager server.

Related tasks

“Preparing the environment for the installation”

Preparing the environment for the installation

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

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

To create a vCenter Server role for backup and recovery operations, add a role, for example named "FCM for VMware", using the vSphere Client and adding the following privileges:

- Datastore -> Allocate space, Browse datastore, Configure datastore, Remove datastore, Rename datastore, Low level file operations, Update virtual machine files
- Folder -> Create folder, Delete folder, Rename folder
- Host Configuration -> Storage partition configuration, System Management, System resources
- Network -> Assign network
- Resource -> Assign virtual machine to resource pool
- Virtual machine Configuration -> Add existing disk, Add new disk, Add or Remove device, Advanced, Change CPU count, Change resource, Disk change tracking, Disk Lease, Host USB device, Memory, Modify device setting, Raw device, Reload from path, Remove disk, Rename, Reset guest information, Settings, Swapfile placement, Upgrade virtual hardware
- Virtual Machine Interaction -> Answer question, Backup operation on virtual machine, Power[®] off, Power on, Reset, Suspend
- Virtual machine Inventory -> Create new, Register, Remove, Unregister
- Virtual machine Provisioning -> Allow disk access, Allow read-only disk access, Allow virtual machine download, Allow virtual machine files upload
- Virtual machine State -> Create snapshot, Remove snapshot, Revert to snapshot

Because the recovery operation requires privileges for operations on hosts, networks, and datastores, this new role must be applied to the datacenter object or higher in the VMware vCenter Server hierarchy. Ensure that the checkbox "Propagate to Child Object" is selected when adding the permission.

Note: You should consider adding other privileges to this role that might be needed for the user to perform other tasks not related to backup and recovery.

Before installing Tivoli Storage FlashCopy Manager for VMware, review the Tivoli Storage FlashCopy Manager for VMware Preinstallation checklist on the technote: Hardware and Software Requirements: Tivoli Storage FlashCopy Manager for VMware, <http://www.ibm.com/software/tivoli/products/storage-flashcopy-mgr/>. The preinstallation checklist contains the most current requirements for the Tivoli Storage FlashCopy Manager for VMware installation. Use the Tivoli Storage FlashCopy Manager for VMware installation sheet, provided within the technote to collect all the information needed for the product installation.

The installation directory for Tivoli Storage FlashCopy Manager for VMware is `/opt/tivoli/tsm/tdpvmware/fcm`.

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

- All the Tivoli Storage FlashCopy Manager for VMware daemons for example, `acsd`, `acsgen`, `vmware`, and `fccli`
- All the message catalogs
- The setup script
- The Tivoli Storage FlashCopy Manager for VMware license file

The following common components are installed during the Tivoli Storage FlashCopy Manager for VMware installation.

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

When IBM Tivoli Storage Manager for Virtual Environments is installed on the server or the VM, the common components that are already installed and configured are not installed again.

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

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

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

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

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

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

Related tasks

“Installing Tivoli Storage FlashCopy Manager for VMware”

Installing Tivoli Storage FlashCopy Manager for VMware

You can install Tivoli Storage FlashCopy Manager for VMware using the graphical, console, or silent mode.

The Tivoli Storage FlashCopy Manager for VMware installation packages are delivered as InstallAnywhere files. They are provided on an installation CD or from an image that is downloaded from IBM Passport Advantage. These files use the following naming format:

```
3.1.0.0-TIV-TSFCM-VMware.bin
```

You must use the root user ID for the installation. Use the following steps to install Tivoli Storage FlashCopy Manager for VMware.

1. Log in to the vStorage Backup Server as root user ID. The vStorage Backup Server is either a Linux VM or a physical machine.
2. Start the installation by running the 3.1.0.0-TIV-TSFCM-VMware.bin file. The installation can be run in a graphical, a console or a silent mode.

Installation in the **graphical mode** requires the following steps:

- a. To start the installation in the graphical mode specify this command:

```
./3.1.0.0-TIV-TSFCM-VMware.bin
```

- b. Select "Default" or "Advanced" to choose the installation method.
- c. In the installation wizard, you must register the Data Protection for VMware vCenter plug-in with the vCenter.

Installation in the **console mode** requires the following steps:

- a. Start the installation in the console mode by specifying this command:

```
./3.1.0.0-TIV-TSFCM-VMware.bin -i console
```

- b. Select "Default" or "Advanced" to choose the installation method.
- c. You must register the Data Protection for VMware vCenter plug-in.

Installation in the **silent mode** requires the following steps:

- a. The silent mode runs in the console. You must have a properties file to run the installation in silent mode.
- b. You can use the graphical or console mode to generate a properties file during an installation. The following command generates the properties file during a console mode installation.

```
./3.1.0.0-TIV-TSFCM-VMware.bin [-i console] -DRECORDFILE=/tmp/installer.properties
```

- c. Start the silent mode installation with this command.

```
./3.1.0.0-TIV-TSFCM-VMware.bin -i silent -f properties file
```

You must specify the full path name for the properties file.

You must add the `VCENTER_PASSWORD` parameter in the properties file that is generated by the installer. `VCENTER_PASSWORD=password` is the syntax for the properties file.

3. The status of the Tivoli Storage FlashCopy Manager for VMware installation is stored in the `installation.log` file, in the `/opt/tivoli/tsm/tdpvmware` directory. If an error occurs during the installation process, check the error messages and correct the errors. After correcting the errors, restart the installation procedure.
4. The status of Data Protection for VMware vCenter plug-in installation is stored in the `vecommon_installation.log` file in the `/opt/tivoli/tsm/tdpvmware` installation directory and tested by the Tivoli Storage FlashCopy Manager for VMware installation package.

Related tasks

“Uninstalling Tivoli Storage FlashCopy Manager for VMware”

Uninstalling Tivoli Storage FlashCopy Manager for VMware

Tivoli Storage FlashCopy Manager for VMware is uninstalled with the uninstallation wizard.

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

- `VCENTER_HOSTNAME`
- `VCENTER_USERNAME`
- `VCENTER_PASSWORD`
- `WEBSERVER_HOSTNAME`

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

- Embedded WebSphere

- IBM User Interface Help System
- The Data Protection for VMware vCenter plug-in
- The vmcli database
- The Data Protection for VMware command-line interface

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

Upgrading Tivoli Storage FlashCopy Manager for VMware

You must start the upgrade by running the `./upgrade_version-TIV-TSFCM-VMware.bin` command. The Tivoli Storage FlashCopy Manager for VMware installer will recognize that the product is already installed and the upgrade wizard will start.

Chapter 4. Configuring Tivoli Storage FlashCopy Manager for VMware

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

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

The profile file

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

The target volumes files

You must create and edit the target volumes files that are needed to specify the target volumes for Tivoli Storage FlashCopy Manager for VMware backups on DS8000, SAN Volume Controller and Storwize V7000.

Note: Target volume files are not required for the XIV system and SAN Volume Controller 5.1 and later.

The password file

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

The setup script, `setup.sh`.

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

Tivoli Storage FlashCopy Manager for VMware profile

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

A profile file must be available on the server where the management agent, the `acsd` daemon, is running. The Tivoli Storage FlashCopy Manager for VMware profile is created or updated by using the setup script. The standard profile is called *profile*. It is located in the `$HOME/tdpvmware/config/` directory. The `ACS_DIR` profile parameter is used to define the configuration 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.

Tivoli Storage FlashCopy Manager for VMware profile sections

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

- GLOBAL
- ACSD
- VMWARE
- VMCLI
- DEVICE_CLASS

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

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

GLOBAL section

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

ACSD section

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

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

VMWARE section

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

VMCLI section

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

DEVICE_CLASS section

The DEVICE_CLASS section contains parameters that are related to the storage system. At least one DEVICE_CLASS section is required to configure the management agent. A DEVICE_CLASS section describes the characteristics of a storage device that can be used to create a snapshot backup and depends heavily on the specific storage subsystem. You can specify multiple DEVICE_CLASS sections within one profile and assign unique names to these sections. The values of the parameters in this section are recorded in the Tivoli Storage FlashCopy Manager for VMware repository in order to identify the appropriate DEVICE_CLASS section that

is used during restore processing . For each storage device, a password is required. The following command starts the setup script, which sets the password:

```
setup.sh
```

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.

Configuring Tivoli Storage FlashCopy Manager for VMware by using the profile

A profile is created in the `$HOME/tdpvmware/config/profile` directory where `$HOME` is the home directory of the user name created during the installation. The profile contains the configuration information for Tivoli Storage FlashCopy Manager for VMware. Changes to the profile take effect immediately, except when the `GLOBAL` or `ACSD` sections of the profile file are modified. When the `GLOBAL` section of the profile file is changed, you must complete the following steps to update the changes in the Tivoli Storage FlashCopy Manager for VMware configuration. To run the `setup.sh` script, you must log in as the user name created during the installation.

1. Stop Tivoli Storage FlashCopy Manager for VMware on the system where it is installed:

```
setup.sh -a stop
```

2. Update the parameters you want to change in the `GLOBAL` or `ACSD` sections.
3. Start Tivoli Storage FlashCopy Manager for VMware on all systems where it is stopped:

```
setup.sh -a start
```

Tivoli Storage FlashCopy Manager for VMware target set definitions

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

Target set definition with the target volumes file

During a Tivoli Storage FlashCopy Manager for VMware backup on DS8000, SAN Volume Controller or Storwize V7000, a set of target volumes, the target set, is required for each set of source volumes that are to be copied. More than one target set can be defined for use in different Tivoli Storage FlashCopy Manager for VMware backups. The volumes in each target set that are used in a backup must be specified in a similar way in a separate target set topic. These target sets are specified in a target volumes file, the `.fct` file. For SAN Volume Controller or Storwize V7000, the `.fct` file is not mandatory. The target set section name, in the target volumes file, starts with the prefix `TARGET_SET` if the `VOLUMES_FILE` parameter is used, and 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 further simplify target mapping on SAN Volume Controller or Storwize V7000, when you use the TARGET_SETS parameter, you can specify a naming convention for your target volumes. Tivoli Storage FlashCopy Manager for VMware can map source volumes to suitable target volumes without requiring you to manually list all targets in the target volumes file.

Configuring using the setup script

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

After you complete the installation, you must use the setup script, `setup.sh`, to set up Tivoli Storage FlashCopy Manager for VMware for use with your environment. You are required to only set up your environment once after the initial installation of the product. The script is located in `/opt/tivoli/tsm/tdpvmware/fcm`. To run the setup script, you must log in as the user name created during the installation.

The setup script uses this command syntax:

```
setup.sh [-a <action>] [-advanced]
```

The `./setup.sh` command starts the configuration wizard.

The `./setup.sh -advanced` option runs the configuration wizard in advanced mode. In advanced mode, you can specify additional parameters. The default values for these parameters are suitable for most environments

You can use the setup script for the following purposes:

- Use the following command for initial configuration and reconfiguration with the configuration wizard:

```
./setup.sh
```

- Use the following command for initial configuration and reconfiguration with the configuration wizard in advanced mode:

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

- Use the following command to add the entries for the Tivoli Storage FlashCopy Manager for VMware daemons into `/etc/inittab`:

```
./setup.sh -a install_agents
```

- Use the following command to start the entries for the Tivoli Storage FlashCopy Manager for VMware daemons in `/etc/inittab`:

```
./setup.sh -a start
```

- Use the following command to stop the entries for the Tivoli Storage FlashCopy Manager for VMware daemons in `/etc/inittab`.

```
./setup.sh -a stop
```

- Use the following command to removes the entries from `/etc/inittab`. The script stops the daemons and then removes the entries from the `inittab` file:

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

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

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

Chapter 5. Operating the Data Protection for VMware command-line interface

The Data Protection for VMware command-line interface is a new component for the Tivoli Storage FlashCopy Manager for VMware. You can use the Data Protection for VMware command-line interface to back up and restore a virtual machine with Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments and to query the vmcli database. You can also use this to run all the tasks that are available in the Data Protection for VMware vCenter plug-in.

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. The Data Protection for VMware command-line interface also includes a simple backup scheduler. With this scheduler, you can schedule reoccurring backup tasks.

The Data Protection for VMware command-line interface provides detailed backup information for Tivoli Storage FlashCopy Manager for VMware backups and Tivoli Storage Manager for Virtual Environments backups.

Data Protection for VMware vCenter plug-in is the preferred way to run tasks in a virtualized environment because it provides full integration of Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments backups in a single view. It is also useful to start backup, restore, inquire, and delete commands 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.

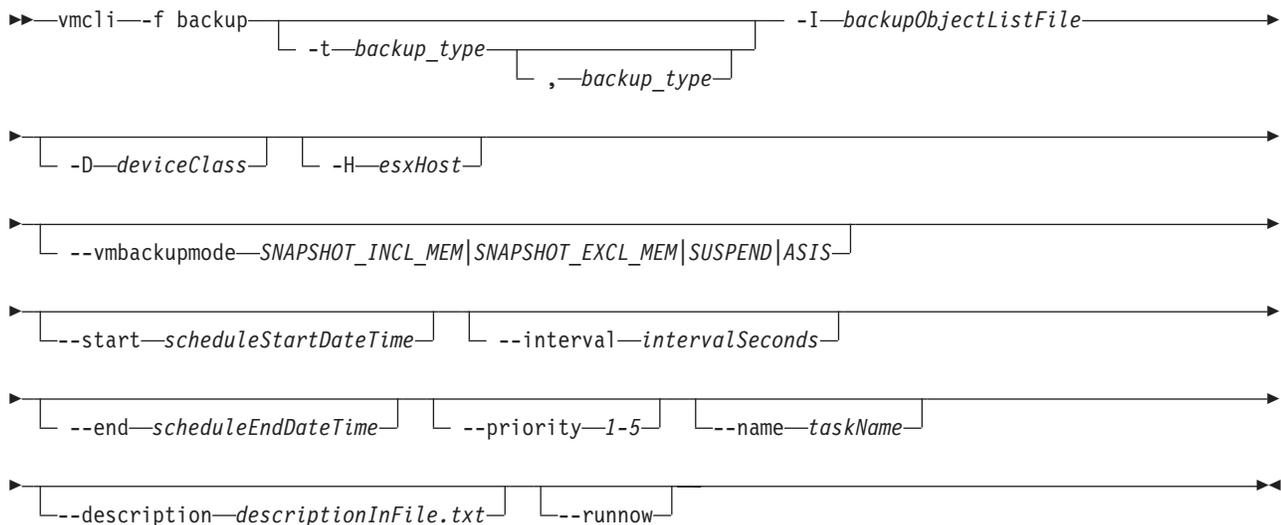
The Data Protection for VMware command-line interface provides a full-function command set. You can use Data Protection for VMware command-line interface for the following scenarios:

- Create a backup of a datastore for immediate or scheduled execution.
- Inquire about 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 of a virtual machine
- Delete a backup or a scheduled task

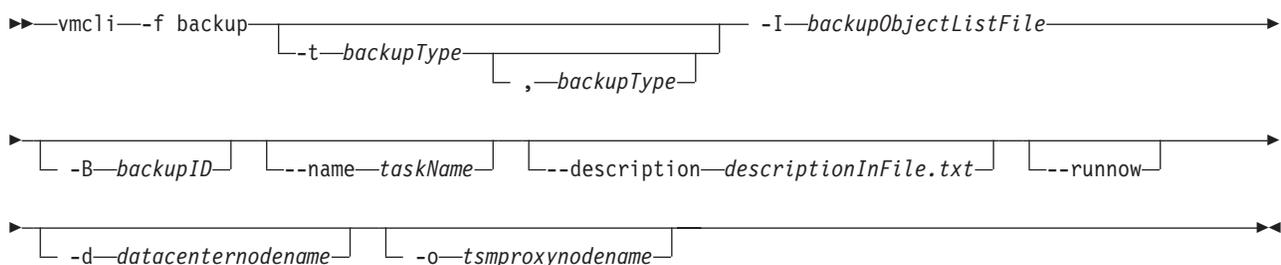
These scenarios are described in detail in the following sections.

To create a backup

If Tivoli Storage FlashCopy Manager for VMware and Tivoli Storage Manager for Virtual Environments are installed and configured you can select what type of backup to create (`-t backupType`). You can start the task immediately or create a schedule for it using the `--start`, `--interval`, `--end` parameters. The `--start` parameter postpones the run of the task to a certain date and time. If an `--interval` parameter is provided, together with the `--start` parameter, the task will rerun at the specified interval. The `--end` parameter indicates the date and time when the task reruns end. You must specify the datastores to back up in an input file, by using the `-I backupObjectListFile` parameter. You can specify a name for the task (`--name`) and some descriptive information (`--description`). If Tivoli Storage Manager for Virtual Environments is not installed, the backup type is always FCM and you can omit this parameter from backup commands. For a Tivoli Storage FlashCopy Manager for VMware type backup the user 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`. The following syntax diagram shows the Tivoli Storage FlashCopy Manager for VMware backup command:



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:



See “VMCLI backup” on page 73 for more details about the `vmcli -f backup` command and the `backupObjectListFile` structure and syntax.

To inquire about the status and details of a backup.

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 available are `vmcli -f inquire` and `vmcli -f inquire_detail`. The `inquire` command gathers information from the vmcli database. The `inquire_detail` command retrieves additional information from the specified back-end or, if no backup type is specified, all available back-end plug-ins. Use the `--type`, `-t`, `-B` and `-T` parameters to set filters for the objects of interest.

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 *vmname* on *dataCenterName* when the input file contains:

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

You can inquire about 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 inquire about all tasks from a given time frame by using the `vmcli -f inquire --fromdate timestamp --todate timestamp` command. Other examples of `inquire` commands are:

- `vmcli -f inquire vmcli -f inquire -t FCM,TSM 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 tasks with runs of type `backup` or `restore` for Tivoli Storage FlashCopy Manager for VMware that are currently not running.

- `vmcli -f inquire -t FCM --type backup,restore -B backupID`

This command inquires about all tasks with runs that are currently not running and are associated with the specified *backupID* with a *tasktype* of `backup` or `restore` for Tivoli Storage FlashCopy Manager for VMware.

- `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 the task with the specified *taskid* and all the runs for this task.

- `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.

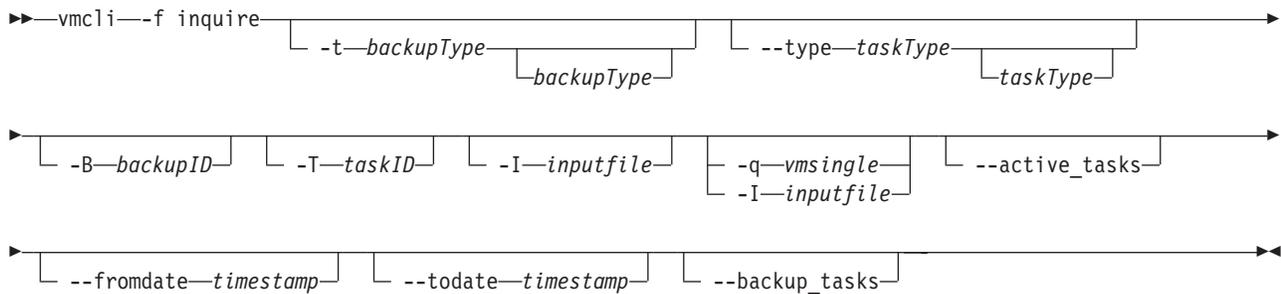
- `vmcli -f inquire --backup_tasks`

This command shows all backup tasks with their latest run.

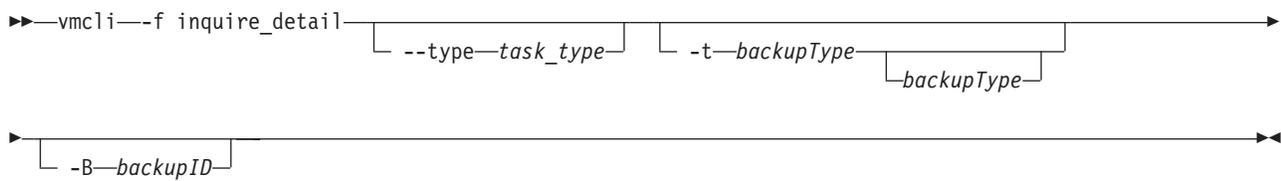
- `vmcli -f inquire --type attach --fromdate 20110822000000`

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

The following syntax diagram shows the inquire command:



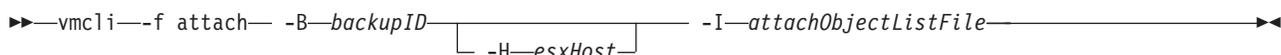
The following syntax diagram shows the inquire_detail command:



See “VMCLI inquire” on page 79 and “VMCLI inquire_detail” on page 85 for more details about the `vmcli -f inquire` and `vmcli -f inquire_detail` commands.

To attach and detach the virtual disks of a backup to a target virtual machine

Specified virtual disks in a Tivoli Storage FlashCopy Manager for VMware backup can be attached to a specified ESX host or target virtual machine. If the `-H esxHost` parameter is not specified, the value of the `AUXILIARY_ESX_HOST` profile parameter is used as the target virtual machine. The `-H` parameter can be used to overwrite the profile setting for the `AUXILIARY_ESX_HOST` parameter. The `attachObjectListFile` specifies which virtual disks are attached to the target virtual machine. The file contains one VM identifier per line, optionally specifying an alternate target VM. The following syntax diagram shows the attach command:



See “VMCLI attach” on page 72 for more details about the `vmcli -f delete` command and the `attachObjectListFile` structure and syntax.

The detach command is used to remove the virtual disks that are attached to the ESX host. The `-F` parameter forces a detach operation even if the corresponding backup task is still running.

```

▶▶ vmcli --f detach -B backupID -F

```

To restore a backup

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` 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. The `-H` parameter can be used to overwrite the profile setting for the `AUXILIARY_ESX_HOST` parameter. This parameter specifies the ESX host where the datastores in the selected backup are attached.

```

▶▶ vmcli --f restore -t backup_type -I restoreObjectListFile -H esxHost

```

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

```

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

```

See “VMCLI restore” on page 86 for more details about the `vmcli -f restore` command and the `restoreObjectListFile` structure and syntax .

To restore single disks of a virtual machine

The restore command can be used to restore a single disk of a virtual machine. You must specify one or more keys of the disks to restore in the `restoreObjectListFile`, 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

```

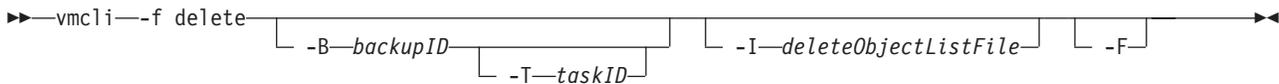
You must specify a valid backup to use in restore operation with, `-B backupID`. You can overwrite the target ESX host setting for this restore operation with the `-H` parameter.

To delete a backup

This function deletes one of the following options:

- The specified backup (-B)
- The specified task (-T)
- The list of objects in the input file (-I)

If a backup is deleted the 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. The following syntax diagram shows the delete command:



See “VMCLI delete” on page 78 for more details about the `vmcli -f delete` command and the `deleteObjectListFile` structure and syntax.

The vmcli database

The Data Protection for VMware command-line interface maintains metadata about each backup. A database is installed with Tivoli Storage FlashCopy Manager for VMware and this database is used to store the meta information about all backup, restore, and delete tasks.

Tivoli Storage FlashCopy Manager for VMware installs a database during the application installation. This database is used to hold the information about all 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. The `VMCLI_RECON_INTERVAL_FCM` parameter specifies the interval between reconciliation operations on the vmcli database with the Tivoli Storage FlashCopy Manager for VMware. Reconciliation operations delete metadata for backups that are no longer available.

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

The `VMCLI_TASK_EXPIRATION_TIME` parameter specifies the time a task is stored in the vmcli database. This parameter applies to attach, detach, delete, inquire_config, tape_backup, and used_capacity tasks. 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.

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

The Data Protection for VMware command-line interface command `vmcli -f db_backup` is used to back up the vmcli database. The following syntax diagram shows the `db_backup` 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. See the “VMCLI section” on page 51 in the profile parameters chapter.

The `vmcli -f db_restore` command restores a backup of the vmcli database. The following syntax diagram shows the `db_restore` 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—-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—-f db_compact—————▶▶

For more information about the Data Protection for VMware command-line interface database commands, see “VMCLI `db_backup`” on page 89.

Chapter 6. Tivoli Storage FlashCopy Manager for VMware configuration files

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

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

- Profile
- Target volumes file
- Password file

Tivoli Storage FlashCopy Manager for VMware profile parameters

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

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

- “GLOBAL section”
- “ACSD section” on page 48
- “VMWARE section” on page 49
- “VMCLI section” on page 51
- “DEVICE_CLASS section” on page 53

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

Name	Description	Default value	Advanced mode only
ACS_DIR	<p>The path of the Tivoli Storage FlashCopy Manager for VMware directory. This parameter is required.</p> <p>The Tivoli Storage FlashCopy Manager for VMware directory contains the following subdirectories:</p> <ul style="list-style-type: none">• The logs subdirectory contains all log and trace information that Tivoli Storage FlashCopy Manager for VMware generates.• 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, and a <i>master password</i> that is used by all components to authenticate when connecting to the management agent.	None	No

Table 12. Tivoli Storage FlashCopy Manager for VMware profile parameters - GLOBAL section (continued)

Name	Description	Default value	Advanced mode only
ACSD	<i>hostname port</i> The host name and the port of the system on which the management agent (acsd) is running. Separate the values with a space.	localhost 57328	No
TRACE	Activates tracing. Wait for instructions from support when setting those values. YES Enable tracing. NO Disable tracing.	None	Yes

ACSD section

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

Table 13. Tivoli Storage FlashCopy Manager for VMware profile parameters - ACSD section

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

VMWARE section

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

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

Name	Description	Default value	Advanced mode only
AUXILIARY_ESX_HOST	The auxiliary ESX host is used to offload backups to IBM Tivoli Storage Manager for Virtual Environments and for attach and restore operations. Specify the full qualified ESX host name as it is defined in the vCenter. The auxiliary ESX host is also used as the default in a command when an ESX host is not specified.	None	No
FCM_VM_NAME	If you installed Tivoli Storage FlashCopy Manager for VMware in a virtual machine within a vSphere environment, you must specify the virtual machine display name as the FCM_VM_NAME parameter value. Using this parameter value, Tivoli Storage FlashCopy Manager for VMware can avoid conflicts by ensuring that this virtual machine is automatically excluded from any backup and restore operations. If Tivoli Storage FlashCopy Manager for VMware is installed on a physical machine or a virtual machine in another vSphere environment that is not protected by this Tivoli Storage FlashCopy Manager for VMware instance, this parameter is optional and you can omit it.	None	Yes
HOST_NAME_MAPPING	This parameter specifies how an auxiliary ESX host in the vSphere environment is mapped to the host name that is used for this server on the storage subsystem. Multiple auxiliary ESX hosts can be mapped to the same host name by using a cluster that is defined on a storage subsystem, for example XIV, that covers more than one ESX host. In this case the parameter value specified is the name of this cluster. If an auxiliary ESX host does not have a mapping that is specified by this parameter, Tivoli Storage FlashCopy Manager for VMware derives the host name from the given auxiliary ESX host by using the first part, up to the first dot, of the fully qualified ESX host name. This parameter can be specified multiple times within this section of the profile. The parameter value format is <i>Auxiliary ESX host name : storage subsystem host name</i> for example HOST_NAME_MAPPING esxserv1.domain.com:esxserv1_xivname where esxserv1.domain.com is the fully qualified ESX server host name as defined in the vSphere environment and esxserv1_xivname is the name of this host as defined on the XIV system. See Note 1.	None	No
MAX_VERSIONS	ADAPTIVE The maximum number varies depending on the available space. Tivoli Storage FlashCopy Manager for VMware reuses the oldest target set as the target for the current backup. The maximum number of snapshot versions to be maintained. When this limit is reached, the oldest version is deleted.	ADAPTIVE	No

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

Name	Description	Default value	Advanced mode only
NUMBER_CONCURRENT_VM_TASKS	<p>This parameter specifies the number of operations that can be run concurrently at backup time. The optimum value for this parameter depends on the specific characteristics of your vSphere environment and must be evaluated empirically.</p> <p>For example if VM_BACKUP_MODE is set to SNAPSHOT_EXCL_MEM, NUMBER_CONCURRENT_VM_TASKS specifies the number of VMware snapshots that are run concurrently, to speed up the process.</p>	1	Yes
VM_BACKUP_MODE	<p>This parameter specifies how virtual machines selected for backup are processed before the actual hardware snapshot of the datacenter. Specify one of the following options:</p> <p>SNAPSHOT_INCL_MEM Create a VMware snapshot including a working memory for each virtual machine included in the backup. The virtual machine can be resumed after restore. The achieved consistency level is <i>filesystem</i> consistency</p> <p>SNAPSHOT_EXCL_MEM Create a VMware snapshot without a working memory image for every virtual machine included in the backup. The virtual machine must be booted after restore. The achieved consistency level is <i>filesystem</i> consistency.</p> <p>SUSPEND Suspend each virtual machine 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 selected for backup so that it is halted for a moment. The achieved consistency level is <i>filesystem</i> consistency.</p> <p>ASIS Do not perform any action before the actual hardware snapshot. The virtual machine must be booted after a restore. The achieved consistency level is <i>crash consistency</i>.</p> <p>When you use the Data Protection for VMware vCenter plug-in to create backups, you can specify the backup type for each backup task individually, overwriting the VM_BACKUP_MODE specified in the profile. When using the Data Protection for VMware command-line interface to create backups, you can also overwrite the VM_BACKUP_MODE specified in the profile by using a command-line option to specify the backup mode.</p>	SNAPSHOT_EXCL_MEM	No
VCENTER_SERVER	This parameter specifies the host name or IP address of the vCenter server that is managing the vSphere environment that is protected by this installation.	None	No
VCENTER_SERVER_USER	This parameter specifies the user name that is used to log on to the vCenter server.	Administrator	No

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

Name	Description	Default value	Advanced mode only
VCENTER_SERVER_VM_NAME	This parameter is used to specify the display name of the vCenter server virtual machine so that it can be excluded from backup operations. If you are running the vCenter server as a virtual machine within a vSphere environment, specify the virtual machine name. Using this parameter value, Tivoli Storage FlashCopy Manager for VMware can avoid conflicts by ensuring that this virtual machine is automatically excluded from any backup and restore operations. If the vCenter server is running on a physical machine or a virtual machine in another vSphere environment that is not protected by this Tivoli Storage FlashCopy Manager for VMware instance, this parameter is optional and you can omit it.	None	Yes
<p>Note: 1 For DS8000, use PREASSIGNED_VOLUMES as <i>storage subsystem host name</i>. The target set volumes need to be statically mapped to the auxiliary ESX server. For SAN Volume Controller, use PREASSIGNED_VOLUMES as <i>storage subsystem host name</i> if you use static volume mapping to the auxiliary ESX server.</p>			

VMCLI section

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

Table 15. Tivoli Storage FlashCopy Manager for VMware profile parameters - VMCLI section

Name	Description	Default value	Advanced mode only
VMCLI_DB_BACKUP	<p>This parameter controls the backup of the vmcli database containing the metadata of the Data Protection for VMware command-line interface. Specify one of the following values:</p> <p>NO This option does not perform a backup of the vmcli database.</p> <p>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.</p> <p>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 Environmentsbackup operation.</p> <p>The default location for the backups of the vmcli database is <i>install_dir/derby_backups</i>. Specify <i>T0 path</i> to set a custom path.</p>	AT 00:00	No
VMCLI_DB_BACKUP_VERSIONS	This parameter defines the maximum number of backup generations that are maintained for the vmcli database, before the oldest version is overwritten by a new version. This parameter only applies to the backups of the vmcli database containing metadata. It has no effect on the number of backup generations that are maintained for the backups of a vSphere environment.	3	No

Table 15. Tivoli Storage FlashCopy Manager for VMware profile parameters - VMCLI section (continued)

Name	Description	Default value	Advanced mode only
VMCLI_SCHEDULER_INTERVAL	This parameter defines the interval, in seconds, between scheduler checks for scheduled tasks due for execution.	60 seconds	No
VMCLI_RESTORE_TASK_EXPIRATION_TIME	This parameter specifies the time that a restore task is stored in the vmcli database.	2592000 seconds (30 days)	No
VMCLI_LOG_DIR	This parameter specifies the absolute location or the relative location of the installation directory path where the Data Protection for VMware command-line interface stores its log files.	logs directory	No
VMCLI_TASK_EXPIRATION_TIME	This parameter specifies the time that a task is stored in the vmcli database. This parameter applies to attach, detach, delete, inquire_config, tape_backup, and used_capacity tasks.	864000 seconds (10 days)	No
DERBY_HOME	This parameter specifies the location of the vmcli database.	None	No
VMCLI_RECON_INTERVAL_FCM	This parameter specifies the interval between reconciliation operations on the vmcli database with the Tivoli Storage FlashCopy Manager for VMware. Reconciliation operations delete metadata for backups that are no longer available, ensuring the vmcli database remains in synch with the Tivoli Storage FlashCopy Manager for VMware repository.	600 seconds (10 minutes)	No
VMCLI_GRACE_PERIOD	This parameter specifies the time between the deletion date of the backup and the time the backup is deleted.	None	No
VMCLI_TRACE	This parameter activates tracing files. Activate tracing only when instructed to do so by IBM Software Support.	None	Yes
VMCLI_RECON_INTERVAL_TSM	This parameter specifies the interval between reconciliation operations on vmcli database with the IBM Tivoli Storage Manager for Virtual Environments. Reconciliation operations delete metadata for backups that are no longer available, ensuring vmcli database remains in synch with the Tivoli Storage Manager for Virtual Environments repository.	1200 seconds (20 min)	No
VE_DATACENTER_NAME	This parameter maps a datacenter name in the vSphere server to the Tivoli Storage Manager for Virtual Environments node name for this datacenter. This parameter must be specified for each datacenter in the vSphere that has a different Tivoli Storage Manager for Virtual Environments datacenter node name. However, Tivoli Storage Manager for Virtual Environments does not support data centers with the same name in the vCenter. This parameter can have multiple occurrences if the vCenter manages multiple datacenters. The value of this parameter is a tuple of <i>datacentername</i> and <i>datacenternodename</i> . For example, VE_DATACENTER_NAME datacenter1::datacenternodename1 VE_DATACENTER_NAME datacenter2::datacenternodename2. See Note 1	None	No
VE_TSMCLI_NODE_NAME	This parameter specifies the node name under which the backup-archive client GUI or CLI operations are issued. See Note 1.	None	No
VE_TSM_SERVER_NAME	This parameter specifies the name of the Tivoli Storage Manager for Virtual Environments server that is used for user data backups. See Note 1	None	No
VE_TSM_SERVER_PORT	This parameter specifies the port of the Tivoli Storage Manager for Virtual Environments server. See Note 1	1500	Yes

Table 15. Tivoli Storage FlashCopy Manager for VMware profile parameters - VMCLI section (continued)

Name	Description	Default value	Advanced mode only
VE_VCENTER_NODE_NAME	This parameter specifies the Tivoli Storage Manager for Virtual Environments virtual node. The node that represents all the datacenters or a subset of datacenters, within a vCenter domain. See Note 1	None	No
Note: 1 The profile parameters with names <i>VE_*</i> are only applicable when using Tivoli Storage Manager for Virtual Environments with Tivoli Storage FlashCopy Manager for VMware.			

DEVICE_CLASS section

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

Table 16. Tivoli Storage FlashCopy Manager for VMware profile parameters - DEVICE_CLASS section

Device Applicability	Name	Description	Default value	Advanced mode only
IBM System Storage DS8000 IBM System Storage SAN Volume Controller or IBM Storwize v7000 IBM XIV Storage Systems	COPYSERVICES_HARDWARE_TYPE	This parameter specifies one of the following storage systems: DS8000 This value specifies IBM System Storage DS8000 SVC This value specifies IBM System Storage SAN Volume Controller or IBM Storwize v7000 XIV This value specifies IBM XIV Storage Systems	None	No
IBM System Storage DS8000 IBM System Storage SAN Volume Controller or IBM Storwize v7000	COPYSERVICES_PRIMARY_SERVERNAME	This parameter defines the TCP/IP address of the host that is running the CIM agent for the DS Open API, which can manage the primary and secondary copy services servers of the IBM System Storage DS8000 cluster, the SAN Volume Controller master console, or the embedded CIM agent. For SAN Volume Controller, the COPYSERVICES_PRIMARY_SERVERNAME parameter, must point to the SAN Volume Controller cluster with the embedded CIM server. If a SAN Volume Controller console (CIM proxy) is transitionally used, it must be connected to only one SAN Volume Controller cluster, or the volume names must be unique across all connected clusters. Specify the server name or TCP/IP address.	localhost	No

Table 16. Tivoli Storage FlashCopy Manager for VMware profile parameters - DEVICE_CLASS section (continued)

Device Applicability	Name	Description	Default value	Advanced mode only
IBM System Storage DS8000	COPYSERVICES_SECONDARY_SERVERNAME	This parameter specifies the name of the backup copy services server located within a snapshot devices cluster. You can specify either the IP address or the DNS name of the server. The default value is <i>none</i> . This parameter is used only for IBM System Storage DS8000 in combination with the proxy CIM agent.	<i>none</i>	Yes
IBM XIV Storage Systems	COPYSERVICES_SERVERNAME	This parameter specifies the host name of the XIV Storage System. This parameter is only valid when COPYSERVICES_HARDWARE_TYPE parameter is specified with a value of <i>XIV</i>	'none'	No
IBM System Storage DS8000 IBM System Storage SAN Volume Controller or IBM Storwize v7000 IBM XIV Storage Systems	COPYSERVICES_USERNAME	This parameter specifies the user name used for the . <i>cim user</i> CIM agent for DS Open API, which can manage the primary and secondary copy services servers of the IBM System Storage DS8000 cluster. <i>svc user</i> SAN Volume Controller master console or cluster <i>XIV user</i> The user name to log in to the XIV Storage Systems.	superuser	No
IBM XIV Storage Systems	PATH_TO_XCLI	This parameter specifies the path where the XIV Storage Systems command-line interface, XCLI, is installed. There is no default value. This parameter is only valid when the COPYSERVICES_HARDWARE_TYPE parameter is specified with a value of <i>XIV</i> .	None	No
IBM System Storage DS8000 IBM System Storage SAN Volume Controller or IBM Storwize v7000	COPYSERVICES_SERVERPORT	This parameter specifies the port number on the host that is running the CIM agent for DS Open API, which can manage the primary and secondary copy services servers of the IBM System Storage DS8000 cluster, the SAN Volume Controller master console, or embedded CIM agent).	See Note 1.	Yes
IBM System Storage DS8000 IBM System Storage SAN Volume Controller or IBM Storwize v7000	COPYSERVICES_TIMEOUT	This parameter specifies the maximum length of time, in minutes that the CIM Client waits for the response to a call issued to the CIMOM, the CIM Agent. If the CIM Client does not receive a response within the specified time, an error message is issued.	6	Yes

Table 16. Tivoli Storage FlashCopy Manager for VMware profile parameters - DEVICE_CLASS section (continued)

Device Applicability	Name	Description	Default value	Advanced mode only
IBM System Storage DS8000 IBM System Storage SAN Volume Controller or IBM Storwize v7000	COPYSERVICES_COMMPROTOCOL	This parameter specifies the protocol to be used for communication with the CIM agent. Specify one of the following values: HTTP Communication in unsecure mode HTTPS Communication in secure mode	HTTPS	No
IBM System Storage DS8000 IBM System Storage SAN Volume Controller or IBM Storwize v7000	COPYSERVICES_CERTIFICATEFILE	See Note 2.	NO_CERTIFICATE	Yes
IBM System Storage DS8000 IBM System Storage SAN Volume Controller or IBM Storwize v7000	FLASHCOPY_TYPE	This parameter specifies whether the storage system performs a bit-level copy of data from one logical volume to another. 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: <ul style="list-style-type: none"> You intend to perform a fast (snapshot) restore of a backup. A copy of the data on the target volume is needed. INCR Copies those tracks that were modified since the previous incremental FlashCopy was created. NOCOPY Directs the storage system to perform a bit-level copy of a track if the data is modified after the FlashCopy request. See Note 3.	COPY	No
IBM System Storage DS8000 IBM System Storage SAN Volume Controller or IBM Storwize v7000	TARGET_SETS	This parameter specifies the target volumes to be used in the FlashCopy operation by using one of the following values: <ul style="list-style-type: none"> VOLUMES_FILE list of target set names (only SAN Volume Controller and Storwize V7000) <ul style="list-style-type: none"> TARGET_NAMING string with wildcards %SOURCE and %TARGETSET See Note 4 and "Tivoli Storage FlashCopy Manager for VMware target set definitions" on page 35.	None	No

Table 16. Tivoli Storage FlashCopy Manager for VMware profile parameters - DEVICE_CLASS section (continued)

Device Applicability	Name	Description	Default value	Advanced mode only
IBM System Storage DS8000 IBM System Storage SAN Volume Controller or IBM Storwize v7000	VOLUMES_FILE	Specify the name of the target volumes file (.fct). See "Tivoli Storage FlashCopy Manager for VMware target set definitions" on page 35. You must specify this parameter if TARGET_SETS is set to VOLUMES_FILE.	None	No
IBM System Storage DS8000 IBM System Storage SAN Volume Controller or IBM Storwize v7000	TARGET_NAMING <string with wildcards %SOURCE and %TARGETSET>	Specify the naming convention for target volumes. Whenever a backup volume is required at backup time, Tivoli Storage FlashCopy Manager for VMware has already determined the name of the target set for the current operation and the name of the source volume to be backed up. The name of the target volume storing the backup is the name specified once the strings %SOURCE and %TARGETSET are replaced with the respective values in the current operation. You must specify this parameter if TARGET_SETS is set to VOLUMES_FILE.	None	No
IBM System Storage SAN Volume Controller or IBM Storwize v7000	SVC_COPY_RATE	This parameter specifies the priority that the SAN Volume Controller gives to the FlashCopy background process for the current backup or restore operation. Enter a value of 0 - 100. See Note 5.	50	No
IBM System Storage SAN Volume Controller or IBM Storwize v7000	SVC_CLEAN_RATE	Specify the cleaning rate for the FlashCopy mapping. Enter a value from 1 to 100.	50	Yes
IBM XIV Storage Systems	USE_WRITABLE_SNAPSHOTS	YES NO AUTO Specify whether writable snapshots are used. The AUTO setting automatically selects the recommended value based upon your environment.	AUTO	Yes
IBM XIV Storage Systems	USE_CONSISTENCY_GROUPS	YES NO Specify if consistency groups are used. The use of consistency groups decreases the time needed for the FlashCopy operation.	YES	Yes
IBM XIV Storage Systems	GRACE_PERIOD	Specify the period of time (in hours) to retain snapshots that are not contained in the snapshot repository or not contained on the IBM XIV Storage System. A 0 value reconciles all snapshots. This parameter is only valid when COPYSERVICES_HARDWARE_TYPE specifies XIV.	24 hours	Yes

Table 16. Tivoli Storage FlashCopy Manager for VMware profile parameters - DEVICE_CLASS section (continued)

Device Applicability	Name	Description	Default value	Advanced mode only
IBM System Storage DS8000 IBM System Storage SAN Volume Controller or IBM Storwize v7000 IBM XIV Storage Systems	RECON_INTERVAL	Specify the interval (in hours) to perform reconciliation for the storage system.	12 hours	Yes

COPYSERVICES_SERVERPORT

Note: 1

The default port number depends on the settings of the COPYSERVICES_HARDWARE_TYPE and COPYSERVICES_COMMPROTOCOL parameters:

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

COPYSERVICES_CERTIFICATEFILE

Note: 2

If COPYSERVICES_COMMPROTOCOL parameter is set, or defaults, to HTTPS the following parameters are required:

certificate file name

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

NO_CERTIFICATE

Select null trust provider mode.

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

To enable the HTTPS protocol, the Tivoli Storage FlashCopy Manager for VMware profile parameter COPYSERVICES_COMMPROTOCOL must specify HTTPS (default value). In this case, parameter COPYSERVICES_CERTIFICATEFILE can define a *certificate file name*, and Tivoli Storage FlashCopy Manager for VMware exports the certificate using this file.

The CIM Agent also provides another communication mode known as *null trust provider*. In this case, the CIM Agent does not verify that the certificate passed by

the client matches a known certificate. It accepts any certificate from the client, including a null string for the file name. To enable this mode, the value of `COPYSERVICES_CERTIFICATEFILE` must be `NO_CERTIFICATE`. This mode is recommended only if the production and backup systems, and the storage system, are protected by a firewall. If `NO_CERTIFICATE` is in effect, the `cimom.properties` parameter `DigestAuthentication` must be set to 'false'.

FLASHCOPY TYPE

Note: 3

- This parameter applies to all snapshot devices, except the XIV system. The values `INCR` and `NOCOPY` apply only to FlashCopy devices.
- `COPY`, `INCR`, or `NOCOPY` is needed if you plan to run a snapshot restore using SAN Volume Controller 5.1 or later or Storwize V7000,
- Specify `INCR` if you want Tivoli Storage Manager to back up data from disk copies. Specify `INCR` when the following conditions are true:
 - You intend to perform a snapshot restore of the backup database
 - You intend to schedule more frequent backups for your database

In a System Storage DS8000 environment, you can specify only one target set in the target volumes file for incremental snapshots. CIM errors might occur when more than one target set is specified.

- Specify `NOCOPY` when the following conditions are true:
 - A complete copy of the source volumes, which contain the database files, to the target volumes is not needed.
 - Backup time constraints are a concern

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

TARGET_SETS

Note: 4

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

VOLUMES_FILE

Specify the name of the target volumes file.

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

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

TARGET_NAMING <string with wildcards %SOURCE and %TARGETSET>

Defines the naming convention for target volumes. Whenever a backup volume is required at backup time, Tivoli Storage FlashCopy Manager for VMware has already determined the name of the target set for the current operation and the name of the source volume to be backed up. The name of the target volume storing the backup is the name specified after the strings `%SOURCE` and `%TARGETSET` are replaced with the respective values in the current operation.

SVC_COPY_RATE

Note: 5

The parameter value represents a priority in the range 0 - 100. The responsiveness of the storage system is greatest when SVC_COPY_RATE is 100. A value of 0 suppresses the background copy process and forces the FLASHCOPY_TYPE parameter to be set to NOCOPY.

If Tivoli Storage FlashCopy Manager for VMware is installed, you can change the copy rate for an active FlashCopy operation dynamically with the `tsm4acs -f modify_copyrate` function.

Tivoli Storage FlashCopy Manager for VMware password file

Tivoli Storage FlashCopy Manager for VMware requires a password file in order 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.

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

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

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

Tivoli Storage FlashCopy Manager for VMware target volumes file

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

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

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

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

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

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

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

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

Managing target volumes by storage system

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

Table 17. Managing target volume LUNs by storage system

DS8000	SAN Volume Controller or Storwize V7000	XIV system
Manual target LUN creation using the target volumes file (.fct) with the VOLUMES_FILE.	Manual target LUN creation using the target volumes file (.fct) with the VOLUMES_FILE. or Naming convention using the TARGET_NAMING parameter	Automatic target LUN creation <i>without</i> using the target volumes file (.fct)

On DS8000 and SAN Volume Controller or Storwize V7000 storage systems, use the TARGET_SETS parameter to specify the target volumes file (VOLUMES_FILE). The VOLUMES_FILE can be used to share a target volume file between multiple device classes by restricting a target set to a specific DEVICE_CLASS.

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

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

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

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

- SAN Volume Controller or Storwize V7000 only: The TARGET_NAMING parameter naming convention specified:

The following sample explains the usage of the naming convention specified by the TARGET_SETS and TARGET_NAMING parameters:

- Assuming the source volumes are named A01pro_1 and A01pro_2
- Assuming the TARGET_SETS profile parameter has a value of 1
- Assuming the TARGET_NAMING parameter value as %SOURCE_t %TARGETSET

Using this target naming definition, the source volume A01pro_1, with target set named 1, results in target volume A01pro_1_t1, and source volume A01pro_2 results in the target volume A01pro_2_t1.

- VOLUMES_FILE:

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

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

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

This example shows the syntax of target volumes files specified by the VOLUMES_FILE parameter:

```
>>> TARGET_SET <target set name>

DEVICE_CLASS <device class name> # this parameter is optional and allows to
                                # restrict the use of this target set to a
                                # specific device class

    TARGET_VOLUME <target> [<source>] [<size>]
    [...]

<<<
[...]
```

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

Related reference

Chapter 6, “Tivoli Storage FlashCopy Manager for VMware configuration files,” on page 47

Target volume parameter settings for a DS8000 configuration

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

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

Table 18. Parameters of the 'VOLUMES_SET_x' Topic (DS8000)

Parameter Name	Value
TARGET_VOLUME <target volume serial number> <source volume serial number> <source volume size>	<p>A target set definition file contains a list of target volumes that are organized into target sets. Tivoli Storage FlashCopy Manager for VMware attempts to match source volumes to suitable targets within a target set during backup. To determine source target relations in advance, specify a source serial number with a target serial number in the target set definition file. In this situation, the relation between the source and target is required and backup processing fails if one of the targets is unavailable for the specified source.</p> <p>This example shows a configuration where the DS8000 source volume with serial 75924811011 must be used in a FlashCopy with the target volume with serial number 75924811001.</p> <pre>TARGET_VOLUME 75924811001 75924811011 Size=2.0_GB</pre> <p>The source serial number and the size can be omitted completely or dashes can be entered in both fields as placeholders, as shown in the following example:</p> <pre>TARGET_VOLUME 75924811001 - -</pre> <p>The dashes will be ignored. Note the target volume requirements for a FlashCopy:</p> <ul style="list-style-type: none"> • The size must be the same as that of the source volume • The source and target volumes that are listed in one TARGET_SET must be in the same storage subsystem <p>Note: 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 60 for detailed information about the criteria that are used to associate a target volume to a source volume.</p>

The FLASHCOPY_TYPE parameter is only valid for DS8000 and SAN Volume Controller or Storwize V7000. If you need to change any of the following:

- Change the FLASHCOPY_TYPE value of an existing target set.
- Remove a target volume from an existing target set.
- Remove a complete target set.

You must use the VMCLI delete command with the force option. This command is described in the "VMCLI delete" on page 78 section of "Tivoli Storage FlashCopy Manager for VMware command-line interface".

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

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

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

Table 19. Parameters of the 'VOLUMES_SET_X' Topic (SAN Volume Controller and Storwize V7000)

Parameter Name	Value
TARGET_VOLUME <target volume virtual disk name> <source volume virtual disk name> <source volume size>	<p>A target set definition file contains a list of target volumes that are organized into target sets. Tivoli Storage FlashCopy Manager for VMware attempts to match source volumes to suitable targets within a target set during backup. To determine source target relations in advance, specify a source virtual disk name with a target virtual disk name in the target set definition file. In this situation, the relation between the source and target is required and 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 must be 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 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 svdftgt4 - -</pre> <p>The dashes are ignored. A FlashCopy has the following target volume requirements :</p> <ul style="list-style-type: none"> • the size must be the same as the source volume size • the source and target volumes that are listed in one TARGET_SET must be in the same SAN Volume Controller cluster. <p>Note: 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 60 for detailed information about the criteria that are used to associate a target volume to a source volume.</p>

The FLASHCOPY_TYPE parameter is only valid for DS8000, SAN Volume Controller and Storwize V7000. If it becomes necessary to make any of these changes:

- 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.

You must use the VMCLI delete command with the force option. This command is described in the “VMCLI delete” on page 78 section of “Tivoli Storage FlashCopy Manager for VMware command-line interface”.

Note: SAN Volume Controller 5.1 (or later) and Storwize V7000: Tivoli Storage FlashCopy Manager for VMware only allows the deletion of FlashCopy mappings 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, then the background operation that actually deletes the mappings is delayed until all older backups are also deleted or are reused by a new backup request.

Example:

This is a typical SE MTFC cascade:

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 T4 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 7. Starting the Data Protection for VMware vCenter plug-in

Follow these instructions to start the Data Protection for VMware vCenter plug-in.

The Data Protection for VMware vCenter plug-in is installed on a VM guest machine, off-host physical machine, or the same machine used by the Tivoli Storage Manager Administration Center. Each Data Protection for VMware vCenter plug-in installation manages a backup domain that contains one or more VMware data centers. By default, a domain contains all data centers that are associated with a vCenter. You can use the Data Protection for VMware vCenter plug-in to limit a domain to one or more VMware data centers.

Tip: Although this procedure provides an overview of how to start the Data Protection for VMware vCenter plug-in, complete product information is provided in the online help shipped with the Data Protection for VMware vCenter plug-in.

Follow the following instructions to start the Data Protection for VMware vCenter plug-in:

1. Start the vSphere Client and log on to the vCenter. If the vSphere Client is already running, you must close and restart it.
2. Start the Data Protection for VMware vCenter plug-in by clicking the icon in the Solutions and Applications window of your vSphere Client as shown in:

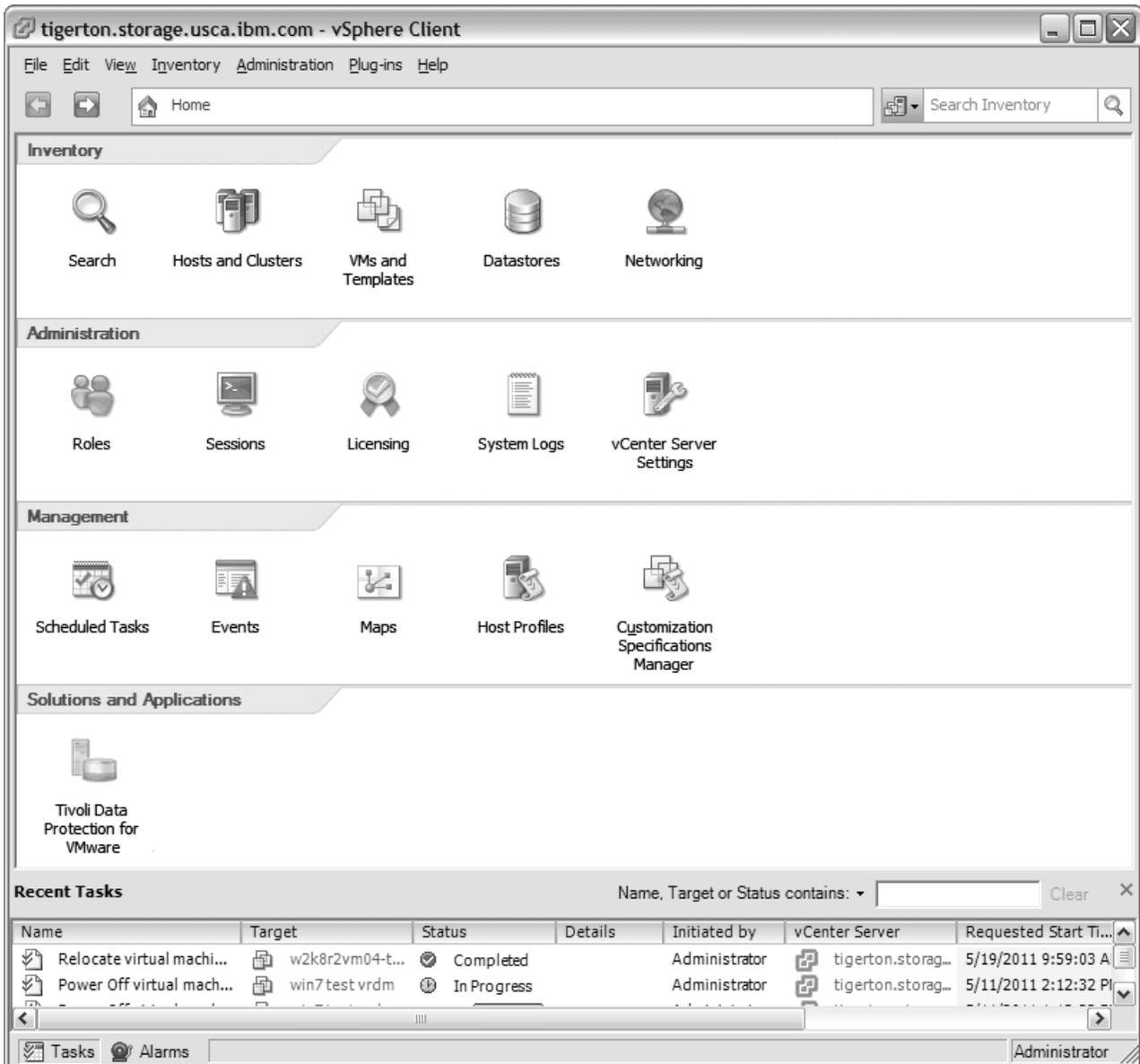


Figure 7. Data Protection for VMware vCenter plug-in icon shown in the Solutions and Applications of the vSphere Client

Tip: If the icon is not shown, then the Data Protection for VMware vCenter plug-in was not registered or a connection error occurred.

- a. In the vSphere Client menu, go to **Plug-ins > Manage Plug-ins** to start the Plug-in Manager.
- b. If you can locate the Data Protection for VMware vCenter plug-in and a connection error occurred, complete these tasks:
 - 1) Verify connectivity to the machine where the Data Protection for VMware vCenter plug-in is installed by issuing the ping command.
 - 2) When the IP address changes on the system where the Data Protection for VMware vCenter plug-in is installed, you must set up the client acceptor again using the Tivoli Storage Manager Client Configuration wizard. Otherwise, the Plug-in Manager shows the Data Protection for VMware vCenter plug-in status as disabled.
 - 3) Verify that IBM WebSphere Application Server is running.

You can also start the Data Protection for VMware vCenter plug-in in the file menu by going to **View > Solutions and Applications > Tivoli Data Protection for VMware**.

3. When Tivoli Storage Manager for Virtual Environments is installed and the Data Protection for VMware vCenter plug-in starts for the first time, edit the Tivoli Storage Manager server settings by going to **Configuration window > Tivoli Storage Manager Server > Edit**.

Chapter 8. Integrating Tivoli Storage FlashCopy Manager for VMware with Tivoli Storage Manager for Virtual Environments

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

Functions that are available when Tivoli Storage Manager for Virtual Environments is installed are described in this section.

Backup overview

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

Restore overview

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

- Restore to the original location.
- Restore to the same datastore but to a new VM with a new name.
- Restore to a different datastore using the same VM name.
- Restore to a different datastore to a new VM with a new name.

Components

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

Data Protection for VMware vCenter plug-in

This component is a graphical user interface (GUI) that integrates with the VMware vSphere Client. The Data Protection for VMware vCenter plug-in is accessed as a vCenter Server extension in the Solutions and Applications panel of your vCenter Server System. Use the Data Protection for VMware vCenter plug-in as the primary interface from which to complete these Tivoli Storage Manager for Virtual Environments tasks:

- Initiate a backup of your VMs to a Tivoli Storage Manager server (or schedule a backup for a later time).
- Initiate a full recovery of your VMs from a Tivoli Storage Manager server.

- Issue reports concerning backup, restore, and configuration activity.

Data Protection for VMware command-line interface

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

- Initiate a backup of your VMs 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 VMs, VM files, or VM Disks (VMDKs) from a Tivoli Storage Manager server.

Although the Data Protection for VMware vCenter plug-in is the primary task interface to use for Tivoli Storage Manager for Virtual Environments operations, the Data Protection for VMware command-line interface provides a useful secondary interface. For example, the Data Protection for VMware command-line interface can be used to implement a scheduling mechanism different from the one implemented by the Data Protection for VMware vCenter plug-in. Also, the Data Protection for VMware command-line interface is useful when evaluating automation results with scripts.

Requirements

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

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

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

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

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

- “VMCLI attach” on page 72
- “VMCLI backup” on page 73
- “VMCLI delete” on page 78
- “VMCLI detach” on page 79
- “VMCLI inquire” on page 79
- “VMCLI inquire_config” on page 83
- “VMCLI inquire_detail” on page 85
- “VMCLI restore” on page 86
- “VMCLI set_domain” on page 88
- “VMCLI tape_backup” on page 88
- “VMCLI used_capacity” on page 89
- “VMCLI db_backup” on page 89
- “VMCLI db_restore” on page 90
- “VMCLI db_inquire” on page 90
- “VMCLI db_compact” on page 90

Command output

The Data Protection for VMware command-line interface sends its output to the stdout (and errors to the stderr) stream. The output contains messages that start with a “#” sign followed by a message tag identifier and some additional text. All output is read line by line. Lines that do not start with a “#” are considered a multiple line message and belong to the last received tag identifier. 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 `::`.
- 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
```

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: 3.1.0.0 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 -f backup [-t backupType [,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]

```

Parameters

-t *backupType*

Specify the type of backup to run. You can choose from one of the following types:

FCM This option 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

This option 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

When the `FCM_TSM_LATEST` option is selected for a snapshot backup and the off-loaded backup to Tivoli Storage FlashCopy Manager for VMware has either not started or has failed, any new snapshot backup with option `FCM_TSM_LATEST` removes the previous backup request to Tivoli Storage FlashCopy Manager for VMware .

TSM This option creates a Tivoli Storage Manager for Virtual Environments backup.

TSM_INCR

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

TSM_FULL

This option creates a full image Tivoli Storage Manager for Virtual Environments backup.

-I *backupObjectListFile*

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

- Each line can contain only one identifier and its value, separated by a colon.
- The valid datastore identifiers are the data storeurl, datastoreurl, and the datastore name datastorename.
- Exclude statements are allowed and begin with an exclamation point !. These statements can contain a vminstanceuuid, vmname, datastoreurl, or datastorename. Name statements can contain wildcards. Wildcard characters ? and * are allowed for the datastorename or vmname.

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 is not supported at this time.

An example *backupObjectListFile* is provided here:

```
# 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
#
# One or more include statements are required
# Includes may comprise datastoreurl and datastorename identifier
#
# Excludes 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
#Exclude VM with this uuid from the backup
!vminstanceuuid:vmUuid
#Exclude VM with this name from the backup (needs to be unique)
!vmname:vmName
#Exclude all vms matching this wildcard string from the backup
```

```
!vmname:vmN*
#Exclude datastore with this URL from the backup
!datastoreurl:dsUrl
#Exclude all datastores matching this wildcard string from the backup
!datastorename:ds?am*
```

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

-D *deviceClass*

Specifies the Tivoli Storage FlashCopy Manager for VMware device class to be used in the backup operation. This device class must exist in the profile, otherwise the operation fails. The default is *STANDARD*.

-H *esxHost*

Specifies the ESX host where the datastores are attached during a subsequent offload backup to Tivoli Storage Manager for Virtual Environments. The default is the value of *AUXILIARY_ESX_HOST* in the Tivoli Storage FlashCopy Manager for VMware profile.

--vmbackupmode *vmsnapType*

Specifies if software snapshots are created for each virtual machine or if the virtual machines are suspended before the hardware snapshot. The default value is the value of the *VM_BACKUP_MODE* parameter in the Tivoli Storage FlashCopy Manager for VMware profile.

--start

Specifies a date/time when this scheduled backup is started

--interval *intervalSeconds*

Specifies an interval in seconds after which the backup operation reruns. This parameter is only valid when *--start* is specified.

--end *scheduleEndDate*

Specifies the end date/time when the scheduled reruns ends. This parameter is only valid when *--start* and *--interval* are specified.

--priority *1-5*

If two backup tasks are scheduled to run at the same time, the task with a higher priority runs first. The priority is an integer value between 1 (lowest) and 5 (highest) priority.

--name *taskName*

This string can be used to identify this backup task.

--description *descriptionInFile*

This parameter specifies a text file which contains some textual description of this backup task.

--runnow

If scheduling options are set, this option can be used to start this task immediately.

Output

```
#TASK taskID taskType dateCreated
#PARAM TASK_NAME=taskName
#PARAM BACKUP_TYPE=backupType[,backupType[,...]]
#PARAM AUXILIARY_ESX_HOST=esxHostname
#PARAM OBJECT=datastoreurl:datastoreurl
#PARAM OBJECT=vminstanceuid:vminstanceuid
#PARAM OBJECT=vminstanceuid:vminstanceuid
#RUN runID runDate
#LANG country-code (en-US,de-DE)
```

```

#PARAM BID=BID
#PARAM CHAIN_NUMBER=CHAIN_NUMBER
#PARAM BACKEND=backendType
#PARAM Version: 3.1.0.0 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 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 reruns a defined backup task against the corresponding backup backend. 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. This command is only available in the Data Protection for VMware command-line interface.

Syntax

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

```
vmcli -f delete (-B backupID |-T taskID |-I deleteObjectListFile) [-F]
```

This function runs a Tivoli Storage FlashCopy Manager for VMware delete operation. You can use the *backupID*, or the *taskID* to specify the backup or the backup schedule. You can use the *deleteObjectListFile* to specify more than one backup ID or task ID. 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.

-T *taskID*

The taskID of the task to be deleted.

-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
taskid:task1ID
backupid:backup54ID
backupid:backup63ID
```

-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 the datastore or datastores from the ESX host and remove any disks that were attached to a VM during an attach command.

Syntax

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

```
vmcli -f detach [-B backupID] [-F ]
```

Parameters

-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.

Output

```
#TASK taskID taskType dateCreated
#PARAM BACKUP_ID=backupID
#RUN runID runDate
#LANG country-code (en-US,de-DE)
#PARAM BACKEND=backupType
#PARAM Version: 3.1.0.0 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 -f inquire [-t backupType,[backupType]] [[--type taskType]]|[-B backupID]|
|[-T taskID][[-d dataCenterName][-q vsingle -I inputfile]]| [--active_tasks] ||
[--fromdate timestamp [--todate timestamp]]| [--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.

-d *dataCenterName*

A list of virtual machine backups is requested from the specified datacenter name.

-q *vmsingle***-I** *inputfile***--active_tasks****--fromdate** *timestamp***--todate** *timestamp***--backup_tasks**

There are three 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 timestamp is used. The syntax of the timestamp 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]] ]]
```

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 this retrieves the data directly from the Tivoli Storage Manager for Virtual Environments server. The following two commands query virtual machines backups in a specified datastore:

1. `vmcli -f inquire -t FCM -I infile`

Query a list of virtual machine backups from a datacenter. The *infile* should contains the following:

```
datacenter:datacentername
```

2. `vmcli -f inquire -t FCM -q vmSingle -I inputfile`

Query all backups for *vmSingle* on *dataCenterName*. The *infile* should contain the following:

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

Output

```
#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: 3.1.0.0 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

```

VMCLI inquire_config

Use this command to retrieve configuration information about the backup back-end.

Syntax

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

```
vmcli -f inquire_config [-t backupType][-v vcenternodename][-s tmsserverhostname]  
[-n vctrclinodename] [-p tmsserverport]
```

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 *tmsserverhostname*

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 *tmsserverport*

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 ACS_D=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
#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=tsmserverhostname
#PARAM COPYSERVICES_USERNAME=copyservices_username
#PARAM SVC_COPY_RATE=svc_copy_rate
#PARAM COPYSERVICES_COMMPROTOCOL=HTTPS
#PARAM COPYSERVICES_CERTIFICATEFILE=NO_CERTIFICATE
#PARAM COPYSERVICES_SERVERPORT=tsmserverport
#PARAM FLASHCOPY_TYPE=INCR|COPY|NOCOPY
#PARAM TARGET_SETS=target_sets
#PARAM TARGET_NAMING=%SOURCE %TARGETSET
#END SECTION DEVICE_CLASS STANDARD
#SECTION DEVICE_CLASS SVC_61
#PARAM COPYSERVICES_HARDWARE_TYPE=SVC|XIV|DS8000
#PARAM COPYSERVICES_PRIMARY_SERVERNAME=tsmserverhostname
#PARAM COPYSERVICES_USERNAME=copyservices_username
#PARAM SVC_COPY_RATE=svc_copy_rate
#PARAM COPYSERVICES_COMMPROTOCOL=HTTPS
#PARAM COPYSERVICES_CERTIFICATEFILE=NO_CERTIFICATE
#PARAM COPYSERVICES_SERVERPORT=tsmserverport
#PARAM FLASHCOPY_TYPE=INCR|COPY|NOCOPY
#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=tsmserverhostname
#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 through the plug-in. If no backup type is specified, the inquire_detail command calls each back-end plug-in.

Syntax

The vmcli -f inquire_detail command uses the following syntax:

```

vmcli -f inquire_detail [--type taskType] [-t backupType,backupType]
[-B backupID] [-T taskID]

```

The --type, -t, -B, -T, and -I options can be used to set filters for the information of interest.

Parameters

--type *taskType*

Specifies the type of the task for this inquire_detail command. You can specify one of the following task types for the inquire_detail command.

ALL Specifies that the inquire_detail operation shows tasks of all types.

backup

Specifies that the inquire_detail operation shows backup tasks.

delete Specifies that the inquire_detail operation shows delete tasks.

restore

Specifies that the inquire operation shows restore tasks.

attach Specifies that the inquire_detail operation shows attach tasks.

detach Specifies that the inquire_detail operation shows detach tasks.

The default is ALL.

-t *backupType*

ALL Specifies that the inquire_detail operation is performed for all registered backup types.

FCM Specifies that the inquire_detail operation is performed for Tivoli Storage FlashCopy Manager for VMware backups.

TSM Specifies that the inquire_detail operation is performed for Tivoli Storage Manager for Virtual Environments backups.

-B backupID

The ID of the backup for the inquire_detail command.

-T taskID

The taskID of the task 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 restore

This function runs a restore operation.

Syntax

The vmcli -f restore command uses the following syntax:

```
vmcli -f restore [-t backupType] -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 and the hardware snapshot must be used as a base of the restore. This is the default restore Type if the option -t is not specified.

TSM Specifies that the restore operation should be performed from a backup that was generated by Tivoli Storage Manager for Virtual Environments (with backup types FCM_TSM_YES, FCM_TSM_MANDATE, FCM_TSM_LATEST or TSM). The Tivoli Storage Manager for Virtual Environments backup must be used as base of the restore.

-I *restoreObjectListFile*

Specify the file that contains the list of objects to restore. The *restoreObjectListFile* must have one backup ID and one VM identifier per line, optionally specifying a different target VM, an alternate 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 data center names that contain English 7 bit ASCII characters only. Virtual machine names and data center names that use other language characters is not supported at this time.

An example *restoreObjectListFile* is provided here:

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

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

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

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

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

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

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

-H *esxHost*

Specifies the ESX host where the datastores in the selected backup are attached. The default value is the value of AUXILIARY_ESX_HOST parameter in the Tivoli Storage FlashCopy Manager for VMware profile.

Output

```
#PHASE_COUNT 4
#PHASE_PREPARE_RESTORE
#CHILD datastoreurl:<dsUrl>
#PARENT vmuuid:<vmUuid>/
#PHASE MOUNT
#PHASE RESTORE
#PHASE UNMOUNT
#END
```

VMCLI set_domain

Use this command to apply changes to the domain settings.

Syntax

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

```
vmcli -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 contains one datacenter identifier per line.
- The valid identifier is the datacenter name. Names may include wildcards.

If no domain has been configured the current FCM instance is used to manage all data centers that are available in the vCenter. When the `setDomain` 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

```
#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 -f tape_backup
```

Output

```
Backup Timestamp: 20110128104856942
#END
```

VMCLI used_capacity

This function reports the managed capacity per source disk and the total source capacity managed by Tivoli Storage FlashCopy Manager for VMware.

Syntax

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

```
vmcli -f used_capacity [-t backupType]
```

Parameters

`-t backupType`

Output

```
#TASK taskId used_capacity dateCreated
#PARAM TASK_NAME=used_capacity
#PARAM TASK_DESCRIPTION=used_capacity
#PARAM BACKUP_TYPE=FCM
#RUN runId startRunDate
#LANG en-US
#PARAM BACKEND=FCM
#PARAM SOURCE_VOLUME=<volume ID>
#PARAM MANAGED_CAPACITY=<size in GB>
... (more SOURCE_VOLUME / MANAGED_CAPACITY pairs)
#PARAM TOTAL_MANAGED_CAPACITY=<size in GB>
#PARAM STATUS=runStatus
#END RUN runID endRunDate
#END TASK taskID
#END
```

VMCLI db_backup

Use this command to create a backup of the vmcli database.

Syntax

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

```
vmcli -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 -f db_restore -B backup_id
```

This command restores a backup of the vmcli database. During the restore process the vmcli database is shut down, if it is running. It is recommended, but not required, to 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 -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 -f db_compact
```

This command reclaims unused space in the vmcli database. This function requires an exclusive lock for each table that is compacted. It is recommended, but not required, to 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 following list includes the major accessibility features in the Tivoli Storage Manager family of products:

- Keyboard-only operation
- Interfaces that are commonly used by screen readers
- Keys that are discernible by touch but do not activate just by touching them
- Industry-standard devices for ports and connectors
- The attachment of alternative input and output devices

The Tivoli Storage Manager Information Center, and its related publications, are accessibility-enabled. The accessibility features of the information center are described at http://publib.boulder.ibm.com/infocenter/tsminfo/v6r3/topic/com.ibm.help.ic.doc/iehs36_accessibility.html.

Keyboard navigation

On Windows, the Tivoli Storage Manager product family follows Microsoft conventions for all keyboard navigation and access. Drag and Drop support is managed using the Microsoft Windows Accessibility option known as MouseKeys. For more information about MouseKeys and other Windows accessibility options, please refer to the Windows online help (keyword: MouseKeys).

On other operating systems, these products follow the operating-system conventions for keyboard navigation and access.

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 for more information about the commitment that IBM has to accessibility.

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Glossary

This glossary includes terms and definitions for IBM Tivoli Storage Manager and IBM Tivoli Storage FlashCopy Manager products.

To view glossaries for other IBM products, go to <http://www.ibm.com/software/globalization/terminology/>.

The following cross-references are used in this glossary:

- *See* refers the reader from a term to a preferred synonym, or from an acronym or abbreviation to the defined full form.
- *See also* refers the reader to a related or contrasting term.

A

absolute mode

In storage management, a backup copy-group mode that specifies that a file is considered for incremental backup even if the file has not changed since the last backup. See also *modified mode*.

access control list (ACL)

In computer security, a list associated with an object that identifies all the subjects that can access the object and their access rights. For example, an access control list is associated with a file that identifies the users who can access that file and their access rights.

access mode

An attribute of a storage pool or a storage volume that specifies whether the server can write to or read from the storage pool or storage volume. The access mode can be read/write, read-only, or unavailable. Volumes in primary storage pools can also have an access mode of destroyed. Volumes in copy storage pools can also have an access mode of offsite.

acknowledgment

The transmission of acknowledgment characters as a positive response to a data transmission.

ACL See *access control list*.

activate

To validate the contents of a policy set and then make it the active policy set.

active-data pool

A named set of storage pool volumes that contain only active versions of client backup data.

active file system

A file system to which space management has been added. With space management, tasks for an active file system include automatic migration, reconciliation, selective migration, and recall. Contrast with *inactive file system*.

active policy set

The activated policy set that contains the policy rules in use by all client nodes that are assigned to the policy domain. See also *policy domain* and *policy set*.

active version

The most recent backup copy of a file stored. The active version of a file cannot be deleted until a backup process detects that the user has either replaced the file with a newer version or has deleted the file from the file server or workstation. Contrast with *inactive version*.

activity log

A log that records normal activity messages that are generated by the server. These messages include information about server and client operations, such as the start time of sessions or device I/O errors.

adaptive subfile backup

A type of backup that sends only changed portions of a file to the server, instead of sending the entire file. Adaptive subfile backup reduces network traffic and increases the speed of the backup.

administrative client

A program that runs on a file server, workstation, or mainframe that administrators use to control and monitor the Tivoli Storage Manager server. Contrast with *backup-archive client*.

administrative command schedule

A database record that describes the

planned processing of an administrative command during a specific time period. See also *client schedule*.

administrative privilege class

See *privilege class*.

administrative session

A period of time during which an administrator user ID communicates with a server to perform administrative tasks. Contrast with *client node session*.

administrator

A user who is registered to the server as an administrator, and who is authorized to perform tasks and issue commands through the assignment of an administrative privilege class.

Advanced Program-to-Program Communication (APPC)

An implementation of the SNA LU 6.2 protocol that allows interconnected systems to communicate and share the processing of programs.

agent node

A client node that has been granted proxy authority to perform operations on behalf of another client node, which is the target node.

aggregate

An object, stored in one or more storage pools, consisting of a group of logical files that are packaged together. See also *logical file* and *physical file*.

aggregate data transfer rate

A performance statistic that indicates the average number of bytes that were transferred per second while processing a given operation.

APPC See *Advanced Program-to-Program Communication*.

application client

A program that is installed on a system to protect an application. The Tivoli Storage Manager server provides backup services to an application client.

archive

To copy programs, data, or files to other storage media, usually for long-term storage or security. Contrast with *retrieve*.

archive copy

A file or group of files that was archived to server storage.

archive copy group

A policy object containing attributes that control the generation, destination, and expiration of archived files.

archive-retention grace period

The number of days that the storage manager retains an archived file when the server is unable to rebind the file to an appropriate management class. See also *bind*.

association

(1) The defined relationship between a client node and a client schedule. An association identifies the name of a schedule, the name of the policy domain to which the schedule belongs, and the name of a client node that performs scheduled operations.

(2) On a configuration manager, the defined relationship between a profile and an object such as a policy domain. Profile associations define the configuration information that is distributed to a managed server when it subscribes to the profile.

audit

To check for logical inconsistencies between information that the server has and the actual condition of the system. The storage manager can audit information about items such as volumes, libraries, and licenses. For example, when a storage manager audits a volume, the server checks for inconsistencies between information about backed-up or archived files that are stored in the database and the actual data that are associated with each backup version or archive copy in server storage.

authentication

The process of checking a user's password before permitting user access to the Tivoli Storage Manager server. Authentication can be turned on or off by an administrator with system privilege.

authentication rule

A specification that another user can use to either restore or retrieve files from storage.

authority

The right to access objects, resources, or functions. See also *privilege class*.

authorization rule

A specification that permits another user to either restore or retrieve a user's files from storage.

authorized user

A user who has administrative authority for the Tivoli Storage Manager client on a workstation. This user changes passwords, performs open registrations, and deletes file spaces.

AutoFS

See *automounted file system*.

automatic detection

A feature that detects, reports, and updates the serial number of a drive or library in the database when the path from the local server is defined.

automatic migration

The process that is used to automatically move files from a local file system to storage, based on options and settings that are chosen by a root user on a workstation. See also *threshold migration* and *demand migration*.

automatic reconciliation

The process that is used to reconcile file systems at regular intervals. The intervals are set by a user with root user authority. See also *reconciliation*.

automounted file system (AutoFS)

A file system that is managed by an automounter daemon. The automounter daemon monitors a specified directory path, and automatically mounts the file system to access data.

B**backup-archive client**

A program that runs on a workstation or file server and provides a means for users to back up, archive, restore, and retrieve files. Contrast with *administrative client*.

backup copy group

A policy object containing attributes that control the generation, destination, and expiration of backup versions of files. A backup copy group belongs to a management class.

backup-retention grace period

The number of days the storage manager retains a backup version after the server is unable to rebind the file to an appropriate management class.

backup set

A portable, consolidated group of active versions of backup files that are generated for a backup-archive client.

backup set collection

A group of backup sets that are created at the same time and which have the same backup set name, volume names, description, and device classes. The server identifies each backup set in the collection by its node name, backup set name, and file type.

backup version

A file or directory that a client node backed up to server storage. More than one backup version can exist in server storage, but only one backup version is the active version. See also *active version* and *inactive version*.

bind To associate all versions of a file with a management class name. See *rebind*.

bindery

A database that consists of three system files for a NetWare server. The files contain user IDs and user restrictions.

C

cache To place a duplicate copy of a file on random access media when the server migrates a file to another storage pool in the hierarchy.

cache file

A snapshot of a logical volume created by Logical Volume Snapshot Agent. Blocks are saved immediately before they are modified during the image backup and their logical extents are saved in the cache files.

CAD See *client acceptor*.

central scheduler

A function that permits an administrator to schedule client operations and administrative commands. The operations can be scheduled to occur periodically or on a specific date. See *client schedule* and *administrative command schedule*.

client A software program or computer that requests services from a server.

client acceptor

An HTTP service that serves the applet for the web client to web browsers. On Windows systems, the client acceptor is installed and run as a service. On AIX®, UNIX, and Linux systems, the client acceptor is run as a daemon, and is also called the *client acceptor daemon (CAD)*.

client acceptor daemon (CAD)

See *client acceptor*.

client domain

The set of drives, file systems, or volumes that the user selects to back up or archive data, using the backup-archive client.

client node

A file server or workstation on which the backup-archive client program has been installed, and which has been registered to the server.

client node session

A session in which a client node communicates with a server to perform backup, restore, archive, retrieve, migrate, or recall requests. Contrast with *administrative session*.

client options file

An editable file that identifies the server and communication method, and provides the configuration for backup, archive, hierarchical storage management, and scheduling.

client option set

A group of options that are defined on the server and used on client nodes in conjunction with client options files.

client-polling scheduling mode

A method of operation in which the client queries the server for work. Contrast with *server-prompted scheduling mode*.

client schedule

A database record that describes the planned processing of a client operation during a specific time period. The client operation can be a backup, archive, restore, or retrieve operation, a client operating system command, or a macro. See also *administrative command schedule*.

client/server

Pertaining to the model of interaction in

distributed data processing in which a program on one computer sends a request to a program on another computer and awaits a response. The requesting program is called a client; the answering program is called a server.

client system-options file

A file, used on AIX, UNIX, or Linux system clients, containing a set of processing options that identify the servers to be contacted for services. This file also specifies communication methods and options for backup, archive, hierarchical storage management, and scheduling. This file is also called the *dsm.sys* file. See also *client user-options file*.

client user-options file

A file that contains the set of processing options that the clients on the system use. The set can include options that determine the server that the client contacts, and options that affect backup operations, archive operations, hierarchical storage management operations, and scheduled operations. This file is also called the *dsm.opt* file. For AIX, UNIX, or Linux systems, see also *client system-options file*.

closed registration

A registration process in which only an administrator can register workstations as client nodes with the server. Contrast with *open registration*.

collocation

The process of keeping all data belonging to a single-client file space, a single client node, or a group of client nodes on a minimal number of sequential-access volumes within a storage pool. Collocation can reduce the number of volumes that must be accessed when a large amount of data must be restored.

collocation group

A user-defined group of client nodes whose data is stored on a minimal number of volumes through the process of collocation.

commit point

A point in time when data is considered consistent.

Common Programming Interface for Communications (CPI-C)

A call-level interface that provides a consistent application programming interface (API) for applications that use program-to-program communications. CPI-C uses LU 6.2 architecture to create a set of interprogram services that can establish and end a conversation, send and receive data, exchange control information, and notify a partner program of errors.

communication method

The method by which a client and server exchange information. See also *Transmission Control Protocol/Internet Protocol*.

communication protocol

A set of defined interfaces that permit computers to communicate with each other.

compression

A function that removes repetitive characters, spaces, or strings of characters from the data being processed and replaces the repetitive characters with control characters. Compression reduces the amount of storage space that is required for the data.

configuration manager

A server that distributes configuration information, such as policies and schedules, to managed servers according to their profiles. Configuration information can include policy and schedules. See also *managed server* and *profile*.

conversation

A connection between two programs over a session that allows them to communicate with each other while processing a transaction.

copy backup

A full backup in which the transaction log files are not deleted so that backup procedures that use incremental or differential backups are not disrupted.

copy group

A policy object containing attributes that control how backup versions or archive copies are generated, where backup versions or archive copies are initially

located, and when backup versions or archive copies expire. A copy group belongs to a management class. See also *archive copy group*, *backup copy group*, *backup version*, and *management class*.

copy storage pool

A named set of volumes that contain copies of files that reside in primary storage pools. Copy storage pools are used only to back up the data that is stored in primary storage pools. A copy storage pool cannot be a destination for a backup copy group, an archive copy group, or a management class (for space-managed files). See also *primary storage pool* and *destination*.

CPI-C See *Common Programming Interface for Communications*.

D**daemon**

A program that runs unattended to perform continuous or periodic functions, such as network control.

damaged file

A physical file in which Tivoli Storage Manager has detected read errors.

data access control mode

A mode that controls whether a command can access a migrated file, see a migrated file as zero-length, or receive an input/output error if it attempts to access a migrated file. See also *execution mode*.

database backup series

One full backup of the database, plus up to 32 incremental backups made since that full backup. Each full backup that is run starts a new database backup series. A number identifies each backup series.

database snapshot

A complete backup of the entire database to media that can be taken off-site. When a database snapshot is created, the current database backup series is not interrupted. A database snapshot cannot have incremental database backups associated with it. See also *database backup series*. Contrast with *full backup*.

data deduplication

A method of reducing storage needs by eliminating redundant data. Only one instance of the data is retained on storage

media. Other instances of the same data are replaced with a pointer to the retained instance.

data manager server

A server that collects metadata information for client inventory and manages transactions for the storage agent over the local area network. The data manager server informs the storage agent with applicable library attributes and the target volume identifier.

data mover

A device that moves data on behalf of the server. A network-attached storage (NAS) file server is a data mover.

data storage-management application-programming interface (DSMAPI)

A set of functions and semantics that can monitor events on files, and manage and maintain the data in a file. In an HSM environment, a DSMAPI uses events to notify data management applications about operations on files, stores arbitrary attribute information with a file, supports managed regions in a file, and uses DSMAPI access rights to control access to a file object.

default management class

A management class that is assigned to a policy set. This class is used to govern backed up or archived files when a file is not explicitly associated with a specific management class through the include-exclude list.

deduplication

See *data deduplication*.

demand migration

The process that is used to respond to an out-of-space condition on a file system for which hierarchical storage management (HSM) is active. Files are migrated to server storage until space usage drops to the low threshold that was set for the file system. If the high threshold and low threshold are the same, one file is migrated.

desktop client

The group of backup-archive clients that includes clients on Microsoft Windows, Apple, and Novell NetWare operating systems.

destination

A copy group or management class attribute that specifies the primary storage pool to which a client file will be backed up, archived, or migrated.

device class

A named set of characteristics that are applied to a group of storage devices. Each device class has a unique name and represents a device type of disk, file, optical disk, or tape.

device configuration file

(1) For a server, a file that contains information about defined device classes, and, on some servers, defined libraries and drives. The information is a copy of the device configuration information in the database.

(2) For a storage agent, a file that contains the name and password of the storage agent, and information about the server that is managing the SAN-attached libraries and drives that the storage agent uses.

device driver

A program that provides an interface between a specific device and the application program that uses the device.

disaster recovery manager (DRM)

A function that assists in preparing and using a disaster recovery plan file for the server.

disaster recovery plan

A file that is created by the disaster recovery manager (DRM) that contains information about how to recover computer systems if a disaster occurs and scripts that can be run to perform some recovery tasks. The file includes information about the software and hardware that is used by the server, and the location of recovery media.

domain

A grouping of client nodes with one or more policy sets, which manage data or storage resources for the client nodes. See *policy domain* or *client domain*.

DRM See *disaster recovery manager*.

DSMAPI

See *data storage-management application-programming interface*.

dynamic serialization

A type of copy serialization in which a file or folder is backed up or archived on the first attempt regardless of whether it changes during a backup or archive.

E

EA See *extended attribute*.

EB See *exabyte*.

EFS See *Encrypted File System*.

Encrypted File System (EFS)

A file system that uses file system-level encryption.

enterprise configuration

A method of setting up servers so that the administrator can distribute the configuration of one of the servers to the other servers, using server-to-server communication. See also *configuration manager*, *managed server*, *profile*, and *subscription*.

enterprise logging

The process of sending events from a Tivoli Storage Manager server to a designated event server. The event server routes the events to designated receivers, such as to a user exit. See also *event*.

error log

A data set or file that is used to record error information about a product or system.

estimated capacity

The available space, in megabytes, of a storage pool.

event (1) An administrative command or a client operation that is scheduled to be run using Tivoli Storage Manager scheduling.

(2) A message that an Tivoli Storage Manager server or client issues. Messages can be logged using Tivoli Storage Manager event logging.

event record

A database record that describes actual status and results for events.

event server

A server to which other servers can send events for logging. The event server routes the events to any receivers that are enabled for the sending server's events.

exabyte (EB)

For processor storage, real and virtual storage, and channel volume, 1 152 921 504 606 846 976 bytes. For disk storage capacity and communications volume, 1 000 000 000 000 000 000 bytes.

exclude

The process of identifying files in an include-exclude list. This process prevents the files from being backed up or migrated whenever a user or schedule enters an incremental or selective backup operation. A file can be excluded from backup and space management, backup only, or space management only.

exclude-include list

See *include-exclude list*.

execution mode

A mode that controls the space-management related behavior of commands that run under the **dsmmode** command.

expiration

The process by which files, data sets, or objects are identified for deletion because their expiration date or retention period has passed.

expiring file

A migrated or premigrated file that has been marked for expiration and removal from storage. If a stub file or an original copy of a premigrated file is deleted from a local file system, or if the original copy of a premigrated file is updated, the corresponding migrated or premigrated file is marked for expiration the next time reconciliation is run.

extend

To increase the portion of available space that can be used to store database or recovery log information.

extended attribute (EA)

Names or value pairs that are associated with files or directories. There are three classes of extended attributes: user attributes, system attributes, and trusted attributes.

extent The part of a file that is created during the data-deduplication process. Extents are compared with other file extents to identify duplicates.

external library

A type of library that is provided by Tivoli Storage Manager that permits LAN-free data movement for StorageTek libraries that are managed by Automated Cartridge System Library Software (ACSL). To activate this function, the Tivoli Storage Manager library type must be EXTERNAL.

F**file access time**

On AIX, UNIX, or Linux systems, the time when the file was last accessed.

file age

For migration prioritization purposes, the number of days since a file was last accessed.

file device type

A device type that specifies the use of sequential access files on disk storage as volumes.

file server

A dedicated computer and its peripheral storage devices that are connected to a local area network that stores programs and files that are shared by users on the network.

file space

A logical space in server storage that contains a group of files that have been backed up or archived by a client node, from a single logical partition, file system, or virtual mount point. Client nodes can restore, retrieve, or delete their file spaces from server storage. In server storage, files belonging to a single file space are not necessarily stored together.

file space ID (FSID)

A unique numeric identifier that the server assigns to a file space when it is stored in server storage.

file state

The space management mode of a file that resides in a file system to which space management has been added. A file can be in one of three states: resident, premigrated, or migrated. See also *resident file*, *premigrated file*, and *migrated file*.

file system migrator (FSM)

A kernel extension that intercepts all file system operations and provides any space

management support that is required. If no space management support is required, the operation is passed to the operating system, which performs its normal functions. The file system migrator is mounted over a file system when space management is added to the file system.

file system state

The storage management mode of a file system that resides on a workstation on which the hierarchical storage management (HSM) client is installed. A file system can be in one of these states: native, active, inactive, or global inactive.

frequency

A copy group attribute that specifies the minimum interval, in days, between incremental backups.

FSID See *file space ID*.

FSM See *file system migrator*.

full backup

The process of backing up the entire server database. A full backup begins a new database backup series. See also *database backup series* and *incremental backup*. Contrast with *database snapshot*.

fuzzy backup

A backup version of a file that might not accurately reflect what is currently in the file because the file was backed up at the same time as it was being modified.

fuzzy copy

A backup version or archive copy of a file that might not accurately reflect the original contents of the file because it was backed up or archived the file while the file was being modified. See also *backup version* and *archive copy*.

G**General Parallel File System**

A high-performance shared-disk file system that can provide data access from nodes in a cluster environment.

gigabyte (GB)

In decimal notation, 1 073 741 824 when referring to memory capacity; in all other cases, it is defined as 1 000 000 000.

global inactive state

The state of all file systems to which

space management has been added when space management is globally deactivated for a client node. When space management is globally deactivated, hierarchical storage management (HSM) cannot perform migration, recall, or reconciliation. However, a root user can update space management settings and add space management to additional file systems. Users can access resident and premigrated files.

Globally Unique Identifier (GUID)

An algorithmically determined number that uniquely identifies an entity within a system.

GPFS™

See *General Parallel File System*.

GPFS node set

A mounted, defined group of GPFS file systems.

group backup

The backup of a group containing a list of files from one or more file space origins.

GUID See *Globally Unique Identifier*.

H

hierarchical storage management (HSM)

A function that automatically distributes and manages data on disk, tape, or both by regarding devices of these types and potentially others as levels in a storage hierarchy that range from fast, expensive devices to slower, cheaper, and possibly removable devices. The objectives are to minimize access time to data and maximize available media capacity.

hierarchical storage management (HSM) client

A client program that works with the Tivoli Storage Manager server to provide hierarchical storage management (HSM) for a system. See also *hierarchical storage management* and *space manager client*.

HSM See *hierarchical storage management*.

HSM client

See *hierarchical storage management client*.

I

ILM See *information lifecycle management*.

image A file system or raw logical volume that is backed up as a single object.

image backup

A backup of a full file system or raw logical volume as a single object.

inactive file system

A file system for which space management has been deactivated. Contrast with *active file system*.

inactive version

A backup version of a file that is either not the most recent backup version, or that is a backup version of a file that no longer exists on the client system. Inactive backup versions are eligible for expiration processing according to the management class assigned to the file. Contrast with *active version*.

include-exclude file

A file containing statements to determine the files to back up and the associated management classes to use for backup or archive. See also *include-exclude list*.

include-exclude list

A list of options that include or exclude selected files for backup. An exclude option identifies files that should not be backed up. An include option identifies files that are exempt from the exclusion rules or assigns a management class to a file or a group of files for backup or archive services.

incremental backup

(1) A copy of all database data that has changed since the most recent successful full backup operation. An incremental backup is also known as a *cumulative backup image* because each incremental backup includes the contents of the previous incremental backup.

(2) The process of backing up information in the database that is new or changed since the last full backup. Contrast with *full backup*. See also *database backup series*.

(3) For Data Protection for Microsoft Exchange Server, a backup in which the transaction logs are backed up and then cleared.

individual mailbox restore

See *mailbox restore*.

information lifecycle management (ILM)

GPFS policy-based file management for storage pools and file sets.

inode The internal structure that describes the individual files on AIX, UNIX, or Linux systems. An inode contains the node, type, owner, and location of a file.

inode number

A number specifying a particular inode file in the file system.

IP address

A unique address for a device or logical unit on a network that uses the IP standard.

J

job file

A generated file that contains configuration information for a migration job. The file is XML format and can be created and edited in the hierarchical storage management (HSM) client for Windows client graphical user interface.

journal-based backup

A method for backing up Windows clients and AIX clients that exploits the change notification mechanism in a file to improve incremental backup performance by reducing the need to fully scan the file system.

journal daemon

On AIX, UNIX, or Linux systems, a program that tracks change activity for files residing in file systems.

journal service

In Microsoft Windows, a program that tracks change activity for files residing in file systems.

K

kilobyte (KB)

For processor storage, real and virtual storage, and channel volume, 210 or 1 024 bytes. For disk storage capacity and communications volume, 1 000 bytes.

L

LAN See *local area network*.

LAN-free data movement

The movement of client data between a client system and a storage device on a storage area network (SAN), bypassing the local area network. This process is also referred to as *LAN-free data transfer*.

LAN-free data transfer

See *LAN-free data movement*.

leader data

Bytes of data, from the beginning of a migrated file, that are stored in the file's corresponding stub file on the local file system. The amount of leader data that is stored in a stub file depends on the stub size that is specified.

library

(1) A repository for demountable recorded media, such as magnetic disks and magnetic tapes.

(2) A collection of one or more drives, and possibly robotic devices (depending on the library type), which can be used to access storage volumes.

library client

A server that uses server-to-server communication to access a library that is managed by another storage management server. See also *library manager*.

library manager

A server that controls device operations when multiple storage management servers share a storage device. See also *library client*.

local (1) Pertaining to a device, file, or system that is accessed directly from a user system, without the use of a communication line.

(2) For HSM products, pertaining to the destination of migrated files that are being moved.

local area network (LAN)

A network that connects several devices in a limited area (such as a single building or campus) and that can be connected to a larger network.

local shadow volumes

Data that is stored on shadow volumes localized to a disk storage subsystem.

LOFS See *loopback virtual file system*.

logical file

A file that is stored in one or more server storage pools, either by itself or as part of an aggregate. See also *aggregate* and *physical file*.

logical occupancy

The space that is used by logical files in a

storage pool. This space does not include the unused space created when logical files are deleted from aggregate files, so it might be less than the physical occupancy.

logical unit (LU)

An access point through which a user or application program accesses the Systems Network Architecture (SNA) network to communicate with another user or application program.

logical unit number (LUN)

In the Small Computer System Interface (SCSI) standard, a unique identifier that is used to differentiate devices, each of which is a logical unit (LU).

logical volume

A portion of a physical volume that contains a file system.

logical volume backup

A backup of a file system or logical volume as a single object.

Logical Volume Snapshot Agent (LVSA)

Software that can act as the snapshot provider for creating a snapshot of a logical volume during an online image backup.

loopback virtual file system (LOFS)

A file system that is created by mounting a directory over another local directory, also known as mount-over-mount. A LOFS can also be generated using an automounter.

LU See *logical unit*.

LUN See *logical unit number*.

LVSA See *Logical Volume Snapshot Agent*.

M

macro file

A file that contains one or more storage manager administrative commands, which can be run only from an administrative client using the MACRO command. Contrast with *Tivoli Storage Manager command script*.

mailbox restore

A function that restores Microsoft Exchange Server data (from IBM Data Protection for Microsoft Exchange backups) at the mailbox level or mailbox-item level.

managed object

In Tivoli Storage Manager, a definition in the database of a managed server that was distributed to the managed server by a configuration manager. When a managed server subscribes to a profile, all objects that are associated with that profile become managed objects in the database of the managed server. In general, a managed object cannot be modified locally on the managed server. Objects can include policy, schedules, client option sets, server scripts, administrator registrations, server definitions, and server group definitions.

managed server

A Tivoli Storage Manager server that receives configuration information from a configuration manager using a subscription to one or more profiles. Configuration information can include definitions of objects such as policy and schedules. See also *configuration manager*, *subscription*, and *profile*.

management class

A policy object that users can bind to each file to specify how the server manages the file. The management class can contain a backup copy group, an archive copy group, and space management attributes. See also *copy group*, *space manager client*, *bind*, and *rebind*.

maximum transmission unit

The largest possible unit of data that can be sent on a given physical medium in a single frame. For example, the maximum transmission unit for Ethernet is 1500 bytes.

MB See *megabyte*.

media server

In a z/OS® environment, a program that provides access to z/OS disk and tape storage for Tivoli Storage Manager servers that run on operating systems other than z/OS.

megabyte (MB)

(1) 1 048 576 bytes (2 to the 20th power) when used in this publication.

(2) For processor storage, real and virtual storage, and channel volume, 2 to the power of 20 or 1 048 576 bits. For disk

storage capacity and communications volume, 1 000 000 bits.

metadata

Data that describes the characteristics of data; descriptive data.

migrate

To move data from one storage location to another. In Tivoli Storage Manager products, migrating can mean moving data from a client node to server storage, or moving data from one storage pool to the next storage pool defined in the server storage hierarchy. In both cases the movement is controlled by policy, such as thresholds that are set. See also *migration threshold*.

migrated file

A file that has been copied from a local file system to Tivoli Storage Manager storage. For HSM clients on UNIX or Linux systems, the file is replaced with a stub file on the local file system. On Windows systems, creation of the stub file is optional. See also *stub file* and *resident file*. For HSM clients on UNIX or Linux systems, contrast with *premigrated file*.

migrate-on-close recall mode

A mode that causes a migrated file to be recalled back to its originating file system temporarily. Contrast with *normal recall mode* and *read-without-recall recall mode*.

migration job

A specification of files to migrate, and actions to perform on the original files after migration. See also *job file*.

migration threshold

High and low capacities for storage pools or file systems, expressed as percentages, at which migration is set to start and stop.

mirroring

The process of writing the same data to multiple locations at the same time. Mirroring data protects against data loss within the recovery log.

mode

A copy group attribute that specifies whether to back up a file that has not been modified since the last time the file was backed up. See *modified mode* and *absolute mode*.

modified mode

In storage management, a backup copy-group mode that specifies that a file is considered for incremental backup only if it has changed since the last backup. A file is considered a changed file if the date, size, owner, or permissions of the file have changed. See also *absolute mode*.

mount limit

The maximum number of volumes that can be simultaneously accessed from the same device class. The mount limit determines the maximum number of mount points. See also *mount point*.

mount point

On the Tivoli Storage Manager server, a logical drive through which volumes in a sequential access device class are accessed. For removable-media device types, such as tape, a mount point is a logical drive that is associated with a physical drive. For the file device type, a mount point is a logical drive that is associated with an I/O stream. The number of mount points for a device class is defined by the value of the mount limit attribute for that device class. See also *mount limit*.

mount retention period

The maximum number of minutes that the server retains a mounted sequential-access media volume that is not being used before it dismounts the sequential-access media volume.

mount wait period

The maximum number of minutes that the server waits for a sequential-access volume mount request to be satisfied before canceling the request.

MTU See *maximum transmission unit*.

N**Nagle algorithm**

An algorithm that reduces congestion of TCP/IP networks by combining smaller packets and sending them together.

named pipe

A type of interprocess communication that permits message data streams to pass between peer processes, such as between a client and a server.

NAS See *network-attached storage*.

NAS node

A client node that is a network-attached storage (NAS) file server. Data for the NAS node is transferred by a NAS file server that is controlled by the network data management protocol (NDMP). A NAS node is also called a NAS file server node.

native file system

A file system that is locally added to the file server and is not added for space management. The hierarchical storage manager (HSM) client does not provide space management services to the file system.

native format

A format of data that is written to a storage pool directly by the Tivoli Storage Manager server. Contrast with *non-native data format*.

NDMP

See *Network Data Management Protocol*.

NetBIOS

See *Network Basic Input/Output System*.

network-attached storage (NAS) file server

A dedicated storage device with an operating system that is optimized for file-serving functions. A NAS file server can have the characteristics of both a node and a data mover.

Network Basic Input/Output System (NetBIOS)

A standard interface to networks and personal computers that is used on local area networks to provide message, print-server, and file-server functions. Application programs that use NetBIOS do not have to handle the details of LAN data link control (DLC) protocols.

Network Data Management Protocol (NDMP)

A protocol that allows a network storage-management application to control the backup and recovery of an NDMP-compliant file server, without installing vendor-acquired software on that file server.

network data-transfer rate

A rate that is calculated by dividing the total number of bytes that are transferred by the data transfer time. For example, this rate can be the time that is spent transferring data over a network.

node A file server or workstation on which the backup-archive client program has been installed, and which has been registered to the server.

node name

A unique name that is used to identify a workstation, file server, or PC to the server.

node privilege class

A privilege class that gives an administrator the authority to remotely access backup-archive clients for a specific client node or for all clients in a policy domain. See also *privilege class*.

non-native data format

A format of data that is written to a storage pool that differs from the format that the server uses for operations.

normal recall mode

A mode that causes a migrated file to be copied back to its originating file system when it is accessed.

O**offline volume backup**

A backup in which the volume is locked so that no other system applications can access it during the backup operation.

online volume backup

A backup in which the volume is available to other system applications during the backup operation.

open registration

A registration process in which users can register their workstations as client nodes with the server. Contrast with *closed registration*.

operator privilege class

A privilege class that gives an administrator the authority to disable or halt the server, enable the server, cancel server processes, and manage removable media. See also *privilege class*.

options file

A file that contains processing options. On Windows and NetWare systems, the file is called *dsm.opt*. On AIX, UNIX, Linux, and Mac OS X systems, the file is called *dsm.sys*.

originating file system

The file system from which a file was

migrated. When a file is recalled using normal or migrate-on-close recall mode, it is always returned to its originating file system.

orphaned stub file

A file for which no migrated file can be found on the Tivoli Storage Manager server that the client node is contacting for space management services. For example, a stub file can be orphaned when the client system-options file is modified to contact a server that is different than the one to which the file was migrated.

out-of-space protection mode

A mode that controls whether the program intercepts out-of-space conditions. See also *execution mode*.

P

pacing

In SNA, a technique by which the receiving system controls the rate of transmission of the sending system to prevent overrun.

packet In data communication, a sequence of binary digits, including data and control signals, that is transmitted and switched as a composite whole.

page A defined unit of space on a storage medium or within a database volume.

partial-file recall mode

A recall mode that causes the hierarchical storage management (HSM) function to read just a portion of a migrated file from storage, as requested by the application accessing the file.

password generation

A process that creates and stores a new password in an encrypted password file when the old password expires. Automatic generation of a password prevents password prompting. Password generation can be set in the options file (passwordaccess option). See also *options file*.

path An object that defines a one-to-one relationship between a source and a destination. Using the path, the source accesses the destination. Data can flow from the source to the destination, and back. An example of a source is a data

mover (such as a network-attached storage [NAS] file server), and an example of a destination is a tape drive.

pattern-matching character

See *wildcard character*.

physical file

A file that is stored in one or more storage pools, consisting of either a single logical file, or a group of logical files that are packaged together as an aggregate. See also *aggregate* and *logical file*.

physical occupancy

The amount of space that is used by physical files in a storage pool. This space includes the unused space that is created when logical files are deleted from aggregates. See also *physical file*, *logical file*, and *logical occupancy*.

plug-in

A self-contained software component that modifies (adds, or changes) the function in a particular system. When a plug-in is added to a system, the foundation of the original system remains intact.

policy domain

A grouping of policy users with one or more policy sets, which manage data or storage resources for the users. The users are client nodes that are associated with the policy domain.

policy privilege class

A privilege class that gives an administrator the authority to manage policy objects, register client nodes, and schedule client operations for client nodes. Authority can be restricted to certain policy domains. See also *privilege class*.

policy set

A group of rules in a policy domain. The rules specify how data or storage resources are automatically managed for client nodes in the policy domain. Rules can be contained in management classes. See also *active policy set* and *management class*.

premigrated file

A file that has been copied to Tivoli Storage Manager storage, but has not been replaced with a stub file on the local file system. An identical copy of the file resides both on the local file system and

in Tivoli Storage Manager storage. Premigrated files occur on UNIX and Linux file systems to which space management has been added. Contrast with *migrated file* and *resident file*.

premigrated files database

A database that contains information about each file that has been premigrated to Tivoli Storage Manager storage. The database is stored in a hidden directory named `.SpaceMan` in each file system to which space management has been added.

premigration

The process of copying files that are eligible for migration to Tivoli Storage Manager storage, but leaving the original file intact on the local file system.

premigration percentage

A space management setting that controls whether the next eligible candidates in a file system are premigrated following threshold or demand migration.

primary storage pool

A named set of volumes that the server uses to store backup versions of files, archive copies of files, and files migrated from client nodes. See also *destination* and *copy storage pool*.

privilege class

A level of authority that is granted to an administrator. The privilege class determines which administrative tasks the administrator can perform. See also *node privilege class*, *operator privilege class*, *policy privilege class*, *storage privilege class*, and *system privilege class*.

profile

A named group of configuration information that can be distributed from a configuration manager when a managed server subscribes. Configuration information can include registered administrator IDs, policies, client schedules, client option sets, administrative schedules, storage manager command scripts, server definitions, and server group definitions. See also *configuration manager* and *managed server*.

Q

quota (1) For HSM on AIX, UNIX, or Linux systems, the limit (in megabytes) on the

amount of data that can be migrated and premigrated from a file system to server storage.

(2) For HSM on Windows systems, a user-defined limit to the space that is occupied by recalled files.

R

randomization

The process of distributing schedule start times for different clients within a specified percentage of the schedule's startup window.

raw logical volume

A portion of a physical volume that is comprised of unallocated blocks and has no journaled file system (JFS) definition. A logical volume is read/write accessible only through low-level I/O functions.

read-without-recall recall mode

A mode that causes hierarchical storage management (HSM) to read a migrated file from storage without storing it back on the local file system. The last piece of information read from the file is stored in a buffer in memory on the local file system. Contrast with *normal recall mode* and *migrate-on-close recall mode*.

rebind

To associate all backed-up versions of a file with a new management class name. For example, a file that has an active backup version is rebound when a later version of the file is backed up with a different management class association. See also *bind*.

recall In Tivoli Storage Manager, to copy a migrated file from server storage back to its originating file system using the space management client. See also *transparent recall*, *selective recall*, and *recall mode*.

recall mode

A mode that is assigned to a migrated file with the `dsmattr` command that determines how the file is processed when it is recalled. It determines whether the file is stored on the local file system, is migrated back to Tivoli Storage Manager storage when it is closed, or is read from Tivoli Storage Manager storage without storing it on the local file system.

receiver

A server repository that contains a log of server and client messages as events. For example, a receiver can be a file exit, a user exit, or the Tivoli Storage Manager server console and activity log. See also *event*.

reclamation

The process of consolidating the remaining data from many sequential-access volumes onto fewer, new sequential-access volumes.

reclamation threshold

The percentage of space that a sequential-access media volume must have before the server can reclaim the volume. Space becomes reclaimable when files are expired or are deleted.

reconciliation

The process of synchronizing a file system with the Tivoli Storage Manager server, and then removing old and obsolete objects from the Tivoli Storage Manager server.

recovery log

A log of updates that are about to be written to the database. The log can be used to recover from system and media failures. The recovery log consists of the active log (including the log mirror) and archive logs.

register

To define a client node or administrator ID that can access the server.

registry

A repository that contains access and configuration information for users, systems, and software.

remote

- (1) Pertaining to a system, program, or device that is accessed through a communication line.
- (2) For HSM products, pertaining to the origin of migrated files that are being moved.

resident file

On a Windows system, a complete file on a local file system that might also be a migrated file because a migrated copy can exist in Tivoli Storage Manager storage. On a UNIX or Linux system, a complete

file on a local file system that has not been migrated or premigrated, or that has been recalled from Tivoli Storage Manager storage and modified. Contrast with *stub file* and *premigrated file*. See *migrated file*.

restore

To copy information from its backup location to the active storage location for use. For example, to copy information from server storage to a client workstation.

retention

The amount of time, in days, that inactive backed-up or archived files are kept in the storage pool before they are deleted. Copy group attributes and default retention grace periods for the domain define retention.

retrieve

To copy archived information from the storage pool to the workstation for use. The retrieve operation does not affect the archive version in the storage pool.

roll back

To remove changes that were made to database files since the last commit point.

root user

A system user who operates without restrictions. A root user has the special rights and privileges needed to perform administrative tasks.

S

SAN See *storage area network*.

schedule

A database record that describes client operations or administrative commands to be processed. See *administrative command schedule* and *client schedule*.

scheduling mode

The type of scheduling operation for the server and client node that supports two scheduling modes: client-polling and server-prompted.

scratch volume

A labeled volume that is either blank or contains no valid data, that is not defined, and that is available for use.

script

A series of commands, combined in a file, that carry out a particular function when the file is run. Scripts are interpreted as

they are run. Contrast with *Tivoli Storage Manager command script*.

Secure Sockets Layer (SSL)

A security protocol that provides communication privacy. With SSL, client/server applications can communicate in a way that is designed to prevent eavesdropping, tampering, and message forgery.

selective backup

The process of backing up certain files or directories from a client domain. The files that are backed up are those that are not excluded in the include-exclude list. The files must meet the requirement for serialization in the backup copy group of the management class that is assigned to each file. Contrast with *incremental backup*.

selective migration

The process of copying user-selected files from a local file system to Tivoli Storage Manager storage and replacing the files with stub files on the local file system. Contrast with *threshold migration* and *demand migration*.

selective recall

The process of copying user-selected files from Tivoli Storage Manager storage to a local file system. Contrast with *transparent recall*.

serialization

The process of handling files that are modified during backup or archive processing. See *dynamic serialization*, *static serialization*, *shared static serialization*, and *shared dynamic serialization*.

server A software program or a computer that provides services to other software programs or other computers.

server options file

A file that contains settings that control various server operations. These settings affect such things as communications, devices, and performance.

server-prompted scheduling mode

A client/server communication technique where the server contacts the client node when tasks must be done. Contrast with *client-polling scheduling mode*.

server storage

The primary, copy, and active-data storage

pools that are used by the server to store user files such as backup versions, archive copies, and files migrated from space manager client nodes (space-managed files). See also *active-data pool*, *primary storage pool*, *copy storage pool*, *storage pool volume*, and *volume*.

session

A logical or virtual connection between two stations, software programs, or devices on a network that allows the two elements to communicate and exchange data.

session resource usage

The amount of wait time, processor time, and space that is used or retrieved during a client session.

shared dynamic serialization

A value for serialization that specifies that a file must not be backed up or archived if it is being modified during the operation. Tivoli Storage Manager retries the backup or archive operation a number of times; if the file is being modified during each attempt, Tivoli Storage Manager will back up or archive the file on its last try. See also *serialization*. Contrast with *dynamic serialization*, *shared static serialization*, and *static serialization*.

shared library

A library device that is used by multiple storage manager servers.

shared static serialization

A copy-group serialization value that specifies that a file must not be modified during a backup or archive operation. Tivoli Storage Manager attempts to retry the operation a number of times. If the file is in use during each attempt, the file is not backed up or archived. See also *serialization*. Contrast with *dynamic serialization*, *shared dynamic serialization*, and *static serialization*.

snapshot

An image backup type that consists of a point-in-time view of a volume.

space-managed file

A file that is migrated from a client node by the space manager client. The space manager client recalls the file to the client node on demand.

space management

The process of keeping sufficient free storage space available on a local file system for new data by migrating files to server storage. Synonymous with *hierarchical storage management*.

space manager client

A program that runs on a UNIX or Linux system to manage free space on the local file system by migrating files to server storage. The program can recall the files either automatically or selectively. Also called *hierarchical storage management (HSM) client*.

space monitor daemon

A daemon that checks space usage on all file systems for which space management is active, and automatically starts threshold migration when space usage on a file system equals or exceeds its high threshold.

sparse file

A file that is created with a length greater than the data it contains, leaving empty spaces for the future addition of data.

special file

On AIX, UNIX, or Linux systems, a file that defines devices for the system, or temporary files that are created by processes. There are three basic types of special files: first-in, first-out (FIFO); block; and character.

SSL See *Secure Sockets Layer*.

stabilized file space

A file space that exists on the server but not on the client.

stanza A group of lines in a file that together have a common function or define a part of the system. Each stanza is identified by a name that occurs in the first line of the stanza. Depending on the type of file, a stanza is ended by the next occurrence of a stanza name in the file, or by an explicit end-of-stanza marker. A stanza can also be ended by the end of the file.

startup window

A time period during which a schedule must be initiated.

static serialization

A copy-group serialization value that specifies that a file must not be modified

during a backup or archive operation. If the file is in use during the first attempt, the storage manager cannot back up or archive the file. See also *serialization*. Contrast with *dynamic serialization*, *shared dynamic serialization*, and *shared static serialization*.

storage agent

A program that enables the backup and restoration of client data directly to and from storage attached to a storage area network (SAN).

storage area network (SAN)

A dedicated storage network that is tailored to a specific environment, combining servers, systems, storage products, networking products, software, and services.

storage hierarchy

(1) A logical order of primary storage pools, as defined by an administrator. The order is typically based on the speed and capacity of the devices that the storage pools use. The storage hierarchy is defined by identifying the next storage pool in a storage pool definition. See also *storage pool*.

(2) An arrangement of storage devices with different speeds and capacities. The levels of the storage hierarchy include: main storage, such as memory and direct-access storage device (DASD) cache; primary storage (DASD containing user-accessible data); migration level 1 (DASD containing data in a space-saving format); and migration level 2 (tape cartridges containing data in a space-saving format).

storage pool

A named set of storage volumes that are the destination that is used to store client data. A storage pool contains backup versions, archive copies, and files that are migrated from space manager client nodes. A primary storage pool is backed up to a copy storage pool. See also *primary storage pool*, *copy storage pool*, and *active-data pool*.

storage pool volume

A volume that has been assigned to a storage pool. See also *volume*, *active-data pool*, *copy storage pool*, and *primary storage pool*.

storage privilege class

A privilege class that gives an administrator the authority to control how storage resources for the server are allocated and used, such as monitoring the database, the recovery log, and server storage. See also *privilege class*.

stub A shortcut on the Windows file system that is generated by the hierarchical storage management (HSM) client for a migrated file that allows transparent user access. A stub is the sparse file representation of a migrated file, with a reparse point attached.

stub file

A file that replaces the original file on a local file system when the file is migrated to storage. A stub file contains the information that is necessary to recall a migrated file from Tivoli Storage Manager storage. It also contains additional information that can be used to eliminate the need to recall a migrated file.

stub file size

The size of a file that replaces the original file on a local file system when the file is migrated to Tivoli Storage Manager storage. The size that is specified for stub files determines how much leader data can be stored in the stub file. The default for stub file size is the block size defined for a file system minus 1 byte.

subscription

In a Tivoli environment, the process of identifying the subscribers that the profiles are distributed to. For Tivoli Storage Manager, a subscription is the process by which a managed server receives configuration information associated with a particular profile on a configuration manager. See also *managed server*, *configuration manager*, and *profile*.

system privilege class

A privilege class that gives an administrator the authority to issue all server commands. See also *privilege class*.

Systems Network Architecture (SNA)

The description of the logical structure, formats, protocols, and operational sequences for transmitting information through and controlling the configuration and operation of networks.

T**tape library**

A set of equipment and facilities that support an installation's tape environment. The tape library can include tape storage racks, mechanisms for automatic tape mounting, a set of tape drives, and a set of related tape volumes mounted on those drives.

tape volume prefix

The high-level-qualifier of the file name or the data set name in the standard tape label.

target node

A client node for which other client nodes (called agent nodes) have been granted proxy authority. The proxy authority allows the agent nodes to perform operations such as backup and restore on behalf of the target node, which owns the data.

TCA See *trusted communications agent*.

TCP/IP

See *Transmission Control Protocol/Internet Protocol*.

threshold migration

The process of moving files from a local file system to Tivoli Storage Manager storage based on the high and low thresholds that are defined for the file system. Contrast with *demand migration*, *selective migration*, and *migration job*.

throughput

In storage management, the total bytes in the workload, excluding overhead, that are backed up or restored, divided by elapsed time.

timeout

A time interval that is allotted for an event to occur or complete before operation is interrupted.

timestamp control mode

A mode that determines whether commands preserve the access time for a file or set it to the current time.

Tivoli Storage Manager command script

A sequence of Tivoli Storage Manager administrative commands that are stored in the database of the Tivoli Storage Manager server. The script can run from any interface to the server. The script can

include substitution for command parameters and conditional logic.

tombstone object

A small subset of attributes of a deleted object. The tombstone object is retained for a specified period, and at the end of the specified period, the tombstone object is permanently deleted.

Transmission Control Protocol/Internet Protocol (TCP/IP)

An industry-standard, nonproprietary set of communication protocols that provides reliable end-to-end connections between applications over interconnected networks of different types.

transparent recall

The process that is used to automatically recall a file to a workstation or file server when the file is accessed. See also *recall mode*. Contrast with *selective recall*.

trusted communications agent (TCA)

A program that handles the sign-on password protocol when clients use password generation.

U

UCS-2 A 2-byte (16-bit) encoding scheme based on ISO/IEC specification 10646-1. UCS-2 defines three levels of implementation: Level 1-No combining of encoded elements allowed; Level 2-Combining of encoded elements is allowed only for Thai, Indic, Hebrew, and Arabic; Level 3-Any combination of encoded elements are allowed.

UNC See *Universal Naming Convention name*.

Unicode

A character encoding standard that supports the interchange, processing, and display of text that is written in the common languages around the world, plus some classical and historical texts. The Unicode standard has a 16-bit character set defined by ISO 10646.

Unicode-enabled file space

Unicode file space names provide support for multilingual workstations without regard for the current locale.

Unicode transformation format 8

Unicode Transformation Format (UTF), 8-bit encoding form, which is designed for ease of use with existing ASCII-based

systems. The CCSID value for data in UTF-8 format is 1208.

Universal Naming Convention (UNC) name

A name that is used to access a drive or directory containing files shared across a network. The UNC name includes the system name and a SharePoint name that represents the shared drive or directory.

Universally Unique Identifier (UUID)

The 128-bit numeric identifier that is used to ensure that two components do not have the same identifier.

UTF-8 See *Unicode transformation format 8*.

UUID See *Universally Unique Identifier*.

V**validate**

To check a policy set for conditions that can cause problems if that policy set becomes the active policy set. For example, the validation process checks whether the policy set contains a default management class.

version

A backup copy of a file stored in server storage. The most recent backup copy of a file is the active version. Earlier copies of the same file are inactive versions. The number of versions retained by the server is determined by the copy group attributes in the management class.

virtual file space

A representation of a directory on a network-attached storage (NAS) file system as a path to that directory.

virtual volume

An archive file on a target server that represents a sequential media volume to a source server.

volume

A discrete unit of storage on disk, tape or other data recording medium that supports some form of identifier and parameter list, such as a volume label or input/output control. See also *scratch volume*, and *storage pool volume*.

volume history file

A file that contains information about volumes that have been used by the server for database backups and for export of administrator, node, policy, or

server data. The file also has information about sequential-access storage pool volumes that have been added, reused, or deleted. The information is a copy of volume information that is recorded in the server database.

Volume Shadow Copy Service

A set of Microsoft application-programming interfaces (APIs) that you can use to create shadow copy backups of volumes, exact copies of files, including all open files, and so on.

VSS See *Volume Shadow Copy Service*.

VSS Backup

A backup operation that uses Microsoft Volume Shadow Copy Service (VSS) technology. The backup operation produces an online snapshot (point-in-time consistent copy) of Microsoft Exchange data. This copy can be stored on local shadow volumes or on Tivoli Storage Manager server storage.

VSS Fast Restore

A function that uses a Microsoft Volume Shadow Copy Service (VSS) software provider to restore VSS Backups (IBM Data Protection for Microsoft Exchange database files and log files) that reside on local shadow volumes.

VSS Instant Restore

A volume-level hardware-assisted Microsoft Volume Shadow Copy Service (VSS) function where target volumes that contain the snapshot are copied back to the original source volumes.

VSS offloaded backup

A backup operation that uses a Microsoft Volume Shadow Copy Service (VSS) hardware provider (installed on an alternate system) to move IBM Data Protection for Microsoft Exchange data to the Tivoli Storage Manager server. This type of backup operation shifts the backup load from the production system to another system.

VSS Restore

A function that uses a Microsoft Volume Shadow Copy Service (VSS) software provider to restore VSS Backups (IBM Data Protection for Microsoft Exchange database files and log files) that reside on

Tivoli Storage Manager server storage to their original location.

W**wildcard character**

A special character such as an asterisk (*) or a question mark (?) that can be used to represent one or more characters. Any character or set of characters can replace the wildcard character.

workstation

A terminal or personal computer at which a user can run applications and that is usually connected to a mainframe or a network.

worldwide name

A 64-bit, unsigned name identifier that is unique.

workload partition (WPAR)

A partition within a single operating system instance.

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