

IBM Tivoli Storage FlashCopy Manager  
Version 3.1

*Installation and User's Guide for UNIX  
and Linux*





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Version 3.1

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and Linux*



**Note:**

Before using this information and the product it supports, read the information in “Notices” on page 259.

This edition applies to Version 3.1 of Tivoli Storage FlashCopy Manager for UNIX and Linux (product numbers 5608-W07, 5641-A06, and 5724-X94) 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 on installing, configuring, administering, and using IBM® Tivoli® Storage FlashCopy® Manager for UNIX and Linux.

Tivoli Storage FlashCopy Manager for UNIX and Linux is provided as a single installation package that supports the following database applications, IBM storage systems, and operating systems:

- One of these database applications:
  - DB2® (native DB2 or DB2-based SAP® environments)
  - Oracle (native Oracle or Oracle-based SAP® environments)
- Custom applications such as file systems or other non-DB2 or non-Oracle databases
- One of these IBM storage systems used for the database:
  - IBM System Storage® Disk Storage Model DS8000®
  - IBM System Storage SAN Volume Controller (SVC)
  - IBM XIV® Storage Systems
  - IBM Storwize V7000
- One of these operating systems:
  - AIX®
  - Linux
  - Solaris
  - HP-UX

Tivoli Storage FlashCopy Manager performs online or offline backups of DB2, Oracle databases or other applications residing on snapshot-oriented storage systems. Optionally, it performs backups to Tivoli Storage Manager storage by using IBM Tivoli Storage Manager for Enterprise Resource Planning, Tivoli Storage Manager for Databases or Tivoli Storage Manager Backup-Archive client, as appropriate. The integration with the RMAN Media Management API maximizes the protection of Oracle data, thus providing a comprehensive storage management solution.

Tivoli Storage Manager is a client-server licensed product that provides storage management services in a multi-platform computer environment. It is required only if the offload tape backup function of Tivoli Storage FlashCopy Manager is needed.

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## Who should read this publication

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

In this publication, it is assumed that you have an understanding of the following areas:

- The following IBM storage systems used for the database:
  - IBM System Storage DS8000

- IBM System Storage SAN Volume Controller or IBM Storwize V7000
- IBM XIV Storage Systems
- The AIX operating system and the Logical Volume Manager (LVM)
- Oracle or DB2 database administration
- Oracle Server
- Tivoli Storage Manager server

## 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 Manager publications

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

*Table 1. 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

*Table 1. Tivoli Storage Manager server publications (continued)*

<b>Publication title</b>	<b>Order number</b>
<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 2. Tivoli Storage Manager storage agent publications*

<b>Publication title</b>	<b>Order number</b>
<i>IBM Tivoli Storage Manager for SAN for AIX Storage Agent User's Guide</i>	SC23-9797
<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 3. Tivoli Storage Manager client publications*

<b>Publication title</b>	<b>Order number</b>
<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 4. Tivoli Storage Manager data protection publications*

<b>Publication title</b>	<b>Order number</b>
<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

*Table 4. Tivoli Storage Manager data protection publications (continued)*

<b>Publication title</b>	<b>Order number</b>
<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 5. IBM Tivoli Storage Manager troubleshooting and tuning publications*

<b>Publication title</b>	<b>Order number</b>
<i>IBM Tivoli Storage Manager Problem Determination Guide</i>	GC23-9789
<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](http://publib.boulder.ibm.com/infocenter/tsminfo/v6r3/c_complydataretention_ovr.html).

## **Tivoli Storage FlashCopy Manager publications**

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

*Table 6. Tivoli Storage FlashCopy Manager publications*

<b>Publication title</b>	<b>Order number</b>
<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



Table 6. Tivoli Storage FlashCopy Manager publications (continued)

Publication title	Order number
IBM Tivoli Storage FlashCopy Manager for VMware Installation and User's Guide	SC27-4007
IBM Tivoli Storage FlashCopy Manager Messages	GC27-4008

## Related publications

Table 7. Related storage system publications

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

## 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.

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

## Describing the problem and gathering background information

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

To save time, know the answers to these questions:

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

## Submitting the problem to IBM Software Support

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

### Online

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

### By telephone

For 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**.



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## New for Tivoli Storage FlashCopy Manager Version 3.1

This section provides an overview of the new features in Version 3.1.

The following features are new for Tivoli Storage FlashCopy Manager Version 3.1:

- Tivoli Storage FlashCopy Manager Version 3.1 runs on the HP-UX operating system.
- The ability to create Oracle RMAN incremental backups from a FlashCopy image is provided for SAP environments by using IBM Tivoli Storage Manager for Enterprise Resource Planning for Oracle Version 6.3 with Tivoli Storage FlashCopy Manager Version 3.1.





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## Chapter 1. Overview

Introductory information about Tivoli Storage FlashCopy Manager is provided.

Tivoli Storage FlashCopy Manager uses the copy services capabilities of intelligent disk subsystems to create point-in-time copies. These are application aware copies (FlashCopy<sup>®</sup> or snapshot) of the production data. This copy is then retained on disk as backup allowing for a fast restore operation (Flashback). Tivoli Storage FlashCopy Manager also allows mounting the copy on an auxiliary server (backup server) as a logical copy. This copy (instead of the original data on the production server) is made accessible for further processing. This processing includes creating a tape backup or performing backup verification functions (for example, the Database Verify Utility).

In environments where Tivoli Storage FlashCopy Manager is used with Tivoli Storage Manager, automatic backups to Tivoli Storage Manager can be scheduled. The backup can start immediately after the point-in-time copy is created, or at another time when resources are available to complete the backup request. If a backup to Tivoli Storage Manager fails, Tivoli Storage FlashCopy Manager can restart the backup after the cause of the failure is corrected. In this case, data already committed to Tivoli Storage Manager is not re-sent. Tivoli Storage FlashCopy Manager can also use this point-in-time copy to create a clone database with or without changing the name of the cloned database.

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### Backup granularity

All copy services functions used by Tivoli Storage FlashCopy Manager are at the volume group level.

In addition, multiple volumes that are organized into volume groups require Tivoli Storage FlashCopy Manager to process these volume groups consistently. As a result, non-application data residing on a volume group that is processed by Tivoli Storage FlashCopy Manager is included in the backup. Similarly, all data that resides on a volume group that is being restored is overwritten.

**Note:** Oracle Automatic Storage Management (ASM) uses the term *disk group* instead of the term *volume group*.

The terms "volume level" and "volume group level" are sometimes used interchangeably. All copy services functions used by Tivoli Storage FlashCopy Manager are at the volume group level.

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### Supported applications

Overview information about the applications supported by Tivoli Storage FlashCopy Manager is provided.

#### DB2 in SAP<sup>®</sup> and non-SAP<sup>®</sup> environments

Because SAP<sup>®</sup> environments are fully integrated with DB2, the DB2 backup command can be used in both environments. DB2 notifies Tivoli Storage FlashCopy Manager of the current environment to enable Tivoli Storage FlashCopy Manager to implement the appropriate workflow. Tivoli Storage FlashCopy

Manager supports single partition databases, and logically or physically partitioned databases on file systems that are supported by Tivoli Storage FlashCopy Manager for your platform. DB2 backup options are documented in the DB2 user publications. Tivoli Storage FlashCopy Manager supports these DB2 backup functions:

- Full database backups, both online and offline
- Backups of selected database partitions
- Backups of database partitions including or excluding database logs

However, consider these guidelines when backing up DB2 databases:

- You cannot back up individual table spaces and archiving database logs. Consider Tivoli Storage Manager as a solution to those backup needs.
- In a multi-partition database environment, DB2 suspends all partitions sequentially (serial mode) for non-SAP® workloads. For SAP® workloads, all partitions are suspended in parallel (parallel mode).
- The **db2 backup** command is available in the DB2 Control Center. For SAP® environments, this command is also available in the Computing Center Management System (CCMS).

For DB2 in SAP environments, consider IBM Tivoli Storage Manager for Enterprise Resource Planning as a solution for backups to tape and archiving database log files.

For DB2 in non-SAP environments, IBM Tivoli Storage Manager for Databases can be used for backups to tape and archiving database log files.

## **SAP® for Oracle environments**

SAP® BR\*Tools 7.10 (or later) provides an extension to the backint interface. This extension enables BRBACKUP and BRRESTORE to back up and restore data at a volume group level. Tivoli Storage FlashCopy Manager uses this interface extension to implement point-in-time copy backups of SAP® for Oracle databases.

You can use Tivoli Storage FlashCopy Manager for SAP® for Oracle databases on file systems that are supported by Tivoli Storage FlashCopy Manager on your platform. Although all backint backup functions are supported, use only volume copy backup operations. For example:

- Full database backups at the volume level
- Control files (that are backed up in the control run) after the volume copy backup into the Tivoli Storage FlashCopy Manager repository completes

Consider IBM Tivoli Storage Manager for Enterprise Resource Planning as a solution for backups to tape and archiving database redo logs.

SAP® BR\*Tools backup commands are also available in the CCMS.

## **Native Oracle environments**

Tivoli Storage FlashCopy Manager provides its own backup and recovery interface for native Oracle databases that creates full database backups and restores. Optionally, the database control files can be backed up into the Tivoli Storage FlashCopy Manager backup repository. Tivoli Storage FlashCopy Manager supports databases on file systems that are supported by Tivoli Storage FlashCopy

Manager for your platform and on Oracle ASM running on raw physical volumes. In those cases, Tivoli Storage FlashCopy Manager supports the following backup functions:

- Full database backups at a volume level.
- Back up of database control files into the Tivoli Storage FlashCopy Manager repository after a full backup completes.  
Tivoli Storage Manager for Databases can be used for backups of native Oracle databases.
- Database restores with or without restoring database control files.

## Custom application environments

Tivoli Storage FlashCopy Manager supports snapshot backups of file systems that contain data that was created by custom applications. To prepare these applications for volume-level snapshots, preprocessing and postprocessing scripts can be used. These snapshots are managed as backup versions by using Tivoli Storage FlashCopy Manager management policies and remain available for fast restore operations. These snapshot backups can also be mounted on a secondary system. When Tivoli Storage Manager is available in the environment, Tivoli Storage FlashCopy Manager can optionally create a backup to Tivoli Storage Manager storage by using the Tivoli Storage Manager backup-archive client.

A practical example of how Tivoli Storage FlashCopy Manager can be used with custom applications is with DB2 standby server environments. In this environment, Tivoli Storage FlashCopy Manager creates snapshot backups of a DB2 high-availability disaster recovery (HADR) target. Although DB2 HADR systems cannot be directly backed up to Tivoli Storage Manager storage, snapshots of the DB2 HADR target can be directly backed up to Tivoli Storage Manager storage. Tivoli Storage FlashCopy Manager provides sample preprocessing and postprocessing commands that stop the DB2 HADR target before the snapshot is taken and then restart DB2 after the snapshot completes.

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## Supported storage subsystems

Tivoli Storage FlashCopy Manager and the required applications infrastructure rely on the copy-services capabilities of the storage subsystems.

Tivoli Storage FlashCopy Manager currently supports copy services provided with the storage subsystems listed in this table:

*Table 8. Supported storage subsystems and functionality*

Device	COPY	INCR	NO COPY	Space-efficient snapshots	LVM (AIX-only)	VIO (AIX-only)	Changes made to a mounted snapshot backup
DS8000	Yes	One per LVM mirror (at most)	Restore not supported	N/A	Yes	Yes	Remains persistent and alters the content of the backup
Storwize® v7000	Yes	Yes	Yes  Includes space-efficient copies if configured accordingly.	N/A	Yes	Yea	Remains persistent and alters the content of the backup

Table 8. Supported storage subsystems and functionality (continued)

Device	COPY	INCR	NO COPY	Space-efficient snapshots	LVM (AIX-only)	VIO (AIX-only)	Changes made to a mounted snapshot backup
SAN Volume Controller 5.1, or later; SAN Volume Controller 6.1, or later	Yes	Yes	Yes  Includes space-efficient copies if configured accordingly.	N/A	Yes	Yes	Remains persistent and alters the content of the backup
SAN Volume Controller 4.3.x	Yes	Yes	Restore not supported	N/A	Yes	Yes	Remains persistent and alters the content of the backup
XIV	N/A	N/A	N/A	Yes	Yes	POWER6 NPIV	Reverted during unmount and does not alter the backup, or remains persistent and alters the content of the backup. The second option is mandatory if LVM mirroring is used.

## FlashCopy Devices (SAN Volume Controller, DS8000, Storwize V7000)

Available FlashCopy features are dependent on the exact level of the storage subsystem used in the environment.

Depending on that level, Tivoli Storage FlashCopy Manager provides support for the following FlashCopy types:

Table 9. FlashCopy types and supported devices

FlashCopy Type	Description	Supported Devices
COPY	A COPY 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	Like a COPY FlashCopy except that a reduced amount of data is copied between two consecutive FlashCopy backups. Only those blocks that have changed after the previous FlashCopy is created are copied to the target.	DS8000 <sup>1</sup> , SAN Volume Controller, Storwize V7000

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). For SAN Volume Controller, NOCOPY FlashCopy can be performed to a space-efficient FlashCopy target.	DS8000 <sup>2</sup> , SAN Volume Controller <sup>2</sup> , Storwize V7000
FlashCopy to Space-Efficient Volumes	For SAN Volume Controller, FlashCopy can be performed to a space-efficient target. In order to avoid the volume size increasing because of background copying, run the FlashCopy to a space-efficient target with option NOCOPY.	SAN Volume Controller <sup>3</sup> , Storwize V7000

**Note:**

1. DS8000 allows one incremental FlashCopy per source volume. When production volumes are mirrored using Logical Volume Manager (LVM) mirroring or ASM failure groups, only one FlashCopy backup of this type per volume mirror is created. For DS8000, there must be only one target set specified in the target volumes file (.fct) for incremental snapshots. Common Information Model (CIM) errors might occur when more than one target set is specified.
2. DS8000 and SAN Volume Controller 4.3.x do not allow restoring point-in-time copies that were created using NOCOPY. As a result, Tivoli Storage FlashCopy Manager does not allow restoring backups of this type. However, these backups can be restored when using SAN Volume Controller 5.1, or later and Storwize V7000. DS8000 and SAN Volume Controller 4.3.x and 5.1 or later and Storwize V7000 support mounting the image on a remote server and backing up the image to Tivoli Storage Manager.
3. FlashCopy to space-efficient volumes must be created using NOCOPY. See Note 2 for restrictions.

## CIM Server

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

## Support for LVM Mirroring (AIX-only) and ASM Failure Groups

If AIX Logical Volume Manager (LVM) mirroring is used in the environment, Tivoli Storage FlashCopy Manager can create separate FlashCopy images of either mirror. In an Oracle Automatic Storage Management (ASM) environment, a FlashCopy image of selected failure groups is created. However, there must be enough

remaining failure groups to mount the corresponding disk group for this image to be created.

## **Support for virtual I/O (AIX-only)**

DS8000, SAN Volume Controller and Storwize V7000 logical unit numbers (LUNs) can be attached to a host directly or using Virtual I/O (VIO). Both setups are supported, as long as there is a 1-1 relation between VIO logical volumes and storage LUNs on the storage subsystem.

A VIO is a logical partition (LPAR) on a pSeries<sup>®</sup> machine controlled by the IBM Hardware Management Console (HMC) or IBM<sup>®</sup> Integrated Virtualization Manager (IVM). It owns the hardware adapters or optical devices and allows access for other logical partitions. This feature allows the device to be shared. The LPAR associated with the resources is the VIO Server and the logical partitions that use it are VIO Clients. For example, they can share one disk on the VIO Server instead of rebooting each logical partition from a Small Computer System Interface (SCSI) adapter and SCSI disk. This function eliminates the number of required adapters, adapter slots, and disks.

Tivoli Storage FlashCopy Manager uses virtual SCSI adapters to map disks from a VIO to a client LPAR. Physical volumes are required to be mapped from the VIO to the client. However, mapping logical volumes or storage pools are not supported. Refer to the requirements checklist for details of the supported combinations of operating system and storage subsystem levels and for further references and resources.

## **Remote access to FlashCopy images**

Tivoli Storage FlashCopy Manager allows mounting a FlashCopy backup image to another host. This image is writable and any changes performed on that image are reflected in the backup and are included in the subsequent restore.

## **IBM XIV Storage Devices**

IBM XIV Storage System copy services differ significantly from FlashCopy copy services.

Whenever Tivoli Storage FlashCopy Manager creates a backup on an IBM XIV Storage System, it performs a snapshot. This snapshot is always a space-efficient read only copy of the application. When the `USE_WRITABLE_SNAPSHOTS` parameter specifies NO, this image is not mounted directly to another host. Instead Tivoli Storage FlashCopy Manager creates a duplicate from the snapshot as part of the mount procedure, which is removed once the backup is unmounted. A duplicate is a space-efficient logical copy of the snapshot. It is also writable.

## **Dependent software packages**

Tivoli Storage FlashCopy Manager requires the IBM XIV Storage System command-line interface (XCLI) to be installed on all hosts where Tivoli Storage FlashCopy Manager is installed. A CIM server is not required.

## **Support for LVM Mirroring (AIX only) and ASM Failure Groups**

If AIX LVM mirroring is used in the environment, Tivoli Storage FlashCopy Manager can create separate snapshots of either mirror. In an Oracle ASM

environment, a snapshot of selected failure groups is created. However, there must be enough remaining failure groups to mount the corresponding disk group for this image to be created.

### **Support for virtual I/O (AIX only)**

IBM XIV Storage System and Tivoli Storage FlashCopy Manager only support VIO with POWER6® n-port ID virtualization.

### **Remote access to snapshot backups**

Tivoli Storage FlashCopy Manager allows mounting a backup image to another host. Unlike FlashCopy devices, Tivoli Storage FlashCopy Manager creates a duplicate from the snapshot which is then mounted to the host. As the duplicate is effectively another image, changes to the duplicate are not reflected in the snapshot. As a result, the mounted image can be altered without affecting the backup image and any subsequent restore of that backup. Tivoli Storage FlashCopy Manager removes the duplicate during the unmount operation. All changes that were performed on the duplicate are undone at this point in time. A subsequent mount presents the image as created when the snapshot occurred.

### **Use of writable snapshots**

Tivoli Storage FlashCopy Manager optionally uses IBM XIV Storage System capabilities to restore writable snapshots. When this option is enabled, a mount operation does not create duplicates but directly mounts the original snapshot to another host. All changes to the snapshot are preserved, and a subsequent mount (or backup operation) presents all changes that might have occurred to the snapshot while mounted. The use of writable snapshots is required in LVM mirroring environments.

For details see the **USE\_WRITABLE\_SNAPSHOTS** parameter.

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## **Component overview**

Introductory information is provided about the components that Tivoli Storage FlashCopy Manager supports.

The following applications are the key components of the Tivoli Storage FlashCopy Manager installation package:



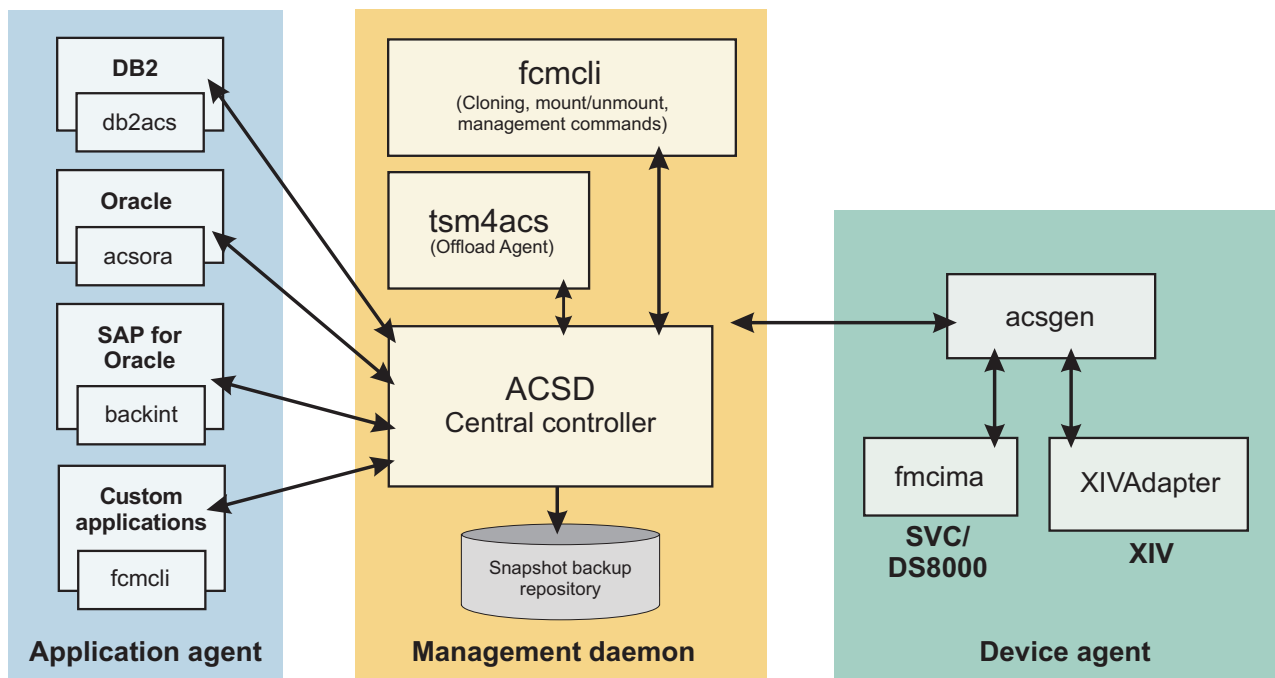


Figure 1. Overview of the Tivoli Storage FlashCopy Manager installation package

## Common Tivoli Storage FlashCopy Manager components

A description of the software components that are shared by the individual database-platform versions of Tivoli Storage FlashCopy Manager are provided.

### Application Agent

The Application Client provides the necessary support for implementing snapshot-based backup and restore operations.

(DB2) The client is implemented as the *Snapshot Backup Library* (referred to as a *vendor library* in DB2 terms). The library is also a component of Tivoli Storage FlashCopy Manager and is invoked by using the "... use snapshot..." phrase in the 'db2 backup database' or 'db2 restore database' commands.

(Oracle, SAP with Oracle) The client functions are acsora or backint.

(Custom applications) Tivoli Storage FlashCopy Manager for Custom Applications provides custom application support with the Tivoli Storage FlashCopy Manager command line interface, fcmcli.

### Management Agent (acsd)

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.

### Device Agent for Generic Devices (acsgen)

The Device Agent for Generic Devices (acsgen) is an operating system independent and storage device independent software layer that interacts with operating system specific and storage device-specific adapters. This agent is also used to send and request updates of the progress and usability information that is stored in the local snapshot backup repository.



**CIM Adapter (fmcima)**

The CIM Adapter (fmcima) is used with the Generic Device Agent (acsgen). It is the component that invokes a snapshot command on a FlashCopy device (such as DS8000, Storwize V7000, and SAN Volume Controller) using the CIM interface.

**XIV Adapter Oracle Java™ Archive (XivAdapter.jar)**

The XIV Adapter (XivAdapter.jar) is used with the Generic Device Agent (acsgen). It communicates with acsgen and issues commands to the XIV command-line interface (XCLI).

**Query Capacity (fmquery)**

The Query Capacity (fmquery) command lists all backups (FlashCopy or snapshot backups) that are registered in a particular repository. Use this command to periodically check the amount of storage space used for backups and to verify compliance with the licensed capacity amount.

**Volume Group Takeover script (acsvg.sh) (AIX only)**

The Volume Group Takeover utility (acsvg.sh) is a shell script. It is only required in special high-availability scenarios where enhanced concurrent capable volume groups are used on production systems. In these situations, this script exports and reimports the volume groups on an HACMP™ takeover system after a snapshot restore is performed. This process is necessary in order to synchronize the AIX Object Data Manager (ODM) on the production and HACMP takeover systems.

**Offload Agent (tsm4acs)**

The primary role of the Offload Agent is to provide a single user interface for backing up an existing snapshot to Tivoli Storage Manager. Tivoli Storage FlashCopy Manager includes a license file that enables the use of the enhanced functions of the Offload Agent. The Offload Agent also calls the generic device agent for mount and unmount operations on the backup systems.

**Tivoli Storage FlashCopy Manager command line interface (fcmcli)**

The Tivoli Storage FlashCopy Manager manager executable file, tsm4acs, is also the cloning interface for Oracle, DB2, DB2 DPF databases in SAP and non-SAP environments on AIX, Solaris, xLinux and HP-UX. For further details on Tivoli Storage FlashCopy Manager see the Tivoli Storage FlashCopy Manager wiki at <http://www.ibm.com/developerworks/mydeveloperworks/wikis/home/wiki/Tivoli%20Storage%20FlashCopy%20Manager/page/Home>.

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## Advanced functions

Information is provided about advanced functions that enhance Tivoli Storage FlashCopy Manager capabilities.

## Mounting of backup images

Tivoli Storage FlashCopy Manager can mount a backup image on a remote host. Although the characteristics of that image depend on the storage subsystem, the characteristics described in this section are common among all storage subsystems.

### Use of multiple backup servers and backup server selection

A backup image created with Tivoli Storage FlashCopy Manager can be mounted on only one host (backup server). This host is selected at the time of the backup according to backup criteria defined for the storage system in the `DEVICE_CLASS` sections. The association between `DEVICE_CLASS` sections and the backup hosts is established during configuration. As a result, a snapshot backup created for a certain `DEVICE_CLASS` is always mounted by the same backup server. In order to use multiple backup servers, subsequent backups have to be performed with a `DEVICE_CLASS` section that is associated with each backup server. Simultaneously mounting multiple backup generations of the same application to the same backup server is not allowed. However, single backup server can be used for multiple applications.

### Forced mount

Tivoli Storage FlashCopy Manager supports different levels of consistency features for point-in-time backup operations, such as suspend database or freeze I/O. Depending on the specified consistency level, Tivoli Storage FlashCopy Manager might require a consistency check of the backup on a remote system. In those situations, Tivoli Storage FlashCopy Manager requires at least one available backup server to mount the backup image for this consistency check (forced mount). This backup server might also be used to start a subsequent tape backup.

A forced mount is required during these circumstances:

- The database is running in an LVM mirrored environment on AIX
- FlashCopy cloning is used
- Conditions that require a forced mount for the different storage subsystem environments:

**XIV** A forced mount is required if the profile parameter `USE_CONSISTENCY_GROUPS` is set to `NO` and a freeze or thaw was not used for the file systems.

#### **SVC, Storwize V7000 or DS**

A forced mount is required if the profile parameter `BACKUP_HOST_NAME` is set to `PREASSIGNED_VOLUMES` and the operating system is Linux or Solaris.

**DS** A forced mount is required if the profile parameter `BACKUP_HOST_NAME` is set to `PREASSIGNED_VOLUMES` and a freeze or thaw was not used for the file systems, and the operating system is AIX or HP-UX.

## FlashCopy backup of individual mirrors

Tivoli Storage FlashCopy Manager supports two types of mirroring.

### Mirroring using the AIX logical volume manager (LVM mirroring)

Tivoli Storage FlashCopy Manager provides LVM mirroring support for DS8000, IBM XIV® Storage System, IBM Storwize V7000, and SAN Volume Controller. For those devices, Tivoli Storage FlashCopy Manager creates a FlashCopy backup where only one of the mirrors is copied during the backup. When LVM is used to mirror the database across sites, you can create tape backups on either site with Tivoli Storage FlashCopy Manager. In this situation, you do not have to transfer the backup image across sites. To perform this task, a backup server is required on either site where backup images can be mounted locally in order to transfer them to secondary backup media. For DS8000, you can create at most one INCREMENTAL FlashCopy per source volume. However, in LVM environments, each source volume is mirrored. Therefore, Tivoli Storage FlashCopy Manager can create two INCREMENTAL FlashCopy backups for DS8000.

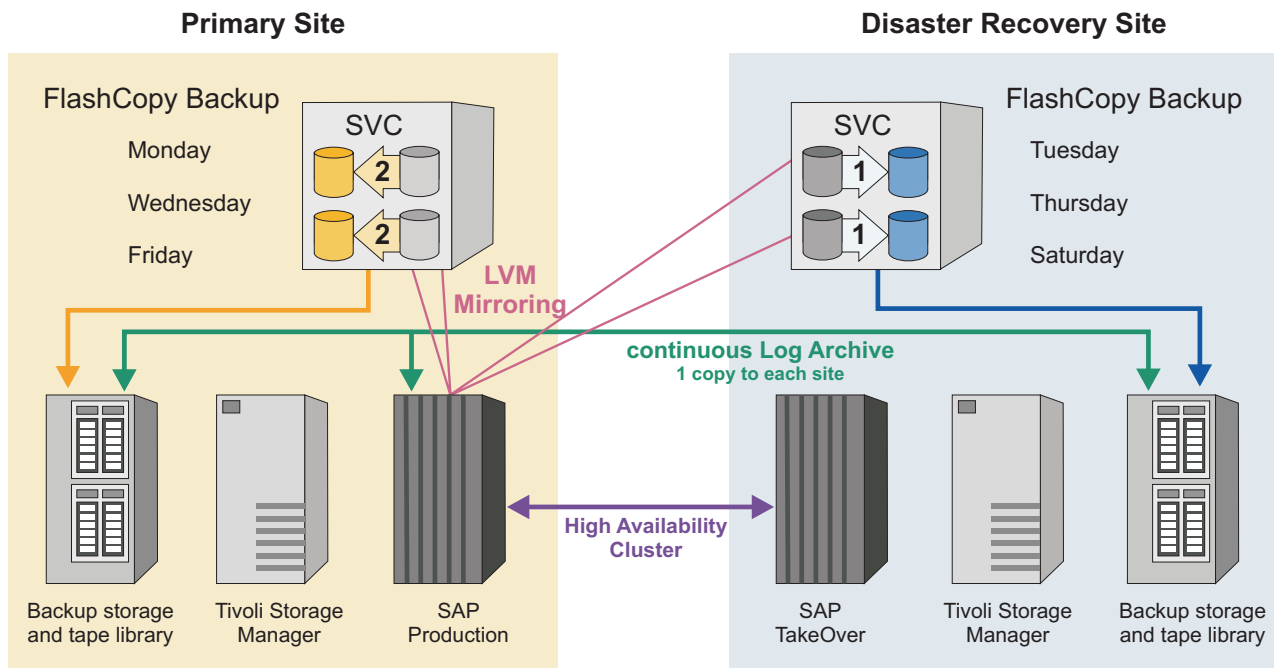


Figure 2. Cross-site mirrored SAP® Database protected with Tivoli Storage FlashCopy Manager and Tivoli Storage Manager.

### Support of AIX enhanced concurrent capable volume groups

In order to support high-availability environments, Tivoli Storage FlashCopy Manager supports enhanced concurrent capable volume groups.

### Support of Oracle ASM Failure Groups

ASM organizes data in disk groups which consist of a collection of disk drives located in the same loop as configured by the storage subsystem. Tivoli Storage FlashCopy Manager uses an ASM instance to map these disk groups to physical disks. Each disk group can have multiple failure groups which are redundant copies of each other. These failure groups can be used as a technique to mirror

storage volumes. You can do this technique by defining disk groups with normal redundancy that are composed of two failure groups (or by defining disk groups with high redundancy that are composed of three failure groups), and by placing the volumes for each of the failure groups on a dedicated storage cluster. Although the default Oracle System ID (SID) for the ASM instance is +ASM, other SIDs are supported.

In such a configuration, Tivoli Storage FlashCopy Manager is capable of creating FlashCopy backups of an individual failure group for all supported storage devices (DS8000, Storwize V7000, SAN Volume Controller, and IBM XIV Storage System).

## **Heterogeneous device mirroring**

Tivoli Storage FlashCopy Manager does not require the storage devices of different mirrors to be at the same version level.

## **Integration with Tivoli Storage Manager**

Tivoli Storage FlashCopy Manager can back up data from a remote system (backup server) to Tivoli Storage Manager.

These components must be installed and configured on the backup server in order to back up to Tivoli Storage Manager:

- IBM Tivoli Storage Manager for Enterprise Resource Planning (SAP® with DB2, SAP® with Oracle)
- The DB2 native Tivoli Storage Manager agent (DB2 in non-SAP® environments)
- Tivoli Storage Manager for Databases (Oracle in non-SAP® environments)
- Tivoli Storage Manager Backup-Archive Client (custom application environments)

Tivoli Storage FlashCopy Manager provides these functions with Tivoli Storage Manager:

- Back up to Tivoli Storage Manager immediately after the Tivoli Storage FlashCopy Manager backup completes successfully.
- Perform the Tivoli Storage Manager backup with a separate schedule. This function allows delaying the backup to Tivoli Storage Manager to a time when the availability of tape drives is at its best.
- Manually restart a backup to Tivoli Storage Manager after an error. In this situation, data that has already been committed on the Tivoli Storage Manager server is not sent again.

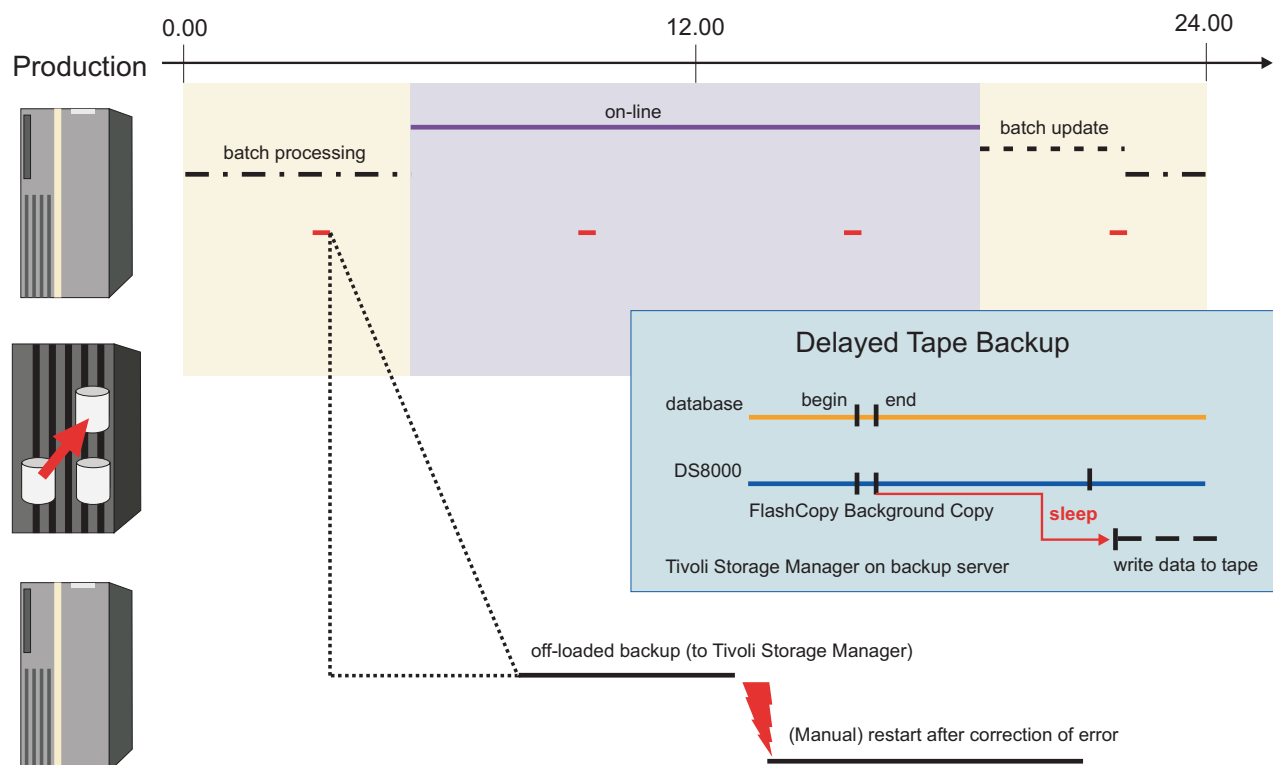


Figure 3. Overview of Tivoli Storage FlashCopy Manager environment when integrated with Tivoli Storage Manager

## Custom application support with Tivoli Storage Manager

Tivoli Storage FlashCopy Manager backs up custom applications that are not explicitly supported by Tivoli Storage FlashCopy Manager.

IBM Tivoli Storage FlashCopy Manager for Custom Applications provides a generic snapshot backup for a file system or volume group with user exits that enable you to run preprocessing and postprocessing scripts to prepare the applications for volume level snapshots.

Tivoli Storage FlashCopy Manager can create consistent snapshot images of one or more file systems on a production system. The snapshots are managed as backup versions using the existing version management policies of Tivoli Storage FlashCopy Manager. The snapshots can be used as a source for instant restore operations. To support applications that need to be quiesced before a snapshot is created, Tivoli Storage FlashCopy Manager provides presnapshot and postsnapshot user exits that enable you to prepare and resume the application before and after snapshot creation. You can also mount the snapshot backups on a secondary system. In Tivoli Storage Manager environments, Tivoli Storage FlashCopy Manager can use the backup-archive client to initiate a subsequent backup to the Tivoli Storage Manager server.



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

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

These steps assist with preparing the production system, validating the configuration, and adding backup servers to the environment (as a secondary setup). Review the Tivoli Storage FlashCopy Manager pre-installation checklist that is attached to the technote for hardware and software requirements for Tivoli Storage FlashCopy Manager. This technote can be accessed from the Tivoli Storage FlashCopy Manager support portal ([http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli\\_Storage\\_FlashCopy\\_Manager](http://www.ibm.com/support/entry/portal/Overview/Software/Tivoli/Tivoli_Storage_FlashCopy_Manager)) by using the keywords: "3.1 UNIX requirements". The pre-installation checklist contains the most current requirement information and provides quick validation of your environment. Tivoli Storage FlashCopy Manager depends on the correct setup of different subsystem components. These conditions are the minimum environment requirements:

- A suitable disk layout of the application on the production host
- Correctly defined storage definitions on the storage subsystem
- Proper connectivity from the production host to the storage subsystem

In an advanced configuration, the production system can be distributed across multiple hosts and storage subsystems. The storage subsystems can also be distributed across sites. Backup servers might be required for operations such as backing up data to Tivoli Storage Manager.

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### Capacity planning

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

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

- Space required for the product installation on a system
- Space required to enable each individual database instance with Tivoli Storage FlashCopy Manager
- Space required on the storage device for the actual snapshot backups or clones

### Global product installation

The space that is required for the product installation of Tivoli Storage FlashCopy Manager varies depending on the underlying operating system. 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*

Operating system	Default installation path	Space required (MB)
AIX	/usr/tivoli/tsfcm/acs_3.1.0.0	650
Solaris	/opt/tivoli/tsfcm/acs_3.1.0.0	400
Linux	/opt/tivoli/tsfcm/acs_3.1.0.0	250

Table 10. Space requirements for a global product installation of Tivoli Storage FlashCopy Manager (continued)

Operating system	Default installation path	Space required (MB)
HP-UX	/opt/tivoli/tsfcm/acs_3.1.0.0	1000

## Database instance or custom application activation

**Note:** In this section the term database instance should be replaced by custom application when Tivoli Storage FlashCopy Manager for Custom Applications is used.

In addition to the space that is required for the global product installation, Tivoli Storage FlashCopy Manager must be installed on each database instance that is enabled for snapshot-based data protection or cloning. FlashCopy Manager must also be installed on the database instances on a backup server unless it shares its FlashCopy Manager installation with the production server by using NFS.

The space required for each FlashCopy Manager enabled database instance is equal to the amount of space that is required for the global product installation.

Additional space is required for log files and trace files. Log and trace files are written continuously without automatically deleting the older ones. Hence, the amount of storage that is required for log and trace files can grow to several hundred megabytes. As a best practice, delete log and trace files using a custom script.

**Note:** For simple Oracle database instances, Tivoli Storage FlashCopy Manager stores the database control files in the FlashCopy Manager repository for each snapshot backup. For stand-alone FlashCopy Manager installations without IBM Tivoli Storage Manager for Enterprise Resource Planning in an SAP with Oracle environment, all database files are stored in the repository when:

- The backup\_dev\_type option specifies util\_file or util\_file\_online
- The ALLOW\_FULL\_FILE\_BACKUP parameter specifies YES in the CLIENT section of the FlashCopy Manager profile

Avoid creating such a configuration. However, if you must create this type of configuration, consider the space requirements for the FlashCopy Manager repository. The repository path can be freely configured so that it can be switched to a volume with sufficient space (using profile parameter ACS\_REPOSITORY).

## Snapshot copies

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

- The total size of all source volumes that are part of the volume group that contains the application data
- The type of snapshot (full copy versus space-efficient)
- The rate that the source volumes are altered after a snapshot is taken (only applies 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 XIV initially require a small amount of space for metadata. This space demand grows with every block that is being changed on the corresponding source volume.



Accordingly, the more source volume blocks that are changed, the more space is required for the target volumes that represent a snapshot copy of those applications.

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## Preparing the production environment

All Tivoli Storage FlashCopy Manager backup operations are based on volume-level copy operations (provided by the storage subsystem). They are implemented at a volume group level.

For Oracle ASM environments, backup operations are implemented at the disk group level. Tivoli Storage FlashCopy Manager determines the disk groups to be backed up by mapping application data to files and directories. These files and directories are then mapped to the disk groups that they belong to. As a last step, Tivoli Storage FlashCopy Manager determines the volumes that are subordinate to a disk group. It then triggers the appropriate storage subsystem-specific commands for creating a disk-group level copy on the storage device.

Tivoli Storage FlashCopy Manager cannot create consistent point-in-time copies of data at a level less than a volume group. This condition is due to the nature of the copy services. As a result, Tivoli Storage FlashCopy Manager requires a correct disk layout in order to operate correctly.

## Preparing native DB2 systems

Information is provided for preparing a native DB2 system.

Tivoli Storage FlashCopy Manager requires this volume group structure:

- At least one volume group per database partition, containing table spaces and the local database directory.
- At least one volume group per database partition containing database log files.

In addition to storing this data in dedicated volume groups, the volume groups must reside on file systems that are supported by Tivoli Storage FlashCopy Manager. Non-application data (that is stored on these volume groups) is also processed by Tivoli Storage FlashCopy Manager and is included in the backup images. This non-application data is overwritten during a restore operation. As a result, do not store other objects (such as database instance binary files or log archives) on the volume groups used for backup data. If Tivoli Storage FlashCopy Manager detects such data in one of the volumes to be backed up, the backup operation fails. To ensure the backup operation is successful specify the `NEGATIVE_LIST` profile parameter with the appropriate value. For information about the `NEGATIVE_LIST` profile parameter, see “Tivoli Storage FlashCopy Manager profile parameters” on page 137.

Tivoli Storage FlashCopy Manager only processes table spaces, the local database directory, and log files. The following volume group layout is recommended for DB2:

*Table 11. Volume group layout for DB2*

Type of data	Location of data	Contents of data	Comments
Table space volume groups	Supported storage subsystem	Table spaces Local database directory	Dedicated volume groups per database partition are required

Table 11. Volume group layout for DB2 (continued)

Type of data	Location of data	Contents of data	Comments
Log volume groups	Supported storage subsystem	Log files	Dedicated volume groups per database partition are required
Instance	Storage subsystem or local storage	DB2 instance directory DB2 binary files	Tivoli Storage FlashCopy Manager does not require a specific storage layout for those objects. However, the data must not be stored on one of the volume groups containing table spaces or logs.
Other data	N/A	Data of other applications	
Archive	N/A	Directory for the log archive	
rootvg	N/A	OS and other binary files	

You can also use only a single volume group per database partition that contains table spaces, the local database directory, and log files (if all backup and restore operations are including the log files). However, you might not be able to use a roll-forward recovery to restore the database because the latest online log files are overwritten by the log files contained in the backup. In addition, Tivoli Storage FlashCopy Manager does not support non-mirrored databases where a single database partition is spread across multiple storage devices. In an AIX logical volume manager mirroring environment, each mirror must reside within a separate storage cluster.

## Preparing SAP® on DB2

Information is provided for preparing an SAP® on DB2 system.

The recommended storage layout for SAP® on DB2 is identical to the storage layout described in “Preparing native DB2 systems” on page 17. In addition, Tivoli Storage FlashCopy Manager supports SAP® database environments where multiple logical partitions of a DB2 database reside within a single volume group. This setting is referred to as volume sharing (see the PARTITION\_GROUP parameter for more details). With volume sharing, individual database partitions cannot be restored and the **db2 restore use snapshot** command cannot be used.

In addition, Tivoli Storage FlashCopy Manager does not support non-mirrored databases where a single database partition is spread across multiple storage devices. In an LVM environment, each mirror must reside within a separate storage cluster.

## Preparing SAP® with Oracle

Information is provided for preparing an SAP® with Oracle system.

**Tip:** Review the exact volume layout specifications (supported through the SAP® BR\*Tools Disk - Volume Backup function) that are available in the *SAP® Database Guide for Oracle*.

Tivoli Storage FlashCopy Manager requires that all database files, online redo logs, and control files are on file systems that are supported by Tivoli Storage FlashCopy Manager. The data that is under the sapdata, origlog and mirrlog directories must be located on separate volume groups. If other data is stored within those volume

groups, it is processed by Tivoli Storage FlashCopy Manager and included in the Tivoli Storage FlashCopy Manager backup image. This data is overwritten during a restore operation. As a result, do not store other objects (such as database instance binary files and offline redo logs) on the volume groups used for backup data. If Tivoli Storage FlashCopy Manager detects such data in one of the volumes to be backed up, the backup operation fails. SAP BR\*Tools requires a list of files and directories that can be backed up. Use the `util_vol_nlist` keyword in the BR\*Tools configuration file to specify a list of non-database files or directories that are located on the database disk volume. To disable SAP BR\*Tools from checking for additional files, specify `util_vol_nlist = no_check`. However, when you specify `util_vol_nlist = no_check`, SAP BR\*Tools not only copies those files during backup, but also overwrites those files during restore processing.

Tivoli Storage FlashCopy Manager only processes table spaces at the volume level. The following volume group layout is recommended for SAP® with Oracle.

*Table 12. Volume group layout for SAP® with Oracle*

Type of data	Location of data	Contents of data	Comments
sapdata	Supported storage subsystem	Database files  Optionally a copy of the database control file	One or more dedicated volume groups. You allowed but not required to use the dedicated volume groups for each sapdata subdirectory
origlog	Supported storage subsystem	Online redo logs  Optionally a copy of the database control file	One or more dedicated volume groups
mirrlog	Supported storage subsystem	Online redo logs  Optionally a copy of the database control file	One or more dedicated volume groups
Other data	N/A	Data of other applications	Recommended.
rootvg	N/A	Operating system and other binary files	Currently Tivoli Storage FlashCopy Manager does not require a specific storage layout for those objects. However, the data must not be stored on one of the volume groups containing table spaces or logs.

To perform offloaded incremental backups from an SAP with Oracle system, Tivoli Storage FlashCopy Manager requires an Oracle database instance to be installed and configured on the backup server. The Oracle-specific environment variables, for example `ORACLE_HOME`, and paths must be exported so that they are accessible if the `su - oracle_user -c` command is issued. This can be verified by running `su - oracle_user -c env | grep ORACLE` as root user. The recovery catalog database must exist. In this database Oracle RMAN records all offloaded

backups. For details on the set-up of a recovery catalog database see the Oracle manuals. To verify this setup, run the following command as the Oracle user on the production host:

```
rman target / catalog <catalog user> / <catalog password> @ <catalog connect string>
```

To verify the setup of the backup system run the following command as the root user on the backup host:

```
su -oracle user -c "rman target / catalog catalog user/catalog password@catalog connect string"
```

The command should be able to connect to both the target and the recovery catalog databases and then show the RMAN prompt. This can be finished with the command quit. For example:

```
$ rman target / catalog rman/rman@catdb
```

```
Recovery Manager: Release 10.2.0.5.0 - Production on Thu Mar 10 16:18:04 2011
```

```
Copyright (c) 1982, 2007, Oracle. All rights reserved.
```

```
connected to target database: P01 (DBID=1213110920, not open)
connected to recovery catalog database
```

```
RMAN> quit
```

```
Recovery Manager complete.
$
```

Tivoli Storage FlashCopy Manager does not support non-mirrored databases where the database is spread across multiple storage devices. In an LVM environment, each mirror must reside within a separate storage cluster.

## Preparing native Oracle systems (non-SAP®, non-ASM)

Information is provided for preparing a native Oracle system (non-SAP®, non-ASM).

Tivoli Storage FlashCopy Manager processes database files at a volume level on native Oracle systems and requires these database files to reside on one or more dedicated volume groups. The database files must reside on file systems that are supported by Tivoli Storage FlashCopy Manager on your platform, or raw logical volumes. However, database control files must not reside in the same volume group as the database files.

Non-application data, stored on these volume groups, is also processed by Tivoli Storage FlashCopy Manager and is included in the backup images. This non-application data is overwritten during a restore operation. As a result, do not store other objects, such as database binary files, offline redo logs, or control files, on the volume groups used for backup data. If Tivoli Storage FlashCopy Manager detects such data in one of the volumes to be backed up, the backup operation fails. To ensure the backup operation is successful specify the `NEGATIVE_LIST` profile parameter with the appropriate value. For information about the `NEGATIVE_LIST` profile parameter, see “Tivoli Storage FlashCopy Manager profile parameters” on page 137.

Tivoli Storage FlashCopy Manager only processes table spaces. Use the following volume group layout for native Oracle systems (non-SAP®, non-ASM):

*Table 13. Volume group layout for native Oracle systems (non-SAP®, non-ASM)*

Type of data	Location of data	Contents of data	Comments
Table space volume groups	Supported disk subsystem	Table space files	Dedicated volume groups required
Online redo log volume groups	Supported disk subsystem  To perform both cloning and FlashCopy backup, the online redo logs must reside on their own volumes on a supported disk subsystem separated from other files.	Online redo logs	Not required, but useful for FlashCopy backup.  Required for cloning.
Binary files, control files	For cloning, at least one of the control files must reside on the same volume as the table space files or the online redo logs.  If cloning and FlashCopy backup are performed, this control file must reside on the volumes of the online redo logs.	Binary files, control files	
Offline redo log volume group	N/A	Offline redo logs	Currently Tivoli Storage FlashCopy Manager does not require a specific storage layout for those objects. However, the data may cannot be stored on one of the volume groups containing table spaces or redo logs.
Other data	N/A	Data of other applications	
rootvg	N/A	OS and other binary files	

Tivoli Storage FlashCopy Manager requires the use of a catalog database. Tivoli Storage FlashCopy Manager does not support non-mirrored databases where the database is spread across multiple storage devices. In an LVM environment, each mirror must reside within a separate storage cluster.

If the operating system user uses a shell different from ksh, the Oracle-specific environment variables (such as ORACLE\_HOME) and paths must be exported in a manner that makes them accessible if the `su - <oracle_user> -c` command is issued.

## Preparing Oracle ASM

Tivoli Storage FlashCopy Manager only supports Oracle Automatic Storage Management (ASM) environments when ASM disk groups are set up on raw physical volumes. Because Tivoli Storage FlashCopy Manager processes database files at the ASM disk group level, the database files are required to be on dedicated disk groups. Non-application data, that is stored on these disk groups, is also processed by Tivoli Storage FlashCopy Manager and is included in the backup images. This non-application data is overwritten during a restore operation. As a result, do not store other objects on the disk groups used for backup data. If Tivoli Storage FlashCopy Manager detects such data in one of the volumes to be backed up, the backup operation fails. To ensure that the backup operation is successful specify the `NEGATIVE_LIST` profile parameter with the appropriate value. For information about the `NEGATIVE_LIST` profile parameter, see “Tivoli Storage FlashCopy Manager profile parameters” on page 137.

Tivoli Storage FlashCopy Manager only processes table spaces. The following disk group layout is recommended for Oracle ASM environments:

*Table 14. Disk group layout for Oracle ASM*

Type of data	Location of data	Contents of data	Comments
Table space disk groups	Supported disk subsystem	Table space files	One or more ASM disk groups dedicated exclusively to the protected database.
Online redo log disk groups	Supported disk subsystem	Online redo logs	A separate disk group is currently not required, but is recommended.
Offline redo log disk groups	N/A	Offline redo logs	Currently Tivoli Storage FlashCopy Manager does not require a specific storage layout for those objects. They might be within ASM or within the file system. However, this data must not be stored on one of the volume groups or disk groups containing table spaces or redo logs.
Binary files, control files	Disk subsystem	Binary files, control files	
Other data	N/A	Data of other applications	
rootvg	N/A	Operating system and other binary files	

Tivoli Storage FlashCopy Manager requires the use of a catalog database. Typically one ASM instance can serve multiple databases. Tivoli Storage FlashCopy Manager supports such a setup as long as dedicated disk groups are used for each database. For normal-redundancy disk groups and high-redundancy disk groups, Tivoli Storage FlashCopy Manager handles failure groups in a unique manner as described in “ASM failure group support” on page 27. For DS8000, Tivoli Storage FlashCopy Manager does not use consistency groups. As a result, the only ASM environment supported on DS8000 is that where all table space files reside in one disk group. In addition, this disk group contains exactly one LUN on the DS8000. Tivoli Storage FlashCopy Manager does not support databases that are distributed across multiple storage clusters, except in environments where failure groups are

used in a manner where every storage cluster contains a complete image of the database.

A disk group must be created on the backup system in order to host the control file. This disk group must have the same name as the disk group where the control file is located on the production system. The repository directory where the control file is restored from (and temporarily stored for RMAN) must exist on the backup system. This directory is typically located under the `$ORACLE_BASE/diag/$ORACLE_SID` directory for an Oracle 11g database.

The Oracle-specific environment variables, such as `ORACLE_HOME`, and paths must be exported in a manner that makes them accessible if the `su - oracle_user -c` command is issued. For `ksh` or `bash`, this can be verified by running the command `su - oracle_user -c env | grep ORA` as the root user.

## Preparing custom applications

Some prerequisites are necessary when preparing a custom application environment.

Tivoli Storage FlashCopy Manager performs snapshot backups of plain file systems on a volume group level. Therefore, ensure that the files you want to protect are stored in dedicated file systems and volume groups.

In addition to storing this data in dedicated volume groups, those volume groups must reside on a file system type that is supported by Tivoli Storage FlashCopy Manager (see the release notes for details). Any other data, stored on these volume groups, is also processed by Tivoli Storage FlashCopy Manager, and it is included in the backup images. The whole backup image will be restored and any data on the file systems updated or created after the backup will be deleted.

**Attention:** Do not store any data that you do not want to restore within volume groups that are being processed by Tivoli Storage FlashCopy Manager. If Tivoli Storage FlashCopy Manager detects such data in one of the volumes to be backed up, the backup operation fails.

To ensure the backup is successful specify the `NEGATIVE_LIST` profile parameter with the appropriate value. For information about the `NEGATIVE_LIST` profile parameter, see “Tivoli Storage FlashCopy Manager profile parameters” on page 137.

**Tip:** To achieve a transaction-consistent backup of your custom application by keeping its data on the snapshot copied file systems, you can configure Tivoli Storage FlashCopy Manager to run a pre-flash, or post-flash, command immediately prior to, or after, the creation of the snapshot. Those commands can be used to suspend and resume the application in order to create a consistent backup.



## Preparing the DB2 high-availability disaster recovery server or DB2 standby server

Information is provided for preparing a DB2 high-availability disaster recovery (HADR) or DB2 standby server environment.

A DB2 HADR server or a DB2 standby server environment is protected by Tivoli Storage FlashCopy Manager if the corresponding primary DB2 database is also protected by Tivoli Storage FlashCopy Manager.

Upon takeover, the protection of the former DB2 HADR standby environment can be continued by Tivoli Storage FlashCopy Manager for DB2.

The storage layout for a DB2 HADR or DB2 standby server environment must be identical to the storage layout described in “Preparing native DB2 systems” on page 17. In addition, the names of files, file systems, and mount points must be identical for both the DB2 primary and the DB2 standby environments.

**Remember:** In a typical environment, both sides of a DB2 HADR or DB2 standby server environment can act as the primary or the standby system. To support such configurations, you can create a single profile at each site (see Figure 4) that can be used regardless of whether the system is the active or inactive copy of DB2.

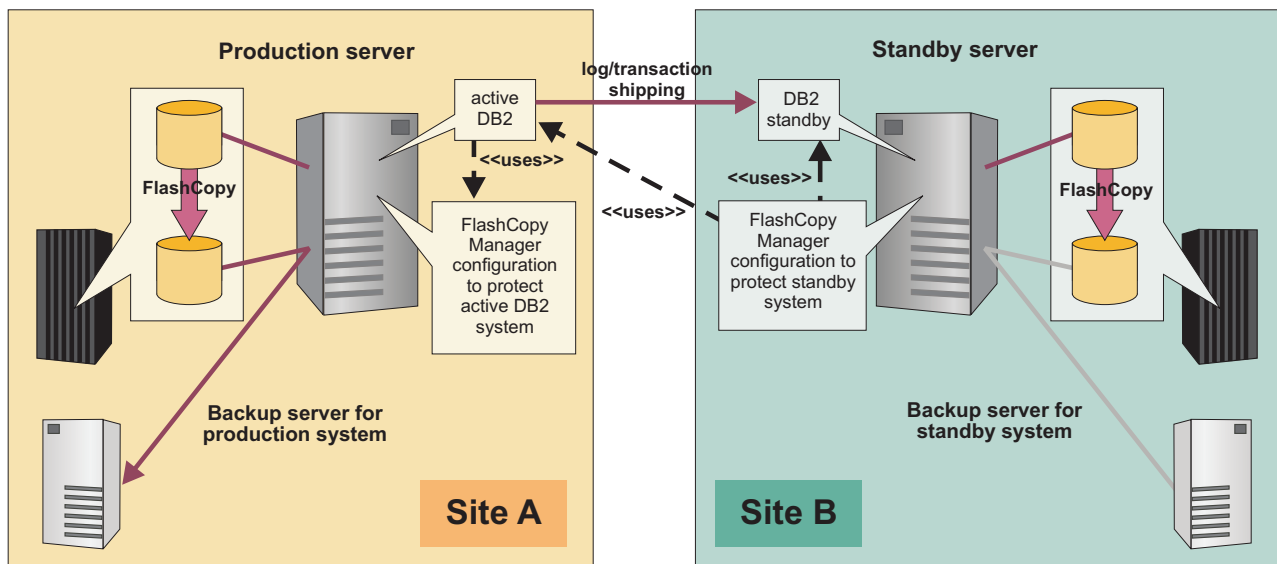


Figure 4. Protection of DB2 HADR standby nodes with IBM Tivoli Storage FlashCopy Manager for Custom Applications

Although a single profile can be used on either side, for instance, one profile for the Site A and one profile for the Site B, there are different commands for backing up DB2. When it is the primary, the command is `db2 backup use snapshot ...` and when it is the standby or HADR system the command is `fmccli -f backup_db2standby...`. In an environment where Tivoli Storage Manager is configured, this also affects the way Tivoli Storage FlashCopy Manager triggers the Tivoli Storage Manager backup. While DB2 is active, Tivoli Storage FlashCopy Manager issues a `db2 backup` command for the backup to Tivoli Storage Manager. If DB2 is inactive, Tivoli Storage FlashCopy Manager creates the backup using the Tivoli Storage Manager backup-archive client.



**Restriction:** Because Tivoli Storage FlashCopy Manager communicates with the active site to query DB2 for a list of files to back up, the names of mount points and file systems containing DB2 data must be identical in site A and site B.

**Remember:** Although you can create a single profile on either site that can be used regardless of whether the site is active or passive, you must install Tivoli Storage FlashCopy Manager separately on each site. There is no installation option that installs Tivoli Storage FlashCopy Manager on either site simultaneously.

## Using symbolic links

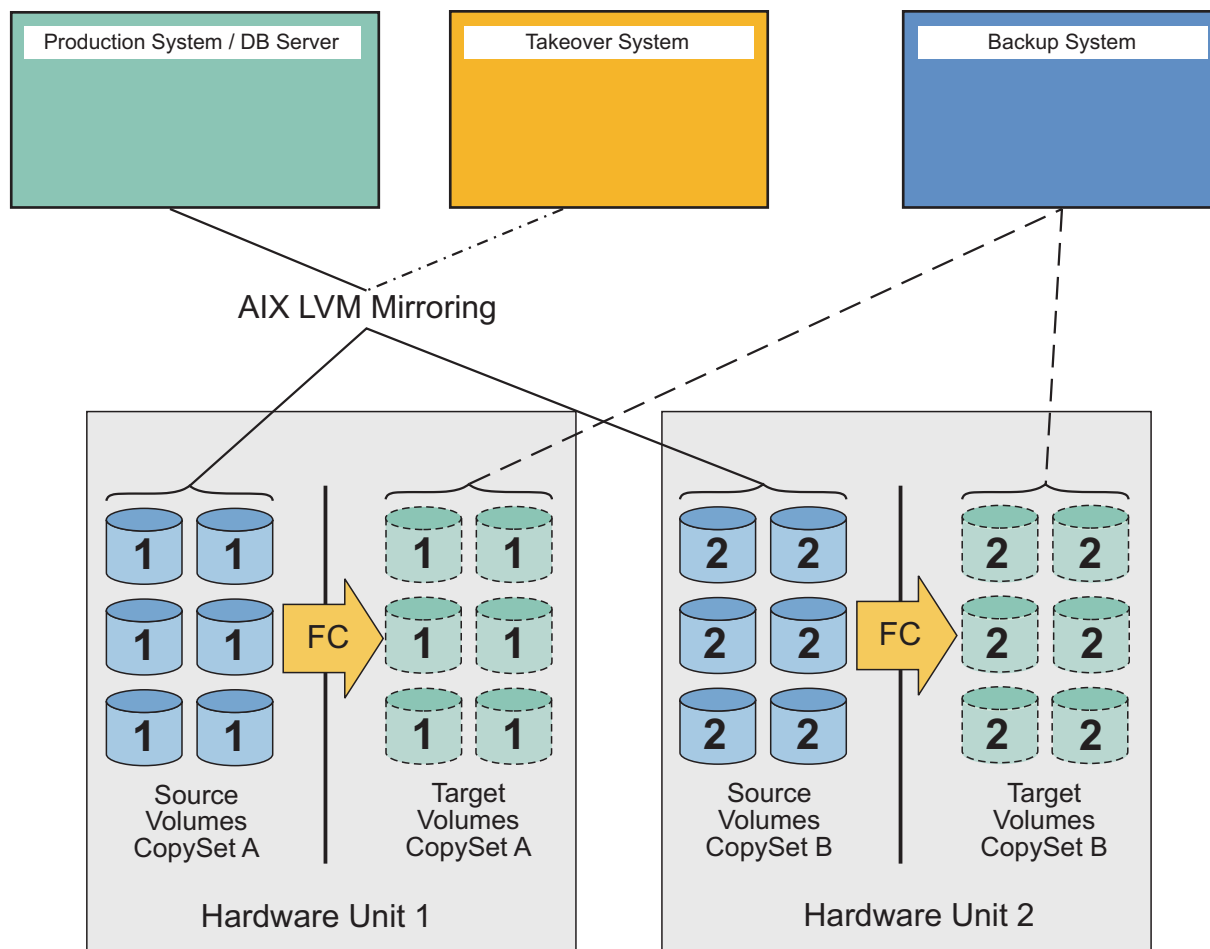
Tivoli Storage FlashCopy Manager follows symbolic links when application data is mapped to volume groups.

However, symbolic links might complicate volume-based backup operations. This complication is especially possible when a file system in a volume group points to an object in another file system, and this file system resides on a different volume group. Therefore, the recommended method is to avoid using symbolic links in your application environment.

## Logical Volume Manager support (AIX-only)

You can use Tivoli Storage FlashCopy Manager in environments where volume groups are mirrored between two storage clusters using Logical Volume Manager (LVM) on AIX.

This support is provided on DS8000, SAN Volume Controller, Storwize V7000, and IBM XIV<sup>®</sup> Storage System environments. When LVM is used to mirror volume groups between two storage clusters, a FlashCopy backup is created such that only one of the mirrors is being copied.



- Permanent connection to the DB with 2 AIX LVM mirrors from the production system
- - - - - Connection to the DB with 2 AIX LVM mirrors from the takeover system in the case of a takeover situation
- - - - - Temporary connection to only 1 target volume copy set at a time (from snapshot initiation until withdraw)

Figure 5. Tivoli Storage FlashCopy Manager in an LVM environment

LVM provides these advantages:

- Only one of the two LVM mirrors are used in the FlashCopy<sup>®</sup> process, which saves the number of needed target volumes and reduces the time needed for the FlashCopy<sup>®</sup> process.
- Avoids unnecessary performance degradation within the storage system.
- All LVM mirrors on the production system remain synchronized during the FlashCopy<sup>®</sup> backup process.
- Online or offline FlashCopy<sup>®</sup> backups can be created in both LVM and non-LVM environments. There is no change in the backup and restore procedures as provided in the applicable documentation.

- The FlashCopy® backup process at no time compromises the high-availability purpose for which the mirrors were set up. It is not necessary to resynchronize the logical volumes after the FlashCopy® backup request.
- Tivoli Storage FlashCopy Manager provides information about asymmetrical LVM mirror setups when encountered, which cannot only prevent the FlashCopy® backup from running in unfavorable situations but can also reveal a general deficiency of the high-availability setup as well.

Tivoli Storage FlashCopy Manager requires that the LVM mirroring sets are in different storage subsystems. For example, different SAN Volume Controller clusters, Storwize V7000, DS8000, or IBM XIV® Storage Systems. Complete mirrors are recommended to be stored on both storage clusters. If this setting is not possible, Tivoli Storage FlashCopy Manager continues processing for those clusters where a complete image of the application can be found.

In order to configure Tivoli Storage FlashCopy Manager for LVM mirroring, define both storage subsystems within the Tivoli Storage FlashCopy Manager profile. Use the `DEVICE_CLASS` parameter to allow Tivoli Storage FlashCopy Manager to select the storage subsystem. At least one backup server is required so that Tivoli Storage FlashCopy Manager can mount a FlashCopy® backup to verify the consistency of the backup and split the LVM mirrors.

During a restore operation, Tivoli Storage FlashCopy Manager runs all the commands required to prepare the LVM environment again for the second mirror. The administrator is informed by message FFM0755I (in the detailed restore log file) that the volume groups are ready for synchronization. The administrator can run this operation at a more suitable time (for instance after completion of the database recovery).

**Note:** The administrator must examine the log files for these messages. They do not display on the screen.

## ASM failure group support

Oracle Automatic Storage Management (ASM) failure groups allows backups of disk groups. These backups are like backups of individual mirrors in an LVM mirroring environment.

When the ASM database is set up with normal (or high) redundancy, and all the disk groups are composed of two (or three) failure groups that reside on two (or three) respective storage clusters, Tivoli Storage FlashCopy Manager creates a backup entirely within only one of the storage clusters. As a result, all the storage clusters must be defined within the Tivoli Storage FlashCopy Manager profile (using the `DEVICE_CLASS` profile parameter). These definitions must specify that Tivoli Storage FlashCopy Manager selects the cluster for the current operation. When an ASM disk group is set up with normal redundancy, the backup completes even if one of the failure groups is not located on the storage device. Also, when an ASM disk group is set up with high redundancy, the backup completes even if two of the failure groups are not located on the storage device.

Consider these additional guidelines when using ASM failure groups:

- In situations where all failure groups are residing on one storage cluster, Tivoli Storage FlashCopy Manager backs up all failure groups.
- Tivoli Storage FlashCopy Manager is not required to split the failure groups on a remote system. For LVM environments, mirrors are required to be split on the backup system.

- Failure group support does not require a backup server. (For LVM environments, a backup server is required.)
- In order to avoid additional I/O load during restore, Tivoli Storage FlashCopy Manager does not recreate failure groups when completing a restore. In order to regain the wanted redundancy level, manually add the missing failure groups after restore.

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## Preparation of the storage device

Consider these guidelines when preparing the storage device.

### IBM XIV Storage System

The storage device and its storage volumes must be accessible from all backup servers in the environment when using IBM XIV Storage Systems.

In addition, the IBM XIV Storage System command-line interface (XCLI) must be installed on the production system and on all backup systems of the environment. A typical IBM XIV Storage 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
BACKUP_HOST_NAME  backup_host
<<<
```

You can set up policies within the IBM XIV Storage System that deletes snapshots created with Tivoli Storage FlashCopy Manager. For that purpose, Tivoli Storage FlashCopy Manager periodically checks whether backups on the storage subsystem are still valid. This checking process is referred to as reconciliation. The reconciliation interval can be specified by the profile parameter **RECON\_INTERVAL** (in hours). During this reconciliation process, however, Tivoli Storage FlashCopy Manager also removes snapshots on the storage device it created and that are not reflected in the Tivoli Storage FlashCopy Manager 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 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 can be used for restore operations. If writable snapshots are used, no duplicates are created during mount operations and all changes applied to the snapshot are preserved. Writable snapshots are only required in LVM mirroring environments.

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 for one database instance, all volumes managed by Tivoli Storage FlashCopy Manager reside in the same storage pool. In addition, they must not already belong to any consistency group. The use of consistency groups

is only required for ASM environments and is optional in other environments.

## **IBM System Storage DS8000, Storwize V7000 and SAN Volume Controller**

Information is provided about CIM server and target volume requirements for DS8000, Storwize V7000 and SAN Volume Controller.

Tivoli Storage FlashCopy Manager uses a CIM server to communicate with a storage cluster. Starting with SAN Volume Controller 4.3.1 and DS8000 R4.1, this CIM server is embedded into the storage device. As a result, it does not need to be installed and configured separately. For prior SAN Volume Controller and DS8000 releases, a proxy CIM server is required and must be configured to manage the necessary storage clusters. Refer to the DS8000 and SAN Volume Controller documentation for configuration details. Tivoli Storage FlashCopy Manager supports both configuration options for the SAN Volume Controller and DS8000 releases that support both a proxy CIM server and an embedded CIM server. Tivoli Storage FlashCopy Manager supports Storwize V7000 with an embedded CIM server.

Unlike IBM XIV® Storage Systems, Tivoli Storage FlashCopy Manager requires that suitable FlashCopy backup target volumes be created in advance on SAN Volume Controller and DS8000. In order to provide a target set definition to Tivoli Storage FlashCopy Manager, you must organize target volumes into target sets, where each target set represents one backup generation. Although Tivoli Storage FlashCopy Manager automatically matches source volumes to suitable target volumes, each target set must contain at least one suitable target volume for each source volume to be backed up. Additional target volumes in a target set are allowed but 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 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 is unable to distinguish whether the relationship was withdrawn because the background copy process has completed successfully, or whether the relationship was manually withdrawn before the background copy process has completed.

Environment conditions :

- SAN Volume Controller 4.3 or 5.1
- DS8000

## Space-efficient multitarget FlashCopy on SAN Volume Controller and Storwize V7000

Space-efficient targets that are part of a multitarget FlashCopy cascade might be deleted by SAN Volume Controller and Storwize V7000 if other targets of the same cascade are restored or overwritten by a new snapshot.

In a SAN Volume Controller 5.1, or later, or a Storwize V7000 environment, the following situations might cause space-efficient targets to be deleted:

### Backup operations and cloning operations

A Tivoli Storage FlashCopy Manager 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. This situation can also happen when a new FlashCopy cloning operation is started with the force option (-F).

### Restore operation

A Tivoli Storage FlashCopy Manager restore operation destroys any FlashCopy backups that are newer than the backup that is being restored.

### 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 resides on the target volume is destroyed.

## SAN Volume Controller and Storwize V7000

SAN Volume Controller 5.1, or later and Storwize V7000 introduce new capabilities for Tivoli Storage FlashCopy Manager.

### SAN Volume Controller

**Note:** All references to SAN Volume Controller 5.1, or later, also apply to Storwize V7000 .

SAN Volume Controller 5.1, or later adds a new feature to cascading FlashCopy that allows Tivoli Storage FlashCopy Manager to restore FlashCopy backups before completion of a background copy. This feature is essential to enable space-efficient volumes as backup targets. It is essential because the background copy rate has to be set to zero in order to prevent the FlashCopy target from becoming fully allocated.

Because of this new feature, consider these consequences when setting up Tivoli Storage FlashCopy Manager with SAN Volume Controller 5.1, or later:

### Physical capacity

The physically allocated capacity of a space-efficient target volume must be sized sufficiently. 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:** SAN Volume Controller allows creating “auto-expandable” target volumes. In this case, additional storage is assigned to the target whenever storage capacity decreases and sufficient extra capacity is available.

## FlashCopy relationships

During a restore, Tivoli Storage FlashCopy Manager needs to stop all FlashCopy relations. These relations consist of relations that were established after (and including) the point in time when the backup was created. As a result, all backups to space-efficient targets that are newer than the backup used for restore (and the backup from which you are restoring) are deleted. The same restriction applies to FULL or INCREMENTAL FlashCopy backups, as long as the background copy has not been completed.

In order to check if a backup will be deleted, you can query the usability state of Tivoli Storage FlashCopy Manager backups. If the backup will be deleted, the `DESTRUCTIVELY_RESTORABLE` state is set during restore. Otherwise, the state is set to `REPETITIVELY_RESTORABLE`.

## Target sets

Tivoli Storage FlashCopy Manager 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 reuses a target set, it deletes all backups that have been created before this point in time. In a non-mirrored environment, this action is always the case when these settings exist:

- The same profile for your Tivoli Storage FlashCopy Manager backups is used.
- This profile contains only one `DEVICE_CLASS` statement in the `CLIENT` section.

In a mirrored environment, this action is always the case when the `CLIENT` section of the profile contains one `DEVICE_CLASS` statement per LVM mirror. If multiple device classes are specified within this statement, each device class must manage the same number of target sets.

## Recommendations

Recommendations for SAN Volume Controller 5.1, or later environments:

- Do not use space-efficient volumes as source volumes.
- Decide whether you want to use space-efficient or fully allocated backup targets. In mirrored environments, a different choice can be made for each mirror.
- For each mirror, use one `DEVICE_CLASS` statement at most for disk-only backups. Use one `DEVICE_CLASS` statement at most for dual backups (disk plus tape) as well. Make sure that the schedule is defined so that the target sets are reused cyclically across both device classes (per mirror).

For example:

- Define three target sets in the `DISK_ONLY` device class. Schedule these disk only backups to occur at 6:00, 12:00, and 18:00.
- Define one target set in a `DUAL_BACKUP` device class. Set this schedule to create a disk+TSM backup at 00:15.

Do not specify six target sets to retain disk only backups (created at 6:00, 12:00, and 18:00) for two days if you retain only one target set generation for dual backups. The second dual backup operation attempts to reuse the target set of the previous dual backup. This action results in a deletion of all disk only backups taken before that point in time (if the versioning policy specifies `ADAPTIVE`). Otherwise, it causes the dual backup to fail if retain specifies seven versions.



- The backup from which you are currently restoring, and all backups taken after that point in time, are deleted when this condition exists:
  - The usability state of the corresponding backup indicates that the backup is DESTRUCTIVELY\_RESTORABLE.

The backup is not deleted when the backup was created with FLASHCOPY\_TYPE FULL or INCR, and the background copy completed.

## Examples

Example 1: This sample profile is an example of a profile in a non-mirrored environment. Create three space-efficient disk-only backups and one dual backup (at midnight) per day.

```
>>> CLIENT
...
TSM_BACKUP LATEST USE_FOR DISK_TSM
DEVICE_CLASS DISK_ONLY FROM 5:30 TO 23:59
DEVICE_CLASS DISK_TSM FROM 0:00 TO 05:29
<<<
>>> 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
...
<<<
```

Example 2: This scenario illustrates a profile in a mirrored environment. On MIRROR\_1, two space-efficient FlashCopy backups were created on Monday, Wednesday, and Friday. The backup created at midnight is copied to Tivoli Storage Manager. The backup created at noon is retained only on disk. The backup created on Monday is retained until the target sets are reused on Wednesday. On MIRROR\_2, only one incremental FlashCopy backup was created on Sunday, Tuesday, Thursday, and Saturday. This backup is also copied to Tivoli Storage Manager. The backup is retained until the next full backup completes.



```

>>> CLIENT
...
TSM_BACKUP LATEST USE_FOR MIRROR_1_DISK_TSM MIRROR_2
DEVICE_CLASS MIRROR_1_DISK_ONLY USE_AT Mon Wed Fri
DEVICE_CLASS MIRROR_1_DISK_TSM USE_AT Mon Wed Fri
DEVICE_CLASS MIRROR_2 USE_AT SUN Tue Thu Sat
<<<
>>> DEVICE_CLASS MIRROR_1_DISK_ONLY
COPYSERVICES_HARDWARE_TYPE SVC
FLASHCOPY_TYPE NOCOPY # space efficient targets
TARGET_SETS D0
TARGET_NAMING %SOURCE_%TARGETSET
...
<<<
>>> DEVICE_CLASS MIRROR_1_DISK_TSM
COPYSERVICES_HARDWARE_TYPE SVC
FLASHCOPY_TYPE NOCOPY # space efficient targets
TARGET_SETS DT
TARGET_NAMING %SOURCE_%TARGETSET
...
<<<
>>> DEVICE_CLASS MIRROR_2
COPYSERVICES_HARDWARE_TYPE SVC
FLASHCOPY_TYPE INCR
TARGET_SETS 1
TARGET_NAMING %SOURCE_%TARGETSET
...
<<<

```

Example 3: This example is like Example 2 but it does not create Tivoli Storage Manager backups from MIRROR\_1. Rather, it retains the space-efficient FlashCopy images for one week (same schedule).

```

>>> CLIENT
...
TSM_BACKUP LATEST USE_FOR MIRROR_1_DISK_TSM MIRROR_2
DEVICE_CLASS MIRROR_1_DISK_ONLY USE_AT Mon Wed Fri
DEVICE_CLASS MIRROR_2 USE_AT Sun Tue Thu Sat
<<<
>>> DEVICE_CLASS MIRROR_1_DISK_ONLY
COPYSERVICES_HARDWARE_TYPE SVC
FLASHCOPY_TYPE NOCOPY # space efficient targets
TARGET_SETS 1A 1B 3A 3B 5A 5B
TARGET_NAMING %SOURCE_%TARGETSET
...
<<<
>>> DEVICE_CLASS MIRROR_2
COPYSERVICES_HARDWARE_TYPE SVC
FLASHCOPY_TYPE INCR
TARGET_SETS 1
TARGET_NAMING %SOURCE_%TARGETSET
...
<<<

```

## Target set definitions

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

Define targets by using target set definition files (SAN Volume Controller and DS8000) or by using a naming convention (SAN Volume Controller 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 attempts to match source volumes to suitable targets within a target set during backup. To determine source 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 details on the target selection algorithms, see “Tivoli Storage FlashCopy Manager target volumes file” on page 194.

If Tivoli Storage FlashCopy Manager attempts to mount the target set, the volumes within the target set must be assigned to a backup host. For example, the target set is mounted to create a backup to Tivoli Storage Manager. Since all target volumes (within a single target) are mounted to the same host, assign all target volumes (within a target set) to the same host. When using multiple backup servers within your environment, use multiple target set definition files.

### Example

This example is of a target set definition file for a database running on DS8000:

```
>>> TARGET_SET SET_1 # FCM determines a suitable target for every source
TARGET_VOLUME 40913158
TARGET_VOLUME 40A13158
TARGET_VOLUME 40B13158
<<<
>>> TARGET_SET SET_2 # For every source the target is mandated in the target set
                        # definition (source name following target name)
TARGET_VOLUME 40C13158 40613158
TARGET_VOLUME 40D13158 40713158
TARGET_VOLUME 40E13158 40813158
<<<
```

## Target set definition file for multi-partition DB2 databases

Multi-partition DB2 database target set definitions must be specified for each partition.

As a result, the contents of the target set definition file is separated into multiple sections. One section is used for each partition, as shown in this example:

```
>>> TARGET_SET SET_1 # FCM determines a suitable target for every source
>>> PARTITION NODE0000
TARGET_VOLUME 40913158
TARGET_VOLUME 40A13158
<<<
>>> PARTITION NODE0001
TARGET_VOLUME 40B13158
TARGET_VOLUME 50913158
TARGET_VOLUME 50A13158
TARGET_VOLUME 50B13158
TARGET_VOLUME 51713158
<<<
>>> PARTITION NODE0002
TARGET_VOLUME 51813158
TARGET_VOLUME 52113158
TARGET_VOLUME 52313158
<<<
<<<
```

A single backup server environment (for a multi-partition DB2 database) can be distributed across multiple servers. In this situation, make sure that the target volumes in the target set definition file are assigned to the correct host. For best results, assign all target volumes in the target set definition file (and that are associated with the same partition) to the same host. In environments where multiple partitions reside on the same volume group (volume sharing), target set definition files need to specify certain values. See the PARTITION\_GROUP parameter for more information.

## 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 this example profile, the keywords are in bold:

```
>>> DEVICE_CLASS STANDARD
COPYSERVICES_HARDWARE_TYPE DS8000
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. If all target sets within the target set definition file are then assigned to the same host, all target sets associated with a single DEVICE\_CLASS can be mounted from the same host.

## Target set definitions using the naming convention

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

Tivoli Storage FlashCopy Manager supports using a naming convention (instead of a definition file) for target set definitions on SAN Volume Controller. Tivoli Storage FlashCopy Manager 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). A TARGET\_NAMING rule is also specified that determines the name of the target volume from the name of the source. For example, if the database is stored on a volume named db\_vol, the targets required by Tivoli Storage FlashCopy Manager are db\_vol\_bt1, db\_vol\_bt2, and db\_vol\_bt3. These targets depend on the target set selected for the current backup.

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

## Target set definition files for users who are upgrading from Tivoli Storage Manager for Advanced Copy Services

Tivoli Storage FlashCopy Manager can read target set definition files that were used with Tivoli Storage Manager for Advanced Copy Services 6.1.

Set the TARGET\_SETS parameter to VOLUMES\_DIR. Then use the VOLUMES\_DIR parameter to point to the location where the target set definitions previously resided. For example:

```
>>> DEVICE_CLASS STANDARD
COPYSERVICES_HARDWARE_TYPE DS8000
COPYSERVICES_PRIMARY_SERVERNAME <hostname> #
TARGET_SETS VOLUMES_DIR
VOLUMES_DIR <name of target set definition directory>
FLASHCOPY_TYPE INCR
<<<
```

**Note:** The VOLUMES\_DIR parameter is deprecated. Use the VOLUMES\_FILE or TARGET\_NAMING parameters for new configurations.

### Selecting the FLASHCOPY\_TYPE

DS8000 and SAN Volume Controller supports various FlashCopy® types which provide different capabilities for your backup strategy.

Using different FlashCopy® types for different backup generations is a valid strategy for Tivoli Storage FlashCopy Manager. To implement such a backup strategy, 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. These DEVICE\_CLASS section definitions allow rules to be defined in the CLIENT profile section. These rules allow Tivoli Storage FlashCopy Manager to select the appropriate DEVICE\_CLASS section for the next backup. See the DEVICE\_CLASS parameter in the CLIENT section for more information.

If the FLASHCOPY\_TYPE is changed for one DEVICE\_CLASS, complete the following steps:

1. Unmount the backup if it is mounted on a backup system.
2. Delete the backup with the delete force option. For details on which commands to use, see “Deleting Tivoli Storage FlashCopy Manager snapshot backups” on page 104.
3. Change the FLASHCOPY\_TYPE in the DEVICE\_CLASS and run a new backup with the new FLASHCOPY\_TYPE.

Table 15. Selecting the FLASHCOPY\_TYPE for DS8000 and SAN Volume Controller

FLASHCOPY_TYPE	DS8000	SAN Volume Controller <sup>1</sup>
COPY	Can be used for backup and restore. Protects from physical failures of the source volumes once the background copy has completed.	Can be used for backup and restore. Protects from physical failures of the source volumes once 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. In mirroring environments, this setting allows it to retain one backup generation per mirror. 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 mounted remotely but cannot be restored.	Can be mounted remotely. SAN Volume Controller 5.1, or later is required to restore from a NOCOPY FlashCopy.  Can be used to create a FlashCopy® to a space-efficient target, but does not offer protection from physical failures to the source volume. <b>Note:</b> Space-efficient target volumes can reach capacity limits in which case they go offline. When this situation occurs, you lose the current backup and all older backups 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 ” on page 30 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 backs up data on DS8000 and SAN Volume Controller with volumes that are simultaneously used as Metro Mirror and Global Mirror sources.

For SAN Volume Controller however, any existing Metro Mirror and Global Mirror relation must be stopped before attempting a restore operation. Although DS8000 supports using FlashCopy® targets as Metro Mirror and Global Mirror sources, it is not recommended when using Tivoli Storage FlashCopy Manager. Using FlashCopy® targets as Metro Mirror and Global Mirror sources is not supported on SAN Volume Controller.

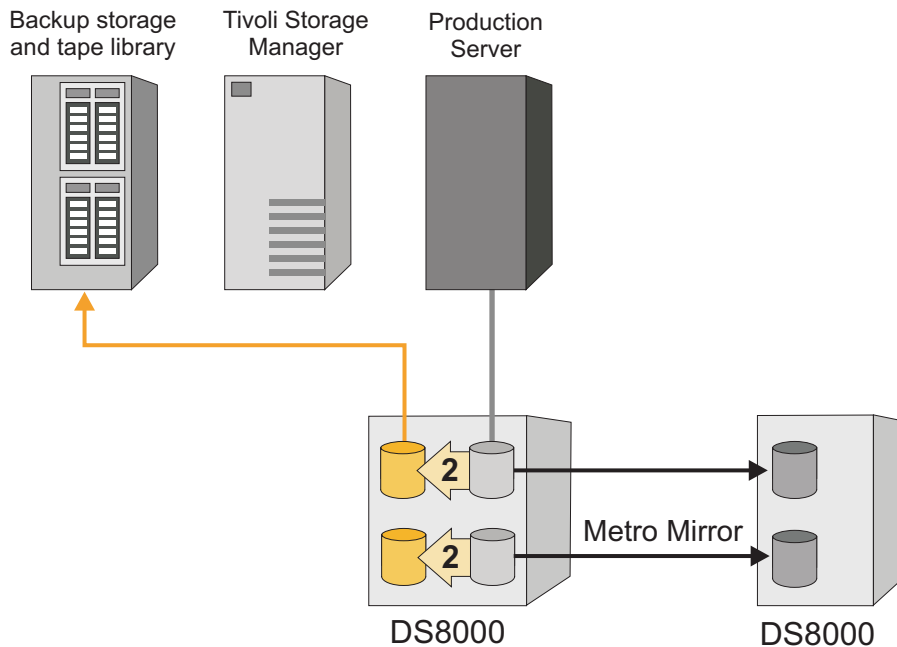


Figure 6. Metro Mirror and Global Mirror relations

## LVM mirroring and ASM failure group environments

In LVM mirroring and ASM failure group environments, multiple `DEVICE_CLASS` configuration sections (one section per storage cluster or LVM mirror) are required.

This requirement is needed even in those cases where Tivoli Storage FlashCopy Manager is connected to a proxy CIM server that manages both storage clusters. In addition, the storage system ID must be specified in the Tivoli Storage FlashCopy Manager `DEVICE_CLASS` configuration section. It must also be specified if only one storage system is managed from the CIM server. For example:

```

>>> DEVICE_CLASS MIRR_1
COPYSERVICES_HARDWARE_TYPE DS8000
COPYSERVICES_PRIMARY_SERVERNAME <hostname>
STORAGE_SYSTEM_ID 13158
TARGET_SETS VOLUMES_FILE
VOLUMES_FILE <name of target set definition file 1>
FLASHCOPY_TYPE INCR
<<<
>>> DEVICE_CLASS MIRR_2
COPYSERVICES_HARDWARE_TYPE DS8000
COPYSERVICES_PRIMARY_SERVERNAME <hostname>
STORAGE_SYSTEM_ID 12067
TARGET_SETS VOLUMES_FILE
VOLUMES_FILE <name of target set definition file 2>
FLASHCOPY_TYPE INCR
<<<

```

The `STORAGE_SYSTEM_ID` parameter is required when ASM failure groups are distributed across multiple storage devices. Each device section in the profile requires this parameter to specify the storage subsystem ID. Do not specify this parameter when all failure groups reside on the same storage subsystem.

*Table 16. STORAGE\_SYSTEM\_ID parameter description*

Parameter Name	Value
<code>STORAGE_SYSTEM_ID</code> <i>hardware ID</i>	<p>In an LVM mirror environment, this parameter specifies the name of the cluster for SAN Volume Controller. For DS8000 and XIV<sup>®</sup>, this parameter specifies the serial number that contains a complete set of at least one copy of all database logical volumes that are subject to the backup process. Only the volumes on this cluster are used during the backup.</p> <p>Default: None. Ignored if not defined.</p>

## Preparation of the backup and cloning servers

A backup server or a clone server is an auxiliary host where Tivoli Storage FlashCopy Manager can mount some or all of its backups or clones.

In environments where Tivoli Storage Manager is used, backup servers also offload the workload of a Tivoli Storage Manager backup to an alternate machine. Multiple backup or clone servers for a single application are also supported, and also sharing a backup or clone server among multiple applications. However, Tivoli Storage FlashCopy Manager does not allow backup images or clone images to be mounted directly on the production system. As a result, a backup or clone server is always required to be a separate host.

## Determining the number of backup and clone servers in the environment

After the production database has been prepared for use with Tivoli Storage FlashCopy Manager, determine how many backup servers are needed in your environment. If FlashCopy Cloning is used, determine how many clone servers are needed. A clone server can also be used as a backup server and vice versa.

A backup server allows the mounting of a backup image. If Tivoli Storage FlashCopy Manager is used in combination with Tivoli Storage Manager, Tivoli Storage FlashCopy Manager also uses a backup server to create a backup to Tivoli Storage Manager.

At least one backup server is required, when the following situations exist or tasks are planned. If FlashCopy cloning is used, a clone server is always required.

- Mount backups on another system (for example, on the backup server)
- Create a backup to tape for instance using Tivoli Storage Manager
- Tivoli Storage FlashCopy Manager enforces a mount during backup. This enforcement occurs when these conditions exist:
  - The database is running in an LVM mirrored environment on AIX
  - FlashCopy cloning is used
  - Conditions that require a forced mount for the different storage subsystem environments:

**XIV** A forced mount is required if the profile parameter `USE_CONSISTENCY_GROUPS` is set to NO and a freeze or thaw was not used for the file systems.

### **SVC, Storwize V7000 or DS**

A forced mount is required if the profile parameter `BACKUP_HOST_NAME` is set to `PREASSIGNED_VOLUMES` and the operating system is Linux or Solaris.

**DS** A forced mount is required if the profile parameter `BACKUP_HOST_NAME` is set to `PREASSIGNED_VOLUMES` and a freeze or thaw was not used for the file systems, and the operating system is AIX or HP-UX.

The number of required backup servers is then determined by the number of servers from where you access backup images. For example, to access backup images on either site of a disaster recovery environment, at least two backup servers are needed.

The number of clone servers is determined by the number of servers on which you want to have a cloned database of your production database. Backup servers and clone servers can reside on the same machine.

For a physically partitioned DB2 database, multiple backup servers are allowed to be used. The physical partitioning of the production system is not required to be identical to the physical partitioning of the backup system.

A backup server can also simultaneously be used for multiple applications and multiple production servers.



## Installation prerequisites for a backup or clone server

A host that is used as a backup or clone server must be at the same operating system level as the production system.

For cloning in Oracle environments the database SID cannot contain lower case letters. If the SID contains lower case letters, the clone database is created, but the lower case letters in the SID of the clone system will be converted to capital letters.

A database instance is required on each backup server in the following cases:

- DB2 (SAP and non-SAP).
- Oracle non-SAP.
- Oracle SAP, only if RMAN is used on the backup server and the parameter INCREMENTAL is not set to NO in the Tivoli Storage Manager for ERP profile.

If Tivoli Storage FlashCopy Manager is used in combination with Tivoli Storage Manager, a backup server can also be used. This backup server is used to offload the backup workload of a Tivoli Storage Manager backup from the production system to a backup server.

The following application agents are used by Tivoli Storage FlashCopy Manager for offload backups and must be installed on the backup server:

- DB2 native Tivoli Storage Manager agent for non-SAP<sup>®</sup> DB2 environments
- Tivoli Storage Manager for ERP for SAP<sup>®</sup> on DB2 and SAP<sup>®</sup> on Oracle
- Tivoli Storage Manager for Databases for Oracle in non-SAP<sup>®</sup> environments
- Tivoli Storage Manager Backup-Archive client in custom application environments

The appropriate database instance and application agent are required to be installed and configured on the backup server.

As a result, Tivoli Storage FlashCopy Manager requires these settings:

- The user name and group name of the database instance owner on the production system are also available on the backup server with the same user ID (UID) and group ID (GID).
- For DB2 (SAP<sup>®</sup> and non-SAP<sup>®</sup>): A database instance with the same version as the database instance on the production server is required to be installed on the backup server.
- For non-SAP<sup>®</sup> Oracle: A database instance with the same version as the database instance on the production server is required to be installed on the backup server.
- For SAP Oracle: An Oracle database instance and also SAP BR\*Tools are not required on the backup system.
- For all applications: For log file archiving and database backups to Tivoli Storage Manager of the cloned database, the appropriate Tivoli Storage Manager application agent as previously identified is installed and configured. The Tivoli Storage Manager application version on the clone server must be the same level on the production server.

For FlashCopy cloning, the appropriate database instances and application agents are required to be installed and configured on the clone server. For Oracle, only one clone instance is required. For DB2, two instances are required: the instance

with the same name as the production instance, and a second instance with the name of the cloned instance in which the cloned database is created.

As a result, Tivoli Storage FlashCopy Manager requires the following settings for FlashCopy cloning:

**For DB2 (SAP® and non-SAP®):**

The user name and group name of the database instance owner on the production system are also available on the clone server with the same user ID (UID) and group ID (GID). Another user and group with a different user ID (UID) and group ID (GID) is available on the clone server for the clone instance.

Two database instances with the same version as the database instance on the production server are required to be installed on the clone server. One database contains the production instance name and the other contains the clone instance name.

The user name and group name of the clone database instance owner on the clone system are available on the clone server with a different user ID (UID) and group ID (GID).

**For Oracle (SAP® and non-SAP®):**

A clone database instance with the same version as the database instance on the production server is required to be installed on the clone server with the clone instance name.

**For all applications:**

The appropriate Tivoli Storage Manager application agent is installed and configured. The Tivoli Storage Manager application version on the clone server must be the same level on the production server.

For Oracle in SAP® environments, SAP® BR\*Tools are not required to be installed on the backup and clone servers.

Update the Tivoli Storage Manager password on the production server and all backup servers whenever it changes. When Tivoli Storage Manager is configured to use PASSWORDACCESS GENERATE, the password might change without notification. If the Tivoli Storage Manager application is configured to use PASSWORDACCESS GENERATE, use the Tivoli Storage Manager proxy-node capability to avoid authentication errors upon password reset. Create one node (data node) on the Tivoli Storage Manager server to which all application agents (from all backup and production servers) are sending and retrieving data. Create one authentication node for each production server and backup server that is configured as proxy node to this data node.

## Backup and clone server assignment

Tivoli Storage FlashCopy Manager allows backups and clones to be mounted; however, each backup or clone image can only be mounted on one server.

Choose the appropriate method to perform a mount:

- issue the mount request command `tsm4acs -f mount` on the production server
- issue a create clone `tsm4acs -f create_clone`
- refresh clone request `tsm4acs -f refresh_clone`

Tivoli Storage FlashCopy Manager selects the backup or clone server on which the backup or clone is mounted in the following manner:

1. It determines the name of the device configuration section (DEVICE\_CLASS) that was used to create the backup or clone.
2. It determines those servers that are eligible to mount backups or clones for this DEVICE\_CLASS configuration section.

On each backup or clone server, mount agents that were initialized with DEVICE\_CLASS names through command-line entries are running. As a result, the association between both is indirectly established. The volumes that must be mounted must also be assigned to the selected backup or clone servers before mounting. For IBM XIV<sup>®</sup> Storage Systems, this assignment is automatically performed during the mount request. In mirroring environments, the device configuration section (DEVICE\_CLASS) refers to that storage cluster on which the backup or clone was created. For Oracle environments and for each DB2 database partition, Tivoli Storage FlashCopy Manager allows for one backup or clone server per device class. If the identified servers have not yet mounted another backup or clone image, the mount request is propagated to those servers. The backup or clone is then mounted.

When SAN Volume Controller is used with BACKUP\_HOST\_NAME <backup\_server\_hostname>, the volumes are also mapped dynamically on SAN Volume Controller. For details, see the description for the BACKUP\_HOST\_NAME parameter in “Profile parameter notes” on page 179.

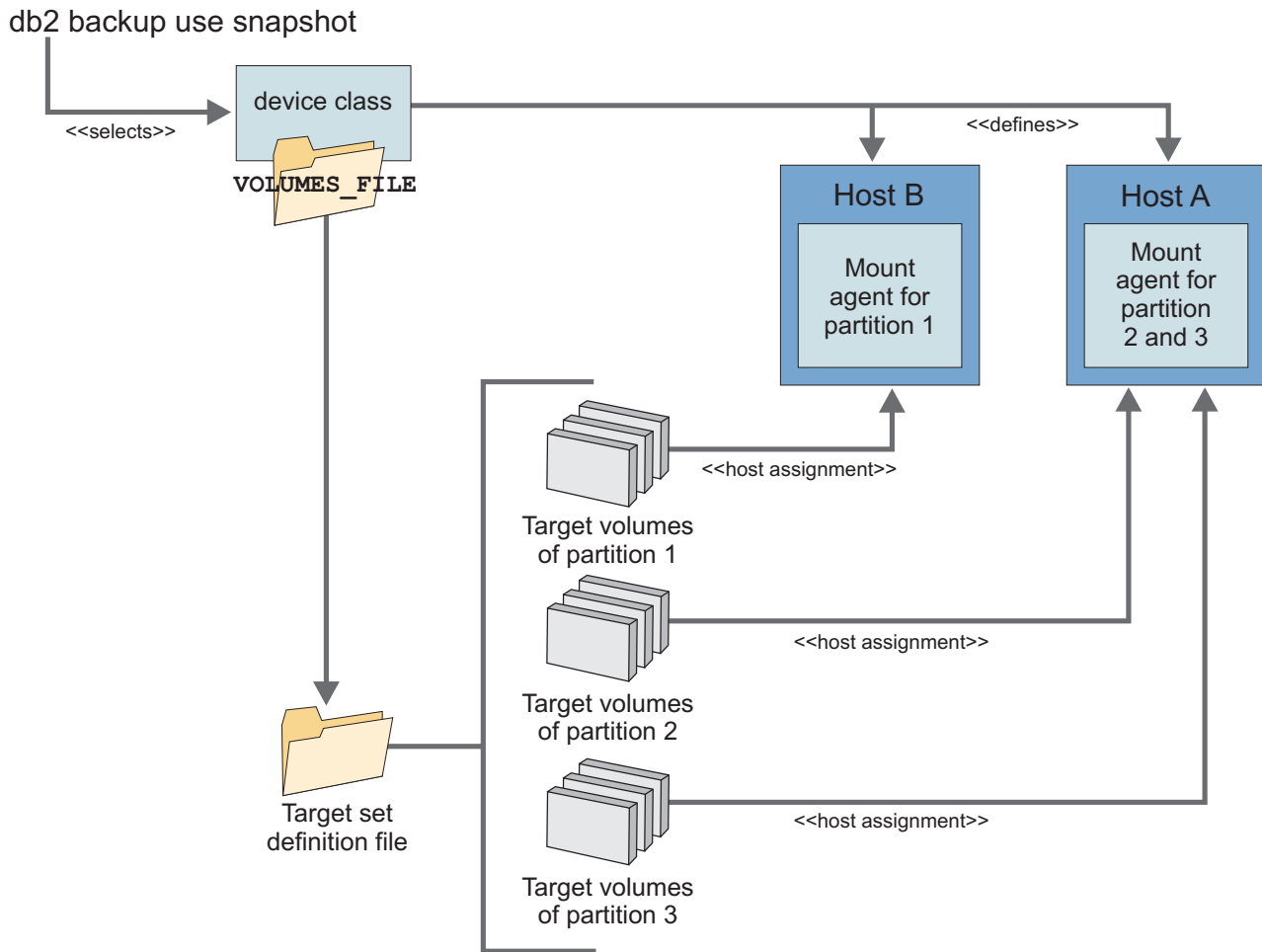


Figure 7. Tivoli Storage FlashCopy Manager host assignments for DB2.

For DS8000 and SAN Volume Controller, Tivoli Storage FlashCopy Manager requires the target volumes to be preassigned to a specific backup or clone server. Because a device class always directs mount requests to the same server, assign target volumes to a particular backup or clone server before mounting. Ensure that all target sets (associated with a specific DEVICE\_CLASS) are assigned to the same hosts. If target set definition files are used, assign all volumes within one target set definition file to the same host. This setting ensures that all targets associated with a single device class are always mounted from the same backup or clone server.

When SAN Volume Controller is used with BACKUP\_HOST\_NAME <backup\_server\_hostname>, the volumes are also mapped dynamically on SAN Volume Controller. For details, see the description for the BACKUP\_HOST\_NAME parameter in “Profile parameter notes” on page 179.

---

## Managing backups and clones with the **DEVICE\_CLASS** parameter

Use the **DEVICE\_CLASS** parameter in the **CLIENT** section of the FlashCopy Manager profile to select the storage device configurations for backups, and use the **DEVICE\_CLASS** parameter in the **CLONING** section of the profile to select the storage device configurations for cloning.

The Tivoli Storage FlashCopy Manager profile parameter **DEVICE\_CLASS** can be used as a filter to determine these backup criteria:

- Partition number
- Day of week
- Time of backup
- Device class used by last backup operation
- Cloning only: Clone database name

When used in this manner, the **DEVICE\_CLASS** parameter provides access to a specific storage device. This device is identified by the copy services type, user name, and server name defined by the corresponding **DEVICE\_CLASS** profile section. It also provides a backup policy that is device-specific. For example, this device-specific backup policy might be defined by these factors:

- List of target sets on DS8000 or SAN Volume Controller
- The type of FlashCopy<sup>®</sup> backup to be performed (for example, INCR, COPY)
- The mount location of the backup
- Whether a backup to Tivoli Storage Manager server storage is created from the snapshot

The **DEVICE\_CLASS** must be specified in the profile but it can be overridden with a command-line option. Depending on the application, the command-line option will be one of the following:

**DB2**    **OPTIONS** **DEVICE\_CLASS**=*device class* on the db2 backup command line.

### **SAP Oracle**

-S *device class* in SAP<sup>®</sup> BR\*Tools configuration profile (.sap) util\_options parameter.

When running Tivoli Storage FlashCopy Manager restore, mount, unmount, and delete commands it is not possible to specify the **DEVICE\_CLASS**. Instead, the backup ID can be specified, or the latest backup is used. Tivoli Storage FlashCopy Manager automatically uses the **DEVICE\_CLASS** that was used for the selected backup at backup time.

## **Examples of how to use **DEVICE\_CLASS** filters**

This example creates alternating backups to each mirror. Device classes **MIRROR\_1** and **MIRROR\_2** refer to two separate storage clusters. Only those backups created to **MIRROR\_2** are backed up to Tivoli Storage Manager server storage:

```
>>> CLIENT
TSM_BACKUP YES USE_FOR MIRROR_2
DEVICE_CLASS MIRROR_1 MIRROR_2
[...]
<<<
```

This example creates backups of a partitioned DB2 database with five partitions. While partition 0 uses `DEVICE_CLASS PARTITION0`, the partitions 1-4 use `DEVICE_CLASS PARTITIONX`:

```
>>> CLIENT
DEVICE_CLASS PARTITION0 ON_DBPARTITIONNUMS 0
DEVICE_CLASS PARTITIONX ON_DBPARTITIONNUMS 1 2 3 4
[...]
<<<
```

This example creates backups to `MIRROR_1` on Monday (1), Wednesday (3), and Friday (5). It creates backups to `MIRROR_2` on Sunday (0), Tuesday (2), and Thursday (4), and Saturday (6). All backups are stored on Tivoli Storage Manager server storage:

```
>>> CLIENT
TSM_BACKUP YES
DEVICE_CLASS MIRROR_1 USE_AT Mon Wed Fri
DEVICE_CLASS MIRROR_2 USE_AT Sun Tue Thu Sat
[...]
<<<
```

This example creates disk only backups during the specified period of the day. These disk only backups are considered space-efficient. A full backup is also created at midnight that is stored on Tivoli Storage Manager server storage. Although the `DAYTIME` and `MIDNIGHT` device classes might have the same configuration, two different device classes are used. This setting is used even if both device classes point to the same SAN Volume Controller cluster:

```
>>> CLIENT
TSM_BACKUP YES USE_FOR MIDNIGHT
DEVICE_CLASS DAYTIME FROM 1:00 TO 23:59
DEVICE_CLASS MIDNIGHT FROM 0:00 TO 0:59
[...]
<<<

>>> DEVICE_CLASS DAYTIME
COPYSERVICES_HARDWARE_TYPE SVC
FLASHCOPY_TYPE NOCOPY
[...]
<<<

>>> DEVICE_CLASS MIDNIGHT
COPYSERVICES_HARDWARE_TYPE SVC
FLASHCOPY_TYPE INCR
SVC_COPY_RATE 80
[...]
<<<
```

This example demonstrates how to create clone databases on different clone servers from the same production database. In this scenario, there are two clone servers, each one using a different device class. The clone server `host1` uses `DEVICE_CLASS CLONE1` and `host2` uses `DEVICE_CLASS CLONE2`. When a clone request is started with clone database `B01` selected, this clone is created with `DEVICE_CLASS CLONE1` and it is created on clone server `host1`.

```
>>> CLONING
DEVICE_CLASS CLONE1 USE_FOR_CLONING B01 C01
DEVICE_CLASS CLONE2 USE_FOR_CLONING B02 C02
<<<
>>> DEVICE_CLASS CLONE1
CLONE_DATABASE YES
...
<<<
>>> DEVICE_CLASS CLONE2
CLONE_DATABASE YES
...
<<<
```





---

## Chapter 3. Installing Tivoli Storage FlashCopy Manager

Installation consists of installing the product code and then setting up your environment.

The installation procedure consists of these tasks:

1. "Preparing the environment for installation"
2. Installing the Tivoli Storage FlashCopy Manager product code
  - "Installing on the production server and remotely on the backup or clone server" on page 51
  - "Installing separately on the backup or clone server" on page 56
3. "Setting up the disk storage environment" on page 57

**Note:** For cloning, the equivalents of the backup server, backup node, and backup system are the clone server, clone node, and clone system.

---

### Preparing the environment for installation

The environment requires certain preparations before attempting to install Tivoli Storage FlashCopy Manager.

**Important:** Before attempting to install Tivoli Storage FlashCopy Manager, make sure to review Tivoli Storage FlashCopy Manager Pre-installation checklist available on the technote: "Hardware and Software Requirements". A link to this document is available at <https://www.ibm.com/support/docview.wss?uid=swg21427692>. The Pre-installation checklist contains the most current requirement information and provides quick validation of your environment. Also, make sure to read and understand the installation and setup concepts presented in this section.

The Tivoli Storage FlashCopy Manager Pre-installation checklist provides guidance for checking the hardware, software, and environment requirements needed for successful installation. Use the Tivoli Storage FlashCopy Manager installation sheet, provided within the Pre-installation checklist, to collect all information needed for the product installation.

### Overview: Installing the product code

Tivoli Storage FlashCopy Manager must be installed on the production system. Optionally, it can also be installed on the backup system. In an environment that contains physically partitioned DB2 databases, Tivoli Storage FlashCopy Manager only needs to be installed on one of the production systems. The Tivoli Storage FlashCopy Manager installation directory is as follows (hereafter referred to as FCM\_INSTALL\_DIR):

**AIX:** /usr/tivoli/tsfcm/acs\_3.1.0.0

**Linux:** /opt/tivoli/tsfcm/acs\_3.1.0.0

**Solaris:**  
/opt/tivoli/tsfcm/acs\_3.1.0.0

**HP-UX:**

`/opt/tivoli/tsfcm/acs_3.1.0.0`

During installation, the Tivoli Storage FlashCopy Manager installer also activates the database instance for later use with Tivoli Storage FlashCopy Manager. During this activation step, the installer launches a setup script that copies all necessary files from the Tivoli Storage FlashCopy Manager installation directory to a database instance-specific or custom application-specific installation directory, and also sets their access rights.

**Tip:** You can activate additional database instances any time by invoking the setup script with the option `-a install` as the root user.

The default database instance-specific installation directory (hereafter referred to as `INSTANCE_DIR`) is as follows:

- (DB2) *Instance owner \$HOME directory/sql/lib/acs/*
- (SAP with Oracle) *Instance owner \$HOME directory/acs/*
- (Oracle) *database instance directory/acs/*

If the home directory of the database instance owner is not identical to the database instance directory, it is recommended to install in the database instance directory. This can be `$ORACLE_HOME`. For installations where `$ORACLE_HOME` is shared between multiple database instances, any other directory that is unique to this instance can be used.

For custom applications, the default installation directory is `$HOME/acs`. `$HOME` is the home directory of the application backup user. The command `./setup_gen.sh -a install -d home directory of the application backup user` creates the `$HOME/acs` folder.

## Setting up your environment: Overview

After installation (and activation) completes, use the setup script to set up Tivoli Storage FlashCopy Manager for use with your environment. You only need to set up your environment once after the initial activation of the product. Setup is required on the production system and is optionally available on the backup system.

During setup, Tivoli Storage FlashCopy Manager creates the following:

- `ACS_DIR` configuration directory as specified in the profile if it is different from the `INSTANCE_DIR` created during activation.
- Profile within `ACS_DIR` configuration directory
- A link (`INSTANCE_DIR/profile`) to the profile located in the `ACS_DIR` configuration directory if it is different from `INSTANCE_DIR`
- A password file within `ACS_DIR/shared`
- `/etc/inittab` entries for daemon processes.

For Red Hat Enterprise Linux 6, the daemon processes are started automatically with Upstart.

You can use the setup script to install Tivoli Storage FlashCopy Manager on multiple backup nodes from the production system. Install Open Secure Shell (OpenSSH) to enable backup nodes for remote installation and configuration from the production system. In addition, you can use OpenSSH or NFS shares with the setup script to update the profile. NFS shares between the production system and

backup system nodes are not required for this type of remote installation. OpenSSH is the preferred method for Tivoli Storage FlashCopy Manager but NFS shares are still supported.

When INSTANCE\_DIR is NFS-shared with other nodes, Tivoli Storage FlashCopy Manager needs to be configured on only one production system node (for federated DPF environments only on one node), and on the backup system. NFS shares are not required when using Open Secure Shell (OpenSSH) to install Tivoli Storage FlashCopy Manager on the backup system nodes.

If both the configuration directory (ACS\_DIR) and the database instance-specific installation directory (INSTANCE\_DIR) are NFS-shared between all production system and backup system nodes, Tivoli Storage FlashCopy Manager is best administered only from the production system (for Oracle or DB2) or master production system node (for physically partitioned DB2 environments). The master production system node is the production system on which Tivoli Storage FlashCopy Manager was installed. For the initial configuration, Tivoli Storage FlashCopy Manager needs to be installed, activated, and configured on the production system, and afterwards configured on the backup system. The installation and activation steps on the backup system can be skipped. Upgrades and reconfiguration should only be performed on the master production system node. There is typically no need for invoking the setup script on the backup system after initial configuration. However, you must edit the inittab entries on the backup system even though the installation and configuration directories are NFS shared. Exceptions to this rule might include:

- The use of alternative storage hardware may require a reconfiguration of Tivoli Storage FlashCopy Manager on the backup system
- Changes to the scheduling policy for offloaded TSM backups may require you to reconfigure the backup system

In these cases, you need to stop Tivoli Storage FlashCopy Manager on the production system before reconfiguration of the backup system. Otherwise you will be prompted to stop Tivoli Storage FlashCopy Manager on the production system. See Chapter 5, “Tivoli Storage FlashCopy Manager commands and scripts,” on page 85 for details regarding how to stop an activated Tivoli Storage FlashCopy Manager instance.

---

## Installing on the production server and remotely on the backup or clone server

Tivoli Storage FlashCopy Manager must be installed on the production server as described in this procedure in order to successfully perform backup and restore operations. This procedure also describes how to optionally install the product remotely on the backup server using OpenSSH.

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

`3.1.0.0-TIV-FCM-OS-platform.bin`

Throughout this procedure, available values for OS-platform are AIX, Linuxx86\_64, SolarisSparc and HP-UX. The installation must be performed as **root** user.

1. Log in to the production server as user ID **root**.
2. Use one of these three modes to install Tivoli Storage FlashCopy Manager:

- **Graphic mode**

Graphic mode requires a graphical X Window System installation. Make sure the environment variable *DISPLAY* specifies host:display, where host identifies the host name of the X Server to be contacted and display is the display number. To install in graphic mode, specify this command and press **Enter**:

```
./3.1.0.0-TIV-FCM-<OS-platform>.bin
```

- **Console mode**

To install in console mode, specify this command, and press **Enter**:

```
./3.1.0.0-TIV-FCM-<OS-platform>.bin -i console
```

- **Silent mode**

The silent mode installs and distributes Tivoli Storage FlashCopy Manager in the non-graphic console mode. Since it requires additional tasks, instructions for this installation mode are available in “Installing Tivoli Storage FlashCopy Manager in silent mode” on page 240.

3. Follow the InstallAnywhere instructions that display.
4. Check the summary issued by InstallAnywhere for successful installation. If an error occurs during the installation process, check the error messages in the output carefully and correct the problems. After correcting the errors repeat the installation procedure. For further analysis, you can find the InstallAnywhere installation log file in the FCM\_INSTALL\_DIR directory with the name installation.log.
5. Log in to the production server:
  - (DB2) as the database instance owner and change to the directory INSTANCE\_DIR
  - (Oracle or SAP® with Oracle) as the database instance owner and change to the directory INSTANCE\_DIR
  - (Custom applications) as the application backup user and change to the directory FCM\_INSTALL\_DIR
6. Start the setup script (without options) by entering the appropriate command for your database environment and press **Enter**:

**DB2:**   ./setup\_db2.sh

**Oracle or SAP® with Oracle:**

      ./setup\_ora.sh

**Custom applications:**

      ./setup\_gen.sh

You can install Tivoli Storage FlashCopy Manager in the advanced mode by using the -advanced option with the appropriate setup script command. In the advanced mode you can specify additional parameters. See “Tivoli Storage FlashCopy Manager profile parameters” on page 137 to get information about the additional parameters that are specified in the advanced mode. The default values for these parameters are suitable for most environments.

7. Follow the setup script instructions that display. Refer to the completed Tivoli Storage FlashCopy Manager installation sheet identified in “Preparing the environment for installation” on page 49. These questions must be answered during configuration. The questions might not be in the order described in this step.
  - a. Choose the type of configuration to perform:

- (1) On-site Production Server configuration with optional remote Backup Server configuration.

This selection guides you through the configuration of Tivoli Storage FlashCopy Manager on the production server. It also provides the option to remotely synchronize the configuration of one (or more) backup servers using OpenSSH.

- (2) On-site Backup Server configuration.

This selection guides you through the configuration of Tivoli Storage FlashCopy Manager on the backup server as a separate installation. See “Installing separately on the backup or clone server” on page 56 for details about this configuration.

b. Select one of these configurations:

backup only  
cloning only  
backup and cloning

Specify whether to configure the database instance for cloning, backup, or both:

- Enter 1 to configure FlashCopy Manager for backup only.
- Enter 2 to configure FlashCopy Manager for cloning only.
- Enter 3 to configure FlashCopy Manager for backup and cloning.

c. Are you going to perform offloaded backups to Tivoli Storage Manager? [Y|N]

- Specify YES to configure support for offloaded tape backups. The profile parameter configuration responds to this decision by displaying or concealing the respective sections and parameters.

**Note:** (SAP® with Oracle) If YES is specified, manually update the IBM Tivoli Storage Manager for Enterprise Resource Planning profile (init<SID>.utl) after configuration completes. This update is required since the Tivoli Storage FlashCopy Manager profile does not contain a CLIENT section after this configuration.

- Specify NO to configure support for disk-based snapshot backups only.

d. Do you want offloaded tape backups being triggered right after snapshot? [Y/N]

Offloaded backups to Tivoli Storage Manager are performed by the Tivoli Storage FlashCopy Manager offload agent (tsm4acs). Determine when to start the offloaded backup to Tivoli Storage Manager:

- Start it immediately after the FlashCopy backup completes.
- Start it at a later time by using a strategy that schedules backups on an individual basis. For example, schedule the FlashCopy backup to occur at midnight and the offloaded backup to Tivoli Storage Manager to occur at 4 am. The backup to Tivoli Storage Manager can also be delayed further until the necessary resources in Tivoli Storage Manager server are available.

Specify YES to backup to Tivoli Storage Manager immediately after the FlashCopy backup completes. The offload agent (tsm4acs) is added to the /etc/inittab. On Linux systems that use Upstart, an Upstart job configuration is created and it runs the offload agent (tsm4acs). In high-availability (HA) environments, nothing is added to the /etc/inittab directory and no Upstart jobs are created.

Specify NO to schedule offloaded backups individually. This answer requires the scheduled backup process to be invoked manually. For example add a

crontab entry. The default value is to run tsm4acs as a daemon process on the production server. In HA environments, nothing is added to /etc/inittab since tsm4acs must be added to the HA script instead. In Linux system that use Upstart, Tivoli Storage FlashCopy Manager requires at least two daemon processes to be running at all times. Tivoli Storage FlashCopy Manager can create and start Upstart jobs for the necessary daemon processes. Alternatively you may choose to start and stop these processes yourself, for instance if you want to include the processes in your HA policy.

Do you want IBM Tivoli Storage FlashCopy(R) Manager to create and start the upstart jobs for you? [y|n] [y]

- e. Tivoli Storage FlashCopy Manager requires at least two daemon processes to be running at all times. Tivoli Storage FlashCopy Manager can add the necessary daemon process to the inittab. Alternatively, you can choose to start and stop the processes yourself, for example, if you want to include the processes in your HA policy.

Do you want FlashCopy Manager to create the inittab entries for you? [Y/N]

Tivoli Storage FlashCopy Manager requires at least two daemon processes to be running at all times. Typically, the configuration wizard registers the Tivoli Storage FlashCopy Manager management daemon (acsd) and generic device agent (acsgen) in the /etc/inittab on the production server. These two daemon processes will be started even after a system reboot. If you are installing Tivoli Storage FlashCopy Manager in an HA environment, these two daemon processes must be started from your HA environment. Add them to your HA startup scripts. In addition, you must set up a mechanism to restart the daemon processes whenever they terminate, similar to what the "respawn" feature of the inittab does.

- Specify NO for the required executable files (including command-line options) to display the entries to run the daemons and for these daemon processes NOT to be added to the /etc/inittab. You must make sure that they are started by your HA startup scripts and that they are restarted whenever they are terminated.
- Specify YES to enter the daemon processes in the /etc/inittab.

**Important:** After this procedure completes, you are prompted whether to deploy the configuration to one or multiple backup systems. This deployment associates the device classes (that are specified in the profile) with the backup systems. This association is used for mounting at a later time.

- f. Select the backup system to update or delete:
- n) to configure a new backup system
  - q) to quit configuration

Tivoli Storage FlashCopy Manager requires a backup server to be available when these conditions exist:

- Offloaded backups to Tivoli Storage Manager are performed.
- FlashCopy backup consistency must be verified during a forced mount.

See "Preparation of the backup and cloning servers" on page 39 and "Managing backups and clones with the DEVICE\_CLASS parameter" on page 45 for helpful information about these conditions.

Select n to configure a new backup system using OpenSSH. OpenSSH must already be available for remote connections from the production system to



the backup system. You are prompted to specify the `DEVICE_CLASS` to be enabled on the backup system. Select one or more `DEVICE_CLASS` parameters from the list displayed on the console. Enter `q` to quit the configuration of the backup system and exit the setup script if one of these conditions exist:

- OpenSSH is not available.
- The `INST_DIR` and `ACS_DIR` are shared between the production system and backup system using NFS.
- You want to configure the backup system in a separate step.

When a backup system is configured, it is possible to run several actions on this backup system, like update, stop start, delete FlashCopy Manager agents running on the backup system or setup SSH key authentication to the backup system.

The following example illustrates this.

Select the backup system to update or delete:

- 1) acsback1
- 2) acsback2
- 3) acsback5

n) to configure a new backup system

q) to quit configuration

1

selected backup system: acsback1

The backup system on acsback1 is configured with the device class `DISK_ONLY3`.

Select the action you want to take on the backup system acsback1:

- 1) update the backup system
- 2) start the backup system
- 3) stop the backup system
- 4) delete the backup system
- 5) setup the SSH key for the backup system

b) return to the the backup system

q) quit the configuration

Select one of the options above.

The same functionality is provided for the configuration of the clone instances with SSH.

- g. If this DB2 instance is a DB2 standby server source or target, or is a source or target in a DB2 HADR configuration, you can also back up the database while it serves as the standby (or HADR) target.

Do you want to configure Tivoli Storage FlashCopy Manager to also protect the database while it acts as a standby (or HADR) target?

[Y/N]

Specify YES to back up a DB2 standby server. An additional `DB2STANDBY` section is added to the profile. If you are using an offloaded backup configuration, an offload section "`OFFLOAD_DB2STANDBY`" is added as well.

Online help is available for the actual profile parameters but not for the questions themselves. To display help information for each profile parameter, type `?` and press **Enter**. Help is best viewed in a terminal window set for at least 130 characters. The configuration wizard can create multiple entries of the same profile parameter with different values. Specify `y` when Do you want to add another instance of this parameter? displays. To delete an entry from the profile for one of these parameters, type `!d` when prompted for the parameter value.

---

## Installing separately on the backup or clone server

This separate installation of Tivoli Storage FlashCopy Manager on the backup servers is only necessary if the recommended remote installation could not be used.

Only use this procedure when either of these situations exist:

- An OpenSSH setup is not available.
- The NFS sharing of INSTANCE\_DIR and ACS\_DIR from production system to the backup system is not possible.

**Note:** NFS sharing of INSTANCE\_DIR and ACS\_DIR is not recommended unless you have a DB2 DPF environment with multiple nodes.

Information about when a backup server is needed is available in these sections:

- “Preparation of the backup and cloning servers” on page 39
- “Managing backups and clones with the DEVICE\_CLASS parameter” on page 45

1. Log in to the backup server as user ID **root**.
2. Use one of these three modes to install Tivoli Storage FlashCopy Manager:
  - **Graphic mode**

Graphic mode requires a graphical X Window installation. Make sure the environment variable DISPLAY specifies host:display, where host identifies the host name of the X Server to be contacted and display is the display number. To install in graphic mode, specify this command and press **Enter**:

```
./<version>-TIV-FCM-<OS-platform>.bin
```
  - **Console mode**

To install in console mode, specify this command and press **Enter**:

```
./<version>-TIV-FCM-<OS-platform>.bin -i console
```
  - **Silent mode**

Silent mode installs and distributes Tivoli Storage FlashCopy Manager in the non-graphic console mode. Since it requires additional tasks, instructions for this installation mode are available in “Installing Tivoli Storage FlashCopy Manager in silent mode” on page 240.
3. Follow the InstallAnywhere instructions that display.
4. Check the summary issued by InstallAnywhere for successful installation. If an error occurs during the installation process, check the error messages in the output carefully and correct the problems. For further analysis, you can find the InstallAnywhere installation log file, installation.log., in the FCM\_INSTALL\_DIR. After correcting the errors repeat the installation procedure.
5. Log in to the production server:
  - (DB2) as the database instance owner and change to the directory INSTANCE\_DIR
  - (Oracle or SAP® with Oracle) as the database instance owner and change to the directory INSTANCE\_DIR
  - (Custom applications) as the application backup user and change to the directory FCM\_INSTALL\_DIR
6. Start the setup script (without options) by entering the appropriate command for your database environment and press **Enter**:
  - DB2: ./setup\_db2.sh



- Oracle or SAP® with Oracle: `./setup_ora.sh`
- IBM Tivoli Storage FlashCopy Manager for Custom Applications:  
`./setup_gen.sh`

You can install Tivoli Storage FlashCopy Manager in the advanced mode by using the `-advanced` option with the appropriate setup script command. In the advanced mode, you can specify additional parameters. See “Tivoli Storage FlashCopy Manager profile parameters” on page 137 to get information about the additional parameters that are specified in the advanced mode. The default values for these parameters are suitable for most environments.

7. Follow the setup script instructions that display. See “Installing on the production server and remotely on the backup or clone server” on page 51 for more information about the configuration wizard.

---

## Required daemons on the production and backup system

Before starting the daemon processes manually, you must know which daemons run on the production, backup or cloning systems.

You can set up the daemon processes manually. The following list specifies where the daemons can run:

- The `INSTANCE_DIR/acsd` acs daemon runs on production system.
- The `INSTANCE_DIR/acsgen -D` generic device agent runs on production system.
- The `INSTANCE_DIR/tsm4acs -D` offload agent runs on the production system, but can also run on backup system. This daemon is only needed if offloaded backups are configured.
- The `INSTANCE_DIR/acsgen -D -M [-s deviceclass[,deviceclass]] [-Hhostname]` mount agent runs on backup or the cloning system.

---

## Setting up the disk storage environment

Each disk storage system requires its own unique configuration tasks.

Follow the steps in the appropriate procedure for your disk storage environment. Be aware that on your disk storage subsystem, data files must be defined on volume groups that are separate from the volume groups where the control files and redo logs are defined. See “Preparing the production environment” on page 17 for details about the volume group layout requirements.

**Note:** IBM XIV® Storage Systems do not require any of the steps documented in this procedure.

## Defining Logical Unit Numbers on DS8000 storage subsystems

Logical Unit Numbers (LUNs) must be defined for the DS8000 storage subsystem.

Perform these steps so that the proper LUNs are defined on both the production system and backup system:

1. Use the DS8000 Storage Manager to create two (or more) LUNs on the production system:  
Real-time manager (or Simulated manager) -> Configure storage -> Open systems -> Volumes-open systems

Note the following:

- This example creates two LUNs.
  - These LUNs are the location where your database will reside.
  - The size of the LUNs is dependent upon the size of the database.
  - The size of the source volumes on the production system and size of the target volumes on the backup system must be the same.
  - Both the Source Volume and Target Volume must be defined on the same storage subsystem.
2. Use the DS8000 Storage Manager to create the same number of LUNs for the backup system as were created for the production system in Step 1:  
Real-time manager (or Simulated manager)-> Configure storage -> Open systems -> Volumes-open systems

These LUNs must also be the same size as the LUNs created for the production system.

3. Identify the serial numbers of the target LUNs using the DS8000 Storage Manager:  
Real-time manager (or Simulated manager)-> Configure storage -> Open systems -> Volumes-open systems

Select the target LUNs created on the backup system in Step 2. Identify the serial numbers with the matching size in the source LUNs. For example:

7501901	Nickname	Number	Status	Type	GB
	sandburr_3300	3300	Normal	DS	2.0
	sandburr_3400	3400	Normal	DS	2.0

In this example, the serial numbers are 75019013300 and 75019013400.

4. Define the TARGET\_VOLUME parameter in the target volumes file specified by the VOLUMES\_FILE profile parameter with the appropriate serial numbers of the target LUNs:

```
TARGET_VOLUME 75019013300
TARGET_VOLUME 75019013400
```

This setting specifies the target volumes to which the database will be backed up.

## Defining virtual disks on SAN Volume Controller and Storwize V7000

Virtual disks must be defined for the SAN Volume Controller and the Storwize V7000 .

This procedure uses the SAN Volume Controller or Storwize V7000 console to complete the tasks. Be aware that the SAN Volume Controller or Storwize V7000 command line interface can also be used.

These instructions assume the following conditions exist:

- A functioning storage area network (SAN) is available.
- Storage disks are attached and available in the SAN Volume Controller or Storwize V7000 environment.

- Subsystem Device Driver (SDD) or Subsystem Device Driver Path Control Module (SDDPCM) is installed and available on the host machines.
- A cluster is available in the SAN Volume Controller or Storwize V7000 environment.
- Each host has at least two (or more) paths to the SAN Volume Controller or Storwize V7000 storage subsystem.

Perform these steps so that the proper vdisks are created on both the production system and backup system:

1. Create a Virtual Disk using the Managed Disk Group:

Work with Virtual Disks-> Virtual Disks -> Create Virtual Disks

Map the Virtual Disk to the hosts that were created for the production and backup systems.

2. Define the TARGET\_VOLUME parameter in the target volumes file specified by the VOLUMES\_FILE profile parameter with the appropriate vdisk names of the target LUNs:

```
TARGET_VOLUME A01pro1_1_t1
TARGET_VOLUME A01pro1_2_t1
```

Assuming the SAN Volume Controller or Storwize V7000 source volumes are named A01pro1\_1 and A01pro1\_2, then it is also possible to use the TARGET\_SETS profile parameter with a value of 1 and specify the TARGET\_NAMING parameter value as %SOURCE\_t%TARGETSET. Using this target naming definition, the source volume A01pro1\_1, with target set named 1, results in target volume A01pro1\_1\_t1.

**Note:** In this case, the TARGET\_NAMING parameter is used and a target set definition file is not needed.



---

## Chapter 4. Operating with Tivoli Storage FlashCopy Manager

Information needed to back up and restore data on FlashCopy devices and snapshot devices with Tivoli Storage FlashCopy Manager is provided. Information about database cloning is also provided.

Review the information carefully before performing a backup, restore, or cloning operation.

---

### Backing up data with Tivoli Storage FlashCopy Manager

Detailed instructions regarding how to back up DB2 (native and SAP® on DB2), Oracle (native), SAP® with Oracle databases, and custom applications (using IBM Tivoli Storage FlashCopy Manager for Custom Applications) are provided.

Tivoli Storage FlashCopy Manager provides two basic backup methods:

- Snapshot backups on storage systems
- Off-loaded tape backups to Tivoli Storage Manager

#### Backing up a DB2 database

Specific command entries are used when backing up a DB2 database.

The following table summarizes the command entries according to the database configuration and type of backup:

Table 17. Summary of Backup Commands for DB2

Database Configuration	Snapshot Backup (Disk Only)	Backup to TSM		
		From Production Database (Tape Only)	Integrated with Snapshot	From Existing Snapshot
DB2 (Native)	db2 backup .... use snapshot ...	db2 backup ...use tsm	db2 backup .... use snapshot <sup>1</sup>	fmccli -f tape_backup <sup>2</sup>
DB2 (SAP®)	db2 backup .... use snapshot ...	db2 backup... load <library> or backom	db2 backup .... use snapshot <sup>1</sup>	fmccli -f tape_backup <sup>2</sup>

#### Note:

1. In addition, the profile parameter TSM\_BACKUP is set to YES and the Offload Agent (tsm4acs) is running in daemon mode on the production server.
2. In addition, the profile parameter TSM\_BACKUP is set to YES and the Offload Agent (tsm4acs) is *not* running in daemon mode.

Snapshot backup is described in more detail in the DB2 High Availability Feature documentation. The 'db2 backup database' command with the 'use snapshot' option is described in the *DB2 Command Reference*.

As of DB2 V9.5, the DB2 Data Partitioning Feature (DPF) has a single system view (SSV) mode to back up a multi-partition database with a single command entry. Typical db2 backup commands using Tivoli Storage FlashCopy Manager would appear in this format:

- Multipartition database: db2 backup db <dbname> on all dbpartitionnums use snapshot
- Single partition database: db2 backup db <dbname> use snapshot

If a different Tivoli Storage FlashCopy Manager profile is used, specify the default INSTANCE\_DIR/acs/profile. In this case, the command would be as follows: db2 backup db <dbname> on all dbpartitionnums use snapshot options "PROFILE=<path to profile/name of profile>"

## **DB2 backups to a Tivoli Storage Manager server**

Tivoli Storage FlashCopy Manager relies on standard DB2 mechanisms to back up a snapshot image to Tivoli Storage Manager tape.

DB2 operates in either of the following environments:

- IBM Tivoli Storage Manager for Enterprise Resource Planning in an SAP environment
- DB2 native Tivoli Storage Manager agent in a native DB2 environment.

A Tivoli Storage Manager backup is performed by the following:

- The TSM\_BACKUP profile parameter in the Tivoli Storage FlashCopy Manager profile initiates a tape backup from the snapshot target set when the snapshot has completed.
- The 'tape\_backup' function of Tivoli Storage FlashCopy Manager (fcmcli), backs up a previously generated snapshot.

Tivoli Storage FlashCopy Manager and IBM Tivoli Storage Manager for Enterprise Resource Planning use their own profiles. The Tivoli Storage FlashCopy Manager profile contains a separate section (OFFLOAD) that defines the parameters related for tape backup.

Every time a profile is created or modified, the Tivoli Storage FlashCopy Manager profile wizard prompts to specify whether off-loaded backups will be performed. When YES is specified, the OFFLOAD section is added to the profile and the TSM\_BACKUP parameter is added to the CLIENT section.

### **Related concepts**

"Tivoli Storage FlashCopy Manager profile description" on page 131

### **Backups without snapshot backup disks:**

Partial backups of a database (such as tablespace backups) can be performed on the production system.

The db2 backup command might access Tivoli Storage Manager for ERP (if installed). Tivoli Storage FlashCopy Manager is not accessed for partial backups.

### **Serial and parallel backup modes for DB2 database partitioning feature partitions:**

DB2 backs up database partitioning feature (DPF) partitions in either serial mode or parallel mode.

These modes are determined by DB2 and cannot be configured by the user:

#### **Serial mode**

In serial mode (used for a native DB2 database), the partitions are processed sequentially: each partition is suspended, the snapshot created,

and the partition resumed before the next partition is processed. Tivoli Storage FlashCopy Manager returns an error during a backup if multiple partitions share a physical volume. A restore operation is always performed on a single partition.

#### Parallel mode

(SAP®) In parallel mode (default mode for an SAP DB2 database), all partitions are suspended before DB2 issues snapshot requests. The requests are then performed in parallel on all partitions. Tivoli Storage FlashCopy Manager allows multiple logical partitions to share a physical volume when these logical partitions are grouped together in a PARTITION\_GROUP. In this situation, fcmcli must be used to perform the restore. The restore proceeds in parallel for all the logical partitions specified in PARTITION\_GROUP.

#### Related tasks

Chapter 5, “Tivoli Storage FlashCopy Manager commands and scripts,” on page 85

#### Related reference

“Tivoli Storage FlashCopy Manager profile parameters” on page 137

“Offload Agent (tsm4acs)” on page 124

## Backing up a native Oracle database

Tivoli Storage FlashCopy Manager integrates with multiple components when backing up an Oracle database.

This table summarizes the command entries according to the type of backup:

Table 18. Summary of Backup Commands for Native Oracle

Snapshot Backup (Disk Only)	Backup to Tivoli Storage Manager		
	From Production Database (Tape Only)	Integrated with Snapshot	From Existing Snapshot
acsora -f backup	RMAN using Data Protection for Oracle	'acsora -f backup' with profile parameter TSM_BACKUP set to YES and Offload Agent (tsm4acs) running in daemon mode on the production server	'tsm4acs -f tape_backup' with profile parameter TSM_BACKUP set to YES and Offload Agent (tsm4acs) not running in daemon mode

Tivoli Storage FlashCopy Manager backs up the database control file and the database profile on the production system to the Tivoli Storage FlashCopy Manager repository. These files are required by Tivoli Storage FlashCopy Manager on the backup system to start the database instance and to perform the off-loaded backup to the Tivoli Storage Manager server. Furthermore, the database control file can be optionally restored during a FlashCopy® restore (profile parameter DATABASE\_CONTROL\_FILE\_RESTORE).

Tivoli Storage FlashCopy Manager does not back up the transaction logs of the Oracle database. The database administrator is responsible for periodically backing up the Oracle database transaction logs. It is recommended that the transaction logs be backed up to the Tivoli Storage Manager server after every full database online backup.

## Backups to a Tivoli Storage Manager server on native Oracle

A Tivoli Storage FlashCopy Manager backup to Tivoli Storage Manager server storage is an integral part of your overall backup strategy.

Perform regular FlashCopy backups of your databases as a part of your backup strategy. In addition, perform FlashCopy backups when any configuration changes are made to your database. Adding new physical disks, new logical volumes, new file systems, or new database containers are some (but not all) examples of such configuration changes. Be aware of these considerations when using Tivoli Storage Manager:

- Data Protection for Oracle must be configured on the backup server.
- The RMAN backup script created by the user must contain the Data Protection for Oracle TDPO\_OPTFILE environment variable. Specify the fully qualified path name to the tdpopt.options file with the TDPO\_OPTFILE environment variable. The allocate channel command and the ENV parameter MUST be specified on the same line. Also, the database command MUST be specified on a line separate from the backup command in the RMAN backup script. See “Example RMAN backup script” on page 223.

### Manually backing up a native Oracle database:

A manual backup performs a one time backup of an Oracle database.

*Table 19. Files used during a manual backup*

File name	Description	Default Location
acsora	Tivoli Storage FlashCopy Manager production system executable file	INSTANCE_DIR/acs
fcmccli	Tivoli Storage FlashCopy Manager production and backup system executable file	INSTANCE_DIR/acs
profile	Tivoli Storage FlashCopy Manager profile	ACS_DIR/profile

1. Log on to the production system as the database instance owner.
2. Run the **backup** command:

```
acsora -f backup
```

### Related concepts

“Tivoli Storage FlashCopy Manager profile description” on page 131

### Fully automating a native Oracle database backup:

A fully automated backup uses a server script to fully automate online backups of Oracle databases.

The backups on the production system can be run manually or via a scheduler.

A distinction must be made between *synchronous* and *asynchronous* offloaded backups. Synchronous means that the backup on the backup host starts as soon as a FlashCopy® has been performed. In this case, the Offload Agent (tsm4acs) is started as a daemon by the init process. Asynchronous means that offloaded backups are triggered manually or triggered by another scheduler by invoking



fcmcli. This is useful if the backup should be delayed until required resources are available. During the installation on the production server the user is asked how he wants to run offloaded backups.

#### Related concepts

“Tivoli Storage FlashCopy Manager profile description” on page 131

## Backing up an SAP® with Oracle database

IBM Tivoli Storage FlashCopy Manager integrates with multiple components when backing up an SAP® with Oracle database.

The following table summarizes the command entries for backing up an SAP® database using Oracle:

Table 20. Summary of Backup Commands (SAP® with Oracle)

Snapshot Backup (Disk Only)	Backup to Tivoli Storage Manager		
	From Production Database (Tape Only)	Integrated with Snapshot	From Existing Snapshot
brbackup -d util_vol ...	brbackup -d util_file ...	brbackup -d util_vol <sup>1</sup>	fcmcli -f tape_backup <sup>2</sup>

#### Note:

1. In addition, the profile parameter TSM\_BACKUP is set to YES and the Offload Agent (tsm4acs) is running as a daemon on the production server.
2. In addition, the profile parameter TSM\_BACKUP is set to YES and the Offload Agent (tsm4acs) is *not* running as a daemon.

To get an overview of the different components and their corresponding profiles, see “Tivoli Storage FlashCopy Manager backint profile (.utl file)” on page 146. The following parameters are used in the initDBSID.sap configuration files in these scenarios. The configuration files are only needed on the production server.

- **backup\_dev\_type:** Determines the backup medium that is used. The default is tape. In order to create a snapshot backup using Tivoli Storage FlashCopy Manager, this parameter must be set to util\_vol or to util\_vol\_online. Recommendation: Minimize the time during which the database is degraded.
- **util\_par\_file:** Specifies the path to the profile (sent to backint) using the -p parameter. Typically this is the .utl file.
- **util\_path:** Specifies the path to the backint executable. If not specified, the backint executable in /usr/sap/<SID>/SYS/exe/run is used.
- **util\_options:** Specifies the option argument which is appended to the backint call.
- **util\_vol\_unit:** Specifies the smallest unit that can be backed up with a snapshot or clone. Refer to the description of util\_vol\_unit in “SAP® BR\*Tools configuration profile (.sap)” on page 152 for further details.

## Incremental backups of an SAP with Oracle database using Oracle RMAN

IBM Tivoli Storage Manager for Enterprise Resource Planning provides incremental backups that allow only the blocks that have changed in the database to be offloaded to a Tivoli Storage Manager backup. This reduces the required space for the back-end storage dramatically.

A full backup must exist before an incremental backup can be created. If there is no full backup, it is created automatically by RMAN.

RMAN incremental backups are enabled using profile parameters in the Tivoli Storage Manager for ERP configuration file (.utl file). Table 42 on page 147 shows the details of these parameters.

To run an incremental level 1 backup on weekdays and a level 0 full backup on Sunday the following parameters should be added to the Tivoli Storage Manager for ERP configuration file (.utl file):

```
INCREMENTAL_LEVEL 1 USE_AT MON TUE WED THU FRI
```

```
INCREMENTAL_LEVEL 0 USE_AT SUN
```

A sample profile is shown in “Example profile for Tivoli Storage FlashCopy Manager for SAP® with Oracle incremental (offload)” on page 227

A recovery catalog database is needed. To set up this database see “Preparing SAP® with Oracle” on page 18.

This action must be performed on the production and on the backup host.

The recovery catalog database requires a password. This password can be set by running

```
backint -p <profile> -f catalog_password
```

## Backup scenario 1: Tivoli Storage FlashCopy Manager only

This scenario demonstrates how the SAP® BR\*Tool brbackup interacts with Tivoli Storage FlashCopy Manager (backint) during backup operations. The SAP® BR\*Tool brbackup calls backint with these command line parameters:

### -t volume, -t volume\_online

Tivoli Storage FlashCopy Manager (backint) uses the snapshot technology available on the FlashCopy device.

### -t file, -t file\_online

Tivoli Storage FlashCopy Manager (backint) transfers the Oracle control files into the Tivoli Storage FlashCopy Manager repository. Since Tivoli Storage Manager for ERP is not installed in this scenario, backint is not available in the /usr/sap/<SID>/SYS/exe/run directory. Therefore, the util\_path parameter must specify the Tivoli Storage FlashCopy Manager INSTANCE\_DIR in the SAP® BR\*Tools profile (initDBSID.sap).

The configuration in this scenario is for a **diskonly** backup.

Contents of the SAP® BR\*Tools profile (initDBSID.sap):

```
backup_dev_type = util_vol | util_vol_online
util_par_file = <ACS_DIR>/profile
util_path = <INSTANCE_DIR>
```

Settings of the Tivoli Storage FlashCopy Manager profile <ACS\_DIR>/profile:

- All files are transferred to the Tivoli Storage FlashCopy Manager repository when `backup_dev_type` specifies `util_file` or `util_file_online`, and the `ALLOW_FULL_FILE_BACKUP` parameter specifies YES in the CLIENT section of the `flashcopymanagerprofile` file. However, such an operation should not be performed unless absolutely necessary because all files are transferred into the repository and there are performance impacts in the Tivoli Storage FlashCopy Manager repository related to backup, restore, and space availability. Even for diskonly backups an integration with Tivoli Storage Manager or a third-party tape backup product should be the preferred solution. See Backup scenario 2 and Backup scenario 3.
- The parameter `ALLOW_FULL_FILE_BACKUP` specifies YES in the CLIENT section of the Tivoli Storage FlashCopy Manager profile file.

## Backup scenario 2: Tivoli Storage FlashCopy Manager and Tivoli Storage Manager for ERP installed

This scenario demonstrates how the same backint profile (`initDBSID.utl`) and SAP® BR\*Tools profile (`.sap`) can be used for a *diskonly* backup and a *dual* backup.

The SAP® BR\*Tools profile, *sap*, is only needed on the production server. A *backint* profile, `initDBSID.utl`, is needed on the production and backup server. The content of the *backint* profiles can be the same on both servers. A Tivoli Storage FlashCopy Manager profile `ACS_DIR/profile` is needed on the production and backup server. Both files are created using the profile wizard.

A diskonly backup is a backup that is created using snapshot technology with Tivoli Storage FlashCopy Manager. The backup is not copied to Tivoli Storage Manager.

A Tivoli Storage Manager only backup is a snapshot that has been created for the sole purpose of creating a Tivoli Storage Manager backup from it. The snapshot is mounted on a secondary system and copied to Tivoli Storage Manager for that purpose.

A dual backup is a hybrid of a diskonly and a Tivoli Storage Manager only backup. A dual backup is a diskonly backup that is afterwards also copied to Tivoli Storage Manager.

Therefore at least two device classes are needed in the backint profile (`initDBSID.utl`). They can be scheduled using concepts described in “Managing backups and clones with the `DEVICE_CLASS` parameter” on page 45. One device class is used for diskonly backups and one for dual backups. As a result, the `TSM_BACKUP_FROM_SNAPSHOT` parameter value is dependent on the device class because of the `USE_FOR` settings. Here it is prepared so it can be used for a diskonly backup and a dual backup as well.

**Important:** For this configuration, the Tivoli Storage FlashCopy Manager profile has no CLIENT section. Some of the parameters that are typically contained in the CLIENT section need to be stated in the `.utl` file instead. Furthermore, some of the parameters appear in the `.utl` file under a different name (for example, `TSM_BACKUP` becomes `TSM_BACKUP_FROM_SNAPSHOT`). For more information, refer to the parameters marked with a "+" symbol in the SAP with Oracle column in the table in “Tivoli Storage FlashCopy Manager profile

parameters” on page 137. More parameters must be copied out of the FlashCopy Manager profile and into the .utl file (for example, the parameters in the GLOBAL section).

These two links are used in this scenario:

- A link named *backint* in /usr/sap/<SID>/SYS/exe/run points to backint that resides in the Tivoli Storage Manager for ERP installation directory.
- A link named *backint\_volume* in /usr/sap/<SID>/SYS/exe/run points to backint that resides in the Tivoli Storage FlashCopy Manager installation directory.

Settings of the common Tivoli Storage FlashCopy Manager .utl file (commonprofile.utl):

```
TSM_BACKUP_FROM_SNAPSHOT NO USE_FOR DISKONLY
TSM_BACKUP_FROM_SNAPSHOT YES USE_FOR DUAL
DEVICE_CLASS DISKONLY USE_AT Mon Wed Fri
DEVICE_CLASS DUAL USE_AT Sun Tue Thu Sat
```

**Note:** The use of multiple device classes and TSM\_BACKUP\_FROM\_SNAPSHOT parameters in the SAP® backint profile requires Tivoli Storage Manager for ERP 6.1.1 (or later). For prior releases of Tivoli Storage Manager for ERP, control the device class by defining multiple BR\*Tools configuration profiles (.sap) in your environment.

Contents of the common SAP® BR\*Tools profile (initDBSID.sap):

```
backup_dev_type = util_vol | util_vol_online
util_par_file = <ORACLE_HOME>/dbs/initDBSID.utl
```

- Tivoli Storage FlashCopy Manager is invoked with -t volume or -t volume\_online to perform the snapshot part of the backup.
- The SAP® control files are backed up to the Tivoli Storage Manager server for **diskonly** and **dual** backups. This is the recommended backup location for the control files. To back up the control files into the Tivoli Storage FlashCopy Manager repository, specify the Tivoli Storage FlashCopy Manager installation directory with the util\_path option in the SAP® BR\*Tools profile (initDBSID.sap).

The Tivoli Storage Manager for ERP executable is invoked from /usr/sap/<SID>/SYS/exe/run and invokes *backint\_volume*, which links to Tivoli Storage FlashCopy Manager to perform the snapshot part of the backup. Invoking Tivoli Storage FlashCopy Manager with the options -t file | -t file\_online fails when TSM\_BACKUP\_FROM\_SNAPSHOT=YES is specified. This is because during dual backups, the Oracle control files should be backed up to Tivoli Storage Manager for reliability reasons.

During the restore operation, the same initDBSID.sap files used during the original backup operation must be specified. For dual backups with Tivoli Storage FlashCopy Manager and Tivoli Storage Manager for ERP, use the initDBSID.sap file to restore both backups: **diskonly** and **dual**. Tivoli Storage Manager for ERP delegates the restore of the snapshot backup to Tivoli Storage FlashCopy Manager.

## Backup scenario 3: Tivoli Storage FlashCopy Manager and third-party tape backup product

This scenario demonstrates how Tivoli Storage FlashCopy Manager and a third-party tape backup product are used in parallel. To perform **diskonly** backups, the contents of the SAP® BR\*Tools profile (initDBSID.sap) and the Tivoli Storage FlashCopy Manager profile (<ACS\_DIR>/profile) are the same as shown in Scenario 1.

There are two alternatives that you can use to perform the tape backup:

1. Offload the snapshot that is managed by Tivoli Storage FlashCopy Manager to tape from a backup server with a third-party product. In this case you must mount the snapshot to a backup server using the 'fcmcli -f mount' command. Then you can offload the mounted backup to tape, and afterwards unmount the snapshot using 'fcmcli -f unmount'. In this scenario your tape backup product must be able to do a redirected restore to the production system.
2. Do a tape backup from the production system with a third-party product and use Tivoli Storage FlashCopy Manager to create complementary snapshot backups for faster recovery.

In this case, you can use the third-party tool configuration as-is without any changes, because the FlashCopy Manager installation does not replace the backint executable located in /usr/sap/<SID>/SYS/exe/run that is provided by the third-party vendor. For this FlashCopy Manager configuration, you can proceed exactly as described in Scenario 1.

### Fully automating an SAP® with Oracle database backup

A scheduled backup starts the backup operation automatically instead of manually.

A Tivoli Storage Manager schedule or crontab (UNIX or Linux) command are examples of those schedules that can be used to automatically run the snapshot disk backups on the production system. Any other suitable scheduler can also be employed.

(SAP®) The SAP® DBA Planning Calendar (either transaction DB13 or DBACOCKPIT) can be used to schedule backups with Tivoli Storage FlashCopy Manager when the SAP® BR\*Tools profile (init<DBSID>.sap) is set up correctly.

## Backing up file systems or custom applications

Tivoli Storage FlashCopy Manager provides an application agent, the IBM Tivoli Storage FlashCopy Manager for Custom Applications, to back up file systems or custom applications.

You can use Tivoli Storage FlashCopy Manager to create a consistent snapshot image of a file system or custom application on a production system. Custom applications are file systems or any database applications other than DB2, Oracle, and SAP with Oracle (for example, Domino®, MAX DB, and WebSphere). The snapshots are managed as backup versions using the version management policies of FlashCopy Manager. The snapshots can be used as a source for instant restore operations.

You can also mount snapshot backups on a secondary system, and in Tivoli Storage Manager environments, the Tivoli Storage Manager backup archive client can be used to initiate a subsequent backup to the Tivoli Storage Manager server.

You can use the `fccli -f backup` command to protect any application or file system.

The following scenario illustrates the backup of a Tivoli Storage Manager server. In this case, the custom application is the Tivoli Storage Manager server:

1. Create a list of files and directories that have to be backed up. This list can be the directories for the DB2 table spaces and the online redo logs. If the storage device supports space-efficient snapshots, you might also include some of the Tivoli Storage Manager disk storage pools such as file pools or the active storage pool. This solution provides you with a consistent image of the system as of the time when the snapshot is created.
2. Create `preflash.sh` and `postflash.sh` scripts files that shut down and restart the Tivoli Storage Manager server, which in this case is the custom application. Add these scripts to the CLIENT section of the Tivoli Storage FlashCopy Manager profile.
3. Create a snapshot backup of the environment by issuing the following command:

```
fccli -f backup -I <infile> -p profile
```

Tivoli Storage FlashCopy Manager typically invokes the `postflash.sh` script about 10 seconds after the `preflash.sh` script ends. Within that time period FlashCopy Manager creates an offline backup of the data. As a result, the Tivoli Storage Manager server is offline for a short time.

Depending on the value of the parameter `TSM_BACKUP` in the FlashCopy Manager profile, FlashCopy Manager afterward triggers a Tivoli Storage Manager backup of the snapshot image using the backup-archive client.

The snapshot must be backed up to another Tivoli Storage Manager server to obtain a useful backup. Because FlashCopy Manager is not aware of data that has been protected, it cannot determine that FlashCopy Manager is set up correctly.

## Backing up DB2 HADR and DB2 standby servers

You can use IBM Tivoli Storage FlashCopy Manager for Custom Applications to create snapshot backups of a DB2 HADR server.

Although DB2 HADR systems cannot be backed up to a Tivoli Storage Manager server directly, snapshot backups and subsequent backups of the snapshot files are possible. You can use a `presnapshot` command to stop the DB2 HADR server, and use a `postsnapshot` command to resume DB2.

Use the `fccli -f backup_db2standby` command to create snapshot backups of a DB2 HADR or DB2 standby servers. This command is a variant of the `fccli -f backup` command that backs up custom database applications. Before starting the backup process, Tivoli Storage FlashCopy Manager communicates with DB2 to determine the list of file systems that must be protected. Sample implementations for `presnapshot` and `postsnapshot` user exits are provided. These sample scripts shut down and restart the DB2 standby server. You can customize the sample scripts.

After a DB2 takeover, the DB2 HADR standby server becomes the DB2 HADR primary server. After this takeover occurs, you are required to use the DB2 snapshot backup command for backup instead of using the `backup_db2standby` function. Tivoli Storage FlashCopy Manager is aware of this requirement and



allows you to share the profile for both types of backups so that you only need to use a different command to start your database backup depending on the current DB2 HADR database role.

It is best practice to use the same device classes for the DB2 snapshot backups and for the DB2 HADR or standby server backups. Normally there is no reason why a different device class is used for those two backup types as the storage system where the DB2 database is stored is the same and also the source volumes and target volumes are the same.

(DS and SAN Volume Controller only): If for any reason you decide to have different device classes for the two backup types but you use the same target volumes, then a DB2 snapshot backup overwrites the backup from a DB2 HADR standby server backup or vice versa, but the inquire command still shows both backups as valid.

Because Tivoli Storage FlashCopy Manager cannot directly communicate with the standby server, FlashCopy Manager queries the DB2 instance running on the production server using DB2 remote connections, and relies on the assumption that the file names for the production server database and the standby server database are identical.

Although you cannot create a Tivoli Storage Manager backup from a standby server, Tivoli Storage FlashCopy Manager triggers a file-based Tivoli Storage Manager backup from the snapshot that DB2 is not aware of. You cannot use DB2 for a database restore from the file-based Tivoli Storage Manager backups. Use the Tivoli Storage Manager backup-archive client to restore the files that have been backed up to the Tivoli Storage Manager serve. Then recover the database using the DB2 recover command.

---

## Restoring data with Tivoli Storage FlashCopy Manager

Detailed instructions regarding how to restore DB2 (native and SAP® on DB2), Oracle (native), SAP® with Oracle databases, and custom applications (using IBM Tivoli Storage FlashCopy Manager for Custom Applications) are provided.

Tivoli Storage FlashCopy Manager provides two basic restore methods:

- Restoring data from a snapshot on the storage subsystem.
- Restoring data from Tivoli Storage Manager.

### Restoring a DB2 database

Specific command entries are used when restoring a DB2 database.

The following table summarizes the command entries according to the database configuration and type of restore:

*Table 21. Summary of Restore Commands for DB2*

Database Configuration	Snapshot Restore	Restore from Tivoli Storage Manager
DB2 (Native)	db2 restore .... use snapshot ...	db2 restore ... or db2 recover...
DB2 (SAP)	db2 restore .... use snapshot ...	db2 restore ..., db2 recover... or backom

Depending on the options specified in the db2 backup database ... use snapshot ... command when the snapshot was created, both backup types (snapshot and Tivoli Storage Manager) for a particular backup level may be eligible for a restore. A snapshot backup type might not be eligible for restore (even though the snapshot backup request completed successfully) because the background copy has not yet completed. Restore from snapshot backups will handle backup objects residing on the target volumes created in the backup operation with a snapshot process. These objects are referred to as snapshots.

In a more complex environment, a restore of a DB2 multi-partition snapshot might use these commands:

```
(catalog node first)
db2_all "<+0< db2 restore db H80 use snapshot without prompting"

(remaining nodes)
db2_all "<-0< db2 restore db H80 use snapshot without prompting"
```

(DB2 on SAP®): If the snapshot backup was performed with the PARTITION\_GROUP parameter, then the restore cannot be performed with the **db2 restore** command. In this situation, you must use the Tivoli Storage FlashCopy Manager fmccli command with this syntax:

```
fmccli -f restore -d <dbname> -B <backupID> -P <partition group name>
```

If more than one partition group was used during the backup, then the restore operation must be performed for all partition groups.

## DB2 backup history file overview

DB2 provides its own history file that stores all information about backup, restore, and changes in the database (such as adding containers to a tablespace).

Issue one of these commands to list information from the backup history file:

```
db2 list history backup all for <SID>
```

or

```
db2 list history rollforward all for <SID>
```

For more information about the **db2 list history** command, see *IBM DB2 Command Reference*.

To restore a backup that was performed on the local production system, you can find the timestamp of the backup with the **db2 list history** command.

## Restoring a native Oracle database

Specific command entries are used when restoring a native Oracle database.

The following table summarizes the command entries according to the type of restore:

*Table 22. Summary of Restore Commands for Native Oracle*

Snapshot Restore	Restore from Tivoli Storage Manager
acsora -f restore [-b backup_ID]	Using Data Protection for Oracle, RMAN.

This section describes how to restore your Oracle database using the snapshot restore feature.



## Snapshot restore for native Oracle databases

This scenario demonstrates how to perform a snapshot restore of the Oracle database *myDB* when FLASHCOPY\_TYPE COPY is specified in the profile and no new file systems or logical volumes have been created on the LUNs that *myDB* resides on since the database was originally backed up.

The following conditions are assumed in the scenario described in this section:

- The redo logs for *myDB* reside in a volume group not shared with any datafiles.
- The Oracle control files are created in volume groups not shared by Oracle datafiles.
- The Oracle datafiles are created on the snapshot devices.

Follow these steps to perform a snapshot restore of database *myDB*:

1. Make sure the database to be restored is stopped. Log on to the production system and issue the following command:

```
acsora -f restore
```

This restores the latest backup. To restore an older backup the backup\_ID of this backup needs to be specified as in

```
acsora -f restore -b <backup ID>
```

acsora -f inquire (or acsutil) can be used to query for existing backup ID's.

2. After snapshot restore processing completes, you must recover the database.
  - If DATABASE\_CONTROL\_FILE\_RESTORE YES is specified in the profile, you must perform an incomplete recovery.
  - If DATABASE\_CONTROL\_FILE\_RESTORE NO is specified in the profile, you must perform a complete recovery.

At this point, snapshot restore processing is complete.

If snapshot restore processing completes successfully, you are now able to start the recovery of the restored database *myDB* and afterwards, open the database. If your snapshot restore was not successful and you receive an error message, see the log file for assistance.

## Restoring a native Oracle database from Tivoli Storage Manager

Tivoli Storage Manager backups are restored as an entire database (Restore Method One) or with datafile granularity (Restore Method Two). RMAN must be used to perform restore procedures.

### Restore Method One (Entire Database):

Perform these tasks to restore Tivoli Storage Manager backups as an entire database. (Restore Method One) or with data file granularity (Restore Method Two).

Perform these steps to restore an entire database backup:

1. Shut down the database (if necessary):

```
shutdown;
```
2. Mount the database:

```
startup mount;
```
3. Start RMAN and connect to the target database and the recovery catalog:

```
rman target username/password rcvcat username/password@connect_string
```

4. Issue the RMAN **run** command by specifying the allocation of channels and the restoration of the database. The following example is from an AIX installation:

```
run
{
  allocate channel t1 type 'sbt_tape' parms
  'ENV=(TDPO_OPTFILE=/usr/tivoli/tsm/client/oracle/bin/tdpo.opt)';
  allocate channel t2 type 'sbt_tape' parms
  'ENV=(TDPO_OPTFILE=/usr/tivoli/tsm/client/oracle/bin/tdpo.opt)';
  allocate channel t3 type 'sbt_tape' parms
  'ENV=(TDPO_OPTFILE=/usr/tivoli/tsm/client/oracle/bin/tdpo.opt)';
  allocate channel t4 type 'sbt_tape' parms
  'ENV=(TDPO_OPTFILE=/usr/tivoli/tsm/client/oracle/bin/tdpo.opt)';
  restore database;
}
```

The previous example also applies to Linux, Solaris and HP-UX, except that the path to the `tdpo.opt` file might be different. On Linux, Solaris and HP-UX, the path is likely to start with `/opt/tivoli`.

5. Recover the database (as needed) by connecting to the target database:

```
recover database;
```

If your restore is not successful and you receive an error message, see the error log file (`tdphw.log` by default) for assistance.

### Restore Method Two (Data File Only):

Perform these tasks to restore Tivoli Storage FlashCopy Manager backups with data file granularity.

Complete the following steps to restore a data file only:

1. Shut down the database if it is not already shut down:  

```
shutdown;
```
2. Mount the database:  

```
startup mount;
```
3. Start RMAN and connect to the target database and the recovery catalog. Enter the following command on one line:  

```
rman target username/password rcvcat username  
/password@connect_string
```

The RMAN command in the preceding example is divided to accommodate page formatting. The actual RMAN command string is on one line.

4. Issue an RMAN **run** command by specifying the allocation of channels and the restoration of the data file *n*, where *n* is the number of the data file. This example is from an AIX installation:

```
run
{
  allocate channel t1 type 'sbt_tape' parms
  'ENV=(TDPO_OPTFILE=/usr/tivoli/tsm/client/oracle/bin/tdpo.opt)';
  allocate channel t2 type 'sbt_tape' parms
  'ENV=(TDPO_OPTFILE=/usr/tivoli/tsm/client/oracle/bin/tdpo.opt)';
  allocate channel t3 type 'sbt_tape' parms
  'ENV=(TDPO_OPTFILE=/usr/tivoli/tsm/client/oracle/bin/tdpo.opt)';
  allocate channel t4 type 'sbt_tape' parms
  'ENV=(TDPO_OPTFILE=/usr/tivoli/tsm/client/oracle/bin/tdpo.opt)';
  restore datafile n;
}
```

This example also applies to Linux, Solaris and HP-UX, except that the path to the `tdpo.opt` file might be different. On Linux, Solaris and HP-UX the path is likely to start with `/opt/tivoli`.

5. Bring the data file online with the following SQL command, where *n* is the number of the data file:  

```
alter database datafile n online;
```
6. Recover the data file as needed by connecting to the target database and issuing:  

```
recover datafile n;
```

If your restore is not successful and you receive an error message, see the error log file for assistance.

## Restoring an SAP® with Oracle database

Specific command entries are used when restoring an SAP® with Oracle database.

The SAP® BR\*Tool BRRECOVER for Oracle databases is used as a database administration tool to help recover your database. BRRECOVER can be used from these interfaces:

- BRRECOVER command line interface
- BRTOOLS with character-based menus or GUI

BRRECOVER can be used for these tasks:

- Complete database recovery
- Database point-in-time (PIT) recovery
- Tablespace PIT recovery
- Whole database reset
- Restore of individual backup files
- Restore and application of offline redo log files
- Disaster recovery

See the SAP® BR\*Tools documentation for information regarding restore and recovery strategies.

The following table summarizes the command entries according to the type of restore:

*Table 23. Summary of Restore Commands for SAP® with Oracle*

Snapshot Restore	Restore from Tivoli Storage Manager
<code>brrestore -d util_vol .....</code>	<code>brrestore -d util_file</code>
<code>brrecover</code>	<code>brrecover</code>

## Restoring file systems or custom applications

You can use the `fccli -f restore` command to restore a file system or custom application that you backed up.

The following examples illustrate the processes that are involved in restoring file systems and custom applications.

Before you begin a restore operation, query Tivoli Storage FlashCopy Manager for all of the snapshot backups that have been taken using the `fccli -f inquire` command. To restore a file system or custom application, do the following steps:

1. Specify what data you want to query. Use one of the following methods:
  - Specify #NULL to query Tivoli Storage FlashCopy Manager for a list of all backup

- Specify a backup ID to query the details of a particular snapshot backup
  - Use the `fccli -f inquire_detail` function to query additional information about the backup (for example, the type of snapshot, the background copy progress, and so on).
2. After running the query, use the `fccli -f restore` command to perform a full or partial snapshot restore of the data that was backed up:
    - To perform a full snapshot restore, provide Tivoli Storage FlashCopy Manager with a backup ID from the query that you ran. If you want to restore the latest backup, you can specify `#NULL`.
    - To restore only a portion of the data, specify a list of files explicitly. Although Tivoli Storage FlashCopy Manager performs restores at a volume level, additional data might be restored as part of the volume restore operation. You can use the parameter `NEGATIVE_LIST` to specify what actions Tivoli Storage FlashCopy Manager takes in these situations.

You can use the backup-archive client to query and restore data from the Tivoli Storage Manager server. Although FlashCopy Manager provides assistance in creating a Tivoli Storage Manager backup from a snapshot, FlashCopy Manager does not provide any assistance for the restore operation. You can use the following options to facilitate the restore:

#### **MODE FULL or MODE DIFF**

You can correlate a Tivoli Storage Manager backup with the corresponding FlashCopy backup by comparing the FlashCopy Manager backup ID with the name of the file list that is backed up as part of the Tivoli Storage Manager backup

#### **MODE ARCHIVE**

You can correlate a Tivoli Storage Manager backup with the corresponding FlashCopy backup by comparing the FlashCopy Manager backup ID with the name of the archive description of the Tivoli Storage Manager backup.

## **Restoring DB2 HADR and DB2 standby server environments**

You can use the `fccli -f restore_db2standby` command to restore a Tivoli Storage FlashCopy Manager snapshot backup of a DB2 HADR server.

This function is a variant of the `fccli -f restore` function that relies on parameters that are optimized for DB2 standby databases. When starting this command on the DB2 HADR standby server, Tivoli Storage FlashCopy Manager tries to stop the DB2 database manager. If the DB2 database is still activated or DB2 HADR is still running, the `restore_db2standby` function fails because it cannot stop the DB2 database manager. Before starting the restore, the database must be deactivated and DB2 HADR must be stopped first. The database deactivation and stoppage are intentionally not done by Tivoli Storage FlashCopy Manager.

A restore operation of an offloaded tape backup from Tivoli Storage Manager can be performed by directly running Tivoli Storage Manager backup-archive client commands on the production system. Tivoli Storage FlashCopy Manager is not needed in this case. To do this efficiently, use proxy node setups, although FlashCopy Manager does not help in the setup and configuration of proxy nodes.

Tivoli Storage FlashCopy Manager maintains a backup ID that can uniquely identify any snapshot backup. Because backup-archive client backups are not associated with backup IDs, there is no correlation between a snapshot backup and its corresponding Tivoli Storage Manager backup, other than the time when either

backup was created. In configurations where the offloaded Tivoli Storage Manager backup is scheduled at a different time from the snapshot backup, this correlation can be difficult to achieve. If you want to maintain that relationship explicitly, Tivoli Storage FlashCopy Manager can use the archive method for offloaded Tivoli Storage Manager backups. This way, Tivoli Storage FlashCopy Manager can correlate both backup methods by using the snapshot backup ID as the archive description for the offloaded backup.

---

## Database cloning

The database cloning process creates an exact copy of a database to provide near-production data for various business needs.

Databases are cloned frequently for the following business needs:

- To test new developments with the actual production data by creating test and quality assurance systems that are recreated regularly from the production systems
- To create a migration or upgrade system from a production system before introducing a new product release or new functions into production
- To create education systems from a master training system to reset before starting a new course
- To create dedicated reporting systems to offload workload from the production environment

The database cloning process can be done by either physically or logically copying the data or by running a redirected restore. Using traditional methods like redirected restore has various challenges, including system downtime and degraded system performance during the cloning process.

## Tivoli Storage FlashCopy Manager cloning

Tivoli Storage FlashCopy Manager uses the FlashCopy or snapshot function of the storage systems for database cloning. This method eliminates downtime and minimizes the impact on the production database.

Furthermore, Tivoli Storage FlashCopy Manager provides a framework for executing user-defined preprocessing and postprocessing scripts. This framework allows the fully automated creation of database clones, which eliminates the need for an intermediate backup. As a result, the time to generate a cloned database is reduced from hours to minutes.

With Tivoli Storage FlashCopy Manager, a cloning process can be started with an online or offline source database (DB2 or Oracle). For online FlashCopy Manager cloning, the source database is suspended for a short time. The suspension occurs when the storage system creates its FlashCopy or snapshot of the source database.

The cloned database (target database) can have the same database name as the source database. The cloned database can also be renamed to any valid database name during the FlashCopy Manager cloning process. Tivoli Storage FlashCopy Manager requires the cloned database to be created on a different database server than the source database server regardless of whether the clone database name is changed.

## Tivoli Storage FlashCopy Manager cloning process

Information about the Tivoli Storage FlashCopy Manager cloning process is provided.

The Tivoli Storage FlashCopy Manager cloning process is initiated by either of the following commands, with the appropriate command-line options:

- `fccli -f create_clone`
- `fccli -f refresh_clone`

The following processing occurs:

1. The selected preprocessing scripts are run, including stopping the clone database. This step only occurs when using the `refresh_clone` command with the `-X <pre-processing configuration file>` option.
2. The FlashCopy clone is unmounted on the clone system. This step occurs only when using `refresh_clone` function.
3. A new FlashCopy clone is created, including the suspension and resumption of the source database, and mounted on the clone system.
4. The cloned database is recovered.
5. The cloned database is renamed to the target database name.
6. Tivoli Storage FlashCopy Manager starts the cloned database.
7. The selected postprocessing scripts are run to clean up the clone database. This step occurs only when the `-Y <post-processing configuration file>` option is used.

## Database cloning preprocessing and postprocessing

Repetitive processing steps that occur before and after database cloning can be automated by scripts.

The required functions in the automated scripts depend largely on the cloning environment. Because all possible environments cannot be covered by one package, preprocessing and postprocessing must be considered outside the scope of FlashCopy Manager cloning.

Tivoli Storage FlashCopy Manager provides a framework in which you can run shell scripts and DB2 or Oracle SQL scripts on the clone system. Run the shell scripts before a clone database is unmounted and after a new clone database has been created. With this capability, you gain the ability and flexibility to fully automate the cloning process.

For more information about the preprocessing and postprocessing configuration files, see “Configuration files used for cloning” on page 203.

### Usability States:

The usability state of a snapshot backup is observed to determine how it can be used by other functions. A snapshot backup generation can have one or more of the following states to indicate how it can or must be used by other Tivoli Storage FlashCopy Manager functions.

*Table 24. Usability States*

Usability state value	Meaning
REMOTELY_MOUNTABLE	Backup data can be mounted from a remote machine.

Table 24. Usability States (continued)

Usability state value	Meaning
REMOTELY_MOUNTABLE	Backup data can be restored (the image can be used multiple times)
DESTRUCTIVELY_RESTORABLE	Data can be restored (upon restore, other backups are potentially destroyed)
SWAP_RESTORABLE	Restore is possible by using the backup volumes directly rather than copying the data back to the source volumes. For storage systems like DSor SAN Volume Controller this means that, in the restore case, the target volumes can be assigned to the system on which the restore is performed. This avoids the background copy process in the storage volume
PHYSICAL_PROTECTION	The snapshot guarantees protection from physical failures on the source volumes, there is no longer a dependency on the source volumes. This does not necessarily mean that a FULL_COPY must be created with each snapshot. For example, block-level continuous data protection (CDP) mechanisms typically replicate the data once and then record only changes
FULL_COPY	A full copy of the data has been generated.
INCOMPLETE	A portion of the data that has been backed up has been deleted and can no longer be restored. This can happen, for example, after a partial restore of an old backup that is only DESTRUCTIVELY_RESTORABLE.
MOUNTING	The mount has been requested on the backup server.
MOUNTED	This backup is currently mounted on a backup server.
DELETING	Indicates that a backup is marked for deletion (The deletion was requested).
DELETED	Indicates that the backup has been deleted. For XIV, this is a physical deletion.
BACKGROUND_MONITOR_PENDING	Indicates that a required background copy process is not yet active or not yet finished. The device agent checks for backups with this state and monitors the associated volumes until the background copy is finished. This state is then replaced by FULL_COPY.



Table 24. Usability States (continued)

Usability state value	Meaning
TAPE_BACKUP_PENDING	Indicates that a requested tape backup has not yet started or is not yet finished successfully. The offload agent checks for backups with this state and performs the requested tape backup. After the tape backup has finished successfully, this state will be reset. If the tape backup terminates with an error, the TAPE_BACKUP_PENDING state remains set, TAPE_BACKUP_IN_PROGRESS is reset, and the <i>retry</i> counter is incremented.
TAPE_BACKUP_IN_PROGRESS	Indicates that the Tivoli Storage FlashCopy Manager offload agent has started the requested tape backup. If the backup fails, only this state is reset. In a DB2 DPF environment, this state is also used as the overall state to indicate that some partitions are successfully backed up to tape and others are still pending backup to tape.
TAPE_BACKUP_COMPLETE	Indicates that the Tivoli Storage FlashCopy Manager offload agent has successfully finished the requested tape backup. In a DB2 DPF environment the TAPE_BACKUP_COMPLETE state is set as overall state only when all partitions of the database are successfully backed up to tape.
TAPE_BACKUP_FAILED	Indicates that the tape backup of the Tivoli Storage FlashCopy Manager offload agent has failed. In a DB2 DPF environment, the TAPE_BACKUP_FAILED state is set as overall state when at least one partition of the database failed during tape backup.
CLONE_DATABASE	Indicates that a Tivoli Storage FlashCopy Manager cloning operation was performed.
RESTORING	Indicates that a Tivoli Storage FlashCopy Manager restore operation was performed.

### Usability State Diagrams:

The following usability state diagrams show the state changes during different operations. The green arrows are used for actions that the you can start. The blue arrows are used for actions that are performed automatically by Tivoli Storage FlashCopy Manager. The black arrows indicate the Tivoli Storage FlashCopy Manager operation that a you can use to change usability states.

### Snapshot Backup:

The first state diagram shows the usability state transitions during aTivoli Storage FlashCopy Manager snapshot backup operation. Depending on the storage system (DS, SAN Volume Controller or XIV) some states differ. For example on XIV, the snapshot backup is immediately restorable and the restore can be repeated multiple times. On DS and SAN Volume Controller the snapshot backup requires a background monitoring operation (acsgen -D) that removes the



BACKGROUND\_MONITOR\_PENDING state and instead sets the FULL\_COPY and PHYSICAL\_PROTECTION state for example (depending on the FlashCopy type that was used for the snapshot backup). Background monitoring operations (acsgen -D) are running automatically.

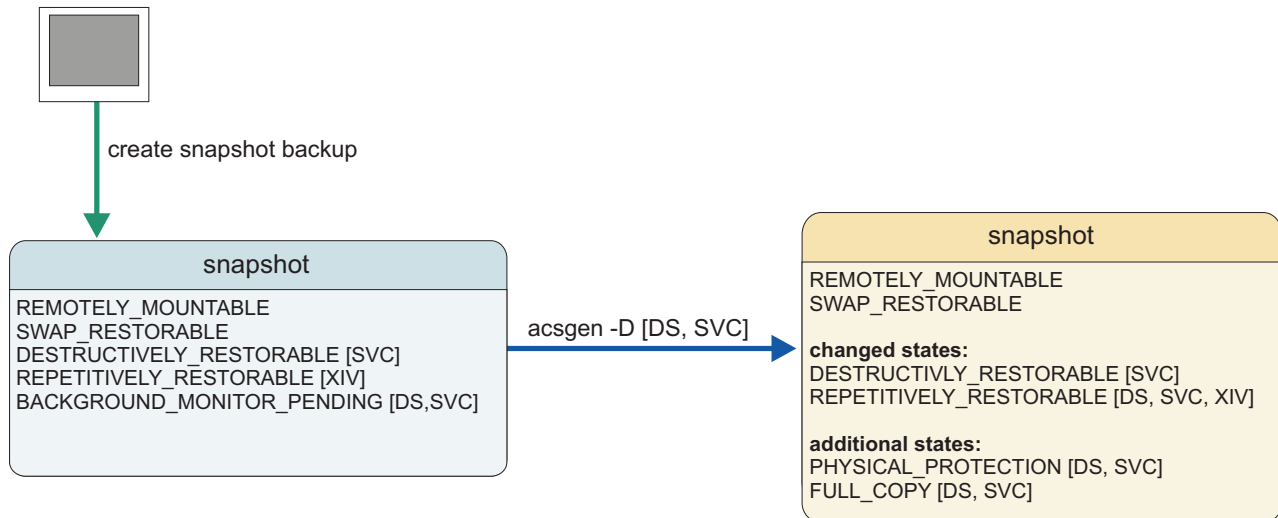


Figure 8. Usability States during Snapshot Backup

#### Snapshot Restore:

The second state diagram shows the usability state transitions during a Tivoli Storage FlashCopy Manager snapshot restore operation. On the DS and SAN Volume Controller storage systems, the usability states change during a snapshot restore operation. But on the XIV storage systems, no change happens on the usability states. For DS and SAN Volume Controller systems, the BACKGROUND\_MONITOR\_PENDING state is switched on and also a RESTORING state. The background monitor process (acsgen -D) will then reset both states when the copy process in the storage system has finished. Background monitoring operations (acsgen -D) are running automatically.

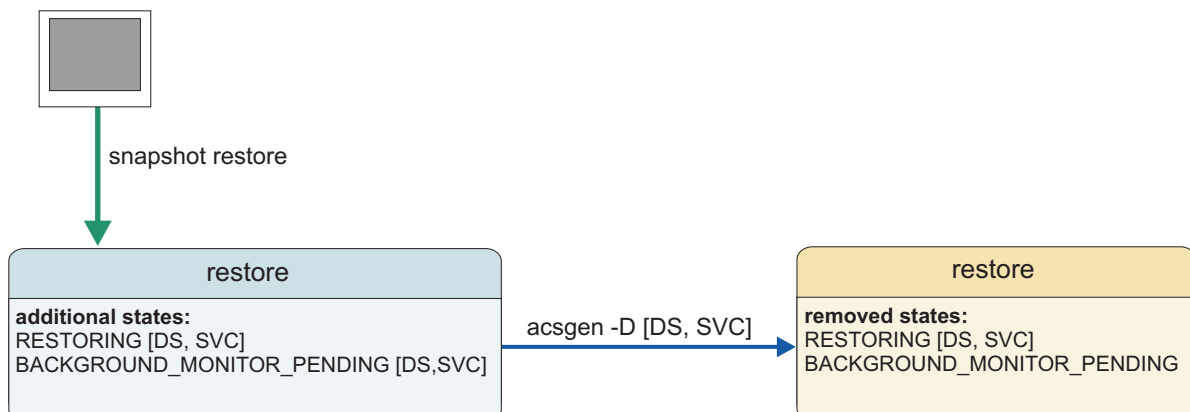


Figure 9. Usability States during Snapshot Restore

#### Snapshot Delete:

The next state diagram shows the usability state transitions during a Tivoli Storage FlashCopy Manager snapshot delete operation. There are two types of delete

operations: delete and delete with force option. For both types, the snapshot backup will first be marked with the DELETING state and a background monitoring operations (acsgen -D), which is running automatically in background, will then switch the states to DELETED. On the XIV storage system, the snapshot in the XIV is deleted by the background monitor agent and the snapshot backup is also deleted from the Tivoli Storage FlashCopy Manager repository. On the DS and SAN Volume Controller storage systems, the FlashCopy relations are not deleted by the background monitor operation unless the delete force option was used on the delete command. On the DS and SAN Volume Controller systems, the snapshot backup is not deleted from the Tivoli Storage FlashCopy Manager repository. Instead a deleted snapshot backup can be reused by a new creation of a snapshot backup.

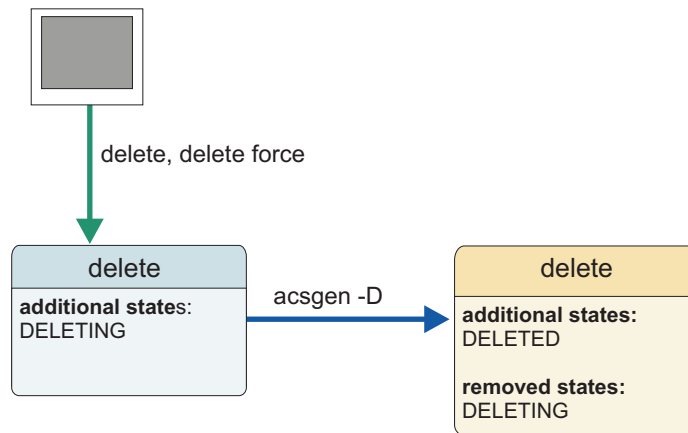


Figure 10. Usability States during Snapshot Delete

### Snapshot Mount:

The next state diagram shows the usability state transitions during a Tivoli Storage FlashCopy Manager snapshot mount operation. You can start a snapshot mount operation by using the mount function of the FlashCopy Manager command-line interface or start it automatically during the creation of a snapshot backup (in the latter case, it is named a forced mount operation). In either case, the mount operation first changes the state to MOUNTING. If the mount operation finishes successfully, the state changes from MOUNTING to MOUNTED. If the mount operation fails, the state stays on MOUNTING. The only operation is allowed to remove a MOUNTING or MOUNTED state is a successful Tivoli Storage FlashCopy Manager unmount operation. If the unmount operation finishes successfully, the MOUNTING or MOUNTED state is removed. If the unmount operation fails, the state remains as MOUNTING or MOUNTED. An unmount force operation is never needed for unmounting unless an offloaded tape backup is currently in progress (see the Snapshot Offload diagram in the next subsection).

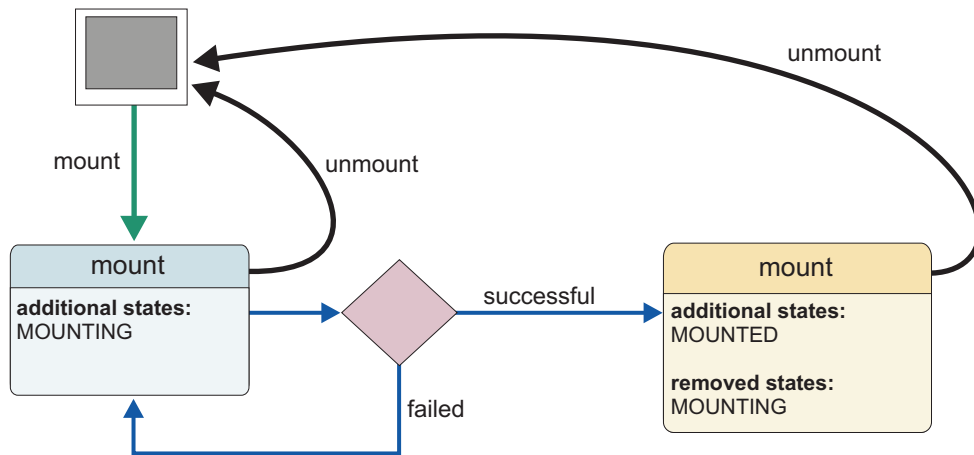


Figure 11. Usability States during Snapshot Mount

### Snapshot Offload:

The last state diagram shows the usability state transitions during a Tivoli Storage FlashCopy Manager snapshot offload operation. You can start a snapshot offload operation with the `tape_backup` function of the FlashCopy Manager command-line interface or run it automatically with the offload agent, which is running in the background (`tsm4acs -D`). If the snapshot backup is not already mounted successfully, a mount operation is started automatically. The mount operation changes the state first to MOUNTING and then to MOUNTED. After that (or in case that the snapshot backup was already mounted), the offload operation adds a state `TAPE_BACKUP_IN_PROGRESS` and performs the offloaded tape backup. If this operation is successful, the state switches from `TAPE_BACKUP_IN_PROGRESS` to `TAPE_BACKUP_COMPLETE`. Otherwise the `TAPE_BACKUP_IN_PROGRESS` state switches to a `TAPE_BACKUP_FAILED` state and the `TAPE_BACKUP_PENDING` state persists. In either case, the automatic unmount operation is started and the MOUNTED state is removed with the operation completes successfully. If the mount operation failed or the tape backup operation was terminated and the MOUNTED or MOUNTING state remains, because the only operation that can remove these states is a successful Tivoli Storage FlashCopy Manager unmount operation. If the unmount operation finishes successfully, the MOUNTED or MOUNTING state is removed. If the unmount operation fails, the states are not removed. An unmount force operation is only needed for unmounting when an offloaded tape backup is currently in progress (`TAPE_BACKUP_IN_PROGRESS` is still set). The unmount force operation resets the `TAPE_BACKUP_IN_PROGRESS` state when it has successfully completed the unmount.

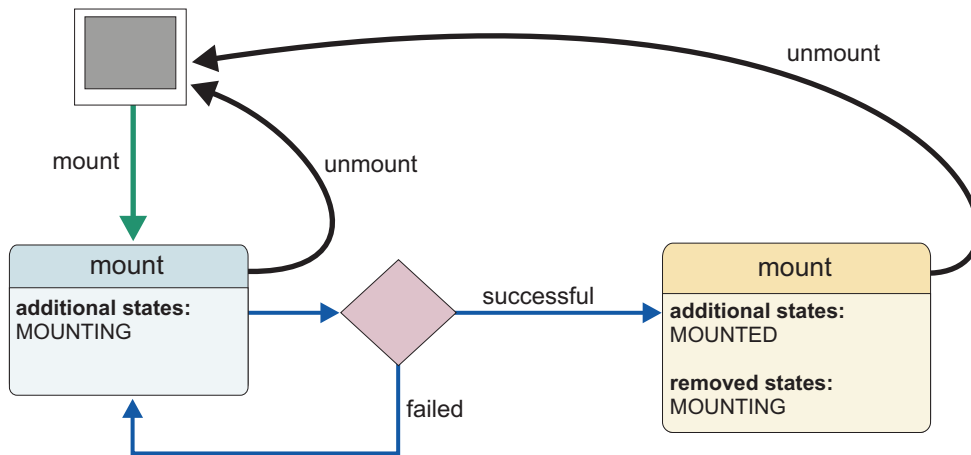


Figure 12. Usability States during Snapshot Offload

The usability state TAPE\_BACKUP\_PENDING can be removed by using the Tivoli Storage FlashCopy Manager function `update_status` with the option `-S TSM_BACKUP=NO`. It can further be removed by starting a new snapshot backup with the option `TSM_BACKUP[_FROM_SNAPSHOT]=LATEST`, which automatically removes the usability state TAPE\_BACKUP\_PENDING from all snapshot backups that currently exist in the Tivoli Storage FlashCopy Manager repository

---

## Chapter 5. Tivoli Storage FlashCopy Manager commands and scripts

A list of various commands and scripts that are used with Tivoli Storage FlashCopy Manager operations is provided.

---

### Backup and restore commands and utilities

The commands to trigger a snapshot backup or snapshot restore, and to inquire and delete snapshot backups within the Tivoli Storage FlashCopy Manager repository are described.

#### Backup and restore commands for DB2

Tivoli Storage FlashCopy Manager fully integrates with DB2 backup utilities like the `db2 backup` and `db2 restore` commands that are documented in detail in the *DB2 Command Reference*. In this section, information about FlashCopy Manager specific extensions of the DB2 backup and restore interfaces is provided.

For detailed information about how to use DB2 to create snapshot backups, see the *DB2 Command Reference*.

You can use the options in the following table as parameters in the `<option string>` option to be specified with the following commands:

- `db2 backup db <dbname> [...] use snapshot options "<option string>"`
- `db2 restore db <dbname> [...] use snapshot options "<option string>"`
- `db2acsutil [...] options "<option string>"`

where "`<option string>`" has the form "`<parameter>[=<value>]` [`<parameter>[=<value>]` ...]".

Table 25. Options available for `db2 backup`, `db2 restore`, and `db2acsutil`

Parameter	Value	Default
PROFILE	Absolute path and file name of profile	<ACS_DIR>/profile
TSM_BACKUP	YES, MANDATE, LATEST, NO  See Table 41 on page 140 for detailed explanations of these values	As specified in the profile
DELETE_FORCE	No value. See note.	For DS8000 and SAN Volume Controller, incremental FlashCopy Relations are not withdrawn
DEVICE_CLASS	<i>device_section_name</i> in profile	As specified in the profile

Table 25. Options available for db2 backup, db2 restore, and db2acsutil (continued)

Parameter	Value	Default
<b>Note:</b>		
1. (DELETE_FORCE) Applies to db2acsutil only:		
<ul style="list-style-type: none"> <li>In conjunction with 'db2acsutil delete', withdraws any FlashCopy relations currently in effect for the target set represented by the backup (applicable to CIM devices only). A manual withdraw of FlashCopy relations is needed in case of a restore when multiple target sets are in use and at least one target set other than the one to be restored is in a NOCOPY or INCR FlashCopy® relation.</li> <li>In conjunction with 'db2acsutil query', also lists backups deleted without the DELETE_FORCE option.</li> </ul>		
2. (TSM_BACKUP), (DEVICE_CLASS) Applies to db2 backup only.		

### **fcmcli -f [inquire, inquire\_detail, delete, restore]**

The **fcmcli** command provides an extension to the native DB2 utilities that enables you to query the FlashCopy Manager repository for valid snapshot backups and to restore snapshot backups by bypassing the db2 restore ... use snapshot command.

The db2 restore ... use snapshot command might be needed in partitioned DB2 environments with SAP workload, where multiple DB2 partitions reside on a single volume group (whose backups cannot be restored directly from DB2).

```

>> fcmcli [-p profile] function-clause [-c acsd_hostname[:acsd_port]]
          [-l acs-directory] [-t] [-d database-name] [-i instance-name]
          [-B backup ID] [-P partition_group_name]

```

The values for the function-clause parameter are described in the following sections.

#### **function-clause: FlashCopy operations of DB2 with partition group**

The following functions are supported by the fcmcli command option -f 'function' for FlashCopy restores of DB2 with partition group:

```

>> -f restore -B backup ID -P partition_group_name [-d database-name]
          [-i instance-name]

```

#### **function-clause: FlashCopy operations of DB2 with and without partition group**

The following functions are supported by the fcmcli command option -f 'function' for FlashCopy inquire and delete of DB2 snapshots:

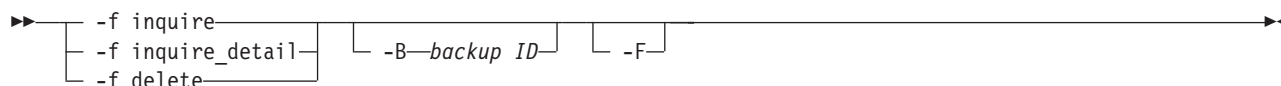


Table 26. Options for the Tivoli Storage FlashCopy Manager 'fcmcli' command

Option	Description	Default
-p profile	Full profile name.	<INSTANCE_DIR>/profile
-c acsd-hostname	Name of the server where the management agent (acsd) is running	localhost
acsd-port	TCP/IP port number or service name on which the management agent (acsd) is listening	57328
-l acs-directory	Directory where the 'logs' and 'shared' directories can be found.	<ACS_DIR>
-d database-name	Database name. Required for '-F' option.	No limitation.
-i instance-name	Instance name to apply to the command. Required for '-F' option.	No limitation.
-F	(DELETE_FORCE flag) Applies to inquire, inquire_detail and delete: <ul style="list-style-type: none"> <li>With the delete function, withdraws any FlashCopy relations currently in effect for the target set represented by the backup (applicable to DS and SAN Volume Controller only).</li> <li>With the inquire[_detail] function, also lists backups deleted without the DELETE_FORCE flag.</li> </ul>	None.
-t	Start with trace on.	Trace off
-v	Display version.	
-h	Display help text.	
-B	The Backup ID as displayed by fcmcli -f inquire [_detail] or db2acsutil.	None.
-P	The name of a partition group as specified in the profile with the PARTITION_GROUP parameter. See Table 41 on page 140 for details.	None.

The return code of the fcmcli command is 0 if it finishes the request without an error or if there were no candidates for the request. Further, the return code is 1 if one or more minor issues occurred that are not critical but should be checked to prevent major issues later. Return code 2 indicates that an error occurred during the command execution.

The following sections describe the details of the various functions specified with the '-f' option of the Tivoli Storage FlashCopy Manager command **fcmcli**.

**-f inquire:**

This command queries the backup repository and lists all available backups.

This command is of special interest in environments where multiple partitions reside on the same volume group (volume sharing).

**-f inquire\_detail:**

This command queries the backup repository and lists all available backups.

This command is similar to `-f inquire` but prints additional information like usability states and background copy progress for each backup. This command is of special interest in environments where multiple partitions reside on the same volume group (volume sharing).

**-f delete:**

The delete function is used as part of the version control mechanism of Tivoli Storage FlashCopy Manager and can only be called by Tivoli Storage FlashCopy Manager itself or by a user. The delete function can only be used to delete full backups.

You can use the delete function to delete a snapshot and eventually free the resources that are associated with this particular backup. The exact behavior of the delete function depends on the characteristics of the storage device. The `-f delete` function operates exclusively on snapshot backups. Backups to Tivoli Storage Manager are not affected by this command.

The impact of the deletion on the snapshot or FlashCopy relations is dependent on the storage system:

- IBM XIV Storage System: The snapshot is not deleted when the delete command is issued.
- IBM System Storage DS8000 and SAN Volume Controller: The FlashCopy relations are not deleted when the delete command is issued. Specify the `-F` option to force the deletion of the FlashCopy relations on these storage systems.

The following example shows the syntax as database instance owner on the production system:

```
./fcmcli -f delete [-F]
```

**-f restore:**

This command starts a restore operation in environments where multiple partitions reside on the same volume group.

See Table 41 on page 140 for details about how to use this command with the `PARTITION_GROUP` parameter.

For such environments the DB2 restore interface cannot be used and `fcmcli -f restore` serves as an alternative interface to trigger the restore operation. During the restore operation the DB2 database will be stopped and a FlashCopy restore is initiated. After the restore operation is completed the database will be started and initialized. The following parameters are also required in order to perform the `-f restore` operation:



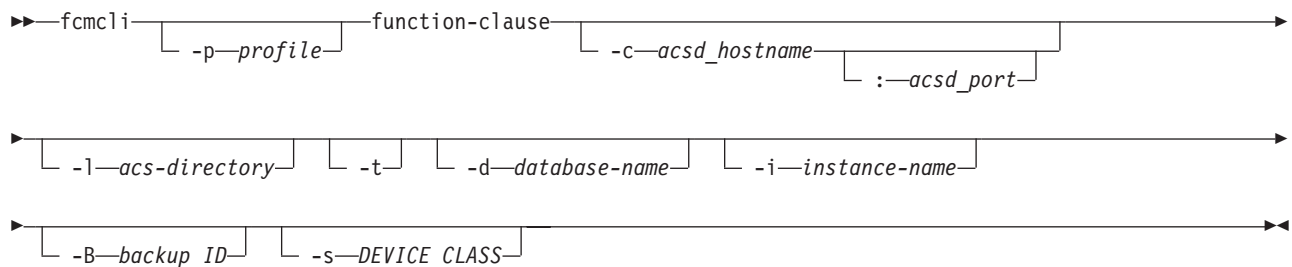
-d database-name  
 -B backup-id  
 -P partition\_group-name

The restore operation is performed for all partitions that correspond to the specified partition group.

## **fcmcli -f \*\_db2standby - support of DB2 standby server (DB2 HADR) environments**

Information for the support of DB2 standby server and DB2 HADR environments are provided.

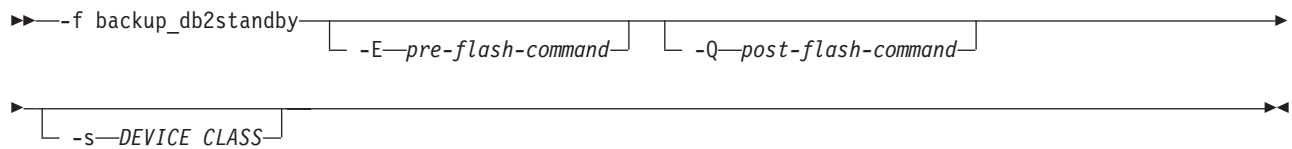
IBM Tivoli Storage FlashCopy Manager for Custom Applications enables you to create snapshot backups of DB2 standby server and DB2 HADR environments, and to create a backup to Tivoli Storage Manager from a snapshot using the Tivoli Storage Manager backup-archive client. Both of these functions are an extension to the native DB2 backup interface and therefore cannot be invoked with native DB2 utilities such as the db2 backup and db2 restore commands.



The values for the function-clause parameter are described in the following sections.

### **function-clause: FlashCopy operations of DB2 HADR databases**

The following functions are supported by the fcmcli command option -f 'function' for FlashCopy backups of DB2 HADR databases:



The following functions are supported by the fcmcli command option -f 'function' for FlashCopy restore, inquire, and delete of DB2 HADR databases:

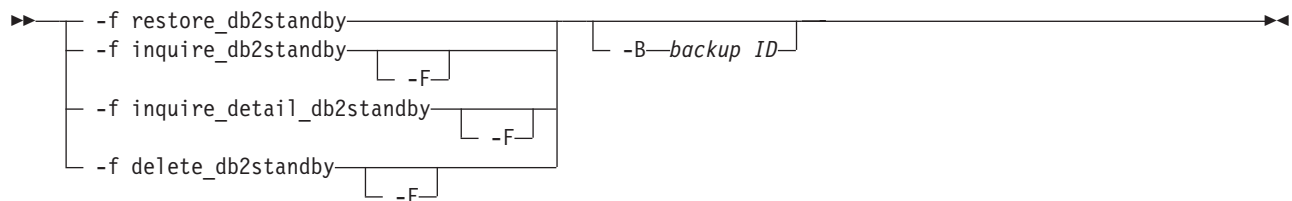


Table 27. Options for the Tivoli Storage FlashCopy Manager 'fcmcli' command for DB2 standby server and DB2 HADR environments

Option	Description	Default
-p profile	Full profile name.	<INSTANCE_DIR>/profile
-c acsd-hostname	Name of the server where the management agent (acsd) is running	localhost
acsd-port	TCP/IP port number or service name on which the management agent (acsd) is listening	57328
-l acs-directory	Directory where the 'logs' and 'shared' directories can be found.	<ACS_DIR>
-d database-name	Database name. Required for '-F' option.	No limitation.
-f backup_db2standby	Back up a DB2 standby server.	
-f restore_db2standby	Restore a DB2 HADR snapshot backup.	
-f delete_db2standby	Unmount and delete a snapshot of a DB2 standby server.	
-f inquire_db2standby	Query the backup repository and list all available backups.	
-f inquire_detail_db2standby	Query the backup repository and list all available backups in detail.	
-E preflash command	<p>Overrides the value of the PRE_FLASH_CMD parameter as specified in the CLIENT section of the profile. The preflash command is run on the production server and can be a script. The return code of the preflash command is evaluated as follows:</p> <p><b>0</b> Successful. The Tivoli Storage FlashCopy Manager backup operation continues.</p> <p><b>Any value other than 0</b> Unsuccessful. The Tivoli Storage FlashCopy Manager backup operation terminates.</p>	
-Q postflash command	<p>Overrides the value of the POST_FLASH_CMD parameter as specified in the CLIENT section of the profile. The postflash command is run on the production server and can be a script. The return code of the postflash command is evaluated as follows:</p> <p><b>0</b> Successful. The Tivoli Storage FlashCopy Manager backup operation continues.</p> <p><b>Any value other than 0</b> Unsuccessful. The Tivoli Storage FlashCopy Manager backup operation terminates.</p>	

Table 27. Options for the Tivoli Storage FlashCopy Manager 'fcmcli' command for DB2 standby server and DB2 HADR environments (continued)

Option	Description	Default
-i instance-name	Instance name to apply to the command. Required for '-F' option.	No limitation.
-F	(DELETE_FORCE flag) Applies to 'inquire_db2standby', 'inquire_detail_db2standby' and 'delete_db2standby': <ul style="list-style-type: none"> <li>With the 'delete_db2standby' function, withdraws any FlashCopy relations currently in effect for the target set represented by the backup (applicable to DS and SAN Volume Controller only).</li> <li>With the 'inquire[_detail]_db2standby' function, also lists backups deleted without the DELETE_FORCE flag.</li> </ul>	None.
-t	Start with trace on.	Trace off
-v	Display version.	
-h	Display help text.	
-B	The Backup ID as displayed by 'fcmcli -f inquire [_detail]' or 'db2acsutil'.	None.
-s DEVICE_CLASS	The name of the DEVICE_CLASS section in the profile that is used for the backup operation.	As specified in the profile.

The return code of the fcmcli command is 0 if it finishes the request without an error or if there were no candidates for the request. Further, the return code is 1 if one or more minor issues occurred that are not critical but should be checked to prevent major issues later. Return code 2 indicates that an error occurred during the command execution.

The following sections describe the details of the various functions specified with the '-f' option of the Tivoli Storage FlashCopy Manager command **fcmcli**.

#### **-f backup\_db2standby:**

This command backs up a DB2 high-availability disaster recovery (HADR) target database.

The -f backup\_db2standby function operates like the fcmcli -f backup function. However, instead of requesting the user to specify a list of files for backup, this command retrieves this information from the active DB2 instance. It is important that the names of the files and file systems from the active DB2 database (HADR primary) match the names of files and file systems of the standby server (HADR secondary). The editable sample preflash and postflash command files assist you to shut down and restart the DB2 standby server (HADR secondary). This action creates a consistent backup image.

The following figure illustrates the workflow that is executed from this command.

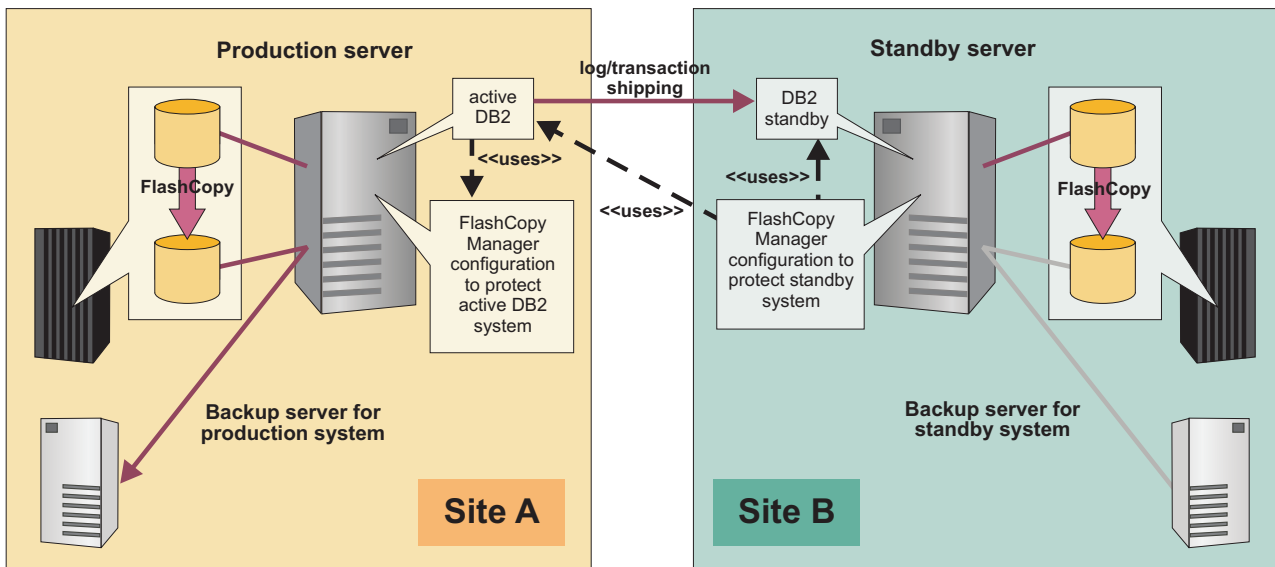


Figure 13. Protection of DB2 HADR standby nodes with IBM Tivoli Storage FlashCopy Manager for Custom Applications

1. It starts with connecting to the active DB2 database (for example site A) to retrieve a list of files from the active database.
2. This list of files is then translated into a list of volumes and LUNs in site B, using the assumption that the names of DB2 files and file systems in site A are identical to the names of files and file systems in site B.
3. The preflash script is invoked. The preflash script typically stops the DB2 standby system in order to enable FlashCopy Manager to create a consistent snapshot backup. The return code of the preflash command is evaluated as follows:

**0** Successful. The Tivoli Storage FlashCopy Manager backup operation continues.

**Any value other than 0**

Unsuccessful. The Tivoli Storage FlashCopy Manager backup operation terminates.

4. Once the snapshot has been taken, the postflash command is invoked, which typically starts the DB2 standby system again. The return code of the postflash command is evaluated as follows:

**0** Successful. The Tivoli Storage FlashCopy Manager backup operation continues.

**Any value other than 0**

Unsuccessful. The Tivoli Storage FlashCopy Manager backup operation terminates.

### **-f inquire\_db2standby:**

This command queries the backup repository and lists all available backups.

This command applies to DB2 HADR standby server environments. To run the `-f inquire_db2standby` command, you can specify the following option to get an overview of the files that are contained in the snapshot backup:

`-B backup-id`

### **-f inquire\_detail\_db2standby:**

This command queries the backup repository and lists all available backups.

This command is similar to the `-f inquire_dbstandby` command but prints additional information like usability states and background copy progress (if available) for each backup. This command applies to DB2 HADR standby server environments. To run the `-f inquire_detail_db2standby` command, you can specify the following option to get an overview of the files that are contained in the snapshot backup:

`-B backup-id`

### **-f restore\_db2standby:**

This command restores a DB2 high-availability disaster recovery (HADR) target database.

During the restore operation, the DB2 database is stopped and a FlashCopy restore is initiated. After the restore operation is completed, the database is started and initialized. The following option is also used when performing `-f restore_db2standby` operations:

`-B backup ID`

### **-f delete\_db2standby:**

This command unmounts and deletes a snapshot of a DB2 standby server that was created with the `backup_db2standby` function.

You can use the `delete_db2standby` function to delete a snapshot and eventually free the resources that are associated with this particular backup. The exact behavior of the `delete_db2standby` function depends on the characteristics of the storage device. The `-f delete_db2standby` function operates exclusively on snapshot backups. Backups to Tivoli Storage Manager are not affected by this command.

The impact of the deletion on the snapshot or FlashCopy relations is dependent on the storage system:

- IBM XIV Storage System: The snapshot is not deleted when `delete_db2standby` is issued.
- IBM System Storage DS8000 and SAN Volume Controller: The FlashCopy relations are not deleted when `delete_db2standby` is issued. Specify the `-F` option to force the deletion of the FlashCopy relations on these storage systems.

This example shows the syntax as database instance owner on the production system:

```
./fcmcli -f delete_db2standby [-F]
```

## Backup and restore commands for Oracle

Commands to back up and restore native Oracle and SAP with Oracle databases are provided.

### acsora - User interface for Oracle in non-SAP environments

The production system user interface (acsora) performs commands on a native Oracle environment.

The acsora syntax is as follows:

```
acsora [-p profile] -f function [-B backupID] [-F] [-s DEVICE_CLASS ]
```

where <function> is one of:

```
backup
restore
delete
inquire
inquire_detail
```

Table 28. Parameters for Oracle in non-SAP environments

Option	Description	Default
-p profile	Full path and name of the profile used by the Management Agent  The Management Agent uses the 'GLOBAL' and 'ACSD' sections of the profile.	<ACS_DIR>/profile
-B backupID	Backup ID for restore, delete, inquire functions	
-f backup	Backup database	Function backup if -f is not specified.
-f restore	Restore database	
-f delete	Delete snapshot backup	
-f inquire	List snapshot backups	
-f inquire_detail	List snapshot backups	
-F	When specified with the -f delete or -f inquire options, the -F option withdraws source and target relationships.	
-s DEVICE_CLASS	The name of the DEVICE_CLASS section in the profile that is used for the backup operation.	As specified in the profile.

The return code of acsora is 0 if it finishes the request without an error. The return code 1 indicates one (or more) minor issues occurred during the process. Although not considered critical, resolve these minor issues to prevent potential critical issues at a later time. Return code 2 indicates that an error occurred during command processing and that the operation did not complete successfully.

### -f backup

This command backs up the Oracle database according to the profile settings.

Example (backup database):

```
acsora -f backup -s STANDARD
```

## **-f restore**

This command restores the Oracle database from the backup specified by the backup ID, or the latest backup.

The Oracle database is available for immediate use after performing a snapshot restore and a roll-forward recovery. However, for DS8000 and SAN Volume Controller, background copy processing from the target volumes to the source volumes might require additional time to complete, especially if FLASHCOPY\_TYPE COPY is specified. Although the database is available, you cannot perform another Tivoli Storage FlashCopy Manager backup or restore until background copy processing completes.

Example (restore specified backup):

```
acsora -f restore -B A0FZ36AY8G
```

See “Restoring a native Oracle database from Tivoli Storage Manager” on page 73 and “Restoring a native Oracle database” on page 72 for detailed instructions on how to restore your Oracle database.

## **-f inquire**

This command lists the details for the snapshot backup denoted by the backup ID (if specified using the '-B' option), or all backups.

Example (list all backups):

```
acsora -f inquire
```

## **-f inquire\_detail**

This command queries the backup repository and lists all available backups.

This command is like the -f inquire command, but it prints additional information like usability states and background copy progress (if available) for each backup.

## **-f delete**

This command deletes the snapshot backup denoted by the entered backup ID.

Example (deleted specified backup):

```
acsora -f delete -B A0FZ36AY8G
```

## BR\*TOOLS - User interface for Oracle in SAP environments

Because Tivoli Storage FlashCopy Manager fully integrates with SAP BR\*TOOLS, Tivoli Storage FlashCopy Manager does not provide a native user interface. Information is provided about the query and deletion of snapshot backups, operations that are not directly supported with BR\*TOOLS.

For detailed information about how to use BR\*TOOLS to create snapshot backups, see *SAP® Database Guide for Oracle*.

**Note:** Tivoli Storage FlashCopy Manager provides a console user interface that can be used to bypass BR\*TOOLS for query and restore operations (see “acsutil - Snapshot Object Manager for Oracle” on page 98).

**Important:** If you are not using IBM Tivoli Storage Manager for Enterprise Resource Planning, in order to not overwrite an existing 'backint' executable program that is used for traditional backups, Tivoli Storage FlashCopy Manager does not install the 'backint' executable to the default path in /usr/sap/<SID>/SYS/exe/run. In order to invoke FlashCopy Manager, you therefore must invoke the executable that is located in the FlashCopy Manager installation directory (<INSTANCE\_DIR>).

If you have installed IBM Tivoli Storage Manager for Enterprise Resource Planning, you can invoke the backint executable from the default installation path.

Inquire and delete using the backint interface.

The syntax of the backint command is as follows:

```
backint [-p profile]
        -f <function>
        -t <backup_type>
        [-F]
```

where <function> is one of:

```
inquire
inquire_detail
delete
```

and <backup\_type> is one of:

```
volume
file
```

Table 29. Parameters for Tivoli Storage FlashCopy Manager Invocation as 'backint'

Option	Meaning
-p	Tivoli Storage FlashCopy Manager Backint profile (see “Tivoli Storage FlashCopy Manager backint profile (.utl file)” on page 146)
-f inquire or inquire_detail	Inquire function with or without detailed information about the backups.
-f delete	Delete function
-t volume	This option can be used to manage snapshot backups created with FlashCopy Manager.
-t file	Use this option to manage files that have been backed up directly to the FlashCopy Manager repository. <b>Note:</b> When IBM Tivoli Storage Manager for Enterprise Resource Planning is installed, both options are also supported by IBM Tivoli Storage Manager for Enterprise Resource Planning. However, in this case option "-t file" is used to manage backups that have been sent to the Tivoli Storage Manager server instead.



Table 29. Parameters for Tivoli Storage FlashCopy Manager Invocation as 'backint' (continued)

Option	Meaning
-F	Force option to be used with inquire, inquire_detail, or delete functions. When used with inquire or inquire_detail, all available backups as well as all backups marked for deletion display. When used with the delete function, it withdraws the source target FlashCopy relations on DS8000 or SAN Volume Controller.

### **-f inquire or -f inquire\_detail**

The **inquire** function, normally invoked by SAP® BR\*Tools and BRRESTORE, will be used to query the Tivoli Storage Manager server for backup IDs or files which belong to a particular backup ID. For troubleshooting, however, it might be necessary to invoke this function manually from the command line as follows.

```
backint -p /oracle/<SID>/dbs/init<SID>.utl -f inquire -t volume
```

Tivoli Storage FlashCopy Manager prompts you to enter the inquiry in one of four formats. These are:

- **#NULL** - to display all backup IDs saved so far. A typical line of the response could be:

```
#BACKUP JE0__A0DNE9Z74C
```

The backup ID in this case is JE0\_\_A0DNE9Z74C (#BACKUP is not part of the backup ID). The first six characters are the user defined prefix. The next 10 characters represent a unique ID of the backup.

- **BackupID** - to display all of the files which belong to this backup ID. A typical result could be:

```
#BACKUP JE0__A0DNE9Z74C /oracle/C21/dbs/initC21.utl.
```

- **#NULL filename** - to display all of the backup IDs corresponding to this file. *Filename* requires an input consisting of path and name of the file.
- **BackupID filename** - to verify whether a particular file has been saved under a certain backup ID. *Filename* requires an input consisting of path and name of the file.

### **-f delete**

The **delete** function is used as part of the version control mechanism of Tivoli Storage FlashCopy Manager and can only be called by Tivoli Storage FlashCopy Manager itself or by a user. The delete function allows you to delete full backups only.

This function can be invoked from the command line as follows:

```
backint -p /oracle/<SID>/dbs/init<SID>.utl -f delete -t volume
```

You will be prompted to enter the backup ID.

The Snapshot Object Manager for Oracle (acsutil) provides a snapshot backup query and restore interface for native Oracle and SAP with Oracle environments.

The Snapshot Object Manager for Oracle (acsutil) provides a front-end for acsora to show available backups, perform restores, and delete unwanted backups. It communicates with acsora via input and output files.

acsutil [-p <profile>]

The first step is an automatic inquire operation for all backup IDs. The following figure shows the screen layout for the list of backup IDs found by the Snapshot Object Manager when the inquiry is complete.

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All backup IDs found in the Tivoli Storage FlashCopy Manager repository are shown on the left. To the right of each backup ID, all the files belonging to that backup ID are displayed. You can select individual backup IDs

If you mark the backup ID you are interested in and then press the Tab key to move the cursor to the right-hand panel, all file names belonging to the marked backup ID will be displayed.

**Up, Down, Left, Right - Move cursor**

Move the highlighted cursor in the direction indicated on the key.

**Tab - Switch window side**

Move the cursor between the left and right sides of the window.

**F2 - Restore**

Restore the marked backup ID.

**F5 - Refresh**

Refresh the list of backup IDs and file names.

**F6 - Fileinfo**

Opens a separate window to display file information.

For backup IDs, the sequence number (backup version count) is shown.

**F8 - Delete**

Delete the selected backup ID and all corresponding files.

**F10 - Exit**

Exit from Snapshot Object Manager

**ENTER - Mark/unmark backup ID**

Mark or unmark the backup ID below the cursor.

The Snapshot Object Manager can delete backup IDs with all included files. It is not possible to delete single files within a backup ID. To delete a backup ID it must be highlighted. After pressing F8 you have to confirm the deletion operation. The backup ID and all included files are deleted.

For each restore, a log file will be created.

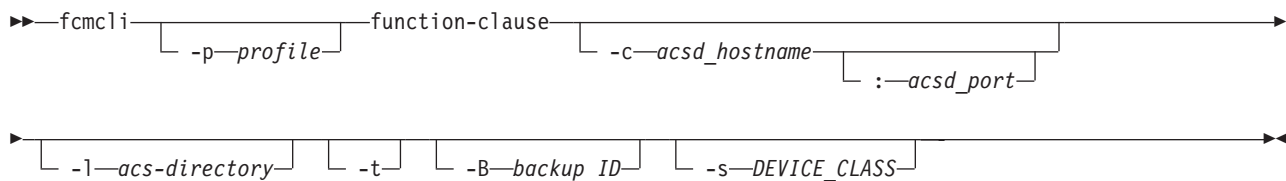
## Backup and restore commands for custom applications

The FlashCopy Manager command line interface (fcmcli) can be used to create snapshot backups, snapshot restores, inquire, and delete operations for applications for which no native backup adapter exists.

When invoking the **fcmcli** command, you must provide a list of files for which a snapshot backup is to be created. You can specify the list of files either through the configuration file or through the command line interface. Optionally, you can provide **fcmcli** with the following scripts:

- A script to prepare your environment before the snapshot is created. For instance, provide a script to quiesce or shutdown the applications that are backed up.
- A script to resume your environment after the snapshot has been taken.

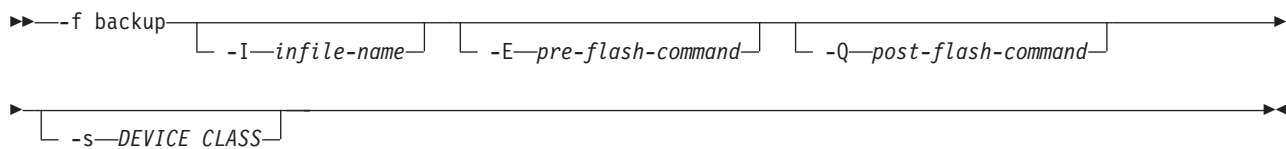
If specified, those scripts are invoked immediately before and after the snapshot is created in order to minimize application downtime.



The values for the function-clause parameter are described in the following sections.

### function-clause: FlashCopy operations of custom applications

The following functions are supported by the fcmcli command option -f 'function' for IBM Tivoli Storage FlashCopy Manager for Custom Applications backups of custom applications:



The following functions are supported by the fcmcli command option -f 'function' for FlashCopy restores, inquire, and delete of custom applications:

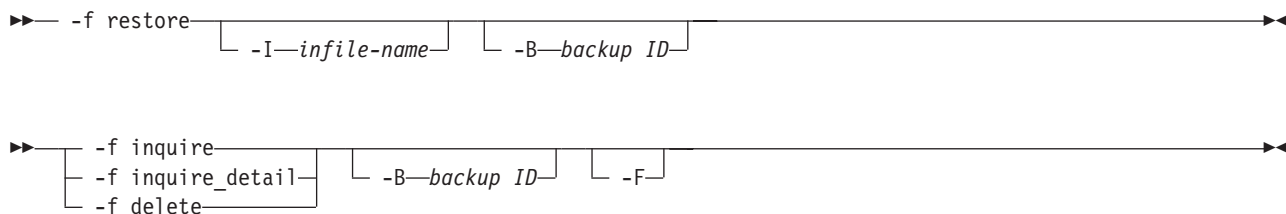


Table 30. Options for the Tivoli Storage FlashCopy Manager 'fcmcli' command for custom applications

Option	Description	Default
-p profile	Full profile name.	INSTANCE_DIR/profile
-c acsd-hostname	Name of the server where the management agent (acsd) is running	localhost
acsd-port	TCP/IP port number or service name on which the management agent (acsd) is listening	57328
-l acs-directory	Directory where the 'logs' and 'shared' directories can be found.	ACS_DIR
-f backup	Back up a custom application.	
-f restore	Restore a regular DB2 snapshot backup (with advanced restore options) or restore a custom application backup.	

Table 30. Options for the Tivoli Storage FlashCopy Manager 'fcmcli' command for custom applications (continued)

Option	Description	Default
-E preflash command	<p>Overrides the value of the PRE_FLASH_CMD parameter as specified in the CLIENT section of the profile. The preflash command is run on the production server and can be a script. The return code of the preflash command is evaluated as follows:</p> <p><b>0</b> Successful. The Tivoli Storage FlashCopy Manager backup operation continues.</p> <p><b>Any value other than 0</b> Unsuccessful. The Tivoli Storage FlashCopy Manager backup operation terminates</p>	
-Q postflash command	<p>Overrides the value of the POST_FLASH_CMD parameter as specified in the CLIENT section of the profile. The postflash command is run on the production server and can be a script. The return code of the postflash command is evaluated as follows:</p> <p><b>0</b> Successful. The Tivoli Storage FlashCopy Manager backup operation continues.</p> <p><b>Any value other than 0</b> Unsuccessful. The Tivoli Storage FlashCopy Manager backup operation terminates</p>	
-I infile	<p>Overrides the value of the INFILE parameter as specified in the CLIENT section of the profile. The fcmcli functions <b>inquire</b>, <b>inquireDetails</b>, and <b>delete</b> do not recognize the infile parameter. The function <b>restore</b> accepts infile as an optional parameter.</p>	
-F	<p>Use the force option with the inquire, inquire_detail, or delete functions. When used with inquire or inquire_detail, all available backups and all backups marked for deletion are displayed. When used with the delete function, the force option withdraws the source target FlashCopy® relations on DS8000 or SAN Volume Controller.</p>	None.
-t	Start with trace on.	Trace off
-v	Display version.	
-h	Display help text.	

Table 30. Options for the Tivoli Storage FlashCopy Manager 'fcmcli' command for custom applications (continued)

Option	Description	Default
-B	The Backup ID as displayed by <code>fcmcli -f inquire [_detail]</code> or <code>db2acsutil</code> .	None.
-s <i>DEVICE_CLASS</i>	The name of the <i>DEVICE_CLASS</i> section in the profile that is used for the backup operation.	As specified in the profile.

The return code of the `fcmcli` command is 0 if it finishes the request without an error or if there were no candidates for the request. The return code is 1 if one or more minor issues occurred which are not critical but should be checked to prevent major issues later. Return code 2 indicates that an error occurred during the command execution.

The following sections describe the details of the various functions specified with the '-f' option of the Tivoli Storage FlashCopy Manager command **fcmcli**.

### **-f backup**

This command creates a FlashCopy backup of custom applications, such as a list of file systems that you provide.

Before and after snapshot creation, Tivoli Storage FlashCopy Manager can optionally call a user exit that quiesces and resumes all applications that store data within those file systems.

When this command is called, it is also determined if the snapshot is retained locally (for disk-only backup) or backed up at a later time to Tivoli Storage Manager. As a backup method for the subsequent Tivoli Storage Manager backup, FlashCopy Manager for Custom Applications uses the Tivoli Storage Manager backup-archive client.

The following optional parameters can be used with the `fcmcli -f backup` command:

```
-I infile
-E preflash command
-Q postflash command
-s DEVICE_CLASS
```

-I *infile* specifies the name of a file that contains a list of all the objects that is processed by FlashCopy Manager.

-E *preflash command* specifies the name of a script or executable program that is called immediately before the snapshot. The pre-flash script is typically used to quiesce an application. The return code of the preflash command is evaluated as follows:

**0** Successful. The Tivoli Storage FlashCopy Manager backup operation continues.

#### **Any value other than 0**

Unsuccessful. The Tivoli Storage FlashCopy Manager backup operation terminates.

`-Q postflash command` specifies the name of a script or executable program that is called immediately after the snapshot. The post-flash script is typically used to resume an application. The return code of the postflash command is evaluated as follows:

0           Successful. The Tivoli Storage FlashCopy Manager backup operation continues.

**Any value other than 0**

Unsuccessful. The Tivoli Storage FlashCopy Manager backup operation terminates.

`-s DEVICE_CLASS` specifies the name of the `DEVICE_CLASS` section in the profile that is used for the backup operation.

**-f inquire**

This command queries the backup repository and lists all available backups.

This command is of special interest in environments where multiple partitions reside on the same volume group (volume sharing).

**-f inquire\_detail**

This command queries the backup repository and lists all available backups.

This command is similar to `-f inquire` but prints additional information like usability states and background copy progress for each backup. This command is of special interest in environments where multiple partitions reside on the same volume group (volume sharing).

**-f delete**

The delete function is used as part of the version control mechanism of Tivoli Storage FlashCopy Manager and can only be called by Tivoli Storage FlashCopy Manager itself or by a user. The delete function can only be used to delete full backups.

You can use the delete function to delete a snapshot and eventually free the resources that are associated with this particular backup. The exact behavior of the delete function depends on the characteristics of the storage device. The `-f delete` function operates exclusively on snapshot backups. Backups to Tivoli Storage Manager are not affected by this command.

The impact of the deletion on the snapshot or FlashCopy relations is dependent on the storage system:

- IBM XIV Storage System: The snapshot is not deleted when the delete command is issued.
- IBM System Storage DS8000 and SAN Volume Controller: The FlashCopy relations are not deleted when the delete command is issued. Specify the `-F` option to force the deletion of the FlashCopy relations on these storage systems.

The following example shows the syntax as database instance owner on the production system:

```
./fcmcli -f delete [-F]
```

### **-f restore**

For custom applications, you can use the `fccli -f restore` command to do a full or partial snapshot restore of the data that has been backed up.

- To restore a full snapshot, provide the backup ID of a particular snapshot backup by specifying the `-B backup-id` parameter. You can obtain the backup ID by using the `fccli -f inquire` command. To restore the latest backup, specify `#NULL`.
- To restore only a portion of the snapshot backup, Tivoli Storage FlashCopy Manager can also specify a list of files explicitly using the `-I <infile>` option. Be aware that even though Tivoli Storage FlashCopy Manager restores data at a volume level, additional data might be restored as part of the volume restore operation. You can use the `NEGATIVE_LIST` parameter to specify what action Tivoli Storage FlashCopy Manager takes in these situations.

## **Deleting Tivoli Storage FlashCopy Manager snapshot backups**

Tivoli Storage FlashCopy Manager snapshot backups can be deleted from the snapshot repository.

It is typically not required to delete snapshot backups on DS8000 and SAN Volume Controller storage subsystems that contain a dedicated set of target volumes in one or more target sets. IBM XIV<sup>®</sup> Storage Systems allow you to create as many snapshot backups as needed, and old backups can be deleted manually. Old backups can also be deleted automatically by using the `MAX_VERSIONS` (`MAX_SNAPSHOT_VERSIONS`) parameter.

Perform these tasks to manually delete a Tivoli Storage FlashCopy Manager snapshot backup:

1. Run the following command to unmount the file systems and export the volume groups on a backup system where the backup using this target set is currently mounted. This step can be omitted if the backup is not currently mounted.  

```
fccli -f unmount [-B <backupID>]
```
2. Based on the use of this target set, any existing source and target FlashCopy relationships (such as INCR or NOCOPY) must be withdrawn by starting one of these appropriate utilities:
  - (DB2) `db2acsutil delete`
  - (Native Oracle) `acsora -f delete -B <backupID>`
  - (SAP on Oracle) `backint -f delete [-b <backupID>]`
  - (Custom applications) `fccli -f delete -B <backupID> [-F]`

**Note:** (IBM XIV<sup>®</sup> Storage System): These commands delete the snapshot backup in the Tivoli Storage FlashCopy Manager snapshot repository, and the snapshot on the IBM XIV<sup>®</sup> Storage System is also deleted.

**Note:** (DS8000 or SAN Volume Controller): These commands delete the snapshot backup in the Tivoli Storage FlashCopy Manager snapshot repository only. The source and target relations on DS8000 or SAN Volume Controller are not withdrawn.

In case you plan to remove a target volume from a target set or you plan to remove a complete target set, you must first run the following steps to free up the target volumes:



1. Run this command to unmount the file systems and export the volume groups on a backup system where the backup using this target set is currently mounted:

```
fccli -f unmount [-T <backupID>]
```

This step can be omitted if the backup is currently not mounted.

2. Based on the use of this target set, any existing source and target FlashCopy relationships (such as INCR or NOCOPY) must be withdrawn by starting one of these appropriate utilities:
  - (DB2) db2acsutil delete options "DELETE\_FORCE"
  - (Native Oracle) acsora -f delete -F -B <backupID>
  - (SAP with Oracle) backint -f delete -F [-b <backupID>]
  - (Custom applications) fccli -f delete -B [-F]

The actual withdraw of the source and target FlashCopy relationship is done by the Tivoli Storage FlashCopy Manager generic device agent (acsgen) as a background operation and it can be delayed as long as 10 minutes. Do not try to reuse the target volumes before the actual withdraw completes successfully.

## Checking the status of snapshot backups in the Tivoli Storage FlashCopy Manager repository

Ensure that you routinely check the status of the Tivoli Storage FlashCopy Manager repository.

To check the status of snapshot backups in the Tivoli Storage FlashCopy Manager repository, the following command can be used (depending on the database type):

- (DB2) fccli -f inquire[\_detail]
- (DB2) db2acsutil query status
- (Native Oracle) acsora -f inquire[\_detail]
- (Native Oracle) acsutil
- (SAP® with Oracle) backint -f inquire[\_detail] -t volume|file -p <SAP Backint profile (.utl)>
- (SAP® with Oracle) acsutil
- (Custom applications) fccli -f inquire[\_detail]

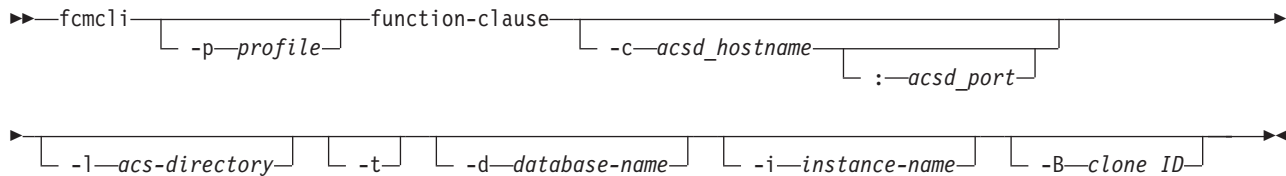
When using the inquire\_detail command with the appropriate tool, output similar to the following displays:

```
Type Partition Backup-ID TSM Backup-ID State DevClass TargetSet Background Copy BytestoreFlashcopied
#BACKUP NODE0000 C01_A0FY303K6B IN-PROGRESS MIRROR1 1 3.000GB of 3.000GB 3.000GB
UsabilityStates :
REMOTELY_MOUNTABLE,REPETITIVELY_RESTOREABLE,SWAP-RESTORABLE,PHYSICAL_PROTECTION,FULL_COPY,TAPE_BACKUP_PENDING
```

**Tip:** The db2acsutil query status command will not show all information that is shown by the inquire\_detail command. That is because db2acsutil is a tool delivered by DB2 which only knows a subset of all possible states that can be set by Tivoli Storage FlashCopy Manager.

## Tivoli Storage FlashCopy Manager cloning commands

You can use the Tivoli Storage FlashCopy Manager command line interface (fcmcli) to create and manage clones of DB2, native Oracle, and SAP with Oracle databases. Cloning of custom applications is currently unavailable.



The values for the function-clause parameter are described in the following sections.

### function-clause: FlashCopy cloning operations

The following functions are supported by the `fcmcli` command option `-f 'function'` for FlashCopy cloning operations:

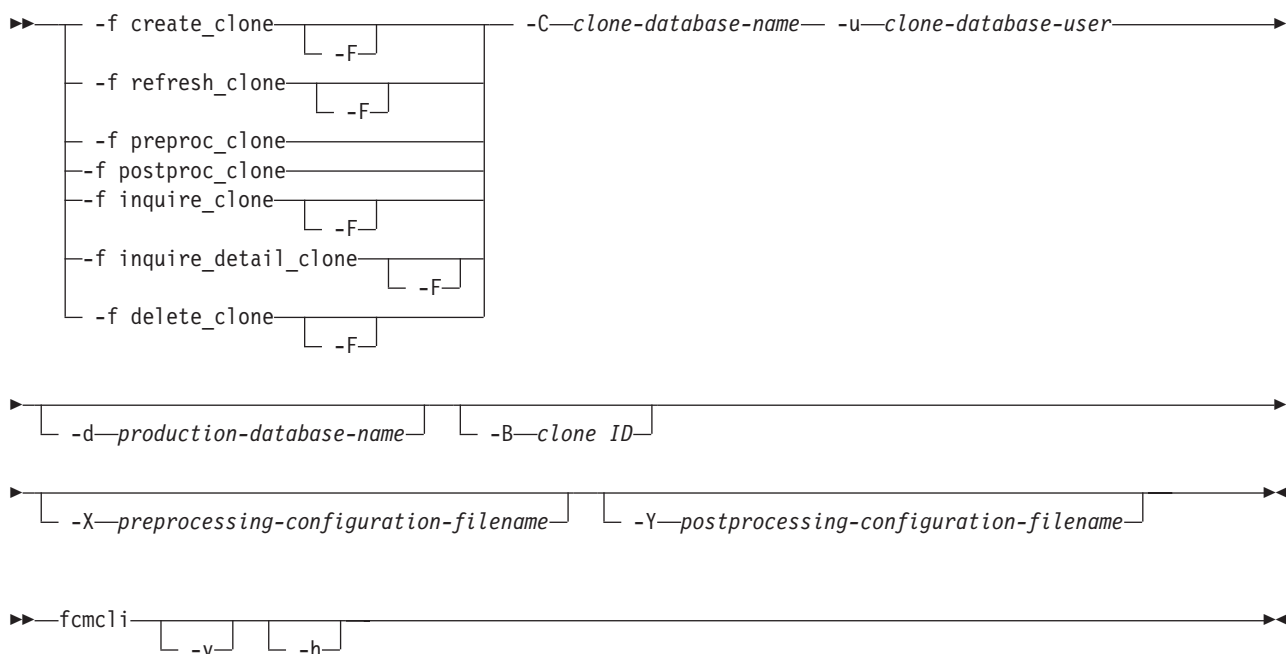


Table 31. Options for the Tivoli Storage FlashCopy Manager 'fcmcli' command

Option	Description	Default
-p profile	Full profile name.	<INSTANCE_DIR>/profile
-c acsd-hostname	Name of the server where the management agent (acsd) is running	localhost
acsd-port	TCP/IP port number or service name on which the management agent (acsd) is listening	57328
-l acs-directory	Directory where the 'logs' and 'shared' directories can be found.	<ACS_DIR>

Table 31. Options for the Tivoli Storage FlashCopy Manager 'fcmcli' command (continued)

Option	Description	Default
-i instance-name	Instance name to apply to the command. Required for '-F' option.	No limitation.
-B	The Backup ID as displayed by <code>fcmcli -f inquire [_detail]</code> or <code>db2acsutil</code> .	None.

Table 32. Cloning options for the Tivoli Storage FlashCopy Manager 'fcmcli' command

Option	Description	Default
-C clone database name	Specifies the name of the cloned database residing on the clone system. Specify a valid DB2 or Oracle database name for the <i>clone database name</i> value. The <i>clone database name</i> can be the name of the production database or a different name. When a name that is the same as the production database name is used, the cloned database is not renamed.	This command line option must be specified for all cloning functions.
-d production database name	Specify the name of the production database on the production system.	The command line option -d <production database name> is optional for Oracle. For DB2, it depends on the number of database entries in the database directory. If the DB2 database directory contains more than one (or no) entry, the command line option -d <production database name> is required to be specified.
-F	Specify the force parameter with these functions: <ul style="list-style-type: none"> <li>delete_clone: The force command line option causes the clone to be unmounted, marked as deleted, and also deletes the FlashCopy relationships. Without the force command line option, the delete_clone function only unmounts the clone and marks it as deleted in the FlashCopy Manager repository.</li> <li>create_clone, refresh_clone: The force command line option deletes all backup versions that are older than the clone targets that are reused for the new or refreshed clone. Without the force command line option, the new or refreshed clone fails if there are backup versions older than the clone targets that are reused for the new or refreshed clone. This command line option is valid with the create_clone and refresh_clone functions on SAN Volume Controller 5.1 only.</li> </ul>	This command line option is optional.

Table 32. Cloning options for the Tivoli Storage FlashCopy Manager 'fcmcli' command (continued)

Option	Description	Default
-u clone instance owner user name	Specify the user name of the clone instance owner. This command line option is required when the following functions are issued: <ul style="list-style-type: none"> <li>• create_clone</li> <li>• refresh_clone</li> <li>• preproc_clone</li> <li>• postproc_clone</li> </ul>	
-X preprocessing configuration file	Specify the name of the configuration file to be used with the preprocessing script. The preprocessing configuration file must reside on the clone server.	This parameter is optional.
-Y postprocessing configuration file	Specify the name of the configuration file to be used with the postprocessing script. The postprocessing configuration file must reside on the clone server.	This parameter is optional.

The return code of the fcmcli command is 0 if it finishes the request without an error or if there were no candidates for the request. The return code is 1 if one or more minor issues occurred which are not critical but should be checked to prevent major issues later. Return code 2 indicates that an error occurred during the command execution.

The following sections describe the details of the various functions specified with the '-f' option of the Tivoli Storage FlashCopy Manager command **fcmcli**.

Issue cloning-related parameters on the production system as the production database instance owner. The cloning parameters must be issued from the INSTANCE\_DIR/acs directory where the Tivoli Storage FlashCopy Manager production files reside. The fcmcli command identifies the name of the production database in the following order:

1. For Oracle databases, the value of the ORACLE\_SID environment variable is used to identify the production database name. For DB2 databases, the DB2 database directory is used. If only one entry exists in the database directory, then this entry is used to identify the production database name.
2. The *-d production database name* command-line option is queried. If this option is specified, this value overwrites the value identified in Step 1. Also, this value is used to identify the production database name. The command-line option *-d* is optional for Oracle. Its use with DB2 depends on the number of database entries in the database directory. If more than one entry is in the DB2 database directory, then the *-d* option is required.

## **-f create\_clone**

This command creates a clone database.

The following actions occur when a clone database is created:

1. A consistent online FlashCopy backup of the production database (including online log files) is created.
2. The FlashCopy backup is mounted on the clone system. The following actions occur during this mount operation:
  - The physical devices on the clone server operating system (used as target volumes during the FlashCopy backup) are configured.
  - The volume groups on the physical devices are imported.
  - These file systems on the imported volume groups are mounted when the clone database is created:
    - Database file systems
    - All additional file systems involved in a FlashCopy operation
3. The database on the clone system is recovered.
4. The database is renamed to match the name of the clone database that resides on the clone system.
5. The clone database is started on the clone system.
6. (Optional) Postprocessing scripts are run against the new clone database.

If the clone database on the clone system exists, it must be shut down and unmounted when issuing this function. An error message and return code 2 are issued if the clone database is not shut down and unmounted. This example shows the syntax as database instance owner on the production system:

```
./fcmcli -f create_clone -u <clone instance owner user name>  
-C <clone database name> [-F]
```

## **-f inquire\_clone**

This command queries a clone database for the list all available backups.

This command is of special interest in FlashCopy Manager cloning operations. The following parameters are also required in order to perform the -f inquire\_clone operation:

```
-d database-name  
-C <clone db name>
```

## **-f inquire\_detail\_clone**

This command queries the backup repository and lists all available backups.

This command works like -f inquire\_clone but prints additional information like usability states and background copy progress (if available) for each backup. This command is of special interest in FlashCopy Manager cloning operations. The following parameters are also required in order to run the -f inquire\_detail\_clone command:

```
-d database-name  
-C <clone db name>
```

## **-f delete\_clone**

This command unmounts and deletes a clone database that was created with the create\_clone or refresh\_clone function. Optionally, preprocessing scripts can run against the clone database that is to be deleted.

The impact of the deletion on the snapshot or FlashCopy relations is dependent on the storage system:

- IBM XIV Storage System: The snapshot is not deleted when delete\_clone is issued.
- IBM System Storage DS8000 and SAN Volume Controller: The FlashCopy relations are not deleted when delete\_clone is issued. Specify the -F option to force the deletion of the FlashCopy relations on these storage systems.

The clone database (on the clone system) must be shut down in order to delete the database. An error message and return code 2 are issued if the clone database is not shut down. This example shows the syntax as database instance owner on the production system:

```
./fcmcli -f delete_clone -C <clone database name> [-F]
```

## **-f preproc\_clone**

This command runs preprocessing scripts against the clone database (on the clone system) before the clone database is refreshed.

This clone database (on the clone system) must be up and running when issuing this function. An error message and return code 2 are issued if the clone database is unavailable. This example shows the syntax as database instance owner on the production system:

```
./fcmcli -f preproc_clone -u <clone instance owner user ID>  
-C <clone database name> -X <preprocessing configuration file>
```

## **-f postproc\_clone**

This command runs postprocessing scripts (on the clone system) against the clone database after a clone database is created.

This new clone database (on the clone system) must be up and running when issuing this function. An error message and return code 2 are issued if the clone database is unavailable. This example shows the syntax as database instance owner on the production system:

```
./fcmcli -f postproc_clone -u <clone instance owner user ID>  
-C <clone database name> -Y <postprocessing configuration file>
```

## **-f refresh\_clone**

This command automatically refreshes an existing clone database.

The following actions occur when a clone database is refreshed:

1. (Optional) Preprocessing scripts are run against the clone database (using the -X cloning parameter). An error message and return code 2 are issued if the clone database is unavailable. Ensure that the last preprocessing script shuts down the clone database, otherwise the **refresh\_clone** function will fail in the next step.
2. The clone database is unmounted. An error message and return code 2 are issued if the clone database is not shut down. Ensure that the last preprocessing script shuts down the clone database.

3. A new clone database is created.
4. (Optional) Postprocessing scripts are run against the new clone database.

If the `-X` and `-Y` cloning parameters are not specified, then no preprocessing and postprocessing are performed. The **refresh\_clone** function requires both the following conditions to be true:

- A clone database must exist and must have been created with the **create\_clone** function.
- The clone database must be mounted on the clone system.

Otherwise, an error message and return code 2 are issued. The following example shows the syntax as database instance owner on the production system:

```
./fcmcli -f refresh_clone -u <clone instance owner user ID>  
-C <clone database name> [-X <preprocessing configuration file>]  
[-Y <postprocessing configuration file>] [-F]
```

---

## Tivoli Storage FlashCopy Manager administrative commands

You can use commands to administer Tivoli Storage FlashCopy Manager.

Administrative commands are available for you to do the following tasks:

- Start, stop, or configure Tivoli Storage FlashCopy Manager.
- Mount or unmount a snapshot backup on a secondary system.
- Create a backup to Tivoli Storage Manager from a snapshot if you have Tivoli Storage Manager configured in your environment

## Configuration commands

Use configuration commands to run the setup script, maintain Tivoli Storage FlashCopy Manager passwords, and query the amount of storage space that is used for backups.

### Installation setup script

The setup script for each database variant provides several action options which are usually employed internally by the Tivoli Storage FlashCopy Manager installer. It is also used without options to perform the manual Tivoli Storage FlashCopy Manager setup and basic configuration.

### Overview

The setup script uses this command syntax:

```
setup_type.sh [-a action]  
              -d [INSTANCE_DIR]
```

The following values are possible for the *type* parameter in the setup script name:

```
setup_db2.sh  
setup_ora.sh  
setup_gen.sh
```

See “Setup script values” on page 114 for more information on the script values.

You can use the setup script for the following purposes:

- Activation or upgrade of Tivoli Storage FlashCopy Manager for one instance specific installation, as root user:

```
setup_type.sh -a install -d INSTANCE_DIR
```

The setup script should be run from the FCM\_INSTALL\_DIR directory.

- Initial configuration and reconfiguration:

```
setup_type.sh
```

The setup script should be run as the database instance owner or, for custom applications, as the application backup user. This script should be run from the INST\_DIR directory.

- Initial configuration and reconfiguration in advanced mode:

```
setup_type.sh -advanced
```

- Stopping an activated instance:

```
setup_type.sh -a stop -d INSTANCE_DIR
```

The stop command should be run as the database instance owner or, for custom applications, as the application backup user. The stop command must be run from the INST\_DIR.

- Starting an activated instance:

```
setup_type.sh -a start -d INSTANCE_DIR
```

The start command should be run as the database instance owner or, for custom applications, as the application backup user. The start command must be run from the INST\_DIR.

- Disabling a stopped instance:

```
setup_type.sh -a disable -d INSTANCE_DIR
```

The disable command should be run as the database instance owner or, for custom applications, as the application backup user. The disable command must be run from the INST\_DIR. This command completely removes the entries from the /etc/inittab.

All of these commands can be issued on either the production or backup system. In order to completely stop or disable Tivoli Storage FlashCopy Manager, the appropriate command needs to be issued first on the production system and then on the backup system, in that order. The setup script can be used to install Tivoli Storage FlashCopy Manager on multiple backup nodes from the production system. As a prerequisite, Open Secure Shell (OpenSSH) must be installed on all of the nodes in the backup system. NFS shares between the production system and backup system nodes are not required for this type of remote installation. OpenSSH is the preferred method for Tivoli Storage FlashCopy Manager.

**Important:** To completely stop or disable Tivoli Storage FlashCopy Manager, issue the appropriate command first on the production system and then on the backup system.

The script must be run from the database instance-specific installation directory:



- (DB2) Instance owner \$HOME directory/sql/lib/acs/
- (Oracle) Instance owner \$HOME directory/acs/

The default action (setup) is performed and the instance is configured.

For IBM Tivoli Storage FlashCopy Manager for Custom Applications, there is no database instance-specific directory. In this case, the script must be run from the backup user's \$HOME directory. The backup user needs to be able to access all file systems that are going to be protected.

If the script is called without parameters, it can be issued as the instance owner. It creates a new profile or modifies an existing one and updates /etc/inittab according to the current profile (production system) or user preference (backup system). Updates to inittab require starting and stopping Tivoli Storage FlashCopy Manager as intermediate steps. This call cannot stop Tivoli Storage FlashCopy Manager on the backup system if it is still running on the production system and the binaries in the instance-specific installation directory are NFS-shared between the production and backup systems. If Tivoli Storage FlashCopy Manager cannot be stopped you will need to stop Tivoli Storage FlashCopy Manager on the production system before executing the script with the -a install option.

### Setting or modifying passwords with the setup script

You can set or modify passwords by issuing the setup script without the -a action option. For example:

```
setup_type.sh
```

Running the setup script without the -a action option proceeds through several tasks that are similar to the tasks described in Chapter 3, “Installing Tivoli Storage FlashCopy Manager,” on page 49.

When this command is issued, the profile wizard launches for you to edit the profile, and later you are prompted to set or modify passwords. This is the recommended method as passwords are verified and can also be updated on the backup systems. To update passwords on the backup system, specify YES at the following prompt:

```
Select the backup system to update or delete:
1) acsback5
n) configure a new backup system
b) return to previous menu
q) quit configuration
Please select one of the options above.
1
The selected backup system is acsback5
The backup system on acsback5 is configured with the device class(es) DISK_ONLY.
Select the action you want to take on the backup system acsback5:
1) update the backup system
2) start the backup system
3) stop the backup system
4) delete the backup system
5) setup SSH key authentication for the backup system
b) return to backup system selection
q) quit the configuration
Please select one of the options above.
1
Do you want to update the Backup System installation on acsback5? [y|n] [y]
```

## Setup script values

These values are available for `setup_type.sh`:

### **setup\_db2.sh**

Configures Tivoli Storage FlashCopy Manager.

### **setup\_ora.sh**

Configures Tivoli Storage FlashCopy Manager for Oracle or Tivoli Storage FlashCopy Manager for *SAP® with Oracle*.

### **setup\_gen.sh**

Configures IBM Tivoli Storage FlashCopy Manager for Custom Applications.

These values are available for action:

### **disable**

This call can be issued as the root or instance owner. It stops Tivoli Storage FlashCopy Manager and removes all entries from `/etc/inittab`. In order to reactivate Tivoli Storage FlashCopy Manager, you need to call the script without parameters.

Note that this call cannot stop Tivoli Storage FlashCopy Manager on the backup system if it is still running on the production system and the binaries in the instance-specific installation directory are NFS-shared between the production and backup systems. If Tivoli Storage FlashCopy Manager cannot be stopped you need to stop Tivoli Storage FlashCopy Manager on the production system before executing `setup_type.sh -a install`.

### **install**

This call needs to be issued with the root user ID. It performs the following:

1. Stops Tivoli Storage FlashCopy Manager (`setup_type.sh -a stop`)
2. Copies all binary files from the Tivoli Storage FlashCopy Manager installation directory to the instance-specific installation directory (`INSTANCE_DIR`)
3. Sets the appropriate access rights for the binary files
4. Restarts Tivoli Storage FlashCopy Manager (`setup_type.sh -a start`)

The steps to start and stop Tivoli Storage FlashCopy Manager are skipped if Tivoli Storage FlashCopy Manager has not yet been configured.

This call cannot stop Tivoli Storage FlashCopy Manager on the backup system if it is still running on the production system and the binary files in the instance-specific installation directory are NFS-shared between the two systems. If Tivoli Storage FlashCopy Manager cannot be stopped you must stop Tivoli Storage FlashCopy Manager on the production system before executing `setup_type.sh -a install`.

### **start**

This call can be issued as the root or instance owner. It starts a previously installed and configured version of Tivoli Storage FlashCopy Manager. This call starts different entries in `/etc/inittab`, by changing the action for the existing entries to *respawn*, depending on whether the call is issued on the backup or production system.

### **stop**

This call can be issued as the root or instance owner. It stops the version of Tivoli Storage FlashCopy Manager that is currently running. This call updates

/etc/inittab and checks that Tivoli Storage FlashCopy Manager has been stopped successfully (a write lock can be acquired for the .lock file that is located in the instance-specific install directory).

This call will fail on the backup system in environments where the instance-specific installation directory is shared between the production and backup systems, if Tivoli Storage FlashCopy Manager is still running on the production system. In order to stop Tivoli Storage FlashCopy Manager in those environments successfully, you need to first stop Tivoli Storage FlashCopy Manager on the production system.

The instance directory name ('-d' option) is required for all explicit actions. It is not required for the default setup function.

## Password administration

You can use the `fccli -f password` command to change Tivoli Storage FlashCopy Manager passwords.

The 'fccli -f password' command supports an interactive and a non-interactive mode. The interactive mode is entered automatically if no passwords are provided as arguments on the command line. The interactive mode will interactively ask for the following information:

- The master password, which is the password of the Management Agent (acsd).
- The password for the ORACLE section if defined in the specified profile.
- The password for the DB2STANDBY section if defined in specified profile.
- The passwords for the disk storage subsystems that are referred to by the DEVICE\_CLASS sections in the specified profile.

**Note:** If the specified profile contains multiple DEVICE\_CLASS sections that refer to the same physical disk storage subsystem, the password is queried only once by combining these DEVICE\_CLASS sections.

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

**Tip:** To ensure that the Backup Servers (BS) are also updated by SSH (if applicable), use the setup scripts for password modification.

Use the following syntax to change the passwords for intercommunication between Tivoli Storage FlashCopy Manager components, and communication to Oracle and DB2 databases and to storage devices.

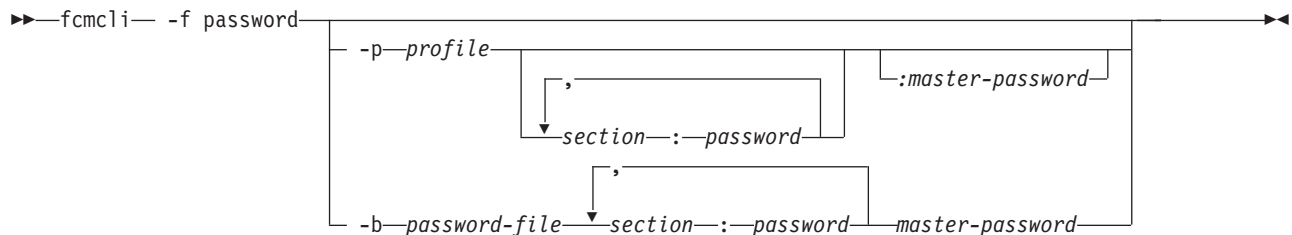


Table 33. *fcmlcli* command options for changing passwords

Option	Description	Default	Overrides profile parameter
-f password	Set or change passwords. <b>Note:</b> If you want to guarantee that the backup servers are updated as well (if OpenSSH is used), do not call <b>fcmlcli -f password</b> directly. Instead, set or change passwords using the setup scripts.		
-p profile	Full path and name of the profile being used.  In interactive mode, the command searches the profile for the ORACLE, DEVICE_CLASS, and DB2STANDBY sections and then queries for the respective passwords.  When the password file name is not specified, the command reads the respective file name from the GLOBAL section of the profile.	The profile in the current working path is used.	
-b password-file	The password file to be created or updated.	The /shared/acsd.pwd located in the directory specified by the ACS_DIR parameter as defined in the GLOBAL section. This information is read from one of these profiles: <ul style="list-style-type: none"> <li>• When -p is not specified, 'profile' is used.</li> <li>• When -p is specified, the profile specified is used.</li> </ul>	(No corresponding profile parameter.)
<sectionname>:<password>	Sets passwords for the according user accounts as referred to by sections ORACLE, DB2STANDBY, and DEVICE_CLASS. Note that for DEVICE_CLASS sections the sectionname follows the syntax DEVICE_CLASS:<instance name>, for example DEVICE_CLASS:STANDARD. Accordingly the syntax of the complete option in this case is DEVICE_CLASS:<device class name>:<password>.  No spaces are allowed between sectionname, colon, and password.		
:<masterpassword>	Master password used to authenticate a library or agent to the Management Agent (acsd).		

## Related concepts

“Tivoli Storage FlashCopy Manager profile description” on page 131

## Query Managed Capacity (fcmcli -f used\_capacity)

Use this command to periodically check the amount of storage space used for backups and to verify compliance with the licensed capacity amount.

This command lists all source volumes protected by Tivoli Storage FlashCopy Manager for which a backup (FlashCopy® or snapshot) was created. If a volume contains multiple backups, that volume is counted only once during the query. Identify the repository from which to list backups by specifying the profile that is associated with the source volume. The output displays the source volume ID, the size (capacity) of each source volume, and the total managed capacity of all source volumes.

The **fcmcli -f used\_capacity** syntax is as follows:

```
fcmcli -f used_capacity -p profile [-c]
```

- p** Specify the name of the Tivoli Storage FlashCopy Manager profile associated with the backups that reside on the volume.
- c** Specify this option to display the output as comma separated values.

## Example output

This command displays all source volumes for the profile that resides in db2/S01/acs:

```
fcmcli -f used_capacity -p /db2/S01/acs/profile
```

Output:

```
FFM0000I managed capacity for repository /db2/S01/acs/repo
FFM0000I volume ID: A0FR6HJ83C capacity: 2 GB
FFM0000I volume ID: A0FR6HENQ1 capacity: 2 GB
FFM0000I volume ID: A0FR6HAV80 capacity: 2 GB
FFM0000I total managed capacity 6 GB
```

This command displays all volumes for the profile that resides in db2/S01/acs as comma separated values:

```
fcmcli -f used_capacity -p /db2/S01/acs/profile -c
```

Output:

```
A0FR6HJ83C,2147483648
A0FR6HENQ1,2147483648
A0FR6HAV80,2147483648
*TOTAL*,6442450944
```

## Background daemons

For Tivoli Storage FlashCopy Manager to work properly, some background daemon processes are required to be up and running. Background daemon processes are not started directly. Instead, they are usually added to the `/etc/inittab` through the `setup_*.sh` commands.

To support high availability environments where the `/etc/inittab` cannot be used, you can instruct the `setup_*.sh` scripts to provide you with the exact commands that must be added to your high availability scripts instead of adding entries to `/etc/inittab`.

### Management Agent (acsd)

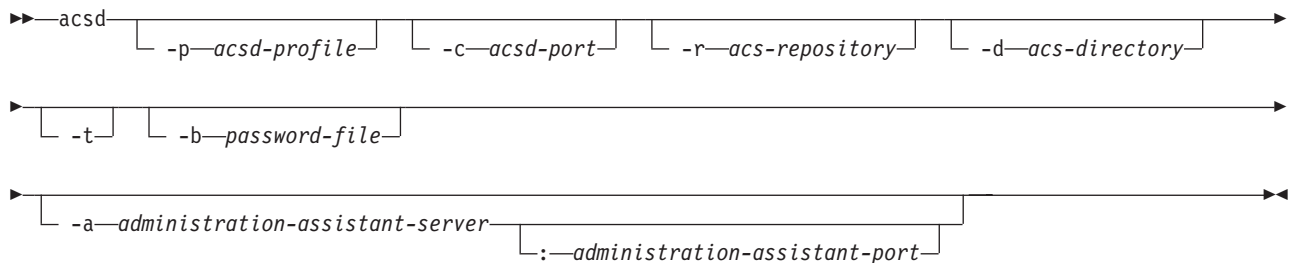
The Management Agent (acsd) coordinates the snapshot backup operation.

The Management Agent is started as a background daemon (see “Background daemons”) so you are not required to start it manually.

The Management Agent (acsd) controls the backup flow and mediates between the other 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.

(DB2) acsd must be started as the DB2 instance owner.

If you must deviate from the standard installation, the Management Agent offers the following command options for customization:



Syntax for obtaining version or help information:

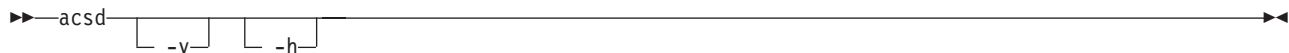


Table 34. Options for Starting the Management Agent (acsd) as a Daemon Process

Option	Description	Default	Overrides Profile Parameter
-p acsd-profile	Full path and name of the profile used by the management agent.  The Management Agent uses the 'GLOBAL' and 'acsd' sections of the profile.	<INSTANCE_DIR>/profile	

Table 34. Options for Starting the Management Agent (acsd) as a Daemon Process (continued)

Option	Description	Default	Overrides Profile Parameter
-c acsd-port	TCP/IP port number or service name on which the management agent is listening	57328	ACSD (port number or service name)
-r acs-repository	Directory name where the snapshot backup repository is located	None.	ACS_REPOSITORY
-d acs-directory	Name of Tivoli Storage FlashCopy Manager directory	<ACS_DIR>	
-t	Turn trace on	Trace off	TRACE
-b password-file	File in which the Tivoli Storage FlashCopy Manager management agent password is stored (in encrypted form). See notes.	<ACS_DIR>/shared/pwd.acsd	(No corresponding profile parameter.)
-a administration-assistant-server	(SAP) Host name of the server on which the Administration Assistant is running	None.	ADMIN_ASSISTANT (hostname)
administration-assistant-port	(SAP) TCP/IP port on which the Administration Assistant is listening	None.	ADMIN_ASSISTANT (port number)
-v	Display version and help information	None.	N/A
-h	Display help information only	None.	N/A

All parameters override the values specified in the acsd-profile or the corresponding default values. The **shared** and **logs** directories will be automatically created in ACS\_DIR. If no parameters are entered, acsd starts with the default profile and using default parameter values where applicable, or it issues an error message if this profile does not exist.

(DB2) When a user installs DB2 and creates a DB2 instance, the Management Agent (acsd) will be copied to <DB2 instance directory>/acs. To activate Tivoli Storage FlashCopy Manager, the user must start the setup script as the DB2 instance owner from this same directory. This script will create two entries in /etc/inittab. The Management Agent (acsd) will thereby be started automatically from /etc/inittab without any command line arguments. In this case the default values will be used for configuring the Management Agent (acsd). The default values can be overridden by providing a profile. By default, this is located in the directory <DB2 instance directory>/acs.

When acsd is started for the first time, or with a new ACS\_DIR parameter, it will

- create the subdirectories 'shared' and 'logs'
- create a password file pwd.acsd in the 'shared' subdirectory
- generate a master password.

As long as the Snapshot Backup Library uses the same ACS\_DIR, it can authenticate itself to acsd with the password provided in the pwd.acsd file. If the Snapshot Backup Library uses a different ACS\_DIR, the default password file pwd.acsd must be copied to that directory so that they can read the master password from that directory.

#### Related concepts

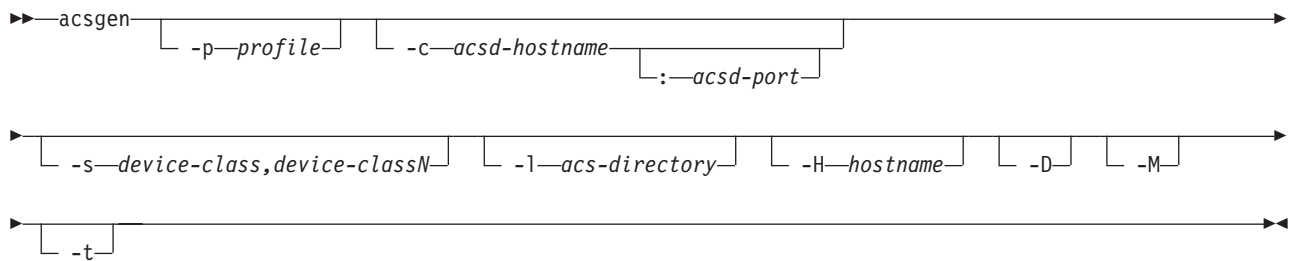
“Tivoli Storage FlashCopy Manager profile description” on page 131

### Generic Device Agent (acsgen)

The Generic Device Agent (acsgen) is the component that uses appropriate adapters to start snapshot commands on snapshot-compatible devices.

The Generic Device Agent is started as a background daemon (see “Background daemons” on page 118) so you are not required to start it manually.

If you must deviate from the standard installation, the Generic Device Agent (acsgen) offers the following command options for customization:



Syntax for obtaining version or help information:

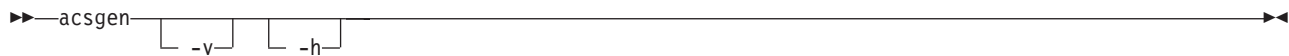


Table 35. Options for Starting the Generic Device Agent (acsgen)

Option	Description	Default
-p profile	Full profile name.	<INSTANCE_DIR>/profile
-c acsd-hostname	Name of the server where the management agent (acsd) is running	localhost
acsd-port	TCP/IP port number or service name on which the management agent (acsd) is listening	57328
-s device-class	Section in the profile that pertains to the device class. Specify multiple device classes by separating each device class by a space.	STANDARD
-l acs-directory	Directory where the 'logs' and 'shared' directories can be found.	<ACS_DIR>
-D	Start as daemon The '-a' option defines which usability states the device agent responds to. Valid only when started from /etc/inittab.	Run and terminate



Table 35. Options for Starting the Generic Device Agent (acsgen) (continued)

Option	Description	Default
-H hostname	The host name where the process is running. The primary use is by the launchpad component to check its partitions in a DB2 multi-partition environment.	The machine host name that is displayed by the hostname command.
-t	Turn trace on	<TRACE>
-M	Start the device agent as a "mount agent". This agent is called for mounting or unmounting the target volumes on the backup system when any of these situations exist: <ul style="list-style-type: none"> <li>• an offloaded backup to Tivoli Storage Manager is requested;</li> <li>• database files reside on JFS file systems;</li> <li>• database files reside on AIX LVM mirrored volumes;</li> <li>• the database was not suspended.</li> </ul> A mount verifies the consistency of the associated file systems.	Start as "monitoring agent".
-v	Display version and help information	None.
-h	Display help information only	None.

## Mounting and unmounting snapshots on a secondary system

FlashCopy Manager commands are available to mount or unmount a snapshot backup on a secondary system.

```

>> fmccli [-p profile] function-clause [-c acsd_hostname] [:-acsd_port]
          [-l acs-directory] [-t] [-d database-name] [-i instance-name]
          [-B backup ID]

```

The values for the function-clause parameter are described in the following sections.

### function-clause: FlashCopy administrative operations

The following functions are supported by the fmccli command option -f 'function' for mount and unmount:

```

>> [-f mount] [-f unmount] [-d database-name] [-i instance-name] [-B backup ID]

```

The following functions are supported by the `fcmcli` command option `-f 'function'` for forced unmount:

➤ ➤ -f unmount -F [ -d *database-name* ] [ -i *instance-name* ] [ -B *backup ID* ]

The functions `mount`, `unmount`, or `tape_backup` cannot run in parallel on the same backup server.

*Table 36. Options for the Tivoli Storage FlashCopy Manager 'fcmcli' command*

Option	Description	Default
-p profile	Full profile name.	<INSTANCE_DIR>/profile
-c acsd-hostname	Name of the server where the management agent (acsd) is running	localhost
acsd-port	TCP/IP port number or service name on which the management agent (acsd) is listening	57328
-l acs-directory	Directory where the 'logs' and 'shared' directories can be found.	<ACS_DIR>
-f mount	Mount snapshot target set	
-f unmount	Unmount snapshot target set	
-d database-name	Database name. Required for '-F' option.	No limitation
-i instance-name	Instance name to apply to the command. Required for '-F' option.	No limitation.
-F	Force a reset of TAPE_BACKUP_IN_PROGRESS usability states for the specified snapshot backup during the unmount force function. This parameter also requires the <ul style="list-style-type: none"> <li>• -d database-name</li> <li>• -i instance-name</li> <li>• -B backup-id</li> </ul> parameters.	None.
-t	Start with trace on.	Trace off
-v	Display version.	
-h	Display help text.	
-B	The Backup ID as displayed by fcmcli -f inquire [_detail] or db2acsutil.	None.

## **-f mount**

This command mounts a snapshot backup on a backup system.

Mounting a backup means the following occurs:

1. Configure the target volumes, which might need to be assigned to the offload system (see the profile parameter `BACKUP_HOST_NAME` in “*DEVICE\_CLASS device* section” on page 160 for details).
2. Import the volume groups from the target volumes.
3. Mount all file systems within the volume groups.

The mount is performed by one mount agent for each backup server. As a result, a mount agent is started by the launchpad daemon that runs on the respective backup server. By specifying additional options (filter arguments) such as

```
-i instance-name  
-d database-name  
-B backup-id
```

a specific snapshot backup can be selected for mounting on the offload system.

**Note:** If the option `-B` is omitted, the oldest backup still in state “`tape_backup_pending`” is selected implicitly.

(DB2) In a DPF environment with multiple partitions, IBM Tivoli Storage FlashCopy Manager always mounts all partitions associated with a snapshot backup operation.

To reflect whether a snapshot backup is currently being mounted or is already mounted, the usability states `MOUNTING` and `MOUNTED`, respectively, will be set for those backups in the snapshot backup repository. These two state values prevent a duplicate mount request for a backup that is currently being mounted, or is already mounted, on the backup system. If multiple snapshot backups of a database are candidates to be mounted, IBM Tivoli Storage FlashCopy Manager always picks the one with the most recent snapshot backup ID.

## **-f unmount**

This command releases all resources on the offload server that were used by the mount command.

**Normal mode:** The unmount itself is performed by one mount agent for each backup server. As a result, a mount agent is started by the launchpad daemon that runs on the respective backup server. The following steps will be done internally:

1. Unmount the filesystems belonging to the target volumes
2. Export the assigned volume group
3. Remove the devices (`vpath/hdisk`) from the offload system

By specifying additional options (filter arguments) such as

```
-i instance-name  
-d database-name  
-B backup-id
```

a specific snapshot backup can be selected for unmounting from the offload system.

(DB2) In a DPF environment with multiple partitions, IBM Tivoli Storage FlashCopy Manager always unmounts all partitions associated with a snapshot backup.

If the unmount does not succeed due to problems on the device agent side, the usability state of the backup will remain MOUNTED in the snapshot backup repository. Thus, after resolving the problems on the backup system (in some cases the only way might be a manual intervention), the fcmcli 'unmount' has to be issued again to finalize the unmount of the filesystems and update the usability state of the backup in the snapshot backup repository accordingly. If an off-loaded tape backup is currently running (usability state TAPE\_BACKUP\_IN\_PROGRESS is set), those backups will not be picked by IBM Tivoli Storage FlashCopy Manager for unmounting.

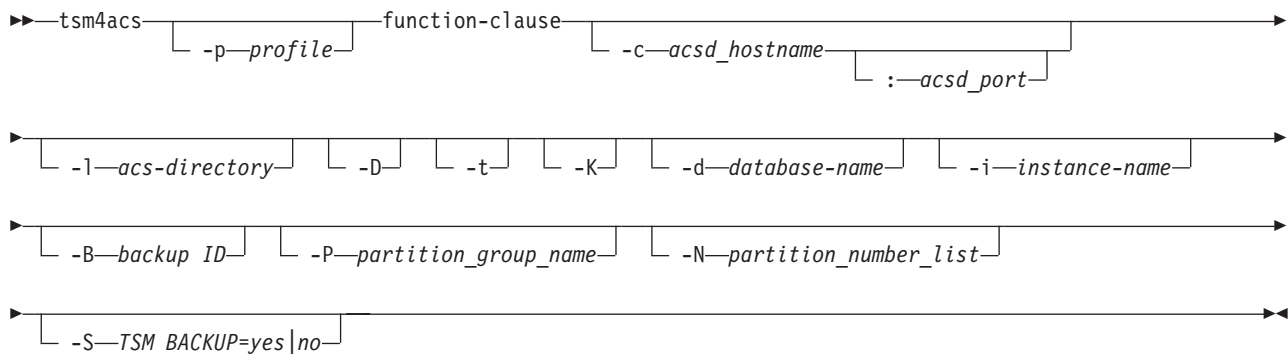
**Force mode:** Unexpected system failures in combination with offloaded tape backups can potentially lead to an incorrect state of the backup reflected in the snapshot backup repository (TAPE\_BACKUP\_IN\_PROGRESS still set). Therefore, a special built-in 'force' option (-F) for the fcmcli 'unmount' function is provided to return the system to a usable state. Besides the normal unmount function, 'unmount force' is able to pick backups currently in the TAPE\_BACKUP\_IN\_PROGRESS state as candidates to be unmounted and to reset the TAPE\_BACKUP\_IN\_PROGRESS usability state for those backups. The '-d', '-i', and '-B' options must be specified to uniquely identify the backup involved.

## Integration with Tivoli Storage Manager

If Tivoli Storage Manager is set up and configured in your environment, you can create a backup to Tivoli Storage Manager from a snapshot.

### Offload Agent (tsm4acs)

The offload agent is a daemon process managing offloaded backups to Tivoli Storage Manager. In addition it provides a command line interface offering functions for managing Tivoli Storage Manager backups.



The values for the function-clause parameter are described in the following sections.

### function-clause: FlashCopy offload operations

In a DB2 environment, the installation of Tivoli Storage FlashCopy Manager enables the offload functionality that otherwise is not available for the built-in snapshot backup functionality that is shipped with DB2.

The following functions are supported by the tsm4acs command option -f 'function':

```

>>> -f tape_backup -d database-name -i instance-name -N partition_number_list
<-K

```

The functions mount, unmount or tape\_backup cannot run in parallel on the same backup server.

The function 'update\_status' is supported by the tsm4acs command:

```

>>> -f update_status -d database-name -i instance-name -B backup ID
<-S TSM_BACKUP=yes|no

```

Table 37. Options for the Tivoli Storage FlashCopy Manager 'tsm4acs' command

Option	Description	Default
-p profile	Full profile name.	<INSTANCE_DIR>/profile
-c acsd-hostname	Name of the server where the management agent (acsd) is running	localhost
acsd-port	TCP/IP port number or service name on which the management agent (acsd) is listening	57328
-l acs-directory	Directory where the 'logs' and 'shared' directories can be found.	<ACS_DIR>
-f tape_backup	Back up a snapshot target set to Tivoli Storage Manager.	
-f update_status	Update the usability state after a snapshot backup operation completes to one of the following: <ul style="list-style-type: none"> <li>• Offload a snapshot backup to Tivoli Storage Manager (TSM_BACKUP=yes).</li> <li>• Do not offload a snapshot backup to Tivoli Storage Manager (TSM_BACKUP=no) if it was scheduled to offload.</li> </ul> These parameters are also required when using -f update_status: <ul style="list-style-type: none"> <li>• -d database-name</li> <li>• -i instance-name</li> <li>• -T snapshot-id</li> <li>• -S TSM_BACKUP=yes no</li> </ul>	
-d database-name	Database name. Required for '-F' option.	No limitation
-N partition   partition list	A single number or list of numbers (separated by a comma) denoting the partitions to be directed by the specified function.	All partitions are directed (when not specified).
-i instance-name	Instance name to apply to the command. Required for '-F' option.	No limitation.

Table 37. Options for the Tivoli Storage FlashCopy Manager 'tsm4acs' command (continued)

Option	Description	Default
-D	Run as daemon process. Valid only when started from /etc/inittab.	Run and terminate.
-K	In a multi-partition environment, the partitions remain mounted as long as all participating partitions are offloaded to Tivoli Storage Manager successfully. The offload agent will unmount all partitions after the last partition is successfully offloaded.	Off. The unmount operation is part of every Tivoli Storage Manager backup operation.
-t	Start with trace on.	Trace off
-v	Display version.	
-h	Display help text.	
-S	TSM_BACKUP=yes no  Use this option to inform Tivoli Storage FlashCopy Manager that a Tivoli Storage Manager backup is no longer required or that a Tivoli Storage Manager backup is currently requested. This option is only valid with the update_status function.	
-B	The Backup ID as displayed by fcmcli -f inquire [_detail] or db2acsutil.	None.
-P	The name of a partition group as specified in the profile with the PARTITION_GROUP parameter.	None.

The tsm4acs process connects to the Management Agent (acsd) process and performs the function specified with the '-f' option. After executing the appropriate operation, tsm4acs notifies acsd, which then updates the snapshot backup repository accordingly. When started as a daemon (-D option), as is the case for the standard /etc/inittab entry, tsm4acs will perform offloaded tape backup operations. This will result in a synchronous tape backup of all snapshot backups. As soon as a new snapshot is started with TSM\_BACKUP YES, the offload agent will start to back it up to tape when it becomes available for mounting on a backup system (REMOTELY\_MOUNTABLE).

The return code of the Offload Agent will be 0 if it finishes the request without an error or if there were no candidates for the request. Further, the return code will be 1 if one or more minor issues occurred which are not critical but should be checked to prevent major issues later. Return code 2 indicates that an error occurred during the command execution.

The following sections describe the details of the various functions specified with the '-f' option of the Tivoli Storage FlashCopy Manager command tsm4acs.

### **-f tape\_backup:**

This offload agent command backs up data to tape storage.

**Note:** IBM Tivoli Storage Manager for Enterprise Resource Planning must be installed on the production and backup server if you use Tivoli Storage FlashCopy Manager in an SAP® environment with Oracle or DB2. Tivoli Storage Manager for Databases (Data Protection for Oracle) as well as Oracle must be installed on the production and backup server if you use Tivoli Storage FlashCopy Manager to protect an Oracle non-SAP environment. If FlashCopy Manager for Custom Applications is used, the Tivoli Storage Manager backup-archive client must be installed on the backup server.

To create a snapshot backup with a subsequent tape backup, TSM\_BACKUP or TAPE\_BACKUP\_FROM\_SNAPSHOT must be specified either as part of the backup command or as a profile parameter, thus applying to all backups. The management agent updates the usability state with TAPE\_BACKUP\_PENDING. The IBM Tivoli Storage FlashCopy Manager offload agent then picks up all snapshot backups in the state TAPE\_BACKUP\_PENDING and backs them up to tape.

To start the offloaded backup to tape, enter the command:

```
tsm4acs -f tape_backup
```

By specifying additional options or filter arguments such as

```
-i instance-name  
-d database-name
```

the appropriate backup for the given instance and or database can be selected for offloading to tape. The "-B backup-id" option cannot be specified in conjunction with "-f tape\_backup". The backups should be processed in chronological order. tsm4acs will always back up the oldest snapshot eligible for transfer to Tivoli Storage Manager.

(DB2) Offloaded tape backups will not be registered in the DB2 history on the production system. They will be reflected in the DB2 history on the offload system as long as the assigned volumes have not been overwritten. See also "DB2 backup history file overview" on page 72.

By specifying the -D option for the offload agent, it will act as a daemon process that periodically checks for outstanding tape backup requests. Furthermore, the offload agent, running as a daemon, tries to offload a snapshot backup to tape only once. If the first attempt fails for some reason, the snapshot backup is marked accordingly and will not be picked a second time by the tsm4acs daemon for offloading to tape. Such a backup must be offloaded to tape manually by issuing:

```
tsm4acs -f tape_backup <filter arguments>
```

If multiple snapshot backups of a database are candidates for offloading to tape, the IBM Tivoli Storage FlashCopy Manager offload agent (whether as a daemon or with the -f tape\_backup function) always selects the one with the oldest snapshot backup ID. This selection ensures that the Tivoli Storage Manager backups are created in the appropriate sequential order.

**Tip:** Whenever a new snapshot backup with TSM\_BACKUP set to YES, MANDATE, or LATEST is created, IBM Tivoli Storage FlashCopy Manager sets the TAPE\_BACKUP\_PENDING status to NO for all snapshot backups that were previously created with TSM\_BACKUP set to LATEST. This prevents backup requests to Tivoli Storage Manager from queuing if they cannot be completed in time. See Table 41 on page 140 for more details.

The tsm4acs 'tape\_backup' function internally does the following steps:

1. Mount the file systems on the offload system if they were not previously mounted using fcmcli with the 'mount' function or by a forced mount request (see "Forced mount" on page 10 for more information). If all necessary file systems were already mounted, this step will be skipped (see "-f mount" on page 123).
2. Update the usability state to TAPE\_BACKUP\_IN\_PROGRESS for all partitions having the usability state TAPE\_BACKUP\_PENDING set.
3. Back up these partitions to tape.
4. Update usability states: For those partitions for which the backup succeeded, reset the usability state TAPE\_BACKUP\_PENDING and set TAPE\_BACKUP\_COMPLETE. For those partitions for which backup failed, set usability state TAPE\_BACKUP\_FAILED. For all participating partitions, reset the usability state TAPE\_BACKUP\_IN\_PROGRESS.
5. Unmount the filesystems from the offload system (see "-f unmount" on page 123).

As long as the usability state for a partition is TAPE\_BACKUP\_IN\_PROGRESS, any request to restart the offload of that partition to tape will be refused.

If a backup to Tivoli Storage Manager fails, FlashCopy Manager can retry the backup operation.

(DB2) In DPF environments, offloaded backups can be performed only when the snapshot was created on all partitions. If the Offload Agent retries a backup operation, it only backs up those partitions that have not already been backed up successfully.

(DB2) In DPF environments with more than one partition it can be useful to perform the offloaded Tivoli Storage Manager backup in parallel on multiple partitions. This is useful especially when the DB2 DPF database is spread across more than one backup system. The profile parameter NUMBER\_BACKUPS\_IN\_PARALLEL in the OFFLOAD section can be used to specify the degree of parallelism. For details see Chapter 6, "Tivoli Storage FlashCopy Manager configuration files," on page 131.

#### **-f update\_status:**

This offload agent command updates the usability state of a specified snapshot backup.

The usability state of a specified snapshot backup can be updated to either offload a snapshot backup to Tivoli Storage Manager (TSM\_BACKUP=yes) or to not offload a snapshot backup to Tivoli Storage Manager (TSM\_BACKUP=no). This provides opportunity to offload a snapshot backup to Tivoli Storage Manager although the TSM\_BACKUP or TSM\_BACKUP\_FROM\_SNAPSHOT profile parameter was deactivated during the snapshot backup operation. In this situation, if there is no longer a need to offload the snapshot backup to Tivoli Storage



Manager (which was performed with the parameter TSM\_BACKUP or TSM\_BACKUP\_FROM\_SNAPSHOT activated), the usability state can be reset accordingly.

In order to identify the backup whose state is to be modified, these parameters must also be specified when using -f update\_status:

- d database-name
- i instance-name
- B backup-id



---

## Chapter 6. Tivoli Storage FlashCopy Manager configuration files

Configuration files are defined by the user with all the information Tivoli Storage FlashCopy Manager needs to successfully perform its functions.

Tivoli Storage FlashCopy Manager uses the following configuration files:

- Profile
- Target volumes file(s)
- Password file
- (SAP® with Oracle) SAP Backint configuration file
- (SAP® with Oracle) SAP® BR\*Tools configuration file
- (Native Oracle) Tivoli Storage Manager options files

---

### Tivoli Storage FlashCopy Manager profile description

Tivoli Storage FlashCopy Manager relies on a profile in order to operate properly.

The profile needs to be available on all database nodes, on the machine where the Management Agent (acsd) is running, and on the backup servers when saving snapshot backups to Tivoli Storage Manager. The profile only uses the GLOBAL section on the backup server.

The Tivoli Storage FlashCopy Manager profile is created or updated using the setup script. The standard profile is named 'profile' and is recommended to be defined as follows:

```
<ACS_DIR>/profile
```

The location where the profile is defined must meet these requirements:

- The profile directory must not be part of any snapshot operation.
- (DB2) The profile directory can be NFS exported and NFS shared on all DB2 DPF partitions.

See Chapter 3, “Installing Tivoli Storage FlashCopy Manager,” on page 49 for more information about defining ACS\_DIR.

The Tivoli Storage FlashCopy Manager profile is typically used with only one database name. The profile is identified by the value of the option -p of the Tivoli Storage FlashCopy Manager executable files and for DB2 databases by the PROFILE vendor option. The elements of the profile are not case sensitive. By convention, section and parameter names are shown in uppercase.

## Tivoli Storage FlashCopy Manager profile sections

Each section of the Tivoli Storage FlashCopy Manager profile file contains information unique to that section.

The profile is structured into these named sections:

- GLOBAL
- ACSD
- CLIENT
- DEVICE\_CLASS *device*
- OFFLOAD
- OFFLOAD\_DB2STANDBY
- ORACLE
- CLONING
- DB2STANDBY

The DEVICE\_CLASS section can occur multiple times, each provided with an arbitrary but unique instance name *device*. The names are changeable and determined by using the DEVICE\_CLASS profile parameter specified within the CLIENT or the CLONING section. Each section has a unique set of specific parameters.

### GLOBAL section

The GLOBAL section contains information that is required and used by all Tivoli Storage FlashCopy Manager components and is therefore required on all database nodes as well as by the management, device, and offload agents. Any component of Tivoli Storage FlashCopy Manager evaluates this section only once (during startup). Therefore, changes within this section require Tivoli Storage FlashCopy Manager to be restarted before they become effective. Depending on the environment, it might be necessary to install Tivoli Storage FlashCopy Manager on multiple machines. Such an environment might be when the database is distributed across multiple application hosts or when using a backup server to transfer snapshot backups to Tivoli Storage Manager. Even in those environments there is always only one active Management Agent, whose location is specified using the ACSD parameter in this section. The GLOBAL section is also used to specify the location for logging, tracing, and password files. The profile only uses the GLOBAL section on the backup server.

### ACSD section

The ACSD section contains information that is used exclusively by the Management Agent (acsd). This section includes the ACS\_REPOSITORY parameter, which specifies the directory where the Management Agent stores its backup repository. This repository is the most important collection of Tivoli Storage FlashCopy Manager data. If the repository is lost, any previously created backup will not be able to be restored.

### CLIENT section

The CLIENT section contains all parameters relating to backup operations, such as SAP or native database applications, the number of backup versions, whether a Tivoli Storage Manager backup is to be created from the snapshot, how many snapshot backup generations to retain, and which DEVICE\_CLASS section is used during snapshot creation. The CLIENT section is used by the Snapshot Backup Library that is loaded to start backup or restore processing. Most of the parameters in the CLIENT section can be overridden by options.

**Tip:** For SAP® with Oracle: When configuring offloaded backups, the profile does not contain a CLIENT section. Instead, the corresponding information from the CLIENT section is located in the .utl file. For more information, see “Tivoli Storage FlashCopy Manager backint profile (.utl file)” on page 146.

#### **DEVICE\_CLASS** *device* section

The DEVICE\_CLASS section contains parameters related to the storage system. At least one DEVICE\_CLASS section is required for the configuration of the Management Agent. A DEVICE\_CLASS section describes the characteristics of a storage device that can be used to create a snapshot backup and as such depends heavily on the specific storage subsystem. You can specify multiple DEVICE\_CLASS sections within one profile and assign arbitrary but unique names of your choosing to these sections. By specifying the DEVICE\_CLASS parameter within the CLIENT or CLONING section, the corresponding DEVICE\_CLASS section will be activated for use during this particular operation. The value of DEVICE\_CLASS is recorded in the IBM Tivoli Storage FlashCopy Manager repository in order to identify the appropriate DEVICE\_CLASS section that is used during restore. For each of the DEVICE\_CLASS sections, a password is required and can be set by issuing the setup script without the -a action option. For example:

```
setup_type.sh
```

The password can also be set in a non-interactive mode using the fcmcli command `fcmcli -f password` command. These passwords are used by Tivoli Storage FlashCopy Manager to authenticate to the storage subsystem represented by the associated DEVICE\_CLASS section. See also “Management Agent (acsd)” on page 118.

**Note:** A DEVICE\_CLASS cannot be referred by the CLIENT and the CLONING sections at the same time.

#### **OFFLOAD** section

The OFFLOAD section contains information on how a snapshot is transferred to Tivoli Storage Manager. It is used by the Offload Agent (tsm4acs) and the offload related functionality of fcmcli. See the FlashCopy offload operations in Chapter 5, “Tivoli Storage FlashCopy Manager commands and scripts,” on page 85 for more details.

To configure Tivoli Storage FlashCopy Manager in a way that protects both active and standby nodes of a DB2 HADR environment, you must have two OFFLOAD sections in the profile. The two sections are named differently--OFFLOAD and OFFLOAD\_DB2STANDBY.

When the Offload Agent is started, it connects to the Management Agent and queries for snapshot backups that have been backed up with profile parameter) TSM\_BACKUP (for SAP with Oracle TSM\_BACKUP\_FROM\_SNAPSHOT) set to YES. If such a backup is found, the Offload Agent mounts this snapshot and initiates a Tivoli Storage Manager backup using the following application:

- (Native DB2) the DB2 built-in Tivoli Storage Manager agent
- (SAP with Oracle or DB2) IBM Tivoli Storage Manager for Enterprise Resource Planning (Tivoli Storage Manager for ERP)
- (Native Oracle) Oracle RMAN and Data Protection for Oracle.
- (IBM Tivoli Storage FlashCopy Manager for Custom Applications) Tivoli Storage Manager backup-archive client

The OFFLOAD section is optional unless one of these conditions exists:

- (SAP® with Oracle) Tivoli Storage Manager for ERP is used for offload tape backup (at least the PROFILE parameter must be present).
- One or more of the default values must be overridden.

#### **ORACLE section**

(Oracle) The ORACLE section contains the parameters describing the native Oracle database. The ORACLE section is not needed for SAP® with Oracle configurations.

#### **CLONING section**

The CLONING section contains the parameters used for cloning operations. The CLONING section is ignored for all other operations. The profile must be available on all database nodes and on the system where the Management Agent (acsd) is running. In addition, the GLOBAL section of the profile is required on the host where the clone databases reside.

#### **DB2STANDBY section**

(DB2) The DB2STANDBY section is used when backing up the standby node of a DB2 high-availability disaster recovery (HADR) environment. Although Tivoli Storage FlashCopy Manager also evaluates all parameters specified within the CLIENT section during HADR operations, some parameters specified in the DB2STANDBY section override the corresponding parameters specified in the CLIENT section. See the parameters in the “DB2STANDBY section” on page 175 for details.

#### **OFFLOAD\_DB2STANDBY section**

The OFFLOAD\_DB2STANDBY has the same semantics as the OFFLOAD section, except that it is evaluated whenever an offloaded backup from a DB2 HADR secondary occurs (instead of the DB2 HADR primary).

**Tip:** Typically, you also need an OFFLOAD section in your profile to protect your databases when DB2 HADR primary and secondary have switched roles.

### **Example**

All parameters belonging to a section are enclosed by a section-begin statement (`>>> sectionname`) and a section-end statement (`<<< sectionname`). The name is optional on the section-end statement. Comments can be used at any place within the profile; they are introduced by '#' and apply to the remainder of the line. Tab characters are permitted. The basic structure for the file sections is as follows:

```

# Global section
>>> GLOBAL
parametername1 value1
parametername2 value1 value2
....
<<<
# ACSD section
>>> ACSD
parametername1 value1
parametername2 value1 value2
....
<<<
# CLIENT section
>>> CLIENT
parametername1 value1
parametername2 value1 value2
....
<<<
# DEVICE_CLASS device section
>>> DEVICE_CLASS device
parametername1 value1
parametername2 value1 value2
....
<<<
# DEVICE_CLASS device2 section
>>> DEVICE_CLASS device2
parametername1 value1
parametername2 value1 value2
....
<<<
# OFFLOAD section
>>> OFFLOAD
parametername1 value1
parametername2 value1 value2
....
<<<
# ORACLE section
>>> ORACLE
parametername1 value1
parametername2 value1 value2
....
<<<
# CLONING section
>>> CLONING
parametername1 value1
parametername2 value1 value2
....
<<<
# DB2STANDBY section
>>> DB2STANDBY
parametername1 value1
parametername2 value1 value2
....
<<<

```

The following example is a sample profile for DB2 including cloning and backup of a standby node of a DB2 high-availability disaster recovery (HADR) environment.

```

>>> GLOBAL
ACS_DIR /db2/AS1/acs
ACSD auntmathilda 54331
# TRACE NO
<<<

>>> ACSD
ACS_REPOSITORY /db2/AS1/acs/acsrepository
# ADMIN_ASSISTANT levi 5126
# REPOSITORY_LABEL TSM
<<<

```

```

>>> CLIENT
# BACKUPIDPREFIX DB2____
APPLICATION_TYPE SAP
# PARTITION_GROUP
TSM_BACKUP YES
# MAX_VERSIONS ADAPTIVE
# LVM_FREEZE_THAW AUTO
# NEGATIVE_LIST no_check
# TIMEOUT_FLASH 120
# GLOBAL_SYSTEM_IDENTIFIER
# DEVICE_CLASS STANDARD
<<<

>>> OFFLOAD
BACKUP_METHOD DB2
OPTIONS @/db2/AS1/dbs/vendor.env.%DB2NODE
# PARALLELISM AUTO
# NUM_SESSIONS 1
# NUM_BUFFERS AUTO
# BUFFER_SIZE AUTO
<<<

>>> DB2STANDBY
DB2_PRODUCTIVE_SERVER akuma DB2_db2as1_svc
DB2_ALIAS AS1
PRE_FLASH_CMD /db2/AS1/acs/db2_pre_flash_script.cmd
POST_FLASH_CMD /db2/AS1/acs/db2_post_flash_script.cmd
DB2_USERNAME db2as1
DB2_AUTH_TYPE SERVER
<<<

>>> OFFLOAD_DB2STANDBY
BACKUP_METHOD TSM_CLIENT
# MODE FULL
ASNODENAME AS1TEST
# DSM_DIR
# DSM_CONFIG
# VIRTUALFSNAME fcm
<<<

>>> CLONING
DEVICE_CLASS CLONE1 USE_FOR_CLONING AS2
<<<

>>> DEVICE_CLASS STANDARD
COPYSERVICES_HARDWARE_TYPE DS8000
COPYSERVICES_PRIMARY_SERVERNAME uncleritus
# COPYSERVICES_SECONDARY_SERVERNAME
COPYSERVICES_USERNAME tsmuser
# COPYSERVICES_COMMPROTOCOL HTTPS
# COPYSERVICES_CERTIFICATEFILE NO_CERTIFICATE
# COPYSERVICES_SERVERPORT 5989
FLASHCOPY_TYPE NOCOPY
# COPYSERVICES_TIMEOUT 6
# RESTORE_FORCE NO
# STORAGE_SYSTEM_ID
TARGET_SETS VOLUMES_FILE
VOLUMES_FILE /db2/AS1/acs/acsvolumes/fct.file
<<<

>>> DEVICE_CLASS CLONE1
COPYSERVICES_HARDWARE_TYPE DS8000
COPYSERVICES_PRIMARY_SERVERNAME uncleritus
# COPYSERVICES_SECONDARY_SERVERNAME
COPYSERVICES_USERNAME tsmuser
# COPYSERVICES_COMMPROTOCOL HTTPS

```



```
# COPYSERVICES_CERTIFICATEFILE NO_CERTIFICATE
# COPYSERVICES_SERVERPORT 5989
# FLASHCOPY_TYPE COPY
# COPYSERVICES_TIMEOUT 6
# RESTORE_FORCE NO
# STORAGE_SYSTEM_ID
TARGET_SETS VOLUMES_FILE
VOLUMES_FILE /db2/AS1/acs/acsvolumes/fct.file.cloning
CLONE_DATABASE YES
<<<
```

## Overriding Tivoli Storage FlashCopy Manager profile parameters

Overwrite Tivoli Storage FlashCopy Manager profile parameters for DB2 and for SAP with Oracle by using vendor options. See Chapter 5, “Tivoli Storage FlashCopy Manager commands and scripts,” on page 85 for details.

## Modifying the GLOBAL or ACSD sections of the Tivoli Storage FlashCopy Manager profile

Changes to the profile take effect immediately and do not require restarting Tivoli Storage FlashCopy Manager except when the GLOBAL or ACSD sections are modified.

However, changes to the GLOBAL section of the profile do require the following procedure:

1. Issue this command to stop Tivoli Storage FlashCopy Manager on all machines where it is currently installed:

```
setup_type.sh -a stop
```

2. Update the parameters in the GLOBAL or ACSD sections.
3. Issue this command to start Tivoli Storage FlashCopy Manager on all machines that were previously stopped:

```
setup_type.sh -a start
```

## Tivoli Storage FlashCopy Manager profile parameters

Use the Tivoli Storage FlashCopy Manager profile parameters to configure Tivoli Storage FlashCopy Manager. The profile parameters are organized into different sections in the Tivoli Storage FlashCopy Manager profile. Tables that summarize the profile parameters are provided.

See “Profile parameter notes” on page 179 for additional information about the profile parameters.

*Table 38. Tivoli Storage FlashCopy Manager profile sections*

Profile parameter section	Page
GLOBAL section	“GLOBAL section” on page 138
ACSD section	“ACSD section” on page 139
CLIENT section	“CLIENT section” on page 139
IBM Tivoli Storage FlashCopy Manager backint profile (.utl file)	“Tivoli Storage FlashCopy Manager backint profile (.utl file)” on page 146

Table 38. Tivoli Storage FlashCopy Manager profile sections (continued)

Profile parameter section	Page
SAP® BR*Tools configuration profile (.sap)	"SAP® BR*Tools configuration profile (.sap)" on page 152
ORACLE section	"ORACLE section" on page 154
CLONING section	"CLONING section" on page 157
DEVICE_CLASS device section	"DEVICE_CLASS device section" on page 160
OFFLOAD section	"OFFLOAD section" on page 168
DB2STANDBY section	"DB2STANDBY section" on page 175
OFFLOAD_DB2STANDBY section	"OFFLOAD_DB2STANDBY section" on page 179

### Related concepts

"Tivoli Storage FlashCopy Manager target volumes file" on page 194

### Related reference

"Key files and directories" on page 205

## GLOBAL section

The profile parameters in the GLOBAL section contain basic configuration information, such as on which port FlashCopy Manager is listening, and where it is writing its logs to. The parameters are independent of the storage device or application.

Table 39. Tivoli Storage FlashCopy Manager profile parameters - GLOBAL section

Name	Value	Default value	Advanced mode only
ACS_DIR	Path of the IBM Tivoli Storage FlashCopy Manager directory. See note 1 in "Profile parameter notes" on page 179.	Required	No
ACSD	<i>hostname port</i>  Hostname and port (separated by space) of the system on which the Management Agent is running.  This parameter must be identical on all systems where Tivoli Storage FlashCopy Manager is installed for a given database instance. However, each instance can be managed by an individual Management Agent.	localhost 57328	No
TRACE	<b>YES</b> Enable tracing  <b>NO</b> Disable tracing For more information, see "Log and trace files summary" on page 246.  TRACE can also be specified in the backint profile.	NO	Yes

### Related reference

"Profile parameter notes" on page 179

## ACSD section

The profile parameters in the ACSD section contain basic information. Except where noted, the parameters are independent of the storage device or application.

Table 40. Tivoli Storage FlashCopy Manager profile parameters - ACSD section

Name	Value	Default value	Advanced mode only
ACS_REPOSITORY	Path to the ACS repository directory.  See note 2 in "Profile parameter notes" on page 179.	This parameter must be specified by the user.	No
ADMIN_ASSISTANT	<server> <port> Server and port on which the Tivoli Storage Manager for ERP Administration Assistant server component is listening.  <b>NO</b> Do not send data to the Administration Assistant. See note 3 in "Profile parameter notes" on page 179. Applies only to SAP environments.	NO	Yes
REPOSITORY_LABEL	A prefix that is added to each volume name on the IBM XIV Storage System. The prefix contains three characters in one of these ranges:  [a-z] [A-Z] [0-9]  See note 4 in "Profile parameter notes" on page 179.	TSM	Yes

### Related reference

"Profile parameter notes" on page 179

## CLIENT section

The CLIENT section contains parameters that relate to the database applications. The parameters do not depend on the storage device. This section is required for all database applications except for SAP with Oracle if Tivoli Storage FlashCopy Manager is used with IBM Tivoli Storage Manager for Enterprise Resource Planning.

In this case, the parameters of the CLIENT section must be included directly within the IBM Tivoli Storage Manager for Enterprise Resource Planning configuration file (.utl file) so they are moved out of the Tivoli Storage FlashCopy Manager profile. These parameters are designated with the "+" in the SAP with Oracle column. See "Tivoli Storage FlashCopy Manager backint profile (.utl file)" on page 146 for more information.

**Note:** Additional DEVICE\_CLASS sections are usually added to the Tivoli Storage FlashCopy Manager profile automatically by the profile wizard whenever you add additional instances of the DEVICE\_CLASS parameter to the CLIENT section. When you use Tivoli Storage FlashCopy Manager with IBM Tivoli Storage Manager for Enterprise Resource Planning, the Tivoli Storage FlashCopy Manager profile does not contain a CLIENT section.

Table 41. Tivoli Storage FlashCopy Manager profile parameters - CLIENT section

Database Environment				Parameter			Advanced mode only
DB2	Native Oracle <sup>1</sup>	SAP <sup>®</sup> with Oracle <sup>2,3</sup>	Custom app.	Name	Value	Default value	
x	x		x	APPLICATION_TYPE	Environment (native or SAP <sup>®</sup> application)  <b>DB2</b> Treat as a generic (native) DB2 system.  <b>ORACLE</b> Treat as a generic (native) Oracle system.  <b>SAP</b> An SAP <sup>®</sup> application that uses DB2 as the underlying database.  <b>SAP_ORACLE</b> An SAP <sup>®</sup> application that uses Oracle as the underlying database  <b>GENERIC</b> A Tivoli Storage Manager application uses the underlying database. See note 30 in "Profile parameter notes" on page 179.	This parameter is preset depending on the setup script variant used.	No
x	x	+	x	TSM_BACKUP <b>Note:</b> This parameter is called TSM_BACKUP in the FlashCopy Manager profile. It is called TSM_BACKUP_FROM_ SNAPSHOT in the SAP with Oracle .utl file (see Table 42 on page 147).	<b>YES</b> Create a Tivoli Storage Manager backup from this snapshot. Reuse of the target set is allowed if the Tivoli Storage Manager backup operation does not complete successfully.  <b>MANDATE</b> In contrast to YES, do not reuse the target set until the Tivoli Storage Manager backup completes.  See note 18 in "Profile parameter notes" on page 179 for complete parameter definitions.	NO	No

Table 41. Tivoli Storage FlashCopy Manager profile parameters - CLIENT section (continued)

Database Environment				Parameter			Advanced mode only
DB2	Native Oracle <sup>1</sup>	SAP <sup>®</sup> with Oracle <sup>2,3</sup>	Custom app.	Name	Value	Default value	
x	x	+	x	TSM_BACKUP (continued) <b>Note:</b> This parameter is called TSM_BACKUP in the profile. It is called TSM_BACKUP_FROM_SNAPSHOT in the SAP with Oracle .utl file (see Table 42 on page 147).	<b>LATEST</b> When a snapshot backup was performed with TSM_BACKUP LATEST and the off-loaded backup to Tivoli Storage Manager has either not started or has failed, any new snapshot backup with option TSM_BACKUP set to LATEST, YES, or MANDATE, removes the backup request to Tivoli Storage Manager from the previous backup. This prevents backup requests to Tivoli Storage Manager from queuing if they cannot be completed in time.  <b>NO</b> Keep the snapshot backup and do not use it as a source for a subsequent tape backup operation.  See note 18 in "Profile parameter notes" on page 179 for complete parameter definitions.	NO	No
x	x	+	x	TSM_BACKUP (continued) <b>Note:</b> This parameter is called TSM_BACKUP in the FlashCopy Manager profile. It is called TSM_BACKUP_FROM_SNAPSHOT in the SAP with Oracle .utl file (see Table 42 on page 147).	<b>TSM_ONLY</b> The backup is automatically marked for deletion during the unmount operation once the Tivoli Storage Manager backup has completed. This occurs regardless of whether the backup was successful or not.  <b>USE_FOR list of device classes</b> This attribute can be combined with any of these options to limit its application to snapshots performed with particular device classes as specified in the profile. Any number of device classes that are listed must be separated by spaces.  See note 18 in "Profile parameter notes" on page 179 for complete parameter definitions.	NO	No

Table 41. Tivoli Storage FlashCopy Manager profile parameters - CLIENT section (continued)

Database Environment				Parameter			Advanced mode only
DB2	Native Oracle <sup>1</sup>	SAP <sup>®</sup> with Oracle <sup>2,3</sup>	Custom app.	Name	Value	Default value	
x	x	+	x	MAX_VERSIONS <b>Note:</b> This parameter is called MAX_VERSIONS in the profile. It is called MAX_SNAPSHOT_VERSIONS in the SAP with Oracle .utl file (see Table 42 on page 147).	<b>ADAPTIVE</b> The maximum number varies depending on the available space. Tivoli Storage FlashCopy Manager reuses the oldest target set as the target for the current backup.  <i>n</i> Maximum number of snapshot versions to be maintained. When this limit is reached, the oldest version is deleted.	ADAPTIVE	No
x	x	+	x	LVM_FREEZE_THAW	Determines when to enable the freeze and thaw actions. See note 11 in "Profile parameter notes" on page 179.		Yes
x	x	+	x	DEVICE_CLASS	<i>&lt;list of device classes&gt; [&lt;conditions&gt;]</i> One of the device classes listed is used during backup in the DEVICE_CLASS statement for which the condition is true. The condition statement is optional and has this syntax: [USE_AT <i>&lt;days of week&gt;</i> ] [FROM <i>&lt;time&gt;</i> TO <i>&lt;time&gt;</i> ] (partitioned DB2 databases) [ON_DBPARTITIONNUMS] <i>&lt;list of partitions&gt;</i> See note 9 in "Profile parameter notes" on page 179 for complete information.	STANDARD	No
x	x		x	NEGATIVE_LIST	<b>NO_CHECK</b> Does not check for additional files.  <b>WARN</b> Issues a warning (processing continues).  <b>ERROR</b> Issues an error (processing ends).  <i>filename</i> The file <i>filename</i> contains fully qualified names of files and directories.  See note 13 in "Profile parameter notes" on page 179.	This parameter must be specified by the user.	No

Table 41. Tivoli Storage FlashCopy Manager profile parameters - CLIENT section (continued)

Database Environment				Parameter			Advanced mode only
DB2	Native Oracle <sup>1</sup>	SAP® with Oracle <sup>2,3</sup>	Custom app.	Name	Value	Default value	
	x	+		TARGET_DATABASE_SUSPEND	YES, NO, OFFLINE  This value specifies whether to suspend activity on the target database until the FlashCopy operation completes. Enter one of the following values: <i>yes</i> , <i>no</i> , or <i>offline</i> . A <i>yes</i> value is recommended when transaction processing activity is high. An <i>offline</i> value specifies that all backups must be offline. If SAP® requests an offline backup, this parameter is ignored.  See note 17 in "Profile parameter notes" on page 179.	This parameter must be specified by the user.	No
	x			VOLUME_MGR	ASM LVM  If ASM is selected, the existing option LVM_FREEZE_THAW will be ignored and not queried by the wizard since there is no file system. If LVM is specified, the ASM-related options in the device section will be ignored and not queried by the wizard.	LVM	No
x				PARTITION_GROUP	Specify all partitions that share the same volume group in a multi-partition database environment.  <group name> Identifier for the partition group.  <db2 node> [<db2 node>] [...] <i>[...]</i> DB2 node name. Multiple entries must be separated by a space.  See note 21 in "Profile parameter notes" on page 179.		Yes
x	x	x	x	TIMEOUT_FLASH	Specify the maximum time (in seconds) that the database agent waits for a response to the management agent call during the 'flash' phase. If the database agent does not receive a response within the specified time, an error message is issued. See note 22 in "Profile parameter notes" on page 179.	120 seconds	Yes
x	x	x	x	TIMEOUT_<PHASE>	Specify the maximum time (in seconds) that the database agent waits for a response to the management agent call during the <phase> phase. If the database agent does not receive a response within the specified time, an error message is issued. See note 23 in "Profile parameter notes" on page 179 for the phases that you can specify.	3600 seconds	

Table 41. Tivoli Storage FlashCopy Manager profile parameters - CLIENT section (continued)

Database Environment				Parameter			Advanced mode only
DB2	Native Oracle <sup>1</sup>	SAP <sup>®</sup> with Oracle <sup>2,3</sup>	Custom app.	Name	Value	Default value	
x	x	x	x	GLOBAL_SYSTEM_IDENTIFIER	Specify a string that used in the IBM Tivoli Storage Manager for Enterprise Resource Planning Administration Assistant that uniquely identifies a DB2 or Oracle database in the system landscape. This parameter only valid when the ADMIN_ASSISTANT parameter is specified in the ACSD section of the profile.	DB2_<DBname> or ORA_<DBname>	Yes
			x	PRE_FLASH_CMD	command string  You can specify this parameter when the APPLICATION_TYPE parameter specifies GENERIC.  This parameter identifies the command script or executable file that is used to quiesce the application immediately before the snapshot operation begins. Arguments can be specified, separated by blanks.  This parameter is optional in the profile, or it can be specified on the command line. If specified on the command line, it overrides the corresponding parameter in the profile.		No
			x	POST_FLASH_CMD	command string  You can specify this parameter when the APPLICATION_TYPE parameter specifies GENERIC.  This parameter identifies the command script or executable file that is used to resume the application immediately after snapshot creation. Arguments can be specified, separated by blanks.  This parameter is optional in the profile, or it can be specified on the command line. If specified on the command line, it overrides the corresponding parameter in the profile.		No



Table 41. Tivoli Storage FlashCopy Manager profile parameters - CLIENT section (continued)

Database Environment				Parameter			Advanced mode only
DB2	Native Oracle <sup>1</sup>	SAP® with Oracle <sup>2,3</sup>	Custom app.	Name	Value	Default value	
			x	INFILE	file  You can specify this parameter when the APPLICATION_TYPE parameter specifies GENERIC.  This parameter identifies the file that contains a list of all objects to be processed. The file must comply with these requirements: <ul style="list-style-type: none"> <li>• Each line specifies only one file or directory to be backed up.</li> <li>• A directory (including all subdirectories) is processed recursively. Links are followed when the directory is expanded.</li> <li>• When a link to a file is specified, FlashCopy Manager protects the file system where the file is located. However, the file system where the link is located is disregarded.</li> </ul> The INFILE parameter can be overridden by a command-line entry. If INFILE is not specified in the profile, it must be specified on the command line.		No
x	x	x	x	BACKUPIDPREFIX	string  Specify a string that will be added in front of the backup ID that is generated by FlashCopy Manager. This parameter can be used to separate the backups within the same repository so that other clients are not able to query, restore or delete these backups.  The string can contain letters, digits, or the ' _ ' (underscore). The string must be exactly 6 characters long, except in DB2 environments.		Yes
<b>Notes:</b> <ol style="list-style-type: none"> <li>1. For native Oracle environments, an additional ORACLE section is required in the profile.</li> <li>2. If you are using FlashCopy Manager with IBM Tivoli Storage Manager for Enterprise Resource Planning to protect SAP with Oracle, put the parameters of the CLIENT section directly into the IBM Tivoli Storage Manager for Enterprise Resource Planning configuration file (.utl file). See "Tivoli Storage FlashCopy Manager backint profile (.utl file)" on page 146.</li> <li>3. For SAP with Oracle, you also need to update the BRTOOLS configuration file (.sap file). See "SAP® BR*Tools configuration profile (.sap)" on page 152.</li> </ol>							

## Related reference

“Profile parameter notes” on page 179

## Tivoli Storage FlashCopy Manager backint profile (.utl file)

The descriptions of the Tivoli Storage FlashCopy Manager backint profile are provided.

## SAP Oracle FlashCopy Manager with Tivoli Storage Manager

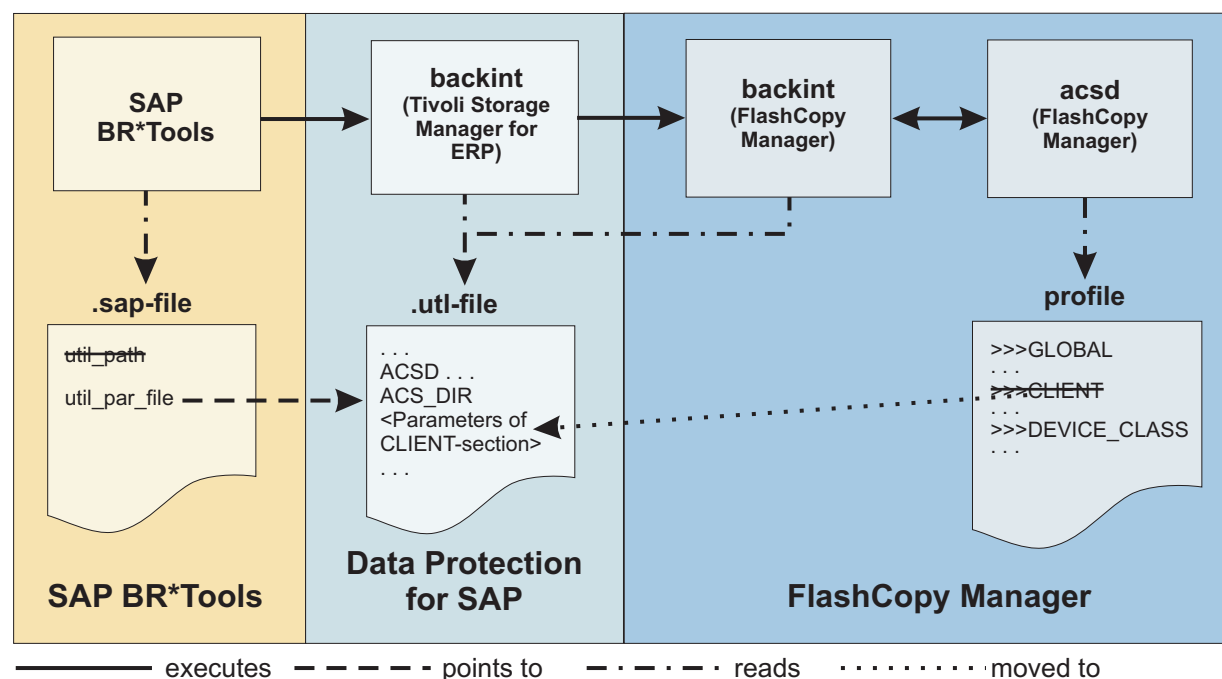


Figure 14. Illustration of SAP with Oracle FlashCopy Manager with Tivoli Storage Manager

If Tivoli Storage FlashCopy Manager is used with IBM Tivoli Storage Manager for Enterprise Resource Planning to protect an SAP system running on top of an Oracle database, the parameters that are typically specified in the CLIENT section can be put directly into the Tivoli Storage Manager for Enterprise Resource Planning configuration file (.utl file) (see Table 42 on page 147). Note that for that purpose there is no need to create a Tivoli Storage Manager for Enterprise Resource Planning configuration file (.utl file). Instead you can update an existing .utl file for that purpose.

**Note:** Additional DEVICE\_CLASS sections are added to the Tivoli Storage FlashCopy Manager profile automatically by the profile wizard whenever you add additional instances of the DEVICE\_CLASS parameter to the CLIENT section. When you use Tivoli Storage FlashCopy Manager with IBM Tivoli Storage Manager for Enterprise Resource Planning, the Tivoli Storage FlashCopy Manager profile does not contain a CLIENT section.

The Tivoli Storage Manager for Enterprise Resource Planning configuration file can contain the following parameters.

Table 42. Tivoli Storage FlashCopy Manager parameters in the SAP with Oracle client configuration file, the .utl file

Name	Value	Default value	Advanced mode only
TSM_BACKUP_FROM_SNAPSHOT	<p><b>YES</b></p> <p>Create a Tivoli Storage Manager backup from this snapshot. Reuse of the target set is allowed if the Tivoli Storage Manager backup operation does not complete successfully.</p> <p><b>MANDATE</b></p> <p>In contrast to YES, do not reuse the target set until the Tivoli Storage Manager backup completes.</p> <p>See note 18 in the Profile parameter notes for the complete parameter definitions.</p>	NO	No
TSM_BACKUP_FROM_SNAPSHOT (continued)	<p><b>LATEST</b></p> <p>When a snapshot backup was performed with TSM_BACKUP LATEST and the offloaded backup to Tivoli Storage Manager has either not started or has failed, any new snapshot backup with option TSM_BACKUP set to LATEST, YES, or MANDATE, removes the backup request to Tivoli Storage Manager from the previous backup. This prevents backup requests to Tivoli Storage Manager from queuing if they could not be completed in time.</p> <p><b>NO</b></p> <p>Keep the snapshot backup and do not use it as a source for a subsequent tape backup operation.</p> <p>See note 18 in the Profile parameter notes for complete parameter definitions.</p>	NO	No

Table 42. Tivoli Storage FlashCopy Manager parameters in the SAP with Oracle client configuration file, the .utl file (continued)

Name	Value	Default value	Advanced mode only
TSM_BACKUP_FROM_SNAPSHOT (continued)	<p><b>TSM_ONLY</b> The backup is automatically marked for deletion during the unmount operation after the Tivoli Storage Manager backup has completed. This occurs regardless of whether the backup was successful or not.</p> <p><b>USE_FOR list of device classes</b> This attribute can be combined with any of these options to limit its application to snapshots performed with particular device classes as specified in the profile. Any number of device classes that are listed must be separated by spaces.</p> <p>See note 18 in the Profile parameter notes for complete parameter definitions.</p>	NO	No
MAX_SNAPSHOT_VERSIONS	<p><b>ADAPTIVE</b> The maximum number varies depending on the available space. Tivoli Storage FlashCopy Manager reuses the oldest target set as the target for the current backup.</p> <p><i>n</i> Maximum number of snapshot versions to be maintained. When this limit is reached, the oldest version is deleted.</p> <p>Determines when to enable the freeze and thaw actions. See note 11.</p>	ADAPTIVE	Yes
LVM_FREEZE_THAW			Yes
DEVICE_CLASS	<p><i>&lt;list of device classes&gt; [&lt;conditions&gt;]</i> One of the device classes listed is used during backup in the DEVICE_CLASS statement for which the condition is true. The condition statement is optional and has this syntax: [USE_AT <i>&lt;days of week&gt;</i>] [FROM <i>&lt;time&gt;</i> TO <i>&lt;time&gt;</i>] (partitioned DB2 databases) [ON_DBPARTITIONNUMS] <i>&lt;list of partitions&gt;</i></p> <p>See note 9 for complete information.</p>	STANDARD	No

Table 42. Tivoli Storage FlashCopy Manager parameters in the SAP with Oracle client configuration file, the .utl file (continued)

Name	Value	Default value	Advanced mode only
TARGET_DATABASE_SUSPEND	YES, NO, OFFLINE  This value specifies whether to suspend activity on the target database until the FlashCopy operation completes. Enter one of the following values: <i>yes</i> , <i>no</i> , or <i>offline</i> . A <i>yes</i> value is recommended when transaction processing activity is high. An <i>offline</i> value specifies that all backups must be offline. If SAP® requests an offline backup, this parameter is ignored.  See note 17 in the Profile parameter notes.	There is no default. A value for this parameter must be specified by the user.	No
ALLOW_FULL_FILE_BACKUP	YES, NO  This value specifies whether to allow a full file backup into the repository. Due to the performance affect, be cautious when setting this parameter to YES. A full database backup into the repository is not recommended. <b>Note:</b> This parameter is not available for editing when using the configuration wizard.	NO	Yes
TIMEOUT_FLASH	Specify the maximum time (in seconds) that the database agent waits for a response to the management agent call during the 'flash' phase. If the database agent does not receive a response within the specified time, an error message is issued. See note 22 in the Profile parameter notes.	120 seconds	Yes
TIMEOUT_<PHASE>	Specify the maximum time (in seconds) that the database agent waits for a response to the management agent call during the <phase> phase. If the database agent does not receive a response within the specified time, an error message is issued. See note 23 in the Profile parameter notes.	3600 seconds	
GLOBAL_SYSTEM_IDENTIFIER	Specify a string that is used in the IBM Tivoli Storage Manager for Enterprise Resource Planning Administration Assistant that uniquely identifies an Oracle database in the system landscape. This parameter is only valid when the ADMIN_ASSISTANT parameter is specified in the ACSD section of the profile.	ORA_<DBname>	Yes
ACS_DIR	Path of the Tivoli Storage FlashCopy Manager directory. See note 1 in the Profile parameter notes.	Required	No

Table 42. Tivoli Storage FlashCopy Manager parameters in the SAP with Oracle client configuration file, the .util file (continued)

Name	Value	Default value	Advanced mode only
ACSD	<p>hostname port</p> <p>Hostname and port (separated by space) of the system on which the Management Agent is running.</p> <p>This parameter must be identical on all systems where Tivoli Storage FlashCopy Manager is installed for a given database instance. However, each instance can be managed by an individual Management Agent.</p>	localhost 57328	No
BACKUPIDPREFIX	<p>string</p> <p>This parameter specifies a string that is added in front of the backup ID that is generated by FlashCopy Manager. This parameter can be used to separate the backups within the same repository so that other clients are not able to query, restore, or delete these backups.</p> <p>The string can contain letters, digits, or the ' ' (underscore) and must be exactly 6 characters long.</p> <p><b>Note:</b> This parameter has the same meaning as the corresponding parameter in the IBM Tivoli Storage Manager for Enterprise Resource Planning *.util file and we recommend to use the same value</p>		Yes
TRACE, TRACEFILE	<p>Activates tracing. Wait for instructions from support when setting those values</p>		Yes
INCREMENTAL <sup>1</sup>	<p><b>NO</b></p> <p>This is the default value. If it is set to NO all the other INCREMENTAL* parameters have no effect.</p> <p><b>CUMULATIVE</b></p> <p>The backup type is incremental RMAN. Incremental backups are run by using RMAN.</p> <p><b>DIFFERENTIAL</b></p> <p>The backup type is incremental RMAN. Incremental backups are run by using RMAN.</p>	NO	
INCREMENTAL_CATALOG_CONNECT_STRING <sup>1</sup>	<p>This parameter specifies the name of the catalog that is passed to RMAN to connect to the catalog database. This is the name of the listener for the catalog database. If the INCREMENTAL parameter is enabled and this value is missing, an error message is displayed.</p>	There is no default. A value for this parameter must be specified by the user.	

Table 42. Tivoli Storage FlashCopy Manager parameters in the SAP with Oracle client configuration file, the .utl file (continued)

Name	Value	Default value	Advanced mode only
INCREMENTAL_CATALOG_USER <sup>1</sup>	This parameter specifies the name of the user that is passed to RMAN to connect to the catalog database. If the INCREMENTAL parameter is enabled and this value is missing an error message is displayed.	There is no default. A value for this parameter must be specified by the user.	
INCREMENTAL_CHANNELS <sup>1</sup>	Specifies the number of parallel RMAN channels, 1 or more, that transfer the data.	1	
INCREMENTAL_LEVEL <sup>1</sup>	The RMAN incremental level is an integer of value 0 or 1. An INCREMENTAL_LEVEL of 0 generates a full backup and an INCREMENTAL_LEVEL value of 1 generates an incremental backup. The specification of day and time is optional. If the day and time are used, multiple occurrences of this parameter are valid as long as the time specification does not overlap. Time must be specified in the 24-hour format. Days can be specified by weekday abbreviations such as 'Mon, Tue,...' or by numerical values 0,1,...,6 where 0 is Sunday and 6 is Saturday. The syntax for day and time specification is [USE_AT <days of week> FROM <time> TO <time>]	0	

**Notes:**

1. This parameter is only for use with RMAN.
2. If you are using IBM Tivoli Storage Manager for Enterprise Resource Planning, the parameters contained in the Tivoli Storage FlashCopy Manager client configuration file can be put directly into the Tivoli Storage Manager for ERP configuration file, the Tivoli Storage Manager for ERP .utl file.

**Related reference**

“Profile parameter notes” on page 179

**SAP® BR\*Tools configuration profile (.sap)**

This configuration profile is located in the \$ORACLE\_HOME/dbs directory.

The .sap profile is described in detail in the *SAP® database guide for Oracle* that is provided by SAP®, and you might already have an existing .sap file in your environment. This guide serves as a reference for all profile parameters that are valid in the .sap profile.

The following list contains parameters that will most likely need to be added or updated in your existing .sap file.

This configuration refers to the following keywords within that profile:

**backup\_type**

Identifies the default type of the database backup. This parameter is only used by brbackup (default is offline).

**backup\_dev\_type**

Determines the backup medium that is used (the default is tape). In order to create a snapshot backup using Tivoli Storage FlashCopy Manager, this parameter must be set to util\_vol or to util\_vol\_online. (Recommendation: Minimize the time during which the database is degraded.)

**util\_par\_file**

If you are running FlashCopy Manager with IBM Tivoli Storage Manager for Enterprise Resource Planning, set this parameter to the fully qualified path of the IBM Tivoli Storage Manager for Enterprise Resource Planning profile (.utl file). This way FlashCopy Manager uses the configuration that was added to the IBM Tivoli Storage Manager for Enterprise Resource Planning configuration file (.utl file).

If you are running FlashCopy Manager in an environment where IBM Tivoli Storage Manager for Enterprise Resource Planning is not configured, set this parameter to the fully qualified path of the FlashCopy Manager profile. This way FlashCopy Manager uses the configuration that was added to the CLIENT section of the FlashCopy Manager profile.

**util\_path**

Specifies the path to the backint executable.

If you are running FlashCopy Manager with IBM Tivoli Storage Manager for Enterprise Resource Planning, you do not need to set this parameter.

If you are running FlashCopy Manager in an environment where IBM Tivoli Storage Manager for Enterprise Resource Planning is not available, set this parameter to the INSTANCE\_DIR (<Instance owner \$HOME directory>/acs/>).

**util\_vol\_unit**

Specifies the smallest unit that can be backed up with a snapshot or clone,



and also determines restore granularity. The possible values are `sap_data` (finest restore granularity), `all_data`, and `all_dbf` (not recommended).

**Note:** SAP requires that the setting of this parameter correctly describes the disk layout of your database.

Use `sap_data` if your disk layout consists of:

- At least one volume group for each sapdata directory
- At least one volume group for each origlog directory
- At least one volume group for each mirrlog directory

For `sap_data`, there must be exactly one volume group for each sapdata directory, exactly one volume group for each origlog directory, and exactly one volume group for each mirrlog directory. If one of the sapdata, origlog, or mirrlog directories contains more than one volume group, there is a fourth parameter value `disk_vol` that must be used. The parameters `disk_vol` and `all_dbf` are not recommended by SAP because they contradict the SAP recommendation about the separation of data files and redo log files. The default value set by SAP is `sap_data`.

Use `all_data` if your disk layout consists of:

- At least one volume group for sapdata
- At least one volume group for origlog
- At least one volume group for mirrlog

#### **util\_vol\_access**

Specifies the accessibility of snapshot backup volumes

- none (required on the production system)
- copy (not supported)
- mount (required on the backup system if SAP® BR\*Tools installed on the backup system)
- both (not supported)

#### **util\_vol\_nlist = (<nfile\_name1>, <nfile\_name2>, ...) | no\_check**

This parameter defines a list of non-database files or directories that are located on the database disk volumes but do not need to appear in the list of files to back up in the input file. These files are automatically included in the backup, but are never reported in the BACKINT interface messages, especially not in the #ERRFILE message. During a restore, these files (and possibly fixed files) might be overwritten without prior warning.

`no_check` deactivates the BACKINT check of the backup volumes. This check makes sure that the backup volumes do not contain either non-database files or database files that belong to a database other than the database to be backed up. When `no_check` is set, the user takes responsibility for making sure that the database volumes (directories sapdata, origlog, and mirrlog) only contain database files of the database to be backed up. Or, if the database volumes contain either non-database files or database files from a database other than the database to be backed up, the user accepts that such files can be overwritten without warning.

#### **util\_options = <additional\_backint\_options>**

This parameter defines additional BACKINT options that BR\*Tools places after the standard command-line options when calling the BACKINT program. With this parameter, the FlashCopy Manager backint options '-O <TSM\_BACKUP\_FROM\_SNAPSHOT value>' and '-S <device class>' can be

specified. See “BR\*TOOLS - User interface for Oracle in SAP environments” on page 96 for more information about these backint options.

Example:

```
util_options = "-0 yes -S STANDARD"
```

### **ORACLE section**

The ORACLE section is an extension to the CLIENT section for ORACLE environments. The parameters do not depend on the storage device.

Table 43. Tivoli Storage FlashCopy Manager profile parameters - ORACLE section

Parameter			
Name	Value	Default value	Advanced Mode Only
CATALOG_DATABASE_CONNECT_STRING	Recovery catalog connect string  This value specifies the connect string of the Recovery Catalog database to be used to catalog backup information. This value must correspond to the value defined in the \$ORACLE_HOME/network/admin/tnsnames.ora file.	This parameter must be specified by the user.	No
CATALOG_DATABASE_USERNAME	User name  This value specifies a user name that has Oracle system database administrator privileges on the Recovery Catalog database.	This parameter must be specified by the user.	No
TARGET_DATABASE_PARAMETER_FILE	Target database parameter file  This value specifies the fully resolved path and file name of the Oracle parameter file (init<SID>.ora by default) for the target database. Note that this file must be a text-based Oracle parameter file (PFILE) and not an Oracle server file.	The default value is \${ORACLE_HOME}/dbs/init\${ORACLE_SID}.ora	Yes
DATABASE_BACKUP_SCRIPT_FILE	Name of the RMAN backup script that contains the Data Protection for Oracle environment variables. See note 8 in "Profile parameter notes" on page 179.	This parameter must be specified by the user for offload configurations.	No
DATABASE_CONTROL_FILE_RESTORE	YES, NO  Specify whether to restore Oracle control files after snapshot restore processing completes.  A <i>no</i> value will not restore Oracle control files and the user will do the full recovery up to the current image of the Oracle database using existing control files residing in the system.  A <i>yes</i> value restores Oracle control files and the user will do the incomplete recovery up to the point when the control files were backed up.	NO	Yes
ASM_INSTANCE_USER	User name  Specify the user name of the ASM instance owner. Use this parameter when the target database and the ASM instance are running under different user IDs. The ASM instance must have sysdba, sysasm, or sysasmn permission. AUTO  When this parameter is set to AUTO, the database user who is running the process is used.	AUTO	No

Table 43. Tivoli Storage FlashCopy Manager profile parameters - ORACLE section (continued)

Parameter			
Name	Value	Default value	Advanced Mode Only
ASM_INSTANCE_ID	SID of the ASM instance  It is not really recommended by Oracle but possible to have a SID for the ASM instance other than '+ASM'. In such environments, this profile parameter can be used to specify the ASM instance SID.	+ASM	No
ASM_ROLE	sysdba   sysasm  Specify the role that should be used when connecting to the ASM instance. The 'sysdba' role must be specified when using Oracle 10g. Specify 'sysasm' when using Oracle 11g.	sysdba	No

**Related reference**

“Profile parameter notes” on page 179

**CLONING section**

The CLONING section of the Tivoli Storage FlashCopy Manager profile contains parameters used for cloning operations. The parameters are independent of the storage device or application.

Table 44. Tivoli Storage FlashCopy Manager profile parameters - CLONING section

Database Environment			Parameter		Value	Default value	Advanced Mode Only
DB2	Native Oracle	SAP® with Oracle	Name				
x	x	x	DEVICE_CLASS		<i>device class</i> Identify the device class to use when cloning a database.  <b>USE_FOR_CLONING</b> <i>list of clone database names conditions</i> ON_DBPARTITIONNUMS < <i>list of partitions</i> > This parameter is required. See note 24 in “Profile parameter notes” on page 179.		No
x	x	x	FLASH_DIR_LIST		<b>[ON_DBPARTITIONNUM</b> <i>list of partitions</i> <b>] fully qualified file name</b> Specify this parameter to include file systems (in the FlashCopy operation) that are not a part of the database files. See note 25 in “Profile parameter notes” on page 179.	No filename specified	Yes
	x	x	OVERWRITE_DATABASE_PARAMETER_FILE		<b>YES</b> Copy the database configuration file from the production system to the clone system.  <b>NO</b> Do not copy the database configuration file from the production system to the clone system. See note 26 in “Profile parameter notes” on page 179.	YES	No
	x	x	TARGET_DATABASE_PARAMETER_FILE		Production target database parameter file. Specify the name of the Oracle parameter file for the production database. See note 27 in “Profile parameter notes” on page 179.	\$(ORACLE_HOME)/dbs/init\$(ORACLE_SID).ora	Yes
x	x	x	DATABASE_SCHEMA		Specify the correct production database schema. See note 28 in “Profile parameter notes” on page 179.	See note 28.	Yes
x	x	x	NEGATIVE_LIST		See the description of this parameter in the CLIENT section.	See the default of this parameter in the CLIENT section.	Yes

Table 44. Tivoli Storage FlashCopy Manager profile parameters - CLONING section (continued)

Database Environment			Parameter			
DB2	Native Oracle	SAP® with Oracle	Name	Value	Default value	Advanced Mode Only
x	x	x	LVM_FREEZE_THAW	See the description of this parameter in the CLIENT section.	See the default of this parameter in the CLIENT section.	Yes
x	x	x	TIMEOUT_PARTITION	See the description of the TIMEOUT_<PHASE> parameter in note 23 in "Profile parameter notes" on page 179.	See the default of this parameter in note 23.	Yes
x	x	x	TIMEOUT_PREPARE	See the description of the TIMEOUT_<PHASE> parameter in note 23 in "Profile parameter notes" on page 179.	See the default of this parameter in note 23.	Yes
x	x	x	TIMEOUT_FLASH	See the description of this parameter in note 22 in "Profile parameter notes" on page 179.	See the default of this parameter in note 22.	Yes
x	x	x	TIMEOUT_VERIFY	See the description of the TIMEOUT_<PHASE> parameter in note 23 in "Profile parameter notes" on page 179.	See the default of this parameter in note 23.	Yes
x	x	x	TIMEOUT_CLOSE	See the description of this parameter in note 23 in "Profile parameter notes" on page 179.	See the default of this parameter in note 23.	Yes
x	x	x	TIMEOUT_FLASHRESTORE	See the description of the TIMEOUT_<PHASE> parameter in note 23 in "Profile parameter notes" on page 179.	See the default of this parameter in note 23.	Yes
x	x	x	TIMEOUT_COMPLETESTORE	See the description of the TIMEOUT_<PHASE> parameter in note 23 in "Profile parameter notes" on page 179.	See the default of this parameter in note 23.	Yes
x	x	x	GLOBAL_SYSTEM_IDENTIFIER	See the description of this parameter in the CLIENT section.	See the default of this parameter in the CLIENT section.	Yes

**Related reference**

“Profile parameter notes” on page 179

**DEVICE\_CLASS *device* section**

The Tivoli Storage FlashCopy Manager profile contains one or more DEVICE\_CLASS sections. Those sections are intended to configure Tivoli Storage FlashCopy Manager for use with a particular storage device. The parameters do not depend on the application that is protected.



Table 45. Tivoli Storage FlashCopy Manager profile parameters - *DEVICE\_CLASS* section

Device Applicability			Parameter			Default value	Advanced Mode Only
DS	SVC or Storwize V7000	XIV	Name	Value			
	x		ALLOW_NOCOPY_FLASHCOPY	Use in combination with CLONE_DATABASE. YES Allow the creation of a FlashCopy Manager clone on space-efficient targets. In order to achieve this, use space-efficient targets for this device class and set FLASHCOPY_TYPE to NOCOPY. FlashCopy backups are not allowed on the same source volumes. NO Do not allow the creation of a FlashCopy Manager clone on space-efficient targets. If both backup and cloning must be performed on the same source volumes, cloning must be done to full targets and ALLOW_NOCOPY_FLASHCOPY must be set to NO.		NO	Yes
x	x	x	COPYSERVICES_HARDWARE_TYPE	Storage system on which the database resides: <b>DS8000</b> IBM DS8100 IBM DS8300 IBM DS8700 IBM DS8800  <b>SVC</b> IBM SAN Volume Controller or IBM Storwize V7000  <b>XIV</b> IBM XIV Storage System  Only one system can be specified.		This parameter is required.	No
x	x	x	CLONE_DATABASE	<b>YES</b> Use the device class for cloning. <b>NO</b> Do not use the device class for cloning. See note 29 in "Profile parameter notes" on page 179.		This parameter is not explicitly set by the user. It is preset by the wizard according to whether the device class is used by a CLIENT or a CLONING section.	No

Table 45. Tivoli Storage FlashCopy Manager profile parameters - DEVICE\_CLASS section (continued)

Device Applicability		Parameter			Default value	Advanced Mode Only
DS	SVC or Storwize V7000	XIV	Name	Value		
x	x		COPYSERVICES_PRIMARY_SERVERNAME	<p><i>server name or address</i></p> <p>Defines the TCP/IP address of the host running the CIM Agent for DS Open API (which can manage the primary and secondary Copy Services servers of the DS8000 cluster), the SAN Volume Controller master console, or embedded CIM Agent and the embedded CIM Agent in the Storwize V7000 . For SVC, the COPYSERVICES_PRIMARY_SERVERNAME parameter, if specified, must point directly to the SVC cluster with the embedded CIM server. If an SVC console (CIM proxy) is transitionally used, it must be connected to one SVC cluster only, or the volume names must be unique across all connected clusters. For Storwize V7000 , the COPYSERVICES_PRIMARY_SERVERNAME parameter must point to the Storwize V7000 cluster.</p>	localhost	No
x			COPYSERVICES_SECONDARY_SERVERNAME	<p>Specify the name of the backup Copy Services server located within a snapshot devices cluster. You can specify either the numeric IP address or the DNS name of the server. The default value is <i>none</i>. This parameter is allowed only in environments with DS8000 in combination with the proxy CIM Agent.</p>	'none'	Yes
		x	COPYSERVICES_SERVERNAME	<p>Specify the hostname of the IBM XIV Storage System. This parameter is only valid when COPYSERVICES_HARDWARE_TYPE specifies XIV.</p>	'none'	No
x	x	x	COPYSERVICES_USERNAME	<p>User name for:</p> <p><i>cim user</i> CIM Agent for DS Open API (which can manage the primary and secondary Copy Services servers of the DS8000 cluster).</p> <p><i>svc user</i> SAN Volume Controller master console or cluster</p> <p><i>XIV user</i> Username to log in to the XIV system.</p> <p><b>Storwize V7000 user</b> Username to log in to the Storwize V7000</p>	superuser	No

Table 45. Tivoli Storage FlashCopy Manager profile parameters - DEVICE\_CLASS section (continued)

Device Applicability			Parameter			Default value	Advanced Mode Only
DS	SVC or Storwize V7000	XIV	Name	Value			
		x	PATH_TO_XCLI	Specify the path where the XIV command line interface (XCLI) is installed. There is no default value. This parameter is only valid when COPYSERVICES_HARDWARE_TYPE specifies XIV.	None	No	
x	x		COPYSERVICES_SERVERPORT	<i>server port</i> Defines the port number on the host running the CIM Agent for DS Open API (which can manage the primary and secondary Copy Services servers of the DS8000 cluster, the SAN Volume Controller master console, or embedded CIM Agent or the Storwize V7000).	See note 6 in "Profile parameter notes" on page 179.	Yes	
x	x		COPYSERVICES_TIMEOUT	<i>timeout</i> Maximum length of time (in minutes) the CIM Client will wait for the response to a call issued to the CIMOM (CIM Agent). If the CIM Client does not receive a response within this time, an error message is issued.	6	Yes	
x	x		COPYSERVICES_COMMPROTOCOL	Protocol to be used for communication with the CIM Agent. <b>HTTP</b> Communication in non-secure mode <b>HTTPS</b> Communication in secure mode	HTTPS	No	
x	x		COPYSERVICES_CERTIFICATEFILE	See note 5 in "Profile parameter notes" on page 179.	NO_CERTIFICATE	Yes	

Table 45. Tivoli Storage FlashCopy Manager profile parameters - DEVICE\_CLASS section (continued)

Device Applicability			Parameter			Default value	Advanced Mode Only
DS	SVC or Storwize V7000	XIV	Name	Value			
x	x		FLASHCOPY_TYPE (See note 10 in “Profile parameter notes” on page 179.)	<p>Specifies whether the storage subsystem performs a bitwise copy of data from one logical volume to another.</p> <p><b>COPY</b></p> <p>Directs the storage system to perform a bit-level copy of the data from one physical volume to another. This value is recommended under the following conditions:</p> <ul style="list-style-type: none"><li>• You intend to perform a fast (snapshot) restore of a backed-up database</li><li>• A copy of the database data on the target volume is desired.</li></ul>	COPY	No	
x	x		FLASHCOPY_TYPE (cont'd)	<p><b>INCR</b></p> <p>Similar to COPY. It differs from COPY by the fact that it only copies those tracks that were modified since the previous incremental FlashCopy was created.</p>	COPY	No	
x	x		FLASHCOPY_TYPE (cont'd)	<p><b>NOCOPY</b></p> <p>Directs the storage system to perform a bit-level copy of a track if data is modified after the FlashCopy request. This technique is typically referred as copy-on-write</p>	COPY	No	
x	x	x	STORAGE_SYSTEM_ID	<p>Specify the storage system ID of the cluster to which the DS8000, IBM XIV, SAN Volume Controller, or Storwize V7000 storage system refers in an AIX Logical Volume Manager mirrored environment.</p> <p>See the Note 21 and “Tivoli Storage FlashCopy Manager target volumes file” on page 194.</p>	None.	No	

Table 45. Tivoli Storage FlashCopy Manager profile parameters - DEVICE\_CLASS section (continued)

Device Applicability		Parameter			Default value	Advanced Mode Only
DS	SVC or Storwize V7000	XIV	Name	Value		
x	x		TARGET_SETS	Specify the target volumes to be used in the FlashCopy operation using one of these values: <ul style="list-style-type: none"> <li>• VOLUMES_DIR</li> <li>• VOLUMES_FILE</li> <li>• &lt;list of target set names&gt; (SAN Volume Controller or Storwize V7000 only) <ul style="list-style-type: none"> <li>– TARGET_NAMING &lt;string with wildcards %SOURCE and %TARGETSET&gt;</li> </ul> </li> </ul> See the Note 20 and “Tivoli Storage FlashCopy Manager target volumes file” on page 194.	This parameter is specified by the user.	No
x	x		VOLUMES_DIR	Fully qualified path of the volumes directory, in which the FlashCopy target volumes file(s) must reside.  See the Note 20 and “Tivoli Storage FlashCopy Manager target volumes file” on page 194.	This parameter is specified by the user.	No
x	x		VOLUMES_FILE	Specify the name of the target volumes file (.fct).  See the Note 20 and “Tivoli Storage FlashCopy Manager target volumes file” on page 194.	This parameter is specified by the user.	No
x	x		TARGET_NAMING <string with wildcards %SOURCE and %TARGETSET>	Specify the naming convention for target volumes.  Whenever a backup volume is required at backup time, FlashCopy Manager 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.	This parameter is specified by the user.	No

Table 45. Tivoli Storage FlashCopy Manager profile parameters - DEVICE\_CLASS section (continued)

Device Applicability		Parameter			Value	Default value	Advanced Mode Only
DS	SVC or Storwize V7000	XIV	Name				
	x		SVC_COPY_RATE		<p><i>priority</i></p> <p>Specifies the priority that the SAN Volume Controller or Storwize V7000 gives to the FlashCopy background process for the current backup or restore. Enter a value from 0-100.</p> <p>See note 16 in "Profile parameter notes" on page 179.</p>	50	No
	x		SVC_CLEAN_RATE		Specify the cleaning rate for the FlashCopy mapping. Enter a value from 1 to 100.		Yes
	x		SVC_GRAIN_SIZE		Grain size for FlashCopy mappings for space_efficient VDisks on SVC or IBM Storwize V7000, measured in KB. For best performance, the grain size of the space-efficient VDisk must match the grain size of the FlashCopy. However, even if the grain sizes are different the mapping will proceed. Possible values: 32, 64, 128, 256 Once set this value cannot be changed until the backup is deleted with option -F to remove the mappings.	256	Yes
x	x		RESTORE_FORCE		YES, NO (See note 15 in "Profile parameter notes" on page 179.)	NO	Yes
		x	USE_WRITABLE_SNAPSHOTS		YES   NO   AUTO Specify whether writable snapshots should be used. Writable snapshots are required in LVM mirrored environments. The AUTO setting automatically selects the recommended value based upon your environment.	AUTO	Yes
		x	USE_CONSISTENCY_GROUPS		YES   NO Specify whether consistency groups should be used. The use of consistency groups decreases the time needed for the FlashCopy operation. A YES setting is required in ASM environments.	YES	Yes
x	x	x	BACKUP_HOST_NAME		Specify the name of the backup host as configured in the storage subsystem that is used during offloaded tape backups only: See note 32 in "Profile parameter notes" on page 179.		No
		x	GRACE_PERIOD		Specify the period of time (in hours) to retain snapshots after they have been created 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 45. Tivoli Storage FlashCopy Manager profile parameters - DEVICE\_CLASS section (continued)

Device Applicability			Parameter		
DS	SVC or Storwize V7000	XIV	Name	Value	Default value
x	x	x	RECON_INTERVAL	Specify the interval (in hours) to perform reconciliation for the storage system.	12 hours
					Advanced Mode Only
					Yes

**Related reference**

“Profile parameter notes” on page 179

**OFFLOAD section**

The OFFLOAD section contains information that is related to Tivoli Storage Manager backups from a snapshot.

File names that are specified in this section typically point to files that are on a backup server. The offload section is optional and can exist for DB2 (non-SAP, SAP), ORACLE (non-SAP, SAP), and custom applications. The parameters do not depend on the storage device.



Table 46. Tivoli Storage FlashCopy Manager profile parameters - OFFLOAD section

Database environment				Parameter			Advanced mode only
DB2	Native Oracle	SAP® with Oracle	Custom app.	Name	Value	Default value	
x	x	x	x	BACKUP_METHOD	<p>The value is preset by the wizard depending on the given application environment:</p> <ul style="list-style-type: none"> <li>• DB2 (SAP, non-SAP) - DB2</li> <li>• DB2 standby server - TSM_CLIENT</li> <li>• Oracle (non-SAP) - ORACLE</li> <li>• Oracle (SAP) - BACKINT</li> <li>• Custom application - TSM_CLIENT</li> </ul> <p>See note 31 in "Profile parameter notes" on page 179.</p>	Preset by the wizard according to given application environment	n/a
			x	MODE	<p>This parameter determines which of the following Tivoli Storage Manager Backup Archive client backup functions to use when creating a Tivoli Storage Manager off-loaded backup:</p> <p><b>ARCHIVE</b> Creates an archive backup of all files and directories that are specified in the backup request. Directories are processed recursively.</p> <p><b>FULL</b> Creates a full backup of all files and directories that are specified in the backup request. Directories are processed recursively.</p> <p><b>DIFF</b> Creates a differential backup of all files and directories that are specified in the backup request. Directories are processed recursively. This operation backs up changes since the most recent full backup.</p> <p><b>USE_FOR device class</b> Allows the backup mode to be changed based on the device class used to create the snapshot. This option can be used to define rules that create a weekly full backup and daily incremental backups.</p> <p><b>Note:</b> You can use the USE_FOR option to define multiple MODE statements within the OFFLOAD section.</p> <p>See note 31 in "Profile parameter notes" on page 179.</p>	FULL	No

Table 46. Tivoli Storage FlashCopy Manager profile parameters - OFFLOAD section (continued)

Database environment				Parameter			Advanced mode only
DB2	Native Oracle	SAP® with Oracle	Custom app.	Name	Value	Default value	
			x	ASNODENAME	nodename This parameter identifies the name of the node where data is stored during a Tivoli Storage Manager offloaded backup. ASNODENAME is the same option that can be set in the dsm.sys file.	This parameter is required.	No
			x	VIRTUALFSNAME	name This parameter identifies the virtual file space name of a backup group. It is available when the MODE parameter specifies a value of FULL or DIFF. VIRTUALFSNAME is optional.	fcm	Yes
			x	DSM_DIR	This optional parameter identifies the path used for the DSM_DIR environment variable. For UNIX and Linux, specify the path where the executable file dsmc, the resource files, and the dsm.sys file reside.	Empty string.	Yes
			x	DMS_OPT	This optional parameter identifies the path and file name of the Tivoli Storage Manager client options file (dsm.opt).	Empty string.	Yes
			x	DSM_LOG	This optional parameter identifies the path used for the Tivoli Storage Manager client error log file (dsmerror.log).	Empty string.	Yes
	x			OVERWRITE_DATABASE_PARAMETER_FILE	<b>YES</b> Replace the database configuration file on the backup system with the version defined on the production system, to ensure they are identical. <b>NO</b> Do not copy the production-system database configuration file to the backup system.	YES	No
	x			DATABASE_BACKUP_INCREMENTAL_LEVEL	n Level of backup to be performed. You can enter any numerical value. See note 7 in "Profile parameter notes" on page 179.	0	No

Table 46. Tivoli Storage FlashCopy Manager profile parameters - OFFLOAD section (continued)

Database environment				Parameter		Value	Default value	Advanced mode only
DB2	Native Oracle	SAP® with Oracle	Custom app.	Name				
x				OPTIONS	<b>&lt;options string&gt;</b> Specifies options to be used for this Tivoli Storage Manager backup operation. The string is passed directly to the backup utility.  <b>@filename</b> Specifies that the options to be used for the Tivoli Storage Manager backup operation are contained in a file located on the backup server. The string will be passed directly to the backup utility.  See note 14 in “Profile parameter notes” on page 179.	Empty string.	No	
x				PARALLELISM	<b>n</b> Number of table spaces that can be read in parallel by the backup utility.  <b>AUTO</b> DB2 calculates an optimum value.	AUTO	Yes	
x				NUM_SESSIONS	<b>n</b> Number of I/O sessions to be created between DB2 and Tivoli Storage Manager.	1	No	
x				NUM_BUFFERS	<b>n</b> Number of buffers to be used by DB2.  <b>AUTO</b> DB2 will calculate the optimum value for this parameter.	AUTO	Yes	
x				BUFFER_SIZE	<b>n</b> The value of this parameter specifies the size, in 4 KB pages, of the buffer used by DB2 when building the backup image. The minimum value is 8 pages.  <b>AUTO</b> DB2 calculates the optimum value if backup was started automatically.	AUTO	Yes	

Table 46. Tivoli Storage FlashCopy Manager profile parameters - OFFLOAD section (continued)

Database environment					Parameter		
DB2	Native Oracle	SAP® with Oracle	Custom app.	Name	Value	Default value	Advanced mode only
x				PARALLEL_BACKUP	<p><b>YES</b></p> <p>The Tivoli Storage Manager backup of all participating partitions will run in parallel.</p> <p><b>NO</b></p> <p>The Tivoli Storage Manager backups of all participating partitions will run sequentially.</p> <p>Before setting this parameter to YES, check the release notes for the requirements to be observed.</p>	NO	Yes
x				DATABASE_MEMORY	<p>For Tivoli Storage FlashCopy Manager, it must be possible to start the DB2 database on the backup system during the offload of this database to Tivoli Storage Manager. To start this database on the backup system, DB2 needs the database memory size specified on the DB2 database on the production system. In some cases, the DB2 database must be started on the backup system with less memory. This parameter specifies the size of DB2 database shared memory on the backup system. By specifying an empty string or 0, the DB2 memory size specified in the DB2 database configuration on the production system is used.</p>	0	Yes

Table 46. Tivoli Storage FlashCopy Manager profile parameters - OFFLOAD section (continued)

Database environment				Parameter		Value	Default value	Advanced mode only
DB2	Native Oracle	SAP® with Oracle	Custom app.	Name				
x				NUMBER_BACKUPS_IN_ PARALLEL		In DB2 DPF environments with more than one DB2 partition it can be useful to start the offloaded Tivoli Storage Manager backup in parallel for multiple DB2 partitions. When running in large DB2 DPF environments with more than one backup systems, the performance of the overall offloaded Tivoli Storage Manager backup can be increased if the Tivoli Storage Manager backups of each DB2 partition can be started in parallel on each of the backup systems. This profile parameter specifies the degree of parallelism to use during the offloaded backup. If you specify a positive integer value for this parameter, the specified number of Tivoli Storage Manager backups start in parallel on each of the backup systems. For example, if a value of 1 is specified, one backup is started in parallel on each backup system. If the parameter value is 0, no parallelism is used. If you want to use a value greater than 0 for NUMBER_BACKUPS_IN_ PARALLEL, you must set the PARALLEL_BACKUP value to NO.	0	Yes
		x		PROFILE		Name of the external SAP Backint profile	This parameter is required.	Yes
	x			ASM_INSTANCE_USER		User name  Specify the user name of the ASM instance owner. Use this parameter when the target database and the ASM instance are running under different user IDs. The ASM instance must have sysdba, sysasm, or sysasm permission. AUTO  When this parameter is set to AUTO, the database user who is running the process is used.  This parameter is used for the backup server.	If it is not specified for the OFFLOAD section, the value of this parameter (as specified in the ORACLE section) is used for the backup server.	Yes
	x			ASM_INSTANCE_ID		SID of the ASM instance  It is not really recommended by Oracle but possible to have a SID for the ASM instance other than '+ASM'. In such environments, this profile parameter can be used to specify the ASM instance SID.  This parameter is used for the backup server.	If it is not specified for the OFFLOAD section, the value of this parameter (as specified in the ORACLE section) is used for the backup server.	Yes

Table 46. Tivoli Storage FlashCopy Manager profile parameters - OFFLOAD section (continued)

Database environment					Parameter		
DB2	Native Oracle	SAP® with Oracle	Custom app.	Name	Value	Default value	Advanced mode only
	x			ASM_ROLE	sysdba   sysasm  Specify the role that should be used when connecting to the ASM instance. The 'sysdba' role must be specified when using Oracle 10g. Specify 'sysasm' when using Oracle 11g.  This parameter is used for the backup server.	If it is not specified for the OFFLOAD section, the value of this parameter (as specified in the ORACLE section) is used for the backup server.	Yes

**Related reference**

“Profile parameter notes” on page 179

**DB2STANDBY section**

The DB2STANDBY section is the same as the CLIENT section, except when it is configured for a DB2 database that acts as a DB2 HADR secondary. After takeover, when the database is active, the CLIENT section is used. The parameters do not depend on the storage device.

Table 47. Tivoli Storage FlashCopy Manager profile parameters - DB2STANDBY section

Parameter name	Value	Default value	Advanced mode only
PRE_FLASH_CMD	command string  This parameter identifies the command script or executable file that is used to quiesce the DB2 standby or DB2 HADR secondary immediately before the snapshot operation begins. When the value of this parameter contains command arguments, place the value between double quotation marks ("").  This parameter is required in the profile or it needs to be specified in the command line. If specified on the command line, it overrides the corresponding parameter in the profile.		No
POST_FLASH_CMD	command string  This parameter identifies the command script or executable file that is used to resume the DB2 standby or DB2 HADR secondary immediately after snapshot creation. When the value of this parameter contains command arguments, place the value between double quotation marks ("").  This parameter is required in the profile or it needs to be specified in the command line. If specified on the command line, it overrides the corresponding parameter in the profile.		No
DB2_PRODUCTION_SERVER	This parameter contains two values:  <b>host name or TCP/IP name</b> Specify the TCP/IP name or hostname of the DB2 server where the HADR primary server is running (production system).  <b>TCP/IP port</b> The TCP/IP port on which the DB2 production database instance is listening for remote connections (DB2 database manager configuration parameter SVCENAME)  Both values must be separated by a space and both values are required to be specified.	This parameter is required.	No
DB2_ALIAS	alias name  Specify the alias name of the DB2 database running on the HADR primary server.	This parameter is required.	No
DB2_USERNAME	DB2 user  Specify the DB2 user that is used to connect from the HADR standby server to the DB2 database running on the HADR primary server.	The user name of the user who started the tsm4acs operation.	Yes



Table 47. Tivoli Storage FlashCopy Manager profile parameters - DB2STANDBY section (continued)

Parameter name	Value	Default value	Advanced mode only
DB2_AUTH_TYPE	<p>SERVER, CLIENT, SERVER_ENCRYPT, DATA_ENCRYPT, GSSPLUGIN</p> <p>Specify the value of the DB2 instance AUTHENTICATION parameter on the DB2 HADR primary server. This parameter is optional. The valid values are:</p> <p><b>SERVER</b> Authentication of the user name and password takes place at the server.</p> <p><b>CLIENT</b> Authentication of the user name and password takes place at the client.</p> <p><b>SERVER_ENCRYPT</b> Specifies that authentication takes place on the node containing the target database, and that the authentication password is to be encrypted.</p> <p><b>DATA_ENCRYPT</b> Specifies that authentication takes place on the node containing the target database, and that connections must use data encryption.</p> <p><b>GSSPLUGIN</b> Specifies that authentication takes place using an external GSS API-based plug-in security mechanism.</p>	SERVER_ENCRYPT	No
TSM_BACKUP	<p>When the DB2 system acts as DB2 standby server or as HADR secondary, this parameter is evaluated instead of the parameter specified in the CLIENT section. In that case, FlashCopy Manager evaluates the OFFLOAD DB2STANDBY section instead of the OFFLOAD section to create a Tivoli Storage Manager backup from the snapshot.</p> <p>This parameter accepts the following values:</p> <ul style="list-style-type: none"> <li>• YES</li> <li>• MANDATE</li> <li>• LATEST</li> <li>• NO</li> <li>• TSM_ONLY</li> <li>• USE_FOR list of device classes</li> </ul> <p>See note 18 in "Profile parameter notes" on page 179 for complete parameter definitions.</p>	No	Yes

Table 47. Tivoli Storage FlashCopy Manager profile parameters - DB2STANDBY section (continued)

Parameter name	Value	Default value	Advanced mode only
MAX_VERSIONS	<p>This parameter is evaluated instead of the parameter specified in the CLIENT section when the DB2 system acts as DB2 standby server or as HADR secondary.</p> <p>This parameter contains the following values:</p> <p><b>ADAPTIVE</b></p> <p>The maximum number varies depending on the available space. Tivoli Storage FlashCopy Manager re-uses the oldest target set as the target for the current backup.</p> <p><i>n</i> Maximum number of snapshot versions to be maintained. When this limit is reached, the oldest version is deleted.</p>	ADAPTIVE	Yes
DEVICE_CLASS	<p>This parameter is evaluated instead of the parameter specified in the CLIENT section when the DB2 system acts as DB2 standby server or as HADR secondary.</p> <p>This parameter contains the following values:</p> <p><i>&lt;list of device classes&gt;</i> [<i>&lt;conditions&gt;</i>]</p> <p>One of the device classes listed is used during backup in the DEVICE_CLASS statement for which the condition is true. The condition statement is optional and has this syntax: [USE_AT <i>&lt;days of week&gt;</i>] [FROM <i>&lt;time&gt;</i> TO <i>&lt;time&gt;</i>] (partitioned DB2 databases) [ON_DBPARTITIONNUMS] <i>&lt;list of partitions&gt;</i></p> <p>See note 9 in "Profile parameter notes" on page 179 for complete information.</p>	STANDARD	Yes

### Related reference

“Profile parameter notes”

### OFFLOAD\_DB2STANDBY section

The OFFLOAD\_DB2STANDBY section has the same semantics as the OFFLOAD section, except that it is evaluated whenever an offloaded backup from a DB2 HADR secondary occurs instead of the DB2 HADR primary.

The parameters in the OFFLOAD\_DB2STANDBY section are the same as the OFFLOAD section, except for the addition of the parameters that are marked for custom applications. The parameters do not depend on the storage device. The parameter BACKUP\_METHOD is set to TSM\_CLIENT for this standby variant of the offload section.

### Related reference

“OFFLOAD section” on page 168

### Profile parameter notes

Additional information about the Tivoli Storage FlashCopy Manager profile parameters are provided.

#### 1. ACS\_DIR

The IBM Tivoli Storage FlashCopy Manager directory contains the following subdirectories:

- Subdirectory logs contains all log and trace information that IBM Tivoli Storage FlashCopy Manager generates. If you want all of your client nodes to store log and trace information within a single directory, you can use an NFS share for this subdirectory.
- Subdirectory shared is used for information that needs to be shared among all Tivoli Storage FlashCopy Manager components. You can either use an NFS filesystem to share this information across multiple servers or transfer a copy of this subdirectory to all systems on which Tivoli Storage FlashCopy Manager is installed.

The shared subdirectory currently contains only the password file (pwd.acsd). This file maintains passwords for all devices specified within the profile (see the device section) and a *master password*, which is used from all components in order to authenticate when connecting to the Management Agent. See “Tivoli Storage FlashCopy Manager password file” on page 194.

**Note:** By mapping ACS\_DIR (or either of the subdirectories logs and shared) on an NFS share that is accessible to all Tivoli Storage FlashCopy Manager components, you gain centralized access to all logs and eliminate the need to distribute the password file. However, remote configuration using SSH from the production system is the preferred method, not NFS sharing.

#### 2. ACS\_REPOSITORY

Specifies the directory in which the IBM Tivoli Storage FlashCopy Manager repository resides. The IBM Tivoli Storage FlashCopy Manager repository is critical for restore. It must be placed in a secure location. If the repository is lost, all backups are effectively deleted. The directory referenced by ACS\_REPOSITORY cannot be in a filesystem that is participating in the snapshot backup. Otherwise, Tivoli Storage FlashCopy Manager might fail. It is recommended that the IBM Tivoli Storage

FlashCopy Manager repository not be in the main IBM Tivoli Storage FlashCopy Manager directory (ACS\_DIR). A preferred location is a subdirectory of <ACS\_DIR>:

<ACS\_DIR>/acsrepository

**Note:** The path to ACS\_REPOSITORY must exist prior to the initial configuration, but the directory itself must not exist. The setup wizard will indicate an error if this directory already exists but does not contain a valid repository. Alternatively, the directory might already exist and contain a valid repository.

### 3. ADMIN\_ASSISTANT

If this parameter is defined, Tivoli Storage FlashCopy Manager will send backup and restore information to the Administration Assistant if Tivoli Storage Manager for ERP and the Administration Assistant component are installed. <server> and <port> are separated by a space. This parameter is ignored in non-SAP environments.

### 4. REPOSITORY\_LABEL

Specify a prefix that will be added to each snapshot name on the storage device. The prefix contains three character in one of the following ranges:

[a-z]

[A-Z]

[0-9]

This optional parameter is only used with IBM XIV Storage Systems. The default value is TSM.

**Note:** If the repository label is changed, backups created with the prior repository label are excluded from reconciliation.

### 5. COPYSERVICES\_CERTIFICATEFILE

If COPYSERVICES\_COMMPROTOCOL is set (or defaults) to HTTPS:

*certificate file name*

Name of a certificate file 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 need to connect using 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 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 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. Rather, it accepts any certificate from the client, including a null string for the filename. To enable this mode, the value of

COPYSERVICES\_CERTIFICATEFILE must be NO\_CERTIFICATE. This mode is recommended only if the production and backup systems, as well as the storage system, are protected by a firewall. If NO\_CERTIFICATE is in effect, the cimom.properties parameter DigestAuthentication must be set to 'false'.

## 6. COPYSERVICES\_SERVERPORT

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

COPYSERVICES_HARDWARE_TYPE	COPYSERVICES_COMMPROTOCOL	Default Port
DS8000	HTTPS	5989
	HTTP	5988
SVC or Storwize V7000	HTTPS	5989
	HTTP	5988

## 7. DATABASE\_BACKUP\_INCREMENTAL\_LEVEL

The following conditions apply:

- A 0 value performs a full backup. This is the default.
  - A full backup must be performed before an incremental backup can be performed.
- A numerical value greater than 0 performs an incremental backup.
  - Incremental backups are progressive. For example, a level 0 backup must be performed before a level 1 backup can occur. A level 1 backup must be performed before a level 2 backup can occur and so on.

## 8. DATABASE\_BACKUP\_SCRIPT\_FILE

The script must:

1. contain commands that are valid for the backup system database (applicable on a database with datafile copies),
2. contain the Data Protection for Oracle environment variable TDPO\_OPTFILE.

Specify the fully qualified path name to the tdpo.opt options file with the TDPO\_OPTFILE environment variable.

3. have the allocate channel command and the ENV parameter on the same line. For example:

```
allocate channel t1 type 'sbt_tape' parms 'ENV=(TDPO_OPTFILE=..)';
```

4. have the database command specified on a line separate from the backup command. For example:

```
backup
(database);
```

## 9. DEVICE\_CLASS

During backup, Tivoli Storage FlashCopy Manager will use one of the device classes listed in the *list of device classes* of the DEVICE\_CLASS statement for which the *conditions* evaluates to true. If multiple *conditions* statements evaluate to true the operation will fail. The device classes listed in the *list of device classes* (separated by spaces) Tivoli Storage FlashCopy Manager will be used 'cyclically'. To be more precise, Tivoli Storage FlashCopy Manager use the device class that follows the device class, which was used most recently, for the next backup operation. If the last device class in the list was used during the most recent backup or no device class in the list was ever used for a backup, Tivoli Storage FlashCopy Manager will use the first device class in the list. The value of the DEVICE\_CLASS parameter has this syntax:

#### *list of device classes [conditions]*

One of the device classes listed is used during backup in the DEVICE\_CLASS statement for which the condition is true. The condition statement is optional and has this syntax:

[USE\_AT *days of week*] [FROM *time* TO *time*]  
(partitioned DB2 databases) [ON\_DBPARTITIONNUMS *list of partitions*]

Multiple sections representing different devices are possible. Any such section can be selected using the DEVICE\_CLASS profile parameter or vendor option. At restore time, Tivoli Storage FlashCopy Manager always uses the same DEVICE\_CLASS value that was used during the backup.

### 10. FLASHCOPY\_TYPE

- This parameter applies generically to any snapshot device. The values INCR and NOCOPY apply only to FlashCopy devices.
- COPY, INCR, or NOCOPY (SAN Volume Controller 5.1 or later) is required if the customer plans to run a snapshot restore.
- INCR is recommended if Tivoli Storage Manager backups are desired from disk copies, which are created with less burden on the storage system than for the COPY option. This value is also recommended under the following conditions:
  - You intend to perform a snapshot restore of the backed-up database.
  - You intend to schedule more frequent backups for your database.

For IBM System Storage 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.

- NOCOPY is recommended under the following conditions:
  - A complete copy of the source volumes on which the database files reside to the target volumes is not desired.
  - Backup time constraints are a concern

A successful backup of the database to the Tivoli Storage Manager server is possible even if the parameter is set to NOCOPY. For SAN Volume Controller and Storwize V7000, SVC\_COPY\_RATE is forced to 0 when FLASHCOPY\_TYPE is specified as NOCOPY or INCR.

### 11. LVM\_FREEZE\_THAW

#### **YES**

Enable freeze prior to snapshot and thaw afterwards. For AIX, the value YES is valid only if all filesystems involved in the backup are JFS2 filesystems.

- NO** Do not perform a freeze. In order to set this parameter to NO, a licensed version of Tivoli Storage FlashCopy Manager is needed and a backup server is required for mounting the snapshot to ensure filesystem consistency.

The value NO is required if at least one JFS filesystem is involved.

#### **AUTO**

If TARGET\_DATABASE\_SUSPEND is YES, treat as LVM\_FREEZE\_THAW YES.

See also “Interdependency of LVM\_FREEZE\_THAW and TARGET\_DATABASE\_SUSPEND” on page 193.

## 12. MAX\_VERSIONS

### ADAPTIVE

The maximum number varies depending on the available space. Tivoli Storage FlashCopy Manager re-uses the oldest target set as the target for the current backup.

- n* Maximum number of snapshot versions to be maintained. When this limit is reached, the oldest version is deleted.

(DB2 with Tivoli Storage Manager for Advanced Copy Services) Accepts only the values '1' and '2' for this parameter when the Tivoli Storage Manager for Advanced Copy Services product is used and not the fully licensed version of Tivoli Storage FlashCopy Manager.

## 13. NEGATIVE\_LIST

Depending on the storage device, Tivoli Storage FlashCopy Manager performs backup and restore operations with volume-group granularity. The parameter NEGATIVE\_LIST is used to control processing when non-database files are stored within the same file systems involved in the backup or restore operation. This parameter is required.

### NO\_CHECK

Does not check for additional files and the operation ignores any additional files that are discovered.

**Attention:** Be aware that during restore processing, this setting will result in all files that reside in one of the file systems or volume groups (that are the subject of the restore) being overwritten.

### WARN

Issues a warning for each file discovered on the volume that is not part of the FlashCopy operation (processing continues). In case of a restore, the additional files found on the file systems to restore will be overwritten by the restore operation.

### ERROR

Issues an error for each file discovered on the volume that is not part of the FlashCopy operation (processing ends).

In an Oracle ASM environment, the output that displays when a file is discovered is shown here:

```
#ERRFILE +<asm_file> <-> + <asm_link>
```

or

```
#ERRFILE +<asm_link> <-> + <asm_file>
```

Both the <asm\_file> and <asm\_link> expressions identify the same entity. To allow this additional file in the FlashCopy operation, add the appropriate <asm\_file> or <asm\_link> expression to the negative-list file.

### *filename*

When files exist that are not part of the database tablespace files but are to be included in the FlashCopy operation, specify the fully qualified names of these files and directories (one entry per line) in this negative-list file (*filename*). Processing continues even when these files



are discovered. When other files are discovered that are not contained in this negative-list file, processing ends. Note that any directory listed in the negative-list file is processed recursively; for example, it allows all files within the directory (and any subdirectory) to be processed during a backup or restore request.

This parameter is not available for SAP® with Oracle because a similar mechanism is provided directly by the SAP® BR\*Tools. Refer to the SAP® documentation for this purpose.

#### 14. OPTIONS

(DB2) A file specification must be a fully qualified file name. If IBM Tivoli Storage Manager for Enterprise Resource Planning is being used, the IBM Tivoli Storage Manager for Enterprise Resource Planning DB2 vendor options file (vendor.env) must be specified.

(DB2) To be able to set up individual partitions in a DPF environment in a different manner, the placeholder string %DB2NODE can be embedded in the options string. At runtime, it will be replaced with the appropriate partition number for which the backup was issued. This placeholder can be part of the vendor options file entry, thus allowing different configuration files depending on the partition. For example, if there are two partitions

```
OPTIONS @/db2/T01/tdpr3/vendor_%DB2NODE.env
```

refers to the two files

```
/db2/T01/tdpr3/vendor_0.env  
/db2/T01/tdpr3/vendor_1.env
```

The first file will be used for partition 0, the second for partition 1. Specifying this parameter overrides the value specified by the VENDOROPT database configuration parameter.

#### 15. RESTORE\_FORCE

In the case of a re-run of a snapshot restore, message FMM0200E is issued if the background copy process in the storage device of the previous snapshot restore is still running and RESTORE\_FORCE is not set to YES. There are two options:

- wait until the background copy process terminates
- specify RESTORE\_FORCE YES in the profile and re-run the snapshot restore. This will withdraw all existing source/target relations and create new ones, resulting in a full copy.

**Note:** If you set RESTORE\_FORCE to YES in a specific situation, but do not want it to apply to all restores, you should consider doing so in a temporary profile.

#### 16. SVC\_COPY\_RATE

The value represents a priority that can range between 0 and 100. A value of 100 is the highest but has the greatest impact on the responsiveness of the storage system. A value of 0 suppresses the background copy process and forces FLASHCOPY\_TYPE to NOCOPY.

#### 17. TARGET\_DATABASE\_SUSPEND

This value specifies whether to suspend activity on the target database until the FlashCopy operation completes. Enter one of the following values:



**YES**

Suspend the target database until the FlashCopy operation completes. This value is recommended when the level of transaction processing is high.

**NO** Do not suspend the target database.

**OFFLINE**

All backups must be offline. If SAP requests an offline backup, this parameter is ignored.

The values YES and NO imply an 'online' backup type. When performing a backup with OFFLINE specified, the target database on the production system must be in a "startup mount" state at the time that acsora or acsutil is issued. Otherwise recovery must be performed to restore the database. See also "Interdependency of LVM\_FREEZE\_THAW and TARGET\_DATABASE\_SUSPEND" on page 193.

**18. TSM\_BACKUP / TSM\_BACKUP\_FROM\_SNAPSHOTS**

To create a Tivoli Storage Manager backup from a snapshot, install Tivoli Storage FlashCopy Manager on a backup server. The Offload Agent can be run to trigger a TSM backup from any snapshot created with TSM\_BACKUP set to YES, MANDATE, or LATEST.

If FlashCopy Manager is used with IBM Tivoli Storage Manager for Enterprise Resource Planning, this parameter is moved to the .utl file under the new name "TSM\_BACKUP\_FROM\_SNAPSHOTS" for SAP with Oracle environments.

**YES**

Create a Tivoli Storage Manager backup from this snapshot. Reuse of the target set is allowed if the Tivoli Storage Manager backup operation does not complete successfully.

**MANDATE**

In contrast to YES, do not reuse the target set until the Tivoli Storage Manager backup completes.

**LATEST**

When a snapshot backup was performed with TSM\_BACKUP LATEST and the off-loaded backup to Tivoli Storage Manager has either not started or has failed, any new snapshot backup with option TSM\_BACKUP set to LATEST, YES, or MANDATE, removes the backup request to Tivoli Storage Manager from the previous backup. This prevents backup requests to Tivoli Storage Manager from queuing if they could not be completed in time.

**NO** Keep the snapshot backup and do not use it as a source for a subsequent tape backup operation.

**TSM\_ONLY**

The backup is automatically marked for deletion during the unmount operation once the Tivoli Storage Manager backup has completed. This occurs regardless of whether the backup was successful or not.

**USE\_FOR** *list of device classes*

This attribute can be combined with any of these options to limit its application to snapshots performed with particular device classes as specified in the profile. Any number of device classes that are listed must be separated by spaces.

**Note:** (DB2) The ability to create a Tivoli Storage Manager backup from a snapshot requires a Tivoli Storage FlashCopy Manager license.

## 19. TARGET\_SETS

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

### VOLUMES\_DIR

Specify a directory that contains all target volumes files (.fct). If you migrated data from Tivoli Storage Manager for Advanced Copy Services to Tivoli Storage FlashCopy Manager, the VOLUMES\_DIR parameter remains effective. However, the VOLUMES\_FILE parameter is the preferred method for specifying the target volumes file.

### VOLUMES\_FILE

Specify the name of the target volumes file (.fct).

### *list of target set names (SAN Volume Controller only)*

Specify a list of target set names, for example TARGET\_SETS 1 2 3. In order 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 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.

## 20. STORAGE\_SYSTEM\_ID

Specify the storage system ID of the cluster to which the DS8000, IBM XIV, SAN Volume Controller or Storwize V7000 storage system refers in a Logical Volume Manager mirrored or ASM mirrored environment. This parameter is required in LVM mirrored environments and must not be used in non-mirrored environments. If several device classes refer to the same target volumes file in a mirrored environment, this parameter must also be specified in the target volumes file. In Oracle ASM mirrored environments, this parameter is required if the failure groups are distributed across multiple storage systems.

For XIV, the STORAGE\_SYSTEM\_ID refers to the 4 digit hexadecimal XIV system ID. For SAN Volume Controller or Storwize V7000, the system ID refers to the SAN Volume Controller Cluster ID.

This parameter must be specified in the DEVICE\_CLASS section of the profile when either of these parameter values exist:

- TARGET\_SETS VOLUMES\_FILE
- TARGET\_SETS VOLUMES\_DIR
- TARGET\_SETS *list of target set names* (SAN Volume Controller only)

This parameter must also be specified in the target volumes file (.fct) when this parameter value exists:

- TARGET\_SETS VOLUMES\_DIR

**Note:** This parameter might be needed for ASM. See “LVM mirroring and ASM failure group environments” on page 38 for more information.

## 21. PARTITION\_GROUP

This parameter is used in multi-partition DB2 environments, when multiple partitions reside on the same volume group (volume sharing). Use it to specify all partitions that share the same volume group. This parameter can be specified multiple times. When PARTITION\_GROUP is used, the VOLUMES\_FILE parameter must be used to specify the .fct file. The VOLUMES\_DIR parameter cannot be used with PARTITION\_GROUP. You can specify:

**<group name>**

Specify an identifier for the partition group.

**<db2 node>**

Specify the DB2 node name. When multiple entries are specified, each entry must be separated by a space.

This is an example of a PARTITION\_GROUP entry:

```
>>> CLIENT
...
PARTITION_GROUP ONE 0 1
PARTITION_GROUP TWO 2 3
...
<<<
```

See “Target set definition file for multi-partition DB2 databases” on page 34 for an example of an .fct file in this environment.

## 22. TIMEOUT\_FLASH

Specify the maximum time (in seconds) that the database agent waits for a response to the management agent call during the 'flash' phase. If the database agent does not receive a response within the specified time, an error message is issued. This parameter allows the maximum time to be specified for which that database is allowed to be suspended. This also implies the maximum time for which JFS2 file systems are allowed to be frozen. If the timeout is reached, then the file systems thaw, the database is resumed, and the backup operation ends with an error. If the parameter LVM\_FREEZE\_THAW is set to AUTO or YES, then the minimal allowed value for TIMEOUT\_FLASH is 5 seconds. Otherwise the minimal value is 1 second.

## 23. TIMEOUT\_<PHASE>

Specify the maximum time (in seconds) that the database agent waits for a response to the management agent call during the <phase> phase. If the database agent does not receive a response within the specified time, the backup or restore operation ends and an error message is issued. The default value is 3600 seconds.

You can specify one of these phase values for a FlashCopy backup (for example, TIMEOUT\_PREPARE):

- PARTITION
- PREPARE
- FLASH (see separate description of this parameter)
- VERIFY
- CLOSE

You can specify one of these phase values for a FlashCopy restore (for example, TIMEOUT\_FLASHRESTORE):

- PREPARERESTORE
- FLASHRESTORE
- COMPLETERESTORE
- CLOSE

**24. DEVICE\_CLASS** *device class* **USE\_FOR\_CLONING** *list of clone database names* [conditions]

Specify this parameter in the CLONING section of the profile to identify the device class to use when cloning a database.

The USE\_FOR\_CLONING statement is required. The *conditions* statement is optional and uses this syntax:

(partitioned DB2 databases)  
[ON\_DBPARTITIONNUMS <list of partitions>]

**25. FLASH\_DIR\_LIST** [ON DBPARTITIONNUM *list of partitions*] *fully qualified file name*

Specify this parameter in the CLONING section of the profile to include file systems in the FlashCopy operation that are not a part of the database files. You must include these files in certain circumstances. For example, when cloning a SAP® Advanced Business Application Programming and Java system, the Java instance is not part of the database files. As a result, a clone of the Java instance must be created along with the clone of the database. Use the FLASH\_DIR\_LIST parameter in this situation to include the Java instance directories and therefore, simplify the cloning process.

Specify a fully qualified directory name and file name. Inside the file, specify one fully qualified file or directory on each line. FlashCopy Manager uses the FlashCopy function to flash copy the complete volume groups in which the specified files or directories reside.

In DB2 Data Partitioning Feature environments that contain multiple partitions, a different file name for each partition can be specified. In this situation, you must specify the ON DBPARTITIONNUM parameter because different file names are specified for different partitions. Each partition number must be separated by a space.

The default value is an empty list. This value prevents additional files or directories from participating in the FlashCopy operation.

**26. OVERWRITE\_DATABASE\_PARAMETER\_FILE** YES|NO

**Important:** Use with Oracle databases only. This parameter also exists in the OFFLOAD section of the profile and specifies whether the database configuration file on the backup server is overwritten with the file from the production server. However, the parameter value in the OFFLOAD section is not applicable to cloning operations and is ignored.

Specify this parameter in the CLONING section of the profile to copy the database configuration file from the production system to the clone system. Tivoli Storage FlashCopy Manager requires two database configuration files to be available in the clone instance on the clone system. The default database configuration file name is \${ORACLE\_HOME}/dbs/init\${ORACLE\_SID}.ora.

In a scenario where the production system is \${ORACLE\_SID}=P01 and the clone system is \${ORACLE\_SID}=C01, these database configuration files are required:

```
/oracle/C01/102_64/dbs/initP01.ora
/oracle/C01/102_64/dbs/initC01.ora
```

The initP01.ora file is used during the cloning process to recover the database (used in the FlashCopy operation) on the clone system. The initC01.ora file is used to rename and start the clone database.

Specify one of these values:

- YES** Copy the database configuration file from the production system to the clone system. The following process occurs:
- The clone database configuration file initP01.ora is copied on the clone system. The existing file (/oracle/C01/102\_64/dbs/initP01.ora) is overwritten.
  - The clone database configuration file /oracle/C01/102\_64/dbs/initP01.ora is copied to /oracle/C01/102\_64/dbs/initC01.ora. The existing file (/oracle/C01/102\_64/dbs/initC01.ora) is overwritten. All occurrences of P01 in this file are renamed C01.
- NO** Do not copy the database configuration file from the production system to the clone system. This value requires that the database configuration files /oracle/C01/102\_64/dbs/initP01.ora and /oracle/C01/102\_64/dbs/initC01.ora are available on the clone system. You must verify that these files are available and are valid.

**Tip:** If the name of the database configuration file on the production database is not the default file name (\${ORACLE\_HOME}/dbs/init\${ORACLE\_SID}.ora), use the TARGET\_DATABASE\_PARAMETER\_FILE parameter (in the CLONING section) to specify the correct name. In this situation, the clone database configuration file name is created by replacing the \${ORACLE\_SID} value of the production database with the name of the clone database.

## **27. TARGET\_DATABASE\_PARAMETER\_FILE** *production target database parameter file*

**Important:** Use with Oracle databases only. This parameter also exists in the ORACLE section of the profile and specifies the database configuration file name. However, the parameter value in the ORACLE section is not applicable to cloning operations and is ignored.

Specify this parameter in the CLONING section of the profile to identify the name of the Oracle parameter file for the production database. Enter the fully resolved path and file name of the Oracle parameter file (*initSID.ora* by default) for the production database. This file must be a text-based Oracle parameter file (PFILE) and not an Oracle server file. The default value is \${ORACLE\_HOME}/dbs/init\${ORACLE\_SID}.ora. If the production database is configured to use an Oracle server file, this parameter is ignored.

## **28. DATABASE\_SCHEMA** *production database schema*

The database schema does not change when a clone database is created from the production database. As a result, the clone database uses the same database schema as the production database. Use the DATABASE\_SCHEMA profile parameter to specify the correct database schema.

DATABASE\_SCHEMA is required for non-SAP databases. There is no default database schema value.

DATABASE\_SCHEMA is optional for SAP databases. The default database schema value is determined by the following environment variables if these environment variables are set on the production database instance owner environment:

```
(DB2)      dbs_db6_schema
(Oracle)   dbs_ora_schema
```

If these environment variables are not set, the default database schema value is SAPR3. When DATABASE\_SCHEMA is used (for an SAP database), the specified database schema value overrides all default database schema values.

DATABASE\_SCHEMA is only evaluated when the following conditions exist:

- A processing script is used with the **preproc\_clone** or **postproc\_clone** command.
- The **refresh\_clone** command is issued with the -X or -Y cloning parameter.
- The **create\_clone** command is issued with the -Y cloning parameter.

## 29. CLONE\_DATABASE YES|NO

This parameter is preset by the profile wizard. Specify this cloning profile parameter in the DEVICE\_CLASS device section of the profile. Specify the value YES with this parameter to assign a device class for use with cloning. Specify one of these values:

- YES** Use the device class for cloning. When this parameter specifies YES, the device class is considered unavailable for non-cloning backup or restore operations. The device class is ignored during backup expiration and reconciliation processing.
- NO** Do not use the device class for cloning. When this parameter specifies NO, any cloning request fails with an error message and return code 2.

This example shows a CLONE\_DATABASE specified in the DEVICE\_CLASS *device section* of the profile:

```
>>> DEVICE_CLASS STANDARD
CLONE_DATABASE YES
COPYSERVICES_HARDWARE_TYPE XIV
# STORAGE_SYSTEM_ID
PATH_TO_XCLI /home/xivtest/XCLI
COPYSERVICES_SERVERNAME nextra
COPYSERVICES_USERNAME admin
# RECON_INTERVAL 12
# GRACE_PERIOD 24
# USE_WRITABLE_SNAPSHOTS AUTO
USE_CONSISTENCY_GROUPS NO
BACKUP_HOST_NAME acsback5
<<<
```

## 30. APPLICATION\_TYPE

When this parameter specifies GENERIC, the following optional settings are available and can be specified in the CLIENT section of the profile:

### INFILE *file*

This parameter identifies the file that contains a list of all objects to be processed. The file must comply with these requirements:

- Each line specifies only one file or directory to be backed up.



- A directory and all subdirectories are processed recursively. Symbolic links are followed when the directory is expanded.
- When a symbolic link to a file is specified, Tivoli Storage FlashCopy Manager protects the file system where the file is located. However, the file system where the symbolic link is located is disregarded.

You can override the INFILE parameter by entering a command on the command line. If you do not specify INFILE in the profile, you must specify it on the command line.

The fcmcli functions inquire, inquireDetails, and delete do not recognize the INFILE parameter. The function restore accepts INFILE as an optional parameter.

#### **PRE\_FLASH\_CMD *file***

This optional parameter identifies the command script or executable file used to quiesce the application immediately before the snapshot operation begins. You can override the PRE\_FLASH\_CMD parameter by entering a command on the command line. When the value of the PRE\_FLASH\_CMD parameter contains command arguments, place the value between double quotation marks ("").

#### **POST\_FLASH\_CMD *file***

This optional parameter identifies the command script or executable file used to resume the application immediately after the snapshot operation completes. You can override the POST\_FLASH\_CMD parameter by entering a command on the command line. When the value of the POST\_FLASH\_CMD parameter contains command arguments, place the value between double quotation marks ("").

### **31. BACKUP\_METHOD**

This parameter is preset by the profile wizard based on the application environment. For custom application environments (APPLICATION\_TYPE=GENERIC) and offload sections related to the DB2 standby servers, the BACKUP\_METHOD is set to TSM\_CLIENT. The following optional settings can be specified in the OFFLOAD section of the profile:

#### **MODE**

This parameter determines which of the following Tivoli Storage Manager Backup Archive client backup functions to use when creating a Tivoli Storage Manager offloaded backup:

#### **ARCHIVE**

Creates an archive backup of all files and directories that are specified in the backup request. Directories are processed recursively.

The ARCHIVE mode is similar to the FULL mode, except that the archive management class is used instead of a backup management class. One of the advantages of the archive management class is that Tivoli Storage FlashCopy Manager does not need to resend all data upon a failure during an archive operation. Only the remainder of the data is sent after the failure.

#### **FULL**

Creates a full backup of all files and directories that are specified in the backup request. Directories are processed recursively.

#### **DIFF**

Creates a differential backup of all files and directories that are

specified in the backup request. Directories are processed recursively. This operation backs up changes since the most recent full backup.

**USE\_FOR** *device class*

Allows the backup mode to be changed based on the device class used to create the snapshot. Use this option to define rules that create a weekly full backup and daily incremental backups.

**Tip:** You can use the USE\_FOR option to define multiple MODE statements within the OFFLOAD section.

**ASNODENAME** *nodename*

This parameter identifies the node name of the system where data is stored during a Tivoli Storage Manager offloaded backup. This parameter is required only for custom applications.

In Tivoli Storage FlashCopy Manager, backups are always made from an offload system, but are restored directly to the production system. For a custom application configuration, the ASNODENAME parameter defines a dedicated node that contains the data of the custom application (in this case, the production system). Tivoli Storage FlashCopy Manager uses the Offload Agent (**tsm4acs**) to create offloaded backups to the Tivoli Storage Manager server from the offload system. The parameter ASNODENAME ensures that this data is backed up such that it can be restored directly to production using the **dsmc** command. This command depends on the choice of the profile parameters MODE and VIRTUALFSNAME of the OFFLOAD section and the value of the parameter BACKUPIDPREFIX from the CLIENT section.

**Note:** You must specify the PASSWORDACCESS GENERATE option in the client system options file on the offload system and production system.

**VIRTUALFSNAME** *name*

This parameter identifies the virtual file space name of a backup group. It is available when the MODE parameter specifies a value of FULL or DIFF. VIRTUALFSNAME is optional and the default value is fcm.

**DSM\_DIR**

This optional parameter identifies the path used for the DSM\_DIR environment variable. For UNIX and Linux, specify the path where the executable file dsmc, the resource files, and the dsm.sys file reside.

**DSM\_OPT**

This optional parameter identifies the path used for the Tivoli Storage Manager client options file. The default value is the path of the Tivoli Storage Manager client installation directory.

## 32. BACKUP\_HOST\_NAME

Specify the name of the backup host that is used during offloaded tape backups only. The possible values of the BACKUP\_HOST\_NAME parameter depend on the storage subsystem and its usage.



Table 48. *BACKUP\_HOST\_NAME* values in the *DEVICE\_CLASS* device section of the profile

Storage subsystem type	BACKUP_HOST_NAME value in device section of the profile	Comments
XIV, SVC, Storwize V7000 , DS8000	NONE	Use this value if you do not have a backup server.
XIV	<backup_server_hostname>	Use this value if you have a backup server. Enter the host name or cluster name of the backup server as configured on the XIV storage subsystem.
SVC, Storwize V7000	PREASSIGNED_VOLUMES	Use this value if you have a backup server and you use static volume mapping. This configuration means your FlashCopy target set disks are already mapped to the backup server and remains unchanged during all FCM operations.
SVC, Storwize V7000	<backup_server_hostname>	Use this value if you have a backup server and you want to use dynamic volume mapping. This configuration means the target set disks are automatically assigned to and removed from a host if required by the FCM operation. Use this value if you have a backup server. Enter the host name of the backup server as configured in the SAN Volume Controller.
DS8000	PREASSIGNED_VOLUMES	Use this value if you have a backup server.

#### Related concepts

“Tivoli Storage FlashCopy Manager target volumes file” on page 194

#### Related reference

“Key files and directories” on page 205

### Interdependency of LVM\_FREEZE\_THAW and TARGET\_DATABASE\_SUSPEND

The LVM\_FREEZE\_THAW and TARGET\_DATABASE\_SUSPEND profile parameters are interdependent.

These two Tivoli Storage FlashCopy Manager profile parameters are interdependent in the following manner:

- If LVM\_FREEZE\_THAW is set to YES, the database must be suspended. Otherwise, write operations to the database might time out and leave the database in an inconsistent state. A specified value of YES for TARGET\_DATABASE\_SUSPEND prevents this situation.
- If LVM\_FREEZE\_THAW is set to NO, the user might want to suspend the database without freezing the file system. Also, if JFS is used, freeze and thaw are not supported.
- If LVM\_FREEZE\_THAW is set to AUTO, and the file systems support the freeze function, the effect of AUTO is described in the following table. If the file systems do not support the freeze function, the AUTO value resolves to NO.

For Oracle ASM environments, TARGET\_DATABASE\_SUSPEND is independent of LVM\_FREEZE\_THAW, and LVM\_FREEZE\_THAW is not allowed for ASM.

The following table summarizes the actions taken depending on the values of the two parameters:

Table 49. Actions Taken Depending on Values of LVM\_FREEZE\_THAW and TARGET\_DATABASE\_SUSPEND

Value of LVM_FREEZE_THAW	Value of TARGET_DATABASE_SUSPEND		
	YES	NO	OFFLINE
YES	Suspend and freeze	Terminate with an appropriate error message. Conflicting parameters.	Offline with freeze
NO	Suspend, no freeze	No suspend, no freeze	Offline without freeze
AUTO	Treat as LVM_FREEZE_THAW YES	Treat as LVM_FREEZE_THAW NO	Offline with freeze

---

## Tivoli Storage FlashCopy Manager password file

Tivoli Storage FlashCopy Manager requires a password file in order to access the storage subsystem where the database volumes are stored.

This password file also contains a *master password*, which is required by the Management Agent to authenticate the database nodes and the Offload Agent. It is possible to share a single password file between all systems by placing it into an NFS mounted file system that is available to all servers on which Tivoli Storage FlashCopy Manager is installed. Separate password file instances can also be used for different database nodes, for the Management Agent, and for the (optional) Offload Agent. Separate password file instances for the Management Agent requires access to the password for the storage subsystem. For the Offload Agent, the master password is required on all systems.

A password file can be created during the initial setup of Tivoli Storage FlashCopy Manager 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 target volumes file

The target volumes file (.fct) identifies the target volumes to be used for a FlashCopy backup.

During a FlashCopy backup on IBM System Storage 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. More than one target set 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 VOLUMES\_SET\_ (if VOLUMES\_DIR is used) or TARGET\_SET (if VOLUMES\_FILE is used) and is appended with a target set *target set name*, which differentiates the various target set sections. The target set name can be any alphanumeric value. Note that target set definitions are not required on XIV®.

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.

When VOLUMES\_DIR is specified in the profile, the target volumes file conforms to this naming convention:

```
<dbm-instance>.<database-name>.<device-class>.<partition-num>.fct
```

- <dbm-instance>: DB2 instance name
- <database-name>: DB2 database alias
- <device-class>: Device class specified in the profile or as a vendor option
- <partition-num>: 'NODEnnnn' where 'nnnn' is the partition number (leading zeroes)

The target volumes file name is case sensitive. For example:

```
keon14.A01.STANDARD.NODE0000.fct
```

## 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 50. Managing target volume LUNs by storage system

IBM System Storage DS8000	SAN Volume Controller or Storwize V7000	XIV®
Manual target LUN creation using target volumes file (.fct) with VOLUMES_FILE or VOLUMES_DIR parameter	Manual target LUN creation using target volumes file (.fct) with VOLUMES_FILE or VOLUMES_DIR parameter  or  Naming convention using TARGET_NAMING parameter	Automatic target LUN creation <i>without</i> using 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) or a directory that contains multiple target volumes files (VOLUMES\_DIR). 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. On a partitioned DB2 environment, use the VOLUMES\_FILE parameter to create target set definitions for specific PARTITION sections. This setting is required when two partitions are accessing the same TARGET\_SET during a single backup operation.

To further simplify target mapping on SAN Volume Controller, the TARGET\_NAMING parameter allows a naming convention to be specified for the target volumes. This enables Tivoli Storage FlashCopy Manager 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 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 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 and VOLUMES\_DIR:  
In both cases 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 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\_DIR parameter:

```
>>> VOLUMES_SET <name>
STORAGE_SYSTEM_ID <id of the storage cluster>
TARGET_VOLUME <target> [<source>] [<size>]
[...]
<<<

[...]
```

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

>>> PARTITION <name of partition> # e.g. NODE0000 for partition 0 or NODE0001 for
                                #partition 1, ...
TARGET_VOLUME <target> [<source>] [<size>]
[...]
<<<

[...]
```

In SAP on DB2 multi-partition environments (especially when migrating from Tivoli Storage Manager for Advanced Copy Services 5.4), some (or all) database files of the DB2 partitions of one production server can be allocated in the same volume groups and on the same source volumes on the storage system. This is referred to as volume sharing. Tivoli Storage FlashCopy Manager supports volume when the TARGET\_SETS profile parameter is set to VOLUMES\_FILE and the PARTITION\_GROUP parameter is specified in the DEVICE\_CLASS. This is an example of such a configuration:

```

<ACS_DIR>/profile:
...
>>> DEVICE_CLASS STANDARD
...
PARTITION_GROUP GROUP_A 0 1
PARTITION_GROUP GROUP_B 2 3
...
TARGET_SETS VOLUMES_FILE
VOLUMES_FILE <ACS_DIR>/acsvolumes/volumes_file.fct
<<<

<ACS_DIR>/acsvolumes/volumes_file.fct:
>>> TARGET_SET 1
>>> PARTITION GROUP_A
TARGET_VOLUME J01acs_td_0
TARGET_VOLUME J01acs_t1_0
TARGET_VOLUME J01acs_td_1
TARGET_VOLUME J01acs_t1_1
...
<<< PARTITION GROUP_A

>>> PARTITION GROUP_B
TARGET_VOLUME J01acs_td_2
TARGET_VOLUME J01acs_t1_2
TARGET_VOLUME J01acs_td_3
TARGET_VOLUME J01acs_t1_3
...
<<< PARTITION GROUP_B
<<< TARGET_SET 1

>>> TARGET_SET 2

...
<<< TARGET_SET 2

```

If you migrated data from Tivoli Storage Manager for Advanced Copy Services 5.5 (or later) to Tivoli Storage FlashCopy Manager, the `VOLUMES_DIR` parameter remains effective. However, specifying `TARGET_SETS VOLUMES_FILE` and setting the `VOLUMES_FILE` parameter is the preferred method for specifying the target volumes file.

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 to map source volumes to suitable target volumes without requiring the storage administrator to manually list all targets in the target volumes file.

In an AIX LVM mirroring environment, the storage system ID of the cluster to which the DS8000 or SAN Volume Controller storage system refers must be specified in the target volumes file with the `STORAGE_SYSTEM_ID` parameter. However, when either `TARGET_SETS VOLUMES_FILE` or `TARGET_SETS list of target set names` is specified, the `STORAGE_SYSTEM_ID` parameter must be specified in the `DEVICE_CLASS`.

#### Related reference

“Tivoli Storage FlashCopy Manager profile parameters” on page 137

“Target volume parameter settings (DS8000 configuration)” on page 199

“Target volume parameter settings for SAN Volume Controller configuration and Storwize V7000 .” on page 200

## Target volume parameter settings (DS8000 configuration)

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

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

Table 51. 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 attempts to match source volumes to suitable targets within a target set during backup. To determine source target relations in advance, specify a source serial number with a target serial number in the target set definition file. In this situation, the relation between the source and target is required and backup processing fails if one of the targets is unavailable for the specified source.</p> <p>This example shows a configuration where the DS8000 source volume with serial 75924811011 must be used in a FlashCopy with the target volume with serial number 75924811001.</p> <pre>TARGET_VOLUME 75924811001 75924811011 Size=2.0_GB</pre> <p>The source serial number and the size can be omitted completely or dashes can be entered in both fields as placeholders, as shown in the following example:</p> <pre>TARGET_VOLUME 75924811001 - -</pre> <p>The dashes will be ignored. Note the target volume requirements for a FlashCopy:</p> <ul style="list-style-type: none"><li>• The size must be the same as that of the source volume</li><li>• The source and target volumes that are listed in one TARGET_SET must be in the same storage subsystem</li></ul> <p><b>Note:</b> Do not change the order of the parameters (target volume serial number, source volume serial number, size of source volume).</p> <p>See “Managing target volumes by storage system” on page 195 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 it becomes necessary to make any of these changes:

- change the FLASHCOPY\_TYPE value of an existing target set
- remove a target volume from an existing target set
- remove a complete target set

You must use the sequence of commands that are described in “Deleting Tivoli Storage FlashCopy Manager snapshot backups” on page 104 with the force option.

### Related reference

“Example target volumes file (DS8000 configuration)” on page 228



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

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

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

Table 52. 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 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 will be ignored. Note the target volume requirements for a FlashCopy:</p> <ul style="list-style-type: none"> <li>• the size must be the same as that of the source volume</li> <li>• the source and target volumes that are listed in one TARGET_SET must be in the same SAN Volume Controller cluster.</li> </ul> <p><b>Note:</b> Do not change the order of the parameters (target volume name, source volume name, size of source volume).</p> <p>See “Managing target volumes by storage system” on page 195 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 value of an existing target set
- remove a target volume from an existing target set
- remove a complete target set

You must use the sequence of commands that are described in “Deleting Tivoli Storage FlashCopy Manager snapshot backups” on page 104 with the force option.

**Note:** SAN Volume Controller 5.1 (or later) and Storwize V7000 : Tivoli Storage FlashCopy Manager 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 1: T2 is restored

All upstream snapshot mappings are stopped: T3,T4

#### Example 2: T2 is overwritten by a new backup

All downstream snapshot mappings are stopped: T1

#### Related reference

"Example target volumes file (SAN Volume Controller configuration or Storwize V7000 )" on page 231

## Target set handling for cloning

Cloning operations require specific settings for target sets.

The TARGET\_SETS profile parameter identifies the target volumes to be used in the FlashCopy operation. This parameter must be specified in the device class section of the profile. You can specify one of these values with cloning operations:

#### **VOLUMES\_FILE** *name of the target volumes file (.fct)*

Specify the name of the target volumes file (.fct). The USE\_FOR\_CLONING *list of clone database names* statement identifies the correct target set to use for a specific clone database name. When more than one clone database name is specified in the list, the referenced target set is used for all specified clone database names. In this situation, the target set must only be used by those clone databases identified in the list. The USE\_FOR\_CLONING list of clone database names must be specified in the target volumes file.

#### **TARGET\_NAMING** *string with wildcards %SOURCE USE\_FOR\_CLONING list of clone database names*

Available for SAN Volume Controller only. Specify the naming convention for target volumes. Whenever a backup volume is required at backup time, Tivoli Storage FlashCopy Manager 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 volume storing the backup is the name specified when the string %SOURCE is replaced with the respective value in the current operation. The required USE\_FOR\_CLONING *list of clone database names* statement identifies the correct target set to use for a specific clone database name. When more than one clone database name is specified in the list, the referenced target set is used for all specified clone database names. In this situation, the target set must only be used by those clone databases identified in the list. The USE\_FOR\_CLONING list of clone database names must be specified with the

TARGET\_NAMING parameter itself. It is possible to have multiple TARGET\_NAMING entries in the device class where each represents a different clone database name.

**Restriction:** SAN Volume Controller 5.1 and Storwize V7000 : When a new backup is started on a target volume that is not the oldest in the chain, SAN Volume Controller stops all mappings to older target volumes. When a restore is requested from a target volume that is not the youngest in the chain, SAN Volume Controller stops all mappings to newer target volumes. When a mapping to a target volume stops in either of these situations, this target volume immediately goes offline if any of these conditions exist:

- The target volume is a space-efficient volume.
- The mapping was for an incremental copy that was ongoing.
- The mapping was for a full copy that was ongoing.

As a result, the target volumes for the production database to be cloned, and the target volumes for the FlashCopy backup of the same database, must not reside on the same SAN Volume Controller or Storwize V7000 cluster. If you are cloning databases in an AIX Logical Volume Mirroring (LVM) environment, use FlashCopy cloning on one of the SAN Volume Controller or Storwize V7000 clusters and FlashCopy backup on the other SAN Volume Controller or Storwize V7000 cluster. It is not recommended to use space-efficient target volumes for cloning. If space-efficient target volumes are used, the profile parameter ALLOW\_NOCOPY\_FLASHCOPY YES must be specified in the cloning device class section of the profile.

## Target volumes file (.fct) cloning examples

The target volumes file (specified by the VOLUMES\_FILE parameter) must have the following syntax (for multi-partition DB2):

```
>>> TARGET_SET target set name
DEVICE_CLASS <device classes> USE_FOR_CLONING <list of clone database names>
# this parameter is mandatory for FlashCopy Cloning and allows to
# restrict the use of this target set to a specific device class
# and to a specific clone database name or a list of clone database names
>>> PARTITION name of partition
# e.g. NODE0000 for partition 0 or NODE0001 for partition 1, ...
# or the name of a PARTITION_GROUP
TARGET_VOLUME target [source] [size]
[...]
```

The target volumes file (specified by the VOLUMES\_FILE parameter) must have the following syntax (single partition DB2 and Oracle):

```
>>> TARGET_SET target set name
DEVICE_CLASS <device classes> USE_FOR_CLONING <list of clone database names>
# this parameter is mandatory for FlashCopy Cloning and allows to
# restrict the use of this target set to a specific device class
# and to a specific clone database name
TARGET_VOLUME target [source] [size]
[...]
```

---

## Tivoli Storage Manager option files for native Oracle

Tivoli Storage Manager provides these options to assist with setting up the native Oracle environment.

### Tivoli Storage Manager option files used by Data Protection for Oracle

Be aware of the names and locations of these Tivoli Storage Manager option files when using Data Protection for Oracle.

- Client system options (dsm.sys)
- Client user options (dsm.opt)
- Data Protection for Oracle options (tdpo.opt)
- RMAN backup script

### Files for Tivoli Storage FlashCopy Manager

Be aware of the names and locations of these Tivoli Storage FlashCopy Manager option files.

- Client system options (dsm.sys)
- Tivoli Storage FlashCopy Manager profile (<ACS\_DIR>/profile)

---

## Configuration files used for cloning

Information is provided about configuration files for use with FlashCopy cloning.

Tivoli Storage FlashCopy Manager uses preprocessing and postprocessing configuration files during cloning operations (for example /oracle/P01/acs/preprocessing.ini). The functions that are provided by the processing scripts depend on the cloning environment where they are issued. All processing configuration files and the scripts that are defined in the configuration files must meet the following requirements:

- They must exist on the clone system.
- They must have a minimum permission of read and execute access for the clone database instance owner. The preprocessing and postprocessing scripts must have a minimum permission of read and execute access for the user who owns the scripts and who is the operator of the scripts. Furthermore, if the scripts are intended to be run by any user registered on the system, the scripts must be owned by the root user and the must have a minimum permission of read and execute for the User, Group, and World user group.
- They must have a minimum permission of read access for the production database instance owner.

**Attention:** A write access level for the World user group must not be granted. Such access might cause a security exposure.

When you add processing configuration files, place each script on a separate line as shown in this example:

```
/oracle/P01/acs/scripts/PreProcessing_stopsap.sh  
/oracle/P01/acs/scripts/PreProcessing_stopdb.sh
```

Both processing configuration files support embedded user comments. A comment line in the configuration file is denoted by the number sign character (#). The scripts must be specified with fully qualified file names. Each line of the processing

configuration file represents one processing script. The Tivoli Storage FlashCopy Manager Offload Agent (tsm4acs) uses these arguments and their values when calling the scripts:

**DBNAME\_PROD**

The database name on the production system.

**DBNAME\_CLONE**

The database name on the cloning system.

**DBHOST\_PROD**

The host name of the production system.

**DBHOST\_CLONE**

The host name of the cloning system.

**CLONE\_TIMESTAMP**

The timestamp when the clone was created. This entry is also the time when the production database is suspended and the FlashCopy operation begins. The timestamp format is YYYYMMDDhhmmss. During preprocessing, the timestamp identifies when the previous FlashCopy clone was created. During postprocessing, the timestamp identifies when the current FlashCopy clone was created.

**SCHEMA**

The database schema of the production database as specified by the profile parameter DATABASE\_SCHEMA. Depending on SAP Kernel release, this schema is SAPR3 or SAPDBname.

You can use the following processing scripts:

- SQL scripts (DB2 SQL or Oracle SQL) with the extension .sql.
- Shell scripts with the extension .sh. Shell scripts can be started by a database user who is different from the clone database user. This feature is useful in certain situations. For example, when installing the SAP® license for the cloned SAP® system, start the postprocessing shell script as the SAP® administration user *sidadm*:

`scripts/PostProcessing_saplicense.sh:c01adm`

By adding `:c01adm` to the script file name, the script runs as user `c01adm` instead of user `orac01` or `db2c01`. This addition requires that the owner of the script to be identical to the user who is intended operator of the script (`c01adm` in this example). The only exception is if a preprocessing or postprocessing script is owned by the 'root' user, which indicates that the script can be executed by any user registered on the system.

The processing scripts that are defined in the processing configuration files are executed sequentially. The return code of each script is validated and have these values:

- RC=0: Processing ended successfully. Continue cloning if it was the last script to be executed or continue with the next script.
- RC=1: Processing ended successfully with warning. Continue cloning if it was the last script to be executed or continue with the next script.
- RC=2: Processing terminated with error. Stop cloning immediately without executing further scripts.

The return code for each script is written to the cloning log files. The output is written to dedicated log files with these file names:

`clone_preproc.<timestamp>`  
`clone_postproc.<timestamp>`

## Processing example: cloning configuration files

In the following processing example, the production database is named P01, and the clone database is named C01:

```
./fcmcli -f preproc_clone -u db2c01 -C C01 -X /oracle/C01/acs/preprocessing.ini
./fcmcli -f postproc_clone -u db2c01 -C C01 -Y /oracle/C01/acs/postprocessing.ini
```

If a processing script needs additional command-line options, add these options to each line of the configuration file. In this example, the additional command-line argument LC01 is added to the script entry in the configuration file:

```
/oracle/C01/acs/scripts/PostProcessing_startListener.sh LC01
```

Tivoli Storage FlashCopy Manager (fcmcli) calls the processing script with the six above listed default arguments first, and calls the additional command-line options next. In this example, the additional command-line argument LC01 is passed to the PostProcessing\_startListener.sh script as the seventh argument:

```
#!/bin/ksh
# FOLLOWING ACTIONS ARE PERFORMED -----
# start the Oracle Listener

DBNAME_PROD=$1
DBNAME_CLONE=$2
DBHOST_PROD=$3
DBHOST_CLONE=$4
CLONE_TIMESTAMP=$5

# ${SCHEMA} is schema owner (for SAP Kernel > 6.10, for userid other than SAPR3)
SCHEMA=$6
SCHEMA=$(echo ${SCHEMA} | tr [a-z] [A-Z])

# ${LISTENER} is the name of the listener to be started (taken from listener.ora)
LISTENER=$7

lsnrctl start ${LISTENER}
```

If a DB2 SQL script needs additional command-line options, use a shell script as a wrapper with the DB2 SQL commands. Tivoli Storage FlashCopy Manager requires that the DB2 SQL script use a semicolon (;) delimiter. If another delimiter character is specified, use another shell script wrapper that calls the DB2 SQL script with the correct delimiter character in the command-line entry. This example shows a shell script wrapper that specifies the correct delimiter character:

```
#!/bin/ksh
DELIMITER=#
db2 -td${DELIMITER} -svf PostProcessing_script1.sql
```

---

## Key files and directories

Certain files and directories are of considerable importance when using Tivoli Storage FlashCopy Manager.

The following tables show the major files and directories involved when using Tivoli Storage FlashCopy Manager in the various database configurations:

Table 53. Key Files and Directories (DB2)

Directory or File	Environment Variable, Vendor Option, Profile Parameter or Option	Default or Recommended Location	Examples and Remarks
DB2 installation directory	DB2DIR	/opt/IBM/db2/<version> or /opt/ibm/db2/<version>	/opt/IBM/db2/V9.5 Applies to a 'root' installation.
Home directory of DB2 database manager instance owner	HOME, INSTHOME	/home/<DB2 instance owner> or /db2/<DB2 instance owner>	/home/db2inst1
DB2 instance directory		\$HOME/sqllib	/home/db2inst1/sqllib
Tivoli Storage FlashCopy Manager installation directory		<ul style="list-style-type: none"> <li>(AIX): /usr/tivoli/tsfcm/acs_3.1.0.0</li> <li>(Linux): /opt/tivoli/tsfcm/acs_3.1.0.0</li> <li>(Solaris): /opt/tivoli/tsfcm/acs_3.1.0.0</li> <li>(HP-UX): /opt/tivoli/tsfcm/acs_3.1.0.0</li> </ul>	/usr/tivoli/tsfcm/acs_3.1.0.0
Tivoli Storage FlashCopy Manager working directory	ACS_DIR	Recommended by installer: <DB2 instance owner \$HOME directory>/acs	/home/db2inst1/acs
Log/trace directory		<ACS_DIR>/logs	/home/db2inst1/acs/logs  See "Log and trace files summary" on page 246.
Tivoli Storage FlashCopy Manager shared directory		<ACS_DIR>/shared	/home/db2inst1/acs/shared
Password file		<ACS_DIR>/shared/pwd.acsd	See "Tivoli Storage FlashCopy Manager password file" on page 194.
Snapshot backup library		libacbdb2.a or libacbdb2.so	
Tivoli Storage FlashCopy Manager license file		<DB2 instance directory>/acs/tsmacs.lic	
Profile	PROFILE -p profile	Recommended by installer: \$HOME/acs/profile with link to this file from <DB2 instance directory>/acs/profile	<b>Profile:</b> /home/db2inst1/acs/profile <b>Link:</b> /home/db2inst1/sqllib/acs/profile -> /home/db2inst1/acs/profile
Target volumes file directory	VOLUMES_DIR	Default: None.  Recommended by installer: \$HOME/acs/acsvolumes	/home/db2inst1/acs/acsvolumes  Recommended not to reside in <DB2 instance directory>  See notes.
Target volumes file	VOLUMES_FILE	Default: None.  Recommended not to reside in <DB2 instance directory>	See notes.

Table 53. Key Files and Directories (DB2) (continued)

Directory or File	Environment Variable, Vendor Option, Profile Parameter or Option	Default or Recommended Location	Examples and Remarks
Tivoli Storage FlashCopy Manager repository directory	ACS_REPOSITORY	Default: None.  Recommended by installer: \$HOME/acs/acsrepository	/home/db2inst1/acs/acsrepository  Recommended not to reside in <DB2 instance directory>  See notes.
Target volumes file(s)		<VOLUMES_DIR>/<filename>	See notes and "Tivoli Storage FlashCopy Manager target volumes file" on page 194.
<b>Note:</b> 1. By convention, the DB2 instance will be created in \$HOME of the DB2 instance owner. 2. The directory specified by ACS_REPOSITORY will be created by Tivoli Storage FlashCopy Manager and must not exist at the time of initial configuration. The path to this directory must exist, however.			

Table 54. Key Files and Directories (Oracle)

Directory or File	Environment Variable, Vendor Option, Profile Parameter or Option	Default or Recommended Location	Examples and Remarks
Tivoli Storage FlashCopy Manager installation directory		<ul style="list-style-type: none"> <li>• (AIX): /usr/tivoli/tsfcm/acs_3.1.0.0</li> <li>• (Linux): /opt/tivoli/tsfcm/acs_3.1.0.0</li> <li>• (Solaris): /opt/tivoli/tsfcm/acs_3.1.0.0</li> <li>• (HP-UX): /opt/tivoli/tsfcm/acs_3.1.0.0</li> </ul>	/usr/tivoli/tsfcm/acs_3.1.0.0
Tivoli Storage FlashCopy Manager working directory	ACS_DIR	Recommended by installer: \$HOME/acs, where \$HOME is the home directory of the Oracle instance owner ora<SID>, where <SID> is the value of ORACLE_SID.	/oracle/C21/acs
Log/trace directory		<ACS_DIR>/logs	/oracle/C21/acs/acs/logs  See "Log and trace files summary" on page 246.
Tivoli Storage FlashCopy Manager shared directory		<ACS_DIR>/shared	/oracle/C21/acs/shared
Password file		<ACS_DIR>/shared/pwd.acsd	See "Tivoli Storage FlashCopy Manager password file" on page 194.
Tivoli Storage FlashCopy Manager license file		<ACS_DIR>/tsmacs.lic	/oracle/C21/acs/tsmacs.lic
Profile	PROFILE -p profile	Recommended by installer: \$HOME/acs/profile with link to this file from <Oracle instance directory>/acs/profile	Profile: /oracle/C21/acs/profile
SAP® Backint profile		Default: \$ORACLE_HOME/dbs/init<DBSID>.utl	/oracle/C21/102_64/dbs/initC21.utl (SAP® with Oracle only)



Table 54. Key Files and Directories (Oracle) (continued)

Directory or File	Environment Variable, Vendor Option, Profile Parameter or Option	Default or Recommended Location	Examples and Remarks
SAP® BR*Tools profile		Default: \$ORACLE_HOME/dbs/initC21.sap	/oracle/C21/102_64/dbs/initC21.sap (SAP® with Oracle only)
Target volumes file directory	VOLUMES_ DIR	Default: None.  Recommended by installer: \$HOME/acs/acsvolumes	/oracle/C21/acs/acsvolumes  See notes.
Target volumes file	VOLUMES_ FILE	Default: None.  Recommended not to reside in \$HOME/acs/acsvolumes	
Tivoli Storage FlashCopy Manager repository directory	ACS_ REPOSITORY	Default: None.  Recommended by installer: \$HOME/acs/acsrepository	/oracle/C21/acs/repository  See notes.
Target volumes file(s)		<VOLUMES_ DIR>/<filename>	See notes and “Tivoli Storage FlashCopy Manager target volumes file” on page 194.
Data Protection for Oracle options file (tdpo.opt)		Default: None.  Its location must be specified in the RMAN script that is used to perform the backup.	Native Oracle only  See <a href="http://publib.boulder.ibm.com/infocenter/tivihelp/v1r1/topic/com.ibm.itmfdoc.ab5u000444.htm">http://publib.boulder.ibm.com/infocenter/tivihelp/v1r1/topic/com.ibm.itmfdoc.ab5u000444.htm</a> in the <i>IBM Tivoli Storage Manager for Databases: Data Protection for Oracle for UNIX and Linux Installation and User's Guide</i> for more information.
Tivoli Storage Manager client system options file (dsm.sys)		Default for AIX: /usr/tivoli/tsm/client/api/bin64/dsm.sys  Default for Linux, Solaris and HP-UX: /opt/tivoli/tsm/client/api/bin64/dsm.sys	
Tivoli Storage Manager client user options files (dsm.opt)		Default for AIX: /usr/tivoli/tsm/client/api/bin64/dsm.opt  Default for Linux, Solaris and HP-UX: /opt/tivoli/tsm/client/api/bin64/dsm.opt	
<b>Note:</b> The directory specified by ACS_REPOSITORY will be created by Tivoli Storage FlashCopy Manager and must not exist at the time of initial configuration. The path to this directory must exist, however.			

Table 55. Key Files and Directories (Custom Applications)

Directory or File	Environment Variable, Vendor Option, Profile Parameter or Option	Default or Recommended Location	Examples and Remarks
Tivoli Storage FlashCopy Manager installation directory		<ul style="list-style-type: none"> <li>(AIX): /usr/tivoli/tsfcm/acs_3.1.0.0</li> <li>(Linux): /opt/tivoli/tsfcm/acs_3.1.0.0</li> <li>(Solaris): /opt/tivoli/tsfcm/acs_3.1.0.0</li> <li>(HP-UX): /opt/tivoli/tsfcm/acs_3.1.0.0</li> </ul>	



Table 55. Key Files and Directories (Custom Applications) (continued)

Directory or File	Environment Variable, Vendor Option, Profile Parameter or Option	Default or Recommended Location	Examples and Remarks
Tivoli Storage FlashCopy Manager working directory	ACS_DIR	Recommended by configuration wizard: \$HOME/acs	
Log/trace directory		<ACS_DIR>/logs	/home/db2inst1/acs/logs  See "Log and trace files summary" on page 246.
Profile	-p profile	Recommended by installer: \$HOME/acs/profile	
Tivoli Storage FlashCopy Manager repository directory	ACS_REPOSITORY	Default: None.  Recommended by installer: \$HOME/acs/acsrepository	
Target volumes file	VOLUMES_FILE	Default: None.	
Tivoli Storage Manager client system options file (dsm.sys)		Default for AIX: /usr/tivoli/tsm/client/api/bin64/dsm.sys  Default for Linux, Solaris and HP-UX: /opt/tivoli/tsm/client/api/bin64/dsm.sys	
Tivoli Storage Manager client user options files (dsm.opt)		Default for AIX: /usr/tivoli/tsm/client/api/bin64/dsm.opt  Default for Linux, Solaris and HP-UX: /opt/tivoli/tsm/client/api/bin64/dsm.opt	
<b>Note:</b> The directory specified by ACS_REPOSITORY will be created by Tivoli Storage FlashCopy Manager and must not exist at the time of initial configuration. The path to this directory must exist, however.			



---

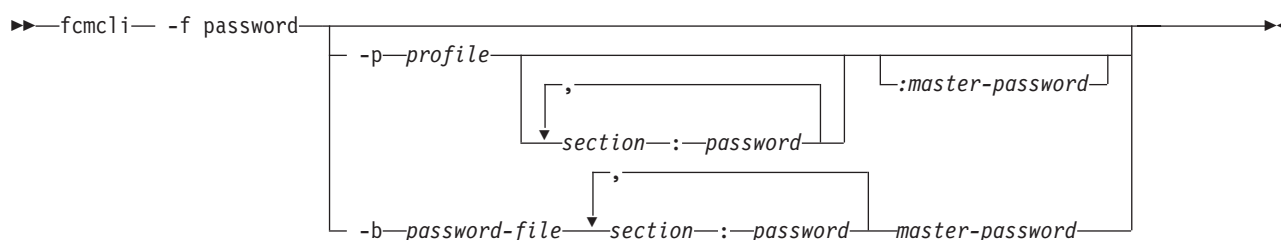
## Appendix A. Tivoli Storage FlashCopy Manager command line specification

The syntax of all Tivoli Storage FlashCopy Manager commands are listed.

See Chapter 5, “Tivoli Storage FlashCopy Manager commands and scripts,” on page 85 for explanations of the options listed here.

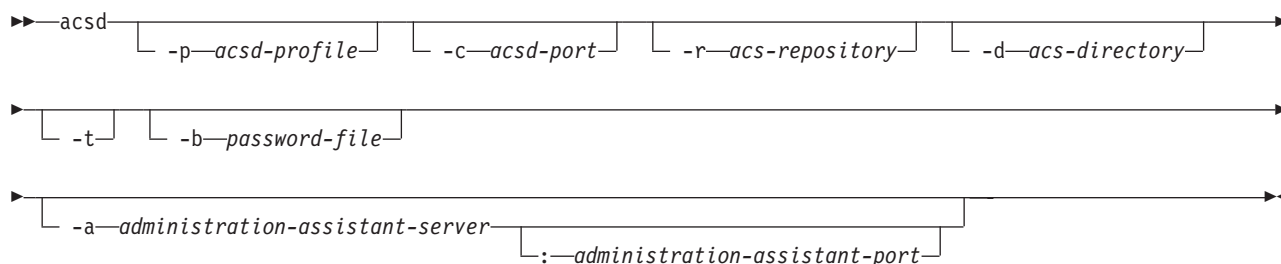
### **fccli -f password**

See “Password administration” on page 115 for more information about the **fccli -f password** command.

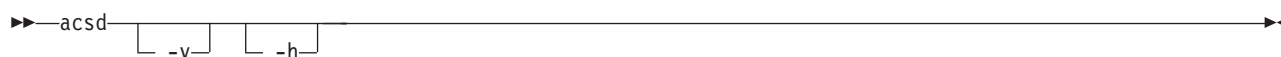


### **acsd**

See “Management Agent (acsd)” on page 118 for more information about the **acsd** command.

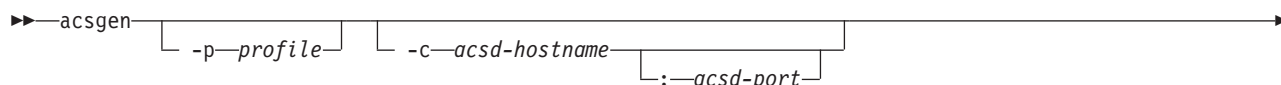


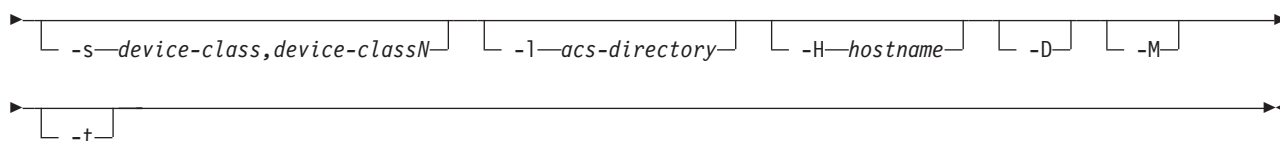
Syntax for obtaining version or help information:



### **acsngen**

See “Generic Device Agent (acsngen)” on page 120 for more information about the **acsngen** command.





## fcmcli -f used\_capacity

See “Query Managed Capacity (fcmcli -f used\_capacity)” on page 117 for more information about the **fcmcli -f used\_capacity** command.

```
fcmcli -f used_capacity -p profile [-c]
```

## acsora

See “acsora - User interface for Oracle in non-SAP environments” on page 94 for more information about the **acsora** command.

```
acsora [-p profile] -f <function> [-B backupID] [-F] [-s <DEVICE_CLASS>]
```

where <function> is one of:

```

  backup
  restore
  delete
  inquire
  inquire_detail

```

## acsutil

See “acsutil - Snapshot Object Manager for Oracle” on page 98 for more information about the **acsutil** command.

```
acsutil [-p <profile>]
```

## backint

See “BR\*TOOLS - User interface for Oracle in SAP environments” on page 96 for more information about the **backint** command.

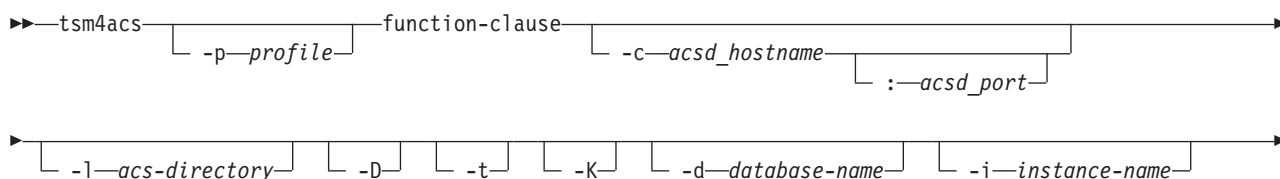
```

backint [-p profile]
        -f <function>
        -t <backup_type>
        [-F]

```

## tsm4acs

See “Offload Agent (tsm4acs)” on page 124 for more information about the **tsm4acs** command.



```

┌ -B—backup ID ─┐ ┌ -P—partition_group_name ─┐ ┌ -N—partition_number_list ─┐
└────────────────┘ └────────────────────────┘ └────────────────────────────────┘
┌ -S—TSM_BACKUP=yes|no ─┐
└────────────────────────┘

```

The values for the function-clause parameter are described in the following sections.

### function-clause: FlashCopy offload operations

In a DB2 environment, the installation of Tivoli Storage FlashCopy Manager enables the offload functionality that otherwise is not available for the built-in snapshot backup functionality that is shipped with DB2.

The following functions are supported by the tsm4acs command option -f 'function':

```

▶▶ -f tape_backup ─┐ ┌ -d—database-name ─┐ ┌ -i—instance name ─┐ ┌ -N—partition_number_list ─┐
└──────────────────┘ └────────────────────────┘ └────────────────────────────────┘
┌ -K ─┐
└────────────────────────┘

```

The functions mount, unmount or tape\_backup cannot run in parallel on the same backup server.

The function 'update\_status' is supported by the tsm4acs command:

```

▶▶ -f update_status ─ -d—database-name ─ -i—instance-name ─ -B—backup ID ─┐
└──────────────────────────────────────────────────────────────────────────┘
▶ -S—TSM_BACKUP=yes|no ─┐
└────────────────────────┘

```

### fcmcli

See the following topics for more information about the **fcmcli** command:

- “Backup and restore commands for DB2” on page 85
- “Backup and restore commands for custom applications” on page 99
- “Tivoli Storage FlashCopy Manager cloning commands” on page 106
- “Mounting and unmounting snapshots on a secondary system” on page 121

```

▶▶ fcmcli ─┐ ┌ -p—profile ─┐ ┌ function-clause ─┐ ┌ -c—acsd_hostname ─┐ ┌ :—acsd_port ─┐
└──────────┘ └──────────┘ └──────────────────┘ └────────────────────────┘ └────────────────────────┘
┌ -l—acs-directory ─┐ ┌ -t ─┐ ┌ -d—database-name ─┐ ┌ -i—instance-name ─┐
└──────────────────┘ └──┘ └────────────────────────┘ └────────────────────────┘
┌ -B—backup ID ─┐ ┌ -P—partition_group_name ─┐
└────────────────┘ └────────────────────────┘

```

## function-clause: FlashCopy operations of DB2 with partition group

```

>> -f restore— -B—backup ID— -P—partition_group_name—
|                                     | -d—database-name—
|
> | -i—instance-name—
|

```

## function-clause: FlashCopy operations of DB2 with and without partition group

```

graph LR
    Start(( )) --> F[-f]
    F --> Inquire[-f inquire]
    F --> InquireDetail[-f inquire_detail]
    F --> Delete[-f delete]
    Inquire --> B[-B backup ID]
    InquireDetail --> B
    Delete --> B
    B --> FFlag[-F]
    B --> V[-v]
    B --> Q[-q]
    FFlag --> End(( ))
    V --> End
    Q --> End
  
```

### function-clause: FlashCopy operations of custom applications

```

>> -f backup -I infile-name -E pre-flash-command -Q post-flash-command
> -s DEVICE CLASS

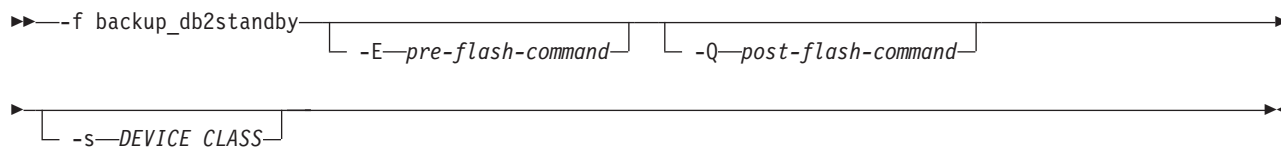
```

►► -f restore -I *infile-name* -B *backup ID*

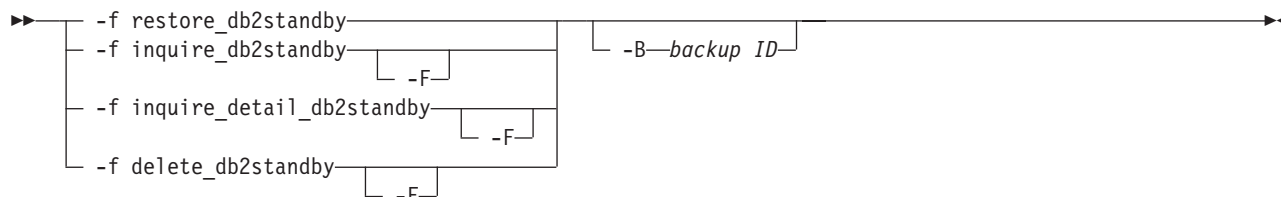
The diagram shows a horizontal line representing a command line. On the left, there is a double arrow pointing right. Below the line, there are three options: `-f inquire`, `-f inquire_detail`, and `-f delete`. These three options are grouped by a bracket underneath them. To the right of this group, there is another option: `-B backup ID`. Further to the right, there is a final option: `-F`. The line ends with a double arrow pointing right.

## function-clause: FlashCopy operations of DB2 HADR databases

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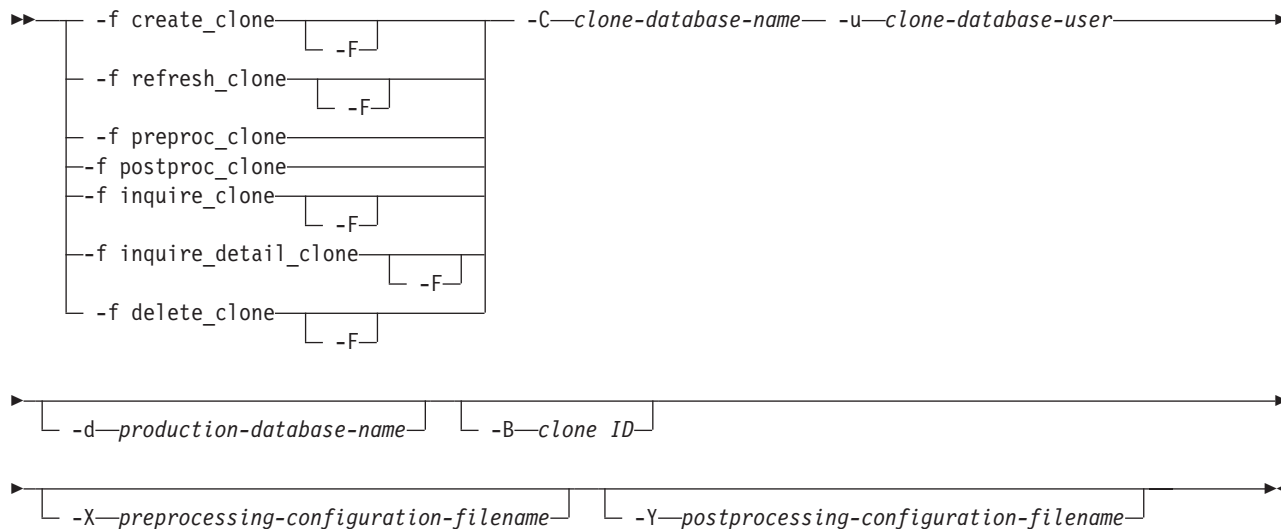


The following functions are supported by the fcmcli command option -f 'function' for FlashCopy restore, inquire, and delete of DB2 HADR databases:



### function-clause: FlashCopy cloning operations

The following functions are supported by the fcmcli command option -f 'function' for FlashCopy cloning operations:







---

## Appendix B. Tivoli Storage FlashCopy Manager examples

Refer to these Tivoli Storage FlashCopy Manager examples when configuring, updating, or performing product tasks.

---

### Examples (DB2)

#### Example overall disk layout for a DB2 environment

Refer to this example when configuring the disk layout for a DB2 environment.

The following figure shows file systems involved in an example disk layout.

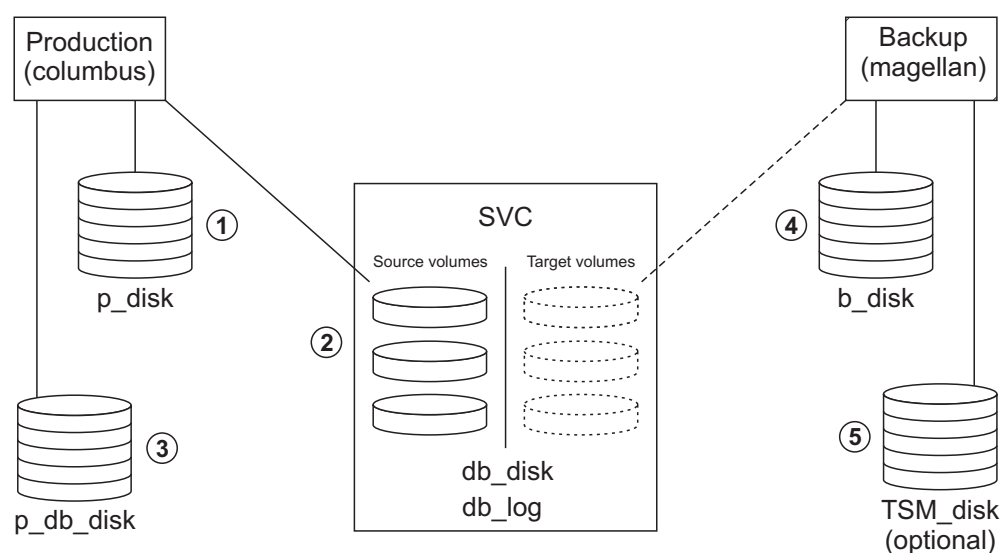


Figure 15. Example overall disk layout for a DB2 environment

The respective disk categories contain the following disk types that are used for the various file systems:

1. Local disks on the production system (p\_disk category) for the file systems
  - /db2/D01
  - /db2/D01/db2dump
  - /db2/D01/db2event
  - /db2/D01/sql1ib
  - /sapmnt/D01
  - /usr/sap/D01
  - /usr/sap/trans
  - /opt/IBM/db2/V9.5
  - /db2/D01/acs (ACS\_DIR)
2. Source volume disks on the production system (db\_disk category) for the file systems
  - /db2/D01/sapdata1
  - /db2/D01/sapdata2
  - /db2/D01/sapdata3
  - /db2/D01/sapdata4
  - /db2/D01/sapdata5
  - /db2/D01/sapdata6
  - /db2/D01/sapdata7
  - /db2/D01/db2d01

Source volume disks on the production system (db\_log category) for the file system

/db2/D01/log\_dir

3. Local disks on the production system (p\_db\_disk category) for the file systems

/db2/D01/log\_archive

/db2/D01/log\_retrieve

4. Local disks on the backup system (b\_disk category) for the file systems

/db2/D01

/opt/IBM/db2/V9.5

/db2/D01/acs (ACS\_DIR)

5. Disks for the Tivoli Storage Manager server (TSM\_disk category) for the file systems

/tsmdb

## Example profile for Tivoli Storage FlashCopy Manager for DB2

Refer to this example when editing the Tivoli Storage FlashCopy Manager profile.

The following depicts a sample profile used for a DB2 DPF environment. It only performs snapshots from 06am to 8pm and snapshots with off-loaded backups for the remaining time. These off-loaded backups use two different SAN Volume Controller clusters, one from 00am to 6am and the other cluster from 8pm to 12pm. Each cluster is backed up by a separate backup system, even though that fact is not obvious in the example.

```
>>> GLOBAL
ACS_DIR /db2/D01/acs
ACSD acsprod5 57328
TRACE NO
<<<
>>> ACSD
ACS_REPOSITORY /db2/D01/acs/acsrepository
# ADMIN_ASSISTANT NO
# REPOSITORY_LABEL TSM
<<<
>>> OFFLOAD
BACKUP_METHOD DB2
OPTIONS @/db2/D01/tdp_r3/vendor.env
# PARALLELISM AUTO
# NUM_SESSIONS 1
# NUM_BUFFERS AUTO
# BUFFER_SIZE AUTO
<<<
>>> CLIENT
# BACKUPIDPREFIX DB2____
APPLICATION_TYPE DB2
TSM_BACKUP YES
TSM_BACKUP NO USE_FOR SVC_NO_TSM
MAX_VERSIONS ADAPTIVE
# LVM FREEZE_THAW AUTO
# NEGATIVE_LIST NO_CHECK
# TIMEOUT_FLASH 120
# GLOBAL_SYSTEM_IDENTIFIER
DEVICE_CLASS SVC2 FROM 00:00 TO 05:59
DEVICE_CLASS SVC_NO_TSM FROM 06:00 TO 20:00
DEVICE_CLASS SVC1 FROM 20:01
<<<
>>> DEVICE_CLASS SVC_NO_TSM
COPYSERVICES_HARDWARE_TYPE SVC
COPYSERVICES_PRIMARY_SERVERNAME 192.168.1.104
# COPYSERVICES_USERNAME superuser
# SVC_COPY_RATE 80
```

```

# SVC_CLEAN_RATE 50
# COPYSERVICES_COMMPROTOCOL HTTPS
# COPYSERVICES_CERTIFICATEFILE NO_CERTIFICATE
COPYSERVICES_SERVERPORT 5989
FLASHCOPY_TYPE COPY
# COPYSERVICES_TIMEOUT 6
# RESTORE_FORCE NO
STORAGE_SYSTEM_ID TSMDEVSV2
TARGET_SETS VOLUMES_FILE
VOLUMES_FILE /db2/D01/acs/acsvolumes/fct.file
BACKUP_HOST_NAME PREASSIGNED_VOLUMES
<<<
>>> DEVICE_CLASS SVC1
COPYSERVICES_HARDWARE_TYPE SVC
COPYSERVICES_PRIMARY_SERVERNAME 192.168.1.101
# COPYSERVICES_USERNAME superuser
# SVC_COPY_RATE 80
# SVC_CLEAN_RATE 50
# COPYSERVICES_COMMPROTOCOL HTTPS
# COPYSERVICES_CERTIFICATEFILE NO_CERTIFICATE
# COPYSERVICES_SERVERPORT 5989
FLASHCOPY_TYPE INCR
# COPYSERVICES_TIMEOUT 6
# RESTORE_FORCE NO
STORAGE_SYSTEM_ID TSMDEVSV1
TARGET_SETS VOLUMES_FILE
VOLUMES_FILE /db2/D01/acs/acsvolumes/fct.file
BACKUP_HOST_NAME PREASSIGNED_VOLUMES
<<<
>>> DEVICE_CLASS SVC2
COPYSERVICES_HARDWARE_TYPE SVC
COPYSERVICES_PRIMARY_SERVERNAME 192.168.1.104
# COPYSERVICES_USERNAME superuser
# SVC_COPY_RATE 80
# SVC_CLEAN_RATE 50
# COPYSERVICES_COMMPROTOCOL HTTPS
# COPYSERVICES_CERTIFICATEFILE NO_CERTIFICATE
COPYSERVICES_SERVERPORT 5989
FLASHCOPY_TYPE INCR
# COPYSERVICES_TIMEOUT 6
# RESTORE_FORCE NO
STORAGE_SYSTEM_ID TSMDEVSV2
TARGET_SETS VOLUMES_file
VOLUMES_FILE /db2/D01/acs/acsvolumes/fct.file
BACKUP_HOST_NAME PREASSIGNED_VOLUMES
<<<

```

---

## Examples (native Oracle)

### Example overall disk layout for a native Oracle environment

Refer to this example when configuring the disk layout in a native Oracle environment.

The following figure shows file systems involved in a sample disk layout.

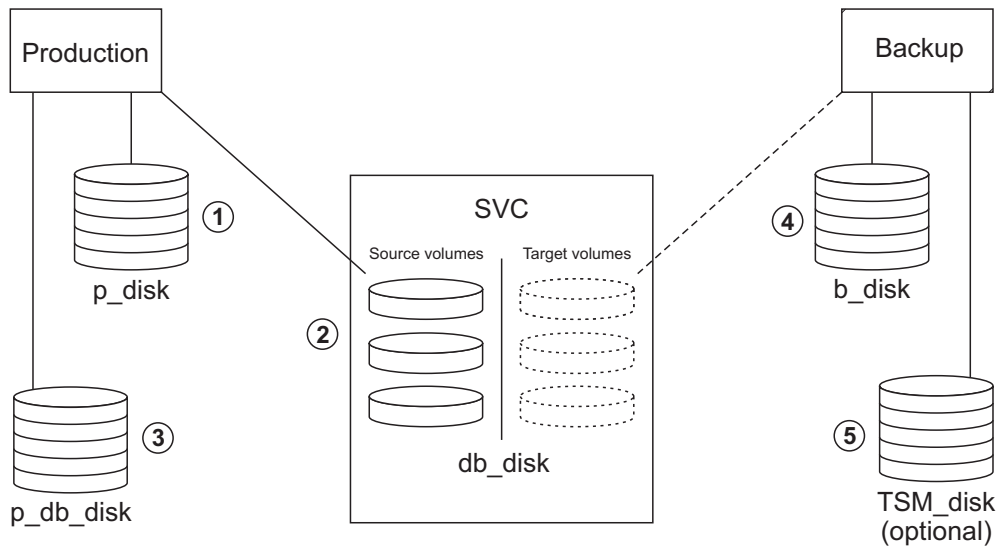


Figure 16. Example overall disk layout for a native Oracle environment

The respective disk categories contain the following disk types that are used for the various file systems:

1. Local disks on the production system (p\_disk category) for the file systems

```
/oracle/A01      part of VG ora_main
/oracle/A01/acs  (ACS_DIR)
```

The Oracle database binary files are located in the directory that is defined by the ORACLE\_HOME environment variable.

2. Source volume disks on the production system (db\_disk category) for the file systems

```
/oracle/A01/oradata/system  part of VG ora_d1
/oracle/A01/oradata/temp    part of VG ora_d2
/oracle/A01/oradata/custom  part of VG ora_d3
```

```
/oracle/A01/origlogA      part of VG ora_11
/oracle/A01/origlogB      part of VG ora_11
```

```
/oracle/A01/mirrlogA      part of VG ora_12
/oracle/A01/mirrlogB      part of VG ora_12
```

The file systems for the control files must not reside on volume groups that are part of the FlashCopy backup. For FlashCopy cloning at least one of the three Oracle control files must reside on a volume group that is part of the FlashCopy cloning operation.

```
/oracle/A01/cntrl/cntrlA01.dbf  part of VG ora_main
/oracle/A01/misc/cntrlA01.dbf   part of VG ora_misc
/oracle/A01/arch/cntrlA01.dbf   part of VG ora_arch
```

3. The p\_db\_disk category is not used for this setup.
4. Local disks on the backup system (b\_disk category) for the file system

```
/oracle/A01
/oracle/A01/acs  (ACS_DIR)
```

There is no need to create separate volume groups for logs and control files.

## Example profile for Tivoli Storage FlashCopy Manager for native Oracle

Refer to this example when editing the Tivoli Storage FlashCopy Manager profile.

The following depicts a sample profile:

```
>>> GLOBAL
ACS_DIR /oracle/A10/acs                                # directory for logs, password file, etc.
ACSD prodsrv 57328                                     # <server> <port>
# TRACE NO                                             # YES | NO
<<<
>>> CLIENT
APPLICATION_TYPE ORACLE                               #
TARGET_DATABASE_SUSPEND YES                           # YES | NO | OFFLINE
# TSM_BACKUP NO                                       # YES | NO
# MAX_VERSIONS ADAPTIVE                               # num | ADAPTIVE
# LVM_FREEZE_THAW AUTO                               # AUTO | YES | NO
# NEGATIVE_LIST NO_CHECK                             # NO_CHECK | WARN | ERROR | <path to negative list file>
# DEVICE_CLASS STANDARD                              #
<<<
>>> OFFLOAD
BACKUP_METHOD ORACLE                                  #
# OVERWRITE_DATABASE_PARAMETER_FILE YES              # YES | NO
# DATABASE_BACKUP_INCREMENTAL_LEVEL 0                 #
<<<
>>> ORACLE
CATALOG_DATABASE_CONNECT_STRING cat_db                # *mandatory parameter*
CATALOG_DATABASE_USERNAME rman                       # *mandatory parameter*
DATABASE_BACKUP_SCRIPT_FILE /oracle/A10/acs/tsm_backup.scr # *mandatory parameter*
TARGET_DATABASE_PARAMETER_FILE /oracle/A10/10gr2/dbs/initA10.ora # *mandatory parameter*
# DATABASE_CONTROL_FILE_RESTORE NO                   # YES | NO
DATABASE_CONTROL_FILE_RESTORE NO                     # YES | NO
<<<
>>> ACSD
ACS_REPOSITORY /oracle/A10/acs/acsrepository          # *mandatory parameter*
# ADMIN_ASSISTANT NO                                  # NO | <server> <port>
<<<
>>> DEVICE_CLASS STANDARD
COPYSERVICES_HARDWARE_TYPE SVC                       # *mandatory parameter* SVC | DS8000 | XIV
COPYSERVICES_PRIMARY_SERVERNAME cim_srv              #
TARGET_SETS_VOLUMES_FILE # *mandatory parameter*
VOLUMES_FILE /oracle/A01/acs/volumes/volumes_file.fct
# COPYSERVICES_SECONDARY_SERVERNAME                  #
# COPYSERVICES_USERNAME superuser                    #
# SVC_COPY_RATE 80                                    # num
# COPYSERVICES_COMMPROTOCOL HTTPS                    # HTTP | HTTPS
# COPYSERVICES_CERTIFICATEFILE NO_CERTIFICATE        # NO_CERTIFICATE | <certificate file>
COPYSERVICES_SERVERPORT 5999                         # *mandatory parameter*
# FLASHCOPY_TYPE COPY                                # COPY | INCR | NOCOPY
# COPYSERVICES_TIMEOUT 6                             # num
# RESTORE_FORCE NO                                    # YES | NO
BACKUP_HOST_NAME NONE
<<<
```

## Example profile for Tivoli Storage FlashCopy Manager for Oracle with ASM

Refer to this example when editing the Tivoli Storage FlashCopy Manager profile for Oracle with ASM.

The following depicts a sample profile:

```

>>> GLOBAL
ACS_DIR /oracle/A10/acs
ACSD prodsrv 57328
# TRACE NO
<<<
>>> CLIENT
APPLICATION_TYPE ORACLE
TARGET_DATABASE_SUSPEND YES
# TSM_BACKUP NO
# MAX_VERSIONS ADAPTIVE
# LVM_FREEZE_THAW AUTO
# NEGATIVE_LIST NO_CHECK
# DEVICE_CLASS STANDARD
VOLUME_MANAGER ASM
<<<
>>> OFFLOAD
BACKUP_METHOD ORACLE
# OVERWRITE_DATABASE_PARAMETER_FILE YES
# DATABASE_BACKUP_INCREMENTAL_LEVEL 0
#ASM_INSTANCE_USER AUTO
#ASM_INSTANCE_ID +ASM
#ASM_ROLE SYSDBA
<<<
>>> ORACLE
CATALOG_DATABASE_CONNECT_STRING cat_db
CATALOG_DATABASE_USERNAME rman
DATABASE_BACKUP_SCRIPT_FILE /oracle/A10/acs/tsm_backup.scr
TARGET_DATABASE_PARAMETER_FILE /oracle/A10/10gr2/dbs/initA10.ora
DATABASE_CONTROL_FILE RESTORE NO
#ASM_INSTANCE_USER AUTO
#ASM_INSTANCE_ID +ASM
#ASM_ROLE SYSDBA
<<<
>>> ACSD
ACS_REPOSITORY /oracle/A10/acs/acsrepository
# ADMIN_ASSISTANT NO
<<<
>>> DEVICE_CLASS STANDARD
COPYSERVICES_HARDWARE_TYPE SVC
COPYSERVICES_PRIMARY_SERVERNAME cim_srv
TARGET_SETS VOLUMES_FILE # *mandatory parameter*
VOLUMES_FILE /oracle/A01/acs/volumes/volumes_file.fct
# COPYSERVICES_SECONDARY_SERVERNAME
# COPYSERVICES_USERNAME superuser
# SVC_COPY_RATE 80
# COPYSERVICES_COMMPROTOCOL HTTPS
# COPYSERVICES_CERTIFICATEFILE NO_CERTIFICATE
COPYSERVICES_SERVERPORT 5999
# FLASHCOPY_TYPE COPY
# COPYSERVICES_TIMEOUT 6
# RESTORE_FORCE NO
BACKUP_HOST_NAME NONE
<<<
# directory for logs, password file, etc.
# <server> <port>
# YES | NO
#
# YES | NO | OFFLINE
# YES | NO
# num | ADAPTIVE
# AUTO | YES | NO
# NO_CHECK | WARN | ERROR | <path to negative list file>
#
# ASM|LVM
#
# YES | NO
#
# User name | AUTO
# ASM instance SID | +ASM
# SYSDBA or SYSASM | SYSDBA
#
# *mandatory parameter*
# *mandatory parameter*
# *mandatory parameter*
# *mandatory parameter*
# YES | NO
# User name | AUTO
# ASM instance SID | +ASM
# SYSDBA or SYSASM | SYSDBA
#
# *mandatory parameter*
# NO | <server> <port>
#
# *mandatory parameter* SVC | DS8000 | XIV
#
#
# num
# HTTP | HTTPS
# NO_CERTIFICATE | <certificate file>
# *mandatory parameter*
# COPY | INCR | NOCOPY
# num
# YES | NO

```

**Note:** The ASM\_INSTANCE\_USER, ASM\_INSTANCE\_ID, and ASM\_ROLE SYSDBA parameters in the OFFLOAD section contain values for the backup server. They can be commented out if the same parameters in the ORACLE section are also valid for the backup server.

## Example RMAN backup script

Refer to this example when configuring Data Protection for Oracle on the backup server.

The RMAN backup script must be specified in the profile with the `DATABASE_BACKUP_SCRIPT_FILE` parameter. This is an example of an RMAN backup script:

```
run
{
    allocate channel 'c1' type 'sbt_tape' parms 'ENV=(TDPO_OPTFILE=/home/oracle/tdpo.opt)';
    backup
    (database);
    release channel c1;
}
```

As shown in this example, the line break after the backup keyword is required.

---

## Examples (SAP with Oracle)

### Example overall disk layout for an SAP® with Oracle environment

Refer to this example when configuring the disk layout in an SAP® with Oracle environment.

The following figure shows file systems involved in a sample disk layout.

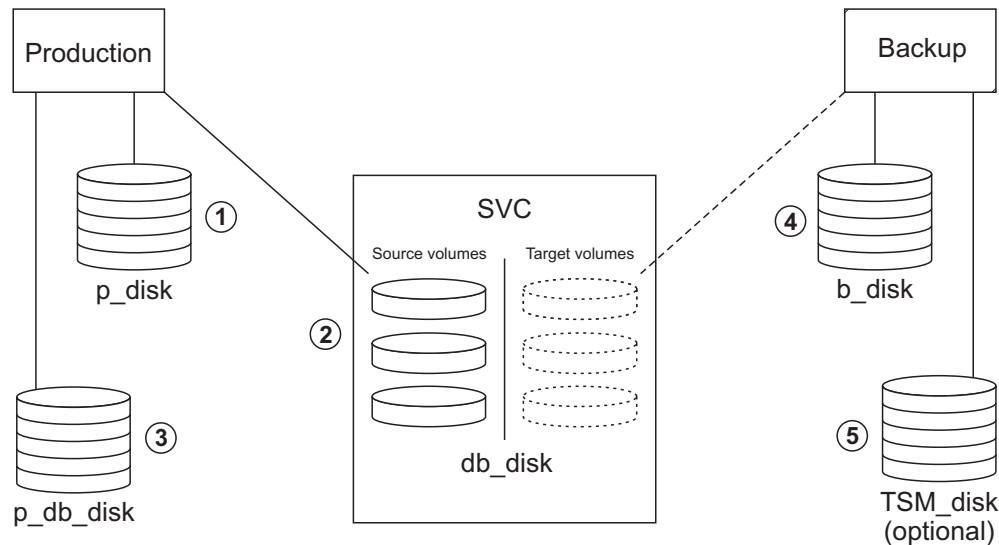


Figure 17. Example overall disk layout for an SAP® with Oracle environment

The respective disk categories contain the following disk types that are used for the various file systems:

1. Local disks on the production system (p\_disk category) for the file systems

```
/oracle/A01
/usr/sap/A01
/usr/sap/trans
/oracle/A01/920_64
```

```

/oracle/A01/sapbackup
/oracle/A01/sapreorg
/sapmnt/A01
/oracle/A01/acs (ACS_DIR)

```

2. Source volume disks on the production system (db\_disk category) for the file systems

```

/oracle/A01/sapdata1      part of VG sapfc11
/oracle/A01/sapdata2      part of VG sapfc12
/oracle/A01/sapdata3      part of VG sapfc12
/oracle/A01/sapdata4      part of VG sapfc13
/oracle/A01/sapdata5      part of VG sapfc13
/oracle/A01/sapdata6      part of VG sapfc13

/oracle/A01/origlogA      part of VG sapfcs1
/oracle/A01/origlogB      part of VG sapfcs1

/oracle/A01/mirrlogA      part of VG sapfcs2
/oracle/A01/mirrlogB      part of VG sapfcs2

```

The sapdata<x> file systems were placed in different VGs just for test/development purposes; they could also have been in a common one.

The Oracle control files are placed in \$ORACLE\_HOME/dbs/init<SID>.ora. :

```

/oracle/A01/sapdata1/cntrl/cntrlA01.dbf
/oracle/A01/origlogA/cntrl/cntrlA01.dbf
/oracle/A01/origlogB/cntrl/cntrlA01.dbf

```

3. Local disks on the production system (p\_db\_disk category) for the file systems

```

/oracle/A01/saparch

```

4. Local disks on the backup system (b\_disk category) for the file systems

```

/oracle/A01
/usr/sap/A01
/usr/sap/trans
/oracle/A01/acs (ACS_DIR)

```

5. (Tivoli Storage Manager server) Disks for the Tivoli Storage Manager server (TSM\_disk category) for the file systems used for the Tivoli Storage Manager databases, logs, and storage volumes.

## Example profile for Tivoli Storage FlashCopy Manager for SAP® with Oracle (disk only)

Refer to this example when editing the Tivoli Storage FlashCopy Manager profile.

The following depicts a sample profile:



```

>>> GLOBAL
# ACS_DIR /oracle/A01/acs
ACSD acsprod5 57328
# TRACE NO
<<<
>>> ACSD
ACS_REPOSITORY /oracle/A01/acs/pmtest
ADMIN_ASSISTANT no
# REPOSITORY_LABEL TSM
<<<
>>> CLIENT
# BACKUPIDPREFIX SAP__
APPLICATION_TYPE SAP_ORACLE
TARGET_DATABASE_SUSPEND YES
TSM_BACKUP YES
# MAX_VERSIONS ADAPTIVE
LVM_FREEZE_THAW 120
# TIMEOUT_FLASH 120
GLOBAL_SYSTEM_IDENTIFIER A01
# DEVICE_CLASS STANDARD
<<<
>>> DEVICE_CLASS STANDARD
COPYSERVICES_HARDWARE_TYPE XIV
# STORAGE_SYSTEM_ID
PATH_TO_XCLI /home/xivtest/XCLI
COPYSERVICES_SERVERNAME nextra
COPYSERVICES_USERNAME admin
# RECON_INTERVAL 12
# GRACE_PERIOD 24
# USE_WRITABLE_SNAPSHOTS AUTO
USE_CONSISTENCY_GROUPS NO
BACKUP_HOST_NAME acsback5
<<<

```

## Example profile for Tivoli Storage FlashCopy Manager for SAP® with Oracle (offload)

Refer to this example when editing the Tivoli Storage FlashCopy Manager profile for an off-loaded backup using IBM Tivoli Storage Manager for Enterprise Resource Planning.

Some parameters that are typically defined within the Tivoli Storage FlashCopy Manager profile are defined in the IBM Tivoli Storage Manager for Enterprise Resource Planning .utl file, with some parameters under different names.

The following profile is an example of a SAP with Oracle profile that does not contain a CLIENT section:

```

>>> GLOBAL
# ACS_DIR /oracle/CET/acs
ACSD dooku 62000
TRACE YES
<<<

>>> ACSD
ACS_REPOSITORY /oracle/CET/acs/repository
# ADMIN_ASSISTANT NO
REPOSITORY_LABEL CET
<<<

>>> OFFLOAD
BACKUP_METHOD BACKINT
PROFILE /oracle/oracle11R2/dbs/initCET.utl
<<<

>>> DEVICE_CLASS STANDARD
COPYSERVICES_HARDWARE_TYPE SVC
COPYSERVICES_PRIMARY_SERVERNAME 192.168.1.104
# COPYSERVICES_USERNAME superuser
SVC_COPY_RATE 95
# SVC_CLEAN_RATE 50
# COPYSERVICES_COMMPROTOCOL HTTPS
# COPYSERVICES_CERTIFICATEFILE NO_CERTIFICATE
# COPYSERVICES_SERVERPORT 5989
FLASHCOPY_TYPE COPY
# COPYSERVICES_TIMEOUT 6
# RESTORE_FORCE NO
# STORAGE_SYSTEM_ID
# RECON_INTERVAL 12
BACKUP_HOST_NAME bano
TARGET_SETS T1
TARGET_NAMING %SOURCE_%TARGETSET
<<<

```

The following excerpt is an example of the GLOBAL and CLIENT sections in a .utl file:

```

...
### TSM4ERP parameters
MAX_SESSIONS ...
CONFIG_FILE ...
BACKUPDPREFIX CET___
...
### FlashCopy Manager parameters
ACS_DIR /oracle/CET/acs/
ACSD dooku 62000
TRACE ON
...
TARGET_DATABASE_SUSPEND YES
LVM_FREEZE_THAW AUTO
TSM_BACKUP_FROM_SNAPSHOT YES
MAX_SNAPSHOT_VERSIONS ADAPTIVE
DEVICE_CLASS STANDARD
...
### TSM4ERP server section parameters
SERVER ...
SESSIONS ...

```

The following example depicts the situation when the two profiles are created for the same database instance:

```

>>> GLOBAL
# ACS_DIR /oracle/CET/acs
ACSD dooku 62000
TRACE NO
<<<

>>> ACSD
ACS_REPOSITORY /oracle/CET/acs/repository
# ADMIN_ASSISTANT NO
REPOSITORY_LABEL CET
<<<

>>> CLIENT
BACKUPIDPREFIX CET__
APPLICATION_TYPE SAP_ORACLE
TARGET_DATABASE_SUSPEND NO
# MAX_VERSIONS ADAPTIVE
# LVM_FREEZE_THAW AUTO
# TIMEOUT_FLASH 120
# GLOBAL_SYSTEM_IDENTIFIER
# DEVICE_CLASS STANDARD
<<<

>>> DEVICE_CLASS STANDARD
COPYSERVICES_HARDWARE_TYPE SVC
COPYSERVICES_PRIMARY_SERVERNAME 192.168.1.104
# COPYSERVICES_USERNAME superuser
# CLONE_DATABASE NO
# SVC_COPY_RATE 80
# SVC_CLEAN_RATE 50
# COPYSERVICES_COMMPROTOCOL HTTPS
# COPYSERVICES_CERTIFICATEFILE NO_CERTIFICATE
# COPYSERVICES_SERVERPORT 5989
FLASHCOPY_TYPE INCR
# COPYSERVICES_TIMEOUT 6
# RESTORE_FORCE NO
# STORAGE_SYSTEM_ID
# RECON_INTERVAL 12
BACKUP_HOST_NAME BANO
TARGET_SETS T1 T2 T3 T4
TARGET_NAMING %SOURCE_%TARGETSET
<<<

```

## Example profile for Tivoli Storage FlashCopy Manager for SAP® with Oracle incremental (offload)

Refer to this example when editing the IBM Tivoli Storage Manager for Enterprise Resource Planning profile (.utl file) for an off-loaded backup using Tivoli Storage Manager for Enterprise Resource Planning with Oracle RMAN.

The following excerpt is an example of a Tivoli Storage Manager for Enterprise Resource Planning profile (.utl file) that can be used on the production and backup server:

```

...
BACKUPIDPREFIX      TPR___

INCREMENTAL          DIFFERENTIAL
INCREMENTAL_CHANNELS 2
INCREMENTAL_LEVEL    1 USE_AT MON TUE WED Thu Fri Sat
INCREMENTAL_LEVEL    0 USE_AT SUN
INCREMENTAL_CATALOG_CONNECT_STRING catdb
INCREMENTAL_CATALOG_USER rman

TARGET_DATABASE_SUSPEND NO

MAX_SESSIONS        2
MAX_ARCH_SESSIONS    1
RL_COMPRESSION       0
REDOLOG_COPIES       2
MAX_VERSIONS         2

BUFFCOPY             PREVENT
BUFFSIZE             131072          # block size in bytes
REPORT              5                # all additional messages + summary
CONFIG_FILE          /oracle/TPR/102_32/dbs/initTPR.bki

SERVER              PYXIS_1          # Servername
SESSIONS            2                # Max sessions
PASSWORDREQUIRED     YES             # Use a password
ADSMNODE            TPR_ORA102_LNX   # Tivoli Storage Manager Nodename
BRBACKUPMGTCCLASS    MBDISK1         # Mgmt-Classes
BRARCHIVEMGTCCLASS   MLOG1 MLOG2     # Mgmt-Classes

```

## Example Target Volumes Files

### Example target volumes file (DS8000 configuration)

Refer to this example when editing the target volumes file for a DS8000 storage subsystem configuration.

The first two samples illustrate the same environment setup. It is clear that the first one is the most convenient to implement.

**Tip:** These two examples refer to the variant required when the TARGET\_SET parameter specifies VOLUMES\_DIR (legacy). In the case of TARGET\_SETS = VOLUMES\_FILE, the syntax of the file is different. The third and fourth samples illustrate the target volumes file for TARGET\_SETS=VOLUMES\_FILE, which is the recommended option to use for new configurations.

```

#####
#===
#=== This file contains setup information about source/target volumes
#=== as they will be used in the FlashCopy function.
#===
#=== The target volumes file identifies the target volumes to be used
#=== for a FlashCopy backup.
#=== The file conforms to the following naming convention:
#=== For DB2 environments:
#=== <Db2 inst name>.<DB2 db name>.<dev class>.<DB2 par num>.fct
#=== For native Oracle environments:
#=== <Oracle SID>.ORCL_<device class>.ORACLE.fct
#=== For SAP for Oracle environments:
#=== <DBSID>.<backup ID prefix>.<device class>.SAP_ORACLE.fct
#=== #===
#=== and resides in the directory specified by the VOLUMES_DIR
#=== parameter in the Tivoli Storage FlashCopy® Manager profile.
#===
#=== It is required to embed the TARGET_VOLUME parameter
#=== between the topic start parameter is (>>> VOLUMES_SET_x)
#=== where x is an integer number starting with 1

```

```

#=== and the topic end parameter is only (<<<).
#===
#===
#=== Note: On the parameter statement TARGET_VOLUME, the
#=== 1st value is target_volume_serial_number
#=== 2nd value is source_volume_serial_number or -
#=== 3rd value is Size=2.0_GB or -
#===
#=== If you specify source volume serial number and size,
#=== you must ensure the target volume size is the same.
#===
#=== A target volume must be available in the same hardware
#=== unit in which the source volume is accessed.
#=====#

#
#***** First sample *****#
#

>>> VOLUMES_SET_1
#=====#
# For each target volume which is planned to be used in the
# FlashCopy operation the volume serial number must be specified as
# the 1st parameter followed by - -
# The characters '-' will be replaced by a (source) volume serial
# number and the Size found for that source volume (if the size matches
# that of the target volume) by Tivoli Storage FlashCopy® Manager
# once the FlashCopy function has been started on the production
# system and identified all (source) volumes.
#
#
# Replace all statements below with your installation values.
#
# Definition is required for each target volume.
#=====#
TARGET_VOLUME 75924811090
TARGET_VOLUME 75924811091
TARGET_VOLUME 75924811092
TARGET_VOLUME 75924811093
TARGET_VOLUME 75924811094
TARGET_VOLUME 75924811095
<<<
#=====#

#
#***** Second sample *****#
#

#=====#

>>> VOLUMES_SET_1
TARGET_VOLUME 75924811190 75924811290 -
TARGET_VOLUME 75924811191 75924811291 -
TARGET_VOLUME 75924811192 75924811292 -
TARGET_VOLUME 75924811193 75924811293 -
TARGET_VOLUME 75924811194 75924811294 -
TARGET_VOLUME 75924811195 75924811295 -
<<<

#=====#

```

The following file is an example of a VOLUMES\_FILE .fct file that includes the target set configuration used for cloning:

```
#
#***** Third sample *****#
#

#=====#

>>> TARGET_SET 1
>>> PARTITION NODE0000
TARGET_VOLUME 13ABCTA0111 - -
TARGET_VOLUME 13ABCTA0112 - -
TARGET_VOLUME 13ABCTA0113 - -
<<<
<<<

>>> TARGET_SET 3

DEVICE_CLASS CLONE USE_FOR_CLONING D98
>>> PARTITION NODE0000
TARGET_VOLUME 13ABCTA011D - -
TARGET_VOLUME 13ABCTA011E - -
TARGET_VOLUME 13ABCTA011F - -
<<<
<<<

#=====#
```

The following file shows another VOLUMES\_FILE .fct file for DB2 EEE configurations:

```
#
#***** Fourth sample *****#
#
#=====#

>>> TARGET_SET 1

DEVICE_CLASS CLONE USE_FOR_CLONING S98
>>> PARTITION NODE0000
TARGET_VOLUME S97p5d1_t1 - -
TARGET_VOLUME S97p5d2_t1 - -
<<<
>>> PARTITION NODE0001
TARGET_VOLUME S97p5d3_t1 - -
TARGET_VOLUME S97p5d4_t1 - -
<<<
>>> PARTITION NODE0002
TARGET_VOLUME S97p511_t1 - -
TARGET_VOLUME S97p512_t1 - -
<<<
>>> PARTITION NODE0003
TARGET_VOLUME S97p513_t1 - -
TARGET_VOLUME S97p514_t1 - -
<<<
<<<

#=====#
```

## Example target volumes file (SAN Volume Controller configuration or Storwize V7000 )

Refer to this example when editing the target volumes file for an SAN Volume Controller or Storwize V7000 storage subsystem configuration.

The following two samples illustrate the same environment setup. It is clear that the first one is the most convenient to implement.

**Note:** These examples refer to the variant required when the TARGET\_SET parameter specifies VOLUMES\_DIR (legacy). In case of TARGET\_SETS = VOLUMES\_FILE, the syntax of the file is different. See the TARGET\_FILE examples in the third and fourth samples in “Example target volumes file (DS8000 configuration)” on page 228.

```
#=====#
#===
#=== This file contains setup information about source/target volumes
#=== as they will be used in the FlashCopy function.
#===
#=== The target volumes file identifies the target volumes to be used
#=== for a FlashCopy backup.
#=== The file conforms to the following naming convention:
#=== For DB2 environments:
#=== <Db2 inst name>.<DB2 db name>.<dev class>.<DB2 par num>.fct
#=== For native Oracle environments:
#=== <Oracle SID>.ORCL_<device class>.ORACLE.fct
#=== For SAP for Oracle environments:
#=== <DBSID>.<backup ID prefix>.<device class>.SAP_ORACLE.fct
#===

#=== and resides in the directory specified by the VOLUMES_DIR
#=== parameter in the Tivoli Storage FlashCopy® Manager profile
#===
#=== It is required to embed the TARGET_VOLUMES parameter
#=== between the topic start parameter (>>>VOLUMES_SET_x)
#=== and topic end parameter (<<<)#===
#===
#=== Note: On the parameter statement TARGET_VOLUME, the
#=== 1st value is target_volume virtual disk name
#=== 2nd value is source_volume virtual disk name or -
#=== 3rd value is Size=2.0_GB or -
#===
#=== If you specify source volume name and size,
#=== you must ensure the target volume size is the same.
#===
#=== A target volume must be available in the same SVC cluster
#=== in which the source volume is accessed.
#=====#

#
#***** first sample *****#
#

>>> TARGET_SET VOLUMES_SET_1
#=====#
# For each target volume which is planned to be used in the
# FlashCopy operation the virtual disk name must be specified as
# the 1st parameter followed by - -
# The characters '-' will be replaced by a (source) volume name
# and the Size found for that source volume (if the size matches
# that of the target volume) by Tivoli Storage FlashCopy® Manager
# once the FlashCopy function has been started on the production system
# and identified all (source) volumes.
```

```

#
#
# Replace all statements below with your installation values.
#
# Definition is required for each target volume.
#=====#
TARGET_VOLUME svdftgt1 - -
TARGET_VOLUME svdftgt2 - -
TARGET_VOLUME svdftgt3 - -
TARGET_VOLUME svdftgt4 - -
TARGET_VOLUME svdftgt5 - -
<<<

#=====#

#
#***** second sample *****#
#

#=====#

>>> TARGET_SET VOLUMES_SET_1
TARGET_VOLUME svdftgt1 svdrsrc2 -
TARGET_VOLUME svdftgt2 svdfsrc3 -
TARGET_VOLUME svdftgt3 svdfsrc4 -
TARGET_VOLUME svdftgt4 svdfsrc5 -
TARGET_VOLUME svdftgt5 svdfsrc6 -
<<<

#=====#

```

## Example target volume file (mirror setup on DS8000 configuration)

Refer to this example when editing the target volumes file for a mirror setup on a DS8000 storage subsystem configuration.

The following sample illustrates the setup of a target volumes file as it is required to run the FlashCopy backup when the AIX LVM mirrors have been set up in DS8000 with serial number 7513158 (see the definition in the 'VOLUMES\_SET\_1' topic) for one FlashCopy backup run and with the mirrors set up in DS8000 with serial number 7512067 (see the definition in the 'VOLUMES\_SET\_2' topic) for another backup run. The two copy sets of LVs have been set up according to the requirements for setting up a copy set which means that 2 DS8000 units are needed.

```

#-----Start of sample target volumes file -----
#===
#=== This file contains setup information about source/target volumes
#=== as they will be used in the FlashCopy function.
#===
#=== The target volumes file identifies the target volumes to be used
#=== for a FlashCopy backup.
#=== The file conforms to the following naming convention:
#=== For DB2 environments:
#=== <Db2 inst name>.<DB2 db name>.<dev class>.<DB2 par num>.fct
#=== For native Oracle environments:
#=== <Oracle SID>.<ORCL_>.<device class>.<ORACLE>.fct
#=== For SAP for Oracle environments:
#=== <DBSID>.<backup ID prefix>.<device class>.<SAP_ORACLE>.fct
#===
#=== and resides in the directory specified by the VOLUMES_DIR parameter
#=== profile

```



```

#===
#=== It is required to embed the TARGET_VOLUME parameters
#=== between the topic start parameter (>>>VOLUMES_SET_x)
#=== and topic end parameter (<<<) #===
#===
#=== Note: On the parameter statement TARGET_VOLUME, the
#=== 1st value is target_volume_serial_number
#=== 2nd value is source_volume_serial_number or -
#=== 3rd value is Size=2.0_GB or -
#===
#=== If you specify source volume serial number and size,
#=== you must ensure the target volume size is the same.
#===
#=== A target volume must be available in the same hardware unit in
#=== which the source volume is accessed.
#-----#

>>> VOLUMES_SET_1
#-----#
# STORAGE_SYSTEM_ID# Defines in an AIX LVM Mirror environment the storage
# subsystem which contains a complete set of at least 1 copy of all DB LVs
# which are to be the object of the backup process. Only the source volumes
# of the specified storage subsystem will be used on the production system
# by Tivoli Storage FlashCopy(R) Manager for the FlashCopy process. Possible
# parameter values : XXXXXXX where XXXXXXX is the 7 digit storage system serial
# number. Parameter definition can only be used if an appropriate setup
# has been done as defined in the Tivoli Storage FlashCopy(R) Manager manual.
# DEFAULT : NOT DEFINED #
#-----#
STORAGE_SYSTEM_ID 7513158
#-----#
#
# For each target volume which is planned to be used in the
# FlashCopy operation the volume serial number must be specified as
# the 1st parameter followed by - -
# The characters '-' will be replaced by a (source) volume serial
# number and the Size found for that source volume (if the size matches
# that of the target volume) by Tivoli Storage FlashCopy® Manager
# once the FlashCopy function has been started on the production system
# and identified all (source) volumes.
#
#
# Replace all statements below with your installation values.
#
#-----#

TARGET_VOLUME 75131581200 - -
TARGET_VOLUME 75131581201 - -
TARGET_VOLUME 75131581202 - -
TARGET_VOLUME 75131581203 - -
TARGET_VOLUME 75131581204 - -
TARGET_VOLUME 75131581205 - -
TARGET_VOLUME 75131581206 - -
TARGET_VOLUME 75131581207 - -
TARGET_VOLUME 75131581208 - -
TARGET_VOLUME 75131581209 - -
<<<

>>> VOLUMES_SET_2
STORAGE_SYSTEM_ID 7512067
TARGET_VOLUME 75120671300 - -
TARGET_VOLUME 75120671301 - -
TARGET_VOLUME 75120671302 - -
TARGET_VOLUME 75120671303 - -
TARGET_VOLUME 75120671304 - -
TARGET_VOLUME 75120671305 - -
TARGET_VOLUME 75120671306 - -

```

```
TARGET_VOLUME 75120671307 - -
TARGET_VOLUME 75120671308 - -
TARGET_VOLUME 75120671309 - -
<<<
```

```
#-----End of sample target volumes file -----#
```

The following sample shows a configuration of SAP in a multi-partition DB2 environment.

<ACS\_DIR>/profile:

```
>>> DEVICE_CLASS STANDARD
...
TARGET_SETS VOLUMES_FILE
VOLUMES_FILE <ACS_DIR>/acsvolumes/volumes_file.fct
<<<
```

<ACS\_DIR>/acsvolumes/volumes\_file.fct:

```
>>> TARGET_SET 1
>>> PARTITION NODE0000
TARGET_VOLUME J01acs_td_0
TARGET_VOLUME J01acs_t1_0
<<<

>>> PARTITION NODE0001
TARGET_VOLUME J01acs_td_1
TARGET_VOLUME J01acs_t1_1
<<<

>>> PARTITION NODE0002
TARGET_VOLUME J01acs_td_2
TARGET_VOLUME J01acs_t1_2
<<<

>>> PARTITION NODE0003
TARGET_VOLUME J01acs_td_3
TARGET_VOLUME J01acs_t1_3
<<<
<<<

>>> TARGET_SET 2
>>> PARTITION NODE0000
TARGET_VOLUME J01acs_td_2_0
TARGET_VOLUME J01acs_t1_2_0
<<<

>>> PARTITION NODE0001
TARGET_VOLUME J01acs_td_2_1
TARGET_VOLUME J01acs_t1_2_1
<<<

>>> PARTITION NODE0002
TARGET_VOLUME J01acs_td_2_2
TARGET_VOLUME J01acs_t1_2_2
<<<

>>> PARTITION NODE0003
TARGET_VOLUME J01acs_td_2_3
TARGET_VOLUME J01acs_t1_2_3
<<<
<<<
```

---

## Example profile for IBM Tivoli Storage FlashCopy Manager for Custom Applications

This example contains a sample profile for IBM Tivoli Storage FlashCopy Manager for Custom Applications in a custom application environment.

```
>>> GLOBAL
# ACS_DIR /home/gbauer/acs
ACSD ehonda 61000
TRACE YES
<<<

>>> ACSD
ACS_REPOSITORY /home/gbauer/acs/repository
REPOSITORY_LABEL GBA
<<<

>>> OFFLOAD
BACKUP_METHOD TSM_CLIENT
# MODE FULL
ASNODENAME GBA_aha_target
# DSM_DIR
# DSM_CONFIG
# VIRTUALFSNAME fcm
<<<

>>> CLIENT
BACKUPIDPREFIX GBA___
APPLICATION_TYPE GENERIC
INFILE /home/gbauer/acs/infile
PRE_FLASH_CMD /home/gbauer/acs/scripts/preflash.cmd
POST_FLASH_CMD /home/gbauer/acs/scripts/postflash.cmd
TSM_BACKUP YES
# MAX_VERSIONS ADAPTIVE
# LVM_FREEZE_THAW AUTO
NEGATIVE_LIST NO_CHECK
# TIMEOUT_FLASH 120
# GLOBAL_SYSTEM_IDENTIFIER
DEVICE_CLASS STANDARD
<<<

>>> DEVICE_CLASS STANDARD
COPYSERVICES_HARDWARE_TYPE SVC
COPYSERVICES_PRIMARY_SERVERNAME 192.168.1.101
# COPYSERVICES_USERNAME superuser
# CLONE_DATABASE NO
SVC_COPY_RATE 90
# SVC_CLEAN_RATE 50
# COPYSERVICES_COMMPROTOCOL HTTPS
# COPYSERVICES_CERTIFICATEFILE NO_CERTIFICATE
# COPYSERVICES_SERVERPORT 5989
FLASHCOPY_TYPE INCR
# COPYSERVICES_TIMEOUT 6
# RESTORE_FORCE NO
# STORAGE_SYSTEM_ID
# RECON_INTERVAL 12
BACKUP_HOST_NAME sagat
TARGET_SETS TS1 TS2 TS3
TARGET_NAMING %SOURCE_%TARGETSET
<<<
```

---

## Example profile for a DB2 HADR standby server environment

This example contains a sample configuration of a DB2 HADR standby server.

```
>>> GLOBAL
ACS_DIR /db2/CET/acs
ACSD ehonda 63000
TRACE YES
<<<

>>> ACSD
ACS_REPOSITORY /db2/CET/acs/acsrepository
REPOSITORY_LABEL CET
<<<

>>> CLIENT
BACKUPIDPREFIX CET___
APPLICATION_TYPE DB2
# MAX_VERSIONS ADAPTIVE
# LVM_FREEZE_THAW AUTO
# NEGATIVE_LIST NO_CHECK
# TIMEOUT_FLASH 120
# GLOBAL_SYSTEM_IDENTIFIER
# DEVICE_CLASS STANDARD
<<<

>>> DB2STANDBY
DB2_PRODUCTIVE_SERVER akuma 60050
DB2_ALIAS CET
PRE_FLASH_CMD /db2/CET/acs/scripts/pre_flash_cmd
POST_FLASH_CMD /db2/CET/acs/scripts/post_flash_cmd
# DB2_USERNAME db2cet
DB2_AUTH_TYPE SERVER
<<<

>>> DEVICE_CLASS STANDARD
COPYSERVICES_HARDWARE_TYPE SVC
COPYSERVICES_PRIMARY_SERVERNAME 192.168.1.104
# COPYSERVICES_USERNAME superuser
# CLONE_DATABASE NO
SVC_COPY_RATE 95
# SVC_CLEAN_RATE 50
# COPYSERVICES_COMMPROTOCOL HTTPS
# COPYSERVICES_CERTIFICATEFILE NO_CERTIFICATE
# COPYSERVICES_SERVERPORT 5989
FLASHCOPY_TYPE INCR
# COPYSERVICES_TIMEOUT 6
# RESTORE_FORCE NO
# STORAGE_SYSTEM_ID
# RECON_INTERVAL 12
BACKUP_HOST_NAME sagat
TARGET_SETS TS1 TS2
TARGET_NAMING %SOURCE_%TARGETSET
<<<
```

---

## Appendix C. Special tasks

These tasks require special settings and procedures.

---

### Migrating existing snapshot data

Review this information when using IBM Tivoli Storage FlashCopy Manager with existing snapshot data.

#### IBM Tivoli Storage FlashCopy Manager upgrade procedure

IBM Tivoli Storage FlashCopy Manager supports the concurrent installation of different product versions. These versions are typically installed underneath `/usr/tivoli/tsfcm/acs_<version_number>`. By invoking the appropriate installation setup script as root user, you can either configure it to protect a new database instance, or you can upgrade the version that is currently protecting a database instance.

Although you can upgrade the current version for a particular database instance, the master IBM Tivoli Storage FlashCopy Manager image (underneath `/usr/tivoli/tsfcm/acs_<version_number>`) is not automatically removed. To remove this image, you need to uninstall the package by invoking the command `/usr/tivoli/tsfcm/acs_<version_number>/uninstall/uninstaller.bin`

#### Note:

- When an OpenSSH connection exists with the backup servers, installation and configuration can be performed from the production system. When an OpenSSH connection does not exist, installation and upgrade tasks must be performed separately on the production system and each backup system.
- For physically partitioned DB2 environments, run the installation and configuration from one node only (typically node 0).

#### Migration from Tivoli Storage Manager for Advanced Copy Services to IBM Tivoli Storage FlashCopy Manager on an IBM XIV® Storage System

For IBM XIV® Storage System, IBM Tivoli Storage FlashCopy Manager retains the configuration and backup history of an existing Tivoli Storage Manager for Advanced Copy Services installation. The backups created with Tivoli Storage Manager for Advanced Copy Services can be restored with IBM Tivoli Storage FlashCopy Manager.

The upgrade from Tivoli Storage Manager for Advanced Copy Services to IBM Tivoli Storage FlashCopy Manager is performed as any standard upgrade. For example, select the database instances to protect during installation. If you plan to upgrade dedicated database instances after installing IBM Tivoli Storage FlashCopy Manager, run the setup utility separately as root user.

In addition, start the installation setup script as database instance owner from `INSTANCE_DIR`. This task updates the current configuration file. As a result, the existing Tivoli Storage Manager for Advanced Copy Services profile is used by IBM Tivoli Storage FlashCopy Manager.

**Note:** Unlike with Tivoli Storage Manager for Advanced Copy Services, the production system is used by IBM Tivoli Storage FlashCopy Manager as the central point of control for offloaded backups to Tivoli Storage Manager. As a result, the OFFLOAD section is required in the profile on the production system. Any OFFLOAD section that is available in the backup system configuration file is discarded.

## Migration from Tivoli Storage Manager for Advanced Copy Services 5.4 on SAN Volume Controller or DS8000

IBM Tivoli Storage FlashCopy Manager uses Tivoli Storage Manager for Advanced Copy Services 5.4 as a separate product, except for these situations:

- IBM Tivoli Storage FlashCopy Manager can reuse Tivoli Storage Manager for Advanced Copy Services 5.4 target volume files (.fct files).
- IBM Tivoli Storage FlashCopy Manager preserves any incremental FlashCopy relations that were established with Tivoli Storage Manager for Advanced Copy Services 5.4.

IBM Tivoli Storage FlashCopy Manager does not restore backups created with Tivoli Storage Manager for Advanced Copy Services 5.4. Use Tivoli Storage Manager for Advanced Copy Services 5.4 for that purpose.

The upgrade from Tivoli Storage Manager for Advanced Copy Services to IBM Tivoli Storage FlashCopy Manager is considered a new installation. If you want to retain existing volumes files, copy all volumes files into a single directory using the following naming conventions. If you are using logical partitioned databases, make sure to also review the note at the end of this section.

- DB2 environments:

```
<DB2 instance name>.<DB2 database name>.<device class>.<DB2 partition number>.fct
```

- Native Oracle environments:

```
<Oracle SID>.ORCL_<device class>.ORACLE.fct
```

- SAP® with Oracle environments:

```
<DBSID>.<backup ID prefix>.<device class>.SAP_ORACLE.fct
```

Use the following settings when configuring the DEVICE\_CLASS section of the profile:

```
TARGET SET VOLUMES_DIR  
VOLUMES_DIR <directory for .fct files>
```

IBM Tivoli Storage FlashCopy Manager and Tivoli Storage Manager for Advanced Copy Services can be used concurrently. However, make sure that these two products do not affect each other if they are accessing a target set. In addition, consider not using Tivoli Storage Manager for Advanced Copy Services after IBM Tivoli Storage FlashCopy Manager is successfully installed. Consider only using Tivoli Storage Manager for Advanced Copy Services in emergency situations. For example, using Tivoli Storage Manager for Advanced Copy Services to restore from those target sets unused by IBM Tivoli Storage FlashCopy Manager. Before attempting a restore with Tivoli Storage Manager for Advanced Copy Services, make sure to check whether IBM Tivoli Storage FlashCopy Manager has already used the target which you have selected for restore. Check by inspecting the IBM

Tivoli Storage FlashCopy Manager summary log file (message FMM1582I). This log file resides in the logs directory in the path specified by ACS\_DIR.

**Note:**

- For logically partitioned DB2 environments, Tivoli Storage Manager for Advanced Copy Services 5.4 used one target set definition file (.fct ) per database host. IBM Tivoli Storage FlashCopy Manager uses one target set definition file per node. To reuse the existing target set definition file (.fct file), associate all nodes that reside on the same host with a single partition group name. Use the PARTITION\_GROUP parameter to associate the nodes. In this situation, IBM Tivoli Storage FlashCopy Manager uses one volumes file per PARTITION\_GROUP. This setting allows the existing volume files to be reused without changes. Copy the existing target set definition files (.fct) to the directory specified by the VOLUMES\_DIR parameter. Rename these files according to this naming convention:

`<DB2 instance name>.<DB2 database name>.<device class>.<partition group name>.fct`

- In an AIX LVM mirrored environment, the STORAGE\_SYSTEM\_ID profile parameter must be added to the DEVICE\_CLASS section. In addition, the HARDWARE\_ID\_LVM\_MIRROR parameter must be renamed to STORAGE\_SYSTEM\_ID in the target set definition file (.fct file).

### **Migration from Tivoli Storage Manager for Advanced Copy Services 5.5 (or later) on SAN Volume Controller or DS8000**

IBM Tivoli Storage FlashCopy Manager uses Tivoli Storage Manager for Advanced Copy Services 5.5 in this manner:

- It can reuse the Tivoli Storage Manager for Advanced Copy Services 5.5 volumes files (.fct ).
- it preserves any incremental FlashCopy relations that were established with Tivoli Storage Manager for Advanced Copy Services 5.5.
- It can reuse most of the Tivoli Storage Manager for Advanced Copy Services 5.5 profile.

However IBM Tivoli Storage FlashCopy Manager cannot restore backups created with Tivoli Storage Manager for Advanced Copy Services 5.5. Also, these two products cannot be installed and configured simultaneously for the same database instance. However, the master copy of both products can be installed simultaneously (in the /usr/tivoli/ directory).

Before configuring IBM Tivoli Storage FlashCopy Manager with the installation setup script, create a copy of the existing Tivoli Storage Manager for Advanced Copy Services profile and repository directory. The repository directory is identified with the ACS\_REPOSITORY parameter in the profile. When running installation setup script, update the ACS\_REPOSITORY parameter with a new location for IBM Tivoli Storage FlashCopy Manager metadata. Also, set the TARGET\_SETS parameter to VOLUMES\_DIR. You do not need to modify the VOLUMES\_DIR value and you do not need to change the .fct files located within this directory.

Once installed and configured, all future operations are performed with IBM Tivoli Storage FlashCopy Manager. In emergency situations, you can still use Tivoli Storage Manager for Advanced Copy Services 5.5 to restore from target sets that have not been used by IBM Tivoli Storage FlashCopy Manager. In this situation, you must restore the original profile and the original Tivoli Storage Manager for

Advanced Copy Services ACS\_REPOSITORY directory. Also, you must run the Tivoli Storage Manager for Advanced Copy Services 5.5 installation setup script again for the current database instance. Before attempting a restore with Tivoli Storage Manager for Advanced Copy Services 5.5, make sure to check whether IBM Tivoli Storage FlashCopy Manager has already used the target which you have selected for restore. Check by inspecting the IBM Tivoli Storage FlashCopy Manager summary log file (message FMM1582I). This log file resides in the logs directory in the path specified by ACS\_DIR.

**Note:** In an AIX LVM mirrored environment, the STORAGE\_SYSTEM\_ID profile parameter must be added to the DEVICE\_CLASS section. In addition, the HARDWARE\_ID\_LVM\_MIRROR parameter must be renamed to STORAGE\_SYSTEM\_ID in the target set definition file (.fct file).

### **Migrating SAN Volume Controller or DS8000 from a proxy to an embedded CIMOM**

Unlike LVM mirrored environments, there is no difference between the proxy CIMOM and the embedded CIMOM. The only required changes when migrating are these adjustments:

- Update the COPYSERVICES\_PRIMARY\_SERVERNAME parameter in the profile.
- Update the COPYSERVICES\_SECONDARY\_SERVERNAME parameter in the profile (if specified).
- Reset the passwords.

In LVM mirrored environments, you must use separate DEVICE\_CLASS sections for each of the storage devices. This task is done by creating a second DEVICE\_CLASS statement in the profile. This statement can be identical to the first statement except for the COPYSERVICES\_PRIMARY\_SERVERNAME and COPYSERVICES\_SECONDARY\_SERVERNAME (if specified) parameters. Both device classes now refer to separate target set definition files (.fct ) because of these settings:

- The different value of the VOLUMES\_FILE parameter.
- The naming convention of volumes files (if target sets are specified using the parameter VOLUMES\_DIR).

Make sure to separate the existing file into two files. Each file contains only those target sets that are eligible for the specific mirror. If the VOLUMES\_DIR parameter is used in an LVM mirroring environment, the STORAGE\_SYSTEM\_ID parameter must also be specified in the DEVICE\_CLASS sections. The HARDWARE\_ID\_LVM\_MIRROR parameter must be renamed to STORAGE\_SYSTEM\_ID in the target set definition file (.fct). Make sure to add rules to the CLIENT section of the profile that control the mirror to be used for the next backup operation. See DEVICE\_CLASS <name> within the CLIENT section.

---

## **Installing Tivoli Storage FlashCopy Manager in silent mode**

You can perform the installation and distribution phases of the Tivoli Storage FlashCopy Manager installation task in the non-graphic console mode. You can also use a response file for silent (or unattended) installation.

You can also generate a properties file during installation (in either graphic or console mode) by invoking the executable file as follows:



```
./<version>-TIV-FCM-<platform>.bin [-i console]
-DRECORDFILE=/tmp/installer.properties
```

1. To install in silent (unattended) mode, first create the response (properties) file, such as `installer.properties`, containing the following variables:

- a. The installation directory:

```
USER_INSTALL_DIR=<installation directory>
```

where `<installation directory>` has the value:

- AIX: `/usr/tivoli/tsfcm/acs_3.1.0.0`
- Linux: `/opt/tivoli/tsfcm/acs_3.1.0.0`
- Solaris: `/opt/tivoli/tsfcm/acs_3.1.0.0`
- HP-UX: `/opt/tivoli/tsfcm/acs_3.1.0.0`

- b. To create a log file during installation, set the variable

```
INSTALL_LOG_DESTINATION=<installation directory>/<log file name>
```

- c. `LICENSE_ACCEPTED=TRUE`

- d. To define the product database component that will be installed, set the following variable:

```
CHOSEN_INSTALL_SET=<InstallSet>
```

where `<InstallSet>` is

```
TSMFCMORA (Oracle component)
TSMFCMSAP (SAP with Oracle component)
TSMFCMDB2 (DB2 component)
```

- e. (Oracle and SAP Oracle) To set the home folder of the Oracle `<SID>`, use the following variable:

```
ORACLE_HOME_FOLDER=/oracle/<SID>
```

- f. (DB2) For a DB2 installation: To copy the required files directly to desired IBM DB2 instances after installing in the main installation directory, set the following variable with a comma-separated list of existing IBM DB2 instances:

```
DB2_INSTANCES_SELECTED=db2inst1,db2inst2
```

If you do not want to copy the files, leave this variable blank:

```
DB2_INSTANCES_SELECTED=
```

2. Invoke the executable file with the `"-i silent"` option (silent mode) and the `"-f"` option if a properties file was generated:

```
./<version>-TIV-FCM-<OS-platform>.bin -i silent [-f <properties file>]
```

The `<properties file>` specification must contain a full path.

### Sample properties file (DB2):

```

# Properties file for Tivoli Storage FlashCopy® Manager Installations
# Created on: May 8, 2010 4:18:38 PM
# This file contains the information, the installer needs to perform a successful installation in silent mode.
#
# Properties recorded:

# Has the license been accepted
# -----
LICENSE_ACCEPTED=TRUE

# The chosen Install Set
# -----
CHOSEN_INSTALL_SET=TSMFCMDB2

# Installation Directory
# -----
USER_INSTALL_DIR=/usr/tivoli/tsfcm/acs_3.1.0.0

# Selected IBM DB2 Instances
# -----
# Specify a comma separated list of existing IBM DB2 instances,
# e.g. DB2_INSTANCES_SELECTED=db2inst1,db2inst2
# During the installation all files from install directory will be copied to
# the home directory of IBM DB2 instance(s) (<instance home>/sqllib/acs)
# If you do not want to copy the files, leave it blank.
DB2_INSTANCES_SELECTED=db2inst1,db2inst2

```

#### Sample properties file (Oracle):

```

# Properties file for Tivoli Storage FlashCopy® Manager Installations
# Created on: May 6, 2010 10:45:09 AM
# This file contains the information, the installer needs to perform a successful installation in silent mode.
#
# Properties recorded:

# Has the license been accepted
# -----
LICENSE_ACCEPTED=TRUE

# The chosen Install Set
# -----
CHOSEN_INSTALL_SET=TSMFCMORA

# Installation Directory
# -----
USER_INSTALL_DIR=/usr/tivoli/tsfcm/acs_3.1.0.0

# ORACLE_HOME Directory
# -----
ORACLE_HOME_FOLDER=/oracle/SID

```

#### Sample properties file for SAP with Oracle:

```
# Properties file for Tivoli Storage FlashCopy® Manager Installations
# Created on: May 11, 2010 1:02:55 PM
# This file contains the information, the installer needs to perform a successful installation in silent mode.
#
# Properties recorded:

# Has the license been accepted
# -----
LICENSE_ACCEPTED=TRUE

# The chosen Install Set
# -----
CHOSEN_INSTALL_SET=TSMFCMSAP

# Installation Directory
# -----
USER_INSTALL_DIR=/usr/tivoli/tsfcm/acs_3.1.0.0

# ORACLE_HOME Directory
# -----
ORACLE_HOME_FOLDER=/oracle/SID

# Selected IBM DB2 Instances
# -----
```

### Sample properties file for IBM Tivoli Storage FlashCopy Manager for Custom Applications

The following sample is the properties file for IBM Tivoli Storage FlashCopy Manager for Custom Applications on a Linux system.

```
LICENSE_ACCEPTED=TRUE
CHOSEN_INSTALL_SET=TSMFCMGEN
USER_INSTALL_DIR=/opt/tivoli/tsfcm/acs_3.1.0.0
#ORACLE_HOME_FOLDER=
#DB2_INSTANCES_SELECTED=
LINUX_DISTRO=SLES11
```

Lines starting with "#" are treated as comments.

## Special tasks for native Oracle

Information is provided about alternative procedures to adjust Tivoli Storage FlashCopy Manager to your production environment.

These procedures assist with adjusting your production environment:

- Configuring system options files for the same server
- Configuring multiple server stanzas

### Configuring system options files to use the same server

This procedure demonstrates how to configure system options files (dsm.sys) to point to the same Tivoli Storage Manager server.

In these examples, the client user options files (dsm.opt) in the /usr/tivoli/tsm/client/ba/bin and /usr/tivoli/tsm/client/api/bin directories are defined for a server with a TCPIP address of *arrow.la.xyzcompany.com*.

## ba/bin Directory

### Example: dsm.opt

```
servername tdphdw
```

### Example: dsm.sys

```
servername      tdphdw
commmethod      tcpip
tcpport         1500
tcpserveraddress arrow.la.xyzcompany.com
passwordaccess  generate
schedmode       prompted
nodename        hdworc1
```

## api/bin Directory

### Example: dsm.opt

```
servername tdporc
```

### Example: dsm.sys

```
servername      tdporc
commmethod      tcpip
tcpport         1500
tcpserveraddress arrow.la.xyzcompany.com
passwordaccess  prompt
nodename        hdworc1
```

**Note:** The *servername* option in the dsm.opt and dsm.sys files define server stanza names only. The *tcpserveraddress* option controls which server is actually contacted.

## Configuring multiple server stanzas

This procedure demonstrates how to configure multiple server stanzas in the system options file (dsm.sys).

In order to configure multiple server stanzas in the system options file (dsm.sys), copy the option settings from the Data Protection for Oracle dsm.sys file to the Tivoli Storage FlashCopy Manager dsm.sys file. For example, a combined dsm.sys file for a server with the name *arrow*:

```
servername      tdphdw
commmethod      tcpip
tcpport         1500
tcpserveraddress arrow.la.xyzcompany.com
passwordaccess  generate
schedmode       prompted

servername      tdporc
commmethod      tcpip
tcpport         1500
tcpserveraddress arrow.la.xyzcompany.com
passwordaccess  prompt
```

---

## Appendix D. Troubleshooting Tivoli Storage FlashCopy Manager

Resolving problems encountered when using Tivoli Storage FlashCopy Manager requires tasks specific to the database environment.

### Related reference

“Log and trace files summary” on page 246

---

### General troubleshooting procedure

This procedure is valid for all Tivoli Storage FlashCopy Manager applications.

The starting point for problem determination is the summary log file located in the <ACS\_DIR>/logs directory. The summary log file name is summary.<timestamp>.log where <timestamp> is an entry that represents the four-digit year, month, and day (for example, summary.20090817.log). A new log file is created each day. This file contains a list of all operations and the most important messages. Each line begins with one of these prefixes to indicate the type of operation:

*Table 56. Message prefixes used in the summary log file*

Prefix	Operation
GEN	Generic message
DB	Database backup or restore; inquire or delete of FlashCopy backups
MON	Monitoring of the background copy that is performed by the storage device
TSM	Off-loaded backup to Tivoli Storage Manager
MNT	Mount and unmount services
CLO	FlashCopy cloning operations

The summary log file only contains the information about operations that were performed and whether they completed successfully. Error messages are also logged when they occur. A dedicated log file is created for each operation in the <ACS\_DIR>/logs/details. These files should be checked for detailed information when an error occurs.

This summary log file example shows a FlashCopy backup of a database. Messages with the DB prefix are issued by the database client. This is the application that requests the backup operation.

```
GEN 00:10:00 (70a)
=====

New backup operation started for database instance db2h51, database H51.

=====
DB 00:10:00 (70a) FMM1510I New connection received.
DB 00:10:00 (70a) FMM1513I ***** Database client connected: db2s95, database S95,
                    partition NODE0000
DB 00:10:00 (70a) FMM1574I Backup for db2s95.S95.DEVICE_CLASS:STANDARD.NODE0000 is
                    created using DEVICE_CLASS
                    DEVICE_CLASS:STANDARD.
DB 00:10:01 (80c) FMM1510I New connection received.
DB 00:10:01 (80c) FMM1514I ***** Device client connected.
DB 00:10:01 (80c) FMM6219I Backup to TSM: NO
```

```

DB 00:10:01 (80c) FMM1582I The target set 1 will be used for the current backup.
DB 00:10:44 (70a) FMM1014I Operation backup completed successful.
GEN 00:12:28 (70e)
=====

```

## Log and trace files summary

Log and trace files are updated during Tivoli Storage FlashCopy Manager operations.

Log and trace files are written to during backup and restore processing by these products:

- DB2
- Oracle
- Tivoli Storage FlashCopy Manager
- Storage system
- CIM
- Tivoli Storage Manager for ERP
- Operating system

The following figure illustrates a sample sequence for examining log and trace files when troubleshooting SAP with Oracle FlashCopy Manager.

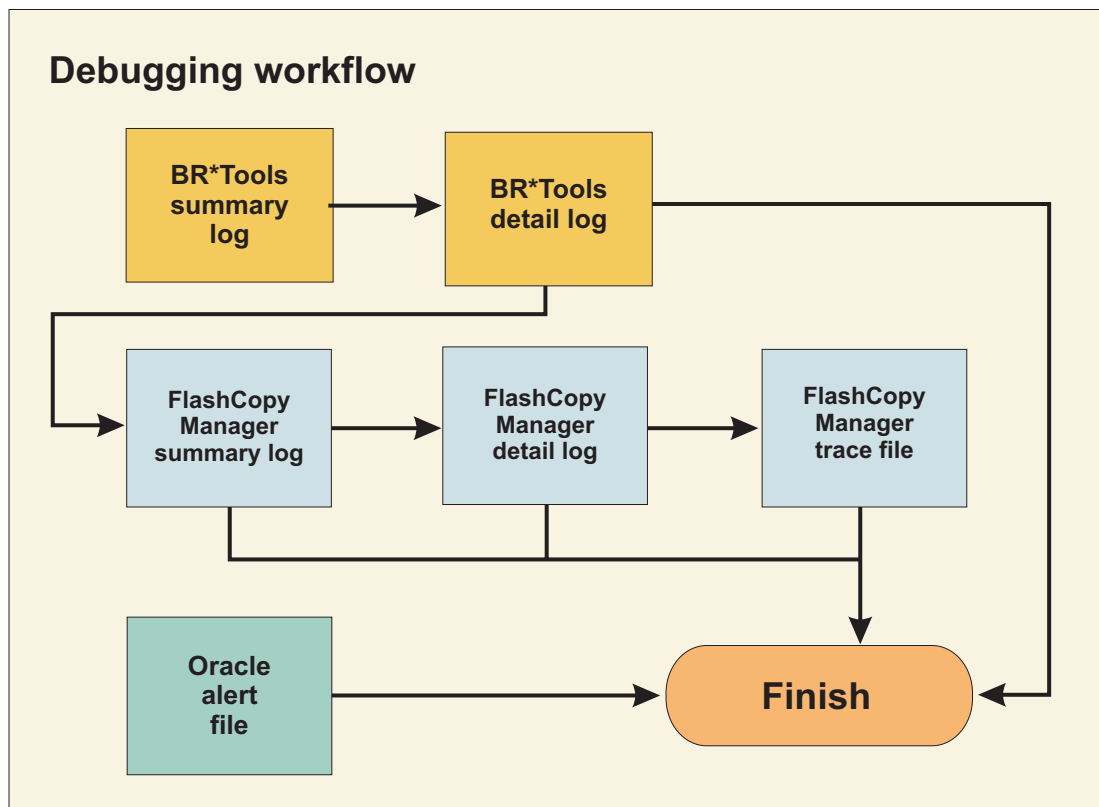


Figure 18. Debugging workflow for SAP with Oracle FlashCopy Manager

The following figure illustrates a sample sequence for examining log and trace files when troubleshooting SAP with Oracle FlashCopy Manager with Tivoli Storage Manager.

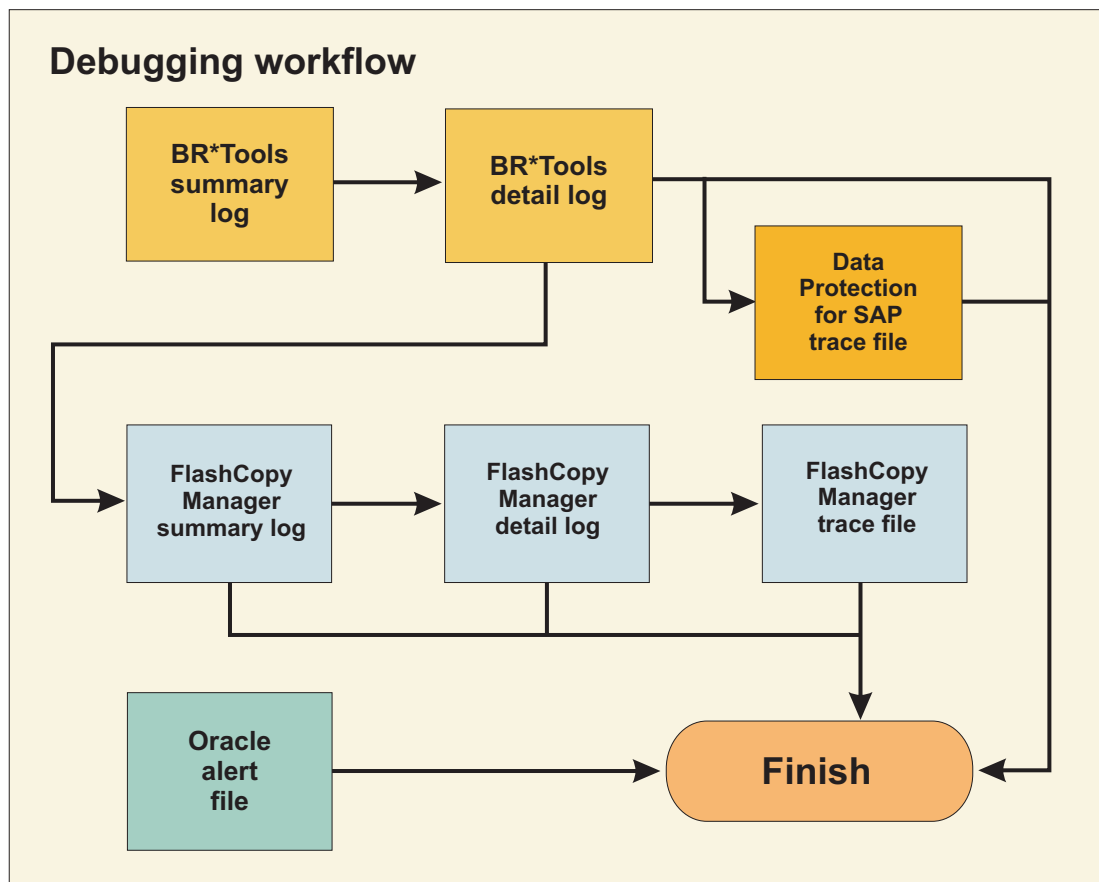


Figure 19. Debugging workflow for SAP with Oracle FlashCopy Manager with Tivoli Storage Manager

## Tivoli Storage FlashCopy Manager log and trace files

Refer to these examples of the log and trace files maintained by Tivoli Storage FlashCopy Manager.

Tivoli Storage FlashCopy Manager document each operation in log files. In addition, trace files can be requested via the TRACE parameter in the profile. However, it is recommended to not activate tracing unless requested by IBM Support. If TRACE is set to YES, each Tivoli Storage FlashCopy Manager component creates an additional trace file in the log directory.

The following tables list the log and trace files maintained by Tivoli Storage FlashCopy Manager. These files reside in <ACS\_DIR>/logs.

Table 57. Tivoli Storage FlashCopy Manager log files

Purpose	File
Overview about performed operations and their result.	summary.<timestamp>.log
Overview about the monitoring of the background copy that is performed by the storage device.	monitor.<timestamp>.log
Detailed log of a particular operation.	details/<function>.<longtimestamp>

Table 57. Tivoli Storage FlashCopy Manager log files (continued)

Purpose	File
<b>Note:</b> <ul style="list-style-type: none"> <li>• &lt;timestamp&gt; is the date ('yyyymmdd')</li> <li>• &lt;longtimestamp&gt; is the date and time ('yyyymmddHHMMSS')</li> <li>• &lt;function&gt; is a value of backup, restore, inquire, delete, mount, unmount, tsm, or clone</li> </ul> <p>The summary log file is always used as an entry point. All major events, such as the start of a new operation or errors, are recorded in this file. A new summary log file is created for every day and records all operations of one day within a single file.</p>	

Table 58. Tivoli Storage FlashCopy Manager trace files

Component	File
Management Agent (acsd)	acsd.<id>.<trace>
Application client (for DB2, the Snapshot Backup Library)	client.<instance>.<db name>.<node>.<id>.<trace>
Generic Device Agent (acsgen)	acsgen.<hostname>.<device class>.<node num>.<id>.<trace> acsgen.<hostname>.<function>.<id>.<trace> acsgend.<hostname>.<id>.<trace>
Device Agent for IBM XIV <sup>®</sup> Storage System Devices	xivadapter_<id>_<function>.<trace>
Device Agent for CIM Devices (DS8000, SAN Volume Controller, Storwize V7000 )	fmcima.<hostname>.<function>.<id>.<trace> fmcima.<hostname>.<device class>.<node num>.<trace>
Offload Agent (tsm4acs)	tsm4acsd.<host>.<id>.<trace>
fcmcli	fcmcli.<host>.<id>.<trace>
RMAN (when invoked by Tivoli Storage FlashCopy Manager)	rman.<SID>.<id>.<log>
<b>Notes:</b> <ul style="list-style-type: none"> <li>• Names ending in '-d' are daemon processes (started with '-D' option).</li> <li>• <i>id</i> is the date ('yyyymmdd') for log files written by daemon processes, date, and process ID ('yyyymmdd.xxxxxx') for trace files written by daemon processes or a timestamp (yyyymmddHHMMSS) for log and trace files for other processes.</li> <li>• &lt;device class&gt; can be a device class specified in the profile or 'all' if no command-line parameter '-s device class' was specified for the device agent. It can also be omitted for traces of the device agent.</li> <li>• &lt;instance&gt; and &lt;db hostname&gt; can be 'undef' for query/delete requests started with db2acsutil.</li> <li>• &lt;node num&gt; is the DB2 partition number in the case of DB2 and SAP with DB2. It is '0' for Oracle and SAP with Oracle or it can also be omitted for Oracle and SAP with Oracle.</li> <li>• &lt;function&gt; is backup, delete, restore, mount, unmount, or reconcile.</li> </ul>	

Table 59. Tivoli Storage FlashCopy Manager return codes

Reason code	Explanation	User response
0	Operation is successful	None



Table 59. Tivoli Storage FlashCopy Manager return codes (continued)

Reason code	Explanation	User response
1	Operation terminated successfully with warnings	The Tivoli Storage FlashCopy Manager operation was successful but warning messages were reported. Check the Tivoli Storage FlashCopy Manager summary log file and the therein referenced detail log files for more information.
2	Operation terminated with error	The Tivoli Storage FlashCopy Manager operation failed. Check the Tivoli Storage FlashCopy Manager summary log file and the therein referenced detail log files for more information.

Table 60. Tivoli Storage FlashCopy Manager installer exit codes

Exit Code	Explanation	User Response
0	The operation completed successfully	The installation completed successfully without any warnings or errors.
1	The operation completed successfully with warnings.	The installation completed successfully, but one or more of the actions from the installation sequence caused a warning or a non-fatal error. See the Tivoli Storage FlashCopy Manager installer log file installation.log in the installation directory for details.
-1	The operation terminated with error	One or more of the actions from the installation sequence caused a unrecoverable error. See the Tivoli Storage FlashCopy Manager installer log file installation.log in the installation directory for details.
>=1000	The operation terminated with error <b>Note:</b> There more error codes with numbers >= 1000 which all mean that some kind of error occurred.	One or more of the actions from the installation sequence caused a unrecoverable error. See the Tivoli Storage FlashCopy Manager installer log file installation.log in the installation directory for details.

Table 61. DB2 vendor reason codes

Reason Code	Explanation	User Response
0	The operation is successful.	None
2	Communication error with device	The Tivoli Storage FlashCopy Manager operation failed. Check the db2diag.log and the Tivoli Storage FlashCopy Manager summary log file for details.
3	The DB2 and vendor products are incompatible	The Tivoli Storage FlashCopy Manager operation failed during initialization of the Tivoli Storage FlashCopy Manager vendor library. The DB2 API version does not match the Tivoli Storage FlashCopy Manager vendor library version. Check the db2diag.log for details.
6	Object specified cannot be found	The Tivoli Storage FlashCopy Manager operation failed because the requested object cannot be found in the Tivoli Storage FlashCopy Manager repository. Check the db2diag.log and the Tivoli Storage FlashCopy Manager summary log file for details.
8	Invalid user ID specified	The Tivoli Storage FlashCopy Manager operation failed because an invalid user ID was specified on the db2 command line. Check the db2diag.log.
9	Invalid password provided	The Tivoli Storage FlashCopy Manager operation failed because an invalid password was specified on the db2 command line. Check the db2diag.log.
10	Invalid options specified	The Tivoli Storage FlashCopy Manager operation failed because an invalid db2 command-line option was specified. Check the db2diag.log.
11	Initialization failed	The Tivoli Storage FlashCopy Manager operation failed because the Tivoli Storage FlashCopy Manager vendor library cannot be initialized. Check the db2diag.log and the Tivoli Storage FlashCopy Manager summary log file for details.
14	End of data reached	Not an error condition.

Table 61. DB2 vendor reason codes (continued)

Reason Code	Explanation	User Response
18	Device error	The Tivoli Storage FlashCopy Manager operation failed. Check the Tivoli Storage FlashCopy Manager summary log file for details.
19	Warning	The Tivoli Storage FlashCopy Manager operation is successful with warning messages. Check the Tivoli Storage FlashCopy Manager summary log file for details.
21	More data to come	Not an error condition.
26	Delete object fails	The Tivoli Storage FlashCopy Manager delete operation failed. Check the Tivoli Storage FlashCopy Manager summary log file for details.
29	Abort request failed	The Tivoli Storage FlashCopy Manager abort request failed. Check the Tivoli Storage FlashCopy Manager summary log file for details.
30	Unexpected Error	The Tivoli Storage FlashCopy Manager operation failed. Check the Tivoli Storage FlashCopy Manager summary log file for details.
31	No data has been returned	Not an error condition.
32	Object not under Backup Adapter control	The Tivoli Storage FlashCopy Manager operation failed because the object specified for a restore or query is not under the control of Tivoli Storage FlashCopy Manager. It might be under control of Tivoli Storage Manager for Enterprise Resource Planning, for example. Check the db2diag.log and the Tivoli Storage FlashCopy Manager summary log file for details.
34	Another database or application is using the same storage groups	The Tivoli Storage FlashCopy Manager snapshot backup operation failed because another database or application is using the same storage group. Check the db2diag.log and the Tivoli Storage FlashCopy Manager summary log file for details.

## Storage system log and trace files

Storage system log and trace files are updated during Tivoli Storage FlashCopy Manager operations.

Consult the documentation for the configured storage system.

## CIM log and trace files

CIM log and trace files are updated during Tivoli Storage FlashCopy Manager operations.

Consult the CIM documentation for logging and tracing information. Currently, only the DS Open API and the SAN Volume Controller and Storwize V7000 master console produce log and trace output.

## Tivoli Storage Manager for ERP log and trace files

Tivoli Storage Manager for ERP log and trace files are updated during backup and restore operations.

See the section "How To Find Files Containing Message Output (Log Files)" in the Tivoli Storage Manager for ERP *Installation and User's Guide* for details concerning logs and traces within Tivoli Storage Manager for ERP.

**Important:** A trace file can be requested by specifying the TRACEFILE parameter in the Tivoli Storage Manager for ERP profile. However, do not place this file on NFS, because this might cause network problems due to the high volume of trace entries being written.

---

## Troubleshooting tips for Tivoli Storage FlashCopy Manager for Oracle

Resolving problems encountered when using Tivoli Storage FlashCopy Manager requires tasks specific to the native Oracle database environment.

If an error condition occurs during a Tivoli Storage FlashCopy Manager event, there are several sources of information you can view to help determine what the problem might be. The sources of information are listed below. If you still encounter problems after reviewing this section, you can contact Tivoli Customer Support for assistance.

Be aware of the following information:

- Make sure to increase the size of the following two Oracle options located in the `$ORACLE_HOME/dbs/init(database_name).ora` file:

```
sort_area_size = 10000000
sort_area_retained_size = 10000000
```

- When using Tivoli Storage FlashCopy Manager to back up an Oracle database, the target database being backed up *cannot* reside on the same volume group as the file system containing `$ORACLE_HOME`. Make sure that the Oracle Server does not share a volume group with the target database.
- When performing a full offline backup of a database, the target database on the production system must be in "startup mount" state at the time **acsora** is issued. Otherwise it will not be possible to restore the resulting backup without performing recovery.

This RMAN script template will restore the database backed up offline as described in the previous paragraph. It restores control files, datafiles, and opens the database *without* any application of logs. This script must be started with the target database in a "startup mount" state:

```
run
{
allocate channel ch1 type 'SBT_TAPE' parms
'ENV=(TDPO_OPTFILE=<full path of tdpo.opt file>)';
set until scn = <Ckp SCN for backup being restored>;
restore control file to '<full path of 1st control file>';
restore control file to '<full path of 2nd control file>';
restore control file to '<full path of 3rd control file>';
alter database mount;
restore
(database);
sql 'alter database open RESETLOGS';
release channel ch1;
}
```

The database will in an open state and in a new incarnation after this script completes. All that remains is to issue the **reset database** command to RMAN and back up the database again since the previous backups are now rendered unusable since the database is in a new incarnation.

The <Ckp SCN for backup being restored> value is the Checkpoint SCN listed for the backup being restored in the RMAN **list backup** command. For example, the Checkpoint SCN is 32024 in the following list:

```
List of Backup Sets
Key Recid Stamp LV Set Stamp Set Count Completion Time
-----
26081 4 469212393 0 469212319 5 06-AUG-02

List of Backup Pieces
Key Pc# Cp# Status Completion Time Piece Name
-----
26082 1 1 AVAILABLE 06-AUG-02 05dvf74v_1_1

Lis of Datafiles Included
File Name LV Type Ckp SCN Ckp Time
-----
1 /dev/rmyfilelv 0 Full 32024 06-AUG-02
2 /dev/rmyrollbklv 0 Full 32024 06-AUG-02
3 /dev/rmytemp1v 0 Full 32024 06-AUG-02
4 /dev/rmyuserlv 0 Full 32024 06-AUG-02
```

Note that for an offline backup, the Checkpoint SCN should be the same for all of the datafiles.

## Guidelines for Oracle variables

Tivoli Storage FlashCopy Manager processing can be impacted when certain Oracle parameter and environment variable settings are not set with appropriate values.

It is recommended that you review this information for clarification.

### TNS\_ADMIN environment variable

This environment variable must be set when the SQL\*Plus or Oracle Net configuration files do not reside in their default location.

## Verify the connection to the Oracle RMAN recovery catalog database

A recovery catalog database is needed to run offloaded backups of Oracle databases. The database must be accessible by RMAN from the production host and the backup host. On the production host, the following command can be used to verify if the connection can be established:

```
rman target / catalog catalog_db_user/catalog_user_password@catalog_db_connect_string
```

You must run this command as the database instance owner.

On the backup host use the following command:

```
su - oracle_instance_owner -c rman target / catalog catalog_db_user/  
catalog_user_password@catalog_db_connect_string
```

You must run this command as root user. If you receive errors that say RMAN is unable to connect to the catalog database, verify the configuration of the `tnames.ora` on the host where the command was run and the listener configuration on the host where the catalog database runs. For details about the setup of the catalog database and the listener configuration see the Oracle documentation.

## Tivoli Storage FlashCopy Manager for Oracle miscellaneous errors

Certain unique errors might display when using Tivoli Storage FlashCopy Manager for native Oracle.

If you receive the following errors:

### **Tivoli Storage FlashCopy Manager fails on the backup system in DBCS locales when the datafile or the path to the datafile contains a DBCS name.**

This is an Oracle problem that has been reported to the Oracle development team. The Oracle Technical Assistance Request (TAR) number for this problem is 2367962.999.

The following procedure provides a workaround until the problem is resolved by Oracle:

1. Take the table space that contains the DBCS name in its datafile or the path to its datafile offline.
2. If the DBCS name is in the datafile, rename the DBCS datafile to an English name. If the DBCS name is in the path to the datafile, move the datafile to a path with an English name.
3. Log in to the Server Manager and issue the following command:  

```
ALTER TABLESPACE <dbcs_tablespace_name> RENAME DATAFILE  
'dbcs_path/dbcs_datafile' TO 'english_path/english_datafile';
```
4. Bring the table space online.
5. Delete the DBCS datafile if necessary.

Although Tivoli Storage FlashCopy Manager supports table spaces named with DBCS, datafiles or paths to the datafiles that contain DBCS must be renamed to English before running Tivoli Storage FlashCopy Manager.

---

## Appendix E. Internet Protocol Version 6 (IPv6) Support

Tivoli Storage FlashCopy Manager for UNIX and Linux supports both IPv4 and IPv6 for internal communication in that it will run in IPv4, IPv6, and mixed environments. However, it does not take advantage of new IPv6 functionality.

In a mixed environment, the actual communication to be used depends on the network settings of the adapters employed. There is no option to enforce the use of a specific protocol other than by network configuration. Specifically, the acsd service tries to listen for both IPv4 and IPv6 connection requests if the system is configured accordingly. Connection requests to acsd will be made for the addresses returned by the system for the respective port on the local host. Connection requests to other machines are made for the addresses specified by the user. Wherever TCP/IP addresses can be specified in a command line or a profile parameter, IPv6 addresses are supported. However, where an IP address and a port was traditionally specified in the format:

`<IPv4 address>:<service or port>`

the format needs to be changed to

`<service or port>@<IP address>`

if the IP address is specified in the IPV6 notation. In the case of a dotted decimal IP4 address, the traditional format can still be used.

The specification of IPv6 addresses assumes that Tivoli Storage FlashCopy Manager is used in an environment in which IPv6 is supported by all hardware and software components involved and has been adequately tested in this environment.





---

## Appendix F. 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](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 (ACSLs). 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 `dsmatrr` 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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