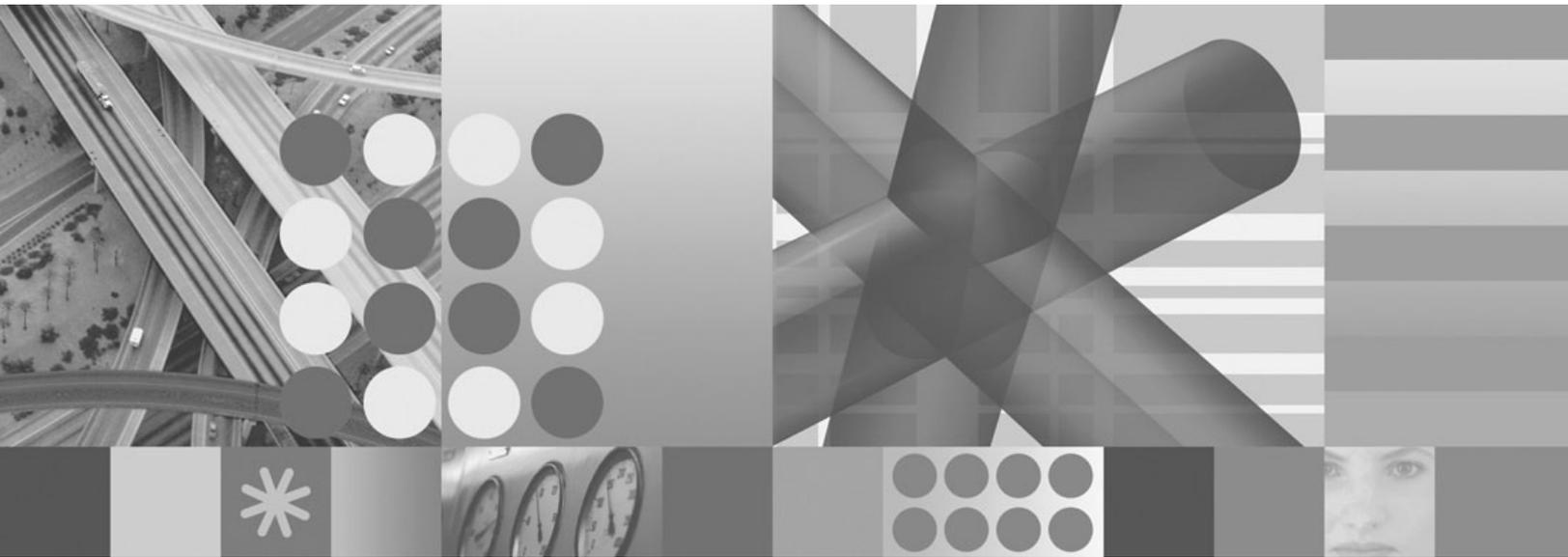




**Installation and User's Guide for AIX**





**Installation and User's Guide for AIX**

**Note**

Before using this information and the product it supports, read the information in "Notices" on page 171.

**Edition notice**

These components are offered as part of IBM Tivoli Storage FlashCopy Manager for AIX, V2.1, Program Number 5724-X94, which is available as a licensed program product, and to all subsequent releases and modifications until otherwise indicated in new editions.

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# Contents

<b>Figures</b> . . . . .	<b>v</b>
--------------------------	----------

<b>Tables</b> . . . . .	<b>vii</b>
-------------------------	------------

<b>Preface</b> . . . . .	<b>ix</b>
--------------------------	-----------

About this publication . . . . .	ix
Who should read this publication . . . . .	ix
Publications . . . . .	ix
IBM Tivoli Storage FlashCopy Manager publications . . . . .	x
Support information . . . . .	xi

<b>Chapter 1. Overview</b> . . . . .	<b>1</b>
--------------------------------------	----------

Backup granularity . . . . .	1
Supported applications . . . . .	1
Supported storage subsystems . . . . .	3
FlashCopy Devices . . . . .	3
Snapshot and clone devices (IBM XIV Storage System) . . . . .	5
Component overview . . . . .	6
Advanced functions . . . . .	8
Mounting of backup images . . . . .	8
FlashCopy back up of individual mirrors . . . . .	9
Integration with Tivoli Storage Manager . . . . .	11

<b>Chapter 2. Preparing your IBM Tivoli Storage FlashCopy Manager environment</b> . . . . .	<b>13</b>
---	-----------

Preparing the production environment . . . . .	13
For native DB2 systems . . . . .	14
For SAP on DB2 . . . . .	15
For SAP with Oracle . . . . .	15
For native Oracle systems (non-SAP, non-ASM) . . . . .	16
For Oracle ASM . . . . .	17
Using symbolic links . . . . .	19
Logical Volume Mirroring support . . . . .	19
ASM failure group support . . . . .	21
Preparation of the storage device . . . . .	22
IBM XIV Storage System . . . . .	22
DS8000 and SAN Volume Controller . . . . .	23
Target set definitions . . . . .	26
Target set definition file for Oracle and for single partitioned DB2 databases . . . . .	26
Target set definition file for multi-partition DB2 databases . . . . .	27
Referring to target set definitions from the profile . . . . .	27
Target set definitions using the naming convention . . . . .	28
Target set definition files for users who are upgrading from Tivoli Storage Manager for Advanced Copy Services . . . . .	28
Selecting the FLASHCOPY_TYPE . . . . .	29
Integration with Metro Mirror and Global Mirror . . . . .	30

A note on LVM mirroring and ASM failure group environments . . . . .	31
Preparation of the backup servers . . . . .	32
Determining the number of backup servers in the environment . . . . .	32
Installation prerequisites for a backup server . . . . .	33
Backup server assignment . . . . .	34
Managing backups with the DEVICE_CLASS parameter in the CLIENT section . . . . .	35

<b>Chapter 3. Installing IBM Tivoli Storage FlashCopy Manager</b> . . . . .	<b>39</b>
---	-----------

Preparing the environment for installation . . . . .	39
Installing on the production server and remotely on the backup server . . . . .	41
Installing separately on the backup server . . . . .	43
Setting up the disk storage environment . . . . .	44
Defining Logical Unit Numbers on DS8000 storage subsystems . . . . .	45
Defining virtual disks on SAN Volume Controller . . . . .	46

<b>Chapter 4. Protecting data with IBM Tivoli Storage FlashCopy Manager.</b> . . . . .	<b>47</b>
--	-----------

Backing up data with IBM Tivoli Storage FlashCopy Manager . . . . .	47
Backing up a DB2 database . . . . .	47
Backing up a native Oracle database . . . . .	49
Backing up an SAP with Oracle database . . . . .	51
Restoring data with IBM Tivoli Storage FlashCopy Manager . . . . .	54
Restoring a DB2 database . . . . .	54
Restoring a native Oracle database . . . . .	55
Restoring an SAP with Oracle database . . . . .	58

<b>Chapter 5. IBM Tivoli Storage FlashCopy Manager commands and scripts</b> . . . . .	<b>59</b>
---	-----------

IBM Tivoli Storage FlashCopy Manager commands and scripts . . . . .	59
Installation setup script . . . . .	59
Options for IBM Tivoli Storage FlashCopy Manager commands . . . . .	62
Options parameters . . . . .	64
Profile Wizard (wizard) . . . . .	64
Management Agent (acsd) . . . . .	66
Generic Device Agent (acsgen) . . . . .	68
Volume Group Takeover Script (acsvg.sh) . . . . .	69
-f update_status . . . . .	70
XIV Adapter Java Archive (XivAdapter.jar) . . . . .	70
IBM Tivoli Storage FlashCopy Manager (fmcima) . . . . .	70
Query Managed Capacity (fmquery) . . . . .	70
Production System User Interface for Oracle (acsora) . . . . .	71
Snapshot Object Manager for Oracle (acsutil) . . . . .	73

IBM Tivoli Storage FlashCopy Manager for <i>SAP with Oracle</i> (backint) . . . . .	75
DB2 Advanced Copy Services commands . . . . .	78
Offload Agent (tsm4acs) . . . . .	78
-f tape_backup . . . . .	81
-f mount . . . . .	82
-f unmount . . . . .	83
-f update_status . . . . .	84
-f inquire . . . . .	84
-f inquire_detail . . . . .	84
-f restore . . . . .	84
Deleting IBM Tivoli Storage FlashCopy Manager snapshot backups . . . . .	85
Checking the status of snapshot backups in the IBM Tivoli Storage FlashCopy Manager repository . . . . .	86

**Chapter 6. Configuration files overview 87**

IBM Tivoli Storage FlashCopy Manager profile description . . . . .	87
Tivoli Storage FlashCopy Manager profile sections. . . . .	88
Modifying the GLOBAL or ACSD sections of the IBM Tivoli Storage FlashCopy Manager profile . . . . .	91
IBM Tivoli Storage FlashCopy Manager profile parameters . . . . .	91
IBM Tivoli Storage FlashCopy Manager password file . . . . .	124
IBM Tivoli Storage FlashCopy Manager target volumes file (.fct) . . . . .	124
Target volume parameter settings (DS8000 configuration) . . . . .	128
Target volume parameter settings (SAN Volume Controller configuration) . . . . .	129
IBM Tivoli Storage FlashCopy Manager backint profile overview (.utl file) . . . . .	130
IBM Tivoli Storage FlashCopy Manager Backint profile keyword definitions. . . . .	130
SAP BR*Tools configuration profile (.sap) . . . . .	131
Tivoli Storage Manager option files for native Oracle . . . . .	132
Tivoli Storage Manager option files used by Data Protection for Oracle . . . . .	132
Files for IBM Tivoli Storage FlashCopy Manager . . . . .	132
Key files and directories. . . . .	132

**Appendix A. IBM Tivoli Storage FlashCopy Manager examples . . . . 137**

Examples (DB2) . . . . .	137
Example overall disk layout for a DB2 environment. . . . .	137
Example profile for IBM Tivoli Storage FlashCopy Manager for DB2 . . . . .	138
Examples (native Oracle) . . . . .	139
Example overall disk layout for a native Oracle environment. . . . .	139
Example profile for Tivoli Storage FlashCopy Manager for native Oracle . . . . .	140

Example profile for Tivoli Storage FlashCopy Manager for Oracle with ASM. . . . .	141
Example RMAN backup script . . . . .	143
Examples (SAP with Oracle) . . . . .	143
Example overall disk layout for an <i>SAP with Oracle</i> environment . . . . .	143
Example profile for Tivoli Storage FlashCopy Manager for <i>SAP with Oracle</i> (disk only) . . . . .	144
Example profile for Tivoli Storage FlashCopy Manager for <i>SAP with Oracle</i> (offload) . . . . .	145
Example Target Volumes Files . . . . .	146
Example target volumes file (DS8000 configuration) . . . . .	146
Example target volumes file (SAN Volume Controller configuration) . . . . .	148
Example target volume file (mirror setup on DS8000 configuration) . . . . .	149

**Appendix B. Special tasks . . . . . 153**

Migrating existing snapshot data . . . . .	153
Installing IBM Tivoli Storage FlashCopy Manager in silent mode . . . . .	156
Special tasks for native Oracle. . . . .	159
Configuring system options files to use the same server . . . . .	159
Configuring multiple server stanzas . . . . .	160

**Appendix C. Troubleshooting IBM Tivoli Storage FlashCopy Manager . . 161**

General troubleshooting procedure . . . . .	161
Log and trace files summary . . . . .	162
IBM Tivoli Storage FlashCopy Manager log and trace files. . . . .	162
Storage system log and trace files . . . . .	163
CIM log and trace files . . . . .	163
Tivoli Storage Manager for ERP log and trace files . . . . .	163
Troubleshooting tips for IBM Tivoli Storage FlashCopy Manager for Oracle . . . . .	164
Guidelines for Oracle variables . . . . .	165
IBM Tivoli Storage FlashCopy Manager for Oracle miscellaneous errors. . . . .	165

**Appendix D. Internet Protocol Version 6 (IPv6) Support . . . . . 167**

**Appendix E. Accessibility features for Tivoli Storage FlashCopy Manager . . 169**

<b>Notices . . . . .</b>	<b>171</b>
<b>Trademarks . . . . .</b>	<b>173</b>
<b>Index . . . . .</b>	<b>175</b>

---

## Figures

1. Overview of the IBM Tivoli Storage FlashCopy Manager install package. . . . .	7	5. Metro Mirror and Global Mirror relations	31
2. Cross-site mirrored SAP Database protected with IBM Tivoli Storage FlashCopy Manager and Tivoli Storage Manager. . . . .	10	6. IBM Tivoli Storage FlashCopy Manager host assignments for DB2. . . . .	35
3. Overview of IBM Tivoli Storage FlashCopy Manager environment when integrated with Tivoli Storage Manager. . . . .	11	7. Example overall disk layout for a DB2 environment . . . . .	137
4. IBM Tivoli Storage FlashCopy Manager in an LVM environment . . . . .	20	8. Example overall disk layout for a native Oracle environment . . . . .	140
		9. Example overall disk layout for an SAP with Oracle environment . . . . .	143



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## Tables

1. Related IBM Tivoli Storage FlashCopy Manager publications . . . . .	x	22. Options for Starting the Management Agent (acsd) as a Daemon Process . . . . .	66
2. Related storage system publications . . . . .	x	23. Options for Starting the Generic Device Agent (acsgen). . . . .	68
3. Related Tivoli Storage Manager publications . . . . .	x	24. Parameters for IBM Tivoli Storage FlashCopy Manager Invocation as 'backint'. . . . .	75
4. Supported storage subsystems and functionality . . . . .	3	25. Options for the IBM Tivoli Storage FlashCopy Manager 'tsm4acs' Command . . . . .	79
5. FlashCopy types and supported devices . . . . .	3	26. IBM Tivoli Storage FlashCopy Manager Profile Parameters. . . . .	92
6. Volume group layout for DB2 . . . . .	14	27. Actions Taken Depending on Values of LVM_FREEZE_THAW and TARGET_DATABASE_SUSPEND . . . . .	123
7. Volume group layout for SAP with Oracle . . . . .	16	28. Managing target volume LUNs by storage system . . . . .	125
8. Volume group layout for native Oracle systems (non-SAP, non-ASM) . . . . .	17	29. Parameters of the 'VOLUMES_SET_x' Topic (DS8000) . . . . .	128
9. Disk group layout for Oracle ASM . . . . .	18	30. Parameters of the 'VOLUMES_SET_x' Topic (SAN Volume Controller) . . . . .	129
10. Selecting the FLASHCOPY_TYPE for DS8000 and SAN Volume Controller . . . . .	29	31. Key Files and Directories (DB2) . . . . .	132
11. STORAGE_SYSTEM_ID parameter description . . . . .	32	32. Key Files and Directories (Oracle). . . . .	134
12. Summary of Backup Commands for DB2 . . . . .	47	33. Message prefixes used in the summary log file . . . . .	161
13. Summary of Backup Commands for Native Oracle . . . . .	49	34. IBM Tivoli Storage FlashCopy Manager Log Files . . . . .	162
14. Files used during a manual backup . . . . .	50	35. IBM Tivoli Storage FlashCopy Manager Trace Files . . . . .	162
15. Summary of Backup Commands (SAP with Oracle) . . . . .	51		
16. Summary of Restore Commands for DB2 . . . . .	54		
17. Summary of Restore Commands for Native Oracle . . . . .	55		
18. Summary of Restore Commands for SAP with Oracle . . . . .	58		
19. Summary of IBM Tivoli Storage FlashCopy Manager commands and scripts. . . . .	59		
20. Options Available . . . . .	63		
21. Options for Starting the Profile Wizard (wizard) (Password Function) . . . . .	64		



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## Preface

The subject of this publication is IBM® Tivoli® Storage FlashCopy® Manager for AIX®.

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## About this publication

This manual provides information on installing, configuring, administering, and using IBM Tivoli Storage FlashCopy Manager for AIX.

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

- One of these database applications:
  - DB2® (native DB2 or DB2-based SAP® environments)
  - Oracle (native Oracle or Oracle-based SAP® environments)
- 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 Tivoli Storage FlashCopy Manager performs online or offline backups of DB2 or Oracle databases 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 or Tivoli Storage Manager for Databases, as appropriate. The integration with the RMAN Media Management API maximizes the protection of 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 IBM 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 solution in one of the supported database environments.

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## Publications

IBM Tivoli Storage FlashCopy Manager publications and other related publications are available online.

You can search all IBM Tivoli Storage FlashCopy Manager publications in this Information Center: <http://publib.boulder.ibm.com/infocenter/tsminfo/v6/index.jsp>

You can download PDF versions of publications from this Information Center <http://publib.boulder.ibm.com/infocenter/tsminfo/v6/index.jsp> or from the IBM Publications Center at <http://www.elink.ibm.com/publications/servlet/pbi.wss>

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

## IBM Tivoli Storage FlashCopy Manager publications

These publications are available to assist with using IBM Tivoli Storage FlashCopy Manager.

*Table 1. Related IBM Tivoli Storage FlashCopy Manager publications*

<b>Publication title</b>	<b>Order number</b>
<i>IBM Tivoli Storage FlashCopy Manager for Windows: Installation and User's Guide</i>	SC27-2504
<i>IBM Tivoli Storage FlashCopy Manager Messages</i>	SC27-2505
<i>IBM Tivoli Storage FlashCopy Manager Quick Start Guide</i>	CF27SML

*Table 2. Related storage system publications*

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

*Table 3. Related Tivoli Storage Manager publications*

<b>Publication title</b>	<b>Order number</b>
<i>IBM Tivoli Storage Manager for Enterprise Resource Planning: Data Protection for SAP<sup>®</sup> Installation and User's Guide for DB2</i>	SC33-6341
<i>IBM Tivoli Storage Manager for Enterprise Resource Planning: Data Protection for SAP<sup>®</sup> Installation and User's Guide for Oracle</i>	SC33-6340
<i>IBM Tivoli Storage Manager for Databases: Data Protection for Oracle for UNIX<sup>®</sup> and Linux<sup>®</sup> Installation and User's Guide</i>	SC32-9064

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## Support information

You can find support information for IBM products from a variety of sources.

To search Internet resources, go to the support Web site for IBM Tivoli Storage FlashCopy Manager at <http://www.ibm.com/software/tivoli/products/storage-flashcopy-mgr/>. From there, you can search a variety of available resources.

For detailed hardware and software requirements, see <http://www.ibm.com/support/docview.wss?&uid=swg21395564>.



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## Chapter 1. Overview

Introductory information about IBM Tivoli Storage FlashCopy Manager is provided.

IBM 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® or snapshot) of the production data. This copy is then retained on disk as backup allowing for a fast restore operation (Flashback). IBM 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 IBM 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, IBM Tivoli Storage FlashCopy Manager can restart the backup once the cause of the failure is corrected. In this case, data already committed to Tivoli Storage Manager is not re sent.

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### Backup granularity

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

In addition, multiple volumes that are organized into volume groups require IBM 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 IBM 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*.

---

### Supported applications

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

#### **DB2 in SAP® and non-SAP® environments**

Since SAP® environments are fully integrated with DB2, the DB2 backup command can be used in both environments. DB2 notifies IBM Tivoli Storage FlashCopy Manager of the current environment in order to enable IBM Tivoli Storage FlashCopy Manager to implement the appropriate workflow. IBM Tivoli Storage FlashCopy Manager supports single partition databases, and logically or physically partitioned databases on journaled file systems (JFS, JFS2). Supported DB2 backup options are documented in the DB2 user publications. IBM 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:

- Back up of individual table spaces and archiving database logs is not supported. 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).

## 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. IBM Tivoli Storage FlashCopy Manager uses this interface extension to implement point-in-time copy backups of SAP® for Oracle databases.

IBM Tivoli Storage FlashCopy Manager supports SAP® for Oracle databases on JFS, JFS2, and raw logical volumes. Although all backint backup functions are supported, the recommended function is to use volume copy backup operations only. 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 IBM 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 or log files.

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

## Native Oracle environments

IBM 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 IBM Tivoli Storage FlashCopy Manager backup repository. IBM Tivoli Storage FlashCopy Manager supports databases on JFS, JFS2, raw logical volumes, and Oracle ASM running on raw physical volumes. In those cases, IBM Tivoli Storage FlashCopy Manager supports these backup functions:

- Full database backups at a volume level.
- Back up of database control files into the IBM Tivoli Storage FlashCopy Manager repository after a full backup completes.
- Database restores with or without restoring database control files.

## Supported storage subsystems

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

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

Table 4. Supported storage subsystems and functionality

Device	COPY	INCR	NO COPY	snapshot or clone	space efficient FlashCopy target	LVM	VIO	Changes performed on a mounted backup
DS8000	Yes	one per LVM mirror (at most)	restore not supported	N/A	No	Yes	Yes	Remains persistent and alters the content of the backup
SAN Volume Controller 5.1	Yes	Yes	Yes	N/A	Yes	Yes	Yes	Remains persistent and alters the content of the backup
SAN Volume Controller 4.3.x	Yes	Yes	restore not supported	N/A	restore not supported	Yes	Yes	Remains persistent and alters the content of the backup
XIV <sup>®</sup>	N/A	N/A	N/A	Yes	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<sup>®</sup> Devices

Available FlashCopy<sup>®</sup> features are dependent on the exact level of the storage subsystem used in the environment.

Depending on that level, IBM Tivoli Storage FlashCopy Manager provides support for the following FlashCopy<sup>®</sup> types:

Table 5. FlashCopy types and supported devices

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

Table 5. 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>1, 2</sup> , SAN Volume Controller <sup>2</sup>
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>

**Note:**

1. DS8000 allows at most one INCREMENTAL FlashCopy® per source volume. When production volumes are mirrored using LVM mirroring or ASM failure groups, only one FlashCopy® backup of this type per volume mirror is created.
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, IBM 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. DS8000 and SAN Volume Controller 4.3.x and 5.1 supports 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**

IBM Tivoli Storage FlashCopy Manager accesses FlashCopy® services on DS8000 or SAN Volume Controller through a 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 and ASM Failure Groups**

If LVM mirroring is used in the environment, IBM Tivoli Storage FlashCopy Manager can create separate FlashCopy® images of either mirror. In an Oracle ASM environment, a FlashCopy® image of selected failure groups is created. However, the remaining failure groups must be sufficient to mount the corresponding disk group for this image to be created.

## Support for virtual I/O

DS8000 and SAN Volume Controller 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 machine controlled by the IBM Hardware Management Console (HMC) or IBM® 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.

IBM 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

IBM 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.

## Snapshot and clone devices (IBM XIV® Storage System)

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

Whenever IBM Tivoli Storage FlashCopy Manager creates a backup on an IBM XIV® Storage System, it performs a snapshot. This snapshot is 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 IBM 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

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

## Support for LVM Mirroring and ASM Failure Groups

If LVM mirroring is used in the environment, IBM Tivoli Storage FlashCopy Manager can create separate FlashCopy® images of either mirror. In an Oracle ASM environment, a FlashCopy® image of selected failure groups is created. However, the remaining failure groups must be sufficient to mount the corresponding disk group for this image to be created.

## Support for virtual I/O (VIO)

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

## Remote access to FlashCopy<sup>®</sup> images

IBM Tivoli Storage FlashCopy Manager allows mounting a FlashCopy<sup>®</sup> backup image to another host. Unlike FlashCopy<sup>®</sup> devices, IBM 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. IBM 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

IBM Tivoli Storage FlashCopy Manager optionally uses of IBM XIV<sup>®</sup> 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 IBM Tivoli Storage FlashCopy Manager supports.

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

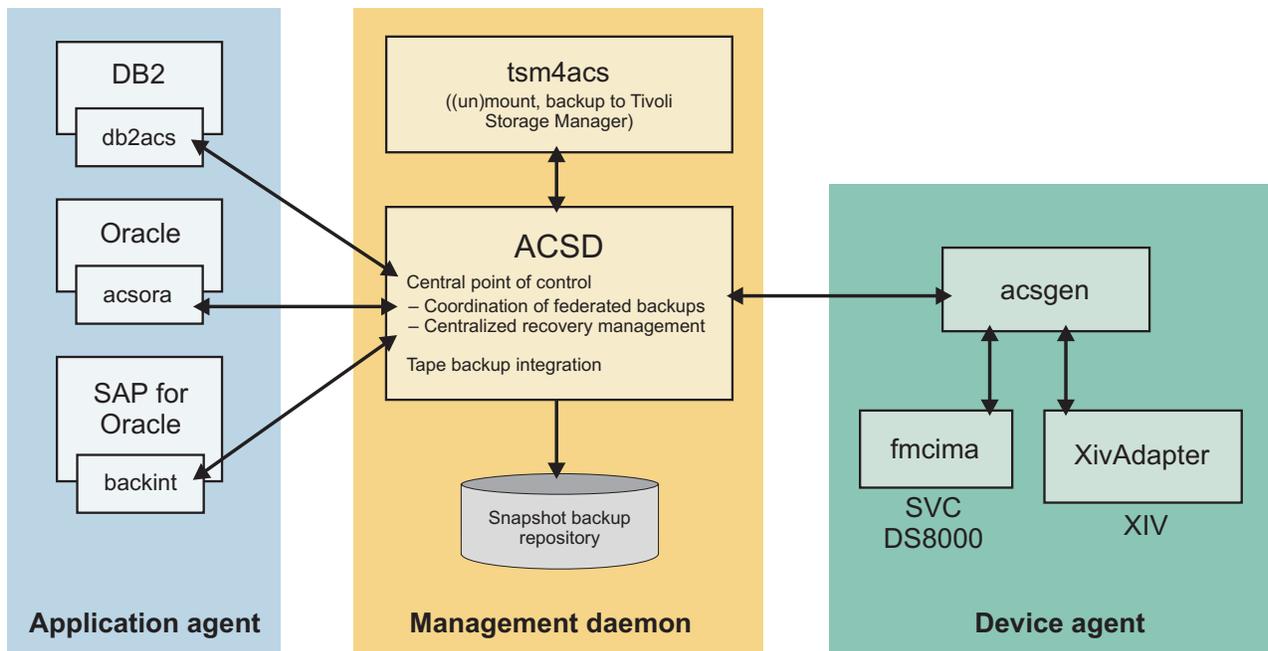


Figure 1. Overview of the IBM Tivoli Storage FlashCopy Manager install package

## Common IBM Tivoli Storage FlashCopy Manager components

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

### Application Client

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 IBM 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.

### 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(R) device (such as DS8000 and SAN Volume Controller) using the CIM interface.

#### **XIV Adapter 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)**

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. IBM Tivoli Storage FlashCopy Manager includes a license file that enables 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.

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## **Advanced functions**

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

### **Mounting of backup images**

IBM 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 IBM 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

IBM 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, IBM Tivoli Storage FlashCopy Manager might require a consistency check of the backup on a remote system. In those situations, IBM 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 application resides fully or partially on a JFS file system.
- The database is not suspended and I/O is not frozen during the backup.
- The database resides in an LVM mirrored environment.

## FlashCopy<sup>®</sup> back up of individual mirrors

Information is provided about the two types of mirroring that IBM Tivoli Storage FlashCopy Manager supports.

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

IBM Tivoli Storage FlashCopy Manager provides LVM mirroring support for DS8000, IBM XIV<sup>®</sup> Storage System, and SAN Volume Controller. For those devices, IBM Tivoli Storage FlashCopy Manager creates a FlashCopy<sup>®</sup> 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 IBM 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<sup>®</sup> per source volume. However, in LVM environments, each source volume is mirrored. Therefore, IBM Tivoli Storage FlashCopy Manager can create two INCREMENTAL FlashCopy<sup>®</sup> backups for DS8000.

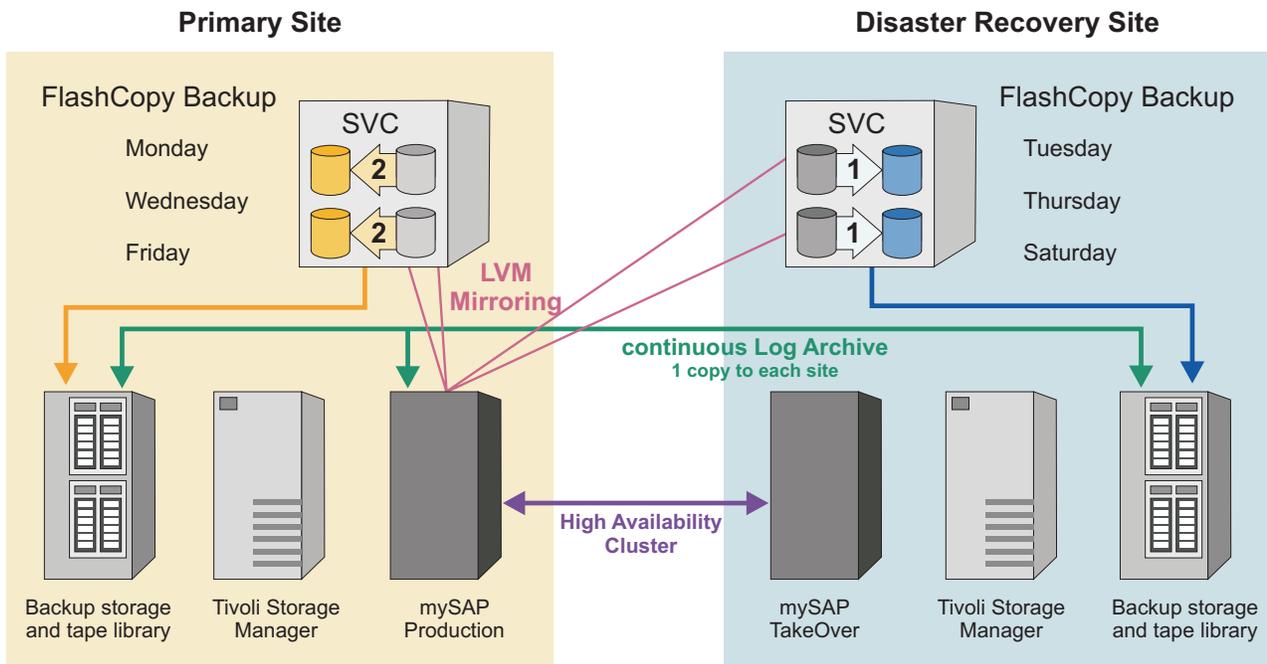


Figure 2. Cross-site mirrored SAP® Database protected with IBM Tivoli Storage FlashCopy Manager and Tivoli Storage Manager.

## Support of enhanced concurrent capable volume groups

In order to support high-availability environments, IBM 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. IBM 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, IBM Tivoli Storage FlashCopy Manager is capable for creating FlashCopy® backups of an individual failure group for all supported storage devices (DS8000, SAN Volume Controller, and IBM XIV® Storage System).

## Heterogeneous device mirroring

IBM 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

IBM 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)

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

- Back up to Tivoli Storage Manager immediately after the IBM 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.

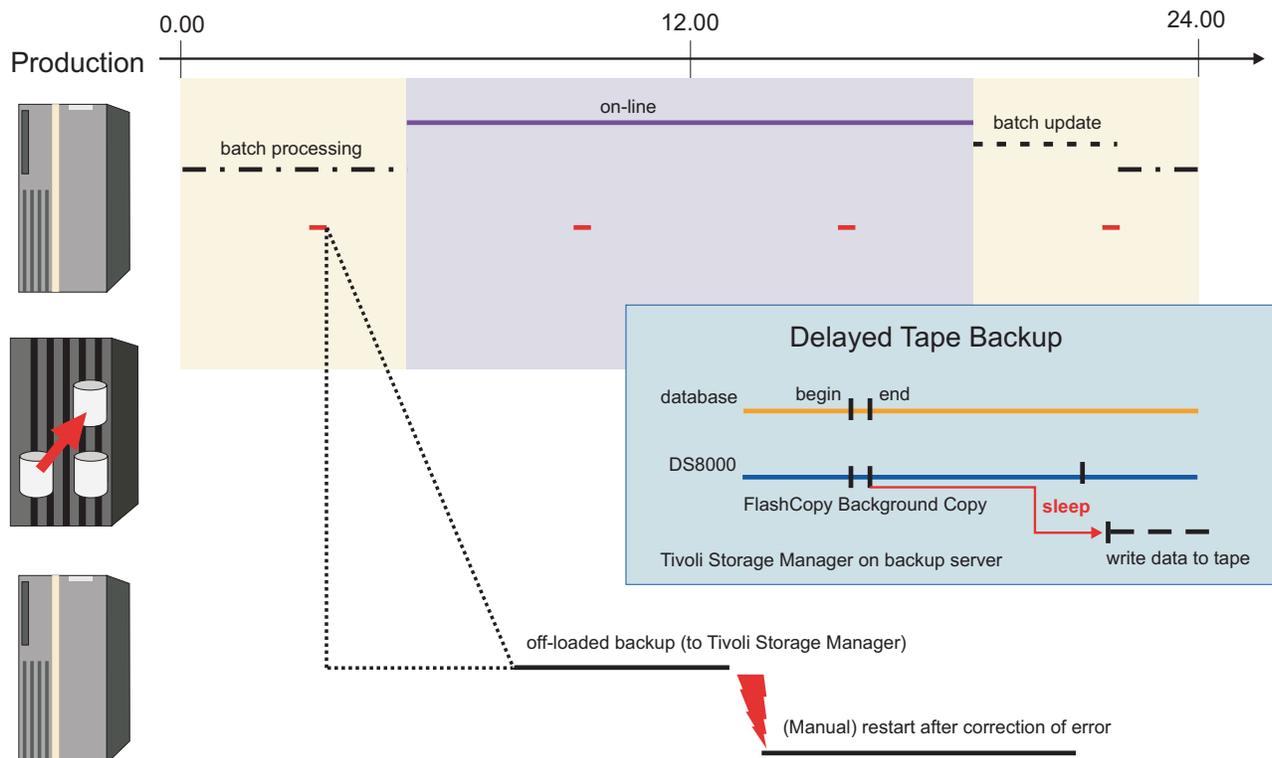


Figure 3. Overview of IBM Tivoli Storage FlashCopy Manager environment when integrated with Tivoli Storage Manager



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

Information is provided about preparing the applications, files, parameters, and devices in your IBM 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 IBM Tivoli Storage FlashCopy Manager prerequisite checklist available in the product release notes. The prerequisite checklist contains the most current requirement information and provides quick validation of your environment. IBM 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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### Preparing the production environment

All IBM 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. IBM Tivoli Storage FlashCopy Manager determines the volume groups to be backed up by mapping application data to files and directories. These files and directories are then mapped to file systems and volume groups. As a last step, IBM Tivoli Storage FlashCopy Manager determines the volumes that are subordinate to a volume group. It then triggers the appropriate storage subsystem-specific commands for creating a volume level copy on the storage device.

IBM 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, IBM Tivoli Storage FlashCopy Manager requires a correct disk layout in order to operate correctly.

## For native DB2 systems

Information is provided for preparing a native DB2 system.

IBM 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, those volume groups must reside on JFS or JFS2 file systems. Non-application data (that is stored on these volume groups) is also processed by IBM 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 IBM Tivoli Storage FlashCopy Manager detects such data in one of the volumes to be backed up, the backup operation fails. You can change this behavior by specifying the `NEGATIVE_LIST` profile parameter with the appropriate value:

- Specify `NEGATIVE_LIST <filename>` to provide IBM Tivoli Storage FlashCopy Manager with a list of files and directories that are allowed to participate in the backup.
- Specify `NEGATIVE_LIST NO_CHECK` to disable IBM Tivoli Storage FlashCopy Manager from checking for additional files at all. `NEGATIVE_LIST NO_CHECK` is the default value.
- Specify `NEGATIVE_LIST WARN` to disable IBM Tivoli Storage FlashCopy Manager from checking for additional files and issue warnings that non-application files are part of the backup and restore process.

**Attention:** Any non-application file that was accepted during backup processing using `NEGATIVE_LIST <filename>`, `NEGATIVE_LIST NO_CHECK`, or `NEGATIVE_LIST WARN`, is overwritten during restore.

IBM 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 6. 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
Log volume groups	supported storage subsystem	Log files	dedicated volume groups per database partition are required
Instance	storage subsystem	DB2 instance directory DB2 binary files	Currently IBM Tivoli Storage FlashCopy Manager does not require a specific storage layout for those objects. However, the data cannot 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 perform a roll forward recovery to the end of the logs because the latest online log files are overwritten by the log files contained in the backup. In addition, IBM 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.

## For 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 “For native DB2 systems” on page 14. In addition, IBM 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, IBM 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.

## For 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*.

IBM Tivoli Storage FlashCopy Manager requires that all database files, online redo logs, and control files reside on JFS or JFS2 file systems. The data that resides under the sapdata, origlog, and mirrlog directories must reside on separate volume groups. If other data is stored within those volume groups, it is processed by IBM Tivoli Storage FlashCopy Manager and included in the IBM 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 IBM Tivoli Storage FlashCopy Manager detects such data in one of the volumes to be backed up, the backup operation fails. You can change this behavior by providing SAP BR\*Tools with a list of files and directories that are allowed to participate in the backup (see the util\_vol\_nlist keyword that is specified in the BR\*Tools configuration file, init<SID>.sap). or disable SAP BR\*Tools from checking for additional files at all by specifying util\_vol\_nlist = no\_check. However, be aware that when util\_vol\_nlist = no\_check is specified, SAP BR\*Tools not only copies those files during backup, but also overwrites those files during restore.

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

Table 7. Volume group layout for SAP® with Oracle

Type of data	Location of data	Contents of data	Comments
sapdata	Supported storage subsystem	Database files Control files	One or more dedicated volume groups. It is allowed but not required that you are using dedicated volume groups for each sapdata subdirectory
origlog	Supported storage subsystem	Online redo logs Control files	one or more dedicated volume groups
mirrlog	Supported storage subsystem	Online redo logs Control files	one or more dedicated volume groups
other data	N/A	data of other applications	Recommended.  Currently IBM Tivoli Storage FlashCopy Manager does not require a specific storage layout for those objects.
rootvg	N/A	Operating system and other binary files	However, the data cannot be stored on one of the volume groups containing table spaces or logs.

IBM 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.

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

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

IBM 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 JFS, JFS2, or raw logical volumes. However, database control files must not reside in the same volume group as the database files. Raw physical volumes are only supported in ASM environments.

Non-application data (that is stored on these volume groups) is also processed by IBM 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 IBM Tivoli Storage FlashCopy Manager detects such data in one of the volumes to be backed up, the backup operation fails. You can change this behavior by specifying the `NEGATIVE_LIST` profile parameter with the appropriate value:

- Specify `NEGATIVE_LIST <filename>` to provide IBM Tivoli Storage FlashCopy Manager with a list of files and directories that are allowed to participate in the backup.

- Specify `NEGATIVE_LIST NO_CHECK` to disable IBM Tivoli Storage FlashCopy Manager from checking for additional files at all. `NEGATIVE_LIST NO_CHECK` is the default value.
- Specify `NEGATIVE_LIST WARN` to disable IBM Tivoli Storage FlashCopy Manager from checking for additional files and issue warnings that non-application files are part of the backup and restore process.

**Attention:** Any non-application file that was accepted during backup processing using `NEGATIVE_LIST <filename>`, `NEGATIVE_LIST NO_CHECK`, or `NEGATIVE_LIST WARN`, is overwritten during restore.

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

*Table 8. 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	Online redo logs	Currently not required, but recommended.
Offline redo log volume group	N/A	Offline redo logs	Currently IBM Tivoli Storage FlashCopy Manager does not require a specific storage layout for those objects.
Binary files, control files	N/A	Binary files, control files	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	

IBM Tivoli Storage FlashCopy Manager requires the use of a catalog database. IBM 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.

## For Oracle ASM

Information is provided for preparing an Oracle ASM environment.

IBM Tivoli Storage FlashCopy Manager only supports Oracle ASM environments when ASM disk groups are set up on raw physical volumes. Since IBM Tivoli Storage FlashCopy Manager processes database files at the ASM disk group level, the database files are required to reside on dedicated disk groups. Non-application data (that is stored on these disk groups) is also processed by IBM 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 IBM Tivoli Storage FlashCopy

Manager detects such data in one of the volumes to be backed up, the backup operation fails. You can change this behavior by specifying the `NEGATIVE_LIST` profile parameter with the appropriate value:

- Specify `NEGATIVE_LIST <filename>` to provide IBM Tivoli Storage FlashCopy Manager with a list of ASM files that are allowed to participate in the backup.
- Specify `NEGATIVE_LIST NO_CHECK` to disable IBM Tivoli Storage FlashCopy Manager from checking for additional files at all. `NEGATIVE_LIST NO_CHECK` is the default value.
- Specify `NEGATIVE_LIST WARN` to disable IBM Tivoli Storage FlashCopy Manager from checking for additional files and issue warnings that non-application files are part of the backup and restore process.

**Attention:** Any non-application file that was accepted during backup processing using `NEGATIVE_LIST <filename>`, `NEGATIVE_LIST NO_CHECK`, or `NEGATIVE_LIST WARN`, is overwritten during restore.

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

*Table 9. 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 recommended.
Offline redo log disk groups	N/A	Offline redo logs	Currently IBM Tivoli Storage FlashCopy Manager does not require a specific storage layout for those objects. They might reside within ASM or within the file system. However, this data cannot 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	

IBM Tivoli Storage FlashCopy Manager requires the use of a catalog database. Typically one ASM instance can serve multiple databases. IBM 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, IBM Tivoli Storage FlashCopy Manager handles failure groups in a unique manner as described in “ASM failure group support” on page 21. For DS8000, IBM Tivoli Storage FlashCopy Manager 2.1 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. IBM 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.

While configuring the backup system for offload operations, specify `ASM_DISKSTRING /dev/rhdisk*` in the `init<ASM_SID>.ora` file. A disk group must also 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 resides 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.

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.

## Using symbolic links

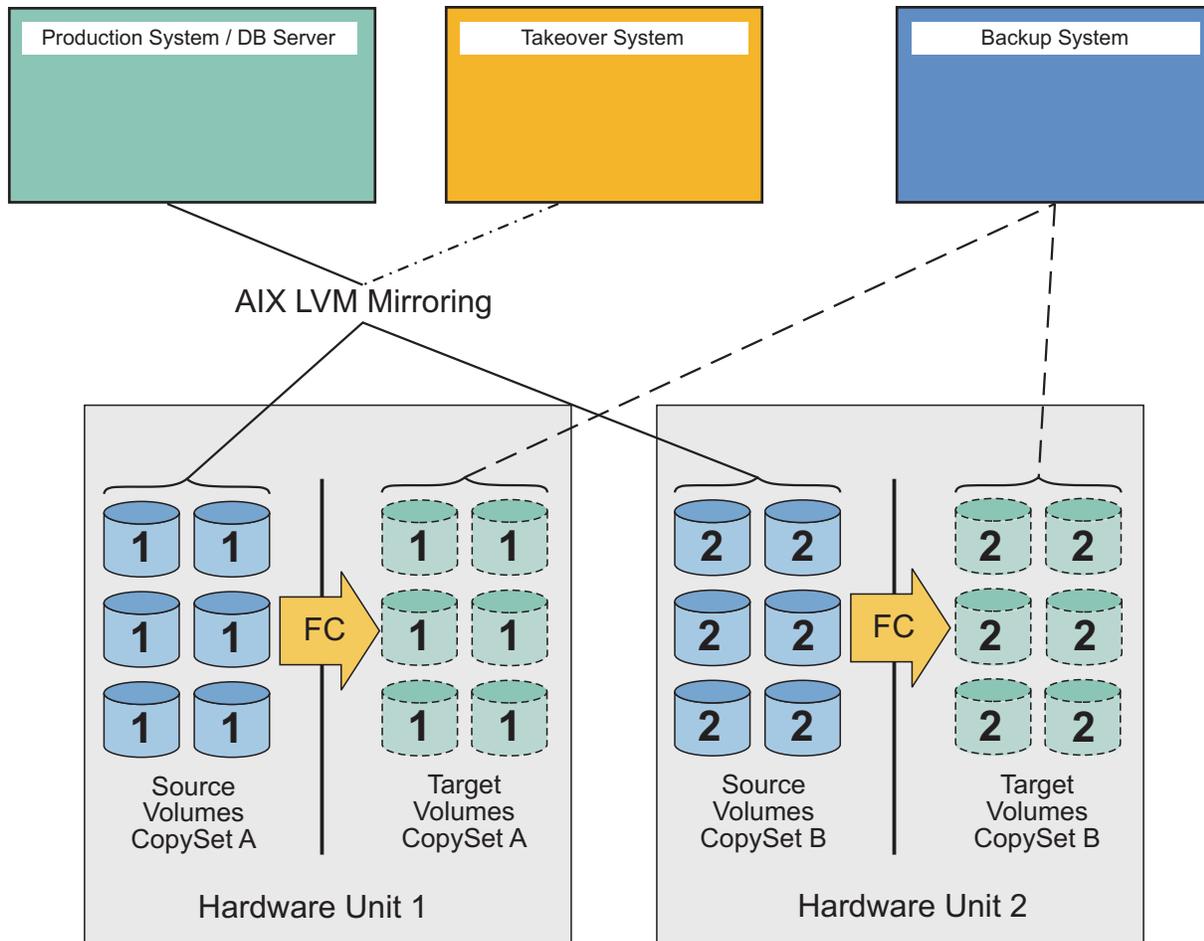
IBM Tivoli Storage FlashCopy Manager can follow symbolic links when application data is mapped to volume groups.

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 Mirroring support

IBM Tivoli Storage FlashCopy Manager supports environments where volume groups are mirrored between two storage clusters using Logical Volume Mirroring (LVM).

This support is provided on DS8000, SAN Volume Controller, 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 4. IBM 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.
- IBM 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.

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

In order to configure IBM Tivoli Storage FlashCopy Manager for LVM mirroring, define both storage subsystems within the IBM Tivoli Storage FlashCopy Manager profile. Use the `DEVICE_CLASS` parameter to allow IBM Tivoli Storage FlashCopy Manager to select the storage subsystem. At least one backup server is required so that IBM 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, IBM 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, IBM 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 IBM Tivoli Storage FlashCopy Manager profile (using the `DEVICE_CLASS` profile parameter). These definitions must specify that IBM 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, IBM Tivoli Storage FlashCopy Manager backs up all failure groups.
- IBM 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, IBM 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<sup>®</sup> Storage System

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

In addition, the IBM XIV<sup>®</sup> 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<sup>®</sup> 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<sup>®</sup> Storage System that deletes snapshots created with IBM Tivoli Storage FlashCopy Manager. For that purpose, IBM 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, IBM Tivoli Storage FlashCopy Manager also removes snapshots on the storage device it created and that are not reflected in the IBM 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 IBM 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 IBM 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.

## DS8000 and SAN Volume Controller

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

IBM 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. IBM 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.

Unlike IBM XIV<sup>®</sup> Storage Systems, IBM 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 IBM Tivoli Storage FlashCopy Manager, you must organize target volumes into target sets, where each target set represents one backup generation. Although IBM 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.

### SAN Volume Controller 5.1

SAN Volume Controller 5.1 introduces new capabilities for IBM Tivoli Storage FlashCopy Manager.

#### SAN Volume Controller 5.1

SAN Volume Controller 5.1 adds a new feature to cascading FlashCopy that allows IBM 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 IBM Tivoli Storage FlashCopy Manager with SAN Volume Controller 5.1:

#### 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, IBM 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 deleted.

In order to check if a backup will be deleted, you can query the usability state of IBM 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

IBM 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 IBM 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 IBM 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 environments:

- Make a choice 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 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 24:00.

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

This 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 0:00 TO 5:59
DEVICE_CLASS DISK_TSM FROM 6:00 TO 23:59
<<<
>>> DISK_ONLY
COPYSERVICES_HARDWARE_TYPE SVC
FLASHCOPY_TYPE NOCOPY # space efficient targets
TARGET_SETS 1 2 3
TARGET_NAMING %SOURCE_%TARGETSET
...
<<<
>>> DISK_TSM
COPYSERVICES_HARDWARE_TYPE SVC
FLASHCOPY_TYPE NOCOPY # space efficient targets
TARGET_SETS DUAL
TARGET_NAMING %SOURCE_%TARGETSET
...
<<<
```

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 1 3 5 FROM 0:00 TO 5:59
DEVICE_CLASS MIRROR_1_DISK_TSM USE_AT 1 3 5 FROM 6:00 TO 23:59
DEVICE_CLASS MIRROR_2 USE_AT 0 2 4 6
<<<
>>> MIRROR_1_DISK_ONLY
COPYSERVICES_HARDWARE_TYPE SVC
FLASHCOPY_TYPE NOCOPY # space efficient targets
TARGET_SETS DO
TARGET_NAMING %SOURCE_%TARGETSET
...
<<<
>>> MIRROR_1_DISK_TSM
COPYSERVICES_HARDWARE_TYPE SVC
FLASHCOPY_TYPE NOCOPY # space efficient targets
TARGET_SETS DT
TARGET_NAMING %SOURCE_%TARGETSET
...
<<<
>>> MIRROR_2
COPYSERVICES_HARDWARE_TYPE SVC
FLASHCOPY_TYPE INCR
TARGET_SETS 1
TARGET_NAMING %SOURCE_%TARGETSET
...
<<<
```

This example is the same as the example of a profile in a non-mirrored environment. However, 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 1 3 5
DEVICE_CLASS MIRROR_2 USE_AT 0 2 4 6
<<<
>>> 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
...
<<<
>>> MIRROR_2
COPYSERVICES_HARDWARE_TYPE SVC
FLASHCOPY_TYPE INCR
TARGET_SETS 1
TARGET_NAMING %SOURCE_%TARGETSET
...
<<<
```

## Target set definitions

IBM Tivoli Storage FlashCopy Manager requires target sets to be defined.

Define targets by using a target set definition file (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 file for Oracle and for single partitioned DB2 databases

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

IBM 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 target set definition file. In this situation, the relation between the source and target is required. Backup processing fails if one of the targets is unavailable for the specified source.

If IBM 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 definiton
TARGET_VOLUME 40C13158 40613158
TARGET_VOLUME 40D13158 40713158
TARGET_VOLUME 40D13158 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.

IBM Tivoli Storage FlashCopy Manager supports using a naming convention (instead of a definition file) for target set definitions on SAN Volume Controller. IBM 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 IBM 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

IBM 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
<<<

```

## 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 IBM Tivoli Storage FlashCopy Manager. To implement such a backup strategy, define multiple DEVICE\_CLASS sections in the profile, where each specifies the same storage device. The only difference is that each specifies a different FlashCopy type. These DEVICE\_CLASS section definitions allow rules to be defined in the CLIENT profile section. These rules allow IBM 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.

*Table 10. 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. It is not recommended to create a COPY FlashCopy® to a space efficient target. This recommendation is because the target eventually becomes fully allocated due to background copying of data.
INCR	Recommended option for DS8000. Same characteristics as COPY FlashCopy® but with less data being copied in the background. DS8000 allows at most one INCR FlashCopy® per source volume. In mirroring environments, this setting allows it to retain one backup generation per mirror.	Same characteristics as COPY FlashCopy® but with less data being copied in the background. It is not recommended to create an INCR FlashCopy to a space efficient target. This recommendation is because the target eventually becomes fully allocated due to background copying of data.

Table 10. Selecting the FLASHCOPY\_TYPE for DS8000 and SAN Volume Controller (continued)

FLASHCOPY_TYPE	DS8000	SAN Volume Controller <sup>1</sup>
NOCOPY	Can be mounted remotely but cannot be restored.	<p>Can be mounted remotely. SAN Volume Controller 5.1 is required to restore from a NOCOPY FlashCopy.</p> <p>Can be used to create a FlashCopy<sup>®</sup> to a space efficient target, but does not offer protection from physical failures to the source volume.</p> <p><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.</p>

**Note:**

1. See “SAN Volume Controller 5.1” on page 23 for planning and configuration details when using SAN Volume Controller 5.1.

## Integration with Metro Mirror and Global Mirror

IBM 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<sup>®</sup> targets as Metro Mirror and Global Mirror sources, it is not recommended when using IBM Tivoli Storage FlashCopy Manager. Using FlashCopy<sup>®</sup> targets as Metro Mirror and Global Mirror sources is not supported on SAN Volume Controller.

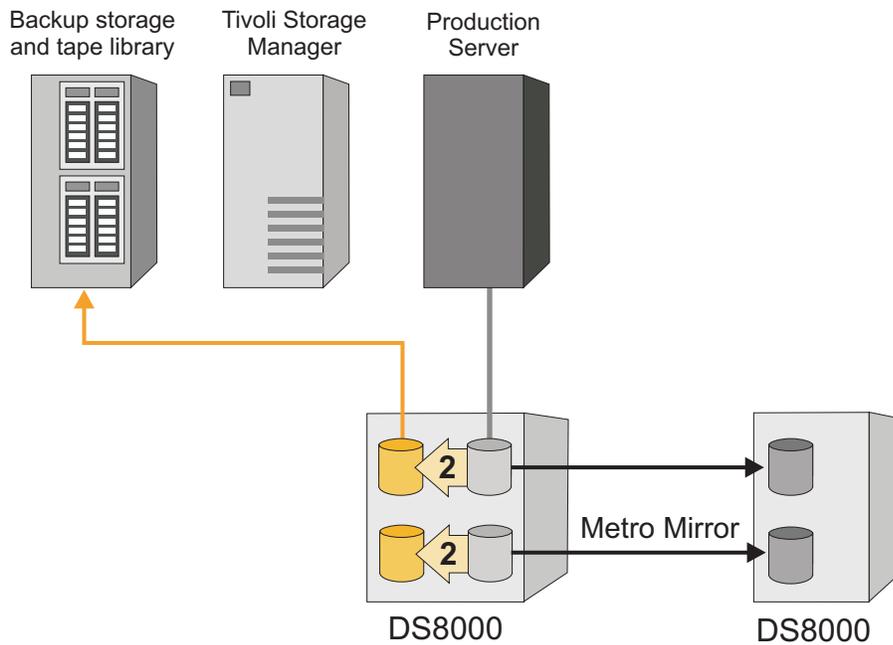


Figure 5. Metro Mirror and Global Mirror relations

## A note on 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 IBM 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 IBM 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 11. STORAGE\_SYSTEM\_ID parameter description

Parameter Name	Value
STORAGE_SYSTEM_ID <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 servers

A backup server is an auxiliary host where IBM Tivoli Storage FlashCopy Manager can mount some (or all) of its backups.

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 servers for a single application are also supported, and also sharing a backup server among multiple applications. However, IBM Tivoli Storage FlashCopy Manager does not allow backup images to be mounted directly on the production system. As a result, a backup server is always required to be a separate host.

## Determining the number of backup servers in the environment

Once the production database has been prepared for use with IBM Tivoli Storage FlashCopy Manager, determine how many backup servers are needed in your environment.

A backup server allows the mounting of a backup image. If IBM Tivoli Storage FlashCopy Manager is used in combination with Tivoli Storage Manager, IBM 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:

- Mount backups on another system (for example, on the backup server)
- Create a backup to tape for instance using Tivoli Storage Manager
- IBM Tivoli Storage FlashCopy Manager enforces a mount during backup. This enforcement occurs when these conditions exist:
  - Your database is running in an LVM mirrored environment
  - Your database is running on a JFS
  - Your database is running on a JFS2 and the file systems are not frozen during the backup (see the LVM\_FREEZE\_THAW and TARGET\_DATABASE\_SUSPEND parameters)

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.

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.

## Installation prerequisites for a backup server

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

A database instance is required on each backup server (except for Oracle in an SAP® environment). For Oracle ASM, an ASM instance is required on each backup server (a single ASM instance can be used for multiple production systems).

If IBM 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. IBM Tivoli Storage FlashCopy Manager uses these application agents for offload backup:

- DB2 native Tivoli Storage Manager agent for non-SAP® DB2 environments
- IBM Tivoli Storage Manager for Enterprise Resource Planning for SAP® on DB2 and SAP® on Oracle
- Tivoli Storage Manager for Databases for Oracle in non-SAP® environments

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

As a result, IBM 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® and non-SAP®): 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® 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 all applications: The appropriate Tivoli Storage Manager application agent (as previously identified) is installed and configured. The Tivoli Storage Manager application version on the backup server must be the same level on the production server.

For Oracle in SAP® environments, Oracle instances or SAP® BR\*Tools are not required to be installed on the backup 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 server assignment

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

Issue the mount request command (`tsm4acs -f mount`) on the production server to perform a mount. IBM Tivoli Storage FlashCopy Manager selects the backup server on which the backup is mounted in the following manner:

1. It determines the name of the device configuration section (`DEVICE_CLASS`) which was used to create the backup.
2. It then determines those servers which are eligible to mount backups for this `DEVICE_CLASS`.

On each backup 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 need to be mounted must also be assigned to the selected backup servers before attempting a mount. For IBM XIV<sup>®</sup> Storage Systems, this assignment is automatically performed during the mount request. In mirroring environments, the device configuration section refers to that storage cluster on which the backup was created. For Oracle environments and for each DB2 database partition, IBM Tivoli Storage FlashCopy Manager allows for exactly one backup server per `DEVICE_CLASS`. If the identified servers have not yet mounted another backup image, the mount request is propagated to those servers. The backup is then mounted.

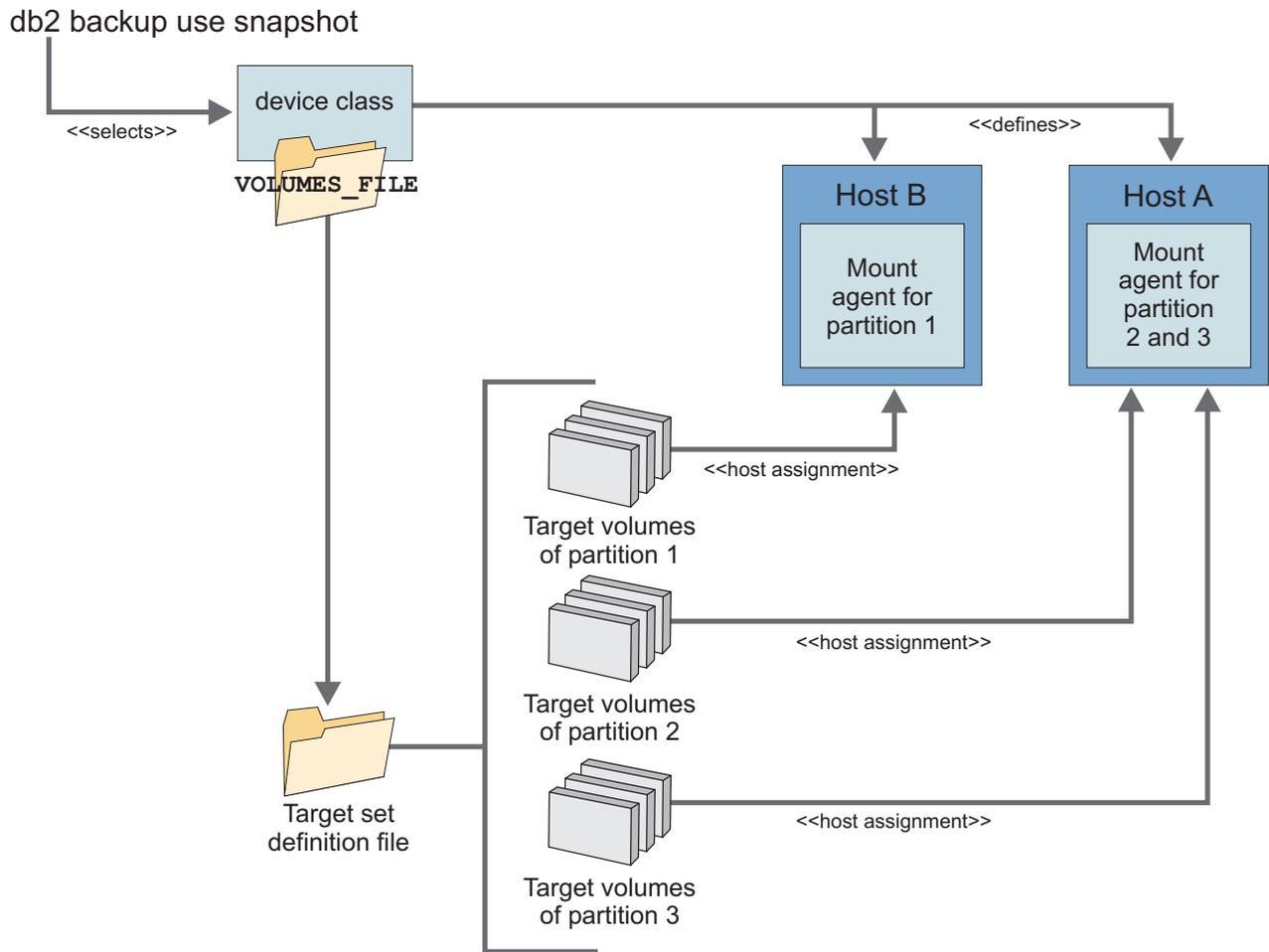


Figure 6. IBM Tivoli Storage FlashCopy Manager host assignments for DB2.

For DS8000 and SAN Volume Controller, IBM Tivoli Storage FlashCopy Manager requires the target volumes to be preassigned to a specific backup server. Because a DEVICE\_CLASS always directs mount requests to the same server, assigning target volumes to a particular backup server before mounting. This task is accomplished by ensuring 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 server.

## Managing backups with the DEVICE\_CLASS parameter in the CLIENT section

Use the DEVICE\_CLASS parameter to set backup criteria.

The IBM 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

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® 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

## Examples 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 four partitions. While partition 0 uses `DEVICE_CLASS PARTITION 1`, 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
[...]
<<<
```



---

## Chapter 3. Installing IBM 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 IBM Tivoli Storage FlashCopy Manager product code
  - “Installing on the production server and remotely on the backup server” on page 41
  - “Installing separately on the backup server” on page 43
3. “Setting up the disk storage environment” on page 44

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### Preparing the environment for installation

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

**Important:** Before attempting to install IBM Tivoli Storage FlashCopy Manager, make sure to review the prerequisite checklist available from the release notes. Also, make sure to read and understand the installation and setup concepts presented in this section.

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

#### Overview: Installing the product code

IBM 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, IBM Tivoli Storage FlashCopy Manager only needs to be installed on one of the production systems. The IBM Tivoli Storage FlashCopy Manager installation directory is `/usr/tivoli/tsfcm/acs_2.1.0.0`.

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

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

- (DB2) `<Instance owner $HOME directory>/sqlib/acs/`
- (Oracle) `<Instance owner $HOME directory>/acs/`

## Overview: Setting up your environment

After installation (and activation) completes, use the setup script to set up IBM 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, IBM Tivoli Storage FlashCopy Manager creates the following:

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

The setup script can be used to install IBM 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. However, NFS shares between the production system and backup system nodes are not required for this type of remote installation. In addition, when the setup script is used to update the profile, you are prompted whether to update the backup system nodes. OpenSSH is the preferred method for IBM Tivoli Storage FlashCopy Manager but NFS shares are still supported.

When INST\_DIR is NFS-shared with other nodes, IBM 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 IBM Tivoli Storage FlashCopy Manager on the backup system nodes.

If both the configuration directory (ACS\_DIR) and the database instance-specific installation directory (INST\_DIR) are NFS-shared between all production system and backup system nodes, IBM 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 IBM Tivoli Storage FlashCopy Manager was installed. For the initial configuration, IBM 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. Exceptions to this rule might include:

- The use of alternative storage hardware may require a reconfiguration of IBM 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 IBM Tivoli Storage FlashCopy Manager on the production system before reconfiguration of the backup system. Otherwise you will be prompted to stop IBM Tivoli Storage FlashCopy Manager on the production system. See Chapter 5, “IBM Tivoli Storage FlashCopy Manager commands and scripts,” on page 59 for details regarding how to stop an activated

---

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

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

```
<version>-TIV-TSFCM-<OS-platform>.bin
```

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 IBM 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**:

**Enter:**

```
./<version>-TIV-TSFCM-<OS-platform>.bin
```

- **Console mode**

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

```
./<version>-TIV-TSFCM-<OS-platform>.bin -i console
```

- **Silent mode**

Silent mode installs and distributes IBM Tivoli Storage FlashCopy Manager in the non-graphic console mode. Since it requires additional tasks, instructions for this installation mode are available in “Installing IBM Tivoli Storage FlashCopy Manager in silent mode” on page 156.

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.
5. Log in to the production server as the **database instance owner** and change to the working directory for `INST_DIR`.
  - (DB2 `INST_DIR`): `/INST_DIR/sql1lib/acs`
  - (Oracle or SAP® with Oracle `INST_DIR`): `/INST_DIR/acs`
6. Start the setup script (without options) by entering the appropriate command for your database environment and press **Enter**:
  - DB2: `./setup_db2.sh`
  - Oracle: `./setup_ora.sh`
  - SAP® with Oracle: `./setup_sapora.sh`
7. Follow the setup script instructions that display. Refer to the completed IBM Tivoli Storage FlashCopy Manager installation sheet identified in “Preparing

the environment for installation” on page 39. 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 IBM 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 IBM Tivoli Storage FlashCopy Manager on the backup server as a separate installation. See “Installing separately on the backup server” on page 43 for details about this configuration.

b. 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 IBM 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.

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

Offloaded backups to Tivoli Storage Manager are performed by the IBM 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 perform the backup to Tivoli Storage Manager immediately after the FlashCopy backup completes. The offload agent (tsm4acs) is added to the /etc/inittab.

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 high-availability (HA) environments, nothing is added to /etc/inittab since tsm4acs must be added to the HA script instead.

d. Do you want to install in an HA environment? [Y/N]

IBM Tivoli Storage FlashCopy Manager requires at least two daemon processes to be running at all times. Typically, the configuration wizard registers the IBM 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 IBM 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.

- Specify YES for the required executable files (including command-line options) to display and for these two daemon processes NOT to be added to the /etc/inittab. You must make sure that they are started by your HA startup scripts.
  - Specify NO to use /etc/inittab. This value is the default behavior.
- e. Do you want to install a new backup server using the OpenSSH protocol? [Y/N]

IBM 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 servers” on page 32 and “Managing backups with the DEVICE\_CLASS parameter in the CLIENT section” on page 35 for helpful information about these conditions.

Specify YES to use 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. Either select a DEVICE\_CLASS from the list displayed on the console or press **Enter** to select all listed DEVICE\_CLASS parameters.

Specify NO 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.

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 the parameter value.

**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.

---

## Installing separately on the backup server

This separate installation of IBM 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 INST\_DIR and ACS\_DIR from production system to the backup system is not possible.

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

- “Preparation of the backup servers” on page 32
  - “Managing backups with the DEVICE\_CLASS parameter in the CLIENT section” on page 35
1. Log in to the backup server as user ID **root**.
  2. Use one of these three modes to install IBM 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-TSFCM-<OS-platform>.bin
    - **Console mode**  
To install in console mode, specify this command and press **Enter**:  
./<version>-TIV-TSFCM-<OS-platform>.bin -i console
    - **Silent mode**  
Silent mode installs and distributes IBM Tivoli Storage FlashCopy Manager in the non-graphic console mode. Since it requires additional tasks, instructions for this installation mode are available in “Installing IBM Tivoli Storage FlashCopy Manager in silent mode” on page 156.
  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.
  5. Log in to the backup server as the **database instance owner** and change to the working directory for INST\_DIR.
    - (DB2 INST\_DIR): /INST\_DIR/sql1lib/acs
    - (Oracle or SAP® with Oracle INST\_DIR): /INST\_DIR/acs
  6. Start the setup script (without options) by entering the appropriate command for your database environment and press **Enter**:
    - DB2: ./setup\_db2.sh
    - Oracle: ./setup\_ora.sh
    - SAP® with Oracle: ./setup\_sapora.sh
  7. Follow the setup script instructions that display. See “Installing on the production server and remotely on the backup server” on page 41 for more information about the configuration wizard.

---

## 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 13 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

Virtual disks must be defined for the SAN Volume Controller.

This procedure uses the SAN Volume Controller Console to complete the tasks. Be aware that the SAN Volume Controller 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 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 environment.
- Each host has at least two (or more) paths to the SAN Volume Controller 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 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%TARGET\_SET. Using this target naming definition, the source volume A01pro1\_1, with target set named 1, results in target volume A01pro1\_1\_t1.

---

## Chapter 4. Protecting data with IBM Tivoli Storage FlashCopy Manager

Information needed to back up and restore data on FlashCopy devices and snapshot devices with IBM Tivoli Storage FlashCopy Manager is provided.

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

---

### Backing up data with IBM Tivoli Storage FlashCopy Manager

Detailed instructions regarding how to back up DB2 (native and SAP<sup>®</sup> on DB2), Oracle (native), and SAP<sup>®</sup> with Oracle databases are provided.

IBM 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 12. 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>	tsm4acs -f tape_backup <sup>2</sup>
DB2 (SAP <sup>®</sup> )	db2 backup .... use snapshot ...	db2 backup... load <library> or backom	db2 backup .... use snapshot <sup>1</sup>	tsm4acs -f tape_backup <sup>2</sup>

#### Note:

1. In addition, the profile parameter TSM\_BACKUP is set to YES and tsm4acs is running in daemon mode on the production server.
2. In addition, the profile parameter TSM\_BACKUP is set to YES and 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 IBM 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 IBM Tivoli Storage FlashCopy Manager profile is used, specify the default INST\_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**

IBM Tivoli Storage FlashCopy Manager (tsm4acs) 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 IBM Tivoli Storage FlashCopy Manager profile initiates a tape backup from the snapshot target set when the snapshot has completed.
- The 'tape\_backup' function of IBM Tivoli Storage FlashCopy Manager (tsm4acs), backs up a previously generated snapshot.

IBM Tivoli Storage FlashCopy Manager and IBM Tivoli Storage Manager for Enterprise Resource Planning use their own profiles. The IBM 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 IBM 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**

"IBM Tivoli Storage FlashCopy Manager profile description" on page 87

#### **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). IBM 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. IBM 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. IBM 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, tsm4acs must be used to perform the restore. The restore proceeds in parallel for all the logical partitions specified in PARTITION\_GROUP.

**Related reference**

“IBM Tivoli Storage FlashCopy Manager profile parameters” on page 91

“Offload Agent (tsm4acs)” on page 78

**Backing up a native Oracle database**

IBM 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 13. 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 running tsm4acs in daemon mode on the production server	'tsm4acs -f tape_backup' with profile parameter TSM_BACKUP set to YES and tsm4acs not running in daemon mode

IBM Tivoli Storage FlashCopy Manager backs up the database control file and the database profile on the production system to the IBM Tivoli Storage FlashCopy Manager repository. These files are required by IBM 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).

IBM 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 IBM 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 tdpo.opt 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 143.

### Manually backing up a native Oracle database:

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

Table 14. Files used during a manual backup

File name	Description	Default Location
acsora	IBM Tivoli Storage FlashCopy Manager production system executable file	INST_DIR/acs
tsm4acs	IBM Tivoli Storage FlashCopy Manager production and backup system executable file	INST_DIR/acs
profile	IBM 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 -p
```

#### Related concepts

“IBM Tivoli Storage FlashCopy Manager profile description” on page 87

## 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 tsm4acs runs in daemon mode started by the init daemon. Asynchronous means that tsm4acs on the production server is started manually or by another scheduler. 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 which way he wants to run tsm4acs.

### Related concepts

“IBM Tivoli Storage FlashCopy Manager profile description” on page 87

## 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 15. 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>	tsm4acs -f tape_backup <sup>2</sup>

### Note:

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

The following parameters are used in the init<DBSID>.sap configuration files in these scenarios:

- **backup\_dev\_type:** Specifies to back up at file level (util\_file, util\_file\_online) or at volume level (util\_vol, util\_vol\_online). A backup at volume level still results in backint calls with -t volume | volume\_online and -t file | file\_online values.
- **util\_par\_file:** Specifies the path to the profile (sent to backint) using the -p parameter.
- **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. The recommended value is 'all\_data'. This requires a disk layout with at least three volume groups:
  - At least one volume group for sapdata.

- At least one volume group for origlog.
- At least one volume group for mirrlog.

## Backup scenario 1: IBM Tivoli Storage FlashCopy Manager only

This scenario demonstrates how the SAP® BR\*Tool brbackup interacts with IBM 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

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

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

IBM Tivoli Storage FlashCopy Manager (backint) transfers the Oracle control files into the IBM Tivoli Storage FlashCopy Manager repository. Since IBM Tivoli Storage Manager for Enterprise Resource Planning 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 IBM Tivoli Storage FlashCopy Manager INST\_DIR in the SAP® BR\*Tools profile (init<DBSID>.sap).

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

Contents of the SAP® BR\*Tools profile (init<DBSID>.sap):

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

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

```
TSM_BACKUP NO
```

- All files are transferred to the IBM 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 IBM 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 flashcopymanagerprofile file.

## Backup scenario 2: IBM Tivoli Storage FlashCopy Manager and IBM Tivoli Storage Manager for Enterprise Resource Planning installed

This scenario demonstrates how the same backint profile (init<DBSID>.uti) and SAP® BR\*Tools profile (.sap) can be used for a **diskonly** backup and a **dual** backup. Therefore at least two device classes are needed in the backint profile (init<DBSID>.uti). They can be scheduled using concepts described in “Managing backups with the DEVICE\_CLASS parameter in the CLIENT section” on page 35. 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.

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 IBM Tivoli Storage Manager for Enterprise Resource Planning installation directory.
- A link named `backint_volume` in `/usr/sap/<SID>/SYS/exe/run` points to `backint` that resides in the IBM Tivoli Storage FlashCopy Manager installation directory.

Settings of the common IBM 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 IBM Tivoli Storage Manager for Enterprise Resource Planning 6.1.1 (or later). For prior releases of IBM Tivoli Storage Manager for Enterprise Resource Planning, control the device class by defining multiple BR\*Tools configuration profiles (`.sap`) in your environment.

Contents of the common SAP® BR\*Tools profile (`init<DBSID>.sap`):

```
backup_dev_type = util_vol | util_vol_online
util_par_file = <ACS_DIR>/commonprofile.utl
```

- IBM 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 IBM Tivoli Storage FlashCopy Manager repository, specify the IBM Tivoli Storage FlashCopy Manager installation directory with the `util_path` option in the SAP® BR\*Tools profile (`init<DBSID>.sap`).

The IBM Tivoli Storage Manager for Enterprise Resource Planning executable is invoked from `/usr/sap/<SID>/SYS/exe/run` and invokes `backint_volume`, which links to IBM Tivoli Storage FlashCopy Manager to perform the snapshot part of the backup. Invoking IBM 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 `init<DBSID>.sap` files used during the original backup operation must be specified. For dual backups with IBM Tivoli Storage FlashCopy Manager and IBM Tivoli Storage Manager for Enterprise Resource Planning, use the `init<DBSID>.sap` file to restore both backups: **diskonly** and **dual**. IBM Tivoli Storage Manager for Enterprise Resource Planning delegates the restore of the snapshot backup to IBM Tivoli Storage FlashCopy Manager.

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

This scenario demonstrates how IBM 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 (init<DBSID>.sap) and the IBM Tivoli Storage FlashCopy Manager profile (<ACS\_DIR>/profile) are the same as shown in Scenario 1.

The configuration below is for a tape backup from the production system with a third-party product. Backint in /usr/sap/<SID>/SYS/exe/run is the installed third-party product. Contents of the SAP® profile (init<DBSID>vendor.sap):

```
backup_dev_type = util_file | util_file_online
util_par_file = <profile_for_vendor_product>
```

### 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 IBM Tivoli Storage FlashCopy Manager when the SAP® BR\*Tools profile (init<DBSID>.sap) is set up correctly.

---

## Restoring data with IBM Tivoli Storage FlashCopy Manager

Detailed instructions regarding how to restore DB2 (native and SAP® on DB2), Oracle (native), and SAP® with Oracle databases are provided.

IBM 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 16. 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 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).

(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 IBM Tivoli Storage FlashCopy Manager tsm4acs command with this syntax:

```
tsm4acs -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.

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 17. 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 datafile 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. Perform an RMAN **run** command by specifying the allocation of channels and the restoration of the database:

```
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;
}
```

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 (Datafile Only):

Perform these tasks to restore IBM Tivoli Storage FlashCopy Manager backups with datafile granularity.

Perform the following steps to restore a datafile only:

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
```

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

4. Perform an RMAN **run** command by specifying the allocation of channels and the restoration of the datafile *n*, where *n* is the number of the datafile:

```
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;
}
```

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

```
alter database datafile n online;
```

6. Recover the datafile 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 18. Summary of Restore Commands for SAP® with Oracle*

Snapshot Restore	Restore from Tivoli Storage Manager
brrestore -d util_vol .....	brrestore -d util_file
brrecover	brrecover

---

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

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

---

### IBM Tivoli Storage FlashCopy Manager commands and scripts

This section describes the command entries used to run the various components of IBM Tivoli Storage FlashCopy Manager.

*Table 19. Summary of IBM Tivoli Storage FlashCopy Manager commands and scripts*

Command	Description
Setup script	"Installation setup script"
Profile Wizard (wizard)	"Profile Wizard (wizard)" on page 64
Management Agent (acsd)	"Management Agent (acsd)" on page 66
Generic Device Agent (acsgen)	"Generic Device Agent (acsgen)" on page 68
Query Managed Capacity (fmquery)	"Query Managed Capacity (fmquery)" on page 70
Offload Agent (tsm4acs)	"Offload Agent (tsm4acs)" on page 78
DB2 Advanced Copy Services commands (these use the IBM Tivoli Storage FlashCopy Manager snapshot backup library)	"DB2 Advanced Copy Services commands" on page 78
(Oracle) Snapshot Object Manager (acsutil)	"Snapshot Object Manager for Oracle (acsutil)" on page 73
(Oracle) Production system user interface (acsora)	"Production System User Interface for Oracle (acsora)" on page 71
(SAP® with Oracle) IBM Tivoli Storage FlashCopy Manager for SAP® with Oracle (backint)	"IBM Tivoli Storage FlashCopy Manager for SAP® with Oracle (backint)" on page 75

Unless otherwise stated, file and directory specifications in the following commands must be fully qualified names. As a general rule, relative names are not supported.

---

### Installation setup script

The setup script for each database variant provides several action options which are usually employed internally by the IBM Tivoli Storage FlashCopy Manager installer. It is also used without options to perform the manual IBM Tivoli Storage FlashCopy Manager setup and basic configuration.

#### Overview

The setup script uses this command syntax:

```
setup_<database>.sh [-a action  
                   -d <Instance directory>
```

You can use the setup script for the following purposes:

- Activation or upgrade of IBM Tivoli Storage FlashCopy Manager for one instance, as root:

```
setup_<database>.sh -a install -d <INST_DIR>
```

- Initial configuration and reconfiguration:

```
setup_<database>.sh
```

- Stopping an activated instance:

```
setup_<database>.sh -a stop -d <INST_DIR>
```

- Starting an activated instance:

```
setup_<database>.sh -a start -d <INST_DIR>
```

- Deinstallation of a stopped instance:

```
setup_<database>.sh -a disable -d <INST_DIR>
```

All of these commands can be issued on either the production or backup system. In order to completely stop or disable IBM 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 IBM 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. However, 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 IBM Tivoli Storage FlashCopy Manager.

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.

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 IBM Tivoli Storage FlashCopy Manager as intermediate steps. This call cannot stop IBM 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 IBM Tivoli Storage FlashCopy Manager cannot be stopped you will need to stop IBM 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_<database>.sh
```

When this command is issued, the profile wizard launches and 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:

```
Do you want to update the BS installation on backup system? [Y/N]
```

Running the setup script without the `-a` action option proceeds through several tasks that are similar to the tasks described in Chapter 3, “Installing IBM Tivoli Storage FlashCopy Manager,” on page 39.

## Setup script values

These values are available for `setup_<database>.sh`:

### **setup\_db2.sh**

Configures IBM Tivoli Storage FlashCopy Manager.

### **setup\_ora.sh**

Configures IBM Tivoli Storage FlashCopy Manager for Oracle.

### **setup\_sapora.sh**

Configures IBM Tivoli Storage FlashCopy Manager for *SAP® with Oracle*

These values are available for action:

### **disable**

This call can be issued as the root or instance owner. It stops IBM Tivoli Storage FlashCopy Manager and removes all entries from `/etc/inittab`. In order to reactivate IBM Tivoli Storage FlashCopy Manager, you need to call the script without parameters.

Note that this call cannot stop IBM 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 IBM Tivoli Storage FlashCopy Manager cannot be stopped you need to stop IBM Tivoli Storage FlashCopy Manager on the production system before executing `setup_<database>.sh -a install`.

### **install**

This call needs to be issued with the root user ID. It performs the following:

1. Stops IBM Tivoli Storage FlashCopy Manager (`setup_<database>.sh -a stop`)
2. Copies all binary files from the IBM Tivoli Storage FlashCopy Manager installation directory to the instance-specific installation directory (`INST_DIR`)
3. Sets the appropriate access rights for the binary files
4. Restarts IBM Tivoli Storage FlashCopy Manager (`setup_<database>.sh -a start`)

The steps to start and stop IBM Tivoli Storage FlashCopy Manager are skipped if IBM Tivoli Storage FlashCopy Manager has not yet been configured.

This call cannot stop IBM 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 IBM Tivoli Storage FlashCopy Manager cannot be stopped you

need to stop IBM Tivoli Storage FlashCopy Manager on the production system before executing `setup_<database>.sh -a install`.

#### **start**

This call can be issued as the root or instance owner. It starts a previously installed and configured version of IBM Tivoli Storage FlashCopy Manager. This call creates different entries in `/etc/inittab` 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 IBM Tivoli Storage FlashCopy Manager that is currently running. This call updates `/etc/inittab` and checks that IBM 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 IBM Tivoli Storage FlashCopy Manager is still running on the production system. In order to stop IBM Tivoli Storage FlashCopy Manager in those environments successfully, you need to first stop IBM 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.

---

## **Options for IBM Tivoli Storage FlashCopy Manager commands**

Specify these options in the `OPTIONS` field of commands or in a file specified by the `OPTIONS` field.

Table 20. Options Available

Device Applicability		Parameter			
DS	SVC	XIV®	Name	Value or Action if specified	Default value or Action if not specified
x	x	x	PROFILE	Absolute path and file name of profile	<ACS_DIR>/profile
x	x	x	TSM_BACKUP (TSM_BACKUP_FROM_SNAPSHOT)	Perform a Tivoli Storage Manager backup	Do not perform a Tivoli Storage Manager backup
x	x	x	DELETE_FORCE	See note.	FlashCopy relations remain active when backup is deleted.
x	x	x	DEVICE_CLASS	<i>device_section_name</i> in profile.	STANDARD

**Note:**

- (DELETE\_FORCE) Applies to db2acsutil only:
  - 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.
  - In conjunction with 'db2acsutil query', also lists backups deleted without the DELETE\_FORCE option.

## Related concepts

“Options parameters”

## Options parameters

Command line options of the snapshot-related commands allow options to be given in the command line or in an external file.

(DB2) The OPTIONS parameter has the following components:

### *options-string*

One or more vendor options in the form ‘parameter=value’ (or simply ‘parameter’ if the parameter has no value or the value is ‘YES’), separated by a space. Multiple options must be enclosed in single or double quotes. The string (without the quotes) is passed to the software that processes the respective command.

### *file-name*

Fully qualified name of a vendor options file (on the DB2 server) that contains the options.

The DB2 VENDOROPT configuration parameter cannot be used to specify vendor options for DB2 snapshot backups and restores.

(SAP® for Oracle) Options corresponding to the profile parameters are specified in the BR\*Tools commands and passed to the backint interface:

- -O (equivalent to TSM\_BACKUP\_FROM\_SNAPSHOT)
- -C (equivalent to FLASHCOPY\_TYPE)
- -S (equivalent to DEVICE\_CLASS)

### Related reference

“Options for IBM Tivoli Storage FlashCopy Manager commands” on page 62

“IBM Tivoli Storage FlashCopy Manager for SAP® with Oracle (backint)” on page 75

---

## Profile Wizard (wizard)

The Profile Wizard (wizard) coordinates changes to the profile.

Use the following syntax to change the passwords for communication between wizard and the storage devices.

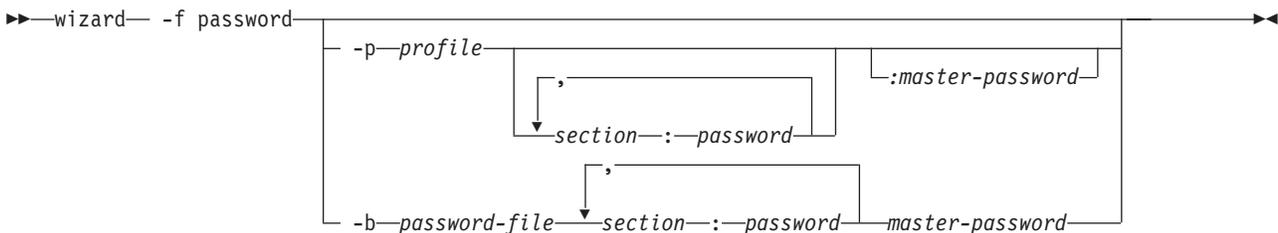


Table 21. Options for Starting the Profile Wizard (wizard) (Password Function)

Option	Description	Default	Overrides Profile Parameter
-f password	Set or change passwords		

Table 21. Options for Starting the Profile Wizard (wizard) (Password Function) (continued)

Option	Description	Default	Overrides Profile Parameter
-p profile	<p>Full path and name of the profile used by the Profile Wizard.</p> <p>In interactive mode, the wizard searches the profile for ORACLE and DEVICE_CLASS sections and then queries for the respective passwords.</p> <p>When the password filename is not specified, the wizard reads the respective filename from the GLOBAL section of the profile.</p>	The profile in the current working path is used.	
-b password-file	The password file to be created or updated.	<p>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:</p> <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.)
section:password	Name of the DEVICE_CLASS or ORACLE sections in the profile and respective passwords for value specified in the DEVICE_CLASS or ORACLE sections.	See note.	
:<masterpassword>	Master password used to authenticate a library or agent to the Profile Wizard	See note.	
<p><b>Note:</b> When no password is specified on the command line, the wizard interactively asks for this information:</p> <ul style="list-style-type: none"> <li>• The passwords for the ORACLE section in the specified profile.</li> <li>• The passwords for all DEVICE_CLASS sections in the specified profile.</li> <li>• The master password.</li> </ul> <p>When the 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.</p>			

### Related concepts

“IBM Tivoli Storage FlashCopy Manager profile description” on page 87

## Management Agent (acsd)

The Management Agent (acsd) coordinates the snapshot backup operation.

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.

Syntax for invoking acsd as a daemon process:

```

acsd [-p acsd-profile] [-c acsd-port] [-r acs-repository] [-d acs-directory]
     [-t] [-b password-file]
     [-a administration-assistant-server] [:-administration-assistant-port]
  
```

Syntax for obtaining version or help information:

```

acsd [-v] [-h]
  
```

Table 22. 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.	<INST_DIR>/profile	
-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 IBM Tivoli Storage FlashCopy Manager directory	<ACS_DIR>	
-t	Turn trace on	Trace off	TRACE

Table 22. Options for Starting the Management Agent (acsd) as a Daemon Process (continued)

Option	Description	Default	Overrides Profile Parameter
-b password-file	File in which the IBM 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 IBM 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.

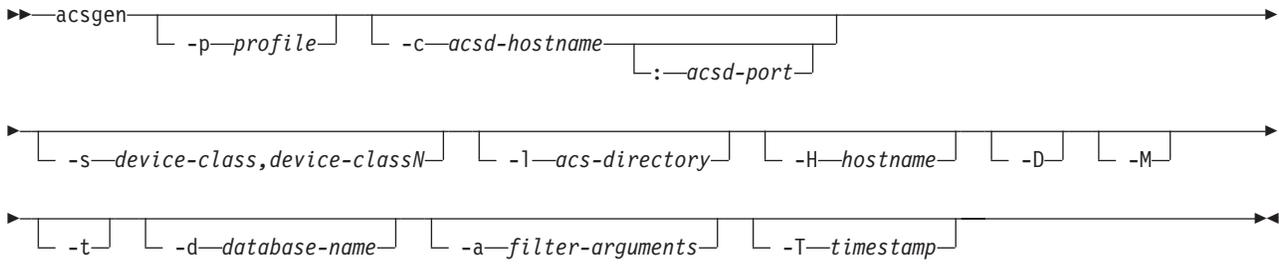
#### Related concepts

"IBM Tivoli Storage FlashCopy Manager profile description" on page 87

## Generic Device Agent (acsgen)

The Generic Device Agent (acsgen) is the component that uses appropriate adapters to invoke snapshot commands on snapshot-compatible devices.

The Generic Device Agent invokes the snapshot command on a snapshot capable device using the appropriate device adapter. This adapter utilizes the CIM interface ( DS8000 and SAN Volume Controller) or XCLI interface (IBM XIV® Storage System) to control the actual storage device. The appropriate device adapter is loaded according to the COPYSERVICES\_HARDWARE\_TYPE profile parameter.



Syntax for obtaining version or help information:



Table 23. Options for Starting the Generic Device Agent (acsgen)

Option	Description	Default
-p profile	Full profile name.  The device agent uses the <ul style="list-style-type: none"> <li>• GLOBAL</li> <li>• CLIENT</li> <li>• DEVICE_CLASS</li> <li>• OFFLOAD</li> <li>• ORACLE</li> </ul> sections of the profile.	<INST_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 will respond to. Valid only when started from /etc/inittab.	Run and terminate

Table 23. Options for Starting the Generic Device Agent (acsgen) (continued)

Option	Description	Default
-H hostname	The hostname 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 displayed by the hostname command.
-t	Turn trace on	<TRACE>
-d database-name	database name	All database names.
-a filter-arguments	Decimal value representing one or more backup usability states. Only entries with the indicated states are considered. The value of this option is the sum of the numeric values given for the desired states.	All usability states applicable to context of request.
-T timestamp	A backup ID to which an operation (delete, background monitoring) is to apply.	None.
-M	Start the device agent as a "mount agent". This agent will be 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 off-loaded backup to Tivoli Storage Manager is requested;</li> <li>• database files reside on JFS filesystems;</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.

The return code of the device agent will be 0 if it finishes the request without warnings and errors, or if there were no candidates for the request. Return code 1 indicates that a warning occurred during the process. Return code 2 indicates that an error occurred during the process.

---

## Volume Group Takeover Script (acsvg.sh)

The Volume Group Takeover Script (acsvg.sh) is used in high-availability situations only.

The Volume Group Takeover script (acsvg.sh) applies only to SAN configurations on AIX systems. It is used only in special high-availability scenarios in which customers use enhanced concurrent capable volume groups on their production systems. In these cases, this script will export volume groups and import them again on an HACMP takeover system after a snapshot restore has been performed. This is necessary to synchronize the AIX ODM on the production and HACMP takeover systems.

## **-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
- -T snapshot-id

---

## **XIV Adapter Java Archive (XivAdapter.jar)**

The XIV Adapter is used in conjunction with the Generic Device Agent (acsgen).

XivAdapter.jar communicates with acsgen and issues commands to the XIV<sup>®</sup> command line interface (xcli).

---

## **IBM Tivoli Storage FlashCopy Manager (fmcima)**

The CIM Adapter (fmcima) is used in conjunction with the Generic Device Agent (acsgen).

This adapter communicates with acsgen and issues commands to snapshot capable devices using the CIM interface for DS8000 and SAN Volume Controller.

---

## **Query Managed Capacity (fmquery)**

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 IBM Tivoli Storage FlashCopy Manager for which a backup (FlashCopy<sup>®</sup> 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 **fmquery** syntax is as follows:

```
fmquery -p profile [-c]
```

- p Specify the name of the IBM 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:

```
fmquery -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:

```
fmquery -p /db2/S01/acs/profile -c
```

Output:

```
A0FR6HJ83C,2147483648
A0FR6HENQ1,2147483648
A0FR6HAV80,2147483648
*TOTAL*,6442450944
```

---

## Production System User Interface for Oracle (acsora)

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]
where <function> is one of:
    backup
    restore
    delete
    inquire
```

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.

Option	Description	Default
-f restore	Restore database	
-f delete	Delete snapshot backup	
-f inquire	List snapshot backups	
-F	When specified with the -f delete or -f inquire options, the -F option withdraws source and target relationships.	

The return code of acsora will be 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, these minor issues should be resolved 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. The profile name must be specified on the production system.

Example (backup database):

```
acsora -f backup
```

### **-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, background copy processing from the target volumes to the source volumes may require additional time to complete, especially if FLASHCOPY\_TYPE COPY is specified. Although the database is available, you cannot perform an IBM Tivoli Storage FlashCopy Manager backup 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 56 and “Restoring a native Oracle database” on page 55 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 delete**

This command deletes the snapshot backup denoted by the entered backup ID.

Example (deleted specified backup):

```
acsora -f delete -b A0FZ36AY8G
```

---

## **Snapshot Object Manager for Oracle (acsutil)**

The Snapshot Object Manager for Oracle (acsutil) provides a snapshot backup query and restore interface for native Oracle environments.

### **Functions of the 'acsutil' command**

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.

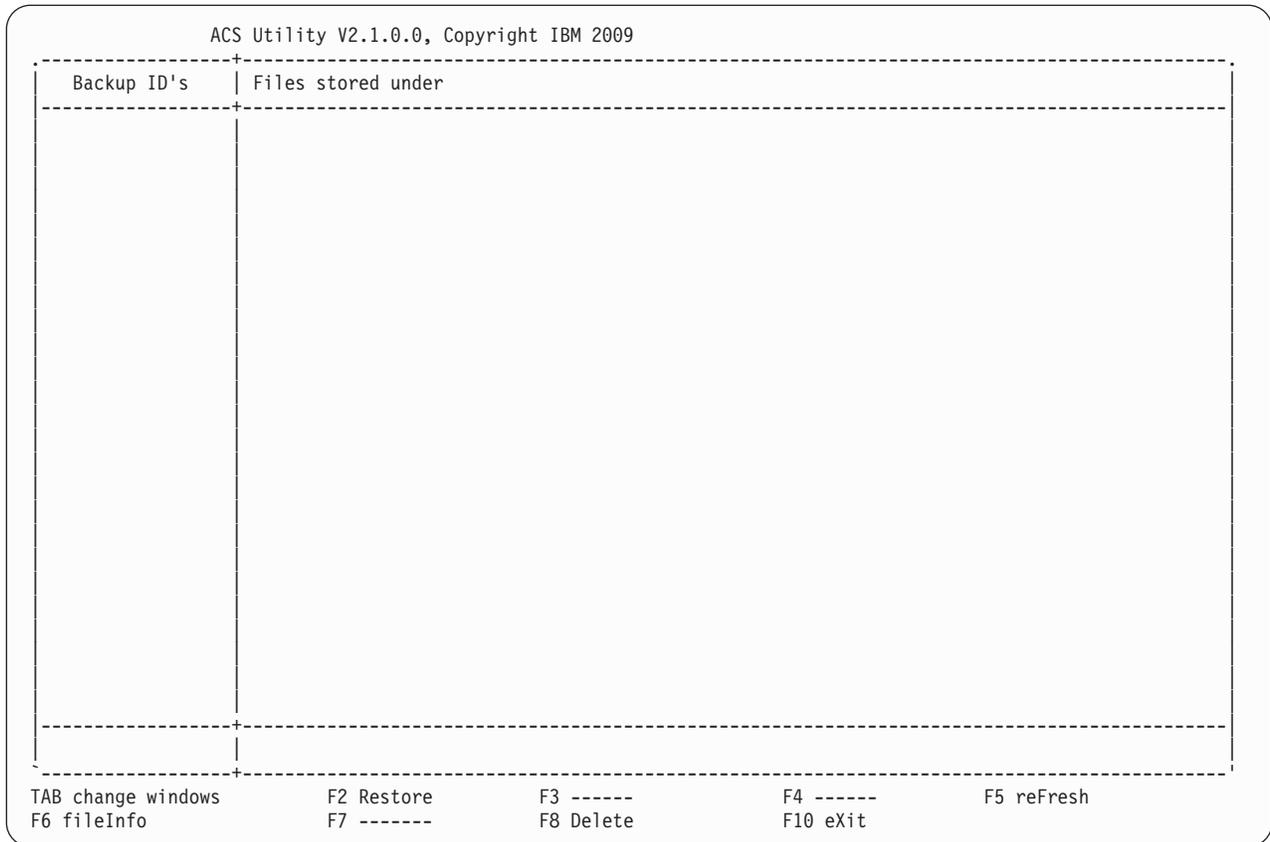
### **Syntax of the 'acsutil' command**

```
acsutil [-p <profile>]
```

<b>Parameter</b>	<b>Description</b>	<b>Default</b>
-p profile	IBM Tivoli Storage FlashCopy Manager profile	<ACS_DIR>/profile

The Snapshot Object Manager user interface consists of a split window, which is character based.

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.



All backup IDs found in the IBM 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.

---

## IBM Tivoli Storage FlashCopy Manager for SAP<sup>®</sup> with Oracle (backint)

The IBM Tivoli Storage FlashCopy Manager executable file 'backint' is called by the SAP<sup>®</sup> BR\*Tools executable files ('brbackup', 'brrestore', 'brrecover') on SAP<sup>®</sup> with Oracle environments.

In the normal case, IBM Tivoli Storage FlashCopy Manager is invoked by the SAP<sup>®</sup> BR\*Tools utilities as the executable file 'backint' (in this implementation, a soft link) with a set of appropriate parameters.

For troubleshooting purposes, however, it is possible to call IBM Tivoli Storage FlashCopy Manager directly from the command line in order to perform data protection operations manually and thus be able to correct errors.

The command:

```
backint -?
```

displays a list of all possible command line options.

**Note:** For the C shell, enclose the option string in quotes (backint '-?').

The syntax of the backint command is as follows:

```
backint [-p profile]
        -f <function>
        -t <backup_type>
        [-n <negative_list> or '-n no_check']
        [-O] [-S] [-F]
```

Table 24. Parameters for IBM Tivoli Storage FlashCopy Manager Invocation as 'backint'

Option	Meaning	Default
-p	IBM Tivoli Storage FlashCopy Manager Backint profile (see "IBM Tivoli Storage FlashCopy Manager backint profile overview (.utl file)" on page 130)	
-f backup	Backup function	
-f restore	Restore function	
-f inquire or inquire_detail	Inquire function with or without detailed information about the backups.	
-f delete	Delete function	
-t volume	Type of backup is volume (snapshot)	

Table 24. Parameters for IBM Tivoli Storage FlashCopy Manager Invocation as 'backint' (continued)

Option	Meaning	Default
-t volume_online	Type of backup is volume (snapshot) with a minimized backup window for Oracle.	
-t file	Type of backup is file. The files are backed up to the repository. When IBM Tivoli Storage Manager for Enterprise Resource Planning is installed, it can be used to back up the files to Tivoli Storage Manager server storage instead of to the repository. In this situation, a file backup into the repository fails when TSM_BACKUP_FROM_SNAPSHOT specifies YES.	
-t file_online	Type of backup is file online with locking. The files are backed up to the repository. When IBM Tivoli Storage Manager for Enterprise Resource Planning is installed, it can be used to back up the files to Tivoli Storage Manager server storage instead of to the repository. In this situation, a file backup into the repository fails when TSM_BACKUP_FROM_SNAPSHOT specifies YES.	
-n <negative_list>	Name of exception file ( <i>negative list</i> ) providing directories and files to be included in the backup or can be overwritten during restore.	
-n no_check	Disable validation of files to include in backup or to be overwritten during restore.	
-O	Offload tape backup. Overrides the TSM_BACKUP_FROM_SNAPSHOT parameter.	Parameter value in profile, or default.
-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.	
-S	Overrides the DEVICE_CLASS parameter	Parameter value in profile, or default.

### **-f backup**

The **backup** function will normally be invoked by the SAP database utilities brbackup and brarchive. These programs give IBM Tivoli Storage FlashCopy Manager an input file (in the case of **backup** and **inquire**) containing the names

and paths of the database files to be handled. For troubleshooting, however, it might be necessary to call this function of IBM Tivoli Storage FlashCopy Manager directly to restore individual files. See the following example.

```
backint -p /oracle/SID/dbs/init<SID>.utl -f backup -t volume
```

The backint profile `init<SID>.utl` has to be specified with the path and file name statement as shown above.

The program prompts you to enter one or more file names. Each successful backup run (collection of one or more files) is allocated its own backup ID within the IBM Tivoli Storage FlashCopy Manager repository and on the storage subsystem.

Remember to press CTRL + D after you enter the name of the file to be backed up.

### **-f restore**

The **restore** function will be normally started by the SAP® database utility `brrestore`. For troubleshooting, however, it might be necessary to call this function of IBM Tivoli Storage FlashCopy Manager directly to restore without SAP® BR\*Tools. This function can be invoked from the command line as follows.

```
backint -p /oracle/SID/dbs/init<SID>.utl -f restore -t volume
```

You will be prompted to enter the backup ID to be restored. If the files are to be restored to another directory, it is necessary to specify the path to the input files.

### **-f inquire**

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
```

IBM Tivoli Storage FlashCopy Manager prompts you to enter the inquiry in one of four formats. These are:

1. **#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.

2. **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.
```

3. **#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.

4. **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 IBM Tivoli Storage FlashCopy Manager and can only be called by IBM 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.

## **DB2 Advanced Copy Services commands**

Commands used by IBM Tivoli Storage FlashCopy Manager.

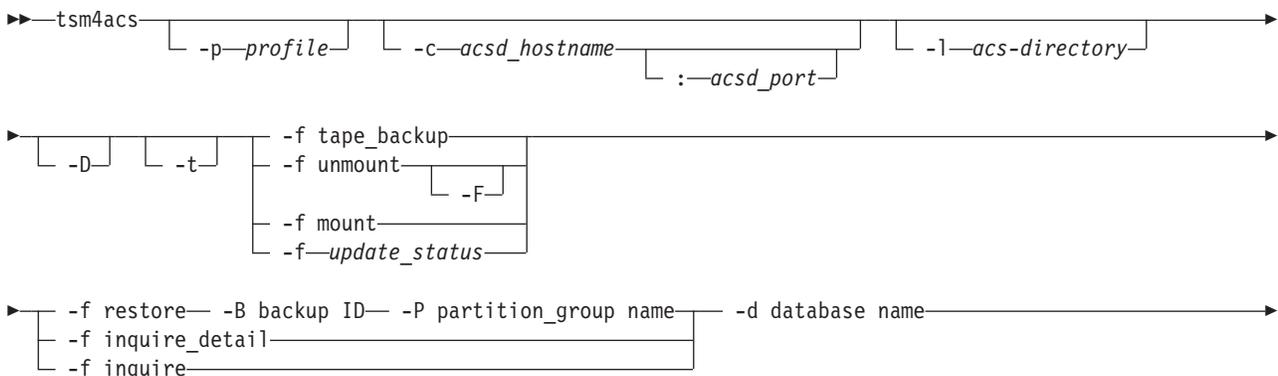
The following DB2 commands use the IBM Tivoli Storage FlashCopy Manager snapshot backup library (libacsd2.a). Refer to the *DB2 Command Reference* for detailed descriptions:

- db2 backup database ... use snapshot... (DB2 snapshot backup)
- db2 restore database ... use snapshot ... (DB2 snapshot restore)
- db2acsutil (DB2 utility for IBM Tivoli Storage FlashCopy Manager)

## **Offload Agent (tsm4acs)**

The Offload Agent provides a command line interface to access a certain set of functionality associated with the IBM Tivoli Storage FlashCopy Manager package. This functionality includes backup to Tivoli Storage Manager and functions for managing Tivoli Storage Manager backups.

(DB2) In a DB2 environment, the Offload Agent is available with IBM Tivoli Storage FlashCopy Manager only.



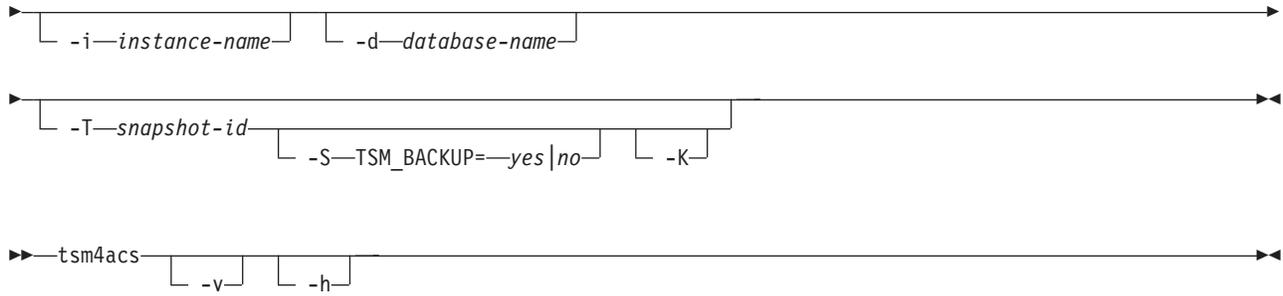


Table 25. Options for the IBM Tivoli Storage FlashCopy Manager 'tsm4acs' Command

Option	Description	Default
-p profile	See "Generic Device Agent (acsgen)" on page 68.	
-c acsd-hostname		
acsd-port		
-l acs-directory		
-f tape_backup	Back up a snapshot target set to Tivoli Storage Manager.	
-f mount	Mount snapshot target set	
-f unmount	Unmount snapshot target set	
-f update_status	<p>Update the usability state after a snapshot backup operation completes to one of the following:</p> <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> <p>These parameters are also required when using -f update_status:</p> <ul style="list-style-type: none"> <li>• -d database-name</li> <li>• -i instance-name</li> <li>• -T snapshot-id</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).
-T snapshot-id	Timestamp identifying a particular snapshot to which the operation is to apply. Required for '-F' option. Do not use in conjunction with '-f tape_backup'.	No limitation.
-i instance-name	Instance name to apply to the command. Required for '-F' option.	No limitation.
-D	Run as daemon process. Valid only when started from /etc/inittab.	Run and terminate.

Table 25. Options for the IBM Tivoli Storage FlashCopy Manager 'tsm4acs' Command (continued)

Option	Description	Default
-F	Force a reset of usability states for the specified snapshot backup. This parameter also requires the <ul style="list-style-type: none"> <li>• -d database-name</li> <li>• -i instance-name</li> <li>• -T snapshot-id</li> </ul> parameters.	None.
-K	In a multi-partition environment, the partitions remain mounted as long as all participating partitions are off-loaded to Tivoli Storage Manager successfully. The offload agent will unmount all partitions after the last partition is successfully off-loaded.	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 IBM 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 tsm4acs -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).

(DB2) The snapshot backups for all participating partitions must have completed before the tape backup process is started.

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 IBM 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 in the case of SAP® with Oracle or SAP® with DB2 or Tivoli Storage Manager for Databases (Data Protection for Oracle) for native Oracle must have been 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 will update the usability state with TAPE\_BACKUP\_PENDING. The IBM Tivoli Storage FlashCopy Manager offload agent will then pick up all snapshot backups in the state TAPE\_BACKUP\_PENDING and back them up to tape.

To start the Offload Agent with the tape backup task, enter the command

```
tsm4acs -f tape_backup
```

By specifying additional options (filter arguments) such as

```
-i instance-name  
-d database-name
```

the appropriate backup for the given instance and or database can be selected for off-loading to tape. The "-T snapshot-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) Off-loaded 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 55.

By specifying the -D option for the IBM Tivoli Storage FlashCopy Manager offload agent, it will act as a daemon process that periodically checks for outstanding tape backup requests. Furthermore, the IBM Tivoli Storage FlashCopy Manager 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 off-loading 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.

The tsm4acs function 'tape\_backup' will internally do the following steps:

1. Mount the filesystems on the offload system, if they were not previously mounted using `tsm4acs` or the mount agent. If all necessary filesystems were already mounted, this step will be skipped (see “-f mount”).

**Note:** For snapshots of a database located on AIX JFS filesystems or LVM mirrors, the mount of the filesystems on a backup system is required to verify the consistency of the snapshot.

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`. 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 83).

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, the Offload Agent can retry the backup operation. In order to avoid an excessive number of retries, the Offload Agent does not perform retries in daemon mode (for example, when started with `-D` option). The retry must be started manually.

If multiple snapshot backups are required to be backed up to Tivoli Storage Manager, the Offload Agent always starts with the snapshot used for the original Tivoli Storage Manager backup request. This makes sure that the Tivoli Storage Manager backups are created in appropriate sequential order. In addition to generating backups, the Offload Agent can be used to mount and unmount a snapshot backup on the backup server.

(DB2) In DPF environments, off-loaded 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.

## **-f mount**

This Offload Agent command mounts a snapshot backup on a backup system.

Mounting a backup means the following occurs:

1. Configure the target volume(s), which must have been assigned to the offload system
2. Import the volume group(s) from the target volume(s)
3. Mount all filesystems within the volume group(s).

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  
-T snapshot-id
```

a specific snapshot backup can be selected for mounting on the offload system.

(DB2) In a DPF environment with multiple partitions, the IBM Tivoli Storage FlashCopy Manager offload agent 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, the IBM Tivoli Storage FlashCopy Manager offload agent always picks the one with the most recent snapshot backup ID.

## **-f unmount**

This Offload Agent 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  
-T snapshot-id
```

a specific snapshot backup can be selected for unmounting from the offload system.

(DB2) In a DPF environment with multiple partitions, the IBM Tivoli Storage FlashCopy Manager offload agent 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 tsm4acs '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 the IBM Tivoli Storage FlashCopy Manager offload agent for unmounting.

**Force mode:** Unexpected system failures in combination with off-loaded 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 tsm4acs '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 '-T' options must be specified to uniquely identify the backup involved.

## **-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`
- `-T snapshot-id`

## **-f inquire**

This Offload Agent command queries the backup repository and list all available backups.

This command is of special interest in environments where multiple partitions reside on the same volume group (volume sharing). The following parameter is also required in order to perform the `-f inquire` operation:

`-d database-name`

## **-f inquire\_detail**

This Offload Agent command queries the backup repository and list all available backups.

It works like `-f inquire` but prints additional information like usability states and background copy progress (if available) for each backup. This command is of special interest in environments where multiple partitions reside on the same volume group (volume sharing). The following parameter is also required in order to perform the `-f inquire_detail` operation:

`-d database-name`

## **-f restore**

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

For such environments the db2 restore interface can not be used and `tsm4acs -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

---

## Deleting IBM Tivoli Storage FlashCopy Manager snapshot backups

IBM 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). 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 IBM 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.  

```
tsm4acs -f unmount [-T <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>]

**Note:** (DS8000 or SAN Volume Controller): These commands delete the snapshot backup in the IBM Tivoli Storage FlashCopy Manager snapshot repository only. The source and target relations on DS8000 or SAN Volume Controller are not withdrawn.

**Note:** (IBM XIV<sup>®</sup> Storage System): These commands delete the snapshot backup in the IBM Tivoli Storage FlashCopy Manager snapshot repository, and the snapshot on the IBM XIV<sup>®</sup> Storage System is also deleted.

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:  

```
tsm4acs -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>]`

The actual withdraw of the source and target FlashCopy relationship is done by the IBM 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 IBM Tivoli Storage FlashCopy Manager repository

Make sure routinely check the IBM Tivoli Storage FlashCopy Manager repository.

To check the current status of snapshot backups in the IBM Tivoli Storage FlashCopy Manager repository, the following command can be used (depending on the database type):

- (DB2) `tsm4acs -f inquire[_detail] -d <DBname>`
- (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® Backupint profile (.utl)>`
- (SAP® with Oracle) `acsutil`

When using the 'inquire\_detail' function with the appropriate tool, output similar to the following displays:

```
#BACKUP C01__A0FY303K6B IN_PROGRESS -
TARGET_SET=1,REMOTEY_MOUNTABLE,REPETITIVELY_RESTORABLE,SWAP_RESTORABLE,
PHYSICAL_PROTECTION,FULL_COPY,TAPE_BACKUP_PENDING ( 2.780 GB of 2.794 GB )
```

```
#BACKUP C01__A0FX791RPU SUCCESSFUL -
TARGET_SET=1,REMOTEY_MOUNTABLE,REPETITIVELY_RESTORABLE,SWAP_RESTORABLE,
PHYSICAL_PROTECTION,FULL_COPY,MOUNTING ( 4.000 GB of 4.000 GB )
```

**Note:** The `db2acsutil query status` command will not show all information that is shown by the `inquire_detail` function. That is because `db2acsutil` is a tool delivered by DB2 which only knows a subset of all possible states that can be set by IBM Tivoli Storage FlashCopy Manager.

---

## Chapter 6. Configuration files overview

Configuration files are defined by the user with all the information IBM Tivoli Storage FlashCopy Manager needs to successfully perform its functions.

IBM Tivoli Storage FlashCopy Manager uses the following configuration files:

- Profile
- Target volumes file(s)
- Password file
- (SAP<sup>®</sup> with Oracle) SAP Backint configuration file
- (SAP<sup>®</sup> with Oracle) SAP<sup>®</sup> BR\*Tools configuration file
- (Native Oracle) Tivoli Storage Manager options files

---

### IBM Tivoli Storage FlashCopy Manager profile description

IBM 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 IBM 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 IBM Tivoli Storage FlashCopy Manager," on page 39 for more information about defining ACS\_DIR.

The IBM 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 IBM 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
- ORACLE

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 section. Each section has a unique set of specific parameters.

### GLOBAL section

The GLOBAL section contains information that is required and used by all IBM 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 IBM Tivoli Storage FlashCopy Manager evaluates this section only once (during startup). Therefore, changes within this section require IBM Tivoli Storage FlashCopy Manager to be restarted before they become effective. Depending on the environment, it might be necessary to install IBM 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 IBM 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.

**Note:** (SAP® with Oracle) The profile wizard prompts whether off-loaded backups to tape will be performed. Based on the response, the profile is updated with a CLIENT section (no off-loaded backup) or the profile is not

updated (perform off-loaded backup) and the .utl file is used. For more information, see “IBM Tivoli Storage FlashCopy Manager backint profile overview (.utl file)” on page 130.

#### **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 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_<database>.sh
```

These passwords are used by IBM Tivoli Storage FlashCopy Manager to authenticate to the storage subsystem represented by the associated DEVICE\_CLASS section. See also “Management Agent (acsd)” on page 66.

#### **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) running on the backup server. See “Offload Agent (tsm4acs)” on page 78.

**Note:** When creating or modifying existing profiles, the configuration wizard prompts whether off-loaded tape backups will be performed. An OFFLOAD section is added to the profile only when YES is specified at this prompt.

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 will mount this snapshot and initiate 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.

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.

## 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
parameter_line 1
....
parameter_line n
<<<
# ACSD section
>>> ACSD
parameter_line 1
....
parameter_line n
<<<
# CLIENT section
>>> CLIENT
parameter_line 1
....
parameter_line n
<<<
# DEVICE_CLASS device section
>>> DEVICE_CLASS device
parameter_line 1
....
parameter_line n
<<<
# DEVICE_CLASS device2 section
>>> DEVICE_CLASS device2
parameter_line 1
....
parameter_line n
<<<
# OFFLOAD section
>>> OFFLOAD
parameter_line 1
....
parameter_line n
<<<
# ORACLE section
>>> ORACLE
parameter_line 1
....
parameter_line n
<<<
```

## Overriding IBM Tivoli Storage FlashCopy Manager profile parameters

Overwrite IBM Tivoli Storage FlashCopy Manager profile parameters for DB2 and for SAP with Oracle by using vendor options. See “Options for IBM Tivoli Storage FlashCopy Manager commands” on page 62 for details.

## Modifying the GLOBAL or ACSD sections of the IBM Tivoli Storage FlashCopy Manager profile

Changes to the profile take effect immediately and do not require restarting IBM Tivoli Storage FlashCopy Manager except when the GLOBAL or ACSD sections are modified.

However, changes to the profile do require the following procedure:

1. Issue this command to stop IBM Tivoli Storage FlashCopy Manager on all machines where it is currently installed:

```
setup_<database>.sh -a stop
```

2. Update the parameters in the GLOBAL or ACSD sections.
3. Issue this command to start IBM Tivoli Storage FlashCopy Manager on all machines that were previously stopped:

```
setup_<database>.sh -a start
```

## IBM Tivoli Storage FlashCopy Manager profile parameters

Refer to this chart for assistance when setting the IBM Tivoli Storage FlashCopy Manager profile parameters.

The following table summarizes the profile parameters.

**Note:** Parameters designated as "+" under "SAP® with Oracle" are physically defined (with any alternate name indicated in parentheses) in the separate SAP® Backint profile (.util file) or optionally, in the IBM Tivoli Storage FlashCopy Manager profile based on the user decision. See "IBM Tivoli Storage FlashCopy Manager backint profile overview (.utl file)" on page 130.

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters

Section	Database Environment			Device Applicability			Parameter		
	DB2	Native Oracle	SAP® with Oracle	DS	SVC	XIV®	Name	Value	Default value
GLOBAL	x	x	x	x	x	x	ACS_DIR	Path of the IBM Tivoli Storage FlashCopy Manager directory. See note 1.	Required
GLOBAL	x	x	x	x	x	x	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 IBM Tivoli Storage FlashCopy Manager is installed for a given database instance. However, each instance can be managed by an individual Management Agent.	localhost 57328
GLOBAL	x		+	x	x	x	TRACE	<b>YES</b> Enable tracing <b>NO</b> Disable tracing For more information, see “Log and trace files summary” on page 162.  TRACE can also be specified in the backint profile.	NO
ACSD	x	x	x	x	x	x	ACS_REPOSITORY	Path to the ACS repository directory. See Note 2.	This parameter must be specified by the user.

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter			
	DB2	Native Oracle	SAP® with Oracle	DS	SVC	XIV®	Name	Value	Default value
ACSD	x		x	x	x	x	ADMIN_ASSISTANT	<p>&lt;server&gt; &lt;port&gt; Server and port on which the Tivoli Storage Manager for ERP Administration Assistant server component is listening.</p> <p><b>NO</b> Do not send data to the Administration Assistant. See note 3.</p>	NO
ACSD	x					x	REPOSITORY_LABEL	A prefix added to each volume name on the IBM XIV® Storage System. A maximum of three characters is allowed in one of these ranges: [a-z] [A-Z] [0-9] See note 4.	TSM
CLIENT	x			x	x	x	APPLICATION_TYPE	<p>Environment (native or SAP® application)</p> <p><b>DB2</b> Treat as a generic (native) DB2 system.</p> <p><b>ORACLE</b> Treat as a generic (native) Oracle system.</p> <p><b>SAP</b> An SAP® application uses the underlying database.</p>	This parameter is preset depending on the setup script variant used.

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter	
	DB2	Native Oracle	SAP® with Oracle	DS	SVC	XIV®	Name
CLIENT	x	x	+	x	x	x	<p>TSM_BACKUP (TSM_BACKUP_FROM_SNAPSHOT)</p> <p><b>Note:</b> This parameter is called TSM_BACKUP in the profile. It is called TSM_BACKUP_FROM_SNAPSHOT in the .utl file.</p> <p><b>Value</b></p> <p><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.</p> <p><b>MANDATE</b> In contrast to YES, do not reuse the target set until the Tivoli Storage Manager backup completes.</p> <p>See note 19 for complete parameter definitions.</p> <p><b>Default value</b></p> <p>NO</p>

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter	
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value
CLIENT	x	x	+	x	x	TSM_BACKUP (TSM_BACKUP_FROM_SNAPSHOT) (continued) <b>Note:</b> This parameter is called TSM_BACKUP in the profile. It is called TSM_BACKUP_FROM_SNAPSHOT in the .utl file.	<p><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 could not be completed in time.</p> <p><b>NO</b> Keep the snapshot backup and do not use it as a source for a subsequent tape backup operation.</p> <p>See note 19 for complete parameter definitions.</p>
							Default value

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter		
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value	
CLIENT	x	x	+	x	x	TSM_BACKUP (TSM_BACKUP_FROM_SNAPSHOT) (continued) <b>Note:</b> This parameter is called TSM_BACKUP in the profile. It is called TSM_BACKUP_FROM_SNAPSHOT in the .utl file.	<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 19 for complete parameter definitions.	NO
CLIENT	x	x	+	x	x	MAX_VERSIONS (MAX_SNAPSHOT_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.	<b>ADAPTIVE</b> The maximum number varies depending on the available space. IBM Tivoli Storage FlashCopy Manager re-uses the oldest target set as the target for the current backup.  // Maximum number of snapshot versions to be maintained. When this limit is reached, the oldest version is deleted.	ADAPTIVE

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter		Default value
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value	
CLIENT	x	x	+	x	x	LVM_FREEZE_THAW	Determines when to enable the freeze and thaw actions. See note 12.	
CLIENT	x	x	+	x	x	DEVICE_CLASS	<p>&lt;list of device classes&gt; [&lt;conditions&gt;]</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 &lt;days of week&gt;] [FROM &lt;time&gt; TO &lt;time&gt;] (partitioned DB2 databases) [ON_DBPARTITIONNUMS] &lt;list of partitions&gt;</p> <p>See note 10 for complete information.</p>	STANDARD
CLIENT	x	x		x	x	NEGATIVE_LIST	<p><b>NO_CHECK</b> Does not check for additional files.</p> <p><b>WARN</b> Issues a warning (processing continues)</p> <p><b>ERROR</b> Issues an error (processing ends)</p> <p><i>filename</i> The file <i>filename</i> contains fully qualified names of files and directories.</p> <p>See note 14.</p>	This parameter must be specified by the user.

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter		
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value	Default value
CLIENT		x	+	x	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 18.	This parameter must be specified by the user.
CLIENT			+			ALLOW_FULL_FILE_BACKUP	YES, NO This value specifies whether to allow a full file backup into the repository. This parameter is only valid when APPLICATION_TYPE specifies SAP with Oracle. Due to the performance impact, 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

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter		
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value	Default value
CLIENT		x		x	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
CLIENT	x			x	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>] [...] DB2 node name. Multiple entries must be separated by a space. See note 22.	
CLIENT	x	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 23.	120 seconds

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter			
	DB2	Native Oracle	SAP® with Oracle	DS	SVC	XIV®	Name	Value	Default value
CLIENT	x	x	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 24.	3600 seconds
CLIENT	x	x	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>
DEVICE_CLASS <i>device</i>	x	x	x	x	x	x	COPYSERVICES, HARDWARE_TYPE	Storage system on which the database resides:  DS8000 IBM DS8100 IBM DS8300  SVC IBM SAN Volume Controller  XIV IBM XIV® Storage System  See note 5.  Only one system can be specified.	This parameter is required.

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter		Default value
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value	
DEVICE_CLASS <i>device</i>	x	x	x	x	x	COPYSERVICES_PRIMARY_SERVERNAME	<i>server name or address</i> 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 SVC master console, or embedded CIM Agent.	localhost
DEVICE_CLASS <i>device</i>	x	x	x	x		COPYSERVICES_SECONDARY_SERVERNAME	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> . On DS, this parameter is only with the proxy CIM Agent.	'none'
DEVICE_CLASS <i>device</i>	x	x	x		x	COPYSERVICES_SERVERNAME	Specify the hostname of the IBM XIV® Storage System. This parameter is only valid when COPYSERVICES_HARDWARE_TYPE specifies XIV.	'none'
DEVICE_CLASS <i>device</i>	x	x	x	x	x	COPYSERVICES_USERNAME	User name for: <i>cim user</i> CIM Agent for DS Open API (which can manage the primary and secondary Copy Services servers of the DS8000 cluster. <i>svc user</i> SVC master console or SVC cluster <i>XIV user</i> Username to log in to the XIV system.	superuser

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter		
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value	Default value
DEVICE_CLASS <i>device</i>	x	x	x	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 SVC master console, or embedded CIM Agent.	See Note 7.
DEVICE_CLASS <i>device</i>	x	x	x	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
DEVICE_CLASS <i>device</i>	x	x	x	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
DEVICE_CLASS <i>device</i>	x	x	x	x	x	COPYSERVICES_CERTIFICATEFILE	See note 6.	NO_CERTIFICATE

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment				Device Applicability		Parameter	
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value	Default value
DEVICE_CLASS <i>device</i>	x	x	x	x	x	FLASHCOPY_TYPE (See note 11.)	Specifies whether the storage subsystem performs a bitwise copy of data from one logical volume to another.  <b>COPY</b> Directs the storage system to perform a bit-level copy of the data from one physical volume to another. This value is recommended under the following conditions: <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
DEVICE_CLASS <i>device</i>	x	x	x	x	x	FLASHCOPY_TYPE (cont'd)	<b>INCR</b> 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.	COPY
DEVICE_CLASS <i>device</i>	x	x	x	x	x	FLASHCOPY_TYPE (cont'd)	<b>NOCOPY</b> Directs the storage system to perform a bit-level copy of a track when and if data is modified after the FlashCopy request. This technique is typically referred as copy-on- write	COPY

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter	
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value
DEVICE_CLASS <i>device</i>	x	x	x	x	x	TARGET_SETS	<p>Specify the target volumes to be used in the FlashCopy operation using one of these values:</p> <ul style="list-style-type: none"> <li>• VOLUMES_DIR</li> <li>• VOLUMES_FILE</li> <li>• &lt;list of target set names&gt; (SVC only) <ul style="list-style-type: none"> <li>- TARGET_NAMING &lt;string with wildcards %SOURCE and %TARGET_SET&gt;</li> </ul> </li> </ul> <p>See the Note 20 and "IBM Tivoli Storage FlashCopy Manager target volumes file (.fct)" on page 124.</p>
DEVICE_CLASS <i>device</i>	x	x	x	x	x	STORAGE_SYSTEM_ID	<p>Specify the storage system ID of the cluster to which the DS8000, IBM XIV®, or SAN Volume Controller storage system refers in a Logical Volume Manager mirrored environment.</p> <p>See the Note 21 and "IBM Tivoli Storage FlashCopy Manager target volumes file (.fct)" on page 124.</p>
DEVICE_CLASS <i>device</i>	x	x	x	x	x	VOLUMES_DIR	<p>Fully qualified path of the volumes directory, in which the FlashCopy target volumes file(s) must reside.</p> <p>See the Note 20 and "IBM Tivoli Storage FlashCopy Manager target volumes file (.fct)" on page 124.</p>

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter		
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value	Default value
DEVICE_CLASS <i>device</i>	x	x	x	x		VOLUMES_FILE	Specify the name of the target volumes file (.fct). See the Note 20 and “IBM Tivoli Storage FlashCopy Manager target volumes file (.fct)” on page 124.	This parameter is specified by the user.
DEVICE_CLASS <i>device</i>	x	x	x	x		SVC_COPY_RATE	<i>priority</i> Specifies the priority that the SVC will give to the FlashCopy background process for the current backup or restore. Enter a value from 0-100.  See note 17.	50
DEVICE_CLASS <i>device</i>	x	x	x		x	SVC_CLEAN_RATE	Specify the cleaning rate for the FlashCopy mapping. Enter a value from 1 to 100.	
DEVICE_CLASS <i>device</i>	x	x	x	x		RESTORE_FORCE	YES, NO (See note 16.)	NO
DEVICE_CLASS <i>device</i>	x	x	x		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
DEVICE_CLASS <i>device</i>	x	x	x		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

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter			
	DB2	Native Oracle	SAP® with Oracle	DS	SVC	XIV®	Name	Value	Default value
DEVICE_CLASS <i>device</i>	x	x	x			x	BACKUP_HOST_NAME	Specify the name of the backup host that is used during off-loaded tape backups only. This parameter is only valid when COPYSERVICES_HARDWARE_TYPE specifies XIV.	
DEVICE_CLASS <i>device</i>	x	x	x			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
DEVICE_CLASS <i>device</i>	x	x	x			x	RECON_INTERVAL	Specify the interval (in hours) to perform reconciliation for the IBM XIV® Storage System. This parameter is only valid when COPYSERVICES_HARDWARE_TYPE specifies XIV.	12 hours
OFFLOAD	x	x	x	x	x	x	BACKUP_METHOD	DB2, ORACLE, BACKINT	Required

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter		
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value	Default value
OFFLOAD	x			x	x	OPTIONS	<p>&lt;options string&gt; Specifies options to be used for this Tivoli Storage Manager backup operation. The string is passed directly to the backup utility.</p> <p>@filename 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 15.</p>	Empty string.
OFFLOAD		x		x	x	OVERWRITE_DATABASE_PARAMETER_FILE	<p><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.</p> <p><b>NO</b> Do not copy the production-system database configuration file to the backup system.</p>	YES
OFFLOAD		x		x	x	DATABASE_BACKUP_INCREMENTAL_LEVEL	n Level of backup to be performed. You can enter any numerical value. See note 8.	0

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter		
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value	Default value
OFFLOAD	x			x	x	PARALLELISM	n Number of table spaces that can be read in parallel by the backup utility. <b>AUTO</b> DB2 calculates an optimum value.	AUTO
OFFLOAD	x			x	x	NUM_SESSIONS	n Number of I/O sessions to be created between DB2 and Tivoli Storage Manager.	1
OFFLOAD	x			x	x	NUM_BUFFERS	n Number of buffers to be used by DB2. <b>AUTO</b> DB2 will calculate the optimum value for this parameter.	AUTO
OFFLOAD	x			x	x	BUFFER_SIZE	n 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

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter		
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value	Default value
OFFLOAD	x			x	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 <b>YES</b>, check the release notes for the requirements to be observed.</p>	NO
OFFLOAD			x			PROFILE	Name of the external SAP Backint profile	
OFFLOAD		x		x	x	ASM_INSTANCE_USER	<p>User name</p> <p>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 sysadm permission. AUTO</p> <p>When this parameter is set to AUTO, the database user who is running the process is used.</p> <p>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.</p>	

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter		Default value
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value	
OFFLOAD		x		x	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.	
OFFLOAD		x		x	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.	

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability			Parameter		
	DB2	Native Oracle	SAP® with Oracle	DS	SVC	XIV®	Name	Value	Default value
ORACLE		x		x	x	x	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.
ORACLE		x		x	x	x	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.
ORACLE		x		x	x	x	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
ORACLE		x		x	x	x	DATABASE_BACKUP_SCRIPT_FILE	Name of the RMAN backup script that contains the Data Protection for Oracle environment variables. See note 9.	This parameter must be specified by the user.

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter		
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value	Default value
ORACLE		x		x	x	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
ORACLE		x		x	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 sysasmn permission. AUTO  When this parameter is set to AUTO, the database user who is running the process is used.	AUTO
ORACLE		x		x	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.	+ASM

Table 26. IBM Tivoli Storage FlashCopy Manager Profile Parameters (continued)

Section	Database Environment			Device Applicability		Parameter		
	DB2	Native Oracle	SAP® with Oracle	DS	SVC XIV®	Name	Value	Default value
ORACLE		x		x	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,	sysdba

## Profile parameter notes

### 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 IBM 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 IBM 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 “IBM Tivoli Storage FlashCopy Manager password file” on page 124.

**Note:** By mapping ACS\_DIR (or either of the subdirectories logs and shared) on an NFS share that is accessible to all IBM 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, IBM 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.

### 3. ADMIN\_ASSISTANT

If this parameter is defined, IBM 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. A maximum of three characters is allowed and must be specified in one of these ranges:

[a-z]  
[A-Z]  
[0-9]

This optional parameter is only used with IBM XIV<sup>®</sup> 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\_HARDWARE\_TYPE

When this parameter specifies XIV, the following settings are required and must be specified in the device section of the profile:

### COPYSERVICES\_SERVERNAME

The hostname of the IBM XIV<sup>®</sup> Storage System. There is no default value.

### PATH\_TO\_XCLI

The path where the XIV<sup>®</sup> command line interface (XCLI) is installed. There is no default value.

When the COPYSERVICES\_HARDWARE\_TYPE parameter specifies XIV, the following settings are optional:

### BACKUP\_HOST\_NAME

The name of the backup host that is used during offloaded tape backups only.

### COPYSERVICES\_USERNAME

The username for the IBM XIV<sup>®</sup> Storage System. The default value is superuser.

### GRACE\_PERIOD

The period of time (specified 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<sup>®</sup> Storage System. The default value is 24 hours. A 0 value reconciles all snapshots.

### RECON\_INTERVAL

The interval (specified in hours) to perform reconciliation for the IBM XIV<sup>®</sup> Storage System. The default value is 12 hours.

## 6. 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 IBM 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 IBM 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 IBM 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'.

## 7. COPYSERVICES\_SERVERPORT

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

<code>COPYSERVICES_HARDWARE_TYPE</code>	<code>COPYSERVICES_COMMPROTOCOL</code>	Default Port
DS8000	HTTPS	5989
	HTTP	5988
SVC (4.3.0 or later)	HTTPS	5989
	HTTP	5988

## 8. 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.

## 9. 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);
```

## 10. DEVICE\_CLASS

During backup, IBM 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) IBM Tivoli Storage FlashCopy Manager will be used 'cyclically'. To be more precise, IBM 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, IBM 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, IBM Tivoli Storage FlashCopy Manager always uses the same DEVICE\_CLASS value that was used during the backup.

## 11. 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.
- 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, SVC\_COPY\_RATE is forced to 0 when FLASHCOPY\_TYPE is specified as NOCOPY or INCR.

## 12. 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. This parameter is ignored when Oracle data files reside on raw logical volumes.

### NO

Do not perform a freeze. In order to set this parameter to NO, a

licensed version of IBM 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 123.

### **13. MAX\_VERSIONS**

#### **ADAPTIVE**

The maximum number varies depending on the available space. IBM 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 IBM Tivoli Storage FlashCopy Manager.

### **14. NEGATIVE\_LIST**

Depending on the storage device, IBM 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<sup>®</sup> with Oracle because a similar mechanism is provided directly by the SAP<sup>®</sup> BR\*Tools. Refer to the SAP<sup>®</sup> documentation for this purpose.

## 15. 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.

## 16. 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.

#### 17. 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.

#### 18. 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 123.

#### 19. TSM\_BACKUP

In order to create a Tivoli Storage Manager backup from a snapshot, it is necessary to install IBM 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.

##### 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 IBM Tivoli Storage FlashCopy Manager license.

## **20. 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 IBM 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 %TARGET\_SET>

Defines the naming convention for target volumes. Whenever a backup volume is required at backup time, IBM 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 %TARGET\_SET are replaced with the respective values in the current operation.

## **21. STORAGE\_SYSTEM\_ID**

Specify the storage system ID of the cluster to which the DS8000, IBM XIV<sup>®</sup>, or SAN Volume Controller storage system refers in a Logical Volume Manager mirrored environment.

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 “A note on LVM mirroring and ASM failure group environments” on page 31 for more information.

## 22. 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 27 for an example of an .fct file in this environment.

## 23. 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.

## 24. 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 values for a FlashCopy backup:

- PARTITION
- PREPARE
- FLASH (see separate description of this parameter)
- VERIFY
- CLOSE

You can specify one of these values for a FlashCopy restore:

- PREPARERESTORE
- FLASHRESTORE
- COMPLETERESTORE
- CLOSE

**Related concepts**

“IBM Tivoli Storage FlashCopy Manager target volumes file (.fct)” on page 124

**Related reference**

“Key files and directories” on page 132

**Interdependency of LVM\_FREEZE\_THAW and TARGET\_DATABASE\_SUSPEND**

The LVM\_FREEZE\_THAW and TARGET\_DATABASE\_SUSPEND profile parameters are interdependent.

These two IBM 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.

For Oracle ASM environments, TARGET\_DATABASE\_SUSPEND is independent of LVM\_FREEZE\_THAW, and LVM\_FREEZE\_THAW is not allowed for ASM. This parameter is ignored when Oracle data files reside on raw logical volumes.

The following table summarizes the actions taken depending on the values of the two parameters:

*Table 27. 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

---

## IBM Tivoli Storage FlashCopy Manager password file

IBM 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 IBM 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 IBM 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.

---

## IBM Tivoli Storage FlashCopy Manager target volumes file (.fct)

The target volumes file identifies the target volumes to be used for a FlashCopy backup.

During a FlashCopy backup on DS8000 or SAN Volume Controller, a set of target volumes (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 (.fct). 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 this example for use with the `VOLUMES_DIR` parameter specified in the profile:

```
>>> VOLUMES_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:

```

>>> VOLUMES_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.

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 upon the available storage system as shown in this table:

Table 28. Managing target volume LUNs by storage system

DS8000	SAN Volume Controller	XIV®
Manual target LUN creation using Target Volumes File (.fct)	Manual target LUN creation using Target Volumes File (.fct) or Naming convention using TARGET_SETS parameter	Automatic target LUN creation <i>without</i> using Target Volumes File (.fct)

On DS8000 and SAN Volume Controller 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.

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. IBM 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 IBM 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 IBM 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**

“IBM Tivoli Storage FlashCopy Manager profile parameters” on page 91

“Target volume parameter settings (DS8000 configuration)” on page 128

“Target volume parameter settings (SAN Volume Controller configuration)” on page 129

## 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 29. 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. IBM 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>

The FLASHCOPY\_TYPE parameter is only valid for DS8000 and SAN Volume Controller. 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 IBM Tivoli Storage FlashCopy Manager snapshot backups” on page 85 with the force option.

### Related reference

“Example target volumes file (DS8000 configuration)” on page 146

## Target volume parameter settings (SAN Volume Controller configuration)

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 30. Parameters of the 'VOLUMES\_SET\_x' Topic (SAN Volume Controller)

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. IBM 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>

The FLASHCOPY\_TYPE parameter is only valid for DS8000 and SAN Volume Controller. 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 IBM Tivoli Storage FlashCopy Manager snapshot backups” on page 85 with the force option.

**Note:** SAN Volume Controller 5.1 (or later): IBM 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.

### Related reference

“Example target volumes file (SAN Volume Controller configuration)” on page 148

---

## IBM Tivoli Storage FlashCopy Manager backint profile overview (.uti file)

The IBM Tivoli Storage FlashCopy Manager backint profile is used in an SAP® with Oracle configuration.

The IBM Tivoli Storage FlashCopy Manager backint profile is typically the same profile used by IBM Tivoli Storage Manager for Enterprise Resource Planning. The linkage between the two reflects the fact that requests made using the SAP® BR\*Tools utilities can specify either snapshot- or file-based processing, and the parameters for either case are accommodated in the IBM Tivoli Storage Manager for Enterprise Resource Planning profile when IBM Tivoli Storage Manager for Enterprise Resource Planning is also installed.

### IBM Tivoli Storage FlashCopy Manager Backint profile keyword definitions

These profile keywords are directly applicable to the implementation of IBM Tivoli Storage FlashCopy Manager in accordance with the backint interface.

This implementation pertains to an SAP® with Oracle database configuration. The parameters listed are typically part of the IBM Tivoli Storage Manager for Enterprise Resource Planning profile, and the formatting requirements for this profile apply. Other parameters in the IBM Tivoli Storage Manager for Enterprise Resource Planning profile are ignored when the backint interface relates to snapshot operations (backup type 'volume'). Conversely, the snapshot-only parameters are ignored when operating in the non-snapshot (backup type 'file') mode employed by IBM Tivoli Storage Manager for Enterprise Resource Planning.

The following parameters are described in “IBM Tivoli Storage FlashCopy Manager profile parameters” on page 91.:

- ACSD
- DEVICE\_CLASS
- LVM\_FREEZE\_THAW
- MAX\_SNAPSHOT\_VERSIONS
- TARGET\_DATABASE\_SUSPEND
- TSM\_BACKUP\_FROM\_SNAPSHOT

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

- TRACE
- TRACEFILE

---

## SAP® BR\*Tools configuration profile (.sap)

This configuration profile is located in the \$ORACLE\_HOME/dbs directory.

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 will be used (default is `tape`). You can specify to back up at the file level (`util_file`, `util_file_online`) or at the volume level (`util_vol`, `util_vol_online`). A backup at volume level still results in backint calls with `-t volume | volume_online` and `-t file | file_online` values.

### **util\_par\_file**

This parameter specifies where the parameter file, which is required for a backup with an external backup program, is located.

### **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\_vol\_unit**

Specifies the smallest unit that can be backed up with a snapshot or clone. The recommended value is `'all_data'`. This requires a disk layout with at least three volume groups:

- 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`
- `mount` (required on the backup system if SAP® BR\*Tools installed on the backup system)
- `both`

### **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.

IBM Tivoli Storage FlashCopy Manager and Tivoli Storage Manager for ERP support several combinations of the keywords `backup_dev_type` and `backup_type`. For example, in order to perform online backups with individual tablespace locking with the external backup program IBM Tivoli Storage FlashCopy Manager, the SAP® BR\*Tools profile parameter must be set or changed as shown in this example:

```
backup_type      = online
backup_dev_type = util_vol_online
util_par_file   = <ORACLE_HOME>/dbs/init<SID>.utl
```

## 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 IBM Tivoli Storage FlashCopy Manager

Be aware of the names and locations of these IBM Tivoli Storage FlashCopy Manager option files.

- Client system options (`dsm.sys`)
- IBM Tivoli Storage FlashCopy Manager profile (`<ACS_DIR>/profile`)

## Key files and directories

Certain files and directories are of considerable importance when using IBM Tivoli Storage FlashCopy Manager.

The following tables show the major files and directories involved when using IBM Tivoli Storage FlashCopy Manager in the various database configurations:

Table 31. 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	<code>/opt/IBM/db2/&lt;version&gt; or /opt/ibm/db2/&lt;version&gt;</code>	<code>/opt/IBM/db2/V9.5</code> Applies to a 'root' installation.
Home directory of DB2 database manager instance owner	HOME, INSTHOME	<code>/home/&lt;DB2 instance owner&gt; or /db2/&lt;DB2 instance owner&gt;</code>	<code>/home/db2inst1</code>

Table 31. Key Files and Directories (DB2) (continued)

Directory or File	Environment Variable, Vendor Option, Profile Parameter or Option	Default or Recommended Location	Examples and Remarks
DB2 instance directory		\$HOME/sqllib	/home/db2inst1/sqllib
IBM Tivoli Storage FlashCopy Manager installation directory		/usr/tivoli/tsfcm/acs_<version number>	/usr/tivoli/tsfcm/acs_2.1.0.0
IBM 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 162.
IBM Tivoli Storage FlashCopy Manager shared directory		<ACS_DIR>/shared	/home/db2inst1/acs/shared
Password file		<ACS_DIR>/shared/pwd.acsd	See "IBM Tivoli Storage FlashCopy Manager password file" on page 124.
Snapshot backup library		libacsd2.a	
IBM 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.
IBM 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.

Table 31. Key Files and Directories (DB2) (continued)

Directory or File	Environment Variable, Vendor Option, Profile Parameter or Option	Default or Recommended Location	Examples and Remarks
Target volumes file(s)		<VOLUMES_DIR>/<filename>	See notes and "IBM Tivoli Storage FlashCopy Manager target volumes file (.fct)" on page 124.
<p><b>Note:</b></p> <ol style="list-style-type: none"> <li>By convention, the DB2 instance will be created in \$HOME of the DB2 instance owner.</li> <li>The directory specified by ACS_REPOSITORY will be created by IBM Tivoli Storage FlashCopy Manager and must not exist at the time of initial configuration. The path to this directory must exist, however.</li> </ol>			

Table 32. 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		/usr/tivoli/tsfcm/acs_<version number>	/usr/tivoli/tsfcm/acs_2.1.0.0
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 162.
Tivoli Storage FlashCopy Manager shared directory		<ACS_DIR>/shared	/oracle/C21/acs/shared
Password file		<ACS_DIR>/shared/pwd.acsd	See "IBM Tivoli Storage FlashCopy Manager password file" on page 124.
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)
SAP® BR*Tools profile		Default: \$ORACLE_HOME/dbs/init<DBSID>.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/acs volumes	/oracle/C21/acs/acs volumes See notes.

Table 32. Key Files and Directories (Oracle) (continued)

Directory or File	Environment Variable, Vendor Option, Profile Parameter or Option	Default or Recommended Location	Examples and Remarks
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 "IBM Tivoli Storage FlashCopy Manager target volumes file (.fct)" on page 124.
Data Protection for Oracle options file		tdpo.opt	Native Oracle only
TSM client system options file		dsm.sys	
TSM client user options files		dsm.opt	
<p><b>Note:</b> The directory specified by ACS_REPOSITORY will be created by IBM Tivoli Storage FlashCopy Manager and must not exist at the time of initial configuration. The path to this directory must exist, however.</p>			



---

## Appendix A. IBM Tivoli Storage FlashCopy Manager examples

Refer to these IBM 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.

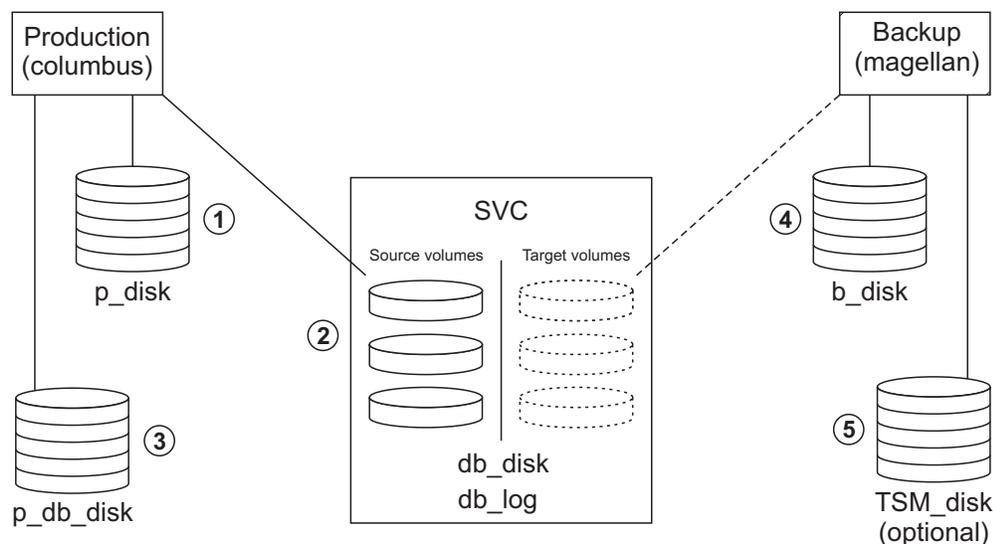


Figure 7. Example overall disk layout for a DB2 environment

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 IBM Tivoli Storage FlashCopy Manager for DB2

Refer to this example when editing the IBM 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
VENDOR_LIB /usr/tivoli/tsm/tdp_r3/db264/libtdpdb2.a
<<<
>>> 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 TSMDEVSVC2
TARGET_SETS VOLUMES_DIR
VOLUMES_DIR /db2/D01/acs/acsvolumes
<<<
>>> 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 TSMDEVSVC1
TARGET_SETS VOLUMES_DIR
VOLUMES_DIR /db2/D01/acs/acsvolumes
<<<
>>> 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 TSMDEVSVC2
TARGET_SETS VOLUMES_DIR
VOLUMES_DIR /db2/D01/acs/acsvolumes
<<<

```

---

## 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.

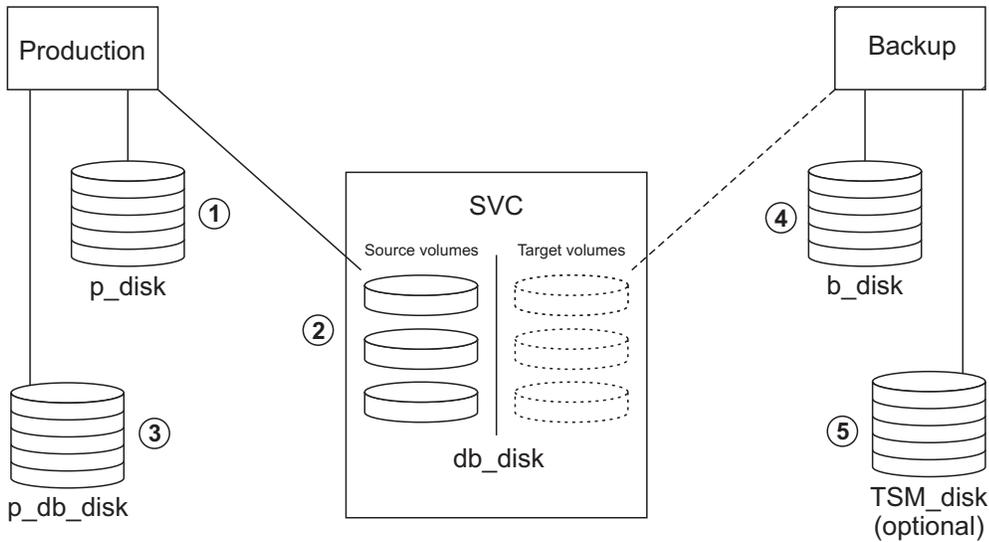


Figure 8. Example overall disk layout for a native Oracle environment

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)
```

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.

```
/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. 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 IBM 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
<<<

```

## Example profile for Tivoli Storage FlashCopy Manager for Oracle with ASM

Refer to this example when editing the IBM Tivoli Storage FlashCopy Manager profile for Oracle with ASM.

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                              #
VOLUME_MANAGER ASM                                   # ASM|LVM
<<<<
>>> OFFLOAD
BACKUP_METHOD ORACLE                                 #
# OVERWRITE_DATABASE_PARAMETER_FILE YES             # YES | NO
# DATABASE_BACKUP_INCREMENTAL_LEVEL 0               #
#ASM_INSTANCE_USER AUTO                              # User name | AUTO
#ASM_INSTANCE_ID +ASM                                # ASM instance SID | +ASM
#ASM_ROLE SYSDBA                                     # SYSDBA or SYSASM | SYSDBA
<<<<
>>> 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
#ASM_INSTANCE_USER AUTO                              # User name | AUTO
#ASM_INSTANCE_ID +ASM                                # ASM instance SID | +ASM
#ASM_ROLE SYSDBA                                     # SYSDBA or SYSASM | SYSDBA
<<<<
>>> 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
<<<<

```

**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<sup>®</sup> with Oracle environment

Refer to this example when configuring the disk layout in an SAP<sup>®</sup> with Oracle environment.

The following figure shows file systems involved in a sample disk layout.

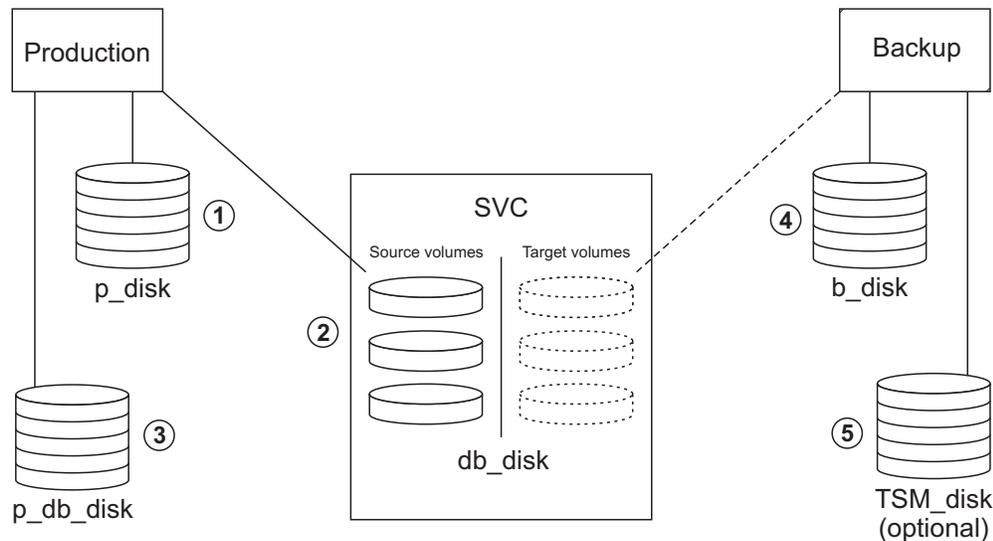


Figure 9. Example overall disk layout for an SAP<sup>®</sup> with Oracle environment

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<sup>®</sup> with Oracle (disk only)**

Refer to this example when editing the IBM 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
<<<
>>> OFFLOAD
BACKUP_METHOD BACKINT
PROFILE /oracle/A01/102_64/dbs/initA01.ut1
<<<
>>> 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<sup>®</sup> with Oracle (offload)

Refer to this example when editing the IBM Tivoli Storage FlashCopy Manager profile for an off-loaded backup using IBM Tivoli Storage Manager for Enterprise Resource Planning.

The following depicts a sample profile:

```

RL_COMPRESSION NO
MULTIPLEXING 1
MAX_SESSIONS 2
CONFIG_FILE /oracle/TXS/102_64/dbs/initTXS.bki
BUFFSIZE 131072
BUFFCOPY PREVENT
MAX_VERSIONS 1
FILE_RETRIES 3
BATCH YES
REDOLOG_COPIES 2
RETRY 3
REPORT 100

PROLE tdpr3ora64

SERVER ulysses2
SESSIONS 2
PASSWORDREQUIRED YES
ADSMNODE acsprod5_TXS
BRBACKUPMGTCCLASS MBDISK1
BRARCHIVMGTCCLASS MLOG1 MLOG2

#TRACE YES
#TRACEFILE /oracle/TXS/sapbackup/backint_%BID.trace

BACKUPIDPREFIX TXS
ACS_DIR /oracle/TXS/acs/
ACSD acsprod5 57004
TSM_BACKUP_FROM_SNAPSHOT YES
MAX_SNAPSHOT_VERSIONS 5
DEVICE_CLASS STANDARD
LVM_FREEZE_THAW AUTO
TARGET_DATABASE_SUSPEND YES

```

## 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 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.

```

#####
####
#### 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 inwhich the source volume is accessed.
#=====#

#
#***** first sample *****#
#

>>> VOLUMES_SET_1
#=====#
# For e a c h 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 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 -
<<<

#=====#

```

## Example target volumes file (SAN Volume Controller configuration)

Refer to this example when editing the target volumes file for an SAN Volume Controller 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.

```
#####  
#===  
#=== 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
<<<
<<<
```



---

## Appendix B. 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<sup>®</sup> Storage System

For IBM XIV<sup>®</sup> 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 `INST_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<sup>®</sup> 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 IBM Tivoli Storage FlashCopy Manager in silent mode**

You can perform the installation and distribution phases of the IBM 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-TSMFCM-<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:

```
/usr/tivoli/tsfcm/acs_FlashCopy Manager version
```

and `version` has the format `2.1.0.0`.

- 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-TSMFCM-<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, 2009 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_2.1.0.0

# 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, 2009 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_2.1.0.0

# 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, 2009 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_2.1.0.0

# ORACLE_HOME Directory
# -----
ORACLE_HOME_FOLDER=/oracle/SID

# Selected IBM DB2 Instances
# -----

```

Lines starting with "#" are treated as comments.

## Special tasks for native Oracle

Information is provided about alternative procedures to adjust IBM 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
commethod           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 IBM 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 C. Troubleshooting IBM Tivoli Storage FlashCopy Manager

Resolving problems encountered when using IBM Tivoli Storage FlashCopy Manager requires tasks specific to the database environment.

### Related reference

“Log and trace files summary” on page 162

---

## General troubleshooting procedure

This procedure is valid for all IBM 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 33. 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

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 update during IBM Tivoli Storage FlashCopy Manager operations.

Log and trace files are written to during backup and restore processing by these products:

- DB2
- Oracle
- IBM Tivoli Storage FlashCopy Manager
- Storage system
- CIM
- Tivoli Storage Manager for ERP
- Operating system

### IBM Tivoli Storage FlashCopy Manager log and trace files

Refer to these examples of the log and trace files maintained by IBM Tivoli Storage FlashCopy Manager.

IBM 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 specifically requested by IBM Support. If TRACE is set to YES, each IBM Tivoli Storage FlashCopy Manager component creates an additional trace file in the log directory.

The following table lists the log and trace files maintained by IBM Tivoli Storage FlashCopy Manager. These files reside in <ACS\_DIR>/logs

Table 34. IBM 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>
Notes: <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, or tsm.</li></ul> The summary log file should always be 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.	

Table 35. IBM 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>

Table 35. IBM Tivoli Storage FlashCopy Manager Trace Files (continued)

Component	File
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® Storage System Devices	xivadapter_<id>_<function>.trace
Device Agent for CIM Devices (DS8000, SAN Volume Controller)	fmcima.<hostname>.<function>.<id>.trace fmcima.<hostname>.<device class>.<node num>.trace
Offload Agent (tsm4acs)	tsm4acs.<host>.<id>.trace tsm4acsd.<host>.<id>.trace
RMAN (when invoked by IBM Tivoli Storage FlashCopy Manager)	rman.<SID>.<id>.log
Notes:	
<ul style="list-style-type: none"> <li>Names ending in '-d' are daemon processes (started with '-D' option).</li> <li>&lt;id&gt; is the date ('yyyymmdd') for log files written by daemon processes, date and process ID ('yyyymmdd.xxxxx') 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>	

## Storage system log and trace files

Storage system log and trace files are updated during IBM 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 IBM 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 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 IBM Tivoli Storage FlashCopy Manager for Oracle

Resolving problems encountered when using IBM Tivoli Storage FlashCopy Manager requires tasks specific to the native Oracle database environment.

If an error condition occurs during a IBM 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 IBM 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 be 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 05dvv74v_1_1

```

```

List 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/rmytemplv 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

IBM 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.

### PFILE parameter

When setting parameters in the profile, make sure the TARGET\_DATABASE\_PARAMETER\_FILE parameter specifies a text-based Oracle initialization parameter file (PFILE) and not an Oracle server file (SFILE). Use of an Oracle server file will cause IBM Tivoli Storage FlashCopy Manager processing to fail. To ensure that Oracle obtains initialization parameter settings from a text-based file and therefore, can access the TARGET\_DATABASE\_PARAMETER\_FILE-specified value successfully, specify the PFILE parameter with the STARTUP command when starting Oracle.

### 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.

## IBM Tivoli Storage FlashCopy Manager for Oracle miscellaneous errors

Certain unique errors might display when using IBM Tivoli Storage FlashCopy Manager for native Oracle.

If you receive the following errors:

### IBM 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 IBM 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 IBM Tivoli Storage FlashCopy Manager.

---

## Appendix D. Internet Protocol Version 6 (IPv6) Support

IBM Tivoli Storage FlashCopy Manager for AIX 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 IBM 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 E. Accessibility features for Tivoli Storage FlashCopy Manager

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully. The major accessibility features of Tivoli Storage FlashCopy Manager are described in this topic.

### Accessibility features

The following list includes the major accessibility features in Tivoli Storage FlashCopy Manager:

- 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
- User documentation provided in HTML and PDF format. Descriptive text is provided for all documentation images.

The information center, and its related publications, are accessibility-enabled.

### Keyboard navigation

The Tivoli Storage FlashCopy Manager for Windows<sup>®</sup> Console follows Microsoft<sup>®</sup> 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).

Tivoli Storage FlashCopy Manager follows AIX operating system conventions for keyboard navigation and access.

### Vendor software

Tivoli Storage FlashCopy Manager 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.

### Related accessibility information

You can view the publications for Tivoli Storage FlashCopy Manager in Adobe<sup>®</sup> Portable Document Format (PDF) using the Adobe Acrobat Reader. You can access these or any of the other documentation PDFs at the IBM Publications Center at <http://www.ibm.com/shop/publications/order/>.

### IBM and accessibility

For more information about the commitment that IBM has to accessibility, see the IBM Human Ability and Accessibility Center at <http://www.ibm.com/able>.



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# Index

## A

- accessibility features 169
- ACS\_DIR parameter
  - description 91
- ACS\_REPOSITORY parameter
  - description 91
- acsd
  - description 66
- ACSD parameter
  - description 91
- acsgen
  - description 68
- acsora
  - description 71
- acsutil
  - description 73
- acsvg.sh
  - description 69
- ADMIN\_ASSISTANT parameter
  - description 91
- ALLOW\_FULL\_FILE\_BACKUP parameter
  - description 91
- APPLICATION\_TYPE parameter
  - description 91
- applications supported 1
- ASM
  - failure groups 9
    - DEVICE\_CLASS 31
- ASM\_INSTANCE\_ID parameter
  - description 91
- ASM\_INSTANCE\_USER parameter
  - description 91
- ASM\_ROLE parameter
  - description 91

## B

- backint
  - description 75
- backint profile (.utl)
  - description 130
  - keyword definitions 130
- backup
  - partial 48
  - starting 54
  - to Tivoli Storage Manager server 48
  - without snapshot disks 48
- backup environment
  - backup servers
    - assignment 34
    - determining 32
    - prerequisites 33
  - installation
    - non-remote 43
    - remote 41
  - preparing
    - backup servers 32
- backup granularity 1

- backup images
  - mounting 8
- backup procedure
  - DB2 47, 48
    - serial mode 49
    - to Tivoli Storage Manager server 48
  - DB2 database
    - parallel mode 49
  - fully automated backup 51
  - manual backup 50
  - native Oracle 49
    - to Tivoli Storage Manager server 50
  - native Oracle automated backup 51
  - native Oracle manual backup 50
  - SAP® with Oracle 51
    - automated backup 54
- BACKUP\_HOST\_NAME parameter
  - description 91
- BACKUP\_METHOD parameter
  - description 91
- backups
  - managing with DEVICE\_CLASS 35
- BUFFER\_SIZE parameter
  - description 91

## C

- CATALOG\_DATABASE\_CONNECT\_STRING parameter
  - description 91
- CATALOG\_DATABASE\_USERNAME parameter
  - description 91
- CIM
  - Generic Device Agent (acsgen) 68
  - log files 163
  - trace files 163
- CIM Adapter (fmcima)
  - description 70
- clone devices 5
- commands
  - list 59
- configuration files
  - description 87
- console mode
  - installation 156
- control files
  - backint profile (.utl)
    - description 130
    - keyword definitions 130
  - password file
    - description 124
  - profile
    - description 87
    - LVM\_FREEZE\_THAW 123
    - parameter descriptions 91
    - parameter examples 138, 140, 141, 144, 145
    - structure 88

- control files (*continued*)
  - profile (*continued*)
    - TARGET\_DATABASE\_SUSPEND 123
    - updating 91
  - SAP® BR\*Tools configuration profile (.sap)
    - description 131
  - target volumes file (.fct)
    - description 124
    - DS8000 parameter settings 128
    - SAN Volume Controller parameter settings 129
- COPYSERVICES\_HARDWARE\_TYPE parameter
  - description 91
- COPYSERVICES\_PRIMARY\_SERVERNAME parameter
  - description 91
- COPYSERVICES\_CERTIFICATEFILE parameter
  - description 91
- COPYSERVICES\_COMMPROTOCOL parameter
  - description 91
- COPYSERVICES\_SECONDARY\_SERVERNAME parameter
  - description 91
- COPYSERVICES\_SERVERNAME parameter
  - description 91
- COPYSERVICES\_SERVERPORT parameter
  - description 91
- COPYSERVICES\_TIMEOUT parameter
  - description 91
- COPYSERVICES\_USERNAME parameter
  - description 91

## D

- DATABASE\_BACKUP\_INCREMENTAL\_LEVEL parameter
  - description 91
- DATABASE\_BACKUP\_SCRIPT\_FILE parameter
  - description 91
- DATABASE\_CONTROL\_FILE\_RESTORE parameter
  - description 91
- DB2
  - backup history file 55
  - commands 78
  - directories 132
  - examples
    - disk layout 137
    - profile 138
  - files 132
  - LIST HISTORY command 55
  - native environment 14
  - OPTIONS parameter 64

- DB2 (*continued*)
  - SAP® environment 15
  - snapshot backup library 78
  - vendor options 62
- defining LUNs
  - DS8000 45
- defining target sets 26
  - DB2
    - multi-partition 27
    - single partition 26
  - naming convention 28
  - Oracle 26
  - profile 27
  - upgrading 28
- defining virtual disks
  - SAN Volume Controller 46
- deleting
  - snapshot backup 85
- DEVICE\_CLASS
  - managing backups 35
- DEVICE\_CLASS parameter
  - description 91
- devices
  - clone 5
  - DS8000 23
  - FlashCopy 3
  - IBM XIV® Storage System
    - preparing 22
  - SAN Volume Controller 23
  - snapshot 5
  - storage
    - log files 163
    - preparing 22
    - setting up 44
    - trace files 163
- directories
  - reference table 132
- disk layout
  - examples
    - DB2 137
    - Oracle native environment 139
    - SAP® with Oracle environment 143
  - sample 143
- DPF
  - backup modes 49
- DS8000
  - defining LUNs 45
  - examples
    - target volumes file 146
    - target volumes file mirror setup 149
  - preparing 23
  - target volumes file (.fct)
    - parameter settings 128
- E**
  - environment
    - backup servers 32
      - assignment 34
      - determining 32
      - prerequisites 33
    - native DB2 14
    - native Oracle 16
    - Oracle ASM 17
    - preparing 13

- environment (*continued*)
  - production 13
  - SAP® on DB2 15
  - SAP® with Oracle 15
- examples
  - DB2
    - disk layout 137
    - profile 138
  - Oracle ASM environment
    - profile 141
  - Oracle native environment
    - disk layout 139
    - profile 140
  - RMAN backup script 143
  - SAP® with Oracle environment
    - disk layout 143
    - profile for disk only 144
    - profile for offload 145
  - target volumes file
    - DS8000 146
    - DS8000 mirror setup 149
    - SAN Volume Controller 148

- F**
  - failure group
    - Oracle ASM overview 21
  - files
    - reference table 132
  - FlashCopy
    - devices 3
    - type 29
  - FLASHCOPY\_TYPE parameter
    - description 91
  - fmcima
    - description 70
  - fmquery
    - description 70
  - forced mount 8
  - fully automated backup 51

- G**
  - Generic Device Agent (acsngen)
    - description 68
  - Global Mirror 30
  - GLOBAL\_SYSTEM\_IDENTIFIER parameter
    - description 91
  - GRACE\_PERIOD parameter
    - description 91

- I**
  - IBM Tivoli Storage FlashCopy Manager
    - fully automated backup 51
    - manual backup 50
    - restore procedure
      - Restore Method One (Entire Database) 56
      - Restore Method Two (Datafile Only) 57
    - snapshot restore
      - procedure 56
    - starting backups automatically 54

- IBM Tivoli Storage FlashCopy Manager
  - SAP® with Oracle (backint)
    - description 75
  - individual mirrors 9
  - inquire function
    - tsm4acs 84
  - inquire\_detail function
    - tsm4acs 84
  - installation 39
    - backup server
      - non-remote 43
      - remote 41
    - console mode 156
    - preparing environment 39
    - production server 41
    - silent mode 156
- Internet Protocol Version 6 167

- L**
  - libacbdb2.a
    - DB2 78
  - links
    - symbolic 19
  - log files
    - CIM 163
    - IBM Tivoli Storage FlashCopy Manager 162
    - storage subsystems 163
    - summary 161, 162
    - Tivoli Storage Manager for ERP 163
  - LVM\_FREEZE\_THAW parameter
    - description 91

- M**
  - Management Agent (acsd)
    - description 66
  - manual backup 50
  - MAX\_SNAPSHOT\_VERSIONS parameter
    - description 91
  - MAX\_VERSIONS parameter
    - description 91
  - Metro Mirror 30
  - migrating 153
  - mirroring
    - examples
      - DS8000 target volumes file 149
    - Global Mirror 30
    - individual 9
    - LVM 9, 19
      - DEVICE\_CLASS 31
    - Metro Mirror 30
    - Oracle ASM
      - DEVICE\_CLASS 31
    - overview 19
  - mount function
    - tsm4acs 82
  - mounting
    - backup images 8
    - forced mount 8
  - multi-partition
    - target set definitions 27

## N

- naming convention 28
- NEGATIVE\_LIST parameter
  - description 91
- NUM\_BUFFERS parameter
  - description 91
- NUM\_SESSIONS parameter
  - description 91

## O

- Offload Agent (tsm4acs)
  - description 78
  - inquire function 84
  - inquire\_detail function 84
  - mount function 82
  - restore function 84
  - tape\_backup function 81
  - unmount function 83
  - update\_status function 70, 84
- option files
  - IBM Tivoli Storage FlashCopy Manager 132
  - Tivoli Storage Manager and Data Protection for Oracle 132
- OPTIONS parameter
  - description 91
- Oracle
  - ASM environment 17
    - profile example 141
  - native environment 16
    - directories 132
    - disk layout example 139
    - files 132
    - multiple server stanzas 160
    - profile example 140
    - system options files 159
  - SAP environment
    - directories 132
    - files 132
  - SAP® environment 15
    - disk layout example 143
    - profile example for disk only 144
    - profile example for offload 145
  - troubleshooting 164
    - miscellaneous errors 165
  - variables
    - troubleshooting 165
- Oracle ASM
  - failure group
    - overview 21
  - failure groups 9
    - DEVICE\_CLASS 31
- overview
  - component 6
  - product 1
- OVERWRITE\_DATABASE\_PARAMETER\_FILE parameter
  - description 91

## P

- PARALLEL\_BACKUP parameter
  - description 91

- PARALLELISM parameter
  - description 91
- parameter 91, 138, 140, 141, 144, 145
- PARTITION\_GROUP parameter
  - description 91
- password file
  - description 124
- prerequisites
  - backup servers 33
- problem determination
  - general procedure 161
  - Oracle environment 164
    - miscellaneous errors 165
  - Oracle variables 165
- production environment
  - installing 41
  - preparing 13
- Production System User Interface (acsora)
  - description 71
- profile
  - description 87
  - example for disk only
    - SAP® with Oracle environment 144
  - example for offload
    - SAP® with Oracle environment 145
  - examples
    - DB2 138
    - Oracle ASM environment 141
    - Oracle native environment 140
  - LVM\_FREEZE\_THAW 123
  - parameter descriptions 91
  - parameter examples 138, 140, 141, 144, 145
  - structure 88
  - target set definitions 27
    - naming convention 28
    - upgrading 28
  - TARGET\_DATABASE\_SUSPEND 123
  - updating 91
- PROFILE parameter
  - description 91
- Profile Wizard (wizard)
  - description 64
- publications
  - download ix
  - order ix
  - search ix

## Q

- Query Managed Capacity (fmquery)
  - description 70

## R

- RECON\_INTERVAL parameter
  - description 91
- repository
  - snapshot backup
    - status 86
- REPOSITORY\_LABEL parameter
  - description 91

- restore function
  - tsm4acs 84
- restore procedure
  - DB2 54
  - native Oracle 56
    - database 56
    - datafile 57
  - Restore Method One (Entire Database) 56
  - Restore Method Two (Datafile Only) 57
  - SAP® with Oracle 58
  - snapshot restore
    - procedure 56
- RESTORE\_FORCE parameter
  - description 91
- RMAN backup script
  - example 143

## S

- SAN Volume Controller
  - defining virtual disks 46
  - examples
    - target volumes file 148
  - preparing 23
  - target volumes file (.fct)
    - parameter settings 129
- SAP® BR\*Tools configuration profile (.sap)
  - description 131
- setup script
  - description 59
- silent mode
  - installation 156
- snapshot backup
  - deleting 85
  - modes with DPF partitions 49
  - repository
    - status 86
- snapshot backup library
  - DB2 78
- snapshot devices 5
- Snapshot Object Manager (acsutil)
  - description 73
- snapshot restore
  - procedure 56
- status
  - repository 86
- storage subsystems 3
  - DS8000
    - defining LUNs 45
    - log files 163
    - preparing 22
      - DS8000 23
      - IBM XIV® Storage System 22
      - SAN Volume Controller 23
    - SAN Volume Controller
      - defining virtual disks 46
      - setting up 44
      - trace files 163
- STORAGE\_SYSTEM\_ID parameter
  - description 91
- support information xi
- supported applications 1
- SVC\_CLEAN\_RATE parameter
  - description 91

SVC\_COPY\_RATE parameter  
description 91  
symbolic links 19

## T

tape\_backup function  
tsm4acs 81  
target set definitions 26  
DB2  
multi-partition 27  
single partition 26  
naming convention 28  
Oracle 26  
profile 27  
upgrading 28  
target volumes file  
examples  
DS8000 146  
DS8000 mirror setup 149  
SAN Volume Controller 148  
target volumes file (.fct)  
description 124  
parameter settings  
DS8000 128  
SAN Volume Controller 129  
TARGET\_DATABASE\_  
PARAMETER\_FILE parameter  
description 91  
TARGET\_DATABASE\_SUSPEND  
parameter  
description 91  
TARGET\_SETS parameter  
description 91  
TIMEOUT\_<PHASE>  
description 91  
TIMEOUT\_FLASH parameter  
description 91  
Tivoli Storage Manager  
backup to Tivoli Storage Manager  
server 48  
integration 11  
Tivoli Storage Manager for ERP  
log files 163  
trace files 163  
trace files  
CIM 163  
IBM Tivoli Storage FlashCopy  
Manager 162  
storage subsystems 163  
summary 161, 162  
Tivoli Storage Manager for ERP 163  
TRACE parameter  
description 91  
troubleshooting  
general procedure 161  
Oracle environment 164  
miscellaneous errors 165  
Oracle variables 165  
TSM\_BACKUP parameter  
description 91  
TSM\_BACKUP\_FROM\_SNAPSHOT  
parameter  
description 91  
tsm4acs  
description 78  
inquire function 84

tsm4acs (*continued*)  
inquire\_detail function 84  
mount function 82  
restore function 84  
tape\_backup function 81  
unmount function 83  
update\_status function 70, 84

## U

unmount function  
tsm4acs 83  
update\_status function  
tsm4acs 70, 84  
upgrading  
target set definitions 28  
USE\_CONSISTENCY\_GROUPS  
parameter  
description 91  
USE\_WRITABLE\_SNAPSHOTS parameter  
description 91

## V

Volume Group Takeover script (acsvg.sh)  
description 69  
VOLUME\_MGR parameter  
description 91  
VOLUMES\_DIR parameter  
description 91  
VOLUMES\_FILE parameter  
description 91

## W

without backup disks 48  
wizard 64

## X

XIV Adapter Java Archive  
(XivAdapter.jar)  
description 70  
XivAdapter.jar  
description 70





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