

Quick Start Guide to FlashCopy Manager for SAP® on IBM DB2® Database



A Best Practices Paper

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Abstract

Backups of SAP® systems are normally performed within a window during batch processing because the impact of the backup load on a database or application can be best tolerated. Compressing all backup activities into this backup window causes an extremely high peak workload for the system infrastructure (network, servers, tape drives). Because of growing database volumes, an increasing number of SAP systems and the business need for 24 by 7 application availability, the backup window can become a key obstacle in meeting service level requirements.

Storage-based FlashCopy or Snapshot solutions provide the operational flexibility necessary for today's IT infrastructure:

- *Zero impact* backups can be started any time during the daily operation of a SAP system, because the FlashCopy technique minimizes the impact on the application (server CPU load, database backup window).
- Backups can be made in two steps: point in time copy to disk and delayed or immediate backup to tape in order to balance tape load and more efficiently utilize the existing infrastructure.
- Backups can be made more frequently (to disk) in order to minimize the amount of log files between backups and hence the time needed for forward recovery to the latest point before failure.

IBM Tivoli® Storage FlashCopy® Manager software provides fast application-aware backups and restores leveraging advanced snapshot technologies in IBM storage systems.

[This paper covers the installation and configuration of FlashCopy Manager for SAP on a DB2® database and AIX® operating system. IBM DS8000® has been used as backend storage system.](#)

Remark: The correct name of the software product is "IBM Tivoli® Storage FlashCopy® Manager". To facilitate readability of the text, the short name "FlashCopy® Manager" is used in this document.

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1 Products Overview

1.1 IBM DS8000® Storage System

The DS8000 system is a cabinet-mounted self-contained disk storage subsystem. It is designed for the higher demands of data storage and data availability that most organizations face today.

The DS8000 series benefits using IBM POWER™ processor technology. Its extended connectivity, with up to 128 Fibre Channel/FICON® ports, makes it suitable for multiple server environments in both the open systems and System z® environments. Depending on your specific needs, the DS8000 system can be equipped with SATA drives, FC drives, and Solid® State Drives.

Its switched Fibre Channel architecture, dual processor complex implementation, high availability design, and the advanced Point-in-Time Copy and Remote Mirror and Copy functions that it incorporates make the DS8000 system suitable for mission-critical business functions.

<http://www.redbooks.ibm.com/abstracts/sg246786.html?Open>
<http://www-03.ibm.com/systems/storage/disk/ds8000/index.html>

DS8000 FlashCopy

The primary objective of FlashCopy is to very quickly create a point-in-time copy of a source volume on a target volume. The benefits of FlashCopy are that the point-in-time target copy is immediately available for use for backups or testing and that the source volume is immediately released so that applications can continue processing with minimal application downtime. The target volume can be either a logical or physical copy of the data, with the latter copying the data as a background process.

The IBM FlashCopy SE feature provides a “track space efficient” copy capability that can greatly reduce the storage capacity needed for point-in-time copies. Only the capacity needed to save pre-change images of the source data is allocated in a copy repository. This enables more space efficient utilization than is possible with the standard FlashCopy function. Furthermore, less capacity can mean fewer disk drives and lower power and cooling requirements, which can help reduce costs and complexity. FlashCopy SE may be especially useful in the creation of temporary copies for tape backup, online application checkpoints, or copies for disaster recovery testing. For more information about FlashCopy SE, refer to the IBM Redpaper at

<http://www.redbooks.ibm.com/abstracts/redp4368.html?Open>

1.2 IBM Tivoli Storage FlashCopy® Manager

In today's IT world, where application servers are operational 24 hours a day, the data on these servers must be fully protected. With the rapid increase in the amount of data on these servers, their critical business needs and the shrinking backup windows, traditional backup and restore methods may be reaching their limits in meeting these challenging requirements. Snapshot operations can help minimize the impact caused by backups and provide near instant restore capabilities. Since a snapshot operation typically takes much less time than the time for a tape backup, the window during which the data is being backed up can be reduced. This helps facilitate more frequent backups and increases the flexibility of backup scheduling and administration because the time spent for forward recovery through transaction logs after a restore is minimized.

IBM Tivoli Storage FlashCopy Manager uses the copy services capabilities of intelligent storage 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 a 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 backup to Tivoli Storage Manager (disk or tape) or performing backup verification functions (for example, the Database Verify Utility).

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.

Figure 1 gives an overview about the support applications and storage servers that can use FlashCopy Manager.

Remark: FlashCopy Manager for Windows® supports the applications Microsoft SQL Server® and Microsoft Exchange. IBM DS3000®, DS4000® and DS5000® storage systems are supported by Windows through VSS.

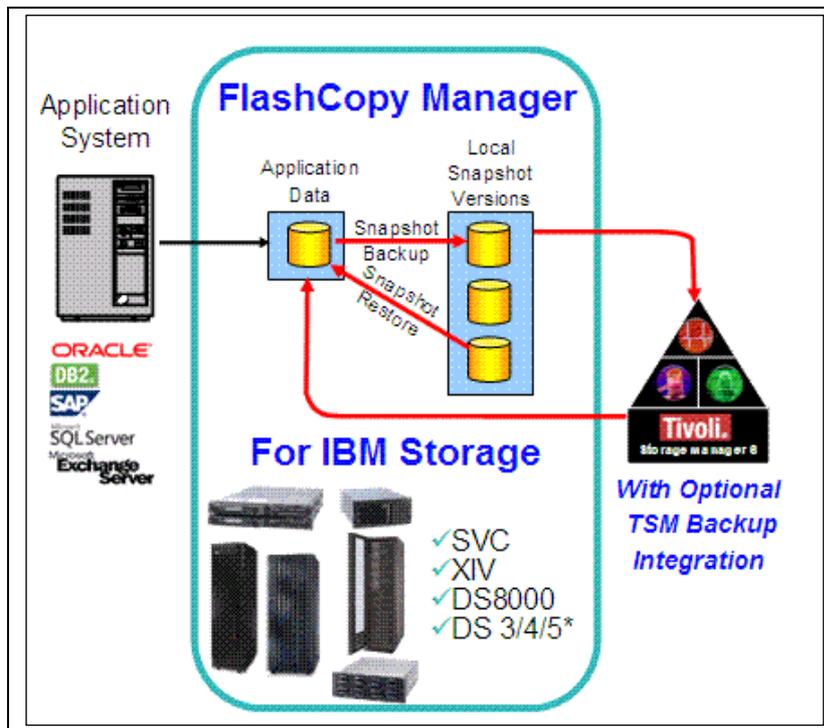


Figure 1: Supported applications and storage systems

For more information about Tivoli Storage FlashCopy Manager, refer to <http://www.ibm.com/software/tivoli/products/storage-flashcopy-mgr/>

2 Hardware/Software Setup (in the Mainz Lab)

This whitepaper covers the installation and configuration of IBM Tivoli FlashCopy Manager with SAP on DB2 database and AIX operating system.

The information in this paper is based on FlashCopy Manager 2.1 tests that were run for SAP R/3 on a DB2 9.5 database at the IBM Systems Lab Europe in Mainz, Germany.

2.1 Hardware and software

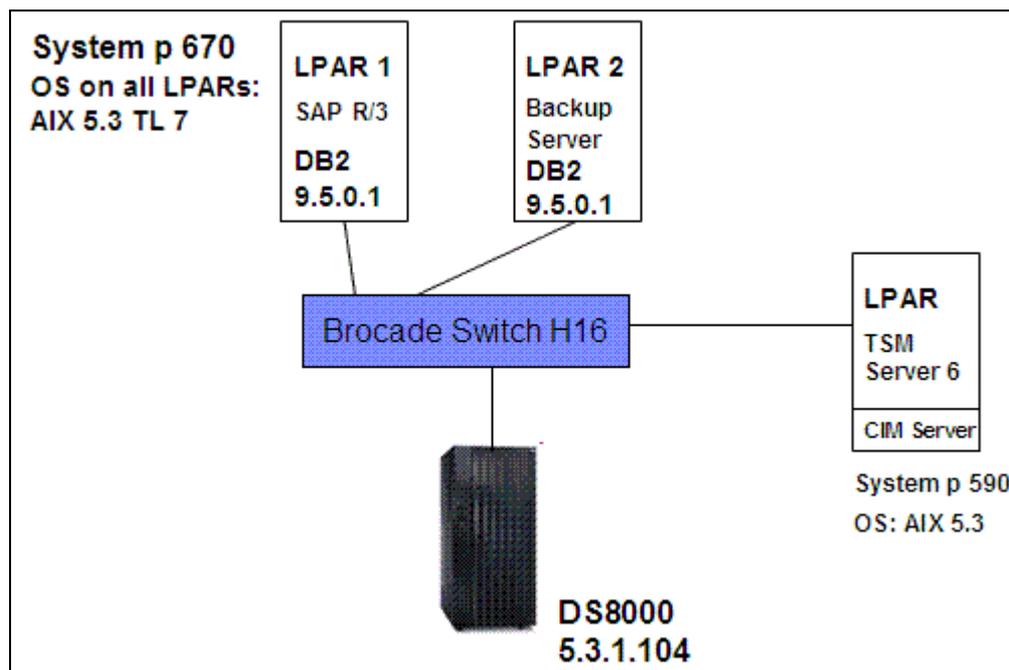


Figure 2: Hardware Setup for FlashCopy Manager with SAP on a DB2 database

The following software was installed on the SAP system LPAR (LPAR1):

- SAP R/3 Enterprise 4.7
- SAP Kernel 6.40 Level 221
- Database IBM DB2 9.5.0.1
- Operating System AIX 5.3 TL 10

	System ID (SID)	Host system name
Production system	OD3	sapr3db
Backup system	n/a	sapr3dbcl

Table 1: Production / Backup System Hostnames

2.2 Volume and Volume Group layout

FlashCopy Manager requires a well-defined volume layout on the storage subsystem and a resulting volume group structure on AIX. Distinct volume groups must be defined for:

- data files (sapdata)
- database logs (log_dir)
- DB2 instance directory (db2_dir)
- AIX boot disk (rootvg)

Other binaries (e.g. DB2 binaries and SAP kernel) should reside on separate volume groups. Note that FlashCopy Manager creates a FlashCopy of the DB2 instance directory. This directory should be created on separate volumes and must not reside on volumes that are not copied by FlashCopy Manager (e.g. the AIX boot disk).

Volume content	Number of logical volumes	Size of logical volumes
Database data files	2	60 GB
Database log files	2	20 GB
DB2 instance directory	2	2 GB
SAP/DB2 software	2	20 GB

Table 2: DS8000 storage system layout

Remark: For each AIX volume group two DS8000 logical volumes were created on separate DS8000 extent pools to distribute the I/O load across the available DS8000 resources.

Table 3 shows the AIX volume group and file system layouts on the DS8000 volumes.

Volume Group	File System	Size
sapdatavg	/db2/OD3/sapdata1	15 GB
	/db2/OD3/sapdata2	20 GB
	/db2/OD3/sapdata3	15 GB
	/db2/OD3/sapdata4	20 GB
	/db2/OD3/saptemp1	1 GB
log_dir	/db2/OD3/log_dir	10 GB
db2_dir	/db2/OD3/db2od3	1 GB
sapdb2*	/sapmnt/OD3	5 GB
	/usr/sap	5 GB
	/db2/OD3	20 GB

Table 3: AIX volume group layout

The DS8000 volume Ids of the SAP production system and the used target volumes for FlashCopy Manager are shown in Table 4.

SAP Production LPAR	Volume group	Extent Pool	Volume IDs	Volume size	FlashCopy target volumes
SID: OD3	Data	P4,P5	4104,4204	60 GB	4E10,4F10
	logs	P5	4105,4205	20 GB	4E11, 4F11
	db2_dir	P4,P5	4107,4207	2 GB	4E12, 4F12
	SAP/DB2	P4,P5	4106,4206	20 GB	
	Swap	P4,P5	4103,4203	10 GB	
	System	P5	4000	20 GB	

Table 4: DS8000 volume Ids from the production server

If FlashCopy Manager’s offload feature is used, a backup server with a DB2 instance must be installed. The volume layout as described above for the production system is also required for the backup system. For the FlashCopy backup solution on the backup server either new logical volumes for database logs and data must be defined or the existing volumes will be overwritten.

3 FlashCopy Manager Prerequisites

The installation of Tivoli FlashCopy Manager requires several pre-installation tasks to be performed. These tasks are described in an essential document: the pre-install checklist (see chapter 3.2). The pre-install checklist defines hardware and software requirements and describes the volume group layout for the SAP environment.

3.1 Overview

This section describes the theoretical background of an SAP backup/restore solution. The concept and products are not explained in detail. Existing links in the document provide references to product manuals, White Papers and other relevant documentation.

Database backup must take several file types into consideration: control files, data files and database logs.

In an SAP environment with a DB2 database, it is possible to control backup and restore operation with DB2 commands. This includes backup and restore to and from local files, to and from a “Tivoli Storage Manager® (TSM) Server” as well as FlashCopy backup/restore.

DB2 directly interfaces with other software products to provide extended backup/restore functions e.g.

- with Tivoli Storage Manager to provide backup and restore to and from TSM storage pools
- with Tivoli FlashCopy Manager to provide FlashCopy backup/restore

In other words: when calling the BACKUP DATABASE or RESTORE DATABASE commands, the “use clause” of the DB2 backup and restore commands can be used to specify TSM or FlashCopy usage to manage database or table space backup or restore operations.

Examples:

Syntax of the DB2 backup command: `db2 backup database ... use snapshot ...`

Syntax of the DB2 backup command: `db2 backup database ... use tsm ...`

This means it is possible to use different backup and restore methods of DB2 in parallel specifying the appropriate method in the use clause e.g. TSM or SNAPSHOT.

SAP provides an interface description that lets vendors of backup/restore software connect their software products to SAP's backup and recovery procedures. IBM/Tivoli offers “Tivoli Storage Manager for Enterprise Resource Planning® (also: TSM for ERP or Data Protection for SAP)” to interact with IBM's backup/restore solution “Tivoli Storage Manager (TSM)”. TSM for ERP in combination with Tivoli Storage Manager provide a reliable solution that enables backup and restore of DB2-based SAP® systems. It is integrated with DB2 backup and recovery facilities and applies SAP backup and recovery procedures.

TSM for ERP provides backup and restore on file level while FlashCopy Manager works on volume level.

Recommendation: Consider TSM for ERP as a complement to FlashCopy Manager for backups to tape and archiving database redo logs or log files.

If FlashCopy Manager is used to offload existing diskonly backups to a TSM Server, a DB2 instance must be installed on the associated backup server. See subchapter 3.7.

Furthermore an offload backup with FlashCopy Manager requires that 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).

Further reading:

Data Protection for SAP® - Installation and User's Guide for DB2

<http://publib.boulder.ibm.com/infocenter/tsminfo/v6/index.jsp>

Database Administration Guide: SAP on IBM DB2 Universal Database for UNIX and Windows

See SAP Service Marketplace at: <http://service.sap.com/instguides>

3.2 Pre-Installation Tasks

The most recent pre-installation task checklist for FlashCopy Manager can be found at:

<http://www-01.ibm.com/support/docview.wss?&uid=swg21395564>

IBM Tivoli Storage FlashCopy® Manager Version 2.1 Hardware and Software Requirements

The checklist defines hardware and software requirements and describes the volume layout for the SAP environment. To have a smooth installation of FlashCopy Manager it is absolutely necessary that all requirements are fulfilled.

For a list of considerations and decisions to be taken before installing IBM Tivoli Storage FlashCopy® Manager Version 2.1 for AIX, refer to the Installation Planning Sheet that is also available under the previous link.

3.3 Secure Shell

A FlashCopy Manager environment that uses one or more backup servers (e.g. to offload backup data to TSM) requires FlashCopy Manager software on production and backup systems. It is possible to separately install and configure FlashCopy Manager on the backups systems running the setup scripts on the backup server(s).

However it is more efficient to maintain the configuration centrally on the production system and create or modify the backup systems' configuration from this central instance. In the latter case communication is required between the production and backup systems.

Two options are available:

- a Secure Shell (OpenSSH) connection
- a NFS-share of the FlashCopy Manager configuration directory (ACS_DIR) and the database instance-specific installation directory (INST_DIR)

NFS sharing of the directories is possible, but OpenSSH is the preferred method for FlashCopy Manager. If Secure Shell is used, installation and configuration updates can be controlled centrally on the production server.

If IBM DS8000 Storage System is used, a CIM Agent must also be installed on the servers to control the storage-based copy services. OpenSSH and the CIM Agent must work together with an OpenSSL (Secure Sockets Layer) library.

All required software components are available for download in the web:

OpenSSL: <http://www.ibm.com/systems/p/os/aix/linux/toolbox/download.html>

(follow the link 'AIX Toolbox Cryptographic Content' on the right)

OpenSSH comes with AIX 6.1. Check if this version works before downloading and installing from

<http://sourceforge.net/projects/openssh-aix/files/#>

Software versions that worked together in the tests for this paper are:

CIM 2.6.1

OpenSSH 4.7.0 (openssh.base.client 4.7.0.5301, openssh.base.server 4.7.0.5301)

OpenSSL 0.9.8 (openssl.base 0.9.8.602)

Note that the FlashCopy Manager installation package includes a Pegasus CIM client. This software is used to connect FlashCopy Manager to the CIM agent that manages the DS8000 or SVC Copy Services. XIV which is also supported by FlashCopy Manager is managed via the command line interface xcli i.e. XIV does not require a CIM setup.

Although FlashCopy Manager does not need a separate Pegasus installation, further information is provided here:

CIM Client version Pegasus2.6.1.40_OSBase1.2.7.40_SMIS1.2.0.40_AIX.tar

https://www14.software.ibm.com/webapp/iwm/web/preLogin.do?lang=en_US&source=aixpegcim

3.4 Installation and Configuration of the CIM Agent (DS8000)

IBM Tivoli Storage FlashCopy Manager accesses FlashCopy® services on DS8000 or SAN Volume Controller through a CIM server. Depending on the storage subsystem microcode level, this CIM server is either embedded directly into the storage subsystem or required to be installed and configured as a proxy CIM server in the environment.

Starting with SAN Volume Controller 4.3.1 and DS8000 R4.1, the CIM server is embedded in the storage device and therefore does not require being 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 those SAN Volume Controller and DS8000 releases that support both a proxy CIM server and an embedded CIM server.

A DS CIM agent consists of the components shown in Figure 3. Main components are the CIM object manager (CIMOM), the service location protocol (SLP), and the device provider. A device can be a storage server such as the DS8000 storage server. The CIM agent registers itself with the SLP Service Agent (SLP SA) to enable discovery by the Client application. The SLP is a directory service daemon that a client application calls to locate the CIM Object Manager. The client application and the CIMOM communicate through CIM Messages. The CIMOM and device provider communicate through method calls made from the CIMOM to the provider. The device provider communicates with the device through proprietary calls.

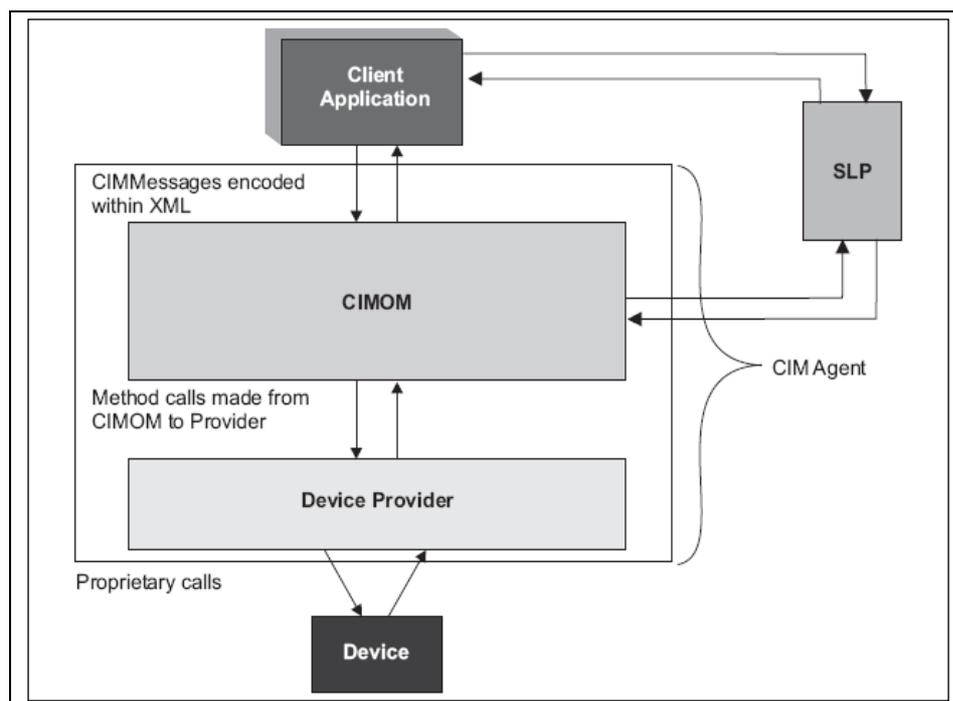


Figure 3: DS CIM Agent components

The DS CIM Agent can coexist with the CIM Client on the same server. However the installation on the backup system is preferred (see Figure 4), because on the production system the CIMOM and particularly Java could impact performance.

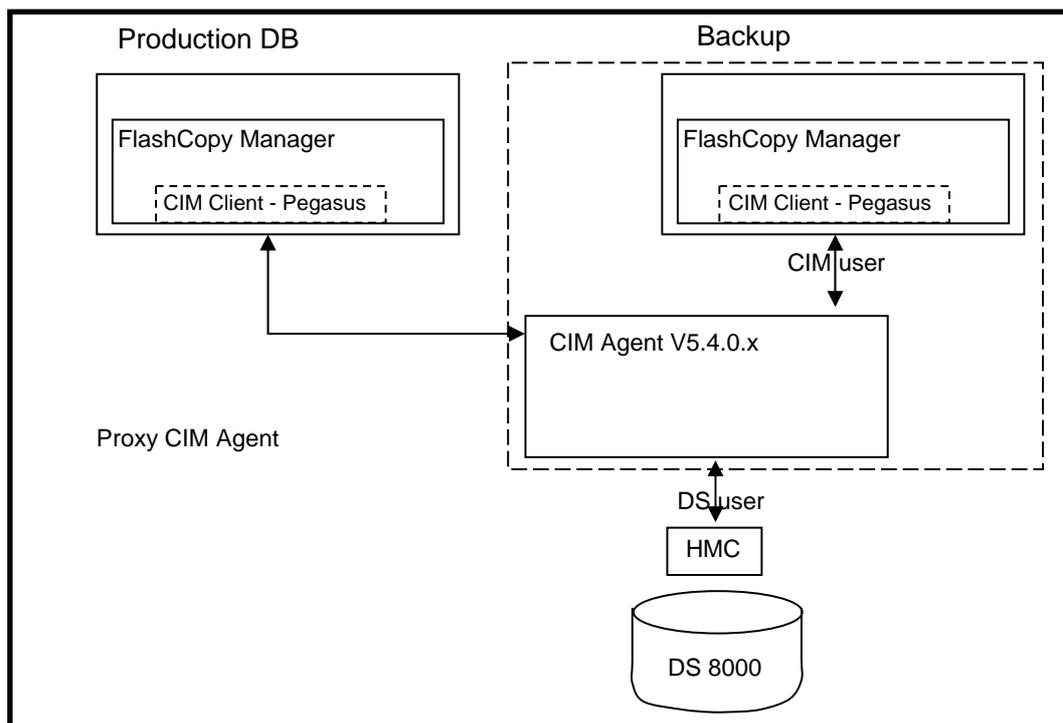


Figure 4: DS CIM Agent for DS8000

To install the CIM agent for DS8000 or SVC download the free available software package from: http://www-01.ibm.com/support/search.wss?rs=1118&tc=STC4NKB&atr=SWVersion&atrvc=5.4*&atrwcs=on&dc=D400&dtm

During the installation of the CIM Agent the following values have to be specified:

Parameter	Value
Install directory	/opt/ibm/dsagent
HTTPS port	5989
HTTP port	5988

3.4.1 Configuring the CIM Agent to access the DS8000

The CIM Agent has to be configured to access the DS8000 storage server. For the configuration on AIX the CIM command line interface must be started in the CIM Agent installation directory: **/opt/IBM/dsagent/bin/**.

With the *dscimcli* command each DS server that the CIM agent should access must be defined: The format of the command *dscimcli* is:

```
./dscimcli mkdev <hmc-ip> -type ds -user <user> -password <password>
```

In this example, the *dscimcli* command configures a DS8000 with the HMC IP 9.155.62.11 and the user "cimsap":

```
bash-3.00# ./dscimcli mkdev 9.155.62.11 -type ds -user cimsap -password passw2rd
Device successfully added.
```

After the DS8000 has been defined the following command verifies that the device is correctly added and has successfully connected:

```
bash-3.00# ./dscimcli lsdev -l
```

Type	IP	IP2	Username	Storage Image	Status	Code Level	Min Codelevel
DS	9.155.62.11	-	cimsap	IBM.2107-7581991	successful	5.3.1.104	5.1.0.309

Environment variable settings are required to issue any of the CIM agent management commands. The start of the profile script envConf sets the necessary variables on the UNIX shell:
source <dest-path>/config/envConf , where <dest-path> is the destination directory where the CIM agent is installed.

The following commands stop, start and check the status of the CIM Agent:

```
Start the CIM agent with:      startagent
Stop the CIM agent with:     stopagent
CIM agent status:           cimagentstatus
```

Verify the installation of the service location protocol (SLP). SLP is a directory service that a client application calls to locate the CIM Object Manager. Open a Command Prompt window and type the following command to verify that SLP is started: # **ps -ef | grep slpd** If the SLP daemon is started, the following output is displayed:

```
bash-3.00# ps -ef | grep slpd
daemon 438298  1  0 12:51:30  - 0:00 /opt/IBM/dsagent/slp/sbin/slpd
```

Verify the installation of the CIM Agent. Check that the cimserver daemon is installed and started by typing the following command: # **ps -ef | grep cimserv**

```
bash-3.00# ps -ef | grep cimserv
root 540692  1  0 12:51:29  - 0:09 [cimserve]
```

3.4.2 Configuring FlashCopy Manager to use a command line interface

This paper describes a FlashCopy Manager setup with IBM DS8000 storage system. To access some other storage systems e.g. IBM XIV® FlashCopy Manager uses a command line interface instead of CIM. In this case, FlashCopy Manager needs the password of the storage system user to control the box via CIM or command line interface. The passwords are specified in a subsequent section of the FlashCopy Manager profile. The setup script question “Do you want to continue by specifying passwords for the defined sections?” must be answered by “yes” to enter this section.

3.5 TSM Client and Server

If an offloaded backup is planned, FlashCopy Manager requires a Tivoli Storage Manager® (TSM) client installation on both the production and backup server. In addition TSM can be used for other purposes e.g. archival of the database logs, backup of the FlashCopy Manager repository.

The client configuration is performed on the production and backup servers. In this setup, the TSM Server is running on the server “p590-tic-1-v49.mainz.de.ibm.com” which is reflected in the TSM configuration files, as shown in Figure 5 **Error! Reference source not found.** and Figure 6 **Error! Reference source not found.**

```
SErvername SAPTSM
COMMMethod      TCPip
TCPPort         1500
TCPServeraddress 9.155.87.188
errorlogname    /tmp/tsmerrlog
```

Figure 5: Example of TSM configuration file “dsm.sys”

SERvername	SAPTSM
------------	--------

Figure 6: Example for TSM configuration file "dsm.opt"

The basic Tivoli Storage Manager Server code has to be installed on the backup server or any other server and configured with an administrative ID and the storage pools must be available. For more information about planning and installing a Tivoli Storage Manager server, refer to the product documentation, or the IBM Redbook, "IBM Tivoli Storage Manager Implementation Guide, SG24-5416".

It is recommended to have a separate policy domain with a policy set, management class and copy group in Tivoli Storage Manager for each of the Tivoli Data Protection modules. In this setup a separate policy domain and policy set for FlashCopy Manager have been defined.

On the TSM server in the test environment the following TSM objects exist:

TSM policy domain: **opsapdom**
 TSM management class: **osapmclass**
 TSM node: **sapr3db2**

Note: Typically separate management classes are defined for backup (BACKUPMGTCCLASS) and archive (ARCHIVEMGTCCLASS). Additional management classes should be considered to backup file system contents, database logs and copies of the database logs.

3.6 TSM for Enterprise Resource Planning

IBM Tivoli Storage Manager for Enterprise Resource Planning (TSM for ERP) quickly and confidently restores your SAP database after almost any kind of business interruption. It provides backup and recovery of SAP on Oracle and SAP on DB2 environments.

The data moving functions of TSM for ERP are implemented in a shared library accessed by DB2 whenever a backup or restore command is issued.

Tivoli Storage Manager for Enterprise Resource Planning can be considered as a solution for backups to tape and archiving database redo logs or log files.

TSM for ERP (6.1 or later) has to be installed on the production server and backup server. During the installation the following information has to be specified:

- DB2 SID
- TSM Server name
- TSM Policy domain
- TSM management class
- TSM node name

After the installation of TSM for ERP the password for the TSM Server access must be configured to TSM for ERP. The command *backom* must be started on the production server with the DB2 administrative user ID *db2<sid>* (here: *db2od3*).

Output of the command *backom*:

```
sapr3db2:db2od3 35> /usr/tivoli/tsm/tdp_r3/db264/backom -c password
```

Data Protection for SAP(R)
 - Version 6, Release 1, Modification 0.0 for AIX LF 64-bit -
 Build: 358 compiled on Nov 4 2008
 (c) Copyright IBM Corporation, 1996, 2008, All Rights Reserved.

```
=====
BKI8540I: Using ProLE at localhost:tdpr3db264
BKI8558I: Setting TSM password for partition 'NODE0000' on host 'SAPR3DB2'.
BKI0049I: Please enter password for node SAPR3DB2 on server P590-TIC-1-V49.MAINZ.DE.IBM.COM:
BKI0051I: Password successfully verified for node SAPR3DB2 on server P590-TIC-1-V49.MAINZ.DE.IBM.COM.
BKI8512I: Return code is: 0
```

The *backom* command **Error! Reference source not found.** connects TSM for ERP with the TSM server and stores the TSM node password inside an encrypted file called *init<SID>.bki*. Once this command has been run successfully it is also confirmed that TSM for ERP can connect to the TSM Server.

It is good practice to configure the directory in which the TSM for ERP configuration files are stored as a Network File System (NFS). Thus the backup server can access the configuration files over NFS and many TSM for ERP configuration steps have to be done only once on the production server.

3.7 DB2 Instance Creation

If a backup server is installed and configured to use FlashCopy Manager's offload feature, a database instance with the same version as the database instance on the production server is required to be installed on the backup server.

The below example shows the creation of a DB2 instance after the DB2 database server software has been installed.

Example:

```
# create DB2 instance as user root:
$ /opt/IBM/db2/V9.5/instance/db2icrt -u db2od3 db2od3
DBI1070I Program db2icrt completed successfully.
```

```
# show a list of instances:
$ su - db2od3
$ db2ilist
db2od3
$
```

4 FlashCopy Manager Installation and Configuration

IBM Tivoli Storage FlashCopy Manager must be installed on the production system. Optionally, it can also be installed on the backup system. The IBM Tivoli Storage FlashCopy Manager installation directory is /usr/tivoli/tsfcm/acs_2.1.x.x. To install FlashCopy Manager with a graphical wizard, an X server has to be installed on the production system. For this setup a VNC server was used (see <http://www.tightvnc.com/>).

The installation package is using the following name format: <version>-TIV-TSFCM-<OS-platform>.bin

4.1 Software Installation

The installation of FlashCopy Manager is done rather quickly. There are three possible modes for the installation:

GUI mode: This requires a running X-Server. `./2.1.0.0-TIV-TSFCM-AIX.bin`

Console mode: Offers same features as GUI mode `./2.1.0.0-TIV-TSFCM-AIX.bin -i console`

Silent mode: An unattended setup requires a properties file. `./2.1.0.0-TIV-TSFCM-AIX.bin -i -f <properties_file>`

The main steps of the FlashCopy Manager installation are shown in Figure 7.

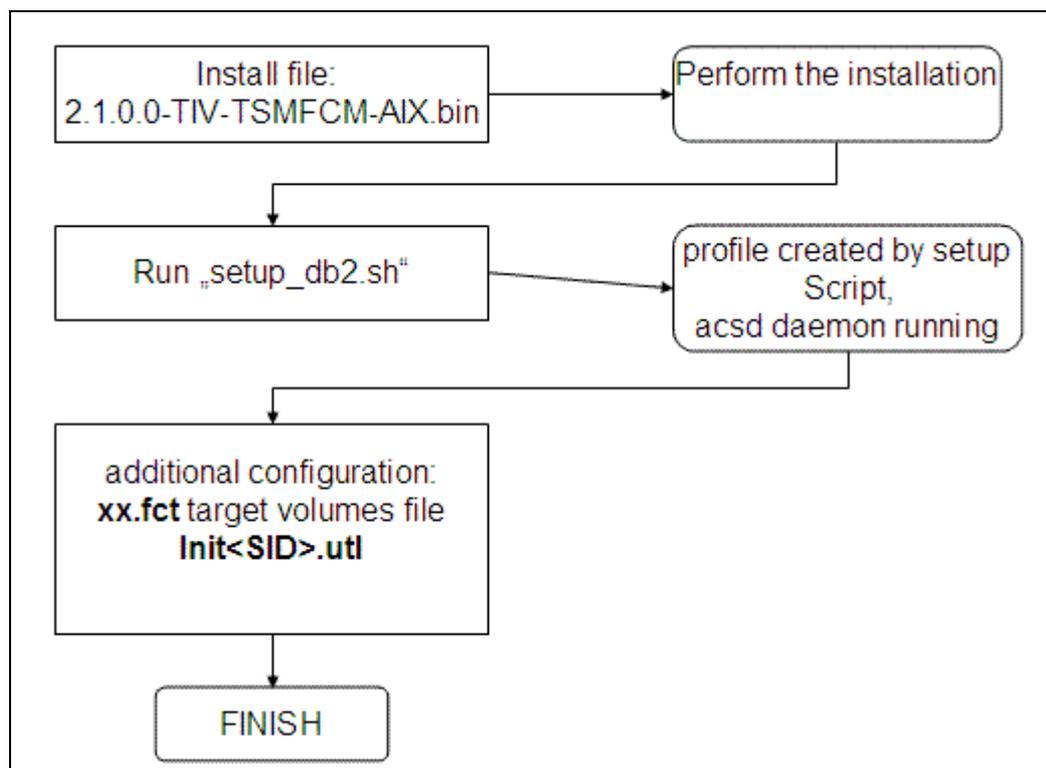


Figure 7: Installation/configuration workflow overview

The installation must be performed as root user.

- 1) Log on to the production server as root user

- 2) Using the GUI mode, enter “./2.1.0.0-TIV-TSFCM-AIX.bin”
- 3) Follow the instruction that are displayed
- 4) Check the summary of the install wizard, as shown in Figure 8. Be sure to enter the correct instance id of the database.
- 5) After the installation has finished log into the server as the database owner and start the script `setup_db2.sh`. This script asks a lot of setup questions that are described in the next chapter.

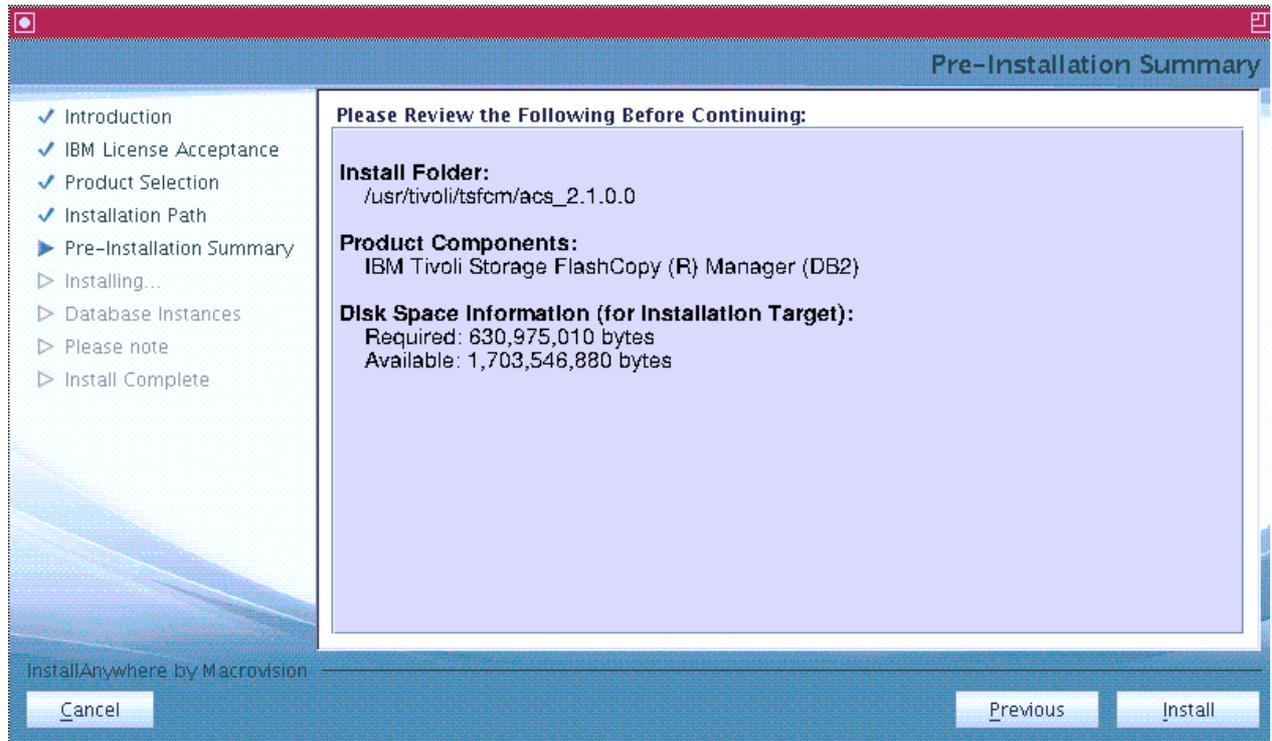


Figure 8: Pre-installation summary

4.2 Configuration for disk only backup

After the installation of FlashCopy Manager a profile is required to successfully run FlashCopy Manager. In the following example FlashCopy Manager is configured for executing a backup to disk only. To create the profile login as the database instance owner and run the script `setup_db2.sh` on the production system. The script asks several questions for the content of the profile. The main questions are:

- Configuration from PS or BS?
 - PS: FlashCopy Manager is configured from PS with subsequent remote deployment to BS via SSH. This is the recommended configuration.
 - BS: This option is required if no SSH is available or no NFS share is possible
- Please enter the directory where the profile will be stored:
 - `/db2/<instance owner's home directory>/acs` e.g. `/db2/db2od3/acs`
- Are you going to perform off-loaded backups to Tivoli Storage Manager?
 - NO: Sections and parameters related to offloaded backups are omitted
- Path of the IBM Tivoli Storage FlashCopy(R) Manager directory {ACS_DIR}
 - `/db2/<instance owner's home directory>/acs` e.g. `/db2/db2od3/acs`
- Hostname and port of machine running Management Agent {ACSD} (<hostname> <port>)
 - <hostname of the production server> 57328
- Path to the repository directory {ACS_REPOSITORY}
 - `/db2/<instance owner's home directory>/acs/acsrepository` e.g. `/db2/db2od3/acs/acsrepository`

The setup script creates a profile that shows the specified parameter settings in the so-called FlashCopy Manager directory (ACS_DIR). This file can be re-created and modified by rerunning the setup script (see chapter 4.3) but can also be edited manually.

Note that some parameter changes require a restart of the FlashCopy Manager processes which is automatically done by the setup script.

FlashCopy Manager profile example:

```
db2od3> cat /db2/db2od3/acs/profile
>>> GLOBAL
ACS_DIR /db2/db2od3/acs
ACSD sapr3db2 57328
# TRACE NO
<<<

>>> ACSD
ACS_REPOSITORY /db2/db2od3/acs/acsrepository
# ADMIN_ASSISTANT NO
# REPOSITORY_LABEL TSM
<<<

>>> CLIENT
```

```

# BACKUPIDPREFIX DB2____
APPLICATION_TYPE SAP
PARTITION_GROUP OPTIONAL_ONLY
# MAX_VERSIONS ADAPTIVE
# LVM_FREEZE_THAW AUTO
NEGATIVE_LIST WARN
# TIMEOUT_FLASH 120
# DEVICE_CLASS STANDARD
<<<

>>> DEVICE_CLASS STANDARD
COPYSERVICES_HARDWARE_TYPE DS8000
COPYSERVICES_PRIMARY_SERVERNAME p590-tic-1-v49.mainz.de.ibm.com
# COPYSERVICES_SECONDARY_SERVERNAME
# COPYSERVICES_USERNAME superuser
# COPYSERVICES_COMMPROTOCOL HTTPS
# COPYSERVICES_CERTIFICATEFILE NO_CERTIFICATE
# COPYSERVICES_SERVERPORT 5989
FLASHCOPY_TYPE INCR
# COPYSERVICES_TIMEOUT 6
# RESTORE_FORCE NO
# STORAGE_SYSTEM_ID
TARGET_SETS VOLUMES_FILE
VOLUMES_FILE /db2/db2od3/acs/od3.od3.standard.node0000.fct
<<<

```

The Appendix shows complete FlashCopy Manager setup protocols for DS8000 storage systems. The setup script creates the profile in the directory *ACS_DIR* and adds the CLIENT section for diskonly backups to the profile. After the setup script has run successfully, a target volumes file must be created for the storage system (here: DS8000) in the *ACS_DIR* directory. FlashCopy Manager requires that the target volumes are defined in a file.

The name of the target volume file has the ending *.fct* and is specified during the execution of the setup script. The target volumes file contains the LUN IDs of the storage system, see Figure 9.

```

>>> TARGET_SET volumes_set_1
TARGET_VOLUME 75819914E10 --
TARGET_VOLUME 75819914E11 --
TARGET_VOLUME 75819914E12 --
TARGET_VOLUME 75819914F10 --
TARGET_VOLUME 75819914F11 --
TARGET_VOLUME 75819914F12 --
<<< volumes_set 1

```

Figure 9: DS8000 target set definition file

As already mentioned, in case of a diskonly backup the database administrator has to take care of the database logs. They are not automatically backed up by FlashCopy Manager.

Independent of the backup type that will be used, the system administrator must explicitly back up the FlashCopy Manager repository (e.g. */db2/db2od3/acs/acsrepository*). This directory contains the backup history of FlashCopy Manager. In case of a server crash, the repository has to be restored.

4.3 Switching from diskonly to offloaded backup

If FlashCopy Manager was already installed and configured on the system without the offload backup option, it is recommended to rerun the script `setup_db2.sh` in order to modify the FlashCopy Manager profile instead of changing the configuration files manually.

Example:

```
Preparing to install on Production System
Found profile /db2/db2od3/sqllib/acs/profile
Do you want to:
  (c)reate a new profile
  (r)euse the profile unchanged
  (m)odify the profile
Please enter one of the strings in parentheses:
m
The management daemon seems to be running.
Do you want me to stop it to proceed with the configuration? [Y/N]
y
Stopping FCM management daemon on your request.
Deactivating FCM management daemon.
Currently off-loaded backups are not configured. Do you want to configure off-loaded backups? [y|n]
y
```

The setup script adds a new section named OFFLOAD to the FlashCopy Manager profile.

```
>>> OFFLOAD
BACKUP_METHOD DB2
# OPTIONS
# PARALLELISM AUTO
# NUM_SESSIONS 1
# NUM_BUFFERS AUTO
# BUFFER_SIZE AUTO
<<<<
```

The Appendix shows complete FlashCopy Manager setup protocols for DS8000 storage system.

5 Backup/Restore scenarios

This chapter describes basic backup and restore scenarios that are supported by FlashCopy Manager. For the examples tested at the IBM lab the following information is provided:

- the command line to invoke the backup or restore
- output information required for follow-on activities (e.g. backup IDs required for a potential restore)

Figure 10 and Figure 11 show the backup and restore options of FlashCopy Manager:

1. A diskonly backup of the production environment leveraging the FlashCopy or Snapshot feature of the storage system
2. A backup server offloading the database backup on the FlashCopy target volumes to a TSM server
3. A restore of the diskonly backup to the production environment reversing an existing FlashCopy or Snapshot
4. A restore from the TSM server to the production environment

Notes:

- For a diskonly backup or restore neither a backup server nor a TSM server is required (scenarios 1 and 3).
- A TSM restore writes directly to the production environment (scenario 4).
- The TSM server can be installed on the backup server.

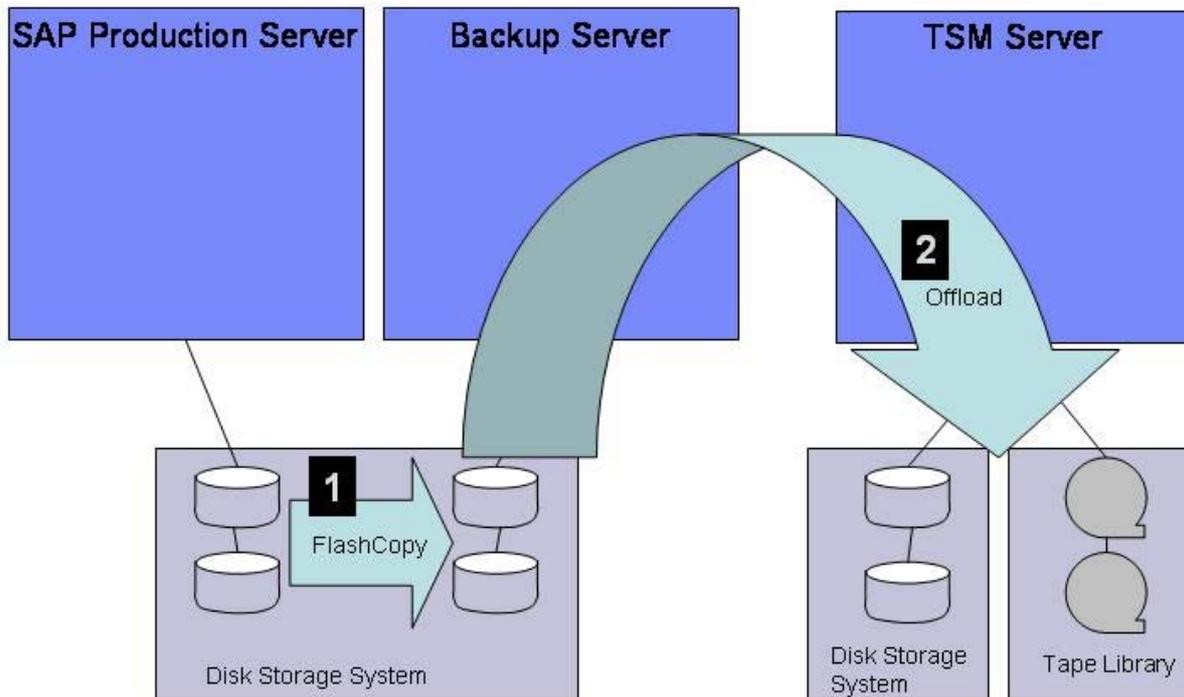


Figure 10: Backup options of FlashCopy Manager

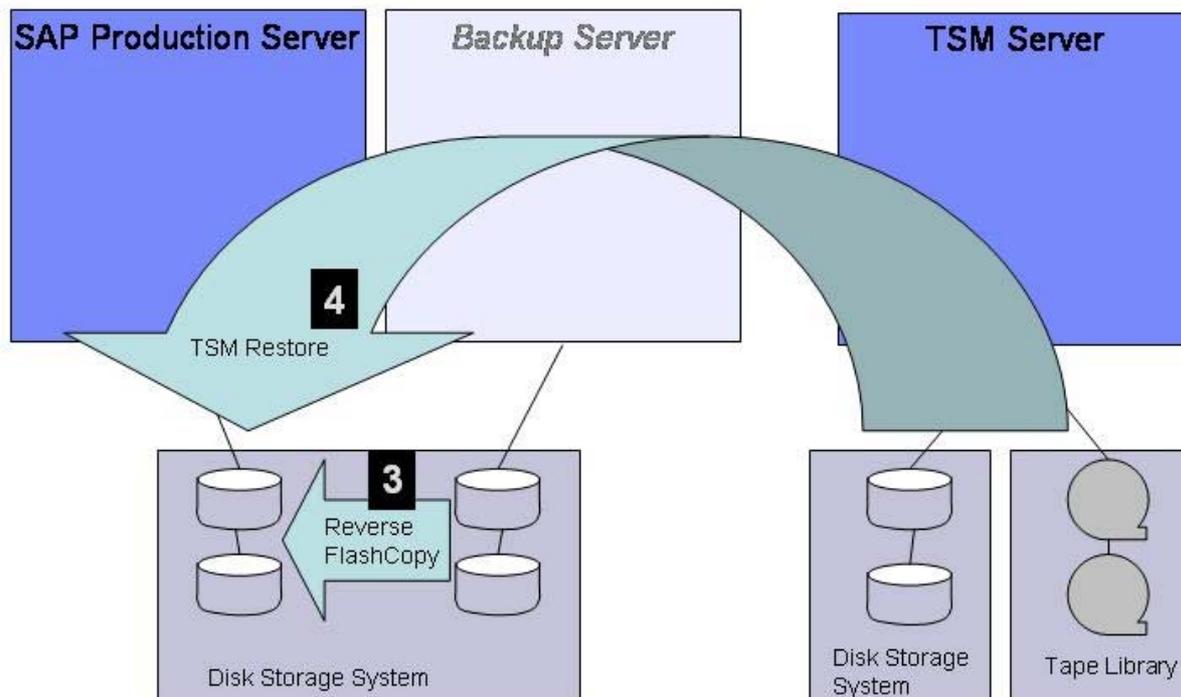


Figure 11: Restore options of FlashCopy Manager

5.1 Diskonly Backup

A diskonly backup leverages the point-in-time copy functionality of the storage subsystem to create copies of the LUNs that host the database. A diskonly backup requires neither a backup server nor a TSM server.

A diskonly backup is initiated with the “db2 backup” command and the “use snapshot” clause.

DB2 creates a timestamp for the backup image ID that is displayed in the output of the “db2 backup” command and can also be read out with the FlashCopy Manager utility **db2acsutil** or the DB2 command “db2 list history”. This timestamp will be required to initiate a restore.

Command line examples:

```
db2od3> db2 backup database OD3 online use snapshot
```

Backup successful. The timestamp for this backup image is : 20090811122318

```
db2od3> db2 list history backup all for OD3|grep 2009
B D 20090721135745001 F D S0000284.LOG S0000284.LOG
Start Time: 20090721135745
End Time: 20090721140223
B D 20090810160337001 N F S0000286.LOG S0000286.LOG
Start Time: 20090810160337
End Time: 20090810160357
B D 20090810161021001 N F S0000287.LOG S0000287.LOG
Start Time: 20090810161021
End Time: 20090810161041
```

```

B D 20090810161249001 F F S0000288.LOG S0000288.LOG
Start Time: 20090810161249
End Time: 20090810161309
R D 20090810162401001 F 20090721135745
Start Time: 20090810162401
End Time: 20090810163128
B D 20090811122318001 N F S0000296.LOG S0000296.LOG
Start Time: 20090811122318
End Time: 20090811122340
    
```

The DS8000 command line interface shows that the FlashCopy pairs have been created.

```

dscli> lsflash -l 4F10 4F11 4F12 4e10 4e11 4e12
Date/Time: 11. August 2009 12:25:22 CEST IBM DSCLI Version: 5.4.2.402 DS: IBM.2107-7581991
ID SrcLSS SequenceNum Timeout ActiveCopy Recording Persistent Revertible
SourceWriteEnabled TargetWriteEnabled BackgroundCopy OutOfSyncTracks DateCreated
DateSynced State AllowTgtSE Pmir
=====
4104:4E10 41 0 60 Enabled Enabled Enabled Disabled
Enabled Enabled Enabled 828332 Tue Aug 11
12:22:15 CEST 2009 Tue Aug 11 12:22:15 CEST 2009 Valid Disabled No
4105:4E11 41 0 60 Enabled Enabled Enabled Disabled
Enabled Enabled Enabled 186072 Tue Aug 11
12:22:15 CEST 2009 Tue Aug 11 12:22:15 CEST 2009 Valid Disabled No
4107:4E12 41 0 60 Disabled Enabled Enabled Disabled
Enabled Enabled Enabled 32700 Tue Aug 11
12:22:15 CEST 2009 Tue Aug 11 12:22:15 CEST 2009 Valid Disabled No
4204:4F10 42 0 60 Enabled Enabled Enabled Disabled
Enabled Enabled Enabled 822760 Tue Aug 11
12:24:14 CEST 2009 Tue Aug 11 12:24:14 CEST 2009 Valid Disabled No
4205:4F11 42 0 60 Enabled Enabled Enabled Disabled
Enabled Enabled Enabled 211360 Tue Aug 11
12:24:14 CEST 2009 Tue Aug 11 12:24:14 CEST 2009 Valid Disabled No
4207:4F12 42 0 60 Disabled Enabled Enabled Disabled
Enabled Enabled Enabled 0 Tue Aug 11
12:24:14 CEST 2009 Tue Aug 11 12:24:14 CEST 2009 Valid Disabled No
    
```

The FlashCopy Pairs must be synchronized i.e. the number of “OutOfSync Tracks” must be zero before a FlashCopy Restore can be initiated.

```

db2od3> /opt/IBM/db2/V9.5/bin/db2acsutil query
Instance Database Part Image Time Host First Log
=====
db2od3 OD3 0 20090821153352 sapr3db2 306

db2od3> /opt/IBM/db2/V9.5/bin/db2acsutil query status
Instance Database Part Image Time Status
=====
db2od3 OD3 0 20090821153352 Remotely mountable + Repetitively restorable + Swap
restorable + Physical protection + Full copy + Tape backup pending + Tape backup in progress
(167936 / 167936 MB)
    
```

Check the FlashCopy Manager Installations and User’s Guide for more detailed information.

5.2 Offload to Tivoli Storage Manager

An existing diskonly backup can be offloaded to a TSM server. A backup server accesses the data on the FlashCopy target volumes and forwards the data to a TSM server which in-turn stores it in one of its storage pools (tape or disk).

FlashCopy Manager supports multiple FlashCopy targets enabling the creation of several backup versions. Nevertheless a diskonly backup will usually be overwritten in shorter intervals than a TSM backup which will usually be kept for weeks.

An existing diskonly backup must be in the status TAPE_BACKUP_PENDING in order to offload it to a TSM server. Snapshot backups must already be created with the flag TSM_BACKUP to prepare a subsequent tape backup. This flag must be specified either as part of the backup command or as a profile parameter, thus applying to all backups.

An offload to TSM is initiated with the FlashCopy Manager utility *tsm4acs*. It is useful to check the status of existing diskonly backups before starting the offload.

Command line examples:

```
db2od3> /opt/IBM/db2/V9.5/bin/db2acsutil query status
```

```
Instance Database Part Image Time Status
```

```
=====
```

```
db2od3 OD3 0 20090821153352 Remotely mountable + Repetitively restorable + Swap
restorable + Physical protection + Full copy + Tape backup pending (167936 / 167936 MB)
```

```
db2od3> /db2/db2od3/sqlllib/acs/tsm4acs -f tape_backup -d OD3
```

```
IBM Tivoli Storage FlashCopy(R) Manager offload agent
- Version 2, Release 1, Level 0.0 BETA for AIX LF 64-bit -
Build: 405 generated on Jul 31 2009
(c) Copyright IBM Corporation, 2000, 2009, All Rights Reserved.
```

```
FMM0005I Start of program at: Thu Aug 27 13:57:13 CEST 2009 .
FMM8800I The command is: tape_backup
```

```
IBM Tivoli Storage FlashCopy(R) Manager offload agent
- Version 2, Release 1, Level 0.0 BETA for AIX LF 64-bit -
Build: 405 generated on Jul 31 2009
(c) Copyright IBM Corporation, 2000, 2009, All Rights Reserved.
```

```
FMM0005I Start of program at: Thu Aug 27 13:57:14 2009 .
FMM8800I The command is: tape_backup
FMM6501I Initializing 'mount' request.
FMM6502I Executing 'mount' request.
```

```
FMM6555I Selected snapshot backup with ID 'db2od3,OD3,20090821153352'.
FMM6503I Terminating 'mount' request.
FMM6512I The 'mount' request for database 'OD3' with partitions (0) processed successfully.
FMM6520I Starting database instance 'db2od3'.
FMM6521I Database instance 'db2od3' was started successfully.
FMM6531I Cataloging database 'OD3' on path '/db2/OD3'.
FMM6537I Database 'OD3' on path '/db2/OD3' already cataloged.
FMM6508I Initializing partition(s) '0' of database 'OD3' as standby.
FMM6510I Partition(s) '0' of database 'OD3' initialized successfully.
FMM6540I 13:57:39: Starting backup of database 'OD3', partition(s) '0' with the following options:
METHOD      /usr/tivoli/tsm/tdp_r3/db264/libtdpdb264.a
SESSIONS    1
OPTIONS     none
```

```

BUFFERS      automatic
BUFFERSIZE   automatic
PARALLELISM  automatic

```

...

5.3 Restore from Snapshot

A diskonly backup can be restored and recovered with DB2 commands. Snapshots are done on a volume group level. In other words: the storage-based snapshot feature is not aware of the database and file systems structures and cannot perform restore operations on the file or table space level. Only the volume groups are backed up and restored by FlashCopy Manager.

The following example shows restore, forward recovery and activation of the database with the appropriate DB2 commands: db2 restore, db2 rollforward, db2 activate

Command line example:

```

db2od3> db2 restore database OD3 use snapshot taken at 20090811122318
SQL2539W Warning! Restoring to an existing database that is the same as the
backup image database. The database files will be deleted.
Do you want to continue ? (y/n) y
SQL1035N The database is currently in use. SQLSTATE=57019

```

```

# su - od3adm
sapr3db2:od3adm 1> stopsap

```

```

db2od3> db2 restore database OD3 use snapshot taken at 20090811122318
SQL2539W Warning! Restoring to an existing database that is the same as the
backup image database. The database files will be deleted.
Do you want to continue ? (y/n) y
DB20000I The RESTORE DATABASE command completed successfully.

```

```

db2od3> db2 start db manager
DB20000I The START DATABASE MANAGER command completed successfully.

```

```

db2od3> db2 rollforward database od3 complete

```

Rollforward Status

```

Input database alias           = od3
Number of nodes have returned status = 1

Node number                    = 0
Rollforward status             = not pending
Next log file to be read      =
Log files processed            = S0000296.LOG - S0000297.LOG
Last committed transaction    = 2009-08-11-10.23.37.000000 UTC

```

```

DB20000I The ROLLFORWARD command completed successfully.

```

```

db2od3> db2 activate db OD3
DB20000I The ACTIVATE DATABASE command completed successfully.

```

5.4 Backup and Restore from TSM Server

Backup and restore to and from a TSM server are not specific to FlashCopy Manager. This means that the *db2 commands backup* and *restore* utilities can be used with appropriate options as if FlashCopy Manager was not installed.

5.5 Additional functions

The tsm4acs utility with the option “-f mount” can be used to access the database on the FlashCopy targets volumes from the backup server without offloading the data to a TSM server. A possible use can be the creation of a new SAP environment for testing purpose. The access can be terminated with “tsm4acs” using the option “-f unmount”.

Troubleshooting hint:

If an offload backup to TSM has been interrupted (e.g. by a server restart), the mount state can still be reflected in the FlashCopy Manager repository and can be reported by the utility db2acsutil. In this case a tsm4acs call with the option unmount is required before the offload can be restarted with the utility tsm4acs using the option tape_backup.

Examples:

```
$ /db2/db2od3/sqllib/acs/tsm4acs -f mount -d OD3 -T 20090819094306
```

```
IBM Tivoli Storage FlashCopy(R) Manager offload agent
- Version 2, Release 1, Level 0.0 BETA for AIX LF 64-bit -
  Build: 405 generated on Jul 31 2009
(c) Copyright IBM Corporation, 2000, 2009, All Rights Reserved.
```

```
FMM0005I Start of program at: Wed Aug 19 09:47:54 CEST 2009 .
FMM8800I The command is: mount
FMM6501I Initializing 'mount' request.
FMM6502I Executing 'mount' request.
FMM6555I Selected snapshot backup with ID 'db2od3,OD3,20090819094306'.
FMM6503I Terminating 'mount' request.
FMM6512I The 'mount' request for database 'OD3' with partitions (0) processed successfully.
FMM0020I End of program at: Wed Aug 19 09:48:08 CEST 2009 .
FMM0021I Elapsed time: 14 sec .
FMM0024I Return code is: 0.
```

```
$ lsvg -o
OD3tdp3
OD3tdp2
OD3tdp1
swap
sapdb2
rootvg
```

```
$ df -g
Filesystem      GB blocks   Free %Used  lused %lused Mounted on
/dev/hd4        0.66      0.39  41%    3117    4% /
/dev/hd2        3.12      0.62  81%   38597   21% /usr
/dev/hd9var     0.03      0.00  94%     494   44% /var
/dev/hd3        2.00      0.72  65%     285    1% /tmp
/dev/hd1        0.03      0.03   8%      98     2% /home
/proc          - - - - - /proc
/dev/hd10opt    1.66      0.06  97%   17089   52% /opt
sapr3db2:/db2/OD3/dbs 1.25      1.24   1%      22     1% /db2/OD3/dbs
/dev/ursaplv   5.00      4.84   4%     228    1% /usr/sap
/dev/sapod3lv  1.25      1.24   1%      22     1% /db2/OD3
/dev/sapdb2od3lv 1.00      0.27  73%   1025    2% /db2/db2od3
/dev/db2dirlv  0.94      0.92   2%      31     1% /db2/OD3/db2od3
/dev/logdirlv  5.00      3.40  33%     59     1% /db2/OD3/log_dir
/dev/sapdata1lv 15.00     6.50  57%     40     1% /db2/OD3/sapdata1
/dev/sapdata2lv 20.00    11.50  43%     40     1% /db2/OD3/sapdata2
/dev/sapdata3lv 15.00     6.50  57%     40     1% /db2/OD3/sapdata3
/dev/sapdata4lv 20.00    11.50  43%     40     1% /db2/OD3/sapdata4
/dev/saptemplv  1.00      1.00   1%      12     1% /db2/OD3/saptemp1
```

\$ /db2/db2od3/sqllib/acs/tsm4acs -f unmount -d OD3

IBM Tivoli Storage FlashCopy(R) Manager offload agent
- Version 2, Release 1, Level 0.0 BETA for AIX LF 64-bit -
Build: 405 generated on Jul 31 2009
(c) Copyright IBM Corporation, 2000, 2009, All Rights Reserved.

FMM0005I Start of program at: Wed Aug 19 09:52:16 CEST 2009 .
FMM8800I The command is: unmount
FMM6501I Initializing 'unmount' request.
FMM6502I Executing 'unmount' request.
FMM6555I Selected snapshot backup with ID 'db2od3,OD3,20090819094306'.
FMM6503I Terminating 'unmount' request.
[FMM6512I The 'unmount' request for database 'OD3' with partitions \(0\) processed successfully.](#)
FMM0020I End of program at: Wed Aug 19 09:52:27 CEST 2009 .
FMM0021I Elapsed time: 11 sec .
FMM0024I Return code is: 0.

6 Backup schedule options

Multiple options are possible to schedule a backup operation e.g.

- a *crontab* entry on UNIX
- a Tivoli Storage Manager schedule
- an entry in SAP's DBA planning calendar (SAP transaction DB13 or DBACOCKPIT)

Note that the planning calendar's ability to specify command line options is limited. BR*Tools' command line options overwrite the values in the BR*Tools profile `init<SID>.sap`. This means that the profile must include all required *brbackup* parameters.

This is a rudimental example how to schedule a DB2 backup using UNIX onboard tools.

Example:

Step 1: create a shell script that initiates a backup

```
db2od3> cat mybackup.sh
#!/bin/ksh
su - db2od3 << EOF
db2 backup database OD3 online use snapshot
EOF

db2od3>
```

Step 2: create a crontab entry that schedules the shell script at a specified time
(here: each weekday at 15 minutes before midnight)

```
sapr3db2:root > cat /var/spool/cron/crontabs/root
...
45 23 * * * /db2/db2od3/mybackup.sh 1>/db2/db2od3/mybackup.log 2>&1
...
```

7 Appendix

The appendix shows two protocols of a FlashCopy Manager setup using the script `setup_sapdb2.sh`:

1. FlashCopy Manager setup for DS8000 for diskonly backup
2. FlashCopy Manager setup for DS8000 with offload backup

In the first example a new profile is created. In the second example the existing profile is modified to include the offload feature of FlashCopy Manager.

The sections that are specific to a storage system are indicated in blue colour. In these examples the storage-specific DEVICE CLASS is named STANDARD.

7.1 Setup script protocol for SAP on DB2 and IBM DS8000

```
# su - db2od3
```

```
db2od3> cd /db2/db2od3/sqlib/acs
```

```
db2od3> ./setup_db2.sh
```

```
checking /db2/db2od3/sqlib/acs/acsgen ...
OK
```

Select one of these configurations:

(1) On-Site Production System configuration with optional remote Backup System configuration

(2) On-Site Backup System configuration

Enter '1' to configure IBM Tivoli Storage FlashCopy(R) Manager on the production server with the option to remotely synchronize the configuration of one or multiple backup systems using Secure Shell.

Enter '2' to configure IBM Tivoli Storage FlashCopy(R) Manager on the backup system as a 'separate installation'.

1

Preparing to install on Production System

Please enter the directory where the profile will be stored: [/db2/db2od3/acs]

selected profile path: /db2/db2od3/acs

Deactivating TSM ACS management daemon.

Is this DB2 instance used for SAP? [Y/N]

y

Are you going to perform off-loaded backups to Tivoli Storage Manager? [y/n]

n

Welcome to new wizard!

Special commands:

'?' -> Show help for current parameter

'!d' -> Delete current parameter instance (only applicable to multi-instance parameters)

FMM8422I Creating new profile '/db2/db2od3/acs/profile' for application 'SAP' ...

***** Profile parameters for section GLOBAL : *****

Path of the IBM Tivoli Storage FlashCopy(R) Manager directory {ACS_DIR} = [/db2/db2od3/acs]

Hostname and port of machine running Management Agent {ACSD} (<hostname> <port>) = [sapr3db2 57328]

Low level tracing {TRACE} (YES|NO) = [NO]

***** Profile parameters for section ACSD : *****

Path to the repository directory {ACS_REPOSITORY} = [/db2/db2od3/acs/acsrepository] /db2/db2od3/acs/acsrepository

Support for Administration Assistant {ADMIN_ASSISTANT} (<hostname> <port>|NO) = [NO]

Prefix for volume names {REPOSITORY_LABEL} = [TSM]

***** Profile parameters for section CLIENT : *****

Identifier for backups of this database instance in the repository {BACKUPIDPREFIX} (<string>) = [DB2___]

Skipping preset parameter: APPLICATION_TYPE (SAP)

Partition group for multi-partition DB2 databases {PARTITION_GROUP} (<string>) = [] OPTIONAL_ONLY

Do you want to add another instance of this parameter? [y, n] n

Maximum number of snapshot versions {MAX_VERSIONS} (<number>|ADAPTIVE) = [ADAPTIVE]

Freeze/thaw filesystem {LVM_FREEZE_THAW} (<seconds> |YES|NO|AUTO) = [AUTO]

Negative list {NEGATIVE_LIST} (<filename>|NO_CHECK|WARN|ERROR) = [NO_CHECK] WARN

Timeout {TIMEOUT_FLASH} for phase 'flash' (<in seconds>) = [120]

Device class(es) {DEVICE_CLASS} (<list of dev classes> [USE_AT <weekdays>] [FROM <time> TO <time>]) = [STANDARD]

Do you want to add another instance of this parameter? [y, n] n

***** Profile parameters for section DEVICE_CLASS STANDARD: *****

```
Type of Storage system {COPYSERVICES_HARDWARE_TYPE} (DS8000|SVC|XIV) = *input mandatory* DS8000
Server name/address of host running CIM Agent {COPYSERVICES_PRIMARY_SERVERNAME} = [localhost] p590-tic-1-
v49.mainz.de.ibm.com
Hostname of backup Copy Services server {COPYSERVICES_SECONDARY_SERVERNAME} = []
Username for storage device {COPYSERVICES_USERNAME} = [superuser]
Communication protocol {COPYSERVICES_COMMPROTOCOL} (HTTPS|HTTP) = [HTTPS]
Certificate file for HTTPS {COPYSERVICES_CERTIFICATEFILE} (<filename>|NO_CERTIFICATE) = [NO_CERTIFICATE]
Copy Services server port number {COPYSERVICES_SERVERPORT} = [5989]
Flashcopy type {FLASHCOPY_TYPE} (INCR|COPY|NOCOPY) = [COPY] INCR
Timeout for CIM Agent calls {COPYSERVICES_TIMEOUT} (<minutes>) = [6]
Force restore {RESTORE_FORCE} (YES|NO) = [NO]
Storage system ID of referred cluster {STORAGE_SYSTEM_ID} = []
Target volumes set {TARGET_SETS} (VOLUMES_DIR|VOLUMES_FILE) = *input mandatory* VOLUMES_FILE
Filename of the target volumes file {VOLUMES_FILE} = *input mandatory*
/db2/db2od3/acs/od3.od3.standard.node0000.fct
```

FMM8426I Saving profile '/db2/db2od3/acs/profile' ...

FMM1555I Profile successfully created.

Do you want to continue by specifying passwords for the defined sections? [Y/N]

Y

Please enter the password for authentication with the ACS daemon: [***]

Please enter the password for device section STANDARD: [***]

Enter the password of the DS8000 user here.

FMM8437I Verifying password...

FMM0005I Start of program at: Wed Dec 2 12:31:16 CET 2009 .

FMM4184I CIM Agent version for DS8000: '5.2.0'.

FMM0020I End of program at: Wed Dec 2 12:31:18 CET 2009 .

FMM0021I Elapsed time: 02 sec .

FMM6959I Script 'LIBPATH=/db2/db2od3/sqlib/acs/pegasus/db2/db2od3/sqlib/acs/fmcima -l /db2/db2od3/sqlib/acs -f checkpw' returned with code 0.

Creating password file at /db2/db2od3/acs/shared/pwd.acsd.

A copy of this file needs to be available to all components that connect to acsd.

IBM Tivoli Storage FlashCopy(R) Manager requires at least two daemon processes to be running at all times.

The management daemon (acsd) and the generic device agent (acsngen) are typically registered in the /etc/inittab on the production server by the configuration wizard.

Both daemon processes restart after a system reboot.

If installing in a High Availability environment, both daemon processes must be started from the High Availability environment.

If you specify YES, these two daemon processes are not be added to the /etc/inittab and the required executable files and command-line options display.

Make sure these two daemon processes are started by the High Availability scripts. If you specify NO, /etc/inittab is used.

Do you want to install in a High Availability environment? [Y/N]

n

A backup system must be installed and configured when off-loaded backups to Tivoli Storage Manager are performed or when FlashCopy backup consistency verification is needed during a forced mount. Note that remote connections from the production system to the backup system must already exist to use Open SSH. Specify YES to use OpenSSH. When prompted to specify which DEVICE_CLASS should be enabled on the backup system, either select from the list of available DEVICE_CLASS parameters or press Enter to select all listed DEVICE_CLASS parameters. Specify NO if OpenSSH is not available, the INST_DIR and ACS_DIR use NFS to share between the production system and backup system, or you want to configure the backup system in a separate step. Do you want to install a new Backup System using the Open Secure Shell (OpenSSH) protocol? [Y/N]

n

db2od3>

7.2 Setup script protocol for SAP on DB2 and IBM DS8000 with offload to TSM Server

db2od3> ./setup_db2.sh

checking /db2/db2od3/sqlib/acs/acsngen ...

OK

Select one of these configurations:

(1) On-Site Production System configuration with optional remote Backup System configuration

(2) On-Site Backup System configuration

Enter '1' to configure IBM Tivoli Storage FlashCopy(R) Manager on the production server with the option to remotely synchronize the configuration of one or multiple backup systems using Secure Shell.

Enter '2' to configure IBM Tivoli Storage FlashCopy(R) Manager on the backup system as a 'separate installation'.

```

1
Preparing to install on Production System
Found profile /db2/db2od3/sql/lib/acs/profile
Do you want to:
  (c)reate a new profile
  (r)euse the profile unchanged
  (m)odify the profile
Please enter one of the strings in parentheses:
m
The TSM ACS management daemon seems to be running.
Do you want me to stop it to proceed with the configuration? [Y/N]
y
Stopping TSM ACS management daemon on your request.
Deactivating TSM ACS management daemon.
Is this DB2 instance used for SAP? [Y/N]
y
Are you going to perform off-loaded backups to Tivoli Storage Manager? [y/n]
y
Welcome to new wizard!

Special commands:
'?' -> Show help for current parameter
'!d' -> Delete current parameter instance (only applicable to multi-instance parameters)

FMM8421I Modifying existing profile '/db2/db2od3/acs/profile' for application 'SAP' ...

***** Profile parameters for section GLOBAL : *****

Path of the IBM Tivoli Storage FlashCopy(R) Manager directory {ACS_DIR} =      [/db2/db2od3/acs]
Hostname and port of machine running Management Agent {ACSD} (<hostname> <port>) =      [sapr3db2 57328]
Low level tracing {TRACE} (YES|NO) =      [NO]

***** Profile parameters for section ACSD : *****

Path to the repository directory {ACS_REPOSITORY} =      [/db2/db2od3/acs/acsrepository]      /db2/db2od3/acs/acsrepository
Support for Administration Assistant {ADMIN_ASSISTANT} (<hostname> <port>|NO) =      [NO]
Prefix for volume names {REPOSITORY_LABEL} =      [TSM]

***** Profile parameters for section OFFLOAD : *****

Skipping preset parameter: BACKUP_METHOD (DB2)
Options for backup utility {OPTIONS} (<string>|@filename) =      []
Number of table spaces read in parallel {PARALLELISM} (<number>|AUTO) =      [AUTO]
Number of I/O sessions {NUM_SESSIONS} =      [1] 2
Number of buffers {NUM_BUFFERS} (<number>|AUTO) =      [AUTO]
Size of buffer for building backup image {BUFFER_SIZE} (<number>|AUTO) =      [AUTO]

***** Profile parameters for section CLIENT : *****

Identifier for backups of this database instance in the repository {BACKUPIDPREFIX} (<string>) =      [DB2___]
Skipping preset parameter: APPLICATION_TYPE (SAP)
Partition group for multi-partition DB2 databases {PARTITION_GROUP} (<string>) =      [OPTIONAL_ONLY]
Do you want to add another instance of this parameter? [y, n] n
Create backup from snapshot {TSM_BACKUP} (NO|YES|TSM_ONLY|MANDATE|LATEST [USE_FOR <list of device classes>])
= [YES] YES
Do you want to add another instance of this parameter? [y, n] n
Maximum number of snapshot versions {MAX_VERSIONS} (<number>|ADAPTIVE) =      [ADAPTIVE]
Freeze/thaw filesystem {LVM_FREEZE_THAW} (<seconds> |YES|NO|AUTO) =      [AUTO]
Negative list {NEGATIVE_LIST} (<filename>|NO_CHECK|WARN|ERROR) =      [WARN]
Timeout {TIMEOUT_FLASH} for phase 'flash' (<in seconds>) =      [120]
Device class(es) {DEVICE_CLASS} (<list of dev classes> [USE_AT <weekdays>] [FROM <time> TO <time>]) =      [STANDARD]
Do you want to add another instance of this parameter? [y, n] n

***** Profile parameters for section DEVICE_CLASS STANDARD: *****

Type of Storage system {COPYSERVICES_HARDWARE_TYPE} (DS8000|SVC|XIV) =      [DS8000]
Server name/address of host running CIM Agent {COPYSERVICES_PRIMARY_SERVERNAME} =      [p590-tic-1-
v49.mainz.de.ibm.com]
Hostname of backup Copy Services server {COPYSERVICES_SECONDARY_SERVERNAME} =      []
Username for storage device {COPYSERVICES_USERNAME} =      [superuser]
Communication protocol {COPYSERVICES_COMMPROTOCOL} (HTTPS|HTTP) =      [HTTPS]
Certificate file for HTTPS {COPYSERVICES_CERTIFICATEFILE} (<filename>|NO_CERTIFICATE) =      [NO_CERTIFICATE]

```

```
Copy Services server port number {COPYSERVICES_SERVERPORT} = [5989]
Flashcopy type {FLASHCOPY_TYPE} (INCR|COPY|NOCOPY) = [INCR]
Timeout for CIM Agent calls {COPYSERVICES_TIMEOUT} (<minutes>) = [6]
Force restore {RESTORE_FORCE} (YES|NO) = [NO]
Storage system ID of referred cluster {STORAGE_SYSTEM_ID} = []
Target volumes set {TARGET_SETS} (VOLUMES_DIR|VOLUMES_FILE) = [VOLUMES_FILE]
Filename of the target volumes file {VOLUMES_FILE} = [/db2/db2od3/acs/od3.od3.standard.node0000.fct]
```

```
FMM8426I Saving profile '/db2/db2od3/acs/profile' ...
FMM1555I Profile successfully created.
```

```
Do you want to continue by specifying passwords for the defined sections? [Y/N]
n
```

IBM Tivoli Storage FlashCopy(R) Manager requires at least two daemon processes to be running at all times. The management daemon (acsd) and the generic device agent (acsgen) are typically registered in the /etc/inittab on the production server by the configuration wizard. Both daemon processes restart after a system reboot. If installing in a High Availability environment, both daemon processes must be started from the High Availability environment. If you specify YES, these two daemon processes are not be added to the /etc/inittab and the required executable files and command-line options display. Make sure these two daemon processes are started by the High Availability scripts. If you specify NO, /etc/inittab is used. Do you want to install in a High Availability environment? [Y/N]

```
n
The off-loaded backup to Tivoli Storage Manager will be performed by the IBM Tivoli Storage FlashCopy(R) Manager offload agent 'tsm4acs'.
Specify YES to perform the off-loaded backup immediately after the FlashCopy backup completes. This adds 'tsm4acs' to the /etc/inittab.
The default is to run 'tsm4acs' as a daemon process on the production server.
In High Availability environments, no entry is made to /etc/inittab since 'tsm4acs' must be added to the High Availability script.
Specify NO to schedule off-loaded backups individually with a crontab entry.
Do you want off-loaded tape backups to begin immediately after the snapshot? [Y/N]
```

```
n
A backup system must be installed and configured when off-loaded backups to Tivoli Storage Manager are performed or when FlashCopy backup consistency verification is needed during a forced mount. Note that remote connections from the production system to the backup system must already exist to use Open SSH. Specify YES to use OpenSSH. When prompted to specify which DEVICE_CLASS should be enabled on the backup system, either select from the list of available DEVICE_CLASS parameters or press Enter to select all listed DEVICE_CLASS parameters. Specify NO if OpenSSH is not available, the INST_DIR and ACS_DIR use NFS to share between the production system and backup system, or you want to configure the backup system in a separate step. Do you want to install a new Backup System using the Open Secure Shell (OpenSSH) protocol? [Y/N]
```

```
y
Please enter the hostname of the backup system:
sapr3db2
sapr3db2 is reachable.
Enter the device classes to use for this Backup System. Make sure each device class is separated by a comma.
Here a list of device classes which are defined in the profile: STANDARD
To use all defined device classes just hit enter.
```

```
The authenticity of host 'sapr3db2 (9.155.66.101)' can't be established.
RSA key fingerprint is 22:e1:16:d3:9e:60:93:b7:94:e4:a5:54:b1:3f:df:22.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'sapr3db2,9.155.66.101' (RSA) to the list of known hosts.
root@sapr3db2's password:
```

```
start copying...
x /db2/db2od3/acs/profile_BS, 71 bytes, 1 media blocks.
x /db2/db2od3/acs/shared
x /db2/db2od3/acs/shared/pwd.acsd, 414 bytes, 1 media blocks.
copy completed.
start agents
```

```
checking /db2/db2od3/sql/lib/acs/acsgen ...
OK
```

```
Successfully installed the Backup System.
A backup system must be installed and configured when off-loaded backups to Tivoli Storage Manager are performed or when FlashCopy backup consistency verification is needed during a forced mount. Note that remote connections from the production system to the backup system must already exist to use Open SSH. Specify YES to use OpenSSH. When prompted to specify which DEVICE_CLASS should be enabled on the backup system, either select from the list of available DEVICE_CLASS parameters or press Enter to select all listed DEVICE_CLASS parameters. Specify NO if OpenSSH is not available, the INST_DIR and ACS_DIR use NFS to share between the production system and backup system, or you want to configure the backup system in a separate step. Do you want to install a new Backup System using the Open Secure Shell (OpenSSH) protocol? [Y/N]
```

```
n
db2od3>
```