

HP Data Protector A.06.10

Zero downtime backup integration guide

for Oracle, SAP R/3, Microsoft SQL Server,
Microsoft Exchange Server, and Microsoft
Volume Shadow Copy Service [Build 500]



T B D

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i n v e n t

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Publication history

Guide updates may be issued between editions to correct errors or document product changes. To ensure that you receive updated or new editions, subscribe to the appropriate product support service. See your HP sales representative for details.

Table 1 Edition history

Part number	Guide edition	Product
B6960-90114	October 2004	Data Protector Release A.05.50
B6960-96013	July 2006	Data Protector Release A.06.00
TBD	TBD	Data Protector Release A.06.10

About this guide

This guide describes how to configure and use Data Protector disk array integrations with other software products.

Intended audience

This guide is intended for backup administrators responsible for planning, setting up, and maintaining network backups. It assumes you are familiar with:

- Basic Data Protector functionality
- Database administration

Conceptual information can be found in the *HP Data Protector concepts guide*, which is recommended to fully understand the fundamentals and the model of Data Protector.

It is also recommended to read the *HP Data Protector zero downtime backup concepts guide* for fundamentals of Data Protector integrations with disk arrays.

Documentation set

Other documents and online Help provide related information.

Guides

Data Protector guides are available in printed format and in PDF format. Install the PDF files during the Data Protector setup procedure by selecting the `English documentation and Help component` on Windows or the `OB2-DOCS component` on UNIX. Once installed, the guides reside in the `Data_Protector_home\docs` directory on Windows and in the `/opt/omni/doc/C/` directory on UNIX.

You can find these documents from the Manuals page of the HP Business Support Center website:

<http://www.hp.com/support/manuals>

In the Storage section, click **Storage Software** and then select your product.

- *HP Data Protector concepts guide*

This guide describes Data Protector concepts and provides background information on how Data Protector works. It is intended to be used with the task-oriented online Help.

- *HP Data Protector installation and licensing guide*

This guide describes how to install the Data Protector software, taking into account the operating system and architecture of your environment. This guide also gives details on how to upgrade Data Protector, as well as how to obtain the proper licenses for your environment.

- *HP Data Protector troubleshooting guide*

This guide describes how to troubleshoot problems you may encounter when using Data Protector.

- *HP Data Protector disaster recovery guide*

This guide describes how to plan, prepare for, test and perform a disaster recovery.

- *HP Data Protector integration guides*

These guides describe how to configure and use Data Protector to back up and restore various databases and applications. They are intended for backup administrators or operators. There are four guides:

- *HP Data Protector integration guide for Microsoft applications: SQL Server, SharePoint Portal Server, Exchange Server, and Volume Shadow Copy Service*

This guide describes the integrations of Data Protector with the following Microsoft applications: Microsoft Exchange Server, Microsoft SQL Server, and Volume Shadow Copy Service.

- *HP Data Protector integration guide for Oracle and SAP*

This guide describes the integrations of Data Protector with Oracle, SAP R3, and SAP DB.

- *HP Data Protector integration guide for IBM applications: Informix, DB2, and Lotus Notes/Domino*

This guide describes the integrations of Data Protector with the following IBM applications: Informix Server, IBM DB2, and Lotus Notes/Domino Server.

- *HP Data Protector integration guide for Sybase, Network Node Manager, Network Data Management Protocol, and VMware*

This guide describes the integrations of Data Protector with Sybase, Network Node Manager, Network Data Management Protocol, and VMware.

- *HP Data Protector integration guide for HP Service Information Portal*
This guide describes how to install, configure, and use the integration of Data Protector with HP Service Information Portal. It is intended for backup administrators. It discusses how to use the OpenView applications for Data Protector service management.
- *HP Data Protector integration guide for HP Reporter*
This manual describes how to install, configure, and use the integration of Data Protector with HP Reporter software. It is intended for backup administrators. It discusses how to use the applications for Data Protector service management.
- *HP Data Protector integration guide for HP Operations Manager for UNIX*
This guide describes how to monitor and manage the health and performance of the Data Protector environment with HP Operations Manager software software and HP Service Navigator on UNIX.
- *HP Data Protector integration guide for HP Operations Manager for Windows*
This guide describes how to monitor and manage the health and performance of the Data Protector environment with HP Operations Manager software software and HP Service Navigator on Windows.
There are two versions of the guide:
 - for OVO 7.1x, 7.2x
 - for OVO 7.5
- *HP Data Protector software integration guide for HP Performance Manager software and HP Performance Agent software*
This guide provides information about how to monitor and manage the health and performance of the Data Protector environment with HP Performance Manager (PM) software and HP Performance Agent (PA) software on Windows, HP-UX, Solaris and Linux.
- *HP Data Protector zero downtime backup concepts guide*
This guide describes Data Protector zero downtime backup and instant recovery concepts and provides background information on how Data Protector works in a zero downtime backup environment. It is intended to be used with the task-oriented *HP Data Protector zero downtime backup administrator's guide* and the *HP Data Protector zero downtime backup integration guide*.
- *HP Data Protector zero downtime backup administrator's guide*
This guide describes how to configure and use the integration of Data Protector with HP StorageWorks Virtual Array, HP StorageWorks Enterprise Virtual Array, EMC Symmetrix Remote Data Facility and TimeFinder, and HP StorageWorks Disk Array XP. It is intended for backup administrators or operators. It covers the

zero downtime backup, instant recovery, and the restore of filesystems and disk images.

- *HP Data Protector zero downtime backup integration guide*

This guide describes how to configure and use Data Protector to perform zero downtime backup, instant recovery, and standard restore of Oracle, SAP R/3, Microsoft Exchange Server, and Microsoft SQL Server databases. The guide also describes how to configure and use Data Protector to perform backup and restore using the Microsoft Volume Shadow Copy Service.

- *HP Data Protector MPE/iX system user guide*

This guide describes how to configure MPE/iX clients and how to back up and restore MPE/iX data.

- *HP Data Protector Media Operations user guide*

This guide provides tracking and management of offline storage media. It is intended for network administrators responsible for maintaining and backing up systems. It describes the tasks of installing and configuring the application, performing daily media operations and producing reports.

- *HP Data Protector product announcements, software notes, and references*

This guide gives a description of new features of HP Data Protector A.06.10. It also provides information on supported configurations (devices, platforms and online database integrations, SAN, and ZDB), required patches, and limitations, as well as known problems and workarounds. An updated version of the supported configurations is available at <http://www.hp.com/support/manuals>

There are also four other *Product announcements, software notes and references*, which serve a similar purpose for the following:

- HP Operations Manager software software UNIX integration
- HP Operations Manager software software Windows integration
- HP Service Information Portal and HP Reporter software
- HP Performance Manager software and HP Performance Agent integration
- HP Media Operations

Online help

Data Protector provides context-sensitive (F1) Help and Help Topics for Windows and UNIX platforms.

You can access the online help from the top-level directory on the installation DVD without installing Data Protector:

- **Windows:** Unzip `DP_help.zip` and open `DP_help.chm`.

- **UNIX:** Unpack the zipped tar file `DP_help.tar.gz`, and access the online help system through `DP_help.htm`.

Documentation map

Abbreviations

Abbreviations in the documentation map that follows are explained below. The guide titles are all preceded by the words “HP Data Protector”.

Abbreviation	Guide
CLI	Command line interface reference
Concepts	Concepts guide
DR	Disaster recovery guide
GS	Getting started guide
Help	Online Help
IG-IBM	Integration guide—IBM applications
IG-MS	Integration guide—Microsoft applications
IG-O/S	Integration guide—Oracle, SAP R/3, and SAP DB/MaxDB
IG-OMU	Integration guide—HP Operations Manager software software, UNIX
IG-OMW	Integration guide—HP Operations Manager software software, Windows
IG-PM/PA	Integration guide—Performance Manager and Performance Agent software
IG-Report	Integration guide—HP Reporter software
IG-SIP	Integration guide—HP Service Information Portal
IG-Var	Integration guide—Sybase, Network Node Manager, NDMP and VMware
Install	Installation and licensing guide

Abbreviation	Guide
MO GS	Media Operations getting started guide
MO RN	Media Operations product announcements, software notes, and references
MO UG	Media Operations user guide
MPE/iX	MPE/iX system user guide
PA	Product announcements, software notes, and references
Trouble	Troubleshooting guide
ZDB Admin	ZDB administrator's guide
ZDB Concpt	ZDB concepts guide
ZDB IG	ZDB integration guide

Map

The following table shows where to find information of different kinds. Shaded squares are a good place to look first.

Integrations

Look in these guides for details of the following integrations:

Integration	Guide
HP Operations Manager software software	IG-OMU, IG-OMW
HP Performance Manager software	IG-PM/PA
HP Performance Agent software	IG-PM/PA
HP Reporter Light	IG-OMW
HP Reporter software	IG-R
HP Service Information Portal	IG-SIP
HP StorageWorks Disk Array XP	all ZDB
HP StorageWorks Enterprise Virtual Array (EVA)	all ZDB
HP StorageWorks Virtual Array (VA)	all ZDB
IBM DB2 UDB	IG-IBM
Informix	IG-IBM
Lotus Notes/Domino	IG-IBM
Media Operations	MO User
MPE/iX System	MPE/iX
Microsoft Exchange Server	IG-MS, ZDB IG
Microsoft Exchange Single Mailbox	IG-MS
Microsoft SQL Server	IG-MS, ZDB IG
Microsoft Volume Shadow Copy Service (VSS)	IG-MS, ZDB IG
NDMP Server	IG-Var
Network Node Manager (NNM)	IG-Var

Integration	Guide
Oracle	IG-O/S
Oracle ZDB	ZDB IG
SAP DB	IG-O/S
SAP R/3	IG-O/S, ZDB IG
Sybase	IG-Var
Symmetrix (EMC)	all ZDB
VMware	IG-Var

Document conventions and symbols

Table 2 Document conventions

Convention	Element
Blue text: Table 2 on page 26	Cross-reference links and e-mail addresses
Blue, underlined text: http://www.hp.com	website addresses
<i>Italic text</i>	Text emphasis
Monospace text	<ul style="list-style-type: none"> • File and directory names • System output • Code • Commands, their arguments, and argument values
<i>Monospace, italic text</i>	<ul style="list-style-type: none"> • Code variables • Command variables
text	Emphasized monospace text

 **CAUTION:**

Indicates that failure to follow directions could result in damage to equipment or data.

 **IMPORTANT:**

Provides clarifying information or specific instructions.

 **NOTE:**

Provides additional information.

 **TIP:**

Provides helpful hints and shortcuts.

Data Protector graphical user interface

Data Protector provides a cross-platform (Windows and UNIX) graphical user interface. You can use the original Data Protector GUI or the Data Protector Java GUI. Refer to the online Help for information about the Data Protector graphical user interface.

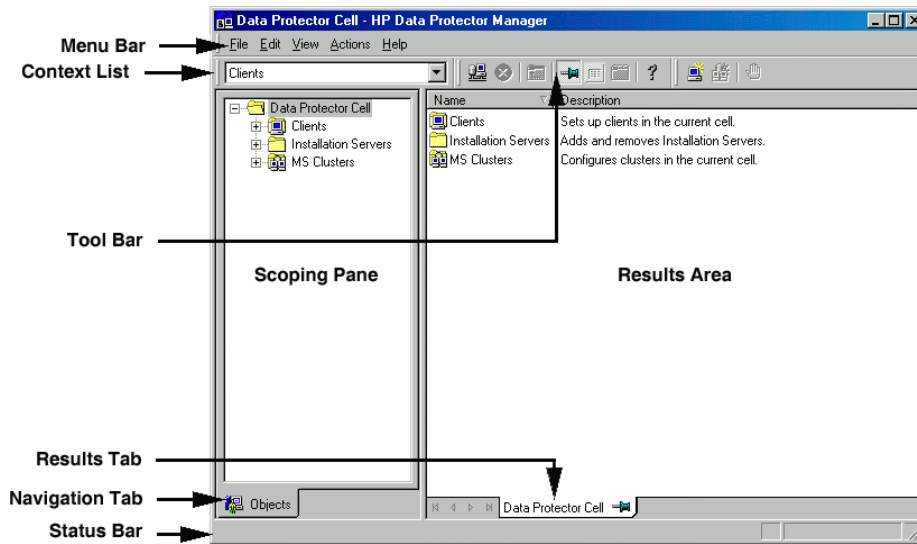


Figure 1 Data Protector graphical user interface

General Information

General information about Data Protector can be found at <http://www.hp.com/go/dataprotector>.

HP technical support

For worldwide technical support information, see the HP support website:

<http://www.hp.com/support>

Before contacting HP, collect the following information:

- Product model names and numbers
- Technical support registration number (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level
- Detailed questions

Subscription service

HP recommends that you register your product at the Subscriber's Choice for Business website:

<http://www.hp.com/go/e-updates>

After registering, you will receive e-mail notification of product enhancements, new driver versions, firmware updates, and other product resources.

HP websites

For additional information, see the following HP websites:

- <http://www.hp.com>
- <http://www.hp.com/go/software>
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1 Data Protector Oracle ZDB integration

Introduction

You can employ a variety of backup strategies to best meet your system priorities. If database availability is the highest priority, for instance, your backup strategy should include online backups that are performed frequently to minimize recovery time. This strategy limits downtime, but uses system resources more intensively. The Data Protector zero downtime backup (ZDB) functionality offers online backup capabilities with minimal degradation of the application system performance.

Supported disk arrays

The following disk arrays can be used for ZDB of Oracle:

- EMC Symmetrix (EMC)
- HP StorageWorks Disk Array XP (XP)
- HP StorageWorks Virtual Array (VA)
- HP StorageWorks Enterprise Virtual Array (EVA)

NOTE:

With the Data Protector EMC integration, only ZDB to tape is supported. Consequently, instant recovery is not supported.

Advantages

The advantages of using Data Protector Oracle ZDB integration are:

- ZDB reduces the performance degradation of the application system.

- The tablespaces are in backup mode (online backup) or the database is shut down (offline backup) only during the short period required to create a **replica** (split the mirror disks or create snapshots).
- The load to the application system is significantly reduced. Following the replica creation, tape backup can be started on the copied data, at leisure, using a separate backup system.

The Data Protector Oracle ZDB integration offers online and offline backup of your Oracle Server System (application system).

The online backup concept is widely used since it enables high application availability. Offline backup requires shutting down the database while creating a replica, and therefore does not offer high availability.

ZDB methods and Oracle versions

The installation, upgrade, configuration, and parts of backup flow are different depending on the selected Oracle ZDB method. These differences are indicated where appropriate.

The procedures for configuration of backup specifications and starting or scheduling backups are the same, regardless of the Oracle ZDB method.

Backup and restore types

Backup

Using Data Protector, you can perform the following types of backup:

- Online ZDB to disk, ZDB to tape, and ZDB to disk+tape.
During the creation of a replica, the database on the application system is in hot backup mode. If a ZDB-to-tape or a ZDB-to-disk+tape session is being performed, the streaming of the data to tape media is subsequently performed on the backup system.
- Offline ZDB to disk, ZDB to tape, and ZDB to disk+tape.
During the creation of a replica, the database is shut down on the application system. Therefore, the database is not available during the short time that it takes to create the replica. If a ZDB-to-tape or a ZDB-to-disk+tape session is being performed, the streaming of the data to tape media is subsequently performed on the backup system.

With both online and offline ZDB to tape or ZDB to disk+tape, a standard Data Protector (non-ZDB) backup of the recovery catalog and the control file is started

automatically, after the target database backup is finished on the backup system. However, you can disable this when creating a backup specification.

 **IMPORTANT:**

Backup of archived logs cannot be done with the Data Protector Oracle ZDB integration. Backup of archive logs has to be done following the standard Data Protector Oracle integration backup procedure. For more information on Oracle archive log backup with Data Protector see the *HP Data Protector integration guide*.

 **NOTE:**

On EMC, decision support, application testing, and similar tasks are possible only if the Oracle binaries are installed on the backup system as well. In most cases, however, the Data Protector EMC integration requirement is that application binaries are installed on the application system only.

Restore

Using Data Protector and the disk array integrations, you can perform the following types of restore:

- Restoring from backup media to the application system on LAN (standard Data Protector restore) and using RMAN on the application system, you can:
 - recover a whole database
 - recover a part of a database
 - recover a whole database as it was at a specific point in time
- Using the instant recovery functionality and RMAN on the application system, you can:
 - perform a full database restore and database recovery
 - perform recovery from incremental backup (for ZDB to tape or ZDB to disk+tape)
 - perform recovery from a chain of incremental backups (for ZDB to tape or ZDB to disk+tape)
 - restore a datafile to a location other than its original one

Table 3 on page 34 provides an overview of recovery methods, depending on the type of backup that was performed and type of recovery required.

Table 3 Oracle recovery methods

Disk array	Backup type	Recover the whole database until		Recover a part of database until now
		Now	A point in time, logseq/thread, or SCN number	
XP, VA, EVA, EMC	ZDB to tape - online	Restore	Restore	Restore
	ZDB to tape - offline	Restore	Restore ¹	Restore
XP, VA, EVA	ZDB to disk - online	Instant recovery+ database recovery	Instant recovery+ database recovery	N/A
	ZDB to disk - offline	Instant recovery	Instant recovery+ database recovery ¹	N/A
	ZDB to disk+tape - online	<ul style="list-style-type: none"> • Restore or • Instant recovery+ database recovery 	<ul style="list-style-type: none"> • Restore or • Instant recovery+ database recovery 	Restore
	ZDB to disk+tape - offline	<ul style="list-style-type: none"> • Restore or • Instant recovery 	<ul style="list-style-type: none"> • Restore or • Instant recovery+ database recovery¹ 	Restore

¹The database must be put in archive mode

Legend

<i>Restore</i>	Use the Data Protector GUI or RMAN scripts to restore the database from backup media to the application system on LAN.
<i>Instant recovery + database recovery</i>	<p>The following three options are possible:</p> <ul style="list-style-type: none"> • Perform instant recovery followed by database recovery from the Data Protector Instant Recovery Context or • Perform instant recovery first and then perform database recovery from the Data Protector Restore Context or • Perform instant recovery first and then use RMAN scripts to recover the database.
<i>Instant recovery</i>	Perform instant recovery without database recovery.

See the *HP Data Protector zero downtime backup concepts guide* for an overview of ZDB concepts and terminology.

Integration concepts

The Data Protector Oracle integration links the Oracle database management software with Data Protector. From the Oracle point of view, Data Protector represents a media management software. On the other hand, the Oracle database management system can be seen as a data source for backup, using media controlled by Data Protector.

Components

The software components involved in backup and restore processes are:

- The Oracle Recovery Manager (RMAN)
- The Data Protector Oracle integration software

Integration functionality overview

The Data Protector Oracle Integration agent (`ob2rman.pl`) works with RMAN to manage all aspects of the following operations on the Oracle target database:

- Database startup and shutdown
- Backups (backup and copy)

- Recovery (restore, recovery, and duplication)

How does the integration work?

`Ob2rman.pl` executes RMAN, which directs the Oracle server processes on the target database to perform backup, restore and recovery. RMAN maintains the required information about the target databases in the recovery catalog, the Oracle central repository of information, and in the control file of a particular target database.

The main information which `ob2rman.pl` provides to RMAN is:

- Number of allocated RMAN channels
- RMAN channel environment parameters
- Information on the database objects to be backed up or restored

For backup, `ob2rman.pl` uses the Oracle target database views to get information on which logical (tablespaces) and physical (datafiles) target database objects are available for backup.

For restore, `ob2rman.pl` uses current control file or recovery catalog (if used) to get information on which objects are available for restore.

Using the Data Protector integration with RMAN, you can back up and restore the Oracle control files, datafiles, and Archived Redo Logs.

The interface from the Oracle server processes to Data Protector is provided by the Data Protector Oracle integration Media Management Library (**MML**), which is a set of routines that allows the reading and writing of data to General Media Agents.

Besides handling direct interaction with the media devices, Data Protector provides scheduling, media management, network backups, monitoring, and interactive backup.

A backup that includes all datafiles and current control file that belong to an Oracle Server instance is known as a whole database backup.

These features can be used for online or offline backup of the Oracle target database. However, you must ensure that the backup objects (such as tablespaces) are switched into the appropriate state before and after a backup session. For online backup, the database instance must operate in the `ARCHIVELOG` mode; whereas for offline backup, objects need to be prepared for backup using the `Pre-exec` and `Post-exec` options in the backup specification.

The Data Protector backup specification contains information about backup options, commands for RMAN, Pre- and Post-exec commands, media, and devices.

The Data Protector backup specification allows you to configure a backup and then use the same specification several times. Furthermore, scheduled backups can only be performed using a backup specification.

Backup and restore of an Oracle target database can be performed using the Data Protector User Interface or the RMAN utility.

The heart of the Data Protector Oracle integration is MML, which enables an Oracle server process to issue commands to Data Protector for backing up or restoring parts or all of the Oracle target database files. The main purpose is to control direct interaction with media and devices.

Non-ZDB flow

A Data Protector scheduled or interactive backup is triggered by the Data Protector Backup Session Manager, which reads the backup specification and starts the `ob2rman.pl` command on the Oracle Server under a specific user. This user must be defined as the owner of the Data Protector Oracle backup specification. Further on, `ob2rman.pl` prepares the environment to start the backup, and issues the RMAN backup command. RMAN instructs the Oracle Server processes to perform the specified command.

The Oracle Server processes initialize the backup through MML, which establishes a connection to the Data Protector Backup Session Manager. The Backup Session Manager starts the General Media Agent, sets up a connection between MML and the General Media Agent, and then monitors the backup process.

The Oracle Server processes read the data from the disks and send it to the backup devices through MML and the General Media Agent.

RMAN writes information regarding the backup either to the recovery catalog (if one is used) or to the control file of the Oracle target database.

Messages from the backup session are sent to the Backup Session Manager, which writes messages and information regarding the backup session to the IDB.

The Data Protector General Media Agent writes data to the backup devices.

Restore flow

A restore session can be started using:

- Data Protector GUI
- RMAN CLI

You must specify which objects are to be restored.

A restore from the Data Protector user interface is triggered by the Data Protector Restore Session Manager, which starts the `ob2rman.pl` command. `Ob2rman.pl` prepares the environment to start the restore, and issues the RMAN restore command. RMAN checks the recovery catalog (if one is used) or the control file to gather the information about the Oracle backup objects. It also contacts the Oracle Server processes, which initialize the restore through MML. MML establishes a connection with the Restore Session Manager and passes along the information about which objects and object versions are needed.

The Restore Session Manager checks the IDB to find the appropriate devices and media, starts the General Media Agent, establishes a connection between MML and the General Media Agent, and then monitors the restore and writes messages and information regarding the restore to the IDB.

The General Media Agent reads the data from the backup devices and sends it to the Oracle Server processes through MML. The Oracle Server Processes write the data to the disks.

The concept of Oracle integration, data and the control flow are shown in [Figure 2](#) on page 39, and the related terms are explained in the following table.

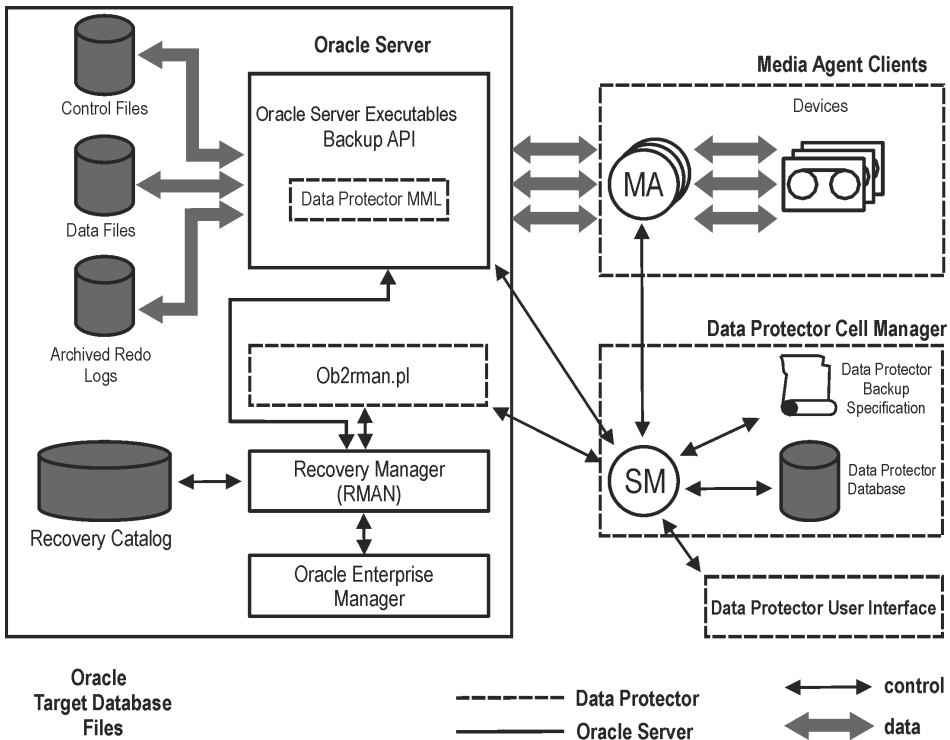


Figure 2 Data Protector Oracle integration concept

Oracle 10g database files can also be part of ASM configuration.

Legend

- SM* The Data Protector Session Manager, which can be the Data Protector Backup Session Manager during a backup session and the Data Protector Restore Session Manager during a restore session.
- RMAN* The Oracle Recovery Manager.
- Data Protector MML* The Data Protector Oracle integration Media Management Library, which is a set of routines that enables data transfer between the Oracle Server and Data Protector.
- Backup API* The Oracle-defined application programming interface.

<i>IDB</i>	The IDB where all the information about Data Protector sessions, including session messages, objects, data, used devices, and media is written.
<i>MA</i>	The Data Protector General Media Agent, which reads and writes data from and to media devices.

Oracle backup set ZDB concepts

See the *HP Data Protector zero downtime backup concepts guide* for a general description of ZDB-to-disk, ZDB-to-tape, and ZDB-to-disk+tape and instant recovery concepts.

With the Oracle backup set ZDB method, the entire data to be backed up is provided to Data Protector through the Oracle API—the data is streamed through the Data Protector Oracle integration MML.

Depending on the location of the Oracle control file, online redo log files, and Oracle 9i/10g SPFILE, the following two options are possible:

- Oracle control file, online redo log files, and SPFILE reside on a **different** volume group (if LVM is used) or source volume than Oracle datafiles.
By default, instant recovery for such a configuration *is* enabled.
- Oracle control file, online redo log files, SPFILE reside on the **same** volume group (if LVM is used) or source volume as Oracle datafiles.

By default, instant recovery for such a configuration is *not* enabled. You can enable instant recovery by setting the `ZDB_ORA_INCLUDE_CF_OLF`, `ZDB_ORA_INCLUDE_SPF`, and `ZDB_ORA_NO_CHECKCONF_IR` omnirc variables to 1. See “[ZDB integrations omnirc variables](#)” on page 410.

IMPORTANT:

If you enable instant recovery by setting the above mentioned variables, note that the control file, SPFILE, and online redo logs are overwritten during instant recovery.

The Oracle archived redo log files do not have to reside on source volumes.

Data Protector MML

The Data Protector Oracle integration Media Management Library, which is a set of routines that enables data transfer between the Oracle Server and Data Protector. This is a Data Protector software library that is linked to the Oracle software.

Backup process for Oracle backup set ZDB

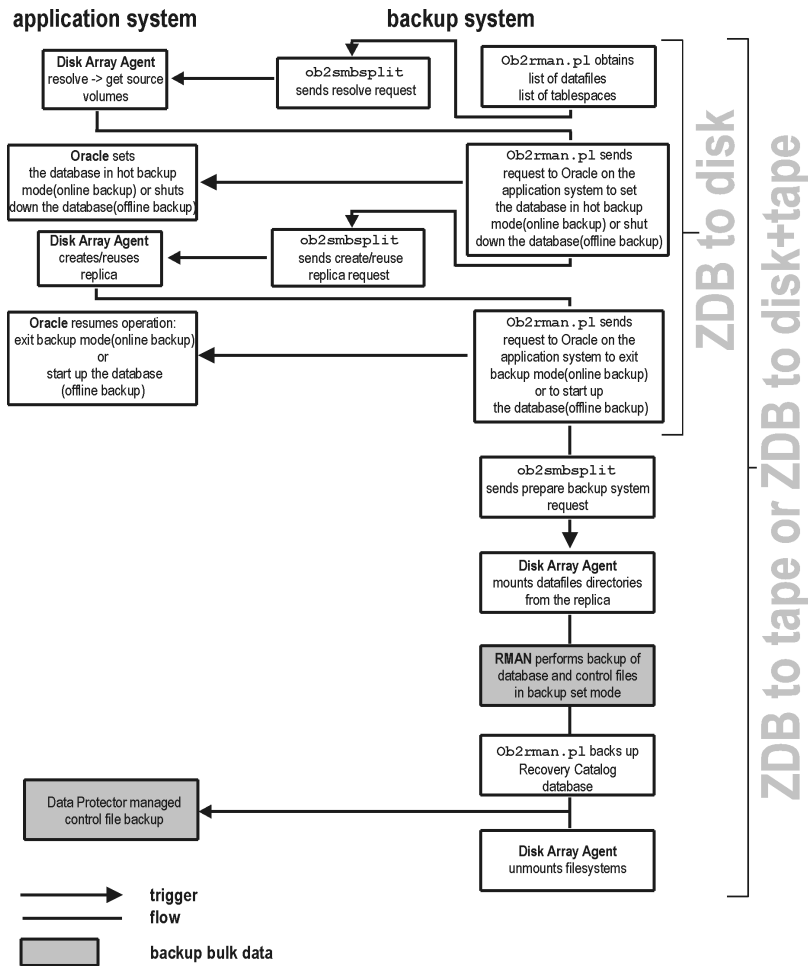


Figure 4 Oracle backup set ZDB flow



NOTE:

The ZDB Agent are SYMA on EMC, SSEA on XP, SNAPA on VA, and SMISA on EVA.

See the *HP Data Protector zero downtime backup concepts guide* for a general description of ZDB and instant recovery concepts.

See the *HP Data Protector zero downtime backup administrator's guide* for a general description of the ZDB-to-disk, ZDB-to-tape, and ZDB-to-disk+tape session flows and for the explanation of actions triggered by ZDB options.

This section provides only the information relevant to the Data Protector Oracle ZDB integration.

Operations on a replica (mounting, activating volume/disk groups,...) described below are dependent on or triggered by ZDB options. See the *HP Data Protector zero downtime backup administrator's guide* for more information on these options.

- Data Protector executes the `ob2rman.pl` command on the backup system. This command retrieves a list of files or raw disks to be backed up from the Oracle database on the application system and starts the resolving process. The list is used only to determine the source volumes to be replicated. If the location for control file copy is specified during configuration, `ob2rman.pl` makes a copy of the control file to the specified directory on the application system. This directory has to reside on a disk array source volume.
- When performing an *online* ZDB session, `ob2rman.pl` then sets the Oracle target database into backup mode by issuing the `sqlplus` command `"ALTER TABLESPACE BEGIN BACKUP"`, starts the procedure to create a replica of the source volumes on which the database is installed; and after the replica is created, takes the database out of backup mode by issuing the `sqlplus` command `"ALTER TABLESPACE END BACKUP"`.

When performing an *offline* ZDB session, `ob2rman.pl` shuts down the Oracle database, starts the procedure to create a replica of the source volumes on which the database is installed; and after the replica is created, starts the Oracle database.

- `Ob2rman.pl` then starts the procedure to prepare the replica on the backup system. In this step, volume/disk groups on the backup system are enabled and, unless the database is installed on raw partitions, the mount points with the Oracle database files are mounted.
- A ZDB Agent then mounts the database on the backup system to the mount points with the same names (created by Data Protector) as on the application system.

 **NOTE:**

There must be nothing already mounted on the mount point concerned on the backup client, or the resolving and backup will fail.

- If a ZDB-to-disk session is being performed, at this point the remaining ZDB options are processed and details of the session are written to the ZDB database. The

session then finishes. The following steps in this description are not performed, therefore RMAN is not given any information about ZDB-to-disk session.

- If a ZDB-to-tape or a ZDB-to-disk+tape session is being performed, the processing continues as follows:
 - `Ob2rman.pl` starts the Oracle backup command RMAN on the backup system, and then sends the Oracle RMAN Backup Command Script to the RMAN cmdfile (input command file).
 - RMAN contacts the Oracle database instance on the backup system, which contacts Data Protector via SBT API and initiates a backup.
 - The Oracle database instance on the backup system reads data from the replica and sends it to the Data Protector General Media Agent for writing to the backup device.
 - At the end of data transfer, the backup system is disabled (filesystems are unmounted on all platforms and volume/disk groups deactivated on UNIX systems) and links are re-established.
 - The recovery catalog and the control file are backed up automatically after the target database backup is finished on the backup system. However, you can disable this when creating a backup specification.

 **NOTE:**

A replica of the archive logs is not created; therefore, the archive logs should be backed up from the application system, following the standard Data Protector Oracle archive logs backup procedure.

Oracle proxy-copy ZDB concepts

See the *HP Data Protector zero downtime backup concepts guide* for a general description of ZDB-to-disk, ZDB-to-tape, ZDB-to-disk+tape, and instant recovery concepts.

The Data Protector Oracle integration MML supports the Proxy Copy functionality. This enables Data Protector to perform backup using filesystem backup methods.

Depending on the location of the Oracle control file, online redo log files, and Oracle 9i/10g SPFILE, the following two options are possible:

- Oracle control file, online redo log files, and SPFILE reside on a **different** volume group (if LVM is used) or source volume than Oracle datafiles.
By default, instant recovery *is* enabled if this option is selected in the GUI.

- Oracle control file, online redo log files, and SPFILE reside on the **same** volume group (if LVM is used) or source volume as Oracle datafiles.
By default, instant recovery is *not* enabled, even if this option is selected in the GUI. You can enable instant recovery by setting the `ZDB_ORA_INCLUDE_CF_OLF`, `ZDB_ORA_INCLUDE_SPF`, and `ZDB_ORA_NO_CHECKCONF_IR` omnirc variables to 1. See “[ZDB integrations omnirc variables](#)” on page 410.

 **IMPORTANT:**

If you enable instant recovery by setting the above mentioned variables, note that the control file, SPFILE, and online redo logs are overwritten during instant recovery.

The Oracle archived redo log files do not have to reside on source volumes.

[Figure 5](#) on page 47 shows the architecture of the Data Protector Oracle ZDB integration. The figure illustrates the configuration, in which the backup is performed on the backup system. It presents the default integration behavior, where Oracle control file, online redo log files, and SPFILE reside on different disk array source volumes than the Oracle data files. For more information on alternative Oracle backup and restore concepts, see “[ZDB integrations omnirc variables](#)” on page 410.

Backup process—Oracle proxy-copy

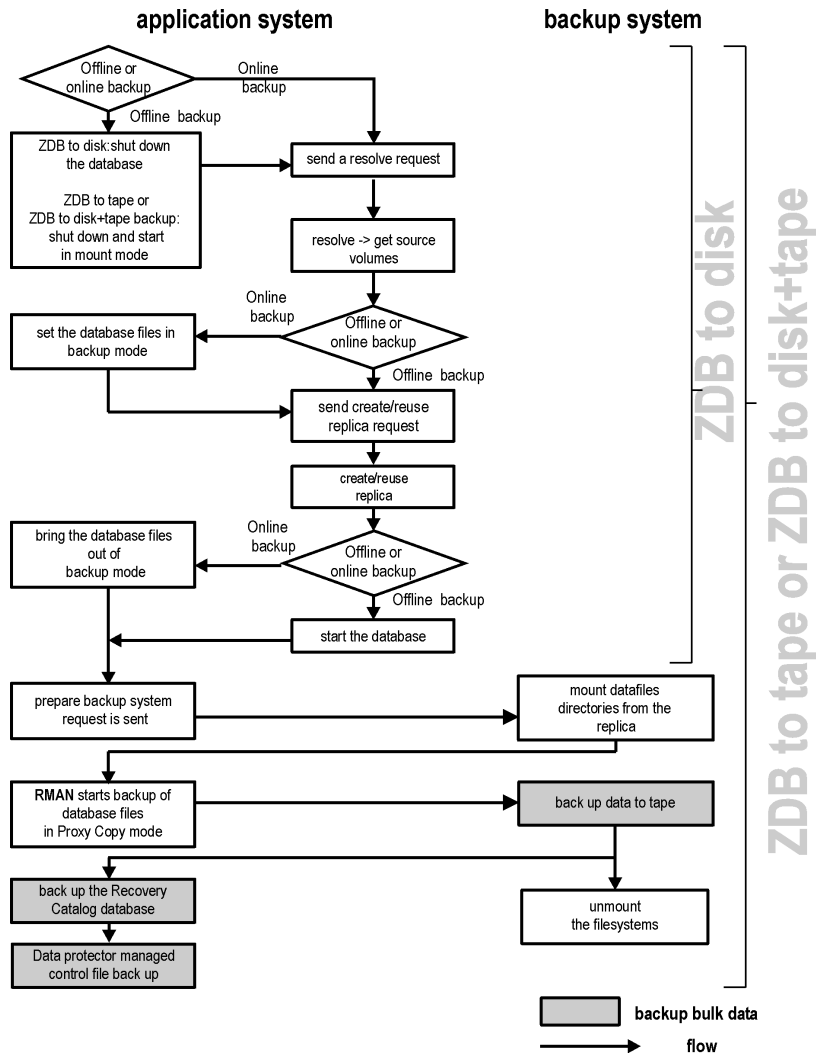


Figure 6 Oracle proxy-copy ZDB flow

See the *HP Data Protector zero downtime backup administrator's guide* for a general description of the ZDB-to-disk, ZDB-to-tape, and ZDB-to-disk+tape sessions flows and for an explanation of actions triggered by ZDB options.

This section provides only the information relevant to the Data Protector Oracle ZDB integration.

Operations on a replica (mounting, activating volume/disk groups...) described below are dependent on or triggered by ZDB options. See the *HP Data Protector zero downtime backup administrator's guide* for more information on these options.

- In the case of an *offline* ZDB-to-disk+tape or ZDB-to-tape session, `ob2rman.pl` shuts down and opens the database instance in mount state. For both, offline and online ZDB-to-disk+tape or ZDB-to-tape sessions, Data Protector starts RMAN in proxy-copy mode.

In the case of an *offline* ZDB-to-disk session, the database is shut down.

- Data Protector retrieves a list of files or raw disks to be included in the replica creation from the Oracle database and starts the resolving process. The list is used only to determine the source volumes to be replicated.

In the case of a *ZDB-to-disk* session, if the location for control file copy is specified during configuration, Data Protector makes a copy of the control file to the specified directory on the application system. This directory has to reside on a disk array source volume.

- In the case of an *online* backup, the Oracle target database is switched into the backup mode.
- `ob2smbsplit` or MML starts the procedure to create a replica of the source volumes on which the database is installed.
- In the case of an *online* backup, the database files are taken out of the backup mode after the replica is created.

In the case of an *offline* backup, the Oracle database is started by `ob2rman.pl` after the replica is created.

- Data Protector (for ZDB to disk) or MML (for ZDB to tape or ZDB to disk+tape) starts the procedure to prepare the replica on the backup system. In this step, volume/disk groups on the backup system are enabled (UNIX systems) and, unless the database is installed on raw disks, the mount points containing the Oracle database files are mounted.
- A ZDB Agent then mounts the database on the backup system to the mount points with the same names (created by Data Protector) as on the application system.
- If a ZDB-to-disk session is being performed, at this point the remaining ZDB options are processed and details of the session are written to the ZDB database. The session then finishes. The following steps in this description are not performed; therefore, RMAN is not given any information about the ZDB-to-disk session.
- MML on the application system sends a request to the Data Protector **data movement agent** (DMA) on the backup system to back up the datafiles to tape.

- The DMA reads data from the backup system and sends it to the General Media Agent to write the actual data to the backup device.
DMA's role is also to disable the General Media Agent requests from accessing the application system. Thus, the database runs on the application system with greatly reduced performance degradation since the backup is performed on the backup system.
- At the end of data transfer, the backup system is disabled (filesystems are unmounted on all platforms and volume/disk groups deactivated on UNIX) and links are re-established.
- The recovery catalog and the control file are backed up automatically after the target database backup is finished on the backup system. However, you can disable this when creating a backup specification.

 **NOTE:**

A replica of the archive logs is not created; therefore, the archive logs should be backed up from the application system, following the standard Data Protector Oracle archive logs backup procedure.

Configuring the integration

Prerequisites

- It is assumed that you are familiar with the Oracle database administration and the basic Data Protector functionality.
- You need a license to use the Data Protector ZDB integration with Oracle. Additional licenses are required for instant recovery and for the online extension. See the *HP Data Protector installation and licensing guide* for information about licensing.
- Before you begin, ensure that you have correctly installed and configured the Oracle Server and Data Protector systems. See the:
 - *HP Data Protector product announcements, software notes, and references* or <http://www.hp.com/support/manuals> for an up-to-date list of supported versions, platforms, devices, and other information.
 - *HP Data Protector installation and licensing guide* for instructions on how to install Data Protector on various architectures and how to install a Data Protector disk array integration (EMC, XP, VA, or EVA) with Oracle.

- *Oracle Recovery Manager User's Guide and References* for Oracle concepts and backup/recovery strategies.
- *Oracle Backup and Recovery Guide* for the configuration and use of Recovery Manager, as well as for Oracle backup terminology and concepts.
- *Oracle Enterprise Manager User's Guide* for information about backup and recovery with the Oracle Enterprise Manager, as well as information about SQL*Plus.
- A Data Protector disk array integration (EMC, XP, VA, or EVA) must be correctly installed and configured. For installation, see the *HP Data Protector installation and licensing guide*. For configuration, see the *HP Data Protector zero downtime backup administrator's guide*.
- The Oracle Server software must be installed on the application system and the Oracle target database must be open or mounted there.
- The Oracle recovery catalog database must be properly configured and open.
- Oracle net services must be properly configured and running (on the application system) for the Oracle target database and the recovery catalog. The net services are needed for the Data Protector Oracle agent to be connected to the Oracle database on the application system through Oracle.

See the *Oracle Recovery Manager User's Guide and References* for more information about different connection options.

See "[Troubleshooting](#)" on page 143 for details about how to check the prerequisites listed above.

Note that the Data Protector Oracle integration uses RMAN for backup and restore. RMAN connection to a target database requires a dedicated server process. To ensure that RMAN does not connect to a dispatcher when the target database is configured for a shared server, the net service name used by RMAN must include `(SERVER_DEDICATED)` in the `CONNECT_DATA` attribute of the connection string.

- On Windows, if the Oracle target database and the Oracle recovery catalog are installed on two different systems, the `Data Protector Inet` service account on the system with the Oracle target database installed must be configured as a *domain* account that is a member of the Administrators group on both systems. For information on how to change the `Data Protector Inet` service account, see the online Help index: "changing Data Protector Inet account".
- In case of Real Application Cluster (RAC), each node must have a dedicated disk for storing archive logs. Such disks must be NFS mounted on all other RAC nodes. However, if the archive logs are not on a NFS mounted disk, you must modify the archive log backup specification. See [Problem](#) on page 159.

Limitations

- The `MAXPIECESIZE` RMAN parameter option is not supported because the restore of multiple backup pieces created during a backup is not possible using the Data Protector Oracle integration.
- The Oracle recovery catalog database must be used as RMAN repository for backup and restore operations. ZDB using the Oracle control file are not supported. This is set when configuring the database. See [“Configuring Oracle databases”](#) on page 61.
- The Oracle database identifier (DBID) must be a unique in a Data Protector cell. If you clone a database you must change the DBID.
- Preview is not possible for Oracle ZDB and restore sessions.
- Using the Oracle proxy-copy ZDB method, individual tablespaces or datafiles cannot be backed up during a ZDB-to-disk or ZDB-to-disk+tape session (instant recovery enabled), only the whole database can be backed up.
- The Oracle backup set ZDB method is not supported on Windows.
- The Oracle backup set ZDB method is supported on UNIX raw logical volumes only if these were created with LVM or VxVM.
- The single host configuration (BC1, TF/1) is not supported for Oracle backup set ZDB sessions.
- Object copying and object mirroring is not supported for ZDB to disk.
- Recovery files residing in the **flash recovery area** (Oracle 10g only) cannot be backed up using ZDB.
- The ASM files can be backed up using ZDB to tape only, because instant recovery is not supported for ASM.
- For backing up the ASM files, only backup set ZDB method is supported.
- **Oracle Data Guard:** Standby database is not supported for ZDB.

Before you begin

- Test whether the Oracle Server system and the Cell Manager communicate properly: Configure and run a Data Protector filesystem backup and restore on the Oracle Server system.
- Identify the Oracle database *user* that will be used by Data Protector for backup. This user must have the `SYSDBA` privilege granted. For example, it could be the Oracle user `sys`, which is created during database creation. See the Oracle documentation for more information on user privileges in Oracle.

- In case of the backup set method, if the Oracle database is installed on symbolic links, create these symbolic links on the backup system too.
- If an Oracle 10g **automatic storage management (ASM)** instance manages files for more than one database, it is recommended to create a separate ASM disk group for each database.
- From the application system, using SQL*Plus, connect to the target database and recovery catalog by specifying the user, password, and net connect identifier. Connect to the target database as the database administrator and to the recovery catalog database as the recovery catalog owner.

Example

If the user name for the target database is `system`, password `manager`, net service name `PROD`, and the user name and password for the recovery catalog is `rman` and the net service name `RMANCAT`, then the commands will look like:

```
sqlplus /nolog
```

```
SQL> connect system/manager@PROD as sysdba;
Connected.
SQL> connect rman/rman@RMANCAT;
Connected.
```

- For *online backup* only, enable the Oracle automatic log archiving:
 1. Shut down the Oracle target database instance on the application system.
 2. Back up the entire database using a filesystem backup.
 3. Select the location for archive logs:
 - If SPFILE is used:

Run:

```
alter system set log_archive_dest=path_to_archive_logs
SCOPE=SPFILE;
```
 - If the `init.ora` file is used:

Run:

```
log_archive_start=true
log_archive_dest=path_to_archive_logs
```

The default path of the file is:

Windows: `ORACLE_HOME\database\initDB_NAME.ora`
UNIX: `ORACLE_HOME/dbs/initDB_NAME.ora`

where `DB_NAME` is the name of the Oracle database instance.

4. Mount the target database and to enable the archive log mode, start SQL*Plus and type:

```
startup mount
alter database archivelog;
alter database open;
```

Example

If the user name for the target database is `system`, password `manager`, instance name `PROD`, and the user name and password for the recovery catalog is `rman`, then the commands will look like:

```
sqlplus /nolog
SQL> connect system/manager@PROD as sysdba;
Connected.
SQL> startup mount;
SQL> alter database archivelog;
Statement processed.
SQL> archive log start;
Statement processed.
SQL> alter database open;
```

5. Back up the entire database.

Backup set method

For backup set method:

- Ensure that the Oracle software on the backup system and application system have the same directory structure. That means that `ORACLE_HOME` for both Oracle installations has to be identical.
- Ensure that the following files are the same on the application system and the backup system. Check also that the permissions are identical as on the application system:
 - `names.ora`
Default path: `ORACLE_HOME/network/admin/names.ora`
 - `initDB_NAME.ora`
Default path: `ORACLE_HOME/dbs/initDB_NAME.ora.`
 - `orapwDB_NAME`
Default path: `ORACLE_HOME/dbs/orapwDB_NAME`
 - `admin/DB_NAME`

Default path: `ORACLE_BASE/admin/DB_NAME`

Ensure that the Oracle net services on the application system and the backup system have the same directory structure. This can be accomplished by either NFS sharing of the files, manually copying the files from the application system to the backup system, or by using the UNIX `rdist` or `tar` commands to distribute the files from the application system.

- Test whether the Oracle user can log in to the Oracle target database as the Oracle database administrator and to the Oracle recovery catalog database as the Oracle recovery catalog owner from the backup system:
 1. Export `ORACLE_HOME`, `DB_NAME`, and on UNIX also `SHLIB_PATH` variables.
 2. Using SQL*Plus, connect to the Oracle recovery catalog database by specifying the user (recovery catalog owner), password, and net connect identifier.
 3. Connect to the Oracle target database locally using the Oracle Net software as the Oracle database administrator with the `SYSDBA` role.

Example

If the `DB_NAME` of the target database is `PROD`, the `DB_NAME` of the Oracle recovery catalog database is `RMANCAT`, and `ORACLE_HOME` is `/oracle/PROD`, then the commands will look like:

```
su - ora
id
uid=101(ora) gid=101(dba)

export DB_NAME=PROD
oracle/PROD/bin/sqlplus
SQL> connect rman/rman@RMANCAT
Connected.

SQL> connect system/manager as sysdba
SQL> connect system/manager@PROD as sysdba;
Connected.
```

- Test whether both the user `root` and the Oracle administrator (for example, the user `oracle`) can connect to the target database and the recovery catalog database using the `RMAN` command on the backup system:
 1. Log in as the Oracle database administrator to the backup system (for example, the user `oracle`).
 2. Execute the `RMAN` command and connect to the target database and the recovery catalog database.

Example

If the `DB_NAME` of the target database is `PROD`, the `DB_NAME` of the Oracle recovery catalog database is `RMANCAT`, and `ORACLE_HOME` is `/oracle/PROD`, then the commands will look like:

```
su - ora
id
uid=101(ora) gid=101(dba)
export DB_NAME=PROD

rman target system/manager catalog rman/rman
Recovery Manager: Release 10.1.0.2.0 - Production
RMAN-06005: connected to target database: PROD
RMAN-06008: connected to recovery catalog database
RMAN> exit
Recovery Manager completed.
```

Cluster-aware clients

In cluster environment, if you intend to use the Data Protector CLI, set the Data Protector environment variable `OB2BARHOSTNAME` to the virtual server name. Set the variable on the Oracle Server system as follows:

Windows: set `OB2BARHOSTNAME=virtual_server_name`

UNIX: export `OB2BARHOSTNAME=virtual_server_name`

HP-UX with RAC: To enable instant recovery, create an MC/ServiceGuard package containing *only* the virtual IP and the virtual hostname parameters and distribute it among the RAC nodes.

Linking Oracle Server with the Data Protector MML

To use the Data Protector Oracle integration, the Oracle Server software needs to be linked with the Data Protector Oracle integration Media Management Library (**MML**) on every client on which an Oracle instance is running.

- On Windows and UNIX clients with Oracle8i, link Oracle Server with the Data Protector MML manually. For details, see the following sections.

 **IMPORTANT:**

After uninstalling the Data Protector Oracle integration on an Oracle server system, the Oracle server software is still linked to MML. You must re-link the Oracle binary to remove this link. If this is not done, the Oracle server cannot be started after the integration has been removed. See [“Using Oracle after removing the Data Protector Oracle integration”](#) on page 142 for information on removing the integration link.

- On Windows and UNIX clients with Oracle9i/10g, you do not need to link Oracle Server with the Data Protector MML manually. When you start backups or restores using the Data Protector GUI or CLI, Data Protector automatically links Oracle Server with the correct platform-specific Data Protector MML. However, for testing purposes, you can override this automatic selection. You can manually specify which platform-specific Data Protector MML should be used by setting the Data Protector `SBT_LIBRARY` parameter. On how to set the parameter, see the `util_cmd` man page. The parameter is saved in the Data Protector Oracle instance configuration file.

MML is invoked by the Oracle server when it needs to write to or read from devices using Data Protector.

MC/ServiceGuard: When linking Oracle with MML, link it on all nodes.

Linking on UNIX systems

On Oracle Server systems, MML is located in the `/opt/omni/lib` directory.

The filename for MML depends on the platform:

Table 4 Filenames for the MML on different platforms

Platforms	32-bit	64-bit
HP-UX	<code>libob2oracle8.sl</code>	<code>libob2oracle8_64bit.sl</code>
HP-UX on IA-64	<code>libob2oracle8.so</code>	<code>libob2oracle8_64bit.so</code>
Solaris	<code>libob2oracle8.so</code>	<code>libob2oracle8_64bit.so</code>

Proceed as follows:

1. Change to the `ORACLE_HOME/lib` directory:
32-bit Oracle: `cd ORACLE_HOME/lib`
64-bit Oracle 8i: `cd ORACLE_HOME/lib64`
64-bit Oracle 9i/10g: `cd ORACLE_HOME/lib`
2. Perform this step only if the `libobk.sl` (HP-UX) or `libobk.so` (Solaris) file is already created in the `ORACLE_HOME/lib` directory. Otherwise, skip this step.
Run:
HP-UX: `mv libobk.sl libobk.sl.orig`
Solaris `mv libobk.so libobk.so.orig`

 **IMPORTANT:**

If you intend to uninstall the Data Protector Oracle integration and to continue using Oracle on the same system after the integration is removed, do not delete `libobk.sl.orig` (HP-UX) or `libobk.so.orig` (Solaris).

3. Run:
HP-UX:
 - 32-bit:
`ln -s /opt/omni/lib/libob2oracle8.sl libobk.sl`
 - 64-bit:
`ln -s /opt/omni/lib/libob2oracle8_64bit.sl libobk.sl`**Solaris:**
 - 32-bit:
`ln -s /optS/omni/lib/libob2oracle8.so libobk.so`
 - 64-bit:
`ln -s /opt/omni/lib/libob2oracle8_64bit.so libobk.so`

Linking on Windows systems

On Oracle Server systems, copy the file
`Data_Protector_home\bin\orasbt.dll` to the directory `Oracle_home\bin`.

Configuring Oracle users on UNIX

On UNIX, to start an Oracle backup session, a user needs to perform an operating system logon to the system where an Oracle Server is running.

If properly configured, this user is allowed to back up or restore an Oracle database. To start a backup of an Oracle database using Data Protector, the user must also become the owner of the Data Protector backup specification.

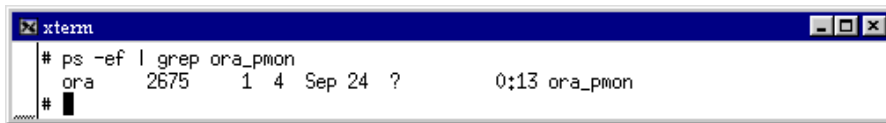
As the owner of the backup specification, the Oracle user must be added to the Data Protector `admin` or `operator` user group.

You can identify this user by running the following command on the Oracle Server system:

```
ps -ef | grep ora_pmon_DB_NAME
```

or

```
ps -ef | grep ora_lgwr_DB_NAME
```



```
xterm
# ps -ef | grep ora_pmon
ora 2675 1 4 Sep 24 ? 0:13 ora_pmon
#
```

Figure 7 Finding the Oracle user

The example above states that the user `ora` has sufficient privileges within the Oracle database to back up and restore the database. Therefore, this user must be added to the corresponding Data Protector user group (`admin` or `operator`) and must also become the owner of the backup specification to be able to back up the Oracle database using Data Protector. For the Oracle backup set ZDB method, an Oracle user with the same user ID, group ID, and other privileges must be configured also on the backup system.

 **IMPORTANT:**

Additionally, the user `root` on the Oracle Server has to be added to the Data Protector `admin` or `operator` user group for both, the application and backup system.

The user account for the added Oracle user must have the same numerical user ID and group ID on the backup system and on the application system (for example, UNIX user `ora` and UNIX group `dba`). The Oracle user must be identical on both systems.

To check the userID and groupID, switch the user name:

```
#su - ora
```

and run the `id` command:

```
#id
```

```
uid=101(ora) gid=101(dba)
```

For information on how to add a user to a user group, see the online Help index: "adding users".

After the two users are added to the Data Protector `admin` or `operator` user group, Data Protector sessions can be started under the user account with all the necessary privileges required to perform an Oracle database backup with Data Protector.

MC/ServiceGuard: In a cluster environment, add both users (the Oracle user and the user `root`) to the Data Protector `admin` or `operator` group on the virtual server and on every physical and virtual node in the cluster.

If two or more Oracle users have the same user ID, all of them must be added to the Data Protector `admin` or `operator` user group.

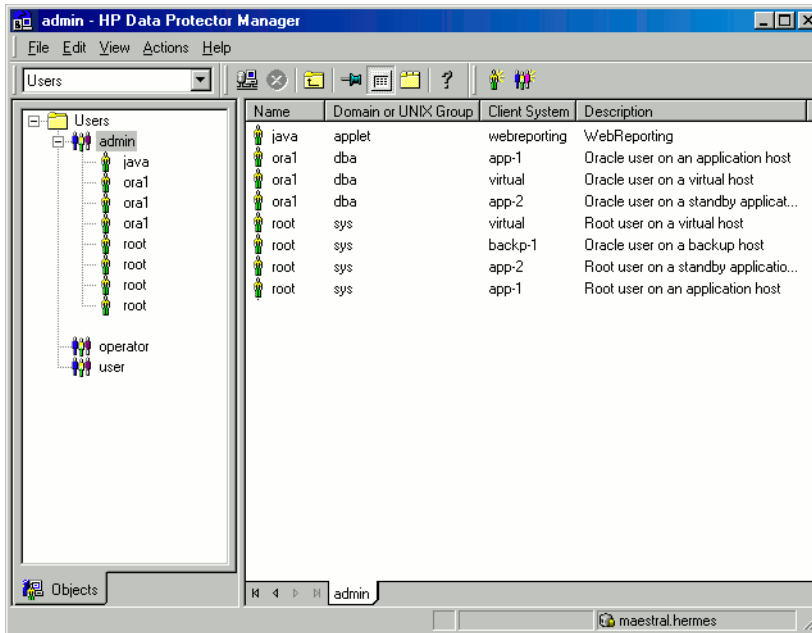


Figure 8 Example user configuration in a cluster environment

Configuring Oracle databases

Configuring an Oracle database involves preparing the environment for starting a backup. The environment parameters such as the Oracle home directory and the connection string to the database are saved in the Data Protector Oracle configuration files on the Cell Manager. The database must be open during the configuration procedure. The configuration must be done for each Oracle database.

If a recovery catalog has been created and the Oracle target database has not yet been registered in the recovery catalog database, this will occur during the configuration procedure.

To configure an Oracle database, use the Data Protector GUI or CLI.

Using the Data Protector GUI

Configure an Oracle database when you create first ZDB backup specification for the database. Start with the procedure described in [“Creating backup specifications”](#) on page 74 and at [Step 6](#) on page 82 proceed as follows:

1. In the **Configure Oracle** dialog box and in the **General** page, specify the pathname of the Oracle Server home directory.

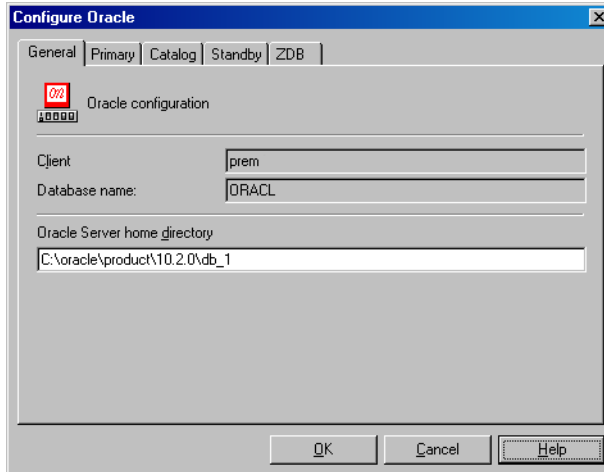


Figure 9 Configuring Oracle - General (Windows)

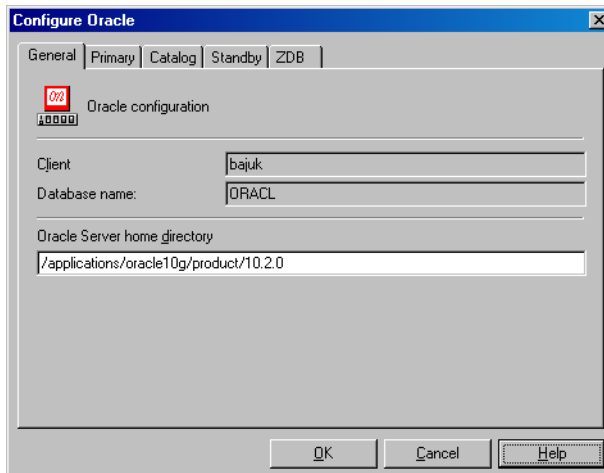


Figure 10 Configuring Oracle - General (UNIX)

2. In the **Primary** page, specify the login information to the primary database.

Note that the user must have the `SYSDBA` privilege granted.

In **Services**, type the net service name for the primary database instance. The backup will be performed on the system where this database instance resides.

RAC: List all net services names for the primary database separated by a comma.

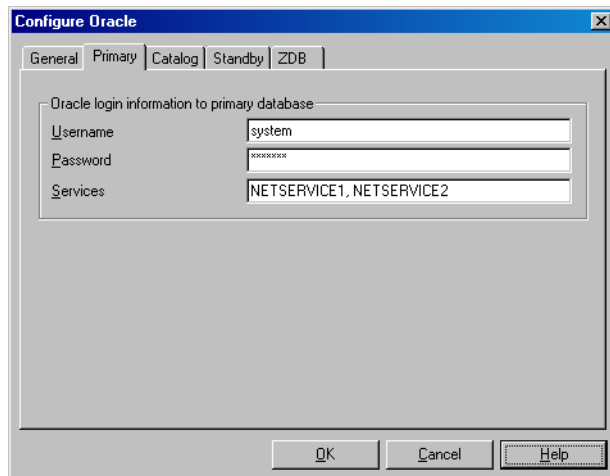


Figure 11 Configuring Oracle - Primary

3. In the **Catalog** page, select **Use target database control file instead of recovery catalog** to use the primary database control file.

To use the recovery database catalog as an RMAN repository for backup history, select **Use recovery catalog** and specify the login information to the recovery catalog.

Note that for ZDB, you must use the recovery catalog.

The user specified must be the owner of the recovery catalog.

In **Services**, type the net service name for the recovery catalog.

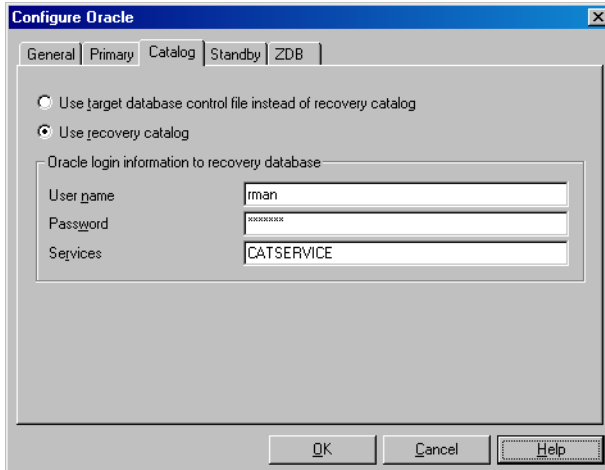


Figure 12 Configuring Oracle - Catalog

4. If you have Oracle Data Guard configuration for *non-ZDB sessions* and if you intend to back up a standby database, configure also the standby database:

In the **Standby** page, select **Configure standby database** and specify the login information to the standby database.

In **Services**, type the net service name for the standby database instance.

RAC: List all net services names for the standby database separated by a comma.

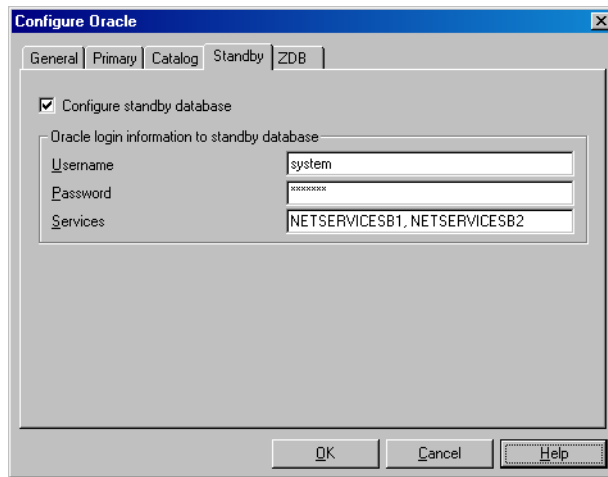


Figure 13 Configuring Oracle - Standby

5. In the **ZDB** page, select **Backup method** and then select **PROXY** or **BACKUP SET** in the drop-down list.

In **Backup control file copy location**, you can specify the location on the source volumes where a backup copy of the current control file will be made during ZDB to disk.

If you do not specify the location, `o2rman.pl` will copy the copy of the control file from the application system to the backup system when it is needed. Thus, you do not need to create an additional disk for this location if you do not need the control file copy on a replica.

If your backup method is *backup set* and if your database instance uses PFILE (and not SPFILE), select the **Parameter file (PFILE)** option and specify the pathname of PFILE residing on the application system.

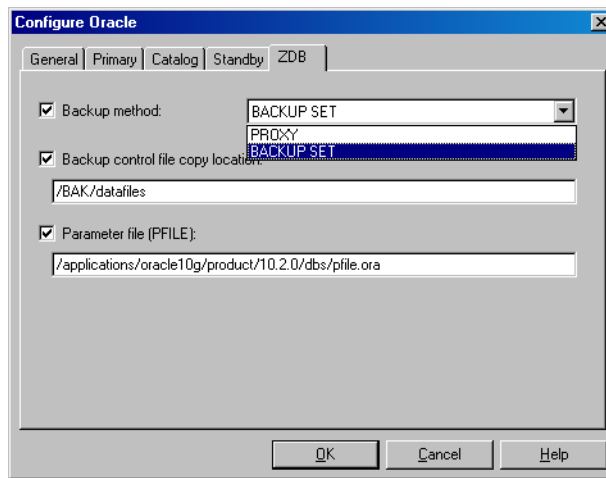


Figure 14 Configuring Oracle - ZDB

Click **OK**.

The Oracle database is configured. Exit the GUI or proceed with creating the backup specification at [Step 7](#) on page 82.

Using the Data Protector CLI

1. **UNIX only:** Log in to the Oracle Server system as user `root` or as the Oracle user that is identified as described in [“Configuring Oracle users on UNIX”](#) on page 59.

2. On the Oracle Server system, from the directory:

Windows: *Data_Protector_home\bin*

HP-UX, Solaris: */opt/omni/lbin*

run:

Windows:

```
perl -I..\lib\perl util_oracle8.pl -config -dbname DB_NAME
-orahome ORACLE_HOME PRIMARY_DB_LOGIN
CATALOG_DB_LOGINZDB_OPTIONS [STANDBY_DB_LOGIN] [-client
CLIENT_NAME]
```

UNIX and OpenVMS:

```
util_oracle8.pl -config -dbname DB_NAME -orahome
ORACLE_HOME PRIMARY_DB_LOGINCATALOG_DB_LOGIN
ZDB_OPTIONS[STANDBY_DB_LOGIN] [-client CLIENT_NAME]
```

where:

PRIMARY_DB_LOGIN is:

-prmuser *PRIMARY_USERNAME*

-prmpasswd *PRIMARY_PASSWORD*

-prmservice

primary_net_service_name_1[,primary_net_service_name_2, ...]

CATALOG_DB_LOGIN is:

-rcuser *CATALOG_USERNAME*

-rcpasswd *CATALOG_PASSWORD*

-rcservice *catalog_net_service_name*

STANDBY_DB_LOGIN is:

-stbuser *STANDBY_USERNAME*

-stbpasswd *STANDBY_PASSWORD*

-stbservice

standby_net_service_name_1[,standby_net_service_name_2, ...]

ZDB_OPTIONS are:

-zdb_method {PROXY | BACKUP_SE T}

`[-ctlcp_location BACKUP_CONTROL_FILE_COPY_LOCATION]`

`[-pfile PARAMETER_FILE]`

`[-bkphost BACKUP_SYSTEM]`

If you have Oracle Data Guard configuration for *non-ZDB sessions* and if you intend to back up a standby database, you must provide the `STANDBY_DB_LOGIN` information.

If your ZDB method is *backup set*, you must provide the `BACKUP_SYSTEM` information.

Parameter description

`CLIENT_NAME`

Name of the Oracle Server system with the database to be configured. It needs to be specified only in a cluster environment.

RAC: Name of the node or the virtual server of the Oracle resource group. The latter can only be used on HP-UX.

Oracle Data Guard: Name of either a primary system or secondary (standby) system.

`DB_NAME`

Name of the database to be configured.

`ORACLE_HOME`

Pathname of the Oracle Server home directory.

`PRIMARY_USERNAME PRIMARY_PASSWORD`

Username and password for login to the target or primary database. Note that the user must have the `SYSDBA` privilege granted.

`primary_net_service_name_1 [,primary_net_service_name_2, ...]`

Net services names for the primary database.

RAC: Each net service name must resolve into a specific database instance.

`CATALOG_USERNAME CATALOG_PASSWORD`

Username and password for login to the recovery catalog. This is optional and is used only if you use the recovery catalog database as an `RMAN` repository for backup history.

`catalog_net_service_name`

Net service name for the recovery catalog.

`STANDBY_USERNAME STANDBY_PASSWORD`

This is used in Oracle Data Guard environment for backing up a standby database. Username and password for login to the standby database.

`standby_net_service_name_1 [,standby_net_service_name_2, ...]`

Net services names for the standby database.

BACKUP_CONTROL_FILE_COPY_LOCATION

A location on a source volume where a copy of the current control file is made before a ZDB to disk. This is optional and if not specified, `ob2rman.pl` will copy the copy of the control file from the application system to the backup system when it is needed. Thus, you do not need to create an additional disk for this location if you do not need the control file copy on a replica.

PARAMETER_FILE

Full pathname of the PFILE residing on the application system. This is optional and used if backup method is backup set and the database instance uses PFILE (and not SPFILE).

BACKUP_SYSTEM

Name of the backup system.

Example

The following example represents configuration on HP-UX or Solaris of an Oracle database and its recovery catalog with the backup set method used and the parameter file location specified.

The following names are used in the example:

- database name: `oracl`
- primary user name: `system`
- primary password: `manager`
- primary net service name 1: `netSERVICE1`
- primary net service name 2: `netSERVICE2`
- recovery catalog user name: `rman`
- recovery catalog password: `manager`
- recovery catalog net service name: `catSERVICE`
- backup system name: `bcksys`

Syntax

```
/opt/omni/lbin/util_oracle8.pl -config -dbname oracl -orahome
/app10g/oracle10g/product/10.1.0 -prmsuser system -prmpasswd
manager -prmservice netSERVICE1,netSERVICE2 -rcuser rman
-rcpasswd manager -rcservice catSERVICE -zdb_method BACKUP_SET
-pfile /app10g/oracle10g/product/10.1.0/dbs/pfile.ora -bkphost
bcksys
```

If you need to export some variables before starting SQL*Plus, listener, or RMAN, these variables must be defined in the `Environment` section of the Data Protector Oracle global configuration file or using the Data Protector GUI.

What happens after the configuration?

The `util_oracle8.pl` command is started on the application system. It saves the configuration parameters in the Data Protector Oracle configuration files.

`util_oracle8.pl` starts the Oracle RMAN command, which registers the target database in the recovery catalog.

Checking the configuration

You can check the configuration of an Oracle database after you have created at least one backup specification for the database. If you use the Data Protector CLI, a backup specification is not needed.

Using the Data Protector GUI

1. In the Context List, select **Backup**.
2. In the Scoping Pane, expand **Backup Specifications** and then **Oracle Server**. Click the backup specification to display the server with the database to be checked.
3. Right-click the server and click **Check configuration**.

IMPORTANT:

On UNIX, it is possible that although the GUI check is successful, the backup still fails. This can happen if the backup owner is not the Oracle user `root` or the Oracle user that is identified as described in [“Configuring Oracle users on UNIX”](#) on page 59.

Using the Data Protector CLI

1. **UNIX only:** Log in to the application system as the Oracle user or as user `root`.

2. From the directory:

Windows: `Data_Protector_home\bin`

HP-UX, Solaris: `/opt/omni/lbin`

run:

Windows:

```
perl -I..\lib\perl util_oracle8.pl -CHKCONF_SMB -dbname  
DB_NAME
```

UNIX:

```
util_oracle8.pl -CHKCONF_SMB -dbname DB_NAME
```

Handling errors

If an error occurs, the error number is displayed in the form

`*RETVAL*error_number`.

To get the error description, on the Cell Manager, run:

Windows: `Data_Protector_home\bin\omnigetmsg 12 error_number`

HP-UX, Solaris: `/opt/omni/lbin/omnigetmsg 12 error_number`

IMPORTANT:

On UNIX, it is possible that although you receive a `*RETVAL*0`, the backup still fails. This can happen if the backup owner is not the Oracle user `root` or the Oracle user that is identified as described in “[Configuring Oracle users on UNIX](#)” on page 59.

Checking configuration for instant recovery

Check if the Oracle configuration is suitable for instant recovery.

On the application system, from the directory:

Windows: `Data_Protector_home\bin`

HP-UX, Solaris: `/opt/omni/lbin`

run:

Windows:

```
perl -I..\lib\perl util_oracle8.pl -CHKCONF_IR -dbname DB_NAME
```

UNIX:

```
util_oracle8.pl -CHKCONF_IR -dbname DB_NAME
```

If the control files, SPFILE, and redo logs are on the same volume group (if LVM is used) or source volume as datafiles, a warning is displayed stating that instant recovery is not possible. You can either:

- Reconfigure the Oracle database instance. See [“Reconfiguring an Oracle instance for instant recovery”](#) on page 405 on how to move the control files and redo logs to source volumes that are not replicated.
Or:
- Set the `ZDB_ORA_INCLUDE_CF_OLF`, `ZDB_ORA_INCLUDE_SPF`, and `ZDB_ORA_NO_CHECKCONF_IR` `omnirc` variables and ignore the warning. However, note that the control file, SPFILE, and online redo logs are overwritten during instant recovery. See [“ZDB integrations omnirc variables”](#) on page 410 on how to set the `omnirc` variables.

Switching between Oracle backup methods

You can switch between the Oracle backup methods by reconfiguring the Data Protector Oracle integration for each database. It is *not* possible to select the method during the backup specification creation.



IMPORTANT:

When switching between the Oracle backup set and proxy-copy methods, you must carefully follow the instructions given below to ensure a successful switch between both methods and to ensure that during a restore or recovery RMAN does not select backup objects backed up using different methods in one restore session. If such a mixed set is used, the restore procedure will fail.

To switch between the backup methods:

1. Successfully back up the entire database using the *currently* selected method.
2. To avoid selecting backup specifications with a backup method different than the current backup method, you may remove or move all ZDB backup specifications belonging to the selected database instance. The backup specifications are located on the Cell Manager in:

Windows: `Data_Protector_home\Config\Server\BarLists\Oracle8`

UNIX: `/etc/opt/omni/server/barlists/oracle8`

3. Re-configure the database with the new *method* selected while creating a new Oracle ZDB specification.
4. Optionally, if you switch *from backup set to proxy-copy*, you may:
 - a. On the Cell Manager, remove the file:
Windows: `Data_Protector_home\Config\Server\Integ\Config\Oracle8\client_name%initDB_NAME_bckp.ora`
UNIX: `/etc/opt/omni/server/integ/config/Oracle8/client_name%initDB_NAME_bckp.ora`
 - b. Remove the Oracle software from the backup system.
5. Perform ZDB of the entire database.



IMPORTANT:

If you need to perform a restore from a time between the start and the end of the first backup of the entire database using the new backup method, RMAN may try to use backup files from old method through a channel allocated for the files from the old method and the restore will fail. See [Problem](#) on page 155 on how to restore such a backup.

Backup

To configure an Oracle ZDB, perform the following steps:

1. Configure the devices you plan to use for a backup. See the online Help index: “configuring devices” for instructions.

For a ZDB to disk, you also need to configure a backup device, as you will have to select it while configuring a backup specification. Otherwise, you cannot configure a backup specification for a ZDB to disk.
2. Configure media pools and media for a backup. See the online Help index: “creating media pools” for instructions.
3. Configure a non-ZDB backup specification and run the backup of Oracle data on the application system to verify that you have properly configured the Oracle environment. See the *HP Data Protector integration guide for Oracle and SAP* on how to create a non-ZDB backup specification.
4. Create a Data Protector Oracle ZDB backup specification. See “[Creating backup specifications](#)” on page 74.

Creating backup specifications

Online ZDB

To perform an online ZDB of an Oracle database, the database has to run in the ARCHIVELOG mode.

Offline ZDB

To perform an offline ZDB, create only a ZDB backup specification.

Cluster-aware clients

Before you perform an *offline* ZDB in a cluster environment, take the Oracle Database resource offline and bring it back online after the replica is created. This can be done using the Oracle `fscommand` command line interface commands in the `Pre-exec` and `Post-exec` commands for the client system in a particular backup specification, or by using the Cluster Administrator.

You cannot perform a ZDB of the archived redo log files. Therefore, you need two create two backup specifications:

- ZDB backup specification for backing up database files
- standard Data Protector Oracle integration backup specification for backing up the application system archived log files

Procedure

To create an Oracle ZDB backup specification:

1. In the Context List, click **Backup**.
2. In the Scoping Pane, expand **Backup Specifications**, right-click **Oracle Server**, and click **Add Backup**.

3. In the Create New Backup dialog box, select the following:

Backup set method

To perform a ZDB of the entire database using the backup set method, select the **SMB_BackupSet_Database** template.

Proxy-copy method

To perform a ZDB of the entire database using the proxy-copy method, select the **SMB_Proxy_Database** template.

On EMC and XP

In the **Backup type** drop-down list, select the **Split mirror backup** option and in the **Sub type** drop-down list, select the split-mirror agent that is installed on the application and the backup systems (**EMC Symmetrix** or **HP StorageWorks XP**). See [Figure 15](#) on page 75.

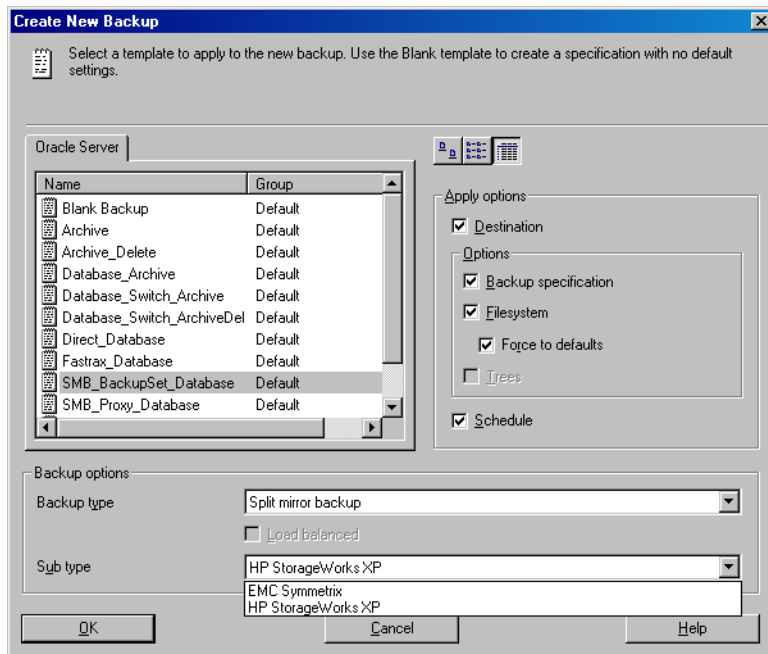


Figure 15 Selecting an Oracle ZDB template and Split mirror backup

On VA and EVA

In the **Backup type** drop-down list, select the **Snapshot backup** option and in the **Sub type** drop-down list, select the snapshot agent you have installed on the application and the backup system (**HP StorageWorks VA** or **HP StorageWorks EVA SMI-S**). See [Figure 16](#) on page 76.

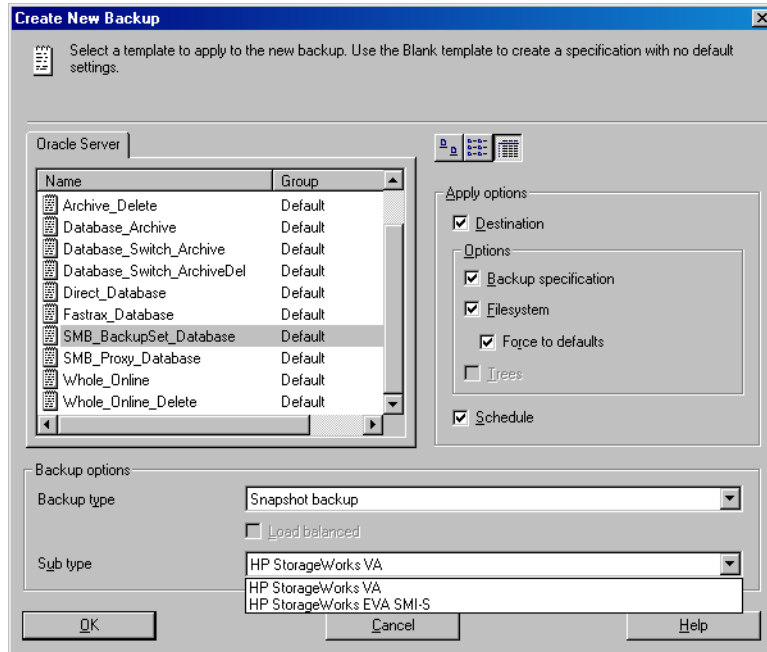


Figure 16 Selecting an Oracle ZDB template and Snapshot backup

Click **OK**.

4. In the Application system drop-down list, select the Data Protector Oracle integration client. In a non-RAC cluster environment, select the virtual server.

RAC: Select either the node or the virtual server of the Oracle resource group. The latter can only be selected on HP-UX.

In the Backup system drop-down list, select the backup system.

Select other disk array specific backup options (see [Figure 17](#) on page 77 for EMC, [Figure 18](#) on page 78 for XP, [Figure 19](#) on page 79 for VA, or [Figure 20](#) on page 80 for EVA backup options). For detailed information on the options, press **F1**.

On EMC

In the EMC GeoSpan for Microsoft Cluster Service environment, select the backup system for the active node and specify the TimeFinder configuration.

After a failover in EMC GeoSpan for MSCS, select the backup system for the currently active node and save the backup specification.

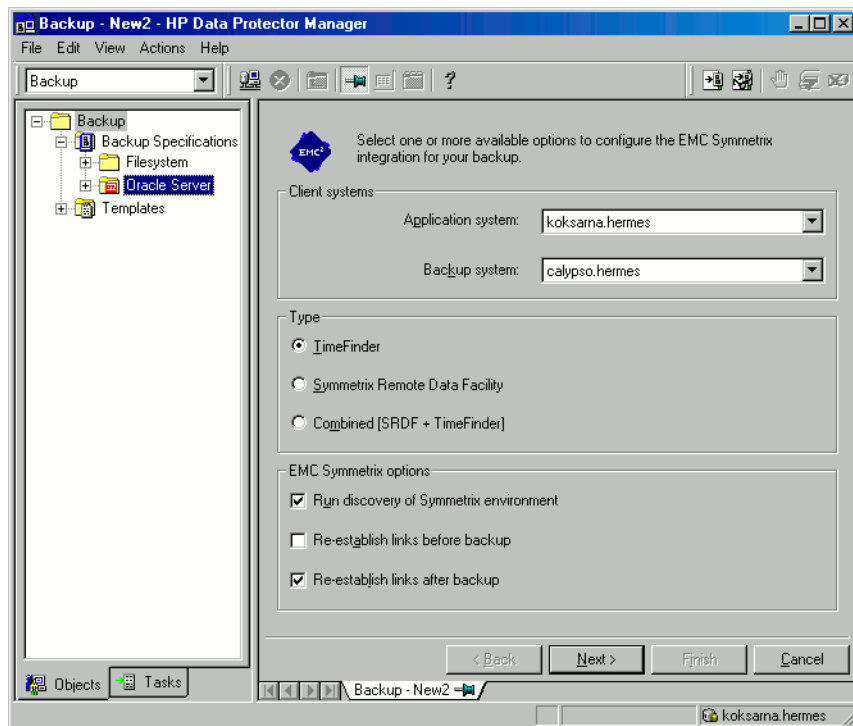


Figure 17 EMC backup options

On XP

To enable instant recovery, leave the **Track the replica for instant recovery** option selected. Note that restore using Data Protector will not be possible if this option is cleared.

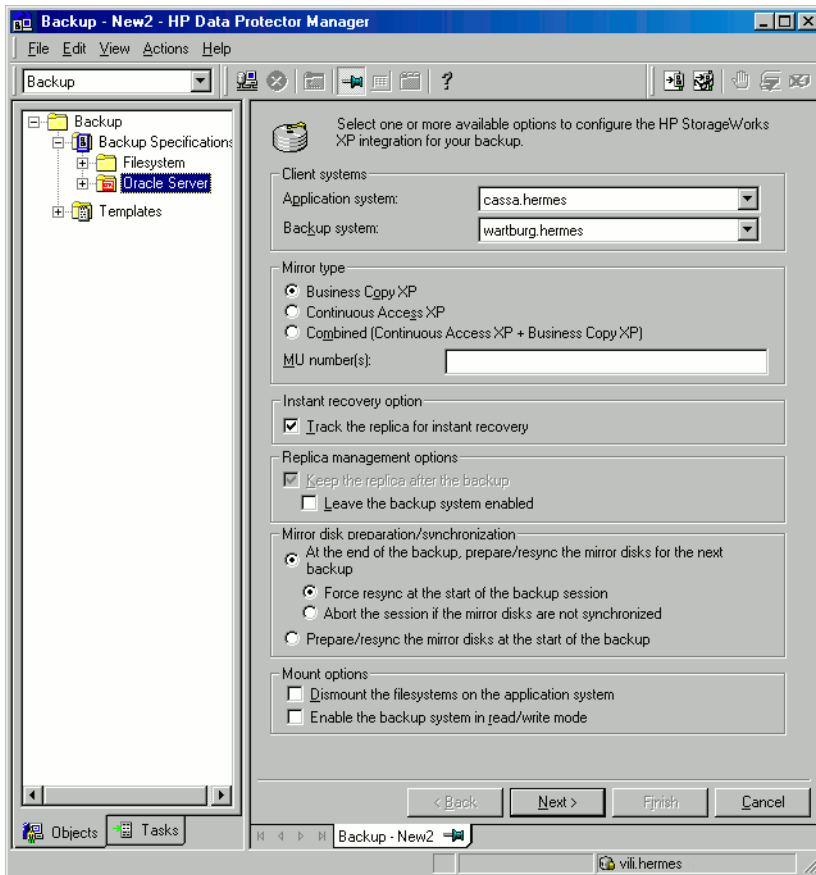


Figure 18 XP backup options

On VA

To enable instant recovery, leave the **Track the replica for instant recovery** option selected.

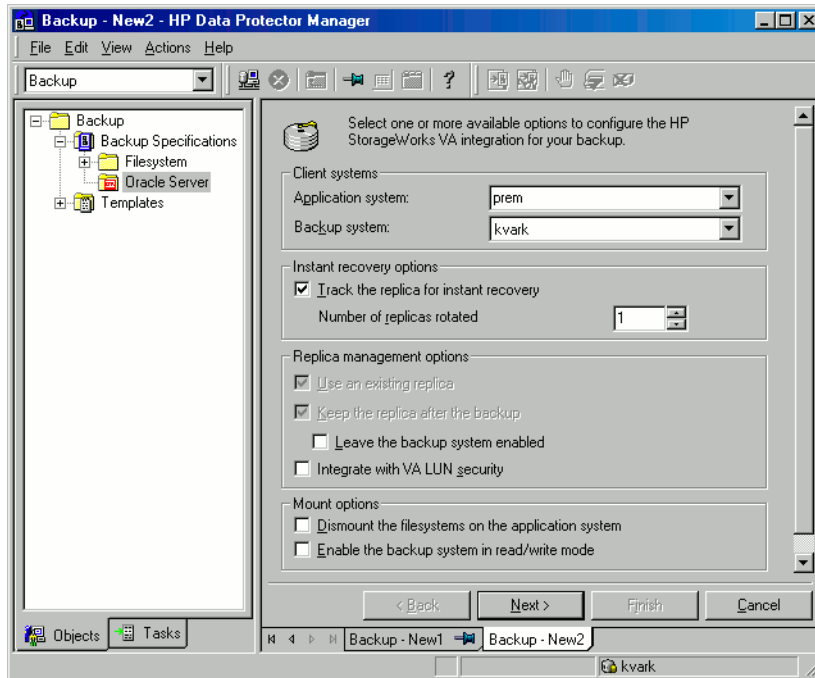


Figure 19 VA backup options

On EVA

To enable instant recovery, select the **Track the replica for instant recovery** option.

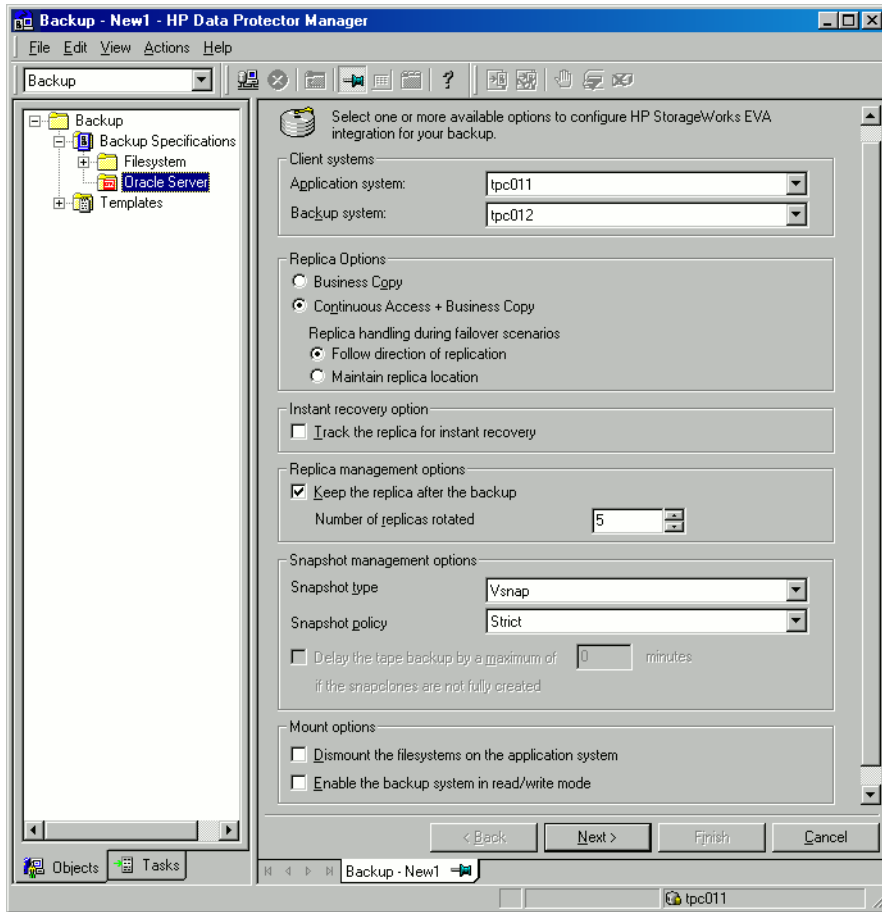


Figure 20 EVA backup options

Click **Next**.

5. Specify the application that you want to back up. In Application database, type the name of the database to be backed up.

The database name can be obtained using SQL*Plus:

```
SQL>select name from v$database;
```

 **NOTE:**

In a single-instance configuration, the database name is usually the same as its instance name. In this case, the instance name can be also used. The instance name can be obtained as follows:

```
SQL>select instance_name from v$instance;
```

RAC: Note that the database name is the same for all instances.

UNIX only: Type the username and user group of the Oracle user. See “[Configuring Oracle users on UNIX](#)” on page 59 for information on how to identify that user.

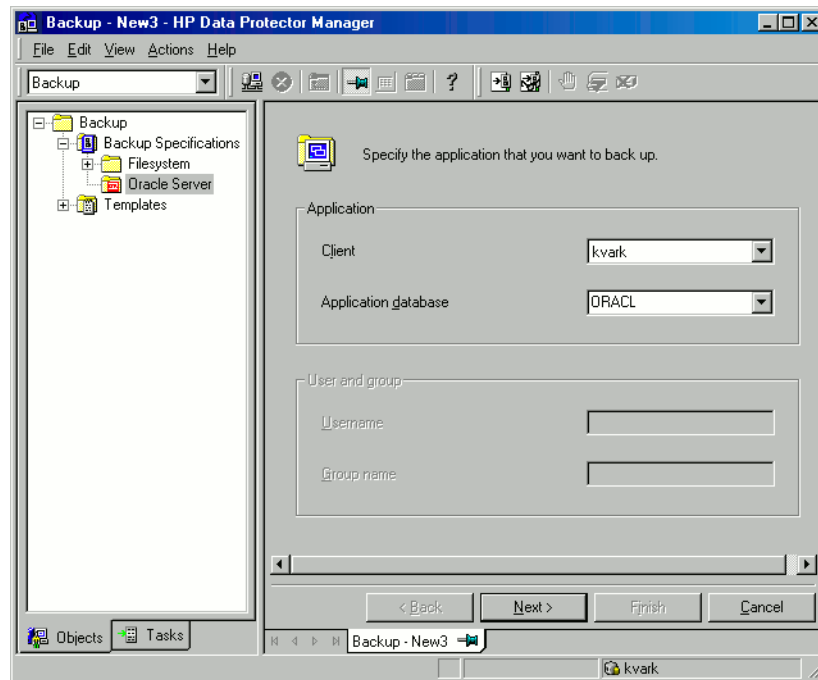


Figure 21 Specifying an Oracle Server system (Windows)

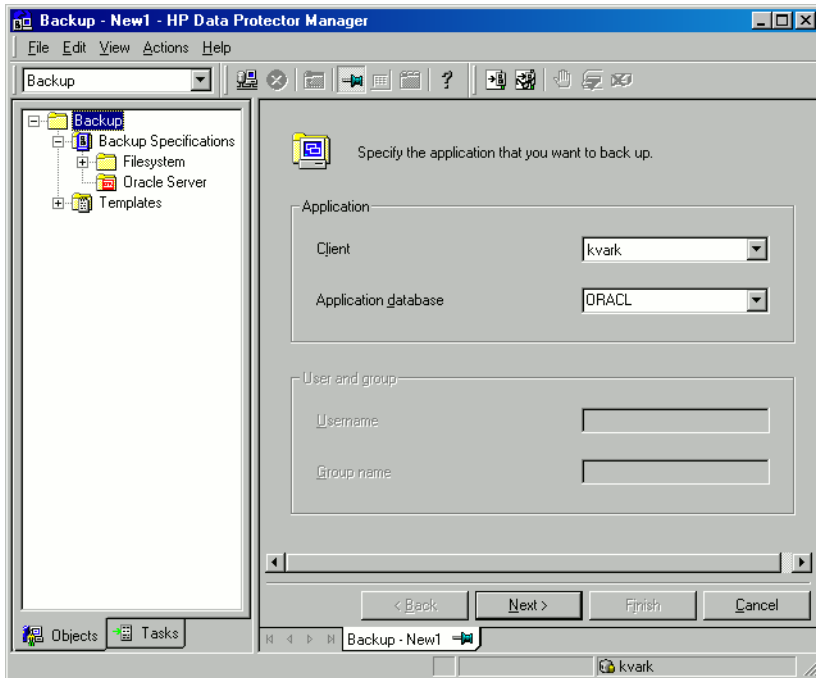


Figure 22 Specifying an Oracle Server system (UNIX)

Click **Next**.

6. If the Oracle database is not configured yet for use with Data Protector, the Configure Oracle dialog box is displayed. Configure the Oracle database for use with Data Protector as described in [“Configuring Oracle databases”](#) on page 61.
7. Select the Oracle database objects to be backed up.

Click **Next**.

If the backup method configured for this instance does not correspond to the method in the backup specification, Data Protector will display a warning and abort the configuration.

8. Select the device(s) you want to use for the backup. Click **Properties** to set the device concurrency, media pool, and preallocation policy. For more information on these options, click **Help**.

You can also specify whether you want to create additional copies (mirrors) of the backup during the backup session. Specify the desired number of mirrors by clicking the **Add mirror** and **Remove mirror** buttons. Select separate devices for the backup and for each mirror.

For detailed information on the object mirror functionality, see the online Help index: "object mirroring".

 **NOTE:**

Object mirroring is not supported for ZDB to disk.

Click **Next** to proceed.

9. Set the backup options.

For information on other the Backup Specification Options and Common Application Options, press **F1**.

Offline ZDB

To perform an offline ZDB, select the **Backup offline** option in the Application Specific Options dialog box. This option stops the database before creating a replica, and restarts it after the replica is created. Note that if a ZDB-to-tape or ZDB-to-disk+tape session is being performed, the database is not offline during the actual backup to tape. See [Figure 23](#) on page 84.

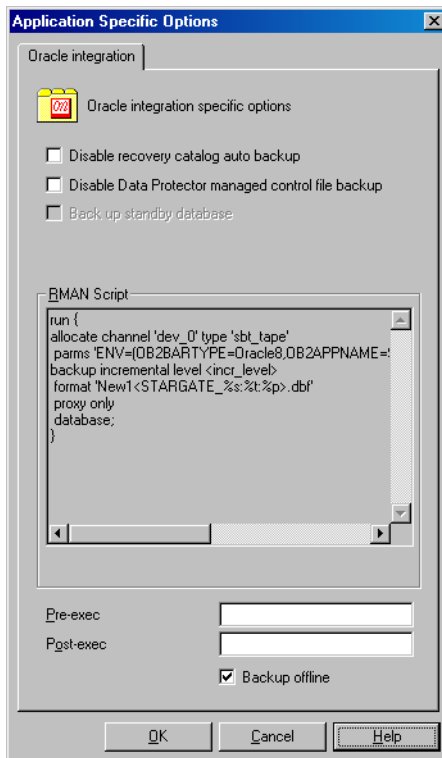


Figure 23 Backup offline option

For information on other Application Specific Options, see [Table 5](#) on page 86 or press **F1**.

Click **Next**.

10. Optionally, schedule the backup. For more details, see [“Scheduling backup specifications”](#) on page 93.

Note that only the **Full** backup type is supported.

Click **Next**.

11. Save the backup specification. It is recommended that you save all Oracle backup specifications in the **Oracle** group.

 **IMPORTANT:**

The word `DEFAULT` is a reserved word and therefore must not be used for backup specification names or labels of any kind. Therefore, do not use a punctuation in the names of backup specifications, since the Oracle channel format is created from the backup specification name.

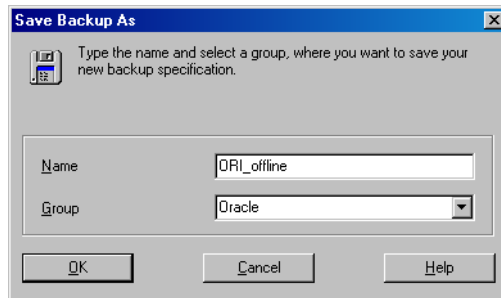


Figure 24 Saving the backup specification

Click **OK**.

To start the backup, see [“Starting backup sessions”](#) on page 92.

12. On UNIX, after the backup specification is saved, verify that the owner of the backup specification is the specified Oracle user. See [“Configuring Oracle users on UNIX”](#) on page 59 for details about this user.

- 13.** For **online backup**, create also a standard Data Protector Oracle integration backup specification for backing up the application system archived log files. See the *HP Data Protector integration guide*.

 **TIP:**

The backup specification for the backup of archived log files can be either triggered by the **Post-Exec** command defined in the ZDB backup specification for the backup of database files (recommended), or started manually after the ZDB backup specification has been started. See online Help index: “pre- and post-exec commands” for more information on configuring the **Pre-Exec** and **Post-Exec** commands.

Table 5 Oracle backup options

Disable recovery catalog auto backup	By default, Data Protector backs up the recovery catalog after every ZDB to tape or ZDB to disk+tape. Select this option to disable backup of the recovery catalog.
Disable Data Protector managed control file backup	By default, Data Protector backs up the Data Protector managed control file after every ZDB to tape or ZDB to disk+tape. Select this option to disable backup of the Data Protector managed control file.
Back up standby database	This option is ignored for ZDB.
RMAN Script	You can edit the Oracle RMAN script section of the Data Protector Oracle backup specification. The script is created by Data Protector during the creation of a backup specification and reflects the backup specification’s selections and settings. You can edit the script only after the backup specification has been saved. For information on how to edit the RMAN script section, see “ Editing the Oracle RMAN script ” on page 88.
Pre-exec, Post-exec	Specify a command or RMAN script that will be started by <code>ob2rman.pl</code> on the Oracle Server system before the backup (<code>pre-exec</code>) or after it (<code>post-exec</code>). RMAN scripts must have the <code>.rman</code> extension. Do not use double quotes.

	For example, you can provide scripts to shut down and start an Oracle instance. For examples of shut-downing and starting an Oracle instance on UNIX, see “Examples of pre-exec and post-exec scripts on UNIX” on page 87. Provide the pathname of the command or RMAN script.
Backup offline	Select this option to perform an offline ZDB session. This option stops the database before creating a replica, and restarts it after the replica is created. See Figure 23 on page 84.

Examples of pre-exec and post-exec scripts on UNIX

Pre-exec example

The following is an example of a script that *shuts down* an Oracle instance:

```
#!/bin/sh
export ORACLE_HOME=$2
export ORACLE_SQLNET_NAME=$1
if [ -f $ORACLE_HOME/bin/sqlplus ]; then
$ORACLE_HOME/bin/sqlplus << EOF
connect sys/manager@$ORACLE_SQLNET_NAME as sysdba
shutdown
EOF
echo "Oracle database \"$DB_NAME\" shut down."
exit 0
else
echo "Cannot find Oracle SQLPLUS ($ORACLE_HOME/bin/sqlplus)."
exit 1
fi
```

Post-exec example

The following is an example of a script that *starts* an Oracle instance:

```
#!/bin/sh
export ORACLE_HOME=$2
export ORACLE_SQLNET_NAME=$1
if [ -f $ORACLE_HOME/bin/sqlplus ]; then
$ORACLE_HOME/bin/sqlplus << EOF
connect sys/manager@$ORACLE_SQLNET_NAME as sysdba
startup
EOF
echo "Oracle database \"$DB_NAME\" started."
```

```
exit 0
else
echo "Cannot find Oracle SQLPLUS ($ORACLE_HOME/bin/sqlplus)."
exit 1
fi
```

Editing the Oracle RMAN script

The RMAN script is used when the Data Protector backup specification is started to perform a backup of the Oracle objects.

The RMAN script section is not written to the backup specification until the backup specification is either saved or manually edited by clicking the **Edit** button.

You can edit the RMAN script section of only after the Data Protector Oracle backup specification has been saved.

Limitations

When editing the RMAN script sections of the Data Protector backup specifications, consider the following limitations:

- The Oracle manual configuration convention must be used and not the Oracle automatic configuration convention (introduced by Oracle 9i).
- Double quotes (") must not be used - single quotes should be used instead.
- By default, RMAN scripts created by Data Protector contain instructions for backing up one or more of the following objects:
 - Databases, tablespaces, or datafiles (the first backup command)
 - Archive logs (the second backup command)
 - Control files (the last backup command)

The RMAN scripts with all combinations of the above listed backup objects are recognized by Data Protector as its own scripts and it is possible to modify the selection of objects that will be backed up in the **Source** tab of the Results Area.

If the RMAN script contains *additional* manually entered backup commands, for example a second backup command for backing up a database that is already listed in the first backup command, the object selection is disabled and it is only possible to browse the **Source** tab.

To edit an Oracle RMAN script, click **Edit** in the **Application Specific Options** window (see [Figure 29](#) on page 101), edit the script, and then click **Save** to save the changes to the script.

See the *Oracle Recovery Manager User's Guide and References* for more information on Oracle RMAN commands.

Data Protector RMAN script structure

The RMAN script created by Data Protector consists of the following parts:

- **The Oracle channel allocation** together with the Oracle environment parameters' definition for every allocated channel.

For all backup specifications except for Oracle proxy-copy ZDB backup specifications, the number of allocated channels is the same as the sum of concurrency numbers for all devices selected for backup.

NOTE:

Once the backup specification has been saved, changing the concurrency number does not change the number of allocated channels in the RMAN script. This has to be done manually by editing the RMAN script.

IMPORTANT:

On Windows systems, a maximum of 32 or 64 (if device is local) channels can be allocated. If the calculated number exceeds this limitation, you have to manually edit the RMAN script and reduce the number of allocated channels.

When an Oracle channel is manually defined by editing the RMAN script, the environment parameters must be added in the following format:

```
parms 'ENV=(OB2BARTYPE=Oracle8, OB2APPNAME=DB_NAME,  
OB2BARLIST=Backup_Specification_Name)';
```

Proxy-copy

For Oracle proxy-copy ZDB backup sessions, Data Protector allocates *one* channel. For Oracle proxy-copy ZDB, the `OB2SMB` parameter must be set to 1. If you use the `Blank Oracle Backup` template, the number of concurrently running DMA (`OB2DMAP`) is automatically calculated as the sum of all device concurrences; for example, if there are 4 devices with concurrency set to 3 then `OB2DMAP` will be set to 12.

If you use the `Oracle_SMB` template, the `OB2DMAP` parameter is set to 1. To improve the backup and restore performance, you may want to increase the value of this parameter. The environment parameters must be added in the following format:

```
parms 'ENV=(OB2BARTYPE=Oracle8, OB2APPNAME=DB_NAME,  
OB2BARLIST=Backup_Specification_Name, OB2SMB=1,  
OB2DMAP=Concurrent_DMAs)';
```

 **NOTE:**

The `OB2DMAP` parameter does not change after it has been calculated, even if you adjust the device concurrency. To change `OB2DMAP`, you have to manually edit the RMAN script.

On HP StorageWorks XP, for an Oracle direct backup, add `OB2DMP=1`.

- Depending on the backup objects selection, **an RMAN backup statement for the backup of the whole database instance, and/or for any combination of RMAN commands to back up tablespaces and datafile**. The `backup` statement consists of the following:

- The Oracle format of the backup file in the following format:

```
format 'Backup_Specification_Name<DB_NAME_%s:%t:%p>.dbf'  
database;
```

 **NOTE:**

When an Oracle format of the backup file is manually defined or changed by editing the RMAN script, any user-defined combination of the Oracle substitution variables can be *added* to the `%s:%t:%p` substitution variables and `DB_NAME`, which are obligatory.

-
- In case of an Oracle proxy-copy ZDB-to-disk+tape or ZDB-to-tape session, the `PROXY ONLY` option is required. Only one `BACKUP` command with the `proxy only` option is permitted and only one additional backup command for backing up the control file is permitted.
 - The RMAN datafile `tablespace_name*datafile_name` command.
 - If the Archived Redo Logs were selected for a backup, **an RMAN backup statement for the backup of Oracle archive logs**.

The `backup` statement consists of the Oracle format of the backup file:

```
format 'Backup_Specification_Name<DB_NAME_%s:%t:%p>.dbf'
```

 **NOTE:**

When an Oracle format of the backup file is manually defined or changed by editing the RMAN script, any user-defined combination of the Oracle substitution variables can be *added* to the obligatory %s:%t:%p substitution variables and *DB_NAME*.

- If the control file was selected for a backup, **an RMAN backup statement for the backup of Oracle control files**. The backup statement consists of the following:

- The Oracle format of the backup file in the following format:

```
format 'Backup_Specification_Name<DB_NAME_%s:%t:%p>.dbf'  
current controlfile;
```

 **NOTE:**

When an Oracle format of the backup file is manually defined or changed by editing the RMAN script, any user-defined combination of the Oracle substitution variables can be *added* to the %s:%t:%p substitution variables and *DB_NAME*, which are obligatory.

- The RMAN `current controlfile` command.

For Oracle proxy-copy ZDB to disk or disk+tape, it is not possible to select only the control file. You must also select either a `DATABASE`, `TABLESPACE`, or `DATAFILE` object.

Example of the Oracle proxy-copy ZDB to disk+tape RMAN script

The following is an example of the RMAN script section as created by Data Protector based on the Oracle `SMB_Proxy_Database` template, after the whole database selection:

```
run {  
  allocate channel 'dev_0' type 'sbt_tape' parms  
  'ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DIPSI,OB2BARLIST=New1,  
  OB2SMB=1,OB2DMAP=1)';  
  backup incremental level <incr_level>  
  format 'New1<DIPSI_%s:%t:%p>.dbf'  
  proxy only  
  database  
  ;
```

```
backup format 'New1<DIPSI_%s:%t:%p>.dbf' controlfile;
}
```

Starting backup sessions

To run a ZDB-to-disk, ZDB-to-tape, or ZDB-to-disk+tape backup session of an Oracle database, use any of the following methods:

Backup methods

- Schedule a backup of an existing Oracle ZDB backup specification using the Data Protector Scheduler. See [“Scheduling backup specifications”](#) on page 93.
- Start an interactive backup of an existing Oracle ZDB backup specification using the Data Protector GUI or the Data Protector CLI. See [“Running an interactive backup”](#) on page 94.

Considerations

Before running an Oracle ZDB session, consider the following:

- It is not possible to start a ZDB, restore, or instant recovery sessions using the same source volume on the application system at the same time. A ZDB, restore, or instant recovery session must be started only after the preceding session that is using the same source volume on the application system has finished the ZDB session or restore; otherwise, the session will fail.
- For the backup set method, if the Oracle database is installed on symbolic links, then these symbolic links have to be also created on the backup system.
- On XP, if the LVM mirroring configuration is used, Data Protector displays a warning during a backup because the volume group source volumes on the application system do not have their BC pairs assigned. This message should be ignored.
- If the control file, SPFILE, or online redo logs are on the same source volumes as the datafiles and the **Track the replica for instant recovery** option is selected, the backup session will be aborted. In this case, you need to either reconfigure the database or set the `ZDB_ORA_INCLUDE_CF_OLF`, `ZDB_ORA_INCLUDE_SPF`, and `ZDB_ORA_NO_CHECKCONF_IR` omnirc variables. See [“Reconfiguring an Oracle instance for instant recovery”](#) on page 405 or [“ZDB integrations omnirc variables”](#) on page 410.
- With the Oracle backup set ZDB method, you must manually re-synchronize the recovery catalog database with the current control file after you modified the physical schema of a database (for example, if you add or drop a tablespace,

add a new datafile, or add or drop a rollback segment) and before you start the next backup.

Scheduling backup specifications

Scheduling a backup specification means setting the time, date, and type of a backup that starts unattended once the scheduling options are defined and saved in the backup specification.

For more information on scheduling, see the online Help index: “scheduled backups”.

To schedule an Oracle ZDB backup specification, proceed as follows:

1. In the Data Protector Manager, switch to the **Backup** context.
2. In the **Scoping Pane**, expand **Backup Specifications** and then **Oracle Server**.
3. Double-click the backup specification you want to schedule and click the **Schedule** tab.
4. In the **Schedule** page, select a date in the calendar and click **Add** to open the **Schedule Backup** dialog box.

5. Specify **Recurring**, **Time options**, **Recurring options**, and **Session options**..

Note that only the Full backup type is supported.

In the case of a ZDB-to-disk or a ZDB-to-disk+tape session, specify the **Split mirror/snapshot backup** option. See [Figure 25](#) on page 94.

 **NOTE:**

You can run a ZDB-to-disk or a ZDB-to-disk+tape session only if the **Track the replica for instant recovery** option is selected in the backup specification.

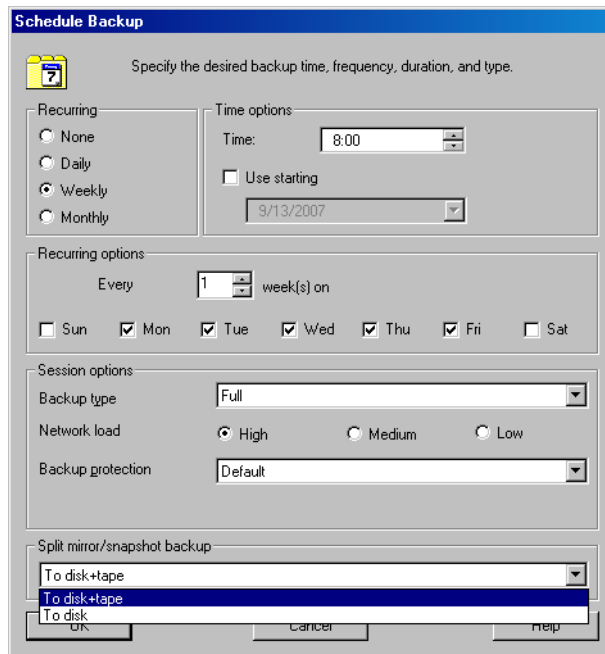


Figure 25 Selecting ZDB to disk or ZDB to disk+tape session using the Data Protector scheduler

Click **OK** and then **Apply** to save the changes.

Running an interactive backup

An interactive backup can be performed any time after a backup specification has been created and saved. You can use the Data Protector GUI or CLI.

Starting a backup using the GUI

To start an interactive ZDB session of an Oracle database using the Data Protector GUI, proceed as follows:

1. In the Context List, click **Backup** context.
2. In the Scoping Pane, expand **Backup Specifications** and then **Oracle Server**. Right-click the backup specification you want to start and click **Start Backup**.
3. In the **Start Backup** dialog box, select the **Network load** option. For information on network load, click **Help**.

Note that only the `Full` backup type is supported.

In the case of a ZDB-to-disk or a ZDB-to-disk+tape session, specify the **Split mirror/snapshot backup** option. See [Figure 26](#) on page 95.

NOTE:

You can run a ZDB-to-disk or a ZDB-to-disk+tape session only if the **Track the replica for instant recovery** option is selected in the backup specification.

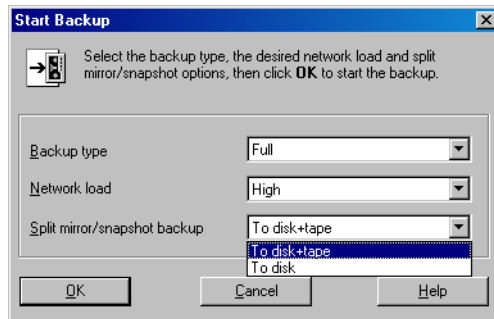


Figure 26 Selecting ZDB to disk or ZDB to disk+tape session when starting an interactive backup

Click **OK**.

Starting a backup using the CLI

To start an Oracle **ZDB-to-tape** or **ZDB-to-disk+tape** session using the Data Protector CLI, run:

```
omnib -oracle8_list Name
```

To start an Oracle **ZDB-to-disk** session using the Data Protector CLI, run:

```
omnib -oracle8_list Name -disk_only
```

where *Name* is the name of the backup specification. For more information on the `omnib` command, see its man page or the *HP Data Protector command line interface reference*.

 **NOTE:**

It is not possible to run a ZDB-to-disk or a ZDB-to-disk+tape session if the **Track the replica for instant recovery** backup option is not selected in the backup specification.

Restore

You can restore the following database objects using both the Data Protector GUI or RMAN:

- Control files
- Datafiles
- Tablespace
- Databases
- Recovery Catalog Databases

Using the Data Protector GUI, you can also **duplicate** a production database. See [“Duplicating an Oracle database”](#) on page 109.

The following are the available methods in Data Protector for restoring database objects:

- Standard restore from backup media to the application system on LAN. See [“Restoring from backup media to the application system on LAN”](#) on page 98.
- Instant recovery. See [“Instant recovery and database recovery”](#) on page 134.

See also [Table 3](#) on page 34 for an overview of recovery methods depending on the backup type and type of recovery.

Microsoft Cluster Server clients

Before you start restoring a cluster-aware Oracle server, take the Oracle Database resource offline using, for example, the **Cluster Administrator** utility. See [Figure 27](#) on page 97.

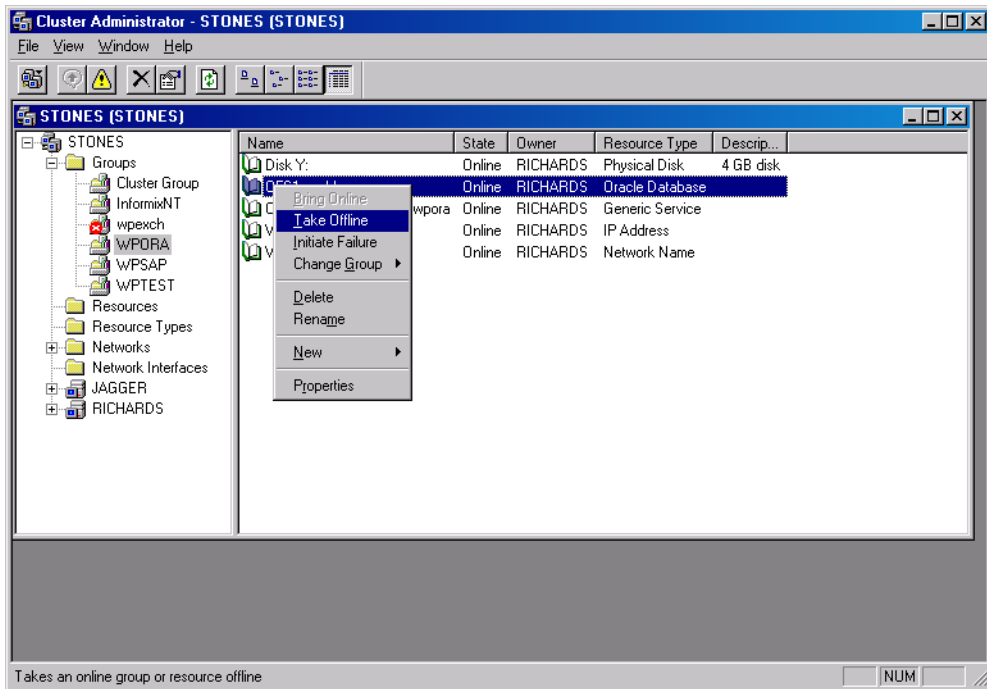


Figure 27 Taking the Oracle resource group offline

Verify that you have set the **Prevent Failback** option for the Oracle resource group and **Do not restart** for the `DB_NAME.world` resource, which is an Oracle Database resource.

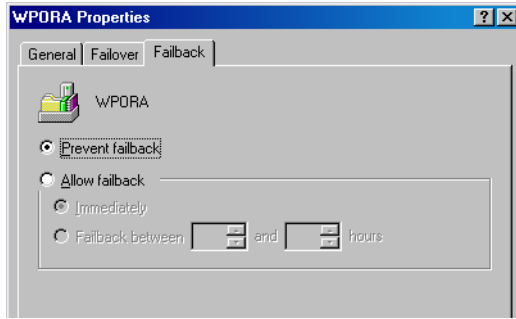


Figure 28 Checking properties

MC/ServiceGuard clients

When restoring the database from a backup performed on a virtual host, you should set `OB2BARHOSTNAME` environment variable in the RMAN script. For example:

```
run {
allocate channel dev1 type 'sbt_tape' parms
'SBT_LIBRARY=Path_to_Data_Protector_MML,
ENV=(OB2BARHOSTNAME=virtual.domain.com)';
restore datafile '/opt/ora9i/oradata/MAKI/example02.dbf';
release channel dev1;
}
```

Prerequisites

- An instance of Oracle must be created on the system to which you want to restore or duplicate the database.
- The database must be in the `Mount` state if the whole database is being restored, or in the `NoMount` state if the control file is being restored or a database duplication is performed.

Restoring from backup media to the application system on LAN

You can restore the database objects using one of the following tools within Data Protector:

- Data Protector GUI. See [“Restoring Oracle using the Data Protector GUI”](#) on page 99.
- RMAN. See [“Restoring Oracle using RMAN”](#) on page 117.

Restoring Oracle using the Data Protector GUI

For restore, RMAN scripts are generated with necessary commands, depending on selections made in the GUI. To use additional commands, use them manually from RMAN itself.

Restoring database items in a disaster recovery

In a disaster recovery situation, database objects must be restored in a certain order. The following list shows you in which order database items must be restored. Under normal conditions it is possible to restore database items in any order.

1. Restore the recovery catalog database (if it was lost)
2. Restore the control file
3. Restore the entire database or data items

Changing the database state

Before you restore any database item or you perform a duplication of a database, ensure that the database is in the correct state:

Table 6 Required database states

Item to restore	Database state
Control file, duplicating a database	NoMount (started)
All other items ¹	Mount

¹When restoring only a few tablespaces or datafiles, then the database can be open with the tablespaces or datafiles to be restored offline.

To put the database into the correct state, run:

```
sqlplus /nolog
```

```
SQL>connect user/password@service as sysdba;
```

```
SQL>shutdown immediate;
```

To put the database into NoMount state, run:

```
SQL>startup nomount;
```

To put the database into `Mount state`, run:

```
SQL>startup mount;
```

Restoring the recovery catalog database

The Oracle recovery catalog database is exported using the Oracle export utility to a binary file and backed up by Data Protector. This file has to be restored back to the disk and then imported into the Oracle database using the Oracle import utility. Data Protector provides a facility to do this automatically using the Oracle integration.

To restore the recovery catalog database:

1. Ensure that the recovery catalog database is in the **Open** state.
2. In the Data Protector GUI, switch to the **Restore** context.
3. Under **Restore Objects**, expand **Oracle Server**, expand the client on which the database, for which you want to restore the recovery catalog, resides, and then click the database.

4. In the **Restore action** drop-down list, select **Perform RMAN Repository Restore**.

In the Results Area, select **RECOVERY CATALOG**.

If you want to change the recovery catalog login information, right-click **RECOVERY CATALOG** and click **Properties**. In **Recovery Catalog Settings**, specify the login information for recovery catalog.

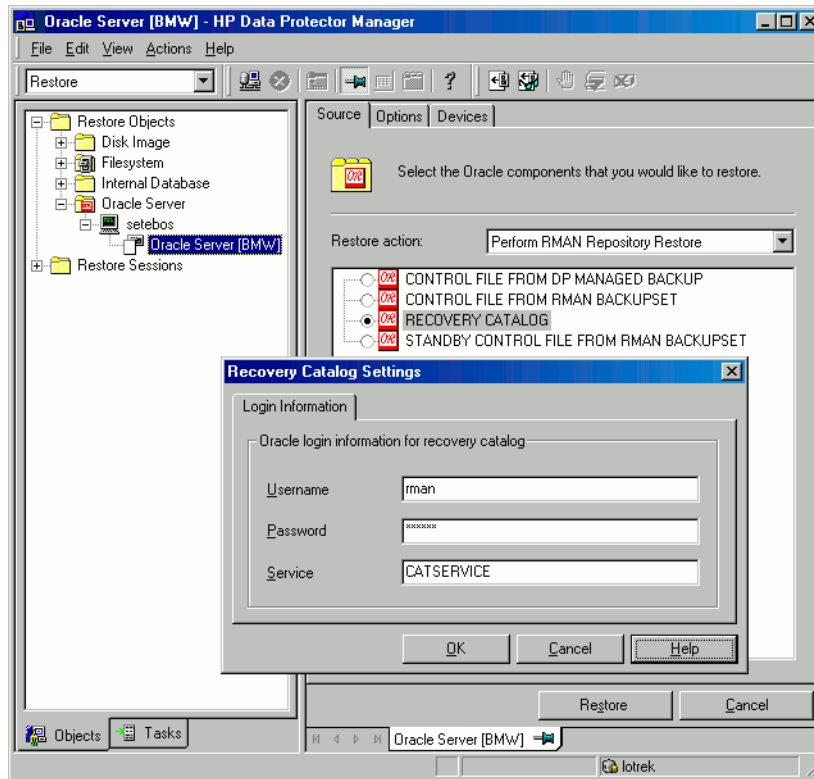


Figure 29 Recovery catalog settings dialog

5. In the **Options** page:

In **User name** and **User group**, specify the user name and password to the recovery catalog database.

From the **Session ID** drop-down list, select the Session ID.

For further information, see

[“Restore, recovery, and duplicate options”](#) on page 113.

6. Click **Restore**.

Proceed to restore the control file.

Restoring the control file

The control file contains all the information about the database structure. If the control file has been lost, you must restore it before you restore any other part of the database. The database should be in the `NOmount` state.

Depending on the type of the control file backup, the following types of restore are possible when restoring the control file:

- Restoring from Data Protector managed control file backup (`CONTROLFILE FROM DP MANAGED BACKUP`)

The control file was backed up automatically by `ob2rman.pl` at the end of a backup session, unless the option `Disable Data Protector managed control file backup` was selected.

The recovery catalog is *not* required for this restore option.

The control files (`ctrlDB_NAME.dbf`) are restored to:

Windows: `Data_Protector_home\tmp`

HP-UX, Solaris: `/var/opt/omni/tmp`

After the restore, run the following script:

```
run {
allocate channel 'dev0' type disk;
restore controlfile from 'TMP_FILENAME';
release channel 'dev0';
}
```

Where `TMP_FILENAME` is the location to which the file was restored.

- Restoring from RMAN backup set (`CONTROLFILE FROM RMAN BACKUPSET`)
The recovery catalog is required.

A backup session can contain more than one type of the control file backup.

To restore the control file:

1. Open the `sqlplus` window and put the database in the `nomount` state. See [“Changing the database state”](#) on page 99.
2. In the Data Protector GUI, switch to the **Restore** context.
3. Under **Restore Objects**, expand **Oracle Server**, expand the client on which the database, for which you want to restore the control file, resides, and then click the database.

4. In the **Restore Action** drop-down list, select **Perform RMAN Repository Restore**.
In the Results area, select the control file for restore.
5. In the **Options** page, from the **Client** drop-down list, select the client on which the Data Protector Oracle integration agent (`ob2rman.pl`) will be started. To restore the control file to a different database than it is selected, click **Settings** and specify the login information for the target database.

Set the other restore options. See ["Restore, recovery, and duplicate options"](#) on page 113 for information.
6. Click **Restore**.

Proceed with restoring the Oracle database objects.

Restoring Oracle database objects

Before you restore Oracle database objects, ensure that you have an up-to-date version of the recovery catalog database and the control file. They contain the database structure information. If you do not have up-to-date versions of these files, restore them as described in ["Restoring the recovery catalog database"](#) on page 100 and ["Restoring the control file"](#) on page 102.

To restore Oracle database objects:

1. Put the database in the mount state. See ["Changing the database state"](#) on page 99.
2. In the Data Protector GUI, switch to the **Restore** context.
3. Under **Restore Objects**, expand **Oracle Server**, expand the client on which the database, for which you restore the database objects, resides, and then click the database.

4. In the **Restore action** drop-down list, select the type of restore you wish to perform. For information on the options, see [“Restore, recovery, and duplicate options”](#) on page 113.

 **IMPORTANT:**

If you do not select **Perform Restore and Recovery** or **Perform Recovery Only**, you will have to recover the database objects manually using RMAN. For information, see [“Restoring Oracle using RMAN”](#) on page 117.

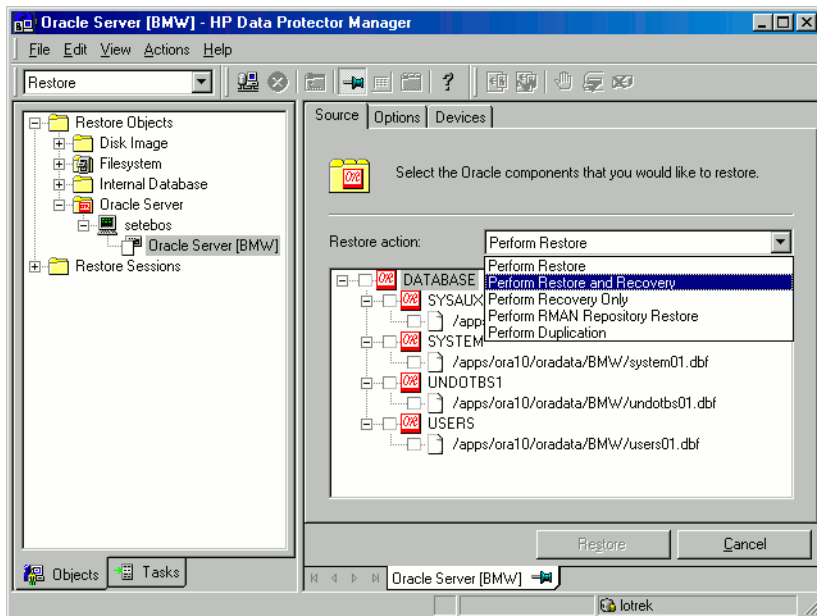


Figure 30 Source page

5. In the Results Area, select objects for restore.

If you are restoring datafiles, you can restore the files to a new location. Right-click the database object, click **Restore As**, and in the **Restore As** dialog box, specify the new datafile location.

 **NOTE:**

When restoring to a new location, current datafiles will be switched to the restored datafile copies only if you have selected **Perform Restore and Recovery** from the **Restore action** drop-down list.

6. In the **Options** page, from the **Client** drop-down list, select the client on which the Data Protector Oracle integration agent will be started. To restore the database objects to a different database than it is selected, click **Settings** and specify the login information for the target database.

Set the other restore options. See [“Restore, recovery, and duplicate options”](#) on page 113 for information.

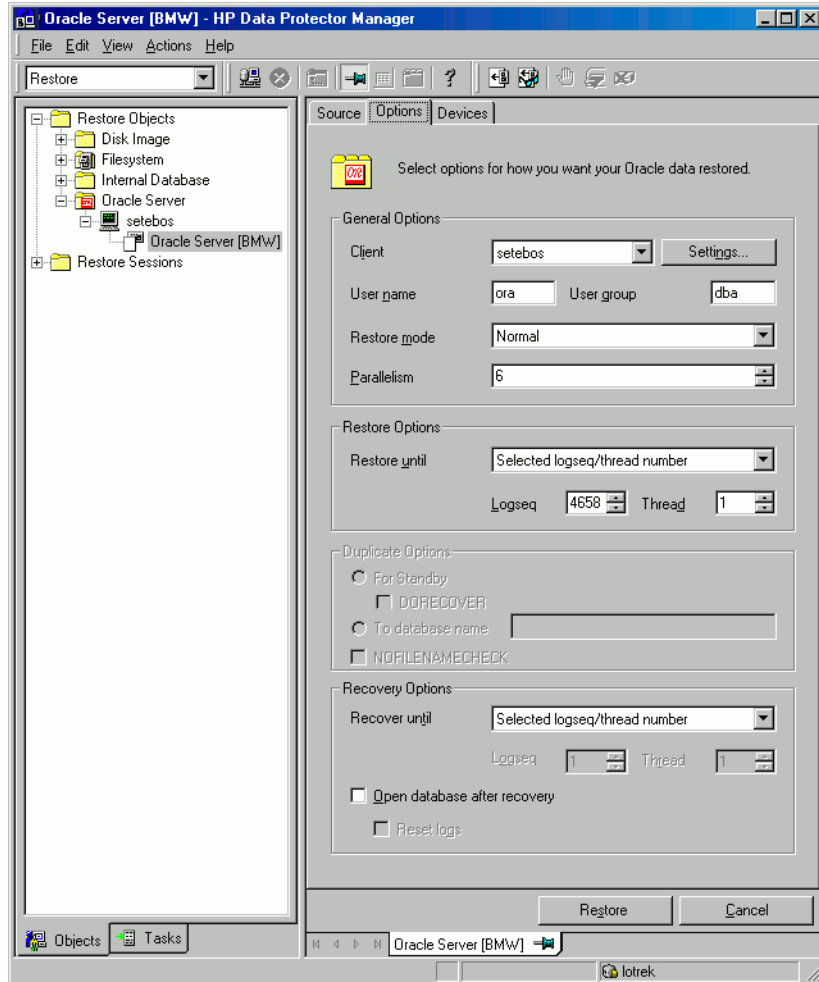


Figure 31 Options page

7. In the **Devices** page, select the devices to be used for the restore. You can restore using a device other than that used for backup, although Data Protector defaults to the original device on which the backup was made. To change the device from which an item is restored, select your desired device and click **Change**.

For more information on the **Devices** page, press **F1**.

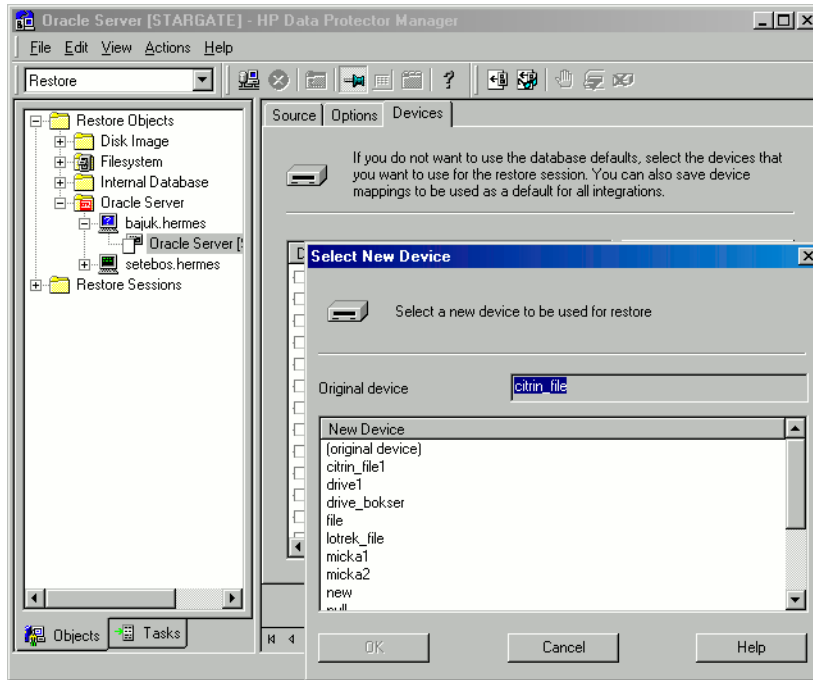


Figure 32 Devices page

8. Click **Restore**.

After the restore:

1. Put the database in the correct state.

If you selected **Perform Restore and Recovery** or **Perform Recovery Only** in the **Source** page, then the database is automatically put into **Open** state by Data Protector.

2. If you performed an Oracle database restore and recovery until point in time, and the session has finished successfully, reset the database to register the new incarnation of database in the recovery catalog.

Connect to the target and recovery catalog database using RMAN and reset the database:

Oracle 9i/10g:

```
rman target Target_Database_Login catalog  
Recovery_Catalog_Login
```

```
RMAN> RESET DATABASE;
```

```
RMAN> exit
```

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

3. If you did not choose to use Data Protector to recover the database objects and if you have all archived redo logs on disk, perform the following after the database is restored:

Open a command line window and enter the following commands:

```
sqlplus /nolog
```

```
SQL>recover database;
```

```
SQL>connect user/password@service as sysdba;
```

```
SQL>alter database open;
```

Restoring tablespaces and datafiles

To restore tablespaces and datafiles:

1. Open a command line window and enter the following commands if you have the database in the Open state:

```
sqlplus /nolog
```

```
SQL>connect user/password@service as sysdba;
```

```
SQL>alter database datafile 'datafile name' offline;
```

If you are restoring a tablespace enter:

```
SQL>alter tablespace tablespace_name offline;
```

2. When the restore has been completed put the datafiles and tablespaces back online with the following procedures:

Open a command line window and enter the following commands:

```
sqlplus /nolog
```

```
SQL>connect user/password@service as sysdba
```

If you are restoring a datafile enter:

```
SQL>alter database datafile 'datafile_name' online;
```

If you are restoring a tablespace enter:

```
SQL>alter tablespace tablespace_name online;
```

Duplicating an Oracle database

Perform a production database duplication to create:

- A standby database which has the same DBID as the production (primary) database. With this, you can:
 - Create a new standby database.
 - Re-create a standby database after:
 - Loss of entire standby database
 - Primary database control file was restored or recreated
 - Database point-in-time recovery was performed on the primary database
 - Switchover or failover of database roles occurred
- An independent copy, with a unique DBID, which can be used for data mining or testing purposes.

Limitation

- Database duplication is not supported using proxy copy backups of the primary database.

Prerequisites

- The whole primary database with the archived logs must be backed up.
- Archive logs, which have not been backed up to tape since the last full backup and are required for duplication must be available on the duplicate system with the same path names as on the target system (system with the production database to be duplicated).

- Net service name for the auxiliary instance must be configured.
- When duplicating a database on the same system on which the target database resides, set all `*_PATH`, `*_DEST`, `DB_FILE_NAME_CONVERT`, and `LOG_FILE_NAME_CONVERT` initialization parameters appropriately. Thus, the target database files will not be overwritten by the duplicate database files.

Limitations

- If you perform duplication of a database (not for standby) on the same system on which the target or production database resides, note that you cannot use the same database name for the target and duplicate databases when the duplicate database resides in the same Oracle home directory as the target database. Note also that if the duplicate database resides in a different Oracle home directory than the target database, then the duplicate database name has to differ from other database names in that same Oracle home directory.

To duplicate a production database:

1. On the client where the selected database will be duplicated, put the Oracle auxiliary database instance in the nomount state. See [“Changing the database state”](#) on page 99.
2. In the Context List of the Data Protector GUI, click **Restore**.
3. Under **Restore Objects**, expand **Oracle Server**, expand the client on which the production database resides, and then click the production database which you want to duplicate. If there are several such clients, select the client on which you want the Data Protector Oracle integration agent (`ob2rman.pl`) to be started.
4. In the **Restore Action** drop-down list, select **Perform Duplication**.

5. In the **Options** page, from the **Client** drop-down list, select the client on which the Data Protector Oracle integration agent (`ob2rman.pl`) will be started.

Click **Settings** to specify the login information (a user name, password, and net services name) for the auxiliary database. If you do not provide the login information, the duplication session will fail.

In **User name** and **User group**, specify the user name and group for the `OSDBA` account, which will be used by the Data Protector Oracle integration agent.

In **Parallelism**, specify the number of RMAN auxiliary channels to be allocated for database duplication.

Set duplicate options. For information, see “[Duplicate options](#)” on page 115 or press **F1**.

If you are creating a new database copy (not for standby), specify also the **Recover until** option to recover the duplicated database until a specified point in time.

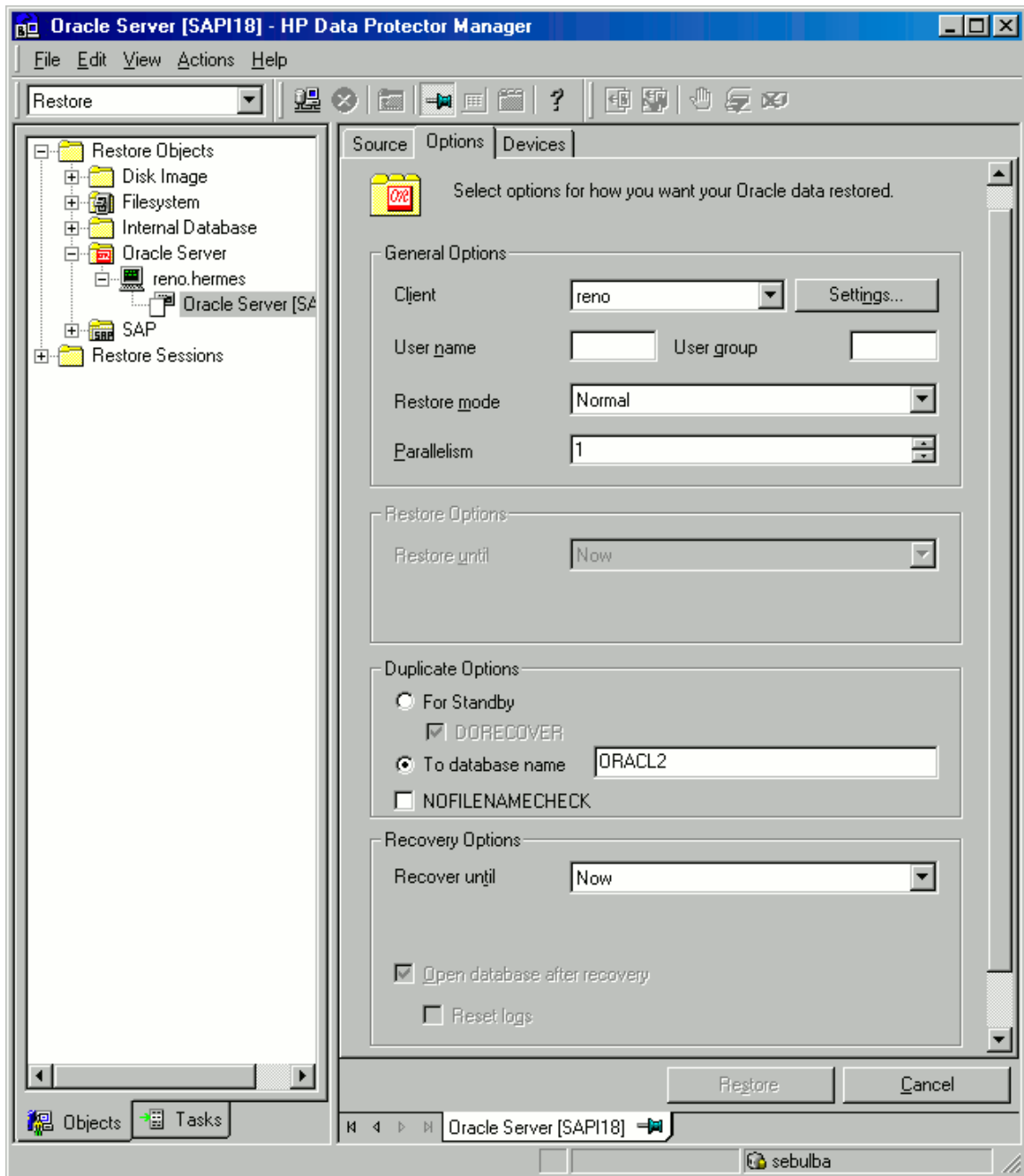


Figure 33 Oracle duplicate options

6. Click **Restore**.

When the standby database is created, it is left mounted. Start the managed recovery process (log apply services) manually.

For information on how to use the RMAN commands to duplicate a database, see Oracle documentation.

Restore, recovery, and duplicate options

Restore action options

The following describes each of the options in the **Source** page. This page is used to define the combination of restore and recovery you would like to perform using the GUI.

In the context of Data Protector “restore” means to restore the datafiles. You can select which database, tablespace, or datafiles they would like to restore and up to which point in time they would like them to be restored. “Recover” means applying the redo logs. You can select which redo logs to apply according to SCN number, logseq, or you can apply all the redo logs to the time of the last backup.

Perform Restore

Use this option to only restore (but not recover) the database objects using Data Protector. After restore, recover the database manually using RMAN. For information on recovering the database using RMAN, see [“Restoring Oracle using RMAN”](#) on page 117.

Perform Restore and Recovery

Use this option to perform both the restore and recovery of the database objects using Data Protector.

Perform Recovery Only

Use this option to only recover the database objects using Data Protector.

Perform RMAN Repository Restore

Use this option to restore the recovery catalog or the control file when the database objects are not available in the **Source** page.

Perform Duplication

This option is used to perform duplication of a production database.

General options

Client

This option specifies the client on which the Data Protector Oracle integration agent (`ob2rman.pl`) will be started.

Settings

Click **Settings** to specify the login information (user name, password, and net service name) for the target database (in case of restore and recovery) or auxiliary database (in case of duplication) where you want the selected database objects to be restored or duplicated.

If this is not specified in the case of restore or recovery, the login information of the selected database that resides on the selected client will be used.

If this is not specified in the case of duplication, the duplication session will fail.

User name (UNIX systems only)

Use this field to enter the Oracle user name. The user needs to be a member of the Oracle `DBA` group.

User group (UNIX systems only)

The User group the user in the **User name** field belongs to. This has to be the Oracle `DBA` group.



NOTE:

The user name and the user group must be the same as defined in the backup ownership. See [“Configuring Oracle users on UNIX”](#) on page 59 for more information on this user and on how to identify it.

Restore mode

This drop-down list allows you to specify which type of restore you would like perform. The options are:

- Normal

This option should be used when a conventional backup or ZDB using the backup set method was performed.

- Proxy copy

This option should be used when the original Oracle backup was made using the Oracle RMAN proxy-copy method, such as ZDB of Oracle 8i/9i.

This option is disabled when you perform recovery only.

Parallelism

This field is used to specify the number of concurrent data streams that can read from the backup device. The default value is one.

In case of `Normal` restore mode, to optimize restore performance, specify the same number of data streams as were used during the backup. For example, if you set the backup concurrency to 3, set the number of parallel data streams to 3 as well. Note that if a very high number of parallel data streams is specified this may result in a resource problem because too much memory is being used. For Oracle proxy-copy ZDB sessions, this option is disabled and Data Protector sets the number of concurrent data streams to the value that was used at backup. If you are restoring a backup created using a previous version of Data Protector, parallelism is set to the number of devices that were used for backup, regardless of the concurrency numbers for these devices.

Duplicate options

Available if **Perform Duplication** was selected.

For Standby

Select this option to create a standby database.

Default: selected.

DORECOVER

Available if **For Standby** was selected.

Select this option if you want RMAN to recover the database after creating it.

To database name

Select this option to create a new database copy. In the text box, specify its name. The name should match the name in the initialization parameter file that was used to start the auxiliary database instance. By default, the database name is set to the database name of the currently selected target database.

NOFILENAMECHECK

Select this option to disable RMAN to check whether the target datafiles share the same names with the duplicated datafiles.

Select this option when the target datafiles and duplicated datafiles have the same names, but resides on different systems.

Default: not selected.

Restore and recovery options

Restore until

The options in this drop-down list allow you to limit the selection to those backups that are suitable for an incomplete recovery to the specified time.

- Now

Use this option to restore the most recent full backup. By default, this option is selected.

- **Selected time**
Use this option to specify an exact time to which you wish the database to be restored. Data Protector restores the backup that can be used in recovery to the specified time.
- **Selected logseq/thread number**
A logseq number is a redo log sequence number. Use this option to specify a particular redo log sequence and a thread number which will act as an upper limit of redo logs to restore. Data Protector restores the backup that can be used in recovery to the specified log sequence number.
- **Selected SCN number**
Use this option to specify the SCN number to which you wish the database to be restored. Data Protector restores the backup that can be used in recovery to the specified SCN number.

Recover until

The options in this drop-down list allow you to specify to which point in time you would like the recovery to be performed.

- **Now**
Data Protector starts RMAN to recover the database to the most recent time possible by applying all archived redo logs. By default, this option is selected.
- **Selected time**
Use this option to specify an exact time to which the archive logs are applied.
- **Selected logseq/thread number**
A logseq number is a redo log sequence number. Use this option to specify a particular redo log sequence and a thread number which will act as an upper limit of redo logs to recover.
- **Selected SCN number**
Use this option to specify the SCN number to which you perform the recovery.

If you reset the logs, also reset the database; otherwise, Oracle will during the next backup try to use the logs that were already reset and the backup will fail. Login to the target and recovery catalog database and run:

Oracle 9i/10g:

```
rman target Target_Database_Login catalog  
Recovery_Catalog_LoginRMAN> RESET DATABASE;RMAN> exit
```

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

Open database after recovery

Opens the database after a recovery is performed.

Reset logs

Resets the archive logs after the database is opened.

Always reset the logs:

- After an incomplete recovery (not **Recover until now**).
- If a backup of a control file is used in recovery or restore and recovery.

Do not reset the logs:

- After a complete recovery (**Recover until now**) when the backup of a control file was not used in recovery or restore and recovery.
- On the primary database, if the archive logs are used for a standby database. However, if you must reset the archive logs, you will need to recreate the standby database.

If you reset the logs when the **Recover until** option is set to **Now**, a warning is displayed, stating that you should reset the logs only if you use an older control file for restore.

NOTE:

Oracle recommends that you perform a complete backup immediately after a database was opened with the **Reset Logs** option.

Restoring Oracle using RMAN

Data Protector acts as a media management software for the Oracle system, therefore RMAN can be used for a restore.

This section only describes *examples* of how you can perform a restore. The examples provided do not apply to all situations where a restore is needed.

See the *Oracle Recovery Manager User's Guide and References* for detailed information on how to perform:

- Restore and recovery of the database, tablespace, control file, and datafile.
- Duplication of a database.

The following examples of restore are given:

- [“Example of full database restore and recovery”](#) on page 120

- [“Example of point-in-time restore”](#) on page 122
- [“Example of tablespace restore and recovery”](#) on page 124
- [“Example of datafile restore and recovery”](#) on page 126
- [“Example of archive log restore”](#) on page 131

The restore and recovery procedure of Oracle control files is a very delicate operation, which depends on the version of the Oracle database you are using. For detailed steps on how to perform the restore of control files, see the *Recovery Manager User’s Guide and References*.

Preparing the Oracle database for restore

The restore of an Oracle database can be performed when the database is in mount mode. However, when you are performing the restore of tablespaces or datafiles, only a part of the Oracle database can be put offline.

Prerequisites

The following requirements must be met before you start a restore of an Oracle database:

- Make sure that the recovery catalog database is open. If the recovery catalog database cannot be brought online, you will probably need to restore the recovery catalog database. See [“Restore”](#) on page 96 for details on how to restore the recovery catalog database.
- Check which ZDB method (proxy-copy or backup set) was used for the backup session that you plan to restore.
- Control files must be available. If the control files are not available, you must restore them. See the *Oracle Recovery Manager User’s Guide and References* for more details.

If you have to perform a restore of the recovery catalog database, you must perform this restore first. Only then can you perform a restore of other parts of the Oracle database.

When you are sure that the recovery catalog database files are in place, start the recovery catalog database.

- Make sure that the following environment variables are set:
 - ORACLE_BASE
 - ORACLE_HOME
 - ORACLE_TERM
 - DB_NAME

- PATH
- NLS_LANG
- NLS_DATE_FORMAT

Windows example

```
ORACLE_BASE=Oracle_home
ORACLE_HOME=Oracle_home\product\10.1.0
ORACLE_TERM=HP
DB_NAME=PROD
PATH=$PATH:Oracle_home\product\10.1.0\bin
NLS_LANG=american
NLS_DATE_FORMAT='Mon DD YYYY HH24:MI:SS'
```

UNIX example

```
ORACLE_BASE=/opt/oracle
ORACLE_HOME=/opt/oracle/product/10.1.0
ORACLE_TERM=HP
DB_NAME=PROD
PATH=$PATH:/opt/oracle/product/10.1.0/bin
NLS_LANG=american
NLS_DATE_FORMAT='Mon DD YYYY HH24:MI:SS'
```

- Check that the `/etc/oratab` file has the following line:

Windows: PROD:Oracle_home\product\10.1.0:N

UNIX: PROD:/opt/oracle/product/10.1.0:N

The last letter determines whether the database will automatically start upon bootup (Y) or not (N).

Connection strings used in the examples

In the examples below, the following connection strings are used:

- Target connection string for target database:

```
sys/manager@PROD
```

where `sys` is the username, `manager` is the password and `PROD` is a net service name.

- Recovery catalog connection string for recovery catalog database:
rman/rman@CATAL
where `rman` is the username and password and `CATAL` is a net service name.

SBT_LIBRARY parameter

On Windows and UNIX clients with Oracle9i/10g, set the `SBT_LIBRARY` RMAN script parameter to point to the correct platform-specific Data Protector MML. The parameter must be specified for each RMAN channel separately. For details on the Data Protector MML location, see the *HP Data Protector integration guide for Oracle and SAP*.

In the following examples, the `SBT_LIBRARY` parameter is set to `/opt/omni/lib/libob2oracle8.so`, which is the correct path for 32-bit Solaris clients.

Example of full database restore and recovery

To perform a full database restore and recovery, you also need to restore and apply all the archive logs. To perform a full database restore and recovery:

1. Log in to the Oracle RMAN:

Oracle 9i/10g:

- On Windows: `ORACLE_HOME\bin\rman target sys/manager@PROD catalog rman/rman@CATAL`
- On UNIX: `ORACLE_HOME/bin/rman target sys/manager@PROD catalog rman/rman@CATAL`

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

2. Start the full database restore and recovery:

For a non-ZDB or ZDB backup set session:

```
run{
allocate channel 'dev1' type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME)';
restore database;
recover database;
sql 'alter database open';
release channel 'dev1';
}
```

For a ZDB proxy-copy session:

```
run{
allocate channel 'dev1' type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2PROXYCOPY=1, OB2APPNAME=DB_NAME)';
restore database;
recover database;
sql 'alter database open';
release channel 'dev1';
}
```

You can also save the script into a file and perform a full database restore using the saved files. The procedure in such cases is as follows:

1. Create a file `restore_database` in the `/var/opt/omni/tmp` (UNIX systems) or `Data_Protector_home\tmp` directory.
2. Start the full database restore:

Oracle 9i/10g:

- On Windows: `ORACLE_HOME\bin\rman target sys/manager@PROD catalog rman/rman@CATAL cmdfile=Data_Protector_home\tmp\restore_datafile`
- On UNIX: `ORACLE_HOME/bin/rman target sys/manager@PROD catalog rman/rman@CATAL cmdfile=/var/opt/omni/tmp/restore_datafile`

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

Example of point-in-time restore

To perform a point-in-time restore, you also need to restore and apply the archive logs to the specified point in time. To perform a point-in-time database restore and recovery:

1. Log in to the Oracle RMAN:

Oracle 9i/10g:

- On Windows: `ORACLE_HOME\bin\rman target sys/manager@PROD catalog rman/rman@CATAL`
- On UNIX: `ORACLE_HOME/bin/rman target sys/manager@PROD catalog rman/rman@CATAL`

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

2. Start the point-in-time restore:

For a non-ZDB or ZDB backup set session:

```
run{
allocate channel 'dev1' type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME)';
set until time 'Mar 14 2004 11:40:00';
restore database;
recover database;
sql 'alter database open';
release channel 'dev1';
}
```

For a ZDB proxy-copy session, allocate one channel for restoring proxy-copy sessions and one channel for database recovery. Release the proxy-copy channel before the recovery:

```
run{
allocate channel 'dev1' type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2PROXYCOPY=1, OB2APPNAME=DB_NAME)';
allocate channel 'dev2' type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8, OB2APPNAME=DB_NAME)';
set until time 'Mar 14 2006 11:40:00';
restore database;
release channel 'dev1';
recover database;
sql 'alter database open';
release channel 'dev2';
}
```

3. After you have performed a point-in-time restore, reset the database in the Recovery Catalog.

You can also save the script into a file and perform a point-in-time restore using the saved files:

1. Create a file `restore_PIT` in the `/var/opt/omni/tmp` or `Data_Protector_home\tmp` directory.

2. Start the point-in-time restore:

Oracle 9i/10g:

- On Windows: `ORACLE_HOME\bin\rman target sys/manager@PROD
catalog rman/rman@CATAL
cmdfile=Data_Protector_home\tmp\restore_PIT`
- On UNIX: `ORACLE_HOME/bin/rman target sys/manager@PROD
catalog rman/rman@CATAL
cmdfile=/var/opt/omni/tmp/restore_PIT`

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

Example of tablespace restore and recovery

If a table is missing or corrupted, you need to perform a restore and recovery of the entire tablespace. To restore a tablespace, you may take only a part of the database offline, so that the database does not have to be in the mount mode. You can use either a recovery catalog database or control files to perform a tablespace restore and recovery. Follow the steps below:

1. Log in to the Oracle RMAN:

Oracle 9i/10g:

- On Windows: `ORACLE_HOME\bin\rman target sys/manager@PROD
catalog rman/rman@CATAL`
- On UNIX: `ORACLE_HOME/bin/rman target sys/manager@PROD
catalog rman/rman@CATAL`

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

2. Start the tablespace restore and recovery.

- If the database is in the open state, the script to restore and recover the tablespace should have the following format:

For a non-ZDB or ZDB backup set session:

```
run{
allocate channel dev1 type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME)';
sql 'alter tablespace TEMP offline immediate';
restore tablespace TEMP;
recover tablespace TEMP;
sql 'alter tablespace TEMP online';
release channel dev1;
}
```

For a ZDB proxy-copy session, allocate one channel for restoring proxy-copy sessions and one channel for database recovery. Release the proxy-copy channel before the recovery:

```
run{
allocate channel 'dev1' type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2PROXYCOPY=1, OB2APPNAME=DB_NAME)';
allocate channel 'dev2' type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8, OB2APPNAME=DB_NAME)';
sql 'alter tablespace TEMP offline immediate';
restore tablespace TEMP;
release channel 'dev1';
recover tablespace TEMP;
sql 'alter tablespace TEMP online';
release channel 'dev2';
}
```

- If the database is in the mount state, the script to restore and recover the tablespace should have the following format:

For a non-ZDB or ZDB backup set session:

```
run{
allocate channel dev1 type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME)';
restore tablespace 'TEMP';
recover tablespace 'TEMP';
release channel dev1;
}
```

For a ZDB proxy-copy session, allocate one channel for restoring proxy-copy sessions and one channel for database recovery. Release the proxy-copy channel before the recovery:

```
run{
allocate channel 'dev1' type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2PROXYCOPY=1, OB2APPNAME=DB_NAME)';
allocate channel 'dev2' type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8, OB2APPNAME=DB_NAME)';
restore tablespace 'TEMP';
release channel 'dev1';
recover tablespace 'TEMP';
release channel 'dev2';
}
```

You can also save the script into a file and perform a tablespace restore using the saved files:

1. Create a file `restore_TAB` in the `/var/opt/omni/tmp` (UNIX systems) or `Data_Protector_home\tmp` (Windows systems) directory.
2. Start the tablespace restore.

Oracle 9i/10g:

- On Windows: `ORACLE_HOME\bin\rman target sys/manager@PROD catalog rman/rman@CATAL cmdfile=Data_Protector_home\tmp\restore_TAB`
- On UNIX: `ORACLE_HOME/bin/rman target sys/manager@PROD catalog rman/rman@CATAL cmdfile=/var/opt/omni/tmp/restore_TAB`

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

Example of datafile restore and recovery

To restore and recover a datafile, you may take only a part of the database offline.

To restore and recover a datafile:

1. Log in to the Oracle RMAN.

Oracle 9i/10g:

- On Windows: `ORACLE_HOME\bin\rman target sys/manager@PROD
catalog rman/rman@CATAL`
- On UNIX: `ORACLE_HOME/bin/rman target sys/manager@PROD
catalog rman/rman@CATAL`

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

2. Start the datafile restore and recovery:

- If the database is in an open state, the script to restore the datafile should have the following format:

UNIX

For a non-ZDB or ZDB backup set session:

```
run{
allocate channel dev1 type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME)';
sql "alter database datafile
'/opt/oracle/data/oradata/DATA/temp01.dbf' offline";
restore datafile
'/opt/oracle/data/oradata/DATA/temp01.dbf';
recover datafile
'/opt/oracle/data/oradata/DATA/temp01.dbf';
sql "alter database datafile
'/opt/oracle/data/oradata/DATA/temp01.dbf' online";
release channel dev1;
}
```

For a ZDB proxy-copy session, allocate one channel for restoring proxy-copy sessions and one channel for database recovery. Release the proxy-copy channel before the recovery:

```
run{
allocate channel dev1 type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME)';
allocate channel dev2 type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME, OB2PROXYCOPY=1)';
sql "alter database datafile
'/opt/oracle/data/oradata/DATA/temp01.dbf' offline";
restore datafile
'/opt/oracle/data/oradata/DATA/temp01.dbf';
release channel dev2;
recover datafile
'/opt/oracle/data/oradata/DATA/temp01.dbf';
sql "alter database datafile
'/opt/oracle/data/oradata/DATA/temp01.dbf' online";
release channel dev1;
}
```

Windows

For a non-ZDB or ZDB backup set session:

```
run{
allocate channel dev1 type 'sbt_tape' parms
'SBT_LIBRARY=Data_Protector_home\bin\orasbt.dll,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME)';
sql "alter database datafile
'C:\oracle\data\oradata\DATA\temp01.dbf' offline";
restore datafile
'C:\oracle\data\oradata\DATA\temp01.dbf';
recover datafile
'C:\oracle\data\oradata\DATA\temp01.dbf';
sql "alter database datafile
'C:\oracle\data\oradata\DATA\temp01.dbf' online";
release channel dev1;
}
```

For a ZDB proxy-copy session, allocate one channel for restoring proxy-copy sessions and one channel for the recovery process. Release the proxy-copy channel before the recovery:

```
run{
allocate channel dev1 type 'sbt_tape' parms
'SBT_LIBRARY=Data_Protector_home\bin\orasbt.dll,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME)';
allocate channel dev2 type 'sbt_tape' parms
'SBT_LIBRARY=Data_Protector_home\bin\orasbt.dll,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME, OB2PROXYCOPY=1)';
sql "alter database datafile
'Oracle_home\data\oradata\DATA\temp01.dbf' offline";
restore datafile
'Oracle_home\data\oradata\DATA\temp01.dbf';
release channel dev2;
recover datafile
'Oracle_home\data\oradata\DATA\temp01.dbf';
sql "alter database datafile
'Oracle_home\data\oradata\DATA\temp01.dbf' online";
release channel dev1;
}
```

- If the database is in a mount state, the script to restore and recover the datafile should have the following format:

UNIX

For a non-ZDB or ZDB backup set session:

```
run{
allocate channel dev1 type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME)';
restore datafile
'/opt/oracle/data/oradata/DATA/temp01.dbf';
recover datafile
'/opt/oracle/data/oradata/DATA/temp01.dbf';
release channel dev1;
}
```

For a ZDB proxy-copy session, allocate one channel for restoring proxy-copy sessions and one channel for the recovery process. Release the proxy-copy channel before the recovery:

```
run{
allocate channel dev1 type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME)';
allocate channel dev2 type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME, OB2PROXYCOPY=1)';
restore datafile
'/opt/oracle/data/oradata/DATA/temp01.dbf';
release channel dev2;
recover datafile
'/opt/oracle/data/oradata/DATA/temp01.dbf';
release channel dev1;
}
```

Windows

For a non-ZDB or ZDB backup set session:

```
run{
allocate channel dev1 type 'sbt_tape' parms
'SBT_LIBRARY=Data_Protector_home\bin\orasbt.dll,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME)';
restore datafile
'Oracle_home\data\oradata\DATA\temp01.dbf';
recover datafile
```

```
'Oracle_home\data\oradata\DATA\temp01.dbf';
release channel dev1;
}
```

For a ZDB proxy-copy session, allocate one channel for restoring proxy-copy sessions and one channel for the recovery process. Release the proxy-copy channel before the recovery:

```
run{
allocate channel dev1 type 'sbt_tape' parms
'SBT_LIBRARY=Data_Protector_home\bin\orasbt.dll,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME)';
allocate channel dev2 type 'sbt_tape' parms
'SBT_LIBRARY=Data_Protector_home\bin\orasbt.dll,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME, OB2PROXYCOPY=1)';
restore datafile
'Oracle_home\data\oradata\DATA\temp01.dbf';
release channel dev2;
recover datafile
'Oracle_home\data\oradata\DATA\temp01.dbf';
release channel dev1;
}
```

You can also save the script into a file and perform a datafile restore using the saved files:

1. Create a file `restore_dbf` the `/var/opt/omni/tmp` or `Data_Protector_home\tmp` (Windows systems) directory.
2. Start the datafile restore:

Oracle 9i/10g:

- On Windows: `ORACLE_HOME/bin/rman target sys/manager@PROD catalog rman/rman@CATAL cmdfile=/var/opt/omni/tmp/restore_dbf`
- On UNIX: `ORACLE_HOME/bin\rman target sys/manager@PROD catalog rman/rman@CATAL cmdfile=Data_Protector_home\tmp\restore_dbf`

Oracle 8i:

Use `revcat` instead of `catalog` in the above syntax.

Example of archive log restore

To restore an archive log:

1. Login to the Oracle RMAN:

Oracle 9i/10g:

- On Windows: `ORACLE_HOME\bin\rman target sys/manager@PROD catalog rman/rman@CATAL`
- On UNIX: `ORACLE_HOME/bin/rman target sys/manager@PROD catalog rman/rman@CATAL`

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

2. Start the archive log restore:

```
run{
allocate channel dev1 type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DE_NAME)';
restore archivelog all;
release channel dev1;}
```

You can also save the script into a file and perform an archive log restore using the saved files:

1. Create a file `restore_arch` in the `/var/opt/omni/tmp` (UNIX systems) or `Data_Protector_home\tmp` (Windows systems) directory.

2. Start the archive log restore:

Oracle 9i/10g:

- On Windows: `ORACLE_HOME\bin\rman target sys/manager@PROD catalog rman/rman@CATAL cmdfile=Data_Protector_home\tmp\restore_arch`
- On UNIX: `ORACLE_HOME/bin/rman target sys/manager@PROD catalog rman/rman@CATAL cmdfile=/var/opt/omni/tmp/restore_arch`

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

Restoring Oracle using CLI

Restoring the recovery catalog

Data Protector can restore the binary file which contains the logical backups of the Oracle recovery catalog. This file is made using the Oracle Export utility, which creates it by reading the Oracle database and writing the output to the binary file, which is then backed up by Data Protector.

This file can be restored back to the disk and then imported to the Oracle database by the Oracle Import utility.

To restore the Oracle recovery catalog, proceed as follows:

1. Login to the Oracle Recovery Catalog Database. Ensure that the recovery catalog database exists and that the recovery catalog is *not* present. If necessary, remove the recovery catalog using the RMAN command `DROP CATALOG`.

Identify the Oracle recovery catalog owner. If necessary, create the Oracle user.

On UNIX, Data Protector determines the Oracle login information for the recovery catalog from the Data Protector Oracle configuration files.

2. Set the `OB2APPNAME` environment variable. Its value must be set to the name of the target database (`DB_NAME`), not of the Oracle recovery catalog:

Windows: `set OB2APPNAME=DB_NAME`

UNIX:

- if you are using an sh - like shell, run:
`OB2APPNAME="DB_NAME"`
`export OB2APPNAME`
- if you are using a csh - like shell, run:
`setenv OB2APPNAME "DB_NAME"`

3. Run:

Windows: From the *Data_Protector_home*\bin directory:

```
perl -I..\lib\perl ob2rman.pl -restore_catalog -session  
Session_ID [-apphost application_hostname]
```

HP-UX, Solaris:

```
/opt/omni/lbin/ob2rman.pl -restore_catalog -session  
session_ID [-apphost application_hostname]
```

Provide the *Session_ID* of the backup session. In case of object copies, do not use the copy session ID, but the object's backup ID, which equals the object's backup session ID.

Restoring using another device

Data Protector supports the restore of Oracle database objects from devices other than those on which the database objects were backed up.

Specify these devices in the */etc/opt/omni/server/cell/restoredev* (UNIX systems) or *Data_Protector_home*\Config\server\Cell\restoredev (Windows systems) file in the following format:

```
"DEV 1" "DEV 2"
```

where

DEV 1 is the original device and DEV 2 the new device.

On Windows, this file must be in UNICODE format.

Note that this file should be deleted after it is used.

Example

Suppose you have Oracle objects backed up on a device called DAT1. To restore them from a device named DAT2, specify the following in the **restoredev** file:

```
"DAT1" "DAT2"
```

Instant recovery and database recovery

For general information on instant recovery, see the *HP Data Protector zero downtime backup concepts guide* and the *HP Data Protector zero downtime backup administrator's guide*. For information on instant recovery in cluster environment

(Cluster File System (CFS), MC/ServiceGuard, and Microsoft Cluster Server), see *HP Data Protector zero downtime backup administrator's guide*.

The Data Protector instant recovery functionality is used only to restore the target volumes on which the database files are located. The database recovery part is performed after instant recovery by the RMAN utility. During database recovery, incremental backups and archive log backups performed after ZDB to disk or ZDB to disk+tape are restored from tape. Only those archive logs that do not reside on the target volumes are restored.

 **IMPORTANT:**

If the Oracle control file, online redo logs, and the Oracle 9i/10g SPFILE are on the same source volumes as datafiles and you enable instant recovery by setting the `omniirc` variables, note that the control file, SPFILE, and online redo logs are overwritten during the instant recovery.

Prerequisites

- The control file that reflects the internal database structure at the time of backup must be available on the application system. If necessary, restore the appropriate control file from a tape backup.
- The recovery catalog must be open.

Limitations

- For ZDB-to-disk sessions, only archived redo logs can be used for a database recovery after an instant recovery.
- The recovery process will fail if the log entry with the specified logseq number or SCN number was created before the target volume.

RAC preparation steps

In case of RAC, set the following variable in the `omniirc` file:

```
ZDB_IR_VGCHANGE=vgchange -a s
```

The instant recovery procedure is the same as without RAC.

However, if instant recovery is to be performed to some other node than the one that was backed up, the following procedure must be performed before the standard instant recovery procedure:

1. Make sure that the MC/SG virtual package is running on the target node.

2. Set the `OB2BARHOSTNAME` environment variable as the virtual hostname before running the configuration from the command line:

```
export OB2BARHOSTNAME=virtual_hostname
```

Instant recovery using the Data Protector GUI

To perform an instant recovery:

1. Shut down the Oracle database instance using `sqlplus`. In case of RAC, shut down all instances.

For example:

```
sqlplus  
sql> shutdown immediate  
sql> exit
```

2. In the Context List, click **Instant Recovery**.
3. Expand **Oracle Server** and select the ZDB-to-disk or ZDB-to-disk+tape session from which you want to perform the restore.

4. In the **Source** tab, select the objects to recover. Only whole databases can be selected. For StorageWorks Virtual Array and HP StorageWorks Disk Array XP, it is recommended to leave the **Keep the replica after the restore** option set to enable a restart of an instant recovery session. For HP StorageWorks Enterprise Virtual Array, replica is kept on the array only if the **Copy replica data to the source location** is selected.

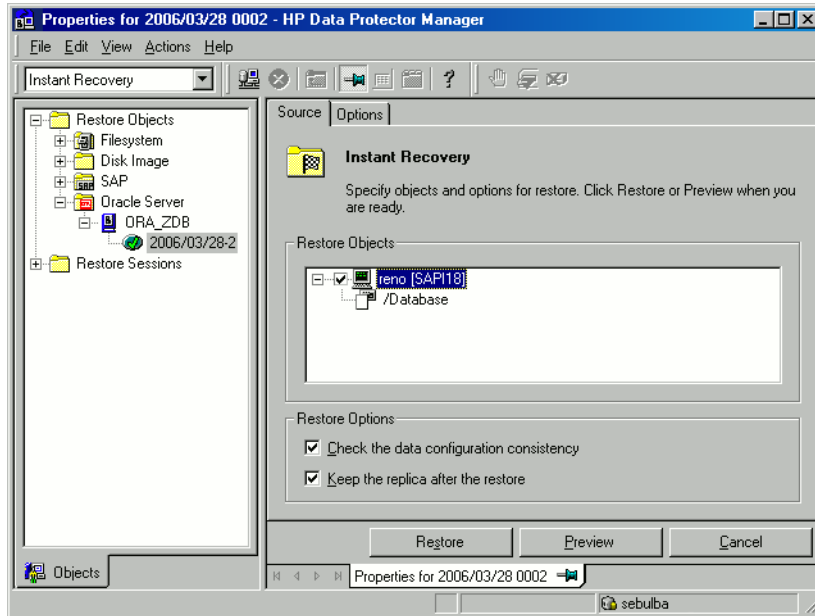


Figure 34 Selecting backup sessions (XP example)

5. At this point, you can decide whether to perform a database recovery immediately after an instant recovery or not:
 - To perform only an instant recovery, click **Restore**.

NOTE:

You can perform a database recovery at a later time either from the Data Protector Manager Restore Context or manually using the RMAN CLI. See [“Oracle database recovery after the instant recovery”](#) on page 139.

- To perform a database recovery immediately after an instant recovery, click on the **Options** tab, select **Recovery** and then select the database recovery options. For a recovery until a selected time, logseq/thread number, or SCN number, it is recommended to reset the log files. See [Figure 35](#) on page 138 and [“Restore, recovery, and duplicate options”](#) on page 113 for details on available options.

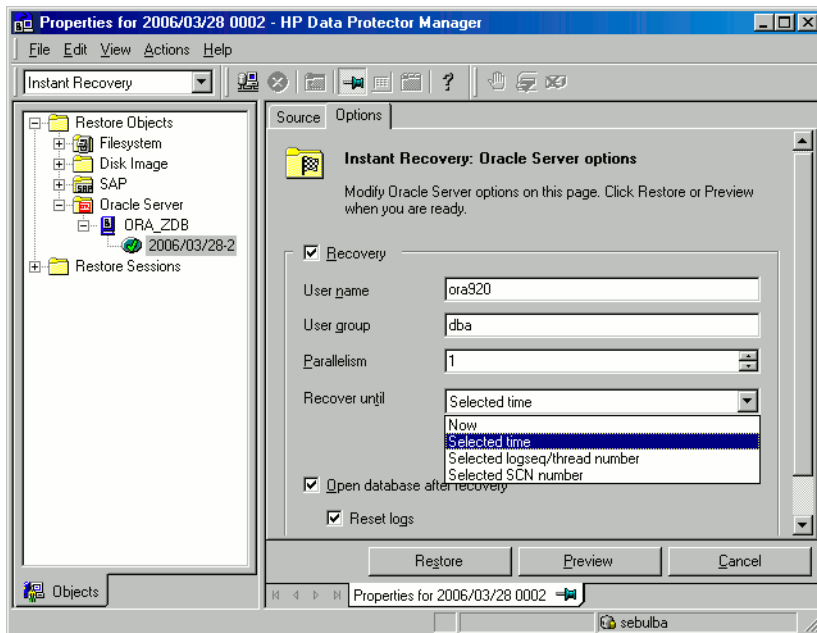


Figure 35 Oracle recovery options

6. Click **Restore** or **Preview**. Note that preview only checks if the replica can be restored. It does not check if the database recovery will be successful.

Data Protector recovers the database after performing instant recovery by switching the database to a mount state, restoring the necessary incremental backups and archived redo logs from tape, and applying the redo logs.

If you reset the logs, reset the database; otherwise, Oracle will during the next backup try to use the logs that were already reset and the backup will fail. Login to the target and recovery catalog database and run:

Oracle 9i/10g:

```
rman target Target_Database_Login catalog  
Recovery_Catalog_Login
```

```
RMAN> RESET DATABASE;
```

```
RMAN> exit
```

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

Oracle database recovery after the instant recovery

To recover the Oracle database after the instant recovery has been performed, perform the following steps:

1. Put the Oracle database in a mount state by connecting to the target database from the `sqlplus` and then running the following command:

```
startup mount
```

2. To recover the database, the following two options are available:
 - Perform a recovery from the Data Protector Manager Restore Context:
 - a. Expand **Oracle Server** and select the database to recover. In the **Source** tab, under **Restore action**, select **Perform recovery only**.

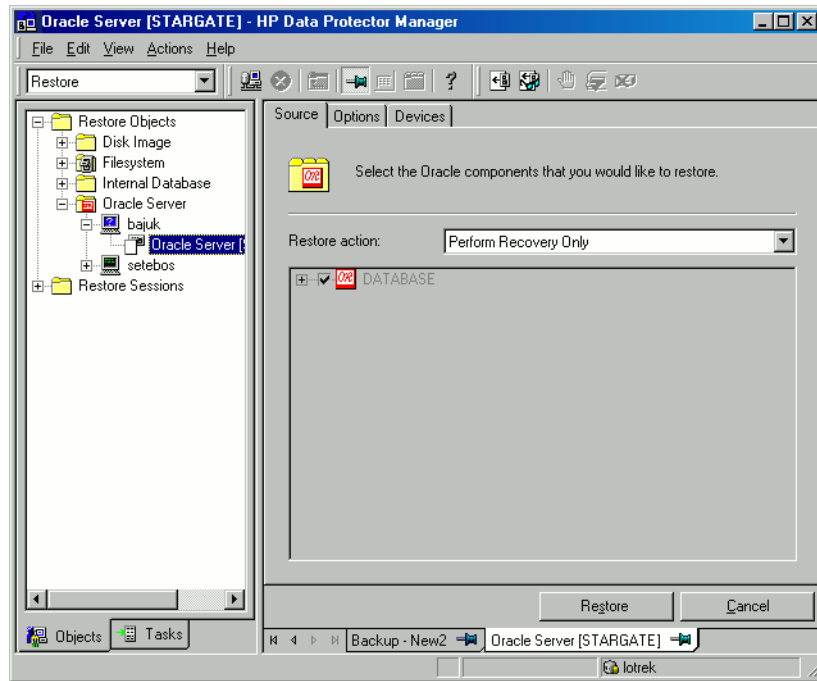


Figure 36 Selecting the database for recovery

- b. In the **Options** tab, select the recovery options. For details, see [“Restore, recovery, and duplicate options”](#) on page 113.
 - c. Click **Restore**.
- Perform a manual database recovery using RMAN.
Run the following RMAN script to recover the database:

```
run {
allocate channel dev1 type 'sbt_tape' parms
'SBT_LIBRARY=/opt/omni/lib/libob2oracle8.so,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME)';
recover database;
sql 'alter database open';
release channel dev1;
}
```

For additional examples on how to recover the database after an instant recovery, see [“Restoring Oracle using RMAN”](#) on page 117.

Oracle in Veritas Cluster instant recovery

If Oracle on the application system runs in a Veritas Cluster, the following two Veritas Cluster resources must be disabled before instant recovery is performed, and enabled after instant recovery has finished to prevent the failover of the Oracle Veritas Cluster Service Group:

- Veritas Cluster application resource for the Oracle application and
- Veritas Cluster mountpoint resource for the Oracle database files.

Follow the steps below to perform an instant recovery to the application system with Oracle in a Veritas Cluster:

1. On the application system, enter the following commands to disable the two Veritas Cluster resources:
 - a.

```
hares -offline application_resource_name -sys system
```

where *application_resource_name* is the name of the Veritas Cluster application resource for the Oracle application and *system* is the name of the active node.

```
hares -offline mountpoint_resource_name -sys system
```

where *mountpoint_resource_name* is the name of the Veritas Cluster mountpoint resource for the Oracle database files and *system* is the name of the active node.
 - b.

```
hares -modify application_resource_name Enabled 0
```

where *application_resource_name* is the name of the Veritas Cluster application resource for the Oracle application.

```
hares -modify mountpoint_resource_name Enabled 0
```

where *mountpoint_resource_name* is the name of the Veritas Cluster mountpoint resource for the Oracle database files.
2. Perform an instant recovery.
3. If you performed only an instant recovery without the database recovery, use RMAN as described in [“Oracle database recovery after the instant recovery”](#) on page 139 to bring the Oracle database to a consistent state.

4. On the application system, enter the following commands to enable the two Veritas Cluster resources:
 - a. `hares -modify mountpoint_resource_name Enabled 1`
where `mountpoint_resource_name` is the name of the Veritas Cluster mountpoint resource for the Oracle database files.
`hares -modify application_resource_name Enabled 1`
where `application_resource_name` is the name of the Veritas Cluster application resource for the Oracle application.
 - b. `hares -online application_resource_name -sys system`
where `application_resource_name` is the name of the Veritas Cluster application resource for the Oracle application and `system` is the name of the active node.
`hares -online mountpoint_resource_name -sys system`
where `mountpoint_resource_name` is the name of the Veritas Cluster mountpoint resource for the Oracle database files and `system` is the name of the active node.

Using Oracle after removing the Data Protector Oracle integration

When you remove the Data Protector Oracle integration from a UNIX or Windows client with Oracle8i, you also need to release the symbolic link between the Data Protector MML and Oracle Server. If this is not done, the Oracle Server cannot be started.

Removing the link on HP-UX systems

To remove the Data Protector Oracle integration link on HP-UX systems:

1. Change to the `ORACLE_HOME/lib` directory:
`cd ORACLE_HOME/lib` (32-bit Oracle),
`cd ORACLE_HOME/lib64` (64-bit Oracle 8i) or
`cd ORACLE_HOME/lib` (64-bit Oracle 9i/10g).

2. If the `libobk.sl.orig` file exists in the `ORACLE_HOME/lib` directory, run:

```
mv libobk.sl.orig libobk.sl
```

where `libobk.sl.orig` is the Oracle soft link as it existed before configuring the integration.

Removing the link on Solaris systems

To remove the Data Protector Oracle integration link on Solaris:

1. Change to the `ORACLE_HOME/lib` directory:

```
cd ORACLE_HOME/lib (32-bit Oracle),  
cd ORACLE_HOME/lib64 (64-bit Oracle 8i) or  
cd ORACLE_HOME/lib (64-bit Oracle 9i/10g).
```
2. If the `libobk.so.orig` file exists in the `ORACLE_HOME/lib` directory, execute the following command:

```
mv libobk.so.orig libobk.so
```

where `libobk.so.orig` is the Oracle soft link as it existed before configuring the integration.

Removing the link on Windows systems

Delete the Data Protector `orasbt.dll` file from the `ORACLE_HOME\bin` directory.

Troubleshooting

This section contains a list of general checks and verifications and a list of problems you might encounter when using the Data Protector Oracle integration. You can start at “[Problems](#)” on page 153 and if you cannot find a solution there, perform general checks and verifications.

For general Data Protector troubleshooting information, see the *HP Data Protector troubleshooting guide*.

For general ZDB, restore, and instant recovery troubleshooting information, see the troubleshooting sections in the *HP Data Protector zero downtime backup administrator's guide*.

Before you begin

- Ensure that the latest official Data Protector patches are installed. See the online Help index: "patches" on how to verify this.
- See the *HP Data Protector product announcements, software notes, and references* for general Data Protector limitations, as well as recognized issues and workarounds.
- See <http://www.hp.com/support/manuals> for an up-to-date list of supported versions, platforms, and other information.

Checks and verifications

For more detailed information about how to perform any of the following procedures, see the Oracle documentation.

If your configuration, backup, or restore failed:

- On the application system, verify that you can access the Oracle target database and that it is opened as follows:

1. UNIX: Export the `ORACLE_HOME` and `DB_NAME` variables as follows:

- if you are using an sh - like shell, enter the following commands:

```
ORACLE_HOME="ORACLE_HOME"  
export ORACLE_HOME  
DB_NAME="DB_NAME"  
export DB_NAME
```

- if you are using a csh - like shell, enter the following commands:

```
setenv ORACLE_HOME "ORACLE_HOME"  
setenv DB_NAME "DB_NAME"
```

Windows: Set the `ORACLE_HOME` and `DB_NAME` variables.

2. Start SQL*Plus from the `bin` directory in the `ORACLE_HOME` directory:

```
sqlplus /nolog
```


3. Start SQL*Plus and type:

```
connect user_name/password@service as sysdba;
select * from dba_tablespaces;
exit
```

If this fails, open the Oracle target database.

- On the application system, verify that you can access the recovery catalog (if used) and that it is opened as follows:

1. Export or set the `ORACLE_HOME` and `DB_NAME` variables as described in [Step 1](#) on page 144.

2. Start SQL*Plus from the `bin` directory in the `ORACLE_HOME` directory:

```
sqlplus /nolog
```

3. Start SQL*Plus and type:

```
connect Recovery_Catalog_Login
select * from rcver;
exit
```

If this fails, open the recovery catalog.

- Verify that the listener is correctly configured for the Oracle target database and the recovery catalog database. This is required to properly establish network connections:
 - 1.** Export or set the `ORACLE_HOME` variable as described in [Step 1](#) on page 144.

2. Start the listener from the `bin` directory in the `ORACLE_HOME` directory:

```
lsnrctl status service
```

If this fails, startup the listener process and see the Oracle documentation for instructions on how to create a configuration file (`LISTENER.ORA`).

On Windows, the listener process can be started in the Control Panel > Administrative Tools > Services.

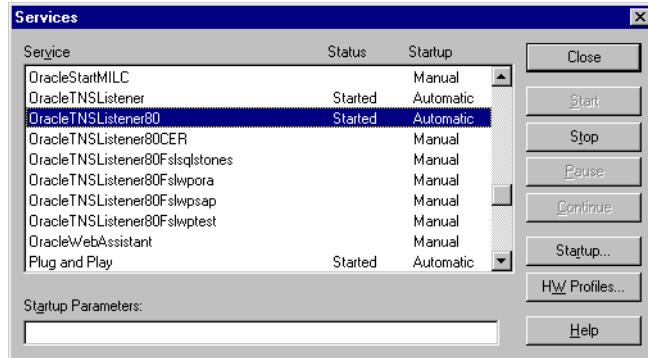


Figure 37 Checking the status of the Oracle listener

The status of the respective listener service in the **Services** window should be **Started**, otherwise you must start it manually.

3. Start SQL*Plus from the `bin` directory in the `ORACLE_HOME` directory:

```
sqlplus /nolog
```

4. Start SQL*Plus and type:

```
connect Target_Database_Login
```

```
exit
```

and then

```
connect Recovery_Catalog_Login
```

```
exit
```

If this fails, see the Oracle documentation for instructions on how to create a configuration file (`NAMES.ORA`).

- From the application system, verify that the target database and recovery catalog database are configured to allow remote connections with the system privileges and to allow backup:

- If you use the recovery catalog database:

Export or set the `ORACLE_HOME` and `DB_NAME` variables as described in [Step 1](#) on page 144.

Oracle 9i/10g:

```
SQL> connect login_to_recovery_catalog_or_target_database
as sysdba;
```

```
> exit
```

```
ORACLE_HOME/bin/rman target login_to_target_database
catalog login_to_Recovery_Catalog
```

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

- If you do not use the recovery catalog database:

Export or set the `ORACLE_HOME` and `DB_NAME` variables as described in [Step 1](#) on page 144.

```
ORACLE_HOME/bin/rman target login_to_target_database
nocatalog
```

See the Oracle documentation for how to set up a password file and parameters in the `initDB_NAME.ora` file and how to add system privileges for a user.

See the section “Recovery Manager Connection Options” in the *Oracle Backup and Recovery Guide* for information.

- If you use the recovery catalog database, verify that the target database is registered in the recovery catalog:

1. Export or set the `ORACLE_HOME` variable as described in [Step 1](#) on page 144.

2. Start SQL*Plus from the `bin` directory in the `ORACLE_HOME`; directory:

```
sqlplus /nolog
```

3. Start SQL*Plus and type:

```
connect Recovery_Catalog_Login;
```

```
select * from rc_database;
```

```
exit
```

If this fails, start the configuration using Data Protector on the application system, or see the Oracle documentation for information on how to register an Oracle target database in the recovery catalog database.

- On the application system, verify backup and restore directly to disk using an RMAN channel type disk:

If you use the recovery catalog:

1. Export or set the `ORACLE_HOME` variable as described in [Step 1](#) on page 144.
2. Start RMAN from the `bin` directory in the `ORACLE_HOME` directory:

Oracle 9i/10g:

```
rman target Target_Database_Login catalog
Recovery_Catalog_Login
```

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

If you do not use the recovery catalog:

1. Export or set the `ORACLE_HOME` variable as described in [Step 1](#) on page 144.
2. Start RMAN from the `bin` directory in the `ORACLE_HOME` directory:

```
rman target Target_Database_Login nocatalog
```

An example of the RMAN backup script is presented below:

```
run {
allocate channel 'dev0' type disk;
backup tablespace tablespace_name format
'ORACLE_HOME/tmp/datafile_name';
}
```

After a successful backup, try to restore the backed up tablespace by running the following restore script:

```
run {
allocate channel 'dev0' type disk;
sql 'alter tablespace tablespace_name offline immediate';
restore tablespace tablespace_name;
recover tablespace tablespace_name;
sql 'alter tablespace tablespace_name online';
}
```

If this fails, see the Oracle documentation for details on how to execute a backup and restore directly to disk using RMAN.

Additionally, if your configuration or backup failed:

- Verify that the Data Protector software has been installed properly. See the *HP Data Protector installation and licensing guide* for details.

- Check if the SYSDBA privilege is granted to the Oracle administrator.
- If you have special Oracle environment settings, ensure that they are entered in the Data Protector Oracle configuration files on the Cell Manager. See the `util_cmd` man page or the *HP Data Protector command line interface reference* for information on setting the variables in the Data Protector Oracle configuration files.
- On UNIX clients with Oracle8i (on application system in case of the Oracle proxy copy ZDB method or backup system in case of the Oracle backup set ZDB method), verify that the Data Protector Oracle integration MML is linked with the Oracle executable:

1. Export `ORACLE_HOME` and `DB_NAME` as described in [Step 1](#) on page 144.
2. Use the following command to check if the `libob2oracle8.sl` (`libob2oracle8_64bit.sl`) file is linked with the Oracle executable:

HP-UX:

```
/usr/bin/chatr ORACLE_HOME/bin/oracle (32-bit Oracle)
/usr/ccs/bin/ldd ORACLE_HOME/bin/oracle (64-bit Oracle)
```

Solaris:

```
/usr/bin/ldd -s ORACLE_HOME/bin/oracle
```

The output must state that the respective MML is required by the Oracle executable. The following is an extract from the command output on HP-UX:

```
bin/oracle:
shared executable
shared library dynamic path search:
SHLIB_PATH enabled second
embedded path disabled first Not Defined
shared library list:
static /opt/omni/lib/libob2oracle8.sl(libob2oracle8_64bit.sl)
dynamic /usr/lib/librt.2
dynamic /usr/lib/libnss_dns.1
dynamic /usr/lib/libdld.2
```

The line starting with `SHLIB_PATH` should be as presented in the example above. If this line is different, enable MML dynamic path as follows:

```
/usr/bin/chatr +s enable ORACLE_HOME/bin/oracle
```

On Solaris and HP-UX (64-bit), `LD_LIBRARY_PATH` is used instead of `SHLIB_PATH` as on HP-UX (32-bit).

- On Windows clients with Oracle8i, verify that the Data Protector Oracle integration MML is loaded:

- a. Switch to the `ORACLE_HOME\bin` directory and right-click `orasbt.dll`.
 - b. Select **Properties** and click the **Version** tab from the `orasbt.dll Properties` window. In **Description**, you should see the file described as a part of the Data Protector integration.
- Perform a filesystem backup (non-ZDB) of the Oracle Server system so that you can eliminate any potential communication problems between the Oracle Server and the Data Protector Cell Manager system.
See the online Help index “standard backup procedure” for details about how to do a filesystem backup.
Ensure that the hostname defined in the backup specification as a system to be backed up is the name of the application system.
 - On Windows, check the `Data Protector Inet` service startup parameters on the Oracle Server system:
Go to `Control Panel > Administrative Tools > Services > Data Protector Inet`.
The service must run under a specified user account. Make sure that the same user is also added to the `Data Protector admin` or `user` group.
 - Examine the system errors reported in the following file on the application system (Oracle proxy-copy ZDB method) or backup system (Oracle backup set ZDB method):

HP-UX, Solaris: `/var/opt/omni/log/debug.log`

Windows: `Data_Protector_home\log\debug.log`

Additionally, if your backup or restore failed:

- Test the Data Protector internal data transfer using the `testbar2` utility:
 1. Verify that the Cell Manager name is correctly defined on the Oracle Server system. Check the following file, which contains the name of the Cell Manager system:

HP-UX, Solaris: `/etc/opt/omni/client/cell_server`

Windows: `Data_Protector_home\Config\client\cell_server`

2. From the `bin` directory in the `ORACLE_HOME` directory, run:

If backup failed:

```
testbar2 -type:Oracle8 -appname:DB_NAME-perform:backup  
-bar:backup_specification_name
```

If restore failed:

```
testbar2 -type:Oracle8 -appname:DB_NAME-perform:restore
```

The hostname should not be specified in the `object` option. It is automatically provided by `testbar2`.

3. You should see only `NORMAL` messages displayed on your screen, otherwise examine the errors reported by the `testbar2` utility by clicking the **Details** button in the Data Protector **Monitor** context.

If the messages indicate problems on the Data Protector side of the integration, proceed as follows:

- Check if the owner of the backup specification (in case of failed backup) or the restore session (in case of failed restore) is the Oracle backup owner, and that this user belongs to the Data Protector `operator` or `admin` group.
- Check that the respective Data Protector user group has the `See private objects` user right enabled.

- **If backup failed:**

Create an Oracle backup specification to back up to a null device or file. If the backup succeeds, the problem may be related to the backup devices. See the *HP Data Protector troubleshooting guide* for instructions on troubleshooting devices.

- **If restore failed:**

As the owner of the restore session, run the `omnidb` command to see objects in the database.

If the test fails again, call a support representative for assistance.

Additionally, if your restore failed:

- Verify that an object exists on the backup media.

This can be done by running the following command on the Oracle server system from the `bin` directory in the `ORACLE_HOME`; directory:

```
omnidb -oracle8 "object_name" -session "Session_ID" -media
```

The output of the command lists detailed information about the specified Oracle object, as well as the session IDs of the backup sessions containing this object

and a list of the media used. For detailed syntax of the `omnidb` command, see its man page.

- Ensure that the database is in the correct state.

If you are trying to restore a database item using the Data Protector GUI and the GUI hangs try one of the following:

- If you are restoring the control file, the database should be in the `NoMount` state.

Open a command window and enter the following:

```
sqlplus/nolog
SQL>connect user/password@service as sysdba
SQL>shutdown immediate
SQL>startup nomount
```

- If you are restoring datafiles, the database should be in the `Mount` state.

Open a command window and enter the following:

```
sqlplus/nolog
SQL>connect user/password@service as sysdba
SQL>shutdown immediate
SQL>startup mount
```

- If there is a problem you cannot resolve while you are trying to restore a database item using the Data Protector GUI, try using the RMAN CLI to restore the database items.

For information, see [“Restoring Oracle using RMAN”](#) on page 117.

- Try putting the database into the Open state manually after using the Data Protector GUI to recover and restore a backup session.

If you have used the Data Protector GUI to recover and restore a backup session and you see the following error message:

```
Oracle Error: ORA-1589: must use RESETLOGS or NORESETLOGS
option for database open.
```

Open a SQLplus window and use the following command:

```
sqlplus/nolog
SQL>connect user/password@service as sysdba
SQL>alter database open noresetlogs;
```

If this does not work, try using the following command:

```
SQL>alter database open resetlogs;
```


Problems

Problem

SQL*Plus is unable to connect to destination.

Action

Check if the Oracle listener process is up and running. Check if there are any environment variables you need to enter (for example, `TNS_ADMIN`). Enter these variables in the Data Protector Oracle configuration files on the Cell Manager. See the `util_cmd` man page for information.

Problem

The following error is displayed: `ORA-12532: : invalid argument.`

If this is reported by SQL*Plus in the Data Protector monitor, the application system may be low on resources (CPU, memory, etc.).

Action

Try to configure the application system in such a way that it consumes as little resources as possible. This error can be reproduced without using Data Protector by starting SQL*Plus on the application system, and connecting to the target database on the application system.

Problem

Backup set ZDB is aborted after 10 minutes

While performing a backup set ZDB, the following warning is displayed for each database datafile:

```
RMAN-06554: WARNING: file n is in backup mode
```

The ZDB session then aborts with the following message:

```
Bar backup se0ssion was started but no client connected in  
600 seconds.
```

Action

Increase the value of the following variables in the global options file (by default, these variables are set to 10):

- If you upgraded Data Protector from a previous version of OmniBack or Data Protector:

```
SmWaitForFirstClient=minutes
```

- If you performed a clean installation:

```
SmWaitForFirstBackupClient=minutes
```

See the *HP Data Protector troubleshooting guide* for more information on the global options file.

Problem

Backup Set ZDB fails after changing the physical schema of the Database

Backup fails after you have modified the physical schema of a database, for example, if you added or dropped a tablespace, added a new datafile, or added or dropped a rollback segment. Depending on the performed modification, different error messages are displayed, for example:

```
RMAN-06056: could not access datafile datafile
```

The problem occurs because the physical schema of target database is not updated in the recovery catalog.

Action

Manually re-synchronize the recovery catalog database with the current control file.

Problem

Proxy copy restore fails

Proxy copy restore fails with the following error:

```
RMAN-10035: exception raised in RPC: ORA-27197: skgfprs:  
sbtprcreate returned error
```

```
RMAN-10031: ORA-27197 occurred during call to  
DBMS_BACKUP_RESTORE.PROXYRESTOREDATAFILE
```

Action

Check the IDB for the session and the objects of the latest backup. You might check if a more recent session exists in the recovery catalog. Connect to the RMAN prompt:

Oracle 9i/10g:

```
rman target user/password@TGT_DB catalog user/password@CDB
```

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

At the `RMAN>` prompt, enter

```
list backup;
```

to display a list of the objects in the recovery catalog. Check the list of Proxy Copy sessions, listed at the end.

To synchronize the recovery catalog and the IDB, run the RMAN command:

```
resync catalog;
```

After the synchronization is performed, restore should be possible.

Problem

Restore after a switch between ZDB methods fails

If you perform a restore to a specified time (`T_RESTORE`) that lies in the time interval between the start of the first backup of the entire database using the new method (`T_START`), and before this backup is finished (`T_FINISH`), RMAN may try to restore the backup files made with the new method using a channel allocated for backup files made using the previous method. As a result, the restore procedure fails.

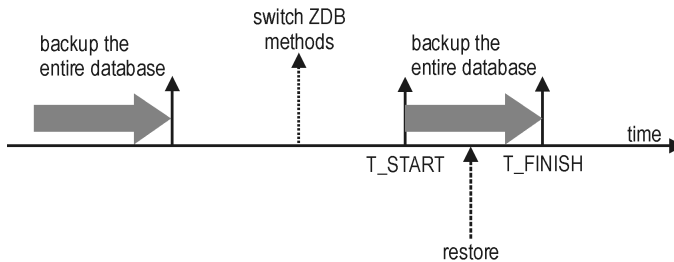


Figure 38 Restore after a switch between ZDB methods fails

Action

Restore the backup session manually using RMAN scripts. Add the required parameter to the allocated channels, that is `OB2PROXYCOPY=1` for the channel which will be used for restoring the backup made using the proxy-copy ZDB method. Then restore the backup files using the correct channels.

For example, if you switched from the backup set to the proxy-copy ZDB method, the script may look similar to the following one:

```

run {
ALOCATE CHANNEL 'dev_0' TYPE 'sbt_tape'
PARMS 'SBT_LIBRARY=Path_to_Data_Protector_MML,
ENV(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME)';
ALOCATE CHANNEL 'dev_1' TYPE 'sbt_tape'
PARMS 'SBT_LIBRARY=Path_to_Data_Protector_MML,
ENV(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME,
OB2PROXYCOPY=1)';
RESTORE DATAFILE list_of_backup_set_backups UNTIL
T_RESTORE CHANNEL 'dev_0';
RESTORE DATAFILE list_of_proxy-copy_backups UNTIL
T_RESTORE CHANNEL 'dev_1';
RELEASE 'dev_0';
RECOVER DATABASE UNTIL T_RECOVER ...
RELEASE 'dev_1';
}

```

Where:

T_RESTORE specifies the time to which to restore and *T_RECOVER* the time to which to apply the transactions.

list_of_backup_set_backups is a list of backups of the entire database using the backup set ZDB method.

list_of_proxy_copy_backups is a list of datafile backups completed after the start of the backup of the entire database (*T_START*) and before *T_RESTORE*.

Problem

Data Protector reports “12:8422” error when using Data Protector Oracle integration after an upgrade of Oracle 8i to Oracle 9i

After Oracle 8i is upgraded to Oracle 9i, the following error is returned during the configuration of Oracle instance or during the backup:

```
*RETVAL*8422
```

Action

Rename the Oracle 8i *svrmgr1* binary to something else so that Data Protector will not find it. The Oracle upgrade process from Oracle 8i to Oracle 9i does not remove the Oracle 8i *svrmgr1* binary, rather it changes its permissions. Once the *svrmgr1* binary is renamed, Data Protector will use Oracle 9i *sqlplus*, as it should, to complete the operations correctly.

Problem

Data Protector reports errors when calling SYS.LT_EXPORT_PKG.schema_inf_exp during Oracle 9i/10g backup

The following errors are listed in the Data Protector monitor:

EXP-00008: ORACLE error 6550 encountered

```
ORA-06550: line 1, column 13:
PLS-00201: identifier 'SYS.LT_EXPORT_PKG' must be declared
ORA-06550: line 1, column 7:
PL/SQL: Statement ignored
EXP-00083: The previous problem occurred when calling
SYS.LT_EXPORT_PKG.schema_info_exp
. exporting statistics
Export terminated successfully with warnings.
[Major] From: ob2rman.pl@machine "MAKI" Time: 10/01/01 16:07:53
```

Export of the Recovery Catalog Database failed.

Action

Start SQL*Plus and grant the execute permission to the LT_EXPORT_PKG as follows (make sure that the user sys has the SYSDBA privilege granted beforehand):

```
sqlplus 'sys/password@CDB as sysdba'
SQL> grant execute on sys.lt_export_pkg to public;
```

Restart the failed backup session.

Problem

On UNIX, Data Protector reports “Cannot allocate/attach shared memory”

Backup fails and the following error message is displayed:

```
Cannot allocate/attach shared memory (IPC Cannot Allocate Shared Memory Segment)
System error: [13] Permission denied) => aborting
```

Action

Set the OB2SHMEM_IPCGLOBAL omnirc variable in the /opt/omni/.omnirc file to 1 to use the memory windowing properly, and restart the failed backup session. See the *HP Data Protector troubleshooting guide* for details on using the omnirc file.

Problem

Backup fails after a point in time restore and recovery

The following error is displayed:

```
RMAN-06004: ORACLE error from recovery catalog database:  
RMAN-20003: target database incarnation not found in recovery  
catalog
```

Action

Connect to the target and recovery catalog database using RMAN and reset the database to register the new incarnation of database in the recovery catalog:

Oracle 9i/10g:

```
rman target Target_Database_Login catalog  
Recovery_Catalog_Login
```

```
RMAN> RESET DATABASE;
```

```
RMAN> exit
```

Oracle 8i:

Use `rcvcat` instead of `catalog` in the above syntax.

Problem

Oracle online backup fails with the following error:

```
RMAN-06004: ORACLE error from recovery catalog database:  
RMAN-20220: controlfile copy not found in the recovery catalog
```

When running an online backup, Data Protector adds the filename of the *controlfilecopy* to the RMAN backup script. This filename has to be cataloged to the RMAN catalog prior to the backup command.

Action

To catalog the *controlfilecopy* to the RMAN catalog:

1. Connect to RMAN on the application system.
2. Run the following command:

```
RMAN> catalog controlfilecopy  
'CONTROL_FILE_LOCATION/ctrlDB_NAME.ctl'
```

Problem

Backup of archive logs on RAC cannot be performed

On RAC, the archive logs are not installed on a NFS mounted disk. Backup of archive logs cannot be performed.

Action

Edit the archive logs backup specification:

- Add an additional `allocate channel` command for each node.
- Add a command to connect to each instance. The connection parameters should be given as `username/password@INSTANCE`.

For example, if you are using two nodes, the backup specification might look as follows:

```
run {
allocate channel 'dev_0' type 'sbt_tape' parms
'SBT_LIBRARY=Path_to_Data_Protector_MML,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME,OB2BARLIST=RAC_arch) '
connect username/password@INSTANCE_1;
allocate channel 'dev_2' type 'sbt_tape' parms
'SBT_LIBRARY=Path_to_Data_Protector_MML,
ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME,OB2BARLIST=RAC_arch) '
connect username/password@INSTANCE_2;
backup
format 'RAC_arch<QU_%s:%t:%p>.dbf'
archivelog all;
}
```

Problem

The Recovery Catalog was lost and the control file cannot be restored from Data Protector managed backup

The Recovery Catalog was not used, the RMAN autobackup feature was not used (for Oracle 9i/10g), and the control file cannot be restored from Data Protector managed backup. A valid control file backup exists on tape.

Action

- For Oracle 8i, restore the control file from RMAN backup set with the following SQL script:

```
DECLARE
devtype varchar2(256);
```

```

done boolean;
BEGIN
devtype:=dbms_backup_restore.deviceallocate('sbt_tape',
params=>'ENV=(OB2BARTYPE=Oracle8,OB2APPNAME=DB_NAME,
OB2BARHOSTNAME=hostname) ');
dbms_backup_restore.restoreresetdatafile;
dbms_backup_restore.restorecontrolfileto('/tmp/tmp.cf');
dbms_backup_restore.restorebackuppiece('backup piece handle',
done=>done);
END;

```

For the *backup piece handle* search the Data Protector internal database and session outputs of previous backup sessions.

Use the following RMAN script to copy the control file, mount and restore the database, and perform a database recovery:

```

run {
allocate channel 'dev_0' type disk;
replicate controlfile from '/tmp/foo.cf';
sql 'alter database mount';
set until time 'MMM DD YY HH24:MM:SS';
restore database;
recover database;
sql 'alter database open resetlogs';
release channel 'dev_0';
}

```

At this point you must manually register any backups made after the control file backup that was restored. After that, continue with the restore procedure.

- For Oracle 9i/10g, restore the control file from RMAN backup set, mount and restore the database, and perform database recovery:

```

run {
allocate channel 'dev_0' type 'sbt_tape' parms
'SBT_LIBRARY=Path_to_Data_Protector_MML';
restore controlfile from 'backup piece handle';
sql 'alter database mount';
set until time 'MMM DD YY HH24:MM:SS';
restore database;
recover database;
sql 'alter database open resetlogs';
release channel 'dev_0';
}

```

At this point you must manually register any backups made after the control file backup that was restored. After that, continue with the restore procedure.

For the *backup piece handle* search the Data Protector internal database and session outputs of previous backup sessions.

Problem

Shared library that provides thread local storage cannot be loaded

The problem occurs with Oracle8i on HP-UX 11.11.

When, during restore, Data Protector attempts to dynamically load a shared library that provides thread local storage, an error similar to the following is displayed:

```
Can't dlopen() a library containing Thread Local Storage:  
ORACLE_HOME/JRE/lib/PA_RISC/native_threads/libjava.sl
```

The problem occurs when the Radius Authentication Adapter is installed. In this case, `libclntsh.sl` is dynamically linked with the library `libjava.sl` that provides thread local storage.

Action

Uninstall the Radius Authentication Adapter to remove `libjava.sl` from the list of dynamic libraries for `libclntsh.sl`. See *Oracle MetaLink, DOC ID: 113395.1* for information on how to uninstall the Radius Authentication Adapter.

Problem

Binary util_orarest is missing

The message below sometimes appears when you are restoring database items to a new host:

```
"Binary util_orarest is missing. Cannot get information from  
the remote host."
```

Action

To resolve the problem:

1. Close Data Protector.
2. Set the environment variable on the system where the Cell Manager resides:

```
OB2_ORARESTHOSTNAME = target_Oracle_host
```

3. Restart Data Protector and try to restore the database items again.
4. When the restore is complete, close Data Protector and re-set the following environment variable:

```
OB2_ORARESTHOSTNAME = empty
```

5. Restart Data Protector.

Problem

How to modify the RMAN restore script

When you start a restore of an Oracle database using the Data Protector GUI or CLI, an RMAN restore script is created, which is instantly run, so you cannot edit it first.

Action

To edit the script before it is run, set the Data Protector `omnirc` variable `OB2RMANSAVE` to point to an existing directory. When the variable is set and you start a restore, the RMAN restore script, which is created at run time, is saved to the specified location under the name

`RMAN_restore_backup_specification_name.rman`, and the actual restore is skipped. Then you can edit the script and run it manually afterwards. On how to set the `omnirc` variable, see the online Help index: "omnirc options".

To start a restore using Data Protector again, clear the `OB2RMANSAVE` variable by deleting its content or commenting or removing the whole variable. If you comment or remove the variable on a Windows client, restart the Data Protector `Inet` service for the settings to take effect.

2 Data Protector SAP R/3 ZDB integration

Introduction

This chapter explains how to configure and use the Data Protector SAP R/3 ZDB integration (**SAP R/3 ZDB integration**). It describes concepts and methods you need to understand to back up and restore the following files of the SAP R/3 database environment (**SAP R/3 objects**):

- data files
- control files
- online redo logs
- offline (archived) redo logs
- SAP R/3 logs and parameter files

Data Protector supports offline and online backups. During an online backup, the SAP R/3 application is actively used.

Data Protector offers interactive and scheduled backups of the following types:

- ZDB to disk
- ZDB to tape
- ZDB to disk+tape

Data Protector supports only a filesystem restore. You can restore SAP R/3 files:

- To the original location
- To another client
- To another directory

Table 7 on page 164 shows which restore methods are available, depending on the ZDB session you restore from.

Table 7 Backup and restore sessions

ZDB type	Restore methods
ZDB to tape	Standard restore
ZDB to disk	Instant recovery
ZDB to disk+tape	Standard restore, instant recovery

When the restore completes, you can recover the database to a specific point in time using the SAP BRTOOLS interface.

Table 8 Supported disk arrays and array configurations

Supported array	Supported configurations
EMC Symmetrix	TimeFinder, SRDF, combined SRDF+TimeFinder
HP StorageWorks Disk Array XP (XP)	BC, CA, combined BC+CA
HP StorageWorks Enterprise Virtual Array (EVA)	BC, combined CA+BC
HP StorageWorks Virtual Array (VA)	BC

This chapter provides information specific to the Data Protector SAP R/3 ZDB integration. For general Data Protector procedures and options, see the *online Help*. For details on ZDB terminology, ZDB types, advantages of offline and online backups, and instant recovery concepts, see the *HP Data Protector zero downtime backup concepts guide*.

Integration concepts

Figure 39 on page 165 shows the architecture of the Data Protector SAP R/3 ZDB integration. The figure illustrates the preferred configuration, in which the Oracle control file, online redo log files, and Oracle9i SPFILE reside on a different volume group than the Oracle data files.

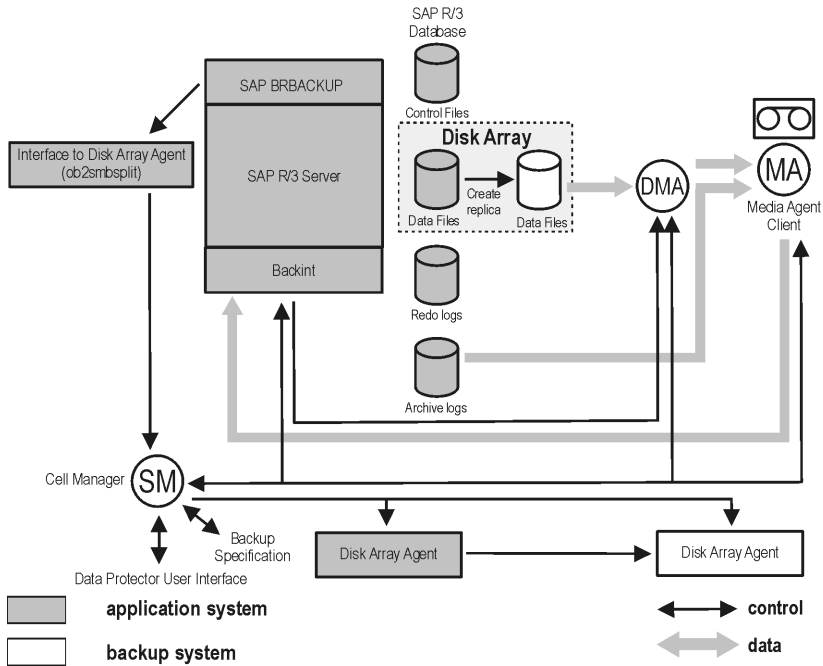


Figure 39 SAP R/3 integration architecture

For other supported configurations, see “ZDB integrations omnirc variables” on page 410.

ZDB flow

For details on how ZDB options affect the ZDB flow, including mounting, activating volume/disk groups and so on, see the *HP Data Protector zero downtime backup administrator's guide*.

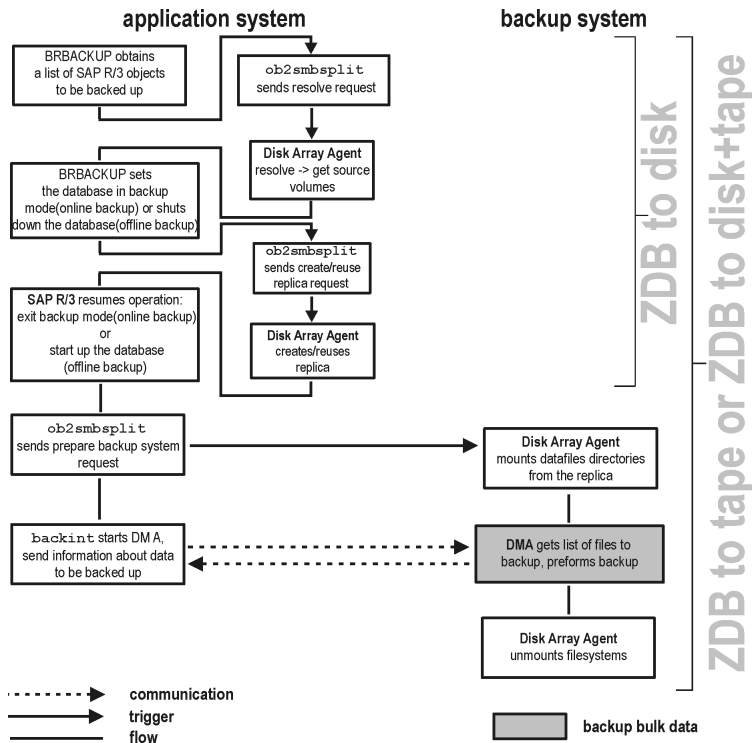


Figure 40 SAP R/3 ZDB session flow (BRBACKUP started on the application system)

1. The SAP R/3 backup specification is read and the Data Protector `omnisap.exe` program is started on the application system.
2. `omnisap.exe` starts BRBACKUP, which switches the database to the backup mode (online backup) or shuts down the database (offline backup), and starts the split command on the application system, with the list of files to be included in the replica creation.

The database is put out of the backup mode (online backup) or is restarted (offline backup) after the replica is created.



NOTE:

Data Protector can use the `splitint` interface (if BRTOOLS supports it) to reduce the time during which the database is in the backup mode.

3. The Data Protector `ob2smbsplit` command resolves the backup configuration, creates a replica, and preparing the replica for backup.
The mountpoints for the backed up object are created on the backup system.
The backup volume/disk groups are activated and the filesystems are mounted on the backup system.
4. **ZDB to disk only:** The remaining ZDB options are processed and the details on the session are written to the ZDB database. The session then finishes.
5. **ZDB to tape, ZDB to disk+tape:** BRBACKUP starts the Data Protector `backint` program, which starts establishing a connection between the Data Protector Data Movement Agents (DMA) on the backup system and the General Media Agents (MA). The process is coordinated by the Data Protector Backup Session Manager (BSM). When the connection is established, the data specified for backup is streamed to tape.
6. When the data transfer completes, the backup system is disabled (filesystems are unmounted on all platforms and volume/disk groups deactivated on UNIX).
7. **EMC and XP only:** Links are re-established, depending on how ZDB options are specified.

Data Protector SAP R/3 configuration file

Data Protector stores the integration parameters for every configured SAP R/3 database in the following file on the Cell Manager:

- On UNIX:
`/etc/opt/omni/server/integ/config/SAP/client_name%ORACLE_SID`
- On Windows:
`Data_Protector_home\Config\Server\Integ\Config\Sap\client_name%ORACLE_SID`

The parameters stored are:

- Oracle home directory
- encoded connection string to the target database
- BRTOOLS home directory
- the variables which need to be exported prior to starting a backup
- SAPDATA home directory
- user name and user group
- temporary directory used for the copy of the control file or redo logs
- list of control files and redo logs that will be copied to a safe location

- character set (ORA_NLS_CHARACTERSET)
- speed parameters (time needed for a specific file to back up - in seconds)
- manual balancing parameters

The configuration parameters are written to the Data Protector SAP R/3 configuration file:

- during configuration of the integration
- during creation of a backup specification
- when the configuration parameters are changed

IMPORTANT:

To avoid problems with your backups, take extra care to ensure the syntax and punctuation of your configuration file match the examples.

NOTE:

You can set up the parameters in the `Environment` section (sublist) of the file by referring to other environment variables in the following way:

```
SAPDATA_HOME=${ORACLE_HOME}/data
```

Syntax

The syntax of the Data Protector SAP R/3 configuration file is as follows:

```
ORACLE_HOME='ORACLE_HOME';
ConnStr='ENCODED_CONNECTION_STRING_TO_THE_TARGET_DATABASE';
BR_directory='BRTOOLS_HOME';
SAPDATA_HOME='SAPDATA_HOME';
ORA_NLS_CHARACTERSET='CHARACTER_SET';
OSUSER='USER_NAME';
OSGROUP='USER_GROUP';
Environment={
  [ENV_var1='value1'];
  [ENV_var2='value2';
  ...]
}
SAP_Parameters={backup_spec_name=('-concurrency #_of_concurrency
| '-time_balance' | '-load_balance' | '-manual_balance');
}
speed={
```



```

AVERAGE=1;
'filename'=#_of_seconds_needed_to_back_up_this_file;
}
compression={'filename'=size_of_the_file_in_bytes_after_the
_compression;
}
manual_balance={backup_specification_name={
'filename'=device_number;
}
}
}

```

The `ORA_NLS_CHARACTERSET` parameter is set automatically by Data Protector during SAP R/3 database configuration. For details on how to configure SAP R/3 database for use with Data Protector, see [“Configuring SAP R/3 databases”](#) on page 182.

Example

This is an example of the file:

```

ORACLE_HOME='/app/oracle805/product';
ConnStr='EIBBKIBBEIBBFIBBGHBBOHBB
QDBBOFBBCFBFBBCFBBIFBBGFBBDBBBFBBCFBBDFBBCFBB';
BR_directory='/usr/sap/ABA/SYS/exe/run';
SAPDATA_HOME='/sap';
ORA_NLS_CHARACTERSET='USASCII7';
OSUSER='orasid';
OSGROUP='dba';

Environment={
}
SAP_Parameters={
sap_weekly_offline=('-concurrency 1', '-no_balance');
sap_daily_online=('-concurrency 3', '-load_balance');
sap_daily_manual=('-concurrency 3', '-manual_balance');
}
speed={
AVERAGE=203971;
'/file1'=138186;
'/file2'=269756;
}
compression={
'/file1'=1234;
'/file2'=5678;
}
manual_balance={
sap_daily_manual={
'/file1'=1; /* file 1 is backed up by the first sapback */

```

```

'/file2'=2; /* file 2 is backed up by the second sapback */
'/file3'=1; /* file 3 is backed up by the first sapback */
'/file4'=1;
}
}

```

Setting, retrieving, listing, and deleting Data Protector SAP R/3 configuration file parameters using the CLI

The Data Protector SAP R/3 configuration file parameters are normally written to the Data Protector SAP R/3 configuration file after:

- the Data Protector configuration of the Oracle instance that is run by SAP R/3 is completed.
- a new backup specification is created.
- a backup that uses balancing by time algorithm is completed.

The `util_cmd` command

You can set, retrieve, list, or delete the Data Protector SAP R/3 configuration file parameters using the `util_cmd -putopt` (setting a parameter), `util_cmd -getopt` (retrieving a parameter), or `util_cmd -getconf` (listing all parameters) command on the Data Protector SAP R/3 client. The command resides in the `Data_Protector_home\bin` (Windows systems) or `/opt/omni/lbin` (HP-UX, Solaris systems) directory.

Cluster-aware clients

In a cluster environment, the environment variable `OB2BARHOSTNAME` must be defined as the virtual hostname before running the `util_cmd` command from the command line (on the client). The `OB2BARHOSTNAME` variable is set as follows:

- On UNIX: `export OB2BARHOSTNAME=virtual_hostname`
- On Windows: `set OB2BARHOSTNAME=virtual_hostname`

The `util_cmd` synopsis

The syntax of the `util_cmd` command is as follows:

```

util_cmd -getconf[ig] SAP oracle_instance [-local filename]
util_cmd -getopt[ion] [SAP oracle_instance] option_name
[-sub[list] sublist_name] [-local filename]

```

```
util_cmd -putopt[ion] [SAP oracle_instance] option_name  
[option_value] [-sub[list] sublist_name] [-local filename]
```

where:

option_name is the name of the parameter

option_value is the value for the parameter

`[-sub[list] sublist_name]` specifies the sublist in the configuration file to which a parameter is written to or taken from.

`[-local filename]` specifies one of the following:

- When it is used with the `-getconf[ig]` option, it specifies the filename for the output of the command to be written to. If the `-local` option is not specified, the output is written to the standard output.
- When it is used with the `-getopt[ion]`, it specifies the filename of the file from which the parameter and its value are to be taken and then written to the standard output. If the `-local` option is not specified, the parameter and its value are taken from the Data Protector SAP R/3 configuration file and then written to the standard output.
- When it is used with the `-putopt[ion]` option, it specifies the filename for the output of the command to be written to. If the `-local` option is not specified, the output is written to the Data Protector SAP R/3 configuration file.

 **NOTE:**

If you are setting the *option_value* parameter as a number, the number must be put in single quotes, surrounded by double quotes.

Return values

The `util_cmd` command displays a short status message after each operation (writes it to the standard error):

- Configuration read/write operation successful.
This message is displayed when all the requested operations have been completed successfully.
- Configuration option/file not found.
This message is displayed when either an option with the specified name does not exist in the configuration, or the file specified as the `-local` parameter does not exist.

- Configuration read/write operation failed.

This message is displayed if any fatal errors occurred, for example: the Cell Manager is unavailable, the Data Protector SAP R/3 configuration file is missing on the Cell Manager, etc.

Setting parameters

To set the Data Protector `OB2OPTS` and the Oracle `BR_TRACE` parameters for the Oracle instance `ICE` that is run by SAP R/3, use the following commands on the Data Protector SAP R/3 client:

Windows

```
Data_Protector_home\bin\util_cmd -putopt SAP ICE OB2OPTS  
'-debug 1-200 debug.txt' -sublist Environment
```

```
Data_Protector_home\bin\util_cmd -putopt SAP ICE BR_TRACE  
"'10'" -sublist Environment
```

HP-UX, Solaris

```
/opt/omni/lbin/util_cmd -putopt SAP ICE OB2OPTS '-debug \  
1-200 debug.txt' -sublist Environment
```

```
/opt/omni/lbin/util_cmd -putopt SAP ICE BR_TRACE "'10'"  
-sublist Environment
```

Retrieving parameters

To retrieve the value of the `OB2OPTS` parameter for the Oracle instance `ICE`, use the following command on the Data Protector SAP R/3 client:

- On Windows: `Data_Protector_home\bin\util_cmd -getopt SAP ICE OB2OPTS -sublist Environment`
- On HP-UX, Solaris: `/opt/omni/lbin/util_cmd -getopt SAP ICE OB2OPTS \
-sublist Environment`

Listing parameters

To list all the Data Protector SAP R/3 configuration file parameters for the Oracle instance `ICE`, use the following command on the Data Protector SAP R/3 client:

- On Windows: `Data_Protector_home\bin\util_cmd -getconf SAP ICE`
- On HP-UX, Solaris: `/opt/omni/lbin/util_cmd -getconf SAP ICE`

Deleting parameters

To remove the value of the `OB2OPTS` parameter for the Oracle instance `ICE`, use the following command on the Data Protector SAP R/3 client:

- On Windows: `Data_Protector_home\bin\util_cmd -putopt SAP ICE OB2PTS "" -sublist Environment`
- On HP-UX, Solaris: `/opt/omni/1bin/util_cmd -putopt SAP ICE OB2OPTS "" -sublist Environment`

Configuring the integration

To configure the integration:

1. Configure the required user accounts. See [“Configuring user accounts”](#) on page 175.
2. Configure SQL*Net V2 or Net8 TNS listener. See [“Configuring SQL*Net V2 or Net8 TNS listener”](#) on page 177.
3. Check the connection to the Oracle database from the application system. See [“Checking the connection”](#) on page 178.
4. Enable the use of the authentication password file. See [“Authentication password file”](#) on page 178.
5. Optionally, set the archived logging mode to enable online backups. See [“Enabling archived logging”](#) on page 179.
6. Share directories on the application system. See [“Sharing directories on the application system”](#) on page 180.
7. Configure every SAP R/3 database you intend to back up from or restore to. See [“Configuring SAP R/3 databases”](#) on page 182.
8. Configure the SAP R/3 parameter file. See [“Configuring the SAP R/3 parameter file”](#) on page 191.

Prerequisites

- Ensure that you have correctly installed and configured the SAP R/3 application. The database used by the SAP R/3 application must be an Oracle database. If any other database is used, you can back it up using the corresponding Data Protector integration.

- For supported versions, platforms, devices, and other information, see the *HP Data Protector product announcements, software notes, and references* or <http://www.hp.com/support/manuals>.
- For information on installing, configuring, and using the SAP R/3 application and the SAP backup and restore tools (BRBACKUP, BRRESTORE, and BRARCHIVE), see the SAP R/3 application documentation.
- Ensure that you have a license to use the Data Protector SAP R/3 ZDB integration. For information, see the *HP Data Protector installation and licensing guide*.
- Ensure that you have correctly installed Data Protector.
 - For information on how to install the Data Protector disk array integration (EMC, XP, VA, or EVA) with SAP R/3 in various architectures, see the *HP Data Protector installation and licensing guide*.
 - On how to configure the Data Protector ZDB integration (EMC, XP, VA, or EVA), see the *HP Data Protector zero downtime backup administrator's guide*.
 - For information on the Data Protector Cell Manager package configuration in the MC/SG cluster, see the online Help index: "MC/ServiceGuard integration".



NOTE:

You cannot run ZDB sessions in the RMAN mode.

Before you begin

- Configure devices and media for use with Data Protector.
- To test whether the SAP R/3 system and the Cell Manager communicate properly, configure and run a Data Protector filesystem backup and restore.
- **Windows only:** Restart the Data Protector `Inet` service under the Oracle operating system user account described in "[Configuring user accounts](#)" on page 175. For information on changing the Data Protector `Inet` account, see the online Help index: "changing Data Protector `Inet` account".

Cluster-aware clients

- Configure SAP R/3 databases only on one cluster node, since the configuration files reside on the Cell Manager.

UNIX: During the configuration, Data Protector creates a link to the Data Protector `backint` and `splitint` programs on the currently active node. On all the other nodes, do it manually. Run:

```
ln -s /opt/omni/1bin/backint \  
/usr/sap/ORACLE_SID/sys/exe/run
```

If `splitint` is supported by BRTOOLS, also run:

```
ln -s /opt/omni/1bin/ob2smbsplit \  
/usr/sap/ORACLE_SID/sys/exe/run/splitint
```

Windows: During the configuration, Data Protector copies the Data Protector `backint` and `ob2smbsplit.exe` programs (the latter only if `splitint` is supported by BRTOOLS) from `Data_Protector_home\bin` to the directory that stores the SAP backup tools and renames `ob2smbsplit.exe` to `splitint.exe`. This is done only on the currently active node. On the other node, do it manually.

- If you intend to use the Data Protector CLI, set the Data Protector environment variable `OB2BARHOSTNAME` to the virtual server name as follows:

Windows: set `OB2BARHOSTNAME=virtual_server_name`

UNIX: export `OB2BARHOSTNAME=virtual_server_name`

- **Tru64:** Create the following links:

```
ln -s /sapfiles/admin/dbs/initsap.dba initSAP.dba
```

```
ln -s /sapfiles/admin/dbs/initsap.ora initSAP.ora
```

```
ln -s /sapfiles/admin/dbs/initsap.sap initSAP.sap
```



NOTE:

SAP recommends to install SAP backup utilities on all cluster nodes.

Configuring user accounts

To enable backup and restore of SAP R/3 database files, you need to configure or create several user accounts.

Oracle operating system user account	Operating system user account that is added to the following user groups: <ul style="list-style-type: none">• UNIX systems: <code>dba</code> and <code>sapsys</code>• Windows systems: <code>ORA_DBA</code> and <code>ORA_SID_DBA</code> local groups
--------------------------------------	--

	<p>For example, user <code>oraSID</code>.</p> <p>UNIX systems only: Ensure that this user is the owner of the filesystem or of the raw logical volume on which the database is mounted. The minimum permissions should be 740.</p>
User account <code>root</code> (UNIX systems only)	Default operating system administrator's user account added to the <code>dba</code> user group.
Oracle database user account	<p>Database user account granted at least the following Oracle roles:</p> <ul style="list-style-type: none"> • <code>sysdba</code> • <code>sysoper</code> <p>For example, user <code>system</code>.</p>

Add the following user accounts to the Data Protector `admin` or `operator` user group:

- Oracle operating system user account
- **UNIX systems only:** User account `root` (for both the application system and backup system)

In cluster environments, add these user accounts to the Data Protector `admin` or `operator` user group for the following clients:

- virtual server
- every node in the cluster

For information on adding Data Protector users, see the online Help index: "adding users".

Configuring SQL*Net V2 or Net8 TNS listener

1. Ensure that the `listener.ora` and `tnsnames.ora` files on the application system are configured as shown in the following example. The files are located in:

UNIX: `ORACLE_HOME/network/admin`

Windows: `ORACLE_HOME\network\admin`

Example

Oracle instance: PRO

Application system: alpha.hp.com

<code>listener.ora</code>	<pre>LISTENER = (DESCRIPTION_LIST = (DESCRIPTION = (AADDRESS = (PROTOCOL = TCP) (HOST = alpha.hp.com) (PORT = 1522)))) SID_LIST_LISTENER = (SID_LIST = (SID_DESC = (GLOBAL_DBNAME = PRO) (SID_NAME = PRO) (ORACLE_HOME = /app/oracle815/product)))</pre>
<code>tnsnames.ora</code>	<pre>PRO = (DESCRIPTION = (ADDRESS_LIST = (ADDRESS = (PROTOCOL = TCP) (HOST = alpha.hp.com) (PORT = 1522))) (CONNECT_DATA = (SERVICE_NAME = PRO)))</pre>

2. Start the SQL*Net V2 or Net8 TNS listener by running the following on the Oracle Server system:

UNIX: `ORACLE_HOME/bin/lsnrctl start`

Windows: `ORACLE_HOME\bin\lsnrctl start`

Checking the connection

To check the connection to the Oracle instance from the application system:

1. Log in to the application system as the Oracle OS user.
2. Export/set the `ORACLE_HOME` and `ORACLE_SID` variables.
3. Start `sqlplus`.
4. Connect to the Oracle target database as the Oracle database user, first with the `sysdba` role and then with the `sysoper` role.

Example

For the following configuration:

Oracle instance: PRO `ORACLE_HOME: /app/oracle816/product`

run:

```
id
uid=102(oraprod) gid=101(dba)
export ORACLE_SID=PRO
export ORACLE_HOME=/app/oracle816/product
export SHLIB_PATH=/app/oracle816/product/lib:/opt/omni/lbin
sqlplus /nolog
SQLPLUS> connect system/manager@PRO as sysdba;
Connected.
SQLPLUS> connect system/manager@PRO as sysoper;
Connected.
```

Authentication password file

Enable the use of the authentication password file for the database administrator:

1. Shut down the Oracle target database on the application system.
2. In the `initORACLE_SID.ora` file, specify:

```
remote_login_passwordfile = exclusive
```

For instructions on how to set up the password file, see the Oracle documentation.

Enabling archived logging

When you set the database to the archived logging mode, you protect the unsaved online redo logs from being overwritten. Online backup of data files is useless without the related redo logs because you cannot recover the database to a consistent state.

 **TIP:**

Archive the redo log files generated during the online backup immediately after BRBACKUP completes.

To protect the archive directory from overflowing, clear the directory regularly.

To enable archived logging:

1. In the `initORACLE_SID.ora` file, set
`log_archive_start = true`
and specify the `log_archive_dest` option.

Example

This is an example of the `initORACLE_SID.ora` file for the Oracle instance PRO:

```
# @(#)initSID.ora      20.4.6.1      SAP      98/03/30
#####
# (c)Copyright SAP AG, Walldorf
#####
. . . .
. . . . .
. . . . .
. . . . .
### ORACLE Authentication Password File
remote_login_passwordfile = exclusive
### ORACLE archiving
log_archive_dest = /oracle/PRO/saparch/PROarch
log_archive_start = true
. . . . .
```

2. Mount the Oracle database and start the archived logging mode using the Oracle Server Manager. Run:

```
startup mount
alter database archivelog;
archive log start;
alter database open;
```

Example

For the Oracle instance PRO, run:

UNIX: export ORACLE_SID=PRO **Windows:** set ORACLE_SID=PRO

```
sqlplus /nolog
SQLPLUS> connect user/passwd@PRO;
Connected.
SQLPLUS> startup mount
ORACLE instance started.
Total System Global Area          6060224 bytes
Fixed Size                        47296 bytes
Variable Size                     4292608 bytes
Database Buffers                  1638400 bytes
Redo Buffers                       81920 bytes
Database mounted.
SQLPLUS> alter database archivelog;
Statement processed.
SQLPLUS> archive log start;
Statement processed.
SQLPLUS> alter database open;
```

Sharing directories on the application system

The following directories on the application system must be accessible:

- sapbackup
- sapreorg
- Oracle home directory
- BR*Tools home directory

 **NOTE:**

The `sapreorg` and `BR*Tools` home directories must be accessible only if you want to run SAP compliant ZDB sessions (BRBACKUP is started on the backup system and not on the application system).

UNIX application system

1. Share the directories on the application system through NFS with root permissions.

For example, suppose that the `sapbackup` directory on the application system points to `/oracle/SID/sapbackup` and the backup system is `backup.company.com`. To share the `sapbackup` directory:

HP-UX: In the file `/etc/exports` on the application system, add the line:

```
/oracle/SID/sapbackup -root=backup.company.com
```

Solaris: In the file `/etc/dfs/dfstab` on the application system, add the line:

```
share -F nfs -o root=backup.company.com  
/oracle/SID/sapbackup
```

2. Mount the directories on the backup system. Ensure that you have the same directory structure on both the application and backup system.

For example, suppose that you have an HP-UX application system `app.company.com`. To mount the `/oracle/SID/sapbackup` directory on the backup system, add the following line to the file `/etc/fstab` on the backup system:

```
app.company.com:/oracle/SID/sapbackup  
/oracle/SID/sapbackup nfs defaults 0 0
```

Windows application system

- On the application system, find the location of the `sapbackup` and `sapreorg` directories. If they reside inside the SAP data home directory, share this directory under any name you want. Then, on the backup system, create the `SAPDATA_HOME` Windows registry key, specifying the SAP data home directory path as seen from the backup system.

For example, suppose your application system is `mycomputer.company.com` and the SAP data home is `K:\oracle\my_instance`, which you share under the name `my_SAPinstance`. Then, the `SAPDATA_HOME` Windows registry key

on the backup system must have the value
`\\mycomputer.company.com\my_SAPinstance.`

If the `sapbackup` and `sapreorg` directories do not reside together, share each directory separately and also create a separate Windows registry key on the backup system (`SAPBACKUP`, `SAPREORG`).

- Share the Oracle home directory on the application system and specify its path in the `ORACLE_HOME` Windows registry key on the backup system, similarly as described above.
- Ensure that the BR*Tools home directory on the application system is accessible from the backup system as follows:

```
\\application_system\sapmnt\SAP_SID\SYS\exe\run
```



TIP:

Instead of creating registry keys, you can also set the Data Protector SAP R/3 integration environment variables (`ORACLE_HOME`, `SAPDATA_HOME`, `SAPBACKUP`, `SAPREORG`).

Choosing authentication mode

Data Protector SAP R/3 ZDB integration supports two authentication modes for accessing Oracle databases that are used by SAP R/3:

- database authentication mode
- operating system authentication mode

With database authentication mode, you need to re-configure an SAP R/3 database with the new Oracle login information each time the respective Oracle database user account changes. Such a reconfiguration is not needed if operating system authentication mode is used.

You select the preferred authentication mode when you configure a particular SAP R/3 database.

Configuring SAP R/3 databases

You need to provide Data Protector with the following configuration parameters:

- Oracle Server home directory
- SAP R/3 data home directory

- Optionally, if you choose database authentication mode, Oracle database user account. The user account is used by BRBACKUP and BRARCHIVE during backup.
- Directory in which the SAP backup utilities are stored
- If Oracle 10g Instant Client is installed on the backup system, the directory in which the SQL tools are installed.

Data Protector then creates the configuration file for the SAP R/3 database on the Cell Manager and verifies the connection to the database. On UNIX, Data Protector also creates a soft link for the `backint` program from the directory that stores the SAP backup utilities to `/opt/omni/lbin`.

On Windows, Data Protector copies the `backint` and programs (the latter only if `splitint` is supported by BR*Tools) from `Data_Protector_home\bin` to the directory that stores the SAP backup tools and renames `ob2smbsplit.exe` to `splitint.exe`.

To configure an SAP R/3 database, use the Data Protector GUI or CLI.

Before you begin

- Ensure that the SAP R/3 database is open.

Using the Data Protector GUI

1. In the Context List, click **Backup**.
2. In the Scoping Pane, expand **Backup Specifications**, right-click **SAP R/3**, and click **Add Backup**.
3. In the **Create New Backup** dialog box, select the template.
In the **Backup type** drop-down list, select the **Split mirror backup**.
Click **OK**.

4. In **Application system**, select the SAP R/3 client to be backed up. In cluster environments, select the virtual server.

In **Backup system**, select the backup system.

Specify other disk array specific backup options (see [Figure 46](#) on page 197 for EMC, [Figure 47](#) on page 198 for XP, [Figure 48](#) on page 199 for VA, or [Figure 49](#) on page 200 for EVA). For details on the options, press **F1**.



NOTE:

XP, VA, and EVA only: To enable instant recovery, select **Track the replica for instant recovery**.

5. In **Client**, select the SAP R/3 system. In cluster environments, select the virtual server.

In **Application database**, type the Oracle instance name (ORACLE_SID).

UNIX only: In **Username**, type the Oracle OS user described in “Configuring user accounts” on page 175. In **Group name**, type dba.

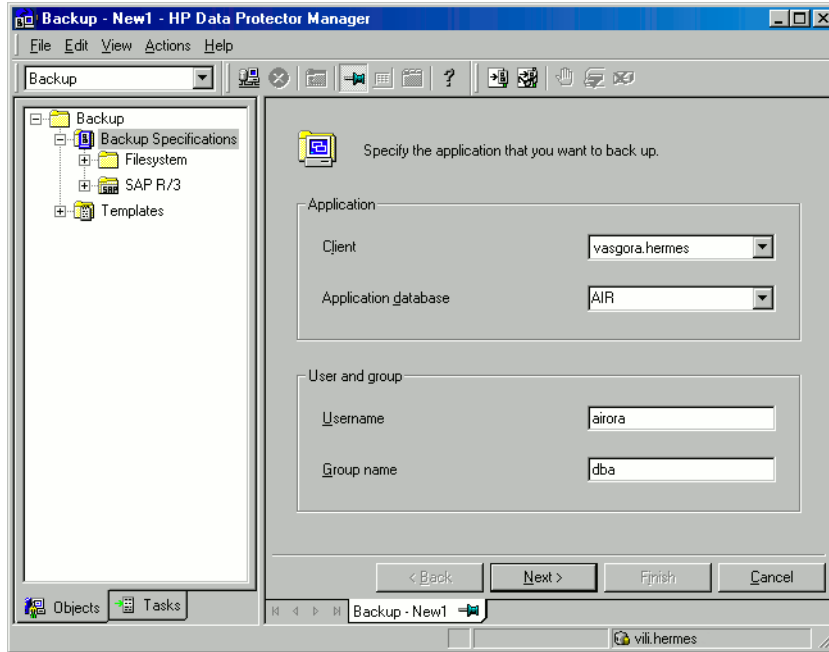


Figure 41 Specifying an SAP R/3 system and Oracle instance

Click **Next**.

6. In the **Configure SAP** dialog box, specify the pathname of the Oracle Server home directory and SAP R/3 data home directory. If you leave the fields empty, the default `ORACLE_HOME` directory is used.

Under **Oracle login information to target database**, specify the following:

- **Username** and **Password**: These two options determine the authentication mode that is used for accessing the Oracle database.
 - To select the database authentication mode, specify the user name and password of the Oracle database user account described in “[Configuring user accounts](#)” on page 175.
 - To select the operating system authentication mode, leave the text boxes empty.
- **Service**: Specify the Oracle service name.

In **Backup and restore executables directory**, specify the pathname of the directory in which the SAP backup utilities reside. By default, the utilities reside in:

UNIX: `/usr/sap/ORACLE_SID/SYS/exe/run`

Windows: `\\SAP_system\sapmnt\ORACLE_SID\sys\exe\run`



Figure 42 Configuring an SAP R/3 database on a UNIX system (operating system authentication mode)

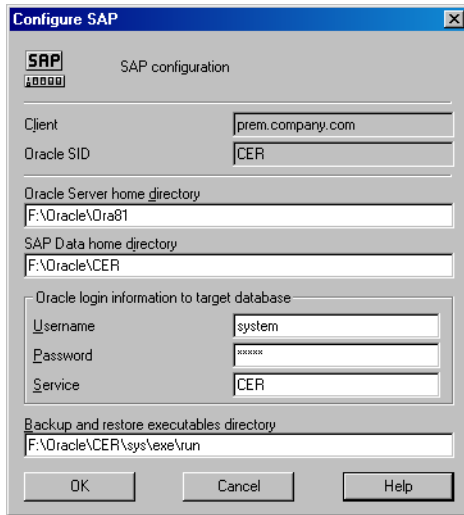


Figure 43 Configuring an SAP R/3 database on a Windows system (database authentication mode)

Click **OK**.

7. The SAP R/3 database is configured. Exit the GUI or proceed with creating the backup specification at [Step 7](#) on page 201.

Using the Data Protector CLI

1. Log in to the SAP R/3 system using the Oracle operating system user account.
2. At the command prompt, change current directory to the following directory:

Windows systems: `Data_Protector_home\bin`

HP-UX, Solaris systems: `/opt/omni/lbin`

3. Run:

```
util_sap.exe -CONFIG ORACLE_SID ORACLE_HOME
targetdb_connection_string SAPTOOLS_DIR
[SAPDATA_HOME] [SQL_PATH]
```

Parameter description

`ORACLE_SID`

Oracle instance name.

`ORACLE_HOME`

Pathname of the Oracle Server home directory.

targetdb_connection_string

This argument value determines the authentication mode used for accessing the Oracle database:

- To select the database authentication mode, specify the login information to the target database in the format *user_name/password@Oracle_service*.
- To select the operating system authentication mode, specify only the character */*.

SAPTOOLS_DIR

Pathname of the directory that stores the SAP backup utilities.

SAPDATA_HOME

Pathname of the directory where the SAP R/3 data files are installed. By default, this parameter is set to *ORACLE_HOME*.

SQL_PATH

Pathname of the directory where the SQLPlus tools are installed. Required if you installed Oracle 10g Instant Client on the backup client. If not specified, *ORACLE_HOME\bin* is used.

A successful configuration displays the message **RETVL*0*.

Handling errors

If you receive the message **RETVL*error_number* where *error_number* is different than zero, an error occurred.

To get the error description:

Windows:

Data_Protector_home\bin\omnigetmsg 12 error_number

which is located on the Cell Manager.

HP-UX, Solaris: Run:

/opt/omni/lbin/omnigetmsg 12 error_number

 **TIP:**

To get a list of Oracle instances that are used by the SAP R/3 application, run:

```
util_sap.exe -APP
```

To get a list of tablespaces of an Oracle instance, run:

```
util_sap.exe -OBJS0 ORACLE_SID
```

To get a list of database files of a tablespace, run:

```
util_sap.exe -OBJS1 ORACLE_SID TABLESPACE
```

Checking the configuration

You can check the configuration of an SAP R/3 database after you have created at least one backup specification for this database. Use the Data Protector GUI or CLI.

Using the Data Protector GUI

1. In the Context List, select **Backup**.
2. In the Scoping Pane, expand **Backup Specifications** and then **SAP R/3**. Click the backup specification to display the Oracle instance to be checked.
3. Right-click the Oracle instance and click **Check configuration**.

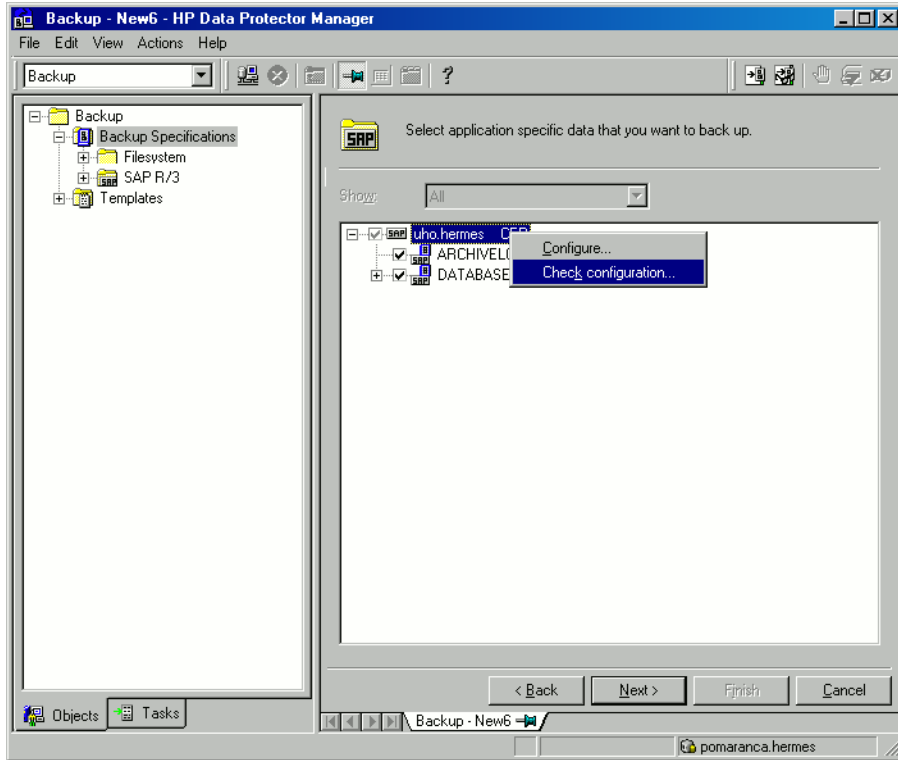


Figure 44 Checking the SAP R/3 configuration

Using the Data Protector CLI

Log in to the SAP R/3 system as the Oracle OS user. From the directory:

Windows: `Data_Protector_home\bin`

HP-UX, Solaris: `/opt/omni/lbin`

run:

```
util_sap.exe -CHKCONF ORACLE_SID
```

where `ORACLE_SID` is the name of the Oracle instance.

A successful configuration check displays the message `*RETV*0`.

If you receive the message `*RETV*error_number` where `error_number` is different than zero, an error occurred. On how to get the error description, see “[Handling errors](#)” on page 188.

To check if the SAP R/3 configuration is suitable for instant recovery, from the directory,

Windows: `Data_Protector_home\bin`

HP-UX, Solaris: `/opt/omni/lbin`

run:

```
util_sap.exe -CHKCONF_IR ORACLE_SID [-verbose]
```

The `-verbose` option creates a file with a list of control files and redo log files that are on the same source volumes as the database files. If this list is not empty, a warning is displayed, stating that instant recovery is impossible. On how to solve this problem, see [“Reconfiguring an Oracle instance for instant recovery”](#) on page 405.

Configuring the SAP R/3 parameter file

To configure the integration, you need to set some parameters in the SAP parameter file on the application system. The file template is located in:

UNIX: `ORACLE_HOME/dbs/initORACLE_SID.sap`

Windows: `ORACLE_HOME\database\initORACLE_SID.sap`

Table 9 SAP parameter file settings

Parameter	Value/Description
split_cmd	<p>UNIX: <code>"/opt/omni/lbin/ob2smbsplit \$"</code></p> <p>Windows: <code>"Data_Protector_home\bin\ob2smbsplit \$"</code></p> <p>Windows only: If the pathname contains spaces, use Windows short names instead.</p> <p>BRBACKUP uses this parameter to trigger the replica creation. At run time, the optional sign "\$" is replaced with the name of the text file containing the names of files to be backed up.</p>
primary_db	<p>This parameter defines the service name of the Oracle database to link the backup system to the application system.</p> <p>On the application system: LOCAL</p> <p>On the backup system: the name of the service that is used for connecting to the Oracle database</p>

Backup

The integration provides online and offline database backups of the following types:

- ZDB to disk
- ZDB to tape
- ZDB to disk+tape

To configure a backup, create a ZDB backup specification.

Archived logs can only be backed up in a ZDB to disk+tape, ZDB to tape, or non-ZDB (standard backup) session. If you try to back up archived logs in a ZDB to disk session, the session fails.



TIP:

Create a separate (non-ZDB) backup specification for backing up archived logs.

What is backed up depends on your selection in the backup specification. For details, see [Table 10](#) on page 192.

Table 10 What is backed up

Selected items	Backed up files
ARCHIVELOGS	<ul style="list-style-type: none">• offline (archived) redo logs• control files
DATABASE or individual tablespaces	<ul style="list-style-type: none">• data files• control files• SAP R/3 logs and parameter files• online redo logs (only during offline backups)

You can specify SAP R/3 backup options in two different ways:

- Using the BRBACKUP options.
- Using the SAP parameter file.

 **NOTE:**

The BRBACKUP options override the settings in the SAP parameter file.

You can specify BRBACKUP options when you create a backup specification. If no options are specified, the SAP R/3 application refers to the current settings in the SAP parameter file. In such a case, before running a backup, ensure that the SAP parameter file is correctly configured.

 **TIP:**

When you create a backup specification, select a backup template that already contains the desired BRBACKUP options.

Considerations

- Before you start a backup, ensure that the SAP R/3 database is in the `open` or `shutdown` mode.
- ZDB, restore, and instant recovery sessions that use the same source volume on the application system cannot run simultaneously.
- You cannot start a ZDB to disk session if another session is backing up the archived logs, even if the Oracle data files and the archived logs reside on different source volumes.
- **ZDB to disk only:** BRBACKUP displays the following error, which should be ignored.

```
Ignoring BRBACKUP return value 5 because it is disk-only backup
```
- **XP only:** If the LVM Mirroring configuration is used, Data Protector displays a warning during a backup because the volume group source volumes on the application system do not have their BC pairs assigned. The message should be ignored.
- **ZDB to disk only:** Archived logs cannot be backed up. To back up archived logs, create a non-ZDB (standard) SAP R/3 backup specification. For information, see the *HP Data Protector integration guide for Oracle and SAP*.
- Configurable backup modes are supported only through using the templates.

- By default, Data Protector supports all BRTOOL options except `-a` and `-b`. To enable support for `-a` and `-b`, set the `OB2BRTNOSECU omnirc` variable to 1. On how to set the `omnirc` variable, see the online Help index: “`omnirc options`”.

Creating backup specifications

Create a backup specification using the Data Protector Manager.

1. In the Context List, click **Backup**.
2. In the Scoping Pane, expand **Backup Specifications**, right-click **SAP R/3**, and click **Add Backup**.

3. In the **Create New Backup** dialog box, select a template (Figure 45 on page 195) and click **OK**.

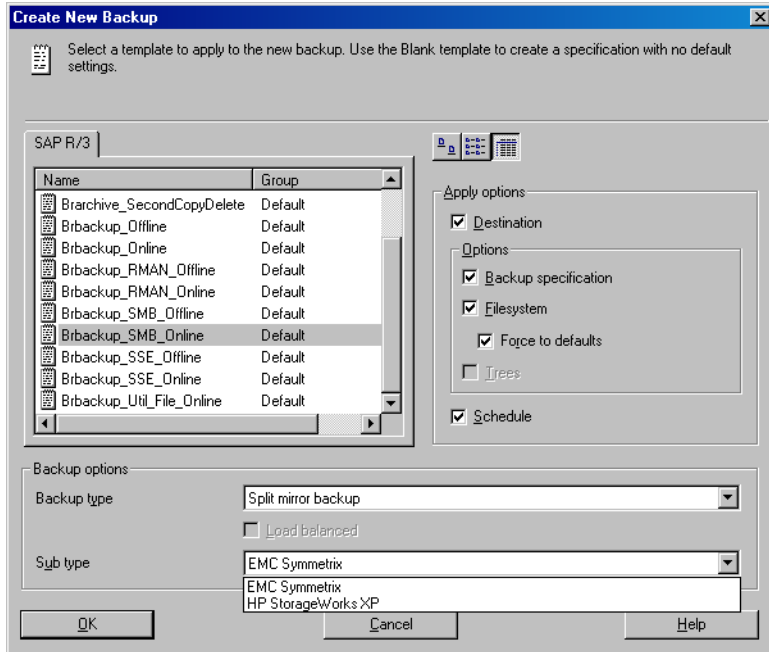


Figure 45 Selecting a template

Table 11 Backup templates

Blank SAP Backup	No predefined options.
Brbackup_SMB_Offline	Used for an offline ZDB (split mirror or snapshot backup). The database is stopped during the creation of a replica.
Brbackup_SMB_Online	Used for an online ZDB (split mirror or snapshot backup). The database is active during the creation of a replica.
Brbackup_SPLITINT_Offline	Used for an offline ZDB (split mirror or snapshot backup) using <code>splitint</code> . The database is stopped during the creation of a replica. The database is offline for a shorter period of time than if <code>SMB_offline</code> was used, but <code>splitint</code> must be supported by <code>BRTTOOLS</code> .

Brbackup_SPLITINT_Online	Used for an online ZDB (split mirror or snapshot backup) using <code>splitint</code> . The database is active during the creation of a replica. The database is in the backup mode for a shorter period of time than if <code>SMB_online</code> was used, but <code>splitint</code> must be supported by BRTOOLS.
--------------------------	---

In **Backup type**, select:

EMC and XP: Split mirror backup

VA and EVA: Snapshot backup

In **Sub type**, select the appropriate disk array agent.

4. In **Application system**, select the SAP R/3 client to be backed up. In cluster environments, select the virtual server.

In **Backup system**, select the backup system.

Specify other disk array specific backup options (see [Figure 46](#) on page 197 for EMC, [Figure 47](#) on page 198 for XP, [Figure 48](#) on page 199 for VA, or [Figure 49](#) on page 200 for EVA for EVA). For details on the options, press **F1**.

 **NOTE:**

XP, VA, and EVA only: To enable instant recovery, leave **Track the replica for instant recovery** selected.

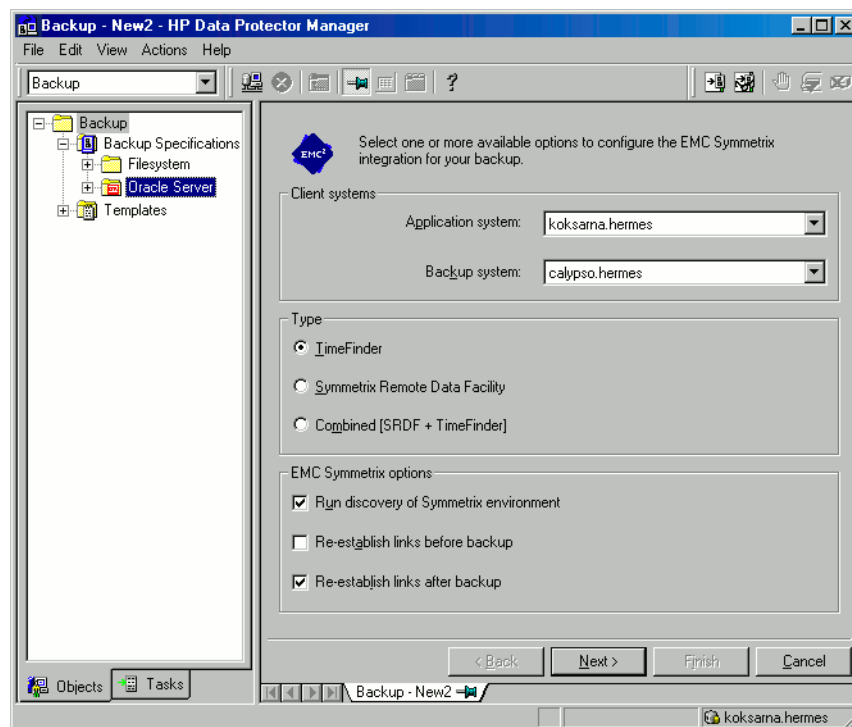


Figure 46 EMC backup options

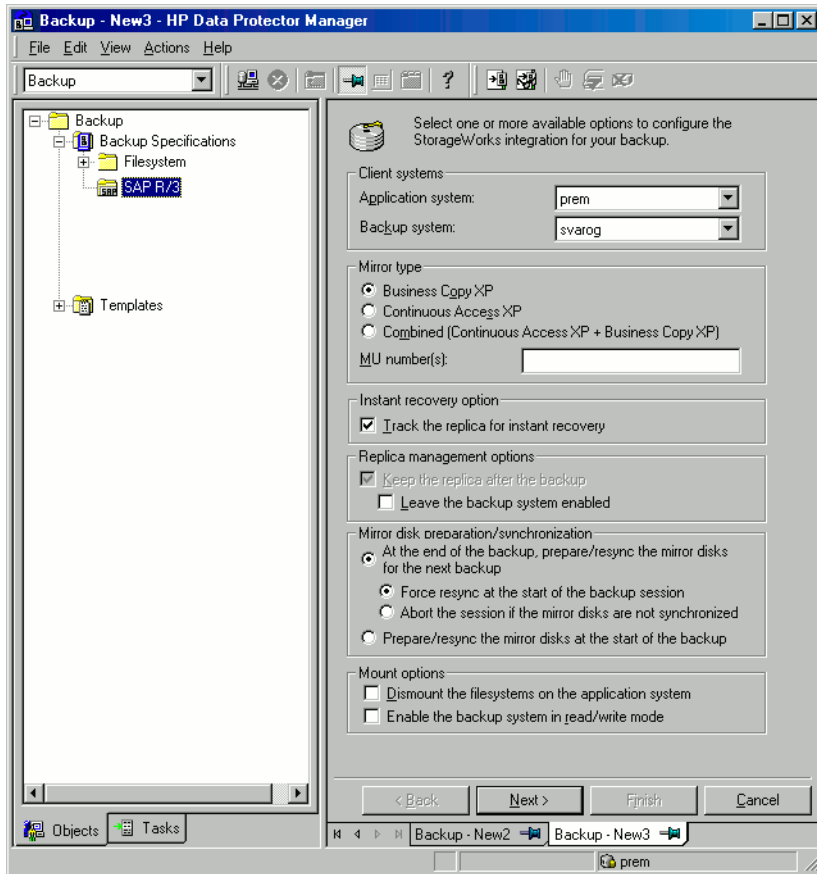


Figure 47 XP backup options

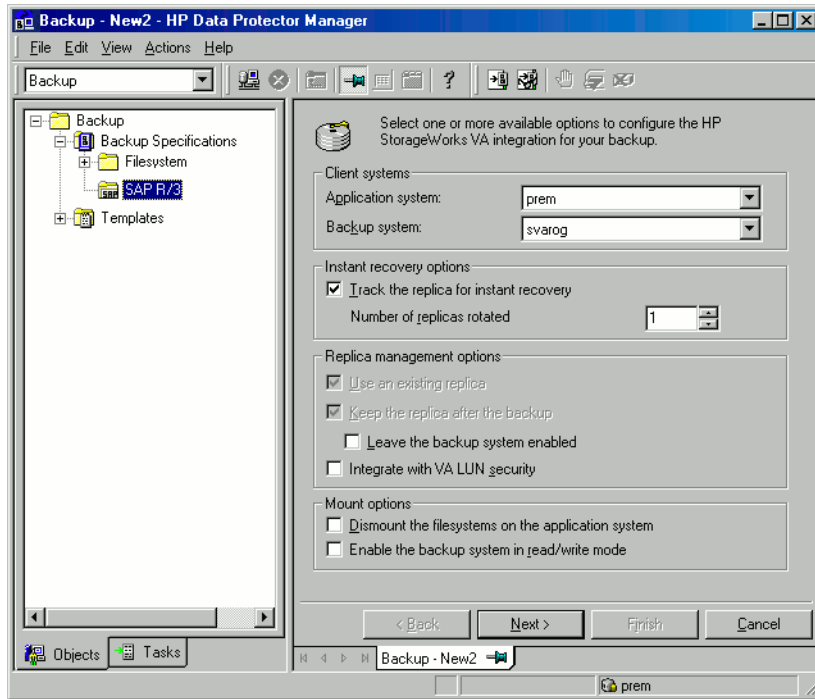


Figure 48 VA backup options

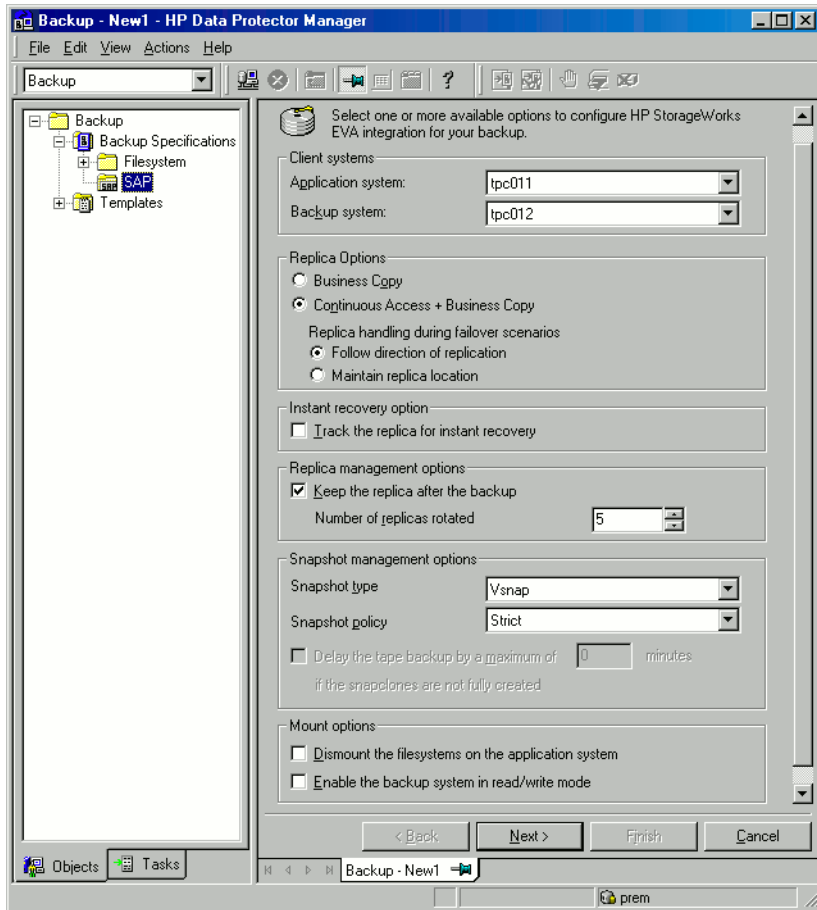


Figure 49 EVA backup options

Click **Next**.

5. In **Application database**, select the Oracle instance (ORACLE_SID) to be backed up.

UNIX only: In **Username**, type the Oracle OS user name described in “Configuring user accounts” on page 175. In **Group name**, type dba.

Click **Next**.

6. If the SAP R/3 database is not configured yet for use with Data Protector, the **Configure SAP** dialog box is displayed. Configure it as described in “Configuring SAP R/3 databases” on page 182.

7. Select SAP R/3 objects to be backed up. You can select individual tablespaces, data files, or archived logs.

 **NOTE:**

If you plan to do instant recovery, select the whole **DATABASE** item.

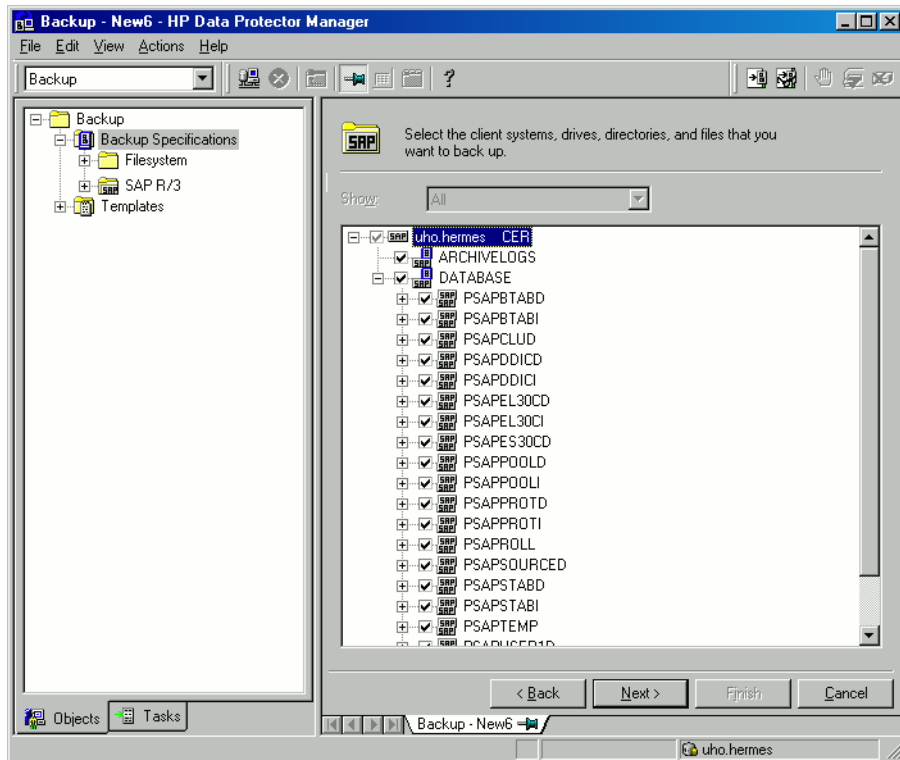


Figure 50 Selecting backup objects

Click **Next**.

8. Select devices to use for the backup.

To specify device options, right-click the device and click **Properties**. Specify the number of parallel backup streams in the **Concurrency** tab and the media pool.

 **NOTE:**

Parallelism (the number of streams your SAP R/3 database is backed up with) is set automatically. If load balancing is used, the number of streams equals the sum of concurrencies of the selected devices.

Click **Next**.

9. Set backup options. For information on the application specific options, see [Table 12](#) on page 203.

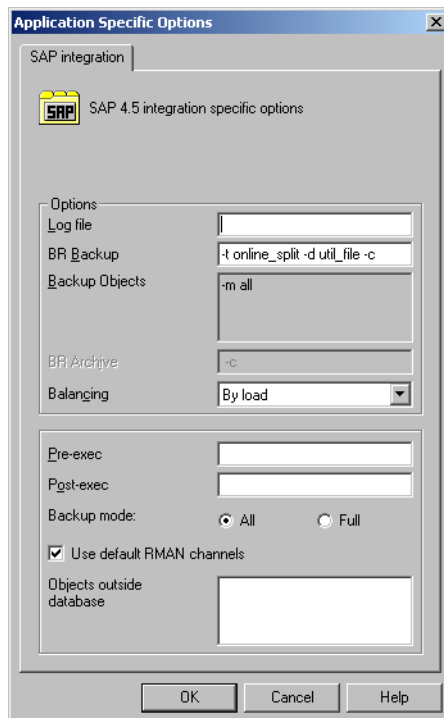


Figure 51 Application specific options

Click **Next**.

10. Optionally, schedule the backup. See [“Scheduling backup specifications”](#) on page 205.

Click **Next**.

11. Save the backup specification, specifying a name and a backup specification group.

 **TIP:**

Preview your backup specification before using it for real. See [“Previewing backup sessions”](#) on page 206.

Table 12 SAP R/3 backup options

Option	Description
Log file	If you want to create a backint log file during backup, specify a pathname for the file. By default, this file is not created because Data Protector stores all relevant information about backup sessions in the database.
BR Backup	Specifies BRBACKUP options. For example, for online backup using the <code>splitint</code> interface, type <code>-t online_mirror</code> . If <code>splitint</code> is not supported by BRTOOLS, type <code>-t online_split</code> . To run BRBACKUP under a different Oracle database user than the one specified during the configuration, type <code>-u user_name</code> .
Backup Objects	Lists BRBACKUP options passed by <code>omnisap.exe</code> . The list is displayed after you save the backup specification.
BR Archive	Specifies BRARCHIVE options. Not applicable for ZDB to disk.
Balancing: By Load	Groups files into subsets of approximately equal sizes. The subsets are then backed up concurrently by Data Protector <code>sapback</code> programs. If your backup devices use hardware compression, the sizes of the original and backed up files differ. To inform Data Protector of this, specify the original sizes of the backed up files in the

Option	Description
	<p><code>compression</code> section of the Data Protector SAP R/3 configuration file. See "Data Protector SAP R/3 configuration file" on page 167.</p>
Balancing: By Time	<p>Groups files into subsets that are backed up in approximately equal periods of time. The duration depends on the file types, speed of the backup devices, and external influences (such as mount prompts). This option is best for environments with large libraries of the same quality. The subsets are backed up concurrently by Data Protector <code>sapback</code> programs. Data Protector automatically stores backup speed information in the <code>speed</code> section of the Data Protector SAP R/3 configuration file. It uses this information to optimize the backup time.</p> <p>This type of balancing may lead to non-optimal grouping of files in the case of an online backup or if the speed of backup devices varies significantly.</p>
Balancing: Manual	<p>Groups files into subsets as specified in the manual balancing section of the Data Protector SAP R/3 configuration file. For more information, see "Manual balancing" on page 212.</p> <p>Not applicable for ZDB to disk.</p>
Balancing: None	<p>No balancing is used. The files are backed up in the same order as they are listed in the internal Oracle database structure. To check the order, use the Oracle Server Manager SQL command:</p> <pre>select * from dba_data_files</pre>
Pre-exec, Post-exec	<p>The command specified here is started by <code>omnisap.exe</code> on the SAP R/3 system before the backup (<code>pre-exec</code>) or after it (<code>post-exec</code>). Do not use double quotes. Provide only the name. The command must reside in the directory:</p> <p>Windows: <code>Data_Protector_home\bin</code> HP-UX, Solaris: <code>/opt/omni/bin</code></p>
Backup mode	Not applicable for ZDB.
Use default RMAN channels	Not applicable for ZDB.
Objects outside database	Specifies non-database files of the Oracle SAP R/3 environment to be saved.

Option	Description
	Save these files in a separate backup session.



NOTE:

The total number of sapback processes started in one session using Data Protector is limited to 256.

Modifying backup specifications

To modify your backup specification, click its name in the Scoping Pane of the Backup context, then click the appropriate tab, and apply the changes.

Scheduling backup specifications

You can run unattended backups at specific times or periodically. For details on scheduling, see the online Help index: “scheduled backups”.

Scheduling example

To schedule ZDB to disk+tape at 8:00, 13:00, and 18:00 during week days:

1. In the **Schedule** property page, select the starting date in the calendar and click **Add** to open the **Schedule Backup** dialog box.
2. Under **Recurring**, select **Weekly**. Under **Time options**, select **8:00**. Under **Recurring Options**, select **Mon, Tue, Wed, Thu, and Fri**.
In **Split mirror/snapshot backup** drop-down list, select **To disk+tape**. See [Figure 52](#) on page 206.
Click **OK**.
3. Repeat [Step 1](#) on page 205 and [Step 2](#) on page 205 to schedule backups at 13:00 and 18:00.
4. Click **Apply** to save the changes.

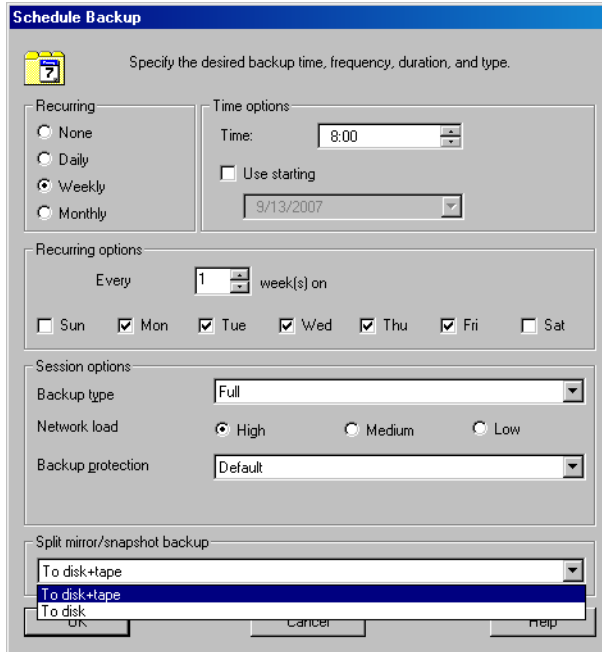


Figure 52 Scheduling backups

Previewing backup sessions

Preview the backup session to test it. You can use the Data Protector GUI or CLI.

Using the Data Protector GUI

1. In the Context List, click **Backup**.
2. In the Scoping Pane, expand **Backup Specifications** and then **SAP R/3**. Right-click the backup specification you want to preview and click **Preview Backup**.
3. Specify **Backup type** and **Network load**. Click **OK**.

The message `Session completed successfully` is displayed at the end of a successful preview.

Using the Data Protector CLI

From the directory:

Windows: `Data_Protector_home\bin`

HP-UX, Solaris: `/opt/omni/bin/`

run:

```
omnib -sap_list backup_specification_name -test_bar
```

What happens during the preview?

The `omnisap.exe` command is started, which starts the Data Protector `testbar` command to test the following:

- The syntax of the backup specification
- If devices are correctly specified
- If the necessary media are in the devices

Starting backup sessions

Interactive backups are run on demand. They are useful for urgent backups or restarting failed backups.

Backup methods

Start a backup of SAP R/3 objects in any of the following ways:

- Using the Data Protector GUI.
- Using the Data Protector CLI.
- Using the SAP BR*Tools.

Using the Data Protector GUI

1. In the Context List, click **Backup**.
2. In the Scoping Pane, expand **Backup Specifications**, and then **SAP R/3**. Right-click the backup specification you want to start and click **Start Backup**.

3. Specify **Network load**. Click **OK**.



NOTE:

Only the `Full` backup type is supported.

ZDB to disk, ZDB to disk+tape only: Specify the **Split mirror/snapshot backup** option.

The message `Session completed successfully` is displayed at the end of a successful backup session.

Using the Data Protector CLI

From the directory:

Windows: `Data_Protector_home\bin`

HP-UX, Solaris: `/opt/omni/bin/`

run:

ZDB to tape, ZDB to disk+tape:

```
omnib -sap_list backup_specification_name
```

ZDB to disk:

```
omnib -sap_list backup_specification_name -disk_only
```

For details, see the `omnib` man page or the *HP Data Protector command line interface reference*.

Using the SAP BRTOOLS

1. Log in to the SAP R/3 backup system or SAP R/3 application system as the Oracle OS user.

2. Export/set the following environmental variables:

ORACLE_SID=*SAP_instance_name*

ORACLE_HOME=*Oracle_software_home_directory*

[SAPBACKUP_TYPE=OFFLINE]

Default is ONLINE.

SAPDATA_HOME=*database_files_directory*

SAPBACKUP=*BRTOOLS_logs_and_control_file_copy_directory*

SAPREORG=*BRSPACE_logs_directory*

OB2BARLIST=*backup_specification_name*

Specifies Data Protector devices to be used for backup. Other information from the backup specification, like SAP R/3 objects to be backed up or the BRBACKUP options, is ignored and has to be specified manually at run time.

[OB2BARHOSTNAME=*application_system_name*]

Required if you are logged in to the backup system. Optional if you want to specify virtual server name in cluster environments.

[OB2BACKUPHOSTNAME=*backup_system_name*]

Required if you are logged in to the application system.

OB2SMB=1

Specifies a ZDB session.

[OB2SMBIR=1]

Specifies tracking replica for instant recovery.

[ZDB_ORA_INCLUDE_CF_OLF=1]

Required if you are logged in to the backup system. For details, see [“ZDB integrations omnirc variables”](#) on page 410.

[OB2DISKONLY=1]

Specifies a ZDB-to-disk session.

If you are logged in to the backup system, also ensure that the NLS_LANG environmental variable has the same value as the NLS_LANG environmental variable on the application system.

3. Run the BRBACKUP command. The command syntax depends on whether you are logged in to the application system or backup system:

Application system:

```
brbackup -t [online | offline]_[split | mirror] -d  
util_file -m all -c -u user/password
```

Backup system:

```
brbackup -t [online | offline]_mirror [-q split] -d  
util_file -m all -c -u user/password
```

The `-q split` option is required if `OB2DISKONLY` is set to 1.

Configuring SAP compliant ZDB sessions

SAP R/3 standards recommend that, in ZDB sessions that use the `splitint` backup interface, BRBACKUP is started on the backup system and not on the application system. You can configure Data Protector to comply with these standards by setting the Data Protector `OB2_MIRROR_COMP` environmental variable to 1. The variable is saved in the Data Protector SAP R/3 instance configuration file. Consequently, in all `splitint` ZDB sessions for this SAP R/3 instance, BRBACKUP will be started on the backup system. By default, BRBACKUP is started on the application system.

Set the `OB2_MIRROR_COMP` environmental variable using the Data Protector GUI or CLI.

Using the Data Protector GUI

1. In the Context List, click **Backup**.
2. In the Scoping Pane, expand **Backup Specifications** and then **SAP R/3**. Click a backup specification for your SAP R/3 instance.
3. In the Source page, right click the SAP R/3 instance and click **Set Environmental Variables**.
4. In the Advanced dialog box, set `OB2_MIRROR_COMP` to 1. See [Figure 53](#) on page 211.

Click **OK**.

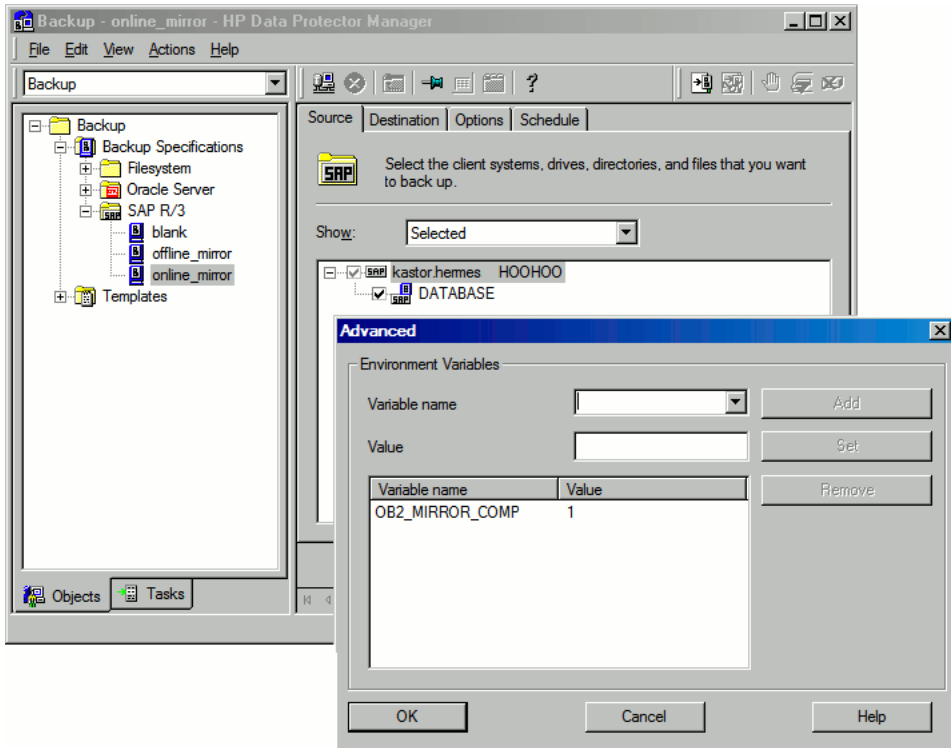


Figure 53 Setting environmental variables

Using the Data Protector CLI

From the directory:

Windows: `Data_Protector_home\bin`

HP-UX, Solaris, and Linux: `/opt/omni/bin/`

Other UNIX: `/usr/omni/bin/`

run:

```
util_cmd -putopt SAP instance_name OB2_MIRROR_COMP 1 -sublist
Environment
```

Manual balancing

Manual balancing means that you manually group files into subsets, which are then backed up in parallel. To group files into subsets, add the `manual_balance` section to the Data Protector SAP R/3 configuration file as described in the following example.

Example

Suppose that we have a backup specification named `SAP-R3` with the following files to be backed up: `fileA`, `fileB`, `fileC`, `fileD`. To group the files into three subsets (`0={fileA, fileC}`, `1={fileB}`, `2={fileD}`), add the following lines to the Data Protector SAP R/3 configuration file:

```
manual_balance={
SAP-R3={
fileA=0;
fileB=1;
fileC=0;fileD=2;}}
```

When you group files into subsets, consider the following:

- Use only one file from the same hard disk at a time.
- The number of files in a subset must be equal to or smaller than the sum of the concurrencies of all devices specified for backup.
- If the backup specification contains files that are not allocated to any subset, Data Protector automatically adds these files to the list of files to be backed up using the load balancing principle. Before the backup, this list is logged in:

UNIX: `ORACLE_HOME/sapbackup/*.lst`

Windows: `SAPDATA_HOME\sapbackup*.lst`

Restore

You can restore SAP R/3 objects using any of the following methods:

- **Standard restore:** Data is restored from backup media created in ZDB to tape, ZDB to disk+tape, and non-ZDB (standard backup) sessions. See “[Standard restore](#)” on page 214.
- **Instant recovery:** Data is restored from a replica created in *online* ZDB-to-disk or ZDB-to-disk+tape sessions. See “[Instant recovery](#)” on page 219.

After the restore, you can recover the database to a specific point in time using the SAP BRTOOLS interface. Instant recovery method enables you to restore and recover

the database within the same session. However, you can only restore (and recover) the whole database. To restore only a part of the database or the archived logs, use the standard restore method.

Table 13 on page 213 shows which restore methods are available, depending on the backup session you restore from.

Table 13 SAP recovery methods

Disk arrays	Backup type	Recovery of the whole database		Recovery of a part of the database
		Until now	To a point in time, logseq/thread or SCN number	
XP, VA, EVA, EMC	ZDB to tape - online	Restore	Restore	Restore
	ZDB to tape - offline	Restore	Restore	Restore
XP, VA, EVA	ZDB to disk - online	Instant recovery + database recovery	Instant recovery + database recovery	N/A
	ZDB to disk - offline	N/A	N/A	N/A
	ZDB to disk+tape - online	<ul style="list-style-type: none"> • Instant recovery + database recovery or • Restore 	<ul style="list-style-type: none"> • Instant recovery + database recovery or • Restore 	Restore
	ZDB to disk+tape - offline	Restore	Restore	Restore

Table 14 Legend

Restore	You can do a standard restore from the Data Protector media using the Data Protector GUI or the SAP BRTOOLS. After the restore, you can recover the database using the SAP BRTOOLS.
---------	---

Instant recovery + database recovery	You can do an instant recovery. You can include database recovery in the instant recovery session or do it afterwards, using the SAP BRTOOLS.
N/A	Not available.

Considerations

- SAP R/3 tablespaces located on raw partitions cannot be restored using the Data Protector GUI. Workaround: Use SAP restore commands (for example, `brrestore`).
- If your Oracle database is localized, you may need to set the appropriate Data Protector encoding before you start a restore. For details, see [“Localized SAP R/3 objects”](#) on page 226.
- Restore preview is not supported.

Standard restore

Restore SAP R/3 objects using the Data Protector Manager.

1. In the Context List, click **Restore**.
2. In the Scoping Pane, expand **SAP R/3**, expand the client (backup system) from which the data was backed up, and then click the Oracle instance you want to restore.

3. In the **Source** page, select SAP R/3 files to be restored.

To restore a file under a different name or to a different directory, right-click the file and click **Restore As/Into**.

To restore a file from a specific backup session, right-click the file and click **Restore Version**.

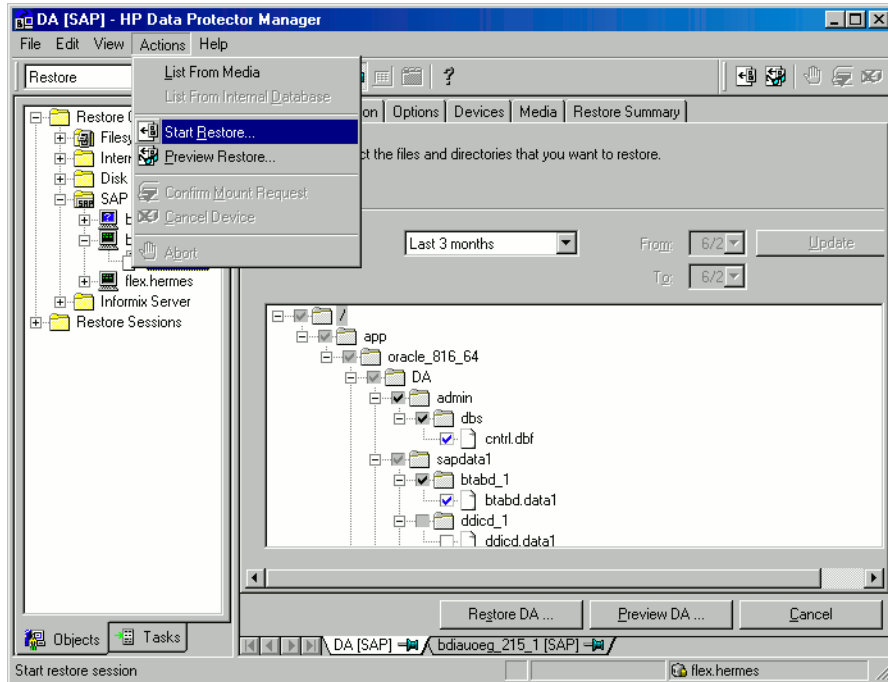


Figure 54 Selecting objects for restore

4. In the **Destination** tab, select the client to restore to (**Target client**). By default, this is the application system. See [Figure 55](#) on page 216.

For details on options, press **F1**.

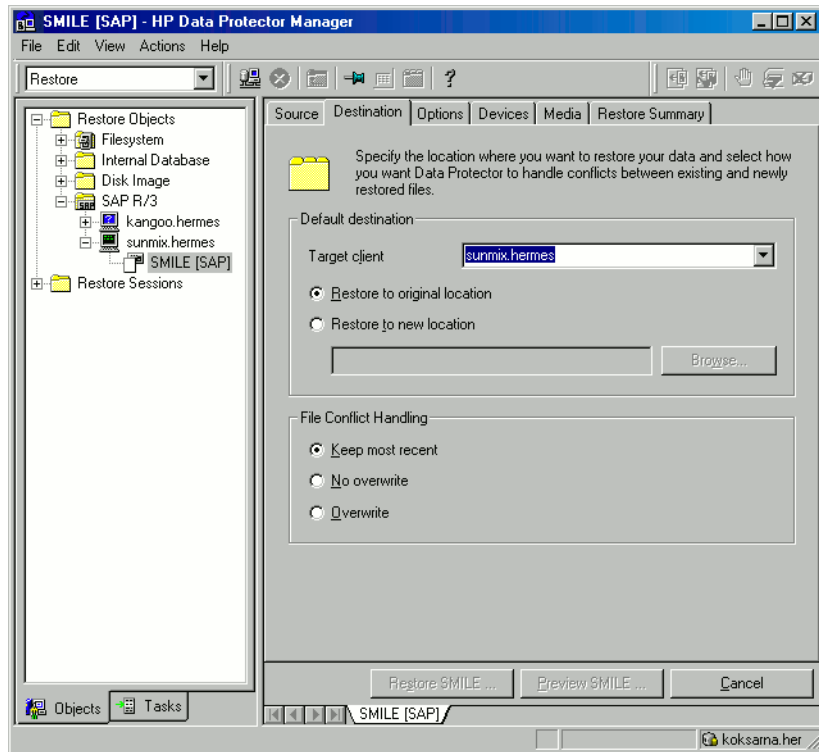


Figure 55 Selecting the target client

5. In the **Options** page, set the restore options. For information, press **F1**.
6. In the **Devices** page, select devices to use for the restore.
7. Click **Restore**.
8. In the **Start Restore Session** dialog box, click **Next**.
9. Specify **Report level** and **Network load**.

- 10. EMC and XP:** This step is relevant only if you have both the EMC Symmetrix Agent and HP StorageWorks XP Agent components installed on the application system.

EMC: Select EMC Symmetrix restore.

XP: Select StorageWorks XP restore. See [Figure 56](#) on page 217.

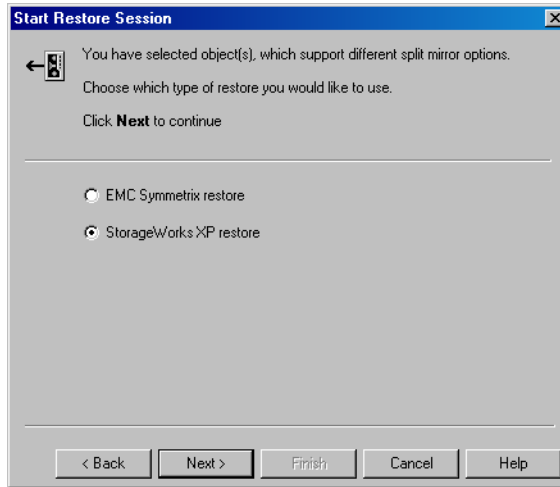


Figure 56 Selecting the XP restore

Click **Next**.

- 11. EMC and XP:** In the EMC Symmetrix mode or Mirror mode drop-down list, select **Disabled**. This sets the restore from backup media to the application system directly. See [Figure 57](#) on page 218.

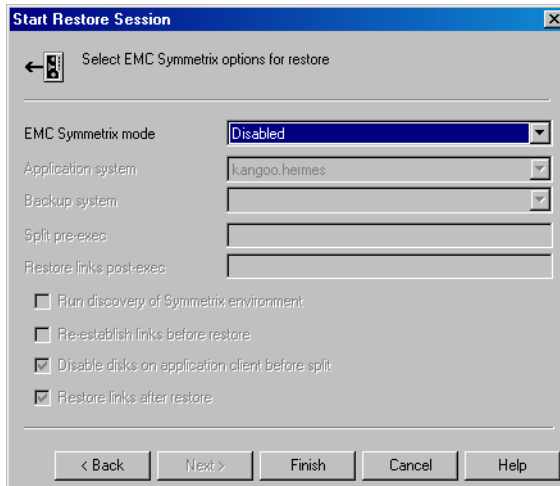


Figure 57 EMC - Selecting restore to the application system directly

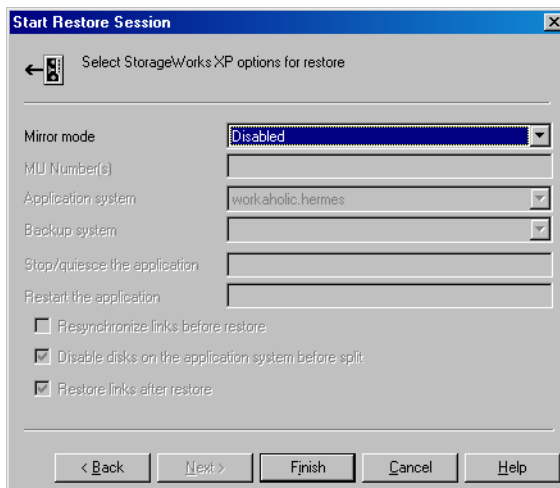


Figure 58 XP - Selecting restore to the application system directly

- 12.** Click **Finish** to start the restore.

The message `Session completed successfully` is displayed at the end of a successful session.

Instant recovery

For general information on instant recovery, see *HP Data Protector zero downtime backup concepts guide* and *HP Data Protector zero downtime backup administrator's guide*. For information on instant recovery in cluster environment (Cluster File System (CFS), MC/ServiceGuard, and Microsoft Cluster Server), see *HP Data Protector zero downtime backup administrator's guide*.

You can start an instant recovery using the Data Protector GUI or CLI.

Considerations

- The database recovery part is performed after the instant recovery procedure. During database recovery, archive log backups performed after the ZDB are restored from tape by the SAP BR*Tools utilities. If selected, the logs are reset and the database is opened.
- If the replica to be used for instant recovery contains the control file, first see [“Instant recovery from replicas containing the control file”](#) on page 224.

Instant recovery using the Data Protector GUI

To perform an instant recovery:

1. Shut down the Oracle database using `sqlplus`:

For example:

```
sqlplus
sqlplus> shutdown immediate
sqlplus> exit
```

2. In the Data Protector Manager Context List, select **Instant Recovery**.
3. Expand **SAP R/3** and select the ZDB-to-disk or ZDB-to-disk+tape session from which you want to perform the restore.

4. In the **Source** tab, select the objects to recover. Only whole databases can be selected.

For HP StorageWorks Disk Array XP, it is recommended to leave the **Keep the replica after the restore** option selected to enable a restart of an instant recovery session. The option is selected by default, except for an offline backup where the database was in NOARCHIVELOG mode during the backup. For HP StorageWorks Enterprise Virtual Array, replica is kept on the array only if the **Copy replica data to the source location** is selected.

Set the HP StorageWorks Enterprise Virtual Array or HP StorageWorks Disk Array XP options. For details, press **F1**.

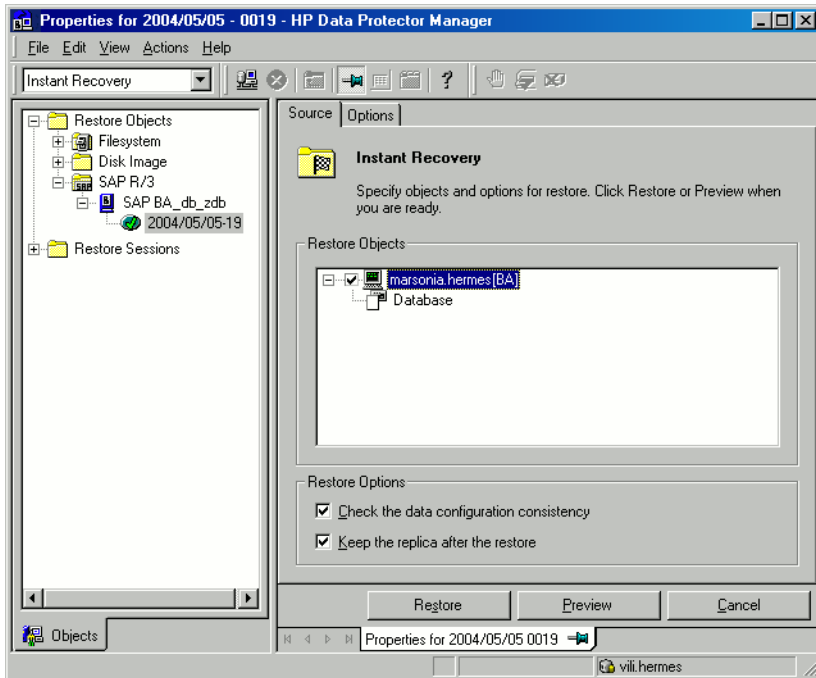


Figure 59 SAP R/3 source options

5. At this point, you can decide whether to perform a database recovery immediately after an instant recovery or not:
- To perform only an instant recovery, click **Restore**.
 - To automatically perform a database recovery after an instant recovery, select the recovery options. For details refer to “[Database recovery options](#)” on page 221.

 **NOTE:**

Click **Restore**.

Data Protector recovers the database after performing instant recovery by switching the database to mount state, restoring the necessary archive redo logs from tape, and applying the redo logs.

Database recovery options

- | | |
|---------------------------------------|--|
| User name (UNIX systems only) | Specifies the user name under which the instant recovery is performed. The user needs to be a member of the DBA group. |
| User group (UNIX systems only) | Specifies the user group the user in the User name field belongs to. |

 **NOTE:**

The **User name** and the **User group** must be the same as defined in the backup ownership.

- | | |
|----------------------|---|
| Recovery | Enables database recovery after instant recovery. |
| Recover until | The options in this drop-down list enables you to specify to which point in time you would like the recovery to be performed.
The following options are available:
Now: All existing archive logs are applied. |

Selected time: Only archive logs until the specified time are applied.

Selected logseq/ thread number: Specifies an incomplete recovery. Only archive logs with a lower or equal number than the specified log sequence or thread number are applied.

Selected SCN number: Only archive logs until the specified SCN number are applied.

Open database after recovery

Opens the database after the recovery was performed.

Reset logs

Resets the archive logs after the database is opened. This option is by default not selected if the **Recover until** option is set to **Now**.

The following are Oracle recommendations on when to reset the logs:

Always reset the logs:

- After an incomplete recovery, that is, if not all archive redo logs are applied.
- If a backup of the control file is used for recovery.

Do not reset the logs:

- After a complete recovery, when the control file is not used.
- If the archive logs are used for a standby database. However, if you must reset the archive logs, recreate the standby database.

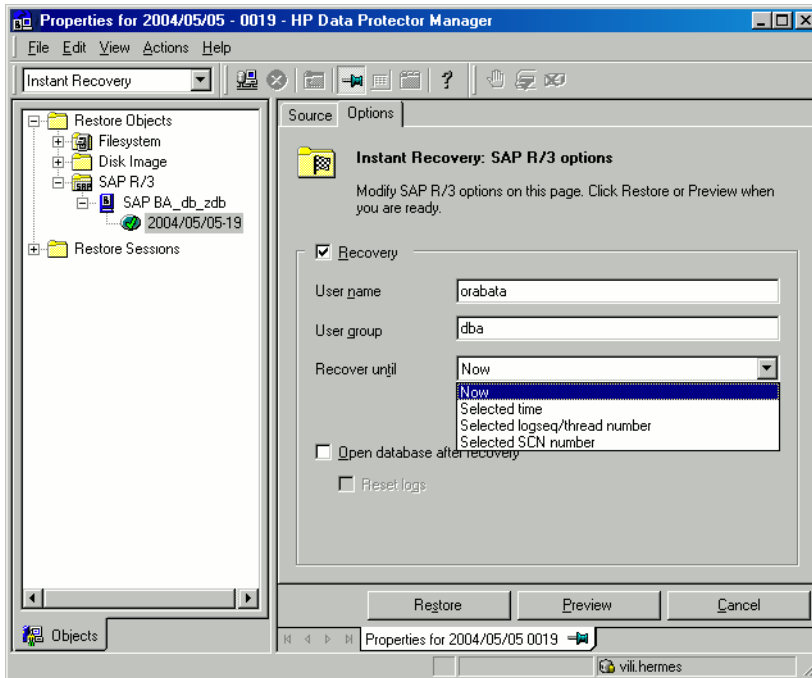


Figure 60 SAP R/3 recovery options

Instant recovery using the Data Protector CLI

From the directory:

Windows: `Data_Protector_home\bin`

HP-UX: `/opt/omni/bin/`

run:

`omnir -sap`

`-host ClientName`

`-session SessionID`

`{DISK_ARRAY_XP_OPTIONS | ENTERPRISE_VIRTUAL_ARRAY_OPTIONS}`

`[-appname DB_Name`

`-user UserName -group GroupName`

```
[-recover {now | time MM/DD/YY hh:mm:ss | logseq LogSeqNumber  
thread ThreadNumber | SCN Number} [-open [-resetlogs]]  
]  
[-preview]
```

The order of options is important. On Windows clients, the user name and group name options are not required. For a detailed description of the options, see the *HP Data Protector command line interface reference*.

Instant recovery from replicas containing the control file

Before you start an instant recovery from a replica that contains the control file, you need to copy the current control file and online redo logs to a safe location to be able to do a database recovery afterwards.

A replica contains the control file if it is created in any of the following sessions:

- *Online* ZDB session with the `omniarc` variable `ZDB_ORA_INCLUDE_CF_OLF` set to 1
- *Online* SAP compliant ZDB session
- *Offline* ZDB session (any configuration)

NOTE:

A replica created in an *offline* ZDB session also contains the online redo logs. Such a replica is suitable for version recovery because it overwrites the current control file and online redo logs. For version recovery, you do not need to follow the below steps.

To restore and recover the database:

1. Copy the current control files and online redo logs to a safe location.
2. Perform instant recovery (without database recovery). Use the Data Protector GUI or CLI.
3. Copy the current control files and online redo logs back to their original location.
4. Mount the target database.

5. Restore missing archived redo logs required for database recovery.

Example:

```
# sqlplus user/password@net_service_name
SQL> select SEQUENCE#, NAME from V$ARCHIVED_LOG where
(NEXT_TIME>to_date('2007/10/03')) and (FIRST_CHANGE#<='until_SCN');
# brrestore -a log_no,... -d util_file -c force -u user/password
```

6. Recover the target database.

Example:

```
# rman target user/password@net_service_name
RMAN> run{
2> allocate channel dbrec type disk;
3> recover database until scn until_SCN;
4> release channel dbrec;
5> }
```

Restoring using another device

You can restore using a device other than that used for backup.

Using the Data Protector GUI

On how to specify another device for restore using the Data Protector GUI, see the online Help index: “restore, selecting devices for”.

Using the Data Protector CLI or SAP commands

If you are restoring using the Data Protector CLI or SAP R/3 commands, specify the new device in the file:

Windows: *Data_Protector_home*\Config\Server\cell\restoredev

UNIX: /etc/opt/omni/server/cell/restoredev

Use the format:

```
"DEV 1" "DEV 2"
```

where DEV 1 is the original device and DEV 2 the new device.



IMPORTANT:

Delete this file after use.

On Windows, use the Unicode format for the file.

Localized SAP R/3 objects

Oracle Server uses its own encoding, which may differ from the encoding used by the filesystem. In the Backup context, Data Protector displays the logical structure of the Oracle database (with Oracle names) and in the Restore context, the filesystem structure of the Oracle database. Therefore, to display non-ASCII characters correctly, ensure that the Data Protector encoding matches with the Oracle Server encoding during backup and with the filesystem encoding during restore. However, the incorrect display does not impact the restore.

UNIX: To be able to switch between the Data Protector encodings, start the GUI in UTF-8 locale.

Windows: If the current values of DBCS and the default Windows character set for non-Unicode programs do not match, problems arise. See [“ZDB, restore, or instant recovery sessions fail due to invalid characters in filenames”](#) on page 238.

Monitoring sessions

You can monitor currently running sessions in the Data Protector GUI. When you run an interactive backup or a restore session, a monitor window shows you the progress of the session. Closing the GUI does not affect the session.

You can also monitor sessions from any Data Protector client with the `User Interface` component installed, using the Monitor context.

On how to monitor a session, see the online Help index: “viewing currently running sessions”.

System messages generated during backups are sent to both the SAP R/3 and the Data Protector monitor. However, mount requests are sent only to the Data Protector monitor.

Troubleshooting

This section lists general checks and verifications plus problems you might encounter when using the Data Protector SAP R/3 integration.

For general Data Protector troubleshooting information, see the *HP Data Protector troubleshooting guide*.

For general ZDB, restore, and instant recovery related troubleshooting, see the troubleshooting sections in the *HP Data Protector zero downtime backup administrator's guide*.

See also the troubleshooting section in the SAP R/3 chapter of the *HP Data Protector integration guide*.

Before you begin

- Ensure that the latest official Data Protector patches are installed. See the online Help index: "patches" on how to verify this.
- See the *HP Data Protector product announcements, software notes, and references* for general Data Protector limitations, as well as recognized issues and workarounds.
- See the support matrices at <http://www.hp.com/support/manuals> for an up-to-date list of supported versions, platforms, and other information.

General troubleshooting

Data Protector reports "12:8422" error when using Data Protector Oracle integration after an upgrade of Oracle8i to Oracle9i

Problem

After Oracle8i is upgraded to Oracle9i, the following error is returned during the configuration of Oracle instance or during the backup:

```
*RETVAl*8422
```

Action

Rename the Oracle8i `svrmgr1` binary to something else so that Data Protector will not find it. The Oracle upgrade process from Oracle8i to Oracle9i does not remove the Oracle8i `svrmgr1` binary, rather it changes its permissions. Once the `svrmgr1` binary is renamed, Data Protector will use Oracle9i `sqlplus`, as it should, to complete the operations correctly.

Configuration fails due to a database operation failure

Problem

During configuration of an SAP R/3 database, Data Protector reports the following error:

```
Integration cannot be configured.
```

The database reported error while performing requested operation.

Action

Review user group membership for the user account which is used in Oracle database access authentication. For details, see “[Configuring user accounts](#)” on page 175.

Verifying the prerequisites (Oracle side)

Perform the following verification steps, in numerical order, to verify that Oracle is installed properly:

1. On the application system, verify that the target database is online, as follows:

UNIX:

```
export ORACLE_SID=Oracle_SID
export ORACLE_HOME=Oracle_home_path
$ORACLE_HOME/bin/sqlplus
```

Windows:

```
set ORACLE_SID=Oracle_SID
set ORACLE_HOME=Oracle_home_path
%ORACLE_HOME%\bin\sqlplus
```

At the SQLPlus prompt, type:

```
connect user/passwd@service
select * from dba_tablespaces
exit;
```

Try starting the target database.

2. In order to establish the TNS network connection, verify that Net8 software is configured correctly for the target database, as follows:
 - On the application system, perform the following:

UNIX:

```
$ORACLE_HOME/bin/lsnrctl status service
```

Windows:

```
%ORACLE_HOME%\bin\lsnrctl status service
```

If it fails, either start the TNS listener process or refer to the Oracle documentation on how to create the TNS configuration file (LISTENER.ORA).
 - On the application system, perform the following. For Oracle9i, use `sqlplus` (and not `svrmgr1`):

UNIX:

```
export ORACLE_SID=Oracle_SID
export ORACLE_HOME=Oracle_home_path
$ORACLE_HOME/bin/sqlplus
```

Windows:

```
set ORACLE_SID=Oracle_SID
set ORACLE_HOME=Oracle_home_path
%ORACLE_HOME%\bin\sqlplus
```

At the SQLPlus prompt, type:

```
connect user/passwd@service;
exit;
```

If it fails, refer to the Oracle documentation on how to create the TNS configuration file (TSNAMES.ORA).

Verifying the prerequisites (SAP side)

Before you begin the steps in this section, be sure you have completed all the steps in “[Verifying the prerequisites \(Oracle side\)](#)” on page 228.

Perform the following verification steps, in numerical order, to verify that SAP is installed properly:

1. On the application system, verify a backup directly to disk, as follows:

```
brbackup -d disk -u user/password
```

If it fails, refer to the SAP Online help for instructions on how to execute a backup to disk using the SAP backup utility.

2. On the application system, verify a restore from the disk, as follows:

```
brrestore -d disk -u user/password
```

If it fails, refer to the SAP Online help for instructions on how to execute a restore to disk using the SAP restore utility.

3. On the application system, verify that SAP is configured properly, as follows:

Move the original `backint`. Create a test script with the name `backint` in the directory with the SAP backup utility, with the following entries:

```
#!/usr/bin/sh
echo "Test backint called as follows:"
echo "$0 $*"
echo "exiting 3 for a failure"
exit 3
```

Export all environment variables required by the SAP (`SAPDATA_HOME`, `SAPBACKUP...`) and then start the command with the backup owner user:

```
brbackup -t offline_split -d util_file -u user/password
-c
```

or, if Data Protector uses `splitint`:

```
brbackup -t offline_mirror -d util_file -u user/password
-c
```

If you receive arguments from `backint`, that means SAP is properly configured for backup using `backint`. Otherwise, you should reconfigure SAP.

Verifying the configuration

Before you begin this section, be sure that you completed all the steps provided in the sections [“Verifying the prerequisites \(Oracle side\)”](#) on page 228 and [“Verifying the prerequisites \(SAP side\)”](#) on page 229.

Perform the following verification steps, in numerical order, to verify that Data Protector is configured properly:

1. On the application system, verify a Data Protector filesystem backup of the SAP Database Server:

Perform a filesystem backup of the Oracle Server system so that you can eliminate any potential communication problems between the Oracle Server and the Data Protector Cell Manager system.

See the online Help index “standard backup procedure” for details about how to do a filesystem backup.

If it fails, refer to the *HP Data Protector troubleshooting guide* for help with troubleshooting a filesystem backup.

2. Verify the environment variable on the application system:

If you have to export some variables before starting the SAP backup utilities, Oracle Server Manager, or the TNS listener, set these environment variables using the Data Protector GUI.

3. Verify the permissions of the SAP user on application system:

SAP user permissions must be set to enable you to perform an SAP backup or restore with Data Protector. See “[Configuring user accounts](#)” on page 175. Use the `testbar2` to check the permissions:

- Login in as an SAP user
- Execute `/opt/omni/bin/testbar2 -perform:checkuser`

If the user account has all the required permissions, you will see only the usual messages displayed on the screen.

4. Examine the system errors:

System errors are reported in the following file on the Oracle Server:

```
/var/opt/omni/log/debug.log
```

Verifying the backup configuration

Before you begin this section, be sure that you completed all the steps provided in the sections “[Verifying the prerequisites \(Oracle side\)](#)” on page 228 and “[Verifying the prerequisites \(SAP side\)](#)” on page 229.

Perform the following verification steps, in numerical order, to verify that Data Protector is configured properly:

1. Verify the Data Protector SAP ZDB configuration on the application system:

Execute the following command:

HP-UX: /opt/omni/lbin/util_sap -CHKCONF ORACLE_SID

Windows: Data_Protector_home\bin\util_sap.exe -CHKCONF ORACLE_SID

If an error occurs, the error number is displayed in the form

*RETVAL*error_number.

To get the error description, on the Cell Manager, run:

Windows: Data_Protector_home\bin\omnigetmsg 12 error_number

which is located on the Cell Manager.

HP-UX, Solaris: /opt/omni/lbin/omnigetmsg 12 error_number

2. Verify the SAP user.

Check that the respective user group has the See Private Objects user right selected. Also refer to “[Configuring user accounts](#)” on page 175.

3. On the application system, verify the backup using testbar2:

Execute the following to ensure that communication within Data Protector is established:

- Create a non-ZDB backup specification on the application system.
- Run:

```
/opt/omni/bin/testbar2 -type:SAP -appname:ORACLE_SID  
-perform:backup -file:file_name -bar barlist_name
```

If it fails, check the errors and try to fix them or call a support representative for assistance.

4. On the application system, verify the backup using backint:

Execute the following command to ensure that communication within Data Protector is established and that a backup of files can be performed:

- Create a non-ZDB backup specification on the backup system.
- ```
export OB2BARLIST=barlist_name
export OB2APPNAME=ORACLE_SID
/opt/omni/lbin/backint -f backup -t file -u ORACLE_SID
-i input_file
```

where *input\_file* is the file containing the full pathnames for backup.

If it fails, check the errors and try to fix them or call a support representative for assistance.

## Verifying restore

Before you begin this section, be sure that you completed all the steps provided in the sections “[Verifying the prerequisites \(Oracle side\)](#)” on page 228 and “[Verifying the prerequisites \(SAP side\)](#)” on page 229.

Perform the following verification steps, in numerical order, to verify that Data Protector is configured properly:

**1.** Verify the user for the restore

Verify that the user specified for the restore session is the user of the backup session and that they belong to the Data Protector operator or admin group. Check that the respective user group has the `See private objects user` right selected.

**2.** Verify that files are backed up and in the Data Protector database:

- Using the `omnidb` command;  
See the appropriate man page on using the `omnidb` command.

- Using `backint`;

SAP tools also use this command to make a query.

```
/opt/omni/lbin/backint -f inquiry -u ORACLE_SID -i
input_file
```

where `input_file` is what will be queried. `Backint` expects a list of files in the following format:

```
backint_ID_1 pathName_1
```

```
backint_ID_2 pathName_2
```

```
backint_ID_3 pathName_3
```

To retrieve the `backint_ID` numbers, enter the following command:

```
echo "#NULL #NULL" | backint -f inquiry -u ORACLE_SID
```

or, alternatively, you can just specify `#NULL` as `backint_ID_1` in the `input_file`. In this case, the latest backup session for the file is used for the restore.

If it fails, proceed as follows:

- Check the backup session - was it successful?
- Check the user rights. Was the query started under the correct SAP user account?
- Call a support representative for assistance.

**3.** Verify the restore using Data Protector or CLI:

If it fails, proceed as follows:

- Check the backup session - was it successful?
- Check that the files are in the Data Protector database.
- Check the user rights. Was the restore started under the correct SAP user account?
- Call a support representative for assistance.

#### 4. Verify the restore using `testbar2`:

Execute the following to ensure that restore is possible:

```
/opt/omni/bin/testbar2 -type:SAP -appname:ORACLE_SID
-perform:restore -file:file_name -bar barlist_name -object
objectName
```

If it fails, proceed as follows:

- Check the backup session - was it successful?
- Check that the files are in the Data Protector database.
- Check the user rights. Was the a restore started under the correct SAP user account
- Call a support representative for assistance.

#### 5. Verify the restore using `backint`:

`backint` is the same command used by the SAP backup utility.

```
/opt/omni/lbin/backint -f restore -u ORACLE_SID -i
input_file
```

where `input_file` specifies what will be restored; `backint` expects the list of files in the following format:

```
backint_ID_1 pathName_1 [targetDirectory_1]
backint_ID_2 pathName_2 [targetDirectory_2]
backint_ID_3 pathName_3 [targetDirectory_3]
```

To retrieve the `backint_ID` numbers, enter the following command:

```
echo "#NULL #NULL" | backint -f inquiry -u ORACLE_SID
```

or, alternatively, you can just specify `#NULL` as `backint_ID_1` in the `input_file`. In this case, the latest backup session for the file is used for the restore.

If it fails, proceed as follows:

- Check the backup session - was it successful?
- Check that the files are in the Data Protector database.
- Check the user rights. Was the restore started under the correct SAP user account?
- Call a support representative for assistance.

## Configuration and backup problems

The following list gives a description of problems and actions to be taken to resolve them:

- **The Server Manager is unable to connect to the destination**

Check whether the Oracle TNS listener process is up and running. Check whether there are any environment variables required for a successful remote connection to the target database; for example, *TNS\_ADMIN* and *SHLIB\_PATH*. Set these environment variables using the Data Protector GUI.

Refer to [Data Protector SAP R/3 configuration file](#) for more information on the Data Protector SAP configuration file.

- **Configuration procedure fails**

Check whether the Oracle Server is up and running.

Check the login information for the target from the application system using Oracle Server Manager. If you cannot log in, then perform the following actions:

Check whether *sysoper* and *sysdba* rights are set for the Oracle administrator user.

Examine system errors reported in:

- On UNIX:

`/var/opt/omni/log/debug.log`

`/var/opt/omni/log/sap.log`

`/var/opt/omni/log/oracle8.log`

- On Windows:

`Data_Protector_home\log\debug.log,`

`Data_Protector_home\log\sap.log`

`Data_Protector_home\log\oracle8.log`

If you have special Oracle environment settings, ensure that they are registered in the `Environment` sublist of the Data Protector SAP configuration file:

`/etc/opt/omni/server/integ/config/SAP/client_name%ORACLE_SID`  
(UNIX Cell Manager), or

`Data_Protector_home\Config\server\integ\config\sap\client_name%ORACLE_SID`  
(Windows Cell Manager).

Refer to “[Data Protector SAP R/3 configuration file](#)” on page 167 for more information on the Data Protector SAP configuration file.

- **Starting the backup fails**

On UNIX systems, check the output of the following command on the application system:

```
/opt/omni/sbin/util_sap.exe -CHKCONF ORACLE_SID
```

In case of an error, the error number is displayed in the form:

```
*RETVAL*Error_number
```

To get the error description, start the following command on the application system:

```
/opt/omni/sbin/omnigetmsg 12 Error_number
```

On Windows systems, perform the following procedure using the Data Protector GUI:

1. In the Context List, select **Backup**.
2. In the Scoping Pane, expand **Backup**, **Backup Specifications**, and then **SAP R/3**. A list of SAP backup specifications is displayed.
3. In the Scoping Pane, select the failed backup specification and right-click on the SAP R/3 server item in the Results Pane to display a pop-up menu.
4. From the pop-up menu, select **Check Configuration**.

A short description of the problems and how to resolve them is displayed.

- **Backup does not work**

Check whether the Cell Manager is correctly set on the application system. The file `/etc/opt/omni/client/cell_server` (UNIX systems) or `HKEY_LOCAL_MACHINE\SOFTWARE\Hewlett-Packard\OpenView\OmniBackIT\Site\CellServer` (Windows systems) must contain the name of the Cell Manager.

On UNIX systems, check whether the users are properly configured in user groups. Both the UNIX Oracle administrator (`oraORACLE_SID`) and UNIX SAP administrator (`ORACLE_SIDadm`) have to be in the Data Protector operator class.

On UNIX systems, check whether the permissions of the `SAPDATA_HOME/sapbackup/` directory are set to 755.

On Windows systems, check that the user account that started the Data Protector Inet service is added in the Data Protector operator class.

- **Backup fails with "Connect to database instance failed"**

If you start a backup while the database instance is in the `unmount` or `mount` mode, the session fails with a message similar to the following:

```
BR0301E SQL error -1033 at location BrDbConnect-2
ORA-01033: ORACLE initialization or shutdown in progress
BR0310E Connect to database instance HOOHOO failed
```

Before you start a backup, ensure that the database instance is the open or shutdown mode.

## Configuration fails due to a script failure

### Problem

During configuration of an SAP R/3 database, Data Protector reports the following error:

```
Integration cannot be configured.
```

```
Script failed. Cannot get information from remote host.
```

### Action

If the SAP R/3 database is located on a Windows system, check the environment settings and ensure Data Protector Inet is running under a user account which has the required privileges. For details, see [“Before you begin”](#) on page 174.

If the SAP R/3 database is located on a UNIX system, resolve the problem by reviewing the user account configuration. For details, see [“Configuring user accounts”](#) on page 175.

## Restore problems

### ZDB, restore, or instant recovery sessions fail due to invalid characters in filenames

### Problem

On Windows systems, where the Oracle Database Character Set (DBCS) is not set to the same value as the default Windows character set for non-Unicode programs, and where SAP tools are used to create Oracle datafiles, ZDB, restore, and Instant Recovery fail if the datafiles contain non-ASCII or non-Latin 1 characters.

### Actions

Use any of the following solutions:

- For new Oracle installations, set the DBCS to UTF-8.
- If you do not use other non-Unicode programs, set the language for non-Unicode programs to the same value as DBCS.
- Do not use non-ASCII or non-Latin 1 characters for filenames.

### Restore of SAP R/3 tablespaces located on raw partitions fails

## Problem

When restoring SAP tablespaces that are located on raw partitions using the Data Protector GUI, the restore fails with a message similar to the following:

```
[Major] From: VRDA@joca.company.com "SAP" Time: 5/9/06 3:33:51
PM /dev/sapdata/rsapdata Cannot restore -> rawdisk section
![Warning] From: VRDA@joca.company.com "SAP" Time: 5/9/06
3:42:45 PM Nothing restored.
```

## Action

Use SAP commands (for example, `brrestore`) to restore these tablespaces.





---

# 3 Data Protector Microsoft SQL Server ZDB integration

## Introduction

This chapter explains how to configure and use the Data Protector Microsoft SQL Server ZDB integration. It describes the concepts and methods you need to understand to back up and restore the Microsoft SQL Server (**SQL Server**) database objects.

During the backup, an SQL Server snapshot is made (the database files are frozen and any transactions to them are cached), so the database is highly available (*online* backup). The I/O to it is suspended during the time it takes to create a **replica** (split the mirror disks or create snapshots).



### NOTE:

SQL Server snapshot is an SQL Server related term and does not mean the same as a disk array snapshot.

---

The following disk arrays and array configurations are supported:

| Supported array                                | Supported configurations                   |
|------------------------------------------------|--------------------------------------------|
| EMC Symmetrix (EMC)                            | TimeFinder, SRDF, combined SRDF+TimeFinder |
| HP StorageWorks Disk Array XP (XP)             | BC, CA, combined BC+CA                     |
| HP StorageWorks Enterprise Virtual Array (EVA) | BC, combined CA+BC                         |
| HP StorageWorks Virtual Array (VA)             | BC                                         |

All ZDB types (ZDB to tape, ZDB to disk, and ZDB to disk+tape) are supported by this integration. For ZDB types description, see the *HP Data Protector zero downtime backup concepts guide* and the online Help.

Using Data Protector, you can restore your SQL Server data:

- From backup media to the application system on LAN (standard restore).
- Using the instant recovery functionality.

The following table gives an overview of SQL Server recovery methods:

| ZDB type         | Recovery method                    |
|------------------|------------------------------------|
| ZDB to tape      | Standard restore                   |
| ZDB to disk      | Instant recovery                   |
| ZDB to disk+tape | Standard restore, instant recovery |

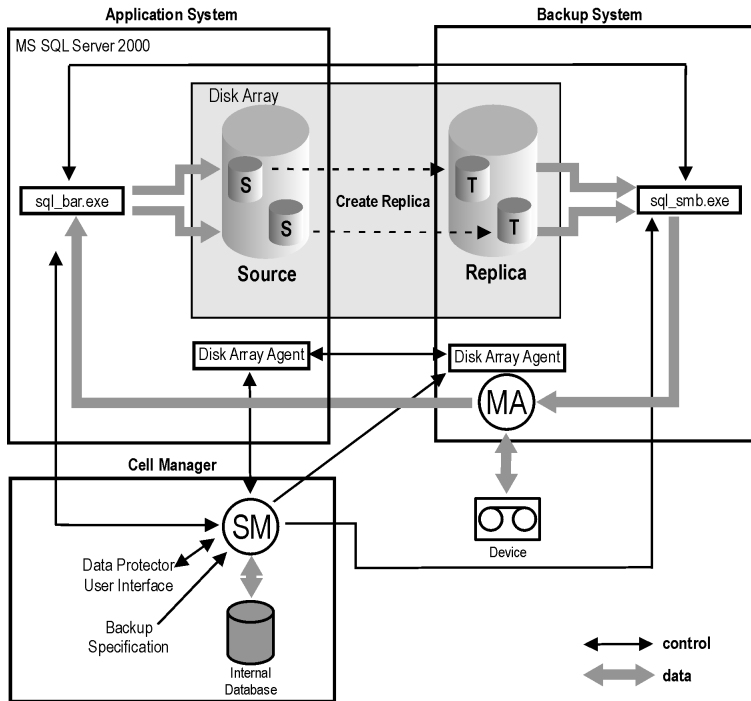
For a description of ZDB and instant recovery concepts, see the *HP Data Protector zero downtime backup concepts guide*.

## Integration concepts

Data Protector integrates with SQL Server through the Data Protector `sql_bar.exe` executable, installed on SQL Server. During backup, `sql_bar.exe`, started on the application system, connects to SQL Server to find the locations of the database files. The integration then backs up SQL Server database(s), which are replicated within a disk array.

During restore, `sql_bar.exe` connects to SQL Server to receive the restore data, which is then written to disks.

ZDB process depends on whether you replicate your data in a split mirror or snapshot replication and on the selected ZDB type. Restore process depends on the restore type - standard restore or instant recovery. See the *HP Data Protector zero downtime backup concepts guide* for a detailed description of replication techniques and ZDB and restore processes.



**Figure 61 Backup and restore concepts**

## Configuring the integration

### Prerequisites

- You need a license to use the SQL Server ZDB integration. See the *HP Data Protector installation and licensing guide* for information.
- Ensure that you correctly installed and configured SQL Server.
  - For supported versions, platforms, devices, and other information, see the *HP Data Protector product announcements, software notes, and references* or <http://www.hp.com/support/manuals>.
  - For information on installing, configuring, and using SQL Server, see the SQL Server documentation.
- Ensure that you correctly installed Data Protector. For information on installing Data Protector in various architectures and installing a Data Protector disk array integration (EMC, XP, VA, or EVA) with SQL Server, see the *HP Data Protector installation and licensing guide*.

Every SQL Server to be used with Data Protector must have the MS SQL Integration component installed.

- Install SQL Server on the application system. Install user databases on the disk array source volumes (system databases can be installed anywhere). If the system databases are also installed on a disk array, they *must* reside on *different* source volumes than user databases.

If SQL Server is installed on the backup system as well, its databases *must* reside on source volumes *different* from the source volumes used for this integration. Drive letters/mount points assigned to those volumes must also be different from the drive letters/mount points assigned to the volumes used for this integration.

## Before you begin

- Configure devices and media for use with Data Protector. See the online Help index: “configuring devices” and “creating media pools” for instructions.  
For ZDB to disk, configure a backup device (for example, a standalone file device), as you will have to select it when configuring a backup specification. For information on configuring standalone devices, see the online Help index: “standalone devices”.
- On the SQL Server client, restart the Data Protector `Inet` service under a Windows domain user account that has Windows administrative rights on the client. Ensure that this user has appropriate SQL Server permissions for running backups and restores if you plan to use the Integrated authentication type. For more information on authentication types, see “Configuring SQL Server” on page 246. For information on changing the user account under which the Data Protector `Inet` service is running, see the online Help index: “Inet, changing account”.
- To test whether SQL Server and Cell Manager communicate properly, configure and run a Data Protector filesystem ZDB and restore. See the online Help for instructions.

## Data Protector SQL Server configuration file

Data Protector stores integration parameters for every configured SQL Server on the Cell Manager in:

### **HP-UX, Solaris:**

```
/etc/opt/omni/server/integ/config/MSSQL/client_name%instance_name
```

### **Windows:**

```
Data_Protector_home\Config\Server\Integ\Config\MSSQL\client_name%instance_name
```

Configuration parameters are the username and password of the SQL Server user, who must have permissions to run backups and restores within SQL Server (assuming the standard security is used). They are written to the Data Protector SQL Server configuration file during configuration of the integration.

The syntax of the configuration file is:

```
Login='user';
Password='encoded_password';
```

---

 **IMPORTANT:**

To avoid backup problems, ensure that the syntax of your configuration file matches the examples.

---

## Examples

- **SQL Server authentication:**

```
Login='sa';
Domain='';
Password='jsk74yh80fh43kdf';
```

- **Windows authentication:**

```
Login='Administrator';
Domain='IPR';
Password='dsjf08m80fh43kdf';
```

- **Integrated authentication:**

```
Login='';
Domain='';
Password='kf8u3hdgtfh43kdf';
```

## Configuring users

Add the Windows domain user account under which the Data Protector `Inet` service on the SQL Server client is running to the Data Protector `admin` or `operator` group.

For information on adding users to Data Protector groups, see the online Help index: “adding users”.

## Configuring SQL Server

Configuration is performed during the creation of the first backup specification and consists of setting the username and password for the Data Protector services. Thereafter, the services are able to connect to SQL Server and operate under the specified account. The specified login information is saved to the Data Protector SQL Server instance configuration file on the Cell Manager.

---

### NOTE:

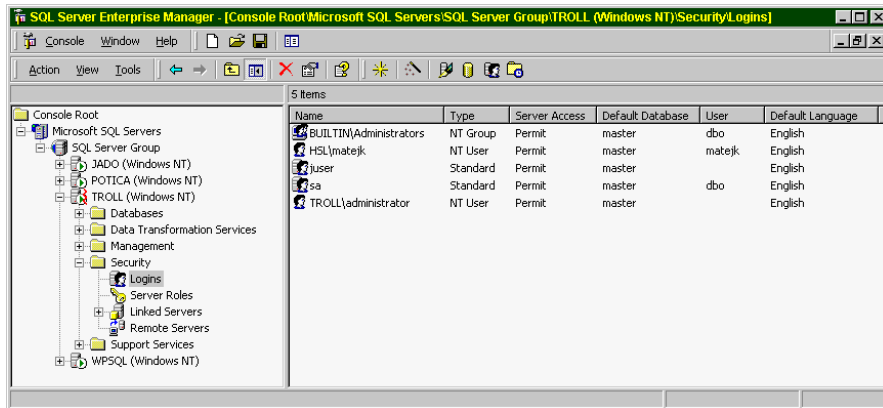
Ensure that the user account to be used has appropriate SQL Server permissions for running backups and restores. Check the permissions using SQL Server Enterprise Manager.

---

You can change configuration by following instructions described in “[Changing and checking configuration](#)” on page 249.

### Prerequisites

- SQL Server must be online during configuration.
- Configuration must be performed for every SQL Server instance separately.



**Figure 62 SQL Server users**

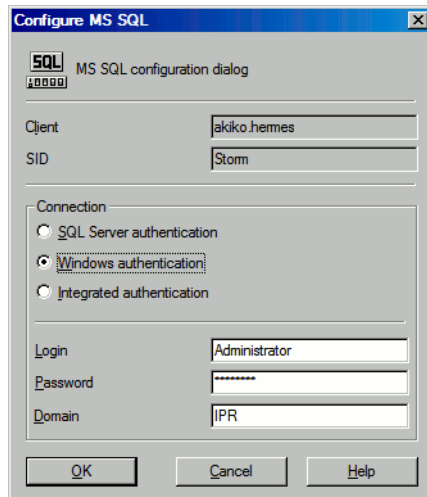
Configure SQL Server instances using the Data Protector GUI or CLI.

## Using the Data Protector GUI

1. In the Context List, click **Backup**.
2. In the Scoping Pane, expand **Backup Specifications**, right-click **MS SQL Server**, and click **Add Backup**.
3. In the **Create New Backup dialog box**, select the **Blank Microsoft SQL Server Backup** template and specify backup type. For details, see [Step 3](#) on page 252.  
Click **OK**.
4. Specify ZDB specific options. For details, see [Step 4](#) on page 254.
5. In **Application database**, specify the name of the SQL Server instance.  
Click **Next**.

6. In the Configure MS SQL dialog box, specify the user account that Data Protector should use to connect to the SQL Server instance:
  - **SQL Server authentication:** SQL Server user account. Specify a username and password.
  - **Windows authentication:** Windows domain user account (preferred option). Specify a username, password, and the domain.
  - **Integrated authentication:** Windows domain user account under which the Data Protector `Inet` service on the SQL Server system is running.

See [Figure 63](#) on page 248.



**Figure 63** Configuring SQL Server



**NOTE:**

It is recommended that the SQL Server system administrator configures the integration.

For details about security, see the SQL Server documentation.

Click **OK** to confirm the configuration.

7. The SQL Server instance is configured. Exit the GUI or proceed with creating the backup specification at [Step 7](#) on page 258.



## Using the Data Protector CLI

From the `Data_Protector_home\bin` directory, run:

```
sql_bar config [-appsrv:SQL_Server_client]
[-instance:instance_name] [-dbuser:SQL_Server_user
-password:password | -dbuser:Windows_user -password:password
-domain:domain]
```

### Parameter description

`-appsrv:SQL_Server_client`

Client system on which the SQL Server instance is running. This option is not required if you run the command locally.

`-instance:instance_name`

SQL Server instance name. If you omit this option, the default SQL Server instance is configured.

`-dbuser:SQL_Server_user -password:password`

SQL Server user account

`-dbuser:Windows_user -password:password -domain:domain`

Windows domain user account

---

#### NOTE:

If no user account is specified, Data Protector will connect to the SQL Server instance with the Windows domain user account under which the Data Protector `Inet` service on the SQL Server system is running.

---

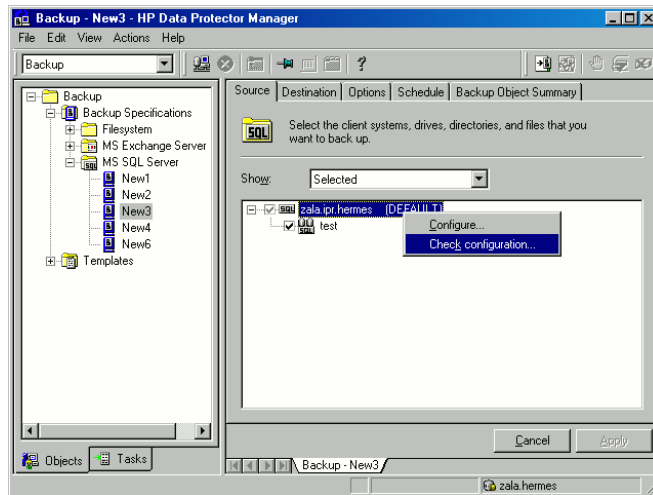
## Changing and checking configuration

You can check and change configuration using the Data Protector GUI or CLI.

### Using the Data Protector GUI

1. In the Context List, click **Backup**.
2. In the Scoping Pane, expand **Backup Specifications** and then **MS SQL Server**. Click a backup specification for which you want to change the configuration.
3. In the **Source** property page, right-click the SQL Server name and select **Configure**.

4. Configure SQL Server as described in “Configuring SQL Server” on page 246.
5. Right-click SQL Server and select **Check Configuration**. See Figure 64 on page 250.



**Figure 64** Checking configuration

## Using the Data Protector CLI

To change the configuration, run the command for configuring SQL Server instances again, entering different data.

To check configuration, run:

```
sql_bar chkconf [-instance:instance_name]
```

If the optional parameter `-instance:instance_name` is not specified, the default instance is checked.

If the integration is not properly configured, the command returns:

```
*RETVAL*8523
```

To get the information about the existing configuration, run:

```
sql_bar getconf [-instance:instance_name]
```

If `-instance:instance_name` is not specified, Data Protector returns configuration for the default instance.

# Backup

To run ZDB of an existing SQL Server ZDB specification:

- Schedule a backup using the Data Protector Scheduler.
- Start an interactive backup using the Data Protector GUI or CLI.

## Prerequisites

- The same drive letters, on which the source volumes to be replicated reside on the application system, must exist on the backup system to enable successful mounting of the target volumes. If the same drive letters do not exist on the backup system, the backup fails. The drive letters on the application and backup systems must be the same also in case of nested mount points.

## Considerations

Your session will fail if:

- You start ZDB, restore, or instant recovery using the same source volume on the application system at the same time. A session must be started only after the preceding session using the same source volume on the application system finishes.
- SQL Server services are not running when the backup starts.

To configure a ZDB, create a Data Protector SQL Server ZDB specification.

## Creating ZDB specifications

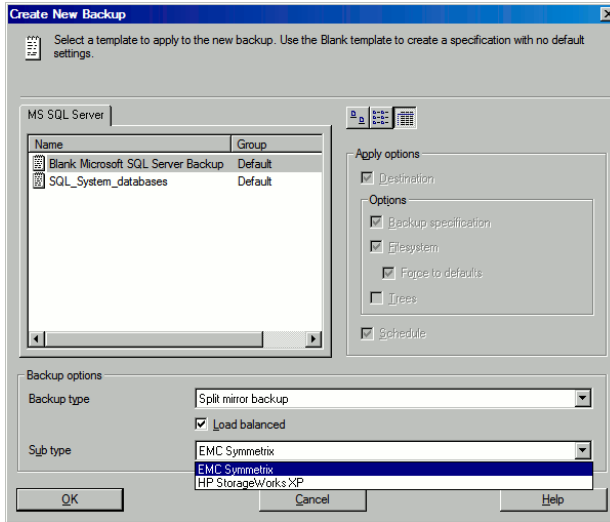
Create a ZDB specification, using the Data Protector Manager.

1. In the Context List, click **Backup**.
2. In the Scoping Pane, expand **Backup Specifications**, right-click **MS SQL Server**, and click **Add Backup**.

3. In the **Create New Backup** dialog box, select the **Blank Microsoft SQL Server Backup** template.

**XP, EMC:**

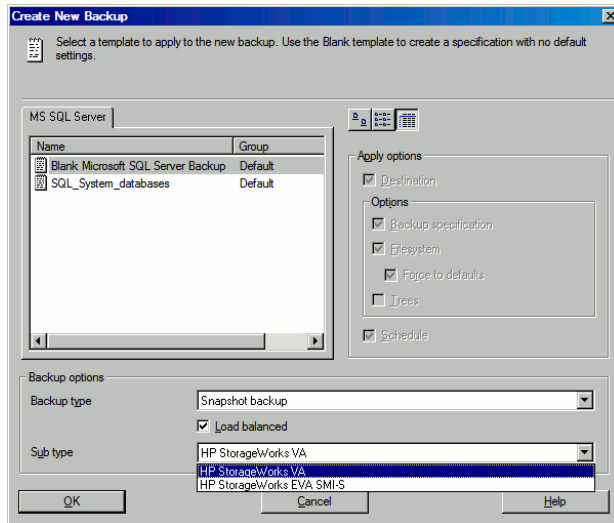
In the **Backup type** drop-down list, select **Split mirror backup**. In the **Sub type** drop-down list, select either **EMC Symmetrix** or **HP StorageWorks XP**. See [Figure 65](#) on page 252.



**Figure 65 Selecting a split mirror backup**

**VA, EVA:**

In the **Backup type** drop-down list, select **Snapshot backup**. In the **Sub type** drop-down list, select either **HP StorageWorks VA** or **HP StorageWorks EVA SMI-S**. See [Figure 66](#) on page 253.



**Figure 66** Selecting a snapshot backup

Click **OK**.

4. Under **Client systems**, select the SQL Server system. In cluster environments, select the virtual server of the SQL Server resource group.

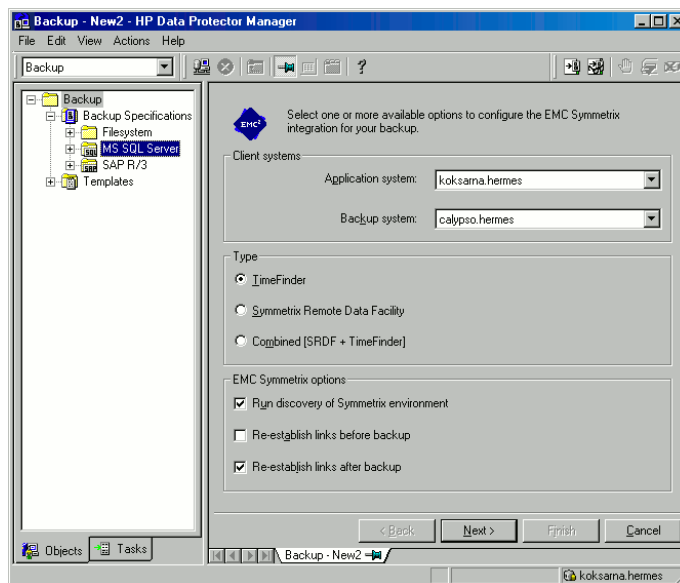
In the **Backup system** drop-down list, select the backup system.

Select other disk array specific backup options (see [Figure 68](#) on page 255 for EMC, [Figure 69](#) on page 256 for XP, [Figure 70](#) on page 257 for VA, or [Figure 70](#) on page 257 for EVA). For detailed information on options, press **F1**.

#### **EMC:**

In the EMC GeoSpan for Microsoft Cluster Service environment, select the backup system for the active node and specify the TimeFinder configuration.

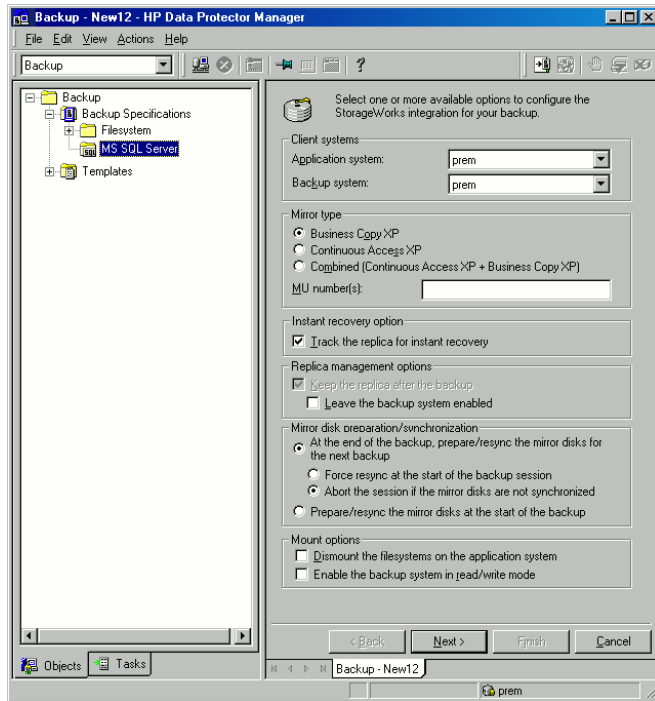
After a failover in EMC GeoSpan for MSCS, select the backup system for the currently active node and save the backup specification.



**Figure 67 EMC backup options**

#### **XP:**

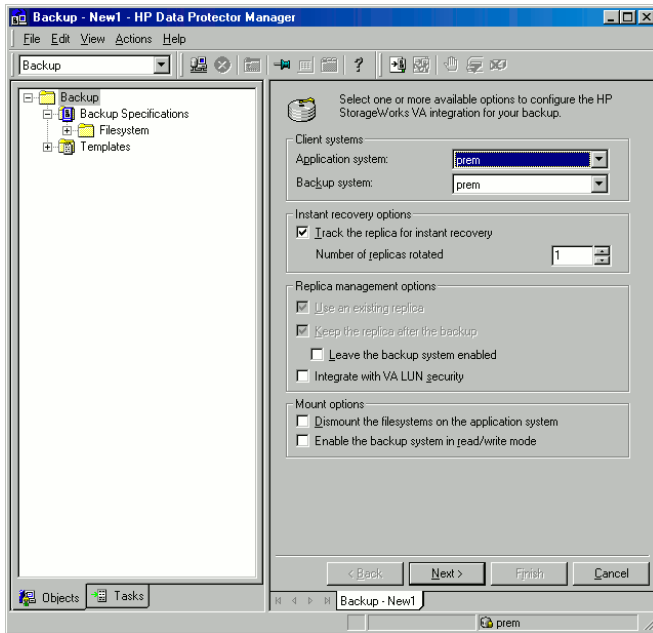
To enable instant recovery, leave **Track the replica for instant recovery** selected.



**Figure 68 XP backup options**

**VA:**

To enable instant recovery, leave **Track the replica for instant recovery** selected.

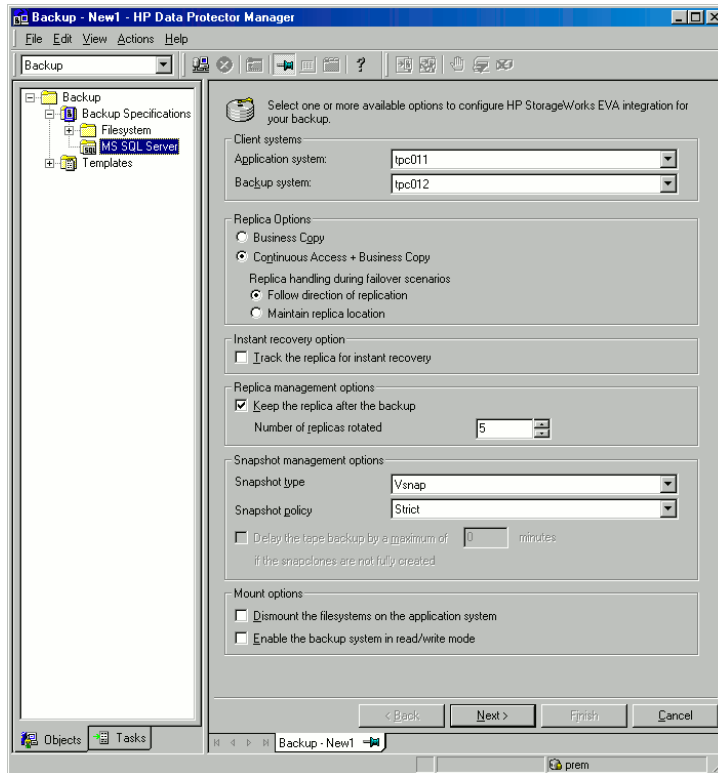


**Figure 69 VA backup options**

**EVA:**

To enable instant recovery, select **Track the replica for instant recovery**.





**Figure 70 EVA backup options**

Click **Next**.

5. In **Application database**, specify the name of the SQL Server instance.

Click **Next**.

6. If the client is not configured, the **Configure Microsoft SQL** dialog box appears. Configure it as described in [“Configuring SQL Server”](#) on page 246.

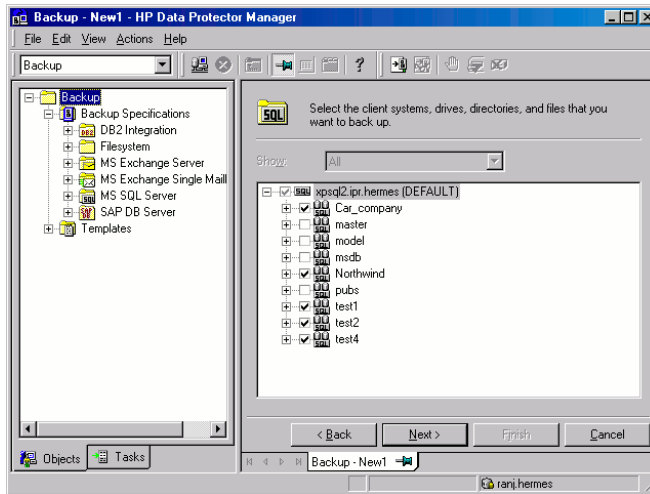
7. Select the databases to be backed up.

---

 **IMPORTANT:**

To enable instant recovery, create different backup specifications for user and system databases.

---



**Figure 71** Selecting user databases

Click **Next**.

8. Select the devices. Click **Properties** to set the device concurrency, media pool, and preallocation policy. For more information on options, press **F1**.

To create additional backup copies (mirrors), specify the desired number by clicking **Add mirror/Remove mirror**. Select separate devices for each mirror. The minimum number of devices for mirroring equals the number of devices used for backup.

For more information on object mirroring, see the online Help.

---

 **NOTE:**

Object mirroring is not supported for ZDB to disk.

---

Click **Next**.

9. Select backup options.

For information on **Backup Specification Options** and **Common Application Options**, see the online Help.

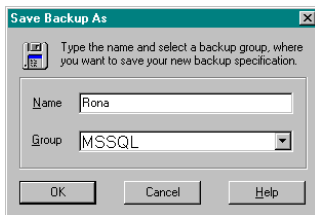
For information on **Application Specific Option**, see “[SQL Server Specific Backup Options](#)” on page 260.

Click **Next**.

10. Optionally, schedule the backup. For information on scheduler, press **F1**.

Note that only **Full** backup is performed.

11. Save the backup specification, specifying a name and backup specification group. You start the backup specification by clicking **Start Backup**.



**Figure 72 Saving a backup specification**

**Table 15 SQL Server backup options**

|                          |                                                                                                                                                                                                                                                |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Concurrent streams       | Ignored for ZDB sessions.                                                                                                                                                                                                                      |
| Fast direct mode         | Ignored for ZDB sessions.                                                                                                                                                                                                                      |
| Check database integrity | Performs data integrity validation before backup. If the check fails, the session completes with warnings.                                                                                                                                     |
| Pre-exec                 | Specifies a command with arguments or a script started by <code>sql_bar.exe</code> on SQL Server before backup. Resides in the <code>Data_Protector_home\bin</code> directory. Only the filename must be provided in the backup specification. |
| Post-exec                | Specifies a command with arguments or a script started by <code>sql_bar.exe</code> on SQL Server after backup. Resides in the <code>Data_Protector_home\bin</code> directory. Only the filename must be provided in the backup specification.  |

---

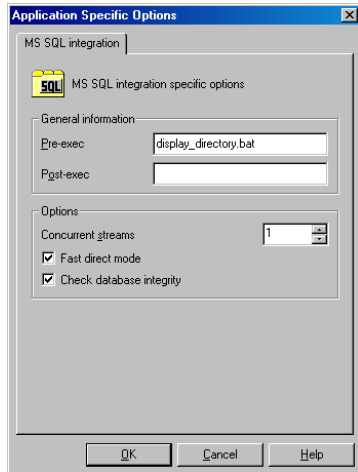
 **NOTE:**

Do not use double quotes (" ") in object-specific pre-exec and post-exec commands.

---

## SQL Server Specific Backup Options

SQL Server specific backup options are specified by clicking the **Advanced** tab in the **Application Specific Options** group box.



**Figure 73 Application specific options**

## Scheduling backups

You can run unattended ZDB at specific times or periodically. For details on scheduling, see the online Help index: "scheduled backups".

---

 **NOTE:**

You cannot run ZDB to disk or ZDB to disk+tape if **Track the replica for instant recovery** is not selected in the backup specification.

---

## Scheduling example

To schedule a database ZDB at 8:00, 13:00, and 18:00 during week days:

1. In the **Schedule** property page, select the starting date in the calendar and click **Add** to open the **Schedule Backup** dialog box.
2. Under **Recurring**, select **Weekly**. Under **Time options**, select **8:00**. Under **Recurring Options**, select **Mon, Tue, Wed, Thu, and Fri**.  
Click **OK**.
3. Repeat [Step 1](#) on page 261 and [Step 2](#) on page 261 to schedule backups at 13:00 and 18:00.
4. Click **Apply** to save the changes.



### NOTE:

For ZDB sessions, the backup type is set to **Full**.

---

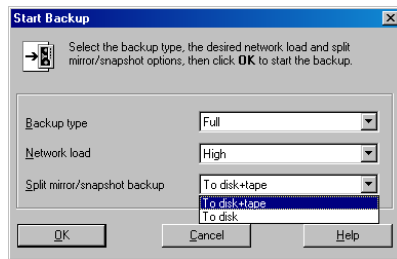
## Starting backup sessions

Interactive backups are run on demand. They are useful for urgent backups or restarting failed backups.

## Using the Data Protector GUI

1. In the Context List, click **Backup**.
2. In the Scoping Pane, expand **Backup Specifications**, and then **MS SQL Server**. Right-click the backup specification you want to start and select **Start Backup**.

3. Select **Network load**. For information on network load, click **Help**. Click **OK**.  
For ZDB sessions, the backup type is set to **Full**.  
For ZDB to disk or ZDB to disk+tape, specify the **Split mirror/snapshot backup** option.



**Figure 74 Starting interactive backups**

## Using the Data Protector CLI

To start ZDB to tape or ZDB to disk+tape, run:

```
omnib -mssql_list ListName
```

To start ZDB to disk, run:

```
omnib -mssql_list ListName -disk_only
```

where *ListName* is the name of the backup specification. For more information on omnib, see its man page.

## Restore

Data Protector offers restore from backup media to the application system on LAN (standard restore), where you can select various restore options depending on your restore scenario, and instant recovery. See the below sections for more information.

### Before you begin

- Before starting restore, verify that the database is not being in use.

## Standard restore



---

### NOTE:

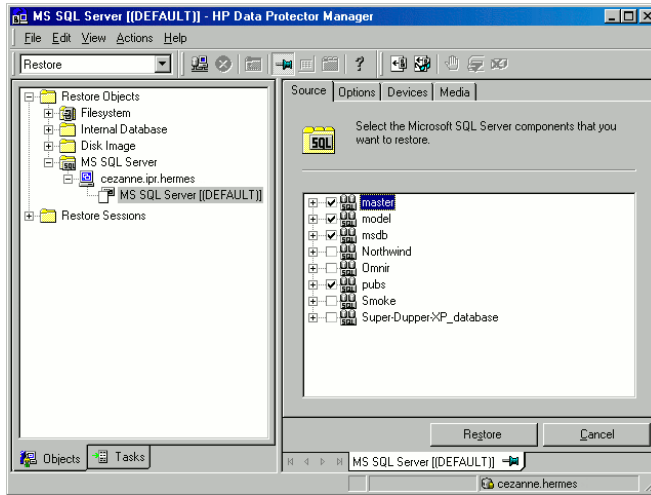
There is no need to create an empty database before restore, because the database and its files are generated automatically by SQL Server.

---

Proceed as follows using the Data Protector Manager:

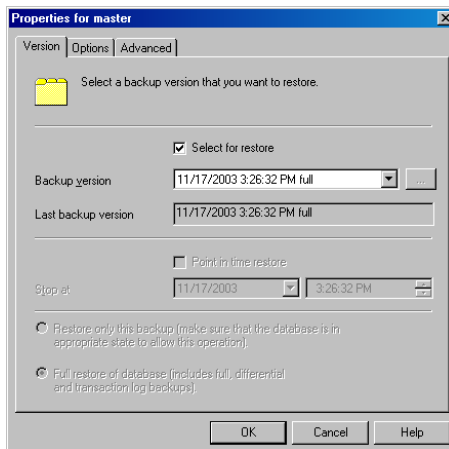
1. In the Context List, click **Restore**.
2. In the Scoping Pane, expand **Restore Objects, MS SQL Server**, and then select the client (backup system) from which you want to restore. A list of backed up objects is displayed in the Results Area.

3. Select the restore objects. See [Figure 75](#) on page 264.



**Figure 75 Restore objects**

To select backup object specific options, right-click the object and select **Properties**.



**Figure 76 Selecting object specific options**

You can select the version (backup date) from which you want to restore and choose SQL Server specific restore options. See [“Restore options”](#) on page 266 for details.

Click **OK**.



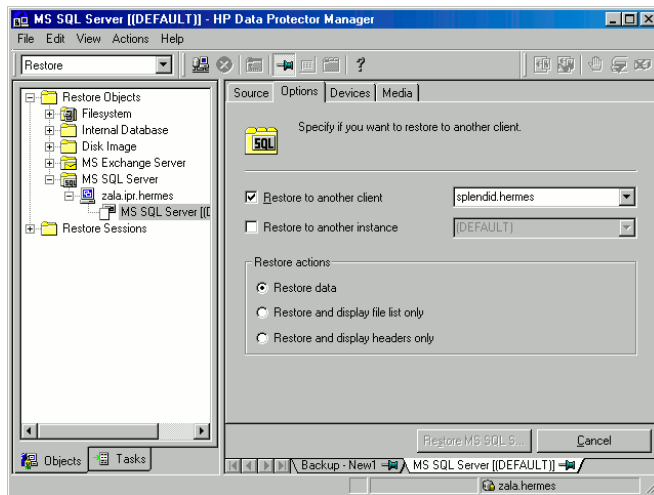
4. If you want to restore your data to another client or instance, specify new locations for the databases in the **Options** property page. See “Restore options” on page 266.

 **NOTE:**

When you click **Options**, the cell is browsed for running SQL Server instances that can become target instances for restore. If no instances are found, **Restore to another instance** is disabled and the message **There are no instances on this client system** is displayed.

Select one of the following **Restore actions**:

- **Restore data** (default). Select to restore the whole database.
- **Restore and display file list only**. Select if you do not know the original filenames. In this case, the files backed up in a particular session are displayed.
- **Restore and display headers only**. Select if you need specific details about backup. SQL Server header information is displayed.



**Figure 77** Restore options

5. In the **Devices** page, select devices to use for the restore.

The **Automatic device selection** option is selected by default, but it is recommended to select the **Original device selection** option.

---

 **IMPORTANT:**

If you decide to select the **Automatic device selection** option, ensure that the number of available devices is equal to or greater than the number of devices that were used for backup.

---

---

 **NOTE:**

For restore, you can use a different device than you used for backup. For information on restoring using another device, see the online Help index: “selecting, devices for restore”.

---

6. Click **Restore MS SQL Server** and then **Next** to select **Report level** and **Network load**.

Click **Finish** to start restore.

## Restore options

**Table 16 SQL Server restore options**

| Option                       | Description                                                                                                                                                                                                                                                                                                                          |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Backup version</b>        | Specifies the backup session from which the selected objects will be restored.                                                                                                                                                                                                                                                       |
| <b>Point-in-time restore</b> | Specifies a point in time to which the database state will be restored (you also need to select <b>Backup version</b> and set <b>Stop at</b> ). After recovery, the database is in the state it was at the specified date and time.<br>Only transaction logs written before the specified date and time are applied to the database. |

| Option                                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Stop at</b>                                  | <p>Specifies the exact time when the rollforward of transactions will be stopped. Therefore, to enable the database recovery to a particular point in time, backup you restore from must include transaction log backups.</p> <p>You cannot use this option used with <b>NORECOVERY</b> or <b>STANDBY</b>. If you specify <b>Stop at</b> time that is after the end of <b>RESTORE LOG</b> operation, the database is left in a non-recovered state (as if <b>RESTORE LOG</b> is run with <b>NORECOVERY</b>).</p>                                                                 |
| <b>Restore only this backup</b>                 | <p>If you restored a database version and left it in a non-operational or standby state, you can subsequently restore differential or transaction log backups one by one, leaving each version non-operational to restore additional backups.</p>                                                                                                                                                                                                                                                                                                                                |
| <b>Full restore of the database</b>             | <p>All necessary versions are restored, including the latest full backup, the latest differential backup (if one exists), and all transaction log backups from the last differential up to the selected version.</p>                                                                                                                                                                                                                                                                                                                                                             |
| <b>Force restore over the existing database</b> | <p>Overwrites the existing database residing on the target server. If a database with the same name as the one you are restoring already exists and has a different internal structure, SQL Server does not let you rewrite the database unless you select this option.</p>                                                                                                                                                                                                                                                                                                      |
| <b>Recovery completion state</b>                | <p>Enables selecting the database state after recovery. You may select from:</p> <ul style="list-style-type: none"> <li>• Leaving the database operational. Once the last transaction log is restored and the recovery completed, the database becomes operational.</li> <li>• Leaving the database non-operational after the last transaction log is restored. You may restore additional transaction logs one by one.</li> <li>• Leaving the database in read-only mode. You may restore additional transaction logs before the database is set to read-write mode.</li> </ul> |
| <b>Restore database with a new name</b>         | <p>Restores the database under a different name. Specify the database logical filename and the destination filename (suboptions of <b>Restore files to new locations</b>).</p>                                                                                                                                                                                                                                                                                                                                                                                                   |

| Option                                | Description                                                                                                                                                                                                                                                |
|---------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Restore files to new locations</b> | Restores files to a new location. Specify the database logical filename and a destination target filename for the specified logical filename. Use this option if you restore data to another server, instance, or make a database copy on the same server. |



**TIP:**

To allow different restore scenarios, you can combine general restore options, such as **Restore database to another Microsoft SQL Server** and **Restore using a different device**, with object-specific restore options, such as **Point-in-time restore**, **Recovery completion state**, **Force restore over existing database**.

## Restoring to another SQL Server instance or/and another SQL Server

### Prerequisites

- Both SQL Servers must have the same local settings (code page and sort order). This information is displayed in the session monitor for each backup.
  - The target SQL Server must be configured and reside in the same Data Protector cell as the original SQL Server. For configuration procedure, see [“Creating ZDB specifications”](#) on page 251.
- 1.** Select the databases you want to restore and their versions.
  - 2.** Select the following:
    - To restore to another SQL Server, select **Restore to another client** and the target client from the drop-down list.
    - To restore to another SQL Server instance, select **Restore to another instance**. If there are no instances in the drop-down list, enter the instance name yourself.
    - To restore to another SQL Server and another SQL Server instance, enter the name of the instance that exists on the target client. Otherwise, restore fails.
  - 3.** Specify new database locations.
  - 4.** Start restore. See [“Restore”](#) on page 262.

## Instant recovery

See the *HP Data Protector zero downtime backup concepts guide* and *HP Data Protector zero downtime backup administrator's guide* for general information on instant recovery.

### Prerequisites

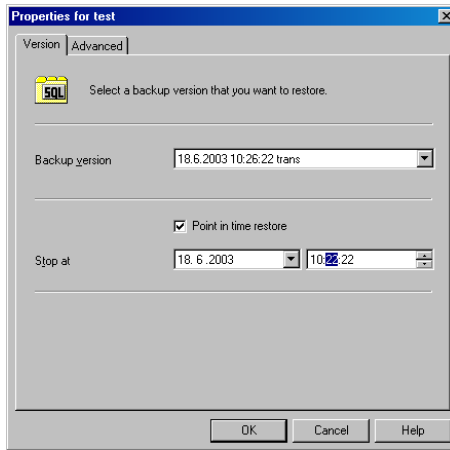
- If you restore user databases, put the databases offline:
  1. Start SQL Server Enterprise Manager.
  2. Selecting the database and click **Action**.
  3. Select all tasks and take them offline.
- If you restore system databases, put SQL Server offline by starting SQL Server Enterprise Manager, right-clicking SQL Server, and clicking **Stop**.

Perform instant recovery using the Data Protector Manager:

1. In the Context List, click **Instant Recovery**.
2. Expand **MS SQL Server** and select the backup session (replica) from which you want to restore. By default, the database will be recovered until the last backed up transaction.

3. To recover user databases to a specific point in time:
  - a. In the **Source** property page, under **Restore Objects**, right-click a database and click **Properties**.
  - b. In the **Backup version** drop-down list, select the required replica. The latest version is selected by default.

Select **Point in time restore**. From the **Stop at** drop-down list, select the point in time to which the transactions should be applied, and click **OK**. If no transaction logs are available, this option is disabled.



**Figure 78 Point-in-Time restore**

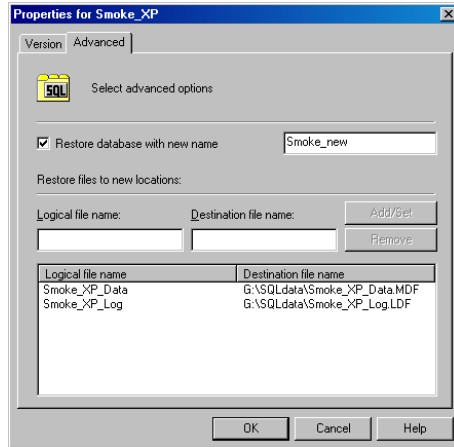
To restore the database under a different name, click **Advanced** and select **Restore database with new name**. See [Figure 79](#) on page 271.

---

 **IMPORTANT:**

If the logical filename and physical filename are not listed, add them to the list. Specify the same names as used for ZDB; otherwise, instant recovery fails.

---



**Figure 79 Restoring database with a new name**

**4. Click Restore MS SQL Server.**

If you restore system databases, SQL Server displays errors because its services are offline. Therefore, when restore completes, start SQL Server manually using SQL Server Enterprise Manager.

## Monitoring sessions

You can monitor currently running or view previous sessions in the Data Protector GUI. When you run an interactive session, the monitor window shows you the session progress. Closing the GUI does not affect the session.

You can also monitor sessions using the **Monitor** context from any Data Protector client with the **User Interface** component installed.

For information on monitoring sessions, see the online Help index: “viewing currently running sessions” and “viewing finished sessions”.

## Troubleshooting

This section lists general checks and verifications, plus problems you might encounter when using the Data Protector SQL Server integration. Start at “[Problems](#)” on page 273. If you cannot find a solution there, perform general checks and verifications.

For general Data Protector troubleshooting information, see the *HP Data Protector troubleshooting guide*.

For general ZDB, restore, and instant recovery related troubleshooting, see the *HP Data Protector zero downtime backup administrator's guide*.

## Before you begin

- Ensure that the latest official Data Protector patches are installed. See the online Help index: “patches” on how to verify this.
- See the *HP Data Protector product announcements, software notes, and references* for general Data Protector limitations, as well as recognized issues and workarounds.
- See <http://www.hp.com/support/manuals> for an up-to-date list of supported versions, platforms, and other information.

## Checks and verifications

If your configuration, backup, or restore failed:

- Check that SQL Server services are running.
- Examine system errors reported in `Data_Protector_home\log\debug.log` on SQL Server functioning as a Data Protector client.  
Additionally, check `errorlog` and `VDI.log` files in the `MSSQL\log` directory.
- Make a test filesystem backup and restore of the problematic client. For information, see the online Help.
- Check that every SQL Server used with Data Protector has the `MS SQL Integration` component installed.
- Connect to SQL Server via SQL Server Enterprise Manager using the same login ID as you specified in the Data Protector **Configuration** dialog box.
- Perform a database backup using SQL Server Enterprise Manager. If the backup fails, fix any SQL Server problems, and then perform a backup using Data Protector.

Additionally, if your backup failed:

- Verify the configuration file to check if the Cell Manager is correctly set on SQL Server.
- If you do not see the SQL Server instance as the application database when creating a backup specification, enter the instance name yourself. When “not-named instance” is not displayed, insert the `DEFAULT` string.
- If Data Protector reports that the integration is properly configured, verify that the SQL Server user has appropriate rights to access the required databases.



During restore, if the following error occurred when executing an SQL statement:

```
Error message: "Microsoft SQL-DMO (ODBC SQLState: 01000)?15[152:5]
1646 [Microsoft][ODBC SQL Server Driver][SQL Server]The master database
has been successfully restored. Shutting down SQL Server.[Microsoft]
[ODBC SQL Server Driver] [SQL Server]SQL Server is terminating this
process."
```

note that this is the expected behavior when the master database is restored in a single user mode.

## Problems

### Problem

#### The integration is properly configured but the database backup fails after a timeout

- With an error similar to:

```
[Warning] From: OB2BAR@computer1.com "MSSQL70"
Time: 3/14/2000 8:19:22 PM
Error has occurred while executing SQL statement.
Error message: 'Microsoft SQL-DMO (ODBC SQLState: 42000) Error
number: bc5
[Microsoft][ODBC SQL Server Driver][SQL Server]Backup or restore
operation terminating abnormally.'
[Critical] From: OB2BAR@computer1.com "MSSQL70"
Time: 3/14/00 8:19:24 PM
Received ABORT request from SM => aborting
```

- SQL Server error log contains an entry similar to:

```
2000-03-14 20:19:21.62 kernel
BackupVirtualDeviceSet::Initialize: Open failure on backup
device 'Data_Protector_master'.
Operating system error -2147024891(Access is denied.).
```

- SQL Server **VDI.LOG** file contains an entry similar to:

```
2000/03/15 13:19:31 pid(2112)
Error at BuildSecurityAttributes: SetSecurityDescriptorDacl
Status Code: 1338, x53A Explanation: The security descriptor structure
is invalid.
```

SQL Server service and Data Protector Inet are running under different accounts. The integration cannot access SQL Server due to security problems.

## Action

Restart the `Data Protector Inet` service under the same account as the SQL Server service is running.

## Problem

### Backup fails if the appropriate drive letter on the backup system does not exist

Backup fails with an error, similar to:

```
[Major] From: SSEA@computer1.com "" Time: 02-Feb-08 14:07:54
Filesystem \\.\Volume{ef58fe0e-b2b8-11db-aa08-000802804af6} could not be mounted
to Q:\Program Files\Microsoft SQL Server\MSSQL.1\MSSQL\DATA\
([87] The parameter is incorrect.).
```

Backup fails because SSE agent tries to mount the filesystem to the drive letter which does not exist on the backup system. The drive letter must be the same as on the application system. SSE or SMIS agents always mount the filesystems to the same drive letters on the backup systems as if the `ZDB_PRESERVE_MOUNTPOINTS` omnirc variable is set to 1.

## Action

For source volumes to be successfully replicated, create the same drive letters on the backup system as they are used on the application system for mounting the source volumes.

## Problem

### Restore from an object copy fails

## Action

Before restarting the restore:

- Increase the number of Disk Agent buffers for the device.
- If all backup objects are recorded in the IDB:
  1. In the **Internal Database** context, find the objects belonging to the same backup (identified by the same backup ID).
  2. Copy each object in a separate object copy session to a separate device, for example a file library. For each object, use a separate medium with the non-appendable media policy.
  3. Set the highest media location priority for the newly created copies.

## Problem

### Database is left in unrecovered state after “Invalid value specified for STOPAT parameter” is reported

The database remains in an unrecovered state as if the `RESTORE LOG` operation was run with `Leave the database non-operational`.

## Action

Recover the database to the latest point in time using SQL Query Analyzer:

```
RESTORE DATABASE database_name WITH RECOVERY
```

After the recovery, additional transaction logs cannot be applied.

## Problem

### Database restore fails with “Error has occurred while executing SQL statement”

If the database to be restored is still running, an error similar to the following may be reported:

```
[Warning] From: OB2BAR@taz "(DEFAULT)" Time: 3/12/2001 7:20:28 PM
```

```
Error has occurred while executing SQL statement
```

```
Error message: 'Microsoft SQL-DMO (ODBC SQLState: 42000)
Error number: cld
```

```
[Microsoft][ODBC SQL Server Driver][SQL Server]Exclusive access
could not be obtained because the database is in use.
```

```
[Microsoft][ODBC SQL Server Driver][SQL Server]RESTORE DATABASE
is terminating abnormally.'
```

## Action

To put the database offline, start SQL Server Enterprise Manager, go to the database and click **Action**. Select all tasks and put them offline.

## Problem

### Transaction logs cannot be restored from tape

The recovery completed successfully and the database was put in `norecovery` state, but transaction logs cannot be restored from tape.

## Action

Recover the database to the state of ZDB to disk using the SQL Query Analyzer:

```
RESTORE DATABASE database name WITH RECOVERY
```

After the recovery, additional transaction logs cannot be applied.

## Problem

### **Instant recovery of SQL Server databases fails**

## Action

Restart SQL Server instance services after instant recovery completes. If restarting services does not automatically start the recovery of all system databases, start the SQL Server instance in a single-user mode and manually start the recovery of the master database. Do the same with other system databases. At the end, restart SQL Server instance services.

## Problem

### **Instant recovery completes with errors**

The following errors appear:

```
[Critical] From: OB2BAR_Main@qawin46.dpqaexch.com "(DEFAULT)"
Time: 4/8/2006 7:01:42 PM
```

Microsoft SQL Server reported the following error during login:

The object was not open.

```
[Warning] From: OB2BAR_Main@qawin46.dpqaexch.com "(DEFAULT)"
Time: 4/8/2006 7:01:42 PM
```

```
[152:9208] Data Protector is probably not configured for use
with SQL Server on this host.
```

These errors are displayed because SQL Server is offline.

## Action

After the recovery, start SQL Server manually using SQL Server Enterprise Manager.

## Problem

### **Restore to another client in the Data Protector cell not configured for use with SQL Server fails**

## Action

Configure the SQL integration on this client (see “Configuring the integration” on page 243).

## Problem

### **Database is left in unrecovered state after restore completed successfully**

If you set the time for `Stop` at beyond the end of the `RESTORE LOG` operation, the database remains in the unrecovered state as if the `RESTORE LOG` operation was run with `Leave the database non-operational`.

## Action

Recover the database to the latest point in time by using the SQL Query Analyzer:

```
RESTORE DATABASE database_name WITH RECOVERY
```

After the recovery, additional transaction logs cannot be applied.

## Problem

### **Restoring a Microsoft SQL Server 2005 instance to an alternate location when full-text indexing is enabled fails**

When the Use full-text indexing option is enabled for a particular database in a Microsoft SQL Server 2005 instance, the restore session does not complete successfully, since restore of the full-text catalog of the SQL database fails. The session report contains warning messages about the full-text catalog file being used by the affected database.

## Action

To solve the problem:

1. In the HP Data Protector Manager, switch to the **Restore** context.
2. In the Scoping Pane, expand **Restore Objects** and then **MS SQL Server**. Select name of the Microsoft SQL Server for which you want to perform restore.
3. In the Results Area, double-click the bar name corresponding to the particular Microsoft SQL Server instance. A list of backed up objects gets displayed.

4. Select the desired Microsoft SQL Server database, right-click it, and click **Properties**.
5. In the Properties window, click the **Advanced** tab.
6. Select the **Restore database with new name** option, and enter the new database name in the text box.
7. For all logical file names that are already present on the list, update contents of the Destination file name column accordingly.
8. Add the full-text catalog to the list.

In the Logical file name text box, enter the string `sysft_Full-Text_Catalog_Name`. In the Destination file name text box, enter the corresponding physical location.



**NOTE:**

The full-text catalog is always restored to its original location, regardless of the specified physical location.

---

9. Click **Add/Set**.
10. In the Version and Options property pages, specify the appropriate options. For details, see “ [Standard restore](#) ” on page 263.
11. Click **OK** to close the Properties window.
12. In the Options, Devices, and Media property pages, specify the appropriate options. For details, see “ [Standard restore](#) ” on page 263.
13. Click **Restore** and then **Next** to select the Report level and Network load.
14. Click **Finish** to start the restore session.

---

# 4 Data Protector Microsoft Exchange Server ZDB integration

## Introduction

This chapter explains how to configure and use the Data Protector Microsoft Exchange Server ZDB integration. It describes the concepts and methods you need to understand to back up and restore the Microsoft Exchange Server (**Exchange Server**) database objects.

During backup, the database is only stopped for the time it takes to create a **replica** (split mirror disks or create snapshots). If ZDB to tape is performed, backup is subsequently performed offline on the backup system.

The following disk arrays and array configurations are supported:

| Supported array                                | Supported configurations |
|------------------------------------------------|--------------------------|
| HP StorageWorks Disk Array XP (XP)             | BC, CA, combined BC+CA   |
| HP StorageWorks Enterprise Virtual Array (EVA) | BC, combined CA+BC       |
| HP StorageWorks Virtual Array (VA)             | BC                       |

All ZDB types (ZDB to tape, ZDB to disk, and ZDB to disk+tape) are supported by this integration. For ZDB types description, see the *HP Data Protector zero downtime backup concepts guide* and the online Help.

Using Data Protector, you can restore Exchange Server data:

- From backup media to the application system on LAN (standard restore).

- Using instant recovery.

The following table gives an overview of Exchange Server recovery methods:

|                         | Rollforward recovery                                                                                                                                                                               | Point-in-time recovery                                                                                                 |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>ZDB to tape</b>      | Standard restore (database) + standard restore (transaction logs)                                                                                                                                  | Standard restore (database)                                                                                            |
| <b>ZDB to disk</b>      | Instant recovery (database) + standard restore (transaction logs)                                                                                                                                  | Instant recovery (database)                                                                                            |
| <b>ZDB to disk+tape</b> | <ul style="list-style-type: none"> <li>• Instant recovery (database) + standard restore (transaction logs)</li> <li>• Standard restore (database) + standard restore (transaction logs)</li> </ul> | <ul style="list-style-type: none"> <li>• Instant recovery (database)</li> <li>• Standard restore (database)</li> </ul> |

For a description of ZDB and instant recovery concepts, see the *HP Data Protector zero downtime backup concepts guide*.

## Integration concepts

The Exchange ZDB integration backs up Microsoft Information Store (MIS), Key Management Service (KMS), and Site Replication Service (SRS), which are replicated within a disk array.

Data Protector integrates with Exchange Server through:

- The Data Protector `ese_bar.exe` executable, installed on Exchange Server and used for retrieving locations of files and folders pertaining to a storage group/store.
- The `omniEx2000.exe` command, responsible for mounting and dismounting databases and purging transaction logs after a transaction logs backup.

An Exchange ZDB specification is created using the `omnicreated1` command. Based on this specification, you can perform a filesystem ZDB using the Data Protector GUI. During backup, `ese_bar.exe` resolves database objects and retrieves a list of files and folders to be backed up. The following happens:



- Stop/quiesce application is executed, which dismounts the databases and verifies their consistency using `esefile.exe` (Exchange 2000) or `eseutil.exe` (Exchange 2003). See [Checking Exchange files for consistency](#).
- When the replica is created, Restart the application is executed, which mounts dismounted databases.
- If ZDB to tape is performed, Data Protector backs up Exchange databases on the backup system. Transaction logs are not deleted and can be backed up in a separate session using non-ZDB procedure.

ZDB process depends on whether you replicate your data in a split mirror or snapshot replication and on the selected ZDB type. Restore process depends on the restore type - standard restore or instant recovery. See the *HP Data Protector zero downtime backup concepts guide* for a detailed description of replication techniques, as well as ZDB and restore processes.

## Configuring the integration

### Prerequisites

- You need a license to use the Exchange Server ZDB integration. See the *HP Data Protector installation and licensing guide* for information.
- Ensure that you correctly installed and configured Exchange Server.
  - For supported versions, platforms, devices, and other information, see the *HP Data Protector product announcements, software notes, and references* or <http://www.hp.com/support/manuals>.
  - For information on installing, configuring, and using Exchange Server, see the Exchange Server documentation.
- Ensure that you correctly installed Data Protector. For information on installing Data Protector in various architectures and installing a Data Protector disk array integration (XP, VA, or EVA) with Exchange Server, see the *HP Data Protector installation and licensing guide*.

Every Exchange Server system to be used with Data Protector must have the `MS Exchange Integration` component installed.

- Install Exchange Server on the application system. All parts of the Exchange database (Information Store (MIS), Key Management Service (KMS), and Site Replication Service (SRS)) must be installed on the disk array source volumes.
- Split mirror backup of Exchange Server 2003 databases requires Exchange Server 2003 SP2 or higher.

## Limitations

- Due to incompatibility between Microsoft Exchange Server 2007 and earlier Exchange Server versions, Exchange Server 2007 backup objects cannot be restored to Data Protector clients on which an earlier Exchange Server version is installed, and vice versa.

## Before you begin

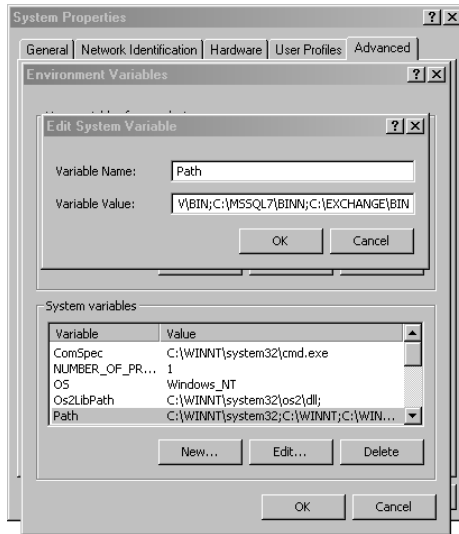
- Configure devices and media for use with Data Protector. See the online Help index: “configuring devices” and “creating media pools” for instructions. For ZDB to disk, configure a backup device (for example, a standalone file device), as you will have to select it when configuring a backup specification. For information, see the online Help index: “standalone devices”.
- To test whether Exchange Server and Cell Manager communicate properly, configure and run a Data Protector filesystem ZDB and restore. See the online Help for instructions.
- Before performing transaction logs backups, disable **circular logging** for all storage groups.

If the application is cluster-aware, disable circular logging on all cluster nodes.

- Add the `Exchange_home\bin` directory to the Windows **Path** environment variable:
  1. In the Windows Explorer, right-click **My Computer** and click **Properties**.
  2. In the **Properties** dialog box, click **Advanced** and then **Environment Variables**.
  3. Select **Path** in the **System Variables** list and click **Edit**.
  4. Add `Exchange_home\bin` in the **Variable Value** text box and click **OK**.

See [Figure 80](#).

If the integration is cluster-aware, perform this procedure on all cluster nodes.



**Figure 80 Path system variable**

- In cluster environments, prior to configuring a ZDB specification, create a new physical resource (LUN for VA, virtual disk for EVA, and LDEV for XP) for the cluster and move the Exchange Server database and transaction log files to it. For information on moving the Exchange Server database and transaction log files, see the following documents available at <http://support.microsoft.com>:
  - *How to Move Exchange Databases and Logs in Exchange Server 2003 (821915)*
  - *XADM: How to Move Exchange Databases and Logs in Exchange 2000 Server (257184)*
  - *HOW TO: Add New Mailbox Stores in Exchange Server 2003 (821748)*
  - *HOW TO: Add New Mailbox Stores in Exchange 2000 (319218)*

## Backup

To run ZDB of an existing Exchange Server ZDB specification:

- Schedule a backup using the Data Protector Scheduler.
- Start an interactive backup using the Data Protector GUI or CLI.

### Limitations

- Backup preview is not supported.

## Considerations

- You can perform transaction logs backups only if circular logging is disabled for the involved Exchange Server.  
Circular logging is a Microsoft Exchange mode, where transaction logs are automatically overwritten when the data they contain is committed to the database. If enabled, this option reduces disk storage space requirements, but does not allow you to perform transaction logs backups.
- Exchange Server on the application system must be running. Otherwise, data consistency is not guaranteed.
- You cannot start ZDB, restore, or instant recovery using the same source volume on the application system at the same time. A session must be started only after the preceding session using the same source volume on the application system finishes; otherwise, the session fails.
- Transaction logs must be backed up using the common filesystem backup functionality.
- When backing up log files, select either **Log all** or **Log files** logging level in the **Advanced Filesystem Options** dialog box. This enables purging backed up log files from disk. For more information, see the online Help index: “filesystem options”.

## Configuring Exchange Server ZDB

To configure a ZDB:

1. Configure devices and media for backup.
2. Create a Data Protector Exchange Server ZDB specification.

## Creating ZDB specifications

Create a ZDB specification using the `omnicreated1` command. After that, perform a filesystem ZDB using the Data Protector GUI.

The `omnicreated1` command creates a ZDB specification with included `Stop/quiesce the application` and `Restart the application` scripts (`omniEx2000.exe`) for mounting/dismounting backed up databases and checking their consistency.

Additionally, `omnicreated1` creates a transaction logs backup specification for each storage group specified in a ZDB specification (circular logging disabled). See [Figure 96](#). The transaction logs backup specification includes the post-exec script for purging backed up log files.

---

 **TIP:**

A transaction logs backup specification can either be triggered by post-exec (configured on the backup specification level) in the backup specification for database files backup (recommended), or started manually after the backup specification for database files backup is started. For more information, see the online Help index: "pre- and post-exec commands".

---

The following is the synopsis of the `omnicreatedl` command:

```
omnicreatedl -ex2000 -datalistName [-deviceName]
{DISK_ARRAY_XP_OPTIONS | VIRTUAL_ARRAY_OPTIONS |
ENTERPRISE_VIRTUAL_ARRAY_OPTIONS} EXCHANGE_OPTIONS [-force]
[-virtualSrvName]
```

For a detailed synopsis of `DISK_ARRAY_XP_OPTIONS`, `VIRTUAL_ARRAY_OPTIONS`, `ENTERPRISE_VIRTUAL_ARRAY_OPTIONS`, and `EXCHANGE_OPTIONS`, see the `omnicreatedl` man page.

Descriptions of the parameters are presented in the tables below:

---

 **IMPORTANT:**

If parameters contain spaces, use double quotes when specifying them in the `omnicreatedl` command. For example, `-storage_group "First Storage Group"`.

---

**Table 17 General options**

| Parameter                   | Description                                                                                                                                                                                          |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-ex2000</code>        | Instructs <code>omnicreatedl</code> to create a ZDB specification and transaction logs backup specification for all specified storage groups (circular logging disabled).                            |
| <code>-datalist Name</code> | Specifies the name of the ZDB specification created on the Cell Manager in <code>Data_Protector_home\config\server\datalists</code> (Windows) or <code>/etc/opt/omni/server/datalists</code> (UNIX). |

| Parameter               | Description                                                                                                      |
|-------------------------|------------------------------------------------------------------------------------------------------------------|
| -device <i>Name</i>     | Specifies the backup device. If this option is not used, specify the backup device using the Data Protector GUI. |
| -force                  | Forces overwriting of an existing ZDB specification with the same name.                                          |
| -virtualSrv <i>Name</i> | In cluster configurations, specifies the name of the Exchange Server virtual server.                             |

**Table 18 XP options**

| Parameter                                                                                                                  | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| -split_mirror -sse                                                                                                         | Instructs <code>omnicreated1</code> to create a split mirror ZDB specification.                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| ( -local <i>app_sys</i> <i>bck_sys</i>   -remote <i>app_sys</i> <i>bck_sys</i>   -combined <i>app_sys</i> <i>bck_sys</i> ) | <p>Specifies XP configurations:</p> <ul style="list-style-type: none"> <li>-local selects Business Copy (BC) XP.</li> <li>-remote selects Continuous Access (CA) XP.</li> <li>-combined selects Business Copy + Continuous Access (BC+CA) XP.</li> </ul> <p>For all configurations, <i>app_sys</i> sets the application system and <i>bck_sys</i> sets the backup system.</p> <p>In cluster environments, specify the virtual server hostname (rather than the physical node hostname).</p>                            |
| -mirrors<br><i>MU_Numbers</i>                                                                                              | <p>Sets the number of replicas in the replica set. Enter an integer number from 0 to 2 or any range/combination of integer numbers from 0 to 2 separated by a comma, for example:</p> <p>1<br/>1-2<br/>2,0,1</p> <p>A sequence does not set the order in which the replicas are used. The algorithm of using replicas is described in the <i>HP Data Protector zero downtime backup concepts guide</i>.</p> <p>A range must be specified in ascending order.</p> <p>If this option is not specified, MU# 0 is set.</p> |

| Parameter                                         | Description                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|---------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [ <code>-split</code>   <code>-establish</code> ] | <p>This parameter is optional.</p> <p>If <code>-split</code> is selected, mirrored disks in the replica are resynchronized with P-VOLs at the backup start.</p> <p>If <code>-establish</code> is selected and the replica for the next backup is not synchronized, a resync is initiated before next backup.</p> <p>Default: <code>-establish</code>.</p>                                                                                                 |
| <code>-leave_enabled_bs</code>                    | <p>Available if <code>-keep_version</code> is specified.</p> <p>By default, Data Protector dismounts filesystems on the backup system after each backup. If this option is specified, filesystems remain mounted after backup.</p> <p>Thus, you can use the backup system for data warehouse activity, but not for instant recovery.</p>                                                                                                                  |
| <code>-instant_restore</code>                     | <p>This parameter is optional.</p> <p>Select to perform ZDB to disk or ZDB to disk+tape and leave the replica on a disk array for instant recovery. If this option is not set, you cannot perform instant recovery from the replica created or reused in this session.</p> <p>When <code>-instant_restore</code> is selected, <code>omnicreated1</code> automatically sets the <code>-keep_version</code> option.</p>                                     |
| <code>-keep_version</code>                        | <p>This parameter is optional.</p> <p>If selected, participating pairs remain split after backup, enabling you to restore directly from the replica.</p> <p>If not selected, participating disks are resynchronized after backup if one or no replica is set by <code>-mirrors MU_Numbers</code>. If more than one replica is set, the disks remain split.</p> <p>If this option is not specified, you cannot specify <code>-leave_enabled_bs</code>.</p> |

**Table 19 VA options**

| Parameter                            | Description                                                                                        |
|--------------------------------------|----------------------------------------------------------------------------------------------------|
| <code>-snapshot</code>               | Instructs <code>omnicreated1</code> to create a snapshot ZDB specification.                        |
| <code>-va app_sys<br/>bck_sys</code> | Specifies the application system <code>app_sys</code> and the backup system <code>bck_sys</code> . |

| Parameter                           | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-use_existing_snapshot</code> | <p>By default, this option is automatically selected if <code>-instant_recovery</code> is set.</p> <p>If configuring a ZDB to tape, select this option to reuse an existing replica.</p> <p>The replica can be reused only if it already exists on a disk array. Only replicas not marked for instant recovery or replicas with snapshots not listed in the VA LUN exclude file can be reused.</p>                                                                                 |
| <code>-instant_recovery</code>      | <p>This parameter is optional.</p> <p>Select to perform a ZDB to disk or ZDB to disk+tape and leave the replica on a disk array for instant recovery. Also, specify <code>-snapshots number</code>. The options <code>-use_existing_snapshot</code> and <code>-leave_version</code> are automatically selected.</p> <p>If this option is not set, you cannot perform instant recovery from the replica created or reused in this session.</p>                                      |
| <code>-snapshots number</code>      | <p>This parameter is optional.</p> <p>During ZDB, Data Protector creates a new replica and leaves it on the array until the specified <code>-snapshots number</code> is reached (specify if you selected <code>-instant_recovery</code>). After that, the oldest replica is reused.</p> <p>Default: 1. Maximum: 1024.</p>                                                                                                                                                          |
| <code>-leave_version</code>         | <p>This parameter is optional.</p> <p>By default, this option is automatically selected if <code>-instant_recovery</code> is set.</p> <p>For ZDB to tape, select it to keep the replica on a disk array after backup. This replica is not available for instant recovery, but can be reused for future backups using the same backup specification (<code>-use_existing_snapshot</code> selected).</p> <p>If this option is not selected, the replica is deleted after backup.</p> |
| <code>-leave_enabled_bs</code>      | <p>Available if <code>-leave_version</code> is selected.</p> <p>By default, Data Protector dismounts filesystems on the backup system after each backup. If this option is specified, filesystems remain mounted.</p> <p>Thus, you can use the backup system for data warehouse activities, but not for instant recovery.</p>                                                                                                                                                      |



| Parameter                  | Description                                                                                                                                                                                                                                     |
|----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-lun_security</code> | Specify this option to apply LUN security to child LUNs (target volumes or snapshots) created by the integration.<br><i>If Secure Manager is activated, specify this option and configure passwords correctly; otherwise, the backup fails.</i> |

**Table 20 EVA options**

| Parameter                                                      | Description                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-snapshot</code>                                         | Instructs <code>omnicreatedl</code> to create a snapshot ZDB specification.                                                                                                                                                                                                                                                                                                                                                            |
| <code>-smis app_sys<br/>bck_sys</code>                         | Specifies the application system <code>app_sys</code> and the backup system <code>bck_sys</code> .                                                                                                                                                                                                                                                                                                                                     |
| <code>-instant_recovery</code>                                 | This parameter is optional.<br>Select to perform a ZDB to disk or ZDB to disk+tape and leave the replica on a disk array for instant recovery. Also, specify <code>-snapshots number</code> . The options <code>-snapshot_type clone</code> and <code>-snapshot_policy strict</code> are automatically selected.<br>If this option is not set, you cannot perform instant recovery from the replica created or reused in this session. |
| <code>-snapshots number</code>                                 | This parameter is optional.<br>During ZDB, Data Protector creates a new replica and leaves it on the array until the specified <code>-snapshots number</code> is reached. After that, the oldest replica is reused.<br>Default: 1.<br>The maximum number for <code>vsnap</code> s and standard snapshots is 7. Data Protector does not limit the number of replicas rotated, but the session fails if the limit is exceeded.           |
| <code>-snapshot_type<br/>{standard   vsnap<br/>  clone}</code> | Instructs Data Protector to create a particular type of EVA snapshots:<br><code>-standard</code> creates snapshots with the pre-allocation of disk space.<br><code>-vsnap</code> creates snapshots without the pre-allocation of disk space.<br><code>-clone</code> creates a clone of a source volume (original virtual disk).                                                                                                        |

| Parameter                                                                                                                    | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-snapshot_policy</code><br>{ <code>strict</code>   <code>loose</code> }                                                | <p>Specifies a snapshot policy depending on the type of already existing snapshots for the same source volume.</p> <p>When <code>-strict</code> is selected, Data Protector attempts to create snapshots as specified by <code>-snapshot_type</code>. If the source volumes used in the session have existing snapshots of a different type, the selected type is not created (the session is aborted).</p> <p>When <code>-loose</code> is selected, Data Protector creates snapshots of a different type than specified by <code>-snapshot_type</code> (if this helps to complete a session successfully).</p> <p>For example, if you select standard snapshots, but Data Protector detects that standard snapshots cannot be created because vsnaps/snapclones of the source volumes already exist in a replica set, it creates either vsnaps or snapclones instead of standard snapshots.</p> <p>Note that Data Protector can use only one type of snapshots in a backup session. For example, if the source volumes used in a session have existing standard snapshots/vsnaps, the session is aborted.</p> |
| <code>-wait_clonecopy</code><br><i>number</i>                                                                                | <p>Available if <code>-snapshot_type clone</code> is selected.</p> <p>Specify to prevent degradation of the application data access times by delaying moving data to tape until the cloning process completes (ZDB to tape, ZDB to disk+tape). Set the maximum waiting time. When the specified time is reached, backup to tape starts (even if cloning is not finished).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <code>-replica_conf</code><br>{ <code>local</code>   <code>combined</code> }                                                 | <p>Specifies EVA configurations:</p> <p><code>local</code> selects Business Copy (BC) EVA.</p> <p><code>combined</code> selects Continuous Access + Business Copy (CA+BC) EVA.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <code>-ca_failover_option</code><br>{ <code>follow_replica_direction</code><br> <br><code>maintain_replica_location</code> } | <p>Available if <code>combined</code> configuration is selected.</p> <p>Specify to control the replication direction after a failover.</p> <p>Select <code>follow_replica_direction</code> to follow the replication direction and create replicas on the array remote to current source. A failover reverses the replication direction and the replicas are created on the array that was originally a source EVA.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

| Parameter | Description                                                                                                                                                                                                                                                                                                                                                             |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | <p>Select <code>maintain_replica_location</code> to maintain the replica location and create replicas on the array remote to home. After a failover, replicas continue to be created on the destination array that has also become a source EVA.</p> <p>When <code>-ca_failover_option</code> is selected, <code>follow_replica_direction</code> is set as default.</p> |

**Table 21 Exchange Server options**

| Parameter                                      | Description                                                                                                                                                                                                                                                                            |
|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>-annotation { MIS   SRS   KMS }</code>   | <p>Specifies Exchange Server annotations: Microsoft Information Store (MIS), Site Replication Service (SRS), and Key Management Service (KMS).</p> <p>Default: MIS.</p>                                                                                                                |
| <code>-all_storage_groups</code>               | <p>Creates a backup specification for all databases relating to MIS (specified by <code>-annotation MIS</code>).</p>                                                                                                                                                                   |
| <code>-storage_group Storage_Group_Name</code> | <p>Creates a backup specification for all stores relating to the specified. Multiple declarations of <code>-storage_group</code> create a backup specification for the selected storage groups.</p>                                                                                    |
| <code>-store Store</code>                      | <p>Creates a backup specification only for specified store(s) inside the storage group. To create a backup specification for many stores, specify a list of stores after the <code>-store</code> parameter.</p> <p>You can obtain store names using Exchange System Administrator.</p> |

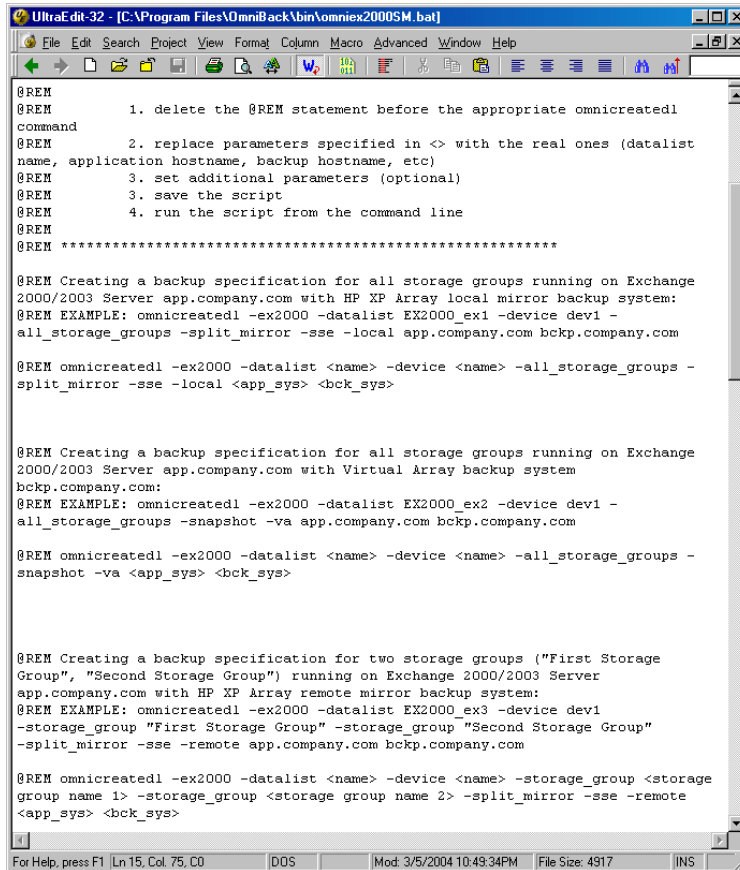
For more information, see the `omnicreated1` man page.

 **TIP:**

To create an Exchange ZDB specification and a transaction logs backup specification, you can also use the `omniex2000SM.bat` file, located in the `Data_Protector_home\bin` directory on the application system. The script provides templates and examples of `omnicreated1` usage. You can modify `omniex2000SM.bat` using any text editor. Uncomment (delete `@REM` before the command) the line with the appropriate command and edit parameters. See [Figure 81](#).

To create an Exchange ZDB specification and a transaction logs backup specification using `omniex2000SM.bat`, make the necessary modifications and run:

`Data_Protector_home\bin\omniex2000SM.bat`.



```
UltraEdit-32 - [C:\Program Files\OmniBack\bin\omniex2000SM.bat]
File Edit Search Project View Format Column Macro Advanced Window Help
@REM
@REM 1. delete the @REM statement before the appropriate omnicreatedl
command
@REM 2. replace parameters specified in <> with the real ones (datalist
name, application hostname, backup hostname, etc)
@REM 3. set additional parameters (optional)
@REM 3. save the script
@REM 4. run the script from the command line
@REM
@REM *****
@REM
@REM Creating a backup specification for all storage groups running on Exchange
2000/2003 Server app.company.com with HP XP Array local mirror backup system:
@REM EXAMPLE: omnicreatedl -ex2000 -datalist EX2000_ex1 -device dev1 -
all_storage_groups -split_mirror -sse -local app.company.com bckp.company.com
@REM omnicreatedl -ex2000 -datalist <name> -device <name> -all_storage_groups -
split_mirror -sse -local <app_sys> <bck_sys>
@REM
@REM Creating a backup specification for all storage groups running on Exchange
2000/2003 Server app.company.com with Virtual Array backup system
bckp.company.com:
@REM EXAMPLE: omnicreatedl -ex2000 -datalist EX2000_ex2 -device dev1 -
all_storage_groups -snapshot -va app.company.com bckp.company.com
@REM omnicreatedl -ex2000 -datalist <name> -device <name> -all_storage_groups -
snapshot -va <app_sys> <bck_sys>
@REM
@REM Creating a backup specification for two storage groups ("First Storage
Group", "Second Storage Group") running on Exchange 2000/2003 Server
app.company.com with HP XP Array remote mirror backup system:
@REM EXAMPLE: omnicreatedl -ex2000 -datalist EX2000_ex3 -device dev1
-storage_group "First Storage Group" -storage_group "Second Storage Group"
-split_mirror -sse -remote app.company.com bckp.company.com
@REM omnicreatedl -ex2000 -datalist <name> -device <name> -storage_group <storage
group name 1> -storage_group <storage group name 2> -split_mirror -sse -remote
<app_sys> <bck_sys>
For Help, press F1 Ln 15, Col. 75, CO DOS Mod: 3/5/2004 10:49:34PM File Size: 4917 INS
```

**Figure 81 omniex2000SM.bat file**

## Examples of using `omnicreatedl`

### **Example 1 - XP:**

To create a ZDB specification `BS1`, using device `dev1`, for all storage groups running on Exchange Server on the application system `computer_app.company.com` and backup system `computer_bck.company.com` using the BC configuration, run:

```
omnicreatedl -ex2000 -datalist BS1 -device dev1
-all_storage_groups -split_mirror -sse -local
computer_app.company.com computer_bck.company.com
```

**Example 2 - XP:**

To create a ZDB specification BS2, using device dev1, for two storage groups (First Storage Group and Second Storage Group) running on Exchange Server on the application system computer\_app.company.com and backup system computer\_bck.company.com using the CA configuration, run:

```
omnicreatedl -ex2000 -datalist BS2 -device dev1 -storage_group
"First Storage Group" -storage_group "Second Storage Group"
-split_mirror -sse -remote computer_app.company.com
computer_bck.company.com
```

**Example 3 - XP:**

To create a ZDB specification BS3, using device dev1, for two stores (Public and Mailbox, part of First Storage Group) running on Exchange Server on the application system computer\_app.company.com and backup system computer\_bck.company.com using the BC+CA configuration, run:

```
omnicreatedl -ex2000 -datalist BS3 -device dev1 -storage_group
"First Storage Group" -store "Public" "Mailbox" -split_mirror
-sse -combined computer_app.company.com
computer_bck.company.com
```

**Example 4 - VA:**

To create a ZDB-to-tape specification BS1, using the backup device dev1, for all storage groups running on Exchange Server on the application system computer1.company.com and backup system computer2.company.com, run:

```
omnicreatedl -ex2000 -datalist BS1 -device dev1 -snapshot -va
computer1.company.com computer2.company.com -leave_version
-storage_group "First Storage Group" -force
```

If the backup specification already exists, it will be overwritten. If it does not exist, omnicreatedl creates a transaction logs backup specification file First Storage Group (LOGS) computer1.company.com for First Storage Group log files backup. The replica is kept for future (non-instant recovery) use.

**Example 5 - VA:**

To create a ZDB-to-disk+tape or ZDB-to-disk specification Exchange\_example to back up Site Replication Service to the backup device dev1, using the replica set with 5 replicas, run:

```
omnicreatedl -ex2000 -datalist Exchange_example -device dev1
-snapshot -va computer1.company.com computer2.company.com
-instant_recovery -snapshots 5 -annotation SRS
```

The `omnicreatedl` creates a transaction logs backup specification file `SRS (LOGS) computer1.company.com` for Site Replication Service log files backup (circular logging disabled). When `omnib` or Data Protector GUI is used to start backup, select ZDB to disk or ZDB to disk+tape.

**Example 6 - EVA:**

To create a ZDB-to-tape specification `BS1`, using the backup device `dev1`, for all storage groups running on Exchange Server on the application system `computer1.company.com` and backup system `computer2.company.com`, run:

```
omnicreatedl -ex2000 -datalist BS1 -device dev1 -snapshot
-smis computer_app.company.com computer_bck.company.com
-snapshot_type vsnap -snapshot_policy strict -storage_group
"First Storage Group"
```

The `omnicreatedl` creates a transaction logs backup specification file `First Storage Group (LOGS) computer1.company.com` for First Storage Group log files backup (if it does not already exist). Data Protector attempts to create `vsnap`s, and if they cannot be created, the session aborts.

**Example 7 - EVA:**

To create a ZDB-to-disk specification `Exchange_example` to back up Site Replication Service using the backup device `dev1`, using the replica set with 5 replicas, run:

```
omnicreatedl -ex2000 -datalist Exchange_example -device dev1
-snapshot -smis computer1.company.com computer2.company.com
-instant_recovery -snapshots 5 -annotation SRS
```

The `omnicreatedl` creates a transaction logs backup specification file `SRS (LOGS) computer1.company.com` for Site Replication Service log files backup (circular logging disabled). When `omnib` or Data Protector GUI is used to start backup, select ZDB to disk.

**Example 8 - EVA:**

To create a ZDB-to-disk+tape specification `Exchange_example` to back up Site Replication Service to the backup device `dev1`, using the replica set with 3 replicas and delay backup to tape for 50 minutes, run:

```
omnicreatedl -ex2000 -datalist Exchange_example -device dev1
-snapshot -smis computer1.company.com computer2.company.com
```

```
-instant_recovery -snapshots 3 -wait_clonecopy 50 -annotation
SRS
```

The `omnicreatedl` creates a transaction logs backup specification file `SRS (LOGS) computer1.company.com` for Site Replication Service log files backup (circular logging disabled). When `omnib` or Data Protector GUI is used to start backup, select ZDB to disk+tape.

## Modifying ZDB specifications

After you created an Exchange ZDB specification and a transaction logs backup specification using `omnicreatedl`, you can modify them using the Data Protector GUI.



### NOTE:

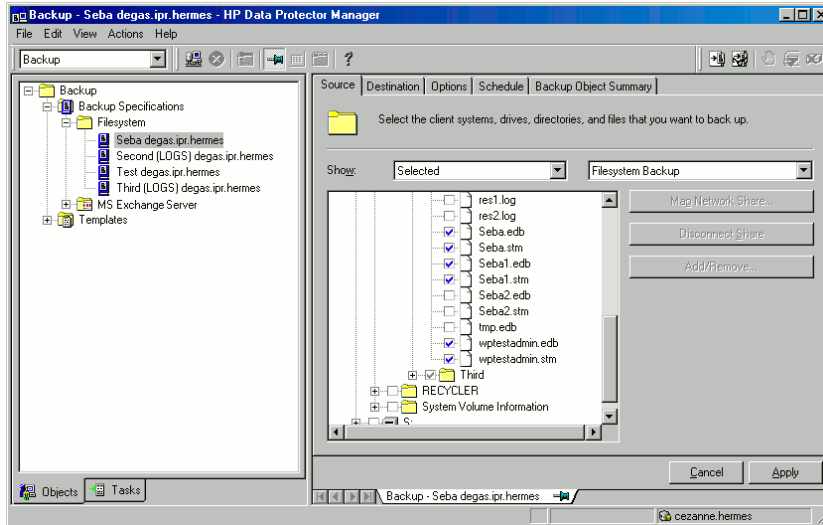
To add/remove storage groups from a ZDB specification, create a new backup specification rather than modify the existing one. Changing the saved ZDB specification manually can impact `Stop/quiesce` the application and `Restart` the application parameters, which are automatically defined when a new backup specification is created using `omnicreatedl`.

---

Proceed as follows using the Data Protector Manager:

1. In the Context List, click **Backup**.

2. In the Scoping Pane, expand **Backup Specifications**, then **Filesystem**, and click a ZDB specification. See [Figure 82](#).



**Figure 82 Exchange ZDB specification**

3. Modify backup devices, set ZDB options, schedule, and start backup. For a particular database, back up `.edb` and `.stm` files.

To create additional backup copies (mirrors), specify the desired number by clicking **Add mirror/Remove mirror** under the **Destination** tag. Select separate devices for backup and each mirror.

For information on object mirroring, see the online Help index: “object mirroring”.



**NOTE:**

Object mirroring is not supported for ZDB to disk.

## Checking Exchange files for consistency

Exchange Server allows you to perform a page level integrity check of the database files. It is run on the Exchange offline database during ZDB using `esefile` (Exchange 2000) and `esutil` (Exchange 2003) utilities. For more information, see *Esefile Support Utility for Exchange Server 5.5 and Exchange 2000 Server (248406)* and *How To: Use the Eseutil Utility to Detect File Header Damage in Exchange 2003 (825088)* available at <http://support.microsoft.com>.





---

**IMPORTANT:**

Page level integrity check is not supported on EVA.

---

Proceed as follows:

1. Copy the utility to the backup system.

The `esefile` resides on the Exchange 2000 Installation CD at:

`CD:\ENGLISH\EXCH2000\ENT\SUPPORT\UTILS\I386\ESEFILE`

The `eseutil` resides in `Exchange_Server_home\bin` once the Exchange Server 2003 is installed.



---

**NOTE:**

On XP, do not mirror the location where the utility resides, to prevent the file from being overwritten when the mirror is synchronized.

---

2. Write a script that runs `esefile.exe` or `eseutil.exe` and save it, for example, as `integritycheck.bat`. Basically, the command looks like:  
`Path_to_esefile\esefile.exe /s`  
`Exchange_Server_database_file` (Exchange 2000) or  
`Path_to_eseutil\eseutil.exe /k`  
`Exchange_Server_database_file` (Exchange 2003) The `esefile.exe` utility with the `/s` option or `eseutil.exe` with the `/k` option tests the checksums on the Exchange Server database.

### Example

The `esefile.exe` resides in `C:\` directory on the backup system. Data Protector mounts the backup data to `C:\Program Files\Omniback\tmp` with the mountpoints

```
zdb.hp.com\H\First\MailStore.edb,
zdb.hp.com\H\First\MailStore2.edb, and
zdb.hp.com\H\First\Public.edb.
```

```
C:\esefile.exe /s "C:\Program Files\Omniback\tmp\zdb.hp.com\H\exchsrvr\First\MailStore.edb"
C:\esefile.exe /s "C:\Program Files\Omniback\tmp\zdb.hp.com\H\exchsrvr\First\MailStore2.edb"
C:\esefile.exe /s "C:\Program Files\Omniback\tmp\zdb.hp.com\H\exchsrvr\First\Public.edb"
```

### Figure 83 Example script for MS Exchange Server 2000

See the *HP Data Protector zero downtime backup administrator's guide* for information on the mountpoint creation. The commands in the script ensure that `*.edb` database files specified in the backup specification are checked for consistency.

3. Modify the ZDB specification to include `integritycheck.bat` as post-exec. Execute the script on the backup system. See the online Help index: "pre- and post-exec commands" for more information.
4. In the backup specification, select `Leave the backup system enabled`. This ensures that the database is available on the backup system when the integrity check is started.

After backup, `esefile` or `eseutil` perform page level integrity check against database files specified in `integritycheck.bat`.

## Scheduling backups

You can run unattended ZDB at specific times or periodically. For details on scheduling, see the online Help index: "scheduled backups".

---

 **NOTE:**

You cannot run ZDB to disk or ZDB to disk+tape if `-instant_restore` (XP) or `-instant_recovery` (VA, EVA) is not selected in the backup specification.

---

## Scheduling example

To schedule a database ZDB at 8:00, 13:00, and 18:00 during week days:

1. In the **Schedule** property page, select the starting date in the calendar and click **Add** to open the **Schedule Backup** dialog box.
2. Under **Recurring**, select **Weekly**. Under **Time options**, select **8:00**. Under **Recurring Options**, select **Mon, Tue, Wed, Thu, and Fri**.  
Click **OK**.
3. Repeat [Step 1](#) and [Step 2](#) to schedule backups at 13:00 and 18:00.
4. Click **Apply** to save the changes.

---

 **NOTE:**

For ZDB sessions, the backup type is set to **Full**.

---

For ZDB to disk and ZDB to disk+tape, specify **Split mirror/snapshot backup**.

## Starting backup sessions

Interactive backups are run on demand. They are useful for urgent backups or restarting failed backups.

---

 **NOTE:**

You cannot run ZDB to disk or ZDB to disk+tape if `-instant_restore` (XP) or `-instant_recovery` (VA, EVA) is not selected in the backup specification.

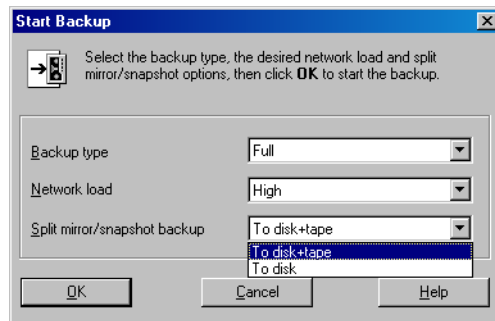
---

## Using the Data Protector GUI

1. In the Context List, click **Backup**.
2. In the Scoping Pane, expand **Backup Specifications** and then **Filesystem**. Right-click the backup specification you want to start and select **Start Backup**.
3. Select **Network load**. For information on network load, click **Help**. Click **OK**.

For ZDB sessions, the backup type is set to **Full**.

For ZDB to disk or ZDB to disk+tape, specify the **Split mirror/snapshot backup** option.



**Figure 84 Starting interactive backups**

Click **OK**.

## Using the Data Protector CLI

To start ZDB to tape or ZDB to disk+tape, run:

```
omnib -datalist Name
```

To start ZDB to disk, run:

```
omnib -datalist Name -disk_only
```

where *Name* is the backup specification name. For more information on `omnib`, see its man page.

## Restore

Data Protector offers restore from backup media to the application system on LAN (standard restore), where you can select among various restore options depending

on your restore scenario, and instant recovery. See the below sections for more information.

## Considerations

- Instant recovery restores data from a replica on the backup system to the source volumes on the application system. Therefore, you cannot *selectively* restore objects (storage groups, stores, or Exchange Server) that do not reside on separate source volumes.
- Transaction logs must be backed up to perform rollforward recovery.



### NOTE:

In case of a disaster, Exchange Server must be installed and configured with the same database names and locations as before the disaster.

---

## Standard restore

You can restore Exchange objects to any Exchange Server with the same configuration as the original system within the Data Protector cell.

You can recover Exchange databases using:

- Point-in-time recovery  
Only data files (.edb and .stm) are restored. Databases are restored to their state at the backup time, and all data modified after that is lost.
- Rollforward recovery  
Restores Exchange database files and transaction logs, and then replays the transaction logs. Databases are recovered to their last consistent state.



### TIP:

You can improve data transfer rate by configuring a backup device on the application system. See the online Help index: “configuring, backup devices” for details. You can also perform a restore using another device. See the online Help index “select, devices for restore”.

---

You can perform a filesystem restore of Exchange databases (.edb and .stm files) and transaction logs (.log files); however, to recover the database, you need to

perform some additional steps. For details, see *Offline Backup and Restoration Procedures for Exchange (296788)* at <http://support.microsoft.com>.

For a detailed procedure on performing filesystem restore, see the online Help index: “standard restore procedure”. The procedures below provide only a general description of the restore process.

## Point-in-Time recovery



### IMPORTANT:

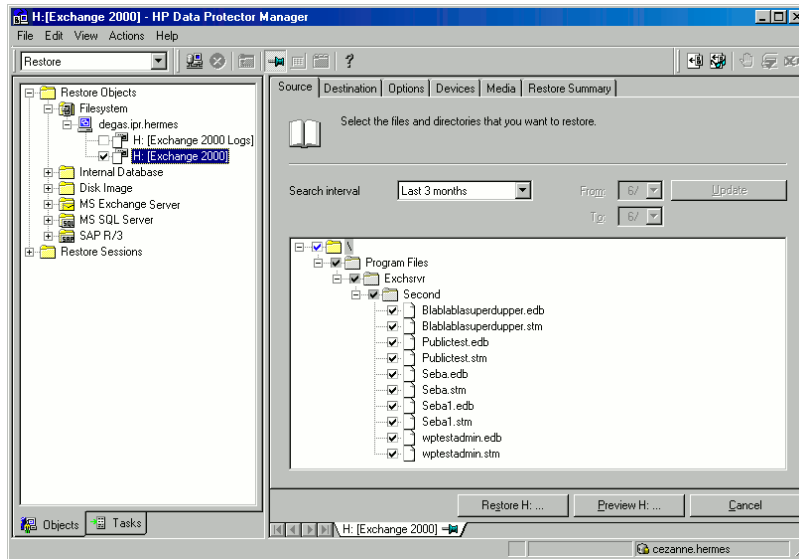
The procedure described below gives instructions on how to copy `.edb` and `.stm` files to the appropriate database location and is only part of the procedure described in *Offline Backup and Restoration Procedures for Exchange (296788)*.

---

Proceed as follows using the Data Protector Manager:

1. In the Context List, select **Restore**.

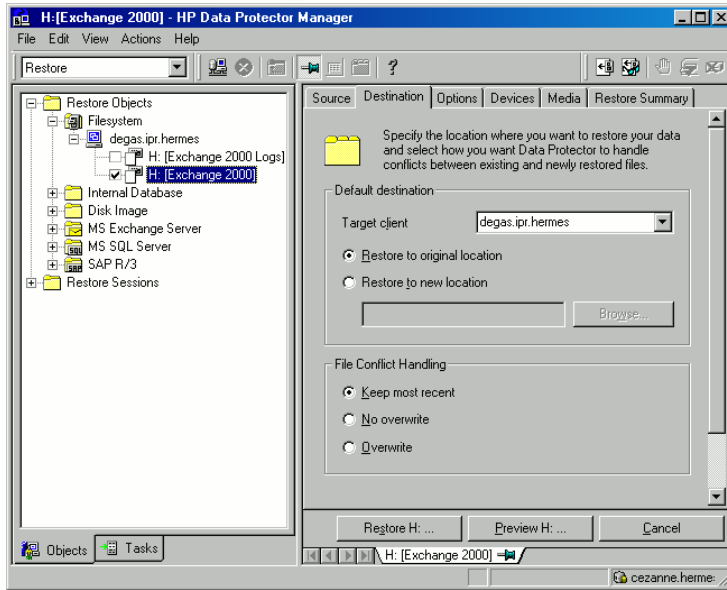
2. In the Scoping Pane, expand **Restore Objects**, **Filesystem**, and then select the client (backup system). Mark the drive letter on which the database resides.



**Figure 85 Restoring Exchange database**

Exchange database consists of two files: *name.edb* and *name.stm*. For a particular database, select both files. You can restore a storage group by selecting the storage group folder when the entire storage group was backed up and all databases reside in the same directory.

3. Under the **Destination** tab, select the application system as the **Target client**.



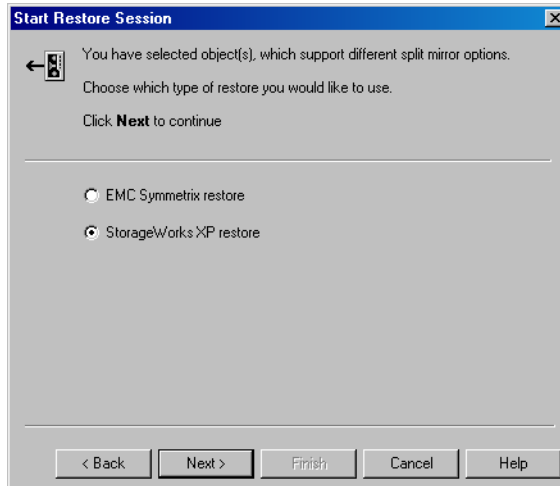
**Figure 86** Selecting the application system

4. Set restore options. For information, see the online Help index: "restore, options".
5. Click **Restore**. The **Start Restore Session** dialog box is displayed.
6. Specify **Report level** and **Network load**.



## 7. XP, EMC:

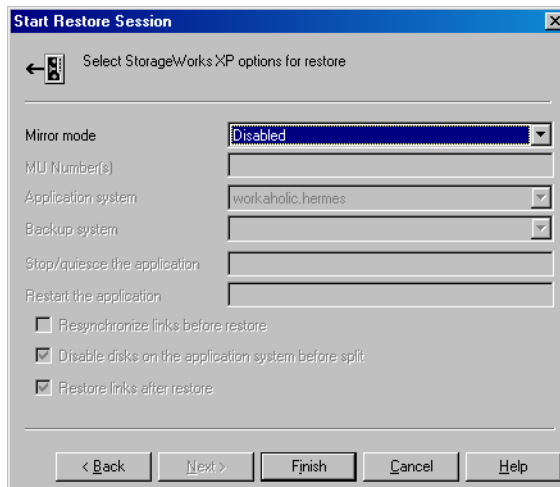
Select **StorageWorks XP restore**. Click **Next**.



**Figure 87** Selecting XP restore

## 8. XP:

In the **Start Restore Session** dialog box, select **Disabled** in the **Mirror mode** drop-down list. This sets a direct restore from the backup media to the application system on LAN.



**Figure 88** XP Restore option

9. Click **Finish** to start restore.

## Rollforward recovery

---

 **IMPORTANT:**

The procedure described below gives instructions on how to copy `.edb`, `.stm`, and `.log` files to the appropriate database location and only part of the procedure described in the *Offline Backup and Restoration Procedures for Exchange (296788)*.

When following the Microsoft procedure, use the procedure below to copy `.edb`, `.stm` and `.log` files to the appropriate database location.

The procedure below needs to be utilized twice: for the database and for transaction logs restore.

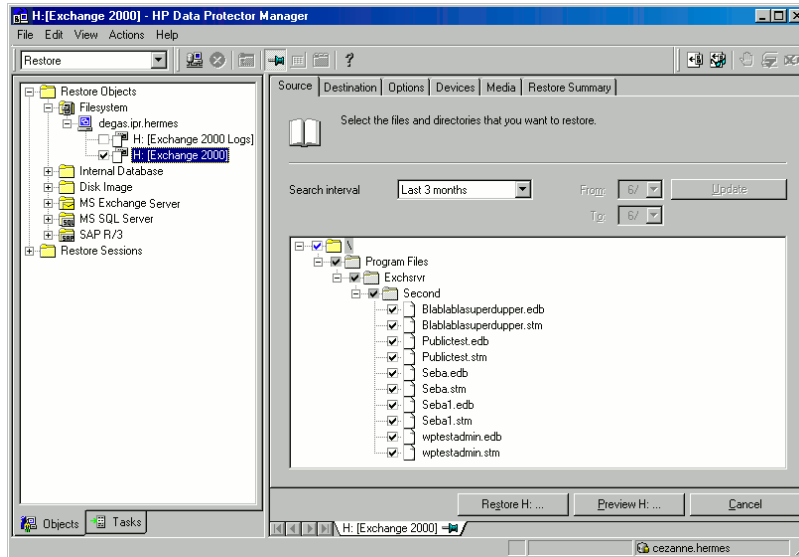
---

Proceed as follows using the Data Protector Manager:

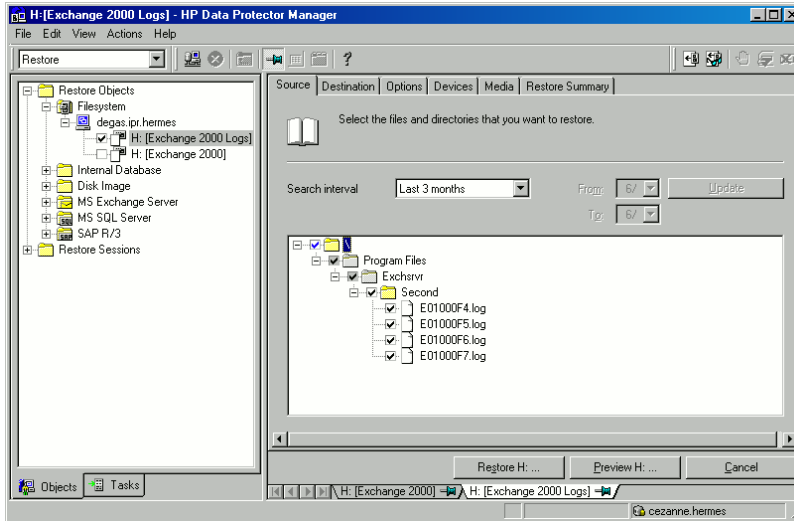
1. In the Context List, select **Restore**.

2. Proceed as follows:

- To restore the database, expand **Restore Objects**, **Filesystem**, and the name of the backed up server. Then select the **[Exchange 2000]** object as shown in [Figure 89](#).
- To restore transaction logs, expand **Restore Objects**, **Filesystem**, and the name of the backed up server. Then select the **[Exchange 2000 Logs]** object as shown in [Figure 90](#).



**Figure 89 Restoring Exchange database**

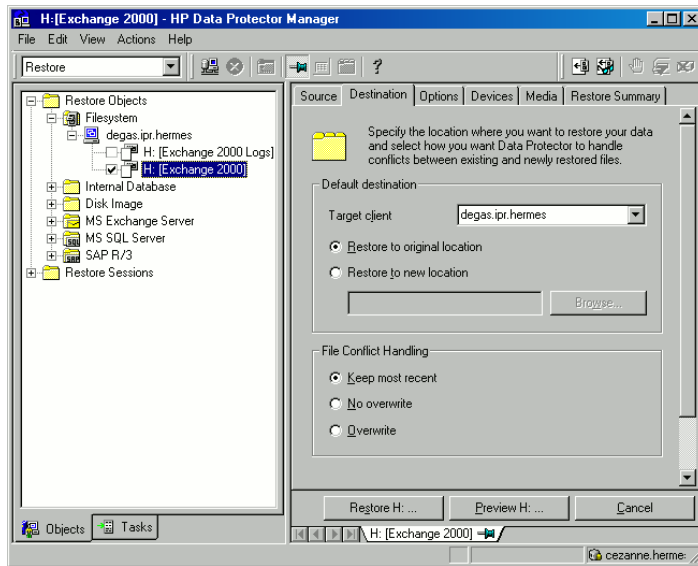


**Figure 90 Restoring log files**

**3.** Make the following selections in the Results Area:

- To restore the Exchange database, select `.edb` and `.stm` files. For a particular database, select both files. You can restore a storage group by selecting the storage group folder when the entire storage group was backed up and all databases reside in the same directory.
- To restore transaction logs, select `.log` files.

4. Select the application system as the **Target client** under the **Destination** tab.

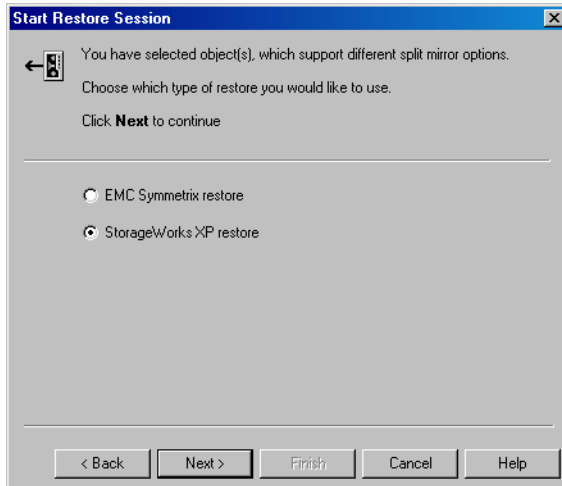


**Figure 91** Selecting the application system

5. Set restore options. For information, see the online Help index: "restore, options".
6. Click **Restore**. The **Start Restore Session** dialog box is displayed.
7. Specify **Report level** and **Network load**. Click **Next**.

## 8. XP, EMC:

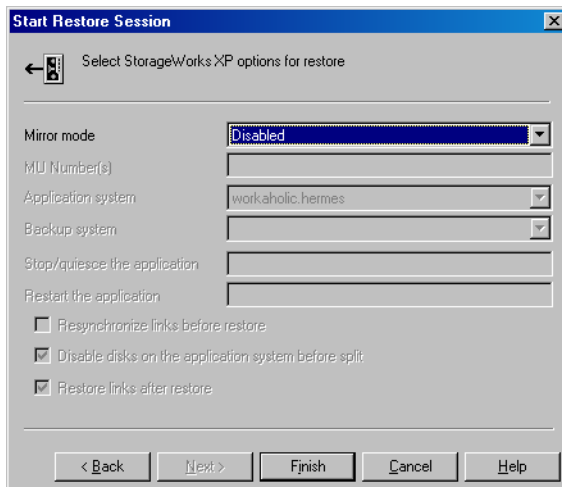
Select **StorageWorks XP restore**. Click **Next**.



**Figure 92** Selecting XP restore

## 9. XP:

In the **Start Restore Session** dialog box, select **Disabled** in the **Mirror mode** drop-down list. This sets a direct restore from the backup media to the application system on LAN.



**Figure 93** XP Restore option

10. Click **Finish** to start restore.

## Instant recovery

See the *HP Data Protector zero downtime backup concepts guide* and *HP Data Protector zero downtime backup administrator's guide* for general information on instant recovery.

You can recover Exchange databases using:

- Point-in-time recovery  
Databases are restored to their state at the backup time, and all data modified after that is lost.
- Rollforward recovery  
Restores Exchange database files and transaction logs, and then replays the transaction logs. Databases are recovered to their last consistent state.

## Point-in-Time recovery

For detailed procedure on how to recover the Exchange Server, see *Offline Backup and Restoration Procedures for Exchange (296788)* at <http://support.microsoft.com>

When following the Microsoft procedure, see the *HP Data Protector zero downtime backup administrator's guide* for information on copying backed up .edb and .stm files to the appropriate database using instant recovery.

## Rollforward recovery

For detailed procedure on how to recover the Exchange Server, see *Offline Backup and Restoration Procedures for Exchange (296788)* at <http://support.microsoft.com>:

When following the Microsoft procedure, see the *HP Data Protector zero downtime backup administrator's guide* for information on copying backed up .edb and .stm files to the appropriate database using instant recovery.

The procedure below gives instructions on how to restore Exchange transaction logs using the Data Protector GUI when following the Microsoft procedure:

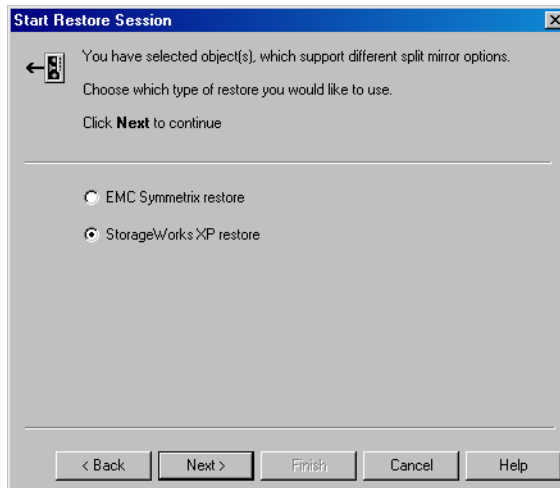
1. In the Context List, select **Restore**.
2. In the Scoping Pane, expand **Restore Objects, Filesystem**, and then the name of the backed up server. Select the **[Exchange 2000 Logs]** object as shown in [Figure 90](#).

3. Under the **Destination** tab, select the application system as the **Target client as shown in Figure 91**.
4. Set restore options. For information, see the online Help index: "restore, options".
5. Click **Restore**. The **Start Restore Session** dialog box is displayed.
6. Specify **Report level** and **Network load**. Click **Next**.



## 7. XP, EMC:

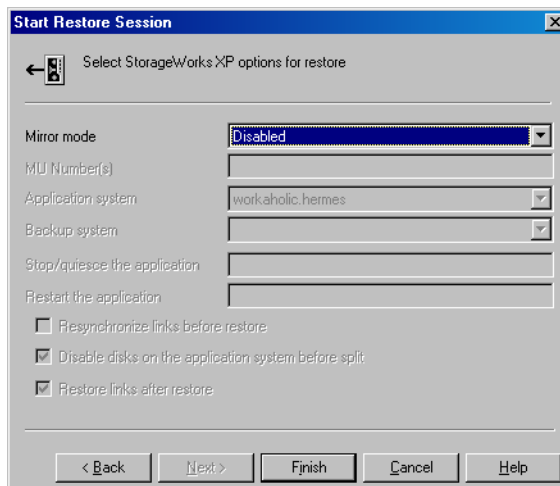
Select **StorageWorks XP restore**. Click **Next**.



**Figure 94** Selecting XP restore

## 8. XP:

In the **Start Restore Session** dialog box, select **Disabled** in the **Mirror mode** drop-down list. This sets a direct restore from the backup media to the application system on LAN.



**Figure 95** XP Restore option

9. Click **Finish** to start restore.

## Troubleshooting

This section lists general checks and verifications, plus problems you might encounter when using the Data Protector Exchange Server integration. Start at [Problems](#). If you cannot find a solution there, perform general checks and verifications.

For general Data Protector troubleshooting information, see the *HP Data Protector troubleshooting guide*.

For general ZDB, restore, and instant recovery related troubleshooting, see the *HP Data Protector zero downtime backup administrator's guide*.

### Before you begin

- Ensure that the latest official Data Protector patches are installed. See the online Help index: "patches" on how to verify this.
- See the *HP Data Protector product announcements, software notes, and references* for general Data Protector limitations, as well as recognized issues and workarounds.
- See <http://www.hp.com/support/manuals> for an up-to-date list of supported versions, platforms, and other information.

### Checks and verifications

If your configuration, backup, or restore failed:

- Check that Exchange Server services (Microsoft Exchange System Attendant and Microsoft Exchange Information Store) are running.
- Using Exchange System Manager, check that all stores to be backed up are mounted and all stores to be restored are dismounted.
- Perform a backup of the Exchange Information Store using Windows Backup. If the backup fails, fix Exchange Server problems first, and then perform a backup using Data Protector.
- Ensure that the Cell Manager is correctly set on Exchange Server by checking the following registry entry:

```
HKEY_LOCAL_MACHINE\SOFTWARE\Hewlett-Packard\OpenView\OmniBack
II\Site
```

Its name and value must be `CellServer` and `"Cell Manager hostname"`, respectively.

- Examine system errors reported in `Data_Protector_home\log\debug.log` on Exchange Server functioning as a Data Protector client. Additionally, examine the errors reported in the Windows Event log.
- Check if the following directories exist on the Data Protector Cell Manager:  
`Data_Protector_home\config\server\barlists\msese`  
`Data_Protector_home\config\server\barschedules\msese`
- Make a test filesystem backup and restore of the problematic client. For information, see the online Help.
- Create a backup specification to back up to a null or file device and run the backup. If the backup succeeds, the problem may be related to backup devices. See the *HP Data Protector troubleshooting guide* for instructions on troubleshooting devices.
- Try to restart the Microsoft Exchange Server and start the backup again.
- Check that the `Exchange_home\bin` directory is added to the Windows `Path` environment variable. For details, see “[Configuring the integration](#)” on page 281.
- If you cannot mount the storage after a successful restore, check that LOGS storage on the same storage group is also restored.
- Define a directory for temporary log files in the **Restore** context. Check if the specified directory exists. If it does not, create it or specify another existing directory.
- To restore to another system, make sure Exchange Server is installed on that system and has the same organization and site names as the restored server.

## Problems

### Problem

#### **Exchange integration is unable to initiate clsEx2000 class**

The following error is reported in the `debug.log` file:

```
Unable to initiate clsEx2000 class. Error: -2147221164
```

### Action

Register `omniex2000.dll` by running the following command from `Data_Protector_home\bin`: `regsvr32 omniex2000.dll`

## Problem

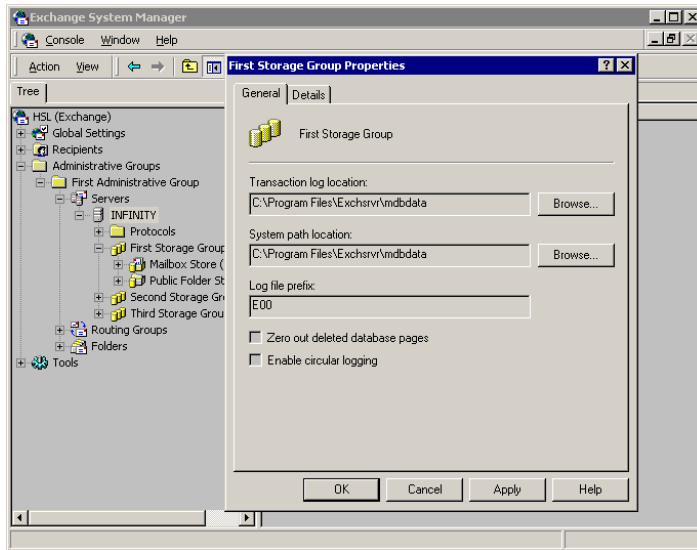
### Omnicroatedl cannot create a backup specification for the log file backup

The following error is reported:

```
Cannot create log datalist for name.
```

## Action

Check if circular logging is disabled on the Exchange Server for the storage group. If not, disable it.



**Figure 96 Disabling circular logging**

## Problem

### Omnicroatedl cannot create a backup specification and the session is aborted

The following error is reported:

```
[ERROR] Could not obtain any data for backup from host
app_sys. Make sure the Exchange server is running and Data
Protector Exchange Integration installed.
```

## Actions

- If the application is cluster-aware, specify the `-virtualSrv` parameter.

- Check the user rights on the application system client. You must have the `Save backup specification` user right to create and save a backup specification.
- Check that `Exchange_home\bin` is listed in the `Path` system variable. For instructions, see [Creating ZDB specifications](#).

## Problem

### Error starting service

If the KMS service password is not kept on disk, the following error is reported:

```
[Major] From: OB2BAR_main@machine.com "" Time: 10/20/2003
5:17:24 PMError starting service.
```

Reconfigure KMS to store the KMS service password on disk. See *XADM: How to Change the KMS Service Password Startup Location (196129)* for information. Then restart the backup.



---

# 5 Integrating the Data Protector ZDB integrations and Microsoft Volume Shadow Copy Service

## Introduction

A traditional backup process is based on the direct communication between the backup application and the application whose data is backed up. This backup method requires from the backup application an individual interface for each application it backs up.

The number of applications on the market is constantly increasing. The necessity of handling application specific features can cause difficulties in backup, restore, and storage activities. An effective solution to this problem is introducing a coordinator among the actors of the backup and restore process.

### Volume Shadow Copy Service

**Volume Shadow Copy Service (VSS)** is a software service introduced by Microsoft on Windows operating systems. This service collaborates with the backup application, applications to be backed up, shadow copy providers, and the operating system kernel to implement the management of volume shadow copies and shadow copy sets.

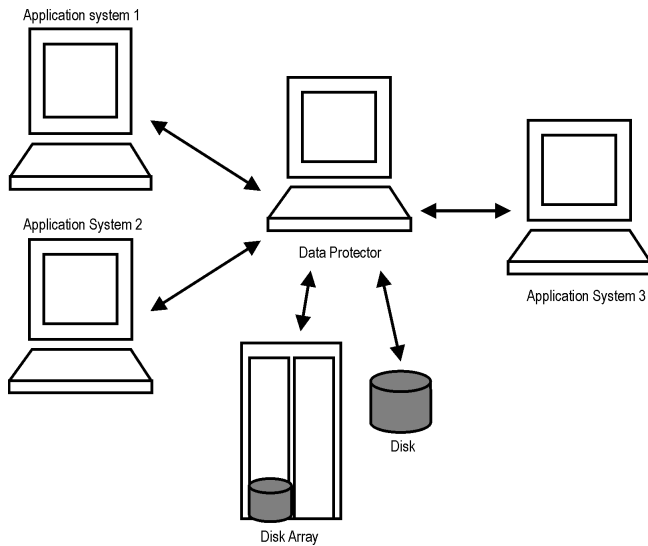
Data Protector supports the integration with VSS.

The Data Protector Volume Shadow Copy integration provides a unified communication interface that can coordinate backup and restore of an application regardless of their specific features. With this approach, a backup application does not need to handle each application to be backed up specifically. However, the

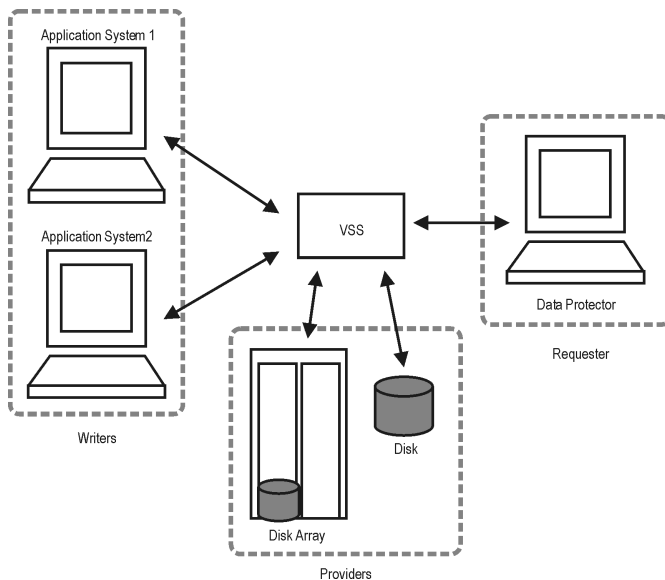
production application as well as the backup application must conform to the VSS specification.

[Figure 97](#) on page 321 and [Figure 98](#) on page 321 show the differences between the traditional backup model and the model with the Data Protector Microsoft Volume Shadow Copy integration.





**Figure 97 Actors of the traditional backup model**



**Figure 98 Actors of the Data Protector VSS integration backup model**

Without using the Volume Shadow Copy Service, Data Protector has to communicate with each application to be backed up individually. The Data Protector VSS integration introduces a unified backup and restore interface and provides the coordination among the participants of the backup and restore process.

## VSS backup types

Data Protector supports only *full* backups.

The following backup types are available with the Data Protector VSS integration:

- Local or network VSS backup  
The shadow copy is backed up to tape or to disk from the application system.
- VSS transportable backup  
Instead of presenting the volume shadow copies to the application system they are presented to an alternate system, the backup system, which then performs the backup to tape, thus reducing the impact of backup on the application server to the creation of volume shadow copies. A VSS hardware provider that supports transportable snapshots is required. It also provides the option to mount the backup replicas on a backup system.

### VSS transportable backup advantages

VSS transportable snapshot backup offers additional advantages over local or network VSS backup:

- The impact on performance on the application server is reduced.
- Following the shadow copy creation, the tape backup can be performed on the backup system at leisure pace.

## VSS restore

Using Data Protector, you can perform the restore:

- From backup media to the application system on LAN (standard restore).
- Using the instant recovery functionality with the Microsoft Exchange Server and Microsoft SQL Server ZDB integrations. During the instant recovery, the data in the specified replica (left unchanged for the purpose of instant recovery) is restored to the application system source volumes. Only the needed differential and transaction log backups are restored from the backup medium.

### Instant recovery considerations

- The instant recovery functionality restores data from a replica on the backup system to the source volumes on the application system. Therefore, using instant recovery, it is *only* possible to *selectively* restore separate writer's components if they reside on separate source volumes.

# Integration concepts

The Data Protector integration with the Microsoft Volume Shadow Copy Service provides full support for certified VSS writers. This includes automatic detection of the VSS writers and backup and restore functionality.

Refer to the *HP Data Protector zero downtime backup concepts guide* for a general description of ZDB (split mirror or snapshot backup) and instant recovery concepts.

For a complete list of supported VSS writers and providers refer to the latest support matrices at <http://www.hp.com/support/manuals>.

## Benefits of using the integration

Advantages of using the Data Protector VSS integration are the following:

- Unified backup interface is provided for all applications that provide a writer.
- Data integrity is provided on application level, because it is provided by the writers. No interference is needed from the backup application.

## VSSBAR agent

The central part of the integration is the **VSSBAR agent**, which links Data Protector with the Microsoft Volume Shadow Copy Service. Data Protector Microsoft Volume Shadow Copy integration uses the VSSBAR agent for automatic browsing of VSS-aware writers, coordinating backup and restore. VSSBAR agent is responsible for the following actions:

- detecting VSS writers
- examining and analyzing Writer Metadata Document (WMD)  
**Writer Metadata Document (WMD)** is metadata provided by each writer. Writers identify themselves by the metadata and instruct the backup application what to back up and how to restore the data. Thus, Data Protector follows the requirements provided by the writer when selecting the volumes to be backed up and the restore method.
- requesting shadow copy creation
- backing up writers' data to media
- coordinating restore session start
- restoring the Writer Metadata Document
- restoring writer's data from media

## Backup

During the Data Protector VSS integration backup, Data Protector does not interact directly with each writer, but through the VSS interface. It uses the VSSBAR agent to coordinate the backup process. The consistency of data is a responsibility of the VSS writer and not dependent on Data Protector functionality. The backup process of the VSS writers consists of the following phases:

1. When you select writers and components you want to back up and start a VSS integration backup, Data Protector communicates with the Volume Shadow Copy Service (backup coordinator) to notify that the backup is about to start.
2. The coordinator identifies all writers that support the VSS feature and passes the list of available writers and their characteristics (Writer Metadata Document) back to Data Protector.
3. Data Protector examines Writer Metadata and identifies the volumes that contain the data to be backed up. Then the VSS informs available writers about selected components.
4. Data Protector prepares a list of volumes (shadow copy set) that must be put into consistent state, and passes the list back to the coordinator for preparing a shadow copy.
5. The VSSBAR agent notifies the writers about the shadow copy creation. The VSS mechanism ensures that there are no writes on the volume while the shadow copy is being created.



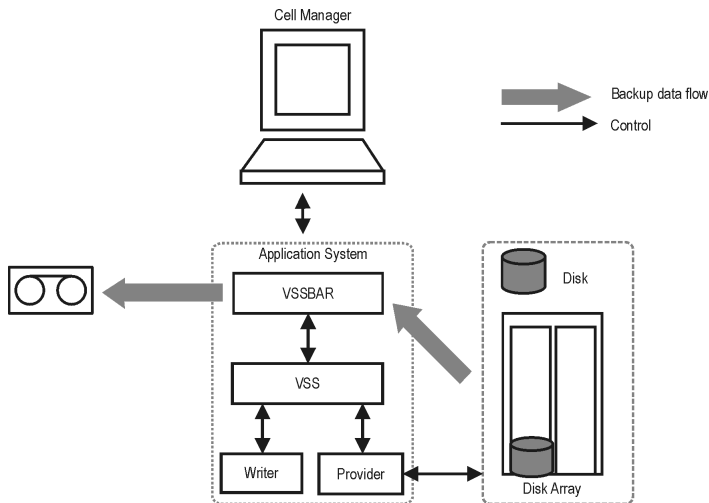
### NOTE:

When the VSSBAR agent creates a shadow copy of the volume, this volume is marked in order to avoid attempts to simultaneously create another shadow copy of the same volume. In order to prevent any deadlocks arising from volume locking, only a single VSSBAR agent at a time is allowed to define a shadow copy set.

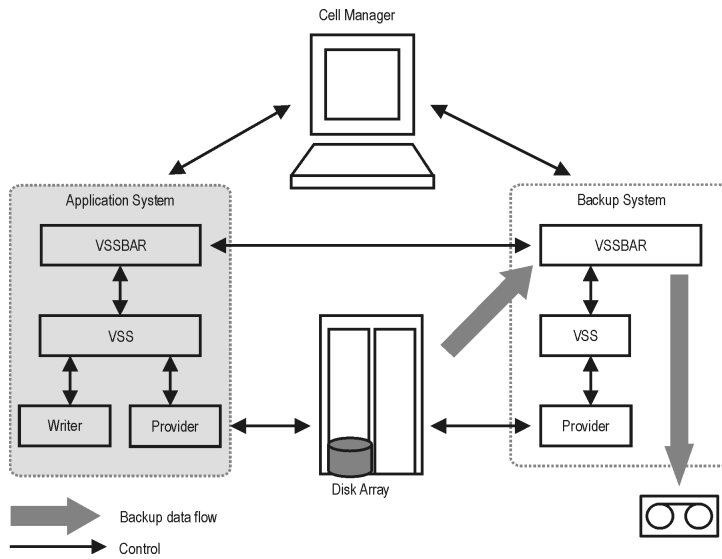
---

6. When the writers are fully prepared for the consistent shadow copy backup, the VSSBAR agent passes shadow copy creation requests to VSS.
7. After a shadow copy is created, the VSS service returns the related information to the Data Protector.

8. Depending on the backup type, in the next step the following two options are possible:
- With a local or network backup, Data Protector backs up the data from the shadow copy to media and then notifies the VSS service that the shadow copy can be released. VSS issues a command to the shadow copy provider to destroy the shadow copy that has been already backed up. [Figure 99](#) on page 325 shows the relations between the actors of a local or network VSS backup.
  - With a transportable VSS backup, the shadow copy is presented to the backup system. Data Protector backs up the data from the shadow copy on the backup system to the backup media. After the backup is completed, the vssbar agent on the backup system deletes the shadow copy and disconnects from the application system. [Figure 100](#) on page 326 shows the relations between the actors of a VSS transportable backups.



**Figure 99 Local or network VSS backup**



**Figure 100 Transportable VSS backup**

## Data consistency

The **filesystem backup** does not guarantee application data consistency, only filesystem consistency. Application data consistency can be achieved only by using supported application writers, such as Microsoft Exchange Server writer.

## Backup with the Enterprise Virtual Array VSS and VDS hardware provider

There are three replica types available when backing up using the Enterprise Virtual Array (EVA) hardware provider:

- Standard snapshot
- Vsnap
- Snapclone

However, in the GUI, you can select only between snapshot and snapclone. When you select snapshot replica type, standard snapshot is created by default. For instant recovery, only snapclone is available. For more information, see [“Snapshot replica”](#) on page 348.

## Backup with the Disk Array XP VSS and VDS hardware provider

There are two configuration modes available for the backup with the Disk Array XP (XP) hardware provider:

- VSS Compliant Mode

When the XP provider is in the VSS compliant mode, the source volume (P-VOL) and its replica (S-VOL) are in simplex, unpaired state after a backup. Therefore the number of replicas (S-VOLs per a P-VOL) rotated is not limited. Restore from a backup in such a configuration is possible only by switching of the disks.

- Resync Mode

When the XP provider is in the resync mode, the source volume (P-VOL) and its replica (S-VOL) are in a suspended mirror relationship after a backup. The maximum number of replicas (S-VOLs per a P-VOL) rotated is three provided that MU range is 0-2 or 0, 1, 2. Restore from a backup in such a configuration is possible only by re-synchronization of an S-VOL with its P-VOL.

## Restore

Data Protector offers two restore modes:

- **component restore** using the VSS service
- **file restore** using the DMA instead of VSS.

By default, Data Protector restores writer components using the VSS service.

Instant recovery is also available within the Data Protector VSS integration. This functionality requires VDS hardware providers.

## Restoring components

During the restore procedure, the Data Protector VSS integration coordinates communication between Data Protector and the writers. In general, the restore flow consists of the following phases: preparing for restore, restoring components, and notifying the application writers that a restore has been completed. The restore procedure of the VSS-aware writers consists of the following phases.

1. Data Protector first restores the metadata, which was collected during the backup. Then it examines the metadata to identify the backup components and determine the restore method. It also checks if restore to specific volumes is possible.
2. Data Protector connects to the coordinator (VSS service) to notify that the restore is about to start, which in turn communicates with the writer. Data Protector

restores the data from the backup media to the locations specified in the backup metadata. During the restore, Data Protector follows the writers' instructions regarding any additional checking or processing specified in the WMD.

3. After the data are successfully restored from the backup media, Data Protector informs the coordinator that the restore is completed and the writers can now access the newly-restored data and start the internal processing, for example recovery.

## Restoring files

For a successful restore of a VSS component, all files comprising this component must be restored. If a restore of a single file fails, the restore of the a whole component fails. Data Protector offers an additional restore mode for restoring single files that does not use the Microsoft Volume Shadow Copy Service, thus solving this problem. This mode can also be used for restoring to systems that do not support VSS or do not have a VSS writer installed.

When restoring files or a group of files, DMA is started and the files are restored using the standard Data Protector filesystem restore procedure.



### IMPORTANT:

As the file restore mode does not utilize VSS services, additional tasks that are performed after a component restore – such as database recovery – are not performed and your application data may be left in an inconsistent state, requiring additional manual procedures before the application is recovered.

---

## Instant recovery

Instant recovery consists of two phases:

- An instant recovery session is started and the relevant data files are restored back to the system.
- A writer performs the instant recovery, which is based on the restored data. In case of MSDE, SQL Server 2005, and Microsoft Exchange Server 2003 and 2007 writers, database recovery is performed automatically by the database engine.



---

 **IMPORTANT:**

During instant recovery, the whole replica is restored. This means not only are the originally selected backup objects restored, but the complete content of all the volume groups that contained them. After the instant recovery, the content is returned to the states when the replica was created.

---

For detailed information on instant recovery, refer to the *HP Data Protector zero downtime backup concepts guide* and *HP Data Protector zero downtime backup administrator's guide*.

## Microsoft Exchange Server 2007 writer concepts

### Backup

With Microsoft Exchange Server 2007 writer, you can use two models of replication to protect your data:

- Local Continuous Replication (LCR)

With LCR, you can create and maintain an exact copy (LCR copy) of databases in a storage group. An LCR copy is used in case of data corruption because you can switch to the LCR copy in a few seconds. If an LCR copy is used for backup and if it is located on a different disk than the original data, then the load on a production database is minimal.

- Cluster Continuous Replication (CCR)

The same characteristics as with LCR apply to CCR. The difference is only that in the CCR environment, databases and logs are replicated to separate servers. Therefore, a CCR copy can be used for disaster recovery. You can perform backups using VSS on your passive Exchange Server node where the CCR copy is located and thus reducing the load on the active node.

The replicated storage groups are represented as a new Exchange writer instance, Exchange Replication Service. They are backed up like original or production storage groups. Backups of the replicated storage groups (LCR and CCR copies) are possible only using VSS hardware provider.

## Restore

With Microsoft Exchange Server 2007 writer, you can restore your data not only to the original location (from where the backup was performed) but also to a different location. You can restore:

- A whole storage group (including LCR or CCR copies)
- A single store (including LCR or CCR copies)

You can restore them to:

- Original storage group
- Different storage group
- Non-Exchange location. After restore is completed, Recovery Storage Group (RSG) can be created automatically.
- Recovery server (different client and different storage group)

If you perform restore to a different storage group, you can access single mailboxes or individual mails on an alternate location without the need to compromise the original storage group with a potentially unsuccessful restore operation. Also, if the whole server is destroyed, a restore to an alternate Exchange server (recovery server) will minimize downtime of your mailboxes.

## Prerequisites and limitations

This is a list of prerequisites and limitations for the Data Protector Microsoft Volume Shadow Copy Service integration. Additional limitations and recommendations that are not directly connected to the integration (such as operating system and GUI limitations) and disk array limitations are listed in the *HP Data Protector product announcements, software notes, and references*.

## Prerequisites

### Common prerequisites

- Before you begin, ensure that you have correctly installed and configured Data Protector, writers and providers. Refer to the:
  - *HP Data Protector product announcements, software notes, and references* for an up-to-date list of supported versions, platforms, devices, disk arrays, limitations, and other information.

- *HP Data Protector installation and licensing guide* on how to install Data Protector on various architectures and how to install the Data Protector Microsoft Volume Shadow Copy Service integration.
- Writers and shadow copy providers documentation for instructions on how to install and configure writers and providers on your system.

### Instant recovery prerequisites

- The VDS hardware provider must be installed and configured on the application and backup system. Refer to the provider documentation for details.
- To be able to perform a backup for instant recovery purposes and instant recovery, ensure that the source volumes do not reside on GPT (GUID Partition Table) disks. If the system where you want to install an application database has GPT disks, convert them to MBR (Master Boot Record) disks using the Windows Management Console. For instructions on how to perform the conversion, see the Microsoft Windows Help.

### VSS transportable snapshot prerequisites

- The backup system must be configured to accept connections from the application system.
- The VSS and VDS hardware providers must be installed and configured on the application and backup system. Refer to the provider documentation for details.

### Limitations

For a list of general Data Protector limitations, see the *HP Data Protector product announcements, software notes, and references*.

### Common limitations

- Maximum 64 shadow copies per volume are allowed. The number of shadow copies per volume is limited by system resources.
- To run a VSS integration backup, the writer's data must be on an NTFS filesystem.
- The VSS integration backup of writers which store their data on network shared volumes is not supported.
- The Data Protector Microsoft VSS integration does not provide any restore method for writers requesting a custom restore method. These writers are by default not presented by Data Protector.

If a writer specifies a custom restore method, it is only possible to restore the writer's data as plain files using the Data Protector functionality. You can perform

the custom restore manually. Refer to the writers documentation for additional information on the restore methods.

- Preview is not possible for VSS backup and restore sessions.

## Enterprise Virtual Array hardware provider limitations

- With the EVA provider, if there are too many source volumes selected for backup (more than four), the creation of snapshots may take too long and VSS may fail the snapshots creation process.

It is strongly recommended not to specify too many objects in a backup specification, since they might reside on more than four source volumes. This means that, for example, a Microsoft Exchange Server storage group should not reside on more than four source volumes, and only one storage group should be selected for backup in this case. The same limitations applies to Microsoft SQL Server databases.

## Disk Array XP hardware provider limitations

- If the Disk Array XP VSS hardware provider is in the VSS compliant mode, and there is a heavy I/O load on the disk array, the replica creation may take a long time. Consequently, the backup session may fail.

By default, Data Protector waits for a maximum of 45 minutes (2700 seconds) for mirrors to become synchronized. If synchronization is not completed when the waiting period expires, Data Protector aborts the backup session.

You can increase the waiting period duration by setting the `OB2VSS_WAIT_TIMEOUT omnirc` variable. The variable value determines the period (in seconds) for which Data Protector agent waits for mirrors, which are created in one session, to become fully synchronized. If the `OB2VSS_WAIT_TIMEOUT` variable is set to more than 2 hours (7200 seconds), you should additionally increase the value of the global variable `SmIdleTimeout` past the value of `OB2VSS_WAIT_TIMEOUT`. The value of `SmIdleTimeout` should be specified in minutes, rather than seconds.

If backup sessions are lengthy and there is a possibility that VSS backup window will not be met, it is highly recommended that you first switch the Disk Array XP VSS hardware provider to resync mode. Afterwards, consecutively run backup sessions until the backup session count reaches the current value of the **Number of replicas rotated** option. This will start creation of replicas that will be used in scheduled backups. Shadow copy creation failures or timeouts in these backup sessions can be ignored.

- There is a problem with Microsoft Exchange Server 2007 when running in a CCR environment with Disk Array XP as the VSS hardware provider, and where the

backup system is the virtual server. In such setup, in case of a failover, the backup system may change the physical node where the virtual server runs.

Such physical node change may happen in two cases:

- When backup sessions are configured to always use the system where the database copy resides (in the GUI, the Exchange Replication service instance is selected as the backup object, and the additional Exchange option **Revert the active node on failure** is selected).
- When the system where the production database resides is used as the backup system.

The problem does not occur in a setup where the backup system is a physical node. In such setup, in case of a failover, the next backup session will fail to rotate replicas which were used in the oldest session. Such replica rotation failure should not prevent the current session from succeeding. Consider the following:

- If only one disk array is used, ensure that the VSS hardware provider does not run out of disk space (LUNs that belong to secondary volumes (S-VOLs)) due to replica rotation failure.
- If two disk arrays are used, ensure that the second array is configured in the same way as the first disk one.

As soon as the old backup system is up and running, you should use the `omnidbvss` command to manually delete all the sessions that should have been deleted in the replica rotation process. Do not use tools like Command View XP or RAID Manager XP for this purpose. Do not delete references from the ZDB database before you make sure that all LUNs that had been created in that backup session have been deleted from the array.

- If the Disk Array XP VSS hardware provider is in the resync mode, and the backup system is configured as the virtual server in a quorum cluster, you must create a host group on the disk array that contains host bus adapter (HBA) World Wide Names (WWNs) from all physical systems in your cluster.

If such host group is not created, your backups may fail after the cluster fails over from one physical node to the other. If a failover occurs, the backup session will fail to rotate the oldest replica and will not free the MU number that has been used for the mirror replica in that session. As a consequence, a new backup session will not have a free MU number available to create a new mirror and the session will fail. You can prevent this failure by setting the **Number of replicas rotated** option to a value of 1 and configure the Disk Array XP VSS hardware provider to use all available MU numbers.

## ZDB limitations

- Only writers that have data on volumes managed by VSS hardware providers, can be included in VSS transportable backups.
- Dynamic disks (Logical Disk Manager partitions) cannot be used in combination with hardware providers.
- GPT disks are not supported for backup and instant recovery purposes.

## Instant recovery limitations

- Only writers that have data on volumes managed by VDS hardware providers can be restored using the instant recovery functionality.
- Not all VSS writers supported by Data Protector can be used with the instant recovery functionality. For a list of the VSS writers that support the instant recovery functionality, refer to the latest support matrices at <http://www.hp.com/support/manuals>.

# Configuring the integration

The Data Protector Microsoft Volume Shadow Copy integration by itself does not require any configuration steps neither on the Data Protector nor on the application side, unless you are configuring a cluster-aware Data Protector VSS integration. However, some applications such as Microsoft Exchange Server may require additional configuration steps. For details, see the appropriate sections. You must also configure the VSS and VDS hardware providers.

VSS writers are either a part of Windows operating system or delivered with applications. Data Protector automatically detects writers when the VSS backup specification is created and registers them.

You may check which writers and providers are installed and registered on your system using the following Windows operating system command:

- For a list of writers: `VSSadmin list writers`
- For a list of VSS providers: `VSSadmin list providers`
- VDS hardware providers should be present in the list of installed software. Check **Control Panel > Add/Remove Programs**.

For instant recovery enabled backups, only non-system writers are supported, because instant recovery cannot be performed on a system disk.

## Prerequisites

- Disable the operating system option **Automatic mounting of new volumes**. At Command Prompt, run:  

```
mountvol /N
```
- Do not manually mount target volumes that have been created by Data Protector.

## Configuring HP StorageWorks Enterprise Virtual Array

This section describes how to configure the Data Protector HP StorageWorks Enterprise Virtual Array (EVA) integration for use with the VSS integration.

### Prerequisites

- Install **HP storage components and licenses**:
  - HP StorageWorks Virtual Controller Software (VCS or XCS) and Command View (CV) EVA. See the VCS and CV EVA documentation for installation instructions. See the support matrices on the web for information on supported product versions.
  - HP Operations Manager software (HP StorageWorks SMI-S EVA provider part).
  - HP StorageWorks Business Copy (BC) EVA microcode and license.
  - If the alternate paths solution is used, install HP MPIO DSM for EVA.
  - An EVA license for, at least, basic and snapshot operation.
- Install **Data Protector components and licenses**:
  - An instant recovery license.
  - HP StorageWorks EVA SMI-S Agent.  
For installation and licensing information, see the *HP Data Protector installation and licensing guide*.
- Make sure the same operating system (and its version) is installed on the application and backup systems.
- Connect EVA to the application and backup systems through the SAN. Backup system must be connected to the same SAN as the EVA.

For supported backup and connectivity topologies, see *HP Data Protector zero downtime backup administrator's guide*.

For general Data Protector and integration-specific limitations, see *HP Data Protector product announcements, software notes, and references*.

## Configuring the Integration

Before you start configuration, make sure you met the prerequisites described in “Prerequisites” on page 337. Then set the login information for SMIS-S EVA provider running on a management system.

To set, delete, list, or check the login information, use the `omnidbsmis -ompasswd` CLI command. For command syntax and examples, see the *HP Data Protector command line interface reference*.

The information you provide is kept in the ZDB database for EVA integration (SMISDB).

For each management systems you configure, the following information is stored:

- Hostname as recognized in the IP network.
- Port number through which SMI-S Agent communicates (default - 5988). If SMI-S provider accepts the SSL-based connection, the default port number is 5989.
- User name and encoded password for SMI-S EVA provider login.

SMISDB resides on the Cell Manager in: `Data_Protector_home\db40\smisdb`.

## Considerations

If a failover from the active to the standby management system happens, proceed as follows:

- If standby and failed management systems have the same hostname, no action is needed.
- If standby and failed management systems have different hostnames, remove the failed system from the Data Protector configuration, and then add the new management system.

---

### IMPORTANT:

It is recommended to use the default port number (5988 for non-SSL and 5989 for SSL-based SMI-S provider connection settings).

It is also recommended to run

`omnidbsmis -ompasswd -check [-host HostName]` before backup or instant recovery to verify the configuration of SMI-S EVA Provider.

---



## Configuring HP StorageWorks Disk Array XP

This section describes how to configure the Data Protector HP StorageWorks Disk Array XP integration for use with the VSS integration.

### Prerequisites

- Install **Disk Array XP components and licenses:**
  - RAID Manager library on the application and backup systems. See the RAID Manager library documentation for installation instructions.  
RAID Manager Library is firmware-dependant. Consult the HP sales representative for information on which version of RAID Manager and RAID Manager Library to use.
  - Business Copy (BC) XP microcode and a license for, at least, basic and business copy operation.
  - XP VSS and VDS provider.
  - Device specific module (MPIO DSM) 2.0.
- Install **Data Protector components and licenses:**
  - An instant recovery license.
  - The HP StorageWorks XP Agent.  
For installation and licensing information, see the *HP Data Protector installation and licensing guide*.
- Make sure the same operating system (and its version) is installed on the application and backup systems.
- Connect the application and backup systems to the same Disk Array XP.
- Assign LUNs to the respective ports.
- Pre-configure the LDEVs for the VSS snapshot creation and put them in the SVOL host group. If you perform restore using VDS, you need to put new LDEVs in the SVOL host group after the restore, since the VDS restore switches the disks and the replica becomes the source volume. Add as many new LDEVs as you used them for restore.

### Limitations

- Second-level mirrors are not supported.
- You cannot switch between the VSS compliant mode and resync mode during execution of a backup session.

- Maximum three replicas (S-VOLs) can be created for a source volume (P-VOL) if the XP provider is in the resync mode.

For supported backup and connectivity topologies, see *HP Data Protector zero downtime backup administrator's guide*.

For general Data Protector and integration-specific limitations, see *HP Data Protector product announcements, software notes, and references*.

## Configuring the Data Protector VSS cluster-aware integration

The configuration of the Data Protector VSS cluster-aware integration consists of:

1. Configuring an VSS cluster-aware client. Refer to [“Configuring a VSS cluster-aware client”](#) on page 338.
2. Configuring a cluster-aware VSS integration backup. Refer to [“Configuring backups for a cluster-aware VSS client”](#) on page 338

Find below an overview of global configuration tasks with cluster-specific steps.

### Configuring a VSS cluster-aware client

The client configuration must be performed on one cluster node per one VSS client, since the Data Protector VSS configuration file resides on the Cell Manager.

### Configuring backups for a cluster-aware VSS client

To configure backups for a cluster-aware VSS client, create a Data Protector VSS backup specification, as explained in [“Creating backup specifications using GUI”](#) on page 349 taking into account the VSS infrastructure specifics described below.

The Microsoft VSS infrastructure does not identify writers that run as cluster resources (for example, cluster-aware writers). Therefore, the Microsoft VSS integration agent cannot distinguish between the cluster-aware and non-cluster-aware writers when creating a backup specification. This means you need to configure different backup specifications for cluster-aware and non-cluster-aware writers.

When backing up cluster-aware writers (such as SQL Server via the MSDE Writer), specify the name of the VSS client system as the virtual server name given in the particular writer resource group.

When backing up writers that are not cluster-aware (such as System Writer or Event Log Writer), specify the name of the VSS client system as the physical node.

## Example 1. VSS cluster specifics

The example below shows why it is necessary to create different backup specifications for cluster-aware and non-cluster-aware writers.

You have `node_A` and `node_B`, and MS Exchange Server running on a virtual host `exchsvr`. When creating a backup specification, you can select, among others, MS Exchange Writer and Event Log Writer. Suppose, at the time of a backup, Exchange is running on `node_A`. If you create just one backup specification for both writers, the following problems will occur:

- If you select `node_A` as your source host, you have Event Log Writer and Exchange Server associated with `node_A`. While it is true, that Event Log Writer is a property of the physical node, it is wrong to associate Exchange Server with it, as it is a property of the virtual server.

Suppose that after a failover, MS Exchange Server is running on `node_B`. When you try to restore the data to `node_A`, the restore will fail because Exchange disks are now owned by `node_B` and you cannot write to them. However, the restore of Event Log Writer will succeed.

- If you select `exchsvr` as your source host, you have Event Log Writer and Exchange Server associated with a virtual server `exchsvr`. While it is true, that Exchange Server is a property of the virtual server, it is wrong to associate Event Log Writer with it, as it is a property of the physical node.

Suppose that after a failover, MS Exchange Server is running on `node_B`. When you try to restore Event Log Writer data to `exchsvr`, it will overwrite (or try to overwrite) the data in the Event Log of `node_B` with the data from the Event Log of `node_A`. The restore of Event Log Writer will fail, while Exchange Server will be restored successfully.

## VSS and VDS provider configuration for ZDB and instant recovery

To be able to perform ZDB and instant recovery, you must configure the VSS and VDS provider for EVA or Disk Array XP. Perform the configuration task before you run the backup with the specified instant recovery options for the first time.

Refer to the hardware provider documentation for details on how to configure the provider.

### Configuring the VSS Hardware Provider for EVA

Open the HP StorageWorks VSS Configuration Utility for EVA and follow the steps below:

1. Ensure that the correct management appliance IP Address is specified.
2. Click on **Login** and in the Login dialog box, enter the username and password.
3. Select **SnapClone** as the Snapshot Type.
4. Click **Select Disk Group**. Select the disk group where the disks that you intend to back up for instant recovery reside.

Open the HP StorageWorks VDS Configuration Utility for EVA and follow the steps below:

1. Ensure that the correct Appliance IP Address is specified.
2. Click on **Login** and in the Login dialog box, enter the username and password.

After you once performed this procedure, the VSS and VDS providers are ready to be used for backup and instant recovery.

## Configuring the VSS Hardware Provider for Disk Array XP

Before you run backups, open the HP StorageWorks XP VSS Hardware Provider Configuration Utility and choose the configuration mode for your backups: `VSS Compliant Mode` or `Resync Mode`.



### NOTE:

Changing the modes between backup sessions can impact the restore. For details, see [“HP StorageWorks Disk Array XP considerations”](#) on page 381.

---

## Microsoft Exchange Server writer specific configuration

A backup of the Microsoft Exchange database can be considered successful only if the consistency check of the replicated datafiles succeeds.

For instant recovery enabled backups, it is recommended that the database stores and transaction logs reside on different source volumes. In this case, you can restore only stores and perform roll-forward recovery. Otherwise, if both are on the same source volume, all data residing on this volume must be restored.

## Microsoft Exchange Server 2007 configuration in LCR environment

When configuring an LCR environment, ensure that the original database and the database copy have the same directory structure for their files. Otherwise, after restore of an LCR copy to original database, mounting of the database will not be correct.

## Microsoft Exchange Server 2007 configuration in CCR environment

If you have a CCR environment where a production database resides on a different EVA disk array than its copy and if the backup system is different from the application system, ensure that:

- The backup system is connected to the same disk array where the replicas (volume shadow copies) of backup objects (either production database or database copy) will be created. For example, if you back up the production database, the backup system must be connected to the same disk array on which the production database resides. If you back up the database copy, then the backup system must be connected to the same disk array on which the database copy resides.
- The VSS/VDS hardware provider is configured for the same Command View on both EVAs due to the hardware provider limitation, which can detect only one EVA disk array.

Otherwise, the presentation of replicas to the backup system fails and consequently the backup session fails.

Also in case where the application and backup systems are the same, ensure that the VSS/VDS hardware provider is configured for the same Command View on both EVAs. Otherwise, rotation and deletion of old replicas from other EVA cannot be performed.

Note that if a failover of the production and copy databases happens, the backup using the same backup specification as before failover will fail, since the backup system is no longer connected to the disk array where the new replicas reside. In this case, you can:

- Perform manual failover of the production and copy databases to enable the same configuration as before the first failover.
- Create a new backup specification with the new backup objects specified.
- Change the backup system connection to the disk array where the new replicas reside.

For restore limitation of this scenario, see “[Limitations](#)” on page 383.

## Configuration check

With instant recovery, it is possible to *selectively* restore separate writer's components if they reside on separate source volumes. Instant recovery of separate components also requires that the volumes with components data should not contain any other data. The configuration check detects, whether there are more than one component on the volume and whether there is any other data besides the component's data.

At backup time, Data Protector can check whether the individual components can be selectively restored using the instant recovery functionality. At instant recovery time, Data Protector, can check whether the data required for the components restore is available.

In case of the Microsoft Exchange Server Writer, it is checked, whether the whole storage group should be restored, or whether the separate database stores can be restored individually. In case of the MSDE Writer, it is checked, whether the user, system, and log files are on separate volumes.

If the check fails for a component during the backup, you will not be able to select this component for the instant recovery, you will need to recover all writer components. If the check fails during the instant recovery, the instant recovery session will fail.

### Configuration check modes

You can select between three configuration check modes:

- **Strict**  
If any file or folder on the volume does not belong to the component, the ZDB to disk or instant recovery fails.
- **Non-strict**  
If any folder on the volume does not belong to the component, the ZDB to disk or instant recovery fails.
- **Disabled**  
A check detects whether there is more than one component on the volume and whether there is any other data besides the component's data on the volume, but the session will not fail.

---

 **IMPORTANT:**

If the configuration check is disabled for an instant recovery, you will lose the data that does not belong to a component, but resides on the same volume as the component. Disable configuration check only if instant recovery cannot be performed with an enabled configuration check and only if you are sure that this will not result in a loss of data during the instant recovery.

---

The configuration check should not be disabled except for the cases when instant recovery cannot be performed with an enabled configuration check. Due to the specific behavior, some writers (not applicable to the MSDE Writer and Microsoft Exchange Server writers) may create temporary files on components volumes during backup and instant recovery causing the check failure. In such cases, instant recovery will not be possible.

## Writers specifics

This section describes specific information about VSS writers, that you need to take into account before backing up or restoring the writers.

VSS writers either come with the Windows operating system or with applications. For a complete list of supported VSS writers and providers refer to the latest support matrices at <http://www.hp.com/support/manuals>.

The Data Protector Microsoft VSS integration does not provide any restore method for writers requesting a custom restore. If a writer specifies a custom restore method, it is only possible to restore the writer's data as plain files using the Data Protector functionality. You can perform the custom restore manually. Refer to the writers documentation for additional information on the restore methods.

---

 **NOTE:**

Writers requiring custom restore methods are by default not shown by Data Protector. The `omnirc` variable `OB2VSS_SHOWALLWRITERS` must be set to 1 for all writers to be displayed.

---

Table 22 on page 344 provides a description of VSS writers.

**Table 22 Writer description**

| Writer name                  | Description                                                                                                                                                                                                                                                                                                                                                                                        | Restore method                     |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Certificate Authority Writer | This is a system writer, used to back up and restore Certificate Authority (CA) Service database. This service issues, revokes, and manages certificates employed in public key-based cryptography technologies.                                                                                                                                                                                   | Files are restored after a reboot. |
| Cluster Service Writer       | This VSS writer using a custom API, is used to back up and restore Cluster Service on Microsoft Cluster Server (MSCS). The Cluster Service is a component on Windows servers used to control server cluster activities on cluster nodes. It is fundamental to the operation of the cluster.                                                                                                        | Custom restore method              |
| COM+ REGDB Writer            | This VSS writer using a custom API, is used to back up and restore COM+ Database Service. This service provides automatic distribution of events to subscribing COM+ components.                                                                                                                                                                                                                   | Custom restore method              |
| DHCP Jet Writer              | This is a system writer, used to back up and restore DHCP Service database. DHCP Service provides dynamic IP address assignment and network configuration for Dynamic Host Configuration Protocol (DHCP) clients.                                                                                                                                                                                  | Files are restored after a reboot. |
| Event Log Writer             | This is a system writer, used to back up and restore Event Logs. Event Logs are files where the Windows operating system saves information about events, such as starting and stopping services or the logging on and logging off of a user.                                                                                                                                                       | Files are restored after a reboot. |
| FRS Writer                   | This VSS writer using a custom API, is used to back up and restore File Replication Service data. File Replication Service is a multithreaded replication engine that replicates system policies and logon scripts stored in System Volume (SYSVOL). FRS can also replicate data for Distributed File System (Dfs), copy and maintain shared files and folders on multiple servers simultaneously. | Custom restore method              |



| Writer name                          | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Restore method                                                          |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| IIS Metabase Writer                  | This is a system writer, used to back up and restore Microsoft Internet Information Server (IIS). IIS is a network file and application server that supports multiple protocols. Primarily, IIS transmits information in Hypertext Markup Language (HTML) pages by using the Hypertext Transport Protocol (HTTP).                                                                                                                                                                                                                                                                                                                                                                                      | Files are restored after a reboot.                                      |
| MSDE Writer                          | This is a writer used to back up and restore Microsoft SQL Server 2000. SQL Server is a database management system that can respond to queries from client machines formatted in the SQL language.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Refer to “ <a href="#">MSDE writer restore specifics</a> ” on page 370. |
| Microsoft SQL 2005 Writer            | This is a writer used to back up and restore Microsoft SQL Server 2005. SQL Server is a database management system that can respond to queries from client machines formatted in the SQL language.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Standard VSS restore and instant recovery.                              |
| Microsoft Exchange Server Writer     | This is a writer used to back up and restore Microsoft Exchange Server. Microsoft Exchange Server is a mail and groupware server.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Standard VSS restore and instant recovery.                              |
| Microsoft Virtual Server 2005 Writer | This is a writer used to back up and restore Microsoft Virtual Server 2005. Microsoft Virtual Server 2005 is a virtualization platform for Microsoft Windows servers. Data Protector supports live back up of individual virtual machines and the Virtual Server configuration, ensuring data consistency of the backup and restore. Hardware providers are not supported if a Virtual Server Machine is in online mode; use a software provider or put the Virtual Server Machine in offline mode. For details about Virtual Server online and offline mode, see the Microsoft Virtual Server documentation.<br><br>Cluster configurations are not supported, only individual nodes can be backed up. | Standard VSS restore and instant recovery.                              |
| NTDS Writer                          | This is a system writer used to back up and restore Microsoft Active Directory on Windows servers. Active Directory Service is a Windows                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | To restore Active Directory, boot into Directory restore mode.          |

| Writer name                      | Description                                                                                                                                                                                                                                                                                                                                                  | Restore method                                     |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
|                                  | server directory service that enables you to manage data structures distributed over a network. For example, Active Directory Service stores information about user accounts, passwords, phone numbers, profiles, and installed services. It provides methods for storing directory data and making this data available to network users and administrators. | Files will be restored if they can be overwritten. |
| Registry Writer                  | This VSS writer using a custom API, is used to back up and restore Windows Registry. Windows Registry is a database repository of information containing the Windows system configuration.                                                                                                                                                                   | Custom restore method                              |
| Remote Storage Writer            | This is a system writer used to back up and restore Remote Storage Service (RSS). RSS is used to automatically move infrequently accessed files from local to remote storage. Remote files are recalled automatically when the file is opened.                                                                                                               | Files are restored after a reboot.                 |
| Removable Storage Manager Writer | This is a system writer used to back up and restore Removable Storage Manager Service. This service manages removable media, drives, and libraries.                                                                                                                                                                                                          | Files are restored after a reboot.                 |
| System Writer                    | This is a system writer that backs up a specific set of Windows dynamic link libraries (DLL).                                                                                                                                                                                                                                                                | Files are restored after a reboot.                 |
| TermServlicensing Writer         | This is a system writer that backs up Windows Terminal Services. These services provide a multi-session environment that allows client systems to access a virtual Windows desktop session and Windows-based programs running on the server.                                                                                                                 | Files are restored after a reboot.                 |
| WINS Jet Writer                  | This is a system writer, used to back up and restore Windows Internet Name Service (WINS). WINS is a dynamic replicated database service that can register and resolve NetBIOS names to IP addresses used on a TCP/IP network.                                                                                                                               | Files are restored after a reboot.                 |

| Writer name | Description                                                                                                                                                                           | Restore method                     |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| WMI Writer  | This is a system writer, used to back up and restore Windows Management Instrumentation (WMI). WMI is a unified management infrastructure in Windows for monitoring system resources. | Files are restored after a reboot. |

## Backing up writers data

### Overview

To run backups and restores of the VSS writers and filesystems, you need to configure the Data Protector Microsoft Volume Shadow Copy Service integration backup specifications.

To configure the backup using the VSS integration, perform the following steps:

### Configuration steps

1. Configure disk arrays, devices, media, and media pools needed for the backup. See the online Help for instructions.
2. Create a Data Protector VSS backup specification specifying the VSS components to back up, the media and devices to which you want your data to be backed up, as well as the Data Protector backup options that define the behavior of your backup or restore session.

If you are using Data Protector VSS to perform a zero downtime backup (ZDB) of the MSDE Writer or Microsoft Exchange Server Writer, the Microsoft SQL Server or Microsoft Exchange Server has to be running on the application system for a backup to start.

### Replica types

The two basic families of replicas available with Data Protector are split mirror and snapshot.

## Split mirror replica

This type of replica is produced using mirroring technology, provided by HP StorageWorks Disk Array XP. Mirroring technology allows a duplicate (a mirror) of the filesystem or application data to be created during normal application use. When a replica is required, a disk from the S-VOL host group is first synchronized with the (P-VOL) and after that the pair is split leaving a fixed copy, or an independent split mirror replica of the source volume. Depending on the configuration mode set in the VSS hardware provider, two types of mirror replicas are possible after the pair is split:

- If the provider is in the *VSS compliant mode*, the replica is independent copy or clone of the source volume with no pair relationship between the replica and its source volume.
- If the provider is in the *resync mode*, the replica and its source volume are in the suspended mirror relationship enabling restore of such replica only by re-synchronization the replica with its source volume.

## Snapshot replica

This type of replica is produced using snapshot technology, provided by HP StorageWorks Enterprise Virtual Array.

In the case of a snapshot replica, no synchronization is required before creating the fixed point-in-time copies because a snapshot is a logical copy of the pointers to the data rather than the data itself. Snapshot replicas are considered to be created almost instantaneously and are immediately available for use. However, in some implementations, background processes may continue for some time afterwards.

A range of snapshot techniques is available, each with its own particular merits from the storage and data processing points of view. Data Protector supports the following snapshot replica types using the EVA hardware provider:

- Snapshot *with* pre-allocation of disk space (**standard snapshot**).
- Snapshot *without* pre-allocation of disk space (**vsnaps** or Virtually Capacity-Free Snapshot).
- A full copy of the source volume (original virtual disk), independent of the original virtual disk (**(snap)clone**).

You select the replica type in the GUI when creating a backup specification. However, you can choose only between clone or snapshot replica type or you select default. If **Snapshot (Differential)** is selected, standard snapshots are created by default. To create vsnaps, configure the hardware provider to create vsnaps prior creating a backup specification.

If **Default** is selected, the replica type created will be the one which is configured in the hardware provider.

Note that for instant recovery, only snapclone is available.

## HP StorageWorks EVA specifics

### Replica creation and reuse

A new replica is created and added to the replica set when the specified **Number of replicas rotated** is not reached.

The oldest replica in the set is deleted and the new one is created when the specified **Number of replicas rotated** is reached.

### Limitations

- When a cloning process of a source volume is in progress, another snapshot (any type) of that source volume cannot be created.
- Only one type of target volume per source volume can exist on an EVA disk array at the same time. For example, the creation of a snapclone may fail if a snapshot or vsnap for the same source volume exists on the array. Such replicas should be deleted first using the Data Protector command `omnidbvss`.

## HP StorageWorks Disk Array XP specifics

- For backups in resync mode, the number is limited to a maximum of three replicas (S-VOLs) per source volume (P-VOL). If you use the same P-VOL in more than one backup specification, note that the Number of replicas rotated should not be more than three in all backup specifications together.
- You can change the XP hardware provider mode between different backup sessions using the same backup specification, but this is not recommended when you use replica rotation, because restore of such a backup can fail. For details, see [“HP StorageWorks Disk Array XP considerations”](#) on page 381.

## Creating backup specifications using GUI

The procedure below shows how to back up Microsoft VSS objects using the Data Protector GUI. Some writers have specific limitations. For writers specific limitations, see:

- For Microsoft Exchange Server specifics, see [“Microsoft Exchange Server writer backup specifics”](#) on page 357.

You need to configure different backup specifications for cluster-aware and non-cluster-aware writers. Refer to [“Configuring the Data Protector VSS cluster-aware integration”](#) on page 338.

To create a new backup specification for the VSS integration, proceed as follows:

1. In the **HP Data Protector Manager**, switch to the **Backup** context.
2. In the Scoping Pane, expand **Backup Specifications**.
3. Right-click **MS Volume Shadow Copy Writers** and click **Add Backup**.
4. In the **Create New Backup** dialog box, select the backup type. You can choose between the following types:

- **Local or network backup**

This type is used for single host VSS backup. If you want to perform a ZDB for instant recovery purposes, you need a hardware provider. Otherwise, no hardware provider is required.

- **VSS transportable backup**

Use this option to create a shadow copy or replica on the application system and present it to the backup system, which can perform the backup to tape. This option selects the VSS ZDB backup. A hardware provider is required for this type of backup.

5. Specify the following options:

- The name of the application system.  
When backing up cluster-aware writers (such as SQL Server via the MSDE Writer, or Exchange Server in the CCR environment), specify the virtual server name given in the particular writer resource group as the application system.
- For transportable backup, the name of the backup system from where the shadow copy can be backed up to tape..
- For local or network backup, the type of provider: select **Use Hardware Provider** if you want to enable instant recovery and other ZDB options.
- To enable instant recovery, select **Track the replica for instant recovery**.
- If you have selected **Track the replica for instant recovery**, specify the configuration check mode. Configuration check applies to the disk backups that are to be used for instant recovery and does not apply to the tape backup. For information on the options, see [“Configuration check”](#) on page 342.
- If you clear **Track the replica for instant recovery**, you can specify the replica type:

**Default**

The replica type created depends on the provider configuration.

**Mirror/Clone (Plex)**

A target volume, independent from its source volume is created:

- With EVA provider, snapclone is created.
- With XP provider, the replica created depends on the provider mode (clone in case of VSS compliant mode, or mirror in case of resync mode).

**Snapshot (Differential)**

A target volume, dependent on its source volume is created: by default, standard snapshot (disk space is pre-allocated).

This replica type is not supported by XP provider.

A provider may support one or both types. If you select an unsupported replica type, the backup will fail.

For more information on EVA provider replica types, see “[Snapshot replica](#)” on page 348.

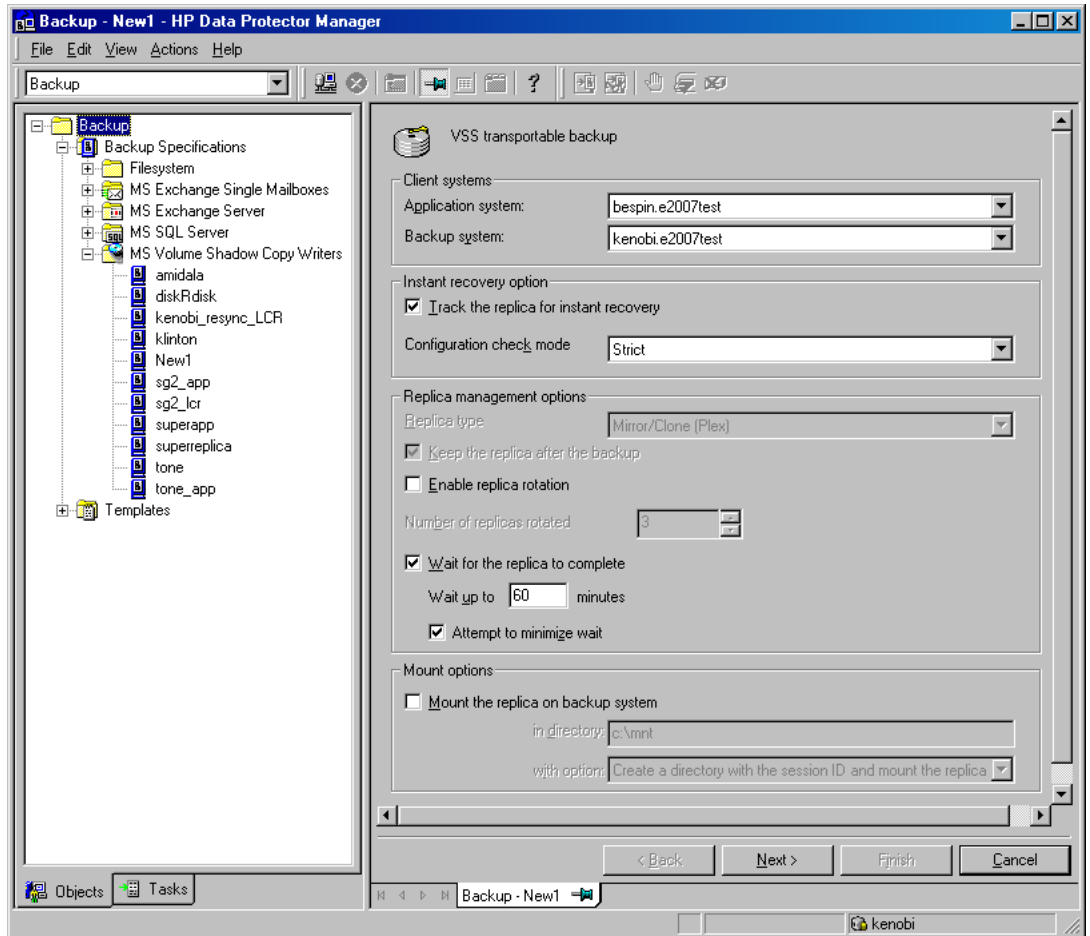
Optionally, specify the mount and replica management options:

- Select **Keep the replica after the backup** to keep the replica on a disk array after backup. If this option is not selected, the replica is deleted after backup. By default, this option is automatically selected if **Track the replica for instant recovery** is set, and cannot be deselected.
- During a VSS backup session, a virtual replica is immediately available for use. However, in the background, the copy process runs for some time to copy all data from the source to the target storage. To avoid the slowdown of the copy process caused by the backup to tape or by the integrity check process (Exchange Server), use the **Wait for the replica to complete** option. The integrity check resumes after the time specified in **Wait up to *n* minutes** (default: 60) is reached even if the copy process is not finished. The **Attempt to minimize wait** option resumes the integrity check process after the copy process has finished if it is finished before the specified time.
- With XP provider, deselect the option **Wait for the replica to complete** because it is not applicable to this integration and a warning message is displayed during backup if the option is selected.

For details, press **F1**.

Click **Next**.





**Figure 101 VSS transportable backup options**

6. This page only displays the selection of your VSS client. Click **Next**.

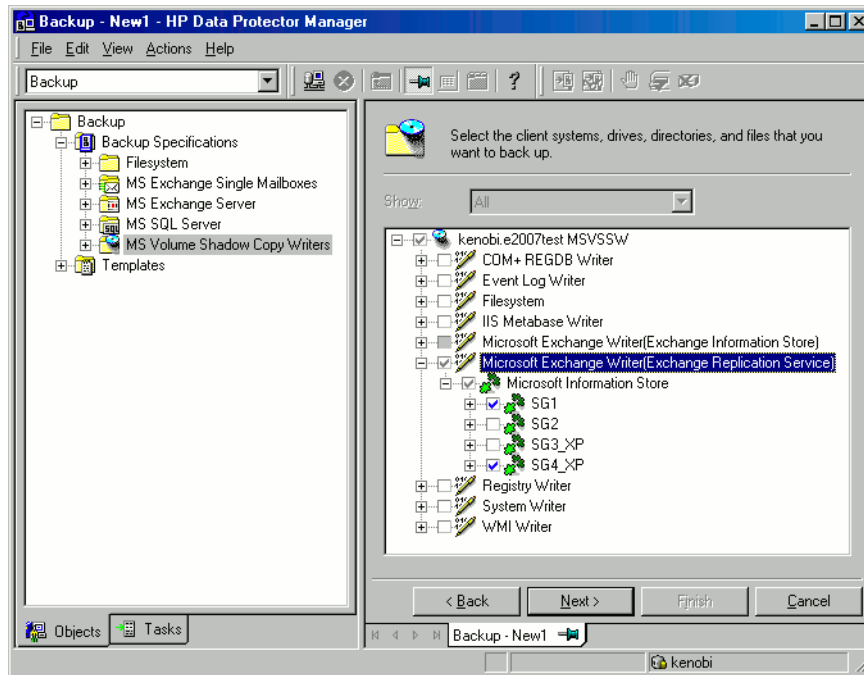
7. Select the backup objects you want to back up.

You can specify a **full client backup** by selecting the top-level item (the name of the client), a single writer or a writer's component backup by selecting a lower-level item.

If full client is selected, Data Protector checks which writers exist on the client and backs up all of them at backup time.

 **NOTE:**

If you want to perform an instant recovery, do not select too many objects because they might reside on more than four source volumes. If the objects reside on more than four source volumes, create several backup specifications where objects do not reside on more than four source volumes.



**Figure 102 Selecting backup objects (Microsoft Exchange Server 2007 CCR)**

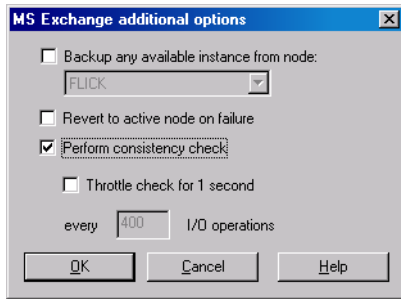
If a writer requires all of its components to be backed up, lower-level items are automatically selected. If you select such a writer for backup, all its components will be backed up.

If a writer has no components to be backed up, it is not displayed in the list of writers, and is not backed up when the full client is selected.

The **Filesystem** item displays all mounted disks. If another disk is mounted under a disk, the parent disk is displayed twice. The first item is the parent disk (for example `c:`) and the second one is the container for the mountpoint (for example `c:\mnt\1`). To select a mounted disk, select the mountpoint. A hardware provider is required for this backup object.

**Microsoft Exchange Writer:** Optionally, to specify options for the consistency check of Microsoft Exchange Server Writer, right-click **Microsoft Exchange Writer** and click **Additional options**.

**Microsoft Exchange Server 2007 Writer in a CCR environment:** Optionally, to specify cluster options, right-click **Microsoft Exchange Writer** and click **Additional options**.



**Figure 103 Additional options for Microsoft Exchange Server 2007 in CCR environment**

8. For ZDB to tape, select the device(s) you want to use for the backup to tape. Click **Properties** to set the device concurrency, media pool, and preallocation policy. For more information on these options, click **Help**. If you do not select a device, *only backup to disk* will be available.

---

 **IMPORTANT:**

If you do not configure devices and do not select the option **Track the replica for instant recovery**, you will not be able to restore the data with Data Protector.

---

In case of ZDB to tape, you can also specify whether you want to create additional copies (mirrors) of the backup during the backup session. Specify the desired number of mirrors by clicking the **Add mirror** and **Remove mirror** buttons. Select separate devices for the backup and for each mirror.

For detailed information on the object mirror functionality, see the online Help.

9. Following the wizard, select the backup options and schedule your backup.

---

 **TIP:**

If you are not sure about selecting the backup options, keep the default values.

---

See the online Help for details about the options common to all Data Protector backup specifications.

10. Once you have defined all backup options and the schedule, you need to name and save the newly-created backup specification. You have now completed the creation of a Microsoft Volume Shadow Copy Writers backup specification.
11. You can review the newly-created and saved backup specification in the **Backup** context, under the specified group of backup specifications.
12. You can run backup using one of the following methods:
  - Schedule the backup of an existing Microsoft Volume Shadow Copy Writers backup specification using the Data Protector Scheduler.
  - Start an interactive backup of an existing Microsoft Volume Shadow Copy Writers backup specification.

## VSS specific backup options

**Table 23 VSS specific backup options**

| Option    | Description                                                                                                                                                                                                                                                     |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pre-exec  | Specify a command that will be started by <code>vssbar.exe</code> on the application system before the backup. Do not use double quotes. Type only the name of the command, not the pathname. The command must reside in <code>Data_Protector_home\bin</code> . |
| Post-exec | Specify a command that will be started by <code>vssbar.exe</code> on the application system after the backup. Do not use double quotes. Type only the name of the command, not the pathname. The command must reside in <code>Data_Protector_home\bin</code> .  |

## Microsoft Exchange Server writer backup specifics

The Microsoft Exchange Server Writer supports the following Microsoft Exchange backup types:

### Backup types

The Microsoft Exchange Server Writer supports the following Microsoft Exchange backup types:

- *Full* - backs up databases, transaction logs, and checkpoint files. The transaction logs are truncated.
- *Incremental* - backs up the transaction logs to record changes since the last full or incremental backup. The transaction logs are truncated. Requires Service Pack 1.

- *Differential* - similar as incremental backup, but the transaction logs are not truncated. Requires Service Pack 1.
- *Copy* - a Full backup, but the logs are not truncated. This type of backup is not intended for use in recovering failed systems.

### Limitations

- A combination of VSS snapshot backups and incremental stream backups is not possible.
- You can back up only the whole server or full storage groups. Single stores cannot be backed up.
- Incremental and differential backups cannot be mixed in one restore chain.
- Circular logging must be disabled; otherwise, only full backup recovery is possible.
- With Exchange Server 2003, only one VSS backup session can be running on the same application system at once. With Exchange Server 2007, only one VSS backup session backing up a specific storage group can be running on the same application system at once. Consequently, if you start a backup while another one is in progress, the latter waits until the first one finishes.

### Recommendations

- With the HP StorageWorks EVA provider, an Exchange storage group should not reside on more than four source volumes. However, the recommended configuration is that transaction logs reside on one source volume and the stores on another source volume. This configuration enables you to perform a rollforward recovery if only the stores are lost.

Create *one backup specification for each storage group* and schedule them in a row.

- With EVA provider, an Exchange storage group should not reside on more than four source volumes.
- Configuration with transaction logs residing on different source volume than stores enables you to perform a rollforward recovery when only the stores are lost.
- Create one backup specification for each storage group and schedule them in a row.

### Rollforward recovery

Transaction logs must be backed up to be able to perform the rollforward operation. If you want to combine rollforward recovery with instant recovery, you need to create a separate backup specification for *Incremental* or *Differential* backup with the same object and description as you have in the backup specification for instant recovery.

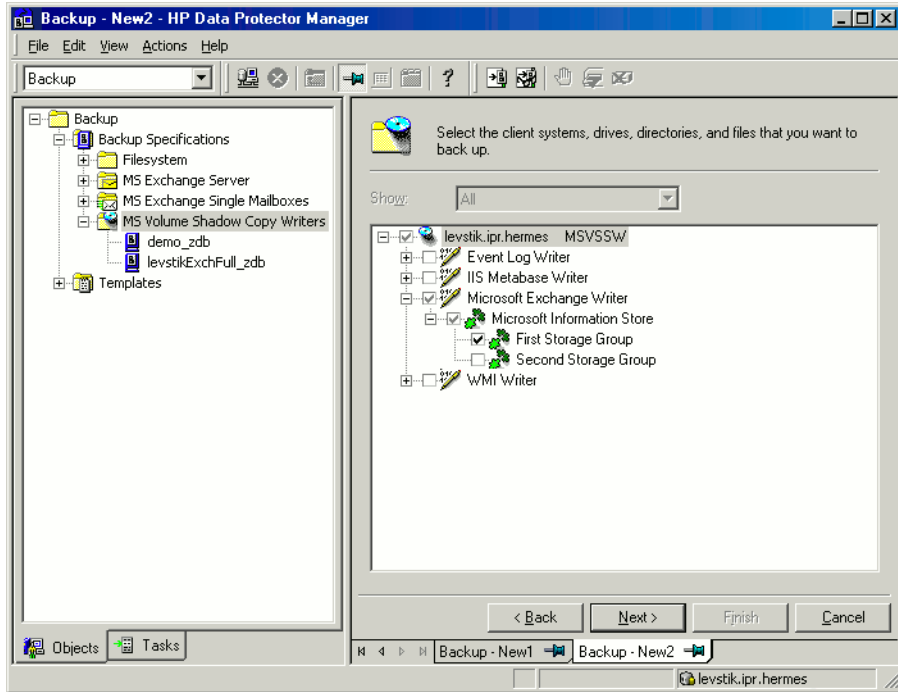
## Writer stabilization

After each Microsoft Exchange Server Writer backup, Data Protector by default waits 10 minutes for Microsoft Exchange Server Writer to stabilize. You can disable this option or you can reduce the waiting time using the `OB2VSS_EXCHANGE_WRITER_STABILIZATION` omnirc variable.

## Consistency check

A backup of the Microsoft Exchange Server database is considered as successful only if the consistency check of the replicated datafiles succeeds. To enable consistency check, click on a created backup specification, right-click **Microsoft Exchange Writer** in the Source tab, and then click **Additional options**.

The consistency check can also be run before instant recovery.



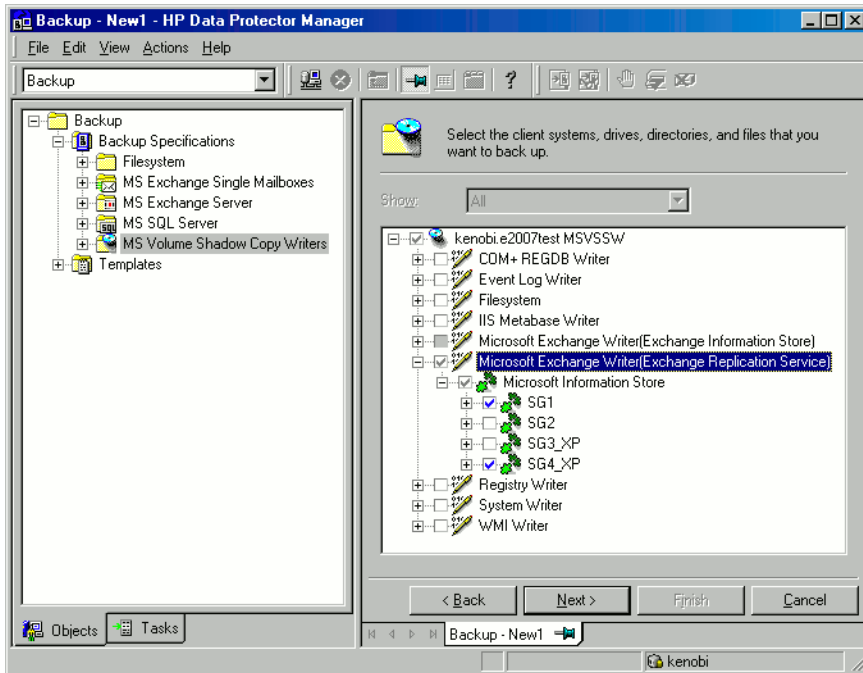
**Figure 104 Selecting Microsoft Exchange Server 2003 storage groups**

### Microsoft Exchange Server 2007 writer backup specifics

In an LCR or CCR environment, the replicated storage groups are represented as a new instance of Exchange writer, **Exchange Replication Service**. The replicated storage groups are backed up in the same way as original production storage groups.

You can select any of these storage groups (original or replicated) for a backup. However, you cannot select both in the same backup specification. See [Figure 105](#).





**Figure 105 Selecting a replicated Microsoft Exchange Server 2007 storage group**

In a CCR environment, you can select a cluster node from where you want your backup to be performed, regardless of which instance (Information Store or Replication Service) resides on this node. If you select the cluster node, Data Protector backs up any available instance on this node ignoring the selection of the instance in the GUI even if you, for example, select the replicated storage group (Exchange Replication Service) as backup object.

To specify the cluster node from where you want to perform backup of any instance residing on this node, right-click an Exchange writer and select the node in the additional options dialog box under **Back up any available instance from node**. See [Figure 103](#).

When backing up Replication Service instance, it may happen that it cannot be backed up due to the following reasons:

- The selected node is not available.
- The status of the storage group to be backed up is not "Healthy".
- Data Protector is not running on the selected node.
- `vssbar.exe` could not be started on the selected node.

To avoid the session failure, you can select the option **Revert to active node on failure** in the same dialog box. The backup will be restarted on the original server (active cluster node) and the original storage group will be backed up. If Information Store instance is backed up, this option is ignored.

### Limitations

- In a CCR environment, if a storage group or a replicated storage group (Replication Service instance) is selected for backup, no other writer (for example, filesystem writer or SQL Server writer) can be selected to be backed up in the same backup session. This is because the two writers are located on different servers and an Data Protector limitation is that two different servers cannot be backed up in the same session.
- In an LCR or CCR environment, a storage group can control only one store.
- The LCR and CCR clusters can have only two nodes.

### Considerations

- After any Microsoft Exchange Server backups, the transaction log files are truncated. The LCR and CCR Exchange backups guarantee that logs that have not been replicated are not deleted. The implication of this behavior is that running backups in a mode that deletes logs may not actually free space if replication is sufficiently far behind in its log copying.

## Scheduling the backup

For more detailed information on scheduling, refer to the online Help index: “scheduled backups”.

To schedule a Microsoft Volume Shadow Copy Writers backup specification, perform the following steps in the Data Protector GUI:

1. In the **HP Data ProtectorManager**, switch to the **Backup** context.
2. In the Scoping Pane, expand **Backup**, then **Backup Specifications**. Click **MS Volume Shadow Copy Writers**.  
A list of available backup specifications is displayed in the Results Area.
3. Double-click the backup specification you want to schedule and click the **Schedule** tab to open the **Schedule** property page.
4. In the **Schedule** property page, select a date in the calendar and click **Add** to open the **Schedule Backup** dialog box.

5. Specify **Recurring**, **Time options**, **Recurring options**, and **Session options**.

Note that the backup type for ZDB sessions that are to be used for instant recovery is set to **Full**.

In the case of a ZDB-to-disk or a ZDB-to-disk+tape session, specify the **Split mirror/snapshot backup** option.

The screenshot shows the 'Schedule Backup' dialog box. It is titled 'Schedule Backup' and has a subtitle 'Specify the desired backup time, frequency, duration, and type.' The dialog is divided into several sections:

- Recurring:** Radio buttons for 'None', 'Daily', 'Weekly' (selected), and 'Monthly'.
- Time options:** A 'Time:' field set to '15:45', a 'Use starting' checkbox, and a date field set to '7/ 3/2007'.
- Recurring options:** An 'Every' field set to '1' week(s) on, and checkboxes for 'Sun', 'Mon', 'Tue', 'Wed' (checked), 'Thu', 'Fri', and 'Sat'.
- Session options:** A 'Backup type' dropdown set to 'Full', 'Network load' radio buttons for 'High' (selected), 'Medium', and 'Low', and a 'Backup protection' dropdown set to 'Default'.
- Split mirror/snapshot backup:** A dropdown set to 'To disk+tape'.

At the bottom of the dialog are three buttons: 'OK', 'Cancel', and 'Help'.

**Figure 106 Scheduling a backup**

6. Click **OK** to return to the **Schedule** property page.
7. Click **Apply** to save the changes.

## Running an interactive backup

An interactive backup can be started using the Data Protector GUI by following these steps:

1. In the **HP Data Protector Manager**, switch to the **Backup** context.
2. In the Scoping Pane, expand **Backup**; then expand the **Backup Specifications** and the **MS Volume Shadow Copy Writers** items.

3. Right-click the backup specification you want to run, and then select **Start Backup** from the pop-up menu.

The **Start Backup** dialog box appears.

Select the backup type and the network load (**High**, **Medium**, or **Low**).

Note that the backup type for ZDB sessions that are to be used for instant recovery is set to **Full**.

In the case of a ZDB-to-disk or a ZDB-to-disk+tape session, specify the **Split mirror/snapshot backup** option.

Refer to online Help for a description of network load.

4. Click **OK**. Upon successful completion of the backup session, a `Session Completed Successfully` message appears.

## Restoring writers data

You can restore the Data Protector Microsoft Volume Shadow Copy Service integration backup objects using the Data Protector GUI.

Data Protector offers two methods for restoring the writers:

- From backup media to the application system on LAN (standard restore). Refer to “[Restore procedure](#)” on page 365.
- Using the instant recovery functionality with the Microsoft Exchange Server and Microsoft SQL Server ZDB integrations. Refer to “[Instant recovery](#)” on page 377.



### NOTE:

Data Protector first restores the Writer Metadata collected during the backup time. This metadata contains the information about the backup components and the restore method. Data Protector performs restore according to the restore method specified by the writers.

---

### Limitations for custom restore

- Data Protector Microsoft VSS integration does not automatically provide any restore method for writers requesting custom restore. If a writer specifies custom restore method, it is only possible to restore the writer's data as plain files using the Data Protector file restore functionality. You can use the `Restore Into` option to specify an alternate restore path for these plain files. You can then

perform the custom restore from these plain files manually. For information on writer's custom restore, refer to the writers documentation.

---

 **NOTE:**

Writers requiring custom restore methods are by default not shown by Data Protector. The `omnirc` variable `OB2VSS_SHOWALLWRITERS` must be set to 1 for all writers to be displayed.

---

## Restore procedure

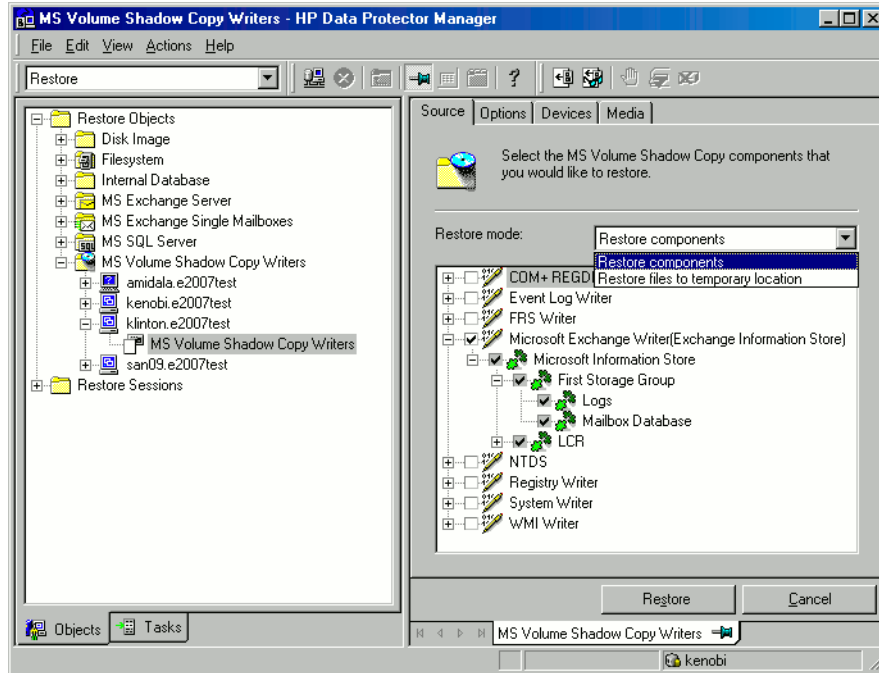
The procedure below shows how to restore Microsoft VSS components using the Data Protector GUI. Some writers require custom restore procedures and/or have specific limitations. See also the appropriate sections:

- For Microsoft Exchange Server Writer specifics, see [“Microsoft Exchange Server writer restore specifics”](#) on page 372.
- For MSDE Writer specifics, see [“MSDE writer restore specifics”](#) on page 370.

To restore Microsoft VSS objects using the Data Protector GUI, proceed as follows:

1. In the **HP Data Protector**, switch to the **Restore** context.
2. Expand **Restore Objects**, expand **MS Volume Shadow Copy Writers**, expand the client from which you want to restore the data, and then click **MS Volume Shadow Copy Writers**. In the Results Area, a list of writers, which were backed up on this client, is displayed.
3. Select the Restore mode:
  - **Restore components**  
With this option selected, whole components are restored using the Volume Shadow Copy Service. Individual files cannot be selected for restore.
  - **Restore files to temporary location**  
With this option, you can select individual files or a group of files that were backed up using the selected writer. The files are restored using the Data Mover Agent and not the Volume Shadow Copy service.

4. In the Results Area, select the writers or writers' components (for component restore) or files or a group of files (for file restore mode).



**Figure 107 Restore objects**

You can select the top-level item (full writer restore) or only specific components. If you select a full writer restore, but some components of this writer were not backed up in the same session, the unavailable components are shaded and you cannot select them. To select the version (the date of a backup), right-click the object name and click **Properties**. The last backup version is selected by default, however, you can select a different version from the drop-down list.

**Exchange Server Writer:** Optionally, to specify options for the consistency check of a Microsoft Exchange writer, right-click the writer and click **Additional options**.

You can perform *point-in-time* or *rollforward* restore of Microsoft Exchange Server writer. For more information, see [Microsoft Exchange Server writer restore specifics](#).

**Exchange Server 2007 Writer:**

If you restore an LCR or CCR copy to the original location, note that restore will be performed to the original database (Exchange Information Store) and not to the database copy (Exchange Replication Service).

To perform *restore to a different location*:

- a. Right-click a storage group, a store, or logs and click **Restore as**.
- b. In the MS Exchange Additional options dialog box, select the target location for the components you want to restore: target server, target storage group, and target stores. The following options are possible:

- **Restore to a different store**

This option is selected by default. It enables you to select the target stores for each store to be restored (original stores). Select the target server first and then from the Original and Target drop-down list, select the stores pairs. For example, to restore only one store, select only one target store for the original store you want to restore. Note that only stores cannot be restored, so logs are automatically selected in the restore session to different location.

- **Restore to a non-Exchange location**

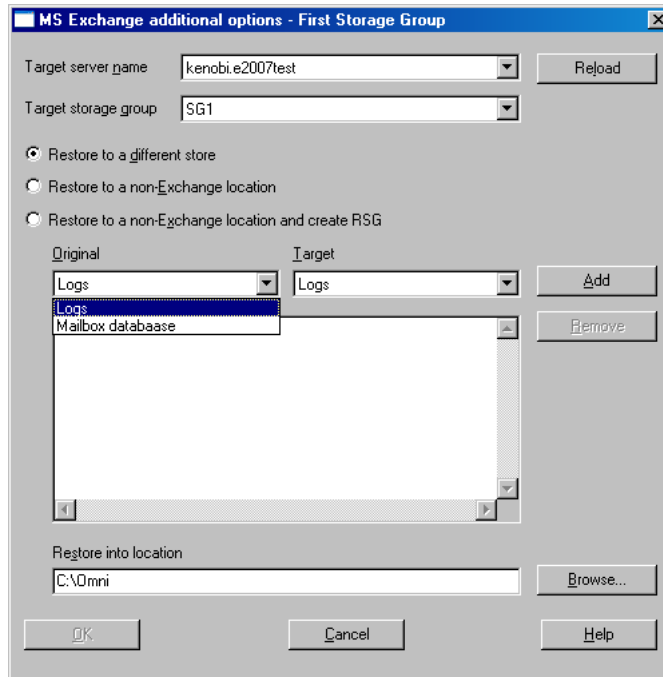
Select this option to restore your data to a non-Exchange location. This means that the restored data will not be managed by Exchange Server and Recovery Storage Group (RSG) will not be created. You can create RSG when data is restored. Select the target server first and then from the **Original** drop-down list, select the stores to be restored.

- **Restore to a non-Exchange location and create RSG**

Select this option to restore your data to a non-Exchange location. After restore, Data Protector will create a Recovery Storage Group called **TBD** on the target server. The stores that you have selected and logs will be restored to this recovery group. Select the target server first and then from the **Original** drop-down list, select the stores to be restored.

Optionally, select the new location for the storage group (**Restore into location**) if you want to be different than default, which is `C:\Omni`.





**Figure 108 Restore to different location options (Exchange Server 2007 Writer)**

5. In the **Options** property page, select the MS Volume Shadow Copy specific restore options. Refer to “[Restore options](#)” on page 370.
6. In the **Devices** and **Media** property pages, the devices and media for restore are automatically selected.

Note that you can change the device used for the restore. Therefore, you have the possibility of using a different device for a restore than the one that was used for the backup. See the online Help index: “selecting devices for restore”.

7. Click **Restore**. Review your selection, and then click **Finish** to start a restore session.

The restore session messages are displayed in the Results Area.

8. If you are restoring a VSS writer that requires a custom restore, continue manually, using the writers specific methods, if it is provided by a writer. Refer to the writers’ documentation.

## Restore options

The following restore options are specific to the Data Protector MS Volume Shadow Copy integration.

### **Restore to another client**

By default, the components or files are restored to the client from which the application data was backed up. However, you may restore the data to another VSS client if you specify the **Restore to another client** option. The new target Microsoft VSS client must be a part of the Data Protector cell. For component restore, it must also run on the same platform and have the MS Volume Shadow Copy Integration software component installed. For file restore, the MS Volume Shadow Copy Integration software component is not required.

### **Restore into the following directory**

By default, you restore the data to the same directory from which it was backed up (it can be on the original client or on some other client which you selected).

However, if you specify the **Restore into the following directory** option, your data will be restored to another directory. When defining the restore location, you can specify the path to the directory where you want to restore your data.

## MSDE writer restore specifics

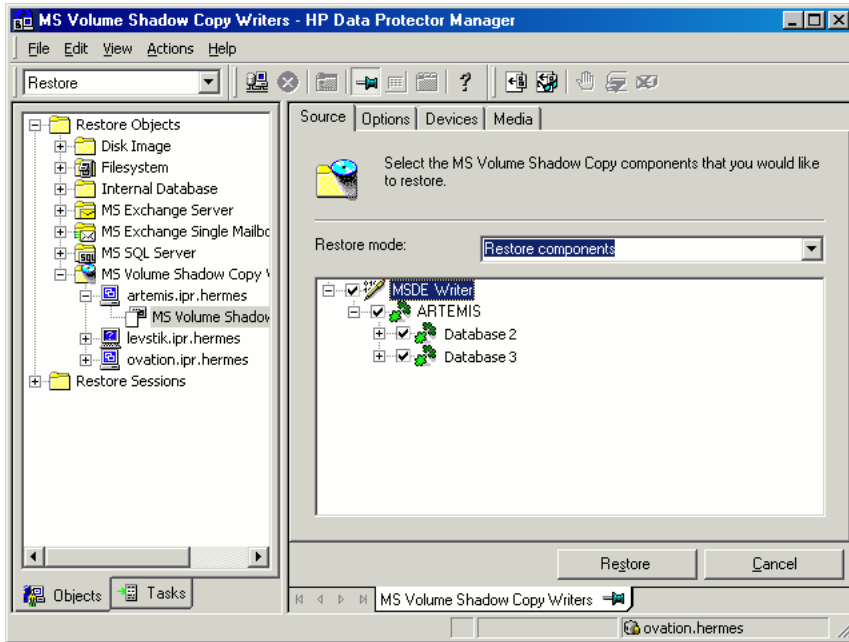
MSDE writer is used to back up and restore Microsoft SQL database.

---

 **IMPORTANT:**

Before restoring the SQL system databases (`master`, `model`, `msdb` and `pub`), you have to stop the SQL service.

---



**Figure 109 MSDE writer**

When you expand the MSDE Writer item in the Results Area, all Microsoft SQL Server instances are displayed. Each instance contains all databases it includes. System databases (`master`, `model`, `msdb` and `pub`) are always listed there.

---

 **IMPORTANT:**

If system databases are restored, the whole internal database structure will be changed.

---

---

 **NOTE:**

Only point-in-time restore is possible. Rollforward restore is not supported.

---

User databases will be restored only if it is possible to overwrite the files. MSDE writer will take the user databases offline before the restore, while SQL service will have to be stopped manually in order to restore the system databases.

## Microsoft Exchange Server writer restore specifics

Microsoft Exchange Server Writer is used to restore Microsoft Exchange Server database files.

When restoring from a Microsoft Exchange backup, the following two scenarios are possible:

- One or more databases are corrupted, but the log files are not damaged. In this case the database is restored and transaction logs are applied. See [“Rollforward recovery from the loss of one or more databases”](#) on page 372.
- The log files are corrupted or missing. In this case all databases and log files need to be restored. A rollforward recovery of the database is not possible. See [“Point-in-time restore after loss of a log file”](#) on page 373.

### Microsoft Exchange Server 2003 limitations

- Shadow copies cannot be restored to alternate locations on the backup system.
- You cannot restore the shadow copy to the Recovery Storage Group.
- Rollforward recovery cannot be performed after a point-in-time restore.
- Restore to Microsoft Exchange Server 2007 from backup made with Microsoft Exchange Server 2003 is not supported.

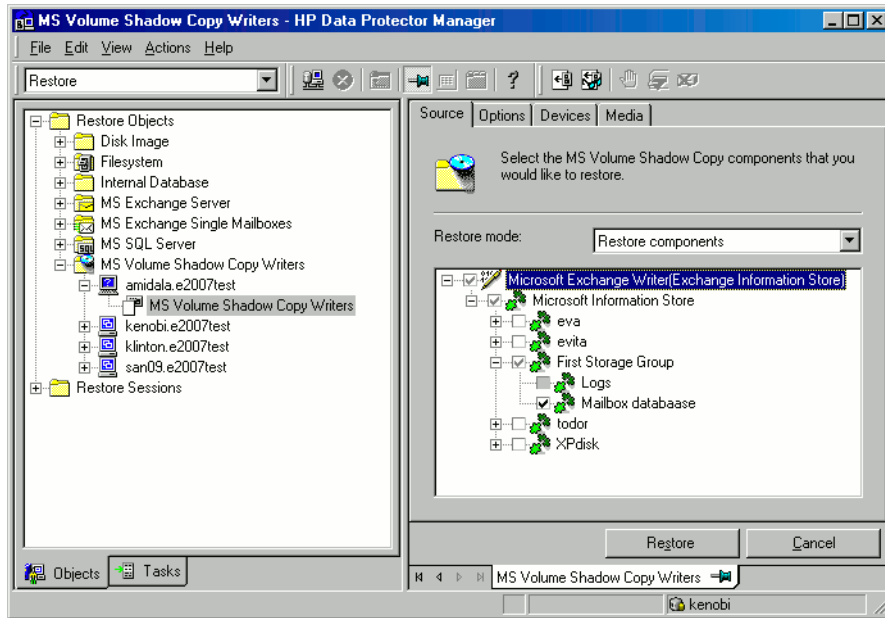
## Rollforward recovery from the loss of one or more databases

For a rollforward recovery:

1. Dismount all stores from the storage group in which the target store resides using Microsoft Exchange System Manager.

2. In the Data Protector GUI, switch to the **Restore** context. Expand **Restore Objects** and **MS Volume Shadow Copy Writers** and select the client from which you want to restore the data.

In the Results Area, expand Microsoft Exchange Writer and select the stores you want to recover. The **Logs** component is shaded and cannot be selected. You cannot select versions of individual stores, because a rollforward recovery is performed only to the current storage group state.



**Figure 110 Selecting Microsoft Exchange Server 2007 stores for rollforward recovery**

3. Proceed as with general VSS writer restore. See “[Restore procedure](#)” on page 365 for the general VSS writer restore procedure.
4. Mount all stores from the storage group in which they reside using Exchange System Manager. Selected stores are recovered.

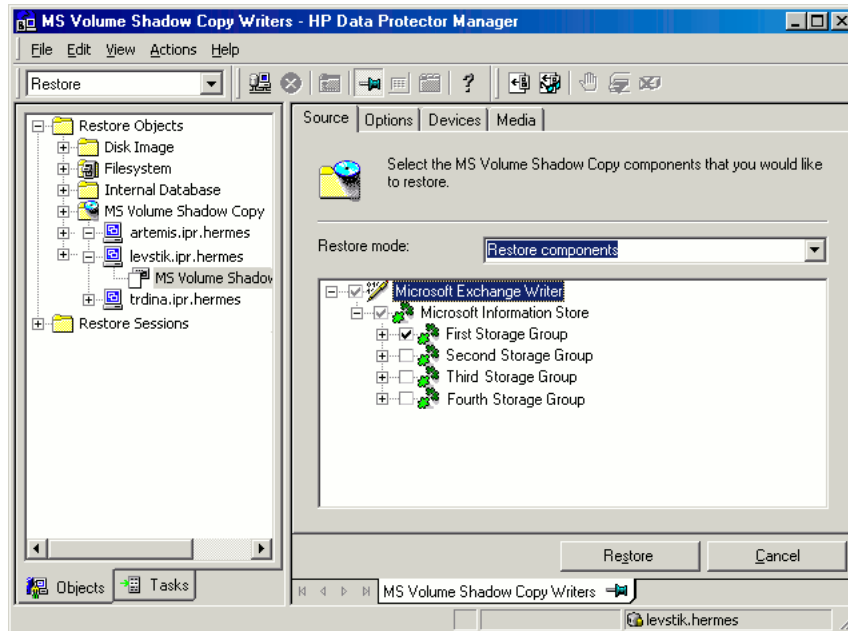
## Point-in-time restore after loss of a log file

To perform a point-in-time restore:

1. Start Exchange System Manager and check if the storage group is already unmounted. If not, unmount the whole group.

2. Switch to the **Restore** context. Expand **Restore Objects** and **Microsoft Volume Shadow Copy Writers** and select the client from which you want to restore the data.

In the Results Area, expand Microsoft Exchange Writer and select the whole storage group. Do not select individual stores.



**Figure 111** Selecting Microsoft Exchange Server 2003 stores for point-in-time restore

3. Proceed as with general VSS writer restore. See “[Restore procedure](#)” on page 365 for the general VSS writer restore procedure.
4. Mount the stores from the storage group in which the target stores reside using Exchange System Manager. All stores are mounted and put in the state as they were at the last selected full, incremental, or differential backup.

## Microsoft Exchange Server 2007 writer restore specifics

Exchange Server 2007 offers additional restore option:

- Restore to a different location than the location from where the backup was made (original location).

The following restore scenarios are supported:

- Restore of a whole storage group or individual stores to the original location.
- Restore of LCR and CCR copies (their storage groups or individual stores) to the original database.
- Restore of a whole storage group (including LCR or CCR copies) or individual stores to a different location:
  - *Restore to a different storage group*  
Data can be restored to a **different storage group**. During the restore, data is restored into the target component destination path and all needed information is stored there. Exchange Server can then replay the restored logs from the original storage group on the target storage group to bring the restored database up to date. If you perform restore to a different storage group, you can access single mailboxes or individual mails on an alternate location without the need to compromise the original storage group with a potentially unsuccessful restore operation.
  - *Restore to a non-Exchange location*  
Data can be restored to a **non-Exchange location**. On session level, this option is already available if you use **Restore into the following directory** option. But on a storage group level, one storage group can be restored to a target directory, another to a different storage group in the same session if the target restore client system is the same. Also single store can be restored to a non-Exchange location. During the restore, data is restored into target component destination path.  
Once the data is restored, it is not managed by Exchange Server.
  - *Restore to a non-Exchange location and creating Recovery Storage Group (RSG)*  
Data can be restored to a non-Exchange location and after that a **Recovery Storage Group** can be created for the databases. Exchange Server recognizes the Recovery Storage Group created by Data Protector, which is called **TBD**.
  - *Restore to Recovery Server*  
If a whole Exchange Server system is unusable, then the whole storage group can be restored to some other Exchange Server system (**Recovery Server**) and some other storage group. If the target system is identical to original (the same host name, storage groups names, stores names, and the same directory structure), restore can be started as normal restore to original location. If there are differences, then restore to a different location must be used.

To restore to a different location on a storage group or store level, right-click the storage group or store or logs to be restored and click **Restore as**. Select the target location for all the components you want to restore.

You can restore two storage groups to both original and a different location in the same restore session if the target restore client system is the same.

During restore to original location, all stores in the storage group to be restored are dismounted even if only one store from the storage group will be restored. Stores are left dismounted after the restore.

## Prerequisites

- For restore to a different location, `Inet` must run under domain account that has the permissions assigned to the Exchange Server Administrators group. The account must also be a member of the local Administrators group on that computer.
- If you restore to different storage group and if there are any dismounted stores you want to use for the restore, mount them before the restore. Otherwise, Data Protector cannot list them for the target selection in the GUI.

If this is done while the Data Protector GUI is opened, you can refresh the current GUI page by clicking **Reload** in the **MS Exchange additional options** dialog box.



### IMPORTANT:

If you restore to a non-Exchange location and create RSG, check that Recovery Storage Group does not already exist on this location. If Recovery Storage Group already exists, it will be deleted by Data Protector. All data stored in the existing Recovery Storage Group will be lost.

---

## Limitations

- Restore to an LCR or CCR storage group copy (Exchange Replication Service instance) is not supported due to the Microsoft Exchange Server limitations. Restore of an LCR or CCR copy to original location will be performed to the original database (Exchange Information Store) and not to the database copy (Exchange Replication Service).
- When restoring to a different location, you cannot restore a specific database store without the transaction logs. When a store is selected for restore, logs are automatically included for the restore.
- Only one storage group can be restored with the option **Restore to a non-Exchange location and create RSG**. This is due to the Microsoft Exchange Server limitation that only one RSG per server is supported.
- You cannot mount public folders to RSG due to the Microsoft Exchange Server limitations.



- All stores in a RSG must originate from the same storage group due to the Microsoft Exchange Server limitations.

## Instant recovery

For general information and concepts on instant recovery, see the *HP Data Protector zero downtime backup concepts guide* and *HP Data Protector zero downtime backup administrator's guide*.

The Data Protector VSS integration provides instant recovery of MSDE Writer, SqlServer Writer, Microsoft Exchange Server 2003 Writer, and Microsoft Exchange Server 2007 Writer.

You can *selectively* restore separate writer's components only if they reside on separate target volumes. Instant recovery of separate components also requires that the target volumes with components data should not contain any other data. If you do not select all writer's components residing on the target volumes to be restored, the restore fails.

Before starting an instant recovery, Data Protector checks whether the data that is required for the components restore is available. If the check fails, the instant recovery session also fails, ensuring that no data that does not belong to the components is lost.

For Exchange Server 2007 writer specifics (prerequisites and limitations), see "[Microsoft Exchange Server 2007 instant recovery prerequisites and limitations](#)" on page 383.

## Overview

Instant recovery restores data directly from a replica to source volumes. All data in the replica is restored (regardless of selections during backup). For instant recovery concepts, see the *HP Data Protector zero downtime backup concepts guide*.

Restore can be performed:

- **Using Microsoft Virtual Disk Service (VDS)**

With this method, a switch of a replica from the specified backup session with the source volume is performed. Information about the replica is deleted from the VSSDB, therefore, it is not possible to perform another instant recovery from that replica. For more information about the switch method, see "[Switch of disks](#)" on page 378.

In case of XP integration, this type of restore can be performed if a backup was created with the XP provider in the VSS compliant mode.

- **Using a disk array integration** (HP StorageWorks EVA or HP StorageWorks Disk Array XP)

## Limitations

- Instant recovery cannot be performed after a point-in-time restore. To be able to perform an instant recovery, you need to run a new backup with the instant recovery options set.
- The number of replicas available for instant recovery is limited by **Number of replicas rotated**, which sets the size of the replica set. You can view these replicas in the **Instant Recovery** GUI context by expanding **Restore Sessions**. Replicas are identified by the backup specification name and the session ID. Other information, such as time when the replica was created, is also provided. Alternately, you can use CLI to list sessions (for information about the `omnidbvss` command, see the *HP Data Protector command line interface reference*).
- Concurrent restores utilizing the same backup system or the same application system are not supported. Restores utilizing the same backup system or the same application system must be performed serially.
- For restore of Exchange Server 2007 writer data to a different location, the Microsoft Virtual Disk Service restore options and the HP StorageWorks EVA restore options are not available.
- For additional Exchange Server 2007 writer limitations, see [“Microsoft Exchange Server 2007 instant recovery prerequisites and limitations”](#) on page 383.

## Restore using HP StorageWorks EVA

Depending on the instant recovery options you select in the Data Protector GUI, instant recovery can be performed in three ways.

### Switch of disks

With this method, the source volume is unrepresented and the target volume (replica) is presented in the place of the source volume. You can select to retain the old source volume. However, you cannot retain the replica and perform another restore from this backup.

### Advantages

- Restore is very fast.
- The old source volume can be retained after restore.
- If you select the **Restore using Microsoft Virtual Disk Service** option, you can restore your data without using HP StorageWorks EVA SMI-S Agent.

## Disadvantages

- It is not possible to perform another restore from the same backup.
- With the EVA integration, this method of instant recovery changes the physical location of the application production data. After instant recovery, a replica becomes the source volume, therefore, the physical location of the original storage changes. The application starts running on the physical disks that were used for backup. Thus, if a replica to be restored belongs to a different disk group than its source volume, the disk group of the replica becomes the disk group of the source volume after instant recovery.

To perform this type of restore, select the **Restore using Microsoft Virtual Disk Service** option or the **Restore using HP StorageWorks EVA** and **Switch to the replica** options in the Data Protector GUI.

## Copy of replica data with the source volume retained

With this method, a new copy from a replica is created in the same disk group in which the source volume resides. When the copy is finished, a switch of disks between the source and the new copy is performed. The old source volume is retained.

You can also select to retain the replica and thus enable to perform another restore from this backup.

## Advantages

- The old source volume is retained after restore.
- Disk group of the source volume is not changed after instant recovery.
- Another restore from the same backup is possible.

## Disadvantages

- Restore is not as fast as with the "switch of disks" method.
- Physical location of the application production data changes.

To perform this type of restore, select the **Copy replica data to the source location** option and leave selected the **Retain source for forensics** option in the Data Protector GUI.

## Copy of replica data with the source volume not retained

With this method, the source volume is directly overwritten by the replica. The old source volume is not retained and if the restore session fails, the original application data residing on the source volumes is lost.

You can select to retain the replica and thus enable to perform another restore from this backup.

### Advantages

- Disk group of the source volume is not changed after instant recovery.
- Physical location of the application production data remains the same.
- Another restore from the same backup is possible.

### Disadvantages

- Restore is not as fast as with the "switch of disks" method.
- The "old" source volume is lost during restore.

To perform this type of restore, select the **Copy replica data to the source location** option and clear the **Retain source for forensics** option in the Data Protector GUI.

### HP StorageWorks EVA considerations

- After instant recovery, the replica used in the session can become the source volumes (physical location of the original application data changes). This depends on the restore options you select in the GUI.

Additionally, if a replica resides in another disk group than the source volumes, this replica disk group becomes the disk group of the source volumes.

- Depending on the restore options you select in the GUI, the restored replica can be deleted from the replica set after instant recovery. In this case, you cannot run instant recovery using the same session ID again.
- If you restore using HP StorageWorks EVA, before instant recovery, it is recommended to check if the SMI-S CIMOMs were configured properly in the Data Protector cell by running the `omnidbsmis -ompasswd -check [HostName]` command.

This command performs a health check of you environment, which may help identify such potential problems as wrong user name or password provided, a broken network connection, a DNS resolution problem, and so on.

---

#### **IMPORTANT:**

After instant recovery, restored filesystems are mounted to the same mount points or drive letters as they were at the backup time. If these mount points or drive letters have other filesystems mounted, these filesystems are automatically dismounted before instant recovery, and the restored filesystems are mounted afterwards.

---

## Restore using HP StorageWorks Disk Array XP

This type of restore can be performed if a backup was created with the XP provider in the resync mode.

With this type of restore, the XP integration agent (SSEA) synchronizes an S-VOL with its P-VOL and then splits the pair during the restore.

If the option **Wait for the replica to complete** is selected, SSEA waits for the re-synchronization or copy process to complete (normal restore). Only then, the source volume is available. If this option is not selected, the source volume is immediately available while the re-synchronization or copy process is running in the background (quick restore).

---

### **IMPORTANT:**

The old source volume is not retained after restore so if the restore session fails the original application data is lost.

---

### HP StorageWorks Disk Array XP considerations

- Restore depends on the XP hardware provider mode which was used during backup. If the VSS compliant mode was used, you can restore your data only using VDS. If the resync mode was used, you can restore your data only using HP StorageWorks Disk Array XP.
- You can switch between the XP hardware provider modes between different backup sessions using the same backup specification, but this is not recommended if the specified number of replicas rotated is more than 1 because restore will fail in the following situations:
  - If you perform a backup in one mode and then the same backup in the other mode, restore of the backup performed in the VSS compliant mode (the "switch of disks" restore) will fail because the relationship between the S-VOL and its P-VOL will be detected from the other backup performed in the resync mode. This pair relationship should not be removed during restore and thus a switch of the source volume with the replica cannot be performed.  
To restore such a backup, perform one of the following prior to restore:
    - Manually remove the S-VOLs that were created during backups made in resync mode using the `omnidbvss` command.
    - Set the variable `OB2VSS_FORCE_INSTANT_RECOVERY` in the `omnirc` file and enable the restore option **Retain source for forensics** in the GUI.

This option must be selected to preserve the pair relationship between the S-VOL and its P-VOL created in the backup performed in the resync mode.

- If you perform restore using re-synchronization (the "copy of replica data" restore) and the production source volume (P-VOL) is not presented on the system, the restore is aborted. This can happen if you have at least two backups created in different mode and you performed the "switch of disks" restore before "the copy of replica data" restore.

To restore such a backup, perform one of the following prior to restore:

- Manually present the P-VOL on the application system.
- Set the variable `OB2VSS_FORCE_INSTANT_RECOVERY` in the `omnirc` file.

The following considerations apply to restore using HP StorageWorks Disk Array XP only:

- Only three first-level mirrors can be used for instant recovery. Six additional (cascading) copies are not supported.
- You cannot start another instant recovery using the same disk on the application system at the same time. A session can be started only after the preceding session using the same disk on the application system finishes synchronization.



#### IMPORTANT:

After instant recovery, restored filesystems are mounted to the same drive letters as they were at the backup time. If these drive letters have other filesystems mounted, these filesystems are automatically dismounted before instant recovery, and the restored filesystems are mounted afterwards.

---

## Microsoft Exchange Server writer instant recovery specifics

This section provides specific information on the instant recovery point-in-time, and rollforward restore of the Microsoft Exchange Server Writer.

With Microsoft Exchange Server 2003, you can restore a whole storage group or individual stores only to the original location. With Microsoft Exchange Server 2007 Writer, you can restore a whole storage group or individual stores to the original and to a different location. For details, see "[Microsoft Exchange Server 2007 writer restore specifics](#)" on page 374.

If you restore to the original location, note that restore will fail if you do not select all objects residing on the target volume to be restored. If for example you have four

stores and transaction logs on the target volume to be restored and would like to restore only one store, the restore fails since it can restore only all objects residing on the target volume. Due to this fact, the following configuration scenarios are possible when restoring Microsoft Exchange Server Writer:

- Transaction logs and database stores are on the same target volume.  
You cannot select only the database stores for instant recovery in the GUI. If the transaction logs and/or database stores are lost, the whole storage group (or all objects residing on the target volume) should be recovered.  
In this case, you can perform only *point-in-time* restore. The transaction logs will be replaced with the backed up logs.
- Transaction logs and database stores are on different target volumes.  
You can select only the database stores for instant recovery in the GUI. If a data store is lost, it can be recovered separately providing that it resides alone on the target volume to be recovered. Otherwise, all stores residing on the target volume must be selected for restore. If the transaction logs are lost, the whole storage group should be recovered.  
In this case, you can perform both *point-in-time* or *rollforward* restore.  
To perform a *point-in-time* restore of Microsoft Exchange Server writer, select the whole storage group. The transaction logs will be replaced with the backed up logs.  
To perform a *rollforward* restore, select only the database stores and original location. The existing logs will be applied to the restored databases. However, note that rollforward restore will not be possible if the *point-in-time* restore of the same session was performed before.

## Microsoft Exchange Server 2007 instant recovery prerequisites and limitations

### Prerequisites

For restore prerequisites which applies also to instant recovery, see "[Prerequisites](#)" on page 376.

### Limitations

- If you have a CCR environment where the original database resides on a different EVA disk array than the database copy and you perform backup of the database copy, note that the restore of this copy to original database will fail, because restore to a different disk array is not supported. In this case, perform manual failover of the databases before the restore.
- Restore to a different location is only possible using Microsoft Virtual Disk Service.

With XP hardware provider this means that restore to a different location is possible only after a backup in VSS compliant mode.

- With the XP VSS hardware provider, if a backup of an LCR or CCR storage group copy is performed in the resync mode, restore of such backup to the original location (original database or Exchange Information Store) by default fails.

The reason is that the source volumes, on which the database copy (or Exchange Replication Service) resides, are in the suspended mirror relationship with the replicas, which should be restored to the original database.

To perform such restore, the source volumes presented to the database copy are first unpresented from the database copy and presented to the original database. This results in the lack of source disks presented to the database copy, so you should again set up the CCR or LCR environment after restore.

To enable such restore, set the omnirc variable `OB2VSS_FORCE_INSTANT_RECOVERY` to 1, perform restore, and after it, manually set up the LCR or CCR environment.

- With Microsoft Exchange Server 2007 which is running in a CCR environment and whose database copy resides on the backup system, there are three particular situations where you need to consider additional steps for performing instant recovery:
  - When XP hardware provider is used, and the application system, where the production database resides, and the backup system, where the database copy resides, are connected to two different disks arrays that are not configured in the same SAN. In such configuration, the application system does not see LUNs on the backup system and vice versa.
  - When EVA hardware provider is used, and the disks array of the application system and the disk array of the backup system are not controlled by the same Command View.
  - When the XP hardware provider is used in the resync mode, no matter if one or two disk arrays are used.

In the above situations, there is only one instant recovery scenario that is supported. For a successful instant recovery, follow the steps:

- 1.** Fail over Exchange Server, so that your production database resides on the former backup system where the database copy resided before.
- 2.** Perform instant recovery.
- 3.** After the instant recovery session completes, fail back Exchange Server. This action will ensure that all backup LUNs are available on the same backup system where the database copy resides.



---

 **NOTE:**

It is recommended that both production and replication server systems are using disks of the same disk array. If this is not possible, the disks of both disk arrays must be visible to both systems.

---

For other restore prerequisites which applies also to instant recovery, see “[Limitations](#)” on page 376.

## Database recovery

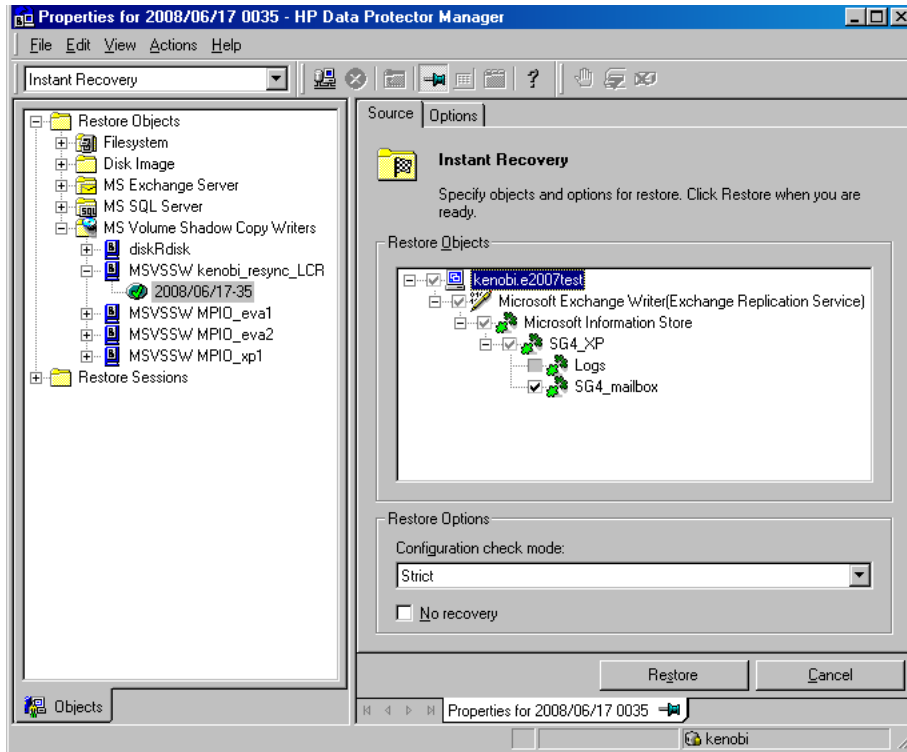
You can run a database recovery from the **Instant Recovery** context of the Data Protector GUI. This option is available, if you have created a separate backup specification for **Incremental/Differential** backup with the same object and description as you have in the backup specification for instant recovery. Such an **Incremental/Differential** backup is based on the **Full** backup with the selected instant recovery option. You can select an **Incremental/Differential** backup in the **Instant Recovery** context and start restore. Instant recovery will be performed and transaction logs will be automatically applied to the recovered storage group.

## Instant recovery procedure

### Prerequisites

- For Microsoft Exchange Server 2007, in case of CCR or LCR restore of the database copy, mount (bring online) the target store. If you cannot mount the target store (for example, if the files are missing or the database is corrupted), proceed as follows: Using the Exchange Management Console, delete the files of the database you wish to mount, then perform mount operation, and then confirm the message to create an empty database.
  - For Microsoft Exchange Server 2003, manually dismount the databases to be recovered.
1. In the **HP Data Protector Manager**, switch to the **Instant Recovery** context.

2. In the Scoping Pane, expand **MS Volume Shadow Copy Writers** under **Restore Objects**, expand the backup specification from which you want to restore, and click the backup session from which you want to restore.



**Figure 112** Selecting writers components for instant recovery

3. In the Source property page, specify writers and/or components for recovery. Select the configuration check mode. For more information, see [“Configuration check”](#) on page 342.

*TBD (what is No recovery option for in case of DP ZDB)*

To perform additional steps after the instant recovery before recovering the database, such as *restoring logs backed up using third-party backup software*, select the **No recovery** option. Data Protector will not perform a database recovery and you can finish the recovery steps (such as applying transaction logs) later on manually.

If the option is not selected, all recovery steps are finished. In such a case, additional tasks cannot be performed.

This option is available only for the *SQLServer writer* and *Microsoft Exchange Server 2007 writer*. It is not supported for Microsoft Exchange writer, where the transaction logs are always applied when the store is mounted.

**Exchange Server Writer:** Optionally, to specify options for the consistency check of a Microsoft Exchange writer, right-click the writer and click **Additional options**.

You can perform *point-in-time* or *rollforward* restore of Microsoft Exchange Server writer. For more information, see [“Microsoft Exchange Server writer instant recovery specifics”](#) on page 382.

#### **Exchange Server 2007 Writer:**

If you restore an LCR or CCR copy to the original location, note that restore will be performed to the original database (Exchange Information Store) and not to the database copy (Exchange Replication Service).

To perform restore to a different location:

- a. Right-click a storage group, a store, or logs and click **Restore as**.
- b. In the MS Exchange Additional options dialog box, select the target location for the components you want to restore: target server, target storage group, and target stores. The following options are possible:

- **Restore to a different store**

This option is selected by default. It enables you to select the target stores for each store to be restored (original stores). Select the target server first and then from the Original and Target drop-down list, select the stores pairs. For example, to restore only one store, select only one target store for the original store you want to restore. Note that only stores cannot be restored, so logs are automatically selected in the restore session to different location.

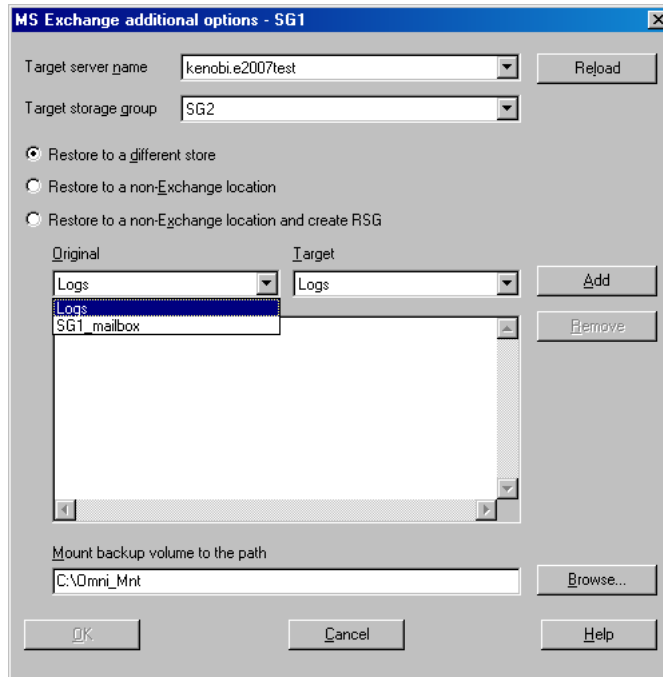
- **Restore to a non-Exchange location**

Select this option to restore your data to a non-Exchange location. This means that the restored data will not be managed by Exchange Server and Recovery Storage Group (RSG) will not be created. You can create RSG when data is restored. Select the target server first and then from the **Original** drop-down list, select the stores to be restored.

- **Restore to a non-Exchange location and create RSG**

Select this option to restore your data to a non-Exchange location. After restore, Data Protector will create a Recovery Storage Group called **AppRM RSG** on the target server. The stores that you have selected and logs will be restored to this recovery group. Select the target server first and then from the **Original** drop-down list, select the stores to be restored.

Optionally, select the mount location for the storage group if you want to be different than default, which is `C:\Omni_Mnt`.



**Figure 113 Restore to different location options (Exchange Server 2007 Writer)**

4. Optionally, select the VDS or disk array options under the **Options** tab.

For both types of restore, to retain the source volume, select **Retain source for forensics**.

For a **Restore using HP StorageWorks EVA**, additional options are available:

- The restore method: **Copy replica data to the source volume** or **Switch the replica**.

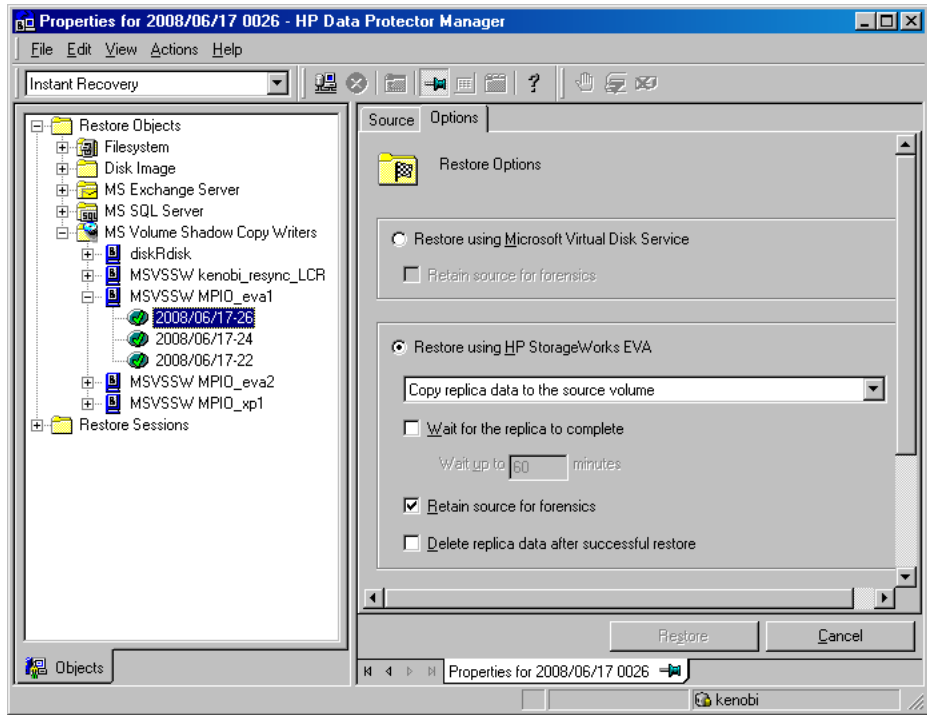
If you select **Copy replica data to the source volume**, a full copy of the replica is created in the source storage (the copy is then switched with the source volume). A virtual copy is created and immediately available for use.

However, in the background, the copy process runs for some time to copy all data from the replica to the source storage. To avoid the slowdown of the copy process caused by application use or the integrity check process (Exchange Server), use this option. The restore resumes after the time specified in **Wait up to *n* minutes** (default: 60) is reached (even if the copy process is not finished) or after the copy process has finished if it is finished before the specified time.

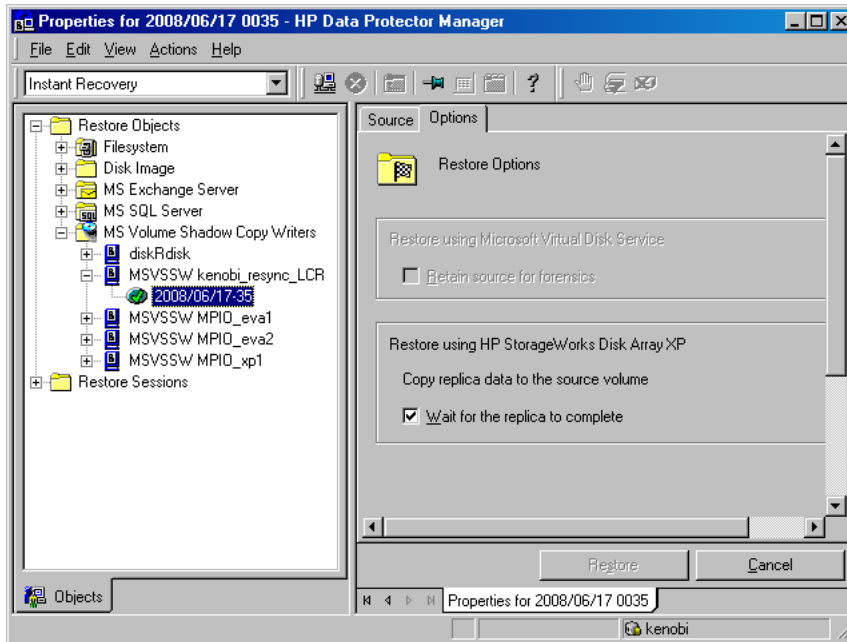
- To delete the replica after the restore, select **Delete replica after successful restore**.

For details, press **F1**.

These options are not available if you restore Exchange Server 2007 writer to a different location.



**Figure 114** Selecting instant recovery options (EVA integration)



**Figure 115 Selecting instant recovery options (XP integration)**

5. Click **Restore**.
6. If you restored Microsoft Exchange Server writers data, manually re-mount the database stores. If you restored the data to **AppRM RSG**, manually re-mount the stores in the RSG.
7. If you restored an LCR or CCR copy to the original database, perform additional steps:
  - In case of an LCR restore, it is recommended to *seed* the restored database to synchronize the restored original database with its copy. For more information, see the web page <http://technet.microsoft.com/en-us/library/aa995973.aspx>.
  - In case of a CCR restore, see *"Additional steps after restore of a Microsoft Exchange Server CCR copy to the original database"* on page 393 for information on additional steps.

## Clusters

To perform an instant recovery in the cluster environment, use the above instant recovery procedure. Use virtual hostnames. For details on performing an instant



recovery in cluster configurations, see the *HP Data Protector zero downtime backup administrator's guide*.

## Additional steps after restore of a Microsoft Exchange Server CCR copy to the original database

In a CCR environment, after an instant recovery of a CCR copy to the original database residing on the application system, perform the following steps to enable normal operation of the original and copy databases:

---

### △ CAUTION:

Do not move the clustered mailbox server without first performing the following steps. If you move the server (using the `Move-ClusteredMailboxServer` cmdlet), you can risk data loss.

- 
1. Mount the restored store on the application system.
  2. On the passive node, where the copy of the database exists, delete the transaction logs.
  3. On the passive node, use the `Update-StorageGroupCopy` cmdlet to seed the storage group copy or to re-synchronize the original and copy storage group.
  4. On the passive node, use the `Resume-StorageGroupCopy` cmdlet to resume the storage group copy.

You can now move the clustered mailbox server to other node by using the `Move-ClusteredMailboxServer` cmdlet.

## Troubleshooting

This sectionchapter lists problems you might encounter when using the Data Protector Microsoft Volume Shadow Copy integration.

For general Data Protector troubleshooting information, see the *HP Data Protector troubleshooting guide*.

## Before you begin

- Ensure that the latest official Data Protector patches are installed. See the online Help index: “patches” on how to verify this.

- See the *HP Data Protector product announcements, software notes, and references* for general Data Protector limitations, as well as recognized issues and workarounds.
- See <http://www.hp.com/support/manuals> for an up-to-date list of supported versions, platforms, and other information.

## Checks and verifications

- On the application and backup systems, examine system errors reported in:
  - HP-UX, Solaris:** `/var/opt/omni/log/debug.log`
  - Windows:** `Data_Protector_home\log\debug.log`
- With the XP integration, ensure that RAID Manager Library is correctly installed on both the application and backup systems.
  - HP-UX, Solaris:** The `/usr/omni/bin/ssea` command should return the following output:
 

```
HP Data Protector A.06.10: SSEA, internal build build_ID,
built on date
```

 In addition:
    - **HP-UX:** `ls RMLIB_home/libsvrrm.sl` should return:
 

```
RMLIB_home/libsvrrm.sl
```
    - **Solaris:** `ls RMLIB_home/libsvrrm.so` should return:
 

```
RMLIB_home/libsvrrm.so
```
  - Windows:** Check if the `libsvrrm.dll` file exists in the `RMLIB_home` directory.

## Common problems

### Problem

#### **Backup or instant recovery aborts due to VDS problems.**

A backup or instant recovery session aborts with the following error:

```
Failed to load VDS service.
```

This error can appear as a result of abnormal termination of a VDS service.

## Actions

1. Stop the Virtual Disk Service (VDS):
  - Check that Virtual Disk Service is started, stop it using the command `net stop vds` or via the Control Panel.
  - If the above step does not help, stop the Virtual Disk Service by terminating the process `vds.exe` using the Task Manager. VDS will be started automatically as needed.
  - Alternatively, you could also log in to the system again and check if the system requests your confirmation to stop a crashed VDS. If it does, reconfigure the debugger to launch automatically to avoid similar problems in the future. This can be done by setting the `HKLM\SOFTWARE\Microsoft\Windows NT\CurrentVersion\AeDebug` value `Auto` to `1`.
2. Check your configuration.

Successful Data Protector backup or restore completion is influenced by a number of factors imposed by non-Data Protector components, including Microsoft Exchange Server and VSS. One of the factors is timing, which in turn is impacted by environmental conditions such as I/O loads, storage device activity and concurrent Data Protector actions.

To inhibit potential issues, it is recommended that you balance Data Protector activity across the available activity or maintenance window. If you encounter issues, *review and possibly reduce concurrent Data Protector activities* such as concurrent backups or restores.

## Backup problems

### Problem

#### **Microsoft Exchange Server 2003 writer backup failed.**

When you start a backup of a Microsoft Exchange Server 2003 Writer, the following error is displayed:

```
[MAJOR]: Writer 'Microsoft Exchange Writer' failed to prepare files for backup.
```

The reason may be the failure of the previous backup and, due to a Microsoft Exchange Server 2003 issue, the Exchange Server Writer could not perform a proper cleanup.

## Action

Restart the Information Store.

For more information, see the web page <http://support.microsoft.com/kb/945424/en-us>.

## Problem

### **Microsoft Exchange Server 2003 aborts the backup if the shadow copy creation takes over 20 seconds.**

If an Exchange Server 2003 Writer is being backed up, the session can fail with VSSBAR reporting:

```
Snapshot could not be created.
```

In the application event log on the application system, the following event is recorded:

```
Event Type: Error
Event Source: ESE Event
Category: (16)
Event ID: 2004
Information Store (4916) Shadow copy 3 time-out (20000 ms).
```

## Action

The following can help to solve the problem:

- Limit the number of users that are accessing the management system.
- Reduce the number of volumes in a snapshot set. Create a backup specification dedicated to each storage group instead of one specification for the whole server. See “[Microsoft Exchange Server writer backup specifics](#)” on page 357.

## Problem

### **Snapshots (volume shadow copies) creation fails with EVA provider.**

During a VSS backup, the following error is displayed:

```
[Critical] It was not possible to create Volume Shadow Copies.
```

If there are too many source volumes selected for backup (more than four) it may happen that the creation of snapshots takes too long and VSS fails the snapshots creation process.

## Action

Do not select too many objects in a backup specification because they might reside on more than four source volumes. This means that for example a Microsoft Exchange Server storage group should not reside on more than four source volumes and only one storage group should be specified for backup in this case. The same applies to a Microsoft SQL Server database.

## Problem

**No HP StorageWorks SMI-S EVA provider login entries are configured within SMISDB.**

## Action

Add the login information for HP StorageWorks SMI-S EVA provider by running:

```
omnidbsmis -ompasswd -add HostName [-ssl] [-port PortNumber]
[-namespace Namespace] [-user Username] [-passwd Password]
```

## Problem

**Configuration of an HP StorageWorks SMI-S EVA CIMOM failed**

## Action

Run the following command to perform a health check of you environment, which may help identify any potential problems that occurred during the configuration:

```
omnidbsmis -ompasswd -check [HostName]
```

## Problem

*TBD: this whole problem should be checked if applicable for DP ZDB*

**Volume shadow copies cannot be imported due to low space in registry and consequently backup fails.**

If one of the following errors is reported during backup:

- By Data Protector:

```
[Critical] It was not possible to import Volume Shadow Copies from
application host.
```

- By Windows operating system:



**Figure 116 Error reported by registry**

it means that the Windows registry is out of space.

If there are too many entries in the Windows system registry, the registry runs out of space and consequently backup fails. Although Data Protector does not write anything to registry directly, the registry contains entries about all volumes and disks ever presented on the system recorded by the volume storage driver.

### Action

The registry should be cleaned up. For information on how to clean the registry, see the web page <http://support.microsoft.com/kb/277222/en-us>.

In case of problems with the installation of the Scrubber utility provided by Microsoft, contact Microsoft Product Support Services.

It is recommended to perform registry management tasks periodically to prevent the registry from filling.

### Problem

#### **Data Protector reports “Volume was not removed”.**

A backup session reports the error:

```
Volume 'StorageID', which is part of backup 'backupID', was not removed.
```

This error may appear if the replica on the disk array is removed but the entry in the VSS database (VSSDB) remains intact.

For example, this may happen:

- If a backup fails and there is no replica and the reference that was created during the process could not be removed due to network problems.
- In a cluster environment on Disk Array XP, when the backup system is a virtual server, or during local backup when the application system (which is the same as the backup system) is a virtual server. In this case, after a failover, replicas on the other (failed-over) system cannot be properly removed from the database.

## Action

To remove the false entry from the VSSDB:

1. In the error messages, find the ID of the session which could not remove the target volume.
2. Run:  

```
omnidbvss -remove session SessionID -reference
```

where *SessionID* is the session whose target volume(s) could not be removed.
3. Upon successful removal, the command displays `Removing references of session SessionID from VSSDB.`

## Problem

**P-VOL has no paired S-VOL.**

## Action

Check the XP configuration as follows:

**BC:** All P-VOLs on the application system must have associated BC S-VOLs on the backup system.

## Problem

**Backup of a Microsoft Exchange Server 2007 CCR database copy fails.**

A backup session of a database copy in a CCR environment reports a major error that the backup session has failed.

A backup session may fail in a CCR environment when you want to back up a database copy, which has "Healthy" status in the Exchange Management Console, but in reality the status of the database is "Failed". This is the Microsoft Exchange Server 2007 issue.

## Action

To repair the Exchange Management Console to show the real status of the database copy, perform one of the following two actions:

1. Install the Microsoft Exchange Server 2007 Service Pack 1.  
Or:
2. Perform reseeding procedure as described below:

- a. On the passive node, where the copy of the database exists, suspend the replication by using `Suspend-StorageGroupCopy` cmdlet.
- b. Delete all log files from the `Logs` directory of the database copy.
- c. Seed the database copy or re-synchronize the original and copy databases by using the `Update-StorageGroupCopy` cmdlet.
- d. Resume the database copy by using the `Resume-StorageGroupCopy` cmdlet.
- e. Check the status of the Exchange Replication Service by using `vssadmin list writers` command on the passive node. If the status is not stable, restart the Exchange Replication Service.

## Restore problems

### Problem

**After the restore of system writers was aborted, the Windows operating system is corrupted when you restart it.**

If the restore of some system writers (for example, System Writer) is aborted for any reason (hardware or software failure, manually aborted, etc.), the Windows operating system may be corrupted after the restart (for example, the GUI or some system services cannot be started, etc.).

### Action

Depending on the nature of the corruption, repair or re-install the operating system from the Windows installation CD-ROM.

### Problem

**Some components are not restored during the restore session.**

If a component cannot be restored to the location specified in Writer Metadata Document (for example, if this location is locked or it is not possible to perform regular restore), this component will be skipped during the restore procedure.

### Action

Specify a location, where skipped files will be redirected in case of failure, by setting the `OB2VSS_DUMPTO` environmental variable in the `Data_Protector_home\omnirc` file. Restart the Data Protector services to apply the changes in the `omnirc` file.



## Example

If you want the files that are skipped during the restore to be copied to the `F:\Restore` directory, set `OB2VSS_DUMP_TO=F:\Restore` in the `omnirc` file. In case the SQL component `Company` was skipped during the restore, it will be copied to the specified directory as follows:

```
F:\Restore\2002-12-09-23\G\SQL\Log\Company.ldf
F:\Restore\2002-12-09-23\G\SQL\Log\Company.mdf
```

The pathname includes the backup session ID and the pathname to the original location.

## Problem

### **Instant recovery of the Microsoft Exchange Server Writer fails.**

This problem may occur if the Microsoft Exchange Writer is not in the stable state. Check this by running `VSSadmin list writers` from the command prompt.

## Action

Bring the Exchange Server Writer to a stable state by restarting the Microsoft Exchange Information Store.

## Problem

In some cases, if the HBAs are changed on the application system, the software driver from previous HBAs can cause this error after restore.

## Action

Remove older drivers of uninstalled HBAs from the application system.

## Problem

### **After an SQLServer writer instant recovery is restarted, the database cannot be brought online.**

If an instant recovery of the SQLServer writer is aborted or fails, you can restart the session. However, the SQLServer writer may report an error, stating that the files cannot be prepared during the instant recovery and the session completes with errors.

The issue can appear if the disk was dismounted before the session was aborted and the files are not visible to the writer. As a result, an error is reported and the database can not be brought online after restore.

## Action

To recover the database:

1. Detach from the database.
2. Attach to the database.

# User scenario for Microsoft Exchange Server 2003 backup and restore

This section provides examples of backup and restore policies for Microsoft Exchange Server 2003. Three examples are provided, one for ZDB (transportable VSS snapshots) and two for different types of restore.

## Example - VSS transportable backup

This example describes a backup scenario for Microsoft Exchange Server 2003 using VSS transportable backup together with HP StorageWorks EVA. The data is to be backed up on tape once a day for the storage group containing critical mailboxes and every second day for all other storage groups.

The storage groups should be backed up separately.

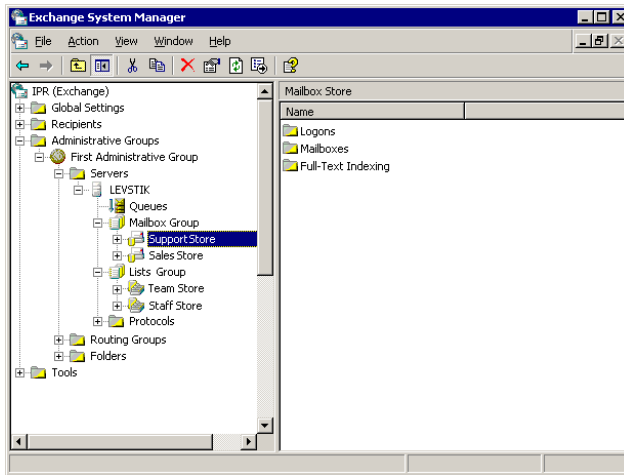
The following example setup is possible:

- A Microsoft Exchange Server 2003 is running on the application system and is connected to a HP StorageWorks Enterprise Virtual Array. A tape drive is connected to the application system for restore purposes.
- A separate backup system is connected to a tape library.
- Two storage groups are configured on the Microsoft Exchange Server 2003, each containing two stores.

The first storage group, named Lists\_Group, contains company-wide mailing lists. The storage group contains two stores, Staff\_Store for general mailing lists and Team\_Store for team mailing lists.

The second storage group, named Mailbox\_Group, contains a larger number of individual mailboxes for employees, which are given higher priority. This way the mailboxes are still available even if mailing lists are down. The mailboxes are set up in two separate stores, one store for each department, and named Sales\_Store and Support\_Store.

- Every storage group has a separate backup specification to reduce the time needed for the shadow copy creation. Refer to “[Backup problems](#)” on page 395.



**Figure 117 Microsoft Exchange Server 2003 storage groups**

For the first storage group (Lists\_Group), create the following backup specification:

1. Select **VSS transportable backup** as the backup type. Select the application and backup system and specify **Snapshot (Differential)** as the replica type.
2. Expand the Microsoft Exchange Server 2003 writer and select the first storage group (Lists\_Group) for backup.
3. Using the Data Protector scheduler, schedule the backup specification to start a VSS transportable backup at night. In the Recurring box, specify **Full** backup **Weekly** on Wednesdays and Fridays and **Incremental** backup **Weekly** on other days. Set the backup protection to 2 days.

For the second storage group (Mailbox\_Group), create the backup specification that can be used for instant recovery:

1. Select **VSS transportable backup** as the backup type. Select the application and backup system and set the **Track the replica for instant recovery** option.
2. Expand the Microsoft Exchange Server 2003 writer and select the second storage group (Mailbox\_Group) for backup.
3. Using the Data Protector scheduler you need to schedule the backup specification to start a VSS transportable backup everyday. In the Recurring box, select **Daily**, set **Recurring** options to 1 day and set the backup protection to 4 days.

## Example restore scenario for Microsoft Exchange Server 2003

In this example the Microsoft Exchange Server 2003 is configured as in “[Example - VSS transportable backup](#)” on page 402 and the backup policy given in the example was implemented.

### Example 2. Example - restoring a single store

The second store (Support\_Store) in the second storage group (Mailbox\_Group), which contains user mailboxes, is damaged, but the transaction logs and other stores are not damaged. Therefore, a rollforward recovery will be performed only for this store.

To perform a rollforward recovery, proceed as follows:

1. Start the Microsoft Exchange Manager and unmount all stores in Mailbox\_Group, but do not unmount the stores from the first storage group.
2. Start Data Protector, go to the **Instant Recovery** context and expand the application system. Select the last backup session of the backup specification with enabled instant recovery options and expand Microsoft Exchange Server 2003 Writer. Select Support\_Store under Mailbox\_Group for instant recovery. Click **Restore**.
3. After the session is restored, start the Microsoft Exchange Manager. Mount all stores in the second storage group.

### Example 3. Example - restoring a complete storage group after loss of transaction logs

In this example, the first store (Staff\_Store) and transaction logs in the first storage group (Lists\_Group) are damaged but the second store (Mailbox\_Group) is intact. Since the transaction logs are damaged, a point-in-time restore of the whole storage group will be performed.

To restore the complete Lists\_Group storage group, perform the following steps:

1. Start Exchange System Manager and check if the first storage group (Lists\_Group) is already unmounted. If not, unmount the whole group.
2. Start Data Protector. In the Restore context expand the application system. Select the last backup session and then Microsoft Exchange Server 2003 Writer. Select the first storage group (Lists\_Group).  
Start the restore.
3. Start Microsoft Exchange Manager and mount all stores in Lists\_Group.

---

# A Appendix

## In this appendix

This appendix gives information on the following topics:

- [“Reconfiguring an Oracle instance for instant recovery”](#) on page 405
- [“ZDB integrations omnirc variables”](#) on page 410

## Reconfiguring an Oracle instance for instant recovery

If the control files or redo logs are located on the same volume group (if LVM is used) or source volume as the database files, the control files and online redo logs are overwritten during instant recovery. In such case, you may want to reconfigure the Oracle instance. Refer to [“Oracle backup set ZDB concepts”](#) on page 40 and to [“Oracle proxy-copy ZDB concepts”](#) on page 45 for details on the required configuration. For additional examples on how to move the redo logs and control files, refer to [“Examples for moving the control files and redo logs to different locations”](#) on page 407.

### Moving Online Redo Logs

To move the *online redo log files* from the source volumes to be replicated, to other locations:

1. List the online redo log files:

```
$ sqlplus
SQL> select member from v$logfile;
```

2. Shut down the database:

```
SQL> connect user/password@service as sysdba;
SQL> shutdown
SQL> exit
```

**3.** Move the log files to a different location using operating system tools.

**4.** Start the database in mount mode:

```
$ sqlplus
SQL> connect user/password@service as sysdba;
SQL> startup mount;
```

**5.** Register the new locations for each moved file:

```
SQL> alter database rename file 'OldPathName' to
'NewPathName';
```

where *OldPathName* and *NewPathName* are full paths to the log file.

**6.** Open the database in normal mode:

```
SQL> alter database open;
```

## Moving Control Files

To move the *control files* from the source volumes to be replicated, to other locations:

**1.** For Oracle8i, display the control file information:

```
SQL> select name from v$controlfile
```

For Oracle9i/10g, determine if the database uses the SPFILE parameter:

```
SQL> show parameter SPFILE
```

**2.** If the database does not use SPFILE:

**a.** Shut down the database.

```
SQL> shutdown
```

**b.** Move the control files to a different location using operating system tools.

**c.** Edit the `CONTROL_FILES` parameter in the database's initialization parameter file (usually located in the `$ORACLE_HOME/dbs/initSID.ora` directory) to change the existing control file names:

```
control_files = ("NewPathName", ...)
```

**d.** Restart the database:

```
SQL> startup
```

If the database uses SPFILE:

**a.** Specify the new location for control files by running the following command:

```
SQL> alter system set control_files='NewPathName1',
```

```
'NewPathName2',..., scope=spfile
```

- b.** Shut down the database.

```
SQL> shutdown
```

- c.** Move the control files to a different location.

- d.** Restart the database:

```
SQL> startup
```

## Examples for moving the control files and redo logs to different locations

### Example - Moving Online Redo Logs

In the following example for Oracle9i on HP-UX, the data files are on the same source volume as the control files and redo logs, which is

```
/opt/oracle/product/9.2.0.
```

To move the *online redo log files* from `/opt/oracle/product/9.2.0` to `/oracle/logs` (which is not replicated):

**1. List the online redo log files:**

```
$ sqlplus
SQL> select member from v$logfile;

/opt/oracle/product/9.2.0/oradata/redo01.log
/opt/oracle/product/9.2.0/oradata/redo02.log
/opt/oracle/product/9.2.0/oradata/redo03.log
```

List the filenames and tablespaces to check whether they are on the same source volumes as the control files:

```
SQL> select FILE_NAME, TABLESPACE_NAME, BYTES from
dba_data_files;
```

```
FILE_NAME

TABLESPACE_NAME BYTES

/opt/oracle/product/9.2.0/oradata/system01.dbf
SYSTEM 419430400
/opt/oracle/product/9.2.0/oradata/undotbs01.dbf
UNDOTBS1 377487360
/opt/oracle/product/9.2.0/oradata/cwmlite01.dbf
CWMLITE 20971520
```

**2. Shut down the database:**

```
SQL> connect user/password@service as sysdba;
SQL> shutdown
SQL> exit
```

**3. Move the log files to a different location.**

```
$ mv /opt/oracle/product/9.2.0/oradata/redo* /oracle/logs
```

**4. Start the database in mount mode:**

```
$ sqlplus
SQL> connect user/ password@service as sysdba;
SQL> startup mount;
```



**5.** Rename the new locations for each moved file:

```
alter database rename file
'/opt/oracle/product/9.2.0/oradata/redo01.log' to
'/oracle/logs/redo01.log';
```

Database altered.

```
alter database rename file
'/opt/oracle/product/9.2.0/oradata/redo02.log' to
'/oracle/logs/redo01.log';
```

Database altered.

```
alter database rename file
'/opt/oracle/product/9.2.0/oradata/redo03.log' to
'/oracle/logs/redo01.log';
```

Database altered.

**6.** Open the database in normal mode:

```
SQL> alter database open;
```

### Example - Moving Control Files for Oracle8i

To move the Oracle8i *control files* from source volumes (/opt/oracle/oradata) to a non-replicated source volume (/oracle8/oractl):

**1.** Display the control file information:

```
SQL> select name from v$controlfile

/opt/oracle/oradata/control01.ctl
/opt/oracle/oradata/control02.ctl
/opt/oracle/oradata/control03.ctl
```

**2.** Shut down the database:

```
SQL> shutdown
```

**3.** Move the control files:

```
mv /opt/oracle/oradata/control01.ctl /oracle8/oractl
mv /opt/oracle/oradata/control02.ctl /oracle8/oractl
mv /opt/oracle/oradata/control03.ctl /oracle8/oractl
```

4. Edit the `CONTROL_FILES` parameter in the database's initialization parameter file:

```
control_files = ("/oracle8/oradata/control01.ctl",
"/oracle8/oractl/control02.ctl",
"/oracle8/oractl/control03.ctl")
```

5. Restart the database:

```
SQL> startup
```

## Example - Moving Control Files for Oracle9i

In the following example, the Oracle9i database uses SPFILE. To move the control files from `/opt/oracle/product/9.2.0/` to `/oracle/oractl/`:

1. Determine if the database uses the SPFILE parameter:

```
SQL> show parameter spfile;
```

| NAME   | TYPE   | VALUE             |
|--------|--------|-------------------|
| -----  | -----  | -----             |
| spfile | string | ?/dbs/spfile@.ora |

2. Specify the new location for the control files by running the following command:

```
SQL> alter system
control_files='/oracle/log/RCAI/control01.ctl','/oracle/log/RCAI/control02','/oracle/log/RCAI/control03.ctl'
scope=spfile;
```

3. Shut down the database:

```
SQL> shutdown
```

4. Move the control files to the new location:

```
mv /opt/oracle/product/9.2.0/oradata/control*
/oracle/oractl
```

5. Restart the database:

```
SQL> startup
```

## ZDB integrations omnirc variables

The Data Protector ZDB integrations use environment variables, which can be set in the `/opt/omni/.omnirc` (on UNIX systems) or `Data_Protector_home\omnirc` file (on Windows systems), on both the application and backup systems. These

variables are used for Data Protector ZDB integrations customizing. See the online Help index: “omnirc options” for information on how to use the `omnirc` file.

For information on Data Protector ZDB agents `omnirc` file variables, see the *HP Data Protector zero downtime backup administrator's guide*.

This section explains the `omnirc` file variables that can be set for the Data Protector ZDB integrations.

**ZDB\_ORA\_INCLUDE\_CF\_OLF:** An Oracle integration or SAP R/3 integration related variable.

---

 **NOTE:**

This variable is not supported on EMC.

---

The default value is 0. Possible values are 0 and 1.

If an offline backup is performed using the Data Protector SAP R/3 integration, the variable is ignored and the integration behaves as if the variable was set to 1.

## Instant Recovery

The instant recovery process depends on whether the control file and redo logs reside on the same disk array source volume as datafiles or not:

- If this variable is set to 0 (default), during a ZDB session, Data Protector creates target volumes only for the source volumes containing Oracle datafiles. Target volumes for source volumes containing Oracle control file and Oracle online redo logs are not created.

For Oracle proxy-copy or backup set ZDB and restore concepts when this variable is set to 0, see “[Oracle backup set ZDB concepts](#)” on page 40 and “[Oracle proxy-copy ZDB concepts](#)” on page 45. For SAP R/3 backup and restore concept when this variable is set to 0, see “[Integration concepts](#)” on page 164.

- If this variable is set to 1, Data Protector creates target volumes for all source volumes containing Oracle datafiles, Oracle control file, and if Oracle integration is used, Oracle online redo logs.

---

 **IMPORTANT:**

If the `ZDB_ORA_INCLUDE_CF_OLF` variable is set to 1 the control files and redo logs are overwritten during instant recovery.

---

## Opening the Database on the Backup System

To successfully open the database on the backup system for *other* purposes than Data Protector, note:

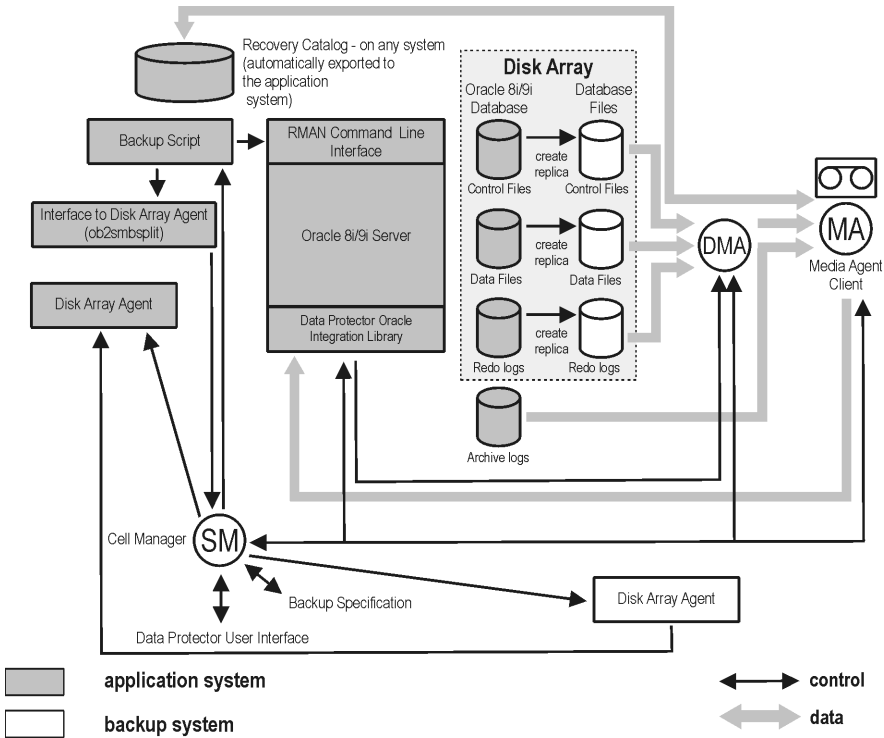
- With Oracle proxy-copy ZDB method, set this variable to 1.
- With Oracle backup set ZDB method, used with the Oracle integration, you can always open the database on the backup system.

## Prerequisites

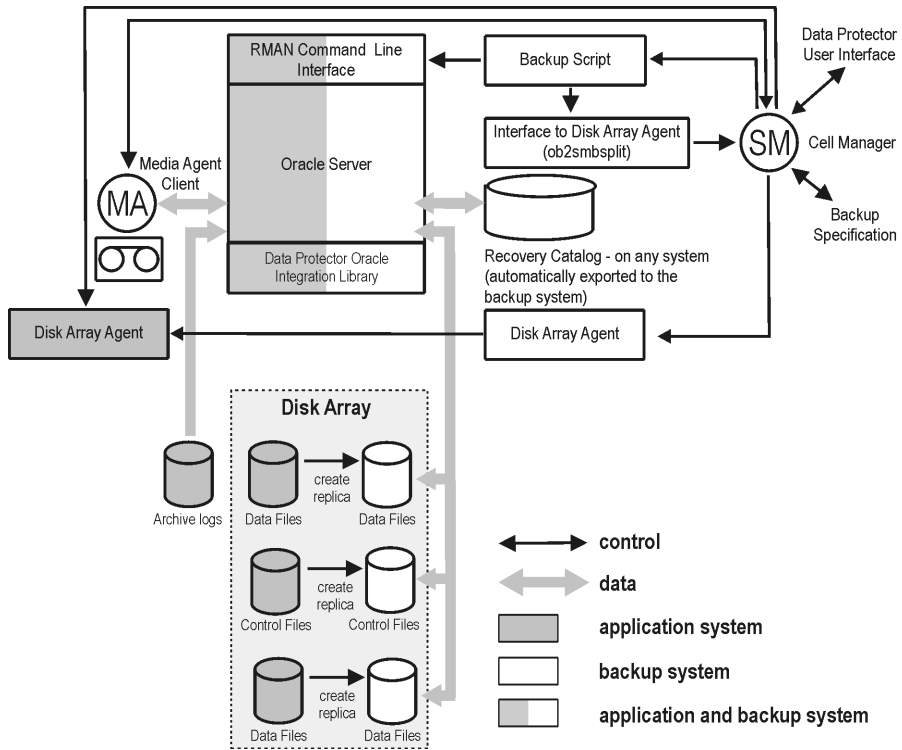
The prerequisites for this variable to be set to 1 are:

- Data Protector Oracle integration: Oracle datafiles, Oracle control file, and Oracle online redo logs must be installed on a disk array.
- Data Protector SAP R/3 integration: Oracle datafiles and Oracle control file must be installed on a disk array.

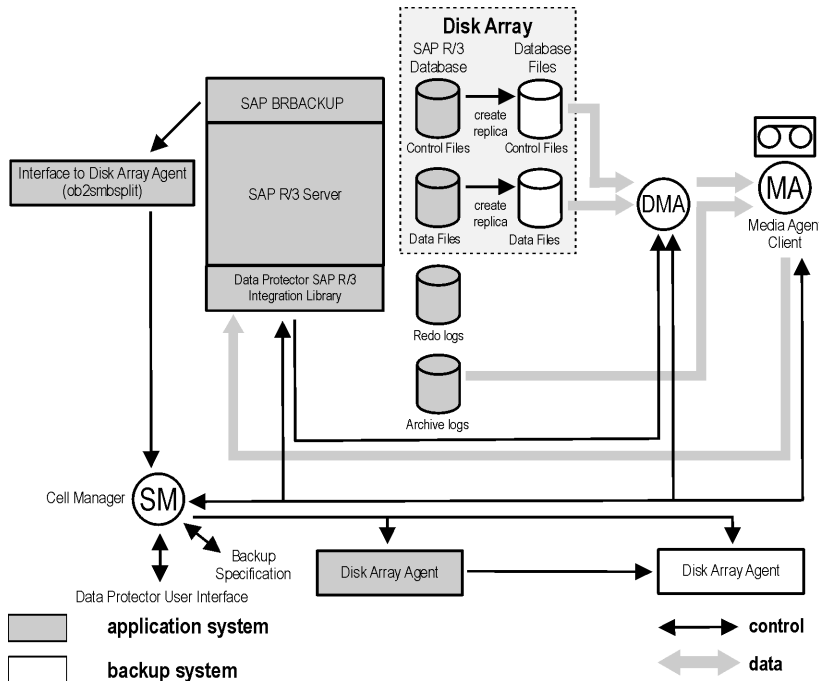
See [Figure 118](#) on page 413 and [Figure 119](#) on page 414 for Oracle backup and restore concepts when this variable is set to 1. See [Figure 120](#) on page 415 for SAP R/3 backup and restore concepts when this variable is set to 1.



**Figure 118 Oracle proxy-copy ZDB and restore concepts when the ZDB\_ORA\_INCLUDE\_CF\_OLF variable is set to 1**



**Figure 119 Oracle backup set ZDB and restore concept when the ZDB\_ORA\_INCLUDE\_CF\_OLF variable is set to 1**



**Figure 120 SAP R/3 backup and restore concept when the ZDB\_ORA\_INCLUDE\_CF\_OLF variable is set to 1 with online backup, or in case of offline backup**

**ZDB\_ORA\_INCLUDE\_SPF:** An Oracle9i/10g related variable.

The default value is 0. Possible values are 0 and 1.

The variable is ignored and the integration behaves as if the variable was set to 1 in the following cases:

- Oracle8/8i is used with the Data Protector Oracle integration.
- Offline backup is performed using the Data Protector SAP R/3 integration.

By default (if this variable is set to 0), during a ZDB session, Data Protector checks if Oracle9i/10g datafiles and the SPFILE are on the same source volumes. If the SPFILE and datafiles are on the same volumes and instant recovery is enabled, the ZDB session is aborted.

If the ZDB\_ORA\_INCLUDE\_SPF variable set to 1, Data Protector skips the check.

---

 **IMPORTANT:**

If the `ZDB_ORA_INCLUDE_SPF` variable is set to 1 and the SPFILE is on the same source volumes as datafiles, it is overwritten during instant recovery.

---

**ZDB\_ORA\_NO\_CHECKCONF\_IR:** An Oracle8i/9i/10g (if the Oracle integration is used) and Oracle8/8i/9i (if the SAP R/3 integration is used) related variable.

The default value is 0. Possible values are 0 and 1.

By default, the Oracle configuration is checked whether or not the control file, SPFILE, and online redo logs are on different volume groups than datafiles. To check the configuration, the CLI binary `omniresolve` is used internally. This binary needs to have the `setuid` bit set on UNIX. Setting this variable to 1, the check will be skipped, and the `omniresolve` binary will not be used to check the Oracle configuration.

Note that checking Oracle for instant recovery suitability is important to be sure that the instant recovery will not overwrite the control file, online redo logs, and the SPFILE.

**OB2MARAWREAD\_KB:** This variable sets the read block size for Oracle and SAP R/3 ZDB integrations on UNIX systems with Oracle tablespaces or datafiles installed on disk images and when using the proxy-copy method (when using DMA).

The default value is 64KB. The specified value must be in the range between 1KB and 1MB.

The specified size is automatically adjusted to a size which is a multiple of the block size. The values above 256KB could cause the DMA to fail.



---

# Glossary

|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>access rights</b>      | See <a href="#">user rights</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>ACSLs</b>              | <i>(StorageTek specific term)</i> The Automated Cartridge System Library Server (ACSLs) software that manages the Automated Cartridge System (ACS).                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Active Directory</b>   | <i>(Windows specific term)</i> The directory service in a Windows network. It contains information about resources on the network and makes them accessible to users and applications. The directory services provide a consistent way to name, describe, locate, access and manage resources regardless of the physical system they reside on.                                                                                                                                                                                                                                                                             |
| <b>AML</b>                | <i>(EMASS/GRAU specific term)</i> Automated Mixed-Media library.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>application agent</b>  | A component needed on a client to back up or restore online database integrations.<br>See also <a href="#">Disk Agent</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>application system</b> | <i>(ZDB specific term)</i> A system the application or database runs on. The application or database data is located on source volumes.<br>See also <a href="#">backup system</a> and <a href="#">source volume</a> .                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>archived redo log</b>  | <i>(Oracle specific term)</i> Also called offline redo log. If the Oracle database operates in the ARCHIVELOG mode, as each online redo log is filled, it is copied to an archived log destination. This copy is the archived redo log. The presence or absence of an archived redo log is determined by the mode the database is using: <ul style="list-style-type: none"><li>• ARCHIVELOG - The filled online redo log files are archived before they are reused. The database can be recovered if an instance or a disk fails. A “hot” backup can be performed only when the database is running in this mode.</li></ul> |

- NOARCHIVELOG - The filled online redo log files are not archived.

See also [online redo log](#).

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>archive logging</b>              | <i>(Lotus Domino Server specific term)</i> Lotus Domino Server database mode where transaction log files are overwritten only after they have been backed up.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>ASR Set</b>                      | A collection of files stored on several diskettes, required for proper reconfiguration of the replacement disk (disk partitioning and logical volume configuration) and automatic recovery of the original system configuration and user data that was backed up during the full client backup. These files are stored as an ASR archive file on the Cell Manager (in <code>Data_Protector_home\Config\Server\dr\asr</code> on a Windows Cell Manager or in <code>/etc/opt/omni/server/dr/asr/</code> on a UNIX Cell Manager) as well as on the backup medium. The ASR archive file is extracted to three diskettes for 32-bit Windows systems or four diskettes for 64-bit Windows systems after a disaster occurs. You need these diskettes to perform ASR. |
| <b>Audit Logs</b>                   | Data files to which auditing information is stored.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Audit Report</b>                 | User-readable output of auditing information created from data stored in audit log files.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Auditing Information</b>         | Data about every backup session that was performed over an extended, user-defined period for the whole Data Protector cell.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>autochanger</b>                  | See <a href="#">library</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>autoloader</b>                   | See <a href="#">library</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Automatic Storage Management</b> | <i>(Oracle specific term)</i> Automatic Storage Management is an Oracle 10g integrated filesystem and volume manager that manages Oracle database files. It eliminates complexity associated with managing data and disk and provides striping and mirroring capabilities to optimize performance.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>automigration</b>                | <i>(VLS specific term)</i> The functionality that allows data backups to be first made to the VLS' virtual tapes and then migrated to physical tapes (one virtual tape emulating one physical tape) without using an intermediate backup application.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

See also [Virtual Library System \(VLS\)](#) and [virtual tape](#).

|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BACKINT</b>           | <p>(SAP R/3 specific term) SAP R/3 backup programs can call the Data Protector backint interface program via an open interface, which enables them to communicate with Data Protector software. For backup and restore, SAP R/3 programs issue orders for the Data Protector backint interface.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>backup API</b>        | <p>The Oracle interface between the Oracle backup/restore utility and the backup/restore media management layer. The interface defines a set of routines to allow the reading and writing of data to the backup media, the creation, searching and removing the backup files.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>backup chain</b>      | <p>See <a href="#">restore chain</a>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>backup device</b>     | <p>A device configured for use with Data Protector, which can write data to and read data from storage media. This can be, for example, a standalone DDS/DAT drive or a library.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>backup generation</b> | <p>One backup generation includes one full backup and all incremental backups until the next full backup.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>backup ID</b>         | <p>An identifier of an integration object that equals the session ID of the backup of this object. The backup ID is preserved when an object is copied, exported, or imported.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>backup object</b>     | <p>A backup unit that contains all items backed up from one disk volume (logical disk or mount point). The backed up items can be any number of files, directories, or the entire disk or mount point. Additionally, a backup object can be a database/application entity or a disk image (rawdisk).<br/>A backup object is defined by:</p> <ul style="list-style-type: none"><li>• Client name: Hostname of the Data Protector client where the backup object resides.</li><li>• Mount point: For filesystem objects — the access point in a directory structure on the client where the backup object is located (drive on Windows and mount point on UNIX). For integration objects — backup stream identification, indicating the backed up database/application items.</li><li>• Description: For filesystem objects — uniquely defines objects with identical client name and mount point. For integration</li></ul> |

|                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                             | <p>objects — displays the integration type (for example, SAP or Lotus).</p> <ul style="list-style-type: none"> <li>• Type: Backup object type. For filesystem objects — filesystem type (for example, WinFS). For integration objects — “Bar”.</li> </ul>                                                                                                                                                                                                                                                                                  |
| <b>backup owner</b>         | Each backup object in the IDB has an owner. The default owner of a backup is the user who starts the backup session.                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>backup session</b>       | <p>A process that creates a copy of data on storage media. The activities are specified in a backup specification or an interactive session. All clients configured in one backup specification are backed up together in one backup session using the same backup type (full or incremental). The result of a backup session is a set of media, which was written to, also called the backup or media set.</p> <p>See also <a href="#">backup specification</a>, <a href="#">incremental backup</a>, and <a href="#">full backup</a>.</p> |
| <b>backup set</b>           | A complete set of integration objects associated with a backup.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>backup set</b>           | <p><i>(Oracle specific term)</i> A logical grouping of backed up files that are created using the RMAN backup command. A backup set is a complete set of files associated with a backup. The files can be multiplexed to increase performance. A backup set contains either datafiles or archived logs, but not both together.</p>                                                                                                                                                                                                         |
| <b>backup specification</b> | <p>A list of objects to be backed up, together with a set of devices or drives to be used, backup options for all objects in the specification, and days and time that you want backups to be performed. The objects are entire disks/volumes or parts of them such as files, directories, or even the Windows Registry for example. File selection lists such as include-lists and exclude-lists can be specified.</p>                                                                                                                    |
| <b>backup system</b>        | <p><i>(ZDB specific term)</i> A system connected to target volumes of one or multiple application systems. The backup system is typically connected to a backup device to perform the backup of the data in a replica.</p> <p>See also <a href="#">application system</a>, <a href="#">target volume</a>, and <a href="#">replica</a>.</p>                                                                                                                                                                                                 |
| <b>backup types</b>         | See <a href="#">incremental backup</a> , <a href="#">differential backup</a> , <a href="#">transaction backup</a> , <a href="#">full backup</a> , and <a href="#">delta backup</a> .                                                                                                                                                                                                                                                                                                                                                       |

|                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>backup to IAP</b> | A Data Protector based backup to the HP Integrated Archiving Platform (IAP) appliance. It takes advantage of the IAP capability to eliminate redundancies in the stored data at a block (or chunk) level, by creating a unique content address for each data chunk. Only changed chunks are transmitted over the network and added to the store.                                                                                                                                                                                                                                                                                                                                     |
| <b>backup view</b>   | Data Protector provides different views for backup specifications:<br>By Type - according to the type of data available for backups/templates. Default view.<br>By Group - according to the group to which backup specifications/templates belong.<br>By Name - according to the name of backup specifications/templates.<br>By Manager - if you are running MoM, you can also set the Backup view according to the Cell Manager to which backup specifications/templates belong.                                                                                                                                                                                                    |
| <b>BC</b>            | <i>(EMC Symmetrix specific term)</i> Business Continuance are processes that allow customers to access and manage instant copies of EMC Symmetrix standard devices.<br>See also <a href="#">BCV</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>BC</b>            | <i>(HP StorageWorks Disk Array XP specific term)</i> The Business Copy XP allows to maintain internal copies of HP StorageWorks Disk Array XP LDEVs for purposes such as data backup or data duplication. The copies (secondary volumes or S-VOLs) can be separated from the primary volumes (P-VOLs) and connected to a different system for various purposes, such as backup and development. For backup purposes, P-VOLs should be connected to the application system, and one of the S-VOL mirror sets should be connected to the backup system.<br>See also <a href="#">HP StorageWorks Disk Array XP LDEV, CA, Main Control Unit, application system, and backup system</a> . |
| <b>BC EVA</b>        | <i>(HP StorageWorks EVA specific term)</i> Business Copy EVA is a local replication software solution enabling you to create point-in-time copies (replicas) of the source volumes using the snapshot and clone capabilities of the EVA firmware.<br>See also <a href="#">replica</a> , <a href="#">source volume</a> , <a href="#">snapshot</a> , and <a href="#">CA+BC EVA</a> .                                                                                                                                                                                                                                                                                                   |
| <b>BC Process</b>    | <i>(EMC Symmetrix specific term)</i> A protected storage environment solution that has defined specially configured EMC Symmetrix                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

devices as mirrors or Business Continuance Volumes to protect data on EMC Symmetrix standard devices.  
See also [BCV](#).

**BC VA** *(HP StorageWorks Virtual Array specific term)* Business Copy VA allows you to maintain internal copies of HP StorageWorks Virtual Array LUNs for data backup or data duplication within the same virtual array. The copies (child or Business Copy LUNs) can be used for various purposes, such as backup, data analysis or development. When used for backup purposes, the original (parent) LUNs are connected to the application system and the Business Copy (child) LUNs are connected to the backup system. See also [HP StorageWorks Virtual Array LUN](#), [application system](#), and [backup system](#).

**BCV** *(EMC Symmetrix specific term)* Business Continuance Volumes, or BCV devices, are dedicated SLDs that are pre-configured in the ICDA on which the business continuation operation runs. BCV devices are assigned separate SCSI addresses, differing from the addresses used by the SLDs they mirror. The BCV devices are used as splittable mirrors of the primary EMC Symmetrix SLDs that need to be protected. See also [BC](#) and [BC Process](#).

**Boolean operators** The Boolean operators for the full text search functionality of the online Help system are AND, OR, NOT, and NEAR. Used when searching, they enable you to define your query precisely by creating a relationship between search terms. If no operator is specified in a multi-word search, AND is used by default. For example, the query manual disaster recovery is equivalent to manual AND disaster AND recovery.

**boot volume/disk/partition** A volume/disk/partition with files required for the initial step of the boot process. Microsoft terminology defines the boot volume/disk/partition as a volume/disk/partition containing the operating system files.

**BRARCHIVE** *(SAP R/3 specific term)* An SAP R/3 backup tool that allows you to archive redo log files. BRARCHIVE also saves all the logs and profiles of the archiving process. See also [BRBACKUP](#), and [BRRESTORE](#).

**BRBACKUP** *(SAP R/3 specific term)* An SAP R/3 backup tool that allows an online or offline backup of the control file, of individual data

files, or of all tablespaces and, if necessary, of the online redo log files.

See also [BRARCHIVE](#), and [BRRESTORE](#).

## **BRRESTORE**

*(SAP R/3 specific term)* An SAP R/3 tool that can be used to restore files of the following type:

- Database data files, control files, and online redo log files saved with BRBACKUP
- Redo log files archived with BRARCHIVE
- Non-database files saved with BRBACKUP

You can specify files, tablespaces, complete backups, log sequence numbers of redo log files, or the session ID of the backup.

See also [BRBACKUP](#), and [BRARCHIVE](#).

## **BSM**

The Data Protector Backup Session Manager controls the backup session. This process always runs on the Cell Manager system.

## **CA**

*(HP StorageWorks Disk Array XP specific term)* Continuous Access XP allows you to create and maintain remote copies of HP StorageWorks Disk Array XP LDEVs for purposes such as data duplication, backup, and disaster recovery. CA operations involve the main (primary) disk arrays and the remote (secondary) disk arrays. The main disk arrays contain the CA primary volumes (P-VOLs), which contain the original data and are connected to the application system. The remote disk arrays contain the CA secondary volumes (S-VOLs) connected to the backup system.

See also [BC](#) *(HP StorageWorks Disk Array XP specific term)*, [Main Control Unit](#) and [HP StorageWorks Disk Array XP LDEV](#).

## **CA+BC EVA**

*(HP StorageWorks EVA specific term)* The combination of Continuous Access (CA) EVA and Business Copy (BC) EVA enables you to create and maintain copies (replicas) of the source volumes on a remote EVA, and then use these copies as the source for local replication on this remote array.

See also [BC EVA](#), [replica](#), and [source volume](#).

## **CAP**

*(StorageTek specific term)* Cartridge Access Port is a port built into the door panel of a library. The purpose is to enter or eject media.

|                                                      |                                                                                                                                                                                                                                                                                                                                                                              |
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| <b>catalog protection</b>                            | Defines how long information about backed up data (such as file names and file versions) is kept in the IDB.<br>See also <a href="#">data protection</a> .                                                                                                                                                                                                                   |
| <b>CDB</b>                                           | The Catalog Database is a part of the IDB that contains information about backups, object copies, restores, media management sessions,, and backed up data. Depending on the selected logging level, it also contains file names and file versions. This part of the database is always local to the cell.<br>See also <a href="#">MMDB</a> .                                |
| <b>CDF file</b>                                      | <i>(UNIX specific term)</i> A Context Dependent File is a file consisting of several files grouped under the same pathname. The system ordinarily selects one of the files using the context of the process. This mechanism allows machine dependent executables, system data, and device files to work correctly from all hosts in a cluster while using the same pathname. |
| <b>cell</b>                                          | A set of systems that are under the control of a Cell Manager. The cell typically represents the systems on a site or an organizational entity, which are connected to the same LAN. Central control is available to administer the backup and restore policies and tasks.                                                                                                   |
| <b>Cell Manager</b>                                  | The main system in the cell where the essential Data Protector software is installed and from which all backup and restore activities are managed. The GUI used for management tasks can be located on a different system. Each cell has one Cell Manager system.                                                                                                            |
| <b>centralized licensing</b>                         | Data Protector allows you to configure centralized licensing for the whole enterprise environment consisting of several cells. All Data Protector licenses are installed and kept on the Enterprise Cell Manager system. You can then allocate licenses to specific cells to suit your needs.<br>See also <a href="#">MoM</a> .                                              |
| <b>Centralized Media Management Database (CMMDB)</b> | See <a href="#">CMMDB</a> .                                                                                                                                                                                                                                                                                                                                                  |



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| <b>Change Journal</b>                    | <i>(Windows specific term)</i> A Windows filesystem feature that logs a record of each change as it occurs to the files and directories on a local NTFS volume.                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Change Log Provider</b>               | <i>(Windows specific term)</i> A module that can be queried to determine which objects on a filesystem have been created, modified, or deleted.                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>channel</b>                           | <p><i>(Oracle specific term)</i> An Oracle Recovery Manager resource allocation. Every allocated channel starts a new Oracle process, which performs backup, restore, and recovery actions. The type of channel allocated determines the type of media used:</p> <ul style="list-style-type: none"> <li>• type 'disk'</li> <li>• type 'sbt_tape'</li> </ul> <p>If the specified channel is of type 'sbt_tape' and Oracle is integrated with Data Protector, the server process will attempt to read backups from or write data files to Data Protector.</p>       |
| <b>chunking</b>                          | <p><i>(IAP specific term)</i> The process of dividing data into blocks (chunks), where each chunk gets a unique content address. This address is then used to determine whether a particular chunk is already backed up to the IAP appliance. If the duplicate data is identified (two addresses are identical, that is the address is the same as for another data chunk already stored into IAP), it is not backed up. This way, the data redundancy is eliminated and the optimal data storage is achieved.</p> <p>See also <a href="#">backup to IAP</a>.</p> |
| <b>circular logging</b>                  | <i>(Microsoft Exchange Server and Lotus Domino Server specific term)</i> Circular logging is a Microsoft Exchange Server database and Lotus Domino Server database mode, in which the transaction log file contents are periodically overwritten after the corresponding data is committed to the database. Circular logging reduces disk storage space requirements.                                                                                                                                                                                             |
| <b>client backup</b>                     | A backup of all filesystems mounted on a client. Filesystems mounted on the client after the backup specification was created are not automatically detected.                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>client backup with disk discovery</b> | A backup of all filesystems mounted on a client. When the backup starts, Data Protector discovers the disks on the clients. Client backup with disk discovery simplifies backup configuration                                                                                                                                                                                                                                                                                                                                                                     |

and improves backup coverage of systems that often mount or dismount disks.

**client** or **client system** Any system configured with any Data Protector functionality and configured in a cell.

**cluster-aware application** It is an application that supports the cluster Application Programming Interface. Each cluster-aware application declares its own critical resources (disk volumes (on Microsoft Cluster Server), volume groups (on MC/ServiceGuard), application services, IP names and addresses, and so on).

**Cluster Continuous Replication** (*Microsoft Exchange Server specific term*) Cluster continuous replication (CCR) is a high availability solution that uses cluster management and failover options to create and maintain an exact copy (CCR copy) of a storage group. A storage group is replicated to a separate server. CCR removes any single point of failure in your Exchange back-end servers. You can perform backups using VSS on your passive Exchange Server node where a CCR copy is located and thus reducing the load on the active node. A CCR copy is used for disaster recovery since you can switch to the CCR copy in a few seconds. A replicated storage group is represented as a new instance of Exchange writer called Exchange Replication Service and can be backed up (using VSS) like an ordinary storage group. See also [Exchange Replication Service](#) and [Local Continuous Replication](#).

**CMD Script for Informix Server** (*Informix Server specific term*) A Windows CMD script that is created in INFORMIXDIR when an Informix Server database is configured. The CMD script is a set of system commands that export environment variables for Informix Server.

**CMMDB** The Data Protector Centralized Media Management Database (CMMDB) is the result of merging MMDBs from several cells in the MoM environment. It allows you to share high-end devices and media across multiple cells in a MoM environment. One cell can control the robotics, serving the devices that are connected to systems in other cells. The CMMDB must reside on the MoM Manager. A reliable network connection between the MoM cell and the other Data Protector cells is highly recommended. See also [MoM](#).

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| <b>COM+ Registration Database</b>   | <i>(Windows specific term)</i> The COM+ Registration Database and the Windows Registry store COM+ application attributes, class attributes, and computer-level attributes. This guarantees consistency among these attributes and provides common operation on top of these attributes.                                                                                                                                                                                                                                                                                                             |
| <b>command-line interface (CLI)</b> | A set of DOS and UNIX like commands that you can use in shell scripts to perform Data Protector configuration, backup, restore, and management tasks.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Command View (CV) EVA</b>        | <i>(HP StorageWorks EVA specific term)</i> The user interface that enables you to configure, manage, and monitor your HP StorageWorks EVA storage system. It is used to perform various storage management tasks, for example, creating virtual disk families, managing storage system hardware, and creating snapclones and snapshots of virtual disks. The Command View EVA software runs on the HP OpenView Storage Management Appliance, and is accessed by a Web browser.<br>See also <a href="#">HP StorageWorks EVA SMI-S Agent</a> and <a href="#">HP StorageWorks SMI-S EVA provider</a> . |
| <b>Command View VLS</b>             | <i>(VLS specific term)</i> A web browser-based GUI that is used to configure, manage, and monitor the VLS through a LAN.<br>See also <a href="#">Virtual Library System (VLS)</a> .                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>concurrency</b>                  | See <a href="#">Disk Agent concurrency</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>control file</b>                 | <i>(Oracle and SAP R/3 specific term)</i> An Oracle data file that contains entries specifying the physical structure of the database. It provides database consistency information used for recovery.                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>copy set</b>                     | <i>(HP StorageWorks EVA specific term)</i> A pair that consists of the source volumes on a local EVA and their replica on a remote EVA.<br>See also <a href="#">source volume</a> , <a href="#">replica</a> , and <a href="#">CA+BC EVA</a>                                                                                                                                                                                                                                                                                                                                                         |
| <b>CRS</b>                          | The Cell Request Server process (service), which runs on the Data Protector Cell Manager, and starts and controls the backup and restore sessions. The service is started as soon as Data Protector is installed on the Cell Manager. On Windows systems, the CRS runs under the account of the user specified at installation time. On UNIX systems, it runs under the account <code>root</code> .                                                                                                                                                                                                 |

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| <b>CSM</b>                         | The Data Protector Copy and Consolidation Session Manager process controls the object copy and object consolidation sessions and runs on the Cell Manager system.                                                                                                                                                                                                                                                                           |
| <b>data file</b>                   | <i>(Oracle and SAP R/3 specific term)</i> A physical file created by Oracle that contains data structures such as tables and indexes. A data file can only belong to one Oracle database.                                                                                                                                                                                                                                                   |
| <b>data protection</b>             | Defines how long the backed up data on media remains protected, that is, Data Protector will not overwrite it. When the protection expires, Data Protector will be able to reuse the media in one of the next backup sessions.<br><i>See also <a href="#">catalog protection</a>.</i>                                                                                                                                                       |
| <b>data stream</b>                 | Sequence of data transferred over the communication channel.                                                                                                                                                                                                                                                                                                                                                                                |
| <b>database library</b>            | A Data Protector set of routines that enables data transfer between Data Protector and a server of an online database integration, for example, Oracle Server.                                                                                                                                                                                                                                                                              |
| <b>database parallelism</b>        | More than one database is backed up at a time if the number of available devices allows you to perform backups in parallel.                                                                                                                                                                                                                                                                                                                 |
| <b>Data Replication (DR) group</b> | <i>(HP StorageWorks EVA specific term)</i> A logical grouping of EVA virtual disks. It can contain up to eight copy sets provided they have common characteristics and share a common CA EVA log.<br><i>See also <a href="#">copy set</a>.</i>                                                                                                                                                                                              |
| <b>database server</b>             | A computer with a large database stored on it, such as the SAP R/3 or Microsoft SQL database. A server has a database that can be accessed by clients.                                                                                                                                                                                                                                                                                      |
| <b>Dobject</b>                     | <i>(Informix Server specific term)</i> An Informix Server physical database object. It can be a blob space, db space, or logical log file.                                                                                                                                                                                                                                                                                                  |
| <b>DC directory</b>                | The Detail Catalog (DC) directory contains DC binary files, which store information about file versions. It represents the DCBF part of the IDB, which occupies approximately 80% of the IDB. The default DC directory is called the <code>dcbf</code> directory and is located in the <code>Data_Protector_home\db40</code> directory on a Windows Cell Manager and in the <code>/var/opt/omni/server/db40</code> directory on a UNIX Cell |

Manager. You can create more DC directories and use a custom location. Up to 10 DC directories are supported per cell. The default maximum size of a DC directory is 16 GB.

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| <b>DCBF</b>             | The Detail Catalog Binary Files (DCBF) part of the IDB stores information about file versions and attributes. It occupies approximately 80% of the IDB. One DC binary file is created for each Data Protector medium used for backup. Its maximum size is limited by the file system settings.                                                                                                                                                                                                                        |
| <b>delta backup</b>     | A delta backup is a backup containing all the changes made to the database from the last backup of any type.<br>See also <a href="#">backup types</a> .                                                                                                                                                                                                                                                                                                                                                               |
| <b>device</b>           | A physical unit which contains either just a drive or a more complex unit such as a library.                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>device chain</b>     | A device chain consists of several standalone devices configured for sequential use. When a medium in one device gets full, the backup automatically continues on a medium in the next device in the device chain.                                                                                                                                                                                                                                                                                                    |
| <b>device group</b>     | <i>(EMC Symmetrix specific term)</i> A logical unit representing several EMC Symmetrix devices. A device cannot belong to more than a single device group. All devices in a device group must be on the same EMC Symmetrix unit. You can use a device group to identify and work with a subset of the available EMC Symmetrix devices.                                                                                                                                                                                |
| <b>device streaming</b> | A device is streaming if it can feed enough data to the medium to keep it moving forward continuously. Otherwise, the tape has to be stopped, the device waits for more data, reverses the tape a little and resumes to write to the tape, and so on. In other words, if the data rate written to the tape is less or equal the data rate which can be delivered to the device by the computer system, then the device is streaming. Streaming significantly improves the performance of the device and use of space. |
| <b>DHCP server</b>      | A system running the Dynamic Host Configuration Protocol (DHCP) providing dynamic IP address assignment and network configuration for DHCP clients.                                                                                                                                                                                                                                                                                                                                                                   |

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| <b>differential backup</b>          | An incremental backup that backs up changes made since the last full backup. To perform this type of backup, specify the Incr1 backup type.<br>See also <a href="#">incremental backup</a> .                                                                                                                                                                                                                                                                                                                                                                        |
| <b>differential backup</b>          | <i>(Microsoft SQL Server specific term)</i> A database backup that records only the data changes made to the database after the last full database backup.<br>See also <a href="#">backup types</a> .                                                                                                                                                                                                                                                                                                                                                               |
| <b>differential database backup</b> | A differential database backup records only those data changes made to the database after the last full database backup.                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>direct backup</b>                | A SAN-based backup solution in which data movement directly from disk to tape (or to other secondary storage) is facilitated by the SCSI Extended Copy (Xcopy) command. Direct backup lessens the backup I/O load on systems in a SAN environment. The data movement is facilitated directly from disk to tape (or to other secondary storage) by the SCSI Extended Copy (XCOPY) command. The command is provided by any element of the infrastructure including bridges, switches, tape libraries, and disk subsystems.<br>See also <a href="#">XCOPY engine</a> . |
| <b>directory junction</b>           | <i>(Windows specific term)</i> Directory junctions use the reparse point concept of Windows. An NTFS 5 directory junction allows you to redirect a directory/file request to another location.                                                                                                                                                                                                                                                                                                                                                                      |
| <b>disaster recovery</b>            | A process to restore a client's main system disk to a state close to the time when a (full) backup was performed.                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Disk Agent</b>                   | A component needed on a client to back it up and restore it. The Disk Agent controls reading from and writing to a disk. During a backup session, the Disk Agent reads data from a disk and sends it to the Media Agent, which then moves it to the device. During a restore session the Disk Agent receives data from the Media Agent and writes it to the disk.                                                                                                                                                                                                   |
| <b>Disk Agent concurrency</b>       | The number of Disk Agents that are allowed to send data to one Media Agent concurrently.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>disk discovery</b>               | The detection of disks during client backup with disk discovery. During this backup, Data Protector discovers (detects) the disks that are present on the client — even though they might not have                                                                                                                                                                                                                                                                                                                                                                  |

been present on the system when the backup was configured — and backs them up. This is particularly useful in dynamic environments, where configurations change rapidly. After the disks are expanded, each inherits all options from its master client object. Even if pre- and post-exec commands are specified once, they are started many times, once per each object.

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| <b>disk group</b>                    | <i>(Veritas Volume Manager specific term)</i> The basic unit of data storage in VxVM system. A disk group can consist of one or more physical volumes. There can be more than one disk group on the system.                                                                                                                                                                   |
| <b>disk image (rawdisk) backup</b>   | A high-speed backup where Data Protector backs up files as bitmap images. A disk image (rawdisk) backup does not track the files and directory structure stored on the disk, but stores a disk image structure on byte level. You can perform a disk image backup of either specific disk sections or a complete disk.                                                        |
| <b>disk quota</b>                    | A concept to manage disk space consumption for all or a subset of users on a computer system. This concept is used by several operating system platforms.                                                                                                                                                                                                                     |
| <b>disk staging</b>                  | The process of backing up data in several phases to improve the performance of backups and restores, reduce costs of storing the backed up data, and increase the data availability and accessibility for restore. The backup stages consist of backing up data to one media type first (for example disk) and later copying it to a different media type (for example tape). |
| <b>distributed file media format</b> | A media format, available with the file library, which supports a space efficient type of synthetic backup called virtual full backup. Using this format is a prerequisite for virtual full backup. See also <a href="#">virtual full backup</a> .                                                                                                                            |
| <b>Distributed File System (DFS)</b> | A service that connects file shares into a single namespace. The file shares can reside on the same or on different computers. DFS provides client access to the resources in a location-transparent manner.                                                                                                                                                                  |
| <b>DMZ</b>                           | The Demilitarized Zone (DMZ) is a network inserted as a "neutral zone" between a company's private network (intranet) and the outside public network (Internet). It prevents outside users from getting direct access to company servers in the intranet.                                                                                                                     |

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| <b>DNS server</b>                                                   | In the DNS client-server model, this is the server containing information about a portion of the DNS database that makes computer names available to client resolvers querying for name resolution across the Internet.                                                                                                                                                                                                                                                                                                |
| <b>domain controller</b>                                            | A server in a network that is responsible for user security and verifying passwords within a group of other servers.                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>DR image</b>                                                     | Data required for temporary disaster recovery operating system (DR OS) installation and configuration.                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>DR OS</b>                                                        | A disaster recovery operating system is an operating system environment in which disaster recovery runs. It provides Data Protector a basic runtime environment (disk, network, tape, and filesystem access). The OS has to be installed and configured before the Data Protector disaster recovery can be performed. DR OS not only hosts the Data Protector disaster recovery process but is also a part of the restored system because it replaces its own configuration data with the original configuration data. |
| <b>drive</b>                                                        | A physical unit that receives data from a computer system and can write it onto a magnetic medium (typically a tape drive). It can also read the data from the medium and send it to the computer system.                                                                                                                                                                                                                                                                                                              |
| <b>drive index</b>                                                  | A number that identifies the mechanical position of a drive inside a library device. This number is used by the robotic control to access a drive.                                                                                                                                                                                                                                                                                                                                                                     |
| <b>dynamic client</b>                                               | See <a href="#">client backup with disk discovery</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>EMC Symmetrix Agent (SYMA)<br/>(EMC Symmetrix specific term)</b> | See <a href="#">Symmetrix Agent (SYMA)</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>emergency boot file</b>                                          | <i>(Informix Server specific term)</i> The Informix Server configuration file <code>ixbar.server_id</code> that resides in the directory <code>INFORMIXDIR/etc</code> (on Windows) or <code>INFORMIXDIR\etc</code> (on UNIX). <code>INFORMIXDIR</code> is the Informix Server home directory and <code>server_id</code> is the value of the <code>SERVERNUM</code> configuration parameter. Each line of the emergency boot file corresponds to one backup object.                                                     |



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| <b>enhanced incremental backup</b>          | Conventional incremental backup backs up files that have changed since a previous backup, but has certain limitations in detection of changes. Unlike conventional incremental backup, enhanced incremental backup reliably detects and backs up also renamed and moved files, as well as files with changes in attributes.                                                   |
| <b>Enterprise Backup Environment</b>        | Several cells can be grouped together and managed from a central cell. The enterprise backup environment includes all clients located in several Data Protector cells which are managed and administered from a central cell using the Manager-of-Managers concept.<br><i>See also <a href="#">MoM</a>.</i>                                                                   |
| <b>Event Log (Data Protector Event Log)</b> | A central repository of all Data Protector related notifications. By default, all notifications are sent to the Event Log. The Event Log is accessible only to Data Protector users in the <code>Admin</code> group and to Data Protector users who are granted the <code>Reporting and notifications</code> user rights. You can view or delete all events in the Event Log. |
| <b>Event Logs</b>                           | Files in which Windows logs all events, such as the starting or stopping of services and the logging on and off of users. Data Protector can back up Windows Event Logs as part of the Windows configuration backup.                                                                                                                                                          |
| <b>Exchange Replication Service</b>         | <i>(Microsoft Exchange Server specific term)</i> The Microsoft Exchange Server service that represents storage groups that were replicated using either Local Continuous Replication (LCR) or Cluster Continuous Replication (CCR) technology.<br><i>See also <a href="#">Cluster Continuous Replication</a> and <a href="#">Local Continuous Replication</a>.</i>            |
| <b>exchanger</b>                            | Also referred to as SCSI Exchanger.<br><i>See also <a href="#">library</a>.</i>                                                                                                                                                                                                                                                                                               |
| <b>exporting media</b>                      | A process that removes all data about backup sessions, such as systems, objects, and file names, which reside on the media from the IDB. Information about the media and their relation to a pool is also removed from the IDB. The data on the media remains unchanged.<br><i>See also <a href="#">importing media</a>.</i>                                                  |

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| <b>Extensible Storage Engine (ESE)</b> | <i>(Microsoft Exchange Server specific term)</i> A database technology used as a storage system for information exchange in Microsoft Exchange Server.                                                                                                                                                                                                                                                                                                 |
| <b>failover</b>                        | Transferring of the most important cluster data, called group (on Windows) or package (on UNIX) from one cluster node to another. A failover can occur mostly because of software or hardware failures or maintenance on the primary node.                                                                                                                                                                                                             |
| <b>failover</b>                        | <i>(HP StorageWorks EVA specific term)</i> An operation that reverses the roles of source and destination in CA+BC EVA configurations.<br>See also <a href="#">CA+BC EVA</a> .                                                                                                                                                                                                                                                                         |
| <b>FC bridge</b>                       | See <a href="#">Fibre Channel bridge</a> .                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Fibre Channel</b>                   | An ANSI standard for high-speed computer interconnection. Using either optical or copper cables, it allows the high speed bi-directional transmission of large data files and can be deployed between sites kilometers apart. Fibre Channel connects nodes using three physical topologies: point-to-point, loop, and switched.                                                                                                                        |
| <b>Fibre Channel bridge</b>            | A Fibre Channel bridge or multiplexer provides the ability to migrate existing parallel SCSI devices, like RAID arrays, solid state disks (SSD), and tape libraries to a Fibre Channel environment. On one side of the bridge or multiplexer there is a Fibre Channel interface while on the other side there are parallel SCSI ports. The bridge or multiplexer enables SCSI packets to be moved between the Fibre Channel and parallel SCSI devices. |
| <b>file depot</b>                      | A file containing the data from a backup to a file library device.                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>file jukebox device</b>             | A device residing on disk consisting of multiple slots used to store file media.                                                                                                                                                                                                                                                                                                                                                                       |
| <b>file library device</b>             | A device which resides on a disk emulating a library with several media, hence containing multiple files, referred to as file depots.                                                                                                                                                                                                                                                                                                                  |
| <b>File Replication Service (FRS)</b>  | A Windows service that replicates the domain controller store logon scripts and group policies. FRS also enables replication of Distributed File System (DFS) shares between systems and allows any server to perform replication activity.                                                                                                                                                                                                            |

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| <b>file tree walk</b>      | <i>(Windows specific term)</i> The process of traversing a filesystem to determine which objects have been created, modified, or deleted.                                                                                                                                                                                                                              |
| <b>file version</b>        | The same file can be backed up multiple times in case of full backups and incremental backups (if the file changed). If the log level ALL is selected for backup, Data Protector retains one entry in the IDB for the filename itself and one for each version (date/time) of the file.                                                                                |
| <b>filesystem</b>          | The organization of files on a hard disk. A filesystem is backed up so that the file attributes and the file contents are stored on the backup media.                                                                                                                                                                                                                  |
| <b>first-level mirror</b>  | <i>(HP StorageWorks Disk Array XP specific term)</i> HP StorageWorks Disk Array XP allows up to three mirror copies of a primary volume and each of these copies can have additional two copies. The three mirror copies are called first-level mirrors. See also <a href="#">primary volume</a> and <a href="#">MU number</a> .                                       |
| <b>flash recovery area</b> | <i>(Oracle specific term)</i> Flash recovery area is an Oracle 10g managed directory, filesystem, or Automatic Storage Management disk group that serves as a centralized storage area for files related to backup and recovery (recovery files). See also <a href="#">recovery files</a> .                                                                            |
| <b>fnames.dat</b>          | The <code>fnames.dat</code> files of the IDB contain information on the names of the backed up files. Typically, these files occupy about 20% of the IDB, if filenames are stored.                                                                                                                                                                                     |
| <b>formatting</b>          | A process that erases any data contained on a medium and prepares it for use with Data Protector. Information about media (medium ID, description, and location) is saved in the IDB as well as on the respective media (media header). Data Protector media with protected data are not formatted until the protection expires or the media are unprotected/recycled. |
| <b>free pool</b>           | An auxiliary source of media for use by media pools when they run out of media. The media pools must be configured to use free pools.                                                                                                                                                                                                                                  |
| <b>full backup</b>         | A backup in which all selected objects are backed up, whether or not they have been recently modified. See also <a href="#">backup types</a> .                                                                                                                                                                                                                         |

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| <b>full database backup</b> | A backup of all data in a database, not only the data that has been changed after the last (full or incremental) backup of the database. A full database backup does not depend on any other backup.                                                                                                                                                                                                                                                                                 |
| <b>full mailbox backup</b>  | A full mailbox backup is a backup of the entire mailbox content.                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>full ZDB</b>             | A ZDB to tape or ZDB to disk+tape session in which all selected objects are streamed to tape, even if there are no changes from the previous backup.<br>See also <a href="#">incremental ZDB</a> .                                                                                                                                                                                                                                                                                   |
| <b>global options file</b>  | A file that allows you to customize Data Protector. It explains the global options, which cover various aspects of Data Protector, typically time-outs and limits, and affect the entire Data Protector cell. The file is located in the <code>/etc/opt/omni/server/options</code> directory on HP-UX and Solaris systems and in the <code>Data_Protector_home\Config\Server\Options</code> directory on Windows systems.                                                            |
| <b>group</b>                | <i>(Microsoft Cluster Server specific term)</i> A collection of resources (for example disk volumes, application services, IP names, and addresses) that are needed to run a specific cluster-aware applications.                                                                                                                                                                                                                                                                    |
| <b>GUI</b>                  | A cross-platform (HP-UX, Solaris, Linux, and Windows) graphical user interface, provided by Data Protector for easy access to all configuration, administration, and operation tasks. Besides the original Data Protector GUI, Data Protector also provides a Java-based graphical user interface with the same look and feel. As Java can run on numerous platforms, the Data Protector Java GUI is supported on a larger number of platforms than the original Data Protector GUI. |
| <b>hard recovery</b>        | <i>(Microsoft Exchange Server specific term)</i> A Microsoft Exchange Server database recovery that is performed after a restore by the database engine, using transaction log files.                                                                                                                                                                                                                                                                                                |
| <b>heartbeat</b>            | A cluster data set with a time stamp carrying information about the operational status of a particular cluster node. This data set or packet is distributed among all cluster nodes.                                                                                                                                                                                                                                                                                                 |

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| <b>Hierarchical Storage Management (HSM)</b> | A method for optimizing the use of expensive hard disk storage by migrating less frequently used data to less expensive optical platters. When needed, the data is migrated back to hard disk storage. This balances the need for fast retrieval from hard disk with the lower cost of optical platters.                                                                  |
| <b>Holidays file</b>                         | A file that contains information about holidays. You can set different holidays by editing the Holidays file:<br>/etc/opt/omni/server/Holidays on the UNIX Cell Manager and<br>Data_Protector_home\Config\Server\holidays on the Windows Cell Manager.                                                                                                                    |
| <b>host backup</b>                           | See <a href="#">client backup with disk discovery</a> .                                                                                                                                                                                                                                                                                                                   |
| <b>hosting system</b>                        | A working Data Protector client used for Disk Delivery Disaster Recovery with a Data Protector Disk Agent installed.                                                                                                                                                                                                                                                      |
| <b>HP ITO</b>                                | See <a href="#">OM</a> .                                                                                                                                                                                                                                                                                                                                                  |
| <b>HP OpC</b>                                | See <a href="#">OM</a> .                                                                                                                                                                                                                                                                                                                                                  |
| <b>HP OpenView SMART Plug-In (SPI)</b>       | A fully integrated, out-of-the-box solution which "plugs into" HP Operations Manager software, extending the managed domain. Through the Data Protector integration, which is implemented as an HP OpenView SMART Plug-In, a user can have an arbitrary number of Data Protector Cell Managers monitored as an extension to HP Operations Manager software (OM).          |
| <b>HP OM</b>                                 | See <a href="#">OM</a>                                                                                                                                                                                                                                                                                                                                                    |
| <b>HP StorageWorks Disk Array XP LDEV</b>    | A logical partition of a physical disk within an HP StorageWorks Disk Array XP. LDEVs are entities that can be replicated in the Continuous Access XP (CA) and Business Copy XP (BC) configurations, or can be used as standalone entities. See also <a href="#">BC</a> , <a href="#">CA</a> (HP StorageWorks Disk Array XP specific term), and <a href="#">replica</a> . |
| <b>HP StorageWorks EVA SMI-S Agent</b>       | A Data Protector software module that executes all tasks required for the HP StorageWorks Enterprise Virtual Array integration. With the EVA SMI-S Agent, the control over the array is established through HP StorageWorks SMI-S EVA provider, which directs communication between incoming requests and CV EVA.                                                         |

See also [Command View \(CV\) EVA](#) and [HP StorageWorks SMI-S EVA provider](#).

- HP StorageWorks SMI-S EVA provider** An interface used for controlling HP StorageWorks Enterprise Virtual Array. SMI-S EVA provider runs as a separate service on the HP OpenView Storage Management Appliance system and acts as a gateway between incoming requests and Command View EVA. With the Data Protector HP StorageWorks EVA integration, SMI-S EVA provider accepts standardized requests from the EVA SMI-S Agent, communicates with Command View EVA for information or method invocation, and returns standardized responses.  
See also [HP StorageWorks EVA SMI-S Agent](#) and [Command View \(CV\) EVA](#).
- HP StorageWorks Virtual Array LUN** A logical partition of a physical disk within an HP StorageWorks Virtual Array. LUNs are entities that can be replicated in the HP StorageWorks Business Copy VA configuration, or can be used as standalone entities.  
See also [BC VA](#) and [replica](#).
- HP VPO** See [OM](#).
- ICDA** (*EMC Symmetrix specific term*) EMC's Symmetrix Integrated Cached Disk Arrays (ICDA) is a disk array device that combines a set of physical disks, a number of FWD SCSI channels, an internal cache memory, and control and diagnostic software commonly referred to as the microcode.
- IDB** The Data Protector Internal Database is an embedded database located on the Cell Manager that keeps information regarding which data is backed up, on which media it is backed up, how backup and restore sessions are run, and which devices and libraries are configured.
- IDB recovery file** An IDB file (obrindex.dat) with information about IDB backups, media, and devices used for the backup. This information can significantly simplify IDB recovery. It is recommended to relocate the file, together with IDB transaction logs, to a separate physical disk from other IDB directories, and, additionally, to make an additional copy of the file.

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| <b>importing media</b>             | A process that re-reads all data about backup sessions which are on the medium back into the IDB. This then allows for fast and convenient access to the data on the media.<br><i>See also <a href="#">exporting media</a>.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>incremental backup</b>          | A backup that selects only files that have changed since a previous backup. Several levels of incremental backup are available, which enables detailed control of restore chain length.<br><i>See also <a href="#">backup types</a>.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>incremental backup</b>          | <i>(Microsoft Exchange Server specific term)</i> A backup of the Microsoft Exchange Server data that has changed since the last full or incremental backup. With the incremental backup, only the transaction log files are backed up.<br><i>See also <a href="#">backup types</a>.</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>incremental mailbox backup</b>  | An incremental mailbox backup backs up all the changes made to the mailbox after the last backup of any type.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>incremental1 mailbox backup</b> | An incremental1 mailbox backup backs up all the changes made to the mailbox after the last full backup.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>incremental (re)-establish</b>  | <i>(EMC Symmetrix specific term)</i> A BCV or SRDF control operation. In BCV control operations, an incremental establish causes the BCV device to be synchronized incrementally and to function as an EMC Symmetrix mirrored medium. The EMC Symmetrix devices must have been previously paired. In SRDF control operations, an incremental establish causes the target (R2) device to be synchronized incrementally and to function as an EMC Symmetrix mirrored medium. The EMC Symmetrix devices must have been previously paired.                                                                                                                                                                                                                                                           |
| <b>incremental restore</b>         | <i>(EMC Symmetrix specific term)</i> A BCV or SRDF control operation. In BCV control operations, an incremental restore reassigns a BCV device as the next available mirror of the standard device in the pair. However, the standard devices are updated with only the data that was written to the BCV device during the time of the original pair split, and the data that was written to the standard device during the split is overwritten with data from the BCV mirror. In SRDF control operations, an incremental restore reassigns a target (R2) device as the next available mirror of the source (R1) device in the pair. However, the source (R1) devices are updated with only the data that was written to the target (R2) device during the time of the original pair split, and |

the data that was written to the source (R1) device during the split is overwritten with data from the target (R2) mirror.

- incremental ZDB** A filesystem ZDB to tape or ZDB to disk+tape session in which only changes from the last protected full or incremental backup are streamed to tape.  
See also [full ZDB](#).
- Inet** A process that runs on each UNIX system or service that runs on each Windows system in the Data Protector cell. It is responsible for communication between systems in the cell and for starting other processes needed for backup and restore. The Inet service is started as soon as Data Protector is installed on a system. The Inet process is started by the inetd daemon.
- Information Store** (*Microsoft Exchange Server specific term*) The Microsoft Exchange Server service that is responsible for storage management. Information Store in Microsoft Exchange Server manages two kinds of stores: mailbox stores and public folder stores. A mailbox store consists of mailboxes that belong to individual users. A public folder store contains public folders and messages that are shared among several users.  
See also [Key Management Service](#) and [Site Replication Service](#).
- Informix Server** (*Informix Server specific term*) Refers to Informix Dynamic Server.
- initializing** See [formatting](#).
- Installation Server** A computer system that holds a repository of the Data Protector software packages for a specific architecture. The Installation Server is used for remote installation of Data Protector clients. In mixed environments at least two Installation Servers are needed: one for UNIX systems and one for Windows systems.
- instant recovery** (*ZDB specific term*) A process in which a replica, produced by a ZDB-to-disk or a ZDB-to-disk+tape session, is used to restore the contents of the source volumes to their states at the time at which the replica was created, avoiding the need to perform a restore from tape. Depending on the application or database concerned, this may be all that is required, or other steps, such as the application of transaction log files, may be required for full recovery.  
See also [replica](#), [zero downtime backup \(ZDB\)](#), [ZDB to disk](#), and [ZDB to disk+tape](#).



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| <b>integration object</b>                  | A backup object of a Data Protector integration, such as Oracle or SAP DB.                                                                                                                                                                                                                                                                  |
| <b>Internet Information Services (IIS)</b> | <i>(Windows specific term)</i> Microsoft Internet Information Services is a network file and application server that supports multiple protocols. Primarily, IIS transmits information in Hypertext Markup Language (HTML) pages by using the Hypertext Transport Protocol (HTTP).                                                          |
| <b>IP address</b>                          | An Internet Protocol address is a numeric address of a system used to uniquely identify the system on the network. The IP address consists of four groups of numbers separated by periods (full stops).                                                                                                                                     |
| <b>ISQL</b>                                | <i>(Sybase specific term)</i> A Sybase utility used to perform system administration tasks on Sybase SQL Server.                                                                                                                                                                                                                            |
| <b>ITO</b>                                 | See <a href="#">OM</a> .                                                                                                                                                                                                                                                                                                                    |
| <b>Java GUI Client</b>                     | The Java GUI Client is a component of the Java GUI that contains only user interface related functionalities and requires connection to the Java GUI Server to function.                                                                                                                                                                    |
| <b>Java GUI Server</b>                     | The Java GUI Server is a component of the Java GUI that is installed on the Data Protector Cell Manager system. The Java GUI Server receives requests from the Java GUI Client, processes them and then sends the responses back to the Java GUI Client. The communication is done through Hypertext Transfer Protocol (HTTP) on port 5556. |
| <b>jukebox</b>                             | See <a href="#">library</a> .                                                                                                                                                                                                                                                                                                               |
| <b>jukebox device</b>                      | A device consisting of multiple slots used to store either optical or file media. When being used to store file media, the jukebox device is known as the “file jukebox device”.                                                                                                                                                            |
| <b>Key Management Service</b>              | <i>(Microsoft Exchange Server specific term)</i> The Microsoft Exchange Server service that provides encryption functionality for enhanced security.<br>See also <a href="#">Information Store</a> and <a href="#">Site Replication Service</a> .                                                                                           |
| <b>keychain</b>                            | A tool that eliminates the supply of a passphrase manually when decrypting the private key. It needs to be installed and                                                                                                                                                                                                                    |

configured on the Installation Server if you perform remote installation using secure shell.

**LBO** *(EMC Symmetrix specific term)* A Logical Backup Object (LBO) is an object of data storage/retrieval in the EMC Symmetrix environment. It is stored/retrieved by EMC Symmetrix as one entity and can only be restored as a whole.

**library** Also called autochanger, jukebox, autoloader, or exchanger. A library contains media in repository slots. Each slot holds one medium (for example, DDS/DAT). Media are moved between slots and drives by a robotic mechanism, allowing random access to media. The library can contain multiple drives.

**lights-out operation** or **unattended operation** A backup or restore operation that takes place outside of normal business hours without an operator. This implies that no operator personnel is present to work with the backup application or service mount requests, for example.

**LISTENER.ORA** *(Oracle specific term)* An Oracle configuration file that describes one or more Transparent Network Substrate (TNS) listeners on a server.

**load balancing** By default, Data Protector automatically balances the usage of devices selected for backup, so that they are used evenly. Load balancing optimizes the device usage by balancing the number of objects written to each device. Since load balancing is done automatically during backup time, you do not need to manage how the data is actually backed up. You just specify the devices to be used. If you do not want to use load balancing, you can select which device will be used for each object in the backup specification. Data Protector will access the devices in the specified order.

**local and remote recovery** Remote recovery is performed if all Media Agent hosts specified in the SRD file are accessible. If any of them fails, the disaster recovery process fails over to the local mode. This means that the target system is searched for locally attached devices. If only one device is found, it is automatically used. Otherwise, Data Protector prompts you to select the device, which will be used for restore.

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| <b>Local Continuous Replication</b> | <p>(<i>Microsoft Exchange Server specific term</i>) Local continuous replication (LCR) is a single-server solution that creates and maintains an exact copy (LCR copy) of a storage group. An LCR copy is located on the same server as the original storage group. When an LCR copy is created, it is kept up to date through change propagation (log replay) technology. The replication feature in LCR guarantees that logs that have not been replicated are not deleted. The implication of this behavior is that running backups in a mode that deletes logs may not actually free space if replication is sufficiently far behind in its log copying. An LCR copy is used for disaster recovery because you can switch to the LCR copy in a few seconds. If an LCR copy is used for backup and if it is located on a different disk than the original data, then the I/O load on a production database is minimal. A replicated storage group is represented as a new instance of Exchange writer called Exchange Replication Service and can be backed up (using VSS) as a normal storage group. See also <a href="#">Cluster Continuous Replication</a> and <a href="#">Exchange Replication Service</a>.</p> |
| <b>lock name</b>                    | <p>You can configure the same physical device several times with different characteristics, by using different device names. The lock name is a user specified string that is used for locking all such device configurations to prevent collision if several such devices (device names) are used concurrently. Use an identical lock name for all device definitions which use the same physical device.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>log_full shell script</b>        | <p>(<i>Informix Server UNIX specific term</i>) A script provided by ON-Bar that you can use to start backing up logical log files when Informix Server issues a logfull event alarm. The Informix Server <code>ALARMPROGRAM</code> configuration parameter defaults to the <code>INFORMIXDIR/etc/log_full.sh</code>, where <code>INFORMIXDIR</code> is the Informix Server home directory. If you do not want logical logs to be backed up continuously, set the <code>ALARMPROGRAM</code> configuration parameter to <code>INFORMIXDIR/etc/no_log.sh</code>.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>logging level</b>                | <p>The logging level determines the amount of details on files and directories written to the IDB during backup, object copying, or object consolidation. You can always restore your data, regardless of the logging level used during backup. Data Protector provides four logging levels: Log All, Log Directories, Log Files, and No Log. The different logging level settings</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

influence the IDB growth, backup speed, and the convenience of browsing data for restore.

**logical-log files**

This applies to online database backup. Logical-log files are files in which modified data is first stored before being flushed to disk. In the event of a failure, these logical-log files are used to roll forward all transactions that have been committed as well as roll back any transactions that have not been committed.

**login ID**

*(Microsoft SQL Server specific term)* The name a user uses to log on to Microsoft SQL Server. A login ID is valid if Microsoft SQL Server has an entry for that user in the system table syslogin.

**login information to the Oracle Target Database**

*(Oracle and SAP R/3 specific term)* The format of the login information is *user\_name/password@service*, where:

- *user\_name* is the name by which a user is known to Oracle Server and to other users. Every user name is associated with a password and both have to be entered to connect to an Oracle Target Database. This user must have Oracle SYSDBA or SYSOPER rights.
- *password* must be the same as the password specified in the Oracle password file (*orapwd*), which is used for authentication of users performing database administration.
- *service* is the name used to identify an SQL\*Net server process for the target database.

**login information to the Recovery Catalog Database**

*(Oracle specific term)* The format of the login information to the Recovery (Oracle) Catalog Database is *user\_name/password@service*, where the description of the user name, password, and service name is the same as in the Oracle SQL\*Net V2 login information to the Oracle target database. In this case, *service* is the name of the service to the Recovery Catalog Database, not the Oracle target database. Note that the Oracle user specified here must be the owner of the Oracle Recovery Catalog.

**Lotus C API**

*(Lotus Domino Server specific term)* An interface for the exchange of backup and recovery information between Lotus Domino Server and a backup solution, like Data Protector.

**LVM**

A Logical Volume Manager is a subsystem for structuring and mapping physical disk space to logical volumes on UNIX

systems. An LVM system consists of several volume groups, where each volume group has several volumes.

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| <b>Magic Packet</b>              | See <a href="#">Wake ONLAN</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>mailbox</b>                   | <i>(Microsoft Exchange Server specific term)</i> The location to which e-mail is delivered, which is set up by the administrator for each user. If a set of personal folders is designated as the e-mail delivery location, e-mail is routed from the mailbox to this location.                                                                                                                                                                                                     |
| <b>mailbox store</b>             | <i>(Microsoft Exchange Server specific term)</i> A part of the Information Store that maintains information in user mailboxes. A mailbox store consists of a binary rich-text <code>.edb</code> file and a streaming native internet content <code>.stm</code> file.                                                                                                                                                                                                                |
| <b>Main Control Unit (MCU)</b>   | <i>(HP StorageWorks Disk Array XP specific term)</i> An HP StorageWorks XP disk array that contains the primary volumes for the CA and BC configurations and acts as a master device. See also <a href="#">BC</a> (HP StorageWorks Disk Array XP specific term), <a href="#">CA</a> (HP StorageWorks Disk Array XP specific term), and <a href="#">HP StorageWorks Disk Array XP LDEV</a> .                                                                                         |
| <b>Manager-of-Managers (MoM)</b> | See <a href="#">MoM</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>MAPI</b>                      | <i>(Microsoft Exchange Server specific term)</i> The MAPI (Messaging Application Programming Interface) is the programming interface that lets applications and messaging clients interact with messaging and information systems.                                                                                                                                                                                                                                                  |
| <b>MCU</b>                       | See <a href="#">Main Control Unit (MCU)</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Media Agent</b>               | A process that controls reading from and writing to a device, which reads from or writes to a medium (typically a tape). During a backup session, a Media Agent receives data from the Disk Agent and sends it to the device for writing it to the medium. During a restore session, a Media Agent locates data on the backup medium and sends it to the Disk Agent. The Disk Agent then writes the data to the disk. A Media Agent also manages the robotics control of a library. |
| <b>media allocation policy</b>   | Determines in which sequence media are used for backup. The Strict allocation policy directs Data Protector to prompt for a                                                                                                                                                                                                                                                                                                                                                         |

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|                                 | specific medium. The Loose policy directs Data Protector to prompt for any suitable medium. The Formatted First policy directs Data Protector to give preference to unknown media, even if unprotected media are available in the library.                                             |
| <b>media condition</b>          | The quality of a medium as derived from the media condition factors. Heavy usage and age result in an increased number of read and write errors with tape media. Media need to be replaced when they are marked as POOR.                                                               |
| <b>media condition factors</b>  | The user-assigned age threshold and overwrite threshold used to determine the state of a medium.                                                                                                                                                                                       |
| <b>medium ID</b>                | A unique identifier assigned to a medium by Data Protector.                                                                                                                                                                                                                            |
| <b>media label</b>              | A user-defined identifier used to describe a medium.                                                                                                                                                                                                                                   |
| <b>media location</b>           | A user-defined physical location of a medium, such as "building 4" or "off-site storage".                                                                                                                                                                                              |
| <b>media management session</b> | A session performing some action on a medium, such as initializing, scanning the content, verifying data on a medium, or copying a medium.                                                                                                                                             |
| <b>media pool</b>               | A set of media of the same type (such as DDS) used and tracked as a group. Media are formatted and assigned to a media pool.                                                                                                                                                           |
| <b>media set</b>                | The result of a backup session is data backed up on a group of media called media set. Depending on the media usage policy, several sessions can share the same media.                                                                                                                 |
| <b>media type</b>               | The physical type of media, such as DDS or DLT.                                                                                                                                                                                                                                        |
| <b>media usage policy</b>       | The media usage policy controls how new backups are added to the already used media. It can be <code>Appendable</code> , <code>Non-Appendable</code> , or <code>Appendable for incrementals only</code> .                                                                              |
| <b>merging</b>                  | This defines one mode to resolve file conflicts during restore. If the file to be restored already exists at the destination, the one with the more recent modification date is kept. Files not present on the disk are always restored.<br><i>See also <a href="#">overwrite</a>.</i> |

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| <b>Microsoft Exchange Server</b>                                              | A "client-server" messaging and a workgroup system that offers a transparent connection to many different communication systems. It provides users with an electronic mail system, individual and group scheduling, online forms, and workflow automation tools. It provides a developer with a platform on which to build custom information-sharing and messaging-service applications.                                                                                                                 |
| <b>Microsoft Management Console (MMC)</b>                                     | <i>(Windows specific term)</i> An administration model for Windows-based environments. It provides a simple, consistent, and integrated administration user interface allowing management of many applications through the same GUI, provided that the applications adhere to the MMC model.                                                                                                                                                                                                              |
| <b>Microsoft SQL Server</b>                                                   | A database management system designed to meet the requirements of distributed "client-server" computing.                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Microsoft Volume Shadow Copy Service (VSS)</b>                             | A software service that provides a unified communication interface to coordinate backup and restore of a VSS-aware application regardless of its specific features. This service collaborates with the backup application, writers, shadow copy providers, and the operating system kernel to implement the management of volume shadow copies and shadow copy sets. See also <a href="#">shadow copy</a> , <a href="#">shadow copy provider</a> , <a href="#">replica</a> , and <a href="#">writer</a> . |
| <b>mirror (EMC Symmetrix and HP StorageWorks Disk Array XP specific term)</b> | See <a href="#">target volume</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>mirror rotation (HP StorageWorks Disk Array XP specific term)</b>          | See <a href="#">replica set rotation</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>MMD</b>                                                                    | The Media Management Daemon process (service) runs on the Data Protector Cell Manager and controls media management and device operations. The process is started when Data Protector is installed on the Cell Manager.                                                                                                                                                                                                                                                                                   |
| <b>MMDB</b>                                                                   | The Media Management Database (MMDB) is a part of the IDB that contains information about media, media pools, devices,                                                                                                                                                                                                                                                                                                                                                                                    |

libraries, library drives, and slots configured in the cell, as well as the Data Protector media used for backup. In an enterprise backup environment, this part of the database can be common to all cells.

See also [CMMDB](#), [CDB](#).

- MoM** Several cells can be grouped together and managed from a central cell. The management system of the central cell is the Manager-of-Managers (MoM). The cells are called MoM clients. The MoM enables you to configure and manage multiple cells from a central point.
- mount request** A screen prompt that tells you to insert a specific medium into a device. Once you respond to the mount request by providing the required medium and confirm the mount request, the session continues.
- mount point** The access point in a directory structure for a disk or logical volume, for example `/opt` or `d:`. On UNIX, the mount points are displayed using the `bdf` or `df` command.
- MSM** The Data Protector Media Session Manager, which runs on the Cell Manager and controls media sessions, such as copying media.
- MU number** (*HP StorageWorks Disk Array XP specific term*) Mirror Unit number. An integer number (0, 1 or 2), used to indicate a first-level mirror.  
See also [first-level mirror](#).
- multi-drive server** A license that allows you to run an unlimited number of Media Agents on a single system. This license, which is bound to the IP address of the Cell Manager, is no longer available.
- obdrindex.dat** See [IDB recovery file](#).
- OBDR capable device** A device that can emulate a CD-ROM drive loaded with a bootable disk and can thus be used as a backup or boot device for disaster recovery purposes.
- object** See [backup object](#).
- object consolidation** The process of merging a restore chain of a backup object, consisting of a full backup and at least one incremental backup,



into a new, consolidated version of this object. The process is a part of the synthetic backup procedure. The result is a synthetic full backup of the specified backup object.

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| <b>object consolidation session</b> | A process that merges a restore chain of a backup object, consisting of a full backup and at least one incremental backup, into a new, consolidated version of this object.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>object copy</b>                  | A copy of a specific object version that is created during an object copy session or a backup session with object mirroring.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>object copy session</b>          | A process that creates an additional copy of the backed up data on a different media set. During an object copy session, the selected backed up objects are copied from the source to the target media.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>object copying</b>               | The process of copying selected object versions to a specific media set. You can select object versions from one or several backup sessions to be copied.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>object ID</b>                    | <i>(Windows specific term)</i> The object IDs (OIDs) enable access to NTFS 5 files no matter where in the system the files reside. Data Protector treats the OIDs as alternate streams of the files.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>object mirror</b>                | A copy of a backup object created using object mirroring. Object mirrors are often referred to as object copies.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>object mirroring</b>             | The process of writing the same data to several media sets during a backup session. Data Protector enables you to mirror all or some backup objects to one or more media sets.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>offline backup</b>               | A backup during which an application database cannot be used by the application. <ul style="list-style-type: none"><li>• For simple backup methods (non ZDB), the database is generally put into a quiescent state that allows use by the backup system, but not the application, for the whole backup period (several minutes or hours). For instance, for backup to tape, until streaming of data to the tape is finished.</li><li>• For ZDB methods, the database is also put into the quiescent state, but for the period of the data replication process only (several seconds). Normal database operation can then be resumed for the rest of the backup process.</li></ul> |

See also [zero downtime backup \(ZDB\)](#) and [online backup](#).

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| <b>offline recovery</b> | Offline recovery is performed if the Cell Manager is not accessible, for example, due to network problems. Only standalone and SCSI library devices can be used for offline recovery. Recovery of the Cell Manager is always offline.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>offline redo log</b> | See <a href="#">archived redo log</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>On-Bar</b>           | <p><i>(Informix Server specific term)</i> A backup and restore system for Informix Server. ON-Bar enables you to create a copy of your Informix Server data and later restore the data. The ON-Bar backup and restore system involves the following components:</p> <ul style="list-style-type: none"> <li>• the <code>onbar</code> command</li> <li>• Data Protector as the backup solution</li> <li>• the XBSA interface</li> <li>• ON-Bar catalog tables, which are used to back up dbobjects and track instances of dbobjects through multiple backups.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>ONCONFIG</b>         | <p><i>(Informix Server specific term)</i> An environment variable that specifies the name of the active ONCONFIG configuration file. If the ONCONFIG environment variable is not present, Informix Server uses the configuration values from the <code>onconfig</code> file in the directory <code>INFORMIXDIR\etc</code> (on Windows) or <code>INFORMIXDIR/etc/</code> (on UNIX).</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>online backup</b>    | <p>A backup performed while a database application remains available for use. The database is placed into a special backup mode of operation for the time period that the backup application requires access to the original data objects. During this period, the database is fully operational, but there may be a small performance impact and log files may grow very quickly.</p> <ul style="list-style-type: none"> <li>• For simple backup methods (non ZDB), backup mode is required for the whole backup period (several minutes or hours). For instance, for backup to tape, until streaming of data to tape is finished.</li> <li>• For ZDB methods, backup mode is required for the short period of the data replication process only (several seconds). Normal database operation can then be resumed for the rest of the backup process.</li> </ul> <p>In some cases, transaction logs may also have to be backed up to allow a consistent database to be restored.<br/>See also <a href="#">zero downtime backup (ZDB)</a>, and <a href="#">offline backup</a>.</p> |

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| <b>online redo log</b>   | <i>(Oracle specific term)</i> Redo logs that have not been archived, but are either available to the instance for recording database activity or are filled and waiting to be archived or reused. See also <a href="#">archived redo log</a> .                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>OpC</b>               | See <a href="#">OM</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>OpenSSH</b>           | A set of network connectivity tools used to access remote machines securely, by using a variety of authentication and encryption methods. It needs to be installed and configured on the Installation Server and the client if you perform remote installation using secure shell.                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Oracle Data Guard</b> | <i>(Oracle specific term)</i> Oracle Data Guard is Oracle's primary disaster recovery solution. Oracle Data Guard is able to maintain up to nine standby databases, each of which is a real-time copy of the production (primary) database, to protect against corruptions, data failures, human errors, and disasters. If a failure occurs on the production (primary) database, then a failover to one of the standby databases which becomes the new primary database is possible. In addition, planned downtime for maintenance can be reduced because the production processing can be moved from the current primary database to a standby database and back quickly. |
| <b>Oracle instance</b>   | <i>(Oracle specific term)</i> Each installation of an Oracle database on one or more systems. One computer system can have several instances of a database running.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>ORACLE_SID</b>        | <i>(Oracle specific term)</i> A unique name for an Oracle Server instance. To switch among Oracle Servers, specify the desired <code>ORACLE_SID</code> . The <code>ORACLE_SID</code> is included in the <code>CONNECT DATA</code> parts of the connect descriptor in a <code>TNSNAMES.ORA</code> file and in the definition of the TNS listener in the <code>LISTENER.ORA</code> file.                                                                                                                                                                                                                                                                                      |
| <b>original system</b>   | The system configuration backed up by Data Protector before a computer disaster hits the system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>overwrite</b>         | An option that defines one mode to resolve file conflicts during restore. All files are restored from a backup even if they are older than existing files. See also <a href="#">merging</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

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| <b>OM</b>          | <p>HP Operations Manager software for UNIX provides powerful capabilities for operations management of a large number of systems and applications on in a network. Data Protector provides an integration into this management product. This integration is implemented as a SMART Plug-In for OM management servers on HP-UX, Solaris, and Linux. Earlier versions of OM were called IT/Operation, Operations Center and Vantage Point Operations.</p> <p>See also <a href="#">merging</a>.</p>                                                                                                                                                                                                                                                                                                    |
| <b>ownership</b>   | <p>The ownership of a backup determines who can restore from the backup. The user who starts an interactive backup is the session owner. If a user starts an existing backup specification without modifying it, the session is not considered interactive. In that case, if the backup owner has been defined in the backup specification, they remain the session owner. Otherwise, the session owner becomes the user who started the backup in question. For the scheduled backups, by default, the session owner is for the UNIX Cell Manager: <code>root.sys@Cell Manager</code>, and for the Windows Cell Manager, the user that was specified during the installation of the Cell Manager. It is possible to modify the ownership, so that the specific user becomes the session owner.</p> |
| <b>P1S file</b>    | <p>P1S file contains information on how to format and partition all disks installed in the system during Enhanced Automated Disaster Recovery (EADR). It is created during full backup and is saved on backup medium and on Cell Manager into <code>Data_Protector_home\Config\Server\dr\pls</code> directory on a Windows Cell Manager or in <code>/etc/opt/omni/server/dr/pls</code> directory on a UNIX Cell Manager with the filename <code>recovery.pls</code>.</p>                                                                                                                                                                                                                                                                                                                            |
| <b>package</b>     | <p><i>(MC/ServiceGuard and Veritas Cluster specific term)</i> A collection of resources (for example volume groups, application services, IP names and addresses) that are needed to run a specific cluster-aware application.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>pair status</b> | <p><i>(HP StorageWorks Disk Array XP specific term)</i> A mirrored pair of disks can have various status values depending on the action performed on it. The three most important status values are:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

- COPY - The mirrored pair is currently re-synchronizing. Data is transferred from one disk to the other. The disks do not contain the same data.
- PAIR - The mirrored pair is completely synchronized and both disks (the primary volume and the mirrored volume) contain identical data.
- SUSPENDED - The link between the mirrored disks is suspended. That means that both disks are accessed and updated independently. However, the mirror relationship is still maintained and the pair can be re-synchronized without transferring the complete disk.

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| <b>parallel restore</b>            | Restoring backed up data to multiple disks at the same time (that is, in parallel) by running multiple Disk Agents, that receive data from one Media Agent. For the parallel restore to work, select data that is located on different disks or logical volumes and during backup, the data from the different objects must have been sent to the same device using a concurrency of 2 or more. During a parallel restore, the data for multiple objects selected for restore is read from media at the same time, thereby improving performance. |
| <b>parallelism</b>                 | The concept of reading multiple data streams from an online database.                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>physical device</b>             | A physical unit that contains either a drive or a more complex unit such as a library.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>post-exec</b>                   | A backup option that executes a command or script after the backup of an object or after the entire session completes. Post-exec commands are not supplied by Data Protector. You need to create your own. They can be written as executables or batch files on Windows and as shell scripts on UNIX. See also <a href="#">pre-exec</a> .                                                                                                                                                                                                         |
| <b>pre- and post-exec commands</b> | Pre- and post-exec commands are used to perform additional action before and after a backup or restore session. They are not supplied by Data Protector. You need to create your own commands. They can be written as executables or batch files on Windows and as shell scripts on UNIX.                                                                                                                                                                                                                                                         |
| <b>prealloc list</b>               | A subset of media in a media pool that specifies the order in which media are used for backup.                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

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| <b>pre-exec</b>                      | A backup option that executes a command or script before the backup of an object or before the entire session is started. Pre-exec commands are not supplied by Data Protector. You need to create your own. They can be written as executables or batch files on Windows and as shell scripts on UNIX. See also <a href="#">post-exec</a> .                                  |
| <b>primary volume (P-VOL)</b>        | <i>(HP StorageWorks Disk Array XP specific term)</i> Standard HP StorageWorks Disk Array XP LDEVs that act as a primary volume for the CA and BC configurations. The P-VOL is located in the MCU. See also <a href="#">secondary volume (S-VOL)</a> and <a href="#">Main Control Unit (MCU)</a> .                                                                             |
| <b>protection</b>                    | See <a href="#">data protection</a> and also <a href="#">catalog protection</a> .                                                                                                                                                                                                                                                                                             |
| <b>public folder store</b>           | <i>(Microsoft Exchange Server specific term)</i> The part of the Information Store that maintains information in public folders. A public folder store consists of a binary rich-text <code>.edb</code> file and a streaming native internet content <code>.stm</code> file.                                                                                                  |
| <b>public/private backed up data</b> | When configuring a backup, you can select whether the backed up data will be: <ul style="list-style-type: none"> <li>• public, that is visible (and accessible for restore) to all Data Protector users</li> <li>• private, that is, visible (and accessible for restore) only to the owner of the backup and administrators</li> </ul>                                       |
| <b>RAID</b>                          | Redundant Array of Inexpensive Disks.                                                                                                                                                                                                                                                                                                                                         |
| <b>RAID Manager Library</b>          | <i>(HP StorageWorks Disk Array XP specific term)</i> The RAID Manager Library is used internally by Data Protector on Solaris systems to allow access to HP StorageWorks Disk Array XP configuration, status, and performance data and to key HP StorageWorks Disk Array XP features through the use of function calls translated into a sequence of low level SCSI commands. |
| <b>RAID Manager XP</b>               | <i>(HP StorageWorks Disk Array XP specific term)</i> The RAID Manager XP application provides an extensive list of commands to report and control the status of the CA and BC applications. The commands communicate through a RAID Manager instance with the HP StorageWorks Disk Array XP Disk Control Unit. This                                                           |

instance translates the commands into a sequence of low level SCSI commands.

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| <b>rawdisk backup</b>            | See <a href="#">disk image backup</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>RCU</b>                       | See <a href="#">Remote Control Unit (RCU)</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>RDBMS</b>                     | Relational Database Management System.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>RDF1/RDF2</b>                 | <i>(EMC Symmetrix specific term)</i> A type of SRDF device group. Only RDF devices can be assigned to an RDF group. An RDF1 group type contains source (R1) devices and an RDF2 group type contains target (R2) devices.                                                                                                                                                                                                                                                                                                                           |
| <b>RDS</b>                       | The Raima Database Server process (service) runs on the Data Protector Cell Manager and manages the IDB. The process is started when Data Protector is installed on the Cell Manager.                                                                                                                                                                                                                                                                                                                                                              |
| <b>Recovery Catalog</b>          | <i>(Oracle specific term)</i> A set of Oracle tables and views that are used by Recovery Manager to store information about Oracle databases. This information is used by Recovery Manager to manage the backup, restore, and recovery of Oracle databases. The recovery catalog contains information about: <ul style="list-style-type: none"><li>• The physical schema of the Oracle target database</li><li>• Data file and archived log backup sets</li><li>• Data file copies</li><li>• Archived Redo Logs</li><li>• Stored scripts</li></ul> |
| <b>Recovery Catalog Database</b> | <i>(Oracle specific term)</i> An Oracle database that contains a recovery catalog schema. You should not store the recovery catalog in your target database.                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>recovery files</b>            | <i>(Oracle specific term)</i> Recovery files are Oracle 10g specific files that reside in the flash recovery area: the current control file, online redo logs, archived redo logs, flashback logs, control file autobackups, datafile copies, and backup pieces. See also <a href="#">flash recovery area</a> .                                                                                                                                                                                                                                    |
| <b>RecoveryInfo</b>              | When backing up Windows configuration files, Data Protector collects the information about the current system configuration (information on disk layout, volume, and network configuration). This information is needed for disaster recovery.                                                                                                                                                                                                                                                                                                     |

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| <b>Recovery Manager (RMAN)</b>               | <i>(Oracle specific term)</i> An Oracle command-line interface that directs an Oracle Server process to back up, restore, or recover the database it is connected to. RMAN uses either the recovery catalog or the control file to store information about backups. This information can be used later in restore sessions.                                                                                                                                                                                        |
| <b>recycle</b>                               | A process that removes the data protection from all backed up data on a medium, allowing Data Protector to overwrite it during one of the next backups. Data that belongs to the same session(s) but resides on other media is also unprotected. Recycling does not actually alter the data on the medium.                                                                                                                                                                                                         |
| <b>redo log</b>                              | <i>(Oracle specific term)</i> Every Oracle database has a set of two or more redo log files. The set of redo log files for the database is known as the database's redo log. Oracle uses the redo log to record all changes made to data.                                                                                                                                                                                                                                                                          |
| <b>Remote Control Unit (RCU)</b>             | <i>(HP StorageWorks Disk Array XP specific term)</i> The Remote Control Unit (RCU) acts as a slave of an MCU in a CA configuration. In bidirectional configurations, the RCU can act as an MCU.                                                                                                                                                                                                                                                                                                                    |
| <b>Removable Storage Management Database</b> | <i>(Windows specific term)</i> A Windows service used for managing removable media (such as tapes and disks) and storage devices (libraries). Removable Storage allows applications to access and share the same media resources.                                                                                                                                                                                                                                                                                  |
| <b>reparse point</b>                         | <i>(Windows specific term)</i> A system-controlled attribute that can be associated with any directory or file. The value of a reparse attribute can have user-controlled data. The format of the data is understood by the application that stored the data and a filesystem filter that was installed to interpret the data and process such files. Whenever the filesystem encounters a file with a reparse point, it attempts to find the filesystem filter associated with the data format.                   |
| <b>replica</b>                               | <i>(ZDB specific term)</i> An image, at a particular point in time, of the data in source volumes that contain user-specified backup objects. Depending on the hardware or software with which it is created, the image may be an independent exact duplicate (clone) of the storage blocks at the physical disk level (for example, a split mirror or snapclone), or a virtual copy (for example, a snapshot). From perspective of a basic operating system, the complete physical disk containing backup objects |



is replicated. However, if a volume manager is used on UNIX, the whole volume or disk group containing a backup object (logical volume) is replicated. If partitions are used on Windows, the whole physical volume containing the selected partition is replicated.

See also [snapshot](#), [snapshot creation](#), [split mirror](#), and [split mirror creation](#).

- replica set** *(ZDB specific term)* A group of replicas, all created using the same backup specification.  
See also [replica](#) and [replica set rotation](#).
- replica set rotation** *(ZDB specific term)* The use of a replica set for regular backup production: Each time the same backup specification requiring the use of a replica set is run, a new replica is created and added to the set, until the maximum number for the set is reached. After that, the oldest replica in the set is replaced, maintaining the maximum number of replicas in the set.  
See also [replica](#) and [replica set](#).
- restore chain** All backups that are necessary for a restore of a backup object to a certain point in time. A restore chain consists of a full backup of the object and any number of related incremental backups.
- restore session** A process that copies data from backup media to a client.
- resync mode** *(HP StorageWorks Disk Array XP VSS provider specific term)* One of two XP VSS hardware provider operation modes. When the XP provider is in the resync mode, the source volume (P-VOL) and its replica (S-VOL) are in the suspended mirror relationship after a backup. The maximum number of replicas (S-VOLs per a P-VOL) rotated is three provided that MU range is 0-2 or 0, 1, 2. Restore from a backup in such a configuration is possible only by re-synchronization of an S-VOL with its P-VOL.  
See also [VSS compliant mode](#), [source volume](#), [primary volume \(P-VOL\)](#), [replica](#), [secondary volume \(S-VOL\)](#), [MU number](#), and [replica set rotation](#).
- RMAN (Oracle specific term)** See [Recovery Manager](#).
- RSM** The Data Protector Restore Session Manager controls the restore session. This process always runs on the Cell Manager system.

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| <b>RSM</b>                      | <i>(Windows specific term)</i> Removable Storage Manager (RSM) includes a media management service that facilitates communication among applications, robotic changers, and media libraries. It enables multiple applications to share local robotic media libraries and tape or disk drives and to manage removable media.                                                                                                                                 |
| <b>scan</b>                     | A function that identifies the media in a device. This synchronizes the MMDB with the media that are actually present at the selected locations (for example, slots in a library).                                                                                                                                                                                                                                                                          |
| <b>scanning</b>                 | A function which identifies the media in a device. This synchronizes the MMDB with the media that are actually present at the selected locations (for example, slots in a library). It is useful to perform a scan and check the actual media in the device if someone has manually manipulated media without using Data Protector to eject or enter, for example.                                                                                          |
| <b>Scheduler</b>                | A function that controls when and how often automatic backups occur. By setting up a schedule, you automate the start of backups.                                                                                                                                                                                                                                                                                                                           |
| <b>secondary volume (S-VOL)</b> | <i>(HP StorageWorks Disk Array XP specific term)</i> secondary volumes, or S-VOLs, are XP LDEVs that act as a secondary CA or BC mirror of another LDEV (a P-VOL). In the case of CA, S-VOLs can be used as failover devices in a MetroCluster configuration. The S-VOLs are assigned separate SCSI addresses, different from the addresses used by the P-VOLs. See also <a href="#">primary volume (P-VOL)</a> and <a href="#">Main Control Unit (MCU)</a> |
| <b>session</b>                  | See <a href="#">backup session</a> , <a href="#">media management session</a> , and <a href="#">restore session</a> .                                                                                                                                                                                                                                                                                                                                       |
| <b>session ID</b>               | An identifier of a backup, restore, object copy, object consolidation, or media management session, consisting of the date when the session ran and a unique number.                                                                                                                                                                                                                                                                                        |
| <b>session key</b>              | This environment variable for the pre-exec and post-exec script is a Data Protector unique identification of any session, including preview sessions. The session key is not recorded in the database, and it is used for specifying options for the <code>omnimnt</code> , <code>omnistat</code> , and <code>omniabort</code> commands.                                                                                                                    |

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| <b>shadow copy</b>              | <i>(Microsoft VSS specific term)</i> A volume that represents a duplicate of the original volume at a certain point in time. The data is then backed up from the shadow copy and not from the original volume. The original volume continues to change as the backup process continues, but the shadow copy of the volume remains constant.<br>See also <a href="#">Microsoft Volume Shadow Copy Service</a> and <a href="#">replica</a> . |
| <b>shadow copy provider</b>     | <i>(Microsoft VSS specific term)</i> An entity that performs the work on creating and representing the volume shadow copies. Providers own the shadow copy data and expose the shadow copies. Providers can be software (for example, system providers) or hardware (local disks, disk arrays).<br>See also <a href="#">shadow copy</a> .                                                                                                  |
| <b>shadow copy set</b>          | <i>(Microsoft VSS specific term)</i> A collection of shadow copies created at the same point in time.<br>See also <a href="#">shadow copy</a> and <a href="#">replica set</a> .                                                                                                                                                                                                                                                            |
| <b>shared disks</b>             | A Windows disk on another system that has been made available to other users on the network. Systems with shared disks can be backed up without a Data Protector Disk Agent installed.                                                                                                                                                                                                                                                     |
| <b>SIBF</b>                     | The Serverless Integrations Binary Files (SIBF) is a part of the IDB that stores raw NDMP meta data. This data is necessary to perform restore of NDMP objects.                                                                                                                                                                                                                                                                            |
| <b>single instancing</b>        | <i>(IAP specific term)</i> The process of recognizing redundancy of data, at both a whole object and a chunk level. It computes a strong hash for each data chunk and uses it as a unique content address needed to determine whether attempts to store duplicates are being made.<br>See also <a href="#">backup to IAP</a> .                                                                                                             |
| <b>Site Replication Service</b> | <i>(Microsoft Exchange Server specific term)</i> The Microsoft Exchange Server 2000/2003 service that permits compatibility with Microsoft Exchange Server 5.5 by emulating the Exchange Server 5.5 directory service.<br>See also <a href="#">Information Store</a> and <a href="#">Key Management Service</a> .                                                                                                                          |
| <b>slot</b>                     | A mechanical position in a library. Each slot can hold a medium, such as a DLT tape. Data Protector references each slot with a                                                                                                                                                                                                                                                                                                            |

number. To read a medium, a robotic mechanism moves the medium from a slot into the drive.

- SMB** See [split mirror backup](#).
- smart copy** (*VLS specific term*) A copy of the backed up data created from the virtual tape to the physical tape library. The smart copy process allows Data Protector to distinguish between the source and the target medium thus enabling media management. See also [Virtual Library System \(VLS\)](#).
- smart copy pool** (*VLS specific term*) A pool that defines which destination library slots are available as smart copy targets for a specified source virtual library. See also [Virtual Library System \(VLS\)](#) and [smart copy](#).
- SMBF** The Session Messages Binary Files (SMBF) part of the IDB stores session messages generated during backup, restore, object copy, object consolidation, and media management sessions. One binary file is created per session. The files are grouped by year and month.
- snapshot** (*HP StorageWorks VA and HP StorageWorks EVA specific term*) A form of replica produced using snapshot creation techniques. A range of snapshot types is available, with different characteristics, depending on the arrays/techniques used. Such replicas are dynamic and may be either virtual copies, still reliant upon the contents of the source volumes, or independent exact duplicates (clones), depending on the snapshot type and the time since creation. See also [replica](#) and [snapshot creation](#).
- snapshot backup**  
(*HP StorageWorks VA and HP StorageWorks EVA specific term*) See [ZDB to tape](#), [ZDB to disk](#), and [ZDB to disk+tape](#).
- snapshot creation** (*HP StorageWorks VA and HP StorageWorks EVA specific term*) A replica creation technique, in which copies of source volumes are created using storage virtualization techniques. The replicas are considered to be created at one particular point in time, without pre-configuration, and are immediately available for

use. However background copying processes normally continue after creation.

See also [snapshot](#).

- source (R1) device** *(EMC Symmetrix specific term)* An EMC Symmetrix device that participates in SRDF operations with a target (R2) device. All writes to this device are mirrored to a target (R2) device in a remote EMC Symmetrix unit. An R1 device must be assigned to an RDF1 group type.  
See also [target \(R2\) device](#).
- source volume** *(ZDB specific term)* A storage volume containing data to be replicated.
- sparse file** A file that contains data with portions of empty blocks. Examples are: a matrix in which some or much of the data contains zeros, files from image applications, and high-speed databases. If sparse file processing is not enabled during restore, it might be impossible to restore this file.
- split mirror** *(EMC Symmetrix and HP StorageWorks Disk Array XP specific term)* A replica created using split mirror techniques. Such a replica provides an independent, exact duplicate, or clone of the contents of the source volumes.  
See also [replica](#) and [split mirror creation](#).
- split mirror backup** *(EMC Symmetrix specific term)* See [ZDB to tape](#).
- split mirror backup** *(HP StorageWorks Disk Array XP specific term)* See [ZDB to tape](#), [ZDB to disk](#), and [ZDB to disk+tape](#).
- split mirror creation** *(EMC Symmetrix and HP StorageWorks Disk Array XP specific term)* A replica creation technique, in which a pre-configured set of target volumes (a mirror) is kept synchronized with a set of source volumes until the time at which a replica of the contents of the source volumes is required. Then, the synchronization is stopped (the mirror is split) and a split mirror replica of the source volumes at the time of the split remains in the target volumes.  
See also [split mirror](#).

- split mirror restore** *(EMC Symmetrix and HP StorageWorks Disk Array XP specific term)* A process in which data backed up in a ZDB-to-tape or a ZDB-to-disk+tape session is restored from tape media to a split mirror replica, which is then synchronized to the source volumes. Individual backup objects or complete sessions can be restored using this method.  
See also [ZDB to tape](#), [ZDB to disk+tape](#), and [replica](#).
- sqlhosts file** *(Informix Server specific term)* An Informix Server connectivity information file (on UNIX) or registry (on Windows) that contains the names of each of the database servers and any aliases to which the clients on a host computer can connect.
- SRD file** The Data Protector System Recovery Data (SRD) file contains system information required for installing and configuring the operating system in case of a disaster. The SRD file is an ASCII file, generated when a CONFIGURATION backup is performed on a Windows client and stored on the Cell Manager.
- SRDF** *(EMC Symmetrix specific term)* The EMC Symmetrix Remote Data Facility is a business continuation process that enables effective, real-time data replication of SLDs between dislocated processing environments. These environments could be situated within the same root computer environment or separated by long distances.
- SSE Agent** *(HP StorageWorks Disk Array XP specific term)* A Data Protector software module that executes all tasks required for a split mirror backup integration. It communicates with the HP StorageWorks Disk Array XP storing system using the RAID Manager XP utility (HP-UX and Windows systems) or RAID Manager Library (Solaris systems).
- sst.conf file** The file `/usr/kernel/drv/sst.conf` is required on each Data Protector Sun Solaris client to which a multi-drive library device is connected. It must contain an entry for the SCSI address of the robotic mechanism of each library device connected to the client.
- st.conf file** The file `/kernel/drv/st.conf` is required on each Data Protector Solaris client with a backup device connected. It must contain device information and a SCSI address for each backup drive connected to that client. A single SCSI entry is required

for a single-drive device and multiple SCSI entries are required for a multi-drive library device.

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| <b>stackers</b>                 | Devices with multiple slots for media storage usually with only one drive. A stacker selects media from the stack sequentially. In contrast, a library can randomly select media from its repository.                                                                                                                                                                                                                      |
| <b>standalone file device</b>   | A file device is a file in a specified directory to which you back up data.                                                                                                                                                                                                                                                                                                                                                |
| <b>Storage Group</b>            | <i>(Microsoft Exchange Server specific term)</i> A collection of mailbox stores and public folder stores that share a set of transaction log files. Exchange Server manages each storage group with a separate server process.                                                                                                                                                                                             |
| <b>StorageTek ACS library</b>   | <i>(StorageTek specific term)</i> Automated Cartridge System is a library system (also known as Silo) consisting of one Library Management Unit (LMU) and one to 24 Library Storage Modules (LSM) connected to the unit.                                                                                                                                                                                                   |
| <b>storage volume</b>           | <i>(ZDB specific term)</i> A storage volume represents an object that may be presented to an operating system or some other entity (for example, a virtualization mechanism) upon which volume management systems, file systems, or other objects may exist. The volume management systems, file systems are built on this storage. Typically, these can be created or exist within a storage system such as a disk array. |
| <b>switchover</b>               | See <a href="#">failover</a> .                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Sybase Backup Server API</b> | <i>(Sybase specific term)</i> An industry-standard interface developed for the exchange of backup and recovery information between a Sybase SQL Server and a backup solution like Data Protector.                                                                                                                                                                                                                          |
| <b>Sybase SQL Server</b>        | <i>(Sybase specific term)</i> The server in the Sybase “client-server” architecture. Sybase SQL Server manages multiple databases and multiple users, keeps track of the actual location of data on disks, maintains mapping of logical data description to physical data storage, and maintains data and procedure caches in memory.                                                                                      |
| <b>Symmetrix Agent (SYMA)</b>   | <i>(EMC Symmetrix specific term)</i> The Data Protector software module that prepares the EMC Symmetrix environment for backup and restore operations.                                                                                                                                                                                                                                                                     |

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| <b>synthetic backup</b>             | A backup solution that produces a synthetic full backup, an equivalent to a conventional full backup in terms of data, without putting stress on the production servers or the network. A synthetic full backup is created from a previous full backup and any number of incremental backups.                                                                                                                                                                                                                                                                                |
| <b>synthetic full backup</b>        | The result of an object consolidation operation, where a restore chain of a backup objects is merged into a new, synthetic full version of this object. A synthetic full backup is equivalent to a conventional full backup in terms of restore speed.                                                                                                                                                                                                                                                                                                                       |
| <b>System Backup to Tape</b>        | <i>(Oracle specific term)</i> An Oracle interface that handles the actions required to load, label, and unload correct backup devices when Oracle issues a backup or restore request.                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>system databases</b>             | <i>(Sybase specific term)</i> The four system databases on a newly installed Sybase SQL Server are the: <ul style="list-style-type: none"> <li>• master database (master)</li> <li>• temporary database (tempdb)</li> <li>• system procedure database (sybssystemprocs)</li> <li>• model database (model).</li> </ul>                                                                                                                                                                                                                                                        |
| <b>System State</b>                 | <i>(Windows specific term)</i> The System State data comprises the Registry, COM+ Class Registration database, system startup files, and the Certificate Services database (if the server is a certificate server). If the server is a domain controller, Active Directory services and the SYSVOL directory are also contained in the System State data. If the server is running the Cluster service, the System State data also includes resource registry checkpoints and the quorum resource recovery log, which contains the most recent cluster database information. |
| <b>system volume/disk/partition</b> | A volume/disk/partition containing operating system files. Microsoft terminology defines the system volume/disk/partition as the volume/disk/partition containing files required for the initial step of the boot process.                                                                                                                                                                                                                                                                                                                                                   |
| <b>SysVol</b>                       | <i>(Windows specific term)</i> A shared directory that stores the server copy of the domain's public files, which are replicated among all domain controllers in the domain.                                                                                                                                                                                                                                                                                                                                                                                                 |



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| <b>tablespace</b>                              | A part of a database structure. Each database is logically divided into one or more tablespaces. Each tablespace has data files or raw volumes exclusively associated with it.                                                                                                                                                                                                                                                                                                            |
| <b>tapeless backup<br/>(ZDB specific term)</b> | See <a href="#">ZDB to disk</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>target database</b>                         | <i>(Oracle specific term)</i> In RMAN, the target database is the database that you are backing up or restoring.                                                                                                                                                                                                                                                                                                                                                                          |
| <b>target (R2) device</b>                      | <i>(EMC Symmetrix specific term)</i> An EMC Symmetrix device that participates in SRDF operations with a source (R1) device. It resides in the remote EMC Symmetrix unit. It is paired with a source (R1) device in the local EMC Symmetrix unit and receives all write data from its mirrored pair. This device is not accessed by user applications during normal I/O operations. An R2 device must be assigned to an RDF2 group type.<br>See also <a href="#">source (R1) device</a> . |
| <b>target system</b>                           | <i>(Disaster Recovery specific term)</i> A system after a computer disaster has occurred. The target system is typically in a non-bootable state and the goal of disaster recovery is to restore this system to the original system configuration. The difference between a crashed system and a target system is that a target system has all faulty hardware replaced.                                                                                                                  |
| <b>target volume</b>                           | <i>(ZDB specific term)</i> A storage volume to which data is replicated.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Terminal Services</b>                       | <i>(Windows specific term)</i> Windows Terminal Services provide a multi-session environment that allows clients to access a virtual Windows desktop session and Windows-based programs running on the server.                                                                                                                                                                                                                                                                            |
| <b>thread</b>                                  | <i>(Microsoft SQL Server specific term)</i> An executable entity that belongs to only one process. It comprises a program counter, a user-mode stack, a kernel-mode stack, and a set of register values. Several threads can run at a time within one process.                                                                                                                                                                                                                            |
| <b>TimeFinder</b>                              | <i>(EMC Symmetrix specific term)</i> A business continuation process that creates an instant copy of single or multiple Symmetrix Logical Devices (SLDs). The instant copy is created on specially preconfigured SLDs called BCVs and is accessible via a separate device address to the system(s).                                                                                                                                                                                       |
| <b>TLU</b>                                     | Tape Library Unit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

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| <b>TNSNAMES.ORA</b>           | <i>(Oracle and SAP R/3 specific term)</i> A network configuration file that contains connect descriptors mapped to service names. The file may be maintained centrally or locally, for use by all or individual clients.                                           |
| <b>transaction</b>            | A mechanism for ensuring that a set of actions is treated as a single unit of work. Databases use transactions to keep track of database changes.                                                                                                                  |
| <b>transaction backup</b>     | Transaction backups generally use fewer resources than database backups, so they can be created more frequently than database backups. By applying transaction backups, you can recover the database to a specific point in time prior to when a problem occurred. |
| <b>transaction backup</b>     | <i>(Sybase and SQL specific term)</i> A backup of the transaction log providing a record of changes made since the last full or transaction backup.                                                                                                                |
| <b>transaction log backup</b> | Transaction log backups generally use fewer resources than database backups so they can be created more frequently than database backups. By applying transaction log backups, you can recover the database to a specific point in time.                           |
| <b>transaction log files</b>  | Files that record transactions of the database modifications, and provide fault tolerance in case of a database disaster.                                                                                                                                          |
| <b>transaction logs</b>       | <i>(Data Protector specific term)</i> Keep track of IDB changes. The archiving of transaction logs should be enabled to prevent you from losing the transaction log files that are created after the last IDB backup and are necessary for IDB recovery.           |
| <b>transaction log table</b>  | <i>(Sybase specific term)</i> A system table in which all changes to the database are automatically recorded.                                                                                                                                                      |
| <b>transportable snapshot</b> | <i>(Microsoft VSS specific term)</i> A shadow copy that is created on the application system and can be presented to the backup system where a backup can be performed.<br>See also <a href="#">Microsoft Volume Shadow Copy Service (VSS)</a> .                   |
| <b>TSANDS.CFG file</b>        | <i>(Novell NetWare specific term)</i> A file that allows you to specify the names of containers where you want backups to begin. It is a text file located in the <code>SYS:SYSTEM\TSA</code> directory on the server where <code>TSANDS.NLM</code> is loaded.     |

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| <b>UIProxy</b>                                    | The Java GUI Server ( <code>UIProxy</code> service) runs on the Data Protector Cell Manager. It is responsible for communication between the Java GUI Client and the Cell Manager, moreover, it performs business logic operations and sends only important information to the client. The service is started as soon as Data Protector is installed on the Cell Manager.                                                              |
| <b>unattended operation</b>                       | See <a href="#">lights-out operation</a> .                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>user account (Data Protector user account)</b> | You can use Data Protector only if you have a Data Protector user account, which restricts unauthorized access to Data Protector and to backed up data. Data Protector administrators create this account specifying a user logon name, the systems from which the user can log on, and a Data Protector user group membership. This is checked whenever the user starts the Data Protector user interface or performs specific tasks. |
| <b>user disk quotas</b>                           | NTFS quota-management support enables an enhanced tracking mechanism and control over disk space usage on shared storage volumes. Data Protector backs up user disk quotas on the whole system and for all configured users at a time.                                                                                                                                                                                                 |
| <b>user group</b>                                 | Each Data Protector user is member of a User Group. Each User Group has a set of user rights that are given to every user in that User Group. The number of User Groups with their associated user rights can be defined as desired. Data Protector provides three default user groups: admin, operator, and user.                                                                                                                     |
| <b>user profile</b>                               | <i>(Windows specific term)</i> Configuration information retained on a user basis. This information includes desktop settings, screen colors, network connections, and so on. When the user logs on, the user profile is loaded and the Windows environment is set accordingly.                                                                                                                                                        |
| <b>user rights</b>                                | User rights or access rights are the permissions needed to perform specific Data Protector tasks. Configuring a backup, starting a backup session, or starting a restore session are typical user rights. Users have the access rights of the user group to which they belong.                                                                                                                                                         |
| <b>vaulting media</b>                             | The process of storing media to a safe and remote place. The media are brought back to the data center when they are needed for restore or are ready for reuse in subsequent backups.                                                                                                                                                                                                                                                  |

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|                                          | The vaulting procedure depends on your company's backup strategy and policies for data protection/reliability.                                                                                                                                                                                                                                          |
| <b>verify</b>                            | A function that lets you check whether the Data Protector data on a specified medium is readable. Additionally, consistency within each block can be checked if the backup was performed with the cyclic redundancy check (CRC) option ON.                                                                                                              |
| <b>Virtual Controller Software (VCS)</b> | <i>(HP StorageWorks EVA specific term)</i> The firmware that manages all aspects of storage system operation, including communication with Command View EVA through the HSV controllers. See also <a href="#">Command View (CV) EVA</a> .                                                                                                               |
| <b>Virtual Device Interface</b>          | <i>(Microsoft SQL Server specific term)</i> This is a SQL Server programming interface that allows fast backup and restore of large databases.                                                                                                                                                                                                          |
| <b>virtual disk</b>                      | <i>(HP StorageWorks EVA specific term)</i> A unit of storage allocated from an HP StorageWorks Enterprise Virtual Array storage pool. Virtual disks are the entities that are replicated using the HP StorageWorks Enterprise Virtual Array snapshot functionality. See also <a href="#">source volume</a> and <a href="#">target volume</a> .          |
| <b>virtual full backup</b>               | An efficient type of synthetic backup where data is consolidated using pointers instead of being copied. It is performed if all the backups (the full backup, incremental backups, and the resulting virtual full backup) are written to a single file library that uses distributed file medium format.                                                |
| <b>Virtual Library System (VLS)</b>      | A disk-based data storage device hosting one or more virtual tape libraries (VTLs).                                                                                                                                                                                                                                                                     |
| <b>virtual server</b>                    | A virtual machine in a cluster environment defined in a domain by a network IP name and address. Its address is cached by the cluster software and mapped to the cluster node that is currently running the virtual server resources. This way all requests for a particular virtual server are cached by a specific cluster node.                      |
| <b>virtual tape</b>                      | <i>(VLS specific term)</i> An archival storage technology that backs up data to disk drives in the same way as if it were being stored on tape. Benefits of virtual tape systems include improved backup and recovery speed and lower operating costs. See also <a href="#">Virtual Library System (VLS)</a> and <a href="#">Virtual Tape Library</a> . |

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| <b>Virtual Tape Library (VTL)</b>    | <i>(VLS specific term)</i> An emulated tape library that provides the functionality of traditional tape-based storage.<br>See also <a href="#">Virtual Library System (VLS)</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>volser</b>                        | <i>(ADIC and STK specific term)</i> A VOLume SERIAL number is a label on the medium to identify the physical tape used in very large libraries. A volser is a naming convention specific to ADIC/GRAU and StorageTek devices.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>volume group</b>                  | A unit of data storage in an LVM system. A volume group can consist of one or more physical volumes. There can be more than one volume group on the system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>volume mount point</b>            | <i>(Windows specific term)</i> An empty directory on a volume that can be used to mount another volume. The volume mount point acts as a gateway to the target volume. Provided that the volume is mounted, users and applications can refer to the data on the mounted volume by the full (merged) filesystem path as if both volumes are one integral part.                                                                                                                                                                                                                                                                                                                         |
| <b>Volume Shadow Copy Service</b>    | See <a href="#">Microsoft Volume Shadow Copy Service</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>VPO</b>                           | See <a href="#">OM</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>VSS</b>                           | See <a href="#">Microsoft Volume Shadow Copy Service</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>VSS compliant mode</b>            | <i>(HP StorageWorks Disk Array XP VSS provider specific term)</i> One of two XP VSS hardware provider operation modes. When the XP provider is in the VSS compliant mode, the source volume (P-VOL) and its replica (S-VOL) are in simplex, unpaired state after a backup. Therefore the number of replicas (S-VOLs per a P-VOL) rotated is not limited. Restore from a backup in such a configuration is possible only by switching of the disks.<br>See also <a href="#">resync mode</a> , <a href="#">source volume</a> , <a href="#">primary volume (P-VOL)</a> , <a href="#">replica</a> , <a href="#">secondary volume (S-VOL)</a> , and <a href="#">replica set rotation</a> . |
| <b>VxFS</b>                          | Veritas Journal Filesystem.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>VxVM (Veritas Volume Manager)</b> | A Veritas Volume Manager is a system for managing disk space on Solaris platforms. A VxVM system consists of an arbitrary group of one or more physical volumes organized into logical disk groups.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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| <b>Wake ONLAN</b>                   | Remote power-up support for systems running in power-save mode from some other system on the same LAN.                                                                                                                                                                                                                                                                                                  |
| <b>Web reporting</b>                | The Data Protector functionality that allows you to view reports on backup, object copy, and object consolidation status and Data Protector configuration using the Web interface.                                                                                                                                                                                                                      |
| <b>wildcard character</b>           | A keyboard character that can be used to represent one or many characters. The asterisk (*), for example, typically represents one or more characters, and the question mark (?) typically represents a single character. Wildcard characters are often used in operating systems as a means of specifying more than one file by name.                                                                  |
| <b>Windows CONFIGURATION backup</b> | Data Protector allows you to back up Windows CONFIGURATION, including Windows Registry, user profiles, Event Logs, and WINS and DHCP server data (if configured on a system) in one step.                                                                                                                                                                                                               |
| <b>Windows Registry</b>             | A centralized database used by Windows to store configuration information for the operating system and the installed applications.                                                                                                                                                                                                                                                                      |
| <b>WINS server</b>                  | A system running Windows Internet Name Service software that resolves Windows networking computer names to IP addresses. Data Protector can back up WINS server data as part of the Windows configuration.                                                                                                                                                                                              |
| <b>writer</b>                       | <i>(Microsoft VSS specific term)</i> A process that initiates change of data on the original volume. Writers are typically applications or system services that write persistent information on a volume. Writers also participate in the shadow copy synchronization process by assuring data consistency.                                                                                             |
| <b>XBSA interface</b>               | <i>(Informix Server specific term)</i> ON-Bar and Data Protector communicate with each other through the X/Open Backup Services Application Programmer's Interface (XBSA).                                                                                                                                                                                                                              |
| <b>XCopy engine</b>                 | <i>(direct backup specific term)</i> A SCSI-3 copy command that allows you to copy data from a storage device having a SCSI source address to a backup device having a SCSI destination address, thus enabling direct backup. The data flows from a source device (either block or streaming, that is, disk or tape) to the destination device (either block or streaming) through XCopy. This releases |

the controlling server of reading the data from the storage device into memory and then writing the information to the destination device.

See also [direct backup](#).

**ZDB**

See [zero downtime backup \(ZDB\)](#).

**ZDB database**

*(ZDB specific term)* A part of the IDB, storing ZDB related information such as source volumes, replicas and security information. The ZDB database is used for ZDB, instant recovery, and split mirror restore.

See also [zero downtime backup \(ZDB\)](#).

**ZDB to disk**

*(ZDB specific term)* A form of zero downtime backup where the replica produced is kept on the disk array as a backup of the source volumes at a specific point in time. Multiple replicas, produced using the same backup specification at different times, can be kept in a replica set. A replica from ZDB to disk can be restored using the instant recovery process.

See also [zero downtime backup \(ZDB\)](#), [ZDB to tape](#), [ZDB to disk+tape](#), [instant recovery](#), and [replica set rotation](#).

**ZDB to disk+tape**

*(ZDB specific term)* A form of zero downtime backup where the replica produced is kept on the disk array as a backup of the source volumes at a specific point in time, in the same way as with ZDB to disk. However, data in the replica is also streamed to a backup medium, as with ZDB to tape. If this backup method is used, data backed up in the same session can be restored using the instant recovery process, the standard Data Protector restore from tape, or on split mirror arrays, split mirror restore.

See also [zero downtime backup \(ZDB\)](#), [ZDB to disk](#), [ZDB to tape](#), [instant recovery](#), [replica](#), and [replica set rotation](#).

**ZDB to tape**

*(ZDB specific term)* A form of zero downtime backup where data in the replica produced is streamed to a backup medium, typically tape. Instant recovery is not possible from such a backup, so the replica need not be retained on the disk array after backup completion. The backed-up data can be restored using standard Data Protector restore from tape. On split mirror arrays, split mirror restore can also be used.

See also [zero downtime backup \(ZDB\)](#), [ZDB to disk](#), [instant recovery](#), [ZDB to disk+tape](#), and [replica](#).

**zero downtime backup (ZDB)**

A backup approach in which data replication techniques, provided by a disk array, are used to minimize the impact of backup operations on an application system. A replica of the data to be backed up is created first. All subsequent backup operations are performed on the replicated data rather than the original data, while the application system can be returned to normal operation.

See also [ZDB to disk](#), [ZDB to tape](#), [ZDB to disk+tape](#), and [instant recovery](#).



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