

Veritas NetBackup™ for SAP Administrator's Guide

for UNIX, Windows, and Linux

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VERITAS™

Veritas NetBackup™ for SAP Administrator's Guide

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Contents

Chapter 1	Introduction to NetBackup for SAP	13
	About NetBackup for SAP	13
	Features of NetBackup for SAP	14
	Technical overview of NetBackup for SAP	15
	Sequence of operation for NetBackup for SAP	17
	Using NetBackup for SAP on Oracle databases without RMAN	17
	Using NetBackup for SAP on Oracle databases with RMAN	18
	SAP tools overview	19
	NetBackup for SAP on MaxDB databases	20
Chapter 2	Introduction to NetBackup SAP HANA	23
	About NetBackup for SAP HANA	23
	NetBackup for SAP HANA databases	24
Chapter 3	Installing NetBackup for SAP	25
	Planning the installation of NetBackup for SAP	25
	Verifying the operating system and platform compatibility	26
	NetBackup server and client requirements	27
	SAP server software requirements	27
	Requirements for using NetBackup for SAP MaxDB, SAP Oracle, and SAP HANA in a NetBackup cluster	28
	Configuration and licensing requirements for NetBackup for SAP with Snapshot Client	28
	About the license for NetBackup for SAP	28
	Copying the SAP binary file (Windows Oracle databases without RMAN only)	29
	Linking NetBackup for SAP with backint (UNIX or Linux Oracle databases without RMAN only)	29
	Linking the Oracle instances with the SBT library (UNIX or Linux Oracle databases with RMAN only)	30

Chapter 4	Installing NetBackup for SAP HANA	33
	Planning the installation	33
	Verifying the operating system and platform compatibility for NetBackup for SAP HANA	34
	NetBackup server and client requirements for NetBackup for SAP HANA	34
	SAP HANA software requirements for NetBackup for SAP HANA	35
 Chapter 5	 Configuring NetBackup for SAP	 37
	About configuring NetBackup for SAP	37
	About configuring a backup policy for SAP	38
	Adding a new NetBackup for SAP policy	39
	About policy attributes	40
	NetBackup for SAP backup types	40
	Configuring an application backup schedule	41
	Example application backup schedule	42
	Configuring automatic backup schedules	42
	Example automatic backup schedule	43
	About schedule properties	43
	Adding clients to a policy	44
	Adding NetBackup for SAP scripts to the backup selections list	45
	Rules for NetBackup for SAP scripts	46
	NetBackup for SAP backup scripts	47
	Modifying the NetBackup for SAP backup scripts	49
	Example NetBackup for SAP backup script (Windows)	50
	Example NetBackup for SAP backup script (UNIX)	52
	NetBackup for SAP backup script parameters	54
	Configuring the logon account for the NetBackup Client Service for NetBackup for SAP	55
	About SAP configuration files	55
	Relationships between SAP database configuration files	56
	Modifying the initSID.utl file for NetBackup for SAP	56
	Example NetBackup for SAP initSID.utl file	57
	Modifying the initSID.sap file (NetBackup for SAP Oracle databases only)	58
	Example initSID.sap file (NetBackup for SAP on Oracle databases only)	60
	Modifying the bsi.env file (NetBackup for SAP on MaxDB databases)	62
	Backing up files mounted with LOFS with NetBackup for SAP (UNIX or Linux)	65

	About permissions for NetBackup for SAP log files (UNIX)	65
	Reviewing the auto-discovered mappings in Host Management	66
	Configuring the Maximum jobs per client for NetBackup for SAP	68
	Performing a manual backup	69
	Testing multiple concurrent backup jobs for NetBackup for SAP for Oracle (without RMAN)	70
Chapter 6	Configuring NetBackup for SAP HANA	71
	About configuring the master and the media servers	71
	Configuring the media server for NetBackup SAP HANA	72
	Configuring the master server for NetBackup SAP HANA	72
	Setting the logging level	73
	Setting maximum jobs per client	73
	Creating a backup policy for SAP HANA	73
	Configuring redirected restores	74
	Configuring the NetBackup client	75
	Updating the initsap.utl file	75
	Configuring the SAP HANA Agent	75
	Node level configuration	76
	SAP HANA backint configuration	76
	Configuring SAP HANA instance for redirected restore	78
Chapter 7	Performing backups and restores of SAP	79
	Using NetBackup for SAP to perform a backup	79
	Using BRTools to start an SAP backup (for Oracle database only)	80
	Performing an SAP offline backup with SAPDBA	81
	Performing brbackup online SAP backups	81
	Performing an SAP archive	82
	Using the NetBackup multiple copies feature to create an SAP archive	83
	Using two brarchive commands in sequence to create an SAP archive	83
	Performing SAP restores using the SAPDBA utility (SAP on Oracle databases only)	84
	Redirecting a restore to a different client (SAP on Oracle databases only)	85
	SAP redirected restore sample environment (UNIX)	88
	Disaster recovery using BRRECOVER	89
	Restarting failed NetBackup for SAP backups and restores	89
	Restarting NetBackup for SAP backups	90
	Restarting SAP database restores on Oracle	101

Chapter 8	Performing backups and restores of SAP HANA	
	.....	109
	About backup and restore of SAP HANA	109
	Using the SAP HANA studio for backup	109
	Using the SAP HANA studio for restore	113
	Using SAP HANA studio for SAP HANA instance redirected restore	120
Chapter 9	NetBackup for SAP with Snapshot Client	133
	NetBackup for SAP with Snapshot Client overview	133
	Using NetBackup for SAP with Snapshot Client to back up large databases	136
	How the NetBackup for SAP Snapshot Client works	138
	How NetBackup for SAP performs a split mirror backup using backint	139
	How NetBackup for SAP performs a split mirror backup using RMAN	140
	The util_file parameter incompatible with Snapshot Client	142
	About the NetBackup for SAP restore process	142
	SAP database objects supported by advanced backup methods	142
	Configuration requirements for snapshot backups with NetBackup for SAP	143
	About configuring Snapshot Client with NetBackup for SAP	144
	Configuring a snapshot policy for NetBackup for SAP	145
	About NetBackup for SAP backup types	148
	Prerequisites for instant recovery backups (UNIX or Linux)	149
	Configuring a snapshot policy with Instant Recovery for NetBackup for SAP	150
	Additional configuration required for NetBackup for SAP with Network Attached Storage (NAS) on UNIX or Linux	153
	Configuring a NAS snapshot policy for NetBackup for SAP on UNIX/Linux	154
	About configuring NetBackup for SAP block-level incremental backups on UNIX	157
	How BLI works with NetBackup for SAP (UNIX)	157
	About Nodata Storage Checkpoint and NetBackup for SAP	158
	About Fulldata Storage Checkpoint and NetBackup for SAP	158
	Storage Checkpoint configuration on the NetBackup for SAP client	159
	Configuration requirements for BLI backups with NetBackup for SAP	159

	Configuring policies for BLI backups with NetBackup for SAP	160
	About restoring individual files from a NetBackup for SAP snapshot backup	161
	About NetBackup for SAP restores of volumes and file systems using snapshot rollback	162
	Performing a NetBackup for SAP snapshot rollback	162
	Notes on NetBackup for SAP instant recovery restores	163
	Performing SAP restores of volumes and file systems using block-level restore (Unix/Linux) or Fast File Resync (Windows)	163
	Troubleshooting NetBackup for SAP rollback restores	163
	About NetBackup for SAP sample backup scripts (UNIX or Linux)	164
	About NetBackup for SAP sample backup scripts (Windows)	164
	Mixing RMAN stream and RMAN proxy NetBackup for SAP backups	165
	Performing user-directed snapshot backups with NetBackup for SAP	166
Chapter 10	NetBackup for SAP on MaxDB databases	169
	About NetBackup for SAP on MaxDB databases	169
	About configuring NetBackup for SAP on MaxDB databases	170
	Creating a backup medium for NetBackup for SAP	170
	Using NetBackup for SAP on a MaxDB database to perform backups and restores	171
	Performing a MaxDB database backup	171
	Performing a MaxDB database query	172
	Performing a MaxDB database restore	172
	Performing SAP backups and restores using parallel medium groups	173
Chapter 11	Troubleshooting NetBackup for SAP and SAP HANA	175
	About troubleshooting NetBackup for SAP	175
	NetBackup debug logs and reports	175
	Enabling the debug logs for a NetBackup for SAP client automatically (Windows)	176
	.....	177
	Enabling the debug logs manually (UNIX)	178
	About the bphdb directory on the Windows database client	179
	About the bphdb directory on the UNIX database client	179

	About the backint directory on the UNIX database client	179
	.....	180
	Setting the debug level on a UNIX client	180
	About NetBackup server reports	180
	sapdba logs and messages (Oracle-based SAP environments only)	
	.....	180
	NetBackup for SAP backup and restore log files	181
	NetBackup for SAP archive log files	181
	Minimizing timeout failures on large database restores	182
	About troubleshooting NetBackup for SAP HANA	183
	NetBackup for SAP Oracle backup fails	183
	NetBackup SAP HANA backup jobs fail with error 41 and 25	183
	Recovery of SAP HANA database from tape storage fails	184
	Log backup fails with status 50 for SAP HANA	184
	Disaster recovery of an SAP Hana database	185
Appendix A	backint command line interface	187
	About backint command line interface for SAP	187
	About the BC-BRI BACKINT Interface	190
	About backint command line interface for SAP HANA	190
Appendix B	Input and output files for SAP HANA	193
	About input and output files for SAP HANA	193
Appendix C	backint -i in_file contents	195
	About backint -i in_file contents	195
Appendix D	backint -o out_file contents	197
	About backint -o out_file contents	197
Appendix E	NetBackup for SAP environment variables for	
	 backint	199
	.....	199
Appendix F	NetBackup for SAP configuration or bp.conf file	
	 settings	203
	.....	203

Appendix G	Parameters used in initSID.utl	205
	About parameters used in initSID.utl	206
	initSID.utl parameter summary	206
	backup_stream_buffersize <size>	208
	client <client_name>	208
	custom_sort_file <file_path>	208
	drives <number_of_drives>	212
	inquiry_query_period <months>	212
	master_time_offset <minutes> (UNIX or Linux)	213
	multistream_restore	213
	policy <policy_name>	213
	policy2 <policy_name>	214
	restore_stream_buffersize <size>	214
	retry_backup <number_of_retries>	214
	schedule <schedule_name>	214
	schedule2 <schedule_name>	215
	server <server_name>	215
	sort_backup_type <value>	215
	sort_backup_type custom	216
	sort_backup_type device	216
	sort_backup_type drive	217
	sort_backup_type size (default)	218
	sort_restore_type <value>	221
	sort_restore_type custom	221
	sort_restore_type drive	221
	sort_restore_type image (default)	222
	switch_list <control_file_path>	223
	switch_log <control_file_path>	224
	switch_sem <control_file_path>	224
Appendix H	Configuring split mirror backups	227
	About configuring split mirror backups	227
	Local-host snapshot method: nbu_snap (Solaris SPARC platform only)	
	.....	228
	Local-host snapshot method: VxVM (Solaris SPARC, HP-UX, Windows)	
	.....	229
	Local-host snapshot method: VxFS_Checkpoint (UNIX or Linux)	230
	Off-host alternate client, FlashSnap method	231
	Off-host alternate client, VVR method (Solaris SPARC, HP-UX)	233
	Hardware array-based snapshot method: Hitachi Shadow Image, EMC	
	TimeFinder, HP Business Copy (UNIX or Linux)	236

Appendix I	Register authorized locations	237
	Registering authorized locations used by a NetBackup database script-based policy	237
Index		241

Introduction to NetBackup for SAP

This chapter includes the following topics:

- About NetBackup for SAP
- Features of NetBackup for SAP
- Technical overview of NetBackup for SAP
- Sequence of operation for NetBackup for SAP
- Using NetBackup for SAP on Oracle databases without RMAN
- Using NetBackup for SAP on Oracle databases with RMAN
- SAP tools overview
- NetBackup for SAP on MaxDB databases

About NetBackup for SAP

NetBackup for SAP integrates the database backup and recovery capabilities of SAP with the backup and the recovery management capabilities of NetBackup.

NetBackup for SAP supports SAP environments based on the following databases:

- Oracle databases. In an Oracle environment, you can use the Oracle database either with or without the recovery manager (RMAN).
- SAP DB and MaxDB™ databases. This documentation describes using NetBackup for SAP with both SAP DB and MaxDB databases. For readability, the remainder of this manual uses only the term “MaxDB” to describe these database platforms.

Note: When necessary, differences are explained between using SAP on an Oracle database and SAP on a MaxDB database. For most tasks, NetBackup for SAP operates the same way in each environment.

Features of NetBackup for SAP

Table 1-1 shows NetBackup for SAP’s main features and introduces some terms used in this documentation.

Table 1-1 NetBackup for SAP features and descriptions

Feature	Description
Media and device management	All devices supported by Media Manager are available to NetBackup for SAP.
Scheduling facilities	<p>NetBackup scheduling facilities on the master server can be used to schedule automatic and unattended SAP backups.</p> <p>This feature also lets you choose the times when these operations can occur. For example, to prevent interference with normal daytime operations, you can schedule your database backups to occur only at night.</p>
Multiplexed backups and restores	NetBackup for SAP lets you take advantage of NetBackup’s multiplexing capabilities. Multiplexing directs multiple data streams to one backup device, thereby reducing the time necessary to complete the operation.
Transparent SAP and regular file system backup and restore operations	<p>All backups and restores run simultaneously and transparently without any action from the NetBackup administrator.</p> <p>The database administrator can run database backup and restore operations through NetBackup. An administrator or any other authorized user can use NetBackup to run database backups and restores.</p> <p>Alternatively, if you use NetBackup for SAP on an Oracle database, you can use SAP Tools as if NetBackup were not present.</p>
Sharing the same storage units used for other file backups	It is possible to share the same devices and media used for other backups or to give SAP exclusive use of certain devices and media. NetBackup for SAP can use Media Manager, disk, and PureDisk storage units.

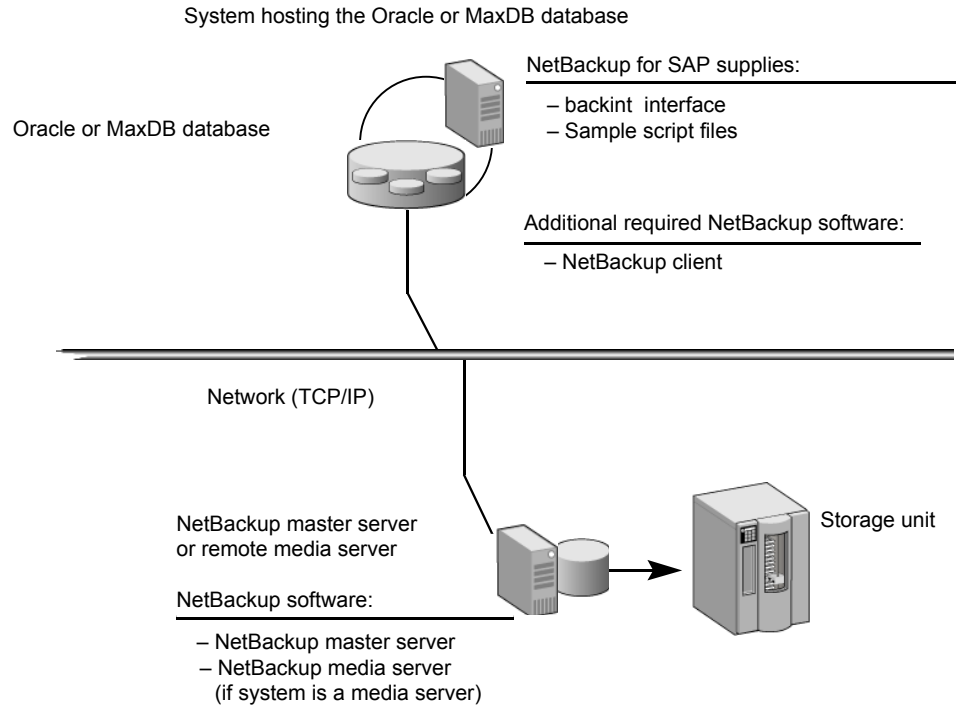
Table 1-1 NetBackup for SAP features and descriptions (*continued*)

Feature	Description
Centralized and networked backup operations	From the NetBackup master server, you can schedule database backups or start them manually for any client. The SAP databases can also reside on hosts that are different from the devices on which NetBackup stores the backups.
Graphical user interfaces	<p>NetBackup provides the following graphical user interfaces for client users and administrators:</p> <ul style="list-style-type: none"> ■ NetBackup Administration Console ■ Backup, Archive, and Restore user interface <p>A database administrator or NetBackup administrator can start backup or restore operations for SAP from the NetBackup graphical user interface on the master server.</p>
Parallel backup and restore operations	NetBackup for SAP supports the parallel backup and restore capabilities of SAP Tools. For example, this permits the user to run more than one tape device at a time for a single SAP backup or restore, thereby reducing the time necessary to complete the operation.
Compression	<p>Compression increases backup performance over the network and reduces the size of the backup image that NetBackup writes to the storage unit.</p> <p>NetBackup for SAP supports compression for the following types of backups:</p> <ul style="list-style-type: none"> ■ Stream-based backups through both MaxDB and RMAN. ■ File-based backups through <code>backint</code>. ■ Snapshot Client backups through <code>backint</code>. <p>NetBackup for SAP does not support compression for Snapshot Client backups through RMAN.</p>

Technical overview of NetBackup for SAP

Figure 1-1 shows the major components in a NetBackup for SAP configuration. The server that is hosting the Oracle or the MaxDB database must be a NetBackup client. It must also have NetBackup for SAP licensed.

Figure 1-1 NetBackup for SAP environment on an Oracle or MaxDB database



NetBackup for SAP assumes either an Oracle or a MaxDB database as the underlying database.

The following additional components are present depending on the underlying database:

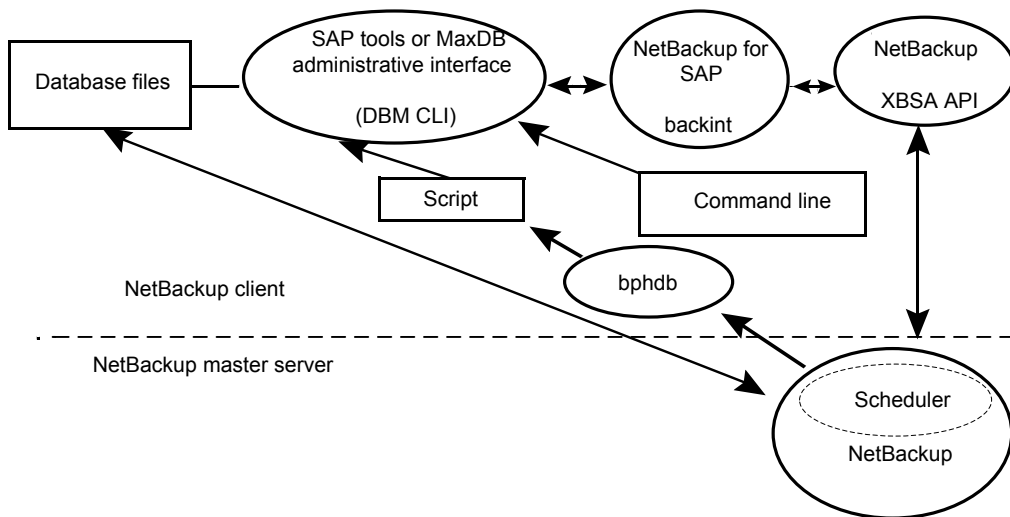
- In an Oracle environment, the SAP tools perform database-related tasks. The `brbackup`, `brarchive`, and `brrestore` utilities communicate with NetBackup through the NetBackup for SAP `backint` interface. The `sapdba` component of SAP tools also communicates with NetBackup through the `backint` interface. The component queries the NetBackup image catalog and determines the status of backup images. The component also accesses the backup catalog used by NetBackup in order to determine the status of the valid backups.
- In a MaxDB environment, you initiate backups and restores through the MaxDB administrative interface. This interface can be the database manager graphical user interface (DBM GUI), the database manager command line interface (DBM CLI), and the Web database manager (Web DBM).

Sequence of operation for NetBackup for SAP

NetBackup users or schedules start database backups or restores by executing the SAP script. If a policy on the master server initiates the backup, a NetBackup process called `bphdb` starts the SAP script on the client. Alternatively a user or process on the client host can execute the script. The script executes the SAP tools command line interface which, then starts the requested operation on the databases.

Figure 1-2 shows the sequence of operation.

Figure 1-2 NetBackup for SAP operations



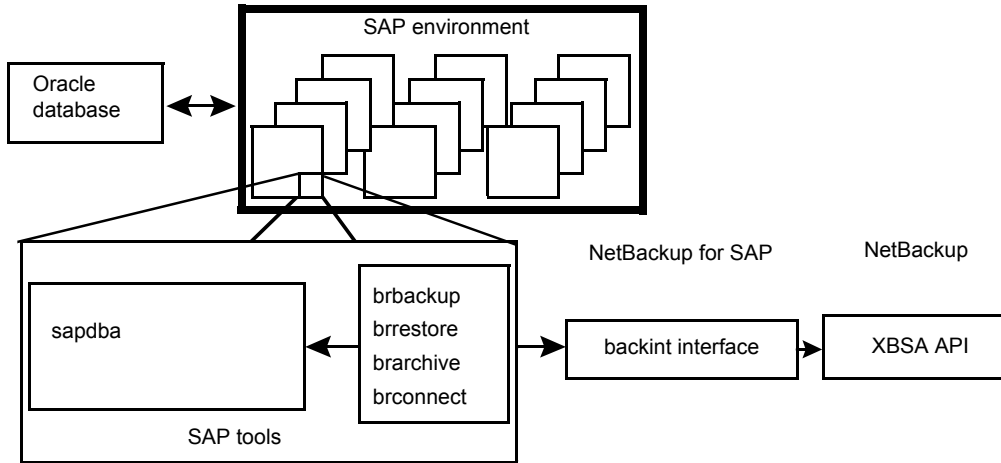
For a backup, `brbackup` calls the NetBackup for SAP `backint` interface. The `backint` interface calls the XBSA API to interface with NetBackup.

A restore works in a similar way as a backup. Except that the NetBackup for SAP `backint` interface calls the XBSA API. Therefore causes NetBackup to retrieve the data from secondary storage and send it to the client.

Using NetBackup for SAP on Oracle databases without RMAN

Figure 1-3 shows the components that are found in a NetBackup for SAP on Oracle database environment without RMAN.

Figure 1-3 Software components in a NetBackup for SAP on Oracle database environment



Using NetBackup for SAP on Oracle databases with RMAN

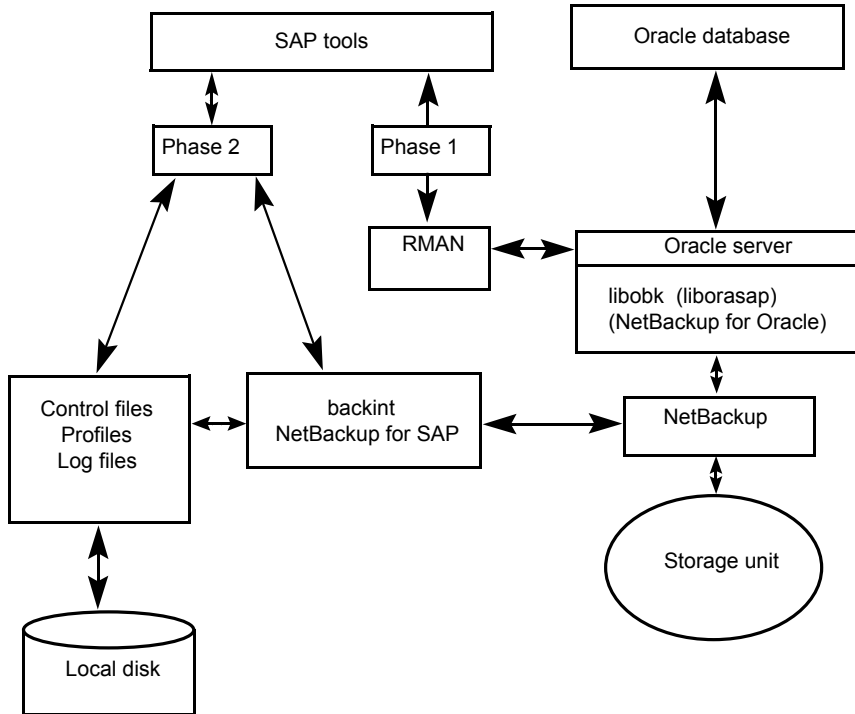
NetBackup for SAP implements the Oracle defined SBT interface, which integrates the SAP tools with RMAN.

You do not need to use RMAN to use NetBackup for SAP on Oracle databases, but the benefits of using RMAN backups are as follows:

- RMAN supports incremental backups, which are backups of only those blocks that have changed since the previous backup. This results in a reduced number of blocks being backed up. Unused and unchanged database blocks are not backed up.
- RMAN detects logical errors in database blocks during backup processing.
- The `BEGIN BACKUP` and `END BACKUP` commands are not needed for online backups because RMAN performs a block-by-block check to verify data consistency. This results in a reduced amount of redo log information.
- You can use RMAN's `verify` command to verify backups.

Figure 1-4 shows a NetBackup for SAP on Oracle database environment that includes RMAN.

Figure 1-4 Software components in a NetBackup for SAP on Oracle database environment with RMAN



If you are in a NetBackup for SAP on Oracle database environment with RMAN, the backup consists of the following phases:

- Phase 1 backs up the Oracle database files.
- Phase 2 backs up the SAP control, log, and configuration files.

SAP tools overview

The SAP environment consists of many modules and applications. One component is the SAP tools. You can use the SAP tools whether or not you also use RMAN.

Table 1-2 lists the software that is included in the SAP tools.

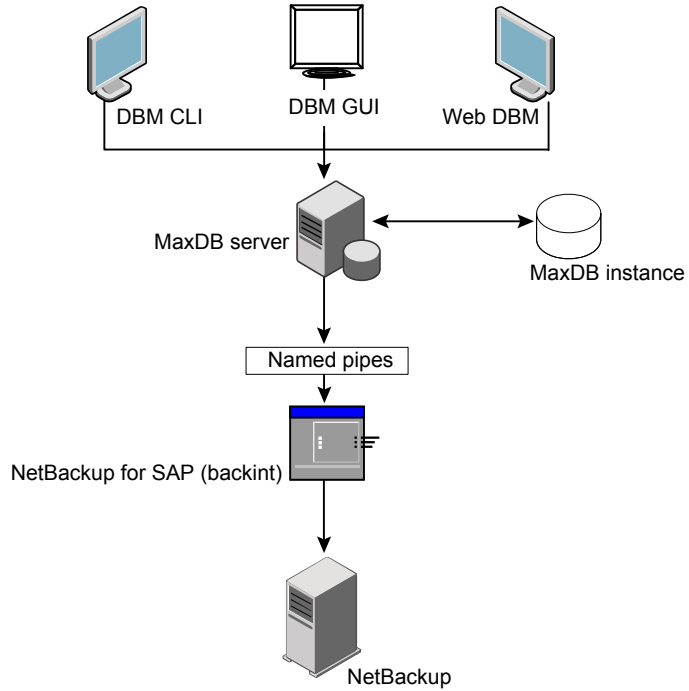
Table 1-2 SAP tools software

Component	Function
sapdba	<p>sapdba is a menu-driven utility, with menus designed to reflect the user's point of view.</p> <p>sapdba provides easy access to brbackup, brarchive, and brrestore for database backups and restores. The tool can restore a backup of an entire database or reset the database to a previous state.</p>
brbackup	<p>This command brings database servers online or offline, checks the status of SAP files, and places database tablespaces into BACKUP mode to guarantee their data consistency. The brbackup command provides online and offline backups. It also keeps a profile and log of each backup.</p> <p>brbackup uses the NetBackup software, through NetBackup for SAP, for the following actions:</p> <ul style="list-style-type: none"> ■ SAP data file backups ■ Data file and online log backups ■ Error handling
brarchive	<p>This command archives Oracle offline redo log files by communicating with the NetBackup for SAP backint interface. These files are copied by Oracle in its archiving directory. The brarchive command ensures that duplicates of these logs are available and that original files are not deleted prematurely. This command also keeps a profile and log of each archive.</p>
brrestore	<p>This command recovers database data files, control files, and online redo log files through the NetBackup for SAP backint interface. The brrestore command ensures that sufficient space is available before restoring these files, and it removes the files that are overwritten during the recovery. This command also provides a query mode.</p>
SAP script	<p>This script is a small script that contains SAP commands such as brbackup and brrestore.</p>

NetBackup for SAP on MaxDB databases

Figure 1-5 shows the components that are found in a NetBackup for SAP on MaxDB database environment.

Figure 1-5 Software components for a NetBackup for SAP on MaxDB database environment



Introduction to NetBackup SAP HANA

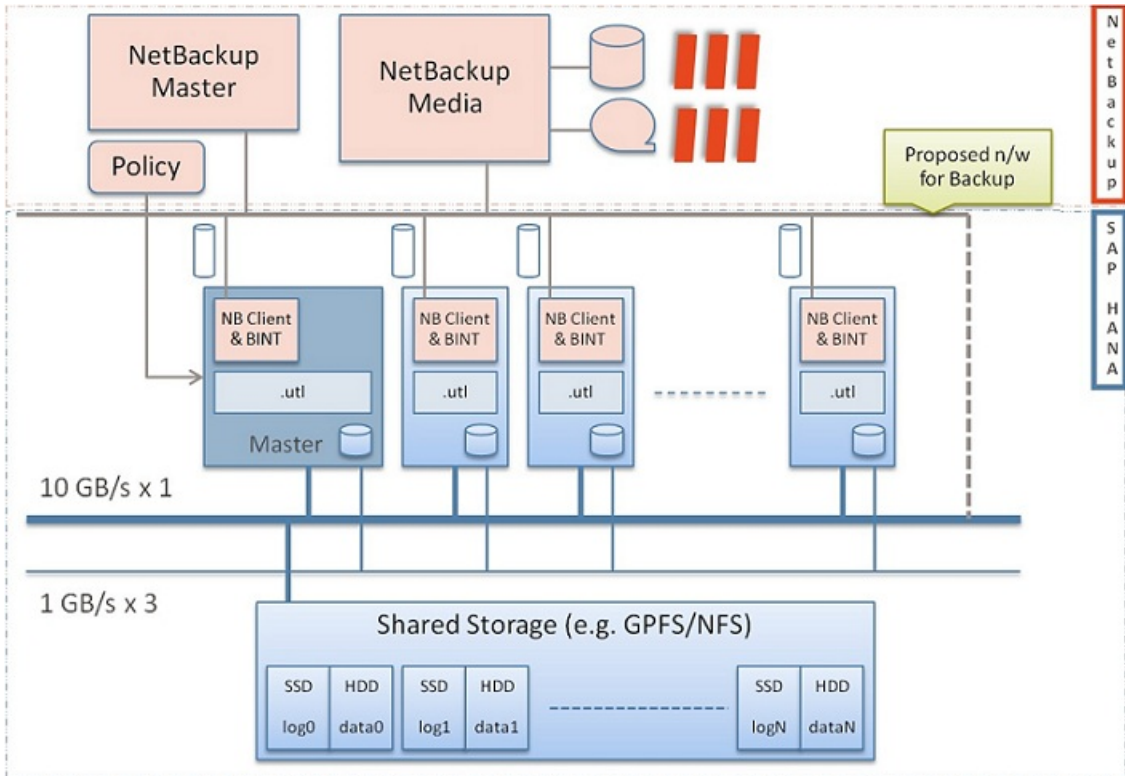
This chapter includes the following topics:

- About NetBackup for SAP HANA
- NetBackup for SAP HANA databases

About NetBackup for SAP HANA

The NetBackup for SAP HANA Agent integrates the `backint` interface for SAP HANA along with the backup and the recovery management capabilities of NetBackup.

The software works in single as well as multi-node environments.



NetBackup for SAP HANA databases

The NetBackup HANA agent implementation should work on all vendor HANA appliances that have HANA version 5, revision 46 and later versions. For Hitachi and IBM appliance there is a need to add an extra library `libelf.so.0`.

For the current support, a backup and a restore for HANA are initiated from the SAP HANA studio and not from NetBackup Administration Console.

Installing NetBackup for SAP

This chapter includes the following topics:

- Planning the installation of NetBackup for SAP
- Verifying the operating system and platform compatibility
- NetBackup server and client requirements
- SAP server software requirements
- Requirements for using NetBackup for SAP MaxDB, SAP Oracle, and SAP HANA in a NetBackup cluster
- Configuration and licensing requirements for NetBackup for SAP with Snapshot Client
- About the license for NetBackup for SAP
- Copying the SAP binary file (Windows Oracle databases without RMAN only)
- Linking NetBackup for SAP with backint (UNIX or Linux Oracle databases without RMAN only)
- Linking the Oracle instances with the SBT library (UNIX or Linux Oracle databases with RMAN only)

Planning the installation of NetBackup for SAP

Table 3-1 shows the major installation steps needed to run NetBackup for SAP.

Table 3-1 Installation steps for NetBackup for SAP

Step	Action	Description
Step 1	Verify the installation prerequisites.	See “Verifying the operating system and platform compatibility” on page 26. http://www.netbackup.com/compatibility See “NetBackup server and client requirements” on page 27. See “SAP server software requirements” on page 27. See “Configuration and licensing requirements for NetBackup for SAP with Snapshot Client” on page 28.
Step 2	Verify that master server has a valid license for NetBackup for SAP and any NetBackup options or add-ons that you want to use.	See “About the license for NetBackup for SAP” on page 28.
Step 3	Perform the appropriate linking procedure. OR Copy the NetBackup for SAP binary file	See “Linking NetBackup for SAP with backint (UNIX or Linux Oracle databases without RMAN only)” on page 29. See “Linking the Oracle instances with the SBT library (UNIX or Linux Oracle databases with RMAN only)” on page 30. See “Copying the SAP binary file (Windows Oracle databases without RMAN only)” on page 29.

Verifying the operating system and platform compatibility

Verify that the NetBackup for SAP agent is supported on your operating system or platform.

To verify operating system and compatibility

- 1** Go to the NetBackup compatibility list site.
<http://www.netbackup.com/compatibility>
- 2** Click on the following document:
 Application/Database Agent Compatibility List
- 3** For information on support for Snapshot Client, see the following document:
 Snapshot Client Compatibility List

NetBackup server and client requirements

Verify that the following requirements are met for the NetBackup server:

- The NetBackup server software is installed and operational on the NetBackup server.
See the NetBackup Installation Guide.
- Make sure that you configure any backup media that the storage unit uses. The number of media volumes that are required depends on several things:
 - The devices that are used and storage capacity of the media
 - The sizes of the databases that you want to back up
 - The amount of data that you want to archive
 - The size of your backups
 - The frequency of backups or archives
 - The length of retention of the backup imagesSee the NetBackup Administrator's Guide, Volume I.

Verify that the following requirements are met for the NetBackup clients:

- The NetBackup client software is installed on the computer that has the databases you want to back up.
If the database is clustered, you must use the same version of NetBackup on each node in the cluster.
- To use the new features that are included in NetBackup for SAP in NetBackup 9.0, you must upgrade your NetBackup for SAP clients to NetBackup 9.0. The NetBackup media server must use the same version as the NetBackup for SAP client or a higher version than the client.

SAP server software requirements

Verify the following regarding the SAP server software on the NetBackup server or client:

- SAP server software must be installed and operational.
- One or more SAP instances must exist.

See "NetBackup server and client requirements" on page 27.

Requirements for using NetBackup for SAP MaxDB, SAP Oracle, and SAP HANA in a NetBackup cluster

If you plan to use NetBackup for SAP on a NetBackup server configured in a NetBackup cluster, verify the following requirements:

- NetBackup supports your cluster environment.
See the Software Compatibility List (SCL).
- The NetBackup server software is installed and configured to work in a NetBackup cluster.
See the NetBackup Installation Guide.
See the NetBackup Clustered Master Server Administrator's Guide.
- The NetBackup client software is installed and operational on each node to which NetBackup can failover.
- A valid license for NetBackup for SAP must exist on each node where NetBackup server resides.

Configuration and licensing requirements for NetBackup for SAP with Snapshot Client

To use NetBackup for SAP with Snapshot Client, you must have a valid license for NetBackup Snapshot Client on the master server.

About the license for NetBackup for SAP

The NetBackup for SAP agent is installed with the NetBackup client software. No separate installation is required. A valid license for the agent must exist on the master server.

More information is available on how to add licenses.

See the NetBackup Administrator's Guide, Volume I.

For a NetBackup cluster, a valid license for NetBackup for SAP must exist on each node where NetBackup server resides.

Copying the SAP binary file (Windows Oracle databases without RMAN only)

Perform the following procedures only if you use NetBackup for SAP with an Oracle database but without the Oracle recovery manager (RMAN).

SAP requires that all SAP tools be located in a predetermined directory. The directory path is as follows:

```
C:\usr\sap\SID\SYS\exe\run
```

where *SID* is the unique name for an Oracle database instance. SID is also known as the System ID.

The directory should contain the following commands:

- brarchive
- brbackup
- brconnect
- brrestore
- brtools
- sapdba

To copy the NetBackup for SAP binary file (Windows Oracle databases without RMAN only)

- ◆ Copy `backint.exe` from the NetBackup install directory to the SAP tools directory.

For example, if the Oracle instance name is CER, enter the following command:

```
copy install_path\NetBackup\bin\backint.exe  
c:\usr\sap\CER\sys\exe\run
```

Linking NetBackup for SAP with backint (UNIX or Linux Oracle databases without RMAN only)

Perform the following procedures only if you use NetBackup for SAP with an Oracle database but without the Oracle recovery manager (RMAN).

SAP requires that all SAP tools be located in a predetermined directory. The directory path is as follows:

```
/usr/sap/SID/SYS/exe/run
```

where *SID* is the unique name for an Oracle database instance. SID is also known as the System ID.

The directory should contain the following commands:

- brarchive
- brbackup
- brconnect
- brrestore
- brtools
- sapdba

To link the NetBackup for SAP binary file (UNIX or Linux Oracle databases without RMAN only)

- ◆ Link `backint` from the NetBackup install directory to the SAP tools directory.

```
ln -s /usr/opensv/netbackup/bin/backint \  
/usr/sap/CER/SYS/exe/run/backint
```

Note: Never copy the file from one directory to another. Whenever NetBackup is upgraded it replaces `/usr/opensv/netbackup/bin/backint` with a new version. SAP automatically uses the updated file by the symbolic link. Copying a file can give errors.

Linking the Oracle instances with the SBT library (UNIX or Linux Oracle databases with RMAN only)

Perform the linking procedures that are described in this topic only if you use NetBackup for SAP with an Oracle database and RMAN. The exact linking command to use depends on your operating system platform.

Note: You must link Oracle with the SBT library for all Oracle instances on the host that are planned to be backed up through NetBackup for SAP using RMAN. Whenever a new Oracle instance is added it must also be similarly linked.

Link the library with NetBackup when:

- Using NetBackup for SAP for the first time.

Linking the Oracle instances with the SBT library (UNIX or Linux Oracle databases with RMAN only)

- Adding a new SAP instance that should be backed up with NetBackup for SAP with RMAN.

To link the NetBackup for SAP binary file on AIX (64-bit) and 64-bit Oracle9i R2 or later software

- ◆ Enter the following command to link the Oracle database and the SBT library to NetBackup:

```
ln -s /usr/opensv/netbackup/bin/libsapora.a64 \  
$ORACLE_HOME/lib/libobk.a
```

To link the NetBackup for SAP binary file on HP-Itanium and 64-bit Oracle9i R2 or later software

- ◆ Enter the following command to link the Oracle database and the SBT library to NetBackup:

```
ln -s /usr/opensv/netbackup/bin/libsapora.so \  
$ORACLE_HOME/lib/libobk.so
```

To link the NetBackup for SAP binary file on HP PA-RISC (64-bit) and 64-bit Oracle9i R2 or later software

- ◆ Enter the following command to link the Oracle database and the SBT library to NetBackup:

```
ln -s /usr/opensv/netbackup/bin/libsapora.sl64 \  
$ORACLE_HOME/lib/libobk.sl
```

To link the NetBackup for SAP binary file on Linux IBMpSeries or Linux Itanium and 64-bit Oracle9i R2 or later software

- ◆ Enter the following command to link the Oracle database and the SBT library to NetBackup:

```
ln -s /usr/opensv/netbackup/bin/libsapora.so \  
$ORACLE_HOME/lib/libobk.so
```

To link the NetBackup for SAP binary file on Linux (64-bit) and 64-bit Oracle9i R2 or later software

- ◆ Enter the following command to link the Oracle database and the SBT library to NetBackup:

```
ln -s /usr/opensv/netbackup/bin/libsapora.so64 \  
$ORACLE_HOME/lib/libobk.so
```

To link the NetBackup for SAP binary file on Solaris SPARC (64-bit) and 64-bit Oracle 9i R2 or later software

- ◆ Enter the following command to link the Oracle database and the SBT library to NetBackup:

```
ln -s /usr/opensv/netbackup/bin/libsapora.so64.1 \  
$ORACLE_HOME/lib/libobk.so
```

To link the NetBackup for SAP binary file on Solaris Opteron and 64-bit Oracle 10g R2 or later supported versions

- ◆ Enter the following command to link the Oracle database and the SBT library to NetBackup:

```
ln -s /usr/opensv/netbackup/bin/libsapora.so.1 \  
$ORACLE_HOME/lib/libobk.so
```


Installing NetBackup for SAP HANA

This chapter includes the following topics:

- Planning the installation
- Verifying the operating system and platform compatibility for NetBackup for SAP HANA
- NetBackup server and client requirements for NetBackup for SAP HANA
- SAP HANA software requirements for NetBackup for SAP HANA

Planning the installation

Table 4-1 shows the major installation steps that are needed to run NetBackup for SAP HANA. Each step contains one or more links to pertinent procedures and concepts.

For details about installing the media server and the master server, refer to the NetBackup Installation Guide.

Table 4-1 Installation steps for NetBackup for SAP HANA

Step	Action	Description
Step 1	Verify the installation prerequisites.	See “Verifying the operating system and platform compatibility for NetBackup for SAP HANA” on page 34. See “NetBackup server and client requirements for NetBackup for SAP HANA” on page 34. See “SAP HANA software requirements for NetBackup for SAP HANA” on page 35.
Step 2	Add the license key for NetBackup for SAP.	See “About the license for NetBackup for SAP” on page 28.

Verifying the operating system and platform compatibility for NetBackup for SAP HANA

Verify that the NetBackup for SAP HANA agent is supported on your operating system or platform.

To verify operating system and compatibility

- 1 Go to the following webpage:
<http://www.netbackup.com/compatibility>
- 2 In the list of documents, click on the following document:
Application/Database Agent Compatibility List

NetBackup server and client requirements for NetBackup for SAP HANA

Verify that the following requirements are met for the NetBackup server:

- The NetBackup server software is installed and operational on the NetBackup server. The NetBackup server platform can be any that NetBackup supports. See the NetBackup Installation Guide.
Make sure that you configure any backup media that the storage unit uses. The number of media volumes that are required depends on several things:

- The devices that are used and storage capacity of the media
- The sizes of the databases that you want to back up
- The amount of data that you want to archive
- The size of your backups
- The length of retention of the backup images.
- The frequency of backups or archives
See the NetBackup Administrator's Guide, Volume I.

Verify that the following requirements are met for the NetBackup clients:

- The NetBackup client software is installed on the computer that has the databases you want to back up.
- Check that `libelf.so.0` is symbolically linked to the `libelf.so.0.8.12` file. These files are located in `/usr/lib64/`.

SAP HANA software requirements for NetBackup for SAP HANA

Verify the following regarding the SAP HANA software on the NetBackup client:

- SAP HANA software must be installed and operational.
- One or more SAP HANA instances must exist.

Configuring NetBackup for SAP

This chapter includes the following topics:

- About configuring NetBackup for SAP
- About configuring a backup policy for SAP
- NetBackup for SAP backup scripts
- Configuring the logon account for the NetBackup Client Service for NetBackup for SAP
- About SAP configuration files
- Backing up files mounted with LOFS with NetBackup for SAP (UNIX or Linux)
- About permissions for NetBackup for SAP log files (UNIX)
- Reviewing the auto-discovered mappings in Host Management
- Configuring the Maximum jobs per client for NetBackup for SAP
- Performing a manual backup
- Testing multiple concurrent backup jobs for NetBackup for SAP for Oracle (without RMAN)

About configuring NetBackup for SAP

Before attempting to configure NetBackup for SAP, verify that your environment meets the prerequisites and perform any other configuration that is required.

After you complete the installation, follow the procedures in to configure your environment.

Note: If you use NetBackup for SAP on an Oracle database, all the configuration topics apply. If you use NetBackup for SAP on a MaxDB database, differences are noted in these topics. Also see the information on how to use NetBackup for SAP on MaxDB databases.

See “About NetBackup for SAP on MaxDB databases” on page 169.

Table 5-1 Steps to configure NetBackup for SAP

Step	Action	Description
Step 1	Configuring a backup policy.	See “About configuring a backup policy for SAP ” on page 38.
Step 2	Create backup scripts.	See “NetBackup for SAP backup scripts” on page 47.
Step 3	(Windows) Configure the logon account for the NetBackup Client Service	See “Configuring the logon account for the NetBackup Client Service for NetBackup for SAP ” on page 55.
Step 4	Edit SAP configuration files.	See “About SAP configuration files” on page 55.
Step 5	(UNIX or Linux) Configure the backups of files that are mounted with LOFS.	See “Backing up files mounted with LOFS with NetBackup for SAP (UNIX or Linux)” on page 65.
Step 6	(UNIX and Linux) Configure the permissions for log files.	See “About permissions for NetBackup for SAP log files (UNIX)” on page 65.
Step 7	Test the configuration settings.	See “Performing a manual backup” on page 69.
Step 8	Test multiple drives.	See “Testing multiple concurrent backup jobs for NetBackup for SAP for Oracle (without RMAN)” on page 70.

About configuring a backup policy for SAP

A backup policy for a database defines the backup criteria for a specific group of one or more clients.

These criteria include the following:

- Storage unit and media to use
- Policy attributes
- Backup schedules
- Clients to be backed up
- The script files to run on the clients

To back up the database environment, define at least one SAP policy with the appropriate schedules. A configuration can have a single policy that includes all clients, or there can be many policies, some of which include only one client.

See “Adding a new NetBackup for SAP policy” on page 39.

Adding a new NetBackup for SAP policy

This topic describes how to add a new backup policy for a database.

To add a new NetBackup for SAP policy

- 1** Log on to the master server as administrator (Windows) or root (UNIX).
- 2** Start the NetBackup Administration Console.
- 3** If your site has more than one master server, choose the one on which you want to add the policy.
- 4** In the NetBackup Administration Console, select **NetBackup Management > Policies**. Then select **Actions > New > Policy**.
- 5** In the **Add a New Policy** dialog box, in the **Policy name** box, type a unique name for the new policy.
- 6** Click **OK**.
- 7** In the **Add New Policy** dialog box, in the **Policy type** list, select **SAP**.
 The SAP policy type does not appear in the drop-down list unless your master server has a license for the database agent.
- 8** Complete the entries on the **Attributes** tab.
 See “About policy attributes” on page 40.
- 9** Add other policy information as follows:
 - Add schedules.
 See “Configuring an application backup schedule” on page 41.
 See “Configuring automatic backup schedules” on page 42.
 - Add clients.
 See “Adding clients to a policy” on page 44.

- Add scripts to the backup selections list.
 See “Adding NetBackup for SAP scripts to the backup selections list” on page 45.
- 10** When you have added all the schedules, clients, and backup selections you need, click **OK**.

About policy attributes

With a few exceptions, NetBackup manages the policy attributes set for a database backup like a file system backup. Other policy attributes vary according to your specific backup strategy and system configuration.

Table 5-2 describes some of the policy attributes available for a NetBackup for SAP policy. For more information on policy attributes, see the NetBackup Administrator’s Guide, Volume I.

Table 5-2 Policy attribute for NetBackup for SAP policies

Attribute	Description
Policy type	Determines the types of clients that can be backed up with the policy. For SAP databases, select the policy type SAP.
Follow NFS	<p>This option is available for SAP policies on UNIX. Select this attribute to back up the files from NFS-mounted file systems. If this option is not selected, NetBackup cannot perform a backup of NFS-mounted files.</p> <p>See “Backing up files mounted with LOFS with NetBackup for SAP (UNIX or Linux)” on page 65.</p> <p>Also see the NetBackup Administrator’s Guide, Volume I.</p> <p>Note: This option is not available for snapshot backups.</p>
Keyword phrase	For NetBackup for SAP, the Keyword phrase entry is ignored.
Snapshot Client and Replication Director	This group contains the options that enable backups with Snapshot Client.

NetBackup for SAP backup types

Table 5-3 shows the backup schedules you can specify.

Table 5-3 SAP backup types

Backup type	Description
Application Backup	The Application Backup schedule enables user-controlled NetBackup operations from the client. These operations include those initiated from the client and those initiated from an automatic schedule on the master server. Configure at least one Application Backup schedule for each database policy. The Default-Application-Backup schedule is configured automatically as an Application Backup schedule.
Automatic Full Backup	An automatic full backup schedule specifies the dates and times for NetBackup to automatically start backups. NetBackup runs the scripts in the order that they appear in the file list. If there is more than one client in the policy, the scripts are run on each client. The schedule name and type are passed to the scripts so they can distinguish initiation from a full vs incremental schedule and operate appropriately.
Automatic Incremental Backup	<p>An automatic incremental backup is a backup of only those blocks that have changed since the last automatic full (baseline) backup. This kind of backup takes less time and space than a full backup because the automatic incremental backup contains only the changed data.</p> <p>NetBackup for SAP supports this type of backup in MaxDB environments and in Oracle environments with RMAN.</p> <p>This schedule type has no direct value in Oracle environments without RMAN because a file level backup, and not the block level backup, is performed.</p>

Configuring an application backup schedule

A database backup requires an application backup schedule. You cannot perform backups if this type of schedule is not included in the policy. The NetBackup for SAP agent automatically creates this schedule and names it

Default-Application-Backup.

The backup window for an application backup schedule must encompass the time period during which all scheduled jobs and client-initiated jobs can occur. This window is necessary because the application backup schedule accepts the backup request from NetBackup for SAP regardless of whether the backup was initiated from an automatic schedule or from the client. You can choose to set the window for the application backup schedule for 24 hours per day, seven days per week. This window ensures that your operations are never locked out due to the application backup schedule.

To configure an application backup schedule

- 1 In the **Policy** dialog box, click the **Schedules** tab.
To access the **Policy** dialog box, double-click the policy name in the **Policies** list in the NetBackup Administration Console.
- 2 Double-click the schedule that is named **Default-Application-Backup**.
- 3 Specify the other properties for the schedule.

Note: Some types of SAP backups allow for multiple application backup schedules, so that storage and retention attributes can be set appropriately. In that case, additional application schedules can be created. Specify the application backup schedule name in the `initSID.utl` file on the client.

See “About schedule properties ” on page 43.

Example application backup schedule

Assume the following:

- Users perform database backup operations during business hours, 08:00 to 13:00.
- The automatic backups that use this policy start between 18:00 and 22:00.

In this scenario, the application backup schedule must have a start time of 0800 and a duration of 14 hours. Alternatively, the schedule can have two windows each day; one with a start time of 0800 and duration of 5 hours, and another with a start time of 1800 and a duration of 4 hours.

Table 5-4 Example settings for a NetBackup for SAP application backup schedule

Schedule option	Setting
Retention	2 weeks
Backup window	Sunday through Saturday 00:08:00 - 22:00:00

Configuring automatic backup schedules

If you plan to have NetBackup perform automatic backups, or if you use Snapshot Client features, you need one or more automatic backup schedules.

To configure an automatic backup schedule

- 1** On the **Policy** dialog box, click the **Schedules** tab.
- 2** Click **New**.
- 3** Specify a unique name for the schedule.
- 4** Select the **Type of backup**.
See “NetBackup for SAP backup types” on page 40.
- 5** Specify the other properties for the schedule.
See “About schedule properties ” on page 43.
- 6** Click **OK**.

Example automatic backup schedule

Table 5-5 shows example settings for an automatic backup schedule.

Table 5-5 Example settings for a NetBackup for SAP automatic backup schedule

Schedule property	Setting
Retention	2 weeks
Frequency	Every week
Backup window	Sunday, 18:00:00 - 22:00:00

About schedule properties

This topic describes the schedule properties that have a different meaning for database backups than for file system backups. Other schedule properties vary according to your specific backup strategy and system configuration. Additional information about other schedule properties is available. See the NetBackup Administrator’s Guide, Volume I.

Table 5-6 Description of schedule properties

Property	Description
Type of backup	Specifies the type of backup that this schedule can control. The selection list shows only the backup types that apply to the policy you want to configure. See “NetBackup for SAP backup types” on page 40.

Table 5-6 Description of schedule properties (*continued*)

Property	Description
Schedule type	<p>You can schedule an automatic backup in one of the following ways:</p> <ul style="list-style-type: none">■ Frequency Frequency specifies the period of time that can elapse until the next backup operation begins on this schedule. For example, assume that the frequency is 7 days and a successful backup occurs on Wednesday. The next full backup does not occur until the following Wednesday. Typically, incremental backups have a shorter frequency than full backups.■ Calendar The Calendar option lets you schedule the backup operations that are based on specific dates, recurring week days, or recurring days of the month.
Multiple copies	<p>If you want to specify multiple copies of a backup for the policy, configure Multiple copies on the application backup schedule. If using Snapshot Client, also specify Multiple copies on the automatic schedule.</p>

Adding clients to a policy

The client list contains a list of the clients on which your scripts are run during an automatic backup or the clients that can send backup requests to the application schedule. A NetBackup client must be in at least one policy but can be in more than one.

For a NetBackup for SAP policy, clients you want to add must have the following items installed or available:

- SAP
- NetBackup client or server
- The backup or restore scripts

To add clients to a NetBackup for SAP policy

- 1 Open the policy you want to edit or create a new policy.
To access the **Policy** dialog box, double-click the policy name in the **Policies** list in the NetBackup Administration Console.
- 2 Click the **Clients** tab.
- 3 Click **New**.

- 4 Type the name of the client and select the hardware and operating system of the client.

If SAP is installed in a cluster, specify the virtual name of the SAP server as the client name.

Note: If you installed NetBackup on more than one node in the SAP cluster, you must perform additional configuration.

See “Reviewing the auto-discovered mappings in Host Management” on page 66.

- 5 Choose one of the following:
 - To add another client, click **Add**.
 - If this client is the last client you want to add, click **OK**.
- 6 In the **Policy** dialog box, click **OK**.

Adding NetBackup for SAP scripts to the backup selections list

The backup selections list in a database policy is different from the list in non-database policies. For example, in a Standard or MS-Windows policy, the list contains files and directories to be backed up. In a database policy, you specify scripts to be run.

Add scripts to the backup selections list only if you want to create a policy for automatic backups. In that case, add the scripts to a policy that has automatic backup schedules. NetBackup runs the scripts in the order that the scripts appear in the backup selections list.

See “NetBackup for SAP backup scripts” on page 47.

To add scripts to the backup selections list

- 1 Ensure that the script resides on the client.

See “Registering authorized locations used by a NetBackup database script-based policy” on page 237.
- 2 Open the **Policy** dialog box.

To access the **Policy** dialog box, double-click the policy name in the policies list in the NetBackup Administration Console.
- 3 Click the **Backup Selections** tab.
- 4 Click **New**.

- 5 In the **Script** box, type the full path name of a script on the client.

For example:

```
/usr/opensv/netbackup/ext/db_ext/sap/scripts/sap_oracle/my_sap_<SID>_offline_backup
```

- 6 Click **Add**.
- 7 Choose one of the following:
 - To add another script, repeat step 5 and step 6.
 - If this client is the last script you want to add, click **OK**.
- 8 Click **OK**.

To browse for scripts to add to the backup selections list

- 1 Ensure that the script resides on the client.
See “Registering authorized locations used by a NetBackup database script-based policy” on page 237.
- 2 In the **Policy** dialog box, click the **Backup Selections** tab.
To access the **Policy** dialog box, double-click the policy name in the policies list in the NetBackup Administration Console.
- 3 Click **New**.
- 4 Click **Browse**.
- 5 Navigate to and select the script file, then click **OK**.
- 6 Choose one of the following:
 - To add another script, repeat step 4 and step 5.
 - If this client is the last script you want to add, click **OK**.
- 7 Click **OK**.

Rules for NetBackup for SAP scripts

Observe the following when you use scripts:

- To ensure that scripts run successfully on all clients, ensure that:
 - The scripts reside on each client in the client list and in the same location on each client
 - The script location is registered.
See “Registering authorized locations used by a NetBackup database script-based policy” on page 237.

- That NetBackup can access the location.
- If you use NetBackup for SAP in a cluster, that the scripts reside in a location that is available after a failover.

See “NetBackup for SAP backup scripts” on page 47.

NetBackup for SAP backup scripts

If you configured a policy for automatic scheduling, you also need to specify backup scripts to be run automatically. You can either create your own scripts or you can modify one or more of the scripts that are included in the following location(s):

Windows:

```
install_path\NetBackup\DbExt\SAP\samples
```

UNIX or Linux:

```
/usr/opensv/netbackup/ext/db_ext/sap/scripts/sap_oracle  

/usr/opensv/netbackup/ext/db_ext/sap/scripts/sap_maxdb
```

Table 5-7 shows the sample scripts.

Table 5-7 NetBackup for SAP scripts

Script name	Used by (underlying database)	Comments
sap_offline_backup sap_offline_backup.cmd	Oracle without RMAN	<p>Issues a <code>brbackup</code> command and performs a whole offline database backup.</p> <p>When initiated from an automatic schedule, the NetBackup <code>bphdb</code> process will set these variables into the environment, for use by the script and/or SAP <code>backint</code> interface. They identify the master server and policy that caused the script to be executed.</p> <p>UNIX/Linux: <code>\$\$SAP_SERVER \$\$SAP_POLICY</code></p> <p>Windows: <code>%SAP_SERVER% %SAP_POLICY%</code></p> <p>If the script is initiated from the client host, these variables can be set into the environment manually. On UNIX/Linux, the variables should be exported after being set.</p>

Table 5-7 NetBackup for SAP scripts (*continued*)

Script name	Used by (underlying database)	Comments
sap_online_backup.cmd sap_online_backup	Oracle without RMAN	Issues the <code>brbackup</code> and <code>brarchive</code> commands and performs a whole online database backup followed by an offline redo log backup.
sap_redo_log_backup sap_redo_log_backup.cmd	Oracle without RMAN	Issues the <code>brarchive</code> command and backs up the offline redo log files.
sap_rman_backup sap_rman_backup.cmd	Oracle with RMAN	Issues the <code>brbackup</code> command to perform either an RMAN incremental level 0 or incremental level 1 cumulative backup depending on whether the script was initiated from an Automatic Full or Automatic Cumulative schedule. If this script is to be initiated from the client, add logic to set the <code>SAP_FULL</code> or <code>SAP_CINC</code> variable appropriately. Otherwise the script will exit with status 0 without taking a backup.
sap_maxdb_backup sap_maxdb_backup.cmd	MaxDB	Issues a <code>dbmcli</code> command and uses the specified backup medium to perform either a full or cumulative incremental backup depending on whether the script was initiated from an Automatic Full or Automatic Cumulative schedule. If this script is to be initiated from the client, add logic to set the <code>SAP_FULL</code> or <code>SAP_CINC</code> variable appropriately. Otherwise the script will exit with status 0 without taking a backup.

If you decide to use these scripts, customize them for your environment.

Note: Always specify the correct script when configuring automatic backups or when starting operations through NetBackup. NetBackup for SAP does not generate an error if a restore script is used for a backup operation or a backup script is used for a restore operation.

Note: All scripts must be stored and run locally. One recommendation is that scripts should not be world-writable. Scripts are not allowed to be run from network or remote locations. Any script that is created and saved in the NetBackup `db_ext` (UNIX) or `dbext` (Windows) location needs to be protected during a NetBackup uninstall.

See “Registering authorized locations used by a NetBackup database script-based policy” on page 237.

Modifying the NetBackup for SAP backup scripts

This topic describes how to modify the backup scripts for NetBackup for SAP.

To modify the backup scripts

- 1 Copy the example script(s) from one of the following director(ies) to a different location on your client.

UNIX or Linux:

```
/usr/opensv/netbackup/ext/db_ext/sap/scripts/sap_oracle  
/usr/opensv/netbackup/ext/db_ext/sap/scripts/sap_maxdb
```

Windows:

```
install_path\NetBackup\DbExt\SAP\samples
```

The SAP scripts must reside in an authorized location on the client. Do not store your scripts in the sample directory because your modifications are lost if you upgrade or reinstall. Always relocate your scripts to a safe location. If the client is clustered, this location must be available after a failover.

See “Registering authorized locations used by a NetBackup database script-based policy” on page 237.

- 2 Enable proper permissions on the script files so NetBackup can run the scripts. On UNIX or Linux, set the access permissions of these scripts to `775`.

3 Modify the script according to the instructions in the file.

On UNIX or Linux, remember to edit the lines that starts with `su`. If you do not include `su - user` in your script, it does not run with the proper account and environment variables. (*user* is the SAP administrator account.) This situation can lead to problems with database backups and restores.

See “Example NetBackup for SAP backup script (Windows)” on page 50.

See “Example NetBackup for SAP backup script (UNIX)” on page 52.

4 Test the scripts you created.

See “Performing a manual backup” on page 69.

Example NetBackup for SAP backup script (Windows)

This topic includes an example backup script that was created for Windows.

For example, the `sap_offline_backup.cmd` script contains the following lines:

```
@REM
@REM $Header: sap_offline_backup.cmd,v 1.2 2002/11/20 00:47:59 $
@REM
@echo off

REM This environment variable are created by NetBackup (bphdb)

echo SAP_SCHEDULED = %SAP_SCHEDULED%
echo SAP_USER_INITIATED = %SAP_USER_INITIATED%
echo SAP_SERVER = %SAP_SERVER%
echo SAP_POLICY = %SAP_POLICY%

REM -----
REM Replace cer below with the Oracle SID of the target database.
REM -----

set ORACLE_SID=cer

REM -----
REM Replace c:\oracle below with the Oracle home path.
REM -----

set ORACLE_HOME=c:\oracle

REM -----
REM Replace C:\oracle\CER with SAPData Home Path
```

```

REM -----

set SAPDATA_HOME=C:\oracle\CER

REM -----
REM Replace path with the correct sap archive path.
REM -----

set SAPARCH=%SAPDATA_HOME%\saparch

REM -----
REM Replace path with the correct sap backup path.
REM -----

set SAPBACKUP=%SAPDATA_HOME%\sapbackup

REM -----
REM Replace path with the correct sap reorg path.
REM -----

set SAPREORG=%SAPDATA_HOME%\sapreorg

REM -----
REM Replace path with the correct Path to Brtools
REM -----

set SAPEXE=C:\usr\sap\%ORACLE_SID%\sys\exe\run

REM -----
REM Replace path with the correct BRBACKUP path.
REM -----

set BRBACKUP=c:\usr\sap\%ORACLE_SID%\sys\exe\run\brbackup

REM Full offline backup

set CMD_LINE=%BRBACKUP% -u internal/ -c -d util_file -t offline -m all
%CMD_LINE%

REM -----
REM To communicate with NetBackup's job monitor for an automatic schedule
REM a "STATUS_FILE" variable is created by NetBackup (bphdb) that contains
REM a path to a file. This file is check by NetBackup to determine if the

```

```
REM automatic schedule was successful. It is up to the script to write
REM a 0 (passed) or 1 (failure) to the status file to communicate to NetBackup
REM the status of the execution of the script. The following code echo a 0
REM to %STATUS_FILE% if successful and echo a 1 to %STATUS_FILE% for a
REM failure.
REM -----

if errorlevel 1 goto errormsg
echo BRBACKUP successful
if "%STATUS_FILE%" == "" goto end
if exist "%STATUS_FILE%" echo 0 > "%STATUS_FILE%"
goto end

:errormsg
echo Execution of BRBACKUP command failed - exiting
if "%STATUS_FILE%" == "" goto end
if exist "%STATUS_FILE%" echo 1 > "%STATUS_FILE%"

:end
```

Example NetBackup for SAP backup script (UNIX)

For example, the `sap_offline_backup` script contains the following lines:

```
#!/bin/sh
#
#NOTE:IF your SAP user (in this script orasap) runs in C shell, environmental
#variables can not be exported. In that case, you should modify this script to
#work in your environment. For example:
#   SAP_SERVER=$SAP_SERVER; export SAP_SERVER; (Correct for Bourne and Korn shells)
#   can change into
#   setenv SAP_SERVER $SAP_SERVER; (Correct for C shell)
#
#
#This environment variable are created by NetBackup (bphdb)
#
echo "SAP_SCHEDULED = $SAP_SCHEDULED"
echo "SAP_USER_INITIATED = $SAP_USER_INITIATED"
echo "SAP_SERVER = $SAP_SERVER"
echo "SAP_POLICY = $SAP_POLICY"
```

```
RETURN_STATUS=0

SAP_ENV=""
#
# If SAP_SERVER exists then export it to make it available to backint
#
if [ -n "$SAP_SERVER" ]
then
    SAP_ENV="$SAP_ENV SAP_SERVER=$SAP_SERVER; export SAP_SERVER;"
#if Oracle DBA account( orasap user) uses C Shell, comment the above line and
#uncomment next line
#    SAP_ENV="$SAP_ENV setenv SAP_SERVER $SAP_SERVER;"
fi

#
# If SAP_POLICY exists then export it to make it available to backint
#
if [ -n "$SAP_POLICY" ]
then
    SAP_ENV="$SAP_ENV SAP_POLICY=$SAP_POLICY;export SAP_POLICY;"
#if Oracle DBA account( orasap user) uses C Shell, comment the above line and
#uncomment next line
#    SAP_ENV="$SAP_ENV setenv SAP_POLICY $SAP_POLICY;"
fi

#
# Full offline backup
#

CMD_LINE="$SAP_ENV brbackup -c -d util_file -t offline -m all"

#
# The username on the "su" command needs to be replaced with the correct
# user name.
#
echo "Execute $CMD_LINE"
su - orasap -c "$CMD_LINE"

RETURN_STATUS=$?

exit $RETURN_STATUS
```

NetBackup for SAP backup script parameters

The SAP scripts that enable the SAP utilities to perform backups and restores use parameters defined in the following sources:

- Environment variables
- Configuration files. For example, `initSID.utl`, where `SID` is the instance.
- (UNIX or Linux) NetBackup configuration file (`bp.conf`)
- (Windows) NetBackup configuration

You can use the different parameter sources to create SAP scripts to perform different database backup and restore tasks.

For example, you can define `%SAP_POLICY%` (`$SAP_POLICY`) in an SAP script to perform different types of backups.

Table 5-8 describes the environment variables that are created locally when NetBackup’s automatic scheduler runs an SAP script. Their values can be used to direct the flow of actions within the script. Some affect the `SAP backint` interface, and can be changed within the script.

Table 5-8 Environment variables

Environment variable	Purpose
<code>\$SAP_POLICY</code> <code>%SAP_POLICY%</code>	Names the NetBackup for SAP policy, if initiated from an automatic backup schedule. If set, specifies the policy to which the application backup jobs will be sent.
<code>\$SAP_SCHEDULED</code> <code>%SAP_SCHEDULED%</code>	Is set to <code>1</code> if this operation was initiated from an automatic schedule. If not set to <code>1</code> , the script can then set values for the other variables during client-initiated operations.
<code>\$SAP_SERVER</code> <code>%SAP_SERVER%</code>	Names the NetBackup server if initiated from an automatic backup schedule. If set, specifies the master server to which the application backup jobs will be sent.
<code>\$SAP_USER_INITIATED</code> <code>%SAP_USER_INITIATED%</code>	The opposite of <code>SAP_SCHEDULED</code> . Is set to <code>0</code> if this operation was initiated from an automatic schedule.
<code>SAP_SNC_SCHED</code>	Names the NetBackup for SAP automatic schedule, if initiated from an automatic schedule.
<code>SAP_FULL/SAP_CINC/SAP_INCR</code>	If the backup initiated from an automatic schedule, the appropriate one will be set to <code>1</code> , the others to <code>0</code> .

Table 5-8 Environment variables (*continued*)

Environment variable	Purpose
SAP_CLIENT	Names the NetBackup for SAP client from the policy, if initiated from an automatic schedule. If set, specifies the client name which the application backup job will use

Configuring the logon account for the NetBackup Client Service for NetBackup for SAP

To configure the logon account for the NetBackup Client Service for NetBackup for SAP

- 1 Open the Windows Services application.
- 2 Double-click on the **NetBackup Client Service** entry.
- 3 Click on the **Log On** tab.
- 4 Type the password.
- 5 Click **OK**.
- 6 Stop and start the NetBackup Client Service.
- 7 Close the Services control panel application.

About SAP configuration files

Table 5-9 lists the files that you need to modify depending upon whether your underlying database is an Oracle database or a MaxDB database.

Table 5-9 SAP configuration files

File	Underlying database	Comments
initSID.utl	Oracle and MaxDB	SAP parameter file. This file specifies policy, schedule, client, and other information to the <code>backint</code> interface.
initSID.sap	Oracle	SAP profile file. This file contains the information that the SAP tools use to interact with the <code>backint</code> and <code>RMAN</code> interfaces.
bsi.env	MaxDB	MaxDB configuration file. This file contains the information that the SAP tools use to interact with the <code>backint</code> interface.

See “About configuring NetBackup for SAP” on page 37.

See “Relationships between SAP database configuration files” on page 56.

See “NetBackup for SAP backup types” on page 40.

Relationships between SAP database configuration files

The SAP tools pass information in these configuration files to the `backint` interface.

When `backint` runs, the following occurs:

- In NetBackup for SAP on Oracle databases, you specify the actual `initSID.utl` file name as the argument to the `util_par_file` parameter in the `initSID.sap` file.
- In NetBackup for SAP on MaxDB databases, you specify the actual `initSID.utl` file name as the argument to the `PARAMETERFILE` parameter in the `bsi.env` file.
- The `initSID.utl` file name becomes the argument to the `backint` command’s `-p par_file` parameter.

See “About SAP configuration files” on page 55.

See “NetBackup for SAP on MaxDB databases” on page 20.

See “NetBackup for SAP backup types” on page 40.

Modifying the `initSID.utl` file for NetBackup for SAP

The `initSID.utl` file is the SAP parameter file. Edit this file as part of configuring NetBackup for SAP.

To modify the `initSID.utl` file

- 1 Check for an existing parameter file.

If an `initSID.utl` file already exists in the `$ORACLE_HOME/dbs` or `%ORACLE_HOME%\database` directory, copy it to a backup file.

- 2 Create a new parameter file.

Copy the parameter file that is included in the NetBackup for SAP software distribution to the appropriate directory:

Windows:

```
%ORACLE_HOME%\database
```

UNIX or Linux:

```
$ORACLE_HOME/dbs
```

For example, if the Oracle instance is `SAP`, copy the NetBackup example `.utl` file to `initSAP.utl`, as follows:

Windows:

```
copy install_path\NetBackup\dbext\sap\scripts\initSAP.utl
%ORACLE_HOME%\database\initSAP.utl
```

UNIX or Linux:

```
cp /usr/opensv/netbackup/ext/db_ext/sap/scripts/sap_oracle/initSAP.utl \
$ORACLE_HOME/dbs/initSAP.utl
```

- 3 Modify `initSID.utl` file with a text editor to set the parameters to values that are appropriate to your site.

The following parameters are required: `client`, `switch_list`, `switch_log`, `switch_sem`.

You can set the following additional parameters depending on whether or not you use RMAN:

- If you use RMAN, set `policy`, `schedule`, and `server`.
- If you do not use RMAN, set `drives`, `policy`, `schedule`, and `server`.

Example NetBackup for SAP `initSID.utl` file

The following shows example `initSID.utl` files with all the parameters required for NetBackup for SAP on Oracle databases:

UNIX or Linux:

```
policy sap_policy_1
schedule Default-Application-Backup
client puffin
server puffin
drives 2
switch_list /oracle/sap/sapbackup/.switch.lis
switch_sem /oracle/sap/sapbackup/.switch.sem
switch_log /oracle/sap/sapbackup/.switch.log
```

Windows:

```
policy sap_policy_1
schedule Default-Application-Backup
client puffin
server puffin
drives 2
switch_list F:\oracle\SID\SAPBackup\.switch.lis
switch_sem F:\oracle\SID\SAPBackup\.switch.sem
switch_log F:\oracle\SID\SAPBackup\.switch.log
```

Note: The question mark (?) and ampersand (&) Oracle substitution characters and the \$ORACLE_HOME (%ORACLE_HOME%) environment variable are not allowed in the `initSID.utl` file. They are not allowed in the `par_file` that the `backint -p parfile` option identifies.

Modifying the `initSID.sap` file (NetBackup for SAP Oracle databases only)

The `initSID.sap` file is the SAP profile file. This file signals to the SAP tools that you use the `backint` interface and conveys information about NetBackup for SAP to the SAP tools. Edit this file as part of configuring NetBackup for SAP when the underlying database is Oracle.

To modify the `initSID.sap` file

- 1 Check for an existing profile file.

If an `initSID.sap` file already exists in the `$ORACLE_HOME/dbs` (`%ORACLE_HOME%\database`) directory, copy it to a backup file.

- 2 Create a new profile file.

Copy the profile file that is included in the NetBackup for SAP software distribution to the `$ORACLE_HOME/dbs` (`%ORACLE_HOME%\database`) directory.

For example, if the Oracle instance is `SAP`, copy the NetBackup example `.sap` file to `initSAP.sap`, as follows:

Unix or Linux:

```
cp /usr/opensv/netbackup/ext/db_ext/sap/scripts/sap_oracle/initSAP.sap \  
$ORACLE_HOME/dbs/initSAP.sap
```

Windows:

```
copy install_path\NetBackup\dbext\sap\scripts\initSAP.sap \  
%ORACLE_HOME%\database\initSAP.sap
```

- 3 Modify the `initSID.sap` file with a text editor to set the `backup_dev_type` and `util_par_file` parameters to values that are appropriate to your site.

- 4 (Conditional) Specify the `rman_parms` parameter and set the `NB_ORA_SAP` environment variable.

Perform this step only if you use NetBackup for SAP on an Oracle database with RMAN. For example:

```
rman_parms = "ENV=(NB_ORA_SAP=file) "
```

where *file* specifies the full path to the `initSID.utl` file. Do not use substitution in the *file* specification.

For example, this parameter might look like the following:

Unix or Linux:

```
rman_parms = "ENV=(NB_ORA_SAP=/apps/oracle/dbs/initCER.utl) "
```

Windows:

```
rman_parms = "ENV=(NB_ORA_SAP=C:\apps\oracle\database\initCER.utl) "
```

Depending on your site practices, you might want to specify the following additional NetBackup environment variables and their values as arguments to the `rman_parms` parameter: `NB_ORA_POLICY`, `NB_ORA_SCHED`, `NB_ORA_CLIENT`, and `NB_ORA_SERV`. You can also specify values for these environment variables in the `initSID.utl` file. If you specify differing values, the ones in `initSID.sap` override those in `initSID.utl`.

For example, consider that you want to use one policy and schedule for the first part of a backup (data files). You want a different policy and schedule for the second part of a backup (the control file backup). You can set the `NB_ORA_POLICY` and `NB_ORA_SCHED` variables in `initSID.sap` to pertain to the first part of the backup. Then, you can set these variables to the different values that pertain to the second part of the backup in `initSID.utl`. NetBackup for SAP checks only `initSID.utl` when backing up the control files; it does not check `initSID.sap`.

You can include other RMAN parameters in this file. For more information on other parameters, see your SAP documentation.

- 5 Save and close the `initSID.sap` file.

Example initSID.sap file (NetBackup for SAP on Oracle databases only)

For example, assume that `initSAP.sap` is your profile file and `initSAP.utl` is your parameter file. You can use the following procedure to set parameters.

To edit the `initSID.sap` file (NetBackup for SAP on Oracle databases only)

1 Use a text editor to open the `initSAP.sap` file.

2 Find the following line:

```
backup_dev_type = tape
```

3 Copy and paste this line under the original.

```
backup_dev_type = tape  
backup_dev_type = tape
```

4 Comment out the original line.

```
#backup_dev_type = tape  
backup_dev_type = tape
```

5 Change `tape` to `util_file`.

```
#backup_dev_type = tape  
backup_dev_type = util_file
```

6 Find the following line:

```
util_par_file = file_path
```

7 Copy and paste this line under the original.

```
util_par_file = file_path  
util_par_file = file_path
```

- 8 Comment out the original line.

```
#util_par_file = file_path  
util_par_file = file_path
```

- 9 Change *file_path* to the path to the `initSID.utl` parameter file.

UNIX or Linux:

```
#util_par_file = file_path  
util_par_file = ?/dbs/init@.utl
```

Windows:

```
#util_par_file = file_path  
util_par_file = ?\database\init@.utl
```

This example file uses environment variable settings and Oracle substitution characters. When the SAP tools interpret the `initSID.sap` profile file, they replace the question mark (?) and at sign (@) characters.

These characters are replaced with the values assigned to the `$ORACLE_HOME` (`%ORACLE_HOME%`) and `$ORACLE_SID` (`%ORACLE_SID%`) environment variables, respectively.

Modifying the `bsi.env` file (NetBackup for SAP on MaxDB databases)

The `bsi.env` file specifies the following:

- The `backint` for MaxDB program's location, which is NetBackup for SAP on MaxDB.
- How to communicate with `backint`.

The database manager uses this information when it performs backups and restores.

`bsi.env` is the default name for this configuration file. If you want to change this name, you can specify a different name in the `BSI_ENV` environment variable in the MaxDB user environment.

Table 5-10 lists the parameters that you can include in the `bsi.env` file.

Table 5-10 bsi.env file parameters

Parameter	Description
BACKINT /usr/opencv/netbackup/bin/backint BACKINT <install_path>\Veritas\NetBackup \bin\backint.exe	Specifies the absolute path and file name of the <code>backint</code> for MaxDB program.
INPUT <i>absolute_path/file_name</i> INPUT <i>absolute_path\file_name</i> OUTPUT <i>absolute_path/file_name</i> OUTPUT <i>absolute_path\file_name</i> ERROROUTPUT <i>absolute_path/file_name</i> ERROROUTPUT <i>absolute_path\file_name</i>	<p>The <code>INPUT</code> parameter specifies the absolute path and file name of the standard input file. The <code>OUTPUT</code> parameter specifies the absolute path and file name of the standard output file. The <code>ERROROUTPUT</code> file specifies the absolute path and file name of the standard error output file.</p> <p>The database manager creates these files temporarily and uses them for standard input, output, and error output for <code>backint</code> for MaxDB.</p>
PARAMETERFILE <i>absolute_path/file_name</i> PARAMETERFILE <i>absolute_path\file_name</i>	Specifies the absolute path and file name of the configuration file for the <code>backint</code> for MaxDB program, <code>initSAP.utl</code> .
TIMEOUT_SUCCESS <i>seconds</i>	<p>The number of seconds after which the backup tool exits and after the database kernel has copied all data successfully. Default is 300.</p> <p>This value is the period of time after which the database manager terminates the backup tool if all data has been copied to the pipes. Note that the backup tool always exits after this defined period. This exit occurs whether all the data is copied from the database kernel is backed up by the backup tool or not.</p>
TIMEOUT_FAILURE <i>seconds</i>	<p>This parameter is effective only if the database kernel has stopped the backup due to an error. In such a case, <i>seconds</i> specifies the number of seconds after which the backup tool exits. Default is 300.</p> <p>Allow enough time for the backup tool to save all the data that the database kernel copies. The backup tool always exits when this timeout is reached, even if not all of the copied data has been saved yet. However, do not specify too much time. You risk a situation in which a backup that is stopped by the database kernel blocks other backups, such as automatic nightly backups, from being started.</p>

Table 5-10 bsi.env file parameters (continued)

Parameter	Description
ORIGINAL_RUNDIRECTORY <i>absolute_path</i>	<p>Specifies the absolute path of the run directory of the source database. The default value is the run directory of the current database instance. This value is case-sensitive.</p> <p>Specify this parameter only for a migration. The following prerequisite must be met for migration from one computer to another:</p> <p>The version of <code>backint</code> for MaxDB that you use is capable of backing up from the source computer available on the target computer.</p>

To create a MaxDB configuration file

- 1 Use a text editor to create the MaxDB configuration file, `bsi.env`.
 You can give the MaxDB configuration file a name other than `bsi.env`. If so, edit the `BSI_ENV` environment variable and include the full path to this file.
- 2 Use the parameters to specify backup characteristics.
 You must include the following parameters in `bsi.env`: `BACKINT`, `INPUT`, `OUTPUT`, `ERROROUTPUT`, and `PARAMETERFILE`. All other parameters are optional.
 The following is an example of a file with the minimum configuration specified:

UNIX or Linux:

```
BACKINT /usr/openv/netbackup/bin/backint
INPUT /export/home/sapdb/logs/backint.in
OUTPUT /export/home/sapdb/logs/backint.out
ERROROUTPUT /export/home/sapdb/logs/backint.err
PARAMETERFILE /export/home/sapdb/indep_data/wrk/initSAP.utl
```

Windows:

```
BACKINT install_path\NetBackup\bin\backint
INPUT C:\sapdb\logs\backint.in
OUTPUT C:\sapdb\logs\backint.out
ERROROUTPUT C:\sapdb\logs\backint.err
PARAMETERFILE C:\sapdb\indep_data\wrk\initSAP.utl
```


Backing up files mounted with LOFS with NetBackup for SAP (UNIX or Linux)

The NetBackup for SAP Agent for Unix/Linux supports backups of files from a loopback virtual file system (LOFS). An LOFS file system lets you create a virtual file system that provides access to existing files through the use of alternate pathname. Consider a loopback mount of the `/oracle` file system onto the `/database` file system. This loopback mount allows the `/oracle` file system to also appear under the `/database` file system. All files in `/oracle` are then accessible either from a pathname relative to `/oracle` or relative to `/database`. For example, `/database/sapdata1/system/system.dbf`.

If you have a local file system mounted as an LOFS, you do not need to select **Follow NFS**.

Select the “Follow NFS” option for backups of an LOFS if the actual file system (for example, `/oracle`) is either of the following:

- An NFS mount
- A Solaris global zone file system and mounted with LOFS onto a non-global zone.

About permissions for NetBackup for SAP log files (UNIX)

NetBackup uses the `/usr/opensv/netbackup/logs` directory tree not only for the recording of troubleshooting information, but for progress and communication updates to users and other NetBackup applications. Restrictive permissions on these directories can not only disable the collection of troubleshooting data, but also prevent the application itself from functioning correctly.

Back up and restore operations fail when permissions are too restrictive. We recommend that you make all of the `usr/opensv/netbackup/logs` directories and subdirectories readable and writeable by all users (777 permissions). However, security requirements may prohibit global read-write access. If so, you can restrict permissions of specific directories to a single group or user. You can restrict permissions in this way if the processes the group or a user runs initiate all backup and restore operations for that directory.

Check that the `/usr/opensv/netbackup/logs/user_ops` directory tree has 777 permissions. The items in this directory need to be accessible for the applications to operate correctly.

Reviewing the auto-discovered mappings in Host Management

In certain scenarios, a NetBackup host shares a particular name with other hosts or has a name that is associated with a cluster. To successfully perform backups and restores with NetBackup for SAP, you must approve each valid **Auto-Discovered Mapping** that NetBackup discovers in your environment. These mappings appear in the Host Management properties on the master server. You can also use the `nbhostmgmt` command to manage the mappings. See the NetBackup Administrator's Guide, Volume I for more details on Host Management properties.

Examples of the configurations that have multiple host names include:

- A host is associated with its fully qualified domain name (FQDN) and its short name or its IP address.
- If the SAP server is clustered, the host is associated with its node name and the virtual name of the cluster.

Auto-discovered mappings for a cluster

In a SAP cluster environment, you must map the node names to the virtual name of the cluster if the following apply:

- If the backup policy includes the cluster name (or virtual name)
This mapping is not required for SAP HANA. That type of policy includes the node names in the cluster and not the virtual name of the cluster.
- If the NetBackup client is installed on more than one node in the cluster
If the NetBackup Client is only installed on one node, then no mapping is necessary.

Note: This procedure only applies to SAP, not to SAP HANA.

To approve the auto-discovered mappings for a cluster

- 1** In the NetBackup Administration Console, expand **Security Management > Host Management**.
- 2** At the bottom of the **Hosts** pane, click the **Mappings for Approval** tab.

The list displays the hosts in your environment and the mappings or additional host names that NetBackup discovered for those hosts. A host has one entry for each mapping or name that is associated with it.

For example, for a cluster with hosts `client01.lab04.com` and `client02.lab04.com`, you may see the following entries:

Host	Auto-discovered Mapping
<code>client01.lab04.com</code>	<code>client01</code>
<code>client01.lab04.com</code>	<code>clustername</code>
<code>client01.lab04.com</code>	<code>clustername.lab04.com</code>
<code>client02.lab04.com</code>	<code>client02</code>
<code>client02.lab04.com</code>	<code>clustername</code>
<code>client02.lab04.com</code>	<code>clustername.lab04.com</code>

- 3** If a mapping is valid, right-click on a host entry and click **Approve**.
 For example, if the following mappings are valid for `client01.lab04.com`, then you approve them.

Auto-discovered Mapping	Valid name for
<code>client01</code>	The short name of the client
<code>clustername</code>	The virtual name of the cluster
<code>clustername.lab04.com</code>	The FQDN of the virtual name of the cluster

- 4 When you finish approving the valid mappings for the hosts, click on the **Hosts** tab at the bottom of the **Hosts** pane.

For hosts `client01.lab04.com` and `client02.lab04.com`, you see **Mapped Host Names/IP Addresses** that are similar to the following:

Host	Mapped Host Names/IP Addresses
client01.lab04.com	client01.lab04.com, client01, clustername, clustername.lab04.com
client02.lab04.com	client02.lab04.com, client02, clustername, clustername.lab04.com

- 5 If you need to add a mapping that NetBackup did not automatically discover, you can add it manually.

Click on the **Hosts** tab, then right-click in the **Hosts** pane and click **Add Shared or Cluster Mappings**. For example, provide the name of the virtual name of the cluster. Then click **Select Hosts** to choose the node names in the cluster to which you want to map that virtual name.

Table 5-11 Example mapped host names for a SAP cluster environment

Environment	Host	Mapped Host Names
Cluster with two nodes	Physical name of <i>Node 1</i>	Virtual name of SAP server
	Physical name of <i>Node 2</i>	Virtual name of SAP server

Configuring the Maximum jobs per client for NetBackup for SAP

The following procedure shows how to set the **Maximum jobs per client** attribute.

To configure the maximum jobs per client

- 1 In the left pane of the NetBackup Administration Console, expand **NetBackup Management > Host Properties**.
- 2 Select **Master Server**.
- 3 In the right pane, double-click the server icon.

4 In the **Master Server Properties: <master server name>** window, click **Global Attributes**.

5 Change the **Maximum jobs per client** value to 99.

The **Maximum jobs per client** specifies the maximum number of concurrent backups that are allowed per client. The default is 1.

The following points help you to determine an appropriate Maximum jobs per client setting:

- Determine which policies can be active concurrently based on scheduling and duration of backup.
- For each policy determine the number of jobs that can be sent concurrently by the client.
 - For SAP with RMAN backups, how many channels are specified in the `initSID.sap` file or the default instance configuration?
 - For SAP without RMAN, this is based on the keywords in the `initSID.utl` file; `sort_backup_type` and `drives`.
 - For MaxDB, this is the count of backup medium that is used for the backup. Typically one unless a parallel medium group is used.
 - Check if the policy specifies a lower concurrent job limit.
- Check if the settings for the storage units or storage servers that are used by the policies specify lower maximum numbers of concurrent jobs.
- For tape storage units, the number of tape drives may provide a lower limit. Check the MPX settings in the storage unit and policy; the lower MPX setting, times the number of tape drives, limits the number of jobs.

Note: Enter a large enough value for the **Maximum jobs per client** attribute to meet the number of jobs that SAP runs. You may need to experiment with different values at your site.

Performing a manual backup

After you configure the servers and clients in your environment, you can test the configuration settings with a manual backup. Perform a manual backup (or backups) with the automatic backup schedules you created.

To perform a manual backup

- 1 In the left pane, click **Policies**.
- 2 In the **All Policies** pane, select the policy you want to test.
- 3 Select **Actions > Manual Backup**.
- 4 Select the schedule that you want to use for the manual backup.
- 5 Select the clients that you want to include for the manual backup.

Testing multiple concurrent backup jobs for NetBackup for SAP for Oracle (without RMAN)

The following steps help you to test multiple concurrent jobs:

To test multiple drives

- 1 Complete the configuration of NetBackup, NetBackup for SAP, and SAP tools as described previously in this chapter.
- 2 Change the `drives` parameter in the following file:

Windows:

```
%ORACLE_HOME%\database\initSAP.utl
```

UNIX or Linux:

```
$ORACLE_HOME/dbs/initSAP.utl
```

Change the value of this parameter to the number jobs the storage unit can accept concurrently.

See “About parameters used in `initSID.utl`” on page 206.

When you perform a backup, you should see two or more backups running.

The NetBackup for SAP `backint` interface waits for all backups to complete before it reports success or failure to `brbackup`.

Configuring NetBackup for SAP HANA

This chapter includes the following topics:

- About configuring the master and the media servers
- Configuring the media server for NetBackup SAP HANA
- Configuring the master server for NetBackup SAP HANA
- Configuring the NetBackup client
- Configuring the SAP HANA Agent
- Configuring SAP HANA instance for redirected restore

About configuring the master and the media servers

You must configure the master and the media servers before you configure the NetBackup client. The procedures for configuring master and media servers are very similar. However, Veritas recommends that you configure all server information such as storage devices and volumes from the master server. Following this configuration sequence helps ensure that the master server properly administers the media servers.

For initial NetBackup server configuration, Veritas recommends that you launch the NetBackup Administration Console and click the **Getting Started** icon. Configure the storage devices, volumes, and the catalog backup and then create a backup policy.

Note: Before beginning the NetBackup configuration for each HANA appliance, check that `libelf.so.0` is linked to the `libelf.so.0.8.12` file in each HANA box Operating System. The location of the library is `/usr/lib64/`.

If the `libelf.so.0.8.12` file is not present at the `/usr/lib64/` location then copy the `libelf.so.0.8.12` file from installable of SUSE SLES 11 SP1 to `/usr/lib64/`.

Run the following commands:

- `cd /usr/lib64/`
- `ln -s libelf.so.0.8.12 libelf.so.0`

For more details about the `libelf.so.0.8.12` file error, see [TECH208377](#)

See “Configuring the media server for NetBackup SAP HANA” on page 72.

See “Configuring the master server for NetBackup SAP HANA” on page 72.

Configuring the media server for NetBackup SAP HANA

For SAP HANA, for debugging and troubleshooting purpose you need to set the logging level to 5 (maximum).

Host Properties > Media Servers select the media server > **Properties Logging > Global logging level.**

Configuring the master server for NetBackup SAP HANA

When you configure the master server for SAP HANA, you must make the following additional changes:

- You must add the media server to the list of servers that the client will accept connections from. To add the media server:
Select **Host Properties > Clients** (select the client) > **Properties > Servers > Additional Servers > Add.**
- Configure the maximum number of concurrent jobs in the selected storage unit. The maximum concurrent jobs setting on the storage unit specifies the maximum number of jobs that NetBackup can send to a disk storage unit at one time. The default setting is one job and the job count can range from 0 to 256. For SAP policy type, configured for HANA, set this value to a value greater than 64.

For SAP policy type (specifically for HANA), when the storage unit is Advanced Disk type, or MSDP, set the **Maximum Jobs Per Client** setting to a value in accordance to the value of the Maximum Streams Per Drive * number of drives. Set the **Maximum Jobs Per Policy** setting to a value higher than the value of Maximum Streams Per Drive * number of drives. For example, if you have 2 drives and **Maximum Streams Per Drive** is set to 3, the total expected jobs to that storage unit is 6.

- Set the logging level.
See “Setting the logging level” on page 73.
- Set value of the maximum jobs per client.
See “Setting maximum jobs per client” on page 73.
- Create a SAP HANA-specific backup policy.
See “Creating a backup policy for SAP HANA” on page 73.

Setting the logging level

For SAP HANA, for debugging and troubleshooting purpose you need to set the logging level to **5 (maximum)**. To set the logging level:

Select **Host Properties > Master Servers** (select the master server) > **Properties > Logging > Global Logging level**.

Make sure that you change the logging level to **0 (minimum)**, once the jobs are running correctly.

Setting maximum jobs per client

The Maximum jobs per client property specifies the maximum number of backup and archive jobs that NetBackup clients can perform concurrently. The default is one job.

For the SAP HANA software, set this value to 100. To set the value:

Select **Host Properties > Master Servers** (select the master server) > **Properties > Global Attributes > Maximum jobs per client**.

Creating a backup policy for SAP HANA

This topic describes how to create a new backup policy for the SAP HANA.

To create a backup policy for SAP HANA

- 1 Log on to the master server as root or administrator.
- 2 Start the NetBackup Administration Console.

- 3 In the left pane, click **Policies**. In the **All Policies** pane, right-click the master server, and click **New Policy**.
- 4 In the **Add a New Policy** dialog box, in the **Policy name** field, type a unique name (for example, `sap_backup`) for the policy.
- 5 Click **OK**.
- 6 In the **Add New Policy** dialog box, in the **Policy type** list, select **SAP**.
- 7 Select a disk-based storage unit from the **Policy storage** drop-down list.
- 8 On the **Attributes** tab, select the **Follow NFS**, **Compress** and **Encrypt** options.

Note: When you use media server deduplication pools, PureDisk deduplication pool, or a virtual tape library as the storage unit, do not select **Compress** and **Encrypt** options.

- 9 Complete the entries on the **Attributes** tab.
See “About policy attributes” on page 40.
- 10 Add other policy information as follows:
 - NetBackup automatically creates a schedule for SAP HANA. Make any changes on the **Schedules** tab.
 - On the **Clients** tab, add all the SAP HANA nodes.
 - Add scripts to the backup selections list.
See “Adding NetBackup for SAP scripts to the backup selections list” on page 45.
- 11 After you complete adding the required clients and scripts, click **OK**.

Configuring redirected restores

In a SAP HANA multiple-host system, recover data of one host by another host by following these instructions:

To allow a host to redirect a restore:

1. On the master server, create an `altnames` file for the host that you want to have permissions to perform redirected restores.

For example, to give HostB permissions to restore from another host, create the following file:

- On Windows
`install_path\NetBackup\db\altnames\HostB`

- On UNIX

```
/usr/opensv/netbackup/db/altnames/HostB
```

2. In the `altnames` file, add the names of the client(s) whose files the requesting client wants to restore.

For example, if you want HostB to have permissions to redirect restores from HostA, add HostA to the HostB file.

Configuring the NetBackup client

The following steps help you configure the NetBackup client:

- Setting the log levels.
- Updating the `initSAP.utl` file.

See “Enabling the debug logs manually (UNIX)” on page 178.

See “Setting the debug level on a UNIX client” on page 180.

See “Updating the `initsap.utl` file” on page 75.

If you need to un-install or remove the NetBackup client software, refer to the NetBackup Installation Guide.

Updating the `initsap.utl` file

A default `initSAP.utl` file is provided with NetBackup. The `initSAP.utl` is a text file that contains comments, parameters (required and optional), and parameter values. These parameters determine the backup and restore procedure between NetBackup and the SAP tools.

The `initsap.utl` file that is located at the following path,

```
/usr/opensv/netbackup/ext/db_ext/sap/scripts/sap_oracle/initSAP.utl
```

For the SAP HANA software, you must change the name of the policy in the configuration file. Uncomment the policy keyword and specify the correct policy name that is configured on NetBackup Master Server to take an SAP HANA backup.

Configuring the SAP HANA Agent

To configure the SAP HANA agent, you must perform a node level configuration. You must also configure the `backint` file.

Node level configuration

The Database Instance installation creates a directory `/usr/sap/<SID>` containing links to the installation directory.

So the path `/usr/sap/<SID>/SYS/global/hdb/opt/hdbbackint` is the same on each HANA installation, independent of the hardware vendor.

- Manually create a `node_names.txt` file under `/usr/opensv/netbackup/ext/db_ext/sap`.

This file should contain all probable client names (appliance node), one name per line.

For example:

```
node1.test.lab  
node2.test.lab
```

The SAP HANA admin should update this file whenever a new node is added or removed from the appliance.

Using the root user, give `+r` permissions to the newly created file `node_names.txt` on every client (appliance node).

- Create a link from SAP HANA's `hdbbackint` to `hdbbackint_script` script instead of NetBackup's `hdbbackint` binary.

```
ln -s /usr/opensv/netbackup/bin/hdbbackint_script  
/usr/sap/<SID>/SYS/global/hdb/opt/hdbbackint
```

Note: If the `opt` directory is not present, at

`/usr/sap/<SID>/SYS/global/hdb` location, you must create it and then create a `hdbbackint` link as mentioned above.

The HANA DB Master node triggers the backups on all the nodes.

SAP HANA backint configuration

The following configurations must be done from the SAP HANA studio:

- Create `hdbbackint` soft link from `/usr/sap/<SID>/SYS/global/hdb/opt/hdbbackint` to `/usr/opensv/NetBackup/bin/hdbbackint_script` for every database instance.
- The parameter file (`initSAP.utl`) must be specified for data in the SAP HANA database instance configuration. To specify the parameter file, go to **Instance->Configuration-> global.ini > data_backup_parameter_file**.

- The parameter file (`initSAP.utl`) must be specified for logs in the SAP HANA database instance configuration. To specify backup using the parameter file, go to **Instance->Configuration->global.ini-> log_backup_parameter_file**. To specify backup using the `backint` file, go to **Instance->Configuration->global.ini-> log_backup_using_backint->SYSTEM = true**.

The screenshot shows the SAP HANA Configuration Manager interface. The 'Configuration' tab is active, and the 'global.ini' configuration is expanded to show the 'backup' section. Two rows are highlighted with red boxes: 'data_backup_parameter_file' and 'log_backup_using_backint'. The 'log_backup_using_backint' row is further expanded to show 'SYSTEM' set to 'true'.

Name	Default	System	Host - ftshonar19
attributes.ini			---
daemon.ini			◆
executor.ini			---
extensions.ini			---
filter.ini			---
global.ini		◆	
[] backup		◆	
data_backup_buffer_size	512		
data_backup_parameter_file		◆ /usr/openw/netbackup/...	
log_backup_buffer_size	128		
log_backup_parameter_file		◆ /hana/symantec/test_b...	
log_backup_using_backint	false	◆ true	
max_recovery_backint_ch	64		
max_recoveryfile_age	300		
[] debug			
[] event_handler			
[] execution			

Note: While restoring from the HANA studio, locate log backups if the log backups were written to the file system and subsequently moved. You need to specify their current location. If you do not specify an alternative location for the log backups, the system uses the location where the log backups were first saved. The directory that is specified is searched recursively.

Configuring SAP HANA instance for redirected restore

SAP HANA Platform SPS 09 and later have a new feature: redirected restore of an SAP HANA instance to another SAP HANA instance. With NetBackup release 7.7.1 and later, the NetBackup SAP HANA agent also supports this feature.

Note: For additional information about SAP HANA Multi-Tenant Database Containers, see the SAP documentation.

To configure an SAP HANA instance to support redirected restores

- 1 Add all destination instance of SAP HANA hosts in the source instance NetBackup policy.

Ensure the backup policy name is the same in the source and target `initsAP.utl` file. For more details on adding the destination host client from the Clients tab, see See “Creating a backup policy for SAP HANA” on page 73.
- 2 Add the current source SAP HANA master node name in the destination SAP HANA Master node file. Open the node file from the following location:


```
/usr/opensv/netbackup/ext/db_ext/sap/node_names.txt
```


For more details on node-level configuration, see See “Configuring the SAP HANA Agent” on page 75.
- 3 Follow the steps in the Copying a Database Using Third-Party Backup Tools topic in the *SAP HANA Administration Guide*. This topic describes the requirements to use the `$(SAPSYSTEMNAME)` in the SAP HANA configuration.

Performing backups and restores of SAP

This chapter includes the following topics:

- Using NetBackup for SAP to perform a backup
- Using BRTools to start an SAP backup (for Oracle database only)
- Performing an SAP archive
- Performing SAP restores using the SAPDBA utility (SAP on Oracle databases only)
- Redirecting a restore to a different client (SAP on Oracle databases only)
- SAP redirected restore sample environment (UNIX)
- Disaster recovery using BRRECOVER
- Restarting failed NetBackup for SAP backups and restores

Using NetBackup for SAP to perform a backup

You can use the following methods to perform a backup with NetBackup for SAP:

- Manual SAP backups
You can use the NetBackup server software to manually execute an automatic backup schedule for the SAP policy.
See “Performing a manual backup” on page 69.
- Automatic SAP backups

The most convenient way to back up your database is to set up schedules for automatic backups. When the NetBackup scheduler invokes a schedule for an automatic backup, the SAP scripts start the database backup.

The SAP scripts run as follows:

- In the same order as they appear in the file list
- On all clients that have them (that is, matching path names)

There are instructions that explain how to create and configure a policy that uses the SAP scripts to back up your database automatically according to the schedules you specify.

- Client-initiated SAP backup
The SAP tools on the SAP host can, either manually or via a non-NetBackupscheduler, initiate a backup to the NetBackup backint or libsapora/orasbt APIs.

Using BRTools to start an SAP backup (for Oracle database only)

Note: This information applies to NetBackup for SAP on Oracle databases only. A different configuration is required for NetBackup for SAP on a MaxDB database.

See “About NetBackup for SAP on MaxDB databases” on page 169.

You can start a backup in one of the following ways.

- Through the `SAPDBA` utility’s menus
- Through the `brbackup` command line

When you use the `SAPDBA` utility or the `brbackup` command to start a backup, the following events occur:

- `brbackup` status messages appear on the console. These messages report when the database server is started or stopped. They also report when the backup mode of the tables is changed.
- The `brbackup` command starts the NetBackup for SAP `backint` interface, and it submits files to be backed up.
- The NetBackup for SAP `backint` interface processes input files and calls the XBSA interface. During the file-online mode, each database file is backed up, one at a time. The NetBackup for SAP `backint` interface coordinates with `brbackup` using a semaphore file.

- After all files are backed up, the full file list is displayed. The file list is displayed in the format that the NetBackup for SAP `backint` interface specification requires as to success or failure. This format includes a backup ID (BID) to be used for later restores. The SAP tools maintain a log of the backup session to keep track of the BID. This allows cross-referencing by `brrestore`.

Performing an SAP offline backup with SAPDBA

The following procedure shows you how to perform an offline backup with SAPDBA.

To perform an offline backup with SAPDBA

- 1 Verify that you have completely configured NetBackup, NetBackup for SAP, and the SAP tools.

See “About configuring NetBackup for SAP” on page 37.

- 2 Verify that you are user `sapadm`.
- 3 Run the `stopsap R3` command to stop SAP.
- 4 Start `sapdba`.
- 5 Type `h` to select the `Backup database` menu item.
- 6 Type `d` to select `Objects for backup`.
- 7 Type `g` and type the name of the object to back up.

For example: `PSAPUSER1D`.

- 8 Type `q` to go back to the previous menu.

The information that is returned indicates the following:

- The backup device type is `external backup tool (backint)`.
- The backup type is `offline_force`.
- Tablespace is `PSAPUSER1D`.

- 9 Type `s` to start the backup.

Performing brbackup online SAP backups

You can use `brbackup` instead of `sapdba` to perform SAP database backups. This section shows an online backup with dynamic switching of files into and out of backup mode. You can change the `backup_type` and `backup_dev_type` by changing the `initSAP.sap` parameter file or by specifying `-t online` and `-d util_file_online` on the `brbackup` command. Here is what these changes look like in the `initSAP.sap` file:

```
backup_type = online  
backup_dev_type = util_file_online
```

This backup method allows `sapdba` or `brbackup` to use the switch files with the NetBackup for SAP `backint` interface. This method provides a better online backup for very large files because only the necessary tablespaces are placed in backup mode. When NetBackup is ready to process another file, it notifies `brbackup` to take the completed file out of backup mode and put the next file into backup mode.

To perform brbackup online SAP backups

- 1 Verify that you have completely configured NetBackup, NetBackup for SAP, and the SAP tools.

See “About configuring NetBackup for SAP” on page 37.

- 2 Verify that you are user `sapadm`.

- 3 Enter the `brbackup` command.

- To initiate an online backup, enter the following command:

```
brbackup -d util_file_online -t online -m all
```

- To initiate a full backup when you use RMAN, enter the following command:

```
brbackup -d rman_util -t online -m full -c
```

- To initiate an incremental backup when you use RMAN, enter the following command:

```
brbackup -d rman_util -t online -m incr -c
```

Performing an SAP archive

An archive is performed in a fashion similar to a backup, but using `brarchive` instead of `brbackup`, or alternatively using `brbackup -a`. You can use the NetBackup multiple copies feature or `brarchive` command to create multiple copies that are stored on separate media or media servers. Depending on how you use NetBackup for SAP, create archive log backups copies with the method that is easiest for you.

The following examples show how to backup and restore an SAP archive:

Example 1 Issue the following command to create the SAP archive:

```
brarchive -d util_file -s
```

Example 2

To restore the first available copy of an archive log file, issue the following command:

```
brrestore -d util_file -a log_number
```

where *log_number* is the number of the archive log you want to restore.

Using the NetBackup multiple copies feature to create an SAP archive

If the option for multiple copies is enabled in the backup schedule used for the job, NetBackup automatically makes up to four copies of a backup. For more information on the multiple copies feature, see the NetBackup Administration Guide, Volume 1.

Using two brarchive commands in sequence to create an SAP archive

You can also create two copies of the archive log by issuing two `brarchive` commands in sequence.

For the first copy, call `brarchive` with the `-s` option. For the second copy, call `brarchive` with the `-sc` option. Both commands automatically determine that the archive log file needs to be backed up and perform the backup.

Be sure that each `brarchive` command uses either a separate `util` file or separate environment variable values where either the policy or schedule name differ. The policy or schedule should identify the unique media or storage units to use to ensure that the second copy is not written to the same media as the first copy (and subject to loss at the same time). For example, you can write each backup copy to two different volume pools, to disk and tape, or to two different DSUs.

The following example shows how two `brarchive` commands are used in sequence to create two copies of an SAP archive. This example assumes that only one archive log is to be backed up, archive log 77.

To create the backup copies

To create the first backup copy, issue the following commands:

```
SAP_SCHED=To-DSU ; export SAP_SCHED
brarchive -d util_file -s
```

To create the second backup copy, issue the following commands:

```
SAP_SCHED=To-Pool1 ; export SAP_SCHED
brarchive -d util_file -sc
```

On Windows, the syntax to set the environment variables is:

```
SET SAP_SCHED=To-DSU
```

To restore the archived log files

To restore from the first backup copy, issue the following command:

```
brrestore -a 77
```

To restore from the second backup copy, issue the following command:

```
brrestore -a2 77
```

Performing SAP restores using the SAPDBA utility (SAP on Oracle databases only)

To restore a partial database or full Oracle database, you must have a list of valid restores. Use the `sapdba` system to maintain the list of restores for specific tablespaces or complete database restores.

When the user restores either individual tablespaces or full databases, the user is prompted before an existing copy of the target file is deleted. `sapdba` then invokes the `brrestore` command.

`brrestore` submits the BID and file name list to the NetBackup for SAP `backint` interface. The `backint` interface cross-references the exact date and time to when the backup was made and uses NetBackup to recover the file. The `backint` interface monitors the progress of the restore and reports status back to `brrestore`.

Upon completion, the `backint` interface saves a copy of the NetBackup restore logs for auditing purposes. `sapdba` then provides required database recovery, such as media recovery, and restarts the database server.

To use `brrestore` to restore database files

- 1 In Oracle-based environments without RMAN, use the command with the following options:

```
brrestore -d util_file -b last -m full -c force
```

- 2 In Oracle-based environments with RMAN, use the command with the following options:

```
brrestore -d rman_util -b last -m full -c force
```

Redirecting a restore to a different client (SAP on Oracle databases only)

You have the option to restore an SAP database to a client other than the one that originally supplied the backup. This process to restore data to a different client is called a redirected restore.

Note: In some situations, you can restore from lower to higher release levels of Oracle. For more information, see your Oracle documentation.

To perform a redirected restore, the following conditions must be present:

- The source client and destination client must have identical computer system architectures, OS versions, and bit levels.
- The source client and destination client must have identical Oracle RDBMS levels.

The redirected restore has the following process:

- Configure the NetBackup server.
- Copy files from the source client to the destination client.
- Configure the NetBackup for SAP destination client.
- Perform the redirected restore.

The following procedures explain each part of the process. For more information on redirected restores, see the NetBackup Administrator's Guide, Volume 1.

To configure the NetBackup server

- 1 Verify that you are logged on as the NetBackup administrator.
- 2 Configure the NetBackup server to allow redirected restores.

Redirecting a restore to a different client (SAP on Oracle databases only)

- Allow restores from any client.
Continue with step 3.
 - Allow restores from only selected clients.
Continue with step 5.
- 3** To allow any client to restore the backups of any other client, create the following file on the NetBackup master server:

Windows:

```
install_path\NetBackup\db\altnames\No.Restrictions
```

UNIX or Linux:

```
/usr/opensv/netbackup/db/altnames/No.Restrictions
```

- 4** Continue with step 7.
- 5** To allow only the destination client to restore from all other clients, create the following file:

Windows:

```
install_path\NetBackup\db\altnames\client_name
```

UNIX or Linux:

```
/usr/opensv/netbackup/db/altnames/client_name
```

where *client_name* is the name of the destination client that is allowed to perform the redirected restore.

- 6** If you performed step 5, and want to restrict the destination client to only restore from the source client, add the name of the NetBackup for SAP source client to the *client_name* file.
- 7** On the destination client, back up the existing control files to preserve the original configuration.

These files are usually in the `$ORACLE_HOME/dbs (%ORACLE_HOME%\database)` directory.

To configure the NetBackup for SAP destination client

- 1** Change the client parameter on the destination client.

Do one of the following:

- Change the client parameter in the `initSID.utl` file on the destination client to the name of the source client.

- Set the `SAP_CLIENT` environment variable on the destination client to the name of the source client. For example:

```
SAP_CLIENT=source_client
export SAP_CLIENT
```

The `SAP_CLIENT` variable has higher priority than the value in the `initSID.utl` file.

- 2 (Windows) On the destination client, create a file path like the one on the source client.

For example:

- Source client actual path is:

```
C:\Oracle\SAP
```

- Destination client actual path is:

```
C:\Oracle\SAP
```

- 3 (UNIX or Linux) Create a symbolic link on the destination client that resembles the actual path of the source client. Point it to the directory that points to the SAP files.

To copy the configuration and the control files (UNIX or Linux)

- ◆ Copy configuration and control files from the NetBackup for SAP source client to the NetBackup for SAP destination client.
 - Copy the following files from the source client, usually `$ORACLE_HOME/dbs`, to the same location on the destination client:

```
initSID.sap
initSID.utl
initSID.ora
initSID.dba
```

- Copy the `$$SAPDATA_HOME/sapbackup` directory from the source client to the same location on the destination client.

To copy the configuration and the control files (Windows)

- ◆ Copy configuration and control files from the NetBackup for SAP source client to the NetBackup for SAP destination client.
 - Copy the following files from the source client, usually `%ORACLE_HOME%\database`, to the same location on the destination client:

```
initSID.sap  
initSID.utl  
initSID.ora  
initSID.dba
```

- Copy the `%SAPDATA_HOME%\sapbackup` directory from the source client to the same location on the destination client.

To perform a NetBackup for SAP redirected restore

- 1 Log onto the NetBackup for SAP destination client.
- 2 Enter the following command:

```
brrestore -d util_file -b last -m full
```

Do not use the `-m dest_dir` option with `brrestore`. This option restores the files to the directory you specify, rather than to the original directories.

SAP redirected restore sample environment (UNIX)

This sample environment shows how a redirected restore uses the `restore_filter` script.

This example assumes the following:

- Source client
 - Actual path is `/home_db/oracle/sap`
 - Includes soft link `/oracle/SAP` (`SAP` is the system ID), which points to `/home_db/oracle/sap`.
- Destination client
 - Actual path is `/home2/sap`
 - Also has soft link `/oracle/SAP`, which points to `/home2/sap`.
 - Make soft link `/home_db/oracle/sap`, which points to `/home2/sap`

In the `restore_filter` script, substitute the path that was provided in the input file list of the destination client with the actual path of the source client. The resulting script sample might look like the following:

```
#!/bin/sh  
# this shell is used to change some logically linked files
```



```
# during a restore  
sed -e 's#/oracle/SAP/#/home_db/oracle/sap/#' $1 > $2
```

When the backup starts, the file list contains the file path with the following soft link:

```
/oracle/SAP/sapdata1/btabd_1/btabd.data1
```

However, the file is backed up with the following actual path:

```
/home_db/oracle/sap/sapdata1/btab_d/btabd.data
```

When the request for a restore is issued, the input file list contains file paths with soft links. These are converted to the actual path of the destination client. Because this path is different from the source client path, the restore would fail in the inquire phase. To prevent this kind of failure, use the `restore_filter` script.

Disaster recovery using BRRECOVER

When you run disaster recovery using BRRECOVER, if the `initSID.sap` file is not present, BRRECOVER calls BACKINT without the “-p init<SID>.util” parameter.

If NetBackup for SAP is called without the `util` file parameter, it checks for the `SAP_RECOVERY` environment variable. If the environment variable is set to “disaster”, the restore is allowed without `util` file parameter. NetBackup for SAP then restores using the default SAP policy.

Restarting failed NetBackup for SAP backups and restores

A backup or a restore can fail or terminate because of system error or resource contention. For example, a backup can fail because of the following reasons: the tape library ran out of tapes, the storage unit ran out of space, or a network connection was lost. In the case of large environments with more than a terabyte of data, it might not be feasible to repeat the backup all over again.

If the policy is enabled for checkpoint restart, SAP tools can resume the backup from a point shortly before the failure. If enabled, the default checkpoint interval is 15 minutes unless adjusted on the backup policy’s attributes tab. For a failed job, NetBackup retains partial image and catalog entries in the NetBackup catalog for the files that have been already backed up.

SAP tools can also restart a restore of just the files that were not previously restored. This ability is independent of the checkpoint restart option in the backup policy.

Caution: Attempts to restart a backup or restore from the Activity Monitor will fail.

Note: SAP tools use `backint` to restart failed backups and restores of Oracle databases.

Sap tools do not support the use of RMAN to restart failed backups and restores of Oracle databases. MaxDB also cannot restart failed backups or restores.

Restarting NetBackup for SAP backups

The `brbackup` command initiates the backup for SAP on Oracle databases. The `brbackup` command calls the NetBackup for SAP agent (`backint`) with appropriate options and gives a list of files for backup. Backups can be either successful or unsuccessful.

The results are as follows:

- For a successful backup:
For each file that is backed up successfully, `backint` sends the following message to `brbackup`:

```
#SAVED BID filename
```

For each `SAVED ...` message that `brbackup` receives, `brbackup` writes the following information to its log file:

UNIX or Linux:

```
#FILE..... /home1/orasap/inp/file1
```

```
#SAVED.... VXF1134574401
```

Windows:

```
#FILE..... C:\oracle\SUD\sapdata1\file1.dbf
```

```
#SAVED.... VXF1134574401
```

- For an unsuccessful backup:
For each file that is not backed up successfully, `backint` sends the following message to `brbackup`:

```
#ERROR filename
```

For each `ERROR ...` message that `brbackup` receives, `brbackup` writes the following message to its log file:

UNIX or Linux:

```
BR0233E Backup utility has reported an error while saving
file /home/orasap/inp/filename
```

Windows:

```
BR0233E Backup utility has reported an error while saving
file C:\oracle\SUD\sapdata1\file1.dbf
```

A backup can fail for several reasons that are unrelated to NetBackup operations:

- The tape library ran out of tapes
- A network connection problem occurred
- The user killed the backup but wants to restart it sometime later

For situations like these, NetBackup for SAP saves the partial image for the files that have been already backed up.

Catalog entries in the NetBackup catalog are also saved. It returns the following messages:

- #SUCCESS *BID filename* - For the files that were backed up
- #ERROR *filename* - For the files that were not backed up

If a backup has terminated because of any problems that are not related to NetBackup, you do not have to repeat a complete backup again. Use the `brbackup` command and the `-f logfile` parameter. The `brbackup` command automatically determines the files that still need to be backed up. The next section describes how to use the `-f` parameter to restart a backup.

Configuring the checkpoint restart option in a NetBackup for SAP policy

To restart backups from the point of failure, you must enable checkpoint in your NetBackup for SAP policy. To enable this feature, in the attributes for the policy, select **Take Checkpoints Every**. By default, this option is disabled. When this option is not enabled, a failed backup that is based on this policy is restarted from the beginning of the job.

When **Take Checkpoints Every** is enabled, by default the NetBackup for SAP agent takes a checkpoint every 15 minutes. You can configure this time interval for a different duration.

Restarting a NetBackup for SAP backup with the `brbackup -f` command

You can use the `brbackup` command's `-f` option to back up only the files that failed to be backed up. You do not have to specify that all files be backed up again.

The `brbackup` command examines the specified file. It determines the files that were backed up successfully and the files that were not backed up successfully. `brbackup` sends `backint` the list of files that still need to be backed up. `brbackup` starts a new job only for the files that still need to be backed up.

Example 1. The following command specifies a log file:

```
brbackup -d util_file -m all -c -f bdprcayp.aff
```

Example 2. The following command specifies the last backup job:

```
brbackup -d util_file -m all -c -f last
```

To restart a NetBackup for SAP backup with the `brbackup -f` command

- ◆ Run the `brbackup` command with the `-f logfile` parameter.
For log file, specify one of the following:
 - The log file name of the failed job. When the log file is specified, `brbackup` checks it for the files that were not backed up successfully.
 - The keyword `last`. When this keyword is specified, `brbackup` checks the status of the last backup job for the files that were not backed up successfully.

Example: Restarting a failed NetBackup for SAP backup job (UNIX or Linux)

This example shows how to restart a failed backup job on UNIX or Linux. In this example, assume the following:

- The backup job was deliberately cancelled from the activity manager. In a real user case, a job might fail for different reasons.
- You enabled checkpoint (the **Take Checkpoints Every** option in the policy).
- You ran the backup according to the following `brbackup` command:

```
brbackup -d util_file -t offline -m all -c force
```

The following is an excerpt from the output log:

```
BR0280I BRBACKUP time stamp: 2006-02-28 21.07.59
BR0057I Backup of database: SUD
BR0058I BRBACKUP action ID: bdsbecnl
BR0059I BRBACKUP function ID: aff
BR0110I Backup mode: ALL
BR0077I Database files for backup:

/oracle/SUD/origlogA/log1_m1.dbf
/oracle/SUD/origlogB/log2_m1.dbf
/oracle/SUD/origlogA/log3_m1.dbf
/oracle/SUD/origlogB/log4_m1.dbf
/oracle/SUD/saparch/cntrl/cntrlSUD.dbf

BR0061I 29 files found for backup, total size 853.604 MB
```

The previous output log shows the 29 files for backup. `brbackup` calls the NetBackup SAP agent for backup.

In this example, we have configured the checkpoint frequency for 5 minutes. By the time first checkpoint was taken (that is, in the first 5 minutes), 13 files were backed up. The user killed the job from the NetBackup activity monitor after NetBackup took the first checkpoint. `backint` returned `#SUCCESS` messages to `brbackup` for 13 files that were backed up. For the files that were yet to be backed up, `backint` returned `#ERROR`. The following are the output messages from the `brbackup` log:

```
BR0280I BRBACKUP time stamp: 2006-02-28 21.08.04
BR0229I Calling backup utility with function 'backup'...

BR0278I Command output of '/usr/sap/SUD/SYS/exe/run/backint -u SUD -f backup -I /oracle/
SUD/sapbackup/.bdsbecnl.lst -t file -p /home1/orasap/ora920/dbs/initSUD.utl
-c':

*****

Program:                /usr/sap/SUD/SYS/exe/run/backint 6.5
Input File:             /oracle/SUD/sapbackup/.bdsbecnl.lst
Profile:                /home1/orasap/ora920/dbs/initSUD.utl

Program:                backint 6.5
Input File:             C:\oracle\SUD\sapbackup\.bdsbedhj.lst
Profile:                C:\oracle\ora920\dbs\initSUD.utl

Function:               BACKUP
Backup Type:           BACKUP_FILE
```

94 | Performing backups and restores of SAP
Restarting failed NetBackup for SAP backups and restores

```
*****
BR0280I BRBACKUP time stamp: 2006-02-28 21.15.50

#FILE..... /oracle/SUD/sapdata1/btabd_1/btabd.data1

#SAVED.... VXF1141141105

BR0280I BRBACKUP time stamp: 2006-02-28 21.15.50

#FILE..... /oracle/SUD/sapdata2/btabi_1/btabi.data1

#SAVED.... VXF1141141105

...
...
BR0233E Backup utility has reported an error while saving file

/oracle/SUD/saparch/cntrl/cntrlSUD.dbf

*****
BR0280I BRBACKUP time stamp: 2006-02-28 21.15.50

BR0279E Return code from '/usr/sap/SUD/SYS/exe/run/backint -u SUD -f backup -I /oracle/
SUD/sapbackup/.bdsbecnl.lst -t file -p /home1/orasap/ora920/dbs/initSUD.utl
-c': 2

BR0232E 13 of 29 files saved by backup utility
BR0280I BRBACKUP time stamp: 2006-02-28 21.15.50
BR0231E Backup utility call failed

BR0280I BRBACKUP time stamp: 2006-02-28 21.15.52
BR0304I Starting and opening database instance SUD ...

BR0280I BRBACKUP time stamp: 2006-02-28 21.16.00
BR0305I Start and open of database instance SUD successful

BR0056I End of database backup: bdsbecnl.aff 2006-02-28 21.15.50
BR0280I BRBACKUP time stamp: 2006-02-28 21.16.00
BR0054I BRBACKUP terminated with errors
```

You can then restart the preceding job with following command:

```
brbackup -d util_file -t offline -m all -f last -c force
```

The `brbackup` command examined the last backup log and found that the backup failed for some files. It writes following messages in the beginning of output log for this session:

```
BR0051I BRBACKUP 6.40 (22)
BR0055I Start of database backup: bdsbedhj.aff 2006-02-28 21.16.35

BR0453W Error message found in /oracle/SUD/sapbackup/bdsbecnl.aff:

'BR0233E Backup utility has reported an error while saving file
/oracle/SUD/sapraw/rawDev4'
BR0453W Error message found in /oracle/SUD/sapbackup/bdsbecnl.aff:
'BR0233E Backup utility has reported an error while saving file
/oracle/SUD/sapraw/rawDev5'

...
...

BR0453W Error message found in /oracle/SUD/sapbackup/bdsbecnl.aff:
'BR0279E Return code from '/usr/sap/SUD/SYS/exe/run/backint -u SUD -f backup -I
/oracle/SUD/sapbackup/.bdsbecnl.lst -t file -p /home1/orasap/ora920/dbs/initSUD.utl
-c': 2'

BR0453W Error message found in /oracle/SUD/sapbackup/bdsbecnl.aff:

'BR0232E 13 of 29 files saved by backup utility'

BR0453W Error message found in /oracle/SUD/sapbackup/bdsbecnl.aff:

'BR0231E Backup utility call failed'

BR0459W Backup /oracle/SUD/sapbackup/bdsbecnl.aff terminated with errors

...
...

BR0280I BRBACKUP time stamp: 2006-02-28 21.16.36
BR0057I Backup of database: SUD
BR0058I BRBACKUP action ID: bdsbedhj
BR0059I BRBACKUP function ID: aff
BR0110I Backup mode: ALL
BR0077I Database files for backup:

/oracle/SUD/origlogA/log1_m1.dbf
/oracle/SUD/origlogB/log2_m1.dbf
/oracle/SUD/origlogA/log3_m1.dbf
/oracle/SUD/origlogB/log4_m1.dbf
/oracle/SUD/saparch/cntrl/cntrlSUD.dbf

BR0061I 16 files found for backup, total size 283.502 MB
BR0091I 13 files were already saved in: bdsbecnl.aff
```

As the preceding output log shows, 13 files were already backed up. The following is the output of a successful `brbackup` restart job. This job is the one that backed up the remaining 16 files:

```
BR0280I BRBACKUP time stamp: 2006-02-28 21.16.41
BR0229I Calling backup utility with function 'backup'...

BR0278I Command output of '/usr/sap/SUD/SYS/exe/run/backint -u SUD -f backup -I
/oracle/SUD/sapbackup/.bdsbedhj.lst -t file -p /home1/orasap/ora920/dbs/initSUD.utl

-c':
*****

Program:                /usr/sap/SUD/SYS/exe/run/backint 6.5
Input File:             /oracle/SUD/sapbackup/.bdsbedhj.lst
Profile:                home1/orasap/ora920/dbs/initSUD.utl

Function:               BACKUP
Backup Type:            BACKUP_FILE
*****

BR0280I BRBACKUP time stamp: 2006-02-28 21.21.38

#FILE..... /oracle/SUD/sapraw/rawDev4

#SAVED.... VXF1141141607

...
...
BR0280I BRBACKUP time stamp: 2006-02-28 21.21.38

#FILE..... /oracle/SUD/saparch/cntrl/cntrlSUD.dbf

#SAVED.... VXF1141141607
*****

BR0280I BRBACKUP time stamp: 2006-02-28 21.21.38
BR0232I 16 of 16 files saved by backup utility
BR0230I Backup utility called successfully
```

Example: Restarting a failed NetBackup for SAP backup job (Windows)

This example shows how to restart a failed backup job. In this example, assume the following:

- The backup job was deliberately cancelled from the activity manager. In a real user case, a job might fail for different reasons.
- You enabled checkpoint (the **Take Checkpoints Every** option in the policy).
- You ran the backup according to the following `brbackup` command:

```
brbackup -d util_file -t offline -m all -c force
```

The following is an excerpt from the output log:

```
BR0280I BRBACKUP time stamp: 2006-02-28 21.07.59
BR0057I Backup of database: SUD
BR0058I BRBACKUP action ID: bdsbecnl
BR0059I BRBACKUP function ID: aff
BR0110I Backup mode: ALL
BR0077I Database files for backup:

C:\oracle\SUD\origlogA\log1_m1.dbf
C:\oracle\SUD\origlogB\log2_m1.dbf
C:\oracle\SUD\origlogA\log3_m1.dbf
C:\oracle\SUD\origlogB\log4_m1.dbf
C:\oracle\SUD\saparch\cntrl\cntrlSUD.dbf

BR0061I 29 files found for backup, total size 853.604 MB
```

The previous output log shows the 29 files for backup. `brbackup` calls the NetBackup SAP agent for backup.

In this example, we have configured the checkpoint frequency for 5 minutes. By the time first checkpoint was taken (that is, in the first 5 minutes), 13 files were backed up. The user killed the job from the NetBackup activity monitor after NetBackup took the first checkpoint. `backint` returned `#SUCCESS` messages to `brbackup` for 13 files that were backed up. For the files that were yet to be backed up, `backint` returned `#ERROR`. The following are the output messages from the `brbackup` log:

```
BR0280I BRBACKUP time stamp: 2006-02-28 21.08.04
BR0229I Calling backup utility with function 'backup'...

BR0278I Command output of 'backint.exe -u SUD -f backup -I
C:\oracle\SUD\sapbackup\bdsbecnl.lst -t file -p C:\oracle\ora920\dbs\initSUD.utl
-c':
```

```
*****
```

98 | Performing backups and restores of SAP
Restarting failed NetBackup for SAP backups and restores

```
Program:                backint 6.5
Input File:             C:\oracle\SUD\sapbackup\.bdsbedhj.lst
Profile:                C:\oracle\ora920\dfs\initSUD.utl

Function:               BACKUP
Backup Type:            BACKUP_FILE
*****
BR0280I BRBACKUP time stamp: 2006-02-28 21.15.50

#FILE..... C:\oracle\SUD\sapdata1\btabd_1\btabd.data1
#SAVED.... VXF1141141105

BR0280I BRBACKUP time stamp: 2006-02-28 21.15.50

#FILE..... C:\oracle\SUD\sapdata2\btabi_1\btabi.data1
#SAVED.... VXF1141141105

...
...
BR0233E Backup utility has reported an error while saving file
C:\oracle\SUD\saparch\cntrl\cntrlSUD.dbf
*****
BR0280I BRBACKUP time stamp: 2006-02-28 21.15.50

BR0279E Return code from 'backint -u SUD -f backup -I
C:\oracle\SUD\sapbackup\.bdsbecnl.lst -t file -p C:\oracle\ora920\dfs\initSUD.utl
-c': 2

BR0232E 13 of 29 files saved by backup utility
BR0280I BRBACKUP time stamp: 2006-02-28 21.15.50
BR0231E Backup utility call failed

BR0280I BRBACKUP time stamp: 2006-02-28 21.15.52
BR0304I Starting and opening database instance SUD ...

BR0280I BRBACKUP time stamp: 2006-02-28 21.16.00
BR0305I Start and open of database instance SUD successful

BR0056I End of database backup: bdsbecnl.aff 2006-02-28 21.15.50
BR0280I BRBACKUP time stamp: 2006-02-28 21.16.00
BR0054I BRBACKUP terminated with errors
```

You can then restart the preceding job with following command:

```
brbackup -d util_file -t offline -m all -f last -c force
```

The `brbackup` command examined the last backup log and found that the backup failed for some files. It writes following messages in the beginning of output log for this session:

```
BR0051I BRBACKUP 6.40 (22)
BR0055I Start of database backup: bdsbedhj.aff 2006-02-28 21.16.35
BR0453W Error message found in C:\oracle\SUD\sapbackup\bdsbecnl.aff:
'BR0233E Backup utility has reported an error while saving file
C:\oracle\SUD\sapdata5\datafile.4'
BR0453W Error message found in C:\oracle\SUD\sapbackup\bdsbecnl.aff:
'BR0233E Backup utility has reported an error while saving file
C:\oracle\SUD\sapdata5\datafile.5'
...
...
BR0453W Error message found in C:\oracle\SUD\sapbackup\bdsbecnl.aff:
'BR0279E Return code from 'backint -u SUD -f backup -I
C:\oracle\SUD\sapbackup\bdsbecnl.lst -t file -p C:\oracle\ora920\dbs\initSUD.utl
-c': 2'
BR0453W Error message found in C:\oracle\SUD\sapbackup\bdsbecnl.aff:
'BR0232E 13 of 29 files saved by backup utility'
BR0453W Error message found in C:\oracle\SUD\sapbackup\bdsbecnl.aff:
'BR0231E Backup utility call failed'
BR0459W Backup C:\oracle\SUD\sapbackup\bdsbecnl.aff terminated with errors
...
...
BR0280I BRBACKUP time stamp: 2006-02-28 21.16.36
BR0057I Backup of database: SUD
BR0058I BRBACKUP action ID: bdsbedhj
BR0059I BRBACKUP function ID: aff
BR0110I Backup mode: ALL
BR0077I Database files for backup:
C:\oracle\SUD\origlogA\log1_m1.dbf
C:\oracle\SUD\origlogB\log2_m1.dbf
```

100 | Performing backups and restores of SAP
Restarting failed NetBackup for SAP backups and restores

```
C:\oracle\SUD\origlogA\log3_m1.dbf  
C:\oracle\SUD\origlogB\log4_m1.dbf  
C:\oracle\SUD\saparch\cntrl\cntrlSUD.dbf
```

```
BR0061I 16 files found for backup, total size 283.502 MB  
BR0091I 13 files were already saved in: bdsbecnl.aff
```

As the preceding output log shows, 13 files were already backed up. The following is the output of a successful `brbackup` restart job. This job is the one that backed up the remaining 16 files:

```
BR0280I BRBACKUP time stamp: 2006-02-28 21.16.41  
BR0229I Calling backup utility with function 'backup'...  
  
BR0278I Command output of 'backint -u SUD -f backup -I  
C:\oracle\SUD\sapbackup\.bdsbedhj.lst -t file -p C:\oracle\ora920\db\initSUD.utl
```

```
-c':  
*****  
  
Program:                backint 6.5  
Input File:             C:\oracle\SUD\sapbackup\.bdsbedhj.lst  
Profile:                C:\oracle\ora920\db\initSUD.utl  
  
Function:              BACKUP  
Backup Type:           BACKUP_FILE  
*****
```

```
BR0280I BRBACKUP time stamp: 2006-02-28 21.21.38
```

```
#FILE..... C:\oracle\SUD\sapdata5\datafile.4
```

```
#SAVED... VXF1141141607
```

```
...
```

```
...
```

```
BR0280I BRBACKUP time stamp: 2006-02-28 21.21.38
```

```
#FILE..... C:\oracle\SUD\saparch\cntrl\cntrlSUD.dbf
```

```
#SAVED... VXF1141141607
```

```
*****
```

```
BR0280I BRBACKUP time stamp: 2006-02-28 21.21.38
```

```
BR0232I 16 of 16 files saved by backup utility
```

```
BR0230I Backup utility called successfully
```

Restarting SAP database restores on Oracle

You can restore an SAP database that is based on Oracle by using the `brrestore` command. The `brrestore` command writes a record into the input file for each file to be restored. This record is named *BID filename*. `brrestore` then calls the NetBackup for SAP agent (`backint`) with the appropriate options.

Restores can be either successful or unsuccessful.

For each record in the input file, the `brrestore` command expects one of the following messages from `backint`:

- For a successful restore:

```
#FILE..... filename
#RESTORED BID
```

- For an unsuccessful restore:

```
#ERROR filename
```

If the restore is successful, `backint` reports `#RESTORED BID filename`. Then, `brrestore` writes the following:

UNIX or Linux:

```
#FILE..... /oracle/CER/sapdata1/btabd_1/btabd.data1
#RESTORED. VXF1147974254
```

Windows:

```
#RESTORED. VXF1147974254
```

`brrestore` does not write any messages if `backint` reports `#ERROR filename`.

If the restore job fails after restoring some files, the NetBackup for SAP agent (`backint`) reports `#RESTORED` for the files it restored. It reports `#ERROR` for the files that it did not restore.

Restarting a restore with the `brrestore -f` option

You can use the `brrestore` command's `-f` option to restore only the files that failed to be restored. You do not have to specify that all files be restored again.

To restart a restore

- ◆ Run the `brrestore` command with the `-f logfile` parameter.

For `logfile`, specify one of the following:

- The log file name of the failed job. When the log file is specified, `brrestore` checks it for the files that were not restored successfully.
- The keyword `last`. When this keyword is specified, `brbackup` checks the status of the last restore job for the files that were not restored successfully.

The `brrestore` command examines the specified file. It determines the files that were restored successfully and the files that were not restored successfully. `brrestore` sends `backint` the list of files that still need to be restored. `brrestore` starts a new job only for the files that still need to be restored.

The following command specifies a log file:

```
brrestore -d util_file -m all -f rdsqcxdf.rsb
```

The following command specifies the last restore job:

```
brrestore -d util_file -m all -f last
```

Example: Restarting a NetBackup for SAP restore job (UNIX or Linux)

This section shows how to restart a failed restore job. Assume that the you deliberately cancelled the job from the activity monitor. In reality, the job might fail due to different reasons.

This example shows the log messages that `brrestore` created while restoring the files for the `CER` database, using the following command:

```
brrestore -d util_file -b last -m all
```

The following are excerpts from the corresponding `brrestore` log file:

```
BR0280I BRRESTORE time stamp: 2006-05-18 23.18.15
BR0407I Restore of database: CER
BR0408I BRRESTORE action ID: rdsqcxdf
BR0409I BRRESTORE function ID: rsb
BR0449I Restore mode: ALL
BR0419I Files will be restored from backup: bdsqcw1l.aff 2006-05-18 23.14.01
BR0416I 19 files found to restore, total size 645.148 MB
BR0421I Restore device type: util_file
BR0134I Unattended mode with 'force' active - no operator confirmation allowed

BR0280I BRRESTORE time stamp: 2006-05-18 23.18.16
BR0229I Calling backup utility with function 'restore'...
```

```
BR0278I Command output of '/usr/sap/CER/SYS/exe/run/backint -u CER -f restore -I
/oracle/CER/sapbackup/.rdsqcxdf.lst -t file -p /home/orasap/Ora920/dbs/initCER.utl -c':
```

```
*****
```

```
Program: /usr/sap/CER/SYS/exe/run/backint 6.5
Input File: /oracle/CER/sapbackup/.rdsqcxdf.lst
Profile: /home/orasap/Ora920/dbs/initCER.utl
```

```
Function: RESTORE
```

```
*****
```

```
BR0280I BRRESTORE time stamp: 2006-05-18 23.18.57
```

```
#FILE..... /oracle/CER/sapdata1/btabd_1/btabd.data1
```

```
#RESTORED. VXF1147974254
```

```
...
```

```
...
```

```
BR0280I BRRESTORE time stamp: 2006-05-18 23.18.57
```

```
#FILE..... /oracle/CER/sapdata1/el46bi_1/el46bi.data1
```

```
#RESTORED. VXF1147974254
```

```
*****
```

```
BR0374E 7 of 19 files restored by backup utility
```

```
BR0280I BRRESTORE time stamp: 2006-05-18 23.18.57
```

```
BR0231E Backup utility call failed
```

After you start the `brrestore` command, you cancel the restore job from the activity monitor. As the preceding log indicates, `brrestore` restored 7 out of the 19 files. You can restore the remaining files as part of a new `brrestore` session. In a production situation, you should identify and correct the cause of failure before restarting `brrestore`.

Enter the following command with the `-f` option to start `brrestore`:

```
brrestore -d util_file -m all -f last
```

The following output is an excerpt from the corresponding `brrestore` log file:

```
BR0453W Error message found in /oracle/CER/sapbackup/rdsqcxdf.rsb:
```

```
'BR0374E 7 of 19 files restored by backup utility'
```

```
BR0453W Error message found in /oracle/CER/sapbackup/rdsqcxdf.rsb:
```

```
'BR0231E Backup utility call failed'  
  
BR0471W Restore /oracle/CER/sapbackup/rdsqcxdf.rsb terminated with errors  
  
BR0428W File /oracle/CER/sapdata6/es46bd_1/es46bd.data1 will be overwritten  
  
BR0280I BRRESTORE time stamp: 2006-05-18 23.19.20  
BR0407I Restore of database: CER  
BR0408I BRRESTORE action ID: rdsqcxfs  
BR0409I BRRESTORE function ID: rsb  
BR0449I Restore mode: ALL  
BR0419I Files will be restored from backup: bdsqcwtl.aff 2006-05-18 23.14.01  
BR0416I 12 files found to restore, total size 520.094 MB  
BR0445I 7 files were already restored in the following run: rdsqcxdf.rsb  
BR0421I Restore device type: util_file
```

brrestore checks the previous log file and finds that 12 files need to be restored and that 7 files are already restored. brrestore directs backint to restore the 12 files. The log file is as follows:

```
BR0134I Unattended mode with 'force' active - no operator confirmation allowed  
  
BR0280I BRRESTORE time stamp: 2006-05-18 23.19.20  
BR0229I Calling backup utility with function 'restore'...  
  
BR0278I Command output of '/usr/sap/CER/SYS/exe/run/backint -u CER -f restore -I /oracle/  
CER/sapbackup/.rdsqcxfs.lst -t file -p /home/orasap/Ora920/dbs/initCER.utl -c':  
  
*****  
Program:/usr/sap/CER/SYS/exe/run/backint 6.5  
Input File:/oracle/CER/sapbackup/.rdsqcxfs.lst  
Profile:/home/orasap/Ora920/dbs/initCER.utl  
  
Function:RESTORE  
*****  
BR0280I BRRESTORE time stamp: 2006-05-18 23.20.09  
  
#FILE..... /oracle/CER/sapdata6/es46bd_1/es46bd.data1  
  
#RESTORED. VXF1147974254  
  
...  
...  
BR0280I BRRESTORE time stamp: 2006-05-18 23.20.09  
  
#FILE..... /oracle/CER/sapdata1/system_1/system.data1
```



```
#RESTORED. VXF1147974254
*****
BR0280I BRRESTORE time stamp: 2006-05-18 23.20.09
BR0374I 12 of 12 files restored by backup utility
BR0230I Backup utility called successfully
```

As the preceding log shows, the remaining 12 files are restored successfully.

Example: Restarting a NetBackup for SAP restore job (Windows)

This section shows how to restart a failed restore job. Assume that the you deliberately cancelled the job from the activity monitor. In reality, the job might fail due to different reasons.

This example shows the log messages that `brrestore` created while restoring the files for the `CER` database, using the following command:

```
brrestore -d util_file -b last -m all
```

The following are excerpts from the corresponding `brrestore` log file:

```
BR0280I BRRESTORE time stamp: 2006-05-18 23.18.15
BR0407I Restore of database: CER
BR0408I BRRESTORE action ID: rdsqcxdf
BR0409I BRRESTORE function ID: rsb
BR0449I Restore mode: ALL
BR0419I Files will be restored from backup: bdsqcwtl.aff 2006-05-18 23.14.01
BR0416I 19 files found to restore, total size 645.148 MB
BR0421I Restore device type: util_file
BR0134I Unattended mode with 'force' active - no operator confirmation allowed

BR0280I BRRESTORE time stamp: 2006-05-18 23.18.16
BR0229I Calling backup utility with function 'restore'...

BR0278I Command output of 'backint -u CER -f restore -I
C:\oracle\SUD\sapbackup\.rdsqcxdf.lst -t file -p C:\oracle\Ora920\dbs\initCER.utl
-c':

*****

Program: backint 6.5
Input File: C:\oracle\SUD\sapbackup\.rdsqcxdf.lst
Profile: C:\oracle\Ora920\dbs\initCER.utl
```

```
Function: RESTORE
*****
BR0280I BRRESTORE time stamp: 2006-05-18 23.18.57

#FILE..... C:\oracle\SUD\sapdata1\btabd_1\btabd.data1

#RESTORED. VXF1147974254

...
...
BR0280I BRRESTORE time stamp: 2006-05-18 23.18.57

#FILE..... C:\oracle\SUD\sapdata1\el46bi_1\el46bi.data1

#RESTORED. VXF1147974254
*****

BR0374E 7 of 19 files restored by backup utility
BR0280I BRRESTORE time stamp: 2006-05-18 23.18.57
BR0231E Backup utility call failed
```

After you start the `brrestore` command, you cancel the restore job from the activity monitor. As the preceding log indicates, `brrestore` restored 7 out of the 19 files. You can restore the remaining files as part of a new `brrestore` session. In a production situation, you should identify and correct the cause of failure before restarting `brrestore`.

Enter the following command with the `-f` option to start `brrestore`:

```
brrestore -d util_file -m all -f last
```

The following output is an excerpt from the corresponding `brrestore` log file:

```
BR0453W Error message found in C:\oracle\SUD\sapbackup\rdsqcxdf.rsb:
'BR0374E 7 of 19 files restored by backup utility'
BR0453W Error message found in C:\oracle\SUD\sapbackup\rdsqcxdf.rsb:
'BR0231E Backup utility call failed'
BR0471W Restore C:\oracle\SUD\sapbackup\rdsqcxdf.rsb terminated with errors
BR0428W File C:\oracle\SUD\sapdata6\es46bd_1\es46bd.data1 will be overwritten
BR0280I BRRESTORE time stamp: 2006-05-18 23.19.20
BR0407I Restore of database: CER
BR0408I BRRESTORE action ID: rdsqcxfs
```

```
BR0409I BRRESTORE function ID: rsb
BR0449I Restore mode: ALL
BR0419I Files will be restored from backup: bdsqcw1l.aff 2006-05-18 23.14.01
BR0416I 12 files found to restore, total size 520.094 MB
BR0445I 7 files were already restored in the following run: rdsqcxdf.rsb
BR0421I Restore device type: util_file
```

brrestore checks the previous log file and finds that 12 files need to be restored and that 7 files are already restored. brrestore directs backint to restore the 12 files. The log file is as follows:

```
BR0134I Unattended mode with 'force' active - no operator confirmation allowed

BR0280I BRRESTORE time stamp: 2006-05-18 23.19.20
BR0229I Calling backup utility with function 'restore'...

BR0278I Command output of '/usr/sap/CER/SYS/exe/run/backint -u CER -f restore -I
C:\oracle\SUD\sapbackup\.rdsqcxfs.lst -t file -p C:\oracle\Ora920\dbs\initCER.utl -c':
*****

Program:/usr/sap/CER/SYS/exe/run/backint 6.5
Input File:C:\oracle\SUD\sapbackup\.rdsqcxfs.lst
Profile:C:\oracle\Ora920\dbs\initCER.utl

Function:RESTORE
*****
BR0280I BRRESTORE time stamp: 2006-05-18 23.20.09

#FILE..... C:\oracle\SUD\sapdata6\es46bd_1\es46bd.data1

#RESTORED. VXF1147974254

...
...
BR0280I BRRESTORE time stamp: 2006-05-18 23.20.09

#FILE..... C:\oracle\SUD\sapdata1\pooli_1\pooli.data1

#RESTORED. VXF1147974254
*****

BR0280I BRRESTORE time stamp: 2006-05-18 23.20.09
BR0374I 12 of 12 files restored by backup utility
BR0230I Backup utility called successfully
```

As the preceding log shows, the remaining 12 files are restored successfully.

Performing backups and restores of SAP HANA

This chapter includes the following topics:

- About backup and restore of SAP HANA
- Using the SAP HANA studio for backup
- Using the SAP HANA studio for restore
- Using SAP HANA studio for SAP HANA instance redirected restore

About backup and restore of SAP HANA

You can run backups using the SQL commands. You can also use Cron to schedule the backups. Check the SAP website for the SAP HANA Administration Guide.

Backups for SAP HANA can be initiated from NetBackup. SAP HANA data restore is initiated from the SAP HANA studio and not from NetBackup Administration Console. For more information, see the following tech note on the Veritas Support website for full backup:

https://www.veritas.com/support/en_US/article.000018776

See the following tech note on the Veritas Support website for full, differential, and incremental backup:

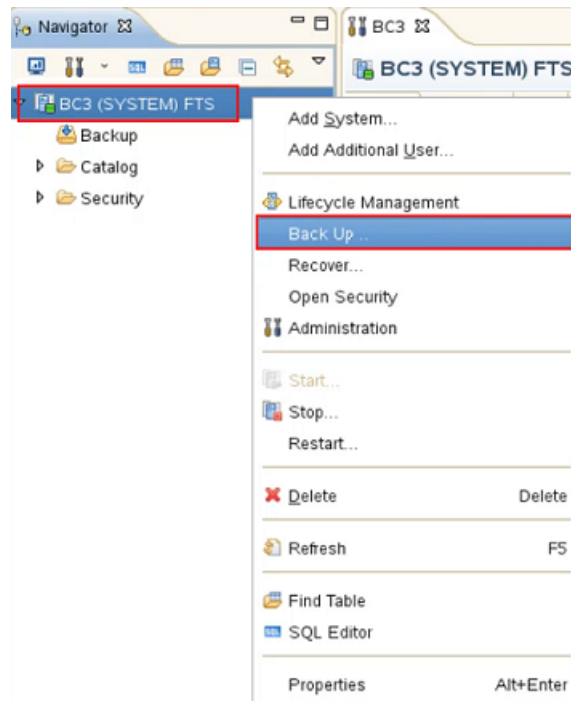
https://www.veritas.com/support/en_US/article.000025716

Using the SAP HANA studio for backup

Use the SAP HANA studio to backup the SAP HANA data. The following steps help you to set up the backup.

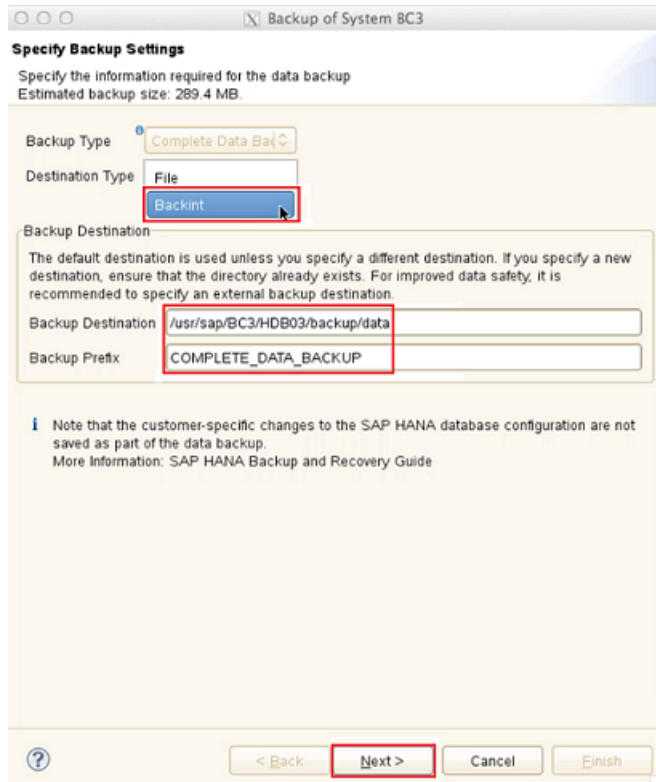
Setting up the backup using the SAP HANA studio

- 1 On the SAP HANA studio interface, select the HANA instance that you want to backup. In this case <SID>.
- 2 Right-click on the instance and select the **Back Up** option as shown.

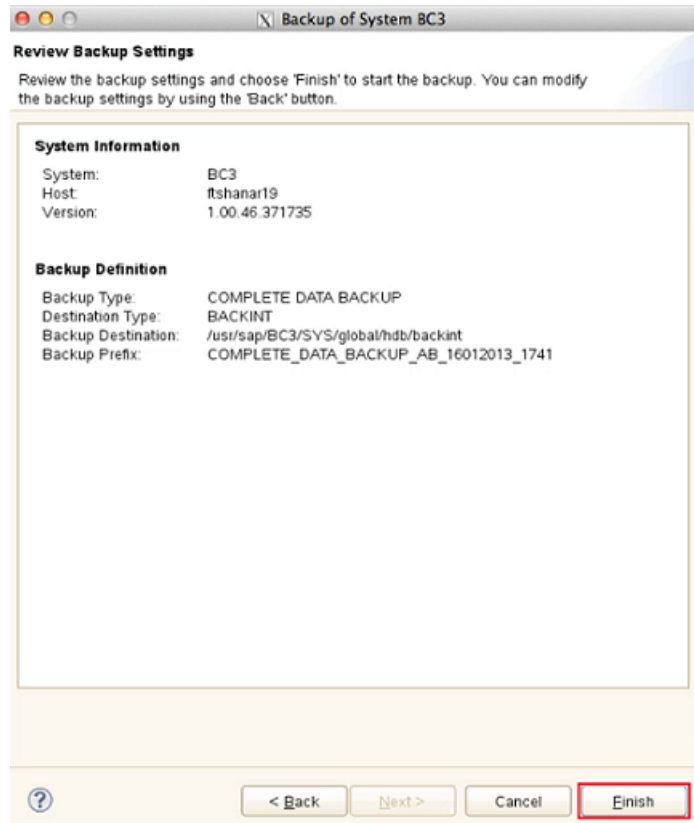


- 3 The Backup of System screen is displayed. Select the **Backint** option. Specify the **Backup Destination** and **Backup Prefix** as shown and click **Next**.

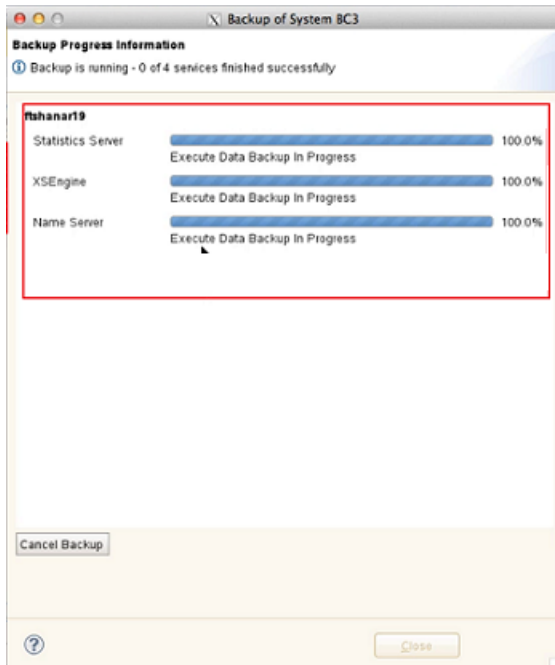
Note: If you are using SAP HANA SPS 10, you can also select **Differential Data Backup** or **Incremental Data Backup** as the **Backup Type**. Enter a **Backup Prefix** that indicates if the backup type is incremental or differential. For example, for an incremental data backup, the backup prefix could be *INCRE_DATA_BACKUP*.



- 4 Confirm the settings under **Review Backup Settings** as shown and click **Finish**.



- 5 Check the Activity Monitor of the NetBackup Administration Console to get the backup information. On a successful backup, the following results are displayed:



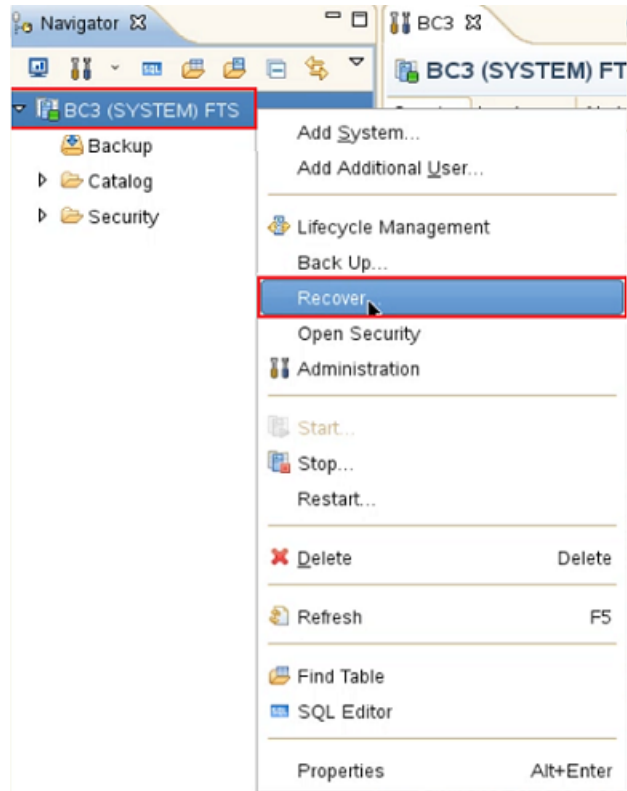
- 6 On the Backup of System screen, click **Close**.

Using the SAP HANA studio for restore

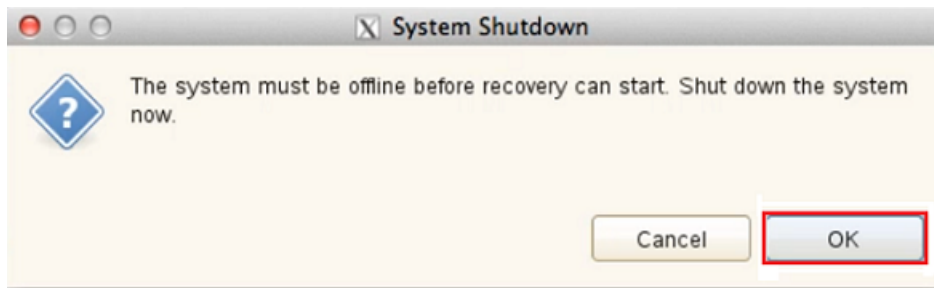
Use the SAP HANA studio to backup the SAP HANA data. The following steps help you to set up the restore.

Setting up the restore using the SAP HANA studio

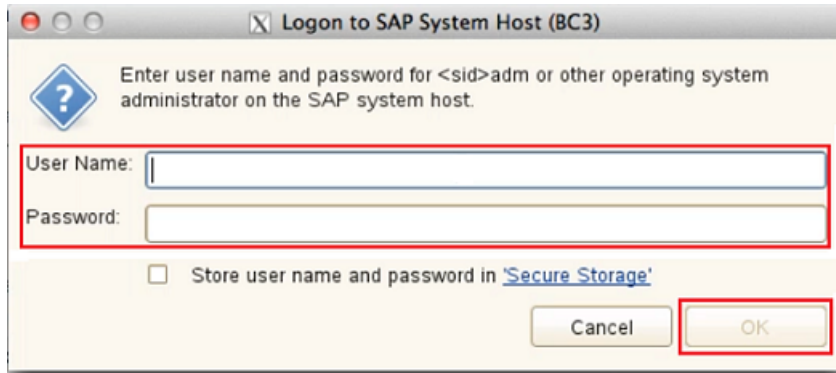
- 1 On the SAP HANA studio interface, select the HANA instance that you want to recover. In this case <SID>.
- 2 Right-click on the instance and select the **Recover** option as shown.



- 3 For a recovery, the system must be offline. Select **OK** on the System Shutdown screen as shown.



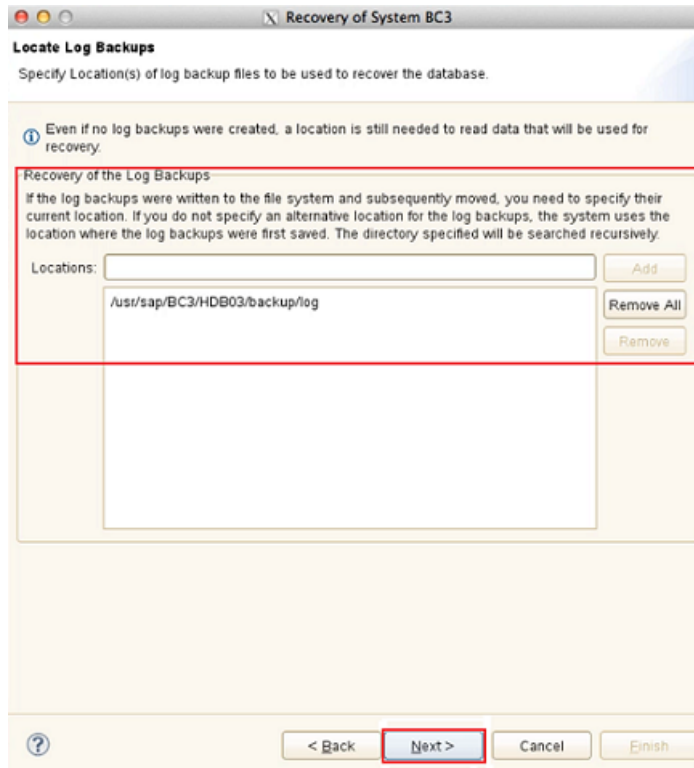
- 4 The **Logon to SAP System Host** screen displays. Specify the user name and password as shown and click **OK**.



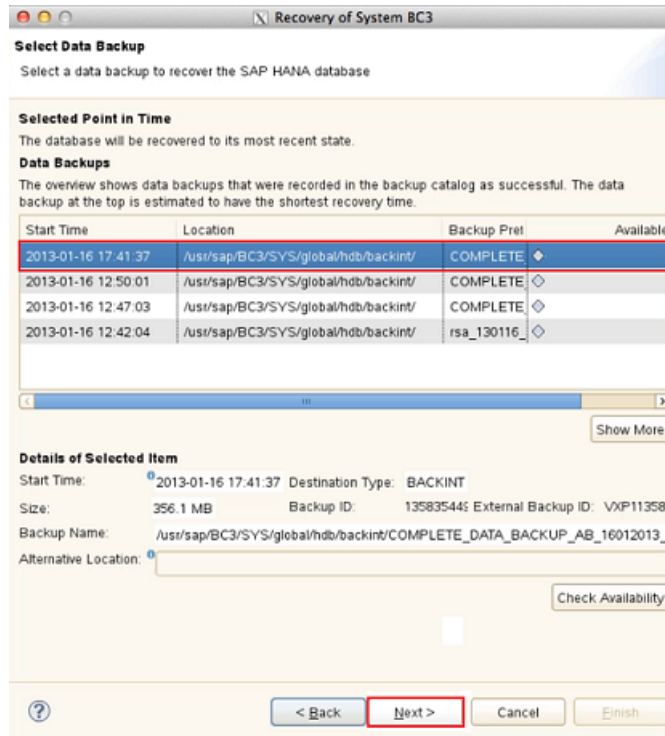
- 5 In the **Recovery of System** screen, select the **Recover the database to its most recent state** option and click **Next**.



- 6 Check the details under **Recovery of the Log Backups** and click **Next**.



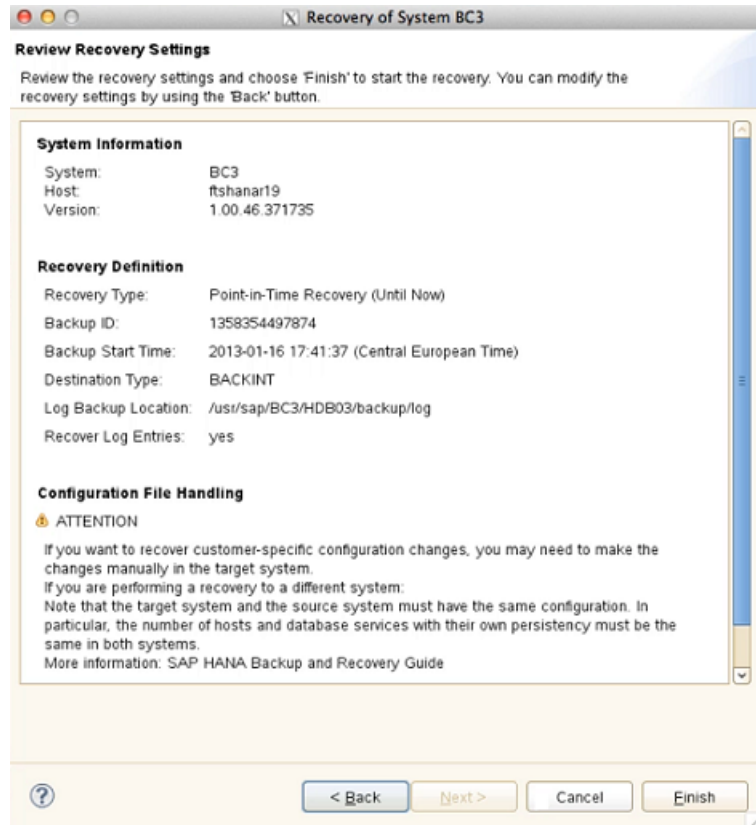
- 7 Under **Select Data Backup**, select the data backup to recover the SAP HANA database and click **Next**.



- In the Other Settings screen, in the **Check Availability of Delta and Log Backups** section, select the **Third-Party Backup Tool (Backint)** check box.

Note: If you are using SAP HANA SPS 10 or later, then ensure that in the **Use Delta Backups** section, the **Use Delta Backups** check box is selected.

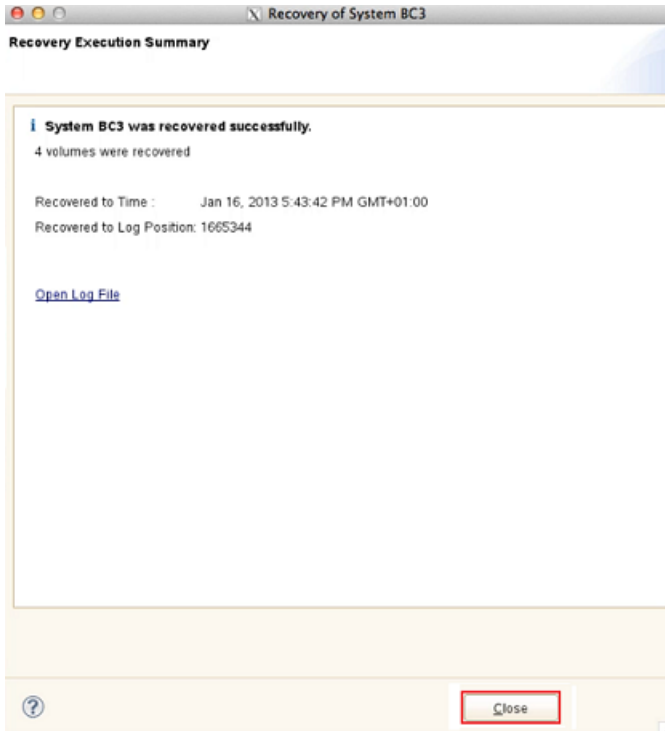
- Confirm the recovery details under **Review Recovery Settings** and click **Finish**.



- 10 Check the Activity Monitor of the NetBackup Administration Console to get the recovery information. On a successful recovery the following results are displayed:



11 After the recovery, on the **Recovery of System** screen, click **Close**.



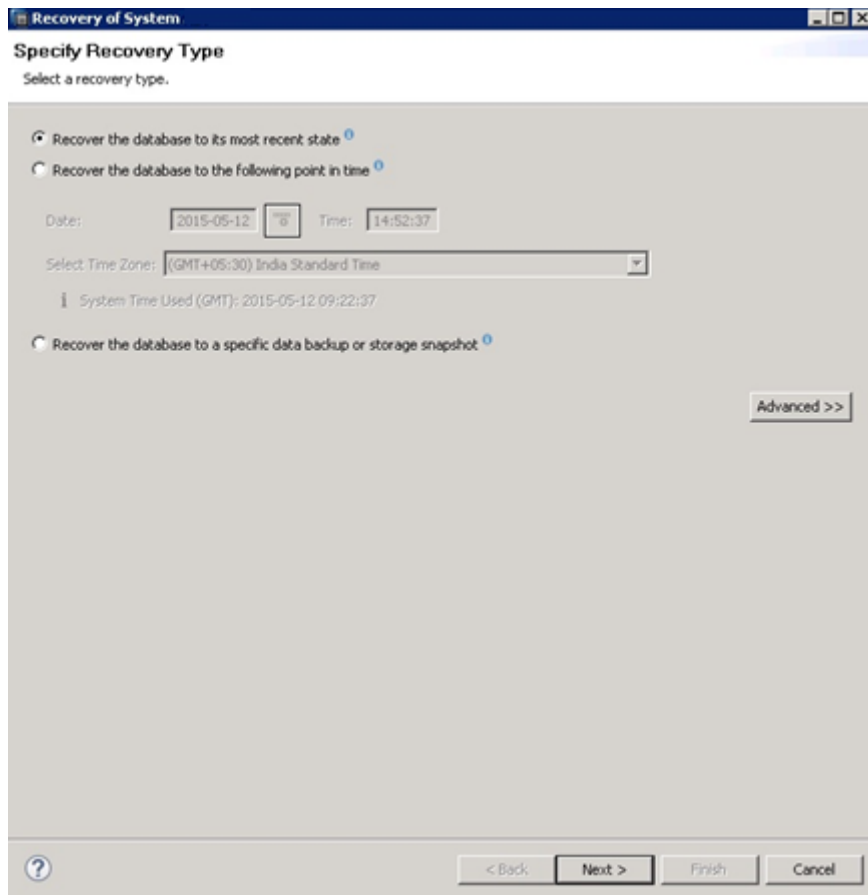
Using SAP HANA studio for SAP HANA instance redirected restore

Use the SAP HANA studio to backup the SAP HANA data. The following steps help you to set up the redirected restore.

Setting up the SAP HANA instance redirected restore using the SAP HANA studio

- 1 On the SAP HANA studio interface, select the destination SAP HANA instance that you want to recover.
- 2 Right-click the SAP HANA instance, and select **Backup and Recovery > Recover System**.
- 3 On the **Shutdown System** screen, select **OK**.
Before a recovery can start, the system must be offline.

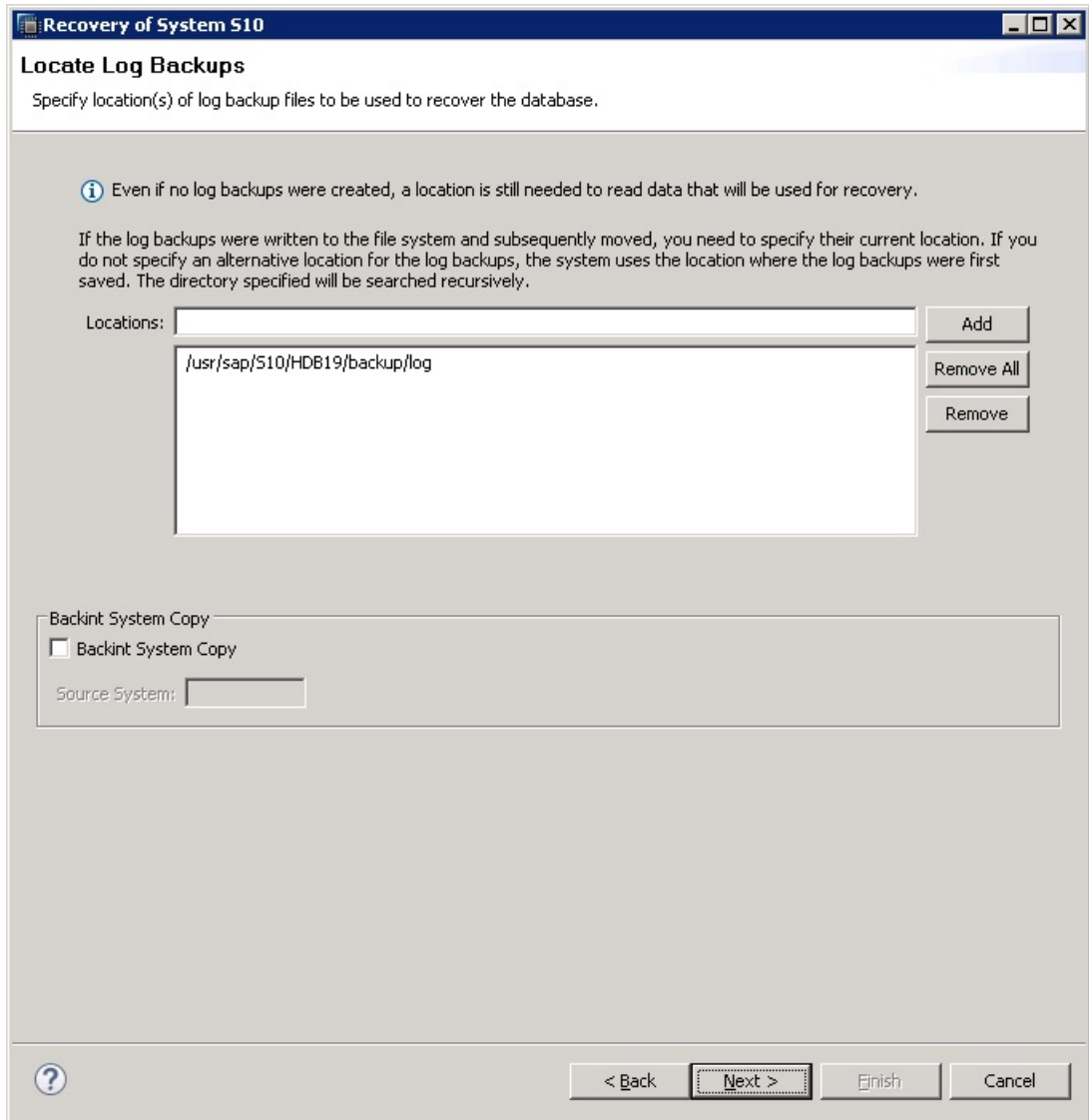
- 4 In the **Recovery of System <system name>** screen, select one of the following options, and click **Next**.
- **Recover the database to its most recent state** - If you select this option, see step 5 for further steps.
 - **Recover the database to the following point in time** - If you select this option, see step 5 for further steps.
 - **Recover the database to a specific data backup or storage snapshot** – Select this option when you want to restore only the data backup and not the log backups. If you select this option, see step 10 for further steps.



- 5 Specify the source instance name in the **Source System** field, and click **Next**.

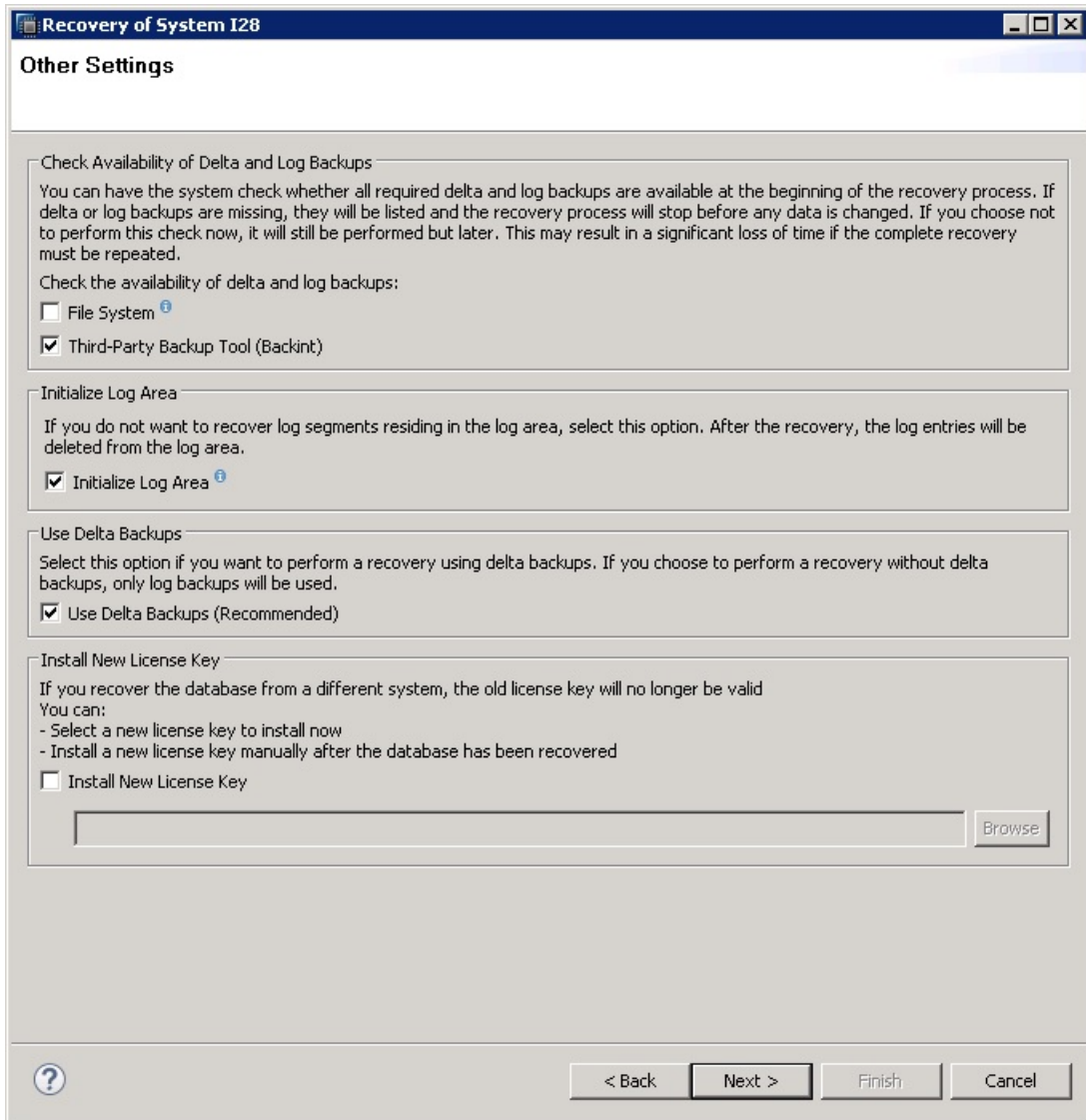
Note: By default, the **Source System** field is prepopulated with the destination SAP HANA instance name.

In SAP HANA SPS 10 and later, you must select the **Backint System Copy** check box to enable the **Source System** field.

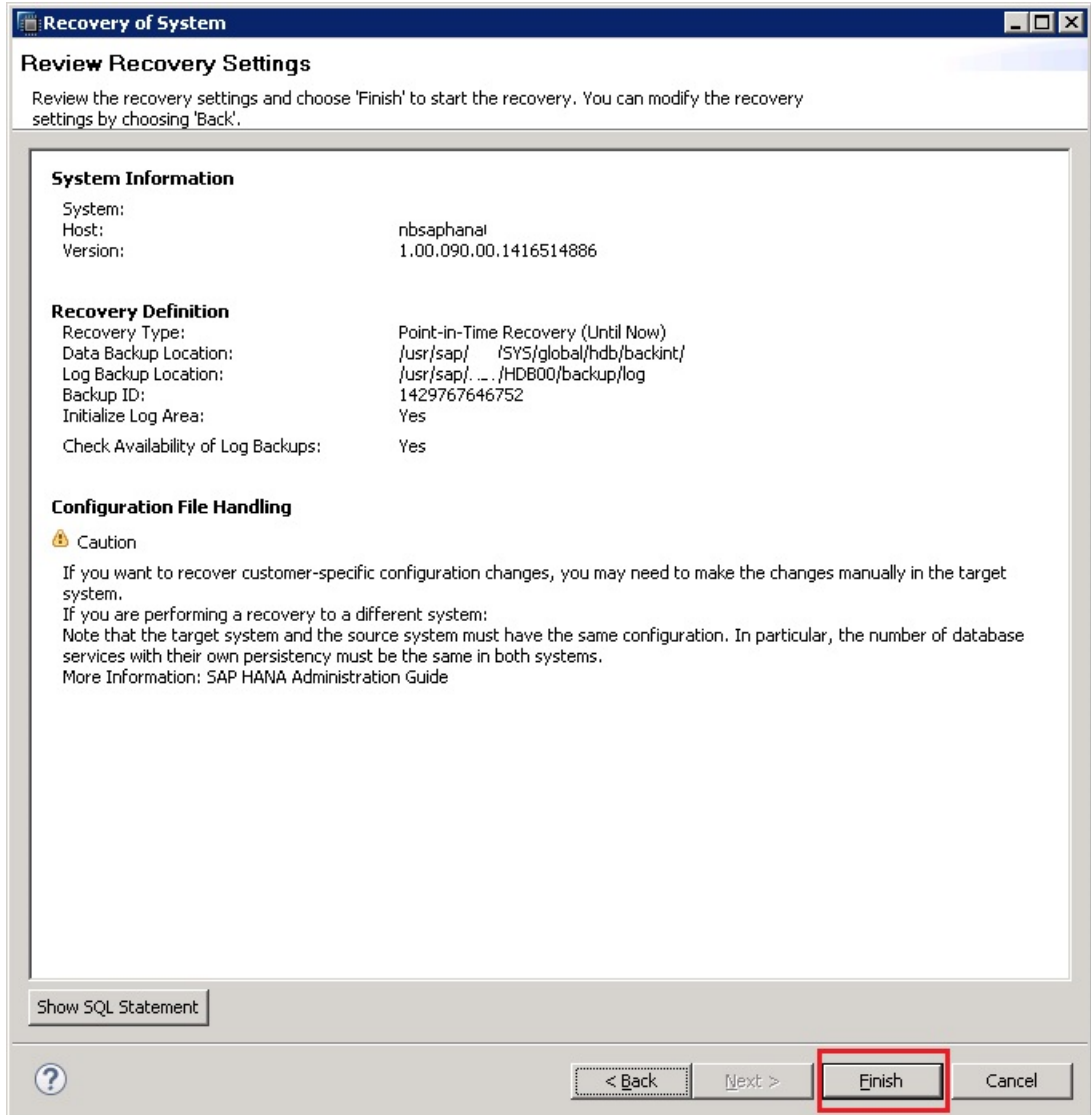


- 7 In the **Check Availability of Log Backups** section, clear the **File System** check box and select the **Third-Party Backup Tool (Backint)** check box. In the **Initialize Log Area** section, select the **Initialize Log Area** check box, and then click **Next**.

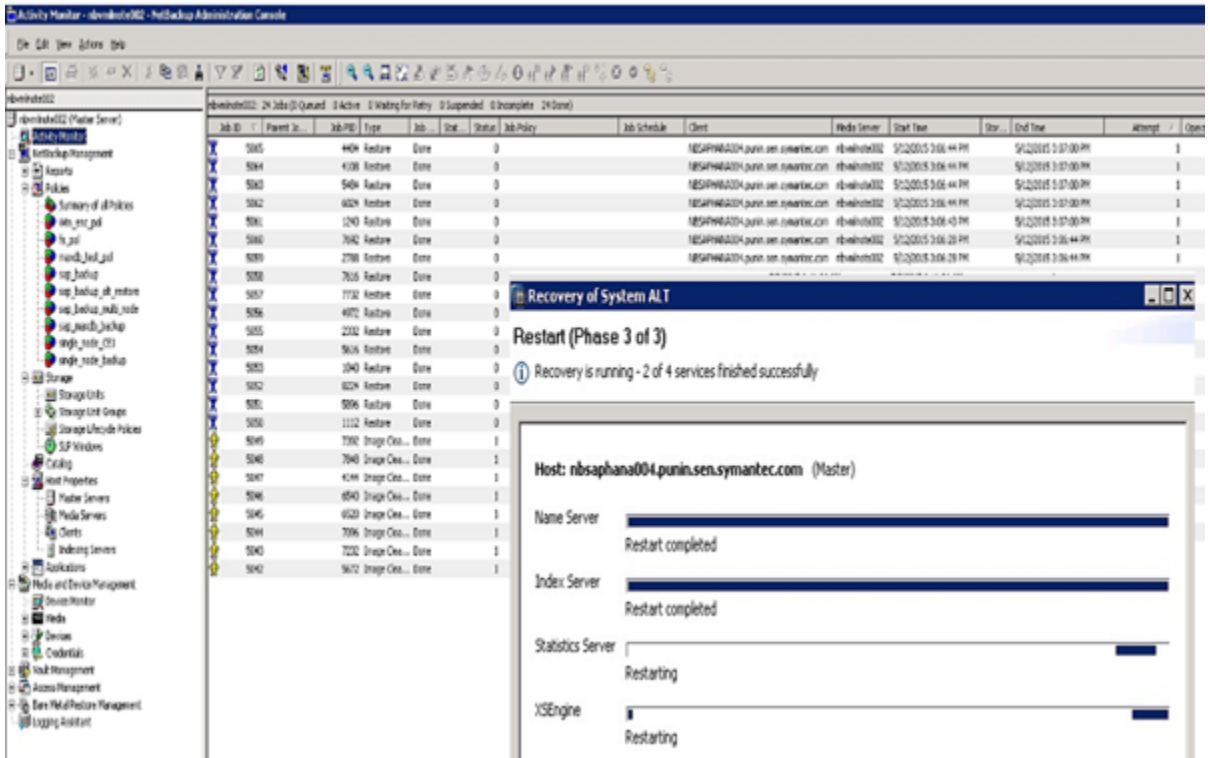
Note: If you use SAP HANA SPS 10 and later, ensure that the **Use Delta Backups** check box is selected.



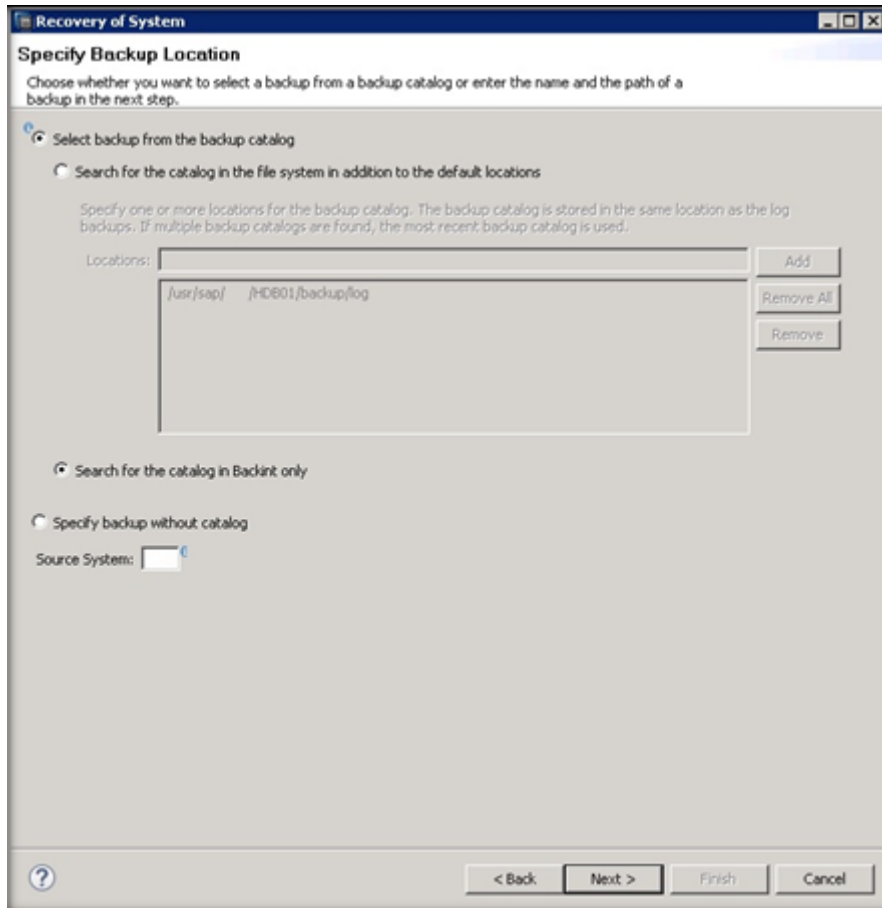
- 8 In the **Review Recovery Settings** screen, confirm the recovery details, and click **Finish**.



- 9 Check the Activity Monitor of the NetBackup Administration Console to view the recovery information.



- 10 If you have selected **Recover the database to a specific data backup or storage snapshot** in step 3 and clicked **Next**, then in the **Specify Backup Location** screen, you can select one of the following options:
 - **Search for the catalog in Backint only** – see Step 11 for further steps.
 - **Specify backup without catalog** – see Step 16 for further steps.



- 11 Specify the source instance name in the **Source System** field, and click **Next**.

Note: By default, the **Source System** field is prepopulated with the destination SAP HANA instance name.

If you use SAP HANA SPS 10 and later, you must select the **Backint System Copy** check box to enable the **Source System** field.

- 12 In the **Select a Backup** screen, select a data backup to recover the SAP HANA database, and click **Next**.

- 13 In the **Other Settings** screen, the **Initialize Log Area** check box is selected by default. Click **Next**.

Note: If you use SAP HANA SPS 10 and later, ensure that the **Use Delta Backups** check box is selected.

- 14 In the **Review Recovery Settings** screen, confirm the recovery details, and click **Finish**.
- 15 Check the Activity Monitor of the NetBackupAdministration Console to view the recovery information.
- 16 Specify the source instance name in the **Source System** field, and click Next.

Note: By default, the **Source System** field is prepopulated with the destination SAP HANA instance name.

If you use SAP HANA SPS 10 and later, you must select the **Backint System Copy** check box to enable the **Source System** field.

- 17 In the **Specify the Backup to Recover** screen, specify the **Destination Type** as **Backint** and in the **Backup Prefix** field, specify the backup prefix. Click **Next**.

The screenshot shows a dialog box titled "Recovery of System ALT" with the subtitle "Specify the Backup to Recover". Below the subtitle is the instruction "Specify the backup to be recovered." The dialog contains a "Destination Type" dropdown menu set to "Backint". A section titled "Locate the Data Backup" contains the instruction "Specify the destination of the data backup that you want to use to recover the database." Below this are two input fields: "Location" with the text "/usr/sap/ALT/SYS/global/hdb/backint" and "Backup Prefix" with the text "COMPLETE DATA BACKUP". At the bottom of the dialog are four buttons: a help icon (?), "< Back", "Next >", "Finish", and "Cancel".

Recovery of System ALT

Specify the Backup to Recover

Specify the backup to be recovered.

Destination Type:

Locate the Data Backup

Specify the destination of the data backup that you want to use to recover the database.

Location:

Backup Prefix:

- 18 In the **Other Settings** screen, the **Initialize Log Area** check box is selected by default. Click **Next**.

Note: If you use SAP HANA SPS 10 and later, ensure that the **Use Delta Backups** check box is selected.

- 19 In the **Review Recovery Settings** screen, confirm the recovery details, and click **Finish**.
- 20 Check the Activity Monitor of the NetBackupAdministration Console to view the recovery information.

NetBackup for SAP with Snapshot Client

This chapter includes the following topics:

- NetBackup for SAP with Snapshot Client overview
- Using NetBackup for SAP with Snapshot Client to back up large databases
- How the NetBackup for SAP Snapshot Client works
- Configuration requirements for snapshot backups with NetBackup for SAP
- About configuring Snapshot Client with NetBackup for SAP
- About configuring NetBackup for SAP block-level incremental backups on UNIX
- About restoring individual files from a NetBackup for SAP snapshot backup
- About NetBackup for SAP restores of volumes and file systems using snapshot rollback
- About NetBackup for SAP sample backup scripts (UNIX or Linux)
- About NetBackup for SAP sample backup scripts (Windows)
- Mixing RMAN stream and RMAN proxy NetBackup for SAP backups
- Performing user-directed snapshot backups with NetBackup for SAP

NetBackup for SAP with Snapshot Client overview

The NetBackup for SAP Snapshot Client software consolidates a variety of snapshot-based technologies into a single, easy-to-use backup solution. When

NetBackup for SAP is used with Snapshot Client, the environments that are based on Oracle are supported.

Note: Environments that are based on MaxDB databases are not supported.

The ability to restore your environment quickly depends on your ability to back up business-critical data quickly. Backups enable you to restore your environment in the event of logical database errors or physical errors such as hardware failures or disasters. Snapshot backups enable you to minimize the length of time that a database is in backup mode or offline. Veritas recommends that customers perform online backups at least daily and offline backups once a week. Since periods of low SAP system activity are few and far between because customers tend to run long batch jobs on weekends or during night hours, snapshots make it possible to protect the data with minimal delay.

Table 9-1 describes the Snapshot Client features.

Table 9-1 NetBackup for SAP with Snapshot Client features

Snapshot Client feature	Description
Array and software snapshot integration	Supports a variety of array and software snapshots and provides a base for all Snapshot Client solutions.
Snapshot backups	<p>A snapshot backup occurs when NetBackup creates a point-in-time copy of the disk volumes on which the database resides. When snapshot backup is used with Snapshot Client, NetBackup for SAP backs up Oracle objects by taking snapshot images of the component files on the local host. Later it backs up the snapshot to a storage unit.</p> <p>The snapshot process is nearly instantaneous; so user access to the database is not interrupted. Client operations and user access continue without interruption during the backup. The backup does not affect the performance or availability of the database. You can perform snapshot backup by using the <code>backint</code> command or by using RMAN proxy copy.</p>

Table 9-1 NetBackup for SAP with Snapshot Client features (*continued*)

Snapshot Client feature	Description
Instant recovery backups	<p>This feature makes backups available for instant recovery from disk. Instant recovery combines snapshot technology with the ability to do rapid disk-based restores. NetBackup creates the image without interrupting user access to data. The snapshot can optionally be backed up to tape or other storage long-term storage, but is retained for recovery in the short term. Instant recovery makes it possible to perform file promotion and rollback without accessing the long-term storage. Additionally for UNIX and Linux, instant recovery makes it possible to perform block-level restores.</p>
Off-host backups	<p>An off-host backup shifts the burden of the backup process onto a separate backup agent, such as an alternate client or data mover. An off-host backup reduces the effect on the client's resources that a local backup ordinarily causes. The backup agent reads the data from the client disk and writes it to storage. You can perform off-host backups by using the <code>backint</code> command or by using RMAN proxy.</p>
Block-level incremental backup and recovery	<p>This feature is available for UNIX and Linux. Less data leads to high performance data protection. A Block-Level Incremental (BLI) Backup uses the change tracking capabilities of the Veritas File System (VxFS) Storage Checkpoint feature. In a BLI backup, only the changed blocks of data are backed up, not the entire file or file system. A BLI backup saves time, decreases the amount of backup media that is required, and significantly reduces CPU and network overhead during backups.</p>
RMAN proxy copy	<p>Proxy copy is an extension to Oracle's media management API. A proxy copy is a special type of backup in which RMAN turns over control of the data transfer to the NetBackup for SAP Agent. The agent can then manage the entire data movement between the disks that contain the Oracle data files and the storage devices that NetBackup manages.</p> <p>With proxy copy, RMAN provides a list of files that require backup or restore to the NetBackup for SAP Agent. The NetBackup for SAP Agent determines how the data is moved.</p>

Table 9-1 NetBackup for SAP with Snapshot Client features *(continued)*

Snapshot Client feature	Description
RMAN stream-based backups	<p>RMAN stream-based operations are the standard way by which NetBackup for SAP implements conventional RMAN backups and restores. In a stream-based backup, NetBackup moves the data that the Oracle server process provides.</p> <p>NetBackup for SAP captures the data stream content that RMAN provides and stores it to media.</p> <p>If the user configures SAP for RMAN with multiple channels, the following occurs:</p> <ul style="list-style-type: none"> ■ RMAN makes multiple backup requests to NetBackup in parallel ■ NetBackup backs up and catalogs the multiple backups as separate images
RMAN proxy and RMAN stream-based backups intermixed	<p>RMAN Proxy backups can be used to perform off-host snapshot-based split mirror full backups. For example, you can use RMAN proxy for weekly full backups.</p> <p>RMAN stream-based backups can be used to perform on-host incremental backups. In this way you can perform daily backups.</p> <p>NetBackup for SAP offers you the flexibility to intermix backup methods. You can specify both RMAN proxy copy off-host snapshot backups and RMAN stream-based on-host incremental backups. When you perform both types of backups, you remove the backup load from the production host during full backups. You also reduce the amount of data for incremental backups.</p>

Using NetBackup for SAP with Snapshot Client to back up large databases

Veritas recommends that customers with production databases back up their environments on a daily basis. This daily backup often is not feasible for databases of a size between 100 GB to over 1 TB.

This issue exists due to the following concerns:

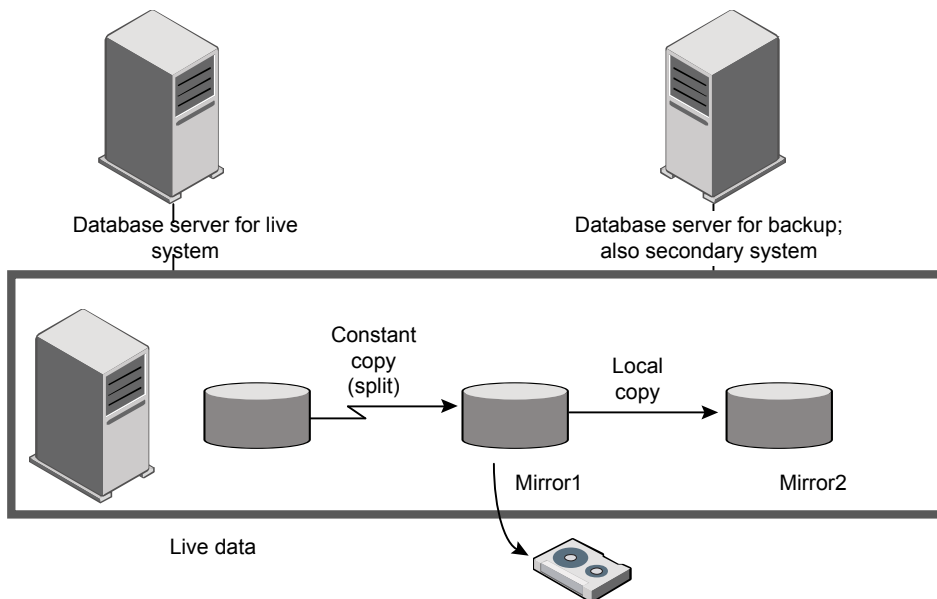
- **Server performance.** The backup process for large databases can cause severe performance problems because the process consumes the database server's resources. CPU time, the system bus, the I/O bus, hard disk controllers, and

volume controllers become saturated. As a result, online use of the SAP system is limited and system performance is unpredictable during the backup.

- **System availability.** Traditionally, backup activities were carried out when there was little or no system activity. This time window usually occurred at night. In today's production environments, which require little or no system downtime, this window is small, if one even exists.
- **Network performance.** Instability and further performance loss may be experienced with a backup of large databases from the production host and over the network.

NetBackup for SAP with Snapshot Client supports split mirror backups. Split mirror backups are the recommended backup method for large databases because these backups overcome the preceding concerns.

Figure 9-1 SAP split mirror backup scenario



In SAP environments, the Snapshot Client technology supports the following major backup strategies:

- **Off-host backup,** which offers more performance. It offloads database backup activity and CPU cycles from the production host to the backup host. Thus, it improves the performance of the production environment.
- **Snapshot backup,** which requires no downtime of your production system. SAP supports both offline split mirror and online split mirror backups. In an online

split mirror backup, the production database remains available for user transactions. The need for backup windows is eliminated and 24/7 uptime functionality is provided for continuous business transactions.

- (UNIX or Linux) Block-Level Incremental (BLI) Backup. BLI backups decrease the amount of backup media that is required for incremental backups and to significantly reduce CPU and network overhead during backups. BLI, may not be used for incremental backups with SAP with RMAN.
- Split mirror backups. Because the mirrors are split from their standard devices and mounted on the backup server, the backup does not overload the network. The backup is run on the backup server without affecting the network.

How the NetBackup for SAP Snapshot Client works

A backup is initiated when:

- An automatic schedule executes the backup script that is specified in the Backup Selection of the policy. The backup script contains `brtools` commands to start a backup.
- A user or external process on the client host invokes the `brtools` commands to start a backup.

The `brtools` include the `brbackup` command. The `brbackup` command initiates backup of the specified objects. The `brbackup` command provides a list of physical file names to NetBackup for SAP.

See “SAP database objects supported by advanced backup methods” on page 142.

The argument to the `brbackup` command `-d` parameter determines if the backup uses the `backint` or `RMAN` backup interfaces. Then either `brbackup` or `RMAN` provides the file list to NetBackup for SAP. NetBackup for SAP verifies that the policy it selected for the backup is configured with the appropriate Snapshot Client attributes, and then initiates file-based backups of the Oracle files, and performs the data movement.

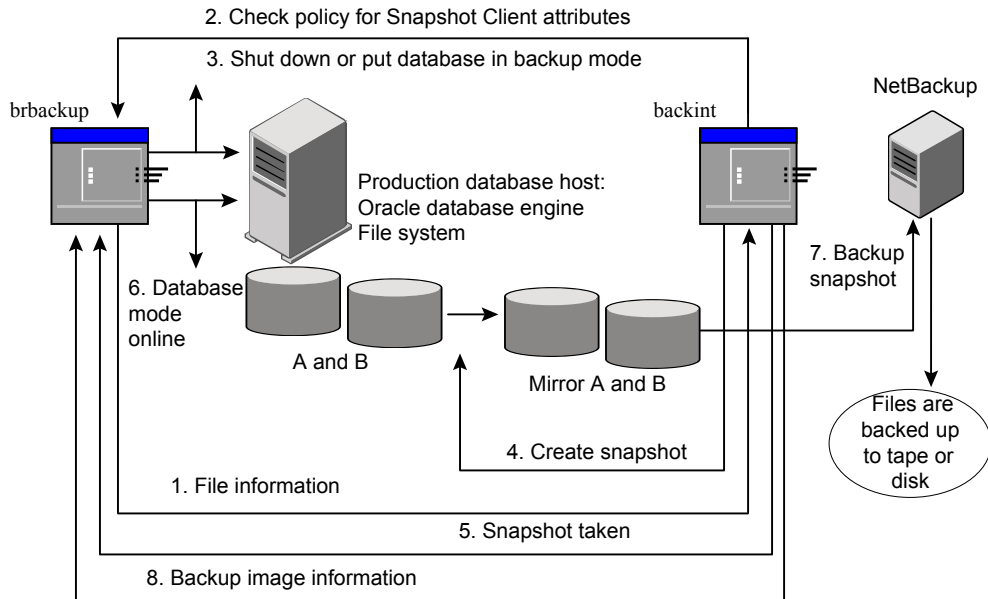
Before NetBackup for SAP performs the backups, it requests that `brbackup` or `RMAN` put the data files being backed up into backup mode.

NetBackup then creates a snapshot of the files. When the snapshot is complete, NetBackup for SAP signals back to `brbackup` or `RMAN` to take the data files out of backup mode. The data files that are selected for backup are in backup mode for the time necessary to capture a snapshot of the data.

How NetBackup for SAP performs a split mirror backup using backint

Figure 9-2 lists the sequence of operations when you use `backint` to perform a backup.

Figure 9-2 SAP Oracle online and offline backups by using the `brbackup` command and `backint` command



When NetBackup for SAP performs a backup by using the `backint`, the following occurs:

- 1 NetBackup for SAP receives a list of files to back up from `brbackup`.
- 2 NetBackup for SAP queries the policy to check whether the Snapshot Client policy attributes are specified.

When NetBackup for SAP is ready to back up the files, it sends a request to `brbackup` to put the data files into backup mode

Depending on the parameters with which the `brbackup` command was invoked, `brbackup` either shuts down the database or puts the database in backup mode.

- If `brbackup` is invoked with following command, `brbackup` shuts down the database:

```
# brbackup -d util_file_online -t offline -m all -c force
```

- If `brbackup` is invoked with following command, `brbackup` puts the database or tablespace into backup mode:

```
# brbackup -d util_file_online -t online -m all -c force
```

- 4 NetBackup for SAP quickly creates a snapshot of the files to back up. This operation typically takes a few seconds or minutes.
- 5 NetBackup for SAP notifies `brbackup` that the snapshot has been taken and that the database can be either started or taken out of backup mode.
- 6 `brbackup` either starts the database or takes the database out of backup mode.
- 7 NetBackup backs up the snapshot that it created.
- 8 NetBackup returns backup image information to `brbackup`.

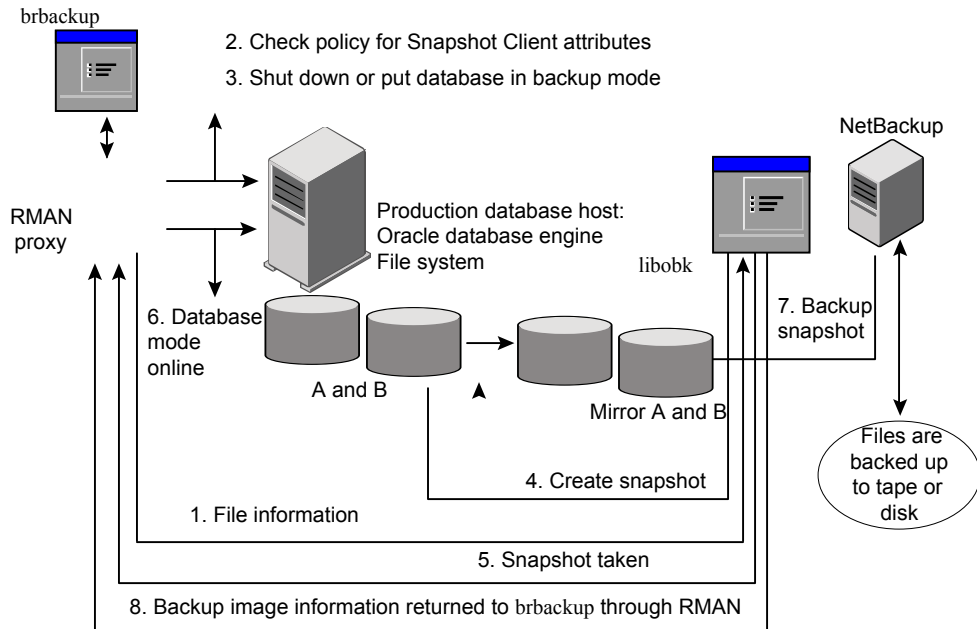
See “The `util_file` parameter incompatible with Snapshot Client” on page 142.

See “How the NetBackup for SAP Snapshot Client works” on page 138.

How NetBackup for SAP performs a split mirror backup using RMAN

Figure 9-3 lists sequence of operations when you use RMAN proxy to perform a backup.

Figure 9-3 SAP Oracle online and offline backups by using RMAN proxy



When NetBackup for SAP performs a backup by using RMAN, the following occurs:

- 1 NetBackup for SAP receives a list of files to back up from RMAN.
- 2 NetBackup for SAP queries the policy to check whether the Snapshot Client policy attributes are specified.
- 3 When NetBackup for SAP is ready to back up the files, it sends a request to RMAN. The RMAN puts the data files into backup mode or shuts down. NetBackup sends this request by using an SBT API.
- 4 Depending on the parameters with which the brbackup command was invoked, RMAN either shuts down the database or puts the database in backup mode.

- If brbackup is invoked with following command, RMAN shuts down the database:

```
# brbackup -d rman_util -t offline -m full -c force
```

- If brbackup is invoked with following command, RMAN puts the database or tablespace into backup mode:

```
# brbackup -d rman_util -t online -m full -c force
```

- 5 NetBackup for SAP quickly creates a snapshot of the files to back up. This operation typically takes a few seconds or minutes.
- 6 NetBackup for SAP notifies RMAN that the snapshot has been taken and that the database can be either started or taken out of backup mode.
- 7 RMAN either starts the database or takes the database out of backup mode.
- 8 NetBackup backs up the snapshot that it created.
- 9 NetBackup returns backup image information to `brbackup`.

The `util_file` parameter incompatible with Snapshot Client

NetBackup for SAP does not perform snapshot backups if the following parameter is specified on the `brbackup` command line:

```
-d util_file
```

When you specify this parameter, `brbackup` either shuts down the database or puts the database in backup mode. Then `brpbackup` calls the NetBackup for SAP Agent. The database remains in backup mode for the duration of entire backup.

Doing snapshot-based backups in this scenario is not useful. The snapshot technology adds no value because the database is either offline or in backup mode for several hours. If you initiate backups with this parameter in effect, NetBackup for SAP performs only standard backups directly to the storage unit. NetBackup for SAP ignores any snapshot-related configuration in the policy

About the NetBackup for SAP restore process

If you use the NetBackup for SAP Snapshot Client during a backup, you can use the typical NetBackup for SAP restore process. The Snapshot Client has no effect on the restore process.

Follow the existing NetBackup for SAP mechanism to perform restores of split mirror backups or block-level incremental backups (UNIX or Linux). If you use the instant recovery with rollback option, you must export the `SAP_RESTORE` environment variable.

SAP database objects supported by advanced backup methods

The `brbackup` command and Oracle RMAN control the kinds of database objects that can be backed up using Snapshot Client backup methods. Oracle allows proxy copy backups of databases, tablespaces, and data files.

For profile and configuration files, the NetBackup for SAP `backint` command performs standard backups directly to the configured storage unit. NetBackup for SAP uses advanced methods only when it moves Oracle data files.

The following is additional information on special file types for UNIX or Linux:

- Symbolic links and raw data files. NetBackup for SAP with Snapshot Client backs up and restores the data files that consist of symbolic links and regular files. NetBackup for SAP backs up and restores both the symbolic link and the file. If you select **Retain snapshots for Instant Recovery or SLP management**, the symbolic link must reside on the same file system as the data file. When you use instant recovery, if the symbolic link resides on a different file system than the data file it points to, the restore fails.

NetBackup for SAP with Snapshot Client backs up and restores the data.

Files that are created on raw partitions:

- Quick I/O data files. NetBackup for SAP with Snapshot Client backs up and restores Quick I/O Oracle data files. A Quick I/O file consists of two components: A hidden file with space allocated for it and a link that point to the Quick I/O interface of the hidden file.
 - On the backup, NetBackup for SAP with Snapshot Client follows the symbolic link and backs up both components of the Quick I/O file: The symbolic link and the hidden file.
 - On the restore, NetBackup for SAP with Snapshot Client restores both components from the backup image. If one or both of the components are missing, NetBackup for SAP with Snapshot Client creates the missing component(s).

Configuration requirements for snapshot backups with NetBackup for SAP

Each snapshot type has its own hardware requirements, software requirements, compatibility with certain features, and the snapshot methods that are supported. Special requirements apply for specific types of backups. See the NetBackup Snapshot Client Administrator's Guide and the Veritas Support website for more information. Familiarize yourself with this information before you configure any snapshot backups.

The following list highlights some of the requirements that pertain to database agents:

- Snapshot Client backups do not back up all database objects. Your backup configuration must include schedules to perform snapshot and stream-based

backups. This configuration ensures that the entire database can be restored successfully.

- On UNIX, the user identification and group identification numbers (UIDs and GIDs) associated with the files to be backed up must be available. The UID and GID must be available to both the primary client and the alternate backup client. The UID on the primary client and the alternate backup client must be the same. Similarly, the GID on the primary client and the alternate backup client must be the same.
- Ensure that the data files reside on a volume or a file system that does not contain archive logs, control files, or executables.
- The hardware and software that is required for the appropriate snapshot method must be installed and configured correctly.
- NetBackup Snapshot Client must be installed and configured correctly, and the master server must have a valid license for this option.
- To perform off-host backups, specify the off-host in the backup policy and ensure that host has the software and permissions to mount the snapshot.
- To perform Snapshot Client backups or restores, you need `brtools` version 6.40, patch level 36 or greater.

About configuring Snapshot Client with NetBackup for SAP

This topic explains how to configure snapshot and instant recovery backups for the SAP policy. For information on how a snapshot method is automatically selected and details on the types of backup methods, see the NetBackup Snapshot Client Administrator's Guide.

Snapshot backups do not back up all database objects. Your backup configuration must include one or more automatic schedules to perform snapshot backups and one or more application schedules to perform stream-based backups. This configuration ensures that the entire database can be restored successfully.

For snapshot or instant recovery backups, configure the following SAP policy and schedules as follows:

- On UNIX, snapshot methods for the file systems (raw partitions or logical volumes) on which the data objects (data files) reside.
- A backup method on the policy attributes dialog box.
- An Automatic Full Backup schedule to perform snapshot and off-host backups of the data files in `brbackup` phase 1.

- An Application Backup schedule to back up the profile files in `brbackup` phase 2. NetBackup for SAP does not support snapshot backups for `brbackup` phase 2.

Configuring a snapshot policy for NetBackup for SAP

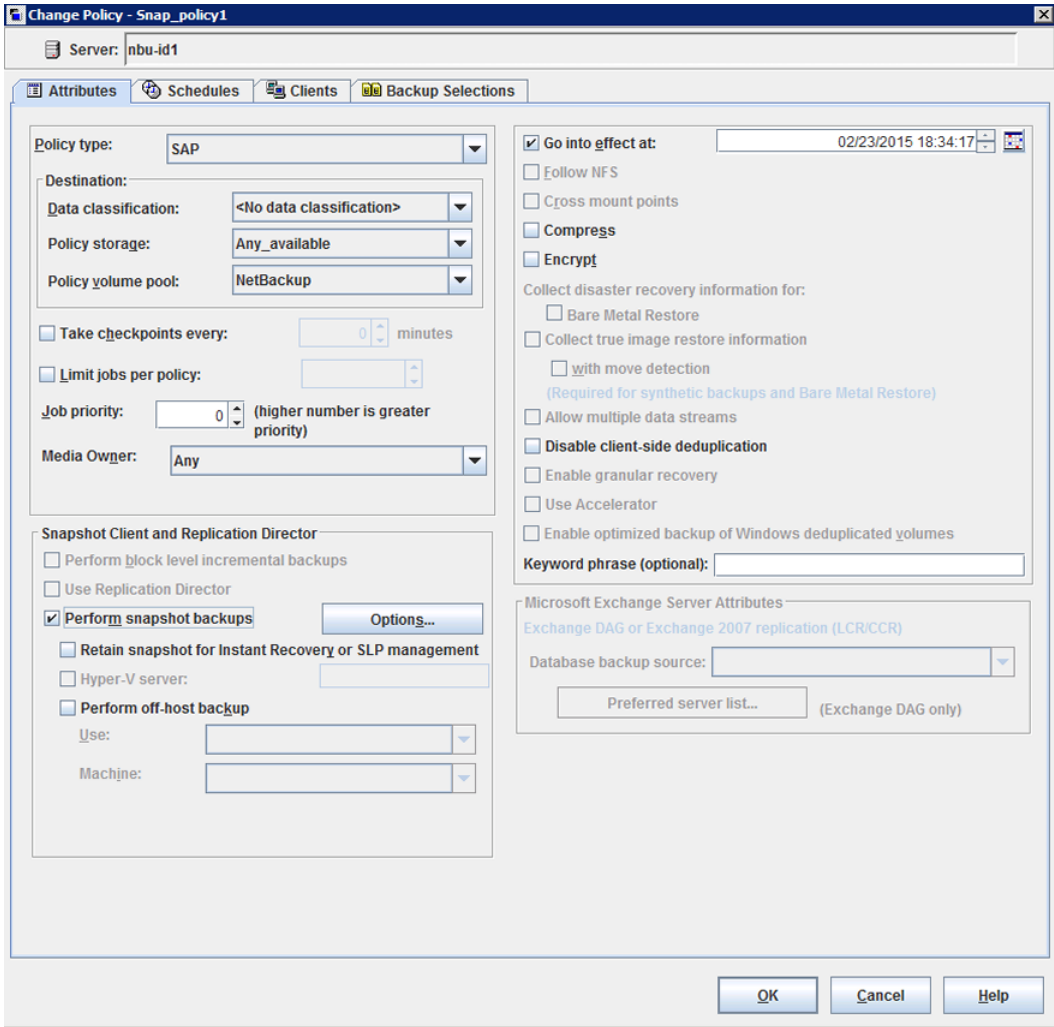
The following procedure shows how to configure a snapshot policy with optional snapshot retention and off-host backup. For information on instant recovery policies, see the following topic.

See “Prerequisites for instant recovery backups (UNIX or Linux)” on page 149.

To configure a snapshot policy for NetBackup for SAP

- 1 Open the policy you want to configure.
- 2 Click on the **Attributes** tab.
- 3 Select the SAP policy type.
- 4 Select a policy storage unit from the **Policy storage** list.

5 Click **Perform snapshot backups**.



6 (Optional) Click **Options** to choose a snapshot method.

By default NetBackup chooses a snapshot method for you. To choose a snapshot method, click **auto** (the default) or click one of the methods that are presented in the list.

The snapshot method that you must use depends on your hardware environment and software environment. Only certain snapshot methods are supported in certain environments. See the NetBackup Snapshot Client Administrator's Guide or the supported platforms matrix on the Veritas Support website for more information.

You can configure only one snapshot method per policy. For example, assume that you want one snapshot method for clients a, b, and c, and a different method for clients d, e, and f. Then you need to create two policies for each group of clients and select one method for each policy.

7 (Optional) Select **Perform off-host backup**.

By default, the client that hosts the database performs the backup. If you want to reduce the I/O processing load on the client that hosts the database, specify an alternate client to perform the backup.

8 (Conditional) Select an off-host backup method.

The following off-host backup methods are available:

Use Alternate client (UNIX and Windows clients) If you select **Alternate client**, also specify the name of the client to perform the backup. This option may require additional configuration. The alternate client must be a client that shares the disk array.

Use Data mover (UNIX clients only). See "Configuring a NAS snapshot policy for NetBackup for SAP on UNIX/Linux" on page 154.

9 Click the **Schedules** tab.

10 Click **New**.

11 Configure an Automatic schedule for the database files.

These files are backed up in `brbackup` phase 1.

- 12** (Conditional) In the **Schedules** dialog box, in the **Instant Recovery** group, select **Snapshots only**.

This setting suppresses NetBackup's default behavior, which is to copy the snapshot to a storage unit. When you select **Snapshots only**, NetBackup creates the on-disk snapshot copy of the database, but it does not copy the snapshot to a storage unit. The on-disk snapshot becomes the only backup copy. Note that the on-disk snapshot is not considered to be a replacement for a traditional backup.

- 13** Configure an Application Backup schedule that backs up profile and configuration files, which are backed up in `brbackup` phase 2.

NetBackup for SAP copies the profile files or configuration files to the storage unit you select.

- 14** On the **Clients** tab, specify the clients to be included in this policy.

- 15** On the **Backup Selections** tab, specify a backup script.

See "About NetBackup for SAP backup types " on page 148.

- 16** Configure other attributes and add any additional schedules and backup selections.

About NetBackup for SAP backup types

The following backup type roles are available on the **Schedules** tab of the policy. You can use this information when you configure the NetBackup for SAP with Snapshot Client.

Table 9-2 Backup type roles

Backup Type	Description
Application Backup	<p>The Application Backup schedule enables user-controlled NetBackup operations from the client. This schedule type allows operations the client initiates and operations an automatic schedule initiates from the NetBackup master server. NetBackup uses the Application Backup schedule when the SAP user starts a backup manually. Configure at least one Application Backup schedule for each SAP policy.</p> <p>By default, an Application Backup is configured automatically. NetBackup for SAP uses the Application Backup schedule to back up the profile files that are backed up in <code>brbackup</code> phase 2.</p>

Table 9-2 Backup type roles (*continued*)

Backup Type	Description
Automatic Full Backup	An Automatic Full Backup schedule specifies the dates and times on which NetBackup is to start backups. Backups commence by running the SAP scripts automatically in the order they appear in the file list. If there is more than one client in the SAP policy, NetBackup for SAP runs the SAP scripts on each client. You must configure the Automatic Full Backup schedule in order for Snapshot Client methods to back up Oracle data files.
Automatic Differential incremental backup	In a differential incremental backup, NetBackup for SAP backs up all data blocks that changed since the most recent full or incremental backup. This type of backup can be used with the Snapshot Client BLI method.
Automatic Cumulative incremental backup	In a cumulative incremental backup, NetBackup for SAP backs up all data blocks that changed since the most recent full backup. This type of backup can be used only with the Snapshot Client BLI method or for RMAN stream-based incremental. Cumulative incremental backups reduce the work that is needed for a restore. You only need one cumulative incremental backup from any particular level at restore time. However, cumulative backups typically require more space and time than differential incremental backups. Cumulative backups duplicate the data that was captured in previous backups at same level.

Prerequisites for instant recovery backups (UNIX or Linux)

The following procedure explains the prerequisites to meet before you configure an instant recovery policy.

To perform prerequisites for an instant recovery backup (UNIX or Linux)

- 1** Shut down the database.
- 2** Copy the data files in the `/EPP/sapdata*` directory to a temporary location on another server:
- 3** Create multiple disk volumes and mount the disk volumes in their respective directories under `/EPP`.

Create as many volumes as there are data file directories. For example, if you had data file directories named `sapdata1`, `sapdata2`, and `sapdata3`, create and mount the following new data file directories:

- `/EPP/sapdata1`

- /EPP/sapdata2
 - /EPP/sapdata3
- 4 Associate a snapshot mirror with all the directories you create.
 - 5 Copy the data files from the temporary location to their respective directories.
That is, copy the data files you moved in step 2 to the directories you created in step 3.
 - 6 Start the database.

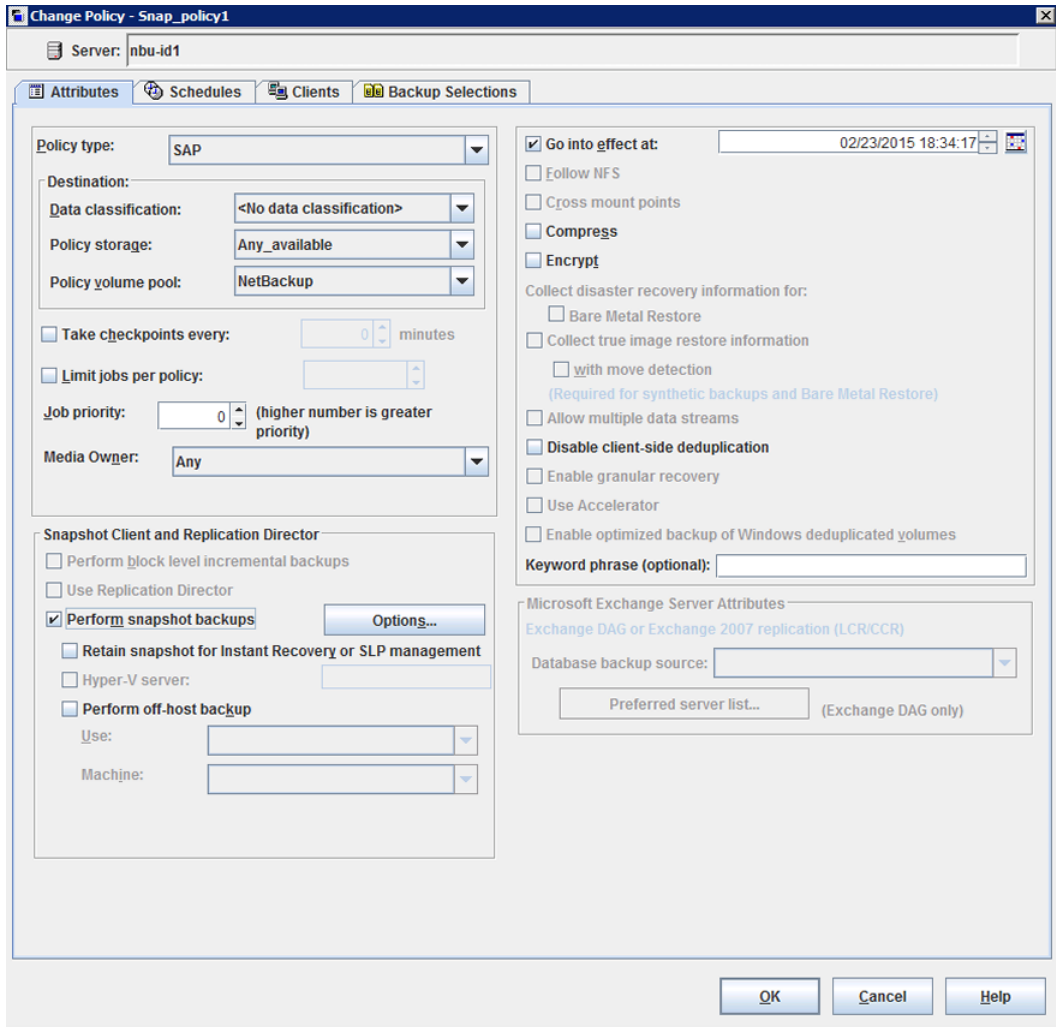
Configuring a snapshot policy with Instant Recovery for NetBackup for SAP

The following procedure describes how to configure a snapshot policy with Instant Recovery and optional snapshot retention and off-host backup. For information on standard snapshot policies, see the following topic.

See “Configuring a snapshot policy for NetBackup for SAP” on page 145.

To configure a snapshot policy with instant recovery for NetBackup for SAP

- 1 (UNIX or Linux) Perform the prerequisite configuration steps.
See “Prerequisites for instant recovery backups (UNIX or Linux)” on page 149.
- 2 Open the policy you want to configure.
- 3 Click on the **Attributes** tab.
- 4 Select the SAP policy type.



5 Select a policy storage unit from the **Policy storage** list.

Select a policy storage unit in this step even if you plan to select **Snapshots only** later in this procedure. NetBackup for SAP uses this storage unit to back up the profile files and configuration files that are backed up in `brbackup` phase 2.

6 Click **Perform snapshot backups**.

7 (Optional) Click **Options** to choose a snapshot method.

By default, NetBackup chooses a snapshot method for you. To choose a snapshot method, click **auto** (the default) or click one of the methods that are presented in the list.

The snapshot method that you can use depends on your hardware environment and software environment. Only certain snapshot methods are supported in certain environments. See the NetBackup Snapshot Client Administrator's Guide or the supported platforms matrix on the Veritas Support website for more information.

You can configure only one snapshot method per policy. For example, assume that you want one snapshot method for clients a, b, and c, and a different method for clients d, e, and f. Then you need to create two policies for each group of clients and select one method for each policy.

8 (Optional) Select **Perform off-host backup**.

By default, the client that hosts the database performs the backup. If you want to reduce the I/O processing load on the client that hosts the database, specify an alternate client to perform the backup.

9 (Conditional) Select an off-host backup method.

The following off-host backup methods are available:

Use Alternate client (UNIX and Windows clients) If you select **Alternate client**, also specify the name of the client to perform the backup. This option may require additional configuration. The alternate client must be a client that shares the disk array.

Use Data mover (UNIX clients only). See "Configuring a NAS snapshot policy for NetBackup for SAP on UNIX/Linux" on page 154.

10 Click the **Schedules** tab.

11 Click **New**.

12 Configure an Automatic schedule for the database files.

These files are backed up in `brbackup` phase 1.

13 In the **Schedules** dialog box, in the **Instant Recovery** group, select **Snapshots only**.

This setting suppresses NetBackup's default behavior, which is to copy the snapshot to a storage unit. When you select **Snapshots only**, NetBackup creates the on-disk snapshot copy of the database, but it does not copy the snapshot to a storage unit. The on-disk snapshot becomes the only backup

copy. Note that the on-disk snapshot is not considered to be a replacement for a traditional backup.

- 14** Configure an Application Backup schedule that backs up profile and configuration files, which are backed up in `brbackup` phase 2.

NetBackup for SAP copies the profile files or configuration files to the storage unit you select.

- 15** On the **Clients** tab, specify the clients to be included in this policy.

- 16** On the **Backup Selections** tab, specify a backup script.

See “About NetBackup for SAP backup types ” on page 148.

- 17** Configure other attributes and add any additional schedules and backup selections.

Additional configuration required for NetBackup for SAP with Network Attached Storage (NAS) on UNIX or Linux

Additional configuration is required if you want to use Network Attached Storage (NAS).

Table 9-3 Additional configuration for NAS

Backup type	Configuration
RMAN proxy backups with NAS	Keep all database data files on the NAS. Other database files should be located on the local file system. (These files include the online redo logs, control files, archive redo logs, Oracle executables, and the configuration files.)
BACKINT backups with NAS	Keep all database data files, online redo logs and all copies of control files on the NAS. Other database files including Oracle executables, configuration files (e.g. <code>SAPBACKUP</code> directory, <code>initCER.utl</code>) and the archive redo logs should be under the local file system.

Table 9-3 Additional configuration for NAS (*continued*)

Backup type	Configuration
Online backups	Use the <code>BR_CNTRL_DIR</code> environment variable to define the control file location for <code>brbackup</code> . The control file should be located on the NAS. (By default <code>brbackup</code> makes a copy of the control file in the <code>SAPBACKUP</code> directory, which is on the local file system. <code>brbackup</code> then provides that copy for backup).
Offline backups	No special configuration is required.

The following is an example of how to use the `BR_CNTRL_DIR` variable.

```
bash# export BR_CNTRL_DIR=/oracle/CER/cntrl_loc
```

Where `/oracle/CER/cntrl_loc` should be on the NAS. It should not be located where the actual control file resides.

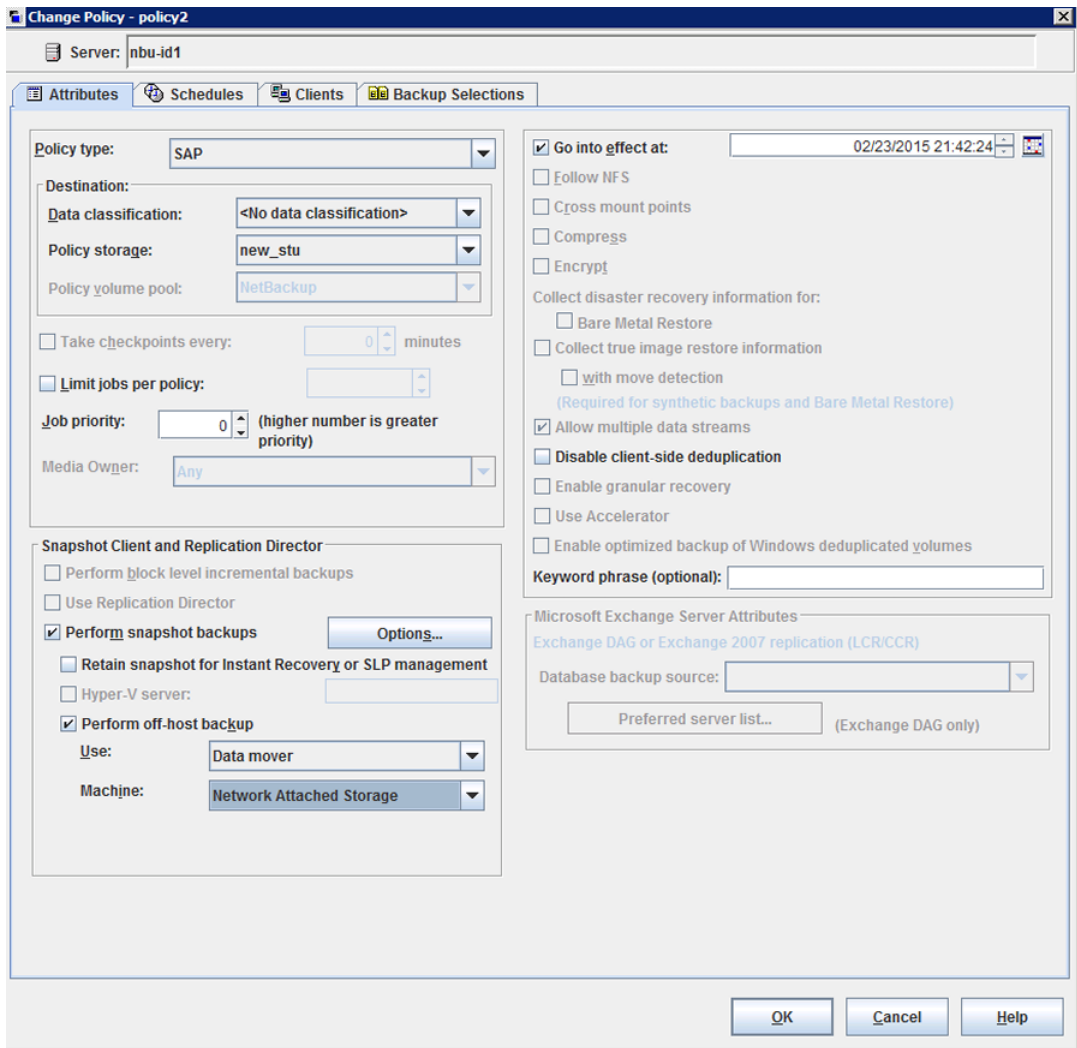
Configuring a NAS snapshot policy for NetBackup for SAP on UNIX/Linux

This topic describes how to configure a NetBackup for SAP NAS snapshot policy.

To configure a NetBackup for SAP NAS snapshot policy

- 1 Open the policy you want to configure.
- 2 Click on the **Attributes** tab.

3 Select the SAP policy type.



4 Select a storage unit.

- NetBackup creates the snapshot on disk regardless of which storage unit you select.
- NetBackup for SAP uses the policy storage unit for backups of the profile and the configuration files. (The files that are backed up as part of `brbackup`

phase 2). You can override this storage unit in the Application Backup schedule.

5 Select **Perform snapshot backups** and **Retain snapshots for instant recovery or SLP management**.

6 Select **Perform off-host backup**.

7 From the **Use** list, select **Data Mover**.

8 From the **Machine** list, select **Network Attached Storage**.

See the policy configuration topic of the NetBackup Snapshot Client Administrator's Guide.

When the policy runs, NetBackup automatically selects the NAS_Snapshot method for creating the snapshot.

As an alternative, you can manually select the NAS_Snapshot method in the **Advanced Snapshot Options** dialog box from the policy display. Information about the **Maximum Snapshots (Instant Recovery only)** parameter is available.

9 Click the **Schedules** tab.

10 Click **New**.

Configure both an Automatic Backup schedule and an Application Backup schedule, as follows:

- The Automatic Backup schedule is for the database files.
In the **Destination** panel, under **Instant recovery**, select **Snapshots only**. This option suppresses NetBackup's default behavior, which is to copy the snapshot to a storage unit.
- The Application Backup schedule is for the archived redo logs and the control files.

11 Click the **Clients** tab.

Specify clients to be backed up by this policy.

12 Click the **Backup Selections** tab.

13 Specify a backup script.

Review the information for how to use scripts for a NetBackup for SAP with Snapshot Client policy

See "About NetBackup for SAP backup types " on page 148.

14 Configure other attributes and add any additional schedules and backup selections.

About configuring NetBackup for SAP block-level incremental backups on UNIX

If only a small portion of a database changes on a daily basis, full database backups are costly in terms of time and media. The Block-Level Incremental (BLI) Backup interface extends the capabilities of NetBackup to back up only the file system blocks that contain changed data blocks.

A database BLI backup is done at the file system block level, which means only changed file blocks are backed up. Unchanged blocks within the files are not backed up. The VxFS Storage Checkpoint facility tracks changed blocks in real time. Accordingly, a BLI backup does not need to search the entire volume for the modified blocks at backup time. BLI backup saves time, decreases the amount of backup media that is required, and significantly reduces CPU and network overhead during backups. In addition, BLI backup allows more frequent backups, so backup images are more up to date.

BLI backup is particularly useful for any large databases that are sized in terms of hundreds of gigabytes or terabytes. Most traditional methods for database backup require that any change in the database—no matter how small—requires that the entire database is backed up. With BLI backup, only modified blocks (or file) need to be backed up.

How BLI works with NetBackup for SAP (UNIX)

BLI backup supports two types of incremental backups: differential and cumulative. Full, differential incremental, and cumulative incremental backups are specified as part of the policy schedule configuration. When a restore is performed, NetBackup restores an appropriate full backup. Then it applies the changed blocks from the incremental backups.

Restoring any of the incremental backup images requires NetBackup to restore the last full backup image and all the subsequent incremental backups. The restore process continues until the specified incremental backup image is restored. NetBackup performs this restore process automatically, and it is completely transparent. The media that stored the last full backup and the subsequent incremental backups must be available, or the restore cannot proceed.

Note that restoring a file rewrites all blocks in that file. The first subsequent differential incremental backup and or all subsequent cumulative incremental backups back up all the blocks in the restored file. After an entire database is restored, the first subsequent backup results in a full backup.

The restore destination can be a VxFS, UFS (Solaris), JFS (AIX), or HFS (HP-UX) file system. The destination VxFS file system does not need to support the Storage

Checkpoint feature to restore files. However, a VxFS file system with the Storage Checkpoint feature is needed to perform BLI backups of the restored data.

This topic uses the following terms to describe BLI backups:

- Full Backup.
A backup in which NetBackup backs up each database file completely, not just data blocks that have changed since the last full or incremental backup.
- Cumulative BLI Backup.
This type of backup is a backup of all the changed blocks in the database files since the last full backup. A cumulative BLI backup image contains only the data blocks of database files that changed since the last full backup. A cumulative BLI backup can reduce the number of incremental backup images that must be applied during a restore operation. This speeds up the restore process.
- Differential BLI backup.
A backup in which NetBackup performs a backup of only those data blocks (within the database files) that changed since the last backup. The previous backup can be of type full, cumulative incremental, or differential incremental.

When NetBackup initiates BLI backups, it creates, manages, and uses the appropriate Storage Checkpoints of the filesystem(s) hosting the Oracle data file systems. These Storage Checkpoints identify and maintain a list of modified blocks.

About Nodata Storage Checkpoint and NetBackup for SAP

The Nodata Storage Checkpoint sets a bit to indicate if a file block changed. When you use Nodata Storage Checkpoints, the data files are left in backup mode for the duration of the backup. The amount of redo logs generated depends on the number of changes that were made during the backup.

To support BLI backup, the VxFS file systems need extra disk space to keep track of the block change information. The space that is required depends on the database workload while the backup is running. For Nodata Storage Checkpoints, the additional space requirement by each file system is about 1% of the file system size.

Note: The default option that NetBackup uses for backups is Fulldata Storage Checkpoint. With this option, the NetBackup for SAP keeps the Oracle data files in backup mode only for the time that is needed to create a Storage Checkpoint.

About Fulldata Storage Checkpoint and NetBackup for SAP

The Fulldata Storage Checkpoint, once started makes a copy of the original file block at the moment before the block is about to be changed. When you use Fulldata

Storage Checkpoints, tablespaces or data files are in backup mode for only a few seconds while the Storage Checkpoint is created. The database is put in this mode so the extra archive log space that is used is smaller.

However, space in the file system is needed to keep a copy of the original block of data that changed. If the workload is light during the backup an additional 10% of the file system size is usually sufficient. Also, if the backup window is relatively short (such as for incremental backups), an additional 10% of the file system size is usually sufficient. If the database has a heavy workload while a full backup is running, the file systems may require more space. The space requirement depends on the rate of change.

While archive log mode is required when the database is online, this mode provides the best recoverability for taking offline Storage Checkpoints, too.

Storage Checkpoint configuration on the NetBackup for SAP client

By default, the NetBackup for SAP with Snapshot Client for BLI backups uses the Fulldata Storage Checkpoint. When Fulldata Storage Checkpoint is in effect, the NetBackup for SAP agent keeps the Oracle data files in backup mode. The Oracle data files are kept in backup mode only for the time that is needed to create a Storage Checkpoint.

To change the default option to use Nodata Storage Checkpoint, a user must create the following file, which can remain empty:

```
/usr/opensv/netbackup/ext/db_ext/NODATA_CKPT_PROXY
```

If the agent finds this file during run time, it uses Nodata Storage Checkpoint, and it keeps the data files in backup mode. The data files are kept in backup mode for the duration of the backup.

Configuration requirements for BLI backups with NetBackup for SAP

Before you configure BLI backups, make sure that your configuration meets the following requirements:

- NetBackup for SAP is installed, licensed, and configured.
- NetBackup Snapshot Client is installed and configured, and the master server must have a valid license for this option.
- Veritas Storage Foundation for Oracle must be installed and configured.
- Veritas File System must have Storage Checkpoint licensed.

For more information on requirements, see the NetBackup Snapshot Client Administrator's Guide.

Configuring policies for BLI backups with NetBackup for SAP

This topic explains how to configure BLI backups for SAP policies. BLI backups do not back up all database objects. Include policies to perform snapshot and stream-based backups.

Your backup configuration must ensure that the entire database can be successfully restored.

To configure a policy for BLI backups, configure the following:

- The BLI backup method on the policy attributes dialog box.
- An **Automatic Backup** schedule to perform full and incremental snapshot backups of the data files.
- An **Application Backup** schedule to back up profile and configuration files. These files are backed up during `brbackup` phase 2.

To configure a policy for BLI backups

- 1 Open the policy you want to configure.
- 2 Click the **Attributes** tab.
- 3 From the **Policy Type** list, choose **SAP**.
- 4 Select a **Policy storage**.
- 5 Select **Perform block level incremental backups**.
- 6 To configure schedules, click the **Schedules** tab.

SAP does not support snapshot backups of archive logs or the database profile and configuration files in the `brbackup` phase 2.

To perform a whole database backup, configure the following:

- One or more Automatic Backup schedules to perform BLI backups of the data files.
This backup automatically includes the control file.
 - An Application Backup schedule type to back up the control files and archive logs and phase 2 profile and configuration files.
- 7 On the **Clients** tab, specify clients to be backed up with this policy.
 - 8 On the **Backup Selections** tab, specify the script.

About the types of NetBackup for SAP BLI backups

NetBackup performs BLI backups with Automatic Full Backup, Automatic Differential Incremental Backup, and Automatic Cumulative Incremental Backup schedules.

NetBackup for SAP supports BLI backups only through `backint`. If you attempt to perform a BLI backup through RMAN proxy, the agent issues the following message:

```
BLIB with RMAN proxy is not a valid use case. Perform BLIB  
through backint.
```

NetBackup for SAP checks that a full backup was performed before it proceeds with an incremental backup. If the NetBackup scheduler or user initiates an incremental backup, and NetBackup for SAP finds no record of a full backup using the same policy, it performs a full backup.

To ensure that it has a proper set of images to restore, NetBackup performs a full backup when it encounters the following situations:

- If NetBackup does not have a valid full backup image for the same policy in its database. For example, this situation can occur if images were expired.
- If a new file was added to or deleted from the list of files for an incremental backup.
- If the number of backup streams that is specified has changed from the previous backup.

NetBackup for SAP always initiates a full backup under these conditions, even if you want to perform an incremental backup.

About restoring individual files from a NetBackup for SAP snapshot backup

Data that is backed up with Snapshot Client methods is restored in the same way as data that is backed up without Snapshot Client methods.

See “Performing SAP restores using the SAPDBA utility (SAP on Oracle databases only)” on page 84.

Use this procedure for the files that were backed up with, or without, instant recovery enabled. In all cases, SAP determines the files that were backed up, and it initiates a corresponding restore request to the database agent.

If instant recovery is enabled, NetBackup attempts to restore the file by using the unique restore methods available with the instant recovery feature. The type of restore method that NetBackup uses depends on your environment and the type of backup performed. If NetBackup is unable to use any of the instant recovery methods, it restores the file in the typical manner. Data is copied from the snapshot to the primary file system. Information on the instant recovery methods that NetBackup uses is available.

See the NetBackup Snapshot Client Administrator’s Guide.

About NetBackup for SAP restores of volumes and file systems using snapshot rollback

You can request that an entire volume or an entire file system be restored from an instant recovery Snapshot backup. This type of a restore is called a point in time rollback. All the data in the snapshot is restored; single file restore is not available in a rollback.

You can perform a snapshot rollback from an instant recovery backup that was made with the following methods:

- UNIX: NAS_Snapshot
- UNIX: VxFS_Checkpoint snapshot
- vxvm snapshot
- FlashSnap snapshots

See the NetBackup Snapshot Client Administrator's Guide.

The following considerations are relevant for NetBackup for SAP restores:

- Snapshot rollback overwrites the entire volume.
- With NetBackup for SAP, snapshot rollback always performs file verification. The agent checks for the following:
 - The requested files (number and names) are identical to those in the snapshot
 - The primary volume does not contain any files that were created after the snapshot was madeIf verification fails, the rollback aborts with status 249.
- Use snapshot rollback with database files only. Control files and archive redo logs should exist on different file systems or volumes.

Performing a NetBackup for SAP snapshot rollback

You can use the `brrestore` command to perform a snapshot rollback restore. The additional configuration that is required depends on whether you used `backint` or RMAN for the snapshot backup, as follows:

- For the backups that are performed with `backint`, set the following environment variable in the script or on the command line:

```
SAP_RESTORE=rollback
```

- For the backups that are performed with RMAN, add the following entry in the `initSID.sap` file:

```
rman_send = ``NB_ORA_PC_RESTORE=rollback``
```

Notes on NetBackup for SAP instant recovery restores

An SAP database instance generally contains three instances of control files. These reside in the following data and archive log directories:

UNIX or Linux:

```
.../saparch/cntrl/cntrlSID.dbf
.../sapdata1/cntrl/cntrlSID.dbf
.../sapdata2/cntrl/cntrlSID.dbf
```

Windows:

```
...\saparch\cntrl\cntrlSID.dbf
...\sapdata1\cntrl\cntrlSID.dbf
...\sapdata2\cntrl\cntrlSID.dbf
```

If the data files in `sapdata1` and `sapdata2` directories are on one volume, a snapshot of this volume contains these control files. However, at the time of the restore, `brrestore` provides only data files for restore and not control files. Therefore, the instant recovery with rollback method fails. For the rollback method, the files in the snapshot and the files in the restore file list should match. In this case, the files do not match, so instant recovery rollback restores method fail.

To avoid this problem, move the control files under locations `sapdata1` and `sapdata2` to some other location after you install your SAP database instance. First stop the database, then move the control files to different locations, adapt the profile file or `spfile` accordingly, and restart the database.

Performing SAP restores of volumes and file systems using block-level restore (Unix/Linux) or Fast File Resync (Windows)

This method requires the original primary data file to be present at the time of restore. The `brrestore` command deletes database files before restores to avoid permission problems. You can suppress this action by setting an environment variable. For example, use: `BR_NFD = 1` or `brrestore` command parameter `-NFD`.

Troubleshooting NetBackup for SAP rollback restores

If the rollback restore fails, it may be because the database still has a file open. Shut down and restart the database to try to correct this problem.

About NetBackup for SAP sample backup scripts (UNIX or Linux)

NetBackup for SAP installs sample scripts in the following location:

```
/usr/opensv/netbackup/ext/db_ext/sap/scripts/sap_oracle
```

You can use some of the sample scripts as they are, or with a little modification. You can use them to perform snapshot backups.

The scripts are as follows:

- `sap_online_backup`
This script sets environment variables and calls `brbackup` with the appropriate options to perform online backups of the Oracle database through `backint`.
- `sap_rman_backup`
By default, this script performs offline backups of the Oracle database through RMAN.
You can use this script to perform online snapshot backups of Oracle through RMAN proxy. Change the `brbackup` commands in this script to read as follows:

```
if [ $$SAP_FULL -eq 1 ]; then  
    CMD_LINE="$SAP_ENV brbackup -d rman_util -t online -m full -c"  
elif [ $$SAP_CINC -eq 1 ]; then  
    CMD_LINE="$SAP_ENV brbackup -d rman_util -t online -m incr -c"  
fi
```

If you want to perform backups by using the `brbackup` command through RMAN proxy, add following lines in the `initSID.sap` file:

```
rman_proxy = yes  
rman_send = "'NB_ORA_PC_SCHED=auto_sched_name'"
```

About NetBackup for SAP sample backup scripts (Windows)

NetBackup for SAP installs sample scripts in the following location:

```
install_path\NetBackup\DbExt\SAP\samples
```

You can use some of the sample scripts as they are, or with a little modification. You can use them to perform snapshot backups.

The scripts are as follows:

- `sap_online_backup.cmd`
 This script sets environment variables and calls `brbackup` with the appropriate options to perform online backups of the Oracle database through `backint`.
- `sap_rman_backup.cmd`
 By default, this script performs offline backups of the Oracle database through RMAN.
 You can use this script to perform online snapshot backups of Oracle through RMAN proxy. Change the `brbackup` commands in this script to read as follows:

```
@if "%SAP_FULL%" EQU "1" @set CMD_LINE=%BRBACKUP% -u internal/ -c -d rman_util -t
online -m full
@if "%SAP_CINC%" EQU "1" @set CMD_LINE=%BRBACKUP% -u internal/ -c -d rman_util -t
online -m incr
```

If you want to perform backups by using the `brbackup` command through RMAN proxy, add following lines in the `initSID.sap` file:

```
rman_proxy = yes
rman_send = "'NB_ORA_PC_SCHED=auto_sched_name'"
```

Mixing RMAN stream and RMAN proxy NetBackup for SAP backups

You can use the split-mirror full backups that use RMAN proxy with the standard incremental backups that use RMAN stream methods. For example, use RMAN proxy file-based backups for weekly full backups using snapshot methods. You can then use RMAN stream-based incremental backups for daily backups. To mix backup methods, perform the following additional configuration procedure.

To mix RMAN stream and RMAN proxy NetBackup for SAP backups

- 1 Copy `initSID.sap` to the `initFullSID.sap` and `initIIncrSID.sap` files.
- 2 Edit the `init_fullSID.sap` and `initI_incrSID.sap`.

Edit the files as follows:

- Specify the `rman_parms` parameter.
 - Set the `NB_ORA_SAP` environment variable to the `initSID.utl` path.
- 3 Edit the `init_fullSID.sap` file.
 Do the following:
 - Enable the `rman_proxy` flag.

- Set the following, where “auto_sched” is the name of the automatic schedule:

```
rman_send = "'NB_ORA_PC_SCHED=auto_sched'"
```

- 4 Copy following sample script to a different location on your client:
on UNIX or Linux:

```
/usr/opensv/netbackup/ext/db_ext/sap/scripts/sap_oracle/sap_rman_backup
```

on Windows:

```
install_path\NetBackup\DbExt\SAP\samples\sap_rman_backup.cmd
```

- 5 On UNIX or Linux, modify the `if..elif..fi` condition as follows:

```
if [ $SAP_FULL -eq 1 ]  
then CMD_LINE="$SAP_ENV brbackup -d rman_util -t offline -p initFullSID.sap -m full -c"  
elif [ $SAP_CINC -eq 1 ]  
then CMD_LINE="$SAP_ENV brbackup -d rman_util -t offline -p initIncrSID.sap -m incr -c"
```

- 6 On Windows, modify the condition as follows:

```
@if "%SAP_FULL%" EQU "1" @set CMD_LINE=%BRBACKUP% -u internal/ -c -d rman_util -t  
offline -m full -p initFullSID.sap  
@if "%SAP_CINC%" EQU "1" @set CMD_LINE=%BRBACKUP% -u internal/ -c -d rman_util -t  
offline -m incr -p initIncrSID.sap
```

- 7 Specify the script from step 4 in the backup selection of your NetBackup for SAP policy

Performing user-directed snapshot backups with NetBackup for SAP

For scheduled backups, the NetBackup scheduler automatically exports or sets all the environment variables and system settings necessary to run the backups. However, if you want to initiate backups, you must set certain environment variables.

You can initiate a backup in one of the following ways:

- By running the `brbackup` command from the command line.
- By running a script that contains the `brbackup` command.

If you want to enable user-initiated backups, set the following in your environment:

- Set the following environment variable to the name of the automatic schedule to use for the phase 1 backup:

```
SAP_SNC_SCHED=schedule_name_of_backup_type_to_perform
```

- Set the schedule parameter in the `initSID.utl` file to Application Backup schedule. NetBackup for SAP uses this schedule for backing up control files, configuration files, and archive redo log files.
- Additionally, if you plan to run the `sap_rman_backup` script from the command line, export the following before you run the script:

```
SAP_FULLL = 1 (for performing full backups)
```

```
SAP_CINC = 1 (for performing cumulative incremental backups)
```

See “Mixing RMAN stream and RMAN proxy NetBackup for SAP backups” on page 165.

See “About NetBackup for SAP sample backup scripts (UNIX or Linux)” on page 164.

See “About NetBackup for SAP backup types ” on page 148.

NetBackup for SAP on MaxDB databases

This chapter includes the following topics:

- About NetBackup for SAP on MaxDB databases
- About configuring NetBackup for SAP on MaxDB databases
- Creating a backup medium for NetBackup for SAP
- Using NetBackup for SAP on a MaxDB database to perform backups and restores

About NetBackup for SAP on MaxDB databases

NetBackup for SAP requires different configuration for a MaxDB database than for an Oracle database.

For more information about MaxDB databases, see your MaxDB documentation.

Note: NetBackup documentation uses the terms “media” or “medium” to refer to removable media tape in a storage unit. NetBackup writes a backup file to a storage medium. MaxDB database documentation, however, uses the term “backup medium” to include the named pipes and other entities that are needed for performing backups. This manual uses the term backup medium to refer to backing up MaxDB database files.

About configuring NetBackup for SAP on MaxDB databases

Configure NetBackup for SAP for the MaxDB database environment. Follow only the instructions in that section that pertain to MaxDB databases. MaxDB databases also require you to create a backup medium.

Creating a backup medium for NetBackup for SAP

As part of the configuration process, also create at least one backup medium. Create this medium before you perform any backups. databases require at least one backup medium before a backup or restore can be performed.

To create a backup medium

- ◆ Use the DBM CLI interface and enter the following commands:

```
OS_prompt% dbmcli -d database_name -u usr,password  
dbmcli> medium_put medium_name medium_path PIPE backup_type
```

where

database_name Name of the SAP database

usr user name.

passwd password.

medium_name Name of the backup medium. The first four characters must be BACK. The *medium_name* must be in format BACK*name*. For example, BACKData.

medium_path Full path to the named pipe. For example:

```
/export/home/medium1
```

or

```
\\.\PIPE\medium1
```

backup_type Specify one of the following:

- DATA for a full data backup
- PAGES for an incremental data backup
- LOG for a log backup

Using NetBackup for SAP on a MaxDB database to perform backups and restores

SAP on a MaxDB database does not include the BR*Tools. Instead SAP provides completely different methods of initiating a backup or restore.

You can initiate backup and restore operations through the MaxDB administrative interface when you invoke one of the following interfaces:

- DBM GUI
- DBM CLI
- Web DBM

For example, when you use the MaxDB administrative interface through the DBM CLI, the following occurs:

- The DBM CLI communicates with the MaxDB server, which creates one or more named pipes.
- The MaxDB server streams the data from the MaxDB instance to the named pipes.
- The MaxDB server calls NetBackup for SAP with a list of named pipes.
- NetBackup for SAP reads named pipes and sends data to NetBackup.

In case of a restore, the process is same except that data goes from NetBackup for SAP to the MaxDB server by the named pipes.

Performing a MaxDB database backup

The following procedure shows you how to perform a MaxDB database backup using NetBackup for SAP.

To perform a backup

- 1 Make sure that you have modified the proper configuration files and created a backup medium.
- 2 Type the following command to start a utility session:

```
dbmcli> util_connect
```

- 3 Type the following command to initiate the backup:

```
dbmcli> backup_start medium_name backup_type
```

where:

medium_name Name of the backup medium.

backup_type Specify either DATA, PAGES, or LOG.

Performing a MaxDB database query

Prior to performing a restore, use the following procedure to query backup information and to obtain a listing of backup information. This information is needed for a restore. The following procedure shows you how to perform a MaxDB database query using NetBackup for SAP.

To perform a query

- ◆ Type the following commands to obtain the BID:

```
dbmcli> backup_ext_ids_get medium_name database_name server  
dbmcli> backup_ext_ids_list
```

where:

medium_name Name of the backup medium.

database_name Name of the SAP database.

server Name of the server that hosts the MaxDB database.

Performing a MaxDB database restore

The following procedure shows you how to perform a MaxDB database restore using NetBackup for SAP.

To perform a restore

- 1 To obtain the external backup identification information, perform a query.
See “Performing a MaxDB database query” on page 172.
- 2 Type the following command to initiate the restore:

```
dbmcli> recover_start medium_name backup_type ExternalBackupId
"database_name BID medium_path"
```

where:

<i>medium_name</i>	Name of the backup medium.
<i>backup_type</i>	Specify either DATA, PAGES, or LOG.
<i>BID</i>	The external backup identifier. This information is returned when you perform a backup.
<i>database_name</i>	Name of the SAP database.
<i>medium_path</i>	Specify full path to the named pipe. For example, /export/home/medium1 or \\.\PIPE\medium1.

Performing SAP backups and restores using parallel medium groups

Parallel backups and restores are used to improve backup and restore performance.

Note: Parallel backups can only be used with backup_type data, not PAGES, or log.

- You can combine individual backup mediums to form parallel mediums. When parallel mediums are used for backup, the MaxDB database passes two or more named pipes to NetBackup for SAP. NetBackup for SAP starts as many backup streams as there are named pipes. It processes each named pipe independently from the rest of the named pipes in the backup job. If the policy and the storage

unit are configured for multiplexing, the streams can be interleaved on the same tape.

- Even if a backup is done in parallel, you can perform a restore of that data in either the parallel or sequential mode. In other words, parallel backups do not require parallel restores.

When the MaxDB database requests a parallel restore by listing multiple named pipes in an input file, NetBackup for SAP processes each pipe independently from the rest of the named pipes. Note that the MaxDB database requires that the number of media in a group of parallel media equal the number of media used during backup.

Troubleshooting NetBackup for SAP and SAP HANA

This chapter includes the following topics:

- About troubleshooting NetBackup for SAP
- NetBackup debug logs and reports
- sapdba logs and messages (Oracle-based SAP environments only)
- Minimizing timeout failures on large database restores
- About troubleshooting NetBackup for SAP HANA
- Disaster recovery of an SAP Hana database

About troubleshooting NetBackup for SAP

NetBackup for SAP contains several processes and resources that can help you to troubleshoot database backups. These resources include the logs and reports that NetBackup, NetBackup for SAP, and the SAP tools provide. These reports are useful for finding the errors that are associated with those applications.

NetBackup debug logs and reports

The NetBackup server and client software let you enable detailed debugging logs. The information in these log files can help you troubleshoot the problems that occur outside of either the database agent or the SAP tools.

Note the following with regard to these logs:

- These logs do not reveal the errors that occur when SAP tools is running unless those errors also affect NetBackup. SAP may (or may not) write errors in the application to the NetBackup logs. Your best sources for SAP error information are the logs provided by SAP.
- Generally, each debug log corresponds to a NetBackup process and executable.

Information about the debugging log files is available.

See the NetBackup Troubleshooting Guide.

Also refer to the following file:

```
UNIX: /usr/opensv/netbackup/logs/README.debug file
```

Enabling the debug logs for a NetBackup for SAP client automatically (Windows)

You can enable debug logging by running a batch file that creates each log directory. To create all log file directories automatically, run the following:

```
install_path\NetBackup\logs\mklogdir.bat
```


Creating the NetBackup for SAP for Windows database agent logs manually

- 1 Create the following directories on the client in a DOS window:

```
install_path\NetBackup\logs\bpbackup
```

```
install_path\NetBackup\logs\bpbkar32
```

```
install_path\NetBackup\logs\bpbdb
```

```
install_path\NetBackup\logs\bprestore
```

```
install_path\NetBackup\logs\tar32
```

```
install_path\NetBackup\logs\backint
```

For example:

```
cd install_path\NetBackup\logs
```

```
mkdir bpbdb
```

- 2 Enable logging for the `nbpem`, `nbjm`, and `nbrb` scheduling processes, which use unified logging.

NetBackup writes unified logs to `install_path\NetBackup\logs`.

You do not need to create log directories for processes that use unified logging. For information on how to use logs and reports, see the NetBackup Troubleshooting Guide.

Enabling the debug logs manually (UNIX)

To enable the debug logs manually

- 1 Create the following directories on the client:

```
/usr/opensv/netbackup/logs/bpbackup  
/usr/opensv/netbackup/logs/bpbkar  
  
/usr/opensv/netbackup/logs/bphdb  
  
/usr/opensv/netbackup/logs/bprestore  
  
/usr/opensv/netbackup/logs/tar  
/usr/opensv/netbackup/logs/backint  
chmod 777 /usr/opensv/netbackup/logs/backint
```

For example:

```
cd /usr/opensv/netbackup/logs  
mkdir bphdb
```

- 2 (Conditional) If you run NetBackup for SAP on Oracle with RMAN, create the following additional directory:

```
/usr/opensv/netbackup/logs/dbclient
```

- 3 The `user_ops`, each of the log directories, and any subdirectories should have 777 permissions. They must exist and be accessible for the applications to operate correctly.

For example:

```
chmod 777 bphdb
```

See “About permissions for NetBackup for SAP log files (UNIX)” on page 65.

- 4 Enable logging for the `nbpem`, `nbjm`, and `nbrb` scheduling processes that use unified logging.

NetBackup writes unified logs to `/usr/opensv/logs`.

You do not need to create log directories for processes that use unified logging.

Information on how to use logs and reports is available.

See the NetBackup Troubleshooting Guide.

About the bphdb directory on the Windows database client

The `install_path\NetBackup\logs\bphdb` directory contains log files.

The following types of logs exist:

- `sap_stdout.mmddyy.hhmmss.txt`

Unless it is redirected elsewhere, NetBackup writes SAP script output to this file.

- `sap_stderr.log.mmddyy.hhmmss.txt`

Unless it is redirected elsewhere, NetBackup writes SAP script errors to this file.

- This log contains debugging information for the `bphdb` process. `bphdb` is the NetBackup database backup binary. It is invoked when an automatic backup schedule is run. NetBackup for SAP uses this client process for SAP script execution.

About the bphdb directory on the UNIX database client

The `/usr/opensv/netbackup/logs/bphdb` directory contains logs.

The following types of logs exist:

- `sap_stdout.mmddyy`

Unless it is redirected elsewhere, NetBackup writes SAP script output to this file.

- `sap_stderr.mmddyy`

Unless it is redirected elsewhere, NetBackup writes SAP script errors to this file.

- `mmddyy`

This log contains debugging information for the `bphdb` process. `bphdb` is the NetBackup database backup binary. It is invoked when an automatic backup schedule is run. NetBackup for SAP uses this client process for SAP script execution.

About the backint directory on the UNIX database client

The `/usr/opensv/netbackup/logs/backint` directory contains execution logs.

The following execution log exists:

- `log.mmddyy`

See “Enabling the debug logs manually (UNIX)” on page 178.

To control the amount of information that is written to the debug logs, change the Database debug level. Typically, the default value of 0 is sufficient. However, technical support may ask you to set the value higher to analyze a problem.

- 1 Open the **Backup, Archive, and Restore** interface.
- 2 Select **File > NetBackup Client Properties**.
- 3 Click the **Troubleshooting** tab.
- 4 Set the **General** debug level.
- 5 Set the **Verbose** debug level.
- 6 Set the **Database** debug level.
- 7 Click **OK** to save your changes.

Setting the debug level on a UNIX client

To control the amount of information that is written to the debug logs, change the “Database” debug level. Typically, the default value of 0 is sufficient. However, Technical Support may ask you to set the value higher to analyze a problem.

The debug logs are located in `/usr/opensv/netbackup/logs`.

To set the debug level on a UNIX client

- ◆ Enter the following line in the `bp.conf` file.

```
VERBOSE = X
```

Where *X* is the debug level you want.

About NetBackup server reports

NetBackup provides other reports that are useful in isolating problems. One such report is All Logs Entries on the server. Information on server reports is available.

See the NetBackup Administrator’s Guide, Volume I.

sapdba logs and messages (Oracle-based SAP environments only)

The SAP tools log provides information on SAP operations. You can check the log files to determine the ultimate success or failure of database backups and restores.

You can view the backup and restore logs in the following ways:

- Through the following `sapdba` menu options: `Show>Cleanup` and `Show log files>profiles`.
- In the directories for `brbackup` and `brrestore` log information and `brarchive` log information.

NetBackup for SAP backup and restore log files

The following directories contain log files for different types of backups and restores:

Windows:

`%SAPDATA_HOME%\sapbackup`

UNIX or Linux:

`$(SAPDATA_HOME)/sapbackup`

The files in this directory are named according to the following pattern:

- The summary log file is named `backSID.log`, where `SID` is the unique name for the Oracle database instance.
- The detail log files are named `encoded_timestamp.xyz`, where:

encoded_timestamp A timestamp that is used in each detail log name that guarantees a unique file name.

xyz for backup logs:

x *a* represents all, *i* represents incremental, *p* represents partial.

y *n* represents online. *f* represents offline.

z *f* represents `util_file` backup, *r* represents `rman_util` backup

xyz for restore logs:

xyz *rsb* represents restore backup files.

xyz *rsa* represents restore archive files.

xyz *rsf* represents restore individual files.

NetBackup for SAP archive log files

The following directories contain log files for different types of archive activities:

Windows:

```
%SAPDATA_HOME%\saparch
```

UNIX or Linux:

```
$$SAPDATA_HOME/saparch
```

The files in this directory are named according to a pattern. The *encoded_timestamp* is a timestamp used in each detail log name that guarantees a unique file name.

Table 11-1 lists the suffixes that differentiate the different types of archive logs.

Table 11-1 File suffixes

File name	Meaning
<i>encoded_timestamp.sve</i>	Original saved.
<i>encoded_timestamp.svd</i>	Original saved and deleted.
<i>encoded_timestamp.cpy</i>	Original copied or saved a second time.
<i>encoded_timestamp.cpd</i>	Original copied or saved a second time and deleted.
<i>encoded_timestamp.dcp</i>	Deleted that were saved twice.
<i>encoded_timestamp.dsv</i>	Deleted that were saved.

Minimizing timeout failures on large database restores

Large database restores sometimes fail when multiple restore sessions compete for resources. In this situation, a restore session can be delayed while waiting for media or device access. If the delay is too long, the restore session times out. Use the following procedure to minimize session timeouts and to allow the restores to complete successfully.

To minimize timeout failures on large database restores

- 1 In the NetBackup Administration Console, expand **NetBackup Management > Host Properties > Clients**.
- 2 Double-click the client.
- 3 Select the **Timeouts** properties.

- 4 Set the **Client read timeout** property to a large value.

The default for the **Client read timeout** setting is 300 seconds (5 minutes). For database agent clients, increase the value significantly from the recommended value.

See the NetBackup Administrator's Guide, Volume 1.

For example, change this setting to 30-60 minutes to minimize timeout errors.

- 5 Click **OK** for each client.

Note: This change may delay detecting problems during subsequent backups. Consider putting the original value back in place once any restore that requires a change is complete.

About troubleshooting NetBackup for SAP HANA

The following sections contain several processes and resources that can help you to troubleshoot the issues that are related to SAP HANA.

NetBackup for SAP Oracle backup fails

SAP Oracle database backup might fail if your media server or client runs on NetBackup 8.0 or earlier versions and the **Enable insecure communication with NetBackup 8.0 and earlier hosts** check box is disabled.

For a successful backup, do one of the following:

- In the NetBackup Administration Console, under **Security Management > Global Security Settings**, select the **Enable insecure communication with NetBackup 8.0 and earlier hosts** check box.
- Upgrade the media server or client to use NetBackup 8.1 or later versions.

NetBackup SAP HANA backup jobs fail with error 41 and 25

Tape backups on a multi-node and single-node SAP HANA appliance fail.

The default **Client read timeout** is 300 seconds. For tape backups, change the **Client connect timeout** and **Client read timeout** to 3000 seconds. The following procedure helps you to change the timeout period.

Changing the timeout period

- 1 In the NetBackup Administration Console, expand **NetBackup Management > Host Properties > Master Servers**. Double-click the master server.
- 2 Set the **Client connect timeout** and the **Client read timeout** property to the required (3000 here) value.

See the NetBackup Administrator's Guide, Volume 1.
- 3 Click **OK** for each client.

Recovery of SAP HANA database from tape storage fails

Recovery of SAP HANA database from tape storage fails to complete successfully as the restore jobs hang indefinitely. This failure is specifically seen during the logs restore phase.

By default, SAP HANA does not read all the pipes that it has opened during recovery. As NetBackup processes the pipes randomly, it is possible that the pipe where NetBackup tries to write is not open. This situation creates a deadlock situation and hence the jobs are stalled in the Activity Monitor.

To streamline the read and write operations on the pipe, set the following parameter in the `global.ini` file:

In HANA Studio, double-click on instance tab.

Instance-> Configuration-> global.ini->backup-> enter **1** as the `max_recovery_backint_channels` value (by default, this value is 64).

This setting ensures that only a single request is sent to NetBackup. Hence only a single pipe is open for reading and NetBackup writes on that pipe only.

Note: This issue is not seen in case of disk recovery. Hence no change is required for `max_recovery_backint_channels` in case of disk recovery.

Log backup fails with status 50 for SAP HANA

Log backup fails with status 50 for SAP HANA

A log backup fails if a recovery job is also initiated at the same time. A recovery job shuts down the database and log backups fail with error 50.

When a recovery job is initiated, the SAP HANA Studio forces a shutdown of the system and the backup jobs fail. To avoid the shutdown and subsequent backup failure, stop the system. You can then start the recovery job.

Disaster recovery of an SAP Hana database

Use the SAP HANA studio for disaster recovery of SAP HANA SPS 09 and later. For disaster recovery, follow the same steps as used for the redirected restore of an SAP HANA instance using the SAP HANA studio.

See “Using SAP HANA studio for SAP HANA instance redirected restore” on page 120.

backint command line interface

This appendix includes the following topics:

- About backint command line interface for SAP
- About backint command line interface for SAP HANA

About backint command line interface for SAP

The NetBackup for SAP `backint` interface communicates instructions from the SAP tools to NetBackup. The `backint` interface implements the SAP system's BC-BRI BACKINT Interface specification.

See "About the BC-BRI BACKINT Interface" on page 190.

Note: Veritas recommends that you use the `backint` command only with guidance from a technical support staff member.

The `backint` interface performs the following functions:

- The backup function. The backup function of the `backint` interface supports and defines the SAP `brbackup` and `brarchive` tools to NetBackup. `brbackup` and `brarchive` communicate with the `backint` interface through an `in_file` and an `out_file` parameter. The `in_file` parameter includes a list of files to be backed up or archived. The `out_file` parameter reports the status for each file and assigns a backup ID (BID) to each file. In the event of a partial backup, this function can identify successfully backed up files to the user.
- The restore function. The restore function of the `backint` interface supports and defines the `brrestore` tool to NetBackup. It communicates with the `backint`

interface through the *in_file* parameter and *out_file* parameter. The *in_file* parameter includes a list of files to be restored through NetBackup. It also includes the BID assigned during the backup function. The *out_file* parameter contains the status of the restore for each file. When the NetBackup restore operation is complete, the restore function lists successfully restored files. It also lists BIDs used during the operation.

During the backup function, NetBackup assigns the BID. It can identify one or more backup runs, a single file backup, or a group of files. During a backup function, the BID is submitted to the *out_file* parameter. During the restore and the inquiry functions, the BID can only be set in the *in_file* parameter.

If the BID is not set, the restore function uses the BID of the last backup. As an option, this function can also include a list of directories into which files are restored.

- The inquiry function. The inquiry function supports and defines the *sapdba* tool to NetBackup. *sapdba* uses the *in_file* parameter and the *out_file* parameter to collect backup information. The *in_file* parameter contains optional BIDs and file names.

If only a #NULL is received on the *in_file* parameter, a list of BIDs is generated to the *out_file* parameter. If a BID is received, a list of files belonging to the BID is generated. If a file name is entered along with the #NULL, a list of BIDs containing that file is listed.

The *backint* command line uses the following syntax:

```
backint -u user_id -f function [-t type] -p par_file [-i in_file] [-o out_file]
```

Table A-1 shows the *backint* command options.

Table A-1 *backint* command options

Option	Arguments and purpose
<i>-u user_id</i>	Required. UID for backup utility user. No default.
<i>-f function</i>	Required. Defines the function that SAP tools requests of NetBackup for SAP: <ul style="list-style-type: none"> ■ <i>backup</i> - If backup is specified, NetBackup backs up the files in the list that SAP tools provide. ■ <i>restore</i> - If restore is specified, NetBackup restores the files in the list that SAP tools provide. ■ <i>inquiry</i> - If inquiry is specified, NetBackup returns the saved, or the not saved status of the files in the list that SAP tools provide.

Table A-1 backint command options (*continued*)

Option	Arguments and purpose
<code>-t type</code>	<p>Optional. It defines the type of backup that NetBackup for SAP should perform. If no <i>type</i> is specified, the default value of <i>file</i> is used. Specify one of the following arguments:</p> <ul style="list-style-type: none"> ■ <code>file</code> - All data files are either offline or in backup mode. NetBackup for SAP can back them all up without coordination with SAP tools. ■ <code>file_online</code> - Allows NetBackup for SAP to request that SAP tools set each tablespace into #BEGIN/#END backup mode when a related file backup takes place. It is used for online backups only. The architecture is based on the switch files that are defined in the <code>-p par_file</code> parameter.
<code>-p par_file</code>	<p>Required. A text file that contains parameters (required and optional), and parameter values. These parameters determine the backup and restore procedure between the SAP tools and NetBackup for SAP and between NetBackup for SAP and NetBackup. The following list explains the components of <i>par_file</i>:</p> <ul style="list-style-type: none"> ■ A pound character (#) in column one denotes a comment. Any other character in column one is considered valid. ■ All required parameters must be specified with a valid value before the NetBackup for SAP <code>backint</code> interface can execute correctly. ■ You can comment out an optional parameter by placing a # in column one. If optional parameters are specified, they must have valid values for the NetBackup for SAP <code>backint</code> interface to run correctly. If an invalid parameter name is found, the NetBackup for SAP <code>backint</code> interface reports a warning message and continues. <p>The SAP tools parameter file specifies the location of this <i>par_file</i>. For an example file, see the following:</p> <p>on UNIX or Linux:</p> <pre style="font-family: monospace;">/usr/opensv/netbackup/ext/db_ext/sap/scripts/sap_oracle initSAP.utl</pre> <p>on Windows:</p> <pre style="font-family: monospace;">install_path\NetBackup\dbext\sap\samples\initSAP.utl</pre> <p>See “About parameters used in initSID.utl” on page 206.</p>

Table A-1 backint command options (continued)

Option	Arguments and purpose
<code>-i in_file</code>	<p>Optional. Specifies a text file, the contents of which list the files to backup, inquire, or restore. The format can vary. If this option is not specified, the content of this file is data from standard input.</p> <p>See "About backint -i in_file contents" on page 195.</p>
<code>-o out_file</code>	<p>Optional. Specifies a text file that contains each file that is processed and associated status. May also contain other process messages. If this option is not specified, the output is written to standard output.</p> <p>See "About backint -o out_file contents" on page 197.</p>

About the BC-BRI BACKINT Interface

One of the key outputs and then input parameters of the BC-BRI BACKINT Interface specification is an external backup ID (BID). The BID is a unique identifier that a successful backup NetBackup for SAP creates. After a backup, it is returned to SAP tools and stored for use for future inquire or restore functions.

The parameter has two formats:

- VXF<ctime> - NetBackup for SAP Oracle
- VXP<ctime> - NetBackup for SAP MaxDB

It is similar to the backup ID created by NetBackup (*client_name_ctime*) for all backup images but is not stored within NetBackup. The *ctime* in the BID matches the *ctime* in the NetBackup backup ID. Therefore allowing NetBackup for SAP to make efficient image queries to the image database on the master server.

About backint command line interface for SAP HANA

To execute backup and recovery `backint` needs to be provided with additional information. This information is given through the command line options.

Table A-2 lists the `backint` command options

Table A-2 backint command options

Parameter	Description	Values
-u <user_id>	The user ID defines a common name space for file names in a multi-host SAP HANA database. The user ID is bound to a database instance and used by all the servers in this instance.	
-f <function>	The requested function	backup, restore, inquire, delete
-p <par_file>	Name of the vendor supplied parameter file	
-i <in_file>	The name of the input file containing the parameters for the corresponding function (-f). If this option is not set, the input is read from <code>stdin</code> .	
-o <out_file>	The <code>backint</code> uses this name of the output file to write return values and messages. If this option is not set, the output is written to <code>stdout</code> .	
-s <database_backup_id>	The database backup ID which can be used to determine which calls to <code>backint</code> belong to a specific multi-file backup. This option is only usable if the function is backup.	
-c <number_of_objects>	The number of objects that belong to the database backup ID specified using the <code>-s</code> option. This option is only usable if the function is backup and in combination with option <code>-s</code> .	complete log
-l <backup_level>	The backup level indicates the type of backup. This option is only usable if the function is backup.	

Table A-2 backint command options (continued)

Parameter	Description	Values
-v2	This option requests the version to be printed to <code>stdout</code> . One line describing <code>backint</code> API version and <code>backint</code> implementation version. It should be the same string as <code>#SOFTWAREID</code> in the output file. For example: <code>backint 1.04 "ACME Corp backint 0815.2012.06.</code>	
-V2	Detailed version information, same as text as for option '-v' plus additional lines with detailed version and or licensing information.	

Note: The SAP HANA database does not rely on any action that is related to the parameters that are passed with options `-s`, `-c`, or `-l`. These are for informational purposes only.

The SAP HANA database never calls the options `-v` and `-V`. They are for diagnosis only. The implementation of `-v` is optional.

Input and output files for SAP HANA

This appendix includes the following topics:

- About input and output files for SAP HANA

About input and output files for SAP HANA

The input file contains information necessary to perform the requested function (-f). It usually contains a list of objects.

The output file contains result information for the database.

Each line must start with a keyword defined in the following sections. The lines that do not start with a keyword are considered as comments. These lines may contain any plain text. For example, to indicate progress or to support error analysis.

The character encoding of both files is UTF-8.

The formatting requirements for the parameters following keywords are listed:

- Parameters may be quoted with double quotation marks " .
- Parameters containing a space must be quoted with double quotation marks.
- If a parameter contains a double quote, the double quote must be escaped with a backslash.
- A backslash escapes double quotes only. A backslash in a parameter value must not be escaped.

The following are examples of valid input or output lines:

```
#PIPE /var/tmp/backup_Monday_cw47_2012
```

```
#PIPE "/var/tmp/backup Monday cw47 2012"
```

```
#EBID "Hb12\"NAB" "/var/tmp/myTool.#YSOwa"
```

The input files with multiple lines handling objects by pipe like `#PIPE` in function `BACKUP` or `#EBID` and `#NULL` in function `RESTORE` must be processed in sequential order starting from top to bottom. One `backint` may handle multiple pipes in parallel. However, it should not skip entries for later processing or pause processing of entries depending on events in subsequent entries.

The input and the output files are provided to `backint` by the SAP HANA database.

backint -i in_file contents

This appendix includes the following topics:

- About backint -i in_file contents

About backint -i in_file contents

This appendix explains how to create a `backint` input file. You specify the name of this input file as the argument to the `backint` command's `-i in_file` option. The input file consists of one or more directive lines that specify how to perform a backup, restore, or inquiry.

The input file format differs depending on the function you want `backint` to initiate and on the underlying database.

Table C-1 lists the directives that you can include in `in_file` and indicates the databases that use them.

Table C-1 Directives in the *in_file*

Directive	The underlying database
Directives for an input file that requests a backup:	
<i>file</i>	Oracle
<i>pipe</i> #PIPE	MaxDB
<i>special_file size</i>	Oracle
Directives for an input file that requests a restore:	
<i>BID file</i> [<i>dest_dir</i>]	Oracle

Table C-1 Directives in the *in_file* (continued)

Directive	The underlying database
#NULL <i>file</i> [<i>dest_dir</i>]	Oracle
<i>BID pipe</i> [<i>dest_name</i>]	MaxDB
#NULL <i>pipe</i> [<i>dest_name</i>]	MaxDB
Directives for an input file that performs an inquiry:	
#NULL	Oracle and MaxDB
<i>BID</i>	Oracle and MaxDB
#NULL <i>file</i>	Oracle
#NULL <i>pipe</i>	MaxDB
<i>BID file</i>	Oracle
<i>BID pipe</i>	MaxDB

Table C-2 lists the variables that you need to specify in the *in_file*:

Table C-2 Variables in the *in_file*

Variable	Specification
<i>file</i>	The full path name of the file that you want to back up, restore, or inquire about.
<i>pipe</i>	A named pipe. Specify the keyword #PIPE after the pipe name.
<i>special_file</i>	The name of a special file, such as a raw device file.
<i>size</i>	The file size as specified to the Oracle database.
<i>BID</i>	The external backup identifier, as generated by NetBackup for SAP.
<i>dest_dir</i>	The name of a directory or folder to which the restore is written.
<i>dest_name</i>	The name of a pipe to which the restore is written.

If you use the #NULL keyword, backint uses the most recent version of the file or pipe.

backint -o out_file contents

This appendix includes the following topics:

- About backint -o out_file contents

About backint -o out_file contents

When the `backint` command finishes, it writes an output file to the file that the `-o out_file` option specifies on its command line. The contents of the output text file change depending on the function `backint` performed.

The following table shows the `backint` output that is returned from a backup, restore, or inquiry request.

Table D-1 `backint -o out_file` contents

Output	Description
Information returned for a backup	<p>If a backup completes successfully, the output file includes the following:</p> <ul style="list-style-type: none">■ The external backup ID (BID) assigned to the backup by NetBackup for SAP.■ The files, pipes, directories, or folders that are backed up and their sizes. <p>If a backup function fails, the output file lists the files or pipes that it could not back up.</p>

Table D-1 backint -o out_file contents (*continued*)

Output	Description
Information returned for a restore	If a restore completes successfully, the output file entry includes the following: <ul style="list-style-type: none">■ The BID.■ The files or pipes restored. If a restore function fails, the output file lists the files and pipes not found. It also lists the files and pipes that were not successfully restored.
Information returned for an inquiry	If an inquiry completes successfully, the output file entry includes the following: <ul style="list-style-type: none">■ The BID.■ The files or pipes that are backed up.

NetBackup for SAP environment variables for backint

This appendix includes the following topics:

-

Table E-1 describes the environment variables that the NetBackup for SAP `backint` interface recognizes.

Note: These environment variables apply only to the `backint` interface and are not applicable to the phase 1 backup that SAP performs with RMAN. The `initSID.sap` settings are applicable to the phase 2 backup.

Table E-1 NetBackup for SAP `backint` interface environment variables

UNIX/Linux	Windows	Purpose
<code>\$SAP_CLIENT</code>	<code>%SAP_CLIENT%</code>	<p>Sets the name of the NetBackup client. It can be used to override the current client and perform an alternate restore of a different client. This variable is same as the <code>client</code> parameter in the <code>initSID.utl</code> file.</p> <p>This variable also overrides the <code>CLIENT_NAME</code> option in the registry or <code>bp.conf</code> file.</p>
<code>\$SAP_DRIVES</code>	<code>%SAP_DRIVES%</code>	<p>Sets the number of simultaneous backups or restore operations the NetBackup for SAP <code>backint</code> interface can execute for a single operation. This environment variable overrides the <code>drives</code> parameter in the <code>initSID.utl</code> file.</p>

Table E-1 NetBackup for SAP `backint` interface environment variables
(continued)

UNIX/Linux	Windows	Purpose
<code>\$\$SAP_POLICY</code>	<code>%SAP_POLICY%</code>	<p>Sets the name of the NetBackup policy. Used to define which policy to use for different types of database backup or inquiry functions. You can use one policy to perform offline database backups and another policy to perform archive log backups. This environment variable overrides as the <code>policy</code> parameter in the <code>initSID.utl</code> file.</p> <p>This variable also overrides the <code>BPBACKUP_POLICY</code> option in the registry or <code>bp.conf</code> file.</p>
<code>\$\$SAP_RECOVERY</code>	<code>%SAP_RECOVERY</code>	<p>Set this environment variable to disaster when the disaster recovery is used with <code>BRRECOVER</code>. If the <code>initSID.sap</code> file is not present, <code>BRRECOVER</code> calls <code>BACKINT</code> without the “-p <code>initSID.utl</code>” parameter. If NetBackup for SAP is called without the <code>util</code> file parameter, it expects that the <code>SAP_RECOVERY</code> environment variable is set to disaster.</p>
<code>\$\$SAP_RESTORE</code>	<code>%SAP_RESTORE</code>	<p>Set this environment variable to rollback to specify a snapshot rollback restore from <code>BACKINT</code>-based backups.</p>
<code>\$\$SAP_SCHED</code>	<code>%SAP_SCHED%</code>	<p>Sets the name of the SAP backup policy schedule. This schedule provides an easy way to switch to a different schedule for each SAP database backup. This environment variable overrides the <code>schedule</code> parameter in the <code>initSID.utl</code> file.</p> <p>This variable also overrides the <code>BPBACKUP_SCHED</code> option in the registry or <code>bp.conf</code> file.</p>
<code>\$\$SAP_SNC_SCHED</code>	<code>%SAP_SNC_SCHED%</code>	<p>Sets the name of the SAP backup policy schedule. This schedule is used to perform file-based snapshot and off-host backups of the data file in <code>brbackup</code> phase 1. The following types of schedules can be used for this type of backup: Automatic Full, Automatic Differential Incremental, or Automatic Cumulative Incremental.</p>
<code>\$\$SAP_SERVER</code>	<code>%SAP_SERVER%</code>	<p>Sets the name of the NetBackup master server. It can be used to override the current server and perform a backup to an alternative server. This environment variable overrides the <code>server</code> parameter in the <code>initSID.utl</code> file.</p> <p>This variable also overrides the <code>SERVER</code> option in the registry or <code>bp.conf</code> file.</p>

Table E-1 NetBackup for SAP `backint` interface environment variables
(continued)

UNIX/Linux	Windows	Purpose
\$SAPSWITCH	%SAPSWITCH%	<p>Set this environment variable to specify the location of the <code>.switch</code> files (<code>.switch.lis</code>, <code>.switch.sem</code>, <code>.switch.log</code>).</p> <p>This variable gets higher precedence than the switch parameters (<code>switch_list</code>, <code>switch_sem</code>, <code>switch_log</code>) mentioned in <code>intSID.utl</code> file.</p>

NetBackup for SAP configuration or bp.conf file settings

This appendix includes the following topics:

-

This topic describes the NetBackup for SAP configuration parameters. You can specify parameters in several places.

Table F-1 describes the order of precedence, in the case of conflicts.

Table F-1 Order of precedence for NetBackup for SAP parameters

Setting	Precedence
Environment variables	Highest precedence. Overrides the values in the <code>initSID.utl</code> and in the <code>bp.conf</code> file or registry.
<code>initSID.utl</code> file	Medium precedence. Values in environment variables override the values that are specified in this file, but values in this file override those in the <code>bp.conf</code> file or registry.
(UNIX or Linux) <code>/usr/openv/netbackup/bp.conf</code> file	Lowest precedence. Values in environment variables and in <code>initSID.utl</code> override values that are specified in the <code>bp.conf</code> file.

Table F-1 Order of precedence for NetBackup for SAP parameters
(continued)

Setting	Precedence
(Windows) NetBackup registry	Lowest precedence. Values in environment variables and in <i>initSID.utl</i> override values that are specified in the registry.

Table F-2 lists the variable names and definitions you can use in the *bp.conf* file (UNIX or Linux) or the registry (Windows).

Table F-2 NetBackup for SAP variable names and definitions

UNIX or Linux	Windows	Meaning
\$SERVER	%SERVER%	Specifies the NetBackup master server. This option is the same as the <i>\$SAP_SERVER</i> (%SAP_SERVER%) environment variable and the <i>server</i> parameter in the <i>initSID.utl</i> file.
\$CLIENT_NAME	%CLIENT_NAME%	Specifies the NetBackup client. This option is the same as the <i>\$SAP_CLIENT</i> (%SAP_CLIENT%) environment variable and the <i>client</i> parameter in the <i>initSID.utl</i> file.
\$BPBACKUP_POLICY	%BPBACKUP_POLICY%	Specifies the NetBackup policy. This option is the same as the <i>\$SAP_POLICY</i> (%SAP_POLICY%) environment variable and the <i>policy</i> parameter in the <i>initSID.utl</i> file.
\$BPBACKUP_SCHED	%BPBACKUP_SCHED%	Specifies the NetBackup schedule. This option is the same as the <i>\$SAP_SCHED</i> (%SAP_SCHED%) environment variable and the <i>schedule</i> parameter in the <i>initSID.utl</i> file.

For more information, see the NetBackup Administrator's Guide, Volume II.

Parameters used in initSID.utl

This appendix includes the following topics:

- About parameters used in initSID.utl
- initSID.utl parameter summary
- backup_stream_buffersize <size>
- client <client_name>
- custom_sort_file <file_path>
- drives <number_of_drives>
- inquiry_query_period <months>
- master_time_offset <minutes> (UNIX or Linux)
- multistream_restore
- policy <policy_name>
- policy2 <policy_name>
- restore_stream_buffersize <size>
- retry_backup <number_of_retries>
- schedule <schedule_name>
- schedule2 <schedule_name>
- server <server_name>

- `sort_backup_type <value>`
- `sort_restore_type <value>`
- `switch_list <control_file_path>`
- `switch_log <control_file_path>`
- `switch_sem <control_file_path>`

About parameters used in initSID.utl

This appendix shows the parameters you can specify in the `initSID.utl` configuration file. The SAP tools pass these parameters to the `backint` interface through its `-p parfile` option.

Unless otherwise noted, the parameters in this appendix section apply to the following environments:

- NetBackup for SAP on Oracle databases without RMAN
- NetBackup for SAP on Oracle databases with RMAN
- NetBackup for SAP on MaxDB databases

Where necessary, the parameter descriptions indicate whether they apply to only one or two of these environments.

initSID.utl parameter summary

Table G-1 summarizes the parameters and the database environments that support them.

Table G-1 NetBackup for SAP parameters and the database environments

Parameter name	Underlying database and usage notes
<code>backup_stream_buffersize</code>	MaxDB See “ <code>backup_stream_buffersize <size></code> ” on page 208.
<code>client</code>	See “ <code>client <client_name></code> ” on page 208.
<code>custom_sort_file</code>	Oracle without RMAN See “ <code>custom_sort_file <file_path></code> ” on page 208.

Table G-1 NetBackup for SAP parameters and the database environments
(continued)

Parameter name	Underlying database and usage notes
drives	Oracle without RMAN See “drives <number_of_drives>” on page 212.
inquire_query_period	See “inquiry_query_period <months>” on page 212.
master_time_offset (UNIX or Linux)	See “master_time_offset <minutes> (UNIX or Linux)” on page 213.
multistream_restore	Oracle without RMAN See “multistream_restore” on page 213.
policy	See “policy <policy_name>” on page 213.
policy2	See “policy2 <policy_name>” on page 214.
restore_stream_buffersize	MaxDB See “restore_stream_buffersize <size>” on page 214.
retry_backup	See “retry_backup <number_of_retries>” on page 214.
schedule	See “schedule <schedule_name>” on page 214.
schedule2	See “schedule2 <schedule_name>” on page 215.
server	See “server <server_name>” on page 215.
sort_backup_type	Oracle without RMAN See “sort_backup_type <value>” on page 215.
sort_restore_type	Oracle without RMAN See “sort_restore_type <value>” on page 221.
switch_list	Oracle without RMAN See “switch_list <control_file_path>” on page 223.

Table G-1 NetBackup for SAP parameters and the database environments
(continued)

Parameter name	Underlying database and usage notes
switch_log	Oracle without RMAN See "switch_log <control_file_path>" on page 224.
switch_sem	Oracle without RMAN See "switch_sem <control_file_path>" on page 224.

backup_stream_buffersize <size>

This parameter specifies the buffer size, in bytes, for stream-based backups. NetBackup receives data from MaxDB through the stream (pipe). When MaxDB passes the data to NetBackup, it uses this buffer size. Also see the `restore_stream_buffersize` parameter.

client <client_name>

This parameter specifies the host name by which the master server knows this SAP client, as entered into the policy. In some cases the server and the client host are same hosts. The following is an example:

```
client saturn
```

If the NetBackup for SAP `backint` interface finds the `$$SAP_CLIENT (%SAP_CLIENT%)` environment variable, the `$$SAP_CLIENT` environment variable value overrides the `client` parameter value.

If the `client` parameter is not specified, and there is no environment variable, the `client` parameter defaults to the value that is specified for the `CLIENT_NAME` option in the `bp.conf` file or the registry. If the value is not specified there, the NetBackup for SAP `backint` interface uses the value the `gethostname ()` library function returns.

custom_sort_file <file_path>

Specify this parameter only when the `sort_backup_type` or the `sort_restore_type` parameters are set to `custom`.

When `custom` is specified, set the `custom_sort_file` parameter to a valid file. The `file_path` value must be a full path name to a custom sort file that an end user created, and it must have public permissions. The following is an example argument to the `custom_sort_file` parameter:

UNIX or Linux:

```
/usr/opensv/dbext/ext/db_ext/sap/scripts/sap_custom_sort_file
```

Windows:

```
install_path\NetBackup\dbext\SAP\Samples\sap_custom_sort_file
```

Note: Not applicable in MaxDB database environments or in any Oracle database environments that use RMAN.

The custom sort file must include two fields. The first field groups a set of files into a particular job. The second field is a file path name that maps the SAP backup file list to a group ID.

The following is an example of a custom sort file for Windows:

```
1 c:\oracle\sap\sapdata1\btabd_1\btabd.data1
1 c:\oracle\sap\sapdata2\btabi_1\btabi.data1
1 c:\oracle\sap\sapdata2\clud_1\clud.data1
1 c:\oracle\sap\sapdata1\ddicd_1\ddicd.data1
1 c:\oracle\sap\sapdata5\ddici_1\ddici.data1
1 c:\oracle\sap\sapdata4\el30cd_1\EL30cd.data1
1 c:\oracle\sap\sapdata1\el30ci_1\el30ci.data1
1 c:\oracle\sap\sapdata6\es30cd_1\es30cd.data1
1 c:\oracle\sap\sapdata2\poold_1\poold.data1
1 c:\oracle\sap\sapdata1\pooli_1\pooli.data1
1 c:\oracle\sap\sapdata4\protd_1\protd.data1

2 c:\oracle\sap\sapdata1\roll_1\roll.data1
2 c:\oracle\sap\sapdata2\sourced_1\sourced.data1
2 c:\oracle\sap\sapdata3\stabd_1\stabd.data1
2 c:\oracle\sap\sapdata2\stabi_2\stabi.data2
2 c:\oracle\sap\sapdata1\temp_1\temp.data1
2 c:\oracle\sap\sapdata4\userid_1\userid.data1
2 c:\oracle\sap\sapdata2\userli_1\userli.data1
2 c:\oracle\sap\sapdata1\system_1\system.data1
2 c:\oracle\sap\saplog1\log_g1_m1\log1_m1.dbf
2 c:\oracle\sap\saplog1\log_g2_m1\log2_m1.dbf
2 c:\oracle\sap\saplog1\log_g3_m1\log3_m1.dbf
```

```
2 c:\oracle\sap\saplog1\log_g4_m1\log4_m1.dbf
2 c:\oracle\sap\dbs\cntrlSAP.dbf
```

The following is an example of a custom sort file for UNIX or Linux:

```
1 /oracle/sap/sapdata1/btabd_1/btabd.data1
1 /oracle/sap/sapdata2/btabi_1/btabi.data1
1 /oracle/sap/sapdata2/clud_1/clud.data1
1 /oracle/sap/sapdata1/ddicd_1/ddicd.data1
1 /oracle/sap/sapdata5/ddici_1/ddici.data1
1 /oracle/sap/sapdata4/el30cd_1/EL30cd.data1
1 /oracle/sap/sapdata1/el30ci_1/el30ci.data1
1 /oracle/sap/sapdata6/es30cd_1/es30cd.data1
1 /oracle/sap/sapdata2/poold_1/poold.data1
1 /oracle/sap/sapdata1/pooli_1/pooli.data1
1 /oracle/sap/sapdata4/protd_1/protd.data1

1 /dev/rdisk/c0t4d0s6

2 /oracle/sap/sapdata1/roll_1/roll.data1
2 /oracle/sap/sapdata2/sourced_1/sourced.data1
2 /oracle/sap/sapdata3/stabd_1/stabd.data1
2 /oracle/sap/sapdata2/stabi_2/stabi.data2
2 /oracle/sap/sapdata1/temp_1/temp.data1
2 /oracle/sap/sapdata4/userld_1/userld.data1
2 /oracle/sap/sapdata2/userli_1/userli.data1
2 /oracle/sap/sapdata1/system_1/system.data1
2 /oracle/sap/saplog1/log_g1_m1/log1_m1.dbf
2 /oracle/sap/saplog1/log_g2_m1/log2_m1.dbf
2 /oracle/sap/saplog1/log_g3_m1/log3_m1.dbf
2 /oracle/sap/saplog1/log_g4_m1/log4_m1.dbf
2 /oracle/sap/dbs/cntrlSAP.dbf
```

Based on the custom sort file, if SAP tools submit the entire file list to `backint` for backup, two jobs are created. The first job includes all the files that have a “1” in the first field. The second job includes all the files that have a “2” in the first field.

The following is a list of jobs and associated files:

- Backup job and restore job 1

Windows:

```
c:\oracle\sap\sapdata1\btabd_1\btabd.data1
c:\oracle\sap\sapdata2\btabi_1\btabi.data1
c:\oracle\sap\sapdata2\clud_1\clud.data1
c:\oracle\sap\sapdata1\ddicd_1\ddicd.data1
```

```
c:\oracle\sap\sapdata5\ddici_1\ddici.data1
c:\oracle\sap\sapdata4\el30cd_1\EL30cd.data1
c:\oracle\sap\sapdata1\el30ci_1\el30ci.data1
c:\oracle\sap\sapdata6\es30cd_1\es30cd.data1
c:\oracle\sap\sapdata2\poold_1\poold.data1
c:\oracle\sap\sapdata1\pooli_1\pooli.data1
c:\oracle\sap\sapdata4\protd_1\protd.data1
c:\dev\rdisk\c0t4d0s6
```

UNIX or Linux:

```
/oracle/sap/sapdata1/btabd_1/btabd.data1
/oracle/sap/sapdata2/btabi_1/btabi.data1
/oracle/sap/sapdata2/clud_1/clud.data1
/oracle/sap/sapdata1/ddicd_1/ddicd.data1
/oracle/sap/sapdata5/ddici_1/ddici.data1
/oracle/sap/sapdata4/el30cd_1/EL30cd.data1
/oracle/sap/sapdata1/el30ci_1/el30ci.data1
/oracle/sap/sapdata6/es30cd_1/es30cd.data1
/oracle/sap/sapdata2/poold_1/poold.data1
/oracle/sap/sapdata1/pooli_1/pooli.data1
/oracle/sap/sapdata4/protd_1/protd.data1/dev/rdisk/c0t4d0s6
```

■ Backup job and restore job 2:

Windows:

```
c:\oracle\sap\sapdata1\roll_1\roll.data1
c:\oracle\sap\sapdata2\sourced_1\sourced.data1
c:\oracle\sap\sapdata3\stabd_1\stabd.data1
c:\oracle\sap\sapdata2\stabi_2\stabi.data2
c:\oracle\sap\sapdata1\temp_1\temp.data1
c:\oracle\sap\sapdata4\userid_1\userid.data1
c:\oracle\sap\sapdata2\userli_1\userli.data1
c:\oracle\sap\sapdata1\system_1\system.data1
c:\oracle\sap\saplog1\log_g1_m1\log1_m1.dbf
c:\oracle\sap\saplog1\log_g2_m1\log2_m1.dbf
c:\oracle\sap\saplog1\log_g3_m1\log3_m1.dbf
c:\oracle\sap\saplog1\log_g4_m1\log4_m1.dbf
c:\oracle\sap\dbs\cntrlSAP.dbf
```

UNIX or Linux:

```
/oracle/sap/sapdata1/roll_1/roll.data1
/oracle/sap/sapdata2/sourced_1/sourced.data1
/oracle/sap/sapdata3/stabd_1/stabd.data1
```

```
/oracle/sap/sapdata2/stabi_2/stabi.data2  
/oracle/sap/sapdata1/temp_1/temp.data1  
/oracle/sap/sapdata4/userld_1/userld.data1  
/oracle/sap/sapdata2/userli_1/userli.data1  
/oracle/sap/sapdata1/system_1/system.data1  
/oracle/sap/saplog1/log_g1_m1/log1_m1.dbf  
/oracle/sap/saplog1/log_g2_m1/log2_m1.dbf  
/oracle/sap/saplog1/log_g3_m1/log3_m1.dbf  
/oracle/sap/saplog1/log_g4_m1/log4_m1.dbf  
/oracle/sap/dbs/cntrlSAP.dbf
```

drives <number_of_drives>

This parameter specifies the number of jobs into which `backint` should divide the file list when `backup_sort_type` is `drive` or `size`.

Note: Not applicable in MaxDB database environments or in any Oracle database environments that use RMAN.

The following is an example entry:

```
drives 5
```

If the NetBackup for SAP `backint` interface finds the `$$SAP_DRIVES (%SAP_DRIVES%)` environment variable, the `$$SAP_DRIVES (%SAP_DRIVES%)` environment variable value overrides the `drives` parameter value. If the `drives` parameter is not specified and there is no environment variable, then the NetBackup for SAP `backint` interface exits with an error.

inquiry_query_period <months>

In the case of `#NULL` based inquiry queries, NetBackup for SAP restricts the catalog search to the last 6 months by default. You can use this parameter to specify a different query period. Specify an integer value for *months*. For example, if you want to set the query to the last 10 months, set this parameter as follows:

```
inquiry_query_period 10
```

master_time_offset <minutes> (UNIX or Linux)

This parameter restores old backups if there was a time difference between the master server and the client hosts.

Use this option only when the date and times are out of sync between the server and the client hosts.

The parameter value that is specified in minutes is subtracted from the start time and added to the end time for a restore or inquire. The following is an example of an entry:

```
master_time_offset 3
```

multistream_restore

This parameter is optional. The parameter can be set to 0 or 1. Specify 0 so that NetBackup master server determines the most efficient way to create restore jobs from the selected backup images. All these run as one job. Specify 1 to create restore streams based on the values of `drives` and `sort_restore_type`. Each stream then becomes a separate job.

Note: Some sites find it easier to monitor and restart failed streams for large restores if they are separate jobs.

A value of 0 is the default setting.

```
multistream_restore 0
```

Note: Not applicable in MaxDB database environments or in any Oracle database environments that use RMAN.

policy <policy_name>

This parameter specifies the name of an SAP policy that is defined in NetBackup. The SAP policy must have an Application Backup schedule defined in order for the NetBackup for SAP `backint` interface to work. The following is an example entry:

```
policy sap_nb
```

If the NetBackup for SAP `backint` interface finds the `$$SAP_POLICY` (%SAP_POLICY%) environment variable, the `$$SAP_POLICY` environment variable value overrides the `policy` parameter value. If the `policy` parameter is not specified, and there is no

environment variable, then the `policy` parameter value defaults to the specification for the `BPBACKUP_POLICY` option in the NetBackup `bp.conf` file or the NetBackup registry. By default, if `BPBACKUP_POLICY` is not specified in any `bp.conf` file or in the NetBackup registry, NetBackup uses the first active SAP policy it finds for the client with an Application Backup schedule.

policy2 <policy_name>

This parameter specifies the name of a policy to be used for the secondary SAP (phase 2) backup. A secondary backup is performed for each SAP database backup on any files that are needed to track SAP backup information. You can use this option to save the backup information on a different media. If `policy2` is not specified and `schedule2` is specified, NetBackup uses the value that is specified for the `policy` parameter.

restore_stream_buffersize <size>

This parameter specifies the buffer size, in bytes, for stream-based restores. MaxDB receives data from NetBackup through the stream (pipe). When MaxDB receives the data from NetBackup and copies it to the pipe, it uses this buffer size. For more information, see the `backup_stream_buffersize` parameter.

retry_backup <number_of_retries>

This parameter specifies the number of retries for a failed backup. `backint` retries a failed job the specified number of times. For example:

```
retry_backup 2
```

schedule <schedule_name>

This parameter specifies the name of an Application Backup schedule that is associated with an SAP policy type. The schedule can define aspects of the backup such as how long NetBackup retains images, maximum multiplexing per drive, storage unit, and volume pool. The following is an example entry:

```
schedule sap_full_backup
```

If the NetBackup for SAP `backint` interface finds the `$$SAP_SCHED` (`%SAP_SCHED%`) environment variable, the `$$SAP_SCHED` (`%SAP_SCHED%`) environment variable value overrides the `schedule` parameter value. If the `schedule` parameter

is not specified and there is no environment variable, then the `schedule` parameter value defaults to the `BPBACKUP_SCHED` option in the NetBackup `bp.conf` file or the NetBackup registry. If `BPBACKUP_SCHED` is not specified there, NetBackup uses the first Application Backup schedule it finds in the SAP policy.

schedule2 <schedule_name>

This parameter specifies name of an Application Backup schedule to be used for the secondary SAP (phase 2) backup. If it is not specified, the `schedule` parameter value is used.

For each SAP backup, NetBackup performs two individual backups. The first backup backs up database data. The second backup backs up the log files that are needed to track SAP backup information. You can use this parameter to save SAP log files to a different media. This can make it easier to restore a database. You can also use this option to save the backup information to a different volume pool. The following is an example entry:

```
schedule2 sap_backup_information
```

See “About parameters used in initSID.utl” on page 206.

See “initSID.utl parameter summary” on page 206.

server <server_name>

This parameter specifies the network routable hostname of the NetBackup master server. The server provides most of the administration and control for NetBackup operations. It contains the NetBackup database. The following is an example entry:

```
server jupiter
```

If the NetBackup for SAP `backint` interface finds a `$$SAP_SERVER` environment variable, the `$$SAP_SERVER (%SAP_SERVER%)` environment variable value overrides the `server` parameter value. If the `server` parameter is not specified, and there is no environment variable, the `server` parameter value defaults to the first `SERVER` value in the `bp.conf` file or the NetBackup registry.

sort_backup_type <value>

This parameter specifies one of four different backup sort parameter values: `custom`, `device`, `drive`, or `size` (default).

Note: Not applicable in MaxDB database environments or in any Oracle database environments that use RMAN.

See “`sort_backup_type custom`” on page 216.

See “`sort_backup_type device`” on page 216.

See “`sort_backup_type drive`” on page 217.

See “`sort_backup_type size (default)`” on page 218.

`sort_backup_type custom`

Specifies that a customized sort file be used.

If `sort_backup_type custom` is specified, also specify the `custom_sort_file` parameter with a file path.

See “`custom_sort_file <file_path>`” on page 208.

`sort_backup_type device`

Specifies that NetBackup create jobs based on a file’s device ID. This causes the `drives` parameter in the `initSID.utl` file to be ignored.

For example, if 12 files are requested for backup, and they reside on two different devices (`X` and `Y`), then two jobs are created. The first job contains all the files that are associated with device `X`, and the second job contains all the files on device `Y`.

Note: The implementation is based on the `st_dev` value from the `stat()` function. This value identifies a file partition.

The following UNIX or Linux example shows how jobs are created when device is specified:

- Input file list from SAP (`brbackup, sapdba`):

```
/oracle/sap/sapdata1/btabd_1/btabd.data1  
/oracle/sap/sapdata2/btabi_1/btabi.data1  
/oracle/sap/sapdata2/clud_1/clud.data1  
/oracle/sap/sapdata1/ddicd_1/ddicd.data1  
/oracle/sap/sapdata5/ddici_1/ddici.data1  
/oracle/sap/sapdata4/el30cd_1/EL30cd.data1  
/oracle/sap/sapdata1/el30ci_1/el30ci.data1  
/oracle/sap/sapdata6/es30cd_1/es30cd.data1  
/oracle/sap/sapdata2/poold_1/poold.data1
```



```
/oracle/sap/sapdata1/pooli_1/pooli.data1  
/oracle/sap/sapdata4/protd_1/protd.data1  
/dev/rdisk/c0t4d0s6 11812864
```

- Backup job 1 (all have the device ID x):

```
/oracle/sap/sapdata1/btabd_1/btabd.data1  
/oracle/sap/sapdata2/btabi_1/btabi.data1  
/oracle/sap/sapdata2/clud_1/clud.data1  
/oracle/sap/sapdata1/ddicd_1/ddicd.data1  
/oracle/sap/sapdata5/ddici_1/ddici.data1  
/oracle/sap/sapdata4/el30cd_1/EL30cd.data1  
/oracle/sap/sapdata1/el30ci_1/el30ci.data1  
/oracle/sap/sapdata6/es30cd_1/es30cd.data1  
/oracle/sap/sapdata2/poold_1/poold.data1  
/oracle/sap/sapdata1/pooli_1/pooli.data1  
/oracle/sap/sapdata4/protd_1/protd.data1
```

- Backup job 2 (all have the same device ID y):

```
/dev/rdisk/c0t4d0s6 11812864
```

The following Windows example shows how jobs are created when device is specified:

- Input file list from SAP (*brbackup, sapdba*):
- Backup job 1 (all have the device ID x):
- Backup job 2 (all have the same device ID y):

sort_backup_type drive

Specifies that *backint* should distribute the input file list in a cyclic fashion. The distribution will be amongst a number of jobs equal to the drives parameter specified in the *initSID.utl* file

For example, on UNIX or Linux, if there are three tape drives and 10 SAP files, the following distribution occurs:

- Input file list from SAP:

```
/oracle/sap/sapdata1/roll_1/roll.data1  
/oracle/sap/sapdata2/sourced_1/sourced.data1  
/oracle/sap/sapdata3/stabd_1/stabd.data1  
/oracle/sap/sapdata2/stabi_2/stabi.data2  
/oracle/sap/sapdata1/temp_1/temp.data1
```

```
/oracle/sap/sapdata4/userld_1/userld.data1  
/oracle/sap/sapdata2/userli_1/userli.data1  
/oracle/sap/sapdata1/system_1/system.data1  
/oracle/sap/saplog1/log_g1_m1/log1_m1.dbf
```

- Backup job and restore job 1:

```
/oracle/sap/sapdata1/roll_1/roll.data1  
/oracle/sap/sapdata2/stabi_2/stabi.data2  
/oracle/sap/sapdata2/userli_1/userli.data1
```

- Backup job and restore job 2:

```
/oracle/sap/sapdata2/sourced_1/sourced.data1  
/oracle/sap/sapdata1/temp_1/temp.data1  
/oracle/sap/sapdata1/system_1/system.data1
```

- Backup job and restore job 3:

```
/oracle/sap/sapdata3/stabd_1/stabd.data1  
/oracle/sap/sapdata4/userld_1/userld.data1  
/oracle/sap/saplog1/log_g1_m1/log1_m1.dbf
```

For example, on Windows, if there are three tape drives and 10 SAP files, the following distribution occurs:

- Input file list from SAP:
- Backup job and restore job 1:
- Backup job and restore job 2:
- Backup job and restore job 3:

sort_backup_type size (default)

This value is the default for the `sort_backup_type` parameter.

If `sort_backup_type size` is specified, `backint` sorts the files by size before distributing them amongst the jobs based upon the drives that are specified in the `initSID.utl` file.

The number of drives that are specified does not have to equal the number of physical storage units. The number of drives correlates to the number of simultaneous jobs created by the NetBackup for SAP `backint` interface. For example, if you have 10 SAP files and three tape drives, you can specify 10 drives in the `initSID.utl` file. This value creates 10 jobs with one file for each `bpbackup`

job. NetBackup handles all of the job scheduling. Initially, three jobs are active and the other seven jobs are queued.

Note: Not applicable in MaxDB database environments or in any Oracle database environments that use RMAN.

For example, if three tape drives are specified, the files are divided evenly into three `bpbackup` jobs based on size. So, if there are 25 input files from SAP and three tape drives, then three `bpbackup` jobs run at the same time.

The following files are in each job, on UNIX or Linux:

- Input file list from SAP (`brbackup`, `sapdba`):

```
/oracle/sap/sapdata1/btabd_1/btabd.data1
/oracle/sap/sapdata2/btabi_1/btabi.data1
/oracle/sap/sapdata2/clud_1/clud.data1
/oracle/sap/sapdata1/ddicd_1/ddicd.data1
/oracle/sap/sapdata5/ddici_1/ddici.data1
/oracle/sap/sapdata4/el30cd_1/EL30cd.data1
/oracle/sap/sapdata1/el30ci_1/el30ci.data1
/oracle/sap/sapdata6/es30cd_1/es30cd.data1
/oracle/sap/sapdata2/poold_1/poold.data1
/oracle/sap/sapdata1/pooli_1/pooli.data1
/oracle/sap/sapdata4/protd_1/protd.data1
/dev/rdisk/c0t4d0s6 11812864
/oracle/sap/sapdata1/roll_1/roll.data1
/oracle/sap/sapdata2/sourced_1/sourced.data1
/oracle/sap/sapdata3/stabd_1/stabd.data1
/oracle/sap/sapdata2/stabi_2/stabi.data2
/oracle/sap/sapdata1/temp_1/temp.data1
/oracle/sap/sapdata4/userld_1/userld.data1
/oracle/sap/sapdata2/userli_1/userli.data1
/oracle/sap/sapdata1/system_1/system.data1
/oracle/sap/saplog1/log_g1_m1/log1_m1.dbf
/oracle/sap/saplog1/log_g2_m1/log2_m1.dbf
/oracle/sap/saplog1/log_g3_m1/log3_m1.dbf
/oracle/sap/saplog1/log_g4_m1/log4_m1.dbf
/oracle/sap/dbs/cntrlSAP.dbf
```

- Backup job 1:

```
size= 36708352: file /name=/oracle/sap/sapdata1/roll_1/roll.data1
size= 10493952: file name=/oracle/sap/sapdata1/temp_1/temp.data1
```

```
size= 5251072: file name=/oracle/sap/sapdata1/ddicd_1/ddicd.data1
size= 5251072: file name=/oracle/sap/sapdata1/el30ci_1/el30ci.data1
size= 5243392: file name=/oracle/sap/saplog1/log_g4_m1/log4_m1.dbf
Total=62947840
```

■ **Backup job 2:**

```
251072: file name=/oracle/sap/sapdata2/btabi_1/btabi.data1
size= 5251072: file name=/oracle/sap/sapdata5/ddici_1/ddici.data1
size= 5251072: file name=/oracle/sap/sapdata6/es30cd_1/es30cd.data1
size= 5251072: file name=/oracle/sap/sapdata2/poold_1/poold.data1
size= 5251072: file name=/oracle/sap/sapdata3/stabd_1/stabd.data1
size= 5251072: file name=/oracle/sap/sapdata1/pooli_1/pooli.data1
size= 5251072: file name=/oracle/sap/sapdata2/user1i_1/user1i.data1
size= 5243392: file name=/oracle/sap/saplog1/log_g1_m1/log1_m1.dbf
size= 231936: file name=/oracle/sap/dbs/cntrlSAP.dbf
Total=57969664
```

■ **Backup job 3:**

```
size= 11812864: file name=/dev/rdisk/c0t4d0s6
size= 5251072: file name=/oracle/sap/sapdata2/clud_1/clud.data
size= 5251072: file name=/oracle/sap/sapdata4/el30cd_1/EL30cd.data1
size= 5251072: file name=/oracle/sap/sapdata4/protd_1/protd.data1
size= 5251072: file name=/oracle/sap/sapdata2/sourced_1/sourced.data1
size= 5251072: file name=/oracle/sap/sapdata2/stabi_2/stabi.data2
size= 5251072: file name=/oracle/sap/sapdata4/user1d_1/user1d.data1
size= 5251072: file name=/oracle/sap/sapdata1/btabd_1/btabd.data1
size= 5243392: file name=/oracle/sap/saplog1/log_g2_m1/log2_m1.dbf
size= 5243392: file name=/oracle/sap/saplog1/log_g3_m1/log3_m1.dbf
Total=59057152
```

The following files are in each job, on Windows:

- Input file list from SAP (brbackup, sapdba):
- Backup job 1:
- Backup job 2:
- Backup job 3:

sort_restore_type <value>

To use this parameter, the `multistream_restore` parameter must be set to 1. NetBackup can use the `sort_restore_type` parameter to restore the backup images.

`sort_restore_type` specifies one of three different restore sort options: `custom`, `drive`, or `image` (default).

The following sections describe the possible parameter values.

Note: Not applicable in MaxDB database environments or in any Oracle database environments that use RMAN.

sort_restore_type custom

Specifies that a customized sort file be used.

If `sort_restore_type custom` is specified, also specify the `custom_sort_file` parameter with a file path.

See “`custom_sort_file <file_path>`” on page 208.

sort_restore_type drive

Specifies that NetBackup create jobs based on the `drives` parameter in the `initSID.utl` file. The following examples show the distribution if there are 3 tape drives and 10 SAP files.

UNIX or Linux:

- Input file list from SAP:

```
/oracle/sap/sapdata1/roll_1/roll.data1
/oracle/sap/sapdata2/sourced_1/sourced.data1
/oracle/sap/sapdata3/stabd_1/stabd.data1
/oracle/sap/sapdata2/stabi_2/stabi.data2
/oracle/sap/sapdata1/temp_1/temp.data1
/oracle/sap/sapdata4/userld_1/userld.data1
/oracle/sap/sapdata2/userli_1/userli.data1
/oracle/sap/sapdata1/system_1/system.data1
/oracle/sap/saplog1/log_g1_m1/log1_m1.dbf
```

- Backup job and restore job 1:

```
/oracle/sap/sapdata1/roll_1/roll.data1  
/oracle/sap/sapdata2/stabi_2/stabi.data2  
/oracle/sap/sapdata2/userli_1/userli.data1
```

- Backup job and restore job 2:

```
/oracle/sap/sapdata2/sourced_1/sourced.data1  
/oracle/sap/sapdata1/temp_1/temp.data1  
/oracle/sap/sapdata1/system_1/system.data1
```

- Backup job and restore job 3:

```
/oracle/sap/sapdata3/stabd_1/stabd.data1  
/oracle/sap/sapdata4/userld_1/userld.data1  
/oracle/sap/saplog1/log_g1_m1/log1_m1.dbf
```

Windows:

- Input file list from SAP:
- Backup job and restore job 1:
- Backup job and restore job 2:
- Backup job and restore job 3:

sort_restore_type image (default)

Specifies that `backint` create groups of files based on their backup image IDs and create a job for each group. This behavior is the default if the `sort_restore_type` parameter is not set in the `intSID.utl` file.

For example, if nine files were backed up by two `bpbbackup` jobs, each file is associated with one of two backup image IDs. If all nine files are restored, the NetBackup for SAP `backint` interface creates the two jobs, one job for each image. The files are grouped the way they were backed up. The following are examples of a restore.

Note: Restore creates a separate job for raw partition files. The partition files cannot be grouped with regular files.

UNIX or Linux:

Input file list from SAP (`brrestore`, `sapdba`):

- Image 1:

```
/oracle/sap/sapdata1/roll_1/roll.data1  
/oracle/sap/sapdata2/sourced_1/sourced.data1  
/oracle/sap/sapdata3/stabd_1/stabd.data1  
/oracle/sap/sapdata2/stabi_2/stabi.data2  
/oracle/sap/sapdata1/temp_1/temp.data1
```

- Image 2:

```
/oracle/sap/sapdata4/userld_1/userld.data1  
/oracle/sap/sapdata2/userli_1/userli.data1  
/oracle/sap/sapdata1/system_1/system.data1  
/oracle/sap/saplog1/log_g1_m1/log1_m1.dbf
```

- Restore job 1:

```
/oracle/sap/sapdata1/roll_1/roll.data1  
/oracle/sap/sapdata2/sourced_1/sourced.data1  
/oracle/sap/sapdata3/stabd_1/stabd.data1  
/oracle/sap/sapdata2/stabi_2/stabi.data2  
/oracle/sap/sapdata1/temp_1/temp.data1
```

- Restore job 2:

```
/oracle/sap/sapdata4/userld_1/userld.data1  
/oracle/sap/sapdata2/userli_1/userli.data1  
/oracle/sap/sapdata1/system_1/system.data1  
/oracle/sap/saplog1/log_g1_m1/log1_m1.dbf
```

Windows:

Input file list from SAP (brrestore, sapdba):

- Image 1:
- Image 2:
- Restore job 1:
- Restore job 2:

switch_list <control_file_path>

This parameter specifies a control file that communicates from the NetBackup for SAP `backint` interface to `brbackup` for online backups. A switch list file is created each time `backint` wants to take a snapshot, or back up a file. The switch list file is also created when it wants to indicate that a snapshot or backup is finished.

Note: Not applicable in MaxDB database environments or in any Oracle database environments that use RMAN.

The `switch_list` parameter must specify a file path in one of the following locations:

```
$SAPDATA_HOME/sapbackup/.switch.lis
```

The following are examples of valid entries:

```
switch_list /oracle/sap/sapbackup/.switch.lis
```

switch_log <control_file_path>

This parameter specifies a control file that communicates to the NetBackup for SAP `backint` interface from `brbackup`. After the switch semaphore file has been deleted, the NetBackup for SAP `backint` interface opens and reads the switch log file to determine if `brbackup` was successful at making the file ready for snapshot or backup.

Note: Not applicable in MaxDB database environments or in any Oracle database environments that use RMAN.

The `switch_log` parameter must specify a file path in one of the following locations:

```
$SAPDATA_HOME/sapbackup/.switch.log
```

The following are examples of valid entries:

```
switch_list /oracle/sap/sapbackup/.switch.log
```

switch_sem <control_file_path>

This parameter specifies a control file that communicates between the NetBackup for SAP `backint` interface and `brbackup`. After the switch list file is created and closed, the NetBackup for SAP `backint` interface creates the switch semaphore file and waits until `brbackup` deletes it.

Note: Not applicable in MaxDB database environments or in any Oracle database environments that use RMAN.

The `switch_sem` parameter must specify a file path in the following location:


```
$$SAPDATA_HOME/sapbackup/.switch.sem
```

The following is an example of a valid entry:

```
switch_list /oracle/sap/sapbackup/.switch.sem
```

226 | Parameters used in initSID.utl
| **switch_sem <control_file_path>**

Configuring split mirror backups

This appendix includes the following topics:

- About configuring split mirror backups
- Local-host snapshot method: `nbu_snap` (Solaris SPARC platform only)
- Local-host snapshot method: `VxVM` (Solaris SPARC, HP-UX, Windows)
- Local-host snapshot method: `VxFS_Checkpoint` (UNIX or Linux)
- Off-host alternate client, FlashSnap method
- Off-host alternate client, VVR method (Solaris SPARC, HP-UX)
- Hardware array-based snapshot method: Hitachi Shadow Image, EMC TimeFinder, HP Business Copy (UNIX or Linux)

About configuring split mirror backups

The following snapshot methods are available for configuring split mirror backups for NetBackup for SAP.

- Local-host
 - See “Local-host snapshot method: `nbu_snap` (Solaris SPARC platform only)” on page 228.
 - See “Local-host snapshot method: `VxVM` (Solaris SPARC, HP-UX, Windows)” on page 229.
 - See “Local-host snapshot method: `VxFS_Checkpoint` (UNIX or Linux)” on page 230.
- Off-host

Local-host snapshot method: nbu_snap (Solaris SPARC platform only)

See “Off-host alternate client, FlashSnap method” on page 231.

See “Off-host alternate client, VVR method (Solaris SPARC, HP-UX)” on page 233.

- Hardware array-based (UNIX or Linux)
See “Hardware array-based snapshot method: Hitachi Shadow Image, EMC TimeFinder, HP Business Copy (UNIX or Linux)” on page 236.

Some of the configuration methods are platform-specific.

Local-host snapshot method: nbu_snap (Solaris SPARC platform only)

The `nbu_snap` snapshot method is for Solaris (SPARC) clients only. It makes copy-on-write snapshots for any SAP Oracle databases that reside in UFS or Veritas File Systems (VxFS).

For the `nbu_snap` methods, you must identify a cache device for the copy-on-write process. The cache device is a raw disk partition, either a logical volume or physical disk. It stores the portions of the client’s data that the incoming write requests change while the copy-on-write is in progress.

For the cache device, do not select an active partition that contains valuable data. Any data in that partition is lost when the snapshot is complete. Specify the raw partition as the full path name of either the character special device file or the block device file.

For example, specify the following:

- Solaris (SPARC) raw partition: `/dev/rdisk/c2t0d3s3` or `/dev/dsk/c2t0d3s3`
- VxVM volume: `/dev/vx/rdsk/diskgroup_1/volume_3` or `/dev/vx/dsk/diskgroup_1/volume_3`

Do not specify wildcards (such as `/dev/rdsk/c2*`) as paths.

The cache partition must be unmounted and must reside on the same host as the snapshot source (the client’s data to back up). The partition must have enough space to hold all the writes to the partition that can occur during the backup. Note that backups during off-peak periods normally require a smaller cache than a backup during peak activity.

For more information, see the NetBackup Snapshot Client Administrator’s Guide.

Configuring NetBackup for SAP with the local-host snapshot method (nbu_snap)

- 1 On the production database host, install NetBackup Client, which includes the NetBackup Snapshot Client, and NetBackup for SAP.
- 2 Identify a cache device for the copy-on-write process. Manually select the snapshot method on the **Advanced Snapshot Options** dialog box.
- 3 Specify the raw cache partition using one of the following methods:
 - Specify the raw partition in the default cache device path for snapshots field. (Open **NetBackup Management > Host Properties > Clients**. Then in the **Client Properties** dialog box, expand **UNIX Client > Client Settings**). This setting applies to the client in all policies.
 - In the **Advanced Snapshot Options** dialog box, specify the cache device path value field. This cache setting applies to all clients in the current policy and overrides the cache setting in the client settings dialog box.

Local-host snapshot method: VxVM (Solaris SPARC, HP-UX, Windows)

Use the following procedure to configure.

To configure the local host snapshot method

- 1 Install and configure the following on the production database host:
 - Install NetBackup Client, NetBackup Snapshot Client, and NetBackup for SAP Agent.
 - Configure the production database (Oracle).
 - You can install NetBackup master server on a separate host.
- 2 Attach the external disk D1 to the primary client (production database host) and create a VM disk group using the following command:

```
root@primary# vxdbg init diskgroup [cde=on|off] diskname=devicename
```

- 3 Create a volume in primary disk D using the following command:

```
root@primary# vxassist -g diskgroup make volume size
```

- 4 Add a DCO log to the volume using the following command:

```
root@primary# vxassist -g diskgroup addlog volume logtype=dc
```

Local-host snapshot method: VxFS_Checkpoint (UNIX or Linux)

- 5 Enable FastResync on the volume using the following command:

```
root@primary# vxvol -g diskgroup set fastresync=on volume
```

- 6 Create a VxFS file system on this volume and mount it using the following commands:

```
root@primary# mkfs -F vxfs /dev/vx/rdisk/diskgroup/volume  
root@primary# mount -F vxfs /dev/vx/dsk/diskgroup/volume mnt
```

- 7 Create the SAP production database on this volume.
- 8 Start the snapshot for the data volume in the primary client using the following command:

```
root@primary# vxassist -g diskgroup -b snapstart volume
```

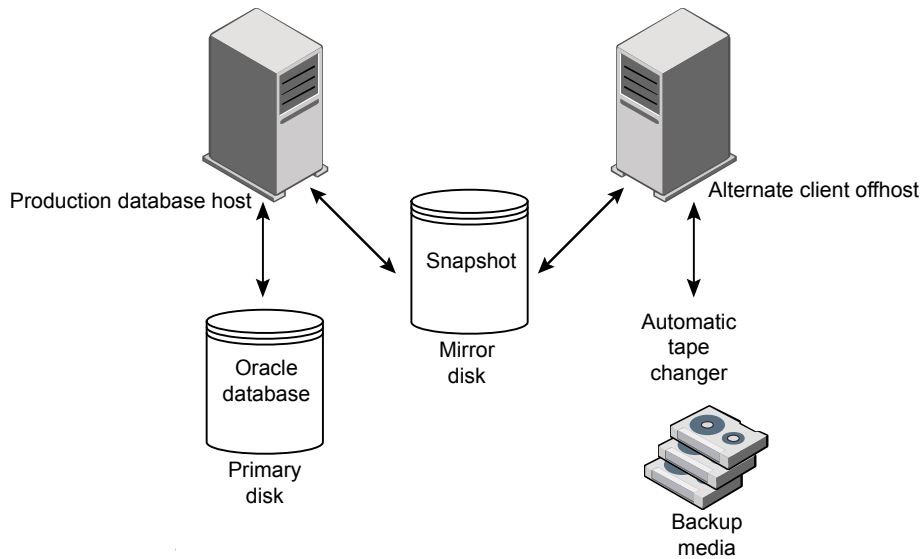
Local-host snapshot method: VxFS_Checkpoint (UNIX or Linux)

Configure the Oracle database in the Veritas File System (VxFS) in the production host. The same requirements apply to the VxFS_Checkpoint method as for BLI backups.

See “About configuring NetBackup for SAP block-level incremental backups on UNIX” on page 157.

Off-host alternate client, FlashSnap method

Figure H-1 Typical SAP split mirror off-host backup with FlashSnap



Based on this FlashSnap configuration, the typical flow during the Snapshot Client backup for SAP is as follows:

- The database shuts down or the tablespaces are put in backup mode in the production host.
- The alternate client off-host takes the snapshot of the production database from primary disk D1 to mirror disk D2.
- The production database in primary disk D1 is created online.
- The mirror disk D2 is split to perform backup from the snapshot to the backup media.
- The snapshot from the mirror disk D2 is then joined back to the volume in primary disk D1.

The user identification and group identification numbers (UIDs and GIDs) associated with the files to be backed up must be available to the primary client and the alternate backup client. The UID on the primary client and the alternate backup client must be the same. Similarly, the GID on the primary client and the alternate backup client must be the same.

To configure the local host snapshot method

- 1 Install and configure the following on the production database host:

- Install NetBackup Client, NetBackup Snapshot Client, and the NetBackup for SAP Agent.
 - Configure the production database (Oracle).
 - You can install the NetBackup master server on a separate host.
- 2 Install the following on the alternate client (off-host):
 - Install NetBackup Client and NetBackup Snapshot Client. The NetBackup for SAP Agent is not required.
 - The NetBackup master server. You can install the master server on the same host or on a separate host where you want to attach the backup media.
 - The UID number can be different than the GID number.
 - 3 Attach the external disk D1 to the primary client (production database host) and create a VM disk group using the following command:

```
root@primary# vxvg init diskgroup [cbs=on|off] diskname=devicename
```

- 4 Create a volume in primary disk D using the following command:

```
root@primary# vxassist -g diskgroup make volume size
```

- 5 Add a DCO log to the volume using the following command:

```
root@primary# vxassist -g diskgroup addlog volume logtype=dco
```

- 6 Enable FastResync on the volume using the following command:

```
root@primary# vxvol -g diskgroup set fastresync=on volume
```

- 7 Create a VxFS file system on this volume and mount it using the following commands:

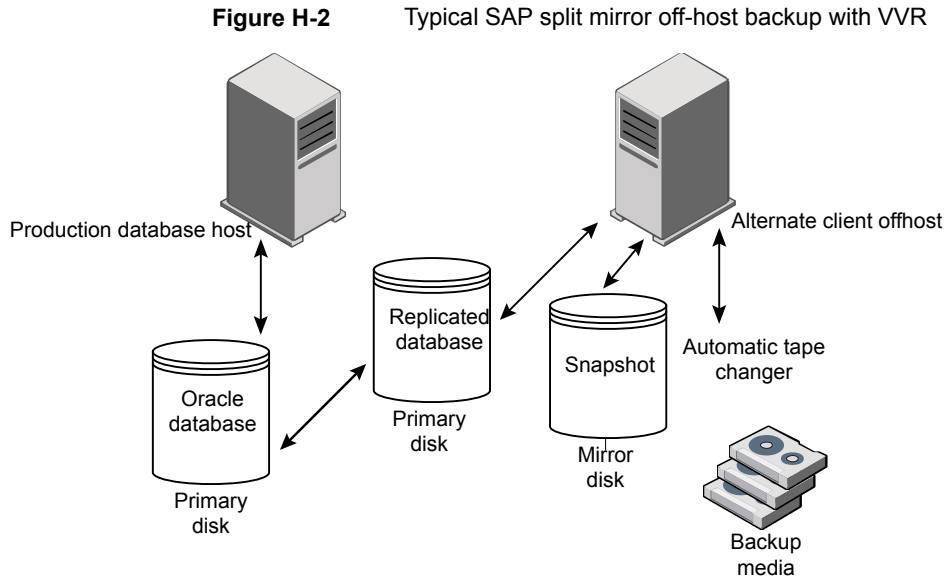
```
root@primary# mkfs -F vxfs /dev/vx/rdisk/diskgroup/volume
```

```
root@primary# mount -F vxfs /dev/vx/dsk/diskgroup/volume mnt
```

- 8 Create the SAP production database on this volume.
- 9 Connect the external mirror disk D2 to the primary client and the alternate client, so the disk is accessible to both hosts.
- 10 Start the snapshot for the data volume in the primary client using the following command:

```
root@primary# vxassist -g diskgroup -b snapstart volume
```


Off-host alternate client, VVR method (Solaris SPARC, HP-UX)



Based on this VVR configuration, the typical flow during the Snapshot Client backup for SAP:

- The database shuts down or tablespaces are put in backup mode in the production host.
- Replication is stopped between primary disk D1 and replication disk D2.
- The alternate client off-host takes the snapshot of the replication database from disk D2 to mirror disk D3.
- The production database in primary disk D1 is created online.
- The mirror disk D3 is split to perform backup from the snapshot to the backup media.
- The snapshot from the mirror disk D3 is then joined back to the volume in replication disk D2.
- Then the storage replication log (SRL) resync happens in primary disk D1 and secondary disk D2.
- Finally, replication resumes.

Before configuring this method, install and configure the following:

- Install and configure the following on the production database host:
 - Install NetBackup Client, NetBackup Snapshot Client, and the NetBackup for SAP Agent
 - Configure the production database (Oracle).
 - You can install the NetBackup master server on a separate host
- Install the following on the alternate client (off-host):
 - Install NetBackup Client and NetBackup Snapshot Client. The NetBackup for SAP Agent is not required.
 - The NetBackup media server. You can install the media server on the same host or on separate host where you want to attach the backup media.

The following procedures describe how to configure both the volume replicator primary and the volume replicator secondary.

To configure the volume replicator primary (production database host)

- 1 Attach the external primary disk D1 to the volume replicator primary, and create a VM disk group using the following command:

```
root@primary# vxdbg init diskgroup [cds=on|off] diskname=devicename
```

- 2 Create a data volume in primary disk D1 using the following command:

```
root@primary# vxassist -g diskgroup make volume size
```

By default, it creates two copies that require two disks in one group. To override the default, enter the following command:

```
root@primary # vxassist -g diskgroup addlog volume logtype=dcn nlog=1
```

- 3 Create the VxFS file system on this volume and mount it using the following commands:

```
root@primary# mkfs -F vxfs /dev/vx/rdisk/diskgroup/volume  
root@primary# mount -F vxfs /dev/vx/dsk/diskgroup/volume mnt
```

- 4 Create the SAP production database on this volume.
- 5 Create a Storage Replicator Log (SRL) volume in primary disk D1 using the following command:

```
root@primary# vxassist -g diskgroup make volume_srl size
```

To configure the volume replicator secondary (alternate client off-host)

- 1 Attach the external replication disk D2 to the volume replicator secondary and create the VM disk group using the following command:

```
root@secondary# vxdg init diskgroup [cds=on|off] diskname=devicename
```

- 2 Create a data volume in replication disk D2 using the following command:

```
root@secondary # vxassist -g diskgroup make volume size
```

By default, it creates two copies that require two disks in one group. To override the default, enter the following command:

```
root@secondary# vxassist -g diskgroup addlog volume logtype=dcn nlog=1
```

- 3 Create a Storage Replicator Log (SRL) volume in the replication disk D2 using the following command:

```
root@secondary# vxassist -g diskgroup make volume_srl size
```

- 4 Create the primary replicated volume group (RVG) specifying the data volume(s) and the SRL volume. On the volume replicator primary (production database host), run the following command:

The names of the disk group and volumes must be same as on the primary host.

```
root@primary# vradm -g diskgroup createpri rvg_name data_volumes(s) srl_volume
```

- 5 Ensure that authentication can complete.

Before you add a new secondary host (by using the `addsec`) or overwrite data on a remote host (by using the `syncvol`), `vradm` performs some authentication. This process checks that the `/etc/vx/vras/.rdg` file on the remote host contains an entry for the primary disk group ID. The `vradm addsec` or `syncvol` command fails if the `/etc/vx/vras/.rdg` file on the remote host does not have such an entry.

If authentication cannot complete, do the following:

- Add the primary disk group ID to the `/etc/vx/vras/.rdg` file on the remote host.
- To find disk group ID, run the `vxprint -l diskgroup_name` command on the primary.

Hardware array-based snapshot method: Hitachi Shadow Image, EMC TimeFinder, HP Business Copy (UNIX or Linux)

- Ensure that the `/etc/hosts` file has entries of primary and secondary host names in both hosts.

- 6 Add the secondary RVG to form the replicated data set (RDS) using the following command:

```
root@primary# vradmin -g diskgroup addsec rvg_name primary_hostname secondary_hostname
```

- 7 Start replication between the volume replicator primary and secondary using the following command:

```
root@primary# vradmin -g group_1 -a startrep v1_rvg
```

- 8 Attach the external mirror disk D3 to the alternate client for taking a snapshot mirror.
- 9 On the volume replicator secondary (alternate client off-host), start the snap for the data volume using the following command:

```
root@secondary# vxassist -g diskgroup -b snapstart volume
```

Hardware array-based snapshot method: Hitachi Shadow Image, EMC TimeFinder, HP Business Copy (UNIX or Linux)

Ensure that the vendor-related library files are installed in the following directory:
`/usr/lib`.

Register authorized locations

This appendix includes the following topics:

- Registering authorized locations used by a NetBackup database script-based policy

Registering authorized locations used by a NetBackup database script-based policy

During a backup, NetBackup checks for scripts in the default script location and any authorized locations. The default, authorized script location for UNIX is `usr/opensv/netbackup/ext/db_ext` and for Windows is `install_path\netbackup\dbext`. If the script is not in the default script location or an authorized location, the policy job fails. You can move any script into the default script location or any additional authorized location and NetBackup recognizes the scripts. You need to update the policy with the script location if it has changed. An authorized location can be a directory and NetBackup recognizes any script within that directory. An authorized location can also be a full path to a script if an entire directory does need to be authorized.

If the default script location does not work for your environment, use the following procedure to enter one or more authorized locations for your scripts. Use `nbsetconfig` to enter an authorized location where the scripts reside. You can also use `bpsetconfig`, however this command is only available on the master or the media server.

Note: One recommendation is that scripts should not be world-writable. NetBackup does not allow scripts to run from network or remote locations. All scripts must be stored and run locally. Any script that is created and saved in the NetBackup `db_ext` (UNIX) or `dbext` (Windows) location needs to be protected during a NetBackup uninstall.

For more information about registering authorized locations and scripts, review the knowledge base article:

To add an authorized location

- 1 Open a command prompt on the client.
- 2 Use `nbsetconfig` to enter values for an authorized location. The client privileged user must run these commands.

The following examples are for paths you may configure for the Oracle agent. Use the path that is appropriate for your agent.

- On UNIX:

```
[root@client26 bin]# ./nbsetconfig
nbsetconfig>DB_SCRIPT_PATH = /Oracle/scripts
nbsetconfig>DB_SCRIPT_PATH = /db/Oracle/scripts/full_backup.sh
nbsetconfig>
<ctrl-D>
```

- On Windows:

```
C:\Program Files\Veritas\NetBackup\bin>nbsetconfig
nbsetconfig> DB_SCRIPT_PATH=c:\db_scripts
nbsetconfig> DB_SCRIPT_PATH=e:\oracle\fullbackup\full_rman.sh
nbsetconfig>
<ctrl-Z>
```

Note: Review the NetBackup Command Reference Guide for options, such as reading from a text file and remotely setting clients from a NetBackup server using `bpsetconfig`. If you have a text file with the script location or authorized locations listed, `nbsetconfig` or `bpsetconfig` can read from that text file. An entry of `DB_SCRIPT_PATH=none` does not allow any script to execute on a client. The `none` entry is useful if an administrator wants to completely lock down a server from executing scripts.

Registering authorized locations used by a NetBackup database script-based policy

- 3** (Conditional) Perform these steps on any clustered database or agent node that can perform the backup.
- 4** (Conditional) Update any policy if the script location was changed to the default or authorized location.

240 | Register authorized locations
| **Registering authorized locations used by a NetBackup database script-based policy**

Index

A

- alternate client restore
 - see redirected restore 85
- altnames directory 74
- Application Backup schedule
 - for block level incremental backups 160
 - overview 41
- application backup schedule
 - configuring 42
 - overview 42
 - retention 42
- Approving the auto-discovered mappings in Host Management 66
- archives
 - creating 82
- automatic backup
 - create scripts 48
- automatic backup schedules 43
 - configuring 43
- Automatic Full Backup schedule 41
 - with Snapshot Client 144
- Automatic Incremental Backup schedule 41
- automatic SAP backups 80

B

- backint configuration 76
- backint interface
 - theory of operation 187
- backint interface
 - command line 188
 - defined 187
 - input file 195
 - linking with NetBackup for SAP 30
 - parameter file 189
 - restore process 84
 - role in backup process 80
 - sequence of operation 17
 - technical overview 16
- BACKINT parameter 63–64
- backup
 - automatic 69

- backup (*continued*)
 - manual 69
- Backup ID
 - see BID 81
- backup media required 27
- backup medium
 - configuring 170
 - defined 169
- Backup policy 73
- Backup Selections list
 - adding selections 45–46
- backup_dev_type parameter 59
- backup_stream_buffersize parameter 208
- backups
 - automatic (configuring scripts) 48
 - offline 81
 - online 81
 - output file contents 197
 - scripts for backup operations 49
 - when using MaxDB 171
- BID
 - generation process 81
 - returned on backup 197
- block level incremental backup
 - configuring 160
 - overview 157
- bp.conf
 - repository for script parameters 54, 203
- bphdb
 - role in backups and restores 17
 - role in offline backups 47
- bphdb log
 - UNIX 179
 - Windows 179
- brarchive command
 - example script 48
 - overview 16, 20
 - using 82
- brbackup command
 - backint parameter file 223
 - example script 47
 - overview 16, 20

- brbackup command (*continued*)
 - sequence of operation 17
 - use in online backup 81
 - using to start a backup 80
 - using without sapdba 81
- brrestore command
 - overview 16, 20
 - using 84
- bsi.env file
 - overview 55
 - parameters 62
 - procedure for modifying 62

C

- client parameter 57, 208
- client read timeout property 183
- client-initiated backups 80
- clients list, for backup policies 44
- commands
 - backint 188
 - brarchive 16, 20, 48, 82
 - brbackup 16–17, 20, 47, 81
 - brrestore 16, 20, 84
 - export 47
 - installation directory 29–30
 - stopsap R3 81
 - su 50
- compatibility information 26
- Configure client 75
- Configure master and media servers 71
- Configure master server 72
- Configure media server 72
- Configure node level 76
- Configure SAP HANA 75
- custom_sort_file parameter 209

D

- daemons
 - scheduling processes 178
- daemons, see processes<\$nopagebsgt 17
- debug logs
 - debug level 180
 - enabling 175–176
 - in /usr/opensv/netbackup/logs 178
 - in install_path\NetBackup\bslogs 177
 - troubleshooting with log files 175
- drives parameter 57, 70, 212

E

- environment variables 54, 200
- ERROROUTPUT parameter 63–64
- export command 47

F

- FlashSnap snapshots 162
- Fulldata Storage Checkpoint 159

H

- Host Management 66

I

- initsap.utl file 75
- initSID.sap file
 - Oracle substitution characters 62
 - procedure for modifying 58
 - script parameters 54
- initSID.utl file
 - Oracle substitution characters 58
 - overview 55
 - parameter summary 206
 - procedure for modifying 56
 - script parameters 54
 - specifying a schedule name in 42
- INPUT parameter 63–64
- inquiry_query_period parameter 212
- installation
 - adding a license 28
 - prerequisites for clusters 28
 - requirements for NetBackup clients 27
 - requirements for NetBackup servers 27
- instant recovery
 - configuration requirements 143
 - policy configuration 144
 - restore method 161

J

- Jobs per client 73

L

- licenses 28
- log files
 - sapdba utility 181
- Log level 73

M

- manual backups 79
- master_time_offset parameter 213
- MaxDB database
 - administrative interface 16
 - backup script 48
 - bsi.env file 55
 - configuration 170
 - configuration files 55
 - SAP parameter file 55
 - technical overview 15, 20
 - terminology 13
- maximum jobs per client 68
- media
 - defined 169
- medium
 - defined 169
- multiple copies feature 44
- multiplexing
 - overview 14

N

- NAS_Snapshot 162
- NAS_Snapshot method 156
- nbjm scheduling process 178
- nbpem scheduling process 178
- nbrb scheduling process 178
- NetBackup Client Service logon account,
 - configuring 55
- NetBackup for SAP NAS Snapshot
 - configuring a policy for 154
- Nodata Storage Checkpoint 158

O

- offhost backup
 - configuring 147, 152
- offline backups 81
- online backups 81
- Oracle database
 - configuration files 55
 - initSID.sap file 55
 - SAP parameter file 55
 - SAP profile file 55
 - SAP tools support 13
 - substitution characters 58, 62
 - technical overview 15
 - with RMAN
 - backup script 48

- Oracle database *(continued)*
 - with RMAN *(continued)*
 - linking with the SBT library 30
 - technical overview 18
 - without RMAN
 - backup script 47–48
 - copying the NetBackup for SAP binary 29
 - linking with backint 30
 - technical overview 17
- ORIGINAL_RUNDIRECTORY parameter 64
- OUTPUT parameter 63–64

P

- parameter file
 - initSID.sap 54
 - initSID.utl 54
- PARAMETERFILE parameter 63–64
- parameters
 - BACKINT 63–64
 - backup_dev_type 59
 - backup_stream_buffersize 208
 - client 57, 208
 - custom_sort_file 209
 - drives 57, 70, 212
 - ERROROUTPUT 63–64
 - INPUT 63–64
 - inquiry_query_period 212
 - master_time_offset 213
 - ORIGINAL_RUNDIRECTORY 64
 - OUTPUT 63–64
 - PARAMETERFILE 63–64
 - policy 57, 213
 - policy2 214
 - restore_stream_buffersize 214
 - retry_backup 214
 - rman_parms 60
 - schedule 57, 214
 - schedule2 215
 - server 57, 215
 - sort_backup_type 215
 - sort_restore_type 221
 - switch_list 57, 223
 - switch_log 57, 224
 - switch_sem 57, 224
 - TIMEOUT_FAILURE 63
 - TIMEOUT_SUCCESS 63
 - util_par_file 56, 59
- policy configuration
 - adding clients 44

policy configuration (*continued*)
 attributes 40
 backup selections list 45
 for databases 39
 for Snapshot Client 145, 150, 160
 overview 38
 testing 69

policy parameter 57, 213

policy2 parameter 214

processes

bphdb 47

scheduling (nbpem
 nbjm). See nbrb

R

redirected restore 85

reports 175

See also log files

All Log Entries report 180

NetBackup server reports 180

restore

Point-in-time rollback 162

snapshot rollback 162

with Snapshot Client methods 162

restore_stream_buffersize parameter 214

restores

output file contents 198

using sapdba 84

with MaxDB 173

with Snapshot Client methods 163

retry_backup parameter 214

rman_parms parameter 60

S

SAP DB database

terminology 13

SAP HANA 23

SAP tools

see sapdba 20

SAP_CLIENT environment variable 199

SAP_DRIVES environment variable 199

sap_maxdb_backup script 48

sap_offline_backup script 47

sap_online_backup script 48

SAP_POLICY environment variable 200

sap_redo_log script 48

sap_rman_backup script 48

SAP_SCHED environment variable 200

SAP_SERVER environment variable 200

SAP_SWITCH environment variable 201

sapdba

backup process 81

databases that sapdba supports 13

defined 20

examples 81

offline backup 81

restore process 84

technical overview 16

utility log 181

schedule parameter 57, 214

schedule2 parameter 215

schedules

frequency 43

properties 43

scripts

backup 48

examples 47

restore 48

su command 50

type of operation 48

usage caution 48

server parameter 57, 215

snapshot backup 144, 162

configuration requirements 143

database objects included 144

policy configuration 144

restore method 161

Snapshot Client

backup type roles 148

configuring policies 144

RMAN backups 165

sample scripts 164

snapshot rollback 162

sort_backup_type parameter 215

sort_restore_type parameter 221

switch_list parameter 57, 223

switch_log parameter 57, 224

switch_sem parameter 57, 224

T

testing multiple concurrent jobs 70

testing policy configuration 69

timeout failures

minimizing 182

TIMEOUT_FAILURE parameter 63

TIMEOUT_SUCCESS parameter 63

transaction logs
 see archive logs 160

U

unified logging 177–178
utl_par_file parameter 56
utl_par_file parameters 59

V

Veritas Storage Foundation 159
VxFS_Checkpoint snapshot 162
vxvm snapshot 162