Symantec NetBackup™ for SAP Administrator's Guide

for UNIX, Windows, and Linux

Release 7.5

✔Symantec™

Symantec NetBackup™ for SAP Administrator's Guide

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Contents

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	NetBackup scheduling facilities on the master server can be used to schedule automatic and unattended SAP backups.
	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.
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	All backups and restores run simultaneously and transparently without any action from the NetBackup administrator.
	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.
	Alternatively, if you use NetBackup for SAP on an Oracle database, you can use SAP Tools as if NetBackup were not present.
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	NetBackup provides the following graphical user interfaces for client users and administrators: ■ NetBackup Administration Console for Java ■ NetBackup Administration Console for Windows A database administrator or NetBackup administrator can start backup or restore operations for SAP from the NetBackup graphical user interface on the master server.
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	Compression increases backup performance over the network and reduces the size of the backup image that NetBackup writes to the storage unit. NetBackup for SAP supports compression for the following types of backups: ■ Stream-based backups through both MaxDB and RMAN. ■ File-based backups through `backint`. ■ Snapshot Client backups through `backint`. NetBackup for SAP does not support compression for Snapshot Client backups through RMAN.

For more information on general NetBackup terminology, see the *NetBackup Administrator's Guide, Volume I.*

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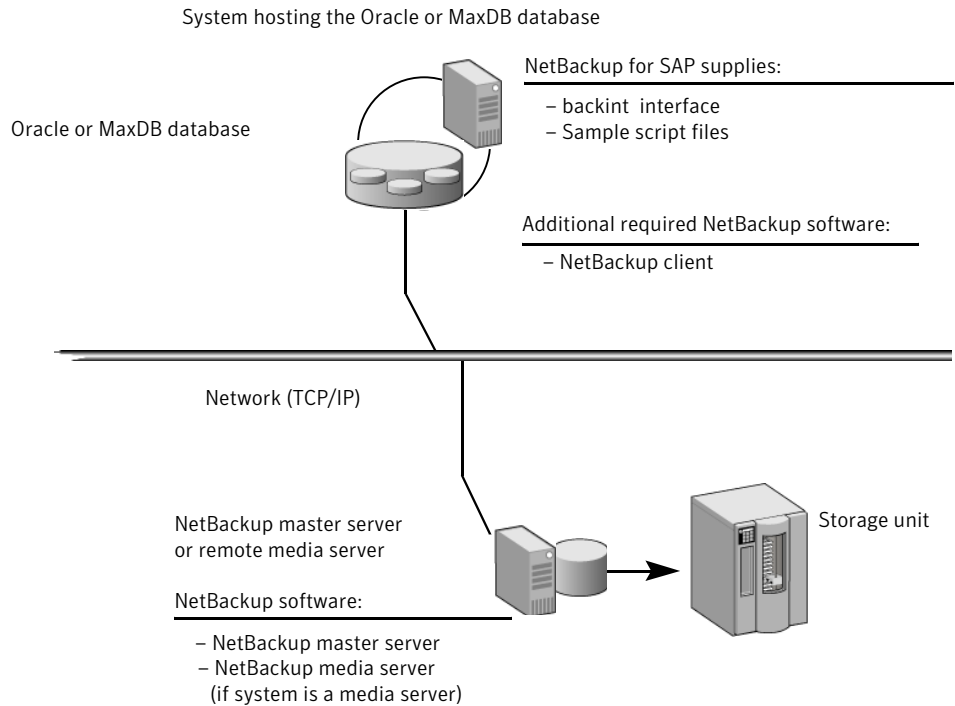
NetBackup for SAP assumes either an Oracle or a MaxDB database as the underlying database.

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 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 selecting an SAP script. A NetBackup process called `bphdb` starts the SAP script on the client if the backup is initiated by a policy on the master server. The SAP application then starts the requested operation on the databases.

Figure 1-2 shows the sequence of operation.

Figure 1-2   NetBackup for SAP operations
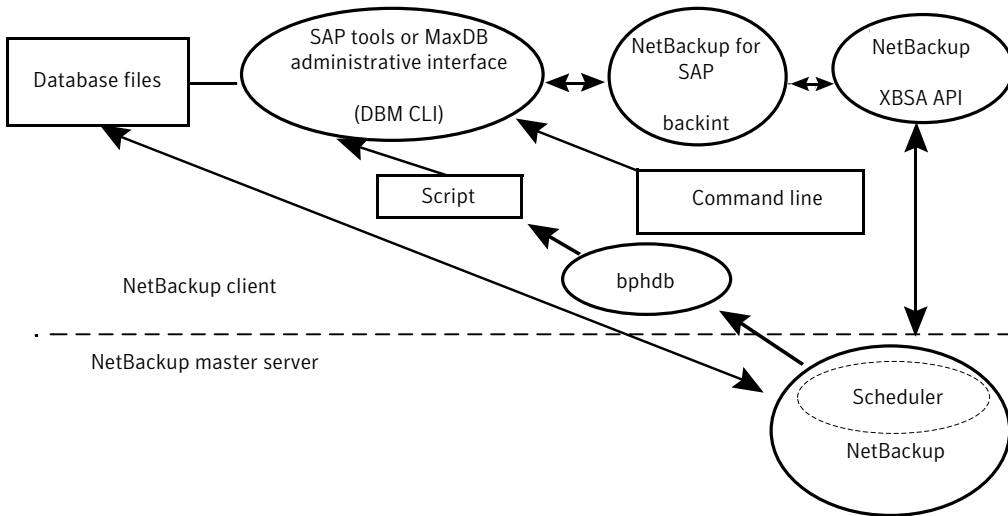
For a backup, `brbackup` calls the NetBackup for SAP `backint` interface. The `backint` interface calls the XBSA API to interface with NetBackup.

A restore works similarly except that the NetBackup for SAP `backint` interface calls the XBSA API, causing 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 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
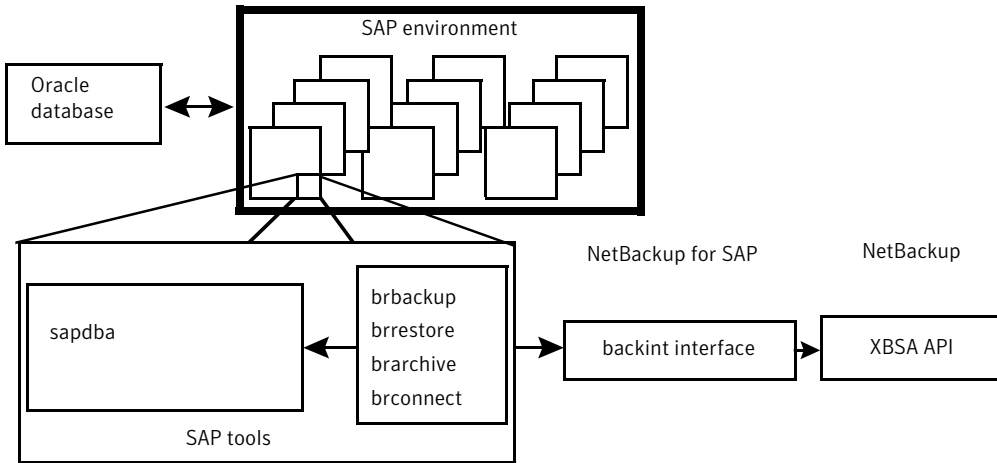
Using NetBackup for SAP on Oracle databases with RMAN

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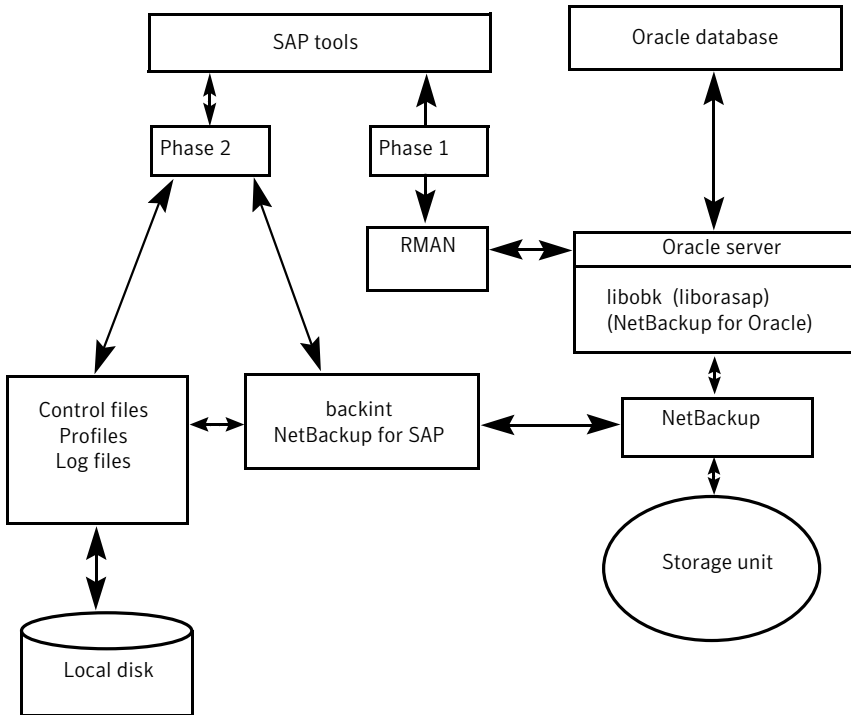
If you are in a NetBackup for SAP on Oracle database environment with RMAN, the backup consists of the following phases:

■ 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 shows the software included in the SAP tools.

Table 1-2   SAP tools software

Component	Function
sapdba	sapdba is a menu-driven utility, with menus designed to reflect the user's point of view. 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.
brbackup	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. brbackup uses the NetBackup software, through NetBackup for SAP, for the following actions: ■ SAP data file backups ■ Data file and online log backups ■ Error handling
brarchive	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.
brrestore	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 prior to restoring these files, and it removes files that are overwritten during the recovery. This command also provides a query mode.
SAP script	This is a small script that contains SAP commands such as brbackup and brrestore.

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
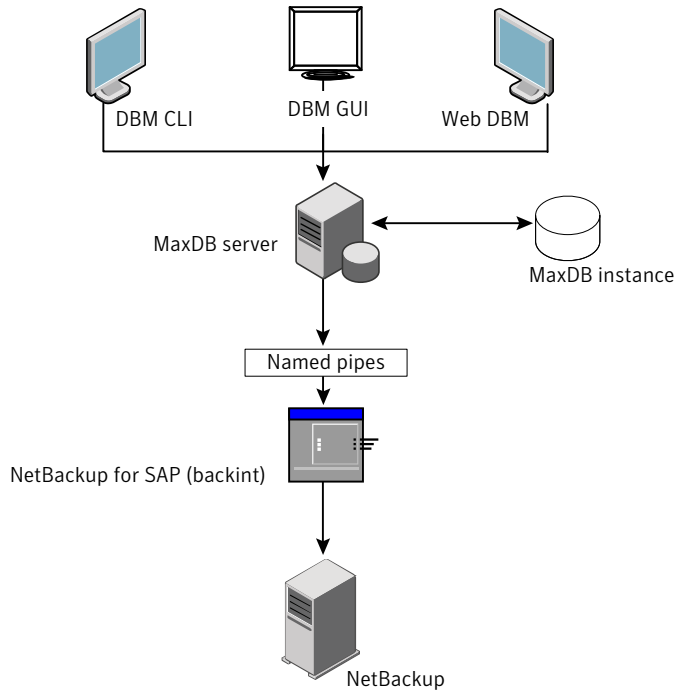
Installing NetBackup for SAP

This chapter includes the following topics:

- Planning the installation of NetBackup for SAP

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

- NetBackup server and client requirements for NetBackup for SAP

- SAP server software requirements for NetBackup for SAP

- Requirements for installing NetBackup for SAP in a NetBackup cluster

- Configuration and licensing requirements for NetBackup for SAP with Snapshot Client

- Adding license keys for NetBackup for SAP backups

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

Planning the installation of NetBackup for SAP

Table 2-1 shows the major installation steps needed to run NetBackup for SAP. Each step contains one or more links to pertinent procedures and concepts.

Table 2-1	Installation steps for NetBackup for SAP	
Step	**Action**	**Description**
Step 1	Verify the installation prerequisites.	See "Verifying the operating system and platform compatibility for NetBackup for SAP" on page 26.
		See "NetBackup server and client requirements for NetBackup for SAP" on page 26.
		See "SAP server software requirements for NetBackup for SAP" on page 27.
Step 2	Add the license key for NetBackup for SAP.	See "Adding license keys for NetBackup for SAP backups" on page 28.

Verifying the operating system and platform compatibility for NetBackup for SAP

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 Symantec Support Web page:

http://www.symantec.com/business/support/index.jsp

2 Click on the link for **NetBackup Enterprise Server**.

3 In the list of documents, click on the following document:

NetBackup Database Agent Compatibility List

4 For information on supported cluster environments for NetBackup for SAP, see the following document:

NetBackup Cluster Compatibility List

5 For information on support for Snapshot Client, see the following document:

NetBackup Snapshot Client Compatibility List

NetBackup server and client requirements for NetBackup for SAP

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 used
  - 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

  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.

SAP server software requirements for NetBackup for SAP

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.

Requirements for installing NetBackup for SAP in a NetBackup cluster

If you plan to use the database agent software on a NetBackup server configured in a NetBackup cluster, verify the following requirements:

- Your cluster environment is supported by NetBackup:
  See "Verifying the operating system and platform compatibility for NetBackup for SAP" on page 26.

- 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 SAP server software is installed and operational on each node to which NetBackup can failover.

- On each node where NetBackup server resides, add the license key for the database agent.

Configuration and licensing requirements for NetBackup for SAP with Snapshot Client

To use NetBackup for SAP with Snapshot Client, you must have a license for NetBackup Snapshot Client.

Adding license keys for NetBackup for SAP backups

To use NetBackup for SAP, add a valid license key for it on the master server. More information is available on how to add license keys.

See the *NetBackup Administrator's Guide, Volume I.*

In a NetBackup cluster, add the key on each node where the NetBackup server is installed.

To add a NetBackup for SAP license key in the NetBackup Administration Console

1 On the master server, open the NetBackup Administration Console.

2 Choose **Help > License Keys**.

3 Click the **New** icon.

4 Type the license key and click **Add**.

On UNIX and Linux, you can also add a license key by using the `get_license_key` command.

To add a NetBackup for SAP license key with the `get_license_key` command

1 From the master server server, run the following command:

   `/usr/openv/netbackup/bin/admincmd/get_license_key`

2 When the system prompts you, type the host name of the NetBackup master server.

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

Perform the following procedures that 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 that 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/openv/netbackup/bin/backint \
/usr/sap/CER/SYS/exe/run/backint
```

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

Perform the linking procedure 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.

Link the library with NetBackup in the following circumstances:

- If you licensed NetBackup for SAP for the first time.

To link the NetBackup for SAP binary file on AIX (64-bit) and 64-bit Oracle8i software

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

```
ln -s /usr/openv/netbackup/bin/libsapora.a64 \
$ORACLE_HOME/lib64/libobk.a
```

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

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

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

To link the NetBackup for SAP binary file on HP-Itanium and 64-bit Oracle8 or Oracle8i software

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

```
ln -s /usr/openv/netbackup/bin/libsapora.so \
$ORACLE_HOME/lib64/libobk.so
```

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

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

```
ln -s /usr/openv/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 Oracle8 or Oracle8i software

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

```
ln -s /usr/openv/netbackup/bin/libsapora.sl64 \
$ORACLE_HOME/lib64/libobk.sl
```

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

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

```
ln -s /usr/openv/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 Oracle8 or Oracle8i software

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

```
ln -s /usr/openv/netbackup/bin/libsapora.so
$ORACLE_HOME/lib64/libobk.so
```

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

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

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

To link the NetBackup for SAP binary file on Linux x86 (64-bit) and 64-bit Oracle8 or Oracle8i software

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

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

To link the NetBackup for SAP binary file on Linux x86 (64-bit) and 64-bit Oracle9i or later software

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

```
ln -s /usr/openv/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 Oracle8 or Oracle8i software

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

```
ln -s /usr/openv/netbackup/bin/libsapora.so64.1 \
$ORACLE_HOME/lib64/libobk.so
```

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

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

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

To link the NetBackup for SAP binary file on Solaris Opteron and 64-bit Oracle9i or later software

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

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

Configuring NetBackup for SAP

This chapter includes the following topics:

- About configuring NetBackup for SAP
- About user interface terminology
- About configuring a backup policy for an SAP database
- About the NetBackup for SAP backup scripts
- Configuring the log on account for the NetBackup Client Service for NetBackup for SAP on Windows
- 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 and Linux)
- Configuring the Maximum jobs per client
- Testing configuration settings for NetBackup for SAP
- Testing multiple drives and files for NetBackup for SAP

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.

See "Planning the installation of NetBackup for SAP" on page 25.

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 133.

Table 3-1   Steps to configure NetBackup for SAP

Step	Action	Description
Step 1	Configuring a backup policy.	See "About configuring a backup policy for an SAP database" on page 37.
Step 2	Create backup scripts.	See "About the NetBackup for SAP backup scripts" on page 46.
Step 3	(Windows) Configure the log on account for the NetBackup Client Service	See "Configuring the log on account for the NetBackup Client Service for NetBackup for SAP on Windows" on page 53.
Step 4	Edit SAP configuration files.	See "About SAP configuration files" on page 53.
Step 5	(UNIX or Linux) Configure backups of files mounted with LOFS.	See "Backing up files mounted with LOFS with NetBackup for SAP (UNIX or Linux)" on page 63.
Step 6	(UNIX and Linux) Configure the permissions for log files.	See "About permissions for NetBackup for SAP log files (UNIX and Linux)" on page 63.
Step 7	Configure the Maximum jobs per client.	See "Configuring the Maximum jobs per client" on page 64.
Step 8	Test the configuration settings.	See "Testing configuration settings for NetBackup for SAP" on page 65.
Step 9	Test multiple drives.	See "Testing multiple drives and files for NetBackup for SAP" on page 65.

About user interface terminology

You perform many configuration steps from the NetBackup Administration Console on the master server. The type of console available depends on your master server platform. NetBackup supports a Java interface for both Windows and UNIX master servers. In addition, NetBackup supports a Windows interface for Windows master servers.

The Java and Windows interfaces are nearly identical. If interface differences exist in the configuration procedures, the term "Windows" or "Java" appears in the procedure to differentiate between the two interfaces.

About configuring a backup policy for an SAP database

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.

Most requirements for database policies are the same as for file system backups. In addition to the policy attributes for this database agent, other attributes are available that you should consider.

See the *NetBackup Administrator's Guide, Volume I*.

To add and configure a policy, see the following topics:

- See "Adding a new NetBackup for SAP policy" on page 38.

- See "About policy attributes for NetBackup for SAP" on page 38.

- See "About adding schedules to a NetBackup for SAP policy" on page 39.

- See "Adding clients to a NetBackup for SAP policy" on page 43.

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   Do one of the following:

   ■   Windows: In the left pane, right-click **Policies** and choose **New Policy**.

   ■   Java interface: In the left pane, click **Policies**. In the **All Policies** pane, right-click the master server, and click **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 database agent policy type does not appear in the drop-down list unless your master server has a license key for the database agent.

8   Complete the entries on the **Attributes** tab.

   See "About policy attributes for NetBackup for SAP" on page 38.

9   Add other policy information as follows:

   ■   Add schedules.
       See "About adding schedules to a NetBackup for SAP policy" on page 39.

   ■   Add clients.
       See "Adding clients to a NetBackup for SAP policy" on page 43.

   ■   Add scripts to the backup selections list.
       See "About backup selections for an SAP client" on page 44.

10   When you have added all the schedules, clients, and backup selections you need, click **OK**.

About policy attributes for NetBackup for SAP

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

For more information on policy attributes, see the *NetBackup Administrator's Guide, Volume I*.

Table 3-2   Policy attribute descriptions for NetBackup for SAP policies

Attribute	Description
Policy type	Determines the types of clients that can be in the policy. In some cases the policy type determines the types of backups that NetBackup can perform on those clients. To use the SAP database agent, you must define at least one policy of type that is SAP.
Follow NFS	This option is available for SAP policies on UNIX or Linux. Select this attribute to back up files from NFS mounted file systems. If this option is not selected, NetBackup cannot perform a backup of NFS mounted files. See "Backing up files mounted with LOFS with NetBackup for SAP (UNIX or Linux)" on page 63. Also see the *NetBackup Administrator's Guide for UNIX*. **Note:** This option is not available for snapshot backups.
Keyword phrase	For NetBackup for SAP, the **Keyword phrase** entry is ignored.
Perform snapshot backups	This option enables backups with Snapshot Client.

About adding schedules to a NetBackup for SAP policy

Each policy has its own set of schedules. These schedules initiate automatic backups and specify when a user can initiate operations. A database backup has these types of schedules: application backup and automatic backup.

About the NetBackup for SAP backup types

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

Table 3-3   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 by an automatic schedule on the master server. NetBackup uses the Application Backup schedule when the user starts a backup manually. Configure at least one Application Backup schedule for each database policy. The Default-Application-Backup schedule is configured automatically as an Application Backup schedule.

Table 3-3 SAP backup types *(continued)*

Backup type	Description
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.
Automatic Incremental Backup	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.
	NetBackup for SAP supports this type of backup in MaxDB environments and in Oracle environments with RMAN.

Configuring a NetBackup for SAP 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 unscheduled jobs can occur. This window is necessary because the application backup schedule starts the processes that are required for all database backups, including those started automatically. 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.

    See "About NetBackup for SAP schedule properties" on page 42.

Example application backup schedule for NetBackup for SAP

Note: Specify the application backup schedule name in the init*SID*.utl file on the client.

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.

Table 3-4   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 NetBackup for SAP 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 "About the NetBackup for SAP backup types" on page 39.

5 Specify the other properties for the schedule.

   See "About NetBackup for SAP schedule properties" on page 42.

6 Click **OK**.

Example automatic backup schedule for NetBackup for SAP

Table 3-5 shows example settings for an automatic backup schedule.

Table 3-5   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 NetBackup for SAP 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 3-6   Description of schedule properties

Property	Description
Type of backup	Specifies the type of backup that this schedule controls. The selection list shows only the backup types that apply to the policy you want to configure. See "About the NetBackup for SAP backup types" on page 39.
Schedule type	You can schedule a backup in one of the following ways: ■ **Frequency** This setting is used only for scheduled backups. It is not used for user-directed backups. **Frequency** specifies the period of time that can elapse until the next backup or archive operation begins on this schedule. For example, assume that the frequency is seven 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** This setting is used only for scheduled backups. It is not used for user-directed backups. The **Calendar** option allows you to schedule backup operations that are based on specific dates, recurring week days, or recurring days of the month.

Table 3-6	Description of schedule properties *(continued)*

Property	Description
Retention	The retention period for an application backup schedule refers to the length of time that NetBackup keeps backup images (stream-based backups). The retention period for an automatic schedule controls how long NetBackup keeps records of when scheduled backups occurred (proxy backups). For example, if your database is backed up once every Sunday morning, you should select a retention period of at least 2 weeks. The retention period is affected by the type of schedule you select, as follows: ■ Frequency-based scheduling Set a retention period that is longer than the frequency setting for the schedule. For example, if the frequency setting is set to one week, set the retention period to be more than one week. The NetBackup scheduler compares the latest record of the automatic backup schedule to the frequency of that automatic backup schedule to determine whether a backup is due. This means that if you set the retention period to expire the record too early, the scheduled backup frequency is unpredictable. However, if you set the retention period to be longer than necessary, the NetBackup catalog accumulates unnecessary records. ■ Calendar-based scheduling The retention period setting is not significant for calendar-based scheduling.
Multiple copies	If you want to specify multiple copies of a backup for the policy, configure **Multiple copies** on the application backup schedule.

Adding clients to a NetBackup for SAP policy

The client list contains a list of the clients on which your scripts are run during an automatic backup. 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 software installed:

■ SAP

■ NetBackup client or server

■ The backup or restore script(s)

To add clients to a NetBackup for SAP policy

1   In the **Policy** dialog box, click the **Clients** tab.

   To access the **Policy** dialog box, double-click the policy name in the **Policies** list in the NetBackup Administration Console.

2   Click **New**.

3   Type the name of the client and press **Enter** (Windows) or click **Add** (Java).

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

4   (Windows) To add another client, repeat step 2 and step 3.

5   (Java) To add another client, repeat step 3.

6   If this client is the last client you want to add, click **OK**.

7   (Java) In the **Policy** dialog box, click **Close**.

About backup selections for an SAP client

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.

About NetBackup for SAP scripts rules

Observe the following when you use scripts:

- Make sure the scripts reside on each client in the client list. Scripts can reside in any location. Make sure that NetBackup can access the location you choose and that NetBackup can run the scripts.

- NetBackup installs sample scripts when you install the software; you can modify these scripts for your own use. Write the scripts to a location outside of the original installation location. This ensures that future NetBackup installations do not overwrite your site's scripts.

- If you use NetBackup for SAP in a NetBackup server cluster, make sure that the scripts reside in a location that is available after a failover.

Add scripts to the backup selections list only if you want to set up a policy for automatic backups. These scripts are run for manual backups and for automatic backup schedules as specified under the Schedules tab. NetBackup runs the scripts in the order that the scripts appear in the backup selections list.

See "About the NetBackup for SAP backup scripts" on page 46.

Adding NetBackup for SAP scripts to the backup selections list

The following procedures describe how to add scripts to the backup selections list by with the Java interface and the Windows interface. Review the information on backup scripts if necessary.

See "About the NetBackup for SAP backup scripts" on page 46.

Note: Be sure to specify the correct script names in the backup selections list to prevent an error or possibly a wrong operation. Make sure that the script resides on the client before you try to add it to the backup selections list.

To add NetBackup for SAP scripts to the backup selections list from the Java interface

1   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.

2   Click the **Backup Selections** tab.

3   Click **New**.

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

    For example:

```
/usr/openv/netbackup/ext/db_ext/sap/scripts/sap_oracle/sap_offline_backup
```

```
C:\Program Files\VERITAS\NetBackup\DbExt\SAP\samples\sap_offlne_backup.cmd
```

5   Click **Add** to add the script to the list.

6   Click **OK**.

To add NetBackup for SAP scripts to the backup selections list from the Windows interface

1   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.

2   Click **New**.

3   Specify the names of the scripts you want NetBackup to use.

    Use one of the following methods:

    ■ Type the full path name of the script on the client. For example:

```
/usr/openv/netbackup/ext/db_ext/sap/scripts/sap_oracle/sap_offline_backup
```

```
C:\Program Files\VERITAS\NetBackup\DbExt\SAP\samples\sap_offlne_backup.cmd
```

    ■ Click the **Remote Folder** button.

4 Navigate to and select the script file, then click **OK**.

5 Click **OK**.

About the 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:

```
C:\Program Files\Veritas\NetBackup\DbExt\SAP\samples
```

UNIX or Linux:

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

shows the sample scripts.

Table 3-7 NetBackup for SAP scripts

Script name	Used by (underlying database)	Comments
sap_offline_backup sap_offline_backup.cmd	Oracle without RMAN	Issues a `brbackup` command and performs a full offline database backup. Use the `export` command to make `%SAP_SERVER%` and `%SAP_POLICY%` (UNIX or Linux) or `$SAP_SERVER` and `$SAP_POLICY` (Windows). `bphdb` creates these variables in root, available to the NetBackup for SAP `backint` interface process.
sap_online_backup.cmd sap_online_backup	Oracle without RMAN	Issues the `brbackup` and `brarchive` commands and performs a full online database backup.
sap_redo_log_backup sap_redo_log_backup.cmd	Oracle without RMAN	Issues the `brarchive` command and backs up the offline redo log files.

Table 3-7   NetBackup for SAP scripts *(continued)*

Script name	Used by (underlying database)	Comments
sap_rman_backup sap_rman_backup.cmd	Oracle with RMAN	Issues the `brbackup` command with the RMAN option.
sap_maxdb_backup sap_maxdb_backup.cmd	MaxDB	Issues a `dbmcli` command and uses the specified backup medium.

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.

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

Windows:

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

The SAP scripts can reside anywhere 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. In a NetBackup server cluster, this location must be available after a failover.

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 48.

See "Example NetBackup for SAP backup script (UNIX)" on page 50.

4 Test the scripts you created.

See "Testing configuration settings for NetBackup for SAP" on page 65.

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 succcessful 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, init*SID*.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 3-8 describes the environment variables that are created locally when NetBackup's automatic scheduler runs an SAP script.

Table 3-8   Environment variables

Environment variable	Purpose
$SAP_POLICY %SAP_POLICY%	Names the NetBackup for SAP policy.
$SAP_SCHEDULED %SAP_SCHEDULED%	Set to 1 if this operation is an automatic backup (scheduled SAP).
$SAP_SERVER %SAP_SERVER%	Names the NetBackup server.
$SAP_USER_INITIATED %SAP_USER_INITIATED%	Set to 1 if this operation is a user-initiated backup. That is, if the SAP backup is started from the master server.

When an SAP script starts from the Java interface, it creates all of the preceding variables except for the %SAP_POLICY% ($SAP_POLICY) variable.

Configuring the log on account for the NetBackup Client Service for NetBackup for SAP on Windows

Because the NetBackup Client Service is started by default under the SYSTEM account, you also must give special attention to database user authentication. The SYSTEM account does not have permission to connect to the target database if you use OS authentication instead of passwords.

If you use OS authentication, run the NetBackup client service under an account that has SYSDBA privileges.

Note: In a cluster environment, perform the steps on each database node in the cluster. For an off-host backup, perform the steps on the alternate client.

To configure the log on account for the NetBackup Client Service

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 account name with SYSDBA privileges.

5   Type the password.

6   Click **OK**.

7   Stop and start the NetBackup Client Service.

8   Close the Services control panel application.

About SAP configuration files

Table 3-9 shows the files you need to modify depending upon whether your underlying database is an Oracle database or a MaxDB database.

Table 3-9   SAP configuration files

File	Underlying database	Comments
init*SID*.utl	Oracle and MaxDB	SAP parameter file. This file specifies policy, schedule, client, and other information to the backint interface.

Table 3-9   SAP configuration files *(continued)*

File	Underlying database	Comments
init*SID*.sap	Oracle	SAP profile file. This file contains information that the SAP tools use to interact with the `backint` interface.
bsi.env	MaxDB	MaxDB configuration file. This file contains information that the SAP tools use to interact with the `backint` interface.

Relationships between SAP database configuration files

The SAP tools and NetBackup for SAP 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 init*SID*.utl file name as the argument to the `util_par_file` parameter in the init*SID*.sap file.

- In NetBackup for SAP on MaxDB databases, you specify the actual init*SID*.utl file name as the argument to the `PARAMETERFILE` parameter in the bsi.env file.

- The init*SID*.utl file name becomes the argument to the `backint` command's `-p par_file` parameter.

Modifying the initSID.utl file for NetBackup for SAP

The init*SID*.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/dbs`

    Unix or Linux:

    `%ORACLE_HOME%\database`

    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/openv/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 `init`*SID*`.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 `init`*SID*`.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 init*SID*.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/openv/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 init*SID*.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 to the value `SAP`.

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=$ORACLE_HOME/dbs/initCER.utl)"
```

Windows:

```
rman_parms = "ENV=(NB_ORA_SAP=%ORACLE_HOME%\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_SCHEDULE`, `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_SCHEDULE` 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 init*SID*.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 init*SID*.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 3-10 shows the parameters you can include in the bsi.env file.

Table 3-10   bsi.env file parameters

Parameter	Description
BACKINT *absolute_path*/*file_name* BACKINT *absolute_path**file_name*	Specifies the absolute path and file name of the backint for MaxDB program.
INPUT *absolute_path*/*file_name* INPUT *absolute_path**file_name* OUTPUT *absolute_path*/*file_name* OUTPUT *absolute_path**file_name* ERROROUTPUT *absolute_path*/*file_name* ERROROUTPUT *absolute_path**file_name*	The INPUT parameter specifies the absolute path and file name of the standard input file. The OUTPUT parameter specifies the absolute path and file name of the standard output file. The ERROROUTPUT file specifies the absolute path and file name of the standard error output file. The database manager creates these files temporarily and uses them for standard input, output, and error output for backint for MaxDB.
PARAMETERFILE *absolute_path*/*file_name* PARAMETERFILE *absolute_path**file_name*	Specifies the absolute path and file name of the configuration file for the backint for MaxDB program, init*SAP*.utl.
TIMEOUT_SUCCESS *seconds*	The number of seconds after which the backup tool exits and after the database kernel has copied all data successfully. Default is 300. 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.
TIMEOUT_FAILURE *seconds*	This parameter is effective only if the database kernel has stopped the backup due to an error. In such a case, *seconds* specifies the number of seconds after which the backup tool exits. Default is 300. 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 stopped by the database kernel blocks other backups, such as automatic nightly backups, from being started.

| Table 3-10 | bsi.env file parameters *(continued)* |

Parameter	Description
ORIGINAL_RUNDIRECTORY *absolute_path*	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 .
	Specify this parameter only for a migration. The prerequisite for the migration from one computer to another is that the version of backint for MaxDB that you use can make backups from the source computer available on the target computer.

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 C:\Program Files\VERITAS\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 pathnames. 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 global zone file system and mounted with LOFS in a Solaris Zone

About permissions for NetBackup for SAP log files (UNIX and Linux)

NetBackup uses the `/usr/openv/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.

Backup and restore operations fail when permissions are too restrictive. We recommend that you make all of the usr/openv/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 if the following is true: Processes that run as members of that group or as that user initiate all backup and restore operations that are related to that directory.

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

If you restrict permissions on the other directories that are located in `/usr/openv/netbackup/logs`, backup and restore operations are not affected. However, troubleshooting efforts may be hindered when processes do not have the appropriate permissions to update the debug logs therein.

Configuring the Maximum jobs per client

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   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.

You can use the following formula to calculate a smaller value for the Maximum jobs per client setting:

Maximum jobs per client = *number_of_drives* X *number_of_policies*

Refer to the following definitions:

number_of_drives	The number of concurrent `brbackup` jobs. The `drives` parameter in the `init`*SID*`.utl` file defines these jobs.
number_of_policies	The number of policies of any type that can back up this client at the same time. This number can be greater than one. For example, a client can be in two policies to back up two different databases. These backup windows can overlap.

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.

Testing configuration settings for NetBackup for SAP

After you configure the master server for NetBackup for SAP, test the configuration settings. Perform a manual backup (or backups) with the automatic backup schedules you created. A description of status codes and other troubleshooting information is available.

See the *NetBackup Status Codes Reference Guide*.

See the *NetBackup Troubleshooting Guide*.

To test the configuration settings

1   Log onto the master server as administrator (Windows) or root (UNIX).

2   Start the NetBackup Administration Console.

3   In the left pane, click **Policies**.

4   Click the policy you want to test.

5   Select **Actions > Manual Backup**.

   The **Schedules** pane contains the name of an automatic schedule (or schedules) configured for the policy that you want to test. The **Clients** pane contains the name of the client(s) listed in the policy that you want to test.

6   Follow the directions in the **Manual Backup** dialog box.

7   To check the status of the backup, click **Activity Monitor** in the NetBackup Administration Console.

   The Activity Monitor and the script output indicate the status of the backup operation.

   For more information, see the *Troubleshooting* chapter.

Testing multiple drives and files for NetBackup for SAP

To test multiple drives, you must have the following in your environment:

■   More than one tablespace to back up

■   Multiple storage units to write to at the same time

You can also use the multiplex value to simulate multiple tape and disk drives.

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 of storage units. For example, the multiplex value multiplied by the number of tape drives = `drives`.

```
drives 2
```

See "About parameters used in initSID.utl" on page 166.

When you perform a backup, you should see two or more backups running. This number depends upon how many drives you have identified in the following parameter file:

Windows:

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

UNIX or Linux:

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

The number of drives in the utility file should match the number of drives multiplied by the multiplex value. The NetBackup for SAP `backint` interface waits for all backups to complete before it reports success or failure to `brbackup`.

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 "Testing configuration settings for NetBackup for SAP" on page 65.
- 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.

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 133.

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 also maintain a log of the backup session.

The standard NetBackup logs keep track of the images created. The NetBackup for SAP `backint` interface only needs to keep track of the BID date and time. 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 35.

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. You can change the `backup_mode` by changing the `initSAP.sap` parameter file or by specifying `-t online` on the `brbackup` command. Here is what these changes look like in `initSAP.sap`:

```
backup_type = online_file
```

This backup mode allows `sapdba` or `brbackup` to use a semaphore file with the NetBackup for SAP `backint` interface. This mode 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`. You can change the `backup_mode` to online to test this 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 35.

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 offline -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. You can use the NetBackup multiple copies feature or `brarchive` command to create the backup copies. You can store each copy on separate media and retrieve them. Depending on how you use NetBackup for SAP, create archive log backups copies with the method that is easiest for you.

Using the NetBackup multiple copies feature to create an SAP archive

If the option for multiple copies is enabled in a backup schedule, NetBackup automatically makes up to four copies of a backup. The `brarchive` command uses this information and creates the specified number of backup copies of the archive log file. For more information on the multiple copies feature, see the *NetBackup Administration Guide, Volume 1*.

The following examples show how NetBackup uses multiple copies to create an SAP archive.

Example 1   When multiple copies are enabled, the following command creates the number of backup copies that are specified and writes each copy to a different tape:

```
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 two brarchive commands in sequence to create an SAP archive

You can also create a backup copy of the archive log by issuing two `brarchive` commands in sequence. You can write each backup copy to different media. For example, you can write each backup copy to two different tapes, to disk and tape, or to any combination of media.

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.

The following example shows how two `brarchive` commands are used in sequence to create 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 command:

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

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

```
brarchive -d util_file -sc
```

To restore the archived log files   To restore the first backup copy, issue the following command:

```
brrestore -a 77
```

To restore 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 tablespace 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
    ```

If you are using NetBackup for SAP on a MaxDB database, you must use a different configuration.

See "Using NetBackup for SAP on a MaxDB database to perform backups and restores" on page 135.

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*.

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.

- Allow restores from any client.
  Continue with step 3.

- Allow restores from only selected clients.
  Continue with step 5.

3   To remove restrictions for all clients, create the following file on the NetBackup master server:

Windows:

```
C:\Program Files\NetBackup\db\altnames\No.Restrictions
```

UNIX or Linux:

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

4   Continue with step 6.

5 To restrict clients to restore only from certain other clients, create the
   following file:

   Windows:

   `C:\Program Files\NetBackup\db\altnames\`*`client_name`*

   UNIX or Linux:

   `/usr/openv/netbackup/db/altnames/`*`client_name`*

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

6 If you performed step 5, 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 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:

      `init`*`SID`*`.sap`
      `init`*`SID`*`.utl`
      `init`*`SID`*`.ora`
      `init`*`SID`*`.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:

      `init`*`SID`*`.sap`
      `init`*`SID`*`.utl`

```
initSID.ora
initSID.dba
```

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

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 (Conditional, UNIX or Linux) Set the `restore_filter` parameter in the `initSID.utl` file on the destination client.

Perform this step only if you want to restore the images that were created with a NetBackup for SAP version before 6.0.

For example, consider if the source client path is set to `/home_db/oracle/sap` and the input file contains the path `/oracle/SAP`. Then the value of `restore_filter` is a script such as 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
```

4 (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 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 sytem 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 init*DBSID*.sap file is not present, BRRECOVER calls BACKINT without the "-p init<DBSID>.utl" 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. You might have already missed the current backup window, so the backup can happen only in the next backup window. In this situation, you can use the checkpoint restart capability.

NetBackup for SAP enables you to restart backups and restores from the point of failure. By default, NetBackup for SAP takes checkpoints every 15 minutes during a backup. You can specify that these checkpoints occur at a different interval on the backup policy's attributes tab. For a failed job, the agent retains partial image and catalog entries in the NetBackup catalog for the files that have been already backed up.

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

Note: NetBackup for SAP uses `backint` to restart failed backups and restores of Oracle databases.

NetBackup for SAP does not support the use of RMAN to restart failed backups and restores of Oracle databases. Nor can it restart failed backups or restores of any databases that are based on MaxDB.

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 checkpointing 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 logfile, 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 checkpointing (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 retuned #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
**********************************************************************
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 checkpointing (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` retuned #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':

**********************************************************************

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
**********************************************************************
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\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 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
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\dbs\initSUD.utl

-c':
**********************************************************************

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
**********************************************************************

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:

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

```
#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: 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 '/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: 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
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.

NetBackup for SAP with Snapshot Client

This chapter includes the following topics:

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. 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. Symantec recommends that customers perform online backups at least daily and offline backups once a week. 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.

Table 5-1 describes the Snapshot Client features.

Table 5-1   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	A snapshot backup occurs when NetBackup creates a point-in-time disk image of the database and copies that image to disk. When it 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 version to a storage unit.
	This process is nearly instantaneous; so user access to the database is not interrupted during the backup. Client operations and user access continue without interruption during the backup. The resulting capture or snapshot can be backed up without affecting the performance or availability of the database. You can perform snapshot backup by using `backint` or by using RMAN proxy copy.

Table 5-1   NetBackup for SAP with Snapshot Client features *(continued)*

Snapshot Client feature	Description
Instant recovery backups	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. Optionally, you can specify that the image be retained on disk and backed up to storage. Instant recovery makes it possible to perform file promotion and rollback. Additionally for UNIX and Linux, instant recovery makes it possible to perform block-level restores.
Off-host backups	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 `backint` or by using RMAN proxy.
Block-level incremental backup and recovery	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.
RMAN proxy copy	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. 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 and when to move the data.

Table 5-1   NetBackup for SAP with Snapshot Client features *(continued)*

Snapshot Client feature	Description
RMAN stream-based backups	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.
	NetBackup for SAP captures the data stream content that RMAN provides.
	If the user specifies multiple streams, the following occurs:
	■ RMAN opens multiple streams ■ NetBackup catalogs the multiple streams as separate images
RMAN proxy and RMAN stream-based backups intermixed	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.
	RMAN stream-based backups can be used to perform on-host incremental backups. In this way you can perform daily backups.
	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.

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

Symantec 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. A backup of large databases from the production host and over the network can lead to instability and further performance loss.

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 5-1   SAP split mirror backup scenario
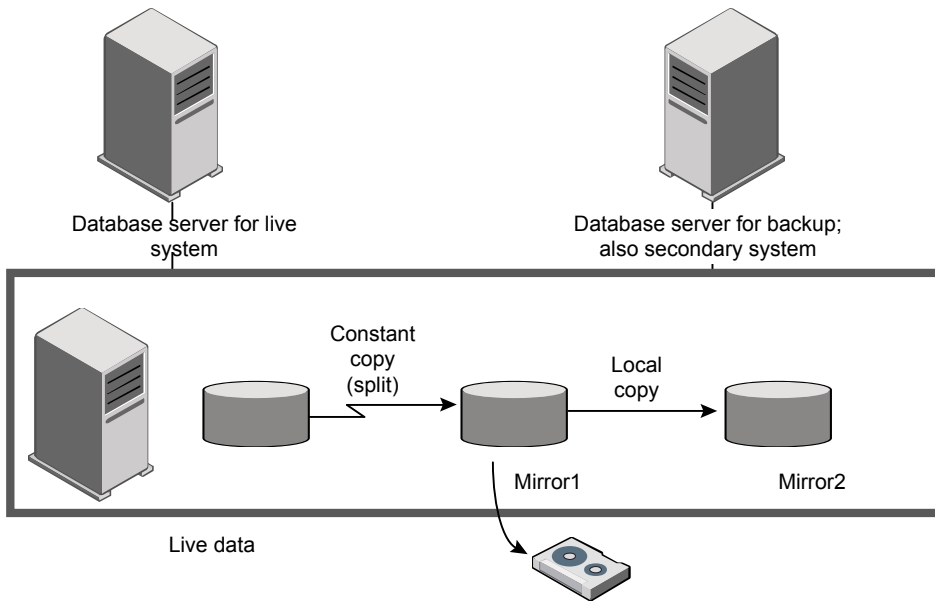
In SAP environments, the Snapshot Client technology supports the following major backup strategies:

■ 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 and significantly reduce CPU and network overhead during backups.

- 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

NetBackup initiates a database backup when a user requests a backup or when a schedule indicates that it is time to run a backup. A shell script in the backup selections list of a NetBackup for SAP policy contains the backup commands. These are the commands that the brtools need to use to perform the 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 that are supported by advanced backup methods" on page 106.

NetBackup for SAP verifies that the policy it selected for the backup is configured with the appropriate Snapshot Client attributes. NetBackup for SAP then initiates file-based backups of the Oracle files, either through backint or RMAN proxy. NetBackup determines whether to use backint or RMAN when it reads the file that is specified as an argument to the -d parameter on the brbackup command. The NetBackup Snapshot Client interface 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 only for the period of time necessary to capture a snapshot of the data.

How NetBackup for SAP performs a split mirror backup using backint

Figure 5-2 shows the sequence of operations when you use backint to perform a backup.

Figure 5-2   SAP Oracle online and offline backups using `brbackup` and `backint`
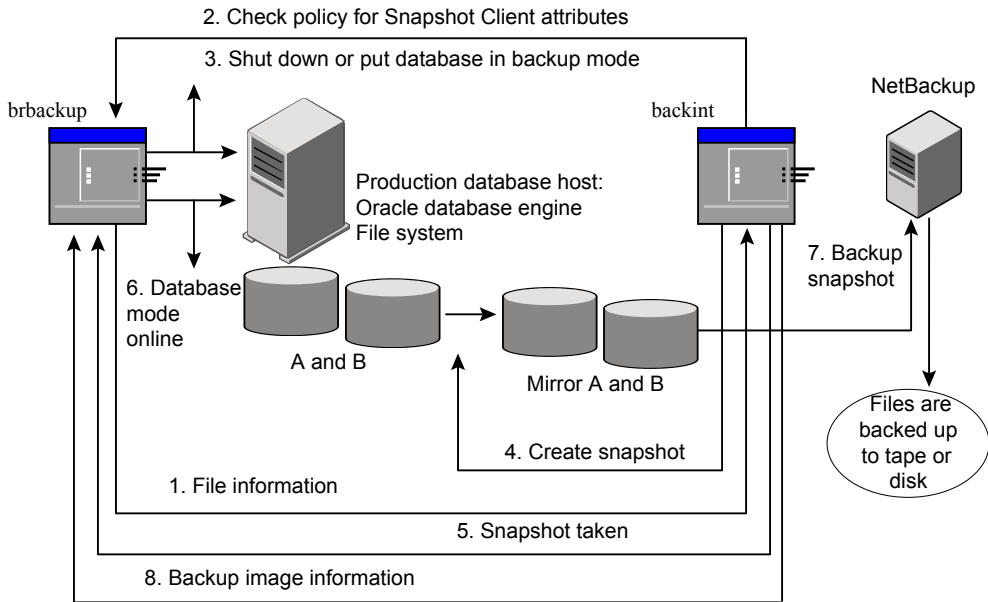
When NetBackup for SAP performs a backup by using backint, the following occurs:

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 "NetBackup for SAP brbackup command parameters" on page 105.

See "How the NetBackup for SAP Snapshot Client works" on page 102.

How NetBackup for SAP performs a split mirror backup using RMAN

Figure 5-3 shows sequence of operations when you use RMAN proxy to perform a backup.

Figure 5-3   SAP Oracle online and offline backups using RMAN proxy
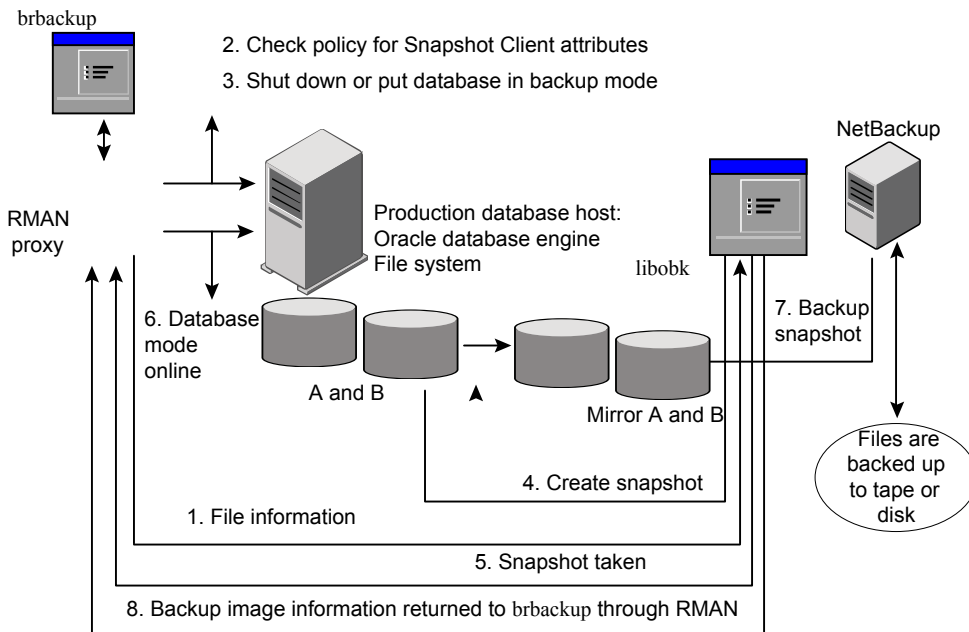
When NetBackup for SAP performs a backup by using RMAN, the following occurs:

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. 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.

NetBackup for SAP brbackup command parameters

NetBackup for SAP does not perform snapshot backups if the following parameters
are specified on the brbackup command line:

    -d util_file -t offline/online

When you specify these parameters, brbackup either shuts down the database or
brbackup 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.

There is no value to doing snapshot-based backups in this scenario. The snapshot
technology adds no value because the database is either offline or in backup mode

for several hours. If you initiate backups with these parameters in effect, NetBackup for SAP performs only standard backups directly to the secondary device. 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 need to export the `SAP_RESTORE` environment variable.

SAP database objects that are supported by advanced backup methods

The `brbackup` command and Oracle RMAN control the kinds of database objects that proxy copy can back up. They also control what NetBackup can back up using Snapshot Client backup methods. Oracle allows proxy copy backups of databases, table spaces, 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. However, if you selected **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 agent 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 Symantec Support Web site 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 policies to perform file-based and stream-based backups. This configuration ensures that the entire database can be restored successfully.

- On UNIX or Linux, the user identification and group identification numbers (UIDs and GIDs) associated with the files to be backed up 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.

  Note: The UID number can be different than the GID number.

- Allocate up to three different volumes or file systems for database activities, as follows:
  - Allocate one or more volumes or file systems to the database data files.
  - Allocate a different set of volumes or file systems to the Oracle executables, configuration files, and the archive redo logs.

  One reason to have two different volumes is to separate the data files from the other files. If the logs are configured on the same volumes (or file systems)

as the data files, the logs are temporarily frozen while NetBackup takes the snapshot. The process cannot access the logs when the database is active, so the database activity may freeze until the logs become accessible again. Another reason for writing the data files to their own repository is because it is required for an instant recovery point-in-time rollback. Only data files can exist on the volume or the file system that you want to restore.

- 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 license key for this option must be registered.

- To perform off-host backups, perform any special configuration that is required.

- To perform Snapshot Client backups or restores through RMAN proxy, 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 policies to perform file-based and 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 and Linux, 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 file-based snapshot and off-host backups of the datafiles 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.
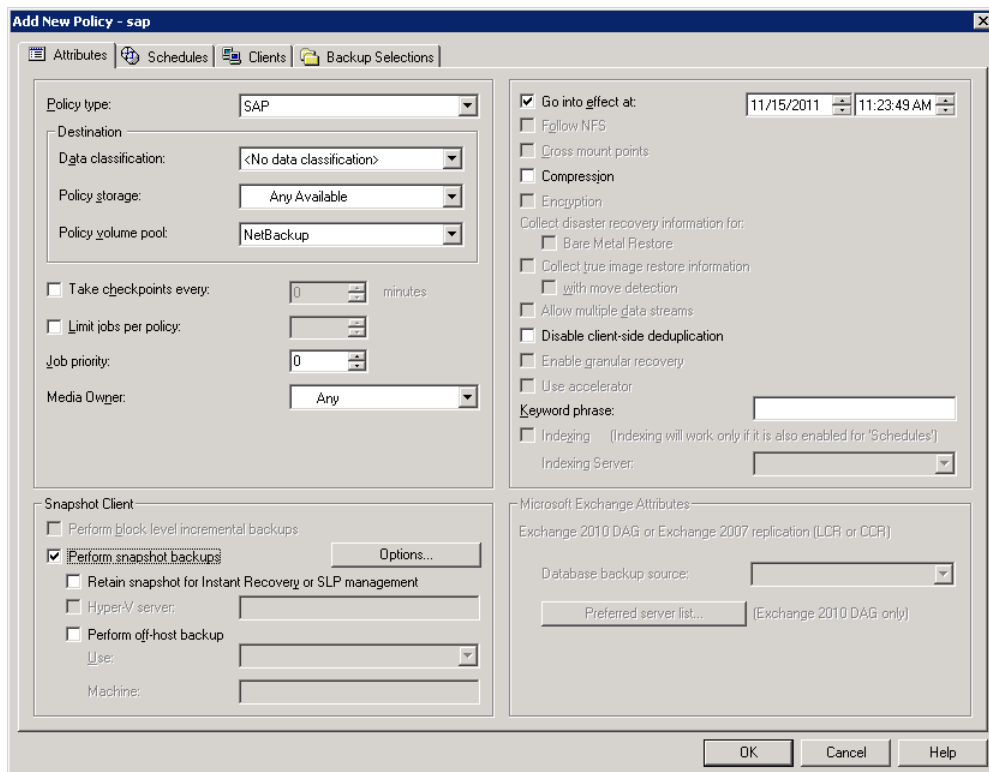
Configuring a snapshot policy for NetBackup for SAP

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 115.

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 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 Symantec Support Web site 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 111.

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 125.

16 Configure other attributes and add any additional schedules and backup selections.

About NetBackup for SAP NAS snapshot policies with optional SnapVault capabilities on UNIX and Linux

To use NAS snapshot with NetBackup for SAP, the SAP database must be installed and configured to work in a NAS environment.

NetBackup does not support multistreamed backups for a NetBackup for SAP snapshot policy that uses NAS.

If you want to use a SnapVault storage unit, make sure the storage unit is configured before you start to configure the NAS snapshot policy.

For more information about NAS snapshot and SnapVault, see the *NetBackup Snapshot Client Administrator's Guide.*
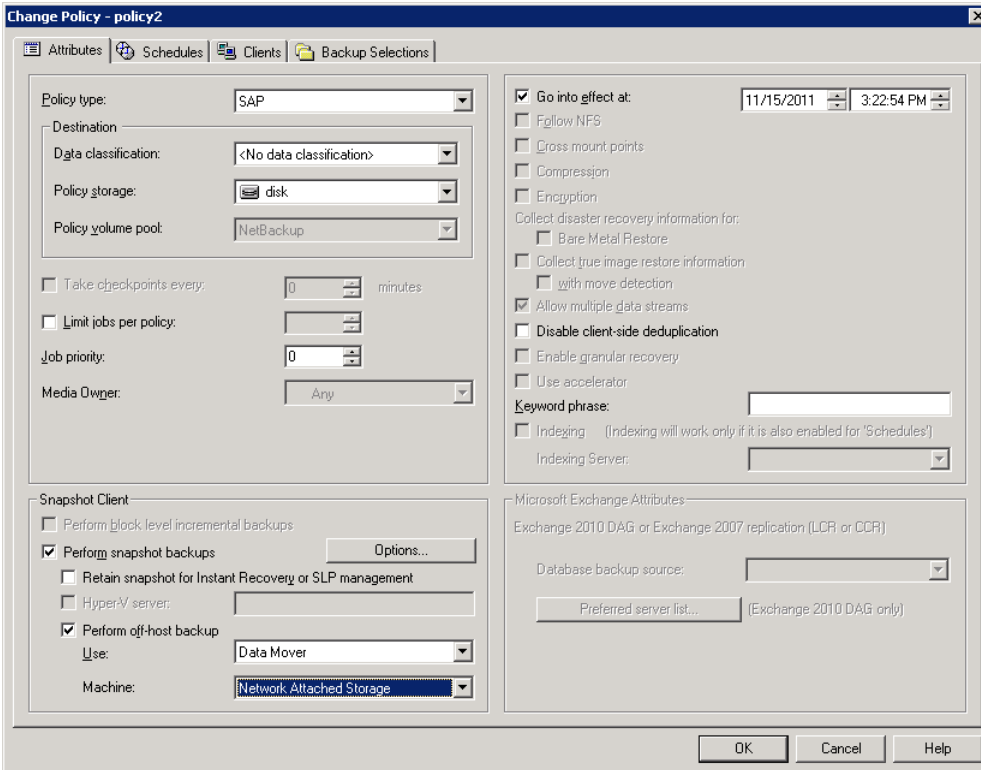
Configuring a NAS snapshot policy for NetBackup for SAP on UNIX/Linux

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.

- If you do not want to use a SnapVault storage unit, from the **Policy storage** list, select an appropriate non-SnapVault storage unit. Although the policy cannot run without a specified storage unit, NetBackup does not use the storage unit for NAS snapshot backups. 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.

- If you want to use a SnapVault storage unit, make sure that you have defined a disk storage unit. Select the disk storage unit you have configured for SnapVault in the **Policy storage** list.

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.
    If you use SnapVault, the level you specify in the **Retention** field determines the retention period for the SnapVault copies on the SnapVault secondary.

■ The Application Backup schedule is for the archived redo logs and the control files.
    If you use SnapVault, override the policy storage unit and specify a storage unit that is appropriate for the control files and archive logs.

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 125.

14 Configure other attributes and add any additional schedules and backup selections.

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 72.

Use this procedure for the files that were backed up with, or without, instant recovery enabled. In all cases, NetBackup 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 and Linux: NAS_Snapshot

- UNIX and Linux: 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 made

  If verification fails, the rollback aborts with 249.

- Use snapshot rollback with database files only. Control files and archive redo logs should exist on different file systems or volumes.

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 shows 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 109.

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 115.

2   Open the policy you want to configure.

3   Click on the **Attributes** tab.

4 Select the SAP policy type.
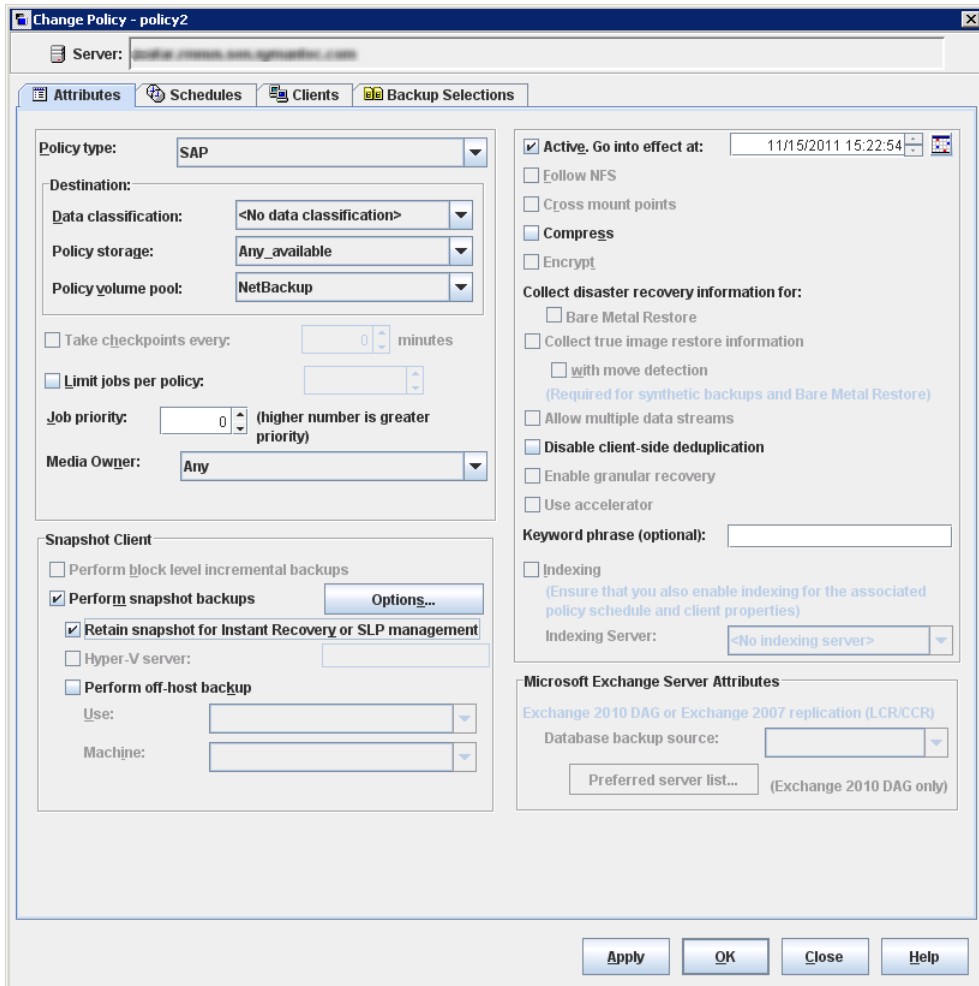
5 Select a policy storage unit from the **Policy storage** list.

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 Symantec Support Web site 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   Select **Retain snapshots for Instant Recovery or SLP management**.

When this option is selected, NetBackup retains the snapshot backup image on disk for later use in recovery.

9   (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.

10 (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 111.

11 Click the **Schedules** tab.

12 Click **New**.

13 Configure an Automatic schedule for the database files.

These files are backed up in `brbackup` phase 1.

14 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.

15 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.

16 On the **Clients** tab, specify the clients to be included in this policy.

17 On the **Backup Selections** tab, specify a backup script.

See "About NetBackup for SAP backup types " on page 125.

18 Configure other attributes and add any additional schedules and backup selections.

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 backups performed with `backint`, set the following environment variable in the script or on the command line:

  `SAP_RESTORE=rollback`

- For backups performed with RMAN, add the following entry in `init`*SID*`.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 directories `sapdata1` and `sapdata2` 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. This is a problem when using the instant recovery with rollback method. 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`.

Performing a NetBackup for SAP point-in-time rollback restore from a SnapVault backup (UNIX and Linux)

When you select a point-in-time rollback restore from a SnapVault backup, NetBackup restores the entire subvolume (qtree) to a new subvolume (qtree) on the primary host. The restore does not overwrite the existing subvolume. File verification is not performed.

The format of the new subvolume name is as follows:

*mountpointname*_restore.*timestamp*

For example: `subvol1_restore.2005.05.19.10h49m04s`

To perform a NetBackup for SAP point-in-time rollback restore from a SnapVault backup (UNIX and Linux)

1   Unmount the original subvolume, which is the subvolume that the restore process did not overwrite.

2   Rename the original subvolume.

3   Rename the new subvolume with the name of the original.

4   Mount the new subvolume on the client. Use the `ALTER DATABASE RENAME DATAFILE` command to point to the restored data file on the newly created subvolume.

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 configuring NetBackup for SAP block-level incremental backups on UNIX and Linux

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 changed data blocks.

A database BLI backup is done at the file system block level, which means only changed blocks are backed up. Changed files are not backed up. VxFS Storage Checkpoint facility identifies changed blocks in real time. BLI backup does not need to search the entire database for the modified blocks. 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 data blocks need to be backed up.

How BLI works with NetBackup for SAP (UNIX and Linux)

BLI backup supports two types incremental backups: differential and cumulative. Full, differential incremental, and cumulative incremental backups are specified

as part of the backup schedule. When performing a restore, 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 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 all subsequent cumulative incremental backups back up all the blocks in the restored file. After restoring an entire database, 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, but 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 the entire database file, not just data blocks changed since the last full or incremental backup.

- Cumulative BLI Backup.
  This is a backup of all the data blocks of database files that changed 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, but a cumulative BLI backup can reduce the number of incremental backup images that must be applied to a restore operation. This speeds up the restore process.

- Differential BLI backup.
  This is a backup in which NetBackup performs a backup of only those data blocks of database files that changed since the last backup of any type (full, cumulative incremental, or differential incremental backup) was performed.

When NetBackup initiates full database backups, followed by BLI backups, it creates, manages, and uses the appropriate Storage Checkpoints of the Oracle data file file systems.

About Nodata Storage Checkpoint and NetBackup for SAP

The Nodata Storage Checkpoint sets a bit to indicate that a 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 required depends on the database workload while the backup is running. For Nodata Storage Checkpoints, the additional space required by each file system is about 1% of the file system size.

The default option that NetBackup uses for backups is to use Fulldata Storage Checkpoint. With this option, the NetBackup for SAP agent keeps the Oracle data files in backup mode only for the time needed to create a Storage Checkpoint.

About Fulldata Storage Checkpoint and NetBackup for SAP

The Fulldata Storage Checkpoint makes a copy of the original data block it makes a change. When you use Fulldata Storage Checkpoints, the tablespaces and data files are in backup mode for only a few seconds while the Storage Checkpoint is created, so the extra archived redo log space used is very small.

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 or 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.

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 proxy 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 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/openv/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 for the duration of the backup.

Configuration requirements for BLI backups with NetBackup for SAP

Before you configure BLI backups, make sure your configuration meets the following requirements:

- NetBackup for SAP is installed, licensed, and configured.

- NetBackup Snapshot Client is installed and configured, and the license key for this option is registered.

- 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 standard 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 file-based 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.

   Database profile and configuration files are backed up in brbackup phase 2. These files are backed up as a standard backup.

   To perform a whole database backup, configure the following:

   - One or more automatic backup schedules to perform proxy BLI backups of the data files.
     This backup automatically includes the profile and the configuration files.

■ An Application Backup schedule type to back up the control files and archive logs.

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 proxy 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 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 5-2   Backup type roles

Backup Type	Description
Application Backup	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.
	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 `brbackup` phase 2.
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 with the Snapshot Client BLI method or for RMAN stream-based incrementals.
	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.

About NetBackup for SAP sample backup scripts (UNIX or Linux)

NetBackup for SAP installs sample scripts in the following location:

```
/usr/openv/netbackup/ext/db_ext/sap/samples/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 `brbackup` through RMAN proxy, add following lines in the init*SID*.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:

`C:\Program Files\VERITAS\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 `brbackup` 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 `init_fullSID.sap` and `initI_incrSID.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/openv/netbackup/ext/db_ext/sap/samples/sap_oracle/sap_rman_backup
```

on Windows:

```
C:\Program Files\VERITAS\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:

    SAP_SNC_SCHED=schedule_name_of_backup_type_to_perform

■ Set the schedule parameter in the init*SID*.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_FULL = 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 128.

See "About NetBackup for SAP sample backup scripts (UNIX or Linux)" on page 126.

See "About NetBackup for SAP backup types " on page 125.

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 5-3   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. SAPBACKUP directory, initCER.utl) and the archive redo logs should be under the local file system.

Table 5-3   Additional configuration for NAS *(continued)*

Backup type	Configuration
Online backups	Use the `BR_CNTRL_DIR` environment variable to define the control file location for `brbackup`. The control file should be located on the NAS. (By default `brbackup` makes a copy of the control file in the `SAPBACKUP` directory, which is on the local file system. `brbackup` 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.

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. MaxDB 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,passwd
dbmcli> medium_put medium_name medium_path PIPE backup_type
```

where

database_name	Name of the SAP database
usr	MaxDB user name.
passwd	MaxDB 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

The NetBackup for SAP on a MaxDB database does not include the SAP backup and restore tools.

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 issue a backup command using 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 the case of a restore, the process is the same except that data goes the other way.

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 backup identifier:

```
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 136.

2   Type the following command to initiate the restore:

```
dbmcli> recover_start medium_name backup_type ExternalBackupId "BID"
```

where:

medium_name	Name of the backup medium.
backup_type	Specify either DATA, PAGES, or LOG.
BID	The backup identifier. This information is returned when you perform a query.

Performing SAP backups and restores using parallel medium groups

Parallel backups and restores are used to improve backup and restore performance.

> **Note:** Parallel backups are optional only for data backups.

■ You can combine individual backup mediums to form parallel mediums. Parallel mediums allow you to implement multiplexing. 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.

■ Even if a backup is done in parallel, you can perform a restore of that data in either 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

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

- Minimizing loading and unloading of tapes for database backups (UNIX and Linux)

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:

```
Windows: install_path\NetBackup\logs\README.debug file
```

```
UNIX and Linux: /usr/openv/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
```

Or, you can manually create the directories for the log files you want created.

See "Enabling the debug logs for NetBackup for SAP manually (Windows)" on page 141.

Enabling the debug logs for NetBackup for SAP manually (Windows)

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\bphdb

    install_path\NetBackup\logs\bprestore

    install_path\NetBackup\logs\tar32
    install_path\NetBackup\logs\backint

    For example:

    cd *install_path*\NetBackup\logs
    mkdir bphdb

2   (Conditional) If you are running NetBackup for SAP on Oracle with RMAN, create the following additional directory:

    install_path\NetBackup\logs\dbclient

3   Make sure there is share access to the log directories.

4   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 for a NetBackup for SAP for UNIX or Linux client

Enabling the NetBackup for SAP logs manually (UNIX/Linux)

1 Create the following directories on the client:

```
/usr/openv/netbackup/logs/bpbackup
/usr/openv/netbackup/logs/bpbkar
```

```
/usr/openv/netbackup/logs/bphdb
```

```
/usr/openv/netbackup/logs/bprestore
```

```
/usr/openv/netbackup/logs/tar
/usr/openv/netbackup/logs/backint
chmod 777 /usr/openv/netbackup/logs/backint
```

For example:

cd /usr/openv/netbackup/logs
mkdir bphdb

2 (Conditional) If you run NetBackup for SAP on Oracle with RMAN, create the following additional directory:

```
/usr/openv/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 and Linux)" on page 63.

4 Enable logging for the `nbpem`, `nbjm`, and `nbrb` scheduling processes that use unified logging.

NetBackup writes unified logs to `/usr/openv/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.*mmddyy*.*hhmmss*.txt

  Unless it is redirected elsewhere, NetBackup writes SAP script errors to this file.

- *mmddyy*.log

  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 or Linux database client

The /usr/openv/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 or Linux database client

The /usr/openv/netbackup/logs/backint directory contains execution logs.

The following execution log exists:

■ *mmddyy*

About the backint directory on the Windows database client

The *install_path*\NetBackup\logs\backint directory contains execution logs, as follows:

mmddyy.log

This log contains debugging information and execution status for the SAP NetBackup client processes linked to the library program provided with NetBackup for SAP.

Setting the debug level on a NetBackup for SAP Windows 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 *install_path*\NetBackup\logs.

To set the debug level on a NetBackup for SAP for Windows client

1   From the Windows Start menu, choose **Programs > Symantec NetBackup > Backup, Archive, and Restore**.

2   Select **File > NetBackup Client Properties**.

3   Click the **Troubleshooting** tab.

4   Set the **Database** debug level.

5   Click **OK** to save your changes.

Setting the debug level on a UNIX or Linux 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 /user/openv/netbackup/logs.

To set the debug level on a UNIX or Linux 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*.

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 `back``SID``.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 used in each detail log name that guarantees a unique file name.
xyz for backup logs:	
x	`a` represents all. `p` represents partial.

y	`n` represents online. `f` represents offline.
z	`f` represents `utility_file_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 7-1 lists the suffixes that differentiate the different types of archive logs.

Table 7-1   File suffixes

File name	Meaning
encoded_timestamp.sve	Original saved.
encoded_timestamp.svd	Original saved and deleted.
encoded_timestamp.cpy	Original copied/saved a second time.
encoded_timestamp.cpd	Original copied/saved a second time and deleted.
encoded_timestamp.dcp	Deleted that were saved twice.
encoded_timestamp.dsv	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   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.

3   Click **OK** for each client.

Minimizing loading and unloading of tapes for database backups (UNIX and Linux)

You can minimize excessive unloading and reloading of tapes between multistreamed database backups by making changes on the NetBackup media server.

To minimize loading and unloading of tapes

◆   In the `/usr/openv/netbackup/bp.conf` file on the NetBackup media server, add the following options:

   ■   `MEDIA_UNMOUNT_DELAY`.

   ■   `MEDIA_REQUEST_DELAY`. Use this variable only with non-robotic drives, such as tape stackers.

backint command line interface

This appendix includes the following topics:

■ About backint command line interface

About backint command line interface

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.

Note: Symantec 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
`-u user_id`	Required. UID for backup utility user. No default.

Table A-1   `backint` command options *(continued)*

Option	Arguments and purpose
`-f` *function*	Required. It defines a key value that performs different functions between SAP and NetBackup. Specify one of the following arguments: ■ `backup` - This argument supports and defines `brbackup` and `brarchive` to NetBackup. If `backup` is specified, NetBackup backs up SAP. ■ `restore` - This argument supports and defines `brrestore` to NetBackup. If `restore` is specified, NetBackup restores SAP. ■ `inquiry` - This argument supports and defines `sapdba` to NetBackup. `sapdba` uses this argument when a recovery is performed to get backup information for NetBackup.
`-t` *type*	Optional. It defines the backup type, the backup of individual files, and character special devices. If no *type* is specified, the default value of `file` is used. Specify one of the following arguments: ■ `file` – Defines when to perform a backup, restore, and inquiry function with data files and special character devices. Backups from directories are not supported. `file_online` – Allows `brbackup` to set 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 control files that are defined in the `-p` *par_file* parameter.

Table A-1 `backint` command options *(continued)*

Option	Arguments and purpose

`-p par_file`	Required. It 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 following list explains the components of *par_file*:
	
	■ 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 `backint` 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 `backint` interface to run correctly. If an invalid parameter name is found, the NetBackup for SAP `backint` interface reports a warning message and continues.
	
	The SAP tools parameter file specifies the location of this *par_file*. For an example file, see the following:
	
	on UNIX or Linux:
	
	`/usr/openv/netbackup/ext/db_ext/sap/scripts/`
	`initSAP.utl`
	
	on Windows:
	
	`install_path\NetBackup\dbext\sap\initSAP.utl`
	
	See "About parameters used in initSID.utl" on page 166.

`-i in_file`	Optional. Specifies a text file, the contents of which can vary, depending on the NetBackup for SAP `backint` interface function initiated. If this option is not specified, the content of this file is data from standard input. See "About backint -i in_file contents" on page 153.
`-o out_file`	Optional. Specifies a text file that contains process messages for a function. If this option is not specified, the output is written to standard output. See "About backint -o out_file contents" on page 155.

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 B-1 shows the directives you can include in in_file and indicates the databases that use them.

Table B-1 Directives in the *in_file*

Directive	Underlying database
Directives for an input file that requests a backup:	
file	Oracle
pipe #PIPE	MaxDB
special_file size	Oracle
Directives for an input file that requests a restore:	
backup_id file [*dest_dir*]	Oracle

Table B-1 Directives in the *in_file (continued)*

Directive	Underlying database
`#NULL` *file* [*dest_dir*]	Oracle
backup_id pipe [*dest_name*]	MaxDB
`#NULL` *pipe* [*dest_name*]	MaxDB
Directives for an input file that performs an inquiry:	
`#NULL`	Oracle and MaxDB
backup_id	Oracle and MaxDB
`#NULL` *file*	Oracle
`#NULL` *pipe*	MaxDB
backup_id file	Oracle
backup_id pipe	MaxDB

Table B-2 lists the variables you need to specify in the in_file:

Table B-2 Variables in the *in_file*

Variable	Specification
file	The full path name of the file that you want to back up, restoring, or inquiring about.
pipe	A named pipe. Specify the keyword `#PIPE` after the pipe name.
special_file	The name of a special file, such as a raw device file.
size	The file size as specified to the Oracle database.
backup_id	The BID or backup identifier, as generated by NetBackup.
dest_dir	The name of a directory or folder to which the restore is written.
dest_name	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 is specified by the `-o out_file` option 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 C-1 `backint` -o out_file contents

Output	Description
Information returned for a backup	If a backup completes successfully, the output file includes the following:
	■ The backup ID (BID) assigned to the backup by NetBackup.
	■ The files, pipes, directories, or folders backed up and their sizes.
	If a backup function fails, the output file lists the files or pipes that it could not back up.

Table C-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: ■ 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: ■ The BID. ■ The files or pipes backed up.

NetBackup for SAP environment variables for backint

This appendix includes the following topics:

■ backinit environment variables

backinit environment variables

Table D-1describes the environment variables that the NetBackup for SAP `backint` interface recognizes.

Table D-1   NetBackup for SAP `backint` interface environment variables

UNIX/Linux	Windows	Purpose
`$SAP_CLIENT`	`%SAP_CLIENT%`	Sets the name of the NetBackup client. It can be used to override the current client and perform an alternate restore to a different client. This variable is the same as the `client` parameter in the `initSID.utl` file. This variable also represents the `CLIENT_NAME` option in the NetBackup Administration Console or `bp.conf` file.
`$SAP_DRIVES`	`%SAP_DRIVES%`	Sets the number of simultaneous `bpbackup`/`bprestore` operations the NetBackup for SAP `backint` interface can execute. This environment variable is the same as the `drives` parameter in the `initSID.utl` file.

| | Table D-1 | NetBackup for SAP `backint` interface environment variables *(continued)* |

UNIX/Linux	Windows	Purpose
`$SAP_POLICY`	`%SAP_POLICY%`	Sets the name of the NetBackup policy. You can use this policy to define different types of database backups. You can use one policy type to perform offline database backups and another policy type to perform archive log backups. This environment variable is the same as the `policy` parameter in the `initSID.utl` file. This variable also represents the `BPBACKUP_POLICY` option in the NetBackup Administration Console or `bp.conf` file.
`$SAP_RECOVERY`	`%SAP_RECOVERY`	Set this environment variable to "disaster" while running disaster recovery using `BRRECOVER`. If the `initDBSID.sap` file is not present, `BRRECOVER` calls `BACKINT` without the "-p initDBSID.utl" parameter. If NetBackup for SAP is called without the util file parameter, then it expects that the SAP_RECOVERY environment variable is set to "disaster".
`$SAP_RESTORE`	`%SAP_RESTORE`	Set this environment variable to "rollback" to specify a snapshot rollback restore from BACKINT-based backups.
`$SAP_SCHED`	`%SAP_SCHED%`	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 is the same as the `schedule` parameter in the `initSID.utl` file. This variable also represents the `BPBACKUP_SCHED` option in the NetBackup Administration Console or `bp.conf` file.
`$SAP_SNC_SCHED`	`%SAP_SNC_SCHED%`	Sets the name of the SAP backup policy schedule. This schedule is used to perform file-based snapshot and off-host backups of the datafiles in `brbackup` phase 1. The following types of schedules can be used for this type of backup: Automatic Full, Automatic Differential Incremental, or Automatic Cumulative Incremental.
`$SAP_SERVER`	`%SAP_SERVER%`	Sets the name of the NetBackup server. It can be used to override the current server and perform a backup to an alternative server. This environment variable is the same as the `server` parameter in the `initSID.utl` file. This variable also represents the `SERVER` option in the NetBackup Administration Console or `bp.conf` file.

Table D-1   NetBackup for SAP `backint` interface environment variables
(continued)

UNIX/Linux	Windows	Purpose
`$SAPSWITCH`	`%SAPSWITCH%`	Set this environment variable to specify the location of the `.switch` files (`.switch.lis`, `.switch.sem`, `.switch.log`). This variable gets higher precedence than the switch parameters (`switch_list`, `switch_sem`, `switch_log`) mentioned in `int`*SID*`.utl` file.

E

NetBackup for SAP configuration or bp.conf file settings

This appendix includes the following topics:

■ About NetBackup for SAP parameters

About NetBackup for SAP parameters

This topic describes the NetBackup for SAP configuration parameters. You can specify parameters in several places.

Table E-1 describes the order of precedence, in the case of conflicts.

Table E-1   Order of precendence for NetBackup for SAP parameters

Setting	Precedence
Environment variables	Highest precedence. Overrides values in init*SID*.utl and in the bp.conf file or NetBackup Administration Console.
init*SID*.util file	Medium precedence. Values in environment variables override values specified in this file, but values in this file override those in the bp.conf file or NetBackup Administration Console.

Table E-1   Order of precendence for NetBackup for SAP parameters *(continued)*

Setting	Precedence
(UNIX or Linux) `/usr/openv/netbackup/bp.conf` file	Lowest precedence. Values in environment variables and in init*SID*.utl override values specified in the `bp.conf` file.
(Windows) NetBackup Administration Console	Lowest precedence. Values in environment variables and in init*SID*.utl override values specified in the NetBackup Administration Console.

Table E-2 lists the variable names and definitions you can use in the `bp.conf` file (UNIX or Linux) or the NetBackup Administration Console (Windows).

Table E-2   NetBackup for SAP variable names and definitions

UNIX or Linux	Windows	Meaning
`$SERVER`	`%SERVER%`	Specifies the NetBackup server. This option is the same as the `$SAP_SERVER` (`%SAP_SERVER%`) environment variable and the `server` parameter in the init*SID*.util file.
`$CLIENT_NAME`	`%CLIENT_NAME%`	Specifies the NetBackup client. This option is the same as the `$SAP_CLIENT` (`%SAP_CLIENT%`) environment variable and the `client` parameter in the init*SID*.util file.
`$BPBACKUP_POLICY`	`%BPBACKUP_POLICY%`	Specifies the NetBackup policy. This option is the same as the `$SAP_POLICY` (`%SAP_POLICY%`) environment variable and the `policy` parameter in the init*SID*.util file.

Table E-2   NetBackup for SAP variable names and definitions *(continued)*

UNIX or Linux	Windows	Meaning
`$BPBACKUP_SCHED`	`%BPBACKUP_SCHED%`	Specifies the NetBackup schedule. This option is the same as the `$SAP_SCHED`(`%SAP_SCHED%`) environment variable and the `schedule` parameter in the init*SID*.util file.

For more information, see the *NetBackup Administrator's Guide, Volume II.*

Parameters used in initSID.utl

This appendix includes the following topics:

- 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 init*SID*.utl configuration file. The software passes 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.util parameter summary

Table F-1 summarizes the parameters and the database environments that support them.

Table F-1   NetBackup for SAP parameters and the database environments

Parameter name	Underlying database and usage notes
backup_stream_buffersize	MaxDB See "backup_stream_buffersize <size>" on page 168.
client	See "client <client_machine_name>" on page 168.
custom_sort_file	Oracle without RMAN See "custom_sort_file <file_path>" on page 168.

Table F-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 172.
`inquire_query_period`	See "inquiry_query_period <months>" on page 173.
`master_time_offset` (UNIX or Linux)	See "master_time_offset <minutes> (UNIX or Linux)" on page 173.
`multistream_restore`	Oracle without RMAN See "multistream_restore" on page 173.
`policy`	See "policy <policy_name>" on page 173.
`policy2`	See "policy2 <policy_name>" on page 174.
`restore_stream_buffersize`	MaxDB See "restore_stream_buffersize <size>" on page 174.
`retry_backup`	See "retry_backup <number_of_retries>" on page 174.
`schedule`	See "schedule <schedule_name>" on page 174.
`schedule2`	See "schedule2 <schedule_name>" on page 175.
`server`	See "server <server_name>" on page 175.
`sort_backup_type`	Oracle without RMAN See "sort_backup_type <value>" on page 176.
`sort_restore_type`	Oracle without RMAN See " sort_restore_type <value>" on page 183.
`switch_list`	Oracle without RMAN See "switch_list <control_file_path>" on page 187.

Table F-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 188.
switch_sem	Oracle without RMAN See "switch_sem <control_file_path>" on page 188.

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_machine_name>

This parameter specifies the machine that contains the NetBackup client software, a database, and an SAP environment. In some cases the server and the client machine are the same machine. 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, then the client parameter value defaults to the specification for the CLIENT_NAME option in the bp.conf file or the NetBackup Administration Console. 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/openv/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 `bpbackup` 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 UNIX or Linux:

```
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\user1d_1\user1d.data1
2 c:\oracle\sap\sapdata2\user1i_1\user1i.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 Windows:

```
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/rdsk/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/user1d_1/user1d.data1
2 /oracle/sap/sapdata2/user1i_1/user1i.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 submits the entire file list for backup, there are two bpbackup jobs running at the same time. 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\rdsk\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/rdsk/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\user1d_1\user1d.data1
c:\oracle\sap\sapdata2\user1i_1\user1i.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/user1d_1/user1d.data1
/oracle/sap/sapdata2/user1i_1/user1i.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 `bpbackup` and `bprestore` commands to run. To maximize write performance to a storage unit, set the `drives` value as follows: multiply the number of storage units by the multiplex value per schedule. Based on the number of drives specified, the NetBackup for SAP `backint` interface simultaneously runs the same number of `bpbackup` and `bprestore` commands.

Note: Not applicable in MaxDB database environments or in any Oracle database environments that use RMAN.

If, for example, multiplexing is set to 4 and there are two available tape drives, set the `drives` parameter to `8` (4 X 2). The NetBackup for SAP `backint` interface runs eight `bpbackup`/`bprestore` jobs at the same time with four data streams going to each tape. The `drives` parameter should be set to the following rule:

```
drives = Number_of_drives_per_policy X MPX_value_in_schedule
```

The `drives` parameter value must not exceed the set maximum jobs per client global attribute. 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 six 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 and the client machines.

Use this option only when the date and times are out of sync between the server and the client machines.

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 to have the NetBackup master server determine the most efficient way to create restore jobs from the selected backup images. Specify 1 to create parallel restore streams. The number of restore streams is based on the values of `drives` and `sort_restore_type`.

A value of 0 is the default setting.

```
multistream_restore 0
```

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 Administration Console. By default, if `BPBACKUP_POLICY` is not specified in any NetBackup `bp.conf` file or in the NetBackup Administration Console, NetBackup uses the first active SAP policy type 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 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, then 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 `bpbackup` 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 Administration Console. If `BPBACKUP_SCHED` is not specified there, NetBackup uses the first Application Backup schedule it finds in the first active SAP policy.

schedule2 <schedule_name>

This parameter specifies name of an Application Backup schedule to be used for the secondary SAP 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 166.

See "initSID.util parameter summary" on page 166.

server <server_name>

This parameter specifies the name of the NetBackup master server. The NetBackup master server is the name of the machine that 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 `SERVER` value in the `bp.conf` file or the NetBackup Administration Console.

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.

---

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.

sort_backup_type device

Specifies that NetBackup create jobs based on a file's device ID. Because this parameter overrides the `drives` parameter, the number of storage units that are specified in the `int`*SID*`.utl` file is not used.

For example, if 12 files are requested for backup, and they reside on two different devices (`x` and `y`), then two jobs are forked. 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/rdsk/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/rdsk/c0t4d0s6   11812864
```

The following Windows example shows how jobs are created when device is specified:

■ Input file list from SAP (brbackup, sapdba):

```
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\rdsk\c0t4d0s6 11812864
```

- Backup job 1 (all have the device ID x):

```
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
```

- Backup job 2 (all have the same device ID y):

```
c:\dev\rdsk\c0t4d0s6   11812864
```

sort_backup_type drive

Specifies that NetBackup create jobs based on the number of simultaneous backup jobs that the `drives` parameter specifies in the init*SID*.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/user1d_1/user1d.data1
/oracle/sap/sapdata2/user1i_1/user1i.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\user1i_1\user1i.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/user1d_1/user1d.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:

```
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\user1d_1\user1d.data1
c:\oracle\sap\sapdata2\user1i_1\user1i.data1
c:\oracle\sap\sapdata1\system_1\system.data1
c:\oracle\sap\saplog1\log_g1_m1\log1_m1.dbf
```

■ Backup job and restore job 1:

```
c:\oracle\sap\sapdata1\roll_1\roll.data1
c:\oracle\sap\sapdata2\stabi_2\stabi.data2
c:\oracle\sap\sapdata2\user1i_1\user1i.data1
```

■ Backup job and restore job 2:

```
c:\oracle\sap\sapdata2\sourced_1\sourced.data1
c:\oracle\sap\sapdata1\temp_1\temp.data1
c:\oracle\sap\sapdata1\system_1\system.data1
```

■ Backup job and restore job 3:

```
c:\oracle\sap\sapdata3\stabd_1\stabd.data1
c:\oracle\sap\sapdata4\user1d_1\user1d.data1
c:\oracle\sap\saplog1\log_g1_m1\log1_m1.dbf
```

sort_backup_type size (default)

This value is the default for the `sort_backup_type` parameter.

If `sort_backup_type size` is specified, NetBackup creates jobs based upon the number of drives that are specified in the init*SID*.utl file. Each file being backed up is associated with a backup job based on size.

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 `bpbackup` jobs run 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 init*SID*.utl file. This value creates 10 `bpbackup` jobs with one file for each `bpbackup` job. NetBackup handles all of the job scheduling. Initially, three `bpbackup` jobs are active and the other seven jobs are queued. You can increase the number of active jobs and data throughput by increasing the multiplex value for the policy.

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/rdsk/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/user1d_1/user1d.data1
                            /oracle/sap/sapdata2/user1i_1/user1i.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/rdsk/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`):

```
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\rdsk\c0t4d0s6  11812864
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\user1d_1\user1d.data1
c:\oracle\sap\sapdata2\user1i_1\user1i.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
```

- Backup job 1:

```
size= 36708352: file name=c:\oracle\sap\sapdata1\roll_1\roll.data1
size= 10493952: file name=c:\oracle\sap\sapdata1\temp_1\temp.data1
size=  5251072: file name=c:\oracle\sap\sapdata1\ddicd_1\ddicd.data1
size=  5251072: file name=c:\oracle\sap\sapdata1\el30ci_1\el30ci.data1
size=  5243392: file name=c:\oracle\sap\saplog1\log_g4_m1\log4_m1.dbf
Total=62947840
```

- Backup job 2:

```
size= 15736832: file name=c:\oracle\sap\sapdata1\system_1\system.data1
size=  5251072: file name=c:\oracle\sap\sapdata2\btabi_1\btabi.data1
size=  5251072: file name=c:\oracle\sap\sapdata5\ddici_1\ddici.data1
size=  5251072: file name=c:\oracle\sap\sapdata6\es30cd_1\es30cd.data1
size=  5251072: file name=c:\oracle\sap\sapdata2\poold_1\poold.data1
size=  5251072: file name=c:\oracle\sap\sapdata3\stabd_1\stabd.data1
size=  5251072: file name=c:\oracle\sap\sapdata1\pooli_1\pooli.data1
size=  5251072: file name=c:\oracle\sap\sapdata2\user1i_1\user1i.data1
size=  5243392: file name=c:\oracle\sap\saplog1\log_g1_m1\log1_m1.dbf
size=   231936: file name=c:\oracle\sap\dbs\cntrlSAP.dbf
Total=57969664
```

■ Backup job 3:

```
size= 11812864: file name=c:\dev\rdsk\c0t4d0s6
size=  5251072: file name=c:\oracle\sap\sapdata2\clud_1\clud.data
size=  5251072: file name=c:\oracle\sap\sapdata4\el30cd_1\EL30cd.data1
size=  5251072: file name=c:\oracle\sap\sapdata4\protd_1\protd.data1
size=  5251072: file name=c:\oracle\sap\sapdata2\sourced_1\sourced.data1
size=  5251072: file name=c:\oracle\sap\sapdata2\stabi_2\stabi.data2
size=  5251072: file name=c:\oracle\sap\sapdata4\user1d_1\user1d.data1
size=  5251072: file name=c:\oracle\sap\sapdata1\btabd_1\btabd.data1
size=  5243392: file name=c:\oracle\sap\saplog1\log_g2_m1\log2_m1.dbf
size=  5243392: file name=c:\oracle\sap\saplog1\log_g3_m1\log3_m1.dbf
Total=59057152
```

sort_restore_type <value>

The sort_restore_type parameter is available with NetBackup for SAP in
NetBackup 7.0 and later. 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 that are created with NetBackup 7.0 or later or
NetBackup 6.x.

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 168.

sort_restore_type drive

Specifies that NetBackup create jobs based on the number of storage units that are specified in the `drives` parameter in the init*SID*.utl file. The examples below show the distribution if there are three 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/user1d_1/user1d.data1
/oracle/sap/sapdata2/user1i_1/user1i.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/user1i_1/user1i.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/user1d_1/user1d.data1
/oracle/sap/saplog1/log_g1_m1/log1_m1.dbf
```

Windows:

- Input file list from SAP:

```
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\user1d_1\user1d.data1
c:\oracle\sap\sapdata2\user1i_1\user1i.data1
c:\oracle\sap\sapdata1\system_1\system.data1
c:\oracle\sap\saplog1\log_g1_m1\log1_m1.dbf
```

- Backup job and restore job 1:

```
c:\oracle\sap\sapdata1\roll_1\roll.data1
c:\oracle\sap\sapdata2\stabi_2\stabi.data2
c:\oracle\sap\sapdata2\user1i_1\user1i.data1
```

- Backup job and restore job 2:

```
c:\oracle\sap\sapdata2\sourced_1\sourced.data1
c:\oracle\sap\sapdata1\temp_1\temp.data1
c:\oracle\sap\sapdata1\system_1\system.data1
```

- Backup job and restore job 3:

```
c:\oracle\sap\sapdata3\stabd_1\stabd.data1
c:\oracle\sap\sapdata4\user1d_1\user1d.data1
c:\oracle\sap\saplog1\log_g1_m1\log1_m1.dbf
```

sort_restore_type image (default)

Specifies that `backint` create groups of files based on their backup image numbers and fork a `bprestore` 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 `bpbackup` jobs, each file is associated with one of two backup image IDs. If all nine files are restored, the NetBackup for SAP `backint` interface forks the two `bprestore` 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 forks another job for raw partition files if they are 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/user1d_1/user1d.data1
/oracle/sap/sapdata2/user1i_1/user1i.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/user1d_1/user1d.data1
/oracle/sap/sapdata2/user1i_1/user1i.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:

```
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
```

■ Image 2:

```
c:\oracle\sap\sapdata4\user1d_1\user1d.data1
c:\oracle\sap\sapdata2\user1i_1\user1i.data1
c:\oracle\sap\sapdata1\system_1\system.data1
c:\oracle\sap\saplog1\log_g1_m1\log1_m1.dbf
```

■ Restore job 1:

```
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
```

■ Restore job 2:

```
c:\oracle\sap\sapdata4\user1d_1\user1d.data1
c:\oracle\sap\sapdata2\user1i_1\user1i.data1
c:\oracle\sap\sapdata1\system_1\system.data1
c:\oracle\sap\saplog1\log_g1_m1\log1_m1.dbf
```

switch_list <control_file_path>

This parameter specifies a control file that communicates between the NetBackup for SAP `backint` interface and `brbackup` for online backups. A switch list file is created every time `brbackup` wants to back up a file or when it wants to indicate that a 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`

`%SAPDATA_HOME%\sapbackup\.switch.lis`

The following are examples of valid entries:

```
switch_list /oracle/sap/sapbackup/.switch.lis

switch_list F:\oracle\SID\SAPBackup\.switch.lis
```

switch_log <control_file_path>

This parameter specifies a control file that communicates between the NetBackup for SAP `backint` interface and `brbackup`. After the switch semaphore file has been deleted, the NetBackup for SAP `backint` interface opens and reads the switch log file. `brbackup` creates this log file to determine if the process is successful.

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

%SAPDATA_HOME%\sapbackup\.switch.log
```

The following are examples of valid entries:

```
switch_list /oracle/sap/sapbackup/.switch.log

switch_list F:\oracle\SID\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

%SAPDATA_HOME%\sapbackup\.switch.sem
```

The following is an example of a valid entry:

```
switch_list /oracle/sap/sapbackup/.switch.sem
```

```
switch_list F:\oracle\SID\SAPBackup\.switch.sem
```

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 2003 or later)
- Local-host snapshot method: VxFS_Checkpoint (UNIX or Linux)
- Local-host snapshot method: VSS (Windows 2003 only)
- 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 192.
  See "Local-host snapshot method: VxVM (Solaris SPARC, HP-UX, Windows 2003 or later)" on page 193.

- Off-host

- Hardware array-based (UNIX or Linux)

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/rdsk/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, NetBackup Snapshot Client, and NetBackup for SAP.

2   Identify a cache device for the copy-on-write process in one of the following ways.

   ■ Use the Policy Configuration Wizard to create a Snapshot Client policy and specify the raw partition.

   ■ Manually select the snapshot method on the **Advanced Snapshot Options** dialog box. Continue with step 3

3   When you manually select the snapshot method you have the following options for specifying the raw cache partition:

   ■ 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 2003 or later)

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# vxdg init diskgroup [cds=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=dco
```

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/rdsk/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 and Linux" on page 121.

Local-host snapshot method: VSS (Windows 2003 only)

Ensure that the Windows service "Volume Shadow Copy" is started on the production host.

Off-host alternate client, FlashSnap method

Figure G-1   Typical SAP split mirror off-host backup with FlashSnap
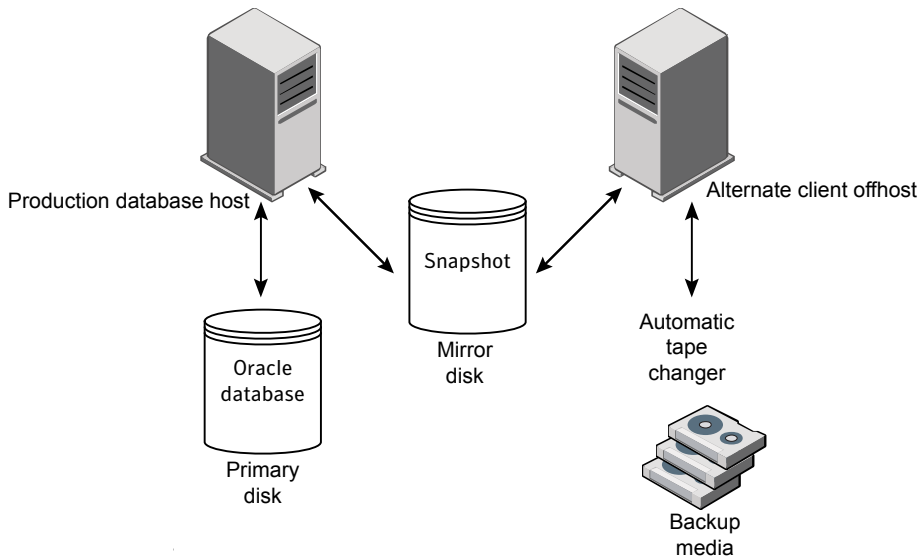
Based on this FlashSnap configuration, the typical flow during the Snapshot Client backup for SAP is as follows:

- 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 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.

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# vxdg init diskgroup [cds=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/rdsk/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)

Figure G-2   Typical SAP split mirror off-host backup with VVR
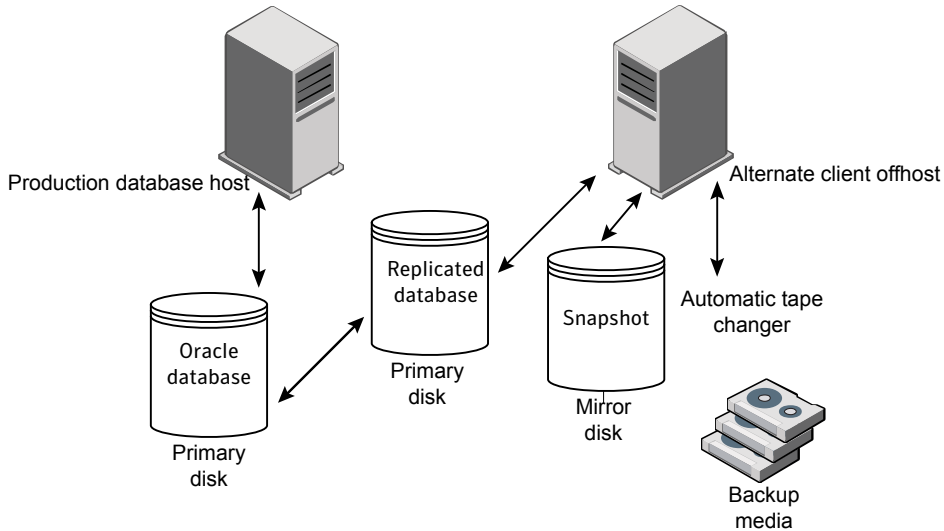
Based on this VVR configuration, the typical flow during the Snapshot Client backup for SAP:

■ 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# vxdg 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=dcm 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/rdsk/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=dcm 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# vradmin -g diskgroup createpri rvg_name data_volumes(s) srl_volume
```

5   Ensure that authentication can complete.

Before you add a new secondary host (using addsec) or overwrite data on a remote host (using syncvol), vradmin 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 vradmin 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.

■ 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 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`.

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