Disaster Recovery for Oracle

White Paper: Oracle Database Administration

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INTRODUCTION

If you lose your entire system (possibly including hardware) and you have not taken any special precautions against this (for example, an Oracle standby configuration), you must restore the system step-by-step. This document describes how to reinstall your system and how to keep data loss to a minimum by using the SAP tools BRRECOVER and BRRESTORE.

> You can **automatically** perform the most important disaster recovery steps, especially the restore of profiles and log files, with BRRECOVER. We strongly recommend you to use BRRECOVER for disaster recovery.
>
> The procedures described here explain the interconnections. Only use these procedures in an exceptional situation if definitely required, otherwise you can destroy an existing database.

Note the following:

	UNIX	Windows
Environment variables	`$ORACLE_HOME` `$SAPDATA_HOME`	`%ORACLE_HOME%` `%SAPDATA_HOME%`
Oracle SQLPLUS tool	`sqlplus`	`sqlplus`
Profile file directory	`$ORACLE_HOME/dbs`	`%ORACLE_HOME%\database`

The default values for these variables are as follows:

UNIX	Windows
`$ORACLE_HOME =` `/oracle/<DBSID>/<DB_VERS>`	`%ORACLE_HOME% =` `<x>:\oracle\<DBSID>\<DB_VERS>`
`$SAPDATA_HOME =` `/oracle/<DBSID>`	`%SAPDATA_HOME% =` `<y>:\oracle\<DBSID>`

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> Windows: If the `SAPARCH`, `SAPBACKUP`, or `SAPREORG` directories are not located under `%SAPDATA_HOME%`, use the corresponding environment variables `%SAPARCH%`, `%SAPBACKUP%` or `%SAPREORG%`. The separator character used in UNIX "/" must be replaced with "\" for Windows.

RESTORING THE HARDWARE AND OPERATING SYSTEM

Install the same version of the operating system you were using before the loss. When replacing the hard disks, make sure the replacement disks can be used to recreate the original structure and size of your disk partitions. Format the replacement disks according to the procedure described in the SAP installation guide. Keep the reserved memory for the superuser (`root`) to a minimum as recommended in the installation guide.

INSTALLING THE DATABASE AND SAP SOFTWARE

The installation of the SAP software includes the software installation of the database. The initial SAP database should be completely new. However, do not load any data into the empty SAP tables. Alternatively, restore a full backup of your operating system or use the SAP installation CD.

CREATING THE FILE SYSTEMS

It is important to take into account the file systems that were mounted at the time of the loss. If necessary, create new `SAPDATA` directories (mount points). These are usually used to define a disk or logical storage area (logical volume). Place the tape from the last successful complete BRBACKUP tape into the tape drive.

I. DISASTER RECOVERY WITH BRRECOVER

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We recommend you to perform disaster recovery with BRRECOVER if possible.

If you lose your entire Oracle database system (possibly including hardware) and you have not taken any special security precautions - such as setting up a Standby Database - then you have to recover the system as much as possible, step by step. This section describes how to begin reinstalling the system in the event of such a disaster, and how to keep data loss to a minimum by using BRRECOVER.

You can only restore profiles and log files using this function. This is a preparation step for subsequent database recovery with one of the following:

- Database point-in-time recovery
- Whole database reset

Before you start disaster recovery, make sure that:

- SAP and Oracle software is correctly installed
- The file systems – that is, `sapdata<x>` directories – exist and are configured as before the disaster.

Disaster Recovery Phases with BRRECOVER

The following figure shows how disaster recovery works:
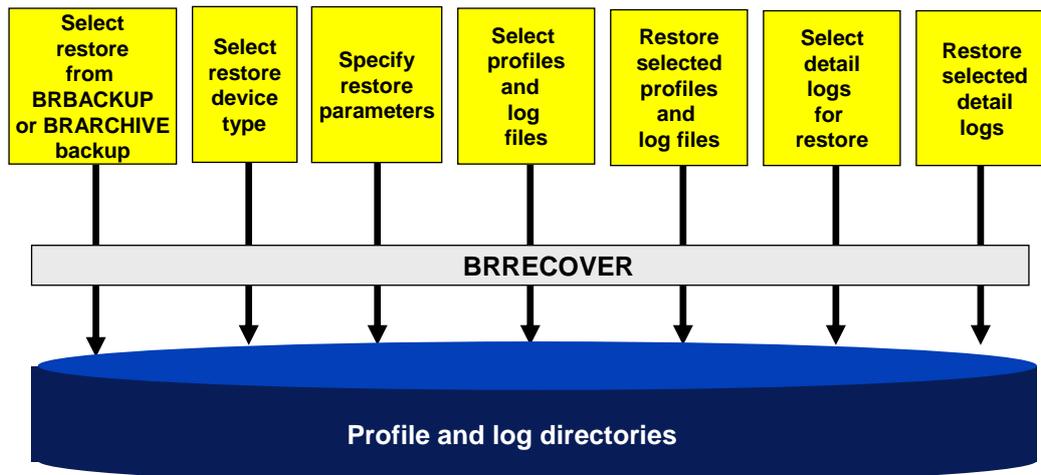
Disaster recovery consists of these phases:

1. Select restore from BRBACKUP or BRARCHIVE backup.
   You select the BRBACKUP or BRARCHIVE backup that contains the required profiles and logs.
2. Select restore device type phase
   You select the device to be used from the following possibilities:
   - Local tape
   - Remote tape
   - Local disk
   - Remote disk
   - Backup utility

3. Specify restore parameters phase

   Depending on your choice of restore device type, you specify appropriate restore parameters.

4. Select profiles and log files phase

   You select the profiles and log files that you want to restore from the following:

   – BR*Tools profile

   – Oracle profile

   – BACKINT utility profile – `util_par_file`

   – Detail log from one of the following:

      o BRARCHIVE detail Log

      o BRBACKUP detail Log

   – Summary log from one of the following

      o BRARCHIVE summary Log

      o BRBACKUP summary Log

      o BRSPACE summary Log

      o BRSPACE structure Change Log

      o BRSPACE parameter Change Log

   – Control file from a BRARCHIVE backup

   – Oracle wallet file

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   The control file must only be reloaded here when the offline redo log files were saved with RMAN after the last run of BRBACKUP was started.

5. Restore selected profiles and log files phase

   BRRECOVER directly restores the selected profiles and log files without calling BRRESTORE.

6. Select detail logs for restore phase

   You select the detail logs that you want to restore. You can only select logs on the selected restore device type, such as a disk or external backup tool (BACKINT). For tape device type, the details logs are determined by the mounted tape volume.

7. Restore selected detail logs phase

   BRRECOVER directly restores the selected detail logs from the disk, tape, or external backup tool without calling BRRESTORE.

Performing Disaster Recovery with BRRECOVER

You can use BR*Tools for Oracle to recover from a disaster. You use BRRECOVER to restore missing or damaged profiles and log files. BRRESTORE is not called by disaster recovery, because it might require the BRBACKUP logs or the BRARCHIVE logs, which might not be available in a disaster.

You use this process if either of the following is true:

- You have lost the entire database, including the profiles and the BRBACKUP logs or the BRARCHIVE logs.

- You have only lost the profiles and the BRBACKUP or BRARCHIVE logs.

This process does not actually restore data files or recover redo log files. It only restores the profiles and BRBACKUP or BRARCHIVE logs from copies that you made during previous backups. Therefore, it prepares the database for you to perform one of the following guided BR*Tools options:

- Database point-in-time (PIT) recovery

- Whole database reset

Complete database recovery and tablespace PIT recovery are not possible after disaster recovery because the current control file (required for complete database recovery) is missing and the database cannot be opened (required for tablespace PIT recovery).

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> Only perform this process if you are an expert in Oracle database administration. Even as an expert, we recommend that you first try other types of recovery supported by BR*Tools.
>
> If you are not an expert, you might severely damage the database with this procedure. You might lose data and cause downtime to fix the problem.

Prerequisites

- Since this function is designed for experts, the usual safeguards are not present:
  - There is no database status check.
  - You have less guidance than otherwise, since BRRECOVER cannot offer you default choices in all situations.
  - You can choose individual actions independently.
- For all procedures, the backup medium with the required backup files must obviously be present.
- You need to know exactly which file to restore and where it is. You are effectively performing a copy at operating-system level.
- BRRECOVER restores the profiles and logs to the standard directory.
- If you choose device type *Backup utility* for the restore, note the following:
  - The BACKINT repository with the latest backup must be available because the tapes are administered using this repository in the backup utility.
  - The BACKINT parameter file must normally exist, depending on the specific implementation that you are using. If it is required but is unavailable, you must first try and recreate it before performing disaster recovery.
  - BRRECOVER calls BACKINT to perform the restore.
  - BACKINT performs the restore of the profiles or logs from the latest backup.

Process

1. You start BRGUI or BRTOOLS.
2. You choose *Restore and recovery → Disaster recovery*.
3. You choose the required procedure:
   - Restore profiles and logs files from BRBACKUP backup
   - Restore profiles and logs files from BRARCHIVE backup

   BRRECOVER starts the restore and displays the menu *Device Type.*
4. You choose the device tape where the backups of the profiles or logs are stored.

   BRRECOVER displays the parameters for restoring the profiles or logs, depending on what kind of device type you specified. The default parameters are taken from the current profile, initialization profile `init<DBSID>.sap`, if available.
5. For a disk backup or a utility backup, you note the following:

   For a disk backup, you can specify the backup directory. BRRECOVER looks in the sub-directory `<DBSID>` of the specified directory to find the summary log for BRBACKUP or BRARCHIVE. It uses the information there for the restore.

   For a utility backup, check *Prerequisites* above.
6. You choose *Continue* to continue the restore with the displayed parameters.

   BRRECOVER warns you that the profiles and logs might be overwritten.

BRRECOVER displays the restore menu where you can specify which profiles and logs to restore:

- If a log or profile already exists on disk, the recommendation is *No* to avoid overwriting it.
- If a log or profile does not exist on disk, the recommendation is *Yes* to let you restore it.

7. If required, you change the recommended values for restoring the profiles and logs. You can select several profiles or logs to restore.

8. You choose *Continue* to start restoring the selected profiles or logs.

9. You check the results in the BRRECOVER logs:

- The summary log `recov<DBSID>.log` displays the return code.
- The detail log `v<encoded timestamp>.drv` displays the progress.

II. DISASTER RECOVERY WITH BRRESTORE

Restoring the init<DBSID>.sap File from Tape

At least one valid `init<DBSID>.sap` file must exist before you can start BRRESTORE. You can find a sample file as follows:

```
/usr/sap/<SID>/SYS/exe/run/initSID.sap
```

Adapt this file, for example with respect to the devices and drivers used.

For more information, see "Additional Information" [page 13].

Check all operating system-dependent parameters and adapt these as required. Configure the same block size in the `cpio_in_flags` parameter and – if you used the `dd` command for the backup – the `dd_in_flags` parameter as for backups.

Then enter the following commands to restore the latest backup of the BR*Tools profile file `$ORACLE_HOME/dbs/init<DBSID>.sap`:

```
OS> cd $ORACLE_HOME/dbs
OS> brrestore -n init_sap
```

Alternatively the `init<DBSID>.sap` file can also be read as a third file from a BR*Tools tape using the `cpio` operating system command:

UNIX	Windows
`cd $ORACLE_HOME/dbs`	`cd %ORACLE_HOME%\database`
`mt -f /dev/… rewind`	`mt -f /dev/… rewind`
`mt -f dev/… fsf 2`	`mt -f /dev/… fsf 2`
`cpio -ivuB < /dev/…`	`cpio -ivuB -I /dev/…`

If you have configured a different block size in the `init<DBSID>.sap` parameter `cpio_flags`, you must use this same block size when restoring.

Restoring Other Profile and Log Files from Tape

First, restore the files backed up during the last BRBACKUP backup of the database:

- Profile files

  Oracle profile file: `$ORACLE_HOME/dbs/init<DBSID>.ora`

  To restore the files, enter the following commands:
  ```
  OS> cd $ORACLE_HOME/dbs
  OS> brrestore -n init_ora
  ```
- BRSPACE summary and structure log files
  - BRSPACE summary log: `$SAPDATA_HOME/sapreorg/space<DBSID>.log`
  - Structure log: `$SAPDATA_HOME/sapreorg/struc<DBSID>.log`

  To restore both log files, enter the following commands:
  ```
  OS> cd $SAPDATA_HOME/sapreorg
  ```

> OS> **brrestore -n space_log**

- BRBACKUP summary log file, $SAPDATA_HOME/sapbackup/back<DBSID>.log

  To restore the file, enter the following command:

  > OS> **cd $SAPDATA_HOME/sapbackup**

  > OS> **brrestore -n sum_log**

  The last entry in the summary log corresponds to the last backup. This is the relevant entry for the detail log (see next file below). The last entry is usually incomplete – for example, Return Code not current – but this does not affect any subsequent operations.

- BRBACKUP detail log file, $SAPDATA_HOME/sapbackup/<coded timestamp>.<fid>

  > OS> **brrestore -n det_log**

  Note the <coded_timestamp> (that is, the filename without extension) and the function ID <fid> (that is, the filename extension) from the name of this restored file in the restore directory. These are required for the following steps.

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  Alternatively you can quickly restore all logs from the BRBACKUP tape into the current directory using a single BRRESTORE command:

  brrestore –n all_log

  Then copy the individual logs into the correct directories.

Remove the BRBRACKUP tape from the tape drive and replace it with the BRARCHIVE tape of the last backup of the offline redo log files.

Now restore the BRARCHIVE summary log, $SAPDATA_HOME/saparch/arch<DBSID>.log, from the BRARCHIVE tape by entering the following commands:

> OS> **cd $SAPDATA_HOME/saparch**

> OS> **brrestore -n sum_log**

> OS> **cd $SAPDATA_HOME/sapreorg**

> OS> **brrestore –n control_file**

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> The last command above, which reloads the control file, is only necessary when the offline redo log files were saved with RMAN after the last run of BRBACKUP was started.

> If the control file is reloaded, you must copy it to all the original locations defined in the Oracle parameter control_files.

Remove the BRARCHIVE tape from the tape drive and replace it with the BRBACKUP tape.

Using an External Backup Program

If you use the BACKINT interface, the procedure is somewhat different. The profiles init<DBSID>.utl (optional, depending on backup program) and init<DBSID>.sap must exist before you use BACKINT. For the init<DBSID>.sap profile, you only have to set the backup_dev_type parameter to util_file and define the profile name of the external backup program in the util_par_file parameter. You might have to reconstruct this profile either by editing or by using the external backup program directly.

Then restore the following files one by one:

- BRBACKUP current summary log: $SAPDATA_HOME/sapbackup/back<DBSID>.log

  > OS> **brrestore -b2 "#NULL" –m $SAPDATA_HOME/sapbackup/back<DBSID>.log**

  The last entry in the summary log corresponds to the last backup. This is the relevant entry for the detail log (see next file below). The last entry is usually incomplete (for example, Return Code not

current), but this does not affect any subsequent operations. Note the <coded_timestamp> (that is, the filename without extension) and the <fid> (that is, the filename extension) from the name of this restored file in the restore directory. These are required for the following steps.

- BRBACKUP last detail log, $SAPDATA_HOME/sapbackup/<coded timestamp>.<fid>

    OS> **brrestore -b2 "#NULL" -m $SAPDATA_HOME/sapbackup/<coded timestamp>.<fid>**

You can restore all other files in the same way with this command:

    OS> **brrestore -b2 "#NULL" -m <pathname>**

Replace <pathname> by:

    $ORACLE_HOME/dbs/init<DBSID>.ora
    $ORACLE_HOME/dbs/init<DBSID>.sap
    $ORACLE_HOME/dbs/init<DBSID>.dba
    $ORACLE_HOME/dbs/init<DBSID>.utl
    $SAPDATA_HOME/saparch/arch<DBSID>.log
    $SAPDATA_HOME/sapreorg/struct<DBSID>.log
    $SAPDATA_HOME/sapreorg/reorg<DBSID>.log
    $SAPDATA_HOME/sapreorg/cntrl<DBSID>.dbf

> The last item above, for the control file, is only necessary when the offline redo log files were saved with RMAN after the last run of BRBACKUP was started.
>
> If the control file is reloaded, you must copy it to all the original locations defined in the Oracle parameter control_files.

The procedure described above is complex. Alternatively, you can use the external tool's restore function.

Resetting the Database to the Last Backup

You always have to recover an online backup to a point in time after the backup. You can also perform a recovery for an offline backup if you want a more up-to-date status than that of the restored offline backup.

Restore control files if not yet restored:

    OS> **brrestore -b <coded_timestamp>.<fid> -m 0**

Restore online redo log files if an offline backup is used:

    OS> **brrestore -b <coded_timestamp> -m 00**

Mount the database if the backup was done using RMAN:

    SQL> **connect / as sysdba**
    SQL> **startup mount**

Restore all database files:

    OS> **brrestore -b <coded_timestamp>.<fid> -m all**

You have determined <coded_timestamp> and <fid> from the summary BRBACKUP log in a previous step.

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> If you want to perform further recovery, do **not** open the database at this point. This can happen after the restore of an offline backup.

Recovery Procedure

Remove the BRBRACKUP tape from the tape drive and replace it with the BRARCHIVE tape.

Restore the required offline redo log files:

```
OS> brrestore -a <log_seg_No_A>-<log_seg_No_B>
```

`<Log_Seg_No_A>` is the current log sequence number found in the header of the BRBACKUP log.

`<Log_Seg_No_B>` corresponds to the sequence number of the last offline redo log file backed up

(that is, the last entry in the summary BRARCHIVE log: `arch<DBSID>.log`).

You can perform database recovery using the Oracle SQLPLUS as follows (mount the database only if not yet done):

```
SQL> connect / as sysdba
SQL> set autorecovery off
SQL> startup mount
SQL> recover database using backup controlfile until cancel
```

You must confirm every recovery step with `ENTER`. After the entire recovery procedure is finished, complete this step with cancel.

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

ADDITIONAL INFORMATION

SAP Library

You can find more information on Oracle database administration and the contents of this document in the SAP Library as follows:

All paths refer to SAP NetWeaver 7.3.

1. Call up the SAP Help Portal at **help.sap.com/nw73** → *Application Help* → *SAP Library: English.*

2. Choose *SAP NetWeaver Library: Function-Oriented View* → *Database Administration* → *Database Administration for Oracle* → *SAP Database Guide: Oracle* → *Approach to Oracle DBA* → *Restore and Recovery* → *Disaster Recovery..*

You can also find this plus selected extracts from the SAP Library at:

www.sdn.sap.com/irj/sdn/ora → *SAP on Oracle Knowledge Center* → *SAP Documentation in Help Portal*

SAP Notes

You can find SAP Notes at:

service.sap.com/notes