BR*Tools to Back Up the Oracle Database

White Paper: Oracle Database Administration

BR*TOOLS TO BACK UP THE ORACLE DATABASE

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BR*TOOLS TO BACK UP THE ORACLE DATABASE

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INTRODUCTION

All the business application data of the three-tiered SAP client/server system is saved in a relational database. Therefore, it is essential to perform backups regularly using an appropriate backup strategy. You need to not only regularly back up data and other components of the relational database but also profiles and SAP programs that have been changed (for example, during an upgrade).

The basic backup programs (for example, "dd," "cpio," "tar") for UNIX operating systems are not optimal on their own for backing up a relational database because they do **not**:

- Deal with special problems that may be encountered during a database backup
- Provide tape management

Therefore, SAP offers its own backup programs and tools to help you easily perform complete backups of the SAP system, so ensuring smooth and trouble-free system operation.

Status

The following SAP tools are available for backing up and managing Oracle database backups:

- BRBACKUP

  Backup of data files, control files and online redo log files of the database

- BRARCHIVE

  Backup of the offline redo log file

- BRRESTORE

  Restore of data files, control files, online redo log files and offline redo log files

- BBRECOVER

  Automatic restore/recovery, disaster recovery

General Information

BRBACKUP and BRARCHIVE for backing up data are command-line programs, which you can easily schedule in the background. You can call online help when entering parameters. The messages of both programs are available in English and German.

The backups are based on the following programs:

- cpio, dd in a UNIX environment (cp or dd for a disk backup). See figure "SAP – Oracle Database Backup Using cpio or dd" [page 4] below.
- MKS-cpio, MKS-dd for Windows – deprecated for BRTOOLS native tape copy routines ("copy" or MKS-dd for a disk backup)
- External backup programs that can be accessed using the BACKINT interface program. See graphic "SAP – Oracle Database Backup Using an External Backup Program" [page 10] below.
- Oracle Recovery Manager (RMAN) on both UNIX and Windows platforms. For more information, see the documentation BR*Tools with Oracle Recovery Manager at:

  www.sdn.sap.com/irj/sdn/ora → *SAP on Oracle Knowledge Center → Key Topics → Backup and Recovery*

SAP – Oracle Database Backup Using cpio or dd

Oracle Database
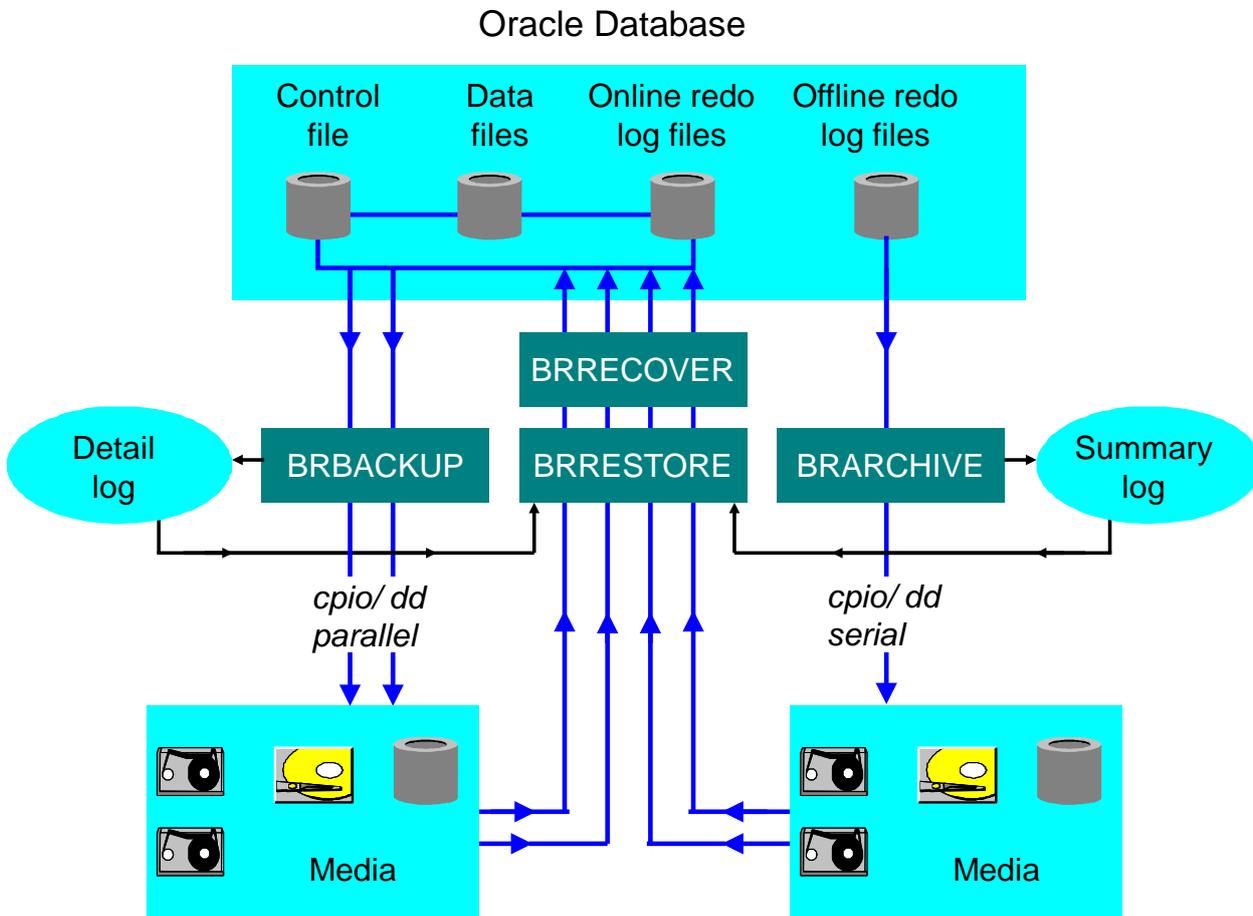
All actions are logged in the file system and corresponding database tables. Backup logs and profiles are always included in backups performed by BRBACKUP and BRARCHIVE.

BRBACKUP and BRARCHIVE allow extensive volume management. To use the functions provided, the volumes need to be initialized with BRBACKUP and BRARCHIVE to ensure that they include an SAP-specific label. Volumes that have not been released for use cannot be overwritten, if the retention period has not expired.

You can use query mode to find the names and number of volumes required for BRBACKUP and BRARCHIVE or BRRESTORE, without starting a backup or restore.

BR*Tools provide a complete and detailed verification to be performed when the backup is completed.

BRBACKUP

The BRBACKUP tool allows an online or offline backup of the control file, of data files in individual or all tablespaces and, if necessary, of the online redo log files, as shown in the graphic "SAP – Oracle Database Backup Using cpio or dd" [page 4] above. BRBACKUP also saves the profiles and logs relevant for the backup.

In addition to the actual backup, BRBACKUP also:

- Changes the state of the database automatically, depending on the type of backup wanted (that is, online or offline)
- Checks the status of files
- Optimizes the data distribution on the backup media. The algorithm for distribution is specially adapted to the requirements of a database backup, that is, to backing up a small number of large files. The distribution of data depends on whether you carry out a serial or parallel backup
- Performs software compression, if the option is selected
- Saves to hardware compressing tape stations, taking previously determined compression rates into account

The BRCONNECT program makes sure that the database status required for the online or offline backup remains unchanged during the backup. The saving rates largely depend on the number of tape stations in use and the CPU load (particularly when software compression is used).

You can also back up any files or directories you want. However, the backup of a directory is restricted to the files it contains. This enables backups of all SAP objects that do not belong to the database (for example, programs, SAP start profiles, selected logs, and so on).

You can also perform database backups on several disks or remotely connected tape stations. BRBACKUP also supports Oracle databases on raw devices and, Oracle Real Application Cluster (RAC), and Oracle Automatic Storage Management (ASM), including Oracle database appliances like Oracle Exadata Database Machine configurations.

BRARCHIVE

You can use the BRARCHIVE tool to back up the offline redo log files, that is, the online redo log files saved to the archiving directory by Oracle. For more information, see the graphic "SAP – Oracle Database Backup Using cpio or dd" [page 4] above. BRARCHIVE also saves all the logs and profiles of the backup process.

Reasons for backing up offline redo log files include the following:

- In the event of a failure, a consistent database status can only be recovered, if all relevant redo log files are available.
- The database system of a production SAP System has to be operated in the ARCHIVELOG mode to prevent overwriting of unsaved online redo log files. To protect the archive directory against overflowing, it has to be emptied regularly.
- An online backup of data files is useless if the related redo log files are missing. Therefore, you must back up the offline redo log files generated during the online database backup immediately after running BRBACKUP.

For security reasons, BRARCHIVE offers duplicate backup of offline redo log files (redundant serial or parallel backup is possible). On the basis of the logs, BRARCHIVE can make sure that redo log files are not deleted before they have been backed up and that the same files are saved once or twice.

BRARCHIVE allows the database administrator to continually back up offline redo log files. This means that the archiving directory, where Oracle places the offline redo log files, can be kept free by continually saving and then deleting saved redo log files.

You can save offline redo log files on local or remote tape or on local or remote disk. Backup on disk is used particularly in the standby database environment.

BRRESTORE

You can use the BRRESTORE tool to restore files of the following type:

- Database data files, control files and online redo log files saved with BRBACKUP
- Offline redo log files saved with BRARCHIVE
- Non-database files saved with BRBACKUP

You can specify files, tablespaces, complete backups, log sequence numbers of redo log files, or the position of a file on tape. The BRRESTORE program automatically determines the corresponding backup tape and the position of the files needed on the tape. BRRESTORE checks whether the required free disk space is available to allow the files to be restored.

If you perform an automatic recovery with BRRECOVER, BRRESTORE is called internally to restore the files from the backup.

BRRECOVER

You can use the BRRECOVER tool to help recover your database with the following functions:

- Complete database recovery
- Database point-in-time (PIT) recovery
- Tablespace point-in-time (PIT) recovery
- Whole database reset
- Restore of individual backup files
- Restore and application of offline redo log files
- Disaster recovery

BRRECOVER recovers transactions lost since the database backup, using backups of the offline redo log files to roll forward the lost transactions. BRRECOVER supports database recovery after:

- Media errors, such as a disk crash or accidental deletion of database files
- User errors such as software problems or when a user accidentally drops a table
- Disaster, when the entire database is lost, including backup profiles and logs

After recovery, BRRECOVER automatically rebuilds NOLOGGING indexes that were created during or after the backups used. For more information, see SAP Note 849485.

BACKUP CONCEPT

Your chosen backup concept depends basically on data volumes, available hardware and tolerated downtimes in the event of an offline backup or a recovery. A reliable backup concept is essential to deal with situations such as:

- Database failure due to faulty disk
- Database failure due to handling errors
- Resetting the database to a previous status
- Disaster recovery

A possible backup strategy for the Oracle database of a productive SAP System is for example:

- Complete database backup (offline) every weekend with backup verification
- Complete database backup (online) daily (on working days)
- Daily double backup of offline redo log files after an offline backup or directly after an online backup
- Possibly an additional logical backup (using Oracle export) of the most important tables

The amount of data involved varies. It ranges from about 50 GB with little redo information to about 500 GB or more, with 10 GB redo information per day, when a production system is using OLTP processing.

Capacity planning for the future might estimate values of up to several TB data in a database, depending on the application. The backup procedure for such large amounts of data has to consider tolerated downtimes and incorporate technical strategies to ensure high availability and prevent failures. For example, you can achieve this by using an Oracle Real Application Cluster (RAC) configuration, disk mirroring with a RAID system, or having a standby database system.

Measures taken to prevent hardware failure do not help if a logical error occurs. For this reason, restoring with BRRESTORE and recovering data with BRRECOVER is just as important as the data backup with BRBACKUP and BRARCHIVE. For more information, see "Additional Information" [page 15].

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We recommend that you verify backups, ideally once a week, and at least once in each tape management cycle.

EXTERNAL BACKUP PROGRAMS

All SAP backup programs can call the interface program BACKINT that enables them to communicate with an external backup program, as shown in the graphic below.

SAP – Oracle Database Backup Using an External Backup Program
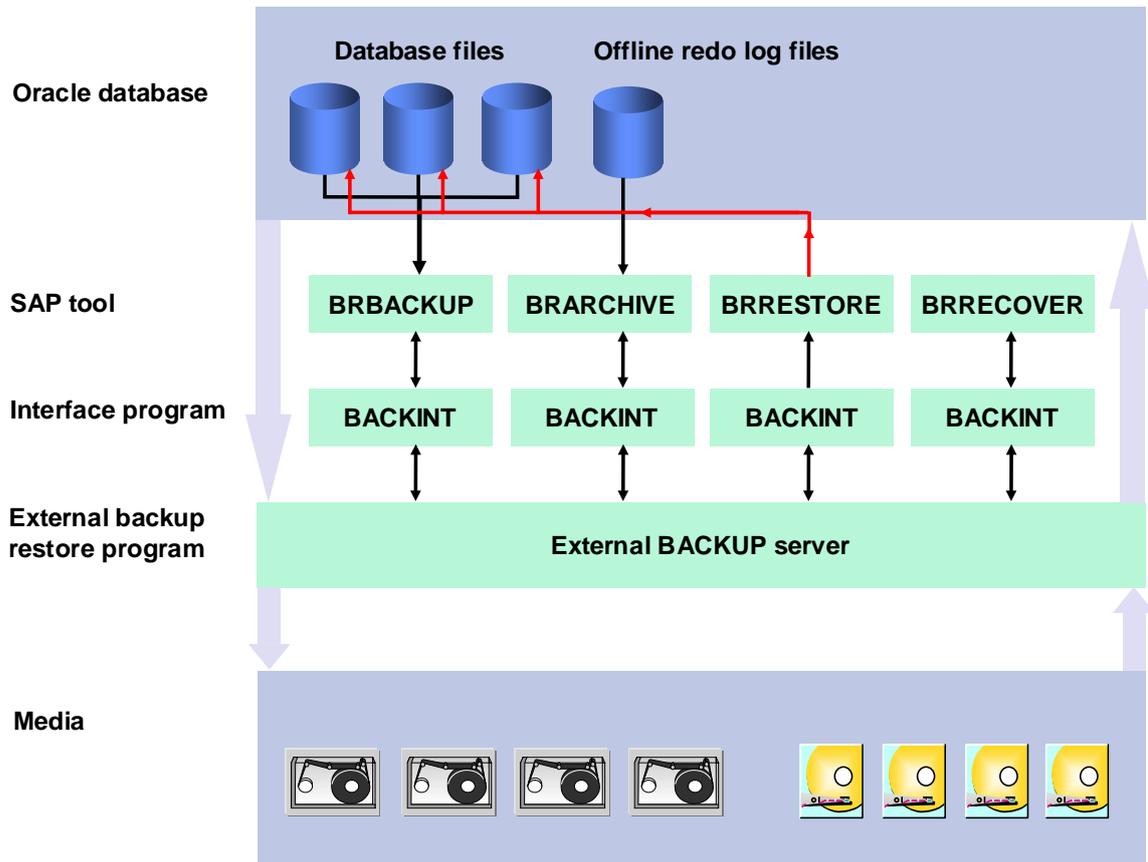
BACKINT is generally implemented and sold by the vendor of the external backup program. SAP assumes responsibility for defining BACKINT and guarantees the functions related to BRBACKUP, BRARCHIVE, BRRESTORE, and BRRECOVER.

SAP has defined a BACKINT certification for external backup tools to ensure optimal functions in combination with BACKINT.

Most of the external backup programs support well-known UNIX operating systems as well as Windows on the client side.

We strongly recommend using the BACKINT solution only with certified external backup tools. The advantages of this solution are:

- A uniform backup strategy for the database and the file system
- Client/server backup configuration allows use of one backup server
- Support of various backup media such as tape robots

The BACKINT interface provides granular (that is, dynamic) switching for the tablespace status (BEGIN-/END-BACKUP) during backup. This drastically reduces the volume of redo log information.

For a list of companies and their products supporting the BACKINT interface, see:

www.sap.com/partners

For more information on the external backup programs, contact the relevant vendor.

COMPUTING CENTER MANAGEMENT SYSTEM

With the Database Planning Calendar of the Computing Center Management System (CCMS), you can schedule and start several database administration tasks and check their results. See transaction DBACOCKPIT. For example, you can start and check online or offline backups with BRBACKUP and backup of offline redo log files with BRARCHIVE, as shown in the graphic below.

CCMS – DBA Planning Calendar

CCMS lets you check the results of performed database actions by displaying the following:

- Overview of all backups, the last successful, or last unsuccessful backup performed with BRBACKUP
- The location and status of the redo log directory as well as the amount of free space available in the directory, the archive status of offline redo logs and BRARCHIVE action logs.
- Check on the adequacy of your backups for a recovery and the backup and redo logs that are currently required to recover the database

For more information, see the graphic "CCMS – Overview of BRBACKUP or BRARCHIVE Backups" [page 13] below.

You can also display detailed information including the runtime of the actions and the amounts of data transferred.

CCMS – Overview of BRBACKUP or BRARCHIVE Backups

ADDITIONAL FUNCTIONS

The following additional functions are available:

- Backup of non-database files with BRBACKUP

- SAP tool BRRESTORE integrated in BRRECOVER for restoring files

- Verification of completed backups

- Support of raw devices

- Support of Oracle Storage Management (ASM)

- Support of the Oracle Real Application Cluster (RAC) configuration

- Support of Oracle database appliances like Oracle Exadata Database Machine

- Backup of file system files with the dd command

- Support of the Oracle standby database configuration

- Restart for BRBACKUP and BRRESTORE.

  If a backup or a restore fails, you can continue with the remaining objects. You do not have to start from the beginning. You can also use this function to assure the completeness of partial backups.

- Delayed verification of a backup

  You can perform the verification at any time after the backup. This can improve performance and shorten the backup.

- Database and offline redo log backups on one tape

  This is a BRBACKUP and BRARCHIVE run on one tape. For example, after the backup the tapes are not rewound but BRARCHIVE continues writing the archive logs on them and performs the end label checking.

- Backup of a disk backup using two-step backup strategy

  This is a database backup to disk and then a backup of the disk to tape. You can perform this under full control of BRBACKUP or BRARCHIVE.

- Consistent online backup

  If you cannot perform an offline backup, you can perform an online backup which includes the offline redo logs generated during the online backup as an alternative. The entire backup is then logically consistent.

- Backups with jukeboxes and autoloaders

  These select and mount tapes in an arbitrary sequence.

- Integration of Oracle Recovery Manager (RMAN)

  RMAN is integrated into the SAP backup tools BRBACKUP, BRARCHIVE, and BRRESTORE. For example, this enables you to perform SAP-supported incremental backups.

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.*
3. Choose one of the following:
   – *Approach to Oracle DBA* → *Database Backup or Restore and Recovery*
   – *BR*Tools for Oracle DBA* → *BR*Tools in Detail* → *BRBACKUP or BRARCHIVE or BRRESTORE or BRRECOVER*

   You can also find these 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.