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ORACLE DATABASE 10g   **Oracle Recovery Manager**

Oracle Recovery Manager satisfies the most pressing demands of performant, manageable backup and recovery, for all Oracle data formats.

A complete high availability and disaster recovery strategy requires dependable data backup, restore, and recovery procedures. Oracle Recovery Manager (RMAN), a command-line and Enterprise Manager-based tool, is the Oracle-preferred method for efficiently backing up and recovering your Oracle database. RMAN is designed to work intimately with the server, providing block-level corruption detection during backup and restore. RMAN optimizes performance and space consumption during backup with file multiplexing and backup set compression, and integrates with leading tape and storage media products via the supplied Media Management Library (MML) API.

RMAN takes care of all underlying database procedures before and after backup or restore, freeing dependency on OS and SQL*Plus scripts. It provides a common interface for backup tasks across different host operating systems, and offers features not available through user-managed methods, such as parallelization of backup/recovery data streams, backup files retention policy, and detailed history of all backups.

Overview of RMAN Functional Components

The RMAN environment consists of the utilities and databases that play a role in backing up your data. At a minimum, the environment for RMAN must include the following:

- The target database to be backed up
- The RMAN client, which interprets backup and recovery commands, directs server sessions to execute those commands, and records your backup and recovery activity in the target database control file.

Some environments will also use these optional components:

- A flash recovery area, a disk location in which the database can store and manage files related to backup and recovery
- Media management software, required for RMAN to interface with backup devices such as tape drives
- A recovery catalog database, a separate database schema used to record RMAN activity against one or more target databases

The following diagram illustrates these components:

Technology
. RMAN Overview
. New Features in Oracle Database 10g Release 2
. General Features & Benefits
. Backup Solutions Program (BSP)

Customer Success Stories
. Fannie Mae (pdf)
. ChevronTexaco (pdf)

Product Literature
. Technical Collateral
. OracleWorld Presentations
. Articles

Documentation
. Recovery Manager Quick Start Guide
. Backup and Recovery Basics
. Backup and Recovery Advanced User's Guide
. Recovery Manager Reference

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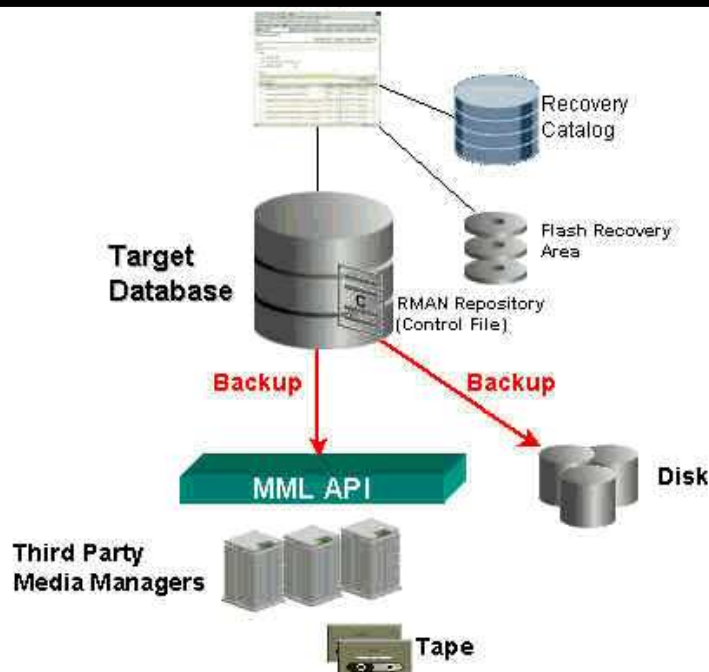· Oracle By Example

Target Database
The target database is the database that you are backing up,
restoring, or recovering with RMAN.

RMAN Client
RMAN is a command-line-oriented database client, much like
SQL*Plus, with its own command syntax. From the RMAN client you
can issue RMAN commands and SQL statements to perform and
report on backup and recovery operations.

RMAN can take interactive input or read input from plain text files
(called command files). RMAN then communicates with one or more
server processes on the target database server which actually perform
the work. You can also access RMAN through the Enterprise Manager
(refer to Oracle Enterprise Manager Administrator's Guide for more
details).

The RMAN executable is typically installed in the same directory as the
other database executables. On Unix systems, for example, the RMAN
executable is located in $ORACLE_HOME/bin.

RMAN Repository
RMAN maintains metadata about the target database and its backup
and recovery operations in the RMAN repository. Among other things,
RMAN stores information about its own configuration settings, the
target database schema, archived redo logs, and all backup files on
disk or tape. RMAN's LIST, REPORT, and SHOW commands display
RMAN repository information.

RMAN repository data is always stored in the control file of the target
database. The CONTROL_FILE_RECORD_KEEP_TIME initialization
parameter controls how long backup records are kept in the control file
before those records are re-used to hold information about more
recent backups. The repository can also be kept in a recovery catalog,
a separate database that keeps historical data on backup activities
much longer than the control file and preserves backup information if
the control file is lost.

Flash Recovery Area
The Automatic Disk-Based Backup and Recovery feature simplifies
managing disk space and files related to backup and recovery, by
managing all backup and recovery related files in a flash recovery

discarded. RMAN then manages your backup storage, deleting obsolete backups and backups already copied to tape when space is needed, but keeping as many backups on disk as space permits. This minimizes restores from tape during data recovery operations to shorten restore and recovery times.

Recovery Catalog
In addition to RMAN repository records, the recovery catalog can also hold RMAN stored scripts, sequences of RMAN commands for common backup tasks. Centralized storage of scripts in the recovery catalog can be more convenient than working with command files. For more information on the recovery catalog see Oracle Database Backup and Recovery Advanced User's Guide.

Media Managers
To access sequential media devices like tape libraries, RMAN uses third-party media management software. A media manager controls these devices during backup and recovery, managing the loading, labeling and unloading of media, among other functions. Oracle Corporation's Backup Solutions Program (BSP) works with vendors to help them produce media management software for their devices. For enterprises that already use media management software in their enterprise, many of those software products can be directly integrated with RMAN. Contact your media management software vendor for details about whether they participate in the BSP and have an RMAN-compatible media management layer.

New Features in Oracle Database 10g Release 2

Backup Set Encryption
Backup security is vital to the well-being of any company. Backups should only be able to be opened and read by their creators. With Oracle Database 10gR2, backup sets made to disk can now be encrypted, for the whole database or particular tablespaces, using the new CONFIGURE ENCRYPTION FOR [DATABASE | TABLESPACE …] option.

Dynamic Channel Allocation for RAC Environments
By configuring the PARALLELISM parameter, RMAN will dynamically allocate the specified number of channels across all active RAC nodes, to perform the backup or restore operation. RMAN utilizes Oracle Clusterware (formerly known as Cluster Ready Services) to allocate channels to the least loaded nodes, to perform the operations. In this way, the overall backup or restore workload can be distributed across the RAC nodes more efficiently.

Enterprise Manager Enhancements
Oracle Enterprise Manager, a single, integrated solution for administering and monitoring systems and applications based on the Oracle technology stack, is further enhanced for managing and monitoring backup jobs.

Database Control allows DBAs to view all backup jobs by date range and backup type (e.g. full, datafile, archive log), along with their status (e.g. "completed", "completed with warnings"), input and output sizes, and output rate. Each backup job can be further drilled down to review input files and output backup sets/image copies, their sizes, and compression ratio (if enabled).

Grid Control offers several enhancements to manage backups across the enterprise. Backup jobs can be viewed across all target databases, and a failed job can be easily restarted without having to resubmit the job again. In case a backup job fails, the DBA can be notified immediately via email. In addition, user-defined RMAN scripts can be created as jobs and applied to any number of target databases. The recovery wizard has also been enhanced to allow restore and recovery to a different Oracle home, in the event that the original Oracle home or database is lost.

General Features & Benefits

1. *Guaranteed, accurate backup and recovery*

The Flash Recovery Area, a single directory on disk or ASM disk group, consolidates all recovery-related files, including control, data, archive log, RMAN backup set files; everything needed by RMAN upon recovery can be retrieved from this directory. With a rapidly dropping price, disk has become a more attractive option for primary backup storage, in addition to faster read/write performance than tape. In addition, Flash Recovery Area can automatically warn administrators of disk capacity issues and obsolete outdated backup sets to reclaim space.

- With the automatic channel failover feature, when an error occurs during a disk backup or restore, RMAN will attempt to complete as much of the job as possible, rather than aborting the job. RMAN accomplishes this by utilizing multiple channels, as specified by the CONFIGURE command. This offers a higher level of resiliency when streaming problems arise and better utilization of system resources, versus restarting jobs manually.

- During a restore, when RMAN finds corruption in a backup, or finds that a backup cannot be accessed, RMAN will try to restore the file from a different backup. RMAN will try to restore the desired file from all possible backups before returning an error. This is done automatically whenever RMAN restores file(s) during the RESTORE or RECOVER commands, relieving the need to search for valid backups and performing a manual RESTORE or RECOVER.

These features are in addition to the Oracle9i RMAN resumeable backup/restore. In case of a failed backup job or restore, restarting the job will automatically pickup the operation from the last successfully backed up file.

2. **Automatic block corruption detection and repair**

   Block Media Recovery allows RMAN to fix a corrupted block (detected on backup) while the data file remains online, and non-affected data continues to be available for selecting and updating. This increases data availability and reduces mean time to recover by selectively restoring and recovering the damaged blocks. Minimal I/O is needed because redo is only applied to damaged blocks.

3. **Comprehensive reporting**

   Using special V$ views, users can retrieve information on all currently executing and completed RMAN backup jobs, as well as details on all backed up files and obsolete backup sets. This output can also be easily viewed in Enterprise Manager, under Backup Set Management.

4. **Performance-optimized, space-saving operations**

   RMAN takes advantage of intimate knowledge of Oracle block structures to provide high backup and restore data streaming performance and efficient file compression. By default, when creating backup sets, RMAN backs up only blocks that are in use (or have ever been used) and saves disk space by merging blocks into as few backup pieces as necessary.

   New features for RMAN in Oracle Database 10g

space usage by 50-75%.

- Block change tracking for incremental backups allows the server to record and read only the changed blocks, rather than performing full data file scans on every operation, thus dramatically shortening completion time.
- With the new DURATION option for the RMAN BACKUP command, DBAs can weigh backup performance against system service level requirements. By specifying a duration, RMAN will automatically calculate the appropriate backup rate. In addition, DBAs can optionally specify whether backups should minimize time or system load.
- For recovery, completion time is reduced through the use of the incrementally updated backup feature. This allows incremental backups to be continually rolled into data file image copies, thus eliminating the need to apply incrementals on recovery.

5. **Intelligent disk consumption monitoring**

New in Oracle Database 10g Release 1, Flash Recovery Area allows administrators to setup notifications on disk space usage and automate obsolescence of expired backup sets, via RMAN client command-line or EM interfaces.

6. **Simple and centralized management**

Administrators can take advantage of the RMAN client command-line interface, whose commands are written in an OS-independent scripting language, or by using the Enterprise Manager Backup and Recovery Management console. With EM, performing backup job scheduling and recovery operations is completely automated via step-by-step wizards.

In addition, EM includes:

- Retention policy parameters
- Mean-time-to-recovery monitoring
- Archived log multiplexing
- New features for EM in Oracle Database 10g Release 1:
    - Backup set and image copies management
    - Flash recovery area settings
    - Catalog synchronization
    - One-button crosscheck

7. **Fine-granular data operations**

RMAN provides fine-granular, on and offline backups at the database, tablespace, archive log, datafile, control file, and block level. Also, both up-to-the-present and point-in-time recoveries can be performed, based on a date or SCN number, by rolling forward archived logs. RMAN in Oracle Database 10g Release 1 eliminates the need for a DBA to manually create an auxiliary instance for tablespace point-in-time recovery (TSPITR). RMAN takes care of instance creation on the same server as the target database, and removal upon completion of the tablespace recovery.

8. **Extensible to third party media managers**

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For additional details on these and other new features,
see the New Features Overview or documentation.

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