




What's New in Oracle Recovery Manager (RMAN) 11g: Comprehensive, Intelligent Backup & Recovery

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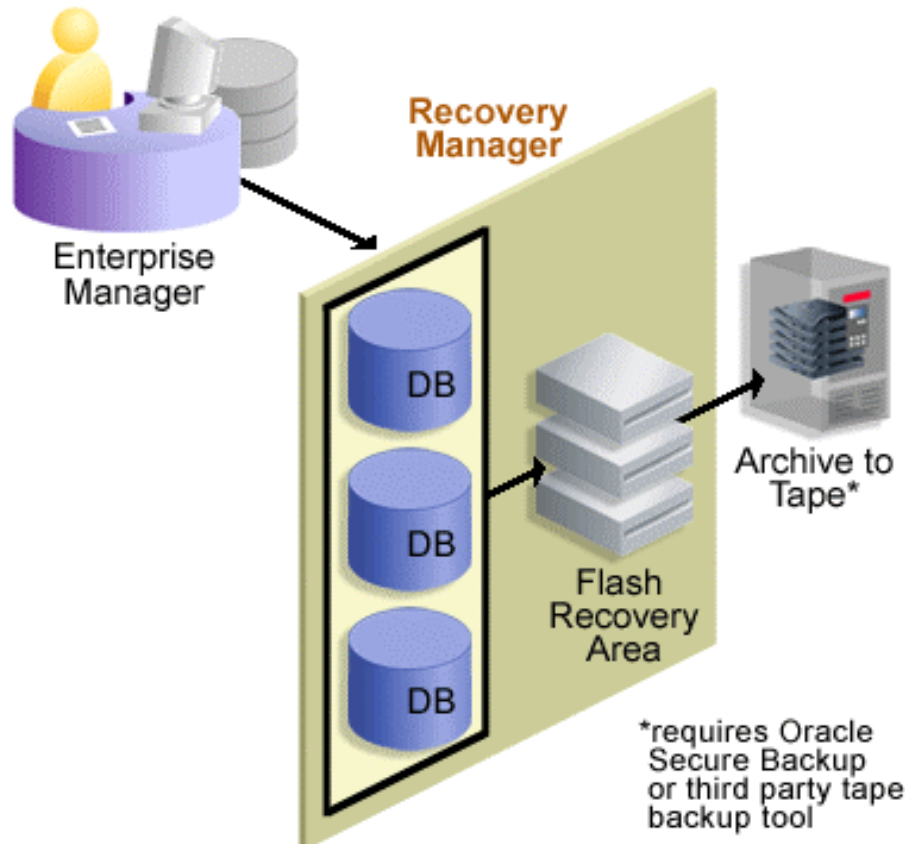
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Agenda

- RMAN Overview
- Oracle Database 11g RMAN New Features
- Best Practices
- Q&A

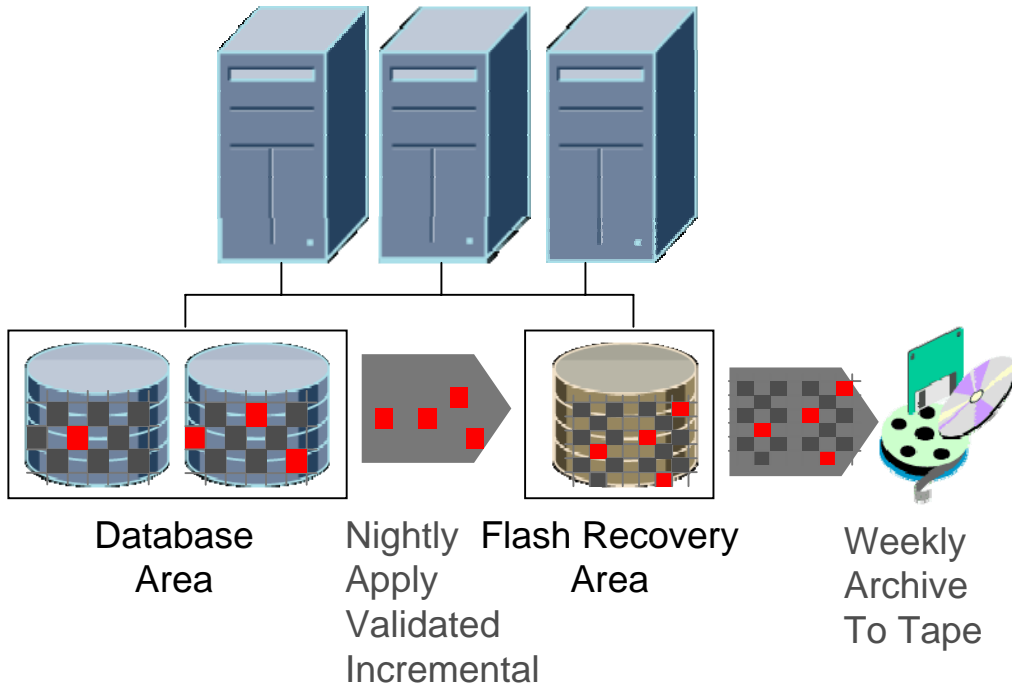
Oracle Recovery Manager - RMAN

The Native Oracle Database Backup & Recovery Utility



- Intimate knowledge of database file formats and recovery procedures
- Create and maintain backup policies
- Catalog all backup and recovery activities
- Operates online and in parallel for fast processing
- Corrupt block detection during backup and restore with the ability to validate backups
- Integrated with Oracle HA solutions such as Oracle Secure Backup, Data Guard, ASM, Enterprise Manager, and also third party backup products

Automated Disk-to-Disk Backups



✓ *Integrated de-duplication*
✓ *Integrated storage tiering*

- Fully automatic disk-based backup and recovery
 - Blocks validated to prevent corruption of backup copy
- Fast incremental backups
 - Backs up only changed blocks
 - Changed blocks are tracked using a very efficient algorithm – 20x faster
- Nightly incremental backup rolls forward recovery area backup
 - No need to do full backups
- Low cost ATA disks can be used for recovery area

RMAN Enhancements

- **Improved performance**

- Intra-file parallel backup and restore of single data files (*multi-section backup*)
- Faster backup compression (ZLIB, ~40% faster)*
- Faster, smaller full backups by eliminating committed undo**

- **Lower space consumption**

- Create clone or standby database without intermediate staging areas using network-enabled DUPLICATE.

*Requires Advanced Compression Option

RMAN Enhancements

- **Improved usage with Data Guard**
 - Assign backups to be only accessible to specific databases
 - Fast incremental backups on physical standby database*
- **New archived log auto-deletion policies**
 - Auto-delete archive logs on primary database if they have been transferred to standby database
 - Auto-delete archive logs if the log has been backed up 'n times' to disk or tape.
- **Better security**
 - Virtual Private Catalog - allows the catalog administrator to grant visibility of a subset of registered databases in the catalog to specific RMAN users

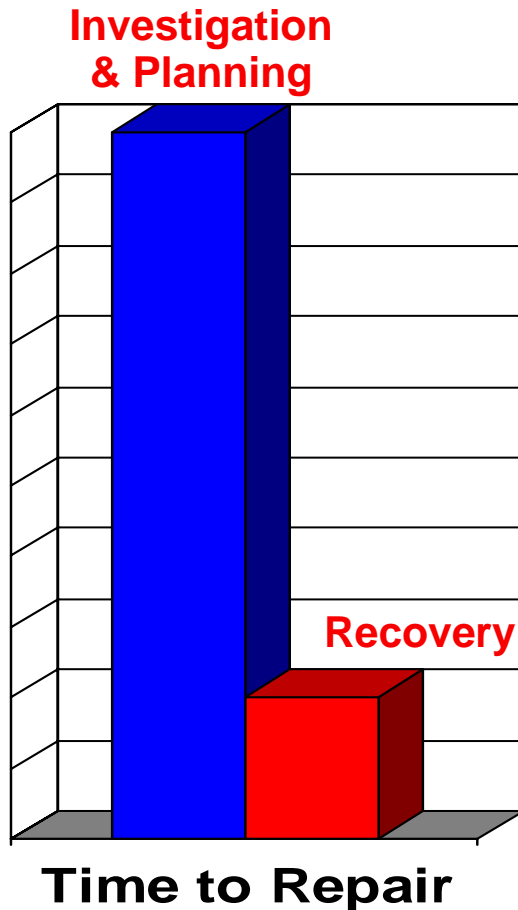
**Requires Active Data Guard Option

RMAN Enhancements

- **Improved handling of online, long-term backups**
 - Retains only the archived logs needed to make backup consistent
- **Faster block media recovery**
 - Utilizes available flashback logs, before going to backups (e.g. tape)
- **Real-time corruption logging to V\$DATABASE_BLOCK_CORRUPTION**
 - 'BACKUP VALIDATE' not needed to populate view before using block media recovery
- **Improved scripting with substitution variables**
- **Integration with Windows Volume Shadow Copy Services (VSS) API**
 - Allows database to participate in snapshots coordinated by VSS-compliant backup management tools and storage products
 - Database is automatically recovered upon snapshot restore via RMAN

Data Recovery Advisor

The Motivation



- Oracle provides robust tools for data repair:
 - ✓ RMAN – physical media loss or corruptions
 - ✓ Flashback – logical errors
 - ✓ Data Guard – physical or logical problems
- However, problem diagnosis and choosing the right solution can be error prone and time consuming
 - Errors more likely during emergencies

Data Recovery Advisor

- Oracle Database tool that automatically diagnoses data failures, presents repair options, and executes repairs at the user's request
- Determines failures based on symptoms
 - E.g. an “open failed” because datafiles f045.dbf and f003.dbf are missing
 - Failure Information recorded in diagnostic Automatic Diagnostic Repository (ADR)
 - Flags problems before user discovers them, via automated health monitoring
- Intelligently determines recovery strategies
 - Aggregates failures for efficient recovery
 - Presents only feasible recovery options
 - Indicates any data loss for each option
- Can automatically perform selected recovery steps
- Accessed via RMAN or EM

Reduces downtime by eliminating confusion

Data Recovery Advisor Wizard

Database Instance: mystar >

Information

1. [Database Failures](#) - 1
2. [Current Status](#) - MOUNTED

Perform Recovery

Oracle Advised Recovery

The Data Recovery Advisor has detected failures. Click on "Advise and Recover" to have Oracle analyze and produce recovery advice.

Advise and Recover

Failures Detected **Critical: 0 High: 1 Low: 0**
Failure Description **One or more non-system datafiles are missing**

User Directed Recovery

Recovery Scope **Whole Database**

Recover

- Operation Type
- ☒ Recover to the current time or a previous point-in-time
Flashback database option is available for faster recovery. You can also recover to a point-in-time prior to the Flashback log retention time. In that case, traditional restore and recovery will be used.
 - ☐ Restore all datafiles
Specify Time, SCN or log sequence. The backup taken at or prior to that time will be used. No recovery will be performed in this operation.
 - ☐ Recover from previously restored datafiles

Overview

- Recover database failures as advised by Oracle
- Restore and/or recover the entire database or selected objects
- Restore files to a new location
- Recover tablespaces to a point-in-time based on a timestamp, system change number (SCN), or log sequence number
- Recover datafile data blocks that are marked as corrupted, or based on datafile block IDs or tablespace block addresses
- Flashback database or tables to a specific system change number (SCN) or timestamp

Data Recovery Advisor – View Failures

ORACLE® Enterprise Manager 11g
Database Control

[Help](#)

Database

Database Instance: mystar >

View and Manage Failures

Last Refresh April 10, 2007 11:34:19 AM EDT 

Select dropdown values and optionally enter failure description and impact strings to filter the data that is displayed in your results set.

Failure Description Impact Priority Status Time Detected
 CRITICAL or HIGH OPEN All

Select failures and ...

[Select All](#) | [Select None](#) | [Expand All](#) | [Collapse All](#)

Select	Failure Description	Impact	Priority	Status	Time Detected
<input type="checkbox"/>	▼ Data Failures				
<input checked="" type="checkbox"/>	▼ One or more non-system datafiles are missing	See impact for individual child failures	HIGH	OPEN	2007-04-10 11:19:53.0
<input checked="" type="checkbox"/>	Datafile 5: '/scratch/oracle/ship070327/oradata/mystar/example01.dbf' is missing	Some objects in tablespace EXAMPLE might be unavailable	HIGH	OPEN	2007-04-10 11:19:53.0

Data Recovery Advisor – Manual Repair

ORACLE Enterprise Manager 11g Database Control

Help
Database

Database Instance: mystar >

Manual Actions

Re-assess Failures

Continue with Advise

The following user actions may provide a faster recovery path for certain simple failures. Click "Re-assess Failures" if user actions are performed.

Manual Action Details

If file /scratch/oracle/ship070327/oradata/mystar/example01.dbf was unintentionally renamed or moved, restore it

Data Recovery Advisor – Recovery Advice

ORACLE® Enterprise Manager 11g
Database Control

[Help](#)

Database

Database Instance: mystar >

Recovery Advice

Cancel

Continue

The Data Recovery Advisor generated recovery advice of: NO DATA LOSS

RMAN Script

```
# restore and recover datafile  
restore datafile 5;  
recover datafile 5;
```

Data Recovery Advisor – Recovery Summary

ORACLE Enterprise Manager 11g

Database Control

[Help](#)

Database

Database Instance: mystar >

Review

Cancel

Submit Recovery Job

The Data Recovery Advisor generated recovery advice of: NO DATA LOSS

☒ Open Database after Recovery

The database is currently not open. Open the database after a successful recovery operation.

Failures That Will Be Resolved

[Expand All](#) | [Collapse All](#)

Failure Description	Impact	Priority
▼ Failures That Will Be Resolved		
▼ One or more non-system datafiles are missing	See impact for individual child failures	HIGH
Datafile 5: '/scratch/oracle/ship070327/oradata/mystar/example01.dbf' is missing	Some objects in tablespace EXAMPLE might be unavailable	HIGH

RMAN Script

```
# restore and recover datafile
restore datafile 5;
recover datafile 5;
```

RMAN Best Practices

- Flash Recovery Area sizing guidelines
 - If you want to keep:
 - Control file backups and archived logs
 - Estimate archived logs generated between successive backups on the busiest days and multiply their total size by 2 (for unexpected redo spikes)
 - Archived logs and Flashback logs
 - Multiply the archived log size between backups by 4
 - Incremental backups
 - Add in their estimated sizes
 - All above and on-disk backup
 - Add in size of the database minus the size of temp files
 - Further details:
http://download.oracle.com/docs/cd/B28359_01/backup.111/b28270/rcmconfb.htm#BRADV89422

RMAN Best Practices ... contd.

- Tuning RMAN backup and restore performance
 - Assess host resource utilization, production disk I/O, HBA/network, and tape drive throughput
 - Minimum performant component of these will be performance bottleneck
- Additional resources
 - RMAN Backup and Recovery Optimization
 - http://www.oracle.com/technology/deploy/availability/pdf/br_optimization.pdf
 - Fannie Mae: Breaking the 1 TB/Hour Backup Barrier
 - http://www.oracle.com/technology/deploy/availability/pdf/2004FannieMaeOracleProfileArticleJune1520041_final.pdf
 - Using Recovery Manager with Oracle Data Guard in Oracle Database 10g
 - http://www.oracle.com/technology/deploy/availability/pdf/RMAN_DataGuard_10g_wp.pdf

Very Large Database (VLDB) Backup & Recovery Best Practices

- Exploit partitioning and read-only tablespaces
 - Older partitions can be moved to read-only tablespaces
 - Backup read-only tablespaces once, then periodically, depending on tape retention policy
- Take incremental backup when NOLOGGING operations finish to ensure recoverability
- Divide full backup workload across multiple days
- Save time with tablespace level backups
 - Backup index tablespaces less frequently than data tablespaces
 - Backup scarcely used tablespaces less frequently
 - Reduce restore time for most critical tablespaces, by grouping them together in separate backups
- Further details:
http://download.oracle.com/docs/cd/B28359_01/server.111/b32024/vldb_backup.htm#BABGJDJE



Q & A

QUESTIONS
ANSWERS