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November 11–15, 2007

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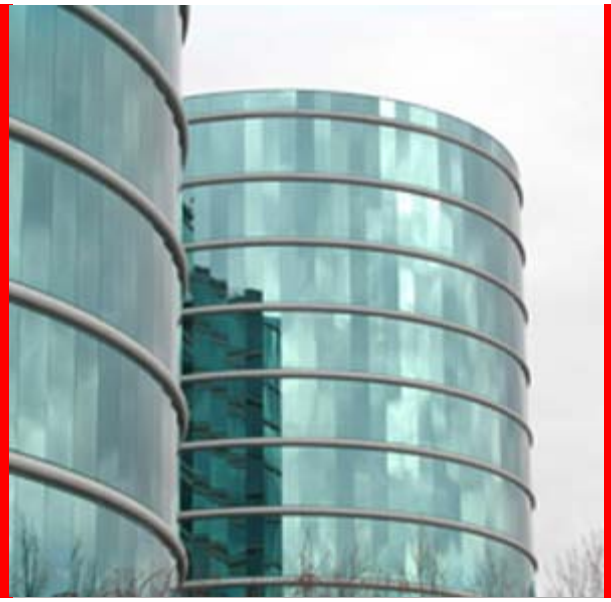

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Oracle Database 11g Data Repair Technologies: Comprehensive, Intelligent Recovery

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Dell Inc.

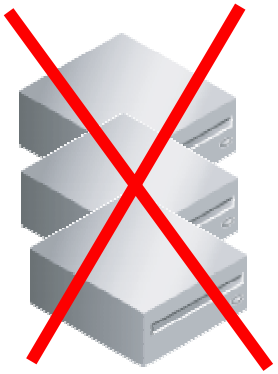
Agenda

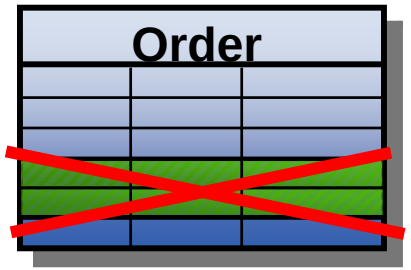
- Data Failures – What Can Happen?
- Oracle Data Repair Technologies
  - Human/application error
    - Flashback Technologies
  - Physical/media failure
    - Data Recovery Advisor
    - Recovery Manager
    - Oracle Secure Backup
- Dell Case Study
- Summary/Q&A

“Where’s My Data?!”

What every DBA dreads..

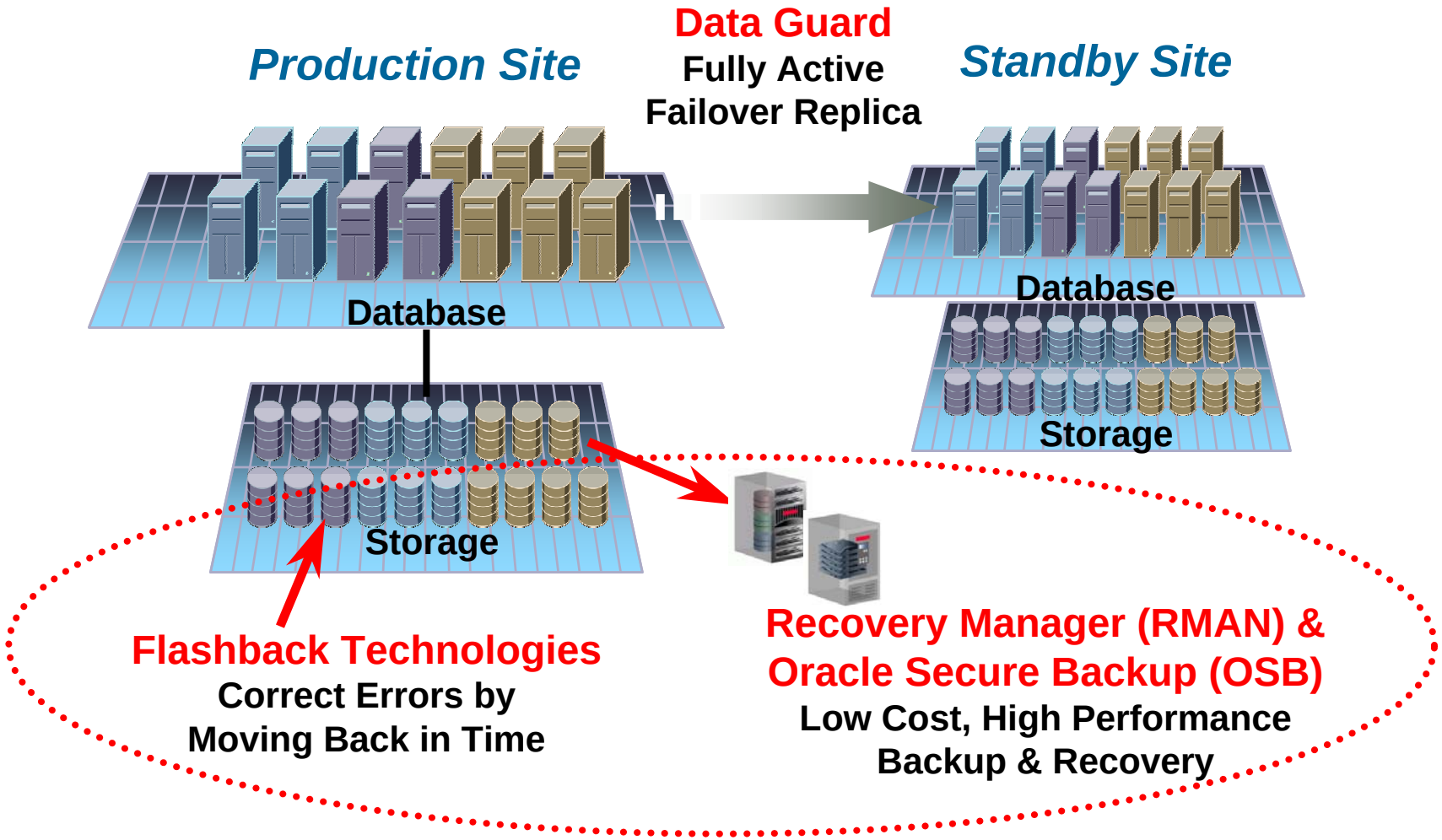
- Data failure root causes:
  - Physical failures
    - Storage failure
    - Bad I/O
    - OS driver issue
    - Data corruption
    - Site-wide disaster
  - Logical failures (i.e. media stays intact)
    - Operator or application error
    - Malicious user



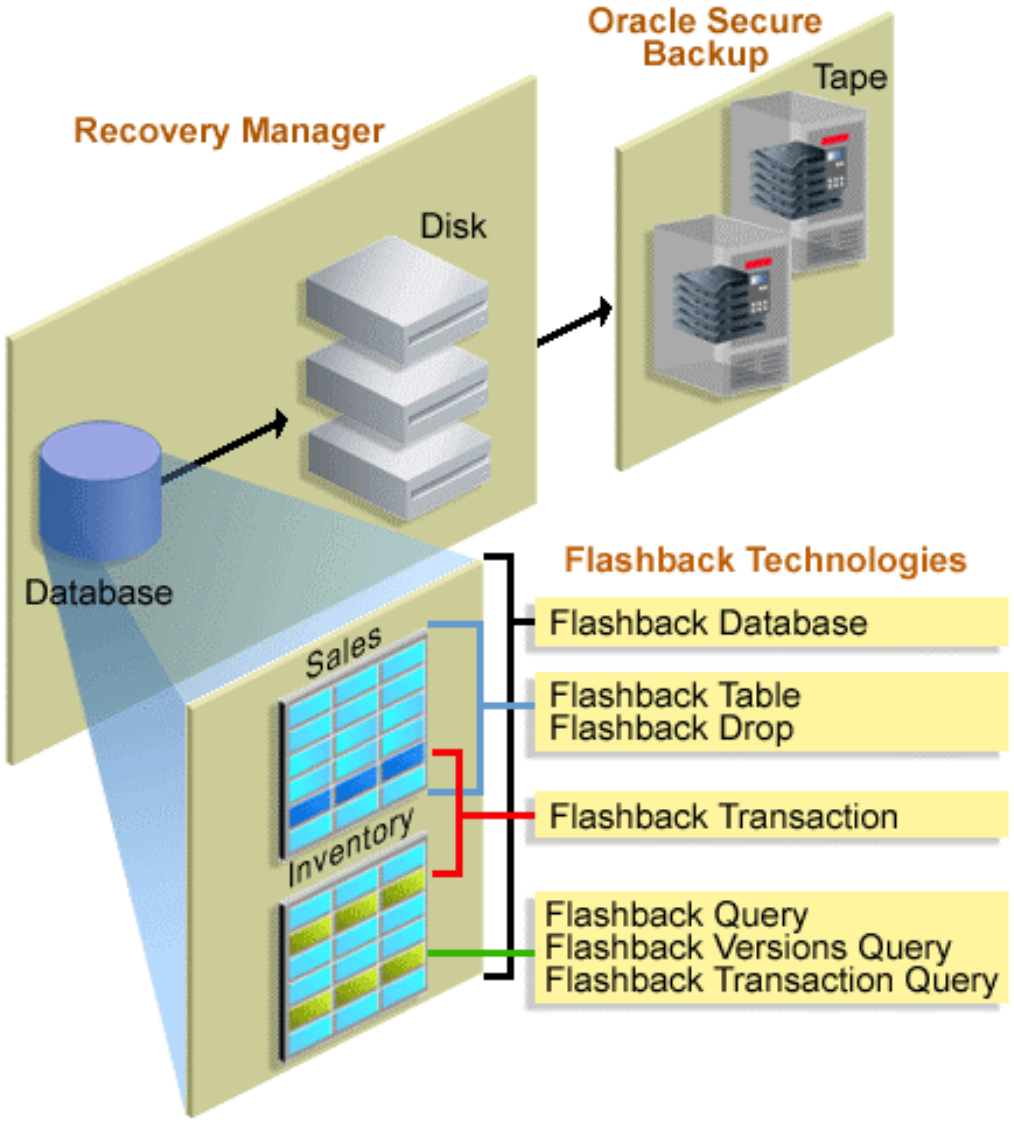


Oracle Data Repair Technologies

Robust & Integrated Data Protection



Oracle Data Repair Technologies



Best Data Repair at Lowest Cost

- Efficient and reliable database backup and recovery
- Fine-grained recovery at row, transaction, table, tablespace, database level
- Fastest database backup and restore to/from tape
- Recovery Manager and Flashback Technologies are included with database
- Oracle Secure Backup offers low cost, fixed pricing per tape drive

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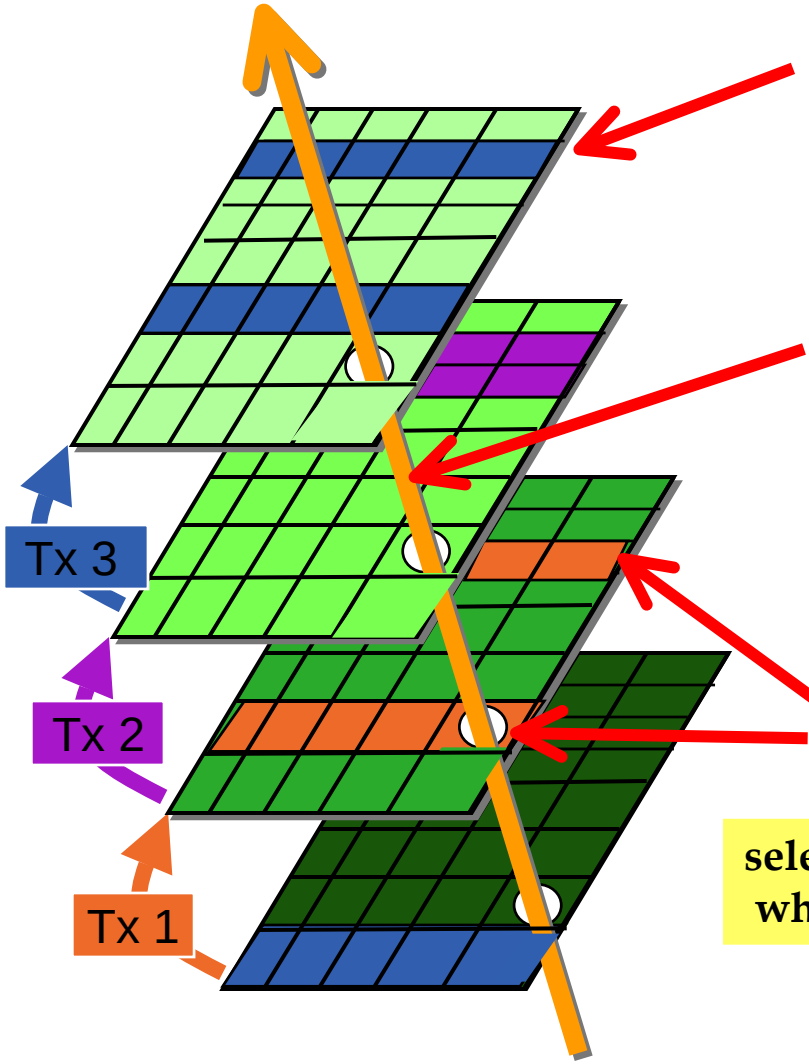
Revolution in Recovery

- Flashback Revolutionizes Error Recovery
  - Operates on just changed data
  - Time to correct error equals time to make error
    - Minutes instead of hours

Correction Time = Error Time + ~~f(DB_SIZE)~~

- Flashback is Easy
  - Single command instead of complex procedure
- Very low performance overhead – less than 2%
- Also great for testing!

Error Investigation with Flashback



- **Flashback Query**
  - Query all data at point in time

```
select * from Salary AS OF '12:00 P.M.' where …
```

- **Flashback Version Query**
  - See all versions of a row between times
  - See transactions that changed the row

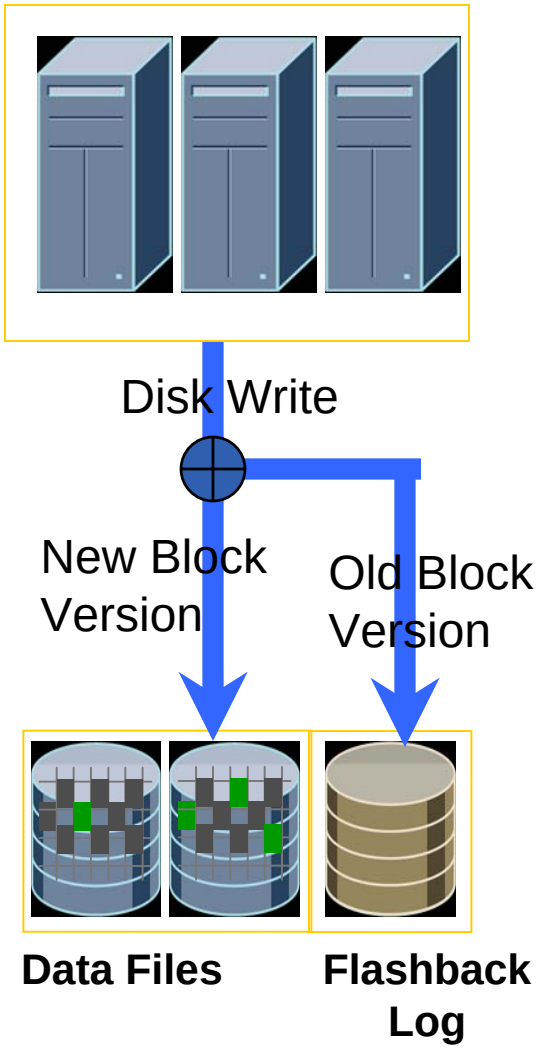
```
select * from Salary VERSIONS BETWEEN
 '12:00 PM' and '2:00 PM' where …
```

- **Flashback Transaction Query**
  - See all changes made by a transaction

```
select * from FLASHBACK_TRANSACTION_QUERY
 where xid = HEXTORAW('0002000300000002D');
```

- **All above are based on available undo**

Flashback Database

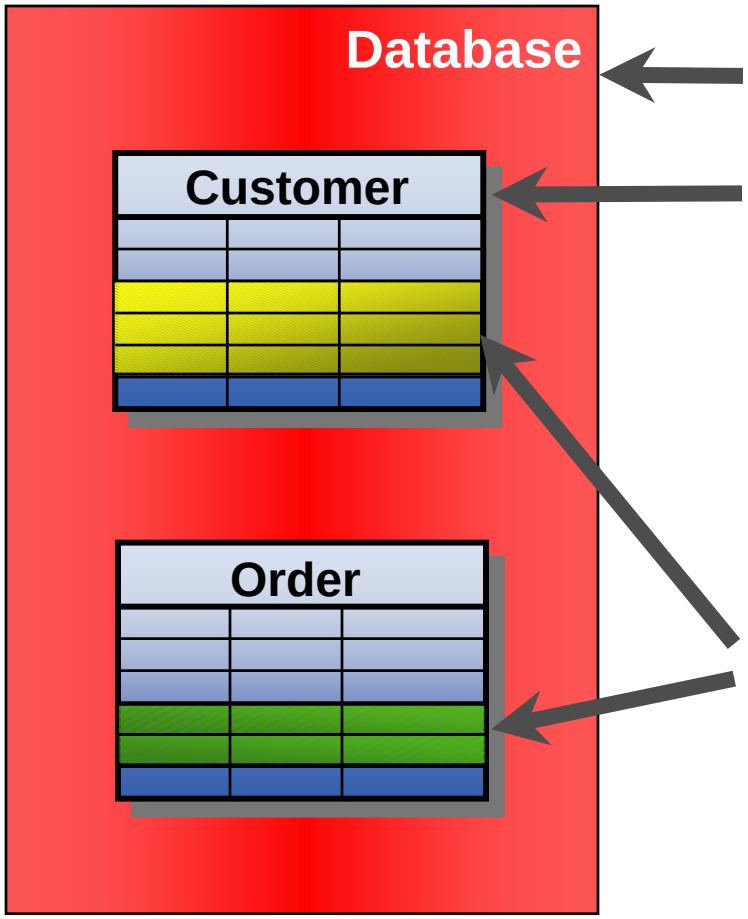


- Fast point-in-time recovery strategy
- Eliminate the need to restore a whole database backup
- Continuous data protection for database
  - Optimized, before-change block logging
  - Restores just changed blocks
  - Replay log to restore DB to desired time
- It's fast - recover in minutes, not hours
- It's easy - single command restore

  Flashback Database to '2:05 PM'

"Rewind" button for the Database

Error Correction with Flashback



- Correct errors at any level
- **Flashback Database** – restore database to point-in-time
- **Flashback Table** – recover contents of tables to point-in-time (undo-based)
- **Flashback Drop** – restore accidentally dropped tables (based on free space in tablespace)

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- **Flashback Transaction** – back out transaction and all subsequent conflicting transactions (redo-based)

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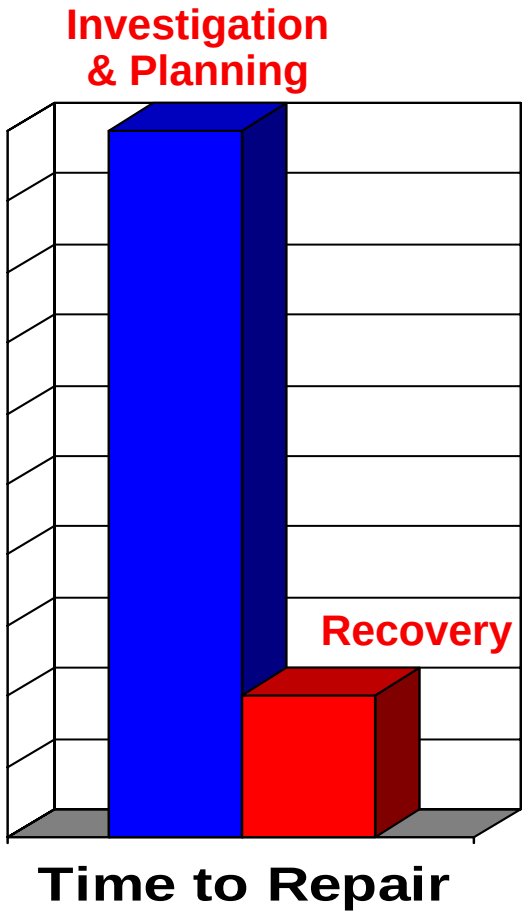
Data Recovery Advisor

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

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- Oracle Database tool that automatically diagnoses data failures, presents repair options, and executes repairs at the user's request

- **Addresses a range of failures**
  - E.g. Database startup issue, block corruption, missing files
- **Determines failures based on symptoms**
  - E.g. an “open failed” because datafiles f045.dbf and f003.dbf are missing
  - Failure information recorded in diagnostic repository (ADR)
  - Flags problems before user discovers them via integrity checks
- **Intelligently determines recovery strategies**
  - Consolidates failures for efficient recovery
  - Presents only feasible recovery options
  - Indicates any data loss for each option
- **Automatically performs user-selected recovery steps, if desired**

Reduces downtime by eliminating confusion

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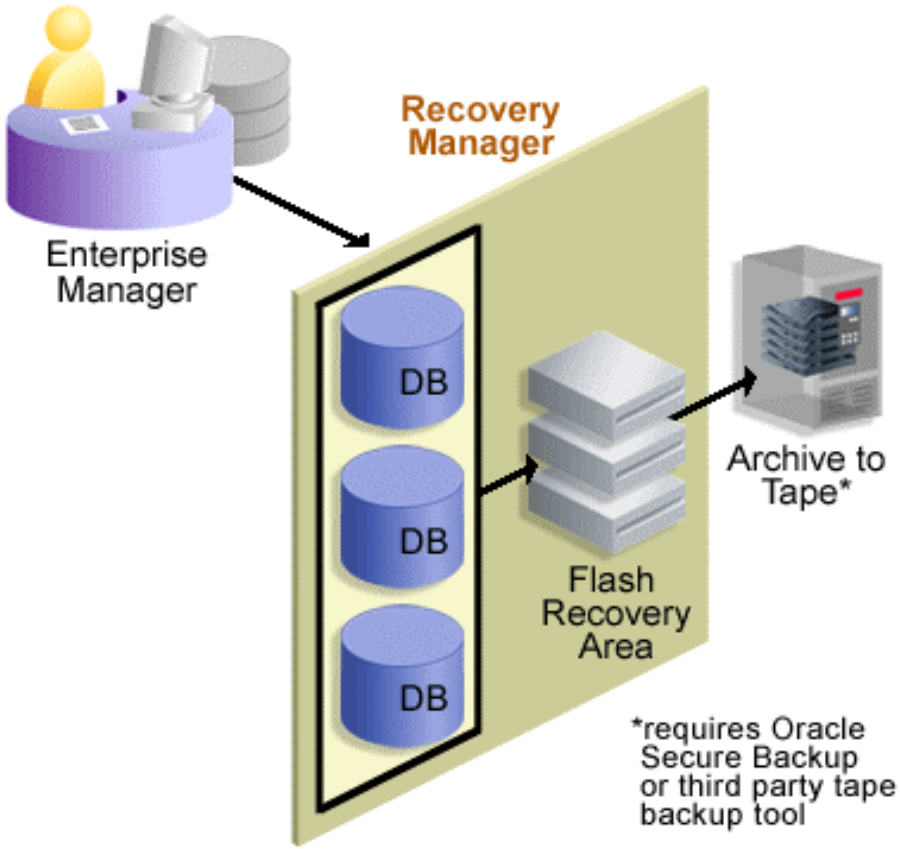
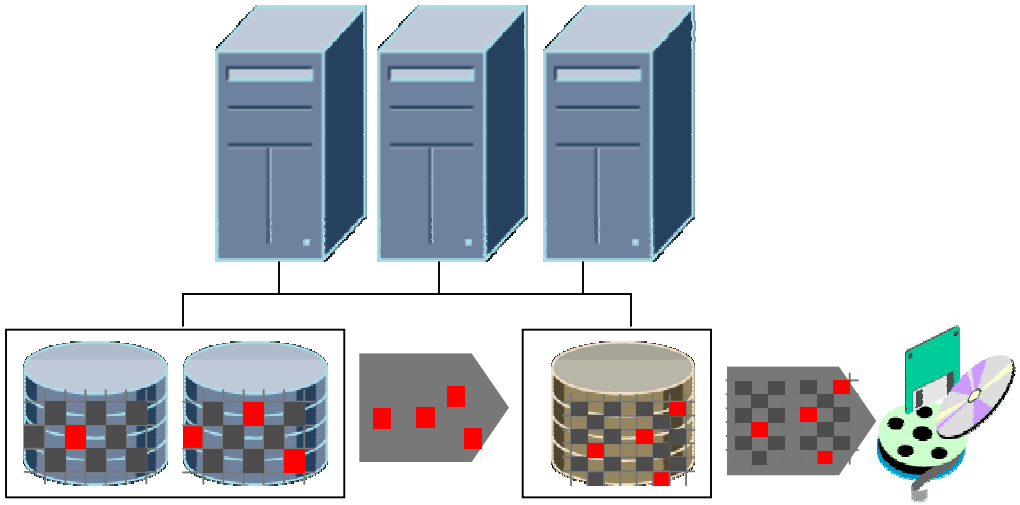
Recovery Manager: Oracle's Backup & Recovery Utility



- Intimate knowledge of database file formats and recovery procedures
- Manages and automates the backup, restore, and recovery process
- 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 Enterprise Manager, Oracle Secure Backup, and third party backup products

Automated Disk Backups



Integrated storage tiering within the database!

- Fully automatic disk-based backup and recovery
  - Set and Forget
- Nightly incremental backup rolls forward recovery area backup
  - Changed blocks are tracked in production DB
- Full scan is never needed
  - Dramatically faster (20x)
  - Blocks validated to prevent corruption of backup copy
- Low cost ATA disks can be used for recovery area

RMAN Enhancements

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- **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`.
- **Improved usage with Data Guard**
  - Assign backups to be only accessible to specific databases
- **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.

RMAN Enhancements

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- **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
- **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

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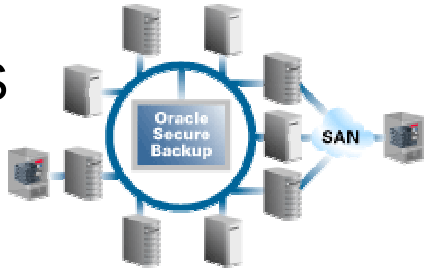
Oracle Secure Backup

Data Protection for Your Entire Environment

- Unified backup management in heterogeneous, distributed environments over LAN, WAN or SAN
  - **File systems:** Unix / Linux / Windows / NAS
  - **Oracle Database:** Oracle9*i*, Oracle Database 10*g* and 11*g*
- Multi-faceted security levels
- Policy-based backup management
- Independent release schedule and versioning from the database
  - OSB 10.1 – GA
  - OSB 10.2 – Now in beta

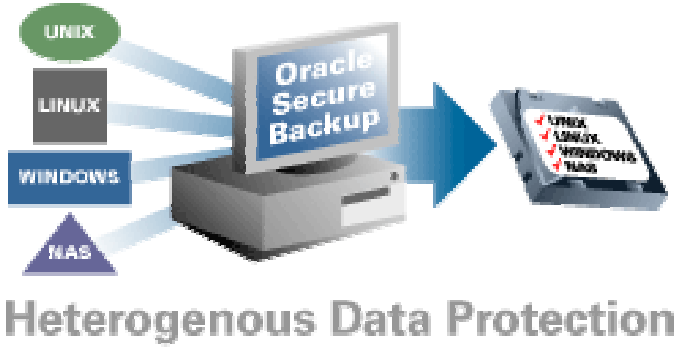


Centralized Tape Backup Management

Oracle Secure Backup 10.2

Enhancements

- **Increased Security for data and backup domain**
  - Backup encryption for file systems and Oracle9*i,* Oracle Database 10*g*, Oracle Database 11*g*
  - Hardening of security architecture between client and media server
- **Advanced media management**
  - Vaulting
  - Tape duplication
  - StorageTek ACSLS support
- **Improved Manageability**
  - Automated backup of OSB catalog
  - Policy-based migration from VTL to tape
- **Improved Performance**
  - Tighter integration with the Oracle Database reduces data movement overhead
  - Eliminates backup (and reads) of committed undo



Advanced Functionality at NO Extra Cost!

Dell Case Study

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Summary

- Research all potential data failures based on root cause and business impact
  - Do not underestimate impact of user/application errors
- Leverage built-in Oracle Data Repair Technologies
  - Flashback Technologies
    - Fine-granular recovery at row, transaction, table, database levels
  - Recovery Manager
    - Comprehensive physical backup and recovery
    - Failure-aware and automated Data Recovery Advisor
  - Oracle Secure Backup
    - Centralized tape backup for database and filesystem
    - Fastest Oracle database backup
    - Low-cost, per-tape drive licensing

QUESTIONS
ANSWERS

Database HA Sessions From Oracle Development

Wednesday, Nov 14

- **S291487 - Backup and Recovery Best Practices for Very Large Databases (VLDB), 11:15 am - 12:15 pm, Moscone South 104**
- S291920 - Oracle Active Data Guard: How to Utilize Your Standby Databases for Production Workload - What They Didn't Print in the Manuals, 3:00 - 4:00 pm, Moscone South 304
- S291917 - Oracle Data Guard Tips and Tricks: Direct From Oracle Development, 4:30 - 5:30 pm, Moscone South 102

Thursday, Nov 15

- S291495 - Oracle Streams Replication and Advanced Queuing (AQ): What's New in Oracle Database 11*g*, 8:30 - 9:30 am, Moscone South 304
- S291499 - Best Practices for Implementing Replication with Oracle Streams in Oracle Database 10*g* and 11*g*, 10:00 - 11:00 am, Moscone South 304
- S291525 - Maximum Availability Architecture (MAA) Best Practices: Online Patching, Rolling Upgrades and Planned Maintenance with Minimal Downtime with Oracle Database, 11:30 am - 12:30 pm, Moscone South 104
- S290542 - Maximum Availability Architecture (MAA) Best Practices for Siebel 8.0, 2:30 pm - 3:30 pm, Marriott Salon 10 & 11


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