Agenda

• Environment Overview
• RMAN Best Practices
  • Data Guard
  • Streams
• Nokia Case Study
• British Telecommunications Case Study
• Summary
• Q&A
Environment Overview

**Production Site**

- Primary Database

**Active Standby Site**

- Standby Database

**Data Guard / Streams**

- Active-active Sites, Data Protection, Rolling Upgrades

**Recovery Manager**

- Data Protection & Archival

- **Data Guard**
  - Comprehensive data protection, fast failover
  - Zero data loss over large distances

- **Streams**
  - All sites active, multi-master replication
  - Database platform & release-neutral

- **Recovery Manager (RMAN)**
  - Fully automated disk-based backup & recovery
  - Corrupt block detection during backup & restore
RMAN & Data Guard

- RMAN & Physical Standby
- RMAN Configuration
- Backup & Recovery Strategies
- RMAN & Logical Standby
RMAN & Physical Standby

Production Database

Redo Shipping

Physical Standby DB

RMAN Backup

Flash Recovery Area

RMAN Backup

Flash Recovery Area

Recovery Catalog

Archive to Tape

Integrated RMAN & Data Guard Configuration

• Single-step, no-downtime standby database creation
• Offload backups to physical standby database
• Share backups among databases
RMAN Configuration Best Practices
Setup Flash Recovery Area & Recovery Catalog

• On all databases:
  • Configure Flash Recovery Area (archived logs, backups, etc.), SPFILE

• Oracle Database 10g target database and catalog:
  • Setup identical datafile directories on primary and standby databases.
  • Uniquely name archived log and backup directories for each database.
  • [CROSSCHECK | DELETE] ARCHIVELOG LIKE <directory name>
  • Uniquely TAG backups, if they are taken on primary and standby databases.
  • Specify tag in CROSSCHECK, DELETE, RESTORE commands.

• Oracle Database 11g target database and catalog:
  • Enhanced catalog tracks files & backups based on DB_UNIQUE_NAME
  • Restore auto-adjusts datafile names – no more ‘SET NEWNAME’
  • Primary controlfile can be restored as standby control file & vice versa
  • Physical standby leverages block change tracking for fast incrementals.

• Protect Recovery Catalog
  • RMAN backup, resync to secondary catalog, Data Guard, etc.
RMAN Configuration Best Practices
Setup Backup Management Policies

• All databases:
  • CONFIGURE CONTROLFILE AUTOBACKUP ON
  • CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK CLEAR
  • CONFIGURE CHANNEL DEVICE TYPE SBT PARMS ‘<channel parameters>’

• Primary database:
  • REGISTER DATABASE
  • CONFIGURE RETENTION POLICY TO RECOVERY WINDOW OF <n> DAYS

• Database where backups are taken:
  • CONFIGURE BACKUP OPTIMIZATION ON
  • CONFIGURE ARCHIVELOG DELETION POLICY TO NONE
  • Oracle Database 10g:
    • DELETE ARCHIVELOG .. BACKED UP <n> TIMES TO DEVICE TYPE [SBT | DISK]
  • Oracle Database 11g:
    • CONFIGURE ARCHIVELOG DELETION POLICY BACKED UP <n> TIMES TO DEVICE TYPE [SBT | DISK]
**RMAN Configuration Best Practices**

Setup Backup Management Policies

- Databases where backups are **not** taken
  - `CONFIGURE ARCHIVELOG DELETION POLICY TO APPLIED ON STANDBY`
  - MetaLink Note 331924.1 to allow all standby databases to be considered*
  - `CONFIGURE ARCHIVELOG DELETION POLICY TO APPLIED ON ALL STANDBY**`

- All `CONFIGURE` commands can be run from single session**
  - `CONFIGURE DB_UNIQUE_NAME <name> CONNECT IDENTIFIER 'TNS alias'`
  - `CONFIGURE ARCHIVELOG DELETION POLICY .. FOR DB_UNIQUE_NAME '<name>'`
  - `RESYNC CATALOG FROM DB_UNIQUE_NAME ALL;`

- Note that after switchover/failover, `CONFIGURE .. DELETION POLICY` should be re-executed, if backup locations switch.

* Oracle Database 10g
** Oracle Database 11g
Disk & Tape Backup Strategy

- Daily backup script on standby database:
  
  ```sql
  RESYNC CATALOG FROM DB_UNIQUE_NAME ALL;**
  RECOVER COPY OF DATABASE WITH TAG 'OSS';
  BACKUP DEVICE TYPE DISK INCREMENTAL LEVEL 1 FOR 
    RECOVER OF COPY WITH TAG 'OSS' DATABASE;
  BACKUP DEVICE TYPE SBT ARCHIVELOG ALL;
  BACKUP BACKUPSET ALL;
  ```

- Weekly backup script on standby database:
  
  ```sql
  BACKUP RECOVERY FILES;
  DELETE OBSOLETE DEVICE TYPE SBT;
  ```

- Flash Recovery Area auto-deletes on-disk archived logs and backups, when space pressure occurs.
  - Files must be backed up, obsolete, or satisfy deletion policy.

** Oracle Database 11g**
## Develop Recovery Procedures

<table>
<thead>
<tr>
<th>Recovery Scenario</th>
<th>Primary Database Affected</th>
<th>Standby Database Affected</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Loss of data files</strong></td>
<td>• Switchover/failover</td>
<td>• Stop MRP</td>
</tr>
<tr>
<td></td>
<td>• Restore data file from backup</td>
<td>• Restore datafile from backup</td>
</tr>
<tr>
<td></td>
<td>• Or, restore from standby copy (via network**)</td>
<td>• Or, restore from primary copy</td>
</tr>
<tr>
<td></td>
<td>• Recover file</td>
<td>• Restart MRP</td>
</tr>
<tr>
<td>**Loss of all control</td>
<td>• Failover</td>
<td>• Restore standby control file</td>
</tr>
<tr>
<td>files**</td>
<td>• Flashback failed primary to standby role</td>
<td>• Or, restore backup control file from primary**</td>
</tr>
<tr>
<td></td>
<td>• Startup database nomount</td>
<td>• Alter database mount</td>
</tr>
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<td></td>
<td>• Restore backup control file</td>
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</tr>
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<td></td>
<td>• Or, restore backup control file from standby**</td>
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<tr>
<td></td>
<td>• Alter database mount</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Recover database &amp; open resetlogs</td>
<td></td>
</tr>
<tr>
<td><strong>Human error</strong></td>
<td>• Flashback primary database to good SCN</td>
<td>• Flashback primary database as before</td>
</tr>
<tr>
<td></td>
<td>• Open resetlogs and switch logs on primary</td>
<td>• Flashback standby database to good SCN</td>
</tr>
<tr>
<td></td>
<td>• Or, minimize impact to primary database:</td>
<td>• Restart MRP</td>
</tr>
<tr>
<td></td>
<td>• Flashback standby database to good SCN</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Open standby read-only</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Import good data into primary via network link</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Startup standby mount &amp; restart MRP</td>
<td></td>
</tr>
</tbody>
</table>

** Oracle Database 11g**
RMAN Creation of Standby Database

- **DUPLICATE TARGET DATABASE FOR STANDBY**
  - With Oracle Database 11g, no backups and intermediary storage needed with **DUPLICATE .. FROM ACTIVE DATABASE**
- Leverage incremental backup to synchronize standby database
  - Startup standby database in **MOUNT** & note current SCN
  - Restore all data file backups to standby database
  - **BACKUP INCREMENTAL FROM SCN <STANDBY SCN> TAG ‘FORSTANDBY’** on primary & copy backups to standby server
  - On standby server,
    - Oracle Database 10g:
      - Recreate standby control file from primary and start standby in **MOUNT**
      - **CATALOG START WITH ‘<INCREMENTAL BACKUP DIRECTORY>’**
    - Oracle Database 11g:
      - **CATALOG START WITH ‘<INCREMENTAL BACKUP DIRECTORY>’**
      - **RESTORE STANDBY CONTROLFILE FROM TAG ‘FORSTANDBY’**
      - Start standby in **MOUNT**
      - **RECOVER DATABASE NOREDO**
    - Restart MRP
RMAN & Logical Standby

• Logical standby is an independent database
  • Backups must be taken separately
  • When using catalog, GUARD must be set to STANDBY
  • Take control file backup immediately following creation
  • Before performing tablespace point-in-time recovery on logical standby, ensure that:
    • Tablespace contains no tables or partitions maintained by SQL Apply
    • Or, after recovery, re-instantiate or register to be skipped, all maintained tables contained in the tablespace.

• Oracle Database 10gR2
  • Store incoming logs outside Flash Recovery Area – logical standby will automatically delete after being applied.

• Oracle Database 11g
  • Store incoming logs (i.e. foreign archived logs) inside Flash Recovery Area
    • Logs retained for Flashback retention target time period (or 24 hours, if not specified)
RMAN & Streams
RMAN & Streams
## RMAN Best Practices - Log Maintenance

<table>
<thead>
<tr>
<th></th>
<th>Oracle Database 10g Source DB</th>
<th>Oracle Database 11g Source DB</th>
</tr>
</thead>
</table>
| **Local Capture - Backup archived logs on source database** | - Configure non-FRA archived log destination.  
  - FRA logs may be deleted under space pressure, before local capture.  
  DELETE OBSOLETE;  
  BACKUP ARCHIVELOG .. DELETE INPUT; | - Same as in Oracle Database 10g.                                                             |
| **Downstream Capture - Archived logs backed up on source database** | DELETE ARCHIVELOG .. BACKED UP <N> TIMES TO DEVICE TYPE <DEVICE_TYPE>;  
  - Ensures that a log is not deleted before it has been backed up. | CONFIGURE ARCHIVELOG DELETION POLICY TO SHIPPED TO ALL STANDBY BACKED UP <n> TIMES TO DEVICE TYPE <device_type>;  
  - Ensures that FRA logs are deleted only after being shipped and backed up.  
  - FRA space reclamation and RMAN delete honor deletion policy. |
| **Downstream Capture - Archived logs not backed up** | DELETE ARCHIVELOG .. COMPLETED BEFORE <transfer time>;  
  - Ensures that logs older than <transfer time> are deleted. | CONFIGURE ARCHIVELOG DELETION POLICY TO SHIPPED TO ALL STANDBY;  
  - Ensures that FRA logs are deleted only after being shipped. |
Other Considerations

- Destination database creation
  - DUPLICATE – same platform
  - CONVERT DATABASE – different platforms (same endian)
  - TRANSPORT TABLESPACE – different endian platforms
  - After creation, set instantiation SCN at destination database
    - \([\text{Source SCN to which destination database is recovered}] + 1\)
- Use one-way replication for protecting recovery catalog
  - One source database->one destination database
  - Multiple source databases->one destination database
- Point-in-time recovery considerations on source & destination database
  - See Streams documentation links in References
Nokia Case Study
British Telecommunications Case Study
Summary/Q&A
References

• Oracle Database 10g
  • Using Recovery Manager with Data Guard
    • http://www.oracle.com/technology/deploy/availability/pdf/RMAN_DataGuard_10g_wp.pdf
  • MetaLink Note 421176.1 – RMAN & Streams Archived Log Management

• Oracle Database 11g
  • Oracle Data Guard Concepts and Administration
    • Using RMAN to Backup and Restore Files
      • http://download.oracle.com/docs/cd/B28359_01/server.111/b28294/rman.htm#SBYDB04700
  • Oracle Streams Concepts and Administration
    • Appendix A - Oracle Streams and Recovery Manager
    • Performing Database Point-in-Time Recovery in an Oracle Streams Environment
      • http://download.oracle.com/docs/cd/B28359_01/server.111/b28322/man_gen_rep.htm#i1014311
Summary

• RMAN and Data Guard offer an integrated, comprehensive data protection and availability solution.
• RMAN and Streams combines flexible, active-active replication solution with best-of-breed backup & recovery.
• RMAN provides single-command creation of Data Guard standby and Streams destination databases.
• RMAN in Oracle Database 11g continues to innovate.
  - Fully integrated with Active Data Guard
HA Sessions, Labs, Demos From Oracle Development

**Mon, Sep 22**
- 2:30 pm - Database 11g: Next-Gen HA, Moscone South 103

**Tue, Sep 23**
- 9:00 am - Active-Active Data Centers, Moscone South 103
- 11:30 am - Sharding with Oracle, Moscone South 302
- 11:30 am - HA with Oracle VM, Moscone West 3024
- 1:00 pm - Active Data Guard, Moscone South 104

**Wed, Sep 24**
- 9:00 am - Fusion Middleware Grid HA, Marriott Nob Hill AB
- 11:30 am - RMAN Best Practices, Moscone South 103
- 1:00 pm - Database in the Cloud, Moscone South 305
- 5:00 pm - Data Guard & Real Application Testing, Moscone 102

**Wed, Sep 24 (contd.)**
- 5:00 pm - EM in Secure MAA, Moscone West 2001
- 5:00 pm - E-Business Suite HA, Moscone West 2002/04

**Thu, Sep 25**
- 9:00 am - Oracle Secure Backup, Moscone South 102
- 10:30 am - Streams Replication, Moscone South 102
- 12:00 pm - Rolling Database Upgrades, Moscone South 103
- 1:30 pm - Streams Performance, Moscone South 102
- 3:00 pm - Oracle Grid Computing, Moscone South 303
- 3:00 pm - E-Business Suite R12 MAA, Moscone West 2007
- 3:00 pm - Siebel MAA, Moscone South 308
- 3:00 pm - Fusion SOA HA & Scalability, Marriott Salon 14/15

**Hands On Labs - Thu, Sep 25**
- 10:30 - 11:30 am, 12:00 - 1:00 pm - Active Data Guard, Marriott Golden Gate A3

**DEMOgrounds, Mon-Thu**
- Active Data Guard, Streams, Oracle Secure Backup, RMAN/Flashback, MAA
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