

ENGINEEREDFOR INNOVATION

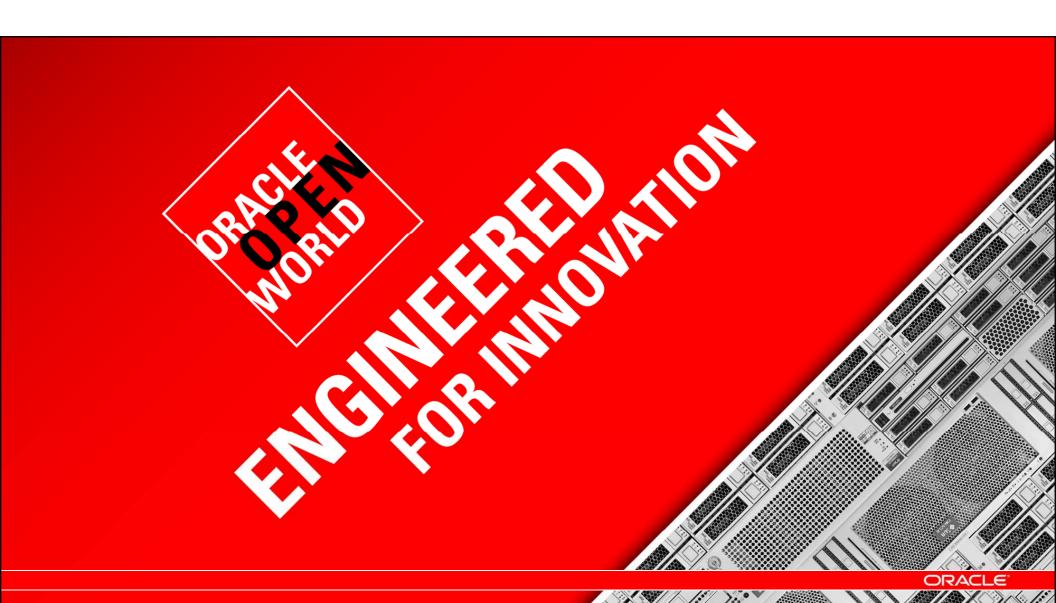


ORACLE

How to Best Configure, Size, and Monitor the Oracle Database Fast Recovery Area

Cris Pedregal, Oracle

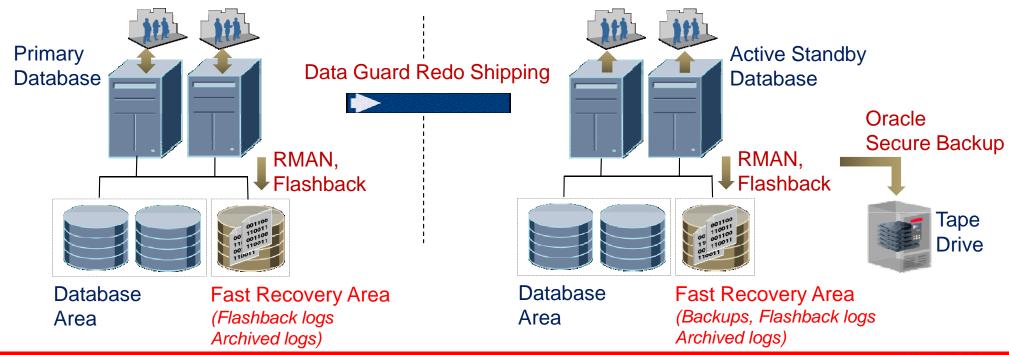




Fast Recovery Area – Key MAA Element

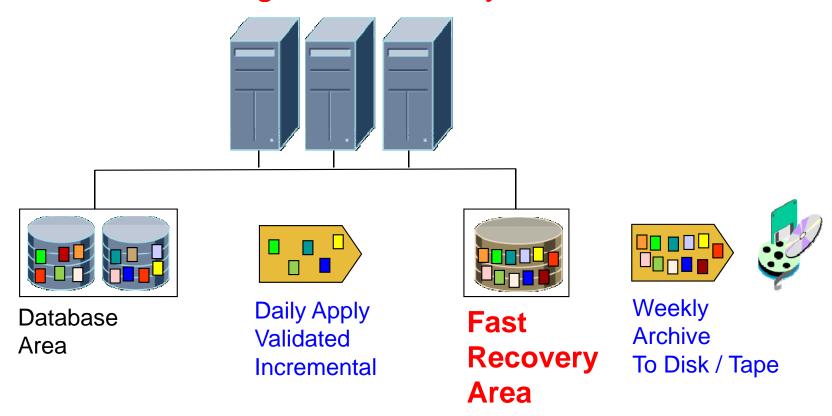
RMAN + Secure Backup + Flashback + Data Guard

Integrated backup & recovery, continuous data protection, disaster recovery



Fast Recovery Area (FRA)

Stores and manages all recovery-related files



FRA in Enterprise Manager



▼ Enable Minimal Supplemental Logging

Minimal supplemental logging logs the minimal amount of information needed for LogMiner (and any product building on LogMiner technology) to identify, group, and merge the redo operations associated with DML changes.

Fast Recovery

This database is using a fast recovery area. The chart shows space used by each file type that is not reclaimable by Oracle. Performing backups to tertiary storage is one way to make space reclaimable. Usable Fast Recovery Area includes free and reclaimable space.



Non-reclaimable Fast Recovery Area (GB) 8.84

Reclaimable Fast Recovery Area (GB) 23.09

Free Fast Recovery Area (GB) 68.07

▼ Enable Flashback Database*

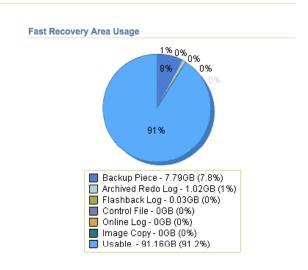
Flashback database can be used for fast database point-in-time recovery, as it returns the database to a prior point-in-time without restoring files. Flashback is the preferred point-in-time recovery method in the recovery wizard when appropriate. The fast recovery area must be set to enable flashback database.

> Flashback Retention Time 24 Hours

Current size of the flashback logs(MB) 30.391

Lowest SCN in the flashback data 3945600

Flashback Time Sep 26, 2011 12:53:23 PM





Agenda

Oracle Fast Recovery Area (FRA) overview



- How to best configure, size, and monitor the FRA
 - Files to keep in FRA & relationship to Backup policy and Flashback
 - Configuring FRA Size and Location & EM view of the FRA
- Enkitec's Real-World Experiences



Files Necessary for Fast Recovery

Transient Files

- Archived Redo logs
- Backup files and autobackups
- Flashback logs (if FB enabled)
- Oracle knows when to delete or trim
- Age-out or backed-up to tertiary

Permanent Files

- Multiplexed Control File
- Multiplexed Online Redo
- Guaranteed Restore Points
- Complete the set for fast recovery
- Could fill up FRA so DBA must monitor

Best Practice: Generous FRA on ASM

- All recovery-related files in Fast Recovery Area
- FRA on ASM with enough space and spindles

Configuring the Fast Recovery Area

• Size – backups, archived logs, redo, flashback...

Location – fast, available disk

Two Configuration Parameters to create FRA

Set Space Quota and Storage location

- Disk Quota: DB_RECOVERY_FILE_DEST_SIZE
 - Per Database; provision for all permanent and transient files
- Location: DB RECOVERY FILE DEST
 - File system directory or ASM group

Set via DB Configuration Assistant, or DB initialization parameter file, or SQL (ALTER SYSTEM SET)

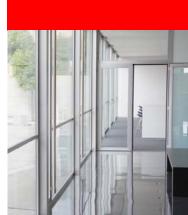
Fast Recovery Area in Enterprise Manager

Location, Size, Usage Breakdown

Viewlet

Agenda

Oracle Fast Recovery Area (FRA) overview



- How to best configure, <u>size</u>, and monitor the FRA
 - Given Backup & Flashback policy, count files FRA needs to keep
 - How to get number and size of files. Multiply and add to FRA size
- Enkitec's Real-World Experiences



FRA Size: Summing Files in FRA by Example

- 2 Comprehensive Scenarios Show How to Sum Up All Files
- Both scenarios: 7-day recovery window RMAN> configure retention policy to recovery window of 7 days;
- Scenario #1: all recovery files for window are in FRA
- Scenario #2: adds FRA backup to external storage to 1
 - Flashback enabled in both scenarios
 - We do not take into account disk mirroring –a good practice, omitted for simplicity

7-Day Window, No Tape - Scripts

Daily: Roll forward image copy and take incremental backup

```
# daily disk (keeps 7-day-old image copy)
recover copy of database with tag DB BACKUP
 until time 'sysdate-8';
backup incremental level 1 for recover of
 copy with tag DB BACKUP database;
```

7-Day Window, No Tape – Sum up needed files

FRA disk space needed – add these file sizes:

- = Control File size
- + Online Redo Log size
- + size of Archived Logs (for 8 days)
- + Database size (minus temp files)
- + size of Incremental Backups (for 8 days)
- + Flashback Logs size (initially Redo rate X FB retention time)
- For load spikes: 1.5 to 2 X space for Archive and Flashback logs

7-Day Window, with Tape - Scripts

Daily incremental and back up FRA to tape every 2 days

```
# Daily disk (7 day window using tape)
recover copy of database with tag DB_BACKUP;
backup incremental level 1 for recover of
 copy with tag DB_BACKUP database;
# Tape backup executed once every 2 days
backup recovery area;
delete obsolete device type sbt;
```

7-Day Window, with Tape – File Count

FRA disk space needed – add these sizes

- = Control File size
- + Online Redo Log size
- + size of Archived Logs (for 3 days tape every 2)
- + Database size (minus temp files)
- + size of Incremental Backups (for 3 days tape)
- + Flashback Logs size (initially Redo rate X FB retention time)
- For load spikes: 1.5 to 2 X space for Archive and Flashback logs

Counting Files in FRA – Notes

- Easy to account for mirroring, or multiple copies of logs
 - multiply space requirement as needed (full FRA, or log type)
- As of 11g Release 2, can back up FRA to secondary disk

Counting Files in FRA – Recap

Function of Recovery Window, Flashback, Tape Use

- Oracle <u>implicitly</u> deletes obsolete (or trims) files in FRA
 - Tertiary storage not part of FRA, hence explicit sbt delete command
- Tradeoff: use less FRA space for slower (tape) recovery
 - Both scenarios provide the same 7-day recovery window
- ... What about Flashback?

Configuring Flashback

Flashback Logs Managed by Oracle in FRA

- If Flashback is enabled, must specify Flashback window
 - DB_FLASHBACK_RETENTION_TARGET
- To check that Flashback window is met by logs in FRA

```
-SELECT oldest_flashback_scn,
 oldest flashback time
   FROM v$flashback database log;
```

FRA and Flashback Queries

Location, quota, in use/reclaimable space, number of files SELECT * FROM v\$recovery_file_dest; For each file type, percent of FRA space it uses and is reclaimable and number of files of that type SELECT * FROM v\$recovery_area_usage; Estimated space used by Flashback logs SELECT estimated_flashback_size FROM v\$flashback database log;

FRA Size: Queries to Determine File Sizes

- Backup and Flashback policies define which/how many files are kept for how long in FRA –
 - We already learned by example how to sum up those files
- To obtain FRA size, need the size of each file
 - Oracle provides views, used by EM or directly via SQL -- next

FRA Size – How to Determine File Sizes

Using SQL Queries

Viewlet

Sizes: Image Copy, Online Redo, Control File

- Size of Database Image Copy File
 SELECT SUM(bytes) fsize FROM V\$DATAFILE;
- Size of Online Redo Log
 SELECT SUM (bytes*blocksize) fsize FROM V\$LOG;
- Size of Control File
 SELECT (block_size * file_size_blks) fsize
 FROM V\$CONTROLFILE WHERE rownum = 1;

Sizes (2): Incremental Backups

Size of Incremental Backups Generated so far

```
SELECT end_time, output_bytes
 FROM V$RMAN_BACKUP_JOB_DETAILS
       WHERE input_type = 'DB INCR'
       ORDER BY end_time DESC;
```

Sizes (3): Archived Logs generated per day

```
SELECT TO_CHAR(first_time, 'DD-MON-YYYY') "Date",
SUM(bytes)
   FROM (SELECT UNIQUE
                blocks * block size bytes,
                thread#,
                sequence#,
                resetlogs change#,
                first_time
          FROM V$ARCHIVED_LOG$)
  GROUP BY TO_CHAR(first_time, 'DD-MON-YYYY')
  ORDER BY 1 DESC;
```

Sizes (4): Flashback Logs

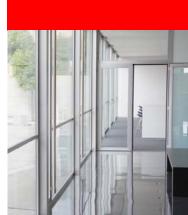
If Flashback is enabled

```
SELECT estimated_flashback_size,
FROM V$FLASHBACK_DATABASE_LOG;
```

— See also the value of the current flashback logs via:
SELECT flashback_size FROM V\$FLASHBACK_DATABASE_LOG;

Agenda

Oracle Fast Recovery Area (FRA) overview



- How to best configure, size, and monitor the FRA
 - Additional considerations multiple databases and Exadata
 - The DBA needs to remain involved
- Enkitec's Real-World Experiences

Configuring the FRA – Multiple Databases

To share one FRA across multiple Databases

- Set same value for DB_RECOVERY_FILE_DEST on all
- Use different DB_UNIQUE_NAMEs (if undefined, different DB_NAMEs)
- Separate directories will be created for each Database

Configuring the FRA – Exadata Considerations

- FRA must be on local Storage ASM diskgroup RECO
- With Disk Backups on External Storage, RECO set to 20% of total disk space
- No External Backups, RECO is 60% of disk space
- File Locations
 - Archived and Flashback Logs and all Backup go in FRA
 - Control Files and Redo Logs in High Redundancy Disk group

More: Session 12962 Exadata Backup & Recovery



"Bad" Practices for Fast Recovery Area

A few "DO NOTs"

- 1. DO NOT use FORMAT to back up files to FRA
- 2. DO NOT specify LOG_ARCHIVE_DEST_n to FRA location to archive files to FRA. Instead use 'USE_DB_RECOVERY_FILE_DEST', e.g.,
 - LOG ARCHIVE DEST 1='location=USE DB RECOVERY FILE DEST'
- 3. DO NOT delete files from FRA using OS commands or asmcmd utility
 - Instead use RMAN's DELETE command
- 4. DO NOT specify DB_RECOVERY_FILE_DEST_SIZE to more than the available disk space
- 5. DO NOT keep Guaranteed Restore Points around forever. They take up disk space permanently

The DBA Must Remain Involved

FRA automates a lot, but the DBA is still in the loop:

- Optimizing resource usage (scarce by definition)
- Tracking changes in activity volume, in RTO/RPO -and adjusting / prioritizing
- ... Oracle takes care of routine space management ORA-19809: limit exceeded for recovery files

How to Best Configure, Size, and Monitor the Oracle Database Fast Recovery Area

Presented by: Andy Colvin
Principal Consultant, Enkitec
October 6, 2011



About Me/Enkitec

- Who am I?
 - Principal Consultant at Enkitec
 - Worked with Oracle dating back to version 7
- What is Enkitec?
 - Oracle-centered Platinum Partner based in Irving, TX
 - Database consultants averaging over 15 years Oracle experience
 - Making a name for ourselves in the Exadata world



Why I Use the FRA

- Ease of use
- Allows for DBA-level space management
- Provides for easier standardization of environments
 - Uniform place for all recovery-related files



Two Real World Customers

Customer #1 - Document Processing

- \$350M Revenue, 8,500 employees
- Services 50% of Fortune 100

Customer #2 - Energy Utility

• \$15B Revenue, 5 million customers



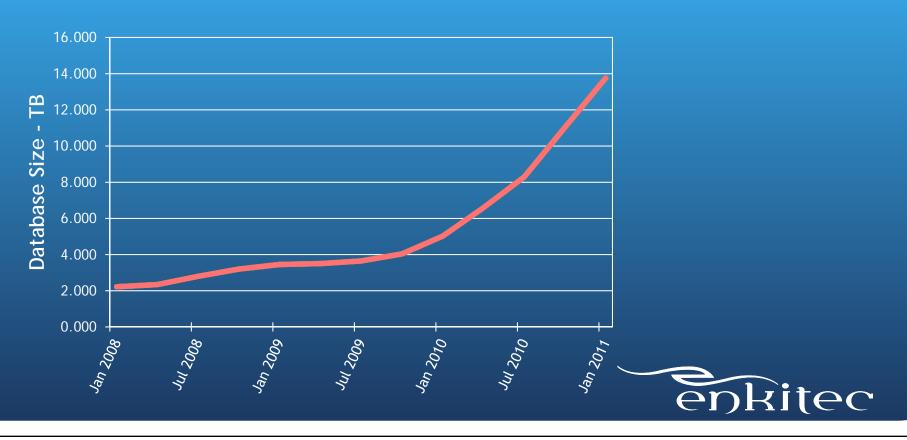
Customer #1 - Document Processing

- 15TB database, production environment
- Repository for document management
- 270 GB of redo generated daily
- Backups going directly to tape



#1 - Accelerated Database Growth

7x Growth in 3 Years



#1 - Document Processing - Solution

- FRA originally sized at 2TB (based on 7 day archive log retention)
- Monitored database growth with OEM
- Monitored redo generation through Data Guard console in OEM
- Increased db_file_recovery_dest_size to match the growth of the database monthly
- FRA now sized at 9TB



#1 - Document Processing - Solution

Data Guard Considerations

- Standby environment created identical to primary
 - Exadata → Exadata
 - Same size diskgroups for +DATA and +RECO
- All logs sent to FRA
- Always remember that DR site has to be able to run as primary!
 - This includes FRA size backups, flashback, archive logs, etc



#1 - Backup Commands

#RMAN archivelog backup command

backup archivelog all not backed up

- Avoid "delete obsolete" through RMAN Allow the FRA to manage files itself
- Example of FRA automatic file management:
 deleted Oracle managed file <file_name>



#1 - FRA file management

```
RMAN> backup archivelog all not backed up;

skipping archived log file <archive_log>; already backed on <date>
skipping archived log file <archive_log>; already backed on <date>
skipping archived log file <archive_log>; already backed on <date>
...

input archived log thread=1 sequence=7 RECID=26 STAMP=762905532

input archived log thread=1 sequence=8 RECID=27 STAMP=762905541
```



Customer #2 - Energy Utility

- Development database
- Customer billing transaction system will service 5 million customers
- 600GB database
- Backups going to FRA and tape
- Weekly data refresh
- Flashback database enabled



#2 - Energy Utility - Solution

- FRA sized at 150GB
- Sizing based on:
 - Flashback logs
 - Archive log generation
 - Database backups
- Frequent database flashbacks



#2 - Energy Utility - Solution

Flashback Methodology

- Flashback retention set to 1 week
- Created a guaranteed restore point before each refresh, data refreshed weekly
- Monitored the usage of the FRA through OEM reports, alerting based on space available
- After process was repeated a few times, optimal FRA size was found, based on recovery file generation



#2 - Energy Utility - Solution Monitoring FRA Usage

SQL> SELECT * FROM V\$FLASH_RECOVERY_AREA_USAGE WHERE PERCENT_SPACE_USED > 0 ;

FILE_TYPE	% USED	% RECLAIM	# FILES
CONTROL FILE	.24	0	1
REDO LOG	3.72	0	3
ARCHIVED LOG	31.11	26.82	31
BACKUP PIECE	33.17	0	15
FLASHBACK LOG	17.6	0	42



Two Real World Customers

Customer #1 - Document Processing

Customer #2 - Energy Utility

What we learned from each

- Configuring and sizing FRA was quick and easy
- Monitoring usage of the FRA is imperative, especially with rapid database growth
- Be prepared to tweak the settings during the initial stages



FRA On Exadata and ODA

- Planning the size of the FRA is even more important with Oracle's engineered systems
- Disk sizing is more difficult to perform on these systems after they are in place because the diskgroups share the same physical disks
- If you have the space, leave plenty for RECO, so that you can utilize image copies and longer flashback/backupset retention period



Questions?

Andy Colvin, Enkitec

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Best Practice: Provision, Monitor, Repeat

- Provision per Oracle's recommendations
- Monitor your database's steady state
 - Also account for peak loads
 - Understand how FRA deletes files and handles scarce or exhausted resources, and how a DBA can intervene
- Repeat

Summary: FRA for Simple Fast Recovery

- Create FRA on ASM and let it manage all recovery files
 - Make FRA part of your High Availability strategy
- Provision, Monitor, Repeat
 - Understand how FRA works and when DBA action is necessary

Use the FRA for simple & fast recovery

Q&A

Resources

OTN HA Portal:

http://www.oracle.com/goto/availability

Maximum Availability Architecture (MAA):

http://www.oracle.com/goto/maa

MAA Blogs:

http://blogs.oracle.com/maa

Exadata on OTN:

http://www.oracle.com/technetwork/database/exadata/index.html

Oracle HA Customer Success Stories on OTN:

http://www.oracle.com/technetwork/database/features/ha-casestudies-098033.html

Key HA Sessions, Demos, Labs by Oracle Development

Monday, 3 Oct - Moscone South *

11:00a Auto Detect, Prevent and Repair Data Corruptions, Rm 102

12:30p Future of Oracle Exadata, Rm 104

12:30p RMAN: Not Just for Backups Anymore, Rm 304

2:00p Extreme Data Management, Moscone North Hall D

5:00p Oracle High-Availability System Overview, Rm 104

5:00p GoldenGate Product Update and Strategy, Intercontinental-Sutter

Tuesday, 4 Oct – Moscone South *

10:15a Oracle Secure Backup - Best practices, Rm 304

11:45a Oracle Exadata Technical Deep Dive, Rm 104

3:30p RMAN & Data Guard: Seven Cool Tips from Oracle, Rm 304

3:30p Consolidation on Oracle Exadata, Rm 103

Wednesday, 5 Oct - Moscone South *

10:15a Oracle Active Data Guard - Lessons Learned, Rm 102

1:15p Data Guard for Planned Maintenance, Rm 102

1:15p Understanding Oracle RAC Internals, Rm 103

1:15p Clone Oracle with CloneDB and Direct NFS, Rm 270

Thursday, 6 Oct - Moscone South *

9:00a Exadata Backup and Recovery, Rm 304

10:30a Deduplication and Compression for Backups, Rm 304

12:00p Data Guard Switchover / Failover, Rm 103

3:00p Configure, Size, Monitor Fast Recovery Area, Rm 304

3:00p PeopleSoft with Active Data Guard, Moscone West 2022

Demos Moscone South DEMOGrounds

Mon & Tue 9:45a - 5:30p; Wed 9:00a - 4:00p

Maximum Availability Architecture (MAA) Exadata

Oracle Secure Backup Active Data Guard

Recovery Manager & Flashback GoldenGate

Real Application Clusters ASM Hands-on Labs Marriott Marquis, Salon 14 / 15

Monday, Oct 3, 5:00 pm - 6:00 pm Oracle Active Data Guard Tuesday, Oct 4, 10:15 am - 11:15 am Oracle Active Data Guard

*All session rooms at Moscone South unless otherwise noted After Oracle OpenWorld, ref. http://www.oracle.com/goto/availability

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Latin America 2011

December 6-8, 2011

Tokyo 2012

April 4-6, 2012

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