Oracle Database 12c - Recovery Manager New Features

Presented by: Andy Colvin
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*DISCLAIMER*

- Oracle 12c has not been released yet
- Some features may not be available
- I believe Oracle has mentioned these publicly
  - They told me about them in a public forum at OOW

Attention Oracle Lawyers: Please don’t sue me!
About Enkitec

- Extensive Oracle Practice - 9 years old
  - Education
  - Migration
  - Performance Reviews
  - Remote DBA Support
  - Application Express

- Enkitec Extreme Exadata Expo
  - Irving, TX
  - August 5-6
  - http://www.enkitec.com/e4
About Me

• Working around Oracle since 1999
• Background in systems, network, database
• 6 years at Enkitec
• Working on Exadata for 3 years
• Oracle ACE
Why Talk About RMAN?

- Everybody should use RMAN
- It can be quite interesting
- I’m a fan of cruel and unusual punishment
What’s New?

- Pluggable Databases
- Run SQL from RMAN
- Recover Table
- Cross-Platform Restore
- Active Duplicate Enhancements
- New Security Roles
Pluggable Databases

- Oracle 12c introduces the concept of containers and pluggable databases
- Pluggable databases are “virtual” databases
- Pluggable databases share memory and redo logs
Containers vs Pluggable Databases

- Back up container databases like any "standard" database
- Afterwards, open all of your pluggable databases

```
RMAN> RUN
2> {
3>    SET UNTIL SCN 16747183;
4>    RESTORE DATABASE;
5>    RECOVER DATABASE;
6> }
RMAN> alter database open resetlogs;
RMAN> alter pluggable database all open;
```
Pluggable Database Support

- RMAN supports Pluggable Databases
- Back up entire Container Database or individual Pluggable Databases
- Container database - no changes
- PDB point in time recovery
Pluggable Database Support

```
RMAN> report schema;
Report of database schema for database with db_unique_name PLUGGY

List of Permanent Datafiles
===========================
<table>
<thead>
<tr>
<th>File Size(MB)</th>
<th>Tablespace</th>
<th>RB segs</th>
<th>Datafile Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>770</td>
<td>***</td>
<td>+DG/PLUGGY/DATAFILE/FILE</td>
</tr>
<tr>
<td>3</td>
<td>610</td>
<td>***</td>
<td>+DG/PLUGGY/DATAFILE/FILE</td>
</tr>
<tr>
<td>4</td>
<td>60</td>
<td>***</td>
<td>+DG/PLUGGY/DATAFILE/FILE</td>
</tr>
<tr>
<td>5</td>
<td>250</td>
<td>***</td>
<td>+DG/PLUGGY/DATAFILE/FILE</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>***</td>
<td>+DG/PLUGGY/DATAFILE/FILE</td>
</tr>
<tr>
<td>7</td>
<td>490</td>
<td>***</td>
<td>+DG/PLUGGY/DATAFILE/FILE</td>
</tr>
<tr>
<td>8</td>
<td>250</td>
<td>***</td>
<td>+DG/PLUGGY/DATAFILE/FILE</td>
</tr>
<tr>
<td>9</td>
<td>510</td>
<td>***</td>
<td>+DG/PLUGGY/DATAFILE/FILE</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>***</td>
<td>+DG/PLUGGY/DATAFILE/FILE</td>
</tr>
</tbody>
</table>

List of Temporary Files
=======================
<table>
<thead>
<tr>
<th>File Size(MB)</th>
<th>Tablespace</th>
<th>Maxsize(MB)</th>
<th>Tempfile Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TEMP</td>
<td>32767</td>
<td>+DG/PLUGGY/TMPFILE/FILE</td>
</tr>
<tr>
<td>2</td>
<td>PDB$SEED:TEMP</td>
<td>32767</td>
<td>+DG/PLUGGY/TMPFILE/FILE</td>
</tr>
<tr>
<td>3</td>
<td>PLUG1:TEMP</td>
<td>32767</td>
<td>+DG/PLUGGY/TMPFILE/FILE</td>
</tr>
</tbody>
</table>
```
PDB Point In Time Recovery

- Recover PDBs individually

```
RMAN> alter pluggable database ERP close;
RMAN> RUN
2> {
3>   SET UNTIL SCN 1674493;
4>   RESTORE PLUGGABLE DATABASE ERP;
5>   RECOVER PLUGGABLE DATABASE ERP;
6> }
RMAN> alter pluggable database ERP open resetlogs;
```
What’s New?

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- Active Duplicate Enhancements
- New Security Roles
Running SQL From RMAN

- No More “SQL” Tags
- Previous versions didn’t support SELECT statements
- Useful within backup scripts
Running SQL From RMAN

RMAN> select sysdate from dual;

SYSDATE
---------
11-FEB-13

RMAN> desc dba_pdb
Name                   Null?    Type
------------------------ --------------------
PDB_ID                  NOT NULL NUMBER
PDB_NAME                NOT NULL VARCHAR2(128)
DBID                    NOT NULL NUMBER
CON_UID                 NOT NULL NUMBER
GUID                    RAW(16)
STATUS                  VARCHAR2(13)
CREATION_SCN            NOT NULL NUMBER
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Recover Table

- Recover tables from backups
- Useful when you can’t use flashback
- Recover tables or table partitions
- Must connect “as sysdba” or “as sysbackup”

```sql
RMAN> RECOVER TABLE ACOLVIN1.T
  2> UNTIL SCN 1674493
  3> AUXILIARY DESTINATION '/tmp/oracle/recover'
  4> DATAPUMP DESTINATION '/tmp/recover/dumpfiles'
  5> REMAP TABLE 'ACOLVIN1'.'T':'T_RECOVERED';
```
Recover Table - Process

- RMAN automatically finds necessary backupsets
- Auxiliary database created with backupsets
- Data pump export file automatically created
- RMAN performs data pump import of the tables to be recovered (optional)
- RMAN cleans up after itself, deleting datapump file and temporary instance files
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Cross-Platform Backup/Restore

- Great for migrations
- Prior to 12.1, only supported when target is Exadata
- Allows for shorter downtime when moving across platforms
Cross-Platform Backup/Restore

- Methodology
  1. Perform backup of the source database
  2. Restore to the new target database
  3. Take periodical incremental backups and restore to target
  4. Place tablespaces in read-only mode, take final incremental backup
  5. Restore final incremental backup to target database
  6. Import tablespace metadata into target database
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RMAN Duplicate - Old School

- Each channel is assigned a datafile
  - Files assigned to channels starting with largest first
  - When a file is finished, the next largest available file is copied
- Works perfectly when all datafiles are same size
- What if we have different sized datafiles?
What Does This Mean?

- Imagine dozens of datafiles
  - Ranging from 50GB to 9TB
- Allocate too many channels, they will sit idle
- Don’t allocate enough channels, wait on largest datafiles

***This is changed in 12c***
- Active duplicate utilizes backupsets
RMAN Duplicate Channel Allocation

Source Database

- File 1: 1TB
- File 2: 50GB
- File 3: 10GB
- File 4: 20GB

Target Database

RMAN Channel 1

- File 5: 10GB
- File 6: 10GB
- File 7: 10GB
- File 8: 10GB

RMAN Channel 2

- File 3: 10GB
- File 2: 50GB
- File 4: 20GB

File 1: 1TB
File 2: 50GB
File 3: 10GB
File 4: 20GB
File 5: 10GB
File 6: 10GB
File 7: 10GB
File 8: 10GB
Duplicate With Backupsets

- Active duplicate defaults to use backupsets
  - This gives us all of the benefits of backupsets, with active duplicate
    - PIECE SIZE
    - COMPRESSION
- Empty space moves much faster
Duplicate With Backupsets

- Example code
- You can use multiple auxiliary channels

```sql
RMAN> run {
  2> allocate channel d1 device type disk;
  3> allocate channel d2 device type disk;
  4> allocate channel d3 device type disk;
  5> allocate auxiliary channel s1 device type disk;
  6> duplicate target database for standby
  7> from active database piece size 500M;
  8> }
```
Duplicate With Backupsets

- What the output looks like

```sql
channel s1: starting datafile backup set restore
channel s1: using network backup set from service cloudy
channel s1: specifying datafile(s) to restore from backup set
channel s1: restoring datafile 00001 to +SMITHERS/windy/datafile/
    system.273.807276333
channel s1: restoring section 1 of 2
channel s1: restore complete, elapsed time: 00:00:15
channel s1: starting datafile backup set restore
channel s1: using network backup set from service cloudy
channel s1: specifying datafile(s) to restore from backup set
channel s1: restoring datafile 00001 to +SMITHERS/windy/datafile/
    system.273.807276333
channel s1: restoring section 2 of 2
```
Duplicate With Backupsets

- Let’s look closer
- Using a utility called dstat, we can see what’s going on
  ```
  dstat -dnye -D xvda,xvde,xvdf,xvdg -N eth0 -C total
  ```
- Using a utility called dstat, we can see what’s going on
### Duplicate Using Backupsets

<table>
<thead>
<tr>
<th>dsk/xvda</th>
<th>dsk/xvde</th>
<th>dsk/xvdf</th>
<th>dsk/xvdg</th>
<th>net/eth0</th>
<th>total-cpu-usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>read:</td>
<td>writ:</td>
<td>read:</td>
<td>writ:</td>
<td>read:</td>
<td>writ</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>35M:</td>
<td>0</td>
<td>32M:</td>
<td>8192B</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>36M:</td>
<td>0</td>
<td>39M:</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>37M:</td>
<td>32k</td>
<td>37M:</td>
<td>32k</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>38M:</td>
<td>0</td>
<td>37M:</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
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<td>32k</td>
<td>21M:</td>
<td>96k</td>
<td>22M</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>16k</td>
<td>0</td>
<td>16k</td>
<td>16k</td>
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<tr>
<td>0</td>
<td>0</td>
<td>16k</td>
<td>4096B:</td>
<td>32k</td>
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</tr>
<tr>
<td>0</td>
<td>0</td>
<td>4096B:</td>
<td>0</td>
<td>46M:</td>
<td>32k</td>
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<td>0</td>
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<td>44M:</td>
<td>0</td>
<td>46M:</td>
<td>24k</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>16k</td>
<td>0</td>
<td>26M:</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>16k</td>
<td>48M:</td>
<td>16k</td>
<td>45M</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>46M:</td>
<td>0</td>
<td>46M:</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>43M:</td>
<td>0</td>
<td>46M:</td>
<td>0</td>
</tr>
</tbody>
</table>

- **empty datafile**
- **non-empty datafile**
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12c Includes SYSBACKUP Role

- Special role that only has backup privileges
- For example, SYSBACKUP does not include SELECT ANY TABLE
- Recommended method for connecting to RMAN
A Few More Things...

- Image copy backups support section size
- Storage snapshot optimizations
- Specify that duplicated database does not open after duplication
Questions?

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