RMAN: Your Best Friend for Backup and Recovery Has Gotten Better

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Topics of Discussion

- What's in it for me?
- Top 10 reasons to love RMAN updated.
- The golden rule of backup and recovery to remind us all.
- Recovery catalog?
- Cloning made simple. Duplicate, PITR & TSPITR
- Miscellaneous gotcha's
- Using OEM with RMAN.
- Useful notes and articles.

What's in it for me?

- RMAN got me my job and I still have it.
  - No dataloss, ever!
- Did I mention, it's free!
- 3 features that no other 3rd party or home-grown solution offers, according to Tim Gorman of SageLogix, Inc. are reason enough to use rman.

  1. Hot backups without ALTER TABLESPACE..BEGIN BACKUP;

     It's not the command but what it does; ends block fracture and lots of redo.

  2. Incremental backups..no one else has them!
  3. Detecting corruption while you do backup.

     Let's you be a hero!

Anything else?

- Again, to cite Tim Gorman, if you want to do even one of these things then rman is the solution:
  1. Increase the volume of the data you are backing up.
  2. Increase the speed or decrease the duration of backups.
  3 Increase the speed or decrease the duration of restores and recoveries.
  4. Prevent loss of any data, ever. (Write this down!)
- rman is the only way to accomplish all of these things and do them easily

Top Ten Reasons To Love RMAN (now more than ever)

1. Powerful (RESTORE DATABASE, BACKUP DATABASE)
2. Reliable (VALIDATE)
3. Light (no need to do BEGIN BACKUP/END BACKUP)
4. Flexible (DISK, 'SBT_TAPE')
5. Versatile (COPY, BACKUP, CATALOG previous backups)
6. Customizable (FULL, INCREMENTAL, CUMULATIVE INCREMENTAL)
7. Helpful (REPORT NEED BACKUP, REPORT UNRECOVERABLE)
8. Clone-enabled (DUPLICATE)
9. Integrated (part of the RDBMS)
10. Well-timed (SET UNTIL TIME)

From: ORACLE B ACKUP AND RECOV ERY STRATEGIES : HOW I LERNED D TOL LOVE RECOVERY MANAGER

Powerful (RESTORE DATABASE, BACKUP DATABASE)

- single commands to accomplish complicated tasks
- scripts can be stored in the recovery catalog..write once, use over and over
- you can set up configurations which will automatically allocate channels, set the retention, assure controlfile autobackup.

How to preset backup options.

CONFIGURE RETENTION POLICY TO RECOVERY WINDOW OF n DAYS;

CONFIGURE BACKUP OPTIMIZATION OFF;

CONFIGURE DEFAULT DEVICE TYPE TO DISK (or SBT tape);

CONFIGURE CONTROLFILE AUTOBACKUP ON;

CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO 'O_H/control/%d/%F';

CONFIGURE DEVICE TYPE DISK PARALLELISM 4; number of channels

CONFIGURE DATAFILE BACKUP COPIES FOR DEVICE TYPE DISK TO n;

CONFIGURE ARCHIVELOG BACKUP COPIES FOR DEVICE TYPE DISK TO n;

CONFIGURE CHANNEL DEVICE TYPE DISK DEBUG 5;

CONFIGURE CHANNEL 1 DEVICE TYPE DISK FORMAT '/dbback/db_%s%d_%p';

CONFIGURE CHANNEL 2 DEVICE TYPE DISK FORMAT '/dbback/db_%s%d_%p';

CONFIGURE CHANNEL 3 DEVICE TYPE DISK FORMAT dbback/db_%s%d_%p';

CONFIGURE CHANNEL 4 DEVICE TYPE DISK FORMAT '/dbback/db_%%d_%p';

CONFIGURE MAXSETSIZE TO UNLIMITED;

CONFIGURE SNAPSHOT CONTROLFILE NAME TO ’O_H/dbs/snapcf_%d.f';

Reliable (Find Corruption, VALIDATE backups)

- CORRUPTION HAPPENS!
- RMAN uses a server process to conduct backups. So when you use RMAN for backups it can automatically detect block level corruption. This allows you to fix things before they actually experience data loss.
- To make sure you can recover from a completed backup you can ‘restore database validate’.

More About Corruption.

- RMAN automatically detects Physical Block Corruption when performing a backup or copy.
- Because each backup and copy is performed by an Oracle server session it can detect many types of physical block corruption. This error check is enabled by default. This info is reported to the alert.log, the controlfile, and the recovery catalog and can be viewed in several sys.v$ tables.
- RMAN checks for Logical Block Corruption if you set the maxcorrupt parameter. Within a run block enter: set maxcorrupt for datafile 1,2,3…to 0 (or higher).
- Oracle's method for fixing corruption:
  - Find the problem. sys.v$backup_corruption, etc.
  - Fix the problem: Restore from a backup taken before the corruption occurred. (PITR).
  - Recover the database to the desired point-in-time.
- Look like a hero! Being proactive is always better!

Light (no need to do BEGIN BACKUP/END **BACKUP**)

- Ends the problem of fractured blocks without generating huge volumes of redo
- The datafile header blocks are not frozen!
- Online backups are really possible.

FLEXIBLE (DISK,‘SBT_TAPE’)

- Back up onto valid media. If you specify type disk, then you must back up to random-access disks. You can make a backup on any device that can store an Oracle datafile: in other words, if the statement CREATE TABLESPACE tablespace_name DATAFILE 'filename' works, then 'filename' is a valid backup path name. If you specify type 'sbt_tape', then you can back up to any media supported by the media management software.
- You can copy disk backups to tape using the OS backup facilities which means you don’t have to have a media manager. This makes it easy to use right out of the box without incurring any additional expense. This allows you to take backup copies off-site easily. Our off-site option consists of taking the tape copy and hand carrying it to another building.

Versatile (COPY, BACKUP, CATALOG previous backups)

- You can do an image copy of any database, tablespace,or datafile.
- Backup databases with 9 levels of incremental backup.
- Put previous no-catalog backups into an rman catalog easily (8i on).
  - The steps to do this;
    - Register the database in the catalog if not already done.
    - Start rman.
    - Connect to the target and recovery catalog.
    - Resync the catalog.

Customizable (FULL, INCREMENTAL, CUMULATIVE INCREMENTAL)

- As stated, only rman allows 9 levels of incremental backups. You can use this flexibility to save disk space.
- Level 0 is the lowest level and is essentially a full backup including the controlfile. (Very important for point-in-time recovery!)
- You can assure a backup of the control file at the end of each backup with controlfile autobackup. This is important if you need to recover to a point-in-time between the beginning and end of the backup. You can set this in the configurations.

Helpful (REPORT NEED BACKUP, REPORT UNRECOVERABLE)

- You can do the following from rman:
  - Report on datafiles needing backup.
    - report need backup;
  - Find files which are unrecoverable.
    - report unrecoverable;
  - See files which can be deleted.
    - report obsolete;
- Use Sql*Plus to customize reporting.

Clone-enabled (DUPLICATE)

- Use the DUPLICATE command to EASILY create clones for testing,reporting, and development and fixing problems like dropped tables.
- Variations of DUPLICATE allow you to do PITR and TSPITR.
- You can give a duplicate database its own identity with DBNEWID.
- In 8.0.xx, you can also clone databases. You have to fool rman into thinking that it is restoring a backup to it's target. You fool rman by restoring the backup on a different node, and rename the clone.

Integrated (part of the RDBMS)

- RMAN comes with the ORACLE database. No third party software is needed (for disk backups).
- Uses the same Oracle internals to ensure a consistent database backup as sqlplus uses to get a consistent view of the database, the SCN.
  - See the paper by Jeremiah Wilton, Misconceptions:Hot Backup Mode Stops Writing To the Datafiles
    - » "The tablespace is checkpointed, the checkpoint SCN marker in the datafile headers cease to be incremented with checkpoints, and full images of changed DB blocks are written to the redo logs.":

Well-timed (SET UNTIL)

- Point-in-time recovery, PITR, to recover a database to a point-in-time earlier than the present (database must be in archivelog mode).
- TSPITR, tablespace point-in-time recovery for recovering lost objects,etc. No down time using this method!
- You can also set until SCN if you know the SCN you want to recover to.

How to ‘set until time’.

- Establish what time the problem occurred.
- Set the NLS_DATE_FORMAT to mm-dd-yyyy:hh24:mi:ss in the OS. Use this format!
- The first line of your run block, after connecting to the target and rcvcat (optional) should be:

  rman> set until time ‘09-29-2005:03:30:00’;

- If you want to make a duplicate (clone) database using the last backup completed you can run the following sql script on the recovery catalog database:

  select max(to_char(completion_time,'YYYY-MM-DD:hh24:mi:ss')) from RMAN.rc_backup_datafile where db_name=‘yourDB’;

  Add 1 second to the results, e.g. If ss=30 make the seconds=31.

The Golden Rule of backup and recovery backup and recovery

- The golden rule of backup and recovery can be simply stated as:

  The set of disks or other media that contain the redundancy set should be separate from the disks that contain the datafiles, online redo logs, and controlfiles. The redundancy set should be kept separated from the primary copies in every way possible... (Francesco Sanchez, Oracle Corp.)
- You can put your backupsets on any disk on the network, or sbt_tape allowing you to follow this rule. And further, you can use the OS backup facility to put these on tape for storage.
  - This backup to tape can be done in the background with minimal impact to users and processes.

The Recovery Catalog is going away. NOT!

- Oracle says the catalog is going away, but it's not gone yet! Going nocatalog is not ready for prime time!
- So why should I use a catalog?
  - You don't have to have a very large database to hold the catalog.
  - The catalog is a series of tables and views which you can query with SQL*plus.
  - You can store scripts and configurations right in the catalog, and reuse them at will.
  - There will still be backup information in the controlfile, so you can use rman nocatalog if needed.
  - Can you say dbms_backup_recovery?

Planning to Duplicate a database.

- When planning to duplicate a particular database to another location on a regular basis, it helps to have the same directory structure for the clone as the target has.
- If this is not possible, then you must set newname for each datafile so rman knows where to put it.

TSPITR, PITR, & Duplicate

- A TSPITR is only a variation of a PITR which is a Duplicate with a point in time specified
- You must have a place to create a clone database.
  - Preferrably on a different box.
- Follow the directions for duplicating a database but you only need to recover the tablespace(s) which you need.
  - If you need to recover a dropped table, you only need the DATA tablespace (actually its associated datafiles).
- Restore and recover the clone.
- Export the missing file from the clone and import it into the live database.
- Do an online backup or the repaired database ASAP!

Duplicate script with like directory structure

- Here is a script which duplicates a database to a clone with a different file structure:
  - run {
    set until time '2005-07-01:05:04:46'; **this was the time+1second the backup was done.
    allocate auxiliary channel b1 type disk;
    allocate auxiliary channel b2 type disk;
    allocate auxiliary channel b3 type disk;
    allocate auxiliary channel b4 type disk;
    duplicate target database to july1ccs NOFILENAMECHECK;}

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    SET NEWNAME FOR DATAFILE 1 TO '/orasys/july1ccs/j1csys01.dbf' ;
    SET NEWNAME FOR DATAFILE 2 TO '/oradata/july1ccs/j1cdata01.dbf' ;
    ...
    SET NEWNAME FOR DATAFILE 9 TO '/oraidx2/undo/july1ccs/undo01.dbf' ;
    SET NEWNAME FOR DATAFILE 11 TO '/oradata2/july1ccs/j1cdat202.dbf' ;
    SET NEWNAME FOR DATAFILE 12 TO '/oraidx2/undo/july1ccs/undo02.dbf' ;
    allocate auxiliary channel b1 type disk;
    allocate auxiliary channel b2 type disk;
    allocate auxiliary channel b3 type disk;
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Using DBNEWID to create a unique identity

- The database utility DBNEWID can be used to change the dbname and/or the dbid of a database.
  - After the duplicate database has been created and opened successfully:
    - Close the database and open it in mount state.
    - To change the dbid only enter: % nid TARGET=SYS/oracle@test_db
    - To change the dbid and name enter:

      % nid TARGET=SYS/oracle@test DBNAME=test_db

Some great new features:

- Preset your backup and recovery configurations and keep them in the recovery catalog.
- With 10g you will be able to duplicate databases across platforms without exp/imp.
- Here is a note from Jared Still, self-proclaimed Certifiable Oracle DBA and Part Time Perl Evangelist:
  - Perusing the Oracle 10g new features I see that Oracle has eliminated my objection to staging backups on disk.

  This release supports automated, disk-based backup and recovery. The benefits include simplified and unified storage location for backups, archive logs, and any other files needed for Oracle recovery; automatic deletion of the files after they have been successfully backed up by the Recovery Manager (RMAN); the equivalent of a disk cache for tape, which reduces the time needed to restore a file from tape; and reduced risk of an out-of-space condition on disk, by deleting files that are no longer required for database recovery.

  RMAN previously had no method to automatically retrieve files from a backup system that had been moved to tape after the initial backup to disk.

Miscellaneous Gotcha's

- If something goes wrong, don't open the database.
  - If the database won't open (alter database open resetlogs; or alter database open noresetlogs; check the error. There are several reasons usually having to do with the set until time that can be correected by changing the time and trying again.
- The dbms_backup_restore package is a bear! Avoid if you can,
  - but if you must use it, read Metalink note 60545.1, call Support, and pray.
- You may have to recreate the datafiles in the temp tablespace when you do a PITR recovery.

Using OEM with rman.

- In the old days, OEM said it worked with RMAN but it was flaky , to say the least.
- Now you can set up libraries of configurations which can be used over and over.
- You can schedule backups and view them in the active jobs panel and see the full results in the history panel.

Useful papers and notes.

- Using sys.rdbms_backup_recovery:
  - Metalink note 60545.1
- An oldie but goodie:
  - Oracle Backup and Recovery Strategies: How I Learned to Love Recovery Manager Francisco Sanchez, Oracle Corporation
- More talk about how rman does and doesn't work:
  - Misconception: Hot Backup Mode Stops Writing To the Datafiles

    Jeremiah Wilton (www.speakeasy.org/~jwilton/hot-backup.html).
- RMAN: Creating a Duplicate Database
  - Metalink bulletin 73912.1
- RMAN 9i: Consistent Backup, Restore and Recovery using RMAN
  - Metalink Howto 162855.1
- RMAN: RAC Backup and Recovery using RMAN
  - Metalink Bulletin 243760.1