Backup and Recovery Guide

# Tổng quan về Backup và Recovery

## Giới thiêu chung về backup và recovery

**Khái niệm:**

* **Backup** : là 1 bản copy của database có thể sử dụng để khôi phục lại database khi cần thiết
* Có 2 loại backup chính:
  + **physical backup**: là các bản copy của các datafile ( datafile, controlfile…)
  + **logical backup**: lưu trữ dữ liệu logic ( table, procedure…)

**Các công việc chính của backup administration**

* Lên kế hoạch và thử nghiệm các sự cố có thể xảy ra
* Cấu hình môi trường cho database để thực hiện backup và recovery
* Lên lịch backup
* Theo dõi tiến trình backup và recover
* Troubleshooting các vấn đề backup
* Thực hiện recovery khi cần thiết

Ngoài ra còn 1 số nghiệp vụ liên quan như

* Bảo quản dữ liệu:trong đó bao gồm việc tạo ra một bản sao cơ sở dữ liệu để lưu trữ lâu dài
* Data transfer: thực hiện di chuyển dữ liệu của database

**Data Recovery Advisor**

* Tool hỗ trợ backup vs recovery ( bằng các cảnh báo, kiểm tra …)

# Config RMAN và Flashback database

## Kiến trúc RMAN

**Các thành phần của của RMAN Environment:**

**Bắt buộc**:

* **RMAN client**: phần mềm RMAN đã được cài đặt
* **target database:** Database sẽ được client kết nối và làm việc

**Không bắt buộc:**

* recovery catalog database
* recovery catalog schema
* physical standby database
* duplicate database
* fast recovery area
* media manager
* media management catalog
* Oracle Enterprise Manager

Câu lệnh kết nối :

RMAN

[ TARGET connectStringSpec

| { CATALOG connectStringSpec }

| LOG ['] filename ['] [ APPEND ]

.

.

.

]...

connectStringSpec::=

['] [userid] [/ [password]] [@net\_service\_name] [']

Ví dụ :

$ rman TARGET / LOG /tmp/msglog.log APPEND

Câu lệnh nên dùng trước khi restore database:

RMAN> RESTORE DATABASE PREVIEW SUMMARY;

## Cấu hình RMAN

**Xem tất cả cấu hình RMAN**

RMAN > Show all

using target database control file instead of recovery catalog

RMAN configuration parameters for database with db\_unique\_name DBTEST are:

CONFIGURE RETENTION POLICY TO REDUNDANCY 1;

# n: Số bản backup full tối thiểu

# Hoặc CONFIGURE RETENTION POLICY TO RECOVERY WINDOW OF 7 DAYS

# Có thể recover lại 7 ngày trước

CONFIGURE BACKUP OPTIMIZATION OFF; # default

# ON-OFF: RMAN sẽ bỏ qua ko backup những bản backup đã trùng lặp

CONFIGURE DEFAULT DEVICE TYPE TO DISK; # default

# Disk-Tape: Thiết bị lưu trữ mặc định ( disk-tape)

CONFIGURE CONTROLFILE AUTOBACKUP OFF; # default

# ON-OFF: backup controlfile khi backup cả database

CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO '%F'; # default

# Định dạng mặc định khi autobackup controlfile

CONFIGURE DEVICE TYPE DISK PARALLELISM 1 BACKUP TYPE TO BACKUPSET; # default

# Cấu hình số kênh backup

CONFIGURE DATAFILE BACKUP COPIES FOR DEVICE TYPE DISK TO 1; # default

#

CONFIGURE ARCHIVELOG BACKUP COPIES FOR DEVICE TYPE DISK TO 1; # default

CONFIGURE MAXSETSIZE TO UNLIMITED; # default

CONFIGURE ENCRYPTION FOR DATABASE OFF; # default

# ON-OFF: Mã hóa khi backup

CONFIGURE ENCRYPTION ALGORITHM 'AES128'; # default

# Thuật toán mã hóa

CONFIGURE COMPRESSION ALGORITHM 'BASIC' AS OF RELEASE 'DEFAULT' OPTIMIZE FOR LOAD TRUE ; # default

CONFIGURE ARCHIVELOG DELETION POLICY TO NONE; # default

# Cấu hình tự động xóa archivelog file khi đạt policy

CONFIGURE SNAPSHOT CONTROLFILE NAME TO '/u01/app/11.2.0/db/dbs/snapcf\_dbtest1.f';

# Địa chỉ file snapshot của controlfile

**Cấu hình các thành phần RMAN**

Viết lại thông tin giống như phải cấu hình và thay đổi tham số cần thiết

CONFIGURE CONTROLFILE AUTOBACKUP ON

CONFIGURE DEVICE TYPE DISK PARALLELISM 4 BACKUP TYPE TO BACKUPSET;

**Thay đổi cấu hình RMAN về mặc định**

RMAN> CONFIGURE ... CLEAR

RMAN> CONFIGURE BACKUP OPTIMIZATION CLEAR;

RMAN> CONFIGURE RETENTION POLICY CLEAR;

* Sử dụng số bản backup full gần nhất, những bản cũ hơn sẽ đánh dấu obsolete

CONFIGURE RETENTION POLICY TO REDUNDANCY 1;

#Số bản backup full tối thiểu

CONFIGURE BACKUP OPTIMIZATION OFF; # default

CONFIGURE DEFAULT DEVICE TYPE TO DISK; # default

CONFIGURE CONTROLFILE AUTOBACKUP OFF; # default

CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO '%F'; # default

CONFIGURE DEVICE TYPE DISK PARALLELISM 1 BACKUP TYPE TO BACKUPSET; # default

CONFIGURE DATAFILE BACKUP COPIES FOR DEVICE TYPE DISK TO 1; # default

CONFIGURE ARCHIVELOG BACKUP COPIES FOR DEVICE TYPE DISK TO 1; # default

CONFIGURE MAXSETSIZE TO UNLIMITED; # default

CONFIGURE ENCRYPTION FOR DATABASE OFF; # default

CONFIGURE ENCRYPTION ALGORITHM 'AES128'; # default

CONFIGURE COMPRESSION ALGORITHM 'BASIC' AS OF RELEASE 'DEFAULT' OPTIMIZE FOR LOAD TRUE ; # default

CONFIGURE ARCHIVELOG DELETION POLICY TO NONE; # default

CONFIGURE SNAPSHOT CONTROLFILE NAME TO '/u01/app/11.2.0/db/dbs/snapcf\_dbtest1.f';

Check cú pháp RMAN

$ rman CHECKSYNTAX @filename

**Backup & Recovery Lab**

# Backup and recover command

## Backup online

* Backup lv0 + backup archivelog

File: /backup/script/backup\_lv0.rman

run {

ALLOCATE CHANNEL CH01 DEVICE TYPE DISK FORMAT '/backup/db01\_lev0/c1\_db01\_%Y%M%D\_%U';

ALLOCATE CHANNEL CH02 DEVICE TYPE DISK FORMAT '/backup/db01\_lev0/c2\_db01\_%Y%M%D\_%U';

ALLOCATE CHANNEL CH03 DEVICE TYPE DISK FORMAT '/backup/db01\_lev0/c3\_db01\_%Y%M%D\_%U';

CROSSCHECK ARCHIVELOG ALL;

DELETE NOPROMPT EXPIRED ARCHIVELOG ALL;

DELETE NOPROMPT EXPIRED BACKUP;

BACKUP AS BACKUPSET INCREMENTAL LEVEL 0 DATABASE FILESPERSET 4 MAXSETSIZE 40 G TAG LEVEL0;

SQL 'ALTER SYSTEM ARCHIVE LOG CURRENT';

BACKUP AS BACKUPSET BACKUPSET ARCHIVELOG ALL FILESPERSET 4 TAG ARCH ;

DELETE NOPROMPT ARCHIVELOG UNTIL TIME 'SYSDATE-7';

CROSSCHECK BACKUP;

CROSSCHECK COPY;

DELETE NOPROMPT EXPIRED BACKUP;

RELEASE CHANNEL CH01;

RELEASE CHANNEL CH02;

RELEASE CHANNEL CH03;

}

EXIT;

* Backup lv1 + backup archivelog

File: /backup/script/backup\_lv1.rman

run {

ALLOCATE CHANNEL CH01 DEVICE TYPE DISK FORMAT '/backup/db01\_lev1/c1\_db01\_%Y%M%D\_%U';

ALLOCATE CHANNEL CH02 DEVICE TYPE DISK FORMAT '/backup/db01\_lev1/c2\_db01\_%Y%M%D\_%U';

CROSSCHECK ARCHIVELOG ALL;

DELETE NOPROMPT EXPIRED ARCHIVELOG ALL;

DELETE NOPROMPT EXPIRED BACKUP;

BACKUP AS BACKUPSET INCREMENTAL LEVEL 1 DATABASE FILESPERSET 4 MAXSETSIZE 40 G TAG LEVEL1;

SQL 'ALTER SYSTEM ARCHIVE LOG CURRENT';

BACKUP AS BACKUPSET ARCHIVELOG ALL FILESPERSET 4 TAG ARCH ;

DELETE NOPROMPT ARCHIVELOG UNTIL TIME 'SYSDATE-7';

CROSSCHECK BACKUP;

CROSSCHECK COPY;

DELETE NOPROMPT EXPIRED BACKUP;

RELEASE CHANNEL CH01;

RELEASE CHANNEL CH02;

}

EXIT;

* Backup archivelog

run{

BACKUP AS COMPRESSED BACKUPSET ARCHIVELOG ALL FORMAT '/backup/arcbk/arc0\_%T\_%d\_%u\_%s\_%U' FILESPERSET 4 DELETE INPUT TAG ARCH;

}

* Backup controlfile ( Lưu ý : backup sau khi backup database)

run{

BACKUP AS COMPRESSED BACKUPSET CURRENT CONTROLFILE FORMAT '/usr/oracle/backup/ctrbk/bkcontrolfile0\_%T\_%d\_%u\_%s' TAG CTLFILE;

}

## Tạo script OS để tự động chạy job

* Script OS backup incremental lv 0 :

File: /backup/scripts/backup\_lv0.sh

Chú ý: sửa đường dẫn và các tham số cho phù hợp

#!/bin/bash

logfile=`date +%Y%m%d`\_lv0.log

export ORACLE\_SID=db01

export NLS\_DATE\_FORMAT="yyyy-mm-dd hh24:mi:ss"

export ORACLE\_BASE=/oracle/base

export ORACLE\_HOME=/oracle/db

export PATH=$ORACLE\_HOME/bin:$PATH

rman target / catalog Rman/bktct#2013@omr cmdfile /backup/scripts/backup\_lv0.rman log /backup/log\_backup/$logfile

exit

* Script OS backup incremental lv 1 :

File: /backup/scripts/backup\_lv1.sh

Chú ý: sửa đường dẫn và các tham số cho phù hợp

#!/bin/bash

logfile=`date +%Y%m%d`\_lv1.log

export ORACLE\_SID=db01

export NLS\_DATE\_FORMAT="yyyy-mm-dd hh24:mi:ss"

export ORACLE\_BASE=/oracle/base

export ORACLE\_HOME=/oracle/db

export PATH=$ORACLE\_HOME/bin:$PATH

rman target / catalog Rman/bktct#2013@ omr cmdfile /backup/scripts/backup\_lv1.rman log /backup/log\_backup/$logfile

exit

## Backup offline

* Sử dụng để backup khi db ở trạng thái noarchivelog mode
* Backup bằng rman:

RMAN> shutdown immediate;

RMAN> startup mount;

RMAN> backup database #tương tự nhu backup online

RMAN> alter database open;

* Backup bằng cách copy:
  + Tìm vị trí của các file : datafiles, controlfiles, redologs

SQL> select file\_name||' '||tablespace\_name||' '||bytes from dba\_data\_files;

SQL> select group#||' '||member from v$logfile;

SQL> show parameter %control%

* + Shutdown database

SQL> shutdown immediate

Database closed.

Database dismounted.

ORACLE instance shut down.

* + Sử dụng câu lệnh của OS để thực hiện các thao tác copy các datafile sang vị trí đặt backup
  + Khởi động database

SQL> Startup

Oracle instance started

Database mounted

Database Open

## Recover

### Recovery Spfile

* Spfile và pfile được lưu ở $ORACLE\_HOME/dbs
  + spfile có dạng spfileSID.ora
  + pfile có dạng initSID.ora
* Tạo spfile from pfile và ngược lại

SQL> create spfile=’’ from pfile=’’;

SQL> create pfile=’’ from spfile=’’;

* Restore spfile

RMAN> RESTORE CONTROLFILE from '*filename*';

* Khởi động db bằng spfile

SQL> startup spfile='/u01/backup/spfileSID.ora';

* Khởi động db bằng pfile

SQL> startup pfile='/u01/backup/init.ora';

### Recovery controlfile

RMAN> RESTORE CONTROLFILE from '*filename*';

### Recovery datafile/tablespace/database

RMAN> Alter database mount

RMAN> RESTORE DATABASE/DATAFILE/TABLESPACE until SCN 123456

RMAN> RECOVER DATABASE/DATAFILE/TABLESPACE until SCN 123456

# Restore and Recover case

## Loss parameter file

### SPF1: Loss of PFILE/SPFILE When No Backup Exists

**Problem:**

* Loss of PFILE/SPFILE
* You don’t have PFILE/SPFILE backup

**Solution(s):**

* Check database alert.log bottom-up
* When database is UP
  + PFILE 🡪 Query V$PARAMETER2 view
  + SPFILE 🡪 Query V$SPPARAMETER
* Create PFILE/SPFILE from memory (Oracle 11g)

### SPF2: Restore SPFILE From backup file

**Problem:**

* Database is DOWN
* SPFILE is lost
* Autobackup is configured

**Solution:**

* Start database instance in NOMOUNT mode without a parameter file
* Set DBID
* Restore SPFILE from Autobackup

## Loss of Control Files

### CF1: Loosing one of the Multiplexed Control File’s

**Problem:**

* Database is up
* One of the multiplexed control file is lost

**Solution(s):**

* Copy a good control file to the location of the missing control file
* Remove references to the missing control file from CONTROL\_FILES initialization parameter

### CF2: Loosing all Multiplexed Control Files (without a backup)

**Problem:**

* All Control Files are lost
* No backup exists

**Solution:**

* Startup database instance in NOMOUNT mode
* Create a new Control File
* Open the database

### CF3: Restoring Control File From backup file

**Problem:**

* All Control Files are lost
* Autobackup is configured

**Solution:**

* Start database instance in NOMOUNT mode
* Set DBID in RMAN
* Restore control file from autobackup
* MOUNT the database
* Recover database
* Open the database with RESETLOGS option

## Loss of Redo Log Files

### RLF1: Loosing a Member of Multiplexed Redo Log Files

**Problem:**

* A member of multiplexed redo log group is lost
* Database is UP

**Solution(s):**

* Fix the media or
* Drop the affected Redo Log File and Create a new one in a different location

### RLF2: Loosing INACTIVE Redo Log Files

**Problem:**

* The only member of the redo log group is lost
* Status of the Redo Log Group is INACTIVE
* Database is Up

**Solution(s):**

* If this is a temporary media failure, fix the issue and start database
* If the redo log file is lost while the media remains available then clear the archvied/unarchived log file
* If the media failure is permanent then drop and re-create the redo log group to a new location

### RLF3: Loosing CURRENT Redo Log Files

**Problem:**

* All the member of an CURRENT redo log group are lost
* Valid database backup exist

**Solution:**

* Startup database in MOUNT mode
* Identify the last good SCN
* Restore database until last good SCN
* Recover database until last good SCN
* Re-create the redo log group to a different location
* Open database with RESETLOGS option

### RLF4: Loosing ACTIVE Redo Log Files

**Problem:**

* All the member of an ACTIVE redo log group are lost
* Database is Up

**Solution:**

* Issue a Checkpoint
* Check redo log status
* If Checkpoint is SUCCESS then CLEAR redo log group.
* If Checkpoint FAILS to complete then perform incomplete recovery by identifying the last good SCN

## Basic Recovery Solutions

### Datafile Recovery

**Problem:**

* One of the Datafiles is lost
* Database is Up
* Valid backups exist

**Solution:**

* Offline all the required datafiles
* Restore the affected datafiles
* Recover datafiles
* Bring back the datafiles to online state
* Verify restore

### Tablespace Recovery

**Problem:**

* Several datafiles of a tablespace are affected
* Database is Up
* Valid backups exist

**Solution:**

* Offline the affected tablespace
* Restore tablespace
* Recover tablespace
* Bring back the tablespace to online state
* Verify restore

### Recovering Read-Only Tablespace

**Problem:**

* Full database restore is performed
* Read-only tablespaces were ignored by RMAN during restore

**Solution:**

* Use CHECK READONLY option during database restore
* Alternatively, explicitly restore the tablespaces which are in read-only mode

### Recovering Temporary Tablespace

* Add new datafile to temporary tablespace
* Delete missing tablespace

### Tablespace Point-In-Time Recovery (TSPITR)

**Problem:**

* A TRUNCATE TABLE statement was erroneously run in production
* Database is UP
* Valid database backup’s exist

**Solution:**

* List all the objects residing in the affected tablespace
* Identify and resolve any dependencies
* Backup all the objects that will be lost
* Create an auxiliary destination
* Recover the tablespace
* Bring the tablespace online

### Flashback Database

**Problem:**

* An erroneous transaction was performed (TRUNCATE)
* Database is in Flashback mode

**Solution:**

* Identify the SCN to flashback to
* Shutdown database
* Start database in MOUNT mode
* Flashback database
* Open database with RESETLOGS option
* Verify table contents

## Advanced Recovery Solutions

### Recovering Datafiles Not Backed Up

**Problem:**

* New datafile is added to a tablespace (MOMEN\_TS)
* Datafile was lost before it could be backed up
* Valid database backup exists
* All Archive logs exist
* Database is UP

**Solution:**

* List datafiles that need recovery
* Restore datafile
* Recover tablespace
* Verify contents

### Recovering through RESETLOGS

**Problem:**

* Incomplete database recovery was performed (RESETLOGS)
* Soon after restore completed, you suffered from another media failure
* Backup was not performed after opening database with RESETLOGS option
* All the generated archive logs exist

**Solution:**

* Start database in NOMOUNT mode
* Restore Control File
* MOUNT database
* Restore database
* Recover database
* Open database with RESETLOGS option

### Recovering to a Restore Point

**Problem:**

* You have created a Restore Point
* You want to restore database to the created Restore Point
* Valid database backup exists

**Solution:**

* List Restore Points
* MOUNT database
* Restore database until Restore Point
* Recover database until Restore Point
* Open database with RESETLOGS option
* Verify restore

### Recovering to a Previous Incarnation

**Problem:**

* You performed an incomplete recovery
* Now you want to go back in time prior to the time when database was opened with resetlogs
* Valid database backup exists

**Solution:**

* List database incarnations
* Restore Control File
* MOUNT database
* Reset database incarnation
* Restore database until Time
* Recover database until time
* Open database with RESETLOGS option
* Verify restore

### Partial Restore of a Database

**Problem:**

* Database is very large
* Need to recover few tables due to erroneous transaction
* Valid database backups exist

**Solution:**

* Identify required tablespaces and datafiles
* Copy init.ora to a different host
* Start instance in NOMOUNT state
* Restore control file
* Restore required tablespaces
* Delete the existing control file and create a new one with the required datafiles only
* Recover database
* Open database with RESETLOGS
* Confirm contents of table T
* Export the table (T) and import into production database

### Block Recovery

**Problem:**

* Few data blocks are reported as corrupt
* RMAN Backups are safe

**Solution:**

* Identify and list corrupt blocks
* Perform Block Recovery
* Verify results

## Unsupported Recovery Solutions

### Recovering From RMAN Backup Pieces

**Problem:**

* All you have is RMAN backup pieces
* SPFILE, Control File are included in the backup pieces

**Solution:**

* List all backup pieces
* Startup database instance in NOMOUNT mode without parameter file
* Extract SPFILE from the backup pieces
* Extract Control File from the backup pieces
* Restart database in MOUNT mode using restored SPFILE and Control Files
* Restore and recover database
* Open database with RESETLOGS option

### Recovering an Inconsistent Database

**Problem:**

* Full database backup exists as of day “X”
* A backup of SYSTEM, SYSAUX, and data tablespace (MOMEN\_TS) exists as of day “Y”
* Few Archive log’s are missing between day “X” and day “Y”
* Your database is in inconsistent mode

**Solution:**

* Check SCN of datafiles
* Edit init<sid>.ora to include hidden parameters and modify undo management
* Start database instance in MOUNT mode
* Bring all datafiles online
* Perform a fake recovery
* Open database with RESETLOGS
* If the instance crashes then set “10015” event
* Open database with RESETLOGS