ASM HANDS-ON TRAINING
Lab 5 Using RMAN To Migrate a Database Into ASM

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Summary

One of the ways to migrate a database to ASM storage is to use Rman to make a “Backup as Copy” into ASM and then switching the database to the copy.

This technique can be used, combined with incremental backups, to move even very large databases into ASM. The first backup may take a long time, one or more incremental backups can be used to update the first backup, until a downtime window is obtained to switch the database on filesystem to the backup on ASM.

Migrating a Database Into ASM

Backup Database Into ASM

The first step is to create a backup inside ASM, we will use the following script to do that

```
run {   allocate channel dev1 type disk;
        allocate channel dev2 type disk;
        allocate channel dev3 type disk;
        allocate channel dev4 type disk;
        BACKUP AS COPY INCREMENTAL LEVEL 0 DATABASE
        FORMAT '+DATADGNR' TAG 'ORA_ASM_MIGRATION';
    }
```

```
[oracle@asmxpt ~]$ rman target /

Recovery Manager: Release 10.2.0.4.0 - Production on Sat Feb 7 12:19:38 2009

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```

```
connected to target database: SATI (DBID=1728841273)

RMAN> run {   allocate channel dev1 type disk;
2> allocate channel dev2 type disk;
3> allocate channel dev3 type disk;
4> allocate channel dev4 type disk;
5> BACKUP AS COPY INCREMENTAL LEVEL 0 DATABASE FORMAT '+DATADGNR' TAG 'ORA_ASM_MIGRATION';
6>         }

using target database control file instead of recovery catalog
allocated channel: dev1
channel dev1: sid=145 devtype=DISK

allocated channel: dev2
channel dev2: sid=143 devtype=DISK

allocated channel: dev3
channel dev3: sid=142 devtype=DISK

allocated channel: dev4
channel dev4: sid=141 devtype=DISK

Starting backup at 07-FEB-09
channel dev1: starting datafile copy
input datafile fno=00001
name=/u01/app/oracle/10g_db/oradata/SATI/datafile/o1_mf_system_4qtsdl24_.dbf
channel dev2: starting datafile copy
input datafile fno=00003
name=/u01/app/oracle/10g_db/oradata/SATI/datafile/o1_mf_sysaux_4qtsdl4g_.dbf
channel dev3: starting datafile copy
```

```
input datafile fno=00002
name=/u01/app/oracle/10g_db/oradata/SATI/datafile/o1_mf_undotbs1_4qtsdls7_.dbf
channel dev4: starting datafile copy
input datafile fno=00004
name=/u01/app/oracle/10g_db/oradata/SATI/datafile/o1_mf_users_4qtsdlwj_.dbf
output filename=+DATADGNR/sati/datafile/users.259.678198083 tag=ORA_ASM_MIGRATION recid=1
stamp=678198087
channel dev4: datafile copy complete, elapsed time: 00:00:16
output filename=+DATADGNR/sati/datafile/undotbs1.256.678198083 tag=ORA_ASM_MIGRATION
recid=2 stamp=678198094
channel dev3: datafile copy complete, elapsed time: 00:00:19
output filename=+DATADGNR/sati/datafile/sysaux.257.678198083 tag=ORA_ASM_MIGRATION recid=3
stamp=678198200
channel dev2: datafile copy complete, elapsed time: 00:02:15
output filename=+DATADGNR/sati/datafile/system.258.678198083 tag=ORA_ASM_MIGRATION recid=4
stamp=678198225
channel dev1: datafile copy complete, elapsed time: 00:02:30
Finished backup at 07-FEB-09

Starting Control File and SPFILE Autobackup at 07-FEB-09
piece handle=/u01/app/oracle/10g_db/dbs/c-1728841273-20090207-02 comment=NONE
Finished Control File and SPFILE Autobackup at 07-FEB-09
released channel: dev1
released channel: dev2
released channel: dev3
released channel: dev4

RMAN>
```

Once the backup finished we can check that the datafiles were copied to the datadgnr ASM diskgroup

```
[oracle@asmxpt ~]$ asmcmd ls -l DATADGNR/sati/datafile
Type      Redund  Striped  Time             Sys  Name
DATAFILE  MIRROR  COARSE   FEB 07 12:00:00  Y    SYSAUX.257.678198083
DATAFILE  MIRROR  COARSE   FEB 07 12:00:00  Y    SYSTEM.258.678198083
DATAFILE  MIRROR  COARSE   FEB 07 12:00:00  Y    UNDOTBS1.256.678198083
DATAFILE  MIRROR  COARSE   FEB 07 12:00:00  Y    USERS.259.678198083
```

Spfile Backup into ASM

The next step is to make a backup of the spfile and to restore it into ASM

```
[oracle@asmxpt dbs]$ rman target /

Recovery Manager: Release 10.2.0.4.0 - Production on Sat Feb 7 13:10:09 2009

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connected to target database: SATI (DBID=1728841273)

RMAN> run { BACKUP AS BACKUPSET SPFILE;
2>          RESTORE SPFILE TO '+DATADGNR/SATI/spfilesati.ora';
3>        }

Starting backup at 07-FEB-09
using target database control file instead of recovery catalog
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=137 devtype=DISK
channel ORA_DISK_1: starting full datafile backupset
channel ORA_DISK_1: specifying datafile(s) in backupset
including current SPFILE in backupset
```

```
channel ORA_DISK_1: starting piece 1 at 07-FEB-09
channel ORA_DISK_1: finished piece 1 at 07-FEB-09
piece handle=/u01/app/oracle/10g_db/dbs/0ek6p1mv_1_1 tag=TAG20090207T131055 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:02
Finished backup at 07-FEB-09

Starting Control File and SPFILE Autobackup at 07-FEB-09
piece handle=/u01/app/oracle/10g_db/dbs/c-1728841273-20090207-04 comment=NONE
Finished Control File and SPFILE Autobackup at 07-FEB-09

Starting restore at 07-FEB-09
using channel ORA_DISK_1

channel ORA_DISK_1: starting datafile backupset restore
channel ORA_DISK_1: restoring SPFILE
output filename=+DATADGNR/SATI/spfilesati.ora
channel ORA_DISK_1: reading from backup piece /u01/app/oracle/10g_db/dbs/c-1728841273-
20090207-04
channel ORA_DISK_1: restored backup piece 1
piece handle=/u01/app/oracle/10g_db/dbs/c-1728841273-20090207-04 tag=TAG20090207T131057
channel ORA_DISK_1: restore complete, elapsed time: 00:00:07
Finished restore at 07-FEB-09
```

Once the spfile restore into ASM is ready can check again the datadgnr ASM diskgroup. Note that the spfilesati.ora is a link to +DATADGNR/DB_UNKNOWN/PARAMETERFILE/SPFILE.260.678201059

```
[oracle@asmxpt dbs]$ asmcmd ls -l DATADGNR/SATI/spfilesati.ora
Type           Redund  Striped  Time             Sys  Name
                                                 N    spfilesati.ora
```

Consistent database shutdown

Next step is to shutdown the database based on Filesystem

```
[oracle@asmxpt dbs]$ sql

SQL*Plus: Release 10.2.0.4.0 - Production on Sat Feb 7 13:18:20 2009

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Connected to:
Oracle Database 10g Enterprise Edition Release 10.2.0.4.0 - Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options

SQL> shutdown immediate;
Database closed.
Database dismounted.
ORACLE instance shut down.
```

Prepare Pfile for the ASM Database

Next step is to prepare a parameter file “initsati.ora” that will point to the spfile inside ASM

```
[oracle@asmxpt]$ cd $ORACLE_HOME/dbs
[oracle@asmxpt dbs]$ echo "SPFILE=+DATADGNR/SATI/PARAMETERFILE/spfilesati.ora" > initsati.ora
[oracle@asmxpt dbs]$ ls -l initsati.ora
-rw-r--r-- 1 oracle dba 51 Feb  7 13:35 initsati.ora
[oracle@asmxpt dbs]$ cat initsati.ora
SPFILE=+DATADGNR/SATI/PARAMETERFILE/spfilesati.ora
```

Start the database in NOMOUNT mode

On the next step we start the database in nomount mode using the pfile that points into the ASM spfile

```
[oracle@asmxpt dbs]$ sqlplus / as sysdba

SQL*Plus: Release 10.2.0.4.0 - Production on Sat Feb 7 13:39:38 2009

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Connected to an idle instance.

SQL> startup nomount pfile='/u01/app/oracle/10g_db/dbs/initsati.ora'
ORACLE instance started.

Total System Global Area  369098752 bytes
Fixed Size                  1267548 bytes
Variable Size             113248420 bytes
Database Buffers          251658240 bytes
Redo Buffers                2924544 bytes
```

Change Parameters on Spfile to point to ASM

On this step we will prepare the spfile to migrate the controlfile into ASM, an we will set recovery area size and destination, then we will shutdown the database

```
SQL> alter system set control_files='+DATADGNR','+DATADGNR' scope=spfile;
```

```
System altered.

SQL> alter system set DB_RECOVERY_FILE_DEST_SIZE=2g scope=both;

System altered.

SQL> alter system set DB_RECOVERY_FILE_DEST='+ARCHDG' scope=both;

System altered.

SQL> shutdown immediate;
ORA-01507: database not mounted


ORACLE instance shut down.
```

Move the controlfiles into ASM

On this step we check for a controlfile backup on the default destination, $ORACLE_HOME/dbs.

```
[oracle@asmxpt dbs]$ ls -ltr
total 130844
-rw-r----- 1 oracle dba     8385 Sep 11  1998 init.ora
-rw-r--r-- 1 oracle dba    12920 May  3  2001 initdw.ora
-rw-rw---- 1 oracle dba     1544 Jan 26 09:25 hc_sati.dat
-rw-rw---- 1 oracle dba       24 Jan 26 09:26 lkSATI
-rw-r----- 1 oracle dba     1536 Jan 26 09:27 orapwsati
-rw-r--r-- 1 oracle dba       69 Feb  3 06:20 init+ASM.old
-rw-rw---- 1 oracle dba     1544 Feb  3 06:20 hc_+ASM.dat
-rw-rw---- 1 oracle dba       24 Feb  3 06:20 lk+ASM
```

```
-rw-r----- 1 oracle dba     1536 Feb  4 08:00 orapw+ASM
-rw-r----- 1 oracle dba     1536 Feb  6 08:29 spfile+ASM.ora
-rw-r----- 1 oracle dba 97820672 Feb  7 06:22 02k6o9o6_1_1
-rw-r----- 1 oracle dba  7143424 Feb  7 06:22 c-1728841273-20090207-00
-rw-r----- 1 oracle dba  7143424 Feb  7 06:41 c-1728841273-20090207-01
-rw-r--r-- 1 oracle dba      232 Feb  7 06:56 backup_as_copy.rmn
-rw-rw---- 1 oracle dba     1386 Feb  7 12:13 ab_+ASM.dat
-rw-r----- 1 oracle dba     2560 Feb  7 12:14 spfilesati.ora
-rw-r----- 1 oracle dba  7143424 Feb  7 12:23 c-1728841273-20090207-02
-rw-r----- 1 oracle dba    98304 Feb  7 12:58 0ck6p0v1_1_1
-rw-r----- 1 oracle dba  7143424 Feb  7 12:58 c-1728841273-20090207-03
-rw-r----- 1 oracle dba    98304 Feb  7 13:10 0ek6p1mv_1_1
-rw-r----- 1 oracle dba  7143424 Feb  7 13:10 c-1728841273-20090207-04
-rw-r--r-- 1 oracle dba       51 Feb  7 13:35 initsati.ora
```

Then we start the database in nomount mode and from within Rman we restore the controlfile from the last available backup.

The controlfiles will be restored to the location we specified on the previous step using the parameter **control_files.**

```
SQL> startup nomount pfile='/u01/app/oracle/10g_db/dbs/initsati.ora'
ORACLE instance started.

Total System Global Area  369098752 bytes
Fixed Size                  1267548 bytes
Variable Size             113248420 bytes
Database Buffers          251658240 bytes
Redo Buffers                2924544 bytes
SQL> exit
Disconnected from Oracle Database 10g Enterprise Edition Release 10.2.0.4.0 - Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options
```

```
[oracle@asmxpt dbs]$ rman target /

Recovery Manager: Release 10.2.0.4.0 - Production on Sat Feb 7 13:50:48 2009

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connected to target database: sati (not mounted)

RMAN> restore controlfile from '/u01/app/oracle/10g_db/dbs/c-1728841273-20090207-04';

Starting restore at 07-FEB-09
using target database control file instead of recovery catalog
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=156 devtype=DISK

channel ORA_DISK_1: restoring control file
channel ORA_DISK_1: restore complete, elapsed time: 00:00:09
output filename=+DATADGNR/sati/controlfile/current.261.678203559
output filename=+DATADGNR/sati/controlfile/current.262.678203561
Finished restore at 07-FEB-09
```

Switch the Database from File System to ASM

On this step we will actually point the database to switch from the datafiles located on file system to the datafiles located inside ASM.

From within the same Rman session we were working on the previous step we mount the database and we switch to the ASM datafiles.

```
RMAN> mount database;

database mounted
released channel: ORA_DISK_1

RMAN> switch database to copy;

Starting implicit crosscheck backup at 07-FEB-09
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=156 devtype=DISK
Crosschecked 10 objects
Finished implicit crosscheck backup at 07-FEB-09

Starting implicit crosscheck copy at 07-FEB-09
using channel ORA_DISK_1
Crosschecked 4 objects
Finished implicit crosscheck copy at 07-FEB-09

searching for all files in the recovery area
cataloging files...
no files cataloged

datafile 1 switched to datafile copy "+DATADGNR/sati/datafile/system.258.678198083"
datafile 2 switched to datafile copy "+DATADGNR/sati/datafile/undotbs1.256.678198083"
datafile 3 switched to datafile copy "+DATADGNR/sati/datafile/sysaux.257.678198083"
datafile 4 switched to datafile copy "+DATADGNR/sati/datafile/users.259.678198083"
```

Recover The Database

Once the switch is completed we apply any changes that were writen to disk during the process

```
RMAN> recover database;

Starting recover at 07-FEB-09
using channel ORA_DISK_1

starting media recovery

archive log thread 1 sequence 4 is already on disk as file /u01/app/oracle/10g_db/oradata/
SATI/onlinelog/o1_mf_1_4qtsgwn1_.log
archive log filename=/u01/app/oracle/10g_db/oradata/SATI/onlinelog/o1_mf_1_4qtsgwn1_.log
thread=1 sequence=4
media recovery complete, elapsed time: 00:00:03
Finished recover at 07-FEB-09
```

Migrate the Temporary Datafiles to ASM

```
RMAN> run { set newname for tempfile 1 to '+DATADGNR';
2> switch tempfile all;}

executing command: SET NEWNAME
using target database control file instead of recovery catalog

renamed temporary file 1 to +DATADGNR in control file
```

Move Flashback logs into flash recovery Area

```
ALTER DATABASE FLASHBACK OFF;
```

```
SQL> ALTER DATABASE FLASHBACK ON;
ALTER DATABASE FLASHBACK ON
*
ERROR at line 1:
ORA-00600: internal error code, arguments: [krfg_first_barrier1], [1], [], [],
[], [], [], []
```

Move RMAN Change Tracking File Into ASM

```
SQL> alter database disable block change tracking;
alter database disable block change tracking
*
ERROR at line 1:
ORA-19759: block change tracking is not enabled


SQL> alter database enable block change tracking using file '+DATADGNR';

Database altered.
```

Open the Database and Move Online Logs Into ASM

```
SQL> alter database open RESETLOGS;

Database altered.

SQL> select member from v$logfile;
```

```
MEMBER
--------------------------------------------------------------------------------
/u01/app/oracle/10g_db/oradata/SATI/onlinelog/o1_mf_3_4qtsh1yz_.log
/u01/app/oracle/10g_db/oradata/SATI/onlinelog/o1_mf_2_4qtsgzp4_.log
/u01/app/oracle/10g_db/oradata/SATI/onlinelog/o1_mf_1_4qtsgwn1_.log

SQL> @movelogs
SQL> declare
  2  cursor rlc is
  3  select group# grp, thread# thr, bytes/1024 bytes_k, 'NO' srl
  4  from v$log
  5  union
  6  select group# grp, thread# thr, bytes/1024 bytes_k, 'YES' srl
  7  from v$standby_log
  8  order by 1;
  9  stmt varchar2(2048);
 10  swtstmt varchar2(1024) := 'alter system switch logfile';
 11  ckpstmt varchar2(1024) := 'alter system checkpoint global';
 12  begin
 13  for rlcRec in rlc loop
 14  if (rlcRec.srl = 'YES') then
 15  stmt := 'alter database add standby logfile thread ' ||
 16  rlcRec.thr || ' ''+DATADGNR'' size ' ||
 17  rlcRec.bytes_k || 'K';
 18  execute immediate stmt;
 19  stmt := 'alter database drop standby logfile group ' || rlcRec.grp;
 20  execute immediate stmt;
 21  else
 22  stmt := 'alter database add logfile thread ' ||
 23  rlcRec.thr || ' ''+DATADGNR'' size ' ||
 24  rlcRec.bytes_k || 'K';
```

```
 25  execute immediate stmt;
 26  begin
 27  stmt := 'alter database drop logfile group ' || rlcRec.grp;
 28  dbms_output.put_line(stmt);
 29  execute immediate stmt;
 30  exception
 31  when others then
 32  execute immediate swtstmt;
 33  execute immediate ckpstmt;
 34  execute immediate stmt;
 35  end;
 36  end if;
 37  end loop;
 38  end;
 39  /

PL/SQL procedure successfully completed.

SQL> select member from v$logfile;

MEMBER
--------------------------------------------------------------------------------
+DATADGNR/sati/onlinelog/group_2.277.678207055
+DATADGNR/sati/onlinelog/group_1.273.678207041
+DATADGNR/sati/onlinelog/group_4.269.678207023

SQL> select name from v$datafile;

NAME
--------------------------------------------------------------------------------
```

```
+DATADGNR/sati/datafile/system.258.678198083
+DATADGNR/sati/datafile/undotbs1.256.678198083
+DATADGNR/sati/datafile/sysaux.257.678198083
+DATADGNR/sati/datafile/users.259.678198083

SQL> select name from v$controlfile;

NAME
--------------------------------------------------------------------------------
+DATADGNR/sati/controlfile/current.261.678203559
+DATADGNR/sati/controlfile/current.262.678203561
```

Remove the File System Old Files

```
[oracle@asmxpt ~]$ cd /u01/app/oracle/10g_db/oradata
[oracle@asmxpt oradata]$ ls
SATI
[oracle@asmxpt oradata]$ rm -rf SATI
[oracle@asmxpt oradata]$ ls
```

Remove the Old Spfile from Filesystem

```
[oracle@asmxpt oradata]$ cd $ORACLE_HOME/dbs
[oracle@asmxpt dbs]$ ls spfile*
spfile+ASM.ora spfilesati.ora
[oracle@asmxpt dbs]$ rm spfilesati.ora
```

Scripts

Movelogs.sql

Create the online logs inside ASM and remove the old members on file system

```
-- movelogs.sql
declare
cursor rlc is
select group# grp, thread# thr, bytes/1024 bytes_k, 'NO' srl
from v$log
union
select group# grp, thread# thr, bytes/1024 bytes_k, 'YES' srl
from v$standby_log
order by 1;
stmt varchar2(2048);
swtstmt varchar2(1024) := 'alter system switch logfile';
ckpstmt varchar2(1024) := 'alter system checkpoint global';
begin
for rlcRec in rlc loop
if (rlcRec.srl = 'YES') then
stmt := 'alter database add standby logfile thread ' ||
rlcRec.thr || ' ''+DATADGNR'' size ' ||
rlcRec.bytes_k || 'K';
execute immediate stmt;
stmt := 'alter database drop standby logfile group ' || rlcRec.grp;
execute immediate stmt;
else
stmt := 'alter database add logfile thread ' ||
rlcRec.thr || ' ''+DATADGNR'' size ' ||
```

```
rlcRec.bytes_k || 'K';
execute immediate stmt;
begin
stmt := 'alter database drop logfile group ' || rlcRec.grp;
dbms_output.put_line(stmt);
execute immediate stmt;
exception
when others then
execute immediate swtstmt;
execute immediate ckpstmt;
execute immediate stmt;
end;
end if;
end loop;
end;
/
```

End of Lab5