4 RMAN Database Duplication

4.1 Overview

This lab shows how duplicate a database using the RMAN duplicate command. The duplicate database will have a different DBID from the source database and will function entirely independently.

Starting from 11g you can do duplicate database in 2 ways.

1. Active database duplication
2. Backup-based duplication

Active database duplication copies the live target database over the network to the auxiliary destination and then creates the duplicate database.The only difference is that you don't need to have the pre-existing RMAN backups and copies, the duplication work is performed by an auxiliary channel.This channel corresponds to a server session on the auxiliary instance on the auxiliary host.

For more information, review Doc ID 452868.1

As part of the duplicating operation, RMAN automates the following steps:

1. Creates a control file for the duplicate database
2. Restarts the auxiliary instance and mounts the duplicate control file
3. Creates the duplicate datafiles and recovers them with incremental backups and archived redo logs.
4. Opens the duplicate database with the RESETLOGS option

For the active database duplication, RMAN does one extra step .i.e. copy the target database datafiles over the network to the auxiliary instance

Scope of lab is restricted to Active database duplication . For the Backup-base duplication refer Note 259694.1

4.2 Steps to ACTIVE database duplication

4.2.1 Preparing the auxiliary instance

1.- Creating initialization Parameter file for the Auxiliary instance

If you are using SPFILE then only parameter required for the duplicate database is DB_NAME , required parameters are :

DB_NAME
CONTROL_FILES
DB_BLOCK_SIZE
DB_FILE_NAME_CONVERT
LOG_FILE_NAME_CONVERT
DB_RECOVERY_FILE_DEST

2.- Create an Oracle Password File for the Auxiliary Instance

Password file is must for the Active database duplication.A password file is not required for backup-based duplication. For Active database duplication it connects directly to the auxiliary instance using the password file with the same SYSDBA password as target database. In case you are using password file make sure to have same SYSDBA password as the target database.Also you can specify the PASSWORD FILE option on the DUPLICATE command.In this case, RMAN copies the source database password file to the destination host and overwrites any existing password file for the auxiliary instance.

We are using password file option in the duplicate command.

4.2.2 Establish Oracle Net Connectivity to the Auxiliary Instance

Auxiliary instance must be available through Oracle Net if you are duplicating from an ACTIVE database, when using copy and paste, make sure lines are not truncated.

1. Create the parameter file :

```
vi $ORACLE_HOME/dbs/initdb12c.ora

DB_NAME=db12c
diagnostic_dest='/u01/app/oracle'
DB_FILE_name_CONVERT='/u01/app/oracle/oradata/db11g','/u01/app/oracle/oradata/db12
c'
LOG_FILE_NAME_CONVERT='/u01/app/oracle/oradata/db11g','/u01/app/oracle/oradata/db1
2c'
SGA_TARGET=262144000
CONTROL_FILES='/u01/app/oracle/oradata/db12c/control01.ctl','/u01/app/oracle/fast_
recovery_area/db12c/control02.ctl'
COMPATIBLE= '11.2.0.4.0'
```

2. Create directories and password file :

```
mkdir -p /u01/app/oracle/admin/db12c/adump
mkdir -p /u01/app/oracle/oradata/db12c
mkdir -p /u01/app/oracle/fast_recovery_area/db12c

export ORACLE_SID=db12c
export ORACLE_HOME=/u01/app/oracle/product/11.2.0.4/db_1

orapwd FILE=$ORACLE_HOME/dbs/orapwdb12c PASSWORD=oracle

ls -la $ORACLE_HOME/dbs/orapwdb12c
```

3. Start the Auxiliary instance :

```
$ cd $ORACLE_HOME/dbs
$ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.4.0 Production on Wed Jan 29 09:02:23 2014
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to an idle instance.

SQL> startup nomount pfile=initdb12c.ora
ORACLE instance started.

Total System Global Area  263049216 bytes
Fixed Size            2252336 bytes
Variable Size            113246672 bytes
Database Buffers    142606336 bytes
```

```
Redo Buffers               4943872 bytes

SQL> create spfile from pfile;
SQL> exit
```

Add the following line in /etc/oratab, test oraenv script:

```
$ vi /etc/oratab
db12c:/u01/app/oracle/product/11.2.0.4/db_1:N

$ . oraenv
ORACLE_SID = [cdb1] ? db12c
The Oracle base remains unchanged with value /u01/app/oracle
```

4. Create the necessary oracle NET connectivity in the listener.ora and the tnsnames.ora file (In the TARGET and AUXILIARY host, for this workshop is the same server).

Append the SID_LIST_LISTENER on listener.ora file and restart the listener:

```
$ vi $ORACLE_HOME/network/admin/listener.ora

SID_LIST_LISTENER =
  (SID_LIST =
    (SID_DESC =
      (GLOBAL_DBNAME = db12c)
      (ORACLE_HOME = /u01/app/oracle/product/11.2.0.4/db_1)
      (SID_NAME = db12c)
    )
  )


$ lsnrctl stop
$ lsnrctl start

$ vi $ORACLE_HOME/network/admin/tnsnames.ora

db11g =
    (DESCRIPTION =
        (ADDRESS = (PROTOCOL = TCP)(HOST = db12cvm1)(PORT = 1521))
        (CONNECT_DATA =
          (SERVER = DEDICATED)
          (SERVICE_NAME = db11g)
        )
      )

db12c =
    (DESCRIPTION =
        (ADDRESS = (PROTOCOL = TCP)(HOST = db12cvm1)(PORT = 1521))
        (CONNECT_DATA =
```

```
          (SERVER = DEDICATED)
          (SERVICE_NAME = db12c)
        )
      )
```

Confirm the connection to both the target and the auxiliary instance using sqlplus. In this example we are creating the duplicate database in the same server (Auxiliary server).

```
$ tnsping db11g
$ tnsping db12c

[oracle@db12cvm1 ~]$ lsnrctl status

LSNRCTL for Linux: Version 11.2.0.4.0 - Production on 29-JAN-2014 09:37:27

Copyright (c) 1991, 2013, Oracle.  All rights reserved.

Connecting to (DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=db12cvm1.localdomain)
(PORT=1521)))
STATUS of the LISTENER
------------------------
Alias                     LISTENER
Version                   TNSLSNR for Linux: Version 11.2.0.4.0 - Production
Start Date                02-FEB-2014 00:36:24
Uptime                    0 days 0 hr. 1 min. 42 sec
Trace Level               off
Security                  ON: Local OS Authentication
SNMP                      OFF
Listener Parameter File
/u01/app/oracle/product/11.2.0.4/db_1/network/admin/listener.ora
Listener Log File
/u01/app/oracle/diag/tnslsnr/db12cvm1/listener/alert/log.xml
Listening Endpoints Summary...
  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=db12cvm1.localdomain)(PORT=1521)))
  (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc)(KEY=EXTPROC1521)))
Services Summary...
Service "db11g" has 1 instance(s).
  Instance "db11g", status READY, has 1 handler(s) for this service...
Service "db11gXDB" has 1 instance(s).
  Instance "db11g", status READY, has 1 handler(s) for this service...
Service "db12c" has 2 instance(s).
  Instance "db12c", status UNKNOWN, has 1 handler(s) for this service...
  Instance "db12c", status BLOCKED, has 1 handler(s) for this service...
The command completed successfully
```

4.2.3 Enable Archive Log on db11g

A requirement for RMAN duplication is to have archive log active, execute the following commands to enable it:

```
$ . oraenv
ORACLE_SID = [db12c] ? db11g
The Oracle base remains unchanged with value /u01/app/oracle

$ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.4.0 Production on Wed Jan 29 13:29:47 2014
Copyright (c) 1982, 2013, Oracle.  All rights reserved.

Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.4.0 - 64bit Production
With the Partitioning, OLAP, Data Mining and Real Application Testing options

SQL> archive log list

Database log mode              No Archive Mode
Automatic archival             Disabled
Archive destination            USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence     4
Current log sequence           6
SQL> show parameter recovery_file_dest

NAME                           TYPE    VALUE
------------------------------------ ----------- ------------------------------
db_recovery_file_dest              string  /u01/app/oracle/fast_recovery_
                                     area
db_recovery_file_dest_size         big integer 4182M

SQL> shutdown immediate

Database closed.
Database dismounted.
ORACLE instance shut down.

SQL> startup mount
ORACLE instance started.

Total System Global Area 1068937216 bytes
Fixed Size            2260088 bytes
Variable Size             671089544 bytes
Database Buffers    390070272 bytes
Redo Buffers                5517312 bytes
Database mounted.

SQL>  alter database archivelog;

Database altered.

SQL> alter database open;

Database altered.
```

```
SQL> archive log list
Database log mode        Archive Mode
Automatic archival            Enabled
Archive destination           USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence     4
Next log sequence to archive   6
Current log sequence           6

SQL> alter system archive log current;
SQL> alter system archive log current;

SQL> exit
```

4.2.4 Start RMAN and Connect to the Database Instances

Start RMAN and connect to the source database as TARGET, the duplicate database instance as AUXILIARY, and, if applicable, the recovery catalog database. You can start the RMAN client on any host so long as it can connect to all of the database instances. If the auxiliary instance requires a text-based initialization parameter file, then this file must exist on the same host that runs the RMAN client application.

Connect to the TARGET and AUXILIARY database:

```
$ rman

Recovery Manager: Release 11.2.0.4.0 - Production on Wed Jan 29 19:04:22 2014
Copyright (c) 1982, 2011, Oracle and/or its affiliates.  All rights reserved.

RMAN> connect TARGET sys/oracle@db11g ;
connected to target database: DB11G (DBID=301826024)

RMAN> connect AUXILIARY sys/oracle@db12c ;
connected to auxiliary database: DB12C (not mounted)
```

4.2.5 Run the DUPLICATE database command :

For this lab, use **active database duplication** to duplicate the database in the same server, but the same steps apply to clone a database on a separate server:

```
RMAN> DUPLICATE TARGET DATABASE TO 'db12C' FROM ACTIVE DATABASE
DB_FILE_NAME_CONVERT '/u01/app/oracle/oradata/db11g',
'/u01/app/oracle/oradata/db12c';

Starting Duplicate Db at 29-JAN-14
using target database control file instead of recovery catalog
allocated channel: ORA_AUX_DISK_1
channel ORA_AUX_DISK_1: SID=10 device type=DISK
```

```
contents of Memory Script:
{
   sql clone "create spfile from memory";
}
executing Memory Script

sql statement: create spfile from memory

contents of Memory Script:
{
   shutdown clone immediate;
   startup clone nomount;
}
executing Memory Script

Oracle instance shut down

connected to auxiliary database (not started)
Oracle instance started

Total System Global Area     263049216 bytes

Fixed Size                     2252336 bytes
Variable Size                117440976 bytes
Database Buffers             138412032 bytes
Redo Buffers                   4943872 bytes

contents of Memory Script:
{
   sql clone "alter system set  db_name =
 ''DB11G'' comment=
 ''Modified by RMAN duplicate'' scope=spfile";
   sql clone "alter system set  db_unique_name =
 ''DB12C'' comment=
 ''Modified by RMAN duplicate'' scope=spfile";
   shutdown clone immediate;
   startup clone force nomount
   backup as copy current controlfile auxiliary format
'/u01/app/oracle/oradata/db12c/control01.ctl';
   restore clone controlfile to
'/u01/app/oracle/fast_recovery_area/db12c/control02.ctl' from
 '/u01/app/oracle/oradata/db12c/control01.ctl';
   alter clone database mount;
}
executing Memory Script

sql statement: alter system set  db_name =  ''DB11G'' comment= ''Modified by RMAN
duplicate'' scope=spfile

sql statement: alter system set  db_unique_name =  ''DB12C'' comment= ''Modified
by RMAN duplicate'' scope=spfile

Oracle instance shut down

Oracle instance started
```

```
Total System Global Area     263049216 bytes

Fixed Size                     2252336 bytes
Variable Size                117440976 bytes
Database Buffers             138412032 bytes
Redo Buffers                   4943872 bytes

Starting backup at 29-JAN-14
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=19 device type=DISK
channel ORA_DISK_1: starting datafile copy
copying current control file
output file name=/u01/app/oracle/product/11.2.0.4/db_1/dbs/snapcf_db11g.f
tag=TAG20140129T190519 RECID=4 STAMP=838148719
channel ORA_DISK_1: datafile copy complete, elapsed time: 00:00:01
Finished backup at 29-JAN-14

Starting restore at 29-JAN-14
allocated channel: ORA_AUX_DISK_1
channel ORA_AUX_DISK_1: SID=171 device type=DISK

channel ORA_AUX_DISK_1: copied control file copy
Finished restore at 29-JAN-14

database mounted

contents of Memory Script:
{
   set newname for datafile  1 to "/u01/app/oracle/oradata/db12c/system01.dbf";
   set newname for datafile  2 to "/u01/app/oracle/oradata/db12c/sysaux01.dbf";
   set newname for datafile  3 to "/u01/app/oracle/oradata/db12c/undotbs01.dbf";
   set newname for datafile  4 to "/u01/app/oracle/oradata/db12c/users01.dbf";
   set newname for datafile  5 to "/u01/app/oracle/oradata/db12c/example01.dbf";
   backup as copy reuse
   datafile  1 auxiliary format "/u01/app/oracle/oradata/db12c/system01.dbf"
datafile
 2 auxiliary format "/u01/app/oracle/oradata/db12c/sysaux01.dbf"   datafile
 3 auxiliary format "/u01/app/oracle/oradata/db12c/undotbs01.dbf"   datafile
 4 auxiliary format "/u01/app/oracle/oradata/db12c/users01.dbf"   datafile
 5 auxiliary format "/u01/app/oracle/oradata/db12c/example01.dbf"   ;
   sql 'alter system archive log current';
}
executing Memory Script

executing command: SET NEWNAME

executing command: SET NEWNAME

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executing command: SET NEWNAME

executing command: SET NEWNAME

Starting backup at 29-JAN-14
using channel ORA_DISK_1
```

```
channel ORA_DISK_1: starting datafile copy
input datafile file number=00001 name=/u01/app/oracle/oradata/db11g/system01.dbf
output file name=/u01/app/oracle/oradata/db12c/system01.dbf tag=TAG20140129T190526
channel ORA_DISK_1: datafile copy complete, elapsed time: 00:00:25
channel ORA_DISK_1: starting datafile copy
input datafile file number=00002 name=/u01/app/oracle/oradata/db11g/sysaux01.dbf
output file name=/u01/app/oracle/oradata/db12c/sysaux01.dbf tag=TAG20140129T190526
channel ORA_DISK_1: datafile copy complete, elapsed time: 00:00:15
channel ORA_DISK_1: starting datafile copy
input datafile file number=00005 name=/u01/app/oracle/oradata/db11g/example01.dbf
output file name=/u01/app/oracle/oradata/db12c/example01.dbf
tag=TAG20140129T190526
channel ORA_DISK_1: datafile copy complete, elapsed time: 00:00:07
channel ORA_DISK_1: starting datafile copy
input datafile file number=00003 name=/u01/app/oracle/oradata/db11g/undotbs01.dbf
output file name=/u01/app/oracle/oradata/db12c/undotbs01.dbf
tag=TAG20140129T190526
channel ORA_DISK_1: datafile copy complete, elapsed time: 00:00:03
channel ORA_DISK_1: starting datafile copy
input datafile file number=00004 name=/u01/app/oracle/oradata/db11g/users01.dbf
output file name=/u01/app/oracle/oradata/db12c/users01.dbf tag=TAG20140129T190526
channel ORA_DISK_1: datafile copy complete, elapsed time: 00:00:01
Finished backup at 29-JAN-14

sql statement: alter system archive log current

contents of Memory Script:
{
   backup as copy reuse
   archivelog like
"/u01/app/oracle/fast_recovery_area/DB11G/archivelog/2014_01_29/o1_mf_1_8_9gm9d9rb
_.arc" auxiliary format
 "/u01/app/oracle/product/11.2.0.4/db_1/dbs/arch1_8_832156459.dbf"   ;
   catalog clone archivelog
"/u01/app/oracle/product/11.2.0.4/db_1/dbs/arch1_8_832156459.dbf";
   switch clone datafile all;
}
executing Memory Script

Starting backup at 29-JAN-14
using channel ORA_DISK_1
channel ORA_DISK_1: starting archived log copy
input archived log thread=1 sequence=8 RECID=3 STAMP=838148778
output file name=/u01/app/oracle/product/11.2.0.4/db_1/dbs/arch1_8_832156459.dbf
RECID=0 STAMP=0
channel ORA_DISK_1: archived log copy complete, elapsed time: 00:00:01
Finished backup at 29-JAN-14

cataloged archived log
archived log file
name=/u01/app/oracle/product/11.2.0.4/db_1/dbs/arch1_8_832156459.dbf RECID=3
STAMP=838148779

datafile 1 switched to datafile copy
input datafile copy RECID=4 STAMP=838148779 file
name=/u01/app/oracle/oradata/db12c/system01.dbf
```

```
datafile 2 switched to datafile copy
input datafile copy RECID=5 STAMP=838148779 file
name=/u01/app/oracle/oradata/db12c/sysaux01.dbf
datafile 3 switched to datafile copy
input datafile copy RECID=6 STAMP=838148779 file
name=/u01/app/oracle/oradata/db12c/undotbs01.dbf
datafile 4 switched to datafile copy
input datafile copy RECID=7 STAMP=838148779 file
name=/u01/app/oracle/oradata/db12c/users01.dbf
datafile 5 switched to datafile copy
input datafile copy RECID=8 STAMP=838148779 file
name=/u01/app/oracle/oradata/db12c/example01.dbf

contents of Memory Script:
{
   set until scn  1021799;
   recover
   clone database
    delete archivelog
   ;
}
executing Memory Script

executing command: SET until clause

Starting recover at 29-JAN-14
using channel ORA_AUX_DISK_1

starting media recovery

archived log for thread 1 with sequence 8 is already on disk as file
/u01/app/oracle/product/11.2.0.4/db_1/dbs/arch1_8_832156459.dbf
archived log file
name=/u01/app/oracle/product/11.2.0.4/db_1/dbs/arch1_8_832156459.dbf thread=1
sequence=8
media recovery complete, elapsed time: 00:00:00
Finished recover at 29-JAN-14
Oracle instance started

Total System Global Area     263049216 bytes

Fixed Size                     2252336 bytes
Variable Size                117440976 bytes
Database Buffers             138412032 bytes
Redo Buffers                   4943872 bytes

contents of Memory Script:
{
   sql clone "alter system set  db_name =
 ''DB12C'' comment=
 ''Reset to original value by RMAN'' scope=spfile";
   sql clone "alter system reset  db_unique_name scope=spfile";
   shutdown clone immediate;
   startup clone nomount;
}
executing Memory Script
```

```
sql statement: alter system set  db_name =  ''DB12C'' comment= ''Reset to original
value by RMAN'' scope=spfile

sql statement: alter system reset  db_unique_name scope=spfile

Oracle instance shut down

connected to auxiliary database (not started)
Oracle instance started

Total System Global Area     263049216 bytes

Fixed Size                     2252336 bytes
Variable Size                117440976 bytes
Database Buffers             138412032 bytes
Redo Buffers                   4943872 bytes
sql statement: CREATE CONTROLFILE REUSE SET DATABASE "DB12C" RESETLOGS ARCHIVELOG
  MAXLOGFILES     16
  MAXLOGMEMBERS      3
  MAXDATAFILES      100
  MAXINSTANCES     8
  MAXLOGHISTORY      292
 LOGFILE
  GROUP   1 ( '/u01/app/oracle/oradata/db12c/redo01.log' ) SIZE 50 M  REUSE,
  GROUP   2 ( '/u01/app/oracle/oradata/db12c/redo02.log' ) SIZE 50 M  REUSE,
  GROUP   3 ( '/u01/app/oracle/oradata/db12c/redo03.log' ) SIZE 50 M  REUSE
 DATAFILE
  '/u01/app/oracle/oradata/db12c/system01.dbf'
 CHARACTER SET AL32UTF8


contents of Memory Script:
{
   set newname for tempfile  1 to
 "/u01/app/oracle/oradata/db12c/temp01.dbf";
   switch clone tempfile all;
   catalog clone datafilecopy  "/u01/app/oracle/oradata/db12c/sysaux01.dbf",
 "/u01/app/oracle/oradata/db12c/undotbs01.dbf",
 "/u01/app/oracle/oradata/db12c/users01.dbf",
 "/u01/app/oracle/oradata/db12c/example01.dbf";
   switch clone datafile all;
}
executing Memory Script

executing command: SET NEWNAME

renamed tempfile 1 to /u01/app/oracle/oradata/db12c/temp01.dbf in control file

cataloged datafile copy datafile copy file
name=/u01/app/oracle/oradata/db12c/sysaux01.dbf RECID=1 STAMP=838148793
cataloged datafile copy datafile copy file
name=/u01/app/oracle/oradata/db12c/undotbs01.dbf RECID=2 STAMP=838148793
cataloged datafile copy datafile copy file
name=/u01/app/oracle/oradata/db12c/users01.dbf RECID=3 STAMP=838148793
cataloged datafile copy datafile copy file
```

```
name=/u01/app/oracle/oradata/db12c/example01.dbf RECID=4 STAMP=838148793

datafile 2 switched to datafile copy input datafile copy RECID=1 STAMP=838148793
file name=/u01/app/oracle/oradata/db12c/sysaux01.dbf
datafile 3 switched to datafile copy input datafile copy RECID=2 STAMP=838148793
file name=/u01/app/oracle/oradata/db12c/undotbs01.dbf
datafile 4 switched to datafile copy input datafile copy RECID=3 STAMP=838148793
file name=/u01/app/oracle/oradata/db12c/users01.dbf
datafile 5 switched to datafile copy input datafile copy RECID=4 STAMP=838148793
file name=/u01/app/oracle/oradata/db12c/example01.dbf

contents of Memory Script:
{
   Alter clone database open resetlogs;
}
executing Memory Script

database opened
Finished Duplicate Db at 29-JAN-14
```

You should see the words "**Finished Duplicate**", now that the duplication is completed, exit Recovery Manager:

```
RMAN> exit
```