Oracle 11gR2 Physical Standby Database

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1. Create directories on standby database server

Because by default we are using Oracle Managed Files we need to create the directories for datafiles, redo and archivelogs beforehand.

mkdir /u01/app/oracle/admin/PRIMDB/adump mkdir /u02/oradata/PRIMDB mkdir /u02/oradata/PRIMDB/datafile mkdir /u02/oradata/PRIMDB/controlfile mkdir /u02/oradata/PRIMDB/onlinelog mkdir /backup/fast_recovery_area/PRIMDB mkdir /backup/fast_recovery_area/PRIMDB/archivelog mkdir /backup/fast_recovery_area/PRIMDB/controlfile mkdir /backup/fast_recovery_area/PRIMDB/controlfile

2. Add listener.ora/tnsnames.ora entries on both servers

On both primary and standby servers, edit the tnsnames.ora file so that there is connectivity between both databases. Also add a static registration for both databases to their respective listener.ora file.

```
# TNSNAMES.ORA Entry
PRIMDB =
(DESCRIPTION =
  (ADDRESS = (PROTOCOL = TCP)(HOST = botley.dubetech.co.uk)(PORT = 1521)) (CONNECT_DATA =
  (SERVER = DEDICATED)
  (SERVICE_NAME = PRIMDB.dubetech.co.uk)
   (UR = A)
  )
)
STANDBY =
(DESCRIPTION =
  (ADDRESS = (PROTOCOL = TCP)(HOST = panther.dubetech.co.uk)(PORT = 1521))
  (CONNECT DATA =
   (SERVER = DEDICATED)
   (SID = PRIMDB)
   (UR = A)
  )
 )
# LISTENER.ORA Entry
SID_LIST_LISTENER =
(SID_LIST =
  (SID DESC =
  (GLOBAL DBNAME = PRIMDB.dubetech.co.uk)
  (ORACLE_HOME = /u01/app/oracle/product/11.2.0/dbhome_1)
   (SID NAME = PRIMDB)
  )
 )
```

3. Create password file on standby database server

cd \$ORACLE_HOME/dbs orapwd file=\$ORACLE_HOME/dbs/orapw<ORACLE_SID> password=<sys_password>

4. Create simple database configuration on standby server.

echo db_name=PRIMDB > \$ORACLE_HOME/dbs/initPRIMDB.ora export ORACLE_SID=PRIMDB sqlplus / as sysdba STARTUP NOMOUNT

5. Configure primary database

alter system set log_archive_dest_2 = 'service=STANDBY ASYNC db_unique_name=STANDBY VALID_FOR=(ALL_LOGFILES,PRIMARY_ROLE)'; alter system set log_archive_config = 'DG_CONFIG=(PRIMDB,STANDBY)'; alter system set fal_server = 'STANDBY'; alter system set log_archive_dest_state_2 = defer;

alter database add standby logfile; (Repeat 4 times as we have 3 Redo log files) alter database force logging;

6. Instantiate standby database using rman

```
RMAN> connect target sys/<sys_password>@PRIMDB

RMAN> connect auxiliary sys/<sys_password>@STANDBY

RMAN> duplicate target database for standby from active database

dorecover

spfile

set 'db_unique_name' = 'STANDBY'

set 'audit_file_dest' = '/u01/app/oracle/admin/PRIMDB/adump'

set 'fal_server' = 'PRIMDB'

set 'log_archive_config' = 'DG_CONFIG=(PRIMDB,STANDBY)'

set 'memory_max_target' = '1750m'

nofilenamecheck;
```

7. Enable standby database and check log shipping.

STANDBY> ALTER DATABASE RECOVER MANAGED STANDBY DATABASE USING CURRENT LOGFILE DISCONNECT FROM SESSION; PRIMARY> ALTER SYSTEM SET LOG_ARCHIVE_DEST_STATE_2 = ENABLE; STANDBY> SELECT SEQUENCE#, FIRST_TIME, NEXT_TIME FROM V\$ARCHIVED_LOG ORDER BY SEQUENCE#;

8. Add configuration to Cloud Control

Edit /etc/oratab file on Standby Server and add the following details

\$ORACLE_SID:\$ORACLE_HOME:N

For example ...

PRIMDB:/u01/app/oracle/product/11.2.0/dbhome_1:N

Use db_unique_name for database name.

For example ...

PRIMDB : Database Instance: Primary STANDBY : Database Instance: Physical Standby

9. Enable Data Guard Broker

On the Physical and Standby database set the following initialisation parameters:

alter system set dg_broker_config_file1 = '/u02/oradata/dr1PRIMDB.dat'; alter system set dg_broker_config_file2 = '/u02/oradata/dr2PRIMDB.dat'; alter system set dg_broker_start = TRUE;

Now use DGMGRL to create the configuration:

DGMGRL> CREATE CONFIGURATION 'STANDBY' as PRIMARY DATABASE is PRIMDB CONNECT IDENTIFIER is PRIMDB.dubetech.co.uk; DGMGRL> ADD DATABASE STANDBY as CONNECT IDENTIFIER is STANDBY.dubetech.co.uk MAINTAINED AS PHYSICAL; DGMGRL> ENABLE CONFIGURATION; (To confirm creation, should display SUCCESS at end of output)

It is simpler to use Cloud Control

In the Add Standby Database screen, choose Manage an existing standby database with Data Guard Broker. Then choose the database, enter the OS credentials, USE_DB_RECOVERY_FILE_DEST and Cloud Control will do the rest.

10. Configure Application for Standover/Failover

In the event of a disaster we want the application to be in position to see the new Primary database immediately. Therefore the following needs to be done ...

A. Add both servers to thsnames.ora configuration and configure new service.

```
PRIMDB =

(DESCRIPTION =

(ADDRESS_LIST =

(ADDRESS = (PROTOCOL = TCP)(HOST = LEOPARD)(PORT = 1521))

(ADDRESS = (PROTOCOL = TCP)(HOST = PANTHER)(PORT = 1521)))

(CONNECT_DATA = (SERVICE_NAME = UNTELIVE_HA.DUBETECH.CO.UK))

)
```

B. Create service on Primary Database

C. Create a trigger on the Primary Database so that the service will only start if the Database Role is set as "Primary". This trigger will be propagated to the Physical Standby and will be started when a Switchover/Failover occurs.

This way we can confirm that the application will never connect to the wrong database if a Switchover occurs. In the case of a failover it is the DBAs responsibility to shutdown the old primary database if it is still open.

```
create or replace trigger service_management
after startup on database
declare
vrole varchar(30);
begin
select database_role into vrole from v$database;
if vrole = 'PRIMARY' then
   dbms_service.start_service('FINLIVE_HA.DUBETECH.CO.UK');
elsif vrole = 'PHYSICAL STANDBY' then
   dbms_service.stop_service('FINLIVE_HA.DUBETECH.CO.UK');
end if;
end;
/
```

Monitoring using Cloud Control

Log onto the Primary or Physical database, click on Availability and Data Guard Administration

🕆 UNT	EPSTB	(1)					Logge	ed in as 🛛 SYS 🔒 🛛	panther.bournemouth.a	ac.uł
Oracle Da	tabase 🔻	Performance 👻 Availabilit	y 🔻 Schema 👻 Adı	ministratio	on 🔻					
Data G	uard								Logged in as S	YS
Page Ref	freshed F	ebruary 26, 2013 10:11:	22 AM GMT				View Da	ta Real Time: Mar	nual Refresh 💌 🤇	5
Overvie	w				Standt	y Database Pro	ogress Summary			
Data Guard Status V Normal Protection Mode Maximum Performance Fast-Start Failover Disabled			Transport lag is the time difference between the last update on the primary database and the last received redo on the standby database. Apply lag is the time difference between the last update on the primary database and the last applied redo on the standby database.							
Primary	Databa	se			1.0					
Name UNTEPSTB Host panther.bournemouth.ac.uk Data Guard Status V Normal Current Log 45			seconds				Transport Lag]		
	Pr	operties Eart			0.0		0 UNTEDEV	0		
Standb	y Datab	ases								
									Add Standby Database	2
Edit Re	move Swi	itchover Failover Convert								_
Select	Name	Host	Data Guard Status	Role		Real-time Query	Last Received Log	Last Applied Log	Estimated Failover Time	
۲	UNTEDEV	botley.bournemouth.ac.uk	🗸 Normal	Physical	Standby	Disabled	44	44	< 1 second	_

Confirm that the Data Guard status is shown as normal and that the last received and last applied log values are identical.

11. Monitoring using SQL

Oracle documentation on monitoring 11gR2 Data Guard ...

http://docs.oracle.com/cd/E11882_01/server.112/e25608/manage_ps.htm#i1005610

Data Guard Information

SELECT PROTECTION_MODE, PROTECTION_LEVEL, DATABASE_ROLE ROLE, SWITCHOVER_STATUS
FROM V\$DATABASE;

SYS@UNTEDEV> SELECT PROTECTION_MODE, PROTECTION_LEVEL, DATABASE_ROLE ROLE, 2 SWITCHOVER_STATUS FROM V\$DATABASE;									
PROTECTION_MODE	PROTECTION_LEVEL	ROLE	SWITCHOVER_STATUS						
MAXIMUM PERFORMANCE	MAXIMUM PERFORMANCE	PRIMARY	TO STANDBY						

Apply Lag (Run on Standby)

SELECT name, value, datum_time, time_computed FROM V\$DATAGUARD_STATS WHERE name like 'apply lag';

SYS@UNTEDEV> SELECT name, value, datum_time, time_computed FROM V\$DATAGUARD_STATS 2 WHERE name like 'apply lag';								
NAME	VALUE	DATUM_TIME	TIME_COMPUTED					
apply lag	+00 00:00:00	02/26/2013 15:57:23	02/26/2013 15:57:24					

Last Received Log (Run on both servers as comparison)

SELECT MAX(SEQUENCE#) SEQUENCE FROM V\$ARCHIVED_LOG WHERE ARCHIVED = 'YES';

SYS@UNTEDEV> SELECT MAX(SEQUENCE#) SEQUENCE FROM V\$ARCHIVED_LOG WHERE ARCHIVED = 'YES';

SEQUENCE

12. Switchover

Oracle documentation on performing a switchover to a Physical Database ... <u>http://docs.oracle.com/cd/E11882_01/server.112/e25608/role_management.htm#i1026464</u>

Convert the primary database into a physical standby database

SQL> ALTER DATABASE COMMIT TO SWITCHOVER TO PHYSICAL STANDBY WITH SESSION SHUTDOWN; SQL> SHUTDOWN ABORT; SQL> STARTUP MOUNT;

Switch the physical standby database role to the primary role and open it.

SQL> ALTER DATABASE COMMIT TO SWITCHOVER TO PRIMARY WITH SESSION SHUTDOWN; SQL> ALTER DATABASE OPEN;

Start Redo Apply on the new physical standby database

SQL> ALTER DATABASE RECOVER MANAGED STANDBY DATABASE USING CURRENT LOGFILE DISCONNECT FROM SESSION;

Using Cloud Control

On the Data Guard Overview Page in Enterprise Manager, select the standby database that you want to change to the primary role and click **Switchover**. Then, after confirming OS users, click **Yes** to invoke the default Complete switchover option.

Using DGMGRL

On the standby database issue the following command, having checked/resolved any archive log gap issues first ...

SQL> SWITCHOVER TO <database-name>;

13. Failover

Oracle documentation on performing a failover to a Physical Database ... <u>http://docs.oracle.com/cd/E11882_01/server.112/e25608/role_management.htm#i1026491</u>

If the primary database can be mounted it may still be possible to push any unsent redo information to the standby database. With the primary database in the mount state enter the following SQL statement

SQL> ALTER SYSTEM FLUSH REDO TO <db_unique_name>;

Shutdown the primary database if it is open, all further commands will be done on the Standby Database.

Identify and resolve any archived redo log gaps. On the standby database enter the following SQL statement SQL> SELECT THREAD#, LOW_SEQUENCE#, HIGH_SEQUENCE# FROM V\$ARCHIVE_GAP; If this statement returns no rows then continue to next step, otherwise identify the missing archive logs, copy them to the standby server and register them SQL> ALTER DATABASE REGISTER PHYSICAL LOGFILE 'filespec1';

Stop redo apply and finish applying all received redo data

SQL> ALTER DATABASE RECOVER MANAGED STANDBY DATABASE CANCEL; SQL> ALTER DATABASE RECOVER MANAGED STANDBY DATABASE FINISH; If any error occurs and cannot be resolved then enter following SQL statement ... SQL> ALTER DATABASE ACTIVATE PHYSICAL STANDBY DATABASE; If there are no errors then enter the following SQL statement ... SQL> ALTER DATABASE COMMIT TO SWITCHOVER TO PRIMARY WITH SESSION SHUTDOWN;

Finally open the new primary database SQL> ALTER DATABASE OPEN;

Using Cloud Control

On the Data Guard Overview Page in Enterprise Manager, select the standby database that you want to change to the primary role and click **Failover**. Then, on the Failover Confirmation Page, click **Yes** to invoke the default Complete failover option.

Using DGMGRL

On the standby database issue the following command, having checked/resolved any archive log gap issues first ...

SQL> FAILOVER TO <database-name>;

14. Fast Start Failover

Fast start failover can only be used with the Data Guard Broker.

It enables failovers to happen automatically if the primary database is down for a set number of seconds. It is not planned to implement this feature at Bournemouth University.

Once again the simplest way of setting this up is with Cloud Control.

Navigate to Availability – Data Guard Administration

Now click on Disabled, next to Fast-Start Failover and follow the prompts

Data Guard > Fast-Start Failover: Configure	Logged in	1 as SYS					
Difformation There is currently no observer for this configuration, nor has one been specified.							
Fast-Start Failover: Configure	Cancel C	ontinue					
Target Database Selection							
Select a standby database to be the fast-start failover target. Th	e redo transport mode for the selected database will be set to ASYNC (if not currently set to ASYNC).						
Select Name Role	Redo Transport Mode						
UNTEPSTB Physical Standby	ASYNC						
Observer Fast-start fallover requires a Data Guard observer process. For h	chest availability, Oracle recommends that the observer be on a separate host from the primary and standby databases. bearver						
Primary Database Properties							
Automatically Reinstate Primary Automatically Shutdown Primary	Yes Image: The observer will automatically reinstate the former primary database once contact is re-established after the former primary database is started. Does not control initiates behavior for failovers caused by an error condition. Yes Image: The observer will automatically reinstate the former primary database once contact is re-established after the former primary database is started. Does not control initiates the primary database will shut itself down if it independently discens that a fast-start failover may have occurred, but cannot verify it due o network isolation from the observer and the standby database. Does not control shutdown behavior for failovers caused by an error condition.						

15. Snapshot Standby

Oracle documentation on converting to Snapshot Standby ... http://docs.oracle.com/cd/E11882_01/server.112/e25608/manage_ps.htm#BACIEJJI

On the Standby database stop redo apply

SQL> ALTER DATABASE RECOVER MANAGED STANDBY DATABASE CANCEL; Issue the following statement to perform the conversion SQL> ALTER DATABASE CONVERT TO SNAPSHOT STANDBY;

A snapshot database can be opened in read-write mode and is fully updatable. Tables, users can be dropped and new objects created

To convert the Snapshot Database back to a Physical Standby mount the database and perform the conversion

SQL> ALTER DATABASE CONVERT TO PHYSICAL STANDBY;

The database must be remounted, redo received whilst the database was a snapshot database will be automatically applied when redo apply is started.

A. Potential Errors

RMAN-06217: not connected to auxiliary database with a net service name Cannot connect to auxiliary using '/'

ORA-12514: TNS:could not resolve the connect identifier specified Check tnsnames.ora / listener.ora on both servers

ORA-09925: Unable to create audit trail file Create directory in audit_file_dest initialisation parameter value

ORA-17628: Oracle error 19505 returned by remote Oracle server Create required directories (as above)

ORA-16047 Make sure log_archive_config is setup on both databases