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Oracle Database 19c Data Guard Administration

Cd

Oracle Net Services in a DataGuard

Environment

Overview

Overview

In these practices, you will use graphical utilities to create and modify the Oracle network configuration files, and then propagate the resulting files to each server in the Data Guard environment.

Practice 2-1: Configuring the `tnsnames.ora` File

[Overview](#)

[Tasks](#)

Practices for Lesson 3: Creating a Physical Standby Database by Using SQL and RMAN Commands

Practices for Lesson 3: Overview

Practices Overview

Practice 3-1: Prepare the Primary Database to Support Data Guard

Overview

In this practice, you verify that the primary database is configured correctly to support a physical standby database. This should be done in the orclcdb env.

```
$ . oraenv  
orclcdb
```

Tasks

1. On localhost, invoke SQL*Plus and connect as SYSDBA to your primary database . Determine if FORCE LOGGING is enabled. If it is not enabled, enable FORCE LOGGING mode.

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Mon Jun 1 15:49:04
2020
Version 19.3.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0
-----
SQL> SELECT force_logging FROM v$database;

FORCE_LOGGING

NO

SQL> ALTER DATABASE FORCE LOGGING;

Database altered.
-----
SQL> SELECT force_logging FROM v$database;

FORCE_LOGGING

YES
```

2. Make sure the primary is in archivelog mode

- Select log_mode from v\$database;
- If the result is noarchivelog
- Shutdown immediate;
- Startup mount
- Alter database archivelog;
- Alter database open;

3. Determine the number of online redo log groups and their current size. Create standby redo log groups with one member for each group using the same size as the existing online redo logs. You should create one more additional group than the number you have for online redo log groups. Verify creation of the standby redo logs.

```
SQL> select group#,bytes from v$log;

  GROUP#      BYTES
-----  
          1  209715200  
          2  209715200  
          3  209715200

SQL> alter database add standby logfile  
('/u01/app/oracle/oradata/ORCLCDB/stdbyredo01.log') size  
200M;  
  
Database altered.  
  
SQL> alter database add standby logfile  
('/u01/app/oracle/oradata/ORCLCDB/stdbyredo02.log') size  
200M;  
  
Database altered.  
  
SQL> alter database add standby logfile  
('/u01/app/oracle/oradata/ORCLCDB/stdbyredo03.log') size  
200M;  
  
Database altered.  
  
SQL> alter database add standby logfile  
('/u01/app/oracle/oradata/ORCLCDB/stdbyredo04.log') size  
200M;  
  
Database altered.

-----  
SQL> select group#,bytes from v$log;  
  GROUP#      BYTES
-----  
          1  209715200  
          2  209715200  
          3  209715200
```

4	209715200
5	209715200
6	209715200
7	209715200

4. Define the first log archive destination to use the fast recovery area and enable it by using the `set_LAD_1.sql` script. Ensure that the changes are done both in memory and also stored the server parameter file. This location should be valid for any role and also valid for all types of log files.

```
SQL> alter system set
log_archive_dest_1='location=USE_DB_RECOVERY_FILE_DEST
valid_for=(ALL_LOGFILES,ALL_ROLES) db_unique_name=orclcdb'
scope=both;

System altered.

SQL> alter system set log_archive_dest_state_1='enable'
scope=both;

System altered.
```

5. Increase the maximum number of archive processes to 4.

```
SQL> alter system set log_archive_max_processes=4 scope=both;
System altered.
```

Note: The documentation suggests this parameter be set to a value of 10. We are using a reduced number in this lab environment to reduce overhead.

6. Define the `log_archive_config` parameter to include entries for: `orclcdb`, `stndby`. Only `stndby` is needed at this moment, but the others can be added now in preparation for upcoming practices.
7. Enable automatic standby file management so that operating system file additions and deletions on the primary database are replicated to the standby database. This is normally set on the standby database. For the primary database, this is set for role reversals.

```
SQL> alter system set standby_file_management='auto' scope=both;
System altered.
```

Practice 3-2: Prepare Host and Create Physical Standby Database

Overview

In this practice, you will prepare `stndby` to receive the physical standby database and create the physical standby database using RMAN.

Tasks

1. Use a terminal window logged in as `oracle` to `stndby` to create the initial directories needed for a physical standby database by running the `crdir_stndby` script. Since the primary database is using multi-tenant architecture, additional directories are needed.

```
[oracle@stndby ~]$ . oraenv
ORACLE_SID = [oracle] ? stndby
The Oracle base has been set to /u01/app/oracle
[oracle@stndby ~]$ cat /home/oracle/setup/crdir_stndby.sh
...
mkdir -p /u01/app/oracle/admin/stndby/adump
mkdir -p /u01/app/oracle/oradata/STNDBY
mkdir -p /u01/app/oracle/oradata/STNDBY/pdbseed
mkdir -p /u01/app/oracle/oradata/STNDBY/dev1
mkdir -p /u01/app/oracle/fast_recovery_area/STNDBY
[oracle@stndby ~]$ /home/oracle/setup/crdir_stndby.sh
[oracle@stndby ~]$
```

2. Copy the `initstandby.ora` file to the `ORACLE_HOME/dbs` directory.

```
[oracle@stndby ~]$ cat /home/oracle/setup/create_init.sh
[oracle@stndby ~]$ /home/oracle/setup/create_init.sh
[oracle@stndby ~]$
```

3. Verify the contents of the `initstndby.ora` file
4. Run `/home/oracle/setup/create_init.sh`
5. Copy the password file from the primary host to the physical standby host by using the `scp_pwdfile.sh` script. Rename the file accordingly.

```
[oracle@stndby ~]$ /home/oracle/setup/scp_pwdfile.sh
The authenticity of host 'localhost (192.0.2.11)' can't
be established.
```

6. Set the environment to stndby
 - . oraenv
 - stndby
7. Start up nomount the `stndby` standby instance on `stndby`. This assumes that the terminal window you are using has previously set the environment variables to `stndby`. Exit SQL*Plus when done.

```
[oracle@stndby ~]$ sqlplus / as sysdba
SQL*Plus: Release 19.3.0.1.0 Production on Tue Jun 11 03:51:01
2013

(c) 1982, 2019, Oracle. All rights reserved. Connected to
an idle instance.

SQL> startup nomount

ORACLE instance started.

Total System Global Area 217157632 bytes
Fixed Size                  2286656 bytes
Variable Size                159386560 bytes
Database Buffers             50331648 bytes
Redo Buffers                 5152768 bytes
SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
```

8. Create a physical standby on `stndby` by using the RMAN utility.
9. Connect using `rman`
 - `rman target sys/fenago@orclcdb auxiliary sys/fenago@stndby`

```
Recovery Manager complete.  
[oracle@8c793fb03eed ~]$ rman target sys/fenago@orclcdb auxiliary sys/fenago@stn  
dby  
  
Recovery Manager: Release 19.0.0.0.0 - Production on Wed Aug 3 17:35:25 2022  
Version 19.3.0.0.0  
  
Copyright (c) 1982, 2019, Oracle and/or its affiliates. All rights reserved.  
  
connected to target database: ORCLCDB (DBID=2860384372)  
connected to auxiliary database: ORCLCDB (not mounted)
```

- `rman> duplicate target database for standby from active database;`

Practice 3-3: Start Redo Transport and Verify Operation

Overview

Tasks

1. Use a terminal window for `localhost` logged in as `oracle` with the environment variables set to `orclcdb` and start redo transport by defining `log_archive_dest_2` pointing to the physical standby database.

Alter system set `log_archive_dest_2=`

```
Service="stndby", ASYNC NOAFFIRM db_unique_name="stndby", valid_for=
(online_logfile,all_roles)
```

2. On the `orclcdb` database verify log shipping is enabled

- `sqlplus / as sysdba`
- `@/home/oracle/setup/log_ship`
- `@/home/oracle/setup/gap_status`
 - This should say no gap. This is validating logs are being shipped and applied

3. On the `stndby` system, it may be best to open 2 terminal windows, one with the env or `orclcdb` and the other of `stndby`

- `. oraenv`
 - `Stndby`
- `sqlplus / as sysdba`
- `sql>@/home/oracle/setup/enable_dg`
 - This turns on managed recovery on the standby
- `sql>@/home/oracle/setup/mr.sql`
 - This validates managed is running

4. On the primary or orclcdb issue
- Alter system switch logfile;
 - Do this 3 times
 - Within sql then run @/home/oracle/setup/gap_status

```
SQL> @gap_status
```

APPLIED_SEQ#	GAP_STATUS	ARCHIVED_SEQ#
0		45
44	NO GAP	44

```
SQL> █
```

5. The Seq# may vary but no gap should be displayed

Practices for Lesson 4: Managing Physical Standby Files After Structural Changes on the Primary Database

Practices for Lesson 4: Overview

Practices Overview

In these practices, you will test the primary database changes that do not require manual intervention at the standby database with the new features.

Practice 4-1: Refreshing the Password File

Overview

In this practice, you will test the automatic password change propagation feature. As of Oracle Database 19c Release 2 (19.3.0.1), password file changes done on the primary database are automatically propagated to standby databases.

Tasks

1. Open a terminal window and connect to localhost as the oracle OSuser.
2. Use the `oraenv` utility to set the environment variables for the `orclcdb` instance.

```
[oracle@localhost ~]$ . oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
```

3. Invoke SQL*Plus and connect as SYSDBA to your primary database.

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Mon Jun 1 18:45:48
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0
Production
Version 19.3.0.0.0

SQL>
```

4. List all users in the password file by using V\$PWFILE_USERS.

```
SQL> col username format a10
SQL> SELECT username, sysdba, sysdg FROM v$pwfile_users;

USERNAME    SYSDB    SYSDG
-----  -----  -----
SYS          TRUE     FALSE
```

5. Open a new terminal window and use the SSH client to connect to stndby as the oracle OS user.
6. Use the oraenv utility to set the environment variables for the stndby instance.

```
[oracle@stndby ~]$ . oraenv
ORACLE_SID = [oracle] ? stndby
The Oracle base has been set to /u01/app/oracle
```

7. Invoke SQL*Plus and connect as SYSDBA to your primary database.

```
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Mon Jun 1 18:45:48
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL>
```

8. List all users in the password file by using V\$PWFILE_USERS.

```
SQL> col username format a10
SQL> SELECT username, sysdba, sysdg FROM v$pwfile_users;

USERNAME    SYSDB   SYSDG
-----
SYS          TRUE    FALSE
```

9. Stop Media Recovery Process (mrp0) on purpose.

```
SQL> alter database recover managed standby database cancel;
Database altered.
```

10. Return to the terminal connected to primary database orclcdb and create a common user named C##DBA.

```
SQL> CREATE USER c##dba IDENTIFIED BY <password> container=all;
User created.
```

11. Grant SYSDBA and CREATE SESSION privileges to c##dba.

```
SQL> GRANT sysdba, create session TO c##dba container=all;
Grant succeeded.
```

12. Review the output of V\$PWFILE_USERS. The output shows that the newly created user was added to the password file.

```
SQL> SELECT username, sysdba, sysdg FROM v$pwfile_users;

USERNAME    SYSDB   SYSDG
-----
SYS          TRUE    FALSE
C##DBA      TRUE    FALSE
```

13. Return to the terminal session connected to stndby to review the output of V\$PWFILE_USERS. The new entry doesn't appear in the output because the Media Recovery process was stopped.

```
SQL> col username format a10
SQL> SELECT username, sysdba, sysdg FROM v$pwfile_users;

USERNAME    SYSDB   SYSDG
-----
SYS          TRUE    FALSE
```

14. Start the Media Recovery Process (mrp0).

```
SQL> ALTER DATABASE RECOVER MANAGED STANDBY DATABASE  
DISCONNECT;  
  
Database altered.
```

15. Verify V\$PWFILE_USERS for the granted role.

```
SQL> SELECT username, sysdba, sysdg FROM v$pwfile_users;  
  
USERNAME      SYSDB  SYSDG  
-----  
SYS          TRUE   FALSE  
C##DBA        TRUE   FALSE
```

Note: At times, the new entry doesn't appear in the list immediately. In this case, run the GRANT command (step 11) again at localhost to see if the new entry can be added.

16. Return to the terminal session connected to primary and change the password for C##DBA user.

```
SQL> ALTER USER c##dba IDENTIFIED BY Welcome_1;  
  
User altered.
```

17. Test the connection to the standby database (stndby) with the new password.

```
SQL> CONNECT c##dba/Welcome_1@stndby as sysdba  
Connected.
```

18. Drop the c##dba user (primary).

```
SQL> connect / as sysdba  
Connected  
  
SQL> DROP USER c##dba CASCADE;  
  
User dropped.  
  
SQL>
```

19. Exit SQL*Plus on localhost and stndby leaving the terminal windows open.

Practice 4-2: Controlling PDB Replication

Overview

In this practice, you will create two new PDBs (`DEV2` and `DEV3`) in the primary database to demonstrate the control of the PDB replication to the standby database. First check to see if you have a `dev1` pdb. If not use `dbca` to create `dev1`.

Tasks

1. Use the terminal session on `localhost`. Create a directory for the new data files of `DEV2`.

```
[oracle@localhost ~]$ . oraenv
ORACLE_SID = [orclcdb] ? orclcdb
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@localhost ~]$ mkdir -p
/u01/app/oracle/oradata/ORCLCDB/dev2[oracle@localhost ~]$
```

2. Invoke `SQL*Plus` and connect to the CDB root as a user (`SYS` user in this practice) granted with `CREATE PLUGGABLE DATABASE` privilege to clone `DEV2` from `DEV1`.

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Mon Jun 1 21:58:28
2020
Version 19.3.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> CREATE PLUGGABLE DATABASE dev2 FROM dev1
CREATE_FILE_DEST='/u01/app/oracle/oradata/ORCLCDB/dev2';

Pluggable database created.

SQL>
```

3. Check the open mode of `DEV2`.

```
SQL> show pdbs

  CON_ID CON_NAME           OPEN MODE  RESTRICTED
----- -----
        2 PDB$SEED          READ ONLY  NO
        3 DEV1              READ WRITE NO
        4 DEV2              MOUNTED

SQL>
```

4. Open DEV2 in READ WRITE mode.

```
SQL> alter pluggable database DEV2 open;  
Pluggable database altered.  
SQL>
```

5. Use the terminal session connected to `stndby`. Connect as `SYS` to the `stndby` standby database.

```
[oracle@stndby ~]$ sqlplus / as sysdba  
  
SQL*Plus: Release 19.0.0.0.0 - Production on Mon Jun 1 22:08:54  
2020  
Version 19.3.0.0.0  
  
(c) 1982, 2019, Oracle. All rights reserved.  
  
Connected to:  
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -  
Production  
Version 19.3.0.0.0  
  
SQL>
```

6. List the value of the `ENABLED_PDBS_ON_STANDBY` parameter.

Note: The asterisk (*) indicates all PDBs are created and protected in the standby database.

```
SQL> show parameter ENABLED_PDBS_ON_STANDBY  
  
NAME                      TYPE        VALUE  
-----  
enabled_PDBs_on_standby    string      *  
SQL>
```

7. Verify the PDBs in the `stndby` standby database.

Note: The `DEV2` PDB was successfully replicated to the standby database.

```
SQL> show pdbs  
  
CON_ID CON_NAME          OPEN MODE  RESTRICTED  
-----  
2       PDB$SEED          MOUNTED  
3       DEV1              MOUNTED  
4       DEV2              MOUNTED  
SQL>
```

8. Now, let's modify the `ENABLED_PDBS_ON_STANDBY` parameter to include only DEV1 and DEV2 PDBs in the standby database.

```
SQL> alter system set ENABLED_PDBS_ON_STANDBY = "DEV1","DEV2";  
System altered.
```

9. Return to the terminal session on localhost connected to the `orclcdb` database. Create a directory for DEV3.

```
SQL> !mkdir -p /u01/app/oracle/oradata/ORCLCDB/dev3  
  
SQL>
```

10. Create DEV3 from DEV1.

```
SQL> CREATE PLUGGABLE DATABASE dev3 FROM dev1  
CREATE_FILE_DEST='/u01/app/oracle/oradata/ORCLCDB/dev3';  
  
Pluggable database created.  
  
SQL>
```

11. Check the open mode of DEV3.

```
SQL> show pdbs  
  
CON_ID CON_NAME          OPEN MODE  RESTRICTED  
-----  
 2  PDB$SEED            READ ONLY   NO  
 3  DEV1                READ WRITE  NO  
 4  DEV2                READ WRITE  NO  
 5  DEV3                MOUNTED  
  
SQL>
```

12. Open DEV2 in READ WRITE mode.

```
SQL> alter pluggable database DEV3 open;  
  
Pluggable database altered.  
  
SQL>
```

13. Return to the terminal session on `stndby` connected to the `stndby` database. Verify the PDBs in the standby database.

```
SQL> show pdbs  
  
CON_ID CON_NAME          OPEN MODE  RESTRICTED  
-----  
 2  PDB$SEED            MOUNTED  
 3  DEV1                MOUNTED  
 4  DEV2                MOUNTED  
 5  DEV3                MOUNTED
```

14. The DEV3 PDB is listed in the output of the previous step, but it doesn't mean that it is protected. Run the following query to check the `recovery_status` column. This column shows whether recovery is enabled or disabled for the PDB.

```
SQL> col name format a10
SQL> SELECT name, open_mode, recovery_status FROM v$pdbs;
```

NAME	OPEN_MODE	RECOVERY
PDB\$SEED	MOUNTED	ENABLED
DEV1	MOUNTED	ENABLED
DEV2	MOUNTED	ENABLED
DEV3	MOUNTED	DISABLED

```
SQL>
```

15. To clean up the environment, reset the `ENABLED_PDBS_ON_STANDBY` parameter.

```
SQL> ALTER SYSTEM SET enabled_pdbs_on_standby="*";
```

```
System altered.
```

16. Return to the terminal session connected to `localhost` to clean up the environment.

```
SQL> @/home/oracle/setup/cleanup04-02.sql
```

```
Pluggable database altered.
```

```
Pluggable database altered.
```

```
Pluggable database dropped.
```

```
Pluggable database dropped.
```

```
System altered.
```

```
SQL>
```

17. Exit SQL*Plus on `localhost` and `stndby` leaving the terminal windows open for future practice.

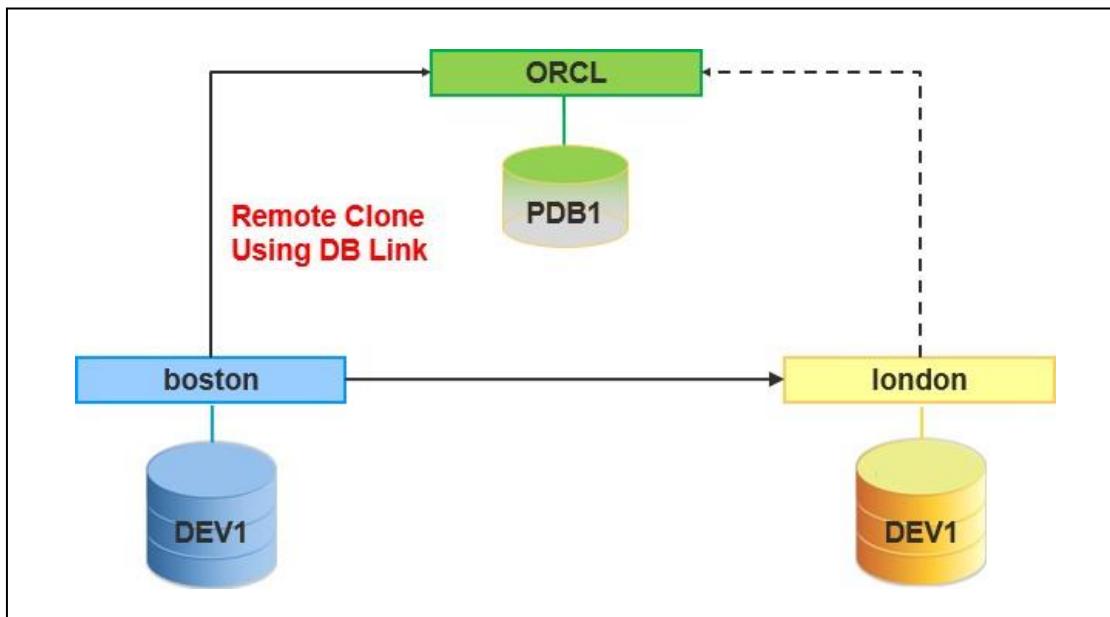
Practice 4-3: Automating Instantiation of a PDB

Overview

In this practice, you will test the usage of `STANDBY_PDB_SOURCE_FILE_DBLINK` to automate instantiation of a PDB in the `stndby` standby database when performing the remote PDB clone in the `orclcdb` primary database. In Oracle Database 19c, creating a PDB as a clone in the primary database requires copy of the data files belonging to the source PDB to the standby database manually.

Assumptions

- `orclcdb`: Primary database with a single PDB called `DEV1`
- `stndby`: Standby database protecting the PDB called `DEV1`
- ORCL: Stand-alone database with a single PDB called `PDB1` as a remote clone source



Prerequisites

- The value of the `STANDBY_PDB_SOURCE_FILE_DBLINK` is only checked and used when a remote clone operation (`create pluggable database....from pdb@dblink...`) is executed on the primary database and the redo is applied at the standby database.
- The standby database must be in Active Data Guard (ADG) mode. We require access to the dictionary for the database link and the dictionary is only available if the standby is in Active Data Guard mode.
- The source PDB must be in Read Only mode and remain for the duration of the copies to the primary and all standby databases in the configuration. We do not at this time support automatic maintenance of the standby database of any type with the 12.2 hot cloning or relocate features.

Tasks

1. Open a terminal window and use the SSH client to connect to `em13c` as the oracle OS user. Check the status of the precreated `ORCL` database and its `PDB1` PDB. If it's not running, start up the database.

```
Last login: Mon Jun 8 09:30:39 2020
[oracle8c793fb03eed ~]$ . oraenv
ORACLE_SID = [ORCL] ? ORCL
The Oracle base remains unchanged with value /u01/app/oracle
[oracle8c793fb03eed ~]$ 
[oracle8c793fb03eed ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Fri Jun 19 16:54:24
          2020
Version 19.3.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> show pdbs

      CON_ID CON_NAME           OPEN MODE  RESTRICTED
----- -----
      2 PDB$SEED            READ ONLY   NO
      3 PDB1                READ WRITE  NO
SQL>
```

2. Create the database link user in the ORCL database.

```
SQL> CREATE USER c##remote_user IDENTIFIED BY <password>
CONTAINER=all;

User created.

SQL> GRANT CREATE SESSION, CREATE PLUGGABLE DATABASE TO
    c##remote_user CONTAINER=ALL;

Grant succeeded.

SQL>
```

3. Use the terminal window connected to localhost and create a database link in the orclcdb primary database to the ORCL source database using the database link.

```
[oracle@localhost ~]$ . oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Tue Jun 2 10:12:34
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> CREATE DATABASE LINK clone_link CONNECT TO c##remote_user
    IDENTIFIED BY <password> USING 'ORCL';

Database link created.

SQL>
```

4. Test the database link from the `orclcdb` primary database to the `ORCL` source database.

```
SQL> SELECT * FROM dual@clone_link;  
  
D  
-  
X  
  
SQL>
```

5. Use the terminal window connected to `stndby` and configure the `stndby` database in Active Data Guard with the real-time query mode by executing the `configure_adg.sql` script.

Note: The real-time query feature is covered in the next lesson.

```
[oracle@stndby ~]$ . oraenv  
ORACLE_SID = [oracle] ? stndby  
The Oracle base has been set to /u01/app/oracle  
[oracle@stndby ~]$ sqlplus / as sysdba  
  
SQL*Plus: Release 19.0.0.0.0 - Production on Tue Jun 2 10:22:21  
2020  
Version 19.3.0.0.0  
  
(c) 1982, 2019, Oracle. All rights reserved.  
  
Connected to:  
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -  
Production  
Version 19.3.0.0.0  
  
SQL> @/home/oracle/setup/configure_adg.sql  
SQL> ALTER DATABASE RECOVER MANAGED STANDBY DATABASE CANCEL;  
  
Database altered.  
  
SQL> ALTER DATABASE OPEN READ ONLY;  
  
Database altered.
```

sql

```
SQL> ALTER DATABASE RECOVER MANAGED STANDBY DATABASE DISCONNECT  
      FROM SESSION;
```

```
Database altered.
```

6. Test the database link from the `stndby` standby database to the `ORCL` source database and set the `STANDBY_PDB_SOURCE_FILE_DBLINK` parameter.

```
SQL> SELECT * FROM dual@clone_link;
```

```
D  
-  
X
```

```
SQL> ALTER SYSTEM SETSTANDBY_PDB_SOURCE_FILE_DBLINK='clone_link' ;
```

```
System altered.
```

7. Return to the `ORCL` terminal session on `localhost:11521` and open `PDB1` in read-only mode.

```
SQL> ALTER PLUGGABLE DATABASE pdb1 CLOSE;
```

```
Pluggable database altered.
```

```
SQL> ALTER PLUGGABLE DATABASE pdb1 OPEN READ ONLY;
```

```
Pluggable database altered.
```

```
SQL>
```

8. Return to the `orclcdb` terminal session on `localhost` and create a new pluggable database called `NEW_PDB1` as a clone of the remote pluggable database `PDB1`.

```
SQL> ALTER SESSION SET
db_create_file_dest='/u01/app/oracle/oradata/ORCLCDB';
Session altered.

SQL> CREATE PLUGGABLE DATABASE new_pdb1 FROM pdb1@clone_link;
Pluggable database created.

SQL>
```

9. Open a new terminal window connected to `stndby` and review the alert log file.

```
oracle@stndby's password: <password>
Last login: Sun Jun 14 17:33:09 2020 from gateway.example.com
[oracle@stndby ~]$ tail -100
/u01/app/oracle/diag/rdbms/stndby/stndby/trace/alert_stndby.log
...
2020-06-02T17:05:09.757443-04:00
Recovery created pluggable database NEW_PDB1
...
Recovery attempting to copy datafiles for pdb-NEW_PDB1 from
source pdb-PDB1 at dblink-clone_link
...
```

10. Return to the `ORCL` terminal session on `8c793fb03eed`. You can now safely open `PDB1` in readwrite mode.

```
SQL> ALTER PLUGGABLE DATABASE pdb1 CLOSE;
Pluggable database altered.

SQL> ALTER PLUGGABLE DATABASE pdb1 OPEN;
Pluggable database altered.
```

11. Return to the `orclcdb` terminal session on `localhost` and open the `NEW_PDB1` PDB. **Note:** You may observe a warning message. It's probably because of the mismatched settings in the source CDB (`ORCL`) and primary database . You can safely ignore it.

```
SQL> ALTER PLUGGABLE DATABASE NEW_PDB1 open;

Pluggable database altered.

SQL> col name format a10
SQL> SELECT name, open_mode, recovery_status FROM v$pdbs;

NAME          OPEN_MODE   RECOVERY
-----
PDB$SEED      READ ONLY  ENABLED
DEV1          READ WRITE ENABLED
NEW_PDB1      READ WRITE ENABLED

SQL>
```

12. Return to terminal session connected to the `stndby` database on `stndby` and reset the parameter and check the status of `NEW_PDB1` PDB.

```
SQL> ALTER SYSTEM RESET standby_pdb_source_file_dblink;

System altered.

SQL> col name format a10
SQL> SELECT name, open_mode, recovery_status FROM v$pdbs;

NAME          OPEN_MODE   RECOVERY
-----
PDB$SEED      READ ONLY  ENABLED
DEV1          MOUNTED    ENABLED
NEW_PDB1      MOUNTED    ENABLED

SQL>
```

13. Return to the `orclcdb` terminal session on `localhost` to clean up the environment.

```
SQL> ALTER PLUGGABLE DATABASE new_pdb1 CLOSE;  
  
Pluggable database altered.  
  
SQL> DROP PLUGGABLE DATABASE new_pdb1 INCLUDING DATAFILES;  
  
Pluggable database dropped.  
  
SQL>
```

14. Exit SQL*Plus on `localhost`, and `stndby` leaving the terminal windows open for future practices.

Congratulations! In this practice, you tested how to automate the instantiation of a PDB in the standby database using the `STANDBY_PDB_SOURCE_FILE_DBLINK` parameter when performing a remote clone in the primary database.

Practices for Lesson 5: Using Oracle Active Data Guard: Supported Workloads in Read-Only Standby

Practices for Lesson 5: Overview

Practices Overview

In these practices, you will configure the Active Data Guard standby databases to support the alte@various offloadable workloads such as real-time query, DML/DDL on Global Temporary Tables, and read-mostly applications.

1. Set parameter temp_undo_enable=true;

```
alter system set adg_redirect_dml=true scope=both;
```

System altered.

```
SQL> show parameter adg_redirect_dml
```

Practice 5-1: Enable Active Data Guard Real-Time Query

Overview

In this practice, you enable the Active Data Guard with the real-time query feature and verify its operation.

Tasks

1. Use a terminal window logged in as `oracle` to `stndby` with the environment variables set for `stndby` appropriately. Make sure that the physical standby database and its `DEV1` PDB are in `READ ONLY` mode.

```
[oracle@stndby ~]$ . oraenv
ORACLE_SID = [oracle] ? stndby
The Oracle base has been set to /u01/app/oracle
[oracle@stndby ~]$
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Tue Jun 2 20:50:44
          2020
Version 19.3.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> show pdbs

  CON_ID CON_NAME           OPEN MODE  RESTRICTED
----- -----
  2 PDB$SEED            READ ONLY  NO
  3 DEV1                MOUNTED

SQL> alter pluggable database DEV1 open;

Pluggable database altered.
SQL>
```

2. **(Optional)** If the physical standby database is in the MOUNT state, stop the redo apply service and open the `stndby` database in READ ONLY mode.

```
SQL> alter database open read only;
alter database open read only
*
ERROR at line 1:
ORA-10456: cannot open standby database; media recovery session
      may be in
progress

SQL>
SQL> alter database recover managed standby database cancel;
Database altered.

SQL> alter database open read only;

Database altered.

SQL> alter pluggable database DEV1 open;

Pluggable database altered.

SQL>
```

3. Restart the Redo Apply process on the physical standby database running in the READ ONLY mode to enable the real-time query feature.

Note: Depending on the Redo Apply process status, you will see one of two results.

```
SQL> alter database recover managed standby database disconnect;
Database altered.

OR

SQL> alter database recover managed standby database disconnect;
alter database recover managed standby database disconnect
*
ERROR at line 1:
ORA-01153: an incompatible media recovery is active

SQL>
```

4. This database is using the Oracle Multitenant option. The default operating system authentication method for the multitenant container database (CDB) is to the container root (CDB\$ROOT). Data Guard environment operations are performed at the CDB level. Schema objects like the sample schemas exist in customer created pluggable databases (PDBs). Verify that the SQL*Plus session is currently connected to the CDB\$ROOT and that sample schemas do not exist in the root container. Two ways are illustrated to determine the current container name. The first technique uses the SQL*Plus show commands. The second technique uses all SQL syntax. The HR.REGIONS table is part of the sample schemas, but should not exist in the root container.

```
SQL> show con_id

CON_ID
-----
1

SQL> show con_name

CON_NAME
CDB$ROOT

SQL> SELECT sys_context('USERENV', 'CON_NAME') FROM dual;

SYS_CONTEXT('USERENV', 'CON_NAME')

CDB$ROOT

SQL> select * from hr.regions;
-----  
select * from hr.regions
      *
ERROR at line 1:

ORA-00942: table or view does not exist
```

5. Switch the SQL*Plus session to the DEV1 pluggable database (PDB) and query the HR.REGIONS table again.

```
SQL> ALTER SESSION SET CONTAINER = DEV1;

Session altered.

SQL> select * from hr.regions;

REGION_ID REGION_NAME
-----
1 Europe
2 Americas
3 Asia
4 Middle East and Africa
SQL>
```

6. Leave the above window open. Open a terminal window (if not already open) logged in as oracle to localhost with the environment variables set for orclcdb appropriately. Launch SQL*Plus and switch session to the DEV1 PDB of the primary database. Query the HR.REGIONS table.

```
[oracle@localhost ~]$ . oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Tue Jun 2 20:50:44
2020
Version 19.3.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> alter session set container = DEV1;
```

```
Session altered.
```

```
SQL> select * from hr.regions order by region_id;
```

```
REGION_ID REGION_NAME
```

```
-----  
1 Europe  
2 Americas  
3 Asia  
4 Middle East and Africa
```

7. Insert a new row into the HR.REGIONS table and commit the SQL statement.

```
SQL> insert into hr.regions values (5,'Australia');
```

```
1 row created.
```

```
SQL> commit;
```

```
Commit complete.
```

8. Return to the SQL*Plus session to the DEV1 PDB that is still open for the physical standby database on `stndby` and query the HR.REGIONS value. The new row is immediately available on the physical standby database for reporting applications after it was inserted on the primary database. This illustrates the real-time query capability of Active Data Guard.

```
SQL> select * from hr.regions order by region_id;
```

```
REGION_ID REGION_NAME
```

```
-----  
1 Europe  
2 Americas  
3 Asia  
4 Middle East and Africa  
5 Australia
```

9. Exit SQL*Plus on `stndby` of the physical standby database. It is recommended to keep the terminal session open with the environment variables set appropriately.
10. Exit SQL*Plus on `localhost`, leaving the window open for future practices.

Practice 5-2: Performing DDL/DML on Global Temporary Table

Overview

In this practice, you will issue DML and DDL operations on a global temporary table in the `stndby` standby database and verify its operations.

This feature benefits Oracle Data Guard in the following ways:

- Read-mostly reporting applications that use global temporary tables for storing temporary data can be offloaded to an Oracle Active Data Guard instance.
- When temporary undo is enabled on the primary database, undo for changes to a global temporary table are not logged in the redo and thus, the primary database generates less redo. Therefore, the amount of redo that Oracle Data Guard must ship to the standby is also reduced, thereby reducing network bandwidth consumption and storage consumption.

Tasks

1. Use a terminal window logged in as `oracle` to `stndby` with the environment variables set for `stndby` appropriately. Check if the real time query is enabled in the `stndby` database as the system user.

```
[oracle@stndby ~]$ . oraenv
ORACLE_SID = [oracle] ? stndby
The Oracle base has been set to /u01/app/oracle
[oracle@stndby ~]$ sqlplus system/<password>

SQL*Plus: Release 19.0.0.0.0 - Production on Wed Jun 3 00:10:07
          2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> select OPEN_MODE, DATABASE_ROLE, DATAGUARD_BROKER from
      v$database;


| OPEN_MODE        | DATABASE_ROLE             | DATAGUAR         |
|------------------|---------------------------|------------------|
| -----<br>MOUNTED | -----<br>PHYSICAL STANDBY | -----<br>ENABLED |


```

2. Attempt to create a Global Temporary Table (GTT) on Active Data Guard (read-only) instance. NOTE: In 19c this is done on the primary database and it moves it to the stndby. So create global table on primary and you will see it on stndby.

```
SQL> CREATE GLOBAL TEMPORARY TABLE gtt01 (c1 number, c2  
varchar2(10)) ON COMMIT PRESERVE ROWS;
```

```
Table created.
```

```
SQL>
```

Note: The DDL operation on the global temporary table is redirected to the primary database. DDL change is visible on the standby database when it catches up with the primary database.

3. Use a terminal window logged in as `oracle` to `localhost` with the environment variables set for `orclcdb` appropriately. Log in as `system` to the `orclcdb` database.

```
[oracle@localhost ~]$ . oraenv  
ORACLE_SID = [oracle] ? orclcdb  
The Oracle base has been set to /u01/app/oracle  
[oracle@localhost ~]$ sqlplus system/<password>
```

```
SQL*Plus: Release 19.0.0.0.0 - Production on Tue Jun 2 22:48:02  
2020
```

```
Version 19.3.0.0.0
```

```
(c) 1982, 2019, Oracle. All rights reserved.
```

```
Connected to:
```

```
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -  
Production
```

```
Version 19.3.0.0.0
```

4. Check if the global temporary table called GTT01 was created in the primary database.

```
SQL> DESC gtt01
      Name          Null?    Type
----- -----
      C1           NUMBER
      C2           VARCHAR2(10)
```

Note: As you can see, the DDL operation was redirected and issued in the primary database.

5. Return to the stndby terminal session on stndby and check the TEMP_UNDO_ENABLED parameter.

```
SQL> show parameter TEMP_UNDO_ENABLED
      NAME          TYPE        VALUE
----- -----
temp_undo_enabled    boolean     FALSE
SQL>
```

6. Now, attempt to insert a row in the global temporary table on the standby database.

```
SQL> INSERT INTO gtt01 VALUES(10, 'ABC');

1 row created.

SQL> COMMIT;

Commit complete.

SQL>
```

Note: Even if the TEMP_UNDO_ENABLED was set to FALSE, the INSERT statement in the physical standby database was allowed. The TEMP_UNDO_ENABLED parameter is only applicable for the primary database. For a standby database, this parameter is ignored because temporary undo is enabled by default on the standby database.

7. Exit SQL*Plus on localhost and stndby, leaving the window open for future practices.

Practice 5-3: Managing Private Temporary Table for DDL/DML

Overview

In this practice, you will create the private temporary tables in the `stndby` physical standby database and test the DML/DDL operations in the private temporary tables.

Private temporary tables are useful in the following situations:

- When an application stores temporary data in transient tables that are populated once, read few times, and then dropped at the end of a transaction or session
- When a session is maintained indefinitely and must create different temporary tables for different transactions
- When the creation of a temporary table must not start a new transaction or commit an existing transaction
- When different sessions of the same user must use the same name for a temporary table
- When a temporary table is required for a read-only database

Tasks

1. Use a terminal window logged in as `oracle` to `stndby` with the environment variables set for `stndby` appropriately. Log in as the `SYSTEM` user.

```
[oracle@stndby ~]$ . oraenv
ORACLE_SID = [oracle] ? stndby
The Oracle base has been set to /u01/app/oracle
[oracle@stndby ~]$ sqlplus system/<password>

SQL*Plus: Release 19.0.0.0.0 - Production on Wed Jun 3 11:24:59
          2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Last Successful login time: Wed Jun 03 2020 10:44:46 -04:00

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0
SQL>
```

2. Attempt to create a private temporary table (PTT).

```
SQL> CREATE PRIVATE TEMPORARY TABLE mine (x NUMBER, y  
VARCHAR2(10));  
CREATE PRIVATE TEMPORARY TABLE mine (x NUMBER, y VARCHAR2(10))  
*  
ERROR at line 1:  
ORA-00903: invalid table name
```

3. Check the value of the PRIVATE_TEMP_TABLE_PREFIX parameter.

```
SQL> show parameter PRIVATE_TEMP_TABLE_PREFIX  
  
NAME                      TYPE        VALUE  
-----  
private_temp_table_prefix   string     ORA$PTT_
```

4. Create a PTT with the appropriate prefix.

```
SQL> CREATE PRIVATE TEMPORARY TABLE ora$ptt_mine (x NUMBER, y  
VARCHAR2(10));  
  
Table created.
```

Note: Because the definition of a private temporary table is stored in memory, you can create it in the read only standby database. But the table name must include the appropriate prefix.

5. Insert rows in the PTT.

```
SQL> INSERT INTO ora$ptt_mine VALUES (1,'Work1');  
  
1 row created.
```

6. Display data from the PTT.

```
SQL> SELECT * FROM ora$ptt_mine;  
  
X  Y  
---  
1  Work1
```

7. Find all information related to the PTT using the show_ptt.sql script.

```
SQL> @/home/oracle/setup/show_ptt.sql  
...  
  
SQL> SELECT sid, serial#, table_name, tablespace_name, duration  
FROM dba_private_temp_tables;  
  
SID      SERIAL# TABLE_NAME          TABLESPACE_NAME DURATION  
---  
237      58512  ORA$PTT_MINE       TEMP             TRANSACTION
```

8. Open another terminal window logged in as oracle to stndby with the environment variables set for stndby appropriately. Log in as the SYSTEM user.

```
[oracle@stndby ~]$ . oraenv
ORACLE_SID = [oracle] ? stndby
The Oracle base has been set to /u01/app/oracle
[oracle@stndby ~]$ sqlplus system/<password>

SQL*Plus: Release 19.0.0.0.0 - Production on Wed Jun 3 11:24:59
          2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved. Last
Successful login time: Wed Jun 03 2020 10:44:46 -04:00

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0
SQL>
```

9. Verify that the PTT created by the first SYSTEM session is not visible to the second system session.

```
SQL> desc ORA$PTT_MINE
ERROR:
ORA-04043: object ORA$PTT does not exist
```

10. Return to the first SYSTEM window session on stndby and issue the ROLLBACK statement.

```
SQL> ROLLBACK;
Rollback complete.

SQL> @/home/oracle/setup/show_ptt.sql
...
SQL> SELECT sid, serial#, table_name, tablespace_name, duration
  FROM dba_private_temp_tables;
no rows selected

SQL>
```

Note: The duration of the ORA\$PTT_MINE table was TRANSACTION. This is the default duration type. This means that the PTT is automatically dropped at the end of the transaction in which the PTT has been created.

11. In the same terminal window, create a new PTT of SESSION duration type that will last until your session ends.

```
SQL> CREATE PRIVATE TEMPORARY TABLE ora$ptt_mine2 (x NUMBER, y VARCHAR2(10)) ON COMMIT PRESERVE DEFINITION;
```

```
Table created.
```

12. Find all information related to the PTT.

```
SQL> @/home/oracle/setup/show_ptt.sql
...
SQL> SELECT sid, serial#, table_name, tablespace_name, duration
  FROM dba_private_temp_tables;

  SID      SERIAL# TABLE_NAME        TABLESPACE_NAME    DURATION
-----  -----
  237      58512  ORA$PTT_MINE2      TEMP                SESSION
```

13. Insert rows in the PTT.

```
SQL> INSERT INTO ora$ptt_mine2 VALUES (2, 'Work2');

1 row created.
```

14. Display data from the PTT.

```
SQL> SELECT * FROM ora$ptt_mine2;

   X    Y
-----
  2  Work2
```

15. Now, issue the COMMIT statement and display the information about PTT.

```
SQL> COMMIT;

Commit complete.

SQL> @/home/oracle/setup/show_ptt.sql
...
SQL> SELECT sid, serial#, table_name, tablespace_name, duration
  FROM dba_private_temp_tables;
```

SID	SERIAL#	TABLE_NAME	TABLESPACE_NAME	DURATION
237	58512	ORA\$PTT_MINE2	TEMP	SESSION

Note: The PTT still exists. It will be dropped at the end of the session.

16. Exit SQL*Plus on `localhost` and `stndby`, leaving the window open for future practices.

Practice 5-4: Configuring Automatic Redirection of DML operations

Overview

In this practice, you will enable automatic redirection of DML operations for standby sessions in an Active Data Guard environment to support read-mostly applications, which occasionally execute DMLs, on the standby database.

Tasks

1. Use a terminal window logged in as `oracle` to `localhost` with the environment variables set for `orclcdb` appropriately. Log in as the `SYS` user.

```
[oracle@localhost ~]$ . oraenv
ORACLE_SID = [orclcdb] ? orclcdb
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Wed Jun 3 13:20:37
          2020
Version 19.3.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL>
```

2. Configure automatic redirection of DML operations in the primary database.

```
SQL> alter system set adg_redirect_dml=true scope=both;
System altered.

SQL> show parameter adg_redirect_dml

NAME                      TYPE            VALUE
-----                    -----          -----
adg_redirect_dml           boolean        TRUE
SQL>
```

3. Use a terminal window logged in as `oracle` to `stndby` with the environment variables set for `stndby` appropriately. Log in as the `SYS` user.

```
[oracle@stndby ~]$ . oraenv
ORACLE_SID = [stndby] ? stndby
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Wed Jun 3 13:24:56
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL>
```

4. Configure automatic redirection of DML operations in the standby database.

```
SQL> alter system set adg_redirect_dml=true scope=both;
System altered.

SQL> show parameter adg_redirect_dml

NAME                      TYPE            VALUE
-----                    -----
adg_redirect_dml          boolean        TRUE
SQL>
```

5. Return to the terminal session connected to `localhost`. Connect to the `DEV1` PDB for testing.

```
SQL> alter session set container=DEV1;

Session altered.

SQL> show con_name
```

```
CON_NAME
```

```
-----  
DEV1  
SQL>
```

6. Create a table called TEST01 and insert a row.

```
SQL> CREATE TABLE test01 (id number(10), name varchar2(10));  
  
Table created.  
  
SQL> INSERT INTO test01 VALUES(10, 'SEAN');  
  
1 row created.  
  
SQL> COMMIT;  
  
Commit complete.  
  
SQL> SELECT * FROM test01;  
  
ID NAME  
-----  
10 SEAN
```

7. Return to the terminal session connected to stndby. Connect to the DEV1 PDB.

```
SQL> alter session set container = DEV1;  
  
Session altered.  
  
SQL> show con_name  
  
CON_NAME  
-----  
DEV1
```

8. Display the data in the TEST01 table.

```
SQL> SELECT * FROM test01;  
  
ID NAME  
-----  
10 SEAN
```

9. Test automatic redirection of DML in the current session.

```
SQL> DELETE FROM test01;
DELETE FROM test01
*
ERROR at line 1:
ORA-16397: statement redirection from Oracle Active Data Guard
standby database
to primary database failed

SQL> !oerr ora 16397
16397, 00000, "statement redirection from Oracle Active Data Guard
standby database to primary database failed"
// *Cause: The statement redirection failed because of one of the
following reasons:
//          1. The primary database connect string was not established.
//          2. The primary database could not be reached.
//          3. The undo-mode or incarnation were not the same.
//          4. The current user and logged-in user were not the same.
//          5. Redirecting CREATE TABLE AS SELECT (CTAS) of the global
temporary
//                  table was not supported.
//          6. Redirecting PL/SQL execution having bind variable was not
supported.
// *Action: Run the statement after fixing the condition that caused the
failure.
```

Note: You need to log in to the DEV1 PDB using username/password instead of the ALTER SESSION SET CONTAINER command.

10. Exit SQL*Plus and log in to the DEV1 PDB again and test automatic redirection of DML.

```
SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@stndby ~]$ sqlplus
sys/<password>@stndby:1521/dev1.example.com as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Wed Jun 3 13:42:48
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> DELETE FROM test01;
1 row deleted.
```

```
SQL> COMMIT;
```

```
Commit complete.
```

11. Return to the terminal session connected to `localhost`. Verify the result of the automatic redirection of DML feature in the `orclcd` primary database.

```
SQL> SELECT * FROM test01;
```

```
no rows selected
```

Note: The `DELETE` statement issued from the standby database was redirected to the primary database.

12. Exit SQL*Plus on `localhost` and `stndby` leaving the terminal windows open for future practices.

Practices for Lesson 6: Using Oracle Active Data Guard: Far Sync and Real- Time Cascading

Practices for Lesson 6: Overview

Practices Overview

In these practices, you will implement two Far Sync instances into the current Data Guard environment.

Practice 6-1: Add Far Sync to the Data Guard Environment

Overview

In this practice, you will create a Far Sync instance (`orclcdbFS`) on `host02` that is in close proximity to the primary database. THIS CLASS doesn't have another network to connect too so this information is for those who have the multiple networks to utilize

Tasks – This is a read only chapter as we do not have another host.

1. Use a terminal window for `localhost` logged in as `oracle` with the environment variables set to `orclcdb`. Use SQL*Plus to create a text-based initialization parameter file named `/tmp/initorclcdbFS.ora` that contains a copy of all the current parameters for primary

```
[oracle@localhost ~]$ . oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Wed Jun 3 15:45:55
2020
Version 19.3.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> create pfile='/tmp/initorclcdbFS.ora' from spfile;

File created.
```

2. Create a Far Sync control file named `/tmp/orclcdbFS.ctl` on the primary database and exit SQL*Plus when done.

```
SQL> alter database create far sync instance controlfile as
'/tmp/orclcdbFS.ctl';

Database altered.

SQL> exit
```

3. Copy the primary password file to the /tmp directory.

```
[oracle@localhost ~]$ cp $ORACLE_HOME/dbs/orapworclcdb /tmp  
[oracle@localhost ~]$
```

4. Transfer the three files staged in the /tmp directory from localhost to host02 and placethem into the /tmp directory on host02.

```
[oracle@localhost ~]$ cat /home/oracle/setup/copy_orclcdbFS.sh  
...  
scp /tmp/initorclcdbFS.ora  
oracle@host02:/tmpscp /tmp/orclcdbFS.ctl  
oracle@host02:/tmp  
scp /tmp/orapworclcdb oracle@host02:/tmp  
  
[oracle@localhost ~]$ /home/oracle/setup/copy_orclcdbFS.sh  
oracle@host02's password: <password>  
initorclcdbFS.ora          100% 1718      1.6MB/s  00:00  
oracle@host02's password: <password>  
orclcdbFS.ctl              100%    18MB   33.5MB/s  00:00  
oracle@host02's password: <password>  
orapworclcdb                100% 2560      2.6MB/s  00:00  
[oracle@localhost ~]$
```

5. Open a terminal window for host02 logged in as oracle with the environment variables set to orclcdbFS. Create the initial directories needed on the Far Sync server. These arethe same directories that were created on the physical standby server stndby in practice 3-2.

```
[oracle@host02 ~]$ . oraenv  
ORACLE_SID = [oracle] ? orclcdbFS  
The Oracle base has been set to /u01/app/oracle  
[oracle@host02 ~]$ cat /home/oracle/setup/crdir_host02.sh  
mkdir -p /u01/app/oracle/admin/orclcdbFS/adump  
mkdir -p /u01/app/oracle/oradata/orclcdbFS  
mkdir -p  
/u01/app/oracle/oradata/orclcdbFS/pdbseedmkdir -p  
/u01/app/oracle/oradata/orclcdbFS/dev1  
mkdir -p /u01/app/oracle/fast_recovery_area/orclcdbFS
```

Note: Linux directory and file names are case sensitive. Throughout these labs, the names for Far Sync use the format orclcdbFS and stndbyFS for readability. The last 2 letters are in upper-case.

- a. The entry for `log_archive_dest_2` uses the `valid_for` option assuming it has the role of primary database. On the Far Sync, this needs to use the role of a standby database. Also the Far Sync should use ASYNC communication to the physical standby environment. Correct the `log_archive_dest_2` parameter to the following value (Changes to make in bold):

```
*.log_archive_dest_2='SERVICE=stndby ASYNC REOPEN=15  
valid_for=(STANDBY_LOGFILES, STANDBY_ROLE) db_unique_name=stndby'
```

- b. The original control files are named `control01.ctl` and `control02.ctl`. We will rename these `orclcdbFS01.ctl` and `orclcdbFS02.ctl`, respectively. This is for preference only since these files are not normal control files. Both changes can be made with the following global search and replace:

```
:%s/control0/orclcdbFS0/g
```

- c. Add the following new entries to the bottom of the file.

```
*.db_unique_name=orclcdbFS  
*.fal_server=orclcdb  
*.log_file_name_convert='ORCLCDB','orclcdbFS'
```

- d. Remove or comment out the `LOCAL_LISTENER` entry if it exists with the value.

```
#*.local_listener='LISTENER_orclcdbFS'
```

- e. Recheck all modifications and case-sensitivity issues. If accurate, then save the changes made to the file.

```
:wq!
```

- f. The complete edited file is listed below for reference. Bold entries indicate changes that were made.

```
[oracle@host02 ~]$ cat
/tmp/initorclcdbFS.oraorclcdbFS.
data_transfer_cache_size=0 orclcdbFS.
db_cache_size=46137344
orclcdbFS._java_pool_size=12582912
orclcdbFS.
large_pool_size=12582912
orclcdbFS._oracle_base='/u01/app/oracle'#ORACLE_BASE set from
environment
orclcdbFS._pga_aggregate_target=209715200
orclcdbFS._sga_target=310378496
orclcdbFS._shared_io_pool_size=4194304
orclcdbFS._shared_pool_size=226492416
orclcdbFS._streams_pool_size=0
*.audit_file_dest='/u01/app/oracle/admin/orclcdbFS/adump'
*.audit_trail='db'
*.compatible='12.1.0.0.0'
*.control_files='/u01/app/oracle/oradata/orclcdbFS/orclcdbFS01.ctl
','/u01/app/oracle/fast_recovery_area/orclcdbFS/orclcdbFS02.ctl'
*.db_block_size=8192
*.db_domain='example.com'
*.db_name='orclcdb'
*.db_recovery_file_dest='/u01/app/oracle/fast_recovery_area'
*.db_recovery_file_dest_size=10g
*.diagnostic_dest='/u01/app/oracle'
*.log_archive_config='dg_config=(orclcdb,orclcdbFS,stndby,stndbyFS
,stndby2)'
*.log_archive_dest_1='location=USE_DB_RECOVERY_FILE_DEST
valid_for=(ALL_LOGFILES,ALL_ROLES) db_unique_name=orclcdbFS'
*.log_archive_dest_2='SERVICE=stndby ASYNC REOPEN=15
valid_for=(STANDBY_LOGFILES,STANDBY_ROLE) db_unique_name=stndby'
*.log_archive_dest_state_1='enable'
*.log_archive_format='arch_%t_%s_%r.log'
*.log_archive_max_processes=4
*.memory_target=496m
*.open_cursors=300
*.processes=300
*.remote_login_passwordfile='EXCLUSIVE'
*.standby_file_management='auto'
*.undo_tablespace='UNDOTBS1'
*.db_unique_name=orclcdb
```

```
*.fal_server=orclcdb  
*.log_file_name_convert='ORCLCDB','orclcdbFS'
```

6. Copy the `/tmp/orclcdbFS.ctl` Far Sync control file to the two destination directories used in the initialization parameter file. Rename the files to the correct name while copying them.

```
[oracle@host02 ~]$ cp /tmp/orclcdbFS.ctl  
/u01/app/oracle/oradata/orclcdbFS/orclcdbFS01.ctl
```

```
[oracle@host02 ~]$ cp /tmp/orclcdbFS.ctl  
/u01/app/oracle/fast_recovery_area/orclcdbFS/orclcdbFS02.ctl
```

7. Copy the password file staged into the `/tmp` directory to the default location of Far Sync instance. Rename the file appropriately while copying it.

```
[oracle@host02 ~]$ cp /tmp/orapworclcdb  
/u01/app/oracle/product/19.3.0/dbhome_1/dbs/orapworclcdbFS
```

8. Verify that the environment variables are defined for `orclcdbFS`. If they are not, then use the `oraenv` utility to set them if needed.

```
[oracle@host02 ~]$ set | grep ORA  
OLD_ORACLE_BASE=  
ORABASE_EXEC=/u01/app/oracle/product/19.3.0/dbhome_1/bin/orabase  
ORACLE_BASE=/u01/app/oracle  
ORACLE_HOME=/u01/app/oracle/product/19.3.0/dbhome_1  
ORACLE_SID=orclcdbFS  
ORAHOME=/u01/app/oracle/product/19.3.0/dbhome_1  
ORASID=oracle  
[oracle@host02 ~]$
```

9. Use SQL*Plus to create a binary server parameter file from the text parameter file. Create the server parameter file into the default directory.

```
[oracle@host02 ~]$ sqlplus / as sysdba  
  
SQL*Plus: Release 19.0.0.0.0 - Production on Wed Jun 3 15:45:55  
2020  
Version 19.3.0.0.0  
  
(c) 1982, 2019, Oracle. All rights reserved.  
  
Connected to:
```

```

Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> create spfile from pfile='/tmp/initorclcdbFS.ora';
File created.

```

10. Start up the Far Sync instance in MOUNT mode.

```

SQL> startup mount
ORACLE instance started.

Total System Global Area 517763072 bytes
Fixed Size                  2290216 bytes
Variable Size                440405464 bytes
Database Buffers             71303168 bytes
Redo Buffers                 3764224 bytes
Database mounted.

```

11. Use a terminal window on localhost logged in as oracle with the environment variables set to orclcdb, the primary database. Launch SQL*plus and examine the current value of log_archive_dest_2.

```

[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Wed Jun 3 15:45:55
2020
Version 19.3.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> show parameter log_archive_dest_2
NAME          TYPE        VALUE
-----
log_archive_dest_2  string      SERVICE=stndby ASYNC REOPEN=15
                                         valid_for=(ONLINE_LOGFILES,

```

```
PRIMARY_ROLE)
db_unique_name=stndby
```

12. The primary is currently forwarding redo to the physical standby database. Alter the primary database to now forward redo to the Far Sync instance instead of the physical standby database. Be sure to make the corrections both in memory and written to the server parameter file.

```
SQL> alter system set log_archive_dest_2='SERVICE=orclcdbFS SYNC
REOPEN=15 valid_for=(ONLINE_LOGFILES,PRIMARY_ROLE)
db_unique_name=orclcdbFS' scope=both;
```

```
System altered.
```

13. Determine the most recently archived redo log on the primary database. Perform a log switch, and verify the next sequence number used.

```
SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG GROUP BY
THREAD#;
```

MAX (SEQUENCE#)	THREAD#
-----	-----
21	1

```
SQL> alter system switch logfile;
System altered.
```

```
SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG GROUP BY
THREAD#;
```

MAX (SEQUENCE#)	THREAD#
-----	-----
22	1

14. Use the previous SQL*Plus session for host02 logged in as oracle with the environment variables set to orclcdbFS, the Far Sync. Verify that the last sequence number of the primary was received on the Far Sync.

```
SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG GROUP BY
THREAD#;
```

MAX (SEQUENCE#)	THREAD#
-----	-----
22	1

15. Open a terminal window on `stndby` logged in as `oracle` with the environment variables set to `stndby`. Launch SQL*Plus and verify that the physical standby on `stndby` is receiving redo from the Far Sync on `host02`.

```
[oracle@stndby]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Wed Jun 3 15:45:55
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG GROUP BY
THREAD#;
MAX (SEQUENCE#)      THREAD#
-----
22                  1
```

16. Exit all SQL*Plus sessions from `localhost`, `host02`, and `stndby`. Leave the terminalsessions open with the environment variables set for each system.

```
(localhost) SQL> exit;
(host02) SQL> exit;
(stndby) SQL> exit;
```

17. Verify on the Far Sync server, `host02`, that the standby redo logs were automatically created.

```
[oracle@host02 ~]$ ls -la
/u01/app/oracle/oradata/orclcdbFS/stdby*
-rw-r-----. 1 oracle oinstall 209715712 Jun  8 15:39
/u01/app/oracle/oradata/orclcdbFS/stdbyredo01.log
-rw-r-----. 1 oracle oinstall 209715712 Jun  8 15:37
/u01/app/oracle/oradata/orclcdbFS/stdbyredo02.log
-rw-r-----. 1 oracle oinstall 209715712 Jun  8 15:37
/u01/app/oracle/oradata/orclcdbFS/stdbyredo03.log
-rw-r-----. 1 oracle oinstall 209715712 Jun  8 15:38
/u01/app/oracle/oradata/orclcdbFS/stdbyredo04.log
[oracle@host02 ~]$
```

Practice 6-2: Add 2nd Far Sync to the Data Guard Environment

Overview

In this practice, you will create an additional Far Sync instance (stndbyFS) on host04 that is in close proximity to the physical standby database. This will be used in future practices that perform role reversal. With a role reversal, the stndby instance on stndby will become the primary database. It will need to forward redo to stndbyFS Far Sync on host04.

In the practice, we copied a Far Sync control file, initialization parameter file, and password file to the /tmp directory on host02. We will start with these files and copy them to host04 since they were already edited for a Far Sync environment.

Tasks

1. Use a terminal window for host02 logged in as oracle with the environment variables set to orclcdbFS. Copy the three files staged in /tmp to host04.

```
[oracle@host02 ~]$ . oraenv
ORACLE_SID = [oracle] ? orclcdbFS
The Oracle base has been set to /u01/app/oracle
[oracle@host02 ~]$
[oracle@host02 ~]$ cat /home/oracle/setup/copy_stndbyFS.sh
...
scp /tmp/orclcdbFS.ctl oracle@host04:/tmp
scp /tmp/initorclcdbFS.ora
oracle@host04:/tmpscp /tmp/orapworclcdb
oracle@host04:/tmp

[oracle@host02 ~]$ /home/oracle/setup/copy_stndbyFS.sh
/home/oracle/setup/copy_stndbyFS.sh
The authenticity of host 'host04 (192.0.2.14)' can't be
established.
ECDSA key fingerprint is
SHA256:JKkb1E9vmYSa8YTFMVqZGa/vXENSXcCJJehEX+UdHfA.
ECDSA key fingerprint is
MD5:74:b9:98:32:37:24:52:3d:f7:a8:12:ac:38:c3:c8:94.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'host04,192.0.2.14' (ECDSA) to the
list of known hosts."
oracle@host04's password: <password>
orclcdbFS.ctl          100%   18MB   52.9MB/s   00:00
oracle@host04's password: <password>
initorclcdbFS.ora      100%  1851     19.0KB/s   00:00
oracle@host04's password: <password>
orapworclcdb           100%  2560    239.8KB/s   00:00
[oracle@host02 ~]$
```

2. Open a new terminal window for host04 logged in as oracle with the environment variables set to stndbyFS. Create the initial directories needed on the Far Sync server. These are the same directories that were created on the physical standby server stndby in practice 3-2.

```
[oracle@host04 ~]$ . oraenv
ORACLE_SID = [oracle] ? stndbyFS
The Oracle base has been set to /u01/app/oracle
[oracle@host04 ~]$
[oracle@host04 ~]$ cat /home/oracle/setup/crdir_host04.sh
...
mkdir -p /u01/app/oracle/admin/stndbyFS/adump
mkdir -p /u01/app/oracle/oradata/stndbyFS
mkdir -p /u01/app/oracle/oradata/stndbyFS/pdbseed
mkdir -p /u01/app/oracle/oradata/stndbyFS/dev1
mkdir -p /u01/app/oracle/fast_recovery_area/stndbyFS
[oracle@host04 ~]$
[oracle@host04 ~]$ /home/oracle/setup/crdir_host04.sh
[oracle@host04 ~]$
```

Note: Linux directory and file names are case-sensitive. Throughout these labs, the names for Far Sync use the format orclcdbFS and stndbyFS for readability. The last two letters are in uppercase.

3. Rename the /tmp/initorclcdbFS.ora file /tmp/initstndbyFS.ora. You will need to make changes to the initialization parameters to reflect the name change from orclcdb to stndby. You will also need to make adjustments for control file name changes and directory name changes.

```
[oracle@host04 ~]$ mv /tmp/initorclcdbFS.ora
/tmp/initstndbyFS.ora
```

```
[oracle@host04 ~]$ vi /tmp/initstndbyFS.ora
```

- a. Globally, search and replace all occurrences of orclcdb with stndby

```
:%s/orclcdb/stndby/g
26 substitutions on 22 lines
```

- b. Three of the substitutions from the global search and replace are incorrect and need to be reverted to their original value. Continue editing the file to locate and correct db_name, log_archive_config, and log_file_name_convert entries. Ask your instructor for assistance if you need help with VI syntax. Remember to always use the <ESC> key before starting a new VI command option.

```
*.db_name='orclcdb'
*.log_archive_config='dg_config=(orclcdb,orclcdbFS,stndby,stndbyF
S
, stndby2)'
```

- c. The entry for `log_archive_dest_2` is defined for a standby database role to ship redo to the `stndby` service. If `stndby` becomes the primary database, then the `stndbyFS` Far Sync should ship redo to `orclcdb`, which will become the standby database after role reversal. Correct the values for this parameter. (Changes are shown in bold.)

```
* .log_archive_dest_2='SERVICE=orclcdb ASYNC REOPEN=15
  valid_for=(STANDBY_LOGFILES, STANDBY_ROLE) db_unique_name=orclcdb'
```

- d. Recheck all modifications and case-sensitivity issues. If accurate, then save the changes made to the file. Less changes were needed since we started with a modified file.

```
:wq!
```

- e. The complete edited file is listed below for reference. Bold entries indicate changes that were made.

```
[oracle@host04 ~]$ cat /tmp/initstndbyFS.ora
stndbyFS._data_transfer_cache_size=0
stndbyFS._db_cache_size=46137344
stndbyFS._java_pool_size=12582912
stndbyFS._large_pool_size=12582912
stndbyFS._oracle_base='/u01/app/oracle' #ORACLE_BASE set from environment
stndbyFS._pga_aggregate_target=209715200
stndbyFS._sga_target=310378496
stndbyFS._shared_io_pool_size=4194304
stndbyFS._shared_pool_size=226492416
stndbyFS._streams_pool_size=0
*.audit_file_dest='/u01/app/oracle/admin/stndbyFS/adump'
*.audit_trail='db'
*.compatible='12.1.0.0.0'
*.control_files='/u01/app/oracle/oradata/stndbyFS/stndbyFS01.ctl',
 '/u01/app/oracle/fast_recovery_area/stndbyFS/stndbyFS02.ctl'
*.db_block_size=8192
*.db_domain='example.com'
*.db_name='orclcdb'
*.db_recovery_file_dest='/u01/app/oracle/fast_recovery_area'
*.db_recovery_file_dest_size=10g
*.diagnostic_dest='/u01/app/oracle'
*.dispatchers='(PROTOCOL=TCP) (SERVICE=stndbyFSXDB)'
*.enable_pluggable_database=true
#*.local_listener='LISTENER_stndbyFS'
*.log_archive_config='dg_config=(orclcdb,orclcdbFS,stndby,stndbyFS,stndby2)'
*.log_archive_dest_1='location=USE_DB_RECOVERY_FILE_DEST
  valid_for=(ALL_LOGFILES, ALL_ROLES) db_unique_name=stndbyFS'
```

```

*.log_archive_dest_2='SERVICE=orclcdb ASYNC REOPEN=15
valid_for=(STANDBY_LOGFILES, STANDBY_ROLE) db_unique_name=orclcdb'
*.log_archive_dest_state_1='enable'
*.log_archive_format='arch_%t_%s_%r.log'
*.log_archive_max_processes=4
*.memory_target=496m
*.open_cursors=300
*.processes=300
*.remote_login_passwordfile='EXCLUSIVE'
*.standby_file_management='auto'
*.undo_tablespace='UNDOTBS1'
*.db_unique_name=stndbyFS
*.fal_server=stndby
*.log_file_name_convert='ORCLCDB', 'stndbyFS'

```

4. Copy the /tmp/orclcdbFS.ctl Far Sync control file to the two destination directories used in the initialization parameter file. Rename the files to the correct name while copying them.

```

[oracle@host04 ~]$ cp /tmp/orclcdbFS.ctl
/u01/app/oracle/oradata/stndbyFS/stndbyFS01.ctl

[oracle@host04 ~]$ cp /tmp/orclcdbFS.ctl
/u01/app/oracle/fast_recovery_area/stndbyFS/stndbyFS02.ctl

```

5. Copy the password file staged into the /tmp directory to the default location of Far Sync instance. Rename the file appropriately while copying it.

```

[oracle@host04 ~]$ cp /tmp/orapworclcdb
/u01/app/oracle/product/19.3.0/dbhome_1/dbs/orapwstndbyFS

```

6. Verify that the environment variables are defined for stndbyFS. If they are not, then use the oraenv utility to set them if needed.

```

[oracle@host04 ~]$ set | grep ORA
OLD_ORACLE_BASE=
ORABASE_EXEC=/u01/app/oracle/product/19.3.0/dbhome_1/bin/orabase
ORACLE_BASE=/u01/app/oracle
ORACLE_HOME=/u01/app/oracle/product/19.3.0/dbhome_1
ORACLE_SID=stndbyFS
ORAHOME=/u01/app/oracle/product/19.3.0/dbhome_1
ORASID=oracle

```

7. Use SQL*Plus to create a binary server parameter file from the text parameter file. Create the server parameter file into the default directory.

```
[oracle@host04 ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Wed Jun 3 20:39:10
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved. Connected to an
idle instance.

SQL> create spfile from pfile='/tmp/initstndbyFS.ora';

File created.
```

8. Start up the Far Sync instance in MOUNT mode. Leave SQL*Plus session open when done.

```
SQL> startup mount
ORACLE instance started.

Total System Global Area 517763072 bytes
Fixed Size                  2290216 bytes
Variable Size                440405464 bytes
Database Buffers            71303168 bytes
Redo Buffers                 3764224 bytes
Database mounted.

SQL> exit;
```

9. Use a terminal window on stndby logged in as oracle with the environment variables set to stndby, the physical standby database. Launch SQL*plus and examine the current value of log_archive_dest_2.

```
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Mon Jun 15 01:30:23
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
```

```
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -  
Production  
Version 19.3.0.0.0
```

```
SQL> show parameter log_archive_dest_2
```

NAME	TYPE	VALUE
log_archive_dest_2	string	

10. The `log_archive_dest_2` parameter of the `stndby` physical standby instance is not currently defined because it is a terminal destination. After role reversals, it would become the primary database. At that time, it should forward redo to the `stndbyFS` Far Sync. Modify the `log_archive_dest_2` parameter so that it forwards redo accordingly.

```
SQL> alter system set log_archive_dest_2='SERVICE=stndbyFS SYNC  
REOPEN=15 valid_for=(ONLINE_LOGFILES,PRIMARY_ROLE)  
db_unique_name=stndbyFS' scope=both;
```

```
System altered.
```

Note: At this point in the labs, the `stndbyFS` Far Sync has been started, but it is not currently used. It will be tested after switchover exercises are performed in future labs.

11. Exit all SQL*Plus sessions from `localhost`, `host02`, `stndby`, and `host04` if they are still open. Leave the terminal sessions open with the environment variables set for each system.

```
(localhost)    SQL>  
exit; (host02)  SQL>  
exit; (stndby)  SQL>  
exit;
```

Practices for Lesson 7: Creating and Managing a Snapshot Standby Database

Practices for Lesson 7: Overview

Practices Overview

In these practices, you will convert the physical standby database to a snapshot database and open it for read-write operations. You will create new schema objects in the database to verify the success of creating the snapshot. Finally, you will convert it back into a physical standby database, discarding the schema objects that were created.

Practice 7-1: Convert Physical Standby to a Snapshot Standby

Overview

In this practice, you will convert the `stndby` physical standby database to a snapshot standby database.

Tasks

1. Use a terminal window logged in as `oracle` to `stndby` with the environment variables set for `stndby` appropriately. Launch SQL*Plus and verify that the current database role is physical standby.

```
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Wed Jun 3 20:53:36
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> select database_role from v$database;

DATABASE_ROLE
-----
PHYSICAL STANDBY

SQL>
```

2. Verify that flashback database is turned off, and show the default value for the flashback retention target.

```
SQL> select flashback_on from v$database;

FLASHBACK_ON
-----
NO

SQL> show parameter DB_FLASHBACK_RETENTION_TARGET
```

NAME	TYPE	VALUE
db_flashback_retention_target	integer	1440

3. Display the values for the two initialization parameters that define the Fast Recovery Area.

```
SQL> show parameter DB_RECOVERY_FILE_DEST
NAME                      TYPE        VALUE
-----
db_recovery_file_dest      string      /u01/app/oracle/fast_recovery_area
db_recovery_file_dest_size big integer 15000M
```

4. Display the current file types, number of files for each type, and percentage of space utilization per file type for the Fast Recovery Area.

Note: Your output varies.

```
SQL> select file_type,number_of_files,percent_space_used from
v$recovery_area_usage;

FILE_TYPE          NUMBER_OF_FILES PERCENT_SPACE_USED
-----
CONTROL FILE          0              0
REDO LOG              0              0
ARCHIVED LOG          4              .15
BACKUP PIECE          0              0
IMAGE COPY             0              0
FLASHBACK LOG          0              0
FOREIGN ARCHIVED LOG  0              0
AUXILIARY DATAFILE COPY 0              0

8 rows selected.
```

5. Attempt to convert the physical standby database to a snapshot standby database.

```
SQL> alter database convert to snapshot standby;
alter database convert to snapshot standby
*
ERROR at line 1:
ORA-38784: Cannot create restore point
'SNAPSHOT_STANDBY_REQUIRED_06/03/2020
20:50:13'.
ORA-01153: an incompatible media recovery is active
```

6. Cancel redo apply on the physical standby database and reattempt to convert the physical standby database to a snapshot standby database.

```
SQL> alter database recover managed standby database cancel;
```

```
Database altered.
```

```
SQL> alter database convert to snapshot standby;
```

```
Database altered.
```

7. Display the current database role.

```
SQL> select database_role from v$database;
```

```
DATABASE_ROLE
```

```
-----
```

```
SNAPSHOT STANDBY
```

8. Verify that flashback database was automatically enabled when the physical standby was converted to a snapshot standby.

```
SQL> select flashback_on from v$database;
```

```
FLASHBACK_ON
```

```
-----
```

```
RESTORE POINT ONLY
```

9. Display the name of the guaranteed restore point that was created and its current storage size.

```
SQL> select name, storage_size from v$restore_point;
```

```
NAME
```

```
STORAGE_SIZE
```

```
-----
```

```
SNAPSHOT_STANDBY_REQUIRED_06/03/2020 20:56:01 209715200
```

10. Display the current open mode for the snapshot standby.

```
SQL> select open_mode from v$database;

OPEN_MODE
-----
MOUNTED
```

11. Verify that a flashback log was automatically created in the Recovery Area.

Note: Your output varies, but you should see one or more flashback logs.

```
SQL> select file_type, number_of_files, percent_space_used from
  v$recovery_area_usage;

FILE_TYPE          NUMBER_OF_FILES PERCENT_SPACE_USED
-----              -----
CONTROL FILE          0                  0
REDO LOG              0                  0
ARCHIVED LOG           4                  .15
BACKUP PIECE          0                  0
IMAGE COPY             0                  0
FLASHBACK LOG          2                  .98
FOREIGN ARCHIVED LOG   0                  0
AUXILIARY DATAFILE COPY 0                  0

8 rows selected.
```

12. Attempt to convert the snapshot standby back to a physical standby.

```
SQL> alter database convert to physical standby;
alter database convert to physical standby
*
ERROR at line 1:
ORA-16433: The database or pluggable database must be opened in
read/write
mode.
```

Note: Even though the command in step 6 succeeded in converting the physical standby into a snapshot standby, it must be opened into read-write mode at least one time before you can reverse the operation back to a physical standby. The purpose of this example is to show what happens if you changed your mind and wanted to convert back to a physical standby without proceeding.

13. Open the snapshot database and verify that it has been opened in read-write mode.

```
SQL> alter database open;
Database altered.

SQL> select open_mode from v$database;

OPEN_MODE
-----
READ WRITE
```

14. Switch the container to the `DEV1` PDB for the session. Even though the container is open, the `DEV1` PDB is mounted. Open the `DEV1` PDB, and create a miscellaneous table. Insert 1 row into the table and commit the result. Return to the root container when done.

```
SQL> alter session set container = DEV1;

Session altered.

SQL> alter database open;

Database altered.

SQL> create table misc1 (x varchar2(50));

Table created.

SQL> insert into misc1 values ('Test Row');

1 row created.

SQL> commit;

Commit complete.

SQL> alter session set container = CDB$ROOT;

Session altered.
```

15. In step 6, managed recovery was stopped for the snapshot database. Use a terminal window logged in as `oracle` to `localhost` to with the environment variables set for `orclcldb` appropriately. Determine the last archived redo log for the primary database and perform a log switch. Exit SQL*Plus when done.

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Wed Jun 3 21:04:42
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG GROUP BY
THREAD#;

MAX (SEQUENCE#)      THREAD#
-----
27                  1

SQL> alter system switch logfile;

System altered.

SQL> exit;
```

16. Return to the SQL*Plus session on `stndby` and verify that the snapshot standby is still receiving redo from the primary database, forwarded to the Far Sync, and then to the snapshot standby. The sequence number should be the next one after the number displayed on the primary database in the previous step.

```
SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG GROUP BY
THREAD#;

MAX (SEQUENCE#)      THREAD#
-----
28                  1
```

Practice 7-2: Convert Snapshot Standby Back to Physical Standby

Overview

In this practice, you convert the snapshot standby back into a physical standby database.

Tasks

1. Use the terminal session connected to `stndby`. Attempt to convert the snapshot standby back into a physical standby.

```
SQL> alter database convert to physical standby;
alter database convert to physical standby
*
ERROR at line 1:
ORA-01126: database must be mounted in this instance and not
open in any Instance
```

2. Shut down the snapshot standby and start it back up in `MOUNT` mode.

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

SQL> startup mount
ORACLE instance started.
Total System Global Area 517763072 bytes
Fixed Size                  2290216 bytes
Variable Size                440405464 bytes
Database Buffers             71303168 bytes
Redo Buffers                 3764224 bytes
Database mounted.
```

3. Reattempt to convert the snapshot standby back into a physical standby.

```
SQL> alter database convert to physical standby;
Database altered.
```

- Verify that flashback has been turned off, and the flashback log was deleted freeing up space in the flash recovery area.

```
SQL> select flashback_on from v$database;

FLASHBACK_ON
-----
NO

SQL> select file_type,number_of_files,percent_space_used from
v$recovery_area_usage;

FILE_TYPE          NUMBER_OF_FILES  PERCENT_SPACE_USED
-----              -----
CONTROL FILE        0                  0
REDO LOG            0                  0
ARCHIVED LOG        5                  .19
BACKUP PIECE        1                  .17
IMAGE COPY          0                  0
FLASHBACK LOG       0                  0
FOREIGN ARCHIVED LOG 0                  0
AUXILIARY DATAFILE COPY 0                  0
```

- Open the container database to enable Active Data Guard, and then switch the session to the DEV1 pluggable database. Open the DEV1 PDB.

```
SQL> alter database open;

Database altered.

SQL> alter session set container = DEV1;

Session altered.

SQL> alter database open;

Database altered.
```

6. Attempt to query the MISCL table that was created, and verify that the table no longer exists after converting the snapshot standby back into a physical standby database.

```
SQL> select * from miscl;
select * from miscl
*
ERROR at line 1:
ORA-00942: table or view does not exist

SQL> select table_name from dba_tables where table_name like
'MISC%';

no rows selected
```

7. Return the session back to the container root. Shut down the physical standby to disable Active Data Guard. Start it back up in the MOUNT state and restart Redo Apply.

```
SQL> alter session set container = CDB$ROOT;

Session altered.

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

SQL> startup mount
ORACLE instance started.
Total System Global Area 517763072 bytes
Fixed Size                  2290216 bytes
Variable Size                440405464 bytes
Database Buffers            71303168 bytes
Redo Buffers                 3764224 bytes
Database mounted.

SQL> alter database recover managed standby database disconnect;

Database altered.
```

8. Exit SQL*Plus on any host machine in which it is open. Do not close the terminal sessions.

```
SQL> exit;
```

Practices for Lesson 8: Creating a Logical Standby Database

Practices for Lesson 8: Overview

Practices Overview

In these practices, you will prepare `stndby` to create a logical standby database. You will use the `RMAN` utility to create the physical standby database and then verify its operation.

Practice 8-1: Identify Unsupported Objects for Logical Standbys

Overview

In this practice, you will examine the primary database to determine which objects will not be supported in a logical standby.

Tasks

1. Use a terminal window on `localhost` connected as `oracle` with the environment variables set to `orclcldb`. Start SQL*Plus and verify that all pluggable databases are open for queries. If any pluggable database is mounted or shut down, the queries that follow this step will not return complete results.
`COL`

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Jun 4 09:44:37
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved. Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 - 
Production
Version 19.3.0.0.0
SQL> col name format a30
SQL> select con_id, name, open_mode from v$containers;

CON_ID NAME          OPEN_MODE
-----
1 CDB$ROOT        READ WRITE
2 PDB$SEED        READ ONLY
3 DEV1            READ WRITE
```

2. Find all tables across all PDBs without unique logical identifiers in the primary database. This query will take a few minutes to run.

```
SQL> SELECT CON_ID, OWNER, TABLE_NAME FROM
CDB_LOGSTDBY_NOT_UNIQUE WHERE (CON_ID, OWNER, TABLE_NAME) NOT IN
(SELECT DISTINCT CON_ID, OWNER, TABLE_NAME FROM
CDB_LOGSTDBY_UNSUPPORTED) AND BAD_COLUMN = 'Y';

no rows selected
```

Note: This query differs from the one listed in the product documentation. It has been modified to examine schema objects across all PDBs.

3. Identify the internal schemas that ship with the Oracle Database. Any user-defined table created into these schemas will not be replicated on the logical standby database. Also, those user-defined tables will not show up in the `DBA_LOGSTDBY_UNSUPPORTED` or `CDB_LOGSTDBY_UNSUPPORTED` views of step 4, even though they are unsupported.

```
SQL> col owner format a30
SQL> SELECT CON_ID, OWNER FROM CDB_LOGSTDBY_SKIP WHERE
STATEMENT_OPT = 'INTERNAL SCHEMA' ORDER BY CON_ID, OWNER;

CON_ID OWNER
-----
...
3 WMSYS
3 XDB
3 XS$NULL

69 rows selected.
```

Note: This query differs from the one listed in the product documentation. It has been modified to examine schema objects across all PDBs.

4. Identify tables that do not belong to internal schemas and that will not be maintained by SQL Apply because of unsupported data types.

```
SQL> SELECT DISTINCT CON_ID,OWNER,TABLE_NAME FROM
CDB_LOGSTDBY_UNSUPPORTED ORDER BY OWNER, TABLE_NAME;

no rows selected
```

5. View the column names and data types that conflict with SQL Apply. Exit SQL*Plus when done.

```
SQL> SELECT CON_ID, COLUMN_NAME,DATA_TYPE FROM
CDB_LOGSTDBY_UNSUPPORTED;

no rows selected

SQL> exit
[oracle@localhost ~]$
```

Practice 8-2: Create a Logical Standby (Temporarily a Physical)

Overview

In this practice, you will prepare `stndby2` to receive the logical standby database and create the logical standby database using RMAN and SQL.

Tasks

1. Use a terminal logged in as `oracle` to `stndby2`. Edit the script `crdir_stndby.sh` script so that it references `stndby2` then Run the `crdir_stndby.sh` script or manually create the directories required. The script will complete all preparation steps and next we will create the `stndby2` standby database.

Note: We already performed similar tasks in practice 3-2. So, we leverage the script to

```
Task 1: Create Directories for stndby2
#####
Done #####
Go to /etc and edit oratab to include the stndby2 database
#emorcl:/u01/app/oracle/product/19.3.0/dbhome_1:N
#orclcdb:/u01/app/oracle/product/19.3.0/dbhome_1:N
#stndby:/u01/app/oracle/product/19.3.0/dbhome_1:N
#orcl:/u01/app/oracle/product/19.3.0/dbhome_1:N
#stndby2:/u01/app/oracle/product/19.3.0/dbhome_1:N

Task 2: Create initstndby2.ora for stndby2
#####

Done #####
Task 3: Create password file for stndby2
#####
Done #####
Task 4: Start stndby2 NOMOUNT #####
#####

[oracle@8c793fb03eed]$.oraenv
ORACLE_SID = [stndby2]
oracle@8c793fb03eed]$ sqlplus / as sysdba
connected to an idle instance
sql> startup nomount pfile=$ORACLE_HOME/dbs/initstndby2.ora
Task 5 Step 1 Insert stndby2 in netmgr as a service and
statically add stndby2 in the listener database services.
Step 2. Bounce the listener. $ lsnrctl stop then start
Step 3. Then go to rman and connect to the target database
orclcdb and auxiliary stndby2. Make sure it shows stndby2
in nomount mode.
RMAN target sys/fenago@orclcdb auxiliary sys/fenago@stndby2
Connected to target database: ORCLCDB (DBID=2860384372)
Connected to auxiliary database: ORCLCDB (not mounted)
Step 4. Execute the duplicated database command below:
RMAN> duplicate target database for standby from active database
:;
```

```
SQL*Plus: Release 19.0.0.0.0 - Production on Thu Jun 4 12:50:16  
2020
```

```
Version 19.3.0.0.0
```

```
(c) 1982, 2019, Oracle. All rights reserved.Connected to  
an idle instance.
```

```
SQL> ORACLE instance started.show  
exi
```

```
Total System Global Area 268434280 bytes  
Fixed Size          8895336 bytes  
Variable Size        201326592 bytes  
Database Buffers    50331648 bytes  
Redo Buffers         7880704 bytes
```

```
SQL> Disconnected from Oracle Database 19c Enterprise Edition  
Release 19.0.0.0.0 - Production
```

```
Version 19.3.0.0.0
```

```
#####
```

```
Task 5: Create stndby2 STANDBY DB
```

```
#####
```

```
1. Edit initstndby2.ora file and change all occurrences  
Of stndby to stndby2.
```

```
Recovery Manager: Release 19.0.0.0.0 - Production on Thu Jun 4  
12:50:24 2020
```

```
Version 19.3.0.0.0
```

```
2. connected to target database via RMAN as shown below:
```

```
RMAN target sys/fenago@orclcdb auxiliary sys/fenago@stndby2  
RMAN> ORCLCDB (DBID=2732274290) connected to auxiliary  
database: STNDBY2 (not mounted)
```

```
3. Execute the following command to create stndby2c/
RMAN> duplicate target database for standby from active database;
}

using target database control file instead of recovery catalog
allocated channel: prmy1
channel prmy1: SID=42 device type=DISK

allocated channel: stby1
channel stby1: SID=20 device type=DISK

Starting Duplicate Db at 04-JUN-20

contents of Memory Script:
{
    backup as copy reuse
    passwordfile auxiliary format
'/u01/app/oracle/product/19.3.0/dbhome_1/dbs/orapwstndby2' ;
    restore clone from service 'orclcdb' spfile to

'/u01/app/oracle/product/19.3.0/dbhome_1/dbs/spfilestndby2.ora'
;
```

```

        sql clone "alter system set spfile=
'''/u01/app/oracle/product/19.3.0/dbhome_1/dbs/spfilestndby2.ora
''";
}

executing Memory Script

Starting backup at 04-JUN-20
Finished backup at 04-JUN-20

Starting restore at 04-JUN-20

channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service orclcdb
channel stby1: restoring SPFILE
output file
name=/u01/app/oracle/product/19.3.0/dbhome_1/dbs/spfilestndby2.
ora
channel stby1: restore complete, elapsed time: 00:00:01
Finished restore at 04-JUN-20

sql statement: alter system set spfile=
'''/u01/app/oracle/product/19.3.0/dbhome_1/dbs/spfilestndby2.ora
'''

contents of Memory Script:
{
    sql clone "alter system set audit_file_dest =
'''/u01/app/oracle/admin/stndby2/adump''' comment=
'''' scope=spfile";
    sql clone "alter system set control_files =
'''/u01/app/oracle/oradata/stndby2/control01.ctl''',
'''/u01/app/oracle/fast_recovery_area/stndby2/control02.ctl''' comment=
'''' scope=spfile";
    sql clone "alter system set dispatchers =
'''(PROTOCOL=TCP) (SERVICE=stndby2XDB)''' comment=
'''' scope=spfile";
    sql clone "alter system set local_listener =
'''LISTENER_stndby2''' comment=

```

```

      ''' scope=spfile";
      sql clone "alter system set db_name =
      ''orclcdb'' comment=
      ''' scope=spfile";
      sql clone "alter system set db_unique_name =
      ''stndby2'' comment=
      ''' scope=spfile";
      sql clone "alter system set db_file_name_convert =
      ''ORCLCDB'', ''stndby2'' comment=
      ''' scope=spfile";
      sql clone "alter system set log_file_name_convert =
      ''ORCLCDB'', ''stndby2'' comment=
      ''' scope=spfile";
      sql clone "alter system set fal_server =
      ''orclcdb'' comment=
      ''' scope=spfile";
      sql clone "alter system set log_archive_dest_1 =
      ''location=USE_DB_RECOVERY_FILE_DEST
      valid_for=(ALL_LOGFILES,ALL_ROLES) db_unique_name=stndby2'''
      comment=
      ''' scope=spfile";
      shutdown clone immediate;
      startup clone nomount;
}
executing Memory Script

sql statement: alter system set audit_file_dest =
  ''/u01/app/oracle/admin/stndby2/adump'' comment= '''
scope=spfile

sql statement: alter system set control_files =
  ''/u01/app/oracle/oradata/stndby2/control01.ctl'',
  ''/u01/app/oracle/fast_recovery_area/stndby2/control02.ctl''
comment= ''' scope=spfile

sql statement: alter system set dispatchers =
  '(PROTOCOL=TCP) (SERVICE=stndby2XDB)' comment= '''
scope=spfile

```

```

sql statement: alter system set local_listener =
''LISTENER_stndby2'' comment= '''' scope=spfile

sql statement: alter system set db_name = ''orclcdb'' comment=
'''' scope=spfile

sql statement: alter system set db_unique_name = ''stndby2''
comment= '''' scope=spfile

sql statement: alter system set db_file_name_convert =
''ORCLCDB'', ''stndby2'' comment= '''' scope=spfile

sql statement: alter system set log_file_name_convert =
''ORCLCDB'', ''stndby2'' comment= '''' scope=spfile

sql statement: alter system set fal_server = ''orclcdb''
comment= '''' scope=spfile

sql statement: alter system set log_archive_dest_1 =
''location=USE_DB_RECOVERY_FILE_DEST
valid_for=(ALL_LOGFILES,ALL_ROLES) db_unique_name=stndby2''
comment= '''' scope=spfile

Oracle instance shut down

connected to auxiliary database (not started)
Oracle instance started

Total System Global Area      629145352 bytes

Fixed Size                  9137928 bytes
Variable Size                188743680 bytes
Database Buffers            423624704 bytes
Redo Buffers                 7639040 bytes
allocated channel: stby1
channel stby1: SID=255 device type=DISK

contents of Memory Script:
{

```

```

        restore clone from service 'orclcdb' standby controlfile;
}
executing Memory Script

Starting restore at 04-JUN-20

channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service orclcdb
channel stby1: restoring control file
channel stby1: restore complete, elapsed time: 00:00:02
output file name=/u01/app/oracle/oradata/stndby2/control01.ctl
output file
name=/u01/app/oracle/fast_recovery_area/stndby2/control02.ctl
Finished restore at 04-JUN-20

contents of Memory Script:
{
    sql clone 'alter database mount standby database';
}
executing Memory Script

sql statement: alter database mount standby database

contents of Memory Script:
{
    set newname for tempfile 1 to
"/u01/app/oracle/oradata/stndby2/temp01.dbf";
    set newname for tempfile 2 to
"/u01/app/oracle/oradata/stndby2/pdbseed/temp012020-06-02_14-
25-16-052-PM.dbf";
    set newname for tempfile 3 to
"/u01/app/oracle/oradata/stndby2/dev1/temp01.dbf";
    switch clone tempfile all;
    set newname for datafile 1 to
"/u01/app/oracle/oradata/stndby2/system01.dbf";
    set newname for datafile 3 to
"/u01/app/oracle/oradata/stndby2/sysaux01.dbf";
    set newname for datafile 4 to

```

```

"/u01/app/oracle/oradata/stndby2/undotbs01.dbf";
      set newname for datafile  5 to
"/u01/app/oracle/oradata/stndby2/pdbseed/system01.dbf";
      set newname for datafile  6 to
"/u01/app/oracle/oradata/stndby2/pdbseed/sysaux01.dbf";
      set newname for datafile  7 to
"/u01/app/oracle/oradata/stndby2/users01.dbf";
      set newname for datafile  8 to
"/u01/app/oracle/oradata/stndby2/pdbseed/undotbs01.dbf";
      set newname for datafile  9 to
"/u01/app/oracle/oradata/stndby2/dev1/system01.dbf";
      set newname for datafile 10 to
"/u01/app/oracle/oradata/stndby2/dev1/sysaux01.dbf";
      set newname for datafile 11 to
"/u01/app/oracle/oradata/stndby2/dev1/undotbs01.dbf";
      set newname for datafile 12 to
"/u01/app/oracle/oradata/stndby2/dev1/users01.dbf";
      restore
      from nonparse   from service
'orclcdb'  clone database
;
      sql 'alter system archive log current';
}
executing Memory Script

executing command: SET NEWNAME

executing command: SET NEWNAME

executing command: SET NEWNAME

renamed tempfile 1 to
/u01/app/oracle/oradata/stndby2/temp01.dbf in control file
renamed tempfile 2 to
/u01/app/oracle/oradata/stndby2/pdbseed/temp012020-06-02_14-25-
16-052-PM.dbf in control file
renamed tempfile 3 to
/u01/app/oracle/oradata/stndby2/dev1/temp01.dbf in control file

```

```
executing command: SET NEWNAME

Starting restore at 04-JUN-20

channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service
orclcdb
channel stby1: specifying datafile(s) to restore from backup
set
channel stby1: restoring datafile 00001 to
/u01/app/oracle/oradata/stndby2/system01.dbf
channel stby1: restore complete, elapsed time: 00:00:38
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service orclcdb
channel stby1: specifying datafile(s) to restore from backup
set
channel stby1: restoring datafile 00003 to
/u01/app/oracle/oradata/stndby2/sysaux01.dbf
```

```
channel stby1: restore complete, elapsed time: 00:00:25
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service orclcdb
channel stby1: specifying datafile(s) to restore from backup
set
channel stby1: restoring datafile 00004 to
/u01/app/oracle/oradata/stndby2/undotbs01.dbf
channel stby1: restore complete, elapsed time: 00:00:07
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service orclcdb
channel stby1: specifying datafile(s) to restore from backup
set
channel stby1: restoring datafile 00005 to
/u01/app/oracle/oradata/stndby2/pdbseed/system01.dbf
channel stby1: restore complete, elapsed time: 00:00:15
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service
orclcdb
channel stby1: specifying datafile(s) to restore from backup
set
channel stby1: restoring datafile 00006 to
/u01/app/oracle/oradata/stndby2/pdbseed/sysaux01.dbf
channel stby1: restore complete, elapsed time: 00:00:07
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service orclcdb
channel stby1: specifying datafile(s) to restore from backup
set
channel stby1: restoring datafile 00007 to
/u01/app/oracle/oradata/stndby2/users01.dbf
channel stby1: restore complete, elapsed time: 00:00:02
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service orclcdb
channel stby1: specifying datafile(s) to restore from backup
set
channel stby1: restoring datafile 00008 to
/u01/app/oracle/oradata/stndby2/pdbseed/undotbs01.dbf
channel stby1: restore complete, elapsed time: 00:00:03
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service orclcdb
channel stby1: specifying datafile(s) to restore from backup
set
```

```
channel stby1: restoring datafile 00009 to
/u01/app/oracle/oradata/stndby2/dev1/system01.dbf
channel stby1: restore complete, elapsed time: 00:00:15
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service orclcdb
channel stby1: specifying datafile(s) to restore from backup
set
channel stby1: restoring datafile 00010 to
/u01/app/oracle/oradata/stndby2/dev1/sysaux01.dbf
channel stby1: restore complete, elapsed time: 00:00:15
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service orclcdb
channel stby1: specifying datafile(s) to restore from backup
set
channel stby1: restoring datafile 00011 to
/u01/app/oracle/oradata/stndby2/dev1/undotbs01.dbf
channel stby1: restore complete, elapsed time: 00:00:04
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service orclcdb
channel stby1: specifying datafile(s) to restore from backup
set
channel stby1: restoring datafile 00012 to
/u01/app/oracle/oradata/stndby2/dev1/users01.dbf
channel stby1: restore complete, elapsed time: 00:00:01
Finished restore at 04-JUN-20

sql statement: alter system archive log current

contents of Memory Script:
{
    switch clone datafile all;
}
executing Memory Script

datafile 1 switched to datafile copy
input datafile copy RECID=5 STAMP=1042203295 file
name=/u01/app/oracle/oradata/stndby2/system01.dbf
datafile 3 switched to datafile copy
```

```

input datafile copy RECID=6 STAMP=1042203295 file
name=/u01/app/oracle/oradata/stndby2/sysaux01.dbf
datafile 4 switched to datafile copy
input datafile copy RECID=7 STAMP=1042203295 file
name=/u01/app/oracle/oradata/stndby2/undotbs01.dbf
datafile 5 switched to datafile copy
input datafile copy RECID=8 STAMP=1042203295 file
name=/u01/app/oracle/oradata/stndby2/pdbseed/system01.dbf
datafile 6 switched to datafile copy
input datafile copy RECID=9 STAMP=1042203295 file
name=/u01/app/oracle/oradata/stndby2/pdbseed/sysaux01.dbf
datafile 7 switched to datafile copy
input datafile copy RECID=10 STAMP=1042203295 file
name=/u01/app/oracle/oradata/stndby2/users01.dbf
datafile 8 switched to datafile copy
input datafile copy RECID=11 STAMP=1042203295 file
name=/u01/app/oracle/oradata/stndby2/pdbseed/undotbs01.dbf
datafile 9 switched to datafile copy
input datafile copy RECID=12 STAMP=1042203295 file
name=/u01/app/oracle/oradata/stndby2/dev1/system01.dbf
datafile 10 switched to datafile copy
input datafile copy RECID=13 STAMP=1042203295 file
name=/u01/app/oracle/oradata/stndby2/dev1/sysaux01.dbf
datafile 11 switched to datafile copy
input datafile copy RECID=14 STAMP=1042203295 file
name=/u01/app/oracle/oradata/stndby2/dev1/undotbs01.dbf
datafile 12 switched to datafile copy
input datafile copy RECID=15 STAMP=1042203295 file
name=/u01/app/oracle/oradata/stndby2/dev1/users01.dbf
Finished Duplicate Db at 04-JUN-20

allocated channel: stby
channel stby: SID=27 device type=DISK

sql statement: alter database recover managed standby database
disconnect
released channel: prmy1
released channel: stby1
released channel: stby

```

```
Recovery Manager complete.
```

```
Done
```

```
#####
#####
```

```
Completed All 5 Tasks. Verify Your Environment
```

```
#####
#####
```

1. Start the database: SQL> STARTUP NOMOUNT;
2. Mount the standby database: SQL> ALTER DATABASE MOUNT STANDBY DATABASE;
3. Start the managed recovery operation: SQL> ALTER DATABASE RECOVER MANAGED STANDBY DATABASE DISCONNECT FROM SESSION;

Practice 8-3: Start Redo Transport and Verify Operation

Overview

In this practice, you will start the redo transport from `localhost` to `stndby` for the new physical standby and verify operation.

Tasks

1. Use a terminal window for `localhost` logged in as `oracle` with the environment variables set to `orclcd` and start redo transport by defining `log_archive_dest_3` pointing to the logical standby database.

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Jun 4 12:59:16
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.
Check to make sure your log_archive_config parameter is set
To below. Sql> show parameter log_archive_config
SQL> alter system set log_archive_config=
'dg_config=(orclcd, stndby, orcl, stndby2)';
Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0
SQL> alter system set log_archive_dest_3='SERVICE="stndby2"
SYNCREOPEN=15 valid_for=(ONLINE_LOGFILES,PRIMARY_ROLE)
db_unique_name="stndby2"' scope=both;
```

Note: For this step, we are configuring redo transportation from the primary database to the logical standby database. This is designed to illustrate a typical configuration where the primary database transports redo directly to the standby site, and provide a little variation in the architecture. Again, this is for illustration only. At a later time, we will change this to use the far sync instance.

2. Determine the last sequence number archived on the primary database.

```
SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG GROUP BY
THREAD#;
MAX (SEQUENCE#)      THREAD#
-----
38                  1
```

3. Use a terminal window on stndby2

```
[oracle@stndby ~]$ . oraenv
ORACLE_SID = [oracle] ? stndby2
The Oracle base has been set to /u01/app/oracle
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Jun 4 13:10:26
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG GROUP BY
THREAD#;

MAX (SEQUENCE#)      THREAD#
-----
38                  1
```

4. Altesta
5. connected as oracle with the environment variables set to stndby2. Start SQL*Plus and determine the last sequence number of the physical standby instance.
6. Return to the terminal window of localhost, and force a log switch to advance the online redolog sequence number. Verify that the sequence number has increased.

```
SQL> alter system switch logfile;
System altered.

SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG GROUP BY
THREAD#;

MAX (SEQUENCE#)      THREAD#
-----
39                  1
```

7. Return to the terminal window of `stndby`, and verify that the `stndby` physical standby instance is receiving redo from the primary database instance.

```
SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG GROUP BY
  THREAD#;
MAX (SEQUENCE#)      THREAD#
-----
39                  1
```

Practice 8-4: Convert Physical Standby to Logical Standby

Overview

In this practice, you will convert the newly created physical standby 'stndby2' to a logical standby database.

Tasks

1. Use a terminal window on localhost connected as oracle with the environment variables set to `stndby2`. Stop redo apply on the stndby2 physical standby.

```
[oracle@stndby ~]$ . oraenv
ORACLE_SID = [oracle] ? stndby2
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sat Jun 6 13:13:37
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0
SQL> c;

Database altered.
```

2. Use a terminal window on localhost connected as oracle with the environment variables set to `orclcldb`. Build the LogMiner dictionary into the redo. Wait for this procedure to finish before continuing with labs.

```
SQL> execute dbms_logstdby.build

PL/SQL procedure successfully completed.
```

3. Use a terminal window on stndby2
 4. connected as oracle with the environment variables set to `stndby2`. Continue applying redo data to the physical standby until it is ready to convert to a logical standby
- ```
SQL> alter database recover to logical standby stndby2;

Database altered.
```
- database.

5. Increase the SGA size allocated to the logical standidby database. **DON'T DO THIS.**

```
Test sga_max_size before using max_target_size.
```

6. Shut down the logical standby database on stndby2, and restart it in MOUNT mode.

```
SQL> shutdown
ORA-01507: database not mounted

ORACLE instance shut down.

SQL> startup mount
ORACLE instance started.

Total System Global Area 880802384 bytes
Fixed Size 9140816 bytes
Variable Size 440401920 bytes
Database Buffers 423624704 bytes
Redo Buffers 7634944 bytes
Database mounted.

SQL>
```

7. Display the LOG\_ARCHIVE\_DEST parameters on stndby2 that were copied from the primary database. Only entries that have values are displayed below.

```
SQL> show parameter log_archive_dest
NAME TYPE VALUE

log_archive_dest_1 string
 location=USE_DB_RECOVERY_FILE_
 DEST valid_for = (ALL_LOGFILES,
 ALL_ROLES) db_unique_name =
 stndby2
log_archive_dest_2 string
 SERVICE=orclcdb SYNC REOPEN=
 15 valid_for=(ONLINE_LOGFILES,
 PRIMARY_ROLE) db_unique_name=
 orclcdb
```

8. Remove the LOG\_ARCHIVE\_DEST\_2 entry on stndby because this logical database will not be a target for role reversal in this course.

```
SQL> alter system set log_archive_dest_2='' scope=both;
System altered.
```

9. Open the logical standby database. Stndby2

```
SQL> alter database open resetlogs;

Database altered.
```

10. Start SQL Apply to begin applying redo data that is received from the primary database.

```
SQL> alter database start logical standby apply immediate;

Database altered.
```

11. Open the DEV1 PDB and verify the mode that it was opened with.

```
SQL> alter pluggable database dev1 open;

Pluggable database altered.

SQL> col name format a20
SQL> select con_id, name, open_mode from v$containers;

CON_ID NAME OPEN_MODE

1 CDB$ROOT READ WRITE
2 PDB$SEED READ ONLY
3 DEV1 READ WRITE
```

12. Exit SQL\*Plus sessions on all host machines. Leave the terminal session windows open with the environment variables set.

```
(localhost) SQL> exit;
(stndby) SQL> exit;
```



# **Practices for Lesson 9: Oracle Data Guard Broker: Overview**

## **Practices for Lesson 9**

---

There are no practices for this lesson.

# **Practices for Lesson 10: Creating a Data Guard Broker Configuration**

## **Practices for Lesson 10: Overview**

---

### **Practices Overview**

In these practices, you will examine the differences between local and remote connections to the Oracle Database instance by using the DGMGRL utility. You will also create and enable a Data Guard broker configuration.

## Practice 10-1: Establishing Local and Remote Connections with DGMGRL

---

### Overview

In this practice, you will use DGMGRL and connect with both local and remote connections. The password file will be updated on the primary database and copied to every other destination in the Data Guard configuration.

### Tasks DON'T DO THIS. DGMGRL is already configured. STOP!!!!

1. Use a terminal window on `localhost` connected as `oracle` with the environment variables set to `orclcldb`. Issue the "ID" command and verify that the `dgdba` operating system group is assigned to the `oracle` account.

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [oracle] ? orclcldb
The Oracle base has been set to /u01/app/oracle
[oracle@localhost]$ id
uid=54321(oracle) gid=54321(oinstall)
groups=54321(oinstall),54322(dba),54323(oper),54324(backupdba),5
4325(dgdba),54326(kmdba)
```

**Note:** The `oracle` user is a member of the `dgdba` group. As part of the class setup, this group was associated with the `SYSDG` privilege for Data Guard.

**The sysdg grant looks like this. ex**

```
SQL> grant sysdg to system
```

**as host** Launch the DGMGRL utility and verify that you are able to connect as the `SYSDG` user with operating system authentication. (The oracle OS

```
[oracle@localhost ~]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Thu Jun 4
14:36:27 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect sysdg
Password: << sysexit >>Connected to
"orclcldb"
Connected as SYSDG.
DGMGRL>
```

exuser is in the `dgdba` group.)

**Note:** With Operating System authentication, any password will work for local connections. However, during switchover and failover operation to the remote site, you must use the correct password.

2. Attempt to make a remote connection to the physical standby database `stndby` as the `SYSDG` user. You must use the password that is in the password file. Exit DGMGRL.

```
DGMGRL> connect sysdg@stndby
Password: fenago
ORA-01017: invalid username/password; logon denied

DGMGRL> exit
[oracle@localhost ~]$
```

**Note:** During the creation of the database, the option to use the same password for all connadministrative accounts was chosen. However, this applied only to the `SYS` and `SYSTEM` database accounts.

3. Use `SQL*Plus` on `localhost` connected as `SYSDBA` to reset the `SYSDG` password and unlockthe account. Exit `SQL*Plus`.

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Jun 4 14:39:05
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> alter user sysdg identified by fenago;

User altered.

SQL> alter user sysdg account unlock;

User altered.

SQL> grant sysdg to sysdg container=all;

Grant succeeded.

SQL> alter pluggable database open all;
SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
```

```
Version 19.3.0.0.0
[oracle@localhost ~]$
```

4. In the current terminal window on `localhost`, copy the modified password file to all other machines overwriting the password files that are already there. On `stndby`, a password file is needed for both the physical standby database and the logical standby database. The password files should be renamed during the copy to the appropriate names for each destination.

```
[oracle@8c793fb03eed dbs]$ cp orapworclcdb orapwstndby
cp: overwrite 'orapwstndby'? y
[oracle@8c793fb03eed dbs]$ cp orapworclcdb orapwstndby2
cp: overwrite 'orapwstndby2'? y
[oracle@8c793fb03eed dbs]$
```

**Note:** As of Oracle Database 19c Release 2 (19.3.0.1), password file changes done on the primary database are automatically propagated to standby databases. The only exception to this is far sync instances. The updated password files must still be manually copied to far sync instances because far sync instances receive redo, but do not apply it.

id

5. Launch the DGMGRL utility on localhost and verify that you are now able to establish a remote connection as sysdg to the physical standby database. Exit DGMGRL when

```
[oracle@localhost ~]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Thu Jun 4
14:46:32 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect sysdg/<password>@stndby
Connected to "stndby"
Connected as SYSDG.
DGMGRL> exit
```

conn

## Practice 10-2: Create and Enable a Data Guard Broker Configuration

---

### Overview

In this practice, you will create and name the Data Guard configuration. The physical standby database, far sync instances, and logical standby database will be added to the configuration. You will enable the configuration and define redo routing rules.

### Tasks

1. Use a terminal window on `localhost (primary)` connected as `oracle` with the environment variables set to `orclcdb`. Connect to the primary database using SQL\*Plus and reset the `LOG_ARCHIVE_DEST_2` and `LOG_ARCHIVE_DEST_3` parameters since they are defined as network locations. Start the Data Guard Broker process. Make sure the changes are persistent. Exit SQL\*Plus.

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Jun 4 15:18:19
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> alter system set dg_broker_start=true scope=both;

System altered.

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
```

```
Version 19.3.0.0.0
[oracle@localhost ~]$
```

CAN't do step 2 - No host02

2. Use a terminal window on **host02** connected as **oracle** with the environment variables set to **orclcdbs**. Connect to Far Sync using SQL\*Plus and reset the **LOG\_ARCHIVE\_DEST\_2** parameter since it is defined as network location. Start the Data Guard broker process for Far Sync. Exit SQL\*Plusa

```
[oracle@host02 ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Jun 4 15:20:05
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> alter system set log_archive_dest_2=''' scope=both;

System altered.

SQL> alter system set dg_broker_start=true scope=both;

System altered.

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@host02 ~]$
```

3. Use a terminal window on `stndby` connected as `oracle` with the environment variables set to `stndby`. Connect to the physical standby using SQL\*Plus and stop managed recovery. Reset the `LOG_ARCHIVE_DEST_2` parameter because it is defined as network location. Start the Data Guard broker process for the physical standby database.

```
[oracle@stndby ~]$. oraenv
ORACLE_SID = [stndby2] ? stndby
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Jun 4 15:21:52
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> alter database recover managed standby database cancel;

Database altered.
Do this only if log_archive_dest_2 has a value.
SQL> alter system set log_archive_dest_2='' scope=both;

System altered.

SQL> alter system set dg_broker_start=true scope=both;

System altered.
```

4. If you are using a separate window for the stndby/stndby2 combination, then you can skip the part about resetting the environment variables. Otherwise, while still using the terminal window for stndby, exit SQL\*Plus. Change the environment variables to the stndby2 logical standby database. The logical standby does not have any network locations defined for redo transportation. Start the Data Guard broker process. Exit SQL\*Plus.

```
SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@stndby ~]$. oraenv
ORACLE_SID = [oracle] ? stndby2
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Jun 4 15:24:21
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> alter database stop logical standby apply;

Database altered.

SQL> alter system set dg_broker_start=true scope=both;

System altered.
SQL> alter pluggable database open all;
SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@stndby ~]$
```

5. Use a terminal window on localhost connected as oracle with the environment variables set to orclcldb. Launch DGMGRL and attempt to show the configuration.

```
[oracle@localhost ~]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Thu Jun 4
15:27:39 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.

Welcome to DGMGRL, type "help" for information.
```

```
DGMGRL> connect sysdg/<password>@orclcdb
Connected to "orclcdb"
Connected as SYSDG.
DGMGRL> show configuration
ORA-16532: Oracle Data Guard broker configuration does not exist

Configuration details cannot be determined by DGMGRL
DGMGRL>
```

6. Create the Data Guard broker configuration and then show the configuration.

```
***BEFORE YOU DO THE CREATE first check to see if it is already
configured
DGMGRL> show configuration - if not do below
DGMGRL> create configuration 'DRSolution' as primary database is
'orclcdb' connect identifier is orclcdb;
Configuration "DRSolution" created with primary database
"orclcdb"
DGMGRL> show configuration

Configuration - DRSSolution

Protection Mode: MaxPerformance
Members:
orclcdb - Primary database

Fast-Start Failover: Disabled

Configuration Status:
DISABLED
```

**Note:** Because the Data Guard broker is a distributed framework, the DGMGRL utility can be launched from any host machine that participates in the Data Guard configuration. The labs will continue to display the machine name (`localhost`), and therefore, the terminal session window being used, for which the DGMGRL utility was launched. It would be acceptable though to launch it from another terminal session connected to another virtual host machine.

7. Add the physical standby database `stndby` to the configuration and show the results.

```
Before doing the below check to see if the stndby database is
already in the DRsolution configuration:
```

```
DGMGRL> show configuration - If not do below.
```

```
DGMGRL> add database 'stndby' as connect identifier is stndby;
```

```
Database "stndby" added
```

```
DGMGRL> show configuration
```

```
Configuration - DRsolution
```

```
Protection Mode: MaxPerformance
```

```
Members:
```

```
orclcdb - Primary database
```

```
orclcdbFS - Far sync
```

```
instance
```

```
stndby - Physical standby database
```

```
Fast-Start Failover: Disabled
```

```
Configuration Status:
```

```
DISABLED
```

8. Add the logical standby database `stndby2` to the configuration and show the results.

```
AGAIN do: DGMGRL> show configuration to see if it is already
added.
DGMGRL> add database 'stndby2' as connect identifier is stndby2;
Database "stndby2" added
DGMGRL> show configuration

Configuration - DRSSolution

Protection Mode: MaxPerformance
Members:
orclcdb - Primary database
orclcdbFS - Far sync
instance
stndby - Physical standby database
stndby2 - Logical standby database

Fast-Start Failover: Disabled

Configuration Status:
DISABLED
```

9. Enable the Data Guard broker configuration and show the results.

```
DGMGRL> enable configuration
Enabled.

DGMGRL> show configuration
Configuration - DRSSolution

Protection Mode: MaxPerformance
Databases:
orclcdb - Primary database
orclcdbFS - Far Sync
(inactive)
stndby - Physical standby database
stndby2 - Logical standby database
stndbyFS - Far Sync (inactive)

Fast-Start Failover: DISABLED
 DISABLE database stndby2
Configuration Status:
```

10.

## DO NOT PERFORM ANY STEPS WHICH USE FAR SYNC

11. Define redo routing rules for the configuration and show the results. The current primary database `orclcdb` should forward redo to the Far Sync `orclcdbFS` synchronously. Additional redo routing rules should be created for role reversal. After role reversal, the primary database will be `stndby` and should forward redo to the Far Sync `stndbyFS` synchronously. The Far Sync `stndbyFS` should then forward redo to the physical standby `orclcdb` and the logical standby. DO NOT PERFORM. These are examples only.

```
DGMGRL> EDIT DATABASE 'orclcdb' SET PROPERTY 'RedoRoutes' =
 '(orclcdb:stndby SYNC)';
Property "RedoRoutes" updated

DGMGRL> EDIT 'orclcdb' SET PROPERTY 'RedoRoutes' =
 '(orclcdb:stndby,stndby2 ASYNC)';
Property "RedoRoutes" updated

DGMGRL> EDIT FAR_SYNC 'stndbyFS' SET PROPERTY 'RedoRoutes' =
 '(stndby:orclcdb,stndby2 ASYNC)';
Property "RedoRoutes" updated
```

**Do not be concerned about warnings on standby logs because they do not match in numbers.**

```
DGMGRL> show configuration
```

Configuration - DRSolution

Protection Mode: MaxPerformance

Members:

orclcldb - Primary database

orclcldbFS - Far sync

instance

stndby - Physical standby database

stndby2 - Logical standby database

Members Not Receiving Redo:

stndbyFS - Far sync instance

Fast-Start Failover: Disabled

Configuration Status:

SUCCESS (status updated 39 second ago)

**Note:** If your output does not match the above, do not proceed with labs until all issues have been resolved. You may need to reissue the SHOW CONFIGURATION command several times to give the Virtual Machines time to catch up with all the background operations that need to be performed. For example, in one test case, it was noted that the stndby2 logical standby database was receiving "ORA-16810: multiple errors or warnings detected for this database." To further diagnose the problem, issue the command "show database stndby2". SQL Apply had stopped with an "ORA-16768: SQL Apply is stopped" message, followed by "ORA-01304: subordinate process error. Check alert and trace logs." An examination of the alert log indicated that SQL Apply had stopped due to an "ORA-4031: unable to allocate XXX bytes of shared memory." SQL Apply was restarted with the command "edit database stndby set state='APPLY-ON'", at which time the configuration reported everything acceptable. Please consult with your instructor if you need to troubleshoot any issues.

## Practice 10-3: Verify and Examine the Data Guard Environment

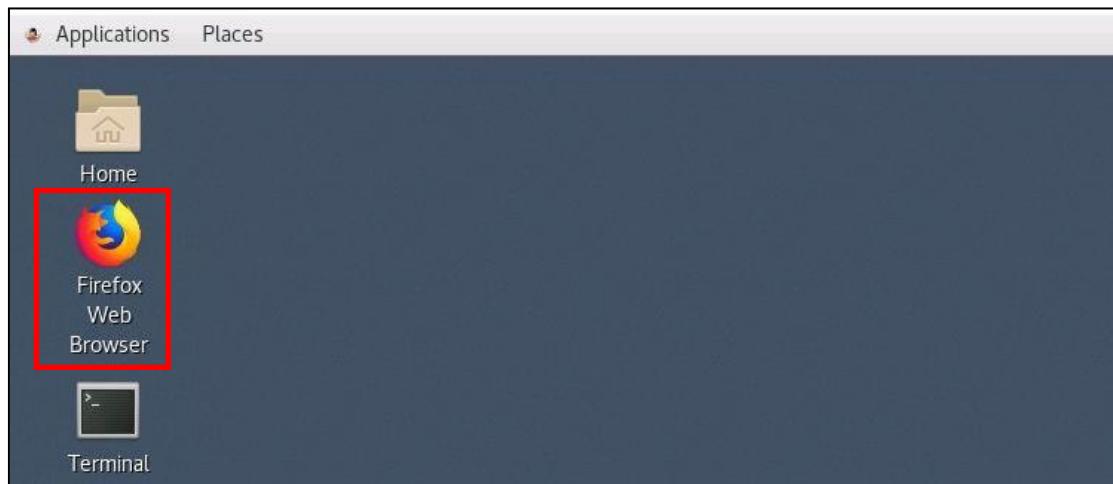
---

### Overview

In this practice, you will discover the members of the Data Guard broker configuration, and examine and verify the Data Guard broker configuration through Enterprise Manager Cloud Control 13c.

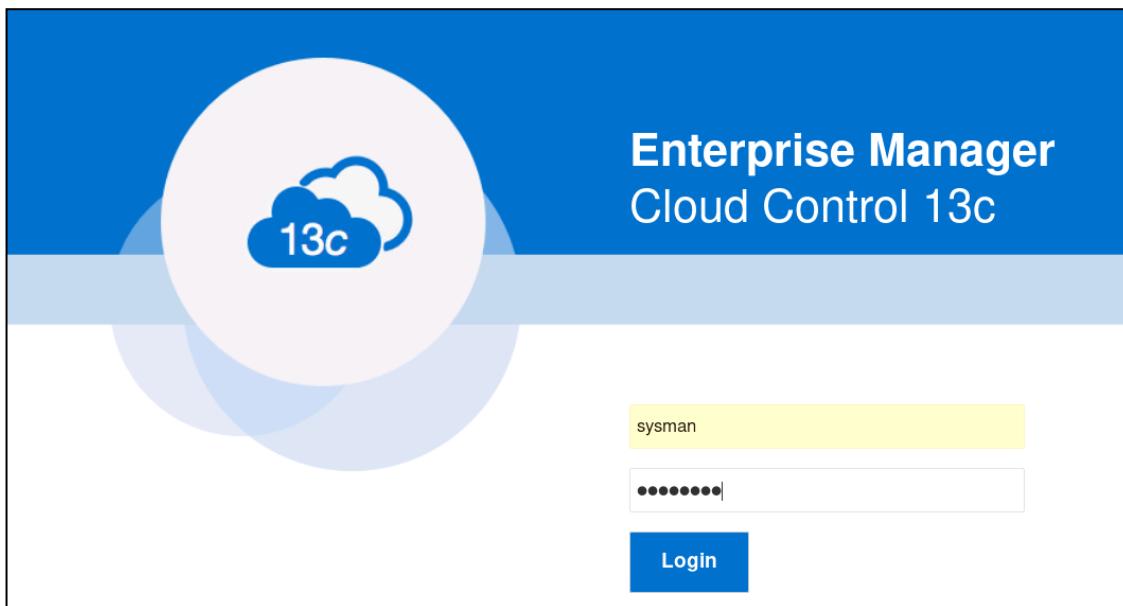
### Tasks

1. Using the Firefox Web Browser icon, start Firefox to access to Enterprise Manager 13c.



2. Enter the URL for Cloud Control. In the current setup, use
3. <https://8c793fb03eed:7803/em/>

4. Log in to Enterprise Manager Cloud Control 13c. Log in to the application with **sysman** as the username and <password> as the password. The password is case-sensitive.



5. If you are not on the Databases page, navigate to the Databases page by selecting **Targets**, and then **Databases** from the drop-down menu that appears.

The image shows the "Databases" page of Oracle Enterprise Manager Cloud Control 13c. The top navigation bar includes links for "All Targets", "Groups", "Systems", "Services", "Hosts", "Databases" (which is highlighted), "Middleware", "Business Applications", "Incidents", and "Composite Applications". The main content area displays a table of database instances. The columns are "Name" and "Type". The data rows are:

| Name               | Type                          | Incidents | Average Compliance Score |
|--------------------|-------------------------------|-----------|--------------------------|
| boston.example.com | Database Instance : Container | 0         | N/A                      |
| ORCL               | Database Instance : Container | 0         | N/A                      |
| rcatcdb            | Database Instance : Container | 0         | N/A                      |

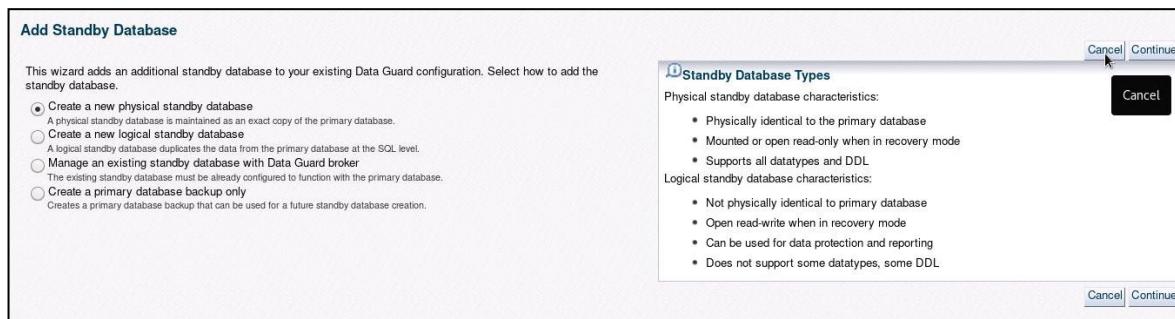
6. On the Databases page, click the link for the `orclcldb` target.

| Name               | Type                                   | Status | Target Version | Incidents | Average Compliance Score | Member Status Summary                                                                                                                               |
|--------------------|----------------------------------------|--------|----------------|-----------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| boston.example.com | Database Instance : Container, Primary | Up     | 19.3.0.0.0     | 0 0 0     | N/A                      | <span style="color: green;">\</span> <span style="color: green;">\</span> <span style="color: green;">\</span> <span style="color: green;">\</span> |
| ORCL               | Database Instance : Container          | Up     | 19.3.0.0.0     | 0 0 0     | N/A                      | <span style="color: green;">\</span> <span style="color: green;">\</span> <span style="color: green;">\</span> <span style="color: green;">\</span> |
| rcatodb            | Database Instance : Container          | Up     | 19.3.0.0.0     | 0 0 0     | N/A                      | <span style="color: green;">\</span> <span style="color: green;">\</span> <span style="color: green;">\</span> <span style="color: green;">\</span> |

7. On the `orclcldb` database home page, select **Data Guard Administration** from the Availability menu.

**(Optional)** If only the Add Standby Database link is visible, then select it. It will not launch the Add Standby Database Wizard, but instead will navigate to the Data Guard home page.

**(Optional)** If the Add Standby Database link shows the Add Standby Database page, click **Cancel** to navigate to the Data Guard home page.



8. On the Database Login Page, select **New** in the Credential option with the following values. Click **Login**.
  - **Username:** sys
  - **Password:** <password>
  - **Role:** SYSDBA
  - **Save As:** NC\_ORCLCDB\_SYS

9. The Data Guard home page, you will see the data guard configuration that you created in practice 10-2.

**Standby Database Progress Summary**

Transport lag is the time difference between the last update on the primary database and the last received database and the last applied redo on the standby database.

| Standby Database    | Apply Lag (seconds) | Transport Lag (seconds) |
|---------------------|---------------------|-------------------------|
| london2.example.com | 0                   | 0                       |
| london.example.com  | 0                   | 0                       |
| londonFS            | 0                   | 0                       |
| host04.example.com  | 0                   | 0                       |

**Standby Databases**

| Edit   Remove   Switchover   Failover   Convert |          | Name               | Host                                        | Data Guard Status | Role     | Redo Source | Real-time Query | Last Received Log |
|-------------------------------------------------|----------|--------------------|---------------------------------------------|-------------------|----------|-------------|-----------------|-------------------|
| <input checked="" type="radio"/>                | bostonFS | host02.example.com | <span style="color: green;">✓</span> Normal | Far Sync          | boston   | N/A         | Not available   |                   |
| <input type="radio"/>                           | london   | host03.example.com | <span style="color: green;">✓</span> Normal | Physical Standby  | bostonFS | Disabled    | 42              |                   |
| <input type="radio"/>                           | london2  | host03.example.com | <span style="color: green;">✓</span> Normal | Logical Standby   | bostonFS | N/A         | 42              |                   |
| <input type="radio"/>                           | londonFS | host04.example.com | <span style="color: green;">✓</span> Normal | Far Sync          | Unknown  | N/A         | Not available   |                   |

10. Review the **Overview** and **Primary Database** sections. It shows the status of the Data Guard configuration and the primary database.

**Overview**

Data Guard Status ✓ Normal  
 Protection Mode Maximum Performance  
 Fast-Start Failover Disabled

**Primary Database**

Name boston.example.com  
 Host host01.example.com  
 Data Guard Status ✓ Normal  
 Current Log 43  
 Properties Edit

11. Review the **Standby Databases** section. It shows the members of the Data Guard configuration and role/status of each member.

| Standby Databases                |                      |                        |                            |                          |                         |
|----------------------------------|----------------------|------------------------|----------------------------|--------------------------|-------------------------|
|                                  | <a href="#">Edit</a> | <a href="#">Remove</a> | <a href="#">Switchover</a> | <a href="#">Failover</a> | <a href="#">Convert</a> |
| Select                           | Name                 | Host                   | Data Guard Status          | Role                     |                         |
| <input checked="" type="radio"/> | bostonFS             | host02.example.com     | Normal                     | Far Sync                 |                         |
| <input type="radio"/>            | london.example.com   | host03.example.com     | Normal                     | Physical Standby         |                         |
| <input type="radio"/>            | london2.example.com  | host03.example.com     | Normal                     | Logical Standby          |                         |
| <input type="radio"/>            | londonFS             | host04.example.com     | Normal                     | Far Sync                 |                         |

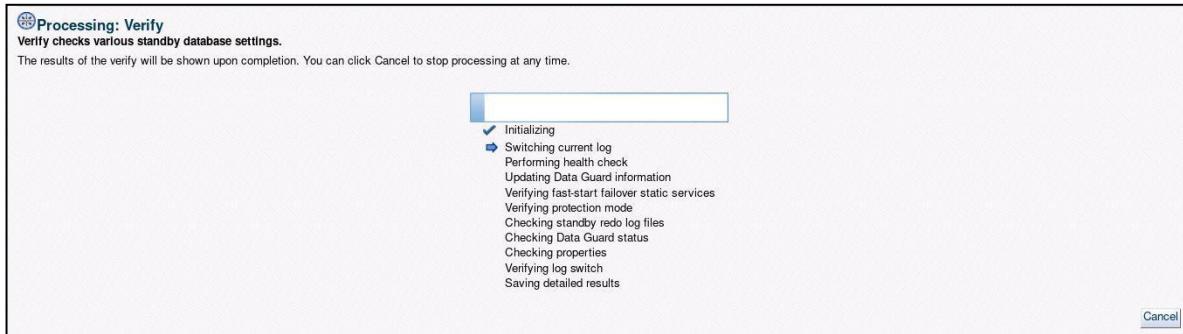
12. Continue to review the **Standby Databases** section. It shows the Redo Source of each member in the Data Guard configuration and additional information. In this section, you can also Add Far Sync or Add Standby Database.

|             |                 |                   |                  |                         | <a href="#">Add Far Sync</a> | <a href="#">Add Standby Database</a> |
|-------------|-----------------|-------------------|------------------|-------------------------|------------------------------|--------------------------------------|
| Redo Source | Real-time Query | Last Received Log | Last Applied Log | Estimated Failover Time |                              |                                      |
| boston      | N/A             | Not available     | Not available    | Not available           |                              |                                      |
| bostonFS    |                 | 42                | 42               | Not available           |                              |                                      |
| bostonFS    | N/A             | 42                | 42               | Not available           |                              |                                      |
| Unknown     | N/A             | Not available     | Not available    | Not available           |                              |                                      |

13. Review the **Performance** and **Additional Administration** sections. It shows the additional links for the Data Guard performance.

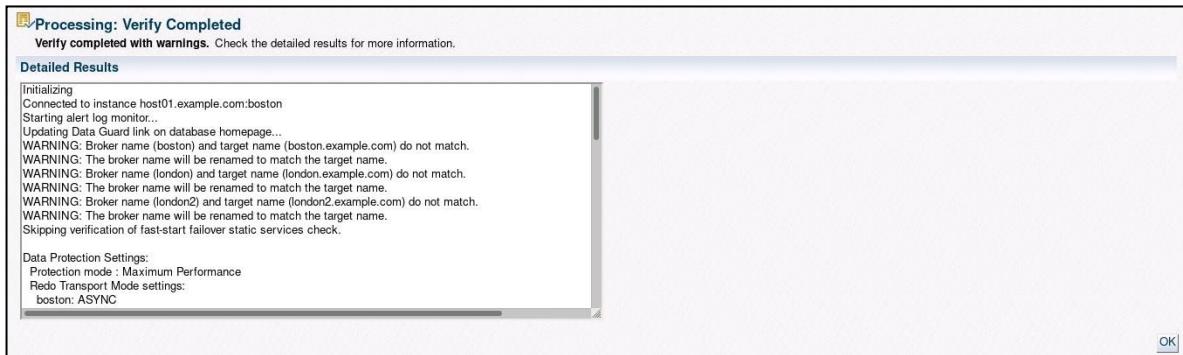
| Performance                            | Additional Administration                       |
|----------------------------------------|-------------------------------------------------|
| <a href="#">Data Guard Performance</a> | <a href="#">Verify Configuration</a>            |
| <a href="#">Log File Details</a>       | <a href="#">Remove Data Guard Configuration</a> |

14. Select the **Verify Configuration** item from the menu. The following image shows the steps performed while verifying the configuration. After verification completes, detailed results are displayed.



**Note:** The verify process will complete with warnings. You can safely ignore these warnings at this time.

15. Click **OK**. The Data Guard Administration page is displayed.





# **Practices for Lesson 11: Monitoring a Data Guard Broker Configuration**

## **Practices for Lesson 11: Overview**

---

### **Practices Overview**

In these practices, you will use the DGMGRL utility to monitor your physical standby database. You will also examine the use of trace files to monitor the Data Guard environment.

## Practice 11-1: Monitoring the Physical Standby Database

---

### Overview

In this practice, you will use DGMGRL and connect with both local and remote connections. The password file will be updated on the primary database and copied to every other destination in the Data Guard configuration.

### Tasks

1. Use a terminal window on `localhost` connected as `oracle` with the environment variables set to `orclcdb`. Launch DGMGRL connecting as the `SYSRG` user with operating system authentication.

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
[oracle@localhost ~]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Thu Jun 4
18:52:53 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect sysdg/<password>@orclcdb
Connected to "orclcdb"
Connected as SYSRG.
DGMGRL>
```

2. Use the `SHOW CONFIGURATION VERBOSE` command to display the current values for the `CommunicationTimeout` property and the `OperationTimeout` property.

```
DGMGRL> show configuration verbose

Configuration - DRSSolution

Protection Mode: MaxPerformance
Members:
orclcdb - Primary database
orclcdbFS - Far sync
instance
 stndby - Physical standby database
 stndby2 - Logical standby database
```

```

Members Not Receiving Redo:
stndbyFS - Far sync instance

Properties:
 FastStartFailoverThreshold = '30'
 OperationTimeout = '30'
 TraceLevel = 'USER'
 FastStartFailoverLagLimit = '30'
 CommunicationTimeout = '180'
 ObserverReconnect = '0'
 FastStartFailoverAutoReinstate = 'TRUE'
 FastStartFailoverPmyShutdown = 'TRUE'
 BystandersFollowRoleChange = 'ALL'
 ObserverOverride = 'FALSE'
 ExternalDestination1 = ''
 ExternalDestination2 = ''
 PrimaryLostWriteAction = 'CONTINUE'
 ConfigurationWideServiceName = 'orclcdb_CFG'
 '

Fast-Start Failover: Disabled

Configuration Status:
SUCCESS

DGMGRL>

```

3. Modify the `CommunicationTimeout` property and set it to a value of 300. Verify the result.

```

DGMGRL> edit configuration set property 'CommunicationTimeout' =
300;
Property "CommunicationTimeout" updated

DGMGRL> show configuration verbose
...
Properties:
 FastStartFailoverThreshold = '30'
 OperationTimeout = '30'
 TraceLevel = 'USER'
 FastStartFailoverLagLimit = '30'
 CommunicationTimeout = '300'
 ObserverReconnect = '0'

```

```
FastStartFailoverAutoReinstate = 'TRUE'
...
```

**Note:** This is not normally needed but it helps with labs running in the Virtual Machine architecture.

4. Modify the OperationTimeout property and set it to the maximum value of 300. Verify the result.

```
DGMGRL> edit configuration set property 'OperationTimeout' =
300;
Property "CommunicationTimeout" updated

DGMGRL> show configuration verbose
...
Properties:
 FastStartFailoverThreshold = '30'
 OperationTimeout = '300'
 TraceLevel = 'USER'
 FastStartFailoverLagLimit = '30'
 CommunicationTimeout = '300'
 ObserverReconnect = '0'
 FastStartFailoverAutoReinstate = 'TRUE'
...
```

5. Use the SHOW DATABASE command for the physical standby database and determine the current transport lag, apply lag, and apply rate.

```
DGMGRL> show database stndby

Database - stndby

Role: PHYSICAL STANDBY
Intended State: APPLY-ON
Transport Lag: 0 seconds (computed 0 seconds ago)
Apply Lag: 0 seconds (computed 0 seconds ago)
Average Apply Rate: 17.00 KByte/s
Real Time Query: OFF
Instance(s):
 stndby

Database Status:
SUCCESS

DGMGRL>
```

6. Stop redo apply on the physical standby database to force an apply rate lag to occur.

```
DGMGRL> edit database stndby set state = 'APPLY-OFF';
Succeeded.
```

7. Without exiting DGMGRL, force a log switch on the primary database.

**Note:** You are currently connected to the primary database.

```
DGMGRL> SQL "alter system switch logfile";
Succeeded.
```

8. Use the SHOW DATABASE command for the physical standby database and display the current apply lag rate.

```
DGMGRL> show database stndby
Database - stndby

Role: PHYSICAL STANDBY
Intended State: APPLY-OFF
Transport Lag: 0 seconds (computed 0 seconds ago)
Apply Lag: 33 seconds (computed 0 seconds ago)
Apply Rate: (unknown)
Real Time Query: OFF
Instance(s):
 stndby

Database Status:
SUCCESS
```

9. Display the standby receive queue for the physical database.

```
DGMGRL> show database stndby 'RecvQEntries';
STANDBY_RECEIVE_QUEUE
 STATUS RESETLOGS_ID THREAD
LOG_SEQ TIME_GENERATED TIME_COMPLETED
FIRST_CHANGE# NEXT_CHANGE# SIZE (KBs)
 PARTIALLY_APPLIED 1042035828 1
63 06/04/2020 18:55:17 06/04/2020 19:03:47
3030103 3032604 4151

DGMGRL>
```

10. **(Optional)** With the navigation techniques learned in practice 10-3, navigate to the `orclcdb` database home page. On the `orclcdb` database home page, click **Data Guard Administration** in the Availability menu.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface for the `orclcdb` database. The top navigation bar has tabs for Availability, Security, Schema, and Administration. The Availability tab is selected. A dropdown menu is open under the Availability tab, showing options: MAA Advisor, Backup & Recovery, Add Standby Database, Data Guard Administration (which is highlighted with a cursor), Data Guard Performance, and Verify Data Guard Configuration. The main content area displays database statistics: Version 19.3.0.0.0, 0 days, 23 hrs Up Time, 94.4% Availability for Last 7 Days, and N/A Last Backup. A graph at the bottom shows Active Sessions over time from 1:18 AM to 2:18 AM, with a significant peak around 1:38 AM.

**(Optional)** If only the Add Standby Database link is visible, then select it. It will not launch the Add Standby Database Wizard, but instead will navigate to the Data Guard home page.

This screenshot is similar to the previous one, showing the Oracle Enterprise Manager Cloud Control 13c interface for the `orclcdb` database. The Availability menu is open, and the 'Add Standby Database...' option is highlighted. The main content area shows the same database statistics and active session graph.

**(Optional)** If the Add Standby Database link shows the Add Standby Database page, click **Cancel** to navigate to the Data Guard home page.

This screenshot shows the 'Add Standby Database' wizard. The first step, 'Create a new physical standby database', is selected. The right panel, titled 'Standby Database Types', contains two sections: 'Physical standby database characteristics' and 'Logical standby database characteristics'. Both sections list several bullet points. At the bottom right of the wizard are 'Cancel' and 'Continue' buttons.

11. (Optional) On the Database Login Page, select **New** in the Credential option with the following values. Click **Login**.

- **Username:** sys
- **Password:** <password>
- **Role:** SYSDBA
- **Save As:** NC\_ORCLCDB\_SYS

The screenshot shows the 'Database Login' page for 'boston.example.com (Container Database)'. The 'Credential' dropdown is set to 'New'. The 'Username' field contains 'sys', the 'Password' field contains '\*\*\*\*\*', and the 'Role' dropdown is set to 'SYSDBA'. The 'Save As' field is filled with 'NC\_BOSTON\_SYS'. The 'Set As Preferred Credentials' checkbox is unchecked. At the bottom are 'Login' and 'Cancel' buttons.

12. (Optional) On the Data Guard home page, you will see the status of redo apply service on the physical standby database

| Standby Databases                |                      |                        |                                                                                  |                          |
|----------------------------------|----------------------|------------------------|----------------------------------------------------------------------------------|--------------------------|
|                                  | <a href="#">Edit</a> | <a href="#">Remove</a> | <a href="#">Switchover</a>                                                       | <a href="#">Failover</a> |
| Select                           | Name                 | Host                   | Data Guard Status                                                                | Role                     |
| <input checked="" type="radio"/> | bostonFS             | host02.example.com     | <span style="color: green;">✓ Normal</span>                                      | Far Sync                 |
| <input type="radio"/>            | london.example.com   | host03.example.com     | <span style="color: red; border: 2px solid red;">✓ Normal, Redo Apply Off</span> | Physical Standby         |
| <input type="radio"/>            | london2.example.com  | host03.example.com     | <span style="color: green;">✓ Normal</span>                                      | Logical Standby          |
| <input type="radio"/>            | londonFS             | host04.example.com     | <span style="color: green;">✓ Normal</span>                                      | Far Sync                 |

13. (Optional) Click the Log File Details link in the Performance section.

14. (Optional) On the Log File Details page, you will see the list of log files that have not been received and applied.

**Note:** The ORA-16664 message can be ignored.

| london.example.com |                   | london2.example.com |                      |                     |           |                     |                                                       |                         |                         |
|--------------------|-------------------|---------------------|----------------------|---------------------|-----------|---------------------|-------------------------------------------------------|-------------------------|-------------------------|
| Log                | Status            | ResetLogs ID #      | First Change # (SCN) | Last Change # (SCN) | Size (KB) | Redo Apply Services | Status                                                | Time Generated          | Time Completed          |
| 44                 | Partially Applied | 1042163641          | 3741406              | 3743852             | 1036      | On                  | Normal, Redo Apply Off                                | Jun 10, 2020 2:11:45 PM | Jun 10, 2020 2:22:41 PM |
| 44                 | Not Received      | 1042163641          | 3741406              | 3743852             | 1036      | On                  | ORA-16664: unable to receive the result from a member | Jun 10, 2020 2:11:45 PM | Jun 10, 2020 2:22:41 PM |

All logs have been received and applied.

15. Restart redo apply on the physical standby database. Verify that the apply lag has been cleared. Exit DGMGRL when done.

**Note:** You may have to wait a minute after restarting redo apply to verify the results.

```
DGMGRL> edit database stndby set state = 'APPLY-ON';
Succeeded.

DGMGRL> show database stndby
Database - stndby

Role: PHYSICAL STANDBY
Intended State: APPLY-ON
Transport Lag: 0 seconds (computed 0 seconds ago) Apply
Lag: 0 seconds (computed 0 seconds ago) Apply Rate:
0 Byte/s
Real Time Query: OFF
Instance(s):
stndby

Database Status:
SUCCESS

DGMGRL> exit;
```

## Practice 11-2: Examining Data Guard Log and Trace Files

---

### Overview

In this practice, you will locate and examine the Data Guard log and trace files.

### Tasks

1. Use a terminal window on localhost connected as oracle with the environment variables set to orclcdb. Connect to the primary database using SQL\*Plus and determine the root directory for the Automatic Diagnostic Repository (ADR). Exit SQL\*Plus when

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Jun 4 19:06:34
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> show parameter diag

NAME TYPE VALUE

diagnostic_dest string /u01/app/oracle

SQL> exit;
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

done.

2. Change directory to the "trace" subdirectory located in the Automatic Diagnostic Repository home location. The ADR home is located at  
<diagnostic\_dest>/diag/rdbms/<dbname>/<instance\_name>.

```
[oracle@localhost]$ cd
/u01/app/oracle/diag/rdbms/orclcdb/orclcdb/trace
```

3. Verify that the previous commands that changed the state of redo apply and connection timeout were recorded in the Data Guard broker log file. The broker log file is named drc<db\_unique\_name>.log.

```
[oracle@localhost trace]$ grep CommunicationTimeout
drcorclcdb.logEDIT CONFIGURATION SET PROPERTY
CommunicationTimeout = 300 Property "CommunicationTimeout"
value set to "300" seconds
EDIT CONFIGURATION SET PROPERTY CommunicationTimeout = 300
completed successfully

[oracle@localhost trace]$ grep APPLY drcorclcdb.log
EDIT DATABASE stndby SET STATE = APPLY-OFF
EDIT DATABASE stndby SET STATE = APPLY-OFF completed
successfully
EDIT DATABASE stndby SET STATE = APPLY-ON
EDIT DATABASE stndby SET STATE = APPLY-ON completed successfully
```

4. Use the "ls -alt | more" command to list the directory contents of the trace directory sorted by modification time descending. The most recent modified file will be displayed first. Use <Ctrl + C> to exit.

```
[oracle@localhost trace]$ ls -alt | more
total 17812
-rw-r-----. 1 oracle oinstall 3130 Jun 4 19:09
orclcdb_m000_7209.trc
-rw-r-----. 1 oracle oinstall 1015 Jun 4 19:09
orclcdb_m000_7209.trm
-rw-r-----. 1 oracle oinstall 12215 Jun 4 19:09
orclcdb_m001_5486.trc
-rw-r-----. 1 oracle oinstall 1602 Jun 4 19:09
orclcdb_m001_5486.trm
-rw-r-----. 1 oracle oinstall 14706 Jun 4 19:09
orclcdb_mmon_5423.trc
-rw-r-----. 1 oracle oinstall 1594 Jun 4 19:09
orclcdb_mmon_5423.trm
-rw-r-----. 1 oracle oinstall 11207 Jun 4 19:08
orclcdb_m004_5819.trc
...
<Ctrl + C>
[oracle@localhost trace]$
```

5. Connect to the primary database using SQL\*Plus and set the level to 16 to track detailed archived redo log destination activity. Force a log switch and exit SQL\*Plus when done.

```
[oracle@localhost trace]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Jun 4 19:10:08
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> alter system set log_archive_trace=16;
System altered.

SQL> alter system switch logfile;

System altered.

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost trace]$
```

6. Use the "ls -alt | more" command to list the directory contents of the trace directory sorted by modification time descending. Identify the newly created files in the directory that were not present for the previous step 4. Use <Ctrl + C> to exit.

```
[oracle@localhost trace]$ ls -alt | more
total 18152
-rw-r-----. 1 oracle oinstall 181546 Jun 4 19:11
orclcdb_lgwr_5343.trc
-rw-r-----. 1 oracle oinstall 2818 Jun 4 19:11
orclcdb_lgwr_5343.trm
-rw-r-----. 1 oracle oinstall 165194 Jun 4 19:11
orclcdb_nss2_5502.trc
-rw-r-----. 1 oracle oinstall 2675 Jun 4 19:11
orclcdb_nss2_5502.trm
```

```
...
<Ctrl + C>
[oracle@localhost
```

7. The resulting log writer process (LGWR) and network server sync process (NSS) trace files can be very large in size. Since the primary database is configured for SYNC redo transport to the `orclcdbFS` far sync destination, verify that communication occurred to this destination in the trace file using the "`grep orclcdbFS <NSS2 trace file name>`" command. The trace file name must be determined from the previous step. You may explore the contents of the trace files if desired.

```
[oracle@localhost trace]$ grep orclcdb orclcdb_nss2_5343.trc
*rfsnam: /u01/app/oracle/oradata/orclcdb/stdbyredo02.log
[oracle@localhost trace]$
```

8. Connect to the primary database using SQL\*Plus and set the `log_archive_trace` level to 0 to disable tracing. Exit SQL\*Plus when done.

```
[oracle@localhost trace]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Jun 4 19:13:55
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> alter system set log_archive_trace=0;

System altered.

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost trace]$
```

## Practice 11-3: Using the VALIDATE commands

---

### Overview

In this practice, you will look at the various ways to use the DGMGRL VALIDATE commands.

### Tasks

1. Use the terminal session connected to localhost as the oracle user and set the environment.

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [orclcdb] ? orclcdb
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@localhost ~]$
```

2. Using DGMGRL, connect to the orclcdb database.

```
[oracle@localhost ~]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Thu Jun 4
21:45:46 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect sysdg/<password>@orclcdb
Connected to "orclcdb"
Connected as SYSDG.
DGMGRL>
```

3. Use the help command to display all possible VALIDATE commands.

```
DGMGRL> help VALIDATE

Performs an exhaustive set of validations for a member

Syntax:

VALIDATE DATABASE [VERBOSE] <database name>;
VALIDATE DATABASE [VERBOSE] <database name> DATAFILE <datafile
number>
 OUTPUT=<file name>;
VALIDATE DATABASE [VERBOSE] <database name> SPFILE;
VALIDATE FAR_SYNC [VERBOSE] <far_sync name>
 [WHEN PRIMARY IS <database name>];
VALIDATE NETWORK CONFIGURATION FOR { ALL | <member name> };
```

```
VALIDATE STATIC CONNECT IDENTIFIER FOR { ALL | <database
name> } ;

DGMGRL>
```

4. Use the VALIDATE command to perform a comparison of SPFILE entries between the orclcdb primary database and the stndby standby database.

```
DGMGRL> VALIDATE DATABASE stndby SPFILE;
Connecting to
"orclcdb".Connected to
"orclcdb"

Connecting to "stndby".

Parameter settings with different values:

audit_file_dest:
orclcdb (PRIMARY) :
/u01/app/oracle/admin/orclcdb/adumpstndby :
/u01/app/oracle/admin/stndby/adump

dispatchers:
orclcdb (PRIMARY) : (PROTOCOL=TCP)
(SERVICE=orclcdbXDB) stndby : (PROTOCOL=TCP)
(SERVICE=stndbyXDB)

enabled_PDBs_on_standby:

log_archive_trace:
orclcdb (PRIMARY) :
0stndby : NOT SPECIFIED

DGMGRL>
```

**Note:** The command above shows only the parameter settings with different values. If you want to list all parameter settings compared, use VALIDATE DATABASE VERBOSE stndby SPFILE.

5. Validate network configuration for the `stndby` database.

```
DGMGRL> VALIDATE NETWORK CONFIGURATION FOR stndby;
Connecting to instance "stndby" on database "stndby" ...
Connected to "stndby"
Checking connectivity from instance "stndby" on database "stndby"
to instance "orclcdb" on database "orclcdb"...
Succeeded.
Checking connectivity from instance "stndby" on database "stndby"
to instance "orclcdbFS" on database "orclcdbFS"...
Succeeded.
Checking connectivity from instance "stndby" on database "stndby"
to instance "stndby2" on database "stndby2"...
Succeeded.
Checking connectivity from instance "stndby" on database "stndby"
to instance "stndbyFS" on database "stndbyFS"...
Succeeded.
Connecting to instance "orclcdb" on database "orclcdb" ...
Connected to "orclcdb"
Checking connectivity from instance "orclcdb" on database
"orclcdb" to instance "stndby" on database "stndby"...
Succeeded.
Connecting to instance "orclcdbFS" on database "orclcdbFS" ...
Connected to "orclcdbFS"
```

```

Checking connectivity from instance "orclcldbFS" on
database "orclcldbFS" to instance "stndby" on database
"stndby"...
Succeeded.
Connecting to instance "stndby2" on database "stndby2" ...
Connected to "stndby2"
Checking connectivity from instance "stndby2" on database "stndby2"
to instance "stndby" on database "stndby"...
Succeeded.
Connecting to instance "stndbyFS" on database "stndbyFS" ...
Connected to "stndbyFS"
Checking connectivity from instance "stndbyFS" on database
"stndbyFS" to instance "stndby" on database "stndby"...
Succeeded.

Oracle Clusterware is not configured on database "stndby".
Connecting to database "stndby" using static connect identifier
"(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=stndby.example.com)(PORT=1521))(CONNECT_DATA=(SERVICE_NAME=stndby_DGMGRL.example.com)(INSTANCE_NAME=stndby)(SERVER=DEDICATED)(STATIC_SERVICE=TRUE)))" ...
Succeeded.
The static connect identifier allows for a connection to database
"stndby".

```

## 6. Validate network configuration for all members.

```

DGMGRL> VALIDATE NETWORK CONFIGURATION FOR all;
Connecting to instance "orclcldb" on database "orclcldb" ...
Connected to "orclcldb"
Checking connectivity from instance "orclcldb" on database
"orclcldb" to instance "orclcldbFS" on database "orclcldbFS"...
Succeeded.
Checking connectivity from instance "orclcldb" on database
"orclcldb" to instance "stndby" on database "stndby"...
Succeeded.
Checking connectivity from instance "orclcldb" on database
"orclcldb" to instance "stndby2" on database "stndby2"...
Succeeded.
Checking connectivity from instance "orclcldb" on database
"orclcldb" to instance "stndbyFS" on database "stndbyFS"...
Succeeded.
Connecting to instance "orclcldbFS" on database "orclcldbFS"
...Connected to "orclcldbFS"
Checking connectivity from instance "orclcldbFS" on database
"orclcldbFS" to instance "orclcldb" on database "orclcldb"...
Succeeded.
Checking connectivity from instance "orclcldbFS" on database
"orclcldbFS" to instance "stndby" on database "stndby"...
Succeeded.
Checking connectivity from instance "orclcldbFS" on database
"orclcldbFS" to instance "stndby2" on database "stndby2"...
Succeeded.

```

```

Checking connectivity from instance "orclcldbFS" on database
"orclcldbFS" to instance "stndbyFS" on database "stndbyFS"...
Succeeded.
Connecting to instance "stndby" on database "stndby" ...
Connected to "stndby"
Checking connectivity from instance "stndby" on database "stndby"
to instance "orclcldb" on database "orclcldb"...
Succeeded.
Checking connectivity from instance "stndby" on database "stndby"
to instance "orclcldbFS" on database "orclcldbFS"...
Succeeded.
Checking connectivity from instance "stndby" on database "stndby"
to instance "stndby2" on database "stndby2"...
Succeeded.
Checking connectivity from instance "stndby" on database "stndby"
to instance "stndbyFS" on database "stndbyFS"...
Succeeded.
Connecting to instance "stndby2" on database "stndby2" ...
Connected to "stndby2"
Checking connectivity from instance "stndby2" on database "stndby2"
to instance "orclcldb" on database "orclcldb"...
Succeeded.
Checking connectivity from instance "stndby2" on database "stndby2"
to instance "orclcldbFS" on database "orclcldbFS"...
Succeeded.
Checking connectivity from instance "stndby2" on database "stndby2"
to instance "stndby" on database "stndby"...
Succeeded.
Checking connectivity from instance "stndby2" on database "stndby2"
to instance "stndbyFS" on database "stndbyFS"...
Succeeded.
Connecting to instance "stndbyFS" on database "stndbyFS" ...
Connected to "stndbyFS"
Checking connectivity from instance "stndbyFS" on database
"stndbyFS" to instance "orclcldb" on database "orclcldb"...
Succeeded.
Checking connectivity from instance "stndbyFS" on database
"stndbyFS" to instance "orclcldbFS" on database "orclcldbFS"...
Succeeded.
Checking connectivity from instance "stndbyFS" on database
"stndbyFS" to instance "stndby" on database "stndby"...
Succeeded.
Checking connectivity from instance "stndbyFS" on database
"stndbyFS" to instance "stndby2" on database "stndby2"...
Succeeded.

Oracle Clusterware is not configured on database "orclcldb".
Connecting to database "orclcldb" using static connect identifier
"(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=localhost.example.com)(P
OR
T=1521))(CONNECT_DATA=(SERVICE_NAME=orclcldb_DGMGRL.example.com)(INS
TANCE_NAME=orclcldb)(SERVER=DEDICATED)(STATIC_SERVICE=TRUE)))" ...
Succeeded.

```

```
The static connect identifier allows for a connection to database
"orclcdb".
```

```
Oracle Clusterware is not configured on database "stndby".
Connecting to database "stndby" using static connect identifier
"(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=stndby.example.com)(POR
T=1521))(CONNECT_DATA=(SERVICE_NAME=stndby_DGMGRL.example.com)(IN
STANCE_NAME=stndby)(SERVER=DEDICATED)(STATIC_SERVICE=TRUE)))" ...
Succeeded.
```

```
The static connect identifier allows for a connection to database
"stndby".
```

```
Oracle Clusterware is not configured on database "stndby2".
Connecting to database "stndby2" using static connect identifier
"(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=stndby.example.com)(POR
T=1521))(CONNECT_DATA=(SERVICE_NAME=stndby2_DGMGRL.example.com)(IN
STANCE_NAME=stndby2)(SERVER=DEDICATED)(STATIC_SERVICE=TRUE)))" ...
Succeeded.
```

```
The static connect identifier allows for a connection to database
"stndby2".
```

```
DGMGRL>
```

## 7. Validate the static connect identifier of the orclcdb database.

```
DGMGRL> VALIDATE STATIC CONNECT IDENTIFIER FOR orclcdb;
Oracle Clusterware is not configured on database "orclcdb".
Connecting to database "orclcdb" using static connect identifier
"(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=localhost.example.com)(P
OR
T=1521))(CONNECT_DATA=(SERVICE_NAME=orclcdb_DGMGRL.example.com)(IN
STANCE_NAME=orclcdb)(SERVER=DEDICATED)(STATIC_SERVICE=TRUE)))" ...
Succeeded.
The static connect identifier allows for a connection to database
"orclcdb".
```

## 8. Validate the static connect identifier for all databases.

```
DGMGRL> VALIDATE STATIC CONNECT IDENTIFIER FOR all;
Oracle Clusterware is not configured on database "orclcdb".
Connecting to database "orclcdb" using static connect identifier
"(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=localhost.example.com)(P
OR
T=1521))(CONNECT_DATA=(SERVICE_NAME=orclcdb_DGMGRL.example.com)(IN
STANCE_NAME=orclcdb)(SERVER=DEDICATED)(STATIC_SERVICE=TRUE)))" ...
Succeeded.
The static connect identifier allows for a connection to database
"orclcdb".

Oracle Clusterware is not configured on database "stndby".
Connecting to database "stndby" using static connect identifier
```

```
T=1521) (CONNECT_DATA=(SERVICE_NAME=stndby_DGMGRL.example.com) (INSTANCE_NAME=stndby) (SERVER=DEDICATED) (STATIC_SERVICE=TRUE)))" ...
Succeeded.
The static connect identifier allows for a connection to database "stndby".
Oracle Clusterware is not configured on database "stndby2".
Connecting to database "stndby2" using static connect identifier "(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=stndby.example.com)(PORT=1521)) (CONNECT_DATA=(SERVICE_NAME=stndby2_DGMGRL.example.com)(INSTANCE_NAME=stndby2) (SERVER=DEDICATED) (STATIC_SERVICE=TRUE)))" ...
Succeeded.
The static connect identifier allows for a connection to database "stndby2".
DGMGRL>
```

9. Exit DGMGRL on localhost leaving the terminal window open for future practices.

# **Practices for Lesson 12: Configuring Data Protection Modes**

## **Practices for Lesson 12: Overview**

---

### **Practices Overview**

In these practices, you will examine the various protection modes and the impact that they may have on the primary database.

## Practice 12-1: Examining the Maximum Availability Protection Mode

### Overview

In this practice, you will use DGMGRL to view the current protection mode and modify it to maximum availability. You will simulate a problem on the standby database and observe the impact if any to the primary database.

### Tasks

1. Use a terminal window on `localhost` connected as `oracle` with the environment variables set to `orclcdb`. Launch the DGMGRL utility and connect as the `sysdg` user with operating system authentication.

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
[oracle@localhost]$ dgmgrl

DGMGRL for Linux: Release 19.0.0.0.0 - Production on Tue Jun 16
02:37:54 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect sysdg/<password>@orclcdb
Connected to "orclcdb"
Connected as SYSDG.
```

2. Use the `SHOW CONFIGURATION` command to display the current protection mode for the Data Guard configuration.

```
DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxPerformance
Members:
orclcdb - Primary database
orclcdbFS - Far sync
instance
 stndby - Physical standby database
 stndby2 - Logical standby database
```

```

stndbyFS - Far sync instance

Fast-Start Failover: Disabled

Configuration Status:
SUCCESS (status updated 58 seconds ago)

DGMGRL>

```

- Using DGMGRL, determine the current LogXptMode for the far sync instance and the physical standby database. EXAMPLE for FAR SYNC applications. DO NOT EXECUTE

```

DGMGRL> show database 'orclcdb' 'LogXptMode';
LogXptMode = 'ASYNC';

DGMGRL> show database stndby 'LogXptMode';
LogXptMode = 'ASYNC';
DGMGRL> exit
[oracle@localhost ~]$

```

**Note:** Database names, far sync instance names, property names and property values do not need to be enclosed in single quotation marks unless they are case-sensitive. The documentation examples generally use a single quote for both property names and property values and that convention has been followed in these labs. For the above example, only the far sync name 'orclcdbFS' would require it to be enclosed by single quotes. The second edit command does not use any single quotes for illustration.

- Optional: DO NOT EXECUTE this example:** If the current LogXptMode is not reported as 'ASYNC' for both the far sync instance and the physical standby database, then explicitly set it to 'ASYNC'. Exit DGMGRL when done.

```

DGMGRL> edit far_sync 'orclcdbFS' set property 'LogXptMode'
='ASYNC';
Property "LogXptMode" updated

DGMGRL> edit database stndby set property LogXptMode = ASYNC;
Property "logxptmode" updated

DGMGRL> exit
[oracle@localhost ~]$

```

5. Connect to the primary database using SQL\*Plus and determine the current value for the LOG\_ARCHIVE\_DEST\_2 parameter. What is the current LogXptMode? Exit SQL\*Plus.

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Fri Jun 5 10:57:04
2020
Version 19.3.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> show parameter LOG_ARCHIVE_DEST_2

NAME TYPE VALUE

log_archive_dest_2 string service="orclcdbfs", SYNC
 AFFIRM delay=0 optional
 compression=disable
 max_failure=0
 max_connections=1 reopen=300
 db_unique_name="orclcdbFS"
 net_timeout=30, valid_for=
 (online logfile, all roles)

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

6. Launch the DGMGRL utility and connect as the SYSDG user.

```
[oracle@localhost ~]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Fri Jun 5
10:58:40 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.
```

```
Welcome to DGMGRL, type "help" for information.
DGMGRL> connect sysdg/<password>@orclcdb
Connected to "orclcdb"
Connected as SYSDG.
DGMGRL>
```

7. Display the value for the RedoRoutes property of the primary database.

```
DGMGRL> show database 'orclcdb' 'RedoRoutes';
RedoRoutes = ''
```

**Note:** When the property 'RedoRoutes' has been defined, it takes precedence over the value of the property 'LogXptMode'. The property 'LogXptMode' will continue to report 'ASYNC' even though the actual transport mode is currently 'SYNC'.

8. Modify the 'RedoRoutes' property for the orclcdb primary database and set it to the 'ASYNC' redo transport mode.

```
DGMGRL> edit database orclcdb set property 'RedoRoutes' =
'(orclcdb:stndby ASYNC)';
Property "RedoRoutes" updated
```

9. Attempt to change the configuration mode to maximum availability and notice the results.

```
DGMGRL> edit configuration set protection mode as
maxavailability;
Error: ORA-16627: operation disallowed since no member would
remain to support protection mode

Failed.
```

10. Modify the RedoRoutes property for the orclcdb primary database and set it to the 'FASTSYNC' redo transport mode.

```
DGMGRL> edit database orclcdb set property 'RedoRoutes' =
'(orclcdb:stndby FASTSYNC)';
Property "RedoRoutes" updated
```

11. Change the configuration mode to maximum availability and verify the results.

```
DGMGRL> edit configuration set protection mode as
maxavailability;
Succeeded.

DGMGRL> show configuration;
```

Configuration - DRsolution

**Protection Mode: MaxAvailability**

Members:

orclcdb - Primary database  
orclcdbFS - Far sync instance  
stndby - Physical standby database  
stndby2 - Logical standby database

Members Not Receiving Redo:

stndbyFS - Far sync instance

Fast-Start Failover: Disabled

Configuration Status:

SUCCESS (status updated 60 seconds ago)

12. Use a terminal window on `stndby` connected as `oracle` with the environment variables set to `stndby`. Connect to the physical standby database using SQL\*Plus and perform a shutdown abort.

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

[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Fri Jun 5 11:04:00
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> shutdown abort
```

```
ORACLE instance shut down.
SQL>
```

13. Return to the DGMGRL session running on localhost and display the configuration.

```
DGMGRL> show configuration
■ The messages will be similar not exact.sho
Configuration - DRsolution

Protection Mode: MaxAvailability
Members:
orclcdb - Primary database
 orclcdbFS - Far sync
 instance
 Error: ORA-16778: redo transport error for one or more
members

 stndby - Physical standby database
 Error: ORA-1034: ORACLE not available

 stndby2 - Logical standby database

Members Not Receiving Redo:
stndbyFS - Far sync instance

Fast-Start Failover: Disabled

Configuration Status:
ERROR (status updated 55 seconds ago)
```

14. Return to the SQL\*Plus session on stndby connected as oracle with the environment variables set to stndby. Use SQL\*Plus to restart and mount the physical standby database. Verify that the DEV1 pluggable database is also mounted.

```
SQL> startup mount
ORACLE instance started.

Total System Global Area 517763072 bytes
Fixed Size 2290216 bytes
Variable Size 440405464 bytes
Database Buffers 71303168 bytes
Redo Buffers 3764224 bytes
```

```
Database mounted.
```

```
SQL> show pdbs
```

| CON_ID | CON_NAME  | OPEN MODE | RESTRICTED |
|--------|-----------|-----------|------------|
| 2      | PDB\$SEED | MOUNTED   |            |
| 3      | DEV1      | MOUNTED   |            |

15. Return to the DGMGRL session running on localhost and display the configuration.

```
DGMGRL> show configuration
```

```
Configuration - DRSSolution
```

```
Protection Mode: MaxAvailability
```

```
Members:
```

```
orclcdb - Primary database
```

```
Error: ORA-16778: redo transport error for one or more members
```

```
stndby - Physical standby database
```

```
Warning: ORA-16809: multiple warnings detected for the member
```

```
stndby2 - Logical standby database
```

```
Members Not Receiving Redo:
```

```
stndbyFS - Far sync instance
```

```
Fast-Start Failover: Disabled
```

```
Configuration Status:
```

```
ERROR (status updated 17 seconds ago)
```

**Note:** The broker may have restarted redo apply before you are able to see the above error. In addition, you may also receive a series of warnings ORA-16778 and ORA-16809 standby disconnected from redo source for longer than specified threshold. This is acceptable.

16. Restart redo apply for the physical standby database. Perform a log switch on the primary database and verify the configuration.

```
DGMGRL> edit database stndby set state = 'APPLY-ON';
Succeeded.

DGMGRL> SQL "alter system switch logfile";
Succeeded.

DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxAvailability
Members:
orclcdb - Primary database
selexcshowinstance
stndby - Physical standby database
stndby2 - Logical standby database

Fast-Start Failover: Disabled

Configuration Status:
SUCCESS (status updated 56 seconds ago)

DGMGRL>
```

17. Before proceeding with additional lab steps, give the transport lag and apply lag an opportunity to catch up. Use the show configuration and show database stndby commands until the lag clears. Repeat these commands as needed.

```
DGMGRL> show database stndby
Database - stndby
Role: PHYSICAL STANDBY
Intended State: APPLY-ON
Transport Lag: 0 seconds (computed 1 second ago) Apply
Lag: 0 seconds (computed 1 second ago) Apply Rate:
0 Byte/s
Real Time Query: OFF
Instance(s):
stndby
```

## Practice 12-2: Examining the Maximum Protection Mode

---

### Overview

In this practice, you will use DGMGRL to modify the current protection mode to maximum protection. You will simulate a problem on the standby database and observe the impact to the primary database.

### Tasks

1. Modify the `RedoRoutes` property for the `orclcdb` primary database and set it to the `SYNCREDO` transport mode. Enable the maximum protection mode for the Data Guard configuration.

```
DGMGRL> edit database orclcdb set property 'RedoRoutes' =
 '(orclcdb:stndby SYNC)';
Property "RedoRoutes" updated

DGMGRL> edit configuration set protection mode as maxprotection;
Error: ORA-16627: operation disallowed since no standby
databases would remain to support protection mode
 NOTE: If you have 2 standby databases up it
will succeed.

Failed.
```

**Note:** The maximum protection mode is not supported by far sync.

2. devshow
3. staEnable the maximum protection mode for the Data Guard configuration and display

```
DGMGRL> edit configuration set protection mode as maxprotection;
Succeeded.

DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxProtection
Members:
orclcdb - Primary database
orclcdbFS - Far sync
instance
stndby2 - Logical standby database
stndby - Physical standby database

Members Not Receiving Redo:
stndbyFS - Far sync instance

Fast-Start Failover: Disabled

Configuration Status:
SUCCESS (status updated 57 seconds ago)

DGMGRL> exit
```

theresulting configuration. Exit DGMGRL.

4. In the same terminal window on `localhost`, connect to the primary database using SQL\*Plus and switch the session to the `DEV1` pluggable database. Leave this window

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Fri Jun 5 11:19:44
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0
```

open.

```
SQL> alter session set container=DEV1;

Session altered.

SQL>
```

5. Use a terminal window on `stndby` connected as `oracle` with the environment variables set to `stndby`. Connect to the physical standby database using SQL\*Plus and perform `ashutdown abort`.

```
[oracle@stndby ~]$. oraenv
ORACLE_SID = [oracle] ? stndby
The Oracle base has been set to /u01/app/oracle
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Fri Jun 5 11:21:26
2020
Version 19.3.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> shutdown abort
ORACLE instance shut down.
SQL>
```

6. Return to the SQL\*Plus session on `localhost` with the session set to the `DEV1` pluggable database. Display the current data for the `HR.REGIONS` table and then insert a new row into the table. Exit the terminated session.

```
SQL> select * from hr.regions order by region_id;

REGION_ID REGION_NAME

1 Europe
2 Americas
3 Asia
4 Middle East and Africa
5 Australia

SQL> insert into hr.regions values (6,'MyRegion');
insert into hr.regions values (6,'MyRegion')
*
ERROR at line 1:
ORA-03135: connection lost contact
Process ID: 19624
Session ID: 20 Serial number: 3265

Note: If the row inserts successfully, then attempt to commit the change. After waiting for about 5 minutes, you will receive ORA-03113 error message.

1 row created.

SQL> commit;
ERROR at line 1:
ORA-03113: end-of-file on communication channel
Process ID: 15203
Session ID: 65 Serial number: 2297

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

**Note:** The primary database has been brought down due to the maximum protection mode and not having the standby database available to accept redo. Depending on timings and blocks cached in memory, the insert may be successful, but the commit will always fail. You may have to wait for the timeout period to elapse before seeing the error message.

7. In the same terminal window on `localhost`, connect to the primary database using SQL\*Plus and attempt to restart the instance. Exit the terminated session.

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Fri Jun 5 11:30:15
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to an idle instance.

SQL> startup
ORACLE instance started.

Total System Global Area 629145352 bytes
Fixed Size 9137928 bytes
Variable Size 373293056 bytes
Database Buffers 239075328 bytes
Redo Buffers 7639040 bytes
Database mounted.

ORA-03113: end-of-file on communication channel
Process ID: 11692
Session ID: 19 Serial number: 51864

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

**Note:** The primary cannot be started with the physical standby down with the maximum protection mode and no other standby databases available that support this mode.

8. Return to the SQL\*Plus session on `stndby` to start up and mount the physical standby database. Verify that the `DEV1` pluggable database is mounted. Exit SQL\*Plus.

```
SQL> startup mount
ORACLE instance started.

Total System Global Area 629145352 bytes
Fixed Size 9137928 bytes
Variable Size 369098752 bytes
Database Buffers 243269632 bytes
Redo Buffers 7639040 bytes
Database mounted.

SQL> show pdbs
CON_ID CON_NAME OPEN MODE RESTRICTED

 2 PDB$SEED MOUNTED
 3 DEV1 MOUNTED

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@stndby ~]$
```

9. Return to the terminal window on `localhost` connected as `oracle` with the environment variables set to `orclcdb`. Use SQL\*Plus to open the primary database. Verify that the pluggable database is open. If not, then open it. Exit SQL\*Plus.

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Fri Jun 5 11:34:12
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved. Connected to an
idle instance.

SQL> startup
ORACLE instance started.

Total System Global Area 629145352 bytes
Fixed Size 9137928 bytes
Variable Size 373293056 bytes
Database Buffers 239075328 bytes
Redo Buffers 7639040 bytes
Database mounted.
Database opened.

SQL> show pdbs

 CON_ID CON_NAME OPEN MODE RESTRICTED
----- -----
 2 PDB$SEED READ ONLY NO
 3 DEV1 READ WRITE

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

10. In the same terminal window on `localhost`, launch the DGMGRL utility and connect as the SYSDG user. Display the Data Guard configuration. Wait until the ORA-\* warning messages are cleared.

```
[oracle@localhost ~]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Fri Jun 5
11:37:13 2020
Version 19.3.0.0.0

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reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect sysdg/<password>@orclcdb
Connected to "orclcdb"
Connected as SYSDG.
DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxProtection
Members:
 orclcdb - Primary database
 orclcdbFS - Far sync
 instance
 stndby2 - Logical standby database
 stndby - Physical standby database

Members Not Receiving Redo:

Fast-Start Failover: Disabled

Configuration Status:
SUCCESS (status updated 45 seconds ago)

DGMGRL>
```

11. Change the Data Guard protection mode to maximum performance.

```
DGMGRL> edit configuration set protection mode as
maxperformance;
Succeeded.
```

12. Restart Redo Apply on the physical standby database and perform a log switch on the primary database.

```
DGMGRL> edit database stndby set state = 'APPLY-ON';
Succeeded.
DGMGRL> SQL "alter system switch logfile";
Succeeded.
```

13. Display the resulting configuration.

```
DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxPerformance
Members:
orclcdb - Primary database
orclcdbFS - Far sync
instance
 stndby - Physical standby database
 stndby2 - Logical standby database

Members Not Receiving Redo:

Fast-Start Failover: Disabled

Configuration Status:
SUCCESS (status updated 60 seconds ago)

DGMGRL>
```

**Note:** It may take some time for Data Guard broker to resynchronize all the changes in this lab environment considering the hardware constraints. The following steps can be performed if needed:

**OPTIONAL LAB – do if we are waiting on other students to complete lab**

14. Before proceeding with additional lab steps, give the transport lag and apply lag an opportunity to catch up. Use the 'show configuration' and 'show database verbose stndby' commands until the lag clears. Repeat these commands as

```
DGMGRL> show database stndby
Database - stndby

Role: PHYSICAL STANDBY
Intended State: APPLY-ON
Transport Lag: 0 seconds (computed 0 seconds ago) Apply
Lag: 0 seconds (computed 0 seconds ago) Apply Rate:
0 Byte/s
Real Time Query: OFF
Instance(s):
stndby

Database Status:
SUCCESS
```

needed.

15. Exit DGMGRL and SQL\*Plus leaving the terminal windows open for future practices.

# **Practices for Lesson 13: Optimizing and Tuning a Data Guard Configuration**

## **Practices for Lesson 13: Overview**

---

### **Practices Overview**

In these practices, you will configure network compression of redo data and SQL TUNING ADVISOR in a DataGuard environment.

## Practice 13-1: Configuring Network Compression of Redo Data

---

### Overview

In this practice, you will set the `RedoCompression` property to configure network compression of redo data.

### Tasks

1. Use a terminal window logged in as `oracle` to `localhost` with the environment variables set for `orclcdb` appropriately. Launch SQL\*Plus on your primary database and

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Fri Jun 5 12:32:07
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> col dest_name format a30
SQL> select dest_name, compression from v$archive_dest;

DEST_NAME COMPRES

LOG_ARCHIVE_DEST_1 DISABLE
LOG_ARCHIVE_DEST_2 DISABLE
LOG_ARCHIVE_DEST_3 DISABLE
LOG_ARCHIVE_DEST_4 DISABLE
LOG_ARCHIVE_DEST_5 DISABLE
LOG_ARCHIVE_DEST_6 DISABLE
LOG_ARCHIVE_DEST_7 DISABLE
LOG_ARCHIVE_DEST_8 DISABLE
LOG_ARCHIVE_DEST_9 DISABLE
LOG_ARCHIVE_DEST_10 DISABLE
```

determine if redo compression is enabled by querying `V$ARCHIVE_DEST`.

Cd

```

LOG_ARCHIVE_DEST_11 DISABLE

DEST_NAME COMPRES

LOG_ARCHIVE_DEST_12 DISABLE
LOG_ARCHIVE_DEST_13 DISABLE
LOG_ARCHIVE_DEST_14 DISABLE
LOG_ARCHIVE_DEST_15 DISABLE
LOG_ARCHIVE_DEST_16 DISABLE
LOG_ARCHIVE_DEST_17 DISABLE
LOG_ARCHIVE_DEST_18 DISABLE
LOG_ARCHIVE_DEST_19 DISABLE
LOG_ARCHIVE_DEST_20 DISABLE
LOG_ARCHIVE_DEST_21 DISABLE
LOG_ARCHIVE_DEST_22 DISABLE

DEST_NAME COMPRES

LOG_ARCHIVE_DEST_23 DISABLE
LOG_ARCHIVE_DEST_24 DISABLE
LOG_ARCHIVE_DEST_25 DISABLE
LOG_ARCHIVE_DEST_26 DISABLE
LOG_ARCHIVE_DEST_27 DISABLE
LOG_ARCHIVE_DEST_28 DISABLE
LOG_ARCHIVE_DEST_29 DISABLE
LOG_ARCHIVE_DEST_30 DISABLE
LOG_ARCHIVE_DEST_31 DISABLE

31 rows selected.

SQL>

```

2. Use a terminal window logged in as `oracle` to `host02` with the environment variables set for `orclcdbs` appropriately. Launch DGMGRL and connect to the primary database.

```

[oracle@host02 ~]$. oraenv
ORACLE_SID = [oracle] ? orclcdbs
The Oracle base has been set to /u01/app/oracle
[oracle@host02 ~]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Fri Jun 5
12:34:02 2020
Version 19.3.0.0.0

```

```
(c) 1982, 2019, Oracle and/or its affiliates. All rights reserved.
```

```
Welcome to DGMGRL, type "help" for information.
```

```
DGMGRL> connect sysdg/<password>@orclcdb
```

```
Connected to "orclcdb"
```

```
Connected as SYSDG.
```

```
DGMGRL>
```

3. Enable redo compression by setting the `RedoCompression` property for your database.  
Exit DGMGRL.

```
DGMGRL> edit database 'orclcdb' set property
'RedoCompression'='ENABLE';
Property "RedoCompression" updated

DGMGRL> exit1
```

4. Return to your SQL\*Plus session on localhost and query `V$ARCHIVE_DEST` again.  
Notethat compression is set for `LOG_ARCHIVE_DEST_2`. Exit SQL\*Plus.

```
SQL> select dest_name, compression from v$archive_dest;

DEST_NAME COMPRESSION

LOG_ARCHIVE_DEST_1 DISABLE
LOG_ARCHIVE_DEST_2 ENABLE
LOG_ARCHIVE_DEST_3 DISABLE
...

31 rows selected.

SQL> show parameter log_archive_dest_2
NAME TYPE VALUE

log_archive_dest_2 string service="orclcdbfs",
 SYNC AFFIRM delay=0
 optional compression=enable
 max_failure=0
 max_connections=1 reopen=300
 db_unique_name="orclcdbFS"
 net_timeout=30,
 valid_for=(online logfile
```

```
,all_roles)

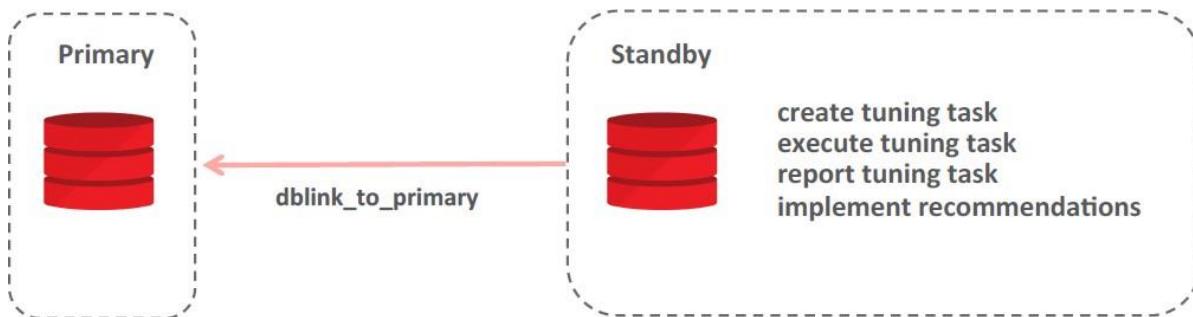
SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

## Practice 13-4: Using SQL Tuning Advisor for an Active Data Guard Instance

### Overview

In this practice, you will see how to use SQL Tuning Advisor for Active Data Guard.

The Active Data Guard (ADG) Databases are widely used to offload reporting or ad hoc query-only jobs from primary. Reporting workload profile is different from primary and often requires tuning. Starting with Oracle Database 12.2, you can run SQL Tuning Advisor to tune SQLs workloads running on ADG database.



- All changes are done on primary and propagated from primary to standby by redo apply.
- The data required for running the tuning tasks are fetched from the primary.
- Support for PDB level tuning
- Test execution (heavy lifting) happens on standby; only minimal write related activity on primary.

### Tasks

1. **(Reference Only, DO NOT RUN)** The environment for this practice has been set up with the `setup_STA.sh` script. This script created the `OE.PRODUCTS`, `OE.ORDER_ITEMS`, `OE.orders`, `OE.CUSTOMERS`, and `OE.stores` tables.

```
[oracle@localhost ~]$ /home/oracle/setup/setup_STA.sh
...
able OE.CUSTOMER:
 30000 Rows successfully loaded.

Check the log file:
 control_customer.log
for more information about the load.
[oracle@localhost ~]$
```

2. Use a terminal window logged in as oracle to localhost with the environment variables set for orclcdb appropriately. Log in to the DEV1 PDB as the SYS user and run the setup13-4.sql script.

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@localhost ~]$ sqlplus sys/<password>@localhost:1521/dev1
as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Fri Jun 5 19:34:38
2020

Version 19.3.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> @/home/oracle/setup/setup13-4.sql
SQL> exec dbms_stats.delete_table_stats('OE','orders'); PL/SQL

procedure successfully completed.

SQL> exec dbms_stats.delete_table_stats('OE','order_items');

PL/SQL procedure successfully completed.

SQL>
```

3. Switch to the CDB root container and create a database link in the primary database for the standby database.

```
SQL> connect / as sysdba
Connected.
SQL> CREATE DATABASE LINK dblink_to_primary CONNECT TO SYS$UMF
IDENTIFIED BY <password> USING 'orclcdb';
```

```
Database link created.
```

```
SQL>
```

4. Use a terminal window logged in as `oracle` to `stndby` with the environment variables set for `stndby` appropriately. Launch SQL\*Plus and run the problem query in the `DEV1` PDB.

```
[oracle@stndby ~]$. oraenv
ORACLE_SID = [oracle] ? stndby
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Fri Jun 5 19:12:20
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Last Successful login time: Fri Jun 05 2020 18:53:53 -04:00

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> alter session set container=dev1;

Session altered.

SQL> show pdbs

CON_ID CON_NAME OPEN MODE RESTRICTED

 3 DEV1 READ ONLY NO
SQL> @/home/oracle/setup/problem_query.sql
```

```

3 SQL> SELECT /* problem_query */
4 SUM(UNIT_PRICE *1.10) revenue, o.order_id --, order_status, order_datetime
5 FROM Order_items I join orders o
6 ---On o.order_id = i.order_id
7 WHERE o.order_datetime < sysdate
8 group by o.order_id
9
10 1950 rows

```

5. Find `sql_id` of the problem query.

```

SQL> select sql_id, sql_text from v$sql where sql_text like
'%'problem_query%'';

SQL_ID

SQL_TEXT

80rmhy60c1nga
select sql_id, sql_text from v$sql where sql_text like
'%problem_query%'

an7zryzf86prm
SELECT /* problem_query */
 SUM(UNIT_PRICE *1.10) revenue, o.order_id --, order_status,
order_datetime
 FROM Order_items I join orders o
 On o.order_id = i.order_id
 WHERE o.order_datetime < sysdate
 group by o.order_id

```

6. Open a new terminal window logged in as `oracle` to `stndby` with the environment variables set for `stndby` appropriately.

```

[oracle@stndby ~]$. oraenv
ORACLE_SID = [oracle] ? stndby
The Oracle base has been set to /u01/app/oracle
[oracle@stndby ~]$ sqlplus / as sysdba

```

```

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Jun 11 01:19:22
2020
Version 19.3.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL>

```

- In the same terminal session, verify that the `sql_id` of the problem query is visible.

**Note:** At times, the problem query doesn't appear in the CDB root container due to an internal delay. If that is the case, return to the terminal session used in step 4 and run the `problem_query.sql` script again.

```

SQL> select sql_id, sql_text from v$sql where sql_text like
'%problem_query%';

SQL_ID

SQL_TEXT

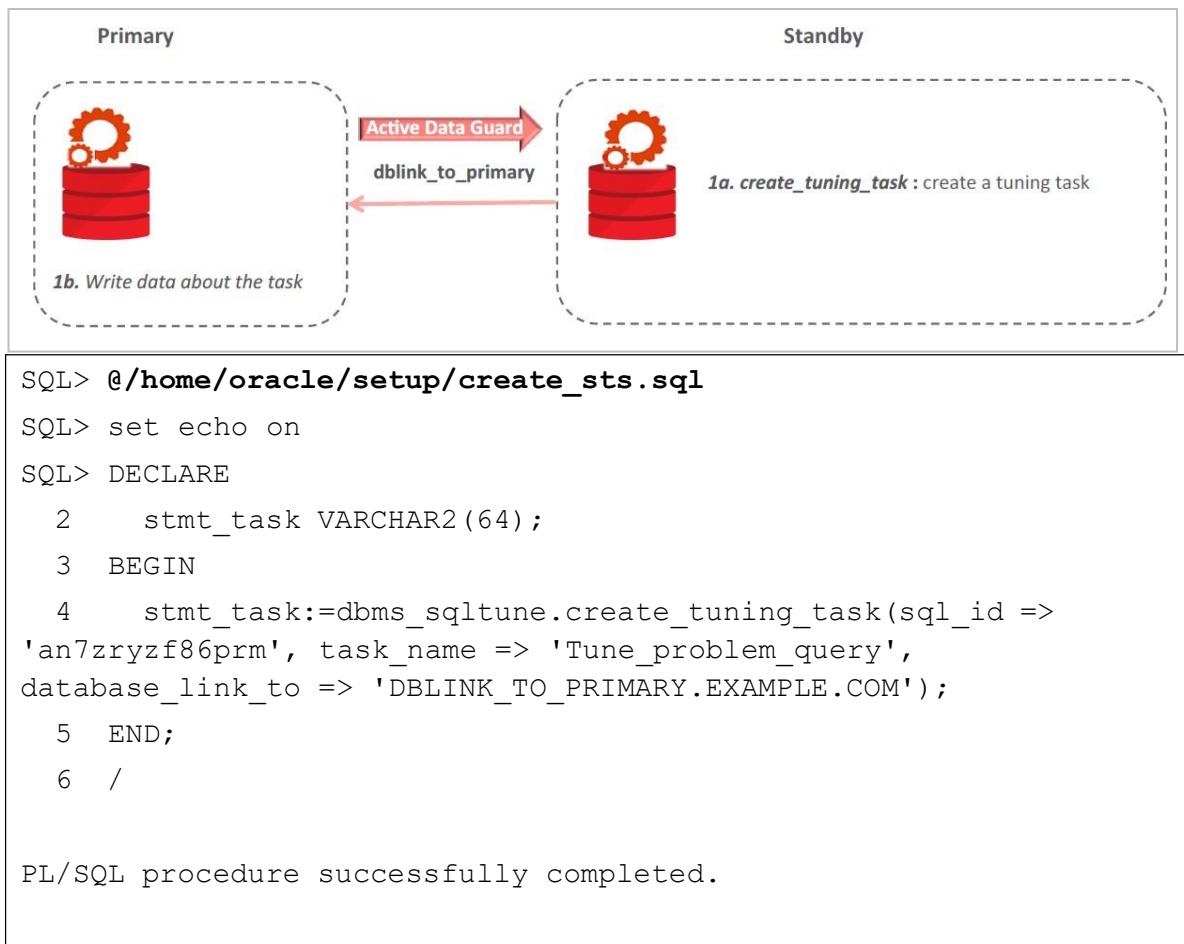
80rmhy60c1nga
select sql_id, sql_text from v$sql where sql_text like
'%problem_query%'

an7zryzf86prm
SELECT /* problem_query */
 SUM(UNIT_PRICE *1.10) revenue, o.order_id --, order_status,
order_datetime
 FROM Order_items I join orders o
 On o.order_id = i.order_id
 WHERE o.order_datetime < sysdate
 group by o.order_id

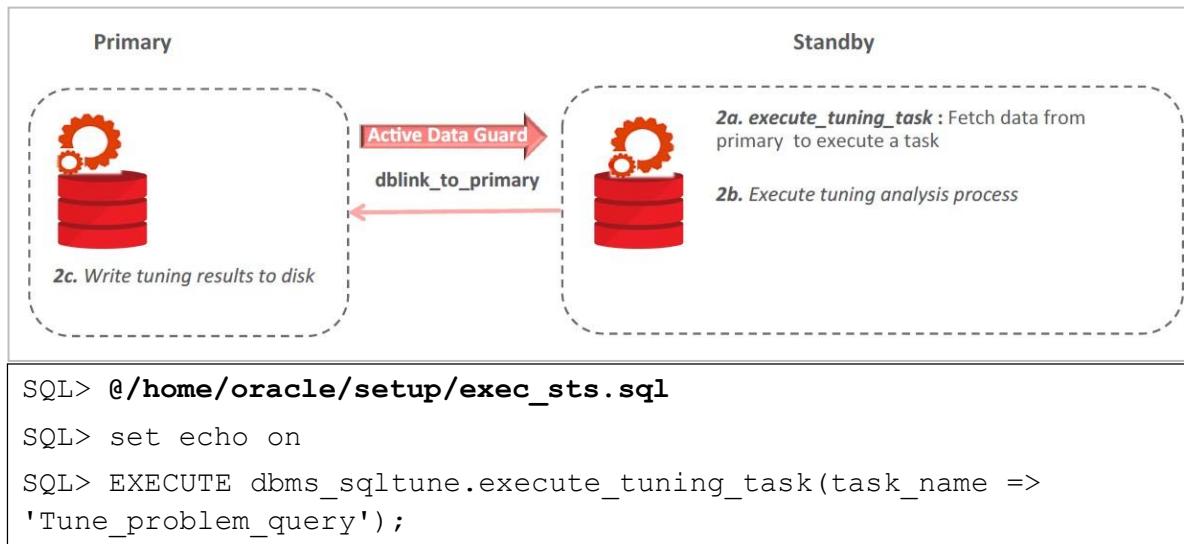
```

## 8. Create a SQL Tuning Task.

**Note:** If you receive ORA-13780: SQL statement does not exist, return to the terminal session used in step 4 and run the problem\_query.sql script again.



## 9. Execute the SQL Tuning Task.

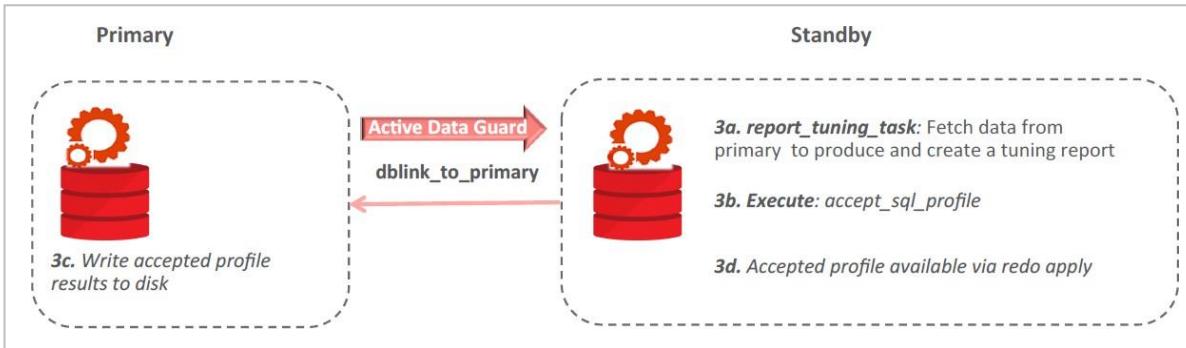


PL/SQL procedure successfully completed.

SQL>

10. Generate the SQL Tuning Task report.

**Note:** The result varies.



```
SQL> @/home/oracle/setup/get_sts.sql
SQL> SET linesize 200
SQL> SET LONG 999999999
SQL> SET pages 1000
SQL> SET longchunksize 20000
SQL> SELECT dbms_sqltune.report_tuning_task('Tune_problem_query',
 'TEXT', 'ALL') FROM dual;
DBMS_SQLTUNE.REPORT_TUNING_TASK('TUNE_PROBLEM_QUERY','TEXT','ALL')

GENERAL INFORMATION SECTION

Tuning Task Name : Tune_problem_query
Tuning Task Owner : OE
Tuning Task ID : 12
Workload Type : Single SQL Statement
Execution Count : 1
Current Execution : EXEC_22
Execution Type : TUNE SQL
```

```
Scope : COMPREHENSIVE
Time Limit(seconds): 1800
Completion Status : COMPLETED
Started at : 06/05/2020 22:21:31
Completed at : 06/05/2020 22:21:35
```

```

Schema Name : OE
Container Name: DEV1
SQL ID : an7zryzf86prm
SQL Text : SELECT /* problem_query */
 SUM(lo_extendedprice * lo_discount) revenue
 FROM oe.lineorder l, oe.date_dim d
 WHERE l.lo_orderdate = d.d_datekey
```

```


FINDINGS SECTION (2 findings)
```

```


1- Statistics Finding
```

```
Table "OE"."DATE_DIM" was not analyzed.
```

```


Recommendation
```

```
- Consider collecting optimizer statistics for this table.
 execute dbms_stats.gather_table_stats(ownname => 'OE',
 tabname =>
 'DATE_DIM', estimate_percent =>
 DBMS_STATS.AUTO_SAMPLE_SIZE,
 method_opt => 'FOR ALL COLUMNS SIZE AUTO');
```

```


Rationale
```

```
The optimizer requires up-to-date statistics for the table in
order to select a good execution plan.
```

## 2- Statistics Finding

---

Table "OE"."order\_items" was not analyzed.

### Recommendation

---

- Consider collecting optimizer statistics for this table.

```
execute dbms_stats.gather_table_stats(ownname => 'OE',
tabname =>
 'ORDER_ITEMS', estimate_percent
=>DBMS_STATS.AUTO_SAMPLE_SIZE,
method_opt => 'FOR ALL COLUMNS SIZE AUTO');
```

### Rationale

---

The optimizer requires up-to-date statistics for the table in order to

select a good execution plan.

---

---

## EXPLAIN PLANS SECTION

---

---

### 1- Original

---

Plan hash value: 2963256899

---

---

| Id   | Operation        | Name | Rows | Bytes | Cost (%CPU) |
|------|------------------|------|------|-------|-------------|
| Time |                  |      |      |       |             |
| 0    | SELECT STATEMENT |      | 1    | 52    | 6448        |
| (1)  | 00:00:01         |      |      |       |             |

---

---

|                |   |                   |           |       |       |      |
|----------------|---|-------------------|-----------|-------|-------|------|
|                | 1 | SORT AGGREGATE    |           | 1     | 52    |      |
|                |   |                   |           |       |       |      |
| *              | 2 | HASH JOIN         | 1610K     | 79M   | 6448  | (1)  |
| 00:00:01       |   |                   |           |       |       |      |
|                | 3 | TABLE ACCESS FULL | DATE_DIM  | 2556  | 33228 | 12   |
| (0)   00:00:01 |   |                   |           |       |       |      |
|                | 4 | TABLE ACCESS FULL | LINEORDER | 1610K | 59M   | 6431 |
| (1)   00:00:01 |   |                   |           |       |       |      |

---



---

Query Block Name / Object Alias (identified by operation id):

---



---

1 - SEL\$1  
 3 - SEL\$1 / D@SEL\$1  
 4 - SEL\$1 / L@SEL\$1

Predicate Information (identified by operation id):

---



---

2 - access ("L"."LO\_ORDERDATE"="D"."D\_DATEKEY")

Column Projection Information (identified by operation id):

---



---

1 - (#keys=0) SUM("LO\_EXTENDEDPRICE" \* "LO\_DISCOUNT") [22]  
 2 - (#keys=1; rowset=256) "LO\_DISCOUNT" [NUMBER,22],  
     "LO\_EXTENDEDPRICE" [NUMBER,22]  
 3 - (rowset=256) "D"."D\_DATEKEY" [NUMBER,22]  
 4 - (rowset=256) "L"."LO\_ORDERDATE" [NUMBER,22],  
     "LO\_EXTENDEDPRICE" [NUMBER,22], "LO\_DISCOUNT" [NUMBER,22]

Note

---

- dynamic statistics used: dynamic sampling (level=2)

---



---

```
SQL>
```

11. Return to the terminal session connected to localhost. Switch to the DEV1 container.

```
SQL> show con_name

CON_NAME

CDB$ROOT
SQL>
SQL>
SQL> alter session set container=dev1;

Session altered.

SQL>
```

12. Optionally, implement the recommendations.

**Note:** If the recommendation is about the implementation of a profile, you can accept the profile directly in the standby database. The accepted profile is written to the primary database. Then the same profile is available in the standby database via redo apply.

```
SQL> execute dbms_stats.gather_table_stats(ownname => 'OE',
 tabname => 'ORDER_ITEMS', estimate_percent =>
 DBMS_STATS.AUTO_SAMPLE_SIZE, method_opt => 'FOR ALL COLUMNS SIZE
 AUTO') ;

PL/SQL procedure successfully completed.

SQL> execute dbms_stats.gather_table_stats(ownname =>
 'OE',tabname => 'ORDERS', estimate_percent =>
 DBMS_STATS.AUTO_SAMPLE_SIZE, method_opt => 'FOR ALL COLUMNS SIZE
 AUTO') ;

PL/SQL procedure successfully completed.

SQL>
```

13. Exit SQL\*Plus on all hosts leaving the current terminal windows.

# **Practices for Lesson 14: Performing Role Transitions**

## **Practices for Lesson 14: Overview**

---

### **Practices Overview**

In these practices, you will perform a switchover, and then switch back to the original configuration to observe the physical standby session connected during role transition.

## Practice 14-1: Performing Switchover

---

### Overview

In this practice, you will use DGMGRL view the configuration status, validate that the databases are ready for a role reversal, and then perform a switchover. During the switchover, you will observe how the session connected to the physical standby database is managed by default.

### Tasks

1. Use a terminal window on localhost connected as oracle with the environment variables set to orclcdb. Launch the DGMGRL utility and connect as the SYSDG user.

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
[oracle@localhost ~]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Sat Jun 6
07:29:43 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect sysdg/<password>@orclcdb
Connected to "orclcdb"
Connected as SYSDG.
DGMGRL>
```

2. Use the SHOW CONFIGURATION command to display the configuration status for the Data Guard configuration.

```
DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxPerformance
Members:
orclcdb - Primary database
instance
 stndby - Physical standby database
 stndby2 - Logical standby database

Members Not Receiving Redo:
```

```
Fast-Start Failover: Disabled

Configuration Status:
SUCCESS (status updated 21 second ago)

DGMGRL>
```

3. Validate that the primary database is ready for role reversal using the **VERBOSE** option. The **VERBOSE** option will show all checks being performed during validation.

```
DGMGRL> validate database verbose orclcdb

Database Role: Primary database

Ready for Switchover: Yes

Flashback Database Status:
orclcdb: Off

Capacity Information:
Database Instances Threads
orclcdb 1 1

Managed by Clusterware:
orclcdb: NO
Validating static connect identifier for the primary
database orclcdb...
The static connect identifier allows for a connection to
database "orclcdb".

Temporary Tablespace File Information:
orclcdb TEMP Files: 3

Data file Online Move in Progress:
orclcdb: No

Transport-Related Information:
Transport On: Yes

Log Files Cleared:
orclcdb Standby Redo Log Files: Cleared

DGMGRL>
```

4. Validate that the physical standby database is ready for role reversal using the VERBOS option.

```
DGMGRL> validate database verbose stndby

Database Role: Physical standby database
Primary Database: orclcdb

Ready for Switchover: Yes
Ready for Failover: Yes (Primary Running)

Flashback Database Status:
 orclcdb: Off
 stndby: Off

Capacity Information:
 Database Instances Threads
 orclcdb 1 1
 stndby 1 1

Managed by Clusterware:
 orclcdb: NO
 stndby: NO
 Validating static connect identifier for the primary
 database orclcdb...
 The static connect identifier allows for a connection to
 database "orclcdb".

Temporary Tablespace File Information:
 orclcdb TEMP Files: 3
 stndby TEMP Files: 3

Data file Online Move in Progress:
 orclcdb: No
 stndby: No

Standby Apply-Related Information:
 Apply State: Running
 Apply Lag: 0 seconds (computed 1 second ago)
 Apply Delay: 0 minutes

Transport-Related Information:
 Transport On: Yes
 Gap Status: No Gap
```

Transport Lag: 0 seconds (computed 1 second ago)

Transport Status: Success

Log Files Cleared:

orclcdb Standby Redo Log Files: Cleared

stndby Online Redo Log Files: Cleared

stndby Standby Redo Log Files: Available

Current Log File Groups Configuration:

| Thread # | Online Redo Log Groups | Standby Redo Log Groups |
|----------|------------------------|-------------------------|
| Status   |                        | (stndby)                |

|   |   |   |
|---|---|---|
| 1 | 3 | 2 |
|---|---|---|

Insufficient SRLs

Future Log File Groups Configuration:

| Thread # | Online Redo Log Groups | Standby Redo Log Groups |
|----------|------------------------|-------------------------|
| Status   |                        | (stndby)                |

|   |   |   |
|---|---|---|
| 1 | 3 | 0 |
|---|---|---|

Insufficient SRLs

Warning: standby redo logs not configured for thread 1 on orclcdb

Current Configuration Log File Sizes:

| Thread # | Smallest Online Redo Log File Size | Smallest Standby Redo Log File Size |
|----------|------------------------------------|-------------------------------------|
|----------|------------------------------------|-------------------------------------|

|  |  |          |
|--|--|----------|
|  |  | (stndby) |
|--|--|----------|

|   |            |            |
|---|------------|------------|
| 1 | 200 MBytes | 200 MBytes |
|---|------------|------------|

Apply-Related Property Settings:

| Property       | orclcdb | Value |
|----------------|---------|-------|
| stndby Value   |         |       |
| DelayMins      | 0       | 0     |
| ApplyParallel  | AUTO    | AUTO  |
| ApplyInstances | 0       | 0     |

Transport-Related Property Settings:

| Property     | orclcdb | Value   |
|--------------|---------|---------|
| stndby Value |         |         |
| LogShipping  | ON      | ON      |
| LogXptMode   | ASYNC   | ASYNC   |
| Dependency   | <empty> | <empty> |
| DelayMins    | 0       | 0       |

|                 |          |          |
|-----------------|----------|----------|
| Binding         | optional | optional |
| MaxFailure      | 0        | 0        |
| ReopenSecs      | 300      | 300      |
| NetTimeout      | 30       | 30       |
| RedoCompression | DISABLE  | DISABLE  |

DGMGRL>

5. Use the terminal connected to `stndby` as oracle with the environment variables set to `stndby`. Launch SQL\*Plus and connect as the `SYSDG` user.

```
[oracle@stndby ~]$. oraenv
ORACLE_SID = [oracle] ? stndby
The Oracle base has been set to /u01/app/oracle
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sat Jun 6 07:36:51
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL>
```

6. Check the value of the `STANDBY_DB_PRESERVE_STATES` parameter.

```
SQL> show parameter STANDBY_DB_PRESERVE_STATES

NAME TYPE VALUE

standby_db_preserve_states string NONE
SQL>
```

**Note:** When a physical standby database is converted to a primary, you have the option of keeping any sessions connected to the physical standby connected, without disruption,

during the switchover or failover. NONE means no sessions on the standby are retained during a switchover or failover. This is the default value.

7. Make sure that the real-time query is enabled in the physical standby database.

```
SQL> select open_mode from v$database;

OPEN_MODE

READ ONLY WITH APPLY

SQL>
```

8. Return to the DGMGRL session on localhost. Switch over to the stndby physical standby database.

```
DGMGRL> switchover to stndby
Performing switchover NOW, please wait...
Operation requires a connection to database "stndby"
Connecting ...
Connected to "stndby"
Connected as SYSDG.
New primary database "stndby" is opening...
Operation requires start up of instance "orclcdb" on database
"orclcdb"
Starting instance "orclcdb"...
Connected to an idle instance.
ORACLE instance started.
Connected to
"orclcdb"Database
mounted.
Database opened.
Connected to
"orclcdb"
```

9. Display the new configuration.

**Note:** It takes a few minutes to clear up the ORA-\* error messages.

```
DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxPerformance
Members:
```

```
stndby - Primary database
stndbyFS - Far sync instance
orclcdb - Physical standby database
stndby2 - Logical standby database

Members Not Receiving Redo:
orclcdbFS - Far sync
instance

Fast-Start Failover: Disabled

Configuration Status:
SUCCESS (status updated 21 second ago)

DGMGRL> exit
```

**Note:** Remember that the indentation used in the output of the SHOW CONFIGURATION command indicates the hierarchy of how redo is being forwarded.

10. Return to the terminal session connected to stndby. Check the current status of the session that was connected to the original physical standby database. Exit SQL\*Plus.

```
SQL> select open_mode from v$database;
select open_mode from v$database
*
ERROR at line 1:
ORA-03135: connection lost contact
Process ID: 15166
Session ID: 52 Serial number: 2296

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition
Release 19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@stndby ~]$
```

**Note:** The physical standby session was lost during role transition. This is the default behavior.

11. In the same terminal window on stndby, launch the DGMGRL utility and connect as the SYSDG user.

```
[oracle@stndby ~]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Sat Jun 6
08:21:20 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect sysdg/<password>@stndby
Connected to "stndby"
Connected as SYSDG.
```

12. Perform a log switch on the new primary database stndby from within DGMGRL.

```
DGMGRL> SQL "alter system switch logfile";
Succeeded.
```

13. Verify that the new standby database orclcdb has zero transport lag and zero apply lag. You may need to wait a minute for this to clear.

```
DGMGRL> show database
orclcdb

Role: PHYSICAL STANDBY
Intended State: APPLY-ON
Transport Lag: 0 seconds (computed 0 seconds ago)
Apply Lag: 0 seconds (computed 0 seconds ago)
Average Apply Rate: 2.00 KByte/s
Real Time Query: ON
Instance(s):
 orclcdb

Database Status:
SUCCESS

DGMGRL>
```

14. Exit DGMGRL leaving the terminal windows open.

## Practice 14-2: Keeping Physical Standby Session Connected During Role Transition

### Overview

In this practice, you will use Enterprise Manager Cloud Control 13c and DGMGRL to view the configuration status, validate that the databases are ready for a role reversal, and then perform a switchover. During the switchover, you will observe how the session connected to the physical standby database is controlled with the `STANDBY_DB_PRESERVE_STATES` parameter.

### Tasks

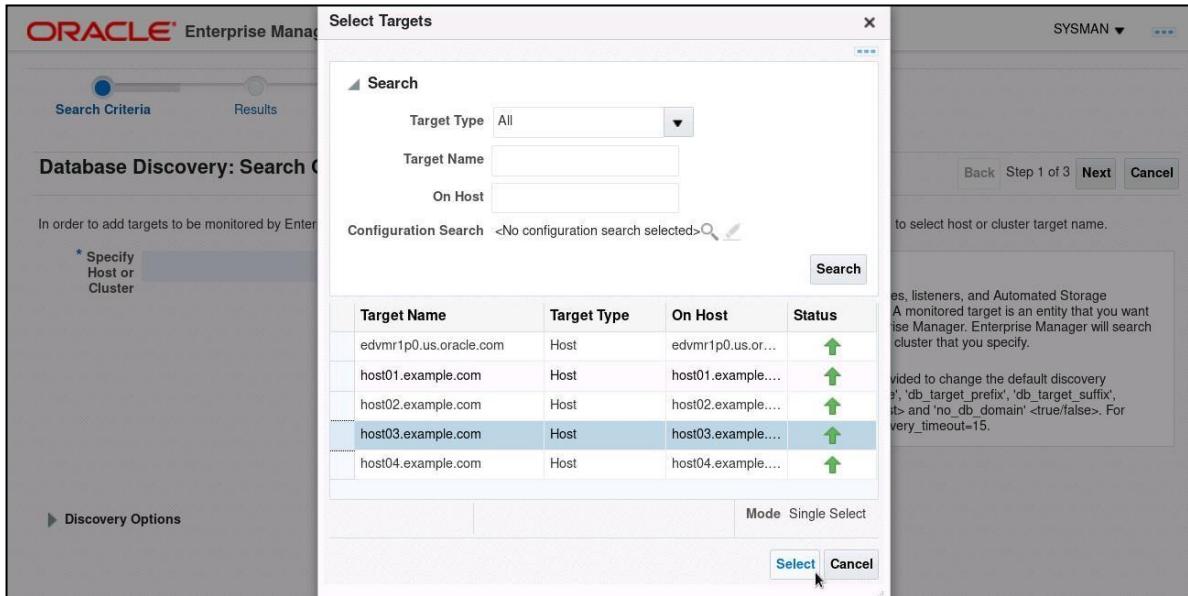
- With the navigation techniques learned in practice 10-3, navigate to the Databases pages.

| Name               | Type                                   | Status         | Target Version | Incidents | Average Compliance Score | Member Status Summary |
|--------------------|----------------------------------------|----------------|----------------|-----------|--------------------------|-----------------------|
| boston.example.com | Database Instance : Container, Primary | Green Up Arrow | 19.3.0.0.0     | 0 0 0     | N/A                      | 0 1 0 0               |
| ORCL               | Database Instance : Container          | Green Up Arrow | 19.3.0.0.0     | 0 0 0     | N/A                      | 0 1 0 0               |
| rcatcdb            | Database Instance : Container          | Green Up Arrow | 19.3.0.0.0     | 0 0 0     | N/A                      | 0 2 0 0               |

- Add the `stndby` database as an EM target in preparation of the Switchover practice through Enterprise Manager. Click **Add > Oracle Database**.

| Name               | Type                                      | Status         |
|--------------------|-------------------------------------------|----------------|
| boston.example.com | Database Instance : Container, Physica... | Green Up Arrow |
| ORCL               | Database Instance : Container             | Green Up Arrow |
| rcatcdb            | Database Instance : Container             | Green Up Arrow |

3. On the Database Discovery: Search Criteria page, enter the name of the host (`stndby`) by clicking the magnifying glass icon and selecting the host name in the dialog box. Then click **Next** to proceed.



4. On the Database Discovery: Results page, select the `stndby` database and provide the following information:
- Monitor Username: `sys`
  - Monitor Password: <password>
  - Role: `SYSDBA`

**Note:** You can also choose `dbsnmp` to lower the privilege instead of the `SYS` user.

The screenshot shows the 'Specify Common Monitoring Credentials' dialog. It has tabs for 'View', 'Specify Common Monitoring Credentials' (which is selected), 'Configure', and 'Test Connection'. The main area shows a table with columns: Target Name, Monitor Username, Monitor Password, Role, and Target Group. There are two rows: one for 'london2.example.com' with 'dbsnmp' as the monitor username and 'Normal' as the role, and another for 'london.example.com' with 'sys' as the monitor username and 'SYSDBA' as the role. The 'Target Group' column for both rows is empty.

5. Select the listed listener on `stndby`. Click **Next**.

The screenshot shows the 'Listeners' dialog. It has tabs for 'View' and 'Configure'. The main area shows a table with columns: Target Name, Listener Name, Machine Name, and Target Group. There are two rows: one for 'LISTENER\_host03.example.com' with 'LISTENER' as the listener name and 'host03.example.com' as the machine name, and another row which is currently not selected. The 'Target Group' column for both rows is empty.

6. On the Database Discovery: Review page, click **Save**.
7. In the Confirmation dialog box, click **Close**.
8. On the Databases page, set the Auto Refresh option to 30 seconds and wait until the `stndby.example.com` target becomes normal. Click the link for the `orclcldb.example.com` target.

Databases

Performance ▾ Availability ▾ Security ▾ Schema ▾ Administration ▾

View (○) Database Load Map (●) Search List

**Search**  
Find Name

View ▾

| Name               | Type                                    | Status | Target Version | Incidents |
|--------------------|-----------------------------------------|--------|----------------|-----------|
| boston.example.com | Database Instance : Container, Physical |        | 19.3.0.0.0     | 0 3 0     |
| london.example.com | Database Instance : Container, Primary  |        | 19.3.0.0.0     | 0 0 0     |
| ORCL               | Database Instance : Container           |        | 19.3.0.0.0     | 0 0 0     |
| rcatdb             | Database Instance : Container           |        | 19.3.0.0.0     | 0 0 0     |

9. On the `orclcldb.example.com` database home page, select **Data Guard Administration** from the Availability menu.

ORACLE® Enterprise Manager Cloud Control 13c

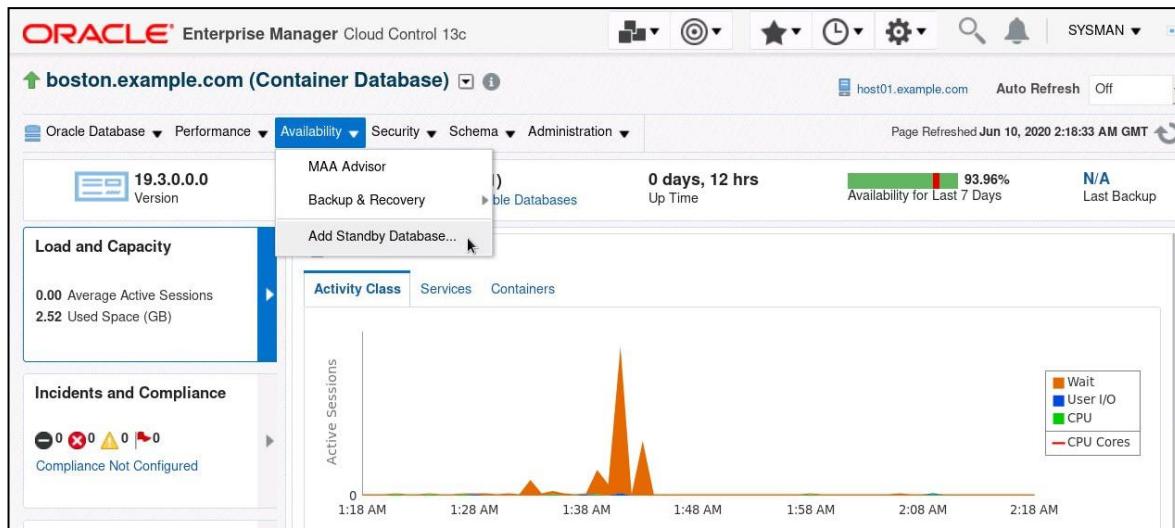
host01.example.com Auto Refresh Off

Page Refreshed Jun 10, 2020 1:29:22 PM GMT

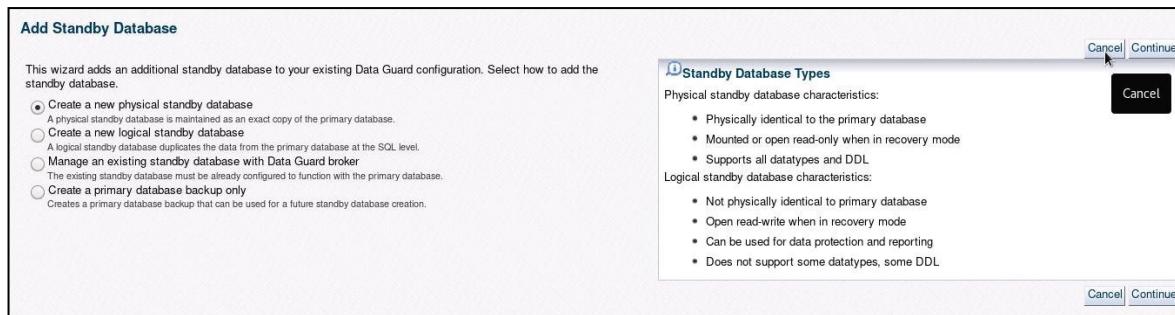
MAA Advisor  
Backup & Recovery  
**Data Guard Administration**  
Add Standby Database  
Data Guard Performance  
Verify Data Guard Configuration

0 days, 23 hrs Up Time  
Availability for Last 7 Days 94.4%  
N/A Last Backup

**(Optional)** If only the **Add Standby Database** link is visible, then select it. It will not launch the Add Standby Database Wizard, but instead, will navigate to the Data Guard home page.



**(Optional)** If the Add Standby Database link shows the Add Standby Database page, click **Cancel** to navigate to the Data Guard home page.



**(Optional)** On the Database Login Page, select **New** in the Credential option with the following values. Click **Login**.

- **Username:** sys
- **Password:** <*password*>
- **Role:** SYSDBA
- **Save As:** NC\_ORCLCDB\_SYS2

10. On the Data Guard home page, make sure that the status of the current primary and physical standby is Normal.

The screenshot shows the Oracle Enterprise Manager Cloud Control 13c interface for a container database named 'boston.example.com'. The 'Data Guard' section displays the following information:

- Primary Database:** Name: london.example.com, Host: host03.example.com, Data Guard Status: ✓ Normal (highlighted with a red box).
- Standby Databases:** A table listing four databases:
 

| Select                           | Name                | Host               | Data Guard Status | Role             |
|----------------------------------|---------------------|--------------------|-------------------|------------------|
| <input checked="" type="radio"/> | boston.example.com  | host01.example.com | ✓ Normal          | Physical Standby |
| <input type="radio"/>            | bostonFS            | host02.example.com | ✓ Normal          | Far Sync         |
| <input type="radio"/>            | london2.example.com | host03.example.com | ✓ Normal          | Logical Standby  |
| <input type="radio"/>            | londonFS            | host04.example.com | ✓ Normal          | Far Sync         |

11. Use the terminal connected to localhost as oracle with the environment variables set to orclcdb. Launch SQL\*Plus and connect as the SYS user.

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sat Jun 6 07:36:51
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.
```

```
Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL>
```

12. Set the value of the STANDBY\_DB\_PRESERVE\_STATES parameter to SESSION and restart the orclcdb database.

```
SQL> alter system set STANDBY_DB_PRESERVE_STATES = session
scope=spfile;

System altered.

SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL> startup
ORACLE instance started.

Total System Global Area 629145352 bytes
Fixed Size 9137928 bytes
Variable Size 373293056 bytes
Database Buffers 239075328 bytes
Redo Buffers 7639040 bytes
Database mounted.
Database opened.

SQL> show pdbs

CON_ID CON_NAME OPEN MODE RESTRICTED

 2 PDB$SEED READ ONLY NO
 3 DEV1 MOUNTED
```

**Note:** When a physical standby database is converted to a primary, you have the option of keeping any sessions connected to the physical standby connected, without disruption,

during the switchover or failover. SESSION means user sessions are retained during a switchover or failover.

13. Open the DEV1 PDB and start the Media Recovery Process. Exit SQL\*Plus.

**Note:** If the Media Recovery process is already running, you will receive the ORA-01153 error message. You can safely proceed to the next step.

```
SQL> alter pluggable database dev1 open;

Pluggable database altered.

SQL> alter database recover managed standby database disconnect;
alter database recover managed standby database disconnect
*
ERROR at line 1:
ORA-01153: an incompatible media recovery is active

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

14. Now, let's establish a new session for testing.

```
[oracle@localhost ~]$ sqlplus
oe/<password>@localhost:1521/dev1.example.com

SQL*Plus: Release 19.0.0.0.0 - Production on Sat Jun 6 08:57:31
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Last Successful login time: Fri Jun 05 2020 22:19:26 -04:00

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0
```

```

SQL> col username format a10
SQL> select username, sid, serial# from v$session where
sid=SYS_CONTEXT('USERENV','SID');

USERNAME SID SERIAL#

OE 42 40779

SQL>

```

15. With the navigation techniques learned, return to the EM Data Guard Home page. Switch over to the `orclcdb` physical standby database like the following.

**Note:** If the EM page shows a warning message due to the restart of the `orclcdb` database, refresh the browser.

- On the EM Data Guard Home page, select `orclcdb.example.com` in the StandbyDatabases section. Click **Switchover**.

| Standby Databases                |                     |                    |                                             |                  |
|----------------------------------|---------------------|--------------------|---------------------------------------------|------------------|
|                                  | Edit                | Remove             | Switchover                                  | Failover         |
| Select                           | Name                | Host               | Data Guard Status                           | Role             |
| <input checked="" type="radio"/> | boston.example.com  | host01.example.com | <span style="color: green;">✓</span> Normal | Physical Standby |
| <input type="radio"/>            | bostonFS            | host02.example.com | <span style="color: green;">✓</span> Normal | Far Sync         |
| <input type="radio"/>            | london2.example.com | host03.example.com | <span style="color: green;">✓</span> Normal | Logical Standby  |
| <input type="radio"/>            | londonFS            | host04.example.com | <span style="color: green;">✓</span> Normal | Far Sync         |

- On the Host Login (`localhost.example.com`) page, select **Preferred** in the Credential option. Click **Continue**.

Host Login: host01.example.com

Credential: Preferred

|                    |          |       |
|--------------------|----------|-------|
| Credential Details | UserName | Value |
|                    | Password | ***** |

Continue

- c. On the Host Login (`stndby.example.com`) page, select **Preferred** in the Credential option. Click **Continue**.

- d. On the Confirmation page, click **Yes**.

- e. Monitor the progress of Switchover. **DON'T WAIT** for completion. Move on to the next step.

16. Return to the SQL\*Plus session connected on `localhost`. Check the current status of the `OE` session periodically. Exit SQL\*Plus.

```

USERNAME SID SERIAL#

OE 42 40779

SQL> /

USERNAME SID SERIAL#

OE 42 40779

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition
Release 19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@stndby ~]$

```

**Note:** The OE session hangs for a while and resumes. With the new feature, the session is retained during role transition.

17. Return to the EM page. Once the switchover operation is complete, you will see the new primary database on the Data Guard home page.

The screenshot shows the Oracle Database Control EM Data Guard page. At the top, there is a yellow banner with an information icon and the text "Information: Switchover completed successfully." Below this, the "Data Guard" section is visible with the message "Page Refreshed June 10, 2020 9:03:50 PM UTC". The "Overview" section displays the following status information:

- Data Guard Status: ✓ Normal
- Protection Mode: Maximum Performance
- Fast-Start Failover: Disabled

The "Primary Database" section shows the following details for the primary database:

- Name: boston.example.com (highlighted with a red box)
- Host: host01.example.com
- Data Guard Status: ✓ Normal
- Current Log: 86
- Properties: Edit

# **Practices for Lesson 15: Using Flashback Database in a Data Guard Configuration**

## **Practices for Lesson 15: Overview**

---

### **Practices Overview**

In these practices, you will enable flashback database on both the primary database and the physical standby database. You will also test the automatic flashback of the physical standby database feature and manual flashback of the logical standby database.

## Practice 15-1: Configuring Flashback Database on the Primary Database

---

### Overview

In this practice, you will configure flashback database on the primary database and verify that it has been enabled.

### Tasks

1. Use a terminal window on localhost connected as oracle with the environment variables set to orclcdb. Launch SQL\*Plus and determine the current state of flashback

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sat Jun 6 10:41:04
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> select flashback_on from v$database;

FLASHBACK_ON

NO

SQL>
```

database.

- Verify that the primary database is in archive log mode, a pre-requisite to flashback database.

```
SQL> archive log list
Database log mode Archive Mode
Automatic archival Enabled
Archive destination USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence 139
Next log sequence to archive 141
Current log sequence 141
SQL>
```

- Verify that the fast recovery area has been configured for the primary database, a pre-requisite to flashback database.

```
SQL> show parameter db_recovery
NAME TYPE VALUE

db_recovery_file_dest string /u01/app/oracle
 /fast_recovery_area
db_recovery_file_dest_size big integer 15000M
```

- Determine the current amount of time in minutes for the flashback window.

```
SQL> show parameter flashback
NAME TYPE VALUE

db_flashback_retention_target integer 1440
SQL>
```

- Adjust the flashback window to be 3 days (1440 minutes/day x 3 days = 4320 minutes).

```
SQL> alter system set db_flashback_retention_target = 4320;
System altered.
```

- Enable flashback database for the whole database.

```
SQL> alter database flashback on;
Database altered
```

7. Verify that flashback database has been enabled.

```
SQL> select flashback_on from v$database;

FLASHBACK_ON

YES
```

8. Determine the current size (in bytes) of the flashback data.

```
SQL> select flashback_size from v$flashback_database_log;

FLASHBACK_SIZE

419430400

SQL>
```

9. Determine the name, quantity, and sizes of the flashback log files that were created when flashback database was enabled. Your file names will be different. Exit SQL\*Plus.

```
SQL> select name,bytes from v$flashback_database_logfile;

NAME

BYTES

/u01/app/oracle/fast_recovery_area/ORCLCDB/flashback/o1_mf_hfqbw2
0q_.flb
209715200

/u01/app/oracle/fast_recovery_area/ORCLCDB/flashback/o1_mf_hfqbw9
o5_.flb
209715200

SQL>
SQL> exit;
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

## Practice 15-2: Configuring Flashback Database on the Physical Standby Database

### Overview

In this practice, you will enable flashback database on the physical standby database.

### Tasks

1. Use a terminal window on `stndby` connected as `oracle` with the environment variables set to `stndby`. Launch SQL\*Plus and determine the current state of the flashback database.

```
[oracle@stndby ~]$. oraenv
ORACLE_SID = [oracle] ? stndby
The Oracle base has been set to /u01/app/oracle
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sat Jun 6 10:45:35
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> select flashback_on from v$database;

FLASHBACK_ON

NO

SQL>
```

2. Verify that the physical standby database is in archive log mode, a pre-requisite to flashback database.

```
SQL> archive log list
Database log mode Archive Mode
Automatic archival Enabled
Archive destination USE_DB_RECOVERY_FILE_DEST
```

```

Oldest online log sequence 0
Next log sequence to archive 0
Current log sequence 0
SQL>

```

- Verify that the fast recovery area has been configured for the physical standby database, a pre-requisite to flashback database.

| SQL> show parameter db_recovery |             |                                        |
|---------------------------------|-------------|----------------------------------------|
| NAME                            | TYPE        | VALUE                                  |
| db_recovery_file_dest           | string      | /u01/app/oracle<br>/fast_recovery_area |
| db_recovery_file_dest_size      | big integer | 15000M                                 |

- Determine the current amount of time in minutes for the flashback window.

| SQL> show parameter flashback |         |       |
|-------------------------------|---------|-------|
| NAME                          | TYPE    | VALUE |
| db_flashback_retention_target | integer | 1440  |

- Adjust the flashback window to be 3 days (1440 minutes/day x 3 days = 4320 minutes).

| SQL> alter system set db_flashback_retention_target = 4320; |  |  |
|-------------------------------------------------------------|--|--|
| System altered.                                             |  |  |

- Enable flashback database for the whole database. Note the error message that is returned.

| SQL> alter database flashback on;                   |  |  |
|-----------------------------------------------------|--|--|
| alter database flashback on                         |  |  |
| *                                                   |  |  |
| ERROR at line 1:                                    |  |  |
| ORA-01153: an incompatible media recovery is active |  |  |

- Stop the managed recovery mode for the physical standby database.

| SQL> alter database recover managed standby database cancel; |  |  |
|--------------------------------------------------------------|--|--|
| Database altered.                                            |  |  |

8. Return to the SQL\*Plus session on `stndby` connected to the `stndby` physical standby database and enable flashback database a second time.

```
SQL> alter database flashback on;
```

```
Database altered.
```

9. Verify that flashback database has been enabled.

```
SQL> select flashback_on from v$database;
```

```
FLASHBACK_ON
```

```

YES
```

10. Restart the managed recovery mode for the `stndby` physical standby database. Exit SQL\*Plus when done.

```
SQL> alter database recover managed standby database disconnect;
```

```
Database altered.
```

```
SQL> exit
```

```
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
```

```
Version 19.3.0.0.0
```

```
[oracle@stndby ~]$
```

## Practice 15-3: Configuring Flashback Database on the Logical Standby Database

---

### Overview

In this practice, you will enable flashback database on the logical standby database.

### Tasks

1. Use a terminal window on `stndby2` connected as `oracle` with the environment variables set to `stndby2`. Launch SQL\*Plus and determine the current state of flashback

```
[oracle@stndby ~]$. oraenv
ORACLE_SID = [stndby] ? stndby2
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sat Jun 6 10:47:39
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> select flashback_on from v$database;

FLASHBACK_ON

NO

SQL>
```

database.

- Verify that the logical standby database is in archive log mode, a pre-requisite to flashback database.

```
SQL> archive log list
Database log mode Archive Mode
Automatic archival Enabled
Archive destination USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence 31
Next log sequence to archive 33
Current log sequence 33
SQL>
```

- Verify that the fast recovery area has been configured for the physical standby database, a pre-requisite to flashback database.

```
SQL> show parameter db_recovery
NAME TYPE VALUE

db_recovery_file_dest string /u01/app/oracle
 /fast_recovery_area
db_recovery_file_dest_size big integer 15000M
```

- Determine the current amount of time in minutes for the flashback window.

```
SQL> show parameter flashback
NAME TYPE VALUE

db_flashback_retention_target integer 1440
```

- Adjust the flashback window to be 3 days (1440 minutes/day x 3 days = 4320 minutes).

```
SQL> alter system set db_flashback_retention_target = 4320;
System altered.
```

- Enable flashback database for the whole database. Note the error message that is returned.

```
SQL> alter database flashback on;
Database altered.
```

7. Verify that flashback database has been enabled.

```
SQL> select flashback_on from v$database;

FLASHBACK_ON

YES

SQL> exit;
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@stndby ~]$
```

## Practice 15-4: Testing Automatic Flashback of Standby Database

---

### Overview

In this practice, you will flash back your primary database after some incorrect updates to the database. After the primary database is recovered, you will observe the automatic flashback of standby database feature.

### Tasks

1. Use a terminal window on localhost connected as oracle with the environment variables set to orclcdb. Launch SQL\*Plus to connect to DEV1 PDB as the SYS user and create a guaranteed restore point called orclcdb\_grp.

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [orclcdb] ? orclcdb
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@localhost ~]$ sqlplus sys/<password>@localhost:1521/dev1
as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sat Jun 6 11:00:55 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> CREATE RESTORE POINT orclcdb_grp GUARANTEE FLASHBACK
DATABASE;

Restore point created.

SQL> col name format a30

NAME SCN REP

ORCLCDB_GR 3955268 NO
```

2. View HR data to determine the sum of the SALARY column in the HR.EMPLOYEES table and the total number of employees in department 90. You will use this information for comparison during this practice.

```
SQL> @/home/oracle/setup/view_HR.sql

SQL> SELECT sum(salary) FROM hr.employees;
```

```

SUM(SALARY)

691416

SQL> SELECT count(*) FROM hr.employees where department_id=90;

COUNT(*)

3

```

3. Execute the `user_errors.sql` script to update tables in the `HR` schema. Assume that it creates issues from which you will “recover” by flashing back the database in this practice.

```

SQL> @/home/oracle/setup/user_errors.sql

update hr.employees set department_id = 90 where job_id =
'IT_PROG';

5 rows updated.

update hr.employees e set salary = least(e.salary, (select
(min_salary + max_salary)/2 * 1.10 from hr.jobs j where j.job_id =
e.job_id)) where job_id not like 'AD_%';

103 rows updated.

COMMIT;

Commit complete

SQL>

```

4. Query the updated data in the `HR` schema and compare the results to the values you received in the queries in step 2.

```

SQL> @/home/oracle/setup/view_HR.sql

SQL> SELECT sum(salary) FROM hr.employees;

SUM(SALARY)

679092.4

SQL> SELECT count(*) FROM hr.employees where department_id=90;

COUNT(*)

8

```

5. Use a terminal window on `stndby` connected as `oracle` with the environment variables set to `stndby`. Launch SQL\*Plus to connect to `DEV1` PDB. If the `DEV1` PDB is not open, open it first.

```
[oracle@stndby ~]$. oraenv
ORACLE_SID = [oracle] ? stndby
The Oracle base has been set to /u01/app/oracle
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sat Jun 6 15:50:36
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> show pdbs

CON_ID CON_NAME OPEN MODE RESTRICTED

 2 PDB$SEED MOUNTED
 3 DEV1 MOUNTED

-- If the stndby database is in the MOUNT mode

SQL> alter database open;

Database altered.

SQL> alter pluggable database dev1 open;

Pluggable database altered.

SQL> show pdbs

CON_ID CON_NAME OPEN MODE RESTRICTED

 2 PDB$SEED READ ONLY NO
 3 DEV1 READ ONLY NO

SQL>
SQL> alter session set container = DEV1;

Session altered.

SQL>
```

6. Verify that the restore points were replicated to the stndby standby database.

```
SQL> col name format a30
SQL> SELECT name, scn, replicated FROM v$restore_point;

NAME SCN REP

ORCLCDB_GRP_PRIMAR 3955268 YES
```

**Note:** The restore point created in the primary database was replicated to the physical standby database.

7. Query the data in the HR schema in the stndby physical standby database.

```
SQL> @/home/oracle/setup/view_HR.sql

SQL> SELECT sum(salary) FROM hr.employees;

SUM(SALARY)

679092.4

SQL> SELECT count(*) FROM hr.employees where department_id=90;

COUNT(*)

8
```

**Note:** As you can see, the unwanted changes were applied in the stndby physical standby database.

8. Return to the terminal session connected to localhost. Shut down and mount the orclcdb database to prepare for the FLASHBACK DATABASE operation. Exit SQL\*Plus.

```
SQL> connect / as sysdba
Connected.
SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL> startup mount
ORACLE instance started.

Total System Global Area 629145352 bytes
Fixed Size 9137928 bytes
Variable Size 377487360 bytes
Database Buffers 234881024 bytes
Redo Buffers 7639040 bytes
Database mounted.
SQL> exit
```

```
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

9. Log in to the RMAN utility to run the FLASHBACK DATABASE command to flash back the database to the restore point called `orclcdb_grp`. Exit RMAN.

```
[oracle@localhost ~]$ rman target ''/ as sysbackup"

Recovery Manager: Release 19.0.0.0.0 - Production on Sat Jun 6
19:27:13 2020
Version 19.3.0.0.0

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reserved.

connected to target database: ORCLCDB (DBID=2732274290, not open)

RMAN> FLASHBACK DATABASE TO RESTORE POINT ORCLCDB_GRP;

Starting flashback at 06-JUN-20
using target database control file instead of recovery catalog
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=15 device type=DISK

starting media recovery
media recovery complete, elapsed time: 00:00:03

Finished flashback at 06-JUN-20

RMAN> exit

Recovery Manager complete.
[oracle@localhost ~]$
```

10. Using SQL\*Plus, log in as the `SYS` user to open the primary database and the `DEV1` PDB in read-only mode.

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sat Jun 6 19:30:34
2020
Version 19.3.0.0.0

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Connected to:
```

```

Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> alter database open read only;

Database altered.

SQL> alter pluggable database dev1 open read only;

Pluggable database altered.

```

11. Connect to the DEV1 PDB to verify that the database was flashed back correctly by querying the HR.EMPLOYEES table again. The values should match the values you obtained in the queries in step 2.

```

SQL> alter session set container = DEV1;

Session altered.

SQL> @/home/oracle/setup/view_HR.sql

SQL> SELECT sum(salary) FROM hr.employees;

SUM(SALARY)

691416

SQL> SELECT count(*) FROM hr.employees where department_id=90;

COUNT(*)

3

```

**Note:** The flashback operation cleaned up the unwanted changes in the primary database.

12. Now, restart the primary database with RESETLOGS and make sure that the DEV1 PDB is open.

```

SQL> connect / as sysdba
Connected.
SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL> startup mount
ORACLE instance started.

Total System Global Area 629145352 bytes
Fixed Size 9137928 bytes

```

```

Variable Size 377487360 bytes
Database Buffers 234881024 bytes
Redo Buffers 7639040 bytes
Database mounted.

SQL> alter database open resetlogs;

Database altered.

SQL> show pdbs

 CON_ID CON_NAME OPEN MODE RESTRICTED
----- -----
 2 PDB$SEED READ ONLY NO
 3 DEV1 READ WRITE NO
SQL>

```

13. Return to the terminal session connected to `stndby` to check if the automatic flashback feature was used in the `stndby` standby database.

```

SQL> @/home/oracle/setup/view_HR.sql

SQL> SELECT sum(salary) FROM hr.employees;

SUM(SALARY)

679092.4

SQL> SELECT count(*) FROM hr.employees where department_id=90;

COUNT(*)

8

```

**Note:** The physical standby database still shows the unwanted changes.

14. In the same SQL\*Plus session on `stndby`, review the alert log file. Press `CTRL+C` to exit.

```

SQL> host tail -100
/u01/app/oracle/diag/rdbms/stndby/stndby/trace/alert_stndby.log|more
...
Errors in file
/u01/app/oracle/diag/rdbms/stndby/stndby/trace/stndby_mrp0_26165.t
rc:
ORA-19909: datafile 1 belongs to an orphan incarnation
ORA-01110: data file 1:
'/u01/app/oracle/oradata/STNDBY/system01.dbf'
2020-06-06T20:36:13.138213-04:00
MRP0 (PID:26165): Recovery coordinator encountered one or more
errors during automatic flashback on standby
2020-06-06T20:36:13.138312-04:00
Background Media Recovery process shutdown (stndby)

```

```

2020-06-06T20:37:17.941175-04:00
 rfs (PID:26865): Opened log for T-1.S-1 dbid 2732274290 branch
1042403723
2020-06-06T20:37:17.947674-04:00
 rfs (PID:26865): Archived Log entry 5 added for B-1042403723.T-
1.S-1 ID 0xa2e0186f LAD:2
2020-06-06T20:37:18.004013-04:00
 rfs (PID:26867): Opened log for T-1.S-2 dbid 2732274290 branch
1042403723
2020-06-06T20:37:18.008815-04:00
 rfs (PID:26867): Archived Log entry 6 added for B-1042403723.T-
1.S-2 ID 0xa2e0186f LAD:2
2020-06-06T20:37:43.939464-04:00
Control autobackup written to DISK device

handle
'/u01/app/oracle/fast_recovery_area/STNDBY/autobackup/2020_06/o
1_mf_s_1042403484_hfrfpq8w_.bkp'

===== CTRL + C =====

SQL>

```

**Note:** The alert log indicates that the automatic flashback on standby didn't work because the standby database is currently open. This feature works in the MOUNT state.

15. Connect as the SYS user and mount the stndby database.

```

SQL> connect / as sysdba
Connected.
SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL> startup mount
ORACLE instance started.

Total System Global Area 880802384 bytes
Fixed Size 9140816 bytes
Variable Size 767557632 bytes
Database Buffers 96468992 bytes
Redo Buffers 7634944 bytes
Database mounted.
SQL>

```

16. Review the alert log file again. Press Ctrl+C to exit.

```

SQL> host grep -i flashback
/u01/app/oracle/diag/rdbms/stndby/stndby/trace/alert_stndby.log|mo
re
...
Flashback Restore Start

```

```
Flashback Restore Complete
Flashback Media Recovery Start
Flashback Media Recovery Complete
...
===== CTRL + C =====
SQL>
```

**Note:** The alert log file includes the Flashback Media Recovery Complete message, which indicates the automatic flashback of physical standby feature was applied in the stndby physical standby database.

17. Open the standby database and DEV1 PDB.

```
SQL> alter database open;
Database altered.

SQL> alter pluggable database dev1 open;
Pluggable database altered.

SQL>
```

18. Run the same query to see if the unwanted changes were cleaned up.

```
SQL> alter session set container = DEV1;
Session altered.

SQL> @/home/oracle/setup/view_HR.sql

SQL> SELECT sum(salary) FROM hr.employees;
SUM(SALARY)

691416

SQL> SELECT count(*) FROM hr.employees where department_id=90;
COUNT(*)

3

SQL>
```

**Note:** The flashback operation was automatically performed in the physical standby database. So, the unwanted changes were cleaned up.

19. Return to the SQL\*Plus session on `localhost` connected to the primary database. Switch to the `DEV1` PDB and drop the restore point.

```
SQL> alter session set container = DEV1;
Session altered.

SQL> drop restore point orclcdb_grp;
Restore point dropped.

SQL>
```

20. Exit SQL\*Plus on `localhost` and `stndby` leaving the terminal windows open for future practices.

## Practice 15-5: Performing Flashback of the Logical Standby Database

---

### Overview

In this practice, you will examine the `stndby2` logical standby database to test if the automatic flashback of standby database feature works with the logical standby database or not. Finally, you will perform the flashback of the `stndby2` logical standby database manually.

### Tasks

1. Use the terminal window connected to `stndby` as oracle with the environment variables set to `stndby2`. Connect to the `DEV1` PDB.

```
[oracle@stndby ~]$. oraenv
ORACLE_SID = [oracle] ? stndby2
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sat Jun 6 13:13:37
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> alter session set container=dev1;
Session altered.

SQL>
```

2. Query the updated data in the `HR` schema.

```
SQL> @/home/oracle/setup/view_HR.sql
SQL> SELECT sum(salary) FROM hr.employees;
SUM(SALARY)

679092.4

SQL> SELECT count(*) FROM hr.employees where department_id=90;
COUNT(*)

8

SQL>
```

3. Open a new terminal window connected to `stndby`. Review the alert log file for the `stndby2` standby database.

```
[oracle@stndby ~]$ tail -f
/u01/app/oracle/diag/rdbms/stndby2/stndby2/trace/alert_stndby2.log
LOGMINER: Memory Release Limit: 1M
LOGMINER: Max Decomp Region Memory: 1M
LOGMINER: Transaction Queue Size: 1024
2020-06-06T13:05:34.735266-04:00
Fatal Error: LogMiner: session# 1 processed beyond new branch
scn.
LOGSTDBY status: ORA-01346: Oracle LogMiner processed redo beyond
primary reset log SCN 3878101

2020-06-06T13:05:34.738051-04:00
Errors in file
/u01/app/oracle/diag/rdbms/stndby2/stndby2/trace/stndby2_lsp0_9101
.trc:
ORA-01346: Oracle LogMiner processed redo beyond primary reset log
SCN 3878101
```

**Note:** The alert log file shows the automatic flashback of the logical standby database didn't work.

4. Since the automatic flashback of standby feature works for the physical standby database, you will have to flash back the logical standby database manually. Use the terminal window to connect to `localhost` as `oracle`.

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [orclcdb] ? orclcdb
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sat Jun 6 13:23:11
2020
Version 19.3.0.0.0

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Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL>
```

5. Using SQL\*Plus, determine an SCN that is at least two SCNs prior to the SCN when the OPEN RESETLOGS command was issued. This is necessary to enable the standby to recover properly through OPEN RESETLOGS. Use the following query to find the “before RESETLOGS” SCN

```
SQL> SELECT TO_CHAR(resetlogs_change# - 2) FROM v$database;
TO_CHAR(RESETLOGS_CHANGE#-2)

3955268
SQL>
```

6. Return the SQL\*Plus session connected to the `stndby2` database. Determine the target SCN for flashback operation at the logical standby. In this step, the `FLASHBACK_SCN` value for `PRIMARY_SCN` is from Step 5.

```
SQL> connect / as sysdba
Connected.
SQL> SELECT DBMS_LOGSTDBY.MAP_PRIMARY_SCN(PRIMARY_SCN => 3955268)
AS TARGET_SCN from DUAL;

TARGET_SCN

3598897
SQL>
```

7. Flash back the standby database to the “before RESETLOGS” SCN that you queried in step 6.

**Note:** Your SCN is different.

```
SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL> startup mount exclusive
ORACLE instance started.

Total System Global Area 880802384 bytes
Fixed Size 9140816 bytes
Variable Size 767557632 bytes
Database Buffers 96468992 bytes
Redo Buffers 7634944 bytes
Database mounted.
SQL> FLASHBACK DATABASE TO SCN <SCN in step 6>;

Flashback complete.
```

8. Open the stndby2 database in READ ONLY mode and verify the HR data in the DEV1 PDB.

```
SQL> alter database open read only;
Database altered.

SQL> alter pluggable database dev1 open read only;
Pluggable database altered.

SQL> alter session set container=DEV1;

Session altered.

SQL> @/home/oracle/setup/view_HR.sql

SQL> SELECT sum(salary) FROM hr.employees;

SUM(SALARY)

691416

SQL> SELECT count(*) FROM hr.employees where department_id=90;

COUNT(*)

3

SQL>
```

**Note:** As you can see, the logical standby database was successfully flushed back.

9. Open the stndby2 database with RESETLOGS.

```
SQL> connect / as sysdba
Connected.
SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL> startup mount
ORACLE instance started.

Total System Global Area 880802384 bytes
Fixed Size 9140816 bytes
Variable Size 658505728 bytes
Database Buffers 205520896 bytes
Redo Buffers 7634944 bytes
Database mounted.

SQL> ALTER DATABASE OPEN RESETLOGS;

Database altered.
```

```
SQL> ALTER PLUGGABLE DATABASE DEV1 OPEN;
Pluggable database altered.
```

10. Restart SQL Apply on the standby database if it's not running. The standby database will be ready to receive and apply logs from the primary database.

**Note:** If SQL Apply is already running, you will receive ORA-16103. Exit SQL\*Plus.

```
SQL> ALTER DATABASE START LOGICAL STANDBY APPLY IMMEDIATE;
Database altered.

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@stndby ~]$
```

11. Launch the DGMGRL utility and connect as the SYSDG user.

```
[oracle@stndby ~]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Sat Jun 6
10:51:51 2020
Version 19.3.0.0.0

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reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect sysdg/<password>@orclcdb
Connected to "orclcdb"
Connected as SYSDG.
```

12. Use the SHOW CONFIGURATION command to display the configuration status for the Data Guard configuration.

```
DGMGRL> show configuration

Configuration - DRSSolution

Protection Mode: MaxPerformance
Members:
 orclcdb - Primary database
 orclcdbFS - Far sync
 instance
 stndby - Physical standby database
```

```
Members Not Receiving Redo:
 stndbyFS - Far sync instance

Fast-Start Failover: Disabled

Configuration Status:
 SUCCESS (status updated 56 seconds ago)

DGMGRL>
```

13. Exit DGMGRL and SQL\*Plus leaving the terminal windows open for future practices.



# **Practices for Lesson 16: Enabling Fast-Start Failover**

## **Practices for Lesson 16: Overview**

---

### **Practices Overview**

In these practices, you will set up and configure fast-start failover. You will then simulate a failure of the primary database and observe the automatic failover to the standby database.

## Practice 16-1: Configuring Fast-Start Failover in Observer-Only Mode

---

### Overview

In this practice, you will configure fast-start failover in observe-only mode. After configuring fast-start failover in observe-only mode, you will start the observer process. Then you will simulate the crash of the primary database for FSFO dry-run.

### Tasks

1. Use a terminal window on localhost connected as oracle with the environment variables set to orclcdb. Launch SQL\*Plus and perform a log switch on the primary database. Exit SQL\*Plus.

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
[oracle@localhost ~]$
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sat Jun 6 23:13:40
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> alter system switch logfile;

System altered.

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

2. Use a terminal window on connected as oracle with the environment variables set to stndby. Launch the DGMGRL utility and connect as the SYSDG user.

```
[oracle@host02 ~]$. oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
[oracle@host02 ~]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Sat Jun 6
23:17:05 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect sysdg/<password>@stndby Connected
to "stndby"
Connected as SYSDG.
DGMGRL>
```

3. Verify that there is no Transport Lag or Apply lag at the physical standby database and logical standby database before proceeding with labs.

```
DGMGRL> show database stndby

Database - stndby

Enterprise Manager Name: stndby:
 PHYSICAL STANDBY
Intended State: APPLY-ON
Transport Lag: 0 seconds (computed 1 second ago)
Apply Lag: 0 seconds (computed 1 second ago)
Average Apply Rate: 7.00 KByte/s
Real Time Query: ON
Instance(s):
 stndby

Database Status:
SUCCESS

DGMGRL> show database stndby2

Database - stndby2

Enterprise Manager Name: stndby2
Role: LOGICAL STANDBY
Intended State: APPLY-ON
Transport Lag: 0 seconds (computed 1 second ago)
Apply Lag: 0 seconds (computed 1 second ago)
Active Apply Rate: 785.02 KByte/s
Instance(s):
 stndby2

Database Status:
SUCCESS
```

sho

4. Display the current configuration and note the current state of fast-start failover.

```
DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxPerformance
Members:
 stndby - Primary database
 instance
 stndby - Physical standby database
 stndby2 - Logical standby database

Members Not Receiving Redo:

Fast-Start Failover: Disabled

Configuration Status:
 SUCCESS (status updated 46 seconds ago)

DGMGRL>
```

5. Set up the `FastStartFailoverTarget` configuration property on the `orclcdb` primary database to indicate the desired `stndby` target standby database.

```
DGMGRL> edit database orclcdb set property
FastStartFailoverTarget = stndby;
Property "faststartfailovertarget" updated
```

6. Define the reciprocal fast-start failover target for when the `stndby` physical standby database becomes the primary database. This would be set automatically by the broker if far sync was not in the configuration.

```
DGMGRL> edit database stndby set property
FastStartFailoverTarget = orclcdb;
Property "faststartfailovertarget" updated
```

7. Display the `FastStartFailoverTarget` configuration property for both the primary database and the physical standby database.

```
DGMGRL> show database stndby faststartfailovertarget;
FastStartFailoverTarget = 'orclcdb'

DGMGRL> show database orclcdb FastStartFailoverTarget;
FastStartFailoverTarget = 'stndby'
```

8. Modify the ObserverReconnect configuration property and set the value to 120 seconds.

```
DGMGRL> edit configuration set property ObserverReconnect=120;
Property "observerreconnect" updated
```

9. To enable fast-start failover the configuration must be upgraded to the maximum availability mode. Display the current RedoRoutes property for both the primary and standby database.

```
DGMGRL> show database orclcdb redoroutes;
RedoRoutes = '(orclcdb:orclcdb SYNC)'
DGMGRL> show database stndby redoroutes;
RedoRoutes = '(stndby:stndby SYNC)'
If this is blank do this:
DGMGRL> edit database stndby set property
'RedoRoutes'='(stndby:orclcdb ASYNC)';
```

**Note:** FASTSYNC would also be acceptable settings for the maximum availability.

10. Upgrade the protection mode to maximum availability.

```
DGMGRL> edit configuration set protection mode as
maxavailability;
Succeeded. -If this fails continue
```

11. Configure fast-start failover in observe-only mode to test how fast-failover will work in your environment.

```
DGMGRL> enable fast_start failover observe only;
Enabled in Observe-Only Mode. If this fails - continue on.
```

12. Start the observer process.

```
DGMGRL> start observer
[W000 2020-06-06T23:31:17.857-04:00] FSFO target standby is
stndby
Observer started
[W000 2020-06-06T23:31:18.273-04:00] Observer trace level is set
to USER
[W000 2020-06-06T23:31:18.273-04:00] Try to connect to the
primary.
[W000 2020-06-06T23:31:18.273-04:00] Try to connect to the
primary orclcdb.
[W000 2020-06-06T23:31:18.314-04:00] The standby stndby is ready
to be a FSFO target
[W000 2020-06-06T23:31:18.314-04:00] Reconnect interval expired,
create new connection to primary database.
[W000 2020-06-06T23:31:18.314-04:00] Try to connect to the
primary.
[W000 2020-06-06T23:31:18.375-04:00] Connection to the primary
restored!
```

```
[W000 2020-06-06T23:31:24.394-04:00] Disconnecting from database
orclcdb.
```

**Note:** The prompt will not return after starting the observer unless you start the observer in the background mode. Keep this terminal window open with the observer running in it.

13. Return to the terminal session connected to localhost. Simulate a crash of the primarydatabase.

```
[oracle@localhost ~]$ pgrep -lf smon
21521 ora_smon_stndby
[oracle@localhost ~]$ kill -9 21521 or whatever smon for stndby is
[oracle@localhost ~]$
```

14. Return to the Observer session Review the output.

```
DGMGRL> start observer
...
[W000 2020-06-06T23:33:18.179-04:00] Try to connect to the
primary.
[W000 2020-06-06T23:34:48.972-04:00] Primary database cannot be
reached.
[W000 2020-06-06T23:34:48.972-04:00] Fast-Start Failover threshold
has not exceeded. Retry for the next 30 seconds
[W000 2020-06-06T23:34:49.973-04:00] Try to connect to the
primary.
ORA-12537: TNS:connection closed

Unable to connect to database using orclcdb
[W000 2020-06-06T23:35:15.727-04:00] Primary database cannot be
reached.
[W000 2020-06-06T23:35:15.727-04:00] Fast-Start Failover threshold
has not exceeded. Retry for the next 3 seconds
[W000 2020-06-06T23:35:16.727-04:00] Try to connect to the
primary.
[W000 2020-06-06T23:35:17.806-04:00] Primary database cannot be
reached.
[W000 2020-06-06T23:35:17.806-04:00] Fast-Start Failover threshold
has not exceeded. Retry for the next 1 second
[W000 2020-06-06T23:35:18.806-04:00] Try to connect to the
primary.
[W000 2020-06-06T23:35:20.000-04:00] Primary database cannot be
reached.
```

```
[W000 2020-06-06T23:35:20.000-04:00] Fast-Start Failover threshold has expired.
[W000 2020-06-06T23:35:20.000-04:00] Try to connect to the standby.
[W000 2020-06-06T23:35:20.000-04:00] Making a last connection attempt to primary database before proceeding with Fast-Start Failover.
[W000 2020-06-06T23:35:20.000-04:00] Check if the standby is ready for failover.
[W000 2020-06-06T23:35:20.005-04:00] A fast-start failover would have been initiated...
[W000 2020-06-06T23:35:20.005-04:00] Unable to failover since this observer is in observe-only mode
[W000 2020-06-06T23:35:20.005-04:00] Fast-Start Failover is not possible because observe-only mode.
[W000 2020-06-06T23:35:21.006-04:00] Try to connect to the primary.
[W000 2020-06-06T23:35:22.095-04:00] Primary database cannot be reached.
[W000 2020-06-06T23:35:23.096-04:00] Try to connect to the primary.
[W000 2020-06-06T23:35:24.214-04:00] Primary database cannot be reached.
[W000 2020-06-06T23:35:25.215-04:00] Try to connect to the primary.
[W000 2020-06-06T23:35:49.321-04:00] Primary database cannot be reached.
[W000 2020-06-06T23:35:49.321-04:00] Fast-Start Failover threshold has not exceeded. Retry for the next 2 seconds
[W000 2020-06-06T23:35:50.322-04:00] Try to connect to the primary.
[W000 2020-06-06T23:35:51.400-04:00] Primary database cannot be reached.
[W000 2020-06-06T23:35:51.400-04:00] Fast-Start Failover threshold has expired.
[W000 2020-06-06T23:35:51.400-04:00] Try to connect to the standby.
[W000 2020-06-06T23:35:51.400-04:00] Making a last connection attempt to primary database before proceeding with Fast-Start Failover.
```

```
[W000 2020-06-06T23:35:51.400-04:00] Check if the standby is ready
for failover.
[W000 2020-06-06T23:35:51.405-04:00] A fast-start failover would
have been initiated...
[W000 2020-06-06T23:35:51.405-04:00] Unable to failover since this
observer is in observe-only mode
...
```

**Note:** The observe-only mode is useful to run the Fast-Start Failover in dry-run mode, where you want to be sure that your infrastructure is configured properly, without false alerts, before having it fully automated.

15. Return to the terminal session on localhost. Using SQL\*Plus, connect as the `SYS` user and start the primary database. Exit SQL\*Plus.

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sat Jun 6 23:50:11
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved. Connected to an
idle instance.

SQL> startup
ORACLE instance started.

Total System Global Area 629145352 bytes
Fixed Size 9137928 bytes
Variable Size 377487360 bytes
Database Buffers 234881024 bytes
Redo Buffers 7639040 bytes
Database mounted.
Database opened.

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

16. Launch the DGMGRL utility and connect as the `SYSDG` user.

```
[oracle@localhost ~]$ dgmgrl

DGMGRL for Linux: Release 19.0.0.0.0 - Production on Sat Jun 6
23:53:33 2020
Version 19.3.0.0.0
```

(c) 1982, 2019, Oracle and/or its affiliates. All rights reserved.

Welcome to DGMGRL, type "help" for information.

```
DGMGRL> connect sysdg/<password>@orclcdb
```

Connected to "orclcdb"

Connected as SYSDG.

```
DGMGRL>
```

17. Stop observer and disable Fast-Start Failover in Observe-only mode.

```
DGMGRL> stop observer
Observer stopped.
DGMGRL> DISABLE FAST_START FAILOVER
Disabled.
DGMGRL>
```

18. Exit DGMGRL and SQL\*Plus. Leave the terminal windows open for future practices.

## Practice 16-2: Enabling Fast-Start Failover

---

### Overview

In this practice, you will enable fast-start failover on `localhost` where the `stndby` is currently running. After enabling fast-start failover, you will start the observer process.

### Tasks

1. Use a terminal window on `localhost` connected as `oracle` with the environment variables set to `stndby`. Launch the DGMGRL utility and connect as the `SYSDB` user with operating system authentication.

```
[oracle@host02 ~]$. oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
[oracle@host02 ~]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Sun Jun 7
00:02:52 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect sysdg/<password>@orclcdb
Connected to "orclcdb"
Connected as SYSDB.
DGMGRL>Connected as SYSDB.
```

2. Verify that there is no Transport Lag or Apply lag at the physical standby database and logical standby database before proceeding with labs.

```
DGMGRL> show database orclcdb

Database - orclcdb

Enterprise Manager Name: orclcdb
Role: PHYSICAL STANDBY
Intended State: APPLY-ON
Transport Lag: 0 seconds (computed 1 second ago)
Apply Lag: 0 seconds (computed 1 second ago)
Average Apply Rate: 6.00 KByte/s
Real Time Query: ON
Instance(s):
orclcdb
```

```
Database Status:
SUCCESS
DGMGRL> show database stndby

Database - stndby2
Enterprise Manager Name: stndby2.example.com
Role: LOGICAL STANDBY
Intended State: APPLY-ON
Transport Lag: 0 seconds (computed 0 seconds ago) Apply
Lag: 0 seconds (computed 0 seconds ago) Apply Rate:
48.04 MByte/s
Instance(s):
stndby2

Database Status:
SUCCESS
```

3. Display the current configuration and note the current state of fast-start failover.

```
DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxAvailability
Members:
stndby - Primary database
instance
orclcdb - Physical standby database
stndby2 - Logical standby database

Members Not Receiving Redo:
stndbyFS - Far sync instance

Fast-Start Failover: Disabled

Configuration Status:
SUCCESS (status updated 61 seconds ago)

DGMGRL>
```

4. Enable fast-start failover.

```
DGMGRL> enable fast_start failover
Enabled in Zero Data Loss Mode.
```

5. Display a detailed status of the current fast-start failover settings.

```
DGMGRL> show fast_start failover

Fast-Start Failover: Enabled in Zero Data Loss Mode

Protection Mode: MaxAvailability
Lag Limit: 0 seconds

Threshold: 30 seconds
Active Target: stndby
Potential Targets: "stndby"
 stndby valid
Observer: (none)
Shutdown Primary: TRUE
Auto-reinstate: TRUE
Observer Reconnect: 120 seconds
Observer Override: FALSE

Configurable Failover Conditions
Health Conditions:
 Corrupted Controlfile YES
 Corrupted Dictionary YES
 Inaccessible Logfile NO
 Stuck Archiver NO
 Datafile Write Errors YES

Oracle Error Conditions:
 (none)
```

```
DGMGRL>
```

6. Start the observer process.

```
DGMGRL> start observer
...
```

**Note:** The prompt will not return after starting the observer. Keep this terminal window open with the observer running in it.

## Practice 16-3: Testing Fast-Start Failover

---

### Overview

In this practice, you will simulate a disaster on the primary database and observe the automatic failover to the standby database.

### Tasks

1. Use a terminal window on localhost connected as oracle with the environment variables set to orclcldb. Connect to the primary database using SQL\*Plus and simulate a failure by issuing the shutdown abort command. Exit SQL\*Plus.

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [oracle] ? orclcldb
The Oracle base has been set to /u01/app/oracle
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sun Jun 7 00:10:38
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> shutdown abort
ORACLE instance shut down.
SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

2. Observe the status output in the terminal session connected to 8c793fb03eed running the observer process from the previous lab step. It may take a minute before the failover is initiated.

```
DGMGRL> start observer
...
2020-06-11T16:23:56.156+00:00
Initiating Fast-Start Failover to database "stndby"...
[SO02 2020-06-11T16:23:56.156+00:00] Initiating Fast-start
Failover.
Performing failover NOW, please wait...
```

3. Use a terminal window on stndby connected as oracle with the environment variables set to stndby. Launch the DGMGRL utility and connect as the SYSDG user.

```
[oracle@stndby ~]$. oraenv
ORACLE_SID = [oracle] ? stndby
The Oracle base has been changed from /home/oracle to
/u01/app/oracle
[oracle@stndby ~]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Sun Jun 7
01:14:48 2020
Version 19.3.0.0.0

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reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect sysdg/<password>@stndby
Connected to "STNDBY"
Connected as SYSDG.
```

4. Display the current configuration and note the current state of fast-start failover.

**Note:** A series of error messages such as ORA-16844, ORA-16856, and ORA-16824 might be displayed for a while. Wait until you see only the ORA-16661 message for the orclcdb database.

```
DGMGRL> show configuration

Configuration - DRSSolution

Protection Mode: MaxAvailability
Members:
stndby - Primary database
stndbyFS - Far sync instance
```

```

orclcdb - Physical standby database (disabled)
ORA-16661: the standby database needs to be reinstated

stndby2 - Logical standby database

Members Not Receiving Redo:
orclcldbFS - Far sync instance

Fast-Start Failover: Enabled in Zero Data Loss Mode

Configuration Status:
SUCCESS (status updated 49 seconds ago)

```

5. Use a terminal window on `localhost` connected as `oracle` with the environment variables set to `orclcldb`. Connect to the former primary database (the new physical standby database) using SQL\*Plus and mount the `orclcldb` database to initiate reinstatement. Exit SQL\*Plus.

```

[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sun Jun 7 01:17:07
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved. Connected to an
idle instance.

SQL> startup mount
ORACLE instance started.

Total System Global Area 629145352 bytes
Fixed Size 9137928 bytes
Variable Size 377487360 bytes
Database Buffers 234881024 bytes
Redo Buffers 7639040 bytes
Database mounted.

SQL> exit

Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$

```

6. Observe the output in the terminal session on 8c793fb03eed running the observer process.

```
2020-06-07T01:18:53.809-04:00
Initiating reinstatement for database "orclcdb"...
Reinstating database "orclcdb", please wait...
[W000 2020-06-07T01:19:15.199-04:00] Primary database cannot be
reached.
[W000 2020-06-07T01:19:15.199-04:00] Fast-Start Failover target
switch is pending.
[W000 2020-06-07T01:20:09.156-04:00] Primary database cannot be
reached.
[W000 2020-06-07T01:20:09.156-04:00] Fast-Start Failover target
switch is pending.
[W000 2020-06-07T01:20:49.175-04:00] Primary database cannot be
reached.
[W000 2020-06-07T01:20:49.175-04:00] Fast-Start Failover target
switch is pending.
Reinstatement of database "orclcdb"
succeeded2020-06-07T01:21:09.990-04:00
[W000 2020-06-07T01:21:09.993-04:00] Successfully reinstated
database orclcdb.
[W000 2020-06-07T01:21:15.094-04:00] Disconnecting from database
stndby.
```

7. Return to the DGMGRL session running on stndby and display the configuration.

```
DGMGRL> show configuration
Configuration - DRSolution
 Protection Mode: MaxAvailability
 Databases:
 stndby - Primary database
 stndbyFS - Far Sync
 orclcdb - (*) Physical standby database
 Warning: ORA-16857: standby disconnected from redo
 source for longer than specified threshold
 stndby2 - Logical standby database
 orclcdbFS - Far Sync (inactive)

 Fast-Start Failover: ENABLED in Zero Data Loss Mode

 Configuration Status:
 WARNING
```

**Note:** The ORA-\* warning messages depend on the lag and overall performance of the environment. You may or may not see this warning statement. It is a matter of timing.

8. It may take a few moments for the lag for the standby database to clear. Keep displaying the status until it has cleared. Do not continue with labs until the apply lag and transport lag have cleared.

```
DGMGRL> show database orclcldb
Database - orclcldb

Role: PHYSICAL STANDBY
Intended State: APPLY-ON
Transport Lag: 0 seconds (computed 1 second ago) Apply
Lag: 0 seconds (computed 1 second ago) Apply Rate:
0 Byte/s
Real Time Query: OFF
Instance(s):
orclcldb

Database Status:
SUCCESS

DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxAvailability
Members:
stndby - Primary database
stndbyFS - Far sync instance
orclcldb - (*) Physical standby database
stndby2 - Logical standby database

Members Not Receiving Redo:
orclcldbFS - Far sync instance

Fast-Start Failover: Enabled in Zero Data Loss Mode

Configuration Status:
SUCCESS (status updated 55 seconds ago)

DGMGRL>
```

## Practice 16-4: Switchover to Reinstated Database

---

### Overview

In this practice, you will perform a switchover to return the configuration to the state that it was before the failover.

### Tasks

1. Validate that the `stndby` primary database is ready for switchover.

```
DGMGRL> validate database stndby

Database Role: Primary database

Ready for Switchover: Yes

Managed by Clusterware:
 stndby: NO
 Validating static connect identifier for the primary
 database stndby...
 The static connect identifier allows for a connection to
 database "stndby".

DGMGRL>
```

2. Validate that the `orclcdb` standby database is ready for switchover.

```
DGMGRL> validate database orclcdb

Database Role: Physical standby database
Primary Database: stndby

Ready for Switchover: Yes
Ready for Failover: Yes (Primary Running)

Managed by Clusterware:
 stndby: NO
 orclcdb: NO
 Validating static connect identifier for the primary
 database stndby...
 The static connect identifier allows for a connection to
 database "stndby".

Log Files Cleared:
 stndby Standby Redo Log Files: Cleared
```

```

orclcdb Online Redo Log Files: Not Cleared
orclcdb Standby Redo Log Files: Available

Current Log File Groups Configuration:
 Thread # Online Redo Log Groups Standby Redo Log Groups
Status (stndby)
 1 3 2
Insufficient SRLs

Future Log File Groups Configuration:
 Thread # Online Redo Log Groups Standby Redo Log Groups
Status (stndby)
 1 3 3
Insufficient SRLs

DGMGRL>

```

3. Switch over to the orclcdb database.

```

DGMGRL> switchover to orclcdb
Performing switchover NOW, please wait...
Operation requires a connection to database "orclcdb"
Connecting ...
Connected to
"orclcdb"Connected as
SYSDG.
New primary database "orclcdb" is opening...
Operation requires start up of instance "stndby" on database
"stndby"
Starting instance "stndby"...
Connected to an idle instance.
ORACLE instance started.
Connected to "stndby"
Database mounted.
Database opened.
Connected to "stndby"
Connected to
"orclcdb"

```

4. Display the resulting configuration.

**Note:** A series of error messages such as ORA-16810 and ORA-16786 might be displayed for a while. Wait until the status of the configuration becomes normal.

```
DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxAvailability
Members:
 orclcdb - Primary database
 orclcdbFS - Far sync
 instance
 stndby - (*) Physical standby database
 stndby2 - Logical standby database

Members Not Receiving Redo:
 stndbyFS - Far sync instance

Fast-Start Failover: Enabled in Zero Data Loss Mode

Configuration Status:
 SUCCESS (status updated 44 seconds ago)
```

5. Stop the observer process.

```
DGMGRL> stop observer
Observer stopped.
DGMGRL>
```

**Note:** The prompt should now be returned in the terminal window that was connected to host02 running the observer process.

6. Disable fast-start failover.

```
DGMGRL> disable fast_start failover
Disabled.
```

7. Reset the protection mode back to maximum performance and exit DGMGRL.

```
DGMGRL> edit configuration set protection mode as
maxperformance;
Succeeded.
DGMGRL> exit
[oracle@stndby ~] $
```

# **Practices for Lesson 17: Backup and Recovery Considerations in an Oracle Data Guard Configuration**

## **Practices for Lesson 17: Overview**

---

### **Practices Overview**

In these practices, you will enable the change tracing feature and setup and configure the recovery manager (RMAN) catalog repository database and use it to perform backup and recovery in a Data Guard environment.

## Practice 17-1: Enable Change Tracking on the Physical Standby Database

---

### Overview

In this practice, you will enable the change tracking feature on `stndby` for the physical standby database and verify its usage.

### Tasks

1. Use a terminal window logged in as `oracle` to `stndby` with the environment variables set for `stndby` appropriately. Using operating system authentication, SQL\*Plus connects, by default, to the root container in the lab environment. Enable change tracking by using the file `/u01/app/oracle/oradata/stndby/rman_change_track.file`.

```
[oracle@stndby ~]$. oraenv
ORACLE_SID = [oracle] ? stndby
The Oracle base has been set to /u01/app/oracle
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sun Jun 7 08:48:36
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> alter database enable block change tracking using file
'/u01/app/oracle/oradata/STNDBY/rman_change_track.file';

Database altered.

SQL>
```

2. Verify that block change tracking is enabled, displaying the file name used and file size of the block change tracking file.

```
SQL> select filename, status, bytes from
 v$block_change_tracking;

FILENAME

STATUS BYTES

/u01/app/oracle/oradata/stndby/rman_change_track.file
ENABLED 11599872
```

3. Exit SQL\*Plus on stndby of the physical standby database. It is recommended to keep the terminal session open with the environment variables set appropriately.

## Practice 17-2: Creating a Recovery Manager Catalog

---

### Overview

In this practice, you will set up and configure the recovery manager (RMAN) catalog repository database.

### Tasks

1. Open a terminal window connected to localhost as the oracle OS user. Enter <password> when you are prompted for the password. Set the environment variables to ORCL.

```
[oracle8c793fb03eed ~]$. oraenv
ORACLE_SID = [ORCL] ? ORCL
The Oracle base remains unchanged with value /u01/app/oracle
```

2. Invoke SQL\*Plus and connect as the SYS user with the SYSDBA privilege. List the PDBs in the connected database.

```
[oracle8c793fb03eed ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sun Jun 7 12:51:44
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> show pdbs

CON_ID CON_NAME OPEN MODE RESTRICTED

2 PDB$SEED READ ONLY NO
3 PDB1 READ WRITE NO
4 EMCCPDB READ WRITE NO
```

3. Connect to the RCATPDB PDB.

```
SQL> alter session set container=ORCL;
```

```
Session altered.
```

```
SQL>
```

4. Determine where the current data files are stored at:

```
SQL> select file_name from dba_data_files;
```

```
FILE_NAME
```

```

/u01/app/oracle/oradata/ORCL/pdb1/system01.dbf
/u01/app/oracle/oradata/ORCL/pdb1/sysaux01.dbf
/u01/app/oracle/oradata/ORCL/pdb1/undotbs01.dbf
/u01/app/oracle/oradata/ORCL/pdb1/users01.dbf
```

```
SQL>
```

5. Create a new tablespace for the recovery manager repository using the same storage architecture as the existing files. Name the tablespace `rcts` and give it an initial size of 30MB with `autoextend` turned on.

```
SQL> create tablespace rcts datafile
'/u01/app/oracle/oradata/ORCL/rcts01.dbf' size 30M autoextend on;
```

```
Tablespace created.
```

6. Create a new schema `rcowner` setting the default tablespace to the tablespace just created.

```
SQL> create user rcowner identified by <password> default
tablespace rcts quota unlimited on rcts;
```

```
User created.
```

7. Grant the recovery catalog owner role to the user just created. Exit SQL\*Plus when done.

```
SQL> grant recovery_catalog_owner to rcowner;
Grant succeeded.

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle8c793fb03eed ~]$
```

8. Use a terminal window on localhost connected as oracle with the environment variables set to orclcldb. Launch the RMAN utility and connect to the rcatpdb service using the account just created.

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
[oracle@localhost ~]$ rman catalog
rcowner/<password>@em13c:1521/ORCL

Recovery Manager: Release 19.0.0.0.0 - Production on Sun Jun 7
13:05:44 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.

connected to recovery catalog database
```

9. Create the recovery catalog.

```
RMAN> create catalog;
recovery catalog created
```

## Practice 17-3: Registering Your Database in the Recovery Catalog

---

### Overview

In this practice, you register the primary database in the recovery catalog.

### Tasks

1. Return to the RMAN session on localhost. Connect to the `orclcdb` primary database with `SYSDBA` privilege and register the database.

```
RMAN> connect target 'sys/<password>@orclcdb as sysdba'

connected to target database: ORCLCDB (DBID=2732402101)

RMAN> register database;

database registered in recovery catalog
starting full resync of recovery catalog
full resync complete

RMAN>
```

**Note:** Your DBID may be different.

2. List the `DB_UNIQUE_NAME` for all databases known to the recovery catalog.

```
RMAN> list db_unique_name of database;

List of Databases
DB Key DB Name DB ID Database Role Db_unique_name
----- -----
1 ORCLCDB 2732402101 PRIMARY ORCLCDB
```

3. Generate a schema report for the `orclcdb` primary database.

```
RMAN> report schema for db_unique_name orclcdb;

Report of database schema for database with db_unique_name
ORCLCDB

List of Permanent Datafiles
=====
File Size (MB) Tablespace RB segs Datafile Name
----- -----

```

```

1 960 SYSTEM YES
/u01/app/oracle/oradata/ORCLCDB/system01.dbf
3 940 SYSAUX NO
/u01/app/oracle/oradata/ORCLCDB/sysaux01.dbf
4 280 UNDOTBS1 YES
/u01/app/oracle/oradata/ORCLCDB/undotbs01.dbf
5 270 PDB$SEED:SYSTEM NO
/u01/app/oracle/oradata/ORCLCDB/pdbseed/system01.dbf
6 330 PDB$SEED:SYSAUX NO
/u01/app/oracle/oradata/ORCLCDB/pdbseed/sysaux01.dbf
7 5 USERS NO
/u01/app/oracle/oradata/ORCLCDB/users01.dbf
8 100 PDB$SEED:UNDOTBS1 NO
/u01/app/oracle/oradata/ORCLCDB/pdbseed/undotbs01.dbf
9 510 DEV1:SYSTEM YES
/u01/app/oracle/oradata/ORCLCDB/dev1/system01.dbf
10 370 DEV1:SYSAUX NO
/u01/app/oracle/oradata/ORCLCDB/dev1/sysaux01.dbf
11 100 DEV1:UNDOTBS1 YES
/u01/app/oracle/oradata/ORCLCDB/dev1/undotbs01.dbf
12 5 DEV1:USERS NO
/u01/app/oracle/oradata/ORCLCDB/dev1/users01.dbf

```

List of Temporary Files

| File | Size (MB) | Tablespace     | Maxsize (MB) | Tempfile Name                                                                |
|------|-----------|----------------|--------------|------------------------------------------------------------------------------|
| ---  |           |                |              |                                                                              |
| 1    | 132       | TEMP           | 32767        | /u01/app/oracle/oradata/ORCLCDB/temp01.dbf                                   |
| 2    | 36        | PDB\$SEED:TEMP | 32767        | /u01/app/oracle/oradata/ORCLCDB/pdbseed/temp012020-06-04_02-09-11-127-AM.dbf |
| 3    | 36        | DEV1:TEMP      | 32767        | /u01/app/oracle/oradata/ORCLCDB/dev1/temp01.dbf                              |

RMAN>

4. List all the archive logs for the `orclcdb` primary database.

```
RMAN> list archivelog all for db_unique_name orclcdb;

List of Archived Log Copies for database with db_unique_name
ORCLCDB
=====
=====

Key Thrd Seq S Low Time

191 1 6 A 04-JUN-20
 Name:
/u01/app/oracle/fast_recovery_area/ORCLCDB/archivelog/2020_06_04
/o1_mf_1_6_hfjpp4gy_.arc

192 1 7 A 04-JUN-20
 Name:
/u01/app/oracle/fast_recovery_area/ORCLCDB/archivelog/2020_06_04
/o1_mf_1_7_hfk3hmrg_.arc

...
328 1 16 A 11-JUN-20
 Name:
/u01/app/oracle/fast_recovery_area/ORCLCDB/archivelog/2020_06_11
/o1_mf_1_16_hg4qd0d3_.arc

RMAN>
```

5. Display all the current configuration parameters for the `orclcdb` primary database.

```
RMAN> show all for db_unique_name orclcdb;

RMAN configuration parameters for database with db_unique_name
ORCLCDB are:
CONFIGURE RETENTION POLICY TO REDUNDANCY 1; # default
CONFIGURE BACKUP OPTIMIZATION OFF; # default
CONFIGURE DEFAULT DEVICE TYPE TO DISK; # default
CONFIGURE CONTROLFILE AUTOBACKUP ON; # 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 RMAN OUTPUT TO KEEP FOR 7 DAYS; # default
CONFIGURE ARCHIVELOG DELETION POLICY TO NONE; # default
CONFIGURE SNAPSHOT CONTROLFILE NAME TO
'/u01/app/oracle/product/19.3.0/dbhome_1/dbs/snapcf_orclcdb.f'; # default

RMAN>
```

## Practice 17-4: Configuring RMAN Parameters

---

### Overview

In this practice, you will configure RMAN for use in a Data Guard environment.

### Tasks

1. In your RMAN session (connected to your primary database), configure the backup retention policy to allow for recovery for seven days.

```
RMAN> configure retention policy to recovery window of 7 days;
new RMAN configuration parameters:
CONFIGURE RETENTION POLICY TO RECOVERY WINDOW OF 7 DAYS;
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

2. Specify that archived redo log files can be deleted after they are applied to the standby database.

```
RMAN> configure archivelog deletion policy to applied on all
standby;
new RMAN configuration parameters:
CONFIGURE ARCHIVELOG DELETION POLICY TO APPLIED ON ALL STANDBY;
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

3. Configure the connect identifier for your primary database.

```
RMAN> configure db_unique_name orclcdb connect identifier
'orclcdb';
new RMAN configuration parameters:
CONFIGURE DB_UNIQUE_NAME 'orclcdb' CONNECT IDENTIFIER 'orclcdb';
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

4. Configure the connect identifier for your physical standby database.

```
RMAN> configure db_unique_name standby connect identifier
'stndby';

new RMAN configuration parameters:
CONFIGURE DB_UNIQUE_NAME 'stndby' CONNECT IDENTIFIER 'stndby';
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

5. Your physical standby database is registered with the recovery catalog. Use the LIST DB\_UNIQUE\_NAME command to see the registration information about your primary and standby databases.

```
RMAN> list db_unique_name of database;
List of Databases
DB Key DB Name DB ID Database Role Db_unique_name
----- -----
1 ORCLCDB 2732402101 PRIMARY ORCLCD
1 ORCLCDB 2732402101 STANDBY B
```

6. Use the REPORT SCHEMA command to view additional information about your physical standby database. Exit RMAN when done.

```
RMAN> report schema for db_unique_name stndby;

Report of database schema for database with db_unique_name
STNDBY

List of Permanent Datafiles
=====
File Size(MB) Tablespace RB segs Datafile Name
---- ----- -----

1 960 SYSTEM YES
3 940 SYSAUX NO
4 280 UNDOTBS1 YES
5 270 PDB$SEED:SYSTEM NO
6 330 PDB$SEED:SYSAUX NO
7 5 USERS NO
8 100 PDB$SEED:UNDOTBS1 NO
9 510 DEV1:SYSTEM YES
10 370 DEV1:SYSAUX NO
11 100 DEV1:UNDOTBS1 YES
12 5 DEV1:USERS NO

RMAN> exit;

Recovery Manager complete.
[oracle@localhost ~]$
```

## Practice 17-5: Recovering a Data File on Your Primary Database Over the Network

---

### Overview

In this practice, you recover a data file in your primary database by using a data file from your physical standby database. You will create a new data file in order to simulate a disaster, without affecting the existing data files on the primary database.

### Tasks

1. The logical standby database does not honor the `DB_FILE_NAME_CONVERT` parameter. This will cause an error when a tablespace is created on the primary database and force the Logical Apply process to shut down because the directory doesn't exist. Use a terminal window logged in as `oracle` to `stndby`. Create a symbolic link `ORCLCDB` linking to `stndby2` so that file creation can proceed.

```
[oracle@stndby ~]$ cd /u01/app/oracle/oradata
[oracle@stndby oradata]$ ln -s stndby2 ORCLCDB
```

**Note:** The Data Guard documentation shows how to create a DDL handler using a procedure, along with the built-in `DBMS_LOGSTDBY.SKIP` procedure to skip over the DDL with the wrong path names and invoke the handler to rename the path in the command.

2. Use a terminal window logged in as `oracle` to `localhost` with the environment variables set for `orclcdb` appropriately. Launch SQL\*Plus and create a new tablespace `SAMPLE` in the `DEV1` pluggable database with a data file `/u01/app/oracle/oradata/orclcdb/dev1/sample01.dbf` and a size of 5 MB.

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sun Jun 7 09:19:53
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> alter session set container=DEV1;
```

```
Session altered.
```

```
SQL> create tablespace SAMPLE datafile
'/u01/app/oracle/oradata/ORCLCDB/dev1/sample01.dbf' size 5M;
```

```
Tablespace created.
```

```
SQL>
```

3. Connect to your physical standby instance as the SYSDBA user and show the standby\_file\_management parameter.

```
SQL> connect sys/<password>@stndby as sysdba
Connected.
```

```
SQL> show parameter standby_file_management
```

| NAME                    | TYPE   | VALUE |
|-------------------------|--------|-------|
| standby_file_management | string | AUTO  |

```
SQL>
```

4. Verify that the data file has successfully been created on the physical standby database.

```
SQL> col name format a65
SQL> select file#,name from v$logfile;

FILE# NAME

1 /u01/app/oracle/oradata/STNDBY/system01.dbf
3 /u01/app/oracle/oradata/STNDBY/sysaux01.dbf
4 /u01/app/oracle/oradata/STNDBY/undotbs01.dbf
5 /u01/app/oracle/oradata/STNDBY/pdbseed/system01.dbf
6 /u01/app/oracle/oradata/STNDBY/pdbseed/sysaux01.dbf
7 /u01/app/oracle/oradata/STNDBY/users01.dbf
8 /u01/app/oracle/oradata/STNDBY/pdbseed/undotbs01.dbf
9 /u01/app/oracle/oradata/STNDBY/dev1/system01.dbf
10 /u01/app/oracle/oradata/STNDBY/dev1/sysaux01.dbf
11 /u01/app/oracle/oradata/STNDBY/dev1/undotbs01.dbf
12 /u01/app/oracle/oradata/STNDBY/dev1/users01.dbf

FILE# NAME

```

```
25 /u01/app/oracle/oradata/STNDBY/dev1/sample01.dbf

12 rows selected.

SQL>
```

5. Connect to your logical standby instance as the SYSDBA user.

```
SQL> connect sys/<password>@stndby2 as sysdba
Connected.
```

6. Verify that the data file has successfully been created on the logical standby database.

```
SQL> select file#,name from v$logfile;

FILE# NAME

1 /u01/app/oracle/oradata/stndby2/system01.dbf
3 /u01/app/oracle/oradata/stndby2/sysaux01.dbf
4 /u01/app/oracle/oradata/stndby2/undotbs01.dbf
5 /u01/app/oracle/oradata/stndby2/pdbseed/system01.dbf
6 /u01/app/oracle/oradata/stndby2/pdbseed/sysaux01.dbf
7 /u01/app/oracle/oradata/stndby2/users01.dbf
8 /u01/app/oracle/oradata/stndby2/pdbseed/undotbs01.dbf
9 /u01/app/oracle/oradata/stndby2/dev1/system01.dbf
10 /u01/app/oracle/oradata/stndby2/dev1/sysaux01.dbf
11 /u01/app/oracle/oradata/stndby2/dev1/undotbs01.dbf
12 /u01/app/oracle/oradata/stndby2/dev1/users01.dbf

FILE# NAME

25 /u01/app/oracle/oradata/ORCLCDB/dev1/sample01.dbf

12 rows selected.

SQL>
```

7. Reconnect to your primary database and create the hr.employees2 table as a copy of the hr.employees table into the newly created tablespace. Exit SQL\*Plus.

```
SQL> connect system/<password>@localhost:1521/DEV1.example.com
Connected.
```

```
SQL> create table hr.employees2 tablespace sample as select *
from hr.employees;
```

```
Table created.
```

- Verify that the table was created by counting the number of rows it contains.

```
SQL> select count(*) from hr.employees2;
COUNT (*)

107
```

- Move the sample01.dbf file to sample01.sav to simulate a failure in the primary database.

```
SQL> !mv /u01/app/oracle/oradata/ORCLCDB/dev1/sample01.dbf
/u01/app/oracle/oradata/ORCLCDB/dev1/sample01.sav
```

- Connect to the root container and shut down abort the primary database. Exit SQL\*Plus.

```
SQL> connect sys/<password>@orclcdb as sysdba
Connected.

SQL> shutdown abort
ORACLE instance shut down.

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

- Launch SQL\*Plus and start the database instance. Exit SQL\*Plus.

```
[oracle@localhost]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sun Jun 7 09:29:05
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.Connected to an
idle instance.
```

```

SQL> startup
ORACLE instance started.

Total System Global Area 629145352 bytes

Fixed Size 9137928 bytes
Variable Size 377487360 bytes
Database Buffers 234881024 bytes
Redo Buffers 7639040 bytes

Database mounted.

Database opened.
SQL> alter pluggable database dev1 open;
alter pluggable database dev1 open
*
ERROR at line 1:
ORA-01157: cannot identify/lock data file 25 - see DBWR trace
file
ORA-01110: data file 25:
'/u01/app/oracle/oradata/ORCLCDB/dev1/sample01.dbf'

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

12. Use RMAN to restore the missing datafile using the physical standby database over the network. Exit RMAN when done.

```

[oracle@localhost ~]$ rman target sys/<password>@orclcdb

Recovery Manager: Release 19.0.0.0.0 - Production on Sun Jun 7
09:37:22 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.

connected to target database: ORCLCDB (DBID=2732402101)

RMAN> restore datafile 25 from service 'stndby';

Starting restore at 07-JUN-20
using target database control file instead of recovery catalog
```

```
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=43 device type=DISK

channel ORA_DISK_1: starting datafile backup set restore
channel ORA_DISK_1: using network backup set from service stndby
channel ORA_DISK_1: specifying datafile(s) to restore from
backup set
channel ORA_DISK_1: restoring datafile 00025 to
/u01/app/oracle/oradata/ORCLCDB/dev1/sample01.dbf
channel ORA_DISK_1: restore complete, elapsed time: 00:00:02
Finished restore at 07-JUN-20

RMAN> recover datafile 25;

Starting recover at 07-JUN-20
using channel ORA_DISK_1

starting media recovery
media recovery complete, elapsed time: 00:00:00

Finished recover at 07-JUN-20

RMAN> exit

Recovery Manager complete.
[oracle@localhost ~]$
```

13. Launch SQL\*Plus and switch the container to the pluggable database.

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sun Jun 7 09:41:20
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> show pdbs
```

| CON_ID CON_NAME | OPEN MODE RESTRICTED |
|-----------------|----------------------|
| 2 PDB\$SEED     | READ ONLY NO         |
| 3 DEV1          | MOUNTED              |

SQL>  
SQL> **alter pluggable database dev1 open;**

Pluggable database altered.

14. Verify that the table has been recovered and the rows exist in the table.

```
SQL> alter session set container = DEV1;

Session altered.

SQL> select * from hr.employees2;
...
EMPLOYEE ID FIRST NAME LAST NAME
----- -----
EMAIL PHONE_NUMBER HIRE_DATE JOB_ID
SALARY

----- -----
COMMISSION PCT MANAGER ID DEPARTMENT ID
----- -----
205 Shelley Higgins
SHIGGINS 515.123.8080 07-JUN-02 AC MGR
12008
101 110

206 William Gietz
WGIETZ 515.123.8181 07-JUN-02 AC ACCOUNT
8300
205 110

EMPLOYEE ID FIRST NAME LAST NAME
----- -----
EMAIL PHONE NUMBER HIRE DATE JOB ID
SALARY

----- -----
COMMISSION PCT MANAGER ID DEPARTMENT ID
```

```

107 rows selected.
```

15. Drop the tablespace that was created in the lab along with the data files. Exit SQL\*Plus.

```
SQL> drop tablespace sample including contents and datafiles;

Tablespace dropped;

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

## Practice 17-6: Rolling Forward a Standby Database with One Command

---

### Overview

In this practice, you will resolve problems such as missing or corrupted archive log file, an unrecoverable archive gap, or the need to roll standby forward in time without applying a large number of archivelog files.

### Tasks

1. Use the terminal window on `localhost` as the `oracle` user. Make sure that you set up your environment variables correctly.

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [orclcdb] ? orclcdb
The Oracle base remains unchanged with value /u01/app/oracle
[oracle@localhost ~]$
```

2. Disable the redo transport service in preparation of the practice.

```
[oracle@localhost ~]$ dgmgrl
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Sun Jun 7
10:35:59 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle and/or its affiliates. All rights
reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect sysdg/<password>@orclcdb
Connected to "orclcdb"
Connected as SYSDG.
DGMGRL> edit database orclcdb set state='TRANSPORT-OFF';
Succeeded.
DGMGRL>
```

3. Use the terminal window on `stndby` as the `oracle` user. Make sure that you set up your environment variables correctly. Launch SQL\*Plus to stop the `stndby` standby database.

```
[oracle@stndby ~]$. oraenv
ORACLE_SID = [oracle] ? stndby
The Oracle base has been set to /u01/app/oracle
[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sun Jun 7 10:39:29
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.
```

```

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

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

```

4. Open a new terminal window on localhost. Then make a note of the current log sequence number. Record the sequence number of the online redo log file in thread 1. In your case, the sequence# is 82)

```

[oracle@localhost ~]$. oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sun Jun 7 10:41:45
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> select thread#, sequence# from v$log where status='CURRENT'
order by 1;

 THREAD# SEQUENCE#

 1 82

SQL>

```

5. In the DEV1 PDB, create a simple table named hr.test17 and insert a few rows.

```

SQL> alter session set container=DEV1;
Session altered.

SQL> @/home/oracle/setup/setup_17-6.sql
SQL> create table hr.test17 (col number);

Table created.

SQL> insert into hr.test17 values (1);

```

```

1 row created.

SQL> insert into hr.test17 values (1);

1 row created.

SQL> insert into hr.test17 values (1);

1 row created.

SQL> commit;

Commit complete.

SQL>

```

6. Switch the current log file to advance the online redo log sequence number.

```

SQL> connect / as sysdba
Connected.
SQL> alter system switch logfile;

System altered.

SQL> SELECT THREAD#, MAX(SEQUENCE#) FROM V$ARCHIVED_LOG WHERE
RESETLOGS_CHANGE# = (SELECT MAX(RESETLOGS_CHANGE#) FROM
V$ARCHIVED_LOG) GROUP BY THREAD#;
 2 3
THREAD# MAX (SEQUENCE#)

1 82

SQL>

```

7. Identify the most current archived log files by using the number identified in step 6.

**Note:** If there are more than one entries, choose the latest archived log file. Exit SQL\*Plus.

```

SQL> col name format a65
SQL> select thread#, name from v$archived_log where thread#=1 and
sequence#=82;

THREAD# NAME

1 orclcdbf
1
/u01/app/oracle/fast_recovery_area/ORCLCDB/archivelog/2020_06_05/
 o1_mf_1_82_hfnrhsbz_.arc

1
/u01/app/oracle/fast_recovery_area/ORCLCDB/archivelog/2020_06_07/
 o1_mf_1_82_hft44916_.arc

```

```
SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

8. Now, simulate a loss of the archived log file before transferring to the standby database. Remove the archived log file identified in the previous step.

```
[oracle@localhost ~]$ rm
/u01/app/oracle/fast_recovery_area/ORCLCDB/archivelog/2020_06_07/o1
_mf_1_82_hft44916_.arc
[oracle@localhost ~]$
```

9. Return to the DGMGRL session on localhost. Start the redo transport service to the physicalstandby database.

```
DGMGRL> edit database orclcdb set state='TRANSPORT-ON';
Succeeded.
DGMGRL>
```

10. Return to the SQL\*Plus session on stndby and start the physical standby database.

```
SQL> startup
ORACLE instance started.

Total System Global Area 629145352 bytes
Fixed Size 9137928 bytes
Variable Size 377487360 bytes
Database Buffers 234881024 bytes
Redo Buffers 7639040 bytes
Database mounted.
Database opened.
SQL> alter pluggable database dev1 open;
Pluggable database altered.
```

11. In the DEV1 PDB, verify that the physical standby is synchronized with the primary database. Exit SQL\*Plus.

```
SQL> alter session set container=DEV1;
Session altered.

SQL> select * from hr.test17;
select * from hr.test17
*
ERROR at line 1:
ORA-00942: table or view does not exist
```

```
SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@stndby ~]$
```

**Note:** The changes made to the primary database have not been applied due to the missing archived log files in the primary database. Remember that you have removed the most current archived log files to simulate the unrecoverable archived log file gap issue.

12. Return to the DGMGRL session on localhost, stop the Managed Recovery Process to prepare for the standby database recovery.

```
DGMGRL> edit database stndby set state='APPLY-OFF';
Succeeded.
DGMGRL>
```

13. Return to the terminal session on stndby. Let's see how we can refresh the standby database with one command in case of the unresolvable scenario. Launch the RMAN utility to recover the standby database with one command. Exit the RMAN utility.

```
[oracle@stndby ~]$ rman target /
Recovery Manager: Release 19.0.0.0.0 - Production on Sun Jun 7
11:28:41 2020
Version 19.3.0.0.0

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reserved.

connected to target database: ORCLCDB (DBID=2732274290, not open)

RMAN> RECOVER STANDBY DATABASE FROM SERVICE=orclcdb;

Starting recover at 07-JUN-20
using target database control file instead of recovery catalog
Executing: alter database flashback off
Executing: alter database disable block change tracking
Oracle instance started

Total System Global Area 629145352 bytes

Fixed Size 9137928 bytes
Variable Size 373293056 bytes
Database Buffers 239075328 bytes
Redo Buffers 7639040 bytes

contents of Memory Script:
{
 restore standby controlfile from service 'orclcdb';
 alter database mount standby database;
}
```

```

executing Memory Script

Starting restore at 07-JUN-20
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=20 device type=DISK

channel ORA_DISK_1: starting datafile backup set restore
channel ORA_DISK_1: using network backup set from service
orclcdbchannel ORA_DISK_1: restoring control file
channel ORA_DISK_1: restore complete, elapsed time: 00:00:02
output file name=/u01/app/oracle/oradata/STNDBY/control01.ctl
output file
name=/u01/app/oracle/fast_recovery_area/STNDBY/control02.ctl
Finished restore at 07-JUN-20

released channel: ORA_DISK_1
Statement processed
Executing: alter system set standby_file_management=manual

contents of Memory Script:
{
 recover database from service 'orclcdb';
}
executing Memory Script

Starting recover at 07-JUN-20
Starting implicit crosscheck backup at 07-JUN-20
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=24 device type=DISK
Crosschecked 14 objects
Finished implicit crosscheck backup at 07-JUN-20

Starting implicit crosscheck copy at 07-JUN-20
using channel ORA_DISK_1
Crosschecked 2 objects
Finished implicit crosscheck copy at 07-JUN-20

searching for all files in the recovery area
cataloging files...
cataloging done

List of Cataloged Files
=====
File Name:
/u01/app/oracle/fast_recovery_area/STNDBY/archivelog/2020_06_07/o1
_mf_1_60_hfr8ln_.arc

...
File Name:
/u01/app/oracle/fast_recovery_area/STNDBY/autobackup/2020_06_01
_mf_s_1042403484_hfrfpq8w_.bkp

```

```

using channel ORA_DISK_1
skipping datafile 5; already restored to SCN 1944601
skipping datafile 6; already restored to SCN 1944601
skipping datafile 8; already restored to SCN 1944601
channel ORA_DISK_1: starting incremental datafile backup set
restore
channel ORA_DISK_1: using network backup set from service orclcdb
destination for restore of datafile 00001:
/u01/app/oracle/oradata/STNDBY/system01.dbf
channel ORA_DISK_1: restore complete, elapsed time: 00:00:35
channel ORA_DISK_1: starting incremental datafile backup set
restore
channel ORA_DISK_1: using network backup set from service orclcdb
destination for restore of datafile 00003:
/u01/app/oracle/oradata/STNDBY/sysaux01.dbf
channel ORA_DISK_1: restore complete, elapsed time: 00:00:35
channel ORA_DISK_1: starting incremental datafile backup set
...
starting media recovery

archived log for thread 1 with sequence xx is already on disk as
file
/u01/app/oracle/fast_recovery_area/STNDBY/archivelog/2020_06_23/o1
_mf_1_37_hh53htbg_.arc
archived log file
name=/u01/app/oracle/fast_recovery_area/STNDBY/archivelog/2020_06_
23/o1_mf_1_37_hh53htbg_.arc thread=1 sequence=37
media recovery complete, elapsed time: 00:00:01
Finished recover at 23-JUN-20
Reenabling controlfile options for auxiliary database
Executing: alter database enable block change tracking using file
'/u01/app/oracle/oradata/STNDBY/rman_change_track.file'
Executing: alter system set standby_file_management=auto
Finished recover at 23-JUN-20
RMAN> exit

Recovery Manager complete.
[oracle@stndby ~]$
```

#### 14. Using SQL\*Plus, connect to the stndby database. Start the database and its PDB.

```

[oracle@stndby ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sun Jun 7 11:34:10
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
```

```

Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> show pdbs

 CON_ID CON_NAME OPEN MODE RESTRICTED
----- -----
 2 PDB$SEED MOUNTED
 3 DEV1 MOUNTED

SQL> alter database open;

Database altered.

SQL> alter pluggable database dev1 open;

Pluggable database altered.

```

15. Return to the DGMGRL session on localhost. Start the redo apply service.

```

DGMGRL> edit database stndby set state='APPLY-ON';
Succeeded.
DGMGRL>

```

16. Return to the SQL\*Plus session on stndby connected to the stndby database. In the DEV1 PDB, verify that the physical standby applies the change made to the primary database. Exit SQL\*Plus.

```

SQL> alter session set container=DEV1;

Session altered.

SQL> select * from hr.test17;

 COL

 1
 1
 1

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@stndby ~]$

```

17. Return to the DGMGRL session on localhost. Display the status of the data guard brokerconfiguration.

```
DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxPerformance
Members:
orclcdb - Primary database
orclcdbFS - Far sync
instance
stndby - Physical standby database
stndby2 - Logical standby database
Warning: ORA-16809: multiple warnings detected for the
member

Members Not Receiving Redo:
stndbyFS - Far sync instance

Fast-Start Failover: Disabled

Configuration Status:
WARNING (status updated 49 seconds ago)
```

**Note:** In this practice, we tested how to recover the physical standby database with a single command in case of the unrecoverable redo gap scenario. The ORA-\* warning message in the stndby2 standby database was caused by the missing redo from the primary database.

18. Disable the stndby2 logical standby database.

**Note:** We can safely disable the stndby2 database because it will not be used in later practices.

```
DGMGRL> disable database stndby2;
Disabled.
DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxPerformance
Members:
orclcdb - Primary database
orclcdbFS - Far sync
instance
stndby - Physical standby database
stndby2 - Logical standby database (disabled)
ORA-16749: The member was disabled manually.
```

```
stndbyFS - Far sync instance
Fast-Start Failover: Disabled
Configuration Status:
SUCCESS (status updated 48 seconds ago)
DGMGRL>
```

19. Exit DGMGRL and SQL\*Plus leaving the terminal window open for future practices.

# **Practices for Lesson 18: Enhanced Client Connectivity in a Data Guard Environment**

## **Practices for Lesson 18: Overview**

---

### **Practices Overview**

In these practices, you will create a service to connect to the `DEV1` pluggable database, and also create a database startup trigger that will start the service on any host machine that the primary database is running on. You will also modify the service to support Application Continuity and test it.

## Practice 18-1: Creating and Testing Primary Database Services

---

### Overview

In this practice, you will create and test a service for the `DEV1` pluggable database on the primary database, and follow that service as it migrates from `localhost` to `stndby` during switchover exercises.

### Tasks

1. Use a terminal window logged in as `oracle` to `localhost` with the environment variables set for `orclcldb` appropriately. Launch SQL\*Plus and set the session container to the `DEV1` pluggable database.

```
[oracle@localhost ~]$. oraenv
ORACLE_SID = [oracle] ? orclcldb
The Oracle base has been set to /u01/app/oracle

[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Sun Jun 7 14:44:47
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL> alter session set container=dev1;

Session altered.
```

2. Create and start a service with the name `PRMY`

```
SQL> exec DBMS_SERVICE.CREATE_SERVICE('PRMY','PRMY')

PL/SQL procedure successfully completed.
```

```
SQL> exec DBMS_SERVICE.START_SERVICE('PRMY')
```

```
PL/SQL procedure successfully completed.
```

3. From within SQL\*Plus, display the status of the Oracle listener running on localhost and verify that the service was started successfully. Do not exit SQL\*Plus.

```
SQL> !lsnrctl status
LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 20-DEC-2013
16:06:01
 (c) 1991, 2013, Oracle. All rights reserved.

Connecting to
 (DESCRIPTION=(ADDRESS=(PROTOCOL=TCP) (HOST=localhost.example.com) (PORT=
 1521) (SEND _SDU=10485760) (RECV _SDU=10485760)))
STATUS of the LISTENER

Alias LISTENER
Version TNSLSNR for Linux: Version 12.1.0.1.0 -
Production
Start Date 18-DEC-2013 10:25:42
Uptime 2 days 5 hr. 40 min. 21 sec
Trace Level off
Security ON: Local OS Authentication
SNMP OFF

Listener Parameter File
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.ora
Listener Log File
/u01/app/oracle/diag/tnslsnr/localhost/listener/alert/log.xml
Listening Endpoints Summary...

 (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp) (HOST=localhost.example.com) (PORT=
 1521)))
 (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc) (KEY=EXTPROC1521)))

 (DESCRIPTION=(ADDRESS=(PROTOCOL=tcps) (HOST=localhost.example.com) (PORT
 =5500)) (Security=(my_wallet_directory=/u01/app/oracle/admin/orclcdb/
 xdb_wallet)) (Presentation=HTTP) (Session=RAW))

 (DESCRIPTION=(ADDRESS=(PROTOCOL=tcps) (HOST=localhost.example.com) (PORT
 =5501)) (Security=(my_wallet_directory=/u01/app/oracle/admin/orclcdb/
 xdb_wallet)) (Presentation=HTTP) (Session=RAW))

Services Summary...
Service "PRMY" has 1 instance(s).
 Instance "orclcdb", status READY, has 1 handler(s) for this
 service...
Service "orclcdb.example.com" has 2 instance(s).
```

```

Instance "orclcdb", status UNKNOWN, has 1 handler(s) for this
service...

Instance "orclcdb", status READY, has 1 handler(s) for this
service...

Service "orclcdbXDB.example.com" has 1 instance(s).

Instance "orclcdb", status READY, has 0 handler(s) for this
service...

Service "orclcdb_DGB.example.com" has 1 instance(s).

Instance "orclcdb", status READY, has 1 handler(s) for
thisservice...

Service "orclcdb_DGMGRL.example.com" has 1 instance(s).

Instance "orclcdb", status UNKNOWN, has 1 handler(s) for this
service...

Service "dev1.example.com" has 1 instance(s).

Instance "orclcdb", status READY, has 1 handler(s) for
thisservice...

The command completed successfully

```

4. Use another terminal window logged in as oracle to host02 with the environment variables set for orclcdbFS appropriately. Launch SQL\*Plus and connect to the PRMY.EXAMPLE.COM service.

```

[oracle@host02 ~]$. oranev
ORACLE_SID = [oracle] ? orclcdbFS
The Oracle base has been set to /u01/app/oracle

[oracle@host02 ~]$ sqlplus system/<password>@prmy
SQL*Plus: Release 19.0.0.0.0 - Production on Sun Jun 7 14:47:38
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Last Successful login time: Sun Jun 07 2020 09:26:10 -04:00

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0

SQL>

```

**Note:** The tnsnames.ora network configuration file was already created, with an entry PRMY that attempts to connect to both localhost.example.com and stndby.example.com, and access a service name of PRMY.EXAMPLE.COM.

5. Verify that you are indeed connected to the `orclcldb` instance (the primary database).

```
SQL> select instance_name from v$instance;

INSTANCE_NAME

orclcldb
```

6. Verify that your connection has been established with the `DEV1` pluggable database and not the root container.

```
SQL> select sys_context ('USERENV', 'CON_NAME') as container FROM
dual;
CONTAINER

DEV1
SQL>
```

7. Return to the SQL\*Plus session running on `localhost` for the primary database. Create an ondatabase startup trigger in the `DEV1` PDB that will open the `DEV1` pluggable database if it isnot already open. The trigger should then start the `PRMY.EXAMPLE.COM` service after it switches the container to the `DEV1` container. The logic should only execute if the databaseis in the primary role. Exit SQL\*Plus on `localhost`.

```
SQL> show con_name

CON_NAME

DEV1
SQL> @/home/oracle/setup/create_trigger.sql
SQL> create or replace trigger primary_services
 2 after startup on database
 3 declare
 4 role varchar2(30);
 5 omode varchar2(30);
 6 begin
 7 select database_role into role from v$database;
 8 select open_mode into omode from v$pdbs where name = 'DEV1';
 9 if role = 'PRIMARY' then
10 if omode != 'READ WRITE' then
11 execute immediate 'alter pluggable database dev1 open';
12 end if;
13 dbms_service.start_service('PRMY');
```

```

14 end if;
15 end;
16 /
Trigger created.

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]

```

8. Launch DGMGRL and connect to the SYSDG account. Show the configuration.

```

[oracle@localhost ~]$ dmgmgrl sysdg/<password>@orclcdb
DGMGRL for Linux: Release 19.0.0.0.0 - Production on Tue Jun 23
20:09:47 2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle and/or its affiliates. All rights reserved.

Welcome to DGMGRL, type "help" for information.
Connected to "orclcdb"
Connected as SYSDG.

DGMGRL>
DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxPerformance
Members:
orclcdb - Primary database
orclcdbFS - Far sync
instance
stndby - Physical standby database
stndby2 - Logical standby database (disabled)
ORA-16749: The member was disabled manually.

Members Not Receiving Redo:

Fast-Start Failover: Disabled

Configuration Status:

```

```
SUCCESS (status updated 48 seconds ago)
```

```
DGMGRL>
```

9. Validate that the primary and physical standby databases are ready for switchover.

```
DGMGRL> validate database
```

Database Role: Primary database

Ready for Switchover: Yes

Flashback Database Status:

orclcdb: On  
stndby: Off

Managed by Clusterware:

orclcdb: NO

Validating static connect identifier for the primary database  
orclcdb...

The static connect identifier allows for a connection to  
database "orclcdb".

```
DGMGRL> validate database stndby
```

Database Role: Physical standby database

Primary Database: orclcdb

Ready for Switchover: Yes

Ready for Failover: Yes (Primary Running)

Flashback Database Status:

orclcdb: On  
stndby: Off

Managed by Clusterware:

orclcdb: NO  
stndby: NO

Validating static connect identifier for the primary database  
orclcdb...

The static connect identifier allows for a connection to  
database "orclcdb".

Current Log File Groups Configuration:

| Thread #                              | Online Redo Log Groups | Standby Redo Log Groups |
|---------------------------------------|------------------------|-------------------------|
| Status                                |                        | (stndby)                |
| 1                                     | 3                      | 3                       |
| Insufficient SRLs                     |                        |                         |
| Future Log File Groups Configuration: |                        |                         |
| Thread #                              | Online Redo Log Groups | Standby Redo Log Groups |
| Status                                |                        | (stndby)                |
| 1                                     | 3                      | 2                       |
| Insufficient SRLs                     |                        |                         |

10. Perform a switch over to the `stndby` physical standby database. Do not exit DGMGRL.

```
DGMGRL> switchover to stndby
Performing switchover NOW, please wait...
Operation requires a connection to database "stndby"
Connecting ...
Connected to "stndby"
Connected as SYSDG.
New primary database "stndby" is opening...
Operation requires start up of instance "orclcdb" on database
"orclcdb"
Starting instance "orclcdb"...
Connected to an idle instance.
ORACLE instance started.
Connected to
"orclcdb"Database
mounted.
Database opened.
Connected to
"orclcdb"
```

11. Return to the SQL\*Plus session on `localhost`. Attempt to verify that your session is now on the `stndby` database.

**Note:** During switchover, you lost the exiting session.

```
SQL> select instance_name from v$instance;
select instance_name from v$instance
*
ERROR at line 1:
ORA-03113: end-of-file on communication channel
Process ID: 24566
Session ID: 297 Serial number: 59237
```

12. Establish a new session using the `PRMY.EXAMPLE.COM` service.

```
SQL> connect system/<password>@prmy
Connected.
SQL>
```

13. Verify that you are now connected to the `stndby` instance (the primary database).

```
SQL> select instance_name from v$instance;
INSTANCE_NAME

stndby
```

14. Verify that your connection has been established with the `DEV1` pluggable database and not the root container. Exit SQL\*Plus.

```
SQL> select sys_context ('USERENV', 'CON_NAME') as container FROM
dual;

CONTAINER

DEV1

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@host02 ~]
```

15. Return to the DGMGRL session running on `localhost` in Step 10. Validate both databases are ready for switchover, and then perform a switchover to return the configuration to the way it was at the start of this practice.

```
DGMGRL> validate database stndby
Database Role: Primary database
Ready for Switchover: Yes

DGMGRL> validate database orclcdb
Database Role: Physical standby database
Primary Database: stndby
Ready for Switchover: Yes
Ready for Failover: Yes (Primary Running)
Current Log File Groups Configuration:
 Thread # Online Redo Log Groups Standby Redo Log Groups
 (stndby)
 1 3 2
Future Log File Groups Configuration:
 Thread # Online Redo Log Groups Standby Redo Log Groups
 (stndby)
 1 3 2

DGMGRL> switchover to orclcdb
Performing switchover NOW, please wait...
Operation requires a connection to database "orclcdb"
Connecting ...
Connected to
"orclcdb"Connected as
SYSDG.
New primary database "orclcdb" is opening...
Operation requires start up of instance "stndby" on database
"stndby"
Starting instance "stndby"...
Connected to an idle instance.
ORACLE instance started.
Connected to "stndby"
Database mounted.
Database opened.
Connected to "stndby"
Connected to
"orclcdb"
Switchover succeeded, new primary is "orclcdb"
DGMGRL>
```

16. Display the status of the data guard configuration. Wait until all warning messages are cleared for practice 18-2.

```
DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxPerformance
Members:
orclcdb - Primary database
orclcdbFS - Far sync
instance
stndby - Physical standby database
stndby2 - Logical standby database (disabled)
ORA-16749: The member was disabled manually.

Members Not Receiving Redo:
stndbyFS - Far sync instance

Fast-Start Failover: Disabled

Configuration Status:
SUCCESS (status updated 48 seconds ago)
```

17. Keep the DGMGRL session on localhost for practice 18-2.

## Practice 18-2: Modifying the Primary Database Service for Application Continuity

---

### Overview

In this practice, you will modify the service PRMY created in the DEV1 pluggable database on the primary database to support Application Continuity.

### Tasks

1. Open a terminal window logged in as oracle to localhost with the environment variables set for orclcdb appropriately. Run the setup18.sh script to prepare for a

```
[oracle@localhost]$. oraenv
ORACLE_SID = [oracle] ? orclcdb
The Oracle base has been set to /u01/app/oracle
[oracle@localhost ~]$ /home/oracle/setup/lab_18-
2/setup18.sh

drop table emp
*
ERROR at line 1:
ORA-00942: table or view does not exist

Table created.
```

simple testing.

2. Launch SQL\*Plus and set the session container to the DEV1 pluggable database.

```
[oracle@localhost ~]$ sqlplus / as sysdba

SQL*Plus: Release 19.0.0.0.0 - Production on Thu Jun 11 22:30:48
2020
Version 19.3.0.0.0

(c) 1982, 2019, Oracle. All rights reserved.

Connected to:
Oracle Database 19c Enterprise Edition Release 19.0.0.0.0 -
Production
Version 19.3.0.0.0
```

```
SQL> alter session set container=dev1;

Session altered.
```

3. Modify the service PRMY.EXAMPLE.COM to support Application Continuity. Exit SQL\*Plus.

```
SQL> @/home/oracle/setup/modify_svc.sql
SQL> DECLARE
 2 params dbms_service.svc_parameter_array;
 3 BEGIN
 4 params ('FAILOVER_TYPE') := 'TRANSACTION';
 5 params ('REPLAY_INITIATION_TIMEOUT') := 1800;
 6 params ('RETENTION_TIMEOUT') := 86400;
 7 params ('FAILOVER_DELAY') := 10;
 8 params ('FAILOVER_RETRIES') := 30;
 9 params ('FAILOVER_RESTORE') := 'LEVEL1';
10 params ('commit_outcome') := 'true';
11 params ('aq_ha_notifications') := 'true';
12 dbms_service.modify_service('prmy.example.com',params);
13 END;
14 /

PL/SQL procedure successfully completed.

SQL> exit
Disconnected from Oracle Database 19c Enterprise Edition Release
19.0.0.0.0 - Production
Version 19.3.0.0.0
[oracle@localhost ~]$
```

**Note:** You have to set two mandatory service attributes (FAILOVER\_TYPE and COMMIT\_OUTCOME) to enable the Application Continuity feature.

4. Examine the script that you will soon use to execute the practice application. The script executes the application code called actest.jar.

```
[oracle@localhost ~]$ cat /home/oracle/setup/lab_18-2/runreplay
java -
classpath ./actest.jar:$ORACLE_HOME/ucp/lib/ucp.jar:$ORACLE_HOME/
jdbc/lib/ojdbc8.jar actest.ACTest actest_replay.properties
[oracle@localhost ~]$
```

5. Examine the properties file.

- Use the Replay Data source: oracle.jdbc.replay.OracleDataSourceImpl
- Use the Application Continuity enabled service: prmy
- Use the Application Continuity supported connection pool: UCP

```
[oracle@localhost ~]$
cat /home/oracle/setup/lab_18-2/actest_replay.properties
username=hr password=hr
autoCommit=false

Use new replay datasource
datasource=oracle.jdbc.replay.OracleDataSourceImpl

url=jdbc:oracle:thin:@(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp) (HOST=host01.example.com) (PORT=1521) (ADDRESS=(PROTOCOL=tcp) (HOST=stndby.example.com) (PORT=1521)) (CONNECT_DATA=(SERVICE_NAME=prmy)))

UCP setting:
ucp_pool_size=2
ucp_validate_connection_on_borrow=true
ucp_connection_wait_timeout=60

Think Time taken to process the results from the database. Time in milliseconds.
-1 means no sleep.
thread_think_time=20

Number of concurrent threads running in the application
UCP is tuned to have MAX and MIN limit set to this
number_of_threads=6

verbose=true
[oracle@localhost
~]$
```

6. Use the terminal window connected to host02. Execute the practice application. While the application runs, a periodic status message is displayed.

```
[oracle@host02 ~]$ cd /home/oracle/setup/lab_18-2/
[oracle@host02 lab_18-2]$./runreplay
#####
Connecting to
jdbc:oracle:thin:@(DESCRIPTION_LIST=(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp) (HOST=localhost.example.com) (PORT=1521)) (CONNECT_DATA=(SERVICE_NAME=PRMY.EXAMPLE.COM))) (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp) (HOST=stndby.example.com) (PORT=1521)) (CONNECT_DATA=(SERVICE_NAME=PRM.Y.EXAMPLE.COM)))
of Threads : 6
UCP pool size : 2
Thread think time : 20 ms
#####

2 active connections, avg response time from db 6 ms
1 active connections, avg response time from db 5 ms
1 active connections, avg response time from db 5 ms
...
...
```

7. While the application continues to execute, return to the DGMGRL session on localhost. Check the status of the data guard configuration and wait until all warning messages are cleared.

```
DGMGRL> show configuration

Configuration - DRSolution

Protection Mode: MaxPerformance
Members:
orclcdb - Primary database
orclcdbFS - Far sync
instance
stndby - Physical standby database
stndby2 - Logical standby database (disabled)
ORA-16749: The member was disabled manually.

Members Not Receiving Redo:
stndbyFS - Far sync instance

Fast-Start Failover: Disabled
```

```
Configuration Status:
SUCCESS (status updated 48 seconds ago)

DGMGRL>
```

8. Verify that both databases are ready for switchover, and then perform a switchover.

```
DGMGRL> validate database

Database Role: Primary database

Ready for Switchover: Yes
....

DGMGRL> validate database stndby

Database Role: Physical standby database
Primary Database: orclcdb

Ready for Switchover: Yes
Ready for Failover: Yes (Primary Running)
....

DGMGRL> switchover to stndby
Performing switchover NOW, please wait...
Operation requires a connection to database "stndby"
Connecting ...
Connected to "stndby"
Connected as SYSDG.
New primary database "stndby" is opening...
Operation requires start up of instance "orclcdb" on
database "orclcdb"
Starting instance "orclcdb" ...
Connected to an idle instance.
ORACLE instance started.
Connected to
"orclcdb" Database
mounted.
Database opened.
Connected to
"orclcdb"
```

9. Return to the terminal session on host02. Press **Ctrl+C** to abort the application.

```
...
2 active connections, avg response time from db 5 ms
2 active connections, avg response time from db 5 ms
0 active connections, avg response time from db 5 ms
2 active connections, avg response time from db 5 ms
1 active connections, avg response time from db 111 r
2 active connections, avg response time from db 5 ms
2 active connections, avg response time from db 7 ms
0 active connections, avg response time from db 6 ms
1 active connections, avg response time from db 5 ms
2 active connections, avg response time from db 5 ms
...
^C[oracle@host02 lab_18-2]$
```

**Note:** Your application is still connected without having any connection issues. There was only a small delay during the switchover operation.

10. **(Optional)** Return to the DGMGRL session on localhost. Optionally, switch back to the original state.

```
DGMGRL> switchover to orclcdb
Performing switchover NOW, please wait...
Operation requires a connection to database "orclcdb"
Connecting ...
Connected to
"orclcdb"Connected as
SYSDG.

New primary database "orclcdb" is opening...
Operation requires start up of instance "stndby" on database
"stndby"

Starting instance "stndby"...
Connected to an idle instance.
ORACLE instance started.

Connected to "stndby"
Database mounted.

Database opened.

Connected to "stndby"
```

```
Switchover succeeded, new primary is "orclcdb"
DGMGRL>
```

11. Exit DGMGRL on localhost.



# **Practices for Lesson 19: Patching and Upgrading Databases in a Data Guard Configuration**

## **Practices for Lesson 19**

---

There are no practices for this lesson.