Practice 23: Switching Over a Refreshable Clone PDB

Practice Overview

In this practice, you will create a refreshable PDB in `ORADB2`, named `PDB1R`, by cloning `PDB1` that is located in `ORADB`. You will then switchover to `PDB1R`.

Practice Assumptions

- You have the `ORADB` (in `srv1`) and `ORADB2` (in `srv2`) databases up and running.

Creating a Refreshable PDB

In the following steps, you will create a refreshable PDB called PDB1R in the machine srv2 by cloning PDB1 in that exists in ORADB1.

PDB1 in ORADB could be referred to in this practice as the **source PDB**, and PDB3R in ORADB2 could be referred to as the **target PDB**.

1. In Oracle VirtualBox, take a snapshot for srv1 and srv2.

Caution: Do not proceed with the practice before taking a snapshot for the srv1 and srv2 first.

2. Open two Putty sessions two srv1 and srv2 as oracle

3. In srv1 and srv2, invoke SQL*Plus, login to oradb as sysdba.

```
sqlplus / as sysdba
```

4. In srv1 and srv2, Submit the following query to retrieve the value of the undocumented parameter _exadata_feature_on.

   This parameter must be turned on to use the “PDB Switchover” functionality. It is not needed for creating refreshable PDBs.

```
set linesize 180
col PARAMETER for a25
col DEFAULTV for a5
col SESSION_V for a15
col INSTANCE_V for a15

SELECT a.ksppinm PARAMETER, b.KSPPSTDF DEFAULTV,
       b.ksppstvl SESSION_V,
       c.ksppstvl INSTANCE_V
FROM   x$ksppi a, x$ksppcv b, x$ksppsv c
WHERE  a.indx = b.indx
AND    a.indx = c.indx AND a.ksppinm LIKE '/_%' escape '/'
AND    a.ksppinm = '_exadata_feature_on'
/
```

5. If the parameter is not turned on, set it to TRUE and restart oradb instance:

```
ALTER SYSTEM SET "_exadata_feature_on"=TRUE SCOPE=SPFILE;
shutdown immediate
startup
```

6. In srv1 and srv2, verify that the local undo is enabled in the CDBs.

   If the local undo is not enabled, we must open the source PDB in ready-only mode before switchover.

```
col PROPERTY_NAME for a30
col PROPERTY_VALUE for a30

SELECT PROPERTY_NAME, PROPERTY_VALUE
FROM   DATABASE_PROPERTIES
WHERE  PROPERTY_NAME = 'LOCAL_UNDO_ENABLED';
```

7. In srv1, create a common user and grant the privileges required to create a pluggable database from pdb1.

   We could use the prebuilt user SYSTEM but it is recommended to create a user dedicated to creating refreshable databases.

```
CREATE USER c##ruser IDENTIFIED BY abc##1234;
GRANT CREATE SESSION, RESOURCE, CREATE ANY TABLE, UNLIMITED TABLESPACE TO
c##ruser CONTAINER=ALL;
GRANT CREATE PLUGGABLE DATABASE TO c##ruser CONTAINER=ALL;
GRANT SYSOPER TO c##ruser CONTAINER=ALL;
```

8. In srv2, connect to the root of ORADB database as sysdba then create a database link to ORADB using c##ruser user.

   This database link will be used to create the refreshable PDB in oradb2.


```
-- verify the db link isn't there:
col DB_LINK for a15
col USERNAME for a15

SELECT DB_LINK, USERNAME FROM DBA_DB_LINKS WHERE DB_LINK='ORADB';

-- create the db link:
CREATE DATABASE LINK oradb CONNECT TO c##ruser IDENTIFIED BY abc##1234 USING
'ORADB';

-- test it:
SELECT SYSDATE FROM DUAL@ORADB;
```

9. In srv2, create a refreshable PDB by cloning PDB1 and set its refresh mode to MANUAL.

```
ALTER SESSION SET DB_CREATE_FILE_DEST='/u01/app/oracle/oradata';
CREATE PLUGGABLE DATABASE pdb1r FROM pdb1@oradb REFRESH MODE MANUAL;
ALTER PLUGGABLE DATABASE pdb1r OPEN READ ONLY;
SELECT REFRESH_MODE FROM DBA_PDBS WHERE PDB_NAME='PDB1R';
```

Switching Over the Refreshable PDB

In the following steps, you will switchover the roles between PDB1 and PDB1R and then switch back.

10. In oradb2 (srv2), create a common user with the same username and password as the one created in oradb.

If the source PDB and clone PDB are in separate CDBs, then the user specified in the database link must have the same name and password in the source PDB and clone PDB. This user will be used for switchover.

```
conn / as sysdba

CREATE USER c##ruser IDENTIFIED BY abc##1234;
GRANT CREATE SESSION, RESOURCE, CREATE ANY TABLE, UNLIMITED TABLESPACE TO
c##ruser CONTAINER=ALL;
GRANT CREATE PLUGGABLE DATABASE TO c##ruser CONTAINER=ALL;
GRANT SYSOPER TO c##ruser CONTAINER=ALL;
```

11. In srv2, retrieve the directory that hosts the PDB1R datafiles. Take a note of it into a temporary text file.

```
SELECT F.NAME FNAME FROM V$DATAFILE F, CDB_PDBS P
WHERE P.PDB_NAME='PDB1R' AND F.CON_ID=P.CON_ID;
```


12. In srv1, display the contents of tnsnames.ora file and make sure it contains a connection descriptor to oradb2. If there is no connection descriptor for oradb2, add it into the file.

```
host cat $TNS_ADMIN/tnsnames.ora
```

13. In srv1, create a database link to oradb2 using c##ruser user.

This database link will be used to switchover to the refreshable PDB

```
conn / as sysdba

-- verify the db link isn't there:
col DB_LINK for a15
col USERNAME for a15

SELECT DB_LINK, USERNAME FROM CDB_DB_LINKS WHERE DB_LINK LIKE 'ORADB2%';

-- create the db link:
CREATE DATABASE LINK oradb2 CONNECT TO c##ruser IDENTIFIED BY abc##1234 USING
'ORADB2';

-- test it:
SELECT SYSDATE FROM DUAL@ORADB2;
```

Now we are ready to switchover to PDB1R. To monitor this process, create two monitoring sessions to the alertlog file of each database. The monitoring sessions in srv1 and srv2 would execute the following command respectively:

```
tail -f /u01/app/oracle/diag/rdbms/oradb/oradb/trace/alert_oradb.log
tail -f /u01/app/oracle/diag/rdbms/oradb2/oradb2/trace/alert_oradb2.log
```

14. In srv1, close PDB1, switch the roles between it and PDB1R.

```
conn / as sysdba
ALTER PLUGGABLE DATABASE pdb1 REFRESH MODE MANUAL FROM pdb1r@oradb2 SWITCHOVER;
```

The switchover command fails and returns the same error that we faced in the last two practices:

```
ORA-65016: FILE_NAME_CONVERT must be specified
```

You can check the monitoring sessions to see details on the returned error.

15. Let's try executing the command with the FILE_NAME_CONVERT option.

Replace the <pdb1r-dir> with the directory of PDB1 datafiles noted earlier.

```
host mkdir /u01/app/oracle/oradata/ORADB/pdb1r

ALTER PLUGGABLE DATABASE REFRESH MODE MANUAL FROM pdb1r@oradb2 SWITCHOVER
FILE_NAME_CONVERT=('<pdb1r-dir>','/u01/app/oracle/oradata/ORADB/pdb1r');
```


The switchover functionality has a bug in the Oracle 19c on-premises databases. I reported this issue to Oracle support and should still waiting for their effective response on it.

Let's examine the status of the PDBs after this error:

16. In srv1, check the OPEN_MODE of PDB1. Try opening it.

The source PDB is not open and cannot be opened.

```
SELECT OPEN_MODE FROM V$PDBS WHERE NAME='PDB1';
ALTER PLUGGABLE DATABASE PDB1 OPEN;
```

17. In srv2, check the OPEN_MODE of PDB1R. Try opening it in read only mode.

The refreshable PDB is not open and cannot be opened.

```
SELECT OPEN_MODE FROM V$PDBS WHERE NAME='PDB1R';
ALTER PLUGGABLE DATABASE PDB1R OPEN READ ONLY;
```

Cleanup

18. Shutdown srv1 and srv2 and restore them from the snapshots taken in the beginning of the practice.

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Summary

- With switchover to a refreshable PDB, we are supposed to be able to switch the roles between the source PDB and its associated refreshable PDB.
- Switchover to refreshable PDB in on-premises Oracle 19c EE has a bug that prevents it from achieving its functionality.