**Practices for Lesson 14**

**Multitenant Architecture and RAC Environment**

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# Practices for Lesson 14: Overview

### Overview

In this practice, you will create a new CDB named cdb1 including one PDB named pdb1. The CDB is hosted in an existing server pool.

Then you will create another PDB named pdb2 and manage the services to affinitize the PDB services to instances.

At the end of the practice, you drop the pdb2 PDB.

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# Practice 12-1: Creating a CDB

### Overview

In this practice, you will create a new CDB named cdb1 with DBCA.

#### Pre CDB Creation Tasks

As root, start host03. Then, remove the existing RAC database. From your classroom PC desktop, execute ssh –X oracle@host01 to open a terminal session on host01 as the oracle user. Then navigate to

/u01/app/oracle/product/12.1.0/dbhome\_1/bin and execute DBCA.

|  |
| --- |
| [vncuser@*classroom\_pc* ~]$ **su –**  Password:  [root@*classroom\_pc* ~]# **xm create host03**  Using config file "/etc/xen/host03". Started domain host03 (id=108)  ***\*\*\* Wait a few moments for host03 to boot completely \*\*\*\****  [root@*classroom\_pc* ~]# **ssh -X oracle@host01**  oracle@host01's password:  [oraclec@host01 ~]# **cd**  **/u01/app/oracle/product/12.1.0/dbhome\_1/bin**  [oracle@host01 bin]$ **./dbca** |

|  |  |  |
| --- | --- | --- |
| **Step** | **Screen/Page Description** | **Choices or Values** |
| a. | Database Operation | Select Delete Database. Click Next. |
| b. | Delete Database | Select orcl and click Next. |
| c. | Management Options | Click Next. |
| d. | Summary | Click Finish. |
| e. | Database Configuration Assistant dialog box | You are informed that the instances and datafiles will be deleted. Click Yes to proceed. |
| f. | Database Configuration Assistant dialog box | You are informed that database deletion is complete. Click OK. |
| g. | Progress Page | Click Close. |

Remove the orcldb server pool.

|  |
| --- |
| [oracle@host01 bin]$ **/u01/app/12.1.0/grid/bin/srvctl remove srvpool -serverpool orcldb**  [oracle@host01 bin]$ **/u01/app/12.1.0/grid/bin/srvctl status srvpool** |

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|  |
| --- |
| Server pool name: Free Active servers count: 3 Server pool name: Generic Active servers count: 0  [oracle@host01 bin]$ |

### Tasks

1. Start DBCA and perform the following steps.

|  |
| --- |
| [oracle@host01 bin]$ ./**dbca** |

|  |  |  |
| --- | --- | --- |
| **Step** | **Window/Page Description** | **Choices or Values** |
| a. | Step 1: Database Operation | Select “Create Database.”  Click Next. |
| b. | Step 2: Creation Mode | Select “Advanced Mode.”  Click Next. |
| c. | Step 3: Database Template | Select “Oracle Real Application Clusters (RAC) database” for Database Type.  Select “Policy-Managed” for Configuration Type.  Select “General Purpose or Transaction Processing.”  Click Next. |
| d. | Step 4: Database Identification | Enter  Global Database Name: cdb1  Select **“Create As Container Database.”**  Select **“Create A Container Database with one or more PDBs.**”  Select 1 for Number of PDBs. Enter pdb1 for PDB Name.  Click Next. |
| e. | Step 5: Database Placement | Select “Create New Server pool for this database”.  Enter “cdb1pool“ for Server pool Name and 3 for Cardinality.  Click Next. |
| f. | Step 6: Management Options | Deselect “Configure Enterprise Manager (EM) Database Express.”  Click Next. |

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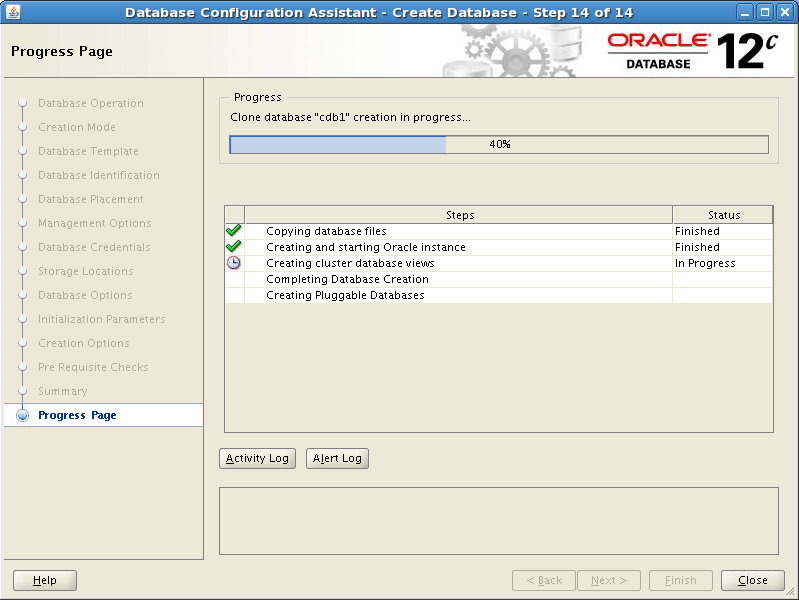
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|  |  |  |
| --- | --- | --- |
| **Step** | **Window/Page Description** | **Choices or Values** |
| g. | Step 7: Database Credentials | Select “Use same Administrative password…” Enter:  Password: *database\_administrative\_password*  Confirm password:  *database\_administrative\_password*  Click Next. |
| h. | Step 8: Storage Locations | Confirm Storage type is “Automatic Storage Management (ASM).”  Confirm “Use Common Location for All Database Files.” in +DATA diskgroup.  Deselect “Specify Fast Recovery Area”. Click Next. |
| i. | Step 9: Database Options | Click Next. |
| j. | Step 10: Initialization Parameters | Set “Memory Size (SGA and PGA)” to 840 MB. Select “Use Automatic Memory Management” Select “Character Sets.”  Select “Use Unicode (**AL32UTF8**).”  Click Next. |
| k. | Step 11: Creation Option | Select “Create Database.”  Click Next. |
| l. | Step 12: Pre Requisite Checks | Click Next. |
| m. | Step 13: Summary | Click Finish. |
| n. | Step 14: Progress Page | On the Database Configuration Assistant page (for password management), click Exit.  Click Close. |

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The screenshot below corresponds to step n.



1. Explore the CDB instances hosted on the nodes of the server pool. You will also see that the pdb1 PDB can be accessed on any instance of the CDB just like a non-CDB can be accessed on any instance in a RAC environment.
   1. Check the cdb1pool server pool and its cardinality.

|  |
| --- |
| [oracle@host01 bin]$ **su - grid**  grid@host01's password:  [grid@host01 ~]$ **. oraenv**  ORACLE\_SID = [grid] ? **+ASM1**  The Oracle base has been set to /u01/app/grid  [grid@host01 ~]$ **srvctl status srvpool**  Server pool name: Free Active servers count: 0 Server pool name: Generic Active servers count: 0 Server pool name: **cdb1pool** Active servers count: **3**  [grid@host01 ~]$ **srvctl status srvpool -serverpool cdb1pool**  Server pool name: cdb1pool Active servers count: 3 |

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|  |
| --- |
| [grid@host01 ~]$ **exit**  logout  [oracle@host01 ~]$ |

* 1. Use SRVCTL to know on which nodes the instances of the CDB are running, as you traditionally do for any non-CDB.

|  |
| --- |
| [oracle@host01 ~]$ **export ORACLE\_HOME=/u01/app/oracle/product/12.1.0/dbhome\_1**  [oracle@host01 ~]$ **cd $ORACLE\_HOME/bin**  [oracle@host01 bin]$ ./**srvctl status database -d cdb1**  Instance cdb1\_1 is running on node host03 Instance cdb1\_2 is running on node host02 Instance cdb1\_3 is running on node host01  [oracle@host01 bin]$ **pgrep -l cdb1\_3**  9770 ora\_pmon\_cdb1\_3  9772 ora\_psp0\_cdb1\_3  9774 ora\_vktm\_cdb1\_3  9778 ora\_gen0\_cdb1\_3  9780 ora\_mman\_cdb1\_3  9784 ora\_diag\_cdb1\_3  9786 ora\_dbrm\_cdb1\_3  9790 ora\_ping\_cdb1\_3  9792 ora\_acms\_cdb1\_3  9794 ora\_dia0\_cdb1\_3  9796 ora\_lmon\_cdb1\_3  9798 ora\_lmd0\_cdb1\_3  9800 ora\_lms0\_cdb1\_3  9804 ora\_rms0\_cdb1\_3  9806 ora\_lmhb\_cdb1\_3  9808 ora\_lck1\_cdb1\_3  9810 ora\_dbw0\_cdb1\_3  9812 ora\_lgwr\_cdb1\_3  9814 ora\_ckpt\_cdb1\_3  9816 ora\_smon\_cdb1\_3  9818 ora\_reco\_cdb1\_3  9820 ora\_lreg\_cdb1\_3  9822 ora\_rbal\_cdb1\_3  9824 ora\_asmb\_cdb1\_3 |

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|  |
| --- |
| 9826 ora\_mmon\_cdb1\_3  9830 ora\_mmnl\_cdb1\_3  9832 ora\_d000\_cdb1\_3  9834 ora\_s000\_cdb1\_3  9836 ora\_mark\_cdb1\_3  9841 ora\_gcr0\_cdb1\_3  9843 ora\_lck0\_cdb1\_3  9857 ora\_rsmn\_cdb1\_3  9906 ora\_tmon\_cdb1\_3  9908 ora\_tt00\_cdb1\_3  9960 ora\_smco\_cdb1\_3  9962 ora\_w000\_cdb1\_3  9968 ora\_gtx0\_cdb1\_3  9970 ora\_rcbg\_cdb1\_3  9972 ora\_ppa7\_cdb1\_3  9987 ora\_aqpc\_cdb1\_3  9989 ora\_qm02\_cdb1\_3  9991 ora\_q001\_cdb1\_3  9993 ora\_q002\_cdb1\_3  9995 ora\_qm05\_cdb1\_3  10013 ora\_p000\_cdb1\_3  10015 ora\_p001\_cdb1\_3  10017 ora\_p002\_cdb1\_3  10019 ora\_p003\_cdb1\_3  10319 ora\_cjq0\_cdb1\_3  11166 ora\_w001\_cdb1\_3  11995 ora\_w002\_cdb1\_3  13641 ora\_p004\_cdb1\_3  13643 ora\_p005\_cdb1\_3 [oracle@host01 bin]$ |

* 1. Use LSNRCTL to list the CDB instances on two nodes of the server pool.
     1. Check the services on the first node.

|  |
| --- |
| [oracle@host01 bin]$ ./**lsnrctl status**  LSNRCTL for Linux: Version 12.1.0.2.0 - Production on 02-SEP- 2014 06:54:40  Copyright (c) 1991, 2014, Oracle. All rights reserved.  Connecting to (ADDRESS=(PROTOCOL=tcp)(HOST=)(PORT=1521)) STATUS of the LISTENER |

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|  |
| --- |
| Alias LISTENER  Version TNSLSNR for Linux: Version 12.1.0.2.0  - Production  Start Date 30-AUG-2014 07:22:00  Uptime 2 days 23 hr. 32 min. 40 sec  Trace Level off  Security ON: Local OS Authentication  SNMP OFF  Listener Parameter File  /u01/app/12.1.0/grid/network/admin/listener.ora Listener Log File  /u01/app/grid/diag/tnslsnr/host01/listener/alert/log.xml  Listening Endpoints Summary... (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc)(KEY=LISTENER)))  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=192.0.2.247)(PORT=1521  )))  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=192.0.2.101)(PORT=1521  )))  Services Summary...  Service "+ASM" has 1 instance(s).  Instance "+ASM1", status READY, has 1 handler(s) for this service...  Service "**cdb1**" has 1 instance(s).  Instance "**cdb1\_3**", status READY, has 1 handler(s) for this service...  Service "cdb1XDB" has 1 instance(s).  Instance "cdb1\_3", status READY, has 1 handler(s) for this service...  Service "**pdb1**" has 1 instance(s).  Instance "**cdb1\_3**", status READY, has 1 handler(s) for this service...  The command completed successfully [oracle@host01 bin]$ |

* + 1. Check the services on the second node.

|  |
| --- |
| [oracle@host01 bin]$ **ssh host02**  Last login: Mon Sep 2 01:17:02 2014 from 192.0.2.1 [oracle@host02 ~]$ **. oraenv**  ORACLE\_SID = [oracle] ? **cdb1\_2**  ORACLE\_HOME = [/home/oracle] ?  **/u01/app/oracle/product/12.1.0/dbhome\_1** |

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|  |
| --- |
| The Oracle base has been set to /u01/app/oracle  [oracle@host02 ~]$ **lsnrctl status**  …  Listening Endpoints Summary... (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc)(KEY=LISTENER)))  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=192.0.2.245)(PORT=1521  )))  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=192.0.2.102)(PORT=1521  )))  Services Summary...  Service "+ASM" has 1 instance(s).  Instance "+ASM3", status READY, has 1 handler(s) for this service...  Service "**cdb1**" has 1 instance(s).  Instance "**cdb1\_2**", status READY, has 1 handler(s) for this service...  Service "cdb1XDB" has 1 instance(s).  Instance "cdb1\_2", status READY, has 1 handler(s) for this service...  Service "**pdb1**" has 1 instance(s).  Instance "**cdb1\_2**", status READY, has 1 handler(s) for this service...  The command completed successfully  [oracle@host02 ~]$ **exit**  logout  Connection to host02 closed. [oracle@host01 bin]$ |

* 1. Use SRVCTL to stop and restart the CDB as you traditionally would do for any non- CDB.

|  |
| --- |
| [oracle@host01 bin]$ **. oraenv**  ORACLE\_SID = [oracle] ? **cdb1\_3**  ORACLE\_HOME = [/home/oracle] ?  **/u01/app/oracle/product/12.1.0/dbhome\_1**  The Oracle base has been set to /u01/app/oracle [oracle@host01 bin]$ **srvctl stop database -d cdb1**  [oracle@host01 bin]$ **srvctl status database -db cdb1**  Instance cdb1\_1 is not running on node host03 |

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|  |
| --- |
| Instance cdb1\_2 is not running on node host02 Instance cdb1\_3 is not running on node host01  [oracle@host01 bin]$ **srvctl start database -d cdb1**  [oracle@host01 bin]$ **srvctl status database -db cdb1**  Instance cdb1\_1 is running on node host03 Instance cdb1\_2 is running on node host02 Instance cdb1\_3 is running on node host01  [oracle@host01 bin]$ **cd**  [oracle@host01 ~]$ |

* 1. Use SQL\*Plus to connect to the instances of the cdb1 CDB, check the UNDO tablespaces and the groups of redo log files, and verify the existence of the pdb1 PDB.
     1. Check the UNDO tablespaces created in the CDB.

|  |
| --- |
| [oracle@host01 ~]$ **sqlplus / as sysdba**  Connected to:  Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production  With the Partitioning, Real Application Clusters, Automatic Storage Management, OLAP, Advanced Analytics and Real Application Testing options  SQL> **SELECT name, cdb, con\_id FROM v$database;**  NAME CDB CON\_ID  - - CDB1 YES 0  SQL> **SELECT instance\_name, con\_id FROM v$instance;**  INSTANCE\_NAME CON\_ID    cdb1\_3 0  SQL> **show con\_name**  CON\_NAME CDB$ROOT |

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|  |
| --- |
| SQL> **SELECT tablespace\_name, con\_id FROM cdb\_tablespaces**  **WHERE contents = 'UNDO';**  TABLESPACE\_NAME CON\_ID UNDOTBS1 1  UNDOTBS2 1  UNDOTBS3 1  SQL> |

* + 1. Check the groups of redo log files created for the three CDB instances.

|  |
| --- |
| SQL> **SELECT group#, con\_id FROM v$logfile;**  GROUP# CON\_ID    2 0  1 0  5 0  6 0  3 0  4 0  6 rows selected.  SQL> |

* + 1. Check the PDB created in the CDB and its open mode. If the PDB is not opened, open it.

|  |
| --- |
| SQL> **COL pdb\_name format a10**  SQL> **SELECT pdb\_id, pdb\_name, guid, status FROM cdb\_pdbs;**  PDB\_ID PDB\_NAME GUID STATUS    3 PDB1 E13E44A728D5266BE043650200C0187D NORMAL  2 PDB$SEED E13D83F6E4966F2AE043650200C0058C NORMAL  SQL> **SELECT name, open\_mode FROM v$pdbs;** |

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|  |
| --- |
| NAME OPEN\_MODE    PDB$SEED READ ONLY  PDB1 MOUNTED  SQL> **ALTER SESSION SET CONTAINER=pdb1;**  Session altered. SQL> **show con\_name**  CON\_NAME PDB1  SQL> **CONNECT / AS SYSDBA**  Connected.  SQL> **SELECT name FROM cdb\_services;**  NAME  SYS$BACKGROUND SYS$USERS  cdb1XDB cdb1  SQL> **ALTER PLUGGABLE DATABASE pdb1 OPEN;**  Pluggable database altered.  SQL> **SELECT name, open\_mode FROM v$pdbs;**  NAME OPEN\_MODE    PDB$SEED READ ONLY  PDB1 READ WRITE  SQL> |

* + 1. Check the services.

|  |
| --- |
| SQL> **SELECT name FROM v$services;** |

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|  |
| --- |
| NAME  pdb1 cdb1XDB cdb1  SYS$BACKGROUND SYS$USERS  SQL> **EXIT** |

* 1. Switch to the second node to verify the open mode of the PDB in the second instance of the CDB.

|  |
| --- |
| [oracle@host01 ~]$ **ssh host02** [oracle@host02 ~]$ **. oraenv** ORACLE\_SID = [oracle] ? **cdb1\_2**  ORACLE\_HOME = [/home/oracle] ?  **/u01/app/oracle/product/12.1.0/dbhome\_1**  The Oracle base has been set to /u01/app/oracle [oracle@host02 ~]$ **sqlplus / as sysdba**  Connected to:  Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production  With the Partitioning, Real Application Clusters, Automatic Storage Management, OLAP, Advanced Analytics and Real Application Testing options  SQL> **SELECT name, cdb, con\_id FROM v$database;**  NAME CDB CON\_ID  - - CDB1 YES 0  SQL> **SELECT instance\_name, con\_id FROM v$instance;**  INSTANCE\_NAME CON\_ID    cdb1\_2 0  SQL> **show con\_name**  CON\_NAME |

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|  |
| --- |
| CDB$ROOT  SQL> **SELECT name, open\_mode FROM v$pdbs;**  NAME OPEN\_MODE    PDB$SEED READ ONLY  PDB1 MOUNTED  SQL> **ALTER SESSION SET CONTAINER=pdb1;**  Session altered.  SQL> **SELECT name FROM v$services;**  NAME  pdb1  SQL> **exit** [oracle@host02 ~]$ **exit** logout  Connection to host02 closed.  [oracle@host01 ~]$ |

* 1. Verify that the pdb1 service is accessible from instance cdb1\_3 on the first node but also from the cdb1\_2 instance on the second node and from the cdb1\_1 instance on the third node. First restart the listener.

|  |
| --- |
| [oracle@host01 ~]$ **su - grid**  Password:  Last login: Mon Sep 2 05:16:31 2014 from host01.example.com [grid@host01 ~]$ **. oraenv**  ORACLE\_SID = [grid] ? **+ASM1**  The Oracle base has been set to /u01/app/grid [grid@host01 ~]$ **srvctl stop listener -listener LISTENER** [grid@host01 ~]$ **srvctl start listener -listener LISTENER**  [grid@host01 ~]$ **exit**  logout |

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|  |
| --- |
| [oracle@host01 ~]$ **sqlplus /nolog**  SQL\*Plus: Release 12.1.0.2.0 Production on Wed Jul 17 00:38:28  2014 |
|  |
| Copyright (c) 1982, 2014, Oracle. All rights reserved. SQL> **CONNECT system@"host01:1521/pdb1"**  Enter password:  Connected.  SQL> **SELECT instance\_name, con\_id FROM v$instance;**  INSTANCE\_NAME CON\_ID    cdb1\_3 0  SQL> **show con\_name**  CON\_NAME PDB1  SQL> **CONNECT system@"host02:1521/pdb1"**  Enter password:  ERROR:  ORA-01033:ORACLE initialization or shutdown in progress Process ID: 0  Session ID: 0 Serial Number: 0  Warning: You are no longer connected to ORACLE. SQL> |

Notice that the connection does not complete because pdb1 was opened for instance cdb1\_3 on host01 only. Remember that the clause INSTANCES was not used in the ALTER PLUGGABLE DATABASE OPEN statement in task 2.e.3).

|  |
| --- |
| SQL> **CONNECT / AS SYSDBA**  Connected.  SQL> **ALTER PLUGGABLE DATABASE pdb1 OPEN INSTANCES=('cdb1\_2');**  Pluggable database altered. |
|  |
| SQL> **CONNECT system@"host02:1521/pdb1"** |

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|  |
| --- |
| Enter password:  Connected.  SQL> **SELECT instance\_name, con\_id FROM v$instance;**  INSTANCE\_NAME CON\_ID    cdb1\_2 0  SQL> **show con\_name**  CON\_NAME PDB1  SQL> **CONNECT system@"host03:1521/pdb1"**  Enter password:  ERROR:  ORA-01033:ORACLE initialization or shutdown in progress Process ID: 0  Session ID: 0 Serial Number: 0  Warning: You are no longer connected to ORACLE. SQL> **EXIT** |

The connection does not complete on host03 because pdb1 was opened for instance

cdb1\_3 on host01 and cdb1\_2 on host02 only.

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# Practice 12-2: Cloning a PDB in the RAC CDB

### Overview

In this practice, you will clone the pdb1 PDB into a new PDB named pdb2 in the cdb1 CDB. This operation requires to close and open PDBs on multiple instances of the CDB.

### Tasks

1. Connect to the root of the multitenant container database cdb1 on any of the three instances.

|  |
| --- |
| [oracle@host01 ~]$ **. oraenv**  ORACLE\_SID = [cdb1] ? **cdb1\_3**  ORACLE\_HOME = [/home/oracle] ?  **/u01/app/oracle/product/12.1.0/dbhome\_1**  The Oracle base has been set to /u01/app/oracle [oracle@host01 ~]$ **sqlplus / as sysdba**  Connected to:  Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production  With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options  SQL> |

1. Use Oracle Managed Files to locate the data files of the new pdb2.

|  |
| --- |
| SQL> **SHOW PARAMETER db\_create\_file\_dest**  **NAME TYPE VALUE**    **db\_create\_file\_dest string +DATA**  SQL> |

1. Create pdb2 from pdb1.
   1. Use the CREATE PLUGGABLE DATABASE command to create pdb2.

|  |
| --- |
| SQL> **CREATE PLUGGABLE DATABASE pdb2 FROM pdb1;**  Pluggable database created.  SQL> SELECT name, open\_mode FROM v$pdbs; NAME OPEN\_MODE |

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|  |
| --- |
| PDB$SEED READ ONLY  PDB1 READ WRITE  PDB2 MOUNTED  SQL> |

* 1. Now, open both PDBs in READ WRITE mode on all the CDB instances.

|  |
| --- |
| SQL> **ALTER PLUGGABLE DATABASE pdb1 CLOSE IMMEDIATE INSTANCES=ALL;**  Pluggable database altered.  SQL> **ALTER PLUGGABLE DATABASE ALL OPEN READ WRITE INSTANCES=ALL;**  Pluggable database altered.  SQL> **SELECT name, open\_mode FROM v$pdbs;**  NAME OPEN\_MODE    PDB$SEED READ ONLY  PDB1 READ WRITE  PDB2 READ WRITE  SQL> **SELECT pdb\_id, pdb\_name, guid, status FROM cdb\_pdbs;**  PDB\_ID PDB\_NAME GUID STATUS    3 PDB1 E13E44A728D5266BE043650200C0187D NORMAL  2 PDB$SEED E13D83F6E4966F2AE043650200C0058C NORMAL  4 PDB2 E2B1483E90856557E043650200C01D40 NORMAL SQL> **ALTER SESSION SET CONTAINER=pdb2;**  Session altered.  SQL> **SELECT name FROM dba\_services;**  NAME  pdb2 |

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|  |
| --- |
| SQL> **EXIT** |

* 1. Use LSNRCTL to verify that the new pdb2 service associated to the new PDB in the CDB instance is automatically started after the PDB is opened. Because the PDB is opened in all the CDB instances, the pdb2 PDB service is started in all the CDB instances.

|  |
| --- |
| [oracle@host01 ~]$ **lsnrctl status**  LSNRCTL for Linux: Version 12.1.0.2.0 - Production on 30-JUL- 2014 05:44:45  Copyright (c) 1991, 2014, Oracle. All rights reserved.  Connecting to (ADDRESS=(PROTOCOL=tcp)(HOST=)(PORT=1521)) STATUS of the LISTENER  Alias LISTENER  Version TNSLSNR for Linux: Version 12.1.0.2.0  - Production  Start Date 16-JUL-2014 05:38:51  Uptime 14 days 0 hr. 5 min. 55 sec  Trace Level off  Security ON: Local OS Authentication  SNMP OFF  Listening Endpoints Summary... |
|  |
| (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc)(KEY=LISTENER)))  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=192.0.2.101)(PORT=1521  )))  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=192.0.2.239)(PORT=1521  )))  Services Summary...  Service "+ASM" has 1 instance(s).  Instance "+ASM1", status READY, has 2 handler(s) for this service...  Service "cdb1" has 1 instance(s).  Instance "cdb1\_3", status READY, has 1 handler(s) for this service...  Service "cdb1XDB" has 1 instance(s). |

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|  |
| --- |
| Instance "cdb1\_3", status READY, has 1 handler(s) for this service...  Service "pdb1" has 1 instance(s).  Instance "cdb1\_3", status READY, has 1 handler(s) for this service...  Service "pdb2" has 1 instance(s).  Instance "cdb1\_3", status READY, has 1 handler(s) for this service...  The command completed successfully  [oracle@host01 ~]$ |

1. Use the net service name to connect to pdb2 as the system user on any of the three instances of the CDB.

|  |
| --- |
| [oracle@host01 ~]$ **sqlplus /nolog** SQL> **CONNECT system@"host01:1521/pdb2"** Enter password:  Connected.  SQL> **show con\_name**  CON\_NAME PDB2  SQL> **CONNECT system@"host02:1521/pdb2"**  Enter password:  Connected.  SQL> **CONNECT system@"host03:1521/pdb2"**  Enter password: Connected.  SQL> **EXIT** |

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# Practice 12-3: Affinitizing PDB Services to CDB Instances

### Overview

In this practice, you will “affinitize” connections to a PDB to one or particular CDB instances. Because server pools determine which services run together or separately, you can configure and maintain required affinity or isolation.

### Tasks

1. Create a dynamic PDB service, mypdb1serv, for the pdb1 PDB in the CDB which will “affinitize” connections to pdb1 to all the CDB instances.
   1. Check the configuration of the server pools.

|  |
| --- |
| [oracle@host01 ~]$ **srvctl status srvpool**  Server pool name: Free Active servers count: 0 Server pool name: Generic Active servers count: 0 Server pool name: cdb1pool Active servers count: 3 [oracle@host01 ~]$  [oracle@host01 ~]$ **srvctl config srvpool -serverpool cdb1pool**  Server pool name: cdb1pool Importance: 0, Min: 0, Max: 3 Category: hub  Candidate server names:  [oracle@host01 ~]$ |

* 1. Check the services. You notice that the default services created at PDB creation are not managed by the clusterware.

|  |
| --- |
| [oracle@host01 ~]$ **srvctl status service -db cdb1**  [oracle@host01 ~]$  [oracle@host01 ~]$ **srvctl config service -db cdb1**  [oracle@host01 ~]$ |

* 1. Create a dynamic PDB service for the pdb1 PDB in the CDB which will “affinitize” connections to pdb1 to all the CDB instances uniformly.
     1. Create the service from the connection on the first node of the server pool.

|  |
| --- |
| [oracle@host01 ~]$ **srvctl add service -db cdb1 -pdb pdb1 - service mypdb1serv -policy automatic -serverpool cdb1pool - cardinality uniform** |

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|  |
| --- |
| [oracle@host01 ~]$ **srvctl config service -db cdb1**  Service name: **mypdb1serv** Service is **enabled** Server pool: **cdb1pool** Cardinality: **UNIFORM** Disconnect: false Service role: PRIMARY  Management policy: AUTOMATIC DTP transaction: false  AQ HA notifications: false Global: false  Commit Outcome: false Failover type:  Failover method:  TAF failover retries:  TAF failover delay:  Connection Load Balancing Goal: LONG Runtime Load Balancing Goal: NONE TAF policy specification: NONE Edition:  Pluggable database name: **pdb1**  Maximum lag time: ANY SQL Translation Profile: Retention: 86400 seconds  Replay Initiation Time: 300 seconds Session State Consistency:  Service is enabled on nodes:  Service is disabled on nodes: [oracle@host01 ~]$ |

* + 1. Check that the PDB service is also created on the two other nodes of the server pool.

|  |
| --- |
| [oracle@host01 ~]$ **ssh host02** [oracle@host02 ~]$ [oracle@host02 ~]$ **. oraenv** ORACLE\_SID = [oracle] ? **cdb1\_2**  ORACLE\_HOME = [/home/oracle] ?  **/u01/app/oracle/product/12.1.0/dbhome\_1**  The Oracle base has been set to /u01/app/oracle |
|  |
| [oracle@host02 ~]$ **srvctl config service -db cdb1** |

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|  |
| --- |
| Service name: **mypdb1serv** Service is enabled Server pool: **cdb1pool** Cardinality: **UNIFORM** Disconnect: false Service role: PRIMARY  Management policy: **AUTOMATIC**  DTP transaction: false  AQ HA notifications: false Global: false  Commit Outcome: false Failover type:  Failover method:  TAF failover retries:  TAF failover delay:  Connection Load Balancing Goal: LONG Runtime Load Balancing Goal: NONE TAF policy specification: NONE Edition:  Pluggable database name: **pdb1**  Maximum lag time: ANY SQL Translation Profile: Retention: 86400 seconds  Replay Initiation Time: 300 seconds Session State Consistency:  Service is enabled on nodes: Service is disabled on nodes: [oracle@host02 ~]$ **exit** logout  Connection to host02 closed.  [oracle@host01 ~]$ |

You can reiterate the same verification on the third node of the server pool.

|  |
| --- |
| [oracle@host01 ~]$ **ssh host03** [oracle@host03 ~]$ **. oraenv** ORACLE\_SID = [oracle] ? **cdb1\_1**  ORACLE\_HOME = [/home/oracle] ?  **/u01/app/oracle/product/12.1.0/dbhome\_1**  The Oracle base has been set to /u01/app/oracle  [oracle@host03 ~]$ **srvctl config service -db cdb1**  Service name: **mypdb1serv** |

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|  |
| --- |
| Service is enabled Server pool: **cdb1pool** Cardinality: **UNIFORM** Disconnect: false Service role: PRIMARY  Management policy: **AUTOMATIC**  DTP transaction: false  AQ HA notifications: false Global: false  Commit Outcome: false Failover type:  Failover method:  TAF failover retries:  TAF failover delay:  Connection Load Balancing Goal: LONG Runtime Load Balancing Goal: NONE TAF policy specification: NONE Edition:  Pluggable database name: **pdb1**  Maximum lag time: ANY SQL Translation Profile: Retention: 86400 seconds  Replay Initiation Time: 300 seconds Session State Consistency:  Service is enabled on nodes: Service is disabled on nodes: [oracle@host03 ~]$ **exit** Logout  Connection to host03 closed.  [oracle@host01 ~]$ |

* 1. Close the PDB. You will verify that restarting the CDB automatically starts the dynamic PDB service and opens the associated PDB.

|  |
| --- |
| [oracle@host01 ~]$ **sqlplus / as sysdba**  Connected to:  Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production  With the Partitioning, Real Application Clusters, Automatic Storage Management, OLAP, Advanced Analytics and Real  Application Testing options |

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|  |
| --- |
| SQL> **ALTER PLUGGABLE DATABASE pdb1 CLOSE IMMEDIATE INSTANCES=ALL;**  Pluggable database altered.  SQL> **SELECT name, open\_mode FROM v$pdbs;**  NAME OPEN\_MODE    PDB$SEED READ ONLY  PDB1 MOUNTED  PDB2 READ WRITE  SQL> EXIT |

* 1. Stop and restart the CDB.

|  |
| --- |
| [oracle@host01 ~]$ **srvctl stop database -d cdb1**  [oracle@host01 ~]$  [oracle@host01 ~]$ **srvctl start database -db cdb1 -eval**  Database **cdb1** will be started on nodes host03,host02,host01 Service **mypdb1serv** will be started on nodes host03,host02,host01 [oracle@host01 ~]$  [oracle@host01 ~]$ **srvctl start database -db cdb1**  [oracle@host01 ~]$ **srvctl status database -db cdb1**  Instance cdb1\_1 is running on node host03 Instance cdb1\_2 is running on node host02 Instance cdb1\_3 is running on node host01  [oracle@host01 ~]$ |

* 1. Verify that the new dynamic PDB service is started and the PDB opened automatically. It may take a few moments for the service to be started on all hosts. (If you do not wish to wait, use SRVCTL to start the service: srvctl start service -d cdb1 - service mypdb1serv).

|  |
| --- |
| [oracle@host01 ~]$ **srvctl status service -db cdb1**  Service mypdb1serv is running on nodes: host03,host02,host01. [oracle@host01 ~]$ **sqlplus / as sysdba**  Connected to:  Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production |

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|  |
| --- |
| With the Partitioning, Real Application Clusters, Automatic Storage Management, OLAP,  Advanced Analytics and Real Application Testing options SQL> **SELECT name, open\_mode FROM v$pdbs;**  NAME OPEN\_MODE    PDB$SEED READ ONLY  **PDB1 READ WRITE**  PDB2 MOUNTED  SQL> **SELECT name FROM v$services;**  NAME  **mypdb1serv**  pdb2 pdb1 cdb1XDB cdb1  SYS$BACKGROUND SYS$USERS  7 rows selected.  SQL> **EXIT**  [oracle@host01 ~]$ |

Notice that PDBs are automatically opened by clusterware in all the instances in which the service is started. There is therefore no need to create a trigger AFTER STARTUP ON DATABASE to open PDBs as it is the case in non-RAC CDBs.

* 1. You can also stop and restart the service manually.

|  |
| --- |
| [oracle@host01 ~]$ **srvctl stop service -d cdb1 -service mypdb1serv**  [oracle@host01 ~]$ **srvctl status service -d cdb1 -service mypdb1serv**  Service mypdb1serv is not running.  [oracle@host01 ~]$ **srvctl start service -d cdb1 -service mypdb1serv** |

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|  |
| --- |
| [oracle@host01 ~]$ **srvctl status service -d cdb1 -service mypdb1serv**  Service mypdb1serv is running on nodes: host03,host02,host01 [oracle@host01 ~]$ **lsnrctl status**  LSNRCTL for Linux: Version 12.1.0.2.0 - Production on 17-JUL- 2014 06:07:37  Copyright (c) 1991, 2014, Oracle. All rights reserved.  Connecting to (ADDRESS=(PROTOCOL=tcp)(HOST=)(PORT=1521)) STATUS of the LISTENER  Alias LISTENER  Version TNSLSNR for Linux: Version 12.1.0.2.0  - Production  Start Date 16-JUL-2014 05:39:02  Uptime 1 days 0 hr. 28 min. 37 sec  Trace Level off  Security ON: Local OS Authentication  SNMP OFF  Listener Parameter File  /u01/app/12.1.0/grid/network/admin/listener.ora  Listener Log File  /u01/app/grid/diag/tnslsnr/host01/listener/alert/log.xml Listening Endpoints Summary...  (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc)(KEY=LISTENER)))  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=192.0.2.101)(PORT=1521  )))  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=192.0.2.239)(PORT=1521  )))  Services Summary...  Service "+ASM" has 1 instance(s).  Instance "+ASM1", status READY, has 2 handler(s) for this service...  Service "cdb1" has 1 instance(s).  Instance "cdb1\_3", status READY, has 1 handler(s) for this service...  Service "cdb1XDB" has 1 instance(s).  Instance "cdb1\_3", status READY, has 1 handler(s) for this service...  Service "**mypdb1serv**" has 1 instance(s). |

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|  |
| --- |
| Instance "cdb1\_3", status READY, has 1 handler(s) for this service...  Service "pdb1" has 1 instance(s).  Instance "cdb1\_3", status READY, has 1 handler(s) for this service...  Service "pdb2" has 1 instance(s).  Instance "cdb1\_3", status READY, has 1 handler(s) for this service...  The command completed successfully [oracle@host01 ~]$ |

* 1. Use the service to connect to the PDB on any of the CDB instances.

|  |
| --- |
| [oracle@host01 ~]$ **sqlplus /nolog**  SQL> **CONNECT system@**"**host01/mypdb1serv**" Enter password:  Connected.  SQL> **SELECT name, open\_mode FROM v$pdbs;**  NAME OPEN\_MODE    PDB1 READ WRITE  SQL> **CONNECT system@**"**host02/mypdb1serv**" Enter password:  Connected.  SQL> **SELECT name FROM v$services;**  NAME  mypdb1serv pdb1  SQL> **CONNECT system@**"**host03/mypdb1serv**" Enter password:  Connected.  SQL> **SELECT name FROM v$services;**  NAME |

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|  |
| --- |
| mypdb1serv pdb1  SQL> **EXIT** |

1. You can also “affinitize” connections to pdb2 to a single node by defining the

singpdb2serv service cardinality to SINGLETON.

* 1. Create and start the service for pdb2.

|  |
| --- |
| [oracle@host01 ~]$ **srvctl add service -db cdb1 -pdb pdb2 - service singpdb2serv -policy automatic -serverpool cdb1pool - cardinality singleton**  [oracle@host01 ~]$ **srvctl start service -d cdb1 -service singpdb2serv -eval**  Service singpdb2serv will be started on node host01  [oracle@host01 ~]$ **srvctl start service -d cdb1 -service singpdb2serv**  [oracle@host01 ~]$ **srvctl status service -d cdb1 -service singpdb2serv**  Service singpdb2serv is running on nodes: host01 [oracle@host01 ~]$ |

* 1. Check that you can use the service to connect to pdb2 only on host01 and that the PDB is opened in the CDB instance on host01 only.

|  |
| --- |
| [oracle@host01 ~]$ **sqlplus /nolog**  SQL> **CONNECT system@**"**host01/singpdb2serv**" Enter password:  Connected.  SQL> **SELECT name, open\_mode FROM v$pdbs;**  NAME OPEN\_MODE    PDB2 READ WRITE  SQL> **SELECT name FROM v$services;**  NAME |

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|  |
| --- |
| **singpdb2serv**  pdb2  SQL> |

* 1. Check that you cannot use the service to connect to pdb2 on host02 nor host03

and that the PDB is closed in the CDB instances on host02 and host03.

|  |
| --- |
| SQL> **CONNECT system@"host02/singpdb2serv"**  Enter password:  ERROR:  ORA-12514: TNS:listener does not currently know of service requested in connect descriptor  Warning: You are no longer connected to ORACLE. SQL> **CONNECT system@"host03/singpdb2serv"**  Enter password:  ERROR:  ORA-12514: TNS:listener does not currently know of service requested in connect descriptor  Warning: You are no longer connected to ORACLE. SQL> **CONNECT system@"host02/cdb1"**  Enter password:  Connected.  SQL> **select name, open\_mode from v$pdbs;**  NAME OPEN\_MODE    PDB$SEED READ ONLY  PDB1 READ WRITE  **PDB2 MOUNTED**  SQL> **CONNECT system@"host03/cdb1"**  Enter password:  Connected.  SQL> **select name, open\_mode from v$pdbs;** |

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Practices for Lesson 12: Multitenant Architecture and RAC Environment

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# Practice 12-4: Dropping a PDB

### Overview

In this practice, you will drop a PDB in the CDB and verify that the services and data files are deleted.

### Tasks

1. To drop the pdb2, first stop and remove the service from the resources configuration.

|  |
| --- |
| [oracle@host01 ~]$ **srvctl stop service -d cdb1 -service singpdb2serv**  [oracle@host01 ~]$ **srvctl remove service -d cdb1 -service singpdb2serv**  [oracle@host01 ~]$ |

1. Drop the pdb2 PDB.

|  |
| --- |
| [oracle@host01 ~]$ ~]$ **sqlplus /nolog**  SQL> **CONNECT system@**"**host01/pdb2**" Enter password:  Connected.  SQL> **SELECT name FROM v$datafile;**  NAME  +DATA/CDB1/DATAFILE/undotbs2.294.825668383  +DATA/CDB1/C45A345T5F09726D9C25F01AZ04366B8/DATAFILE/system.268. 335670735  +DATA/CDB1/C45A345T5F09726D9C25F01AZ04366B8/DATAFILE/sysaux.273. 335670729  +DATA/CDB1/C45A345T5F09726D9C25F01AZ04366B8/DATAFILE/users.282.3 35671601  SQL> **CONNECT / AS SYSDBA**  Connected.  SQL> **SELECT name FROM v$services;**  NAME  mypdb1serv pdb2 |

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|  |
| --- |
| pdb1 cdb1XDB cdb1  SYS$BACKGROUND SYS$USERS  7 rows selected.  SQL> **DROP PLUGGABLE DATABASE pdb2 INCLUDING DATAFILES;**  \*  ERROR at line 1:  ORA-65025: Pluggable database PDB2 is not closed on all instances.  SQL> **ALTER PLUGGABLE DATABASE pdb2 CLOSE INSTANCES=ALL;**  Pluggable database altered.  SQL> **DROP PLUGGABLE DATABASE pdb2 INCLUDING DATAFILES;**  Pluggable database dropped. SQL> |

1. Verify that the data files are deleted.

|  |
| --- |
| SQL> **SELECT name FROM v$datafile;**  NAME  +DATA/CDB1/DATAFILE/system.285.825666373  +DATA/CDB1/DATAFILE/sysaux.287.825666251  +DATA/CDB1/DATAFILE/undotbs1.283.825666541  +DATA/CDB1/DD7C48AA5A4404A2E04325AAE80A403C/DATAFILE/system.286. 825666707  +DATA/CDB1/DATAFILE/users.271.825666537  +DATA/CDB1/DD7C48AA5A4404A2E04325AAE80A403C/DATAFILE/sysaux.284. 825666703  +DATA/CDB1/DATAFILE/undotbs2.294.825668383  +DATA/CDB1/DATAFILE/undotbs3.279.825668393  +DATA/CDB1/E5F09726D9C25FC4E043660200C075A9/DATAFILE/system.268. 825670735 |

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|  |
| --- |
| +DATA/CDB1/E5F09726D9C25FC4E043660200C075A9/DATAFILE/sysaux.273. 825670729  +DATA/CDB1/E5F09726D9C25FC4E043660200C075A9/DATAFILE/users.282.8 25671601  11 rows selected.  SQL> |

Note that all files related to pdb2 are removed. The UNDO datafile is associated with the instance, and not with any PDB.

1. Verify that the services are deleted. Check in V$SERVICES view and with LSNRCTL.

|  |
| --- |
| SQL> **SELECT name FROM v$services;**  NAME  mypdb1serv pdb1 cdb1XDB cdb1  SYS$BACKGROUND SYS$USERS  6 rows selected.  SQL> **EXIT**  [oracle@host01 ~]$ **lsnrctl status**  LSNRCTL for Linux: Version 12.1.0.2.0 - Production on 17-JUL- 2014 06:07:37  Copyright (c) 1991, 2014, Oracle. All rights reserved.  Connecting to (ADDRESS=(PROTOCOL=tcp)(HOST=)(PORT=1521)) STATUS of the LISTENER  Alias LISTENER  Version TNSLSNR for Linux: Version 12.1.0.2.0  - Production  Start Date 16-JUL-2014 05:39:02  Uptime 1 days 0 hr. 28 min. 37 sec  Trace Level off |

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|  |
| --- |
| Security ON: Local OS Authentication  SNMP OFF  Listener Parameter File  /u01/app/12.1.0/grid/network/admin/listener.ora  Listener Log File  /u01/app/grid/diag/tnslsnr/host01/listener/alert/log.xml Listening Endpoints Summary...  (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc)(KEY=LISTENER)))  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=192.0.2.101)(PORT=1521  )))  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=192.0.2.239)(PORT=1521  )))  Services Summary...  Service "+ASM" has 1 instance(s).  Instance "+ASM1", status READY, has 2 handler(s) for this service...  Service "cdb1" has 1 instance(s).  Instance "cdb1\_3", status READY, has 1 handler(s) for this service...  Service "cdb1XDB" has 1 instance(s).  Instance "cdb1\_3", status READY, has 1 handler(s) for this service...  Service "mypdb1serv" has 1 instance(s).  Instance "cdb1\_3", status READY, has 1 handler(s) for this service...  Service "pdb1" has 1 instance(s).  Instance "cdb1\_3", status READY, has 1 handler(s) for this service...  The command completed successfully [oracle@host01 ~]$ |

1. Close all terminal windows opened for this practice.

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