

Oracle Database 12c: Admin, Install and Upgrade Accelerated

Activity Guide

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Practices for Lesson 1: Introduction

Chapter 1

Practices for Lesson 1

Practices Overview

There are no practices for this lesson.

Practices for Lesson 2: Exploring Oracle Database Architecture

Chapter 2

Practices for Lesson 2: Overview

Practices Overview

In these practices, you answer questions to test your knowledge of Oracle Database architecture concepts. Then you list the Oracle Database instances and homes, determine the locations of data files, control files, and redo log files, determine the character set of the existing database(s), and determine the existing listeners,

Practice 2-1: Exploring the Oracle Database Architecture

Fill in the blanks with the correct answers.

1. The two main components of a basic Oracle Database system are:

_____ and _____

Hint: See page 2-3

2. An instance consists of _____ and _____ processes.

Hint: See page 2-3

3. A session is a connection between the _____ process and the _____ process.

Hint: See page 2-5

4. Name the main components of the SGA:

- _____
- _____
- _____
- _____
- _____
- _____
- _____

Hint: See page 2-6

5. List six of the many background processes an Oracle Database instance might have:

- _____
- _____
- _____
- _____
- _____
- _____

Hint: See page 2-20

6. The _____ process writes dirty buffers to data files.

Hint: See page 2-22

7. The _____ process writes redo entries to online redo log files.

Hint: See page 2-24

8. The primary files associated with an Oracle database are:

- _____
- _____
- _____

Additional important files are:

- _____
- _____
- _____
- _____
- _____

Hint: See page 2-32

9. The logical storage structures of an Oracle database are:

- _____
- _____
- _____
- _____
- _____

Hint: See page 2-34

10. The _____ process copies redo log files to an archive destination.

Hint: See page 2-31

11. The _____ contains data and control information for a server or background process.

Hint: See page 2-15

12. The logical tablespace structure is associated with the physical _____ files on disk.

Hint: See page 2-34

13. LGWR writes when:

- _____
- _____
- _____
- _____

Hint: See page 2-24

14. State whether the following statements are true or false.

- a. The SGA includes the database buffer cache and redo log buffer. _____
- b. Each server process has its own PGA. _____
- c. The buffers in the database buffer cache are organized in two lists: the most recently used list and the least recently used (LRU) list. _____
- d. User processes run the application or tool that connects to an Oracle instance. _____
- e. Oracle Database processes include server processes and background processes. _____
- f. Checkpoints are recorded in log file headers. _____

Hint: See pages 2-6, 2-10, 2-15, 2-18, 2-20, 2-26

Practice 2-2: Listing Existing Instances and Oracle Homes

Overview

In this practice, you determine what instances are on your machine.

Tasks

1. List the existing instances, whether they are running or not. There are two ways to find them all.
 - a. Right-click the desktop and click **Open in Terminal** to open a terminal window. Verify that you are logged in as the oracle user.

```
$ id  
uid=54321(oracle) gid=54321(oinstall)  
groups=54321(oinstall),54322(dba),54323(oper),54324(backupdba),5  
4325(dgdba),54326(kmdba),54327(asmdba)  
$
```

- b. To list the running instances, you can search for the SMON background process. Any running instance includes the SMON background process. An instance owns several mandatory background processes including PMON, LGWR, DBW0, CKPT, LREG, MMON, and RECO.

```
$ ps -ef|grep smon  
oracle 13253 13040 0 12:54 pts/0 0:00:00 grep smon  
oracle 21062 1 0 Oct10 ? 0:00:03 ora_smon_em12rep  
oracle 28251 1 0 11:41 ? 0:00:00 ora_smon_dbupgrd  
$
```

- c. There can be instances and related databases that are not currently running. You can view them in the /etc/oratab file. This file is used by Oracle utilities. It is created by root.sh and updated by the Database Configuration Assistant while creating a database or by the ASM Configuration Assistant while creating an ASM instance.

```
$ cat /etc/oratab  
# This file is used by ORACLE utilities. It is created by  
root.sh  
# and updated by either Database Configuration Assistant while  
creating  
# a database or ASM Configuration Assistant while creating ASM  
instance.  
...  
#  
em12rep:/u01/app/oracle/product/12.1.0/dbhome_1:N  
dbupgrd:/u01/app/oracle/product/11.2.0/dbhome_2:N
```

Notice that the two instances run in different Oracle homes:

- The em12rep instance is the Enterprise Manager Cloud Control repository database instance. The Oracle home is /u01/app/oracle/product/12.1.0/dbhome_1.
- The dbupgrd Oracle Database instance is running in /u01/app/oracle/product/11.2.0/dbhome_2, the Oracle home for Oracle Database 11g Release 2. This database will be used in the upgrade practices later in the course.

Practice 2-3: Determining the Locations of Data Files, Control Files, and Redo Log Files

Overview

In this practice, you will determine the locations of the data files of the `dbupgrd` database. Connect to the instance as either `SYS` or `SYSTEM`. Then query the `V$DATAFILE` view.

Tasks

1. Execute the following steps to retrieve information about the `dbupgrd` Oracle database instance.
 - a. Verify that you are logged in as the `oracle` UNIX user.

```
$ id  
uid=54321(oracle) gid=54321(oinstall)  
groups=54321(oinstall),54322(dba),54323(oper),54324(backupdba),54325(dgdba),54326(kmdba),54327(asmdba)  
$
```

- b. Use the `oraenv` utility to set the `ORACLE_SID` environment variable to the appropriate value. The utility automatically sets `ORACLE_HOME` appropriately according to the `ORACLE_SID` entered when prompted. In this case, `ORACLE_HOME` is set to `/u01/app/oracle/product/11.2.0/dbhome_2`. The `oraenv` utility uses `/etc/oratab` to set the `ORACLE_SID`, `ORACLE_BASE`, `ORACLE_HOME`, and `PATH` environment variables.

```
$ . oraenv  
ORACLE_SID = [oracle] ? dbupgrd  
The Oracle base has been set to /u01/app/oracle  
$ env | grep ORA  
ORACLE_SID=dbupgrd  
ORACLE_BASE=/u01/app/oracle  
ORACLE_HOME=/u01/app/oracle/product/11.2.0/dbhome_2  
$
```

c. View the database name.

```
$ sqlplus / as sysdba
SQL*Plus: Release 11.2.0.3.0 Production on Fri Oct 11 13:13:36
2013

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Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 -
64bit Production
With the Partitioning, OLAP, Data Mining and Real Application
Testing options

SQL> show parameter instance_type
NAME                           TYPE        VALUE
-----
instance_type                  string      RDBMS

SQL> select name from v$database;
NAME
-----
DBUPGRD
```

d. View the data file names.

```
SQL> select name from v$datafile;
NAME
-----
/u01/app/oracle/oradata/dbupgrd/system01.dbf
/u01/app/oracle/oradata/dbupgrd/sysaux01.dbf
/u01/app/oracle/oradata/dbupgrd/undotbs01.dbf
/u01/app/oracle/oradata/dbupgrd/user01.dbf
/u01/app/oracle/oradata/dbupgrd/example01.dbf
```

Practice 2-4: Determining the Character Set of the Existing Database(s)

Overview

In this practice, you will determine the character set of the existing Oracle database.

Tasks

1. Query `NLS_DATABASE_PARAMETERS` to determine the database character set.

```
SQL> col VALUE format A16
SQL> select * from nls_database_parameters
  2 where parameter like '%CHARACTERSET%';
PARAMETER          VALUE
-----
NLS_CHARACTERSET      AL32UTF8
NLS_NCHAR_CHARACTERSET    AL16UTF16
```

Note that there are two character sets defined:

- `NLS_CHARACTERSET` represents the database character set used to identify and to hold SQL and PL/SQL source code. `AL32UTF8` encoding is the 8-bit encoding of Unicode. It is a variable-width type of encoding and also a strict superset of ASCII. A strict superset means that each and every character in 7-bit ASCII is available in `AL32UTF8` with the same corresponding code point value. One Unicode character can be 1, 2, 3, or 4 bytes in this encoding. Characters from the European scripts are represented in either 1 or 2 bytes; characters from most Asian scripts are represented in 3 bytes, whereas supplementary characters are represented in 4 bytes.
- `NLS_NCHAR_CHARACTERSET` represents the alternate character set that enables you to store Unicode character data in a database that does not have a Unicode database character set. `AL16UTF16` encoding is the 16-bit encoding of Unicode. One Unicode character can be 2 to 4 bytes in this encoding. Characters from both European (including ASCII) and most Asian scripts are represented in 2 bytes. Supplementary characters are represented in 4 bytes.

2. Log out of SQL*Plus.

```
SQL> exit
```

Practice 2-5: Determining Existing Listeners

Overview

In this practice, you will determine the existing listeners and the environment in which they run.

Tasks

1. Use the listener control utility (LSNRCTL) to determine whether a listener is running.

```
$ lsnrctl status
LSNRCTL for Linux: Version 11.2.0.3.0 - Production on 11-OCT-
2013 13:24:57

Copyright (c) 1991, 2011, Oracle. All rights reserved.

Connecting to (ADDRESS=(PROTOCOL=tcp) (HOST=) (PORT=1521))
STATUS of the LISTENER
-----
Alias                      LISTENER
Version                    TNSLSNR for Linux: Version 12.1.0.1.0
- Production
Start Date                 10-OCT-2013 09:55:39
Uptime                     1 days 3 hr. 29 min. 20 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.o
ra
Listener Log File          /u01/app/oracle/diag/tnslsnr/EDP0/listener/alert/log.xml
Listening Endpoints Summary...
  (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc) (KEY=EXTPROC1521)))

  (DESCRIPTION=(ADDRESS=(PROTOCOL=tcp) (HOST=edp0.us.oracle.com) (PO
RT=1521)))
Services Summary...
Service "dbupgrd" has 1 instance(s).
  Instance "dbupgrd", status READY, has 1 handler(s) for this
service...
Service "em12rep" has 1 instance(s).
  Instance "em12rep", status READY, has 1 handler(s) for this
service...
Service "em12repXDB" has 1 instance(s).
  Instance "em12rep", status READY, has 1 handler(s) for this
service...
```

```
The command completed successfully  
$
```

2. Explore the

```
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.ora  
configuration file.
```

```
$ cat  
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.o  
ra  
# listener.ora Network Configuration File:  
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.o  
ra  
# Generated by Oracle configuration tools.  
  
LISTENER =  
(DESCRIPTION_LIST =  
  (DESCRIPTION =  
    (ADDRESS = (PROTOCOL = IPC) (KEY = EXTPROC1521))  
    (ADDRESS = (PROTOCOL = TCP) (HOST =  
edp0.us.oracle.com) (PORT = 1521))  
  )  
)  
  
$
```

3. Find the user running the LISTENER process.

```
$ ps -ef | grep tnslsnr  
oracle  18725 13040  0 13:27 pts/0      00:00:00 grep tnslsnr  
oracle  21897     1  0 Oct10 ?          00:00:03  
/u01/app/oracle/product/12.1.0/dbhome_1/bin/tnslsnr LISTENER -  
inherit  
$
```

Practices for Lesson 3: Oracle Software Installation Basics

Chapter 3

Practices for Lesson 3

Practices Overview

There are no practices for this lesson.

Practices for Lesson 4: Installing your Oracle Software

Chapter 4

Practices for Lesson 4: Overview

Practices Overview

In this practice, you install the Oracle Database 12c software to enable you to create Oracle Database 12c databases.

The installation media for Oracle Database 12c is staged at:

```
/stage/shiphomes/RDBMS_LINUX.X64_12C/database
```

Perform the steps of the practice as the `oracle` OS user from the `oracle` user terminal window, unless otherwise indicated.

Note: Completing this practice is critical for all following practice sessions.

Practice 4-1: Installing the Oracle Database 12c Software

1. From the `oracle` user terminal window, navigate to the `/stage(shiphomes/RDBMS_LINUX.X64_12C/database` directory. Start the Oracle Universal Installer (OUI) by entering: `./runInstaller`
 - a. Enter the following:

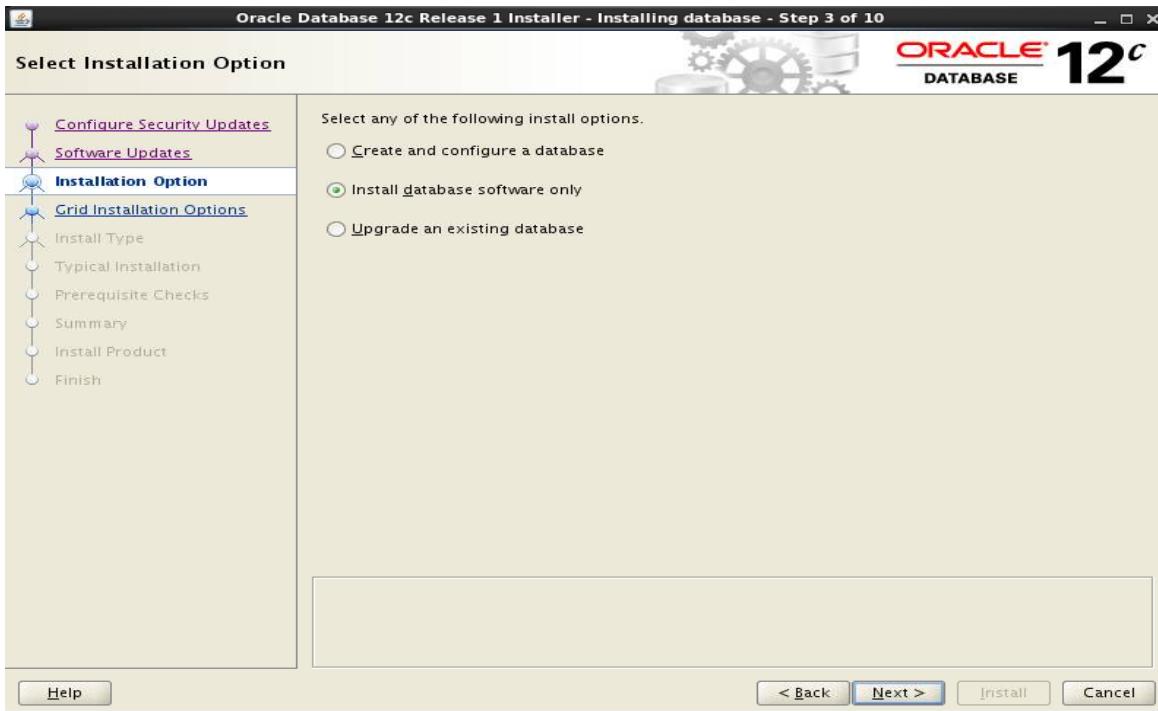
```
$ cd /stage(shiphomes/RDBMS_LINUX.X64_12C/database  
$ ./runInstaller
```



The installation takes 10 to 15 minutes.

Step	Window/Page Description	Choices or Values
a.	Configure Security Updates	Deselect the option to receive security updates via My Oracle Support. <i>Note: In your real-world environment, you would enter your email address and My Oracle Support password; however, because the classroom is an isolated environment, leave the email and password fields null.</i>
b.	Configure Security Updates	Click Next .
c.	Email Address Not Specified warning	Click Yes .
d.	Download Software Updates page	Verify that Skip software updates is selected. Click Next .

e.	Select Installation Option page	Select Install database software only . Click Next . <i>Note: You will create databases by using DBCA in a later practice. The upgrade of the dbupgrd database will be performed in a later practice.</i>
----	---------------------------------	---

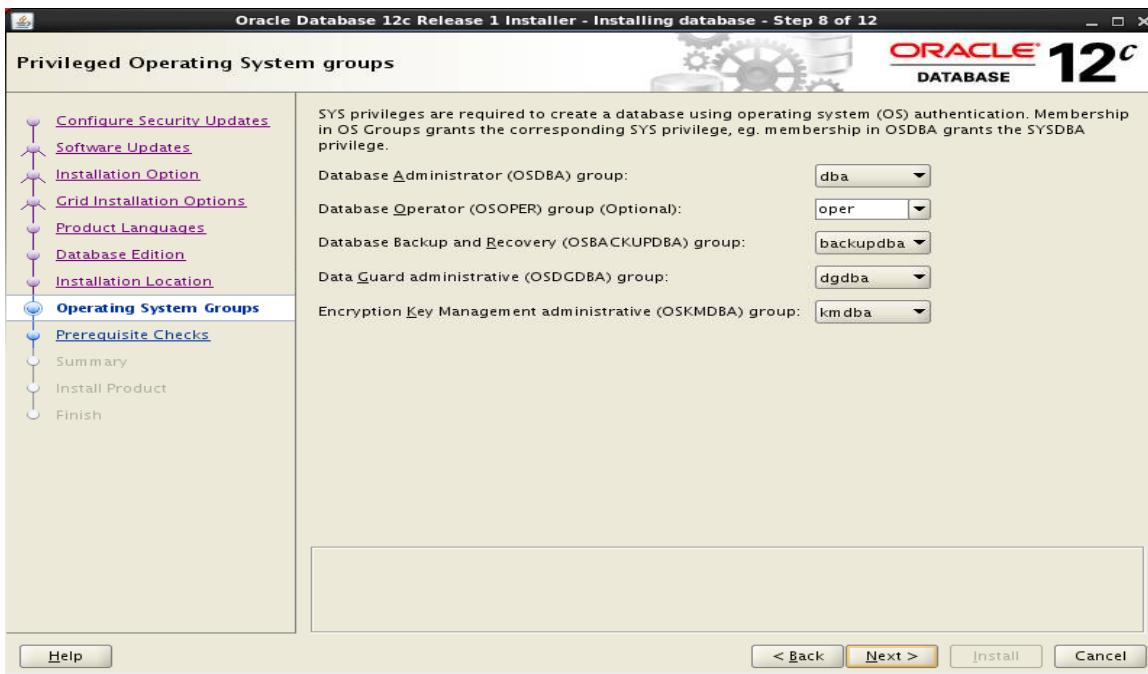


Step	Window/Page Description	Choices or Values
f.	Grid Installation Options page	Verify that Single instance database installation is selected. Click Next . <i>Note: In this course, you are not working on a Real Application Cluster system.</i>
g.	Select Product Languages page	Select all the available languages by using the >> button. Click Next .
h.	Select Database Edition page	Verify that Enterprise Edition (6.4GB) is selected. Click Next . <i>Note: With Enterprise Edition, any existing option can be installed, which is not the case with Standard Edition. This explains the difference of space used.</i>
i.	Specify Installation Location page	1. In the Software location menu, select: /u01/app/oracle/product/12.1.0/dbhome_1

Step	Window/Page Description	Choices or Values
		<p>2. Change dbhome_1 to dbhome_2. <i>Note: dbhome_1 is the installation location for the Enterprise Manager Cloud Control repository database.</i></p> <p>3. Click Next.</p>

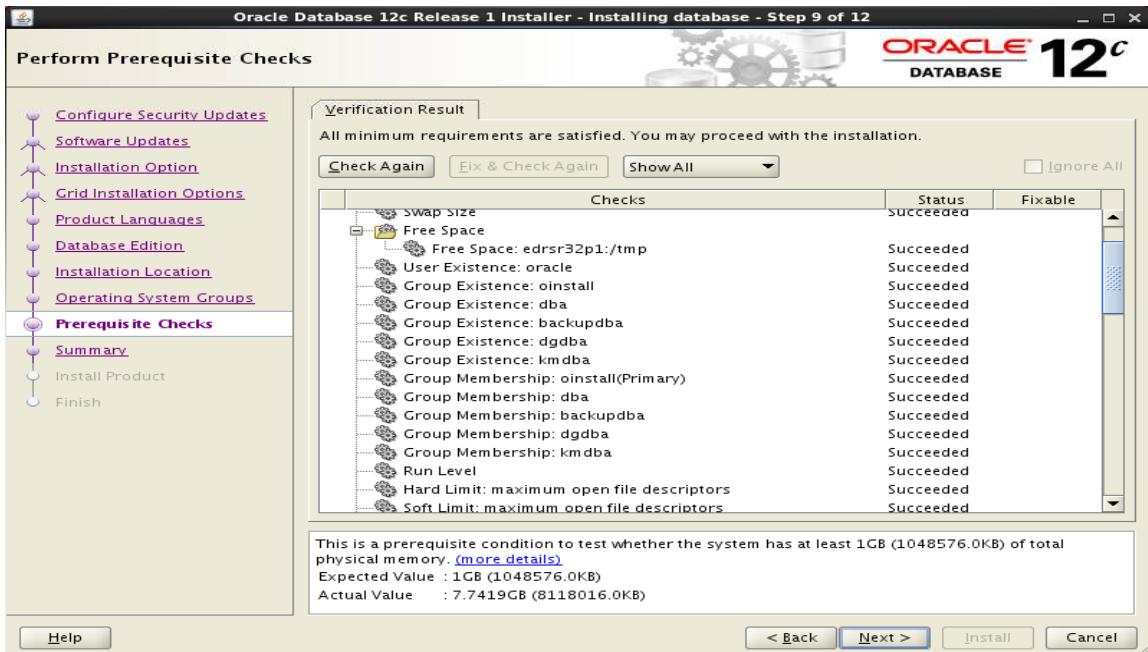


Step	Window/Page Description	Choices or Values
j.	Privileged Operating System groups page	<p>Keep distinct OS groups for separation of duties.</p> <p><i>Note: The OS groups, dba, oper, backupdba, dgdba, and kmdba were created prior to running the installer. You can view them in the /etc/group file.</i></p> <p>Click Next.</p>

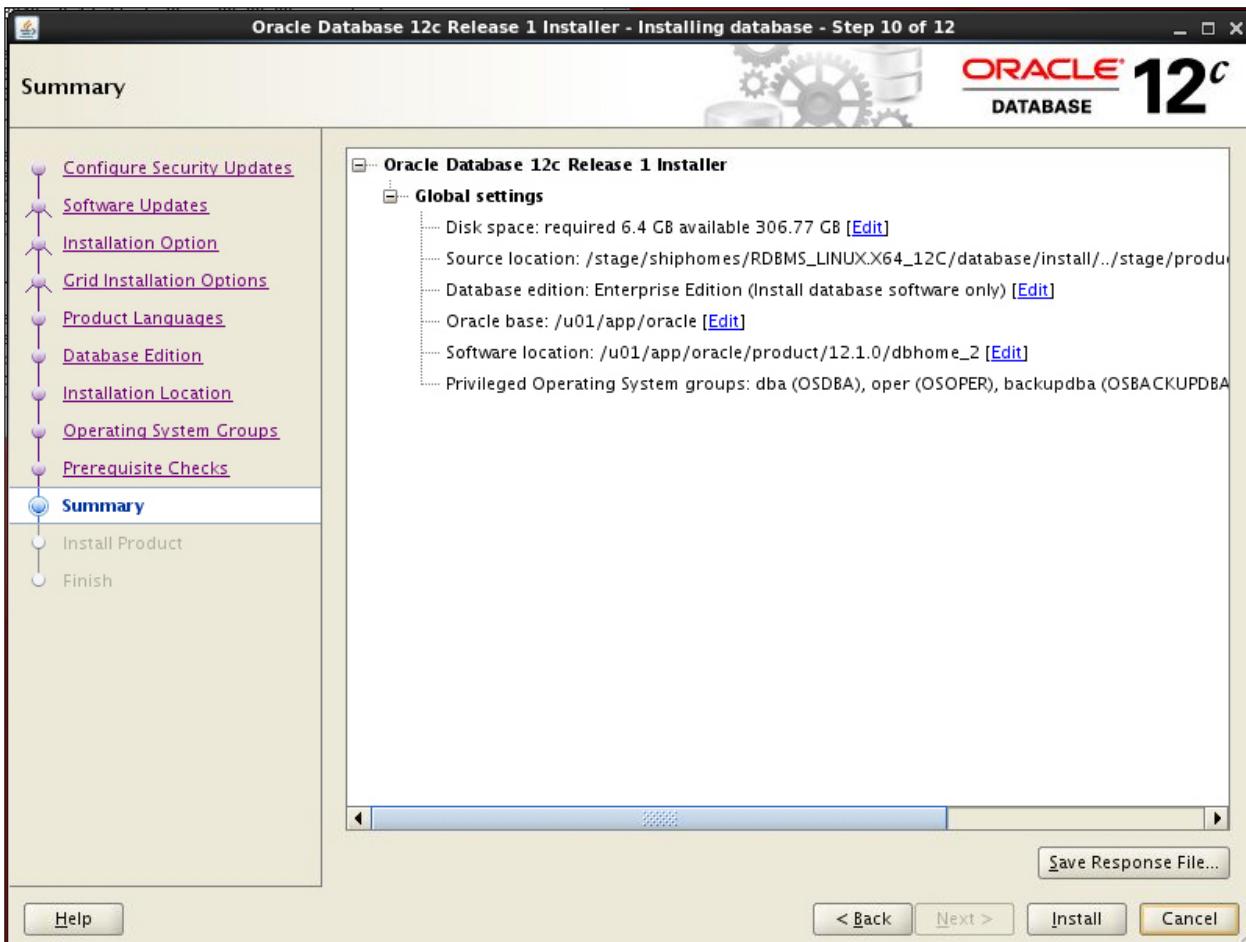


Step	Window/Page Description	Choices or Values
k.	Perform Prerequisites Checks	Appears if any checks failed

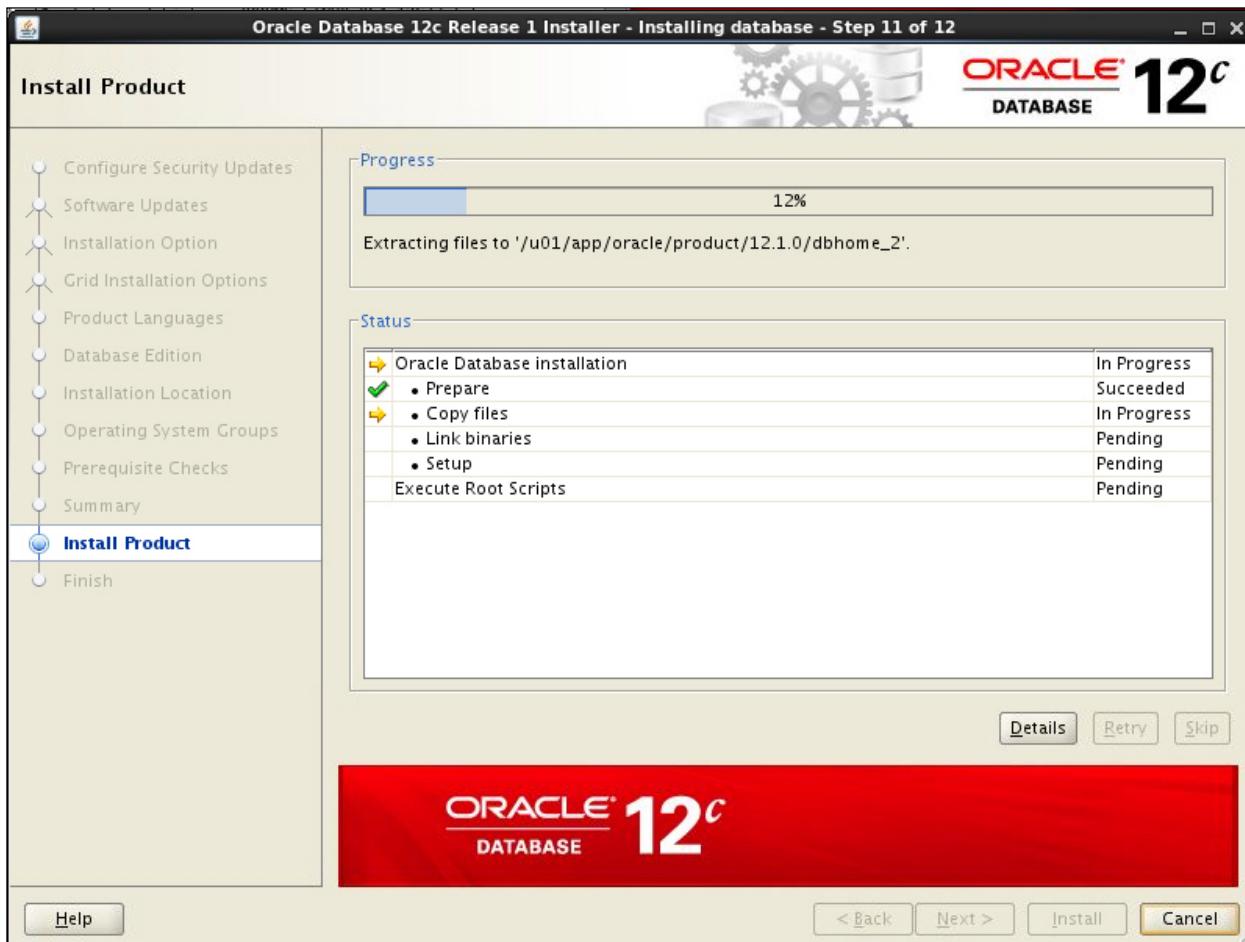
Note: If you want to list all the checks, click the Prerequisite Checks in the navigator in the left pane of the OUI. The check for User Existence is oracle. The groups are listed. Click Next to return to the summary page.



Step	Window/Page Description	Choices or Values
I.	Summary page	Click Install .



Step	Window/Page Description	Choices or Values
m.	Install Product page	Displays the progress of the installation and the status for each individual task being performed



When the Execute Configuration scripts window appears, follow the steps listed in the window.

Step	Window/Page Description	Choices or Values
n.	Execute Configuration scripts	Follow the steps listed in the window.

- Open a terminal window and log in as `root`.

```
$ su -
Password: oracle (does not display)
#
```

- In a terminal window, execute the script that is displayed in the Execute Configuration scripts window. Accept the default for the local `bin` directory and do not overwrite any files. (You can just press `Enter`, because the default option is to not overwrite.)

```
# /u01/app/oracle/product/12.1.0/dbhome_2/root.sh
The following environment variables are set as:
ORACLE_OWNER= oracle
ORACLE_HOME= /u01/app/oracle/product/12.1.0/dbhome_2

Enter the full pathname of the local bin directory:
[/usr/local/bin] :
The file "dbhome" already exists in /usr/local/bin. Overwrite it? (y/n)
[n] :
The file "oraenv" already exists in /usr/local/bin. Overwrite it? (y/n)
[n] :
The file "coraenv" already exists in /usr/local/bin. Overwrite it? (y/n)
[n] :

Entries will be added to the /etc/oratab file as needed by Database Configuration Assistant when a database is created
Finished running generic part of root script.
Now product-specific root actions will be performed.
#
```

- Exit the root session.

```
# exit
logout
$ exit
```

Step	Window/Page Description	Choices or Values
o.	Execute Configuration scripts	Click OK
p.	Finish page	Click Close

2. Return to the `oracle` user UNIX session where `runInstaller` was launched and press **Enter**.

```
$ You can find the log of this install session at:
/u01/app/oraInventory/logs/installActions2013-10-14_11-40-19AM.log
$
```

The name of the log file of the installation is displayed.

Practices for Lesson 5: Creating an Oracle Database by Using DBCA

Chapter 5

Practices for Lesson 5: Overview

Practices Overview

You will create two types of Oracle databases in these practices:

- A non-container database (non-CDB): `orcl`
- A multitenant container database (CDB): `cdb1`

You anticipate that several similar non-CDB databases will be needed in the near future. Therefore, you decide to create a database template and database creation scripts in addition to creating the `orcl` database. Locate the scripts in the `/home/oracle/labs` directory (which is the directory that you use most often throughout this course).

The CDB named `cdb1` will contain sample schemas and one pluggable database named `pdb1`.

Practice 5-1: Creating a Non-CDB

In this practice, you create a non-container database named `orcl`. You use the Database Configuration Assistant (DBCA) to create the database.

1. In the `oracle` user terminal window, set your `ORACLE_HOME` environment variable by using `oraenv`. Enter `orcl` for the `SID` and then enter `/u01/app/oracle/product/12.1.0/dbhome_2` for the new `ORACLE_HOME`.

Note: You enter the full `ORACLE_HOME` path at this time because the `orcl` database does not exist yet. The entry is not yet registered in the `/etc/oratab` file and, therefore, the `ORACLE_HOME` is not known. After the database is created, you will only have to enter `orcl` as the `SID` and it will determine the appropriate `ORACLE_HOME` from the `/etc/oratab` file.

```
$ . oraenv
ORACLE_SID = [dbupgrd] ? orcl
ORACLE_HOME = [/home/oracle] ?
/u01/app/oracle/product/12.1.0/dbhome_2
The Oracle base remains unchanged with value /u01/app/oracle
$
```

The Oracle base remains `/u01/app/oracle` because you are creating a database and, therefore, still working in the Oracle Database environment.

2. Start the Database Configuration Assistant (DBCA).

```
$ dbca
```

Step	Window/Page Description	Choices or Values
a.	Database Operation page	Select Create Database . Click Next .
b.	Creation Mode page	Select Advanced Mode . <i>Note: This option allows more customization.</i> Click Next .
c.	Database Template page	Select the General Purpose or Transaction Processing template. Click Show Details .
d.	Template Details	Answer the following questions:

- 1) **Question 1:** How many control files are created?

Answer: Two

Note: The location is by default

{ORACLE_BASE}/oradata/{DB_UNIQUE_NAME} for the first control file and {ORACLE_BASE}/fast_recovery_area/{DB_UNIQUE_NAME} for the second control file.

- 2) **Question 2:** How many redo log groups are created?

Answer: Three

Note: The location will change later in this practice when we choose to use filesystem as our storage technique.

- 3) **Question 3:** What is the database block size (db_block_size)?

Answer: 8 KB

- 4) **Question 4:** What is the value of Sample Schemas?

Answer: Sample Schemas is set to False.

Note: You will change this setting later in this practice so that the HR sample schema is included in your database.

- 5) **Question 5:** What is the template default for the Database Character Set?

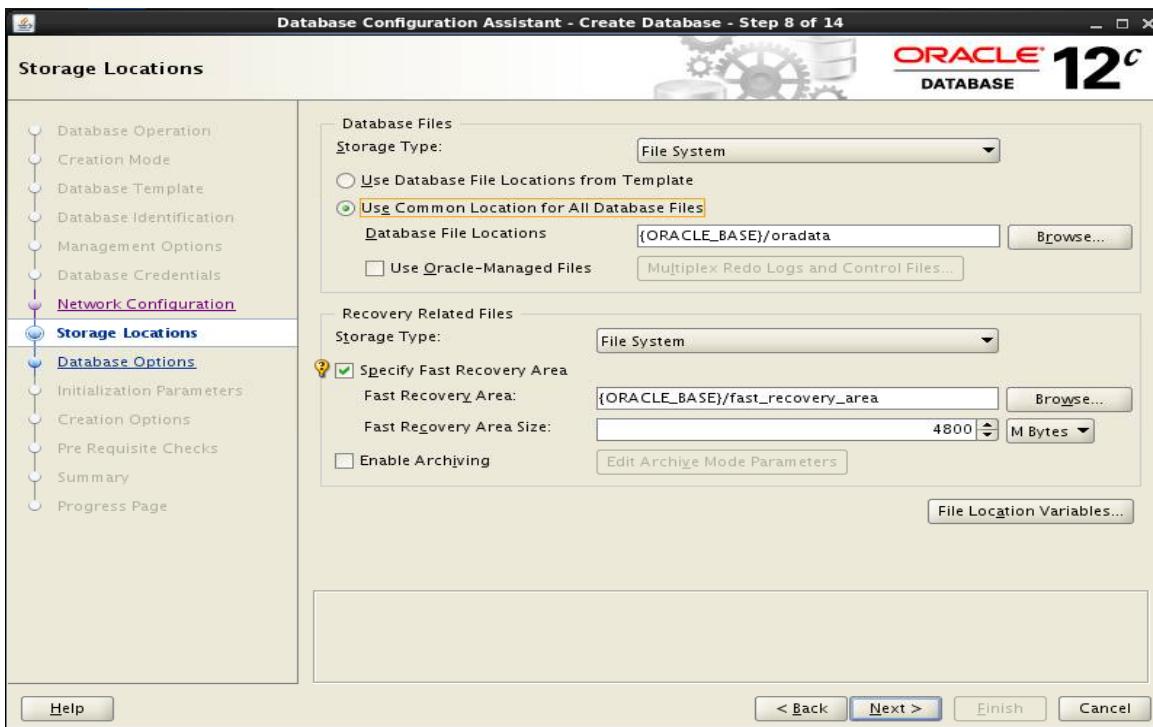
Answer: WE8MSWIN1252

Note: You will change this setting later in this practice to use a Unicode database character set.

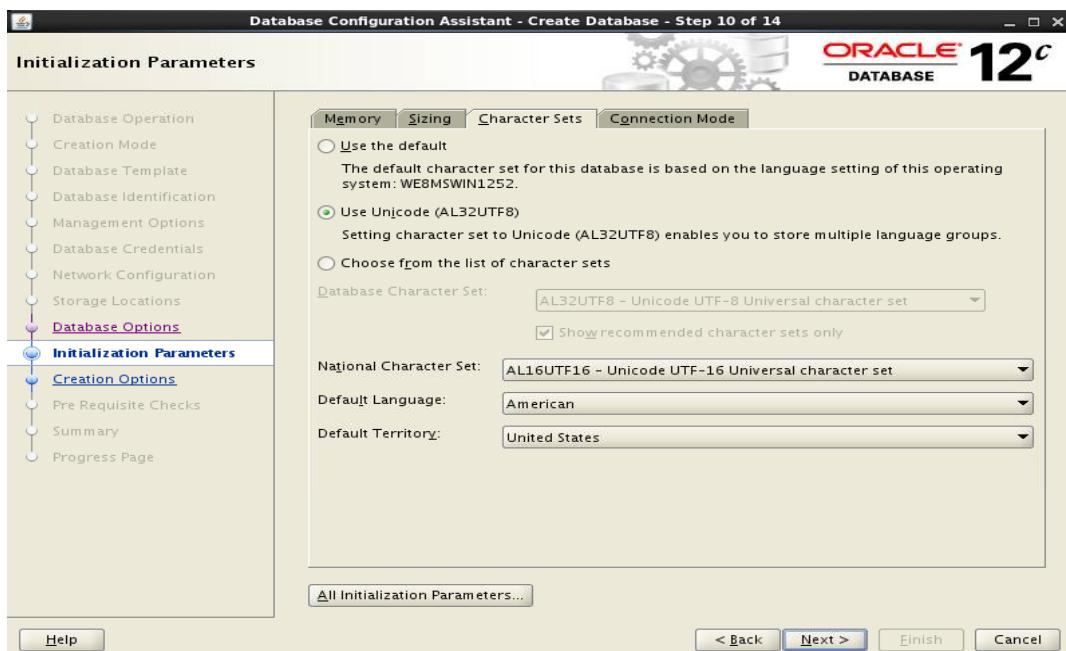
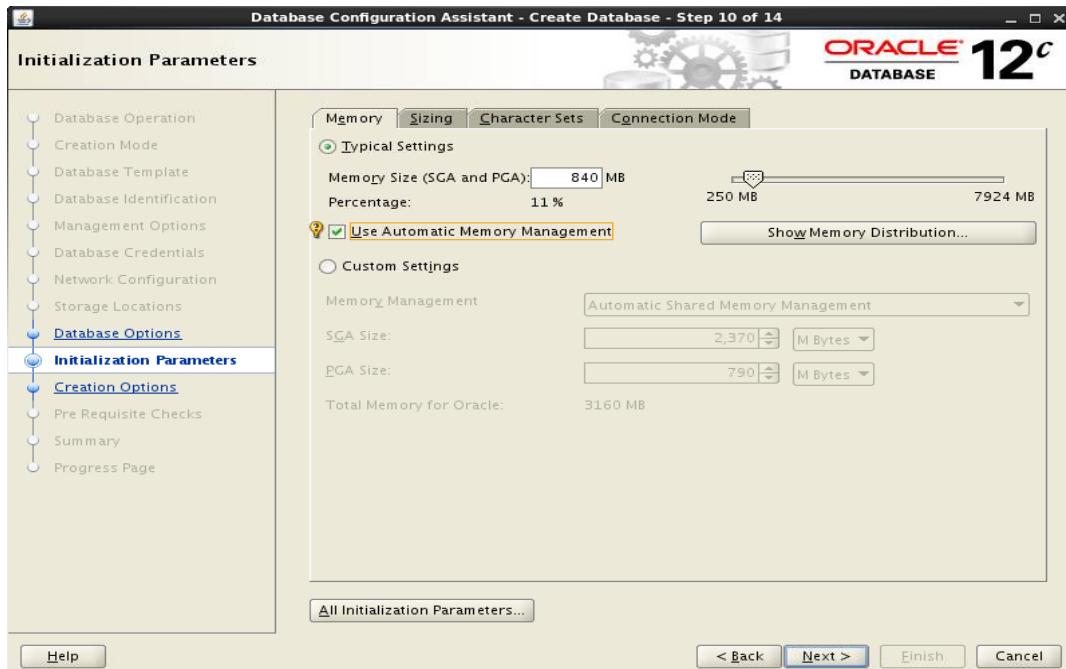
Step	Window/Page Description	Choices or Values
e.	Template Details window	Click OK .
f.	Database Template page	Click Next .
g.	Database Identification page	Global Database Name: orcl <i>Note: The SID defaults to the database name orcl.</i> Verify that the Create As Container Database check box is <i>not</i> checked so that you will create a non-CDB. Click Next .

Note: It is common to input a fully qualified name for the global database name (for example, `orcl.example.com`). Often, the global name must be unique across the domain, which in this case is `example.com`. Notice that the SID excludes the domain name automatically.

Step	Window/Page Description	Choices or Values
h.	Management Options page	<p>Select Configure Enterprise Manager (EM) Database Express.</p> <p><i>Note: Enterprise Manager Database Express allows you to perform DBA tasks through a graphical user interface</i></p> <p>Click Next.</p>
i.	Database Credentials page	<p><i>Best practice tip: Use separate passwords for each account to help maintain separation of duties.</i></p> <p><i>Note: In this course, you are using the same password to minimize disruption to the practices due to a forgotten password.</i></p> <p>Select Use the Same Administrative Password for All Accounts.</p> <p>Password: oracle_4U</p> <p>Confirm Password: oracle_4U</p> <p>Click Next.</p>
j.	Network Configuration page Listener Selection tab	<p>Click Next</p> <p><i>Note: A listener named LISTENER was created as part of the Oracle Database 12c software installation for the Enterprise Manager Cloud Control database. The new orcl database will automatically register with this listener.</i></p>
k.	Storage Locations page	<p>Storage Type: File System</p> <p>Select Use Common Location for All Database Files.</p> <p><i>Note: All the database files of the orcl non-CDB will be created in /u01/app/oracle/oradata/orcl directory. The RMAN backup files will be stored in /u01/app/oracle/fast_recovery_area/orcl. The orcl directories are created automatically—the {ORACLE_BASE}/oradata listed in the Database File Locations field is sufficient. There is no need to add the orcl directory. The same applies to the Fast Recovery Area field.</i></p> <p>Click Next.</p>



Step	Window/Page Description	Choices or Values
l.	Database Options page	Select Sample Schemas . <i>Note: This will create several sample schemas such as HR, OE, SH and others.</i> <i>Best practice tip: Do not create sample schemas in production databases. Sample schemas are for training and testing.</i> Click Next .
m.	Initialization Parameters page Memory tab	Memory Size: 840 MB Select Use Automatic Memory Management .
n.	Initialization Parameters page Character Sets tab	Select Use Unicode (AL32UTF8) .
o.	Initialization Parameters page Sizing tab	Review the settings. Do not change anything.
p.	Initialization Parameters page Connection Mode tab	Review the settings. Do not change anything. Click Next



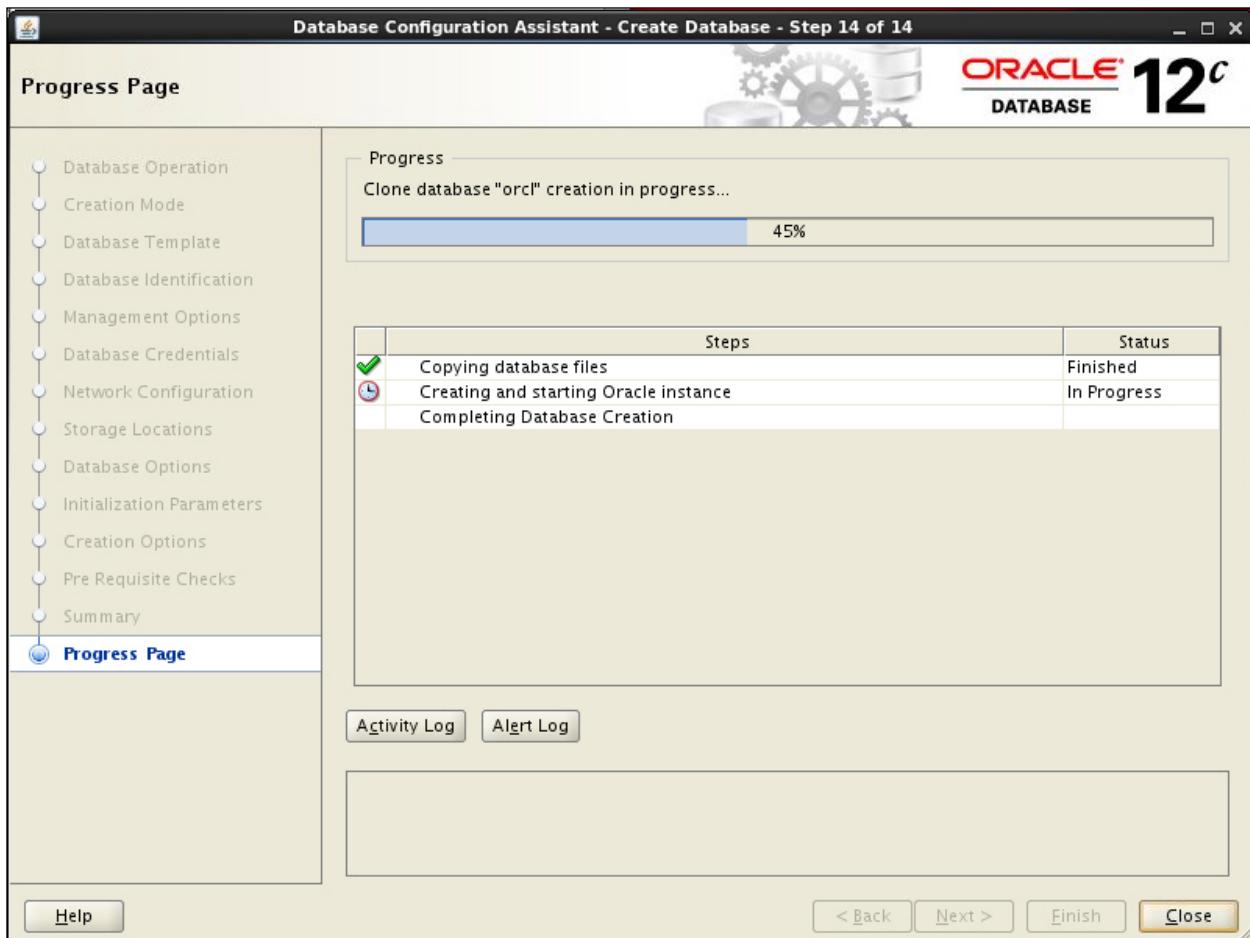
Step	Window/Page Description	Choices or Values
q.	Creation Options page	<p>Select Create Database.</p> <p>Select Save as a Database Template.</p> <ul style="list-style-type: none"> • Name: orcl (the name for the database template) • Description: orcl Database Template <p>Select Generate Database Creation Scripts.</p>

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Step	Window/Page Description	Choices or Values
		Destination Directory: /home/oracle/labs <i>Note: This directory must exist.</i> Click Next .
r.	Pre Requisite Checks	If there are no failed prerequisites, the DBCA moves immediately to the next page
s.	Summary page	Review options, parameters, locations, and settings, specifically the ones in the following table.

Name	Value or Location Value
Sample Schemas	true
db_name	orcl
db_block_size	8KB
Data Files	{ORACLE_BASE}/oradata/{DB_UNIQUE_NAME}/*
Control Files	{ORACLE_BASE}/oradata/{DB_UNIQUE_NAME}/control01.ctl {ORACLE_BASE}/fast_recovery_area/{DB_UNIQUE_NAME}/control02.ctl
memory_target	840MB
Database Character Set	AL32UTF8

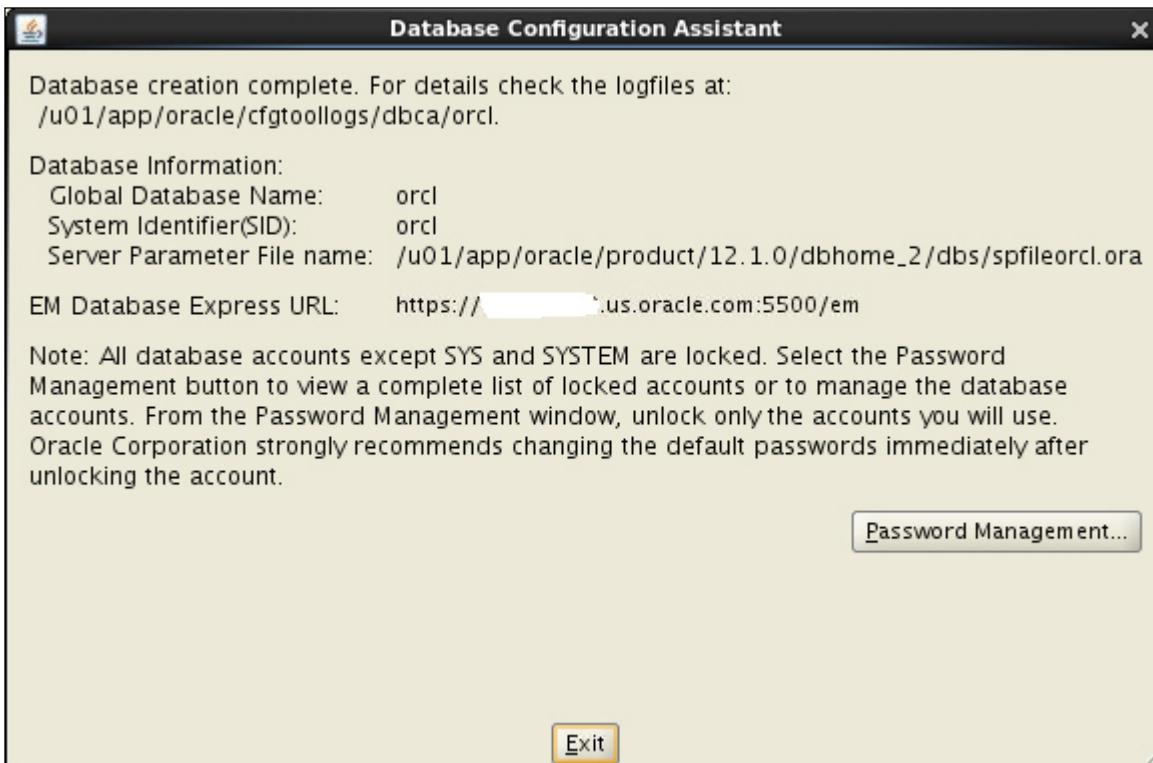
Step	Window/Page Description	Choices or Values
t.	Summary page	Click Finish .
u.	Template has been created	Click OK .
v.	Generation of the database scripts	Click OK .
w.	Progress page	Displays the progress of the various installation steps. This step takes about 15 minutes.



Step	Window/Page Description	Choices or Values
X.	Database creation complete	Displays essential information about the database. Make note of the Enterprise Manager Database Express URL, because it will be used in several of the following practice sessions.

Important: Make note of the Enterprise Manager Database Express URL:

https://_____ : _____ /em



Step	Window/Page Description	Choices or Values
y.	Database creation complete	Click Password Management .
z.	Password Management page	Scroll down to find the HR user. Deselect Lock Account? . New Password: oracle_4U Confirm Password: oracle_4U Click OK .
aa.	Database creation complete	Click Exit .
bb.	Database Creation Assistant	Click Close .

- You have completed the creation of the non-CDB, the `orcl` database template, and the database generation scripts. When you create another database, the `orcl` template will appear on the templates page. Check that the `orcl.sh` shell script exists.

Note: The following `ls` command has the numeral 1 (one) as the last character.

```
$ cd /home/oracle/labs
$ ls -tr -1
init.ora
orcl.sh
tempControl.ctl
initorclTempOMF.ora
rmanRestoreDatafiles.sql
```

```
CloneRmanRestore.sql  
initorclTemp.ora  
cloneDBCreation.sql  
postScripts.sql  
lockAccount.sql  
orcl.sql  
postDBCreation.sql  
$
```

- Verify that the `orcl` database instance entry is added in `/etc/oratab`.

```
$ cat /etc/oratab  
...  
em12rep:/u01/app/oracle/product/12.1.0/dbhome_1:N  
dbupgrd:/u01/app/oracle/product/11.2.0/dbhome_2:N  
orcl:/u01/app/oracle/product/12.1.0/dbhome_2:N  
$
```

- Verify that you can connect as `SYSTEM` and that the database name is `ORCL`. Do not mix up instance and database names.
 - Use views to verify instance and database names. The banner displays “Oracle Database 12c Enterprise Edition Release **12.1.0.1.0**”.

```
$ sqlplus system/oracle_4U  
...  
Connected to:  
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -  
64bit Production  
...  
  
SQL> select instance_name from v$instance;  
  
INSTANCE_NAME  
-----  
orcl  
  
SQL> select name from v$database;  
  
NAME  
-----  
ORCL  
  
SQL> exit  
$
```

- b. View the ORACLE_SID environment variable.

```
$ echo $ORACLE_SID  
orcl  
$
```

6. Verify the existence of initialization parameter files.

```
$ ls $ORACLE_HOME/dbs/*orcl*.ora  
/u01/app/oracle/product/12.1.0/dbhome_2/dbs/spfileorcl.ora  
$
```

Only the server parameter file exists. DBCA removes the text parameter file after the creation of the database is complete. It is a good practice to have a text parameter file to edit when it is necessary to modify initialization parameters. Do not create the text parameter file with the default name. By using a non-default name, it is less likely that you will accidentally start the database instance with a possibly out-of-date parameter file.

- a. Re-create the parameter file.

```
$ sqlplus system/oracle_4U  
  
SQL> create pfile='bkuporcl.ora' from spfile;  
create pfile from spfile  
*  
ERROR at line 1:  
ORA-01031: insufficient privileges  
  
SQL>
```

The SYSTEM user is not privileged enough to create a parameter file. Connect as SYSDBA to create the text parameter file. Then exit SQL*Plus.

```
SQL> connect / as sysdba  
Connected.  
SQL> create pfile='bkuporcl.ora' from spfile;  
  
File created.  
  
SQL> exit  
$
```

- b. Edit the parameter file using gedit or your preferred editor to set the db_recovery_file_dest_size to **6G** instead of **4800m**. Save the changes and quit gedit.

```
$ gedit $ORACLE_HOME/dbs/bkuporcl.ora
```

```

bkuporcl.ora X
orcl._data_transfer_cache_size=0
orcl._db_cache_size=335544320
orcl._java_pool_size=4194304
orcl._large_pool_size=8388608
orcl._oracle_base='/u01/app/oracle'#ORACLE_BASE set from environment
orcl._pga_aggregate_target=352321536
orcl._sga_target=528482304
orcl._shared_io_pool_size=0
orcl._shared_pool_size=167772160
orcl._streams_pool_size=0
*.audit_file_dest='/u01/app/oracle/admin/orcl/adump'
*.audit_trail='db'
*.compatible='12.1.0.0.0'
*.control_files='/u01/app/oracle/oradata/orcl/control01.ctl','/u01/app/oracle/fast_recovery_area/orcl/
control02.ctl'
*.db_block_size=8192
*.db_domain=''
*.db_name='orcl'
*.db_recovery_file_dest='/u01/app/oracle/fast_recovery_area'
*.db_recovery_file_dest_size=6G
*.diagnostic_dest='/u01/app/oracle'
*.dispatchers='(PROTOCOL=TCP) (SERVICE=orclXDB)'
*.memory_target=840m
*.open_cursors=300
*.processes=300
*.remote_login_passwordfile='EXCLUSIVE'
*.undo_tablespace='UNDOTBS1'

```

- c. Be aware that if you shut the instance down and restart it without naming the initialization parameter file, the SPFILE is used by default. If you want the PFILE to be used, use the following steps:

- 1) Shut the instance down.

```

$ sqlplus / as sysdba

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

```

- 2) Start the instance with the PFILE clause.

```

SQL> startup pfile=$ORACLE_HOME/dbs/bkuporcl.ora
ORACLE instance started.

Total System Global Area  876859392 bytes
Fixed Size                  2294360 bytes
Variable Size                62070488 bytes
Database Buffers              247463936 bytes
Redo Buffers                   6340608 bytes
Database mounted.
Database opened.

SQL> show parameter spfile
NAME                      TYPE          VALUE

```

```
-----
spfile                      string
SQL> show parameter db_recovery_file_dest_size

NAME                      TYPE          VALUE
-----
db_recovery_file_dest_size    big integer  6G
SQL>
```

- 3) Restart the instance without specifying the initialization file. Note that the server parameter file is used.

```
SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL> startup
ORACLE instance started.
Total System Global Area  876859392 bytes
Fixed Size                  2294360 bytes
Variable Size                578817448 bytes
Database Buffers            289406976 bytes
Redo Buffers                 6340608 bytes
Database mounted.
Database opened.
SQL> show parameter Spfile
NAME                      TYPE          VALUE
-----
spfile                      string
/u01/app/oracle/product/12.1.0/dbhome_2/dbs/spfileorcl.ora
SQL>
SQL> show parameter db_recovery_file_dest_size
NAME                      TYPE          VALUE
-----
db_recovery_file_dest_size    big integer  4800M
SQL> exit
$
```

7. To prepare for later practices, execute the `$LABS/P5/orcl_setup.sql` script. This script unlocks sample schema accounts and creates users for later practices.

```
$ cd $LABS/P5
$ sqlplus / as sysdba
SQL> @orcl_setup

User altered.
```

```
User altered.  
User altered.  
User altered.  
User altered.  
User altered.  
User created.  
Grant succeeded.  
Grant succeeded.  
User created.  
Grant succeeded.  
Grant succeeded.  
SQL> exit
```

8. Verify that you can connect as the HR user. The HR user is one of the sample schema users.

```
$ sqlplus hr/oracle_4U  
  
SQL> show user  
USER is "HR"  
SQL> select table_name from user_tables;  
  
TABLE_NAME  
-----  
COUNTRIES  
JOB_HISTORY  
EMPLOYEES  
JOBS  
REGIONS  
DEPARTMENTS  
LOCATIONS
```

```
7 rows selected.  
SQL>
```

9. List all data files, control files, and redo log files of the `orcl` database.

- a. List all data files.

```
SQL> connect system/oracle_4U  
Connected.  
SQL> select name from v$datafile;  
  
NAME  
-----  
/u01/app/oracle/oradata/orcl/system01.dbf  
/u01/app/oracle/oradata/orcl/example01.dbf  
/u01/app/oracle/oradata/orcl/sysaux01.dbf  
/u01/app/oracle/oradata/orcl/undotbs01.dbf  
/u01/app/oracle/oradata/orcl/users01.dbf  
  
SQL>
```

The data files are all stored in the `$ORACLE_BASE/oradata/orcl` directory.

- b. List all control files.

```
SQL> select name from v$controlfile;  
  
NAME  
-----  
/u01/app/oracle/oradata/orcl/control01.ctl  
/u01/app/oracle/fast_recovery_area/orcl/control02.ctl  
  
SQL>
```

One control file resides in the `$ORACLE_BASE/oradata/orcl` directory and another control file resides in the `$ORACLE_BASE/fast_recovery_area/orcl` directory.

- c. List all redo log files.

```
SQL> select member from v$logfile;
```

```
MEMBER
```

```
-----  
/u01/app/oracle/oradata/orcl/redo03.log  
/u01/app/oracle/oradata/orcl/redo02.log  
/u01/app/oracle/oradata/orcl/redo01.log
```

```
SQL>
```

There are three redo log groups. Each redo log group owns a single member residing in the \$ORACLE_BASE/oradata/orcl directory. The default configuration does not create multiplexed redo log groups. Best practice is for each group to have two members, each on a different disk drive.

Practice 5-2: Creating a CDB

Overview

In this practice, you create a multitenant container database named `cdb1`. You use the Database Configuration Assistant (DBCA) to create the CDB.

1. In the `oracle` user terminal window, set your `ORACLE_HOME` environment variable by using `oraenv`. Enter `cdb1` for the SID and then enter `/u01/app/oracle/product/12.1.0/dbhome_2` for `ORACLE_HOME`. The entry is not yet registered in the `/etc/oratab` file and, therefore, the `ORACLE_HOME` is not known.

```
$ . oraenv
ORACLE_SID = [orcl] ? cdb1
ORACLE_HOME = [/home/oracle] ?
/u01/app/oracle/product/12.1.0/dbhome_2
The Oracle base remains unchanged with value /u01/app/oracle
$
```

2. Start the Database Configuration Assistant (DBCA) and perform the following steps:

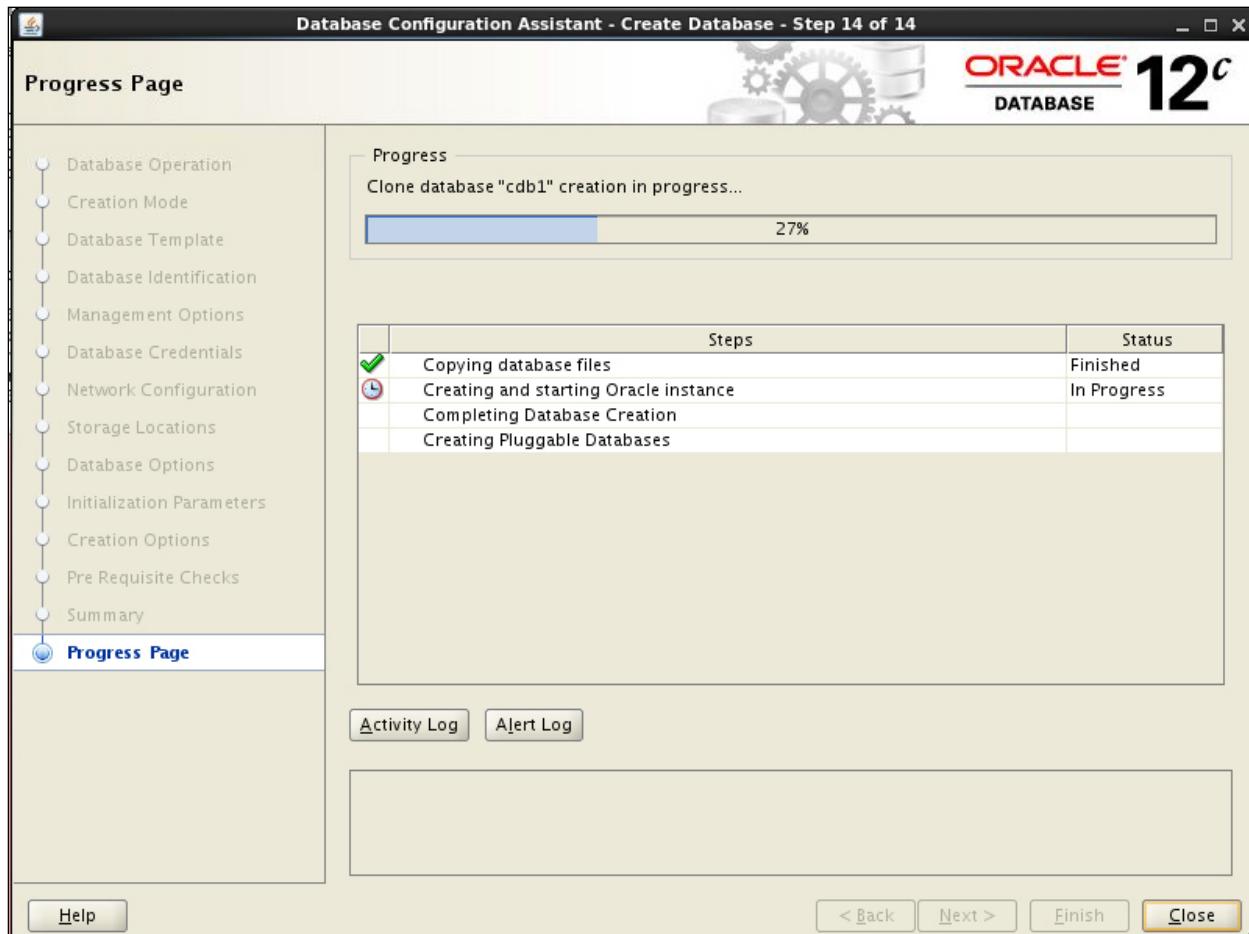
```
$ dbca
```

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	Notice that the template <code>orcl</code> created in practice 5-1 is available. Select General Purpose or Transaction Processing . Click Next .
d.	Step 4: Database Identification	Enter: Global Database Name: <code>cdb1</code> SID: <code>cdb1</code> Select Create As Container Database . Select Create a Container Database with one or more PDBs . Enter: PDB Name: <code>pdb1</code> Click Next .

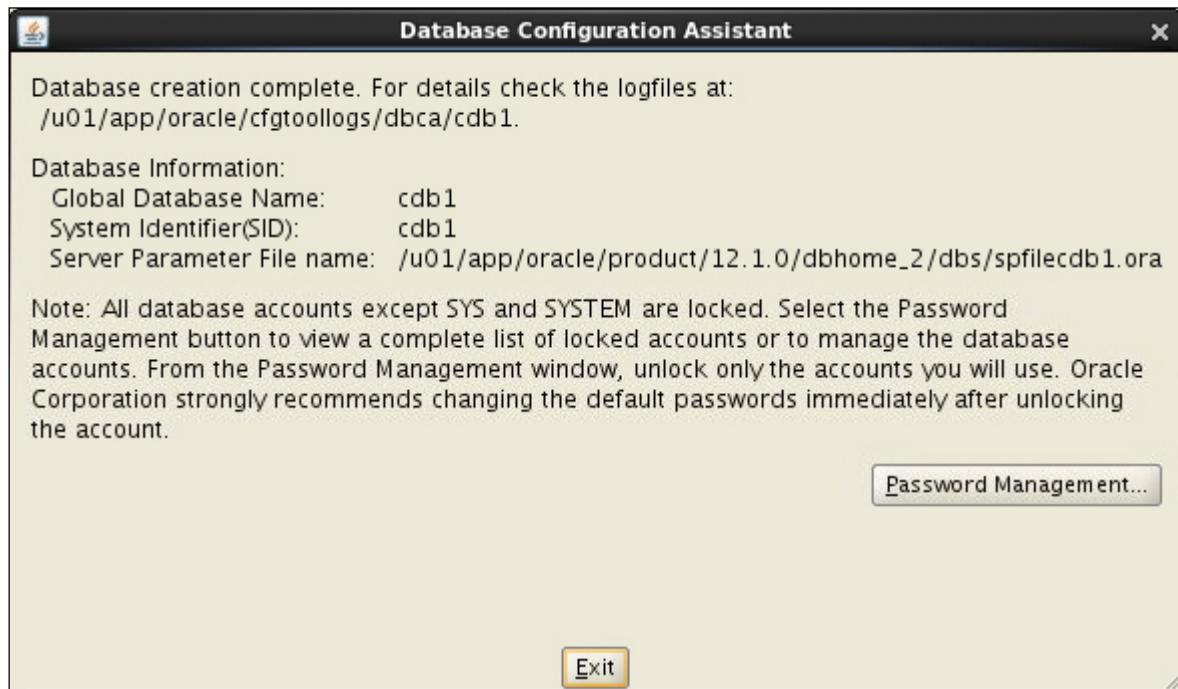
e.	Step 5: Management Options	Deselect Configure Enterprise Manager (EM) Database Express . <i>Note: Each database using Enterprise Manager Database Express requires a separate port. The default port of 5500 has already been assigned so it can be used again for this database.</i> Click Next .
f.	Step 6: Database Credentials	Notice that a new user name of PDBADMIN appears. This user could be the DBA of the pdb1 PDB. Select Use same Administrative password.... Enter: Password: oracle_4U Confirm password: oracle_4U Click Next .
g.	Step 7: Network Configuration	Listener Selection: Click Next .
h.	Step 8: Storage Locations	Confirm that the storage type is File System . Select Use Common Location for All Database Files . Click Next .
i.	Step 9: Database Options	Select Sample Schemas . Click Next .
j.	Step 10: Initialization Parameters Memory Tab	Enter: Memory Size (SGA and PGA): 844 MB Select Use Automatic Memory Management . Select the Character Sets tab. Select Use Unicode (AL32UTF8) . Click Next .
k.	Step 11: Creation Options	Select Create Database . Click Next .
l.	Step 12: Pre Requisite Checks	<i>Note: If there are no warnings or errors, this page automatically advances to the next.</i>
m.	Step 13: Summary	Review options, parameters, locations, and settings. Verify: Number of Pluggable Databases is one . Sample Schema PDB is named pdb1 . Parameter enable_pluggable_database is true . Click Finish .
n.	Step 14: Progress Page	The DBCA displays the progress of the installation steps. This operation takes about 25 minutes.

The progress page is shown in the following screenshot.

- When the CDB is created, two PDBs are created: the PDB\$SEED PDB, automatically created in any CDB as a PDB template to create other PDBs, and pdb1.



- When the database is created, the DBCA displays essential information about the database. Click the **Password Management** button. Scroll down the Password Management page to find the `HR` username. You will not find the `HR` username because it is created only in the PDB, not in the root container of the CDB. Click **Cancel**.



- Click **Exit** to close the Database Configuration Assistant window. Then click **Close** to quit DBCA.
3. Verify that the `cdb1` database instance entry is in `/etc/oratab`.

```
$ cat /etc/oratab
...
em12rep:/u01/app/oracle/product/12.1.0/dbhome_1:N
dbupgrd:/u01/app/oracle/product/11.2.0/dbhome_2:N
orcl:/u01/app/oracle/product/12.1.0/dbhome_2:N
cdb1:/u01/app/oracle/product/12.1.0/dbhome_2:N
$
```

4. You have completed the creation of the CDB, including a PDB. Verify that you can connect as `SYSTEM` and that the database name is `CDB1`. Use views to verify the instance and database names. The `CON_NAME` and `CON_ID` values allow you to verify to which container in the CDB you are connected.

```
$ sqlplus system/oracle_4U

Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production

SQL> show con_name

CON_NAME
-----
CDB$ROOT

SQL> show con_id
```

```
CON_ID
-----
1
SQL> select instance_name from v$instance;

INSTANCE_NAME
-----
cdb1

SQL> select name from v$database;

NAME
-----
CDB1

SQL>
```

The container ID for the root is 1.

5. Display the status of the pdb1 PDB.

```
SQL> select name, open_mode from v$pdbs;

NAME          OPEN_MODE
-----
PDB$SEED      READ ONLY
PDB1          READ WRITE

SQL>
```

The PDB\$SEED PDB is automatically created in any CDB as a PDB template to create other PDBs. The seed PBD is always READ ONLY.

The PDB1 PDB has been created and DBCA automatically put the PDB in READ WRITE mode.

6. Connect to pdb1 as SYSDBA.

```
SQL> connect sys/oracle_4U@localhost:1521/pdb1 as sysdba
Connected.
SQL> show con_name

CON_NAME
-----
PDB1
SQL> show con_id

CON_ID
```

```
-----  
3  
SQL>
```

The container ID for pdb1 is 3. The container with ID 2 is the PDB\$SEED PDB.

7. Connect to pdb1 as HR.

- a. Use the Easy Connect syntax to connect to pdb1 as HR.

```
SQL> connect hr/oracle_4U@localhost:1521/pdb1  
ERROR:  
ORA-28000: the account is locked
```

```
Warning: You are no longer connected to ORACLE.
```

```
SQL>
```

- b. Connect as the administrator of the PDB to unlock the HR account. The HR user is a local user only known in its PDB. Therefore, only the administrator of the PDB can unlock the user.

```
SQL> connect sys/oracle_4U@localhost:1521/pdb1 as sysdba  
Connected.  
SQL> alter user hr identified by oracle_4U account unlock;  
  
User altered.  
  
SQL>
```

- c. Reattempt the connection to pdb1 as HR.

```
SQL> connect hr/oracle_4U@localhost:1521/pdb1  
Connected.  
SQL>
```

- d. Verify that HR is connected in pdb1.

```
SQL> show con_name  
  
CON_NAME  
-----  
PDB1  
SQL>
```

- e. List the tables owned by the HR sample schema.

```
SQL> select table_name from user_tables;

TABLE_NAME
-----
COUNTRIES
JOB_HISTORY
EMPLOYEES
JOBS
REGIONS
DEPARTMENTS
LOCATIONS

7 rows selected.

SQL> exit
$
```

8. Verify the existence of initialization parameter files.

```
$ ls $ORACLE_HOME/dbs/*cdb1*.ora
/u01/app/oracle/product/12.1.0/dbhome_2/dbs/spfilecdb1.ora
$
```

Only the SPFILE server parameter file exists. DBCA removes the PFILE parameter file after the creation of the database is complete. It is a best practice to have a parameter file to edit when necessary to modify initialization parameters.

Also notice that pdb1 does not have an SPFILE.

9. Re-create the parameter file with a non-default name. The SYSTEM user is not privileged enough to create a parameter file. Connect as SYSDBA.

```
$ sqlplus / as sysdba

SQL> create pfile='bkupcdb1.ora' from spfile;

File created.

SQL> exit
$ 
$ ls $ORACLE_HOME/dbs/*cdb1*.ora
/u01/app/oracle/product/12.1.0/dbhome_2/dbs/bkupcdb1.ora
/u01/app/oracle/product/12.1.0/dbhome_2/dbs/spfilecdb1.ora
$
```

10. If you shut down the instance and restart it, the PDBs (only one in our case excluding PDB\$SEED which remains in READ ONLY mode) are all closed or MOUNTED by default.
- Shut the instance down.

```
$ sqlplus / as sysdba

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

- Start the instance.

```
SQL> startup
ORACLE instance started.

Total System Global Area  881037312 bytes
Fixed Size                  2294408 bytes
Variable Size                587206008 bytes
Database Buffers            285212672 bytes
Redo Buffers                 6324224 bytes
Database mounted.
Database opened.
SQL> select name, open_mode from v$pdbs;

NAME          OPEN_MODE
-
PDB$SEED      READ ONLY
PDB1          MOUNTED

SQL>
```

- If you want the PDBs to be opened when the CDB instance is started and the root container opened, create a trigger as follows:

```
CREATE TRIGGER open_all_PDBs
  AFTER STARTUP ON DATABASE
begin
  execute immediate 'alter pluggable database all open';
end open_all_PDBs;
/
```

```
SQL> CREATE TRIGGER open_all_PDBs
  2  after startup on database
  3  begin
  4    execute immediate 'alter pluggable database all open';
  5  end open_all_PDBs;
```

```
6 /
```

```
Trigger created.
```

```
SQL>
```

Use the trigger to open all PDBs or only some PDBs.

- d. Shut down cdb1.

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

- e. Start up cdb1.

```
SQL> startup
ORACLE instance started.

Total System Global Area  881037312 bytes
Fixed Size                  2294408 bytes
Variable Size                587206008 bytes
Database Buffers            285212672 bytes
Redo Buffers                 6324224 bytes
Database mounted.
Database opened.
SQL>
```

- f. Notice that the pdb1 is now in READ WRITE open mode.

```
SQL> select CON_ID, NAME, OPEN_MODE from v$pdbs;

  CON_ID NAME          OPEN_MODE
----- -----
    2     PDB$SEED      READ ONLY
    3     PDB1           READ WRITE

SQL> exit
$
```

11. List all data files, control files, and redo log files of the `cdb1` database.

- a. List all the data files.

```
$ sqlplus system/oracle_4U

SQL> select name from v$datafile;

NAME
-----
/u01/app/oracle/oradata/cdb1/system01.dbf
/u01/app/oracle/oradata/cdb1/sysaux01.dbf
/u01/app/oracle/oradata/cdb1/undotbs01.dbf
/u01/app/oracle/oradata/cdb1/pdbseed/system01.dbf
/u01/app/oracle/oradata/cdb1/users01.dbf
/u01/app/oracle/oradata/cdb1/pdbseed/sysaux01.dbf
/u01/app/oracle/oradata/cdb1/pdb1/system01.dbf
/u01/app/oracle/oradata/cdb1/pdb1/sysaux01.dbf
/u01/app/oracle/oradata/cdb1/pdb1/SAMPLE_SCHEMA_users01.dbf
/u01/app/oracle/oradata/cdb1/pdb1/example01.dbf

10 rows selected.

SQL>
```

The data files are all stored in the `$ORACLE_BASE/oradata/cdb1` directory. There are:

- Four data files for the `root` container:
 - One for the `SYSTEM` tablespace
 - One for the `SYSAUX` tablespace
 - One for the `UNDO` tablespace
 - One for the `USERS` tablespace
- Two data files for the seed container under a `pdbseed` subdirectory:
 - One for the `SYSTEM` tablespace
 - One for the `SYSAUX` tablespace
- Four data files for the `pdb1` container under a `pdb1` subdirectory:
 - One for the `SYSTEM` tablespace
 - One for the `SYSAUX` tablespace
 - One for the `USERS` tablespace
 - One for the `EXAMPLE` tablespace

- b. List all the control files.

```
SQL> select name from v$controlfile;

NAME
-----
/u01/app/oracle/oradata/cdb1/control01.ctl
/u01/app/oracle/fast_recovery_area/cdb1/control02.ctl

SQL>
```

One control file resides in the \$ORACLE_BASE/oradata/cdb1 directory and another control file resides in the \$ORACLE_BASE/fast_recovery_area/cdb1 directory. The control files are mounted at the instance startup. There is only one instance for the whole CDB including the PDBs, and, therefore, the control files are mounted for the single instance.

- c. List all the redo log files.

```
SQL> select member from v$logfile;

MEMBER
-----
/u01/app/oracle/oradata/cdb1/redo03.log
/u01/app/oracle/oradata/cdb1/redo02.log
/u01/app/oracle/oradata/cdb1/redo01.log

SQL>
```

There are three redo log groups whose members reside in the \$ORACLE_BASE/oradata/cdb1 directory. The LGWR process works for the redo stream of the whole CDB including the PDBs. The default configuration does not create multiplexed redo log groups.

Best Practice Tip: Create two members for each group each on a different disk drive. If you had another disk on /u02, you could multiplex the redo log groups to this disk.

- d. On your server, you only have /u01. You use it to multiplex.

```
SQL> alter database add logfile member
'./u01/app/oracle/oradata/cdb1/redo01b.log' to group 1;

Database altered.

SQL> alter database add logfile member
'./u01/app/oracle/oradata/cdb1/redo02b.log' to group 2;

Database altered.

SQL> alter database add logfile member
'./u01/app/oracle/oradata/cdb1/redo03b.log' to group 3;
```

Database altered.

```
SQL> col member format A50
SQL> select group#, member from v$logfile order by 1;
```

GROUP#	MEMBER
1	/u01/app/oracle/oradata/cdb1 redo01.log
1	/u01/app/oracle/oradata/cdb1 redo01b.log
2	/u01/app/oracle/oradata/cdb1 redo02b.log
2	/u01/app/oracle/oradata/cdb1 redo02.log
3	/u01/app/oracle/oradata/cdb1 redo03b.log
3	/u01/app/oracle/oradata/cdb1 redo03.log

6 rows selected.

```
SQL>
```


Practices for Lesson 6: Oracle Database Management Tools

Chapter 6

Practices for Lesson 6: Overview

Practices Overview

Background: The Oracle software has been installed and a database has been created.

Practice 6-1: Registering the `orcl` Database in Oracle Enterprise Manager Cloud Control

In this practice, you use Oracle Enterprise Manager Cloud Control (Cloud Control) to register the `orcl` database.

1. Invoke Cloud Control and log in as the `SYSMAN` user. Which port number does this database use?

Answer: Cloud Control uses port 7802 by default.

- a. Double-click the **Web Browser** icon on your desktop to open your web browser as the `oracle` user.
- b. Enter the URL `https://localhost:7802/em`. The format for this URL is `https://<machine_name>:<port_number>/em`.

Note: The first time you connect, you get an “Untrusted Connection” message (or something similar depending on the browser and version) and an Alert window may appear. To get past this, you add an exception and accept the certificate.



This Connection is Untrusted

You have asked Firefox to connect securely to `edrsr11p1:7802`, but we can't confirm that your connection is secure.

Normally, when you try to connect securely, sites will present trusted identification to prove that you are going to the right place. However, this site's identity can't be verified.

What Should I Do?

If you usually connect to this site without problems, this error could mean that someone is trying to impersonate the site, and you shouldn't continue.

[Get me out of here!](#)

► Technical Details

► I Understand the Risks

- 1) Click I understand the Risks.
- 2) Click Add Exception.

▼ I Understand the Risks

If you understand what's going on, you can tell Firefox to start trusting this site's identification. **Even if you trust the site, this error could mean that someone is tampering with your connection.**

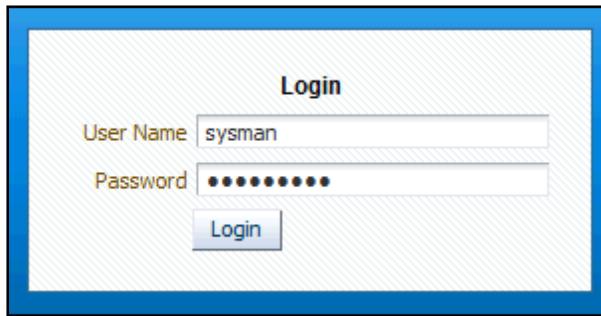
Don't add an exception unless you know there's a good reason why this site doesn't use trusted identification.

[Add Exception...](#)

- 3) Ensure that the option to permanently store this exception is selected and then click **Confirm Security Exception**.



- c. In the Cloud Control Login box, enter **sysman** in the User Name field and **oracle_4U** in the Password field, and then click **Login**.



2. At the first login to Cloud Control, you will be asked to accept the license agreement. Click **I Accept**.
3. Also, at the first login to Cloud Control, you will be asked to select a Home page from several. Click **Select As My Home** next to the **Summary** view. Note that this is the assumed starting point for any subsequent logins.

4. Register your local database named `orcl` with Cloud Control.
 - a. Expand **Targets** and select **Databases**.
 - b. Select **Search List**.
 - c. On the Databases page, note that there are no targets. Click **Add**.

ORACLE Enterprise Manager Cloud Control 12c

Enterprise ▾ Targets ▾ Favorites ▾ History ▾

Databases

View Database Load Map Search List

Search Go Advanced Search

Select	Name	Status	Incidents	Version
No Targets found...				

- d. On the “Add Database Instance Target: Specify Host” page use the Search icon to select your host target. Click **Continue**.
- e. In the Databases section, deselect the `em12rep` database. This is the repository database for Enterprise Manager Cloud Control. You are not going to configure it at this time.
- f. Also deselect the `cdb1` and `dbupgrd` databases.
- g. Enter `oracle_4U` in the Monitor Password field for the `orcl` database. Click **Test Connection**.

Databases

The following databases have been discovered on this host. Administrator can configure the database system name for each of the discovered databases. If user specifies group, Enterprise Manager will add the discovered target(s) to the specified group. Global target properties can be specified on following page for selected targets

Monitor password for default user 'dbsnmp' can be specified and continue with the add of database to Enterprise Manager. Additional properties can be provided for discovered databases by clicking "Configure" button.

Select	Name	Database System	Monitor Password	Group	Configure
<input type="checkbox"/>	cdb1 (Container Database)	cdb1_sys			
<input checked="" type="checkbox"/>	orcl	orcl_sys		
<input type="checkbox"/>	dbupgrd	dbupgrd_sys			
<input type="checkbox"/>	em12rep	em12rep_sys			

TIP Configuration changes will only take effect for those databases that are added as targets.

- h. You receive a confirmation message that the connection test was successful. Click **Finish**.
- i. Click **Save**.
- j. On the Target Configuration Results page, click **OK**.

- k. The `orcl` database appears on the Databases page.

The screenshot shows the 'Databases' page with the following interface elements:

- View:** Options for 'Database Load Map' (radio button) and 'Search List' (radio button, selected).
- Search:** A text input field and a 'Go' button.
- Buttons:** 'Configure', 'Remove', and 'Add'.
- Table Headers:** 'Select', 'Name ▲', 'Status', 'Incidents', and 'Compliance Violations'.
- Table Data:** A single row for the 'orcl' database. The 'Select' column has a radio button. The 'Name' column shows 'orcl'. The 'Status' column shows a clock icon. The 'Incidents' column contains three icons: a minus sign, a red X, and a yellow exclamation mark. The 'Compliance Violations' column shows three red zeros.

- l. Return to the Enterprise Summary page by expanding **Enterprise** and selecting **Summary**.

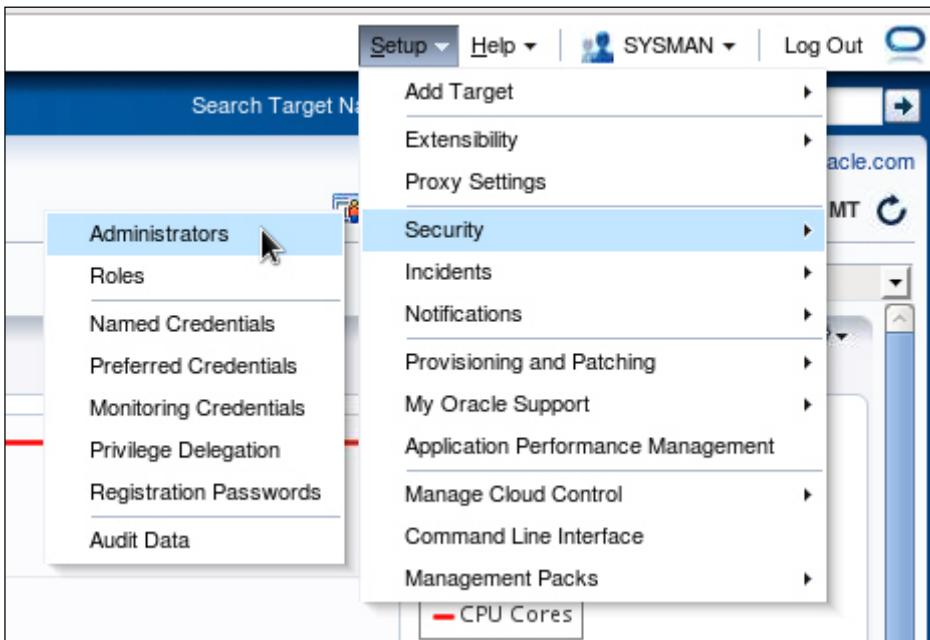
Practice 6-2: Creating an Administrative User

Overview

In this practice, you create an administrative user in Oracle Enterprise Manager Cloud Control. This user has an arbitrary name, and it is not related to the name of any database user. It is a recommended best practice to create and use a separate account for each administration user.

Tasks

1. If you are not logged in to Enterprise Manager Cloud Control, launch Enterprise Manager Cloud Control and log in as the **SYSMAN** user.
2. In the top-right corner of the page, click **Setup > Security > Administrators**.



3. Click **Create** to add the ADMIN user to the Administrators list. This will enable the ADMIN user to perform management tasks by using Enterprise Manager.

ORACLE® Enterprise Manager Cloud Control 12c

Enterprise ▾ Targets ▾ Favorites ▾ History ▾

Security

Administrators

Administrators are Enterprise Manager users who can login to Enterprise Manager to perform management tasks. The level of access depends on the privileges and roles assigned to the administrators.

Select	Name	Access	Authentication Type
<input checked="" type="radio"/>	SYS	Super Administrator	Repository
<input type="radio"/>	SYSMAN	Repository Owner	Repository
<input type="radio"/>	SYSTEM	Super Administrator	Repository

Search Go

[Create](#) [Like](#) [View](#) [Edit](#) [Delete](#)

4. Enter **admin** in the Name field and **oracle_4U** in the Password and Confirm Password fields. Select **Super Administrator** and then click **Review**.

Create Administrator: Properties

* Name	admin
* Password	*****
* Confirm Password	*****
Password Profile	DEFAULT View
You can create additional password profile using database admin pages	
<input type="checkbox"/> Prevent password change	
When checked, administrator is not allowed to change his/her own password.	
<input type="checkbox"/> Expire password now	
When selected, administrator account will be created with expired state. On next logon, administrator will be prompted to change password.	
E-mail Address	Specify one or more e-mail addresses separated by a comma or space. If you are creating multiple accounts, enter the e-mail address for each account on a new line.
Contact	
Location	
Department	
Cost Center	
Line of Business	
Description	
<input checked="" type="checkbox"/> Super Administrator	

5. On the Create Administrator Admin: Review page, click **Finish**.
6. A Confirmation message is displayed.

The screenshot shows the Oracle Enterprise Manager Cloud Control interface. At the top, a yellow banner displays a confirmation message: "Administrator ADMIN was created successfully". Below this, the title "Administrators" is shown, followed by a brief description: "Administrators are Enterprise Manager users who can login to Enterprise Manager to perform management tasks. The level of access depends on the privileges and roles assigned to the administrators." A search bar and a "Go" button are present. Below the search bar is a navigation menu with buttons for "Create", "Like", "View", "Edit", "Delete", and "Create". A table lists four administrators:

Select	Name	Access	Authentication Type
<input checked="" type="radio"/>	ADMIN	Super Administrator	Repository
<input type="radio"/>	SYS	Super Administrator	Repository
<input type="radio"/>	SYSMAN	Repository Owner	Repository
<input type="radio"/>	SYSTEM	Super Administrator	Repository

7. Click **Log Out** in the top-right corner.
8. Enter **ADMIN** in the User Name field and **oracle_4u** in the Password field.
9. The Select Enterprise Manager Home page is displayed. Select the **Summary** view. Click **Select As My Home** beside the thumbnail of the Summary page.
10. The Enterprise Summary page is displayed. Click **Log Out** to exit from Enterprise Manager Cloud Control.

Practice 6-3: Logging In to Oracle Enterprise Manager Database Express

Overview

In this practice, you create a new user and log in to Oracle Enterprise Manager Database Express (EM Express).

Tasks

- It is good practice to create a user separate from `SYS` and `SYSTEM` to perform database administration tasks. Each DBA in your organization should have his or her own privileged account to aid in auditing. Create a privileged user named `DBA1` and grant this user the `CONNECT`, `DBA`, and `SYSDBA` roles by using a script named `labs_06_03_01.sh`. You will examine this script later after discussing user security.

Open a terminal window and log in as the `oracle` user. Execute the `$LABS/P6/lab_06_03_01.sh` script.

```
$ $LABS/P6/lab_06_03_01.sh
lab_06_03_01 completed. You may now login as:
dba1/oracle_4U
```

- Invoke EM Express and log in as the `DBA1` user. Which port number does this database use? Because each database on the same machine must use a different port, you can discover the port numbers being used by executing the following PL/SQL block.

```
DECLARE
    port NUMBER;
Begin
    port := dbms_xdb_config.gethttpsport;
    dbms_output.put_line('DB user port for EM
Express:' || to_char(PORT));
END;
```

- In the Linux command window, set your environment to the `orcl` database by using `oraenv`.

```
$ . oraenv
ORACLE_SID = [oracle] ? orcl
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_2 is
/u01/app/oracle
$
```

- b. Log in to SQL*Plus as the DBA1 user and execute the \$LABS/P6/lab_06_03_02.sql script, which contains the PL/SQL block shown above.

```
$ sqlplus dba1/oracle_4U as sysdba
...
SQL> @$LABS/P6/lab_06_03_02
DB user port for EM Express:5500

PL/SQL procedure successfully completed.
```

Note: 5500 is the Enterprise Manager Database Express port in this database.

3. Double-click the **Web Browser** icon on your desktop to open your web browser as the oracle user.
- Enter the following URL with the port number you found by executing the PL/SQL block. It has the following format:
<http://localhost:portnumber/em>
 - The “This Connection is Untrusted” page appears. You need to add a security exception.



This Connection is Untrusted

You have asked Firefox to connect securely to **localhost:5501**, but we can't confirm that your connection is secure.

Normally, when you try to connect securely, sites will present trusted identification to prove that you are going to the right place. However, this site's identity can't be verified.

What Should I Do?

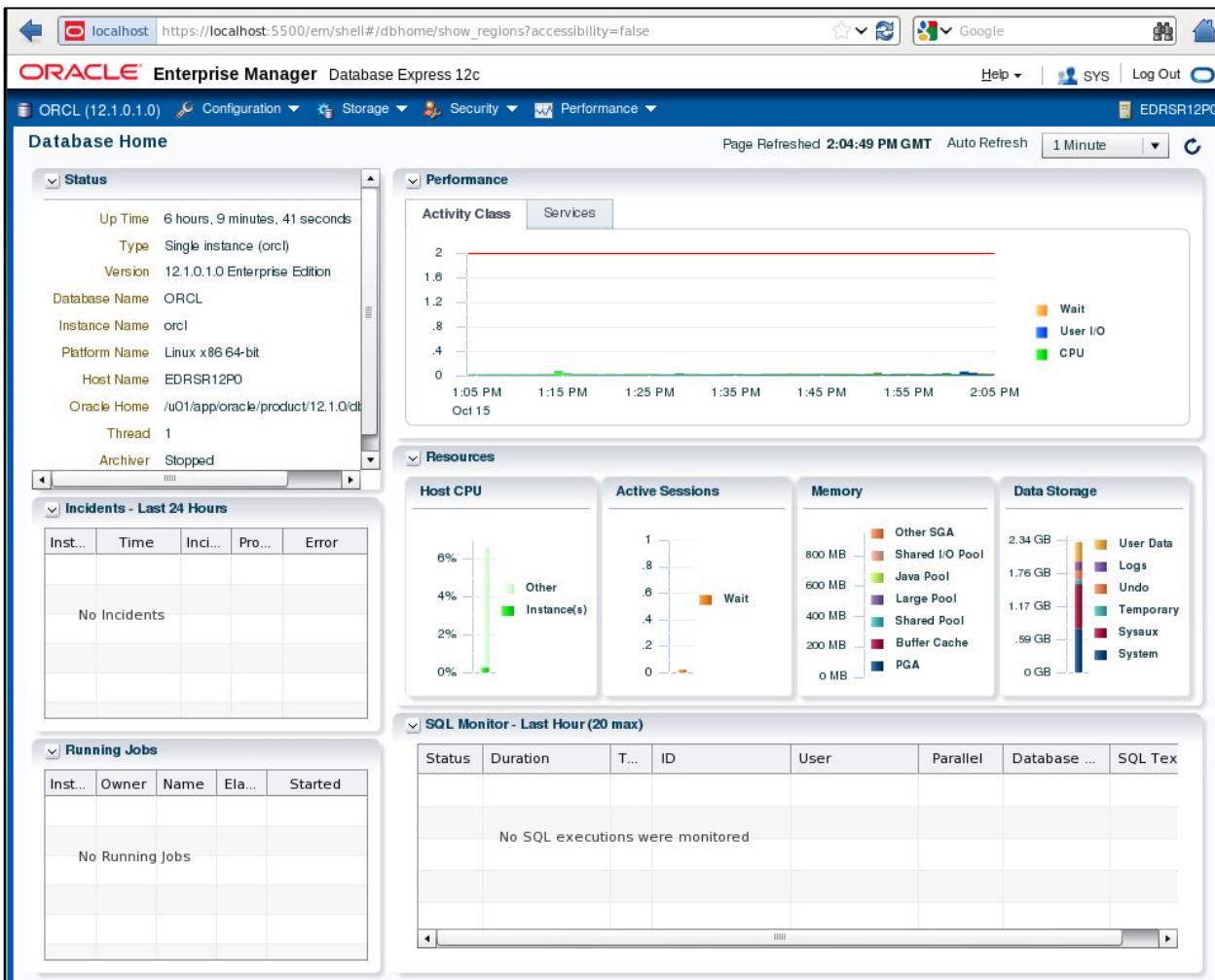
If you usually connect to this site without problems, this error could mean that someone is trying to impersonate the site, and you shouldn't continue.

[Get me out of here!](#)

- ▶ [Technical Details](#)
- ▶ [I Understand the Risks](#)

- At the end of the alert box, click I Understand the Risks.
 - At the bottom of the page, click Add Exception.
 - Confirm that “Permanently store this exception” is selected in your training environment and click Confirm Security Exception.
- c. On the Oracle Enterprise Manager Database Express login page, enter **DBA1** as the User Name, enter **oracle_4U** as the Password, and select **SYSDBA** for Connect As. Then click **Login**.

- d. The Database Home page is displayed.



Practice 6-4: Configuring EM Database Express for CDB1

Overview

In this practice, you configure Enterprise Manager Database Express for the CDB1 database.

Assumptions

You did not configure Enterprise Manager (EM) Database Express when the CDB1 database was created with DBCA. Each database instance requires a separate port for EM Database Express. You are now going to configure it with port 5501. 5500 is being used by the ORCL instance.

Tasks

1. Open a new terminal window and set the environment for the CDB1 database.

```
$ . oraenv
ORACLE_SID = [oracle] ? cdb1
The Oracle base has been set to /u01/app/oracle
$
```

2. Log in to the CDB1 database as the SYSDBA user.

```
$ sqlplus / as sysdba
...
SQL>
```

3. Verify that the DISPATCHERS instance parameter has at least one dispatcher configured for the XMLDB service with the TCP protocol.

```
SQL> show parameter DISPATCHERS

NAME          TYPE        VALUE
-----
Dispatchers    string     (PROTOCOL=TCP) (SERVICE=cdb1XDB)
max_dispatchers integer
SQL>
```

4. Choose between a secured and an unsecured connection. If you choose a secured connection, use the `setHTTPSPort` procedure in the `DBMS_XDB_CONFIG` package to configure port 5501; otherwise, use the `setHTTPPort` procedure. The HTTPS protocol uses Secure Socket Layer (SSL).

```
SQL> exec DBMS_XDB_CONFIG.setHTTPSPort(5501)

PL/SQL procedure successfully completed.

SQL>
```

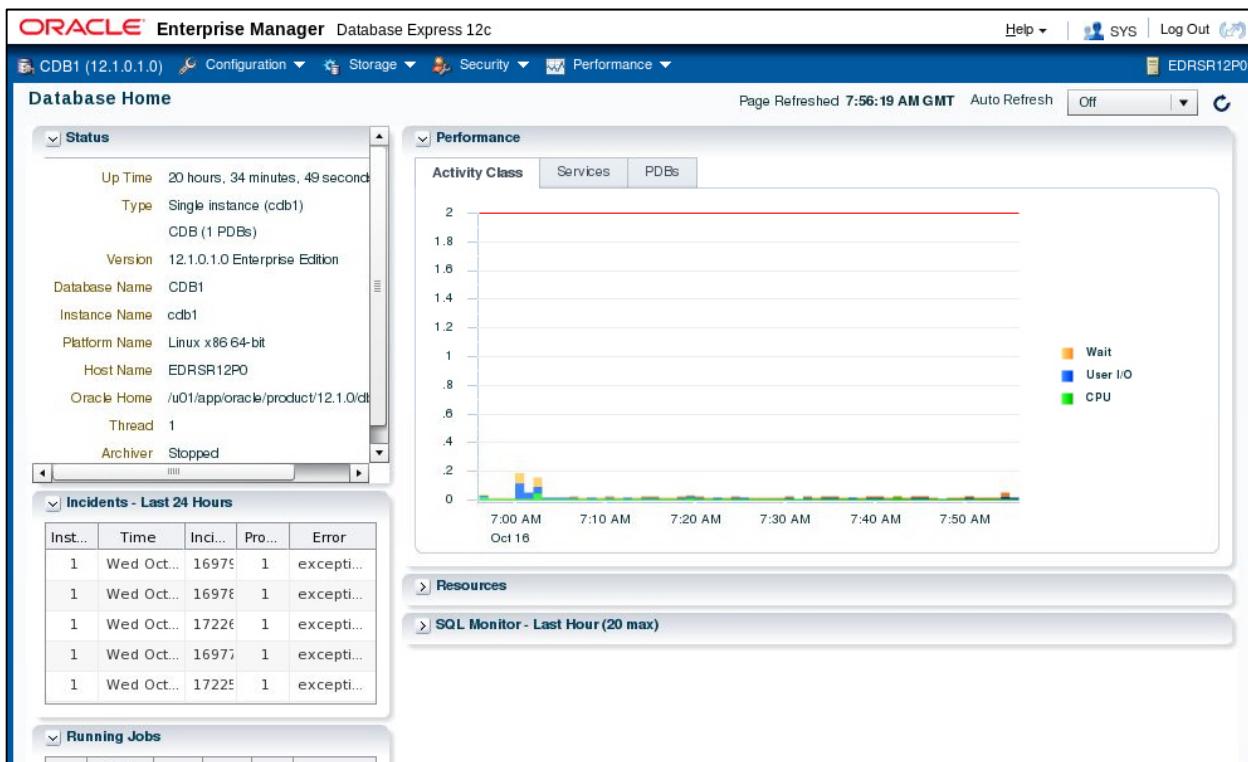
5. Verify the port allocation.

```
SQL> SELECT dbms_xdb_config.gethttpsport FROM DUAL;

GETHTTPSPORT
-----
5501

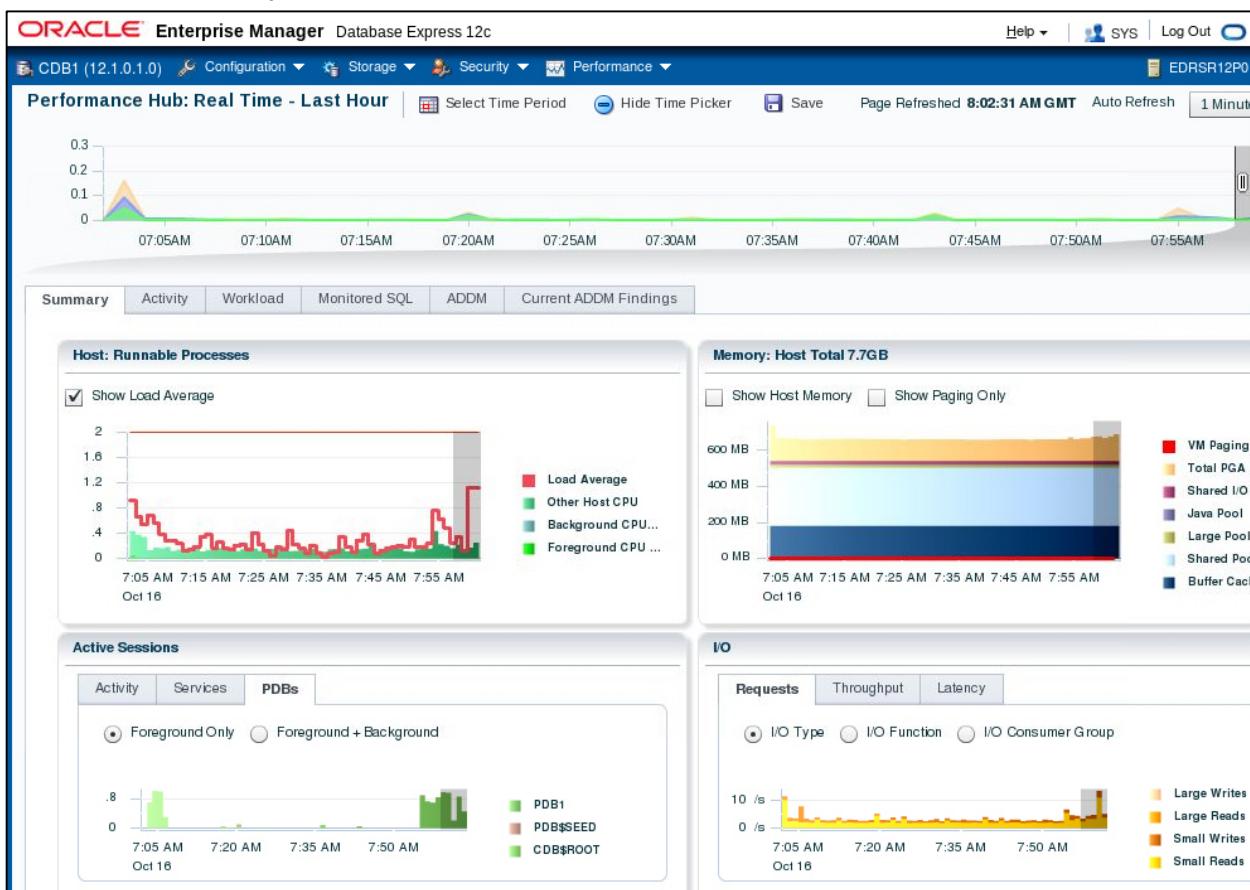
SQL> exit
$
```

6. In a browser, enter the following URL: <https://localhost:5501/em>
7. The “This Connection is Untrusted” page appears. You need to add a security exception.
- At the end of the alert box, click **I Understand the Risks**.
 - At the bottom of the page, click **Add Exception**.
 - In the Add Security Exception pop-up window, click **Get Certificate**.
 - Confirm that “Permanently store this exception” is selected in your training environment and click **Confirm Security Exception**.
8. The Enterprise Manager Database Express Login page appears. On the Login page, enter **sys** in the User Name field and **oracle_4U** in the Password field, select “as sysdba,” and click Login.
9. The CDB1 Database Home page appears.



10. You can view the list of PDBs in the CDB1.
- Click **Performance** in the top menu, and then select Performance Hub from the options.

- b. On the Summary tab, click the **PDBs** tab in the Active Sessions section.



11. Exit EM Database Express by clicking **Log Out**.
12. Close the browser.

Practices for Lesson 7: Managing the Database Instance

Chapter 7

Practices for Lesson 7: Overview

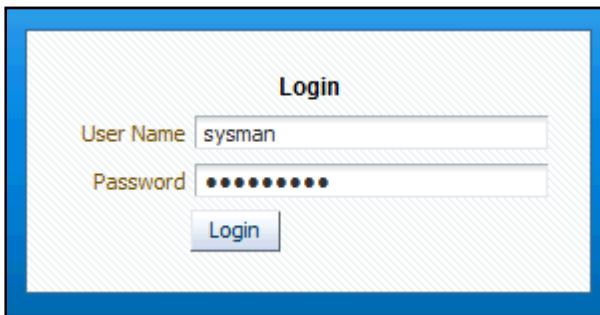
Practices Overview

Background: The Oracle software has been installed and a database has been created. You want to ensure that you can start and stop the database instance and see the application data.

Practice 7-1: Managing the Oracle Instance by Using Oracle Enterprise Manager Cloud Control

In this practice, you use Oracle Enterprise Manager Cloud Control (Cloud Control) to perform the following tasks:

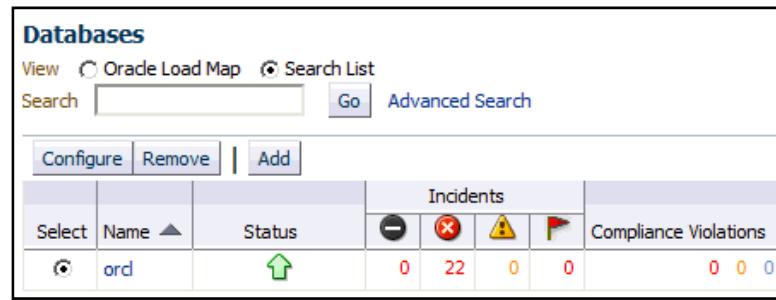
- View and change instance parameters.
 - Shut down the database.
 - Start up the database.
1. Launch Cloud Control, and log in as the **SYSMAN** user.
 - a. Double-click the **Web Browser** icon on your desktop to open your web browser as the **oracle** user.
 - b. Enter the URL `https://localhost:7802/em`. The format for this URL is `https://<machine_name>:<port_number>/em`.
 - c. In the Cloud Control login box, enter **sysman** as the User Name, enter **oracle_4u** as the Password, and then click **Login**.



2. View the initialization parameters and set the `JOB_QUEUE_PROCESSES` parameter to 15. What SQL statement is run to do this?
 - a. Expand **Targets** and select **Databases**.
 - b. Click the **Search List** radio button at the top of the page.



- c. On the Databases page, click **orcl**.



Select	Name	Status	Incidents				Compliance Violations				
							0	22	0	0	0
<input checked="" type="radio"/>	ord						0	22	0	0	0

- d. Navigate to the Initialization parameters page. Select **Administration > Initialization Parameters**.

The screenshot shows the Oracle Enterprise Manager interface for Cloud Control 12c. The top navigation bar includes 'Enterprise', 'Targets', 'Favorites', and 'History'. Below the bar, the database name 'ordl' is displayed. The main menu has tabs for 'Oracle Database', 'Performance', 'Availability', 'Schema', and 'Administration'. A dropdown menu from 'Administration' is open, showing options like 'Initialization Parameters' (which is highlighted), 'Security', 'Storage', 'Oracle Scheduler', 'Streams and Replication', 'Migrate to ASM', 'Resource Manager', and 'Database Feature Usage'.

- e. Create a login for SYS (password oracle_4U) as SYSDBA. Select **Save As** and enter ORCL_SYS in the field. This is a named credential. Click **Login**.

This screenshot shows the 'Database Login' dialog box. It contains fields for 'Username' (set to 'sys'), 'Password' (represented by a series of dots), and 'Role' (set to 'SYSDBA'). There are two checkboxes: one checked for 'Save As' with the value 'ORCL_SYS', and one unchecked for 'Set As Preferred Credentials'. At the bottom are 'Login' and 'Cancel' buttons.

- f. Enter **job** in the Name field, and then click **Go**.

This screenshot shows the 'Initialization Parameters' page. The 'Current' tab is selected. A search bar at the top has the word 'job' entered. Below the search bar, there are five buttons: 'Name', 'Basic', 'Modified', 'Dynamic', and 'Category'. To the right of these buttons is a 'Go' button. A note below the search bar says 'Filter on a name or partial name'. At the bottom of the page is a checkbox for 'Apply changes in current running instance(s) mode to SPFile. For static parameters, you must restart the database.'

- g. When the JOB_QUEUE_PROCESSES initialization parameter appears, change its value to 15.

The screenshot shows the 'Initialization Parameters' page in Oracle Database Control. The 'Current' tab is selected. A search bar at the top has 'job' entered. Below it is a checkbox for applying changes to the current instance. The main table lists the 'job_queue_processes' parameter, which is currently set to '1'. This value is highlighted with a red box. The 'Category' column for this row shows 'Job Queues' with a checkmark. Buttons at the bottom include 'Save to File', 'Execute On Multiple Databases', 'Show SQL', 'Revert', and 'Apply'.

- h. Click **Show SQL** and note the SQL statement that is going to be run.

The screenshot shows the 'Show SQL' page, which is a sub-page of 'Initialization Parameters'. It displays the SQL command: `ALTER SYSTEM SET job_queue_processes = 15 SCOPE=MEMORY`. There are buttons for 'Execute On Multiple Databases' and 'Return'.

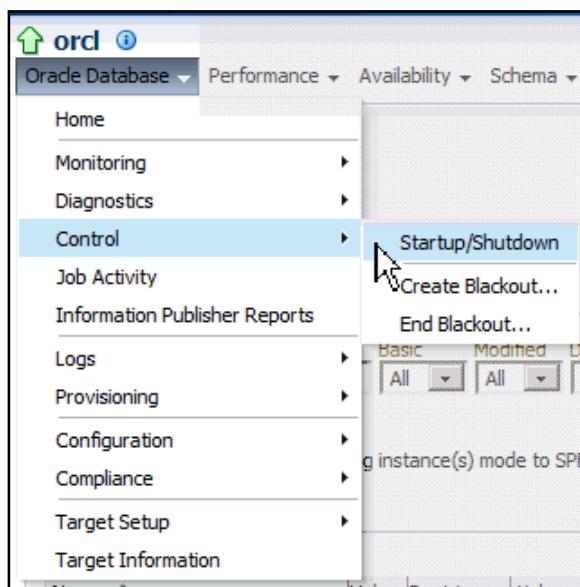
- i. Click **Return** and then click **Apply**.

Question: What is the significance of a check in the Dynamic column?

Answer: A “dynamic” parameter can be modified while the database is running.

3. Shut down the database instance by using Cloud Control.

- a. In the Cloud Control browser session, select **Oracle Database > Control > Startup/Shutdown**.



Step	Window/Page Description	Choices or Values
a.	Startup/Shutdown:Specify Host and Target Database Credentials (See screenshot 3a below.)	Host Credentials: Credential: Select New . Username: oracle Password: oracle Confirm password: oracle Check Set As Preferred Credentials . Select Database Host Credentials . Click Test .
b.	Startup/Shutdown:Specify Host and Target Database Credentials	Response: Test successful
c.	Startup/Shutdown:Specify Host and Target Database Credentials	Database Credentials: Credential: Select New . Username: SYS (<i>This must be uppercase.</i>) Password: oracle_4U Confirm password : oracle_4U Role: SYSDBA Check Set As Preferred Credentials . Select SYSDBA Database Credentials . Click Test .
d.	Startup/Shutdown:Specify Host and Target Database Credentials	Response: Test Successful Click OK .
e.	Startup/Shutdown:Confirmation	Click Advanced Options .
f.	Startup/Shutdown:Advanced Shutdown Options	Examine the options. Notice that the mode for shutting down is Immediate. Do not change the mode; it should remain as "Immediate." Click Cancel .
g.	Startup/Shutdown:Confirmation	Click Yes .
h.	Startup/Shutdown:Activity Information	Wait for next page to be displayed.
i.	The orcl home page is displayed. (See screenshot 3b below.)	Note that the status of the instance is now "Down."

3a.

Startup/Shutdown:Specify Host and Target Database Credentials
Specify the following credentials in order to change the status of the database.

Host Credentials
Specify the OS user name and password to login to target database machine.

Select Credential
Select credential from one of the following options.

Credential	<input type="radio"/> Preferred	<input type="radio"/> Named	<input checked="" type="radio"/> New
* Username	oracle		
* Password	*****		
* Confirm Password	*****		
<input checked="" type="checkbox"/> Save As NC_ORCL_2012-10-30-115416			
<input checked="" type="checkbox"/> Set As Preferred Credentials Database Host Credentials			
Test Test Successful.			

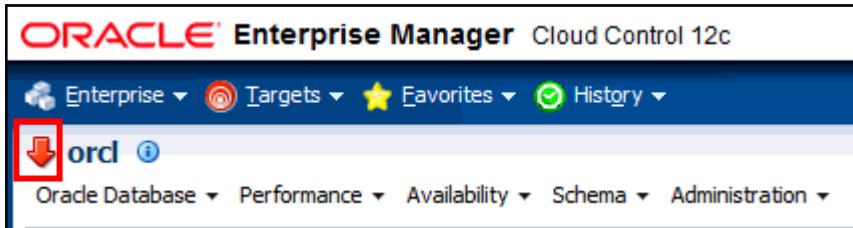
Database Credentials
Specify the credentials for the target database.
To use OS authentication, leave the user name and password fields blank.

Select Credential
Select credential from one of the following options.

Credential	<input type="radio"/> Preferred	<input type="radio"/> Named	<input checked="" type="radio"/> New
* Username	SYS		
* Password	*****		
* Confirm Password	*****		
Role	SYSDBA		
<input checked="" type="checkbox"/> Save As NC_ORCL_2012-10-30-115416			
<input checked="" type="checkbox"/> Set As Preferred Credentials SYSDBA Database Credentials			
Test			

Note that you need to login to the database as SYSDBA or SYSOPER in order to change the status of the database.

3b.



4. Using SQL*Plus, verify that you are *not* able to connect as the HR user to a database that has been shut down.
 - a. In the Linux command window, set your environment to the `orcl` database by using `oraenv`.

```
$ . oraenv
ORACLE_SID = [oracle] ? orcl
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_2 is
/u01/app/oracle
$
```

- b. Enter the following to attempt to log in to the database:
\$ **sqlplus hr**
- c. Enter **oracle_4U** for the password.

```
$ sqlplus hr

SQL*Plus: Release 12.1.0.1.0 Production on Wed Oct 16 10:58:50
2013

Copyright (c) 1982, 2013, Oracle. All rights reserved.

Enter password:
ERROR:
ORA-01034: ORACLE not available
ORA-27101: shared memory realm does not exist
Linux-x86_64 Error: 2: No such file or directory
Process ID: 0
Session ID: 0 Serial number: 0

Enter user-name:
```

Note the ORACLE not available error message.

- d. Press **Ctrl + D** to exit the username prompt.
5. Use Cloud Control to restart the database instance.
 - a. In Cloud Control, navigate to the Startup/Shutdown page by selecting **Oracle Database > Control > Startup/Shutdown**.
 - b. In the Host Credentials, select **Credentials: New**. Enter **oracle** for both Username and Password.
 - c. In Database Credentials, select **Credentials: Named**. Select **ORCL_SYS**. Click **OK**.
 - d. On the Confirmation Page, click **Advanced Options** to see the modes and options available for starting up, but do not change the startup options.
 - e. Click **Cancel** to return to the previous page. Click **Yes**.
 - f. The Startup/Shutdown:Activity Information is displayed. Wait for the next page. The **orcl** home page appears.

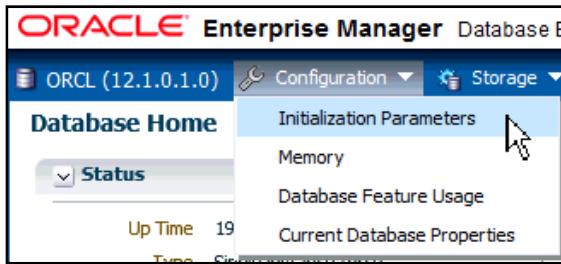
Practice 7-2: Managing the Oracle Instance by Using Oracle Enterprise Manager Database Express

Overview

In this practice, you use Oracle Enterprise Manager Database Express (EM Express) to view and change database instance parameters.

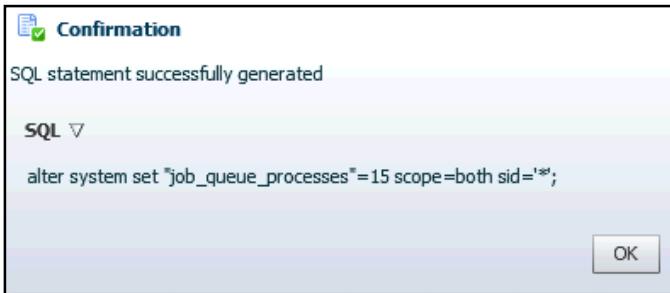
Tasks

1. Invoke EM Express, and log in as the DBA1 user.
 - a. Double-click the **Web Browser** icon on your desktop to open your web browser as the oracle user.
 - b. Enter the following URL: <https://localhost:5500/em>
 - c. On the Oracle Enterprise Manager Database Express login page, enter **DBA1** as the User Name, enter **oracle_4U** as the Password, and select **as sysdba**. Then click **Login**.
2. View the initialization parameters and set the **JOB_QUEUE_PROCESSES** parameter to **15**. What SQL statement is run to do this?
 - a. On the orcl database home page, select **Configuration > Initialization Parameters**.



- b. Enter **job** in the search field.
- c. When the **JOB_QUEUE_PROCESSES** initialization parameter appears, select it and click **Set**.
- d. In the dialog box, change the value to **15**.

- e. Click **Show SQL** and note the SQL statement that is going to be executed.



- f. Click **OK** on the Confirmation page, and then click **OK** on the Set Initialization Parameter page.

- g. Log out of EM Express.

Question: What is the significance of a check in the Dynamic column?

Answer: A “dynamic” parameter can be modified while the database is running.

Practice 7-3: Managing the Oracle Instance by Using SQL*Plus

Overview

In this practice, you use SQL*Plus to view and change instance parameters.

Tasks

1. Set the JOB_QUEUE_PROCESSES initialization parameter to 1000 by using SQL*Plus.
 - a. In the Linux command window, set your environment to the orcl database by using oraenv.

```
$ . oraenv
ORACLE_SID = [oracle] ? orcl
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_2 is
/u01/app/oracle
$
```

- b. Enter the following to log in to the database:

```
$ sqlplus / as sysdba
```

Question: When can you connect to the database instance without a password?

Answer: You can connect to the database without a password when you have a local connection (on the same machine) and the OS user is a member of the privileged OSDBA group. On this machine, the OSDBA group is the dba group.

- c. View the current setting of the JOB_QUEUE_PROCESSES parameter.

```
SQL> SHOW PARAMETER job

NAME                           TYPE        VALUE
-----
job_queue_processes            integer     15
```

- d. Change the JOB_QUEUE_PROCESSES initialization parameter to 1000 in both the current instance (MEMORY) and the server parameter file (SPFILE).

```
SQL> ALTER SYSTEM SET job_queue_processes=1000 SCOPE=BOTH;

System altered.
```

- e. View the changed parameter

```
SQL> SHOW PARAMETER job

NAME                           TYPE        VALUE
-----
job_queue_processes            integer     1000
```

2. Using SQL*Plus, shut down and restart the `orcl` database instance.
- In SQL*Plus, shut down the database instance.

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

- Start the database instance.

```
SQL> startup
ORACLE instance started.

Total System Global Area  876859392 bytes
Fixed Size                  2294360 bytes
Variable Size                578817448 bytes
Database Buffers            289406976 bytes
Redo Buffers                 6340608 bytes
Database mounted.
Database opened.
```

3. Use the `SHOW PARAMETER` command to verify the settings for `SGA_MAX_SIZE`, `DB_CACHE_SIZE`, and `SHARED_POOL_SIZE`.

```
SQL> show parameter sga_max_size

NAME                           TYPE        VALUE
-----
sga_max_size                   big integer 840M

SQL> show parameter db_cache_size

NAME                           TYPE        VALUE
-----
db_cache_size                  big integer 0

SQL> show parameter shared_pool_size

NAME                           TYPE        VALUE
-----
shared_pool_size               big integer 0

SQL>
```

4. Check the value of `JOB_QUEUE_PROCESSES`.

```
SQL> show parameter job_queue_processes
```

NAME	TYPE	VALUE
job_queue_processes	integer	1000

5. Exit from SQL*Plus.

Practice 7-4: Viewing the Alert Log by Using the Automatic Diagnostic Repository Command Interface (ADRCI)

Overview

In this practice, you use command-line tools to view the `orcl` instance alert log and find the startup phases.

Tasks

1. In the alert log, view the phases that the database went through during startup. What are they?

Use ADRCI to view the alert log. Select the option for the `diag/rdbms/orcl/orcl` directory.

Note: The list of home directories may vary from what is shown in the following.

```
$ adrci  
...  
ADR base = "/u01/app/oracle"  
adrci> show alert  
  
Choose the home from which to view the alert log:  
  
1: diag/rdbms/dbupgrd/dbupgrd  
2: diag/rdbms/cdb1/cdb1  
3: diag/rdbms/orcl/orcl  
4: diag/rdbms/em12rep/em12rep  
5: diag/tnslsnr/EDRSR12P0/listener  
Q: to quit  
  
Please select option: 3
```

Note: This opens the alert file using the vi editor by default

2. Scroll through the log and review the phases of the database during startup. Use the `vi` search commands to find the appropriate lines. Your alert log may differ from what is shown in this practice.
 - a. Enter `G` to move to bottom of the file.
 - b. Enter the string: `?Starting ORACLE instance? [CR]` to search from the bottom of the file to find the last time the instance was started. The following will be similar to your alert log. **Note:** Case is significant in the search command.

```
2013-10-16 11:13:09.748000 +00:00  
WARNING: failed to retrieve DB spfile location (unable to  
communicate with CRSD/OHASD)  
Starting ORACLE instance (normal)  
CLI notifier numLatches:3 maxDescs:519
```

```
LICENSE_MAX_SESSION = 0
LICENSE_SESSIONS_WARNING = 0
Initial number of CPU is 2
Number of processor cores in the system is 2
Number of processor sockets in the system is 1
CELL communication is configured to use 0 interface(s):
CELL IP affinity details:
    NUMA status: non-NUMA system
    cellaffinity.ora status: N/A
CELL communication will use 1 IP group(s):
```

- c. Scroll down and find the line that starts with ALTER DATABASE MOUNT.
- d. Scroll down and find the line that starts with ALTER DATABASE OPEN.
- e. Notice that the modes that the database goes through during startup are MOUNT and OPEN.
- f. Exit vi by entering :q. Exit ADRCI by entering Q, and then exit.

```
Choose the home from which to view the alert log:
```

```
1: diag/rdbms/dbupgrd/dbupgrd
2: diag/rdbms/cdb1/cdb1
3: diag/rdbms/orcl/orcl
4: diag/rdbms/em12rep/em12rep
5: diag/tnslsnr/EDRSR12P0/listener
Q: to quit
```

```
Please select option: 2
```

```
Output the results to file: /tmp/alert_22404_1403_orcl_1.ado
```

```
Please select option: Q
```

```
adrci> exit
```

```
$
```


Practices for Lesson 8: Configuring the Oracle Network Environment

Chapter 8

Practices for Lesson 8: Overview

Practices Overview

In these practices, you configure connectivity between your machine and a database on one of your classmate's machines. You also configure and test an additional listener.

Practice 8-1: Configuring the Oracle Network to Access a Database

Configure your network environment so that you can connect to a partner's `orcl` database. Use local naming and create a new network service name called `testorcl` that maps to your partner's `orcl` database. Test your network changes by attempting to connect to your partner's database by using the `testorcl` service name.

1. Make a copy of the `tnsnames.ora` file. It is in the `em12rep` database `$ORACLE_HOME/network/admin` directory.

- a. In a terminal window, use `oraenv` to set your environment to your database home.

```
$ . oraenv
ORACLE_SID = [orcl] ? em12rep
The Oracle base remains unchanged with value /u01/app/oracle
```

- b. Change the directory to `$ORACLE_HOME/network/admin` and then list your current working directory.

```
$ cd $ORACLE_HOME/network/admin
$ pwd
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin
```

- c. Copy the `tnsnames.ora` file to `tnsnames.old`.

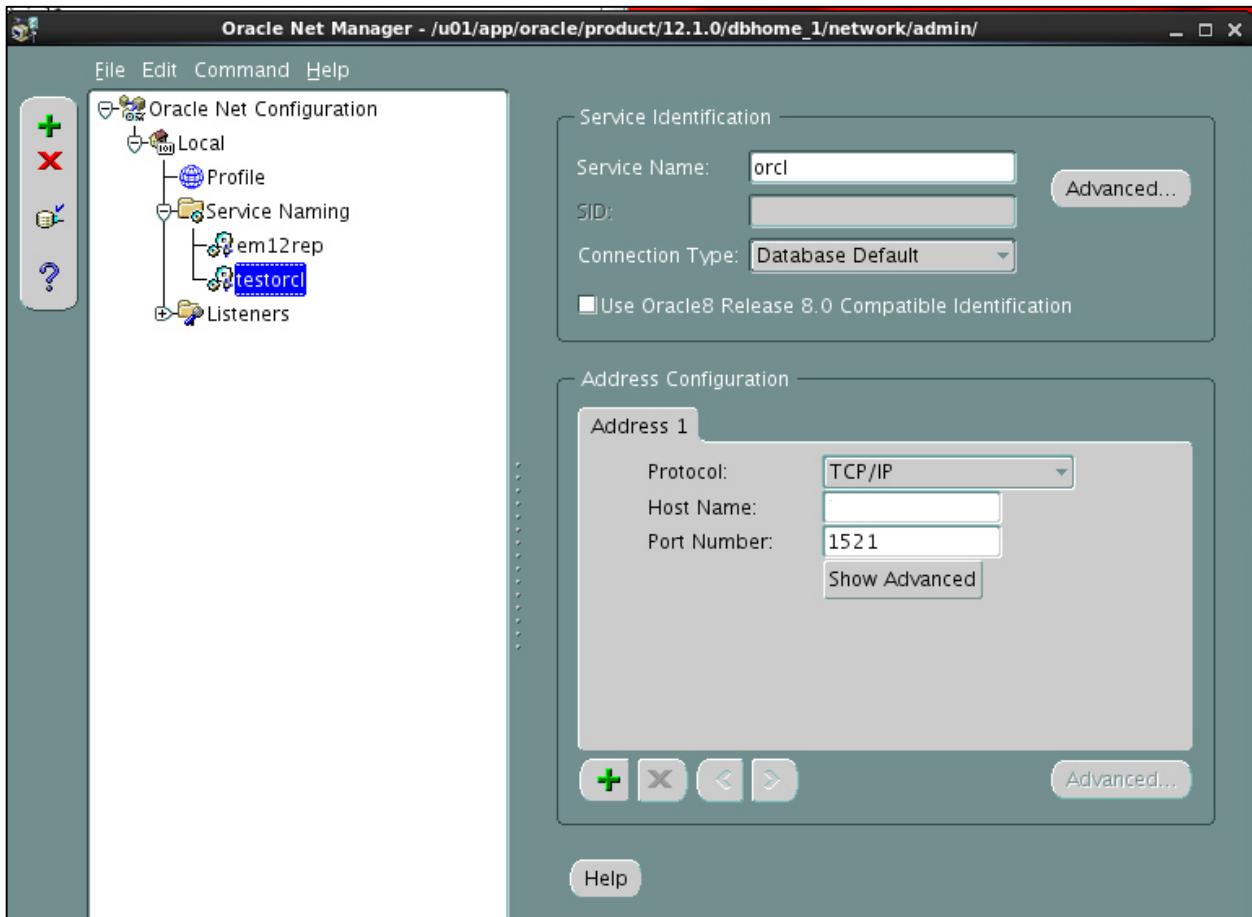
```
$ cp tnsnames.ora tnsnames.old
```

- d. Enter `ls -l` if you want to see the copy and its privileges in your directory.

2. Use Oracle Net Manager (`netmgr`) to create the `testorcl` net service name on your machine.

Step	Window/Page Description	Choices or Values
a.	Terminal as <code>oracle</code> user	<code>\$ netmgr</code>
b.	Net Manager navigation pane	Expand Local .
c.		Select Service Naming .
d.		Expand Service Naming .
e.		Click the green plus sign  to launch the net service name wizard.
f.	Net Service Naming Wizard: Welcome	Service Name: <code>testorcl</code> Click Next .
g.	Net Service Naming Wizard:...Protocol	Select TCP/IP (Internet Protocol) . Click Next .
h.	Net Service Naming Wizard:...Protocol Settings	Host Name: <assigned hostname or IP address> Port Number: <code>1521</code> Click Next .
i.	Net Service Naming Wizard:...Service	Service: <code>orcl</code> Click Next .

Step	Window/Page Description	Choices or Values
j.	Net Service Naming Wizard:...Test	Click Test .
k.	Connection Test	Connection Test was successful. Click Close .
l.	Net Service Naming Wizard:...Test	Click Finish .
m.	Oracle Net Manager	Click File > Save Network Configuration . Click File > Exit .



3. Test your changes to the network configuration by using SQL*Plus. Enter **system@testorcl** and then enter **oracle_4U** when prompted for the password. Select the **INSTANCE_NAME** and **HOST_NAME** columns from the **V\$INSTANCE** view to view information about the host.

- a. In your terminal window, enter:

```
$ sqlplus system@testorcl
```

Enter password: **oracle_4U Note password is not displayed**

SQL>

If you receive any errors or warnings, resolve them.

- b. At the SQL> prompt, enter the following command and then exit SQL*Plus:

```
SQL> select instance_name, host_name from v$instance;
```

INSTANCE_NAME	HOST_NAME
orcl	<assigned_hostname>

```
SQL> exit
```

Practice 8-2: Creating a Second Listener

In this practice, you create a second listener named LISTENER2 by using Oracle Net Manager.

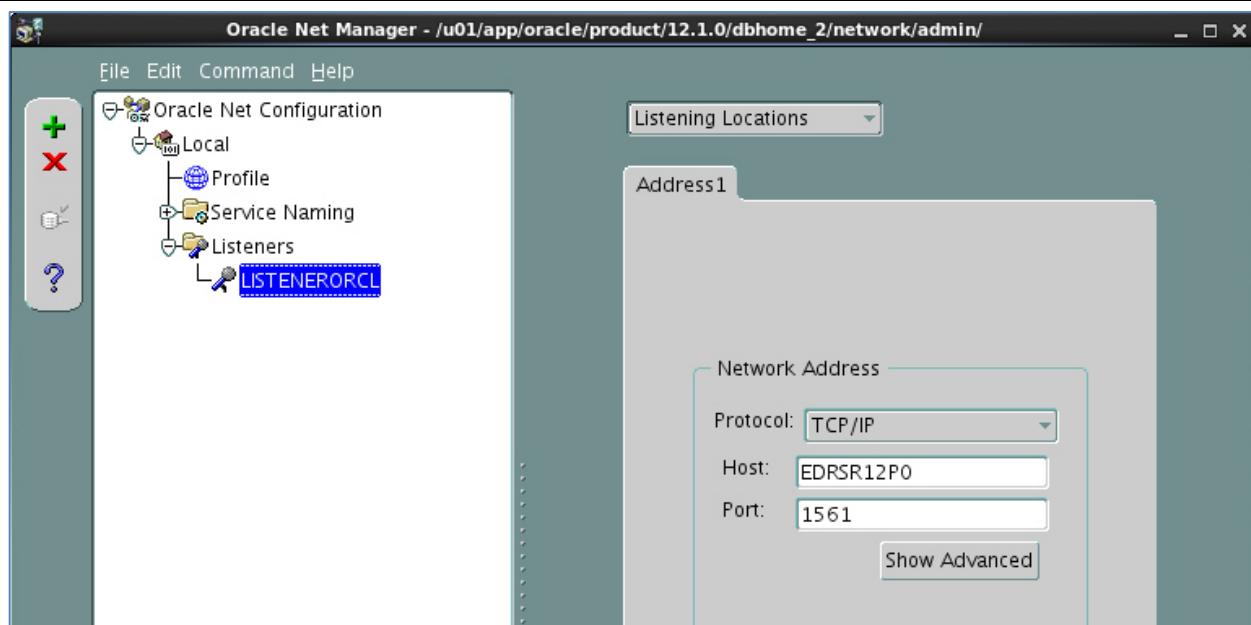
- Create a new listener called LISTENER2. Use port 1561 for this listener. Use Oracle Net Manager (netmgr) to create the new listener.

- Use oraenv to set your environment for the orcl database.

```
ORACLE_SID = [em12rep] ? orcl
The Oracle base remains unchanged with value /u01/app/oracle
$
```

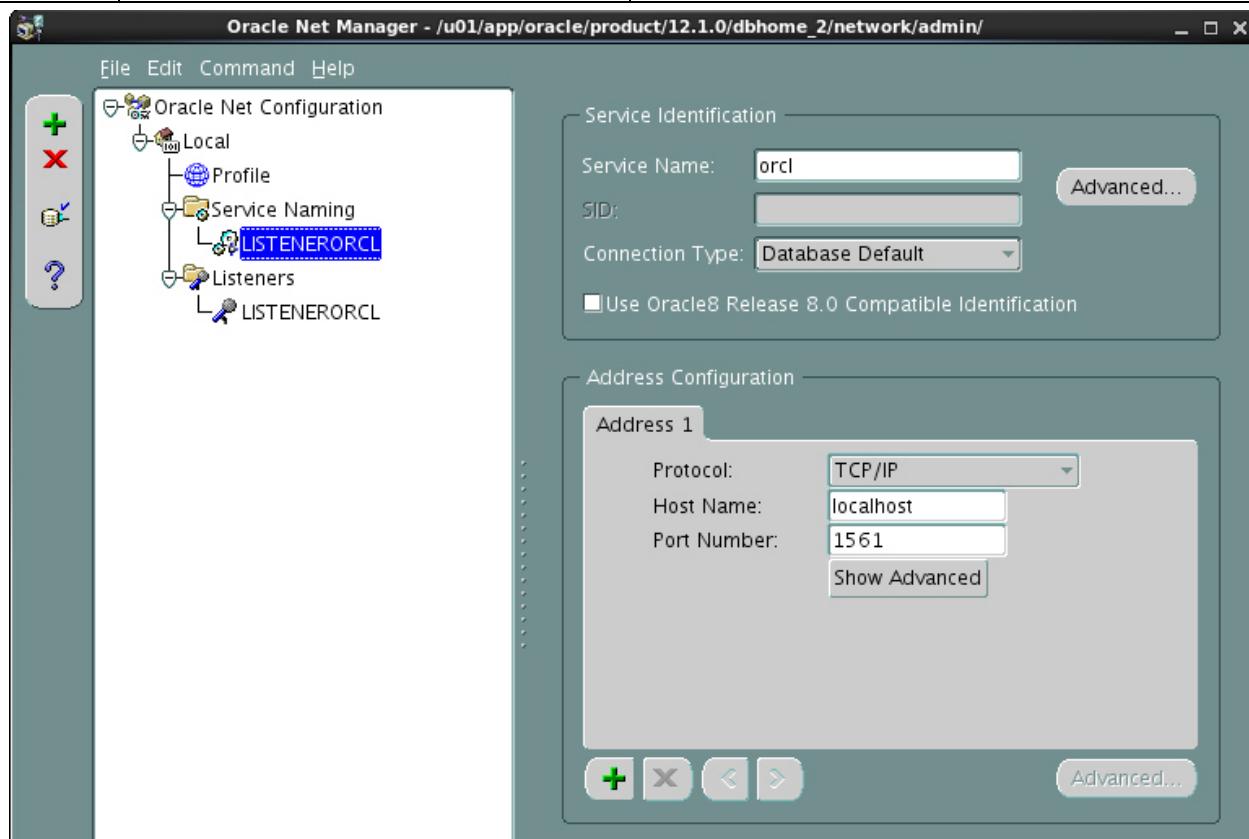
- Perform the following steps in Oracle Net Manager.

Step	Window/Page Description	Choices or Values
a.	Terminal as oracle user	\$ netmgr
b.	Oracle Net Manager navigation pane	Expand Local. Select Listeners . Expand Listeners . Click the green plus sign  to begin defining a new listener.
c.	Choose Listener Name	Enter: LISTENERORCL Click OK .
d.	Oracle Net Manager: (right pane)	Click Add Address .
e.	Oracle Net Manager: Address1	Port Number: 1561
f.	Oracle Net Manager	Click File > Save Network Configuration .



2. Create a Service Name for the listener by using Oracle Net Manager.

Step	Window/Page Description	Choices or Values
a.	Oracle Net Manager	Enter <code>netmgr</code> if necessary.
b.	Oracle Net Manager navigation pane	Select Service Naming . Expand Service Naming . Click the green plus sign  to launch the Net Service Name Wizard.
c.	Net Service Naming Wizard: Welcome	Service Name: <code>LISTENERORCL</code> Click Next .
d.	Net Service Naming Wizard:...Protocol	Select TCP/IP (Internet Protocol) . Click Next .
e.	Net Service Naming Wizard:...Protocol Settings	Host Name: <code>localhost</code> Port Number: <code>1561</code> Click Next .
f.	Net Service Naming Wizard: Service	Service Name: <code>orcl</code>
g.	Net Service Naming Wizard:...Test	Click Finish .
h.	Oracle Net Manager	Click File > Save Network Configuration Click File > Exit .



3. Start the LISTENERORCL listener.

Use the listener control utility to start the listener.

```
$ lsnrctl start listenerorcl
LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 16-OCT-2013
13:45:16

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

Starting /u01/app/oracle/product/12.1.0/dbhome_2/bin/tnslsnr:
please wait...

TNSLSNR for Linux: Version 12.1.0.1.0 - Production
System parameter file is
/u01/app/oracle/product/12.1.0/dbhome_2/network/admin/listener.ora
Log messages written to
/u01/app/oracle/diag/tnslsnr/EDP0/listenerorcl/alert/log.xml
Listening on:
(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=edp0.us.oracle.com)(PORT=
1561)))

Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=EDP0)(PORT=1561)))
STATUS of the LISTENER
-----
Alias                  listenerorcl
Version                TNSLSNR for Linux: Version 12.1.0.1.0 -
Production
Start Date             16-OCT-2013 13:45:20
Uptime                 0 days 0 hr. 0 min. 4 sec
Trace Level            off
Security               ON: Local OS Authentication
SNMP                  OFF
Listener Parameter File
/u01/app/oracle/product/12.1.0/dbhome_2/network/admin/listener.ora
Listener Log File
/u01/app/oracle/diag/tnslsnr/EDP0/listenerorcl/alert/log.xml
Listening Endpoints Summary...

(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=edp0.us.oracle.com)(PORT=
1561)))
The listener supports no services
The command completed successfully
[oracle@EDRSR12P0 ~]$
```

4. Configure the database to register with the LISTENERORCL listener by setting the LOCAL_LISTENER initialization parameter.

Note: The `orcl` database is automatically registered with the `LISTENER` listener because it is on the default port of 1521.

- Set the Oracle environment to `orcl` by using `oraenv`.

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

- Log in to SQL*Plus as the `SYS` user as `SYSDBA`.

```
$ sqlplus / as sysdba
...
SQL>
```

- In SQL*Plus, view and set the `LOCAL_LISTENER` initialization parameter.

```
SQL> show parameter local_listener

NAME                           TYPE        VALUE
-----
local_listener                 string

SQL> ALTER SYSTEM SET LOCAL_LISTENER=LISTENERORCL SCOPE=BOTH;

System altered.

SQL> show parameter local_listener

NAME                           TYPE        VALUE
-----
local_listener                 string      LISTENERORCL
SQL>

SQL> exit
```

- Check the status of the new listener and test the new listener.

- In a terminal window with the Oracle environment properly set, issue the following commands at the command prompt:

```
$ lsnrctl status LISTENERORCL
...
Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=EDP0)(PORT=1561)))
STATUS of the LISTENER
-----
Alias                      listenerorcl
```

```

Version                                TNSLSNR for Linux: Version 12.1.0.1.0
- Production

Start Date                            16-OCT-2013 13:45:20
Uptime                                 0 days 0 hr. 4 min. 5 sec
Trace Level                            off
Security                               ON: Local OS Authentication
SNMP                                    OFF

Listener Parameter File
/u01/app/oracle/product/12.1.0/dbhome_2/network/admin/listener.ora

Listener Log File
/u01/app/oracle/diag/tnslsnr/EDP0/listenerorcl/alert/log.xml

Listening Endpoints Summary...

(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=edp0.us.oracle.com)(PORT=1561)))
Services Summary...
Service "orcl" has 1 instance(s).
  Instance "orcl", status READY, has 1 handler(s) for this service...
Service "orclXDB" has 1 instance(s).
  Instance "orcl", status READY, has 1 handler(s) for this service...
The command completed successfully
[oracle@EDRSR12P0 ~]$

```

- b. Connect to your database by using the new listener by using an easy connect string.
- Note:** This method of connecting is not a recommended approach for a production environment. It is being used in the classroom environment just to prove that the newly created listener works.

```

$ sqlplus hr/oracle_4U@localhost:1561/orcl
...
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

SQL> exit

```

The connection is through your newly created listener. Exit SQL*Plus after you complete this step.

6. Shut down and restart the `orcl` database instance. Verify that Enterprise Manager Database Express is registered with the `LISTENERORCL` listener.
 - a. Shut down the database instance and restart it.

```
$ sqlplus / as sysdba

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

SQL> startup
ORACLE instance started.

Total System Global Area  876859392 bytes
Fixed Size                  2294360 bytes
Variable Size                578817448 bytes
Database Buffers            289406976 bytes
Redo Buffers                 6340608 bytes
Database mounted.
Database opened.
SQL> exit
```

- b. Use `LSNRCTL` to verify that EM Database Express is registered with the `LISTENERORCL` listener.

```
[oracle@EDRSR12P0 ~]$ lsnrctl status listenerorcl

LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 17-OCT-
2013 07:07:07

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

Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=EDP0)(PORT=1561)))
STATUS of the LISTENER
-----
Alias                      listenerorcl
Version                    TNSLSNR for Linux: Version 12.1.0.1.0
- Production
Start Date                 16-OCT-2013 13:45:20
Uptime                     0 days 17 hr. 21 min. 50 sec
Trace Level                off
Security                   ON: Local OS Authentication
SNMP                       OFF
```

```
Listener Parameter File  
/u01/app/oracle/product/12.1.0/dbhome_2/network/admin/listener.ora  
Listener Log File  
/u01/app/oracle/diag/tnslsnr/EDP0/listenerorcl/alert/log.xml  
Listening Endpoints Summary...  
  
(DESCRIPTION= (ADDRESS= (PROTOCOL=tcp) (HOST=edp0.us.oracle.com) (PORT=1561)) )  
  
(DESCRIPTION= (ADDRESS= (PROTOCOL=tcps) (HOST=edp0.us.oracle.com) (PORT=5500)) (Security=(my_wallet_directory=/u01/app/oracle/admin/orcl/xdb_wallet)) (Presentation=HTTP) (Session=RAW) )  
Services Summary...  
Service "orcl" has 1 instance(s).  
    Instance "orcl", status READY, has 1 handler(s) for this service...  
Service "orclXDB" has 1 instance(s).  
    Instance "orcl", status READY, has 1 handler(s) for this service...  
The command completed successfully  
$
```

7. Update the database instance properties in Enterprise Manager Cloud Control to reference the LISTENERORCL listener.
 - a. Log in to Enterprise Manager Cloud Control as the **ADMIN** user.
 - b. Select **Targets > Databases**.
 - c. Select **Search List**.
 - d. Select **orcl** and click **Configure**.
Note: You may see an error message indicating that the Listener refused the connection because the port is still set to 1521. This will be resolved once you complete this step.
 - e. Enter **1561** in the Port field and click **Next**.

Configure Database Instance: Properties

Name orcl
Type Database Instance
Database System orcl_sys
Group(s) None

Test Connection

Name	Value
Oracle Home Path	/u01/app/oracle/product/12.1.0/dbhome
Monitor Username	dbsnmp
Monitor Password
Role	Normal ▾
Listener Machine Name	edRSr12p0.us.oracle.com
Port	1561
Database SID	orcl

Preferred Connect String
Enter the connection string that OMS should use when connecting to the target database. If blank, the OMS would automatically construct one using the host, port, SID provided above.

Cancel Step 1 of 5 **Next**

f. Click **Submit**.

g. Click **OK**.

Practices for Lesson 9: Administering User Security

Chapter 9

Practices for Lesson 9: Overview

Practices Overview

Background: You need to create a user account for Jenny Goodman, the new human resources department manager. There are also two new clerks in the human resources department, David Hamby and Rachel Pandya. All three must be able to log in to the `orcl` database and to select data from, and update records in, all the `HR` schema tables. The manager also needs to be able to insert and delete new `HR` records. Ensure that if the new users forget to log out at the end of the day, they are automatically logged out after 15 minutes. You also need to create a new user account for the inventory application that you are installing.

Practice 9-1: Creating a User and a Profile

In this practice, you create the `INVENTORY` user to own the new Inventory application. You create a profile to limit the idle time of users. If a user is idle or forgets to log out after 15 minutes, the user session is ended.

1. Create the `INVENTORY` user with a password of `oracle_4U`.

In a terminal window, enter:

```
$ sqlplus DBA1/oracle_4U as sysdba
...
Connected to:
...
SQL> create user inventory identified by oracle_4U
  2  default tablespace users
  3  quota unlimited on users;

User created.

SQL> grant connect to inventory;

Grant succeeded.

SQL> exit

Disconnected ...
$
```

2. Create a profile named **HRPROFILE** that allows only 15 minutes idle time.

Invoke Enterprise Manager Database Express. Log in as the **DBA1** user with the **sysdba** role. Then execute the following steps:

Step	Window/Page Description	Choices or Values
a.	EM Express	Select Security > Profiles .
b.	Profiles	Select Create Profile .
c.	Create Profile Dialog: New Profile	Enter HRPROFILE in the Name field. Click the Next icon  .
d.	Create Profile Dialog: General	Select 15 from the Idle Time (Minutes) field menu. Leave all the other fields set to the default value of Unlimited. Click the Next icon  .
e.	Create Profile Dialog: Password	Review the Password options. All should be set to default values of Unlimited or Null. Click Show SQL to review the SQL command for this task.
f.	Confirmation	Click OK .
g.	Create Profile Dialog: Password	Click OK .
h.	Confirmation	Click OK .

3. Set the **RESOURCE_LIMIT** initialization parameter to **TRUE** so that your profile limits are enforced.

Step	Window/Page Description	Choices or Values
a.		Select Configuration > Initialization Parameters .
b.	Initialization Parameters	Enter resource_limit in the Name field.
c.	Initialization Parameters	Select resource_limit . Click Set .
d.	Set Initialization Parameter	Set Value to true . Click OK .
e.	Confirmation	Click OK .

Practice 9-2: Creating Roles

In this practice, you create the **HRCLERK** and **HRMANAGER** roles that will be used in the next practice.

1. Create the role named **HRCLERK** with **SELECT** and **UPDATE** permissions on all the **HR** schema tables.

Step	Window/Page Description	Choices or Values
a.	EM Express	Select Security > Roles .
b.	Roles	Click Create Role .
c.	Create Role: New Role	Enter HRCLERK as Role Name. Click the Next icon.
d.	Create Role: Privilege	Click Show SQL .
e.	Confirmation	Verify the SQL command: <code>create role "HRCLERK" NOT IDENTIFIED</code> Click OK .
f.	Create Role: Privilege	Click OK .
g.	Confirmation	Click OK .
h.	Roles	Select HRCLERK . Select Actions > Grant Object Privileges
i.	Grant Object Privileges Select Schema and Object Type	Set Schema to HR . Set Object Type to Table . Click the Next icon.
j.	Grant Object Privileges: Select Objects	Select all tables on the left (click and shift-click) and move them to Selected Objects. Click the Next icon.
k.	Grant Object Privileges: Grant Object Privileges	Check Select . Check Update . Click Show SQL .
l.	Confirmation	Verify the SQL for each table: (EMPLOYEES table shown as an example) <code>GRANT SELECT ON "HR"."EMPLOYEES" TO "HRCLERK"</code> <code>GRANT UPDATE ON "HR"."EMPLOYEES" TO "HRCLERK"</code> Click OK .
m.	Grant Object Privileges: Grant Object Privileges	Click OK .
n.	Confirmation	Click OK .

2. Create the role named **HRMANAGER** with **INSERT** and **DELETE** permissions on all the **HR** tables. Grant the **HRCLERK** role to the **HRMANAGER** role.

Step	Window/Page Description	Choices or Values
a.	EM Express	Select Security > Roles .
b.	Roles	Click Create Role .
c.	Create Role: New Role	Enter HRMANAGER as Role Name. Click the Next icon.
d.	Create Role: Privilege	Enter HR in the search box. Select HRCLERK and move it to the right pane. Click OK .
e.	Confirmation	Click OK .
f.	Roles	Select HRMANAGER . Click Actions > Grant Object Privileges
g.	Grant Object Privileges Select Schema and Object Type	Set Schema to HR . Set Object Type to Table . Click the Next icon.
h.	Grant Object Privileges: Select Objects	Select all tables and move them to Selected Objects. Click the Next icon.
i.	Grant Object Privileges: Grant Object Privileges	Check Delete . Check Insert . Click Show SQL .
j.	Confirmation	Verify the SQL: (EMPLOYEES is shown as an example) grant INSERT on "HR"."EMPLOYEES" to "HRMANAGER" grant DELETE on "HR"."EMPLOYEES" to "HRMANAGER" Click OK .
k.	Grant Object Privileges: Grant Object Privileges	Click OK .
l.	Confirmation	Click OK .

Practice 9-3: Creating and Configuring Users

In this practice, you create the following users and assign appropriate profiles and roles to these users:

Name	Username	Description
David Hamby	DHAMBY	A new HR Clerk
Rachel Pandya	RPANDYA	A new HR Clerk
Jenny Goodman	JGOODMAN	A new HR Manager

- Create an account for David Hamby, a new HR clerk.

Step	Window/Page Description	Choices or Values
a.	EM Express	Select Security > Users .
b.	Users	Click Create User .
c.	Create User: User Account	Name: DHAMBY Authentication: Select Password . Password: newuser Profile: HRPROFILE Select Password expired . Click the Next icon. Note: This user will have to change the password.
d.	Create User: Tablespaces	Verify: Default Tablespace: USERS Temporary Tablespace: TEMP Click the Next icon.
e.	Create User: Privilege	Select Connect and move it to the right pane. Click Show SQL .
f.	Confirmation	Click OK .
g.	Create User: Privilege	Select HRCLERK and move it to the right pane. Hint: Enter HR in the search/filter box. Click Show SQL .
h.	Confirmation	Copy and paste the SQL statements into a gedit window.
i.	Linux Desktop (see screenshot below)	Click Applications > Accessories > gedit Text Editor . In gedit, click File > Save as . Enter P9script.sql as the file name. Click Save . Click File > Quit
j.	Confirmation	Click OK .

Step	Window/Page Description	Choices or Values
k.	Create User: Privilege	Click OK .
l.	Confirmation	Click OK .



2. Create an account for Rachel Pandya, another new HR clerk. Modify the `P9script.sql` script to create the `RPANDYA` user.
 - a. Open the `/home/oracle/P9script.sql` file in an editor. (These instructions assume that you are using gedit.)
 - b. Substitute `RPANDYA` for `DHAMBY` in every occurrence of `DHAMBY`.
 - c. Specify the password as `newuser`.
 - d. Check the script for SQL end-of-command delimiters “ ; ” (semicolon). Add semicolons as necessary for correct syntax.
 - e. Add an `exit` command to the end of the file.
 - f. Save and close the file.
 - g. In a terminal window, execute the `P9script.sql` script in SQL*Plus as the `DBA1` user with the `SYSDBA` role connected to the `orcl` database.

```
$ sqlplus dba1/oracle_4U as sysdba @/home/oracle/P9script.sql
...
Connected to:
...
User created.

Grant succeeded.

Grant succeeded.
```

```
Disconnected  
...  
$
```

- h. Use EM Express to check that user RPANDYA has been created as expected.

Hint: You may have to refresh EM Express to see the RPANDYA user.

Account Summary

Name	RPANDYA
Profile	HRPROFILE
Authentication	PASSWORD
Expiration Date	Thu Oct 17, 2013 7:55:44 AM
Default Tablespace	USERS
Temporary Tablespace	TEMP
Account Status	EXPIRED
Created	Thu Oct 17, 2013 7:55:44 AM

Details

Privileges & Roles Object Privileges Quotas

Privileges & Roles

Privilege	With Admin	Is Role
CONNECT		<input checked="" type="checkbox"/>
HRCLERK		<input checked="" type="checkbox"/>

3. Create an account for Jenny Goodman, the new HR manager. Modify the P9script.sql script to take parameters for the username and role. Execute the script to create the JGOODMAN user with the HRMANAGER role.
- In gedit or an editor of your choice, open the script /home/oracle/P9script.sql.
 - Change every occurrence of RPANDYA to &&username.
 - Change every occurrence of HRCLERK to &&role.
 - Save and close the file.

- e. Execute the SQL script in SQL*Plus as the DBA1 user with the SYSDBA role connected to the orcl database instance.

```
$ sqlplus dba1/oracle_4U as sysdba @/home/oracle/P9script.sql
...
Connected to:
...
Enter value for username: JGOODMAN
old  1: create user "&&username" identified by newuser profile
"HRPROFILE" password expire account unlock default tablespace
"USERS" temporary tablespace "TEMP"
new  1: create user "JGOODMAN" identified by newuser profile
"HRPROFILE" password expire account unlock default tablespace
"USERS" temporary tablespace "TEMP"

User created.

old  1: grant "CONNECT" to "&&username"
new  1: grant "CONNECT" to "JGOODMAN"

Grant succeeded.

Enter value for role: HRMANAGER
old  1: grant "&&role" to "&&username"
new  1: grant "HRMANAGER" to "JGOODMAN"

Grant succeeded.

Disconnected ...

$
```

Note: The double ampersand && indicates to SQL*Plus to keep the value of this variable and use the same value each time it sees this variable. If you had used a single ampersand &, SQL*Plus would have prompted you to enter the value each time the substitution variable occurred in the script.

4. Test the new users in SQL*Plus. Connect to the orcl database as the DHAMBY user. Use oracle_4U as the new password. Select the row with EMPLOYEE_ID=197 from the HR.EMPLOYEES table. Then attempt to delete it. You should get the “insufficient privileges” error.

- a. In a terminal window, enter:

```
$ . oraenv
ORACLE_SID = [oracle] ? orcl
...
$ sqlplus dhamby
```

Or, if you already have a SQL*Plus session started, use the CONNECT command. If you reconnect as dhamby in SQL*Plus, the login and change-of-password session look like this:

```
SQL> CONNECT dhamby
```

In either case, the next line will be a prompt for the password

```
Enter password: newuser    <<<Password does not appear on screen  
ERROR:  
ORA-28001: the password has expired
```

- b. Change the password to oracle_4U.

```
Changing password for dhamby  
New password: oracle_4U    <<<Password does not appear  
Retype new password: oracle_4U    <<<Password does not appear  
Password changed  
...  
Connected to:  
...  
SQL>
```

- c. Select the salary for employee 197 from the HR.EMPLOYEES table.

```
SQL> SELECT salary FROM hr.employees WHERE EMPLOYEE_ID=197;  
  
        SALARY  
-----  
         3000
```

- d. Now attempt to delete the same row from the HR.EMPLOYEES table.

```
SQL> DELETE FROM hr.employees WHERE EMPLOYEE_ID=197;  
DELETE FROM hr.employees WHERE EMPLOYEE_ID=197  
*  
ERROR at line 1:  
ORA-01031: insufficient privileges
```

5. Repeat the test as the JGOODMAN user. Use oracle_4U as the new password. After deleting the row, issue a rollback, so that you still have the original 107 rows.

- a. Connect to the orcl database as the JGOODMAN user.

```
SQL> connect jgoodman  
Enter password:  
ERROR:  
ORA-28001: the password has expired  
Changing password for jgoodman  
New password: *****
```

```
Retype new password: *****
Password changed
Connected.
SQL>
```

- b. Select the row for employee 197 from the HR.EMPLOYEES table.

```
SQL> SELECT salary FROM hr.employees WHERE EMPLOYEE_ID=197;

SALARY
-----
3000
```

- c. Now delete the same row from the HR.EMPLOYEES table.

```
SQL> DELETE FROM hr.employees WHERE EMPLOYEE_ID=197;

1 row deleted.
```

- d. Roll back the delete operation (because this was just a test).

```
SQL> rollback;

Rollback complete.
```

- e. Confirm that you still have 107 rows in this table.

```
SQL> SELECT COUNT(*) FROM hr.employees;

COUNT(*)
-----
107

SQL>
```

Question: You did not grant the CREATE SESSION system privilege to any of the new users, but they can all connect to the database. Why?

Answer: Because Enterprise Manager automatically assigns the CONNECT role to the new users, and CREATE SESSION is contained within that role.

6. Use SQL*Plus to connect to the `orcl` database as the `RPANDYA` user. Change the password to `oracle_4U`. (You must change the password, because this is the first connection as RPANDYA.) Leave RPANDYA connected during the next lesson or at the end of the day. `HRPROFILE` specifies that users whose sessions are inactive for more than 15 minutes will automatically be logged out. Verify that the user was automatically logged out by trying to select from the `HR.EMPLOYEES` table again.

```
SQL> SELECT salary FROM hr.employees WHERE EMPLOYEE_ID=197;  
ERROR at line 1:  
ORA-02396: exceeded maximum idle time, please connect again
```


Practices for Lesson 10: Managing Database Storage Structures

Chapter 10

Practices for Lesson 10: Overview

Practices Overview

In these practices, you will view existing storage structure information and create a new tablespace for the INVENTORY application. You will also create a database user to perform all administrative tasks without using the SYS and SYSTEM accounts.

Practice 10-1: Viewing Database Storage Structure Information

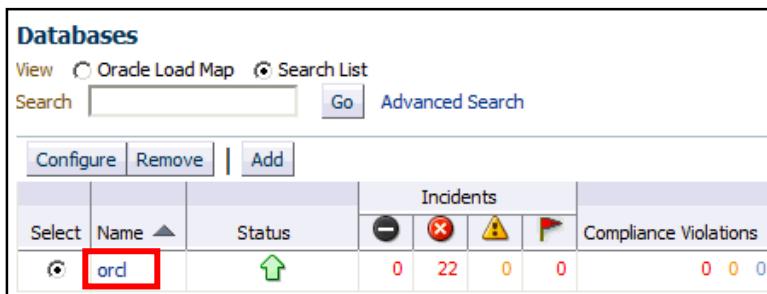
In this practice, you examine existing storage structure information for your database.

Assumptions: The `lab_06_03_01.sh` script has already been executed to create a user named DBA1 in the database. This user has SYSDBA privileges.

1. Launch Enterprise Manager Cloud Control and log in as ADMIN.
2. Navigate to the `orcl` Database Home page (Targets > Database).
 - a. Navigate to your target database: Targets > Databases
 - b. Click the **Search List** radio button at the top of the page.



- c. On the Databases page, click `orcl`.



3. The `orcl` Database Home page appears.
4. Using Cloud Control, view information about the **EXAMPLE** tablespace. Answer the following questions about it:

Question 1: What percentage of free space can be used up before the Warning threshold is reached?

Step	Window/Page Description	Choices or Values
a.	Database home page	Select Administration > Storage > Tablespaces.
b.	Database Login page (See the screenshot below.)	Username: DBA1 Password: <code>oracle_4U</code> Role: SYSDBA Check Save As . Check Set as Preferred Credentials . Select SYSDBA Database Credentials . Click Login .

Database Login

* Username: dba1

* Password: *****

Role: SYSDBA ▾

Save As: DBA1_CRED

Set As Preferred Credentials: SYSDBA Database Credentials ▾

Login **Cancel**

Step	Window/Page Description	Choices or Values
c.	Tablespaces	Click the EXAMPLE tablespace name. At the bottom of the page, view the Tablespace Full Metric Thresholds.

Answer: 85%

Tablespace Full Metric Thresholds

Space Used (%)
This tablespace is using the database default space used thresholds.
Warning (%) 85
Critical (%) 97

Question 2: How many segments are there in the EXAMPLE tablespace?

Step	Window/Page Description	Choices or Values
a.	View Tablespace: EXAMPLE	From the Actions drop-down list, select Show Tablespace Contents . Click Go .
b.	Show Tablespace Contents	View the number of rows displayed; this is the number of objects in the tablespace.

Answer: 351 (Your answer may vary.)

Tablespaces > View Tablespace: EXAMPLE > Show Tablespace Contents Logged in As SYS

Show Tablespace Contents

Size (MB)	356.3	Used (MB)	323.1	Extent Mgmt	LOCAL	Auto Extend	Yes
Block Size (KB)	8	Used (%)	90.7	Segment Mgmt	AUTO	Extents	557

Segments

Search

Segment Name	Type	Minimum Size (KB)	Minimum Extents
	All Types		

By default, the search returns all uppercase matches beginning with the string you entered. To run an exact or case-sensitive match, double quote the search string. You can use the wildcard symbol (%) in a double quoted string.

Previous | 1-10 of 351 | Next 10

Segment Name	Type	Size (KB)	Extents
SH.CUSTOMERS	TABLE	13,312	28

Question 3: Which index in the EXAMPLE tablespace takes up the most space?

Step	Window/Page Description	Choices or Values
a.	Show Tablespace Contents	Under Segments, select INDEX in the Type drop-down list. Click Go .
b.	Show Tablespace Contents	Notice the Size column is the sort column and that it is sorted in descending order.

Previous | 1-10 of 90 | Next 10

Segment Name	Type	Size (KB)	Extents
SH.CUSTOMERS_PK	INDEX	1,024	16
OE.PROD_NAME_IX	INDEX	512	8
OE.PRD_DESC_PK	INDEX	320	5
SH.CUSTOMERS_YOB_BIX	INDEX	192	3

Answer: SH.CUSTOMERS_PK

Practice 10-2: Creating a Tablespace

In this practice, you create a script to create the `INVENTORY` tablespace that will be used in a later practice.

- Create a new locally managed tablespace (LMT) called `INVENTORY` of size **5 MB**.

Step	Window/Page Description	Choices or Values
a.	Show Tablespace Contents	Navigate to the Tablespaces page by clicking Tablespaces in the locator link at the top of the page.
b.	Tablespaces	On right side of the page, click Create .
c.	Create Tablespace	Tablespace Name: INVENTORY Extent Management is Locally Managed . Type is Permanent . Status is Read Write . In the Datafiles region: Verify that “Use bigfile tablespace” is <i>not</i> selected. Click Add .

Tablespaces > Create Tablespace
Create Tablespace Logged in As SYS

Execute On Multiple Databases Show SQL Cancel OK

General Storage

* Name

Extent Management	Type	Status
<input checked="" type="radio"/> Locally Managed <input type="radio"/> Dictionary Managed	<input checked="" type="radio"/> Permanent <input type="checkbox"/> Set as default permanent tablespace <input type="checkbox"/> Encryption Encryption Options	<input checked="" type="radio"/> Read Write <input type="radio"/> Read Only <input type="radio"/> Offline
	<input type="radio"/> Temporary <input type="checkbox"/> Set as default temporary tablespace	
	<input type="radio"/> Undo	Undo Retention Guarantee <input type="radio"/> Yes <input checked="" type="radio"/> No

Datafiles

Use bigfile tablespace
Tablespace can have only one datafile with no practical size limit.

Select	Name	Directory	Size (MB)	Maximum File Size (MB)
	No items found			

[Add](#)

Step	Window/Page Description	Choices or Values
d.	Add Datafile	Filename: inventory01.dbf File Size: 5 MB Click Continue .

Tablespaces > Add Datafile Logged in As SYS

Add Datafile

* File Name:

* File Directory:

Tablespace: INVENTORY

File Size: MB

Reuse Existing File

Storage

Automatically extend datafile when full (AUTOEXTEND)

Increment: MB

Maximum File Size: Unlimited
 Value: MB

TIP Changes made on this page will NOT take effect until you click "OK" button on the Tablespace page.

Step	Window/Page Description	Choices or Values
e.	Create Tablespace: General tab	Click the Storage tab.
f.	Create Tablespace: Storage tab	Verify: Extent Allocation: Automatic Segment Space Management: Automatic Compression Options: No Compression Enable Logging: Yes Click the General tab.
g.	Create Tablespace: General tab	Click Show SQL
h.	Linux Desktop	Open a gedit editor window. Select Applications > Accessories > gedit Text Editor .



Step	Window/Page Description	Choices or Values
i.	Show SQL	Select the text of the SQL statement.
j.	gedit	Click the right mouse button and select Paste.
k.	Show SQL	Click Return .
l.	Create Tablespace	Click Cancel .
m.	gedit	Review the SQL command. Edit it if necessary. Ensure that it ends with a semicolon (;).
n.	gedit	Select File > Save as
o.	Save As ...	Enter: Name: P10script.sql Folder: oracle Click Save .
p.	gedit	Select File > Quit .

2. Execute the `P10script.sql` script that you just created.
 - a. In a terminal window, change the directory to `~oracle`.
 - b. Set the Oracle environment for the `orcl` database.
 - c. Execute the `P10script.sql` script as the `DBA1` user with password `oracle_4U`.

```
$ cd ~oracle
$ . oraenv
ORACLE_SID = [orcl] ? orcl
The Oracle base remains unchanged with value /u01/app/oracle
$ sqlplus DBA1 @P10script.sql
```

```
...
Enter password:*****
...
Connected to:
...
Tablespace created.

SQL> exit
```

3. As the DBA1 user, execute the `lab_10_02_03.sql` script to create and populate a table (called X) in the INVENTORY tablespace. What error do you eventually see?

- a. In a terminal window, navigate to the \$LABS/P10 directory.

```
$ cd $LABS/P10
```

- b. Log in to SQL*Plus as the dba1 user (with password oracle_4u) and run the `lab_10_02_03.sql` script.

Note: Remember to use oraenv to set your environment to the orcl database, if you have not already done so in your terminal window.

```
$ sqlplus dba1
...
Enter password:*****
...
Connected to:
...
SQL> @lab_10_02_03.sql
```

- c. Note that there is eventually an ORA-01653 error indicating that the table cannot be extended. There is not enough space to accommodate all the rows to be inserted.

```
...
SQL> insert into x select * from x
  2  /
1024 rows created.

SQL> insert into x select * from x
  2  /
insert into x select * from x
*
ERROR at line 1:
ORA-01653: unable to extend table DBA1.X by 128 in tablespace
INVENTORY

SQL> commit
```

```
2 / 

Commit complete.

SQL> quit
Disconnected ...
```

4. In Cloud Control, go to the Tablespaces page for the `orcl` database and increase the amount of space available for the `INVENTORY` tablespace. For educational purposes, you will accomplish this by using two different methods. First, increase the size of the current data file to **40 MB**. Then, add a second data file by using file system storage. This second data file should be **30 MB** in size. For both techniques, use the show SQL functionality to view the supporting SQL statements.

Step	Window/Page Description	Choices or Values
a.	orcl Database Home page	Select Administration > Storage > Tablespaces .
b.	Database Credentials	For Credential, select Preferred . Select SYSDBA Database Credentials . Click Login .
c.	Tablespaces	Select the <code>INVENTORY</code> tablespace. Click Edit .
d.	Edit Tablespace: INVENTORY	In the Datafiles region, click Edit .
e.	Edit Tablespace: INVENTORY: Edit Datafile	Change File Size to 40 MB . Click Continue .
f.	Edit Tablespace: INVENTORY	Click Show SQL . <i>Note: An ALTER DATABASE statement is used to change the size of a data file.</i> Click Return .

Show SQL

```
ALTER DATABASE DATAFILE '/u01/app/oracle/oradata/orcl/inventory01.dbf' RESIZE 40M
```

Step	Window/Page Description	Choices or Values
g.	Edit Tablespace: INVENTORY	In the Datafiles region, click Add .
h.	Add Datafile	File Name: <code>inventory02.dbf</code> File Size: 30 MB Click Continue .
i.	Edit Tablespace: INVENTORY	Click Show SQL . (See the screenshot below.)

Step	Window/Page Description	Choices or Values
		<i>Note: Both actions are included. Notice that the SQL statements do not have a semicolon to end the statements.</i> Click Return .
j.	Edit Tablespace: INVENTORY	Click Apply .

Show SQL

[Execute On Multiple Databases](#) [Return](#)

```
ALTER DATABASE DATAFILE '/u01/app/oracle/oradata/orcl/inventory01.dbf' RESIZE 40M
ALTER TABLESPACE "INVENTORY" ADD DATAFILE '/u01/app/oracle/oradata
/orcl/inventory02.dbf' SIZE 30M
```

Notice that there are now two data files for the INVENTORY tablespace:

Datafiles

[Add](#)

Select	Name	Directory	Size (MB)	Used (MB)	Maximum File Size (MB)	Auto Extend
<input checked="" type="radio"/>	inventory01.dbf	/u01/app/oracle/oradata/ord/	40.00	1.00	0.00	No
<input type="radio"/>	inventory02.dbf	/u01/app/oracle/oradata/ord/	30.00	1.00	0.00	No

5. Go back to the terminal window and execute the `lab_10_02_03.sql` script again. It drops the table and re-executes the original script that previously returned the space error.
 - a. Go to the terminal window.
 - b. Log in to SQL*Plus as the `dba1` user (with a password of `oracle_4U`) and run the `$LABS/P10/lab_10_02_03.sql` script.

Note: Remember to use `oraenv` to set your environment to the `orcl` database if you have not already done so in your terminal window.

```
$ sqlplus dba1 @$LABS/P10/lab_10_02_03.sql
...
Enter password:

Connected to:
...
PL/SQL procedure successfully completed.

SQL> CREATE TABLE x
  2    (a CHAR(1000)
  3    ) TABLESPACE inventory;

Table created.
```

```
SQL> INSERT INTO x
  2   VALUES ('a');

1 row created.

SQL> INSERT INTO x
  2   SELECT * FROM x;

1 row created.

...
SQL> INSERT INTO x
  2   SELECT * FROM x ;

2048 rows created.

SQL> COMMIT;

Commit complete.

SQL> quit
```

- c. Note that the same number of row inserts is attempted, but, because of the increased size of the tablespace, there is no error.
- 6. In a terminal window, execute the `$LABS/P10/lab_10_02_06.sql` script in SQL*Plus as the `dba1` user to clean up the tablespace for later practice sessions.

```
$ sqlplus dba1 @$LABS/P10/lab_10_02_06.sql

...
Enter password:

Connected to:
...
Table dropped.

SQL> exit
```

Practices for Lesson 11: Managing Space

Chapter 11

Practices for Lesson 11: Overview

Lesson Overview

Background: To prepare for an upcoming merger, you want to set the warning and critical thresholds to a lower value than the default. Ensure that you receive early warnings to give yourself more time to react. When you finish your test case, drop the tablespace that you used.

Practice 11-1: Managing Storage

Overview

In this practice, you will set a tablespace fullness threshold so as to be warned when a tablespace has reached the fullness threshold tolerated.

Tasks

Access the `orcl` database as the `SYS` user (with password `oracle_4U`, connect as `SYSDBA`) and perform the necessary tasks through Enterprise Manager Cloud Control or through SQL*Plus. All scripts for this practice are in the `$LABS/P11` directory.

1. Using the `DBMS_SERVER_ALERT.SET_THRESHOLD` procedure, reset the database-wide threshold values for the Tablespace Space Usage metric. Connect to a SQL*Plus session and execute the following procedure:

```
$ . oraenv
ORACLE_SID = [orcl] ? orcl
The Oracle base remains unchanged with value /u01/app/oracle
$ cd $LABS/P11
$ sqlplus / as sysdba
...
Connected to:
...
SQL> exec DBMS_SERVER_ALERT.SET_THRESHOLD(
  > dbms_server_alert.tablespace_pct_full,-
  > NULL,NULL,NULL,NULL,1,1,NULL,-
  > dbms_server_alert.object_type_tablespace,NULL);
PL/SQL procedure successfully completed.

SQL>
```

2. In your SQL*Plus session, check the database-wide threshold values for the Tablespace Space Usage metric by using the following command (output formatted for clarity):

```
SQL> SELECT warning_value,critical_value
  2  FROM    dba_thresholds
  3  WHERE   metrics_name='Tablespace Space Usage'
  4  AND     object_name IS NULL;

WARNING_VALUE CRITICAL_VALUE
-----
85           97

SQL>
```

3. Create a new tablespace called TBSALERT with a 120 MB file called tbsalert.dbf. Make sure that this tablespace is locally managed and uses Automatic Segment Space Management. Do *not* make it auto-extensible, and do *not* specify any thresholds for this tablespace.

```
SQL> CREATE TABLESPACE tbsalert
  2  DATAFILE '/u01/app/oracle/oradata/orcl/tbsalert.dbf'
  3  SIZE 120M REUSE LOGGING EXTENT MANAGEMENT LOCAL
  4  SEGMENT SPACE MANAGEMENT AUTO;

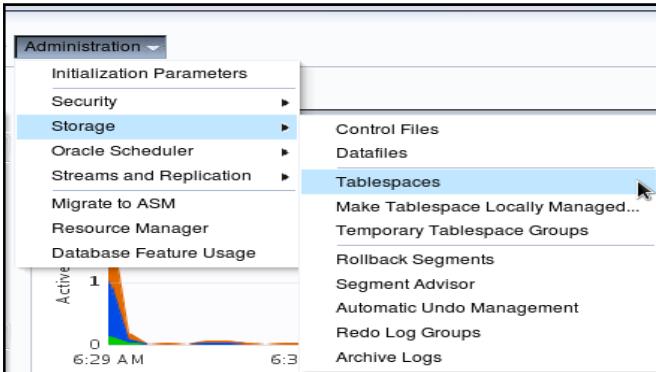
Tablespace created.

SQL> SELECT autoextensible FROM dba_data_files
  2  WHERE tablespace_name='TBSALERT';

AUT
-
-
NO

SQL>
```

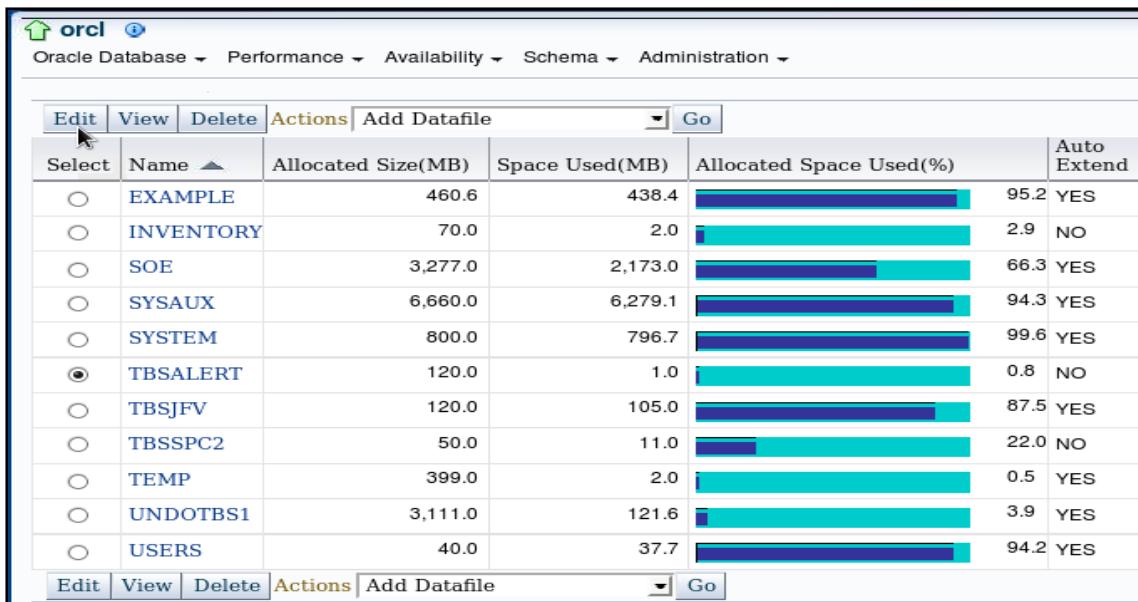
4. If necessary, log in to Enterprise Manager Cloud Control as the ADMIN user. Navigate to the orcl Database Home page. Then select **Administration > Storage > Tablespaces**.



5. On the Database Login page, select **New**. Specify **sys** as the username and **oracle_4U** as the password. Select **SYSDBA** in the Role menu and click **Login**.

Note: If you are logged in as another user, click **Logout**. Select **Logout of orcl** and **Display login page after logout**. Then log in as the **SYS** user.

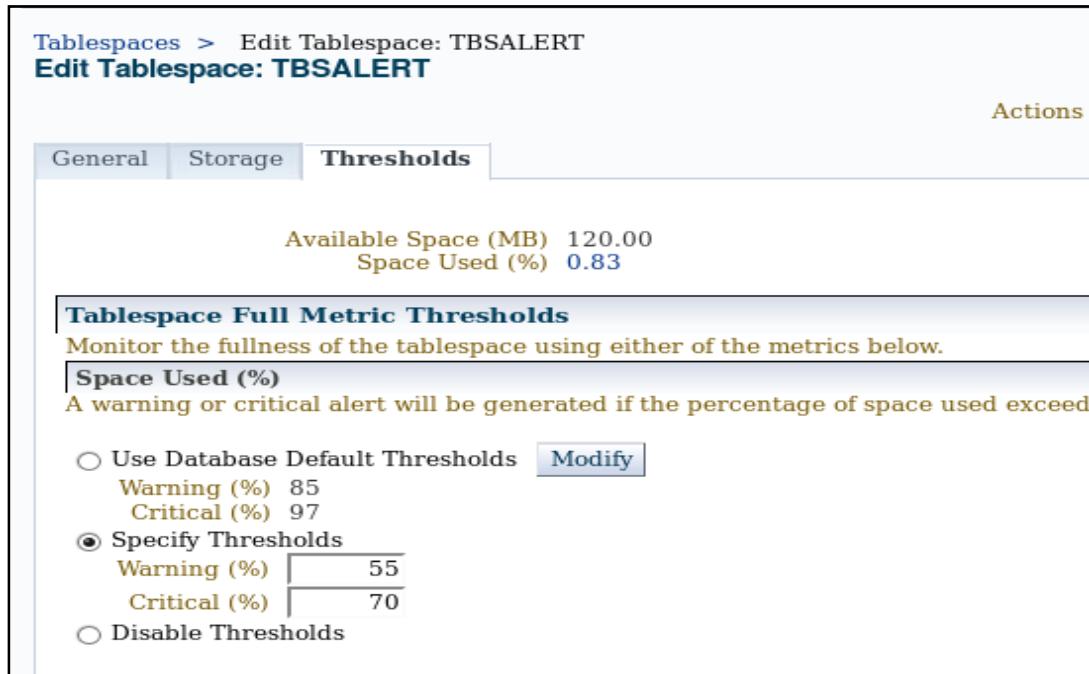
6. Change the Tablespace Space Usage thresholds of the TBSALERT tablespace. Set its warning level to 55 percent and its critical level to 70 percent.
- On the Tablespaces page, select TBSALERT and click **Edit**.



The screenshot shows the Oracle Database Performance section with the Tablespaces page open. The TBSALERT tablespace is selected and highlighted with a red circle. The table displays various tablespaces with their details: Name, Allocated Size(MB), Space Used(MB), Allocated Space Used(%), and Auto Extend status. A horizontal bar chart indicates the space used percentage for each tablespace.

Select	Name	Allocated Size(MB)	Space Used(MB)	Allocated Space Used(%)	Auto Extend
<input type="radio"/>	EXAMPLE	460.6	438.4	95.2	YES
<input type="radio"/>	INVENTORY	70.0	2.0	2.9	NO
<input type="radio"/>	SOE	3,277.0	2,173.0	66.3	YES
<input type="radio"/>	SYSAUX	6,660.0	6,279.1	94.3	YES
<input type="radio"/>	SYSTEM	800.0	796.7	99.6	YES
<input checked="" type="radio"/>	TBSALERT	120.0	1.0	0.8	NO
<input type="radio"/>	TBSJFV	120.0	105.0	87.5	YES
<input type="radio"/>	TBSSPC2	50.0	11.0	22.0	NO
<input type="radio"/>	TEMP	399.0	2.0	0.5	YES
<input type="radio"/>	UNDOTBS1	3,111.0	121.6	3.9	YES
<input type="radio"/>	USERS	40.0	37.7	94.2	YES

- On the Edit Tablespace: TBSALERT page, click the **Thresholds** tab.
- Select **Specify Thresholds** and enter 55 as Warning (%) and 70 as Critical (%) under the Space Used section. Then click **Show SQL**.



The screenshot shows the Edit Tablespace: TBSALERT page with the Thresholds tab selected. The Space Used (%) section is highlighted with a red box. It shows the available space (120.00 MB) and space used (0.83%). The Tablespace Full Metric Thresholds section contains three options: Use Database Default Thresholds, Specify Thresholds (selected), and Disable Thresholds. The Specify Thresholds section shows the warning threshold set to 55 and critical threshold set to 70.

Tablespace Full Metric Thresholds	
Monitor the fullness of the tablespace using either of the metrics below.	
<input type="radio"/> Space Used (%) A warning or critical alert will be generated if the percentage of space used exceeds	
<input type="radio"/> Use Database Default Thresholds Modify Warning (%) 85 Critical (%) 97	
<input checked="" type="radio"/> Specify Thresholds Warning (%) <input type="text" value="55"/> Critical (%) <input type="text" value="70"/>	
<input type="radio"/> Disable Thresholds	

- d. Review the statement and click **Return**.

Show SQL

```
BEGIN
DBMS_SERVER_ALERT.SET_THRESHOLD(9000,4,'55',4,'70',1,1,NULL,5,'TBSALERT');
END;
```

Execute On Multiple Databases | Return

Execute On Multiple Databases | Return

- e. On the Edit Tablespace: TBSALERT page, click **Apply** to modify the threshold values. You should receive a success message.

Tablespaces > Edit Tablespace: TBSALERT
Edit Tablespace: TBSALERT

Actions Add Datafile

Update Message
 Tablespace TBSALERT has been modified successfully

7. Return to your SQL*Plus session and check the new threshold values for the TBSALERT tablespace. In your SQL*Plus session, enter the following query (shown here with output formatted):

```
SQL> select warning_value,critical_value
  2  from dba_thresholds
  3  where metrics_name='Tablespace Space Usage' and
  4  object_name='TBSALERT';

WARNING_VALUE CRITICAL_VALUE
-----
55           70

SQL>
```

8. In your SQL*Plus session, query the REASON and RESOLUTION columns in DBA_ALERT_HISTORY for the TBSALERT tablespace. Exit SQL*Plus.

```
SQL> select reason, resolution
  2  from dba_alert_history
  3  where object_name='TBSALERT';

REASON
-----
RESOLUT
-----
Threshold is updated on metrics "Tablespace Space Usage" cleared
SQL> exit
Disconnected ...
$
```

9. Review and execute the `$LABS/P11/seg_advsr_setup.sh` script that creates and populates new tables in the `TBSALERT` tablespace.
- a. Review the script by using the `cat` command:

```
$ cd $LABS/P11
$ cat seg_advsr_setup.sh
#!/bin/sh
# For training only, execute as oracle OS user

sqlplus /nolog <<EOF
connect / as sysdba
alter system set disk_asynch_io = FALSE scope = spfile;
shutdown immediate;
startup
set echo on
create table employees1 tablespace tbsalert as select * from
hr.employees;
create table employees2 tablespace tbsalert as select * from
hr.employees;
create table employees3 tablespace tbsalert as select * from
hr.employees;
create table employees4 tablespace tbsalert as select * from
hr.employees;
create table employees5 tablespace tbsalert as select * from
hr.employees;

alter table employees1 enable row movement;
alter table employees2 enable row movement;
alter table employees3 enable row movement;
alter table employees4 enable row movement;
alter table employees5 enable row movement;

BEGIN
FOR i in 1..10 LOOP
    insert into employees1 select * from employees1;
    insert into employees2 select * from employees2;
    insert into employees3 select * from employees3;
    insert into employees4 select * from employees4;
    insert into employees5 select * from employees5;
    commit;
END LOOP;
END;
/
insert into employees1 select * from employees1;
insert into employees2 select * from employees2;
```

```
insert into employees3 select * from employees3;
commit;
exit
EOF
$
```

- b. Execute the script:

```
$ ./seg_advsr_setup.sh

SQL> Connected.

SQL>

System altered.

SQL> Database closed.

Database dismounted.

ORACLE instance shut down.

SQL> ORACLE instance started.

Total System Global Area  876859392 bytes
Fixed Size                  2294360 bytes
Variable Size                578817448 bytes
Database Buffers            289406976 bytes
Redo Buffers                 6340608 bytes

Database mounted.

Database opened.

SQL> SQL>
Table created.

SQL> SQL>
Table altered.

SQL>
Table altered.

SQL>
Table altered.

SQL>
Table altered.

SQL>
Table altered.
```

```
Table altered.  
SQL> SQL> 2 3 4 5 6 7 8 9 10 11  
PL/SQL procedure successfully completed.  
SQL>  
109568 rows created.  
SQL>  
109568 rows created.  
SQL>  
109568 rows created.  
SQL>  
Commit complete.  
  
SQL> Disconnected ...  
$
```

10. Check the fullness level of the TBSALERT tablespace by using Enterprise Manager Cloud Control or SQL*Plus. The current level should be around 60 percent. Wait a few minutes and check that the warning level is reached for the TBSALERT tablespace. (*If you are too fast and receive errors, just use your browser's Refresh button or select your destination again.*)

- a. Log in to SQL*Plus as the SYS user and enter the following query:

```
$ sqlplus / as sysdba  
...  
Connected to:  
...  
SQL> select sum(bytes) *100 /125829120  
  2  from dba_extents  
  3  where tablespace_name='TBSALERT';  
  
SUM (BYTES) *100/125829120  
-----  
          60  
SQL>
```

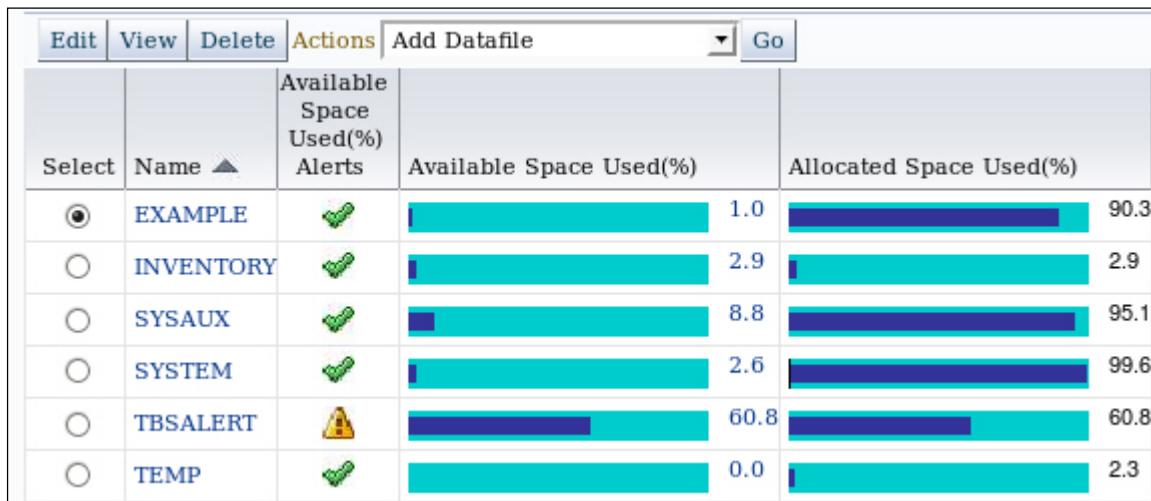
Note: You created the tablespace with 120 MB (125829120 bytes) of space.

- b. Enter the following query. Your results should be similar to the following:

```
SQL> select reason  
  2  from dba_outstanding_alerts  
  3  where object_name='TBSALERT';  
  
REASON  
-----  
Tablespace [TBSALERT] is [60 percent] full  
  
SQL>
```

Note: If your result is “no rows selected,” wait a little longer and repeat the query.

- In Enterprise Manager Cloud Control, return to the **Tablespaces** page.
- On the Tablespaces page, check the Allocated Space Used (%) column for the TBSALERT tablespace.



- Select **Oracle Database > Monitoring > Incident Manager**.

- Click **Events without incidents**.

Severity	Message	Target Name	Target Type	Event Reported	Category
Warning	Tablesapce TBSALERT is 60 percent full	orcl	Database Instance	Dec 4, 2012 10:20:31	Capacity
Warning	User SYS logged on from EDRSR32P1.	orcl	Database Instance	Dec 4, 2012 9:38:32	

You should see the new alert. It might take several minutes for the alert to appear.

11. In your SQL*Plus session, execute the following `INSERT` statements to add more data to `TBSALERT`. Wait a few moments and view the critical level through a query in SQL*Plus and Enterprise Manager Cloud Control. Verify that `TBSALERT` fullness is around 75 percent.

- a. Execute the following commands:

```
SQL> insert into employees4 select * from employees4;
109568 rows created.

SQL> commit;

Commit complete.

SQL> insert into employees5 select * from employees5;
109568 rows created.

SQL> commit;

Commit complete.

SQL>
```

- b. Wait a few minutes and view the critical level. Verify that `TBSALERT` fullness is around 75 percent. In SQL*Plus, enter the following query:

```
SQL> select sum(bytes) *100 /125829120
  2  from dba_extents
  3  where tablespace_name='TBSALERT';

SUM(BYTES)*100/125829120
-----
75

SQL>
```

- c. Check the outstanding alerts. You may need to wait a few minutes.

```
SQL> select reason, message_level
  2  from dba_outstanding_alerts
  3  where object_name='TBSALERT';

REASON                                     MESSAGE_LEVEL
-----
Tablespace [TBSALERT] is [75 percent] full          1

SQL>
```

- d. In Enterprise Manager Cloud Control, navigate to the **Administration > Storage > Tablespaces** page, and review the Allocated Space Used (%) value for TBSALERT.

Actions	Add Datafile	Go				
Select	Name	Available Space Used(%) Alerts	Available Space Used(%)	Allocated Space Used(%)	Auto Extend	
<input checked="" type="radio"/>	EXAMPLE		<div style="width: 1.0%; background-color: #00AEEF;"></div>	1.0	<div style="width: 90.3%; background-color: #3366CC;"></div> 90.3	YES
<input type="radio"/>	INVENTORY		<div style="width: 2.9%; background-color: #00AEEF;"></div>	2.9	<div style="width: 2.9%; background-color: #3366CC;"></div> 2.9	NO
<input type="radio"/>	SYSAUX		<div style="width: 8.8%; background-color: #00AEEF;"></div>	8.8	<div style="width: 95.1%; background-color: #3366CC;"></div> 95.1	YES
<input type="radio"/>	SYSTEM		<div style="width: 2.6%; background-color: #00AEEF;"></div>	2.6	<div style="width: 99.6%; background-color: #3366CC;"></div> 99.6	YES
<input type="radio"/>	TBSALERT		<div style="width: 75.8%; background-color: #3366CC;"></div>	75.8	<div style="width: 75.8%; background-color: #3366CC;"></div> 75.8	NO
<input type="radio"/>	TEMP		<div style="width: 0.0%; background-color: #00AEEF;"></div>	0.0	<div style="width: 2.3%; background-color: #3366CC;"></div> 2.3	YES

- e. Navigate to **Oracle Database > Home** and check the list of incidents and problems in the **Incidents and Problems** section. You can also navigate to **Oracle Database > Monitoring > Incident Manager** and click **Events without incidents**. You should see the new alert. It will take several minutes for the change in status to take effect.

Note: You should now see a red flag instead of the yellow one. Check “All open incidents” if you do not see the event in “Events without incidents.”

Incident Manager: All open incidents

Views	Search	Actions	View	View search criteria	Acknowledge	Clear...
Standard						
My open incidents and problems						
Unassigned incidents						
Unacknowledged incidents						
Escalated incidents						
All open incidents						
Unassigned problems						
All open problems						
Events without incidents						

Severity Summary Target Priority Status Last Updated Owner Ackno Escala Type

Tablespace TBSALERT is 75 percent full orcl None New Oct 18, 2013 8:24:42 AM - No No Incident

12. In your SQL*Plus session, execute the following **DELETE** statements to delete rows from tables in TBSALERT. These statements will take several minutes to complete. Then exit your SQL*Plus session.

```
SQL> delete employees1;
219136 rows deleted.

SQL> commit;

Commit complete.

SQL> delete employees2;
219136 rows deleted.
```

```
SQL> commit;

Commit complete.

SQL> delete employees3;

219136 rows deleted

SQL> commit;

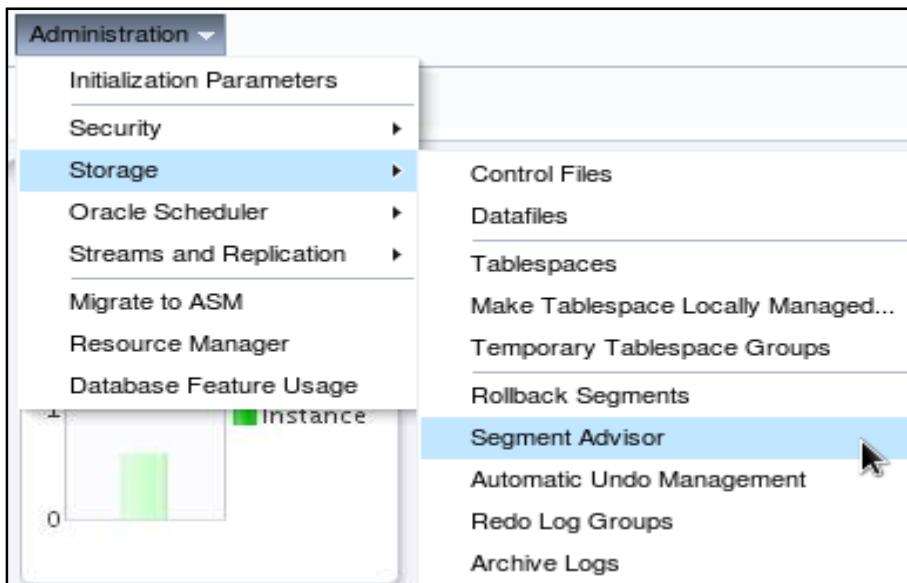
Commit complete.

SQL> exit
SQL> Disconnected ...

$
```

13. Execute the Segment Advisor for the TBSALERT tablespace in Enterprise Manager Cloud Control. Make sure that you run the Advisor in Comprehensive mode without time limitation. Accept and implement its recommendations. After the recommendations have been implemented, check whether the fullness level of TBSALERT is below 55 percent.

- a. Navigate to **Administration > Storage > Segment Advisor**.



- b. On the Segment Advisor Recommendations page, select **Run Segment Advisor Manually** in the Related Links section.

Related Links

- Advisor Central
- [Run Segment Advisor Manually](#)
- Job Scheduler

Automated Maintenance Tasks
Chained Row Analysis

- c. On the Segment Advisor: Scope page, select **Tablespaces**. Then click **Next**.

Segment Advisor: Scope
Database orcl Logged In As sys Cancel Step 1 of 4 Next

Automatic Segment Advisor Information
Beginning in Oracle Database 11, Oracle provides an Automatic Segment Advisor task which automatically detects segment issues.

You can get advice on shrinking segments for individual schema objects or entire tablespaces.
 Tablespaces
 Schema Objects

Overview
The segment advisor determines whether objects have unused space that can be released, taking estimated future space requirements into consideration. The estimated future space calculation is based on historical trends.

- d. On the Segment Advisor: Objects page, click **Add** and select **TBSALERT**. Click **OK** and then click **Show Advanced Options**.

- e. In the Options section, select **Unlimited**. Then click **Next**.

Segment Advisor: Tablespaces
Database orcl Logged In As sys Cancel Back Step 2 of 4 Next Submit Add

Name	Type	Extent Management	Segment Space Management	Size (MB)	Used (MB)	Used (%)	Remove
TBSALERT	PERMANENT	LOCAL	AUTO	120.00	91.00	75.83	

Options
 Hide Advanced Options
 Time Limit for Analysis
 Unlimited
 Limited
 Time Limit (mins)
 Advisory Results Retention (days) 30

- f. On the Segment Advisor: Schedule page, make sure that **Immediately** is selected. Select your proper time zone (ask your Instructor) and click **Next**.

The screenshot shows the Segment Advisor: Schedule page. At the top, there is a navigation bar with four tabs: Scope, Objects, Schedule (which is selected and highlighted in blue), and Review. Below the tabs, it displays the database as 'orcl' and the user as 'sys'. A 'TIP' message suggests scheduling the operation during off-peak hours. The 'Task Information' section contains fields for 'Task Name' (SEGMENTADV_3720834) and 'Task Description' (Get shrink advice based on object growth trend). The 'Schedule' section shows 'Schedule Type' as 'Standard'. Under 'Repeating', the 'Repeat' dropdown is set to 'Do Not Repeat'. In the 'Start' section, 'Immediately' is selected instead of 'Later'. The 'Date' is set to 'Oct 18, 2013' and the 'Time' is set to '9:00 AM'. Buttons for 'Cancel', 'Back', 'Step 3 of 4', 'Next', and 'Submit' are visible at the bottom right.

- g. On the Segment Advisor: Review page, click **Show SQL**.
- h. Review the statements and click **Return**.

The screenshot shows the 'Review: Show SQL' page. It contains two sections: 'Create task and objects script' and 'Execute task script'. The 'Create task and objects script' section displays the following PL/SQL code:

```

CREATE task and objects script
DECLARE

taskname varchar2(100);
taskdesc varchar2(128);
task_id number;
object_id number;
timeLimit varchar2(25);
numDaysToRetain varchar2(25);
objectName varchar2(100);
objectType varchar2(100);

BEGIN
taskname := 'SEGMENTADV_3720834';
taskdesc := 'Get shrink advice based on object growth trend';
numDaysToRetain := '30';
dbms_advisor.create_task('Segment Advisor', ?, taskname, taskdesc, NULL);
dbms_advisor.create_object(taskname, 'TABLESPACE', 'TBSALERT', ' ', ' ', NULL, object_id);
dbms_advisor.set_task_parameter(taskname, 'RECOMMEND_ALL', 'TRUE');
dbms_advisor.set_task_parameter(taskname, 'DAYS_TO_EXPIRE', numDaysToRetain);
END;

```

The 'Execute task script' section displays the following PL/SQL code:

```

Execute task script
DECLARE
taskname varchar2(100);
BEGIN
taskname := 'SEGMENTADV_3720834';
dbms_advisor.reset_task(taskname);
dbms_advisor.execute_task(taskname);
END;

```

- i. On the Segment Advisor: Review page, click **Submit**.

Segment Advisor: Review

Database: orcl Logged In As: sys

Task Name: SEGMENTADV_3720834
Task Description: Get shrink advice based on object growth trend
Time Limit for Analysis (mins): Unlimited
Advisory Results Retention (days): 30

Selected Objects

Tablespace	Type
TBSALERT	PERMANENT

Buttons: Cancel, Show SQL, Back, Step 4 of 4, Submit

- j. The Segment Advisor Recommendations page appears. Select **Advisor Central** in the Related Links section.

Related Links

Advisor Central	Automated Maintenance Tasks
Run Segment Advisor Manually	Chained Row Analysis
Job Scheduler	

- k. In the Advisor Tasks section of the Advisor Central page, click the **SEGMENTADV_nnnnnnn** link when the task status shows COMPLETED.

Advisor Tasks

Search
Select an advisory type and optionally enter a task name to filter the data that is displayed in your results set.

Advisory Type	Task Name	Advisor Runs	Status
All Types		Last 31 Days	All

By default, the search returns all uppercase matches beginning with the string you entered. To run an exact or case-sensitive match, double quote the search string. You can use the wildcard symbol (%) in a double quoted string.

Results

View Result	Delete	Actions	Re-schedule	Go	Previous	1-25 of 96	Next 25	
Select	Name	Advisory Type	Description	User	Status	Start Time	Duration (seconds)	Expires In (days)
<input checked="" type="radio"/>	SEGMENTADV_3720834	Segment Advisor	Get shrink advice based on object growth trend	SYS	COMPLETED	Oct 18, 2013 9:15:48 AM	6	30
<input type="radio"/>	ADDM:1356577982_1_92	ADDM	ADDM auto run: snapshots [91, 92], instance 1, database id 1356577982	SYS	COMPLETED	Oct 18, 2013 9:01:00 AM	1	30

- l. You can see that there are three recommendations for the TBSALERT tablespace. Click **3** in the Recommendations column.

Advisor Central > Segment Advisor Task: SEGMENTADV_3720834

Segment Advisor Task: SEGMENTADV_3720834

Task Name	SEGMENTADV_3720834	Started	Oct 18, 2013 9:15:48 AM UTC
Status	COMPLETED	Ended	Oct 18, 2013 9:15:54 AM UTC
Running Time (seconds)	6	Time Limit (mins)	UNLIMITED

Segment Space Recommendations

The following table contains the minimum reclaimable space summary for the evaluated segments in that tablespace. Oracle recommends shrinking, reorganizing or compressing these segments to release unused space. Select the Recommendation Details button to view and implement the recommendations.

Recommendation Details							
Select	Tablespace	Recommendations	Tablespace Size (MB)	Evaluated Space (%)	Reclaimable Space (MB)	Extent Management	Segment Space Management
<input checked="" type="radio"/>	TBSALERT	3	120.00	45.00	46.71	LOCAL	AUTO

- m. Click **Select All** and then click **Shrink**.

Select	Schema	Segment	Recommendation	Reclaimable Space (MB)
<input checked="" type="checkbox"/>	SYS	EMPLOYEES1	Shrink	15.57
<input checked="" type="checkbox"/>	SYS	EMPLOYEES2	Shrink	15.57
<input checked="" type="checkbox"/>	SYS	EMPLOYEES3	Shrink	15.57

- n. On the Shrink Segment: Options page, make sure that you select **Compact Segments and Release Space**. Click **Show SQL**.

Compact Segments and Release Space
This will first compact the segments and then release the recovered space to the tablespace. During the short space release phase, any cursors referencing this segment may be invalidated and queries on the segment could be affected.

Compact Segments
Compacting will compact segment data without releasing the recovered space. After compacting the data, the recovered space can be quickly released by running Compact Segments and Release Space.

- o. Review the statements and click **Return**.

```
alter table "SYS"."EMPLOYEES1" shrink space
alter table "SYS"."EMPLOYEES2" shrink space
alter table "SYS"."EMPLOYEES3" shrink space
```

- p. On the Shrink Segment: Options page, click **Implement**.
q. On the Shrink Segment: Schedule page, click **Submit**.

TIP This operation may be resource-intensive and should be scheduled during off-peak hours.

Job Information

* Job Name: SQLSCRIPT_8229467
Job Description:

Schedule

Schedule Type: Standard

Time Zone: (UTC+00:00) Universal Time

Repeating: Do Not Repeat

Start

Immediately
 Later

Date: Oct 18, 2013
(example: Oct 18, 2013)

Time: 9:35:00 AM

- r. On the Scheduler Jobs page, click the **SQLSCRIPT_nnnnnnn** link.

Scheduler Jobs

Page Refreshed Oct 18, 2013 9:22:38 AM UTC [Refresh](#) [Create](#)

All	Running	History							
View Job Status Stop Run View Job Definition Edit Job Definition Delete									
Select	Status	Name	Schema	Start Date	Elapsed Time (seconds)	CPU Used (seconds)	Session ID	Resource Consumer Group	Previous Runs
<input checked="" type="radio"/>		SQLSCRIPT_8229467	SYS	Oct 18, 2013 9:22:36 AM +00:00	1.83	.02	275	OTHER_GROUPS	0

- s. On the View Job page, scroll to the bottom of the page. Under Operation Detail, you should see that the job succeeded. (If it is still running, use your browser's Refresh button.) Then click **OK**.

Scheduler Jobs > View Job: SYS.SQLSCRIPT_8229467

View Job: **SYS.SQLSCRIPT_8229467**

Logged in as SYS

[Edit](#) [OK](#)

General		Schedule	Options
Name	SQLSCRIPT_8229467	Repeat	Do Not Repeat
Schema	SYS	Start Date	Oct 18, 2013 9:22:36 AM UTC
Enabled	FALSE		Priority Medium
Description	None		Schedule Limit (minutes) None
Logging Level	Log job runs only (RUNS)		Maximum Runs None
Job Class	DEFAULT_JOB_CLASS		Maximum Failures None
Auto Drop	FALSE		Job Weight 1
Restartable	FALSE		Instance Stickiness TRUE
Destination			For use in RAC. If instance stickiness is set to TRUE, the Oracle Scheduler will attempt to execute the job on the same instance as the previous run
Credential Name			

Command

Command Type PL/SQL Block

PL/SQL

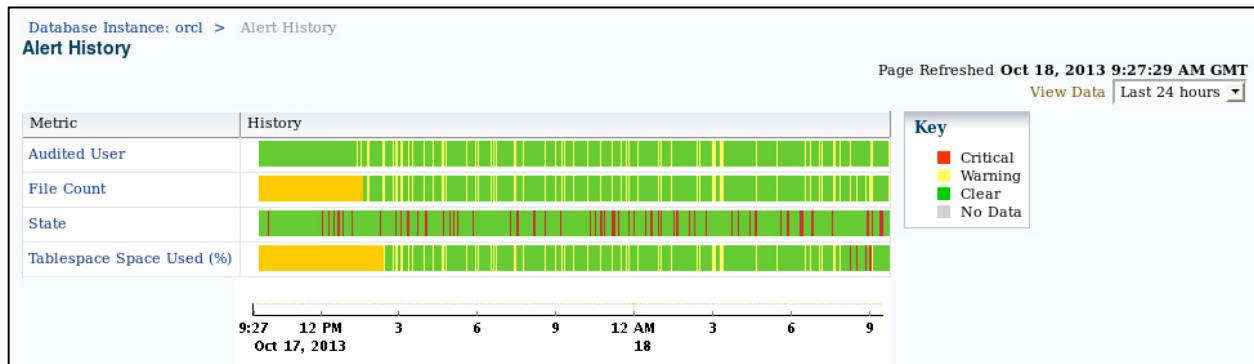
```
begin
EXECUTE IMMEDIATE 'alter table "SYS"."EMPLOYEES1" shrink space';
EXECUTE IMMEDIATE 'alter table "SYS"."EMPLOYEES2" shrink space';
EXECUTE IMMEDIATE 'alter table "SYS"."EMPLOYEES3" shrink space';
end;
```

Operation Detail

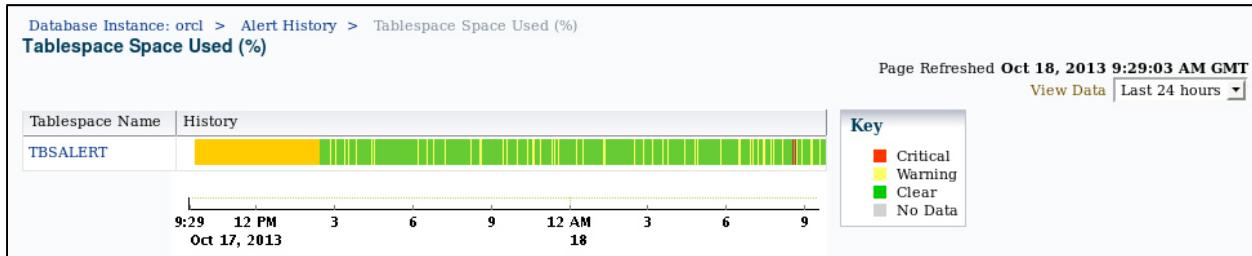
View	Log ID	Log Date	Operation	Status
<input checked="" type="radio"/>	5876	Oct 18, 2013 9:22:46 AM +00:00	RUN	SUCCEEDED

14. Wait a few minutes and check that there are no longer any outstanding alerts for the TBSALERT tablespace. Navigate to **Oracle Database > Monitoring > Incident Manager > Events without incidents**.

15. Retrieve the history of the TBSALERT Tablespace Space Usage metric for the last 24 hours.
- Navigate to **Oracle Database > Monitoring > Alert History**.
 - Click the **Tablespaces Space Used (%)** colored bar in the History column.



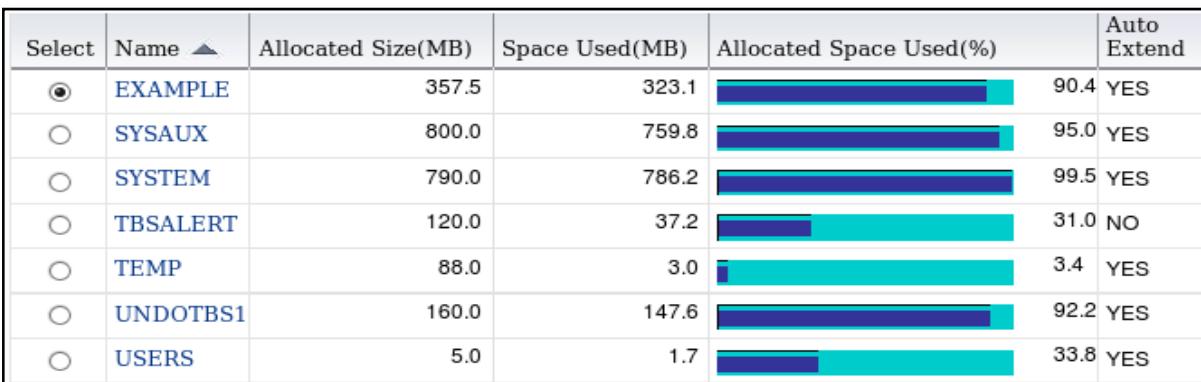
- Click the colored bar in the History column.



- The Status History: Tablespace Space Used (%) page is displayed. Select **Last 24 hours** from the View Data drop-down list. Note that your display may vary somewhat from what is shown in the screenshot.

Database Instance: orcl > Status History : Tablespace Space Used (%)				
Status History : Tablespace Space Used (%)				
Page Refreshed Oct 18,				
Severity	Start Time ▼	End Time	Severity Duration(Min)	Message
✓	Oct 18, 2013 9:24:46 AM		Currently open	Tablespace TBSALERT is 30 percent full
✗	Oct 18, 2013 8:24:38 AM	Oct 18, 2013 9:24:46 AM	60.13	Tablespace TBSALERT is 75 percent full
⚠	Oct 17, 2013 2:22:39 PM	Oct 18, 2013 8:24:38 AM	1081.98	Tablespace TBSALERT is 60 percent full

16. Verify that the TBSALERT tablespace fullness has decreased below the threshold. This is because space has been reclaimed. In Enterprise Manager Cloud Control, navigate to Administration > Storage > Tablespaces.



17. Log in to SQL*Plus as the SYSDBA user. Reset the database-wide default thresholds from the Tablespace Space Usage metric for the tablespace TBSALERT. Exit SQL*Plus.

```
$ sqlplus / as sysdba
...
SQL> EXEC DBMS_SERVER_ALERT.SET_THRESHOLD(
> 9000,NULL,NULL,NULL,NULL,1,1,NULL,5,'TBSALERT')

PL/SQL procedure successfully completed.

SQL> SELECT warning_value,critical_value
  2  FROM dba_thresholds
  3  WHERE metrics_name='Tablespace Space Usage'
  4  AND object_name='TBSALERT';

no rows selected

SQL> exit
Disconnected ...
$
```

18. **Note: This is a mandatory cleanup step.** Review and then execute the `seg_advsr_cleanup.sh` script in the `$LABS/P11` directory to drop your TBSALERT tablespace.

- a. Review the script by using the `cat` command.

```
$ cat seg_advsr_cleanup.sh
#!/bin/sh
# For training only, execute as oracle OS user

sqlplus /nolog <<EOF
connect / as sysdba
alter system set disk_asynch_io = TRUE scope = spfile;
shutdown immediate;
startup
drop tablespace tbsalert including contents and datafiles;
exit
EOF
$
```

- b. Execute the script.

```
$ ./seg_advsr_cleanup.sh
SQL> Connected.
SQL>
System altered.

SQL> Database closed.
Database dismounted.
ORACLE instance shut down.
SQL> ORACLE instance started.

Total System Global Area  876859392 bytes
Fixed Size                  2294360 bytes
Variable Size                578817448 bytes
Database Buffers              289406976 bytes
Redo Buffers                  6340608 bytes
Database mounted.
Database opened.
SQL>
Tablespace dropped.

SQL>
$
```


Practices for Lesson 12: Managing Undo Data

Chapter 12

Practices for Lesson 12: Overview

Practices Overview

Background: The business users and management in your organization decide that they need to have 48-hour retention of undo in the Oracle database to support their flashback needs. Your task is to configure the `orcl` database to support this requirement.

Practice 12-1: Managing Undo Data

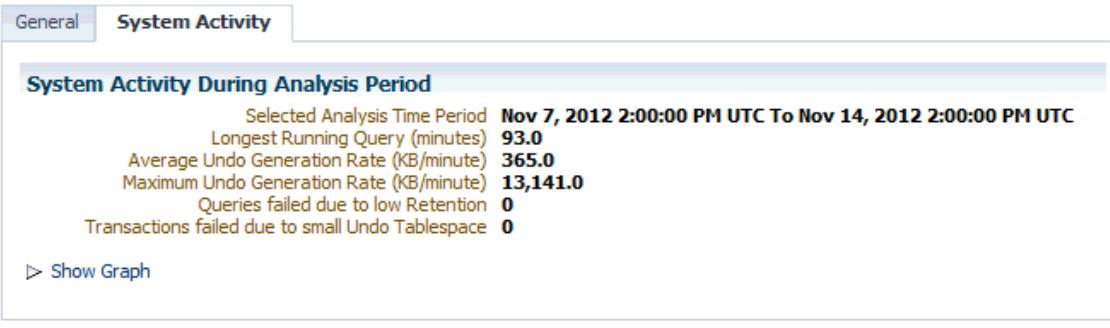
In this practice, you first view your system activity regarding undo, and then you configure the `orcl` database to support 48-hour retention for flashback operations. Enterprise Manager Database Express enables you to change the undo tablespaces and perform undo analysis. For this practice, you will use Oracle Enterprise Manager Cloud Control.

1. In Cloud Control, as the **ADMIN** user, navigate to the `orcl` database and view the undo-related system activity.

Step	Window/Page Description	Choices or Values
a.	Cloud Control login	User: Admin Password: oracle_4U
b.	Cloud Control: Summary	Select Targets > Databases .
c.	Databases	Verify that Search List is selected. Click orcl .
d.	orcl	Select Administration > Storage > Automatic Undo Management
e.	Database Login	Credential: Preferred Preferred Credential Name: SYSDBA Database Credentials Click Login .
f.	Automatic Undo Management: General tab	Review the settings for the analysis. Click the System Activity tab.
g.	Automatic Undo Management: System Activity tab	View System Activity.

Automatic Undo Management

In the General tab, you can view the current undo settings for your instance and use the Undo Advisor to analyze the undo tablespace requirements. This analysis can be performed based on the specified analysis period or the desired undo retention. The system activity for the specified time period can be viewed in the System Activity tab.



Note: The data you view may differ from the screenshots shown due to differences in system activity during your analysis period.

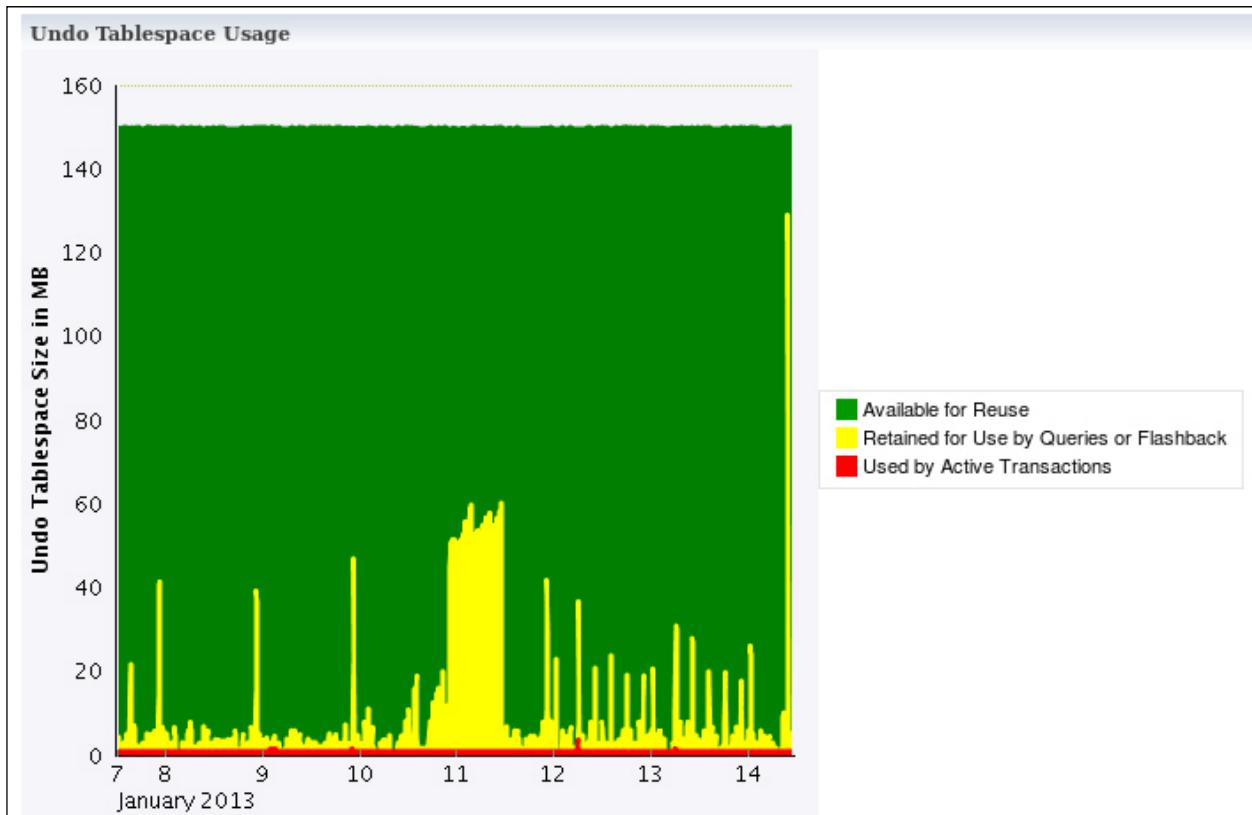
Question: Looking at the preceding screenshot, how many errors did this system encounter?

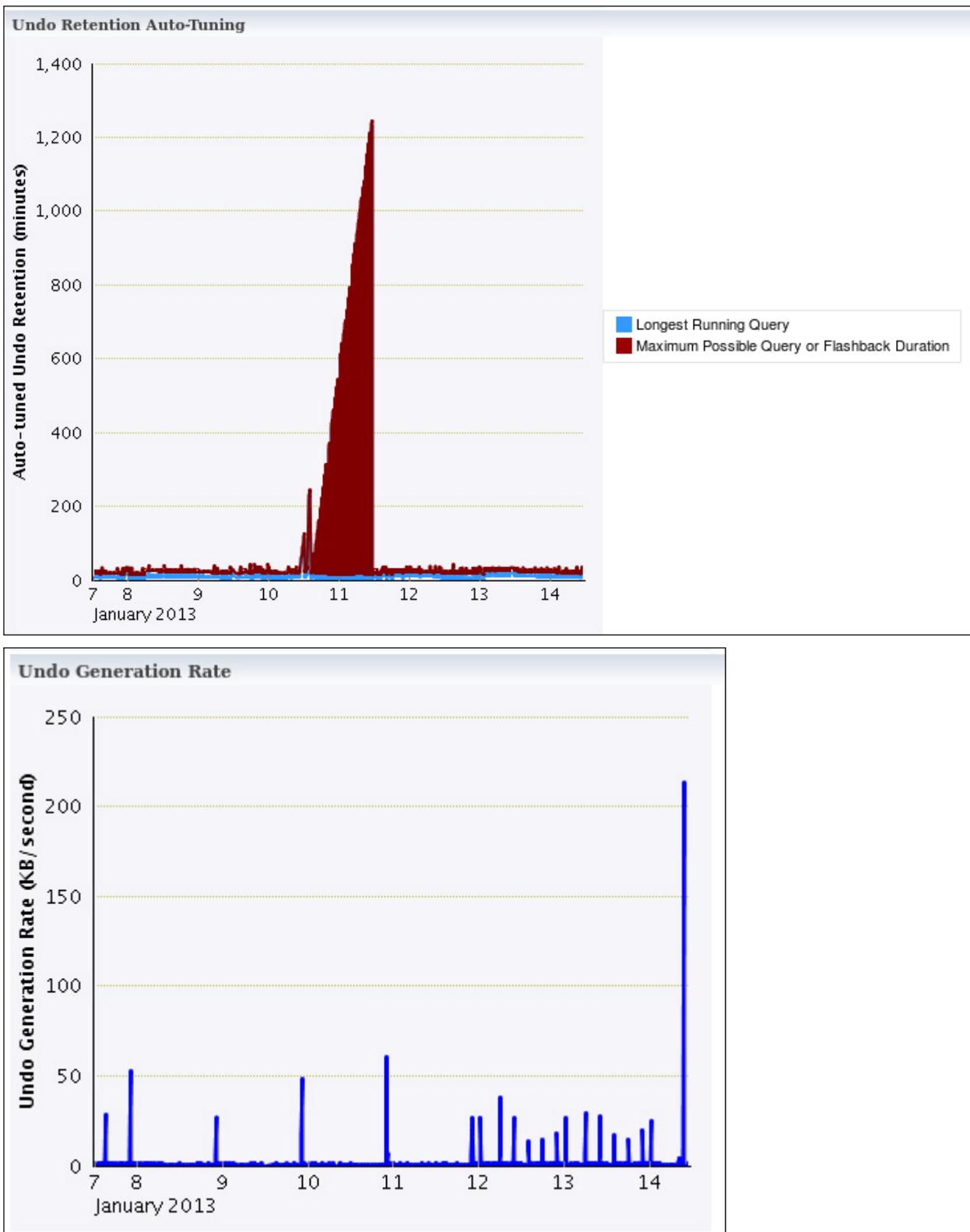
Answer: None. When the undo tablespace is set to auto-extend, transactions should not fail because of lack of space in the tablespace.

Question: Looking at the preceding screenshot, what is the duration of the longest running query?

Answer: 93 minutes (The value in your system may be different.)

Step	Window/Page Description	Choices or Values
h.	Automatic Undo Management: System Activity tab	Click Show Graph to show related graphs.



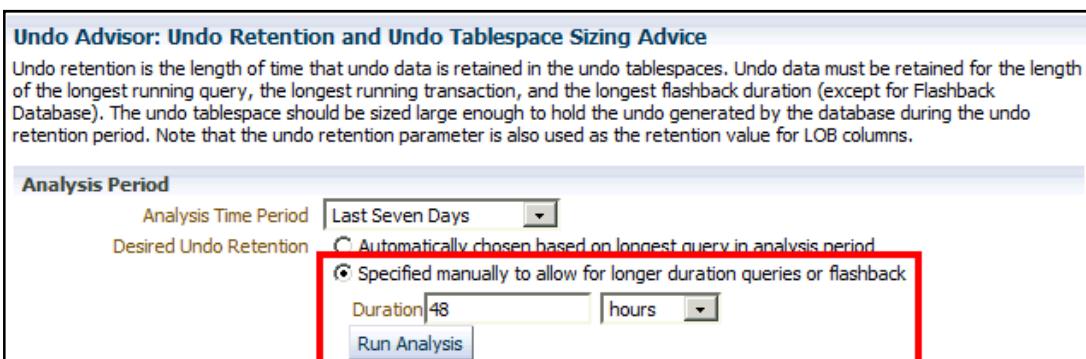


Question: Looking at the preceding Undo Retention Auto-Tuning graph, could this system support flashback for periods longer than the length of the current longest running query?

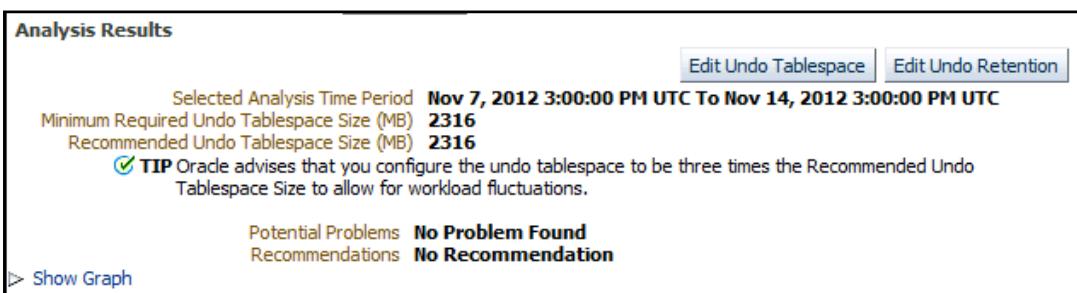
Answer: Yes, but most likely not enough to support the required 48 hours.

2. Modify the undo retention time and calculate the undo tablespace size to support the requested 48-hour retention.

Step	Window/Page Description	Choices or Values
a.	Automatic Undo Management: System Activity tab	Click the General tab.
b.	Automatic Undo Management: General tab	Under the Undo Advisor section, select Specified manually to allow for longer duration queries or flashback . Enter 48 and select hours for Duration. Click Run Analysis .



Step	Window/Page Description	Choices or Values
c.	Automatic Undo Management: General tab	Examine the analysis results.



Make note of the recommended undo tablespace size. **Note:** Your recommended size might be different from what is shown here.

Step	Window/Page Description	Choices or Values
d.	Automatic Undo Management: General tab	Click Edit Undo Retention .
e.	Initialization Parameters	Set Value to 172800 seconds. Check Apply changes in current running instance(s) mode to SPFILE .

Step	Window/Page Description	Choices or Values
f.	Initialization Parameters	<p>Click Show SQL (in the upper-right corner of the page).</p> <p>Notice the value of <code>undo_retention</code>.</p> <p>Click Return.</p>

Initialization Parameters > Show SQL
Show SQL
`ALTER SYSTEM SET undo_retention = 172800 SCOPE=BOTH`

Step	Window/Page Description	Choices or Values
g.	Initialization Parameters	<p>Click Apply.</p> <p>Select Administration > Storage > Automatic Undo Management.</p>
h.	Automatic Undo Management: General tab	<p>Change the Undo tablespace size to the recommended value.</p> <p>Click Edit Undo Tablespace.</p>
i.	Edit Tablespace: UNDOTBS1	<p>In the Datafiles section, click Edit to change the data file size.</p>
j.	Edit Tablespace: UNDOTBS1: Edit Datafile	<p>Change File Size to the value that you determined when you ran the Undo Advisor (2316 MB is the value in the screenshot above).</p> <p>Click Continue.</p>
k.	Edit Tablespace: UNDOTBS1	<p>Click Show SQL.</p>
l.	Show SQL	<p>Verify the SQL commands that will be executed.</p> <pre>ALTER DATABASE DATAFILE '/u01/app/oracle/oradata/orcl/undotbs1. dbf' RESIZE 2316M</pre> <p>Click Return.</p>
m.	Edit Tablespace: UNDOTBS1	<p>Click Apply.</p>

3. Go back to the **Automatic Undo Management** page to see the results of the changes you just made. You see that the undo retention time has increased to support the 48-hours requirement. Your undo tablespace size has also increased based on the changes that you made to the size of the data file for the undo tablespace.

Automatic Undo Management

In the General tab, you can view the current undo settings for your instance and use the Undo Advisor to analyze the undo tablespace requirements. This analysis can be performed based on the specified analysis period or the desired undo retention. The system activity for the specified time period can be viewed in the System Activity tab.

General **System Activity**

Undo Retention Settings

Undo Retention (minutes)	2880
Retention Guarantee	No

Undo Tablespace for this Instance

Tablespace	UNDOTBS1
Size (MB)	2316
Auto-Extensible	Yes

Change Tablespace

Question: Which flashback operations are potentially affected by this change?

Answer: flashback query, flashback transaction, and flashback table

Question: Does undo data survive the shutdown of a database?

Answer: Yes, undo is persistent.

4. Return to the `orcl` database home page.

Practices for Lesson 13: Managing Data Concurrency

Chapter 13

Practices for Lesson 13: Overview

Practices Overview

Background: The Help desk just received a call from Susan Mavris, an HR representative, complaining that the database is “frozen.” Upon questioning the user, you find that she was trying to update John Chen’s personnel record with his new phone number, but when she entered the new data, her session froze and she could not do anything else.

Practice 13-1: Resolving Lock Conflicts

In this practice, you use two separate SQL*Plus sessions to cause a lock conflict. Using Enterprise Manager, you detect the cause of the lock conflict and then resolve the conflict.

1. Users NGREENBERG and SMAVRIS already exist in your database. User NGREENBERG makes an uncommitted update to a row in the HR.EMPLOYEES table. Then user SMAVRIS attempts to update the same row.
 - a. Ensure that your environment is configured for the `orcl` database by executing the `oraenv` command in each terminal window.

```
$ . oraenv
ORACLE_SID = [oracle] ? orcl
...
$
```

- b. In one terminal window, invoke SQL*Plus and connect as NGREENBERG with the password `oracle_4U`. Perform the update shown below. Do *not* commit or exit the SQL*Plus session.

```
$ sqlplus ngreenberg
...
Enter password:

Connected to:
...
SQL> show user
USER is "NGREENBERG"
SQL> update hr.employees set phone_number='650.555.1212'
   2 where employee_id = 110;

1 row updated.

SQL>
```

- c. Leave this session connected in the state that it is currently. *Do not* exit at this time.
2. In a separate terminal window, attempt to update the same row in a separate session by executing the SQL statement shown below. Do not worry if the session seems to “hang”—this is the condition that you are trying to create.

- a. Open a second terminal window. Log in to SQL*Plus as the SMAVRIS user with the password `oracle_4U`.

```
$ sqlplus smavris
...
Enter password:
...
SQL> update hr.employees set salary=8300
   2 where employee_id = 110;
```

- b. Notice that this session appears to be hung. Leave this session as is and move on to the next step.
3. Using Enterprise Manager Database Express, navigate to the Current Findings tab of the Performance Hub page and determine which session is causing the locking conflict.
- a. Open a browser and enter the following URL to launch Enterprise Manager Database Express: <https://localhost:5500/em>
 - b. Enter **SYS** in the User Name field and **oracle_4U** in the Password field. Select “as sysdba” and click Login.
 - c. Select **Performance > Performance Hub**. Then click the **Current ADDM Findings** tab. In the Findings section, click the “Unresolved hangs or session wait chains” detail finding.

Finding	Scope	Priority	Number of Recommendations	Impact
Unresolved hangs or session wait chains	1	100%		
Unresolved hangs or session wait chains	1	100%	1	
SQL statements consuming significant database time	1	71.9%		

- d. In the Details section, you should see two sessions listed. The first session is the blocker. In the example, the session ID of the blocker is 1:35,53403. The session ID you see will be different. Record the session ID _____

Session ID	Blocker Type	Process	Blockers
1:32,35443		Foreground	1:35,53403
1:35,53403		Foreground	

Note: You will resolve the blocking session in Enterprise Manager Cloud Control in later steps. However, note that you could execute the following statement as **SYSDBA** to kill the session:

```
ALTER SYSTEM KILL SESSION (35,53403);
```

You could also issue the following command as an OS sys administrator to stop the OS process associated with the blocking session:

```
$ kill 4131
```

4. Using Enterprise Manager Cloud Control, find the details of the blocking session.
- a. Log in to Cloud Control as the **admin** user with password **oracle_4U**. Then navigate to the **orcl** home page.
 - b. Because Susan Mavris does not know what is wrong, you start Real Time ADDM to diagnose the problem. Select **Performance > Real Time ADDM**.
 - c. If you are asked for credentials, use **Preferred** and **SYSDBA** Database Credentials. Then click **Submit**.
 - d. On the Real-Time ADDM page, in the Results section, click **Start**.

- e. When the Number of Findings field shows a value, click the **Findings** tab.

The screenshot shows the 'Real-Time ADDM Results' window. At the top, there are three buttons: 'Start' (green), 'Stop' (grey), and 'Restart' (blue). Below them is a navigation bar with tabs: 'Progress' (selected, grey), 'Findings' (blue), 'Hardware Resources' (grey), 'Activity' (grey), 'Hang Data' (grey), and 'Statistics' (grey). The main area displays the following information:

- Status: FINISHED
- Start Time: Tue Nov 13, 2012 12:47:00 PM
- End Time: Tue Nov 13, 2012 12:52:48 PM
- Number of Findings: 2 (highlighted with a red box)

Below this, there are two sections:

- Normal Connection:** Contains a list of green checkmarks indicating successful connections:
 - JDBC Connection to the Database
 - Basic Meta-data (database version and number of instances)
 - Database and Instance Meta Data
 - Hang Analysis Data
 - Database Metrics
 - Raw ASH Data
- Diagnostic Connection:** Contains a list of items with status indicators:
 - Acquire SYSDBA Credentials (green checkmark)
 - Session Activity by Wait Classes (red X)
 - Hang Analysis Data (green checkmark)
 - I/O Metrics (green checkmark)
 - Host Metrics (green checkmark)

- f. Notice that the Findings tab displays the same information about blocking sessions that you saw in EM Database Express.

The screenshot shows the 'Real-Time ADDM Results' window with the 'Findings' tab selected. The interface includes the same top buttons and navigation bar as the previous screenshot.

The findings table has the following structure:

Priority	Performance Impact	Finding
High	100	Unresolved hangs or session wait chains Recommendation 1: Kill the session with ID [1,35,53403] (instance number, SID, serial number).

- g. Click the Hang Data tab. Notice that this tab gives you session details for the blocking session, such as user name. You could contact NGREENBERG directly and ask her to commit or rollback the transaction, or you could kill her session. *Do not kill the session at this time.* Continue to investigate the issue.

Session Id	Num Waiters	Cumulative ...	User Name	Program Na...	Service	Module	Action
35	1	324	NGREENBERG	sqlplus@EDRSR32F	SYSSUSERS	SQL*Plus	- No Value -

Session Id	Secs in wait	User Name	Program Name	Module	Action	wait_event_text
32	324	SMAVRIS	sqlplus@EDRSR32P1	SQL*Plus	- No Value -	enq: TX - row lock cont

- h. Select Performance > Blocking Sessions.

Select	Username	Sessions Blocked	Session ID	Serial Number	SQL ID	Wait Class
<input checked="" type="radio"/>	Blocking Sessions	0				
<input checked="" type="radio"/>	NGREENBERG	1	35	53403		Idle
<input type="radio"/>	SMAVRIS	0	32	35443	bk3sumaapsy1b	Application

5. What was the last SQL statement that the blocking session executed?
- Select the NGREENBERG session, and then click **View Session**.
 - Under the Application heading, click the hash value link for **Current SQL** or **Previous SQL**.

- c. Note the SQL that was most recently run. Seeing the last SQL statement can help you to decide which session to kill.

Top Activity > SQL Details: a7s3d40zkg8d9
SQL Details: a7s3d40zkg8d9

Switch to SQL ID Go View Data Real Time: Manual Refresh ▾

Text

```
update hr.employees set phone_number='650.555.1212'
where employee_id = 110
```

6. Resolve the conflict in favor of the user who complained, by killing the *blocking* session.
- Select **Performance > Blocking Sessions**
 - Select the NGREENBERG session, and then click **Kill Session**.
 - On the Confirmation page, select **Kill Immediate**. Click **Show SQL**.
 - On the confirmation page, the SQL Statement is shown.
- Top Activity > Session Details: 35 (NGREENBERG) > Kill Session > Show SQL
Show DDL
- ```
ALTER SYSTEM KILL SESSION '35,53403' IMMEDIATE
```
- Click **Return**.
  - Click **Yes**.
  - On the Blocking Sessions page, the listing is gone, and an information message appears saying that session *nnn* has been killed.
  - Return to the orcl Database Home page.
7. Return to the SQL\*Plus command window, and note that SMAVRIS's update has now completed successfully. Issue a ROLLBACK command in this session and exit SQL\*Plus.

```
SQL> update hr.employees set salary=8300
2> where employee_id = 110;

1 row updated.

SQL> ROLLBACK;

Rollback complete.

SQL> exit
$
```

8. Try issuing a SQL select statement in the NGREENBERG session. What do you see?

```
SQL> SELECT sysdate from dual;
SELECT sysdate from dual
*
ERROR at line 1:
ORA-03135: connection lost contact
Process ID: 17280
Session ID: 29 Serial number: 53403

SQL>
```

*Answer:* The session has been disconnected. There could be other errors such as:

- ORA-12571: TNS:packet writer failure
- ORA-03114: not connected to ORACLE

9. Close all open SQL sessions by entering exit, and then close the terminal windows.

## **Practices for Lesson 14: Implementing Oracle Database Auditing**

**Chapter 14**

## Practices for Lesson 14: Overview

---

### Practices Overview

In the practices for this lesson, you will:

- Enable unified auditing
- Create audit users
- Create an audit policy
- Assign the audit policy to multiple users
- Change an audited table
- Review audit trail data in the `UNIFIED_AUDIT_TRAIL` view
- Maintain the audit trail

**Background:** You have just been informed of suspicious activities in the `HR.JOBS` table in your `orcl` database. The highest salaries seem to fluctuate in a strange way. You decide to enable auditing and monitor data manipulation language (DML) activities in this table.

## Practice 14-1: Enabling Unified Auditing

### Overview

In this practice, you enable unified auditing.

### Tasks

1. Shut down all Oracle processes in the `orcl` Oracle Home.
  - a. Set the environment variables for the `orcl` database.

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

- b. Shut down the `LISNERORCL` listener.

```
$ lsnrctl stop lisnerorcl

LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 18-OCT-
2013 12:24:23

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

Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=EDP0)(PORT=1561)))

The command completed successfully
$
```

- c. Shut down the `orcl` database instance. Exit SQL\*Plus.

```
$ sqlplus / as sysdba
...
Connected to:
...
SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL> EXIT
Disconnected ...
```

2. Enable the unified auditing feature.

```
$ cd $ORACLE_HOME/rdbms/lib
$ make -f ins_rdbms.mk uniaud_on ioracle
/usr/bin/ar d
/u01/app/oracle/product/12.1.0/dbhome_2/rdbms/lib/libknlopt.a
kzanang.o
...
- Linking Oracle
rm -f /u01/app/oracle/product/12.1.0/dbhome_2/rdbms/lib/oracle
/u01/app/oracle/product/12.1.0/dbhome_2/bin/orald -o
/u01/app/oracle/product/12.1.0/dbhome_2/rdbms/lib/oracle -m64 -z
noexecstack -Wl,--disable-new-dtags -
...
mv /u01/app/oracle/product/12.1.0/dbhome_2/rdbms/lib/oracle
/u01/app/oracle/product/12.1.0/dbhome_2/bin/oracle
chmod 6751 /u01/app/oracle/product/12.1.0/dbhome_2/bin/oracle
$
```

3. Restart the processes.

a. Restart the listener.

```
$ lsnrctl start listenerorcl

LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 18-OCT-
2013 12:37:53

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

Starting /u01/app/oracle/product/12.1.0/dbhome_2/bin/tnslsnr:
please wait...

TNSLSNR for Linux: Version 12.1.0.1.0 - Production
System parameter file is
/u01/app/oracle/product/12.1.0/dbhome_2/network/admin/listener.o
ra
Log messages written to
/u01/app/oracle/diag/tnslsnr/EDP0/listenerorcl/alert/log.xml
Listening on:
(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp) (HOST=edp0.us.oracle.com) (PO
RT=1561)))

Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP) (HOST=EDP0) (PORT=1561)))
STATUS of the LISTENER

Alias listenerorcl
```

```
Version TNSLSNR for Linux: Version 12.1.0.1.0
- Production
Start Date 18-OCT-2013 12:37:53
Uptime 0 days 0 hr. 0 min. 0 sec
Trace Level off
Security ON: Local OS Authentication
SNMP OFF
Listener Parameter File
/u01/app/oracle/product/12.1.0/dbhome_2/network/admin/listener.ora
Listener Log File
/u01/app/oracle/diag/tnslsnr/EDP0/listenerorcl/alert/log.xml
Listening Endpoints Summary...
(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=edp0.us.oracle.com)(PORT=1561)))
The listener supports no services
The command completed successfully
$
```

- b. Restart the orcl database instance.

```
$ sqlplus / as sysdba
...
Connected to an idle instance.

SQL> startup
ORACLE instance started.
Total System Global Area 876859392 bytes
Fixed Size 2294360 bytes
Variable Size 583011752 bytes
Database Buffers 285212672 bytes
Redo Buffers 6340608 bytes
Database mounted.
Database opened.
```

- c. Verify that unified auditing is enabled.

```
SQL> SELECT value FROM v$option
 2 where parameter = 'Unified Auditing';

VALUE

TRUE

SQL> EXIT
```

```
Disconnected from Oracle Database 12c Enterprise Edition Release
12.1.0.1.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics, Real
Application Testing and Unified Auditing options
$
```

You can also see that the Unified Auditing feature is enabled by checking the SQL\*Plus banner.

## Practice 14-2: Creating Audit Users

---

### Overview

In this practice, you will create two audit users: one account to administer the audit settings and another account to be used by the external auditor. These additional users are optional, but are a good practice that provides a clear separation of duties as required in many businesses.

### Assumptions

Unified auditing has been enabled in the `orcl` database. Preferred SYSDBA credentials have been set.

### Tasks

1. Create a database user to be the administrator of the audit settings and policies. Name this user `AUDMGR` with the password `oracle_4U`, and assign the `AUDIT_ADMIN` role to this user. Use Enterprise Manager Cloud Control to perform this task.

| Step | Window/Page Description  | Choices or Values                                                                                                                                                        |
|------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a.   | Cloud Control            | Login:<br>User: <b>ADMIN</b><br>Password: <b>oracle_4U</b>                                                                                                               |
| b.   | Enterprise Summary       | Navigate to the <b>orcl</b> Database Home page.                                                                                                                          |
| c.   | orcl database home       | Select <b>Administration &gt; Security &gt; Users</b> .                                                                                                                  |
| d.   | Database Login           | Select:<br><br>Credential: <b>Preferred</b><br>Preferred Credential Name <b>SYSDBA Database Credentials</b><br>Click <b>Login</b> .                                      |
| e.   | Users                    | Click <b>Create</b> .                                                                                                                                                    |
| f.   | Create User :General tab | Enter:<br><br>Name: <b>AUDMGR</b><br>Password: <b>oracle_4U</b><br>Default Tablespace: <b>SYSAUX</b><br>Temporary Tablespace: <b>TEMP</b><br>Click the <b>Roles</b> tab. |
| g.   | Create User :Roles tab   | Click <b>Edit List</b> .                                                                                                                                                 |
| h.   | Modify Roles             | Select <b>AUDIT_ADMIN</b> and move it to <b>Selected Roles</b> .<br>Click <b>OK</b> .                                                                                    |
| i.   | Create User :Roles tab   | Click <b>Show SQL</b> .<br>Click <b>Return</b> .                                                                                                                         |
| j.   | Create User :Roles tab   | Click <b>OK</b> .                                                                                                                                                        |
| k.   | Users                    | An update message is displayed.                                                                                                                                          |

2. Create a database user to be used by any person that needs to view the audit data. Name this user AUDVWR with the password oracle\_4U and assign the AUDIT\_VIEWER role to this user.
  - a. Repeat the steps in Task 1, using AUDVWR as the user name and specifying AUDIT\_VIEWER as the role.
  - b. Return to the orcl Database Home page.

## Practice 14-3: Creating an Audit Policy

### Overview

In this practice, as the AUDMGR user, you will create an audit policy to monitor activity in the HR.JOBS table and apply it to multiple users.

### Assumptions

The AUDMGR user has been created. Several users with DML privileges on HR.JOBS have been created.

### Tasks

1. Invoke SQL\*Plus and connect to the orcl database as the AUDMGR user. Create a policy named JOBS\_AUDIT that audits all auditable statements for the HR.JOBS table.
  - a. Connect to the orcl database as the AUDMGR user by using SQL\*Plus.

```
$ sqlplus audmgr
Enter password: oracle_4U
...
SQL>
```

- b. Create an audit policy to track UPDATE commands issued against the HR.JOBS table.

```
SQL> CREATE AUDIT POLICY jobs_audit_upd
 2 ACTIONS update ON hr.jobs;

Audit policy created.
```

- c. Verify the creation of the JOBS\_AUDIT policy.

```
SQL> SELECT audit_option, audit_option_type, object_schema,
object_name
 2 FROM audit_unified_policies
 3 WHERE policy_name = 'JOBS_AUDIT_UPD';

AUDIT_OPTION AUDIT_OPTION_TYPE OBJECT_SCHEMA OBJECT_NAME
----- ----- ----- -----
UPDATE OBJECT ACTION HR JOBS
```

**Question:** If you had multiple databases with the same users and data, such as a QA and development databases, how would you make sure that this policy is applied in all the databases?

**Answer:** Two ways have been shown: 1) Create a SQL script and run the script in the other databases. 2) Use Cloud Control to run in multiple databases. A third option is to re-create the other databases from the production database after the changes have been applied. This technique is out of the scope of this course.

2. Assign the policy to all users.

```
SQL> AUDIT POLICY jobs_audit_upd;

Audit succeeded.
```

3. View information about the audit policy.

```
SQL> column POLICY_NAME format A20
SQL> column USER_NAME format A20
SQL> SELECT policy_name, enabled_opt,
2> user_name, success, failure
3> FROM audit_unified_enabled_policies;

POLICY_NAME ENABLED_ USER_NAME SUC FAI
----- ----- -----
ORA_SECURECONFIG BY ALL USERS YES YES
JOBS_AUDIT_UPD BY ALL USERS YES YES

SQL>
```

4. Test the audit policy by connecting as a user that has privileges to update rows in the HR.JOB\$ table.

- a. Connect as the DHAMBY user and update MAX\_SALARY of the President to \$50000.

```
SQL> connect DHAMBY
Enter password:
Connected.
SQL> desc hr.jobs
Name Null? Type

JOB_ID NOT NULL VARCHAR2(10)
JOB_TITLE NOT NULL VARCHAR2(35)
MIN_SALARY NUMBER(6)
MAX_SALARY NUMBER(6)

SQL> select * from hr.jobs where job_title = 'President';

JOB_ID JOB_TITLE MIN_SALARY MAX_SALARY
----- ----- -----
AD_PRES President 20080 40000

SQL> update hr.jobs set max_salary = 50000
2 where JOB_ID = 'AD_PRES';

1 row updated.

SQL> exit
```

- b. Connect as the AUDMGR user and view the audit trail records for this change.

```
$ sqlplus audmgr
Enter password:
SQL> col unified_audit_policies format a25
SQL> col action_name format a10
SQL> col object_schema format a10
SQL> col object_name format a10
SQL> select unified_audit_policies, action_name,
2 object_schema, object_name
3 from unified_audit_trail
4 where dbusername = 'DHAMBY';

UNIFIED_AUDIT_POLICIES ACTION_NAM OBJECT_SCH OBJECT_NAM
----- ----- -----
JOBS_AUDIT_UPD UPDATE HR JOBS
ORA_SECURECONFIG LOGON
ORA_SECURECONFIG LOGON
ORA_SECURECONFIG LOGOFF
```

- c. If you did not see any rows as a result of the query in step 4b, flush the audit records.

**Note:** The default behavior of the Unified Audit Engine is to queue the audit records and write them to the Unified Audit trail as the queue fills. The

DBMS\_AUDIT\_MGMT.FLUSH\_UNIFIED\_AUDIT\_TRAIL procedure forces the records in the queue to be written to disk. The audit records are not visible until they are written to the audit trail.

```
SQL> EXEC DBMS_AUDIT_MGMT.FLUSH_UNIFIED_AUDIT_TRAIL;
PL/SQL procedure successfully completed.

SQL> select unified_audit_policies, action_name,
 2 object_schema, object_name
 3 from unified_audit_trail
 4 where dbusername = 'DHAMBY';

UNIFIED_AUDIT_POLICIES ACTION_NAM OBJECT_SCH OBJECT_NAM
----- ----- -----
JOBS_AUDIT_UPD UPDATE HR JOBS
ORA_SECURECONFIG LOGON
ORA_SECURECONFIG LOGON
ORA_SECURECONFIG LOGON
ORA_SECURECONFIG LOGOFF
ORA_SECURECONFIG LOGOFF

6 rows selected.
```

- d. Exit SQL\*Plus.

## **Practices for Lesson 15: Backup and Recovery Concepts**

**Chapter 15**

## Practices for Lesson 15

---

### Practices Overview

There are no practices for this lesson.

## **Practices for Lesson 16: Backup and Recovery Configuration**

**Chapter 16**

## Practices for Lesson 16: Overview

---

### Practices Overview

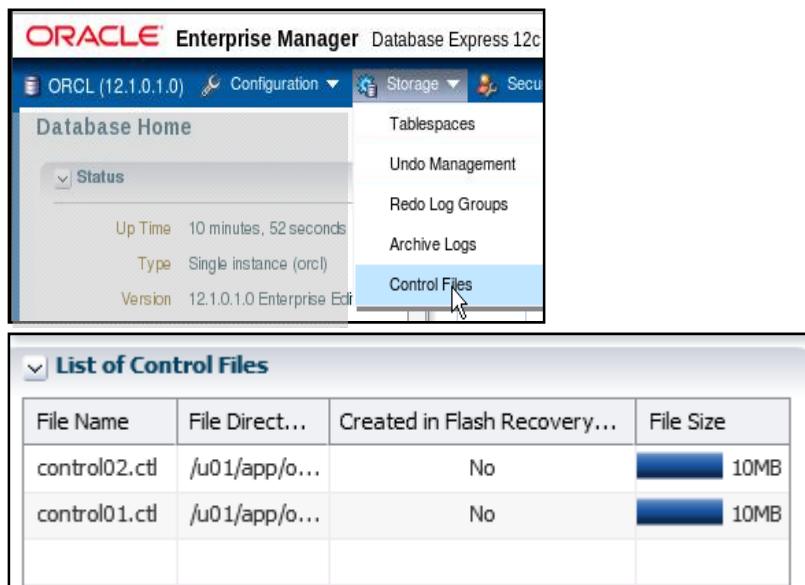
Configure your database to reduce the chances of failure or data loss. To do so, perform the following tasks:

- Ensure redundancy of control files.
- Review the fast recovery area configuration.
- Ensure that there are at least two redo log members in each group.
- Place your database in ARCHIVELOG mode.
- Configure redundant archive log destinations.

## Practice 16-1: Configuring Your Database for Recovery

In this practice, you verify that your database is configured properly to support recovery operations in the event of a failure.

1. Verify that the control files are multiplexed.
  - a. Launch Enterprise Manager Database Express. Log in as the DBA1 user and select as sysdba.
  - b. Select **Storage > Control Files**.



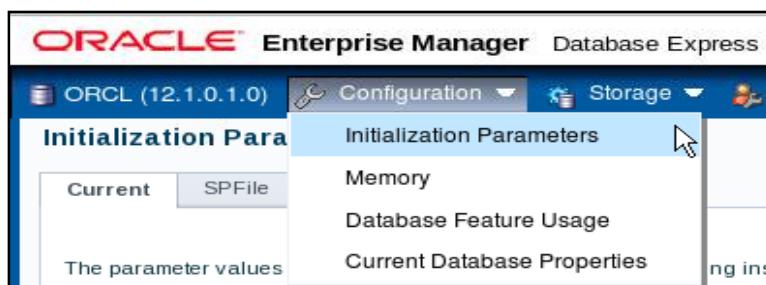
The screenshot shows the Oracle Enterprise Manager Database Express interface for database ORCL (12.1.0.1.0). The left sidebar shows 'Database Home' with status information: Up Time (10 minutes, 52 seconds), Type (Single instance (orcl)), and Version (12.1.0.1.0 Enterprise Edition). The right sidebar has links for Tablespaces, Undo Management, Redo Log Groups, Archive Logs, and Control Files. The 'Control Files' link is highlighted with a mouse cursor. Below this, a table titled 'List of Control Files' displays two entries:

| File Name     | File Direct... | Created in Flash Recovery... | File Size |
|---------------|----------------|------------------------------|-----------|
| control02.ctl | /u01/app/o...  | No                           | 10MB      |
| control01.ctl | /u01/app/o...  | No                           | 10MB      |

*Question 1:* On the Control Files: List of Control Files page, how many control files do you have?

*Answer:* 2

2. Review the fast recovery area configuration and change the size to 8 GB.
  - a. In Enterprise Manager Database Express, select **Configuration > Initialization Parameters**.



The screenshot shows the Oracle Enterprise Manager Database Express interface for database ORCL (12.1.0.1.0). The left sidebar shows 'Initialization Parameters' with tabs for 'Current' and 'SPFile'. The right sidebar lists 'Initialization Parameters', 'Memory', 'Database Feature Usage', and 'Current Database Properties'. The 'Initialization Parameters' link is highlighted with a mouse cursor.

- b. View the values of the initialization parameters in the “Archiving and Recovery” section that start with db\_recovery\_file.

| The parameter values listed here are currently used by the running instance(s) |                              |
|--------------------------------------------------------------------------------|------------------------------|
| <a href="#">View</a> <a href="#">Set...</a> <a href="#">Help</a>               |                              |
| Name                                                                           | Value                        |
| <b>Ans Complianc</b>                                                           |                              |
| blank_trimming                                                                 | false                        |
| <b>Archiving and Recovery</b>                                                  |                              |
| control_file_record_keep_time                                                  | 7                            |
| db_create_online_log_dest_1                                                    |                              |
| db_create_online_log_dest_2                                                    |                              |
| db_create_online_log_dest_3                                                    |                              |
| db_create_online_log_dest_4                                                    |                              |
| db_create_online_log_dest_5                                                    |                              |
| db_recovery_file_dest                                                          | /u01/app/oracle/fast_reco... |
| db_recovery_file_dest_size                                                     | 4800M                        |

*Question:* Is the fast recovery area enabled?

*Answer:* Yes, because the db\_recovery\_file\_dest and db\_recovery\_file\_dest\_size parameters values are not null.

- c. Note the location of the fast recovery area.

*For example:* /u01/app/oracle/fast\_recovery\_area

- d. *Question:* Which essential DBA tasks can you perform in this section?

*Answer:* You can change the location and size for the fast recovery area.

- e. *Question:* Does changing the size of the fast recovery area require the database to be restarted?

*Answer:* No, a restart is not required for this change, because this is a dynamic parameter. This is indicated by the check in the Dynamic column.

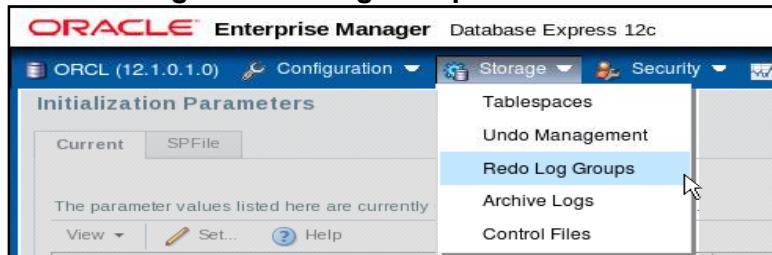
- f. Change the size of the Fast Recovery Area to **8 GB**, by selecting the DB\_RECOVERY\_FILE\_DEST\_SIZE parameter and clicking **Set**. Then enter 8G in the **Value** field of the Set Initialization Parameter page.



- g. Optionally, click **Show SQL**, review the statement, and click **OK**.

```
alter system set 'db_recovery_file_dest_size'='8g'
scope=both sid='*' ;
```

- h. In the Set Initialization Parameter box, click **OK**.  
i. A Confirmation message is returned. Click **OK**.
3. Check how many members each redo log group has. Ensure that there are at least two redo log members in each group. One set of members should be stored in the fast recovery area.
- a. Select **Storage > Redo Log Groups**.



- b. Note how many members are in the Member Count column. There is only one member in each group.

| Name             | Status   | Membe...   | Archived | Size | Sequence | First Change ... | File Dir... |
|------------------|----------|------------|----------|------|----------|------------------|-------------|
| Redo Log Group 1 | Inactive | 1          |          | 50MB | 28       | 2246313          |             |
|                  |          | redo01.log |          | 50MB |          |                  | /u01/a...   |
| Redo Log Group 2 | Inactive | 1          |          | 50MB | 29       | 2265198          |             |
|                  |          | redo02.log |          | 50MB |          |                  | /u01/a...   |
| Redo Log Group 3 | Current  | 1          |          | 50MB | 30       | 2277242          |             |
|                  |          | redo03.log |          | 50MB |          |                  | /u01/a...   |

- c. Select one of your redo log groups and click **Add Member...** to add another member to the Redo Log Group. Enter `redonnb.log` in the File Name field where *nn* represents the redo log group number.



- d. You can click **Show SQL** to view the SQL statement. Click **OK**.

```
ALTER DATABASE
 ADD LOGFILE MEMBER
 '/u01/app/oracle/oradata/orcl/redo01b.log'
 TO GROUP 1;
```

- e. A Confirmation message is returned. Click **OK**.

- f. Now you can see that the **Member Count** column shows 2 for one of the redo log groups.

| Name             | Status   | Member Count | Archived | Size                  | Sequence | First Cha... | File Directory                                                                                  |
|------------------|----------|--------------|----------|-----------------------|----------|--------------|-------------------------------------------------------------------------------------------------|
| Redo Log Group 1 | Inactive | 2            |          | 100MB<br>50MB<br>50MB | 595      | 33931725     | /u01/app/oracle/oradata/orcl/<br>/u01/app/oracle/oradata/orcl/<br>/u01/app/oracle/oradata/orcl/ |
| Redo Log Group 2 | Current  | 1            |          | 50MB<br>50MB          | 596      | 33936712     | /u01/app/oracle/oradata/orcl/<br>/u01/app/oracle/oradata/orcl/                                  |
| Redo Log Group 3 | Inactive | 1            |          | 50MB<br>50MB          | 594      | 33906379     | /u01/app/oracle/oradata/orcl/<br>/u01/app/oracle/oradata/orcl/                                  |

- g. Repeat steps c, d, and e to add another member to the other two redo log groups. After repeating these steps, you should have two members in each redo log group.

| Name             | Status   | Member Count | Archived | Size                          | Sequence | First Cha... | File Directory                                                                                                                   |
|------------------|----------|--------------|----------|-------------------------------|----------|--------------|----------------------------------------------------------------------------------------------------------------------------------|
| Redo Log Group 1 | Inactive | 3            |          | 100MB<br>50MB<br>50MB<br>50MB | 595      | 33931725     | /u01/app/oracle/oradata/orcl/<br>/u01/app/oracle/oradata/orcl/<br>/u01/app/oracle/oradata/orcl/<br>/u01/app/oracle/oradata/orcl/ |
| Redo Log Group 2 | Current  | 3            |          | 100MB<br>50MB<br>50MB<br>50MB | 596      | 33936712     | /u01/app/oracle/oradata/orcl/<br>/u01/app/oracle/oradata/orcl/<br>/u01/app/oracle/oradata/orcl/<br>/u01/app/oracle/oradata/orcl/ |
| Redo Log Group 3 | Inactive | 3            |          | 100MB<br>50MB<br>50MB<br>50MB | 594      | 33906379     | /u01/app/oracle/oradata/orcl/<br>/u01/app/oracle/oradata/orcl/<br>/u01/app/oracle/oradata/orcl/<br>/u01/app/oracle/oradata/orcl/ |

- h. Log out of Enterprise Manager Database Express.

4. You notice that for each redo log group the Archived column has no value. This means that your database is not retaining copies of redo logs to use for database recovery, and in the event of a failure, you will lose all data since your last backup. Place your database in ARCHIVELOG mode, so that redo logs are archived.
- You do not need to specify a naming convention or a destination for the archived redo log files, because you are using a fast recovery area.

**Note:** If you add archive log destinations, you must create the directory if it does not already exist.

Use SQL\*Plus to set the database in ARCHIVELOG mode.

```
$. oraenv
ORACLE_SID = [orcl] ? orcl
The Oracle base remains unchanged with value /u01/app/oracle
$
$ sqlplus / as sysdba
...
Connected to:
...
SQL>
```

- b. Shut down the instance.

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

- c. Start the database in MOUNT mode.

```
SQL> startup mount
ORACLE instance started.

Total System Global Area 876859392 bytes
Fixed Size 2294360 bytes
Variable Size 578817448 bytes
Database Buffers 289406976 bytes
Redo Buffers 6340608 bytes
Database mounted.

SQL>
```

- d. Set the mode to ARCHIVELOG.

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

SQL>
```

- e. Open the database.

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

SQL>
```

- f. Shut down the database instance.

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

- g. Start the database instance again. Once your database has restarted, use the **ARCHIVE LOG LIST** command to verify that the database is in ARCHIVELOG mode. Exit SQL\*Plus.

```
SQL> startup
ORACLE instance started.

Total System Global Area 876859392 bytes
Fixed Size 2294360 bytes
Variable Size 583011752 bytes
Database Buffers 285212672 bytes
Redo Buffers 6340608 bytes
Database mounted.
Database opened.

SQL> archive log list
Database log mode Archive Mode
Automatic archival Enabled
Archive destination USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence 594
Next log sequence to archive 596
Current log sequence 596
SQL> exit
Disconnected ...
$
```

Now that your database is in ARCHIVELOG mode, it will continually archive a copy of each online redo log file before reusing it for additional redo data.

**Note:** Remember that this consumes space on the disk and that you must regularly back up older archive logs to some other storage.

## 5. Configure redundant archive log destinations.

- a. Create a new directory named /u01/app/oracle/oradata/orcl/archive\_dir2 by executing the `mkdir` command at the operating system prompt.

```
$ mkdir /u01/app/oracle/oradata/orcl/archive_dir2
$
```

- b. Set the `LOG_ARCHIVE_DEST_1` parameter to the FRA destination and the `LOG_ARCHIVE_DEST_2` parameter to the new directory.

```
$ sqlplus / as sysdba
...
Connected to:
...
SQL> ALTER SYSTEM SET
log_archive_dest_1='LOCATION=/u01/app/oracle/fast_recovery_area/
ORCL/archivelog' SCOPE=both;
```

```
System altered.
SQL> ALTER SYSTEM SET
log_archive_dest_2='LOCATION=/u01/app/oracle/oradata/orcl/archiv
e_dir2' SCOPE=both;

System altered.

SQL>
```

- c. Verify that archive logs are created in both destinations by querying V\$ARCHIVED\_LOG. Exit SQL\*Plus.

```
SQL> alter system switch logfile;

System altered.

SQL> alter system switch logfile;

System altered.

SQL> alter system switch logfile;

System altered.

SQL> SELECT name from V$ARCHIVED_LOG ORDER BY STAMP;

NAME

/u01/app/oracle/fast_recovery_area/ORCL/archivelog/1_30_80122835
5.dbf
/u01/app/oracle/oradata/orcl/archive_dir2/1_30_801228355.dbf
/u01/app/oracle/fast_recovery_area/ORCL/archivelog/1_31_80122835
5.dbf
/u01/app/oracle/oradata/orcl/archive_dir2/1_31_801228355.dbf
/u01/app/oracle/fast_recovery_area/ORCL/archivelog/1_32_80122835
5.dbf
/u01/app/oracle/oradata/orcl/archive_dir2/1_32_801228355.dbf

6 rows selected.

SQL> EXIT
$
```

## **Practices for Lesson 17: Performing Database Backups**

**Chapter 17**

## Practices for Lesson 17: Overview

---

### Practices Overview

In these practices, you will create backups of your database so that you can recover from various types of failures.

## Practice 17-1: Backing Up the Control File

### Overview

In this practice, you back up your control file to a trace file, creating a file of SQL commands that can be used to re-create the control file.

### Assumptions

Practices for Lesson 16 have been successfully completed.

### Tasks

1. Launch Enterprise Manager Cloud Control and log in as the **ADMIN** user.
2. Navigate to the **orcl** Database Home page.
3. Select **Administration > Storage > Control Files**.
4. Log in to the **orcl** database with your named credential.
5. On the Control Files page, click **Backup to Trace**.

| Valid | File Name     | File Directory                           |
|-------|---------------|------------------------------------------|
| VALID | control01.ctf | /u01/app/oracle/oradata/orcl/            |
| VALID | control02.ctf | /u01/app/oracle/fast_recovery_area/orcl/ |

6. An update message is displayed. Note the location of the trace file. Click **OK**.

7. You can also perform a control file back up to trace by executing a SQL command. Log in to SQL\*Plus as the **DBA1** user and execute the **ALTER DATABASE BACKUP CONTROLFILE TO TRACE** command. Exit SQL\*Plus.

```
SQL> sqlplus dba1 as sysdba
...
SQL> alter database backup controlfile to trace;
Database altered.
SQL> exit
```

8. Navigate to the directory that you noted in step 6 and view the end of the alert log to verify the creation of the trace files and the names of the files.

```
$ cd /u01/app/oracle/diag/rdbms/orcl/orcl/trace
[trace]$ tail alert_orcl.log
Mon Oct 21 11:24:46 2013
ALTER DATABASE BACKUP CONTROLFILE TO TRACE
Mon Oct 21 11:24:46 2013
Backup controlfile written to trace file
/u01/app/oracle/diag/rdbms/orcl/orcl/trace/orcl_ora_31736.trc
Completed: ALTER DATABASE BACKUP CONTROLFILE TO TRACE
Mon Oct 21 11:25:56 2013
alter database backup controlfile to trace
Mon Oct 21 11:25:56 2013
Backup controlfile written to trace file
/u01/app/oracle/diag/rdbms/orcl/orcl/trace/orcl_ora_31844.trc
Completed: alter database backup controlfile to trace
```

## Practice 17-2: Configuring Automatic Backups of the Control File and SPFILE

### Overview

In this practice, you configure automatic backups of the control file and server parameter file (SPFILE) when a backup of the database is made and when there is a structural change to the database.

### Tasks

1. Return to the `orcl` Database Home page in Enterprise Manager Cloud Control.
2. Select **Availability > Backup & Recovery > Backup Settings**.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The top navigation bar includes links for Enterprise, Targets, Favorites, and History. Below the navigation bar, the database name `orcl` is displayed. The main menu bar has tabs for Oracle Database, Performance, Availability (which is selected), Schema, and Administration. A dropdown menu from the Availability tab shows options like High Availability Console, MAA Advisor, and Backup & Recovery. The Backup & Recovery option is highlighted. A secondary dropdown menu from the Backup & Recovery option lists several backup-related functions: Schedule Backup..., Manage Current Backups, Backup Reports, Restore Points, Perform Recovery..., Transactions, Backup Settings (which is also highlighted), Recovery Settings, and Recovery Catalog Settings. The status bar at the bottom shows the current time as 9:56 AM, 10:06 AM, and 10:16.

3. On the Backup Settings page, click the **Policy** tab.
4. Select **Automatically backup the control file and server parameter file (SPFILE) with every backup and database structural change**.

The screenshot shows the Backup Settings page in Oracle Enterprise Manager. The top navigation bar and database selection are identical to the previous screenshot. The main content area is titled "Backup Settings" and features three tabs: Device, Backup Set, and Policy (which is selected). Below the tabs, a section titled "Backup Policy" contains a checkbox labeled "Automatically backup the control file and server parameter file (SPFILE) with every backup and database structural change". This checkbox is checked. Below the checkbox is a section titled "Autobackup Disk Location" with a text input field and a descriptive tooltip: "An existing directory or diskgroup name where the control file and server parameter file will be backed up, backed up to the fast recovery area location."

5. Scroll to the bottom of the page. In the Host Credentials section, select **New**. Enter **oracle** as the username and password. Click **Test** to ensure that you entered the values properly.

**Host Credentials**  
Supply operating system login credentials to access the target database.

Credential  Preferred  Named  New

\* UserName

\* Password

Save As

**Test** Test Successful.

6. Click **OK**.

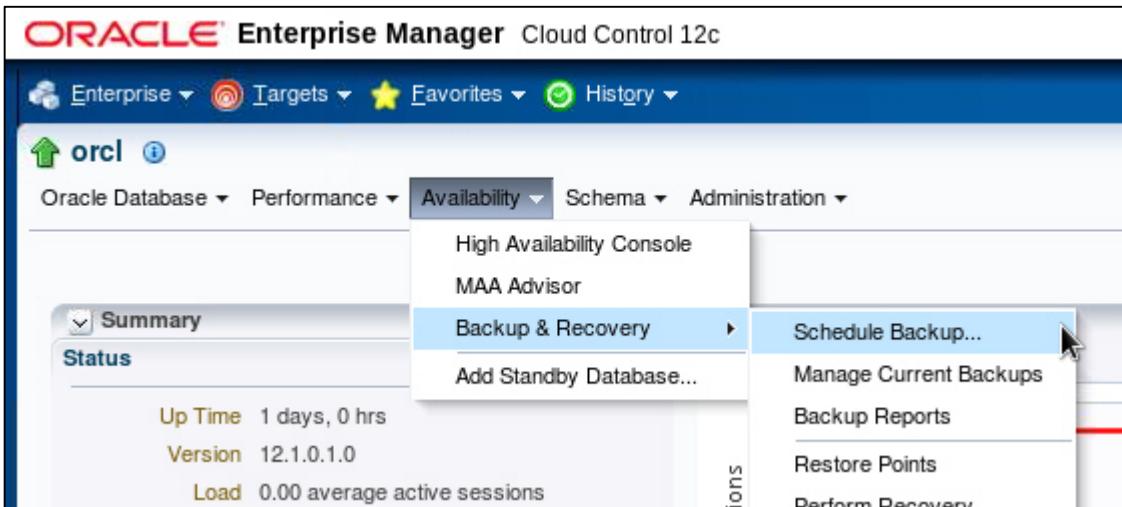
## Practice 17-3: Creating a Whole Database Backup

### Overview

In this practice, you back up your entire database, including the archived redo log files. The backup should be the base for an incremental backup strategy.

### Tasks

1. In Enterprise Manager Cloud Control, select **Availability > Backup & Recovery > Schedule Backup**.



2. In the Customized Backup section, select **Whole Database**. Confirm that the host credentials are set with oracle as the user name and password. Click **Schedule Customized Backup**.

The screenshot shows the 'Schedule Backup' page. At the top, it says 'Oracle provides an automated backup strategy based on your disk and/or tape configuration. Alternatively, you can choose to create a customized backup.' Below this is a section titled 'Oracle-Suggested Backup' with the sub-instruction 'Schedule a backup using Oracle's automated backup strategy.' To its right is a button labeled 'Schedule Oracle-Suggested Backup'. Below this is another section titled 'Customized Backup' with the sub-instruction 'Select the object(s) you want to back up.' To its right is a button labeled 'Schedule Customized Backup'. Under 'Customized Backup', there are several radio buttons: 'Whole Database' (which is selected), 'Tablespaces', 'Datafiles', 'Archived Logs', and 'All Recovery Files on Disk'. A note below these says 'Includes all archived logs and disk backups that are not already backed up to tape.'

3. In the Backup Type section, select **Full Backup** and **Use as the base of an incremental backup strategy**.
4. In the Backup Mode section, select **Online Backup**.

5. In the Advanced section, select **Also back up all archived logs on disk** and **Delete all archived logs from disk after they are successfully backed up**. Click **Next**.

**Schedule Customized Backup: Options**

Database **orcl**  
Backup Strategy **Customized Backup**  
Object Type **Whole Database**

**Backup Type**

Full Backup  
 Use as the base of an incremental backup strategy

Incremental Backup  
A level 1 cumulative incremental backup includes all blocks changed since the most recent level 0 backup.  
 Refresh the latest datafile copy on disk to the current time using the incremental backup

**Backup Mode**

Online Backup  
Can be performed when the database is open.

Offline Backup  
If the database is open at the time of backup, it will be shut down and mounted before the backup, then re-opened after the backup.

**Advanced**

Also back up all archived logs on disk  
 Delete all archived logs from disk after they are successfully backed up

Delete obsolete backups  
Delete backups that are no longer required to satisfy the retention policy.

Use proxy copy supported by media management software to perform a backup  
If proxy copy of the selected files is not supported, a conventional backup will be performed.

6. On the Settings page, select **Disk** as the backup destination. Click **Next**.

**Schedule Customized Backup: Settings**

Database **orcl**  
Backup Strategy **Customized Backup**  
Object Type **Whole Database**

Select the destination media for this backup. You can also override the default backup settings.

Disk  
Disk Backup Location **/u01/app/oracle/fast\_recovery\_area**

Tape  
Media Management Vendor (MMV) Library Parameters Not specified

[View Default Settings](#) [Override Default Settings](#)

Changed settings will only apply to the current backup.

[Return to Schedule Backup](#)

7. On the Schedule page, accept the defaults. Click **Next**.

**Schedule Customized Backup: Schedule**

Database **orcl**  
Backup Strategy **Customized Backup**  
Object Type **Whole Database**

**Job**

\* Job Name **BACKUP\_ORCL\_000081**  
Job Description **Whole Database Backup**

**Schedule**

Type  One Time (Immediately)  One Time (Later)  Repeating

[Return to Schedule Backup](#)

8. On the Review page, review the RMAN script and then click **Submit Job**.

**Schedule Customized Backup: Review**

Database **orcl**  
Backup Strategy **Customized Backup**  
Object Type **Whole Database**

**Settings**

Destination **Disk**  
Backup Type **Use as the base of an incremental backup strategy**  
Backup Mode **Online Backup**  
Fast Recovery Area **/u01/app/oracle/fast\_recovery\_area**

**RMAN Script**

The RMAN script below is generated based on previous input.

```
backup incremental level 0 cumulative device type disk tag '%TAG' database;
backup device type disk tag '%TAG' archivelog all not backed up delete all input;
```

[Return to Schedule Backup](#)

9. A confirmation message is displayed. Click **View Job**.

10. Click the refresh icon on the right side of page until you see that the job has completed successfully.

**Execution: orcl**

[Delete Run](#) [Edit](#) [View Definition](#)

**Summary**

[Log Report](#)

|              |                                    |                         |                                     |
|--------------|------------------------------------|-------------------------|-------------------------------------|
| Status       | Succeeded                          | Type                    | Database Backup                     |
| Scheduled    | Oct 21, 2013 11:33:13 AM GMT+00:00 | Owner                   | ADMIN                               |
| Started      | Oct 21, 2013 11:33:18 AM GMT+00:00 | Description             | Whole Database Backup               |
| Ended        | Oct 21, 2013 11:36:14 AM GMT+00:00 | Execution ID            | E93F81B7AEAD7AC2E0437023B98B0D5E    |
| Elapsed Time | 2 minutes, 56 seconds              | Backup Strategy         | advanced                            |
|              |                                    | Version 10g or higher   | YES                                 |
|              |                                    | Database Connect String | (DESCRIPTION=(ADDRESS_LIST=(ADDR... |
|              |                                    | Database Name           | ORCL                                |
|              |                                    | Blackout                | NO                                  |
|              |                                    | Encryption Mode         | None                                |
|              |                                    | Offline Backup          | NO                                  |
|              |                                    | Oracle Home             | /u01/app/oracle/product/12.1.0/d... |
|              |                                    | Oracle SID              | orcl                                |
|              |                                    | Backup Script           | Show                                |

Targets:

Status:

[Expand All](#) | [Collapse All](#)

| Name              | Targets | Status    | Started                               | Ended                                 | Elapsed Time |
|-------------------|---------|-----------|---------------------------------------|---------------------------------------|--------------|
| Execution: orcl   | orcl    | Succeeded | Oct 21, 2013 11:33:18 AM<br>GMT+00:00 | Oct 21, 2013 11:36:14 AM<br>GMT+00:00 | 2.9 minutes  |
| Step: Pre-Backup  | orcl    | Succeeded | Oct 21, 2013 11:33:18 AM<br>GMT+00:00 | Oct 21, 2013 11:33:21 AM<br>GMT+00:00 | 3 seconds    |
| Step: Backup      | orcl    | Succeeded | Oct 21, 2013 11:33:21 AM<br>GMT+00:00 | Oct 21, 2013 11:36:10 AM<br>GMT+00:00 | 2.8 minutes  |
| Step: Post-Backup | orcl    | Succeeded | Oct 21, 2013 11:36:13 AM<br>GMT+00:00 | Oct 21, 2013 11:36:14 AM<br>GMT+00:00 | 0 seconds    |

11. Return to the `orcl` Database Home page.

## **Practices for Lesson 18: Performing Database Recovery**

**Chapter 18**

## Practices for Lesson 18: Overview

---

### Practices Overview

In this practice, you will use the Data Recovery Advisor to recover a lost data file.

## Practice 18-1: Recovering from the Loss of a Data File

### Overview

In this practice, you recover from the loss of a data file belonging to the EXAMPLE tablespace.

### Tasks

1. Open a terminal window and log in to SQL\*Plus as the `HR` user and query the `REGIONS` table.

```
$ sqlplus hr
Enter password: oracle_4U
SQL> SELECT * FROM regions;

REGION_ID REGION_NAME

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

2. Now connect as the `DBA1` user using the `SYSDBA` role.

```
SQL> connect dba1 as sysdba
Enter password:
Connected.
SQL>
```

3. Execute the `$LABS/P18/lab_18_01_03.sql` script to create a procedure that will be used later in this practice.

```
SQL> @$LABS/P18/lab_18_01_03
Connected.

Java created.
Procedure created.
PL/SQL procedure successfully completed.
...
Grant succeeded.

SQL>
```

4. Execute the `$LABS/P18/lab_18_01_04.sql` script. This script simulates a failure in the database environment by deleting a data file.

```
SQL> @$LABS/P18/lab_18_01_04

PL/SQL procedure successfully completed.

>Data file deleted. Wait a couple minutes before proceeding."
```

```
"Database should be open."
Disconnected...
$
```

5. Invoke SQL\*Plus again and log in as the **HR** user. Again query the REGIONS table.

```
$ sqlplus hr
Enter password:

SQL> select * from hr.regions;
select * from hr.regions
*
ERROR at line 1:
ORA-01116: error in opening database file 2
ORA-01110: data file 2:
'/u01/app/oracle/oradata/orcl/example01.dbf'
ORA-27041: unable to open file
Linux-x86_64 Error: 2: No such file or directory
Additional information: 3

SQL>
```

6. Use Enterprise Manager Cloud Control to troubleshoot the error and recover the data file.
- Launch Enterprise Manager Cloud Control and log in as the **ADMIN** user.
  - Navigate to the **orcl** Database Home page.
  - Log in with your saved named database credentials.
  - Expand **Oracle Database**. Select **Monitoring > Incident Manager**. Note that a critical error is listed, indicating a data failure. You may have to wait a few minutes for the error to appear.

| Severity | Summary                                 | Target | Priority | Status | Last Updated             | Owner | Ackno | Escala | Type     |
|----------|-----------------------------------------|--------|----------|--------|--------------------------|-------|-------|--------|----------|
| Critical | Checker run found 1 new persistent data | orcl   | None     | New    | Oct 21, 2013 12:01:16 PM | -     | No    | No     | Incident |

- Expand **Availability**. Select **Backup & Recovery > Perform Recovery**.

- f. Specify a named host credential or enter **oracle** as the user name and password.  
Click the **Database Failures** link.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. At the top, it says "ORACLE Enterprise Manager Cloud Control 12c". Below that, a yellow bar contains the link "Database Failures - 1", which is highlighted with a red box. The main content area is titled "Perform Recovery". Under "Oracle Advised Recovery", it says "The Data Recovery Advisor has detected failures. Click on "Advise and Recover" to have Oracle analyze and produce recovery advice." A blue button labeled "Advise and Recover" is visible. Below this, it shows "Failures Detected Critical: 0 High: 1 Low: 0" and "Failure Description One or more non-system datafiles are missing". Under "User Directed Recovery", there is a "Recovery Scope" dropdown set to "Whole Database" and a "Recover" button. The "Operation Type" section shows three options: "Recover to the current time or a previous point-in-time" (selected), "Restore all datafiles", and "Recover from previously restored datafiles". Below this is a section titled "Decrypt Backups". Under "Host Credentials", it says "Supply operating system login credentials to access the target database." It shows "Credential" dropdown set to "Named", "Preferred" radio button, and "New" radio button. "Credential Name" dropdown is set to "NC\_ORCL\_2013-10-21-113057". "Credential Details" table shows "UserName" as "oracle" and "Password" as "\*\*\*\*\*". A "More Details" link is at the bottom of the table.

g. View the failure information. Click **Advise**.

**View and Manage Failures**

Last Refresh October 21, 2013 12:07:11 PM UTC

Select dropdown values and optionally enter failure description and impact strings to filter the data that is displayed in your results set.

| Failure Description | Impact | Priority         | Status | Time Detected |
|---------------------|--------|------------------|--------|---------------|
|                     |        | CRITICAL or HIGH | OPEN   | All           |

Select failures and ... **Advise** **Close** **Set Priority High** **Set Priority Low**

**Select All** | **Select None** | **Expand All** | **Collapse All**

| Select                              | Failure Description                            | Impact                                   | Priority | Status | Time Detected       |
|-------------------------------------|------------------------------------------------|------------------------------------------|----------|--------|---------------------|
| <input type="checkbox"/>            | ▼ Data Failures                                |                                          |          |        |                     |
| <input checked="" type="checkbox"/> | ► One or more non-system datafiles are missing | See impact for individual child failures | HIGH     | OPEN   | 2013-10-21 11:57:20 |

**TIP** All CRITICAL failures must be selected before "Advise". All CRITICAL failures must be unselected before "Set Priority High" or "Set Priority Low".

**Related Links**

[Checkers](#)

h. Click **Continue with Advise**.

**Manual Actions**

The following user actions may provide a faster recovery path for certain simple failures. Click "Re-assess Failures" if user actions are performed. Otherwise, click "Continue with Advise" to use the recovery advice generated for the failures selected.

**Manual Action Details**

If file /u01/app/oracle/oradata/orcl/example01.dbf was unintentionally renamed or moved, restore it

**Cancel** **Re-assess Failures** **Continue with Advise**

i. Review the RMAN script that will be used to restore the file and perform recovery. Click **Continue**.

**Recovery Advice**

The repair includes complete media recovery with no data loss

**RMAN Script**

```
restore and recover datafile
sql 'alter database datafile 2 offline';
restore (datafile 2);
recover datafile 2;
sql 'alter database datafile 2 online';
```

- j. Review the information and then click **Submit Recovery Job**.

**Review**

The repair includes complete media recovery with no data loss

**Failures That Will Be Resolved**

[Expand All](#) | [Collapse All](#)

| Failure Description                            | Impact                                   |
|------------------------------------------------|------------------------------------------|
| ▽ Failures That Will Be Resolved               |                                          |
| ▷ One or more non-system datafiles are missing | See impact for individual child failures |

**RMAN Script**

```
restore and recover datafile
sql 'alter database datafile 2 offline';
restore (datafile 2);
recover datafile 2;
sql 'alter database datafile 2 online';
```

- k. A processing page appears and then the Job Activity page appears. Click the job name link.

The screenshot shows the Oracle Database Home page with the path 'orcl > Job Activity'. Below it, the 'Job Activity' page is displayed with a yellow header bar. Under the 'Confirmation' section, it says 'The job was created successfully' and shows a link 'RECOVERY\_ORCL\_000041' which is highlighted with a red box.

- l. On the Job Run page, verify that the status is Succeeded. Then return to the orcl Database Home page.

The screenshot shows the 'Job Run: RECOVERY\_ORCL\_000041' page. At the top, the path 'orcl > Job Activity > Job Run: RECOVERY\_ORCL\_000041' is shown. Below it, the 'Summary' section displays the following details:

|              |                                    |
|--------------|------------------------------------|
| Status       | Succeeded                          |
| Scheduled    | Oct 21, 2013 12:09:42 PM GMT+00:00 |
| Started      | Oct 21, 2013 12:09:50 PM GMT+00:00 |
| Ended        | Oct 21, 2013 12:10:40 PM GMT+00:00 |
| Elapsed Time | 50 seconds                         |

- m. Return to your SQL\*Plus session. Once again query the **HR. REGIONS** table to verify that the data file has been restored and recovered. Exit SQL\*Plus.

```
SQL> select * from hr.regions;

REGION_ID REGION_NAME

1 Europe
2 Americas
3 Asia
4 Middle East and Africa
SQL> exit
$
```

- n. Return to Enterprise Manager Cloud Control. Expand **Oracle Database**. Select **Monitoring > Incident Manager**. Select the incident and click **Clear**.

The screenshot shows the 'Incident Manager: All open incidents' page. On the left, there's a sidebar with 'Views' (Standard, My open incidents and problems, Unassigned incidents, Unacknowledged incidents) and a search bar. The main area has a toolbar with 'Actions', 'View', 'Search', and 'Acknowledge' buttons, with 'Acknowledge' having a red box around it. A table lists one incident: 'Checker run found 1 new persistent data' (Target: orcl, Priority: None, Status: New, Last Updated: Oct 21, 2013 12:01:16 PM, Owner: -, Ackno: No, Escala: No, Type: Incident). There's also a 'Clear...' button next to the 'Acknowledge' button.

| Severity | Summary                                 | Target | Priority | Status | Last Updated             | Owner | Ackno | Escala | Type     |
|----------|-----------------------------------------|--------|----------|--------|--------------------------|-------|-------|--------|----------|
|          | Checker run found 1 new persistent data | orcl   | None     | New    | Oct 21, 2013 12:01:16 PM | -     | No    | No     | Incident |

- o. Click **OK** to confirm.  
p. Return to the **orcl** Database Home page.



## **Practices for Lesson 19: Moving Data**

**Chapter 19**

## Practices for Lesson 19: Overview

---

### Practices Overview

**Background:** In the recent past, you received a number of questions about the `HR` schema. To analyze them without interfering in daily activities, you decide to use Data Pump export to export the `HR` schema to a file. When you perform the export, you are not sure into which database you will be importing this schema.

In the end, you learn that the only database for which management approves an import is the `orcl` database. Therefore, you perform the import with Data Pump import, remapping the `HR` schema to the `DBA1` schema.

Then you receive two data load requests for which you decide to use SQL\*Loader.

## Practice 19-1: Moving Data by Using Data Pump

In this practice, you first grant the DBA1 user the privileges necessary to provide access to the DATA\_PUMP\_DIR directory. You then export the HR schema so that you can then import the tables that you want into the DBA1 schema. In the practice, you import only the EMPLOYEES table.

1. First, you need to grant to the DBA1 user the appropriate privileges on the DATA\_PUMP\_DIR directory. Be sure you know the OS directory where the Data Pump import file will be placed.

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

SQL> SELECT * from dba_directories
 2 WHERE directory_name = 'DATA_PUMP_DIR';

OWNER DIRECTORY_NAME DIRECTORY_PATH

SYS DATA_PUMP_DIR /u01/app/oracle/admin/orcl/dpdump/

SQL> grant read on directory data_pump_dir to dba1;

Grant succeeded.

SQL> grant write on directory data_pump_dir to dba1;

Grant succeeded.

SQL> exit
$
```

2. Use the Data Pump export utility to export the HR schema. Specify the DBA1 user to execute the export operation.

```
$ rm /u01/app/oracle/admin/orcl/dpdump/HREXP01.dmp
rm: cannot remove
`/u01/app/oracle/admin/orcl/dpdump/HREXP01.dmp': No such file or
directory
$ expdp dba1/oracle_4U dumpfile=HREXP%U.dmp
directory=DATA_PUMP_DIR logfile=hrexp.log SCHEMAS=HR

Export: Release 12.1.0.1.0 - Production on Wed Dec 5 03:03:46
2012
```

```
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Connected to: Oracle Database 12c Enterprise Edition Release
12.1.0.1.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing and Unified Auditing options
Starting "DBA1"."SYS_EXPORT_SCHEMA_01": dba1/*********
dumpfile=HREXP%U.dmp directory=DATA_PUMP_DIR logfile=hrexp.log
SCHEMAS=HR
Estimate in progress using BLOCKS method...
Processing object type SCHEMA_EXPORT/TABLE/TABLE_DATA
Total estimation using BLOCKS method: 448 KB
Processing object type SCHEMA_EXPORT/USER
Processing object type SCHEMA_EXPORT/SYSTEM_GRANT
Processing object type SCHEMA_EXPORT/ROLE_GRANT
Processing object type SCHEMA_EXPORT/DEFAULT_ROLE
Processing object type SCHEMA_EXPORT/PRE_SCHEMA/PROCACT_SCHEMA
Processing object type SCHEMA_EXPORT/SEQUENCE/SEQUENCE
Processing object type SCHEMA_EXPORT/TABLE(TABLE)
Processing object type
SCHEMA_EXPORT/TABLE/GRANT/OWNER_GRANT/OBJECT_GRANT
Processing object type SCHEMA_EXPORT/TABLE/COMMENT
Processing object type SCHEMA_EXPORT/PROCEDURE/PROCEDURE
Processing object type SCHEMA_EXPORT/PROCEDURE/ALTER_PROCEDURE
Processing object type SCHEMA_EXPORT/TABLE/INDEX/INDEX
Processing object type SCHEMA_EXPORT/TABLE/CONSTRAINT/CONSTRAINT
Processing object type
SCHEMA_EXPORT/TABLE/INDEX/STATISTICS/INDEX_STATISTICS
Processing object type SCHEMA_EXPORT/VIEW/VIEW
Processing object type
SCHEMA_EXPORT/TABLE/CONSTRAINT/REF_CONSTRAINT
Processing object type SCHEMA_EXPORT/TABLE/TRIGGER
Processing object type
SCHEMA_EXPORT/TABLE/STATISTICS/TABLE_STATISTICS
Processing object type SCHEMA_EXPORT/STATISTICS/MARKER
. . exported "HR"."COUNTRIES" 6.437
KB 25 rows
. . exported "HR"."DEPARTMENTS" 7.101
KB 27 rows
. . exported "HR"."EMPLOYEES" 17.06
KB 107 rows
. . exported "HR"."JOBS" 7.085
KB 19 rows
```

```

. . exported "HR"."JOB_HISTORY" 7.171
KB 10 rows
. . exported "HR"."LOCATIONS" 8.414
KB 23 rows
. . exported "HR"."REGIONS" 5.523
KB 4 rows
Master table "DBA1"."SYS_EXPORT_SCHEMA_01" successfully
loaded/unloaded

Dump file set for DBA1.SYS_EXPORT_SCHEMA_01 is:
/u01/app/oracle/admin/orcl/dpdump/HREXP01.dmp
Job "DBA1"."SYS_EXPORT_SCHEMA_01" successfully completed at Wed
Dec 5 03:05:15 2012 elapsed 0 00:01:21
$
```

3. Now, import the **EMPLOYEES** table from the exported **HR** schema into the **DBA1** schema.
  - a. Enter the following entire command string. Do not press Enter before reaching the end of the command:

```

$ impdp dba1/oracle_4U DIRECTORY=data_pump_dir
DUMPFILE=HREXP01.dmp REMAP_SCHEMA=hr:dba1 TABLES=hr.employees
LOGFILE=empimport.log

Import: Release 12.1.0.1.0 - Production on Wed Dec 5 03:08:36
2012

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rights reserved.

Connected to: Oracle Database 12c Enterprise Edition Release
12.1.0.1.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics, Real
Application Testing and Unified Auditing options
Master table "DBA1"."SYS_IMPORT_TABLE_01" successfully
loaded/unloaded
Starting "DBA1"."SYS_IMPORT_TABLE_01": dba1/*********
DIRECTORY=data_pump_dir DUMPFILE=HREXP01.dmp
REMAP_SCHEMA=hr:dba1 TABLES=hr.employees LOGFILE=empimport.log
Processing object type SCHEMA_EXPORT/TABLE/TABLE
Processing object type SCHEMA_EXPORT/TABLE/TABLE_DATA
. . imported "DBA1"."EMPLOYEES" 17.06
KB 107 rows
Processing object type
SCHEMA_EXPORT/TABLE/GRANT/OWNER_GRANT/OBJECT_GRANT
Processing object type SCHEMA_EXPORT/TABLE/COMMENT
Processing object type SCHEMA_EXPORT/TABLE/INDEX/INDEX
Processing object type SCHEMA_EXPORT/TABLE/CONSTRAINT/CONSTRAINT
```

```

Processing object type
SCHEMA_EXPORT/TABLE/INDEX/STATISTICS/INDEX_STATISTICS
Processing object type
SCHEMA_EXPORT/TABLE/CONSTRAINT/REF_CONSTRAINT
ORA-39083: Object type REF_CONSTRAINT:"DBA1"."EMP_DEPT_FK"
failed to create with error:
ORA-00942: table or view does not exist
Failing sql is:
ALTER TABLE "DBA1"."EMPLOYEES" ADD CONSTRAINT "EMP_DEPT_FK"
FOREIGN KEY ("DEPARTMENT_ID") REFERENCES "DBA1"."DEPARTMENTS"
("DEPARTMENT_ID") ENABLE
ORA-39083: Object type REF_CONSTRAINT:"DBA1"."EMP_JOB_FK" failed
to create with error:
ORA-00942: table or view does not exist
Failing sql is:
ALTER TABLE "DBA1"."EMPLOYEES" ADD CONSTRAINT "EMP_JOB_FK"
FOREIGN KEY ("JOB_ID") REFERENCES "DBA1"."JOBS" ("JOB_ID")
ENABLE
Processing object type SCHEMA_EXPORT/TABLE/TRIGGER
Processing object type
SCHEMA_EXPORT/TABLE/STATISTICS(TABLE_STATISTICS)
Processing object type SCHEMA_EXPORT/STATISTICS/MARKER
ORA-39082: Object type TRIGGER:"DBA1"."UPDATE_JOB_HISTORY"
created with compilation warnings
ORA-39082: Object type TRIGGER:"DBA1"."SECURE_EMPLOYEES" created
with compilation warnings
Job "DBA1"."SYS_IMPORT_TABLE_01" completed with 4 error(s) at
Wed Dec 5 03:09:10 2012 elapsed 0 00:00:31
$
```

**Note:** You may see errors on constraints and triggers not being created because only the EMPLOYEES table is imported and not the other objects in the schema. These errors are expected.

- b. You can also verify that the import succeeded by connecting as DBA1 and selecting data from the EMPLOYEES table.

```

$ sqlplus dba1/oracle_4U
...
SQL> SELECT count(*) FROM employees;

COUNT (*)

107

SQL> exit
$
```

## Practice 19-2: Loading Data by Using SQL\*Loader

In this practice, you load data into the PRODUCT\_DESCRIPTIONS table by using SQL\*Loader Express Mode. Data and control files are provided.

- As the OE user, use SQL\*Loader to load the PRODUCT\_DESCRIPTIONS table from the product\_descriptions.dat data file in Express Mode.

**Warning:** Do not execute this SQL\*Loader command a second time without first executing the cleanup script in step 3. Duplicate rows will be loaded and the Primary Key Index will become unusable.

- Ensure that you are accessing the orcl database.

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

- Ensure that the OE user is unlocked.

```
$ sqlplus dba1/oracle_4U

SQL> alter user oe identified by oracle_4U account unlock;

User altered.

SQL> exit
$
```

- Optionally, view the product\_descriptions.dat file to learn more about its structure before going further. This file is in the \$LABS/P19 directory.

```
$ cd $LABS/P19
$ cat product_descriptions.dat
4001,ENG,Door,Outdoor
4002,FRE,Porte,Porte exterieure
4003,SPA,Puerta,Puerta exterior
4004,GER,Tur,Auberliche Tur
5001,ENG,Shutter,Outdoor shutter
5002,FRE,Volet,Volet exterieur
5003,SPA,Obturador,Obturador exterior
5004,GER,Fenster, Fensterladen
$
```

- Load the records in the product\_descriptions.dat file into the OE.PRODUCT\_DESCRIPTIONS table.

```
$ sqlldr oe/oracle_4U TABLE=product_descriptions

SQL*Loader: Release 12.1.0.1.0 - Production on Wed Dec 5
06:50:36 2012
```

```
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Express Mode Load, Table: PRODUCT_DESCRIPTIONS
Path used: External Table, DEGREE_OF_PARALLELISM=AUTO
SQL*Loader-816: error creating temporary directory object
SYS_SQLLDR_XT_TMPDIR_00000 for file product_descriptions.dat
ORA-01031: insufficient privileges
SQL*Loader-579: switching to direct path for the load
SQL*Loader-583: ignoring trim setting with direct path, using value of LDRTRIM
SQL*Loader-584: ignoring DEGREE_OF_PARALLELISM setting with direct path, using value of NONE
Express Mode Load, Table: PRODUCT_DESCRIPTIONS
Path used: Direct

Load completed - logical record count 8.

Table PRODUCT_DESCRIPTIONS:
 8 Rows successfully loaded.

Check the log file:
 product_descriptions.log
for more information about the load.
$
```

- e. Confirm your results by viewing the `product_descriptions.log` file in your `$LABS/P19` directory.

```
$ cat product_descriptions.log

SQL*Loader: Release 12.1.0.1.0 - Production on Wed Dec 5
06:50:36 2012

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Express Mode Load, Table: PRODUCT_DESCRIPTIONS
Data File: product_descriptions.dat
Bad File: product_descriptions_%p.bad
Discard File: none specified

(Allow all discards)

Number to load: ALL
```

```
Number to skip: 0
Errors allowed: 50
Continuation: none specified
Path used: External Table

Table PRODUCT_DESCRIPTIONS, loaded from every logical record.
Insert option in effect for this table: APPEND

Column Name Position Len Term Encl Datatype

PRODUCT_ID FIRST * , CHARACTER
LANGUAGE_ID NEXT * , CHARACTER
TRANSLATED_NAME NEXT * , CHARACTER
TRANSLATED_DESCRIPTION NEXT * , CHARACTER

Generated control file for possible reuse:
OPTIONS (EXTERNAL_TABLE=EXECUTE, TRIM=LDRTRIM)
LOAD DATA
INFILE 'product_descriptions'
APPEND
INTO TABLE PRODUCT_DESCRIPTIONS
FIELDS TERMINATED BY ","
(
 PRODUCT_ID,
 LANGUAGE_ID,
 TRANSLATED_NAME,
 TRANSLATED_DESCRIPTION CHAR(4000)
)
End of generated control file for possible reuse.

SQL*Loader-816: error creating temporary directory object
SYS_SQLLDR_XT_TMPDIR_00000 for file product_descriptions.dat
ORA-01031: insufficient privileges

SQL*Loader-579: switching to direct path for the load
SQL*Loader-583: ignoring trim setting with direct path, using
value of LDRTRIM
SQL*Loader-584: ignoring DEGREE_OF_PARALLELISM setting with
direct path, using value of NONE

Express Mode Load, Table: PRODUCT_DESCRIPTIONS
```

```
Data File: product_descriptions.dat
Bad File: product_descriptions.bad
Discard File: none specified

(Allow all discards)

Number to load: ALL
Number to skip: 0
Errors allowed: 50
Continuation: none specified
Path used: Direct

Table PRODUCT_DESCRIPTIONS, loaded from every logical record.
Insert option in effect for this table: APPEND

 Column Name Position Len Term Encl
Datatype

PRODUCT_ID FIRST * ,
CHARACTER
LANGUAGE_ID NEXT * ,
CHARACTER
TRANSLATED_NAME NEXT * ,
CHARACTER
TRANSLATED_DESCRIPTION NEXT * ,
CHARACTER

Generated control file for possible reuse:
OPTIONS (DIRECT=TRUE)
LOAD DATA
INFILE 'product_descriptions'
APPEND
INTO TABLE PRODUCT_DESCRIPTIONS
FIELDS TERMINATED BY ","
(
 PRODUCT_ID,
 LANGUAGE_ID,
 TRANSLATED_NAME,
 TRANSLATED_DESCRIPTION CHAR(4000)
)
End of generated control file for possible reuse.
```

```
The following index(es) on table PRODUCT_DESCRIPTIONS were
processed:
index OE.PRD_DESC_PK loaded successfully with 8 keys
index OE.PROD_NAME_IX loaded successfully with 8 keys

Table PRODUCT_DESCRIPTIONS:
 8 Rows successfully loaded.
 0 Rows not loaded due to data errors.
 0 Rows not loaded because all WHEN clauses were failed.
 0 Rows not loaded because all fields were null.

Bind array size not used in direct path.
Column array rows : 5000
Stream buffer bytes: 256000
Read buffer bytes: 1048576

Total logical records skipped: 0
Total logical records read: 8
Total logical records rejected: 0
Total logical records discarded: 0
Total stream buffers loaded by SQL*Loader main thread: 1
Total stream buffers loaded by SQL*Loader load thread: 0

Run began on Wed Dec 05 06:50:36 2012
Run ended on Wed Dec 05 06:50:39 2012

Elapsed time was: 00:00:03.00
CPU time was: 00:00:00.01
$
```

- f. Select the rows inserted in the OE.PRODUCT\_DESCRIPTIONS table.

```
$ sqlplus oe/oracle_4U

SQL> SELECT * FROM PRODUCT_DESCRIPTIONS WHERE product_id > 4000;

PRODUCT_ID LAN TRANSLATED_NAME TRANSLATED_DESCRIPTION

4001 ENG Door Outdoor
4002 FRE Porte Porte exterieure
4003 SPA Puerta Puerta exterior
```

```

4004 GER Tur Auberliche Tur

5001 ENG Shutter Outdoor shutter

5002 FRE Volet Volet exterieur

5003 SPA Obturador Obturador exterior

5004 GER Fenster Fensterladen

8 rows selected.

SQL> exit
$
```

2. As the **oe** user, load data into the **INVENTORIES** table by using SQL\*Loader command line. The **lab\_19\_02\_02.dat** data file contains rows of data for the **PRODUCT\_ON\_HAND** table. The **lab\_19\_02\_02.ctl** file is the control file for this load. Optionally, view the **lab\_19\_02\_02.dat** and **lab\_19\_02\_02.ctl** files to learn more about their structure before going further.
- Ensure that your environment is configured for the **orcl** database by running **oraenv**.

```

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

- Enter the following SQL\*Loader command (in continuation, without pressing Enter before reaching the end of the command).

```

$ sqlldr userid=oe/oracle_4U control=lab_19_02_02.ctl
log=lab_19_02_02.log data=lab_19_02_02.dat

SQL*Loader: Release 12.1.0.1.0 - Production on Wed Dec 5
07:45:16 2012

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rights reserved.

Path used: Conventional
Commit point reached - logical record count 64

Table OE.INVENTORIES:
 0 Rows successfully loaded.

Check the log file:
 lab_19_02_02.log
```

```
for more information about the load.
$
```

You note that no rows were loaded. Read the log file.

```
$ cat lab_19_02_02.log
```

```
SQL*Loader: Release 12.1.0.1.0 - Production on Wed Dec 5
07:45:16 2012
```

```
Copyright (c) 1982, 2012, Oracle and/or its affiliates. All
rights reserved.
```

```
Control File: lab_19_02_02.ctl
Data File: lab_19_02_02.dat
Bad File: lab_19_02_02.bad
Discard File: none specified
```

```
(Allow all discards)
```

```
Number to load: ALL
Number to skip: 0
Errors allowed: 50
Bind array: 64 rows, maximum of 256000 bytes
Continuation: none specified
Path used: Conventional
```

```
Table OE.INVENTORIES, loaded from every logical record.
Insert option in effect for this table: APPEND
```

| Column Name      | Position | Len   | Term  | Encl  |
|------------------|----------|-------|-------|-------|
| Datatype         |          |       |       |       |
| -----            | -----    | ----- | ----- | ----- |
| WAREHOUSE_ID     | FIRST    | *     | ,     |       |
| CHARACTER        |          |       |       |       |
| PRODUCT_ID       | NEXT     | *     | ,     |       |
| CHARACTER        |          |       |       |       |
| QUANTITY_ON_HAND | NEXT     | *     | ,     |       |
| CHARACTER        |          |       |       |       |

```
Record 1: Rejected - Error on table OE.INVENTORIES.
ORA-02291: integrity constraint (OE.INVENTORIES_PRODUCT_ID_FK)
violated - parent key not found
```

```
Record 2: Rejected - Error on table OE.INVENTORIES.
```

```
ORA-02291: integrity constraint (OE.INVENTORIES_PRODUCT_ID_FK)
violated - parent key not found

Record 3: Rejected - Error on table OE.INVENTORIES.
ORA-02291: integrity constraint (OE.INVENTORIES_PRODUCT_ID_FK)
violated - parent key not found

... /* Note all 51 rows are Rejected */

Record 50: Rejected - Error on table OE.INVENTORIES.
ORA-02291: integrity constraint (OE.INVENTORIES_PRODUCT_ID_FK)
violated - parent key not found

Record 51: Rejected - Error on table OE.INVENTORIES.
ORA-02291: integrity constraint (OE.INVENTORIES_PRODUCT_ID_FK)
violated - parent key not found

MAXIMUM ERROR COUNT EXCEEDED - Above statistics reflect partial
run.

Table OE.INVENTORIES:
 0 Rows successfully loaded.
51 Rows not loaded due to data errors.
 0 Rows not loaded because all WHEN clauses were failed.
 0 Rows not loaded because all fields were null.

Space allocated for bind array: 49536 bytes (64
rows)
Read buffer bytes: 1048576

Total logical records skipped: 0
Total logical records read: 64
Total logical records rejected: 51
Total logical records discarded: 0

Run began on Wed Dec 05 07:45:16 2012
Run ended on Wed Dec 05 07:45:17 2012

Elapsed time was: 00:00:01.19
CPU time was: 00:00:00.01
$
```

The loader attempted to load 50 rows, but not more than that because the configuration specifies to stop after 50 errors. The load could not be successfully completed due to constraint violations.

- c. Re-attempt a DIRECT load ignoring constraints.

```
$ sqlldr userid=oe/oracle_4U control=lab_19_02_02.ctl
log=lab_19_02_02.log data=lab_19_02_02.dat DIRECT=TRUE
```

```
SQL*Loader: Release 12.1.0.1.0 - Production on Wed Dec 5
07:51:16 2012
```

```
Copyright (c) 1982, 2012, Oracle and/or its affiliates. All
rights reserved.
```

```
Path used: Direct
```

```
Load completed - logical record count 83.
```

```
Table OE.INVENTORIES:
```

```
83 Rows successfully loaded.
```

```
Check the log file:
```

```
lab_19_02_02.log
for more information about the load.
$
```

- d. Read the log file. You can see that constraints were automatically disabled.

```
$ cat lab_19_02_02.log
```

```
SQL*Loader: Release 12.1.0.1.0 - Production on Wed Dec 5
07:51:16 2012
```

```
Copyright (c) 1982, 2012, Oracle and/or its affiliates. All
rights reserved.
```

```
Control File: lab_19_02_02.ctl
Data File: lab_19_02_02.dat
Bad File: lab_19_02_02.bad
Discard File: none specified
```

```
(Allow all discards)
```

```
Number to load: ALL
Number to skip: 0
Errors allowed: 50
Continuation: none specified
Path used: Direct
```

Table OE.INVENTORIES, loaded from every logical record.  
 Insert option in effect for this table: APPEND

| Column Name<br>Datatype       | Position | Len | Term | Encl |
|-------------------------------|----------|-----|------|------|
| WAREHOUSE_ID<br>CHARACTER     | FIRST    | *   | ,    |      |
| PRODUCT_ID<br>CHARACTER       | NEXT     | *   | ,    |      |
| QUANTITY_ON_HAND<br>CHARACTER | NEXT     | *   | ,    |      |

Referential Integrity Constraint/Trigger Information:  
 NULL, UNIQUE, and PRIMARY KEY constraints are unaffected.

Constraint OE.INVENTORIES.INVENTORIES\_WAREHOUSES\_FK was disabled and novalidated before the load.

Constraint OE.INVENTORIES.INVENTORIES\_PRODUCT\_ID\_FK was disabled and novalidated before the load.

The following index(es) on table OE.INVENTORIES were processed:

index OE.INVENTORY\_IX loaded successfully with 83 keys

index OE.INV\_PRODUCT\_IX loaded successfully with 83 keys

Table OE.INVENTORIES has no constraint exception table.

No CHECK, REFERENTIAL constraints were re-enabled after the load.

Table OE.INVENTORIES:

**83 Rows successfully loaded.**

0 Rows not loaded due to data errors.

0 Rows not loaded because all WHEN clauses were failed.

0 Rows not loaded because all fields were null.

Bind array size not used in direct path.

Column array rows : 5000

Stream buffer bytes: 256000

Read buffer bytes: 1048576

Total logical records skipped: 0

Total logical records read: 83

Total logical records rejected: 0

Total logical records discarded: 0

Total stream buffers loaded by SQL\*Loader main thread: 1

```
Total stream buffers loaded by SQL*Loader load thread: 0

Run began on Wed Dec 05 07:51:16 2012
Run ended on Wed Dec 05 07:51:18 2012

Elapsed time was: 00:00:02.20
CPU time was: 00:00:00.01
$
```

- e. View the rows inserted into the table.

```
$ sqlplus oe/oracle_4U
...
SQL> SELECT * FROM inventories WHERE quantity_on_hand = 7
 2 AND WAREHOUSE_ID>500 ;

PRODUCT_ID WAREHOUSE_ID QUANTITY_ON_HAND

1001 501 7
1001 502 7
...
1030 583 7

83 rows selected.

SQL> EXIT
$
```

3. Execute the `$LABS/P19/lab_19_cleanup.sh` script to remove the rows and files generated by this practice.

```
$ $LABS/P19/lab_19_cleanup.sh
8 rows deleted.

Commit complete.

83 rows deleted.

Commit complete.

$
```



## **Practices for Lesson 20: Database Maintenance**

**Chapter 20**

## Practices for Lesson 20: Overview

---

### Practices Overview

**Background:** You want to proactively monitor your `orcl` database so that common problems can be fixed before they affect users. Users, developers, and unanticipated changes in the way applications are used can bring serious performance problems. As DBA you are seldom informed about what changed, you are instead told that there is a generic problem. At that point, you must find the problem based often on misleading information from users.

In this scenario, a developer is providing scripts for you to run to provision changes to an application. These supplied scripts create a problem so that you can familiarize yourself with the tools that are available. Examine each script to satisfy yourself that the script is doing what you have been told.

These practices have been scripted because delays in performing the tasks can have a large effect on the results you see due to the short time that the workload runs.

## Practice 20-1: Database Maintenance

1. A new tablespace is being added to hold the new tables. The first script creates a new locally managed tablespace called TBSSPC with a data file named /u01/app/oracle/oradata/orcl/tbsspc01.dbf of 50 MB. Ensure that the TBSSPC tablespace does not use Automatic Segment Space Management (ASSM). The lab\_20\_01\_01.sh script performs these tasks. Examine the script and then execute it.
  - a. Open a terminal window and change to the \$LABS/P20 directory. View the contents of the lab\_20\_01\_01.sh script.

```
$ cd $LABS/P20
$ cat lab_20_01_01.sh
...
sqlplus / as sysdba << END

set echo on

drop tablespace TBSSPC including contents and datafiles;

CREATE SMALLFILE TABLESPACE "TBSSPC"
DATAFILE '/u01/app/oracle/oradata/orcl/tbsspc01.dbf' SIZE 50M
AUTOEXTEND ON NEXT 10M MAXSIZE 200M
LOGGING
EXTENT MANAGEMENT LOCAL
SEGMENT SPACE MANAGEMENT MANUAL;

exit;
END

$
```

- b. Execute the script.

```
$./lab_20_01_01.sh
...
Connected to:
...
SQL> SQL> SQL> SQL> drop tablespace TBSSPC including contents
and datafiles
*
ERROR at line 1:
ORA-00959: tablespace 'TBSSPC' does not exist

SQL> SQL> 2 3 4 5 6
Tablespace created.
```

```
SQL> SQL> Disconnected ...
$
```

**Note:** Because this is the first time you have run this script, the error shown when the tablespace is dropped is expected.

2. The `lab_20_01_02.sh` script adds a new user. The script creates the `SPCT` user, identified by `oracle_4U`, assigns the `TBSSPC` tablespace as the default tablespace, assigns the `TEMP` tablespace as the temporary tablespace, and grants the `CONNECT`, `RESOURCE`, and `DBA` roles to the `SPCT` user. Execute the `lab_20_01_02.sh` script to perform these tasks.
  - a. View the contents of the `lab_20_01_02.sh` script.

```
$ cat lab_20_01_02.sh
...
cd /labs/P20

. /labs/set_db.sh

sqlplus / as sysdba << END

set echo on

drop user spct cascade;

create user spct identified by oracle_4U account unlock
default tablespace TBSSPC
temporary tablespace temp;

grant connect, resource, dba to spct;

exit;
END
$
```

- b. Execute the script.

```
$./lab_20_01_02.sh
...
Connected to:
...
SQL> SQL> SQL> SQL> drop user spct cascade
*
ERROR at line 1:
ORA-01918: user 'SPCT' does not exist

SQL> SQL> 2 3
User created.
```

```
SQL> SQL>
Grant succeeded.

SQL> SQL> Disconnected ...

$
```

3. The test workload that is provided runs only a few minutes. In order to get meaningful data, the time between Automatic Workload Repository (AWR) snapshots should be reduced. Use the DBMS\_ADVISOR package to set the database activity time to 30 minutes. The test script, running as the SPCT user, drops and creates the SPCT table and gathers statistics for this table. It also creates a snapshot in AWR. Execute the lab\_20\_01\_03.sh script to perform these tasks.

- a. View the lab\_20\_01\_03.sh script.

```
$ cat lab_20_01_03.sh
...
cd /labs/P17

. /labs/set_db.sh

sqlplus / as sysdba << EOF

set echo on

exec
dbms_advisor.set_default_task_parameter('ADDM', 'DB_ACTIVITY_MIN',
, 30);

connect spct/oracle_4U

drop table spct purge;
create table spct(id number, name varchar2(2000));

exec DBMS_STATS.GATHER_TABLE_STATS(
ownname=>'SPCT', tabname=>'SPCT', -
estimate_percent=>DBMS_STATS.AUTO_SAMPLE_SIZE);

exec DBMS_WORKLOAD_REPOSITORY.CREATE_SNAPSHOT();

exit;
EOF
$
```

- b. Execute the script.

```
$./lab_20_01_03.sh
...
Connected to:
...
SQL> SQL> SQL> SQL>
PL/SQL procedure successfully completed.

SQL> SQL> Connected.
SQL> SQL> drop table spct purge
*
ERROR at line 1:
ORA-00942: table or view does not exist

SQL>
Table created.

SQL> SQL> > >
PL/SQL procedure successfully completed.

SQL> SQL>
PL/SQL procedure successfully completed.

SQL> SQL> Disconnected ...
$
```

4. Execute the workload script. This creates an activity to be analyzed. Execute the `lab_20_01_04.sh` script to perform these tasks. *Do not* wait for the script to finish. Continue to the next step.  
In a terminal window, enter the following. You may have to press Enter after you see that several PL/SQL procedures have completed in order to see the command prompt again.

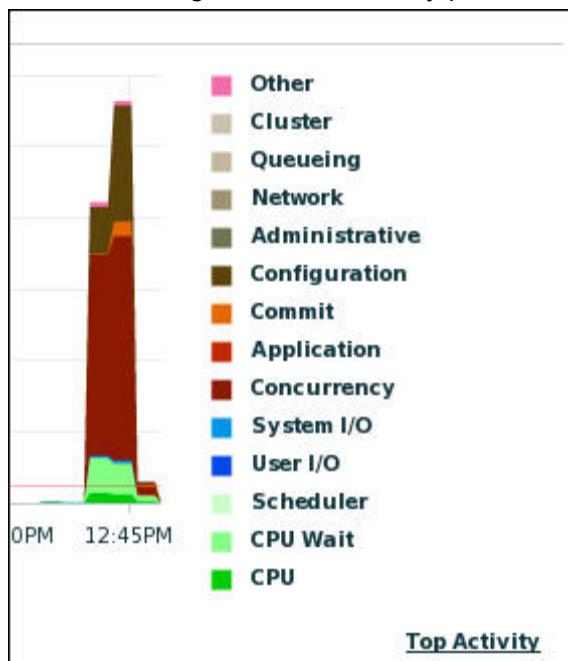
```
$./lab_20_01_04.sh
```

5. Watch the activity in the Active Session Graph on the Cloud Control Performance Home page until the script completes.

| Step | Window/Page Description | Choices or Values                                         |
|------|-------------------------|-----------------------------------------------------------|
| a.   | Cloud Control           | Login<br>User: <b>ADMIN</b><br>Password: <b>oracle_4U</b> |
| b.   | Summary                 | Navigate to the <code>orcl</code> Database Home page.     |
| c.   | orcl Database Home      | Select <b>Performance &gt; Performance Home</b> .         |

| Step | Window/Page Description | Choices or Values                                                                                                                                                                         |
|------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| d.   | Database Login          | Credentials: <b>Preferred</b><br>Preferred Credential Name: <b>SYSDBA Database Credentials</b><br>Click <b>Login</b> .                                                                    |
| e.   | Database Instance: orcl | Verify that the refresh rate is set to <b>Real Time: 15 Second Refresh</b> .<br>Watch the <b>Average Active Session</b> graph until it has peaked and returned to the previous low level. |

This is your activity to be analyzed. By looking at the graph, you can determine that this instance is suffering from concurrency problems.



**Note:** Depending on when you run the workload, you may see differences between your graph and the one provided as a possible solution.

After the spike is finished, execute the `lab_20_01_05.sh` script. This script forces the creation of a new snapshot and gathers statistics on your SPCT table.

**Note:** Causing the same performance problem in all environments is not easy. To help make your test more successful, wait an extra minute or so after the spike has completely finished before running the script.

After the spike has finished, in a terminal window, enter:

```
$./lab_20_01_05.sh
...
Connected to:
.

SQL> SQL> SQL> SQL>
PL/SQL procedure successfully completed.
```

```

SQL> SQL> > >
PL/SQL procedure successfully completed.

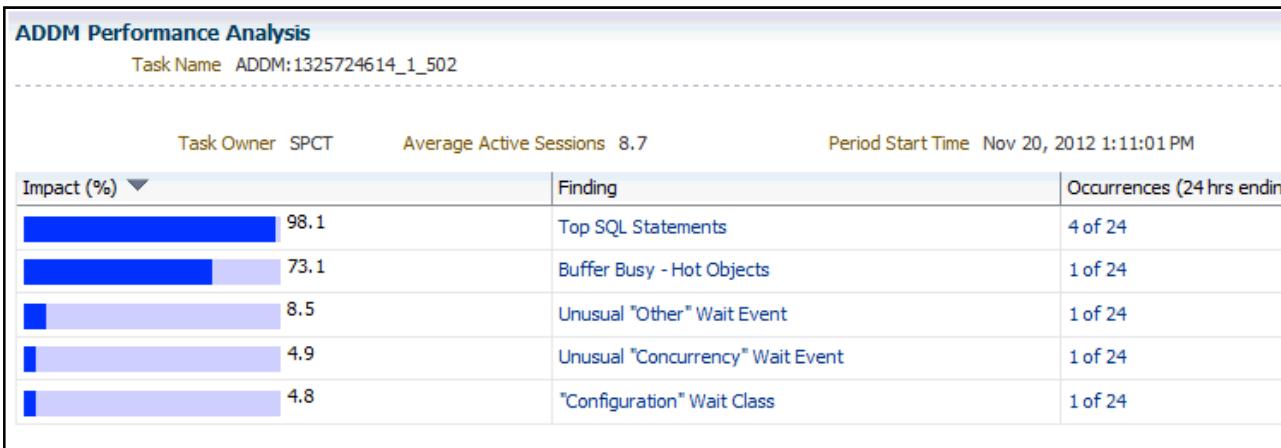
SQL> SQL> Disconnected ...

$
```

6. Find and examine the ADDM Performance Analysis and findings.

| Step | Window/Page Description                      | Choices or Values                                |
|------|----------------------------------------------|--------------------------------------------------|
| a.   | Database Instance: orcl                      | Select <b>Performance &gt; Advisors Home</b> .   |
| b.   | Advisors Central                             | In result section, click the latest ADDM report. |
| c.   | Automatic Database Diagnostic Monitor (ADDM) | Notice the findings.                             |

- d. Look at the Performance Analysis findings in order of their impact. There are several access paths to this information. The results should look similar to the following:



- e. Looking at the Performance Analysis section, you see that the first finding has a high percentage (in this example, 98.1 percent) impact on the system. Therefore, your first step is to look at this finding in more detail. Click the link in the Finding column. In the rationales under Recommendations, you find a “Waiting for event ‘buffer busy waits’” statement.

**Performance Finding Details: Top SQL Statements**

Finding SQL statements consuming significant database time were found. These statements offer a good opportunity for performance improvement. [Finding History](#)

|                                    |                            |
|------------------------------------|----------------------------|
| Impact (Active Sessions)           | 8.56                       |
| Percentage of Finding's Impact (%) | 98.1                       |
| Period Start Time                  | Nov 20, 2012 1:11:01 PM    |
| End Time                           | Nov 20, 2012 1:22:13 PM    |
| Filtered                           | No <a href="#">Filters</a> |

**Recommendations**

[Show All Details](#) | [Hide All Details](#)

| Details   | Category                                                                                                                                                                                                         | Benefit (%) |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| ▼ Hide    | SQL Tuning                                                                                                                                                                                                       | 95.4        |
| Action    | Investigate the INSERT statement with SQL_ID "3csh3g3mjhmzh" for possible performance improvements. You can supplement the information given here with an ASH report for this SQL_ID.                            |             |
| SQL Text  | SQL ID 3csh3g3mjhmzh                                                                                                                                                                                             |             |
| Rationale | The SQL spent only 3% of its database time on CPU, I/O and Cluster waits. Therefore, the SQL Tuning Advisor is not applicable in this case. Look at performance data for the SQL to find potential improvements. |             |
| Rationale | Database time for this SQL was divided as follows: 100% for SQL execution, 0% for parsing, 0% for PL/SQL execution and 0% for Java execution.                                                                    |             |
| Rationale | Waiting for event "buffer busy waits" in wait class "Concurrency" accounted for 71% of the database time spent in processing the SQL statement with SQL_ID "3csh3g3mjhmzh".                                      |             |
| Rationale | Waiting for event "eng: MF - flush space" in wait class "Other" accounted for 14% of the database time spent in processing the SQL statement with SQL_ID "3csh3g3mjhmzh".                                        |             |
| Rationale | Waiting for event "eng: HW - contention" in wait class "Configuration" accounted for 5% of the database time spent in processing the SQL statement with SQL_ID "3csh3g3mjhmzh".                                  |             |
| Rationale | Top level calls to execute the PL/SQL statement with SQL_ID "0k8um5gmv428v" are responsible for 100% of the database time spent on the INSERT statement with SQL_ID "3csh3g3mjhmzh".                             |             |
| SQL Text  | SQL ID 0k8um5gmv428v                                                                                                                                                                                             |             |

- f. Return to the ADDM Performance Analysis page and investigate the other ADDM findings in order of severity. Look at the Buffer Busy findings in particular by clicking the link in the Finding column. For one of the Buffer Busy results, you should see that there is read-and-write contention on your SPCT table. The recommended action is to use the Automatic Segment Space Management (ASSM) feature for your SPCT table. The rationale shows that there is a hot data block that belongs to the SPCT.SPCT table.

The findings may appear in a different order than shown. If you do not see results similar to the ones outlined in the preceding screenshot, you may need to restart this practice. If you still do not see the expected results, you may need to adjust the load by modifying the lab\_20\_01\_04.sh and lab\_20\_01\_04.sql scripts. Ask your instructor for assistance if this is the case. Take care not to increase the load too much or you will slow your system down too much.

**Performance Finding Details: Buffer Busy - Hot Objects**

Read and write contention on database blocks was consuming significant database time.

| Finding                            | Finding History            |
|------------------------------------|----------------------------|
| Impact (Active Sessions)           | 6.37                       |
| Percentage of Finding's Impact (%) | 73.1                       |
| Period Start Time                  | Nov 20, 2012 1:11:01 PM    |
| End Time                           | Nov 20, 2012 1:22:13 PM    |
| Filtered                           | No <a href="#">Filters</a> |

**Recommendations**

Show All Details | Hide All Details

| Details     | Category                                                                                                                                                                                                                                                                                                                                                              | Benefit (%) |
|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| Hide Schema |                                                                                                                                                                                                                                                                                                                                                                       | 73.1        |
| Action      | Consider using ORACLE's recommended solution of automatic segment space management in a locally managed tablespace for the tablespace "TBSSPC" containing the TABLE "SPCT.SPCT" with object ID 93799. Alternatively, you can move this object to a different tablespace that is locally managed with automatic segment space management.<br>Database Object SPCT.SPCT |             |

Rationale There was significant read and write contention on TABLE "SPCT.SPCT" with object ID 93799.  
Database Object SPCT.SPCT

| Show | Schema | 73.1 |
|------|--------|------|
| Show | Schema | 73.1 |

**Findings Path**

Expand All | Collapse All

| Findings                                                                              | Percentage of Finding's Impact (%) | Additional Information |
|---------------------------------------------------------------------------------------|------------------------------------|------------------------|
| Read and write contention on database blocks was consuming significant database time. | 73.1                               |                        |
| Read and write contention on database blocks was consuming significant database time. | 73.1                               |                        |
| Wait class "Concurrency" was consuming significant database time.                     | 78.4                               |                        |

- You decide to implement the recommendation to use Automated Segment Space Management. To do this, you must re-create the object. Create a new, locally managed tablespace, called TBSSPC2 with a 50 MB data file. Ensure that the TBSSPC2 tablespace uses the Automatic Segment Space Management feature. Then execute the `lab_20_01_07.sh` script to drop the SPCT table, re-create the table in the new tablespace, gather statistics, and to take a new snapshot.

| Step | Window/Page Description | Choices or Values                                                                                                                          |
|------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| a.   | Cloud Control           | Select <b>Administration &gt; Storage &gt; Tablespaces</b> .                                                                               |
| b.   | Tablespaces             | Click <b>Create</b> .                                                                                                                      |
| c.   | Create Tablespace       | Name: <b>TBSSPC2</b><br>In the Datafiles section, click <b>Add</b> .                                                                       |
| d.   | Add Datafile            | File Name: <b>tbsspc02.dbf</b><br>File Size: <b>50 MB</b><br>Verify that "Automatically extend data file when full" is <i>not</i> checked. |

| Step | Window/Page Description        | Choices or Values                                                                                                                                                                                                                                     |
|------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                                | Click <b>Continue</b> .                                                                                                                                                                                                                               |
| e.   | Create Tablespace              | Click the <b>Storage</b> tab.                                                                                                                                                                                                                         |
| f.   | Create Tablespace: Storage tab | Verify:<br>Extent Allocation: <b>Automatic</b><br>Segment Space Management: <b>Automatic</b><br>Click <b>Show SQL</b> .                                                                                                                               |
| g.   | Confirmation                   | Examine the SQL Statement. It should be:<br>CREATE SMALLFILE TABLESPACE<br>"TBSSPC2" DATAFILE<br>'/u01/app/oracle/oradata/orcl/tbsspc02.dbf'<br>SIZE 50M LOGGING EXTENT<br>MANAGEMENT LOCAL SEGMENT SPACE<br>MANAGEMENT AUTO<br>Click <b>Return</b> . |
| h.   | Create Tablespace: Storage tab | Click <b>OK</b> .                                                                                                                                                                                                                                     |
| i.   | Tablespaces                    | A success message is displayed.                                                                                                                                                                                                                       |

In a terminal window, enter:

```
$./lab_20_01_07.sh
...
Connected to:
...
SQL> SQL> SQL> SQL>
Table dropped.

SQL> SQL>
Tablespace dropped.

SQL> SQL>
Table created.

SQL> SQL> > >
PL/SQL procedure successfully completed.

SQL> SQL>
PL/SQL procedure successfully completed.

SQL> SQL> Disconnected ...
$
```

8. Execute your workload again by using the `lab_20_01_04.sh` script. *Do not* wait for the script to complete. Continue to the next step.

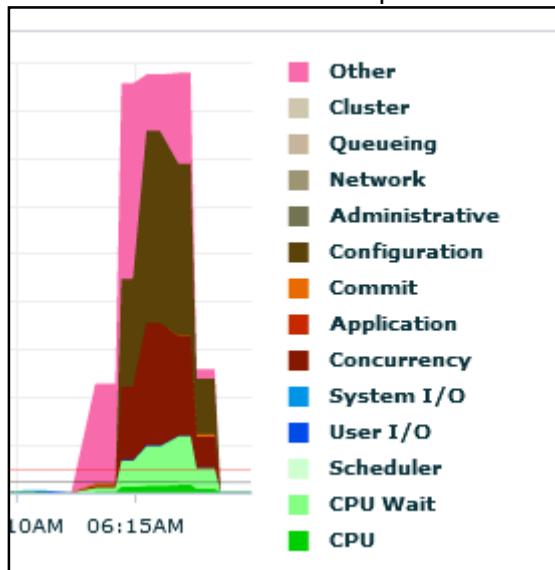
In a terminal window, enter the following. You may have to press Enter after you see that several PL/SQL procedures have completed, in order to see the command prompt again.

```
$./lab_20_01_04.sh
```

9. Return to Enterprise Manager Cloud Control. On the `orcl` Performance Home page, review the Average Active Session graph. View performance data in real time with a 15-seconds refresh cycle. After a while, you should see a spike on the Average Active Sessions graph. Hint: This is that same procedure you used in step 5.

After the spike is finished, execute the `lab_20_01_05.sh` script again. This script forces the creation of a new snapshot and gathers statistics on the table in the workload test.

- Log in to Enterprise Manager Cloud Control as the `DBA1` user with the `SYSDBA` role and navigate to the `orcl` Database Home page.
- Select **Performance Home** in the **Performance** menu. Watch for the spike in the Active Sessions chart to complete.



- After the spike is finished, execute the `lab_20_01_05.sh` script to force the creation of a new snapshot and gather statistics on your SPCT table. Enter the following in a terminal window:

```
$./lab_20_01_05.sh
The Oracle base remains unchanged with value /u01/app/oracle
...
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics, Real
Application Testing and Unified Auditing options

SQL> SQL> SQL> SQL>
PL/SQL procedure successfully completed.
```

```

SQL> SQL> > >
PL/SQL procedure successfully completed.

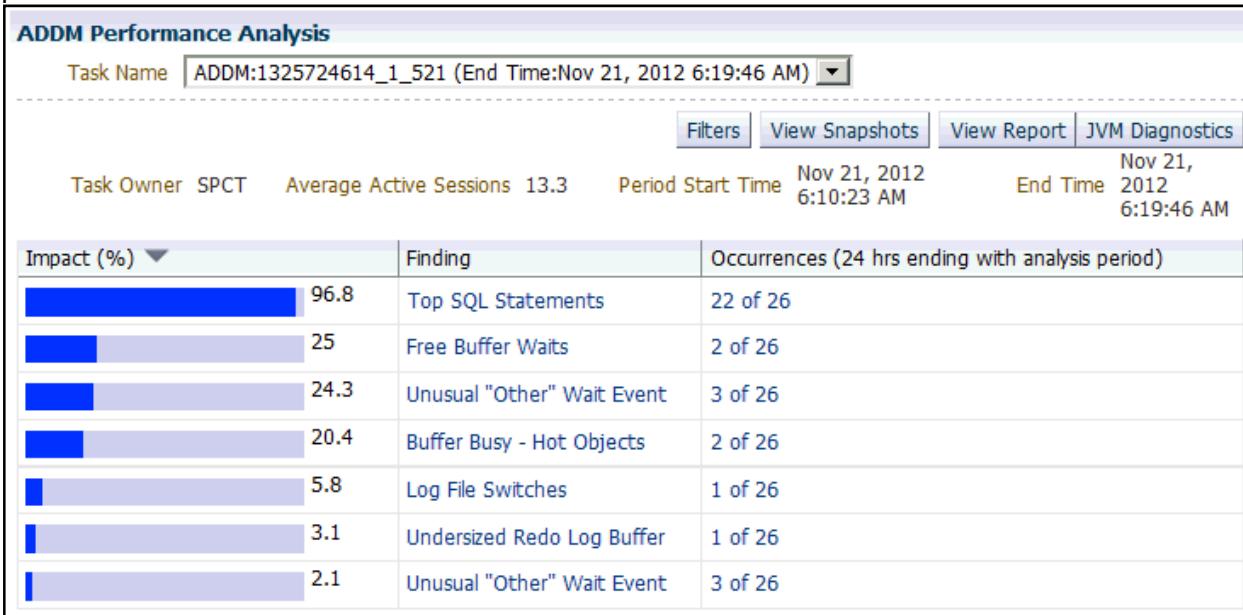
SQL> SQL> Disconnected from Oracle Database 12c Enterprise
Edition Release 12.1.0.1.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics, Real
Application Testing and Unified Auditing options
$
```

10. Review the ADDM report from the **Advisor Home** link.

| Step | Window/Page Description                      | Choices or Values                              |
|------|----------------------------------------------|------------------------------------------------|
| a.   | Cloud Control                                | Select <b>Performance &gt; Advisors Home</b> . |
| b.   | Advisor Central                              | Click the latest ADDM report.                  |
| c.   | Automatic Database Diagnostic Monitor (ADDM) | Review the ADDM Performance Analysis section.  |

You see that the impact value for the Buffer Busy finding (indicating read-and-write contention) has been greatly reduced or is no longer there. By moving the ADDM table to the locally managed TBSSPC2 tablespace, which uses the Automatic Autoextend Segment feature, you obviously fixed the root cause of the contention problem.

**Note:** You may see additional Buffer Busy findings (at a lower impact percentage) and other further recommendations that could improve performance, but you are not going to pursue them at this time.



11. Execute the `lab_20_01_11.sh` script to clean up your environment so that this practice will not affect other practices.

```
$./lab_20_01_11.sh
...
SQL> SQL>
User dropped.

SQL> SQL>
Tablespace dropped.

SQL> SQL>
Tablespace dropped.

SQL> SQL> Disconnected...
```

## **Practices for Lesson 21: Managing Performance**

**Chapter 21**

## Practices for Lesson 21: Overview

---

### Practices Overview

**Background:** Users are complaining about slower-than-normal performance for operations involving the human resources and order-entry applications. When you question other members of the DBA staff, you find that maintenance was recently performed on some of the tables belonging to the HR schema. You need to troubleshoot and make changes as appropriate to resolve the performance problems. SQL script files are provided for you in the \$LABS/P21 directory. Other directories are individually named.

## Practice 21-1: Managing Performance

1. Log in to SQL\*Plus as the DBA1 user and perform maintenance on tables in the HR schema by running the `lab_21_01_01.sql` script.
  - a. Change to the `$LABS/P21` directory. Set the environment for the orcl database. Review the `lab_21_01_01.sql` script.

```
$ cd $LABS/P21
$. oraenv
ORACLE_SID = [oracle] ? orcl
...
$ cat lab_21_01_01.sql
-- Oracle Database 12c: Administration Workshop
-- Oracle Server Technologies - Curriculum Development
--
-- ***Training purposes only***
-- ***Not appropriate for production use***

-- Moves the table hr.employees from one location to another.
This
-- helps fix any migrated rows, as well as compacting unused
space
-- in the segment that may have been caused by deleting data.
-- Has the side effect of making all indexes on this table
UNUSABLE

alter table hr.employees move;

$
```

- b. Log in to SQL\*Plus as the DBA1 user. Execute the `lab_21_01_01.sql` script.

```
$ sqlplus DBA1/oracle_4U as sysdba
SQL> @lab_21_01_01.sql

Table altered.
SQL>
```

2. You get calls from HR application users saying that a particular query is taking longer than normal to execute. The query is in the `lab_21_01_02.sql` script.
  - a. Connect as the HR user. View the `lab_21_01_02.sql` script.

```
SQL> CONNECT hr
Password: oracle_4U <<< Password does not appear on screen
Connected.
SQL> !cat lab_21_01_02.sql
-- Oracle Database 12c: Administration Workshop
-- Oracle Server Technologies - Curriculum Development
```

```
--
-- ***Training purposes only***
-- ***Not appropriate for production use***

select * from hr.employees where employee_id = 200
/
select * from hr.employees where employee_id = 200
/
select * from hr.employees where employee_id = 200
/
```

- b. Execute the **lab\_21\_01\_02.sql** script.

```
SQL> @lab_21_01_02.sql
```

| EMPLOYEE_ID    | FIRST_NAME | LAST_NAME     | EMAIL   | PHONE_NUMBER | HIRE_DATE | JOB_ID  |
|----------------|------------|---------------|---------|--------------|-----------|---------|
| SALARY         |            |               |         |              |           |         |
| 200            | Jennifer   | Whalen        | JWHALEN | 515.123.4444 | 17-SEP-03 | AD_ASST |
| 4400           |            |               |         |              |           |         |
|                | 101        | 10            |         |              |           |         |
| COMMISSION_PCT | MANAGER_ID | DEPARTMENT_ID |         |              |           |         |
|                |            |               |         |              |           |         |
|                |            |               |         |              |           |         |
| EMPLOYEE_ID    | FIRST_NAME | LAST_NAME     | EMAIL   | PHONE_NUMBER | HIRE_DATE | JOB_ID  |
| SALARY         |            |               |         |              |           |         |
| 200            | Jennifer   | Whalen        | JWHALEN | 515.123.4444 | 17-SEP-03 | AD_ASST |
| 4400           |            |               |         |              |           |         |
|                | 101        | 10            |         |              |           |         |
| EMPLOYEE_ID    | FIRST_NAME | LAST_NAME     |         |              |           |         |
|                |            |               |         |              |           |         |
|                |            |               |         |              |           |         |

```

----- EMAIL ----- PHONE_NUMBER ----- HIRE_DATE JOB_ID -----
 SALARY

----- COMMISSION_PCT MANAGER_ID DEPARTMENT_ID -----

 200 Jennifer Whalen
JWHALEN 515.123.4444 17-SEP-03 AD_ASST
4400

 101 10

SQL>

```

3. Using Cloud Control, locate the **HR** session in which the above statement was just executed, and view the execution plan for that statement.

| Step | Window/Page Description | Choices or Values                                                                                   |
|------|-------------------------|-----------------------------------------------------------------------------------------------------|
| a.   | Cloud Control           | Navigate to the <b>orcl</b> database target.                                                        |
| b.   | Database Login          | Connect using Preferred SYSDBA Credentials.                                                         |
| c.   | orcl Database Home      | Select <b>Performance &gt; Search Sessions</b> .                                                    |
| d.   | Search Sessions         | Select <b>DB User</b> in the Filter field menu.<br>Enter <b>HR</b> .<br>Click <b>Go</b> .           |
| e.   | Search Sessions         | Click the <b>SID</b> number in the Results listing.                                                 |
| f.   | Session Details         | Click the <b>hash value link</b> to the right of the Previous SQL label in the Application section. |

Top Activity > Session Details: 51 (HR)      Logged in As **SYS**

**Session Details: 51 (HR)**

Collected From Target Nov 29, 2012 11:42:32 AM

View Data Real Time: 15 Second Refresh Refresh Kill Session Enable SQL Trace

| General                                                                                                                                                                                                                                                                                                                         | Activity                                                                                                                                                                                                      | Statistics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Open Cursors | Blocking Tree | Wait Event History | Parallel SQL | SQL Monitoring |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|---------------|--------------------|--------------|----------------|
| <b>Server</b><br>Current Status <b>INACTIVE</b><br>Serial Number <b>18053</b><br>DB User Name <b>HR</b><br>OS Process ID <b>22451</b><br>Login Time <b>Nov 29, 2012 11:39:25 AM</b><br>Login Duration <b>3:7 (mm:ss)</b><br>Connection Type <b>DEDICATED</b><br>Type <b>USER</b><br>Resource Consumer Group <b>OTHER_GROUPS</b> | <b>Client</b><br>OS User Name <b>oracle</b><br>OS Process ID <b>22320</b><br>Host <b>EDRSR32P1</b><br>Terminal <b>pts/6</b><br>Current Client ID <b>Unavailable</b><br>Current Client Info <b>Unavailable</b> | <b>Application</b><br>Current SQL <b>None</b><br>Current SQL Command <b>UNKNOWN</b><br><b>Previous SQL</b> <b>bckcqw5pd108f</b><br>Last Call Duration <b>2:31 (mm:ss)</b><br>SQL Trace <b>DISABLED</b><br>Current SQL Trace Level <b>1</b><br>Trace With Wait Information <b>DISABLED</b><br>Trace With Bind Information <b>DISABLED</b><br>Open Cursors <b>53</b><br>Program <b>sqlplus@EDRSR32P1 (TNS V1-V3)</b><br>Service <b>ord</b><br>Current Module <b>SQL*Plus</b><br>Current Action <b>Unavailable</b> |              |               |                    |              |                |

| Step | Window/Page Description | Choices or Values                                                                                             |
|------|-------------------------|---------------------------------------------------------------------------------------------------------------|
| g.   | SQL Details             | Click the <b>Plan</b> tab to see the execution plan for the query.<br>Select the <b>Tabular</b> radio button. |

**SQL Details: bckcqw5pd108f**

Switch to SQL ID  Go View Data Real Time: Manual Refresh Refresh SQL Worksheet Schedule SQL T

**Text**

```
select *
 from hr.employees
 where employee_id = 200
```

**Details**

Select the plan hash value to see the details below. Plan Hash Value

Statistics Activity **Plan** Plan Control Tuning History SQL Monitoring

Data Source Cursor Cache Capture Time Nov 29, 2012 11:54:29 AM GMT+00:00 Parsing Schema HR Optimizer Mode ALL\_ROWS

Additional Information  Graphical  Tabular

| Operation         | Object       | Predicat | Pruning | Operation Cost | Estimated Rows | Estim |
|-------------------|--------------|----------|---------|----------------|----------------|-------|
| SELECT STATEMENT  |              |          |         |                |                |       |
| TABLE ACCESS FULL | HR.EMPLOYEES |          |         | 3              | 1              |       |
|                   |              |          |         |                |                |       |
|                   |              |          |         |                |                |       |

You see in the Operation column that this query is doing a full table scan (TABLE ACCESS FULL). Because you know that the query's condition is an equality comparison on the primary key (EMPLOYEE\_ID), you decide to investigate the status of the primary key index.

- Using Cloud Control, check to see the status of the EMPLOYEE table's index on EMPLOYEE\_ID. See whether it is VALID.

| Step | Window/Page Description | Choices or Values                                                                                                                                           |
|------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a.   | SQL Details             | Select <b>Schema &gt; Database Objects &gt; Indexes</b> .                                                                                                   |
| b.   | Indexes                 | Select <b>Table Name</b> in the Search By menu.<br>Enter <b>HR</b> in the Schema field.<br>Enter <b>EMPLOYEES</b> in the Object field.<br>Click <b>Go</b> . |
| c.   | Indexes                 | In the Index column, click the <b>EMP_EMP_ID_PK</b> index.                                                                                                  |

Logged

**Indexes**

Object Type Index

**Search**  
Select an object type and optionally enter a schema name and an object name to filter the data that is displayed in your results set.

Search By Table Name

Schema HR

Object Name EMPLOYEES

Go

By default, the search returns all uppercase matches beginning with the string you entered. To run an exact or case-sensitive match, double quote the search string. You can use the wildcard symbol (%) in a double quoted string.

Selection Mode Single

| Edit                             | View        | Delete    | Actions         | Create Like   | Go                |            |            |             |                   |
|----------------------------------|-------------|-----------|-----------------|---------------|-------------------|------------|------------|-------------|-------------------|
| Select                           | Table Owner | Table     | Indexed Columns | Index Owner ▲ | Index             | Table Type | Tablespace | Partitioned | Last Anal.        |
| <input checked="" type="radio"/> | HR          | EMPLOYEES | DEPARTMENT_ID   | HR            | EMP_DEPARTMENT_IX | TABLE      | EXAMPLE    | NO          | Nov 2019 9:42 UTC |
| <input type="radio"/>            | HR          | EMPLOYEES | EMAIL           | HR            | EMP_EMAIL_UK      | TABLE      | EXAMPLE    | NO          | Nov 2019 9:42 UTC |
| <input type="radio"/>            | HR          | EMPLOYEES | EMPLOYEE_ID     | HR            | EMP_EMP_ID_PK     | TABLE      | EXAMPLE    | NO          | Nov 2019 9:42 UTC |
| <input type="radio"/>            | HR          | EMPLOYEES | JOB_ID          | HR            | EMP_JOB_IX        | TABLE      | EXAMPLE    | NO          | Nov 2019 9:42 UTC |

| Step | Window/Page Description      | Choices or Values                                                                                     |
|------|------------------------------|-------------------------------------------------------------------------------------------------------|
| d.   | View Index: HR.EMP_EMP_ID_PK | In the General section, check the status of the index.<br>You should see a value of <b>UNUSABLE</b> . |

5. Now that you have seen one index with a non-VALID status, you decide to check all indexes. Using SQL\*Plus, as the `HR` user find out which `HR` schema indexes do not have STATUS of VALID. To do this, you can query a data dictionary view with a condition on the STATUS column.
  - a. Go to the SQL\*Plus session where you are still logged in as the `HR` user, and query the `USER_INDEXES` view as follows:

```
SQL> COL INDEX_NAME FORMAT A20
SQL> COL TABLE_NAME FORMAT A20
SQL> select index_name, table_name, status
2 from user_indexes where status <> 'VALID';
```

| INDEX_NAME        | TABLE_NAME | STATUS   |
|-------------------|------------|----------|
| EMP_EMAIL_UK      | EMPLOYEES  | UNUSABLE |
| EMP_EMP_ID_PK     | EMPLOYEES  | UNUSABLE |
| EMP_DEPARTMENT_IX | EMPLOYEES  | UNUSABLE |
| EMP_JOB_IX        | EMPLOYEES  | UNUSABLE |
| EMP_MANAGER_IX    | EMPLOYEES  | UNUSABLE |
| EMP_NAME_IX       | EMPLOYEES  | UNUSABLE |

6 rows selected.

SQL>

- b. You notice that the output lists six indexes, all on the **EMPLOYEES** table.
6. You decide to use Cloud Control to reorganize all the indexes in the **HR** schema that are marked as UNUSABLE.

| Step | Window/Page Description                      | Choices or Values                                                                                                                                       |
|------|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| a.   | View Index: HR.EMP_EMP_ID_PK                 | Select <b>Reorganize</b> in the Actions menu.<br>Click <b>Go</b> .                                                                                      |
| b.   | Reorganize Objects: Objects                  | Click <b>Add</b> .                                                                                                                                      |
| c.   | Objects: Add                                 | Select <b>Indexes</b> in the Type menu.<br>Enter <b>HR</b> in the Schema field.<br>Enter <b>EMP_</b> in the Object Name field.<br>Click <b>Search</b> . |
| d.   | Objects: Add                                 | In the Available Objects section, select all the indexes that match the UNUSABLE indexes in Step 5.<br>Click <b>OK</b> .                                |
| e.   | Reorganize Objects: Objects                  | Check that the six unusable indexes are listed.<br>Click <b>Next</b> .                                                                                  |
| f.   | Reorganize Objects: Options                  | Accept the default options.<br>Click <b>Next</b> .                                                                                                      |
| g.   | Processing: Generating Reorganization Script | Displays briefly.                                                                                                                                       |
| h.   | Reorganize Objects: Impact Report            | The Script Generation Information section should show no warnings or errors.<br>Click <b>Next</b> .                                                     |
| i.   | Reorganize Objects: Schedule                 | In the Host Credentials section:<br>Select <b>New</b> .<br>Enter Username: <b>oracle</b><br>Enter password: <b>oracle</b>                               |

| Step | Window/Page Description    | Choices or Values                                                                                           |
|------|----------------------------|-------------------------------------------------------------------------------------------------------------|
|      |                            | Click <b>Test</b> .<br>When return is Test Successful, click <b>Next</b> .                                  |
| j.   | Reorganize Objects: Review | Click <b>Submit Job</b> .                                                                                   |
| k.   | Job Activity               | A confirmation message appears.<br>Click the <b>REORGANIZE</b> job name listed in the confirmation message. |
| l.   | Job Run: REORGANIZE_ORCL_* | Refresh the Browser until the job shows <b>Succeeded</b> .                                                  |

The screenshot shows the Oracle Database Job Activity page. At the top, it displays the path: `orcl > Job Activity > Job Run: REORGANIZE_ORCL_41` and the date: `Page Refreshed Nov 29, 2012 12:36:18 PM UTC`. Below this, the title **Job Run: REORGANIZE\_ORCL\_41** is shown. On the right, there are buttons for **Delete Run**, **Edit**, and **View Definition**. A **Log Report** link is also present. The main area is titled **Summary**. It shows the following details for the job run:

- Status: Succeeded
- Scheduled: Nov 29, 2012 12:33:58 PM GMT+00:00
- Started: Nov 29, 2012 12:34:10 PM GMT+00:00
- Ended: Nov 29, 2012 12:34:31 PM GMT+00:00
- Elapsed Time: 21 seconds
- Type: Reorganize
- Owner: ADMIN
- Description: Reorganize Job:
- Execution ID: CFA27F3A226B6E48E0438423B988FC9E
- Script: `/u01/app/oracle/product/12.1.0/d...`

Below the summary, there are filters for **Targets** (set to All) and **Status** (set to All). There is also a **Go** button. Under the **Expand All** link, a table shows the execution details:

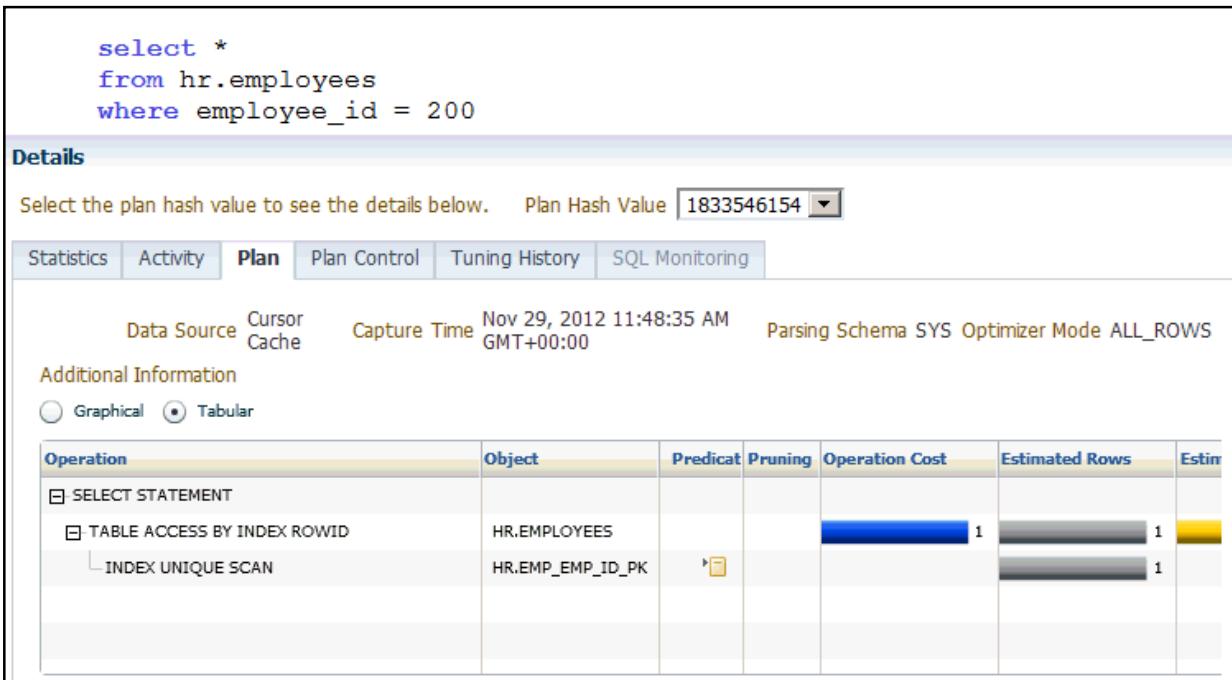
| Name             | Targets | Status    | Started                            | Ended                              | Elapsed Time |
|------------------|---------|-----------|------------------------------------|------------------------------------|--------------|
| Execution: orcl  | orcl    | Succeeded | Nov 29, 2012 12:34:10 PM GMT+00:00 | Nov 29, 2012 12:34:31 PM GMT+00:00 | 21 seconds   |
| Step: Reorganize | orcl    | Succeeded | Nov 29, 2012 12:34:12 PM GMT+00:00 | Nov 29, 2012 12:34:31 PM GMT+00:00 | 18 seconds   |

7. Return to the SQL\*Plus session where the `HR` user is logged in and execute the `lab_21_01_07.sql` script to execute the same kind of query. Then repeat the steps to see the plan of the last SQL statement executed by this session.
  - a. Enter the following at the SQL\*Plus prompt:

```
SQL> @lab_21_01_07.sql
EMPLOYEE_ID FIRST_NAME LAST_NAME
----- -----
EMAIL PHONE_NUMBER HIRE_DATE JOB_ID
SALARY
----- -----
COMMISSION_PCT MANAGER_ID DEPARTMENT_ID
----- -----
201 Michael Hartstein
```

|          |              |           |        |
|----------|--------------|-----------|--------|
| MHARTSTE | 515.123.5555 | 17-FEB-04 | MK_MAN |
| 13000    |              |           |        |
|          | 100          | 20        |        |
| SQL>     |              |           |        |

- b. Repeat step 3 to view the execution plan for the query. Now the icon indicates the use of an index. Click **View Tabular**. Note that the plan now uses an index unique scan.



- c. Exit SQL\*Plus.  
 8. What is the difference in execution plans, and why?  
*Answer:* The statement execution uses a unique index scan instead of a full table scan, because the index is usable after you reorganized the indexes.  
 9. Simulate a working load on your instance by executing the `lab_21_01_09.sql` script as the `SYS` user. **Please note the SID value that is reported.**

**SID value reported:** \_\_\_\_\_

The script takes about 20 minutes to complete. Therefore, run it in a separate terminal window and continue with this practice while it runs. Remember to set your environment appropriately by using `oraenv` in the new terminal window before connecting to SQL\*Plus.

**Note:** Because this script generates a fairly heavy load in terms of CPU and disk I/O, you may notice that response time is slower.

```
$ sqlplus DBA1/oracle_4U as sysdba
SQL> @lab_21_01_09.sql

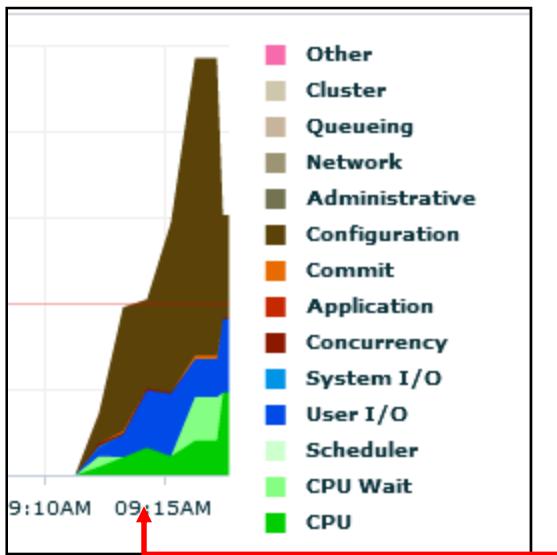
SID is 60
```

PL/SQL procedure successfully completed.

Load is now being generated.

10. Go back to Cloud Control and examine the performance of your database.

| Step | Window/Page Description | Choices or Values                                                                                                                                                                                       |
|------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a.   | orcl Database Home      | Select <b>Performance &gt; Performance Home</b> to investigate system performance.                                                                                                                      |
| b.   | Database Instance: orcl | <p>View the Average Active session Graph at the bottom of the page.</p> <p><i>Note: You may need to wait a minute or two to see the effects of the load generation script appear in the graphs.</i></p> |



Wait to see some levels of activity in the **Average Active Sessions** graph before proceeding.

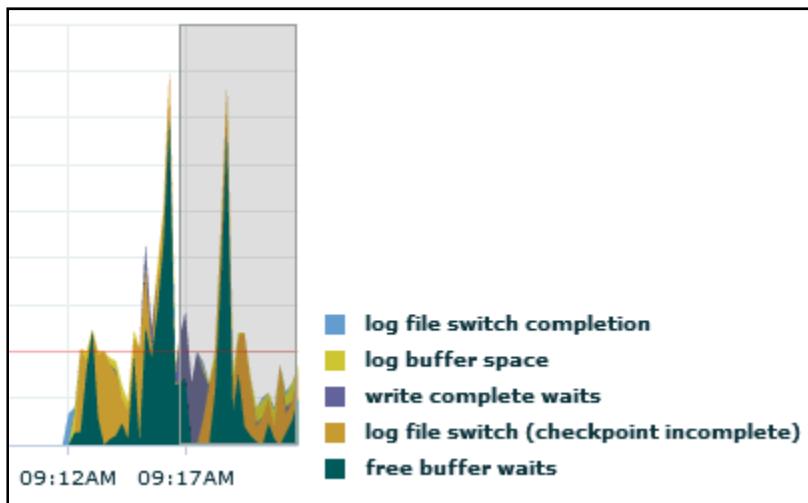
**Question 1:** In the **Average Active Sessions** graph, which two main categories are active sessions waiting for?

**Answer:** In this example, it looks like Configuration issues and User I/O are quite high. CPU is also showing high wait activity. Your results may differ from what is shown here.

**Question 2:** In the Configuration category of waits, what is one of the contributors to the wait time?

| Step | Window/Page Description                | Choices or Values                                         |
|------|----------------------------------------|-----------------------------------------------------------|
| c.   | Database Instance: orcl                | Click <b>Configuration</b> in the legend.                 |
| d.   | Active Sessions Waiting: Configuration | Examine the Active Sessions Waiting: Configuration graph. |

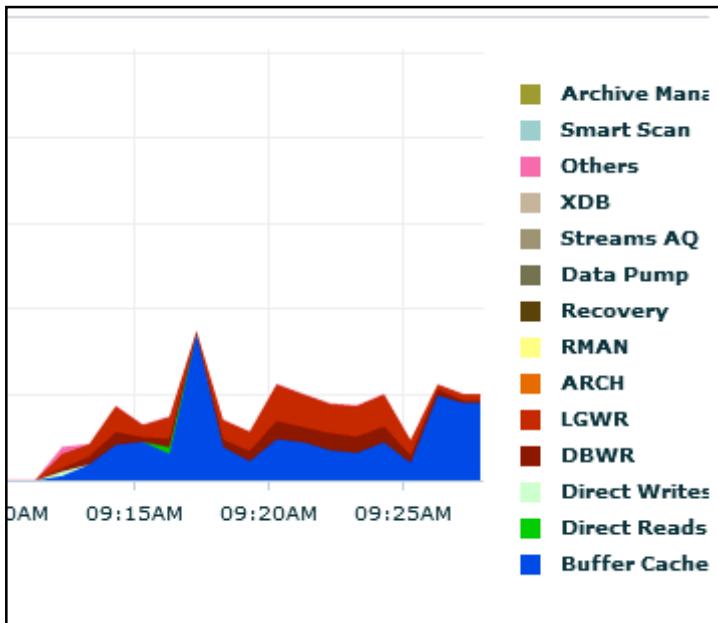
**Answer:** Any one of the waits listed in the screenshot below, but free buffer waits and log file switch completion seem to be the highest contributors:



| Step | Window/Page Description                     | Choices or Values                                                                                                                          |
|------|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| e.   | Active Sessions Waiting:<br>Configuration   | Click the browser's Back button.                                                                                                           |
| f.   | Database Instance: orcl<br>Performance Home | Click <b>Settings</b> .                                                                                                                    |
| g.   | Performance Page Settings                   | In Detail Chart Settings:<br>Select <b>I/O</b> for Default View.<br>Select <b>I/O Function</b> for I/O Chart Setting.<br>Click <b>OK</b> . |
| h.   | Database Instance: orcl<br>Performance Home | Scroll down to the "I/O Megabytes per Second by I/O Function" graph.                                                                       |

**Question 3:** Which process is doing the most writing to the disk?

**Note:** The graph you see may vary.



**Answer:** LGWR

**Note:** Buffer Cache IO shows reads from disk.

| Step | Window/Page Description                  | Choices or Values                                                                                                                                                        |
|------|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| i.   | Database Instance: orcl Performance Home | Click the <b>Top Activity</b> link (below and to the right of the Average Active Sessions graph). You may need to scroll to the bottom to see the horizontal scroll bar. |
| j.   | Top Activity                             | Click the <b>SQL ID</b> of the first DELETE statement listed in the Top SQL region.                                                                                      |
| k.   | SQL Details: 0qqwcxx1quwuv               |                                                                                                                                                                          |

**Detail for Selected 5 Minute Interval**  
Start Time Nov 30, 2012 9:25:41 AM

**Top SQL**

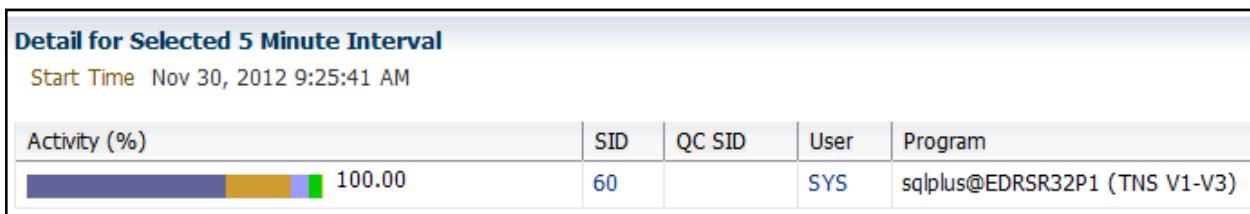
Actions Schedule SQL Tuning Advisor Go

Select All | Select None

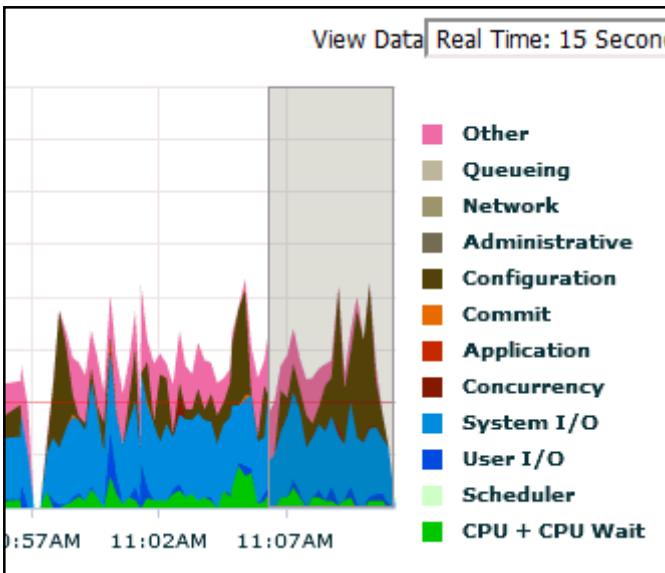
| Select                   | Activity (%) | SQL ID        | SQL Type |
|--------------------------|--------------|---------------|----------|
| <input type="checkbox"/> | 19.97        | 0qqwcxx1quwuv | DELETE   |
| <input type="checkbox"/> | 19.97        | 6fw4jyxz4y45b | SELECT   |
| <input type="checkbox"/> | 19.97        | 3b1yurgfyy0yb | SELECT   |
| <input type="checkbox"/> | 19.97        | 74k6v71dkh1cj | SELECT   |

11. Kill the session that is generating the load. Use the session ID recorded in step 9. The session ID is listed in the **SID** column of “Detail for Selected 5 Minute Interval.”

| Step | Window/Page Description   | Choices or Values                                                                                                                                                                                                                                                                                                                                                            |
|------|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a.   | SQL Details: 0qqwcxx1quuv | Click the <b>SID</b> number for the session ID recorded earlier. This is found under the heading <b>Detail for Selected 5 Minute Interval</b> .                                                                                                                                                                                                                              |
| b.   | Session Details: nn (SYS) | Click <b>Kill Session</b>                                                                                                                                                                                                                                                                                                                                                    |
| c.   | Confirmation              | Click <b>Yes</b>                                                                                                                                                                                                                                                                                                                                                             |
| d.   | Session Details: nn (SYS) | <i>Note: If you remain on this Session Details page long enough for a few automatic refreshes to be done, you may see a warning, “WARNING, Session has expired.” or a SQL Error saying that the session is marked for kill. This warning means that you are attempting to refresh information about a session that has already been killed. You can ignore this warning.</i> |



| Step | Window/Page Description   | Choices or Values                                                                                      |
|------|---------------------------|--------------------------------------------------------------------------------------------------------|
| e.   | Session Details: nn (SYS) | Click <b>Top Activity</b> in the navigation history at the top of the page.                            |
| f.   | Top Activity              | View the Top Activity graph. Note that the session activity in the database has declined considerably. |



12. Log out of Enterprise Manager Cloud Control.
13. Return to the terminal window and press **Enter**. Note that your session has been killed. Exit SQL\*Plus.

```
SQL> @lab_21_01_09.sql

SID is 79

PL/SQL procedure successfully completed.

Load is now being generated.

ERROR:
ORA-03114: not connected to ORACLE

DECLARE
*
ERROR at line 1:
ORA-00028: your session has been killed
ORA-00028: your session has been killed
ORA-06512: at line 14

SQL> SQL> exit
$
```

## Practice 21-2: Using Automatic Memory Management

### Overview

In this practice, you review memory management capabilities.

### Tasks

1. Log in to SQL\*Plus for the `orcl` instance as the `DBA1` user with the `oracle_4U` password and make a copy of your server parameter file (SPFILE).

```
$ sqlplus dba1/oracle_4U as sysdba
SQL> CREATE PFILE='/tmp/initorcl.ora.bak' FROM SPFILE;

File created.

SQL>
```

2. Still connected as the `DBA1` user in SQL\*Plus, set the following parameters to the given value in your SPFILE only! Use the `amm_parameters.sql` file located in your `$LABS/P21` directory to set the parameters.

```
parallel_execution_message_size = 36864
parallel_max_servers = 200
parallel_adaptive_multi_user = FALSE
processes = 200
sga_target = 0
pga_aggregate_target = 0
memory_target = 624M
```

```
SQL> @amm_parameters

SQL> alter system set "parallel_execution_message_size" = 36864
SCOPE=SPFILE;

System altered.

SQL> alter system set "parallel_max_servers" = 200 SCOPE=SPFILE;

System altered.

SQL> alter system set "parallel_adaptive_multi_user" = FALSE
SCOPE=SPFILE;

System altered.

SQL> alter system set "processes" = 200 SCOPE=SPFILE;
```

```
System altered.

SQL> alter system set "pga_aggregate_target" = 0 SCOPE=SPFILE;

System altered.

SQL> alter system set "sga_target" = 0 SCOPE=SPFILE;

System altered.

SQL> alter system set "memory_target" = 624M SCOPE=SPFILE;

System altered.

SQL>
```

3. Execute the `amm_setup.sql` script.

- Drop and re-create the TBSSGA and MYTEMP tablespaces, and the AMM DBA user for which they are defaults by executing the script.

```
SQL> @amm_setup
SQL> REM ****
SQL> REM "For training purposes ONLY, execute as the oracle OS
user
SQL>
SQL> set echo on
SQL> set serveroutput on
SQL> set term on
SQL> set lines 200
SQL> set pages 44
SQL> set pause on pause "Press [Enter] to continue..."
SQL>
SQL> drop tablespace tbssga including contents and datafiles;
drop tablespace tbssga including contents and datafiles
*
ERROR at line 1:
ORA-00959: tablespace 'TBSSGA' does not exist

SQL>
SQL> create tablespace tbssga datafile
'/u01/app/oracle/oradata/tbssga01.dbf' size 20m;

Tablespace created.
```

```
SQL>
SQL> drop tablespace mytemp including contents and datafiles;
drop tablespace mytemp including contents and datafiles
*
ERROR at line 1:
ORA-00959: tablespace 'MYTEMP' does not exist

SQL>
SQL> create temporary tablespace mytemp tempfile
'/u01/app/oracle/oradata/myemp01.dbf' size 40m reuse;

Tablespace created.

SQL>
SQL> drop user amm cascade;
drop user amm cascade
*
ERROR at line 1:
ORA-01918: user 'AMM' does not exist

SQL>
SQL> create user amm
 2 identified by "oracle_4U"
 3 default tablespace tbssga
 4 temporary tablespace mytemp;

User created.

SQL>
SQL> grant connect,resource,dba to amm;

Grant succeeded.

SQL> pause Press [Enter] to continue...
Press [Enter] to continue...

Press [Enter] to continue...
```

- b. To view the current memory components, query the V\$MEMORY\_DYNAMIC\_COMPONENTS view by pressing **Enter** to continue the script.

```
SQL>
SQL> column COMP format a20
SQL>
SQL> SELECT substr(COMPONENT, 0, 20) COMP, CURRENT_SIZE CS,
USER_SPECIFIED_SIZE US
2 FROM v$memory_dynamic_components
3 WHERE CURRENT_SIZE!=0;
Press [Enter] to continue...
```

- c. View the query result by pressing **Enter** to continue the script.

```
SQL>
COMP CS US

shared pool 301989888 0
large pool 8388608 0
java pool 4194304 0
streams pool 4194304 0
SGA Target 574619648 0
DEFAULT buffer cache 218103808 0
Shared IO Pool 25165824 0
PGA Target 306184192 0

8 rows selected.
SQL> pause Press [Enter] to continue...
Press [Enter] to continue...
```

4. Press **Enter** to continue the script. At the SQL prompt, log in as the AMM user with the oracle\_4U password. Execute the amm\_setup2.sql script to re-create the TABSGA table and insert rows.

```
SQL> connect amm
Enter password: oracle_4U <<< not displayed
Connected.
SQL> @amm_setup2.sql
SQL>
...
SQL> drop table tabsga purge;
drop table tabsga purge
*
ERROR at line 1:
ORA-00942: table or view does not exist
```

```
SQL>
SQL> create table tabsga(a number, b number) tablespace tbssga;

Table created.

SQL>
SQL> begin
 2 for i in 1..100000 loop
 3 insert into tabsga values (i, i);
 4 end loop;
 5 end;
 6 /

PL/SQL procedure successfully completed.

SQL> commit;

Commit complete.

SQL> pause Press [Enter] to continue...
Press [Enter] to continue...
```

- a. Modify the TABSGA table to “parallel 64” and create a TESTPGA procedure (which creates a workload) by pressing **Enter** to continue the script.

```
SQL>
SQL>
SQL> alter table tabsga parallel 64;

Table altered.

SQL>
SQL> create or replace procedure testpga(psize number) as
 2 begin
 3 declare
 4 TYPE nAllotment_tabtyp IS TABLE OF char(2048) INDEX BY
BINARY_INTEGER;
 5 myarray nAllotment_tabtyp;
 6 begin
 7 for i in 1..psize loop
 8 myarray(i) := to_char(i);
 9 end loop;
10 end;
11 end;
```

```
12 /

Procedure created.

SQL> pause Press [Enter] to continue...
Press [Enter] to continue...
```

- b. Confirm that there are no errors and query the dynamic memory components again by pressing **Enter** to continue the script.

```
SQL> show errors
No errors.
SQL>
SQL> SELECT substr(COMPONENT, 0, 20) COMP, CURRENT_SIZE CS,
USER_SPECIFIED_SIZE US
2 FROM v$memory_dynamic_components
3 WHERE CURRENT_SIZE!=0;
Press [Enter] to continue...

Press [Enter] to continue...
```

- c. To view the query results, press **Enter** to continue the script.

| COMP                 | CS        | US |
|----------------------|-----------|----|
| shared pool          | 314572800 | 0  |
| large pool           | 8388608   | 0  |
| java pool            | 4194304   | 0  |
| streams pool         | 4194304   | 0  |
| SGA Target           | 574619648 | 0  |
| DEFAULT buffer cache | 205520896 | 0  |
| Shared IO Pool       | 25165824  | 0  |
| PGA Target           | 306184192 | 0  |

```
8 rows selected.
SQL>
SQL> pause Press [Enter] to exit the script...
Press [Enter] to exit the script...
```

**Note:** The size of the SGA, PGA, buffer cache, and shared pool do not change between the query in step 3c and step 4f.

- d. Press **Enter** to exit the script, but remain in the SQL\*Plus session.

```
SQL> set pause off
SQL>
```

5. Connect as SYSDBA in your SQL\*Plus session, and shut down and restart your database instance.

```
SQL> connect dba1/oracle_4U as sysdba
Connected.
SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL>
SQL> startup
ORACLE instance started.

Total System Global Area 651378688 bytes
Fixed Size 2291760 bytes
Variable Size 482346960 bytes
Database Buffers 159383552 bytes
Redo Buffers 7356416 bytes
Database mounted.
Database opened.
SQL>
```

6. As the AMM user, determine the current settings for the various memory buffers as well as the list of resized operations that occurred since you started your instance.

- a. Connect as the AMM user.

```
SQL> connect amm
Enter password: oracle_4U <<< not displayed
Connected.
SQL>
```

- b. Execute the `amm_components.sql` script.

```
SQL> @amm_components.sql
SQL> set echo on
SQL> set serveroutput on
SQL> set term on
SQL> set lines 200
SQL> set pages 100
SQL> set heading on
SQL> column comp format a20
SQL> column final_size format 999999999
SQL> column oper_type format a9
SQL> set pause on pause "Press [Enter] to continue..."
SQL>
SQL> SELECT substr(COMPONENT, 0, 20) COMP, CURRENT_SIZE CS,
USER_SPECIFIED_SIZE US
```

```

2 FROM v$memory_dynamic_components
3 WHERE CURRENT_SIZE!=0;
Press [Enter] to continue...

```

- c. To view the query results, press **Enter** to continue the script.

| COMP                 | CS        | US |
|----------------------|-----------|----|
| shared pool          | 146800640 | 0  |
| large pool           | 8388608   | 0  |
| java pool            | 4194304   | 0  |
| streams pool         | 4194304   | 0  |
| SGA Target           | 390070272 | 0  |
| DEFAULT buffer cache | 213909504 | 0  |
| PGA Target           | 264241152 | 0  |

7 rows selected.

```
SQL> pause Press [Enter] to continue...
```

```
Press [Enter] to continue...
```

- d. View the memory components (ordered by descending START\_TIME) by pressing **Enter** to continue the script.

```

SQL> SELECT substr(COMPONENT, 0, 20) comp, FINAL_SIZE, OPER_TYPE,
OPER_MODE, status
2 FROM v$memory_resize_ops
3 ORDER BY START_TIME desc;
Press [Enter] to continue...

```

- e. To view the query result, press **Enter** to continue the script.

| COMP                 | FINAL_SIZE | OPER_TYPE | OPER_MODE | STATUS   |
|----------------------|------------|-----------|-----------|----------|
| DEFAULT buffer cache | 213909504  | GROW      | DEFERRED  | COMPLETE |
| large pool           | 8388608    | SHRINK    | DEFERRED  | COMPLETE |
| shared pool          | 146800640  | GROW      | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 134217728  | SHRINK    | IMMEDIATE | COMPLETE |
| shared pool          | 142606336  | GROW      | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 138412032  | SHRINK    | IMMEDIATE | COMPLETE |
| shared pool          | 138412032  | GROW      | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 142606336  | SHRINK    | IMMEDIATE | COMPLETE |
| streams pool         | 4194304    | GROW      | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 146800640  | SHRINK    | IMMEDIATE | COMPLETE |
| shared pool          | 134217728  | GROW      | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 150994944  | SHRINK    | IMMEDIATE | COMPLETE |
| shared pool          | 130023424  | GROW      | IMMEDIATE | COMPLETE |

```

DEFAULT buffer cache 155189248 SHRINK IMMEDIATE COMPLETE
DEFAULT buffer cache 163577856 SHRINK IMMEDIATE COMPLETE
DEFAULT buffer cache 167772160 INITIALIZ COMPLETE
DEFAULT buffer cache 167772160 STATIC COMPLETE
ASM Buffer Cache 0 STATIC COMPLETE
DEFAULT 2K buffer ca 0 STATIC COMPLETE
DEFAULT 4K buffer ca 0 STATIC COMPLETE
DEFAULT 8K buffer ca 0 STATIC COMPLETE
DEFAULT 16K buffer c 0 STATIC COMPLETE
DEFAULT 32K buffer c 0 STATIC COMPLETE
KEEP buffer cache 0 STATIC COMPLETE
shared pool 125829120 GROW IMMEDIATE COMPLETE
DEFAULT buffer cache 159383552 SHRINK IMMEDIATE COMPLETE
RECYCLE buffer cache 0 STATIC COMPLETE
PGA Target 264241152 STATIC COMPLETE
SGA Target 390070272 STATIC COMPLETE
streams pool 0 STATIC COMPLETE
java pool 4194304 STATIC COMPLETE
large pool 88080384 STATIC COMPLETE
shared pool 121634816 GROW IMMEDIATE COMPLETE
shared pool 117440512 STATIC COMPLETE

34 rows selected.

SQL> pause Press [Enter] to exit the script...
Press [Enter] to exit the script...

```

- f. Press **Enter** to exit the script.

```

SQL> set pause off
SQL>
SQL>

```

7. Remain connected as the AMM user in your SQL\*Plus session and execute the following query. Immediately after that, determine the component sizes and resized operations. You can use the `amm_query1.sql` script for that purpose. What do you observe?
- a. Execute the `amm_query1.sql` script.

```

SQL> @amm_query1.sql
SQL> select /*+ PARALLEL(s 24) */ count(*) from (select /*+
parallel(s 24) */ a from tabsga s group by a);

COUNT(*)

100000

```

```
SQL>
SQL> column COMP format a20
SQL>
SQL> select substr(COMPONENT, 0, 20) COMP, CURRENT_SIZE CS,
USER_SPECIFIED_SIZE US from v$memory_dynamic_components where
CURRENT_SIZE!=0;

COMP CS US

shared pool 150994944 0
large pool 79691776 0
java pool 4194304 0
streams pool 4194304 0
SGA Target 390070272 0
DEFAULT buffer cache 138412032 0
PGA Target 264241152 0

7 rows selected.

SQL>
SQL> select substr(COMPONENT, 0, 20) COMP, FINAL_SIZE,
OPER_TYPE, OPER_MODE, status from v$memory_resize_ops order by
START_TIME;

COMP FINAL_SIZE OPER_TYPE OPER_MODE STATUS

DEFAULT 8K buffer ca 0 STATIC COMPLETE
DEFAULT 4K buffer ca 0 STATIC COMPLETE
PGA Target 264241152 STATIC COMPLETE
DEFAULT 2K buffer ca 0 STATIC COMPLETE
ASM Buffer Cache 0 STATIC COMPLETE
DEFAULT buffer cache 167772160 STATIC COMPLETE
DEFAULT buffer cache 167772160 INITIALIZ
ING

DEFAULT buffer cache 163577856 SHRINK IMMEDIATE COMPLETE
DEFAULT buffer cache 159383552 SHRINK IMMEDIATE COMPLETE
RECYCLE buffer cache 0 STATIC COMPLETE
shared pool 125829120 GROW IMMEDIATE COMPLETE
shared pool 121634816 GROW IMMEDIATE COMPLETE
shared pool 117440512 STATIC COMPLETE
KEEP buffer cache 0 STATIC COMPLETE
large pool 88080384 STATIC COMPLETE
```

|                      |           |        |           |                    |
|----------------------|-----------|--------|-----------|--------------------|
| java pool            | 4194304   | STATIC |           | COMPLETE           |
| streams pool         | 0         | STATIC |           | COMPLETE           |
| SGA Target           | 390070272 | STATIC |           | COMPLETE           |
| DEFAULT 32K buffer c | 0         | STATIC |           | COMPLETE           |
| DEFAULT 16K buffer c | 0         | STATIC |           | COMPLETE           |
| DEFAULT buffer cache | 155189248 | SHRINK |           | IMMEDIATE COMPLETE |
| shared pool          | 130023424 | GROW   |           | IMMEDIATE COMPLETE |
| DEFAULT buffer cache | 150994944 | SHRINK |           | IMMEDIATE COMPLETE |
| shared pool          | 134217728 | GROW   |           | IMMEDIATE COMPLETE |
| DEFAULT buffer cache | 146800640 | SHRINK |           | IMMEDIATE COMPLETE |
| streams pool         | 4194304   | GROW   |           | IMMEDIATE COMPLETE |
| DEFAULT buffer cache | 142606336 | SHRINK |           | IMMEDIATE COMPLETE |
| shared pool          | 138412032 | GROW   |           | IMMEDIATE COMPLETE |
| DEFAULT buffer cache | 138412032 | SHRINK |           | IMMEDIATE COMPLETE |
| shared pool          | 142606336 | GROW   |           | IMMEDIATE COMPLETE |
| shared pool          | 146800640 | GROW   |           | IMMEDIATE COMPLETE |
| DEFAULT buffer cache | 134217728 | SHRINK |           | IMMEDIATE COMPLETE |
| DEFAULT buffer cache | 213909504 | GROW   | DEFERRED  | COMPLETE           |
| large pool           | 8388608   | SHRINK | DEFERRED  | COMPLETE           |
| shared pool          | 150994944 | GROW   | DEFERRED  | COMPLETE           |
| DEFAULT buffer cache | 209715200 | SHRINK | DEFERRED  | COMPLETE           |
| large pool           | 79691776  | GROW   | IMMEDIATE | COMPLETE           |
| DEFAULT buffer cache | 205520896 | SHRINK | IMMEDIATE | COMPLETE           |
| large pool           | 71303168  | GROW   | IMMEDIATE | COMPLETE           |
| large pool           | 67108864  | GROW   | IMMEDIATE | COMPLETE           |
| large pool           | 62914560  | GROW   | IMMEDIATE | COMPLETE           |
| large pool           | 58720256  | GROW   | IMMEDIATE | COMPLETE           |
| large pool           | 54525952  | GROW   | IMMEDIATE | COMPLETE           |
| large pool           | 50331648  | GROW   | IMMEDIATE | COMPLETE           |
| large pool           | 46137344  | GROW   | IMMEDIATE | COMPLETE           |
| large pool           | 41943040  | GROW   | IMMEDIATE | COMPLETE           |
| large pool           | 37748736  | GROW   | IMMEDIATE | COMPLETE           |
| large pool           | 33554432  | GROW   | IMMEDIATE | COMPLETE           |
| large pool           | 29360128  | GROW   | IMMEDIATE | COMPLETE           |
| large pool           | 25165824  | GROW   | IMMEDIATE | COMPLETE           |
| large pool           | 20971520  | GROW   | IMMEDIATE | COMPLETE           |
| large pool           | 16777216  | GROW   | IMMEDIATE | COMPLETE           |
| large pool           | 12582912  | GROW   | IMMEDIATE | COMPLETE           |
| DEFAULT buffer cache | 138412032 | SHRINK | IMMEDIATE | COMPLETE           |
| DEFAULT buffer cache | 142606336 | SHRINK | IMMEDIATE | COMPLETE           |
| DEFAULT buffer cache | 146800640 | SHRINK | IMMEDIATE | COMPLETE           |
| DEFAULT buffer cache | 150994944 | SHRINK | IMMEDIATE | COMPLETE           |

|                      |           |        |           |          |
|----------------------|-----------|--------|-----------|----------|
| DEFAULT buffer cache | 155189248 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 159383552 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 163577856 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 167772160 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 171966464 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 176160768 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 180355072 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 184549376 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 188743680 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 192937984 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 197132288 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 201326592 | SHRINK | IMMEDIATE | COMPLETE |
| large pool           | 75497472  | GROW   | IMMEDIATE | COMPLETE |

70 rows selected.

SQL>

8. Repeat the query by using the `amm_query2.sql` script. What do you observe?

*Possible Answer:* The same trend continues.

|                                                                |           |       |
|----------------------------------------------------------------|-----------|-------|
| COUNT(*)                                                       |           |       |
| -----                                                          |           |       |
| 100000                                                         |           |       |
| SQL>                                                           |           |       |
| SQL> column COMP format a12                                    |           |       |
| SQL>                                                           |           |       |
| SQL> select substr(COMPONENT, 0, 10) COMP, CURRENT_SIZE CS,    |           |       |
| USER_SPECIFIED_SIZE US from v\$memory_dynamic_components where |           |       |
| CURRENT_SIZE!=0;                                               |           |       |
| COMP                                                           | CS        | US    |
| -----                                                          | -----     | ----- |
| shared pool                                                    | 155189248 | 0     |
| large pool                                                     | 92274688  | 0     |
| java pool                                                      | 4194304   | 0     |
| streams pool                                                   | 4194304   | 0     |
| SGA Target                                                     | 377487360 | 0     |

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```
DEFAULT buffer cache 109051904 0
PGA Target 276824064 0

7 rows selected.

SQL>
SQL> select substr(COMPONENT, 0, 10) COMP, FINAL_SIZE,
OPER_TYPE, OPER_MODE, status from v$memory_resize_ops order by
START_TIME;

COMP FINAL_SIZE OPER_TYPE OPER_MODE STATUS

DEFAULT 8K buffer ca 0 STATIC COMPLETE
DEFAULT 4K buffer ca 0 STATIC COMPLETE
KEEP buffer cache 0 STATIC COMPLETE
DEFAULT 2K buffer ca 0 STATIC COMPLETE
ASM Buffer Cache 0 STATIC COMPLETE
DEFAULT buffer cache 167772160 STATIC COMPLETE
shared pool 125829120 GROW IMMEDIATE COMPLETE
shared pool 121634816 GROW IMMEDIATE COMPLETE
shared pool 117440512 STATIC COMPLETE
large pool 88080384 STATIC COMPLETE
java pool 4194304 STATIC COMPLETE
RECYCLE buffer cache 0 STATIC COMPLETE
streams pool 0 STATIC COMPLETE
SGA Target 390070272 STATIC COMPLETE
DEFAULT 32K buffer c 0 STATIC COMPLETE
DEFAULT 16K buffer c 0 STATIC COMPLETE
PGA Target 264241152 STATIC COMPLETE
DEFAULT buffer cache 159383552 SHRINK IMMEDIATE COMPLETE
DEFAULT buffer cache 163577856 SHRINK IMMEDIATE COMPLETE
DEFAULT buffer cache 167772160 INITIALIZING COMPLETE
 ING
 IMMEDIATE COMPLETE
 IMMEDIATE COMPLETE
```

|                      |           |        |           |          |
|----------------------|-----------|--------|-----------|----------|
| shared pool          | 142606336 | GROW   | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 134217728 | SHRINK | IMMEDIATE | COMPLETE |
| shared pool          | 146800640 | GROW   | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 213909504 | GROW   | DEFERRED  | COMPLETE |
| large pool           | 8388608   | SHRINK | DEFERRED  | COMPLETE |
| DEFAULT buffer cache | 209715200 | SHRINK | DEFERRED  | COMPLETE |
| shared pool          | 150994944 | GROW   | DEFERRED  | COMPLETE |
| large pool           | 79691776  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 75497472  | GROW   | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 205520896 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 201326592 | SHRINK | IMMEDIATE | COMPLETE |
| large pool           | 71303168  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 67108864  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 62914560  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 58720256  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 54525952  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 50331648  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 46137344  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 41943040  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 37748736  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 33554432  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 29360128  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 25165824  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 20971520  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 16777216  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 12582912  | GROW   | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 138412032 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 142606336 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 146800640 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 150994944 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 155189248 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 159383552 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 163577856 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 167772160 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 171966464 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 176160768 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 180355072 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 184549376 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 188743680 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 192937984 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 197132288 | SHRINK | IMMEDIATE | COMPLETE |
| SGA Target           | 377487360 | SHRINK | DEFERRED  | COMPLETE |

|                      |            |           |           |          |
|----------------------|------------|-----------|-----------|----------|
| DEFAULT buffer cache | 125829120  | SHRINK    | DEFERRED  | COMPLETE |
| PGA Target           | 276824064  | GROW      | MANUAL    | COMPLETE |
| DEFAULT buffer cache | 201326592  | GROW      | DEFERRED  | COMPLETE |
| large pool           | 4194304    | SHRINK    | DEFERRED  | COMPLETE |
| shared pool          | 155189248  | GROW      | DEFERRED  | COMPLETE |
| DEFAULT buffer cache | 197132288  | SHRINK    | DEFERRED  | COMPLETE |
| large pool           | 8388608    | GROW      | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 188743680  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 184549376  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 180355072  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 176160768  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 171966464  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 167772160  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 163577856  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 159383552  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 155189248  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 150994944  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 146800640  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 142606336  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 138412032  | SHRINK    | IMMEDIATE | COMPLETE |
| large pool           | 62914560   | GROW      | IMMEDIATE | COMPLETE |
| large pool           | 58720256   | GROW      | IMMEDIATE | COMPLETE |
| large pool           | 54525952   | GROW      | IMMEDIATE | COMPLETE |
| large pool           | 50331648   | GROW      | IMMEDIATE | COMPLETE |
| COMP                 | FINAL_SIZE | OPER_TYPE | OPER_MODE | STATUS   |
| -----                | -----      | -----     | -----     | -----    |
| large pool           | 46137344   | GROW      | IMMEDIATE | COMPLETE |
| large pool           | 41943040   | GROW      | IMMEDIATE | COMPLETE |
| large pool           | 37748736   | GROW      | IMMEDIATE | COMPLETE |
| large pool           | 33554432   | GROW      | IMMEDIATE | COMPLETE |
| large pool           | 29360128   | GROW      | IMMEDIATE | COMPLETE |
| large pool           | 25165824   | GROW      | IMMEDIATE | COMPLETE |
| large pool           | 20971520   | GROW      | IMMEDIATE | COMPLETE |
| large pool           | 16777216   | GROW      | IMMEDIATE | COMPLETE |
| large pool           | 12582912   | GROW      | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 192937984  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 134217728  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 130023424  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 125829120  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 121634816  | SHRINK    | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 117440512  | SHRINK    | IMMEDIATE | COMPLETE |

```

DEFAULT buffer cache 113246208 SHRINK IMMEDIATE COMPLETE
large pool 92274688 GROW IMMEDIATE COMPLETE
large pool 67108864 GROW IMMEDIATE COMPLETE
large pool 71303168 GROW IMMEDIATE COMPLETE
large pool 75497472 GROW IMMEDIATE COMPLETE
large pool 79691776 GROW IMMEDIATE COMPLETE
large pool 83886080 GROW IMMEDIATE COMPLETE
large pool 88080384 GROW IMMEDIATE COMPLETE
DEFAULT buffer cache 109051904 SHRINK IMMEDIATE COMPLETE

119 rows selected.

SQL>

```

9. Still connected as the `AMM` user in your SQL\*Plus session, execute the `amm_query3.sql` script. Immediately afterward, determine the memory component sizes and the list of resize operations. What do you observe?

*Possible Answer:* The same action of growing and shrinking of the memory components

*Alternative Answer:* The memory grows and shrinks until the memory allocation meets the needs of the database activity, and then remains nearly constant.

```

SQL> @amm_query3.sql
SQL> exec testpga(500000);

PL/SQL procedure successfully completed.

SQL>
SQL> column COMP format a12
SQL>
SQL> select substr(COMPONENT, 0, 10) COMP, CURRENT_SIZE CS,
USER_SPECIFIED_SIZE US from v$memory_dynamic_components where
CURRENT_SIZE!=0;

COMP CS US

shared pool 155189248 0
large pool 4194304 0
java pool 4194304 0
streams pool 4194304 0
SGA Target 394264576 0
DEFAULT buffer cache 205520896 0
Shared IO Pool 8388608 0
PGA Target 260046848 0

```

```
8 rows selected.

SQL>
SQL> select substr(COMPONENT, 0, 10) COMP, FINAL_SIZE,
OPER_TYPE, OPER_MODE, status from v$memory_resize_ops order by
START_TIME;

COMP FINAL_SIZE OPER_TYPE OPER_MODE STATUS

DEFAULT 8K buffer ca 0 STATIC COMPLETE
DEFAULT 4K buffer ca 0 STATIC COMPLETE
KEEP buffer cache 0 STATIC COMPLETE
DEFAULT 2K buffer ca 0 STATIC COMPLETE
ASM Buffer Cache 0 STATIC COMPLETE
DEFAULT buffer cache 167772160 STATIC COMPLETE
shared pool 125829120 GROW IMMEDIATE COMPLETE
shared pool 121634816 GROW IMMEDIATE COMPLETE
shared pool 117440512 STATIC COMPLETE
large pool 88080384 STATIC COMPLETE
java pool 4194304 STATIC COMPLETE
RECYCLE buffer cache 0 STATIC COMPLETE
streams pool 0 STATIC COMPLETE
SGA Target 390070272 STATIC COMPLETE
DEFAULT 32K buffer c 0 STATIC COMPLETE
DEFAULT 16K buffer c 0 STATIC COMPLETE
PGA Target 264241152 STATIC COMPLETE
DEFAULT buffer cache 159383552 SHRINK IMMEDIATE COMPLETE
DEFAULT buffer cache 163577856 SHRINK IMMEDIATE COMPLETE
DEFAULT buffer cache 167772160 INITIALIZING COMPLETE
 ING

DEFAULT buffer cache 155189248 SHRINK IMMEDIATE COMPLETE
shared pool 130023424 GROW IMMEDIATE COMPLETE
DEFAULT buffer cache 150994944 SHRINK IMMEDIATE COMPLETE
shared pool 134217728 GROW IMMEDIATE COMPLETE
streams pool 4194304 GROW IMMEDIATE COMPLETE
DEFAULT buffer cache 146800640 SHRINK IMMEDIATE COMPLETE
shared pool 138412032 GROW IMMEDIATE COMPLETE
DEFAULT buffer cache 142606336 SHRINK IMMEDIATE COMPLETE
DEFAULT buffer cache 138412032 SHRINK IMMEDIATE COMPLETE
shared pool 142606336 GROW IMMEDIATE COMPLETE
DEFAULT buffer cache 134217728 SHRINK IMMEDIATE COMPLETE
shared pool 146800640 GROW IMMEDIATE COMPLETE
DEFAULT buffer cache 213909504 GROW DEFERRED COMPLETE
```

|                      |           |        |           |          |
|----------------------|-----------|--------|-----------|----------|
| large pool           | 8388608   | SHRINK | DEFERRED  | COMPLETE |
| DEFAULT buffer cache | 209715200 | SHRINK | DEFERRED  | COMPLETE |
| shared pool          | 150994944 | GROW   | DEFERRED  | COMPLETE |
| large pool           | 79691776  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 75497472  | GROW   | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 205520896 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 201326592 | SHRINK | IMMEDIATE | COMPLETE |
| large pool           | 71303168  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 67108864  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 62914560  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 58720256  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 54525952  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 50331648  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 46137344  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 41943040  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 37748736  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 33554432  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 29360128  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 25165824  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 20971520  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 16777216  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 12582912  | GROW   | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 138412032 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 142606336 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 146800640 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 150994944 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 155189248 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 159383552 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 163577856 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 167772160 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 171966464 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 176160768 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 180355072 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 184549376 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 188743680 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 192937984 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 197132288 | SHRINK | IMMEDIATE | COMPLETE |
| SGA Target           | 377487360 | SHRINK | DEFERRED  | COMPLETE |
| DEFAULT buffer cache | 125829120 | SHRINK | DEFERRED  | COMPLETE |
| PGA Target           | 276824064 | GROW   | MANUAL    | COMPLETE |
| DEFAULT buffer cache | 201326592 | GROW   | DEFERRED  | COMPLETE |
| large pool           | 4194304   | SHRINK | DEFERRED  | COMPLETE |

|                                                |           |        |           |          |
|------------------------------------------------|-----------|--------|-----------|----------|
| shared pool                                    | 155189248 | GROW   | DEFERRED  | COMPLETE |
| DEFAULT buffer cache                           | 197132288 | SHRINK | DEFERRED  | COMPLETE |
| DEFAULT buffer cache                           | 167772160 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 188743680 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 159383552 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 155189248 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 150994944 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 146800640 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 142606336 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 138412032 | SHRINK | IMMEDIATE | COMPLETE |
| large pool                                     | 46137344  | GROW   | IMMEDIATE | COMPLETE |
| large pool                                     | 50331648  | GROW   | IMMEDIATE | COMPLETE |
| large pool                                     | 54525952  | GROW   | IMMEDIATE | COMPLETE |
| large pool                                     | 58720256  | GROW   | IMMEDIATE | COMPLETE |
| large pool                                     | 62914560  | GROW   | IMMEDIATE | COMPLETE |
| large pool                                     | 41943040  | GROW   | IMMEDIATE | COMPLETE |
| large pool                                     | 37748736  | GROW   | IMMEDIATE | COMPLETE |
| large pool                                     | 33554432  | GROW   | IMMEDIATE | COMPLETE |
| large pool                                     | 29360128  | GROW   | IMMEDIATE | COMPLETE |
| large pool                                     | 25165824  | GROW   | IMMEDIATE | COMPLETE |
| <br>COMP FINAL_SIZE OPER_TYPE OPER_MODE STATUS |           |        |           |          |
| -----                                          | -----     | -----  | -----     | -----    |
| large pool                                     | 20971520  | GROW   | IMMEDIATE | COMPLETE |
| large pool                                     | 16777216  | GROW   | IMMEDIATE | COMPLETE |
| large pool                                     | 12582912  | GROW   | IMMEDIATE | COMPLETE |
| large pool                                     | 8388608   | GROW   | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 184549376 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 180355072 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 176160768 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 171966464 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 192937984 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 163577856 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 134217728 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 130023424 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 125829120 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 121634816 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 117440512 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 113246208 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache                           | 109051904 | SHRINK | IMMEDIATE | COMPLETE |
| large pool                                     | 67108864  | GROW   | IMMEDIATE | COMPLETE |
| large pool                                     | 71303168  | GROW   | IMMEDIATE | COMPLETE |

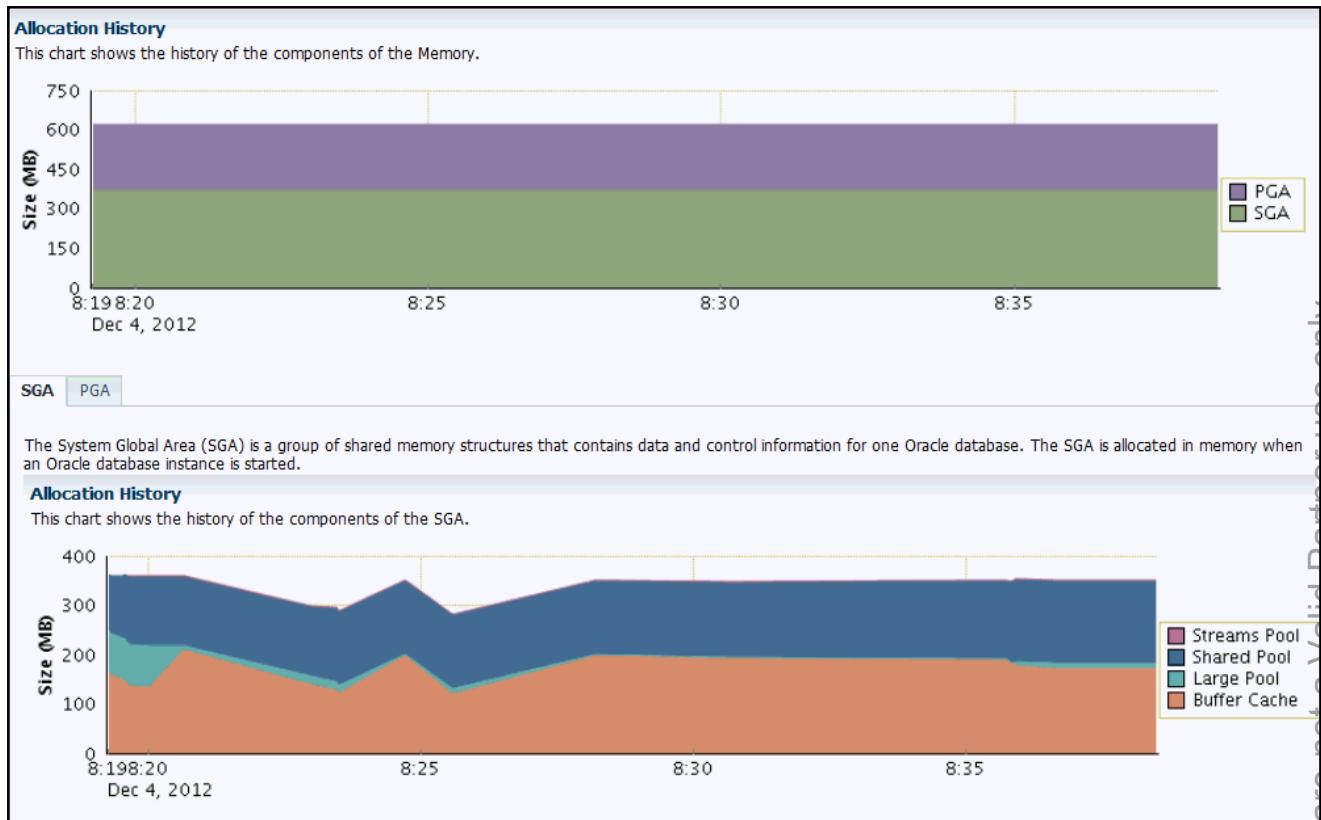
|                      |           |        |           |          |
|----------------------|-----------|--------|-----------|----------|
| large pool           | 75497472  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 79691776  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 83886080  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 88080384  | GROW   | IMMEDIATE | COMPLETE |
| large pool           | 92274688  | GROW   | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 100663296 | SHRINK | IMMEDIATE | COMPLETE |
| DEFAULT buffer cache | 188743680 | GROW   | DEFERRED  | COMPLETE |
| DEFAULT buffer cache | 205520896 | GROW   | MANUAL    | COMPLETE |
| large pool           | 4194304   | SHRINK | DEFERRED  | COMPLETE |
| SGA Target           | 394264576 | GROW   | DEFERRED  | COMPLETE |
| PGA Target           | 260046848 | SHRINK | MANUAL    | COMPLETE |

125 rows selected.

SQL>  
SQL> **exit**  
\$

10. In Enterprise Manager Cloud Control, look at the memory variations that happened during this practice. What do you observe?

| Step | Window/Page Description | Choices or Values                                                                                                       |
|------|-------------------------|-------------------------------------------------------------------------------------------------------------------------|
| a.   | Cloud Control           | Log in to Enterprise Manager Cloud Control as the <b>ADMIN</b> user and navigate to the <b>orcl</b> Database Home page. |
| b.   | orcl Database Home      | Select <b>Performance &gt; Memory Advisors</b> .                                                                        |
| c.   | Memory Advisors         | Scroll down and examine the two graphs.                                                                                 |



**Question:** What changes do you see to the components of the SGA?

**Answer:** You should see modifications of the memory components in the second graph indicating that the large pool grew and shrank.

11. Log out of Enterprise Manager Cloud Control.
12. To clean up your environment, execute the `amm_cleanup.sh` script to shut down your database instance, restore the original SPFILE, and restart your `orcl` database instance.

```
$ cd $LABS/P21
$./amm_cleanup.sh
...
Connected to:
...
SQL> SQL>
User dropped.

SQL>
Tablespace dropped.

SQL>
Tablespace dropped.

SQL> SQL> Database closed.
Database dismounted.
```

```
ORACLE instance shut down.
SQL>
File created.

SQL> SQL> ORACLE instance started.

Total System Global Area 876859392 bytes
Fixed Size 2294360 bytes
Variable Size 583011752 bytes
Database Buffers 285212672 bytes
Redo Buffers 6340608 bytes
Database mounted.
SQL>
Database altered.

SQL>
Database altered.

SQL> Disconnected ...
$
```

## Practice 21-3: Monitoring Services

---

### Overview

In this practice, you create and monitor services.

### Tasks

Several running applications are accessing your database. You want to monitor the resources that are being used by each application. Create a service configuration for each application or application function that uses your database.

In this practice, you create the following configuration in the `orcl` database:

| Service Name | Usage          | Response Time (sec)-<br>Warning/Critical |
|--------------|----------------|------------------------------------------|
| SERV1        | Client service | 0.4, 1.0                                 |

1. Use the `DBMS_SERVICE` package to create a service called `SERV1`. Then make sure that you add the service name to your `tnsnames.ora` file.
  - a. The recommended method for adding a service name to the `tnsnames.ora` file is to use Oracle Net Manager. For this practice, in the interest of time, execute the `sv1_add.sh` script to add the service name.

```
$. oraenv
ORACLE_SID = [orcl] ? orcl
$ cd $LABS/P21
$./sv1_add.sh
EDP1 /* the machine name will be different */
$
```

- b. Review the `tnsnames.ora` file in `$ORACLE_HOME/network/admin` to confirm that the following lines are included. The script substituted the output of the `hostname` command for `<hostname>` below. The output of the host name command is shown in step 1a.

```
$ cat $ORACLE_HOME/network/admin/tnsnames.ora
...
SERV1 =
 (DESCRIPTION =
 (ADDRESS = (PROTOCOL = TCP)
 (HOST = <hostname>.us.oracle.com) (PORT = 1561))
 (CONNECT_DATA =
 (SERVER = DEDICATED)
 (SERVICE_NAME = SERV1.example.com)
)
)
$
```

- c. Use the DBMS\_SERVICE.CREATE\_SERVICE procedure to create a service. (The command is entered on one line.)

```
$ sqlplus dba1/oracle_4U as sysdba

SQL> EXEC
DBMS_SERVICE.CREATE_SERVICE('SERV1','SERV1.example.com')

PL/SQL procedure successfully completed.

SQL> exit
```

2. After you have created your service, try connecting to your database by using your service name.

```
$ sqlplus system@serv1
...
Enter password:
ERROR:
ORA-12514: TNS:listener does not currently know of service
requested in connect
descriptor

Enter username: /* enter [ctrl]-[c] to exit */
```

**Question:** What happens? Why?

**Answer:** You cannot connect by using your service, because although it is defined, it is not started on your instance.

- a. You can verify this by looking at the DBA\_SERVICES view and by looking at the services known to the LISTENERORCL listener.

```
$ sqlplus dba1/oracle_4U as sysdba

SQL> col name format A20
SQL> col network_name format A30
SQL> select name, network_name from DBA_SERVICES;

NAME NETWORK_NAME

SYS$BACKGROUND
SYS$USERS
SERV1 SERV1.example.com
orclXDB orclXDB
orcl orcl

SQL>
SQL> host lsnrctl services listenerorcl
```

```
LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 22-OCT-
2013 13:33:57

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

Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=EDP0)(PORT=1561)))
Services Summary...
Service "orcl" has 1 instance(s).
 Instance "orcl", status READY, has 1 handler(s) for this
service...
 Handler(s):
 "DEDICATED" established:1 refused:0 state:ready
 LOCAL SERVER
Service "orclXDB" has 1 instance(s).
 Instance "orcl", status READY, has 1 handler(s) for this
service...
 Handler(s):
 "D000" established:0 refused:0 current:0 max:1022
state:ready
 DISPATCHER <machine: EDP0, pid: 1316>

(ADDRESS=(PROTOCOL=tcp)(HOST=edp0.us.oracle.com)(PORT=12362))
The command completed successfully

SQL>
```

**Note:** The `SERV1` service is *not* listed in the listener services, but it is listed in the `DBA_SERVICES` view. The `orcl` and `orclXDB` services are registered with the listener because the `orcl` service is included in the `SERVICE_NAMES` initialization parameter.

**Question:** How would you make sure that you can connect using your service?

**Answer:** You must start your service on your instance.

3. Start the service on your instance and connect to your instance by using your service.
  - a. Start the service.

```
SQL> connect dba1/oracle_4U as sysdba
Connected

SQL> EXEC DBMS_SERVICE.START_SERVICE('SERV1')

PL/SQL procedure successfully completed.

SQL> show parameter service
```

| NAME | TYPE | VALUE |
|------|------|-------|
|------|------|-------|

```

service_names string orcl
```

- b. Verify that the service is registered with the LISTENERORCL listener.

```
SQL> host lsnrctl services listenerorcl

LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 22-OCT-
2013 13:35:38

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

Connecting to
(DESCRIPTION= (ADDRESS= (PROTOCOL=TCP) (HOST=EDP0) (PORT=1561)))
Services Summary...
Service "SERV1.example.com" has 1 instance(s).
 Instance "orcl", status READY, has 1 handler(s) for this
 service...
 Handler(s):
 "DEDICATED" established:0 refused:0 state:ready
 LOCAL SERVER
 Service "orcl" has 1 instance(s).
 Instance "orcl", status READY, has 1 handler(s) for this
 service...
 Handler(s):
 "DEDICATED" established:0 refused:0 state:ready
 LOCAL SERVER
 Service "orclXDB" has 1 instance(s).
 Instance "orcl", status READY, has 1 handler(s) for this
 service...
 Handler(s):
 "D000" established:0 refused:0 current:0 max:1022
 state:ready
 DISPATCHER <machine: EDP0, pid: 1316>

(ADDRESS= (PROTOCOL=tcp) (HOST=edRp0.us.oracle.com) (PORT=12362))
The command completed successfully

SQL>
```

- c. Connect using the SERV1 service name.

```
SQL> connect system@SERV1
Enter password: oracle_4U <<< not displayed

Connected.
```

```
SQL> exit
```

4. Create a workload for the SERV1 service. You will create a user for this activity and start a workload.

- a. Execute the sv1\_load.sh script as SYSDBA. This script creates a new SV\_USER user.

```
$ cd $LABS/P21
$./sv1_load.sh

SQL> SQL> SQL> SQL> drop user sv_user cascade
 *
ERROR at line 1:
ORA-01918: user 'SV_USER' does not exist

SQL> SQL> 2 3
User created.

SQL> SQL>
Grant succeeded.
$
```

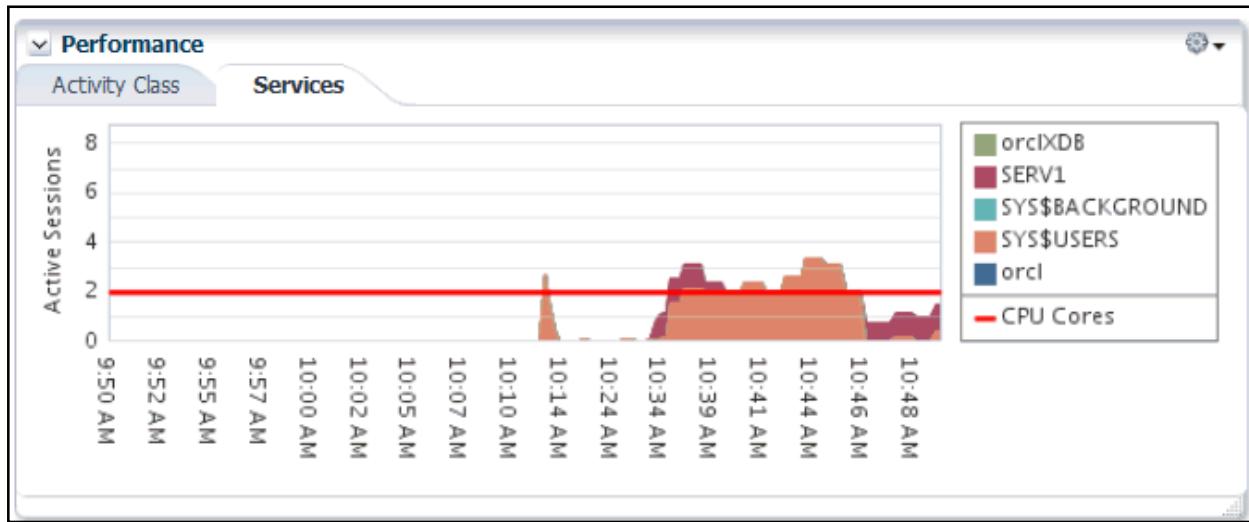
- b. Connect to your instance as the SV\_USER user using the SERV1 service. Create the workload activity by executing the sv1\_load2.sql script. If this script finishes before you complete the next step, use the sv1\_sel.sql script to execute the following query: SELECT COUNT(\*) FROM DBA\_OBJECTS, DBA\_OBJECTS, DBA\_OBJECTS

**Note:** Do not wait for the script to complete before proceeding to the next step.

```
$ sqlplus sv_user@SERV1
...
Enter password: oracle_4U <<< not displayed
Connected to:
...
SQL> @sv1_load2.sql
SQL> DECLARE
 2 t number;
 3 BEGIN
 4 for i in 1..2000 loop
 5 select count(*) into t from dba_objects;
 6 end loop;
 7 END;
 8 /
```

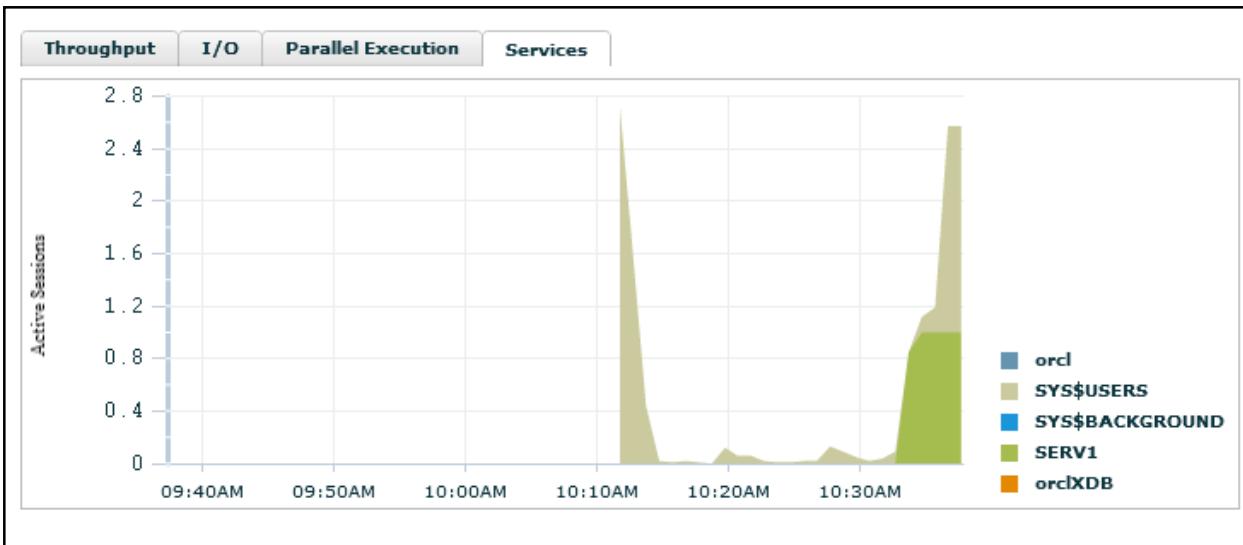
5. After the execution starts, access the Top Consumers page on the Performance tabbed page in Cloud Control, and determine the amount of resources SERV1 is using. Also, check the statistics on your service with V\$SERVICE\_STATS from a SQL\*Plus session connected as SYSDBA.

| Step | Window/Page Description | Choices or Values                                                                                         |
|------|-------------------------|-----------------------------------------------------------------------------------------------------------|
| a.   | Cloud Control           | Log in to Enterprise Manager Cloud Control as the ADMIN user and navigate to the orcl Database Home page. |
| b.   | orcl Database           | Select <b>Oracle Database &gt; Home</b> . In the Performance section, click the <b>Services</b> tab.      |

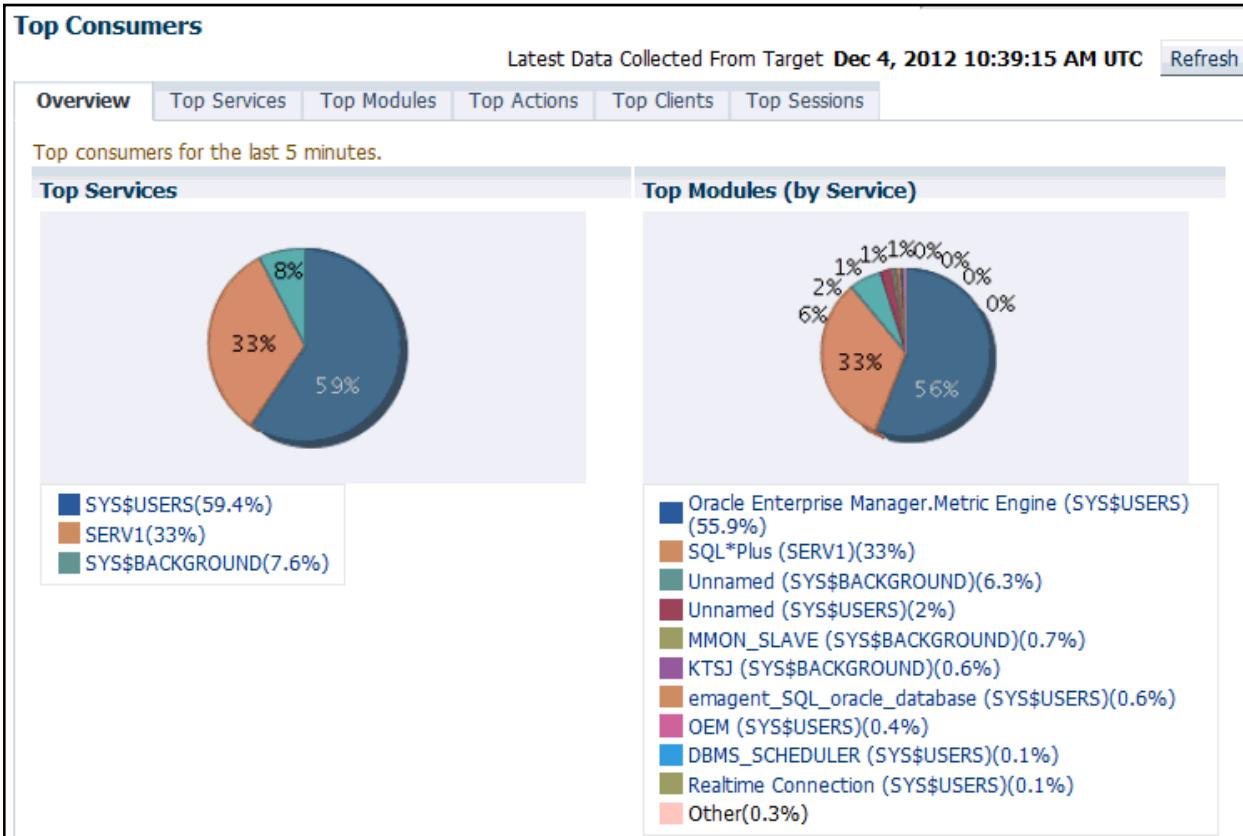


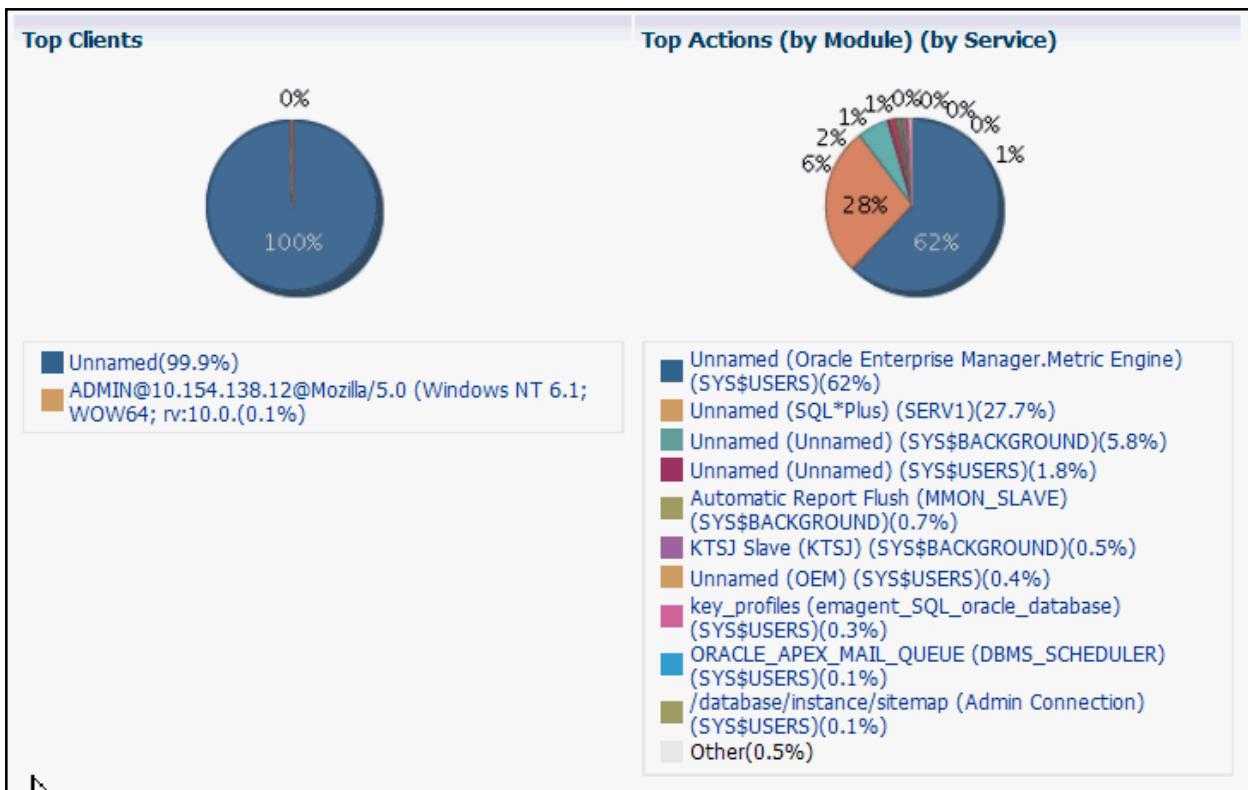
An Active Session graph with the activity aggregated by service name is displayed. The network service name of each connection is recorded as a separate service. Therefore, all the connections made without a service name are aggregated, as are all the connections made as SERV1.

| Step | Window/Page Description | Choices or Values                                                                                       |
|------|-------------------------|---------------------------------------------------------------------------------------------------------|
| c.   | orcl Database Home      | Select <b>Performance &gt; Performance Home</b> .                                                       |
| d.   | Performance Home        | Scroll down to view the Active Session graph aggregated by service by clicking the <b>Services</b> tab. |



| Step | Window/Page Description     | Choices or Values                                                |
|------|-----------------------------|------------------------------------------------------------------|
| d.   | Performance Home            | Scroll down to Additional Links.<br>Click <b>Top Consumers</b> . |
| e.   | Top Consumers: Overview tab | Review the graphs.                                               |





The names and number of services listed in the Top Services Graph depends on the number and type of connections to the database.

| Step | Window/Page Description        | Choices or Values                               |
|------|--------------------------------|-------------------------------------------------|
| f.   | Top Consumers: Overview        | Click the <b>Top Services</b> tab.              |
| g.   | Top Consumers: Top Services    | Click the <b>SERV1</b> link in Service column.  |
| h.   | Service: SERV1: Modules tab    | Click the <b>Statistics</b> tab.                |
| i.   | Service: SERV1: Statistics tab | View Detailed statistics for the SERV1 service. |

**Service: SERV1**

Latest Data Collected From Target **Dec 4, 2012 10:47:10 AM** [Refresh](#)

| Modules                   | Activity    | Statistics       |
|---------------------------|-------------|------------------|
| Previous                  | 1-25 of 28  | Next 3           |
| Name                      | Delta Value | Cumulative Value |
| logons cumulative         | 0           | 3                |
| user calls                | 0           | 36               |
| DB time                   | 0           | 321555488        |
| DB CPU                    | 0           | 276065024        |
| parse count (total)       | 0           | 240              |
| parse time elapsed        | 0           | 430304           |
| execute count             | 0           | 2392             |
| sql execute elapsed time  | 0           | 321023392        |
| opened cursors cumulative | 0           | 2382             |
| session logical reads     | 0           | 4214877          |
| physical reads            | 0           | 59               |
| physical writes           | 0           | 0                |

- If the `sv1_load2.sql` script finishes before you complete step 5, use the `sv1_sel.sql` script to continue creating a workload. When you have completed the tasks, make sure that you stop your running workload by pressing **Ctrl + C** in your terminal window. Then exit SQL\*Plus.

```
SQL> @sv1_sel.sql
SQL> select count(*) from dba_objects,dba_objects,dba_objects
 *
ERROR at line 1:
ORA-01013: user requested cancel of current operation

SQL> exit
```

- Clean up from this practice by executing the `sv1_cleanup.sh` script in the `$LABS/P21` directory.

```
$ cd $LABS/P21
$./sv1_cleanup.sh
```

## **Practices for Lesson 22: Managing Performance SQL Tuning**

**Chapter 22**

## Practices for Lesson 22: Overview

---

### Lesson Overview

By default, Automatic SQL Tuning executes automatically during each nightly maintenance window. For this practice, you simulate the execution of Automatic SQL Tuning, and explore its results

## Practice 22-1: Using Automatic SQL Tuning

---

### Overview

In this practice, you manually launch Automatic SQL Tuning to automatically tune a small application workload. You then investigate the outcome and configuration possibilities.

### Assumptions

ADMIN Super Administrator user has been created in Enterprise Manager Cloud Control.

DBA1 user with SYSDBA privileges has been created in the orcl database.

### Tasks

1. In Cloud Control, configure the automatic SQL tuning task to implement SQL profiles automatically.

| Step | Window/Page Description     | Choices or Values                                                                     |
|------|-----------------------------|---------------------------------------------------------------------------------------|
| a.   | EM Cloud Control            | Log in as <b>ADMIN</b> user.                                                          |
| b.   | Summary page                | Navigate to the <b>orcl</b> Database Home page.                                       |
| c.   | orcl Database Home          | Select <b>Administration &gt; Oracle Scheduler &gt; Automated Maintenance Tasks</b> . |
| d.   | Database Login              | Select <b>SYSDBA Database Credentials</b> and click <b>Login</b> .                    |
| e.   | Automated Maintenance Tasks | Verify that Status is <b>Enabled</b> . Click <b>Configure</b> .                       |

**Automated Maintenance Tasks**

Status Enabled **Configure**

**TIP** If the status is Disabled, there are no future windows.

| Step | Window/Page Description                   | Choices or Values                                    |
|------|-------------------------------------------|------------------------------------------------------|
| f.   | Automated Maintenance Tasks Configuration | Click <b>Configure</b> next to Automatic SQL Tuning. |

**Automated Maintenance Tasks Configuration**

Global Status  Enabled  Disabled

**Task Settings**

- Optimizer Statistics Gathering  Enabled  Disabled **Configure**
- Segment Advisor  Enabled  Disabled
- Automatic SQL Tuning  Enabled  Disabled **Configure**

| Step | Window/Page Description       | Choices or Values                                                                          |
|------|-------------------------------|--------------------------------------------------------------------------------------------|
| g.   | Automatic SQL Tuning Settings | Select <b>Yes</b> for Automatic Implementation of SQL Profiles.<br>Click <b>Show SQL</b> . |

Automated Maintenance Tasks Configuration >  
**Automatic SQL Tuning Settings**

Maximum Time Spent Per SQL During Tuning (sec)

Automatic Implementation of SQL Profiles  Yes  No

Maximum SQL Profiles Implemented Per Execution

Maximum SQL Profiles Implemented (Overall)

| Step | Window/Page Description | Choices or Values                                |
|------|-------------------------|--------------------------------------------------|
| h.   | Show SQL                | View the SQL statement.<br>Click <b>Return</b> . |

**Show SQL**

**Return**

```
BEGIN
dbms_sqltune.set_auto_tuning_task_parameter(
'ACCEPT_SQL_PROFILES', 'TRUE');
END;
```

| Step | Window/Page Description       | Choices or Values    |
|------|-------------------------------|----------------------|
| i.   | Automatic SQL Tuning Settings | Click <b>Apply</b> . |

You should receive a success message.

2. Review and execute the `$LABS/P22/ast_setup.sh` script .This script creates the AST user, turns off automatic maintenance tasks, and drops any existing profiles on queries executed by the AST user.
  - a. Set the environment for the `orcl` database. Change directories to the `$LABS/P22` directory and review the `ast_setup.sh` script.

```
$. oraenv
ORACLE_SID = [orcl] ? orcl
$ cd $LABS/P22
$ cat ast_setup.sh

#!/bin/bash
For training only - execute as oracle OS user
```

```
sqlplus / as sysdba <<EOF!
set echo on

drop user ast cascade;
create user ast identified by "oracle_4U";
grant dba to ast;

alter system flush shared_pool;
--
-- Turn off AUTOTASK
--

alter system set "_enable_automatic_maintenance"=0 scope=MEMORY;

--
-- Clear out old executions of auto-sqltune
--

exec dbms_sqltune.reset_tuning_task('SYS_AUTO_SQL_TUNING_TASK');

--
-- Drop any profiles on AST queries
--

declare
 cursor prof_names is
 select name from dba_sql_profiles where sql_text like
'%AST%';
begin
 for prof_rec in prof_names loop
 dbms_sqltune.drop_sql_profile(prof_rec.name);
 end loop;
end;
/

EOF!
$
```

- b. Execute the `ast_setup.sh` script.

```
$./ast_setup.sh

SQL> SQL> SQL> drop user ast cascade
 *
ERROR at line 1:
ORA-01918: user 'AST' does not exist

SQL>
User created.

SQL>
Grant succeeded.

SQL> SQL>
System altered.

SQL> SQL> SQL> SQL>
System altered.

SQL> SQL> SQL> SQL> SQL>
PL/SQL procedure successfully completed.

SQL> SQL> SQL> SQL> SQL> 2 3 4 5 6 7 8 9
PL/SQL procedure successfully completed.

SQL> SQL>
$
```

3. Execute the `ast_workload_stream.sh` script. This script executes a query that is not correctly optimized multiple times. The query in question uses hints that force the optimizer to pick a suboptimal execution plan. The script executes for approximately 60 seconds. (*Output has been reduced.*)

```
$./ast_workload_stream.sh

Thu Dec 6 12:58:43 UTC 2012
Thu Dec 6 12:59:40 UTC 2012
$
```

4. Automatic SQL Tuning is implemented using an automated task that runs during maintenance windows. However, you are not going to wait for the next maintenance window to open. This might take too long. Instead, you will force the opening of your next maintenance window now. This will automatically trigger the Automatic SQL Tuning task. Review and execute the `ast_run.sh` script to do that. It takes about ten minutes for the script to execute.

a. Review the `ast_run.sh` script.

```
$ cat ast_run.sh
#!/bin/bash
For training only - execute as oracle OS user
date

sqlplus / as sysdba <<EOF!
set echo on
set serveroutput on

exec dbms_workload_repository.create_snapshot;

variable window varchar2(20);
begin
 select upper(to_char(sysdate,'fmday'))||'_WINDOW' into :window
from dual;
end;
/
print window;

--
-- Open the corresponding maintenance window, but with other
clients disabled
--
alter system set "_enable_automatic_maintenance"=1
/
exec dbms_auto_task_admin.disable(
 'auto optimizer stats collection', null, :window);

exec dbms_auto_task_admin.disable(
 'auto space advisor', null, :window);

exec dbms_scheduler.open_window(:window, null, true);

--
-- Close the maintenance window when sqltune is done
--
exec dbms_lock.sleep(60);

declare
 running number;
begin
 loop
```

```
select count(*)
into running
from dba_advisor_executions
where task_name = 'SYS_AUTO_SQL_TUNING_TASK' and
 status = 'EXECUTING';
if (running = 0) then
 exit;
end if;
dbms_lock.sleep(60);
end loop;
dbms_scheduler.close_window(:window);
end;
/
alter system set "_enable_automatic_maintenance"=1 SCOPE=MEMORY
/

-- Re-enable the other guys so they look like they are enabled
in EM.
-- Still they will be disabled because we have set the
underscore.
--

exec dbms_auto_task_admin.enable(
 'auto optimizer stats collection', null, :window);

exec dbms_auto_task_admin.enable(
 'auto space advisor', null, :window);

EOF!

date

$
```

b. Execute the `ast_run.sh` script.

```
$./ast_run.sh
Thu Dec 6 07:51:46 UTC 2012
...
Connected to:
...
SQL> SQL> SQL> SQL>
PL/SQL procedure successfully completed.
```

```
SQL> SQL> SQL> 2 3 4
PL/SQL procedure successfully completed.

SQL>
WINDOW

THURSDAY_WINDOW

SQL> SQL> SQL> SQL> SQL> 2
System altered.

SQL> >
PL/SQL procedure successfully completed.

SQL> SQL> >
PL/SQL procedure successfully completed.

SQL> SQL>
PL/SQL procedure successfully completed.

SQL> SQL> SQL> SQL> SQL>
PL/SQL procedure successfully completed.

SQL> SQL> 2 3 4 5 6 7 8 9 10 11 12
13 14 15 16 17
PL/SQL procedure successfully completed.

SQL> 2
System altered.

SQL> SQL> SQL> SQL> SQL> SQL> >
PL/SQL procedure successfully completed.

SQL> SQL> >
PL/SQL procedure successfully completed.

SQL> SQL>
Thu Dec 6 07:52:52 UTC 2012
$
```

Some of your output, such as the value in the WINDOW column, may look different.

- Execute the `ast_workload_stream.sh` script again. What do you observe?

You should see that the execution time for `ast_workload_stream.sh` is much faster than the original execution. This is probably due to the fact that Automatic SQL Tuning implemented a profile for your statement automatically.

```
$./ast_workload_stream.sh
Thu Dec 6 13:02:19 UTC 2012
Thu Dec 6 13:02:34 UTC 2012
$
```

- Log in as the `AST` user and force the creation of an AWR snapshot.

```
$ sqlplus ast
Enter password: oracle_4U <<< not displayed
SQL> exec dbms_workload_repository.create_snapshot;
PL/SQL procedure successfully completed.

SQL> exit
$
```

- How can you confirm that a SQL Profile was automatically implemented?

- In Enterprise Manager Cloud Control, navigate to **Administration > Oracle Scheduler > Automated Maintenance Tasks**.
- Click **Automatic SQL Tuning**.
- On the Automatic SQL Tuning summary page, view the tuning results.

Advisor Central >  
**Automatic SQL Tuning Result Summary**

The Automatic SQL Tuning runs during system maintenance windows as an automated maintenance task, high-load SQL statements.

**Task Status**

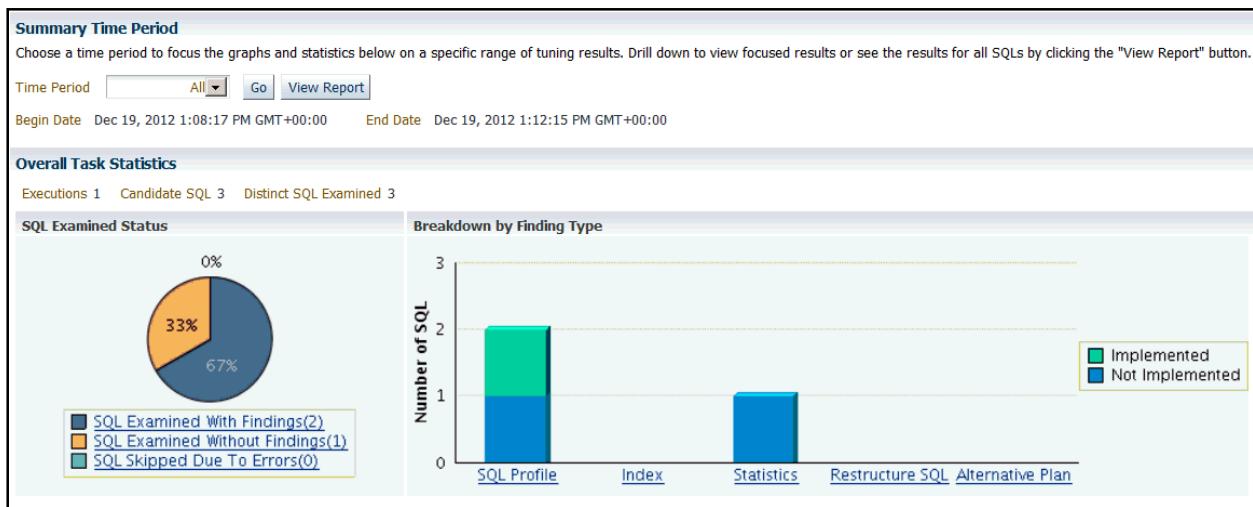
Automatic SQL Tuning (SYS\_AUTO\_SQL\_TUNING\_TASK) is currently Enabled [Configure](#)

Automatic Implementation of SQL Profiles is currently Enabled [Configure](#)

Key SQL Profiles 0

**TIP** Key SQL Profiles were verified to yield at least a 3X performance improvement and would have auto-implementation been enabled.

The task has already run in one maintenance window and has results ready to be viewed.



- Look at the graphs on the Automatic SQL Tuning Result Summary page. (If you do not see any graphs, return to step 5, execute the workload twice, and then continue with step 6 and 7.)
- Focus on understanding the pie chart and the bar graph next to it. You should be able to get a feeling for the general findings breakdown, as well as the number of SQL profiles implemented by the task.
- In the Summary Time Period section, click **View Report** to see a detailed SQL-level report.
- Find and select the SQL statement that ran in the AST schema.

**Note:** The Thumbs Up icon means that the profile was implemented.

Advisor Central > SQL Tuning Summary:SYS.SYS\_AUTO\_SQL\_TUNING\_TASK > **Automatic SQL Tuning Result Details: All Analyzed SQLs** Logged in as SYS

Begin Date Dec 19, 2012 1:08:17 PM GMT+00:00 End Date Dec 19, 2012 1:16:59 PM GMT+00:00

**Recommendations**  
Only profiles that significantly improve SQL performance were implemented.

| Select                           | SQL Text                                        | Parsing Schema | SQL ID        | Weekly DB Time Benefit(sec) | Per-Execution % Benefit | Statistics | SQL Profile | Index | Restructure SQL | Alternative Plan |
|----------------------------------|-------------------------------------------------|----------------|---------------|-----------------------------|-------------------------|------------|-------------|-------|-----------------|------------------|
| <input checked="" type="radio"/> | select /*+ USE_NL(s c) FULL(s)<br>FULL(c) A...) | AST            | by9m5m597zh19 | 36.66                       | 98                      |            | (98%)       |       |                 |                  |
| <input type="radio"/>            | select 'uptime' stat_type, roun...              | DBSNMP         | az0f41hqy50f1 | 0.04                        | <10                     |            | (<10%)      |       |                 |                  |
| <input type="radio"/>            | select dbms_sqltune.report_sql_monitor_l...     | DBSNMP         | g57kbmv1gqfk  |                             |                         |            |             |       |                 |                  |



- Click **View Recommendations**.

- i. Click the **Compare Explain Plans** eyeglass icon for the SQL Profile entry.

**Recommendations for SQL ID:by9m5m597zh19**

Only one recommendation should be implemented.

**SQL Information**

SQL Text    select /\*+ USE\_NL(s c) FULL(s) FULL(c) AST \*/ c.cust\_id, sum(s.quantity\_sold) from sh.sales s, sh.customers c where s.cust\_id = c.cust\_id and c.cust\_id < 2 group by c.cust\_id

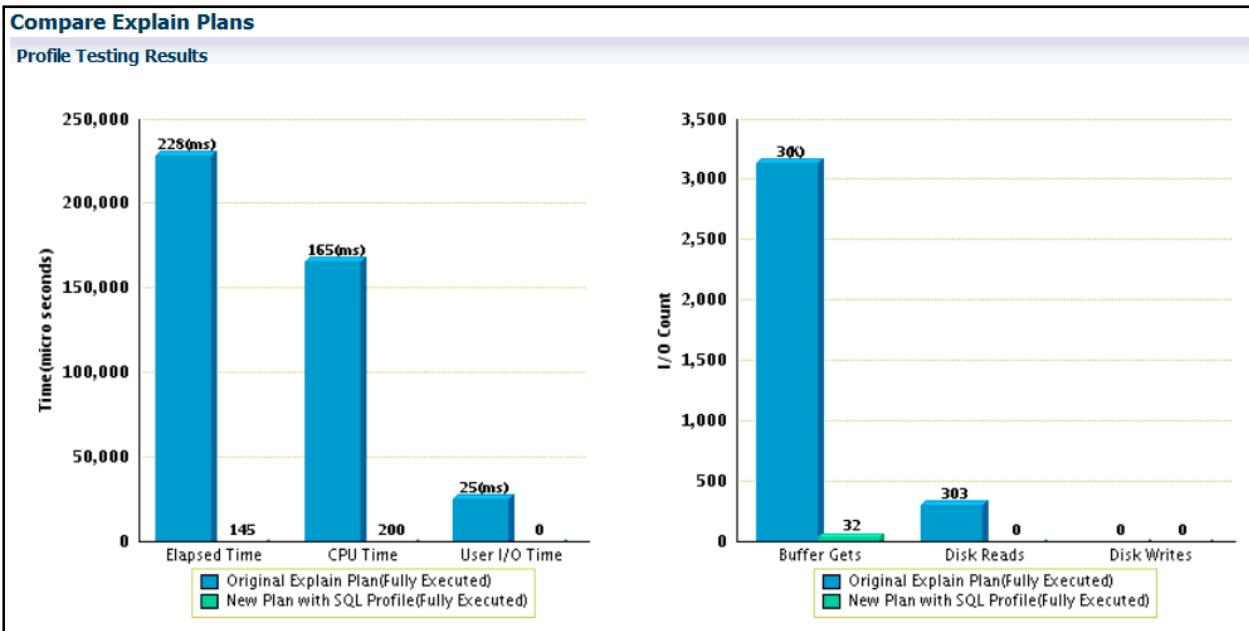
**Select Recommendation**

Original Explain Plan (Annotated)

Implement

| Select | Type        | Findings                                                                                                                                         | Recommendations                                                                              | Rationale | Benefit (%) | Other Statistics | New Explain Plan | Compare Explain Plans |
|--------|-------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------|-------------|------------------|------------------|-----------------------|
| ●      | SQL Profile | A potentially better execution plan was found for this statement. The SQL profile "SYS_SQLPROF_013bb347765c0000" currently has status "ENABLED". | The SQL profile "SYS_SQLPROF_013bb347765c0000" was created automatically for this statement. | 98.98     |             |                  | ●                | ●                     |

- j. Scroll down the page.



- k. Look at the old and new explain plans for the query.

| Original Explain Plan (Annotated)                                                                                                          |         |              |             |       |      |       |       |      |          |                 |
|--------------------------------------------------------------------------------------------------------------------------------------------|---------|--------------|-------------|-------|------|-------|-------|------|----------|-----------------|
| <span style="color: blue;">●</span> Indicates an adjustment from the original plan by the SQL Tuning Advisor<br>Plan Hash Value 4005616876 |         |              |             |       |      |       |       |      |          |                 |
| <a href="#">Expand All</a>   <a href="#">Collapse All</a>                                                                                  |         |              |             |       |      |       |       |      |          |                 |
| Operation                                                                                                                                  | Line ID | Object       | Object Type | Order | Rows | Bytes | Cost  | Time | CPU Cost | I/O Cost        |
| ▼ SELECT STATEMENT                                                                                                                         | 0       |              |             |       | 6    |       | 0.013 | 938  | 1        | 238,857,216 932 |
| ▼ HASH GROUP BY                                                                                                                            | 1       |              |             |       | 5    |       | 0.013 | 938  | 1        | 238,857,216 932 |
| ▼ NESTED LOOPS                                                                                                                             | 2       |              |             |       | 4    |       | 0.013 | 938  | 1        | 237,657,216 932 |
| TABLE ACCESS FULL                                                                                                                          | 3       | SH.CUSTOMERS | TABLE       |       | 1    |       | 0.005 | 423  | 1        | 22,145,352 422  |
| ▼ PARTITION RANGE ALL                                                                                                                      | 4       |              |             |       | 3    |       | 0.008 | 516  | 1        | 215,511,872 510 |
| TABLE ACCESS FULL                                                                                                                          | 5       | SH.SALES     | TABLE       |       | 2    |       | 0.008 | 516  | 1        | 215,511,872 510 |

| New Explain Plan With SQL Profile                         |         |                   |                |       |      |       |       |      |          |              |
|-----------------------------------------------------------|---------|-------------------|----------------|-------|------|-------|-------|------|----------|--------------|
| Plan Hash Value 34974602                                  |         |                   |                |       |      |       |       |      |          |              |
| <a href="#">Expand All</a>   <a href="#">Collapse All</a> |         |                   |                |       |      |       |       |      |          |              |
| Operation                                                 | Line ID | Object            | Object Type    | Order | Rows | Bytes | Cost  | Time | CPU Cost | I/O Cost     |
| ▼ SELECT STATEMENT                                        | 0       |                   |                |       | 8    |       | 0.013 | 55   | 1        | 1,640,778 55 |
| ▼ HASH GROUP BY                                           | 1       |                   |                |       | 7    |       | 0.013 | 55   | 1        | 1,640,778 55 |
| ▼ NESTED LOOPS                                            | 2       |                   |                |       | 6    |       | 0.013 | 55   | 1        | 440,778 55   |
| ▼ PARTITION RANGE ALL                                     | 3       |                   |                |       | 4    |       | 0.008 | 55   | 1        | 438,828 55   |
| ▼ TABLE ACCESS BY LOCAL INDEX ROWID BATCHED               | 4       | SH.SALES          | TABLE          |       | 3    |       | 0.008 | 55   | 1        | 438,828 55   |
| ▼ BITMAP CONVERSION TO ROWIDS                             | 5       |                   |                |       | 2    |       |       |      |          |              |
| BITMAP INDEX RANGE SCAN                                   | 6       | SH.SALES_CUST_BIX | INDEX (BITMAP) | 1     |      |       |       |      |          |              |
| INDEX UNIQUE SCAN                                         | 7       | SH.CUSTOMERS_PK   | INDEX (UNIQUE) | 5     |      |       | 0.005 | 0    | 1        | 1,950 0      |

- i. Click the **Recommendations for SQL ID** locator link (the last of the breadcrumbs on top of the page) to return to the previous page.
- m. Investigate a SQL profile. While still on the “Recommendations for SQL\_ID” page, click the SQL text to go to the SQL Details page for this SQL.

- n. On the SQL Details – Tuning History page note the link to SYS\_AUTO\_SQL\_TUNING\_TASK, which indicates that the SQL was tuned by this tuning task.

The screenshot shows the Oracle SQL Tuning Advisor interface. At the top, there is a text area containing a SQL query:

```
Text
select /*+ USE_NL(s c) FULL(s) FULL(c) AST */ c.cust_id, sum(s.quantity_sold)
from sh.sales s, sh.customers c
where s.cust_id = c.cust_id and c.cust_id < 2 group by c.cust_id
```

Below the text area is a "Details" section with a "Tuning History" tab selected. The "Tuning History" tab displays a table with one row:

| Advisor Task Name        | Task Owner | Task Completion         |
|--------------------------|------------|-------------------------|
| SYS_AUTO_SQL_TUNING_TASK | SYS        | Dec 19, 2012 1:08:33 PM |

There is also a section titled "ADDM Findings for this SQL during historic period" which contains a table with one row labeled "(No data)".

- o. Click the **Plan Control** tab.  
p. Note that a profile was created automatically for this SQL. The type of AUTO means it was automatically created.

The screenshot shows the Oracle SQL Tuning Advisor interface with the "Plan Control" tab selected. The "SQL Profiles and SQL Patches" section displays a table with one row, where the "Type" column is highlighted with a red box:

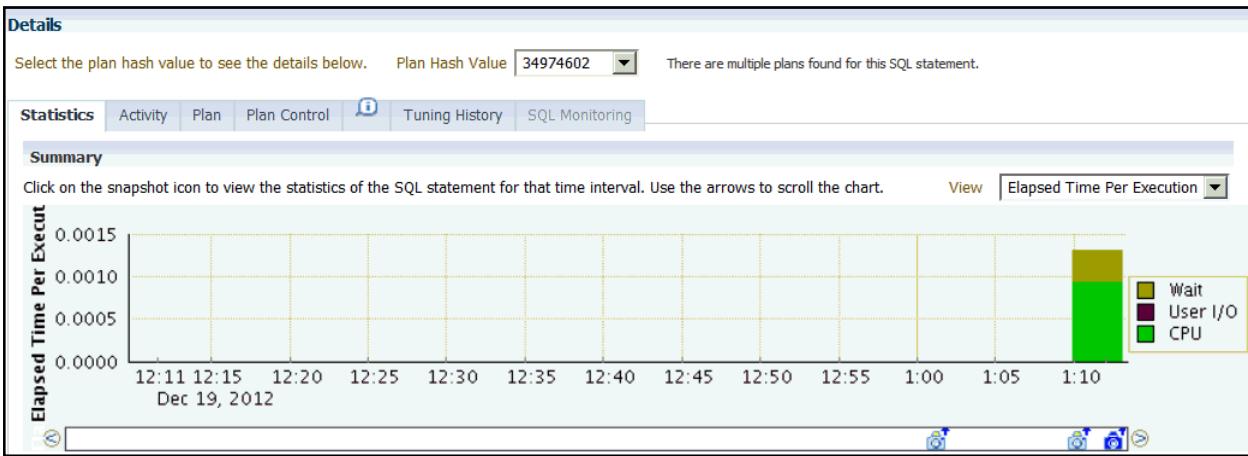
| Select                           | Name                         | Type | Category | Status  | Created                 |
|----------------------------------|------------------------------|------|----------|---------|-------------------------|
| <input checked="" type="radio"/> | SYS_SQLPROF_013bb347765c0000 | AUTO | DEFAULT  | ENABLED | Dec 19, 2012 1:08:23 PM |

Below this is the "SQL Plan Baseline" section, which displays a table with one row labeled "(No data)".

- q. Click the **Statistics** tab to look at the execution history for this SQL.

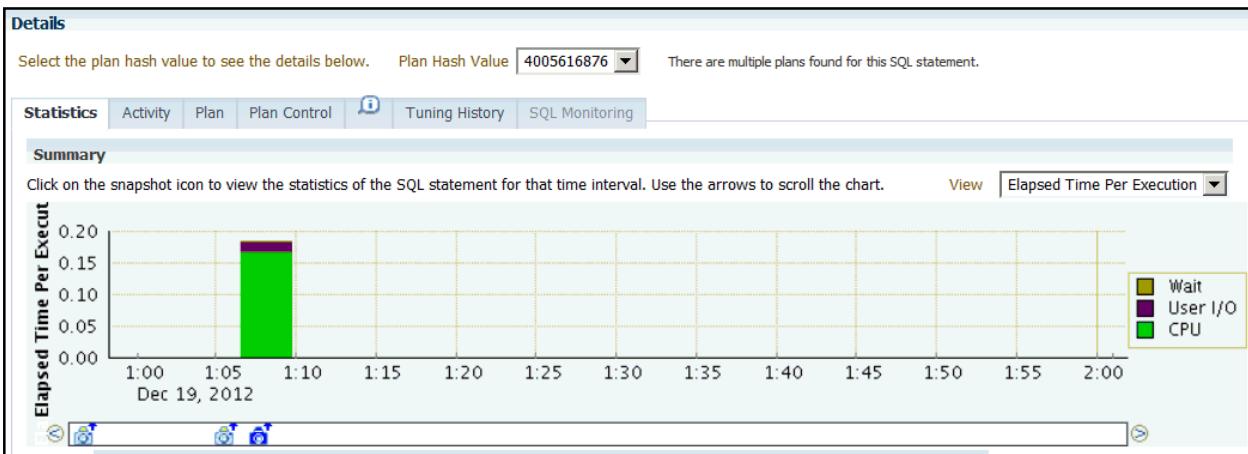
- r. Select one of the plan hash values from the Plan Hash Values drop-down list. What is the time of the execution, and elapsed time per execution?

In the example, the execution time is ~1:10 and the elapsed time is ~0.0013



- s. Select the other plan hash value from the Plan Hash Values drop-down list. What is the time of the execution, and elapsed time per execution?

In the example, the execution time is ~1:07 and the elapsed time is ~0.18



- t. Which of the two executed first? Which one executed more quickly?

The hash value 4005616876 in the example executed first, and the second hash value 34974602 used 1/100 of the time.

- u. Select All from the Plan Hash Values drop-down list. This shows the improved plan and the original in the same graph. The bar graph for the second run with the SQL Profile applied may be so small as to be almost invisible.

8. Generate a text report for more in-depth information. From the command line, execute the `ast_task_report.sh` script. What do you observe?

- a. Notice the first queries that fetch execution name and object number from the advisor schema, followed by the final query that gets the text report. In the text report, look for the section about the SQL profile finding and peruse the Validation Results section. This shows you the execution statistics observed during test-execute and allows you to get more of a feeling about the profile's quality. You can also use the `report_auto_tuning_task` API to get reports that span multiple executions of the task. Review the `ast_task_report.sh` script.

```
$ cat ast_task_report.sh
#!/bin/bash
For training only - execute as oracle OS user

sqlplus / as sysdba <<EOF!
set echo on
set long 1000000000
set longchunksize 1000
set serveroutput on

--
-- Check the execution names
--

alter session set nls_date_format = 'MM/DD/YYYY HH24:MI:SS';

select execution_name, status, execution_start
 from dba_advisor_executions
 where task_name = 'SYS_AUTO_SQL_TUNING_TASK'
 order by execution_start;

variable last_exec varchar2(30);

begin
 select max(execution_name) keep (dense_rank last order by
execution_start)
 into :last_exec
 from dba_advisor_executions
 where task_name = 'SYS_AUTO_SQL_TUNING_TASK';
end;
/

print :last_exec

--
-- Find the object ID for query AST with sql_id by9m5m597zh19
--
variable obj_id number;

begin
 select object_id
 into :obj_id
 from dba_advisor_objects
 where task_name = 'SYS_AUTO_SQL_TUNING_TASK' and
```

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```
 execution_name = :last_exec and
 type = 'SQL' and
 attr1 = 'by9m5m597zh19';
end;
/
print :obj_id

--
-- Get a text report to drill down on this one query
--

set pagesize 0
select dbms_sqltune.report_auto_tuning_task(
 :last_exec, :last_exec, 'TEXT', 'TYPICAL', 'ALL', :obj_id)
from dual;

EOF!

$
```

- b. Execute the `ast_task_report.sh` script.

```
$./ast_task_report.sh

SQL> SQL> SQL> SQL> SQL> SQL> SQL> SQL>
Session altered.

SQL> SQL> 2 3 4
EXECUTION_NAME STATUS EXECUTION_START

EXEC_22 COMPLETED 12/19/2012 13:08:17

SQL> SQL> SQL> SQL> 2 3 4 5 6 7
PL/SQL procedure successfully completed.

SQL> SQL>
LAST_EXEC

EXEC_22

SQL> SQL> SQL> SQL> SQL> SQL> SQL> 2 3 4 5 6 7
8 9 10
PL/SQL procedure successfully completed.
```

```
SQL> SQL>
 OBJ_ID

 3

SQL> SQL> SQL> SQL> SQL> SQL> 2 3 GENERAL INFORMATION
SECTION

Tuning Task Name :
SYS_AUTO_SQL_TUNING_TASK
Tuning Task Owner : SYS
Workload Type : Automatic High-Load
SQL Workload
Scope : COMPREHENSIVE
Global Time Limit(seconds) : 3600
Per-SQL Time Limit(seconds) : 1200
Completion Status : COMPLETED
Started at : 12/19/2012 13:08:17
Completed at : 12/19/2012 13:08:33
Number of Candidate SQLs : 3
Cumulative Elapsed Time of SQL (s) : 40

Object ID : 3
Schema Name: AST
SQL ID : by9m5m597zh19
SQL Text : select /*+ USE_NL(s c) FULL(s) FULL(c) AST */
c.cust_id,
 sum(s.quantity_sold) from sh.sales s, sh.customers
c where
 s.cust_id = c.cust_id and c.cust_id < 2 group by
c.cust_id

FINDINGS SECTION (1 finding)

1- SQL Profile Finding (see explain plans section below)
```

A potentially better execution plan was found for this statement.

SQL profile "SYS\_SQLPROF\_013bb347765c0000" was created automatically for this statement.

Recommendation (estimated benefit: 98.98%)

- An automatically-created SQL profile is present on the system.

Name: SYS\_SQLPROF\_013bb347765c0000  
Status: ENABLED

Validation results

The SQL profile was tested by executing both its plan and the original plan and measuring their respective execution statistics. A plan may have been only partially executed if the other could be run to completion in less time.

|                                  | Original Plan | With SQL Profile | %     |
|----------------------------------|---------------|------------------|-------|
| Improved                         | -----         | -----            | ----- |
| Completion Status:               | COMPLETE      | COMPLETE         |       |
| Elapsed Time (s):<br>99.93 %     | .228494       | .000145          |       |
| CPU Time (s):<br>99.87 %         | .165374       | .0002            |       |
| User I/O Time (s):<br>100 %      | .025089       | 0                |       |
| Buffer Gets:<br>98.98 %          | 3142          | 32               |       |
| Physical Read Requests:<br>100 % | 12            | 0                |       |
| Physical Write Requests:         | 0             | 0                |       |
| Physical Read Bytes:<br>100 %    | 2485452       | 0                |       |
| Physical Write Bytes:            | 0             | 0                |       |
| Rows Processed:                  | 0             | 0                |       |
| Fetches:                         | 0             | 0                |       |
| Executions:                      | 1             | 1                |       |

| Notes                                                                    |    |                     |                |      |       |      |
|--------------------------------------------------------------------------|----|---------------------|----------------|------|-------|------|
| -----                                                                    |    |                     |                |      |       |      |
| 1. Statistics for the original plan were averaged over 5 executions.     |    |                     |                |      |       |      |
| 2. Statistics for the SQL profile plan were averaged over 10 executions. |    |                     |                |      |       |      |
| -----                                                                    |    |                     |                |      |       |      |
| -----                                                                    |    |                     |                |      |       |      |
| EXPLAIN PLANS SECTION                                                    |    |                     |                |      |       |      |
| -----                                                                    |    |                     |                |      |       |      |
| -----                                                                    |    |                     |                |      |       |      |
| 1- Original With Adjusted Cost                                           |    |                     |                |      |       |      |
| -----                                                                    |    |                     |                |      |       |      |
| Plan hash value: 4005616876                                              |    |                     |                |      |       |      |
| -----                                                                    |    |                     |                |      |       |      |
| -----                                                                    |    |                     |                |      |       |      |
|                                                                          | Id | Operation<br>(%CPU) | Name           | Rows | Bytes | Cost |
|                                                                          |    | Time                | Pstart   Pstop |      |       |      |
|                                                                          |    |                     |                |      |       |      |
| 938                                                                      | 0  | SELECT STATEMENT    |                |      | 1     | 13   |
| 938                                                                      |    | (1)   00:00:0       |                |      |       |      |
| 1                                                                        |    |                     |                |      |       |      |
| 938                                                                      | 1  | HASH GROUP BY       |                |      | 1     | 13   |
| 938                                                                      |    | (1)   00:00:0       |                |      |       |      |
| 1                                                                        |    |                     |                |      |       |      |
| 938                                                                      | 2  | NESTED LOOPS        |                |      | 1     | 13   |
| 938                                                                      |    | (1)   00:00:0       |                |      |       |      |
| 1                                                                        |    |                     |                |      |       |      |
| 423                                                                      | 3  | TABLE ACCESS FULL   | CUSTOMERS      | 1    | 5     |      |
| 423                                                                      |    | (1)   00:00:0       |                |      |       |      |
| 1                                                                        |    |                     |                |      |       |      |
| 516                                                                      | 4  | PARTITION RANGE ALL |                | 1    | 8     |      |
| 516                                                                      |    | (2)   00:00:0       |                |      |       |      |
| 1                                                                        |    | 1   28              |                |      |       |      |
| 516                                                                      | 5  | TABLE ACCESS FULL   | SALES          | 1    | 8     |      |
| 516                                                                      |    | (2)   00:00:0       |                |      |       |      |
| 1                                                                        |    | 1   28              |                |      |       |      |

```



```

Predicate Information (identified by operation id):

```

3 - filter("C"."CUST_ID"><2)
5 - filter("S"."CUST_ID"><2 AND "S"."CUST_ID"="C"."CUST_ID")
```

2- Using SQL Profile

```

Plan hash value: 34974602
```

```

| Id | Operation | Name
| Rows |
Bytes | Cost (%CPU) | Time | Pstart| Pstop |

```

```

| 0 | SELECT STATEMENT | -
| 1 |
| 13 | 55 (0) | 00:00:01 | | |
| 1 | HASH GROUP BY | -
| 1 |
| 13 | 55 (0) | 00:00:01 | | |
| 2 | NESTED LOOPS | -
| 1 |
| 13 | 55 (0) | 00:00:01 | | |
| 3 | PARTITION RANGE ALL | -
| 1 |
| 8 | 55 (0) | 00:00:01 | 1 | 28 |
| 4 | TABLE ACCESS BY LOCAL INDEX ROWID BATCHED | SALES
| 1 |
| 8 | 55 (0) | 00:00:01 | 1 | 28 |
| 5 | BITMAP CONVERSION TO ROWIDS | -
| 1 |
| * 6 | BITMAP INDEX RANGE SCAN | -
SALES_CUST_BIX | | | 1 | 28 |
| 1 |
```

```

|* 7 | INDEX UNIQUE SCAN
CUSTOMERS_PK | 1 |
 5 | 0 (0) | 00:00:01 | | |


```

Predicate Information (identified by operation id):

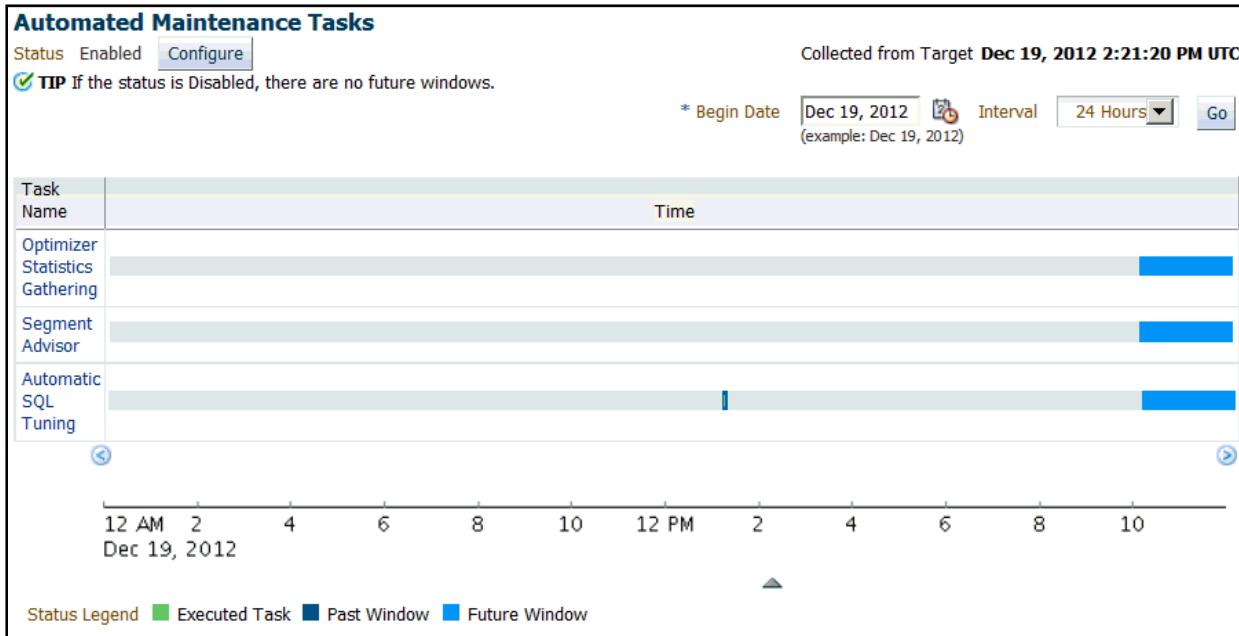
```

6 - access("S"."CUST_ID"<2)
 filter("S"."CUST_ID"<2)
7 - access("S"."CUST_ID"="C"."CUST_ID")
 filter("C"."CUST_ID"<2)
```

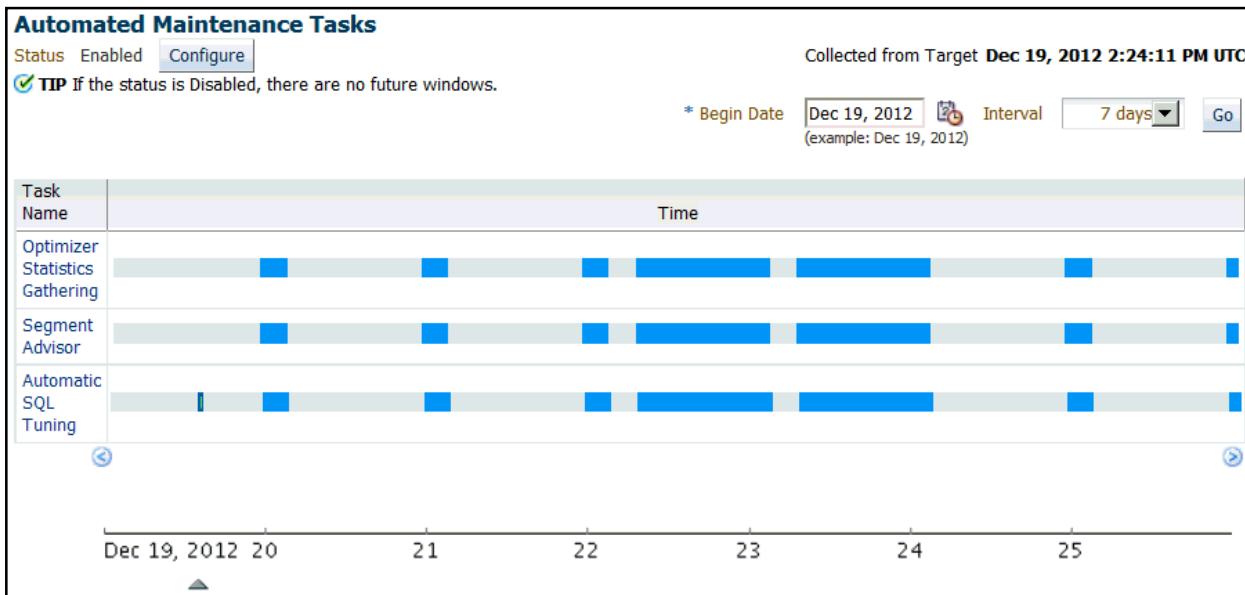
```

SQL> SQL>
$
```

9. Investigate configuring Automatic SQL Tuning with Cloud Control.
  - a. While you are logged in to the `orc1` database target as the `DBA1` user, navigate to **Administration > Oracle Scheduler > Automated Maintenance Tasks**.
  - b. The chart shows times in the past when each client was executed, and times in the future when they are scheduled to run again.



- c. Select **7 days** from the Interval drop-down list to see an entire week's worth of data.

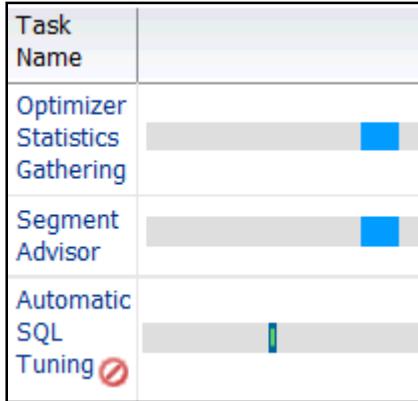


- d. Click the **Configure** button. On the Automated Maintenance Tasks Configuration page, you can disable individual tasks and change which windows they run in.  
e. Disable the Automatic SQL Tuning task entirely and click **Show SQL**.

```
BEGIN
dbms_auto_task_admin.disable(client_name => 'sql tuning advisor',
operation => NULL, window_name => NULL);
END;
```

- f. Review the commands and then click **Return**.  
g. On the Automated Maintenance Tasks Configuration page, click **Apply**. You should receive a success message.  
h. Click the **Automated Maintenance Tasks** locator link.

**Hint:** The locator link is at the top of the page.



- i. Notice the forbidden sign right next to the task name.  
j. Click **Configure**.

- k. **Enable** the Automatic SQL Tuning task.

Automated Maintenance Tasks > Automated Maintenance Tasks

**Automated Maintenance Tasks Configuration**

Global Status  Enabled  Disabled

**Task Settings**

|                                |                                          |                                |                           |
|--------------------------------|------------------------------------------|--------------------------------|---------------------------|
| Optimizer Statistics Gathering | <input checked="" type="radio"/> Enabled | <input type="radio"/> Disabled | <a href="#">Configure</a> |
| Segment Advisor                | <input checked="" type="radio"/> Enabled | <input type="radio"/> Disabled | <a href="#">Configure</a> |
| Automatic SQL Tuning           | <input checked="" type="radio"/> Enabled | <input type="radio"/> Disabled | <a href="#">Configure</a> |

- I. Optionally, click Show SQL, review the commands, and then click **Return**.

```
BEGIN
dbms_auto_task_admin.enable(client_name => 'sql tuning advisor',
operation => NULL, window_name => NULL);
END;
```

- m. Click **Apply** to enable Automatic SQL Tuning. You should receive a success message.  
n. Navigate to the Automatic SQL Tuning page. If you are on the Automated Maintenance Tasks Configuration page, click the **Configure** button for Automatic SQL Tuning.  
o. On the Automatic SQL Tuning Settings page, select **No** beside the “Automatic Implementation of SQL Profiles” field, and click **Show SQL**.

```
BEGIN
dbms_sqltune.set_auto_tuning_task_parameter('ACCEPT_SQL_PROFILES',
'FALSE');
END;
```

- p. Review the command, click **Return**, and then click **Apply**. You should receive a success message.  
q. Return to the `orcl` Database Home page.

10. **OPTIONAL:** Review the `ast_manual_config.sh` script to understand how you can configure Automatic SQL Tuning by using PL/SQL.

## **Practices for Lesson 23: Introduction to Upgrading to Oracle Database 12c**

**Chapter 23**

## Practices for Lesson 23: Overview

---

### Practices Overview

In these practices, you will consider several upgrade scenarios.

A general checklist for any upgrade scenario is:

1. For all cases, the first step is to become familiar with Oracle Database Upgrade Guide 12c Release 1 (12.1).
2. Survey your database to determine whether the current configuration is compatible with Oracle Database 12c. Document any issues that you find.
3. What-if: You have discovered that your database is not a supported release.
  - a. For any patch release before 10.2.0.5, 11.1.0.7, or 11.2.0.2, you cannot upgrade directly to Oracle Database 12c. You must upgrade to a supported patch level (10.2.0.5, 11.1.0.7, 11.2.0.2, or later) and then upgrade to 12c.
  - b. For database versions older than 10.2.x, you must upgrade to a supported version. For example, 9.2.0.8 could be upgraded to 11.2.0.2 or 11.2.0.3, and then to 12.1.
  - c. For other than supported patch releases and for older versions of the Oracle Database software from 10.1.0.1 and later, the database can be migrated using Oracle Data Pump export/import. See Chapter 2 of the *Oracle Database Upgrade Guide 12c Release 1 (12.1)* for more information about Data Pump use.
  - d. For versions of the database earlier than 10.1.0.1, you can use the original Export and Import utilities.
4. Determine the upgrade/migration method.
  - a. Direct upgrade using DBUA
    - Requires a supported version level
    - Requires that source and target ORACLE\_HOME directories have compatible permissions. Both must be owned by the same OS user or by the same OS group. Log files must be directed to a directory accessible by both source and target OS users.
    - Requires that the database be in restricted mode during the upgrade
    - The time required for the upgrade is dependent on the installed components and the number of objects, not on the volume of data.
    - Database files remain in place by default.
    - A downgrade is possible after an upgrade, if the COMPATIBLE parameter has *not* been set to a higher level.
    - **Note:** If the upgrade fails, you must recover the database to the pre-upgrade state. A tested backup and recovery plan to restore database files is essential.
  - b. Direct upgrade using the manual method (same requirements as using DBUA)
    - More flexibility
    - More opportunities for error
    - Requires additional post-upgrade steps

- c. Data Pump export/import
  - Allows you to move a database to a different OS, different hardware, or a different version
  - Allows data transfer over a network (No dump files are created or moved.)
  - Allows data transfer from any version from 10.1.0.1 and higher to 12.1.0.1
  - Allows the transfer of selected schemas and objects
  - The time required for the transfer is dependent on the amount of data.
  - The source database must be in restricted mode while exporting the data (no data updates are allowed).
- d. Original export/import (same restrictions as Data Pump export with exceptions)
  - Allows export from older versions of Oracle Database software older than 10.1.0.1 to Oracle Database 12c
  - Does not allow network transfer of data, except through custom scripting (for example, pipes)

For all upgrade methods to 12c:

- Install Oracle Database 12c in a new ORACLE\_HOME directory.
- The current ORACLE\_HOME directory is not removed. *Do not attempt to open the upgraded database with the older software.*

**Best Practice:** Practice whatever upgrade method you decide to use. Create a test database instance as similar as possible to the source instance. Use this instance to test applications and performance after the upgrade, before upgrading the production instance.

5. Perform pre-upgrade steps and correct all issues.
6. Perform the upgrade using your method of choice.
  - a. Using DBUA (recommended)
  - b. Using manual upgrade
  - c. Using Data Pump export/import
  - d. Using original export/import
7. Perform post-upgrade steps.
  - a. Consider resetting passwords to require case-sensitive passwords. **Note:** The – ignorecase parameter for orapwd to create the Oracle password file is deprecated.
  - b. Add new features. Several new features require setting the COMPATIBLE parameter to 12.0.0.0.0. **Note:** If this parameter is changed, a downgrade operation is not possible. The source database must be restored from backup to return to the prior version.
  - c. Migrate to use Unified Auditing.
8. Test the upgraded database.
  - a. Test for correct application behavior.
  - b. Test performance.

## Practice 23-1: Upgrading an Oracle Database 11g Release 2 Database Using a File System to Oracle Database 12c

---

### Overview

In this practice, you will outline the steps to upgrade an existing Oracle Database 11g Release 2 database using a file system to Oracle Database 12c.

### Tasks

Write an outline of the major steps involved in upgrading an Oracle Database 11g Release 2 database to Oracle Database 12c.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_

## **Solution 23-1: Upgrading an Oracle Database 11g Release 2 Database Using a File System to Oracle Database 12c**

---

### **Suggested Solution**

1. Determine the upgrade method.
2. Use Database Upgrade Assistant (DBUA).
3. Install Oracle Database 12c.
4. Perform pre-upgrade tasks.
5. Upgrade using your chosen method.
6. Perform post-upgrade tasks.
7. Test the upgraded instance.

## Practice 23-2: Upgrading an Oracle Database 11g Release 2 Database on ASM to Oracle Database 12c

---

### Overview

In this practice, you develop an outline for upgrading an Oracle Database 11g Release 2 database on stand-alone ASM to Oracle Database 12c.

### Tasks

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_
11. \_\_\_\_\_
12. \_\_\_\_\_
13. \_\_\_\_\_
14. \_\_\_\_\_
15. \_\_\_\_\_

## Solution 23-2: Upgrading an Oracle Database 11g Release 2 Database on ASM to Oracle Database 12c

---

### Suggested Solution

1. Stop the database instances that are using the 11g ASM instance.
2. Stop any listener running out of the current ORACLE\_HOME for Grid (if it exists).
3. Install Oracle Grid Infrastructure 12c for stand-alone server in a new ORACLE\_HOME.
  - a. Upgrade the ASM instance.
  - b. Create an ASM SPFILE.
  - c. Adjust the ASM parameters.
4. Restart the listener running out of Grid Infrastructure 12c new ORACLE\_HOME (if it exists).
5. Restart the database instances.
6. Install the Oracle Database software in the new ORACLE\_HOME for Oracle Database 12c.
7. Perform pre-upgrade tasks.
8. Upgrade using DBUA.
9. Perform post-upgrade tasks.
10. Test the upgraded instance.
11. Adjust ASM diskgroup parameters and set the diskgroup compatible level, if necessary.

## Practice 23-3: Upgrading an Oracle Database 11g Release 2 Database to Oracle Database 12c on a New OS or Platform

---

### Overview

In this practice, you consider the differences in this scenario from the previous scenarios.

### Tasks

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_
11. \_\_\_\_\_
12. \_\_\_\_\_
13. \_\_\_\_\_
14. \_\_\_\_\_
15. \_\_\_\_\_

## Solution 23-3: Upgrading an Oracle Database 11g Release 2 Database to Oracle Database 12c on a New OS or Platform

### Suggested Solution

Determine compatibility of datafiles and OS versions.

1. Is endianness the same (check)?
  - a. If yes, datafiles can be copied with OS utilities.
  - b. If no, datafiles must be converted to target OS endianness. **Note:** If the source platform and the target platform are of different endianness, then you cannot use the RMAN CONVERT DATABASE command. This process requires both the source and target platform to be the same endian value. Your available options are Data Pump replication, Data Pump export/import, or Transportable Tablespace, with an RMAN CONVERT TABLESPACE. If the platforms are of the same endianness, then no conversion is necessary and data can be transported as if on the same platform.
2. Does either the source or target OS support both Oracle Database versions?
  - a. If yes, consider migrating to new platform and upgrading to the new version as separate operations. Upgrade and then migrate to the new platform or migrate and then upgrade.
  - b. If no, use Data Pump export/import. **Note:** This situation may also have a Golden Gate solution.
3. Is there a difference in bit-width of the OS (that is, one 32-bit and one 64-bit)?
  - a. Follow the notes given in MOS document “Can you / How to Upgrade RDBMS and Convert From 32-bit to 64-bit Binaries Directly on Linux or Windows based Intel Platforms Using the Database Upgrade Assistant (DBUA) [ID 757245.1]”
  - b. Perform the migration to 64-bit separately from the upgrade. **Note:** This may require the 32-bit binaries to be installed for a time on the 64-bit OS to perform the migration in place.

## Practice 23-4: Upgrading an Oracle Database 11g Release 2 Database to Oracle Database 12c with Minimal Downtime

### Overview

In this practice, you consider options to reduce downtime while upgrading from Oracle Database 11g Release 2 to Oracle Database 12c.

### Tasks

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_
11. \_\_\_\_\_
12. \_\_\_\_\_
13. \_\_\_\_\_
14. \_\_\_\_\_
15. \_\_\_\_\_

## Solution 23-4: Upgrading an Oracle Database 11g Release 2 Database to Oracle Database 12c with Minimal Downtime

### Suggested Solution

1. Practice the upgrade as many times as needed to automate pre-upgrade and post-upgrade tasks.
2. Reduce the time for DBUA to run. Before the upgrade, remove any unused components such as Oracle Text and Oracle Spatial, from the database.
3. Script all pre-upgrade tasks.
4. Perform the upgrade with DBUA.
5. Script all post-upgrade tasks.
6. Alternative to using DBUA:

Create a target database and use Oracle GoldenGate to synchronize the source with the target. When the synchronization is complete and applications can be run on the target, stop the applications on the source and restart the applications on the target. Shut down the source database. The detailed procedures for this operation are beyond the scope of this course. See *Oracle Database Global Data Services Concepts and Administration Guide 12c Release 1 (12.1)* for details.



## **Practices for Lesson 24: Preparing a Database for Upgrade**

**Chapter 24**

## Practices for Lesson 24: Overview

---

### Practices Overview

In the previous practices, you created two databases in 12c.

In these practices, you will prepare the dbupgrd database instance currently running on 11g to upgrade to 12c. The upgrade process will use Database Upgrade Assistant (DBUA). The upgrade process will be covered in the next practice. In these practices, you will:

- Execute the preupgrd.sql script
- Review the information displayed by the pre-upgrade information tool
- Resolve issues, if any
- Perform a full database backup before the upgrade process starts

In your upgrade plan, you do not plan to relocate the data files, control files, redo log files, and archive log files to another location.

You are going to work as the oracle user to perform operations in the 11g environment and as the oracle user for other operations in the 12c environment. Therefore, keep a terminal window opened as the oracle user in the 11g environment and another terminal window opened as the oracle user in the 12c environment.

To make it easier for you to determine which terminal window you are using, you can set a terminal name for each terminal window by performing the following steps:

1. Select **Terminal** in the window menu.
2. Select **Set Title**.
3. Specify a title name, such as oracle11g.
4. Click **OK**.

## Practice 24-1: Executing Preliminary Steps and the Pre-Upgrade Script

### Overview

In this practice, you will prepare your dbupgrd database instance for an upgrade to 12c.

You have already installed the Oracle 12c Database software. You need to check that the dbupgrd database instance is compatible with an upgrade from 11.2.0.3.0 to 12.1.0.1.0 before upgrading.

### Tasks

1. List the options that require specific treatment before upgrade.
  - a. In the oracle user terminal window (we will name this window the oracle user 11g terminal window), check whether Oracle Label Security or/and Oracle Database Vault are installed in the 11g dbupgrd database instance.

```
$. oraenv
ORACLE_SID = [orcl] ? dbupgrd
The Oracle base remains unchanged with value /u01/app/oracle
$ env | grep ORA
ORACLE_SID=dbupgrd
ORACLE_BASE=/u01/app/oracle
ORACLE_HOME=/u01/app/oracle/product/11.2.0/dbhome_2
$ sqlplus / as sysdba

SQL> col parameter format A30
SQL> col value format A10
SQL> select * from v$option
 where parameter in
 ('Oracle Label Security', 'Oracle Database Vault');
2 3
PARAMETER VALUE

Oracle Label Security FALSE
Oracle Database Vault FALSE

SQL>
```

**Note:** If one of these two options were enabled, you would have to execute the \$ORACLE\_HOME/rdbms/admin/olspreupgrade.sql script copied from the 12c database ORACLE\_HOME environment to the 11g database ORACLE\_HOME environment. The script moves the AUD\$ table from the SYSTEM schema to the SYS schema. You would have to disable Oracle Database Vault if the option were enabled.

- b. View the olspreupgrade.sql script. This script is available in the 12c ORACLE\_HOME. Open another oracle user terminal window in which you set the environment variables to the 12c Oracle database ORACLE\_HOME. We will name this

window the oracle user 12c terminal window. Set the ORACLE\_SID environment variable to orcl. (The orcl database instance runs in the 12c database environment.)

```
$. oraenv
ORACLE_SID = [oracle] ? orcl
The Oracle base has been set to /u01/app/oracle
$ env | grep ORA
ORACLE_SID=orcl
ORACLE_BASE=/u01/app/oracle
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_2
$
```

- c. Display the content of the \$ORACLE\_HOME/rdbms/admin/olspreupgrade.sql script.

```
$ less $ORACLE_HOME/rdbms/admin/olspreupgrade.sql
Rem
Rem $Header: rdbms/admin/olspreupgrade.sql /st_rdbms_12.1.0.1/1
Rem
Rem olspreupgrade.sql
Rem
Rem Copyright (c) 2012, 2013 Oracle and/or its affiliates. All
rights reserved
Rem
Rem NAME olspreupgrade.sql - OLS Pre processing script prior
to upgrade for 12.1
Rem
Rem DESCRIPTION
Rem This is a mandatory OLS preprocess upgrade script that
needs to be run by Label Security and Database Vault customers
when upgrading to 12.1.
Rem
Rem This script is NOT NEEDED if you DO NOT have Database
Vault or Label Security.
...
```

It is clearly stated that this is a mandatory OLS preprocess upgrade script that needs to be run by Label Security and Database Vault customers when upgrading to 12.1.0; however, this script is *not needed* if you do not have Database Vault or Label Security enabled.

- d. The script clearly describes how to proceed:

```
Rem STEPS TO RUN THIS SCRIPT
Rem -----
Rem To run the Oracle Label Security preprocess upgrade
script, copy the $ORACLE_HOME/rdbms/admin/olspreupgrade.sql
script to the old ORACLE_HOME. Run the script as SYSDBA in the
old ORACLE_HOME.

Rem However, if you have Database Vault, the following
steps need to be done after copying the olspreupgrade.sql to the
old ORACLE_HOME:

Rem To run the OLS preprocess script on a release 11.1.0.7
database before upgrading:

Rem
Rem 1. Start SQL*Plus and connect to the database to be
upgraded as DVOWNER.

Rem 2. Execute the following statement:
Rem SQL>EXEC dbms_macadm.add_auth_to_realm('Database
Vault','SYS',NULL,0);

Rem 3. Run the OLS preprocess script, at
Rem ORACLE_HOME/rdbms/admin/olspreupgrade.sql

Rem 4. After the olspreupgrade.sql has been successfully
run, start
Rem SQL*Plus and connect to the database as DVOWNER.

Rem 5. Execute the following statement:
Rem SQL> EXEC
dbms_macadm.delete_auth_from_realm('Database Vault','SYS');

Rem
...
...
```

- e. Quit the less page browser.

Question: How would you disable Oracle Database Vault?

Answer:

- Log in as the Oracle Database Owner (DV\_OWNER) account:  
sqlplus dvo/password
- Execute the following procedure:  
exec DVSYS.DBMS\_MACADM.DISABLE\_DV
- Restart the instance:  
connect / as sysdba  
shutdown immediate  
startup

2. The upgrade will fail if the tablespaces that are not schema-based such as SYSAUX, SYSTEM, XDB, HTMLDB, and CTXSYS are set to READ ONLY or OFFLINE. Check that none of these tablespaces is set to READ ONLY or OFFLINE mode. In the rare case where queue tables reside in a tablespace that has been set to READ ONLY for the upgrade, that tablespace should be set back to READ WRITE.

In the terminal session that is set to the 11g ORACLE\_HOME, execute the following statement:

```
SQL> select tablespace_name, status from dba_tablespaces;

TABLESPACE_NAME STATUS

SYSTEM ONLINE
SYSAUX ONLINE
UNDOTBS1 ONLINE
TEMP ONLINE
USERS ONLINE
EXAMPLE ONLINE

6 rows selected.

SQL>
```

3. Remove the AUDSYS schema and the AUDIT\_ADMIN and AUDIT\_VIEWER roles. At this stage, there should be no AUDSYS schema. This user and these roles will be created as a predefined user and roles when the database is upgraded to 12c and migrated to Unified Auditing.

```
SQL> DROP USER AUDSYS CASCADE;
DROP USER AUDSYS CASCADE
*
ERROR at line 1:
ORA-01918: user 'AUDSYS' does not exist

SQL> DROP ROLE AUDIT_ADMIN;
DROP ROLE AUDIT_ADMIN
*
ERROR at line 1:
ORA-01919: role 'AUDIT_ADMIN' does not exist

SQL> DROP ROLE AUDIT_VIEWER;
DROP ROLE AUDIT_VIEWER
*
ERROR at line 1:
```

```
ORA-01919: role 'AUDIT_VIEWER' does not exist

SQL> exit
$
```

4. Run the Pre-Upgrade Information Tool using the \$ORACLE\_HOME/rdbms/admin/preupgrd.sql script.
  - a. Copy the \$ORACLE\_HOME/rdbms/admin/preupgrd.sql and \$ORACLE\_HOME/rdbms/admin/utluppkg.sql scripts from the 12c database ORACLE\_HOME environment to the 11g database ORACLE\_HOME environment. Execute the following commands:

```
$ cp
/u01/app/oracle/product/12.1.0/dbhome_2/rdbms/admin/preupgrd.sql
/u01/app/oracle/product/11.2.0/dbhome_2/rdbms/admin/preupgrd.sql
$ cp
/u01/app/oracle/product/12.1.0/dbhome_2/rdbms/admin/utluppkg.sql
/u01/app/oracle/product/11.2.0/dbhome_2/rdbms/admin/utluppkg.sql
$
```

- b. The execution of the preupgrd.sql script will generate a log file and two SQL scripts in the /u01/app/oracle/cfgtoollogs/dbupgrd/preupgrade directory. Create the directory.

```
$ mkdir -p /u01/app/oracle/cfgtoollogs/dbupgrd/preupgrade
$
```

- c. In the oracle user 11g terminal window, execute the preupgrd.sql script.

```
$ sqlplus / as sysdba
...
SQL>
@/u01/app/oracle/product/11.2.0/dbhome_2/rdbms/admin/preupgrd.sql
1
Loading Pre-Upgrade Package...

Executing Pre-Upgrade Checks...
Pre-Upgrade Checks Complete.

Results of the checks are located at:
/u01/app/oracle/cfgtoollogs/dbupgrd/preupgrade/preupgrade.log

Pre-Upgrade Fixup Script (run in source database environment):
/u01/app/oracle/cfgtoollogs/dbupgrd/preupgrade/preupgrade_fixups
.sql

Post-Upgrade Fixup Script (run shortly after upgrade):
```

```
/u01/app/oracle/cfgtoollogs/dbupgrd/preupgrade/postupgrade_fixup
s.sql

Fixup scripts must be reviewed prior to being executed.

=====>> USER ACTION REQUIRED <<=====

The following are *** ERROR LEVEL CONDITIONS *** that must be
addressed prior to attempting your upgrade.
Failure to do so will result in a failed upgrade.

1) Check Tag: PURGE_RECYCLEBIN
Check Summary: Check that recycle bin is empty prior to
upgrade
Fixup Summary:
"The recycle bin will be purged.

You MUST resolve the above errors prior to upgrade

SQL> exit
$
```

## Practice 24-2: Implementing the Pre-Upgrade Information Tool Recommendations

### Overview

In this practice, you will examine the Pre-Upgrade Information Tool output log file and implement the recommended actions. The actions and recommendations resulting from your environment and the ones displayed below may differ.

#### 1. Examine the

/u01/app/oracle/cfgtoollogs/dbupgrd/preupgrade/preupgrade.log file created by the Pre-Upgrade Information Tool. Generally, you will access this in the environment where you ran the script. In the oracle user 11g terminal window, execute the following:

```
$ cat
/u01/app/oracle/cfgtoollogs/dbupgrd/preupgrade/preupgrade.log
Oracle Database Pre-Upgrade Information Tool 02-14-2013 19:13:10
Script Version: 12.1.0.1.0 Build: 006

Database Name: DBUPGRD
 Version: 11.2.0.3.0
 Compatible: 11.2.0.0.0
 Blocksize: 8192
 Platform: Linux x86 64-bit
 Timezone file: V14

[Renamed Parameters]
[No Renamed Parameters in use]

[Obsolete/Deprecated Parameters]
[No Obsolete or Desupported Parameters in use]

[Component List]

--> Oracle Catalog Views [upgrade] VALID
--> Oracle Packages and Types [upgrade] VALID
--> Oracle Workspace Manager [upgrade] VALID
--> Oracle Enterprise Manager Repository [upgrade] VALID

[Tablespaces]

--> SYSTEM tablespace is adequate for the upgrade.
 minimum required size: 748 MB
--> SYSAUX tablespace is adequate for the upgrade.
 minimum required size: 500 MB
```

```
--> UNDOTBS1 tablespace is adequate for the upgrade.
 minimum required size: 400 MB
--> TEMP tablespace is adequate for the upgrade.
 minimum required size: 60 MB
```

[No adjustments recommended]

```

[Pre-Upgrade Checks]

```

WARNING: --> Process Count may be too low

Database has a maximum process count of 150 which is lower than the default value of 300 for this release.

You should update your processes value prior to the upgrade to a value of at least 300.

For example:

```
ALTER SYSTEM SET PROCESSES=300 SCOPE=SPFILE
```

or update your init.ora file.

WARNING: --> Enterprise Manager Database Control repository found in the database

In Oracle Database 12c, Database Control is removed during the upgrade. To save time during the Upgrade, this action can be done prior to upgrading using the following steps after copying **rdbms/admin/emremove.sql** from the new Oracle home

- Stop EM Database Control:

```
$> emctl stop dbconsole
```

- Connect to the Database using the SYS account AS SYSDBA:

```
SET ECHO ON;
SET SERVEROUTPUT ON;
@emremove.sql
```

Without the set echo and serveroutput commands you will not be able to follow the progress of the script.

INFORMATION: --> Older Timezone in use

Database is using a time zone file older than version 18. After the upgrade, it is recommended that DBMS\_DST package

```
be used to upgrade the 11.2.0.3.0 database time zone
version
to the latest version which comes with the new release.
Please refer to My Oracle Support note number 977512.1 for
details.
```

**ERROR: --> RECYCLE\_BIN not empty.**

Your recycle bin contains 2 object(s).

It is REQUIRED that the recycle bin is empty prior to upgrading.

**Immediately before performing the upgrade, execute the following command:**

```
EXECUTE dbms_prep.purge_recyclebin_fixup;
```

```

[Pre-Upgrade Recommendations]

```

```

Dictionary Statistics *****

```

Please gather dictionary statistics 24 hours prior to upgrading the database.

To gather dictionary statistics execute the following command while connected as SYSDBA:

```
EXECUTE dbms_stats.gather_dictionary_stats;
```

^^^ MANUAL ACTION SUGGESTED ^^^

```

[Post-Upgrade Recommendations]

```

```

Fixed Object Statistics *****

```

Please create stats on fixed objects two weeks after the upgrade using the command:

```
EXECUTE DBMS_STATS.GATHER_FIXED_OBJECTS_STATS;
```

```
^^^ MANUAL ACTION SUGGESTED ^^^

***** Summary *****

1 ERROR exist that must be addressed prior to performing your
upgrade.
2 WARNINGS that Oracle suggests are addressed to improve
database performance.
1 INFORMATIONAL message that should be reviewed prior to your
upgrade.

After your database is upgraded and open in normal mode you
must run rdbms/admin/catuppst.sql which executes several
required tasks and completes the upgrade process.

You should follow that with the execution of
rdbms/admin/utlrp.sql, and a comparison of invalid objects
before and after the upgrade using rdbms/admin/utluobj.sql

If needed you may want to upgrade your timezone data using the
process described in My Oracle Support note 977512.1

$
```

2. You have two ways to address the warnings and recommendations. You can run the \$ORACLE\_BASE/cfgtoollogs/dbupgrd/preupgrade/preupgrade\_fixups.sql script, which will attempt to resolve the reported issues, or you can perform the recommend actions manually. Issues that cannot be resolved automatically by the fixup script are flagged with \*\* USER ACTION REQUIRED \*\*. You will have to fix them manually one by one.
3. In the oracle user 11g terminal window, execute the /u01/app/oracle/cfgtoollogs/dbupgrd/preupgrade/preupgrade\_fixups.sql script and check whether all required actions were fixed.
  - a. Log in to SQL\*Plus and execute the script.

```
$ sqlplus / as sysdba

SQL>
@/u01/app/oracle/cfgtoollogs/dbupgrd/preupgrade/preupgrade_fixups.sql

Pre-Upgrade Fixup Script Generated on 2013-02-14 19:13:04
Version: 12.1.0.1 Build: 006
Beginning Pre-Upgrade Fixups...

PL/SQL procedure successfully completed.
```

**PL/SQL procedure successfully completed.**

\*\*\*\*\*

Check Tag: DEFAULT\_PROCESS\_COUNT

Check Summary: Verify min process count is not too low

Fix Summary: **Review and increase if needed, your PROCESSES value.**

\*\*\*\*\*

Fixup Returned Information:

WARNING: --> Process Count may be too low

Database has a maximum process count of 150 which is lower than the default value of 300 for this release.

You should update your processes value prior to the upgrade to a value of at least 300.

For example:

```
ALTER SYSTEM SET PROCESSES=300 SCOPE=SPFILE
or update your init.ora file.
```

\*\*\*\*\*

**PL/SQL procedure successfully completed.**

\*\*\*\*\*

Check Tag: EM\_PRESENT

Check Summary: Check if Enterprise Manager is present

Fix Summary: **Execute emremove.sql prior to upgrade.**

\*\*\*\*\*

Fixup Returned Information:

WARNING: --> Enterprise Manager Database Control repository found in the database

In Oracle Database 12c, Database Control is removed during the upgrade. To save time during the Upgrade, this action can be done prior to upgrading using the following steps after copying rdbms/admin/emremove.sql from the new Oracle home

- Stop EM Database Control:  
\$> emctl stop dbconsole

- Connect to the Database using the SYS account AS SYSDBA:

```
SET ECHO ON;
```

```
SET SERVEROUTPUT ON;
@emremove.sql
Without the set echo and serveroutput commands you will not
be able to follow the progress of the script.

PL/SQL procedure successfully completed.

Check Tag: PURGE_RECYLEBIN
Check Summary: Check that recycle bin is empty prior to upgrade
Fix Summary: The recycle bin will be purged.

Fixup Succeeded

PL/SQL procedure successfully completed.

[Pre-Upgrade Recommendations]

PL/SQL procedure successfully completed.

Dictionary Statistics *****

Please gather dictionary statistics 24 hours prior to
upgrading the database.
To gather dictionary statistics execute the following command
while connected as SYSDBA:
 EXECUTE dbms_stats.gather_dictionary_stats;

^^^ MANUAL ACTION SUGGESTED ^^^

PL/SQL procedure successfully completed.

***** Fixup Summary *****
```

```
1 fixup routine was successful.
2 fixup routines returned INFORMATIONAL text that should be
reviewed.
PL/SQL procedure successfully completed.

***** Pre-Upgrade Fixup Script Complete *****

PL/SQL procedure successfully completed.

SQL>
```

- b. The fixup routine that succeeded is the recycle bin dump. Verify that the recycle bin is now empty.

```
SQL> select * from dba_recyclebin;

no rows selected

SQL>
```

4. Address the issues that the fixup script did not correct.

- a. First, update the PROCESSES parameter to a value of at least 300.

```
SQL> show parameter processes

NAME TYPE VALUE

...
processes integer 150

SQL> ALTER SYSTEM SET PROCESSES=300 SCOPE=SPFILE;

System altered.

SQL> EXIT
$
```

- b. Perform the second recommended action. In Oracle Database 12c, Enterprise Manager Database Control is removed during the upgrade. Enterprise Manager Database Control does not exist in Oracle Database 12c. It is replaced by Enterprise Manager Database Express. To save time during the upgrade, this action can be done prior to upgrading by doing the following:

- 1) Copy the `$ORACLE_HOME/rdbms/admin/emremove.sql` file from the new 12c Oracle home.

```
$ cp
/u01/app/oracle/product/12.1.0/dbhome_2/rdbms/admin/emremove.sql
/u01/app/oracle/product/11.2.0/dbhome_2/rdbms/admin/emremove.sql
$
```

- 2) Stop EM Database Control.

```
$ emctl stop dbconsole
Oracle Enterprise Manager 11g Database Control Release
11.2.0.3.0
Copyright (c) 1996, 2011 Oracle Corporation. All rights
reserved.
https://<your_hostname>:1158/em/console/aboutApplication
Stopping Oracle Enterprise Manager 11g Database Control ...
... Stopped.
$
```

- 3) Execute the removal script. The script takes about six minutes to complete.

```
$ sqlplus / as sysdba

SQL> SET ECHO ON
SQL> SET SERVEROUTPUT ON
SQL> @$ORACLE_HOME/rdbms/admin/emremove.sql
...
Dropping synonym : MGMT$APPLIED_PATCHSETS ...
Dropping synonym : MGMT$APPLIED_PATCHES ...
Dropping synonym : MGMT$ALERT_NOTIF_LOG ...
Dropping synonym : MGMT$ALERT_HISTORY ...
Dropping synonym : MGMT$ALERT_CURRENT ...
Dropping synonym : MGMT$ALERT_ANNOTATIONS ...
Dropping synonym : EMD_MNTR ...
Dropping synonym : ECM_UTIL ...
Finished phase 5
Starting phase 6 : Dropping Oracle Enterprise Manager related
other roles ...
Finished phase 6
The Oracle Enterprise Manager related schemas and objects are
dropped.
Do the manual steps to shutdown the DB Control if not done
before running this
```

```
script and then delete the DB Control configuration files

PL/SQL procedure successfully completed.

SQL>
```

- c. The last recommendation is to gather dictionary statistics 24 hours prior to upgrading the database.

```
SQL> exec dbms_stats.gather_dictionary_stats

PL/SQL procedure successfully completed.

SQL> exit
$
```

5. Examine the

\$ORACLE\_BASE/cfgtoollogs/dbupgrd/preupgrade/postupgrade\_fixups.sql script, which addresses issues that can be fixed after the database is upgraded.

```
$ cat
$ORACLE_BASE/cfgtoollogs/dbupgrd/preupgrade/postupgrade_fixups.sql

REM Post Upgrade Script Generated on: 2013-02-14 19:13:04
REM Generated by Version: 12.1.0.1 Build: 006
SET ECHO OFF SERVEROUTPUT ON FORMAT WRAPPED TAB OFF LINESIZE
750;
BEGIN
 dbms_output.put_line ('Post Upgrade Fixup Script Generated on
2013-02-14 19:13:04 Version: 12.1.0.1 Build: 006');
 dbms_output.put_line ('Beginning Post-Upgrade Fixups...');
END;
/
BEGIN
dbms_preup.clear_run_flag(FALSE);
END;
/
BEGIN
-- ***** Fixup Details *****
-- Name: OLD_TIME_ZONES_EXIST
-- Description: Check for use of older timezone data file
-- Severity: Informational
-- Action: ^^^ MANUAL ACTION REQUIRED ^^^
-- Fix Summary:
-- Update the timezone using the DBMS_DST package after
upgrade is complete.
```

```
dbms_preup.run_fixup_and_report('OLD_TIME_ZONES_EXIST');
END;
/
BEGIN
dbms_output.put_line
('*****');
dbms_output.put_line ('[Post-Upgrade Recommendations]');
dbms_output.put_line
('*****');
dbms_output.put_line ('');
END;
/
BEGIN
dbms_output.put_line (
'*****');
dbms_output.put_line (' ***** Fixed Object Statistics
*****');
dbms_output.put_line (
'*****');
dbms_output.put_line ('');
dbms_output.put_line ('Please create stats on fixed objects two
weeks');
dbms_output.put_line ('after the upgrade using the command:');
dbms_output.put_line ('EXECUTE
DBMS_STATS.GATHER_FIXED_OBJECTS_STATS;');
dbms_output.put_line ('');
dbms_output.put_line ('^^^ MANUAL ACTION SUGGESTED ^^^');
dbms_output.put_line ('');
END;
/
BEGIN dbms_preup.fixup_summary(FALSE); END;
/
BEGIN
dbms_output.put_line ('* Post Upgrade Fixup Script Complete
**');
END;
/
REM Post Upgrade Script Closed At: 2013-02-14 19:13:16
$
```

Recommendations, such as updating the time zone by using the DBMS\_DST package, are suggested for after the upgrade.

## Practice 24-3: Completing Prerequisites Steps Before the Upgrade

### Overview

In this practice, you perform the last actions and verifications before the upgrade.

### Tasks

1. The Pre-Upgrade Information Tool creates and populates the `registry$sys_inv_objs` and `registry$nonsys_inv_objs` tables. If you did not execute the Pre-Upgrade Information Tool script, you can execute the `utluiobj.sql` script before and after upgrading. The script outputs the difference between the invalid objects that existed prior to the upgrade and invalid objects that exist after the upgrade. Consider that you did not execute the Pre-Upgrade Information Tool because you know that DBUA will automatically execute it. You are still logged in the session with the 11g `ORACLE_HOME` set.

```
$ sqlplus / as sysdba

SQL> @$ORACLE_HOME/rdbms/admin/utluiobj.sql
.
.
Oracle Database 11.1 Post-Upgrade Invalid Objects Tool 02-14-
2013 21:42:13
.

This tool lists post-upgrade invalid objects that were not
invalid prior to upgrade (it ignores pre-existing pre-upgrade
invalid objects).

.
.
Owner Object Name Object Type
.

PL/SQL procedure successfully completed.

SQL> select * from REGISTRY$sys_inv_objs;
no rows selected

SQL> select * from REGISTRY$nonsys_inv_objs;
no rows selected

SQL>
```

2. Verify that materialized view refreshes have completed. If materialized view refreshes have not completed, perform the refresh manually using the DBMS\_MVIEW package.

```
SQL> select o.name from sys.obj$ o, sys.user$ u, sys.sum$ s
 where o.type# = 42
 and bitand(s.mflags, 8) =8;
2 3

no rows selected

SQL>
```

3. Ensure that no files need media recovery.

```
SQL> select * from v$recover_file;

no rows selected

SQL>
```

If there are files that need recovery, perform the required recovery using RMAN.

4. Resolve outstanding distributed transactions.

```
SQL> select * from dba_2pc_pending;

no rows selected

SQL>
```

If the query returns any rows, execute the following statements:

```
SELECT local_tran_id FROM dba_2pc_pending;
EXECUTE dbms_transaction.purge_lost_db_entry('');
COMMIT;
```

5. If a standby database exists, you must synchronize it with the primary database.

- a. Check whether a standby database exists.

```
SQL> select
 SUBSTR(value,INSTR(value,'=',INSTR(UPPER(value),'SERVICE'))+1)
 from v$parameter
 where name like 'log_archive_dest%'
 and UPPER(value) like 'SERVICE%';
2 3 4
no rows selected

SQL>
```

- 
- 
- 
- 
- 
- b. If the query returns a row, synchronize the standby database with the primary database.
  - Make sure that all the logs are transported to the standby server after a final log switch in the primary.
  - Start the recovery of the standby database with the NODELAY option.
6. The upgrade process uses a large amount of archive log files. Increase the DB\_RECOVERY\_FILE\_DEST\_SIZE to 30 GB.

```
SQL> alter system set DB_RECOVERY_FILE_DEST_SIZE=30G scope=BOTH;
System altered.

SQL> exit
$
```

## Practice 24-4: Performing a Full Database Backup

### Overview

In this practice, you will perform a full database backup of the dbupgrd database before you start the upgrade.

### Tasks

1. Verify that the database is in ARCHIVELOG mode.
  - a. Stay in the 11g terminal window with the environment set to the dbupgrd instance. Connect to the database instance as SYSDBA.

```
$ sqlplus / as sysdba

SQL> select log_mode from v$database;

LOG_MODE

NOARCHIVELOG

SQL>
```

- b. Set the database instance to ARCHIVELOG mode.
  - 1) Shut down the database instance.

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

SQL>
```

- 2) Start the database instance in MOUNT mode.

```
SQL> startup mount
ORACLE instance started.

Total System Global Area 626327552 bytes
Fixed Size 2230952 bytes
Variable Size 385877336 bytes
Database Buffers 230686720 bytes
Redo Buffers 7532544 bytes
Database mounted.

SQL>
```

- 3) Alter the database instance to ARCHIVELOG mode and open the database.

```
SQL> alter database archivelog;
```

Database altered.

```
SQL> alter database open;
```

Database altered.

```
SQL> exit
```

```
$
```

2. Use RMAN to perform the database full backup.

- a. Verify that the configuration includes the automatic control file and SPFILE backup. If this is not the case, enable the automatic control file and SPFILE backup.

```
$ rman target /
```

```
RMAN> show all;
```

using target database control file instead of recovery catalog  
RMAN configuration parameters for database with db\_unique\_name  
DBUPGRD are:

```
CONFIGURE RETENTION POLICY TO REDUNDANCY 1; # default
```

```
CONFIGURE BACKUP OPTIMIZATION OFF; # default
```

```
CONFIGURE DEFAULT DEVICE TYPE TO DISK; # default
```

```
CONFIGURE CONTROLFILE AUTOBACKUP OFF; # default
```

```
...
```

```
CONFIGURE SNAPSHOT CONTROLFILE NAME TO
'/u01/app/oracle/product/11.2.0/dbhome_2/dbs/snapcf_dbupgrd.f';
default
```

```
RMAN> CONFIGURE CONTROLFILE AUTOBACKUP ON;
```

new RMAN configuration parameters:

```
CONFIGURE CONTROLFILE AUTOBACKUP ON;
```

new RMAN configuration parameters are successfully stored

```
RMAN>
```

- b. Perform the full database backup including all data files, control files, SPFILE, and archive log files.

```
RMAN> backup database plus archivelog;

Starting backup at 14-FEB-13
current log archived
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=147 device type=DISK
channel ORA_DISK_1: starting archived log backup set
channel ORA_DISK_1: specifying archived log(s) in backup set
input archived log thread=1 sequence=12 RECID=1 STAMP=807374917
channel ORA_DISK_1: starting piece 1 at 14-FEB-13
channel ORA_DISK_1: finished piece 1 at 14-FEB-13
piece
handle=+FRA/dbupgrd/backupset/2013_02_14/annnf0_tag20130214t1448
38_0.261.807374919 tag=TAG20130214T144838 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:03
Finished backup at 14-FEB-13

Starting backup at 14-FEB-13
using channel ORA_DISK_1
channel ORA_DISK_1: starting full datafile backup set
channel ORA_DISK_1: specifying datafile(s) in backup set
input datafile file number=00001
name=+DATA/dbupgrd/datafile/system.256.807214393
input datafile file number=00002
name=+DATA/dbupgrd/datafile/sysaux.257.807214393
input datafile file number=00005
name=+DATA/dbupgrd/datafile/example.261.808328869
input datafile file number=00003
name=+DATA/dbupgrd/datafile/undotbs1.258.807214395
input datafile file number=00004
name=+DATA/dbupgrd/datafile/users.258.808326885
channel ORA_DISK_1: starting piece 1 at 14-FEB-13
channel ORA_DISK_1: finished piece 1 at 14-FEB-13
piece
handle=+FRA/dbupgrd/backupset/2013_02_14/nnndf0_tag20130214t1448
41_0.262.807374923 tag=TAG20130214T144841 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:01:45
Finished backup at 14-FEB-13

Starting backup at 14-FEB-13
current log archived
```

```
using channel ORA_DISK_1
channel ORA_DISK_1: starting archived log backup set
channel ORA_DISK_1: specifying archived log(s) in backup set
input archived log thread=1 sequence=13 RECID=2 STAMP=807375027
channel ORA_DISK_1: starting piece 1 at 14-FEB-13
channel ORA_DISK_1: finished piece 1 at 14-FEB-13
piece
handle=+FRA/dbupgrd/backupset/2013_02_14/annnf0_tag20130214t1450
27_0.264.807375029 tag=TAG20130214T145027 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:01
Finished backup at 14-FEB-13

Starting Control File and SPFILE Autobackup at 14-FEB-13
piece
handle=+FRA/dbupgrd/autobackup/2013_02_14/s_807375029.265.807375
031 comment=NONE
Finished Control File and SPFILE Autobackup at 14-FEB-13

RMAN> exit
$
```

At the end of the full database backup, you have:

- Two backup sets of archived logs: one completed *before* the data files backup and one completed *after* the data files backup because modifications in the data files may have been applied by applications. The backup sets are stored in +FRA/dbupgrd/backupset/20yy\_mm\_dd.
- One backup set of the five data files stored in +FRA/dbupgrd/backupset/20yy\_mm\_dd
- One backup set of the control file and SPFILE stored in +FRA/dbupgrd/autobackup/20yy\_mm\_dd

## Practice 24-5: Performing a Transportable Tablespace Export (OPTIONAL)

### Overview

This is an optional practice. If you plan to perform the first practice in “Appendix C, Migrating Data by Using Oracle Data Pump,” you must complete this practice. In this practice, you will perform a transportable tablespace export before the database is upgraded.

### Tasks

1. Set the environment for the `dbupgrd` Oracle Database 11g database. Log in to SQL\*Plus as the `SYSDBA` user.

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

$ sqlplus / as sysdba

SQL>
```

2. Put the user-defined tablespaces in the source database `dbupgrd` in read-only mode.
  - a. Find the list of user-defined tablespaces to be put in read-only mode.

```
SQL> SELECT tablespace_name FROM dba_tablespaces ORDER BY 1;

TABLESPACE_NAME

EXAMPLE
SYSAUX
SYSTEM
TEMP
UNDOTBS1
USERS

6 rows selected.

SQL>
```

- b. The list may be different from yours according to the tablespaces created during the training session. Make all tablespaces except SYSTEM, SYSAUX, TEMP, and UNDOTBS1 read-only.

```
SQL> ALTER TABLESPACE example READ ONLY;

Tablespace altered.

SQL> ALTER TABLESPACE users READ ONLY;

Tablespace altered.

SQL>
```

- c. Find the names of the data files for the read-only tablespaces. Exit SQL\*Plus.

```
SQL> SELECT file_name FROM dba_data_files
 WHERE tablespace_name IN ('EXAMPLE', 'USERS');

2
FILE_NAME

/u01/app/oracle/oradata/dbupgrd/user01.dbf
/u01/app/oracle/oradata/dbupgrd/example01.dbf

SQL> exit
$
```

3. Export the dbupgrd database in transportable tablespace mode.

- a. Remove any previously created dump files.

```
$ rm /u01/app/oracle/admin/dbupgrd/dpdump/expTTS.dmp
rm: cannot remove
`/u01/app/oracle/admin/dbupgrd/dpdump/expTTS.dmp': No such file
or directory
```

- b. Invoke Data Pump export.

```
$ expdp system/oracle_4U DUMPFILE=expTTS.dmp
TRANSPORT_TABLESPACES=example, users TRANSPORT_FULL_CHECK=YES
LOGFILE=expTTS.log
Export: Release 11.2.0.3.0 - Production on Mon Oct 28 07:11:46
2013
```

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Connected to: Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 - 64bit Production

With the Partitioning, OLAP, Data Mining and Real Application Testing options

Starting "SYSTEM"."SYS\_EXPORT\_TRANSPORTABLE\_01":
system/\*\*\*\*\*\*\*\* DUMPFILE=expTTS.dmp

```
TRANSPORT_TABLESPACES=example, users TRANSPORT_FULL_CHECK=YES
LOGFILE=expTTS.log
Processing object type TRANSPORTABLE_EXPORT/PLUGTS_BLK
Processing object type TRANSPORTABLE_EXPORT/TABLE
Processing object type TRANSPORTABLE_EXPORT/TABLE_STATISTICS
Processing object type
TRANSPORTABLE_EXPORT/POST_INSTANCE/PLUGTS_BLK
Master table "SYSTEM"."SYS_EXPORT_TRANSPORTABLE_01" successfully
loaded/unloaded

Dump file set for SYSTEM.SYS_EXPORT_TRANSPORTABLE_01 is:
/u01/app/oracle/admin/dbupgrd/dpdump/expTTS.dmp

Datafiles required for transportable tablespace EXAMPLE:
/u01/app/oracle/oradata/dbupgrd/example01.dbf
Datafiles required for transportable tablespace USERS:
/u01/app/oracle/oradata/dbupgrd/user01.dbf
Job "SYSTEM"."SYS_EXPORT_TRANSPORTABLE_01" successfully
completed at 07:12:11

$
```

4. Create a /home/oracle/labs/dbupgrd12 directory to store the dump file.

```
$ mkdir -p /home/oracle/labs/dbupgrd12
$
```

5. Move the dump file to the /home/oracle/labs/dbupgrd12 directory.

- a. Use the mv command to move the file.

```
$ mv /u01/app/oracle/admin/dbupgrd/dpdump/expTTS.dmp
/home/oracle/labs/dbupgrd12
$
```

- b. Verify that the file is in the new location.

```
$ ls /home/oracle/labs/dbupgrd12
expTTS.dmp
$
```

6. Copy the data files required for the transportable tablespace import of the 11g dbupgrd database to a temporary location.

- a. Create a directory to hold the files.

```
$ mkdir /u01/app/oracle/backup
```

- b. Copy the datafiles to the /u01/app/oracle/backup directory.

```
$ cd /u01/app/oracle/oradata/dbupgrd
$ cp example01.dbf /u01/app/oracle/backup
$ cp user01.dbf /u01/app/oracle/backup
$ cd /u01/app/oracle/backup
$ ls
example01.dbf user01.dbf
```

7. In the oracle user 11g terminal window, log in to SQL\*Plus and put the user-defined tablespaces in the database dbupgrd back in read-write mode.

```
$ sqlplus / as sysdba

SQL> ALTER TABLESPACE example READ WRITE;

Tablespace altered.

SQL> ALTER TABLESPACE users READ WRITE;

Tablespace altered.

SQL> exit
$
```



## **Practices for Lesson 25: Upgrading a Database**

**Chapter 25**

## Practices for Lesson 25: Overview

---

### Practices Overview

In the previous practices, you prepared the `dbupgrd` database instance currently running in 11g to upgrade to 12c. The upgrade process will use Database Upgrade Assistant (DBUA), which is recommended as the best method for upgrading your database.

In these practices, you will:

- Upgrade the Oracle Database 11g Release 2 `dbupgrd` database to Oracle Database 12c by using DBUA
- Plug the `orcl` non-CDB into the `cdb1` CDB as a new PDB

In your upgrade plan, you do not plan to relocate the data files, control files, redo log files, and archive log files to another location.

As the `oracle` user, you will perform operations in the 12c environment. Therefore, keep a terminal window opened as the `oracle` user in the 12c environment.

## Practice 25-1: Upgrading a Database by Using DBUA

### Overview

In this practice, you will upgrade your 11g dbupgrd database instance to 12c.

### Assumptions

- You successfully installed the Oracle 12c Database software in Practice 4-1.
- In Practice 24-1, you checked that the dbupgrd database instance is compatible with an upgrade from 11.2.0.3.0 to 12.1.0.1.0 before upgrading.
- In Practices 24-2 and 24-3, you performed all necessary actions to get the database ready for upgrade.
- The full database backup was successfully completed in Practice 24-4.

### Tasks

1. In the oracle user 12c terminal window, release resources by shutting down the orcl and cdb1 database instances.

- a. Shut down orcl.

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

$ sqlplus / as sysdba

SQL> SHUTDOWN IMMEDIATE
Database closed.
Database dismounted.
ORACLE instance shut down.

SQL> exit
$
```

- b. Shut down cdb1.

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

$ sqlplus / as sysdba

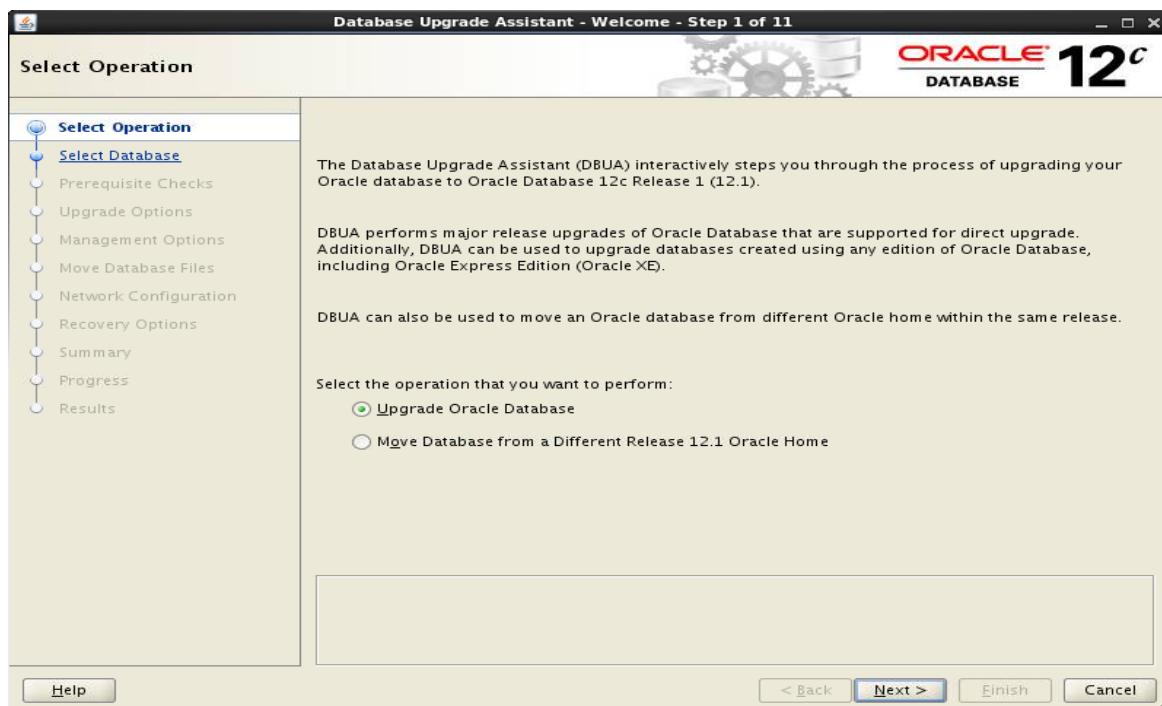
SQL> SHUTDOWN IMMEDIATE
Database closed.
Database dismounted.
ORACLE instance shut down.

SQL> exit
$
```

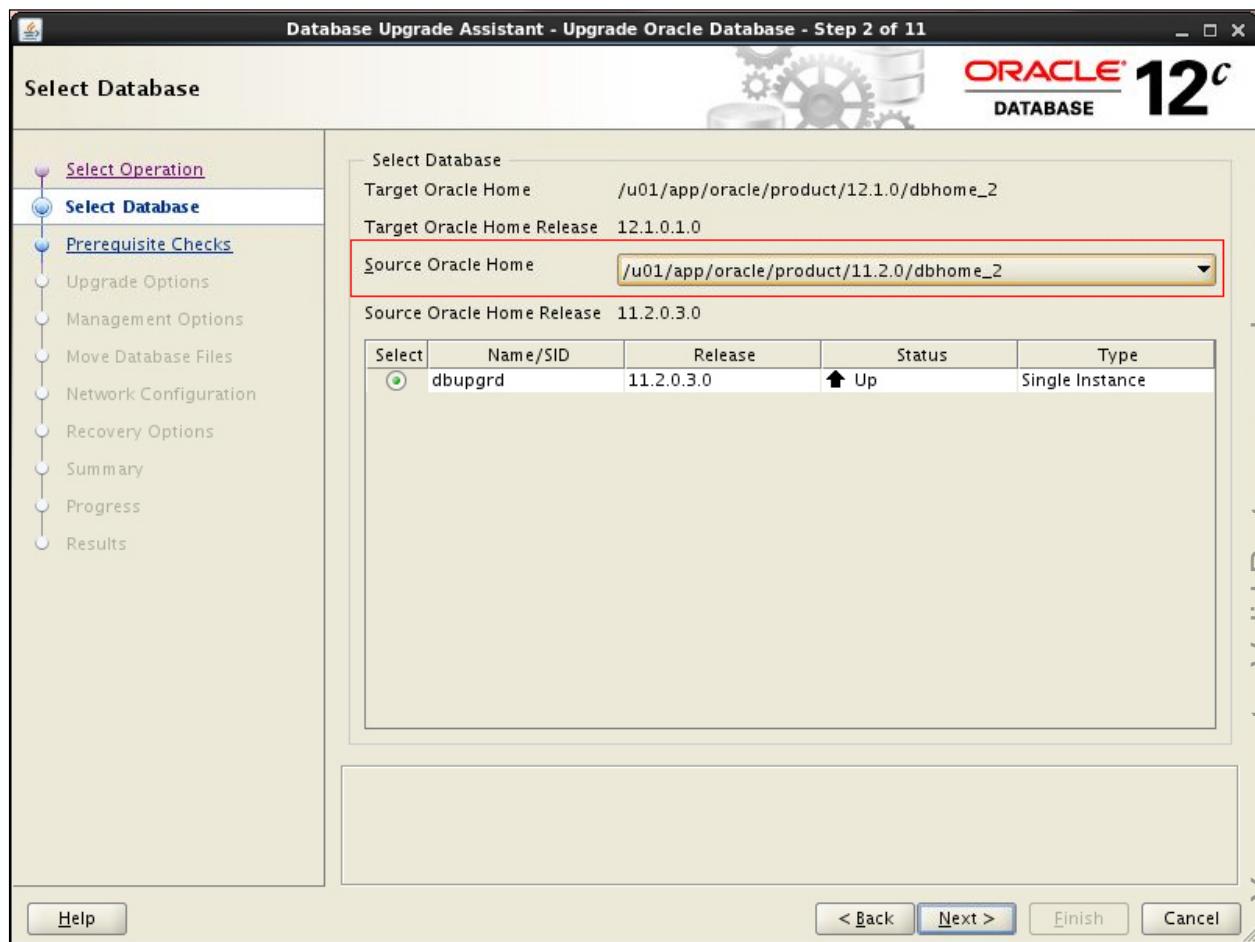
2. Launch DBUA from the Oracle home where the new database software has been installed.

```
$ echo $ORACLE_HOME
/u01/app/oracle/product/12.1.0/dbhome_2
$ dbua
```

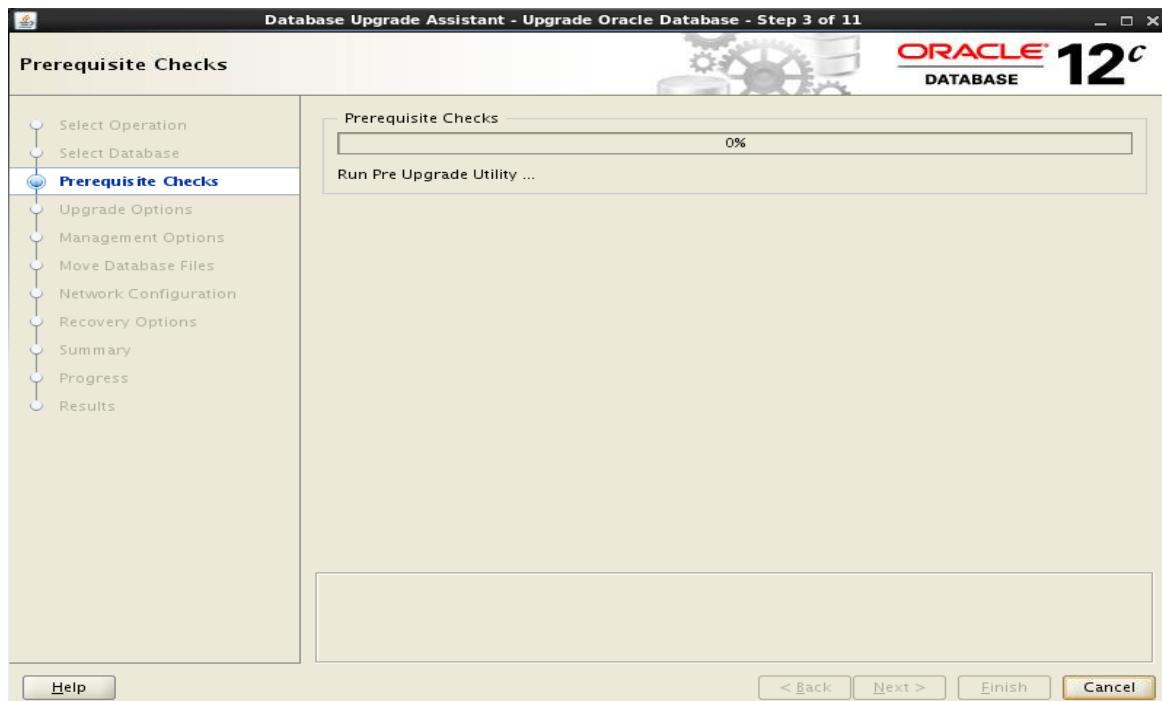
| Step | Window/Page Description | Choices or Values                                                              |
|------|-------------------------|--------------------------------------------------------------------------------|
| a.   | Select Operation page   | Verify that <b>Upgrade Oracle Database</b> is selected.<br>Click <b>Next</b> . |



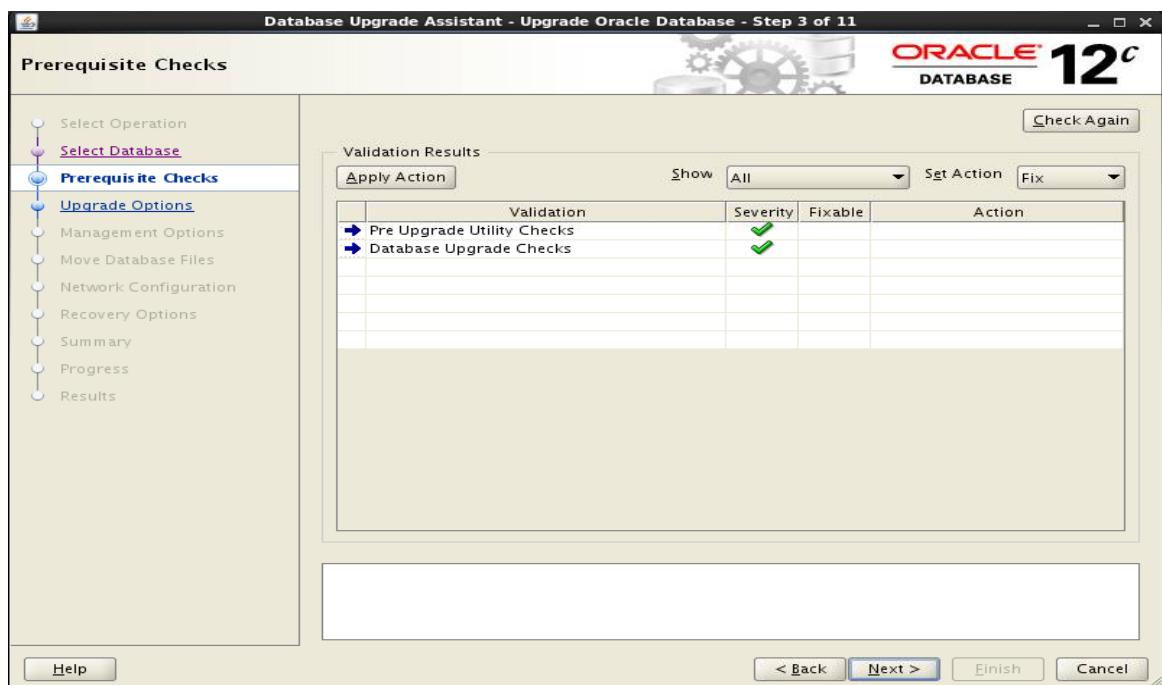
| Step | Window/Page Description | Choices or Values                                                                                                                                                                                              |
|------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| b.   | Select Database page    | Verify that the target Oracle Home is:<br>/u01/app/oracle/product/12.1.0/dbhome_2<br>Set Source Oracle Home<br>to:/u01/app/oracle/product/11.2.0/dbhome_2<br>The dbupgrd entry appears.<br>Click <b>Next</b> . |



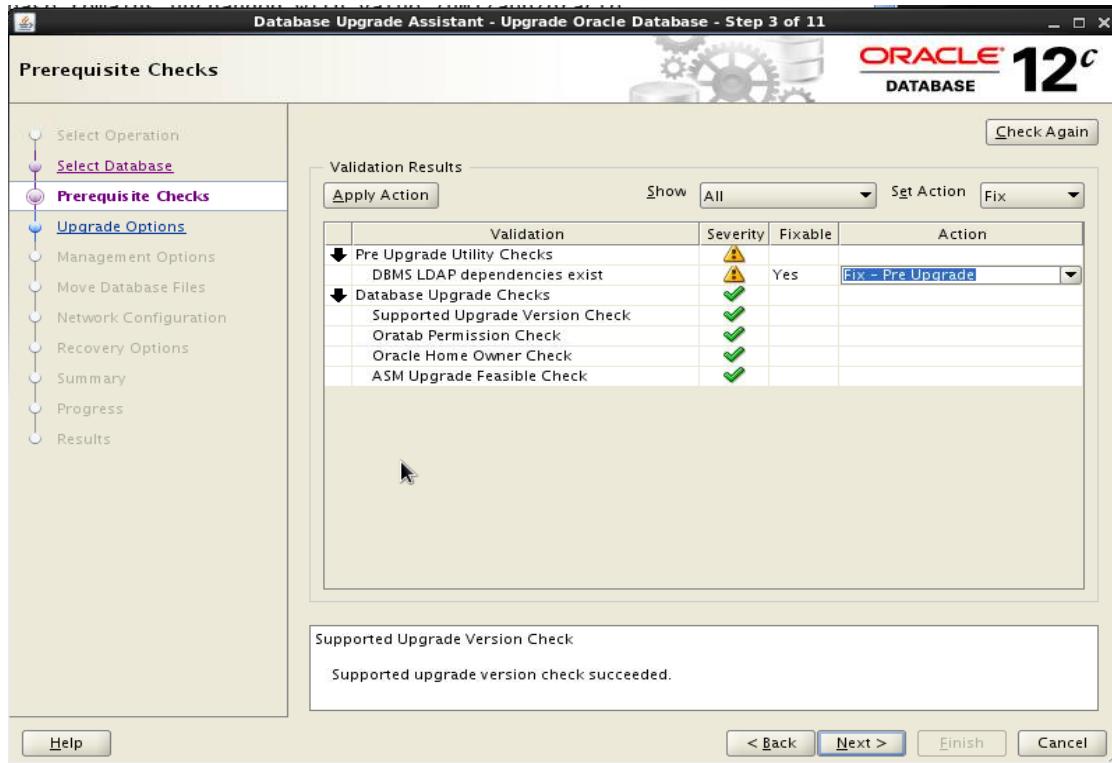
| Step | Window/Page Description  | Choices or Values                                                                                                               |
|------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| C.   | Prerequisite Checks page | Automatic validation starts (using the preupgrd.sql script) and shows progressively the validation result of each prerequisite. |



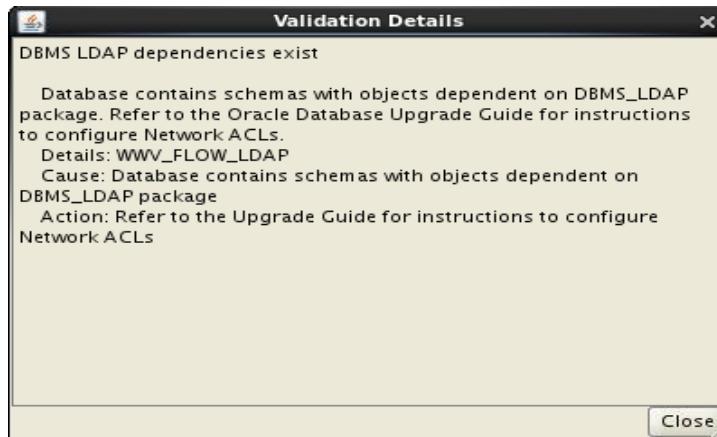
| Step | Window/Page Description  | Choices or Values                                                                                                                                                                                          |
|------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| d.   | Prerequisite Checks page | <p>Validation results appear.</p> <p>The prerequisites are all validated because you executed the <code>preupgrd.sql</code> script and addressed all prerequisites manually.</p> <p>Click <b>Next</b>.</p> |



- If you had prerequisites that were not validated, you would click each Validation entry to get a more detailed list. Below is an example of failed validation prerequisites in a database instance with LDAP dependencies. This is only an example of the procedure you would use if you had failed validation checks.

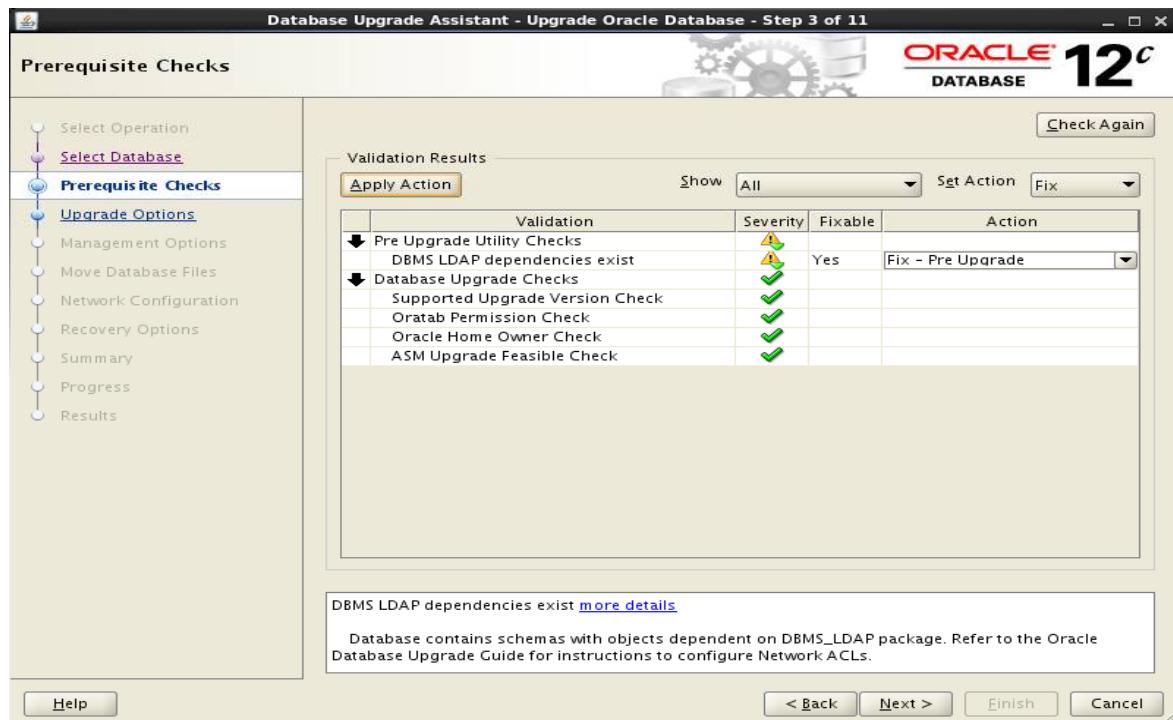


- One check would result in a warning and could be fixed. You would examine in detail the DBMS\_LDAP dependencies that could exist. You would select the "DBMS\_LDAP dependencies exist" entry and click **more details**.

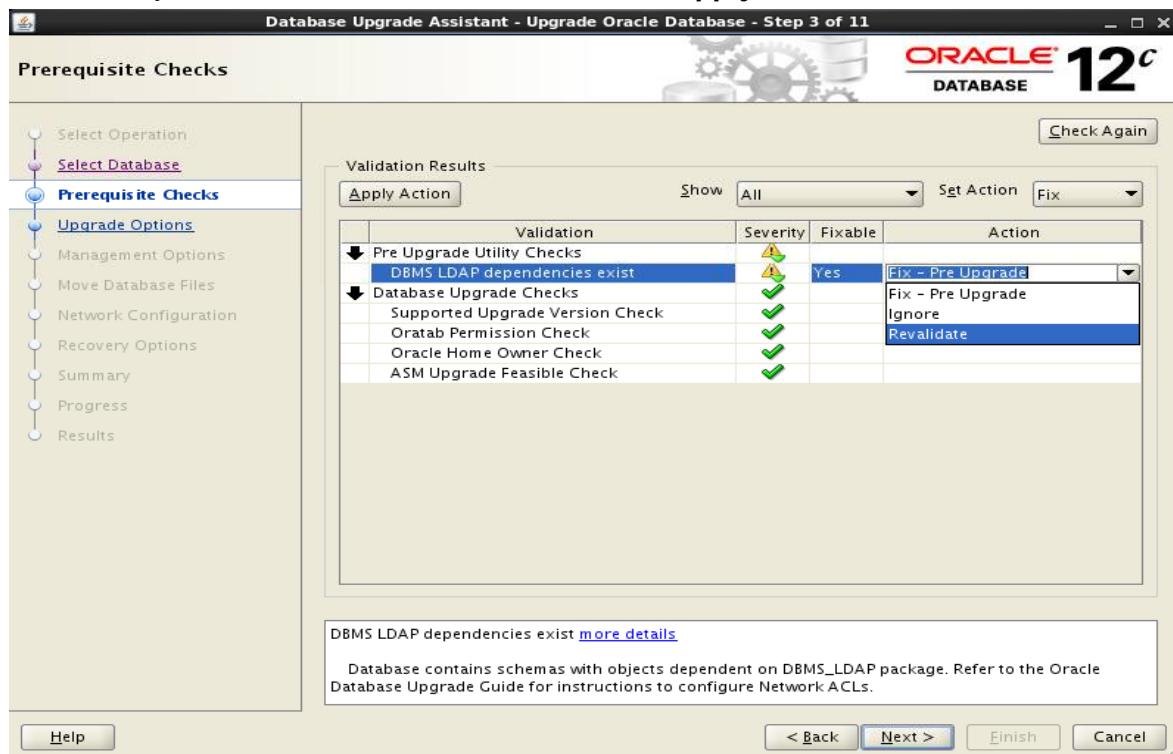


This message indicates that you have not added the object in the ACL privileged list recommended in the preupgrade.log file. You would click **Close**.

- You would click **Apply Action** to fix the issue.

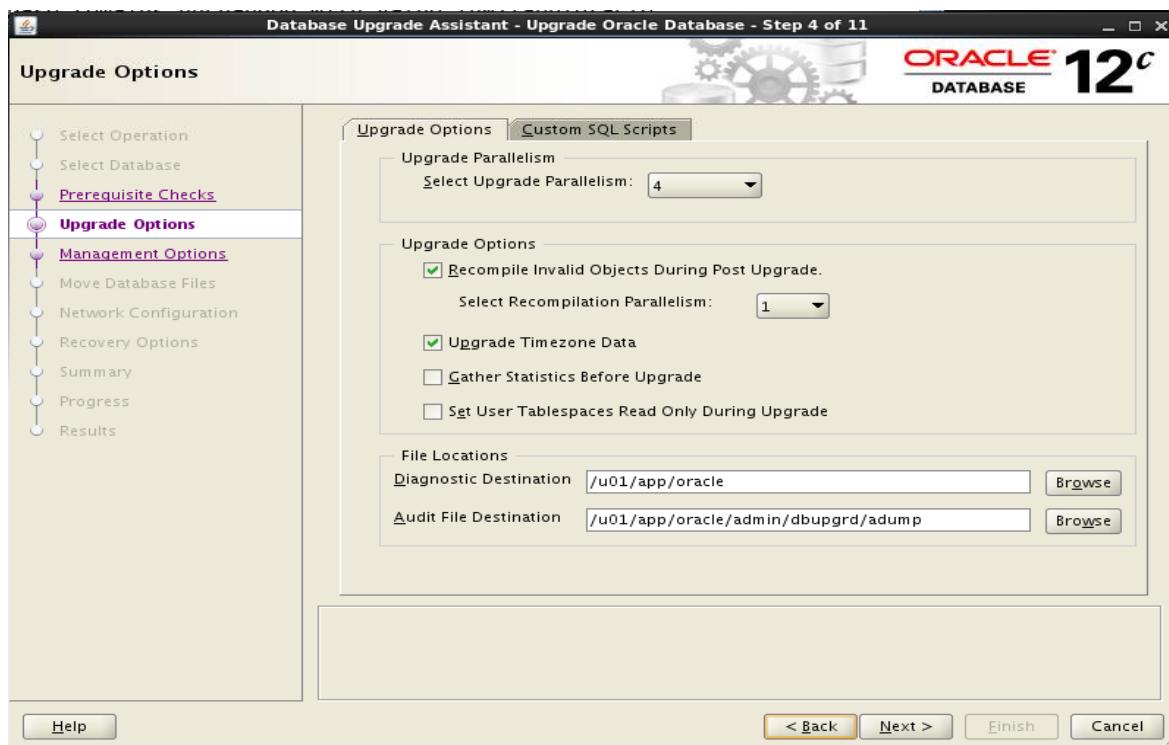


- In Action, you would choose **Revalidate** and click **Apply Action**.

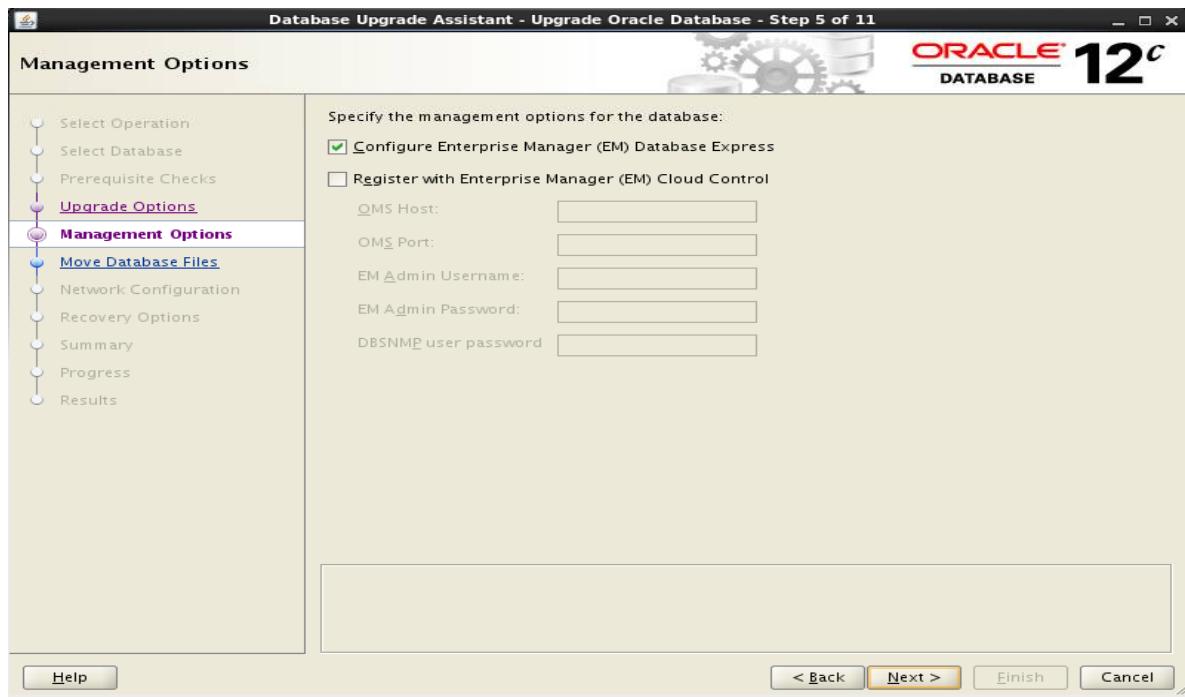


- If the issue persists but would not prevent the upgrade to progress, you could fix this problem after the upgrade. In Action, you would choose **Ignore** and click **Next**.

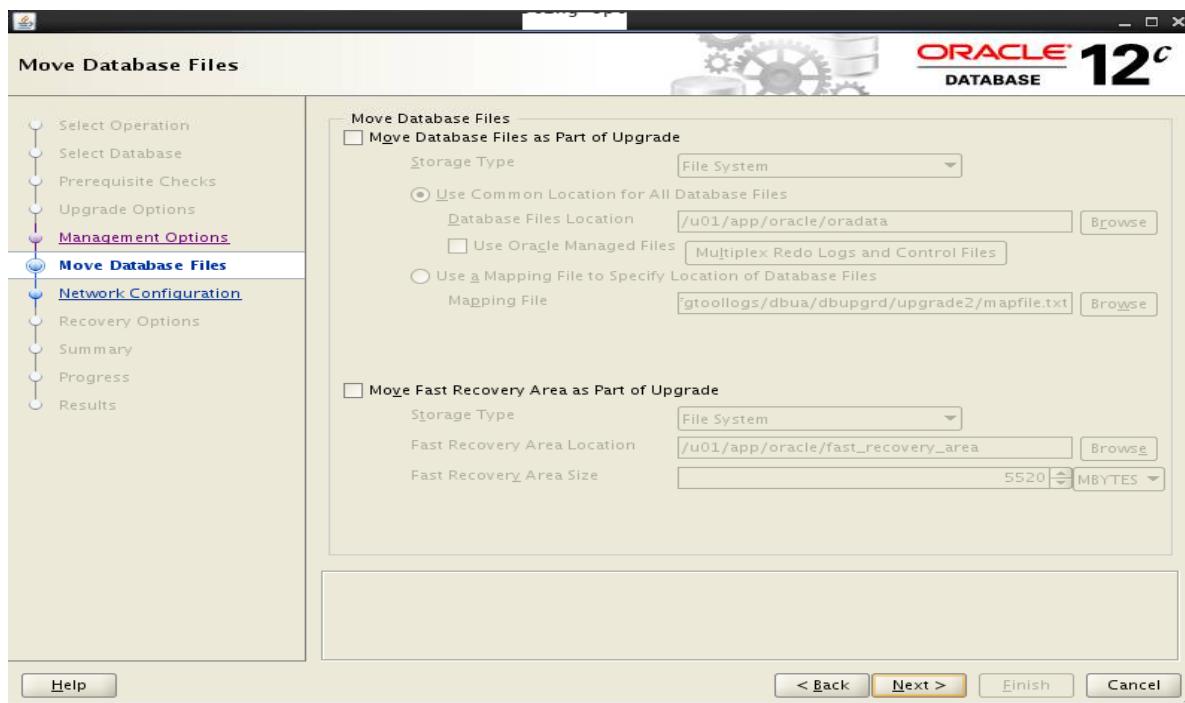
| Step | Window/Page Description                     | Choices or Values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| e.   | Upgrade Options page<br>Upgrade Options tab | <p>Verify that <b>Upgrade Parallelism</b> is set to the number of CPUs or to 2 if the number of CPUs is less than 4. You may select a new value from the <i>Degree of Parallelism</i> drop-down list. This value determines the number of parallel processes used to recompile all invalid PL/SQL modules after the upgrade is complete.</p> <p>Select <b>Upgrade Timezone Data</b>.</p> <p>Deselect <b>Gather Statistics Before Upgrade</b>. You already gathered the statistics before the upgrade.</p> <p>Click <b>Next</b>.</p> |



| Step | Window/Page Description | Choices or Values   |
|------|-------------------------|---------------------|
| f.   | Management Options page | Click <b>Next</b> . |

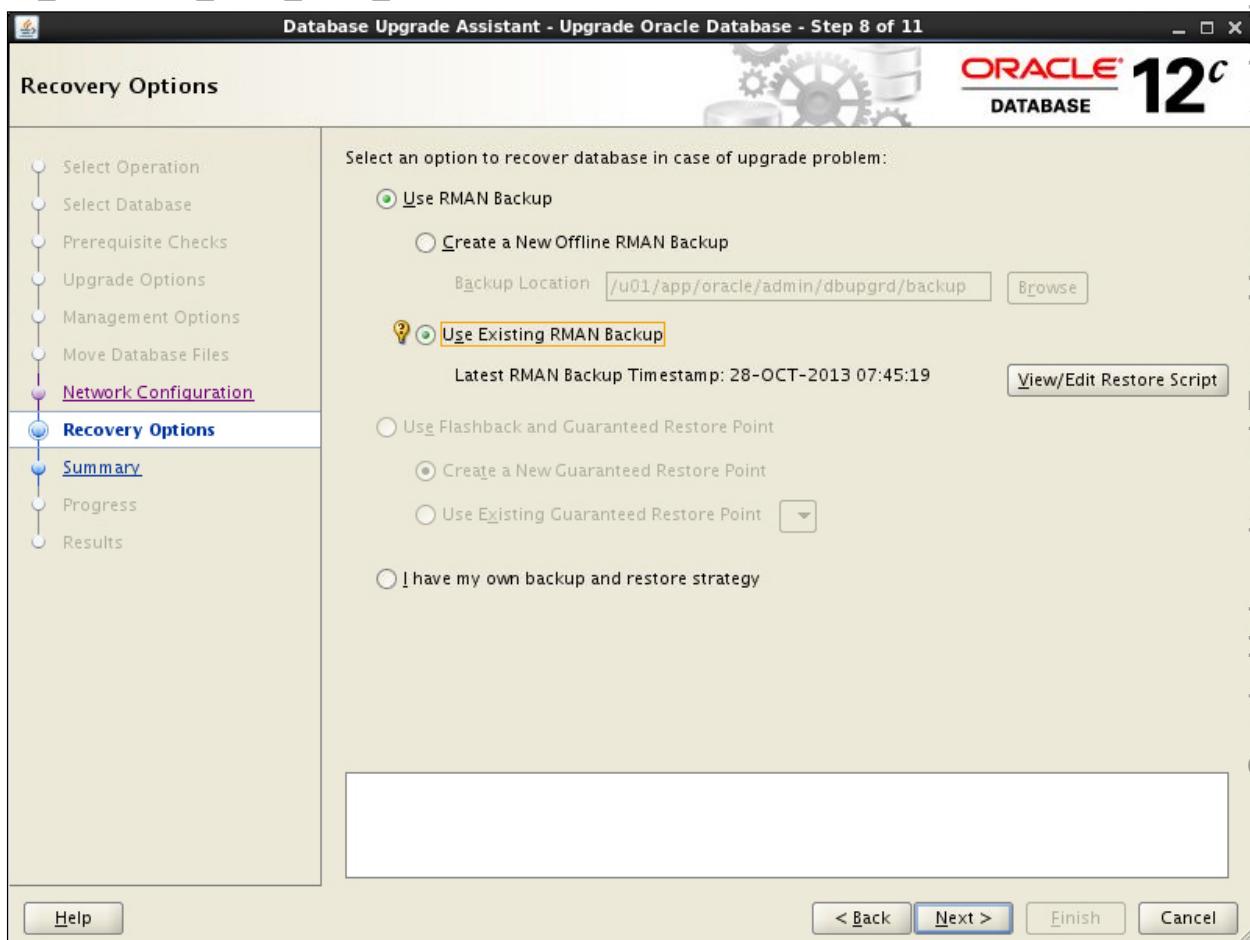


| Step | Window/Page Description  | Choices or Values                                                                                                                                                      |
|------|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| g.   | Move Database Files page | <p><i>In this upgrade, do not move the database files to another type of storage. This operation can be performed after the upgrade.</i></p> <p>Click <b>Next</b>.</p> |



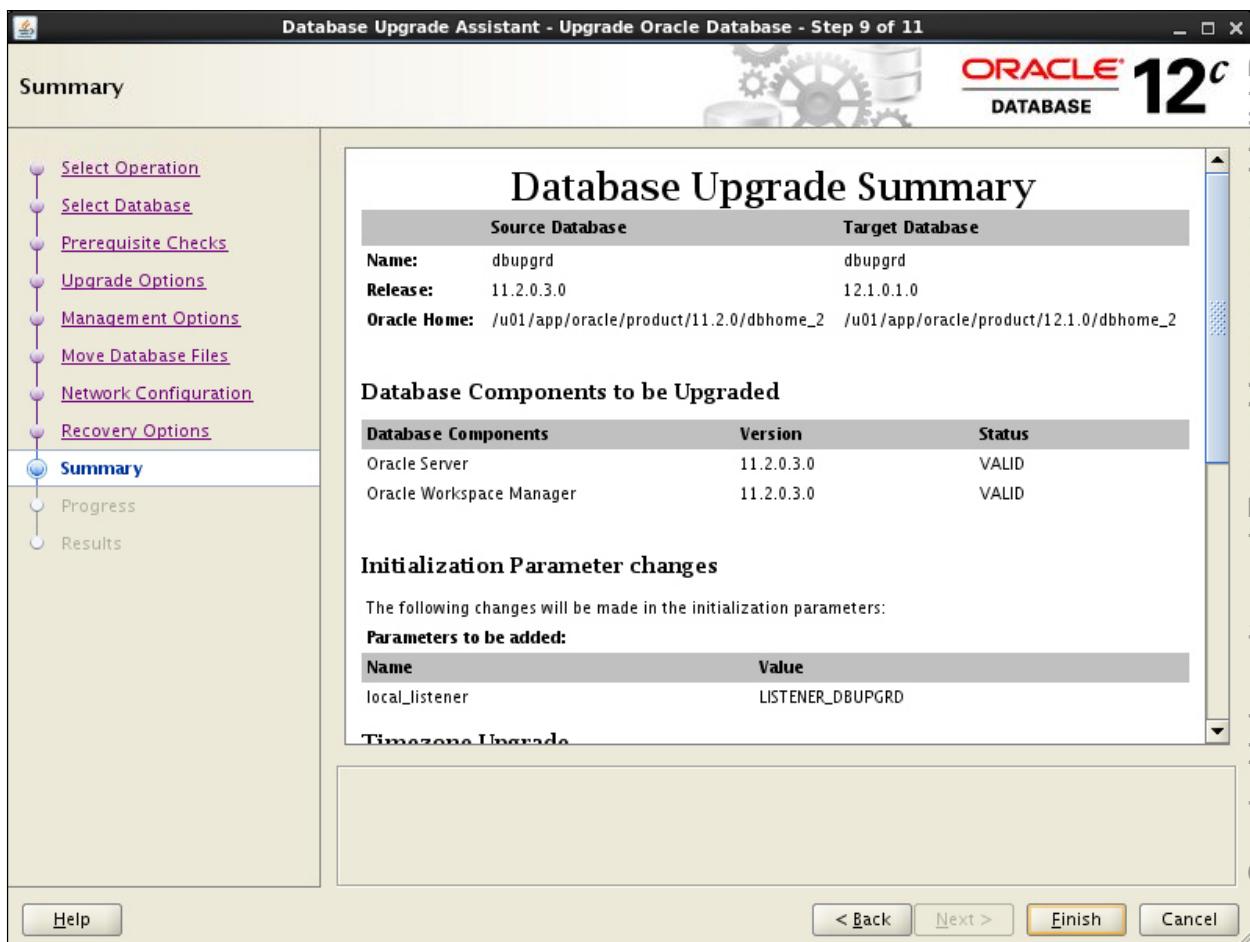
| Step | Window/Page Description    | Choices or Values                                                                                                              |
|------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| h.   | Network Configuration page | Select <b>LISTENERORCL</b> .<br>Click <b>Next</b> .                                                                            |
| i.   | Recovery Options page      | Select <b>Use Existing RMAN Backup</b> .<br><i>You backed up the database in the previous practice.</i><br>Click <b>Next</b> . |

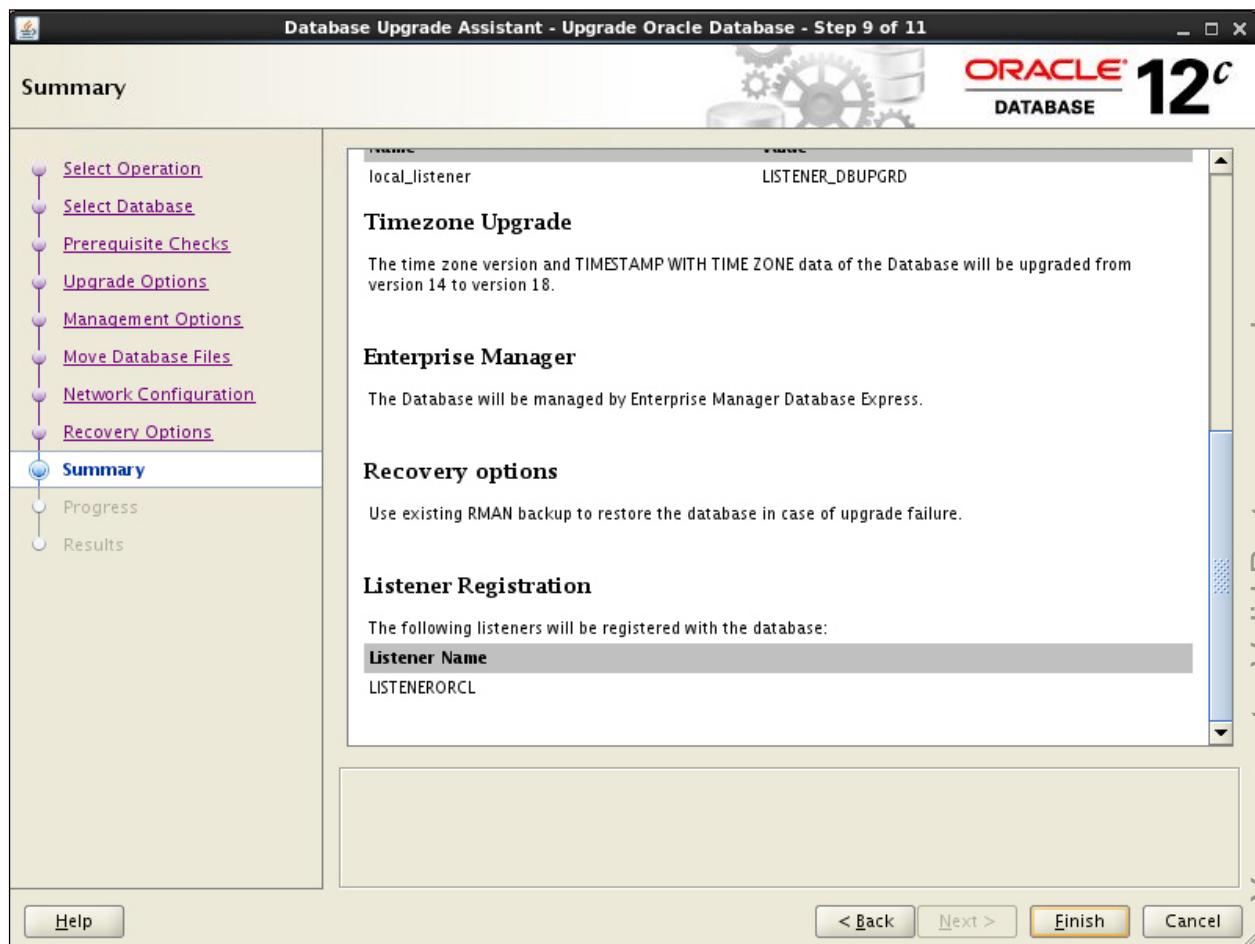
Read carefully the message in the box at the bottom of Recovery Options page *if there is any*. If it says, “*You do not have enough disk space for the archive logs and flashback logs generated during upgrade*,” you would click **more details**. The *Validation Details* page would explicitly provide the required disk space for the archive logs and flashback logs generated during upgrade. In another oracle user UNIX session, connected to the `dbupgrd` instance, you would increase the `DB_RECOVERY_FILE_DEST_SIZE` to the required size, and click **Close**.



| Step | Window/Page Description | Choices or Values                                            |
|------|-------------------------|--------------------------------------------------------------|
| j.   | Summary page            | Review the Database Upgrade Summary.<br>Check the following: |

| Step | Window/Page Description | Choices or Values                                                                                                                                                                                                                                                                                                                                                                        |
|------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                         | <ul style="list-style-type: none"> <li>• Source and target Database releases</li> <li>• Oracle Homes</li> <li>• Warnings ignored if there have been any (as described in step 3d)</li> <li>• Status of the components that will be upgraded</li> <li>• Version of the time zone data</li> </ul> <p>Click <b>Finish</b>. The upgrade may take around 45 minutes (118 minutes on M82).</p> |





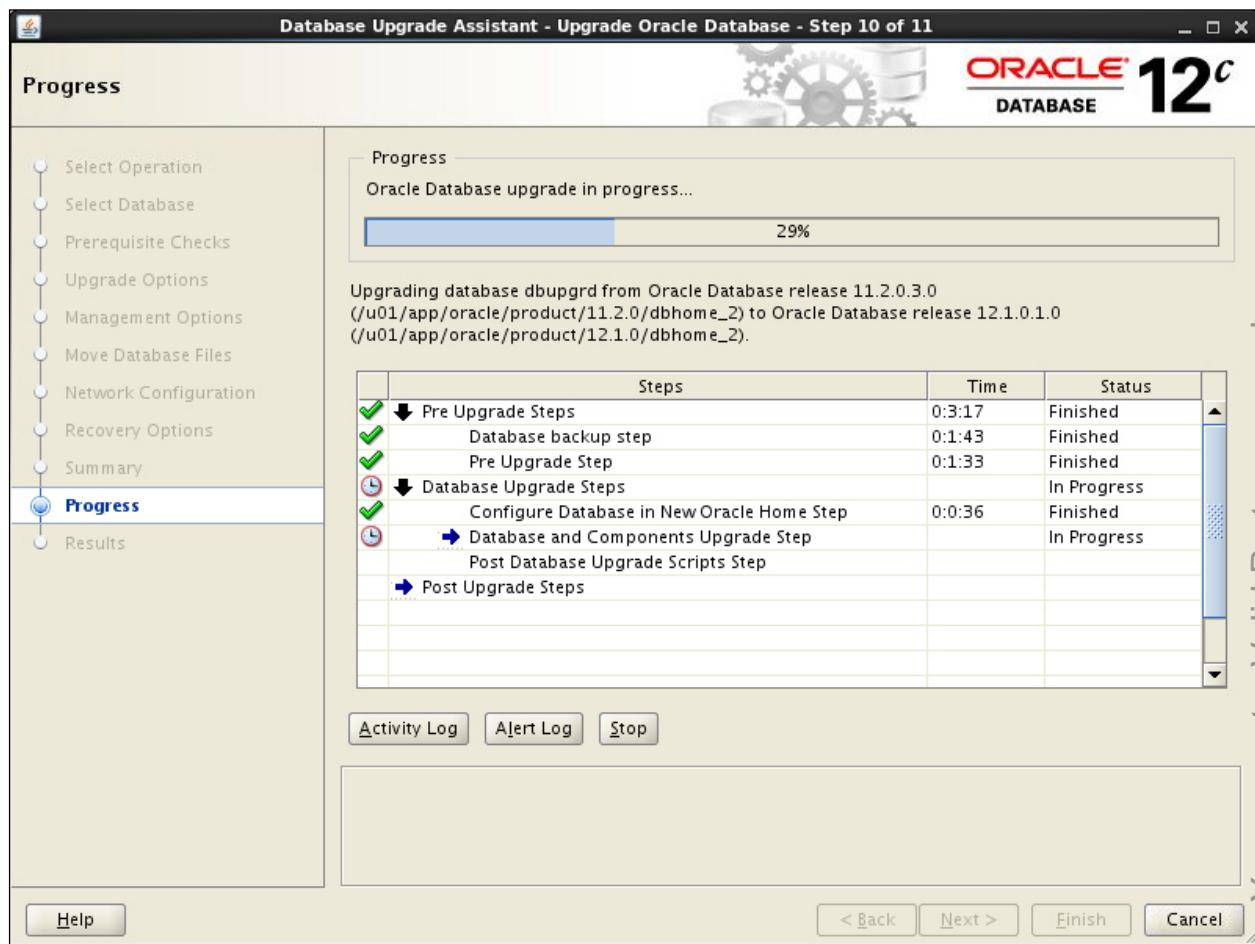
Oracle University and Error : You are not a Valid Partner use only

**Note:** During the upgrade phase, DBUA runs catctl.pl, which runs the upgrade processes in parallel instead of serially, optimally taking advantage of CPU capacity to decrease down time as much as possible.

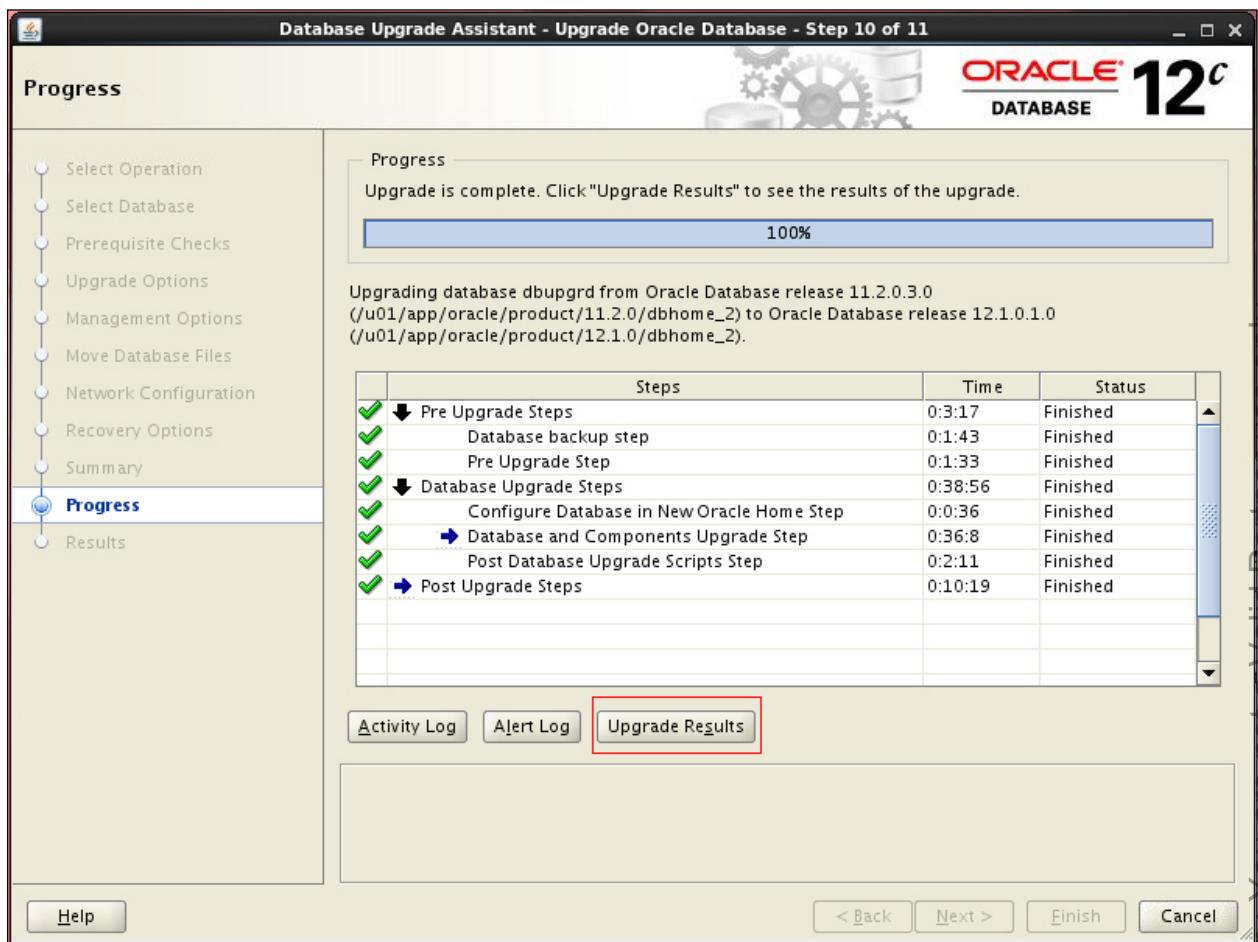
*An error message “OLAPSYS does not exist” would appear if the OLAP option had been installed, which is not the case for this database. In this case, you would drop the OLAP metadata by deleting the OLAPSYS schema (using a recommended script defined in the preupgrd.log). You would then click Ignore.*

*If you had several options or components installed, there would be other recommendations and actions to take during the pre-upgrade phase. These actions are described in an appendix.*

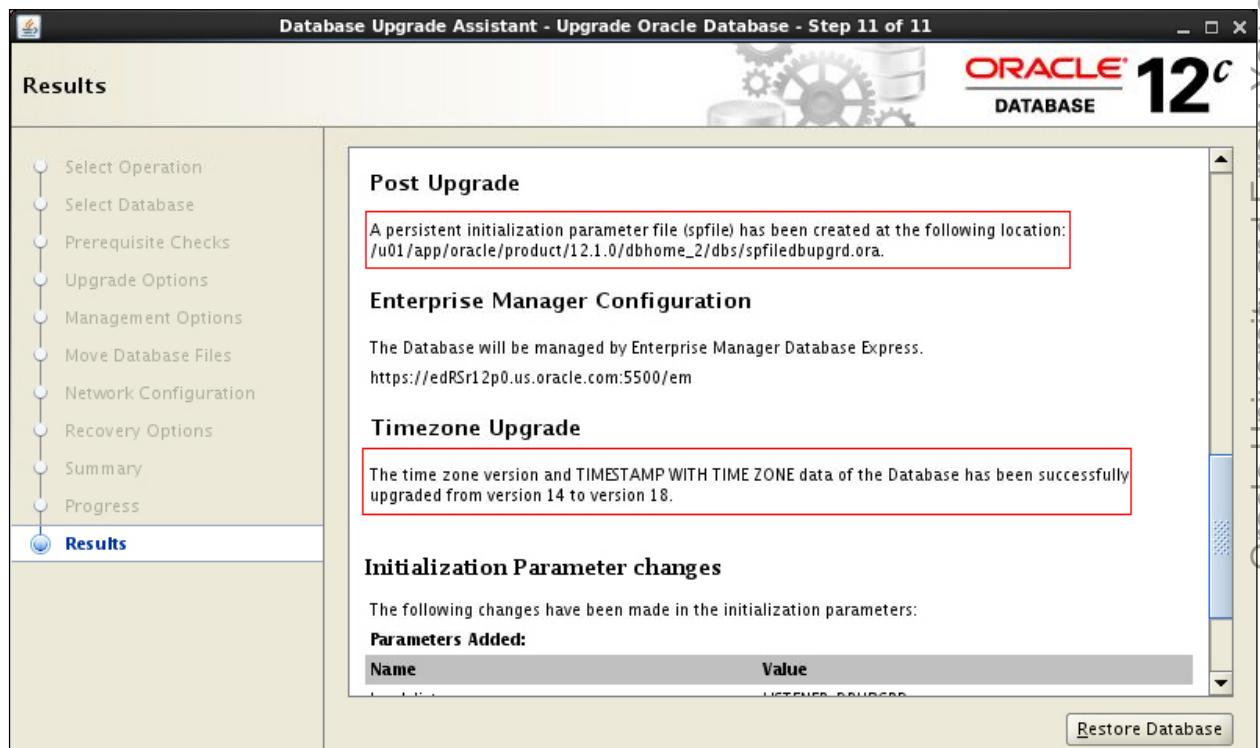
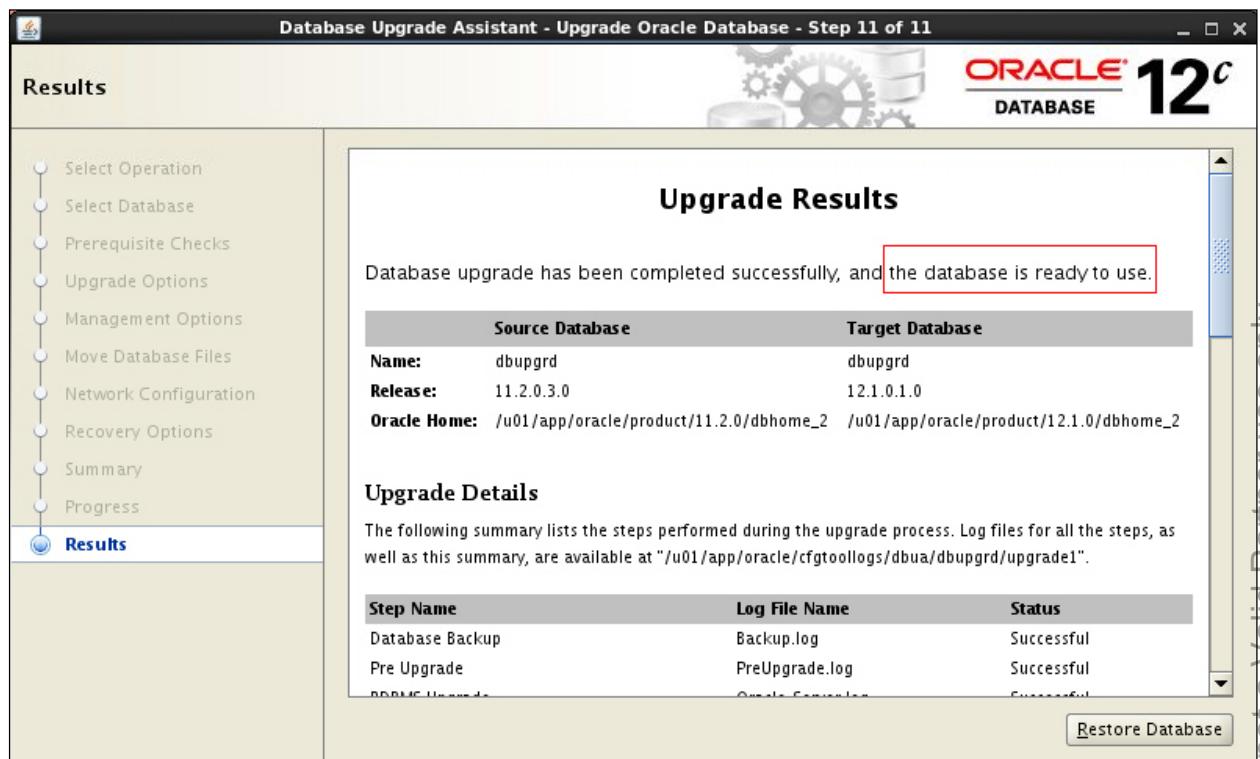
| Step | Window/Page Description | Choices or Values                                                                                    |
|------|-------------------------|------------------------------------------------------------------------------------------------------|
| k.   | Progress page           | You can display the details of the upgrade progress at each step level by expanding each blue arrow. |



| Step | Window/Page Description | Choices or Values                                                                                |
|------|-------------------------|--------------------------------------------------------------------------------------------------|
| I.   | Progress page           | Review the results when the Upgrade Progress is 100% complete.<br>Click <b>Upgrade Results</b> . |



| Step | Window/Page Description | Choices or Values                                                                                                                                                                                                                                                                                                                                                                                                                                |
|------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| m.   | Results page            | <p>Verify that the first message says, "the database is ready to use."</p> <p><i>The dbupgrd database is now running under version 12.1.0.1.0. All the upgrade steps completed successfully.</i></p> <p>Find the location of the SPFILE.</p> <p>Scroll down to find the Timezone information.</p> <p><i>The time zone version and TIMESTAMP WITH TIME ZONE data has been successfully upgraded to version 18.</i></p> <p>Click <b>Close</b>.</p> |



- n. The upgrade process successfully completed. The log files are located in the /u01/app/oracle/cfgtoollogs/dbua/dbupgrd/upgrade1 directory.

```
$ dbua
```

```
Database upgrade has been completed successfully, and the
database is ready to use.
```

```
$
```

## Practice 25-2: Exporting a Non-CDB Application (OPTIONAL)

### Overview

This is an optional practice. If you plan to perform the practice in Appendix C titled “Importing a Non-CDB Application into a CDB,” you must perform this practice.

Before you unplug and plug the `orcl` non-CDB into the `cdb1` CDB and, therefore, make it unusable as a stand-alone database, you will export the `SH` schema from the `orcl` non-CDB so that you can later import it into the `cdb1` CDB.

### Assumptions

The `orcl` non-CDB was successfully created in Practice 5-1.

### Tasks

1. In the 12c terminal window, export the `SH` schema from the `orcl` non-CDB.
  - a. Set the environment for the `orcl` database.

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

- b. Log in to SQL\*Plus as the `SYSDBA` user and start the instance. Exit SQL\*Plus.

```
$ sqlplus / as sysdba

Connected to an idle instance.

SQL> startup
ORACLE instance started.

Total System Global Area 876859392 bytes
Fixed Size 2294360 bytes
Variable Size 583011752 bytes
Database Buffers 285212672 bytes
Redo Buffers 6340608 bytes

Database mounted.
Database opened.

SQL> exit
$
```

- c. Use the `rm` command to remove any previously created export files.

```
$ rm /u01/app/oracle/admin/orcl/dpdump/expSH.dmp
rm: cannot remove `/u01/app/oracle/admin/orcl/dpdump/expSH.dmp' :
No such file or directory
$
```

- d. Create the export dump file of the SH schema.

```
$ expdp system/oracle_4U DUMPFILE=expSH.dmp SCHEMAS=SH
LOGFILE=expSH.log
Export: Release 12.1.0.1.0 - Production on Mon Oct 28 10:08:00
2013

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rights reserved.

Connected to: Oracle Database 12c Enterprise Edition Release
12.1.0.1.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics, Real
Application Testing
and Unified Auditing options
Starting "SYSTEM"."SYS_EXPORT_SCHEMA_01": system/*********
DUMPFILE=expSH.dmp SCHEMAS=SH LOGFILE=expSH.log
Estimate in progress using BLOCKS method...
Processing object type SCHEMA_EXPORT/TABLE/TABLE_DATA
Total estimation using BLOCKS method: 310.8 MB
Processing object type SCHEMA_EXPORT/USER
Processing object type SCHEMA_EXPORT/SYSTEM_GRANT
Processing object type SCHEMA_EXPORT/ROLE_GRANT
Processing object type SCHEMA_EXPORT/DEFAULT_ROLE
Processing object type SCHEMA_EXPORT/PRE_SCHEMA/PROCACT_SCHEMA
Processing object type SCHEMA_EXPORT/TABLE/TABLE
Processing object type
SCHEMA_EXPORT/TABLE/GRANT/OWNER_GRANT/OBJECT_GRANT
Processing object type SCHEMA_EXPORT/TABLE/COMMENT
Processing object type SCHEMA_EXPORT/TABLE/INDEX/INDEX
Processing object type SCHEMA_EXPORT/TABLE/CONSTRAINT/CONSTRAINT
Processing object type
SCHEMA_EXPORT/TABLE/INDEX/STATISTICS/INDEX_STATISTICS
Processing object type SCHEMA_EXPORT/VIEW/VIEW
Processing object type
SCHEMA_EXPORT/TABLE/CONSTRAINT/REF_CONSTRAINT
Processing object type
SCHEMA_EXPORT/TABLE/INDEX/BITMAP_INDEX/INDEX
Processing object type
SCHEMA_EXPORT/TABLE/INDEX/STATISTICS/BITMAP_INDEX/INDEX_STATISTI
CS
Processing object type
SCHEMA_EXPORT/TABLE/STATISTICS(TABLE_STATISTICS
Processing object type SCHEMA_EXPORT/STATISTICS/MARKER
Processing object type
SCHEMA_EXPORT/TABLE/INDEX/DOMAIN_INDEX/INDEX
```

```
Processing object type SCHEMA_EXPORT/MATERIALIZED_VIEW
Processing object type SCHEMA_EXPORT/DIMENSION
 . . exported "SH"."SALES_COPY" 29.62
 MB 918843 rows
 . . exported "SH"."CUSTOMERS" 10.27
 MB 55500 rows
 . . exported "SH"."COSTS": "COSTS_Q1_1998" 139.6
 KB 4411 rows
 . . exported "SH"."COSTS": "COSTS_Q1_1999" 183.7
 KB 5884 rows
 . . exported "SH"."COSTS": "COSTS_Q1_2000" 120.7
 KB 3772 rows
 . . exported "SH"."COSTS": "COSTS_Q1_2001" 228.0
 KB 7328 rows
 . . exported "SH"."COSTS": "COSTS_Q2_1998" 79.66
 KB 2397 rows
 . . exported "SH"."COSTS": "COSTS_Q2_1999" 132.7
 KB 4179 rows
 . . exported "SH"."COSTS": "COSTS_Q2_2000" 119.1
 KB 3715 rows
 . . exported "SH"."COSTS": "COSTS_Q2_2001" 184.7
 KB 5882 rows
 . . exported "SH"."COSTS": "COSTS_Q3_1998" 131.2
 KB 4129 rows
 . . exported "SH"."COSTS": "COSTS_Q3_1999" 137.5
 KB 4336 rows
 . . exported "SH"."COSTS": "COSTS_Q3_2000" 151.6
 KB 4798 rows
 . . exported "SH"."COSTS": "COSTS_Q3_2001" 234.6
 KB 7545 rows
 . . exported "SH"."COSTS": "COSTS_Q4_1998" 144.8
 KB 4577 rows
 . . exported "SH"."COSTS": "COSTS_Q4_1999" 159.2
 KB 5060 rows
 . . exported "SH"."COSTS": "COSTS_Q4_2000" 160.3
 KB 5088 rows
 . . exported "SH"."COSTS": "COSTS_Q4_2001" 278.5
 KB 9011 rows
 . . exported "SH"."SALES": "SALES_Q1_1998" 1.413
 MB 43687 rows
 . . exported "SH"."SALES": "SALES_Q1_1999" 2.071
 MB 64186 rows
 . . exported "SH"."SALES": "SALES_Q1_2000" 2.012
 MB 62197 rows
 . . exported "SH"."SALES": "SALES_Q1_2001" 1.965
 MB 60608 rows
```

|                                                  |       |
|--------------------------------------------------|-------|
| . . . exported "SH"."SALES": "SALES_Q2_1998"     | 1.160 |
| MB 35758 rows                                    |       |
| . . . exported "SH"."SALES": "SALES_Q2_1999"     | 1.754 |
| MB 54233 rows                                    |       |
| . . . exported "SH"."SALES": "SALES_Q2_2000"     | 1.802 |
| MB 55515 rows                                    |       |
| . . . exported "SH"."SALES": "SALES_Q2_2001"     | 2.051 |
| MB 63292 rows                                    |       |
| . . . exported "SH"."SALES": "SALES_Q3_1998"     | 1.634 |
| MB 50515 rows                                    |       |
| . . . exported "SH"."SALES": "SALES_Q3_1999"     | 2.166 |
| MB 67138 rows                                    |       |
| . . . exported "SH"."SALES": "SALES_Q3_2000"     | 1.910 |
| MB 58950 rows                                    |       |
| . . . exported "SH"."SALES": "SALES_Q3_2001"     | 2.130 |
| MB 65769 rows                                    |       |
| . . . exported "SH"."SALES": "SALES_Q4_1998"     | 1.581 |
| MB 48874 rows                                    |       |
| . . . exported "SH"."SALES": "SALES_Q4_1999"     | 2.014 |
| MB 62388 rows                                    |       |
| . . . exported "SH"."SALES": "SALES_Q4_2000"     | 1.814 |
| MB 55984 rows                                    |       |
| . . . exported "SH"."SALES": "SALES_Q4_2001"     | 2.257 |
| MB 69749 rows                                    |       |
| . . . exported "SH"."SUPPLEMENTARY_DEMOGRAPHICS" | 697.6 |
| KB 4500 rows                                     |       |
| . . . exported "SH"."FWEEK_PSCAT_SALES_MV"       | 419.9 |
| KB 11266 rows                                    |       |
| . . . exported "SH"."PROMOTIONS"                 | 59.14 |
| KB 503 rows                                      |       |
| . . . exported "SH"."TIMES"                      | 381.7 |
| KB 1826 rows                                     |       |
| . . . exported "SH"."CAL_MONTH_SALES_MV"         | 6.359 |
| KB 48 rows                                       |       |
| . . . exported "SH"."CHANNELS"                   | 7.390 |
| KB 5 rows                                        |       |
| . . . exported "SH"."COUNTRIES"                  | 10.43 |
| KB 23 rows                                       |       |
| . . . exported "SH"."PRODUCTS"                   | 26.69 |
| KB 72 rows                                       |       |
| . . . exported "SH"."COSTS": "COSTS_1995"        | 0     |
| KB 0 rows                                        |       |
| . . . exported "SH"."COSTS": "COSTS_1996"        | 0     |
| KB 0 rows                                        |       |
| . . . exported "SH"."COSTS": "COSTS_H1_1997"     | 0     |
| KB 0 rows                                        |       |

```
. . . exported "SH"."COSTS":"COSTS_H2_1997" 0
KB 0 rows
. . . exported "SH"."COSTS":"COSTS_Q1_2002" 0
KB 0 rows
. . . exported "SH"."COSTS":"COSTS_Q1_2003" 0
KB 0 rows
. . . exported "SH"."COSTS":"COSTS_Q2_2002" 0
KB 0 rows
. . . exported "SH"."COSTS":"COSTS_Q2_2003" 0
KB 0 rows
. . . exported "SH"."COSTS":"COSTS_Q3_2002" 0
KB 0 rows
. . . exported "SH"."COSTS":"COSTS_Q3_2003" 0
KB 0 rows
. . . exported "SH"."COSTS":"COSTS_Q4_2002" 0
KB 0 rows
. . . exported "SH"."COSTS":"COSTS_Q4_2003" 0
KB 0 rows
. . . exported "SH"."DIMENSION_EXCEPTIONS" 0
KB 0 rows
. . . exported "SH"."SALES":"SALES_1995" 0
KB 0 rows
. . . exported "SH"."SALES":"SALES_1996" 0
KB 0 rows
. . . exported "SH"."SALES":"SALES_H1_1997" 0
KB 0 rows
. . . exported "SH"."SALES":"SALES_H2_1997" 0
KB 0 rows
. . . exported "SH"."SALES":"SALES_Q1_2002" 0
KB 0 rows
. . . exported "SH"."SALES":"SALES_Q1_2003" 0
KB 0 rows
. . . exported "SH"."SALES":"SALES_Q2_2002" 0
KB 0 rows
. . . exported "SH"."SALES":"SALES_Q2_2003" 0
KB 0 rows
. . . exported "SH"."SALES":"SALES_Q3_2002" 0
KB 0 rows
. . . exported "SH"."SALES":"SALES_Q3_2003" 0
KB 0 rows
. . . exported "SH"."SALES":"SALES_Q4_2002" 0
KB 0 rows
. . . exported "SH"."SALES":"SALES_Q4_2003" 0
KB 0 rows
Master table "SYSTEM"."SYS_EXPORT_SCHEMA_01" successfully
loaded/unloaded
```

```


Dump file set for SYSTEM.SYS_EXPORT_SCHEMA_01 is:
/u01/app/oracle/admin/orcl/dpdump/expSH.dmp
Job "SYSTEM"."SYS_EXPORT_SCHEMA_01" successfully completed at
Mon Oct 28 10:10:34 2013 elapsed 0 00:02:23

$
```

2. Copy the /u01/app/oracle/admin/orcl/dpdump/expSH.dmp dump file temporarily to the /home/oracle/labs directory.

```
$ cp /u01/app/oracle/admin/orcl/dpdump/expSH.dmp
/home/oracle/labs
$ ls /home/oracle/labs/*SH*
/home/oracle/labs/expSH.dmp
$
```

## Practice 25-3: Plugging a Non-CDB into a CDB

### Overview

In this practice, you will plug the `orcl` non-CDB into the `cdb1` CDB. You will not use the Data Pump Export/Import method, but instead use the unplugging/plugging method by using the `DBMS_PDB` package. This method has the advantages of being fast and easy. When this package is executed in the `orcl` non-CDB, it generates an XML file describing the tablespaces and data files of the `orcl` non-CDB. The XML file is then used to create a new PDB in the `cdb1` CDB. In this practice, because the `orcl` datafiles are not copied before they are used to plug into a CDB, the `orcl` non-CDB is no longer a valid non-CDB.

### Assumptions

The `cdb1` CDB was successfully created in Practice 5-2.

### Tasks

1. Unplug the `orcl` non-CDB.

- a. Open the database instance in READ ONLY mode.

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

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

SQL> startup mount
Total System Global Area 876859392 bytes
Fixed Size 2294360 bytes
Variable Size 583011752 bytes
Database Buffers 285212672 bytes
Redo Buffers 6340608 bytes
Database mounted.

SQL> alter database open read only;
Database altered.

SQL>
```

- b. Use the `DBMS_PDB.DESCRIBE` package to “unplug” the `orcl` non-CDB.

```
SQL> exec dbms_pdb.describe
('/u01/app/oracle/oradata/orcl/xmlorcl.xml')

PL/SQL procedure successfully completed.
```

- c. Shut down the database instance. Exit SQL\*Plus.

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

2. Create a new PDB, named `pdb_orcl`, to plug the `orcl` non-CDB into `cdb1` CDB by using the XML file generated. The files described in the XML file are used to create the new PDB. The new PDB will consist of the `SYSTEM` and `SYSAUX` tablespaces and the user-defined tablespaces of the `orcl` non-CDB. The `NOCOPY` clause enables a very fast operation because the data files of the `orcl` non-CDB are directly used where they are to create the new PDB. You will have to remove the temp files.

- a. Set the environment for the `cdb1` database.

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

- b. Log in to SQL\*Plus as the `sysdba` user and start the `cdb1` database instance.

```
$ sqlplus / as sysdba

Connected to an idle instance.

SQL> startup
ORACLE instance started.

Total System Global Area 881037312 bytes
Fixed Size 2294408 bytes
Variable Size 578817400 bytes
Database Buffers 293601280 bytes
Redo Buffers 6324224 bytes
Database mounted.
Database opened.
SQL>
```

- c. Create the PDB\_ORCL pluggable database.

```
SQL> create pluggable database PDB_ORCL using
'/u01/app/oracle/oradata/orcl/xmlorcl.xml' NOCOPY;
create pluggable database PDB_ORCL using
'/u01/app/oracle/oradata/orcl/xmlorcl' NOCOPY
*
ERROR at line 1:
ORA-27038: created file already exists
ORA-01119: error in creating database file
'/u01/app/oracle/oradata/orcl/temp01.dbf'
```

- d. Remove the temporary file.

```
SQL> !rm /u01/app/oracle/oradata/orcl/temp01.dbf
```

- e. Again, try to create the PDB\_ORCL pluggable database. Exit SQL\*Plus.

```
SQL> create pluggable database PDB_ORCL using
'/u01/app/oracle/oradata/orcl/xmlorcl.xml' NOCOPY;

Pluggable database created.

SQL> exit
$
```

3. Create a net service name, PDB\_ORCL, to easily connect to the new PDB. Use Net Manager to add the PDB\_ORCL net service name for pdb\_orcl PDB of cdb1 to the tnsnames.ora file.

```
$ $ORACLE_HOME/bin/netmgr
```

| Step | Window/Page Description                                                            | Choices or Values                                                                                    |
|------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| a.   | Oracle Network Manager -<br>/u01/app/oracle/product/12.1.0/dbhome_2/network/admin/ | Expand <b>Local</b> .<br>Select <b>Service Naming</b> .<br>Click <b>Create</b> (the green "+" icon). |
| b.   | Net Service Name Wizard: Welcome                                                   | Enter <b>PDB_ORCL</b> for Net Service Name.<br>Click <b>Next</b> .                                   |
| c.   | Net Service Name Wizard: page 2 of 5 –Protocol                                     | Select <b>TCP/IP</b> (Internet Protocol).<br>Click <b>Next</b> .                                     |

|    |                                                                                   |                                                                                                                 |
|----|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| d. | Net Service Name Wizard: page 3 of 5 –Protocol Settings                           | Enter the following information:<br>Host : <Your hostname><br>or LOCALHOST<br>Port: 1521<br>Click <b>Next</b> . |
| e. | Net Service Name Wizard: page 4 of 5 –Service                                     | Enter the following information:<br>Service Name: <b>pdb_orcl</b><br>Click <b>Next</b> .                        |
| f. | Net Service Name Wizard: page 5 of 5 –Test                                        | Click <b>Finish</b> .                                                                                           |
| g. | Oracle Network Manager -<br>/u01/app/oracle/product/12.1.0/dbhome_1/network/admin | From the <b>File</b> menu, select <b>Save Network Configuration</b> .<br>Select <b>File &gt; Exit</b> .         |

4. To complete the operation, you have to convert the plugged non-CDB to a proper PDB by deleting unnecessary metadata from the SYSTEM tablespace of the PDB.

For this purpose, you execute the \$ORACLE\_HOME/rdbms/admin/noncdb\_to\_pdb.sql script while you are connected to the PDB. The execution may last more than 30 minutes.

- a. Connect to `pdb_orcl` as `sysdba` using the net service name.

```
$ sqlplus sys/oracle_4U@pdb_orcl as sysdba

SQL> SELECT con_id, name, open_mode FROM v$pdbs;

 CON_ID NAME OPEN_MODE
----- -----
 4 PDB_ORCL MOUNTED

SQL>
```

- b. List the tablespaces and data files of the new PDB.

```
SQL> select name from dba_tablespaces;
select name from dba_tablespaces
*
ERROR at line 1:
ORA-01219: database or pluggable database not open: queries
allowed on fixed
tables or views only

SQL>
```

*The PDB is not yet opened.*

- c. First, execute the \$ORACLE\_HOME/rdbms/admin/noncdb\_to\_pdb.sql script. It will take approximately 30 minutes to complete.

```
SQL> @$ORACLE_HOME/rdbms/admin/noncdb_to_pdb.sql
...
SQL> DOC
DOC>#####
#
DOC> The following statement will cause an "ORA-01722: invalid
number"
DOC> error if we're not in a PDB.
DOC>#####
SQL>
SQL> VARIABLE pdbname VARCHAR2(128)
SQL> BEGIN
 2 SELECT sys_context('USERENV', 'CON_NAME')
 3 INTO :pdbname
 4 FROM dual
 5 WHERE sys_context('USERENV', 'CON_NAME') <> 'CDB$ROOT';
 6 END;
 7 /
PL/SQL procedure successfully completed.

...
SQL> =====
SQL> Rem Run component validation procedure
SQL> Rem
SQL> =====
...
SQL> alter session set container=&dbname;

Session altered.

SQL>
SQL> -- leave the PDB in the same state it was when we started
SQL> BEGIN
 2 execute immediate '&open_sql &restricted_state';
 3 EXCEPTION
 4 WHEN OTHERS THEN
 5 BEGIN
 6 IF (sqlcode <> -900) THEN
 7 RAISE;
 8 END IF;
 9 END;
```

```
10 END;
11 /

PL/SQL procedure successfully completed.
```

```
SQL>
SQL> WHENEVER SQLERROR CONTINUE;
SQL>
SQL>
```

- d. When the conversion is complete, open the PDB. Exit SQL\*Plus.

```
SQL> alter pluggable database pdb_orcl open;

Pluggable database altered.

SQL> exit
$
```

5. Connect to PDB\_ORCL.

```
$ sqlplus sys/oracle_4U@PDB_ORCL as SYSDBA

SQL>
```

6. Verify that all application data is in the pdb\_orcl PDB. Exit SQL\*Plus.

```
SQL> select tablespace_name from dba tablespaces;

TABLESPACE_NAME

SYSTEM
SYSAUX
TEMP
USERS
EXAMPLE
INVENTORY

6 rows selected.

SQL> select name from v$datafile;

NAME

/u01/app/oracle/oradata/cdb1/undotbs01.dbf
/u01/app/oracle/oradata/orcl/system01.dbf
/u01/app/oracle/oradata/orcl/sysaux01.dbf
```

```
/u01/app/oracle/oradata/orcl/users01.dbf
/u01/app/oracle/oradata/orcl/example01.dbf
/u01/app/oracle/oradata/orcl/inventory02.dbf
/u01/app/oracle/oradata/orcl/inventory01.dbf

7 rows selected.
SQL> select count(empno) from scott.emp;

COUNT (EMPNO)

14

SQL> select count(*) from hr.employees;

COUNT (*)

107

SQL> exit
$
```

## **Practices for Lesson 26: Performing Post-Upgrade Tasks**

**Chapter 26**

## Practices for Lesson 26: Overview

---

### Practices Overview

In the previous practice, you upgraded the Oracle Database 11g dbupgrd instance to Oracle Database12c by using DBUA.

In this practice, you will complete the upgrade process of the dbupgrd database instance currently running in 12c by:

- Performing post-upgrade actions
- Enabling and using Unified Auditing

## Practice 26-1: Performing Post-Upgrade Actions

### Overview

In this practice, you will:

- Verify that the /etc/oratab file sets the value of ORACLE\_HOME to point to the new Oracle home that is created for the new Oracle Database 12c release
- Show the current state of the Oracle data dictionary
- Check that there are no invalid objects
- Check that the password file exists
- Verify that the SPFILE is created and create the PFILE
- View the contents of the alert.log file
- Launch Enterprise Manager Database Express
- Unlock the application users, if any are locked
- Upgrade optimizer statistics
- Perform a FULL database backup

### Tasks

- In the oracle user 12c terminal window, view the /etc/oratab file.

```
$ cat /etc/oratab|grep dbupgrd
dbupgrd:/u01/app/oracle/product/12.1.0/dbhome_2:N
$
```

- Show the current state of the Oracle data dictionary. The status of all components must be VALID.

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

$ sqlplus / as sysdba

SQL> set lines 80 pages 100
SQL> col comp_id format A12
SQL> col comp_name format A30
SQL> col version format A10
SQL> col status format A6
SQL> select substr(comp_id,1,15) comp_id, substr(comp_name,1,30)
 comp_name, substr(version,1,10) version, status
 from dba_registry order by modified;

COMP_ID COMP_NAME VERSION STATUS
----- ----- -----
CATALOG Oracle Database Catalog Views 12.1.0.1.0 VALID
CATPROC Oracle Database Packages and T 12.1.0.1.0 VALID
```

```
SQL> !ls $ORACLE_HOME/dbs/orapwdupgrd
/u01/app/oracle/product/12.1.0/dbhome_2/dbs/orapwdupgrd
SQL>
```

3. Check that there are no invalid objects.

```
SQL> @$ORACLE_HOME/rdbms/admin/utluiobj.sql
.Oracle Database 12.1 Post-Upgrade Invalid Objects Tool 10-28-
2013 11:24:04.
.This tool lists post-upgrade invalid objects that were not
invalid prior to upgrade (it ignores pre-existing pre-upgrade
invalid objects).
.Owner Object Name Object Type
.PL/SQL procedure successfully completed.

SQL> select * from REGISTRY$sys_inv_objs;
no rows selected

SQL> select * from REGISTRY$nonsys_inv_objs;
no rows selected

SQL>
```

4. Check that the password file exists.

- a. Check for the existence of a traditional password file in the \$ORACLE\_HOME/dbs directory.

```
SQL> !ls $ORACLE_HOME/dbs/orapwdupgrd
/u01/app/oracle/product/12.1.0/dbhome_2/dbs/orapwdupgrd
SQL>
```

- b. Check that the password file is used during an authentication. Exit SQL\*Plus.

```
SQL> connect sys/oracle_4U@localhost:1561/dbupgrd as sysdba
Connected.
SQL> connect sys/oracle@localhost:1561/dbupgrd as sysdba
ERROR:
ORA-01017: invalid username/password; logon denied

Warning: You are no longer connected to ORACLE.
SQL> exit
$
```

5. Verify that the PFILE and the SPFILE exist.

```
$ ls $ORACLE_HOME/dbs/*dbupgrd*.ora
/u01/app/oracle/product/12.1.0/dbhome_2/dbs/initdbupgrd.ora
/u01/app/oracle/product/12.1.0/dbhome_2/dbs/spfiledbupgrd.ora
$
```

6. View the contents of the alert log file

```
$ cd $ORACLE_BASE/diag/rdbms/dbupgrd/dbupgrd/trace
$ ls a*
alert_dbupgrd.log
$ gedit alert_dbupgrd.log

...
Control file expanded from 594 to 614 blocks for upgrade.
Successful mount of redo thread 1, with mount id 2071604359
Database mounted in Exclusive Mode
Lost write protection disabled
Ping without log force is disabled.
Completed: ALTER DATABASE MOUNT
Fri Feb 15 00:55:36 2013
ALTER DATABASE OPEN MIGRATE
...
Completed: ALTER DATABASE OPEN MIGRATE
...
$
```

**From now on, if you encounter any disconnection from the database, reconnect and continue with your administrative operations.**

7. Launch Enterprise Manager Database Express.
  - a. Configure the port number. Exit SQL\*Plus.

```
$ sqlplus / as sysdba

SQL> select DBMS_XDB_CONFIG.getHTTPPort from dual;

GETHTTPPORT

0

SQL> select DBMS_XDB_CONFIG.getHTTPsPort from dual;

GETHTTPSPORT

5500

SQL> exit
$
```

- b. You recall that 5500 is already being used. Verify which port is being used by the CDB1 instance. Return to the window set for the PDB\_ORCL database instance. If the plugging of PDB\_ORCL plugging has not completed, wait until it is finished before performing these steps.

```
$. oraenv
ORACLE_SID = [oracle] ? cdb1
The oracle base has been set to /u01/app/oracle
$
```

Connect to the pdb\_orcl PDB to retrieve the port number used.

```
$ sqlplus sys/oracle_4U@localhost:1521/pdb_orcl as sysdba

SQL> select DBMS_XDB_CONFIG.getHTTPPort from dual;

GETHTTPPORT

0

SQL> select DBMS_XDB_CONFIG.getHTTPsPort from dual;

GETHTTPSPORT

5500

SQL> exit
$
```

- c. Configure the port number of 5502 for Enterprise Manager Database Express for the dbupgrd instance. Switch back to the dbupgrd session.
- 1) Check the value of the DISPATCHERS instance parameter in the dbupgrd instance. There must be at least one dispatcher configured for the XMLDB service with the TCP protocol.

Session 1

```
SQL> show parameter dispatchers
```

| NAME            | TYPE    | VALUE |
|-----------------|---------|-------|
| Dispatchers     | string  |       |
| max_dispatchers | integer |       |
| SQL>            |         |       |

- 2) Set the DISPATCHERS instance parameter.

```
SQL> alter system set
dispatchers='(protocol=tcp)(service=dbupgrdXDB)' scope=both;
```

```
System altered.
```

```
SQL>
```

```
SQL> show parameter dispatchers
```

| NAME            | TYPE    | VALUE                              |
|-----------------|---------|------------------------------------|
| Dispatchers     | string  | (protocol=tcp)(service=dbupgrdXDB) |
| max_dispatchers | integer |                                    |
| SQL>            |         |                                    |

- 3) Set the port number to 5502 for EM Database Express.

```
SQL> exec DBMS_XDB_CONFIG.setHTTPsPort(5502)
```

```
PL/SQL procedure successfully completed.
```

```
SQL> select DBMS_XDB_CONFIG.getHTTPsPort from dual;
```

```
GETHTTPSPORT
```

```

5502
```

```
SQL>
```

- 4) Restart the instance to register the XMLDB service.

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

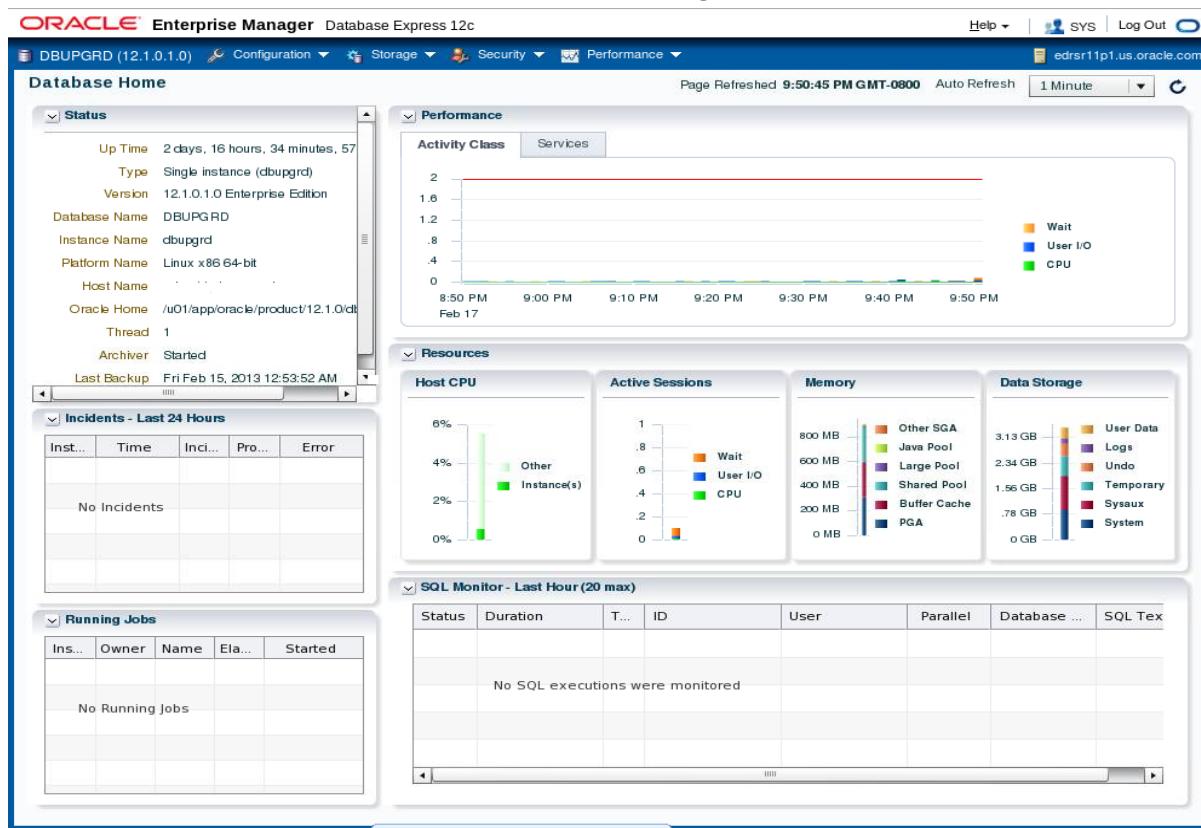
SQL> startup
ORACLE instance started.

Total System Global Area 626327552 bytes
Fixed Size 2291472 bytes
Variable Size 276826352 bytes
Database Buffers 339738624 bytes
Redo Buffers 7471104 bytes
Database mounted.
Database opened.
SQL> exit
$
```

- d. Open the browser and enter the URL for Enterprise Manager Database Express:  
<https://<hostname>:5502/em>. In the current setup, use:  
<https://localhost:5502/em>

- Add an exception for the untrusted connection.

- In the Login window, enter **sys** in the User Name field and **oracle\_4u** in the Password field. Select **as SYSDBA**. Then click **Login**.



- Log out of Enterprise Manager Database Express. If the Authentication Required window displays, click **Cancel** to dismiss it.
8. In the oracle user 12c terminal window, verify that the **SH** and **HR** application users are unlocked.

```
$ sqlplus / as sysdba
...
SQL> set pages 100
SQL> col username format a30
SQL> select username, account_status from dba_users order by 1;

USERNAME ACCOUNT_STATUS

ANONYMOUS EXPIRED & LOCKED
APPQOSSYS EXPIRED & LOCKED
AUDSYS EXPIRED & LOCKED
DBSNMP OPEN
DIP EXPIRED & LOCKED
GSMADMIN_INTERNAL EXPIRED & LOCKED
GSMCATUSER EXPIRED & LOCKED
GSMUSER EXPIRED & LOCKED
HR OPEN
```

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```

ORACLE_OCM EXPIRED & LOCKED
OUTLN EXPIRED & LOCKED
SH OPEN
SYS OPEN
SYSBACKUP EXPIRED & LOCKED
SYSDG EXPIRED & LOCKED
SYSKM EXPIRED & LOCKED
SYSTEM OPEN
WMSYS EXPIRED & LOCKED
XDB EXPIRED & LOCKED
XS$NULL EXPIRED & LOCKED

```

20 rows selected.

SQL>

9. Upgrade optimizer statistics. In Practice 24-2, the last suggestion in /u01/app/oracle/cfgtoollogs/dbupgrd/preupgrade/preupgrade.log was to create statistics on fixed objects two weeks after the upgrade. You can do it now or leave it until the end of the course. In the normal course of database performance management, you will repeat the procedure periodically as well as the `gather_dictionary_stats` procedure to update statistics on data dictionary objects. This procedure takes some time to execute. You can skip it if you are short of time.

```
SQL> exec dbms_stats.gather_fixed_objects_stats
```

PL/SQL procedure successfully completed.

SQL> EXIT

\$

10. After upgrade, perform a FULL database backup using RMAN.

- a. Invoke Recovery Manager.

```
$ rman target /
```

- b. Verify that automatic backups of the control file are configured.

```
RMAN> show all;
```

using target database control file instead of recovery catalog  
RMAN configuration parameters for database with db\_unique\_name DBUPGRD are:

```
CONFIGURE RETENTION POLICY TO REDUNDANCY 1; # default
CONFIGURE BACKUP OPTIMIZATION OFF; # default
CONFIGURE DEFAULT DEVICE TYPE TO DISK; # default
CONFIGURE CONTROLFILE AUTOBACKUP ON;
```

...

## c. Back up the database.

```
RMAN> backup database plus archivelog delete all input;

Starting backup at 26-FEB-13
current log archived
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=263 device type=DISK
channel ORA_DISK_1: starting archived log backup set
channel ORA_DISK_1: specifying archived log(s) in backup set
input archived log thread=1 sequence=35 RECID=1 STAMP=808345285
...
Finished backup at 26-FEB-13

Starting Control File and SPFILE Autobackup at 26-FEB-13
piece
handle=+FRA/DBUPGRD/AUTOBACKUP/2013_02_26/s_808370053.315.808370
057 comment=NONE
Finished Control File and SPFILE Autobackup at 26-FEB-13

RMAN> EXIT
$
```



## **Practices for Appendix A: Using Database Resource Manager**

**Chapter 27**

## Practices for Appendix A: Overview

---

### Overview

You received complaints that certain batch jobs are using too many system resources and that a specific user is known to start data warehouse processes during regular business hours. You decide to use the Database Resource Manager for better system-resource utilization and control.

Your first effort to balance the situation includes creating an APPUSER consumer group and assigning it to the default DEFAULT\_PLAN resource plan. You then map a couple of Oracle users and your major OS user to resource groups. Activate the resource plan and test your assignments. Regularly click **Show SQL** to review all statements that are new to you.

## Practice A-1: Managing Resources

### Overview

In this practice, you use Enterprise Manager Cloud Control and SQL\*Plus to configure a resource plan with consumer groups to balance the resource usage among different users and applications.

### Assumptions

Users SH, OE, and PM are unlocked and the password for each is set to `oracle_4U`.

### Tasks

In this practice, you create an APPUSER consumer group and assign it to the default DEFAULT\_PLAN resource plan. Then you map a few Oracle users and your major OS user to resource groups. Activate the resource plan and test your assignments.

Log in as the DBA1 user (with `oracle_4U` password, connect as SYSDBA) and perform the necessary tasks through Enterprise Manager Cloud Control or through SQL\*Plus. All scripts for this practice are in the \$LABS/PA directory.

Whenever you open a new terminal window, execute the `oraenv` script to set environment variables for the `orcl` database.

1. Using Cloud Control, create a resource group called APPUSER. At this point, do not add users to the group.

| Step | Window/Page Description                        | Choices or Values                                                                                                                    |
|------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| a.   | Cloud Control <code>orcl</code> Database Home  | Select <b>Administration &gt; Resource Manager</b> .                                                                                 |
| b.   | Database Login                                 | Select Credential <b>Preferred</b> .<br>Select Preferred Credential Name: <b>SYSDBA Database Credentials</b><br>Click <b>Login</b> . |
| c.   | Getting Started with Database Resource Manager | Click <b>Consumer Groups</b> .                                                                                                       |
| d.   | Consumer Groups                                | Click <b>Create</b> .                                                                                                                |
| e.   | Create Resource Consumer Group                 | Enter Consumer Group: <b>APPUSER</b><br>Verify Scheduling Policy: <b>Round Robin</b><br>Click <b>Show SQL</b> .                      |
| f.   | Show SQL                                       | Click <b>Return</b> .                                                                                                                |
| g.   | Create Resource Consumer Group                 | Click <b>OK</b> .                                                                                                                    |

Consumer Groups > Create Resource Consumer Group      Logged in As SYS

### Create Resource Consumer Group

**General** Roles

Consumer Groups are user sessions that are grouped together based on resource processing requirements. Each Consumer Group definition specifies the users and roles that are allowed to switch into this Consumer Group.

\* Consumer Group APPUSER  
 Description  
 Scheduling Policy Round Robin

**Users permitted to run in this Consumer Group**

| Select         | User | Admin Option |
|----------------|------|--------------|
| No items found |      | Add          |

**Question 1:** What does the ROUND-ROBIN parameter value mean?

**Possible Answer:** ROUND-ROBIN indicates that CPU resources are fairly allocated to the APPUSER consumer group, according to the active resource plan directives.

**Show SQL**

Execute On Multiple Databases Return

```
BEGIN
dbms_resource_manager.clear_pending_area();
dbms_resource_manager.create_pending_area();
dbms_resource_manager.create_consumer_group(consumer_group =>
'APPUSER',comment => '' , cpu_mth => 'ROUND-ROBIN');
dbms_resource_manager.submit_pending_area();
END;
```

2. Create a new plan called NEW\_DEFAULT\_PLAN that uses the DEFAULT\_PLAN as a template. Use the Create Like action. Add the APPUSER and LOW\_GROUP consumer groups to the DEFAULT\_PLAN resource plan. Change the level 3 CPU resource allocation percentages: 60 percent for the APPUSER consumer group and 40 percent for the LOW\_GROUP consumer group.

| Step | Window/Page Description                        | Choices or Values                                                       |
|------|------------------------------------------------|-------------------------------------------------------------------------|
| a.   | Consumer Groups                                | Select Administration > Resource Manager.                               |
| b.   | Getting Started with Database Resource Manager | Click Plans.                                                            |
| c.   | Resource Plans                                 | Select Default Plan.<br>Select Action <b>Create Like</b> .<br>Click Go. |
| d.   | Create Resource Plan                           | Enter Plan: NEW_DEFAULT_PLAN                                            |
| e.   | Create Resource Plan                           | In Resource Allocation section, click Add/Remove.                       |
| f.   | Select Groups/Subplans                         | Select APPUSER.<br>Click Move from Available Groups/Subplans            |

| Step | Window/Page Description | Choices or Values                                                                                                                                                                                |
|------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                         | pane to Resource Allocations pane.<br>Select <b>LOW_GROUP</b> .<br>Click <b>Move</b> .<br>Click <b>OK</b> .                                                                                      |
| g.   | Create Resource Plan    | In the Resource Allocation section:<br>For APPUSER, set Shares to <b>40</b> .<br>For LOW_GROUP, set Shares to <b>20</b> .<br>For SYS_GROUP, set Shares to <b>30</b> .<br>Click <b>Show SQL</b> . |
| h.   | Show SQL                | Review the PL/SQL code.<br>Click <b>Return</b> .                                                                                                                                                 |
| i.   | Create Resource Plan    | Click <b>OK</b> .                                                                                                                                                                                |

3. There are two ways to assign users to consumer groups: The user can be assigned to one or more groups explicitly and an initial group defined, or the user can be mapped into an initial group based on one or more of the rules in the Consumer Group Mappings. Configure Consumer Group Mappings so that the HR Oracle user belongs to the APPUSER consumer group and the SCOTT user to the LOW\_GROUP consumer group. For the SCOTT user, confirm that his ORACLE\_USER attribute has a higher priority than the CLIENT\_OS\_USER attribute.
- Log in to SQL\*Plus as the DBA1 user.
  - Execute the `$LABS/PA/assign_hr_appuser.sql` script to assign the HR user to the APPUSER consumer group.

```
SQL> @$LABS/PA/assign_hr_appuser
```

PL/SQL procedure successfully completed.

```
SQL>
```

- Execute the `$LABS/PA/assign_scott_lowgroup.sql` script to assign the SCOTT user to the LOW\_GROUP consumer group.

```
SQL> @$LABS/PA/assign_scott_lowgroup
```

PL/SQL procedure successfully completed.

```
SQL>
```

- Return to Enterprise Manager Cloud Control to verify the additions you made in step 3.
  - Select **Administration > Resource Manager**.
  - Click **Consumer Group Mappings**.
  - HR and SCOTT now appear in the list.

**Consumer Group Mappings**

Execute On Multiple Databases | Show SQL | Revert | Apply

**General** | Priorities

Create rules to enable the resource manager to automatically assign sessions to consumer groups

View All

Add Rule for Selected Type

| Select                           | Priority ▲ | View                      | Value                 | Consumer Group | Remove |
|----------------------------------|------------|---------------------------|-----------------------|----------------|--------|
| <input checked="" type="radio"/> | 1          | Service Module and Action | No Mappings Specified |                |        |
| <input type="radio"/>            | 2          | Service and Module        | No Mappings Specified |                |        |
| <input type="radio"/>            | 3          | Module and Action         | No Mappings Specified |                |        |
| <input type="radio"/>            | 4          | Module                    | No Mappings Specified |                |        |
| <input type="radio"/>            | 5          | Service                   | No Mappings Specified |                |        |
| <input type="radio"/>            | 6          | Oracle User               | HR                    | APPUSER        |        |
|                                  |            |                           | SCOTT                 | LOW_GROUP      |        |
|                                  |            |                           | SYS, SYSTEM           | SYS_GROUP      |        |
| <input type="radio"/>            | 7          | Client Program            | No Mappings Specified |                |        |
| <input type="radio"/>            | 8          | Client OS User            | No Mappings Specified |                |        |
| <input type="radio"/>            | 9          | Client Machine            | No Mappings Specified |                |        |
| <input type="radio"/>            | 10         | Client ID                 | No Mappings Specified |                |        |

5. Assign the **PM** Oracle user to the following consumer groups: **APPUSER**, **LOW\_GROUP**, and **SYS\_GROUP** without using the Consumer Group Mappings.

| Step | Window/Page Description                       | Choices or Values                                                                                                                                                     |
|------|-----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a.   | Consumer Group Mappings                       | Select <b>Administration &gt; Security &gt; Users</b> .                                                                                                               |
| b.   | Users                                         | Enter <b>PM</b> in the Search box.<br>Click <b>Go</b> .                                                                                                               |
| c.   | Users                                         | Select the <b>PM</b> user.<br>Click <b>Edit</b> .                                                                                                                     |
| d.   | Edit User: PM                                 | Click the <b>Consumer Group Privileges</b> tab.<br>If you see an error regarding the password for the <b>PM</b> user, enter <b>oracle_4U</b> in both password fields. |
| e.   | Edit User: PM : Consumer Group Privileges tab | Click <b>Edit List</b> .                                                                                                                                              |
| f.   | Modify Consumer Groups                        | Move <b>APPUSER</b> to Selected Consumer Groups.<br>Move <b>LOW_GROUP</b> to Selected Consumer Groups.<br>Move <b>SYSGROUP</b> to Selected Consumer                   |

| Step | Window/Page Description | Choices or Values                                                                                                                                            |
|------|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
|      |                         | Groups.<br>Click <b>OK</b>                                                                                                                                   |
| g.   | Edit User: PM           | Set Default Consumer Group to <b>APPUSER</b> .<br>Click <b>Show SQL</b> .                                                                                    |
| h.   | Show SQL                | <b>Note:</b> The PM user is granted the privilege of switching to any of the three groups, but the initial group is set to APPUSER.<br>Click <b>Return</b> . |
| i.   | Edit User: PM           | Click <b>Apply</b> .                                                                                                                                         |

6. Activate the **NEW\_DEFAULT\_PLAN** resource plan.

| Step | Window/Page Description                        | Choices or Values                                                                                    |
|------|------------------------------------------------|------------------------------------------------------------------------------------------------------|
| a.   | Edit User: PM                                  | Select <b>Administration &gt; Resource Manager</b> .                                                 |
| b.   | Getting Started with Database Resource Manager | Click <b>Plans</b> .                                                                                 |
| c.   | Resource Plans                                 | Select <b>NEW_DEFAULT_PLAN</b> .<br>Select <b>Activate</b> in the Actions menu.<br>Click <b>GO</b> . |
| d.   | Confirmation                                   | Click <b>Yes</b> .                                                                                   |
| e.   | Resource Plans                                 | You should see a success message:<br><b>NEW_DEFAULT_PLAN</b> has been activated successfully         |

7. Test the consumer group mappings. Start two SQL\*Plus sessions: the first with the `system/oracle_4U` connect string and the second with the `scott/tiger` connect string.

- a. As the `oracle` user in a terminal window, execute the `oraenv` script to set environment variables for the `orcl` database.

```
$. oraenv
ORACLE_SID = [orcl] ? orcl
$
```

Your output may be different depending on your previously executed tasks.

- b. To start a SQL\*Plus session with the `system/oracle_4U` connect string and to set your SQL prompt to "FIRST," enter:

```
$ sqlplus system
Enter password: oracle_4U <<< not displayed

SQL> SET SQLPROMPT "FIRST>"
FIRST>
```

- c. As the `oracle` user in a second terminal window, execute the `oraenv` script to set environment variables for the `orcl` database.

```
$. oraenv
ORACLE_SID = [orcl] ? orcl
$
```

Your output may be different depending on your previously executed tasks.

- d. To start a SQL\*Plus session with the `scott/tiger` connect string and to set your SQL prompt to "SECOND," enter:

```
$ sqlplus scott
Enter password: tiger <<< not displayed

SQL> SET SQLPROMPT "SECOND>"
SECOND>
```

- e. In your FIRST SQL\*Plus session, enter:

```
column username format A12
column resource_consumer_group format A24
select Username, RESOURCE_CONSUMER_GROUP, count(Username)
from v$session
Where username is not Null
and Program is not Null
group by Username, RESOURCE_CONSUMER_GROUP;
```

**Note:** This statement is available in the `/solns/sol_qry_vsSession.sql` file.

```
FIRST> column username format A12
FIRST> column resource_consumer_group format A24

FIRST> select Username, RESOURCE_CONSUMER_GROUP, count(Username)
2 from v$session
3 Where username is not Null
4 and Program is not Null
5 group by Username, RESOURCE_CONSUMER_GROUP;

USERNAME RESOURCE_CONSUMER_GROUP COUNT(USERNAME)
----- -----
DBSNMP OTHER_GROUPS 3
SYS SYS_GROUP 1
SCOTT LOW_GROUP 1
SYSTEM SYS_GROUP 1
```

**Question:** To which consumer group does the SCOTT user belong?

**Answer:** SCOTT is in the `LOW_GROUP` consumer group.

**Note:** Your output for this step (and the following steps) may not look exactly like the output shown. The information of concern here is for the specific users being mentioned.

- f. In the SECOND terminal window, connect as the PM user with the oracle\_4U password:

```
SECOND> connect pm
Enter password: oracle_4U <<< not displayed

Connected.
SECOND>
```

- g. In your FIRST SQL\*Plus session, enter / to execute the previous SQL statement again.

```
FIRST>/

USERNAME RESOURCE_CONSUMER_GROUP COUNT (USERNAME)

DBSNMP OTHER_GROUPS 3
SYS SYS_GROUP 1
PM APPUSER 1
SYSTEM SYS_GROUP 1

FIRST>
```

*Question:* To which consumer group does the PM user belong?

*Answer:* PM is in the APPUSER consumer group.

- h. In the SECOND terminal window, connect as the OE user with the oracle\_4U password:

```
SECOND> connect oe
Enter password: oracle_4U <<< not displayed

Connected.
SECOND>
```

- i. In your FIRST SQL\*Plus session, enter / to execute the previous SQL statement again.

```
FIRST>/

USERNAME RESOURCE_CONSUMER_GROUP COUNT (USERNAME)

DBSNMP OTHER_GROUPS 3
OE OTHER_GROUPS 1
SYS SYS_GROUP 1
SYSTEM SYS_GROUP 1

FIRST> exit
```

- j. Exit both SQL\*Plus sessions.

**Question:** When testing your OE Oracle user, you notice that OE is in the OTHER\_GROUPS consumer group. Why is that?

**Possible Answer:** The OE user is not explicitly assigned to another consumer resource group.

8. Revert to your original configuration by deactivating the NEW\_DEFAULT\_PLAN resource group, undoing all consumer group mappings, and finally by deleting the APPUSER resource group.

| Step | Window/Page Description                        | Choices or Values                                                                        |
|------|------------------------------------------------|------------------------------------------------------------------------------------------|
| a.   |                                                | Select <b>Administration &gt; Resource Manager</b> .                                     |
| b.   | Getting Started with Database Resource Manager | Click <b>Plans</b> .                                                                     |
| c.   | Resource Plans                                 | Select <b>INTERNAL_PLAN</b> .<br>Select Actions <b>Activate</b> .<br>Click <b>GO</b> .   |
| d.   | Confirmation                                   | Click <b>Yes</b> .                                                                       |
| e.   | Resource Plans                                 | You should see a success message<br><b>INTERNAL_PLAN has been activated successfully</b> |

- f. To reconfigure or undo all consumer group mappings, review and execute the rsc\_cleanup.sh script from the \$LABS/PA directory:

```
$ cd $LABS/PA
$ cat rsc_cleanup.sh
#!/bin/bash
Oracle Database 12c: Administration Workshop
Oracle Server Technologies - Curriculum Development
#
Training purposes only
Not appropriate for production use
#
This script supports the Resource Manager practice session.
Start this script connected as OS user: oracle.

sqlplus -S "/ as sysdba" << EOF

PROMPT remove PM from consumer groups

BEGIN
 dbms_resource_manager_privs.revoke_switch_consumer_group(
 revokee_name => 'PM',

```

```
 consumer_group => 'APPUSER'
) ;
END;
/
BEGIN
 dbms_resource_manager_privs.revoke_switch_consumer_group(
 revokee_name => 'PM',
 consumer_group => 'LOW_GROUP'
) ;
END;
/
BEGIN
 dbms_resource_manager_privs.revoke_switch_consumer_group(
 revokee_name => 'PM',
 consumer_group => 'SYS_GROUP'
) ;
END;
/
PROMPT remove hr, scott from oracle_user

BEGIN
dbms_resource_manager.clear_pending_area();
dbms_resource_manager.create_pending_area();
dbms_resource_manager.set_consumer_group_mapping(
 dbms_resource_manager.oracle_user,
 'HR',
 NULL
) ;
dbms_resource_manager.set_consumer_group_mapping(
 dbms_resource_manager.oracle_user,
 'SCOTT',
 NULL
) ;
dbms_resource_manager.submit_pending_area();
END;
/
PROMPT remove NEW_DEFAULT PLAN

BEGIN
dbms_resource_manager.clear_pending_area();
dbms_resource_manager.create_pending_area();
```

```
dbms_resource_manager.delete_plan('NEW_DEFAULT_PLAN');
dbms_resource_manager.submit_pending_area();
END;
/

Prompt Remove the APPUSER and LOW_GROUP consumer groups

BEGIN
dbms_resource_manager.clear_pending_area();
dbms_resource_manager.create_pending_area();
dbms_resource_manager.delete_consumer_group('APPUSER');
dbms_resource_manager.delete_consumer_group('LOW_GROUP');
dbms_resource_manager.submit_pending_area();

END;

exit
EOF
```

```
$./rsc_cleanup.sh

remove PM from consumer groups
PL/SQL procedure successfully completed.
PL/SQL procedure successfully completed.
PL/SQL procedure successfully completed.

remove hr, scott from oracle_user
PL/SQL procedure successfully completed.

remove NEW_DEFAULT PLAN
PL/SQL procedure successfully completed.

Remove the APPUSER and LOW_GROUP consumer groups
PL/SQL procedure successfully completed.

$
```

- g. Log out of Enterprise Manager Cloud Control.

## **Practices for Appendix B: Using Oracle Scheduler to Automate Tasks**

**Chapter 28**

## Practices for Appendix B: Overview

---

### Overview

In these practices, you explore Oracle Scheduler capabilities.

## Practice B-1: Creating Scheduler Components

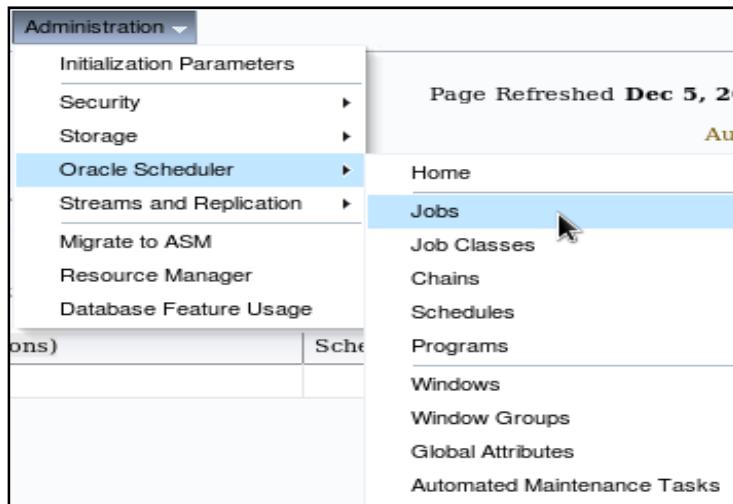
### Overview

In this practice, you create Scheduler components such as programs, jobs, and schedules.

### Tasks

In this practice, you use Enterprise Manager Cloud Control to create Scheduler objects in the ORCL database instance and automate tasks.

1. Use Enterprise Manager Cloud Control to create a simple job that runs a SQL script.
  - a. Log in to Enterprise Manager Cloud Control and navigate to the `orcl` database home page.
  - b. Expand **Administration**. Select **Oracle Scheduler > Jobs**.



- c. Log in with your Named credential or enter `DBA1` in the Username field and `oracle_4U` in the Password field. Click **Login**.
- d. On the Scheduler Jobs page, click **Create** and fill in the fields as follows:
  - **General tab:**

Name: `CREATE_LOG_TABLE_JOB`  
Schema: `HR`  
Enabled: **Yes**  
Description: **Create the SESSION\_HISTORY table**  
Logging Level: **Log job runs only (RUNS)**  
Command Type: **PL/SQL Block**  
PL/SQL Block:  

```
begin
 execute immediate
 ('create table session_history(
 snap_time TIMESTAMP WITH LOCAL TIME ZONE,
 num_sessions NUMBER)');
end;
```

Scheduler Jobs > Create Job  
**Create Job**

**General** Schedule Options Execute On Multiple Databases Show

\* Name

\* Schema

Enabled  Yes  No

Description

Logging Level

Job Class   Create Job Class

Auto Drop    
Specify whether the job should be dropped after completion

Restartable    
Specify whether the job can be restarted manually or in the event of failure

Destination    
Destination and Credential Name only apply for jobs of type executable. For Destination specify the host:port of the machine on which the external job will run if the job is running. Credential Name specify the credential to use to run the external job.

**Command**

Select the command type for the job, then enter the command requirements.

Command Type

```
begin
 execute immediate
 ('create table session_history(
 snap_time TIMESTAMP WITH LOCAL TIME ZONE,
 num_sessions NUMBER)');
end;
```

**PL/SQL**

- **Schedule tab:**

Timezone: Accept the default.

Repeating: **Do not Repeat**

Start: **Immediately**

Scheduler Jobs > Create Job  
**Create Job**

**General** **Schedule** Options Execute On Multiple Databases Show SQL

Schedule Type

Time Zone

**Repeating**

Repeat

**Start**

Immediately

Later

Date   
(example: Dec 5, 2012)

Time        AM  PM

- **Options tab:**

Accept the defaults.

Scheduler Jobs > Create Job  
Create Job

Logged in as DBA

**General** **Schedule** **Options**

Raise Events  Job Started  Job Succeeded  Job Failed  
 Job Stopped  Job Broken  Job Disabled  
 Job Completed  Job Chain Stalled  Job Schedule Limit Reached

Have the scheduler automatically generate events on the selected job state changes

Maximum Run Duration (minutes)  Maximum time that the job will be allowed to run. After this time has elapsed, the job will be stopped

Priority  Sets the level of control for the allocation of resources for concurrent jobs within the Job Class

Schedule Limit (minutes)  Time after which a job that has not been run on the scheduled time will be rescheduled. Only valid for repeating jobs

Maximum Runs  Maximum number of consecutive times this job is allowed to run after which its state will be changed to 'COMPLETED'

Maximum Failures  Number of times a job can fail on consecutive scheduled runs before it is automatically disabled

Job Weight  Job which include parallel queries should set this to the number of parallel slaves they expect to spawn

Instance Stickiness  For use in RAC. If instance\_stickiness is set to TRUE, the Oracle Scheduler will attempt to execute the job on the same instance as the previous run

**Execute On Multiple Databases** **Show SQL** **Cancel** **OK**

- e. Click **Show SQL** if you want to view the SQL statement defining your job. Review the statements and click **Return**.

Scheduler Jobs > Create Job  
**Show SQL**

```

BEGIN
 sys.dbms_scheduler.create_job(
 job_name => '"HR"."CREATE_LOG_TABLE_JOB"',
 job_type => 'PLSQL_BLOCK',
 job_action => 'begin
 execute immediate
 (''create table session_history(
 snap_time TIMESTAMP WITH LOCAL TIME ZONE,
 num_sessions NUMBER)'');
 end;',
 start_date => systimestamp at time zone 'UTC',
 job_class => '"DEFAULT_JOB_CLASS"',
 comments => 'Create the SESSION_HISTORY table',
 auto_drop => FALSE,
 enabled => TRUE);
END;

```

- f. Click **OK** to create the job.

2. Log in to SQL\*Plus as the DBA1 user. Grant the CONNECT, RESOURCE, and DBA roles to the HR user.

```
$. oraenv
ORACLE_SID = [orcl] ? orcl

$ sqlplus dba1/oracle_4U as sysdba
Connected.
SQL> GRANT connect, resource, dba TO hr;

Grant succeeded.

SQL> EXIT
$
```

3. Re-order the jobs by **Last Run Date**. If the job does not appear on the Scheduler Jobs page, click the **Refresh** button until it succeeds. In addition, you may not see it “running,” but with the Last Run Status of SUCCEEDED.

| Scheduler Jobs                   |                                        |                         |                                |                                     |                                     |                                      | <a href="#">Page Refresh</a>                  |                             |
|----------------------------------|----------------------------------------|-------------------------|--------------------------------|-------------------------------------|-------------------------------------|--------------------------------------|-----------------------------------------------|-----------------------------|
|                                  | <a href="#">All</a>                    | <a href="#">Running</a> | <a href="#">History</a>        |                                     |                                     |                                      |                                               |                             |
|                                  |                                        |                         |                                | <a href="#">View Job Definition</a> | <a href="#">Edit Job Definition</a> | <a href="#">Delete</a>               | <a href="#">Run Now</a>                       | <a href="#">Create Like</a> |
| Select                           | Name                                   | Schema                  | Scheduled Date                 |                                     |                                     | Last Run Date ▾                      | Last Run Status                               |                             |
| <input checked="" type="radio"/> | <a href="#">CREATE_LOG_TABLE_JOB</a>   | HR                      | Not Scheduled                  |                                     |                                     | Dec 13, 2012<br>8:19:49 AM<br>+00:00 | SUCCEEDED                                     |                             |
| <input type="radio"/>            | <a href="#">ORACLE_APEX_MAIL_QUEUE</a> | APEX_040200             | Dec 13, 2012 1:20:00 AM -07:00 |                                     |                                     | Dec 13, 2012<br>1:15:00 AM<br>-07:00 | SCHEDULED <input checked="" type="checkbox"/> |                             |
| <input type="radio"/>            | <a href="#">CLEANUP_ONLINE_PMO</a>     | SYS                     | Dec 13, 2012 2:07:06 AM -07:00 |                                     |                                     | Dec 13, 2012<br>1:07:06 AM<br>-07:00 | SCHEDULED <input checked="" type="checkbox"/> |                             |

4. Create a program called LOG\_SESS\_COUNT\_PRGM that logs the current number of database sessions into a table. Use the following code:

```
DECLARE
 sess_count NUMBER;
BEGIN
 SELECT COUNT(*) INTO sess_count FROM V$SESSION;
 INSERT INTO session_history VALUES (systimestamp, sess_count);
 COMMIT;
END;
```

- a. Navigate to **Administration > Oracle Scheduler > Programs**.

- b. On the Scheduler Programs page, click the **Create** button.

Scheduler Programs

Following are the programs that define what are to be executed in the jobs.

| Select                           | Name                 | Schema | Enabled                             | Type             | Description |
|----------------------------------|----------------------|--------|-------------------------------------|------------------|-------------|
| <input checked="" type="radio"/> | HS_PARALLEL_SAMPLING | SYS    | <input checked="" type="checkbox"/> | STORED_PROCEDURE |             |

- c. On the Create Program page, enter and confirm the following values:

Name: **LOG\_SESS\_COUNT\_PRGM**

Schema: **HR**

Enabled: **Yes**

Type: **PL/SQL BLOCK**

Source:

```
DECLARE
 sess_count NUMBER;
BEGIN
 SELECT COUNT(*) INTO sess_count FROM V$SESSION;
 INSERT INTO session_history VALUES (systimestamp,
 sess_count);
 COMMIT;
END;
```

Scheduler Programs > Create Program

**Create Program**

|                                                                                                                                                                              |                                                                                                                                                                                             |                               |          |        |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------|--------|----|
| * Name                                                                                                                                                                       | LOG_SESS_COUNT_PRGM                                                                                                                                                                         | Execute On Multiple Databases | Show SQL | Cancel | OK |
| Schema                                                                                                                                                                       | HR                                                                                                                                                                                          |                               |          |        |    |
| Enabled                                                                                                                                                                      | <input checked="" type="radio"/> Yes <input type="radio"/> No                                                                                                                               |                               |          |        |    |
| Description                                                                                                                                                                  |                                                                                                                                                                                             |                               |          |        |    |
| Type                                                                                                                                                                         | PL/SQL Block                                                                                                                                                                                |                               |          |        |    |
| * Source                                                                                                                                                                     | <pre>DECLARE     sess_count    NUMBER; BEGIN     SELECT COUNT(*) INTO sess_count FROM V\$SESSION;     INSERT INTO session_history VALUES (systimestamp, sess_count);     COMMIT; END;</pre> |                               |          |        |    |
| <input type="button" value="Execute On Multiple Databases"/> <input type="button" value="Show SQL"/> <input type="button" value="Cancel"/> <input type="button" value="OK"/> |                                                                                                                                                                                             |                               |          |        |    |

- d. Click **Show SQL**.

```
Scheduler Programs > Create Program
Show SQL

BEGIN
DBMS_SCHEDULER.CREATE_PROGRAM(
program_name=>'HR"."LOG_SESS_COUNT_PRGM',
program_action=>'DECLARE
sess_count NUMBER;
BEGIN
SELECT COUNT(*) INTO sess_count FROM V$SESSION;
INSERT INTO session_history VALUES (systimestamp, sess_count);
COMMIT;
END;
',
program_type=>'PLSQL_BLOCK',
number_of_arguments=>0,
comments=>',
enabled=>TRUE);
END;
```

- e. Review the statements, and then click **Return**.  
f. Click **OK** to create the program.

| <b>Scheduler Programs</b>                                                   |                      |        |                                     |                  |
|-----------------------------------------------------------------------------|----------------------|--------|-------------------------------------|------------------|
| Following are the programs that define what are to be executed in the jobs. |                      |        |                                     |                  |
| View                                                                        | Edit                 | Delete | Create Like                         | Go               |
| Select                                                                      | Name                 | Schema | Enabled                             | Type             |
| <input checked="" type="radio"/>                                            | HS PARALLEL SAMPLING | SYS    | <input checked="" type="checkbox"/> | STORED_PROCEDURE |
| <input type="radio"/>                                                       | LOG_SESS_COUNT_PRGM  | HR     | <input checked="" type="checkbox"/> | PLSQL_BLOCK      |

You should see the program on the Scheduler Programs page.

5. Create a schedule named `SESS_UPDATE_SCHED` owned by `HR` that executes every three seconds. Use SQL\*Plus and the `DBMS_SCHEDULER.CREATE_SCHEDULE` procedure to create the schedule.

```
BEGIN
DBMS_SCHEDULER.CREATE_SCHEDULE (
schedule_name => 'SESS_UPDATE_SCHED',
start_date => SYSTIMESTAMP,
repeat_interval => 'FREQ=SECONDLY;INTERVAL=3',
comments => 'Every three seconds');
END;
/
```

Return to Enterprise Manager Cloud Control and verify that the `SESS_UPDATE_SCHED` schedule was created.

**Hint:** You may have to refresh the page for the Schedule to appear.

- a. In a terminal window, enter:

```
$ sqlplus hr
Enter password: oracle_4U <<< not displayed

SQL>
```

- b. In your SQL\*Plus session, enter:

```
SQL> BEGIN
 DBMS_SCHEDULER.CREATE_SCHEDULE (
 schedule_name => 'SESS_UPDATE_SCHED',
 start_date => SYSTIMESTAMP,
 repeat_interval => 'FREQ=SECONDLY;INTERVAL=3',
 comments => 'Every three seconds');
 END;
/
2 3 4 5 6 7 8
PL/SQL procedure successfully completed.

SQL>
```

- c. In Enterprise Manager Cloud Control, navigate to **Administration > Oracle Scheduler > Schedules**.
- d. Verify that the SESS\_UPDATE\_SCHED schedule has been created. (You may have to refresh the page for the Schedule to appear.)

| Scheduler Schedules                                                                                            |                                               |                      |                                    |                             |                                                                      |
|----------------------------------------------------------------------------------------------------------------|-----------------------------------------------|----------------------|------------------------------------|-----------------------------|----------------------------------------------------------------------|
| Logged in as DBA1<br>Page Refreshed Dec 5, 2012 12:16:27 PM UTC <a href="#">Refresh</a> <a href="#">Create</a> |                                               |                      |                                    |                             |                                                                      |
|                                                                                                                | <a href="#">Edit</a>                          | <a href="#">View</a> | <a href="#">Delete</a>             | <a href="#">Create Like</a> |                                                                      |
| <input checked="" type="radio"/>                                                                               | <a href="#">DAILY_PURGE_SCHEDULE</a>          | SYS                  |                                    |                             |                                                                      |
| <input type="radio"/>                                                                                          | <a href="#">FILE_WATCHER_SCHEDULE</a>         | SYS                  |                                    |                             |                                                                      |
| <input type="radio"/>                                                                                          | <a href="#">PMO_DEFERRED_GIDX_MAINT_SCHED</a> | SYS                  |                                    |                             |                                                                      |
| <input checked="" type="radio"/>                                                                               | <a href="#">BSLN_MAINTAIN_STATS_SCHED</a>     | SYS                  | Nov 25, 2012 12:00:00 AM<br>-08:00 |                             | Pre-defined schedule for computing moving window baseline statistics |
| <input type="radio"/>                                                                                          | <a href="#">SESS_UPDATE_SCHED</a>             | HR                   | Dec 5, 2012 12:15:39 PM<br>+00:00  |                             | Every three seconds                                                  |

6. Using Enterprise Manager Cloud Control, create a job named LOG\_SESSIONS\_JOB that uses the LOG\_SESS\_COUNT\_PRGM program and the SESS\_UPDATE\_SCHED schedule. Make sure that the job uses FULL logging.
- In Enterprise Manager, navigate to **Administration > Oracle Scheduler > Jobs**, and then click the **Create** button.
  - On the Create Job page, enter and confirm the following values:

Name: **LOG\_SESSIONS\_JOB**

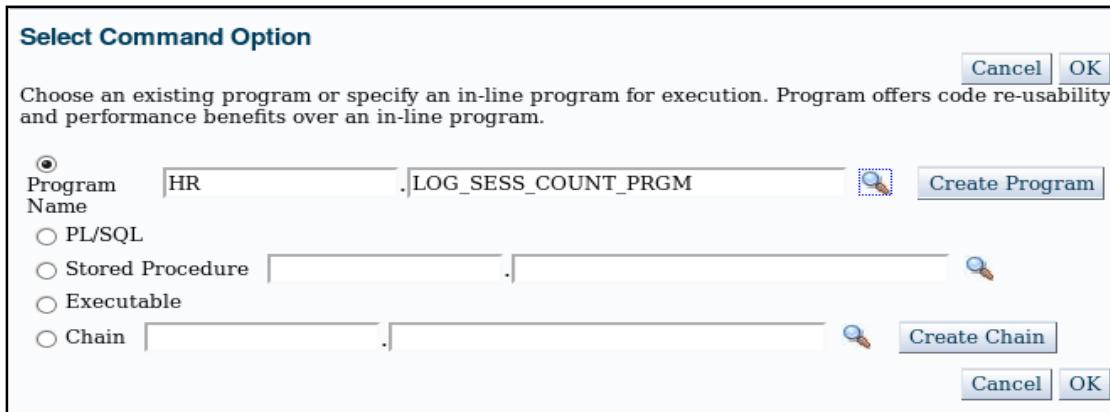
Owner: **HR**

Enabled: **Yes**

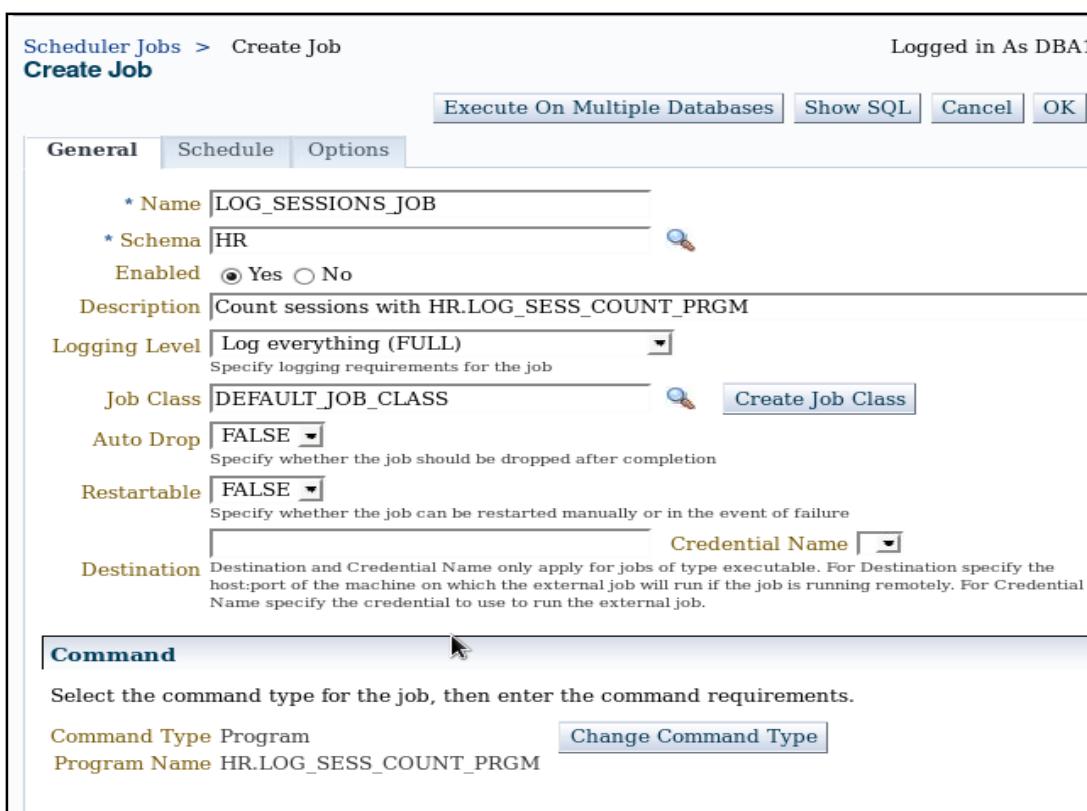
Description: Count sessions with HR.LOG\_SESS\_COUNT\_PRGM

Logging level: Log everything (FULL)

- Click Change Command Type, and on the Select Command Option page, select Program Name, and enter HR.LOG\_SESS\_COUNT\_PRGM in the field next to it, or use the Lookup (flashlight) icon to select the program.



- Click OK.



- Back on the Create Job page, click the Schedule tab.
- Change the Schedule Type to Use Pre-Defined Schedule and select the HR.SESSIONS\_UPDATE\_SCHEDULE schedule by using the flashlight icon.

Scheduler Jobs > Create Job  
**Create Job**

Logged in As DBA1

[Execute On Multiple Databases](#) [Show SQL](#) [Cancel](#) [OK](#)

[General](#) **Schedule** [Options](#)

**Schedule Type** [Use Pre-defined Schedule](#)

Select an existing schedule.

Schedule    [View Details](#)

**General**

Name **SESS\_UPDATE\_SCHED**  
Schema HR  
Description Every three seconds

**Schedule Attributes**

Repeat By Seconds  
Interval (Seconds) 3  
Available to Start Dec 6, 2012 4:28:59 AM GMT+00:00  
Not Available After

g. Click **Show SQL**.

Scheduler Jobs > Create Job  
**Show SQL**

Logged in As DBA1

[Execute On Multiple Databases](#) [Return](#)

```
BEGIN
sys.dbms_scheduler.create_job(
job_name => '"HR"."LOG_SESSIONS_JOB"',
program_name => '"HR"."LOG_SESS_COUNT_PRGM"',
schedule_name => '"HR"."SESS_UPDATE_SCHED"',
job_class => '"DEFAULT_JOB_CLASS"',
comments => 'Count sessions with HR.LOG_SESS_COUNT_PRGM',
auto_drop => FALSE,
enabled => FALSE);
sys.dbms_scheduler.set_attribute(name =>
'"HR"."LOG_SESSIONS_JOB"', attribute => 'logging_level', value
=> DBMS_SCHEDULER.LOGGING_FULL);
sys.dbms_scheduler.enable('"HR"."LOG_SESSIONS_JOB"');
END;
```

h. Review the statements and then click **Return**.

i. On the Create Job page, click **OK** to create the job.

You should receive a success message and see the job on the Scheduler Jobs page.

| Select                           | Name                          | Schema      | Scheduled Date                 | Last Run Date                 | Last Run Status | Enabled                             | Job Class         | Previous Runs |
|----------------------------------|-------------------------------|-------------|--------------------------------|-------------------------------|-----------------|-------------------------------------|-------------------|---------------|
| <input checked="" type="radio"/> | MGMT_STATS_CONFIG_JOB         | ORACLE_OCM  | Jan 1, 2013 1:01:01 AM -07:00  | Dec 5, 2012 4:26:21 AM -07:00 | SCHEDULED       | <input checked="" type="checkbox"/> | DEFAULT_JOB_CLASS | 1             |
| <input type="radio"/>            | MGMT_CONFIG_JOB               | ORACLE_OCM  | MAINTENANCE_WINDOW_GROUP       | Dec 5, 2012 2:00:03 PM -08:00 | SCHEDULED       | <input checked="" type="checkbox"/> | DEFAULT_JOB_CLASS | 1             |
| <input type="radio"/>            | RLM\$SCHDNEGACTION            | EXFSYS      | Dec 6, 2012 4:43:22 AM +00:00  | Dec 6, 2012 3:45:46 AM +00:00 | SCHEDULED       | <input checked="" type="checkbox"/> | DEFAULT_JOB_CLASS | 18            |
| <input type="radio"/>            | RLM\$EVTCLEANUP               | EXFSYS      | Dec 5, 2012 10:34:25 PM -07:00 | Dec 5, 2012 9:34:25 PM -07:00 | SCHEDULED       | <input checked="" type="checkbox"/> | DEFAULT_JOB_CLASS | 19            |
| <input type="radio"/>            | ORACLE_APEX_DAILY_MAINTENANCE | APEX_040200 | Dec 6, 2012 1:00:00 AM -07:00  | Dec 5, 2012 4:26:21 AM -07:00 | SCHEDULED       | <input checked="" type="checkbox"/> | DEFAULT_JOB_CLASS | 1             |
| <input type="radio"/>            | ORACLE_APEX_WS_NOTIFICATIONS  | APEX_040200 | Dec 5, 2012 10:00:00 PM -07:00 | Dec 5, 2012 9:30:00 PM -07:00 | SCHEDULED       | <input checked="" type="checkbox"/> | DEFAULT_JOB_CLASS | 36            |
| <input type="radio"/>            | ORACLE_APEX_MAIL_QUEUE        | APEX_040200 | Dec 5, 2012 9:40:00 PM -07:00  | Dec 5, 2012 9:35:00 PM -07:00 | SCHEDULED       | <input checked="" type="checkbox"/> | DEFAULT_JOB_CLASS | 242           |
| <input type="radio"/>            | ORACLE_APEX_PURGE_SESSIONS    | APEX_040200 | Dec 5, 2012 10:00:48 PM -07:00 | Dec 5, 2012 9:00:49 PM -07:00 | SCHEDULED       | <input checked="" type="checkbox"/> | DEFAULT_JOB_CLASS | 18            |
| <input type="radio"/>            | LOG_SESSIONS_JOB              | HR          | Dec 6, 2012 4:39:08 AM +00:00  | Dec 6, 2012 4:39:05 AM +00:00 | SCHEDULED       | <input checked="" type="checkbox"/> | DEFAULT_JOB_CLASS | 27            |
| <input type="radio"/>            | CREATE_LOG_TABLE_JOB          | HR          | Not Scheduled                  | Dec 6, 2012 4:24:25 AM +00:00 | SUCCEEDED       |                                     | DEFAULT_JOB_CLASS | 1             |

Note that it quickly accumulates previous runs, because it executes every three seconds.

7. In your SQL\*Plus session, check the `HR.SESSION_HISTORY` table for rows.

Enter:

```
SQL> SELECT * FROM SESSION_HISTORY ORDER BY snap_time;
```

```
SNAP_TIME
```

```

```

```
NUM_SESSIONS
```

```

```

```
...
```

```
06-DEC-12 04.41.14.984886 AM
```

```
49
```

```
06-DEC-12 04.41.19.992971 AM
```

```
49
```

```
56 rows selected.
```

```
SQL>
```

Your result looks different but the second values should be three seconds apart.

**Question:** If there are rows in the table, are the time stamps three seconds apart?

**Answer:** Yes, there are rows. Yes, the time stamps are more or less three seconds apart.

8. Use Enterprise Manager Cloud Control to alter the `SESS_UPDATE_SCHED` schedule from every three seconds to every three minutes. Then use SQL\*Plus to verify that the rows are now being added every three minutes by querying the `HR.SESSION_HISTORY` table, ordered by the `SNAP_TIME` column.
- In Enterprise Manager, navigate to **Administration > Oracle Scheduler > Schedules**.
  - Click the **SESS\_UPDATE\_SCHED** link.
  - On the View Schedule page, click **Edit**.
  - Change the description to **Every three minutes**.
  - Click the **Schedule Attributes** tab to change the value in the **Repeat** drop-down list from **By Seconds** to **By Minutes**.

- f. Change “Available to Start” to **Immediately**.

Scheduler Schedules > Edit Schedule: HR.SESSION\_UPDATE\_SCHED  
**Edit Schedule: HR.SESSION\_UPDATE\_SCHED**

General Schedule Attributes

**Repeating**

Repeat: By Minutes

Interval (Minutes): 3

Days of Week:  Monday  Tuesday  Wednesday  Thursday  Friday  Saturday  Sunday

Hours of Day:  0  1  2  3  4  5  6  7  8  9  10  11  12  13  14  15  16  17  18  19  20  21  22  23  24

**Available to Start**

Immediately  
 Later

Date: Dec 6, 2012 (example: Dec 6, 2012)

Time: 4:28:00 AM  AM  PM

Execute On Multiple Databases Show SQL

- g. Ensure that the interval is 3 minutes and then click **Show SQL**.

Scheduler Schedules > Edit Schedule: HR.SESSION\_UPDATE\_SCHED  
**Show SQL**

Logged in As DBA1

Execute On Multiple Databases Return

```

BEGIN
 sys.dbms_scheduler.set_attribute(name =>
 '"HR"."SESSION_UPDATE_SCHED"', attribute => 'repeat_interval', value
 => 'FREQ=MINUTELY;INTERVAL=3');
 sys.dbms_scheduler.set_attribute(name =>
 '"HR"."SESSION_UPDATE_SCHED"', attribute => 'start_date', value =>
 systimestamp at time zone '0:00');
 sys.dbms_scheduler.set_attribute(name =>
 '"HR"."SESSION_UPDATE_SCHED"', attribute => 'comments', value =>
 'Every three minutes');
END;

```

- h. Review the statements, click **Return**, and then click **Apply**.

You should receive a success message.

9. In your SQL\*Plus session, query the **HR.SESSION\_HISTORY** table, ordered by the **SNAP\_TIME** column. (Wait for three minutes after you update the schedule.) Enter:

```

SQL> SELECT * FROM HR.SESSION_HISTORY ORDER BY snap_time;

SNAP_TIME

NUM_SESSIONS

...
06-DEC-12 04.49.40.423805 AM

```

```
06-DEC-12 04.52.40.286777 AM
48

06-DEC-12 04.55.40.345221 AM
48

06-DEC-12 04.58.40.396100 AM
48

06-DEC-12 05.01.40.456793 AM
49

191 rows selected.

SQL>
```

Your results will have different dates (but the minute values should now be three minutes apart).

10. **This is your mandatory cleanup task.** Use Enterprise Manager Cloud Control to drop the LOG\_SESSIONS\_JOB and CREATE\_LOG\_TABLE\_JOB jobs, the LOG\_SESS\_COUNT\_PRGM program, and the SESS\_UPDATE\_SCHED schedule. Use SQL\*Plus to drop the SESSION\_HISTORY table, and then exit your session.

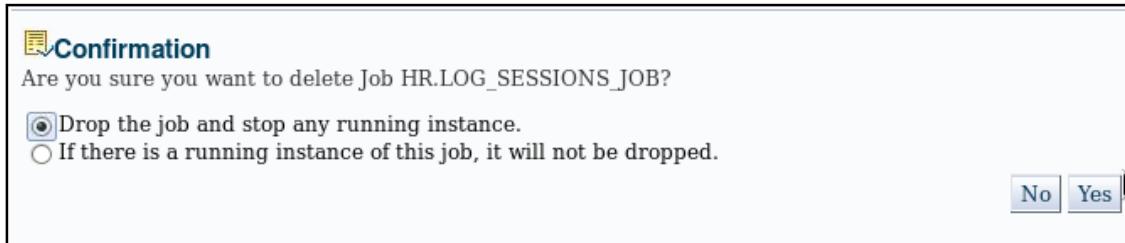
**Note:** Make sure that you do not delete the wrong schedule.

- Navigate to **Administration > Oracle Scheduler > Jobs**.
- Select the **LOG\_SESSIONS\_JOB** job and click **Delete**.

|                                     |                                       |      |                               |
|-------------------------------------|---------------------------------------|------|-------------------------------|
| <input checked="" type="checkbox"/> | <a href="#">LOG_SESSIONS_JOB</a>      | HR   | Dec 6, 2012 5:07:39 AM +00:00 |
| <input type="radio"/>               | <a href="#">CREATE_LOG_TABLE_JOB</a>  | HR   | Not Scheduled                 |
| <input type="radio"/>               | <a href="#">SQLSCRIPT_5941539</a>     | DBA1 | Not Scheduled                 |
| <input type="radio"/>               | <a href="#">SQLSCRIPT_3463476</a>     | DBA1 | Not Scheduled                 |
| <input type="radio"/>               | <a href="#">SQLSCRIPT_4492238</a>     | DBA1 | Not Scheduled                 |
| <input type="radio"/>               | <a href="#">ADV_SEGMENTADV_489805</a> | DBA1 | Not Scheduled                 |

[View Job Definition](#) [Edit Job Definition](#) [Delete](#) [Run Now](#) [Create Like](#)

- c. Select **Drop the job and stop any running instance** and then click **Yes**.



- d. Go back to the Scheduler Jobs page, select **CREATE\_LOG\_TABLE\_JOB**, and click **Delete**. Select **Drop the job and stop any running instance** and then click **Yes**.
- e. Navigate to **Administration > Oracle Scheduler > Programs**.
- f. Select the **LOG\_SESS\_COUNT\_PRGM** program and click **Delete**. Click **Yes** to confirm.

Logged in As DBA1

**Scheduler Programs**

Following are the programs that define what are to be executed in the jobs.

| View                             | Edit                 | Delete | Create Like                         | Go               |             |
|----------------------------------|----------------------|--------|-------------------------------------|------------------|-------------|
| Select                           | Name                 | Schema | Enabled                             | Type             | Description |
| <input type="radio"/>            | HS_PARALLEL_SAMPLING | SYS    | <input checked="" type="checkbox"/> | STORED_PROCEDURE |             |
| <input checked="" type="radio"/> | LOG_SESS_COUNT_PRGM  | HR     | <input checked="" type="checkbox"/> | PLSQL_BLOCK      |             |

- g. Navigate to **Administration > Oracle Scheduler > Schedules**.
- h. Select the **SESS\_UPDATE\_SCHED** schedule and click **Delete**. *Make sure that you do not delete the wrong schedule*.
- i. Select **If there are dependent objects, it will not be dropped** and then click **Yes** to confirm.
- j. In your SQL\*Plus session, as the HR user, delete the **SESSION\_HISTORY** table, and then exit the session. Enter:

```
SQL> DROP TABLE session_history PURGE;
```

Table dropped.

```
SQL> EXIT
```

```
$
```

## Practice B-2: Creating Lightweight Scheduler Jobs

### Overview

In this practice, you create and execute lightweight scheduler jobs.

### Tasks

In this optional practice, you navigate to the \$LABS/PB directory, you create and run a lightweight scheduler job, and you view the metadata for a lightweight scheduler job.

1. Create a job template for the lightweight job. The template must be a PL/SQL procedure or a PL/SQL block. Run the `cr_test_log.sql` script to create the `TEST_LOG` table. Then run `prog_1.sql`. The `prog_1.sql` script in the \$LABS/PB directory creates a job template.

**Note:** The job template has a subset of the attributes of a scheduler program. Most of the attributes of a template cannot be changed for the job.

- a. Navigate to the \$LABS/P21 directory.

```
$ cd $LABS/PB
$
```

- b. Execute the `cr_test_log.sql` and `prog_1.sql` scripts as the system user. The password for the system user is `oracle_4U`.

```
$ sqlplus system
Enter password: oracle_4U <<< not displayed

SQL> @cr_test_log.sql
SQL> -- cleanup previous runs
SQL> -- you will see an error the first time this script is run
SQL> drop table system.test_log;
drop table system.test_log
*
ERROR at line 1:
ORA-00942: table or view does not exist

SQL>
SQL> -- create a table to hold timing information
SQL>
SQL> create table system.test_log
2 (job_type VARCHAR2(10),
3 timemark VARCHAR2(10),
4 act_time TIMESTAMP with TIME ZONE)
5 /

Table created.
```

```
SQL> @prog_1.sql
SQL> REM For training only
SQL> set echo on
SQL>
SQL> BEGIN
 2 -- This will produce an error the first
 3 -- time it is run since PROG_1 does not exist
 4
 5 DBMS_SCHEDULER.DROP_PROGRAM (
 6 program_name => '"SYSTEM"."PROG_1"');
 7 END;
 8 /
BEGIN
*
ERROR at line 1:
ORA-27476: "SYSTEM.PROG_1" does not exist
ORA-06512: at "SYS.DBMS_ISCHED", line 29
ORA-06512: at "SYS.DBMS_SCHEDULER", line 62
ORA-06512: at line 5

SQL> BEGIN
 2 DBMS_SCHEDULER.CREATE_PROGRAM(
 3 program_name=>'"SYSTEM"."PROG_1"'
 4 ,program_action=>'DECLARE
 5 time_now DATE;
 6 BEGIN
 7 INSERT INTO test_log
VALUES (''LWT'', ''DONE'', SYSTIMESTAMP);
 8 END; '
 9 , program_type=>'PLSQL_BLOCK'
10 , number_of_arguments=>0,
11 comments=>'Insert a timestamp into the test_log'
12 ,enabled=>TRUE);
13 END;
14 /
```

PL/SQL procedure successfully completed.

```
SQL>
```

2. Create a lightweight job by using the PL/SQL API. The job will run the `my_prog` template daily with an interval of 2, starting immediately.

**Note:** Enterprise Manager does not include the `JOB_STYLE` setting at this time.

While you are logged in to SQL\*Plus as the `SYSTEM` user, execute the `my_lwt_job.sql` script.

```
SQL> @my_lwt_job.sql
SQL> REM For training only
SQL> set echo on
SQL> BEGIN
 2 -- the drop procedure will give and error the first time
 3 -- this script is run
 4 sys.DBMS_SCHEDULER.DROP_JOB('my_lwt_job');
 5 END;
 6 /
BEGIN
*
ERROR at line 1:
ORA-27475: unknown job "SYSTEM"."MY_LWT_JOB"
ORA-06512: at "SYS.DBMS_ISCHED", line 232
ORA-06512: at "SYS.DBMS_SCHEDULER", line 778
ORA-06512: at line 4

SQL>
SQL> DECLARE
 2 jobname VARCHAR2(30);
 3 BEGIN
 4 -- Create the Job
 5 jobname := 'my_lwt_job';
 6 sys.dbms_scheduler.create_job(
 7 job_name => '"SYSTEM"."MY_LWT_JOB"',
 8 program_name => '"SYSTEM"."PROG_1"',
 9 job_class => '"DEFAULT_JOB_CLASS"',
10 job_style => 'LIGHTWEIGHT',
11 repeat_interval => 'FREQ=DAILY;INTERVAL=2',
12 comments => 'Lightweight job',
13 enabled => TRUE);
14 END;
15 /
PL/SQL procedure successfully completed.
SQL>
```

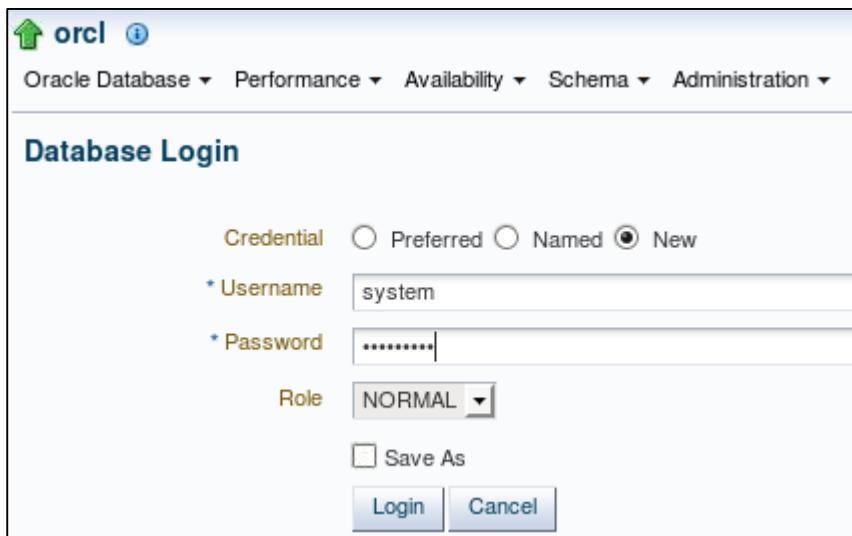
3. Check the Scheduler metadata views `USER_SCHEDULER_JOBS`, `USER_SCHEDULER_PROGRAMS`, and `DBA_JOBS`.

```
SQL> COL program_name format a12
SQL> COL job_name format a30
SQL> SELECT job_name, job_style, program_name
2 FROM USER_SCHEDULER_JOBS;

JOB_NAME JOB_STYLE PROGRAM_NAME
----- -----
MY_LWT_JOB LIGHTWEIGHT PROG_1

SQL>
```

4. Check the Enterprise Manager Cloud Control Scheduler Jobs page, find the `MY_LWT_JOB` job, and view the attributes.
  - In Enterprise Manager Cloud Control, log out of the `orcl` database target.
  - In the confirmation box, select **Logout of orcl and Display login page after logout**. Click **Logout**.
  - On the Database Login page, log in to `orcl` as the `SYSTEM` user with the `oracle_4U` password.



- Navigate to **Administration > Oracle Scheduler > Jobs**. Then click the **History** tab.
- Click **MY\_LWT\_JOB** to view the job attributes.

**Scheduler Jobs**

Page Refreshed **Dec 6, 2012 5:26:24 AM UTC** [Refresh](#) [Create](#)

All | Running | **History**

**Search**  
Optionaly Select a Job Name and Number of recent days to filter the data that is displayed in your results set  
Name:  Days:  [Go](#) [Purge All Logs](#)

| <a href="#">View Job Status</a> <a href="#">Purge Log</a> <a href="#">View Job Definition</a> |                                     |                            | Previous   1-25 of 553   Next 25 |                               |
|-----------------------------------------------------------------------------------------------|-------------------------------------|----------------------------|----------------------------------|-------------------------------|
| Select                                                                                        | Status                              | Name                       | Schema                           | Completion Date ▾             |
| <input checked="" type="radio"/>                                                              | <input checked="" type="checkbox"/> | ORACLE_APEX_MAIL_QUEUE     | APEX_040200                      | Dec 6, 2012 5:25:00 AM +00:00 |
| <input type="radio"/>                                                                         | <input checked="" type="checkbox"/> | <a href="#">MY_LWT_JOB</a> | SYSTEM                           | Dec 6, 2012 5:22:12 AM +00:00 |

f. Click **OK**.

**General**  
Name: MY\_LWT\_JOB  
Schema: SYSTEM  
Enabled: TRUE  
Description: None  
Logging Level: No logging (OFF)  
Job Class: DEFAULT\_JOB\_CLASS  
Auto Drop: TRUE  
Restartable: FALSE  
Destination:  
Credential Name:

**Schedule**  
Repeat: By Days  
Interval (Days): 2  
Repeat Time: Dec 6, 2012 5:22:12 AM Etc/UTC  
Available to Start: Not Available After

**Options**  
Raise Events: None  
Maximum Run Duration (minutes): None  
Priority:  
Schedule Limit (minutes): None  
Maximum Runs: None  
Maximum Failures: None  
Job Weight: None  
Instance Stickiness: TRUE  
For use in RAC. If instance stickiness is set to TRUE, the Oracle Scheduler will attempt to execute the job on the same instance as the previous run.

**Command**  
Command Type: Program  
Program Name: SYSTEM.PROG\_1

**Operation Detail**

| View                             |        |                               |           |           |
|----------------------------------|--------|-------------------------------|-----------|-----------|
| Select                           | Log ID | Log Date ▾                    | Operation | Status    |
| <input checked="" type="radio"/> | 2838   | Dec 6, 2012 5:22:12 AM +00:00 | RUN       | SUCCEEDED |

[Edit](#) [OK](#)

5. Delete the MY\_LWT\_JOB job

- a. Click the **All** tab to return to the list of jobs. Select the MY\_LWT\_JOB job and click **Delete**. Hint: Sort the list by job name.

|                                  |                                       |        |                               |                                |           |
|----------------------------------|---------------------------------------|--------|-------------------------------|--------------------------------|-----------|
| <input type="radio"/>            | <a href="#">ADV_SEGMENTADV_489805</a> | DBA1   | Not Scheduled                 | Dec 6, 2012 12:39:04 AM +00:00 | SUCCEEDED |
| <input checked="" type="radio"/> | <a href="#">MY_LWT_JOB</a>            | SYSTEM | Dec 8, 2012 5:22:12 AM +00:00 | Dec 6, 2012 5:22:12 AM +00:00  | SCHEDULED |

[View Job Definition](#) [Edit Job Definition](#) [Delete](#) [Run Now](#) [Create Like](#)

- b. On the Confirmation page, select **Drop the job and any running instance**. Click **Yes**.

**Confirmation**  
Are you sure you want to delete Job SYSTEM.MY\_LWT\_JOB?

Drop the job and stop any running instance.  
 If there is a running instance of this job, it will not be dropped.

[No](#) [Yes](#)

## Practice B-3: Monitoring the Scheduler

### Overview

In this practice, you view Scheduler components.

### Tasks

In this practice, use Enterprise Manager Cloud Control to view Scheduler components. Click **Show SQL** regularly to review all statements that are new to you.

Log in as the DBA1 user (with `oracle_4U` password, connect as SYSDBA). Perform the necessary tasks either through Enterprise Manager Cloud Control or through SQL\*Plus.

1. Log in to the `orcl` database target as the DBA1 user with the `oracle_4U` password.
2. To view all Scheduler components, navigate to **Administration > Oracle Scheduler > Jobs**. Are there any jobs?

**Answer:** There are some jobs.

| Scheduler Jobs                                                                                                                                     |                               |         |                                 |                                 |                 |                                     |                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------|---------------------------------|---------------------------------|-----------------|-------------------------------------|--------------------|
| Page Refreshed Jun 25, 2013 12:50:29 PM UTC                                                                                                        |                               |         |                                 |                                 |                 |                                     |                    |
| All                                                                                                                                                |                               | Running | History                         |                                 |                 |                                     |                    |
| <a href="#">View Job Definition</a> <a href="#">Edit Job Definition</a> <a href="#">Delete</a> <a href="#">Run Now</a> <a href="#">Create Like</a> |                               |         |                                 |                                 |                 |                                     |                    |
| Select                                                                                                                                             | Name                          | Schema  | Scheduled Date                  | Last Run Date                   | Last Run Status | Enabled                             | Job Class          |
| <input checked="" type="radio"/>                                                                                                                   | XMLDB_NFS_CLEANUP_JOB         | SYS     | Not Scheduled                   | Not Scheduled                   | DISABLED        |                                     | XMLDB_NFS_JOBCLASS |
| <input type="radio"/>                                                                                                                              | LOAD_OPATCH_INVENTORY         | SYS     | Not Scheduled                   | Not Scheduled                   | DISABLED        |                                     | DEFAULT_JOB_CLASS  |
| <input type="radio"/>                                                                                                                              | SM\$CLEAN_AUTO_SPLIT_MERGE    | SYS     | Jun 26, 2013 12:00:00 AM -07:00 | Jun 25, 2013 12:00:00 AM -07:00 | SCHEDULED       | <input checked="" type="checkbox"/> | DEFAULT_JOB_CLASS  |
| <input type="radio"/>                                                                                                                              | RSE\$CLEAN_RECOVERABLE_SCRIPT | SYS     | Jun 26, 2013 12:00:00 AM -07:00 | Jun 25, 2013 12:00:00 AM -07:00 | SCHEDULED       | <input checked="" type="checkbox"/> | DEFAULT_JOB_CLASS  |
| <input type="radio"/>                                                                                                                              | FGR\$AUTOPURGE_JOB            | SYS     | Not Scheduled                   | Not Scheduled                   | DISABLED        |                                     | DEFAULT_JOB_CLASS  |
| <input type="radio"/>                                                                                                                              | BSLN_MAINTAIN_STATS_JOB       | SYS     | Jun 30, 2013 12:00:00 AM -07:00 | Jun 23, 2013 11:50:35 PM -07:00 | SCHEDULED       | <input checked="" type="checkbox"/> | DEFAULT_JOB_CLASS  |

3. Are there any programs?

Navigate to **Administration > Oracle Scheduler > Programs**.

| Scheduler Programs                                                                                              |                          |        |                                     |                  |                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------|--------------------------|--------|-------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------|
| Following are the programs that define what are to be executed in the jobs.                                     |                          |        |                                     |                  |                                                                                                                    |
| <a href="#">View</a> <a href="#">Edit</a> <a href="#">Delete</a> <a href="#">Create Like</a> <a href="#">Go</a> |                          |        |                                     |                  |                                                                                                                    |
| Select                                                                                                          | Name                     | Schema | Enabled                             | Type             | Description                                                                                                        |
| <input checked="" type="radio"/>                                                                                | AQ\$_PROPAGATION_PROGRAM | SYS    | <input checked="" type="checkbox"/> | STORED_PROCEDURE | AQ propagation program                                                                                             |
| <input type="radio"/>                                                                                           | AUTO_SPACE_ADVISOR_PROG  | SYS    | <input checked="" type="checkbox"/> | STORED_PROCEDURE | auto space advisor maintenance program                                                                             |
| <input type="radio"/>                                                                                           | AUTO_SQL_TUNING_PROG     | SYS    | <input checked="" type="checkbox"/> | PLSQL_BLOCK      | Program to run automatic sql tuning and SPM evolve tasks, see dbmssqlt.sql and dbmsspm.sql                         |
| <input type="radio"/>                                                                                           | BSLN_MAINTAIN_STATS_PROG | SYS    | <input checked="" type="checkbox"/> | PLSQL_BLOCK      | Moving window baseline statistics maintenance program                                                              |
| <input type="radio"/>                                                                                           | FILE_WATCHER_PROGRAM     | SYS    | <input checked="" type="checkbox"/> | STORED_PROCEDURE | File Watcher program                                                                                               |
| <input type="radio"/>                                                                                           | GATHER_STATS_PROG        | SYS    | <input checked="" type="checkbox"/> | STORED_PROCEDURE | Oracle defined automatic optimizer statistics collection program                                                   |
| <input type="radio"/>                                                                                           | HS_PARALLEL_SAMPLING     | SYS    | <input checked="" type="checkbox"/> | STORED_PROCEDURE |                                                                                                                    |
| <input type="radio"/>                                                                                           | ORA\$AGE_AUTOTASK_DATA   | SYS    | <input checked="" type="checkbox"/> | STORED_PROCEDURE | deletes obsolete AUTOTASK repository data                                                                          |
| <input type="radio"/>                                                                                           | PMO_DEFERRED_GIDX_MAINT  | SYS    | <input checked="" type="checkbox"/> | PLSQL_BLOCK      | Oracle defined automatic index cleanup for partition maintenance operations with deferred global index maintenance |
| <input type="radio"/>                                                                                           | PROG_1                   | SYSTEM | <input checked="" type="checkbox"/> | PLSQL_BLOCK      | Insert a timestamp into the test_log                                                                               |
| <input type="radio"/>                                                                                           | PURGE_LOG_PROG           | SYS    | <input checked="" type="checkbox"/> | STORED_PROCEDURE | purge log program                                                                                                  |

*Answer:* There are some existing programs.

4. Are there any schedules?

Navigate to Administration > Oracle Scheduler > Schedules.

| Scheduler Schedules                                                                                                                                                                                                        |                               |        |                                 |          |                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|--------|---------------------------------|----------|----------------------------------------------------------------------|
| <a href="#">Edit</a> <a href="#">View</a> <a href="#">Delete</a> <a href="#">Create Like</a> <span style="float: right;">Page Refreshed Jun 25, 2013 12:50:05 PM UTC <a href="#">Refresh</a> <a href="#">Create</a></span> |                               |        |                                 |          |                                                                      |
| Select                                                                                                                                                                                                                     | Name                          | Schema | Start Date                      | End Date | Description                                                          |
| <input checked="" type="radio"/>                                                                                                                                                                                           | DAILY_PURGE_SCHEDULE          | SYS    |                                 |          |                                                                      |
| <input type="radio"/>                                                                                                                                                                                                      | FILE_WATCHER_SCHEDULE         | SYS    |                                 |          |                                                                      |
| <input type="radio"/>                                                                                                                                                                                                      | PMO_DEFERRED_GIDX_MAINT_SCHED | SYS    |                                 |          |                                                                      |
| <input type="radio"/>                                                                                                                                                                                                      | BSLN_MAINTAIN_STATS_SCHED     | SYS    | May 26, 2013 12:00:00 AM -07:00 |          | Pre-defined schedule for computing moving window baseline statistics |

*Answer:* There are four schedules: DAILY\_PURGE\_SCHEDULE, FILE\_WATCHER\_SCHEDULE, PMO\_DEFERRED\_GIDX\_MAINT\_SCHED, and BSLN\_MAINTAIN\_STATS\_SCHED.

5. List the Scheduler windows. Are there any existing windows? Which resource plan is associated with each window?

Navigate to Administration > Oracle Scheduler > Windows.

| Scheduler Windows                                                                                   |                  |                          |         |                          |          |                |        |                                           |
|-----------------------------------------------------------------------------------------------------|------------------|--------------------------|---------|--------------------------|----------|----------------|--------|-------------------------------------------|
| Following are the system windows that specify resource usage limits based on time-duration windows. |                  |                          |         |                          |          |                |        |                                           |
| Select                                                                                              | Name             | Resource Plan            | Enabled | Next Open Date           | End Date | Duration (min) | Active | Description                               |
| <input checked="" type="radio"/>                                                                    | WEEKNIGHT_WINDOW |                          |         | May 24, 2013 10:00:00 PM |          | 480            | FALSE  | Weeknight window - for compatibility only |
| <input type="radio"/>                                                                               | WEEKEND_WINDOW   |                          |         | May 25, 2013 12:00:00 AM |          | 2880           | FALSE  | Weekend window - for compatibility only   |
| <input type="radio"/>                                                                               | TUESDAY_WINDOW   | DEFAULT_MAINTENANCE_PLAN | ✓       | Jun 25, 2013 10:00:00 PM |          | 240            | FALSE  | Tuesday window for maintenance tasks      |
| <input type="radio"/>                                                                               | WEDNESDAY_WINDOW | DEFAULT_MAINTENANCE_PLAN | ✓       | Jun 26, 2013 10:00:00 PM |          | 240            | FALSE  | Wednesday window for maintenance tasks    |
| <input type="radio"/>                                                                               | THURSDAY_WINDOW  | DEFAULT_MAINTENANCE_PLAN | ✓       | Jun 27, 2013 10:00:00 PM |          | 240            | FALSE  | Thursday window for maintenance tasks     |
| <input type="radio"/>                                                                               | FRIDAY_WINDOW    | DEFAULT_MAINTENANCE_PLAN | ✓       | Jun 28, 2013 10:00:00 PM |          | 240            | FALSE  | Friday window for maintenance tasks       |
| <input type="radio"/>                                                                               | SATURDAY_WINDOW  | DEFAULT_MAINTENANCE_PLAN | ✓       | Jun 29, 2013 6:00:00 AM  |          | 1200           | FALSE  | Saturday window for maintenance tasks     |
| <input type="radio"/>                                                                               | SUNDAY_WINDOW    | DEFAULT_MAINTENANCE_PLAN | ✓       | Jun 30, 2013 6:00:00 AM  |          | 1200           | FALSE  | Sunday window for maintenance tasks       |
| <input type="radio"/>                                                                               | MONDAY_WINDOW    | DEFAULT_MAINTENANCE_PLAN | ✓       | Jul 1, 2013 10:00:00 PM  |          | 240            | FALSE  | Monday window for maintenance tasks       |

*Answer:* There are several windows. All are enabled except WEEKNIGHT\_WINDOW and WEEKEND\_WINDOW.

6. Click the **MONDAY\_WINDOW** link. Answer the questions and then click **OK**.

Scheduler Windows > View Window: MONDAY\_WINDOW  
**View Window: MONDAY\_WINDOW**

Name MONDAY\_WINDOW  
Resource Plan DEFAULT\_MAINTENANCE\_PLAN  
Enabled TRUE  
Priority LOW  
Description Monday window for maintenance tasks

**Schedule**

Repeat By Weeks  
Interval (Weeks) 1  
Days of Week Monday  
Repeat Time Hour:10 Minute:00 Second:00 PM  
Duration (min) 4 hour(s) 0 minute(s)  
Available to Start  
Not Available After

*Question 1:* At which time does this window open? **10 PM**

*Question 2:* For how long does it stay open? **For 4 hours**

7. List the Scheduler job classes. Are there any job classes?

Navigate to **Administration > Oracle Scheduler > Job Classes**.

**Scheduler Job Classes**

Page

A job class defines the resource consumer group in which a job will run. Using a resource plan in a window, a DBA can allocate resources to different job classes.

|                                  | <a href="#">Edit</a>                        | <a href="#">View</a> | <a href="#">Delete</a>      | <a href="#">Create Like</a> |  |
|----------------------------------|---------------------------------------------|----------------------|-----------------------------|-----------------------------|--|
| Select                           | Name                                        | Logging Level        | Log Retention Period (Days) | Resource Consumer Group     |  |
| <input checked="" type="radio"/> | <a href="#">XMLDB_NFS_JOBCLASS</a>          | FAILED RUNS          |                             |                             |  |
| <input type="radio"/>            | <a href="#">AQ\$_PROPAGATION_JOB_CLASS</a>  | RUNS                 |                             |                             |  |
| <input type="radio"/>            | <a href="#">ORA\$AT_JCMED_SQ</a>            | FULL                 | 1000000                     | ORA\$AUTOTASK               |  |
| <input type="radio"/>            | <a href="#">ORA\$AT_JCNRM_SQ</a>            | FULL                 | 1000000                     | ORA\$AUTOTASK               |  |
| <input type="radio"/>            | <a href="#">ORA\$AT_JCURG_SQ</a>            | FULL                 | 1000000                     | ORA\$AUTOTASK               |  |
| <input type="radio"/>            | <a href="#">ORA\$AT_JCMED_SA</a>            | FULL                 | 1000000                     | ORA\$AUTOTASK               |  |
| <input type="radio"/>            | <a href="#">ORA\$AT_JCNRM_SA</a>            | FULL                 | 1000000                     | ORA\$AUTOTASK               |  |
| <input type="radio"/>            | <a href="#">ORA\$AT_JCURG_SA</a>            | FULL                 | 1000000                     | ORA\$AUTOTASK               |  |
| <input type="radio"/>            | <a href="#">ORA\$AT_JCMED_OS</a>            | FULL                 | 1000000                     | ORA\$AUTOTASK               |  |
| <input type="radio"/>            | <a href="#">ORA\$AT_JCNRM_OS</a>            | FULL                 | 1000000                     | ORA\$AUTOTASK               |  |
| <input type="radio"/>            | <a href="#">ORA\$AT_JCURG_OS</a>            | FULL                 | 1000000                     | ORA\$AUTOTASK               |  |
| <input type="radio"/>            | <a href="#">DBMS_JOB\$</a>                  | OFF                  |                             |                             |  |
| <input type="radio"/>            | <a href="#">SCHED\$_LOG_ON_ERRORS_CLASS</a> | FAILED RUNS          |                             |                             |  |
| <input type="radio"/>            | <a href="#">DEFAULT_JOB_CLASS</a>           | RUNS                 |                             |                             |  |

*Answer:* There are many job classes.

*Question 2:* Which resource consumer group is associated with the **DEFAULT\_JOB\_CLASS** job class?

*Possible Answer:* None.

- On the Scheduler Job Classes page, click the **ORA\$AT\_JCURG\_OS** link.

**Scheduler Job Classes > View Job Class:ORA\$AT\_JCURG\_OS**  
**View Job Class:ORA\$AT\_JCURG\_OS**

**Name** ORA\$AT\_JCURG\_OS  
**Logging Level** Log everything (FULL)  
**Log Retention Period (Days)** 1000000  
**Resource Consumer Group** ORA\$AUTOTASK  
**Service Name**  
**Description** auto optimizer stats collection

*Question 1:* Which resource consumer group is associated with the job class?

*Answer:* ORA\$AT\_JCURG\_OS is associated with ORA\$AUTOTASK.

*Question 2:* For which task is this job class used?

*Answer:* For automatic optimizer statistics collection

- Click **OK**, and then log out of Enterprise Manager Cloud Control.

## **Practices for Appendix C: Migrating Data by Using Oracle Data Pump**

**Chapter 29**

## Practices for Appendix C: Overview

---

### Practices Overview

In these practices, you will use another method for migrating data from an Oracle Database 11g database to an Oracle Database 12c database. Using Oracle Data Pump:

- Perform a transportable tablespace import from the Oracle Database 11g dbupgrd database into another Oracle Database 12c database
- Import the SH schema from the `orcl` non-CDB into the `pdb_sh` PDB of the `cdb1` CDB

As the `oracle` user, you will perform operations in the 12c environment. Therefore, keep a terminal window open as the `oracle` user in the 12c environment.

## Practice C-1: Performing a Transportable Tablespace Import

### Overview

In this practice, you will perform a transportable tablespace import from the Oracle Database 11g dbupgrd database into another Oracle Database 12c database. In order to avoid the creation of another database, you will use the existing Oracle Database 12c dbupgrd database.

### Assumptions

- You successfully installed the Oracle 12c Database software in Practice 5-1.
- In Practice 24-5, the transportable tablespace export from the dbupgrd database (before the database was upgraded) successfully completed, exporting the EXAMPLE and USERS tablespaces.

### Tasks

1. In the oracle user 12c terminal window, configure the target dbupgrd database as if it were a brand new empty database to be the recipient for the migrated data from the source Oracle 11g Database. If you encounter any disconnection from the database, reconnect and continue with your administrative operations.
  - a. Set your environment to the target database dbupgrd. Log in to SQL\*Plus as the SYSDBA user.

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

SQL>
```

- b. Query the DBA\_TABLESPACES view. Drop the application schemas (HR and SH), and tablespaces (USERS and EXAMPLE).

```
SQL> SELECT tablespace_name FROM dba_tablespaces;

TABLESPACE_NAME

SYSTEM
SYSAUX
UNDOTBS1
TEMP
USERS
EXAMPLE

6 rows selected.

SQL> drop user hr cascade;
```

```
User dropped.

SQL> drop user sh cascade;

User dropped.

SQL> drop tablespace EXAMPLE including contents and datafiles;

Tablespace dropped.

SQL> drop tablespace USERS including contents and datafiles;

drop tablespace USERS including contents and datafiles
*
ERROR at line 1:
ORA-12919: Can not drop the default permanent tablespace

SQL> alter database default tablespace system;

Database altered.

SQL> drop tablespace USERS including contents and datafiles;

Tablespace dropped.

SQL> SELECT tablespace_name FROM dba_tablespaces ORDER BY 1;

TABLESPACE_NAME

SYSAUX
SYSTEM
TEMP
UNDOTBS1

SQL>
```

- c. Create the schemas in the target database instance before importing data. Grant the necessary privileges to the HR and SH users.

```
SQL> create user HR identified by oracle_4U account unlock;

User created.

SQL> create user SH identified by oracle_4U account unlock;

User created.

SQL> grant create session, create table, create materialized
view, unlimited tablespace to HR, SH;

Grant succeeded.

SQL> EXIT
$
```

2. At the end of Practice 24-5, you moved the dump file to the /home/oracle/labs/dbupgrd12 directory and copied the data files of the 11g dbupgrd database to the /u01/app/oracle/backup directory. Now you need to move the files to the appropriate locations before performing the import.

- a. Verify the location of the dump file.

```
$ ls /home/oracle/labs/dbupgrd12
expTTS.dmp
$
```

- b. Move the dump file to the default directory for Data Pump in the dbupgrd database instance.

```
$ mv /home/oracle/labs/dbupgrd12/expTTS.dmp
/u01/app/oracle/admin/dbupgrd/dpdump
$
```

- c. Move the data files from the /u01/app/oracle/backup directory to /u01/app/oracle/oradata/dbupgrd.

```
$ cd /u01/app/oracle/backup
$ ls
example01.dbf user01.dbf
$ mv *.dbf /u01/app/oracle/oradata/dbupgrd
$ ls /u01/app/oracle/oradata/dbupgrd
control01.ctl redo01.log redo03.log system01.dbf
undotbs01.dbf
example01.dbf redo02.log sysaux01.dbf temp01.dbf
user01.dbf
$
```

3. Use the dump file and data files to import the transportable tablespaces from the dbupgrd database into the target database. To make the import quicker, you will import only the HR and SH schemas.

- a. Remove the named log files. If they exist, the import will fail.

```
$ rm /u01/app/oracle/admin/dbupgrd/dpdump/import.log
rm: cannot remove
`/u01/app/oracle/admin/dbupgrd/dpdump/import.log': No such file
or directory
```

- b. Perform the import.

```
$ impdp system/oracle_4U dumpfile=expTTS.dmp
TRANSPORT_DATAFILES='/u01/app/oracle/oradata/dbupgrd/user01.dbf'
, '/u01/app/oracle/oradata/dbupgrd/example01.dbf'
logfile=import.log

Import: Release 12.1.0.1.0 - Production on Mon Oct 28 13:45:01
2013

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rights reserved.

Connected to: Oracle Database 12c Enterprise Edition Release
12.1.0.1.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics, Real
Application Testing and Unified Auditing options
Master table "SYSTEM"."SYS_IMPORT_TRANSPORTABLE_01" successfully
loaded/unloaded
Source TSTZ version is 14 and target TSTZ version is 18.
Starting "SYSTEM"."SYS_IMPORT_TRANSPORTABLE_01":
system/********* dumpfile=expTTS.dmp
TRANSPORT_DATAFILES=/u01/app/oracle/oradata/dbupgrd/user01.dbf,
/u01/app/oracle/oradata/dbupgrd/example01.dbf logfile=import.log
Processing object type TRANSPORTABLE_EXPORT/PLUGTS_BLK
Processing object type TRANSPORTABLE_EXPORT/TABLE
Processing object type TRANSPORTABLE_EXPORT/TABLE_STATISTICS
Processing object type
TRANSPORTABLE_EXPORT/POST_INSTANCE/PLUGTS_BLK
Job "SYSTEM"."SYS_IMPORT_TRANSPORTABLE_01" successfully
completed at Mon Oct 28 13:45:15 2013 elapsed 0 00:00:11

$
```

4. Verify that the EXAMPLE and USERS tablespaces have been created, and that the HR.EMPLOYEES table and the SH.SALES table contain the rows as in the source dbupgrd database.

```
$ sqlplus / as sysdba

SQL> SELECT tablespace_name FROM dba_tablespaces;

TABLESPACE_NAME

SYSTEM
SYSAUX
UNDOTBS1
TEMP
USERS
EXAMPLE

6 rows selected.

SQL> SELECT name FROM v$logfile;

NAME

/u01/app/oracle/oradata/dbupgrd/system01.dbf
/u01/app/oracle/oradata/dbupgrd/sysaux01.dbf
/u01/app/oracle/oradata/dbupgrd/undotbs01.dbf
/u01/app/oracle/oradata/dbupgrd/example01.dbf
/u01/app/oracle/oradata/dbupgrd/user01.dbf

SQL> SELECT count(*) FROM HR.employees;

COUNT(*)

7

SQL> SELECT count(*) FROM SH.sales;

COUNT(*)

5

SQL>
```

5. Set the EXAMPLE and USERS tablespaces to READ WRITE.

```
SQL> alter tablespace example read write;

Tablespace altered.

SQL> alter tablespace users read write;

Tablespace altered.

SQL>
```

6. Reset the default permanent tablespace to the USERS tablespace.

```
SQL> alter database default tablespace users;

Database altered.

SQL>
```

7. Shut down the instance to release resources for the next practice.

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

## Practice C-2: Importing a Non-CDB Application into a CDB

### Overview

In this practice, you will use the export dump file from the `orcl` non-CDB that you created in Practice 25-2 to import the `SH` schema in the `cdb1` CDB into a new `pdb_sh` PDB.

### Assumption

The export of the `SH` schema performed from the `orcl` non-CDB was successfully completed in Practice 25-2.

The `cdb1` CDB was successfully created in Practice 5-2.

### Tasks

1. In the `oracle` user 12c terminal window, create a new PDB named `pdb_sh` in `cdb1` that will be the container/recipient for the `SH` schema exported from the non-CDB `orcl` database.
  - a. Create a directory for the new data files of `pdb_sh` of `cdb1`. A recommended pattern is that the PDB datafiles reside in a separate folder below the CDB. For example, the CDB datafiles are in `$ORACLE_BASE/oradata/cdb1` and the PDB datafiles are in `$ORACLE_BASE/oradata/cdb1/pdb_sh`.

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

$ mkdir -p $ORACLE_BASE/oradata/cdb1/pdb_sh
$
```

- b. Connect to the root container of `cdb1` as a user with the `CREATE PLUGGABLE DATABASE` privilege and create `PDB_SH`. **Note:** The `FILE_NAME_CONVERT` replaces strings, so all the `pdb_seed/*` datafiles will be renamed to `pdb_sh/*` when they are copied for the `pdb_sh` PDB.

```
$ sqlplus / as sysdba

SQL> CREATE PLUGGABLE DATABASE pdb_sh ADMIN USER sh_admin
 IDENTIFIED BY oracle_4U ROLES=(CONNECT)
 FILE_NAME_CONVERT=('/u01/app/oracle/oradata/cdb1/pdbseed'
 , '/u01/app/oracle/oradata/cdb1/pdb_sh');

2 3 4

Pluggable database created.

SQL>
```

- c. Check the open mode of PDB\_SH. The other PDBs are open READ WRITE because you created a trigger to open all of them on startup. pdb\_sh is *not* open, because it was created after the trigger fired.

```
SQL> col con_id format 999
SQL> col name format A10
SQL> select con_id, NAME, OPEN_MODE, DBID, CON_UID from V$PDBS;

CON_ID NAME OPEN_MODE DBID CON_UID
----- -----
 2 PDB$SEED READ ONLY 4056847030 4056847030
 3 PDB1 READ WRITE 3321976125 3321976125
 4 PDB_ORCL READ WRITE 1341873063 1341873063
 5 PDB_SH MOUNTED 1752541684 1752541684
SQL>
```

- d. Open PDB\_SH.

```
SQL> alter pluggable database pdb_sh open;

Pluggable database altered.

SQL> select con_id, NAME, OPEN_MODE, DBID, CON_UID from V$PDBS;

CON_ID NAME OPEN_MODE DBID CON_UID
----- -----
 2 PDB$SEED READ ONLY 4056847030 4056847030
 3 PDB1 READ WRITE 3321976125 3321976125
 4 PDB_ORCL READ WRITE 1341873063 1341873063
 5 PDB_SH READ WRITE 1752541684 1752541684

SQL> exit
$
```

**Note:** A service name for a PDB is created and registered with the listener when the PDB is created, and EZCONNECT may be used to connect to the PDB without creating the net service name in this step. Net service names are often much more convenient.

2. Use Oracle Net Manager to add the `PDB_SH` net service name for `pdb_sh` pluggable database of `cdb1` to the `tnsnames.ora` file.

```
$ $ORACLE_HOME/bin/netmgr
```

Use Net Manager as you did in Practice 25-3 step 3 with the following values:

Net Service Name: `pdb_sh`

Protocol: TCP/IP

Hostname: `<yourservername>`, or localhost

Port Number: 1521

Service Name: `pdb_sh`

3. Test the connection by connecting to `pdb_sh` AS `SYSDBA`.

```
$ sqlplus sys/oracle_4U@pdb_sh AS SYSDBA

SQL> show con_name

CON_NAME

PDB_SH

SQL> exit
```

4. Connect to the target `pdb_sh` PDB as the `SYSTEM` user.

```
$ sqlplus system/oracle_4U@pdb_sh

SQL> SELECT name FROM v$pdbs;

NAME

PDB_SH

SQL>
```

5. Create a Data Pump directory for the dump files stored for any Data Pump operations in `pdb_sh` PDB.

- a. Create the OS directory.

```
SQL> ! mkdir -p /u01/app/oracle/admin/cdb1/pdb_sh/dpdump

SQL>
```

- b. Create the directory in the PDB.

```
SQL> create directory dp_pdb_sh as
'/u01/app/oracle/admin/cdb1/pdb_sh/dpdump';
```

Directory created.

```
SQL>
```

6. Create the EXAMPLE tablespace in the PDB.

```
SQL> create tablespace EXAMPLE datafile
'/u01/app/oracle/oradata/cdb1/pdb_sh/example01.dbf' size 500m;
```

Tablespace created.

```
SQL>
```

7. Create the user and grant privileges before the import operation.

```
SQL> create user SH identified by oracle_4U account unlock
 default tablespace EXAMPLE;
```

2

User created.

```
SQL> grant create session, create table, create materialized
 view, unlimited tablespace to SH;
```

```
SQL> exit
```

```
$
```

8. At the end of the Practice 25-2, you moved the

/u01/app/oracle/admin/orcl/dpdump/expSH.dmp export dump file containing the SH schema of the orcl database to the /home/oracle/labs directory. Move the dump file to the directory of the PDB.

```
$ mv /home/oracle/labs/expSH.dmp
/u01/app/oracle/admin/cdb1/pdb_sh/dpdump
$
```

9. Import the SH schema of the orcl database into the pdb\_sh PDB. Note that the IMPDP command includes the net service\_name in the userid clause.

- a. Remove any log files created during a previous execution.

```
$ rm /u01/app/oracle/admin/cdb1/pdb_sh/dpdump/impSH.log
rm: cannot remove
`/u01/app/oracle/admin/cdb1/pdb_sh/dpdump/impSH.log': No such
file or directory
$
```

b. Import the SH schema.

```
$ impdp system/oracle_4U@pdb_sh FULL=Y dumpfile=expSH.dmp
directory=dp_pdb_sh logfile=impSH.log

Import: Release 12.1.0.1.0 - Production on Thu Feb 21 18:29:00
2013
...
Master table "SYSTEM"."SYS_IMPORT_FULL_01" successfully
loaded/unloaded
Starting "SYSTEM"."SYS_IMPORT_FULL_01": system/********@pdb_sh
FULL=Y dumpfile=expSH.dmp directory=dp_pdb_sh logfile=impSH.log
Processing object type SCHEMA_EXPORT/USER
ORA-31684: Object type USER:"SH" already exists
Processing object type SCHEMA_EXPORT/SYSTEM_GRANT
...
. . imported "SH"."CUSTOMERS" 10.27
MB 55500 rows
. . imported "SH"."COSTS": "COSTS_Q1_1998" 139.6
KB 4411 rows
...
. . imported "SH"."SALES": "SALES_Q1_1998" 1.413
MB 43687 rows
...
. . imported "SH"."SALES": "SALES_Q4_2003" 0
KB 0 rows
...
Processing object type SCHEMA_EXPORT/DIMENSION
Job "SYSTEM"."SYS_IMPORT_FULL_01" completed with 12 error(s) at
Tue Feb 26 18:50:38 2013 elapsed 0 00:01:13
$
```

**Note:** There are some errors due to missing users in the target PDB. The intention of this practice is to show how to handle the process of exporting and importing a non-CDB schema such as SH into a PDB.

10. Connect as SH to the PDB and check that the SH schema exists and the SH.SALES table is created in the pdb\_sh PDB.

```
$ sqlplus sh/oracle_4U@pdb_sh

SQL> SELECT count(*) FROM sh.sales;

COUNT(*)

918843

SQL>
```

If you connect to the `root` container of the CDB, you cannot query the `SH` data.

```
SQL> connect / as sysdba
Connected.
SQL> SELECT count(*) FROM sh.sales;

SELECT count(*) FROM sh.sales
*
ERROR at line 1:
ORA-00942: table or view does not exist

SQL> exit
$
```