

**Oracle Database 12 c: Admin,  
Install and Upgrade  
Accelerated**

Activity Guide

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## **Practices for Lesson 1: Introduction**

### **Chapter 1**

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Practices for Lesson 1: Introduction

Chapter 1 - Page 1

## Practices for Lesson 1

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### Practices Overview

There are no practices for this lesson.

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Practices for Lesson 1: Introduction

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## **Practices for Lesson 2: Exploring Oracle Database Architecture**

### **Chapter 2**

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Practices for Lesson 2: Exploring Oracle Database Architecture

Chapter 2 - Page 1

## 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.

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Practices for Lesson 2: Exploring Oracle Database Architecture

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## 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 00:00:00 grep smon  
oracle 21062 1 0 Oct10 ? 00:00:03 ora_smon_em12rep  
oracle 28251 1 0 11:41 ? 00:00:00 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.

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Practices for Lesson 2: Exploring Oracle Database Architecture

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## 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),5  
4325 (dgdba),54326 (kmdba),54327 (asmdba)  
$
```

- a. 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  
$
```

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- 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 internal 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

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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
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...
```

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Practices for Lesson 2: Exploring Oracle Database Architecture

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```
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.ora  
  
# listener.ora Network Configuration File:  
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.ora  
  
# 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 8 13:27 pts/0 88:00:0 grep tnslsnr  
/u01/app/oracle/product/12.1.0/dbhome_1/bin/tnslsnr LISTENER -  
inherit  
$
```

## **Practices for Lesson 3: Oracle Software Installation Basics**

### **Chapter 3**

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Practices for Lesson 3: Oracle Software Installation Basics

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## Practices for Lesson 3

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### Practices Overview

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Practices for Lesson 3: Oracle Software Installation Basics

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## **Practices for Lesson 4: Installing your Oracle Software**

### **Chapter 4**

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Practices for Lesson 4: Installing your Oracle Software

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## 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.

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Practices for Lesson 4: Installing your Oracle Software

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

- 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`
  - Enter the following:

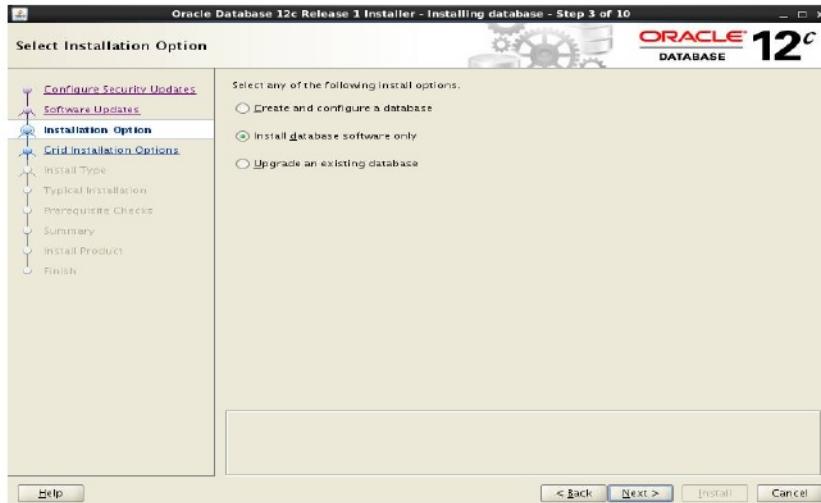
```
$ cd /stage/shiphomes/RDBMS_LINUX.X64_12C/database  
$ ./runInstaller
```



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 <b>Next</b> .
c.	Email Address Not Specified warning	Click <b>Yes</b> .
d.	Download Software Updates page	Verify that <b>Skip software updates</b> is selected. Click <b>Next</b> .

e.	Select Installation Option page	Select <b>Install database software only</b> . Click <b>Next</b> . <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 <b>Single instance database installation</b> is selected. Click <b>Next</b> . <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 <b>&gt;&gt;</b> button. Click <b>Next</b> .
h.	Select Database Edition page	Verify that <b>Enterprise Edition (6.4GB)</b> is selected. Click <b>Next</b> . <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

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



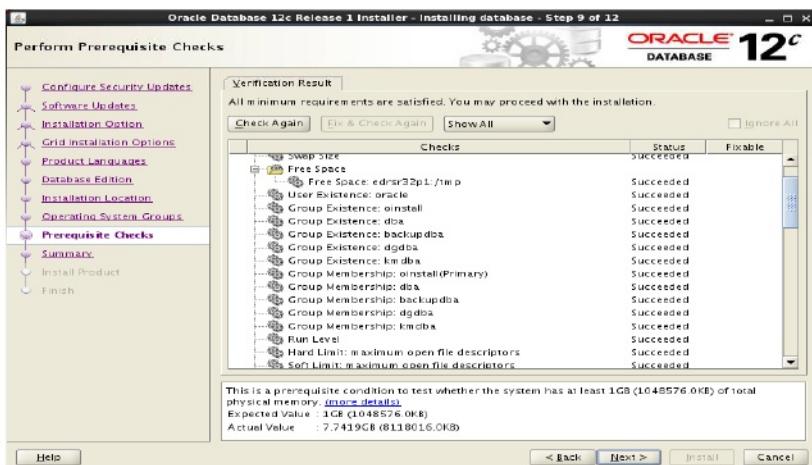
Step	Window/Page Description	Choices or Values
j.	Privileged Operating System groups page	<p>Keep distinct OS groups for separation of duties.</p> <p><i>Note: The OS groups, dba, oper, backupdba, dgdba, and kmdba were created prior to running the installer. You can view them in the /etc/group file.</i>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

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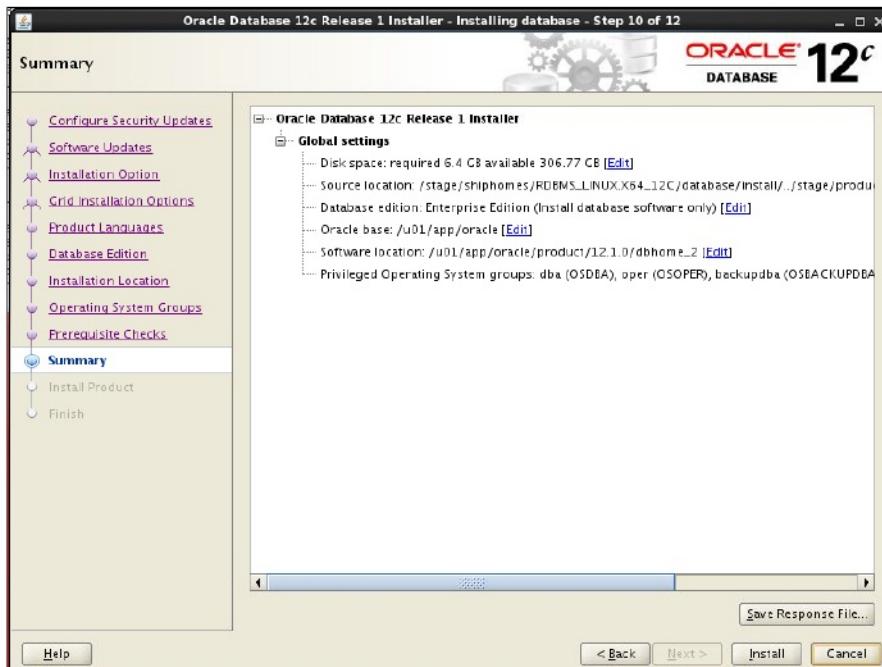
Step	Window/Page Description	Choices or Values
k.	Perform Prerequisites Checks	Appears if any checks failed

**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.



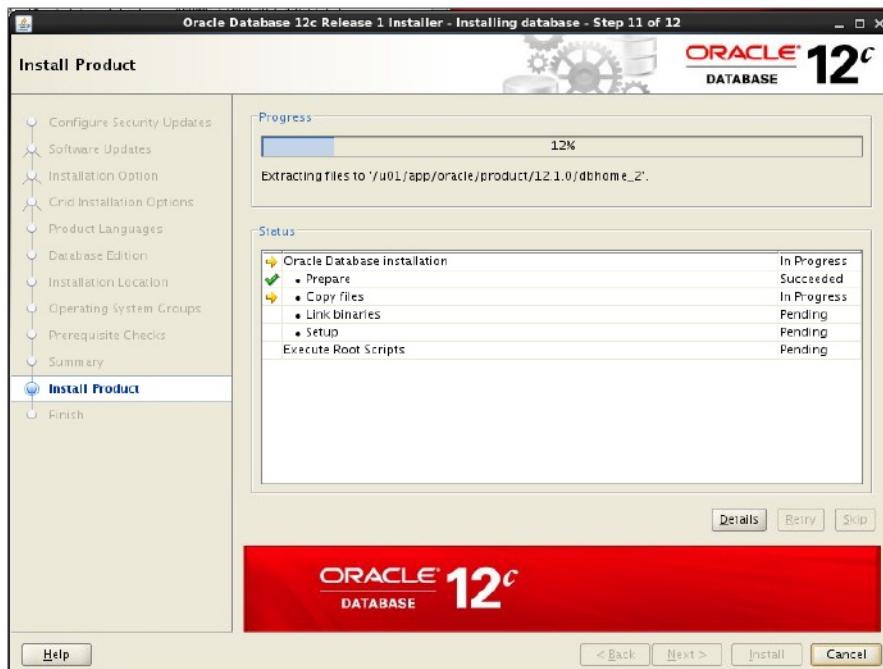
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Step	Window/Page Description	Choices or Values
I.	Summary page	Click <b>Install</b> .



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

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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.)

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```
# /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 <b>OK</b>
p.	Finish page	Click <b>Close</b>

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.

---

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Practices for Lesson 4: Installing your Oracle Software

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

**Chapter 5**

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Practices for Lesson 5: Creating an Oracle Database by Using DBCA  
Chapter 5 - Page 1

## 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`.

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Practices for Lesson 5: Creating an Oracle Database by Using DBCA  
Chapter 5 - Page 2

## 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 <b>Create Database</b> . Click <b>Next</b> .
b.	Creation Mode page	Select <b>Advanced Mode</b> . <i>Note: This option allows more customization.</i> Click <b>Next</b> .
c.	Database Template page	Select the <b>General Purpose or Transaction Processing</b> template. Click <b>Show Details</b> .
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

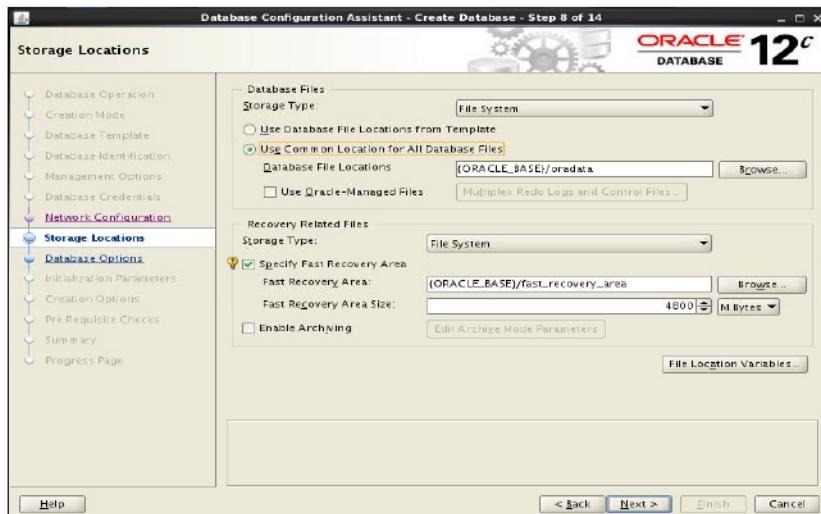
**Note:** You will change this setting later in this practice to use a Unicode database character set.

Step	Window/Page Description	Choices or Values
e.	Template Details window	Click <b>OK</b> .
f.	Database Template page	Click <b>Next</b> .
g.	Database Identification page	Global Database Name: <b>orcl</b> <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 <b>Next</b> .

**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.

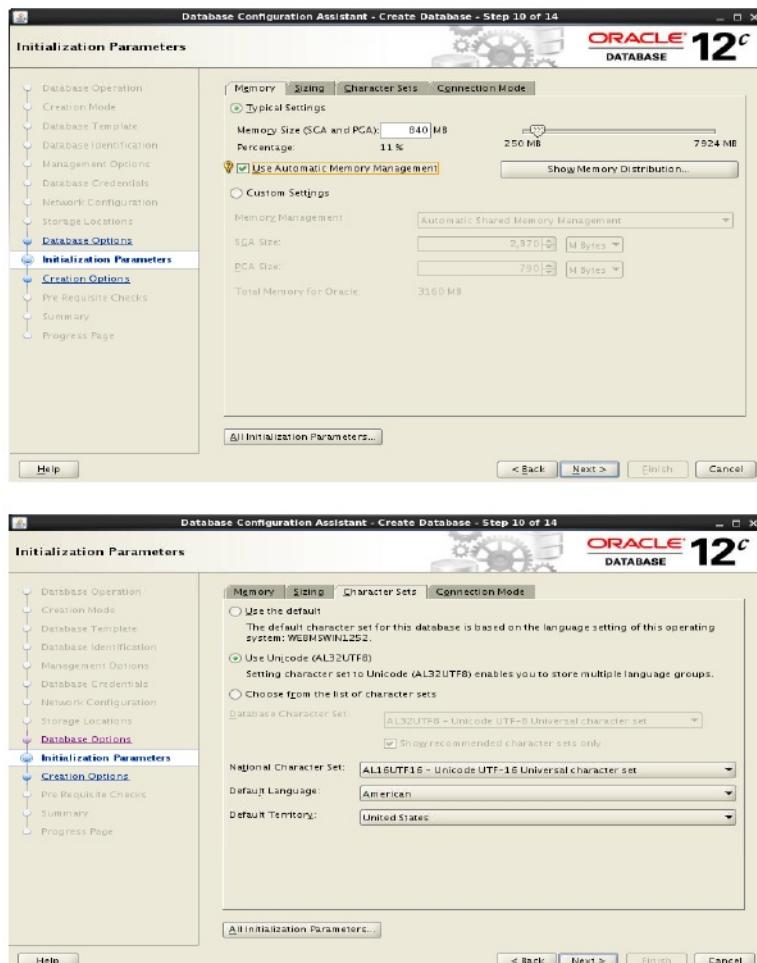
Step	Window/Page Description	Choices or Values
h.	Management Options page	Select <b>Configure Enterprise Manager (EM) Database Express.</b> <i>Note: Enterprise Manager Database Express allows you to perform DBA tasks through a graphical user interface</i> Click <b>Next.</b>
i.	Database Credentials page	<i>Best practice tip: Use separate passwords for each account to help maintain separation of duties.</i> <i>Note: In this course, you are using the same password to minimize disruption to the practices due to a forgotten password.</i> Select <b>Use the Same Administrative Password for All Accounts.</b> Password: <b>oracle_4U</b> Confirm Password: <b>oracle_4U</b> Click <b>Next.</b>
j.	Network Configuration page Listener Selection tab	Click <b>Next</b> <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>
k.	Storage Locations page	Storage Type: <b>File System</b> Select <b>Use Common Location for All Database Files.</b> <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> Click <b>Next.</b>

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Step	Window/Page Description	Choices or Values
i.	Database Options page	Select <b>Sample Schemas</b> . <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 <b>Next</b> .
m.	Initialization Parameters page Memory tab	Memory Size: <b>840 MB</b> Select <b>Use Automatic Memory Management</b> .
n.	Initialization Parameters page Character Sets tab	Select <b>Use Unicode (AL32UTF8)</b> .
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 <b>Next</b>



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

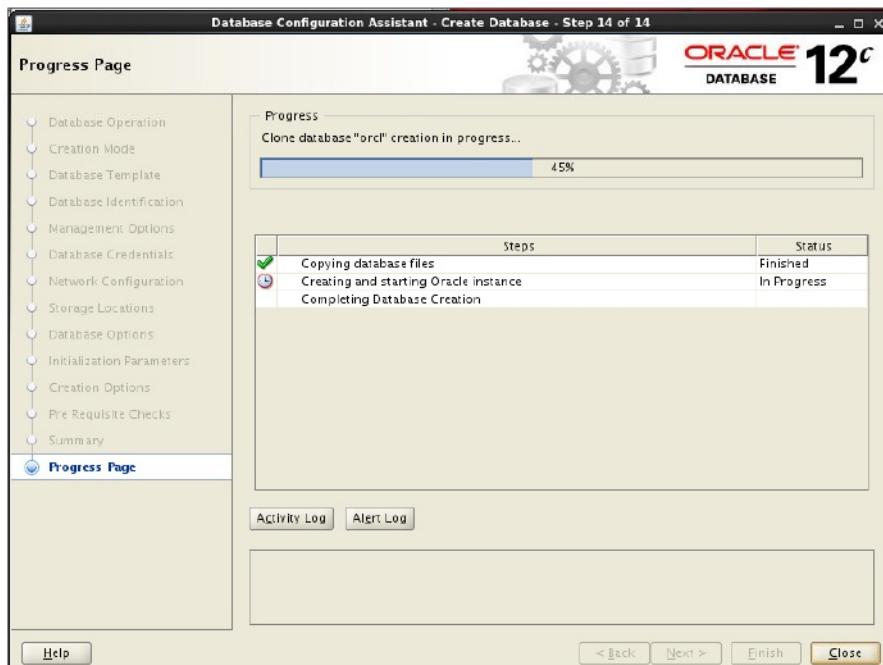
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<b>Step</b>	<b>Window/Page Description</b>	<b>Choices or Values</b>
		Destination Directory: <b>/home/oracle/labs</b> Note: This directory must exist. Click <b>Next</b> .
r.	Pre Requisite Checks	If there are no failed prerequisites, the DBCA moves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

<b>Name</b>	<b>Value or Location Value</b>
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

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

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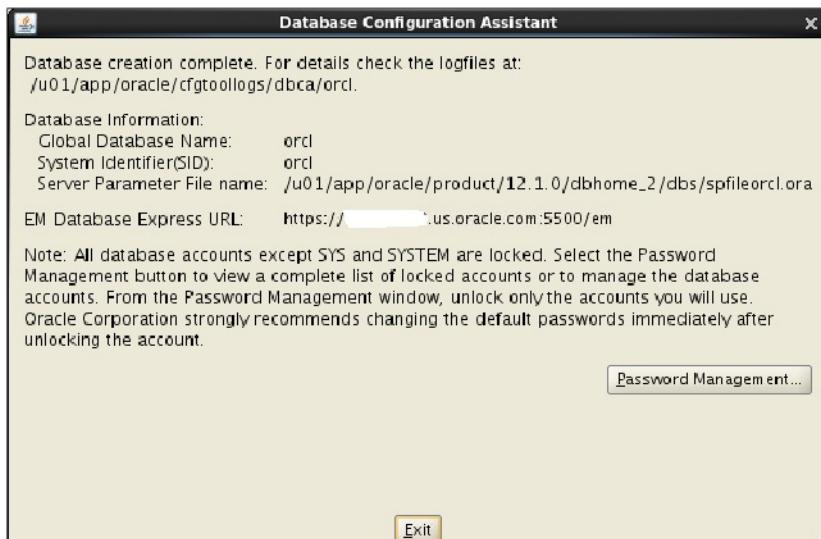


<b>Step</b>	<b>Window/Page Description</b>	<b>Choices or Values</b>
x.	Database creation complete	Displays essential information about the database. Make note of the Enterprise Manager Database Express URL, because it will be used in several of the following practice sessions.

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

**https://\_\_\_\_\_ : \_\_\_\_\_ /em**

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

3. 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
```

---

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

4. 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  
$
```

5. Verify that you can connect as SYSTEM and that the database name is ORCL. Do not mix up instance and database names.

- a. 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

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_ix_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=60
*.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
```

---

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

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```
-----  
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
```

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

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

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

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

- 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
```

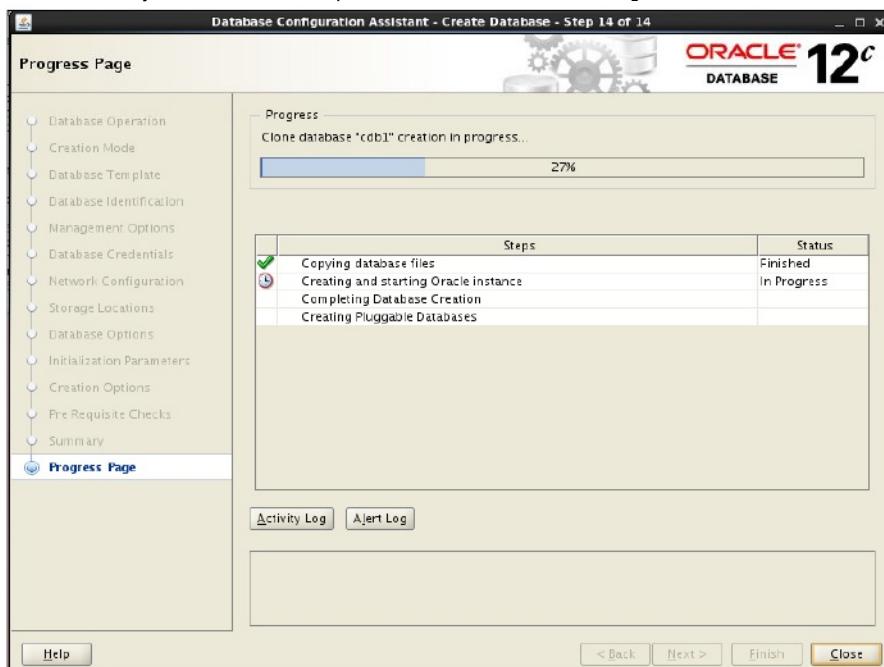
Step	Window/Page Description	Choices or Values
a.	Step 1: Database Operation	Select <b>Create Database</b> . Click <b>Next</b> .
b.	Step 2: Creation Mode	Select <b>Advanced Mode</b> . Click <b>Next</b> .
c.	Step 3: Database Template	Notice that the template <code>orcl</code> created in practice 5-1 is available. Select <b>General Purpose or Transaction Processing</b> . Click <b>Next</b> .
d.	Step 4: Database Identification	Enter: Global Database Name: <code>cdb1</code> SID: <code>cdb1</code> Select <b>Create As Container Database</b> . Select <b>Create a Container Database with one or more PDBs</b> . Enter: PDB Name: <code>pdb1</code> Click <b>Next</b> .

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e.	Step 5: Management Options	Deselect <b>Configure Enterprise Manager (EM) Database Express</b> .  <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 <b>Next</b> .
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 <b>Use same Administrative password</b> .... Enter: Password: <b>oracle_4U</b> Confirm password: <b>oracle_4U</b> Click <b>Next</b> .
g.	Step 7: Network Configuration	Listener Selection: Click <b>Next</b> .
h.	Step 8: Storage Locations	Confirm that the storage type is <b>File System</b> . Select <b>Use Common Location for All Database Files</b> . Click <b>Next</b> .
i.	Step 9: Database Options	Select <b>Sample Schemas</b> . Click <b>Next</b> .
j.	Step 10: Initialization Parameters Memory Tab	Enter: Memory Size (SGA and PGA): <b>844 MB</b> Select <b>Use Automatic Memory Management</b> . Select the <b>Character Sets</b> tab. Select <b>Use Unicode (AL32UTF8)</b> . Click <b>Next</b> .
k.	Step 11: Creation Options	Select <b>Create Database</b> . Click <b>Next</b> .
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 <b>one</b> . Sample Schema PDB is named <b>pdb1</b> . Parameter <code>enable_pluggable_database</code> is <b>true</b> . Click <b>Finish</b> .
n.	Step 14: Progress Page	The DBCA displays the progress of the installation steps.  <i>This operation takes about 25 minutes.</i>

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**.

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- 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
```

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```
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 PDB 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> 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>
```

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- 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.

9. Also notice that `pdb1` does not have an SPFILE.  
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.

- a. Shut the instance down.

```
$ sqlplus / as sysdba

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

- b. 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>
```

- c. 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
  3  after startup on database
  4    begin
  5      execute immediate 'alter pluggable database all open';
  6    end open_all_PDBs;
```

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Practices for Lesson 5: Creating an Oracle Database by Using DBCA  
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```
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$logfile;

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

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;
```

---

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

---

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Practices for Lesson 5: Creating an Oracle Database by Using DBCA  
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## **Practices for Lesson 6: Oracle Database Management Tools**

### **Chapter 6**

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Practices for Lesson 6: Oracle Database Management Tools

Chapter 6 - Page 1

## **Practices for Lesson 6: Overview**

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### **Practices Overview**

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

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Practices for Lesson 6: Oracle Database Management Tools

Chapter 6 - Page 2

## 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.

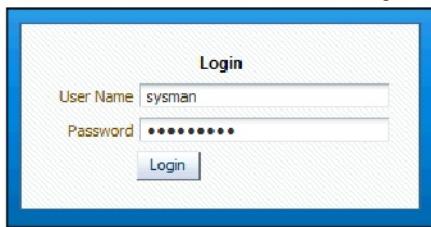
[Add Exception...](#)

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- 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.

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Practices for Lesson 6: Oracle Database Management Tools

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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**.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "ORACLE Enterprise Manager Cloud Control 12c". The top navigation bar includes links for "Enterprise", "Targets", "Favorites", and "History". Below the navigation is a search bar with "Search" and "Go" buttons, and a link to "Advanced Search". The main content area is titled "Databases". It has a "View" dropdown set to "Database Load Map". Below the view dropdown are "Search" and "Go Advanced Search" buttons. A large "Add" button is highlighted with a red box. The main table has columns for "Select", "Name", "Status", and "Incidents". The "Name" column contains "No Targets found...". The "Incidents" column shows four icons: a circle with a minus sign, a red circle with a cross, a yellow triangle with an exclamation mark, and a red flag.

- 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**

The screenshot shows the "Connection" step of the "Add Database Instance Target" wizard. At the top right are buttons for "Test Connection", "Cancel", "Next", and "Finish". Below this is a "Databases" section with a note about discovered databases and their configuration. A table lists databases: `cdb1`, `orcl` (selected), `dbupgrd`, and `em12rep`. The "Monitor Password" column for `orcl` is highlighted with a red box. A tip at the bottom states: "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**.

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

Databases									
View		<input type="radio"/> Database Load Map	<input checked="" type="radio"/> Search List						
Search		<input type="button" value="Go"/>		Advanced Search					
<input type="button" value="Configure"/>		<input type="button" value="Remove"/>	<input type="button" value="Add"/>						
		Incidents					Compliance Violations		
Select	Name	Status	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	0	0	0
<input checked="" type="radio"/>	orcl	<input type="radio"/>							

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

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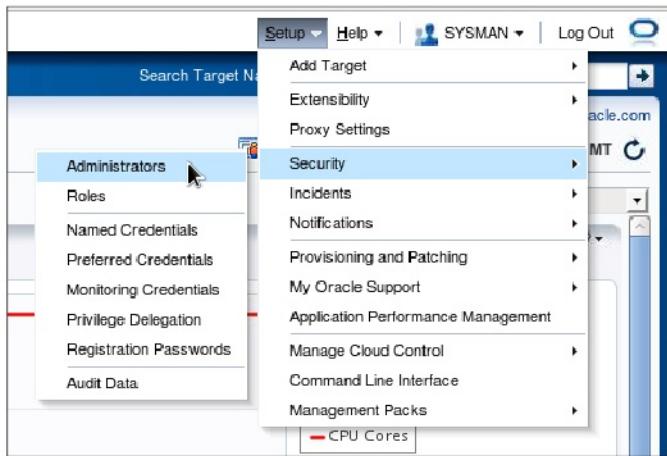
## Practice 6-2: Creating an Administrative User

### 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**.



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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. Their 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

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: oracle\_4u

\* Confirm Password: oracle\_4u

Password Profile: DEFAULT

E-mail Address:

Contact:

Location:

Department:

Cost Center:

Line of Business:

Description:

Super Administrator

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

**Confirmation**  
Administrator ADMIN was created successfully

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

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## 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`.

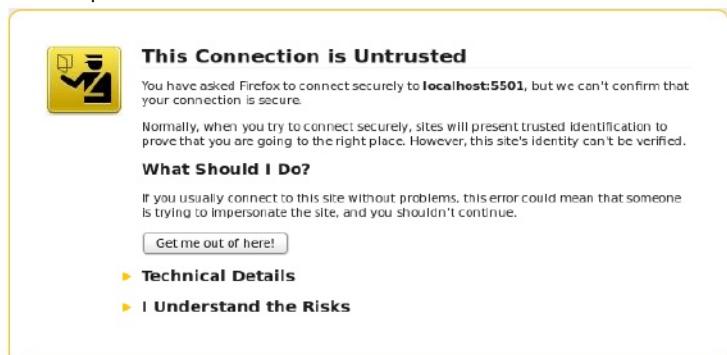
```
$ . oraenv
ORACLE_SID = [oracle] ? orcl
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_2 is
/u01/app/oracle
$
```

- 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

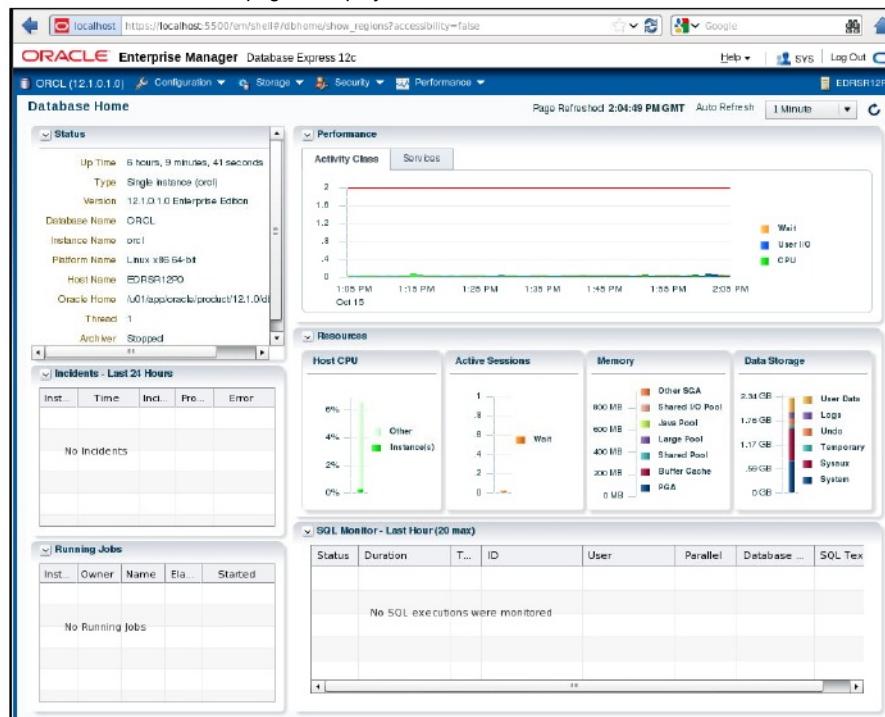
PL/SQL procedure successfully completed.
```

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.



- 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.



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Practices for Lesson 6: Oracle Database Management Tools

Chapter 6 - Page 12

## 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>
```

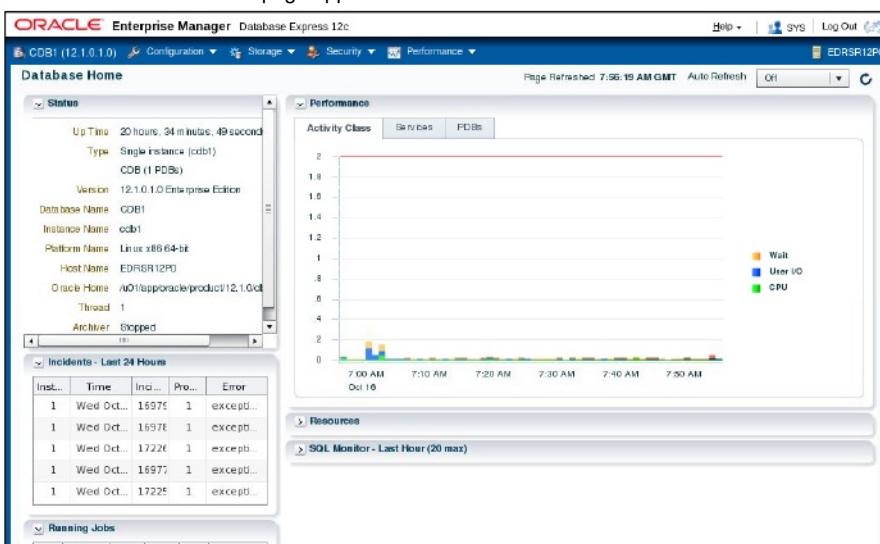
5. Verify the port allocation.

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

GETHTTPSPORT
-----
5501

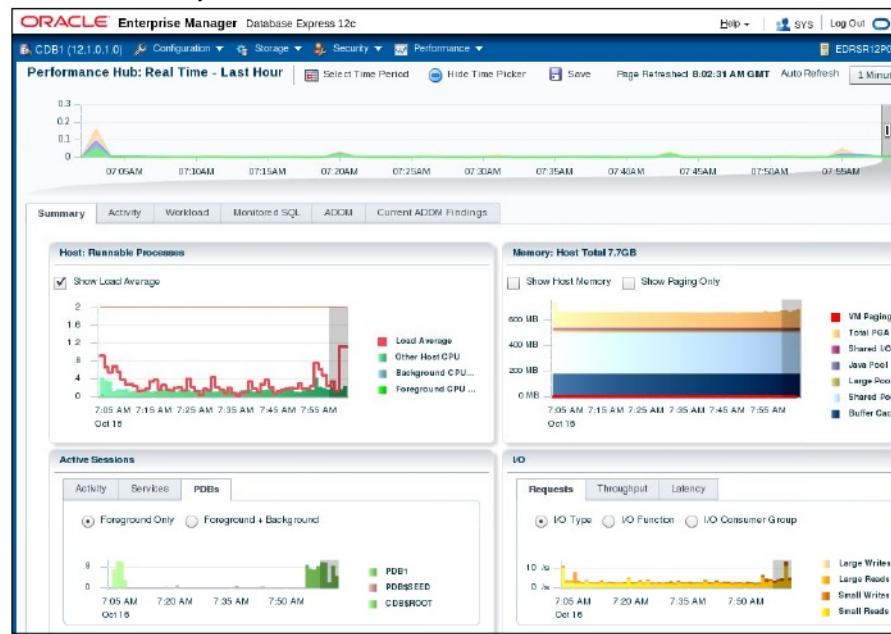
SQL> exit
$
```

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.

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Practices for Lesson 6: Oracle Database Management Tools  
Chapter 6 - Page 16

## **Practices for Lesson 7: Managing the Database Instance**

**Chapter 7**

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Practices for Lesson 7: Managing the Database Instance

Chapter 7 - Page 1

## Practices for Lesson 7: Overview

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### 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.

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Practices for Lesson 7: Managing the Database Instance

Chapter 7 - Page 2

## 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.



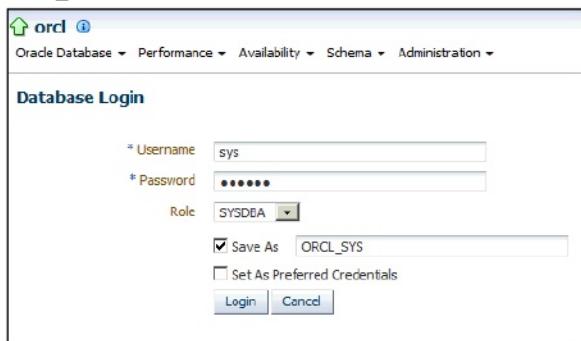
Select	Name	Status	Incidents	Compliance Violations
<input checked="" type="radio"/>	orcl		0 22	0 0 0

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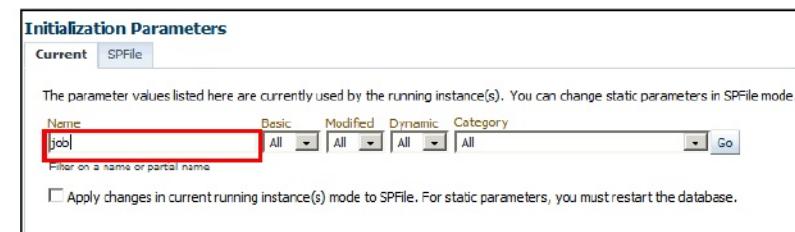
- d. Navigate to the Initialization parameters page. Select **Administration > Initialization Parameters**.



- 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**.



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



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

The screenshot shows the 'Initialization Parameters' page in Oracle Database. The 'SPFile' tab is selected. A table lists parameters, with the 'job\_queue\_processes' row highlighted. The 'Value' column for this row contains the value '15', which is also highlighted with a red box. Other columns include 'Name', 'Type', 'Basic', 'Modified', 'Dynamic', and 'Category'. 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 'Initialization Parameters > Show SQL' page. It displays the SQL command: `ALTER SYSTEM SET job_queue_processes = 15 SCOPE=MEMORY`. Buttons at the bottom include '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 >**

The screenshot shows the 'Startup/Shutdown' menu in the Oracle Cloud Control interface. The 'Control' item is selected, and its submenu includes 'Startup/Shutdown', 'Create Blackout...', and 'End Blackout...'. The 'Basic' and 'Modified' buttons are visible at the bottom of the menu.

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<b>Step</b>	<b>Window/Page Description</b>	<b>Choices or Values</b>
a.	Startup/Shutdown:Specify Host and Target Database Credentials (See screenshot 3a below.)	Host Credentials: Credential: Select <b>New</b> . Username: oracle Password: oracle Confirm password: oracle Check <b>Set As Preferred Credentials</b> . Select <b>Database Host Credentials</b> . Click <b>Test</b> .
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 <b>New</b> . Username: <b>SYS</b> ( <i>This must be uppercase.</i> ) Password: oracle_4U Confirm password : oracle_4U Role: SYSDBA Check <b>Set As Preferred Credentials</b> . Select <b>SYSDBA Database Credentials</b> . Click <b>Test</b> .
d.	Startup/Shutdown:Specify Host and Target Database Credentials	Response: Test Successful Click <b>OK</b> .
e.	Startup/Shutdown:Confirmation	Click <b>Advanced Options</b> .
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 <b>Cancel</b> .
g.	Startup/Shutdown:Confirmation	Click <b>Yes</b> .
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	
<b>Test</b> 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	
<b>Test</b>	

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

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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
$
```

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Practices for Lesson 7: Managing the Database Instance

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- 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

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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.

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## 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

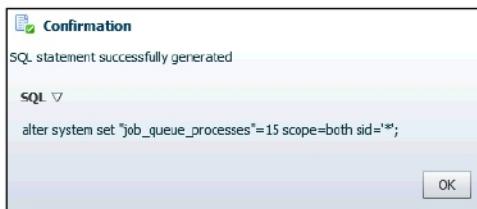
1. Invoke EM Express, and log in as the DBA1 user.
  - a. Double-click the **Web Browser** icon on your desktop to open your web browser as the oracle user.
  - b. Enter the following URL: **https://localhost:5500/em**
  - c. On the Oracle Enterprise Manager Database Express login page, enter **DBA1** 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**.

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- 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.

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## 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

- Set the JOB\_QUEUE\_PROCESSES initialization parameter to 1000 by using SQL\*Plus.
  - In the Linux command window, set your environment to the orcl database by using oraenv.

```
$ . oraenv
The Oracle base for ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_2 is
/u01/app/oracle
$
```

- 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.

- View the current setting of the JOB\_QUEUE\_PROCESSES parameter.

```
SQL> SHOW PARAMETER job
NAME                           TYPE        VALUE
-----                         -----
job_queue_processes            integer     15
```

- 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.
```

- 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.

- a. In SQL\*Plus, shut down the database instance.

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

- b. 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
SQL>
```

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
$
```

---

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Practices for Lesson 7: Managing the Database Instance  
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## **Practices for Lesson 8: Configuring the Oracle Network Environment**

### **Chapter 8**

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Practices for Lesson 8: Configuring the Oracle Network Environment  
Chapter 8 - Page 1

## Practices for Lesson 8: Overview

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### 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.

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Practices for Lesson 8: Configuring the Oracle Network Environment  
Chapter 8 - Page 2

## 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**

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

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

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

- b. Change the directory to **\$ORACLE\_HOME/network/admin** and then list your current working directory.

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

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

```
$ ls -l
```

- 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 oracle user	\$ netmgr
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: <b>testorcl</b> Click Next.
g.	Net Service Naming Wizard:...Protocol	Select <b>TCP/IP (Internet Protocol)</b> . Click Next.
h.	Net Service Naming Wizard:...Protocol Settings	Host Name: <assigned hostname or IP address> Port Number: <b>1521</b> Click Next.
i.	Net Service Naming Wizard:...Service	Service: <b>orcl</b> Click Next.

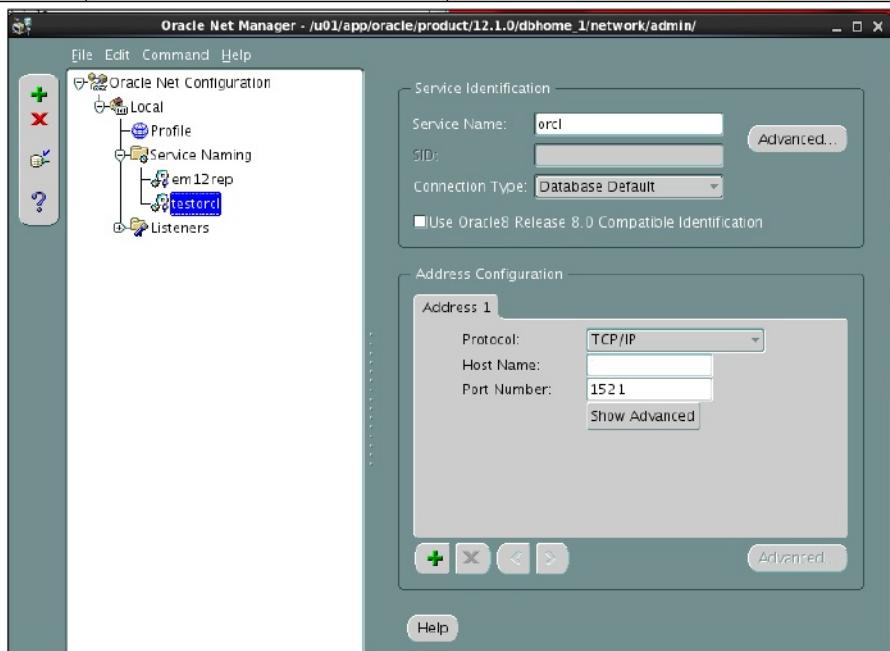
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Practices for Lesson 8: Configuring the Oracle Network Environment

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



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.

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- 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
```

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## Practice 8-2: Creating a Second Listener

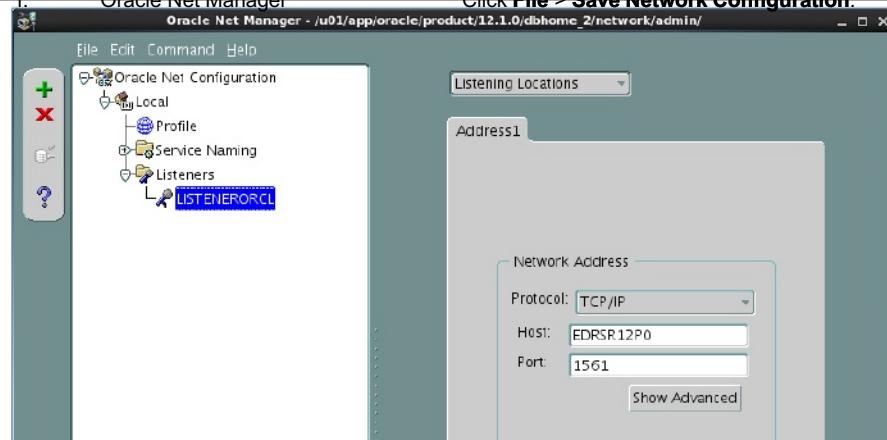
In this practice, you create a second listener named LISTENER2 by using Oracle Net Manager.

- 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
$
```

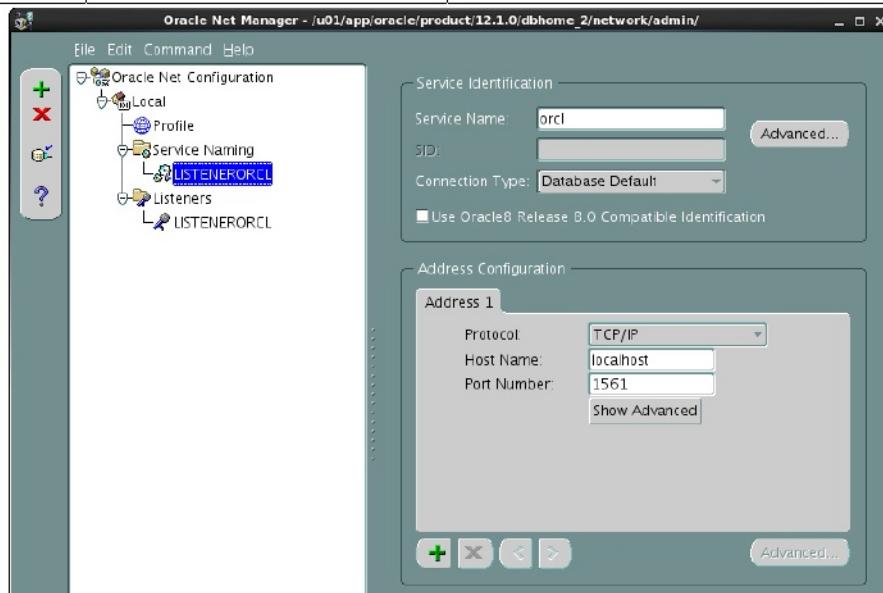
- Perform the following steps in Oracle Net Manager.

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



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



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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

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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.

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**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.o
ra

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) (PO
RT=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.
- 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
```

- 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

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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**.  
**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.
  - d. Select **orcl** and click **Configure**.
  - 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

Name	Value
Oracle Home Path	/u01/app/oracle/product/12.1.0/dbhome
Monitor Username	dbsnmp
Monitor Password	*****
Role	Normal
Listener Machine Name	editUSR12p0.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 connect using the host, port, SID provided above.

Step 1 of 5

f. Click **Submit**.

g. Click **OK**.

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Practices for Lesson 8: Configuring the Oracle Network Environment  
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## **Practices for Lesson 9: Administering User Security**

### **Chapter 9**

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Practices for Lesson 9: Administering User Security

Chapter 9 - Page 1

## 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.

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Practices for Lesson 9: Administering User Security

Chapter 9 - Page 2

## 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 ...
$
```

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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:

<b>Step</b>	<b>Window/Page Description</b>	<b>Choices or Values</b>
a.	EM Express	Select <b>Security &gt; Profiles</b> .
b.	Profiles	Select <b>Create Profile</b> .
c.	Create Profile Dialog: New Profile	Enter <b>HRPROFILE</b> in the Name field. Click the <b>Next &gt;</b> 
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 <b>Next &gt;</b> 
e.	Create Profile Dialog: Password	Review the Password options. All should be set to default values of Unlimited or Null. Click <b>Show SQL</b> to review the SQL command for this task.
f.	Confirmation	Click <b>OK</b> .
g.	Create Profile Dialog: Password	Click <b>OK</b> .
h.	Confirmation	Click <b>OK</b> .

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

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

## Practice 9-2: Creating Roles

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

- 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 <b>Security &gt; Roles</b> .
b.	Roles	Click <b>Create Role</b> .
c.	Create Role: New Role	Enter <b>HRCLERK</b> as Role Name. Click the <b>Next</b> icon.
d.	Create Role: Privilege	Click <b>Show SQL</b> .
e.	Confirmation	Verify the SQL command: <code>create role "HRCLERK" NOT IDENTIFIED</code> Click <b>OK</b> .
f.	Create Role: Privilege	Click <b>OK</b> .
g.	Confirmation	Click <b>OK</b> .
h.	Roles	Select <b>HRCLERK</b> . Select <b>Actions &gt; Grant Object Privileges</b>
i.	Grant Object Privileges Select Schema and Object Type	Set Schema to <b>HR</b> . Set Object Type to <b>Table</b> . Click the <b>Next</b> 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 <b>Next</b> icon.
k.	Grant Object Privileges: Grant Object Privileges	Check <b>Select</b> . Check <b>Update</b> . Click <b>Show SQL</b> .
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 <b>OK</b> .
m.	Grant Object Privileges: Grant Object Privileges	Click <b>OK</b> .
n.	Confirmation	Click <b>OK</b> .

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

<b>Step</b>	<b>Window/Page Description</b>	<b>Choices or Values</b>
a.	EM Express	Select <b>Security &gt; Roles</b> .
b.	Roles	Click <b>Create Role</b> .
c.	Create Role: New Role	Enter <b>HRMANAGER</b> as Role Name. Click the <b>Next</b> icon.
d.	Create Role: Privilege	Enter <b>HR</b> in the search box. Select <b>HRCLERK</b> and move it to the right pane. Click <b>OK</b> .
e.	Confirmation	Click <b>OK</b> .
f.	Roles	Select <b>HRMANAGER</b> . Click <b>Actions &gt; Grant Object Privileges</b>
g.	Grant Object Privileges Select Schema and Object Type	Set Schema to <b>HR</b> . Set Object Type to <b>Table</b> . Click the <b>Next</b> icon.
h.	Grant Object Privileges: Select Objects	Select all tables and move them to Selected Objects. Click the <b>Next</b> icon.
i.	Grant Object Privileges: Grant Object Privileges	Check <b>Delete</b> . Check <b>Insert</b> . Click <b>Show SQL</b> .
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 <b>OK</b> .
k.	Grant Object Privileges: Grant Object Privileges	Click <b>OK</b> .
l.	Confirmation	Click <b>OK</b> .

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### 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

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

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

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Practices for Lesson 9: Administering User Security

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



2. Create an account for Rachel Pandya, another new HR clerk. Modify the `P9script.sql` script to create the `RPANDYA` user.
- Open the `/home/oracle/P9script.sql` file in an editor. (These instructions assume that you are using gedit.)
  - Substitute `RPANDYA` for `DHAMBY` in every occurrence of `DHAMBY`.
  - Specify the password as `newuser`.
  - Check the script for SQL end-of-command delimiters ";" (semicolon). Add semicolons as necessary for correct syntax.
  - Add an exit command to the end of the file.
  - Save and close the file.
  - 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.

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
```

- 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>
```

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

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

- 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
```

- 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 scinal 107 rows.

- 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
```

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Practices for Lesson 9: Administering User Security

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## **Practices for Lesson 10: Managing Database Storage Structures**

**Chapter 10**

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Practices for Lesson 10: Managing Database Storage Structures  
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## 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.

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Practices for Lesson 10: Managing Database Storage Structures  
Chapter 10 - Page 2

## 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.

Databases

View  Oracle Load Map  Search List

Search  Go Advanced Search

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

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 <b>Administration &gt; Storage &gt; Tablespaces</b> .
b.	Database Login page (See the screenshot below.)	Username: <b>DBA1</b> Password: <b>oracle_4U</b> Role: <b>SYSDBA</b> Check <b>Save As</b> . Check <b>Set as Preferred Credentials</b> . Select <b>SYSDBA Database Credentials</b> . Click <b>Login</b> .

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**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 <b>EXAMPLE</b> 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 <b>Actions</b> drop-down list, select <b>Show Tablespace Contents</b> . Click <b>Go</b> .
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		<input type="button" value="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.

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 <b>INDEX</b> in the Type drop-down list. Click <b>Go</b> .
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

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## 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 <b>Tablespaces</b> page by clicking <b>Tablespaces</b> in the locator link at the top of the page.
b.	Tablespaces	On right side of the page, click <b>Create</b> .
c.	Create Tablespace	Tablespace Name: <b>INVENTORY</b> . Extent Management is <b>Locally Managed</b> . Type is <b>Permanent</b> . Status is <b>Read Write</b> . In the Datafiles region: Verify that "Use bigfile tablespace" is <i>not</i> selected. Click <b>Add</b> .

Tablespaces > Create Tablespace  
**Create Tablespace**

Logged in As SYS

General Storage

\* Name **INVENTORY**

Extent Management      Type      Status

Locally Managed       Permanent       Read Write  
 Dictionary Managed       Set as default permanent tablespace       Read Only  
 Undo       Encryption       Offline  
 Temporary       Set as default temporary tablespace

Undo Retention Guarantee  Yes  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)	Add
	No items found				

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

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)  
 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 <b>Storage</b> tab.
f.	Create Tablespace: Storage tab	Verify: Extent Allocation: <b>Automatic</b> Segment Space Management: <b>Automatic</b> Compression Options: <b>No Compression</b> Enable Logging: <b>Yes</b> Click the <b>General</b> tab.
g.	Create Tablespace: General tab	Click <b>Show SQL</b>
h.	Linux Desktop	Open a gedit editor window. Select <b>Applications &gt; Accessories &gt; gedit Text Editor</b> .

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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 <b>Return</b> .
l.	Create Tablespace	Click <b>Cancel</b> .
m.	gedit	Review the SQL command. Edit it if necessary. Ensure that it ends with a semicolon (;).
n.	gedit	Select <b>File &gt; Save as</b>
o.	Save As ...	Enter: <b>Name: P10script.sql</b> <b>Folder: oracle</b> Click <b>Save</b> .
p.	gedit	Select <b>File &gt; Quit</b> .

2. Execute the `P10script.sql` script that you just created.
- In a terminal window, change the directory to `~oracle`.
  - Set the Oracle environment for the `orcl` database.
  - 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?
- In a terminal window, navigate to the **\$LABS/P10** directory.

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

- 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, 30 MB and a second data file by using file system storage.** This second method should be done to demonstrate how to use the `show storage` command to view the supporting SQL statements.

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

**Show SQL**

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

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

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Practices for Lesson 10: Managing Database Storage Structures

Chapter 10 - Page 10

| 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><br>Click <b>Return</b> . |
| j.   | Edit Tablespace: INVENTORY | Click <b>Apply</b> .                                                                                                                           |

**Show SQL**

```
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
```

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

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

**Datafiles**

| 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 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**

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Practices for Lesson 11: Managing Space

Chapter 11 - Page 1

## 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.

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Practices for Lesson 11: Managing Space

Chapter 11 - Page 2

## 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,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;

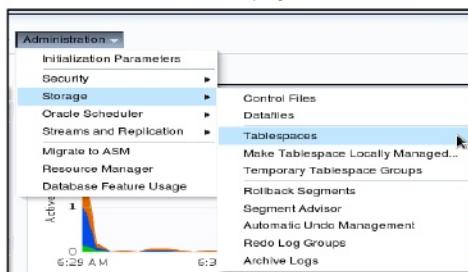
Tablespace created.

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**.

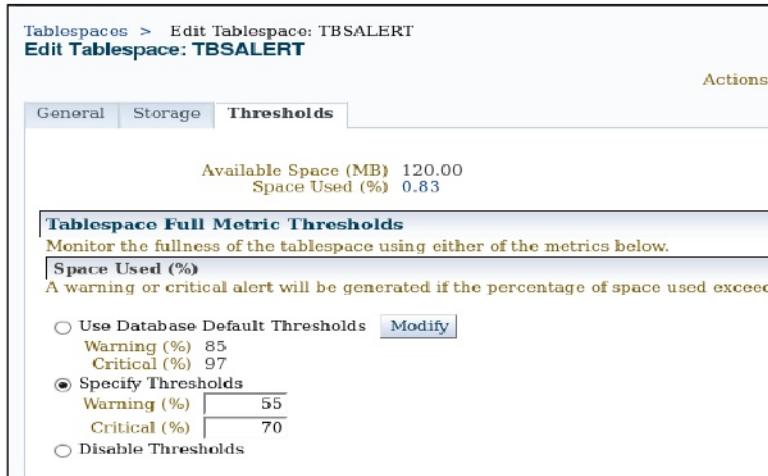
**Note:** If you are logged in as another user, click **Logout**. Select **Logout of orcl** and **Display login page after logout**. Then log in as the **SYS** user.

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**.



| 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    | 6,680.0            | 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**.



Tablespaces > Edit Tablespace: TBSALERT  
Edit Tablespace: TBSALERT

Actions

General Storage Thresholds

Available Space (MB) 120.00  
Space Used (%) 0.83

**Tablespace Full Metric Thresholds**  
Monitor the fullness of the tablespace using either of the metrics below.

**Space Used (%)**  
A warning or critical alert will be generated if the percentage of space used exceeds the threshold.

Use Database Default Thresholds [Modify](#)

Warning (%) 85  
Critical (%) 97

**Specify Thresholds**

|              |    |
|--------------|----|
| Warning (%)  | 55 |
| Critical (%) | 70 |

Disable Thresholds

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- 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.



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 ...
$
```

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Practices for Lesson 11: Managing Space

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9. Review and execute the **\$LABS/P11/seg\_advsr\_setup.sh** script that creates and populates new tables in the TBSALERT tablespace.
- 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;
```

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Practices for Lesson 11: Managing Space

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

- b. Execute the script:

```
$ ./seg_advsr_setup.sh

SQL> Connected.

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>
Table created.

SQL>
Table created.

SQL>
Table created.

SQL>
Table created.

SQL>
Table altered.

SQL>
Table altered.

SQL>

Table altered.

SQL>
Table altered.

SQL>
```

```
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:

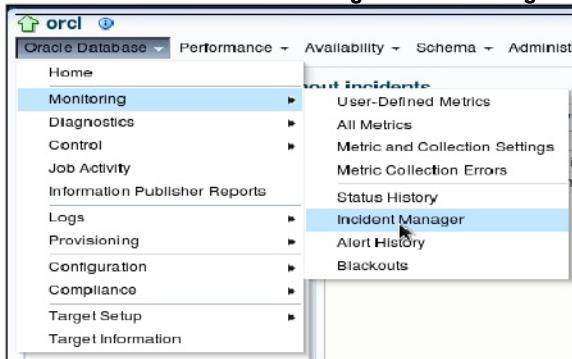
```
SQL> select reason  
2  from dba_outstanding_alerts  
3  where object_name='TBSALERT';  
  
REASON  
  
Tablespace [TBSALERT] is [60 percent] full  
SQL>
```

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

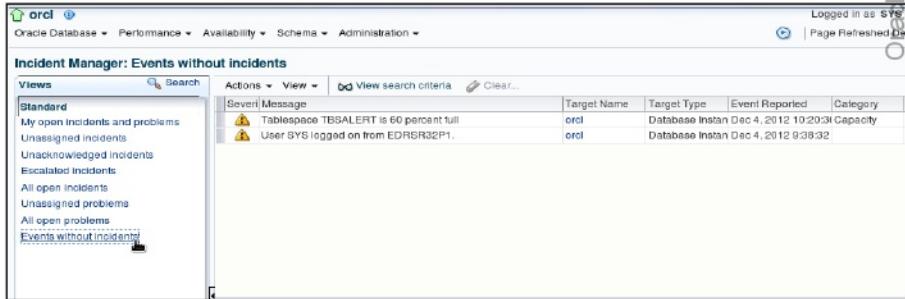
- In Enterprise Manager Cloud Control, return to the **Tablespaces** page.
- On the Tablespaces page, check the Allocated Space Used (%) column for the TBSALERT tablespace.



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



- Click **Events without incidents**.



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

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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.

| Select                           | Name      | Available Space Used(%) Alerts | Available Space Used(%) | Allocated Space Used(%) | Auto Extend |
|----------------------------------|-----------|--------------------------------|-------------------------|-------------------------|-------------|
| <input checked="" type="radio"/> | EXAMPLE   |                                | 1.0                     |                         | 90.3 YES    |
| <input type="radio"/>            | INVENTORY |                                | 2.9                     |                         | 2.9 NO      |
| <input type="radio"/>            | SYSAUX    |                                | 8.8                     |                         | 95.1 YES    |
| <input type="radio"/>            | SYSTEM    |                                | 2.6                     |                         | 99.6 YES    |
| <input type="radio"/>            | TBSALERT  |                                | 75.8                    |                         | 75.8 NO     |
| <input type="radio"/>            | TEMP      |                                | 0.0                     |                         | 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."

| Severity | Summary                                | Target | Priority | Status | Last Updated            | Owner | Ackno | Escala | Type     |
|----------|----------------------------------------|--------|----------|--------|-------------------------|-------|-------|--------|----------|
| critical | Tablespace TBSALERT is 75 percent full | orel   | 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.
```

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Practices for Lesson 11: Managing Space

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```
SQL> commit;
Commit complete.

SQL> delete employees3;
219136 rows deleted

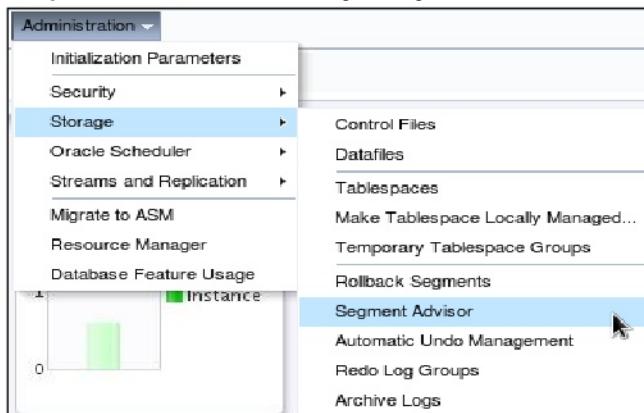
SQL> commit;
Commit complete.

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**.



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- 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: ord Logged In As: sys

**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.

Cancel Step 1 of 4 Next

- 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: Tablespace**

Database: ord Logged In As: sys

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

**Options**

Time Limit for Analysis

**Unlimited**

Limited

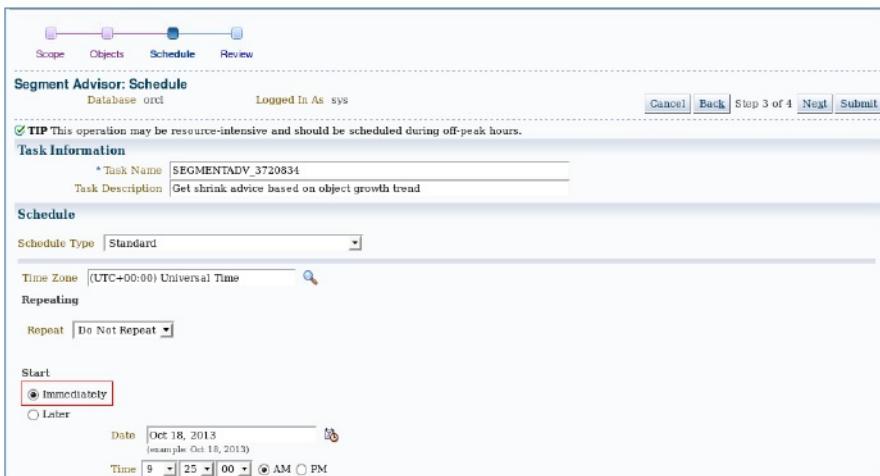
Time Limit (mins):

Advisory Results Retention (days):  30

Cancel Back Step 2 of 4 Next Submit Add

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

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g. On the Segment Advisor: Review page, click **Show SQL**.

h. Review the statements and click **Return**.

```
Execute task script
Review: Show SQL

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;

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

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

The screenshot shows the Segment Advisor: Review page. At the top, there is a progress bar with four steps: Scope, Objects, Schedule, and Review. The 'Review' step is highlighted. Below the progress bar, it says 'Logged in As sys'. The Task Name is 'SEGMENTADV\_3720834' and the Task Description is 'Get shrink advice based on object growth trend'. The Time Limit for Analysis (mins) is 'Unlimited' and the Advisory Results Retention (days) is '30'. Under 'Selected Objects', there is a table with one row: 'TBSALERT' under 'Tablespace' and 'PERMANENT' under 'Type'. At the bottom right, there are buttons for 'Cancel', 'Show SQL', 'Back', 'Step 4 of 4', and 'Submit'.

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

The screenshot shows the Segment Advisor Recommendations page. In the 'Related Links' section, 'Advisor Central' is highlighted with a red box. Other links include 'Run Segment Advisor Manually' and 'Job Scheduler'. To the right, there are sections for 'Automated Maintenance Tasks' and 'Chained Row Analysis'.

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

The screenshot shows the Advisor Tasks page. In the 'Search' section, 'Task Name' is set to 'SEGMENTADV\_3720834'. The results table shows two rows:

| 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.

The screenshot shows the Segment Space Recommendations page for task 'SEGMENTADV\_3720834'. It displays the following information:

- Task Name: SEGMENTADV\_3720834
- Status: COMPLETED
- Running Time (seconds): 6
- Started: Oct 18, 2013 9:15:48 AM UTC
- Ended: Oct 18, 2013 9:15:54 AM UTC
- Time Limit (mins): UNLIMITED

Below this, the 'Segment Space Recommendations' table shows the following data:

| 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 | <b>Shrink</b>  | 15.57                  |
| <input checked="" type="checkbox"/> | SYS    | EMPLOYEES2 | <b>Shrink</b>  | 15.57                  |
| <input checked="" type="checkbox"/> | SYS    | EMPLOYEES3 | <b>Shrink</b>  | 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\_8229407

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 AM

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- r. On the Scheduler Jobs page, click the **SQLSCRIPT\_nnnnnnn** link.

| Scheduler Jobs                                                     |         |                   |                                 |                                      |                                     |                                     |                        |                         |               |
|--------------------------------------------------------------------|---------|-------------------|---------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|------------------------|-------------------------|---------------|
| Page Refreshed Oct 18, 2013 9:22:38 AM UTC <a href="#">Refresh</a> |         |                   |                                 |                                      |                                     |                                     |                        |                         |               |
| <a href="#">Create</a>                                             |         |                   |                                 |                                      |                                     |                                     |                        |                         |               |
|                                                                    |         |                   |                                 |                                      |                                     |                                     |                        |                         |               |
| All                                                                | Running | History           |                                 |                                      |                                     |                                     |                        |                         |               |
|                                                                    |         |                   | <a href="#">View Job Status</a> | <a href="#">Stop Run</a>             | <a href="#">View Job Definition</a> | <a href="#">Edit Job Definition</a> | <a href="#">Delete</a> |                         |               |
| 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<br>9:22:36 AM<br>+00:00 | 1.83                                | .02                                 | 275                    | OTHER_GROUPS            | 0             |

- s. On the View Job page, scroll to the bottom of the page under Operation Details (you can click the **View Job** link to scroll to the bottom of the page under Operation Details if you need to.) Then click **OK**.

Scheduler Jobs > View Job: SYS SQLSCRIPT\_8229467 Logged in as SYS

**View Job: SYS.SQLSCRIPT\_8229467**

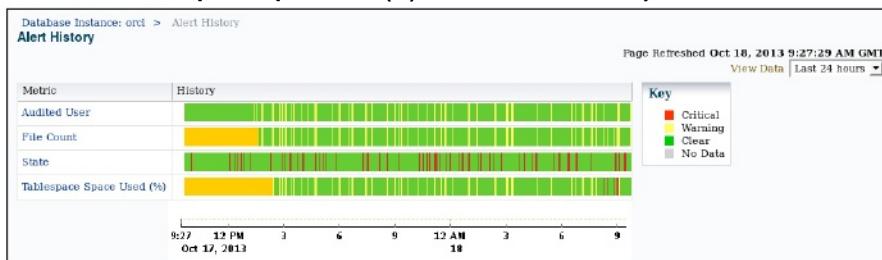
| General                                                                                                                                                                                                                        |                             | Schedule                       |                                   | Options                                                                                                                                               |        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--------------------------------|-----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Name                                                                                                                                                                                                                           | SQLSCRIPT_8229467           | Repeat                         | Do Not Repeat                     | Raise Events                                                                                                                                          | None   |
| Schema                                                                                                                                                                                                                         | SYS                         |                                |                                   | Maximum Run Duration (minutes)                                                                                                                        | None   |
| Enabled                                                                                                                                                                                                                        | FALSE                       | Start Date                     | Oct 18, 2013<br>9:22:36 AM<br>UTC | Priority                                                                                                                                              | Medium |
| Description                                                                                                                                                                                                                    | None                        |                                |                                   | Schedule Limit (minutes)                                                                                                                              | None   |
| Logging Level                                                                                                                                                                                                                  | Log job runs only<br>(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                         |                                   |                                                                                                                                                       |        |
| <pre>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;</pre> |                             |                                |                                   |                                                                                                                                                       |        |
| 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                                                                                                                                             |        |

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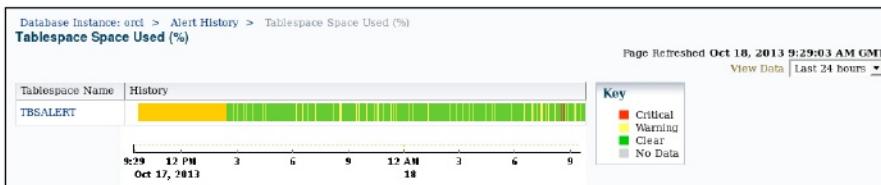
14. Wait a few minutes and check that there are no longer any outstanding alerts for the TBSALERT tablespace. Navigate to **Oracle Database > Monitoring > Incident Manager > Events without incidents.**

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.

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| Database Instance: orcl > Status History : Tablespace Space Used (%) |                         |                         |                        |                                        |
|----------------------------------------------------------------------|-------------------------|-------------------------|------------------------|----------------------------------------|
| Status History : Tablespace Space Used (%)                           |                         |                         |                        |                                        |
| 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

| Select                           | Name ▾   | Allocated Size(MB) | Space Used(MB) | Allocated Space Used(%) | Auto Extend |
|----------------------------------|----------|--------------------|----------------|-------------------------|-------------|
| <input checked="" type="radio"/> | EXAMPLE  | 357.5              | 323.1          | 90.4                    | YES         |
| <input type="radio"/>            | SYSAUX   | 800.0              | 759.8          | 95.0                    | YES         |
| <input type="radio"/>            | SYSTEM   | 790.0              | 786.2          | 99.5                    | YES         |
| <input type="radio"/>            | TBSALERT | 120.0              | 37.2           | 31.0                    | NO          |
| <input type="radio"/>            | TEMP     | 88.0               | 3.0            | 3.4                     | YES         |
| <input type="radio"/>            | UNDOTBS1 | 160.0              | 147.6          | 92.2                    | YES         |
| <input type="radio"/>            | USERS    | 5.0                | 1.7            | 33.8                    | YES         |

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 ...
$
```

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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>
$
```

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Practices for Lesson 11: Managing Space

Chapter 11 - Page 22

## **Practices for Lesson 12: Managing Undo Data**

### **Chapter 12**

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Practices for Lesson 12: Managing Undo Data

Chapter 12 - Page 1

## 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.

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Practices for Lesson 12: Managing Undo Data

Chapter 12 - Page 2

## 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: <b>Admin</b><br>Password: <b>oracle_4U</b>                                                                      |
| b.   | Cloud Control: Summary                         | Select <b>Targets &gt; Databases</b> .                                                                                |
| c.   | Databases                                      | Verify that <b>Search List</b> is selected.<br>Click <b>orcl</b> .                                                    |
| d.   | orcl                                           | Select <b>Administration &gt; Storage &gt; Automatic Undo Management</b>                                              |
| e.   | Database Login                                 | Credential: <b>Preferred</b><br>Preferred Credential Name: <b>SYSDBA Database Credentials</b><br>Click <b>Login</b> . |
| f.   | Automatic Undo Management: General tab         | Review the settings for the analysis.<br>Click the <b>System Activity</b> 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.

General    **System Activity**

**System Activity During Analysis Period**

|                                                  |                                                           |
|--------------------------------------------------|-----------------------------------------------------------|
| Selected Analysis Time Period                    | Nov 7, 2012 2:00:00 PM UTC To Nov 14, 2012 2:00:00 PM UTC |
| Longest Running Query (minutes)                  | 93.0                                                      |
| Average Undo Generation Rate (KB/minute)         | 365.0                                                     |
| Maximum Undo Generation Rate (KB/minute)         | 13,141.0                                                  |
| Queries failed due to low Retention              | 0                                                         |
| Transactions failed due to small Undo Tablespace | 0                                                         |

[Show Graph](#)

**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?

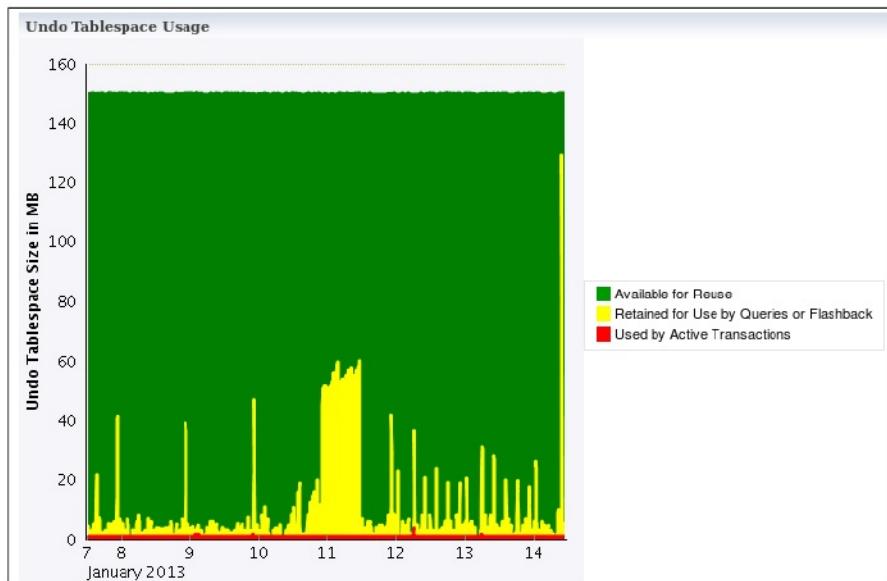
**Answer:** None. When the undo tablespace is set to auto-extend, transactions should not fail because of lack of space in the tablespace.

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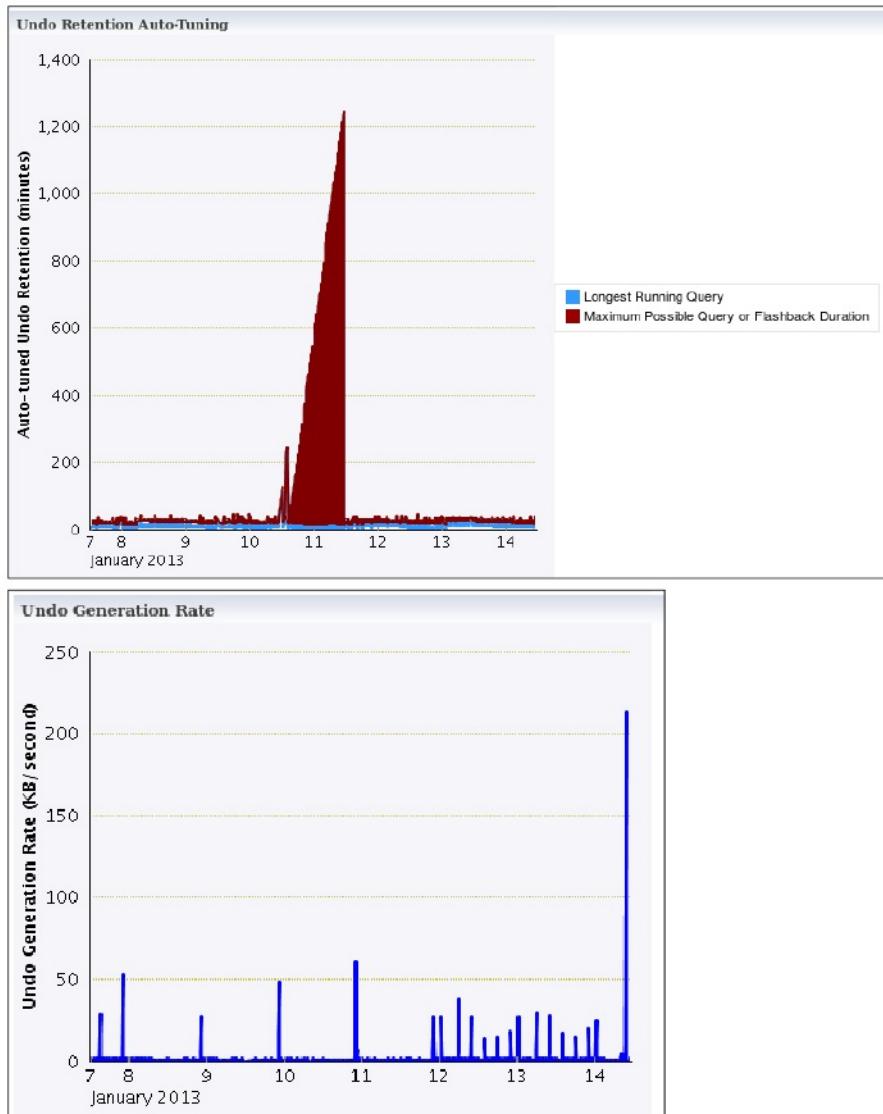
**Question:** Looking at the preceding screenshot, what is the duration of the longest running query?

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

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



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**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.

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Practices for Lesson 12: Managing Undo Data

Chapter 12 - Page 5

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

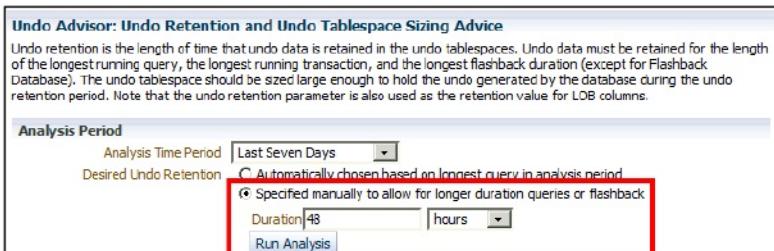
| Step | Window/Page Description                        | Choices or Values                                                                                                                                                                                          |
|------|------------------------------------------------|--------------------------------------------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

**Undo Advisor: Undo Retention and Undo Tablespace Sizing Advice**

Undo retention is the length of time that undo data is retained in the undo tablespaces. Undo data must be retained for the length of the longest running query, the longest running transaction, and the longest flashback duration (except for Flashback Database). The undo tablespace should be sized large enough to hold the undo generated by the database during the undo retention period. Note that the undo retention parameter is also used as the retention value for LOB columns.

**Analysis Period**

Analysis Time Period: Last Seven Days  
 Desired Undo Retention:  
 Specified manually to allow for longer duration queries or flashback.  
 Duration: 48 hours  
 Run Analysis



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

**Analysis Results**

Selected Analysis Time Period: Nov 7, 2012 3:00:00 PM UTC To Nov 14, 2012 3:00:00 PM UTC  
 Minimum Required Undo Tablespace Size (MB) 2316  
 Recommended Undo Tablespace Size (MB) 2316  
 TIP Oracle advises that you configure the undo tablespace to be three times the Recommended Undo Tablespace Size to allow for workload fluctuations.

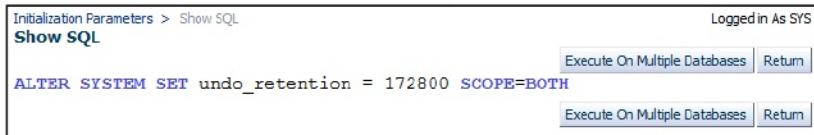
Potential Problems: No Problem Found  
 Recommendations: No Recommendation  
[Show Graph](#)



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 <b>Edit Undo Retention.</b>                                                                                |
| e.   | Initialization Parameters              | Set Value to <b>172800</b> seconds.<br>Check <b>Apply changes in current running instance(s) mode to SPFILE.</b> |

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



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

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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 Tablespace for this Instance |             |
|--------------------------|-------------|-----------------------------------|-------------|
| Undo Retention (minutes) | <b>2880</b> | Tablespace                        | UNDOTBS1    |
| Retention Guarantee      | No          | Size (MB)                         | <b>2316</b> |
|                          |             | Auto-Extensible                   | Yes         |

**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**

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Practices for Lesson 13: Managing Data Concurrency

Chapter 13 - Page 1

## 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.

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Practices for Lesson 13: Managing Data Concurrency

Chapter 13 - Page 2

## 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:

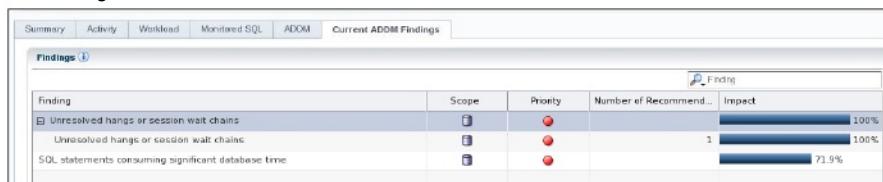
...
SQL> update hr.employees set salary=8300
   2 where employee_id = 110;
```

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Practices for Lesson 13: Managing Data Concurrency

Chapter 13 - Page 3

- 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.



- 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**.

---

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Practices for Lesson 13: Managing Data Concurrency

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

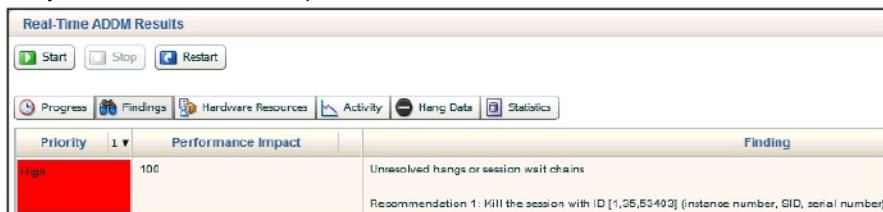
**Real-Time ADDM Results**

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

| Normal Connection                                                                              |                                                                      | Diagnostic Connection |  |
|------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------|--|
| <input checked="" type="checkbox"/> JDBC Connection to the Database                            | <input checked="" type="checkbox"/> Acquire SYSDBA Credentials       |                       |  |
| <input checked="" type="checkbox"/> Basic Meta-data (database version and number of instances) | <input checked="" type="checkbox"/> Session Activity by Wait Classes |                       |  |
| <input checked="" type="checkbox"/> Database and Instance Meta Data                            | <input checked="" type="checkbox"/> Hang Analysis Data               |                       |  |
| <input checked="" type="checkbox"/> Hang Analysis Data                                         | <input checked="" type="checkbox"/> I/O Metrics                      |                       |  |
| <input checked="" type="checkbox"/> Database Metrics                                           | <input checked="" type="checkbox"/> Host Metrics                     |                       |  |
| <input checked="" type="checkbox"/> Raw ASH Data                                               |                                                                      |                       |  |

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



**Real-Time ADDM Results**

Priority 1 ▾ Performance Impact Finding

|      |     |                                                                                                                                           |
|------|-----|-------------------------------------------------------------------------------------------------------------------------------------------|
| High | 100 | Unresolved hangs or session wait chains<br>Recommendation 1: Kill the session with ID [1,35,53403] (instance number, SID, serial number). |
|------|-----|-------------------------------------------------------------------------------------------------------------------------------------------|

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- 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 Name...   | Service   | Module   | Action       |
|------------|-------------|----------------|------------|-------------------|-----------|----------|--------------|
| 35         | 1           | 324            | NGREENBERG | sqlplus@EDRSR32P1 | 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 - |        | end: TX - row lock contention |

- h. Select Performance > Blocking Sessions.

| Select                           | Username          | Sessions Blocked | Session ID | Serial Number | SQL ID         | Wait Class  |
|----------------------------------|-------------------|------------------|------------|---------------|----------------|-------------|
| <input checked="" type="radio"/> | Blocking Sessions |                  |            |               |                |             |
| <input checked="" type="radio"/> | NGREENBERG        | 1                | 35         | 53403         |                | Idle        |
| <input type="radio"/>            | SMAVRIS           | 0                | 32         | 35443         | bk3sumaaapsy1b | 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**.

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- 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**

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Practices for Lesson 14: Implementing Oracle Database Auditing  
Chapter 14 - Page 1

## 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.

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Practices for Lesson 14: Implementing Oracle Database Auditing  
Chapter 14 - Page 2

## 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 LISTENERORCL listener.

```
$ lsnrctl stop listenerorcl  
  
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 ...
```

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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  
kznanang.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.

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Practices for Lesson 14: Implementing Oracle Database Auditing  
Chapter 14 - Page 6

## 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

- 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 <code>orcl</code> Database Home page.                                                                                                                |
| c.   | orcl database home       | Select <b>Administration &gt; Security &gt; Users</b> .                                                                                                              |
| d.   | Database Login           | Select:<br>Credential: <b>Preferred</b><br>Preferred Credential Name <b>SYSDBA Database Credentials</b><br><br>Click <b>Login</b> .                                  |
| e.   | Users                    | Click <b>Create</b> .                                                                                                                                                |
| f.   | Create User :General tab | Enter:<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.                                                                                                                                      |

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Practices for Lesson 14: Implementing Oracle Database Auditing

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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.

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Practices for Lesson 14: Implementing Oracle Database Auditing  
Chapter 14 - Page 8

## 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.JOB\$ table and apply it to multiple users.

### Assumptions

The AUDMGR user has been created. Several users with DML privileges on HR.JOB\$ 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.JOB\$ 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.JOB\$ 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.JOBs 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
-----      -----          20080      40000

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

1 row updated.

SQL> exit
```

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- 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
```

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- 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**

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Practices for Lesson 15: Backup and Recovery Concepts

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## Practices for Lesson 15

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### Practices Overview

There are no practices for this lesson.

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Practices for Lesson 15: Backup and Recovery Concepts

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

**Chapter 16**

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

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Practices for Lesson 16: Backup and Recovery Configuration

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## 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**.

| File Name     | File Direct...   | Created in Flash Recovery... | File Size |
|---------------|------------------|------------------------------|-----------|
| control02.ctl | /u01/app/oracle/ | No                           | 10MB      |
| control01.ctl | /u01/app/oracle/ | 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**.

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- 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). |                              |
|---------------------------------------------------------------------------------|------------------------------|
| View                                                                            | Set...                       |
| Name                                                                            | Value                        |
| <b>Ansi Compliance</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

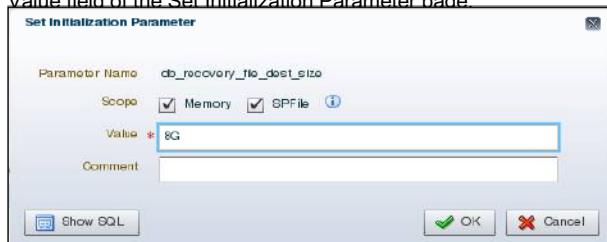
- d. *Question:* Which essential DBA tasks can you perform in this section?

*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.



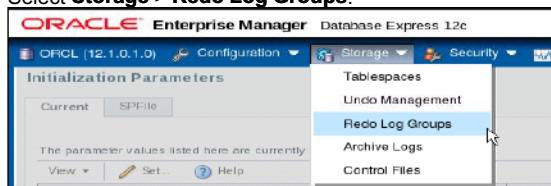
- g. Optionally, click **Show SQL**, review the statement, and click **OK**.

```
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**.

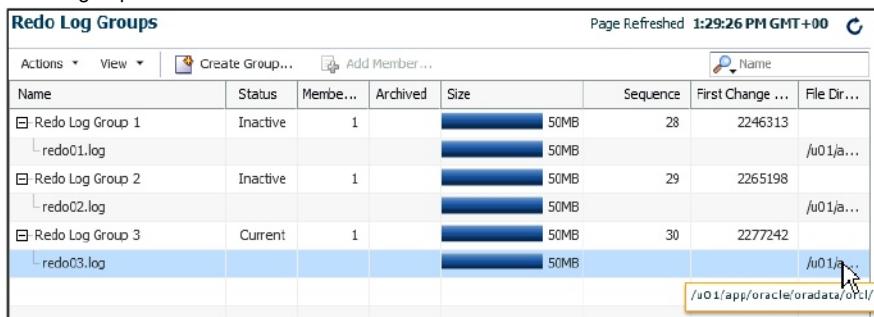
3. Check how many members each redo log group has. Ensure that there are at least two redo log members in each group. One set of members should be stored in the fast recovery area.

- a. Select **Storage > Redo Log Groups**.



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- 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          | /u01/a...   |
| redo01.log       |          |          |          | 50MB |          |                  | /u01/a...   |
| Redo Log Group 2 | Inactive | 1        |          | 50MB | 29       | 2265198          | /u01/a...   |
| redo02.log       |          |          |          | 50MB |          |                  | /u01/a...   |
| Redo Log Group 3 | Current  | 1        |          | 50MB | 30       | 2277242          | /u01/a...   |
| 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 **redo0nb.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**.

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- 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 Ch.. | File Directory                |
|------------------|----------|--------------|----------|-------|----------|------------|-------------------------------|
| Redo Log Group 1 | Inactive | 2            |          | 100MB | 595      | 33931725   |                               |
| redo01.log       |          |              |          | 50MB  |          |            | /u01/app/oracle/oradata/orcl/ |
| redo01b.log      |          |              |          | 50MB  |          |            | /u01/app/oracle/oradata/orcl/ |
| Redo Log Group 2 | Current  | 1            |          | 100MB | 596      | 33936712   |                               |
| redo02.log       |          |              |          | 50MB  |          |            | /u01/app/oracle/oradata/orcl/ |
| Redo Log Group 3 | Inactive | 1            |          | 100MB | 594      | 33906379   |                               |
| redo03.log       |          |              |          | 50MB  |          |            | /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 Ch.. | File Directory                |
|------------------|----------|--------------|----------|-------|----------|------------|-------------------------------|
| Redo Log Group 1 | Inactive | 2            |          | 100MB | 595      | 33931725   |                               |
| redo01.log       |          |              |          | 50MB  |          |            | /u01/app/oracle/oradata/orcl/ |
| redo01b.log      |          |              |          | 50MB  |          |            | /u01/app/oracle/oradata/orcl/ |
| Redo Log Group 2 | Current  | 2            |          | 100MB | 596      | 33936712   |                               |
| redo02.log       |          |              |          | 50MB  |          |            | /u01/app/oracle/oradata/orcl/ |
| redo02b.log      |          |              |          | 50MB  |          |            | /u01/app/oracle/oradata/orcl/ |
| Redo Log Group 3 | Inactive | 2            |          | 100MB | 594      | 33906379   |                               |
| redo03.log       |          |              |          | 50MB  |          |            | /u01/app/oracle/oradata/orcl/ |
| redo03b.log      |          |              |          | 50MB  |          |            | /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 a value. This means that 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.

- a. 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>
```

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Practices for Lesson 16: Backup and Recovery Configuration

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- 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**

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Practices for Lesson 17: Performing Database Backups

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## Practices for Lesson 17: Overview

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### Practices Overview

In these practices, you will create backups of your database so that you can recover from various types of failures.

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Practices for Lesson 17: Performing Database Backups

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## Practice 17-1: Backing Up the Control File

### Overview

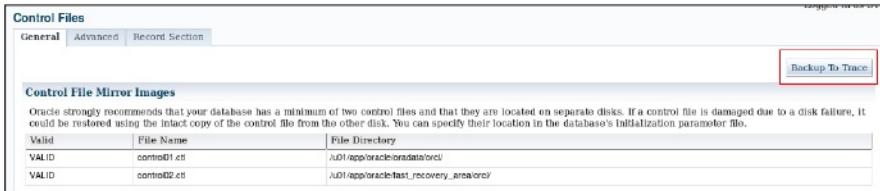
In this practice, you back up your control file to a trace file, creating a file of SQL commands that can be used to re-create the control file.

### Assumptions

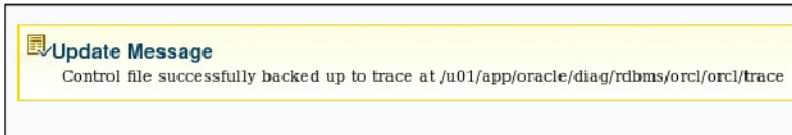
Practices for Lesson 16 have been successfully completed.

### 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**.



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
```

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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 interface for database 'orcl'. The navigation bar at the top includes 'Enterprise', 'Targets', 'Favorites', and 'History'. Below the navigation bar, the main menu has 'Availability' selected. A dropdown menu from 'Availability' contains 'Backup & Recovery', which is also highlighted. A sub-menu for 'Backup & Recovery' lists several options: 'Schedule Backup...', 'Manage Current Backups', 'Back up Reports', 'Restore Points', 'Perform Recovery...', 'Transactions', 'Backup Settings' (which is currently being selected), 'Recovery Settings', and 'Recovery Catalog Settings'. The 'Backup Settings' option is highlighted with a blue selection bar and a cursor arrow pointing to it.

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 includes 'Availability' under 'Backup & Recovery'. The main content area is titled 'Backup Settings' and has tabs for 'Device', 'Backup Set', and 'Policy'. The 'Policy' tab is selected. Under the 'Policy' tab, there is a section titled 'Backup Policy' with a checked checkbox labeled 'Automatically backup the control file and server parameter file (SPFILE) with every backup and database structural change'. Below this checkbox is a section titled 'Autobackup Disk Location' with a text input field containing the path 'C:\ORACLE\product\12.1.0\oradata\orcl\control01.f' and a descriptive note: '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.'

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Practices for Lesson 17: Performing Database Backups

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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 oracle  
\* Password \*\*\*\*\*  
 Save As  
Test Test Successful.

6. Click **OK**.

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Practices for Lesson 17: Performing Database Backups  
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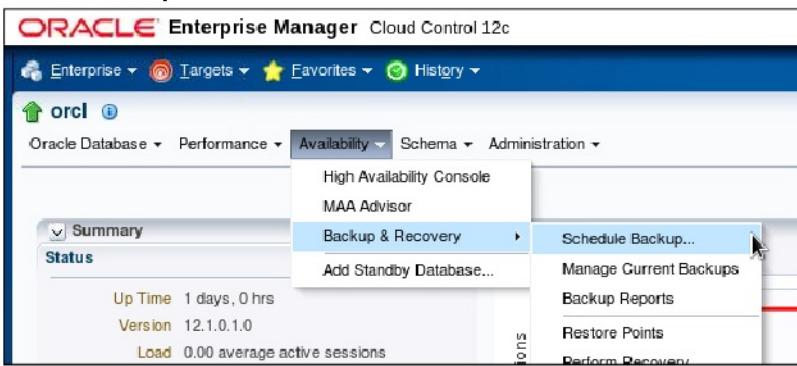
## Practice 17-3: Creating a Whole Database Backup

### 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' dialog box. It has two main sections: 'Oracle-Suggested Backup' and 'Customized Backup'. The 'Oracle-Suggested Backup' section contains a note about automated backups and a button to 'Schedule Oracle-Suggested Backup'. The 'Customized Backup' section contains a note about selecting objects to back up and a list of backup types: Whole Database (selected with a radio button), Tablespaces, Datafiles, Archived Logs, and All Recovery Files on Disk. A note below says it includes all archived logs and disk backups not already backed up to tape. There are buttons for 'Schedule Oracle-Suggested Backup' and 'Schedule Customized Backup'.

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**.

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Practices for Lesson 17: Performing Database Backups

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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](#)

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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**.

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10. Click the refresh icon on the right side of page until you see that the job has completed successfully.

The screenshot shows the Oracle Database Control interface for the 'orcl' database. The top navigation bar includes 'Delete Run', 'Edit', and 'View Definition'. Below this is a 'Log Report' button. The main area is titled 'Summary' and displays the following details:

- Status:** Succeeded
- Scheduled:** Oct 21, 2013 11:33:13 AM GMT+00:00
- Started:** Oct 21, 2013 11:33:18 AM GMT+00:00
- Ended:** Oct 21, 2013 11:36:14 AM GMT+00:00
- Elapsed Time:** 2 minutes, 56 seconds

On the right side, there are several configuration parameters:

- Type: Database Backup
- Owner: ADMIN
- Description: Oracle Database Backup
- Execution ID: E93F81B7AEAD7AC2E0437023B96B0D5E
- Backup Strategy: advanced
- Version 10g or higher: YES
- Database Connect String: (DESCRIPTION=(ADDRESS\_LIST=(ADDR...
- Database Name: ORCL
- Blockout: NO
- Encryption Mode: None
- Offline Backup: NO
- Oracle Home: /u01/app/oracle/product/12.1.0/d...
- Oracle SID: orcl
- Backup Script: Show

Below these settings is a target selection section with a dropdown set to 'All' and a 'Go' button. A link to 'Expand All' is also present.

| 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 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 | 2.6 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.

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## **Practices for Lesson 18: Performing Database Recovery**

**Chapter 18**

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Practices for Lesson 18: Performing Database Recovery  
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## Practices for Lesson 18: Overview

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### Practices Overview

In this practice, you will use the Data Recovery Advisor to recover a lost data file.

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Practices for Lesson 18: Performing Database Recovery

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## 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."
```

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Practices for Lesson 18: Performing Database Recovery

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```
"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     |
|----------|------------------------------------------------|--------|----------|--------|--------------------------|-------|-------|--------|----------|
| Info     | Checker run found 1 new persistent data : orcl | None   | New      | 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 header bar contains the link "Database Failures - 1". The main content area is titled "Perform Recovery". Under "Oracle Advised Recovery", it states: "The Data Recovery Advisor has detected failures. Click on "Advise and Recover" to have Oracle analyze and produce recovery advice." A button labeled "Advise and Recover" is shown. Below this, it says "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 section for "Recovery Scope" set to "Whole Database" with 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". A section titled "Decrypt Backups" is also visible. At the bottom, under "Host Credentials", it says "Supply operating system login credentials to access the target database." It shows a "Credential" dropdown set to "Preferred" (radio button selected), "Named" (radio button selected), and "New" (radio button). The "Credential Name" dropdown is set to "NC\_ORCL\_2013-10-21-113057". A table titled "Credential Details" shows two rows: "UserName" with value "oracle" and "Password" with value "\*\*\*\*\*". A "More Details" link is at the bottom of this section.

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- 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".

**Manual Action Details**

If file /u01/app/oracle/standalone/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';
```

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- 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';
```

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- k. A processing page appears and then the Job Activity page appears. Click the job name link.

The screenshot shows the 'Job Activity' page for the 'orcl' database. A yellow box highlights the 'Confirmation' section, which displays the message: 'The job was created successfully' and 'RECOVERY\_ORCL\_000041'.

- 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' page for job 'RECOVERY\_ORCL\_000041'. It displays the 'Summary' section with the status 'Succeeded' highlighted in a red box. Other details include the scheduled time (Oct 21, 2013 12:09:42 PM GMT+00:00), start time (Oct 21, 2013 12:09:50 PM GMT+00:00), end time (Oct 21, 2013 12:10:40 PM GMT+00:00), and 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
$
```

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- 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 tabs for 'Actions', 'View', 'Search', 'View search criteria', and 'Acknowledge'. A red box highlights the 'Acknowledge' button. Below these are columns for Severity, Summary, Target, Priority, Status, Last Updated, Owner, Ackno, Escal, and Type. One row is visible: 'Checker run found 1 new persistent data orcl' with status 'New'.

| Severity | Summary                                      | Target | Priority | Status | Last Updated             | Owner | Ackno | Escal | 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.

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Practices for Lesson 18: Performing Database Recovery  
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## **Practices for Lesson 19: Moving Data**

**Chapter 19**

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Practices for Lesson 19: Moving Data

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## 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.

- 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
$
```

- 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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```
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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
```

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```

. . 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.
- 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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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
```

---

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Practices for Lesson 19: Moving Data

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```
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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Practices for Lesson 19: Moving Data

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```
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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
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.

- a. 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
$
```

- b. 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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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
```

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Practices for Lesson 19: Moving Data

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```
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

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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.
```

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Practices for Lesson 19: Moving Data

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```
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

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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

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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

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Practices for Lesson 19: Moving Data

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```
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.

$
```

---

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Practices for Lesson 19: Moving Data

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## **Practices for Lesson 20: Database Maintenance**

### **Chapter 20**

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Practices for Lesson 20: Database Maintenance

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## 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.

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Practices for Lesson 20: Database Maintenance

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## 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\_ADVVISOR package to set the database activity time to 30 minutes. The test

script running as the SPCT user drops and recreates the SPCT table and gathers statistics for this table. It also creates a snapshot in AWR. Execute the lab\_20\_01\_03 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 <b>orcl</b> Database Home page.           |
| c.   | orcl Database Home      | Select <b>Performance &gt; Performance Home</b> .         |

---

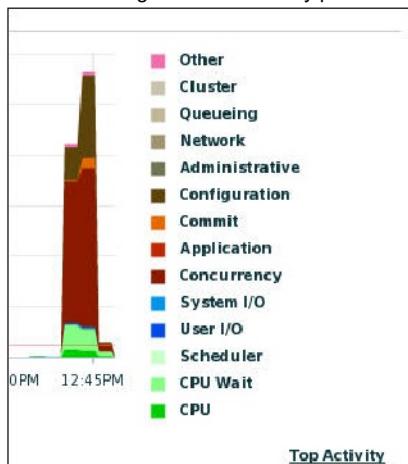
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Practices for Lesson 20: Database Maintenance

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| Step | Window/Page Description | Choices or Values                                                                                                                                                                         |
|------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| d.   | Database Login          | Credentials: <b>Preferred</b><br>Preferred Credential Name: <b>SYSDBA</b><br><b>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.
```

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Practices for Lesson 20: Database Maintenance

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```

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**

SQL statements consuming significant database time were found. These statements offer a good opportunity for performance improvement. [Finding History](#)

|                                    |                            |
|------------------------------------|----------------------------|
| Finding 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**

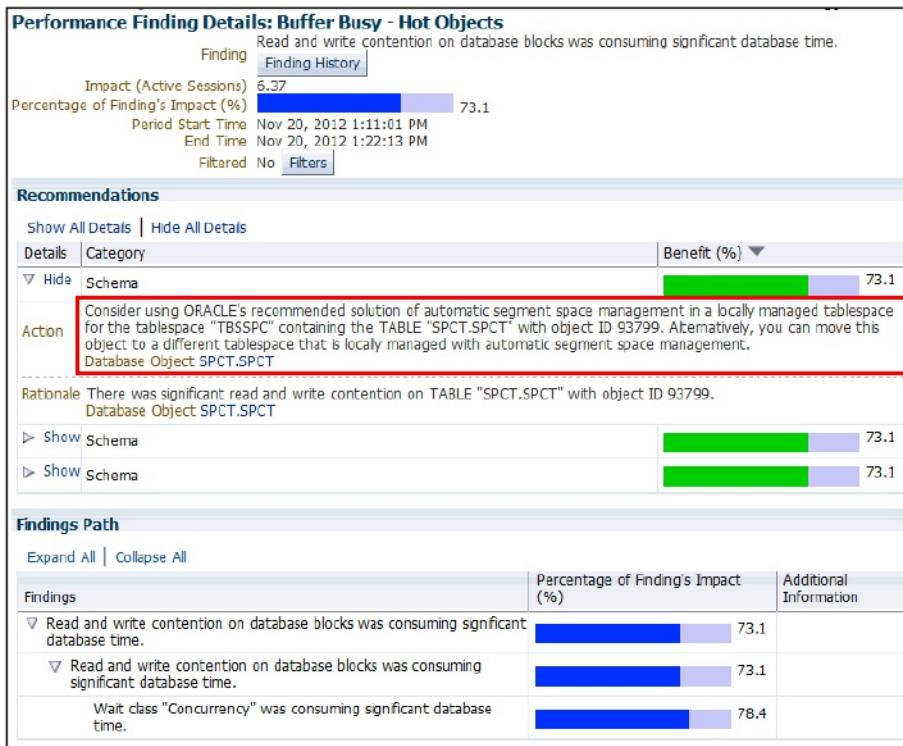
Show All Details | Hide All Details

| Details           | Category                                                                                                                                                                                                         | Benefit (%) |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| ▼ Hide SQL Tuning |                                                                                                                                                                                                                  | 95.4        |
| Action            | Investigate the INSERT statement with SQL_ID "3csh3g3mjhzmh" for possible performance improvements. You can supplement the information given here with an ASH report for this SQL_ID.                            |             |
| SQL Text          | SQL ID 3csh3g3mjhzmh                                                                                                                                                                                             |             |
| 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 "3csh3g3mjhzmh".                                      |             |
| Rationale         | Waiting for event "eng: MR - flush space" in wait class "Other" accounted for 14% of the database time spent in processing the SQL statement with SQL_ID "3csh3g3mjhzmh".                                        |             |
| 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 "3csh3g3mjhzmh".                                  |             |
| 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 "3csh3g3mjhzmh".                             |             |
| SQL Text          | SQL ID 0k8um5gmv428v                                                                                                                                                                                             |             |

- 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.

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7. 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. |

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Practices for Lesson 20: Database Maintenance

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| 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>"TBSPPC02" DATAFILE<br>"/U01/app/oracle/oradata/orcl/tbsppc02.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 ...
$
```

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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.

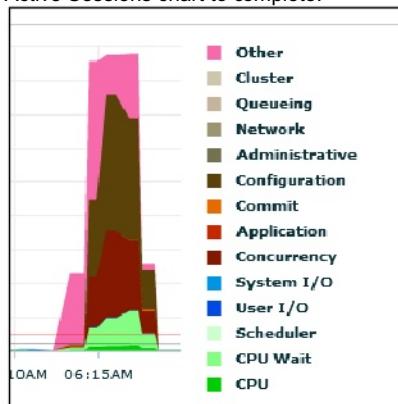
In a terminal window, enter the following. You may have to press Enter after you see that several PL/SQL procedures have completed, in order to see the command prompt again.

```
$ ./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-second refresh cycle. After a while, you should see a spike on the Average Active Sessions graph. Hint: This is the 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.

| <b>Step</b> | <b>Window/Page Description</b>               | <b>Choices or Values</b>                       |
|-------------|----------------------------------------------|------------------------------------------------|
| 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...
```

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## **Practices for Lesson 21: Managing Performance**

**Chapter 21**

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Practices for Lesson 21: Managing Performance

Chapter 21 - Page 1

## 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.

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Practices for Lesson 21: Managing Performance

Chapter 21 - Page 2

## 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
```

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Practices for Lesson 21: Managing Performance

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```
--  
-- ***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  
-----  
COMMISSION_PCT MANAGER_ID DEPARTMENT_ID  
-----  
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  
EMPLOYEE_ID FIRST_NAME LAST_NAME
```

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---

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```

----- 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)

Session Details: 51 (HR)

Collected From Target Nov 29, 2012 11:42:32 AM

Logged in As SYS

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

| Server                                                                                                                                                                                                                                          | Client                                                                                                                                             | Application                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Current Status INACTIVE<br>Serial Number 18053<br>DB User Name HR<br>OS Process ID 22451<br>Login Time Nov 29, 2012 11:39:25 AM<br>Login Duration 3:7 (nm:ss)<br>Connection Type DEDICATED<br>Type USER<br>Resource Consumer Group OTHER_GROUPS | OS User Name oracle<br>OS Process ID 22320<br>Host EDRSR32P1<br>Terminal pts/6<br>Current Client ID Unavailable<br>Current Client Info Unavailable | Current SQL None<br>Current SQL Command UNKNOWN<br>Previous SQL bckcqw5pd108f<br>Last Call Duration 2:31 (nm:ss)<br>SQL Trace DISABLED<br>Current SQL Trace Level 1<br>Trace With Wait Information DISABLED<br>Trace With Bind Information DISABLED<br>Open Cursors 53<br>Program sqlplus@EDRSR32P1 (TNS V1-V3)<br>Service orcl<br>Current Module SQL*Plus<br>Current Action Unavailable |

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| 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<br>GMT+00:00 | Parsing Schema | HR Optimizer Mode | ALL_ROWS |  |
|---------------------------------|------------------------------------------|--------------|---------------------------------------|----------------|-------------------|----------|--|
| Additional Information          |                                          |              |                                       |                |                   |          |  |
| <input type="radio"/> Graphical | <input checked="" type="radio"/> Tabular |              |                                       |                |                   |          |  |
| Operation                       | Object                                   | Predicat     | Pruning                               | Operation Cost | Estimated Rows    | Estim    |  |
| SELECT STATEMENT                | 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.

4. 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.                                                                                                  |

Indexes      Logged

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

| Select                              | Table Owner | Table     | Indexed Columns | Index Owner | Index              | Table Type | Tablespace | Partitioned | Last Analyzed     |
|-------------------------------------|-------------|-----------|-----------------|-------------|--------------------|------------|------------|-------------|-------------------|
| <input checked="" type="checkbox"/> | HR          | EMPLOYEES | DEPARTMENT_ID   | HR          | EMP_DEPARTMENT_IDX | 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_IDX        | 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';
```

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| 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 Control interface. At the top, it says 'orcl > Job Activity > Job Run: REORGANIZE\_ORCL\_41' and 'Page Refreshed Nov 29, 2012 12:36:18 PM UTC'. Below this, there are three buttons: 'Delete Run', 'Edit', and 'View Definition'. A 'Summary' section follows, containing details about 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: CFA27F3A22686E48E0438423B98BFC9E
- Script: /u01/app/oracle/product/12.1.0/d...

Below the summary, there's a 'Targets' section with a dropdown set to 'All' and a 'Go' button. Underneath are 'Expand All' and 'Collapse All' links. A table lists the steps of the job run:

| 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.

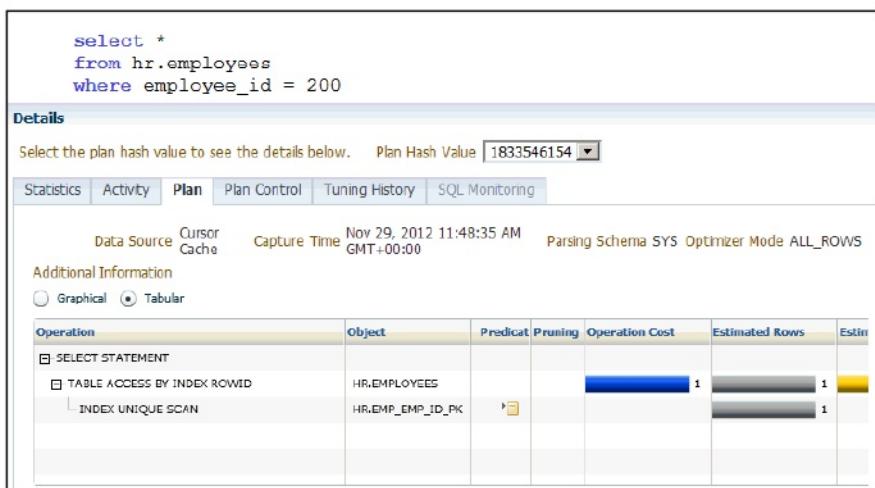
- a. Enter the following at the SQL\*Plus prompt:

```
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
```

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```
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
```

---

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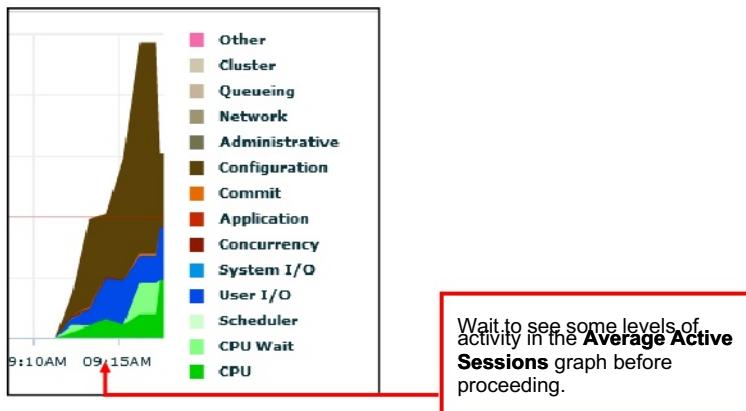
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PL/SQL procedure successfully completed.  
Load is now being generated.

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 | View the Average Active session Graph at the bottom of the page.<br><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> |



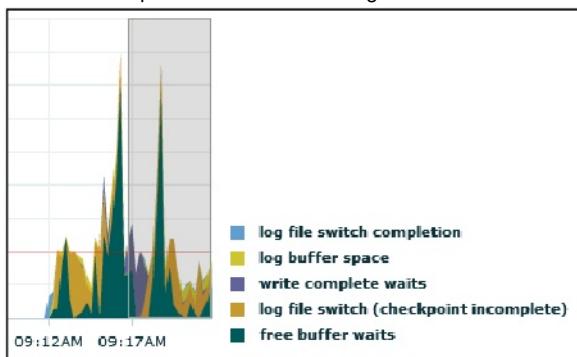
**Question 1:** In the **Average Active Sessions** graph, which two main categories are active sessions waiting for?

**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. |

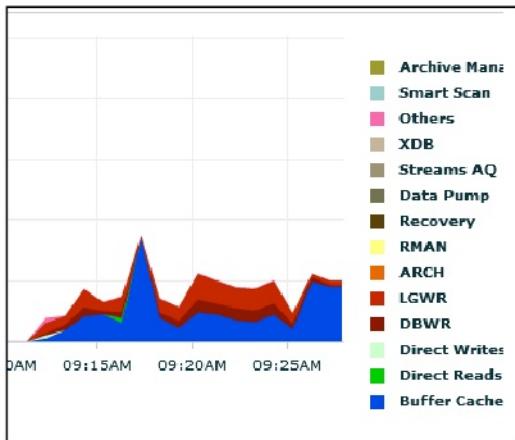
**Answer:** Any one of the waits listed in the screenshot below, but free buffer waits and log file switch completion seem to be the highest contributors:



| Step | Window/Page Description                  | Choices or Values                                                                                                                          |
|------|------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| e.   | Active Sessions Waiting: Configuration   | Click the browser's Back button.                                                                                                           |
| f.   | Database Instance: orcl 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 Performance Home | Scroll down to the "I/O Megabytes per Second" 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<br>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                  |                                                                                                                                                                          |

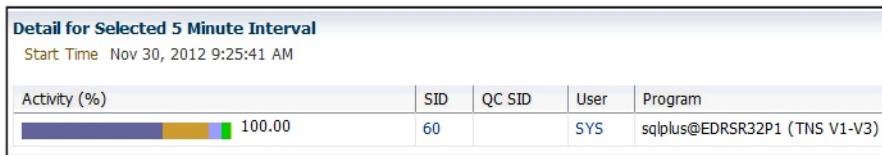
**Detail for Selected 5 Minute Interval**  
Start Time Nov 30, 2012 9:25:41 AM

**Top SQL**

| 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   |

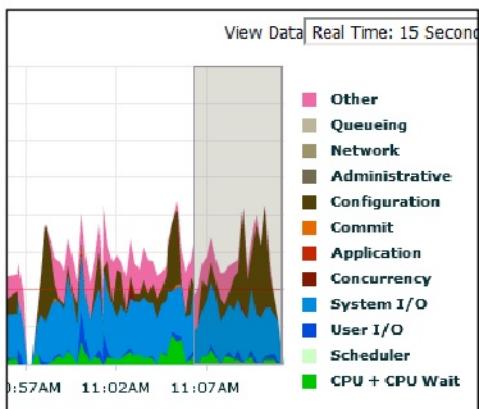
11. Kill the session that is generating the load. Use the session ID recorded in step 9. The session ID is listed in the **SID** column of "Detail for Selected 5 Minute Interval."

| Step | Window/Page Description    | Choices or Values                                                                                                                                                                                                                                                                                                                                                            |
|------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a.   | SQL Details: 0qqwcxx1quwuv | 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 Detail (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 Detail (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. |

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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
$
```

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## 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;
```

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```
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...
```

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- 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
 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> 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> 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 dba/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> 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 tabsa s group by a);

COUNT(*)
-----
100000

```

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```
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 INITIALIZING
   COMPLETE
   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 |

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```

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.

```

SQL> @amm_query2.sql
SQL> select /*+ PARALLEL(s 25) */ count(*) from (select /*+
parallel(s 25) */ * from tabsga s group by a);

----- 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

```

```

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 INITIALIZ      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

```

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|                      |           |        |           |          |
|----------------------|-----------|--------|-----------|----------|
| 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 |

|                      |            |           | DEFERRED  | COMPLETE           |
|----------------------|------------|-----------|-----------|--------------------|
| DEFAULT buffer cache | 125829120  | SHRINK    |           |                    |
| 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 |

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```

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 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 INITIALIZ      COMPLETE
                           ING
                           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
                           GROW      IMMEDIATE COMPLETE
DEFAULT buffer cache   134217728 SHRINK      IMMEDIATE COMPLETE
shared pool            146800640 GROW      IMMEDIATE COMPLETE
DEFAULT buffer cache   213909504 GROW      DEFERRED   COMPLETE
```

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|                      |           |        |           |          |
|----------------------|-----------|--------|-----------|----------|
| 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 |

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|                      |            |           |           |          |
|----------------------|------------|-----------|-----------|----------|
| 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 |
| 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 |

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Practices for Lesson 21: Managing Performance

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```

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?

| <b>Step</b> | <b>Window/Page Description</b>  | <b>Choices or Values</b>                                                                                               |
|-------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------|
| a.          | Cloud Control                   | Log in to Enterprise Manager Cloud Control as the ADMIN user and navigate to the <code>orcl</code> Database Home page. |
| b.          | <code>orcl</code> 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 `srcinal SPFILE`, and restart your `orc1` 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.
```

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Practices for Lesson 21: Managing Performance

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```
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 ...  
$
```

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## 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 [cntl]-[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> host lsnrctl services listenerorcl
```

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```
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 |
|------|------|-------|
|      |      |       |

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- 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

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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> 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

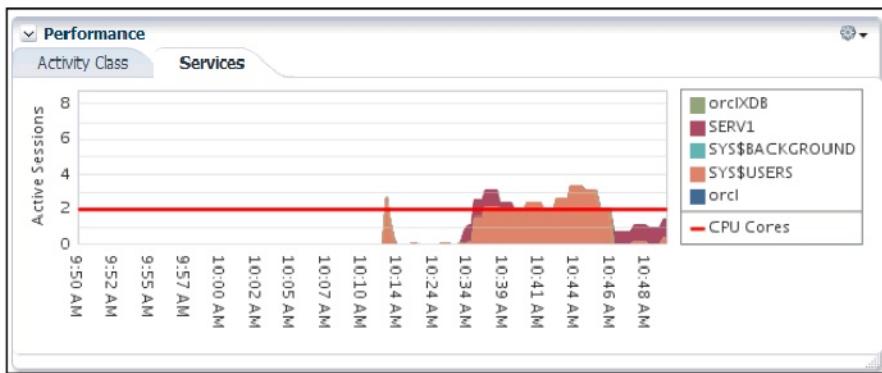
**Note:** Do not wait for the script to complete before proceeding to the next step.

```
$ 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 /
```

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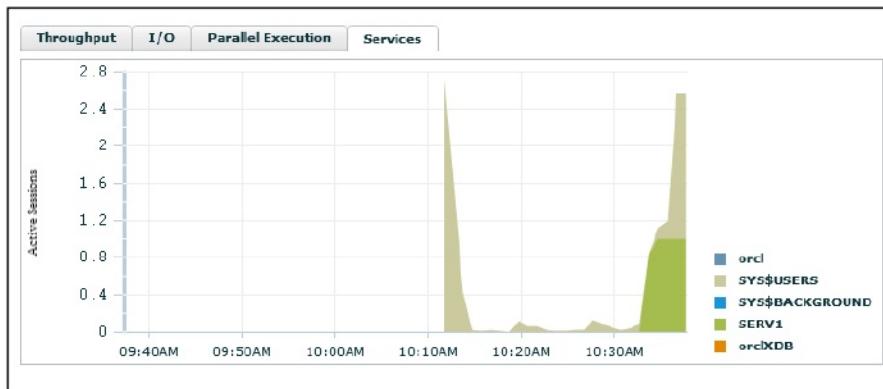
5. After the execution starts, access the Top Consumers page on the Performance tabbed page in Cloud Control, and determine the amount of resources SERV1 is using. Also, check the statistics on your service with V\$SERVICE\_STATS from a SQL\*Plus session connected as SYSDBA.

| 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.      |

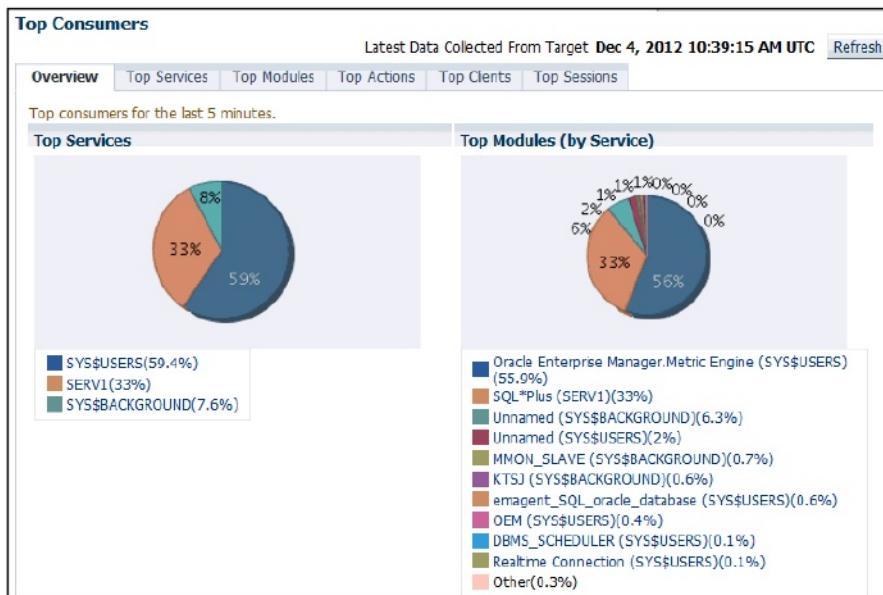


An Active Session graph with the activity aggregated by service name is displayed. The network service name of each connection is recorded as a separate service. Therefore, all the connections made without a service name are aggregated, as are all the connections made as SERV1.

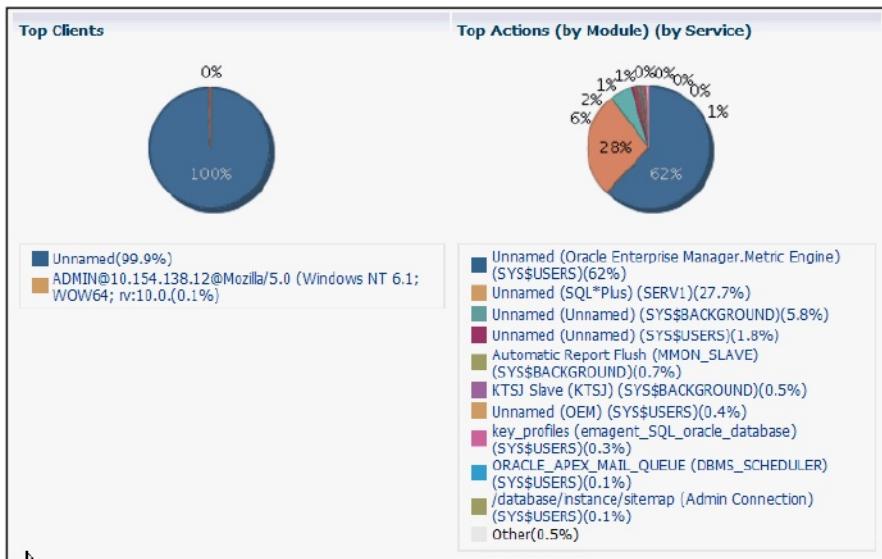
| Step | Window/Page Description | Choices or Values                                                                                       |
|------|-------------------------|---------------------------------------------------------------------------------------------------------|
| c.   | orcl Database 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.                                               |



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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                          |

6. 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
```

7. Clean up from this practice by executing the `sv1_cleanup.sh` script in the `$LABS/P21` directory.

```
$ cd $LABS/P21
$ ./sv1_cleanup.sh
```

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## **Practices for Lesson 22: Managing Performance SQL Tuning**

**Chapter 22**

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Practices for Lesson 22: Managing Performance SQL Tuning  
Chapter 22 - Page 1

## 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

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Practices for Lesson 22: Managing Performance SQL Tuning  
Chapter 22 - Page 2

## 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**

BEGIN  
dbms\_sqltune.set\_auto\_tuning\_task\_parameter(  
'ACCEPT\_SQL\_PROFILES', 'TRUE');  
END;

**Return**

| 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
```

---

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```
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!
$
```

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- 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
```

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```
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.

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5. 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 srcln 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
$
```

6. 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
$
```

7. 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

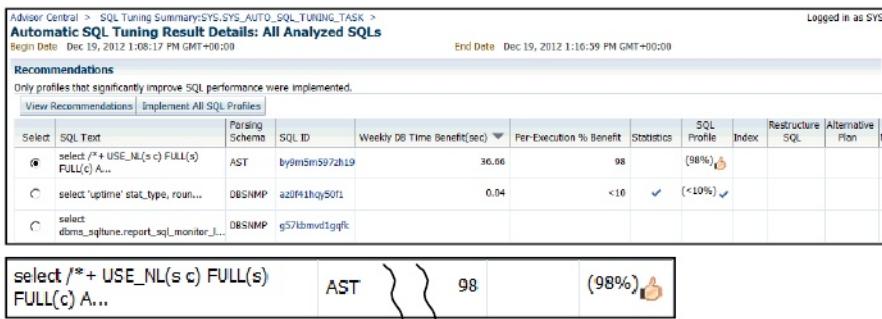
**TIP** Key SQL Profiles were verified to yield at least a 3X performance improvement and would have auto-implementation been enabled.

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.



- Click **View Recommendations**.

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- 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**

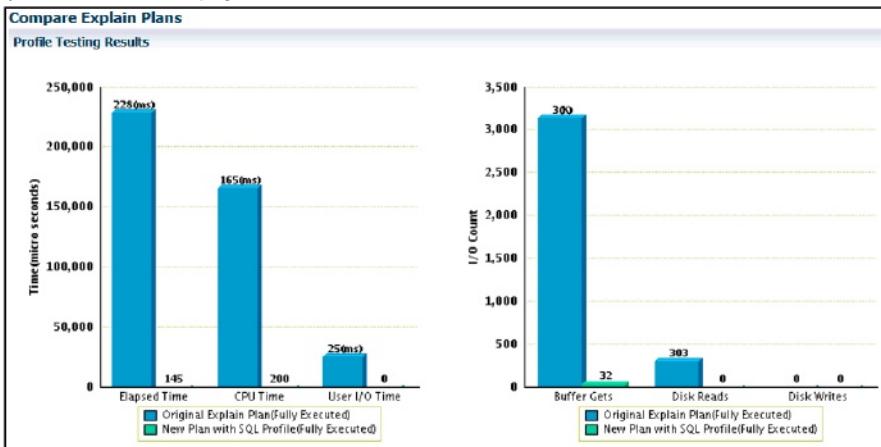
SQL Text: select /\*+ USE\_NL(s c) FULL(s) FULL(c) AST \*/ c.cust\_id, sum(s.quantity\_sold) from sh.sales s, sh.customers c where s.cust\_id = c.cust\_id and c.cust\_id < 2 group by c.cust\_id

**Select Recommendation**

Original Explain Plan (Annotated)

| Select                                       | Type                                                                                                                                             | Findings                                                                                     | Recommendations | Rationale | Benefit (%) | Other Statistics | New Explain Plan | Compare Explain Plans |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|-----------------|-----------|-------------|------------------|------------------|-----------------------|
| <input checked="" type="radio"/> SQL Profile | A potentially better execution plan was found for this statement. The SQL profile "SYS_SQLPROF_0126b247765c0000" currently has status "ENABLED". | The SQL profile "SYS_SQLPROF_0126b247765c0000" was created automatically for this statement. |                 |           | 98.98       |                  |                  |                       |

- j. Scroll down the page.



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- k. Look at the old and new explain plans for the query.

| Original Explain Plan (Annotated)                                                                                        |   |                    |        |             |       |       |       |      |               |          |          |
|--------------------------------------------------------------------------------------------------------------------------|---|--------------------|--------|-------------|-------|-------|-------|------|---------------|----------|----------|
| <small>① Indicates an adjustment from the original plan by the SQL Tuning Advisor<br/>Plan Hash Value 4005616876</small> |   |                    |        |             |       |       |       |      |               |          |          |
| Operation                                                                                                                |   | Line ID            | Object | Object Type | Order | Rows  | Bytes | Cost | Time          | CPU Cost | I/O Cost |
| ▽ SELECT STATEMENT                                                                                                       | 0 |                    |        |             | 6     | 0.013 | ① 938 | 1    | ① 238,857,216 | ① 932    |          |
| ▽ HASH GROUP BY                                                                                                          | 1 |                    |        |             | 5     | 0.013 | ① 938 | 1    | ① 238,857,216 | ① 932    |          |
| ▽ NESTED LOOPS                                                                                                           | 2 |                    |        |             | 4     | 0.013 | ① 938 | 1    | ① 237,857,216 | ① 932    |          |
| TABLE ACCESS FULL                                                                                                        | 3 | SH.CUSTOMERS TABLE |        | 1           |       | 0.005 | ① 423 | 1    | ① 22,145,352  | ① 422    |          |
| ▽ PARTITION RANGE ALL                                                                                                    | 4 |                    |        |             | 3     | 0.008 | ① 516 | 1    | ① 215,511,872 | ① 510    |          |
| TABLE ACCESS FULL                                                                                                        | 5 | SH.SALES TABLE     |        | 2           |       | 0.008 | ① 516 | 1    | ① 215,511,872 | ① 510    |          |

| New Explain Plan With SQL Profile           |   |                   |                |             |       |       |       |      |           |          |          |
|---------------------------------------------|---|-------------------|----------------|-------------|-------|-------|-------|------|-----------|----------|----------|
| <small>Plan Hash Value 34974602</small>     |   |                   |                |             |       |       |       |      |           |          |          |
| 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_BDX | 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.

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- 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 Database SQL Tuning Advisor interface. At the top, there is a text area containing a SQL query: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 message: "Select the plan hash value to see the details below. Plan Hash Value All There are multiple plans found for this SQL statement." Below this are tabs: Statistics, Activity, Plan, Plan Control, Tuning History (which is selected), and SQL Monitoring.

The "Tuning History" section 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 |

Below the table is a section titled "ADDM Findings for this SQL during historic period" with a table:

| Finding Name | Occurrences (during selected historical period) |
|--------------|-------------------------------------------------|
| (No data)    |                                                 |

At the bottom right are buttons: SQL Worksheet and Schedule SQL Tuning Advisor.

- 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 Database SQL Tuning Advisor interface with the "Plan Control" tab selected. At the top, there is a message: "Select the plan hash value to see the details below. Plan Hash Value All There are multiple plans found for this SQL statement." Below this are tabs: Statistics, Activity, Plan, Plan Control (which is selected), Tuning History, and SQL Monitoring.

The "SQL Profiles and SQL Patches" section displays a table with one row:
| Select | Name | Type | Category | Status | Created |
| --- | --- | --- | --- | --- | --- |
|  | SYS\_SQLPROF\_013bb347765c0000 | AUTO | DEFAULT | ENABLED | Dec 19, 2012 1:08:23 PM |

Below the table is a section titled "SQL Plan Baseline" with a table:

| Select    | Name | Fix | Accept | Auto Purge | Enabled | Created |
|-----------|------|-----|--------|------------|---------|---------|
| (No data) |      |     |        |            |         |         |

- q. Click the **Statistics** tab to look at the execution history for this SQL.

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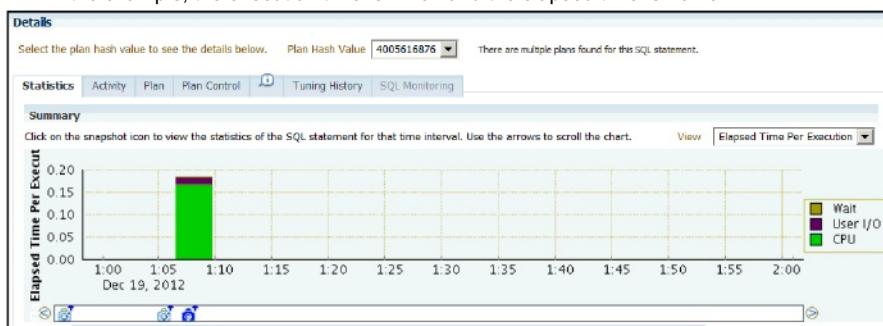
- r. Select one of the plan hash values from the Plan Hash Values drop-down list. What is the time of the execution, and elapsed time per execution?

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 srchinl 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.*

---

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Practices for Lesson 22: Managing Performance SQL Tuning

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```
$ 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)
-----
```

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```
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):       .228494     .000145
99.93 %
CPU Time (s):           .165374     .0002
99.87 %
User I/O Time (s):      .025089     0
100 %
Buffer Gets:            3142        32
98.98 %
Physical Read Requests: 12          0
100 %
Physical Write Requests: 0           0
Physical Read Bytes:    2485452    0
100 %
Physical Write Bytes:   0           0
Rows Processed:         0           0
Fetches:                0           0
Executions:              1           1
```

```

Notes
-----
1. Statistics for the srcinal 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          | Name      | Rows  | Bytes | Cost
| %CPU | Time              |          |       |       |       |
| Pstart| Pstop |          |          |       |       |
-----
| 0   | SELECT STATEMENT  |          |       |       | 13
| (1) | 00:00:0           |          |       |       |
| 1   |                   |          |       |       |       |
| 1   | HASH GROUP BY    |          |       |       | 13
| (1) | 00:00:0           |          |       |       |
| 1   |                   |          |       |       |       |
| 2   | NESTED LOOPS     |          |       |       | 13
(1)	00:00:0				
1					
*  3	TABLE ACCESS FULL	CUSTOMERS	1	5	
(1)	00:00:0				
1					
4	PARTITION RANGE ALL				8
(2)	00:00:0				
1	1	28			
*  5	TABLE ACCESS FULL	SALES	1	8	
(2)	00:00:0				
1	1	28			

```

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| 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") |                                           |          |   |        |       |       |
| <br>2-- Using SQL Profile                                   |                                           |          |   |        |       |       |
| Plan hash value: 34974602                                   |                                           |          |   |        |       |       |
| <br>-----                                                   |                                           |          |   |        |       |       |
| Id                                                          | Operation                                 |          |   |        |       | Name  |
| Rows                                                        |                                           |          |   |        |       |       |
| Bytes                                                       | Cost (%CPU)                               | Time     |   | Pstart | Pstop |       |
| <br>-----                                                   |                                           |          |   |        |       |       |
| 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               |          |   |        |       |       |
|                                                             |                                           |          |   |        |       |       |
| * 6                                                         | BITMAP INDEX RANGE SCAN                   |          |   |        |       |       |
|                                                             | SALES_CUST_BIX                            |          |   |        |       |       |
|                                                             |                                           |          | 1 | 28     |       |       |

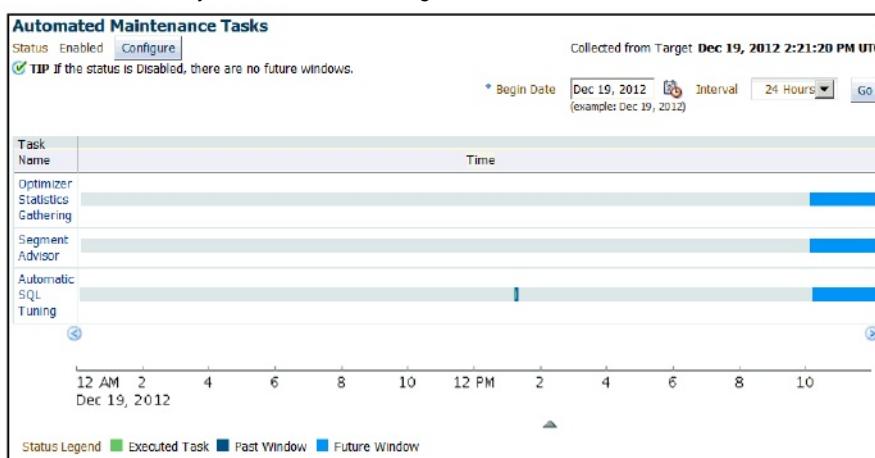
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```

|* 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)

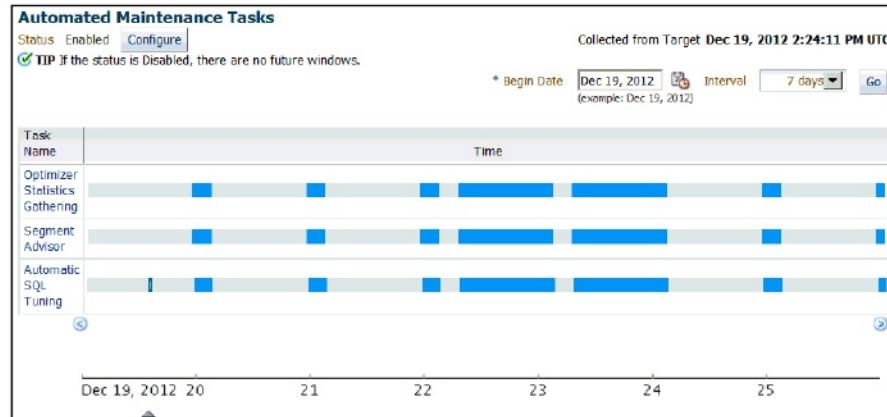
-----
SQL> SQL>
$
```

9. Investigate configuring Automatic SQL Tuning with Cloud Control.
- While you are logged in to the **orcl** database target as the **DBA1** user, navigate to **Administration > Oracle Scheduler > Automated Maintenance Tasks**.
  - The chart shows times in the past when each client was executed, and times in the future when they are scheduled to run again.



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- 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.

| Task Name            |
|----------------------|
| Optimizer            |
| Statistics Gathering |
| Segment Advisor      |
| Automatic SQL Tuning |

- i. Notice the forbidden sign right next to the task name.  
j. Click **Configure**.

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- 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  Enabled  Disabled [Configure](#)

Segment Advisor  Enabled  Disabled [Configure](#)

Automatic SQL Tuning  Enabled  Disabled [Configure](#)

- 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**

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Practices for Lesson 23: Introduction to Upgrading to Oracle Database 12c  
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## 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 srclin 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 srclin 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. \_\_\_\_\_

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## **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.

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Practices for Lesson 23: Introduction to Upgrading to Oracle Database 12c  
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## **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. \_\_\_\_\_

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Practices for Lesson 23: Introduction to Upgrading to Oracle Database 12c  
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## 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.

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Practices for Lesson 23: Introduction to Upgrading to Oracle Database 12c  
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## **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. \_\_\_\_\_

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## 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. \_\_\_\_\_

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Practices for Lesson 23: Introduction to Upgrading to Oracle Database 12c  
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## **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.

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Practices for Lesson 23: Introduction to Upgrading to Oracle Database 12c  
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## **Practices for Lesson 24: Preparing a Database for Upgrade**

**Chapter 24**

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Practices for Lesson 24: Preparing a Database for Upgrade

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## 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/utluppkgs.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/utluppkgs.sql
/u01/app/oracle/product/11.2.0/dbhome_2/rdbms/admin/utluppkgs.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):
```

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Practices for Lesson 24: Preparing a Database for Upgrade

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```
/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
```

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```
--> 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 rdbsms/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
```

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```
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_prepup.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.
```

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```
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;
@emrremove.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_RECYCLEBIN
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.
```

- b. `SOL>` 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_prepup.run_fixup_and_report('OLD_TIME_ZONES_EXIST');
END;
/
BEGIN
dbms_output.put_line (
'*****[Post-Upgrade Recommendations]*****');
dbms_output.put_line (' ***** Fixed Object Statistics *****');
dbms_output.put_line ('*****');
dbms_output.put_line (' ***** MANUAL ACTION SUGGESTED *****');
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 ('* Post Upgrade Fixup Script Complete **');
END;
/
BEGIN dbms_prepup.fixup_summary(FALSE); END;
/
BEGIN
dbms_output.put_line ('* Post Upgrade Fixup 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 \$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>
```

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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  
$
```

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## 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>
```

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- 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_tag20130214t144838_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_tag20130214t144841_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>
```

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- 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.

- 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
```

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```
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  
$
```

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---

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Practices for Lesson 24: Preparing a Database for Upgrade

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## **Practices for Lesson 25: Upgrading a Database**

### **Chapter 25**

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Practices for Lesson 25: Upgrading a Database

Chapter 25 - Page 1

## 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.

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## 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.

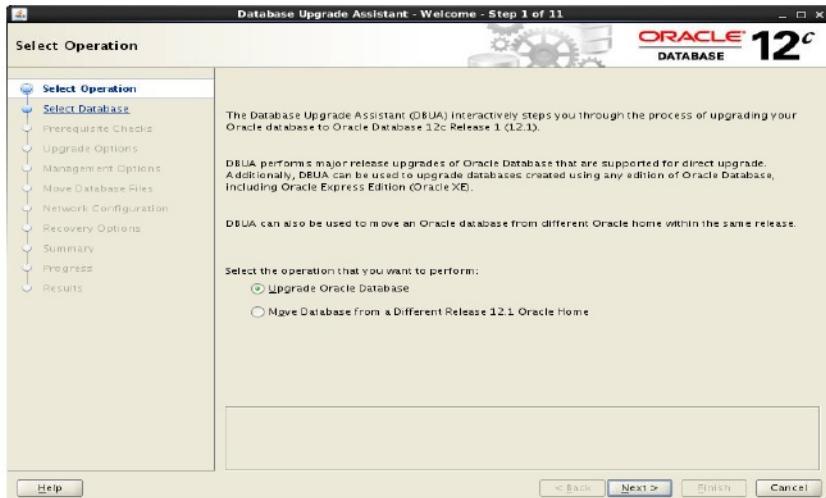
SQL> exit
$
```

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2. Launch DBUA from the Oracle home where the new database software has been installed.

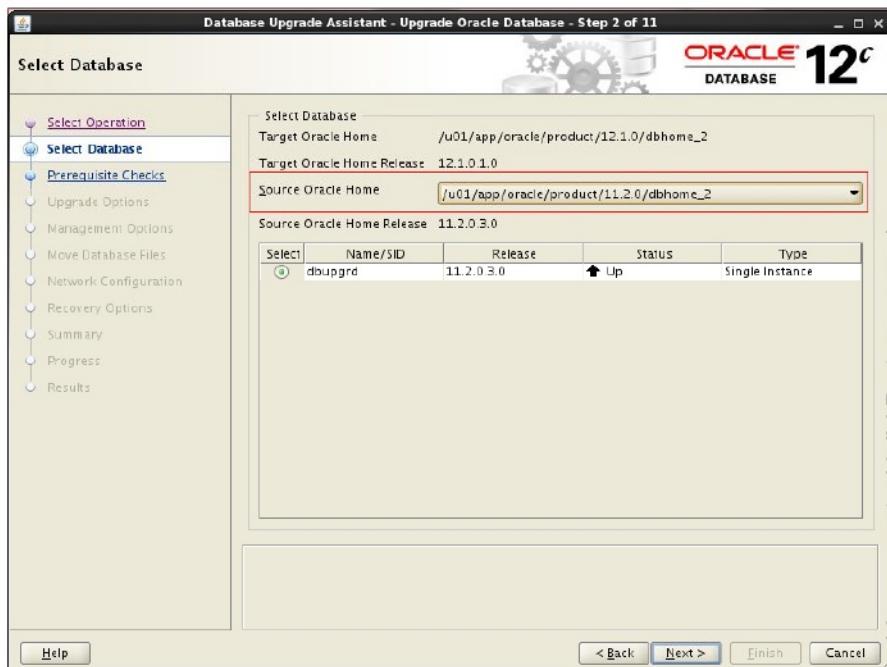
```
$ echo $ORACLE_HOME
/u01/app/oracle/product/12.1.0/dbhome_2
$ dbua
```

Step	Window/Page Description	Choices or Values
a.	Select Operation page	Verify that <b>Upgrade Oracle Database</b> is selected. Click <b>Next</b> .



Step	Window/Page Description	Choices or Values
b.	Select Database page	Verify that the target Oracle Home is: /u01/app/oracle/product/12.1.0/dbhome_2 Set Source Oracle Home to:/u01/app/oracle/product/11.2.0/dbhome_2 The dbupgrd entry appears. Click <b>Next</b> .

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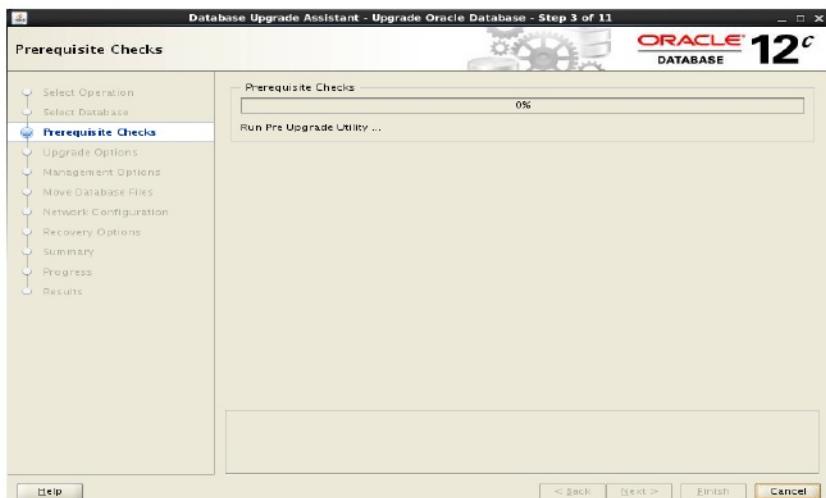
<b>Step</b>	<b>Window/Page Description</b>	<b>Choices or Values</b>
C.	Prerequisite Checks page	Automatic validation starts (using the preupgrd.sql script) and shows progressively the validation result of each prerequisite.

---

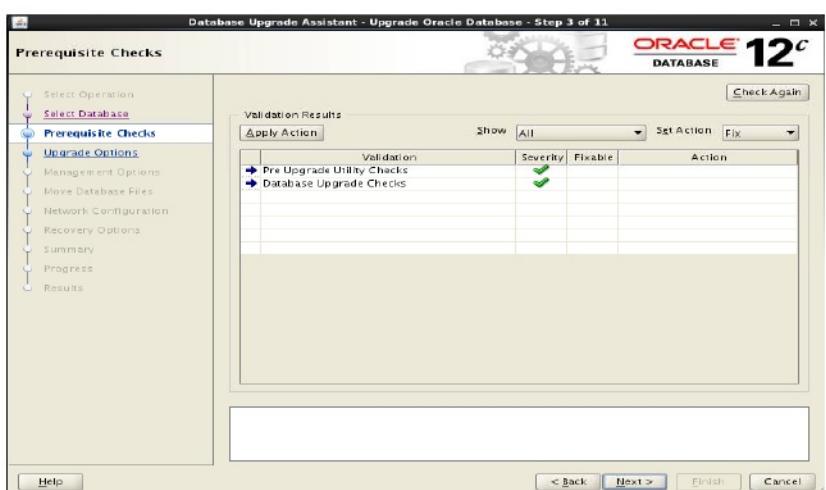
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Practices for Lesson 25: Upgrading a Database

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<b>Step</b>	<b>Window/Page Description</b>	<b>Choices or Values</b>
d.	Prerequisite Checks page	<p>Validation results appear.</p> <p>The prerequisites are all validated because you executed the preupgrd.sql script and addressed all prerequisites manually.</p> <p>Click <b>Next</b>.</p>



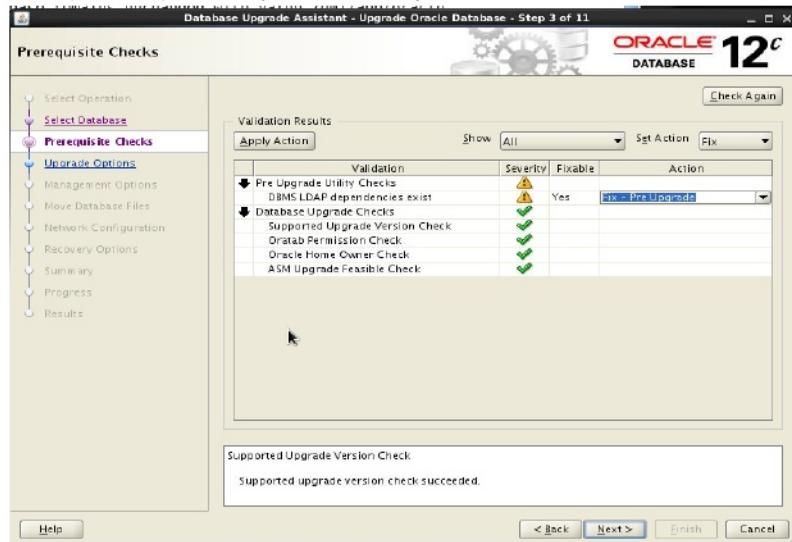
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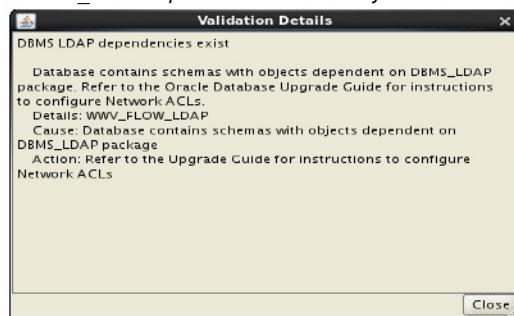
Practices for Lesson 25: Upgrading a Database

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- 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.



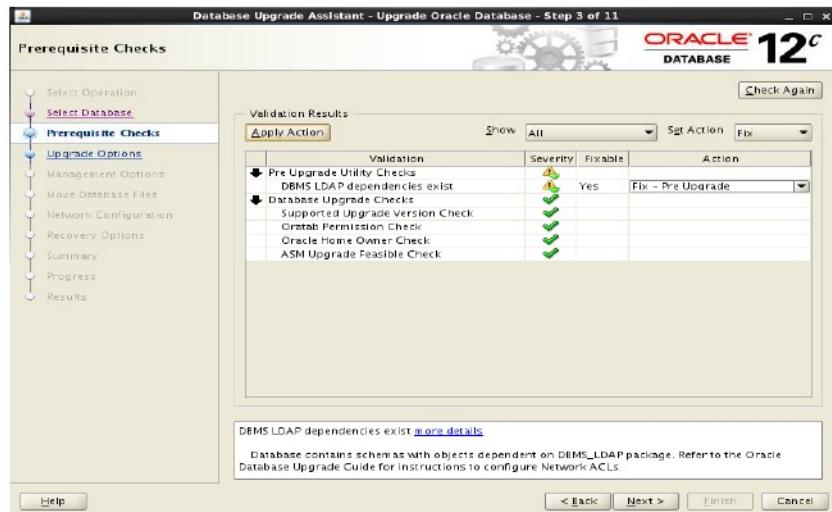
- One check would result in a warning and could be fixed. You would examine in detail the DBMS\_LDAP dependencies that could exist. You would select the "DBMS\_LDAP dependencies exist" entry and click **more details**.



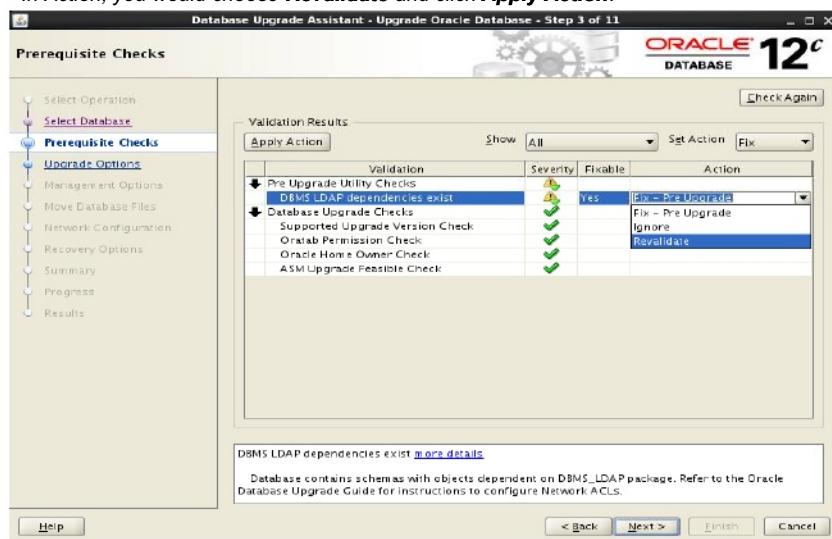
This message indicates that you have not added the object in the ACL privileged list recommended in the preupgrade.log file. You would click **Close**.

- You would click **Apply Action** to fix the issue.

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- In Action, you would choose **Revalidate** and click **Apply Action**.

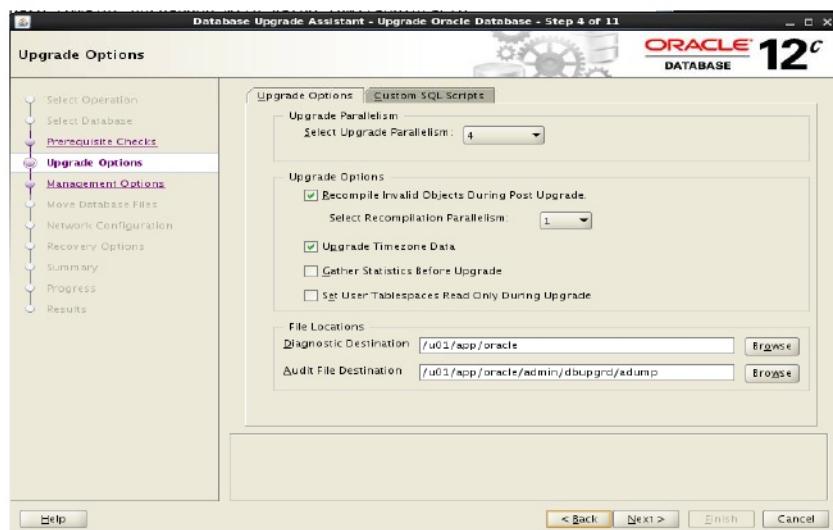


- If the issue persists but would not prevent the upgrade to progress, you could fix this problem after the upgrade. In Action, you would choose **Ignore** and click

**Next.**

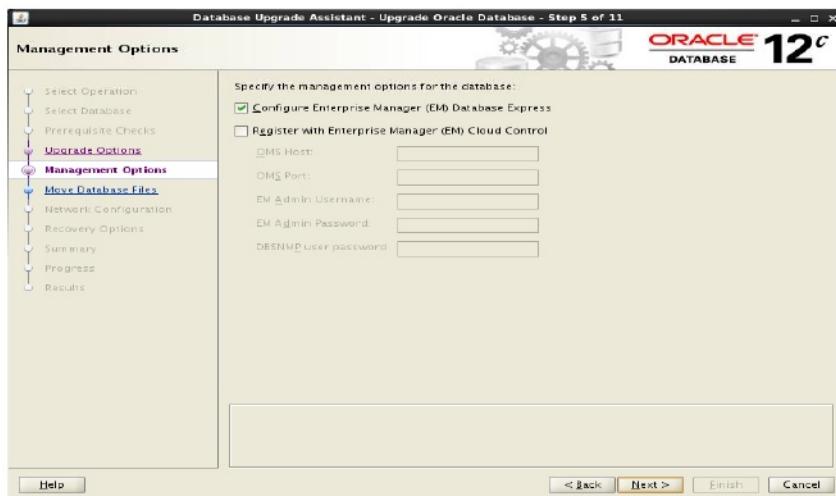
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Step	Window/Page Description	Choices or Values
e.	Upgrade Options page Upgrade Options tab	<p>Verify that <b>Upgrade Parallelism</b> is set to the number of CPUs or to 2 if the number of CPUs is less than 4. You may select a new value from the Degree of Parallelism 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>

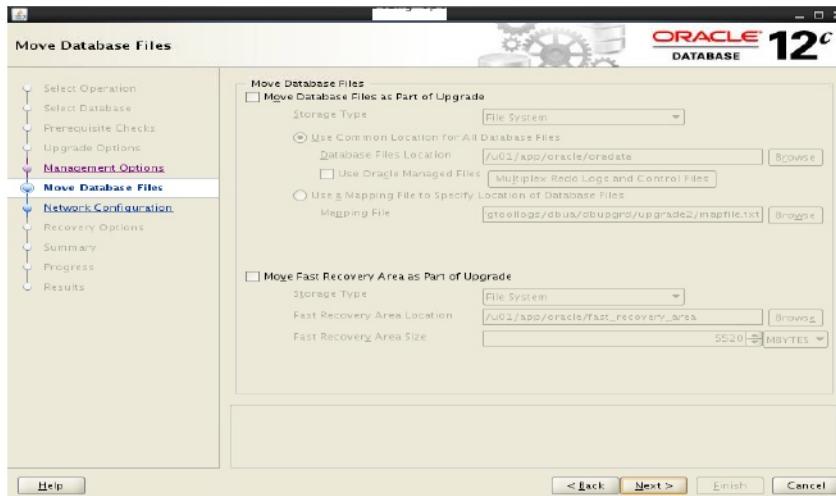


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Step	Window/Page Description	Choices or Values
f.	Management Options page	Click <b>Next</b> .



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>



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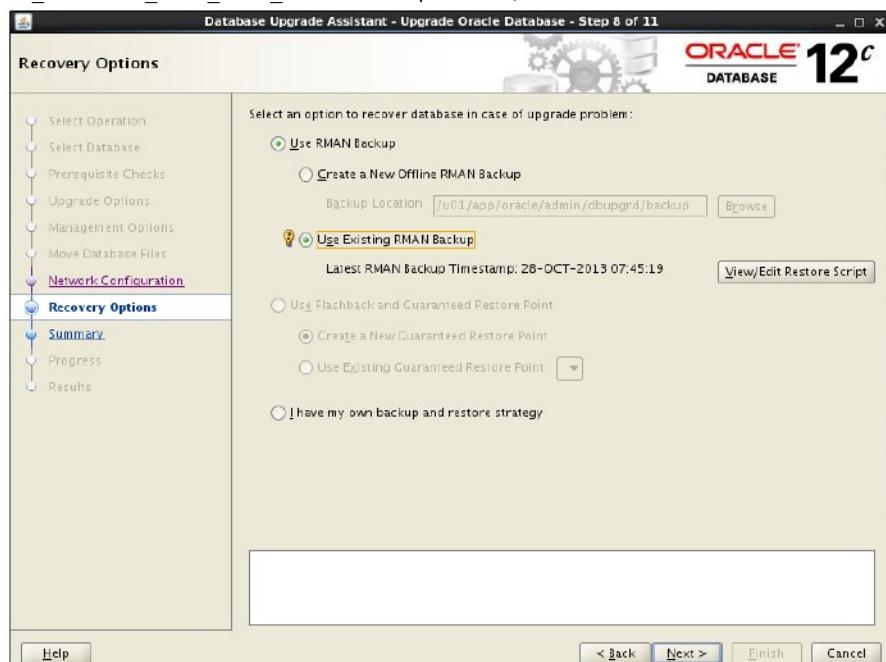
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Practices for Lesson 25: Upgrading a Database

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Step	Window/Page Description	Choices or Values
h.	Network Configuration page	Select <b>LISTENERORCL</b> . Click <b>Next</b> .
i.	Recovery Options page	Select <b>Use Existing RMAN Backup</b> . <i>You backed up the database in the previous practice.</i> 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**.



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Step	Window/Page Description	Choices or Values
j.	Summary page	Review the Database Upgrade Summary. Check the following:

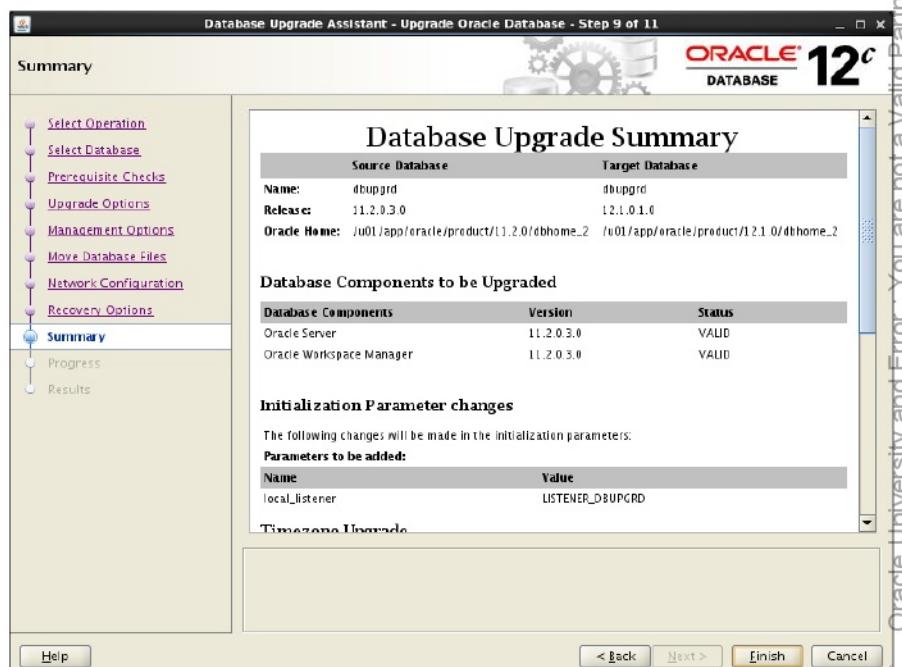
---

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Practices for Lesson 25: Upgrading a Database

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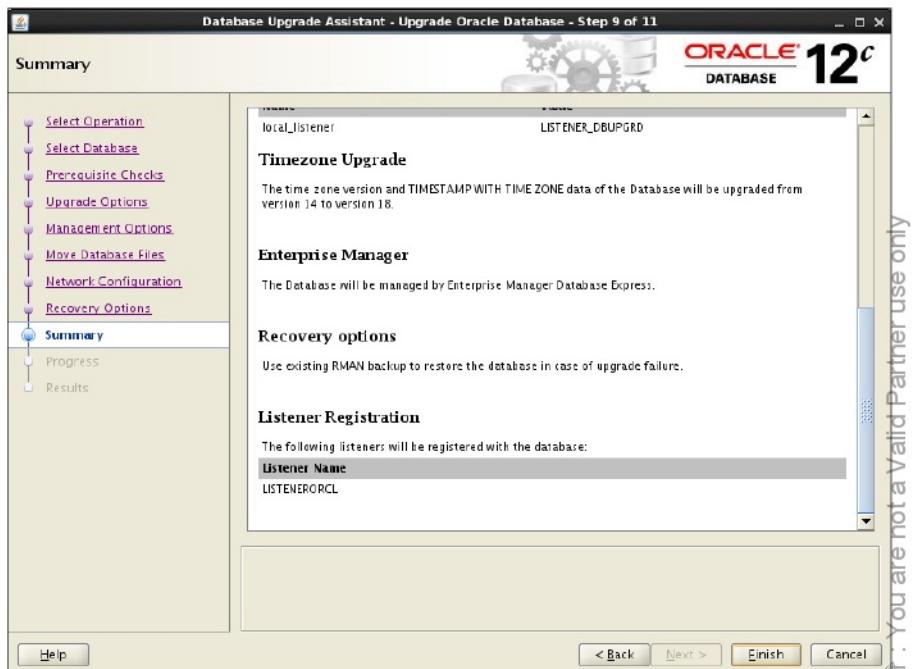
Step	Window/Page Description	Choices or Values
		<ul style="list-style-type: none"> <li>Source and target Database releases</li> <li>Oracle Homes</li> <li>Warnings ignored if there have been any (as described in step 3d)</li> <li>Status of the components that will be upgraded</li> <li>Version of the time zone data</li> </ul> <p>Click <b>Finish</b>. The upgrade may take around 45 minutes (118 minutes on M82).</p>



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Practices for Lesson 25: Upgrading a Database

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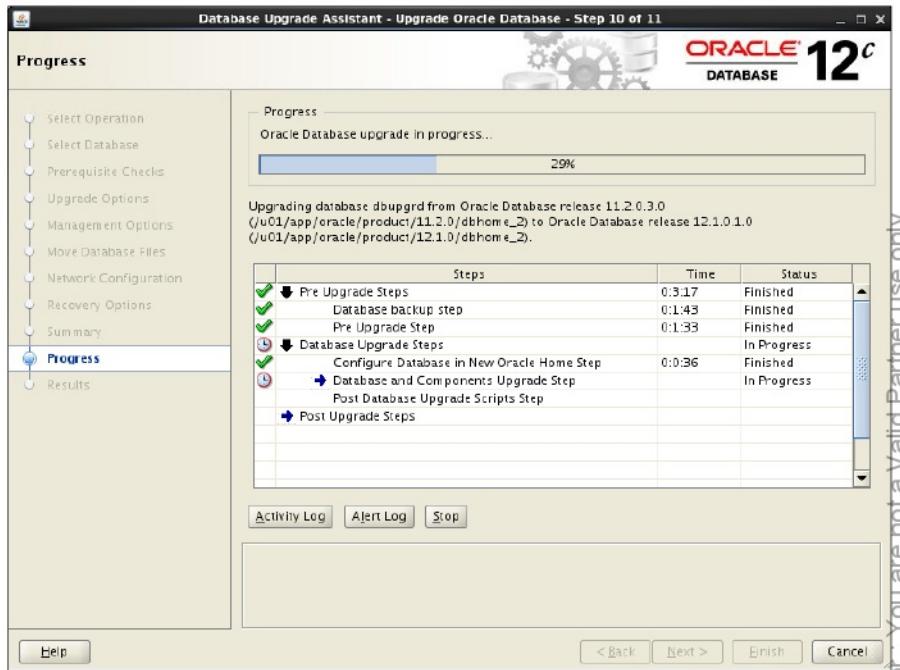


**Note:** During the upgrade phase, DBUA runs in parallel, which runs the upgrade processes in parallel instead of serially, optimally taking advantage of CPU capacity to decrease down time as much as possible.

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**.

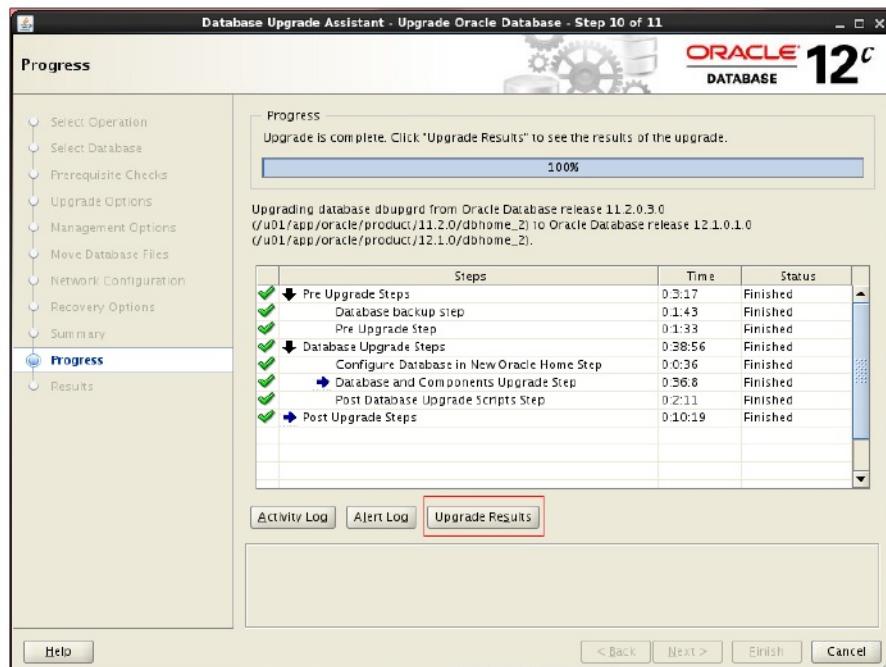
If you had several options or components installed, there would be other recommendations and actions to take during the pre-upgrade phase. These actions are described in an appendix.

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.



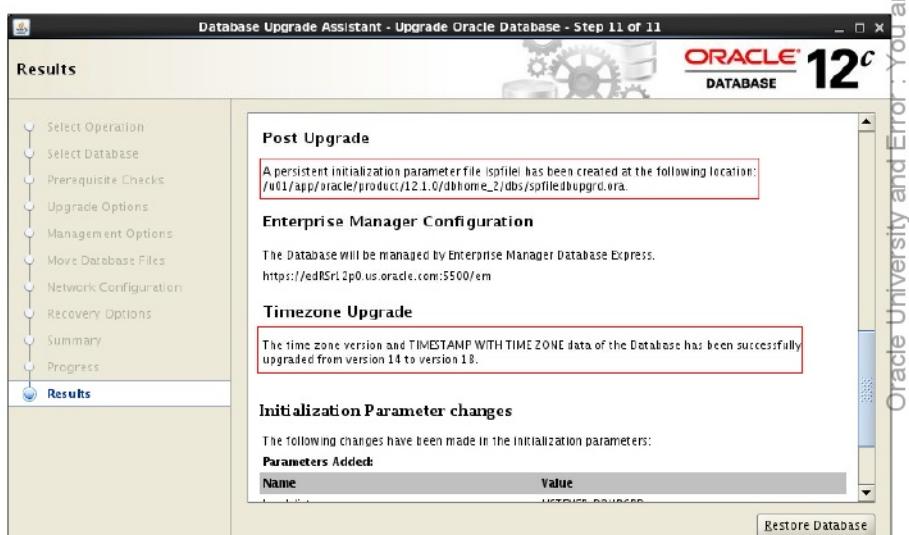
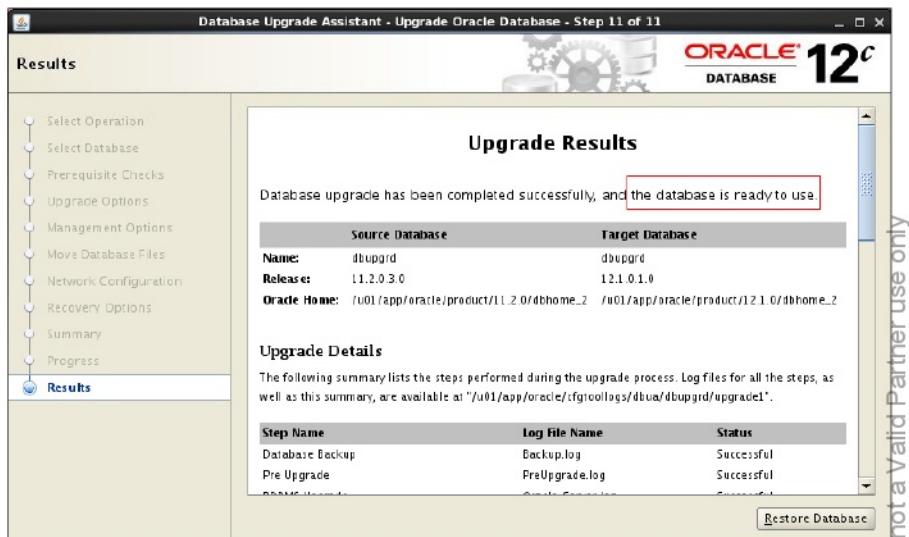
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Step	Window/Page Description	Choices or Values
I.	Progress page	Review the results when the Upgrade Progress is 100% complete. Click <b>Upgrade Results</b> .



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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>



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- 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.
$
```

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## 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  
$
```

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- 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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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
```

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Practices for Lesson 25: Upgrading a Database

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```

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	

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```
. . 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
```

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```
*****
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.

```
$h6Me/u01/app/oracle/admin/orcl/dpdump/expSH.dmp
$ 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 - /u01/app/oracle/product/12.1.0/dbhome_2/network/admin/	Expand <b>Local</b> . Select <b>Service Naming</b> . Click <b>Create</b> (the green "+" icon).
b.	Net Service Name Wizard: Welcome	Enter <b>PDB_ORCL</b> for Net Service Name. Click <b>Next</b> .
c.	Net Service Name Wizard: page 2 of 5 –Protocol	Select <b>TCP/IP</b> (Internet Protocol). Click <b>Next</b> .

d.	Net Service Name Wizard: page 3 of 5 –Protocol Settings	Enter the following information: Host : <Your hostname> or LOCALHOST Port: 1521 Click <b>Next</b> .
e.	Net Service Name Wizard: page 4 of 5 –Service	Enter the following information: Service Name: <b>pdb_orcl</b> Click <b>Next</b> .
f.	Net Service Name Wizard: page 5 of 5 –Test	Click <b>Finish</b> .
g.	Oracle Network Manager - /u01/app/oracle/product/12.1.0/dbhome_1/network/admin	From the <b>File</b> menu, select <b>Save Network Configuration</b> . 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> alter session set container=&pdbname;

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;
```

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Practices for Lesson 25: Upgrading a Database

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```
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
```

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```
/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
$
```

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## **Practices for Lesson 26: Performing Post-Upgrade Tasks**

**Chapter 26**

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Practices for Lesson 26: Performing Post-Upgrade Tasks

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## 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

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Practices for Lesson 26: Performing Post-Upgrade Tasks

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## 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
```

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Practices for Lesson 26: Performing Post-Upgrade Tasks

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```

OWM      Oracle Workspace Manager      12.1.0.1.0  VALID
XDB      Oracle XML Database        12.1.0.1.0  VALID

SQL>

```

3. Check that there are no invalid objects.

```

SQL> @$ORACLE_HOME/rdbms/admin/utluobj.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/orapwdbupgrd
/u01/app/oracle/product/12.1.0/dbhome_2/dbs/orapwdbupgrd

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.**

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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
$
```

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- 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>
```

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- 4) Restart the instance to register the XMLDB service.

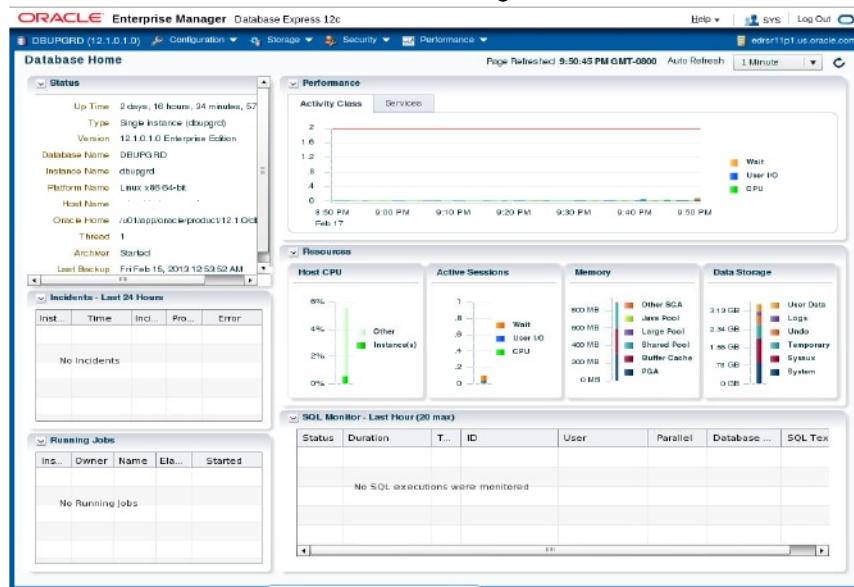
```
SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.

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.
- 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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Practices for Lesson 26: Performing Post-Upgrade Tasks

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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 archive log 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
$
```

---

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Practices for Lesson 26: Performing Post-Upgrade Tasks

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## **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 orcl Database Home	Select <b>Administration &gt; Resource Manager</b> .
b.	Database Login	Select Credential <b>Preferred</b> . Select Preferred Credential Name: <b>SYSDBA</b> <b>Database Credentials</b> 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> Verify Scheduling Policy: <b>Round Robin</b> 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  
**Create Resource Consumer Group**

Logged in As SYS

Execute On Multiple Databases Show SQL Cancel OK

**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**

Add

Select	User	Admin Option
No items found		

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. Select Action Create Like. 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. Click Move from Available Groups/Subplans

Step	Window/Page Description	Choices or Values
		pane to Resource Allocations pane. Select <b>LOW_GROUP</b> . Click <b>Move</b> . Click <b>OK</b> .
g.	Create Resource Plan	In the Resource Allocation section: For APPUSER, set Shares to <b>40</b> . For LOW_GROUP, set Shares to <b>20</b> . For SYS_GROUP, set Shares to <b>30</b> . Click <b>Show SQL</b> .
h.	Show SQL	Review the PL/SQL code. 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.

- a. Log in to SQL\*Plus as the DBA1 user.
- b. 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>
```

- c. 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>
```

4. Return to Enterprise Manager Cloud Control to verify the additions you made in step 3.
- a. Select **Administration > Resource Manager**.
  - b. Click **Consumer Group Mappings**.
  - c. 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		
		HR	 APPUSER	
		SCOTT	 LOW_GROUP	
		SYS, SYSTEM	 SYS_GROUP	
<input type="radio"/>	6 Oracle User	No Mappings Specified		
<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. Click <b>Go</b> .
c.	Users	Select the <b>PM</b> user. Click <b>Edit</b> .
d.	Edit User: PM	Click the <b>Consumer Group Privileges</b> tab. If you see an error regarding the password for the PM user, enter <code>oracle_4U</code> 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. Move <b>LOW_GROUP</b> to Selected Consumer Groups. Move <b>SYSGROUP</b> to Selected Consumer

<b>Step</b>	<b>Window/Page Description</b>	<b>Choices or Values</b>
		Groups. Click <b>OK</b>
g.	Edit User: PM	Set Default Consumer Group to <b>APPUSER</b> . 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. Click <b>Return</b> .
i.	Edit User: PM	Click <b>Apply</b> .

6. Activate the NEW\_DEFAULT\_PLAN resource plan.

<b>Step</b>	<b>Window/Page Description</b>	<b>Choices or Values</b>
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> . Select <b>Activate</b> in the Actions menu. Click <b>GO</b> .
d.	Confirmation	Click <b>Yes</b> .
e.	Resource Plans	You should see a success message: <b>NEW_DEFAULT_PLAN has been activated successfully</b>

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>"
```

- 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>"
```

- 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\_vsessions.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 srcinal 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> . Select Actions <b>Activate</b> . Click <b>GO</b> .
d.	Confirmation	Click <b>Yes</b> .
e.	Resource Plans	You should see a success message <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.

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## Practice B-1: Creating Scheduler Components

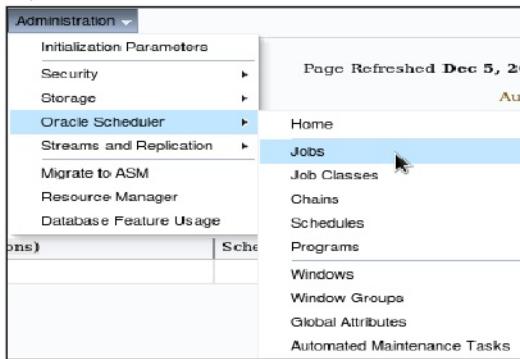
### Overview

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;
```

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**General**

- Name: CREATE\_LOG\_TABLE\_JOB
- Schema: HR
- Enabled: Yes
- Description: Create the SESSION\_HISTORY table
- Logging Level: Log job runs only (RUNS)
- Job Class: DEFAULT\_JOB\_CLASS
- Auto Drop: FALSE
- Restartable: FALSE
- Destination: Credential Name: [empty]

- Schedule tab:**

Timezone: Accept the default.

Repeating: **Do not Repeat**

Start: **Immediately**

**Schedule**

- Schedule Type: Standard
- Time Zone: (UTC+00:00) Universal Time
- Repeating: Do Not Repeat
- Start:
  - Immediately
  - Later
 Date: Dec 5, 2012  
 Time: 12:10:00 AM

- Options tab:**

Accept the defaults.

- 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.

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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 dbal/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							Page Refresh		
All	Running	History							
		View Job Definition		Edit Job Definition		Delete		Run Now	Create Like
Select	Name	Schema	Scheduled Date	Last Run Date	Last Run Status	Enabled			
<input checked="" type="radio"/>	CREATE_LOG_TABLE_JOB	HR	Not Scheduled	Dec 13, 2012 8:19:49 AM +00:00	SUCCEEDED				
<input type="radio"/>	ORACLE_APEX_MAIL_QUEUE	APEX_040200	Dec 13, 2012 1:20:00 AM -07:00	Dec 13, 2012 1:15:00 AM -07:00	SCHEDULED	<input checked="" type="checkbox"/>			
<input type="radio"/>	CLEANUP_ONLINE_PMO	SYS	Dec 13, 2012 2:07:06 AM -07:00	Dec 13, 2012 1:07:06 AM -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.

Screenshot of the Oracle Database Scheduler Programs page. The page title is "Scheduler Programs". It shows a table with one row: "HS\_PARALLEL\_SAMPLING" in the Name column, "SYS" in the Schema column, "Enabled" checked in the Enabled column, and "STORED PROCEDURE" in the Type column. A "Create" button is visible in the top right corner of the page header.

- 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;
```

Screenshot of the Oracle Database Create Program dialog box. The "Name" field is set to "LOG\_SESS\_COUNT\_PRGM". The "Schema" field is set to "HR". The "Enabled" field has "Yes" selected. The "Description" field is empty. The "Type" dropdown is set to "PL/SQL Block". The "Source" code area contains the PL/SQL block provided earlier. At the bottom, there are buttons for "Execute On Multiple Databases", "Show SQL", "Cancel", and "OK".

Oracle University and Error : You are not a Valid Partner user only

- 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.

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> ▾
Select	Name	Schema	Enabled	Type
<input checked="" type="radio"/>	HS PARALLEL SAMPLING	SYS	✓	STORED PROCEDURE
<input type="radio"/>	LOG_SESS_COUNT_PRGM	HR	✓	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.)

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 checked="" type="radio"/>	BSLN_MAINTAIN_STATS_SCHED	SYS	Nov 25, 2012 12:00:00 AM -08:00		Pre-defined schedule for computing moving window baseline statistics
<input type="radio"/>	SESS_UPDATE_SCHED	HR	Dec 5, 2012 12:15:39 PM +00:00		Every three seconds

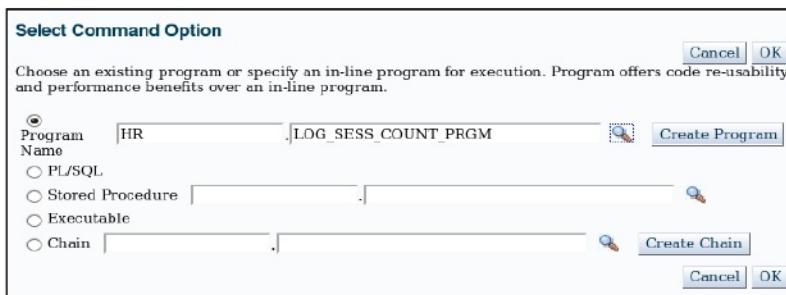
6. Using Enterprise Manager Cloud Control, create a job named LOG\_SESSIONS\_JOB that uses the LOG\_SESS\_COUNT\_PRGM program and the SESS\_UPDATE\_SCHED schedule. Make sure that the job uses FULL logging.

- a. In Enterprise Manager, navigate to **Administration > Oracle Scheduler > Jobs**, and then click the **Create** button.
- b. 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)

- c. 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.



- d. Click **OK**.

Scheduler Jobs > Create Job      Logged in As DBA1

**Create Job**

Execute On Multiple Databases | Show SQL | Cancel | OK

**General**   Schedule   Options

\* Name: LOG\_SESSIONS\_JOB

\* Schema: HR

Enabled:  Yes  No

Description: Count sessions with HR.LOG\_SESS\_COUNT\_PRGM

Logging Level: Log everything (FULL)  
Specify logging requirements for the job

Job Class: DEFAULT\_JOB\_CLASS

Auto Drop: FALSE  
Specify whether the job should be dropped after completion

Restorable: FALSE  
Specify whether the job can be restarted manually or in the event of failure

Credential Name: [dropdown]

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 remotely. For 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.

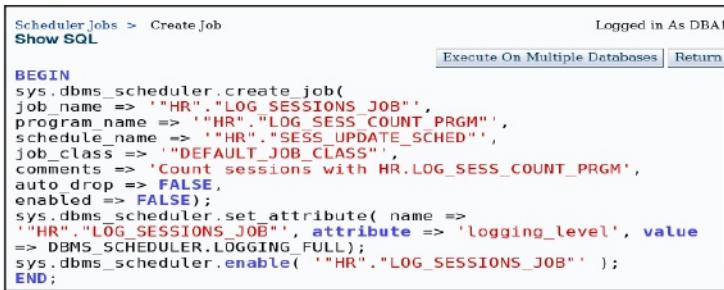
Command Type: Program      Change Command Type

Program Name: HR.LOG\_SESS\_COUNT\_PRGM

- e. Back on the Create Job page, click the **Schedule** tab.
- f. Change the Schedule Type to **Use Pre-Defined Schedule** and select the **HR.SESSIONSCHED** schedule by using the flashlight icon.



- g. Click **Show SQL**.



- 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 4:16:21 AM -07:00	SCHEDULED	<input checked="" type="checkbox"/>	DEFAULT_JOB_CLASS	1
<input type="radio"/>	MGMT_CONFIG_JOB	ORACLE_OCM	MAINTENANCE_WINDOW_GROUP 2:00-02 PM -08:00	Dec 5, 2012 2:00:02 PM -08:00	SCHEDULED	<input checked="" type="checkbox"/>	DEFAULT_JOB_CLASS	1
<input type="radio"/>	RLM\$SCHEDNEGACTION	EXFSYS	Dec 6, 2012 4:43:22 AM +00:00	Dec 6, 2012 3:43:22 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 6, 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 9:39:59 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 4:34:35 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 **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**

(radio buttons) Immediately (selected), Later  
Date: Dec 6, 2012 (example: Dec 6, 2012)  
Time: 4:28:00 AM

Show SQL

- g. Ensure that the interval is 3 minutes and then click **Show SQL**.

Scheduler Schedules > Edit Schedule: HR.SESSION\_UPDATE\_SCHED  
Logged in As DBA1

Show SQL

```
BEGIN
  sys.dbms_scheduler.set_attribute( name =>
    '"HR"."SESS_UPDATE_SCHED"', attribute => 'repeat_interval', value
    => 'FREQ=MINUTELY;INTERVAL=3');
  sys.dbms_scheduler.set_attribute( name =>
    '"HR"."SESS_UPDATE_SCHED"', attribute => 'start_date', value =>
    timestamp at time zone '0:00');
  sys.dbms_scheduler.set_attribute( name =>
    '"HR"."SESS_UPDATE_SCHED"', attribute => 'comments', value =>
    'Every three minutes');
END;
```

Execute On Multiple Databases Return

- 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
```

49

```

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.

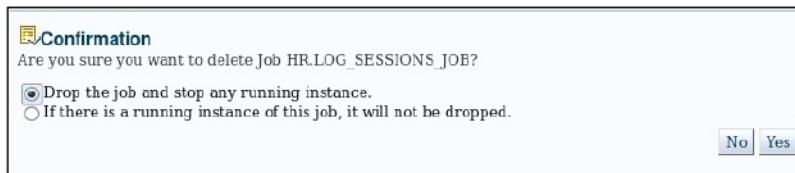
**Note:** Make sure that you do not delete the wrong schedule.

- Navigate to **Administration > Oracle Scheduler > Jobs**.
- Select the **LOG\_SESSIONS\_JOB** job and click **Delete**.

<input checked="" type="radio"/>	<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.

**Scheduler Programs** Logged in As DBA1  
Following are the programs that define what are to be executed in the jobs.

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	

Create

- 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 an 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>
```

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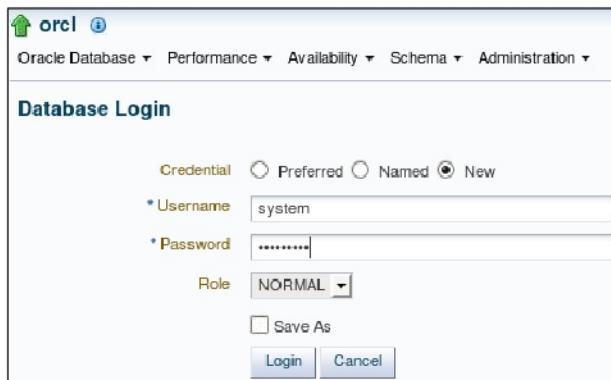
3. Check the Scheduler metadata views `USER_SCHEDULER_JOBS`, `USER_SCHEDULER_PROGRAMS`, and `DBA_JOBS`.

```
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.

The Scheduler Jobs page displays two scheduled jobs:

- ORACLE\_APEX\_MAIL\_QUEUE**: Schema APEX\_040200, Status Enabled, Last Run Dec 6, 2012 5:25:00 AM +0:00, Run Duration 0.0 minutes.
- MY\_LWT\_JOB**: Schema SYSTEM, Status Enabled, Last Run Dec 6, 2012 5:22:12 AM +0:00, Run Duration 0.0 minutes.

- 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
- Restorable: FALSE
- Destination: None
- Credential Name: None

**Schedule**

- Repeat By Days: Interval (Days): 2, Repeat Time: Dec 6, 2012 5:22:12 AM Etc/UTC
- Available to Start: Dec 6, 2012 5:22:12 AM Etc/UTC
- Not Available After: None

**Options**

- Raise Events: None
- Maximum Run Duration (minutes): None
- Priority: None
- Schedule Limit (minutes): None
- Maximum Runs: None
- Maximum Failures: None
- Job Weight: None
- Instance Stickiness: TRUE

**Command**

- Command Type: Program
- Program Name: SYSTEM.PROG\_1

**Operation Detail**

View	Select	Log ID	Log Date	Operation	Status
View	<input checked="" type="radio"/>	2838	Dec 6, 2012 5:22:12 AM +0:00	RUN	SUCCEEDED

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.

Select	Job Name	Schema	Last Run	Status
<input type="radio"/>	ADV_SEGMENTADV_489805	DBA1	Not Scheduled	Dec 6, 2012 12:39:04 AM +0:00 SUCCEEDED
<input checked="" type="radio"/>	MY_LWT_JOB	SYSTEM	Dec 6, 2012 5:22:12 AM +0:00	SCHEDULED

- 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**

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## 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						
<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
<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	✓ 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	✓ DEFAULT_JOB_CLASS
<input type="radio"/>	PGRAUTOPURGE_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	✓ 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	✓	STORED PROCEDURE	AQ propagation program	
<input type="radio"/>	AUTO_SPACE_ADVISOR_PROG	SYS	✓	STORED PROCEDURE	auto space advisor maintenance program	
<input type="radio"/>	AUTO_SQL_TUNING_PROG	SYS	✓	PLSQL_BLOCK	Program to run automatic sql tuning and SPM evolve tasks, see dbmssqltut and dbmsspmtud	
<input type="radio"/>	BSLN_MAINTAIN_STATS_PROG	SYS	✓	PLSQL_BLOCK	Moving window baseline statistics maintenance program	
<input type="radio"/>	FILE_WATCHER_PROGRAM	SYS	✓	STORED PROCEDURE	File Watcher program	
<input type="radio"/>	GATHER_STATS_PROG	SYS	✓	STORED PROCEDURE	Oracle defined automatic optimizer statistics collection program	
<input type="radio"/>	HS_PARALLEL_SAMPLING	SYS	✓	STORED PROCEDURE		
<input type="radio"/>	ORASAGE_AUTOTASK_DATA	SYS	✓	STORED PROCEDURE	deletes obsolete AUTOTASK repository data	
<input type="radio"/>	PMO_DEFERRED_GIDX_MAINT	SYS	✓	PLSQL_BLOCK	Oracle defined automatic index cleanup for partition maintenance operations with deferred global index maintenance	
<input type="radio"/>	PROG_1	SYSTEM	✓	PLSQL_BLOCK	Insert a timestamp into the test_log	
<input type="radio"/>	PURGE_LOG_PROG	SYS	✓	STORED PROCEDURE	purge log program	

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*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> <a href="#">Refresh</a> <a href="#">Create</a>					
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 12:06:00 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	<input checked="" type="checkbox"/>	Jun 25, 2013 10:00:00 PM		240	FALSE	Tuesday window for maintenance tasks
<input type="radio"/>	WEDNESDAY_WINDOW	DEFAULT_MAINTENANCE_PLAN	<input checked="" type="checkbox"/>	Jun 26, 2013 10:00:00 PM		240	FALSE	Wednesday window for maintenance tasks
<input type="radio"/>	THURSDAY_WINDOW	DEFAULT_MAINTENANCE_PLAN	<input checked="" type="checkbox"/>	Jun 27, 2013 10:00:00 PM		240	FALSE	Thursday window for maintenance tasks
<input type="radio"/>	FRIDAY_WINDOW	DEFAULT_MAINTENANCE_PLAN	<input checked="" type="checkbox"/>	Jun 28, 2013 10:00:00 PM		240	FALSE	Friday window for maintenance tasks
<input type="radio"/>	SATURDAY_WINDOW	DEFAULT_MAINTENANCE_PLAN	<input checked="" type="checkbox"/>	Jun 29, 2013 6:00:00 AM		1200	FALSE	Saturday window for maintenance tasks
<input type="radio"/>	SUNDAY_WINDOW	DEFAULT_MAINTENANCE_PLAN	<input checked="" type="checkbox"/>	Jun 30, 2013 6:00:00 AM		1200	FALSE	Sunday window for maintenance tasks
<input type="radio"/>	MONDAY_WINDOW	DEFAULT_MAINTENANCE_PLAN	<input checked="" type="checkbox"/>	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.					
	Edit	View	Delete	Create Like	
Select	Name	Logging Level	Log Retention Period (Days)	Resource Consumer Group	
<input checked="" type="radio"/>	XMLDB_NFS_JOBCLASS	FAILED RUNS			
<input type="radio"/>	AQ\$_PROPAGATION_JOB_CLASS	RUNS			
<input type="radio"/>	ORASAT_JCMED_SQ	FULL	1000000	ORA\$AUTOTASK	
<input type="radio"/>	ORASAT_JCNRM_SQ	FULL	1000000	ORA\$AUTOTASK	
<input type="radio"/>	ORASAT_JCURG_SQ	FULL	1000000	ORA\$AUTOTASK	
<input type="radio"/>	ORASAT_JCMED_SA	FULL	1000000	ORA\$AUTOTASK	
<input type="radio"/>	ORASAT_JCNRM_SA	FULL	1000000	ORA\$AUTOTASK	
<input type="radio"/>	ORASAT_JCURG_SA	FULL	1000000	ORA\$AUTOTASK	
<input type="radio"/>	ORASAT_JCMED_OS	FULL	1000000	ORA\$AUTOTASK	
<input type="radio"/>	ORASAT_JCNRM_OS	FULL	1000000	ORA\$AUTOTASK	
<input type="radio"/>	ORASAT_JCURG_OS	FULL	1000000	ORA\$AUTOTASK	
<input type="radio"/>	DBMS_JOBS	OFF			
<input type="radio"/>	SCHED\$_LOG_ON_ERRORS_CLASS	FAILED RUNS			
<input type="radio"/>	DEFAULT_JOB_CLASS	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**

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Practices for Appendix C: Migrating Data by Using Oracle Data Pump  
Chapter 29 - Page 1

## 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.

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Practices for Appendix C: Migrating Data by Using Oracle Data Pump  
Chapter 29 - Page 2

## 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
```

- 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;
```

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Practices for Appendix C: Migrating Data by Using Oracle Data Pump  
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```
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>
```

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- 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, create temporary 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  
$
```

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  
  
Copyright (c) 1982, 2013, Oracle and/or its affiliates. All  
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$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/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>
```

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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_ORCL  READ WRITE  3321875125 3321875125
  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_ORCL  READ WRITE  3321875125 3321875125
  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>
```

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- 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>
```

---

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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
```

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