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Oracle Database 12*c*: Administration Workshop

Activity Guide
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Table of Contents

Practices for Lesson 1: Introduction 1-1
Practices for Lesson 1: Overview 1-2
Practices for Lesson 2: Exploring Oracle Database Architecture 2-1
Practices for Lesson 2: Overview 2-2
Practice 2-1: Exploring the Oracle Database Architecture 2-3
Practices for Lesson 3: Oracle Database Management Tools 3-1
Practices for Lesson 3: Overview 3-2
Practice 3-1: Registering the orcl Database in Oracle Enterprise Manager Cloud Control 3-3
Practice 3-2: Creating an Administrative User 3-7
Practice 3-3: Logging In to Oracle Enterprise Manger Database Express 3-10
Practices for Lesson 4: Managing the Database Instance 4-1
Practices for Lesson 4: Overview 4-2
Practice 4-1: Managing the Oracle Instance by Using Oracle Enterprise Manager Cloud Control 4-3
Practice 4-2: Managing the Oracle Instance by Using Oracle Enterprise Manger Database Express 4-9
Practice 4-3: Managing the Oracle Instance by Using SQL*Plus 4-11
Practice 4-4: Viewing the Alert Log by Using the Automatic Diagnostic Repository Command Interface (ADRCI) 4-14
Practices for Lesson 5: Configuring the Oracle Network Environment 5-1
Practices for Lesson 5: Overview 5-2
Practice 5-1: Configuring the Oracle Network to Access Another Database 5-3
Practice 5-2: Creating an Alternative Listener 5-5
Practices for Lesson 6: Administering User Security 6-1
Practices for Lesson 6: Overview 6-2
Practice 6-1: Creating a User and a Profile 6-3
Practice 6-2: Creating Roles 6-5
Practice 6-3: Creating and Configuring Users 6-7
Practices for Lesson 7: Managing Database Storage Structures 7-1
Practices for Lesson 7: Overview 7-2
Practice 7-1: Viewing Database Storage Structure Information 7-3
Practice 7-2: Creating a Tablespace 7-6
Practices for Lesson 8: Managing Space 8-1
Practices for Lesson 8: Overview 8-2
Practice 8-1: Managing Storage 8-3
Practices for Lesson 9: Managing Undo Data 9-1
Practices for Lesson 9: Overview 9-2
Practice 9-1: Managing Undo Data 9-3
Practices for Lesson 10: Managing Data Concurrency 10-1
Practices for Lesson 10: Overview 10-2
Practice 10-1: Resolving Lock Conflicts 10-3
Practices for Lesson 11: Implementing Oracle Database Auditing 11-1
Practices for Lesson 11: Overview 11-2
Practice 11-1: Enabling Unified Auditing 11-3
Practice 11-2: Creating Audit Users 11-8
Practice 11-3: Creating an Audit Policy 11-10

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Practices for Lesson 12: Backup and Recovery: Concepts 12-1
Practices for Lesson 12: Overview 12-2
Practices for Lesson 13: Backup and Recovery: Configuration 13-1
Practices for Lesson 13: Overview 13-2
Practice 13-1: Configuring Your Database for Recovery 13-3
Practices for Lesson 14: Performing Database Backups 14-1
Practices for Lesson 14: Overview 14-2
Practice 14-1: Backing Up the Control File 14-3
Practice 14-2: Configuring Automatic Backups of the Control File and SPFILE 14-5
Practice 14-3: Creating a Whole Database Backup 14-7
Practices for Lesson 15: Performing Database Recovery 15-1
Practices for Lesson 15: Overview 15-2
Practice 15-1: Recovering from the Loss of a Data File 15-3
Practices for Lesson 16: Moving Data 16-1
Practices for Lesson 16: Overview 16-2
Practice 16-1: Moving Data by Using Data Pump 16-3
Practice 16-2: Loading Data by Using SQL*Loader 16-8
Practices for Lesson 17: Database Maintenance 17-1
Practices for Lesson 17: Overview 17-2
Practice 17-1: Database Maintenance 17-3
Practices for Lesson 18: Managing Performance 18-1
Practices for Lesson 18: Overview 18-2
Practice 18-1: Managing Performance 18-3
Practice 18-2: Using Automatic Memory Management 18-16
Practice 18-3: Monitoring Services 18-38
Practices for Lesson 19: Managing Performance: SQL Tuning 19-1
Practices for Lesson 19: Overview 19-2
Practice 19-1: Using Automatic SQL Tuning 19-3
Practices for Lesson 20: Using Database Resource Manager 20-1
Practices for Lesson 20: Overview 20-2
Practice 20-1: Managing Resources 20-3
Practices for Lesson 21: Using Oracle Scheduler to Automate Tasks 21-1
Practices for Lesson 21: Overview 21-2
Practice 21-1: Creating Scheduler Components 21-3
Practice 21-2: Creating Lightweight Scheduler Jobs 21-19
Practice 21-3: Monitoring the Scheduler 21-24

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Practices for Lesson 1: Introduction

Chapter 1

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Practices for Lesson 1

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Practices for Lesson 2: Exploring Oracle Database Architecture

Chapter 2

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Practices for Lesson 2: Overview

Practices Overview

In this practice, you review Oracle Database architecture concepts and answer questions to test your knowledge of the lesson topics.

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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 2-26*

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6. The _____process writes dirty buffers to data files.

   Hint: *See page 2-28*

7. The _____process writes redo entries to online redo log files.

   Hint: *See page 2-30*

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

   - _____
   - _____
   - _____

   Additional important files are:

   - _____
   - _____
   - _____
   - _____
   - _____

   Hint: *See page 2-38*

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

   - _____
   - _____
   - _____
   - _____
   - _____

   Hint: *See page 2-40*

10. The _____process copies redo log files to an archive destination.

    Hint: *See page 2-37*

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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 2-40*

13. LGWR writes when:

    - _____
    - _____
    - _____
    - _____

    Hint: *See page 2-30*

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, 2-24, 2-26, 2-32*

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Practices for Lesson 3: Oracle Database Management Tools

Chapter 3

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Practices for Lesson 3: Overview

Practices Overview

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

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Practice 3-1: 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.

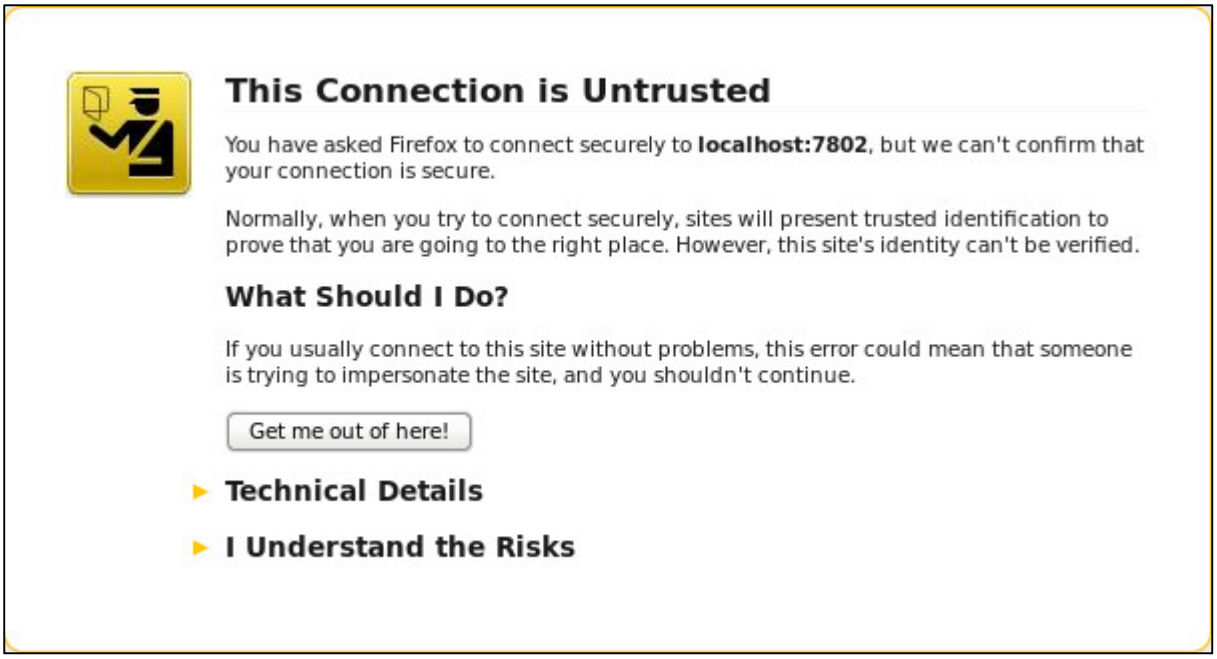
1. Invoke Cloud Control and log in as the `SYSMAN` user. Which port number does this database use?

Answer: Cloud Control uses port 7802 by default.

   a. Click the Firefox browser icon on the top toolbar to launch Firefox.

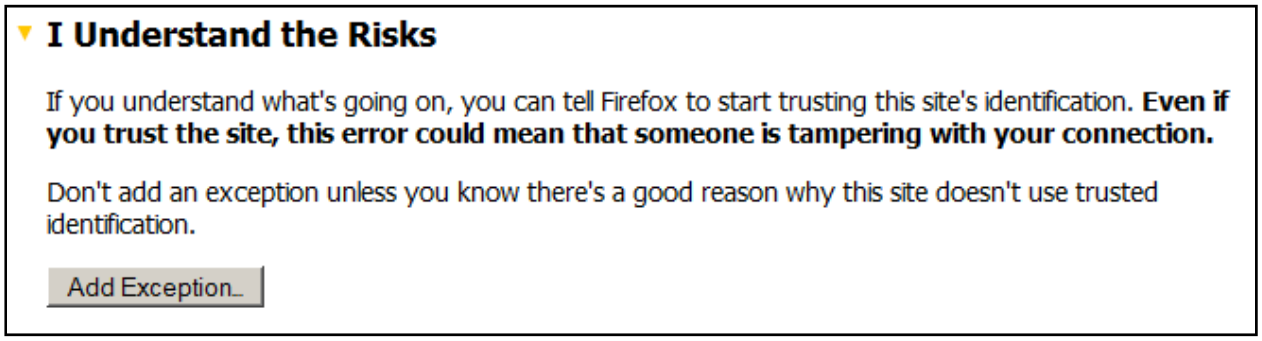
   b. Enter the URL `https://localhost:7802/em`. The format for this URL is https://<machine_name>:<port_number>/em.

   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.



   i) Click **I understand the Risks**.

   ii) Click **Add Exception**.



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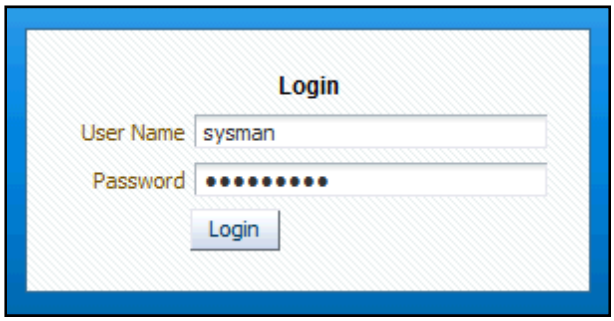
iii) Ensure that the option to permanently store this exception is selected and then click **Confirm Security Exception**.

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



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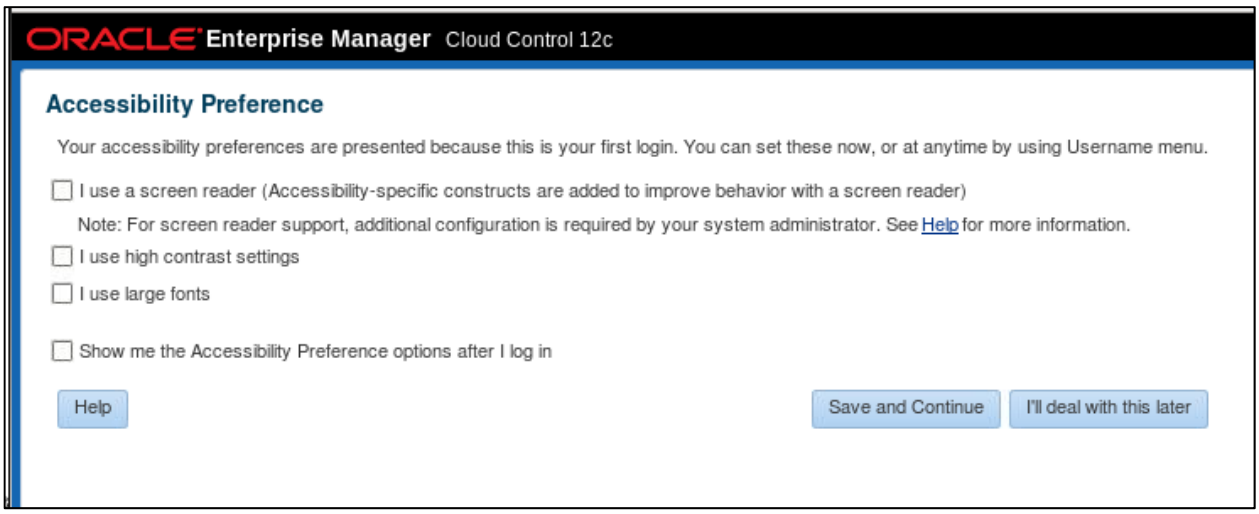
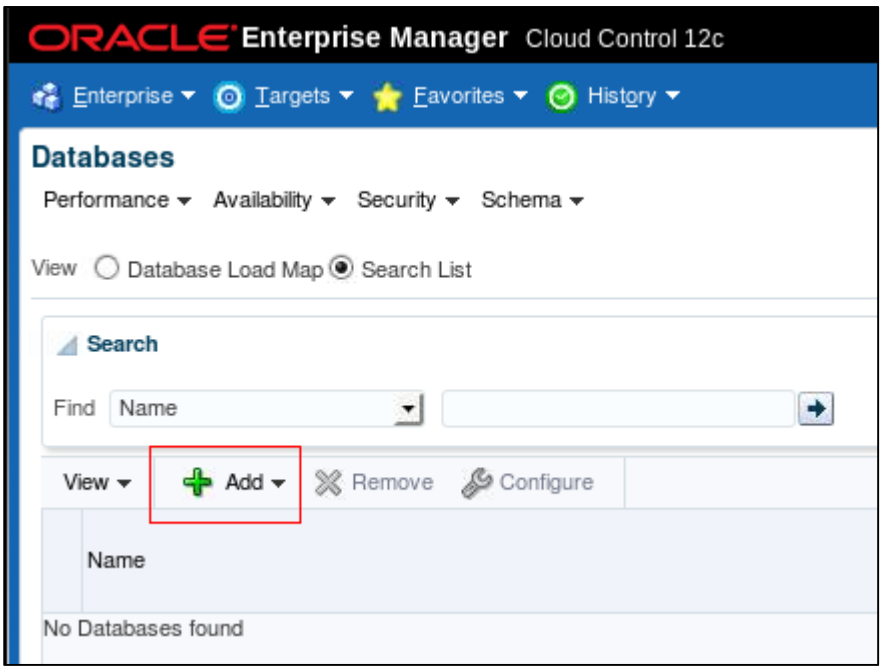
2. The Accessibility Preference page is displayed. Select the appropriate preference and click "Save and Continue."



3. At the first login to Cloud Control, you will be asked to accept the license agreement. Click **I Accept**.
4. Also, at the first the login to Cloud Control, you will be asked to select a Home page from several pages. Click the radio button below the **Summary** view. Note that this is the assumed starting point for any subsequent logins.
5. 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 databases. Expand **Add** and click **Oracle Database**.



   d. On the "Database Discovery: Search Criteria" page, use the Search icon to select your host target on the Search Targets page. Click **Next**.

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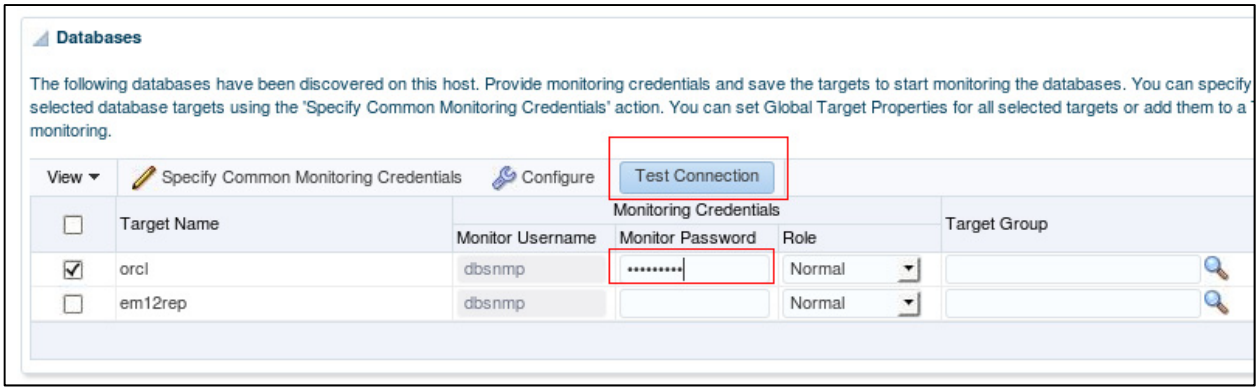
e. In the Databases section, select the **`orcl`** database.

f. Enter **`oracle_4U`** in the Monitor Password field for the `orcl` database. Click **Test Connection**.



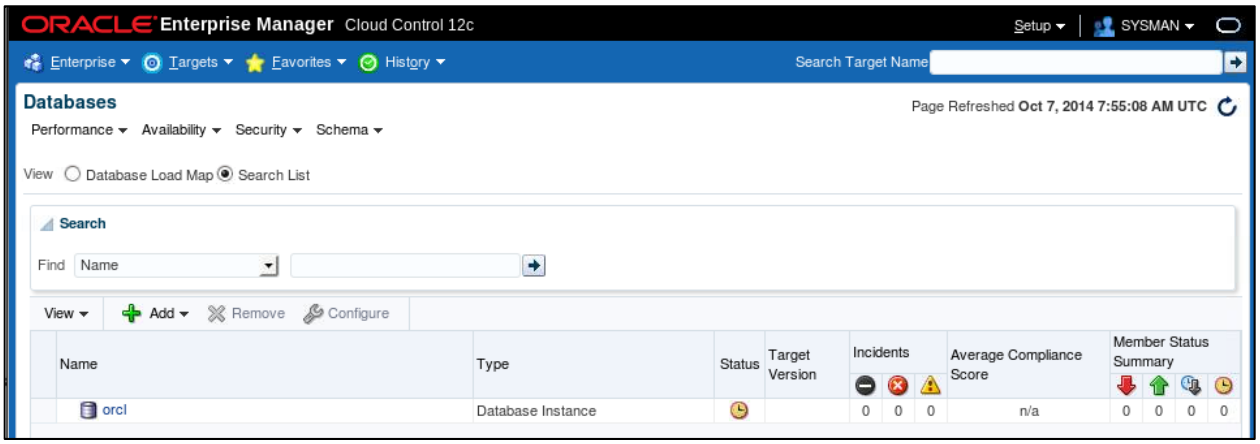
g. You receive a confirmation message that the connection test was successful. Click **OK**.

h. Click **Next**.

i. Click **Save**.

j. On the Target Saving Completed Successfully page, click **Close**.

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



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

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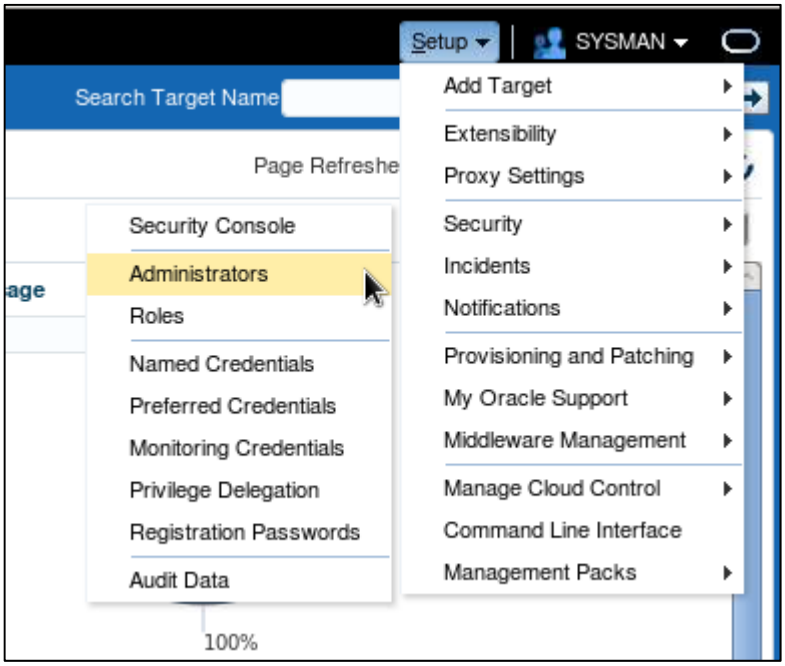
Practice 3-2: Creating an Administrative User

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. On 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.

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

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

7. Expand SYSMAN on the top-right corner and click **Log Out**.
8. Enter `ADMIN` in the User Name field and `oracle_4U` in the Password field. Click **Login**.
9. The Accessibility Preference page is displayed. Select the appropriate preference and click "Save and Continue."
10. The Select Enterprise Manager Home page is displayed. Click the radio button below the **Summary** view.
11. The Enterprise Summary page is displayed. Expand ADMIN and click **Log Out** to exit from Enterprise Manager Cloud Control.

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Practice 3-3: Logging In to Oracle Enterprise Manger Database Express

Overview

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

Tasks

1. 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 `lab_03_03_01.sh`. You will examine this script later after discussing user security.

   Open a terminal window. Execute the `$LABS/P3/lab_03_03_01.sh` script.

```
$ $LABS/P3/lab_03_03_01.sh
lab_03_03_01 completed. You may now login as:
dba1/oracle_4U
```

2. 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.gethttpport;
      dbms_output.put_line('DB user port for EM
Express:'||to_char(PORT));
   END;
```

   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_1 is
/u01/app/oracle
$
```

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b. Log in to SQL*Plus as the `DBA1` user and execute the `$LABS/P3/lab_03_03_02.sql` script, which contains the PL/SQL block shown above.

```
$ sqlplus dba1/oracle_4U as sysdba
…
SQL> @$LABS/P3/lab_03_03_02
DB user port for EM Express:5500

PL/SQL procedure successfully completed.
```

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

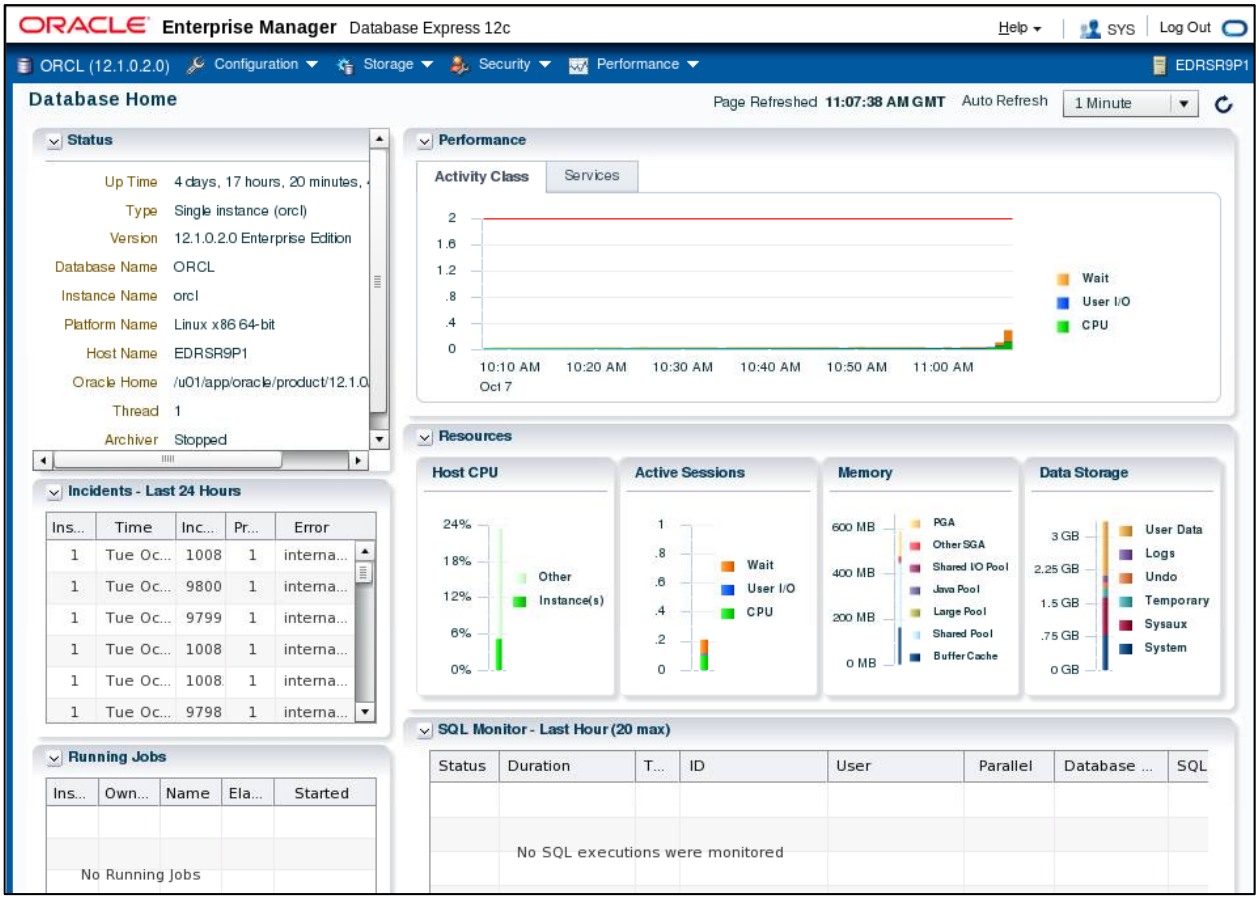
c. Click the **Firefox Web Browser** icon on the top toolbar to open your web browser as the `oracle` user.

d. Enter the URL below with the port number you found by executing the PL/SQL block. It has the following format:

http://localhost:*portnumber*/em

3. 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`**." Click **Login**.

4. The Database Home page is displayed.



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5. Review the data on the Database Home page, and then click **Log Out** on the top-right corner.
6. Log out of SQL*Plus.

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Practices for Lesson 4: Managing the Database Instance

Chapter 4

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Practices for Lesson 4: Overview

Practices Overview

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

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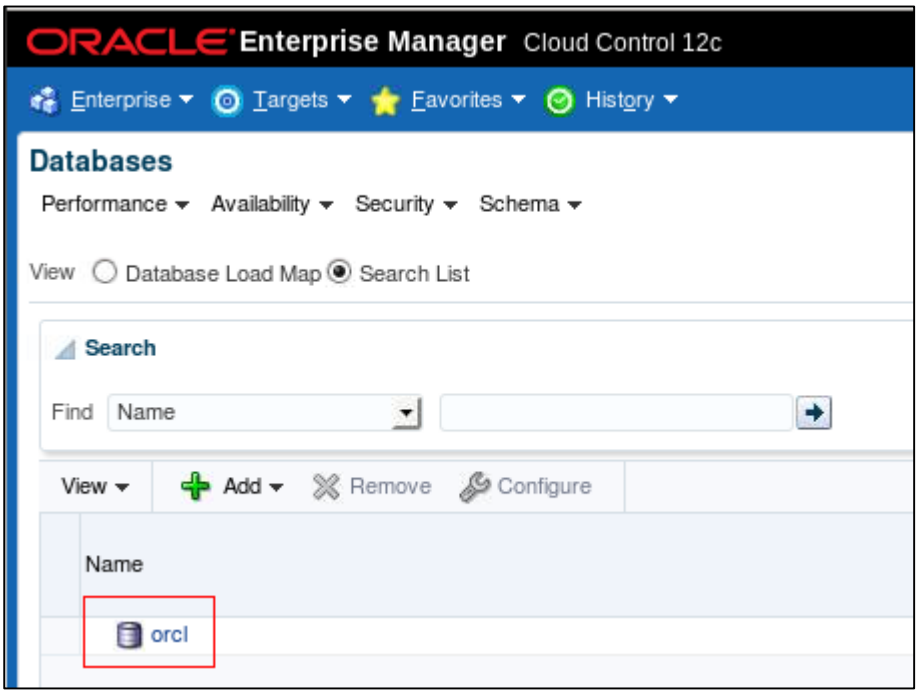
Practice 4-1: Managing the Oracle Instance by Using Oracle Enterprise Manager Cloud Control

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. Click the **Firefox 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. Select the **Search List** radio button at the top of the page.
   c. On the Databases page, click **orcl**.



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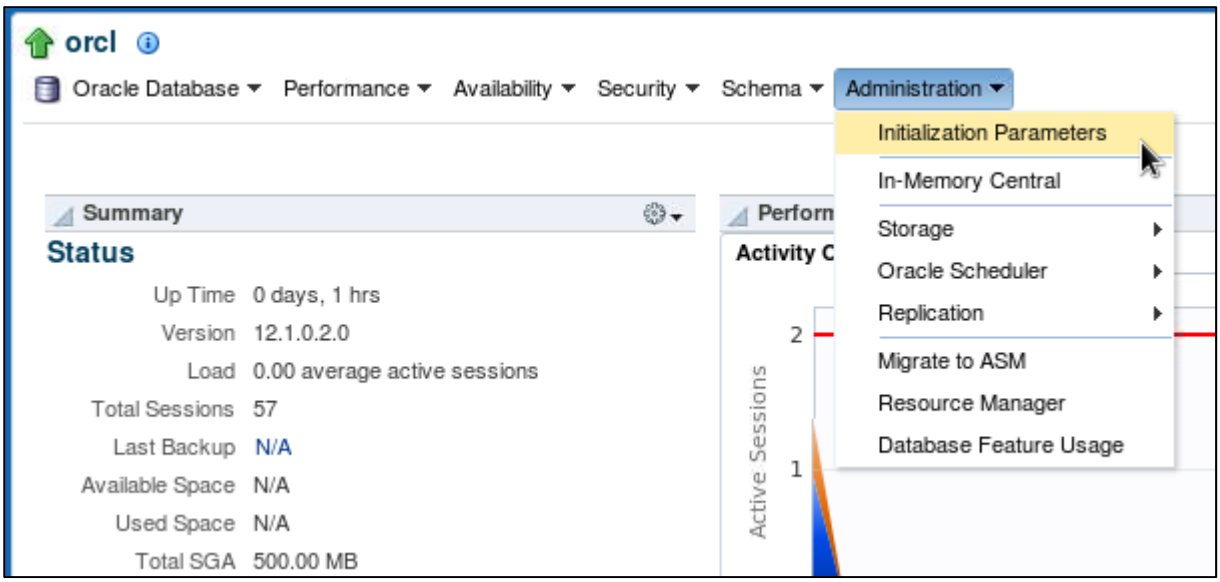
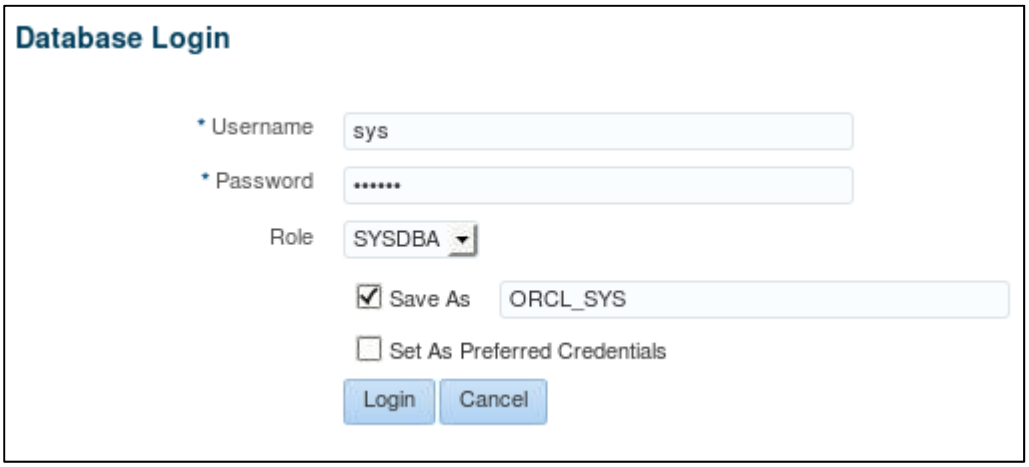
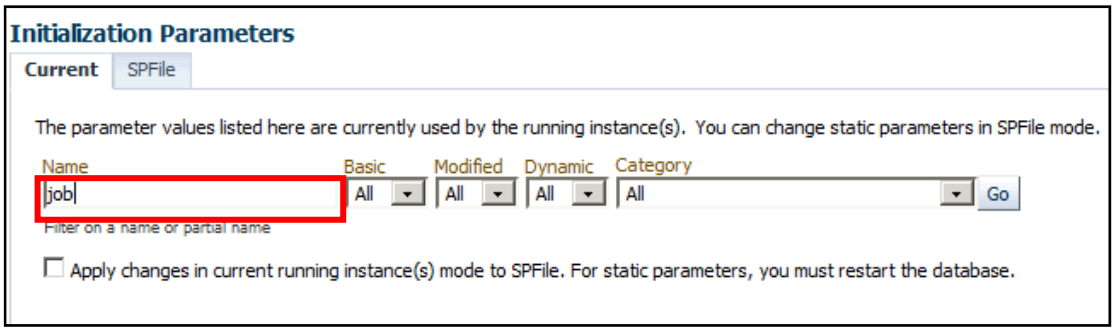
d. Navigate to the Initialization Parameters page by selecting **Administration** > **Initialization Parameters**.



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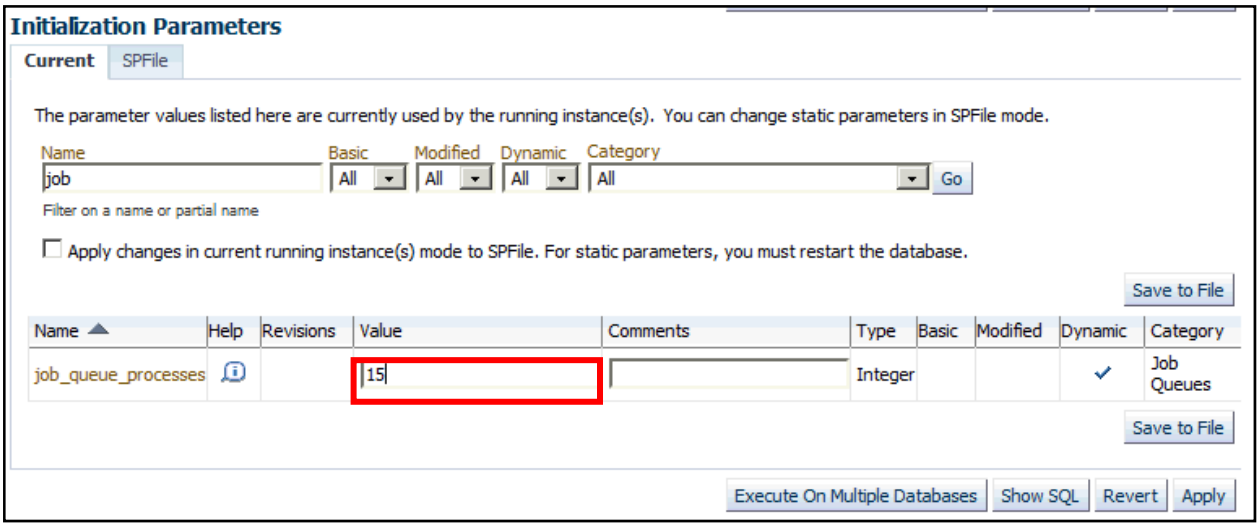
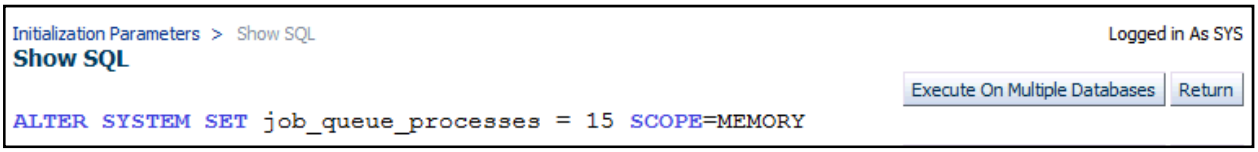
g. When the `JOB_QUEUE_PROCESSES` initialization parameter appears, change its value to **15**.



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



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.

Step	Window/Page Description	Choices or Values
a.	Cloud Control (See screenshot 3a below)	Select **Oracle Database** > **Control** > **Startup/Shutdown**
b.	Startup/Shutdown:Specify Host and Target Database Credentials (See screenshot 3b below)	Host Credentials: Credential: Select **New**. Username: `oracle` Password: `<os password>` Save As: `ORCL_HOST` Confirm password: `oracle` Select Set As Preferred Credentials. Select Database Host Credentials. Click Test.
c.	Startup/Shutdown:Specify Host and Target Database Credentials	Response: Test successful
d.	Startup/Shutdown:Specify Host and Target Database Credentials	Database Credentials: Credential: Select `New`

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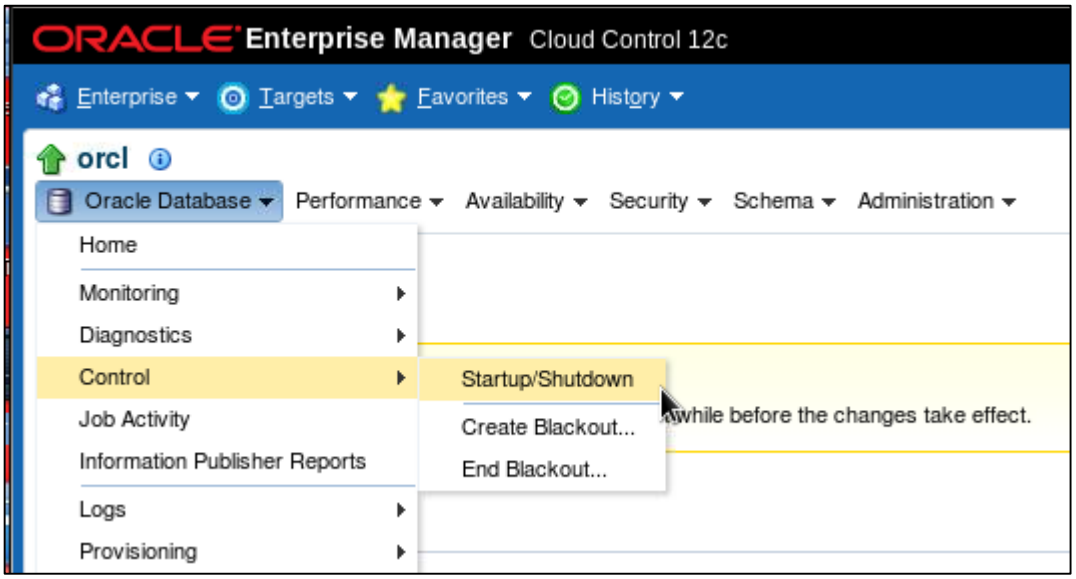
Step	Window/Page Description	Choices or Values
		Username: `SYS` *(this must be uppercase)* Password: `oracle_4U` Save As: `ORCL_SYSDBA` Confirm password : `oracle_4U` Role: `SYSDBA` Select Set As Preferred Credentials. Select SYSDBA Database Credentials. Click Test.
e.	Startup/Shutdown:Specify Host and Target Database Credentials	Response: Test Successful Click OK.
f.	Startup/Shutdown:Confirmation	Click Advanced Options.
g.	Startup/Shutdown:Advanced Shutdown Options	Examine the options. Notice that the mode for shutting down is Immediate. Do not change the mode; it should remain as “Immediate.” Click Cancel.
h.	Startup/Shutdown:Confirmation	Click Yes.
i.	Startup/Shutdown:Activity Information	Wait for next page to be displayed.
j.	orcl home page is displayed (see screenshot 3j below)	Note that the status of the instance is now “Down.”

3a.



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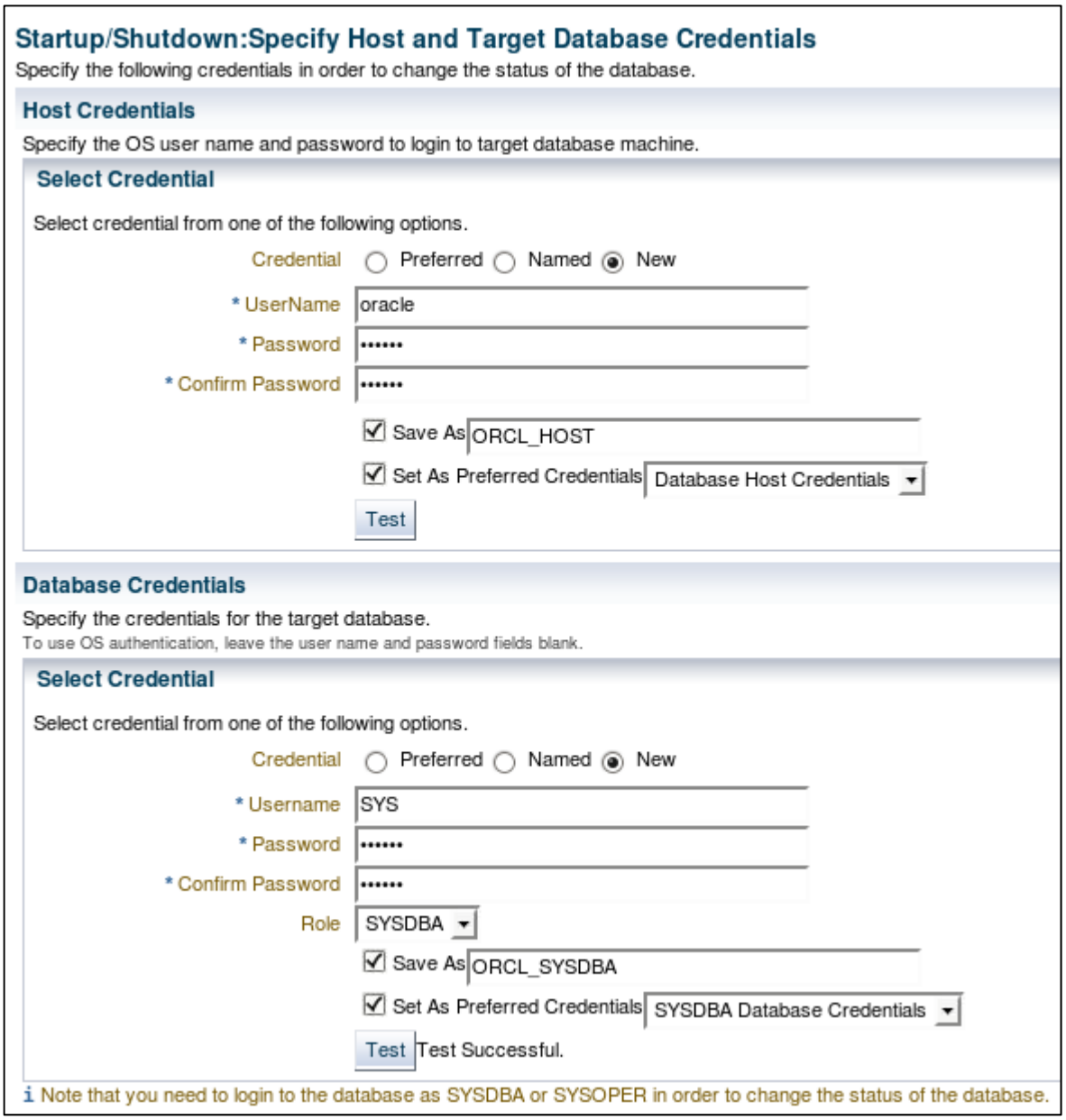
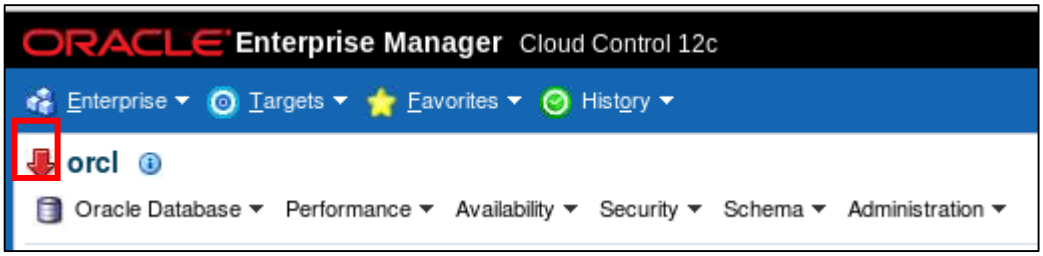
3b.



3c.



4. Using SQL*Plus, verify that you are *not* able to connect as the `HR` user to a database that has been shut down.

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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_1 is
/u01/app/oracle
$
```

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

```
$ sqlplus hr
```

c. Enter **`oracle_4U`** for the password.

Note the `ORACLE not available` error message.

```
$ sqlplus hr

SQL*Plus: Release 12.1.0.2.0 Production on Wed Oct 8 07:22:47
2014

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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
Additional information: 3640
Additional information: 1371676159
Process ID: 0
Session ID: 0 Serial number: 0



Enter user-name:
```

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 Host Credentials, select Credential: Named. Select **ORCL_HOST**.

c. In Database Credentials, select Credential: 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 4-2: Managing the Oracle Instance by Using Oracle Enterprise Manger Database Express

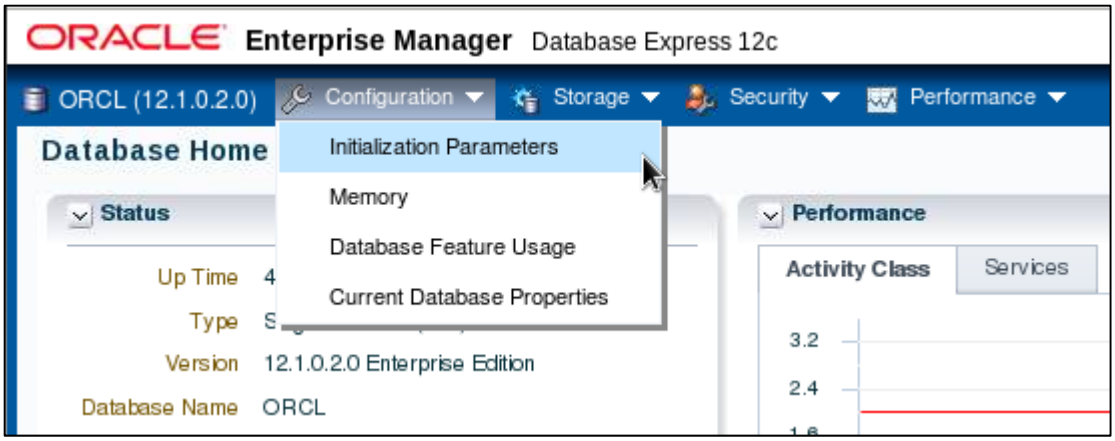
Overview

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. Click the **Firefox Web Browser** icon on your desktop to open your web browser as the `oracle` user.
   b. Enter the following URL: http://localhost:5500/em.
   c. In 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.

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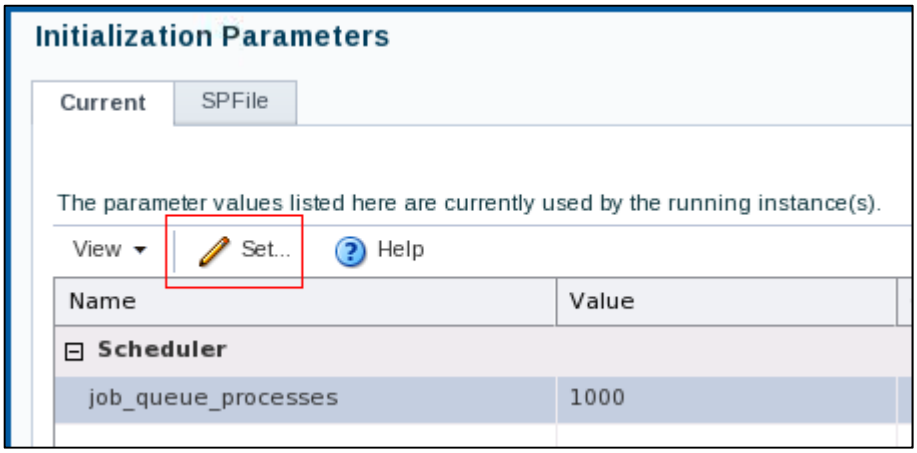
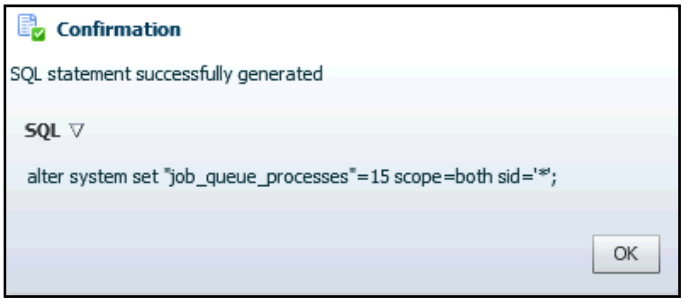
c. When the `JOB_QUEUE_PROCESSES` initialization parameter appears, select it and click Set.



d. In the dialog box, change the value to **15**.

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



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

g. Click **OK** on the Confirmation page.

h. 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 4-3: Managing the Oracle Instance by Using SQL*Plus

Overview

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

Tasks

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

```
$ . oraenv
ORACLE_SID = [oracle] ? orcl
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1 is
/u01/app/oracle
$
```

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

```
$ sqlplus / as sysdba
```

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

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

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

```
SQL> SHOW PARAMETER job

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

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

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

System altered.
```

   e. View the changed parameter.

```
SQL> SHOW PARAMETER job

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

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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  503316480 bytes
Fixed Size                  2926080 bytes
Variable Size             268438016 bytes
Database Buffers          226492416 bytes
Redo Buffers                5459968 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 500M
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>
```

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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.

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Practice 4-4: 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 code box below.

```
$ adrci
…
ADR base = "/u01/app/oracle"
adrci> show alert

Choose the home from which to view the alert log:

1: diag/rdbms/em12rep/em12rep
2: diag/rdbms/orcl/orcl
3: diag/tnslsnr/EDRSR32P1/listener
Q: to quit

Please select option: 2

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.

```
2012-10-31 08:43:37.541000 +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
************************ Large Pages Information
*******************
Per process system memlock (soft) limit = 64 KB
```

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```
Total System Global Area in large pages = 0 KB (0%)

Large pages used by this instance: 0 (0 KB)
Large pages unused system wide = 0 (0 KB)
Large pages configured system wide = 0 (0 KB)
Large page size = 2048 KB
```

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/em12rep/em12rep
2: diag/rdbms/orcl/orcl
3: diag/tnslsnr/EDRSR32P1/listener
Q: to quit

Please select option: 2
Output the results to file: /tmp/alert_5717_14002_orcl_1.ado

Please select option: Q
adrci> exit
$
```

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Practices for Lesson 5: Configuring the Oracle Network Environment

Chapter 5

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Practices for Lesson 5: Overview

Practices Overview

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

Note: This practice is entirely for educational purposes and no future practices rely on successful completion of this practice.

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Practice 5-1: Configuring the Oracle Network to Access Another 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 your **`tnsnames.ora`** file. It is in your database **`$ORACLE_HOME/network/admin`** directory.
   a. In a terminal window, use `oraenv` to set your environment to your database home.

```
$ . oraenv
ORACLE_SID = [orcl] ? orcl
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1 is
/u01/app/oracle
```

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

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

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

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

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

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

Step	Window/Page Description	Choices or Values
a.	Terminal as 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 Name Wizard: Welcome	Enter Service Name: **testorcl** Click **Next**.
g.	Net Service Name Wizard:…Protocol	Select **TCP/IP (Internet Protocol).** Click **Next**.
h.	Net Service Name Wizard:…Protocol Settings	Enter Host Name: **<assigned hostname or IP address>** Enter Port Number: **1521** Click **Next**.

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

3. Test your changes to the network configuration by using SQL*Plus. Enter **`system@testorcl`** and then enter **`oracle_4U`** when prompted for the password. Select the `INSTANCE_NAME` and `HOST_NAME` columns from the `V$INSTANCE` view to view information about the host.
   a. Ensure your environment is set for the `orcl` database by executing the `oraenv` command.

```
$ . oraenv
ORACLE_SID = [oracle] ? orcl
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1 is
/u01/app/oracle
```

   b. 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.

   c. At the `SQL>` prompt, enter the following command, and then exit from 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 5-2: Creating an Alternative Listener

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

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

Step	Window/Page Description	Choices or Values
a.	Terminal as `oracle` user	$ **netmgr**
b.	Oracle Net Manager navigation pane	Expand **Local**. Select **Listeners**. Expand **Listeners**. Click the green plus sign to begin defining a new listener.
c.	Choose Listener Name	Enter **`LISTENER2`**. Click **OK**.
d.	Oracle Net Manager: (right pane)	Click **Add Address**.
e.	Oracle Net Manager: Address1	Enter Port Number: **1561**
f.	Oracle Net Manager	Click **File** > **Save Network Configuration**

2. Create a Service Name for both listeners by using Oracle Net Manager

Step	Window/Page Description	Choices or Values
a.	Oracle Net Manager	Enter **`netmgr`** if necessary.
b.	Oracle Net Manager navigation pane	Select **Service Naming**. Expand **Service Naming**. Click the green plus sign to launch the Net Service Name Wizard.
c.	Net Service Name Wizard: Welcome	Enter Service Name: **`Listener1`** Click **Next**.
d.	Net Service Name Wizard:…Protocol	Select **TCP/IP (Internet Protocol)** Click **Next**.
e.	Net Service Name Wizard:…Protocol Settings	Enter Host Name: **localhost** Enter Port Number: **1521** Click **Next**.
f.	Net Service Name Wizard:…Service	Enter Service: **orcl** Click **Next**.
g.	Net Service Name Wizard:…Test	Click **Finish**.
h.	Oracle Net Manager navigation pane	Select **Service Naming**. Expand **Service Naming**.

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Step	Window/Page Description	Choices or Values
		Click the green plus sign to launch the Net Service Name Wizard.
i.	Net Service Name Wizard: Welcome	Enter Service Name: **`Listener2`** Click **Next**.
j.	Net Service Name Wizard:…Protocol	Select **TCP/IP (Internet Protocol)**. Click **Next**.
k.	Net Service Name Wizard:…Protocol Settings	Enter Host Name: **`localhost`** Enter Port Number: **1561** Click **Next**.
l.	Net Service Name Wizard:…Service	Enter Service: **orcl** Click **Next**.
m.	Net Service Name Wizard:…Test	Click **Finish**.
n.	Oracle Net Manager	Click **File** > **Save Network Configuration** Click **File** > **Exit**.

3. Start the **`LISTENER2`** listener by using the listener control utility.

```
$ lsnrctl start listener2
LSNRCTL for Linux: Version 12.1.0.2.0 - Production on 08-OCT-
2014 10:56:22

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Starting /u01/app/oracle/product/12.1.0/dbhome_1/bin/tnslsnr:
please wait...

TNSLSNR for Linux: Version 12.1.0.2.0 - Production
System parameter file is
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.o
ra
Log messages written to
/u01/app/oracle/diag/tnslsnr/EDRSR9P1/listener2/alert/log.xml
Listening on:
(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=edRSr9p1.us.oracle.com
)(PORT=1561)))

Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=EDRSR9P1)(PORT=1561)))
STATUS of the LISTENER
------------------------
Alias                     listener2
```

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```
Version                   TNSLSNR for Linux: Version 12.1.0.2.0
- Production
Start Date                08-OCT-2014 10:56:24
Uptime                    0 days 0 hr. 0 min. 2 sec
Trace Level               off
Security                  ON: Local OS Authentication
SNMP                      OFF
Listener Parameter File
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.o
ra
Listener Log File
/u01/app/oracle/diag/tnslsnr/EDRSR9P1/listener2/alert/log.xml
Listening Endpoints Summary...

(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=edRSr9p1.us.oracle.com
)(PORT=1561)))
The listener supports no services
The command completed successfully
```

4. Configure the database to register with both listeners. Alter the `LOCAL_LISTENER` initialization parameter.
   a. Start SQL*Plus in a terminal window. Be sure to set the Oracle environment to `orcl` by using `oraenv` if you have started a new terminal window. Connect as the `SYS` user `AS SYSDBA`.
   b. In SQL*Plus, view and set the `LOCAL_LISTENER` initialization parameter to include both listeners. Then exit SQL*Plus.

```
SQL> show parameter local_listener

NAME                                 TYPE        VALUE
------------------------------------ ----------- -------------
local_listener                       string

SQL> ALTER SYSTEM SET LOCAL_LISTENER=LISTENER1,LISTENER2
SCOPE=BOTH;

System altered.

SQL> show parameter local_listener

NAME                       TYPE        VALUE
------------------------- ----------- -------------
local_listener            string      LISTENER1, LISTENER2
SQL>

SQL> exit
```

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5. Check the status of the new listener and test the new listener.
   a. In a terminal window with the Oracle environment properly set, issue the following commands at the command prompt:

```
$ lsnrctl status LISTENER2
…
Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=EDRSR9P1)(PORT=1561)))
STATUS of the LISTENER
------------------------
Alias                     listener2
Version                   TNSLSNR for Linux: Version 12.1.0.2.0
- Production
Start Date                08-OCT-2014 10:56:24
Uptime                    0 days 0 hr. 5 min. 34 sec
Trace Level               off
Security                  ON: Local OS Authentication
SNMP                      OFF
Listener Parameter File
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.o
ra
Listener Log File
/u01/app/oracle/diag/tnslsnr/EDRSR9P1/listener2/alert/log.xml
Listening Endpoints Summary...

(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=edRSr9p1.us.oracle.com
)(PORT=1561)))

(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=edRSr9p1.us.oracle.com
)(PORT=5500))(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
```

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b. Connect to your database 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 12.1.0.2.0 -
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. You can now stop the new `LISTENER2` listener because you do not need it for the remainder of the course.

```
$ lsnrctl stop LISTENER2
LSNRCTL for Linux: Version 12.1.0.2.0 - Production on 08-OCT-
2014 11:19:57

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Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=EDRSR9P1)(PORT=1561)))
The command completed successfully
```

7. Reset the `LOCAL_LISTENER` initialization parameter to the default value.

a. Log in to SQL*Plus as the `DBA1` user with the `AS SYSDBA` option.

b. Execute the `ALTER SYSTEM RESET LOCAL_LISTENER` command to reset the initialization parameter to the default value.

```
SQL> alter system reset local_listener scope=spfile;

System altered.
```

c. Shut down the database instance with the `IMMEDIATE` option.

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

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d. Restart the database instance and exit from SQL*Plus.

```
SQL> startup
ORACLE instance started.
…
Database mounted.
Database opened.
SQL> exit
```

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Practices for Lesson 6: Administering User Security

Chapter 6

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Practices for Lesson 6: 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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Practice 6-1: 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. **Mandatory task:** Create the **`INVENTORY`** user with a password of **`oracle_4U`**.

   In a terminal window enter:

```
$ sqlplus DBA1/oracle_4U as sysdba
…
Connected to:
…

SQL> create user inventory identified by oracle_4U
2>   default tablespace users
3>   quota unlimited on users;

User created.

SQL> grant connect to inventory;

Grant succeeded.

SQL> exit

Disconnected …
$
```

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

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

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

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Step	Window/Page Description	Choices or Values
f.	Confirmation	Click **OK**.
g.	Create Profile Dialog: Password	Click **OK**.
h.	Confirmation	Click **OK**.

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

Step	Window/Page Description	Choices or Values
a.		Select **Configuration** > **Initialization Parameters**
b.	Initialization Parameters	Enter **`resource_limit`** in the Name field.
c.	Initialization Parameters	Confirm that `resource_limit` is set to **`true`**. If it is not set to true, perform steps d–f.
d.	Initialization Parameters	Select **`resource_limit`** Click **Set**.
e.	Set Initialization Parameter	Set Value **true**. Click **OK**.
f.	Confirmation	Click **OK**.

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Practice 6-2: Creating Roles

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

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

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

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

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

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Practice 6-3: 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 **Security** > **Users**
b.	Users	Click **Create User**.
c.	Create User: User Account	Name: **DHAMBY** Authentication: Select **Password** Password: **newuser** Profile: **HRPROFILE** Select **Password expired** Click the **Next** icon. **Note:** This user will have to change the password.
d.	Create User: Tablespace	Verify Default Tablespace: **USERS** Temporary Tablespace: **TEMP** Click the **Next** icon.
e.	Create User: Privilege	Select **Connect** and move it to the right pane. Click **Show SQL**.
f.	Confirmation	Click **OK**.
g.	Create User: Privilege	Select **HRCLERK** and move it to the right pane. Hint: Enter HR in the search/filter box. Click **Show SQL**.
h.	Confirmation	Copy and paste the SQL statements into a gedit window.
i.	Linux Desktop (see screenshot below)	Click **Applications** > **Accessories** > **gedit Text Editor** In gedit, click **File** > **Save as** Enter `P6script.sql` as the file name. Save in the default location of `/home/oracle`. Click **Save**. Click **File** > **Quit**

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

2. Create an account for Rachel Pandya, another new HR clerk. Modify the `P6script.sql` script to create the RPANDYA user.
   a. Open the **`/home/oracle/P6script.sql`** file in an editor (instructions assume you are using `gedit`).
   b. Substitute **`RPANDYA`** for `DHAMBY` in every occurrence of `DHAMBY`.
   c. Specify the password as **`newuser`**.
   d. Check the script for SQL end-of-command delimiters "`;`" (semicolon). Add semicolons as necessary for correct syntax.
   e. Add an `exit` command to the end of the file.
   f. Save and close the file.
   g. In a terminal window, execute the `P6script.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/P6script.sql
…
Connected to:
…
User created.


Grant succeeded.


Grant succeeded.
```

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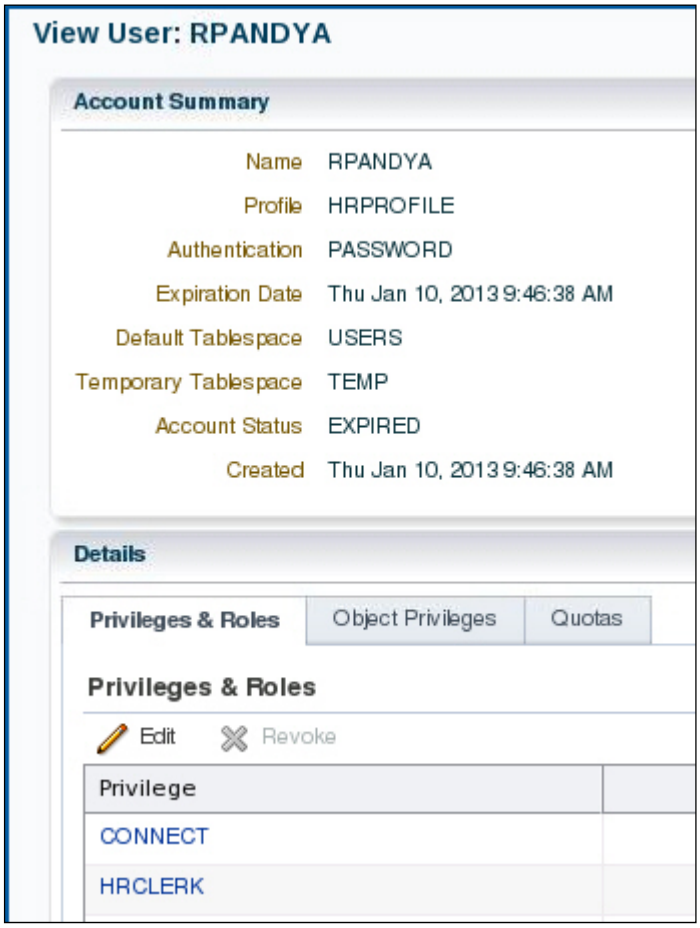
```
Disconnected
…
$
```

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 `P6script.sql` script to take parameters for the username and role. Execute the script to create the **`JGOODMAN`** user with the **`HRMANAGER`** role.

   a. In `gedit` or an editor of your choice, open the script `/home/oracle/P6script.sql`.

   b. Change every occurrence of `RPANDYA` to `&&username`.

   c. Change every occurrence of `HRCLERK` to `&&role`.

   d. 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/P6script.sql
…
Connected to:
```

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```
…
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.

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

Grant succeeded.

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

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

b. Change the password to `oracle_4U`.

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

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

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

    SALARY
----------
      3000
```

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

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

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

a. Connect to the **`orcl`** database as the **`JGOODMAN`** user.

```
SQL> connect jgoodman
Enter password:
ERROR:
ORA-28001: the password has expired
Changing password for jgoodman
New password: *******
Retype new password: *******
Password changed
Connected.
SQL>
```

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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: `CREATE SESSION` is one of the privileges of the `CONNECT` 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 7: Managing Database Storage Structures

Chapter 7

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Practices for Lesson 7: Overview

Practices Overview

You need to view existing storage structure information and create a new tablespace for the INVENTORY application. You also need to create a database user to perform all administrative tasks without using the `SYS` and `SYSTEM` accounts.

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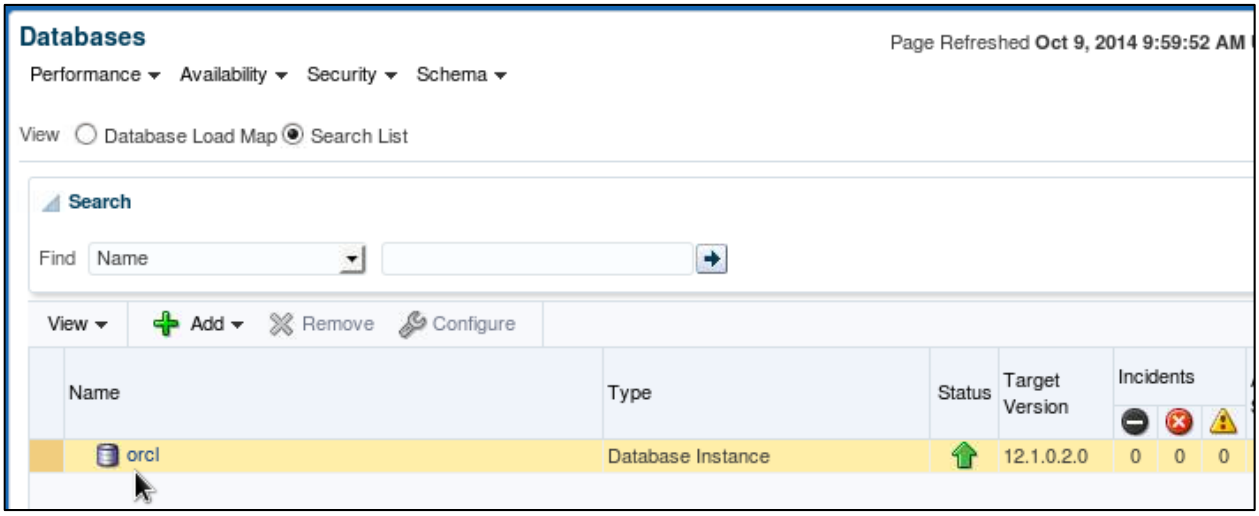
Practice 7-1: Viewing Database Storage Structure Information

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

Assumptions: The `lab_03_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.
   a. Navigate to your target database: **Targets** > **Databases.**
   b. Select the Search List radio button at the top of the page.
   c. On the Databases page, click **orcl**.



3. The orcl Database Home page appears.
4. Using Cloud Control, view information about the **`EXAMPLE`** tablespace and answer the given questions.

Step	Window/Page Description	Choices or Values
a.	Database home page	Select **Administration** > **Storage** > **Tablespaces**.
b.	Database Login page (see image below)	Username: **`dba1`** Password: **`oracle_4U`** Role: **`SYSDBA`** Select **Save As**. Select **Set as Preferred Credentials**. Select **SYSDBA Database Credentials**. Click **Login**.

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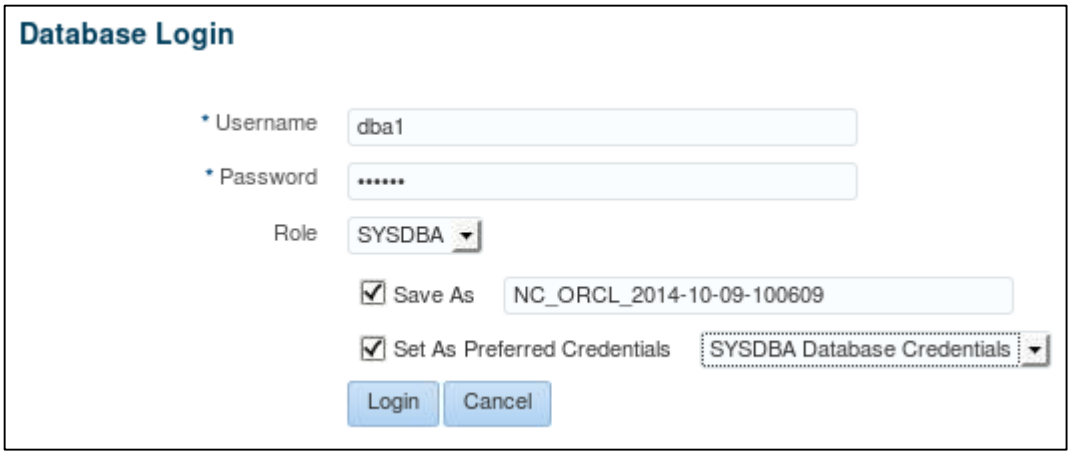
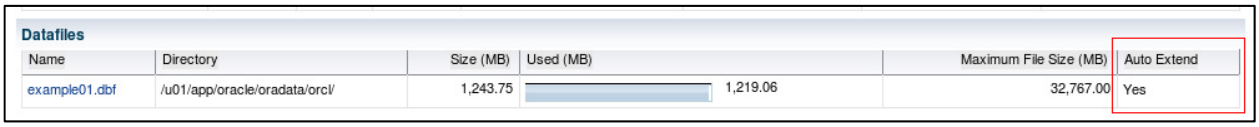


Question 1: The `EXAMPLE` tablespace is nearly full. Can the tablespace size increase without you having to take any action?

Step	Window/Page Description	Choices or Values
c.	Tablespaces	Click the **`EXAMPLE`** tablespace name. At the bottom of the page, view the Datafiles section.

Answer: Yes. The example01.dbf datafile is configured to auto extend.



Datafiles

Name	Directory	Size (MB)	Used (MB)	Maximum File Size (MB)	Auto Extend
example01.dbf	/u01/app/oracle/oradata/orcl/	1,243.75	1,219.06	32,767.00	Yes

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

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

Answer: 351 (Your answer may vary.)

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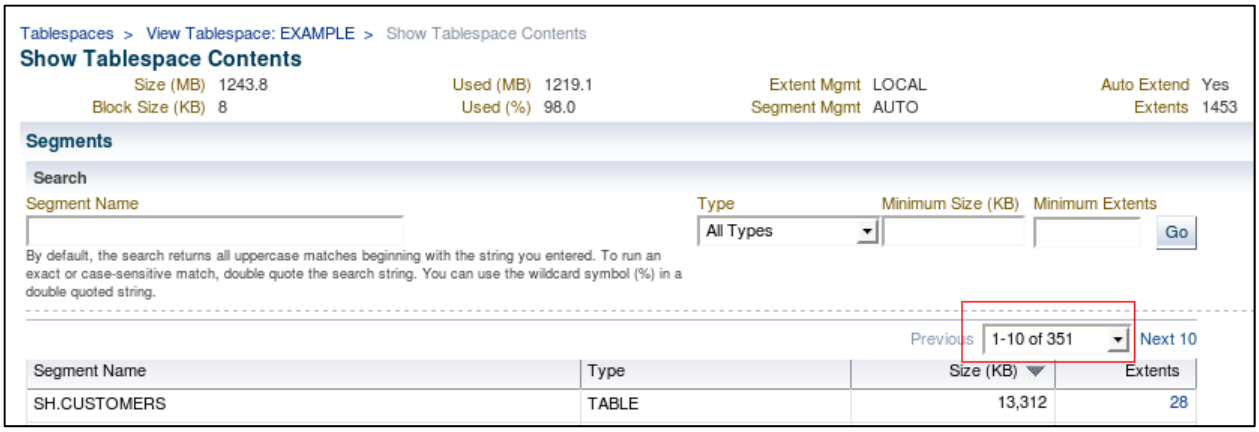
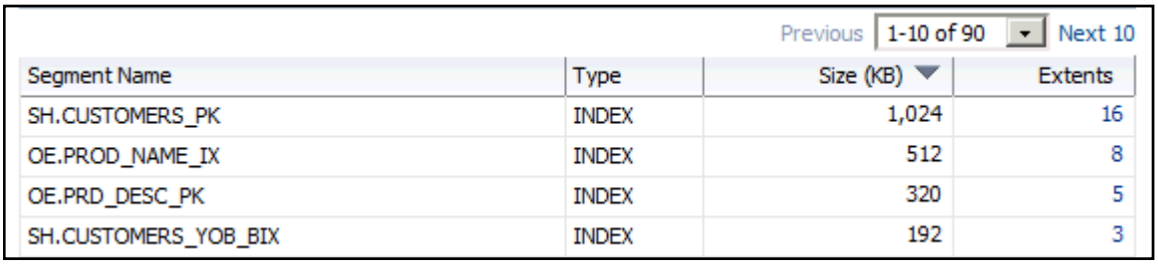


Question 3: Which index in the `EXAMPLE` tablespace takes up the most space?

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



Answer: `SH.CUSTOMERS_PK`

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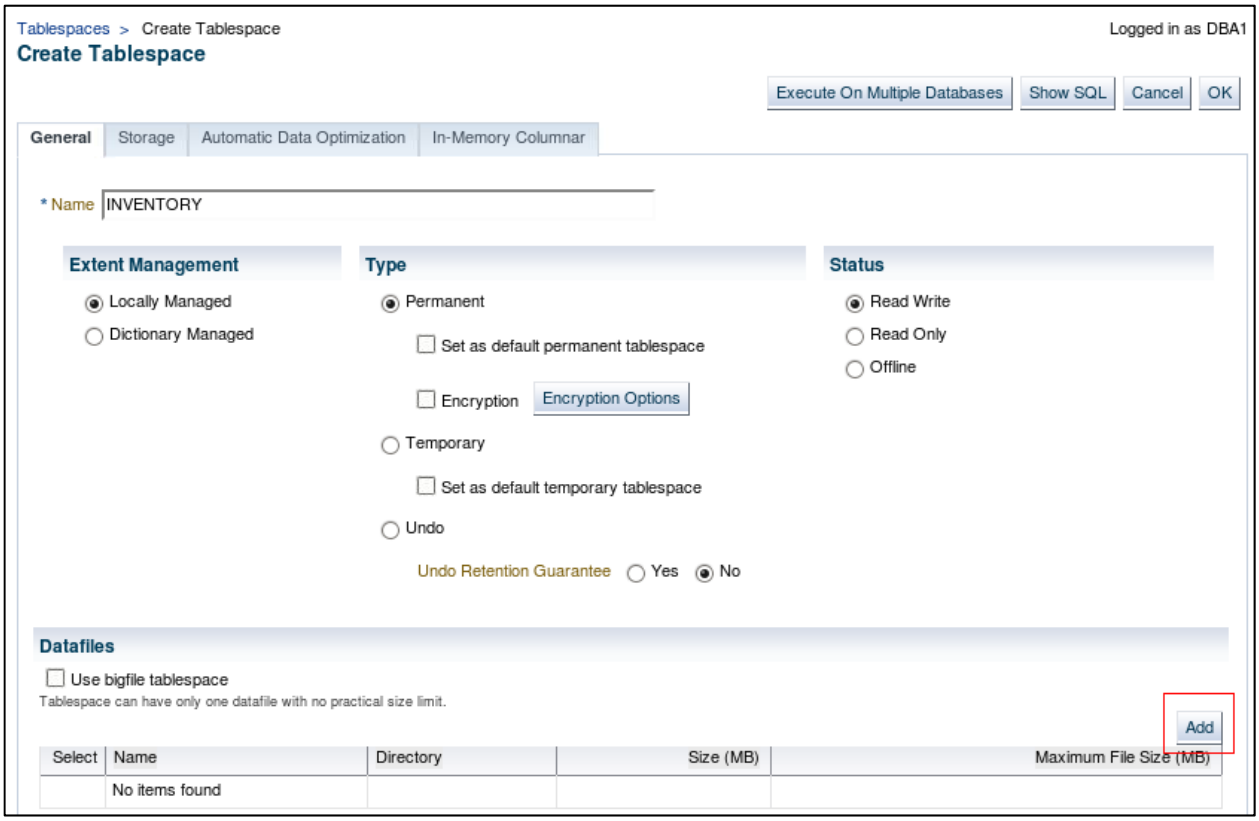
Practice 7-2: Creating a Tablespace

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

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



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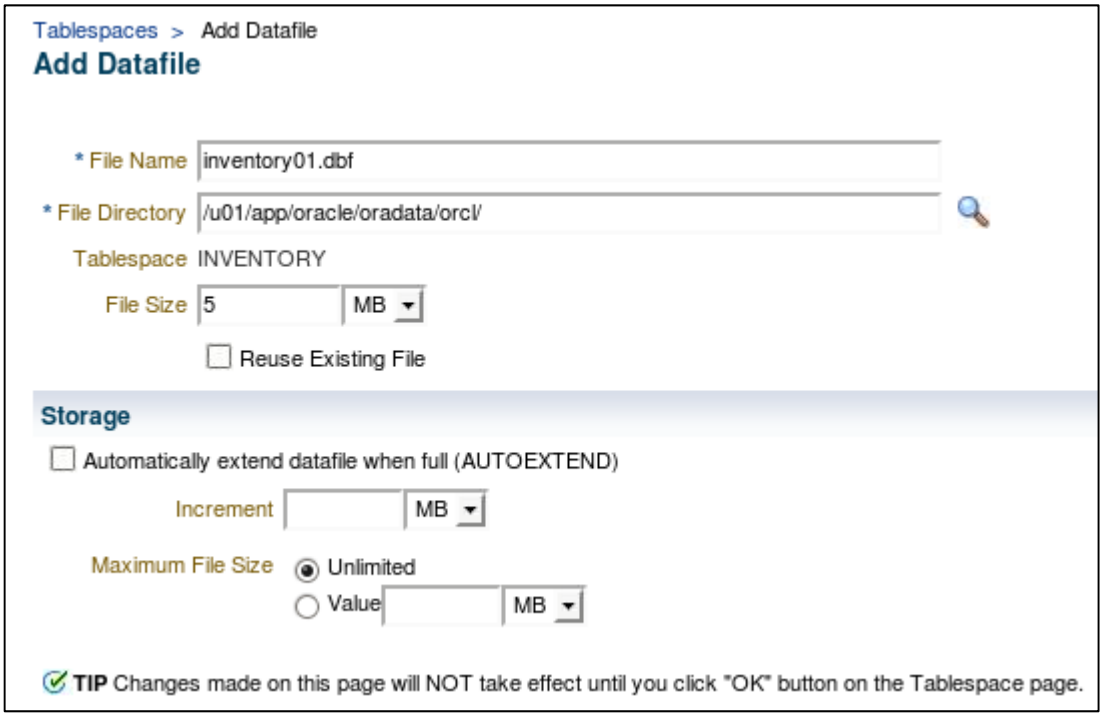
Step	Window/Page Description	Choices or Values
d.	Add Datafile	Filename: **inventory01.dbf** File Size: **5 MB** Click **Continue**.



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

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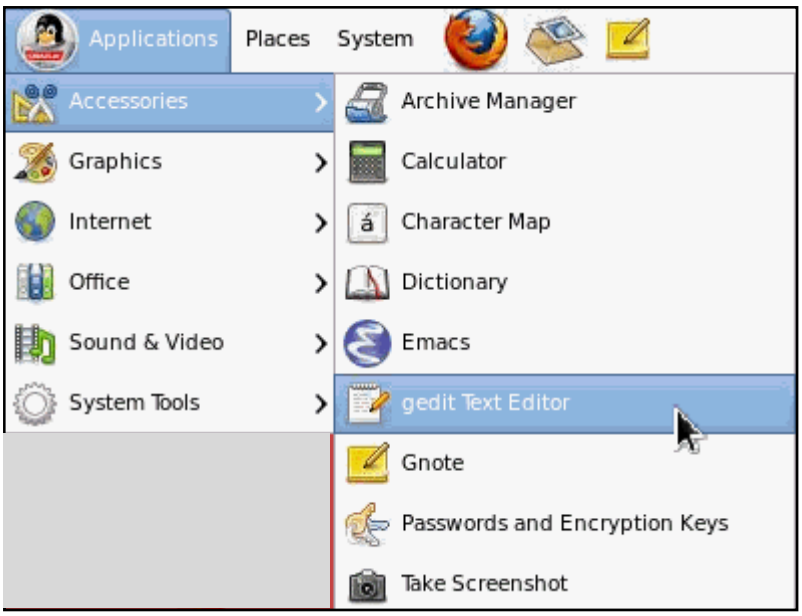

Step	Window/Page Description	Choices or Values
a.	Show SQL	Select the text of the SQL statement. Copy the text.
b.	gedit	Paste the SQL statement into the window.
c.	Show SQL	Click **Return**.
d.	Create Tablespace	Click **Cancel**.
e.	gedit	Review the SQL command. Edit it if necessary. Be sure it ends with a semicolon (`;`).
f.	gedit	Click **File > Save as**.
g.	Save As …	Enter Name: **P7script.sql** Folder: **oracle** Click **Save**.
h.	gedit	Click **File > Quit**.

2. Execute the `P7script.sql` script you just created.
   a. In a terminal window, change the directory to `~oracle`.
   b. Set the Oracle environment for the `orcl` database.
   c. Run the `P7script.sql` script as the `DBA1` user with password of `oracle_4U`.

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

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```
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1 is
/u01/app/oracle
$ sqlplus DBA1 @P7script.sql
…
Enter password:******
…
Connected to:
…
Tablespace created.

SQL> exit
```

3. As the **DBA1** user, run the **lab_07_02_03.sql** script to create and populate a table (called X) in the INVENTORY tablespace. What error do you eventually see?
   a. In a terminal window, navigate to the $LABS/P7 directory.

```
$ cd $LABS/P7
```

   b. Log in to SQL*Plus as the **dba1** user (with a password of **oracle_4U**) and run the **lab_07_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_07_02_03.sql
```

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

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

1024 rows created.

SQL> insert into x select * from x
  2  /
insert into x select * from x
*
ERROR at line 1:
```

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```
ORA-01653: unable to extend table DBA1.X by 128 in tablespace
INVENTORY


SQL> commit
  2  /

Commit complete.

SQL> quit
Disconnected …
```

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

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

Show SQL

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

Step	Window/Page Description	Choices or Values
g.	Edit Tablespace: INVENTORY	In the Datafiles region, click **Add**.

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Step	Window/Page Description	Choices or Values
h.	Add Datafile	File Name: **`inventory02.dbf`** File Size: **30 MB** Click **Continue**.
i.	Edit Tablespace: INVENTORY	Click **Show SQL**. **Note:** Both actions are included. Notice the SQL statements do not have a semicolon to end the statements. Click **Return**.
j.	Edit Tablespace: INVENTORY	Click **Apply**.

Show SQL

Execute On Multiple Databases | Return

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

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

Datafiles

Add

Edit | Remove

Select	Name	Directory	Size (MB)	Used (MB)		Maximum File Size (MB)	Auto Extend
◉	inventory01.dbf	/u01/app/oracle/oradata/orcl/	40.00		5.00	0.00	No
○	inventory02.dbf	/u01/app/oracle/oradata/orcl/	30.00		1.00	0.00	No

5. Log out of Enterprise Manager Cloud Control.
6. Go back to the terminal window and run the **`lab_07_02_03.sql`** script again. It drops the table and re-executes the original script that previously returned the space error.
   a. Go to the terminal window.
   b. Log in to SQL*Plus as the **`dba1`** user (with a password of **`oracle_4U`**) and run the **`$LABS/P7/lab_07_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/P7/lab_07_02_03.sql
…
Enter password:

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

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```
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;

2 rows created.

SQL> INSERT INTO x
  2  SELECT * FROM x;

4 rows created.

SQL> INSERT INTO x
  2  SELECT * FROM x ;

8 rows created.

SQL> INSERT INTO x
  2  SELECT * FROM x ;

16 rows created.

SQL> INSERT INTO x
  2  SELECT * FROM x ;

32 rows created.

SQL> INSERT INTO x
```

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```
  2  SELECT * FROM x ;

64 rows created.

SQL> INSERT INTO x
  2  SELECT * FROM x ;

128 rows created.

SQL> INSERT INTO x
  2  SELECT * FROM x ;

256 rows created.

SQL> INSERT INTO x
  2  SELECT * FROM x ;

512 rows created.

SQL> INSERT INTO x
  2  SELECT * FROM x ;

1024 rows 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 there is no error because of the increased size of the tablespace.

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7. In a terminal window, run the **`$LABS/P7/lab_07_02_06.sql`** script in SQL*Plus as the **`dba1`** user to clean up the tablespace for later practice sessions.

```
$ sqlplus dba1 @$LABS/P7/lab_07_02_06.sql

…

Enter password:

Connected to:
…

SQL> drop table x purge
  2  /

Table dropped.

SQL> exit
```

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Practices for Lesson 8: Managing Space

Chapter 8

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Practices for Lesson 8: 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 you more time to react. When you finish your test case, drop the tablespace that you used.

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Practice 8-1: 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.

Task

Access the `orcl` database as the `SYS` user (with the `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/P8` 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 for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1 is
/u01/app/oracle
$ cd $LABS/P8
$ sqlplus / as sysdba
…
Connected to:
…
SQL> exec DBMS_SERVER_ALERT.SET_THRESHOLD(-
> dbms_server_alert.tablespace_pct_full,-
> NULL,NULL,NULL,NULL,1,1,NULL,-
> dbms_server_alert.object_type_tablespace,NULL);

PL/SQL procedure successfully completed.

SQL>
```

2. From 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>
```

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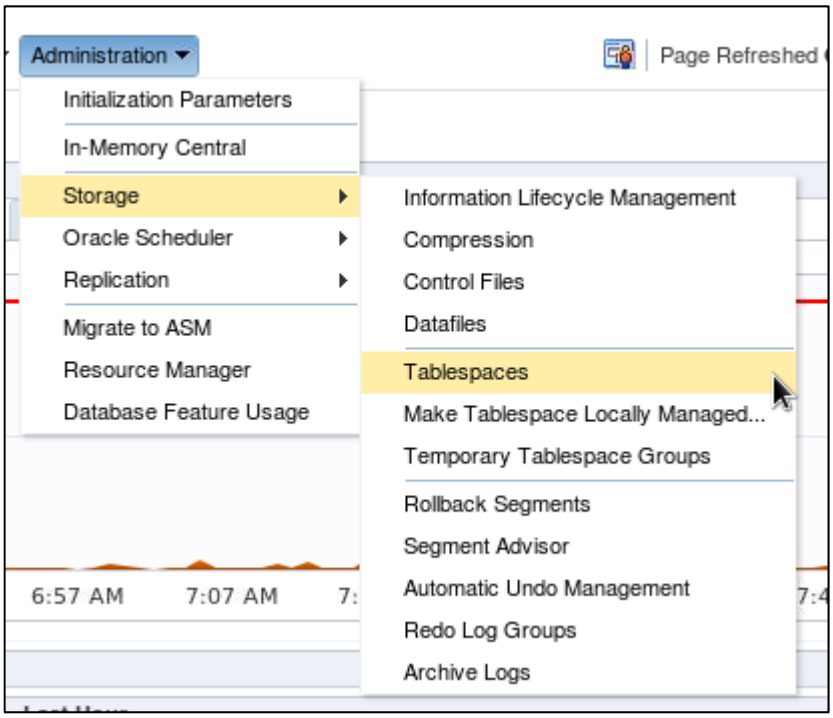
3. Create a new tablespace called `TBSALERT` with a 120 MB file called `tbsalert.dbf`. Make sure that this tablespace is locally managed and uses Automatic Segment Space Management. Do *not* make it auto-extensible, and do *not* specify any thresholds for this tablespace.

```
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. In Enterprise Manager Cloud Control, navigate to the `orcl` database home page. Then Select **Administration** > **Storage** > **Tablespaces**.



5. Select the **New** radio button. Enter **`SYS`** in the Username field, **`oracle_4U`** in the Password field, and choose **`SYSDBA`** in the Role field. Then click **Login**.

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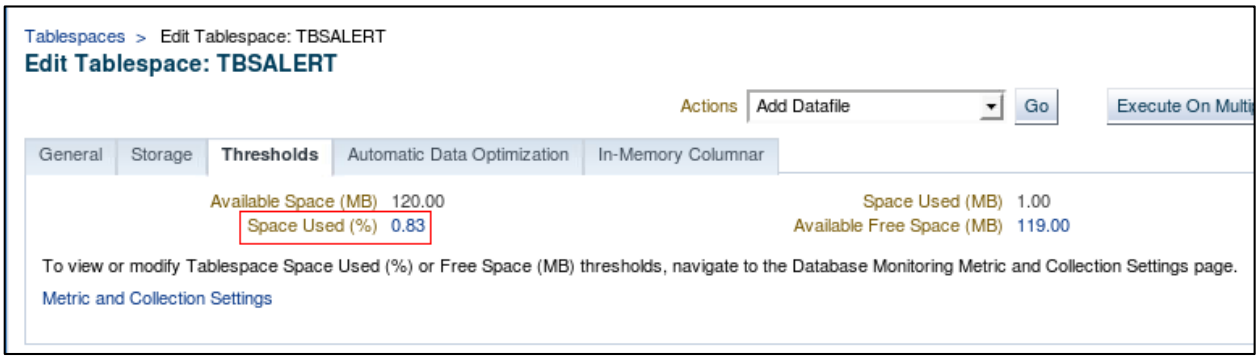
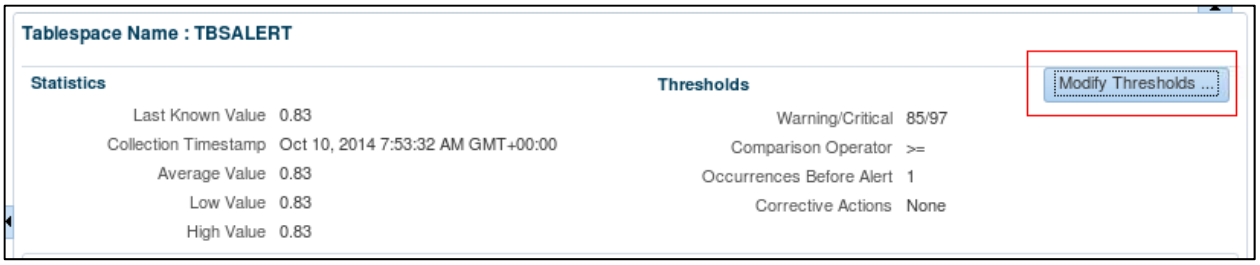
6. Change the Tablespace Space Usage thresholds of the `TBSALERT` tablespace. Set its warning level to 55 percent and its critical level to 70 percent.
   a. On the Tablespaces page, select `TBSALERT` and click **Edit**.
   b. On the Edit Tablespace: TBSALERT page, click the **Thresholds** tab.
   c. On the Thresholds tab, click the **Space Used (%)** value link.



   d. If you do not see the TBSALERT tablespace listed, select **Real Time** in the View Data menu.

   e. In the Tablespace Name: TBSALERT section, click **Modify Thresholds**.



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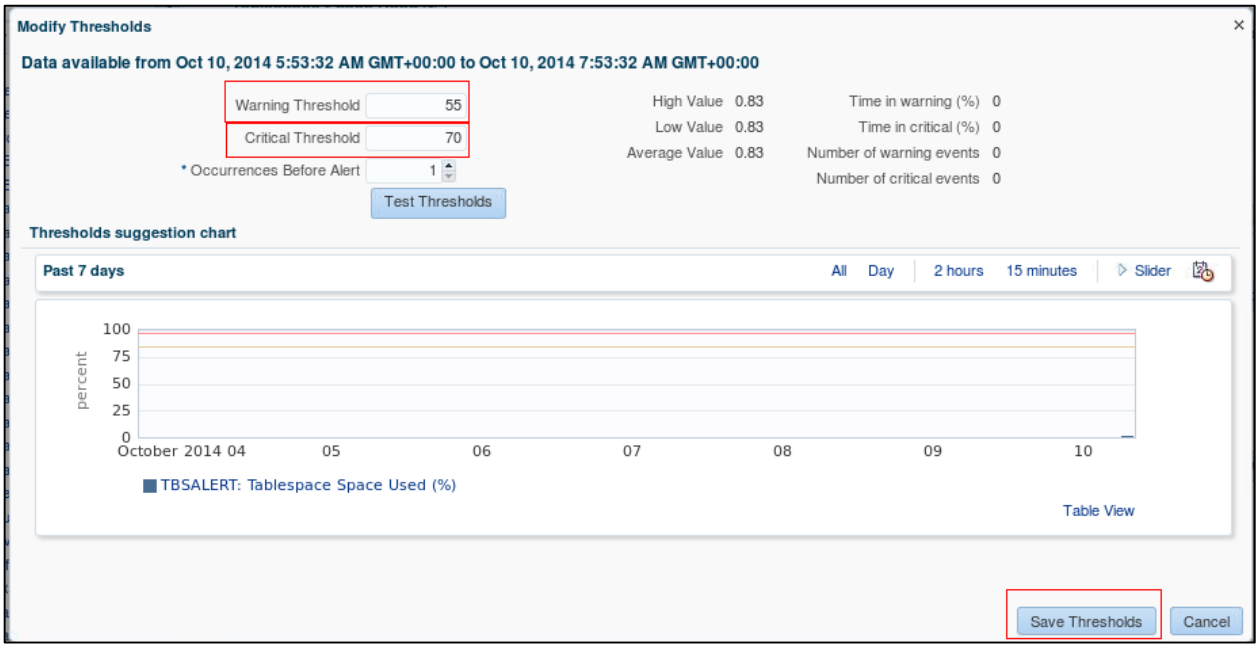
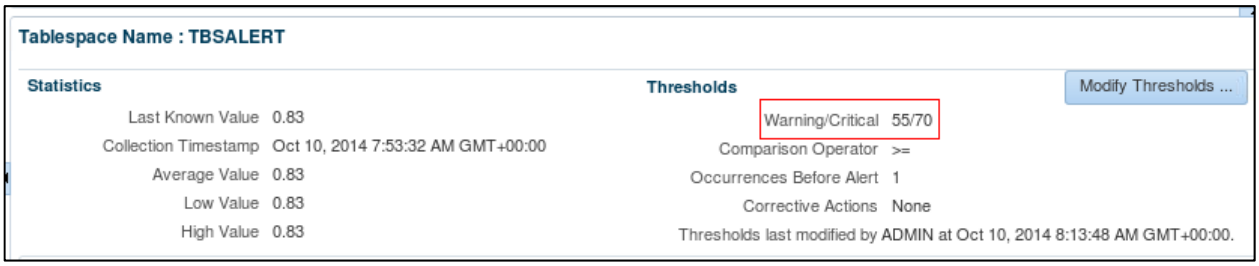
f. On the Modify Thresholds page, enter `55` in the Warning Threshold field and `70` in the Critical Threshold field. Click Save Thresholds.



g. You receive a confirmation message. Note the updated values in the Thresholds section.



7. Return to your SQL*Plus session and check the new threshold values for the `TBSALERT` tablespace. In your SQL*Plus session, enter (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 from `DBA_ALERT_HISTORY` for the `TBSALERT` tablespace. Exit from SQL*Plus.

```
SQL> select reason, resolution
  2  from dba_alert_history
```

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```
  3  where object_name='TBSALERT';

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

9. Review and execute the **$LABS/P8/seg_advsr_setup.sh** script that creates and populates new tables in the TBSALERT tablespace.

```
$ cd $LABS/P8
$ 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;
```

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```
   insert into employees5 select * from employees5;
   commit;
 END LOOP;
END;
/
insert into employees1 select * from employees1;
insert into employees2 select * from employees2;
insert into employees3 select * from employees3;
commit;
exit
EOF
$
```

```
$ ./seg_advsr_setup.sh

SQL> Connected.
SQL>
System altered.

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

Total System Global Area 503316480 bytes
Fixed Size                 2926080 bytes
Variable Size            268438016 bytes
Database Buffers         226492416 bytes
Redo Buffers               5459968 bytes
Database mounted.
Database opened.
SQL> SQL>
Table created.
SQL>
Table created.
SQL>
Table created.
SQL>
Table created.
SQL>
Table created.
SQL> SQL>
Table altered.
```

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```
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. While you are logged in to SQL*Plus as the `SYS` user, enter:

```
$ 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

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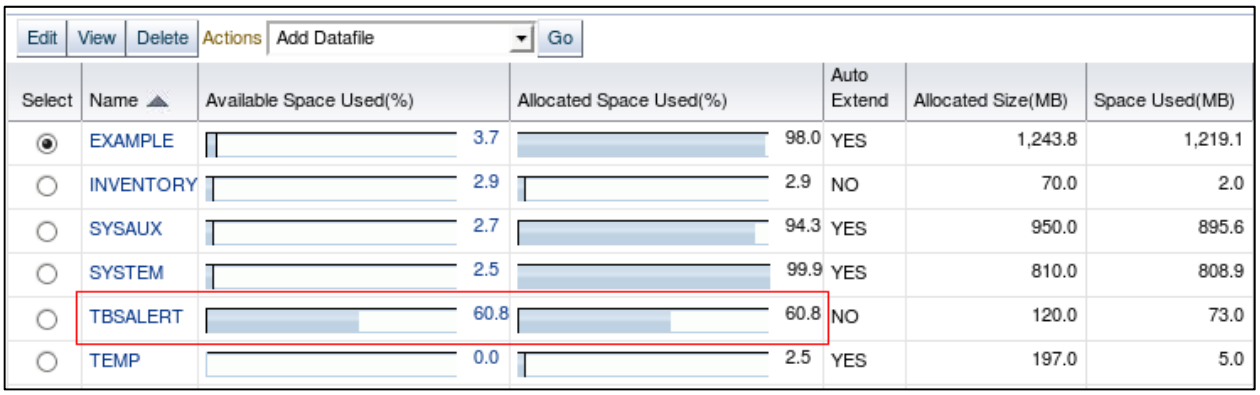
b. Enter the following query. Your results should be similar to the following:

```
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.

c. In Enterprise Manager Cloud Control, return to the **Tablespaces** page.

d. On the Tablespaces page, see Allocated Space Used (%).



Edit | View | Delete | Actions | Add Datafile | Go

Select	Name	Available Space Used(%)	Allocated Space Used(%)	Auto Extend	Allocated Size(MB)	Space Used(MB)
◉	EXAMPLE	3.7	98.0	YES	1,243.8	1,219.1
○	INVENTORY	2.9	2.9	NO	70.0	2.0
○	SYSAUX	2.7	94.3	YES	950.0	895.6
○	SYSTEM	2.5	99.9	YES	810.0	808.9
○	TBSALERT	60.8	60.8	NO	120.0	73.0
○	TEMP	0.0	2.5	YES	197.0	5.0

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

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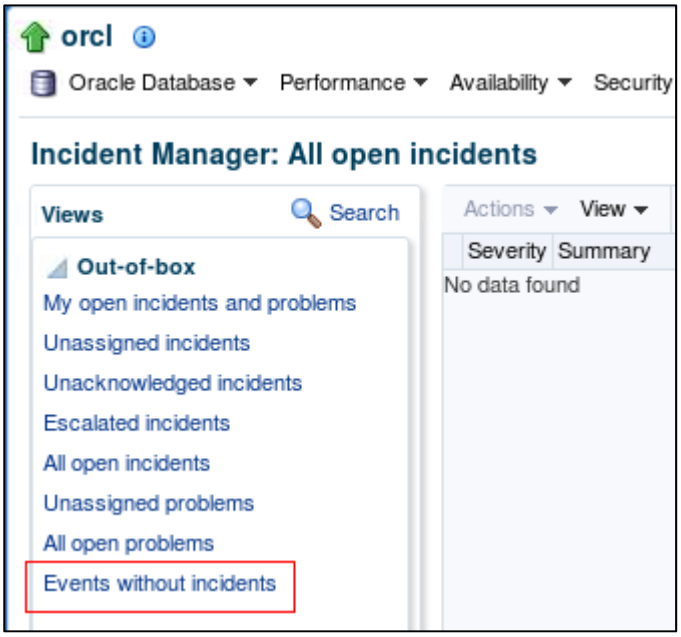
f. Click **Events without incidents**.



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

11. In your SQL*Plus session, execute the inserts below 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>
```

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

```
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.

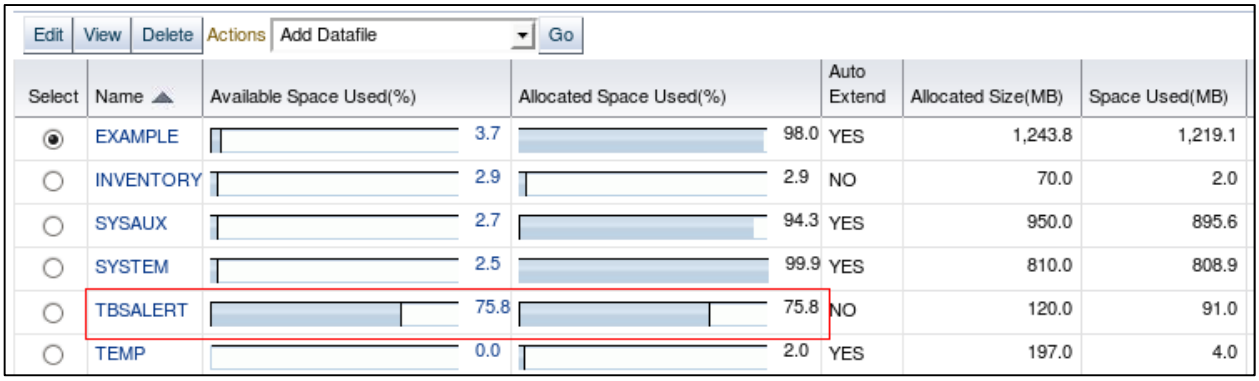
```
SQL> select reason, message_level
  2  from dba_outstanding_alerts
  3  where object_name='TBSALERT';

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 Allocated Space Used (%).



Select	Name	Available Space Used(%)	Allocated Space Used(%)	Auto Extend	Allocated Size(MB)	Space Used(MB)
◉	EXAMPLE	3.7	98.0	YES	1,243.8	1,219.1
○	INVENTORY	2.9	2.9	NO	70.0	2.0
○	SYSAUX	2.7	94.3	YES	950.0	895.6
○	SYSTEM	2.5	99.9	YES	810.0	808.9
○	TBSALERT	75.8	75.8	NO	120.0	91.0
○	TEMP	0.0	2.0	YES	197.0	4.0

e. Navigate to **Oracle Database** > **Home** and check the list of incidents and problems in the **Incidents and Problems** section.
Or 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.”

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

```
SQL> delete employees1;

219136 rows deleted.

SQL> commit;

Commit complete.

SQL> delete employees2;

219136 rows deleted.

SQL> commit;

Commit complete.

SQL> delete employees3;

219136 rows deleted

SQL> commit;

Commit complete.

SQL> exit
SQL> Disconnected …

$
```

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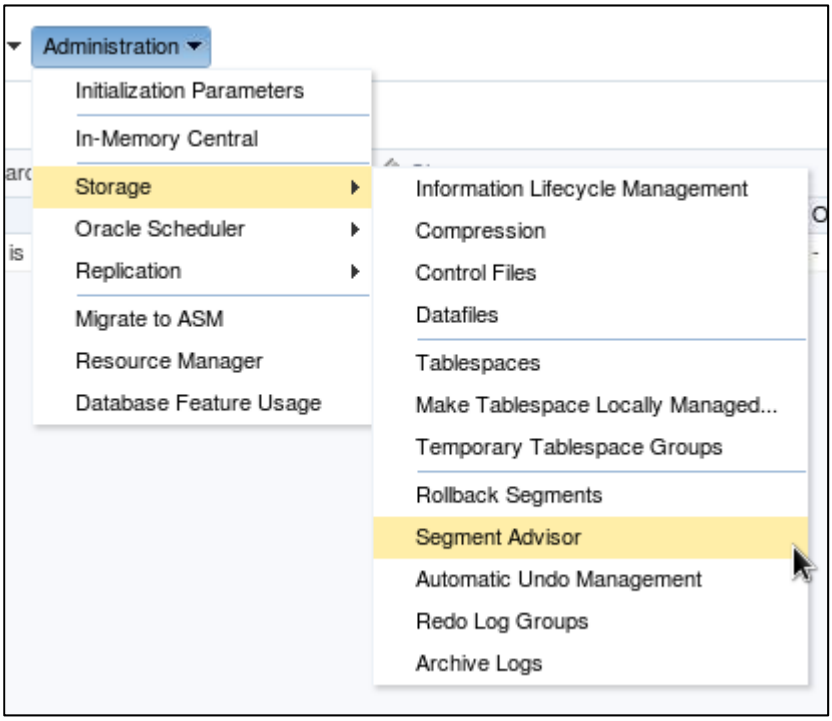
13. Now, run the Segment Advisor for the `TBSALERT` tablespace in Enterprise Manager Cloud Control. Make sure that you run the Advisor in Comprehensive mode without time limitation. Accept and implement its recommendations. After the recommendations have been implemented, check whether the fullness level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



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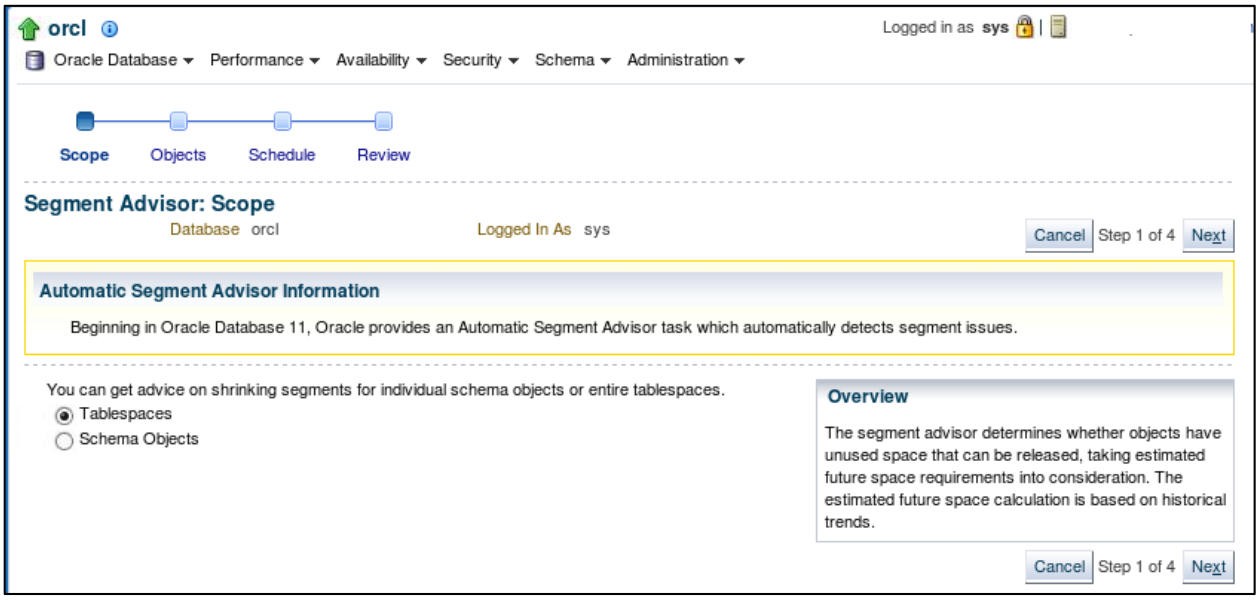
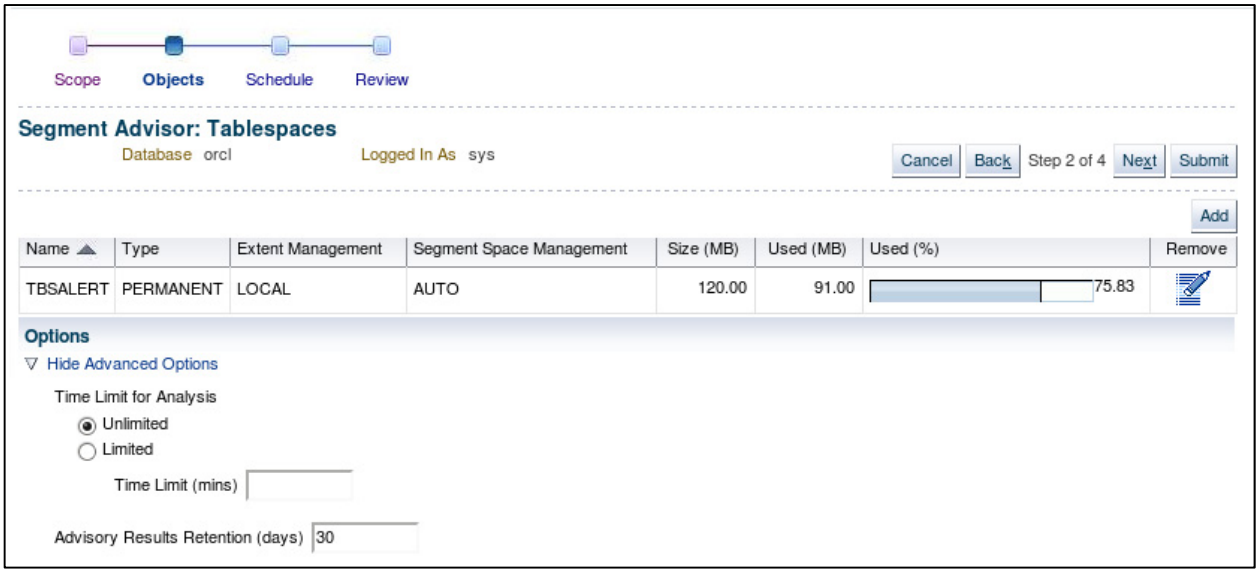
b. On the Segment Advisor Recommendations page, select **Run Segment Advisor Manually** in the Related Links section.

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



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

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



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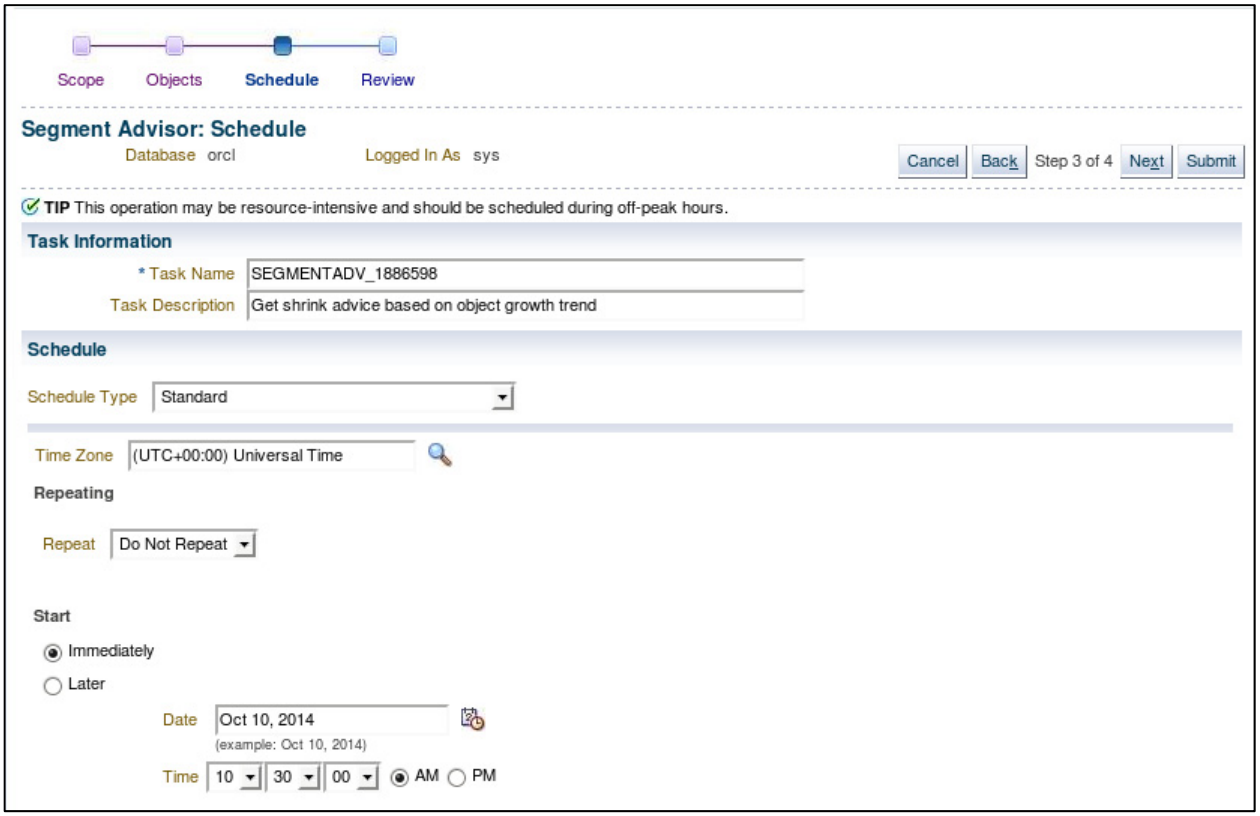
f. On the Segment Advisor: **Schedule** page, make sure **Immediately** is selected. Select your proper time zone (ask your Instructor) and click **Next**.



g. On the Segment Advisor: Review page, click **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_9329905';
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_9329905';
dbms_advisor.reset_task(taskname);
dbms_advisor.execute_task(taskname);
END;
```

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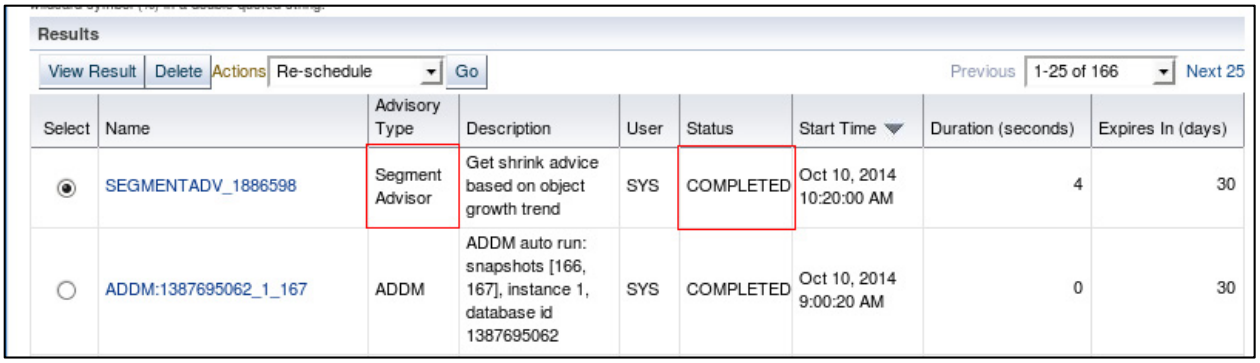
h. Review the statements and click **Return**.

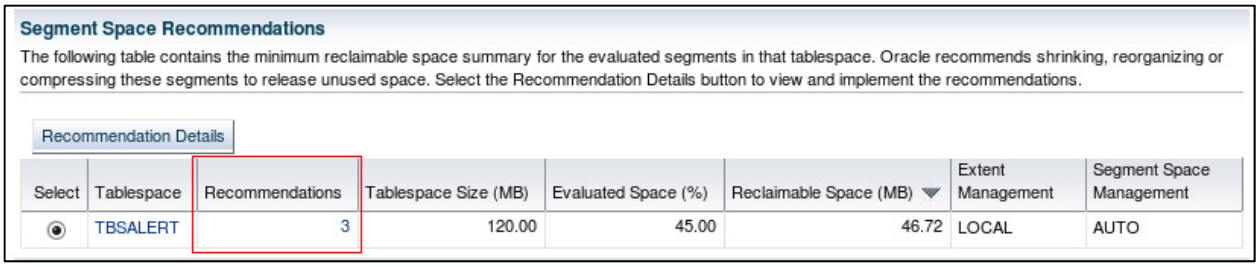
i. On the Segment Advisor: Review page, click **Submit**.

j. This takes you back to the Segment Advisor Recommendations page. Select **Advisor Central** in the Related Links section.

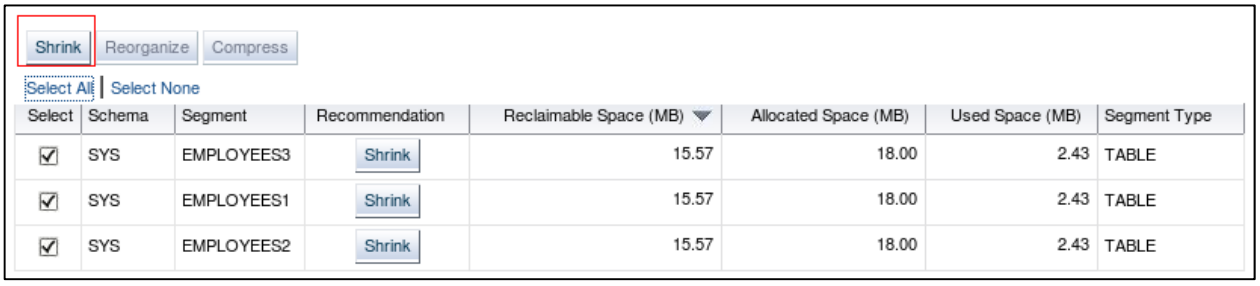
k. On the Advisor Central page in the Advisor Tasks section, click the `SEGMENTADV_`*nnnnnnn* link when the task status shows `COMPLETED`.



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



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



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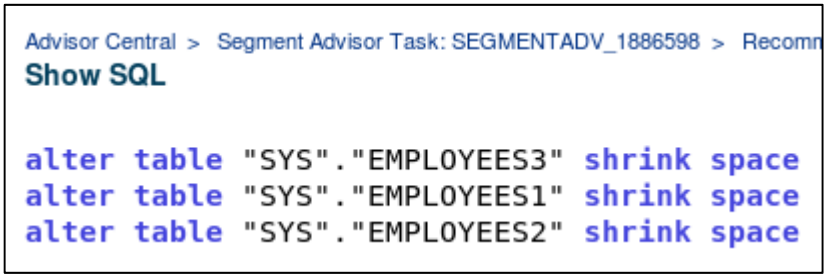
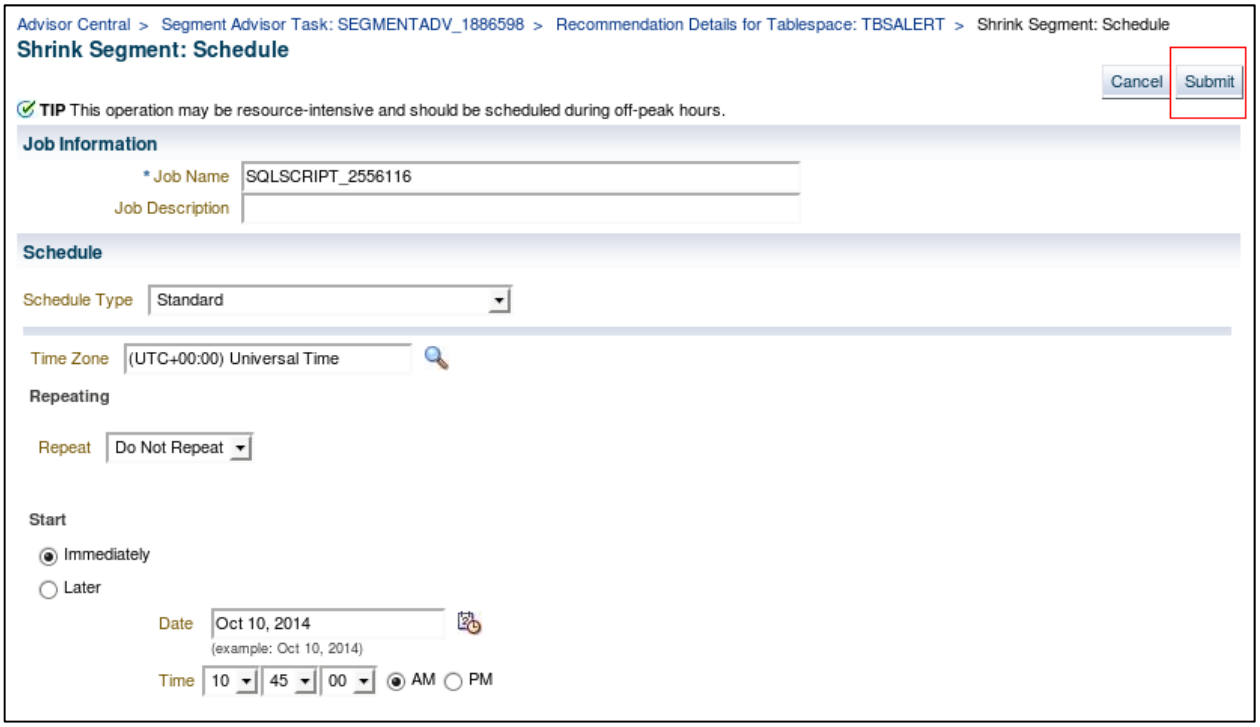
n. On the Shrink Segment: Options page, make sure that you select "**Compact Segments and Release Space**." Click **Show SQL**.

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



p. On the Shrink Segment: Options page, click **Implement**.

q. On the Shrink Segment: Schedule page, click **Submit**.



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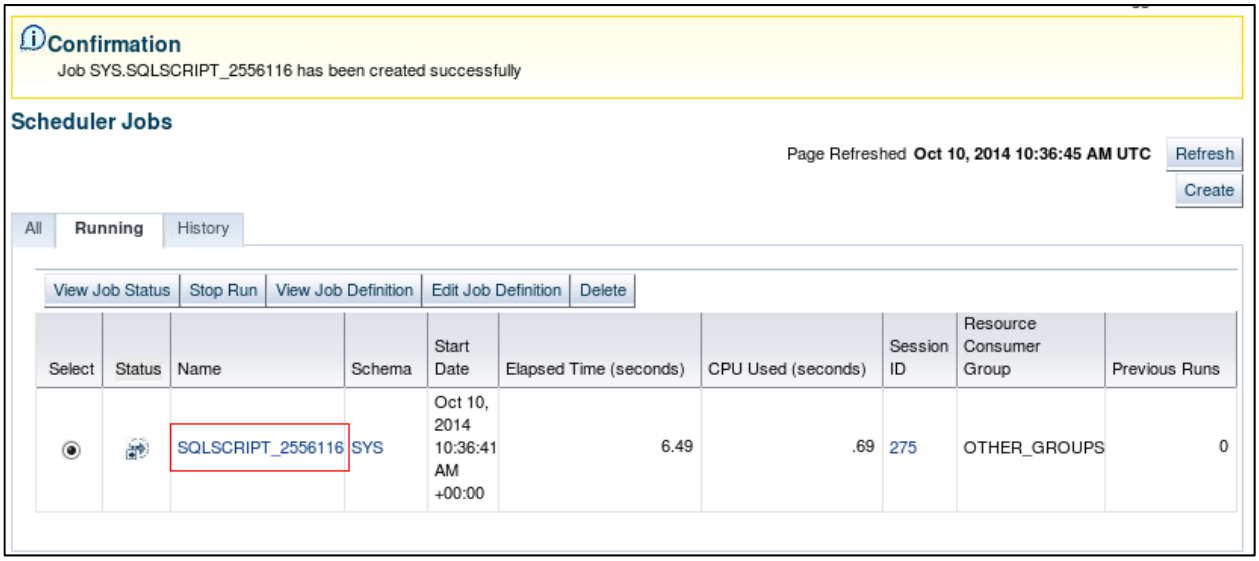
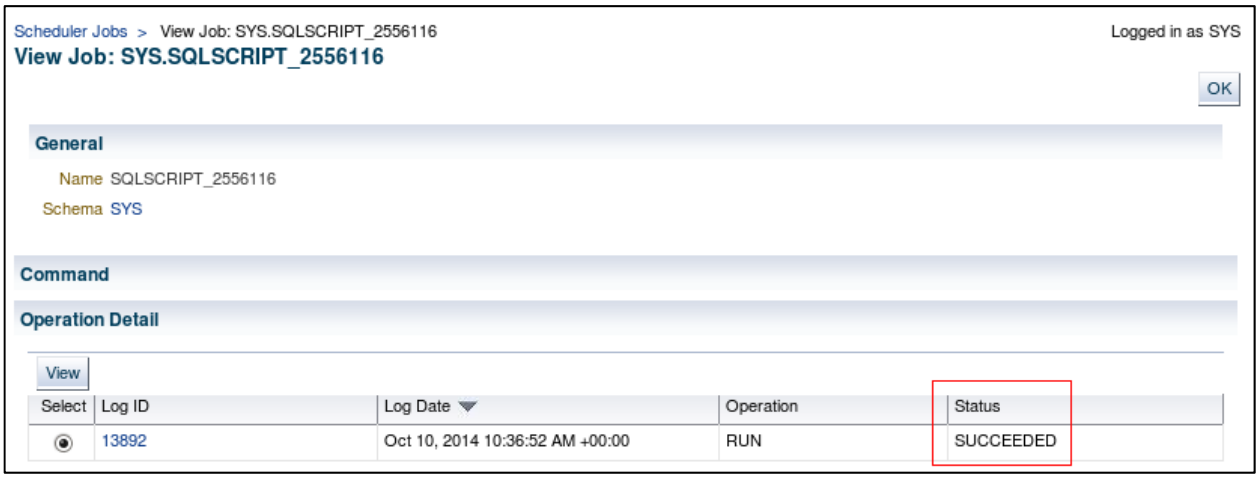
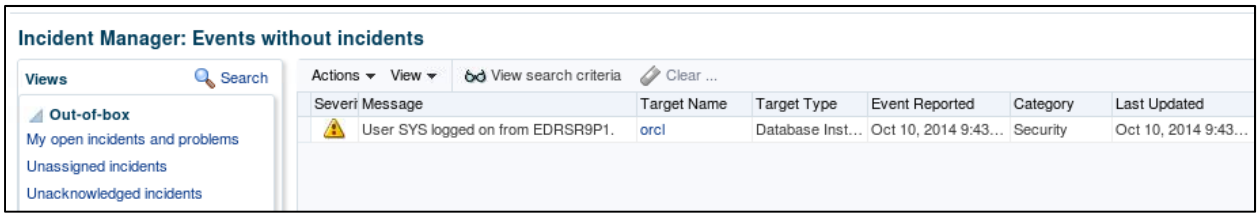
r. On the Scheduler Jobs page, click the `SQLSCRIPT_nnnnnnn` link.



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



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



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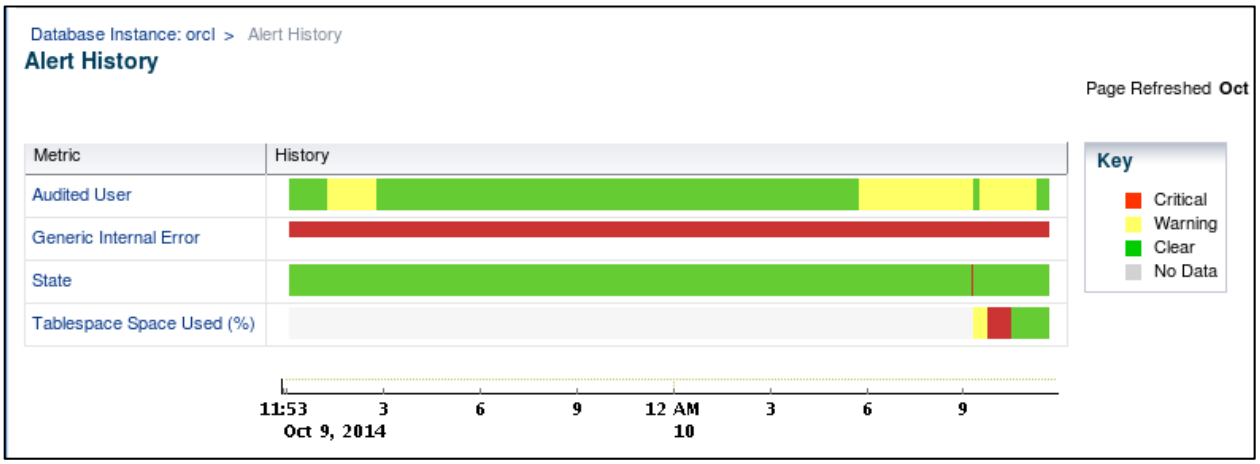
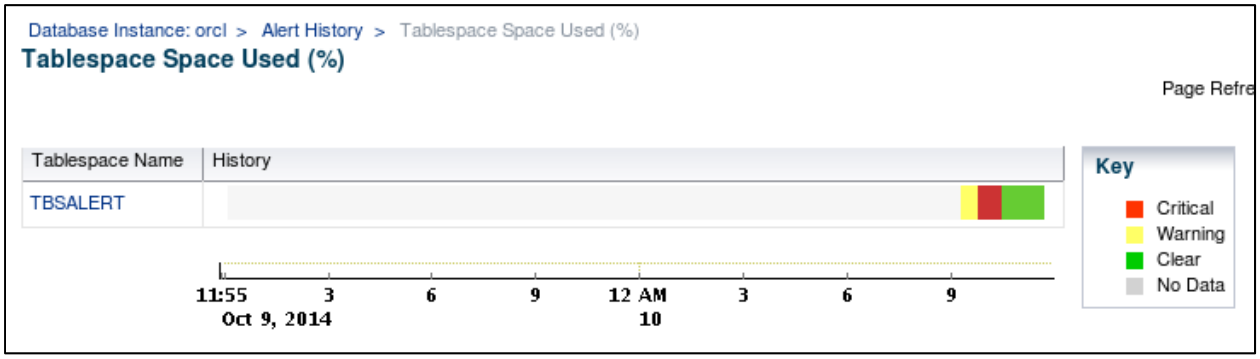
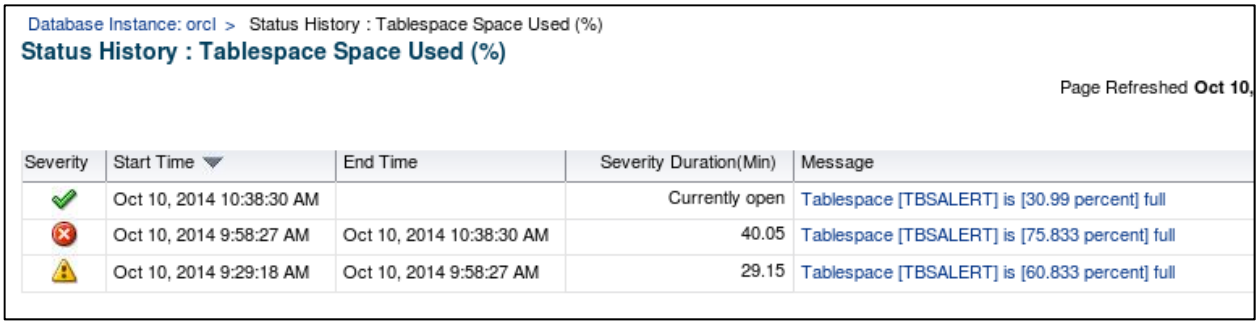
15. Retrieve the history of the `TBSALERT` Tablespace Space Usage metric for the last 24 hours.
    a. Navigate to **Oracle Database** > **Monitoring** > **Alert History**.
    b. Click the **Tablespaces Space Used (%)** colored bar in the History column.



    c. Click the colored bar in the History column.



    d. This takes you to the Status History: Tablespace Space Used (%). 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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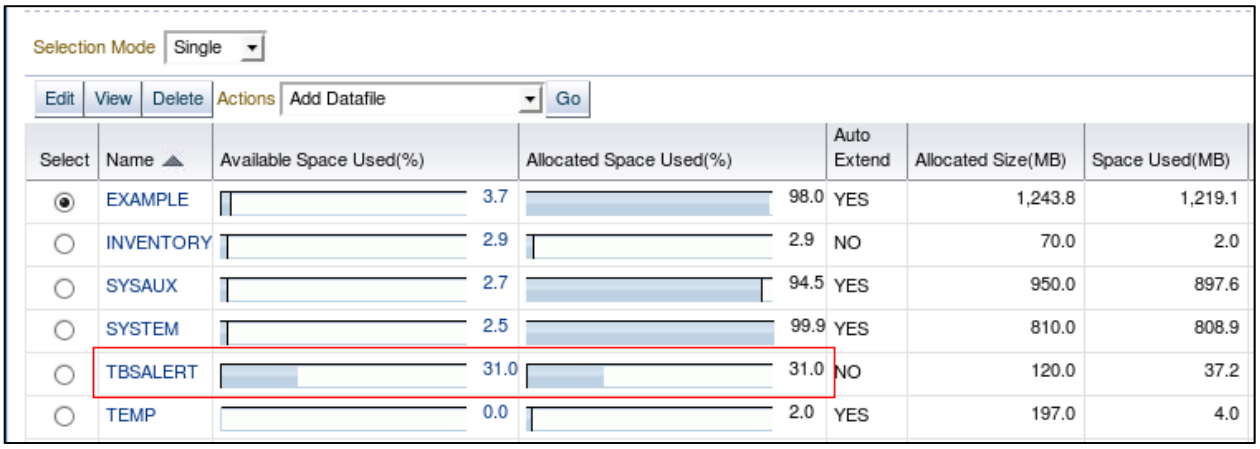
16. Verify that the `TBSALERT` tablespace fullness has decreased below the threshold because space has been reclaimed. In Enterprise Manager Cloud Control, navigate to **Administration** > **Storage** > **Tablespaces**.



Select	Name	Available Space Used(%)	Allocated Space Used(%)	Auto Extend	Allocated Size(MB)	Space Used(MB)
◉	EXAMPLE	3.7	98.0	YES	1,243.8	1,219.1
○	INVENTORY	2.9	2.9	NO	70.0	2.0
○	SYSAUX	2.7	94.5	YES	950.0	897.6
○	SYSTEM	2.5	99.9	YES	810.0	808.9
○	TBSALERT	31.0	31.0	NO	120.0	37.2
○	TEMP	0.0	2.0	YES	197.0	4.0

17. Log in to SQL*Plus as the `SYS` user. In SQL*Plus, reset the `TBSALERT` tablespace Tablespace Space Usage metric. Exit from SQL*Plus.

```
$ sqlplus / as sysdba
…
Connected to:
…
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/P8` directory to drop your `TBSALERT` tablespace.

```
$ 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
$
```

```
$ ./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 503316480 bytes
Fixed Size                 2926080 bytes
Variable Size            268438016 bytes
Database Buffers         226492416 bytes
Redo Buffers               5459968 bytes

Database mounted.
Database opened.
SQL>
Tablespace dropped.

SQL>
$
```

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Practices for Lesson 9: Managing Undo Data

Chapter 9

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Practices for Lesson 9: 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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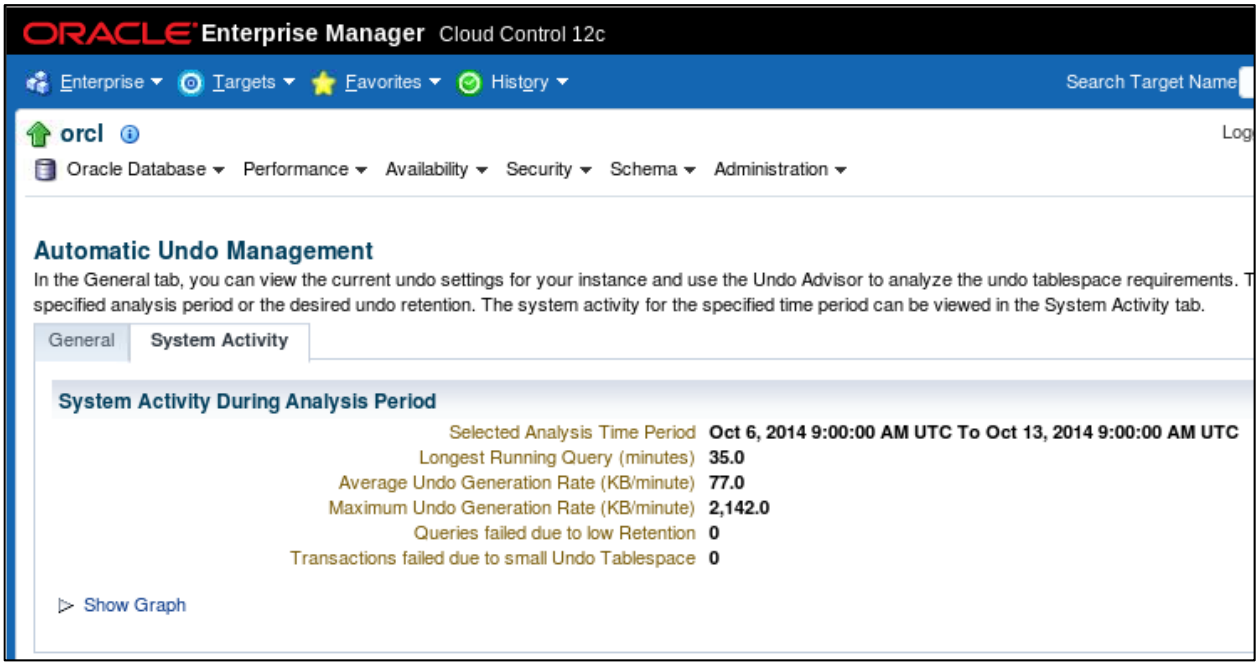
Practice 9-1: Managing Undo Data

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



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Note: The values you see on the Enterprise Manager Cloud Control pages and graphs may vary from what is shown in the screenshots in this guide.

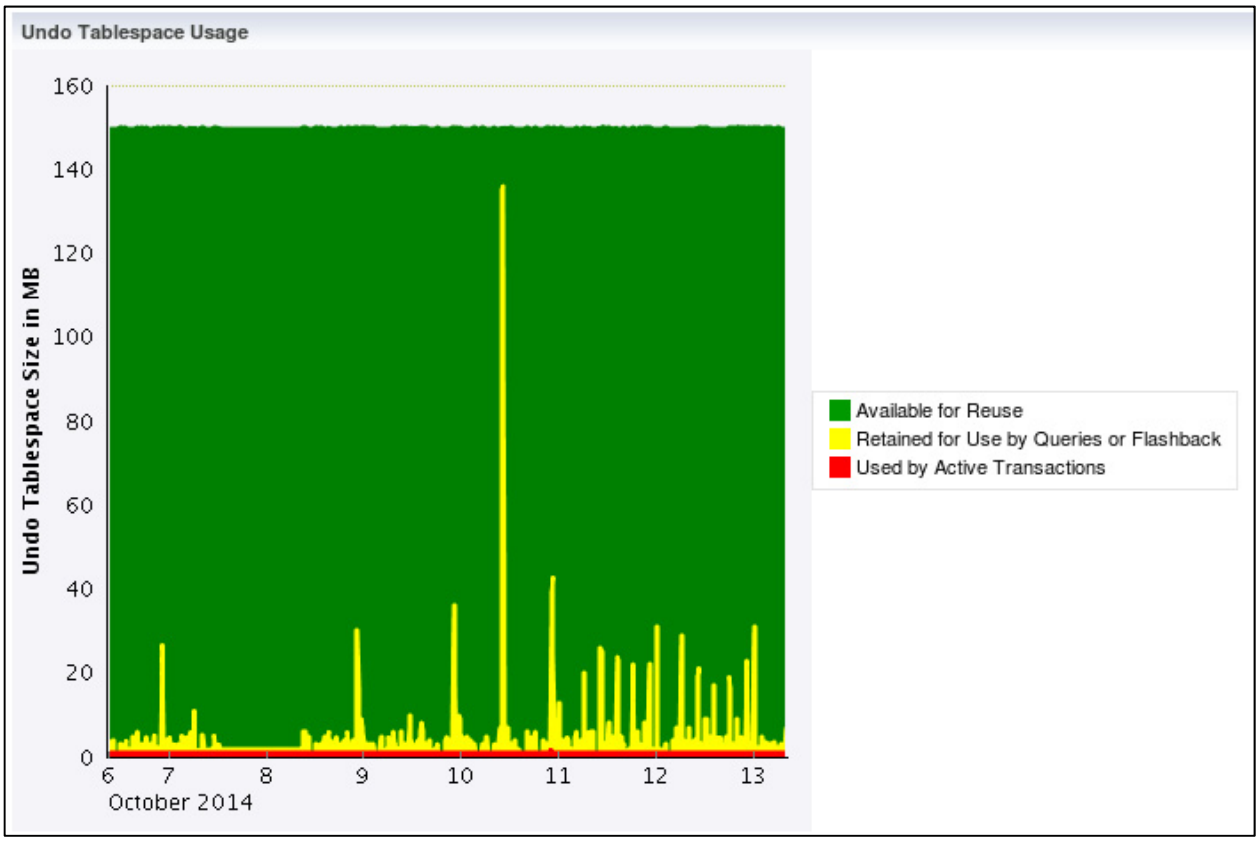
Question: Looking at the preceding screenshot, how many errors did this system encounter?

Answer: None. When the undo tablespace is set to auto-extend, there should not be any failed transactions due to small undo tablespace errors.

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

Answer: 35 minutes (The value in your system may be different.)

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



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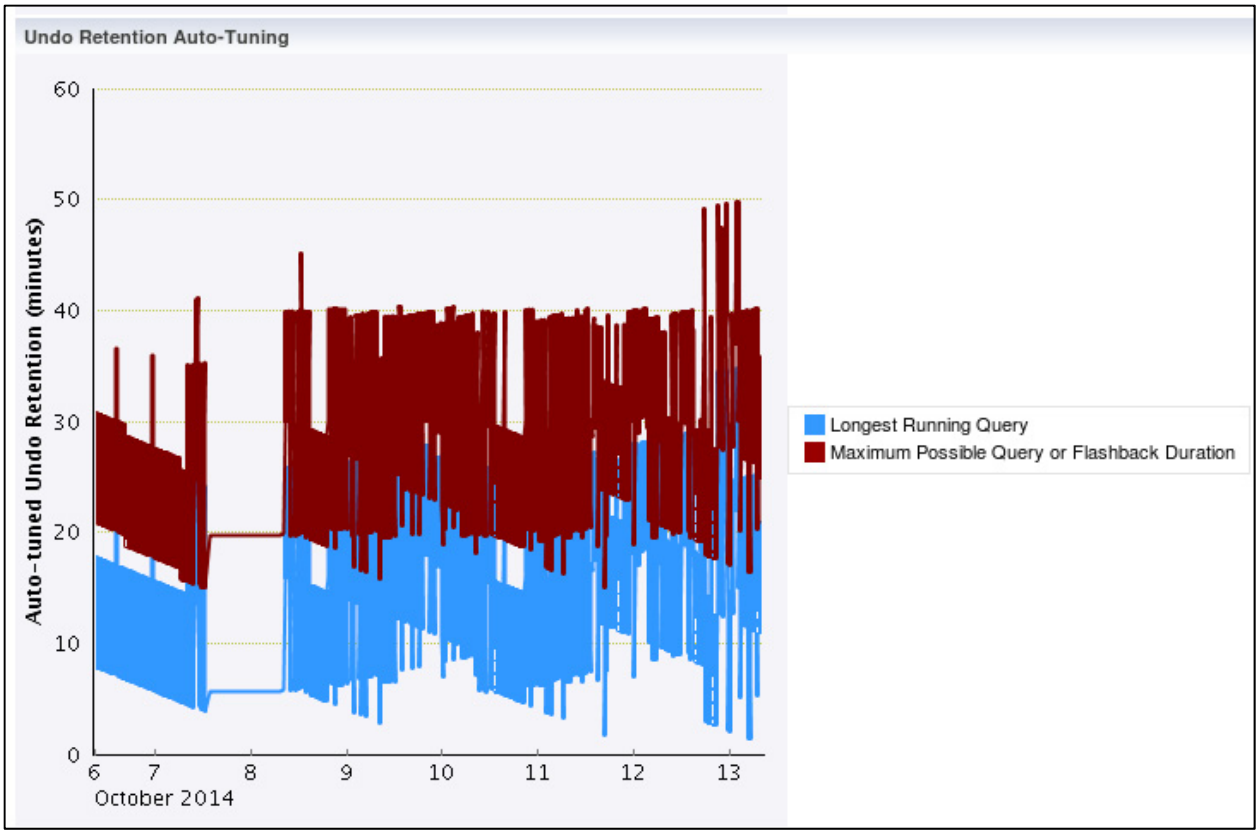

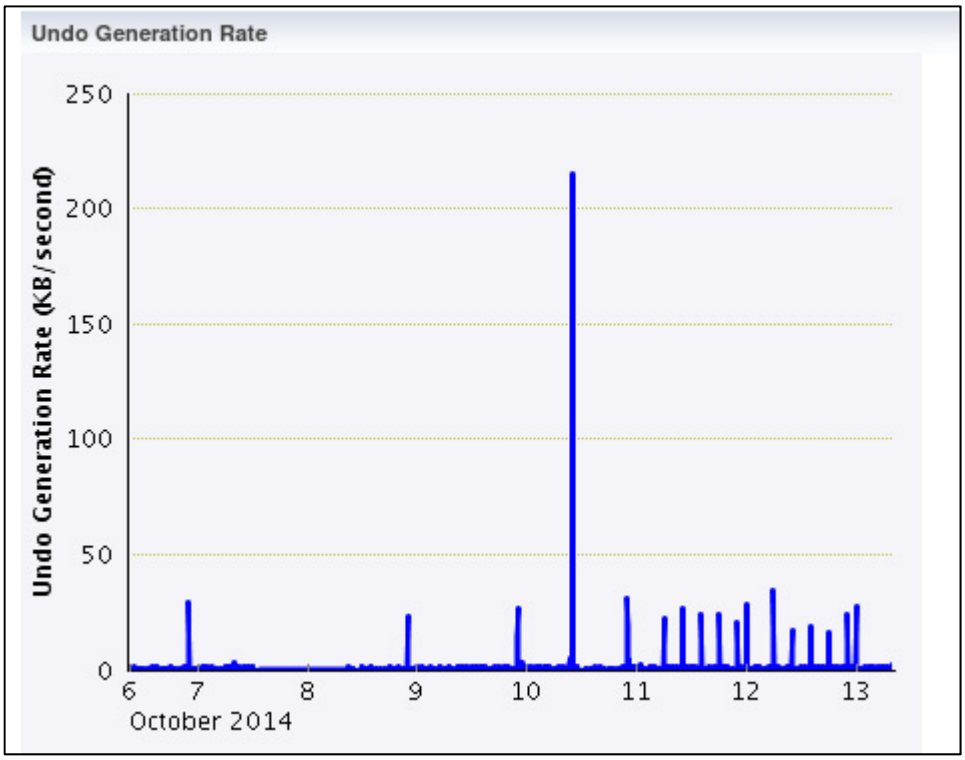

Question: Looking at the preceding Undo Retention Auto-Tuning graph, could this system support flashback above and beyond the current longest running query?

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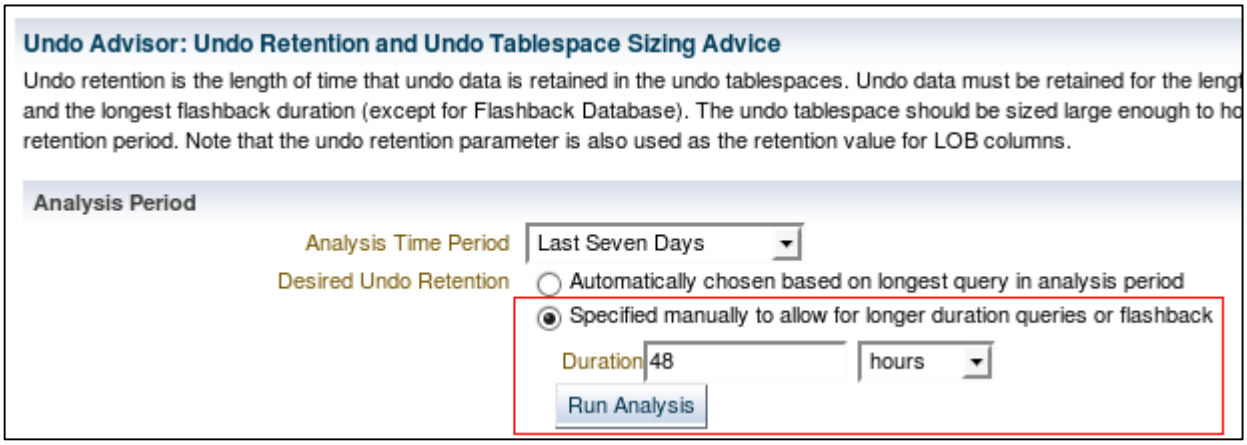
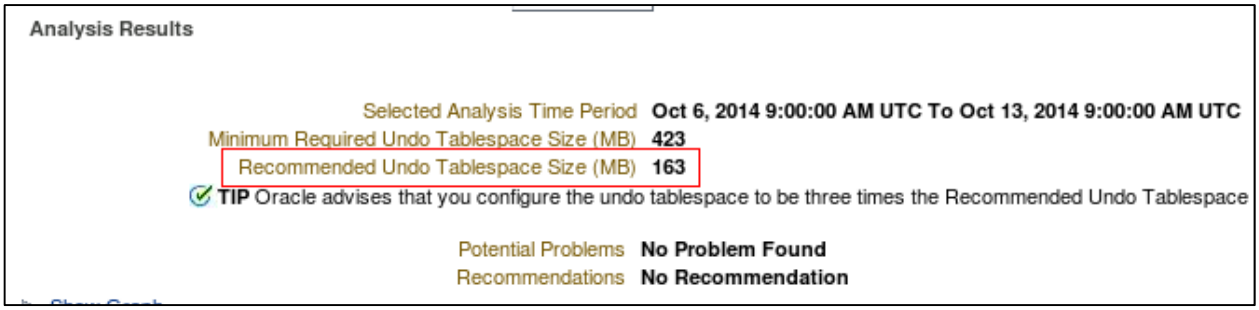
Answer: Yes, (but most likely not enough to support the required 48 hours).

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

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



Step	Window/Page Description	Choices or Values
c.	Automatic Undo Management: General tab	Examine Analysis Results.



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

Step	Window/Page Description	Choices or Values
d.	Automatic Undo Management: General tab	Change the `UNDO_RETENTION` value.

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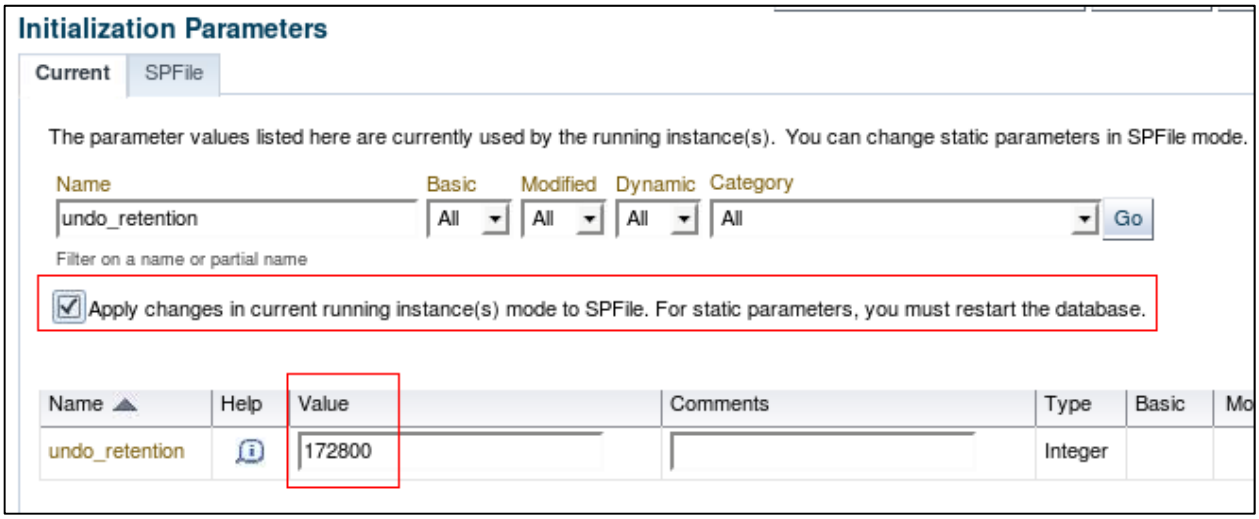
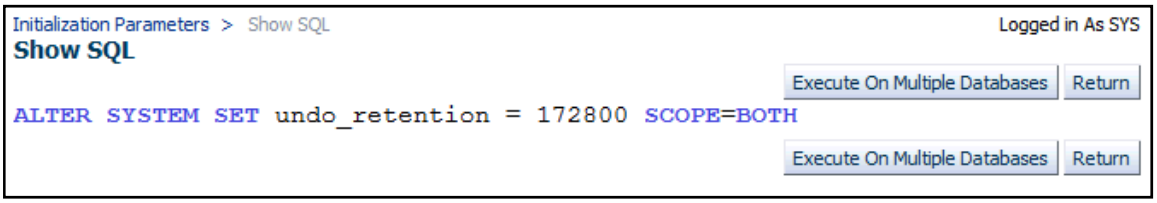
Step	Window/Page Description	Choices or Values
		Click **Edit Undo Retention.**
e.	Initialization Parameters	Set Value to `172800` seconds. Check **Apply changes in current running instance(s) mode to SPFile**.
f.	Initialization Parameters	Click **Show SQL** (upper right corner of page). Click **Return**.





Step	Window/Page Description	Choices or Values
g.	Initialization Parameters	Click **Apply.** Select **Administration** > **Storage** > **Automatic Undo Management**
h.	Automatic Undo Management: General tab	Change the Undo tablespace size to the recommended value. Click **Edit Undo Tablespace.**
i.	Edit Tablespace: UNDOTBS1	In Datafiles section, Click **Edit** to change the data file size.
j.	Edit Tablespace: UNDOTBS1: Edit Datafile	Change File Size to the value you determined when you ran the Undo Advisor (163 MB is the value in the preceding screenshot). Click **Continue**.

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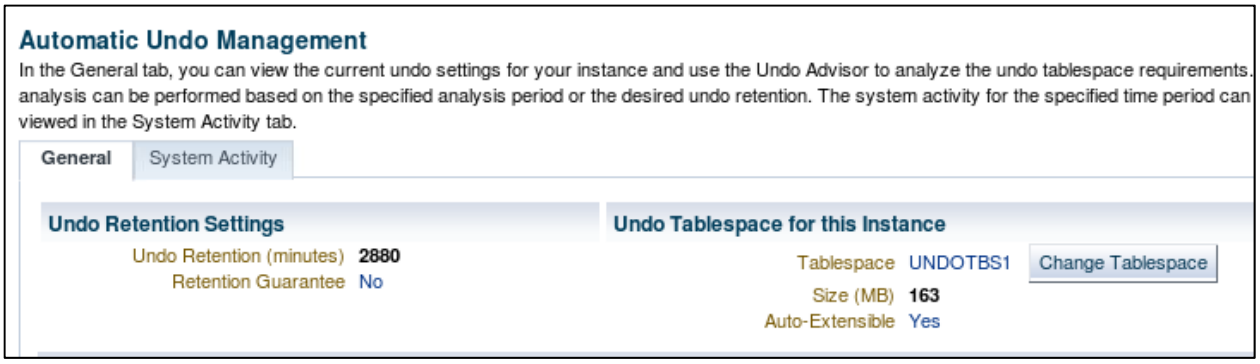
Step	Window/Page Description	Choices or Values
k.	Edit Tablespace: UNDOTBS1	Click **Show SQL**.
l.	Show SQL	Verify the SQL command that will be executed. Click **Return**.
m.	Edit Tablespace: UNDOTBS1	Click **Apply**.

3. Go back to the **Automatic Undo Management** page to see the results of the changes that 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.



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.

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Practices for Lesson 10: Managing Data Concurrency

Chapter 10

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Practices for Lesson 10: 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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Practice 10-1: 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 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 of `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:
…
```

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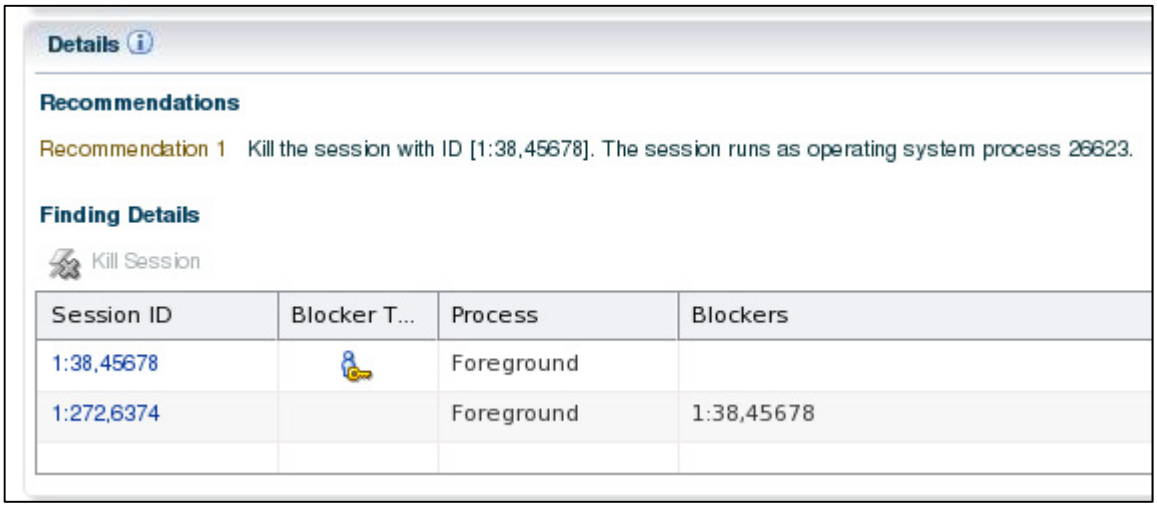
```
SQL> update hr.employees set salary=8300
  2> where employee_id = 110;
```

b. Notice that this session appears to be hung. Leave this session as is and move on to the next step.

3. Using EM Express, navigate to the Current Findings tab of the Performance Hub page and determine which session is causing the locking conflict.

   a. In EM Express, select **Performance** > **Performance Hub**. Then click the **Current ADDM Findings** tab. In the Findings section, click the detail finding "Unresolved hangs or session wait chains."

   b. 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 1:38,45678. The session ID that you see will be different. Record the Session ID _____.



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

```
ALTER SYSTEM KILL SESSION (38,45678);
```

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

```
$ kill 26623
```

4. Using Cloud Control, find the details of the blocking session.

   a. Log in to Cloud Control as the `admin` user with the password `oracle_4U`. Then navigate to the `orcl` home page.

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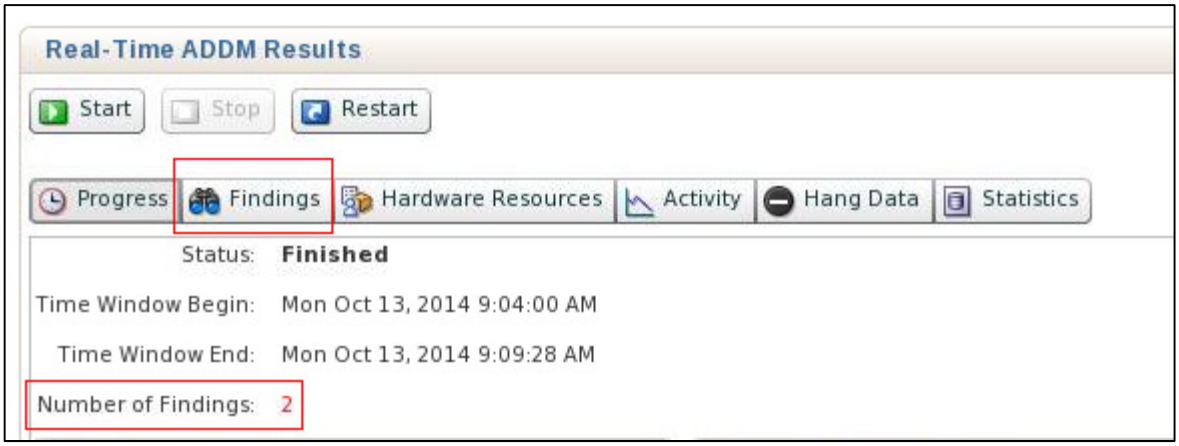
b. Because Susan Mavris doesn't know what is wrong, you start Real Time ADDM to diagnose the problem. Select **Performance** > **Real Time ADDM**.

c. If you are asked to provide credentials, select Preferred and SYSDBA Database Credentials in the SYSDBA Credentials section. In the DB Host Credentials section, select New and enter `oracle` in the User Name field. Enter your OS password in the Password and Confirm Password fields. Then click **Submit**.

d. On the Real Time ADDM page, in the Results section, click **Start.**

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



f. On the Finding tab, notice the same information about blocking sessions that you saw in EM Express.

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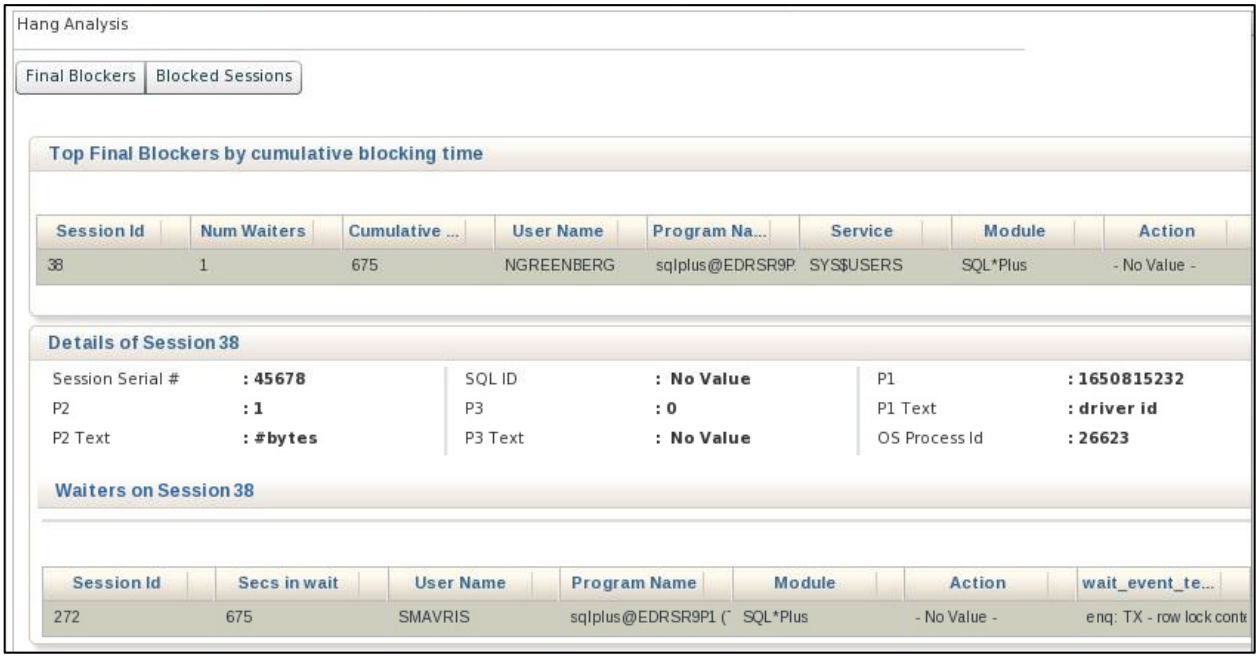
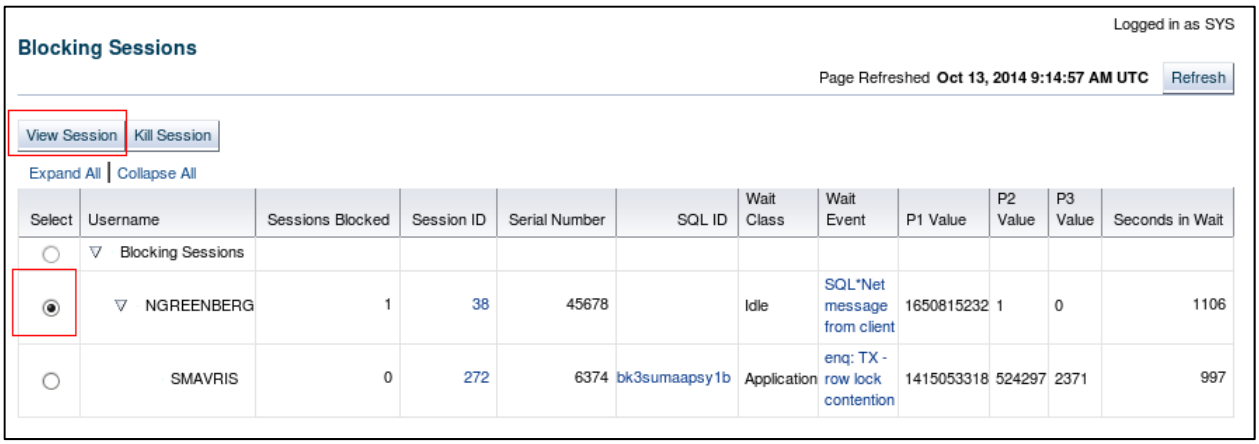
g. Click the Hang Data tab. Notice that this tab gives you the session details of the blocking session such as username. You could contact `NGREENBERG` directly and ask her to commit or roll back the transaction, or you could kill her session. Do NOT kill the session at this time. Continue to investigate the issue.



5. What was the last SQL statement that the blocking session executed?
   a. Click Performance > Blocking Sessions.
   b. Select the `NGREENBERG` session, and then click **View Session**.



   c. Under the Application heading, click the hash value link for **Current SQL** or **Previous SQL**.

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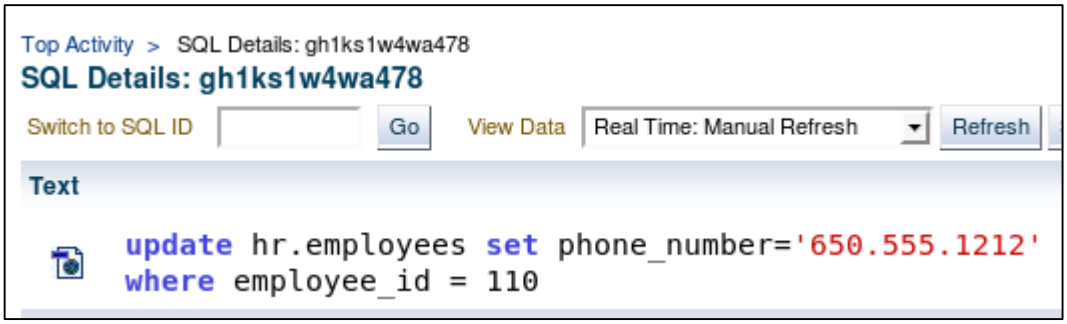
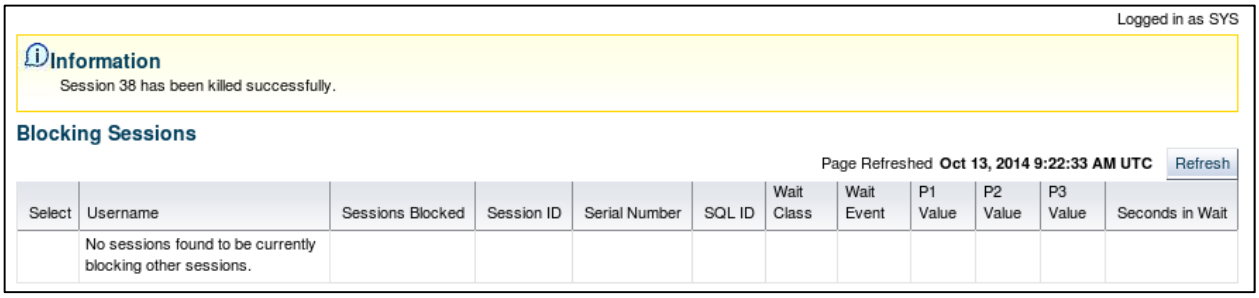
d. Note the SQL that was most recently run. Seeing the last SQL statement can help you to decide which session to kill.



6. Resolve the conflict in favor of the user who complained, by killing the *blocking* session.
   a. Click **Performance** > **Blocking Sessions**.
   b. Select the `NGREENBERG` session, and then click **Kill Session**.
   c. On the Confirmation page, choose the Option **Kill Immediate**. Click **Show SQL**.
   d. On the Show DDL page, the SQL statement is shown.

   e. Click **Return**.
   f. Click **Yes**.
   g. On the Blocking Sessions page, the listing is gone, and an information message appears saying that session *nnn* has been killed.



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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> 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: 26623
Session ID: 38 Serial number: 45678
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.

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Practices for Lesson 11: Implementing Oracle Database Auditing

Chapter 11

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Practices for Lesson 11: Overview

Practices Overview

In the practices for this lesson, you will:

- Enable unified audit
- 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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Practice 11-1: Enabling Unified Auditing

Overview

In this practice, you enable unified auditing.

Tasks

1. Shut down all Oracle processes of all instances.
   a. Shut down the listener.

```
$ . oraenv
[ORACLE_SID = [orcl] ? orcl
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1 is
/u01/app/oracle
$
```

```
$ lsnrctl stop
LSNRCTL for Linux: Version 12.1.0.2.0 - Production on 13-OCT-
2014 13:03:00

Copyright (c) 1991, 2014, Oracle.  All rights reserved.

Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=ed.us.oracle.com)(PORT
=1521)))
The command completed successfully
```

   b. Shut down all instances.

```
$ pgrep -lf pmon
6871 ora_pmon_em12rep
28985 ora_pmon_orcl
$
```

      1) Shut down the `orcl` instance.

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

      2) Shut down the `em12rep` instance.
         a) Stop the OMS.

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```
$ cd /u01/app/oracle/product/middleware/oms
$ export OMS_HOME=/u01/app/oracle/product/middleware/oms

$ $OMS_HOME/bin/emctl stop oms
Oracle Enterprise Manager Cloud Control 12c Release 4
Copyright (c) 1996, 2014 Oracle Corporation.  All rights
reserved.
Stopping WebTier...
WebTier Successfully Stopped
Stopping Oracle Management Server...
Oracle Management Server Successfully Stopped
Oracle Management Server is Down
$
```

b) Shut down `em12rep`, the repository database instance.

```
$ . oraenv
[ORACLE_SID = [orcl] ? em12rep
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1 is
/u01/app/oracle
```

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

3) Verify that all instances are down.

```
$ pgrep -lf pmon
$
```

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_1/rdbms/lib/libknlopt.a
kzanang.o
/usr/bin/ar cr
/u01/app/oracle/product/12.1.0/dbhome_1/rdbms/lib/libknlopt.a
/u01/app/oracle/product/12.1.0/dbhome_1/rdbms/lib/kzaiang.o
```

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```
chmod 755 /u01/app/oracle/product/12.1.0/dbhome_1/bin

 - Linking Oracle
rm -f /u01/app/oracle/product/12.1.0/dbhome_1/rdbms/lib/oracle
/u01/app/oracle/product/12.1.0/dbhome_1/bin/orald  -o
/u01/app/oracle/product/12.1.0/dbhome_1/rdbms/lib/oracle -m64 -z
noexecstack -
…
mv /u01/app/oracle/product/12.1.0/dbhome_1/rdbms/lib/oracle
/u01/app/oracle/product/12.1.0/dbhome_1/bin/oracle
chmod 6751 /u01/app/oracle/product/12.1.0/dbhome_1/bin/oracle
$
```

3. Restart the processes.
   a. Restart the listener.

```
$ lsnrctl start
LSNRCTL for Linux: Version 12.1.0.2.0 - Production on 13-OCT-
2014 13:16:19

Copyright (c) 1991, 2014, Oracle.  All rights reserved.

Starting /u01/app/oracle/product/12.1.0/dbhome_1/bin/tnslsnr:
please wait...

TNSLSNR for Linux: Version 12.1.0.2.0 - Production
System parameter file is
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.o
ra
Log messages written to
/u01/app/oracle/diag/tnslsnr/EDP1/listener/alert/log.xml
Listening on:
(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=edp1.us.oracle.com)(PO
RT=1521)))
Listening on:
(DESCRIPTION=(ADDRESS=(PROTOCOL=ipc)(KEY=EXTPROC1521)))

Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=edp1.us.oracle.com)(PO
RT=1521)))
STATUS of the LISTENER
------------------------
Alias                     LISTENER
Version                   TNSLSNR for Linux: Version 12.1.0.2.0
- Production
Start Date                13-OCT-2014 13:16:20
Uptime                    0 days 0 hr. 0 min. 0 sec
```

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```
Trace Level               off
Security                  ON: Local OS Authentication
SNMP                      OFF
Listener Parameter File
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.o
ra
Listener Log File
/u01/app/oracle/diag/tnslsnr/EDRSR9P1/listener/alert/log.xml
Listening Endpoints Summary...

(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=edp1.us.oracle.com)(PO
RT=1521)))
  (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc)(KEY=EXTPROC1521)))
The listener supports no services
The command completed successfully
$
```

b. Restart the `orcl` database instance.

```
$ . oraenv
[ORACLE_SID = [em12rep] ? orcl
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1 is
/u01/app/oracle

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

SQL> startup
ORACLE instance started.
Total System Global Area 503316480 bytes
Fixed Size                 2926080 bytes
Variable Size            268438016 bytes
Database Buffers         226492416 bytes
Redo Buffers               5459968 bytes
Database mounted.
Database opened.
```

c. Check that unified auditing is enabled.

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

VALUE
----------------------------------------------------------------
```

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```
TRUE

SQL> EXIT

Disconnected from Oracle Database 12c Enterprise Edition Release
12.1.0.2.0 - 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.

d. Start the Enterprise Manager repository instance, `em12rep`.

```
$ . oraenv
ORACLE_SID = [orcl] ? em12rep
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1 is
/u01/app/oracle
[oracle@EDRSR32P1 ~]$ sqlplus / as sysdba
…
Connected to:
…
SQL> startup
ORACLE instance started.
Total System Global Area 503316480 bytes
Fixed Size                 2926080 bytes
Variable Size            268438016 bytes
Database Buffers         226492416 bytes
Redo Buffers               5459968 bytes
Database mounted.
Database opened.
SQL> exit
```

e. Start the OMS. Note that this command can take 10 minutes or so to complete.

```
$ /u01/app/oracle/product/middleware/oms/bin/emctl start oms
Oracle Enterprise Manager Cloud Control 12c Release 4
Copyright (c) 1996, 2014 Oracle Corporation.  All rights
reserved.
Starting Oracle Management Server...
Starting WebTier...
WebTier Successfully Started
Oracle Management Server Successfully Started
Oracle Management Server is Up
$
```

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Practice 11-2: Creating Audit Users

Overview

In this practice you will create 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 required in many businesses.

Assumptions

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

Tasks

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

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

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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. Copy and paste the SQL commands to the `P11script.sql` file. Save and close the file.

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Practice 11-3: Creating an Audit Policy

Overview

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

Assumptions

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

Tasks

1. Invoke SQL*Plus and connect to the orcl database as the AUDMGR user. Create a policy named JOBS_AUDIT_UPD that audits all auditable statements for the HR.JOBS table.
   a. Set the environment for the orcl database by using oraenv.
   b. Connect to the orcl database as the AUDMGR user by using SQL*Plus.

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

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

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

Audit policy created.
```

   d. Verify the creation of the JOBS_AUDIT_UPD 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: There are two ways that 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.

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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
ORA_LOGON_FAILURES   BY       ALL USERS            NO  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
---------- ---------------------------- ---------- ----------
AD_PRES    President                     20080      40000

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

1 row updated.
```

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```
SQL> exit
```

b. Connect as the AUDMGR user and view the audit trail records for this change.
Note: Your output may vary from what is shown depending on how many times you have logged on and logged off as the DHAMBY user. For this practice, you are interested in the row for the JOBS_AUDIT_UPD policy.

```
$ 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
```

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>
```

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d. View the audit trail records.

```
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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Practices for Lesson 12: Backup and Recovery: Concepts

Chapter 12

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Practices for Lesson 12

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Practices for Lesson 13: Backup and Recovery: Configuration

Chapter 13

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Practices for Lesson 13: 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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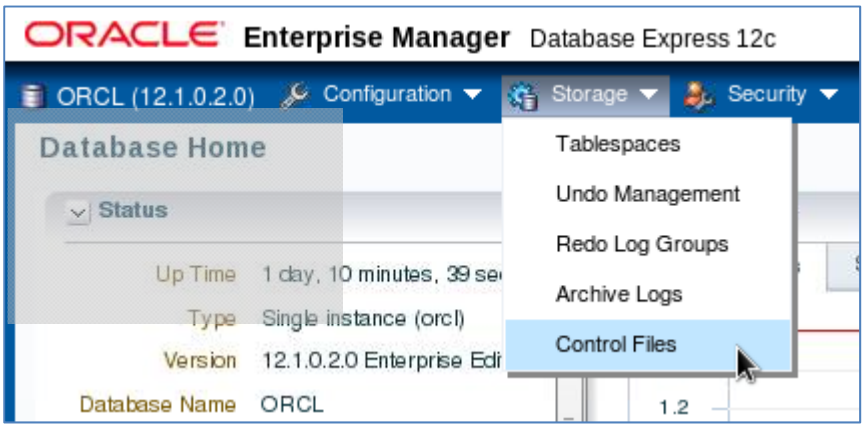
Practice 13-1: Configuring Your Database for Recovery

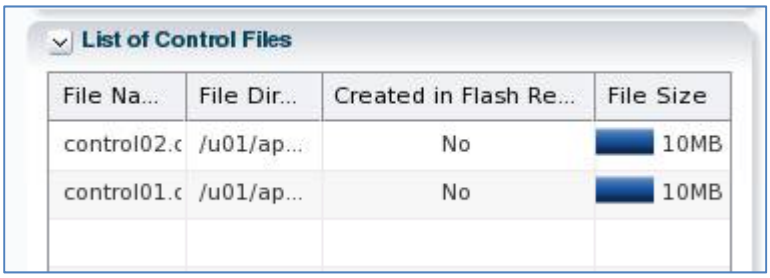
In this practice, you verify that your database is configured properly to support recovery operations in the event of a failure.

1. Verify that the control files are multiplexed.
   a. Launch Enterprise Manager Database Express. Log in as the **DBA1** user.
   b. Click **Storage** > **Control Files**.

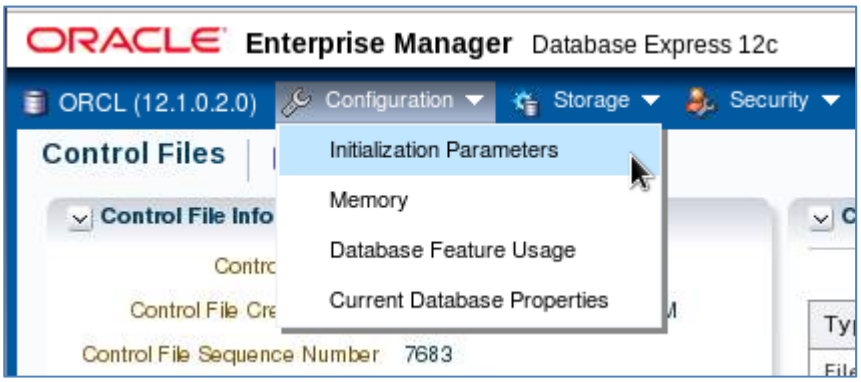


Question 1: On the Control Files: List of Control Files page, how many control files do you have?

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`.

Current | SPFile

The parameter values listed here are currently used by the running instance(s).

View | Set... | Help | Modif

Name	Value	Comment	Modi...	Dyn...	Sess...	Basic
Ansi Compliance						
blank_trimming	false					
Archiving and Recovery						
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_r...		✓	✓		✓
db_recovery_file_dest_size	4560M		✓	✓		✓
db_unrecoverable_scn_tracking	true			✓	✓	
fast_start_io_target	0			✓		

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.

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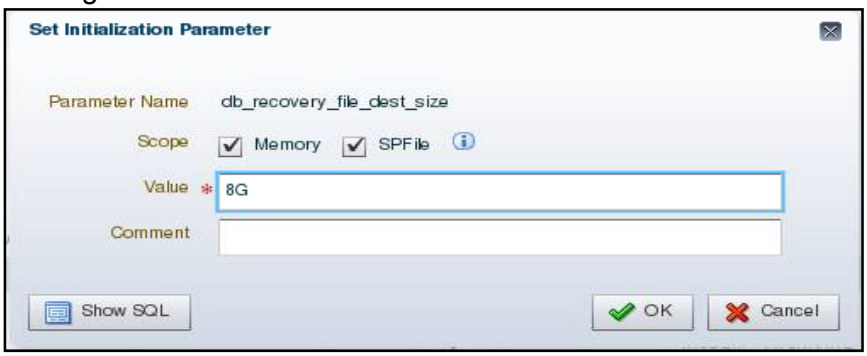
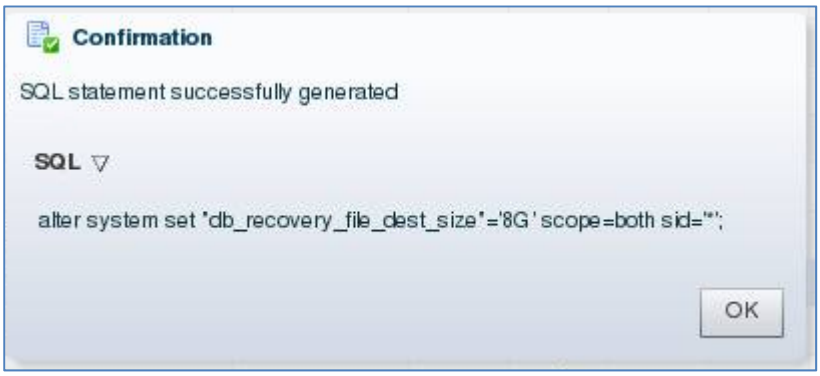
f. Change the size of the Fast Recovery Area to **8 GB**, by selecting the parameter and clicking **Set**. Then enter `8G` in the "Value" field of the Set Initialization Parameter page.



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

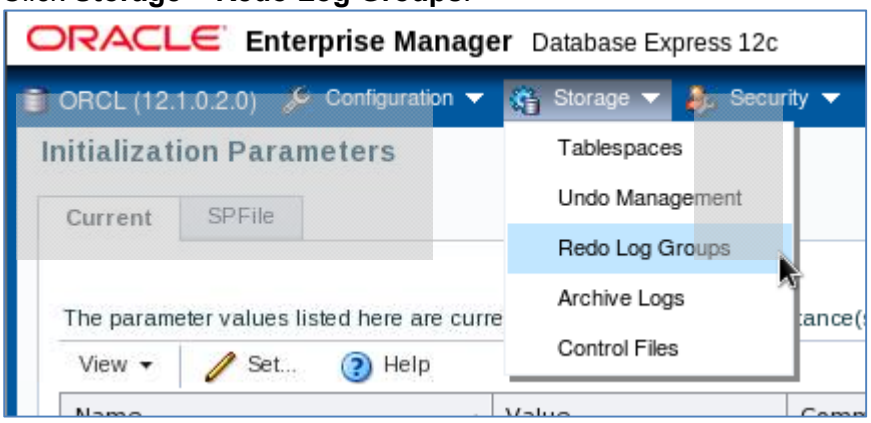


h. In the Set Initialization Parameter box, click **OK**.

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. Click **Storage** > **Redo Log Groups**.



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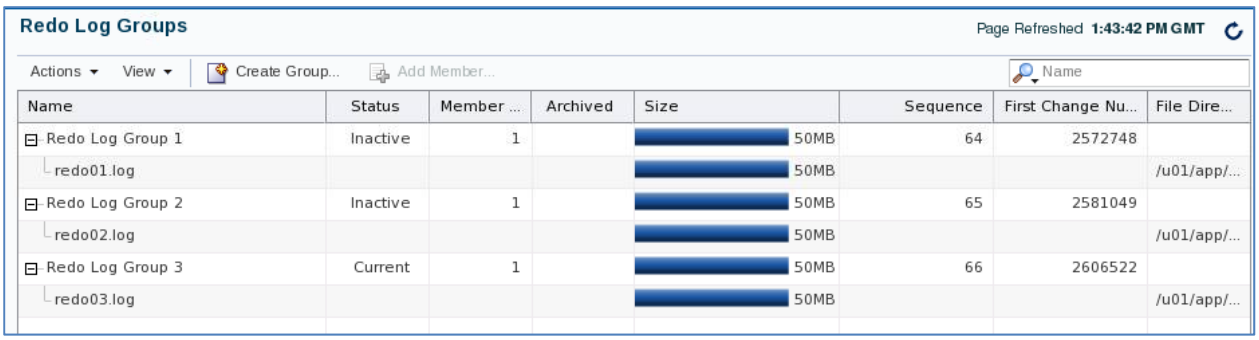
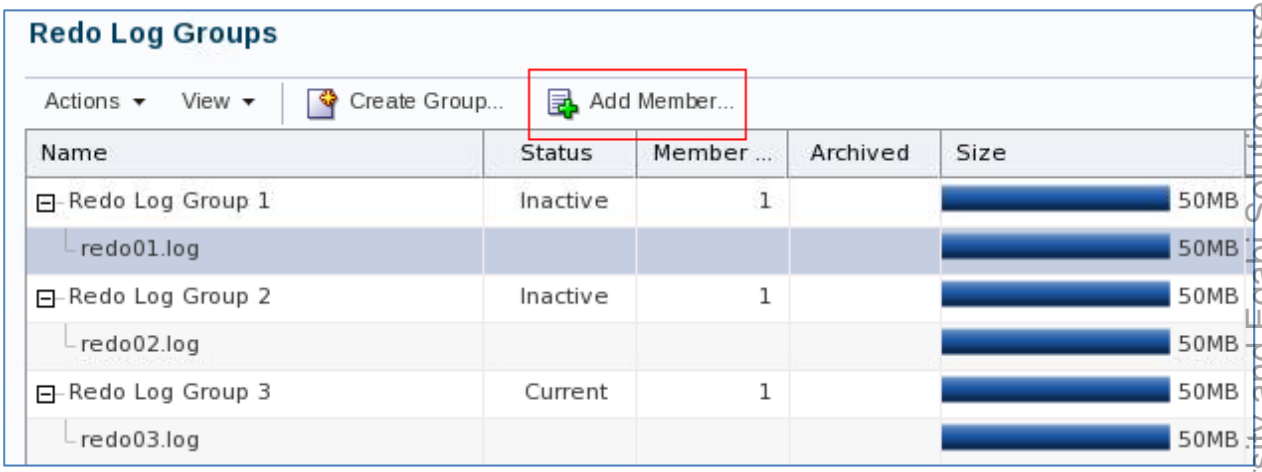
b. Note how many members are in the “Member Count” column. There is only one member in each group.



c. Select one of your redo log groups and click “**Add Member…**” to add another member to the Redo Log Group.



d. Enter **`redonnb.log`** in the File Name field where *`nn`* represents the redo log group number.

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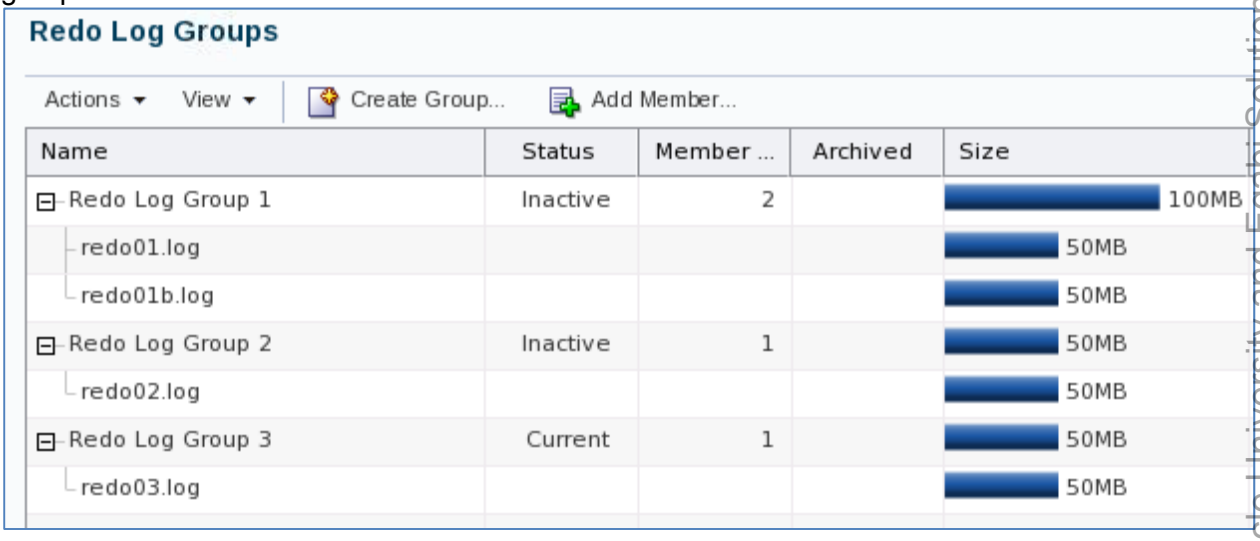
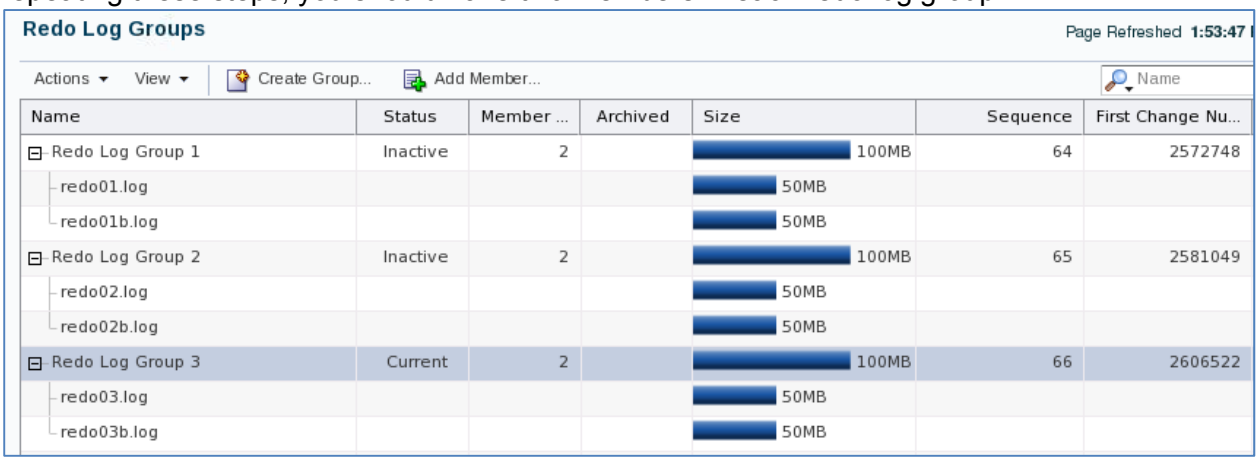
e. You can click **Show SQL** to view the SQL statement. Click **OK**.

f. A Confirmation message is returned. Click **OK**.

g. Now, you can see that the "**Member Count**" column shows 2 for one of the redo log groups.



h. 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.



i. Log out of Enterprise Manager Database Express.

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4. You notice that for each redo log group, the "Archived" column has no value. This means that your database is not retaining copies of redo logs to use for database recovery, and in the event of a failure, you will lose all data since your last backup. Place your database in `ARCHIVELOG` mode, so that redo logs are archived.

   You do not need to specify a naming convention or a destination for the archived redo log files because you are using a fast recovery area.

   Note: If you add archive log destinations, you must create the directory if it does not already exist.

   Use SQL*Plus to set the database in `ARCHIVELOG` mode.

   a. Open a terminal window and set the environment for the `orcl` database.

```
$ . oraenv
ORACLE_SID = [orcl] ? orcl
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1 is
/u01/app/oracle
$
```

   b. Invoke SQL*Plus and log in as `SYSDBA`.

```
$ sqlplus / AS SYSDBA
…
Connected to:
…
SQL>
```

   c. Shut down the instance.

```
SQL> SHUTDOWN IMMEDIATE
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL>
```

   d. Start the database in `MOUNT` mode.

```
SQL> STARTUP MOUNT
ORACLE instance started.
Total System Global Area 503316480 bytes
Fixed Size                 2926080 bytes
Variable Size            268438016 bytes
Database Buffers         226492416 bytes
Redo Buffers               5459968 bytes
Database mounted.

SQL>
```

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e. Set the mode to ARCHIVELOG.

```
SQL> ALTER DATABASE ARCHIVELOG;

Database altered.

SQL>
```

f. Open the database.

```
SQL> ALTER DATABASE OPEN;

Database altered.

SQL>
```

g. Shut down the database instance.

```
SQL> SHUTDOWN IMMEDIATE
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL>
```

h. 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 from SQL*Plus.

```
SQL> STARTUP
ORACLE instance started.

Total System Global Area 503316480 bytes
Fixed Size                 2926080 bytes
Variable Size            268438016 bytes
Database Buffers         226492416 bytes
Redo Buffers               5459968 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 …
$
```

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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. Perform a few log switches. Verify that archive logs are created in both destinations by querying V$ARCHIVED_LOG. Exit from 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
-----------------------------------------------------------------
```

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```
/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
$
```

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Practices for Lesson 14: Performing Database Backups

Chapter 14

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Practices for Lesson 14: Overview

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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Practice 14-1: Backing Up the Control File

Overview

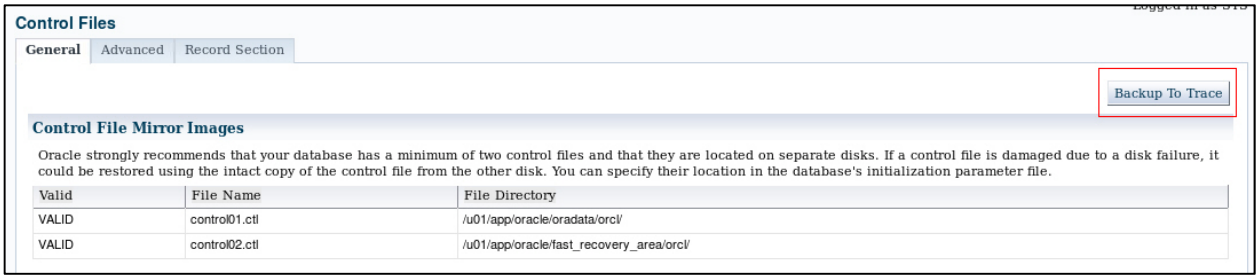
In this practice, you back up your control file to a trace file, creating a file of SQL commands that can be used to re-create the control file.

Assumptions

Practices for lesson 13 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. 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 from SQL*Plus.

```
SQL> alter database backup controlfile to trace;

Database altered.
SQL> exit
```

8. Navigate to the `/u01/app/oracle/diag/rdbms/orcl/orcl/trace` directory 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
Wed Oct 15 12:43:15 2014
ALTER DATABASE BACKUP CONTROLFILE TO TRACE
Wed Oct 15 12:43:15 2014
Backup controlfile written to trace file
/u01/app/oracle/diag/rdbms/orcl/orcl/trace/orcl_ora_21975.trc
Completed: ALTER DATABASE BACKUP CONTROLFILE TO TRACE
Wed Oct 15 12:47:30 2014
alter database backup controlfile to trace
Wed Oct 15 12:47:30 2014
```

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```
Backup controlfile written to trace file
/u01/app/oracle/diag/rdbms/orcl/orcl/trace/orcl_ora_22528.trc
Completed: alter database backup controlfile to trace
```

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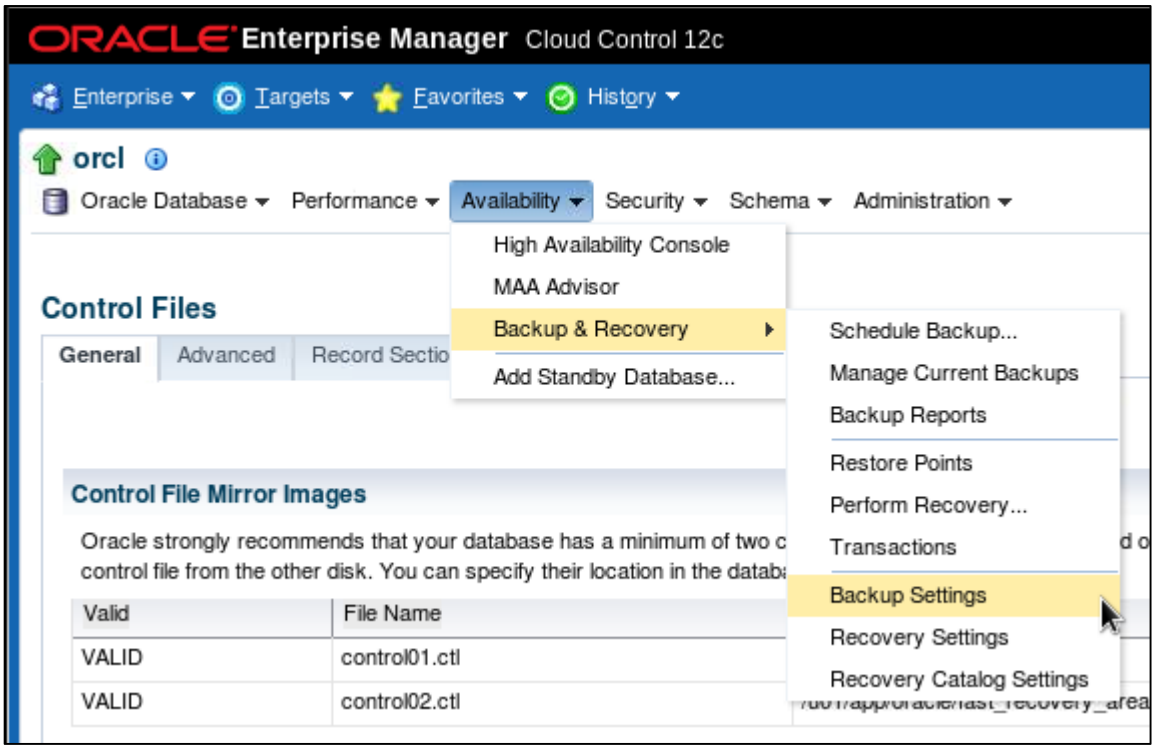
Practice 14-2: Configuring Automatic Backups of the Control File and SPFILE

Overview

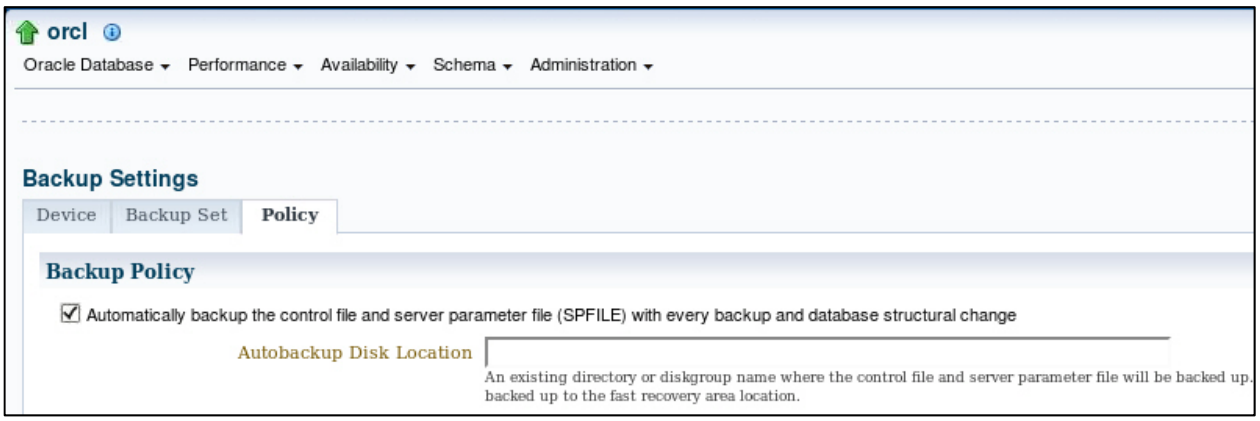
In this practice you configure automatic backups of the control file and server parameter file (SPFILE) when a backup of the database is made and when there is a structural change to the database.

Tasks

1. Return to the `orcl` database home page in Enterprise Manager Cloud Control.
2. Select **Availability > Backup & Recovery > Backup Settings**.



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**."



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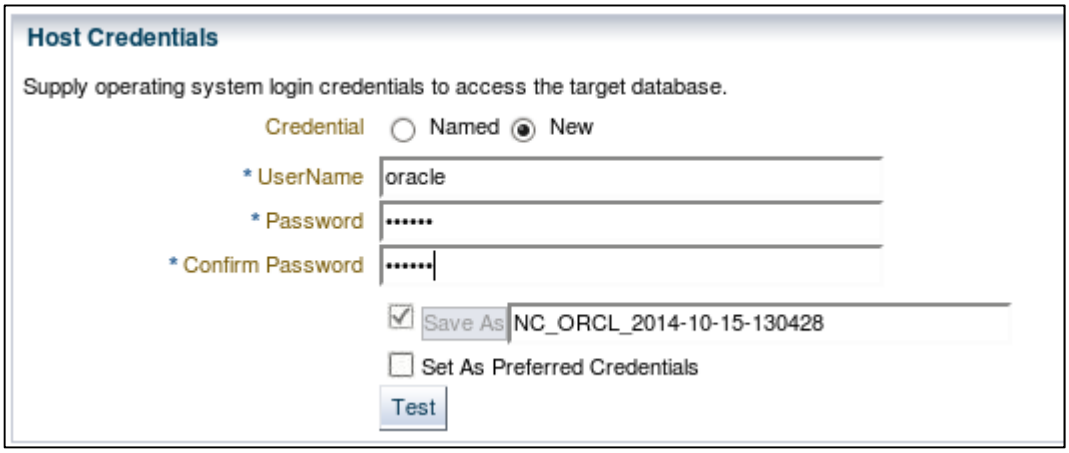
5. Scroll to the bottom of the page. In the Host Credentials section, select **New**. Enter `oracle` in the User Name field. Enter your OS password in the Password and Confirm Password fields. Click **Test** to ensure that you entered the values properly.



6. Click **Apply**.

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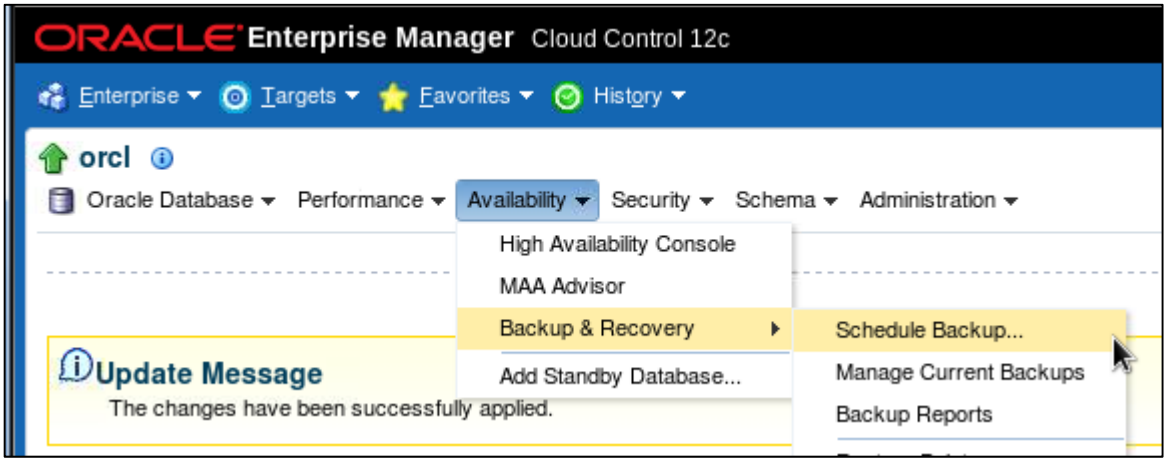
Practice 14-3: Creating a Whole Database Backup

Overview

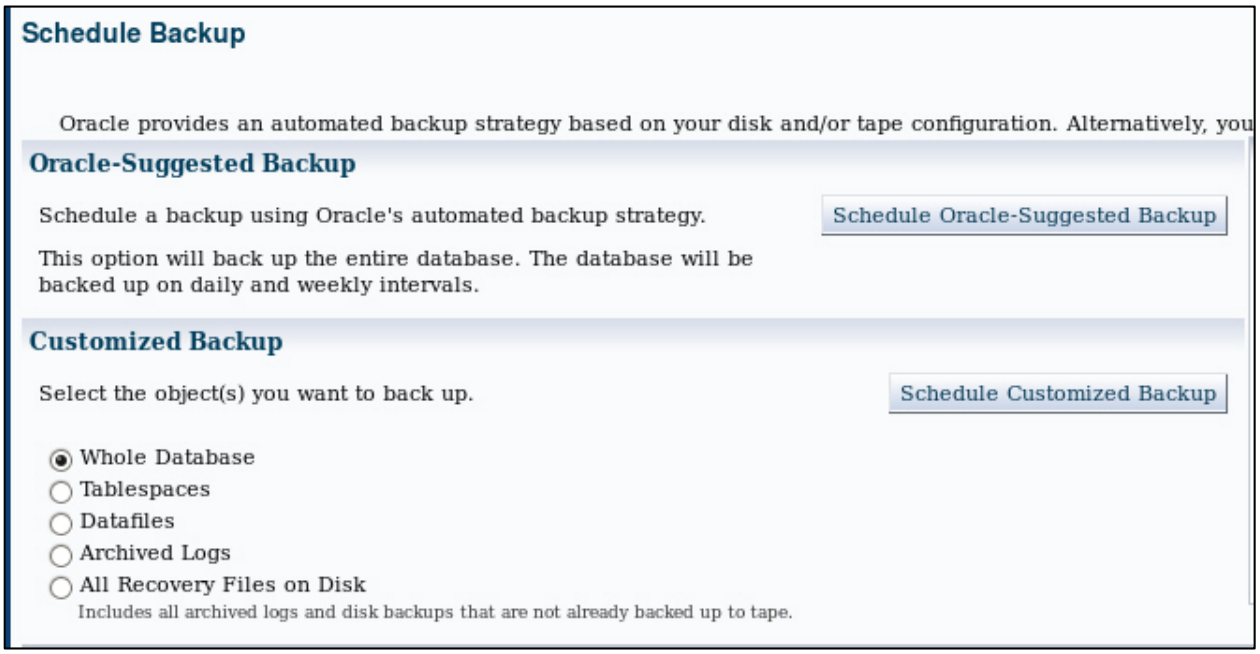
In this practice, you back up your entire database, including the archived redo log files. The backup should be the base for an incremental backup strategy.

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**.



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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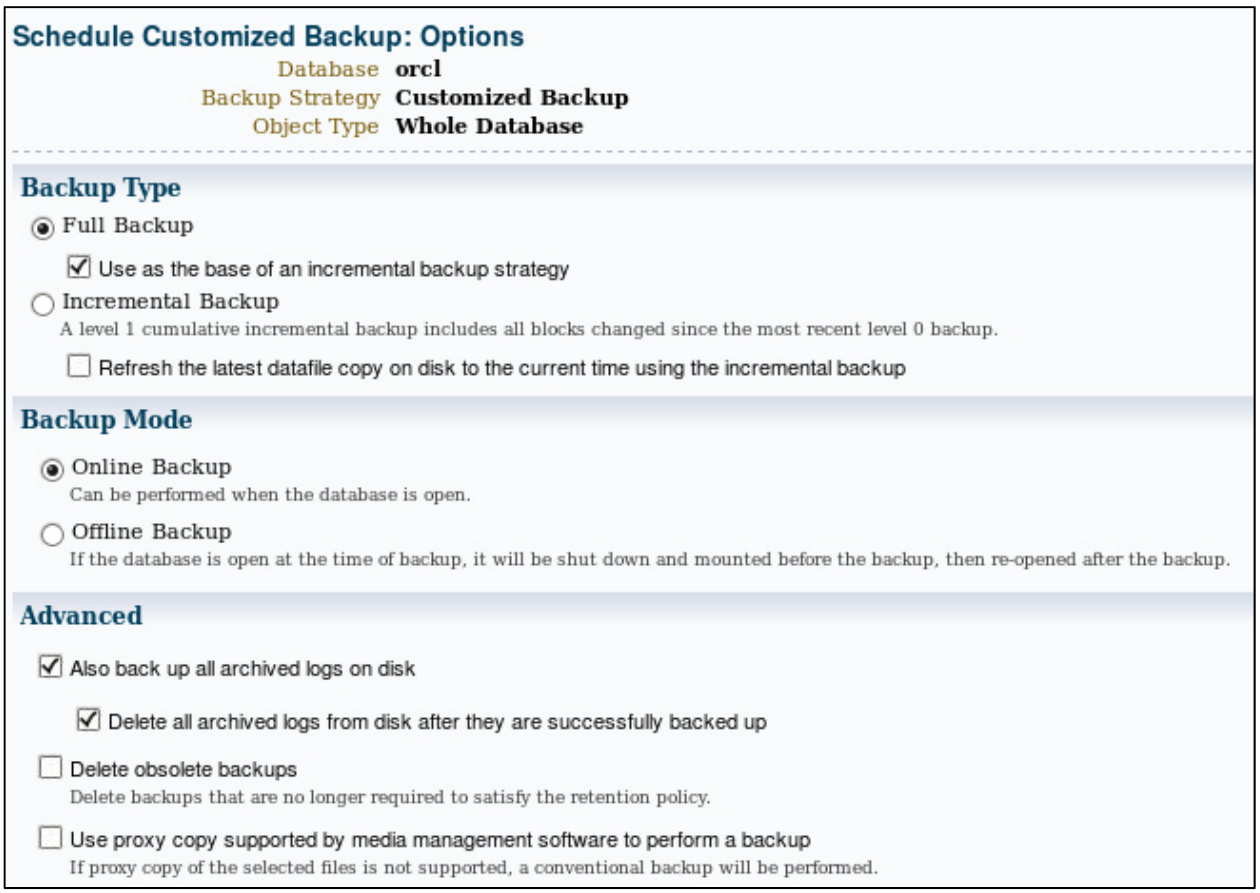
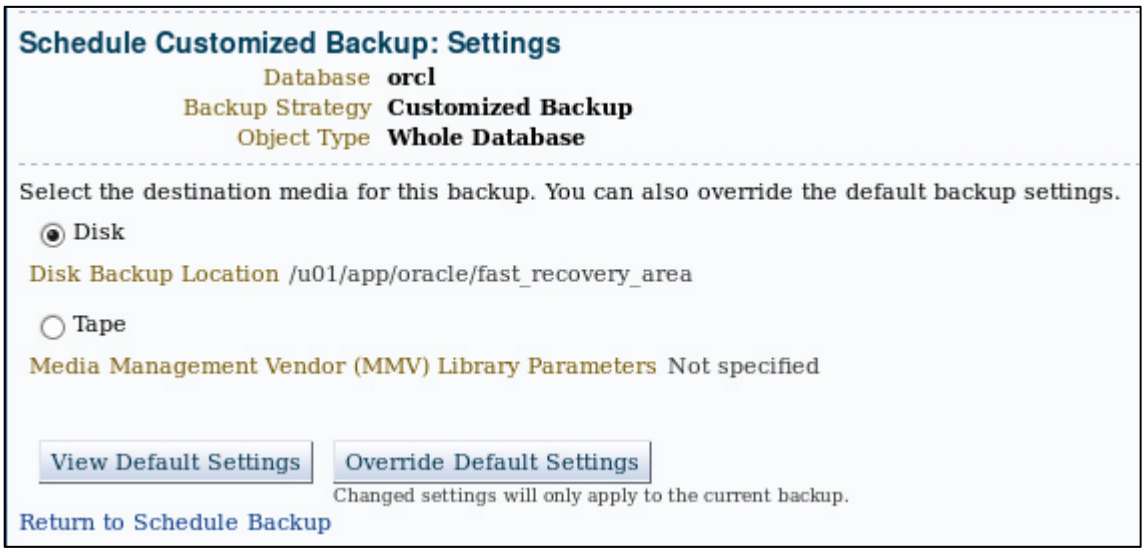
5. In the Advanced section, select "**Also back up all archived logs on disk**" and "**Delete all archived logs from disk after they are successfully backed up**." Click **Next**.



6. On the Settings page, select **Disk** as the backup destination. Click **Next**.



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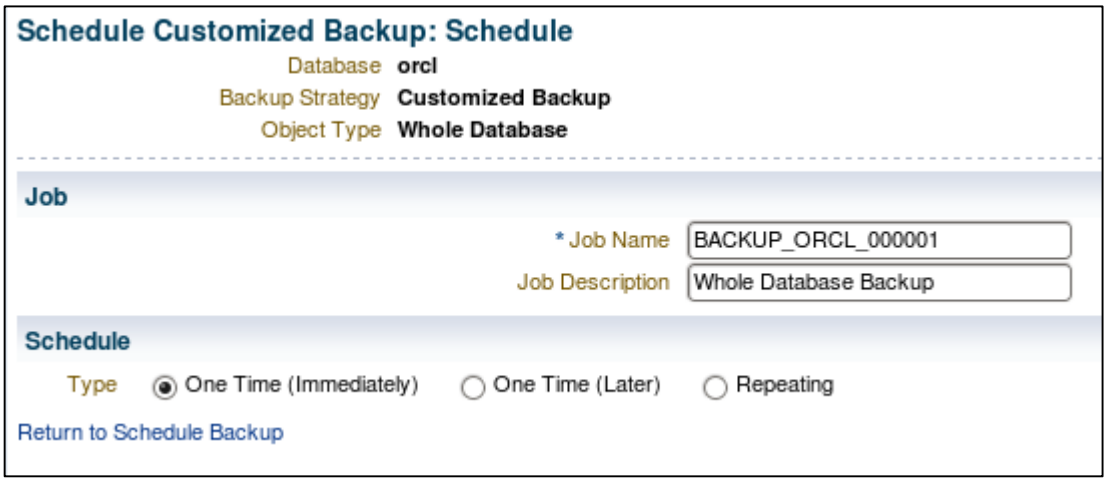
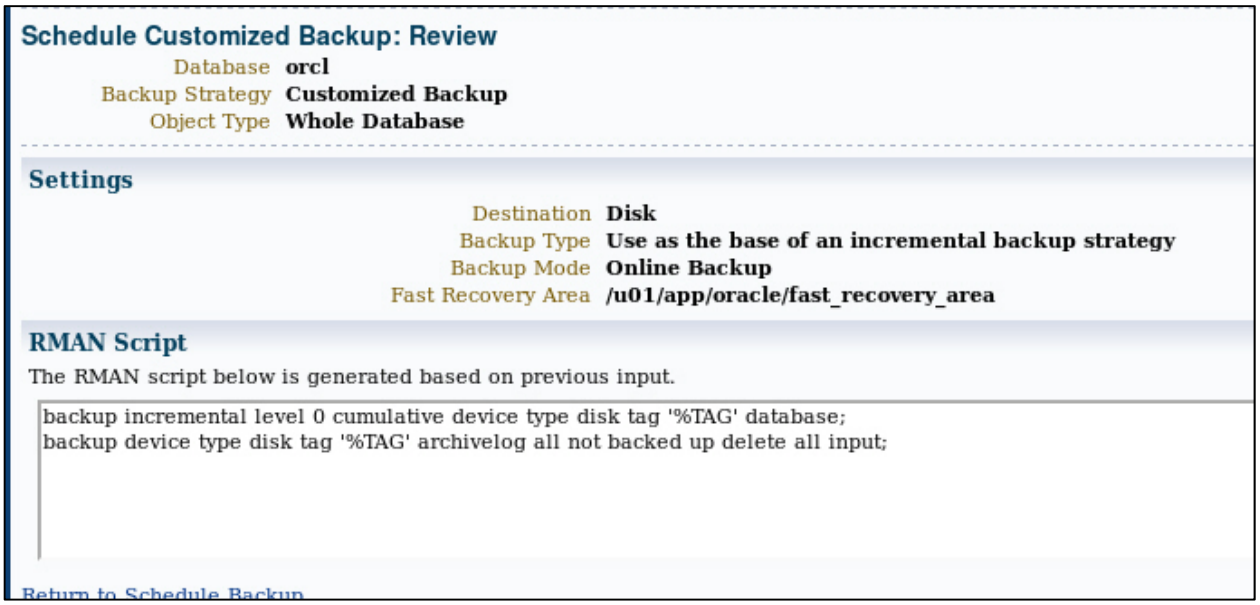
7. On the Schedule page, accept the defaults. Click **Next**.



8. On the Review page, review the RMAN script and then click **Submit Job**.



9. A confirmation message is displayed. Click **View Job**.

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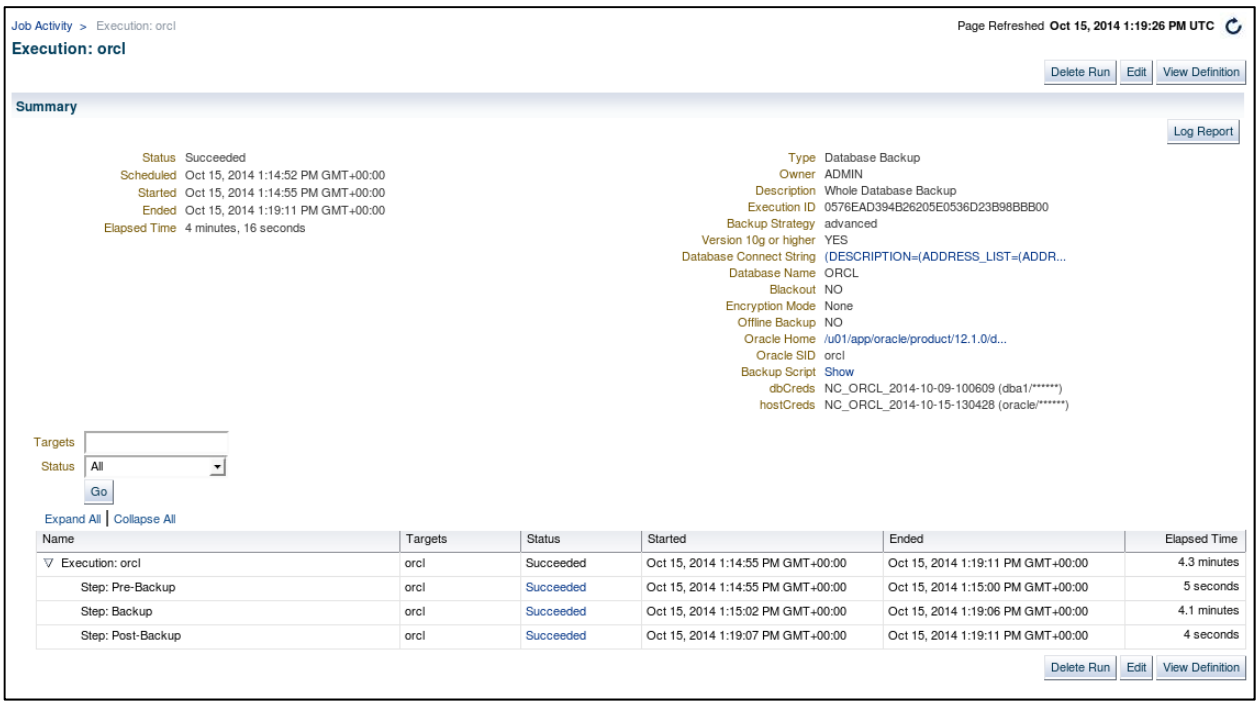
10. Click the Refresh icon on the right side of page until you see that the job has completed successfully.



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Practices for Lesson 15: Performing Database Recovery

Chapter 15

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Practices for Lesson 15: Overview

Practices Overview

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

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Practice 15-1: 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. Log in to SQL*Plus as the **`HR`** user and query the **`REGIONS`** table.

```
$ sqlplus hr
Enter password:
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/P15/lab_15_01_03.sql`** script to create a procedure that will be used later in this practice.

```
SQL> @$LABS/P15/lab_15_01_03
Connected.

Java created.
Procedure created.
PL/SQL procedure successfully completed.
…
Grant succeeded.

SQL>
```

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4. Execute the **$LABS/P15/lab_15_01_04.sql** script. This script simulates a failure in the database environment by deleting a data file.

```
SQL> @$LABS/P15/lab_15_01_04

PL/SQL procedure successfully completed.

"Data file deleted. Wait a couple minutes before proceeding."
"Database should be open."
Disconnected…
$
```

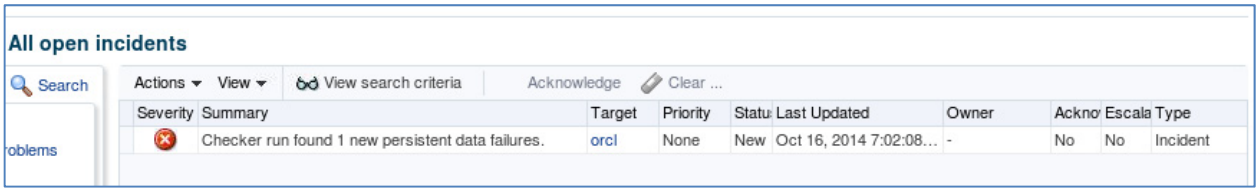
5. Invoke SQL*Plus again and log in as the **HR** user. Again query the REGIONS table.

```
$ sqlplus hr
Enter password:

SQL> select * from hr.regions;
select * from hr.regions
                 *
ERROR at line 1:
ORA-01116: error in opening database file 5
ORA-01110: data file 5:
'/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.
   a. Launch Enterprise Manager Cloud Control and log in as the **ADMIN** user.
   b. Navigate to the orcl database home page.
   c. Log in with your saved database credentials.
   d. Expand **Oracle Database**. Select **Monitoring** > **Incident Manager**. Note that there is a critical error listed, indicating a data failure.



   e. Expand **Availability**. Select **Backup & Recovery** > **Perform Recovery**.
   f. Specify a named host credential, or enter **oracle** as the username and your OS password in the password fields. Click **Continue**.

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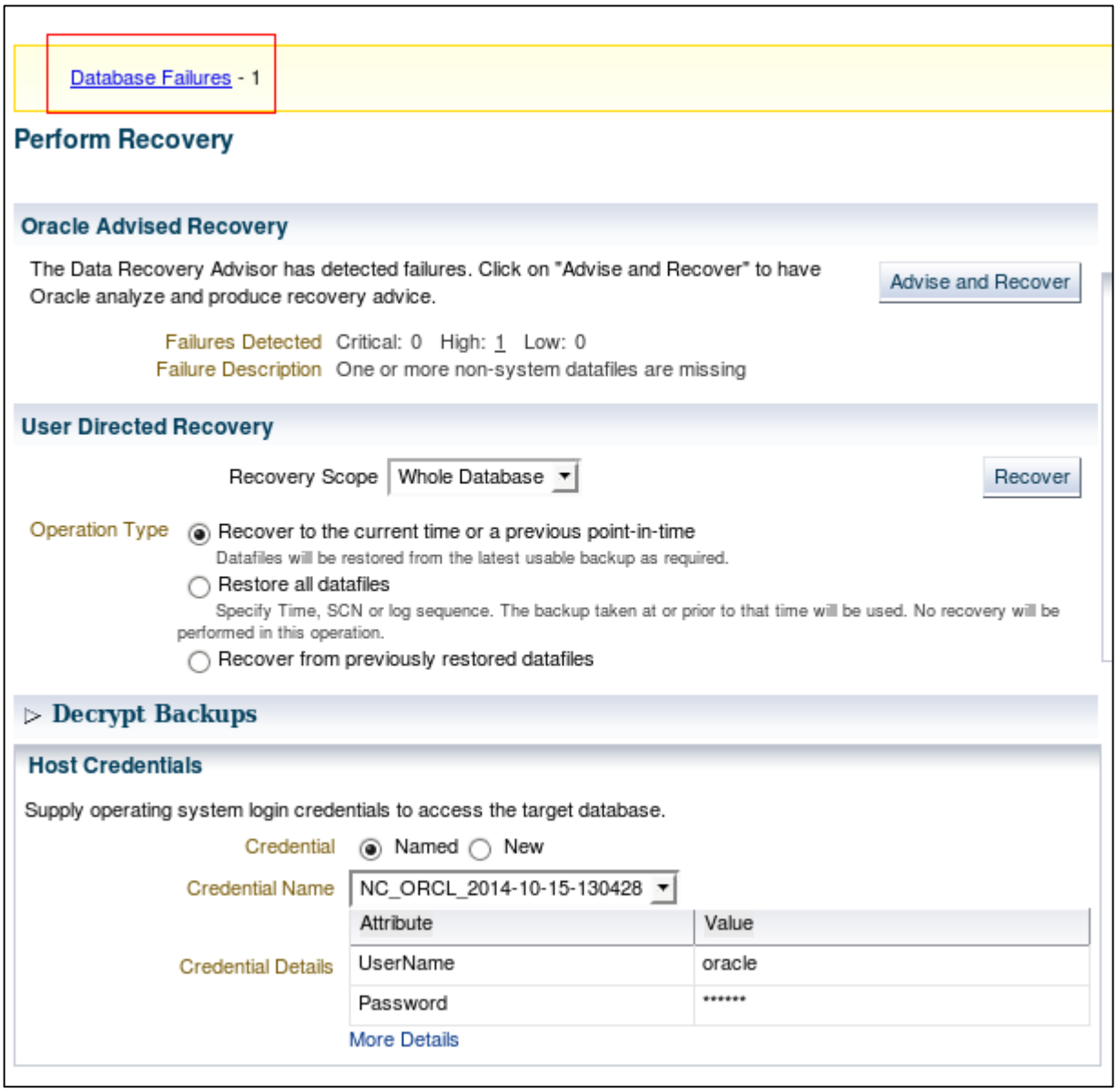
g. Click the "**Database Failures**" link.



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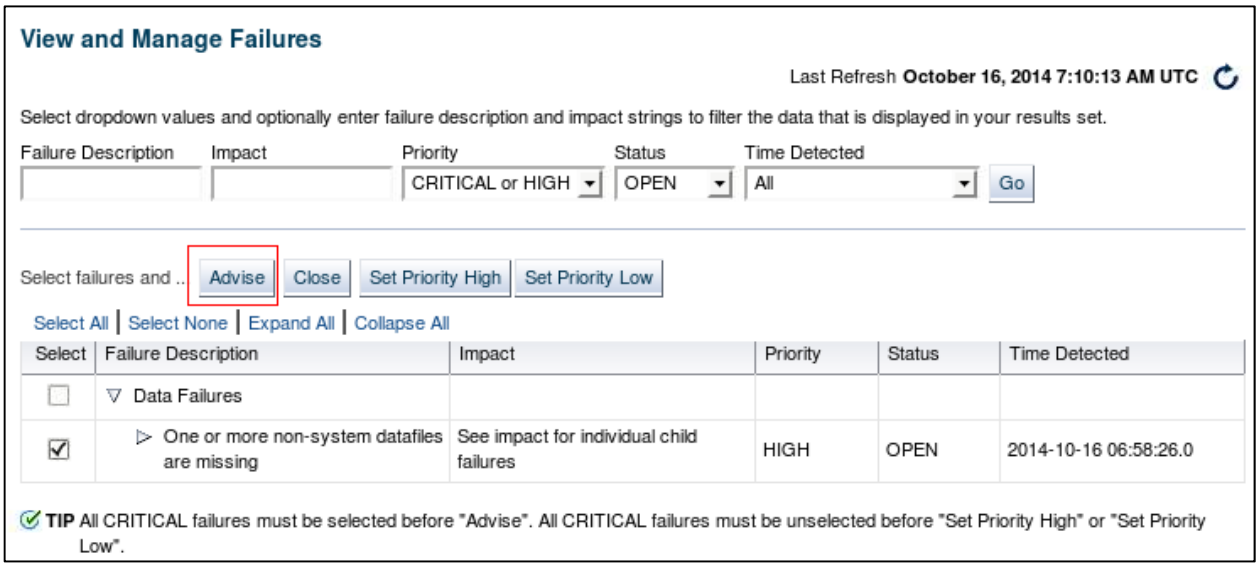
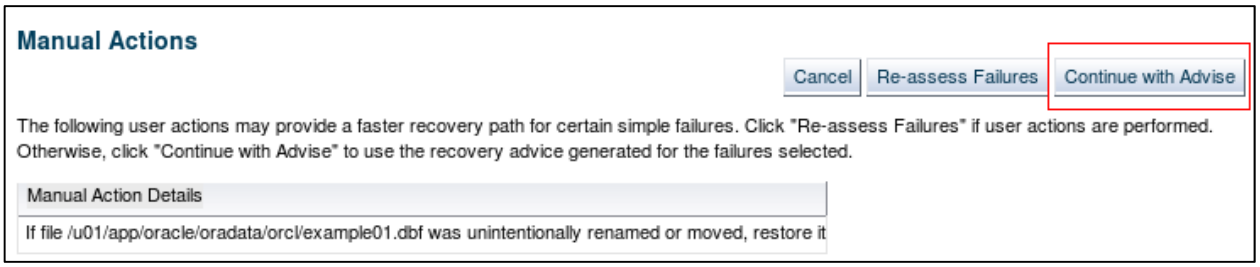
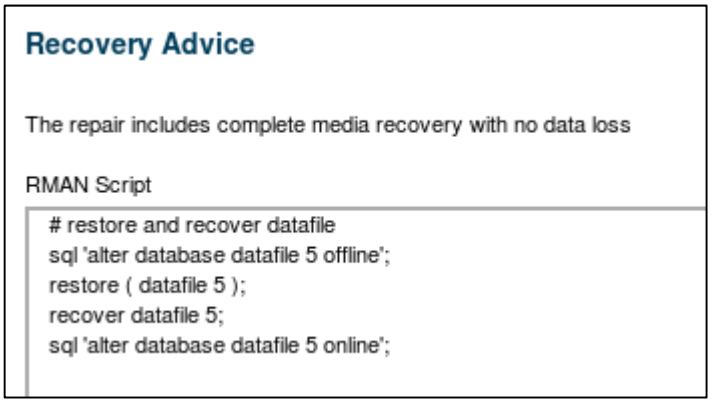
h. View the failure information. Click **Advise**.



i. Click "**Continue with Advise**."



j. Review the RMAN script that will be used to restore the file and perform recovery. Click **Continue**.



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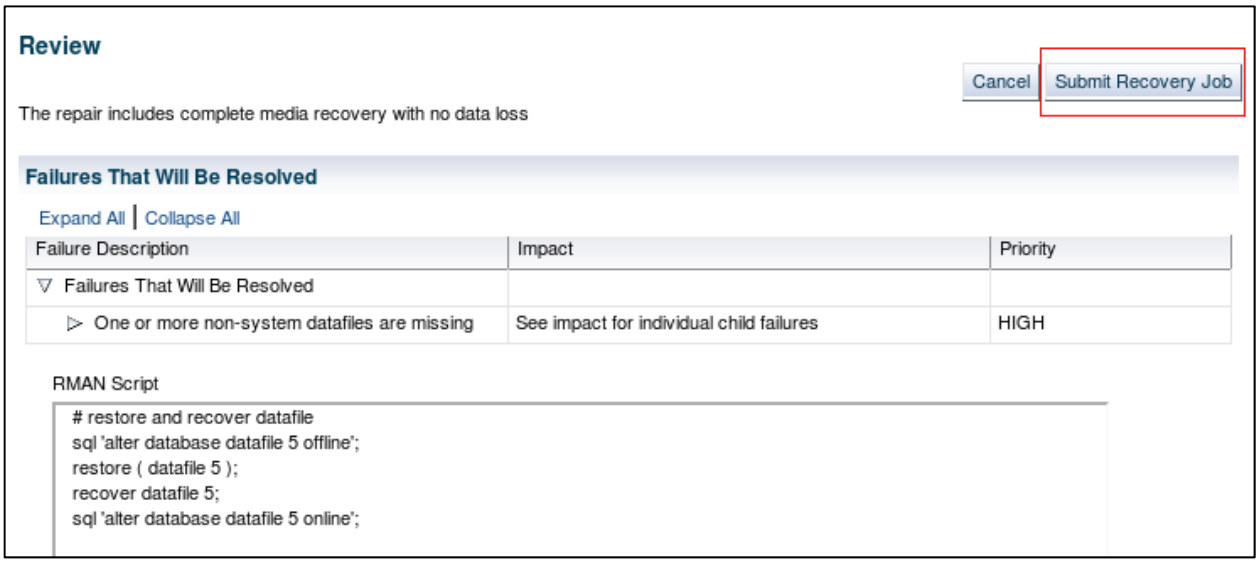
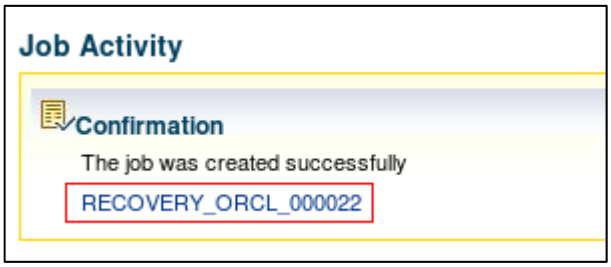
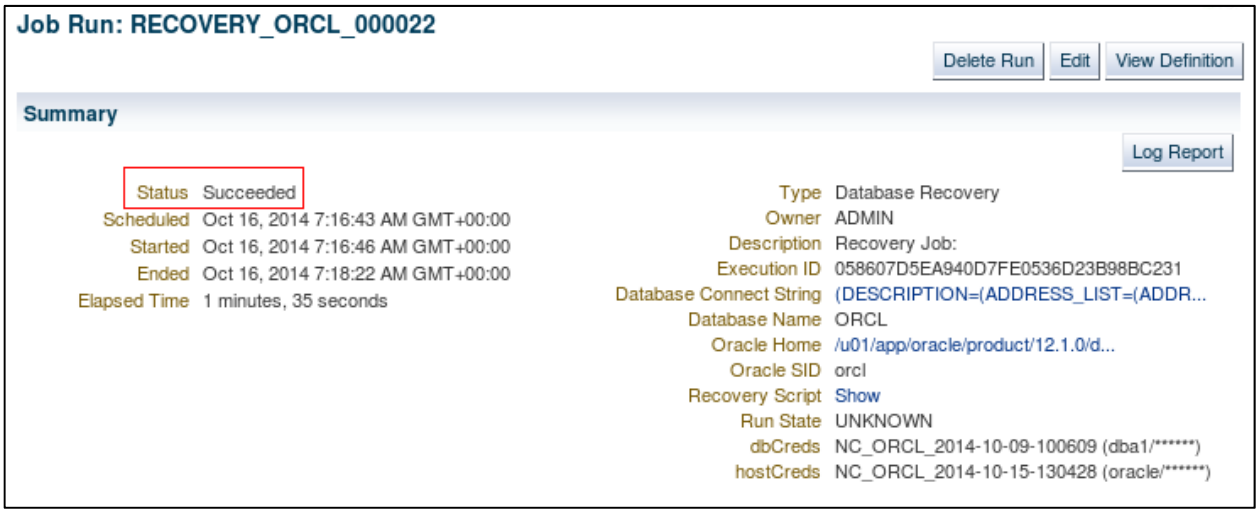
k. Review the information, and then click "**Submit Recovery Job**."



l. A processing page appears, and then the Job Activity page appears. Click the job name link.



m. On the Job Run page, verify that the status is "Succeeded." Then return to the `orcl` database home page.



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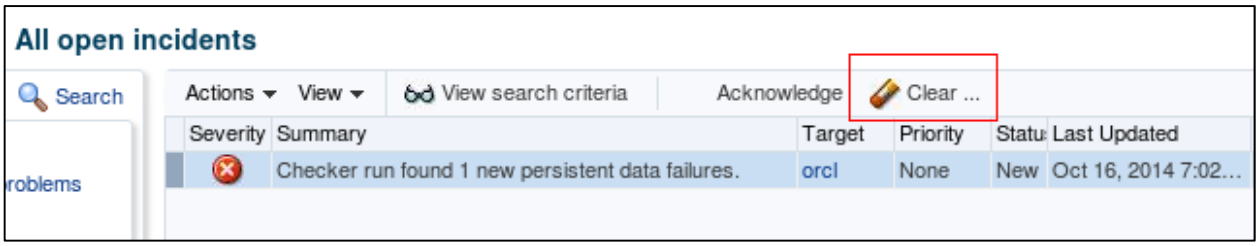
n. Return to your SQL*Plus session. Once again query the **HR.REGIONS** table to verify that the data file has been restored and recovered. Exit from SQL*Plus.

```
SQL> select * from hr.regions;

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

o. Return to Enterprise Manager Cloud Control. Expand **Oracle Database**. Select **Monitoring** > **Incident Manager**. Select the data failure incident and click **Clear**.



p. Select “Clear and do not send e-mail or page notifications.” Click **OK** to confirm.

q. Return to the **orcl** database home page.

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Practices for Lesson 16: Moving Data

Chapter 16

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Practices for Lesson 16: 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. So 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.

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Practice 16-1: 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 at this time.

1. First, you need to grant to the DBA1 user the appropriate privileges on the DATA_PUMP_DIR directory. Be sure you know the OS directory where the Data Pump import file will be placed.

```
$ . oraenv
ORACLE_SID = [oracle] ? orcl
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1 is
/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/
ORIGIN_CON_ID
-------------
            0
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
$
```

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2. Use the Data Pump export utility to export the `HR` schema. Specify the `DBA1` user to execute the export operation.

```
$ rm /u01/app/oracle/admin/orcl/dpdump/HREXP01.dmp
rm: cannot remove
`/u01/app/oracle/admin/orcl/dpdump/HREXP01.dmp': No such file or
directory
$ expdp dba1/oracle_4U dumpfile=HREXP%U.dmp
directory=DATA_PUMP_DIR logfile=hrexp.log SCHEMAS=HR
Export: Release 12.1.0.2.0 - Production on Thu Oct 16 10:39:28
2014


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Connected to: Oracle Database 12c Enterprise Edition Release
12.1.0.2.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics, 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
```

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```
Processing object type
SCHEMA_EXPORT/TABLE/STATISTICS/TABLE_STATISTICS
Processing object type SCHEMA_EXPORT/STATISTICS/MARKER
. . exported "HR"."COUNTRIES"                            6.437
KB      25 rows
. . exported "HR"."DEPARTMENTS"                          7.101
KB      27 rows
. . exported "HR"."EMPLOYEES"                            17.06
KB     107 rows
. . exported "HR"."JOBS"                                 7.085
KB      19 rows
. . exported "HR"."JOB_HISTORY"                          7.171
KB      10 rows
. . exported "HR"."LOCATIONS"                            8.414
KB      23 rows
. . exported "HR"."REGIONS"                              5.523
KB       4 rows
Master table "DBA1"."SYS_EXPORT_SCHEMA_01" successfully
loaded/unloaded
******************************************************************
Dump file set for DBA1.SYS_EXPORT_SCHEMA_01 is:
  /u01/app/oracle/admin/orcl/dpdump/HREXP01.dmp
Job "DBA1"."SYS_EXPORT_SCHEMA_01" successfully completed at Thu
Oct 16 10:41:12 2014 elapsed 0 00:01:38
$
```

3. Now, import the **EMPLOYEES** table from the exported **HR** schema into the **DBA1** schema.
   a. Enter the following entire command string. Do not press Enter before reaching the end of the command:

```
$ impdp dba1/oracle_4U DIRECTORY=data_pump_dir
DUMPFILE=HREXP01.dmp REMAP_SCHEMA=hr:dba1 TABLES=hr.employees
LOGFILE=empimport.log


Import: Release 12.1.0.2.0 - Production on Thu Oct 16 10:46:14
2014


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Connected to: Oracle Database 12c Enterprise Edition Release
12.1.0.2.0 - 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
```

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```
Starting "DBA1"."SYS_IMPORT_TABLE_01":  dba1/********
DIRECTORY=data_pump_dir DUMPFILE=HREXP01.dmp
REMAP_SCHEMA=hr:dba1 TABLES=hr.employees LOGFILE=empimport.log
Processing object type SCHEMA_EXPORT/TABLE/TABLE
Processing object type SCHEMA_EXPORT/TABLE/TABLE_DATA
. . imported "DBA1"."EMPLOYEES"                          17.06
KB     107 rows
Processing object type
SCHEMA_EXPORT/TABLE/GRANT/OWNER_GRANT/OBJECT_GRANT
Processing object type SCHEMA_EXPORT/TABLE/COMMENT
Processing object type SCHEMA_EXPORT/TABLE/INDEX/INDEX
Processing object type SCHEMA_EXPORT/TABLE/CONSTRAINT/CONSTRAINT
Processing object type
SCHEMA_EXPORT/TABLE/INDEX/STATISTICS/INDEX_STATISTICS
Processing object type
SCHEMA_EXPORT/TABLE/CONSTRAINT/REF_CONSTRAINT
ORA-39083: Object type REF_CONSTRAINT:"DBA1"."EMP_DEPT_FK"
failed to create with error:
ORA-00942: table or view does not exist
Failing sql is:
ALTER TABLE "DBA1"."EMPLOYEES" ADD CONSTRAINT "EMP_DEPT_FK"
FOREIGN KEY ("DEPARTMENT_ID") REFERENCES "DBA1"."DEPARTMENTS"
("DEPARTMENT_ID") ENABLE
ORA-39083: Object type REF_CONSTRAINT:"DBA1"."EMP_JOB_FK" failed
to create with error:
ORA-00942: table or view does not exist
Failing sql is:
ALTER TABLE "DBA1"."EMPLOYEES" ADD CONSTRAINT "EMP_JOB_FK"
FOREIGN KEY ("JOB_ID") REFERENCES "DBA1"."JOBS" ("JOB_ID")
ENABLE
Processing object type SCHEMA_EXPORT/TABLE/TRIGGER
Processing object type
SCHEMA_EXPORT/TABLE/STATISTICS/TABLE_STATISTICS
Processing object type SCHEMA_EXPORT/STATISTICS/MARKER
ORA-39082: Object type TRIGGER:"DBA1"."UPDATE_JOB_HISTORY"
created with compilation warnings
ORA-39082: Object type TRIGGER:"DBA1"."SECURE_EMPLOYEES" created
with compilation warnings
Job "DBA1"."SYS_IMPORT_TABLE_01" completed with 4 error(s) at
Thu Oct 16 10:46:49 2014 elapsed 0 00:00:34
$
```

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.

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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
$
```

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Practice 16-2: 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.

1. 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.

   a. Ensure that you are accessing the `orcl` database.

```
$ . oraenv
ORACLE_SID = [orcl] ? orcl
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1 is
/u01/app/oracle
$
```

   b. 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
$
```

   c. Optionally, view the `product_descriptions.dat` file to learn more about its structure before going further. This file is in the `$LABS/P16` directory.

```
$ cd $LABS/P16
$ 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
$
```

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d. 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 12.1.0.2.0 - Production on Thu Oct 16
11:07:22 2014

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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/P16`** directory.

```
$ cat product_descriptions.log

SQL*Loader: Release 12.1.0.2.0 - Production on Thu Oct 16
11:07:22 2014

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Express Mode Load, Table: PRODUCT_DESCRIPTIONS
Data File:      product_descriptions.dat
```

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```
  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=LRTRIM)
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
```

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```
SQL*Loader-583: ignoring trim setting with direct path, using
value of LDRTRIM
SQL*Loader-584: ignoring DEGREE_OF_PARALLELISM setting with
direct path, using value of NONE
---------------------------------------------------------------

Express Mode Load, Table: PRODUCT_DESCRIPTIONS
Data File:      product_descriptions.dat
  Bad File:     product_descriptions.bad
  Discard File:  none specified

 (Allow all discards)

Number to load: ALL
Number to skip: 0
Errors allowed: 50
Continuation:    none specified
Path used:      Direct

Table PRODUCT_DESCRIPTIONS, loaded from every logical record.
Insert option in effect for this table: APPEND

   Column Name                  Position   Len  Term Encl
Datatype
----------------------------- ---------- ----- ---- ---- ----
PRODUCT_ID                         FIRST     *   ,
CHARACTER
LANGUAGE_ID                         NEXT     *   ,
CHARACTER
TRANSLATED_NAME                     NEXT     *   ,
CHARACTER
TRANSLATED_DESCRIPTION              NEXT     *   ,
CHARACTER

Generated control file for possible reuse:
OPTIONS(DIRECT=TRUE)
LOAD DATA
INFILE 'product_descriptions'
APPEND
INTO TABLE PRODUCT_DESCRIPTIONS
FIELDS TERMINATED BY ","
(
  PRODUCT_ID,
  LANGUAGE_ID,
```

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```
  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 Thu Oct 16 11:07:22 2014
Run ended on Thu Oct 16 11:07:26 2014

Elapsed time was:     00:00:04.17
CPU time was:         00:00:00.03
$
```

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
```

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```
      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_16_02_02.dat** data file contains rows of data for the **PRODUCT_ON_HAND** table. The **lab_16_02_02.ctl** file is the control file for this load.
   Optionally, view the `lab_16_02_02.dat and lab_16_02_02.ctl` files to learn more about their structure before going further.
   a. Open a terminal window and navigate to the **$LABS/P16** directory.
   b. Ensure that your environment is configured for the **orcl** database by running **oraenv**.

```
$ . oraenv
ORACLE_SID = [orcl] ? orcl
The Oracle base for
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1 is
/u01/app/oracle
$
```

   c. 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_16_02_02.ctl
log=lab_16_02_02.log data=lab_16_02_02.dat


SQL*Loader: Release 12.1.0.2.0 - Production on Thu Oct 16
11:14:25 2014


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```

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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_16_02_02.log
for more information about the load.
$
```

You note that no rows were loaded. Read the log file.

```
$ cat lab_16_02_02.log

SQL*Loader: Release 12.1.0.2.0 - Production on Thu Oct 16
11:14:25 2014

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Control File:   lab_16_02_02.ctl
Data File:      lab_16_02_02.dat
  Bad File:     lab_16_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
```

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```
QUANTITY_ON_HAND                      NEXT     *   ,
CHARACTER

Record 1: Rejected - Error on table OE.INVENTORIES.
ORA-02291: integrity constraint (OE.INVENTORIES_PRODUCT_ID_FK)
violated - parent key not found

Record 2: Rejected - Error on table OE.INVENTORIES.
ORA-02291: integrity constraint (OE.INVENTORIES_PRODUCT_ID_FK)
violated - parent key not found

Record 3: Rejected - Error on table OE.INVENTORIES.
ORA-02291: integrity constraint (OE.INVENTORIES_PRODUCT_ID_FK)
violated - parent key not found

…  /* Note all 51 rows are Rejected */

Record 50: Rejected - Error on table OE.INVENTORIES.
ORA-02291: integrity constraint (OE.INVENTORIES_PRODUCT_ID_FK)
violated - parent key not found

Record 51: Rejected - Error on table OE.INVENTORIES.
ORA-02291: integrity constraint (OE.INVENTORIES_PRODUCT_ID_FK)
violated - parent key not found


MAXIMUM ERROR COUNT EXCEEDED - Above statistics reflect partial
run.

Table OE.INVENTORIES:
  0 Rows successfully loaded.
  51 Rows not loaded due to data errors.
  0 Rows not loaded because all WHEN clauses were failed.
  0 Rows not loaded because all fields were null.

Space allocated for bind array:                  49536 bytes(64
rows)
Read   buffer bytes: 1048576

Total logical records skipped:          0
Total logical records read:            64
Total logical records rejected:        51
Total logical records discarded:        0
```

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```
Run began on Thu Oct 16 11:14:25 2014
Run ended on Thu Oct 16 11:14:26 2014

Elapsed time was:     00:00:00.55
CPU time was:         00:00:00.03
$
```

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.

d. Re-attempt a `DIRECT` load by ignoring the constraints.

```
$ sqlldr userid=oe/oracle_4U control=lab_16_02_02.ctl
log=lab_16_02_02.log data=lab_16_02_02.dat DIRECT=TRUE

SQL*Loader: Release 12.1.0.2.0 - Production on Thu Oct 16
11:18:48 2014

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Path used:      Direct

Load completed - logical record count 83.

Table OE.INVENTORIES:
  83 Rows successfully loaded.

Check the log file:
  lab_16_02_02.log
for more information about the load.
$
```

e. Read the log file. You can see that constraints were automatically disabled.

```
$ cat lab_16_02_02.log

SQL*Loader: Release 12.1.0.2.0 - Production on Thu Oct 16
11:18:48 2014

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Control File:   lab_16_02_02.ctl
Data File:      lab_16_02_02.dat
  Bad File:     lab_16_02_02.bad
  Discard File:  none specified
```

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```
 (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             Position   Len  Term Encl Datatype
------------------------ ---------- ----- ---- ---- ----
WAREHOUSE_ID                   FIRST     *   ,       CHARACTER
PRODUCT_ID                      NEXT     *   ,       CHARACTER
QUANTITY_ON_HAND                NEXT     *   ,       CHARACTER

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
```

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```
Total logical records skipped:          0
Total logical records read:            83
Total logical records rejected:         0
Total logical records discarded:        0
Total stream buffers loaded by SQL*Loader main thread:        1
Total stream buffers loaded by SQL*Loader load thread:        0

Run began on Thu Oct 16 11:18:48 2014
Run ended on Thu Oct 16 11:18:49 2014

Elapsed time was:     00:00:01.05
CPU time was:         00:00:00.03
$
```

f. 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
$
```

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3. Execute the **`$LABS/P16/lab_16_cleanup.sh`** script to remove the rows and files generated by this practice.

```
$ $LABS/P16/lab_16_cleanup.sh
8 rows deleted.

Commit complete.

83 rows deleted.

Commit complete.

$
```

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Practices for Lesson 17: Database Maintenance

Chapter 17

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Practices for Lesson 17: 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 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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Practice 17-1: 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_17_01_01.sh`** script performs these tasks. Examine the script and then execute it. In a terminal window enter:

```
$ cd $LABS/P17
$ cat lab_17_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

$ ./lab_17_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 …
$
```

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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_17_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_17_01_02.sh`** script to perform these tasks. In a terminal window, enter:

```
$ cat lab_17_01_02.sh
…
cd $LABS/P17

. $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
$

$ ./lab_17_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.
```

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```
SQL> SQL> Disconnected …

$
```

3. The test workload that is provided runs only a few minutes. In order to get meaningful data, the time between Automatic Workload Repository (AWR) snapshots should be reduced. Use the `DBMS_ADVISOR` package to set the database activity time to 30 minutes. The test script, running as the `SPCT` user, drops and creates the `SPCT` table and gathers statistics for this table. It also creates a snapshot in AWR. Execute the `lab_17_01_03.sh` script to perform these tasks. In a terminal window, enter:

```
$ cat lab_17_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

$ ./lab_17_01_03.sh
…
Connected to:
…
SQL> SQL> SQL> SQL>
PL/SQL procedure successfully completed.

SQL> SQL> Connected.
SQL> SQL> drop table spct purge
```

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```
            *
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. Run the workload script. This creates an activity to be analyzed. Execute the **`lab_17_01_04.sh`** script to perform these tasks. DO NOT wait for the script to finish continue to the next step.

```
$ ./lab_17_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 User: **`ADMIN`** Password: **`oracle_4U`**
b.	Summary	Navigate to the **`orcl`** database home page.
c.	orcl database home	Click **Performance** > **Performance Home.**
d.	Database Login	Credentials: Select **Preferred.** Preferred Credential Name: **SYSDBA Database Credentials** Click **Login.**
e.	Database Instance: orcl	Verify that the refresh rate is set to Real Time: 15 Second Refresh Watch the **Average Active Session** 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.

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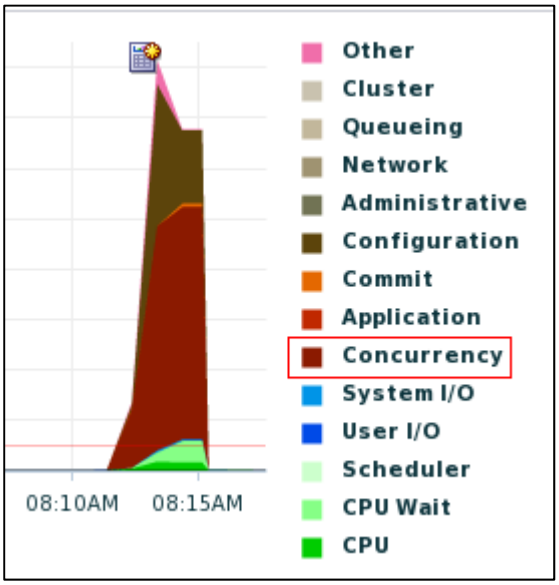

Note: Depending on when you run the workload, you may see differences between your graph and the one provided as a possible solution.

After the spike is finished, execute the **`lab_17_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.

6. After the spike has finished, return to the terminal window to execute the `lab_17_01_05.sh` script.

   Note: You may have to press Enter after the PL/SQL procedures from step 4 have completed in order to see the command prompt again.

```
$ ./lab_17_01_05.sh
…
Connected to:
..

SQL> SQL> SQL> SQL>
PL/SQL procedure successfully completed.

SQL> SQL> > >
PL/SQL procedure successfully completed.

SQL> SQL> Disconnected …

$
```

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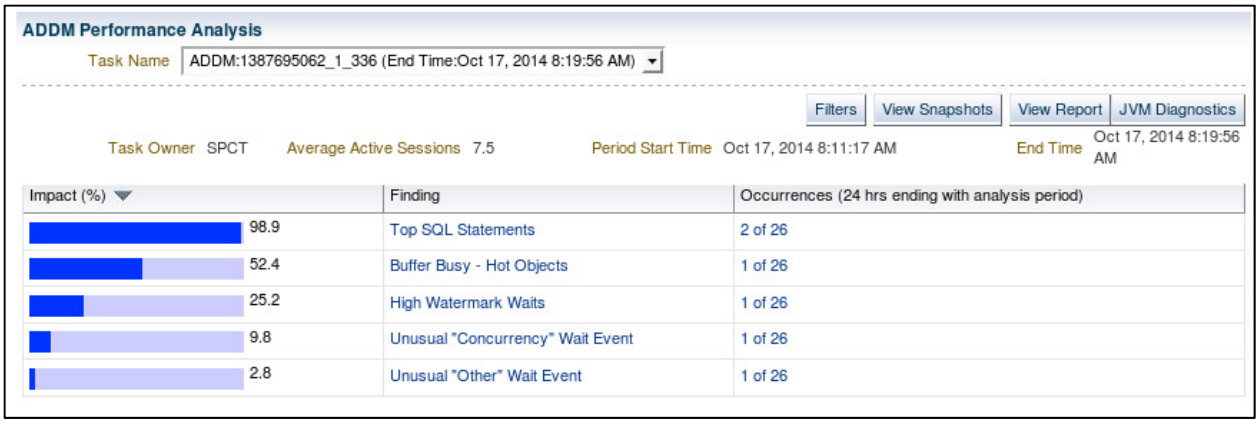
7. Find and examine the ADDM Performance Analysis and findings.

Step	Window/Page Description	Choices or Values
a.	Database Instance: orcl	Click **Performance > Advisors Home**
b.	Advisors Central	In the result section, click the latest ADDM report.
c.	Automatic Database Diagnostic Monitor (ADDM)	Notice the findings. Click each finding. Review the Detail 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, 98.9 percent) impact on the system. So your first step is to look at this finding in more detail. Click the link in the Finding column. In the Recommendations Rationale, you find a statement “waiting for event ‘Buffer Busy Waits’”.

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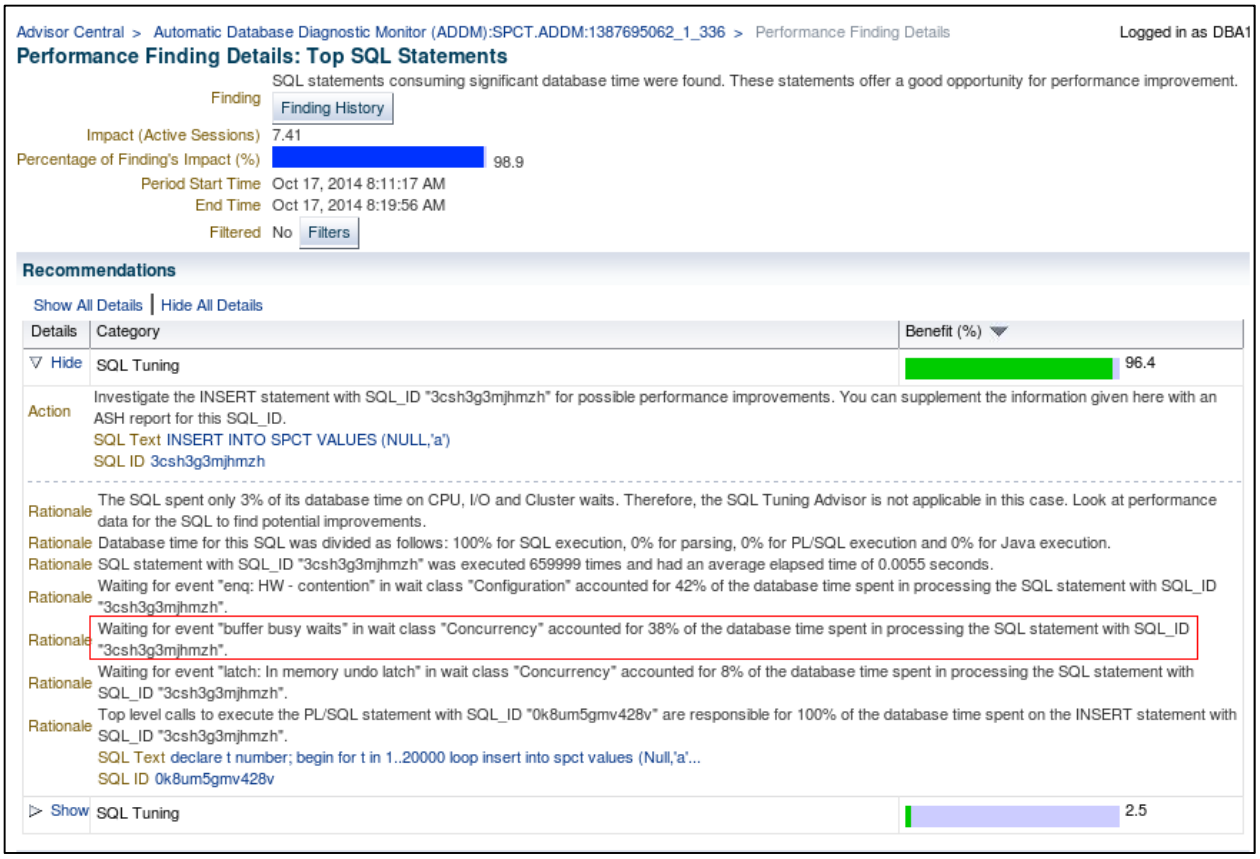

f. Return to the ADDM Performance Analysis page and investigate the other ADDM findings in order of severity. Look at the **Buffer Busy** findings in particular by clicking the link in the Finding column. For one of the Buffer Busy results, you should see that there is read-and-write contention on your `SPCT` table. The recommended action is to use the Automatic Segment Space Management (ASSM) feature for your `SPCT` table. The Rationale shows that there is a hot data block that belongs to the `SPCT.SPCT` table.

The findings may appear in a different order than shown. If you do not see results similar to the ones outlined in the preceding screenshot, you may need to restart this practice. If you still do not see the expected results, you may need to adjust the load by modifying the `lab_17_01_04.sh` and `lab_17_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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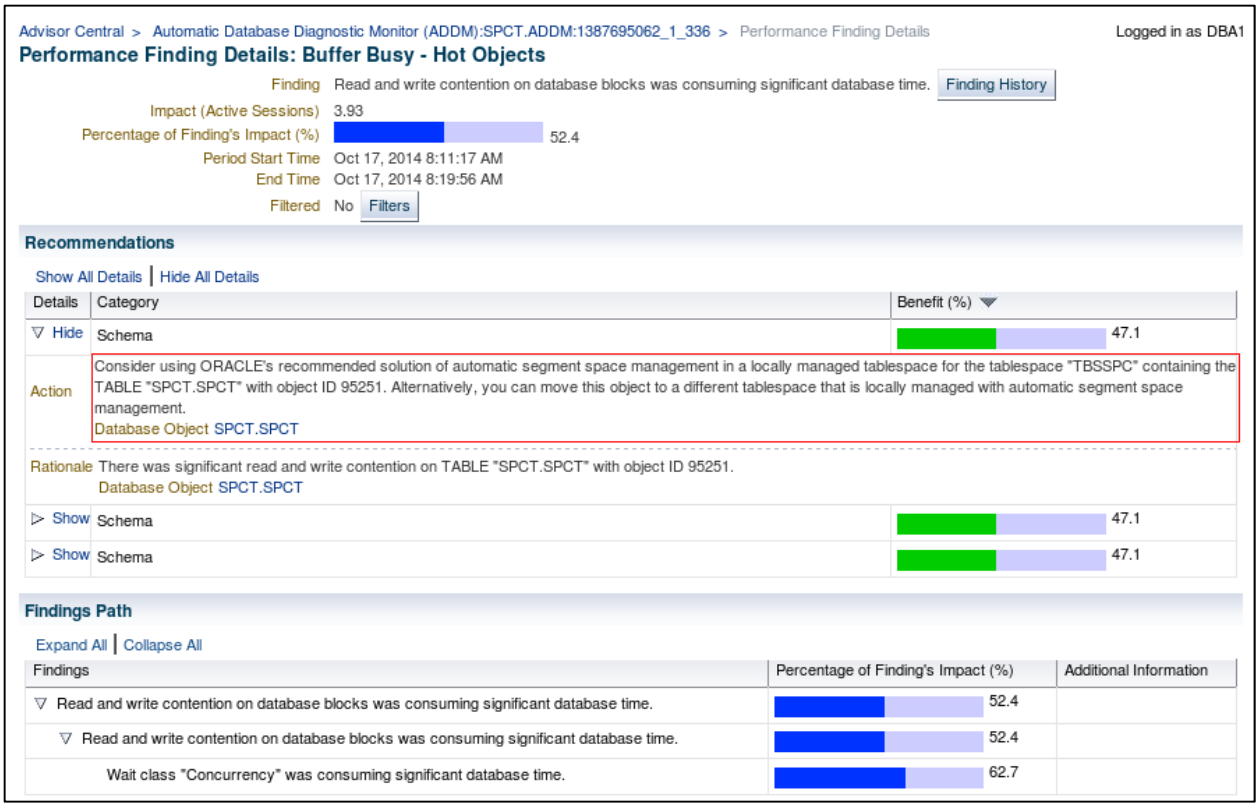

8. You decide to implement the recommendation to use Automated Segment Space Management. To do this, you must re-create the object. Create a new, locally managed tablespace, called `TBSSPC2` with a 50 MB data file. Ensure that the `TBSSPC2` tablespace uses the Automatic Segment Space Management feature. Then execute the **`lab_17_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	Click **Administration > Storage > Tablespaces**
b.	Tablespaces	Click **Create.**
c.	Create Tablespace	Enter Name: **`TBSSPC2`** In the Datafiles section, click **Add.**
d.	Add Datafile	Enter File Name: **`tbsspc02.dbf`** File Size: **50 MB** Verify Automatically extend data file when full is NOT checked Click **Continue.**
e.	Create Tablespace	Click the **Storage** tab.
f.	Create Tablespace: Storage tab	Verify Extent Allocation: **Automatic**

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Step	Window/Page Description	Choices or Values
		Segment Space Management: **Automatic** Click **Show SQL**.
g.	Show SQL	Examine the SQL Statement. It should be: `CREATE SMALLFILE TABLESPACE "TBSSPC2" DATAFILE '/u01/app/oracle/oradata/orcl/tbsspc02.dbf' SIZE 50M LOGGING EXTENT MANAGEMENT LOCAL SEGMENT SPACE MANAGEMENT AUTO` Click **Return**.
h.	Create Tablespace: Storage tab	Click **OK**.
i.	Tablespaces	

In a terminal window, enter:

```
$ ./lab_17_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 …

$
```

9. Execute your workload again. (Use the **`lab_17_01_04.sh`** script.) DO NOT wait for the script to complete continue to next task.

```
$ ./lab_17_01_04.sh
```

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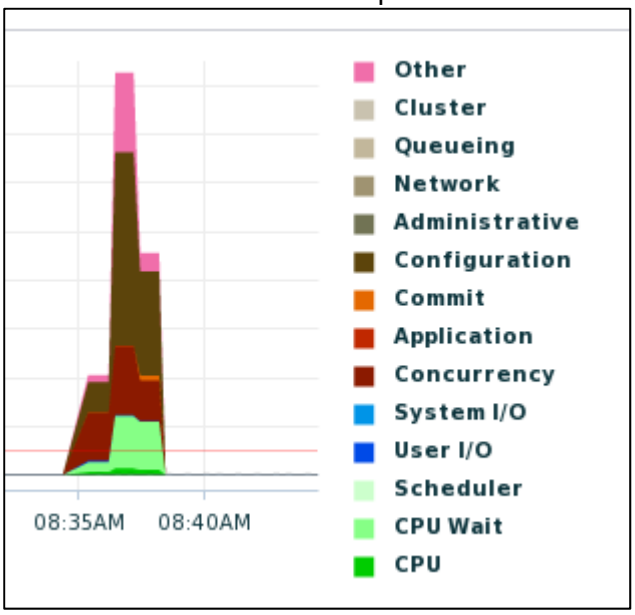
10. Return to Enterprise Manager Cloud Control. On the `orcl` Performance Home page, review the Average Active Session graph. View performance data in real time with a 15-second refresh cycle. After a while, you should see a spike on the Average Active Sessions graph. **Hint:** This is that same procedure that you used in Task 5.

    After the spike is finished, execute the **`lab_17_01_05.sh`** script again. This script forces the creation of a new snapshot and gathers statistics on the table in the workload test.

    a. Invoke Enterprise Manager as the **`DBA1`** user in the **`SYSDBA`** role for your **`orcl`** database.

    b. Select **Performance Home** in the **Performance** menu. Watch for the spike in the Active Sessions chart to complete.



    c. After the spike is finished, run the **`lab_17_01_05.sh`** script to force the creation of a new snapshot and gather statistics on your `SPCT` table.

    Note: You may have to press Enter after the PL/SQL procedures from step 9 have completed in order to see the command prompt again.

```
$ ./lab_17_01_05.sh
```

11. Review the ADDM from the **Advisor Home** link.

Step	Window/Page Description	Choices or Values
a.	Cloud Control	Click **Performance > Advisors Home.**
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

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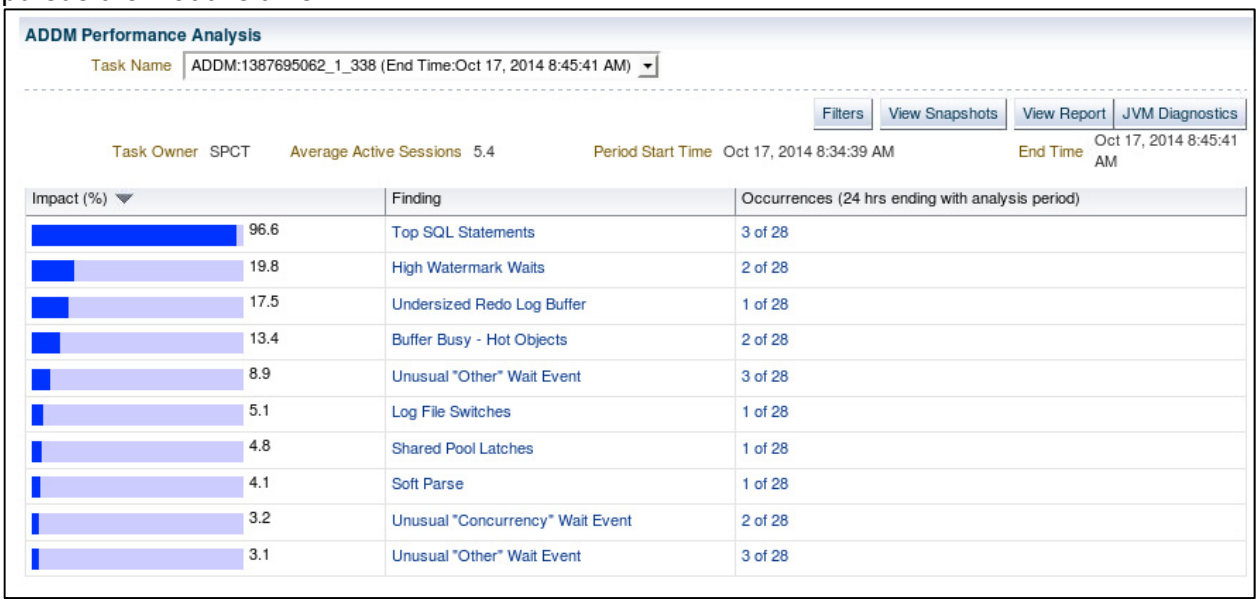
pursue them at this time.



Impact (%)	Finding	Occurrences (24 hrs ending with analysis period)
96.6	Top SQL Statements	3 of 28
19.8	High Watermark Waits	2 of 28
17.5	Undersized Redo Log Buffer	1 of 28
13.4	Buffer Busy - Hot Objects	2 of 28
8.9	Unusual "Other" Wait Event	3 of 28
5.1	Log File Switches	1 of 28
4.8	Shared Pool Latches	1 of 28
4.1	Soft Parse	1 of 28
3.2	Unusual "Concurrency" Wait Event	2 of 28
3.1	Unusual "Other" Wait Event	3 of 28

12. Execute the **`lab_17_01_11.sh`** script to clean up your environment so that this practice will not affect other practices.

```
$ ./lab_17_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 18: Managing Performance

Chapter 18

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Practices for Lesson 18: 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/P18` directory. Other directories are individually named.

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Practice 18-1: 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_18_01_01.sql** script.

```
$ cd $LABS/P18
$ . oraenv
ORACLE_SID = [oracle] ? orcl
…
$ cat lab_18_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;

$ sqlplus DBA1/oracle_4U as sysdba
SQL> @lab_18_01_01.sql

Table altered.
```

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_18_01_02.sql** script. To run this file, enter the following in SQL*Plus:

```
SQL> CONNECT hr
Password: oracle_4U   <<<Password does not appear on screen
Connected.
SQL> !cat lab_18_01_02.sql
-- Oracle Database 12c: Administration Workshop
-- Oracle Server Technologies - Curriculum Development
--
-- ***Training purposes only***
-- ***Not appropriate for production use***
--
```

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```
select * from hr.employees where employee_id = 200
/
select * from hr.employees where employee_id = 200
/
select * from hr.employees where employee_id = 200
/

SQL> @lab_18_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
----------- -------------------- -------------------------
EMAIL                  PHONE_NUMBER         HIRE_DATE JOB_ID
    SALARY
------------------------- -------------------- --------- -------
--- ----------
COMMISSION_PCT MANAGER_ID DEPARTMENT_ID
-------------- ---------- -------------
```

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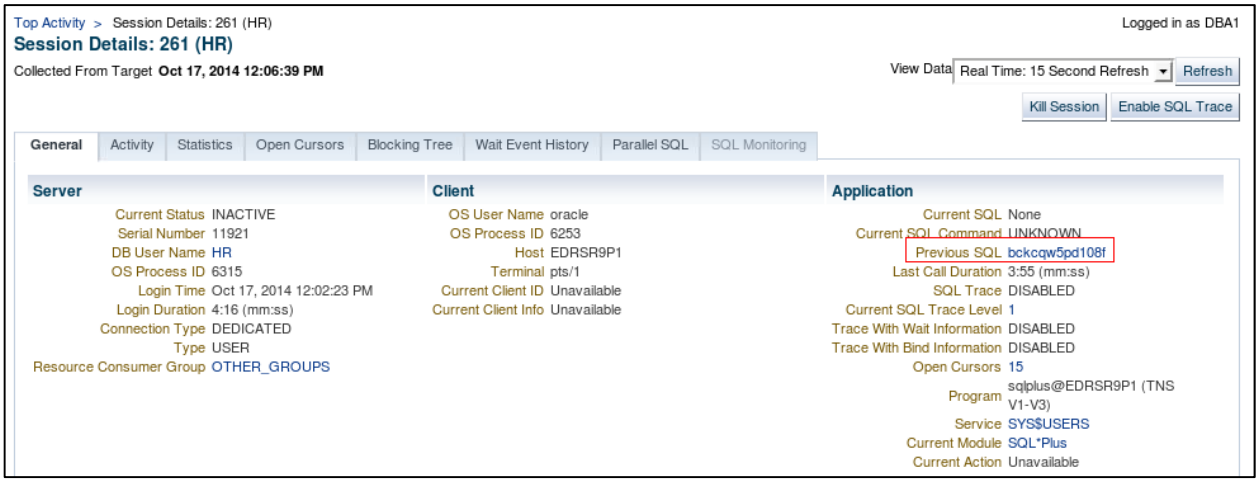
```
     200 Jennifer            Whalen
JWHALEN           515.123.4444          17-SEP-03 AD_ASST
4400
                 101        10



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 `orcl` database target.
b.	orcl database home	Click **Performance > Search Sessions.**
c.	Database Login	Connect by using Preferred `SYSDBA` Credentials.
d.	Search Sessions	Select "**DB User**" in the Filter field menu. Enter **`HR`**. Click **Go.**
e.	Search Sessions	Click the **SID** number in the Results listing.
f.	Session Details	Click the **hash value link** to the right of the "Previous SQL" label in the Application section.



Step	Window/Page Description	Choices or Values
g.	SQL Details	Click the **Plan** tab to see the execution plan for the query. Select the **Tabular** radio button.

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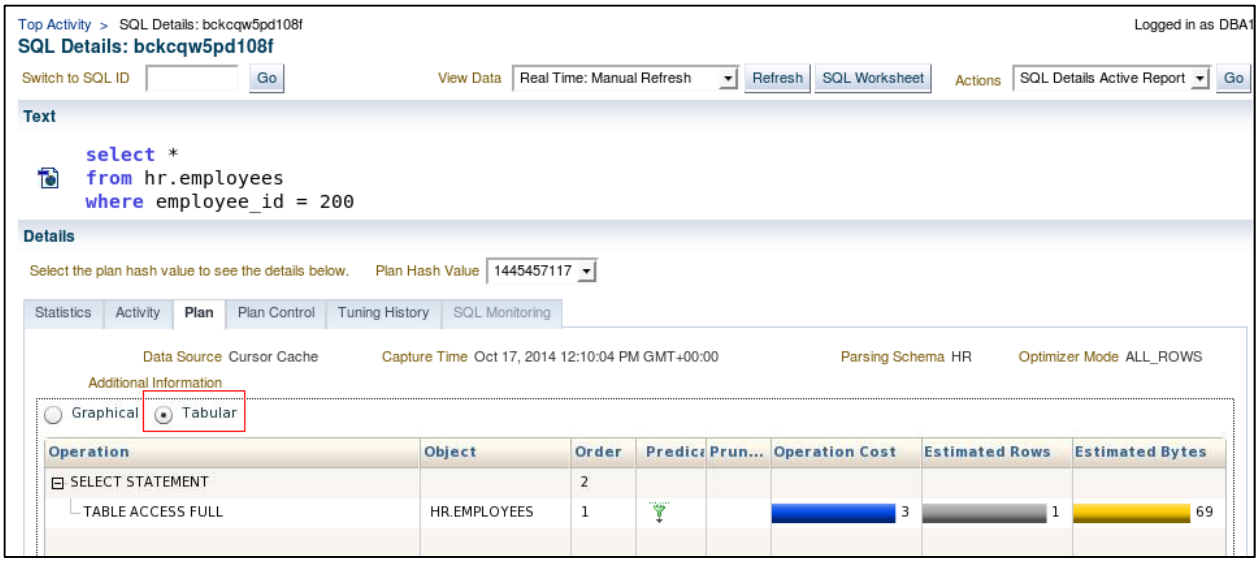
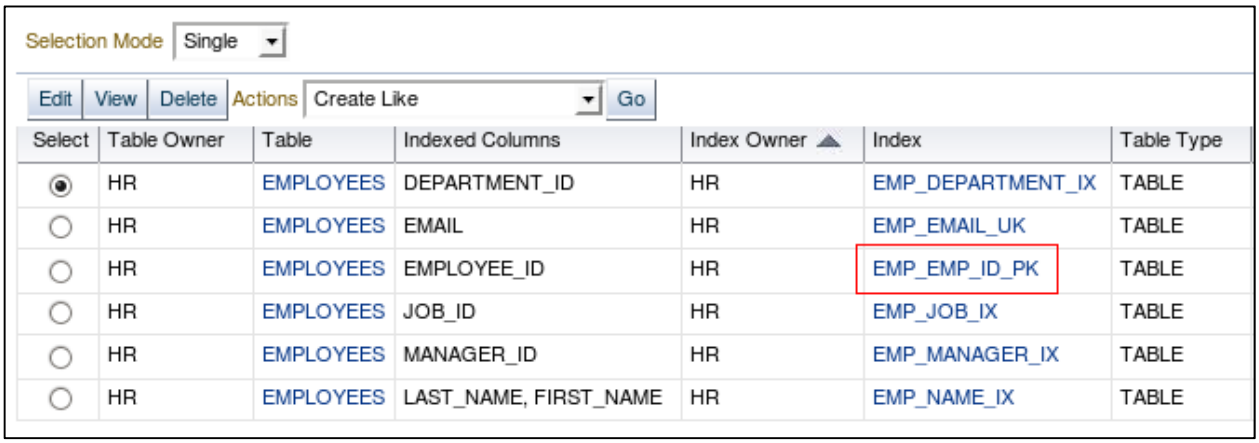


You see in the Operation column that this query is doing a full table scan (TABLE ACCESS FULL). Because you know that the query's condition is an equality comparison on the primary key (`EMPLOYEE_ID`), you decide to investigate the status of the primary key index.

4. Using Cloud Control, check to see the status of the **`EMPLOYEE`** table's index on **`EMPLOYEE_ID`**. See if it is **`VALID`**.

Step	Window/Page Description	Choices or Values
a.	SQL Details	Click **Schema** > **Database Objects** > **Indexes**.
b.	Indexes	Select **Table Name** in the "Search By" menu. Enter **`HR`** in the Schema field. Enter `EMPLOYEES` in the Object field. Click **Go**.
c.	Indexes	In the Index column, click the **`EMP_EMP_ID_PK`** index.



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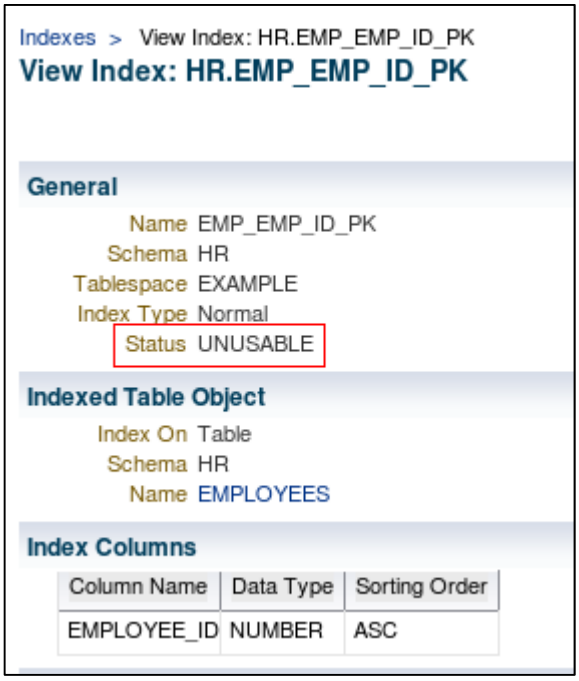
Step	Window/Page Description	Choices or Values
d.	View Index: HR.EMP_EMP_ID_PK	In the General section, check the status of the index. You should see a value of **UNUSABLE**.



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 run this query:

```
SQL> COL INDEX_NAME FORMAT A20
SQL> COL TABLE_NAME FORMAT A20
SQL> select index_name, table_name, status
  2> from user_indexes where status <> 'VALID';

INDEX_NAME           TABLE_NAME                STATUS
-------------------- ------------------------- --------
EMP_EMAIL_UK         EMPLOYEES                 UNUSABLE
EMP_EMP_ID_PK        EMPLOYEES                 UNUSABLE
EMP_DEPARTMENT_IX    EMPLOYEES                 UNUSABLE
EMP_JOB_IX           EMPLOYEES                 UNUSABLE
EMP_MANAGER_IX       EMPLOYEES                 UNUSABLE
EMP_NAME_IX          EMPLOYEES                 UNUSABLE
```

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```
6 rows selected.


SQL>
```

b. You notice that the output lists six indexes, all on the **EMPLOYEES** table. This is a problem you need to fix.

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 **Reorganize** in the Actions menu. Click **Go**.
b.	Reorganize Objects: Objects	Click **Add**.
c.	Objects: Add	Select **Indexes** in the Type menu. Enter **HR** in the Schema field. Enter **EMP_** in the Object Name field. Click **Search**.
d.	Objects: Add	In the Available Objects section, select all the indexes that match the UNUSABLE indexes in Step 5. Click **OK**.
e.	Reorganize Objects: Objects	Check that the six unusable indexes are listed. Click **Next**.
f.	Reorganize Objects: Options	Accept the default options. Click **Next**.
g.	Processing: Generating Script	Displays briefly.
h.	Reorganize Objects: Impact Report	The Script Generation Information section should show no warnings or errors. Click **Next.**
i.	Reorganize Objects: Schedule	In the Host Credentials section, select **New.** Enter Username: **oracle** Enter password: **<OS password>** Click **Test.** When return is Test Successful, click **Next.**
j.	Reorganize Objects: Review	Click **Submit Job.**
k.	Job Activity	A Confirmation message appears. Click the **REORGANIZE** job name listed in the Confirmation Message.
l.	Job Run: REORGANIZE_ORCL_*	Refresh the Browser until the job shows **Succeeded**.

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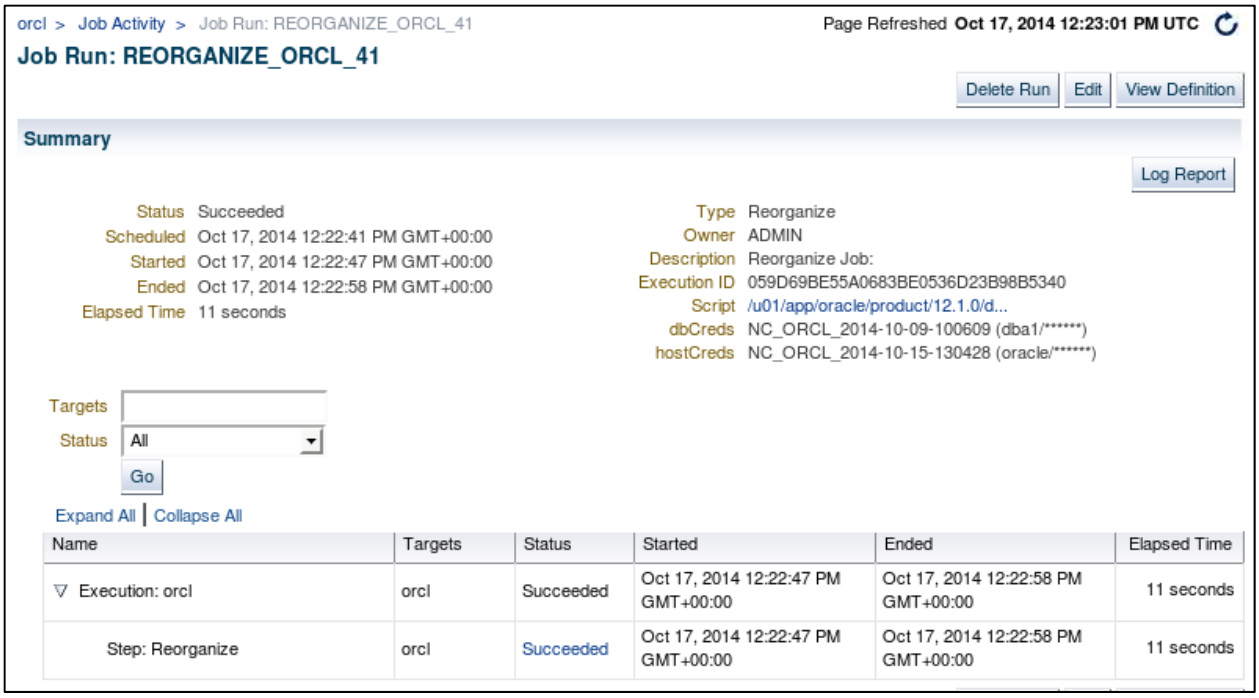

7. Return to the SQL*Plus session where the `HR` user is logged in and run the **`lab_18_01_07.sql`** script to execute the same kind of query. Then repeat the steps to see the plan of the last SQL statement executed by this session.
   a. Enter the following at the SQL*Plus prompt:

```
SQL> @lab_18_01_07.sql
```

Repeat the tasks listed in step 3 to view the execution plan for the query. Now the icon indicates the use of an index. Select the **Tabular** radio button. Note that the plan now uses an index unique scan.

   b. Exit the SQL*Plus session.

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.

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9. Simulate a working load on your instance by running the **`lab_18_01_09.sql`** script as the `SYS` user. **Note the SID value that is reported**.

   SID value reported: _____

   This script takes about 20 minutes to complete. So, run it in a separate terminal window and continue with this practice exercise 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@orcl as sysdba
SQL> @lab_18_01_09.sql

SID is 261

PL/SQL procedure successfully completed.

Load is now being generated.
```

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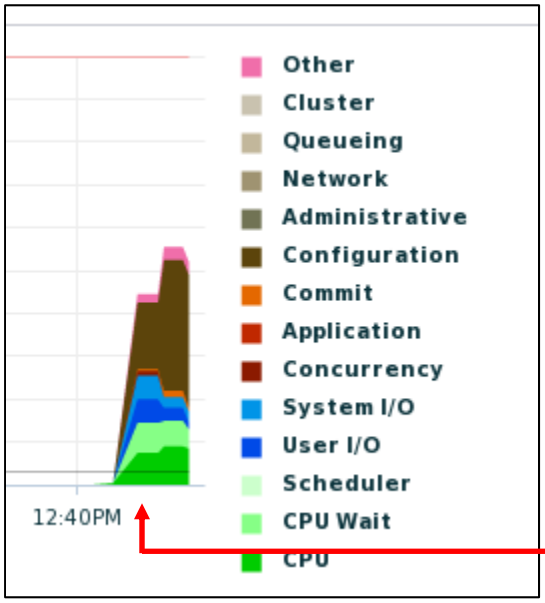
10. Go back to Cloud Control and examine the performance of your database.

Step	Window/Page Description	Choices or Values
a.	orcl database home	Click **Performance > Performance Home** to investigate system performance.
b.	Database Instance: orcl	View the Average Active session Graph at the bottom of the page. **Note:** You may need to wait a minute or two to see the effects of the load generation script appear on the graphs.



Wait to see some levels of activity in the **Average Active Sessions** graph before proceeding.

Question 1: In the **Average Active Sessions** graph, which are the two main categories that active sessions are 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.

Step	Window/Page Description	Choices or Values
c.	Database Instance: orcl	Click **Configuration** in the legend.
d.	Active Sessions Waiting: Configuration	Examine the Active Sessions Waiting: Configuration graph.

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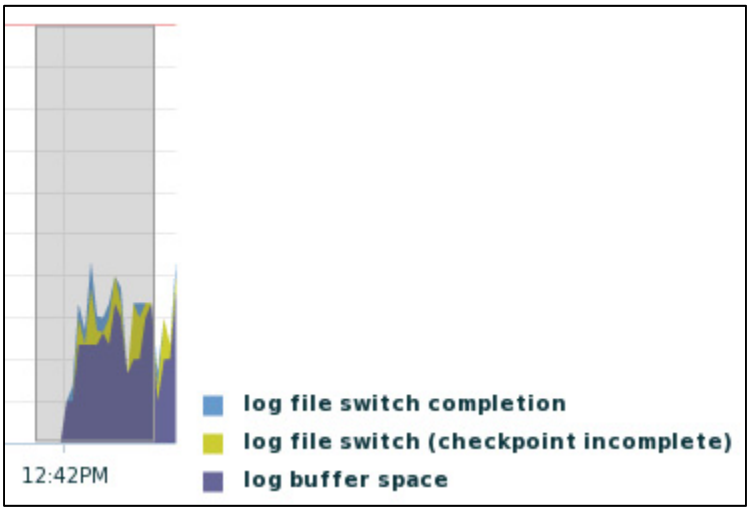
Question 2: In the Configuration category of waits, what is one of the contributors to the wait time?

Answer: Log buffer space is the highest in this example.



Step	Window/Page Description	Choices or Values
a.	Active Sessions Waiting: Configuration	Click the browser back button.
b.	Database Instance: orcl Performance Home	Click **Settings**.
c.	Performance Page Settings	In Detail Chart Settings, select **I/O** for Default View. Select **I/O Function** for I/O Chart Setting. Click **OK**.
d.	Database Instance: orcl Performance Home	Scroll down to I/O Megabytes per Second by I/O Function graph.

Note: The graph you see may vary from the screenshot.

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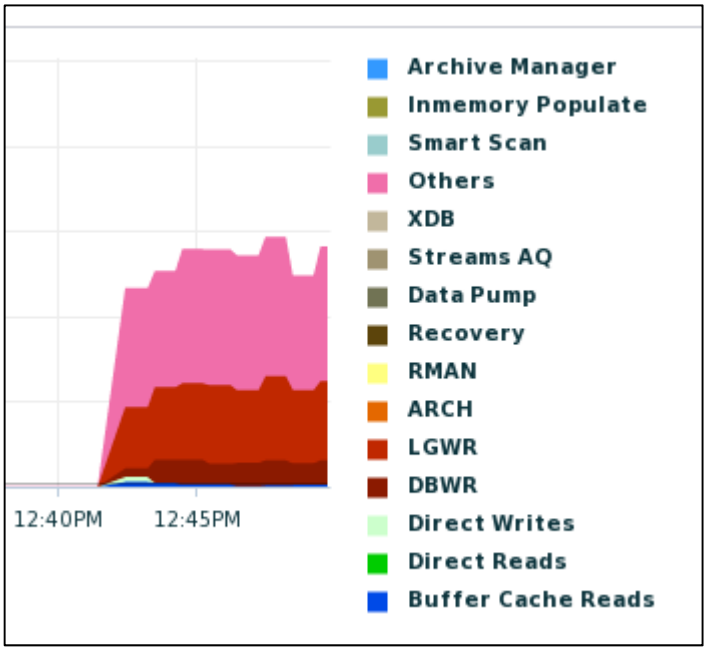

Question 3: Which process is doing the most writing to the disk?

Answer: `LGWR`

Step	Window/Page Description	Choices or Values
e.	Database Instance: orcl Performance Home	Click **Top Activity** link below and right of the Average Active Sessions graph. You may need to scroll to the bottom to see the horizontal scroll bar.
f.	Top Activity	Click the **SQL ID** of the first DELETE statement listed in the Top SQL region.
g.	SQL Details: 0qqwcxx1quwuv	

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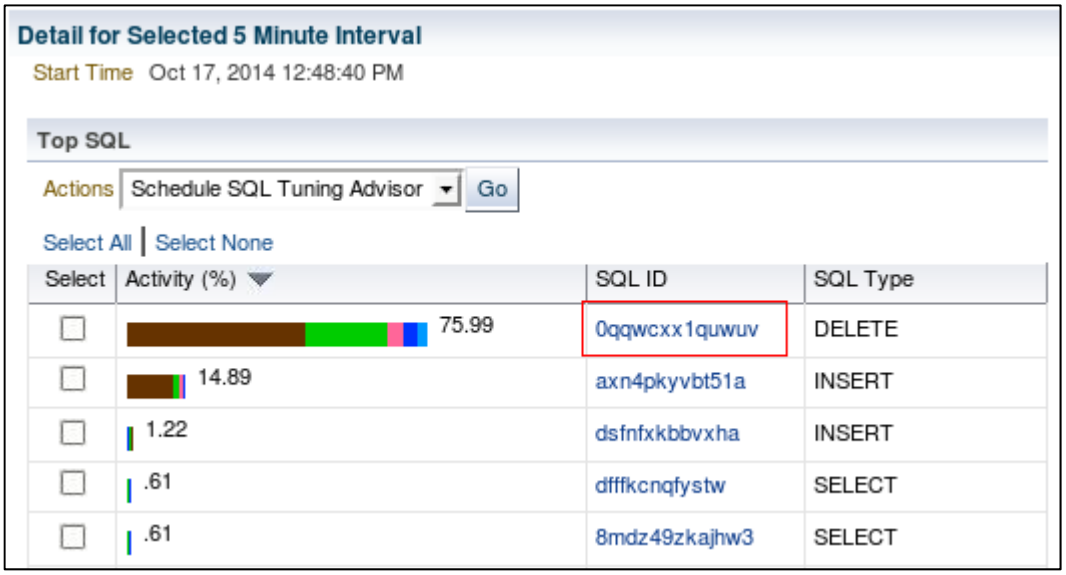
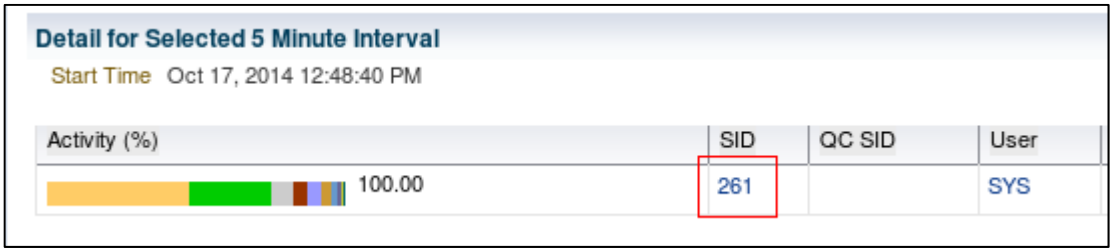


11. Kill the session that is generating the load. Use the session ID recorded in step 9. The session ID is listed in the **SID** column of the Detail for Selected 5 Minute Interval.

Step	Window/Page Description	Choices or Values
a.	SQL Details: 0qqwcxx1quwuv	Click the **SID** number for the session ID recorded earlier. This is found under the heading **Detail for Selected 5 Minute Interval**.
b.	Session Details: *nn* (SYS)	Click **Kill Session**.
c.	Confirmation	Click **Yes**.
d.	Session Details: *nn* (SYS)	**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 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.



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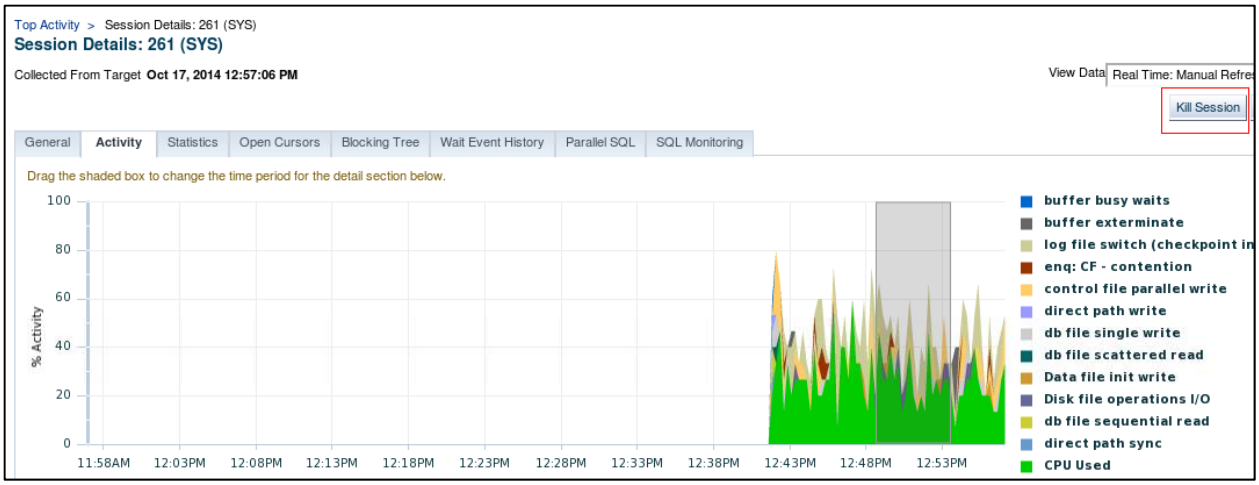
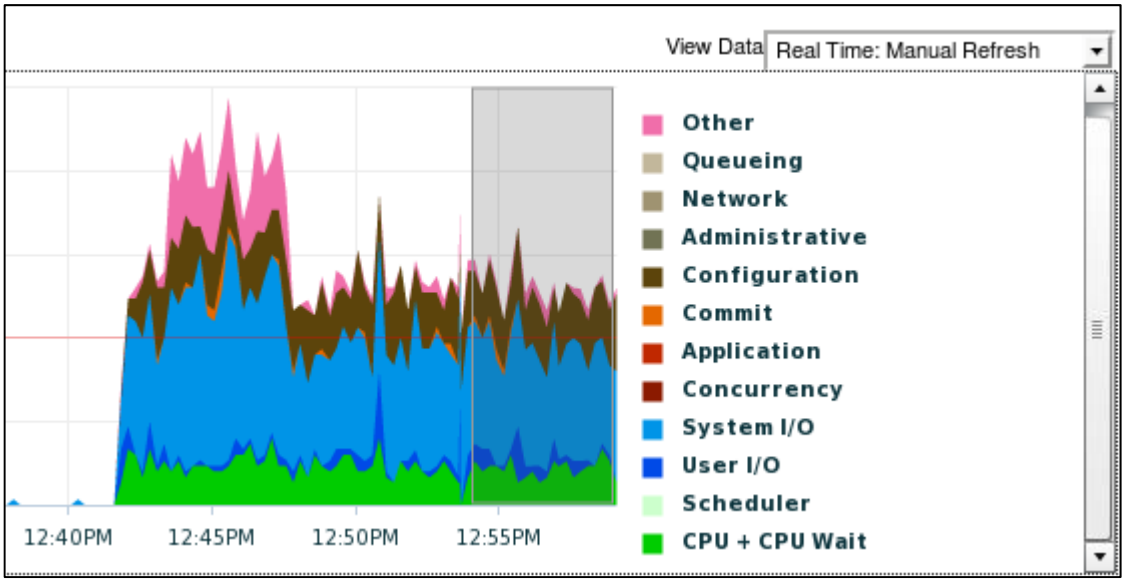


Step	Window/Page Description	Choices or Values
e.	Session Details: *nn* (SYS)	Click **Top Activity** in the navigation history at the top of the page.
f.	Top Activity	View the Top Activity graph. Note that the session activity in the database has declined considerably.



12. Log out of Enterprise Manager Cloud Control.

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Practice 18-2: Using Automatic Memory Management

Overview

In this practice you review memory management capabilities. Note that the values you see may differ slightly from what is shown in this activity guide.

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/P18` 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.
   a. Drop and re-create the `TBSSGA` and `MYTEMP` tablespaces, and the `AMM` DBA user for which they are defaults. Then press Enter to continue.

```
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.
```

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```
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...


SQL>
```

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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           314572800          0
large pool              8388608          0
java pool               4194304          0
streams pool            4194304          0
SGA Target            666894336  666894336
DEFAULT buffer cache  293601280          0
Shared IO Pool         29360128          0
PGA Target            222298112  222298112

8 rows selected.
8 rows selected.
SQL> pause Press [Enter] to continue...
Press [Enter] to continue...

SQL>
```

4. 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
```

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```
SQL>
SQL> create table tabsga(a number, b number) tablespace tbssga;

Table created.

SQL>
SQL> begin
  2    for i in 1..100000 loop
  3      insert into tabsga values (i, i);
  4    end loop;
  5  end;
  6  /

PL/SQL procedure successfully completed.

SQL> commit;

Commit complete.

SQL> pause Press [Enter] to continue...
Press [Enter] to continue...
```

a. Modify the `TABSGA` table to "`parallel 64`" and create a `TESTPGA` procedure (which creates a workload) by pressing Enter to continue the script.

```
SQL>
SQL>
SQL> alter table tabsga parallel 64;

Table altered.

SQL>
SQL> create or replace procedure testpga( psize number ) as
  2  begin
  3  declare
  4    TYPE nAllotment_tabtyp    IS TABLE OF char(2048) INDEX BY
BINARY_INTEGER;
  5    myarray nAllotment_tabtyp;
  6  begin
  7    for i in 1..psize loop
  8      myarray(i) := to_char(i);
  9    end loop;
```

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```
 10  end;
 11  end;
 12  /

Procedure created.

SQL> pause Press [Enter] to continue...
Press [Enter] to continue...
```

b. Confirm that there are no errors and query the dynamic memory components again by pressing Enter to continue the script.

```
SQL> show errors
No errors.
SQL>
SQL> SELECT substr(COMPONENT, 0, 20) COMP, CURRENT_SIZE CS,
USER_SPECIFIED_SIZE US
  2    FROM v$memory_dynamic_components
  3   WHERE CURRENT_SIZE!=0;
Press [Enter] to continue...


Press [Enter] to continue...
```

c. To view the query results, press Enter to continue the script.

```
COMP                          CS         US
-------------------- ---------- ----------
shared pool           314572800          0
large pool              8388608          0
java pool               4194304          0
streams pool            4194304          0
SGA Target            666894336  666894336

DEFAULT buffer cache  293601280          0
Shared IO Pool         29360128          0
PGA Target            222298112  222298112
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 4c.

d. Exit the script, but remain in the SQL*Plus session.

```
SQL> set pause off
SQL>
```

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5. Connect as SYSDBA in your SQL*Plus session, and shut down and restart your database instance. Reconnect as the AMM user with the oracle_4U password:

```
SQL> connect dba1/oracle_4U as sysdba
Connected.
SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL>
SQL> STARTUP
ORACLE instance started.

Total System Global Area  734003200 bytes
Fixed Size                  2928728 bytes
Variable Size             562040744 bytes
Database Buffers          163577856 bytes
Redo Buffers                5455872 bytes
Database mounted.
Database opened.
SQL>
SQL> connect amm
Enter password: oracle_4U <<< not displayed
Connected.
SQL>
```

6. As the AMM user, determine the current settings for the various memory buffers as well as the list of resized operations that were performed since you started your instance.
   a. You can use the **amm_components.sql** script for that purpose.

```
SQL> @amm_components.sql
SQL> set echo on
SQL> set serveroutput on
SQL> set term on
SQL> set lines 200
SQL> set pages 100
SQL> set heading on
SQL> column comp format a20
SQL> column final_size format 999999999
SQL> column oper_type format a9
SQL> set pause on pause "Press [Enter] to continue..."
SQL>
SQL> SELECT substr(COMPONENT, 0, 20) COMP, CURRENT_SIZE CS,
USER_SPECIFIED_SIZE US
  2   FROM v$memory_dynamic_components
```

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```
  3  WHERE CURRENT_SIZE!=0;
Press [Enter] to continue...
```

b. To view the query result, press Enter to continue the script.

```
COMP                          CS         US
-------------------- ---------- ----------
shared pool           150994944          0
large pool             88080384          0
java pool               4194304          0
streams pool            4194304          0
SGA Target            390070272          0
DEFAULT buffer cache  121634816    4194304
Shared IO Pool         12582912          0
PGA Target            264241152          0
8 rows selected.
SQL> pause Press [Enter] to continue...
Press [Enter] to continue...
```

c. 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...
```

d. To view the query result, press Enter to continue the script.

```
COMP                 FINAL_SIZE OPER_TYPE OPER_MODE STATUS
-------------------- ---------- --------- --------- ---------
DEFAULT buffer cache  201326592 GROW   DEFERRED  COMPLETE
large pool           8388608 SHRINK    DEFERRED  COMPLETE
shared pool           150994944 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  121634816 SHRINK      IMMEDIATE COMPLETE
shared pool           146800640 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  125829120 SHRINK      IMMEDIATE COMPLETE
DEFAULT buffer cache  130023424 SHRINK      IMMEDIATE COMPLETE
DEFAULT buffer cache  142606336 SHRINK      IMMEDIATE COMPLETE
shared pool           142606336 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  150994944 SHRINK      IMMEDIATE COMPLETE
DEFAULT buffer cache  146800640 SHRINK      IMMEDIATE COMPLETE
streams pool         4194304 GROW      IMMEDIATE COMPLETE
shared pool           138412032 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  155189248 SHRINK      IMMEDIATE COMPLETE
```

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```
shared pool           134217728 GROW    IMMEDIATE COMPLETE
shared pool           130023424 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  159383552 SHRINK      IMMEDIATE COMPLETE
shared pool           125829120 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  163577856 SHRINK      IMMEDIATE COMPLETE
large pool             88080384 STATIC              COMPLETE
shared pool           121634816 STATIC              COMPLETE
PGA Target            264241152 STATIC              COMPLETE
DEFAULT buffer cache  167772160 INITIALIZ     COMPLETE
                     ING

DEFAULT buffer cache  167772160 STATIC              COMPLETE
KEEP buffer cache          0 STATIC           COMPLETE
RECYCLE 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
In-Memory Area             0 STATIC           COMPLETE
streams pool               0 STATIC           COMPLETE
SGA Target            390070272 STATIC              COMPLETE
ASM Buffer Cache           0 STATIC           COMPLETE
java pool      4194304 STATIC           COMPLETE

36 rows selected.
SQL> pause Press [Enter] to exit the script...
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. You can see that the large pool has a much bigger size, whereas the buffer cache is smaller. This memory transfer was automatically done by the system.

```
SQL> @amm_query1.sql
SQL> select /*+ PARALLEL(s 24) */ count(*) from (select /*+
parallel(s 24) */ a from tabsga s group by a);
```

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```
  COUNT(*)
----------
    100000

SQL>
SQL> column COMP format a20
SQL>
SQL> select substr(COMPONENT, 0, 20) COMP, CURRENT_SIZE CS,
USER_SPECIFIED_SIZE US from v$memory_dynamic_components where
CURRENT_SIZE!=0;

COMP                          CS         US
--------------------- ---------- ----------
shared pool           155189248   0
large pool             79691776   0
java pool       4194304     0
streams pool         4194304     0
SGA Target            390070272   0
DEFAULT buffer cache  125829120    4194304
Shared IO Pool         12582912   0
PGA Target            264241152   0

8 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
-------------------- ---------- ------------- --------- --------
PGA Target            264241152 STATIC               COMPLETE
DEFAULT 2K buffer ca        0 STATIC            COMPLETE
In-Memory Area              0 STATIC            COMPLETE
RECYCLE buffer cache        0 STATIC            COMPLETE
KEEP buffer cache           0 STATIC            COMPLETE
DEFAULT buffer cache  167772160 STATIC               COMPLETE
DEFAULT buffer cache  167772160 INITIALIZ      COMPLETE
                      ING

ASM Buffer Cache            0 STATIC            COMPLETE
DEFAULT 4K buffer ca        0 STATIC            COMPLETE
DEFAULT 8K buffer ca        0 STATIC            COMPLETE
DEFAULT 16K buffer c        0 STATIC            COMPLETE
```

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```
SGA Target            390070272 STATIC               COMPLETE
streams pool                0 STATIC            COMPLETE
java pool       4194304 STATIC            COMPLETE
shared pool           121634816 STATIC               COMPLETE
DEFAULT 32K buffer c        0 STATIC            COMPLETE
large pool             88080384 STATIC               COMPLETE
shared pool           125829120 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  163577856 SHRINK      IMMEDIATE COMPLETE
shared pool           130023424 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  159383552 SHRINK      IMMEDIATE COMPLETE
DEFAULT buffer cache  155189248 SHRINK      IMMEDIATE COMPLETE
shared pool           134217728 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  150994944 SHRINK      IMMEDIATE COMPLETE
DEFAULT buffer cache  146800640 SHRINK      IMMEDIATE COMPLETE
shared pool           138412032 GROW    IMMEDIATE COMPLETE
streams pool         4194304 GROW       IMMEDIATE COMPLETE
DEFAULT buffer cache  142606336 SHRINK      IMMEDIATE COMPLETE
shared pool           142606336 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  130023424 SHRINK      IMMEDIATE COMPLETE
shared pool           146800640 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  125829120 SHRINK      IMMEDIATE COMPLETE
DEFAULT buffer cache  121634816 SHRINK      IMMEDIATE COMPLETE
shared pool           150994944 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  201326592 GROW   DEFERRED  COMPLETE
large pool           8388608 SHRINK    DEFERRED  COMPLETE
shared pool           155189248 GROW    DEFERRED  COMPLETE
DEFAULT buffer cache  197132288 SHRINK      DEFERRED  COMPLETE
large pool             79691776 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  192937984 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
```

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```
large pool             16777216 GROW    IMMEDIATE COMPLETE
large pool             12582912 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  125829120 SHRINK      IMMEDIATE COMPLETE
DEFAULT buffer cache  130023424 SHRINK      IMMEDIATE COMPLETE
DEFAULT buffer cache  134217728 SHRINK      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
large pool             75497472 GROW    IMMEDIATE COMPLETE

72 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
-------------------- ---------- ----------
```

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```
shared pool           155189248   0
large pool             88080384   0
java pool       4194304     0
streams pool         4194304     0
SGA Target            381681664   0
DEFAULT buffer cache  109051904    4194304
Shared IO Pool         12582912   0
PGA Target            272629760   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
-------------------- ---------- --------- --------- ---------
PGA Target            264241152 STATIC              COMPLETE
DEFAULT 2K buffer ca        0 STATIC            COMPLETE
In-Memory Area              0 STATIC            COMPLETE
RECYCLE buffer cache        0 STATIC            COMPLETE
KEEP buffer cache           0 STATIC            COMPLETE
DEFAULT buffer cache  167772160 STATIC              COMPLETE
DEFAULT buffer cache  167772160 INITIALIZ      COMPLETE
                     ING

ASM Buffer Cache            0 STATIC            COMPLETE
DEFAULT 4K buffer ca        0 STATIC            COMPLETE
DEFAULT 8K buffer ca        0 STATIC            COMPLETE
DEFAULT 16K buffer c        0 STATIC            COMPLETE
SGA Target            390070272 STATIC              COMPLETE
streams pool                0 STATIC            COMPLETE
java pool       4194304 STATIC            COMPLETE
shared pool           121634816 STATIC              COMPLETE
DEFAULT 32K buffer c        0 STATIC            COMPLETE
large pool             88080384 STATIC              COMPLETE
shared pool           125829120 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  163577856 SHRINK       IMMEDIATE COMPLETE
shared pool           130023424 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  159383552 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  155189248 SHRINK       IMMEDIATE COMPLETE
shared pool           134217728 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  150994944 SHRINK       IMMEDIATE COMPLETE
```

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```
DEFAULT buffer cache  146800640 SHRINK      IMMEDIATE COMPLETE
shared pool          138412032 GROW    IMMEDIATE COMPLETE
streams pool         4194304 GROW      IMMEDIATE COMPLETE
DEFAULT buffer cache  142606336 SHRINK      IMMEDIATE COMPLETE
shared pool          142606336 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  130023424 SHRINK      IMMEDIATE COMPLETE
shared pool          146800640 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  125829120 SHRINK      IMMEDIATE COMPLETE
DEFAULT buffer cache  121634816 SHRINK      IMMEDIATE COMPLETE
shared pool          150994944 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  201326592 GROW   DEFERRED  COMPLETE
large pool           8388608 SHRINK    DEFERRED  COMPLETE
shared pool          155189248 GROW    DEFERRED  COMPLETE
DEFAULT buffer cache  197132288 SHRINK      DEFERRED  COMPLETE
large pool            79691776 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  192937984 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
large pool            75497472 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  125829120 SHRINK      IMMEDIATE COMPLETE
DEFAULT buffer cache  130023424 SHRINK      IMMEDIATE COMPLETE
DEFAULT buffer cache  134217728 SHRINK      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
```

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```
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
SGA Target           381681664 SHRINK       DEFERRED  COMPLETE
DEFAULT buffer cache  117440512 SHRINK       DEFERRED  COMPLETE
PGA Target           272629760 GROW    MANUAL    COMPLETE
DEFAULT buffer cache  192937984 GROW   DEFERRED  COMPLETE
large pool           4194304 SHRINK    DEFERRED  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  167772160 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  163577856 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  159383552 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  188743680 SHRINK       IMMEDIATE COMPLETE
large pool            12582912 GROW    IMMEDIATE COMPLETE
large pool            16777216 GROW    IMMEDIATE COMPLETE
large pool            20971520 GROW    IMMEDIATE COMPLETE
large pool            25165824 GROW    IMMEDIATE COMPLETE
large pool            29360128 GROW    IMMEDIATE COMPLETE
large pool            33554432 GROW    IMMEDIATE COMPLETE
large pool            37748736 GROW    IMMEDIATE COMPLETE
large pool            46137344 GROW    IMMEDIATE COMPLETE
large pool            41943040 GROW    IMMEDIATE COMPLETE

COMP           FINAL_SIZE OPER_TYPE OPER_MODE STATUS
-------------------- ---------- --------- --------- ---------
DEFAULT buffer cache  146800640 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  142606336 SHRINK       IMMEDIATE COMPLETE
large pool            50331648 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  155189248 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  150994944 SHRINK       IMMEDIATE COMPLETE
large pool            54525952 GROW    IMMEDIATE COMPLETE
large pool            54525952 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  142606336 SHRINK       IMMEDIATE COMPLETE
large pool            67108864 GROW    IMMEDIATE COMPLETE
large pool            71303168 GROW    IMMEDIATE COMPLETE
```

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```
large pool             75497472 GROW    IMMEDIATE COMPLETE
large pool             79691776 GROW    IMMEDIATE COMPLETE
large pool             83886080 GROW    IMMEDIATE COMPLETE
large pool             62914560 GROW    IMMEDIATE COMPLETE
large pool             58720256 GROW    IMMEDIATE COMPLETE
large pool             88080384 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  134217728 SHRINK      IMMEDIATE COMPLETE
DEFAULT buffer cache  138412032 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
DEFAULT buffer cache  130023424 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 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           159383552   0
large pool           4194304     0
java pool       4194304     0
streams pool         4194304     0
SGA Target            377487360   0
```

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```
DEFAULT buffer cache  184549376    4194304
Shared IO Pool         12582912   0
PGA Target            276824064   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 2K buffer ca       0 STATIC            COMPLETE
RECYCLE buffer cache       0 STATIC            COMPLETE
PGA Target            264241152 STATIC               COMPLETE
In-Memory Area             0 STATIC            COMPLETE
KEEP buffer cache          0 STATIC            COMPLETE
DEFAULT buffer cache  167772160 STATIC               COMPLETE
DEFAULT buffer cache  167772160 INITIALIZ      COMPLETE
                     ING

shared pool           121634816 STATIC               COMPLETE
large pool             88080384 STATIC               COMPLETE
java pool      4194304 STATIC            COMPLETE
DEFAULT 32K buffer c       0 STATIC            COMPLETE
streams pool               0 STATIC            COMPLETE
SGA Target            390070272 STATIC               COMPLETE
DEFAULT 16K buffer c       0 STATIC            COMPLETE
DEFAULT 8K buffer ca       0 STATIC            COMPLETE
DEFAULT 4K buffer ca       0 STATIC            COMPLETE
ASM Buffer Cache           0 STATIC            COMPLETE
DEFAULT buffer cache  163577856 SHRINK       IMMEDIATE COMPLETE
shared pool           125829120 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  159383552 SHRINK       IMMEDIATE COMPLETE
shared pool           130023424 GROW    IMMEDIATE COMPLETE
shared pool           134217728 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  155189248 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  146800640 SHRINK       IMMEDIATE COMPLETE
streams pool         4194304 GROW       IMMEDIATE COMPLETE
shared pool           138412032 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  150994944 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  142606336 SHRINK       IMMEDIATE COMPLETE
shared pool           142606336 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  130023424 SHRINK       IMMEDIATE COMPLETE
```

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```
DEFAULT buffer cache  125829120 SHRINK      IMMEDIATE COMPLETE
shared pool          146800640 GROW    IMMEDIATE COMPLETE
shared pool          150994944 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  121634816 SHRINK      IMMEDIATE COMPLETE
DEFAULT buffer cache  201326592 GROW   DEFERRED  COMPLETE
large pool           8388608 SHRINK    DEFERRED  COMPLETE
DEFAULT buffer cache  197132288 SHRINK      DEFERRED  COMPLETE
shared pool          155189248 GROW    DEFERRED  COMPLETE
large pool            79691776 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  192937984 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
large pool            75497472 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  125829120 SHRINK      IMMEDIATE COMPLETE
DEFAULT buffer cache  130023424 SHRINK      IMMEDIATE COMPLETE
DEFAULT buffer cache  134217728 SHRINK      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
```

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```
SGA Target            381681664 SHRINK       DEFERRED  COMPLETE
DEFAULT buffer cache  117440512 SHRINK       DEFERRED  COMPLETE
PGA Target            272629760 GROW    MANUAL    COMPLETE
DEFAULT buffer cache  192937984 GROW    DEFERRED  COMPLETE
large pool           4194304 SHRINK     DEFERRED  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  167772160 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  163577856 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  159383552 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  188743680 SHRINK       IMMEDIATE COMPLETE
large pool            12582912 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
DEFAULT buffer cache  142606336 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  142606336 SHRINK       IMMEDIATE COMPLETE

COMP           FINAL_SIZE OPER_TYPE OPER_MODE STATUS
-------------------- ---------- --------- --------- ---------
DEFAULT buffer cache  155189248 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  150994944 SHRINK       IMMEDIATE COMPLETE
large pool            54525952 GROW    IMMEDIATE COMPLETE
large pool            41943040 GROW    IMMEDIATE COMPLETE
large pool            46137344 GROW    IMMEDIATE COMPLETE
large pool            50331648 GROW    IMMEDIATE COMPLETE
large pool            54525952 GROW    IMMEDIATE COMPLETE
DEFAULT buffer cache  146800640 SHRINK       IMMEDIATE COMPLETE
large pool            88080384 GROW    IMMEDIATE COMPLETE
large pool            83886080 GROW    IMMEDIATE COMPLETE
large pool            79691776 GROW    IMMEDIATE COMPLETE
large pool            75497472 GROW    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
```

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```
DEFAULT buffer cache  109051904 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  113246208 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  117440512 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  121634816 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  125829120 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  130023424 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  134217728 SHRINK       IMMEDIATE COMPLETE
DEFAULT buffer cache  138412032 SHRINK       IMMEDIATE COMPLETE
SGA Target           377487360 SHRINK       DEFERRED  COMPLETE
DEFAULT buffer cache  104857600 SHRINK       DEFERRED  COMPLETE
PGA Target           276824064 GROW    MANUAL    COMPLETE
shared pool          159383552 GROW    DEFERRED  COMPLETE
DEFAULT buffer cache  100663296 SHRINK       DEFERRED  COMPLETE
large pool           4194304 SHRINK    DEFERRED  COMPLETE
DEFAULT buffer cache  184549376 GROW   DEFERRED  COMPLETE

126 rows selected.
SQL> exit
$
```

10. In Enterprise Manager Cloud Control, look at the memory variations that happened during this practice. What do you observe?

Step	Window/Page Description	Choices or Values
a.	Cloud Control	Log in to Enterprise Manager Cloud Control and navigate to the `orcl` Database home page.
b.	orcl Database home	Click **Performance > Advisors Home > Memory Advisors.**
c.	Memory Advisors	Scroll down and examine the two graphs.

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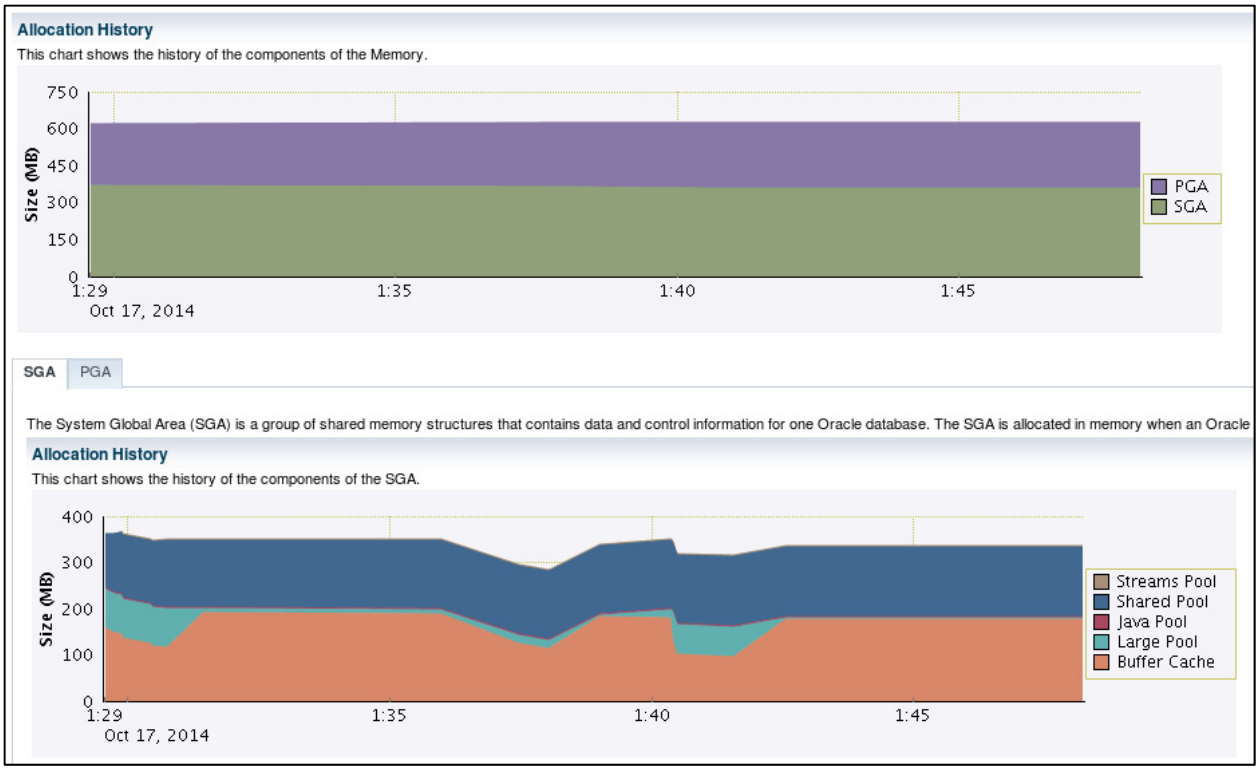

Question: What changes do you see to the components of the SGA?

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, shut down your database instance, restore the original `SPFILE`, and restart your `orcl` database instance by executing the `amm_cleanup.sh` script.

```
$ cd $LABS/P18
$ ./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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```
ORACLE instance shut down.
SQL>
File created.

SQL> SQL> ORACLE instance started.

Total System Global Area  734003200 bytes
Fixed Size                  2928728 bytes
Variable Size             482348968 bytes
Database Buffers          243269632 bytes
Redo Buffers                5455872 bytes
Database mounted.
SQL>
Database altered.

SQL>
Database altered.

SQL> Disconnected …

$
```

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Practice 18-3: Monitoring Services

Overview

In this practice, you create and monitor services.

Tasks

In your database there are several running applications. 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)– 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/P18
$ ./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>)(PORT = 1521))
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = SERV1.example.com)
    )
  )
$
```

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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 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

LSNRCTL for Linux: Version 12.1.0.2.0 - Production on 17-OCT-
2014 14:07:08
```

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```
Copyright (c) 1991, 2014, Oracle.  All rights reserved.
Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=IPC)(KEY=EXTPROC1521)))
Services Summary...
Service "em12rep" has 1 instance(s).
  Instance "em12rep", status READY, has 1 handler(s) for this
service...
    Handler(s):
      "DEDICATED" established:683 refused:0 state:ready
         LOCAL SERVER
Service "em12repXDB" has 1 instance(s).
  Instance "em12rep", status READY, has 1 handler(s) for this
service...
    Handler(s):
      "D000" established:0 refused:0 current:0 max:1022
state:ready
         DISPATCHER <machine: EDP1, pid: 18745>

(ADDRESS=(PROTOCOL=tcp)(HOST=edp1.us.oracle.com)(PORT=13016))
Service "orcl" has 1 instance(s).
  Instance "orcl", status READY, has 1 handler(s) for this
service...
    Handler(s):
      "DEDICATED" established:34 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: EDP1, pid: 10116>

(ADDRESS=(PROTOCOL=tcp)(HOST=edp1.us.oracle.com)(PORT=39588))
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 by using your service?
Answer: You must start your service on your instance.

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3. Start the service on your instance and connect to your instance by using your service.

```
SQL> connect dba1/oracle_4U as sysdba
Connected

SQL> EXEC DBMS_SERVICE.START_SERVICE('SERV1')

PL/SQL procedure successfully completed.

SQL> show parameter service

NAME                        TYPE        VALUE
------------------------- ----------- --------------------
service_names               string      orcl

SQL> host lsnrctl services

LSNRCTL for Linux: Version 12.1.0.2.0 - Production on 17-OCT-
2014 14:09:57

Copyright (c) 1991, 2014, Oracle.  All rights reserved.

Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=IPC)(KEY=EXTPROC1521)))
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 "em12rep" has 1 instance(s).
  Instance "em12rep", status READY, has 1 handler(s) for this
service...
    Handler(s):
      "DEDICATED" established:713 refused:0 state:ready
         LOCAL SERVER
Service "em12repXDB" has 1 instance(s).
  Instance "em12rep", status READY, has 1 handler(s) for this
service...
    Handler(s):
      "D000" established:0 refused:0 current:0 max:1022
state:ready
         DISPATCHER <machine: EDP1, pid: 18745>

(ADDRESS=(PROTOCOL=tcp)(HOST=edp1.us.oracle.com)(PORT=13016))
```

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```
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: EDP1, pid: 19660>

(ADDRESS=(PROTOCOL=tcp)(HOST=edp1.us.oracle.com)(PORT=49410))
The command completed successfully


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/P18
$ ./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.
$
```

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b. Connect to your instance as the `SV_USER` user using the `SERV1` service. Create workload activity by executing the `sv1_load2.sql` script. If this script finishes before you completed the next step, then use the `sv1_sel.sql` script to execute the following query: `SELECT COUNT(*) FROM DBA_OBJECTS,DBA_OBJECTS,DBA_OBJECTS`

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

```
$ sqlplus sv_user@SERV1
…
Enter password: oracle_4U <<< not displayed
Connected to:
…
SQL> @sv1_load2.sql
SQL> DECLARE
  2  t number;
  3  BEGIN
  4  for i in 1..2000 loop
  5    select count(*) into t from dba_objects;
  6  end loop;
  7  END;
  8  /
```

5. After the execution starts, access the Top Consumers page from 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 and navigate to the `orcl` Database home page.
b.	orcl Database	In the Performance section, view the **Services** tab.

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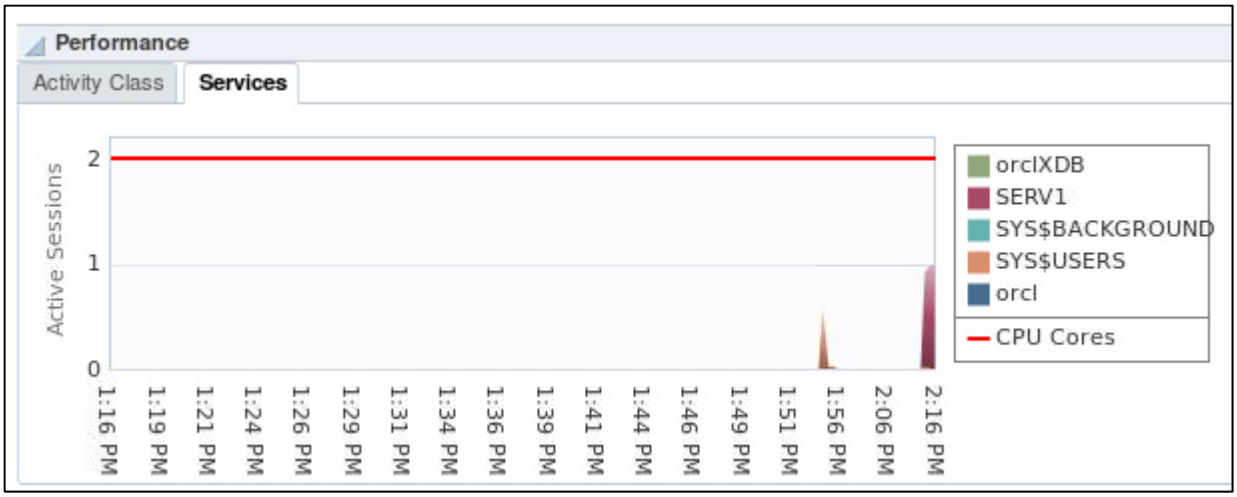
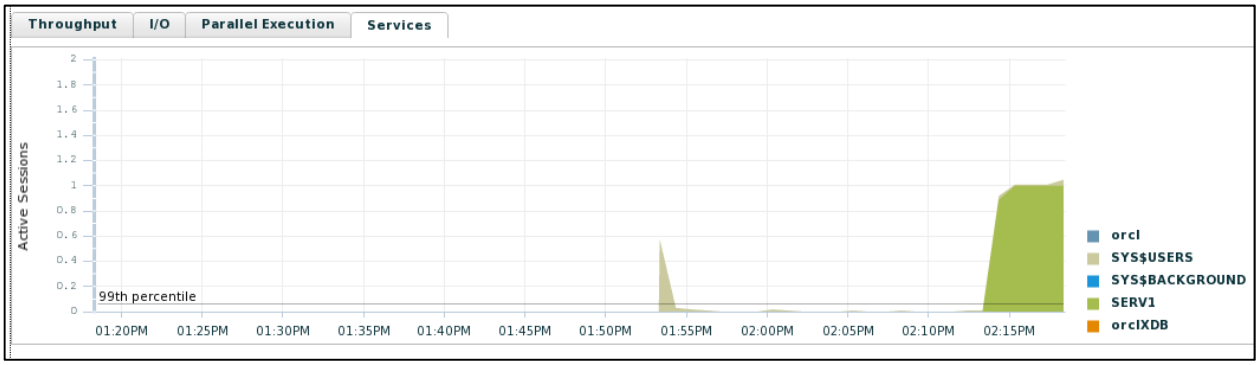


An Active Session graph with the activity aggregated by service name is displayed. The network service name of each connection is recorded as a separate service. So all the connections made without a service name are aggregated, as are all the connections made as `SERV1`.

Step	Window/Page Description	Choices or Values
c.	orcl Database home	Click **Performance > Performance Home.**
d.	Performance Home	Scroll down to view the Active Session graph aggregated by service by clicking the **Services** tab.



Step	Window/Page Description	Choices or Values
e.	Performance Home	Scroll down to Additional Links. Click **Top Consumers**.
f.	Top Consumers: Overview tab	Review the graphs.

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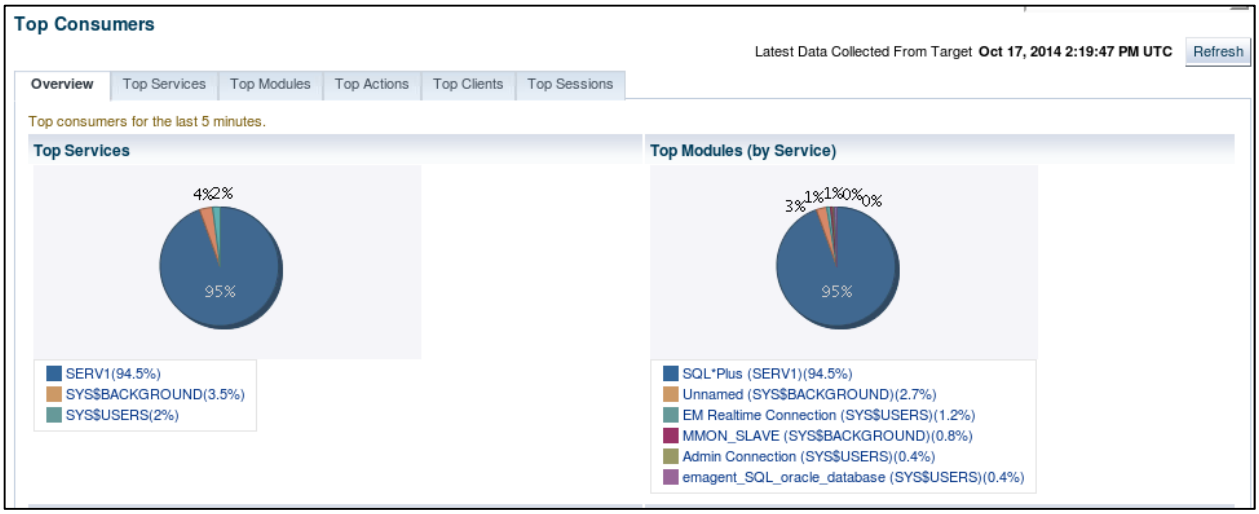

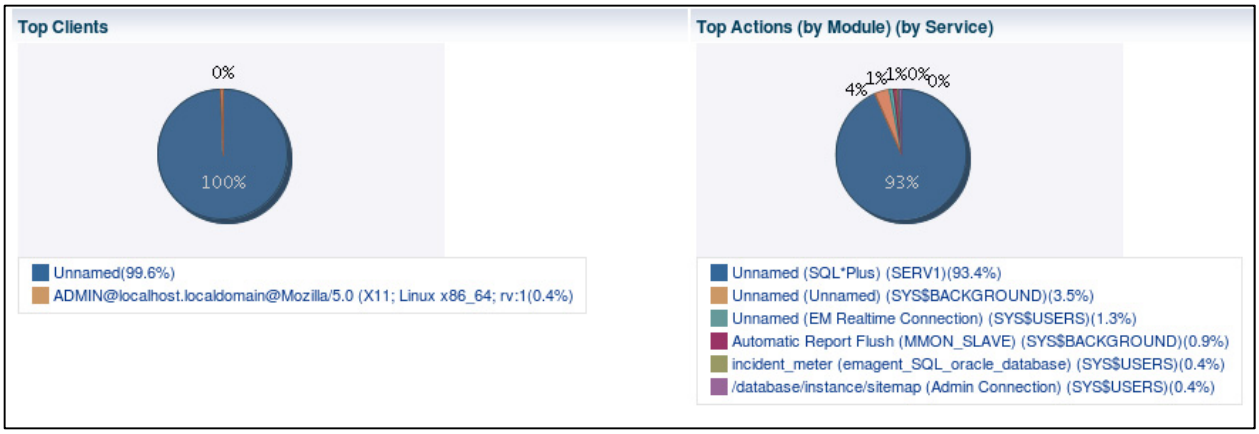

The names and number of services listed in the Top Services Graph depends on the number and type of connections to the database.

Step	Window/Page Description	Choices or Values
g.	Top Consumers: Overview	Click the **Top Services** tab.
h.	Top Consumers:Top Services	Click the **SERV1** link in Service column.
i.	Service: SERV1: Modules tab	Click the **Statistics** tab.
j.	Service: SERV1: Statistics tab	View detailed statistics for the SERV1 service.

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Service: SERV1

Latest Data Collected From Target **Oct 17, 2014 2:22:02 PM** Refresh

Modules | Activity | **Statistics**

Previous 1-25 of 28 Next 3

Name	Delta Value	Cumulative Value
logons cumulative	0	2
user calls	0	32
DB time	0	262022480
DB CPU	0	240662416
parse count (total)	0	141
parse time elapsed	0	94789
execute count	0	2262
sql execute elapsed time	0	261911376
opened cursors cumulative	0	2257
session logical reads	0	8569217
physical reads	0	12
physical writes	0	0
redo size	0	1380

6. If the `sv1_load2.sql` script finishes before you complete this step, then 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.

```
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 running the `sv1_cleanup.sh` script in the `$LABS/P18` directory.

```
$ cd $LABS/P18
$ ./sv1_cleanup.sh
```

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Practices for Lesson 19: Managing Performance: SQL Tuning

Chapter 19

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Practices for Lesson 19: 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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Practice 19-1: 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

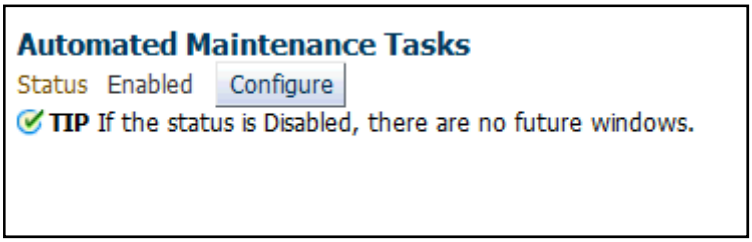
`ADMIN` Super Administrator user has been created in Enterprise Manager Cloud Control.

`DBA1` user with `SYSDBA` privileges has been created in `orcl` database.

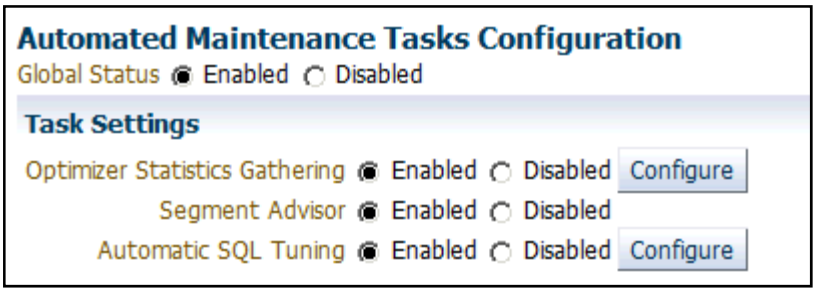
Tasks

1. In Cloud Control, Configure the Automatic SQL Tuning Task to Implement SQL Profiles Automatically.

Step	Window/Page Description	Choices or Values
a.	EMCC Cloud Control	Login as **`ADMIN`** user.
b.	Summary page	Navigate to the **`orcl`** database home page.
c.	orcl database home	Click **Administration > Oracle Scheduler > Automated Maintenance Tasks**.
d.	Database Login	Login with **`SYSDBA`** credentials to database. Use `DBA1/oracle_4U AS SYSDBA`
e.	Automated Maintenance Tasks	Verify Status is **Enabled.** Click **Configure.**



Step	Window/Page Description	Choices or Values
f.	Automated Maintenance Tasks Configuration	Click **Configure** next to Automatic SQL Tuning.



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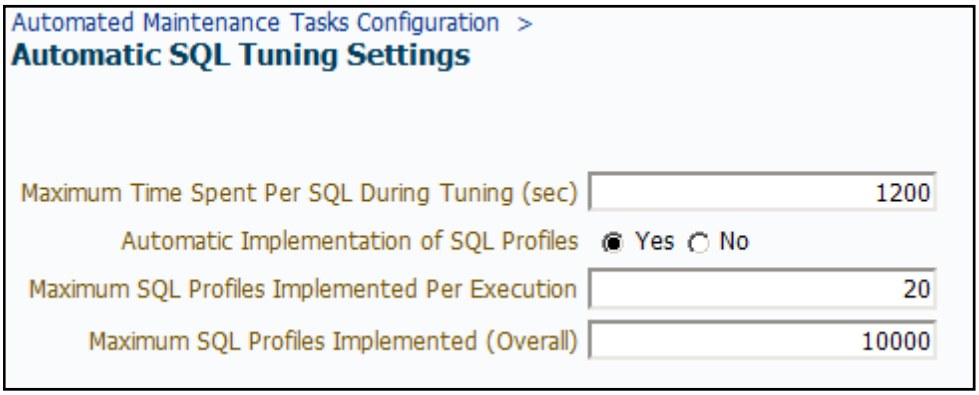
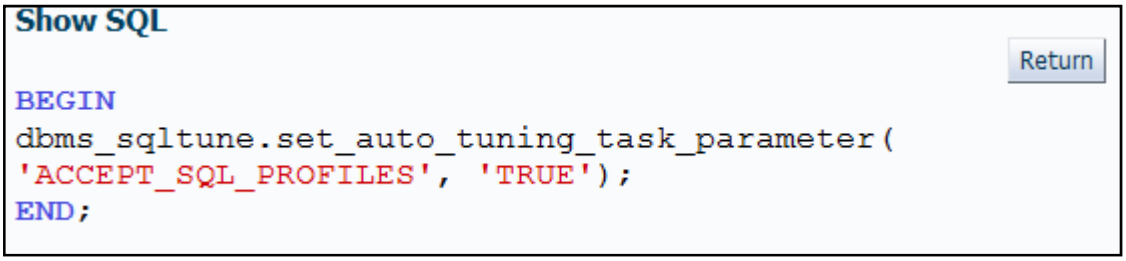
Step	Window/Page Description	Choices or Values
g.	Automatic SQL Tuning Settings	Click **Yes** for Automatic Implementation of SQL Profiles. Click **Show SQL.**



Step	Window/Page Description	Choices or Values
h.	Show SQL	View the SQL statement. Click **Return.**



Step	Window/Page Description	Choices or Values
i.	Automatic SQL Tuning Settings	Click **Apply.**

You should receive a success message.

2. Review and execute the **`$LABS/P19/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.

```
$ . oraenv
ORACLE_SID = [orcl] ? orcl
$ cd $LABS/P19
$ cat ast_setup.sh

#!/bin/bash
#  For training only - execute as oracle OS user

sqlplus / as sysdba <<EOF!
```

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```
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!
$
```

```
$ ./ast_setup.sh

SQL> SQL> SQL> drop user ast cascade
          *
ERROR at line 1:
ORA-01918: user 'AST' does not exist

SQL>
User created.
```

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```
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.

```
$ ./ast_workload_stream.sh

Mon Oct 20 09:05:14 UTC 2014
Mon Oct 20 09:06:22 UTC 2014
$
```

4. Automatic SQL Tuning is implemented by 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 10 minutes for the script to execute.

```
$ 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;
```

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```
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 SCOPE=MEMORY
/
exec dbms_auto_task_admin.disable( -
  'auto optimizer stats collection', null, :window);

exec dbms_auto_task_admin.disable( -
  'auto space advisor', null, :window);

exec dbms_scheduler.open_window(:window, null, true);

--
-- Close the maintenance window when sqltune is done
--
exec dbms_lock.sleep(60);

declare
  running number;
begin
  loop
    select count(*)
    into   running
    from   dba_advisor_executions
    where  task_name = 'SYS_AUTO_SQL_TUNING_TASK' and
           status = 'EXECUTING';
    if (running = 0) then
      exit;
    end if;
    dbms_lock.sleep(60);
  end loop;
  dbms_scheduler.close_window(:window);
end;
```

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```
/
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

$
```

```
$ ./ast_run.sh
Mon Oct 20 09:08:24 UTC 2014
…
Connected to:
…

SQL> SQL> SQL> SQL>
PL/SQL procedure successfully completed.

SQL> SQL> SQL>   2    3    4
PL/SQL procedure successfully completed.

SQL>
WINDOW
----------------------------------------------------------------
MONDAY_WINDOW

SQL> SQL> SQL> SQL> SQL>   2
System altered.

SQL> >
```

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```
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>
Mon Oct 20 09:14:30 UTC 2014
$
```

Some of your output, such as the WINDOW, may look different.

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 original execution. This is probably due to the fact that Automatic SQL Tuning implemented a profile for your statement automatically.

```
$ ./ast_workload_stream.sh
Mon Oct 20 10:10:16 UTC 2014
Mon Oct 20 10:10:36 UTC 2014
$
```

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.
```

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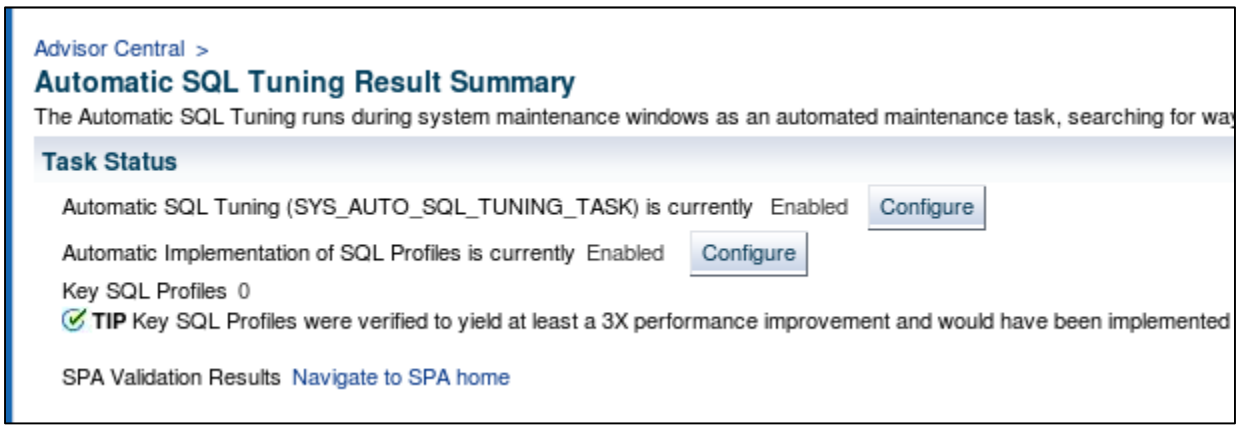
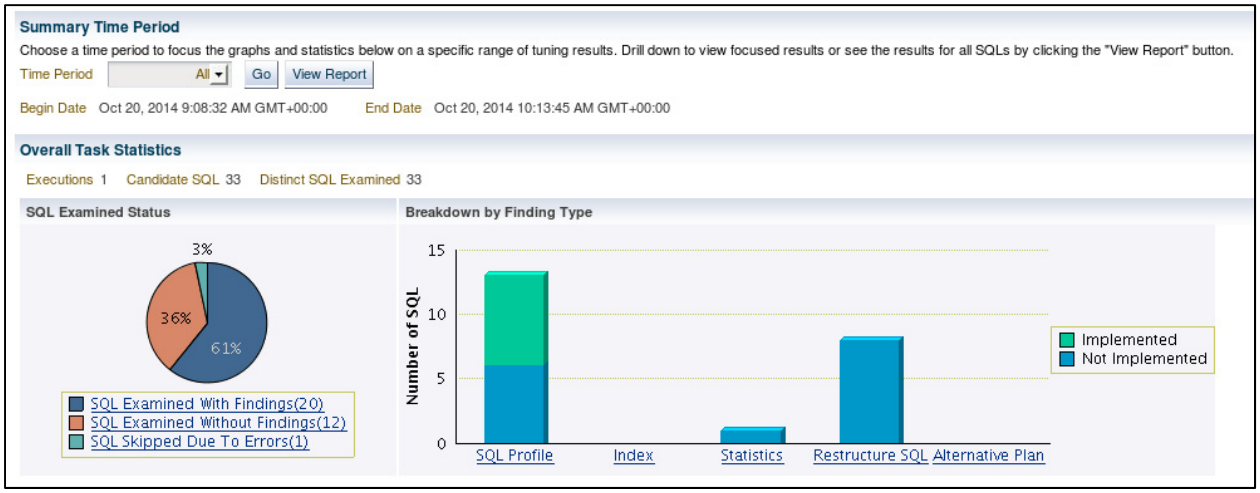
```
SQL> exit
$
```

7. How can you confirm that a SQL Profile was automatically implemented?
   a. In Enterprise Manager Cloud Control, navigate to **Administration > Oracle Scheduler > Automated Maintenance Tasks.**
   b. Click **Automatic SQL Tuning**.
   c. On the Automatic SQL Tuning Result Summary page, view the tuning results.



The task has already run in one maintenance window and has results ready to be viewed.



   d. 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 work load twice, and then continue with step 6 and 7.)
   e. Focus on understanding the pie chart and the bar graph next to it. You should be able to get a sense of the general findings, as well as the number of SQL profiles implemented by the task.
   f. In the Summary Time Period section, Click **View Report** to see a detailed SQL-level report.

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g. Find and select the SQL statement that ran in the `AST` schema.

Note: The Thumbs Up icon means that the profile was implemented.

Advisor Central > SQL Tuning Summary:SYS.SYS_AUTO_SQL_TUNING_TASK >

Automatic SQL Tuning Result Details: All Analyzed SQLs

Begin Date Oct 20, 2014 9:08:32 AM GMT+00:00 End Date Oct 20, 2014 10:17:40 AM GMT+00:00

Recommendations

Only profiles that significantly improve SQL performance were implemented.

View Recommendations | Implement All SQL Profiles | Validate All Profiles with SPA

Select	SQL Text	Parsing Schema	SQL ID	Weekly DB Time Benefit(sec)	Per-Execution % Benefit	Statistics	SQL Profile
◉	select /*+ USE_NL(s c) FULL(s) FULL(c) A...	AST	by9m5m597zh19	45.05	98		(98%)
○	SELECT 1, status, '',archiver, databas...	DBSNMP	gj5r9jj2xad7f	14.17	99		(99%)

h. Click **View Recommendations**.

i. Click the **Compare Explain Plans** eyeglass icon for the SQL Profile entry.

Advisor Central > SQL Tuning Summary:SYS.SYS_AUTO_SQL_TUNING_TASK > SQL Tuning Details:SYS.SYS_AUTO_SQL_TUNING_TASK > Logged in as DBA1

Recommendations for SQL ID:by9m5m597zh19

Return

Only one recommendation should be implemented.

SQL Information

SQL Text select /*+ USE_NL(s c) FULL(s) FULL(c) AST */ c.cust_id, sum(s.quantity_sold) from sh.sales s, sh.customers c where s.cust_id = c.cust_id and c.cust_id < 2 group by c.cust_id

Select Recommendation

Original Explain Plan (Annotated)

Implement | Validate with SPA

Select	Type	Findings	Recommendations	Rationale	Benefit (%)	Other Statistics	New Explain Plan	Compare Explain Plans
◉	SQL Profile	A potentially better execution plan was found for this statement.	The SQL profile "SYS_SQLPROF_01492cd0fe310000" currently has status "ENABLED".	SQL profile "SYS_SQLPROF_01492cd0fe310000" was created automatically for this statement.	98.98			

j. Scroll down the page.

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

Original Explain Plan (Annotated)

Indicates an adjustment from the original plan by the SQL Tuning Advisor

Plan Hash Value 4005616876

Expand All | Collapse All

Operation	Line ID	Object	Object Type	Order	Rows	Bytes	Cost	Time	CPU Cost	I/O Cost
SELECT STATEMENT	0			6		0.013	939	1	277,364,864	932
HASH GROUP BY	1			5		0.013	939	1	277,364,864	932
NESTED LOOPS	2			4		0.013	938	1	237,657,216	932
TABLE ACCESS FULL	3	SH.CUSTOMERS	TABLE	1		0.005	423	1	22,145,352	422
PARTITION RANGE ALL	4			3		0.008	515	1	215,511,872	510
TABLE ACCESS FULL	5	SH.SALES	TABLE	2		0.008	515	1	215,511,872	510

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New Explain Plan With SQL Profile

Plan Hash Value 34974602

Expand All | Collapse All

Operation	Line ID	Object	Object Type	Order	Rows	Bytes	Cost	Time	CPU Cost	I/O Cost
SELECT STATEMENT	0			8		0.013	56	1	40,148,420	55
HASH GROUP BY	1			7		0.013	56	1	40,148,420	55
NESTED LOOPS	2			6		0.013	55	1	440,778	55
PARTITION RANGE ALL	3			4		0.008	55	1	438,828	55
TABLE ACCESS BY LOCAL INDEX ROWID BATCHED	4	SH.SALES	TABLE	3		0.008	55	1	438,828	55
BITMAP CONVERSION TO ROWIDS	5			2						
BITMAP INDEX RANGE SCAN	6	SH.SALES_CUST_BIX	INDEX (BITMAP)	1						
INDEX UNIQUE SCAN	7	SH.CUSTOMERS_PK	INDEX (UNIQUE)	5		0.005	0	1	1,950	0

l. Then click the "**Recommendations for SQL ID**" locator link (the last of the breadcrumbs on top of the page) to return to the previous screen.

m. Investigate a SQL profile. While still on the "Recommendations for `SQL_ID`" page, click the **SQL Text** link to go to the SQL Details page for this SQL.

n. On the SQL Details – Tuning History page note the link to SYS_AUTO_SQL_TUNING_TASK that is there to show that the SQL was tuned by this tuning task.

Top Activity > SQL Details: by9m5m597zh19 Logged in as DBA1

SQL Details: by9m5m597zh19

Switch to SQL ID Go View Data Historical Refresh SQL Worksheet Actions SQL Details Active Report Go

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
```

Details

Select the plan hash value to see the details below. Plan Hash Value All Optimizer Statistics Diff Report There are multiple plans found for this SQL statement.

Statistics | Activity | Plan | Plan Control | Tuning History | SQL Monitoring

SQL Tuning History

The following SQL tuning tasks provide the recommendations to tune this SQL statement.

Advisor Task Name	Task Owner	Task Completion
SYS_AUTO_SQL_TUNING_TASK	SYS	Oct 20, 2014 9:14:23 AM

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.

Details

Select the plan hash value to see the details below. Plan Hash Value All Optimizer Statistics Diff Report There are multiple plans found for this SQL statement.

Statistics | Activity | Plan | Plan Control | Tuning History | SQL Monitoring

SQL Profiles and SQL Patches

A SQL Profile contains additional information(auxiliary statistics) that aids the optimizer to select the optimal execution plan of a particular SQL statement. A SQL Patch is automatically generated to workaro

Change Category | Delete | Disable/Enable

Select	Name	Type	Category	Status	Created
◉	SYS_SQLPROF_01492cd0fe310000	AUTO	DEFAULT	ENABLED	Oct 20, 2014 9:08:54 AM

SQL Plan Baseline

A SQL Plan Baseline is an execution plan deemed to have acceptable performance for a given SQL statement.

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

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

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r. Select one of the plan hash values from the pull down Plan Hash Values. What is the time of the execution, and Elapsed Time per Execution?

s. Select the other plan hash value from the pull down Plan Hash Values. What is the time of the execution, and Elapsed Time per Execution?

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 executed more quickly.

u. Select All in the Plan Hash Values. This shows the improved plan and the original in the same graph. The bar graph for the second run with the SQL Profile applied may be so small as to be almost invisible.

8. Generate a text report for more in-depth information. From the command line, execute the **`ast_task_report.sh`** script. What do you observe?

a. Notice the first queries that fetch the 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 a better sense of the profile's quality. You can also use the `report_auto_tuning_task` API to get reports that span multiple executions of the task.

```
$ cat ast_task_report.sh
#!/bin/bash
```

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```
# 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
         execution_name = :last_exec and
         type = 'SQL' and
```

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```
         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!

$
```

```
$ ./ast_task_report.sh
SQL*Plus: Release 12.1.0.2.0 Production on Mon Oct 20 10:34:13
2014

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Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics, Real
Application Testing
and Unified Auditing options

SQL> SQL> SQL> SQL> SQL> SQL> SQL> SQL> SQL>
Session altered.

SQL> SQL>   2    3    4
EXECUTION_NAME
-----------------------------------------------------------------
----------------
STATUS        EXECUTION_START
----------- -------------------
EXEC_708
COMPLETED   10/20/2014 09:08:32
```

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```
SQL> SQL> SQL> SQL>   2    3    4    5    6    7
PL/SQL procedure successfully completed.

SQL> SQL>
LAST_EXEC
-----------------------------------------------------------------
----------------
EXEC_708

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
----------
     4

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                      : 10/20/2014 09:08:32
Completed at                    : 10/20/2014 09:14:23
Number of Candidate SQLs        : 33
Cumulative Elapsed Time of SQL (s)   : 6302

-----------------------------------------------------------------
---------------
Object ID  : 4
Schema Name: AST
SQL ID       : by9m5m597zh19
SQL Text   : select /*+ USE_NL(s c) FULL(s) FULL(c) AST */
c.cust_id,
```

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```
          sum(s.quantity_sold) from sh.sales s, sh.customers c
where
          s.cust_id = c.cust_id and c.cust_id < 2 group by
c.cust_id

-------------------------------------------------------------------
---------------
FINDINGS SECTION (1 finding)
-------------------------------------------------------------------
---------------

1- SQL Profile Finding (see explain plans section below)
--------------------------------------------------------
  A potentially better execution plan was found for this
statement.
  SQL profile "SYS_SQLPROF_01492cd0fe310000" was created
automatically for
  this statement.

  Recommendation (estimated benefit: 98.98%)
  ------------------------------------------
  - An automatically-created SQL profile is present on the
system.
    Name:   SYS_SQLPROF_01492cd0fe310000
    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):       .367508      .000167      99.95 %
  CPU Time (s):           .205302        .0002  99.9 %
  User I/O Time (s):      .007748          0      100 %
  Buffer Gets:               3142           32      98.98 %
  Physical Read Requests:      13          0      100 %
  Physical Write Requests:      0          0
```

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```
  Physical Read Bytes:          4142421          0      100 %
  Physical Write Bytes:          0          0
  Rows Processed:                0          0
  Fetches:                       0          0
  Executions:                    1          1

  Notes
  -----
  1. Statistics for the original plan were averaged over 3
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      |         |   1 |    13 |   939
(1)| 00:00:0
1 |    |     |
|   1 |  HASH GROUP BY          |       |   1 |    13 |   939
(1)| 00:00:0
1 |    |     |
|   2 |   NESTED LOOPS          |       |   1 |    13 |   938
(1)| 00:00:0
1 |    |     |
|*  3 |    TABLE ACCESS FULL  | CUSTOMERS |     1 |   5 |   423
(1)| 00:00:0
1 |    |     |
```

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```
|   4 |    PARTITION RANGE ALL|        |   1 |   8 |   515   (1)|
00:00:0
1 | 1 |    28 |
|*  5 |     TABLE ACCESS FULL | SALES  |   1 |   8 |   515   (1)|
00:00:0
1 | 1 |    28 |
-------------------------------------------------------------------
----------------
-------------------

Predicate Information (identified by operation id):
---------------------------------------------------

   3 - filter("C"."CUST_ID"<2)
   5 - filter("S"."CUST_ID"<2 AND "S"."CUST_ID"="C"."CUST_ID")

2- Using SQL Profile
--------------------
Plan hash value: 34974602

-------------------------------------------------------------------
----------------
-----------------------------------------------
| Id  | Operation                        | Name           |
Rows  |
Bytes | Cost (%CPU)| Time     | Pstart| Pstop |
-------------------------------------------------------------------
----------------
-----------------------------------------------
|   0 | SELECT STATEMENT                 |                |
1 |
   13 |    56   (2)| 00:00:01 |       |       |
|   1 |  HASH GROUP BY                         |
|     1 |
   13 |    56   (2)| 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 |
```

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```
|   5 |      BITMAP CONVERSION TO ROWIDS        |
|       |
      |      |        |       |       |
|*  6 |       BITMAP INDEX RANGE SCAN           | SALES_CUST_BIX
|       |
      |      |        |     1 |    28 |
|*  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> Disconnected from Oracle Database 12c Enterprise
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Application Testing
and Unified Auditing options

$
```

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

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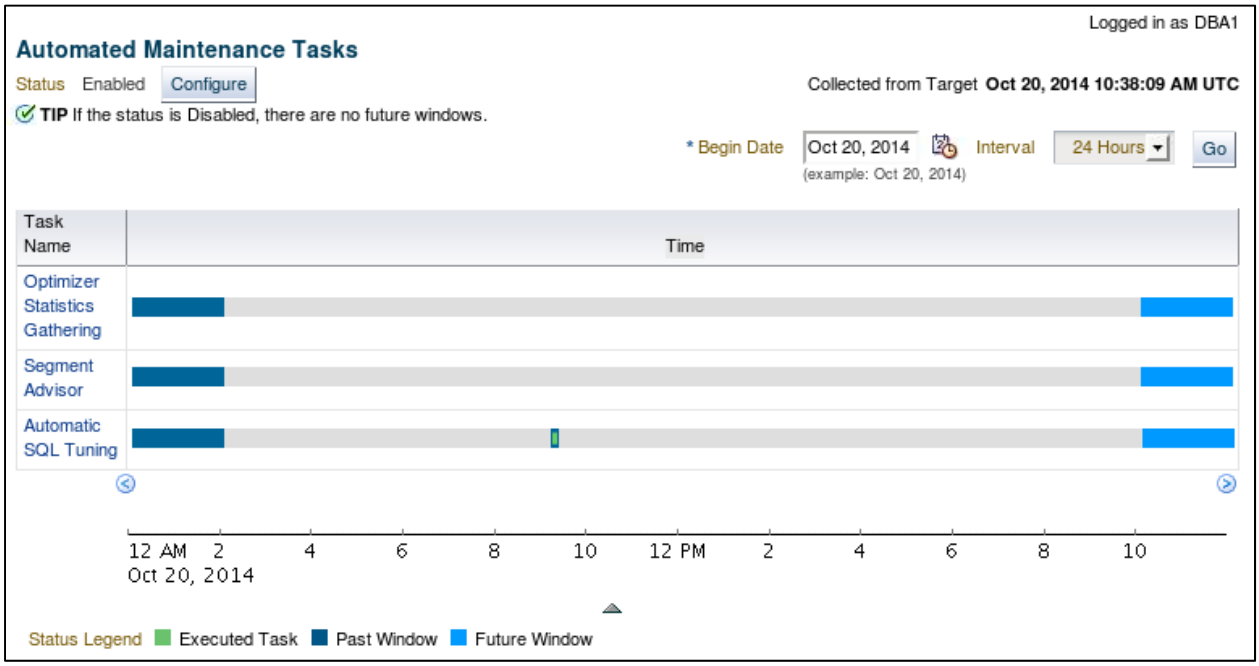
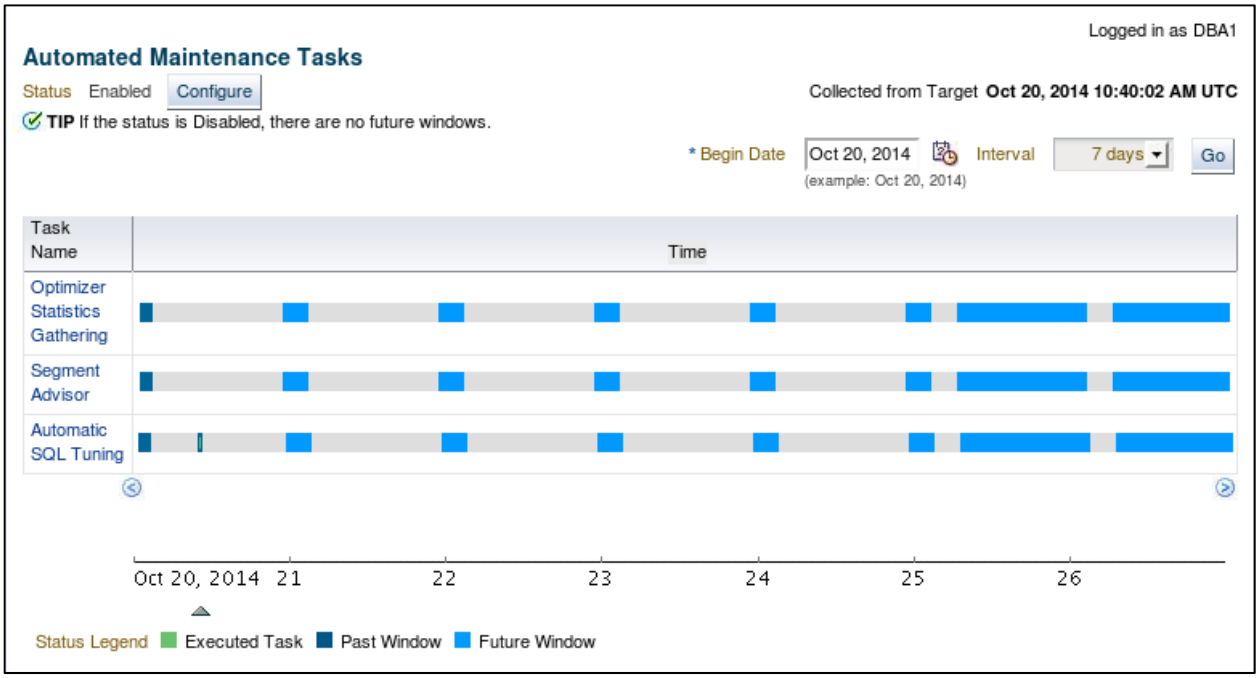


c. Select **7 days** in the Interval menu and click **Go** to see an entire week's worth of data.



d. Click the **Configure** button. On the Automated Maintenance Tasks Configuration page, you can disable individual clients and change which windows they run in.

e. Disable the Automatic SQL Tuning client 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 command and then click **Return**.

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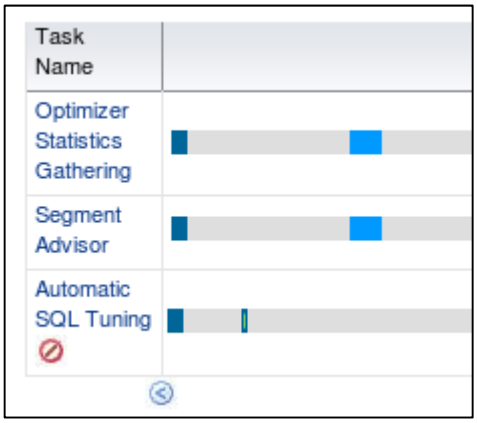
g. On the Automated Maintenance Tasks Configuration page, click **Apply**. You should receive a success message.

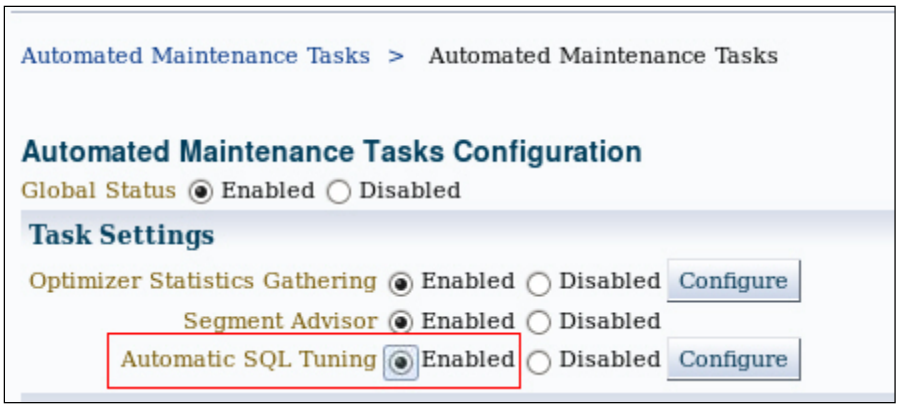
h. Click the **Automated Maintenance Tasks** locator link at the top of the page

i. Notice the forbidden sign right next to the task name.



j. Click **Configure**.

k. **Enable** the Automatic SQL Tuning task.



l. 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 Settings 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;
```

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p. Review the command, click **Return**, and then click **Apply**. You should receive a success message.

10. **OPTIONAL:** Review the `ast_manual_config.sh` script to understand how you can configure Automatic SQL Tuning by using PL/SQL.

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Practices for Lesson 20: Using Database Resource Manager

Chapter 20

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Practices for Lesson 20: Overview

Lesson 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.

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Practice 20-1: 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`.

Task

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/P20` 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	Click **Administration > Resource Manager**
b.	Database Login	Select Credential **Preferred**. Select Preferred Credential Name: **SYSDBA Database Credentials** Click **Login**.
c.	Getting Started with Database Resource Manager	Click **Consumer Groups**.
d.	Consumer Groups	Click **Create**.
e.	Create Resource Consumer Group	Enter Consumer Group: **APPUSER** Verify Scheduling Policy: **Round Robin** Click **Show SQL**.
f.	Show SQL	Click **Return**.
g.	Create Resource Consumer Group	Click **OK**.

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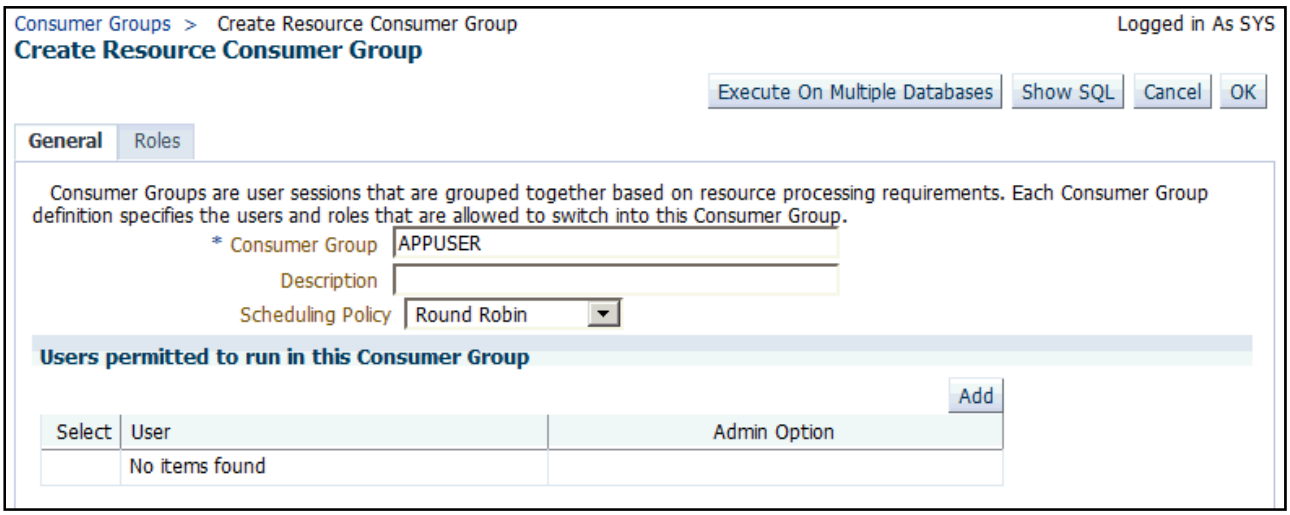

Question 1: What does the `ROUND-ROBIN` parameter value mean?

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	Click **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 Allocations section, click **Add/Remove**.
f.	Select Groups/Subplans	Select **APPUSER**. Click **Move** from Available Groups/Subplans.

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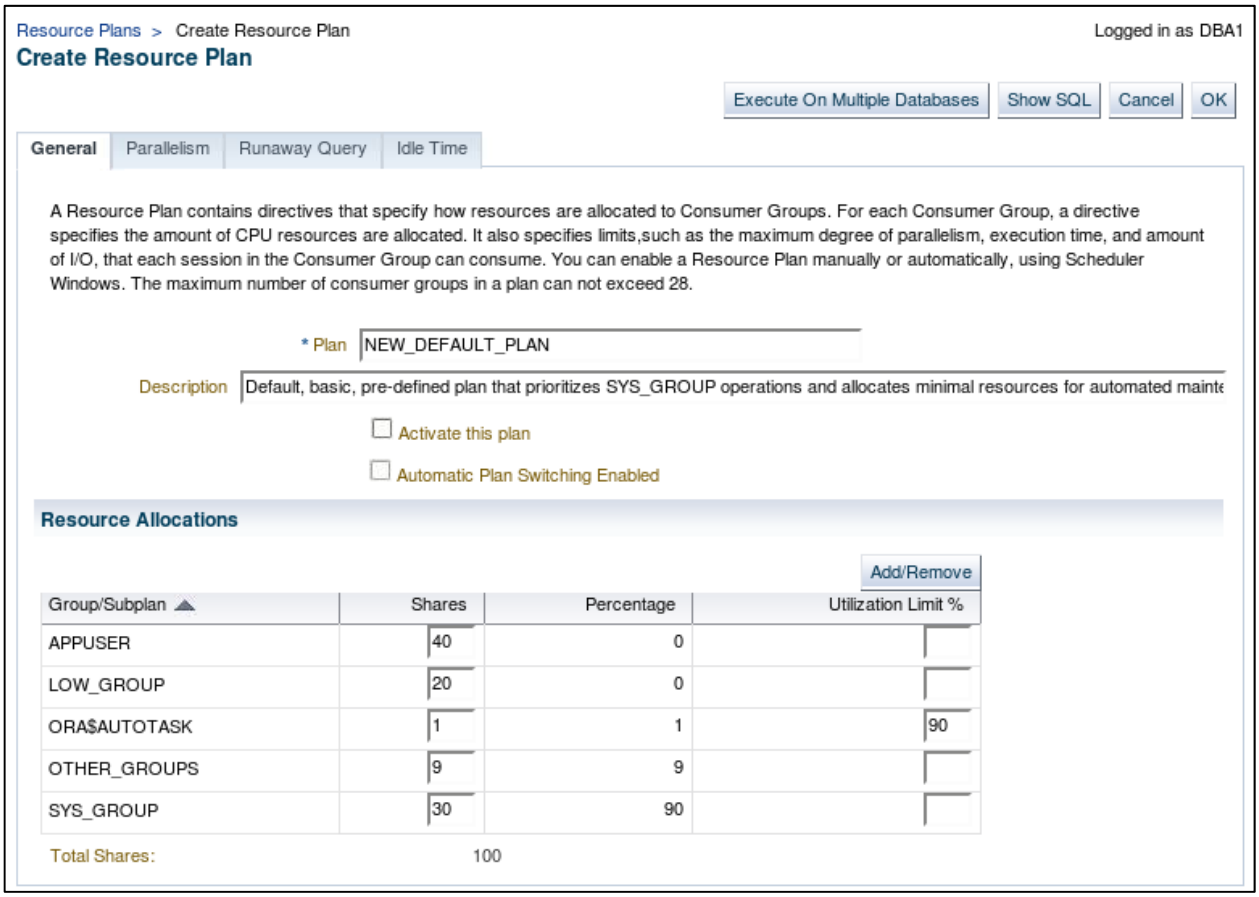
Step	Window/Page Description	Choices or Values
		pane to Resource Allocations pane. Select **LOW_GROUP**. Click **Move**. Click **OK**.
g.	Create Resource Plan	In Resource Allocations section: For APPUSER, set Shares equal to **40**. For LOW_GROUP, set Shares equal to **20**. For SYS_GROUP, set Shares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



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,

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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/P20/assign_hr_appuser.sql** script to assign the HR user to the APPUSER consumer group.

```
SQL> @$LABS/P20/assign_hr_appuser


PL/SQL procedure successfully completed.


SQL>
```

c. Execute the **$LABS/P20/assign_scott_lowgroup.sql** script to assign the SCOTT user to the LOW_GROUP consumer group.

```
SQL> @$LABS/P20/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. Click **Administration > Resource Manager**.

b. Click **Consumer Group Mappings**.

c. HR and SCOTT now appear in the list.

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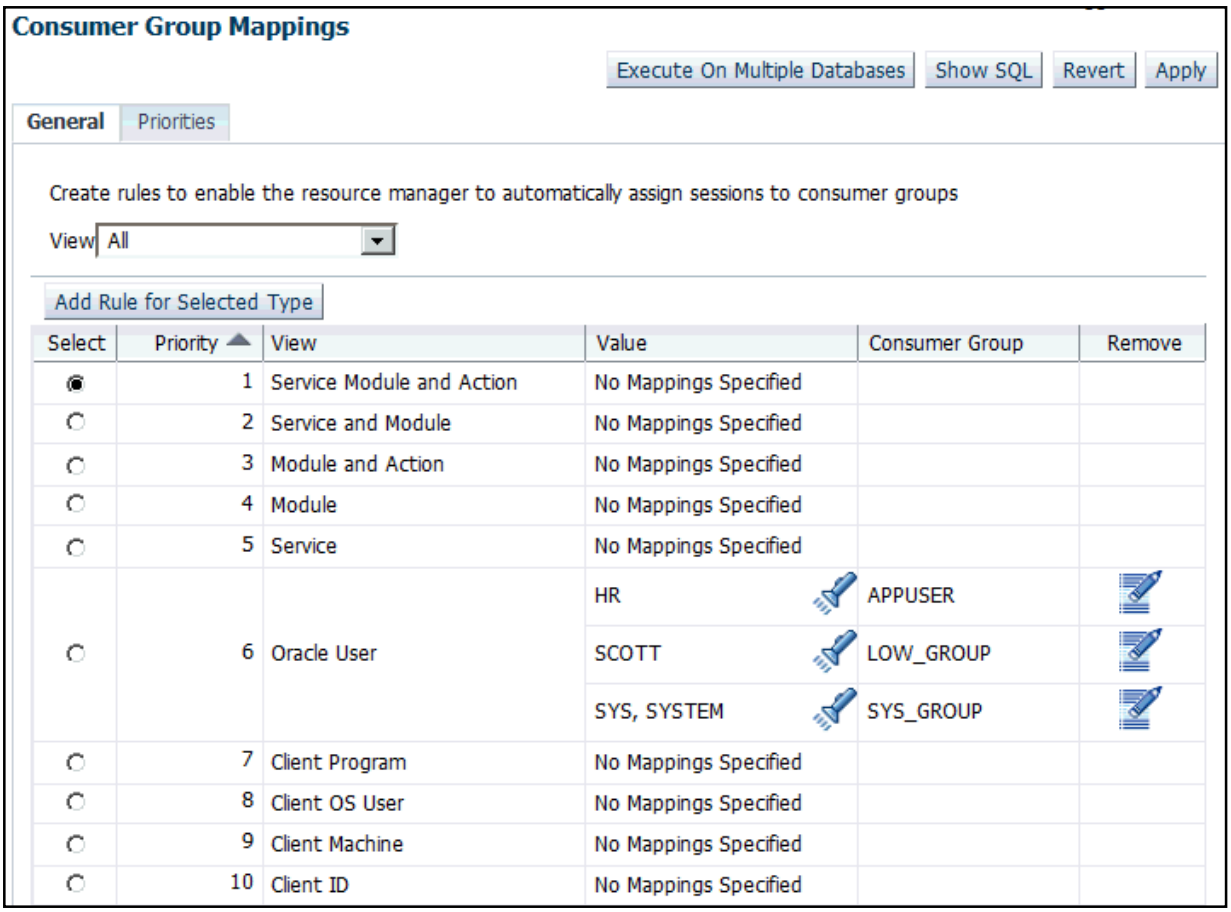

5. Assign the `PM` Oracle user to the following consumer groups: `APPUSER`, `LOW_GROUP`, and `SYS_GROUP` without using the Consumer Group Mappings.

Step	Window/Page Description	Choices or Values
a.	Consumer Group Mappings	Click **Security > Users**.
b.	Users	Enter **PM** in the Search box. Click **Go**.
c.	Users	Select **PM** user. Click **Edit**.
d.	Edit User: PM	Click **Consumer Group Privileges** tab. If you see an error regarding the password for the `PM` user, enter `oracle_4U` in both the password fields.
e.	Edit User: PM : Consumer Group Privileges tab	Click **Edit List**.
f.	Modify Consumer Groups	Move **APPUSER** to Selected Consumer Groups. Move **LOW_GROUP** to Selected Consumer Groups.

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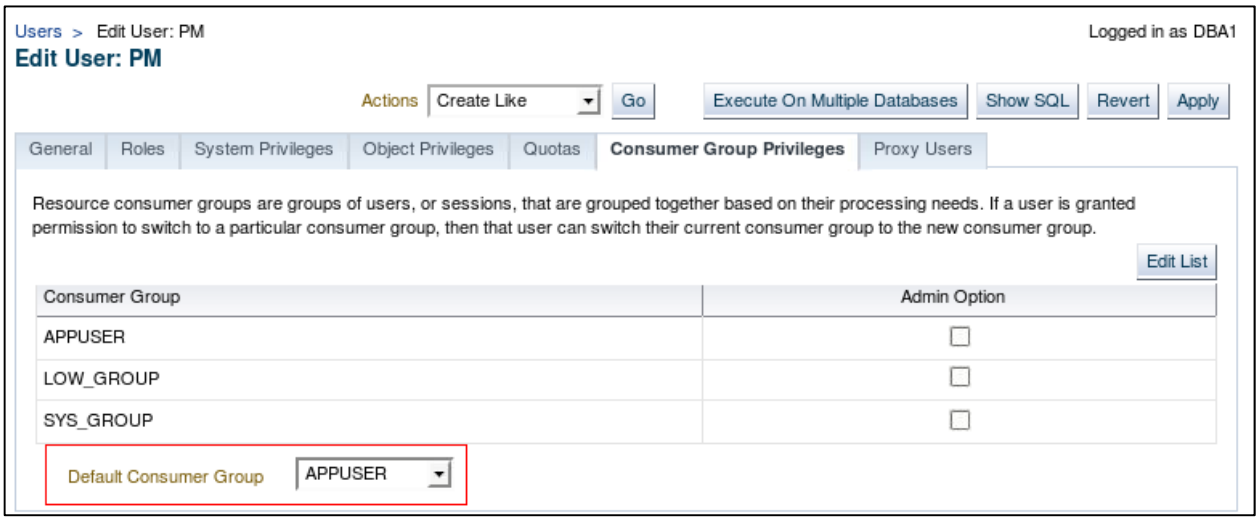
Step	Window/Page Description	Choices or Values
		Move **SYS_GROUP** to Selected Consumer Groups. Click **OK**.
g.	Edit User: PM	Set Default Consumer Group to **APPUSER**. Click **Show SQL**.
h.	Show SQL	**Note:** The PM user is granted the privilege of switching to any of the three groups, but the initial group is set to APPUSER. Click **Return**.
i.	Edit User: PM	Click **Apply**.



6. Activate the `NEW_DEFAULT_PLAN` resource plan.

Step	Window/Page Description	Choices or Values
a.	Edit User: PM	Click **Administration > Resource Manager**
b.	Getting Started with Database Resource Manager	Click **Plans**.
c.	Resource Plans	Select **NEW_DEFAULT_PLAN**. Select **Activate** in the Actions menu. Click **GO**.
d.	Confirmation	Click **Yes**.
e.	Resource Plans	You should see a success message. NEW_DEFAULT_PLAN has status of ACTIVE.

7. Test the consumer group mappings. Start two SQL*Plus sessions: the first with the `system/oracle_4U@orcl` connect string and the second with the `scott/tiger@orcl` connect string.

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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@orcl` connect string and to set your SQL prompt to "FIRST," enter:

```
$ sqlplus system@orcl
Enter password: oracle_4U <<< not displayed

SQL> SET SQLPROMPT "FIRST>"
FIRST>
```

c. As the `oracle` user in a second terminal window, execute the `oraenv` script to set environment variables for the `orcl` database.

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

Your output may be different depending on your previously executed tasks.

d. To start a SQL*Plus session with the `scott/tiger@orcl` connect string and to set your SQL prompt to "SECOND," enter:

```
$ sqlplus scott@orcl
Enter password: tiger <<< not displayed

SQL> SET SQLPROMPT "SECOND>"
SECOND>
```

e. In your `FIRST` SQL*Plus session, enter:

```
column username format A12
column resource_consumer_group format A24
SELECT username, resource_consumer_group, count(username)
  FROM v$session
  WHERE username IS not null
  AND program IS not null
  GROUP BY username, resource_consumer_group;
```

Note: This statement is available in the `/solns/sol_qry_vsession.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
```

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```
  4  AND PROGRAM IS not null
  5  GROUP By username, resource_consumer_group;

USERNAME     RESOURCE_CONSUMER_GROUP  COUNT(USERNAME)
------------ ------------------------ ---------------
DBSNMP       OTHER_GROUPS                           2
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@orcl
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                           2
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@orcl
Enter password: oracle_4U <<< not displayed

Connected.
SECOND>
```

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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                            2
OE           OTHER_GROUPS                            1
SYS          SYS_GROUP                               1
SYSTEM       SYS_GROUP                               1

FIRST> exit
```

j. Exit both the SQL*Plus sessions.

Question: When testing your OE Oracle user, you notice that OE is in the OTHER_GROUPS consumer group. Why is that?

Possible Answer: The OE user is not explicitly assigned to another consumer resource group.

8. Revert to your original configuration by deactivating the NEW_DEFAULT_PLAN resource group, undoing all consumer group mappings, and finally by deleting the APPUSER resource group.

Step	Window/Page Description	Choices or Values
a.		Click **Administration > Resource Manager**
b.	Getting Started with Database Resource Manager	Click **Plans.**
c.	Resource Plans	Select **INTERNAL_PLAN.** Select **Activate** in the Actions menu. Click **GO.**
d.	Confirmation	Click **Yes.**
e.	Resource Plans	You should see a success message INTERNAL_PLAN has status of ACTIVE

f. To reconfigure or undo all consumer group mappings, review and execute the rsc_cleanup.sh script from the $LABS/P20 directory:

```
$ cd $LABS/P20
$ cat rsc_cleanup.sh
#!/bin/bash
# Oracle Database 12c: Administration Workshop
# Oracle Server Technologies - Curriculum Development
#
# ***Training purposes only***
# ***Not appropriate for production use***
```

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```
#
# 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(
```

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```
    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.
```

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```
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.

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Practices for Lesson 21: Using Oracle Scheduler to Automate Tasks

Chapter 21

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Practices for Lesson 21: Overview

Practice Overview

In these practices, you explore Oracle Scheduler capabilities.

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Practice 21-1: Creating Scheduler Components

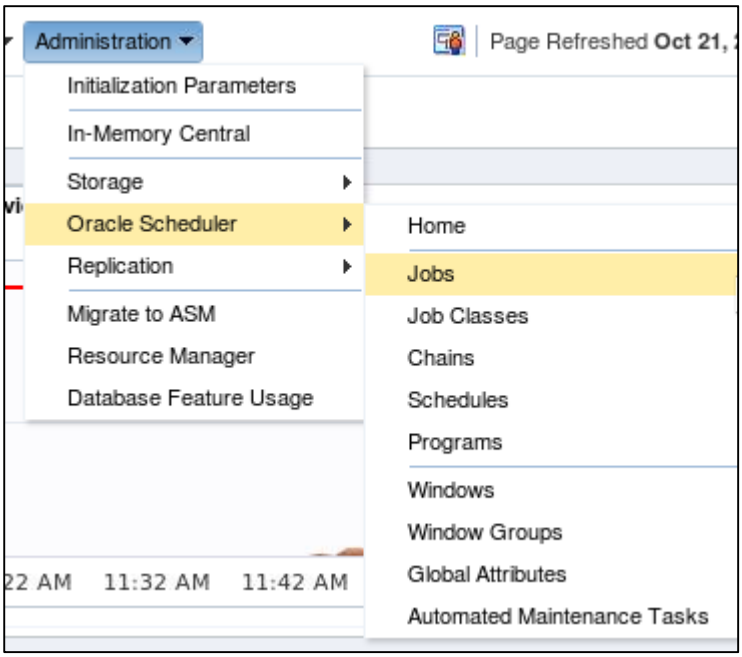
Overview

In this practice, you create Scheduler components such as programs, jobs, and schedules.

Task

In this practice, you use Enterprise Manager Cloud Control to create Scheduler objects in the `ORCL` database instance and automate tasks.

1. Create a simple job that runs a SQL script by using Enterprise Manager Cloud Control.
   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. Accept default values if no value is provided in the instructions.

- **General tab:**

  Name: **`CREATE_LOG_TABLE_JOB`**

  Schema: **`HR`**

  Enabled: **Yes**

  Description: **Create the `SESSION_HISTORY` table**

  Logging Level: **`Log job runs only (RUNS)`**

  Auto Drop: **False**

  Command Type: **PL/SQL Block**

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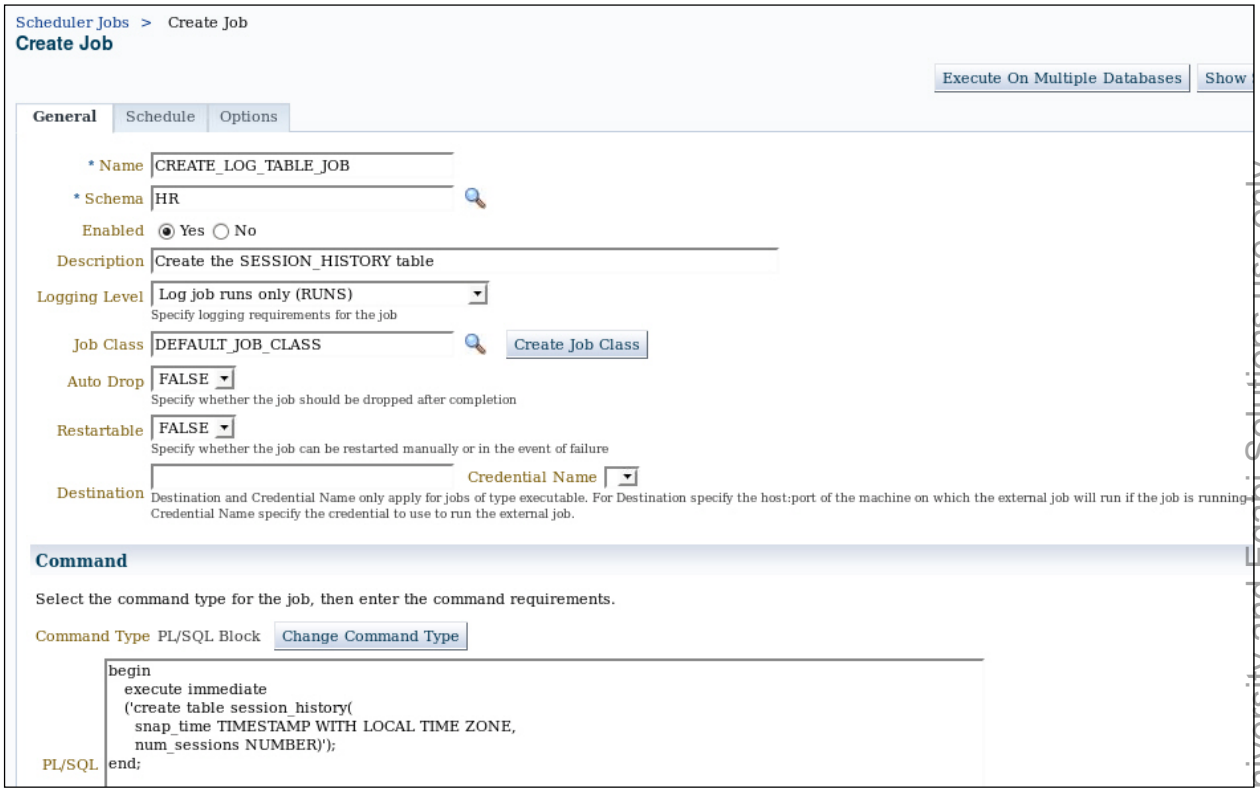
PL/SQL Block:

```
begin
   execute immediate
   ('create table session_history(
     snap_time TIMESTAMP WITH LOCAL TIME ZONE,
     num_sessions NUMBER)');
end;
```



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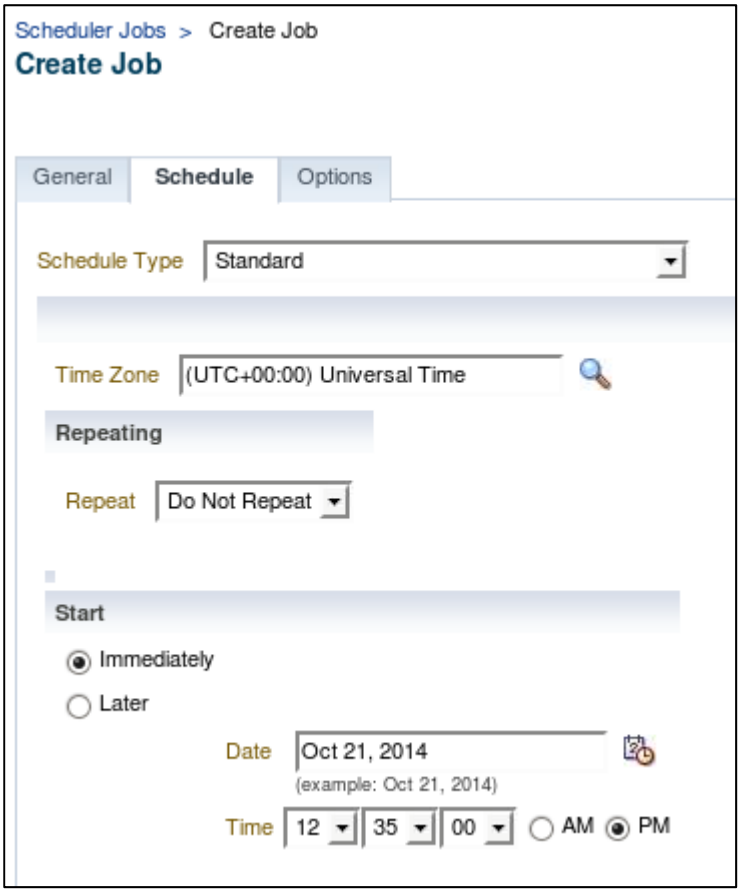
- **Schedule** tab:

  Timezone: Accept the default.

  Repeating: **Do not Repeat**

  Start: **Immediately**



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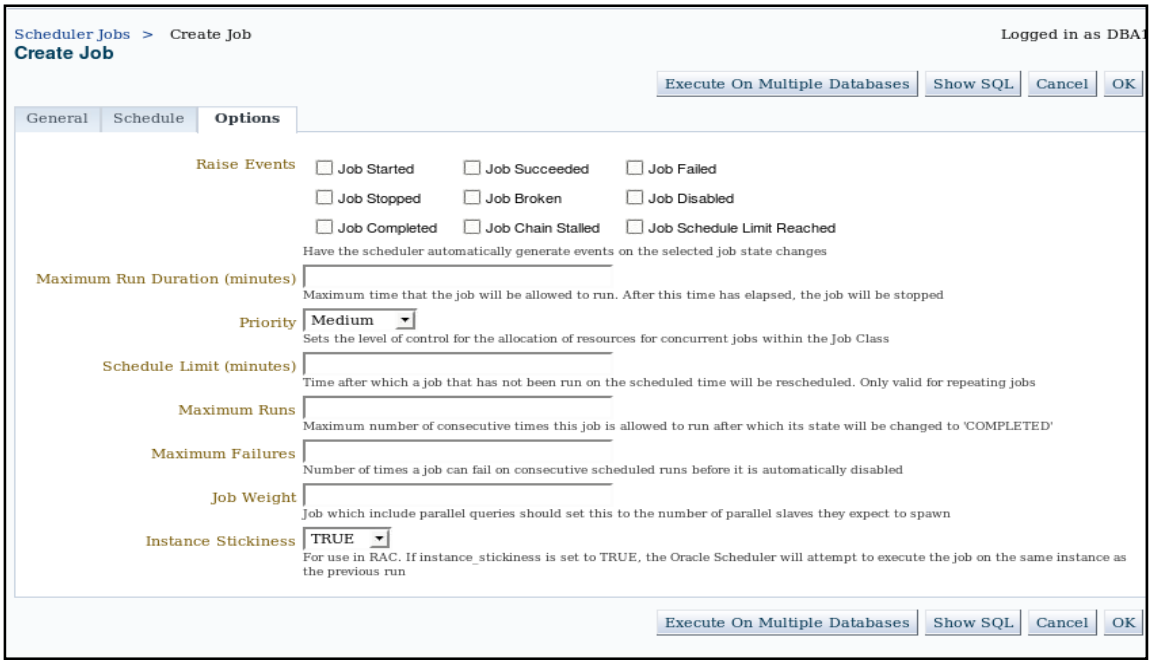
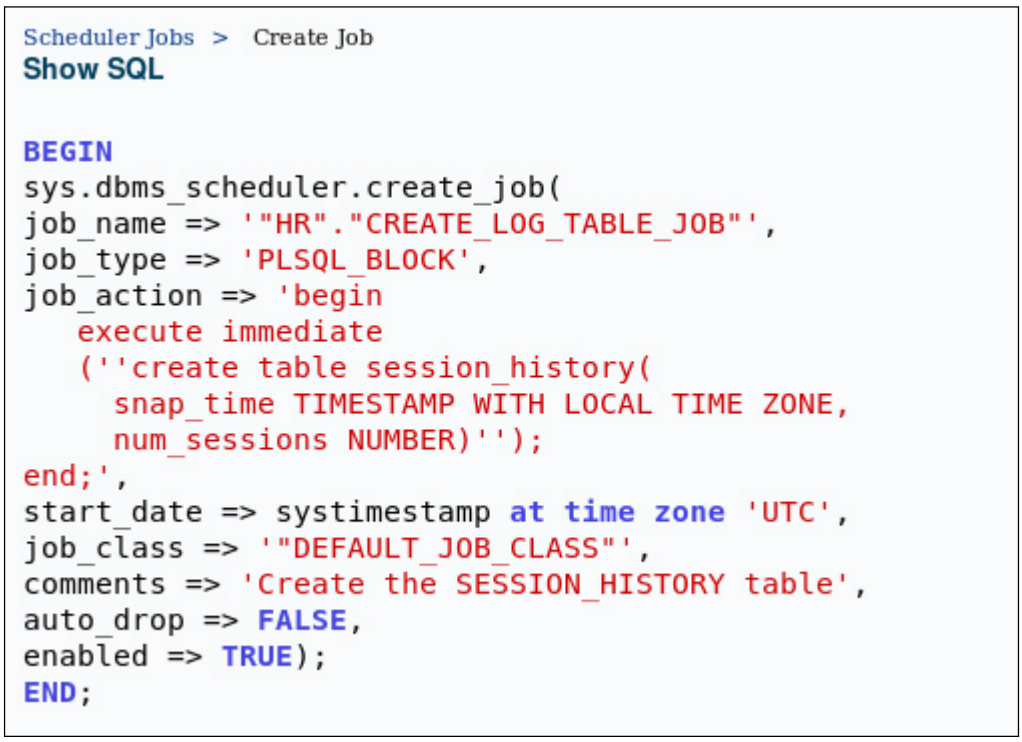
- **Options** tab:

  Accept the defaults.



e. Click **Show SQL** if you want to view the SQL statement defining your job. Review the statements and click **Return**.



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.

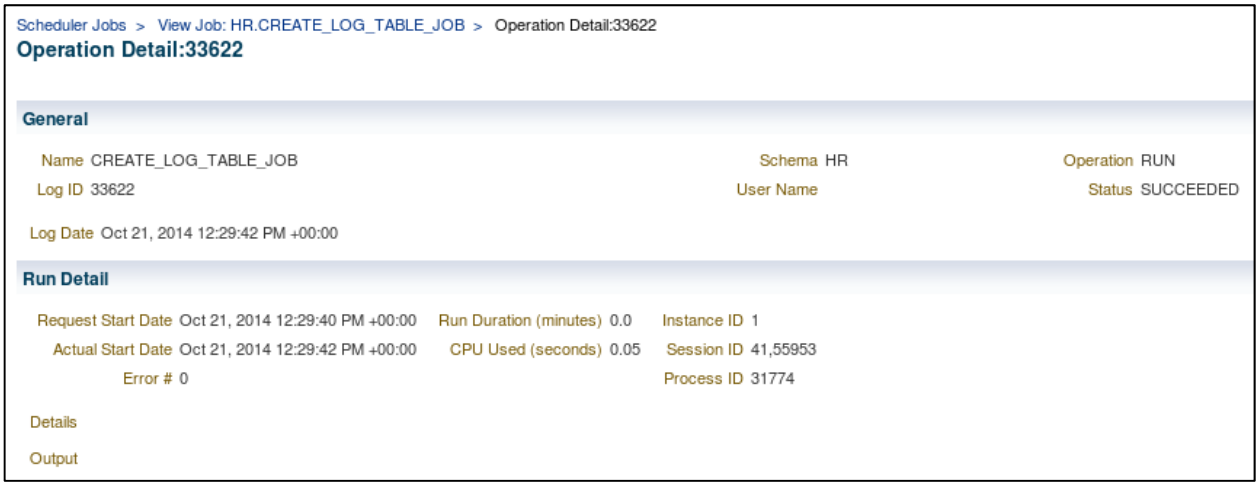
```
$ . oraenv
ORACLE_SID = [orcl] ? orcl

$ sqlplus dba1/oracle_4U as sysdba
Connected.
SQL> GRANT connect, resource, dba TO hr;

Grant succeeded.

SQL> EXIT
$
```

3. Return to Enterprise Manager Cloud Control. On the Scheduler Jobs page, re-order the jobs by **Last Run Date** by clicking the column name until they are in descending order. If the job does not appear on the Scheduler Jobs page, click the Refresh button until it succeeds. Also, you may not see it "running," but with the Last Run Status of `SUCCEEDED`.

   If you do not see the job on the All page, check the History page.

   a. Click the link in the Name column.

   b. Click the Log ID to view details of the job execution.



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.

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c. On the Create Program page, enter and confirm the following values:

Name: **LOG_SESS_COUNT_PRGM**

Schema: **HR**

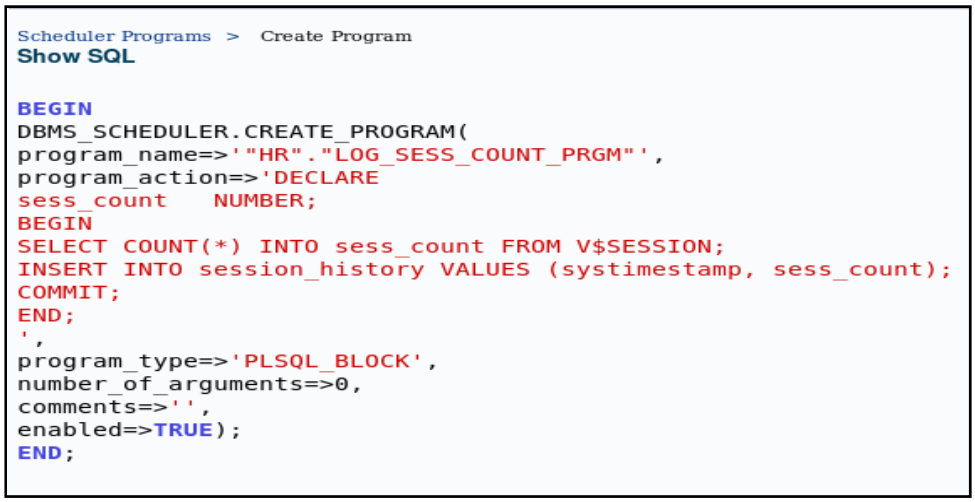
Enabled: **Yes**

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;
```

d. Click **Show SQL**.



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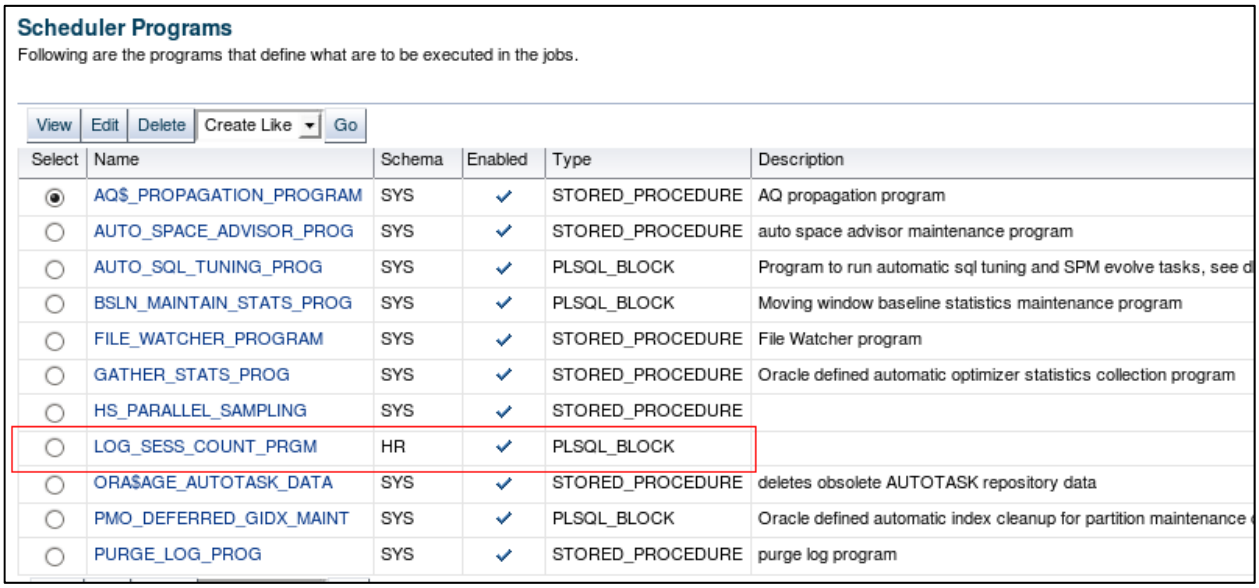
e. Review the statements, and then click **Return**.

f. Click **OK** to create the program. You should see the program on the Scheduler Programs page.



Select	Name	Schema	Enabled	Type	Description
◉	AQ$_PROPAGATION_PROGRAM	SYS	✓	STORED_PROCEDURE	AQ propagation program
○	AUTO_SPACE_ADVISOR_PROG	SYS	✓	STORED_PROCEDURE	auto space advisor maintenance program
○	AUTO_SQL_TUNING_PROG	SYS	✓	PLSQL_BLOCK	Program to run automatic sql tuning and SPM evolve tasks, see d
○	BSLN_MAINTAIN_STATS_PROG	SYS	✓	PLSQL_BLOCK	Moving window baseline statistics maintenance program
○	FILE_WATCHER_PROGRAM	SYS	✓	STORED_PROCEDURE	File Watcher program
○	GATHER_STATS_PROG	SYS	✓	STORED_PROCEDURE	Oracle defined automatic optimizer statistics collection program
○	HS_PARALLEL_SAMPLING	SYS	✓	STORED_PROCEDURE	
○	LOG_SESS_COUNT_PRGM	HR	✓	PLSQL_BLOCK	
○	ORA$AGE_AUTOTASK_DATA	SYS	✓	STORED_PROCEDURE	deletes obsolete AUTOTASK repository data
○	PMO_DEFERRED_GIDX_MAINT	SYS	✓	PLSQL_BLOCK	Oracle defined automatic index cleanup for partition maintenance
○	PURGE_LOG_PROG	SYS	✓	STORED_PROCEDURE	purge log program

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',
```

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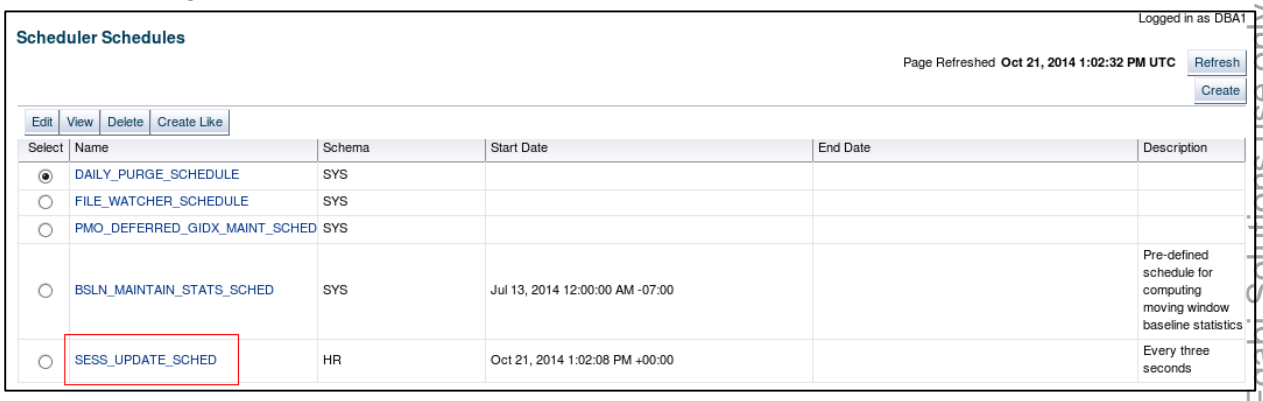
```
      comments => 'Every three seconds');
      END;
/
2     3     4     5     6     7     8
PL/SQL procedure successfully completed.

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.)



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)

      Auto Drop: FALSE

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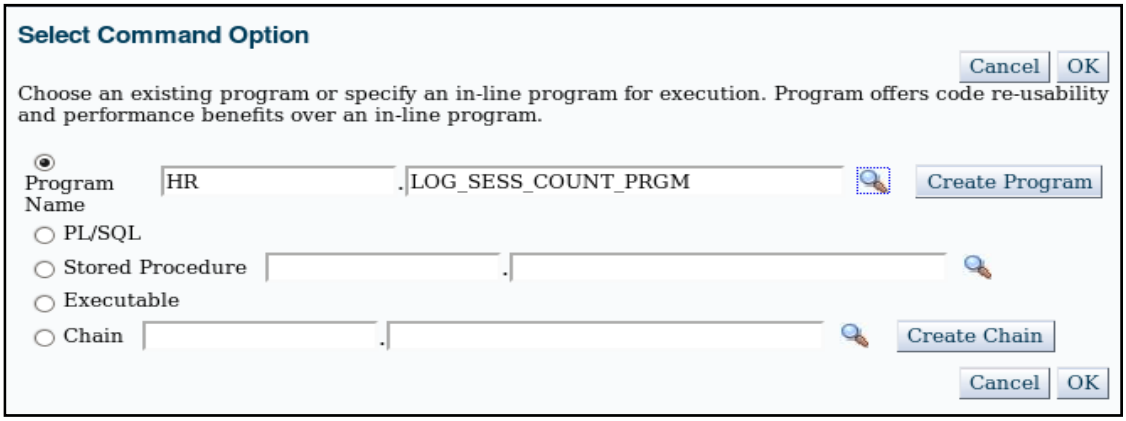
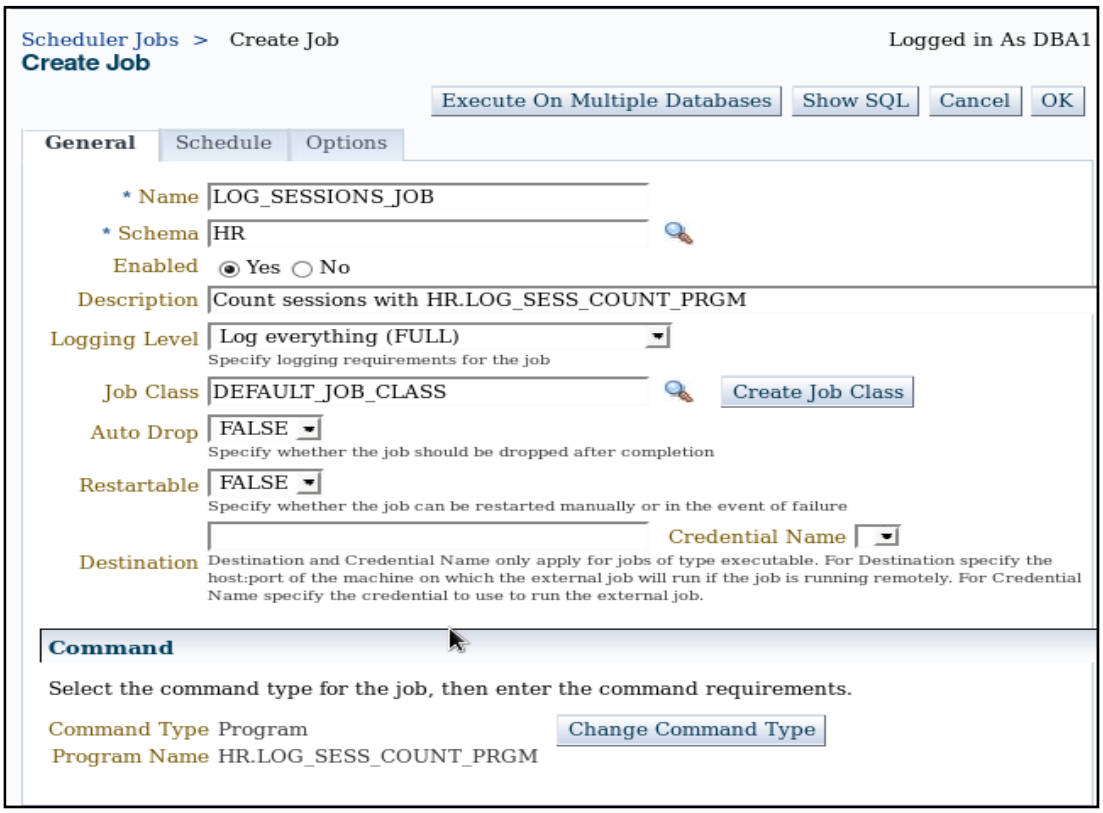
c. Click **Change Command Type**, and on the Select Command Option page, select **Program Name** and enter `HR.LOG_SESS_COUNT_PRGM` in the field next to it, or use the Lookup icon to select the program. Click **OK**.



d. Back on the Create Job page, click the **Schedule** tab.



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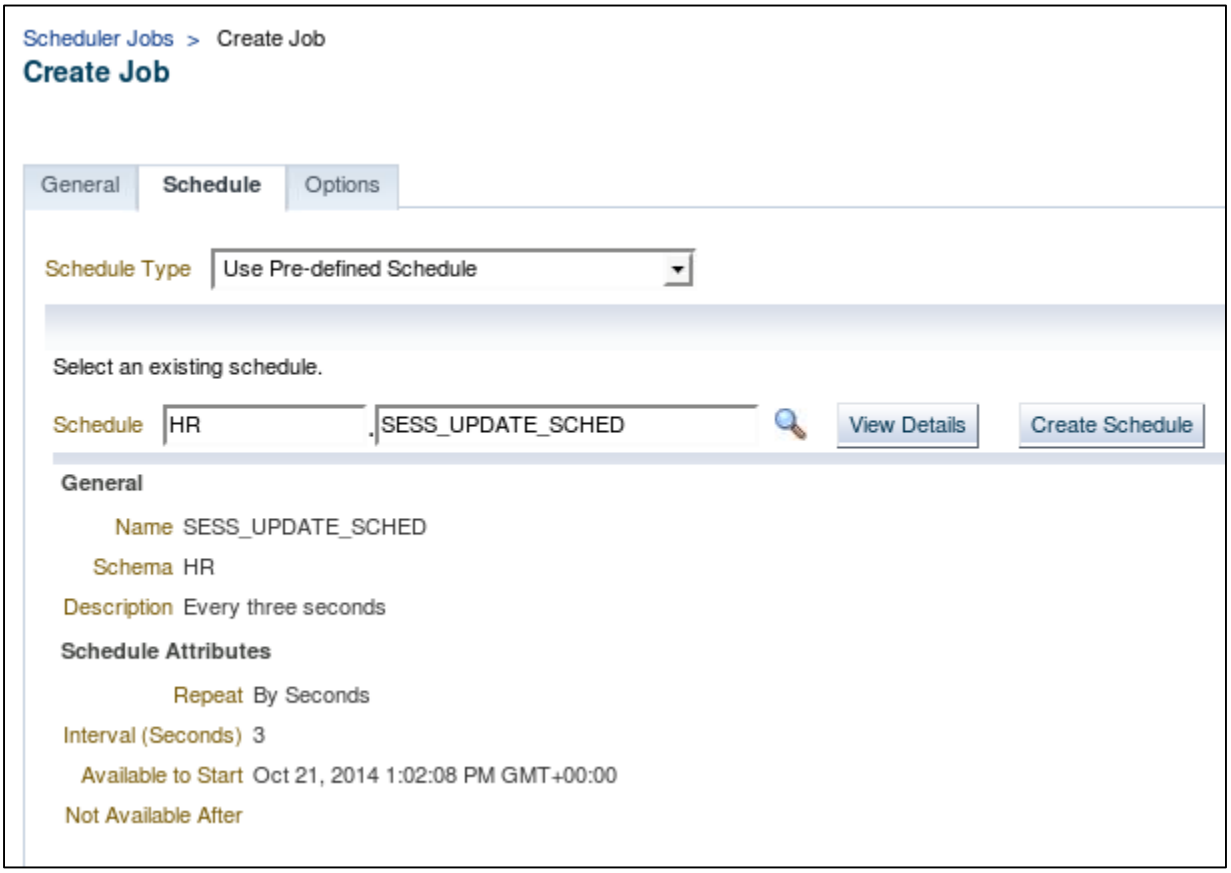
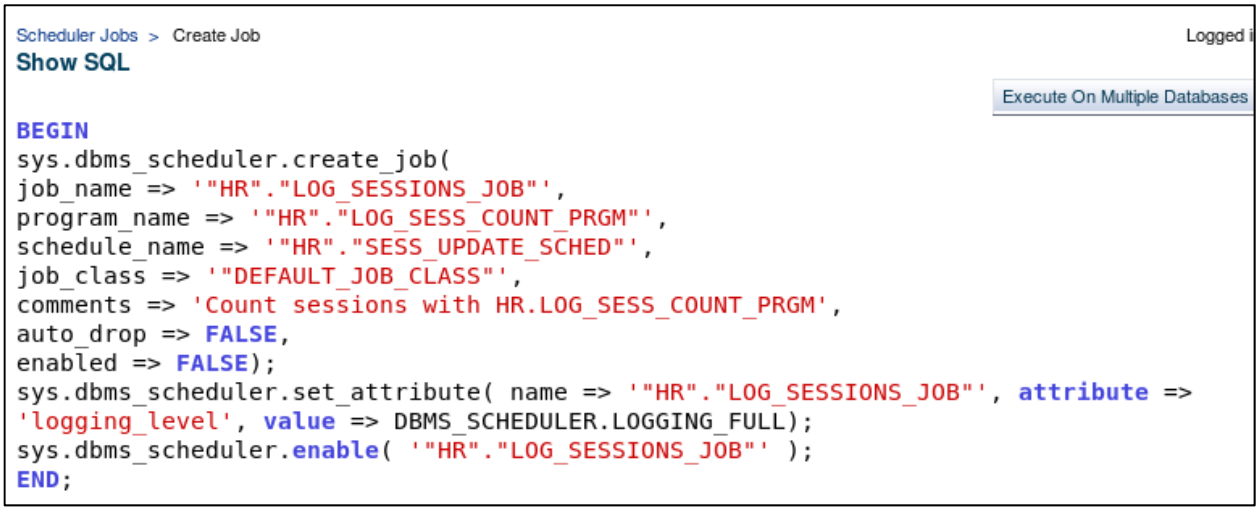
e. Change the Schedule Type to "**Use Pre-Defined Schedule**" and select the **HR.SESS_UPDATE_SCHED** schedule by using the Lookup icon. Click **Show SQL**.



f. Review the statements, and then click **Return**.



g. On the Create Job page, click **OK** to create the job.

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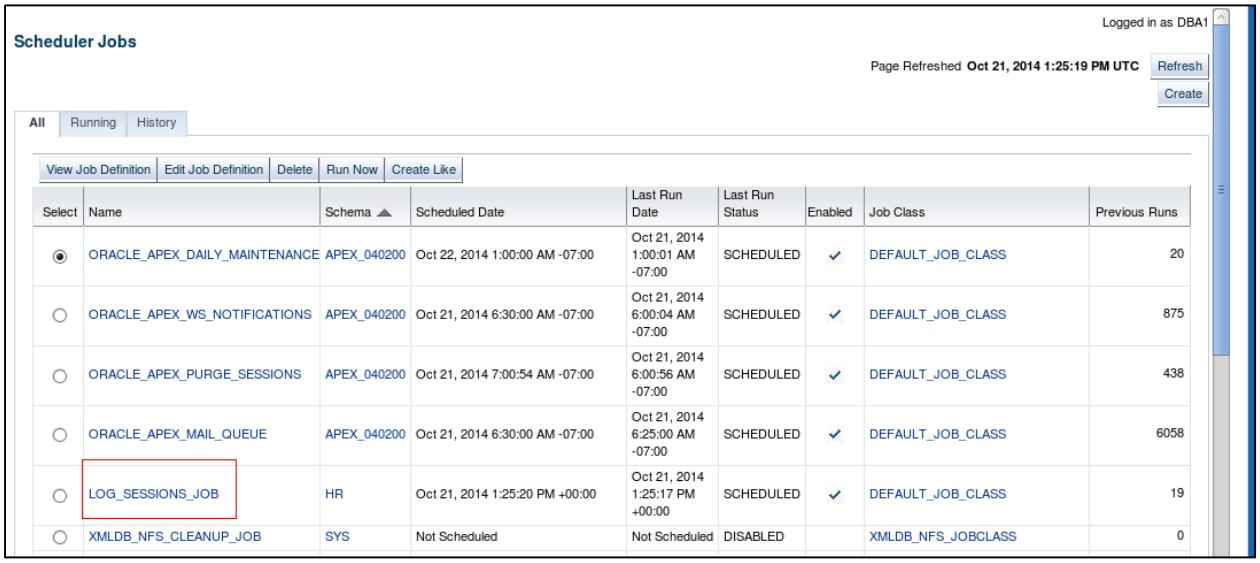
h. You should receive a success message and see the job on the Scheduler Jobs page.



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
------------
...
21-OCT-14 01.27.04.790310 PM
       58

21-OCT-14 01.27.08.887697 PM
       58

21-OCT-14 01.27.12.986016 PM
       58


SNAP_TIME
-------------------------------------------------------------------
NUM_SESSIONS
------------
21-OCT-14 01.27.17.093735 PM
       58
```

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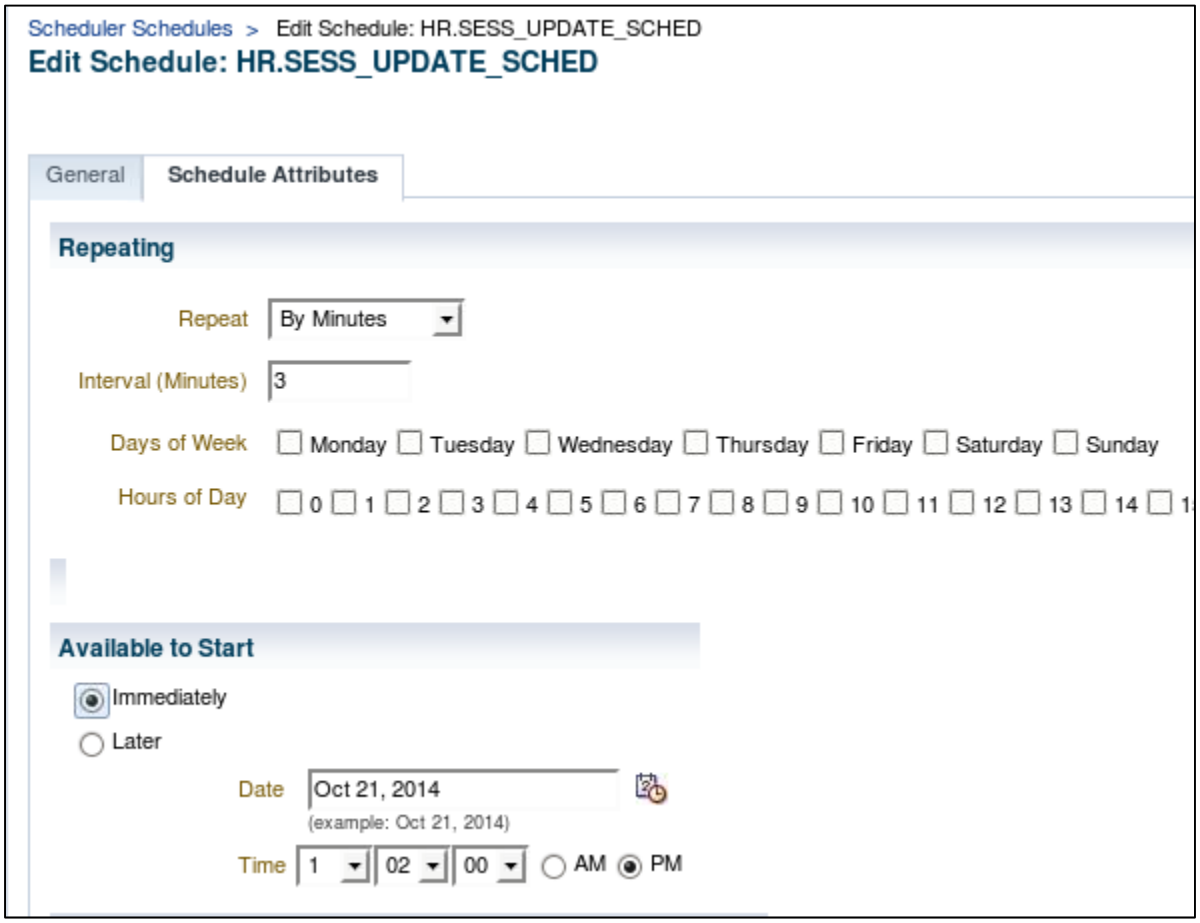
```
52 rows selected.
SQL>
```

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.
   a. In Enterprise Manager, navigate to **Administration** > **Oracle Scheduler** > **Schedules**.
   b. Click the `SESS_UPDATE_SCHED` link.
   c. On the View Schedule page, click **Edit**.
   d. Change the description to “Every three minutes.”
   e. Click **Schedule Attributes** tab to change the value in the **Repeat** drop-down list from By Seconds to **By Minutes**.
   f. Change **Available to Start** to **Immediately**.



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

```
Scheduler Schedules > Edit Schedule: HR.SESS_UPDATE_SCHED                Logged in As DBA1
Show SQL
                                                   Execute On Multiple Databases | Return

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 =>
systimestamp at time zone '0:00');
sys.dbms_scheduler.set_attribute( name =>
'"HR"."SESS_UPDATE_SCHED"', attribute => 'comments', value =>
'Every three minutes');
END;
```

h. Review the statements, click **Return**, and then click **Apply**.

You should receive a success message.

9. In your SQL*Plus session, query the **HR.SESSION_HISTORY** table, ordered by the **SNAP_TIME** column. (Wait for three minutes after you update the schedule.) Enter:

```
SQL> SELECT * FROM HR.SESSION_HISTORY ORDER BY snap_time;

SNAP_TIME
-----------------------------------------------------------------
NUM_SESSIONS
------------
...

21-OCT-14 01.32.43.076946 PM
       58

21-OCT-14 01.32.47.180994 PM
       58

21-OCT-14 01.35.50.726790 PM
       57


SNAP_TIME
-----------------------------------------------------------------
NUM_SESSIONS
------------
21-OCT-14 01.38.50.751317 PM
       57


142 rows selected.
SQL>
```

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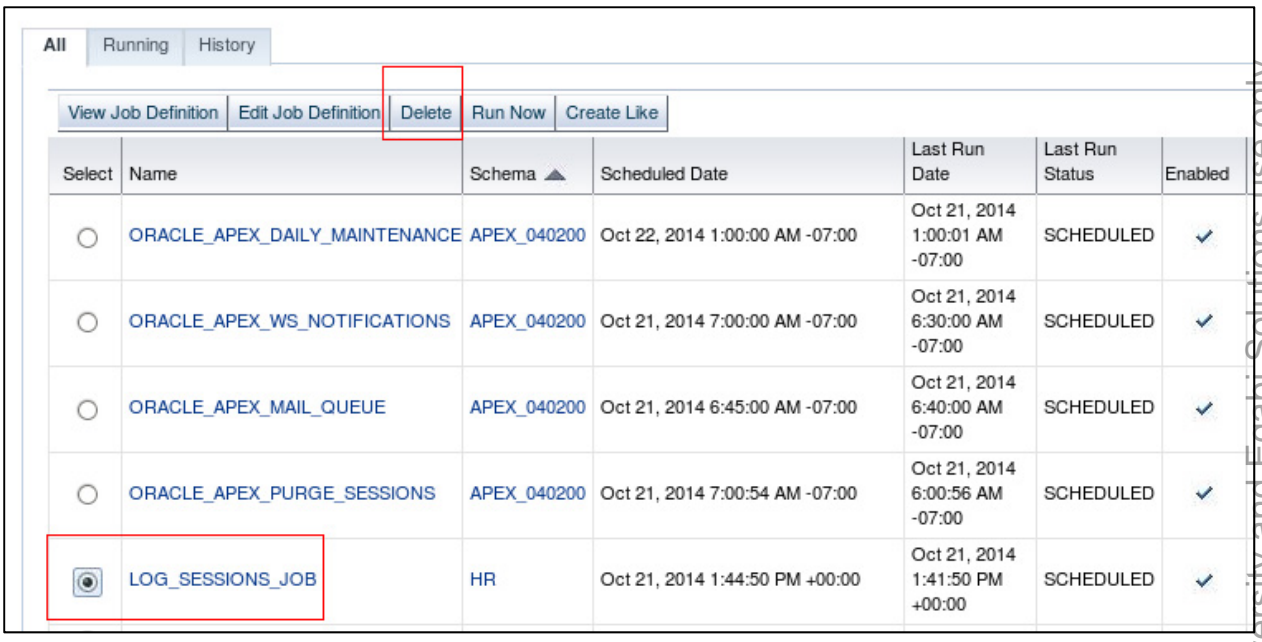
Your results will have different dates (but the minute values should now be three minutes apart).

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 exit from your session.

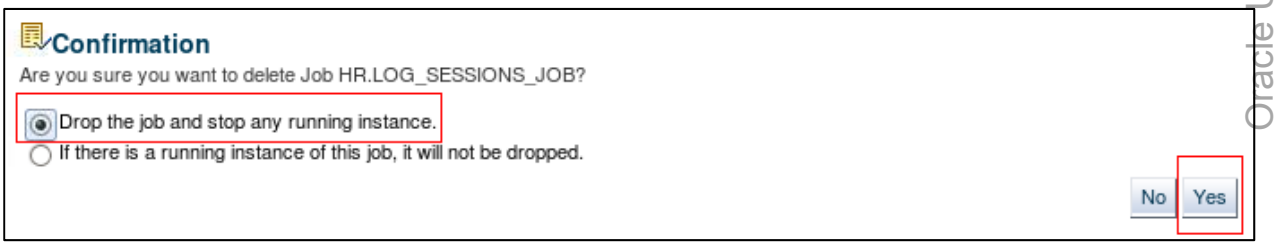
    Note: Make sure that you do not delete the wrong schedule.

    a. Navigate to **Administration** > **Oracle Scheduler** > **Jobs**.

    b. Select the **LOG_SESSIONS_JOB** job and click **Delete**.



    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**.

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f. Select the **LOG_SESS_COUNT_PRGM** program and click **Delete**.

Scheduler Programs

Following are the programs that define what are to be executed in the jobs.

View | Edit | Delete | Create Like | Go

Select	Name	Schema	Enabled	Type	Description
○	AQ$_PROPAGATION_PROGRAM	SYS	✓	STORED_PROCEDURE	AQ propagation program
○	AUTO_SPACE_ADVISOR_PROG	SYS	✓	STORED_PROCEDURE	auto space advisor maintenance program
○	AUTO_SQL_TUNING_PROG	SYS	✓	PLSQL_BLOCK	Program to run automatic sql tuning and SPM evo
○	BSLN_MAINTAIN_STATS_PROG	SYS	✓	PLSQL_BLOCK	Moving window baseline statistics maintenance p
○	FILE_WATCHER_PROGRAM	SYS	✓	STORED_PROCEDURE	File Watcher program
○	GATHER_STATS_PROG	SYS	✓	STORED_PROCEDURE	Oracle defined automatic optimizer statistics colle
○	HS_PARALLEL_SAMPLING	SYS	✓	STORED_PROCEDURE	
◉	LOG_SESS_COUNT_PRGM	HR	✓	PLSQL_BLOCK	
○	ORA$AGE_AUTOTASK_DATA	SYS	✓	STORED_PROCEDURE	deletes obsolete AUTOTASK repository data

g. Click **Yes** to confirm.

h. Navigate to **Administration** > **Oracle Scheduler** > **Schedules**.

i. Select the `SESS_UPDATE_SCHED` schedule and click **Delete**. *Make sure that you do not delete the wrong schedule.*

Scheduler Schedules

Edit | View | Delete | Create Like

Select	Name	Schema	Start Date
○	DAILY_PURGE_SCHEDULE	SYS	
○	FILE_WATCHER_SCHEDULE	SYS	
○	PMO_DEFERRED_GIDX_MAINT_SCHED	SYS	
○	BSLN_MAINTAIN_STATS_SCHED	SYS	Jul 13, 2014 12:00:00 AM -07:00
◉	SESS_UPDATE_SCHED	HR	Oct 21, 2014 1:32:50 PM +00:00

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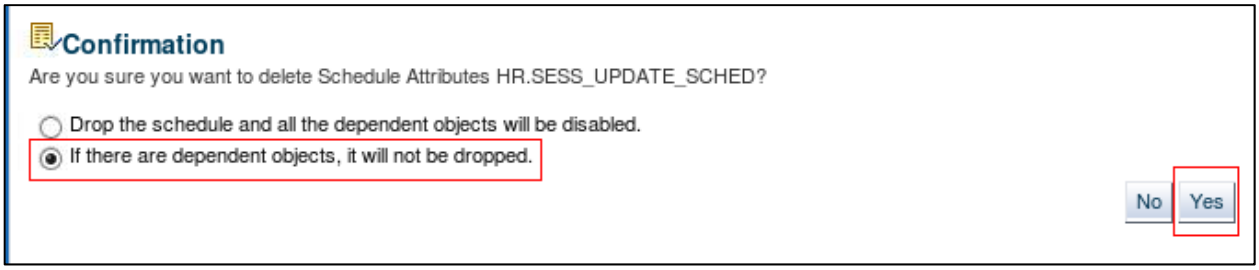
j. Select "**If there are dependent objects, it will not be dropped,**" and then click **Yes** to confirm.



k. 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
$
```

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Practice 21-2: Creating Lightweight Scheduler Jobs

Overview

In this practice, you create and execute lightweight scheduler jobs.

Task

In this optional practice, you create and run a lightweight scheduler job. View the metadata for a lightweight scheduler job. Navigate to your `$LABS/P21` directory.

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/P21` 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/P21
$
```

   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.
```

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```
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.

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Note: Enterprise Manager does not include the `JOB_STYLE` setting at this time.

While you are logged into SQL*Plus as the `SYSTEM` user, execute the `my_lwt_job.sql` script.

```
SQL> @my_lwt_job.sql
SQL> REM For training only
SQL> set echo on
SQL> BEGIN
  2    -- the drop procedure will give and error the first time
  3    -- this script is run
  4    sys.DBMS_SCHEDULER.DROP_JOB('my_lwt_job');
  5  END;
  6  /
BEGIN
*
ERROR at line 1:
ORA-27475: unknown job "SYSTEM"."MY_LWT_JOB"
ORA-06512: at "SYS.DBMS_ISCHED", line 232
ORA-06512: at "SYS.DBMS_SCHEDULER", line 778
ORA-06512: at line 4


SQL>
SQL> DECLARE
  2     jobname VARCHAR2(30);
  3  BEGIN
  4  -- Create the Job
  5  jobname := 'my_lwt_job';
  6  sys.dbms_scheduler.create_job(
  7      job_name => '"SYSTEM"."MY_LWT_JOB"',
  8      program_name => '"SYSTEM"."PROG_1"',
  9      job_class => '"DEFAULT_JOB_CLASS"',
 10      job_style => 'LIGHTWEIGHT',
 11      repeat_interval => 'FREQ=DAILY;INTERVAL=2',
 12      comments => 'Lightweight job',
 13      enabled => TRUE);
 14  END;
 15  /

PL/SQL procedure successfully completed.

SQL>
```

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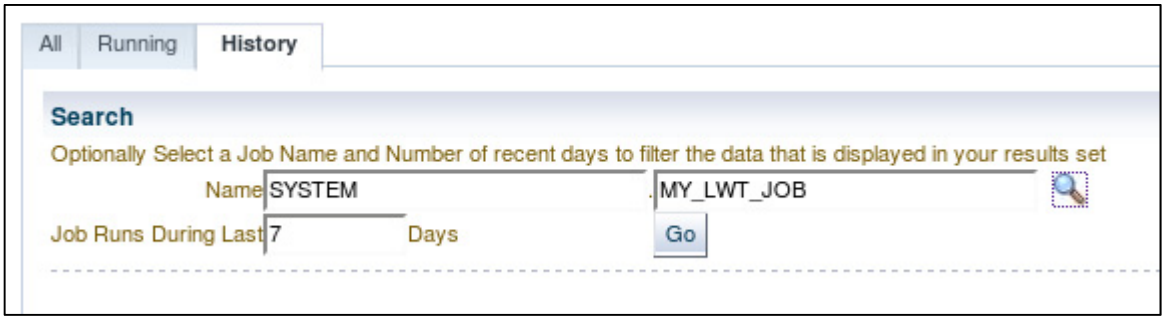
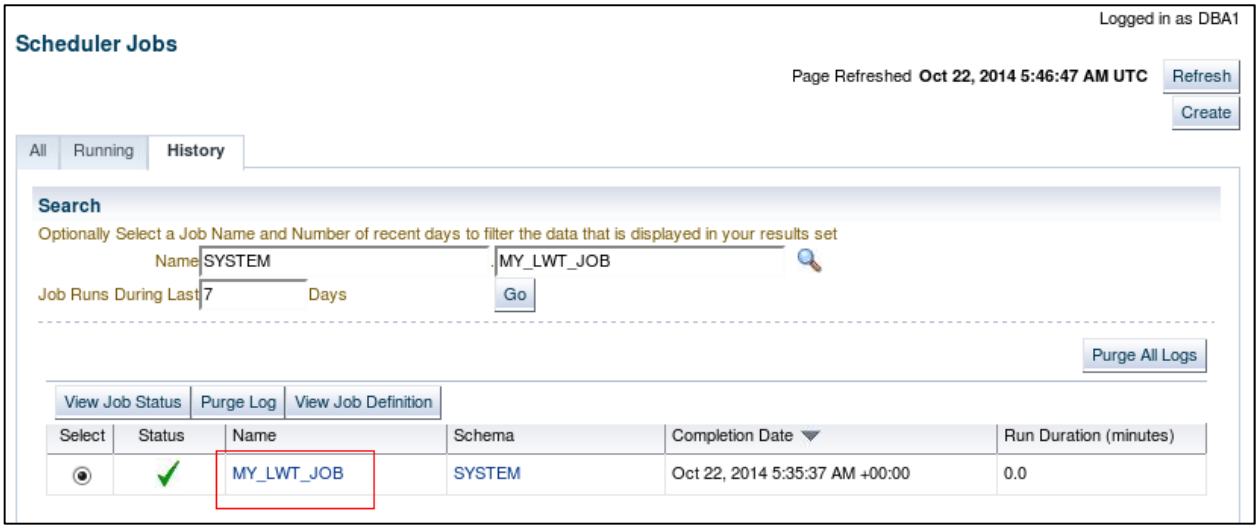
3. Verify that the job was created by querying the `USER_SCHEDULER_JOBS` view.

```
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. Access the Enterprise Manager Cloud Control Scheduler Jobs page, find the `MY_LWT_JOB` job, and view the attributes.
   a. Navigate to **Administration** > **Oracle Scheduler** > **Jobs**. Then click the **History** tab. If you do not see MY_LWT_JOB, you can search for it by clicking the Lookup icon next to the Name field in the search region. Recall that the schema name is SYSTEM. Click **Go**.



   b. View the history of `MY_LWT_JOB`. Click the Job Name to view the job attributes.



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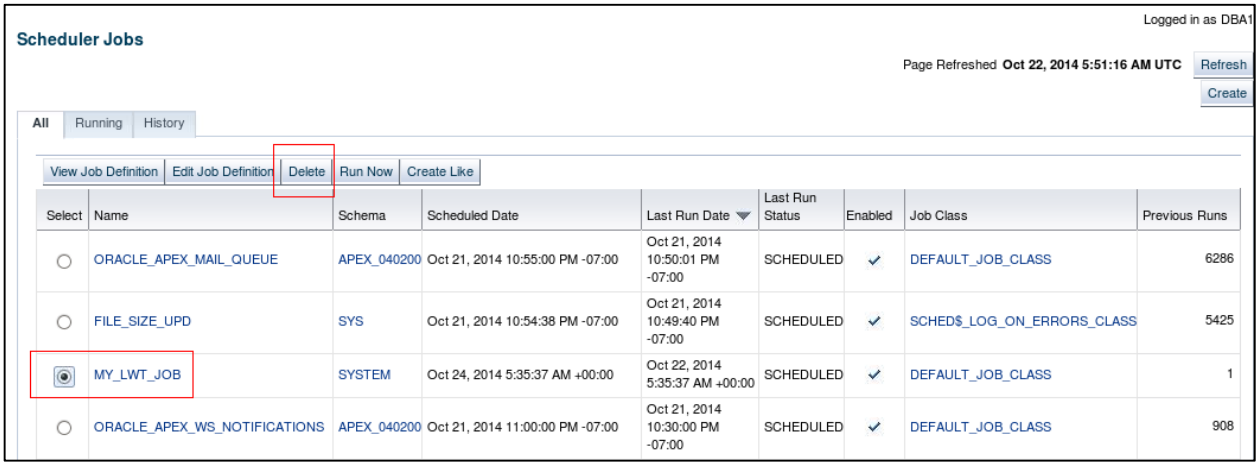
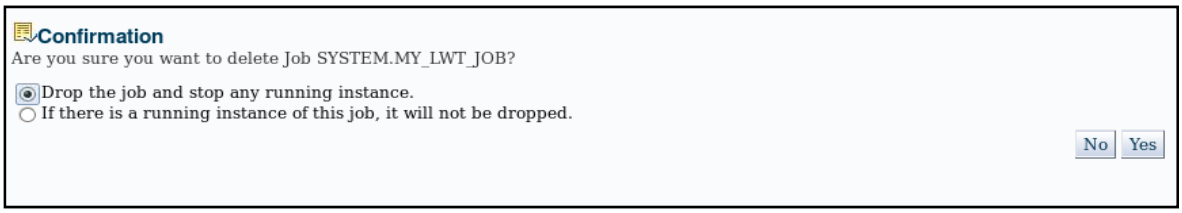
c. After reviewing the details, click **OK**.

5. On the Scheduler Jobs, All page, delete the `MY_LWT_JOB` job.

a. Click the **All** tab on the Scheduler Jobs page. Select the `MY_LWT_JOB` job and click **Delete**. **Hint:** Sort by Last Run Date.



b. On the Confirmation page, select "**Drop the job and stop any running instance**." Click **Yes**.



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Practice 21-3: Monitoring the Scheduler

Overview

In this practice, you view Scheduler components.

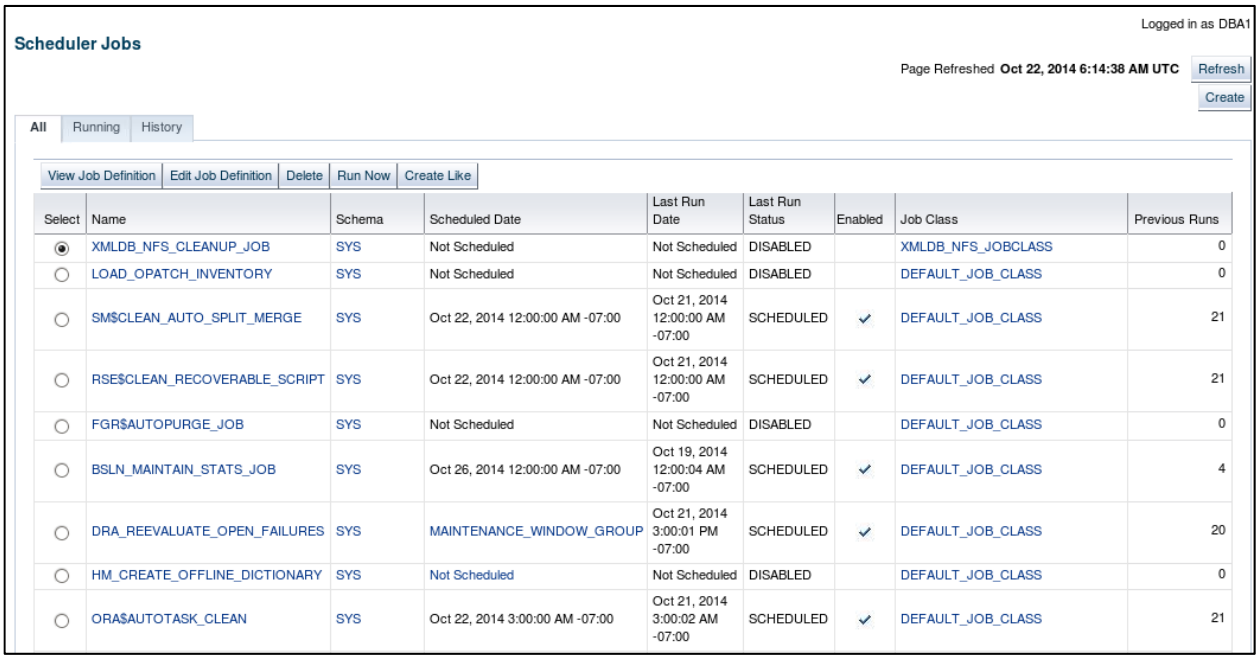
Tasks

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. All scripts for this practice are in the `$LABS/P21` directory.

1. Log in to the `orcl` database target as the `DBA1` user with the `oracle_4U` password.
2. To view the Scheduler jobs, navigate to **Administration** > **Oracle Scheduler** > **Jobs**. Are there any jobs?

   Answer: There are some jobs.



Select	Name	Schema	Scheduled Date	Last Run Date	Last Run Status	Enabled	Job Class	Previous Runs
◉	XMLDB_NFS_CLEANUP_JOB	SYS	Not Scheduled	Not Scheduled	DISABLED		XMLDB_NFS_JOBCLASS	0
○	LOAD_OPATCH_INVENTORY	SYS	Not Scheduled	Not Scheduled	DISABLED		DEFAULT_JOB_CLASS	0
○	SM$CLEAN_AUTO_SPLIT_MERGE	SYS	Oct 22, 2014 12:00:00 AM -07:00	Oct 21, 2014 12:00:00 AM -07:00	SCHEDULED	✓	DEFAULT_JOB_CLASS	21
○	RSE$CLEAN_RECOVERABLE_SCRIPT	SYS	Oct 22, 2014 12:00:00 AM -07:00	Oct 21, 2014 12:00:00 AM -07:00	SCHEDULED	✓	DEFAULT_JOB_CLASS	21
○	FGR$AUTOPURGE_JOB	SYS	Not Scheduled	Not Scheduled	DISABLED		DEFAULT_JOB_CLASS	0
○	BSLN_MAINTAIN_STATS_JOB	SYS	Oct 26, 2014 12:00:00 AM -07:00	Oct 19, 2014 12:00:04 AM -07:00	SCHEDULED	✓	DEFAULT_JOB_CLASS	4
○	DRA_REEVALUATE_OPEN_FAILURES	SYS	MAINTENANCE_WINDOW_GROUP	Oct 21, 2014 3:00:01 PM -07:00	SCHEDULED	✓	DEFAULT_JOB_CLASS	20
○	HM_CREATE_OFFLINE_DICTIONARY	SYS	Not Scheduled	Not Scheduled	DISABLED		DEFAULT_JOB_CLASS	0
○	ORA$AUTOTASK_CLEAN	SYS	Oct 22, 2014 3:00:00 AM -07:00	Oct 21, 2014 3:00:02 AM -07:00	SCHEDULED	✓	DEFAULT_JOB_CLASS	21

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3. Are there any programs? Navigate to **Administration** > **Oracle Scheduler** > **Programs**.

Logged in as DBA1

Scheduler Programs

Following are the programs that define what are to be executed in the jobs.

Create

View | Edit | Delete | Create Like | Go

Select	Name	Schema	Enabled	Type	Description
◉	AQ$_PROPAGATION_PROGRAM	SYS	✓	STORED_PROCEDURE	AQ propagation program
○	AUTO_SPACE_ADVISOR_PROG	SYS	✓	STORED_PROCEDURE	auto space advisor maintenance program
○	AUTO_SQL_TUNING_PROG	SYS	✓	PLSQL_BLOCK	Program to run automatic sql tuning and SPM evolve tasks, see dbmssqlt.sql and dbmsspm.sql
○	BSLN_MAINTAIN_STATS_PROG	SYS	✓	PLSQL_BLOCK	Moving window baseline statistics maintenance program
○	FILE_WATCHER_PROGRAM	SYS	✓	STORED_PROCEDURE	File Watcher program
○	GATHER_STATS_PROG	SYS	✓	STORED_PROCEDURE	Oracle defined automatic optimizer statistics collection program
○	HS_PARALLEL_SAMPLING	SYS	✓	STORED_PROCEDURE	
○	ORA$AGE_AUTOTASK_DATA	SYS	✓	STORED_PROCEDURE	deletes obsolete AUTOTASK repository data
○	PMO_DEFERRED_GIDX_MAINT	SYS	✓	PLSQL_BLOCK	Oracle defined automatic index cleanup for partition maintenance operations with deferred global index maintenance
○	PROG_1	SYSTEM	✓	PLSQL_BLOCK	Insert a timestamp into the test_log
○	PURGE_LOG_PROG	SYS	✓	STORED_PROCEDURE	purge log program

View | Edit | Delete | Create Like | Go

Answer: There are some existing programs.

4. Are there any schedules? Navigate to **Administration** > **Oracle Scheduler** > **Schedules.**

Logged in as DBA1

Scheduler Schedules

Page Refreshed **Oct 22, 2014 6:18:36 AM UTC** Refresh

Create

Edit | View | Delete | Create Like

Select	Name	Schema	Start Date	End Date	Description
◉	DAILY_PURGE_SCHEDULE	SYS			
○	FILE_WATCHER_SCHEDULE	SYS			
○	PMO_DEFERRED_GIDX_MAINT_SCHED	SYS			
○	BSLN_MAINTAIN_STATS_SCHED	SYS	Jul 13, 2014 12:00:00 AM -07:00		Pre-defined schedule for computing moving window baseline statistics

Answer: There are four schedules: DAILY_PURGE_SCHEDULE, FILE_WATCHER_SCHEDULE, PMO_DEFERRED_GIDX_MAINT_SCHED and BSLN_MAINTAIN_STATS_SCHED.

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5. List the Scheduler Windows. Are there any existing windows? Which resource plan is associated with each window? Navigate to **Administration** > **Oracle Scheduler** > **Windows**.

Logged in as DBA1

Scheduler Windows

Following are the system windows that specify resource usage limits based on time-duration windows.

Create

View | Edit | Delete | Create Like | Go

Select	Name	Resource Plan	Enabled	Next Open Date	End Date	Duration (min)	Active	Description
◉	WEEKNIGHT_WINDOW			Jul 7, 2014 10:00:00 PM		480	FALSE	Weeknight window - for compatibility only
○	WEEKEND_WINDOW			Jul 12, 2014 12:00:00 AM		2880	FALSE	Weekend window - for compatibility only
○	WEDNESDAY_WINDOW	DEFAULT_MAINTENANCE_PLAN	✓	Oct 22, 2014 10:00:00 PM		240	FALSE	Wednesday window for maintenance tasks
○	THURSDAY_WINDOW	DEFAULT_MAINTENANCE_PLAN	✓	Oct 23, 2014 10:00:00 PM		240	FALSE	Thursday window for maintenance tasks
○	FRIDAY_WINDOW	DEFAULT_MAINTENANCE_PLAN	✓	Oct 24, 2014 10:00:00 PM		240	FALSE	Friday window for maintenance tasks
○	SATURDAY_WINDOW	DEFAULT_MAINTENANCE_PLAN	✓	Oct 25, 2014 6:00:00 AM		1200	FALSE	Saturday window for maintenance tasks
○	SUNDAY_WINDOW	DEFAULT_MAINTENANCE_PLAN	✓	Oct 26, 2014 6:00:00 AM		1200	FALSE	Sunday window for maintenance tasks
○	MONDAY_WINDOW	DEFAULT_MAINTENANCE_PLAN	✓	Oct 27, 2014 10:00:00 PM		240	FALSE	Monday window for maintenance tasks
○	TUESDAY_WINDOW	DEFAULT_MAINTENANCE_PLAN	✓	Oct 28, 2014 10:00:00 PM		240	FALSE	Tuesday 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	

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Question 1: At which time does this window open? **10 PM**

Question 2: For how long does it stay open? **4 hours**

7. List the Scheduler Job Classes. Are there any Job Classes? Navigate to **Administration** > **Oracle Scheduler** > **Job Classes**.

Logged in as DBA1

Scheduler Job Classes

Page Refreshed **Oct 22, 2014 6:21:47 AM UTC** Refresh

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 among different resource groups and between different job classes.

Create

Edit | View | Delete | Create Like

Select	Name	Logging Level	Log Retention Period (Days)	Resource Consumer Group	Service Name	Description
◉	XMLDB_NFS_JOBCLASS	FAILED RUNS				
○	AQ$_PROPAGATION_JOB_CLASS	RUNS				Default job class for AQ propagation jobs
○	ORA$AT_JCMED_SQ	FULL	1000000	ORA$AUTOTASK		sql tuning advisor
○	ORA$AT_JCNRM_SQ	FULL	1000000	ORA$AUTOTASK		sql tuning advisor
○	ORA$AT_JCURG_SQ	FULL	1000000	ORA$AUTOTASK		sql tuning advisor
○	ORA$AT_JCMED_SA	FULL	1000000	ORA$AUTOTASK		auto space advisor
○	ORA$AT_JCNRM_SA	FULL	1000000	ORA$AUTOTASK		auto space advisor
○	ORA$AT_JCURG_SA	FULL	1000000	ORA$AUTOTASK		auto space advisor
○	ORA$AT_JCMED_OS	FULL	1000000	ORA$AUTOTASK		auto optimizer stats collection
○	ORA$AT_JCNRM_OS	FULL	1000000	ORA$AUTOTASK		auto optimizer stats collection
○	ORA$AT_JCURG_OS	FULL	1000000	ORA$AUTOTASK		auto optimizer stats collection
○	DBMS_JOB$	OFF				This is the job class for jobs created through DBMS_JOB.
○	SCHED$_LOG_ON_ERRORS_CLASS	FAILED RUNS				This is the default job class if you want minimal logging.
○	DEFAULT_JOB_CLASS	RUNS				This is the default job class.

Answer: There are many job classes.

Question 2: Which resource consumer group is associated with the `DEFAULT_JOB_CLASS` job class?

Possible Answer: None

8. 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`.

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Question 2: For which task is this job class used?

Answer: For automatic optimizer statistics collection

9. Click **OK**, and then log out of Enterprise Manager Cloud Control.

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