Oracle Database 12*c*: Data Guard Administration

Activity Guide

D79232GC10

Edition 1.0

February 2014

D85498

ORACLE

Author

Mark Fuller

Technical Contributors and Reviewers

Christopher Andrews, Maria Billings, Trevor Bowen, Harald van Breederode, Larry Carpenter, Al Flournoy, Joe Fong, Gerlinde Frenzen, Joel Goodman, Uwe Hesse, Nitin Karkhanis, Donna Keesling, Sean Kim, Jerry Lee, Stephen Moriarty, Juan Quezada Nunez, Veerabhadra Rao Putrevu, Puneet Sangar, Thorsten Senft, Ira Singer, Branislav Valny

This book was published using: Oracle Tutor

Table of Contents

Practices for Lesson 1: Introduction to Oracle Data Guard 1-1
Practices for Lesson 1: Overview 1-2
Practice 1-1: Laboratory Introduction 1-3

Practices for Lesson 2: Creating a Physical Standby Database by Using Enterprise Manager Cloud Control 2-1
Practices for Lesson 2: Overview 2-2
Practice 2-1: Creating a Physical Standby Database Using Enterprise Manager 2-3
Practice 2-2: Verify and Examine the Data Guard Environment 2-7
Practice 2-3: Generating a Test Workload 2-10
Practice 2-4: Preparing for Command-line Practices 2-11
Practice 2-5: Primary Database Creation 2-16

Practices for Lesson 3: Oracle Net Services in a Data Guard Environment 3-1
Practices for Lesson 3: Overview 3-2
Practice 3-1: Modifying the tnsnames.ora Configuration File 3-3
Practice 3-2: Modifying the listener.ora Configuration File 3-12
Practice 3-3: Correcting Entries to Best Practice Values 3-21

Practices for Lesson 4: Creating a Physical Standby Database by Using SQL and RMAN Commands 4-1
Practices for Lesson 4: Overview 4-2
Practice 4-1: Prepare the Primary Database to Support Data Guard 4-3
Practice 4-2: Prepare Host and Create Physical Standby Database 4-6
Practice 4-3: Start Redo Transport and Verify Operation 4-16

Practices for Lesson 5: Using Oracle Active Data Guard 5-1
Practices for Lesson 5: Overview 5-2
Practice 5-1: Enable Active Data Guard Real-Time Query 5-3
Practice 5-2: Enable Change Tracking on the Physical Standby Database 5-8
Practice 5-3: Add Far Sync to the Data Guard Environment 5-9
Practice 5-4: Add 2nd Far Sync to the Data Guard Environment 5-16

Practices for Lesson 6: Creating and Managing a Snapshot Standby Database 6-1
Practices for Lesson 6: Overview 6-2
Practice 6-1: Convert Physical Standby to a Snapshot Standby 6-3
Practice 6-2: Convert Snapshot Standby Back to Physical Standby 6-8

Practices for Lesson 7: Creating a Logical Standby Database 7-1
Practices for Lesson 7: Overview 7-2
Practice 7-1: Identify Unsupported Objects for Logical Standbys 7-3
Practice 7-2: Create a Logical Standby (Temporarily a Physical) 7-6
Practice 7-3: Start Redo Transport and Verify Operation 7-9
Practice 7-4: Convert Physical Standby to Logical Standby 7-11

Practices for Lesson 8: Oracle Data Guard Broker: Overview 8-1
Practices for Lesson 8: Overview 8-2

Practices for Lesson 9: Creating a Data Guard Broker Configuration 9-1
Practices for Lesson 9: Overview 9-2
Practice 9-1: Establishing Local and Remote Connections with DGMGRL 9-3
Practice 9-2: Create and Enable a Data Guard Broker Configuration 9-6

Practices for Lesson 10: Monitoring a Data Guard Broker Configuration 10-1
Practices for Lesson 10: Overview 10-2
Practice 10-1: Monitoring the Physical Standby Database 10-3
Practice 10-2: Examining Data Guard Log and Trace Files 10-7
Practices for Lesson 11: Configuring Data Protection Modes 11-1
Practices for Lesson 11: Overview 11-2
Practice 11-1: Examining the Maximum Availability Protection Mode 11-3
Practice 11-2: Examining the Maximum Protection Mode 11-10
Practices for Lesson 12: Performing Role Transitions 12-1
Practices for Lesson 12: Overview 12-2
Practice 12-1: Performing Switchover 12-3
Practices for Lesson 13: Using Flashback Database in a Data Guard Configuration 13-1
Practices for Lesson 13: Overview 13-2
Practice 13-1: Configuring Flashback Database on the Primary Database 13-3
Practice 13-2: Configuring Flashback Database on the Physical Standby Database 13-5
Practice 13-3: Configuring Flashback Database on the Logical Standby Database 13-8
Practices for Lesson 14: Enabling Fast-Start Failover 14-1
Practices for Lesson 14: Overview 14-2
Practice 14-1: Enabling Fast-Start Failover 14-3
Practice 14-2: Testing Fast-Start Failover 14-8
Practice 14-3: Switchover to Reinstated Database 14-13
Practices for Lesson 15: Backup and Recovery Considerations in an Oracle Data Guard Configuration 15-1
Practices for Lesson 15: Overview 15-2
Practice 15-1: Creating a Recovery Manager Catalog 15-3
Practice 15-2: Registering Your Database in the Recovery Catalog 15-6
Practice 15-3: Configuring RMAN Parameters 15-9
Practice 15-4: Recovering a Data File on Your Primary Database 15-12
Practices for Lesson 16: Enhanced Client Connectivity in a Data Guard Environment 16-1
Practices for Lesson 16: Overview 16-2
Practice 16-1: Creating and Testing Primary Database Services 16-3
Practices for Lesson 17: Patching and Upgrading Databases in a Data Guard Configuration 17-1
Practices for Lesson 17: Overview 17-2
Practices for Lesson 18: Optimizing a Data Guard Configuration 18-1
Practices for Lesson 18: Overview 18-2
Practice 18-1: Configuring Network Compression of Redo Data 18-3

Practices for Lesson 1: Introduction to Oracle Data Guard

Chapter 1

Practices for Lesson 1: Overview

Practices Overview

In these practices, you will examine the lab environment to become familiar with the lab architecture.

Practice 1-1: Laboratory Introduction

Overview

In this practice you will become familiar with the laboratory environment.

Assumptions

Access to your laboratory environment will be through a graphical display running on your classroom workstation or hosted on a remote machine. Your instructor will provide you with the instructions to access your practice environment. Depending on how you connect to the console for the graphical display, you could be logged in as the `root`, `oracle`, or `vncuser` account initially. The lab practices will indicate which user is needed to perform a particular task. Use the switch user command (`su - username`) to change from the default login account to the account needed for a particular task when necessary. The default password for all three accounts is `oracle`.

The practice environment for this course is hosted on a server (desktop) running Oracle VM Server for x86 as the base installed operating system. Oracle VM Server (OVS) allows for the creation of multiple virtual machines (VMs). Each VM is a logically separate server running a distinct version of Oracle Linux, along with Oracle Database 12*c* Release 1 software and components from Oracle Enterprise Manager Cloud Control 12*c*.

Note: The Oracle VM server is running on your desktop computer, and there are 5 virtual machines running within the Oracle VM server, each running one or more database instances and agent software. Your desktop machines were not sized for this type of workload, so there will be some delays in running the lab tasks. Previous editions of this course required many students to share a single resource. The new architecture allows significantly more Data Guard environments for a single classroom.

Tasks

1. Open a terminal window and determine what account name is the login account. If needed, switch to the `root` user and verify.

```
$ id
uid=500(vncuser) gid=500(vncuser) groups=500(vncuser)
$ su -
Password: oracle
# id
uid=0(root) gid=0(root) groups=0(root), 1(bin), 2(daemon),
3(sys), 4(adm), 6(disk), 10(wheel)
```

   Note: Each classroom where this course is taught could be running a different version of Oracle Virtual Server (OVS). This does not have any effect on the virtual machines running within the OVS, but can impact the desktop being presented to the student. To launch a terminal window, you may be able to right-click anywhere on the desktop background and select a menu item to open a terminal. If this is not available, then try clicking on the top menu bar Applications, Accessories, and then Terminal. Please ask you instructor if these methods do not work.

2. Execute the command **`xm list`**. You should see output similar to the example below. Domain-0 is the Oracle VM Server and is hosting five additional domains.

```
# xm list
Name                        ID   Mem VCPUs      State   Time(s)
Domain-0                     0  1024     2     r-----  25202.6
em12                         1  6656     1     -b----  49533.8
host01                       2  2048     1     -b----   1988.1
host02                       3  1536     1     -b----   1957.8
host03                       4  2048     1     -b----   1939.4
host04                       5  1536     1     -b----   1965.7
```

3. Determine the hostname of Domain-0, the Oracle VM Server that you are currently using. Your output should be different from the example output shown. This will be referred to as dom0 in the lab prompts used for this document.

```
# hostname
edrsr48p1
```

Note: Throughout the labs you will be required to run commands using a terminal window on specific virtual machines. This lab document will list the user account and hostname of the machine that each command should be run on. Your actual prompts will be different.

4. Examine the `/etc/oracle-release` and `/etc/redhat-release` files of Domain-0 to determine the Oracle VM Server for x86 version and also the version of Oracle Linux that it is built with. Additionally, the `uname -a` command will report the kernel version being used.

```
[root@dom0]# cat /etc/oracle-release
Oracle VM Server release 5.7
[root@dom0]# cat /etc/redhat-release
Oracle VM server release 3.2.1
[root@dom0]# uname -a
Linux edrsr48p1 2.6.39-300.22.2.el5uek #1 SMP Fri Jan 4 12:40:29
PST 2013 x86_64 x86_64 x86_64 GNU/Linux
```

Note: Your version of Oracle VM Server may be different than what is shown. Your installation may also not include the oracle-release file depending on your versions. It could also be named ovs-release or enterprise-release. The above example is using Oracle VM Server release 3.2.1 that was built using Oracle Linux x86_64 version 5.7 as a baseline. The Unbreakable Enterprise Kernel Release 2 is being used.

5. (Optional) Domain-0 normally does not install sufficient RPM packages to allow for a graphical desktop or display. In the lab environment, additional RPMs have been installed into Domain-0 to provide for a basic gnome desktop environment along with a few applications such as the Firefox web browser. This is an unsupported environment for Oracle VM Server. Determine the version of Firefox running from Domain-0. To launch Firefox from Domain-0, click the menu items for **Applications**, **Internet**, and then **Firefox Web Browser**. When the application Firefox is running, click the menu item **Help** then **About Firefox** to determine the version of Firefox being used. Close down the Firefox application when the version has been determined.

Note: The version of Firefox is limited by the available libraries and RPMs that have been installed into Domain-0, and cannot be upgraded to the newest available versions. You may be running a different version of Firefox than what is shown here, or Firefox may not even be installed into your Domain-0.

6. Using the SSH client, connect to `host01` as the `root` OS user. Enter `oracle` when you are prompted for the password. In the lab environment, always use the -X option of SSH to enable X11 forwarding back to the Domain-0 console window.

```
[root@dom0]# ssh -X root@host01
root@host01's password: oracle
```

7. Verify that you are on `host01` and execute the command `firefox`. Determine which version of Firefox is being used on `host01`. Exit Firefox when done and also exit the SSH session.

```
[root@host01]# hostname
host01
[root@host01]# firefox
…
[root@host01]# exit
logout
Connection to host01 closed.
```

Note: An icon has been created on the desktop of Domain-0 that will invoke the newer version of Firefox on `host01` running under the `oracle` account and displaying back to Domain-0 for your convenience. For reference, the command being executed by the icon is: `plink -X -ssh -pw oracle -l oracle host01 firefox`. All of the VMs are running Oracle Linux Release 6.3 for the base operating system.

8. You will now learn how to shutdown virtual machines. Open a terminal window on the Domain-0 console and switch to the `root` user if needed. Execute the command **`xm shutdown host04`** to stop the `host04` virtual machine. Verify it has been stopped with the **`xm list`** command. You may need to reissue the **`xm list`** command to allow time for `host04` to completely shutdown.

```
[root@dom0]# xm shutdown host04
[root@dom0]# xm list
Name                        ID   Mem VCPUs      State   Time(s)
Domain-0                     0  1200     4     r-----  25509.4
em12                         7  5120     2     -b----      5.5
host01                       8  1536     1     -b----      9.0
host02                       9  1536     1     -b----      8.3
host03                      10  1536     1     -b----      8.3
```

Note: Any of the other virtual machines can be shutdown using similar syntax and replacing the virtual machine name <host04> with the other virtual machine names. This is equivalent to an operating system shutdown command. Prior to shutting down the virtual machines, it would be best to first stop any Oracle Database resources and Oracle Enterprise Manager Cloud Control resources that may be running.

9. Restart the `host04` virtual machine with the following command: **`xm create host04 /OVS/running_pool/host04/vm.cfg`**. Verify with the **`xm list`** command.

```
[root@dom0]# xm create /OVS/running_pool/host04/vm.cfg
Using config file "/OVS/running_pool/host04/vm.cfg".
Started domain host04 (id=12)
[root@dom0]# xm list
Name                        ID   Mem VCPUs      State   Time(s)
Domain-0                     0  1200     4     r-----  25509.4
em12                         7  5120     2     -b----      5.5
host01                       8  1536     1     -b----      9.0
host02                       9  1536     1     -b----      8.3
host03                      10  1536     1     -b----      8.3
host04                      12  1536     1     r-----      5.9
```

Note: Any of the other virtual machines can be started up using similar syntax and replacing the virtual machine name <host04> with any other virtual machine name in the command.

10. Verify that the Oracle Management Server and Oracle Agent are running on the `em12` virtual machine. You can do this from the Domain-0 with the following commands:

```
plink -X -ssh -pw oracle -l oracle em12
/u01/app/oracle/middleware/oms/bin/emctl status oms
plink -X -ssh -pw oracle -l oracle em12
/u01/app/oracle/agent/agent_inst/bin/emctl status agent
```

Note: If you are asked to store the key in the cache, then type "y" at the prompt.

```
[root@dom0]# plink -X -ssh -pw oracle -l oracle em12
/u01/app/oracle/middleware/oms/bin/emctl status oms
Oracle Enterprise Manager Cloud Control 12c Release 3
Copyright (c) 1996, 2013 Oracle Corporation.  All rights
reserved.
WebTier is Up
Oracle Management Server is Up
[root@dom0]# plink -X -ssh -pw oracle -l oracle em12
/u01/app/oracle/agent/agent_inst/bin/emctl status agent
Oracle Enterprise Manager Cloud Control 12c Release 3
Copyright (c) 1996, 2013 Oracle Corporation.  All rights
reserved.
------------------------------------------------------------
Agent Version     : 12.1.0.3.0
OMS Version       : 12.1.0.3.0
Protocol Version  : 12.1.0.1.0
Agent Home        : /u01/app/oracle/agent/agent_inst
Agent Binaries    : /u01/app/oracle/agent/core/12.1.0.3.0
Agent Process ID  : 1880
Parent Process ID : 1833
Agent URL         : https://em12.example.com:3872/emd/main/
```

```
Repository URL    : https://em12.example.com:4903/empbs/upload
Started at        : 2013-05-14 21:08:33
Started by user   : oracle
Last Reload       : (none)
Last successful upload                       : 2013-05-14
22:13:58
Last attempted upload                        : 2013-05-14
22:13:58
Total Megabytes of XML files uploaded so far : 0.11
Number of XML files pending upload           : 0
Size of XML files pending upload(MB)         : 0
Available disk space on upload filesystem    : 60.99%
Collection Status                            : Collections
enabled
Heartbeat Status                             : Ok
Last attempted heartbeat to OMS              : 2013-05-14
22:13:58
Last successful heartbeat to OMS             : 2013-05-14
22:13:58
Next scheduled heartbeat to OMS              : 2013-05-14
22:14:58

---------------------------------------------------------------
Agent is Running and Ready
```

Note: If the Oracle Management Server and Oracle Agent are not running, they can be started with the following sequence of commands:

a. **ssh -X oracle@em12** (Password is oracle)

b. **. oraenv**
   emrep

c. **lsnrctl start**

d. **sqlplus / as sysdba**
   startup
   quit

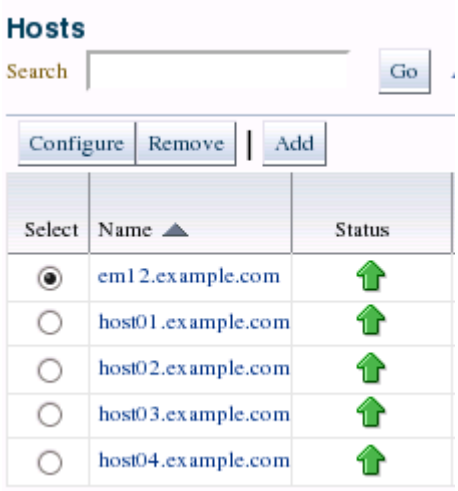
e. **/u01/app/oracle/middleware/oms/bin/emctl start oms**

f. **/u01/app/oracle/agent/agent_inst/bin/emctl start agent**

Note: The following commands can be used to shutdown Oracle Enterprise Manager Cloud Control 12*c* on the `em12` virtual machine.

a. **`ssh -X oracle@em12`** `(Password is oracle)`
b. **`/u01/app/oracle/middleware/oms/bin/emctl stop oms -all`**
c. **`/u01/app/oracle/agent/agent_inst/bin/emctl stop agent`**
d. **`. oraenv`**
   `emrep`
e. **`sqlplus / as sysdba`**
   `shutdown`
   `quit`
f. **`lsnrctl stop`**

11. Use the icon on the desktop to launch Firefox on `host01`. The default web page should be stored as https://em12.example.com:7802/em and prompt for a login to Enterprise Manager Cloud Control 12*c*. The URL will change after it is entered and used. Log in to the application with the credentials of **`sysman`** for user name and **`oracle_4U`** for the password. The password is case sensitive. Select from the menu **Targets** and then **Hosts**, and verify that the agent is running on all five virtual machines.



12. Click "Log Out" in the upper right corner of the application and then exit Enterprise Manager Cloud Control 12*c* when done.

Practices for Lesson 2: Creating a Physical Standby Database by Using Enterprise Manager Cloud Control

Chapter 2

Practices for Lesson 2: Overview

Practices Overview

In these practices, you will use Oracle Enterprise Manager Cloud Control 12*c* Release 3 (12.1.0.3.0) to create a physical standby database. You will then use Oracle Enterprise Manager Cloud Control 12*c* to verify, examine, test, and monitor the Data Guard Environment.

Practice 2-1: Creating a Physical Standby Database Using Enterprise Manager

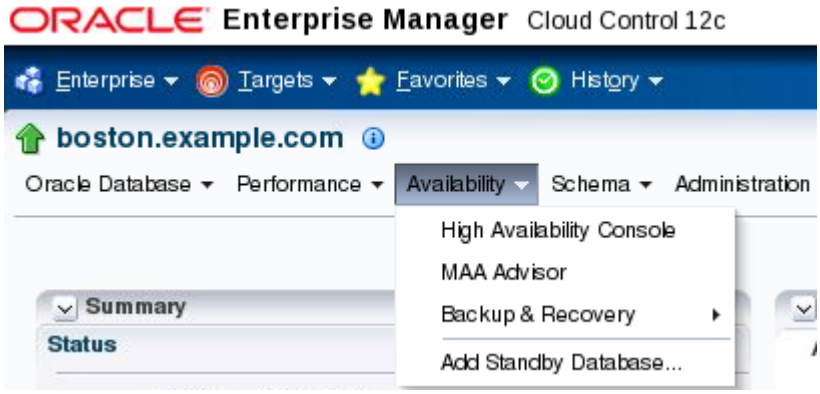
Overview

In this practice you create a physical standby database using Oracle Enterprise Manager Cloud Control 12*c* Release 3 (12.1.0.3.0). In preparation for this lab and to save time, Enterprise Manager has already been installed on the virtual machine `em12.example.com`. On the other 4 virtual machines (host01, host02, host03, host04), the Oracle Database 12*c* Release 1 (12.1.0.1.0) software binaries have been installed into the following directory: `/u01/app/oracle/product/12.1.0/dbhome_1`. In addition to the Oracle Database software binaries, the Oracle Enterprise Manager agent has been deployed on each machine to the following directory: `/u01/app/oracle/agent`. Global default and target preferred credentials were defined for each host.

Tasks

1. Use the icon on the desktop to launch Firefox on host01. The default web page should be stored as https://em12.example.com:7802/em and prompt for a login to Enterprise Manager Cloud Control 12*c*. Log in to the application with the credentials of **`sysman`** for user name and **`oracle_4U`** for the password. The password is case sensitive.

   Note: The default home page displayed to the user when logging in can be changed. It is currently set to display the **All Targets** web page. To change the home page for the user, click the username in the top right corner (`SYSMAN`), and then select **Welcome Page** from the drop down menu that appears. You can change your default home page if desired. This is a matter of job role and personal preference. In this lab document, navigation instructions will be provided using the top level menu bar that is available on all personal home pages.
2. Navigate to the Databases page by selecting **Targets**, and then **Databases** from the drop down menu that appears. You should see two databases that have been discovered by Oracle Enterprise Manager Cloud Control. The `emrep.example.com` database is the repository database used by Oracle Enterprise Manager Cloud Control. Do not make any modifications to this database.
3. Navigate to the **`boston.example.com`** specific database page by clicking on its name from the databases page.
4. Launch the **Add Standby Database** wizard by selecting it from the Availability menu.



5. On the Add Standby Database Wizard page, select the option to "**Create a new physical standby database**" and then click **Continue**.

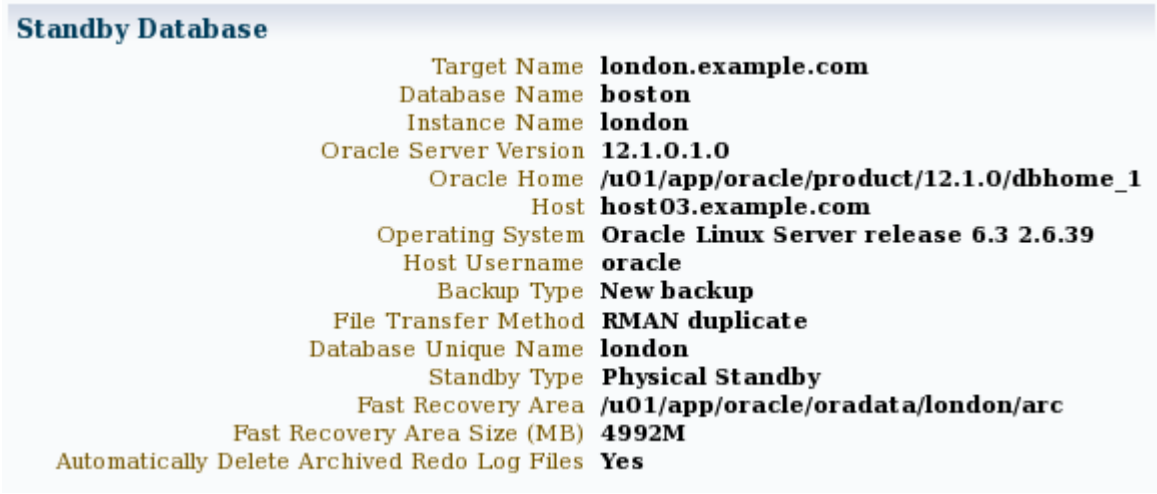
6. On the Add Standby Database: Backup Type page (step 1 of 6), select "**Online Backup**", the option to "**Use Recovery Manager (RMAN) to copy database files**" and then click **Next**.
7. On the Add Standby Database: Backup Options page (step 2 of 6), set the degree of parallelism to **1**. In the Primary Host Credentials section, select the "**Named**" option for the type of credential and then set the credential name to "`NC_HOST_ORACLE`." In the Primary Database Standby Redo Log Files section, **uncheck** the box to use Oracle-managed files (OMF). Provide the following file names for the Standby Redo Logs that will be created on the primary database:

Log File Location
/u01/app/oracle/oradata/boston/**stbyredo01.log**
/u01/app/oracle/oradata/boston/**stbyredo02.log**
/u01/app/oracle/oradata/boston/**stbyredo03.log**
/u01/app/oracle/oradata/boston/**stbyredo04.log**

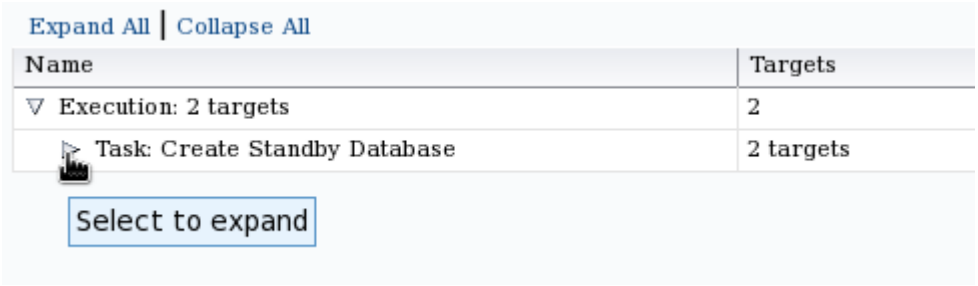
   Click **Next** to Continue
8. On the Add Standby Database: Database Location page (step 3 of 6), change the **Instance Name** in the Standby Database Attributes section to "**`london`**" and verify that the Database Storage option is set to File System. In the Standby Database Location section, change the **Host** field to **`host03`**`.example.com` and verify the Oracle Home is set to `/u01/app/oracle/product/12.1.0/dbhome_1`. In the Standby host Credentials section, verify that the Named credential option is selected and that the Credential Name is set to `NC_HOST_ORACLE`. Click **Next** to continue.
9. On the Add Standby Database: File Locations page (step 4 of 6), verify that the "**Use Oracle Optimal Flexible Architecture-compliant directory structure (OFA)** is selected and then click the **Customize** button within that section. A table of the Primary Database Names mapped to corresponding Standby Database Names is displayed for datafiles, tempfiles, logfiles, and control files. For each of entries, the primary name "`boston`" is converted to the standby name "`london`". Click **OK** to return to the previous page.

   Note: A Warning message is displayed indicating that 2 files already exist on the standby database host and will be overwritten. Those files are `sale1v3.dat` and `qopiprep.bat`. The warning message also indicates that the Fast Recovery Area directory does not exist on the standby database host and that it will be created automatically. Click **Continue**.
10. While still on the Add Standby Database: File Location page (step 4 of 6), enter **`LISTENER`** for the Listener Name and **1521** the Primary Database Port. Click **Next**.
11. On the Add Standby Database: Configuration page (step 5 of 6), change the **Database Unique Name** to "**`london`**" and the **Target Name** to "**`london.example.com`**". Verify that the Standby Archive Location is set to the value: `/u01/app/oracle/oradata/london/arc`. The Use Data Guard Broker should be checked in the Data Guard Broker section. Click **Next**.

12. On the Add Standby Database: Review page (Step 6 of 6), verify the accuracy of the typed entries. If any entry has been typed incorrectly, click the back button as many times as needed and correct it. When satisfied, click **Finish**.



13. An information dialog is returned containing a link "**View Job**." Click the View Job link to navigate to the Job Activity page for the `boston.example.com` database. The **Auto Refresh** option is currently set to "Off." Change this to a **30** second refresh interval.
14. Expand the Task: Create Standby Database by clicking the triangle next to the task as shown in the picture below.



Note: This process will take several minutes to complete. Avoid using the desktop computer for other tasks while this is running. You may need to expand the items again each time the page refreshes.

15. The job will fail at the last step. Verify that steps 1 through 11 have succeeded as shown in the pictures below. You will need to click the link "**Next 11 - 12 of 12**" to display the remaining two steps.

Name	Targets	Status
Task: Create Standby Database	2 targets	Failed
Previous		
Step: Source Validation		Succeeded
Step: Source Preparation	boston.example.com	Succeeded
Step: Create Control File	boston.example.com	Succeeded
Step: Destination Directories Creation	host03.example.com	Succeeded
Step: Transfer Initialization Files via HTTP	2 targets	Succeeded
Step: Transfer Password Files via HTTP	2 targets	Succeeded
Step: Destination Preparation	host03.example.com	Succeeded
Step: Duplicate Database	boston.example.com	Succeeded
Step: Re-create Control File	boston.example.com	Succeeded
Step: Recover Database	host03.example.com	Succeeded
Next 11 - 12 of 12		

Name	Targets	Status
Task: Create Standby Database	2 targets	Failed
Previous 1 - 10 of 12		
Step: Create Standby Database	host03.example.com	Succeeded
Step: Transfer One External File via HTTP	2 targets	Failed
Next		

16. Click the link "**Previous 1 - 10 of 12**" to redisplay the first 10 steps. In the Status column, click the **Succeeded** link for the row "**Step: Destination Preparation**." The output log shows the network listener being started on the standby host, along with a static service "`london_DGMGRL.example.com`" that was created. Scroll to the beginning of the page if necessary and click the link "**Task: Create Standby Database**" to return to the display of the first 10 steps.
17. In the Status column, click the **Succeeded** link for the row "**Step: Duplicate Database**." The output log contains the Recovery Manager (RMAN) script that was used to perform the online backup of the primary database.
18. On the main Enterprise Manager menu, click **Targets** and then **Databases**. You should now see an entry for the `london.example.com` physical standby database instance.

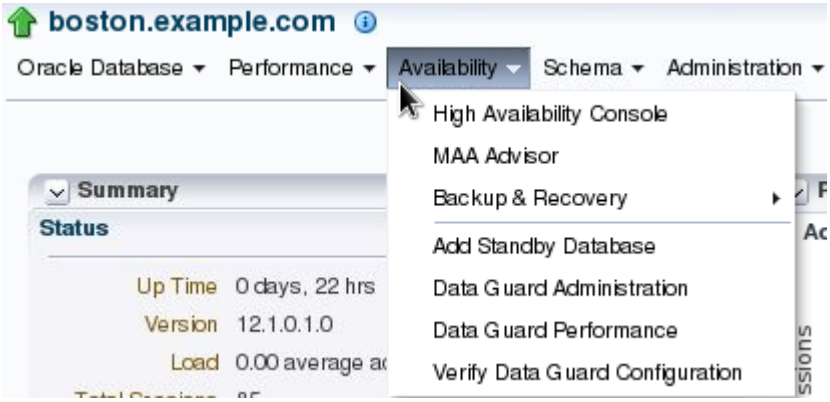
Practice 2-2: Verify and Examine the Data Guard Environment

Overview

In this practice you will verify the Data Guard configuration and examine some of the changes implemented by the Add Standby Database wizard.

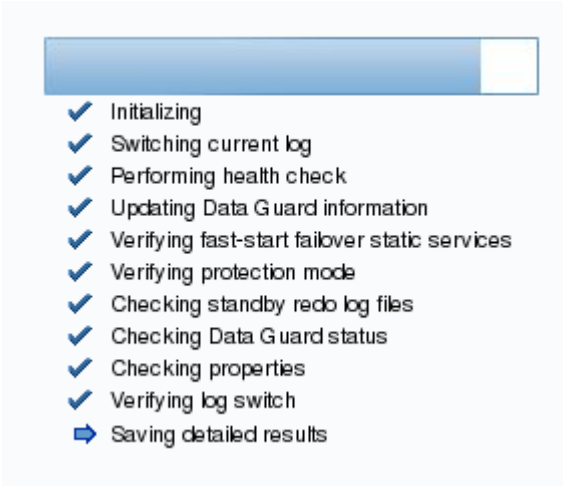
Tasks

1. While still on the Targets -> Databases page from the last lab step, click on the link for the primary database instance `boston.example.com` to navigate to its home page. Click on the Availability menu item and note that the only Data Guard related item is the Add Standby Database wizard as shown in the picture of Practice 2-1 Step 4. Click the "Log Out" menu item in the top right corner. When prompted, select the option to "Logout of Enterprise Manager and all targets."
2. Login to Enterprise Manager Cloud Control 12*c*. Log in to the application with the credentials of **`sysman`** for user name and **`oracle_4U`** for the password. The password is case sensitive. Navigate to the Databases page by selecting **Targets**, and then **Databases** from the drop down menu that appears. On the Databases page, click the link for the `boston.example.com` target.
3. On the boston.example.com database home page, click the Availability menu item and note the additional menu entries.



Note: If only the "Add Standby Database" link is visible, then select it. It will not launch the "Add Standby Database" wizard, but instead will navigate to the Data Guard home page.

4. Select the "Verify Data Guard Configuration" item from the menu. The picture below shows the steps performed while verifying the configuration. After verification completes, detailed results are then displayed.



Note: If your menu does not have the link "Verify Data Guard Configuration", then use the link "**Verify Configuration**" located in the bottom section of the page. The verify process will complete with warnings. You can ignore the 2 warnings regarding the step to check the agent status.

5. Click **OK**. The Data Guard Administration page is then displayed.
6. Examine initialization parameter changes implemented by the Add Standby Database wizard for the primary database. Click **Administration** > **Initialization Parameters**. Click the **Show All** button to display a complete list of initialization parameters on a single web page. You can click the triangle in the Name column to sort the values by Name.

Name	Value
dg_broker_config_file1	/u01/app/oracle/fast_recovery_area/dr1boston.dat
dg_broker_config_file2	/u01/app/oracle/fast_recovery_area/dr2boston.dat
dg_broker_start	TRUE
log_archive_config	dg_config=(boston,london)
log_archive_dest_2	'valid_for=(online_logfile,all_roles)', 'service="(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=host03.example.com)(PORT=1521))(CONNECT_DATA=(SERVICE_NAME=london.example.com)(SERVER=DEDICATED)))"', 'ASYNC NOAFFIRM delay=0 optional compression=disable max_failure=0 max_connections=1 reopen=300 db_unique_name="london" net_timeout=30'

Additional Data Guard related initialization parameters include (not a complete list): `archive_lag_target`, `db_file_name_convert`, `fal_client`, `fal_server`, `log_file_name_convert`, `log_archive_max_processes`, `log_archive_min_succeed_dest`, `log_archive_dest_n`, `log_archive_dest_state_n`, and `standby_file_management`.

7. Select **Targets** > **All Targets** from the menu. It may be necessary to click the red 'X' icon in the refine search section to remove any search filters. This will allow a complete list of targets to be displayed. You can also click the Home icon in the top right corner since the personal home page was set to display all targets. Select Target Type of **Listener** in the refine search section. Notice that only 2 listeners have been discovered by Enterprise Manager. They include `LISTENER_em12.example.com` and `LISTENER_host01.example.com`.
8. Discover the network listener that was created on host03. Select **Setup** > **Add Target** > **Configure Auto Discovery** from the menu. In the Agent-based Auto Discovery Section, click the **wrench icon** next to the row item "**All Discovery Modules**." To highlight the row, click on the gray background area within the first un-named column next to Agent Host Name **host03.example.com** or within the row section underneath "Enabled Discovery Modules." Avoid clicking the active links that will navigate away from this page. With the row highlighted, click the "**Run Discovery Now**" link. Click "**Yes**" on the dialog window that appears. Click **Close** on the completion dialog window that appears.
9. For the row with the Agent Host Name of "host03.example.com", click the number **1** in the column "**Discovered Targets**." You should now see the network listener for host03. **Highlight the row** containing LISTENER_host03.example.com and click the **Promote** link. On the Promote Unmanaged Target page that appears, click the **Promote** button leaving all fields with default values. Click **Close** on the promote target confirmation dialog that appears. Click **Targets** > **All Targets** to return to the list of Listeners. Select the **LISTENER_host03.example.com** link to navigate to its web page.
10. On the LISTENER_host03.example.com page, select from the menu **Oracle Listener** > **Edit Listener**. Select the **Named** option for the Credential and then select **NC_HOST_ORACLE** for the Credential Name. Click the **Login** button. Click the "Static **Database Registration**" tab to view the Service Name entry (london_DGMGRL.example.com) that was created for the Data Guard broker. Click **Cancel** to exit out of the Edit Listener page.

Practice 2-3: Generating a Test Workload

Overview

In this practice, you will generate a test workload on the primary database that will cause log switches to occur. Enterprise Manager graphs will then be examined to display redo generation rates, lag times, and apply rates.

Tasks

1. With the navigation techniques learned from previous steps, navigate to the `boston.example.com` database home page. From the menu, select **Availability** > **Data Guard Performance**.

   Note: If the menu doesn't show this link, then select **Availability** > **Add Standby Database**. If you are taken to the Add Standby Database wizard, then click the **Cancel** button. You will then be taken to the Data Guard home page for the boston primary database. From there, you can find a Data **Guard Performance** link in the lower left section of the web page.
2. In the Test Application section, click the **Start** button to generate a load on the primary database.
3. Click the **Refresh Page icon** periodically located next to the View Data field. After running for a few minutes, the 3 graphs on the Data Guard Performance page should begin to reflect the workload being generated for the Data Guard environment. You should see the Transactions per second number increase. You can click any of the charts to display historical metrics.
4. When you have finished analyzing the graphs, click the **Stop** button in the Test Application section.
5. You can explore using Enterprise Manager in a Data Guard environment for the current two databases. Both databases (boston.example.com and london.example.com) will be deleted in the next section in preparation for learning to manage a Data Guard environment using command-line tools.

Practice 2-4: Preparing for Command-line Practices

Overview

In this practice, you will remove the `boston.example.com` from `host01` and the `london.example.com` database from `host03` in preparation for command-line practices.

Tasks

1. Navigate to the **boston.example.com** database home page. Click **Availability** > **Data Guard Administration** from the menu. In the Standby Databases section, click the **Remove** button. Click "**Yes**" on the confirmation page.

   Note: If the menu doesn't show this link, then select **Availability** > **Add Standby Database**. If you are taken to the Add Standby Database wizard, then click the **Cancel** button. You will then be taken to the Data Guard home page for the boston primary database.
2. Navigate to **Targets** > **Databases**. Highlight the row for the `london.example.com` database and click the **Remove** link. Click the **Yes** button on the Warning page. Highlight the row for the boston.example.com database and click the **Remove** link. Click the **Yes** button on the Warning page.
3. Click **Targets** > **All Targets** on the menu. Remove any filters in the Refine Search area if needed to display a complete list of targets. Click the "**Listener (3)**" link found under the tree structure Target Type > Databases > Listener within the Refine Search section. The three listeners should be listed: `LISTENER_em12.example.com`, `LISTENER_host01.example.com`, and `LISTENER_host03.example.com`.
4. Without clicking, hover the mouse pointer on top of the row `LISTENER_host01.example.com`. The row should highlight. **Right-click** using the mouse button to display a context menu. Select **Target Setup** > **Remove Target** from the menu. Click the **Yes** button on the confirmation window that appears. Click **OK**.
5. Repeat step 6 and remove `LISTENER_host03.example.com`.
6. Click the "**Log Out**" menu item in the top right corner. Close down the Firefox browser session and return to the Domain-0 console desktop.
7. Open a terminal session if needed. Switch to the root account. In the home directory, launch the stopcloudcontrol.sh script. Enter "y" to Store the key in cache if you are prompted on each machine.

```
[anyuser@dom0]$ su -
Password: oracle

[root@dom0]$ ./stopcloudcontrol.sh
***** Stopping agent on host01 *****
Oracle Enterprise Manager Cloud Control 12c Release 3
Copyright (c) 1996, 2013 Oracle Corporation.  All rights
reserved.
Stopping agent ..... stopped.
***** Stopping agent on host02 *****
Oracle Enterprise Manager Cloud Control 12c Release 3
Copyright (c) 1996, 2013 Oracle Corporation.  All rights
reserved.
```

```
Stopping agent ..... stopped.
***** Stopping agent on host03 *****
Oracle Enterprise Manager Cloud Control 12c Release 3
Copyright (c) 1996, 2013 Oracle Corporation.  All rights
reserved.
Stopping agent ..... stopped.
***** Stopping agent on host04 *****
Oracle Enterprise Manager Cloud Control 12c Release 3
Copyright (c) 1996, 2013 Oracle Corporation.  All rights
reserved.
Stopping agent ..... stopped.
***** Stopping OMS on em12 *****
Oracle Enterprise Manager Cloud Control 12c Release 3
Copyright (c) 1996, 2013 Oracle Corporation.  All rights
reserved.
Stopping WebTier...
WebTier Successfully Stopped
Stopping Oracle Management Server...
Oracle Management Server Successfully Stopped
AdminServer Successfully Stopped
Oracle Management Server is Down
***** Stopping agent on em12 *****
Oracle Enterprise Manager Cloud Control 12c Release 3
Copyright (c) 1996, 2013 Oracle Corporation.  All rights
reserved.
Stopping agent ..... stopped.
```

Note: Oracle Enterprise Manager Cloud Control will not be used again in this course, but the configuration has been preserved if needed.

8. Stop the em12 virtual machine. Verify that the VM has been stopped.

```
[root@dom0]# xm shutdown em12
[root@dom0]# xm list
Name      ID   Mem VCPUs      State   Time(s)
Domain-0   0   810     4     r-----  10855.2
host01     7  2048     1     -b----   4313.0
host02     8  1536     1     -b----    338.3
host03     9  2048     1     -b----   2771.5
host04    10  1536     1     -b----    339.9
```

Note: You may need to reissue the XM LIST command if needed while waiting on the virtual machine to stop.

9. Open a terminal session to host03 using the oracle operating system account.

```
[root@dom0]# ssh -X oracle@host03
oracle@host03's password: oracle
Last login: Wed Jul 24 01:11:30 2013 from 192.0.2.1
```

10. Use the oraenv utility to set the environment variables for the `london` database instance.

```
[oracle@host03]$ . oraenv
ORACLE_SID = [oracle] ? london
The Oracle base has been set to /u01/app/oracle
```

11. Startup the London database using SQL*Plus, open the database and then exit SQL*Plus.

```
[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Jul 24 04:52:07
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

SQL> alter database open;
Database altered.

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

12. Start the Database Configuration Assistant (DBCA) utility.

```
[oracle@host03]$ dbca
```

   a. Select **Delete Database** on the Database Operation window. Click **Next**.
   b. Select the '**london**' database on the Delete Database window. Click **Next**.
   c. **Uncheck** the box to deregister from Enterprise Manager on the Management Options window. The database has already been deleted from Enterprise Manager. Click **Next**.
   d. Click **Finish** on the Summary window.
   e. Click **Yes** on the information dialog that appears.
   f. Click **OK** on the information dialog that appears.
   g. Click **Close** to exit the DBCA utility.

13. Stop the network listener on machine host03.

```
[oracle@host03]$ lsnrctl stop
LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 24-JUL-
2013 04:57:11
Copyright (c) 1991, 2013, Oracle.  All rights reserved.
Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=host03.example.com)(PO
RT=1521)))
The command completed successfully
```

14. Navigate to the `$ORACLE_HOME/network/admin` directory and delete the network configuration files.

```
[oracle@host03]$ cd $ORACLE_HOME/network/admin
[oracle@host03]$ rm tnsnames*
[oracle@host03]$ rm listener*
[oracle@host03]$ rm sqlnet*
```

15. Exit the SSH client session to host03, returning the session to Domain-0.

```
[oracle@host03]$ exit
logout
Connection to host03 closed.
[root@dom0]#
```

16. Open a terminal session to host01 using the `oracle` operating system account.

```
[root@dom0]# ssh -X oracle@host01
oracle@host01's password: oracle
Last login: Wed Jul 24 01:12:18 2013 from 192.0.2.1
```

17. Use the `oraenv` utility to set the environment variables for the '`boston`' database instance.

```
[oracle@host01]$ . oraenv
ORACLE_SID = [oracle] ? boston
The Oracle base has been set to /u01/app/oracle
```

18. Start the Database Configuration Assistant (DBCA) utility.

```
[oracle@host01]$ dbca
```

    a. Select **Delete Database** on the Database Operation window. Click **Next**.
    b. Select the '**boston**' database on the Delete Database window. Click **Next**.
    c. **Uncheck** the box to deregister from Enterprise Manager on the Management Options window. The database has already been deleted from Enterprise Manager. Click **Next**.
    d. Click **Finish** on the Summary window.
    e. Click **Yes** on the information dialog that appears.
    f. Click **OK** on the information dialog that appears.
    g. Click **Close** to exit the DBCA utility.

19. Stop the network listener on machine host01.

```
[oracle@host01]$ lsnrctl stop
LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 24-JUL-
2013 04:57:11
Copyright (c) 1991, 2013, Oracle.  All rights reserved.
Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=host03.example.com)(PO
RT=1521)))
The command completed successfully
```

20. Navigate to the `$ORACLE_HOME/network/admin` directory and delete the network configuration files.

```
[oracle@host01]$ cd $ORACLE_HOME/network/admin
[oracle@host01]$ rm listener*
[oracle@host01]$ rm sqlnet*
```

21. Exit the SSH client session to host01, returning the session to Domain-0.

```
[oracle@host01]$ exit
logout
Connection to host01 closed.
[root@dom0]#
```

Practice 2-5: Primary Database Creation

Overview

In this practice, you will create a fresh database for the remainder of the command-line labs in this course.

Assumptions

The system administrator has provided a server, host01, located in the city of Boston to be used for the new database to be created. Oracle Linux 6.3 has already been installed on the server along with the `oracle-rdbms-server-12cR1-preinstall-1.0-8.el6.x86_64.rpm` file to prepare the machine for database software installation. A software only install of the Oracle database software has been performed into the default location of `/u01/app/oracle/product/12.1.0/dbhome_1`. The server was also integrated into the Oracle Enterprise Manager Cloud Control management infrastructure for monitoring with the installation of the agent software into the `/u01/app/oracle/agent/agent_inst` home directory.

Tasks

1. Open a terminal window and use the SSH client to connect to `host01` as the `oracle` OS user. Enter oracle when you are prompted for the password.

```
[root@dom0]# ssh -X oracle@host01
oracle@host01's password: oracle
```

2. Navigate to the `/u01/app/oracle/product/12.1.0/dbhome_1/bin` directory. Invoke the Database Configuration Assistant utility.

```
[oracle@host01]$ cd /u01/app/oracle/product/12.1.0/dbhome_1/bin
[oracle@host01]$ ./dbca
```

   Note: At this starting point, there are no entries in the `/etc/oratab` file that can be used to set environment variables such as `ORACLE_HOME`.

3. On the Database Operation window, select the **Create Database** option and then click **Next**.
4. On the Creation Mode window, select the **Advanced Mode** option and then click **Next**.
5. On the Database Template window, select the **General Purpose or Transaction Processing** option and then click **Next**.
6. On the Database Identification window, enter **boston.example.com** for the Global Database Name. Check the box to **Create As Container Database**. With the Create a Container Database with one or more PDBs selected, enter **1** for the Number of PDBs, and enter **dev1** as the PDB Name. Click **Next**.
7. On the Management Options window, verify that the box is checked for the option to "**Configure Enterprise Manager (EM) Database Express**." Click Next.
8. On the Database Credentials window, select the option to "**Use the Same Administrative Password for All Accounts**." Enter **`oracle_4U`** for the Password and Confirm Password fields. Click Next.
9. On the Network Configuration window, check the box to select the Database home software location. Enter **LISTENER** in the name field, and **1521** in the port field. Click Next.

10. On the Storage Locations window, select the option to "**Use Common Location for All Database Files**." Verify that the "**Specify Fast Recovery Area**" box is checked, and adjust the Fast Recovery Area Size field to **10G** bytes. Check the **Enable Archiving** box. Click the "**Edit Archive Mode Parameters**" button and change the name of the Archive Log File Format to "**arch_%t_%s_%r.log**" and then **OK**. Click **Next**.
11. On the Database Options window, check the **Sample Schemas** box and click **Next**.
12. On the Initialization Parameters window, change the **Memory Size (SGA and PGA)** to **496MB**. Verify that the **Use Automatic Memory Management** box is checked. Click on the Character Sets tab, and select the **Use Unicode (AL32UTF8)** option. Click **Next**.
13. On the Creation Options window, verify that the **Create Database** box is checked and then click **Next**.
14. On the Summary window, click **Finish**. It will take some time for the database to create.
15. When a dialog window appears stating that database creation is complete, click **Exit**.
16. Click **Close** to exit the Database Configuration Assistant utility.
17. Use the icon on the desktop to launch Firefox on host01. The home page that is mapped to https://em12.example.com:7802/em will not display since Enterprise Manager Cloud Control has been stopped. Change the URL to https://host01.example.com:5500/em in order to connect to the Enterprise Manager Database Express 12*c* application.
18. You should receive a web page indicating that the connection is un-trusted is this is the very first time you are accessing it. Click on the link "**I Understand the Risks**" and then click the "**Add Exception**" button. In the Add Security Exception window that appears, click the **Confirm Security Exception** button.
19. Login to the Enterprise Manager Database Express 12*c* application with the username **`SYS`**, password **`oracle_4U`**, and with the "**as sysdba**" box checked. You are now connected to the CDB$ROOT container database for the boston.example.com instance. The resources graph and SQL monitor graph will give errors after some time. Exit the Firefox application. It is not necessary to wait for the graphs to give the error.
20. In the terminal window that was used to run the Database Configuration Assistant utility on `host01`, set the environment variables to the `boston` instance.

```
[oracle@host01]$ . oraenv
ORACLE_SID = [oracle] ? boston
The Oracle base has been set to /u01/app/oracle
```

21. Invoke SQL*Plus connecting with operating system authentication.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Jul 24 20:14:33
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options
SQL>
```

22. Display a list of all pluggable databases and their open mode.

```
SQL> select name,open_mode from v$pdbs;
NAME                           OPEN_MODE
------------------------------ ----------
PDB$SEED                       READ ONLY
DEV1                           READ WRITE
```

23. Use the `ALTER SESSION` statement to switch to the PDB `Dev1` container and verify that it is the current container.

```
SQL> alter session set container = dev1;
Session altered.
SQL> SELECT SYS_CONTEXT ('USERENV', 'CON_NAME') FROM DUAL;
SYS_CONTEXT('USERENV','CON_NAME')
------------------------------------------------------------
DEV1
```

24. Setup Enterprise Manager Database Express 12*c* for the pluggable database by defining a distinct port number for it. Exit SQL*Plus when done.

```
SQL> exec dbms_xdb_config.sethttpsport(5501);
PL/SQL procedure successfully completed.
SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release
12.1.0.1.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options
```

25. Use the icon on the desktop to launch Firefox on host01. Change the URL to **https://host01.example.com:5501/em** in order to connect to the Enterprise Manager Database Express 12*c* application for the Dev1 container.
26. You should receive a web page indicating that the connection is un-trusted is this is the very first time you are accessing it. Click on the link "**I Understand the Risks**" and then click the "**Add Exception**" button. In the Add Security Exception window that appears, click the **Confirm Security Exception** button.
27. Login to the Enterprise Manager Database Express 12*c* application with the username **`SYS`**, password **`oracle_4U`**, and with the "**as sysdba**" box checked. You are now connected to the `Dev1` container database for the boston.example.com instance. All graphs on the home page should now display properly. Exit the Firefox application.

Practices for Lesson 3: Oracle Net Services in a Data Guard Environment

Chapter 3

Practices for Lesson 3: Overview

Practices Overview

In these practices, you will use graphical utilities to create and modify the Oracle network configuration files. You will manually edit the files with a text editor to bypass the current limitations of the Oracle Net Manager utility, and then propagate the resulting files to each server in the Data Guard environment.

Practice 3-1: Modifying the tnsnames.ora Configuration File

Overview

In this practice you will modify the `tnsnames.ora` configuration file using the Graphical Oracle Net Manager utility. You will create service name entries for each database instance that will be used in this course. The following chart summarizes the entries that should be created:

Service Name	Host	Port	SDU	*_BUF_SIZE
boston	host01.example.com	1521	65535	10485760
bostonFS	host02.example.com	1521	65535	10485760
london	host03.example.com	1521	65535	10485760
londonFS	host04.example.com	1521	65535	10485760
london2	host03.example.com	1521	65535	10485760
prmy	host01.example.com host03.example.com	1521	65535	10485760
emrep	em12.example.com	1521		

Note: Due to a limitation of the Oracle Net Manager utility, the best practice values listed in the documentation cannot be entered. The maximum value for SDU allowed by Oracle Net Manager is 32767. This will need to be corrected after using the Oracle Net Manager utility by manually editing the configuration files in practice 3-3.

Tasks

1. If you closed the terminal window from the previous practice, then open a terminal window and use the SSH client to connect to `host01` as the `oracle` OS user. Enter `oracle` when you are prompted for the password.

```
[anyuser@dom0]$ ssh -X oracle@host01
oracle@host01's password: oracle
```

2. Use the `oraenv` utility to set the environment variables for the `boston` instance.

   Note: The prompt in the lab exercises will now show the user and host for the machine that you should be connected to. Throughout labs, you will use 5 different hosts and 2 different operating system accounts. Your actual operating system prompt may display additional information such as the current directory. This will not be shown in labs. If the prompt does not show the user and machine as in the above step, it indicates that you should be using the main console window on Domain-0. The Domain-0 name is unique for each student.

```
[oracle@host01]$ . oraenv
ORACLE_SID = [oracle] ? boston
The Oracle base has been set to /u01/app/oracle
```

3. Use the `lsnrctl` utility to check the status of the network listener.

```
[oracle@host01]$ lsnrctl status
LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 04-JUN-
2013 20:02:49

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

```
Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=host01.example.com)(PO
RT=1521)))
STATUS of the LISTENER
------------------------
Alias                     LISTENER
Version                   TNSLSNR for Linux: Version 12.1.0.1.0
- Production
Start Date                03-JUN-2013 20:02:58
Uptime                    0 days 23 hr. 59 min. 51 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/host01/listener/alert/log.xml
Listening Endpoints Summary...
(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=host01.example.com)(PO
RT=1521)))
(DESCRIPTION=(ADDRESS=(PROTOCOL=ipc)(KEY=EXTPROC1521)))
(DESCRIPTION=(ADDRESS=(PROTOCOL=tcps)(HOST=host01.example.com)(P
ORT=5500))(Security=(my_wallet_directory=/u01/app/oracle/admin/b
oston/xdb_wallet))(Presentation=HTTP)(Session=RAW))
(DESCRIPTION=(ADDRESS=(PROTOCOL=tcps)(HOST=host01.example.com)(P
ORT=5501))(Security=(my_wallet_directory=/u01/app/oracle/admin/b
oston/xdb_wallet))(Presentation=HTTP)(Session=RAW))
Services Summary...
Service "boston.example.com" has 1 instance(s).
  Instance "boston", status READY, has 1 handler(s) for this
service...
Service "bostonXDB.example.com" has 1 instance(s).
  Instance "boston", status READY, has 1 handler(s) for this
service...
Service "dev1.example.com" has 1 instance(s).
  Instance "boston", status READY, has 1 handler(s) for this
service...
The command completed successfully
```

Note: Notice that the entry Listener Parameter File indicates the location of the configuration files. The location can be set with the `ORACLE_HOME` or `TNS_ADMIN` environment variables when starting the listener.

4. Navigate to the `$ORACLE_HOME/network/admin` directory and examine the contents of the network configuration files (`sqlnet.ora`, `listener.ora`, or `tnsnames.ora`).

```
[oracle@host01]$ cd $ORACLE_HOME/network/admin
[oracle@host01]$ cat sqlnet.ora
# sqlnet.ora Network Configuration File:
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/sqlnet.ora
# Generated by Oracle configuration tools.

NAMES.DIRECTORY_PATH= (TNSNAMES, ONAMES, HOSTNAME)
[oracle@host01]$ cat listener.ora
# listener.ora Network Configuration File:
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.o
ra
# Generated by Oracle configuration tools.

LISTENER =
  (DESCRIPTION_LIST =
    (DESCRIPTION =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host01.example.com)(PORT = 1521))
      (ADDRESS = (PROTOCOL = IPC)(KEY = EXTPROC1521))
    )
  )
[oracle@host01]$ cat tnsnames.ora
# tnsnames.ora Network Configuration File:
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/tnsnames.o
ra
# Generated by Oracle configuration tools.

BOSTON =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP)(HOST = host01.example.com)(PORT
= 1521))
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = boston.example.com)
    )
  )
```

5. Invoke the Oracle Net Manager utility to prepare the networking files for Data Guard. Adjust the `tnsnames.ora` configuration file by modifying the “boston” service name entry. Set the Session Data Unit to 64K bytes, and both the Send Buffer Size and Receive Buffer Size to 10M bytes.

```
[oracle@host01]$ netmgr
```

   a. Expand the **Local** menu tree item underneath Oracle Net Configuration

b. Click on the **Profile** menu tree item
c. Highlight the **EZCONNECT** method under the available methods
d. Click the '**>**' button to add it to the Selected Methods list
e. Expand the **Service Naming** menu tree item
f. Highlight the "`boston`" entry
g. Click the **Advanced** button in the Service Identification section
h. Enter **32767** for the Session Data Unit (**Note:** The documentation recommends a value of 65535, but the Oracle Net Manager utility currently limits this value to 32767)
i. Click the **OK** button
j. Click the **Show Advanced** button in the Address Configuration section
k. Enter **10485760** for both the **Send Buffer Size** and the **Receive Buffer Size** in the Advanced Protocol Parameters section

6. Create a new Service Name "`bostonFS`" on `host02.example.com`. Set the Session Data Unit to 64K bytes, and both the Send Buffer Size and Receive Buffer Size to 10M bytes.
   a. Click the green "**+**" button at the top-left of the form to create a new Service Name entry
   b. Enter **`bostonFS`** as the Net Service Name and click the **Next** button
   c. Highlight **TCP/IP (Internet Protocol)** and click the **Next** button
   d. Enter **`host02.example.com`** for the Host Name
   e. Leave the port to its default value of **1521** and click the **Next** button
   f. Enter **`bostonFS.example.com`** as the Service Name and click the **Next** button
   g. Click the **Finish** button
   h. Highlight the "**`bostonFS`**" entry
   i. Click the **Advanced** button in the **Service Identification section**
   j. Enter **32767** for the Session Data Unit (**Note:** The documentation recommends a value of 65535, but the Oracle Net Manager utility currently limits this value to 32767)
   k. Click the **OK** button
   l. Click the **Show Advanced** button in the Address Configuration section
   m. Enter **10485760** for both the **Send Buffer Size** and the **Receive Buffer Size** in the Advanced Protocol Parameters section
7. Create a new Service Name "`london`" on `host03.example.com`. Set the Session Data Unit to 64K bytes, and both the Send Buffer Size and Receive Buffer Size to 10M bytes.
   a. Click the green "**+**" button at the top-left of the form to create a new Service Name entry
   b. Enter **`london`** as the Net Service Name and click the **Next** button
   c. Highlight **TCP/IP (Internet Protocol)** and click the **Next** button
   d. Enter **`host03.example.com`** for the Host Name
   e. Leave the port to its default value of **1521** and click the **Next** button
   f. Enter **`london.example.com`** as the Service Name and click the **Next** button
   g. Click the **Finish** button
   h. Highlight the "**`london`**" entry
   i. Click the **Advanced** button in the Service Identification section

j. Enter **32767** for the Session Data Unit (**Note:** The documentation recommends a value of 65535, but the Oracle Net Manager utility currently limits this value to 32767)
k. Click the **OK** button
l. Click the **Show Advanced** button in the Address Configuration section
m. Enter **10485760** for both the **Send Buffer Size** and the **Receive Buffer Size** in the Advanced Protocol Parameters section

8. Create a new Service Name "`londonFS`" on `host04.example.com`. Set the Session Data Unit to 64K bytes, and both the Send Buffer Size and Receive Buffer Size to 10M bytes.
   a. Click the green "**+**" button at the top-left of the form to create a new Service Name entry
   b. Enter **`londonFS`** as the Net Service Name and click the **Next** button
   c. Highlight **TCP/IP (Internet Protocol)** and click the **Next** button
   d. Enter **`host04.example.com`** for the Host Name
   e. Leave the port to its default value of **1521** and click the **Next** button
   f. Enter **`londonFS.example.com`** as the Service Name and click the **Next** button
   g. Click the **Finish** button
   h. Highlight the "**`londonFS`**" entry
   i. Click the **Advanced** button in the Service Identification section
   j. Enter **32767** for the Session Data Unit (**Note:** The documentation recommends a value of 65535, but the Oracle Net Manager utility currently limits this value to 32767)
   k. Click the **OK** button
   l. Click the **Show Advanced** button in the Address Configuration section
   m. Enter **10485760** for both the **Send Buffer Size** and the **Receive Buffer Size** in the Advanced Protocol Parameters section
9. Create a new Service Name "`london2`" on `host03.example.com`. Set the Session Data Unit to 64K bytes, and both the Send Buffer Size and Receive Buffer Size to 10M bytes.
   a. Click the green "**+**" button at the top-left of the form to create a new Service Name entry
   b. Enter **`london2`** as the Net Service Name and click the **Next** button
   c. Highlight **TCP/IP (Internet Protocol)** and click the **Next** button
   d. Enter **`host03.example.com`** for the Host Name
   e. Leave the port to its default value of **1521** and click the **Next** button
   f. Enter **`london2.example.com`** as the Service Name and click the **Next** button
   g. Click the **Finish** button
   h. Highlight the "**`london2`**" entry
   i. Click the **Advanced** button in the Service Identification section
   j. Enter **32767** for the Session Data Unit (**Note:** The documentation recommends a value of 65535, but the Oracle Net Manager utility currently limits this value to 32767)
   k. Click the **OK** button
   l. Click the **Show Advanced** button in the Address Configuration section
   m. Enter **10485760** for both the **Send Buffer Size** and the **Receive Buffer Size** in the Advanced Protocol Parameters section

10. Create a new Service Name "prmy" on host01.example.com and host03.example.com simultaneously. Set the Session Data Unit to 64K bytes, and both the Send Buffer Size and Receive Buffer Size to 10M bytes.
    a. Click the green "**+**" button at the top-left of the form to create a new Service Name entry
    b. Enter **prmy** as the Net Service Name and click the **Next** button
    c. Highlight **TCP/IP (Internet Protocol)** and click the **Next** button
    d. Enter **host01.example.com** for the Host Name
    e. Leave the port to its default value of **1521** and click the **Next** button
    f. Enter **prmy.example.com** as the Service Name and click the **Next** button
    g. Click the **Finish** button
    h. Highlight the "**prmy**" entry
    i. Click the **Advanced** button in the Service Identification section
    j. Enter **32767** for the Session Data Unit (**Note:** The documentation recommends a value of 65535, but the Oracle Net Manager utility currently limits this value to 32767)
    k. Click the **OK** button
    l. Click the **Show Advanced** button in the Address Configuration section
    m. Enter **10485760** for both the **Send Buffer Size** and the **Receive Buffer Size** in the Advanced Protocol Parameters section
    n. Click the green **+** sign **within the Address Configuration** section to add a second address.
    o. Change the Host Name field to a value of **host03.example.com** and the Port Number field to **1521**.
    p. Click the **Show Advanced** button in the Address Configuration section
    q. Enter **10485760** for both the **Send Buffer Size** and the **Receive Buffer Size** in the Advanced Protocol Parameters section

11. Create a new Service Name "emrep" on em12.example.com.
    a. Click the green "**+**" button at the top-left of the form to create a new Service Name entry
    b. Enter **emrep** as the Net Service Name and click the **Next** button
    c. Highlight **TCP/IP (Internet Protocol)** and click the **Next** button
    d. Enter **em12.example.com** for the Host Name
    e. Leave the port to its default value of **1521** and click the **Next** button
    f. Enter **emrep.example.com** as the Service Name and click the **Next** button
    g. Click the **Finish** button
12. Click **File** > **Save Network Configuration** from the menu.
13. Do not exit the Oracle Net Manager utility. Open a terminal window and use the SSH client to connect to host01 as the oracle OS user. Enter oracle when you are prompted for the password.

```
$ ssh -X oracle@host01
oracle@host01's password: oracle
```

14. Use the `oraenv` utility to set the environment variables for the `boston` instance.

```
[oracle@host01]$ . oraenv
ORACLE_SID = [oracle] ? boston
The Oracle base has been set to /u01/app/oracle
```

15. Navigate to the `$ORACLE_HOME/network/admin` directory and examine the contents of the `sqlnet.ora` and `tnsnames.ora` network configuration files verifying the changes made.

```
[oracle@host01]$ cd $ORACLE_HOME/network/admin
[oracle@host01]$ cat sqlnet.ora
# sqlnet.ora Network Configuration File:
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/sqlnet.ora
# Generated by Oracle configuration tools.
NAMES.DIRECTORY_PATH= (TNSNAMES, HOSTNAME, EZCONNECT)
ADR_BASE = /u01/app/oracle

[oracle@host01]$ cat tnsnames.ora
# tnsnames.ora Network Configuration File:
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/tnsnames.o
ra
# Generated by Oracle configuration tools.

LONDONFS =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host04.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 32767)
    (CONNECT_DATA =
      (SERVICE_NAME = londonFS.example.com)
    )
  )

BOSTONFS =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host02.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 32767)
    (CONNECT_DATA =
      (SERVICE_NAME = bostonFS.example.com)
```

```
    )
  )

EMREP =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST = em12.example.com)(PORT
= 1521))
    )
    (CONNECT_DATA =
      (SERVICE_NAME = emrep.example.com)
    )
  )

BOSTON =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host01.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 32767)
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = boston.example.com)
    )
  )
PRMY =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host01.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host03.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 32767)
    (CONNECT_DATA =
      (SERVICE_NAME = prmy.example.com)
    )
  )
LONDON2 =
  (DESCRIPTION =
```

```
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host03.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 32767)
    (CONNECT_DATA =
      (SERVICE_NAME = london2.example.com)
    )
  )

LONDON =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host03.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 32767)
    (CONNECT_DATA =
      (SERVICE_NAME = london.example.com)
    )
  )
```

Practice 3-2: Modifying the listener.ora Configuration File

Overview

In this practice you will modify the `listener.ora` configuration files on each server in the Oracle Data Guard environment using the Graphical Oracle Net Manager utility. You will create static entries for the "`boston`" , "`london`" , and "`london2`" service names. A static entry is required for RMAN to make a connection after shutting down the instance during physical or logical standby database creation. You will also create entries that are required later in the course for Data Guard Broker operations. The following chart summarizes the entries that need to be created on each server host respectively:

Host	Global Database Name	Oracle Home Directory	SID
host01	boston.example.com	/u01/app/oracle/product/12.1.0/dbhome_1	boston
host01	boston_DGMGRL.example.com	/u01/app/oracle/product/12.1.0/dbhome_1	boston
host02	bostonFS.example.com	/u01/app/oracle/product/12.1.0/dbhome_1	bostonFS
host02	bostonFS_DGMGRL.example.com	/u01/app/oracle/product/12.1.0/dbhome_1	bostonFS
host03	london.example.com	/u01/app/oracle/product/12.1.0/dbhome_1	london
host03	london_DGMGRL.example.com	/u01/app/oracle/product/12.1.0/dbhome_1	london
host03	london2.example.com	/u01/app/oracle/product/12.1.0/dbhome_1	london2
host03	london2_DGMGRL.example.com	/u01/app/oracle/product/12.1.0/dbhome_1	london2
host04	londonFS.example.com	/u01/app/oracle/product/12.1.0/dbhome_1	londonFS
host04	londonFS_DGMGRL.example.com	/u01/app/oracle/product/12.1.0/dbhome_1	londonFS

Tasks

1. Using the Oracle Net Manager utility that is still open from practice 3-1 for `host01`, set the Send Buffer Size and Receive Buffer Size advanced protocol parameters to match the sizes entered in the tnsnames.ora configuration.
   a. Expand the **Listeners** menu tree item
   b. Highlight the **`LISTENER`** entry
   c. Under the **Listening Locations**, **Address 1** section, click the **Show Advanced** button for the **TCP/IP** protocol entry
   d. Enter **65535** for both the **Send Buffer Size** and the **Receive Buffer Size** (**Note:** The documentation recommends a minimum value of 10485760, but the Oracle Net Manager utility currently limits this value to 65535.)
2. Create static listener entries for `host01` identified by the table in the overview section of this practice.
   a. Under the Listening locations drop down menu, select the **Database Services** entry. Currently no database services are explicitly configured for this listener.
   b. Click the **Add Database** button. Enter **`boston.example.com`** for the Global Database Name and **`boston`** for the SID. The Oracle Home Directory should default to the correct location.

c. Click the **Add Database** button. Enter **boston_DGMGRL.example.com** for the Global Database Name and **boston** for the SID. The Oracle Home Directory should default to the correct location.

3. Click **File** > **Save Network Configuration** from the menu.
4. Do not exit the Oracle Net Manager utility. If you closed the terminal window from the previous practice, open a terminal window and use the SSH client to connect to `host01` as the `oracle` OS user. Enter `oracle` when you are prompted for the password.

```
$ ssh -X oracle@host01
oracle@host01's password: oracle
```

5. Use the `oraenv` utility to set the environment variables for the `boston` instance.

```
[oracle@host01]$ . oraenv
ORACLE_SID = [oracle] ? boston
The Oracle base has been set to /u01/app/oracle
```

6. Navigate to the `$ORACLE_HOME/network/admin` directory and examine the contents of the `listener.ora` network configuration file verifying the changes made.

```
[oracle@host01]$ cd $ORACLE_HOME/network/admin
[oracle@host01]$ cat listener.ora
# listener.ora Network Configuration File:
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.o
ra
# Generated by Oracle configuration tools.

SID_LIST_LISTENER =
  (SID_LIST =
    (SID_DESC =
      (GLOBAL_DBNAME = boston.example.com)
      (ORACLE_HOME = /u01/app/oracle/product/12.1.0/dbhome_1)
      (SID_NAME = boston)
    )
    (SID_DESC =
      (GLOBAL_DBNAME = boston_DGMGRL.example.com)
      (ORACLE_HOME = /u01/app/oracle/product/12.1.0/dbhome_1)
      (SID_NAME = boston)
    )
  )

LISTENER =
  (DESCRIPTION_LIST =
    (DESCRIPTION =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host01.example.com)(PORT = 1521)(SEND_BUF_SIZE =
65535)(RECV_BUF_SIZE = 65535))
    )
```

```
    (DESCRIPTION =
      (ADDRESS = (PROTOCOL = IPC)(KEY = EXTPROC1521))
    )
  )

ADR_BASE_LISTENER = /u01/app/oracle
```

7. If the entries appear correct, then exit the Oracle Net Manager utility. Reload the modified configuration for the listener that is now running. If the listener is not running, then start it instead of reloading it.

```
[oracle@host01]$ lsnrctl reload or lsnrctl start
LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 06-JUN-
2013 06:08:02

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

Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=host01.example.com)(PO
RT=1521)(SEND_BUF_SIZE=65535)(RECV_BUF_SIZE=65535)))
The command completed successfully
```

8. Copy the `tnsnames.ora` file and `sqlnet.ora` file to `host02`, `host03` and `host04` as the `oracle` user and place them into the same directory as they exist on `host01`. Do not copy the listener.ora file. Answer **`yes`** to continue and supply the password **`oracle`** if asked.

```
[oracle@host01]$ scp tnsnames.ora
host02:/u01/app/oracle/product/12.1.0/dbhome_1/network/admin
tnsnames.ora                                  100% 1934
1.9KB/s   00:00
[oracle@host01]$ scp tnsnames.ora
host03:/u01/app/oracle/product/12.1.0/dbhome_1/network/admin
tnsnames.ora                                  100% 1934
1.9KB/s   00:00
[oracle@host01]$ scp tnsnames.ora
host04:/u01/app/oracle/product/12.1.0/dbhome_1/network/admin
tnsnames.ora                                  100% 1934
1.9KB/s   00:00
[oracle@host01]$ scp sqlnet.ora
host02:/u01/app/oracle/product/12.1.0/dbhome_1/network/admin
sqlnet.ora                                    100%  202
0.2KB/s   00:00
[oracle@host01]$ scp sqlnet.ora
host03:/u01/app/oracle/product/12.1.0/dbhome_1/network/admin
sqlnet.ora                                    100%  202
0.2KB/s   00:00
[oracle@host01]$ scp sqlnet.ora
host04:/u01/app/oracle/product/12.1.0/dbhome_1/network/admin
```

```
sqlnet.ora                                    100%  202
0.2KB/s   00:00
```

9. Open a new terminal window and use the SSH client to connect to `host02` as the `oracle` OS user. Enter `oracle` when you are prompted for the password. You can leave open the previous window to `host01`. You will soon need windows open to `host01`, `host02`, `host03`, and `host04`.

```
$ ssh -X oracle@host02
oracle@host02's password: oracle
```

10. Create an initial entry into the `/etc/oratab` file on `host02` to facilitate setting environment variables.

```
[oracle@host02]$ echo
bostonFS:/u01/app/oracle/product/12.1.0/dbhome_1:N >>
/etc/oratab
```

11. Use the newly created entry to set the `ORACLE_BASE`, `ORACLE_HOME`, `ORACLE_SID`, `LD_LIBRARY_PATH`, and `PATH` environment variables.

```
[oracle@host02]$ . oraenv
ORACLE_SID = [oracle] ? bostonFS
The Oracle base has been set to /u01/app/oracle
```

12. Invoke the Oracle Net Manager utility on `host02` to create a new listener and add static listener entries specific for that server.

```
[oracle@host02]$ netmgr
```

    a. Expand the **Local** menu tree item. You can expand the Service Naming menu tree item if you want. You should see the entries that were manually copied from `host01`.
    b. Expand the **Listeners** menu tree item. There should be no entries under it at this time.
    c. **Highlight** the **Listeners** menu tree item and click the green plus (**+**) sign to create a new entry.
    d. Click the **OK** button to accept the default Listener Name of **`LISTENER`**.
    e. With **Listening Locations** in the drop down menu box, click **Add Address** button at the bottom of the window.
    f. Change the Host entry from 'host02' to '**host02.example.com**'.
    g. Under the Listening Locations, Address 1 section, click the **Show Advanced** button for the TCP/IP protocol entry
    h. Enter **65535** for both the **Send Buffer Size** and the **Receive Buffer Size** (**Note:** The documentation recommends a minimum value of 10485760, but the Oracle Net Manager utility currently limits this value to 65535.)

13. Create static listener entries for `host02` identified by the table in the overview section of this practice.

    a. Under the **Listening locations** drop down menu, select the **Database Services** entry. Currently no database services are explicitly configured for this listener.
    b. Click the **Add Database** button. Enter **`bostonFS.example.com`** for the Global Database Name and **`bostonFS`** for the SID. The Oracle Home Directory should default to the correct location.

c. Click the **Add Database** button. Enter **bostonFS_DGMGRL.example.com** for the Global Database Name and **bostonFS** for the SID. The Oracle Home Directory should default to the correct location.

14. Click **File** > **Save Network Configuration** from the menu. Exit the Oracle Net Manager utility.
15. Start the listener.

```
[oracle@host02]$ lsnrctl start
…
Listening Endpoints Summary...

(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=host02.example.com)(PO
RT=1521)))
Services Summary...
Service "bostonFS.example.com" has 1 instance(s).
  Instance "bostonFS", status UNKNOWN, has 1 handler(s) for this
service...
Service "bostonFS_DGMGRL.example.com" has 1 instance(s).
  Instance "bostonFS", status UNKNOWN, has 1 handler(s) for this
service...
The command completed successfully
```

16. Open a new terminal window and use the SSH client to connect to `host03` as the `oracle` OS user. Enter `oracle` when you are prompted for the password. You can leave open the previous windows to `host01` and `host02` open.

```
$ ssh -X oracle@host03
oracle@host03's password: oracle
```

17. Create an initial entry into the `/etc/oratab` file on `host03` to facilitate setting environment variables.

```
[oracle@host03]$ echo
london:/u01/app/oracle/product/12.1.0/dbhome_1:N >> /etc/oratab
[oracle@host03]$ echo
london2:/u01/app/oracle/product/12.1.0/dbhome_1:N >> /etc/oratab
```

18. Use the newly created entry to set the `ORACLE_BASE`, `ORACLE_HOME`, `ORACLE_SID`, `LD_LIBRARY_PATH`, and `PATH` environment variables.

```
[oracle@host03]$ . oraenv
ORACLE_SID = [oracle] ? london
The Oracle base has been set to /u01/app/oracle
```

19. Invoke the Oracle Net Manager utility on `host03` to create a new listener and add static listener entries specific for that server.

```
[oracle@host03]$ netmgr
```

    a. Expand the **Local** menu tree item. You can expand the Service Naming menu tree item if you want. You should see the entries that were manually copied from `host01`.
    b. Expand the **Listeners** menu tree item. There should be no entries under it at this time.
    c. **Highlight** the **Listeners** menu tree item and click the green plus (**+**) sign to create a new entry.
    d. Click the **OK** button to accept the default Listener Name of **`LISTENER`**.
    e. With **Listening Locations** in the drop down menu box, click **Add Address** button at the bottom of the window.
    f. Change the Host entry from 'host03' to '**host03.example.com**'.
    g. Under the Listening Locations, Address 1 section, click the **Show Advanced** button for the TCP/IP protocol entry
    h. Enter **65535** for both the **Send Buffer Size** and the **Receive Buffer Size** (**Note:** The documentation recommends a minimum value of 10485760, but the Oracle Net Manager utility currently limits this value to 65535.)

20. Create static listener entries for `host03` identified by the table in the overview section of this practice.
    a. Under the **Listening locations** drop down menu, select the **Database Services** entry. Currently no database services are explicitly configured for this listener.
    b. Click the **Add Database** button. Enter **`london.example.com`** for the Global Database Name and **`london`** for the SID. The Oracle Home Directory should default to the correct location.
    c. Click the **Add Database** button. Enter **`london_DGMGRL.example.com`** for the Global Database Name and **`london`** for the SID. The Oracle Home Directory should default to the correct location.
    d. Click the **Add Database** button. Enter **`london2.example.com`** for the Global Database Name and **`london2`** for the SID. The Oracle Home Directory should default to the correct location.
    e. Click the **Add Database** button. Enter **`london2_DGMGRL.example.com`** for the Global Database Name and **`london2`** for the SID. The Oracle Home Directory should default to the correct location.

21. Click **File** > **Save Network Configuration** from the menu. Exit the Oracle Net Manager utility.

22. Start the listener.

```
[oracle@host03]$ lsnrctl start
…
Listening Endpoints Summary...

(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=host03.example.com)(PO
RT=1521)))
Services Summary...
Service "london.example.com" has 1 instance(s).
  Instance "london", status UNKNOWN, has 1 handler(s) for this
service...
Service "london2.example.com" has 1 instance(s).
  Instance "london2", status UNKNOWN, has 1 handler(s) for this
service...
Service "london2_DGMGRL.example.com" has 1 instance(s).
  Instance "london2", status UNKNOWN, has 1 handler(s) for this
service...
Service "london_DGMGRL.example.com" has 1 instance(s).
  Instance "london", status UNKNOWN, has 1 handler(s) for this
service...
The command completed successfully
```

23. Open a new terminal window and use the SSH client to connect to `host04` as the `oracle` OS user. Enter `oracle` when you are prompted for the password. You can leave open the previous windows to `host01`, `host02` and `host03` open.

```
$ ssh -X oracle@host04
oracle@host04's password: oracle
```

24. Create an initial entry into the `/etc/oratab` file on `host04` to facilitate setting environment variables.

```
[oracle@host04]$ echo
londonFS:/u01/app/oracle/product/12.1.0/dbhome_1:N >>
/etc/oratab
```

25. Use the newly created entry to set the `ORACLE_BASE`, `ORACLE_HOME`, `ORACLE_SID`, `LD_LIBRARY_PATH`, and `PATH` environment variables.

```
[oracle@host04]$ . oraenv
ORACLE_SID = [oracle] ? londonFS
The Oracle base has been set to /u01/app/oracle
```

26. Invoke the Oracle Net Manager utility on `host03` to create a new listener and add static listener entries specific for that server.

```
[oracle@host04]$ netmgr
```

    a. Expand the **Local** menu tree item. You can expand the Service Naming menu tree item if you want. You should see the entries that were manually copied from `host01`.
    b. Expand the **Listeners** menu tree item. There should be no entries under it at this time.

c. **Highlight** the **Listeners** menu tree item and click the green plus (**+**) sign to create a new entry.
d. Click the **OK** button to accept the default Listener Name of **LISTENER**.
e. With Listening Locations in the drop down menu box, click **Add Address** button at the bottom of the window.
f. Change the Host entry from 'host04' to '**host04.example.com**'.
g. Under the Listening Locations, Address 1 section, click the **Show Advanced** button for the TCP/IP protocol entry
h. Enter **65535** for both the **Send Buffer Size** and the **Receive Buffer Size** (**Note:** The documentation recommends a minimum value of 10485760, but the Oracle Net Manager utility currently limits this value to 65535.)

27. Create static listener entries for `host04` identified by the table in the overview section of this practice.
    a. Under the **Listening locations** drop down menu, select the **Database Services** entry. Currently no database services are explicitly configured for this listener.
    b. Click the **Add Database** button. Enter **londonFS.example.com** for the Global Database Name and **londonFS** for the SID. The Oracle Home Directory should default to the correct location.
    c. Click the **Add Database** button. Enter **londonFS_DGMGRL.example.com** for the Global Database Name and **londonFS** for the SID. The Oracle Home Directory should default to the correct location.
28. Click **File** > **Save Network Configuration** from the menu. Exit the Oracle Net Manager utility.
29. Start the listener.

```
[oracle@host04]$ lsnrctl start
…
Listening Endpoints Summary...

(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=host04.example.com)(PO
RT=1521)))
Services Summary...
Service "londonFS.example.com" has 1 instance(s).
  Instance "londonFS", status UNKNOWN, has 1 handler(s) for this
service...
Service "londonFS_DGMGRL.example.com" has 1 instance(s).
  Instance "londonFS", status UNKNOWN, has 1 handler(s) for this
service...
The command completed successfully
```

30. It is advised to keep one terminal window open to each of `host01`, `host02`, `host03`, and `host04`. If you should close any terminal windows, log into each host as the `oracle` account and set the environment variables using the `oraenv` utility as in previous tasks. For `host03`, you could open two distinct windows: one for london and the other for london2. The instance name to use with the `oraenv` utility depends on which host you are connected to according to the following chart:

Host	`oraenv` Utility Instance Name
host01	boston
host02	bostonFS
host03	london or london2
host04	londonFS

Practice 3-3: Correcting Entries to Best Practice Values

Overview

In this practice, you correct the limitations imposed by the Oracle Net Manager utility by manually editing the configuration files and entering best practice values for networking parameters.

Tasks

1. On `host01`, navigate to the `$ORACLE_HOME/network/admin` directory and use the `vi` utility to edit the `tnsnames.ora` network configuration file. Globally replace the SDU value to 65535.

```
[oracle@host01]$ cd $ORACLE_HOME/network/admin
[oracle@host01]$ vi tnsnames.ora
…
:%s/SDU = 32767/SDU = 65535/g
6 substitutions on 6 lines
:wq!
```

2. Examine the contents of the `tnsnames.ora` network configuration file and verify the changes made.

```
[oracle@host01]$ cat tnsnames.ora
# tnsnames.ora Network Configuration File:
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/tnsnames.o
ra
# Generated by Oracle configuration tools.

LONDONFS =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host04.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = londonFS.example.com)
    )
  )

BOSTONFS =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host02.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
```

```
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = bostonFS.example.com)
    )
  )

EMREP =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST = em12.example.com)(PORT
= 1521))
    )
    (CONNECT_DATA =
      (SERVICE_NAME = emrep.example.com)
    )
  )

BOSTON =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host01.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = boston.example.com)
    )
  )
PRMY =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host01.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host03.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = prmy.example.com)
```

```
    )
  )
LONDON2 =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host03.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = london2.example.com)
    )
  )

LONDON =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host03.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = london.example.com)
    )
  )
```

3. Use the `vi` utility to edit the `listener.ora` network configuration file. Globally replace both the `SEND_BUF_SIZE` and `RECV_BUF_SIZE` parameter values to 10485760.

```
[oracle@host01]$ vi listener.ora
…
:%s/BUF_SIZE = 65535/BUF_SIZE = 10485760/g
:wq!
```

4. Examine the contents of the `listener.ora` network configuration file and verify the changes made.

```
[oracle@host01]$ cat listener.ora
# listener.ora Network Configuration File:
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.o
ra
# Generated by Oracle configuration tools.

SID_LIST_LISTENER =
  (SID_LIST =
```

```
    (SID_DESC =
      (GLOBAL_DBNAME = boston.example.com)
      (ORACLE_HOME = /u01/app/oracle/product/12.1.0/dbhome_1)
      (SID_NAME = boston)
    )
    (SID_DESC =
      (GLOBAL_DBNAME = boston_DGMGRL.example.com)
      (ORACLE_HOME = /u01/app/oracle/product/12.1.0/dbhome_1)
      (SID_NAME = boston)
    )
  )

LISTENER =
  (DESCRIPTION_LIST =
    (DESCRIPTION =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host01.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (DESCRIPTION =
      (ADDRESS = (PROTOCOL = IPC)(KEY = EXTPROC1521))
    )
  )

ADR_BASE_LISTENER = /u01/app/oracle
```

5. Reload the modified configuration to the Listener to allow the changes to take effect.

```
[oracle@host01]$ lsnrctl reload
LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 05-JUN-
2013 01:07:23

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

Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=host01.example.com)(PO
RT=1521)(SEND_BUF_SIZE=10485760)(RECV_BUF_SIZE=10485760)))
The command completed successfully
```

6. On `host02`, navigate to the `$ORACLE_HOME/network/admin` directory and use the `vi` utility to edit the `tnsnames.ora` network configuration file. Globally replace the SDU value to 65535.

```
[oracle@host02]$ cd $ORACLE_HOME/network/admin
[oracle@host02]$ vi tnsnames.ora
…
:%s/SDU = 32767/SDU = 65535/g
6 substitutions on 6 lines
:wq!
```

7. Examine the contents of the `tnsnames.ora` network configuration file and verify the changes made.

```
[oracle@host02]$ cat tnsnames.ora
# tnsnames.ora Network Configuration File:
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/tnsnames.o
ra
# Generated by Oracle configuration tools.

LONDONFS =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host04.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = londonFS.example.com)
    )
  )

BOSTONFS =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host02.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = bostonFS.example.com)
    )
  )
```

```
EMREP =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST = em12.example.com)(PORT
= 1521))
    )
    (CONNECT_DATA =
      (SERVICE_NAME = emrep.example.com)
    )
  )

BOSTON =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host01.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = boston.example.com)
    )
  )
PRMY =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host01.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host03.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = prmy.example.com)
    )
  )
LONDON2 =
  (DESCRIPTION =
    (ADDRESS_LIST =
```

```
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host03.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = london2.example.com)
    )
  )

LONDON =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host03.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = london.example.com)
    )
  )
```

8. Use the `vi` utility to edit the `listener.ora` network configuration file. Globally replace both the `SEND_BUF_SIZE` and `RECV_BUF_SIZE` parameter values to 10485760.

```
[oracle@host02]$ vi listener.ora
…
:%s/BUF_SIZE = 65535/BUF_SIZE = 10485760/g
:wq!
```

9. Examine the contents of the `listener.ora` network configuration file and verify the changes made.

```
[oracle@host02]$ cat listener.ora
# listener.ora Network Configuration File:
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.o
ra
# Generated by Oracle configuration tools.

SID_LIST_LISTENER =
  (SID_LIST =
    (SID_DESC =
      (GLOBAL_DBNAME = bostonFS.example.com)
      (ORACLE_HOME = /u01/app/oracle/product/12.1.0/dbhome_1)
      (SID_NAME = bostonFS)
    )
```

```
    (SID_DESC =
      (GLOBAL_DBNAME = bostonFS_DGMGRL.example.com)
      (ORACLE_HOME = /u01/app/oracle/product/12.1.0/dbhome_1)
      (SID_NAME = bostonFS)
    )
  )

LISTENER =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP)(HOST = host02.example.com)(PORT
= 1521)(SEND_BUF_SIZE = 10485760)(RECV_BUF_SIZE = 10485760))
  )

ADR_BASE_LISTENER = /u01/app/oracle
```

10. Reload the modified configuration to the Listener to allow the changes to take effect.

```
[oracle@host02]$ lsnrctl reload
LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 05-JUN-
2013 01:07:23

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

Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=host02.example.com)(PO
RT=1521)(SEND_BUF_SIZE=10485760)(RECV_BUF_SIZE=10485760)))
The command completed successfully
```

11. On `host03`, navigate to the `$ORACLE_HOME/network/admin` directory and use the `vi` utility to edit the `tnsnames.ora` network configuration file. Globally replace the SDU value to 65535.

```
[oracle@host03]$ cd $ORACLE_HOME/network/admin
[oracle@host03]$ vi tnsnames.ora
…
:%s/SDU = 32767/SDU = 65535/g
6 substitutions on 6 lines
:wq!
```

12. Examine the contents of the `tnsnames.ora` network configuration file and verify the changes made.

```
[oracle@host03]$ cat tnsnames.ora
# tnsnames.ora Network Configuration File:
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/tnsnames.o
ra
# Generated by Oracle configuration tools.

LONDONFS =
```

```
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host04.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = londonFS.example.com)
    )
  )

BOSTONFS =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host02.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = bostonFS.example.com)
    )
  )

EMREP =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST = em12.example.com)(PORT
= 1521))
    )
    (CONNECT_DATA =
      (SERVICE_NAME = emrep.example.com)
    )
  )

BOSTON =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
```

```
host01.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = boston.example.com)
    )
  )
PRMY =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host01.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host03.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = prmy.example.com)
    )
  )
LONDON2 =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host03.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = london2.example.com)
    )
  )

LONDON =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host03.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
```

```
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = london.example.com)
    )
  )
```

13. Use the `vi` utility to edit the `listener.ora` network configuration file. Globally replace both the `SEND_BUF_SIZE` and `RECV_BUF_SIZE` parameter values to 10485760.

```
[oracle@host03]$ vi listener.ora
…
:%s/BUF_SIZE = 65535/BUF_SIZE = 10485760/g
:wq!
```

14. Examine the contents of the `listener.ora` network configuration file and verify the changes made.

```
[oracle@host03]$ cat listener.ora
# listener.ora Network Configuration File:
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.o
ra
# Generated by Oracle configuration tools.

SID_LIST_LISTENER =
  (SID_LIST =
    (SID_DESC =
      (GLOBAL_DBNAME = london.example.com)
      (ORACLE_HOME = /u01/app/oracle/product/12.1.0/dbhome_1)
      (SID_NAME = london)
    )
    (SID_DESC =
      (GLOBAL_DBNAME = london_DGMGRL.example.com)
      (ORACLE_HOME = /u01/app/oracle/product/12.1.0/dbhome_1)
      (SID_NAME = london)
    )
    (SID_DESC =
      (GLOBAL_DBNAME = london2.example.com)
      (ORACLE_HOME = /u01/app/oracle/product/12.1.0/dbhome_1)
      (SID_NAME = london2)
    )
    (SID_DESC =
      (GLOBAL_DBNAME = london2_DGMGRL.example.com)
      (ORACLE_HOME = /u01/app/oracle/product/12.1.0/dbhome_1)
      (SID_NAME = london2)
    )
  )
```

```
LISTENER =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP)(HOST = host03.example.com)(PORT
= 1521)(SEND_SDU = 10485760)(RECV_SDU = 10485760))
  )

ADR_BASE_LISTENER = /u01/app/oracle
```

15. Reload the modified configuration to the Listener to allow the changes to take effect.

```
[oracle@host03]$ lsnrctl reload
LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 05-JUN-
2013 01:07:23

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

Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=host03.example.com)(PO
RT=1521)(SEND_BUF_SIZE=10485760)(RECV_BUF_SIZE=10485760)))
The command completed successfully
```

16. On `host04`, navigate to the `$ORACLE_HOME/network/admin` directory and use the `vi` utility to edit the `tnsnames.ora` network configuration file. Globally replace the SDU value to 65535.

```
[oracle@host04]$ cd $ORACLE_HOME/network/admin
[oracle@host04]$ vi tnsnames.ora
…
:%s/SDU = 32767/SDU = 65535/g
6 substitutions on 6 lines
:wq!
```

17. Examine the contents of the `tnsnames.ora` network configuration file and verify the changes made.

```
[oracle@host04]$ cat tnsnames.ora
# tnsnames.ora Network Configuration File:
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/tnsnames.o
ra
# Generated by Oracle configuration tools.

LONDONFS =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host04.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
```

```
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = londonFS.example.com)
    )
  )

BOSTONFS =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host02.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = bostonFS.example.com)
    )
  )

EMREP =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST = em12.example.com)(PORT
= 1521))
    )
    (CONNECT_DATA =
      (SERVICE_NAME = emrep.example.com)
    )
  )

BOSTON =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host01.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = boston.example.com)
    )
  )
```

```
PRMY =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host01.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host03.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = prmy.example.com)
    )
  )
LONDON2 =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host03.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = london2.example.com)
    )
  )

LONDON =
  (DESCRIPTION =
    (ADDRESS_LIST =
      (ADDRESS = (PROTOCOL = TCP)(HOST =
host03.example.com)(PORT = 1521)(SEND_BUF_SIZE =
10485760)(RECV_BUF_SIZE = 10485760))
    )
    (SDU = 65535)
    (CONNECT_DATA =
      (SERVICE_NAME = london.example.com)
    )
  )
```

18. Use the `vi` utility to edit the `listener.ora` network configuration file. Globally replace both the `SEND_BUF_SIZE` and `RECV_BUF_SIZE` parameter values to 10485760.

```
[oracle@host04]$ vi listener.ora
…
:%s/BUF_SIZE = 65535/BUF_SIZE = 10485760/g
:wq!
```

19. Examine the contents of the `listener.ora` network configuration file and verify the changes made.

```
[oracle@host04]$ cat listener.ora
# listener.ora Network Configuration File:
/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.o
ra
# Generated by Oracle configuration tools.

SID_LIST_LISTENER =
  (SID_LIST =
    (SID_DESC =
      (GLOBAL_DBNAME = londonFS.example.com)
      (ORACLE_HOME = /u01/app/oracle/product/12.1.0/dbhome_1)
      (SID_NAME = londonFS)
    )
    (SID_DESC =
      (GLOBAL_DBNAME = londonFS_DGMGRL.example.com)
      (ORACLE_HOME = /u01/app/oracle/product/12.1.0/dbhome_1)
      (SID_NAME = londonFS)
    )
  )

LISTENER =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP)(HOST = host04.example.com)(PORT
= 1521)( SEND_BUF_SIZE=10485760)(RECV_BUF_SIZE=10485760))
  )

ADR_BASE_LISTENER = /u01/app/oracle
```

20. Reload the modified configuration to the Listener to allow the changes to take effect.

```
[oracle@host04]$ lsnrctl reload
LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 05-JUN-
2013 01:07:23

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

Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=host04.example.com)(PO
RT=1521)(SEND_BUF_SIZE=10485760)(RECV_BUF_SIZE=10485760)))
The command completed successfully
```

Note: At this point, if the Oracle Net Manager utility is launched it will generate errors due to the manually increased values for `SDU`, `SEND_BUF_SIZE`, and `RECV_BUF_SIZE`. All future changes to the `listener.ora`, `tnsnames.ora`, and `sqlnet.ora` files will need to be done manually. This should be corrected with a patch when it is available. Oracle Enterprise Manager Cloud Control 12*c* is capable of editing the files using the increased best-practice values.

Practices for Lesson 4: Creating a Physical Standby Database by Using SQL and RMAN Commands

Chapter 4

Practices for Lesson 4: Overview

Practices Overview

In these practices, you will prepare `host01` to become the primary database and `host03` to become a physical standby database. You will use the `RMAN` utility to create the physical standby database and then verify its operation.

Practice 4-1: Prepare the Primary Database to Support Data Guard

Overview

In this practice, you verify that the primary database is configured correctly to support a physical standby database.

Tasks

1. On `host01`, invoke SQL*Plus and connect as `SYSDBA` to your primary database (`boston`). Determine if `FORCE LOGGING` is enabled. If it is not enabled, enable `FORCE LOGGING` mode.

```
[oracle@host01]$ sqlplus / as sysdba

SQL*Plus: Release 12.1.0.1.0 Production on Mon Jun 10 21:09:45
2013

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



Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

SQL> SELECT force_logging FROM v$database;

FORCE_LOGGING
---------------------------------------
NO

SQL> ALTER DATABASE FORCE LOGGING;

Database altered.

SQL> SELECT force_logging FROM v$database;

FORCE_LOGGING
---------------------------------------
YES
```

2. Determine the number of online redo log groups and their current size. Create standby redo log groups with one member for each group using the same size as the existing online redo logs. You should create one more additional group than the number you have for online redo log groups. Verify creation of the standby redo logs.

```
SQL> select group#,bytes from v$log;
    GROUP#      BYTES
---------- ----------
         1   52428800
         2   52428800
         3   52428800

SQL> alter database add standby logfile
('/u01/app/oracle/oradata/boston/stdbyredo01.log') size 50M;
Database altered.

SQL> alter database add standby logfile
('/u01/app/oracle/oradata/boston/stdbyredo02.log') size 50M;
Database altered.

SQL> alter database add standby logfile
('/u01/app/oracle/oradata/boston/stdbyredo03.log') size 50M;
Database altered.

SQL> alter database add standby logfile
('/u01/app/oracle/oradata/boston/stdbyredo04.log') size 50M;
Database altered.

SQL> select group#,bytes from v$log;
    GROUP#      BYTES
---------- ----------
         1   52428800
         2   52428800
         3   52428800
SQL> select group#,bytes from v$standby_log;
    GROUP#      BYTES
---------- ----------
         4   52428800
         5   52428800
         6   52428800
         7   52428800
```

3. Define the first log archive destination to use the flash recovery area and enable it. Ensure that the changes are done both in memory and also stored the server parameter file. This location should be valid for any role and also valid for all types of log files.

```
SQL> alter system set
log_archive_dest_1='location=USE_DB_RECOVERY_FILE_DEST
valid_for=(ALL_LOGFILES,ALL_ROLES) db_unique_name=boston'
scope=both;
System altered.

SQL> alter system set log_archive_dest_state_1='enable'
scope=both;
System altered.
```

4. Increase the maximum number of archive processes to 4.

```
SQL> alter system set log_archive_max_processes=4 scope=both;
System altered.
```

Note: The documentation suggests this parameter be set to a value of 10. We are using a reduced number in this lab environment to reduce overhead.

5. Define the `log_archive_config` parameter to include entries for: `boston`, `bostonFS`, `london`, `londonFS`, and `london2`. Only `london` is needed at this moment, but the others can be added now in preparation for upcoming practices.

```
SQL> alter system set
log_archive_config='dg_config=(boston,bostonFS,london,londonFS,l
ondon2)' scope=both;
System altered.
```

6. Enable automatic standby file management so that operating system file additions and deletions on the primary database are replicated to the standby database. This is normally set on the standby database. For the primary database, this is set for role reversals.

```
SQL> alter system set standby_file_management='auto' scope=both;
System altered.
```

Practice 4-2: Prepare Host and Create Physical Standby Database

Overview

In this practice, you will prepare `host03` to receive the physical standby database and create the physical standby database using RMAN.

Tasks

1. Use a terminal window logged in as `oracle` to `host03` to create the initial directories needed for a physical standby database. Since the primary database is using multi-tenant architecture, additional directories are needed.

```
[oracle@host03]$ mkdir -p /u01/app/oracle/admin/london/adump
[oracle@host03]$ mkdir -p /u01/app/oracle/oradata/london
[oracle@host03]$ mkdir -p /u01/app/oracle/oradata/london/pdbseed
[oracle@host03]$ mkdir -p /u01/app/oracle/oradata/london/dev1
[oracle@host03]$ mkdir -p
/u01/app/oracle/fast_recovery_area/london
```

2. Create a starter initialization file on `host03` for the `london` physical standby instance. The only two parameters required are `DB_NAME` and `DB_DOMAIN`.

```
[oracle@host03]$ echo 'DB_NAME=london' >
/u01/app/oracle/product/12.1.0/dbhome_1/dbs/initlondon.ora
[oracle@host03]$ echo 'DB_DOMAIN=example.com' >>
/u01/app/oracle/product/12.1.0/dbhome_1/dbs/initlondon.ora
```

3. Copy the password file from the primary host to the physical standby host. Rename the file accordingly.

```
[oracle@host03]$ scp
oracle@host01:/u01/app/oracle/product/12.1.0/dbhome_1/dbs/orapwb
oston /u01/app/oracle/product/12.1.0/dbhome_1/dbs/orapwlondon
```

4. Startup nomount the `london` standby instance on `host03`. This assumes that the terminal window you are using has previously set the environment variables to `london`. Exit SQL*Plus when done.

```
[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Jun 11 03:51:01
2013

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

Connected to an idle instance.

SQL> startup nomount
ORACLE instance started.

Total System Global Area  217157632 bytes
Fixed Size                  2286656 bytes
```

```
Variable Size             159386560 bytes
Database Buffers           50331648 bytes
Redo Buffers                5152768 bytes
SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release
12.1.0.1.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options
```

5. Create a physical standby on `host03` using the RMAN utility.

```
[oracle@host03]$ rman target sys/oracle_4U@boston auxiliary
sys/oracle_4U@london
Recovery Manager: Release 12.1.0.1.0 - Production on Tue Jun 11
04:15:35 2013

Copyright (c) 1982, 2013, Oracle and/or its affiliates.  All
rights reserved.

connected to target database: BOSTON (DBID=2507595832)
connected to auxiliary database: LONDON (not mounted)

RMAN> run {
   allocate channel prmy1 type disk;
   allocate auxiliary channel stby1 type disk;
   duplicate target database for standby from active database
     spfile
        parameter_value_convert 'boston','london'
        set db_unique_name='london'
        set db_file_name_convert='boston','london'
        set log_file_name_convert='boston','london'
        set fal_server='boston'
        nofilenamecheck;
    allocate auxiliary channel stby type disk;
    sql channel stby "alter database recover managed standby
database disconnect"; }
using target database control file instead of recovery catalog
allocated channel: prmy1
channel prmy1: SID=105 device type=DISK

allocated channel: stby1
channel stby1: SID=20 device type=DISK

Starting Duplicate Db at 13-JUN-13
```

```
contents of Memory Script:
{
   backup as copy reuse
   targetfile
'/u01/app/oracle/product/12.1.0/dbhome_1/dbs/orapwboston'
auxiliary format
 '/u01/app/oracle/product/12.1.0/dbhome_1/dbs/orapwlondon'   ;
   restore clone from service  'boston' spfile to
 '/u01/app/oracle/product/12.1.0/dbhome_1/dbs/spfilelondon.ora';
   sql clone "alter system set spfile=
''/u01/app/oracle/product/12.1.0/dbhome_1/dbs/spfilelondon.ora''
";
}
executing Memory Script

Starting backup at 13-JUN-13
Finished backup at 13-JUN-13

Starting restore at 13-JUN-13

channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service boston
channel stby1: restoring SPFILE
output file
name=/u01/app/oracle/product/12.1.0/dbhome_1/dbs/spfilelondon.or
a
channel stby1: restore complete, elapsed time: 00:00:01
Finished restore at 13-JUN-13

sql statement: alter system set spfile=
''/u01/app/oracle/product/12.1.0/dbhome_1/dbs/spfilelondon.ora''

contents of Memory Script:
{
   sql clone "alter system set  audit_file_dest =
 ''/u01/app/oracle/admin/london/adump'' comment=
 '''' scope=spfile";
   sql clone "alter system set  control_files =
 ''/u01/app/oracle/oradata/london/control01.ctl'',
''/u01/app/oracle/fast_recovery_area/london/control02.ctl''
comment=
 '''' scope=spfile";
   sql clone "alter system set  dispatchers =
 ''(PROTOCOL=TCP) (SERVICE=londonXDB)'' comment=
```

```
 '''' scope=spfile";
   sql clone "alter system set  log_archive_dest_1 =
 ''location=USE_DB_RECOVERY_FILE_DEST
valid_for=(ALL_LOGFILES,ALL_ROLES) db_unique_name=london''
comment=
 '''' scope=spfile";
   sql clone "alter system set  db_unique_name =
 ''london'' comment=
 '''' scope=spfile";
   sql clone "alter system set  db_file_name_convert =
 ''boston'', ''london'' comment=
 '''' scope=spfile";
   sql clone "alter system set  log_file_name_convert =
 ''boston'', ''london'' comment=
 '''' scope=spfile";
   sql clone "alter system set  fal_server =
 ''boston'' comment=
 '''' scope=spfile";
   shutdown clone immediate;
   startup clone nomount;
}
executing Memory Script

sql statement: alter system set  audit_file_dest =
''/u01/app/oracle/admin/london/adump'' comment= ''''
scope=spfile

sql statement: alter system set  control_files =
''/u01/app/oracle/oradata/london/control01.ctl'',
''/u01/app/oracle/fast_recovery_area/london/control02.ctl''
comment= '''' scope=spfile

sql statement: alter system set  dispatchers =  ''(PROTOCOL=TCP)
(SERVICE=londonXDB)'' comment= '''' scope=spfile

sql statement: alter system set  log_archive_dest_1 =
''location=USE_DB_RECOVERY_FILE_DEST
valid_for=(ALL_LOGFILES,ALL_ROLES) db_unique_name=london''
comment= '''' scope=spfile

sql statement: alter system set  db_unique_name =  ''london''
comment= '''' scope=spfile

sql statement: alter system set  db_file_name_convert =
''boston'', ''london'' comment= '''' scope=spfile
```

```
sql statement: alter system set  log_file_name_convert =
''boston'', ''london'' comment= '''' scope=spfile

sql statement: alter system set  fal_server =  ''boston''
comment= '''' scope=spfile

Oracle instance shut down

connected to auxiliary database (not started)
Oracle instance started

Total System Global Area     517763072 bytes

Fixed Size                     2290216 bytes
Variable Size                440405464 bytes
Database Buffers              71303168 bytes
Redo Buffers                   3764224 bytes
allocated channel: stby1
channel stby1: SID=20 device type=DISK

contents of Memory Script:
{
   restore clone from service  'boston' standby controlfile;
}
executing Memory Script

Starting restore at 13-JUN-13

channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service boston
channel stby1: restoring control file
channel stby1: restore complete, elapsed time: 00:00:07
output file name=/u01/app/oracle/oradata/london/control01.ctl
output file
name=/u01/app/oracle/fast_recovery_area/london/control02.ctl
Finished restore at 13-JUN-13

contents of Memory Script:
{
   sql clone 'alter database mount standby database';
}
executing Memory Script
```

```
sql statement: alter database mount standby database

contents of Memory Script:
{
   set newname for tempfile  1 to
 "/u01/app/oracle/oradata/london/temp01.dbf";
   set newname for tempfile  2 to
 "/u01/app/oracle/oradata/london/pdbseed/pdbseed_temp01.dbf";
   set newname for tempfile  3 to
 "/u01/app/oracle/oradata/london/dev1/dev1_temp01.dbf";
   switch clone tempfile all;
   set newname for datafile  1 to
 "/u01/app/oracle/oradata/london/system01.dbf";
   set newname for datafile  3 to
 "/u01/app/oracle/oradata/london/sysaux01.dbf";
   set newname for datafile  4 to
 "/u01/app/oracle/oradata/london/undotbs01.dbf";
   set newname for datafile  5 to
 "/u01/app/oracle/oradata/london/pdbseed/system01.dbf";
   set newname for datafile  6 to
 "/u01/app/oracle/oradata/london/users01.dbf";
   set newname for datafile  7 to
 "/u01/app/oracle/oradata/london/pdbseed/sysaux01.dbf";
   set newname for datafile  8 to
 "/u01/app/oracle/oradata/london/dev1/system01.dbf";
   set newname for datafile  9 to
 "/u01/app/oracle/oradata/london/dev1/sysaux01.dbf";
   set newname for datafile  10 to

"/u01/app/oracle/oradata/london/dev1/SAMPLE_SCHEMA_users01.dbf";
   set newname for datafile  11 to
 "/u01/app/oracle/oradata/london/dev1/example01.dbf";
   restore
   from service  'boston'   clone database
   ;
   sql 'alter system archive log current';
}
executing Memory Script

executing command: SET NEWNAME

executing command: SET NEWNAME
```

```
executing command: SET NEWNAME

renamed tempfile 1 to /u01/app/oracle/oradata/london/temp01.dbf
in control file
renamed tempfile 2 to
/u01/app/oracle/oradata/london/pdbseed/pdbseed_temp01.dbf in
control file
renamed tempfile 3 to
/u01/app/oracle/oradata/london/dev1/dev1_temp01.dbf in control
file

executing command: SET NEWNAME

executing command: SET NEWNAME

executing command: SET NEWNAME

executing command: SET NEWNAME

executing command: SET NEWNAME

executing command: SET NEWNAME

executing command: SET NEWNAME

executing command: SET NEWNAME

executing command: SET NEWNAME

executing command: SET NEWNAME

executing command: SET NEWNAME

Starting restore at 13-JUN-13

channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service boston
channel stby1: specifying datafile(s) to restore from backup set
channel stby1: restoring datafile 00001 to
/u01/app/oracle/oradata/london/system01.dbf
channel stby1: restore complete, elapsed time: 00:01:05
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service boston
channel stby1: specifying datafile(s) to restore from backup set
```

```
channel stby1: restoring datafile 00003 to
/u01/app/oracle/oradata/london/sysaux01.dbf
channel stby1: restore complete, elapsed time: 00:01:25
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service boston
channel stby1: specifying datafile(s) to restore from backup set
channel stby1: restoring datafile 00004 to
/u01/app/oracle/oradata/london/undotbs01.dbf
channel stby1: restore complete, elapsed time: 00:00:25
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service boston
channel stby1: specifying datafile(s) to restore from backup set
channel stby1: restoring datafile 00005 to
/u01/app/oracle/oradata/london/pdbseed/system01.dbf
channel stby1: restore complete, elapsed time: 00:00:25
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service boston
channel stby1: specifying datafile(s) to restore from backup set
channel stby1: restoring datafile 00006 to
/u01/app/oracle/oradata/london/users01.dbf
channel stby1: restore complete, elapsed time: 00:00:01
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service boston
channel stby1: specifying datafile(s) to restore from backup set
channel stby1: restoring datafile 00007 to
/u01/app/oracle/oradata/london/pdbseed/sysaux01.dbf
channel stby1: restore complete, elapsed time: 00:01:25
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service boston
channel stby1: specifying datafile(s) to restore from backup set
channel stby1: restoring datafile 00008 to
/u01/app/oracle/oradata/london/dev1/system01.dbf
channel stby1: restore complete, elapsed time: 00:00:35
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service boston
channel stby1: specifying datafile(s) to restore from backup set
channel stby1: restoring datafile 00009 to
/u01/app/oracle/oradata/london/dev1/sysaux01.dbf
channel stby1: restore complete, elapsed time: 00:01:15
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service boston
channel stby1: specifying datafile(s) to restore from backup set
channel stby1: restoring datafile 00010 to
/u01/app/oracle/oradata/london/dev1/SAMPLE_SCHEMA_users01.dbf
```

```
channel stby1: restore complete, elapsed time: 00:00:03
channel stby1: starting datafile backup set restore
channel stby1: using network backup set from service boston
channel stby1: specifying datafile(s) to restore from backup set
channel stby1: restoring datafile 00011 to
/u01/app/oracle/oradata/london/dev1/example01.dbf
channel stby1: restore complete, elapsed time: 00:00:35
Finished restore at 13-JUN-13

sql statement: alter system archive log current

contents of Memory Script:
{
   switch clone datafile all;
}
executing Memory Script

datafile 1 switched to datafile copy
input datafile copy RECID=7 STAMP=818005339 file
name=/u01/app/oracle/oradata/london/system01.dbf
datafile 3 switched to datafile copy
input datafile copy RECID=8 STAMP=818005339 file
name=/u01/app/oracle/oradata/london/sysaux01.dbf
datafile 4 switched to datafile copy
input datafile copy RECID=9 STAMP=818005339 file
name=/u01/app/oracle/oradata/london/undotbs01.dbf
datafile 5 switched to datafile copy
input datafile copy RECID=10 STAMP=818005339 file
name=/u01/app/oracle/oradata/london/pdbseed/system01.dbf
datafile 6 switched to datafile copy
input datafile copy RECID=11 STAMP=818005339 file
name=/u01/app/oracle/oradata/london/users01.dbf
datafile 7 switched to datafile copy
input datafile copy RECID=12 STAMP=818005340 file
name=/u01/app/oracle/oradata/london/pdbseed/sysaux01.dbf
datafile 8 switched to datafile copy
input datafile copy RECID=13 STAMP=818005340 file
name=/u01/app/oracle/oradata/london/dev1/system01.dbf
datafile 9 switched to datafile copy
input datafile copy RECID=14 STAMP=818005340 file
name=/u01/app/oracle/oradata/london/dev1/sysaux01.dbf
datafile 10 switched to datafile copy
```

```
input datafile copy RECID=15 STAMP=818005340 file
name=/u01/app/oracle/oradata/london/dev1/SAMPLE_SCHEMA_users01.d
bf
datafile 11 switched to datafile copy
input datafile copy RECID=16 STAMP=818005340 file
name=/u01/app/oracle/oradata/london/dev1/example01.dbf
Finished Duplicate Db at 13-JUN-13

allocated channel: stby
channel stby: SID=19 device type=DISK

sql statement: alter database recover managed standby database
disconnect
released channel: prmy1
released channel: stby1
released channel: stby
RMAN> exit
Recovery Manager complete.
```

Practice 4-3: Start Redo Transport and Verify Operation

Overview

In this practice, you will start the redo transport from `host01` to `host03` and verify operation.

Tasks

1. Use a terminal window for `host01` logged in as `oracle` with the environment variables set to `boston` and start redo transport by defining `log_archive_dest_2` pointing to the physical standby database.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Jun 11 06:28:00
2013

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



Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

SQL> alter system set log_archive_dest_2='SERVICE=london ASYNC
REOPEN=15 valid_for=(ONLINE_LOGFILES,PRIMARY_ROLE)
db_unique_name=london' scope=both;
System altered.
```

2. Determine the last sequence number archived on the primary database (`host01`). You number may be different in lab.

```
SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG GROUP BY
THREAD#;
MAX(SEQUENCE#)    THREAD#
-------------- ----------
            69          1
```

3. Use a terminal window on `host03` connected as `oracle` with the environment variables set to `london`. Start SQL*Plus and determine the last sequence number of the physical standby instance.

```
[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Jun 11 06:58:53
2013

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



Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG GROUP BY
THREAD#;
MAX(SEQUENCE#)    THREAD#
-------------- ----------
            69          1
```

4. Return to the terminal window of `host01`, and force a log switch to advance the online redo log sequence number. Verify the sequence number has increased.

```
(host01) SQL> alter system switch logfile;
(host01) SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG
GROUP BY THREAD#;
MAX(SEQUENCE#)    THREAD#
-------------- ----------
            70          1
```

5. Return to the terminal window of `host03`, and verify that the physical standby instance is receiving redo from the primary database instance

```
(host03) SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG
GROUP BY THREAD#;
MAX(SEQUENCE#)    THREAD#
-------------- ----------
            70          1
```

6. Exit SQL*Plus on both `host01` and `host03`.

```
SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release
12.1.0.1.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options
[oracle@host01] $

SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release
12.1.0.1.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options
[oracle@host03] $
```

Practices for Lesson 5: Using Oracle Active Data Guard

Chapter 5

Practices for Lesson 5: Overview

Practices Overview

In these practices, you will enable Active Data Guard real-time query and verify its operation. You will also enable change tracking on the physical standby database and implement Far Sync into the current environment.

Practice 5-1: Enable Active Data Guard Real-Time Query

Overview

In this practice, you enable the Active Data Guard real-time query feature and verify its operation.

Tasks

1. Use a terminal window logged in as `oracle` to `host03` with the environment variables set for '`london`' appropriately. Attempt to enable Active Data Guard real-time query by opening the physical standby database in read only mode.

```
[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Aug 21 18:08:44
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

SQL> alter database open read only;
alter database open read only
*
ERROR at line 1:
ORA-10456: cannot open standby database; media recovery session
may be in progress
```

2. Active Data Guard real-time query cannot be enabled while Redo Apply is active. Stop redo apply on the physical standby database and attempt to enable it again.

```
(host03) SQL> alter database recover managed standby database
cancel;
Database altered.

(host03) SQL> alter database open read only;
Database altered.
```

3. Restart the Redo Apply process on the physical standby database.

```
(host03) SQL> alter database recover managed standby database
disconnect;
Database altered.
```

4. This database is using the Oracle Multitenant option. The default operating system authentication method for the multitenant container database (CDB) is to the container root (`CDB$ROOT`). Data Guard environment operations are performed at the CDB level. Schema objects like the sample schemas exist in customer created pluggable databases (PDBs). Verify that the SQL*Plus session is currently connected to the `CDB$ROOT` and that sample schemas do not exist in the root container. Two ways are illustrated to determine the

current container name. The first technique uses the SQL*Plus show commands. The second technique uses all SQL syntax. The `HR.REGIONS` table is part of the sample schemas, but should not exist in the root container.

```
(host03) SQL> show con_id
CON_ID
------------------------------
1

(host03) SQL> show con_name
CON_NAME
------------------------------
CDB$ROOT

(host03) SQL> SELECT sys_context ('USERENV', 'CON_NAME') FROM
dual;
SYS_CONTEXT('USERENV','CON_NAME')
--------------------------------------------------------
CDB$ROOT

(host03) SQL> select * from hr.regions;
select * from hr.regions
              *
ERROR at line 1:
ORA-00942: table or view does not exist
```

5. Determine the pluggable database name (PDB) that was used when creating the multitenant database in previous labs. Two different queries are shown that can provide this answer. There are more views available that also provide this information.

```
(host03) SQL> select con_id, name, open_mode from v$containers;
    CON_ID NAME                           OPEN_MODE
---------- ------------------------------ ----------
         1 CDB$ROOT                       READ ONLY
         2 PDB$SEED                       READ ONLY
         3 DEV1                           MOUNTED

(host03) SQL> col pdb_name format a15
(host03) SQL> select pdb_id, pdb_name, status from DBA_PDBS;
    PDB_ID PDB_NAME        STATUS
---------- --------------- -------------
         3 DEV1            NORMAL
         2 PDB$SEED        NORMAL
```

6. Switch the SQL*Plus session to the DEV1 pluggable database (PDB) and attempt to query the HR.REGIONS table again.

```
(host03) (CDB$ROOT) SQL> ALTER SESSION SET CONTAINER = DEV1;
Session altered.

(host03) (DEV1) SQL> select * from hr.regions;
select * from hr.regions
                *
ERROR at line 1:
ORA-01219: database or pluggable database not open: queries
allowed on fixed tables or views only
```

Note: Even thought the 'london' physical standby database was opened read-only to enable Active Data Guard in step 2, this command was performed at the CDB level. It did not open each individual PDB. The output of step 5 shows that the PDB is currently mounted. Therefore, queries against fixed tables are not allowed and return errors.

7. Open the DEV1 PDB with the 'ALTER DATABASE OPEN' command and attempt to query the HR.REGIONS table again.

```
(host03) (DEV1) SQL> alter database open;
Database altered.

(host03) (DEV1) SQL> select * from hr.regions order by
region_id;

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

8. The 'ALTER DATABASE OPEN' command is normally used to open a database to the read-write mode. Use the query in step 5 to determine the open mode of the DEV1 PDB.

```
(host03) (DEV1) SQL> select con_id, name, open_mode from
v$containers;

    CON_ID NAME                           OPEN_MODE
---------- ------------------------------ ----------
         3 DEV1                           READ ONLY
```

Note: Since the current container is DEV1 and not CDB$ROOT, the output is restricted to that of only the DEV1 PDB. Because the entire PDB is a physical standby database, the SQL statement to open the database is only allowed to open to the read only mode even though a normal read write mode was requested.

9. Leave the above window open. Open a terminal window (if not already open) logged in as `oracle` to `host01` with the environment variables set for '`boston`' appropriately. Launch SQL*Plus and switch session to the DEV1 PDB of the primary database. Query the HR.REGIONS table.

```
[oracle@host01] sqlplus / as sysdba

SQL*Plus: Release 12.1.0.1.0 Production on Wed Aug 21 19:27:19
2013

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



Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) (CDB$ROOT) SQL> alter session set container = DEV1;
Session altered.

(host01) (DEV1) SQL> select * from hr.regions order by
region_id;
REGION_ID REGION_NAME
---------- -------------------------
         1 Europe
         2 Americas
         3 Asia
         4 Middle East and Africa
```

10. Insert a new row into the `HR.REGIONS` table and commit the SQL statement.

```
(host01) (DEV1) SQL> insert into hr.regions values
(5,'Australia');
1 row created.

SQL> commit;
Commit complete.
```

11. Return to the SQL*Plus session to the DEV1 PDB that is still open for the physical standby database on host03 and query the HR.REGIONS value. The new row is immediately available on the physical standby database for reporting applications after it was inserted on the primary database. This illustrates the real-time query capability of Active Data Guard.

```
(host03) (DEV1) SQL> select * from hr.regions order by
region_id;
 REGION_ID REGION_NAME
---------- -------------------------
         1 Europe
         2 Americas
         3 Asia
         4 Middle East and Africa
         5 Australia
```

12. Exit SQL*Plus on host03 of the physical standby database. It is recommended to keep the terminal session open with the environment variables set appropriately.
13. Returning to the SQL*Plus session on host01, attempt to perform a log switch on the primary database and observe the error message. This occurs because the session is connected to the DEV1 PDB and not the root container. This presents a challenge when using terminal session for a command line Data Guard environment due to hosts involved (host01,host02,host03,host04), operating system accounts (vncuser, root, oracle), environment variable settings (boston, bostonFS, london, londonFS), and now CDB vs. PDB connected sessions (CDB$ROOT, DEV1). Fictitious prompts have been added to these lab exercises to help the student know how they should be connected. These prompts do not appear in the actual labs.

```
(host01) (DEV1) SQL> alter system switch logfile;
alter system switch logfile
*
ERROR at line 1:
ORA-65040: operation not allowed from within a pluggable
database
```

Note: Remember that all Data Guard operations must be performed at the container root level (CDB$ROOT).

14. Exit SQL*Plus on host01, leaving the window open for future practices.

Practice 5-2: Enable Change Tracking on the Physical Standby Database

Overview

In this practice, you will enable the change tracking feature on `host03` for the physical standby database and verify its usage.

Tasks

1. Use a terminal window logged in as `oracle` to `host03` with the environment variables set for '`london`' appropriately. SQL*Plus using operating system authentication connect by default in the lab environment to the root container. Enable change tracking using the file `/u01/app/oracle/oradata/london/rman_change_track.file`.

```
[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Aug 21 20:06:05
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host03) SQL> alter database enable block change tracking using
file '/u01/app/oracle/oradata/london/rman_change_track.file';
Database altered.
```

2. Verify that block change tracking is enabled, displaying the file name used and file size of the block change tracking file.

```
(host03) SQL> select filename, status, bytes from
v$block_change_tracking;

FILENAME
--------------------------------------------------
STATUS          BYTES
---------- ----------
/u01/app/oracle/oradata/london/rman_change_track.file
ENABLED      11599872
```

3. Exit SQL*Plus on `host03` of the physical standby database. It is recommended to keep the terminal session open with the environment variables set appropriately.

Practice 5-3: Add Far Sync to the Data Guard Environment

Overview

In this practice, you will create a Far Sync instance (bostonFS) on host02 that is in close proximity to the primary database.

Tasks

1. Use a terminal window for host01 logged in as oracle with the environment variables set to 'boston'. Use SQL*Plus to create a text-based initialization parameter file named '/tmp/initbostonFS.ora' that contains a copy of all the current parameters for the primary database.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Aug 21 21:27:25
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) SQL> create pfile='/tmp/initbostonFS.ora' from spfile;
File created.
```

2. Create a Far Sync control file named '/tmp/bostonFS.ctl' on the primary database and exit SQL*Plus when done.

```
(host01) SQL> alter database create far sync instance
controlfile as '/tmp/bostonFS.ctl';
Database altered.

(host01) SQL> exit
```

3. Copy the primary password file to the /tmp directory.

```
[oracle@host01]$ cp $ORACLE_HOME/dbs/orapwboston /tmp
```

4. Transfer the three files staged in the /tmp directory from host01 to host02 and place them into the /tmp directory on host02.

```
[oracle@host01]$ scp /tmp/initbostonFS.ora oracle@host02:/tmp
initbostonFS.ora       100% 1416     1.4KB/s   00:00
[oracle@host01]$ scp /tmp/bostonFS.ctl oracle@host02:/tmp
bostonFS.ctl           100%   18MB  17.7MB/s   00:00
[oracle@host01]$ scp /tmp/orapwboston oracle@host02:/tmp
orapwboston            100% 7680     7.5KB/s   00:00
```

5. Use a terminal window for host02 logged in as oracle with the environment variables set to 'bostonFS'. Create the initial directories needed on the Far Sync server. These are the same directories that were created on the physical standby server host03 in practice 4-2.

```
[oracle@host02]$ mkdir -p /u01/app/oracle/admin/bostonFS/adump
[oracle@host02]$ mkdir -p /u01/app/oracle/oradata/bostonFS
[oracle@host02]$ mkdir -p
/u01/app/oracle/oradata/bostonFS/pdbseed
[oracle@host02]$ mkdir -p /u01/app/oracle/oradata/bostonFS/dev1
[oracle@host02]$ mkdir -p
/u01/app/oracle/fast_recovery_area/bostonFS
```

Note: Linux directory and file names are case sensitive. Throughout these labs, the names for Far Sync use the format bostonFS and londonFS for readability. The last 2 letters are in upper-case.

6. On host02, use the VI utility to edit the /tmp/initbostonFS.ora file. You will need to make changes to the initialization parameters to reflect the name change from 'boston' to 'bostonFS'. You will also need to make adjustments for control file name changes and directory name changes.

```
[oracle@host02]$ vi /tmp/initbostonFS.ora
```

   a. Globally search and replace all occurrences of 'boston' with 'bostonFS'

```
:%s/boston/bostonFS/g
18 substitutions on 16 lines
```

   b. Two of the substitutions from the global search and replace are incorrect and need to be reverted back to their original value. Continue editing the file to locate and correct db_name and log_archive_config entries. Ask your instructor for assistance if you need help with VI syntax. Remember to always use the <ESC> key before starting a new VI command option.

```
*.db_name='boston'
*.log_archive_config='dg_config=(boston,bostonFS,london,londonFS
,london2)'
```

   c. The entry for log_archive_dest_2 uses the valid_for option assuming it has the role of primary database. On the Far Sync, this needs to use the role of a standby database. Also the Far Sync should use SYNC communication to the physical standby environment. Correct the log_archive_dest_2 parameter to the following value (Changes to make in bold):

```
*.log_archive_dest_2='SERVICE=london SYNC REOPEN=15
valid_for=(STANDBY_LOGFILES,STANDBY_ROLE) db_unique_name=london'
```

   d. The original control files are named control01.ctl and control02.ctl. We will rename these to bostonFS01.ctl and bostonFS02.ctl. This is for preference only since these files are not normal control files. Both changes can be made with the following global search and replace:

```
:%s/control0/bostonFS0/g
```

e. Add the following new entries to the bottom of the file.

```
*.db_unique_name=bostonFS
*.fal_server=boston
*.log_file_name_convert='boston','bostonFS'
```

f. Recheck all modifications and case sensitivity issues. If accurate, then save the changes made to the file.

```
:wq!
```

g. The complete edited file is listed below for reference. Bold entries indicate changes that were made.

```
[oracle@host02]$ cat /tmp/initbostonFS.ora
bostonFS.__data_transfer_cache_size=0
bostonFS.__db_cache_size=46137344
bostonFS.__java_pool_size=12582912
bostonFS.__large_pool_size=12582912
bostonFS.__oracle_base='/u01/app/oracle'#ORACLE_BASE set from
environment
bostonFS.__pga_aggregate_target=209715200
bostonFS.__sga_target=310378496
bostonFS.__shared_io_pool_size=4194304
bostonFS.__shared_pool_size=226492416
bostonFS.__streams_pool_size=0
*.audit_file_dest='/u01/app/oracle/admin/bostonFS/adump'
*.audit_trail='db'
*.compatible='12.1.0.0.0'
*.control_files='/u01/app/oracle/oradata/bostonFS/bostonFS01.ctl
','/u01/app/oracle/fast_recovery_area/bostonFS/bostonFS02.ctl'
*.db_block_size=8192
*.db_domain='example.com'
*.db_name='boston'
*.db_recovery_file_dest='/u01/app/oracle/fast_recovery_area'
*.db_recovery_file_dest_size=10g
*.diagnostic_dest='/u01/app/oracle'
*.dispatchers='(PROTOCOL=TCP) (SERVICE=bostonFSXDB)'
*.enable_pluggable_database=true
*.log_archive_config='dg_config=(boston,bostonFS,london,londonFS
,london2)'
*.log_archive_dest_1='location=USE_DB_RECOVERY_FILE_DEST
valid_for=(ALL_LOGFILES,ALL_ROLES) db_unique_name=bostonFS'
*.log_archive_dest_2='SERVICE=london SYNC REOPEN=15
valid_for=(STANDBY_LOGFILES,STANDBY_ROLE) db_unique_name=london'
*.log_archive_dest_state_1='enable'
*.log_archive_format='arch_%t_%s_%r.log'
*.log_archive_max_processes=4
```

```
*.memory_target=496m
*.open_cursors=300
*.processes=300
*.remote_login_passwordfile='EXCLUSIVE'
*.standby_file_management='auto'
*.undo_tablespace='UNDOTBS1'
*.db_unique_name=bostonFS
*.fal_server=boston
*.log_file_name_convert='boston','bostonFS'
```

7. Copy the `/tmp/bostonFS.ctl` Far Sync control file to the two destination directories used in the initialization parameter file. Rename the files to the correct name while copying them.

```
[oracle@host02]$ cp /tmp/bostonFS.ctl
/u01/app/oracle/oradata/bostonFS/bostonFS01.ctl

[oracle@host02]$ cp /tmp/bostonFS.ctl
/u01/app/oracle/fast_recovery_area/bostonFS/bostonFS02.ctl
```

8. Copy the password file staged into the /tmp directory to the default location of Far Sync instance. Rename the file appropriately while copying it.

```
[oracle@host02]$ cp /tmp/orapwboston
/u01/app/oracle/product/12.1.0/dbhome_1/dbs/orapwbostonFS
```

9. Verify that the environment variables are defined for '`bostonFS`'. If they are not, then use the `oraenv` utility to set them if needed.

```
[oracle@host02]$ set | grep ORA
OLD_ORACLE_BASE=
ORABASE_EXEC=/u01/app/oracle/product/12.1.0/dbhome_1/bin/orabase
ORACLE_BASE=/u01/app/oracle
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1
ORACLE_SID=bostonFS
ORAHOME=/u01/app/oracle/product/12.1.0/dbhome_1
ORASID=oracle
```

10. Use SQL*Plus to create a binary server parameter file from the text parameter file. Create the server parameter file into the default directory.

```
[oracle@host02]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Aug 21 22:41:21
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to an idle instance.

(host02) SQL> create spfile from pfile='/tmp/initbostonFS.ora';
File created.
```

11. Startup MOUNT the Far Sync instance.

```
(host02) SQL> startup mount;
ORACLE instance started.

Total System Global Area  517763072 bytes
Fixed Size                  2290216 bytes
Variable Size             440405464 bytes
Database Buffers           71303168 bytes
Redo Buffers                3764224 bytes
Database mounted.
```

12. Use a terminal window for `host01` logged in as `oracle` with the environment variables set to `'boston'`, the primary database. Launch SQL*plus and examine the current value of `log_archive_dest_2`.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Aug 21 22:58:23
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) SQL> show parameter log_archive_dest_2
NAME                 TYPE        VALUE
-------------------- ----------- ------------------------------
log_archive_dest_2   string      SERVICE=london SYNC REOPEN=15
                                 valid_for=(ONLINE_LOGFILES,
                                 PRIMARY_ROLE)
                                 db_unique_name=london
```

13. The primary is currently forwarding redo to the physical standby database. Alter the primary database to now forward redo to the Far Sync instance instead of the physical standby database. Be sure to make the corrections both in memory and written to the server parameter file.

```
(host01) SQL> alter system set
log_archive_dest_2='SERVICE=bostonFS SYNC REOPEN=15
valid_for=(ONLINE_LOGFILES,PRIMARY_ROLE)
db_unique_name=bostonFS' scope=both;

System altered.
```

14. Determine the most recently archived redo log on the primary database. Perform a log switch, and verify the next sequence number used.

```
(host01) SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG
GROUP BY THREAD#;
MAX(SEQUENCE#)    THREAD#
-------------- ----------
           165          1

(host01) SQL> alter system switch logfile;
System altered.

(host01) SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG
GROUP BY THREAD#;
MAX(SEQUENCE#)    THREAD#
-------------- ----------
           166          1
```

15. Use the previous SQL*Plus session for `host02` logged in as `oracle` with the environment variables set to `'bostonFS'`, the Far Sync. Verify that the last sequence number of the primary was received on the Far Sync.

```
(host02) SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG
GROUP BY THREAD#;
MAX(SEQUENCE#)    THREAD#
-------------- ----------
           166          1
```

16. Use a terminal window for `host03` logged in as `oracle` with the environment variables set to `'london'`. Launch SQL*Plus and verify that the physical standby on `host03` is receiving redo from the Far Sync on `host02`.

```
[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Thu Aug 22 01:22:50
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host03) SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG
GROUP BY THREAD#;
MAX(SEQUENCE#)    THREAD#
-------------- ----------
           166          1
```

17. Exit all SQL*Plus sessions from `host01`, `host02`, and `host03`. Leave the terminal sessions open with the environment variables set for each system.

```
(host01) SQL> exit;
(host02) SQL> exit;
(host03) SQL> exit;
```

18. Verify on the Far Sync server, `host02`, that the standby redo logs were automatically created.

```
[oracle@host02]$ ls -la /u01/app/oracle/oradata/bostonFS/stdby*
-rw-r----- 1 oracle oinstall 52429312 Aug 22 02:38
/u01/app/oracle/oradata/bostonFS/stdbyredo01.log
-rw-r----- 1 oracle oinstall 52429312 Aug 22 01:22
/u01/app/oracle/oradata/bostonFS/stdbyredo02.log
-rw-r----- 1 oracle oinstall 52429312 Aug 22 01:13
/u01/app/oracle/oradata/bostonFS/stdbyredo03.log
-rw-r----- 1 oracle oinstall 52429312 Aug 22 01:13
/u01/app/oracle/oradata/bostonFS/stdbyredo04.log
```

Practice 5-4: Add 2nd Far Sync to the Data Guard Environment

Overview

In this practice, you will create an additional Far Sync instance (londonFS) on host04 that is in close proximity to the physical standby database. This will be used in future practices that perform role reversal. With a role reversal, the 'london' instance on host03 will become the primary database. It will need to forward redo to 'londonFS' Far Sync on host04.

Tasks

1. In the practice, we copied a Far Sync control file, initialization parameter file, and password file to the /tmp directory on host02. We will start with these files and copy them to host04 since they were already edited for a Far Sync environment. Use a terminal window for host02 logged in as oracle with the environment variables set to 'bostonFS'. Copy the three files staged in /tmp to host04.

```
[oracle@host02]$ scp /tmp/bostonFS.ctl oracle@host04:/tmp
bostonFS.ctl          100%   18MB  17.7MB/s   00:00

[oracle@host02]$ scp /tmp/initbostonFS.ora oracle@host04:/tmp
initbostonFS.ora      100% 1586     1.6KB/s   00:00

[oracle@host02]$ scp /tmp/orapwboston oracle@host04:/tmp
orapwboston           100% 7680     7.5KB/s   00:00
```

2. Use a terminal window for host04 logged in as oracle with the environment variables set to 'londonFS'. Create the initial directories needed on the Far Sync server. These are the same directories that were created on the physical standby server host03 in practice 4-2.

```
[oracle@host04]$ mkdir -p /u01/app/oracle/admin/londonFS/adump
[oracle@host04]$ mkdir -p /u01/app/oracle/oradata/londonFS
[oracle@host04]$ mkdir -p
/u01/app/oracle/oradata/londonFS/pdbseed
[oracle@host04]$ mkdir -p /u01/app/oracle/oradata/londonFS/dev1
[oracle@host04]$ mkdir -p
/u01/app/oracle/fast_recovery_area/londonFS
```

Note: Linux directory and file names are case sensitive. Throughout these labs, the names for Far Sync use the format bostonFS and londonFS for readability. The last 2 letters are in upper-case.

3. Use a terminal window for host04 logged in as oracle with the environment variables set to 'londonFS'. Rename the /tmp/initbostonFS.ora file to /tmp/initlondonFS.ora. You will need to make changes to the initialization parameters to reflect the name change from 'boston' to 'london'. You will also need to make adjustments for control file name changes and directory name changes.

```
[oracle@host04]$ mv /tmp/initbostonFS.ora /tmp/initlondonFS.ora

[oracle@host04]$ vi /tmp/initlondonFS.ora
```

a. Globally search and replace all occurrences of 'boston' with 'london'

```
:%s/boston/london/g
24 substitutions on 19 lines
```

b. Three of the substitutions from the global search and replace are incorrect and need to be reverted back to their original value. Continue editing the file to locate and correct db_name, log_archive_config, and log_file_name_convert entries. Ask your instructor for assistance if you need help with VI syntax. Remember to always use the <ESC> key before starting a new VI command option.

```
*.db_name='boston'
*.log_archive_config='dg_config=(boston,bostonFS,london,londonFS
,london2)'
*.log_file_name_convert='boston','londonFS'
```

c. The entry for log_archive_dest_2 is defined for a standby database role to ship redo to the 'london' service. If 'london' becomes the primary database, then the 'londonFS' Far Sync should ship redo to 'boston', which will become the standby database after role reversal. Correct the values for this parameter. Changes shown in bold.

```
*.log_archive_dest_2='SERVICE=boston ASYNC REOPEN=15
valid_for=(STANDBY_LOGFILES,STANDBY_ROLE) db_unique_name=boston'
```

d. Recheck all modifications and case sensitivity issues. If accurate, then save the changes made to the file. Less changes were needed since we started with a modified file.

```
:wq!
```

e. The complete edited file is listed below for reference. Bold entries indicate changes that were made.

```
[oracle@host04]$ cat /tmp/initlondonFS.ora
londonFS.__data_transfer_cache_size=0
londonFS.__db_cache_size=46137344
londonFS.__java_pool_size=12582912
londonFS.__large_pool_size=12582912
londonFS.__oracle_base='/u01/app/oracle'#ORACLE_BASE set from
environment
londonFS.__pga_aggregate_target=209715200
londonFS.__sga_target=310378496
londonFS.__shared_io_pool_size=4194304
londonFS.__shared_pool_size=226492416
londonFS.__streams_pool_size=0
*.audit_file_dest='/u01/app/oracle/admin/londonFS/adump'
*.audit_trail='db'
*.compatible='12.1.0.0.0'
*.control_files='/u01/app/oracle/oradata/londonFS/londonFS01.ctl
','/u01/app/oracle/fast_recovery_area/londonFS/londonFS02.ctl'
*.db_block_size=8192
*.db_domain='example.com'
```

```
*.db_name='boston'
*.db_recovery_file_dest='/u01/app/oracle/fast_recovery_area'
*.db_recovery_file_dest_size=10g
*.diagnostic_dest='/u01/app/oracle'
*.dispatchers='(PROTOCOL=TCP) (SERVICE=londonFSXDB)'
*.enable_pluggable_database=true
*.log_archive_config='dg_config=(boston,bostonFS,london,londonFS
,london2)'
*.log_archive_dest_1='location=USE_DB_RECOVERY_FILE_DEST
valid_for=(ALL_LOGFILES,ALL_ROLES) db_unique_name=londonFS'
*.log_archive_dest_2='SERVICE=boston ASYNC REOPEN=15
valid_for=(STANDBY_LOGFILES,STANDBY_ROLE) db_unique_name=boston'
*.log_archive_dest_state_1='enable'
*.log_archive_format='arch_%t_%s_%r.log'
*.log_archive_max_processes=4
*.memory_target=496m
*.open_cursors=300
*.processes=300
*.remote_login_passwordfile='EXCLUSIVE'
*.standby_file_management='auto'
*.undo_tablespace='UNDOTBS1'
*.db_unique_name=londonFS
*.fal_server=london
*.log_file_name_convert='boston','londonFS'
```

4. Copy the `/tmp/bostonFS.ctl` Far Sync control file to the two destination directories used in the initialization parameter file. Rename the files to the correct name while copying them.

```
[oracle@host04]$ cp /tmp/bostonFS.ctl
/u01/app/oracle/oradata/londonFS/londonFS01.ctl

[oracle@host04]$ cp /tmp/bostonFS.ctl
/u01/app/oracle/fast_recovery_area/londonFS/londonFS02.ctl
```

5. Copy the password file staged into the /tmp directory to the default location of Far Sync instance. Rename the file appropriately while copying it.

```
[oracle@host04]$ cp /tmp/orapwboston
/u01/app/oracle/product/12.1.0/dbhome_1/dbs/orapwlondonFS
```

6. Verify that the environment variables are defined for '`bostonFS`'. If they are not, then use the `oraenv` utility to set them if needed.

```
[oracle@host04]$ set | grep ORA
OLD_ORACLE_BASE=
ORABASE_EXEC=/u01/app/oracle/product/12.1.0/dbhome_1/bin/orabase
ORACLE_BASE=/u01/app/oracle
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1
```

```
ORACLE_SID=londonFS
ORAHOME=/u01/app/oracle/product/12.1.0/dbhome_1
ORASID=oracle
```

7. Use SQL*Plus to create a binary server parameter file from the text parameter file. Create the server parameter file into the default directory.

```
[oracle@host04]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Aug 21 22:41:21
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to an idle instance.

(host04) SQL> create spfile from pfile='/tmp/initlondonFS.ora';
File created.
```

8. Startup MOUNT the Far Sync instance. Leave SQL*Plus session open when done.

```
(host04) SQL> startup mount;
ORACLE instance started.

Total System Global Area  517763072 bytes
Fixed Size                  2290216 bytes
Variable Size             440405464 bytes
Database Buffers           71303168 bytes
Redo Buffers                3764224 bytes
Database mounted.

(host04) SQL> exit;
```

9. Use a terminal window for `host03` logged in as `oracle` with the environment variables set to `'london'`, the physical standby database. Launch SQL*plus and examine the current value of `log_archive_dest_2`.

```
[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Aug 21 22:58:23
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host03) SQL> show parameter log_archive_dest_2
NAME                 TYPE        VALUE
-------------------- ----------- ------------------------------
log_archive_dest_2   string
```

10. The `log_archive_dest_2` parameter of the '`london`' physical standby instance is not currently defined because it is a terminal destination. After role reversals, it would become the primary database. At that time, it should forward redo to the '`londonFS`' Far Sync. Modify the `log_archive_dest_2` parameter so that it forwards redo accordingly.

```
(host03) SQL> alter system set
log_archive_dest_2='SERVICE=londonFS SYNC REOPEN=15
valid_for=(ONLINE_LOGFILES,PRIMARY_ROLE)
db_unique_name=londonFS' scope=both;
System altered.
```

Note: At this point in the labs, the 'londonFS' Far Sync has been started, but it is not currently used. It will be tested after switchover exercises are performed in future labs.

11. Exit all SQL*Plus sessions from `host01`, `host02`, `host03`, and `host04` if they are still open. Leave the terminal sessions open with the environment variables set for each system.

```
(host01) SQL> exit;
(host02) SQL> exit;
(host03) SQL> exit;
(host04) SQL> exit;
```

Practices for Lesson 6: Creating and Managing a Snapshot Standby Database

Chapter 6

Practices for Lesson 6: Overview

Practices Overview

In these practices, you will convert the physical standby database to a snapshot database and open it for read-write operations. You will create new schema objects in the database to verify the success of creating the snapshot. Finally, you will convert it back into a physical standby database, discarding the schema objects that were created.

Practice 6-1: Convert Physical Standby to a Snapshot Standby

Overview

In this practice, you will convert the 'london' physical standby database to a snapshot standby database.

Tasks

1. Use a terminal window logged in as `oracle` to `host03` with the environment variables set for '`london`' appropriately. Launch SQL*Plus and verify that the current database role is physical standby.

```
[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Thu Aug 22 03:45:30
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host03) SQL> select database_role from v$database;
DATABASE_ROLE
----------------
PHYSICAL STANDBY
```

2. Verify that flashback database is turned off, and show the default value for the flashback retention target.

```
(host03) SQL> select flashback_on from v$database;
FLASHBACK_ON
------------------
NO

(host03) SQL> show parameter DB_FLASHBACK_RETENTION_TARGET
NAME                                 TYPE        VALUE
------------------------------------ ----------- -------------
db_flashback_retention_target        integer     1440
```

3. Display the values for the two initialization parameters that define the Fast Recovery Area.

```
(host03) SQL> show parameter DB_RECOVERY_FILE_DEST
NAME                         TYPE         VALUE
---------------------------- -----------  ------
db_recovery_file_dest        string
/u01/app/oracle/fast_recovery_area
db_recovery_file_dest_size   big integer  10G
```

4. Display the current file types, number of files for each type, and percent of space utilization per file type for the Fast Recovery Area.

```
(host03) SQL> select
file_type,number_of_files,percent_space_used from
v$recovery_area_usage;
FILE_TYPE               NUMBER_OF_FILES PERCENT_SPACE_USED
----------------------- --------------- ------------------
CONTROL FILE                          0                  0
REDO LOG                              0                  0
ARCHIVED LOG                          4                .15
BACKUP PIECE                          1                .17
IMAGE COPY                            0                  0
FLASHBACK LOG                         0                  0
FOREIGN ARCHIVED LOG                  0                  0
AUXILIARY DATAFILE COPY               0                  0

8 rows selected.
```

5. Attempt to convert the physical standby database to a snapshot standby database.

```
(host03) SQL> alter database convert to snapshot standby;
alter database convert to snapshot standby
*
ERROR at line 1:
ORA-38784: Cannot create restore point
'SNAPSHOT_STANDBY_REQUIRED_08/22/2013
03:57:13'.
ORA-01153: an incompatible media recovery is active
```

6. Cancel redo apply on the physical standby database and reattempt to convert the physical standby database to a snapshot standby database.

```
(host03) SQL> alter database recover managed standby database
cancel;
Database altered.

(host03) SQL> alter database convert to snapshot standby;
Database altered.
```

7. Display the current database role.

```
(host03) SQL> select database_role from v$database;
DATABASE_ROLE
----------------
SNAPSHOT STANDBY
```

8. Verify that flashback database was automatically enabled when the physical standby was converted to a snapshot standby.

```
(host03) SQL> select flashback_on from v$database;
FLASHBACK_ON
------------------
RESTORE POINT ONLY
```

9. Display the name of the guaranteed restore point that was created and its current storage size.

```
(host03) SQL> select name, storage_size from v$restore_point;
NAME                                          STORAGE_SIZE
--------------------------------------------  ------------
SNAPSHOT_STANDBY_REQUIRED_08/22/2013 03:59:36    52428800
```

10. Display the current open mode for the snapshot standby.

```
(host03) SQL> select open_mode from v$database;
OPEN_MODE
--------------------
MOUNTED
```

11. Verify that a flashback log was automatically created in the Recovery Area.

```
(host03) SQL> select file_type, number_of_files,
percent_space_used from v$recovery_area_usage;

FILE_TYPE               NUMBER_OF_FILES PERCENT_SPACE_USED
----------------------- --------------- ------------------
CONTROL FILE                          0                  0
REDO LOG                              0                  0
ARCHIVED LOG                          4                .15
BACKUP PIECE                          1                .17
IMAGE COPY                            0                  0
FLASHBACK LOG                         2                .98
FOREIGN ARCHIVED LOG                  0                  0
AUXILIARY DATAFILE COPY               0                  0

8 rows selected.
```

12. Attempt to convert the snapshot standby back to a physical standby.

```
(host03) SQL> alter database convert to physical standby;
alter database convert to physical standby
*
ERROR at line 1:
ORA-16433: The database or pluggable database must be opened in
read/write
mode.
```

Note: Even though the command in step 6 succeeded in converting the physical standby into a snapshot standby, it must be opened into read-write mode at least one time before you can reverse the operation back to a physical standby. The purpose of this example is to show what happens if you changed your mind and wanted to convert back to a physical standby without proceeding.

13. Open the snapshot database and verify that it has been opened in the read-write mode.

```
(host03) SQL> alter database open;
Database altered.

(host03) SQL> select open_mode from v$database;
OPEN_MODE
--------------------
READ WRITE
```

14. Switch the container to the DEV1 PDB for the session. Even though the container is open, the DEV1 PDB is mounted. Open the DEV1 PDB, and create a miscellaneous table. Insert 1 row into the table and commit the result. Return to the root container when done.

```
(host03) SQL> alter session set container = DEV1;
Session altered.

(host03) SQL> alter database open;
Database altered.

(host03) SQL> create table misc1 (x varchar2(50) );
Table created.

(host03) SQL> insert into misc1 values ('Test Row');
1 row created.

(host03) SQL> commit;
Commit complete.

(host03) SQL> alter session set container = CDB$ROOT;
Session altered.
```

15. In step 6, managed recovery was stopped for the snapshot database. Use a terminal window logged in as `oracle` to `host01` to with the environment variables set for '`boston`' appropriately. Determine the last archived redo log for the primary database and perform a log switch. Exit SQL*Plus when done.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Thu Aug 22 04:27:34
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG
GROUP BY THREAD#;
MAX(SEQUENCE#)    THREAD#
-------------- ----------
           175          1

(host01) SQL> alter system switch logfile;
System altered.

(host01) SQL> exit;
```

16. Return to the SQL*Plus session on `host03` and verify that the snapshot standby is still receiving redo from the primary database, forwarded to the Far Sync, and then to the snapshot standby. The sequence number should be the next one after the number displayed on the primary database in the previous step.

```
(host03) SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG
GROUP BY THREAD#;
MAX(SEQUENCE#)    THREAD#
-------------- ----------
           176          1
```

Practice 6-2: Convert Snapshot Standby Back to Physical Standby

Overview

In this practice, you convert the snapshot standby back into a physical standby database.

Tasks

1. Attempt to convert the snapshot standby back into a physical standby.

```
(host03) SQL> alter database convert to physical standby;
alter database convert to physical standby
*
ERROR at line 1:
ORA-01126: database must be mounted in this instance and not
open in any
Instance
```

2. Shutdown the snapshot standby and start it back up in the MOUNT mode.

```
(host03) SQL> shutdown immediate;
Database closed.
Database dismounted.
ORACLE instance shut down.

SQL> startup mount;
ORACLE instance started.
Total System Global Area  517763072 bytes
Fixed Size                  2290216 bytes
Variable Size             440405464 bytes
Database Buffers           71303168 bytes
Redo Buffers                3764224 bytes
Database mounted.
```

3. Reattempt to convert the snapshot standby back into a physical standby.

```
(host03) SQL> alter database convert to physical standby;
Database altered.
```

4. Verify that flashback has been turned off, and the flashback log was deleted freeing up space in the flash recovery area.

```
(host03) SQL> select flashback_on from v$database;
FLASHBACK_ON
------------------
NO

(host03) SQL> select
file_type,number_of_files,percent_space_used from
v$recovery_area_usage;
FILE_TYPE               NUMBER_OF_FILES PERCENT_SPACE_USED
```

```
---------------------- -------------- ------------------
CONTROL FILE                        0                  0
REDO LOG                            0                  0
ARCHIVED LOG                        5                .19
BACKUP PIECE                        1                .17
IMAGE COPY                          0                  0
FLASHBACK LOG                       0                  0
FOREIGN ARCHIVED LOG                0                  0
AUXILIARY DATAFILE COPY             0                  0
```

5. Open the container database to enable Active Data Guard, and then switch the session to the DEV1 pluggable database. Open the DEV1 PDB.

```
(host03) SQL> alter database open;
Database altered.

(host03) SQL> alter session set container = DEV1;
Session altered.

(host03) (DEV1) SQL> alter database open;
Database altered.
```

6. Attempt to query the MISC1 table that was created in Practice 6-1 step 14, and verify that the table no longer exists after converting the snapshot standby back into a physical standby database.

```
(host03) (DEV1) SQL> select * from misc1;
select * from misc1
              *
ERROR at line 1:
ORA-00942: table or view does not exist


(host03) (DEV1) SQL> select table_name from dba_tables where
table_name like 'MISC%';
no rows selected
```

7. Return the session back to the container root. Shut down the physical standby to disable Active Data Guard. Start in back up in the MOUNT state and restart Redo Apply.

```
(host03) SQL> alter session set container = CDB$ROOT;
Session altered.

(host03) SQL> shutdown immediate;
Database closed.
Database dismounted.
ORACLE instance shut down.

(host03) SQL> startup mount;
ORACLE instance started.
Total System Global Area  517763072 bytes
Fixed Size                  2290216 bytes
Variable Size             440405464 bytes
Database Buffers           71303168 bytes
Redo Buffers                3764224 bytes
Database mounted.

(host03) SQL> alter database recover managed standby database
disconnect;
Database altered.
```

8. Exit SQL*Plus on any host machine in which it is open. Do not close down the terminal sessions.

```
(host03) SQL> exit;
```

Practices for Lesson 7: Creating a Logical Standby Database

Chapter 7

Practices for Lesson 7: Overview

Practices Overview

In these practices, you will prepare `host03` to create a logical standby database. You will use the `RMAN` utility to create the physical standby database and then verify its operation.

Practice 7-1: Identify Unsupported Objects for Logical Standbys

Overview

In this practice, you will examine the primary database to determine which objects will not be supported in a logical standby.

Tasks

1. Use a terminal window on `host01` connected as `oracle` with the environment variables set to `boston`. Start SQL*Plus and verify that all pluggable databases are open for queries. If any pluggable database is mounted or shutdown, the queries that follow this step will not return complete results.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Jun 11 03:51:01
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to an idle instance.

(host01) SQL> select con_id, name, open_mode from v$containers;
    CON_ID NAME                           OPEN_MODE
---------- ------------------------------ ----------
         1 CDB$ROOT                       READ WRITE
         2 PDB$SEED                       READ ONLY
         3 DEV1                           READ WRITE
```

2. Find all tables across all PDBs without unique logical identifiers in the primary database. This query will take a few minutes to run.

```
(host01) SQL> SELECT CON_ID, OWNER, TABLE_NAME FROM
CDB_LOGSTDBY_NOT_UNIQUE WHERE (CON_ID, OWNER, TABLE_NAME) NOT IN
(SELECT DISTINCT CON_ID, OWNER, TABLE_NAME FROM
CDB_LOGSTDBY_UNSUPPORTED) AND BAD_COLUMN = 'Y';

    CON_ID OWNER        TABLE_NAME
---------- ------------ ------------------------------
         1 APEX_040200  WWV_FLOW_BANNER
         1 APEX_040200  APEX$_WS_WEBPG_SECTION_HISTORY
         2 APEX_040200  WWV_FLOW_BANNER
         2 APEX_040200  APEX$_WS_WEBPG_SECTION_HISTORY
         3 APEX_040200  WWV_FLOW_BANNER
         3 APEX_040200  APEX$_WS_WEBPG_SECTION_HISTORY

6 rows selected.
```

Note: This query differs from the one listed in the product documentation. It has been modified to examine schema objects across all PDBs. We can ignore the APEX user, since we will not be using that product in class. The normal response to rows found by the above

query would be to create disabled 'rely' primary constraints, or to have SQL Apply skip changes made to the tables identified.

3. Identify the internal schemas that ship with the Oracle Database. Any user-defined table created into these schemas will not be replicated on the logical standby database. Also, those user-defined tables will not show up in the DBA_LOGSTDBY_UNSUPPORTED or CDB_LOGSTDBY_UNSUPPORTED views of step 4, even though they are unsupported.

```
(host01) SQL> SELECT CON_ID, OWNER FROM CDB_LOGSTDBY_SKIP WHERE
STATEMENT_OPT = 'INTERNAL SCHEMA' ORDER BY CON_ID, OWNER;
…
         3 OLAPSYS
         3 ORACLE_OCM
         3 ORDDATA
         3 ORDPLUGINS

    CON_ID OWNER
---------- --------------------
         3 ORDSYS
         3 OUTLN
         3 SI_INFORMTN_SCHEMA
         3 SYS
         3 SYSBACKUP
         3 SYSDG
         3 SYSKM
         3 SYSTEM
         3 WMSYS
         3 XDB
         3 XS$NULL
88 rows selected.
```

Note: This query differs from the one listed in the product documentation. It has been modified to examine schema objects across all PDBs. The PDB DEV1 contains one additional internal schema not found in the CDB$ROOT or PDB$SEED containers. It is the BI schema.

4. Identify tables that do not belong to internal schemas and that will not be maintained by SQL Apply because of unsupported data types.

```
(host01) SQL> SELECT DISTINCT CON_ID,OWNER,TABLE_NAME FROM
CDB_LOGSTDBY_UNSUPPORTED ORDER BY OWNER,TABLE_NAME;

    CON_ID OWNER                TABLE_NAME
---------- -------------------- ------------------------------
         3 IX                   AQ$_ORDERS_QUEUETABLE_G
         3 IX                   AQ$_ORDERS_QUEUETABLE_H
         3 IX                   AQ$_ORDERS_QUEUETABLE_I
         3 IX                   AQ$_ORDERS_QUEUETABLE_L
         3 IX                   AQ$_ORDERS_QUEUETABLE_S
```

```
         3 IX                    AQ$_ORDERS_QUEUETABLE_T
         3 IX                    AQ$_STREAMS_QUEUE_TABLE_C
         3 IX                    AQ$_STREAMS_QUEUE_TABLE_G
         3 IX                    AQ$_STREAMS_QUEUE_TABLE_H
         3 IX                    AQ$_STREAMS_QUEUE_TABLE_I
         3 IX                    AQ$_STREAMS_QUEUE_TABLE_L

    CON_ID OWNER                 TABLE_NAME
---------- --------------------- ------------------------------
         3 IX                    AQ$_STREAMS_QUEUE_TABLE_S
         3 IX                    AQ$_STREAMS_QUEUE_TABLE_T
         3 IX                    ORDERS_QUEUETABLE
         3 IX                    STREAMS_QUEUE_TABLE
         3 OE                    CATEGORIES_TAB
         3 OE                    CUSTOMERS
         3 OE                    PURCHASEORDER
         3 PM                    PRINT_MEDIA
         3 SH                    DIMENSION_EXCEPTIONS

20 rows selected.
```

5. View the column names and data types that conflict with SQL Apply for only OE.CUSTOMERS table identified in the previous step. The command is this step could be repeated for each table if needed. Exit SQL*Plus when done.

```
(host01) SQL> SELECT CON_ID, COLUMN_NAME,DATA_TYPE FROM
CDB_LOGSTDBY_UNSUPPORTED WHERE OWNER='OE' AND TABLE_NAME =
'CUSTOMERS';
 CON_ID COLUMN_NAME                    DATA_TYPE
------- ------------------------------ -------------
      3 PHONE_NUMBERS                  VARRAY

(host01) SQL> exit;
```

Practice 7-2: Create a Logical Standby (Temporarily a Physical)

Overview

In this practice, you will prepare `host03` to receive the logical standby database and create the logical standby database using RMAN and SQL.

Tasks

1. Use a terminal window logged in as `oracle` to `host03` to create the initial directories needed for a logical standby database. You may want to consider having a separate terminal windows open for the host03/london and host03/london2 combinations. For this lab section you will be working with the host03/london2 combination. Since the primary database is using multi-tenant architecture, additional directories are needed.

```
[oracle@host03]$ mkdir -p /u01/app/oracle/admin/london2/adump
[oracle@host03]$ mkdir -p /u01/app/oracle/oradata/london2
[oracle@host03]$ mkdir -p
/u01/app/oracle/oradata/london2/pdbseed
[oracle@host03]$ mkdir -p /u01/app/oracle/oradata/london2/dev1
[oracle@host03]$ mkdir -p
/u01/app/oracle/fast_recovery_area/london2
```

2. Create a starter initialization file on `host03` for the `london2` logical standby instance. The only two parameters required are `DB_NAME` and `DB_DOMAIN`.

```
[oracle@host03]$ echo 'DB_NAME=london2' >
/u01/app/oracle/product/12.1.0/dbhome_1/dbs/initlondon2.ora
[oracle@host03]$ echo 'DB_DOMAIN=example.com' >>
/u01/app/oracle/product/12.1.0/dbhome_1/dbs/initlondon2.ora
```

3. Copy the password file from the primary database to the new logical standby database. Since a copy already exists on host03, we use the same file renaming it accordingly.

```
[oracle@host03]$ cp
/u01/app/oracle/product/12.1.0/dbhome_1/dbs/orapwlondon
/u01/app/oracle/product/12.1.0/dbhome_1/dbs/orapwlondon2
```

4. Startup nomount the `london2` standby instance on `host03`. You will need to set or change the environment variables to the `london2` standby instance. Up to this point in labs, we have been using `london` when on `host03`.

```
[oracle@host03]$ . oraenv
ORACLE_SID = [oracle] ? london2
The Oracle base has been set to /u01/app/oracle

[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Jun 11 03:51:01
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to an idle instance.
```

```
(host03) SQL> startup nomount
ORACLE instance started.

Total System Global Area  217157632 bytes
Fixed Size                  2286656 bytes
Variable Size             159386560 bytes
Database Buffers           50331648 bytes
Redo Buffers                5152768 bytes

(host03) SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release
12.1.0.1.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options
```

5. Create a physical standby on `host03` using the RMAN utility. The physical standby will be converted to a logical standby later in the practice. Exit RMAN when done.

```
[oracle@host03]$ rman target sys/oracle_4U@boston auxiliary
sys/oracle_4U@london2
Recovery Manager: Release 12.1.0.1.0 - Production on Fri Aug 23
02:39:07 2013

Copyright (c) 1982, 2013, Oracle and/or its affiliates.  All
rights reserved.

connected to target database: BOSTON (DBID=2511874565)
connected to auxiliary database: LONDON2 (not mounted)

RMAN> run {
   allocate channel prmy1 type disk;
   allocate auxiliary channel stby1 type disk;
   duplicate target database for standby from active database
     spfile
        parameter_value_convert 'boston','london2'
        set db_unique_name='london2'
        set db_file_name_convert='boston','london2'
        set log_file_name_convert='boston','london2'
        set fal_server='boston'
        nofilenamecheck;
    allocate auxiliary channel stby type disk;
    sql channel stby "alter database recover managed standby
database disconnect"; }
…
```

```
<<<<<Output truncated. Output is almost identical to the
complete output shown in Practice 4, except that the destination
name is 'london2' instead of 'london'>>>>>


…

RMAN> exit;
Recovery Manager complete.
```

Practice 7-3: Start Redo Transport and Verify Operation

Overview

In this practice, you will start the redo transport from `host01` to `host03` for the new physical standby and verify operation.

Tasks

1. Use a terminal window for `host01` logged in as `oracle` with the environment variables set to `boston` and start redo transport by defining `log_archive_dest_3` pointing to the logical standby database.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Jun 11 06:28:00
2013


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



Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options


(host01) SQL> alter system set
log_archive_dest_3='SERVICE=london2 SYNC REOPEN=15
valid_for=(ONLINE_LOGFILES,PRIMARY_ROLE) db_unique_name=london2'
scope=both;
System altered.
```

Note: For this step, we are configuring redo transportation from the primary database to the logical standby database. Even though there is a far sync configured, we are not using the far sync at this moment. This is designed to illustrate a typical configuration where the primary database transports redo directly to the standby site, and provide a little variation in the architecture. Again, this is for illustration only. At a later time, we will change this to use the far sync instance.

2. Determine the last sequence number archived on the primary database.

```
(host01) SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG
GROUP BY THREAD#;
MAX(SEQUENCE#)    THREAD#
-------------- ----------
           182          1
```

3. Use a terminal window on `host03` connected as `oracle` with the environment variables set to `london2`. Start SQL*Plus and determine the last sequence number of the physical standby instance.

```
[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Jun 11 06:58:53
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host03) SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG
GROUP BY THREAD#;
MAX(SEQUENCE#)    THREAD#
-------------- ----------
           182          1
```

4. Return to the terminal window of `host01`, and force a log switch to advance the online redo log sequence number. Verify the sequence number has increased.

```
(host01) SQL> alter system switch logfile;
System altered.

(host01) SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG
GROUP BY THREAD#;
MAX(SEQUENCE#)    THREAD#
-------------- ----------
           183          1
```

5. Return to the terminal window of `host03`, and verify that the physical standby instance is receiving redo from the primary database instance

```
(host03) SQL> SELECT MAX(SEQUENCE#), THREAD# FROM V$ARCHIVED_LOG
GROUP BY THREAD#;
MAX(SEQUENCE#)    THREAD#
-------------- ----------
           183          1
```

Practice 7-4: Convert Physical Standby to Logical Standby

Overview

In this practice, you will convert the newly created physical standby '`london2`' to a logical standby database.

Tasks

1. Use a terminal window on `host03` connected as `oracle` with the environment variables set to `london2`. Stop redo apply on the 'london2' physical standby.

```
(host03) SQL> alter database recover managed standby database
cancel;
Database altered.
```

2. Use a terminal window on `host01` connected as `oracle` with the environment variables set to `boston`. Build the LogMiner dictionary into the redo. Wait for this procedure to finish before continuing with labs.

```
(host01) SQL> execute dbms_logstdby.build;
PL/SQL procedure successfully completed.
```

3. Use a terminal window on `host03` connected as `oracle` with the environment variables set to `london2`. Continue applying redo data to the physical standby until it is ready to convert to a logical standby database.

```
(host03) SQL> alter database recover to logical standby london2;
Database altered.
```

4. Increase the SGA size allocated to the logical standby database.

```
(host03) SQL> alter system set memory_max_target=640M
scope=spfile;
System altered.

(host03) SQL> alter system set memory_target=640M scope=spfile;
System altered.
```

5. Shutdown the logical standby database on `host03`, and restart it in the MOUNT mode.

```
(host03) SQL> shutdown;
ORA-01507: database not mounted
ORACLE instance shut down.

(host03) SQL> startup mount;
ORACLE instance started.
Total System Global Area  668082176 bytes
Fixed Size                  2291952 bytes
Variable Size             591398672 bytes
Database Buffers           71303168 bytes
Redo Buffers                3088384 bytes
Database mounted.
```

6. Display the LOG_ARCHIVE_DEST parameters on host03 that were copied from the primary database. Only entries that have values are displayed below.

```
(host03) SQL> show parameter log_archive_dest
NAME                 TYPE        VALUE
-------------------- ----------- ------------------------------
log_archive_dest_1   string      location=USE_DB_RECOVERY_FILE_
                                 DEST valid_for = (ALL_LOGFILES,
                                 ALL_ROLES) db_unique_name =
                                 london2
log_archive_dest_2   string      SERVICE=london2FS SYNC REOPEN=
                                 15 valid_for=(ONLINE_LOGFILES,
                                 PRIMARY_ROLE) db_unique_name=
                                 bostonFS
```

7. Remove the LOG_ARCHIVE_DEST_2 entry on host03 since this logical database will not be a target for role reversal in this course.

```
(host03) SQL> alter system set log_archive_dest_2='' scope=both;
System altered.
```

8. Open the logical standby database.

```
(host03) SQL> alter database open resetlogs;
Database altered.
```

9. Start SQL Apply to begin applying redo data that is received from the primary database.

```
(host03) SQL> alter database start logical standby apply
immediate;
Database altered.
```

10. Open the DEV1 PDB and verify the mode that is was opened with.

```
(host03) SQL> alter pluggable database dev1 open;
Pluggable database altered.

(host03) SQL> select con_id, name, open_mode from v$containers;

    CON_ID NAME                           OPEN_MODE
---------- ------------------------------ ----------
         1 CDB$ROOT                       READ WRITE
         2 PDB$SEED                       READ ONLY
         3 DEV1                           READ WRITE
```

11. Exit SQL*Plus sessions on all host mahines. Leave the terminal session windows open with the environment variables set.

```
(host01) SQL> exit;
(host03) SQL> exit;
```

Practices for Lesson 8: Oracle Data Guard Broker: Overview

Chapter 8

Practices for Lesson 8: Overview

Practices Overview

There are no practices for lesson 8.

Practices for Lesson 9: Creating a Data Guard Broker Configuration

Chapter 9

Practices for Lesson 9: Overview

Practices Overview

In these practices, you will examine the differences between local and remote connections to the Oracle Database instance using the DGMRL utility. You will also create and enable a Data Guard broker configuration.

Practice 9-1: Establishing Local and Remote Connections with DGMGRL

Overview

In this practice, you will use DGMGRL and connect with both local and remote connections. The password file will be updated on the primary database and copied to every other destination in the Data Guard configuration.

Tasks

1. Use a terminal window on `host01` connected as `oracle` with the environment variables set to `boston`. Issue the "ID" command and verify that the `dgdba` operating system group is assigned to the `oracle` account.

```
[oracle@host01]$ id
uid=54321(oracle) gid=54321(oinstall)
groups=54321(oinstall),54322(dba),54323(oper),54324(backupdba),5
4325(dgdba),54326(kmdba)
```

   Note: The `oracle` user is a member of the `dgdba` group. This group was specified during the database software installation to be associated with the `SYSDG` privilege for Data Guard.

2. Launch the DGMGRL utility and verify that you are able to connect as the `sysdg` user with operating system authentication (The `oracle` OS user is in the `dgdba` group).

```
[oracle@host01]$ dgmgrl
DGMGRL for Linux: Version 12.1.0.1.0 - 64bit Production
Copyright (c) 2000, 2012, Oracle. All rights reserved.
Welcome to DGMGRL, type "help" for information.

DGMGRL> connect sysdg
Password: <<Any password will work>>
Connected as SYSDG.
```

   Note: With Operating System authentication, any password will work for local connections. However, during switchover and failover operation to the remote site, you must use the correct password.

3. Attempt to make a remote connection to the physical standby database '`london`' as the `sysdg` user. You must use the password that is in the password file. Exit DGMGRL.

```
(host01) DGMGRL> connect sysdg@london
Password: oracle_4U
ORA-01017: invalid username/password; logon denied

(host01) DGMGRL> exit
```

   Note: During the creation of the database, the option to use the same password for all administrative accounts was chosen. However, this only applied to the `SYS` and `SYSTEM` database accounts.

4. Use SQL*Plus on `host01` connected as SYSDBA to reset the SYSDG password and unlock the account. Exit SQL*Plus.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Sep 11 06:17:09
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) SQL> alter user sysdg identified by oracle_4U;
User altered.

(host01) SQL> alter user sysdg account unlock;
User altered.

(host01) SQL> exit;
```

5. Copy the modified password file to all other machines overwriting the password files that are already there. On `host03`, a password file is needed for both the physical standby database and the logical standby database. The password files should be renamed during the copy to the appropriate names for each destination.

```
[oracle@host01]$ scp $ORACLE_HOME/dbs/orapwboston
host02:/u01/app/oracle/product/12.1.0/dbhome_1/dbs/orapwbostonFS
orapwboston                   100% 7680     7.5KB/s   00:00

[oracle@host01]$ scp $ORACLE_HOME/dbs/orapwboston
host03:/u01/app/oracle/product/12.1.0/dbhome_1/dbs/orapwlondon
orapwboston                   100% 7680     7.5KB/s   00:00

[oracle@host01]$ scp $ORACLE_HOME/dbs/orapwboston
host03:/u01/app/oracle/product/12.1.0/dbhome_1/dbs/orapwlondon2
orapwboston                   100% 7680     7.5KB/s   00:00

[oracle@host01]$ scp $ORACLE_HOME/dbs/orapwboston
host04:/u01/app/oracle/product/12.1.0/dbhome_1/dbs/orapwlondonFS
orapwboston                   100% 7680     7.5KB/s   00:00
```

6. Launch the DGMGRL utility on `host01` and verify that you are now able to establish a remote connection as `sysdg` to the physical standby database. Exit DGMGRL when done.

```
[oracle@host01]$ dgmgrl
DGMGRL for Linux: Version 12.1.0.1.0 - 64bit Production
Copyright (c) 2000, 2012, Oracle. All rights reserved.
Welcome to DGMGRL, type "help" for information.

(host01) DGMGRL> connect sysdg/oracle_4U@london
Connected as SYSDG.

(host01) DGMGRL> exit
```

Practice 9-2: Create and Enable a Data Guard Broker Configuration

Overview

In this practice, you will create and name the Data Guard configuration. The physical standby database, far sync instances, and logical standby database will be added to the configuration. You will enable the configuration and define redo routing rules.

Tasks

1. Use a terminal window on `host01` connected as `oracle` with the environment variables set to '`boston`'. Connect to the primary database using SQL*Plus and reset the `LOG_ARCHIVE_DEST_2` and `LOG_ARCHIVE_DEST_3` parameters since they are defined as network locations. Start the Data Guard Broker process. Make sure the changes are persistent. Exit SQL*Plus.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Sep 11 06:17:09
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) SQL> alter system set log_archive_dest_2='' scope=both;
System altered.

(host01) SQL> alter system set log_archive_dest_3='' scope=both;
System altered.

(host01) SQL> alter system set dg_broker_start=true scope=both;
System altered.

(host01) SQL> exit
```

2. Use a terminal window on `host02` connected as `oracle` with the environment variables set to '`bostonFS`'. Connect to the Far Sync using SQL*Plus and reset the `LOG_ARCHIVE_DEST_2` parameter since it is defined as network location. Start the Data Guard broker process for the Far Sync. Exit SQL*Plus.

```
[oracle@host02]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Sep 11 06:17:09
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
```

```
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host02) SQL> alter system set log_archive_dest_2='' scope=both;
System altered.

(host02) SQL> alter system set dg_broker_start=true scope=both;
System altered

(host02) SQL> exit
```

3. Use a terminal window on `host03` connected as `oracle` with the environment variables set to '`london`'. Connect to the physical standby using SQL*Plus and stop managed recovery. Reset the `LOG_ARCHIVE_DEST_2` parameter since it is defined as network location. Start the Data Guard broker process for the physical standby database.

```
[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Sep 11 06:17:09
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host03) SQL> alter database recover managed standby database
cancel;
Database altered.

(host03) SQL> alter system set log_archive_dest_2='' scope=both;
System altered

(host03) SQL> alter system set dg_broker_start=true scope=both;
System altered
```

4. If you are using a separate window for the host03/london2 combination, then you can skip the part about resetting the environment variables. Otherwise, while still using the terminal window for host03, exit SQL*Plus. Change the environment variables to the '`london2`' logical standby database. The logical standby does not have any network locations defined for redo transportation. Start the Data Guard broker process. Exit SQL*Plus.

```
(host03) SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release
12.1.0.1.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

[oracle@host03]$ . oranev
```

```
ORACLE_SID = [oracle] ? london2
The Oracle base has been set to /u01/app/oracle

[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Jun 11 03:51:01
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host03) SQL> alter database stop logical standby apply;
Database altered.

(host03) (london2) SQL> alter system set dg_broker_start=true
scope=both;
System altered.

(host03) SQL> exit
```

5. Use a terminal window on `host04` connected as `oracle` with the environment variables set to '`londonFS`'. Connect to the Far Sync using SQL*Plus and reset the `LOG_ARCHIVE_DEST_2` parameter since it is defined as network location. Start the Data Guard broker process for the Far Sync. Exit SQL*Plus.

```
[oracle@host04]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Sep 11 06:17:09
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host04) SQL> alter system set log_archive_dest_2='' scope=both;
System altered

(host04) SQL> alter system set dg_broker_start=true scope=both;
System altered

(host04) SQL> exit
```

6. Use a terminal window on `host01` connected as `oracle` with the environment variables set to '`boston`'. Launch DGMGRL and attempt to show the configuration.

```
[oracle@host01]$ dgmgrl
DGMGRL for Linux: Version 12.1.0.1.0 - 64bit Production
Copyright (c) 2000, 2012, Oracle. All rights reserved.
Welcome to DGMGRL, type "help" for information.

(host01) DGMGRL> connect sysdg/oracle_4U@boston
Connected as SYSDG.

(host01) DGMGRL> show configuration
ORA-16532: Data Guard broker configuration does not exist
Configuration details cannot be determined by DGMGRL
```

7. Create the Data Guard broker configuration and then show the configuration.

```
(host01) DGMGRL> create configuration 'DRSolution' as primary
database is 'boston' connect identifier is boston;
Configuration "DRSolution" created with primary database
"boston"

(host01) DGMGRL> show configuration
Configuration - DRSolution

  Protection Mode: MaxPerformance
  Databases:
  boston - Primary database

Fast-Start Failover: DISABLED

Configuration Status:
DISABLED
```

Note: Since the Data Guard broker is a distributed framework, the DGMGRL utility can be launched from any host machine that participates in the Data Guard configuration. The labs will continue to display the machine name (`host01`), and therefore the terminal session window being used, for which the DGMGRL utility was launched. It would be acceptable though to launch it from another terminal session connected to another virtual host machine.

8. Add the Far Sync '`bostonFS`' to the configuration and show the results.

```
(host01) DGMGRL> add far_sync 'bostonFS' as connect identifier
is bostonFS;
far sync instance "bostonFS" added

(host01) DGMGRL> show configuration
Configuration - DRSolution
```

```
  Protection Mode: MaxPerformance
  Databases:
  boston   - Primary database
    bostonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED

Configuration Status:
DISABLED
```

9. Add the physical standby database 'london' to the configuration and show the results.

```
(host01) DGMGRL> add database 'london' as connect identifier is
london;
Database "london" added

(host01) DGMGRL> show configuration
Configuration - DRSolution

  Protection Mode: MaxPerformance
  Databases:
  boston   - Primary database
    bostonFS - Far Sync (inactive)
    london   - Physical standby database

Fast-Start Failover: DISABLED

Configuration Status:
DISABLED
```

10. Add the logical standby database 'london2' to the configuration and show the results.

```
(host01) DGMGRL> add database 'london2' as connect identifier is
london2;
Database "london2" added

(host01) DGMGRL> show configuration
Configuration - DRSolution

  Protection Mode: MaxPerformance
  Databases:
  boston   - Primary database
    bostonFS - Far Sync (inactive)
    london   - Physical standby database
    london2  - Logical standby database
```

```
Fast-Start Failover: DISABLED

Configuration Status:
DISABLED
```

11. Add the Far Sync 'londonFS' to the configuration and show the results.

```
(host01) DGMGRL> add far_sync 'londonFS' as connect identifier
is londonFS;
far sync instance "londonFS" added

(host01) DGMGRL> show configuration
Configuration - DRSolution

  Protection Mode: MaxPerformance
  Databases:
  boston   - Primary database
    bostonFS - Far Sync (inactive)
    london   - Physical standby database
    london2  - Logical standby database
    londonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED

Configuration Status:
DISABLED
```

12. Enable the Data Guard broker configuration and show the results.

```
(host01) DGMGRL> enable configuration
Enabled.

(host01) DGMGRL> show configuration
Configuration - DRSolution

  Protection Mode: MaxPerformance
  Databases:
  boston   - Primary database
    bostonFS - Far Sync (inactive)
    london   - Physical standby database
    london2  - Logical standby database
    londonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED
```

```
Configuration Status:
SUCCESS
```

13. Define redo routing rules for the configuration and show the results. The current primary database 'boston' should forward redo to the Far Sync 'bostonFS' synchronously. The Far Sync 'bostonFS' should forward redo to both the physical standby 'london' and to the logical standby 'london2' asynchronously. Additional redo routing rules should be created for role reversal. After role reversal, the primary database will be 'london' and should forward redo to the Far Sync 'londonFS' synchronously. The Far Sync 'londonFS' should then forward redo to the physical standby 'boston' and the logical standby 'london2'.

```
(host01) DGMGRL> EDIT DATABASE 'boston' SET PROPERTY
'RedoRoutes' = '(boston:bostonFS SYNC)';
Property "RedoRoutes" updated

(host01) DGMGRL> EDIT FAR_SYNC 'bostonFS' SET PROPERTY
'RedoRoutes' = '(boston:london,london2 ASYNC)';
Property "RedoRoutes" updated

(host01) DGMGRL> EDIT DATABASE 'london' SET PROPERTY
'RedoRoutes' = '(london:londonFS SYNC)';
Property "RedoRoutes" updated

(host01) DGMGRL> EDIT FAR_SYNC 'londonFS' SET PROPERTY
'RedoRoutes' = '(london:boston,london2 ASYNC)';
Property "RedoRoutes" updated

(host01) DGMGRL> show configuration;
Configuration - DRSolution

  Protection Mode: MaxPerformance
  Databases:
  boston   - Primary database
    bostonFS - Far Sync
      london   - Physical standby database
      london2  - Logical standby database
    londonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS
```

Note: If you output does not match the above. Do not proceed with labs until all issues have been resolved. You may need to reissue the `SHOW CONFIGURATION` command several times to give the Virtual Machines time to catch up with all the background operations that need to be performed. For example in one test case, it was noted that the london2 logical standby database was receiving "`ORA-16810: multiple errors or warnings detected for this database`." To further diagnose the problem issue the command "`show database london2`". SQL Apply had stopped with an "`ORA-16768: SQL Apply is stopped`" message, followed by "`ORA-01304: subordinate process error. Check alert and trace logs`." An examination of the alert log indicated that SQL Apply had stopped due to an "`ORA-4031: unable to allocate XXX bytes of shared memory.`" SQL Apply was restarted with the command "`edit database london set state='APPLY-ON'`", at which time the configuration reported everything acceptable. Please consult with your instructor if you need to troubleshoot any issues.

Practices for Lesson 10: Monitoring a Data Guard Broker Configuration

Chapter 10

Practices for Lesson 10: Overview

Practices Overview

In these practices, you will use the DGMGRL utility to monitor your physical standby database. You will also examine the use of trace files to monitor the Data Guard environment.

Practice 10-1: Monitoring the Physical Standby Database

Overview

In this practice, you will use DGMGRL and connect with both local and remote connections. The password file will be updated on the primary database and copied to every other destination in the Data Guard configuration.

Tasks

1. Use a terminal window on host01 connected as oracle with the environment variables set to '`boston`'. Launch DGMGRL connecting as the `sysdg` user with operating system authentication.

```
[oracle@host01]$ dgmgrl
DGMGRL for Linux: Version 12.1.0.1.0 - 64bit Production
Copyright (c) 2000, 2012, Oracle. All rights reserved.
Welcome to DGMGRL, type "help" for information.

DGMGRL> connect sysdg/oracle_4U@boston
Connected as SYSDG.
```

2. Use the `SHOW CONFIGURATION VERBOSE` command to display the current values for the `CommunicationTimeout` property and the `OperationTimeout` property.

```
(host01) DGMGRL> show configuration verbose
Configuration - DRSolution

  Protection Mode: MaxPerformance
  Databases:
  boston   - Primary database
    bostonFS - Far Sync
      london   - Physical standby database
      london2  - Logical standby database
    londonFS - Far Sync (inactive)

  Properties:
    FastStartFailoverThreshold      = '30'
    OperationTimeout                = '30'
    TraceLevel                      = 'USER'
    FastStartFailoverLagLimit       = '30'
    CommunicationTimeout            = '180'
    ObserverReconnect               = '0'
    FastStartFailoverAutoReinstate  = 'TRUE'
    FastStartFailoverPmyShutdown    = 'TRUE'
    BystandersFollowRoleChange      = 'ALL'
    ObserverOverride                = 'FALSE'
```

```
Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS
```

3. Modify the `CommunicationTimeout` property and set it to a value of 300. Verify the result.

```
(host01) DGMGRL> edit configuration set property
'CommunicationTimeout' = 300;
Property "CommunicationTimeout" updated

(host01) DGMGRL> show configuration verbose
…
  Properties:
    FastStartFailoverThreshold      = '30'
    OperationTimeout                = '30'
    TraceLevel                      = 'USER'
    FastStartFailoverLagLimit       = '30'
    CommunicationTimeout            = '300'
    ObserverReconnect               = '0'
    FastStartFailoverAutoReinstate  = 'TRUE'
…
```

Note: This is not normally needed but it helps with labs running in the Virtual Machine architecture.

4. Modify the `OperationTimeout` property and set it to the maximum value of 300. Verify the result.

```
(host01) DGMGRL> edit configuration set property
'OperationTimeout' = 300;
Property "CommunicationTimeout" updated

(host01) DGMGRL> show configuration verbose
…
  Properties:
    FastStartFailoverThreshold      = '30'
    OperationTimeout                = '300'
    TraceLevel                      = 'USER'
    FastStartFailoverLagLimit       = '30'
    CommunicationTimeout            = '300'
    ObserverReconnect               = '0'
    FastStartFailoverAutoReinstate  = 'TRUE'
…
```

5. Use the SHOW DATABASE command for the physical standby database and determine the current transport lag, apply lag, and apply rate.

```
(host01) DGMGRL> show database london
Database - london

  Role:               PHYSICAL STANDBY
  Intended State:     APPLY-ON
  Transport Lag:      0 seconds (computed 0 seconds ago)
  Apply Lag:          0 seconds (computed 0 seconds ago)
  Apply Rate:         0 Byte/s
  Real Time Query:    OFF
  Instance(s):
    london

Database Status:
SUCCESS
```

6. Stop redo apply on the physical standby database to force an apply rate lag to occur.

```
(host01) DGMGRL> edit database london set state = 'APPLY-OFF';
Succeeded.
```

7. Without exiting DGMGRL, force a log switch on the primary database.
   Note: You are currently connected to the primary database.

```
(host01) DGMGRL> SQL "alter system switch logfile";
Succeeded.
```

8. Use the SHOW DATABASE command for the physical standby database and display the current apply lag rate.

```
(host01) DGMGRL> show database london
Database - london

  Role:               PHYSICAL STANDBY
  Intended State:     APPLY-OFF
  Transport Lag:      0 seconds (computed 0 seconds ago)
  Apply Lag:          33 seconds (computed 0 seconds ago)
  Apply Rate:         (unknown)
  Real Time Query:    OFF
  Instance(s):
    london

Database Status:
SUCCESS
```

9. Display the standby receive queue for the physical standby database.

```
(host01) DGMGRL> show database london 'RecvQEntries';
STANDBY_RECEIVE_QUEUE
              STATUS     RESETLOGS_ID           THREAD
LOG_SEQ       TIME_GENERATED       TIME_COMPLETED
FIRST_CHANGE#     NEXT_CHANGE#       SIZE (KBs)
   PARTIALLY_APPLIED        837070180                1
41  01/17/2014 13:26:46  01/17/2014 14:22:47          2084714
2096633             8084
```

10. Restart redo apply on the physical standby database. Verify that the apply lag has been cleared. Exit DGMGRL when done.

    Note: You may have to wait a minute after restarting redo apply to verify the results.

```
(host01) DGMGRL> edit database london set state = 'APPLY-ON';
Succeeded.

(host01) DGMGRL> show database london
Database - london

  Role:               PHYSICAL STANDBY
  Intended State:     APPLY-ON
  Transport Lag:      0 seconds (computed 0 seconds ago)
  Apply Lag:          0 seconds (computed 0 seconds ago)
  Apply Rate:         0 Byte/s
  Real Time Query:    OFF
  Instance(s):
    london

Database Status:
SUCCESS

(host01) DGMGRL> exit;
```

Practice 10-2: Examining Data Guard Log and Trace Files

Overview

In this practice, you will locate and examine the Data Guard log and trace files.

Tasks

1. Use a terminal window on `host01` connected as `oracle` with the environment variables set to '`boston`'. Connect to the primary database using SQL*Plus and determine the root directory for the Automatic Diagnostic Repository (ADR). Exit SQL*Plus when done.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Oct 15 21:07:58
2013

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

Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) SQL> show parameter diag

NAME                 TYPE        VALUE
-------------------- ----------- ------------------------------
diagnostic_dest      string      /u01/app/oracle

(host01) SQL> exit;
```

2. Change directory to the "trace" subdirectory located underneath the Automatic Diagnostic Repository home location. The ADR home is located at `<diagnostic_dest>/diag/rdbms/<dbname>/<instance_name>`.

```
[oracle@host01]$ cd
/u01/app/oracle/diag/rdbms/boston/boston/trace
```

3. Verify that the previous commands that changed the state of redo apply and connection timeout where recorded in the Data Guard broker log file. The broker log file is named `drc<db_unique_name>.log`.

```
[oracle@host01]$ grep CommunicationTimeout drcboston.log
EDIT CONFIGURATION SET PROPERTY CommunicationTimeout = 300

[oracle@host01]$ grep APPLY drcboston.log
EDIT DATABASE london SET STATE = APPLY-OFF
EDIT DATABASE london SET STATE = APPLY-ON
```

4. Use the "`ls -alt | more`" command to list the directory contents of the trace directory sorted by modification time descending. The most recent modified file will be displayed first.

```
[oracle@host01]$ ls -alt | more
total 12084
-rw-r-----  1 oracle oinstall 4266449 Oct 15 21:20 drcboston.log
-rw-r-----  1 oracle oinstall    8602 Oct 15 21:18
boston_mmon_10187.trc
-rw-r-----  1 oracle oinstall     868 Oct 15 21:18
boston_mmon_10187.trm
drwxr-x---  2 oracle oinstall   36864 Oct 15 20:58 .
-rw-r-----  1 oracle oinstall    2256 Oct 15 20:51
boston_nsv1_7354.trc
-rw-r-----  1 oracle oinstall     217 Oct 15 20:51
boston_nsv1_7354.trm
…
```

5. Use a terminal window on `host01` connected as `oracle` with the environment variables set to '`boston`'. Connect to the primary database using SQL*Plus and set the level to 16 to track detailed archived redo log destination activity. Force a log switch and exit SQL*Plus when done.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Oct 15 21:21:32
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

SQL> alter system set log_archive_trace=16;
System altered.

SQL> alter system switch logfile;
System altered.

(host01) SQL> exit;
```

6. Use the "`ls -alt | more`" command to list the directory contents of the trace directory sorted by modification time descending. Identify the newly created files in the directory that were not present for the previous step 4.

```
[oracle@host01]$ ls -alt | more
total 12104
-rw-r-----  1 oracle oinstall   16177 Oct 15 21:22
boston_lgwr_10177.trc
```

```
-rw-r-----  1 oracle oinstall    1202 Oct 15 21:22
boston_lgwr_10177.trm
-rw-r-----  1 oracle oinstall    8490 Oct 15 21:22
boston_nss2_10213.trc
-rw-r-----  1 oracle oinstall     540 Oct 15 21:22
boston_nss2_10213.trm
-rw-r-----  1 oracle oinstall  274595 Oct 15 21:22
alert_boston.log
-rw-r-----  1 oracle oinstall    2179 Oct 15 21:22
boston_arc0_10217.trc
-rw-r-----  1 oracle oinstall     181 Oct 15 21:22
boston_arc0_10217.trm
…
```

7. The resulting log writer process (LGWR) and network server sync process (NSS) trace files can be very large in size. Since the primary database is configured for SYNC redo transport to the 'bostonFS' far sync destination, verify that communication occurred to this destination in the trace file using the "grep destination <NSS2 trace file name>" command. The trace file name must be determined from the previous step. You may explore the contents of the trace files if desired.

```
[oracle@host01]$ grep destination boston_nss2_10213.trc
NSS2: connecting to remote destination bostonfs
NSS2: connecting to remote destination bostonfs
NSS2: connecting to remote destination bostonfs
```

8. Use a terminal window on host01 connected as oracle with the environment variables set to 'boston'. Connect to the primary database using SQL*Plus and set the log_archive_trace level to 0 to disable tracing. Exit SQL*Plus when done.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Oct 15 21:21:32
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) SQL> alter system set log_archive_trace=0;
System altered.

(host01) SQL> exit;
```

Practices for Lesson 11: Configuring Data Protection Modes

Chapter 11

Practices for Lesson 11: Overview

Practices Overview

In these practices, you will examine the various protection modes and the impact that they may have on the primary database.

Practice 11-1: Examining the Maximum Availability Protection Mode

Overview

In this practice, you will use DGMGRL to view the current protection mode and modify it to maximum availability. You will simulate a problem on the standby database and observe the impact if any to the primary database.

Tasks

1. Use a terminal window on `host01` connected as `oracle` with the environment variables set to `boston`. Launch the DGMGRL utility and connect as the `sysdg` user with operating system authentication.

```
[oracle@host01]$ dgmgrl
DGMGRL for Linux: Version 12.1.0.1.0 - 64bit Production
Copyright (c) 2000, 2012, Oracle. All rights reserved.
Welcome to DGMGRL, type "help" for information.

(host01) DGMGRL> connect sysdg/oracle_4U@boston
Connected as SYSDG.
```

2. Use the `SHOW CONFIGURATION` command to display the current protection mode for the Data Guard configuration.

```
(host01) DGMGRL> show configuration
Configuration - DRSolution

  Protection Mode: MaxPerformance
  Databases:
  boston   - Primary database
    bostonFS - Far Sync
      london   - Physical standby database
      london2  - Logical standby database
    londonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS
```

3. Using DGMGRL, determine the current `LogXptMode` for the far sync instance and the physical standby database.

```
(host01) DGMGRL> show far_sync 'bostonFS' 'LogXptMode';
  LogXptMode = 'ASYNC';

(host01) DGMGRL> show database london 'LogXptMode';
  LogXptMode = 'ASYNC';
```

4. ***Optional:*** If the current LogXptMode is not reported as 'ASYNC' for both the far sync instance and the physical standby database, then explicitly set it to 'ASYNC'. Exit DGMGRL when done.

```
(host01) DGMGRL> edit far_sync 'bostonFS' set property
'LogXptMode' = 'ASYNC';
Property "LogXptMode" updated

(host01) DGMGRL> edit database london set property LogXptMode =
ASYNC;
Property "logxptmode" updated

(host01) DGMGRL> exit;
```

Note: Database names, far sync instance names, property names and property values do not need to be enclosed with single quote marks unless they are case sensitive. The documentation examples generally use a single quote for both property names and property values and that convention has been followed in these labs. For the above example, only the far sync name 'bostonFS' would require it to be enclosed by single quotes. The second edit command does not use any single quotes for illustration.

5. Use a terminal window on host01 connected as oracle with the environment variables set to 'boston'. Connect to the primary database using SQL*Plus and determine the current value for the LOG_ARCHIVE_DEST_2 parameter. What is the current LogXptMode? Exit SQL*Plus.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Oct 16 19:22:29
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) SQL> show parameter LOG_ARCHIVE_DEST_2

NAME                 TYPE        VALUE
-------------------- ----------- ----------------------------
log_archive_dest_2   string      service="bostonfs", SYNC
                                 AFFIRM delay=0 optional
                                 compression=disable
                                 max_failure=0
                                 max_connections=1 reopen=300
                                 db_unique_name="bostonFS"
                                 net_timeout=30, valid_for=
                                 (online_logfile, all_roles)

(host01) SQL> exit;
```

6. Use a terminal window on `host01` connected as `oracle` with the environment variables set to `boston`. Launch the DGMGRL utility and connect as the `sysdg` user with operating system authentication.

```
[oracle@host01]$ dgmgrl
DGMGRL for Linux: Version 12.1.0.1.0 - 64bit Production
Copyright (c) 2000, 2012, Oracle. All rights reserved.
Welcome to DGMGRL, type "help" for information.

(host01) DGMGRL> connect sysdg/oracle_4U@boston
Connected as SYSDG.
```

7. Display the value for the '`RedoRoutes`' property of the primary database.

```
(host01) DGMGRL> show database 'boston' 'RedoRoutes';
  RedoRoutes = '(boston:bostonFS SYNC)'
```

Note: When the property '`RedoRoutes`' has been defined, it takes precedence over the value of the property '`LogXptMode`'. The property '`LogXptMode`' will continue to report '`ASYNC`' even though the actual transport mode is currently '`SYNC`'.

8. Modify the '`RedoRoutes`' property for the 'boston' primary database and set it to the '`ASYNC`' redo transport mode.

```
(host01) DGMGRL> edit database boston set property 'RedoRoutes'
= '(boston:bostonFS ASYNC)';
Property "RedoRoutes" updated
```

9. Attempt to change the configuration mode to maximum availability and notice the results.

```
(host01) DGMGRL> edit configuration set protection mode as
maxavailability;
Error: ORA-16627: operation disallowed since no standby
databases would remain to support protection mode

Failed.
```

10. Modify the '`RedoRoutes`' property for the 'boston' primary database and set it to the new '`FASTSYNC`' redo transport mode.

```
(host01) DGMGRL> edit database boston set property 'RedoRoutes'
= '(boston:bostonFS FASTSYNC)';
Property "RedoRoutes" updated
```

11. Change the configuration mode to maximum availability and verify the results.

```
(host01) DGMGRL> edit configuration set protection mode as
maxavailability;
Succeeded.

(host01) DGMGRL> show configuration;

Configuration - DRSolution
```

```
  Protection Mode: MaxAvailability
  Databases:
  boston   - Primary database
    bostonFS - Far Sync
      london   - Physical standby database
      london2  - Logical standby database
    londonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS
```

12. Use a terminal window on host03 connected as oracle with the environment variables set to '`london`'. Connect to the physical standby database using SQL*Plus and perform a shutdown abort.

```
[oracle@host03]$ . oraenv
ORACLE_SID = [london2] ? london
The Oracle base remains unchanged with value /u01/app/oracle

[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Thu Dec 12 17:16:46
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host03) SQL> shutdown abort;
ORACLE instance shut down.
```

13. Return to the DGMGRL session running on host01 and display the configuration.

```
(host01) DGMGRL> show configuration

Configuration - DRSolution

  Protection Mode: MaxAvailability
  Databases:
  boston   - Primary database
    bostonFS - Far Sync
      Error: ORA-16778: redo transport error for one or more
databases
```

```
      london   - Physical standby database
        Error: ORA-01034: ORACLE not available

      london2  - Logical standby database
    londonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED

Configuration Status:
ERROR
```

14. Use a terminal window on host03 connected as oracle with the environment variables set to '`london`'. Use SQL*Plus to restart and mount the physical standby database. Verify that the '`DEV1`' pluggable database is also mounted.

```
(host03) SQL> startup mount
ORACLE instance started.

Total System Global Area  517763072 bytes
Fixed Size                  2290216 bytes
Variable Size             440405464 bytes
Database Buffers           71303168 bytes
Redo Buffers                3764224 bytes
Database mounted.

(host3) SQL> show pdbs

    CON_ID CON_NAME                  OPEN MODE  RESTRICTED
---------- ------------------------- ---------- ----------
         2 PDB$SEED                  MOUNTED
         3 DEV1                      MOUNTED
```

15. Return to the DGMGRL session running on host01 and display the configuration.

```
(host01) DGMGRL> show configuration

Configuration - DRSolution

  Protection Mode: MaxAvailability
  Databases:
  boston   - Primary database
    bostonFS - Far Sync
      london   - Physical standby database
        Error: ORA-16766: Redo Apply is stopped

      london2  - Logical standby database
```

```
    londonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED

Configuration Status:
ERROR
```

Note: the broker may have restarted redo apply before you are able to see the above error. In addition, you may also receive a warning ORA-16857 standby disconnected from redo source for longer than specified threshold. This is acceptable.

16. Restart redo apply for the physical standby database. Perform a log switch on the primary database and verify the configuration.

```
(host01) DGMGRL> edit database london set state = 'APPLY-ON';
Succeeded.

(host01) DGMGRL> SQL "alter system switch logfile";
Succeeded.

(host01) DGMGRL> show configuration

Configuration - DRSolution

  Protection Mode: MaxAvailability
  Databases:
  boston   - Primary database
    bostonFS - Far Sync
      london   - Physical standby database
      london2  - Logical standby database
    londonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS
```

17. Before proceeding with additional lab steps, give the transport lag and apply lag an opportunity to catch up. In this training environment, all five VMs and domain 0 typically share a single physical desktop class disk drive. Use the '`show configuration`' and '`show database verbose london`' commands until the lag clears. Repeat these commands as needed.

```
DGMGRL> show database verbose london
Database - london
  Role:              PHYSICAL STANDBY
  Intended State:    APPLY-ON
  Transport Lag:     0 seconds (computed 1 second ago)
  Apply Lag:         0 seconds (computed 1 second ago)
  Apply Rate:        0 Byte/s
  Real Time Query:   OFF
  Instance(s):
    london
```

Practice 11-2: Examining the Maximum Protection Mode

Overview

In this practice, you will use DGMGRL to modify the current protection mode to maximum protection. You will simulate a problem on the standby database and observe the impact to the primary database.

Tasks

1. Modify the 'RedoRoutes' property for the 'boston' primary database and set it to the 'SYNC' redo transport mode. Enable the maximum protection mode for the Data Guard configuration.

```
(host01) DGMGRL> edit database boston set property 'RedoRoutes'
= '(boston:bostonFS SYNC)';
Property "RedoRoutes" updated

(host01) DGMGRL> edit configuration set protection mode as
maxprotection;
Error: ORA-16627: operation disallowed since no standby
databases would remain to support protection mode

Failed.
```

Note: The maximum protection mode is not supported by far sync.

2. Modify the redo transport routes so that the primary database ships redo to both the 'bostonFS' far sync and the 'london' physical standby database directly using the SYNC property. Modify the 'bostonFS' far sync so that it only ships redo to the 'london2' logical standby database using the ASYNC property. We are temporarily bypassing the far sync between the primary database and the physical standby database, but leaving the far sync in place for the logical standby database. This is for lab illustration only and would not be practical otherwise.

```
(host01) DGMGRL> edit database boston set property 'RedoRoutes'
= '(boston:bostonFS,london SYNC)';
Property "RedoRoutes" updated

(host01) DGMGRL> edit far_sync 'bostonFS' set property
'RedoRoutes' = '(boston:london2 ASYNC)';
Property "RedoRoutes" updated
```

3. Enable the maximum protection mode for the Data Guard configuration and display the resulting configuration. Exit DGMGRL.

```
(host01) DGMGRL> edit configuration set protection mode as
maxprotection;
Succeeded.

(host01) DGMGRL> show configuration

Configuration - DRSolution
```

```
  Protection Mode: MaxProtection
  Databases:
  boston   - Primary database
    bostonFS - Far Sync
      london2  - Logical standby database
    london   - Physical standby database
    londonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS

(host01) DGMGRL> exit
```

4. Use a terminal window on host01 connected as oracle with the environment variables set to '`boston`'. Connect to the primary database using SQL*Plus and switch the session to the DEV1 pluggable database. Leave this window open.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Oct 16 23:19:29
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) SQL> alter session set container=DEV1;
Session altered.
```

5. Use a terminal window on host03 connected as oracle with the environment variables set to '`london`'. Connect to the physical standby database using SQL*Plus and perform a shutdown abort.

```
[oracle@host03]$ . oraenv
ORACLE_SID = [london2] ? london
The Oracle base remains unchanged with value /u01/app/oracle

[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Thu Dec 12 17:16:46
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
```

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

(host03) SQL> shutdown abort;
ORACLE instance shut down.
```

6. Return to the SQL*Plus session on host01 with the session set to the DEV1 pluggable database. Display the current data for the HR.REGIONS table and then insert a new row into the table. Exit the terminated session.

```
(host01) SQL> select * from hr.regions order by region_id;

 REGION_ID REGION_NAME
---------- -------------------------
         1 Europe
         2 Americas
         3 Asia
         4 Middle East and Africa
         5 Australia

(host01) SQL> insert into hr.regions values (6,'MyRegion');
insert into hr.regions values (6,'MyRegion')
*
ERROR at line 1:
ORA-03135: connection lost contact
Process ID: 19624
Session ID: 20 Serial number: 3265

Note: If the row inserts successfully, then attempt to commit
the change.
1 row created.
(host01) SQL> commit;
ERROR at line 1:
ORA-03113: end-of-file on communication channel
Process ID: 15203
Session ID: 65 Serial number: 2297

(host01) SQL> exit
```

Note: The primary database has been brought down due to the maximum protection mode and not having the standby database available to accept redo. Depending on timings and blocks cached in memory, the insert may be successful, but the commit will always fail. You may have to wait for the timeout period to elapse before seeing the error message.

7. Use a terminal window on host01 connected as oracle with the environment variables set to 'boston'. Connect to the primary database using SQL*Plus and restart the instance. If the instance is already running then open the database. Exit the terminated session.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Oct 16 23:34:43
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to an idle instance.

(host01) SQL> startup
ORACLE instance started.

Total System Global Area  517763072 bytes
Fixed Size                  2290216 bytes
Variable Size             440405464 bytes
Database Buffers           71303168 bytes
Redo Buffers                3764224 bytes
Database mounted.
ORA-03113: end-of-file on communication channel
Process ID: 19973
Session ID: 1 Serial number: 5

(host01) SQL> exit
```

Note: The primary cannot be started with the physical standby down with the maximum protection mode and no other standby databases available that support this mode.

8. Use a terminal window on host03 connected as oracle with the environment variables set to 'london'. Use SQL*Plus to startup and mount the physical standby database. Verify that the DEV1 pluggable database is mounted. Exit SQL*Plus.

```
[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Oct 16 23:56:47
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to an idle instance.

(host03) SQL> startup mount
ORACLE instance started.
Total System Global Area  517763072 bytes
Fixed Size                  2290216 bytes
Variable Size             440405464 bytes
Database Buffers           71303168 bytes
Redo Buffers                3764224 bytes
Database mounted.
```

```
(host03) SQL> show pdbs
    CON_ID CON_NAME                  OPEN MODE  RESTRICTED
---------- ------------------------- ---------- ----------
         2 PDB$SEED                  MOUNTED
         3 DEV1                      MOUNTED

(host03) SQL> exit
```

9. Use a terminal window on host01 connected as oracle with the environment variables set to 'boston'. Use SQL*Plus to open the primary database. Verify that the pluggable database is open. If not, then open it. Exit SQL*Plus.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Oct 16 23:56:47
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to an idle instance.

(host01) SQL> startup
ORACLE instance started.
Total System Global Area  517763072 bytes
Fixed Size                  2290216 bytes
Variable Size             440405464 bytes
Database Buffers           71303168 bytes
Redo Buffers                3764224 bytes
Database mounted.
Database opened.

(host1) SQL> show pdbs

    CON_ID CON_NAME                  OPEN MODE  RESTRICTED
---------- ------------------------- ---------- ----------
         2 PDB$SEED                  READ ONLY  NO
         3 DEV1                      MOUNTED
(host01) SQL> alter pluggable database DEV1 open;
Pluggable database altered.

(host01) SQL> exit
```

10. Use a terminal window on `host01` connected as `oracle` with the environment variables set to `boston`. Launch the DGMGRL utility and connect as the `sysdg` user with operating system authentication. Display the Data Guard configuration.

```
[oracle@host01]$ dgmgrl
DGMGRL for Linux: Version 12.1.0.1.0 - 64bit Production
Copyright (c) 2000, 2012, Oracle. All rights reserved.
Welcome to DGMGRL, type "help" for information.

(host01) DGMGRL> connect sysdg/oracle_4U@boston
Connected as SYSDG.

DGMGRL> show configuration
Configuration - DRSolution

  Protection Mode: MaxProtection
  Databases:
  boston   - Primary database
    bostonFS - Far Sync
      london2  - Logical standby database
    london   - Physical standby database
    londonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS
```

11. Return the Data Guard protection mode to maximum performance.

```
(host01) DGMGRL> edit configuration set protection mode as
maxperformance;
Succeeded.
```

12. Correct the redo routing rules such that the 'boston' primary database forwards redo to only the far sync using the `FASTSYNC` attribute. Adjust the far sync to forward redo to both the '`london`' physical standby database and the '`london2`' logical standby database using the `ASYNC` attribute.

```
(host01) DGMGRL> edit database boston set property 'RedoRoutes'
= '(boston:bostonFS SYNC)';
Property "RedoRoutes" updated

(host01) DGMGRL> edit far_sync 'bostonFS' set property
'RedoRoutes' = '(boston:london,london2 ASYNC)';
Property "RedoRoutes" updated
```

13. Restart Redo Apply on the physical standby database and perform a log switch on the primary database.

```
(host01) DGMGRL> edit database london set state = 'APPLY-ON';
Succeeded.
(host01) DGMGRL> SQL "alter system switch logfile";
Succeeded.
```

14. Display the resulting configuration.

```
(host01) DGMGRL> show configuration

Configuration - DRSolution

  Protection Mode: MaxPerformance
  Databases:
  boston   - Primary database
    bostonFS - Far Sync
      london   - Physical standby database
      london2  - Logical standby database
    londonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS
```

Note: It may take some time for Data Guard broker to resynchronize all the changes in this lab environment considering the hardware constraints. The following actions can be used if needed:

- Stop and restart managed recovery on the physical standby database:
  DGMGRL> edit database london set state = 'APPY-OFF';
  DGMGRL> edit database london set state = 'APPY-ON';
- Stop and restart redo transport from the primary database:
  DGMGRL> edit database boston set state = 'TRANSPORT-OFF';
  DGMGRL> edit database boston set state = 'TRANSPORT-ON';
- Perform a log switch at the primary database:
  DGMGRL> SQL "alter system switch logfile";

15. Before proceeding with additional lab steps, give the transport lag and apply lag an opportunity to catch up. In this training environment, all five VMs and domain 0 typically share a single physical desktop class disk drive. Use the '`show configuration`' and '`show database verbose london`' commands until the lag clears. Repeat these commands as needed.

```
DGMGRL> show database london
Database - london

  Role:               PHYSICAL STANDBY
  Intended State:     APPLY-ON
  Transport Lag:      0 seconds (computed 0 seconds ago)
  Apply Lag:          0 seconds (computed 0 seconds ago)
  Apply Rate:         0 Byte/s
  Real Time Query:    OFF
  Instance(s):
    london

Database Status:
SUCCESS
```

Practices for Lesson 12: Performing Role Transitions

Chapter 12

Practices for Lesson 12: Overview

Practices Overview

In these practices, you will perform a switchover, and then switch back to the original configuration.

Practice 12-1: Performing Switchover

Overview

In this practice, you will use DGMGRL view the configuration status, validate that the databases are ready for a role reversal, and then perform a switchover.

Tasks

1. Use a terminal window on `host01` connected as `oracle` with the environment variables set to `boston`. Launch the DGMGRL utility and connect as the `sysdg` user with operating system authentication.

```
[oracle@host01]$ dgmgrl
DGMGRL for Linux: Version 12.1.0.1.0 - 64bit Production
Copyright (c) 2000, 2012, Oracle. All rights reserved.
Welcome to DGMGRL, type "help" for information.

(host01) DGMGRL> connect sysdg/oracle_4U@boston
Connected as SYSDG.
```

2. Use the `SHOW CONFIGURATION` command to display the configuration status for the Data Guard configuration.

```
(host01) DGMGRL> show configuration
Configuration - DRSolution

  Protection Mode: MaxPerformance
  Databases:
  boston   - Primary database
    bostonFS - Far Sync
      london   - Physical standby database
      london2  - Logical standby database
    londonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS
```

3. Validate that the primary database is ready for role reversal using the `VERBOSE` option. The `VERBOSE` option will show all checks being performed during validation.

```
(host01) DGMGRL> validate database verbose boston

  Database Role:    Primary database

  Ready for Switchover:  Yes

  Capacity Information:
```

```
    Database  Instances        Threads
    boston    1                1

  Temporary Tablespace File Information:
    boston TEMP Files:  1

  Flashback Database Status:
    boston:  Off

  Data file Online Move in Progress:
    boston:  No

  Transport-Related Information:
    Transport On:  Yes

  Log Files Cleared:
    boston Standby Redo Log Files:  Cleared

  Automatic Diagnostic Repository Errors:
    Error                       boston
    No logging operation        NO
    Control file corruptions    NO
    System data file missing    NO
    System data file corrupted  NO
    System data file offline    NO
    User data file missing      NO
    User data file corrupted    NO
    User data file offline      NO
    Block Corruptions found     NO
```

4. Validate that the physical standby database is ready for role reversal using the `VERBOSE` option.

```
(host01) DGMGRL> validate database verbose london

  Database Role:     Physical standby database
  Primary Database:  boston

  Ready for Switchover:  Yes
  Ready for Failover:    Yes (Primary Running)

  Capacity Information:
    Database  Instances        Threads
    boston    1                1
    london    1                1
```

```
Temporary Tablespace File Information:
  boston TEMP Files:  3
  london TEMP Files:  3

Flashback Database Status:
  boston:  Off
  london:  Off

Data file Online Move in Progress:
  boston:  No
  london:  No

Standby Apply-Related Information:
  Apply State:      Running
  Apply Lag:        0 seconds
  Apply Delay:      0 minutes

Transport-Related Information:
  Transport On:      Yes
  Gap Status:        No Gap
  Transport Lag:     0 seconds
  Transport Status:  Success

Log Files Cleared:
  boston Standby Redo Log Files:  Cleared
  london Online Redo Log Files:   Cleared

Current Log File Groups Configuration:
  Thread #  Online Redo Log Groups   Standby Redo Log Groups
            (boston)                 (london)
  1         3                        2

Future Log File Groups Configuration:
  Thread #  Online Redo Log Groups   Standby Redo Log Groups
            (london)                 (boston)
  1         3                        2

Current Configuration Log File Sizes:
  Thread #   Smallest Online Redo      Smallest Standby Redo
             Log File Size             Log File Size
             (boston)                  (london)
  1          50 MBytes                 50 MBytes
```

```
Future Configuration Log File Sizes:
  Thread #   Smallest Online Redo      Smallest Standby Redo
             Log File Size             Log File Size
             (london)                  (boston)
  1          50 MBytes                 50 MBytes

Apply-Related Property Settings:
  Property                  boston Value       london Value
  DelayMins                 0                  0
  ApplyParallel             AUTO               AUTO

Transport-Related Property Settings:
  Property                  boston Value       london Value
  LogXptMode                ASYNC              async
  Dependency                <empty>            <empty>
  DelayMins                 0                  0
  Binding                   optional           optional
  MaxFailure                0                  0
  MaxConnections            1                  1
  ReopenSecs                300                300
  NetTimeout                30                 30
  RedoCompression           DISABLE            DISABLE
  LogShipping               ON                 ON

Automatic Diagnostic Repository Errors:
  Error                       boston   london
  No logging operation        NO       NO
  Control file corruptions    NO       NO
  SRL Group Unavailable       NO       NO
  System data file missing    NO       NO
  System data file corrupted  NO       NO
  System data file offline    NO       NO
  User data file missing      NO       NO
  User data file corrupted    NO       NO
  User data file offline      NO       NO
  Block Corruptions found     NO       NO
```

Note: Your output will contain information regarding thread 3 of redo. There is no thread 3 on this database. This will be fixed with an upcoming patch for the existing issue in Oracle Database 12.1.0.1.0. It has been removed from the above output.

5. Switchover to the 'london' physical standby database.

```
(host01) DGMGRL> switchover to london
Performing switchover NOW, please wait...
```

```
Operation requires a connection to instance "london" on database
"london"
Connecting to instance "london"...
Connected as SYSDG.
New primary database "london" is opening...
Operation requires startup of instance "boston" on database
"boston"
Starting instance "boston"...
ORACLE instance started.
Database mounted.
Switchover succeeded, new primary is "london"
```

6. Display the new configuration.

```
(host01) DGMGRL> show configuration

Configuration - DRSolution

  Protection Mode: MaxPerformance
  Databases:
  london   - Primary database
    londonFS - Far Sync
      boston   - Physical standby database
      london2  - Logical standby database
    bostonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS
(host01) DGMGRL> exit;
```

Note: Remember that the indentation used in the output of the `SHOW CONFIGURATION` command indicates the hierarchy of how redo is being forwarded.

7. Use a terminal window on `host03` connected as `oracle` with the environment variables set to `london`. Launch the DGMGRL utility and connect as the `sysdg` user with operating system authentication.

```
[oracle@host03]$ dgmgrl
DGMGRL for Linux: Version 12.1.0.1.0 - 64bit Production
Copyright (c) 2000, 2012, Oracle. All rights reserved.
Welcome to DGMGRL, type "help" for information.

(host03) DGMGRL> connect sysdg/oracle_4U@london
Connected as SYSDG.
```

8. Perform a log switch on the new primary database 'london' from within DGMGRL.

```
(host03) DGMGRL> SQL "alter system switch logfile";
Succeeded.
```

9. Verify that the new standby database 'boston' has zero transport lag and zero apply lag. You may need to wait a minute for this to clear.

```
(host03) DGMGRL> show database boston

Database - boston

  Role:               PHYSICAL STANDBY
  Intended State:     APPLY-ON
  Transport Lag:      0 seconds (computed 0 seconds ago)
  Apply Lag:          0 seconds (computed 0 seconds ago)
  Apply Rate:         0 Byte/s
  Real Time Query:    OFF
  Instance(s):
    Boston

Database Status:
SUCCESS
```

10. Validate that the new 'london' primary database is ready to switch back a second time. Do not use the VERBOSE option so you can compare the difference in output from the previous steps.

```
(host03) DGMGRL> validate database london

  Database Role:    Primary database

  Ready for Switchover:  Yes

  Flashback Database Status:
    london:  Off
```

11. Validate that the new 'boston' physical standby database is ready to switch back a second time. Do not use the VERBOSE option so you can compare the difference in output from the previous steps.

```
(host03) DGMGRL> validate database boston

  Database Role:     Physical standby database
  Primary Database:  london

  Ready for Switchover:  Yes
  Ready for Failover:    Yes (Primary Running)
```

```
  Flashback Database Status:
    london:  Off
    boston:  Off

  Current Log File Groups Configuration:
    Thread #  Online Redo Log Groups   Standby Redo Log Groups
              (london)                 (boston)
    1         3                        2

  Future Log File Groups Configuration:
    Thread #  Online Redo Log Groups   Standby Redo Log Groups
              (boston)                 (london)
    1         3                        2
```

12. Switchover to the 'boston' physical standby database.

```
(host03) DGMGRL> switchover to boston
Performing switchover NOW, please wait...
Operation requires a connection to instance "boston" on database
"boston"
Connecting to instance "boston"...
Connected as SYSDG.
New primary database "boston" is opening...
Operation requires startup of instance "london" on database
"london"
Starting instance "london"...
ORACLE instance started.
Database mounted.
Switchover succeeded, new primary is "boston"
```

13. Display the resulting configuration. Exit DGMGRL when done.

```
(host03) DGMGRL> show configuration

Configuration - DRSolution

  Protection Mode: MaxPerformance
  Databases:
  boston   - Primary database
    bostonFS - Far Sync
      london   - Physical standby database
      london2  - Logical standby database
    londonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS

(host03) DGMGRL> exit
```

Practices for Lesson 13: Using Flashback Database in a Data Guard Configuration

Chapter 13

Practices for Lesson 13: Overview

Practices Overview

In these practices, you will enable flashback database on both the primary database and the physical standby database.

Practice 13-1: Configuring Flashback Database on the Primary Database

Overview

In this practice, you will configure flashback database on the primary database and verify that it has been enabled.

Tasks

1. Use a terminal window on `host01` connected as `oracle` with the environment variables set to `boston`. Launch SQL*Plus and determine the current state of flashback database.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Dec 17 14:12:34
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) SQL> select flashback_on from v$database;
FLASHBACK_ON
------------------
NO
```

2. Verify that the primary database is in archive log mode, a pre-requisite to flashback database.

```
(host01) SQL> archive log list
Database log mode              Archive Mode
Automatic archival             Enabled
Archive destination            USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence     95
Next log sequence to archive   97
Current log sequence           97
```

3. Verify that the fast recovery area has been configured for the primary database, a pre-requisite to flashback database.

```
(host01) SQL> show parameter db_recovery
NAME                           TYPE     VALUE
------------------------------ -------- ------------------------
db_recovery_file_dest          string        /u01/app/oracle
                                             /fast_recovery_area
db_recovery_file_dest_size     big integer   10G
```

4. Determine the current amount of time in minutes for the flashback window.

```
(host01) SQL> show parameter flashback
NAME                                 TYPE        VALUE
------------------------------------ ----------- ---------------
db_flashback_retention_target        integer     1440
```

5. Adjust the flashback window to be 3 days (1440 minutes/day x 3 days = 4320 minutes).

```
(host01) SQL> alter system set db_flashback_retention_target =
4320;
System altered.
```

6. Enable flashback database for the whole database.

```
(host01) SQL> alter database flashback on;
Database altered
```

7. Verify that flashback database has been enabled.

```
(host01) SQL> select flashback_on from v$database;
FLASHBACK_ON
------------------
YES
```

8. Determine the current size (in bytes) of the flashback data.

```
(host01) SQL> select flashback_size from
v$flashback_database_log;
FLASHBACK_SIZE
--------------
     104857600
```

9. Determine the name, quantity and sizes of the flashback log files that were created when flashback database was enabled. Your file names will be different. Exit SQL*Plus.

```
(host01) SQL> select name,bytes from
v$flashback_database_logfile;
NAME
------------------------------------------------------------------
---------
     BYTES
----------
/u01/app/oracle/fast_recovery_area/BOSTON/flashback/o1_mf_9c0r52
hg_.flb
  52428800

/u01/app/oracle/fast_recovery_area/BOSTON/flashback/o1_mf_9c0r54
t7_.flb
  52428800

(host01) SQL> exit;
```

Practice 13-2: Configuring Flashback Database on the Physical Standby Database

Overview

In this practice, you will enable flashback database on the physical standby database.

Tasks

1. Use a terminal window on `host03` connected as `oracle` with the environment variables set to `london`. Launch SQL*Plus and determine the current state of flashback database.

```
[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Dec 17 14:12:34
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host03) SQL> select flashback_on from v$database;
FLASHBACK_ON
------------------
NO
```

2. Verify that the physical standby database is in archive log mode, a pre-requisite to flashback database.

```
(host03) SQL> archive log list
Database log mode              Archive Mode
Automatic archival             Enabled
Archive destination            USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence     95
Next log sequence to archive   0
Current log sequence           97
```

3. Verify that the fast recovery area has been configured for the physical standby database, a pre-requisite to flashback database.

```
(host03) SQL> show parameter db_recovery
NAME                         TYPE     VALUE
---------------------------- -------- ------------------------
db_recovery_file_dest        string        /u01/app/oracle
                                           /fast_recovery_area
db_recovery_file_dest_size   big integer   10G
```

4. Determine the current amount of time in minutes for the flashback window.

```
(host03) SQL> show parameter flashback
NAME                                 TYPE        VALUE
------------------------------------ ----------- ---------------
db_flashback_retention_target        integer     1440
```

5. Adjust the flashback window to be 3 days (1440 minutes/day x 3 days = 4320 minutes).

```
(host03) SQL> alter system set db_flashback_retention_target =
4320;
System altered.
```

6. Enable flashback database for the whole database. Note the error message that is returned.

```
(host03) SQL> alter database flashback on;
alter database flashback on
*
ERROR at line 1:
ORA-01153: an incompatible media recovery is active
```

7. Use a terminal window on host01 connected as oracle with the environment variables set to boston. Launch the DGMGRL utility and connect as the sysdg user with operating system authentication.

```
[oracle@host01]$ dgmgrl
DGMGRL for Linux: Version 12.1.0.1.0 - 64bit Production
Copyright (c) 2000, 2012, Oracle. All rights reserved.
Welcome to DGMGRL, type "help" for information.

(host01) DGMGRL> connect sysdg/oracle_4U@boston
Connected as SYSDG.
```

8. Stop the managed recovery mode for the physical standby database.

```
(host01) DGMGRL> edit database london set state='APPLY-OFF';
Succeeded.
```

9. Return to the SQL*Plus session on host03 connected to the 'london' physical standby database and enable flashback database a second time.

```
(host03) SQL> alter database flashback on;
Database altered.
```

10. Verify that flashback database has been enabled.

```
(host03) SQL> select flashback_on from v$database;
FLASHBACK_ON
------------------
YES

(host03) SQL> exit;
```

11. Return to the terminal window on host01 that is running DGMGRL and restart the managed recovery mode for the 'london' physical standby database. Exit DGMGRL when done.

```
(host01) DGMGRL> edit database london set state='APPLY-ON';
Succeeded.

(host01) DGMGRL> exit
```

Practice 13-3: Configuring Flashback Database on the Logical Standby Database

Overview

In this practice, you will enable flashback database on the logical standby database.

Tasks

1. Use a terminal window on `host03` connected as `oracle` with the environment variables set to `london2`. Launch SQL*Plus and determine the current state of flashback database.

```
[oracle@host03]$ . oraenv
ORACLE_SID = [london] ? london2
The Oracle base remains unchanged with value /u01/app/oracle

[oracle@host03]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Dec 17 14:12:34
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host03) SQL> select flashback_on from v$database;
FLASHBACK_ON
------------------
NO
```

2. Verify that the logical standby database is in archive log mode, a pre-requisite to flashback database.

```
(host03) SQL> archive log list
Database log mode              Archive Mode
Automatic archival             Enabled
Archive destination            USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence     86
Next log sequence to archive   88
Current log sequence           88
```

3. Verify that the fast recovery area has been configured for the physical standby database, a pre-requisite to flashback database.

```
(host03) SQL> show parameter db_recovery
NAME                         TYPE     VALUE
---------------------------- -------- ------------------------
db_recovery_file_dest        string        /u01/app/oracle
                                           /fast_recovery_area
db_recovery_file_dest_size   big integer   10G
```

4. Determine the current amount of time in minutes for the flashback window.

```
(host03) SQL> show parameter flashback
NAME                                 TYPE        VALUE
------------------------------------ ----------- ---------------
db_flashback_retention_target        integer     1440
```

5. Adjust the flashback window to be 3 days (1440 minutes/day x 3 days = 4320 minutes).

```
(host03) SQL> alter system set db_flashback_retention_target =
4320;
System altered.
```

6. Enable flashback database for the whole database. Note the error message that is returned.

```
(host03) SQL> alter database flashback on;
Database altered.
```

7. Verify that flashback database has been enabled.

```
(host03) SQL> select flashback_on from v$database;
FLASHBACK_ON
------------------
YES

(host03) SQL> exit;
```

Practices for Lesson 14: Enabling Fast-Start Failover

Chapter 14

Practices for Lesson 14: Overview

Practices Overview

In these practices, you will setup and configure fast-start failover. You will then simulate a failure of the primary database and observe the automatic failover to the standby database.

Practice 14-1: Enabling Fast-Start Failover

Overview

In this practice, you will enable fast-start failover on host02 where the 'bostonFS' far sync is currently running. After enabling fast-start failover, you will start the observer process.

Tasks

1. Use a terminal window on host01 connected as oracle with the environment variables set to boston. Launch SQL*Plus and perform a log switch on the primary database. Exit SQL*Plus.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Dec 17 14:12:34
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) SQL> alter system switch logfile;
System altered.

(host01) SQL> exit;
```

2. Use a terminal window on `host02` connected as `oracle` with the environment variables set to `bostonFS`. Launch the DGMGRL utility and connect as the sysdg user with operating system authentication.

```
[oracle@host02]$ dgmgrl
DGMGRL for Linux: Version 12.1.0.1.0 - 64bit Production
Copyright (c) 2000, 2012, Oracle. All rights reserved.
Welcome to DGMGRL, type "help" for information.

(host02) DGMGRL> connect sysdg/oracle_4U@bostonFS
Connected as SYSDG.
```

3. Verify that there is no Transport Lag or Apply lag at the physical standby database and logical standby database before proceeding with labs.

```
(host02) DGMGRL> show database london

Database - london

  Role:              PHYSICAL STANDBY
  Intended State:    APPLY-ON
  Transport Lag:     0 seconds (computed 0 seconds ago)
  Apply Lag:         0 seconds (computed 0 seconds ago)
```

```
  Apply Rate:         0 Byte/s
  Real Time Query:    OFF
  Instance(s):
    london

Database Status:
SUCCESS
(host02) DGMGRL> show database london2

Database - london2

  Role:               LOGICAL STANDBY
  Intended State:     APPLY-ON
  Transport Lag:      0 seconds (computed 0 seconds ago)
  Apply Lag:          0 seconds (computed 0 seconds ago)
  Apply Rate:         48.04 MByte/s
  Instance(s):
    london2

Database Status:
SUCCESS
```

4. Display the current configuration and note the current state of fast-start failover.

```
(host02) DGMGRL> show configuration
Configuration - DRSolution

  Protection Mode: MaxPerformance
  Databases:
  boston   - Primary database
    bostonFS - Far Sync
      london   - Physical standby database
      london2  - Logical standby database
    londonFS - Far Sync (inactive)

Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS
```

5. Display a detailed status of the current fast-start failover settings.

```
(host02) DGMGRL> show fast_start failover
Fast-Start Failover: DISABLED

  Threshold:          30 seconds
  Target:             (none)
  Observer:           (none)
  Lag Limit:          30 seconds
  Shutdown Primary:   TRUE
  Auto-reinstate:     TRUE
  Observer Reconnect: (none)
  Observer Override:  FALSE

Configurable Failover Conditions
  Health Conditions:
    Corrupted Controlfile          YES
    Corrupted Dictionary           YES
    Inaccessible Logfile            NO
    Stuck Archiver                  NO
    Datafile Offline               YES

  Oracle Error Conditions:
    (none)
```

6. Set up the `FastStartFailoverTarget` configuration property on the 'boston' primary database to indicate the desired 'london' target standby database.

```
(host02) DGMGRL> edit database boston set property
FastStartFailoverTarget = london;
Property "faststartfailovertarget" updated
```

7. Display the `FastStartFailoverTarget` configuration property for both the primary database and the physical standby database.

```
(host02) DGMGRL> show database boston faststartfailovertarget;
  FastStartFailoverTarget = 'london'

(host02) DGMGRL> show database london FastStartFailoverTarget;
  FastStartFailoverTarget = ''
```

8. Modify the `ObserverReconnect` configuration property and set the value to 120 seconds.

```
(host02) DGMGRL> edit configuration set property
ObserverReconnect=120;
Property " observerreconnect" updated
```

9. Attempt to enable fast-start failover.

```
(host02) DGMGRL> enable fast_start failover;
Error: ORA-16693: requirements not met for enabling fast-start
failover
Failed.
```

10. Since a far sync is being used, define the reciprocal fast-start failover target for when the 'london' physical standby database becomes the primary database. This would be set automatically by the broker if far sync was not in the configuration.

```
(host02) DGMGRL> edit database london set property
FastStartFailoverTarget = boston;
Property "faststartfailovertarget" updated
```

11. Attempt to enable fast-start failover.

```
(host02) DGMGRL> enable fast_start failover;
Error: ORA-16693: requirements not met for enabling fast-start
failover
Failed.
```

12. To enable fast-start failover when using a far sync, the configuration must be upgraded to the maximum availability mode. Display the current `RedoRoutes` property for both the primary and standby database.

```
(host02) DGMGRL> show database boston redoroutes;
  RedoRoutes = '(boston:bostonFS SYNC)'
(host02) DGMGRL> show database london redoroutes;
  RedoRoutes = '(london:londonFS SYNC)'
```

Note: FASTSYNC would also be acceptable settings for the maximum availability.

13. Upgrade the protection mode to maximum availability.

```
(host02) DGMGRL> edit configuration set protection mode as
maxavailability;
Succeeded.
```

14. Enable fast-start failover.

```
(host02) DGMGRL> enable fast_start failover;
Enabled.
```

15. Display a detailed status of the current fast-start failover settings.

```
(host02) DGMGRL> show fast_start failover;

Fast-Start Failover: ENABLED

  Threshold:          30 seconds
  Target:             london
  Observer:           (none)
  Lag Limit:          30 seconds (not in use)
  Shutdown Primary:   TRUE
  Auto-reinstate:     TRUE
  Observer Reconnect: 120 seconds
  Observer Override:  FALSE

Configurable Failover Conditions
  Health Conditions:
    Corrupted Controlfile          YES
    Corrupted Dictionary           YES
    Inaccessible Logfile            NO
    Stuck Archiver                  NO
    Datafile Offline               YES

  Oracle Error Conditions:
    (none)
```

16. Start the observer process.

```
(host02) DGMGRL> start observer
Observer started
```

Note: The prompt will not return after starting the observer. Keep this terminal window open with the observer running in it.

Practice 14-2: Testing Fast-Start Failover

Overview

In this practice, you will simulate a disaster on the primary database and observe the automatic failover to the standby database.

Tasks

1. Use a terminal window on host01 connected as oracle with the environment variables set to 'boston'. Connect to the primary database using SQL*Plus and simulate a failure by issuing the shutdown abort command. Exit SQL*Plus.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Dec 17 22:40:27
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) SQL> shutdown abort
ORACLE instance shut down.

(host01) SQL> exit;
```

2. Observe the status output in the terminal session connected to host02 running the observer process from the previous lab step. It may take a minute before the failover is initiated.

```
(host02) DGMGRL> start observer
Observer started

12:59:51.40  Wednesday, December 18, 2013
Initiating Fast-Start Failover to database "london"...
Performing failover NOW, please wait...
Failover succeeded, new primary is "london"
13:01:19.70  Wednesday, December 18, 2013

13:01:23.64  Wednesday, December 18, 2013
Initiating reinstatement for database "london2"...
Reinstating database "london2", please wait...
Operation requires shutdown of instance "london2" on database
"london2"
Shutting down instance "london2"...
Database closed.
Database dismounted.
ORACLE instance shut down.
```

```
Operation requires startup of instance "london2" on database
"london2"
Starting instance "london2"...
ORACLE instance started.
Database mounted.
Continuing to reinstate database "london2" ...
Operation requires shutdown of instance "london2" on database
"london2"
Shutting down instance "london2"...
ORA-01109: database not open

Database dismounted.
ORACLE instance shut down.
Operation requires startup of instance "london2" on database
"london2"
Starting instance "london2"...
ORACLE instance started.
Database mounted.
Continuing to reinstate database "london2" ...
Reinstatement of database "london2" succeeded
13:04:04.71  Wednesday, December 18, 2013
```

3. Use a terminal window on `host03` connected as `oracle` with the environment variables set to `london`. Launch the DGMGRL utility and connect as the sysdg user with operating system authentication.

```
[oracle@host03]$ dgmgrl
DGMGRL for Linux: Version 12.1.0.1.0 - 64bit Production
Copyright (c) 2000, 2012, Oracle. All rights reserved.
Welcome to DGMGRL, type "help" for information.

(host03) DGMGRL> connect sysdg/oracle_4U@london
Connected as SYSDG.
```

4. Display the current configuration and note the current state of fast-start failover.

```
(host03) DGMGRL> show configuration
Configuration - DRSolution

  Protection Mode: MaxAvailability
  Databases:
  london   - Primary database
    londonFS - Far Sync
      boston   - (*) Physical standby database (disabled)
        ORA-16661: the standby database needs to be reinstated

      london2  - Logical standby database
```

```
        Warning: ORA-16857: standby disconnected from redo
source for longer than specified threshold

    bostonFS - Far Sync (inactive)

Fast-Start Failover: ENABLED

Configuration Status:
WARNING
```

Note: The ORA-16857 warning message depends on the lag and overall performance of the virtual machine environment. You may or may not see this warning statement. It is a matter of timing.

5. Use a terminal window on host01 connected as oracle with the environment variables set to 'boston'. Connect to the former primary database (the new physical standby database) using SQL*Plus and mount the 'boston' database. Exit SQL*Plus.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Tue Dec 17 22:40:27
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to an idle instance.

(host01) SQL> startup mount
ORACLE instance started.

Total System Global Area  517763072 bytes
Fixed Size                  2290216 bytes
Variable Size             440405464 bytes
Database Buffers           71303168 bytes
Redo Buffers                3764224 bytes
Database mounted.

(host01) SQL> exit;
```

6. Observe the output in the terminal session on host02 running the observer process.

```
Initiating reinstatement for database "boston"...
Reinstating database "boston", please wait...
Reinstatement of database "boston" succeeded
13:10:41.54  Wednesday, December 18, 2013
```

7. Return to the DGMGRL session running on host03 and display the configuration.

```
(host03) DGMGRL> show configuration
Configuration - DRSolution
  Protection Mode: MaxAvailability
  Databases:
  london   - Primary database
    londonFS - Far Sync
      boston   - (*) Physical standby database
        Warning: ORA-16857: standby disconnected from redo
source for longer than specified threshold
      london2  - Logical standby database
    bostonFS - Far Sync (inactive)

Fast-Start Failover: ENABLED

Configuration Status:
WARNING
```

Note: The ORA-16857 warning message depends on the lag and overall performance of the virtual machine environment. You may or may not see this warning statement. It is a matter of timing.

8. It may take a few moments for the lag for the standby database to clear. Keep displaying the status until it has cleared. Do not continue with labs until the apply lag and transport lag have cleared.

```
(host03) DGMGRL> show database boston
Database - boston

  Role:              PHYSICAL STANDBY
  Intended State:    APPLY-ON
  Transport Lag:     0 seconds (computed 1 second ago)
  Apply Lag:         0 seconds (computed 1 second ago)
  Apply Rate:        0 Byte/s
  Real Time Query:   OFF
  Instance(s):
    boston

Database Status:
SUCCESS

(host03) DGMGRL> show configuration
Configuration - DRSolution

  Protection Mode: MaxAvailability
  Databases:
```

```
  london   - Primary database
    londonFS - Far Sync
      boston   - (*) Physical standby database
      london2  - Logical standby database
    bostonFS - Far Sync (inactive)

Fast-Start Failover: ENABLED

Configuration Status:
SUCCESS
```

Practice 14-3: Switchover to Reinstated Database

Overview

In this practice, you will perform a switchover to return the configuration to the state that it was before the failover.

Tasks

1. Validate that the 'london' primary database is ready for switchover.

```
(host03) DGMGRL> validate database london
  Database Role:    Primary database
  Ready for Switchover:  Yes
```

2. Validate that the 'boston' standby database is ready for switchover.

```
(host03) DGMGRL> validate database boston

  Database Role:     Physical standby database
  Primary Database:  london

  Ready for Switchover:  Yes
  Ready for Failover:    Yes (Primary Running)

  Current Log File Groups Configuration:
    Thread #  Online Redo Log Groups   Standby Redo Log Groups
              (london)                 (boston)
    1         3                        2

  Future Log File Groups Configuration:
    Thread #  Online Redo Log Groups   Standby Redo Log Groups
              (boston)                 (london)
    1         3                        2
```

3. Switchover to the 'boston' database.

```
(host03) DGMGRL> switchover to boston
Performing switchover NOW, please wait...
Operation requires a connection to instance "boston" on database
"boston"
Connecting to instance "boston"...
Connected as SYSDG.
New primary database "boston" is opening...
Operation requires startup of instance "london" on database
"london"
Starting instance "london"...
ORACLE instance started.
Database mounted.
Switchover succeeded, new primary is "boston"
```

4. Display the resulting configuration.

```
(host03) DGMGRL> show configuration

Configuration - DRSolution

  Protection Mode: MaxAvailability
  Databases:
  boston   - Primary database
    bostonFS - Far Sync
      london   - (*) Physical standby database
      london2  - Logical standby database
    londonFS - Far Sync (inactive)

Fast-Start Failover: ENABLED

Configuration Status:
SUCCESS
```

5. Stop the observer process.

```
(host03) DGMGRL> stop observer
Done.
```

Note: The prompt should now be returned in the terminal window that was connected to host02 running the observer process.

6. Disable fast-start failover.

```
(host03) DGMGRL> disable fast_start failover;
Disabled.
```

7. Reset the protection mode back to maximum performance and exit DGMGRL.

```
(host03) DGMGRL> edit configuration set protection mode as
maxperformance;
Succeeded.
DGMGRL> exit;
```

Practices for Lesson 15: Backup and Recovery Considerations in an Oracle Data Guard Configuration

Chapter 15

Practices for Lesson 15: Overview

Practices Overview

In these practices, you will setup and configure the recovery manager (RMAN) catalog repository database and use it to perform backup and recovery in a Data Guard environment.

Practice 15-1: Creating a Recovery Manager Catalog

Overview

In this practice, you will setup and configure the recovery manager (RMAN) catalog repository database.

Tasks

1. Open a new terminal window on Domain 0 as was done in the first lab. Switch to the root user and list the virtual machines that are currently running.

```
[vncuser@Domain0]$ su -
Password: oracle

[root@Domain0]# xm list
Name                ID   Mem VCPUs      State   Time(s)
Domain-0             0  1024     2     r-----  15367.0
host01               7  2048     1     -b----    767.4
host02               8  1536     1     -b----    532.4
host03               9  2048     1     -b----   1464.9
host04              10  1536     1     -b----    535.4
```

2. Start the 'em12' virtual machine.

```
[root@Domain0]# xm create /OVS/running_pool/em12/vm.cfg
Using config file "/OVS/running_pool/em12/vm.cfg".
Started domain em12 (id=11)
```

Note: Even though the prompt is returned quickly, it will take a minute for the operating system for virtual machine 'em12' to start networking services and allow connectivity.

3. Using the SSH client, connect to em12 as the oracle OS user. Enter oracle when you are prompted for the password. In the lab environment, always use the -X option of SSH to enable X11 forwarding back to the Domain-0 console window.

```
[root@dom0]# ssh -X oracle@em12
oracle@em12's password: oracle
```

4. Since Enterprise Manager Cloud Control 12*c* is installed on em12, startup scripts were created to automatically start EM when the operating system starts. Stop the EM agent and the EM Management Server. Exit the terminal session and close the window when done.

```
[oracle@em12]$ cd /u01/app/oracle/agent/agent_inst/bin
[oracle@em12]$ ./emctl stop agent
Oracle Enterprise Manager Cloud Control 12c Release 3
Copyright (c) 1996, 2013 Oracle Corporation.  All rights
reserved.
Agent is Not Running

[oracle@em12]$ cd /u01/app/oracle/middleware/oms/bin
[oracle@em12]$ ./emctl stop oms -all
Oracle Enterprise Manager Cloud Control 12c Release 3
```

```
Copyright (c) 1996, 2013 Oracle Corporation.  All rights
reserved.
Stopping WebTier...
WebTier Successfully Stopped
Stopping Oracle Management Server...
Oracle Management Server Successfully Stopped
AdminServer Successfully Stopped
Oracle Management Server is Down

[oracle@em12]$ exit
logout
Connection to em12 closed.

[root@dom0]# exit <<You may leave the terminal window open>>
[vncuser@Domain0]$ exit
```

5. On host01, invoke SQL*Plus and connect as the SYS user with the SYSDBA privilege to the emrep service.

```
[oracle@host01 admin]$ sqlplus sys/oracle_4U@emrep as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Dec 18 15:10:17
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 -
64bit Production
With the Partitioning, OLAP, Data Mining and Real Application
Testing options
```

6. Determine where the current data files are stored at.

```
(host01) SQL> select file_name from dba_data_files;

FILE_NAME
-----------------------------------------------------------
/u01/app/oracle/oradata/emrep/users01.dbf
/u01/app/oracle/oradata/emrep/undotbs01.dbf
/u01/app/oracle/oradata/emrep/sysaux01.dbf
/u01/app/oracle/oradata/emrep/system01.dbf
/u01/app/oracle/oradata/emrep/mgmt_ecm_depot1.dbf
/u01/app/oracle/oradata/emrep/mgmt.dbf
/u01/app/oracle/oradata/emrep/mgmt_deepdive.dbf

7 rows selected.
```

7. Create a new tablespace for the recovery manager repository using the same storage architecture as the existing files. Name the tablesace 'rcts' and give it an initial size of 30MB with autoextend turned on.

```
(host01) SQL> create tablespace rcts datafile
'/u01/app/oracle/oradata/emrep/rcts01.dbf' size 30M autoextend
on;
Tablespace created.
```

8. Create a new schema 'rcowner' setting the default tablespace to the tablespace just created.

```
(host01) SQL> create user rcowner identified by rcpass default
tablespace rcts quota unlimited on rcts;
User created.
```

9. Grant the recovery catalog owner role to the user just created. Exit SQL*Plus when done.

```
(host01) SQL> grant recovery_catalog_owner to rcowner;
Grant succeeded.

(host01) SQL> exit
```

10. On host01, invoke recovery manager and connect to the emrep service using the account just created.

```
[oracle@host01]$ rman
Recovery Manager: Release 12.1.0.1.0 - Production on Wed Dec 18
15:25:35 2013

Copyright (c) 1982, 2013, Oracle and/or its affiliates.  All
rights reserved.
(host01) RMAN> connect catalog rcowner/rcpass@emrep
connected to recovery catalog database
```

11. Create the recovery catalog.

```
(host01) RMAN> create catalog;
recovery catalog created
```

Practice 15-2: Registering Your Database in the Recovery Catalog

Overview

In this practice, you register the primary database in the recovery catalog.

Tasks

1. Connect to the 'boston' primary database with SYSDBA privilege and register the database.

```
(host01) RMAN> connect target 'sys/oracle_4U@boston as sysdba'
connected to target database: BOSTON (DBID=2524687871)

(host01) RMAN> register database;
database registered in recovery catalog
starting full resync of recovery catalog
full resync complete
```

   Note: Your DBID should be different.

2. List the DB_UNIQUE_NAME for all databases known to the recovery catalog.

```
(host01) RMAN> list db_unique_name of database;

List of Databases
DB Key  DB Name  DB ID      Database Role    Db_unique_name
------- -------  ---------- ---------------  ---------------
1       BOSTON   2524687871 PRIMARY          BOSTON
```

3. Generate a schema report for the 'boston' primary database.

```
(host01) RMAN> report schema for db_unique_name boston;

Report of database schema for database with db_unique_name
BOSTON

List of Permanent Datafiles
===========================
File Size(MB) Tablespace           RB segs
---- -------- -------------------- -------
Datafile Name
----------------------------------------------------------------
1    800      SYSTEM               YES
/u01/app/oracle/oradata/boston/system01.dbf
3    780      SYSAUX               NO
/u01/app/oracle/oradata/boston/sysaux01.dbf
4    345      UNDOTBS1             YES
/u01/app/oracle/oradata/boston/undotbs01.dbf
5    260      PDB$SEED:SYSTEM      NO
/u01/app/oracle/oradata/boston/pdbseed/system01.dbf
```

```
6    5        USERS                NO
/u01/app/oracle/oradata/boston/users01.dbf
7    640      PDB$SEED:SYSAUX      NO
/u01/app/oracle/oradata/boston/pdbseed/sysaux01.dbf
8    290      DEV1:SYSTEM          NO
/u01/app/oracle/oradata/boston/dev1/system01.dbf
9    700      DEV1:SYSAUX          NO
/u01/app/oracle/oradata/boston/dev1/sysaux01.dbf
10   5        DEV1:USERS           NO
/u01/app/oracle/oradata/boston/dev1/SAMPLE_SCHEMA_users01.dbf
11   358      DEV1:EXAMPLE         NO
/u01/app/oracle/oradata/boston/dev1/example01.dbf

List of Temporary Files
=======================
File Size(MB) Tablespace           Maxsize(MB) Tempfile Name
---- -------- -------------------- ----------- ----------------
---
1    88       TEMP                 32767
/u01/app/oracle/oradata/boston/temp01.dbf
2    87       PDB$SEED:TEMP        32767
/u01/app/oracle/oradata/boston/pdbseed/pdbseed_temp01.dbf
3    87       DEV1:TEMP            32767
/u01/app/oracle/oradata/boston/dev1/dev1_temp01.dbf
```

4. List all the archive logs for the 'boston' primary database.

```
(host01) RMAN> list archivelog all for db_unique_name boston;
List of Archived Log Copies for database with db_unique_name
BOSTON
=====================================================================
=====

Key     Thrd Seq     S Low Time
------- ---- ------- - ---------
…
202     1    71      A 18-DEC-13
        Name:
/u01/app/oracle/fast_recovery_area/BOSTON/archivelog/2013_12_18/
o1_mf_1_71_9c32odc2_.arc

203     1    72      A 18-DEC-13
        Name:
/u01/app/oracle/fast_recovery_area/BOSTON/archivelog/2013_12_18/
o1_mf_1_72_9c32p1r2_.arc

204     1    73      A 18-DEC-13
```

```
        Name:
/u01/app/oracle/fast_recovery_area/BOSTON/archivelog/2013_12_18/
o1_mf_1_73_9c36xrwt_.arc

205     1    74      A 18-DEC-13
        Name:
/u01/app/oracle/fast_recovery_area/BOSTON/archivelog/2013_12_18/
o1_mf_1_74_9c36yy2d_.arc
…
```

5. Display all the current configuration parameters for the 'boston' primary database.

```
(host01) RMAN> show all for db_unique_name boston;

RMAN configuration parameters for database with db_unique_name
BOSTON are:
CONFIGURE RETENTION POLICY TO REDUNDANCY 1; # default
CONFIGURE BACKUP OPTIMIZATION OFF; # default
CONFIGURE DEFAULT DEVICE TYPE TO DISK; # default
CONFIGURE CONTROLFILE AUTOBACKUP ON; # default
CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO
'%F'; # default
CONFIGURE DEVICE TYPE DISK PARALLELISM 1 BACKUP TYPE TO
BACKUPSET; # default
CONFIGURE DATAFILE BACKUP COPIES FOR DEVICE TYPE DISK TO 1; #
default
CONFIGURE ARCHIVELOG BACKUP COPIES FOR DEVICE TYPE DISK TO 1; #
default
CONFIGURE MAXSETSIZE TO UNLIMITED; # default
CONFIGURE ENCRYPTION FOR DATABASE OFF; # default
CONFIGURE ENCRYPTION ALGORITHM 'AES128'; # default
CONFIGURE COMPRESSION ALGORITHM 'BASIC' AS OF RELEASE 'DEFAULT'
OPTIMIZE FOR LOAD TRUE ; # default
CONFIGURE RMAN OUTPUT TO KEEP FOR 7 DAYS; # default
CONFIGURE ARCHIVELOG DELETION POLICY TO NONE; # default
CONFIGURE SNAPSHOT CONTROLFILE NAME TO
'/u01/app/oracle/product/12.1.0/dbhome_1/dbs/snapcf_boston.f'; #
default
```

Practice 15-3: Configuring RMAN Parameters

Overview

In this practice, you will configure RMAN for use in a Data Guard environment.

Tasks

1. In your RMAN session (connected to your primary database), configure the backup retention policy to allow for recovery for seven days.

```
(host01) RMAN> configure retention policy to recovery window of
7 days;

new RMAN configuration parameters:
CONFIGURE RETENTION POLICY TO RECOVERY WINDOW OF 7 DAYS;
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

2. Specify that archived redo log files can be deleted after they are applied to the standby database.

```
(host01) RMAN> configure archivelog deletion policy to applied
on all standby;

new RMAN configuration parameters:
CONFIGURE ARCHIVELOG DELETION POLICY TO APPLIED ON ALL STANDBY;
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

3. Configure the connect identifier for your primary database.

```
(host01) RMAN> configure db_unique_name boston connect
identifier 'boston';

new RMAN configuration parameters:
CONFIGURE DB_UNIQUE_NAME 'boston' CONNECT IDENTIFIER  'boston';
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

4. Configure the connect identifier for your physical standby database.

```
(host01) RMAN> configure db_unique_name london connect
identifier 'london';

new RMAN configuration parameters:
CONFIGURE DB_UNIQUE_NAME 'london' CONNECT IDENTIFIER  'london';
new RMAN configuration parameters are successfully stored
starting full resync of recovery catalog
full resync complete
```

5. Your physical standby database is registered with the recovery catalog. Use the `LIST DB_UNIQUE_NAME` command to see the registration information about your primary and standby databases.

```
(host01) RMAN> list db_unique_name of database;
List of Databases
DB Key  DB Name  DB ID      Database Role    Db_unique_name
------- ------- ---------- ---------------  ------------------
1       BOSTON   2524687871 PRIMARY          BOSTON
1       BOSTON   2524687871 STANDBY          LONDON
```

6. Use the REPORT SCHEMA command to view additional information about your physical standby database. Exit RMAN when done.

```
(host01) RMAN> report schema for db_unique_name london;
Report of database schema for database with db_unique_name
LONDON
List of Permanent Datafiles
===========================
File Size(MB) Tablespace           RB segs Datafile Name
---- -------- -------------------- ------- ----------------
1    800      SYSTEM               YES
3    770      SYSAUX               NO
4    345      UNDOTBS1             YES
5    260      PDB$SEED:SYSTEM      NO
6    5        USERS                NO
7    640      PDB$SEED:SYSAUX      NO
8    290      DEV1:SYSTEM          NO
9    700      DEV1:SYSAUX          NO
10   5        DEV1:USERS           NO
11   358      DEV1:EXAMPLE         NO

(host01) RMAN> exit;
```

7. Invoke RMAN again and connect to your physical standby database and the recovery catalog.

```
[oracle@host01]$ rman target sys/oracle_4U@london catalog
rcowner/rcpass@emrep
Recovery Manager: Release 12.1.0.1.0 - Production on Wed Dec 18
16:04:49 2013
Copyright (c) 1982, 2013, Oracle and/or its affiliates.  All
rights reserved.
connected to target database: BOSTON (DBID=2524687871, not open)
connected to recovery catalog database
```

Note: Notice that the database name is listed as BOSTON, even though a connection was made to the 'london' physical standby instance.

8. Execute the `SHOW ALL` command to view the configuration parameters for your physical standby database.

```
(host01) RMAN> show all for db_unique_name london;
RMAN configuration parameters for database with db_unique_name
LONDON are:
CONFIGURE RETENTION POLICY TO RECOVERY WINDOW OF 7 DAYS;
CONFIGURE BACKUP OPTIMIZATION OFF; # default
CONFIGURE DEFAULT DEVICE TYPE TO DISK; # default
CONFIGURE CONTROLFILE AUTOBACKUP ON; # default
CONFIGURE CONTROLFILE AUTOBACKUP FORMAT FOR DEVICE TYPE DISK TO
'%F'; # default
CONFIGURE DEVICE TYPE DISK PARALLELISM 1 BACKUP TYPE TO
BACKUPSET; # default
CONFIGURE DATAFILE BACKUP COPIES FOR DEVICE TYPE DISK TO 1; #
default
CONFIGURE ARCHIVELOG BACKUP COPIES FOR DEVICE TYPE DISK TO 1; #
default
CONFIGURE MAXSETSIZE TO UNLIMITED; # default
CONFIGURE ENCRYPTION FOR DATABASE OFF; # default
CONFIGURE ENCRYPTION ALGORITHM 'AES128'; # default
CONFIGURE COMPRESSION ALGORITHM 'BASIC' AS OF RELEASE 'DEFAULT'
OPTIMIZE FOR LOAD TRUE ; # default
CONFIGURE DB_UNIQUE_NAME 'boston' CONNECT IDENTIFIER  'boston';
CONFIGURE DB_UNIQUE_NAME 'london' CONNECT IDENTIFIER  'london';
CONFIGURE RMAN OUTPUT TO KEEP FOR 7 DAYS; # default
CONFIGURE ARCHIVELOG DELETION POLICY TO APPLIED ON ALL STANDBY;
CONFIGURE SNAPSHOT CONTROLFILE NAME TO
'/u01/app/oracle/product/12.1.0/dbhome_1/dbs/snapcf_london.f'; #
default
```

9. Configure backup optimization. Exit RMAN when done.

```
(host01) RMAN> configure backup optimization on;
new RMAN configuration parameters:
CONFIGURE BACKUP OPTIMIZATION ON;
new RMAN configuration parameters are successfully stored

(host01) RMAN> exit;
```

Practice 15-4: Recovering a Data File on Your Primary Database

Overview

In this practice, you recover a data file in your primary database by using a data file from your physical standby database. You will create a new data file in order to simulate a disaster, without affecting the existing data files on the primary database.

Tasks

1. The logical standby database does not honor the `DB_FILE_NAME_CONVERT` parameter. This will cause an error when a tablespace is created on the primary database and force the Logical Apply process to shutdown because the directory doesn't exit. Use a terminal window logged in as oracle to host03. Create a symbolic link 'boston' linking to 'london2' so that file creation can proceed.

```
[oracle@host03]$ cd /u01/app/oracle/oradata
[oracle@host03]$ ln -s london2 boston
```

   Note: The Data Guard documentation shows how to create a DDL handler using a procedure, along with the built-in DBMS_LOGSTDBY.SKIP procedure to skip over the DDL with the wrong path names and invoke the handler to rename the path in the command.

2. Use a terminal window logged in as oracle to host01 to with the environment variables set for 'boston' appropriately. Launch SQL*Plus and create a new tablespace `SAMPLE` in the `DEV1` pluggable database with a data file `/u01/app/oracle/oradata/boston/dev1/sample01.dbf` and a size of 5 MB.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Wed Dec 18 16:23:20
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) SQL> alter session set container=DEV1;
Session altered.

(host01) SQL> create tablespace SAMPLE datafile
'/u01/app/oracle/oradata/boston/dev1/sample01.dbf' size 5M;
Tablespace created.
```

3. Connect to your physical standby instance as the SYSDBA user and show the `standby_file_management` parameter.

```
(host01) SQL> connect sys/oracle_4U@london as sysdba
Connected.

(host01) SQL> show parameter standby_file_management
NAME                                 TYPE        VALUE
------------------------------------ ----------- ------------
standby_file_management              string      AUTO
```

4. Verify that the data file has successfully been created on the physical standby database.

```
(host01) SQL> select file#,name from v$datafile;
FILE# NAME
----- -------------------------------------------------
    1 /u01/app/oracle/oradata/london/system01.dbf
    3 /u01/app/oracle/oradata/london/sysaux01.dbf
    4 /u01/app/oracle/oradata/london/undotbs01.dbf
    5 /u01/app/oracle/oradata/london/pdbseed/system01.dbf
    6 /u01/app/oracle/oradata/london/users01.dbf
    7 /u01/app/oracle/oradata/london/pdbseed/sysaux01.dbf
    8 /u01/app/oracle/oradata/london/dev1/system01.dbf
    9 /u01/app/oracle/oradata/london/dev1/sysaux01.dbf
   10
/u01/app/oracle/oradata/london/dev1/SAMPLE_SCHEMA_users01.dbf
   11 /u01/app/oracle/oradata/london/dev1/example01.dbf
   12 /u01/app/oracle/oradata/london/dev1/sample01.dbf

11 rows selected.
```

5. Connect to your logical standby instance as the SYSDBA user.

```
(host01) SQL> connect sys/oracle_4U@london2 as sysdba
Connected.
```

6. Verify that the data file has successfully been created on the logical standby database.

```
(host01) SQL> select file#,name from v$datafile;
FILE# NAME
----- -------------------------------------------------
    1 /u01/app/oracle/oradata/london2/system01.dbf
    3 /u01/app/oracle/oradata/london2/sysaux01.dbf
    4 /u01/app/oracle/oradata/london2/undotbs01.dbf
    5 /u01/app/oracle/oradata/london2/pdbseed/system01.dbf
    6 /u01/app/oracle/oradata/london2/users01.dbf
    7 /u01/app/oracle/oradata/london2/pdbseed/sysaux01.dbf
    8 /u01/app/oracle/oradata/london2/dev1/system01.dbf
    9 /u01/app/oracle/oradata/london2/dev1/sysaux01.dbf
```

```
   10
/u01/app/oracle/oradata/london/dev1/SAMPLE_SCHEMA_users01.dbf
   11 /u01/app/oracle/oradata/london2/dev1/example01.dbf
   12 /u01/app/oracle/oradata/boston/dev1/sample01.dbf
```

7. Reconnect to your primary database and create the `hr.employees2` table as a copy of the `hr.employees` table into the newly created tablespace. Exit SQL*Plus

```
(host01) SQL> connect
system/oracle_4U@//host01.example.com/DEV1.example.com
Connected.

(host01) SQL> create table hr.employees2 tablespace sample as
select * from hr.employees;
Table created.
```

Note: A service name was never created for the `DEV1` pluggable database. The connection above uses the EZCONNECT method to directly connect to the `DEV1` pluggable database without having an entry in the `TNSNAMES.ORA` file. It connects without having to connect to the `CDB$ROOT` container first and issue the '`alter session set container = DEV1;`' command. Also of interest, the `HR` account is currently expired and locked.

8. Verify that the table was created by counting the number of rows it contains.

```
(host01) SQL> select count(*) from hr.employees2;
  COUNT(*)
----------
       107
```

9. Move the `sample01.dbf` file to `sample01.sav` to simulate a failure in the primary database.

```
(host01) SQL> !mv
/u01/app/oracle/oradata/boston/dev1/sample01.dbf
/u01/app/oracle/oradata/boston/dev1/sample01.sav
```

10. Connect to the root container and shutdown abort the primary database. Exit SQL*Plus.

```
(host01) SQL> connect sys/oracle_4U@boston as sysdba
Connected.

(host01) SQL> shutdown abort
ORACLE instance shut down.

(host01) SQL> exit
```

11. Use a terminal window logged in as oracle to host01 with the environment variables set for 'boston' appropriately. Launch SQL*Plus and start the database instance. Exit SQL*Plus.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Fri Jan 17 17:44:40
2014
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to an idle instance.
```

```
(host01) SQL> startup
ORACLE instance started.

Total System Global Area  517763072 bytes
Fixed Size                  2290216 bytes
Variable Size             440405464 bytes
Database Buffers           71303168 bytes
Redo Buffers                3764224 bytes
Database mounted.
ORA-01157: cannot identify/lock data file 12 - see DBWR trace
file
ORA-01110: data file 12:
'/u01/app/oracle/oradata/boston/dev1/sample01.dbf'
```

12. Since the datafile belongs to a non-critical tablespace such as SYSTEM, offline the datafile and open the database. You will need to change to the DEV1 container where the tablespace was created at in order to offline it. Exit SQL*Plus.

```
(host01) SQL> alter session set container=dev1;
Session altered.

(host01) SQL> alter tablespace sample datafile offline;
Tablespace altered.

(host01) SQL> alter session set container=CDB$ROOT;
Session altered.

(host01) SQL> alter database open;
Database altered.

(host01) SQL> show pdbs
CON_ID CON_NAME                       OPEN MODE  RESTRICTED
------ ------------------------------ ---------- ----------
     2 PDB$SEED                       READ ONLY  NO
     3 DEV1                           MOUNTED

(host01) SQL> alter pluggable database dev1 open;
Pluggable database altered.

(host01) SQL> show pdbs
CON_ID CON_NAME                       OPEN MODE  RESTRICTED
------ ------------------------------ ---------- ----------
     2 PDB$SEED                       READ ONLY  NO
     3 DEV1                           READ WRITE NO
```

```
(host01) SQL> exit
```

13. Use RMAN to restore the missing datafile using the physical standby database. You will need to connect to the physical standby database as the target database, and to the primary database as the auxiliary database. Exit RMAN.

```
[oracle@host01]$ rman
Recovery Manager: Release 12.1.0.1.0 - Production on Fri Dec 20
14:20:37 2013
Copyright (c) 1982, 2013, Oracle and/or its affiliates.  All
rights reserved.

(host01) RMAN> connect target sys/oracle_4U@london
connected to target database: BOSTON (DBID=2524687871)

(host01) RMAN> connect auxiliary sys/oracle_4U@boston
connected to auxiliary database: BOSTON (DBID=2524687871)

(host01) RMAN> backup as copy datafile 12 auxiliary format
'/u01/app/oracle/oradata/boston/dev1/sample01.bkp';
Starting backup at 20-DEC-13
using target database control file instead of recovery catalog
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=43 device type=DISK
channel ORA_DISK_1: starting datafile copy
input datafile file number=00012
name=/u01/app/oracle/oradata/london/dev1/sample01.dbf
output file
name=/u01/app/oracle/oradata/boston/dev1/sample01.bkp
tag=TAG20140117T174920
channel ORA_DISK_1: datafile copy complete, elapsed time:
00:00:01
Finished backup at 20-DEC-13

(host01) RMAN> exit
```

14. Use RMAN with connections to the primary database as the target database and also the recovery catalog. Catalog the copy of the datafile just made so that RMAN is aware of the manual backup.

```
[oracle@host01]$ rman target sys/oracle_4U@boston catalog
rcowner/rcpass@emrep;
Recovery Manager: Release 12.1.0.1.0 - Production on Fri Dec 20
14:27:34 2013
Copyright (c) 1982, 2013, Oracle and/or its affiliates.  All
rights reserved.
connected to target database: BOSTON (DBID=2524687871)
```

```
connected to recovery catalog database

(host01) RMAN> catalog datafilecopy
'/u01/app/oracle/oradata/boston/dev1/sample01.bkp';
starting full resync of recovery catalog
full resync complete
cataloged datafile copy
datafile copy file
name=/u01/app/oracle/oradata/boston/dev1/sample01.bkp RECID=11
STAMP=834676134
```

15. Rename the existing datafile 12 to the new name, switch the control file to use the new file, and recover the file. Exit RMAN.

```
RMAN> run {
set newname for datafile 12 to
'/u01/app/oracle/oradata/boston/dev1/sample01.bkp';
switch datafile 12;
recover datafile 12;
}

executing command: SET NEWNAME
RMAN-06169: could not read file header for datafile 12 error
reason 4
datafile 12 switched to datafile copy
input datafile copy RECID=11 STAMP=834676134 file
name=/u01/app/oracle/oradata/boston/dev1/sample01.bkp
starting full resync of recovery catalog
full resync complete
Starting recover at 20-DEC-13
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=81 device type=DISK
starting media recovery
media recovery complete, elapsed time: 00:00:01
Finished recover at 20-DEC-13

(host01) RMAN> exit
```

16. Use a terminal window logged in as oracle to host01 with the environment variables set for 'boston' appropriately. Launch SQL*Plus and switch the container to the pluggable database. Online the files for the tablespace 'EXAMPLE2.' Verify that the table has been recovered and the rows exist in the table.

```
[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Fri Dec 20 14:34:56
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Connected to:
```

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

(host01) SQL> alter session set container=DEV1;
Session altered.

(host01) SQL> alter tablespace sample datafile online;
Tablespace altered.

(host01) SQL> select * from hr.employees2;
…
EMPLOYEE_ID FIRST_NAME           LAST_NAME
----------- -------------------- -------------------------
EMAIL                     PHONE_NUMBER         HIRE_DATE JOB_ID
SALARY
------------------------- -------------------- --------- -------
--- ----------
COMMISSION_PCT MANAGER_ID DEPARTMENT_ID
-------------- ---------- -------------
        205 Shelley              Higgins
SHIGGINS                  515.123.8080         07-JUN-02 AC_MGR
12008
                      101           110


        206 William              Gietz
WGIETZ                    515.123.8181         07-JUN-02
AC_ACCOUNT       8300
                      205           110

EMPLOYEE_ID FIRST_NAME           LAST_NAME
----------- -------------------- -------------------------
EMAIL                     PHONE_NUMBER         HIRE_DATE JOB_ID
SALARY
------------------------- -------------------- --------- -------
--- ----------
COMMISSION_PCT MANAGER_ID DEPARTMENT_ID
-------------- ---------- -------------



107 rows selected.
```

17. Use the online datafile move command to rename the newly created datafile back to the old name.

```
(host01) SQL> alter database move datafile
'/u01/app/oracle/oradata/boston/dev1/sample01.bkp' TO
'/u01/app/oracle/oradata/boston/dev1/sample01.dbf';
Database altered.
```

Note: The online move operation does not move (or rename) the datafile on the standby sites.

18. Drop the tablespace that was created in the lab along with the datafiles. Exit SQL*Plus.

```
(host01) SQL> drop tablespace sample including contents and
datafiles;
Tablespace dropped;

(host01) SQL> exit
```

Practices for Lesson 16: Enhanced Client Connectivity in a Data Guard Environment

Chapter 16

Practices for Lesson 16: Overview

Practices Overview

In these practices, you will create a service to connect to the DEV1 pluggable database, and also create a database startup trigger that will start the service on any host machine that the primary database is running on.

Practice 16-1: Creating and Testing Primary Database Services

Overview

In this practice, you will create and test a service for the DEV1 pluggable database on the primary database, and follow that service as it migrates from host01 to host03 during switchover exercises.

Tasks

1. Use a terminal window logged in as oracle to host01 with the environment variables set for 'boston' appropriately. Launch SQL*Plus and set the session container to the DEV1 pluggable database.

```
[oracle@host01]$ . oraenv
ORACLE_SID = [boston] ?
The Oracle base remains unchanged with value /u01/app/oracle

[oracle@host01]$ sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Fri Jan 17 18:29:14
2014
Copyright (c) 1982, 2013, Oracle.  All rights reserved.

Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) SQL> alter session set container=dev1;
Session altered.
```

2. Create and start a service with the name 'PRMY.EXAMPLE.COM'.

```
(host01) SQL> exec
DBMS_SERVICE.CREATE_SERVICE('PRMY.EXAMPLE.COM','PRMY.EXAMPLE.COM
');
PL/SQL procedure successfully completed.

(host01) SQL> exec
DBMS_SERVICE.START_SERVICE('PRMY.EXAMPLE.COM');
PL/SQL procedure successfully completed.
```

3. From within SQL*Plus, display the status of the Oracle listener running on host01 and verify that the service was started successfully. Do not exit SQL*Plus.

```
(host01) SQL> !lsnrctl status
LSNRCTL for Linux: Version 12.1.0.1.0 - Production on 20-DEC-
2013 16:06:01
Copyright (c) 1991, 2013, Oracle.  All rights reserved.
```

```
Connecting to
(DESCRIPTION=(ADDRESS=(PROTOCOL=TCP)(HOST=host01.example.com)(PO
RT=1521)(SEND_SDU=10485760)(RECV_SDU=10485760)))
STATUS of the LISTENER
------------------------
Alias                     LISTENER
Version                   TNSLSNR for Linux: Version 12.1.0.1.0
- Production
Start Date                18-DEC-2013 10:25:42
Uptime                    2 days 5 hr. 40 min. 21 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/host01/listener/alert/log.xml
Listening Endpoints Summary...

(DESCRIPTION=(ADDRESS=(PROTOCOL=tcp)(HOST=host01.example.com)(PO
RT=1521)))
  (DESCRIPTION=(ADDRESS=(PROTOCOL=ipc)(KEY=EXTPROC1521)))

(DESCRIPTION=(ADDRESS=(PROTOCOL=tcps)(HOST=host01.example.com)(P
ORT=5500))(Security=(my_wallet_directory=/u01/app/oracle/admin/b
oston/xdb_wallet))(Presentation=HTTP)(Session=RAW))

(DESCRIPTION=(ADDRESS=(PROTOCOL=tcps)(HOST=host01.example.com)(P
ORT=5501))(Security=(my_wallet_directory=/u01/app/oracle/admin/b
oston/xdb_wallet))(Presentation=HTTP)(Session=RAW))
Services Summary...
Service "PRMY.EXAMPLE.COM" has 1 instance(s).
  Instance "boston", status READY, has 1 handler(s) for this
service...
Service "boston.example.com" has 2 instance(s).
  Instance "boston", status UNKNOWN, has 1 handler(s) for this
service...
  Instance "boston", status READY, has 1 handler(s) for this
service...
Service "bostonXDB.example.com" has 1 instance(s).
  Instance "boston", status READY, has 0 handler(s) for this
service...
Service "boston_DGB.example.com" has 1 instance(s).
  Instance "boston", status READY, has 1 handler(s) for this
service...
```

```
Service "boston_DGMGRL.example.com" has 1 instance(s).
  Instance "boston", status UNKNOWN, has 1 handler(s) for this
service...
Service "dev1.example.com" has 1 instance(s).
  Instance "boston", status READY, has 1 handler(s) for this
service...
The command completed successfully
```

4. Use another terminal window logged in as oracle to host02 to with the environment variables set for 'bostonFS' appropriately. Launch SQL*Plus and connect to the `PRMY.EXAMPLE.COM` service.

```
[oracle@host02]$ . oranev
ORACLE_SID = [bostonFS] ?
The Oracle base remains unchanged with value /u01/app/oracle

[oracle@host02]$ sqlplus system/oracle_4U@prmy
SQL*Plus: Release 12.1.0.1.0 Production on Fri Dec 20 15:19:40
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Last Successful login time: Fri Dec 20 2013 14:02:22 +00:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options
```

Note: The `tnsnames.ora` network configuration file was created in practice 3, with an entry '`PRMY`' that attempts to connect to both `host01.example.com` and `host03.example.com`, and access a service name of '`PRMY.EXAMPLE.COM`'.

5. Verify that you are indeed connected to the 'boston' instance (the primary database).

```
(host02) SQL> select instance_name from v$instance;
INSTANCE_NAME
----------------
boston
```

6. Verify that your connection has been established with the DEV1 pluggable database and not the root container. Exit SQL*Plus.

```
(host02) SQL> select sys_context ('USERENV', 'CON_NAME') as
container FROM dual;
CONTAINER
------------------------------------------------------------
DEV1

(host02) exit
```

7. Return to the SQL*Plus session running on host01 for the primary database. Create an on database startup trigger that will open the DEV1 pluggable database if it is not already open. The trigger should then start the 'PRMY.EXAMPLE.COM' service after it switches the container to the DEV1 container. The logic should only execute if the database is in the primary role. Exit SQL*Plus on host01.

```
(host01) SQL> create or replace trigger primary_services
after startup on database
declare
  role   varchar2(30);
  omode  varchar2(30);
begin
  select database_role into role from v$database;
  select open_mode into omode from v$pdbs where name = 'DEV1';
  if role = 'PRIMARY' then
     if omode != 'READ WRITE' then
        execute immediate 'alter pluggable database dev1 open';
     end if;

     execute immediate 'alter session set container=dev1';
     dbms_service.start_service('PRMY.EXAMPLE.COM');
  end if;
end;
/

Trigger created.

(host01) SQL> exit
```

8. Use a terminal window logged in as oracle to host01 with the environment variables set for 'boston' appropriately. Launch DGMGRL and connect to the sysdg account. Show the configuration.

```
[oracle@host01]$ dgmgrl
DGMGRL for Linux: Version 12.1.0.1.0 - 64bit Production
Copyright (c) 2000, 2012, Oracle. All rights reserved.
Welcome to DGMGRL, type "help" for information.

(host01) DGMGRL> connect sysdg/oracle_4U@boston
Connected as SYSDG.

(host01) DGMGRL> show configuration
Configuration - DRSolution
  Protection Mode: MaxPerformance
  Databases:
  boston   - Primary database
```

```
    bostonFS - Far Sync
      london   - Physical standby database
      london2  - Logical standby database
    londonFS - Far Sync (inactive)
Fast-Start Failover: DISABLED
Configuration Status:
SUCCESS
```

9. Validate that the primary and physical standby databases are ready for switchover.

```
(host01) DGMGRL> validate database boston
  Database Role:    Primary database
  Ready for Switchover:  Yes

(host01) DGMGRL> validate database london
  Database Role:     Physical standby database
  Primary Database:  boston

  Ready for Switchover:  Yes
  Ready for Failover:    Yes (Primary Running)

  Current Log File Groups Configuration:
    Thread #  Online Redo Log Groups   Standby Redo Log Groups
              (boston)                 (london)
    1         3                        2

  Future Log File Groups Configuration:
    Thread #  Online Redo Log Groups   Standby Redo Log Groups
              (london)                 (boston)
    1         3                        2
```

10. Perform a switch over to the 'london' physical standby database. Do not exit DGMGRL.

```
(host01) DGMGRL> switchover to london
Performing switchover NOW, please wait...
Operation requires a connection to instance "london" on database
"london"
Connecting to instance "london"...
Connected as SYSDG.
New primary database "london" is opening...
Operation requires startup of instance "boston" on database
"boston"
Starting instance "boston"...
ORACLE instance started.
```

```
Database mounted.
Database opened.
Switchover succeeded, new primary is "london"
```

11. Use another terminal window logged in as oracle to host02 with the environment variables set for 'bostonFS' appropriately. Launch SQL*Plus and connect to the PRMY.EXAMPLE.COM service.

```
[oracle@host02]$ . oranev
ORACLE_SID = [bostonFS] ?
The Oracle base remains unchanged with value /u01/app/oracle

[oracle@host02]$ sqlplus system/oracle_4U@prmy
SQL*Plus: Release 12.1.0.1.0 Production on Fri Dec 20 15:19:40
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Last Successful login time: Fri Dec 20 2013 14:02:22 +00:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options
```

12. Verify that you are now connected to the 'london' instance (the primary database).

```
(host02) SQL> select instance_name from v$instance;
INSTANCE_NAME
----------------
london
```

13. Verify that your connection has been established with the DEV1 pluggable database and not the root container. Exit SQL*Plus.

```
(host02) SQL> select sys_context ('USERENV', 'CON_NAME') as
container FROM dual;
CONTAINER
------------------------------------------------------------
DEV1

(host02) exit
```

14. Return to the DGMRL session running on host01 in Step 10. Validate both databases are ready for switchover, and then perform a switchover to return the configuration to the way it was at the start of this practice. Exit DGMGRL.

```
(host01) DGMGRL> validate database london
  Database Role:    Primary database
  Ready for Switchover:  Yes

(host01) DGMGRL> validate database boston
  Database Role:     Physical standby database
  Primary Database:  london
  Ready for Switchover:  Yes
  Ready for Failover:    Yes (Primary Running)
  Current Log File Groups Configuration:
    Thread #  Online Redo Log Groups   Standby Redo Log Groups
              (london)                 (boston)
    1         3                        2
  Future Log File Groups Configuration:
    Thread #  Online Redo Log Groups   Standby Redo Log Groups
              (boston)                 (london)
    1         3                        2

(host01) DGMGRL> switchover to boston
Performing switchover NOW, please wait...
Operation requires a connection to instance "boston" on database
"boston"
Connecting to instance "boston"...
Connected as SYSDG.
New primary database "boston" is opening...
Operation requires startup of instance "london" on database
"london"
Starting instance "london"...
ORACLE instance started.
Database mounted.
Database opened.
Switchover succeeded, new primary is "boston"

(host01) DGMGRL> exit
```

Practices for Lesson 17: Patching and Upgrading Databases in a Data Guard Configuration

Chapter 17

Practices for Lesson 17: Overview

Practices Overview

There are no practices for lesson 17.

Practices for Lesson 18: Optimizing a Data Guard Configuration

Chapter 18

Practices for Lesson 18: Overview

Practices Overview

In these practices, you will configure network compression of redo data.

Practice 18-1: Configuring Network Compression of Redo Data

Overview

In this practice, you will set the `RedoCompression` property to configure network compression of redo data.

Tasks

1. Use a terminal window logged in as oracle to host01 with the environment variables set for 'boston' appropriately. Launch SQL*Plus on your primary database and determine if redo compression is enabled by querying `V$ARCHIVE_DEST`.

```
[oracle@host01]$ . oraenv
ORACLE_SID = [boston] ?
The Oracle base remains unchanged with value /u01/app/oracle

(host01) SQL> sqlplus / as sysdba
SQL*Plus: Release 12.1.0.1.0 Production on Fri Dec 20 15:19:40
2013
Copyright (c) 1982, 2013, Oracle.  All rights reserved.
Last Successful login time: Fri Dec 20 2013 14:02:22 +00:00
Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 -
64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real
Application Testing options

(host01) SQL> col dest_name format a30
(host01) SQL> select dest_name, compression from v$archive_dest;

DEST_NAME                      COMPRES
------------------------------ -------
LOG_ARCHIVE_DEST_1             DISABLE
LOG_ARCHIVE_DEST_2             DISABLE
LOG_ARCHIVE_DEST_3             DISABLE
LOG_ARCHIVE_DEST_4             DISABLE
LOG_ARCHIVE_DEST_5             DISABLE
LOG_ARCHIVE_DEST_6             DISABLE
LOG_ARCHIVE_DEST_7             DISABLE
LOG_ARCHIVE_DEST_8             DISABLE
LOG_ARCHIVE_DEST_9             DISABLE
LOG_ARCHIVE_DEST_10            DISABLE
LOG_ARCHIVE_DEST_11            DISABLE

DEST_NAME                      COMPRES
------------------------------ -------
```

```
LOG_ARCHIVE_DEST_12             DISABLE
LOG_ARCHIVE_DEST_13             DISABLE
LOG_ARCHIVE_DEST_14             DISABLE
LOG_ARCHIVE_DEST_15             DISABLE
LOG_ARCHIVE_DEST_16             DISABLE
LOG_ARCHIVE_DEST_17             DISABLE
LOG_ARCHIVE_DEST_18             DISABLE
LOG_ARCHIVE_DEST_19             DISABLE
LOG_ARCHIVE_DEST_20             DISABLE
LOG_ARCHIVE_DEST_21             DISABLE
LOG_ARCHIVE_DEST_22             DISABLE

DEST_NAME                       COMPRES
------------------------------- -------
LOG_ARCHIVE_DEST_23             DISABLE
LOG_ARCHIVE_DEST_24             DISABLE
LOG_ARCHIVE_DEST_25             DISABLE
LOG_ARCHIVE_DEST_26             DISABLE
LOG_ARCHIVE_DEST_27             DISABLE
LOG_ARCHIVE_DEST_28             DISABLE
LOG_ARCHIVE_DEST_29             DISABLE
LOG_ARCHIVE_DEST_30             DISABLE
LOG_ARCHIVE_DEST_31             DISABLE

31 rows selected.
```

2. Use a terminal window logged in as oracle to host02 with the environment variables set for 'bostonFS' appropriately. Launch DGMGRL and connect to the primary database.

```
[oracle@host02]$ dgmgrl
DGMGRL for Linux: Version 12.1.0.1.0 - 64bit Production
Copyright (c) 2000, 2012, Oracle. All rights reserved.
Welcome to DGMGRL, type "help" for information.

(host02) DGMGRL> connect sysdg/oracle_4U@boston
Connected as SYSDG.
```

3. Enable redo compression by setting the `RedoCompression` property for your far sync. Exit DGMGRL.

```
(host02) DGMGRL> edit far_sync 'bostonFS' set property
'RedoCompression'='ENABLE';
Property "RedoCompression" updated

(host02) DGMGRL> exit
```

4. Return to your SQL*Plus session and query V$ARCHIVE_DEST again. Note that compression is set for LOG_ARCHIVE_DEST_2. Exit SQL*Plus.

```
(host01) SQL> select dest_name, compression from v$archive_dest;

DEST_NAME                      COMPRES
------------------------------ -------
LOG_ARCHIVE_DEST_1             DISABLE
LOG_ARCHIVE_DEST_2             ENABLE
LOG_ARCHIVE_DEST_3             DISABLE
…

31 rows selected.

(host01) SQL> show parameter log_archive_dest_2;
NAME                 TYPE        VALUE
-------------------- ----------- ------------------------------
log_archive_dest_2   string      service="bostonfs",
                                 SYNC AFFIRM delay=0
                                 optional compression=enable
                                 max_failure=0
                                 max_connections=1 reopen=300
                                 db_unique_name="bostonFS"
                                 net_timeout=30,
                                 valid_for=(online_logfile
                                 ,all_roles)

(host01) SQL> exit
```