ORACLE®
University

Integrated Cloud Applications & Platform Services

Implement Database High Availability & Disaster Recovery on OCI

Activity Guide

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Author

Soumyadeep Mitra

Technical Contributors and Reviewers

Sailaja Pasupuleti

Sharath Bhujani

Tatsuya Nomura

Naoki Kato

Graphic Editor

James Hans

Editor

Aju Kumar

Publishers

Syed Imtiaz Ali

Asief Baig

Michael Sebastian Almeida

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Course Practice Environment: Security Credentials

Course Practice Environment: Security Credentials

For your Oracle Cloud account username and password, see the following:

- If you are attending a classroom-based or live virtual class, ask your instructor or LVC producer for OS credential, Oracle Cloud account information, and instructions on how to connect to your training environment.

- If you are using a self-study format, refer to the communication that you received from Oracle University for this course.

OCI VM - Oracle Cloud Infrastructure (OCI) Account Credentials	
Account Specification	**Information / Password**
Domain / Tenant	*Provided as part of account information*
Cloud Account Username	*Provided as part of account information*
Cloud Account Password	*Provided as part of account information*
Compartment to be used	*Provided as part of account information*

Your practice environment consists of:

- A local Microsoft Windows 64-bit system, i.e. Laptop or Desktop referred to as "**your local system**" or "**your local Windows system**" through the course.

- An Oracle Cloud Infrastructure (OCI) Compute node hosting your Virtual Machine DB Systems, referred to as the "**OCI VM**".

- Access to open internet connection, i.e. not connected to any VPN or working in a restricted network that blocks connection from your local system to cloud service instances.

- We strongly recommend wired network connection over the wireless connection for performing lab practices.

Important: Please ensure the following while working with Oracle Cloud accounts:

- Ensure you are logged in to your assigned cloud account and your compartment inside Oracle Cloud Infrastructure console.

- Create only those services that are necessary for the practices and follow the practice instructions as listed in the Activity Guide.

- You will be working on a shared Oracle Cloud domain / tenant, which is used for various classes running in parallel. You might be able to see each other's services when you log into the Oracle Cloud console.

- Therefore, it is extremely important to add unique identifier to the services being created, so you can spot your services, instance without disturbing other's work.

- Also in the shared Oracle Cloud domain / tenant, **please do not remove other's services or instances.**

Course Practice Environment: Security Credentials

Following is an example of the convention used through the course for code example and command:

Task: Click **Open** on the **File** menu and open the SQL file, which has the following command:

```
SQL> CREATE DIRECTORY dp_from_onprem AS
'/u01/app/oracle/admin/MYORCL/dpdump/from_onprem';
Directory created.

SQL>
```

Notes

- In general, **bold text** indicates graphical user interface elements associated with an action, or terms defined in text.

- *Bold italic text* indicates a field into which you need to enter a value. Ensure you substitute your account details or enter values associated with your account where ever you see this.

- In general codes and commands are in "Courier New" font.

- Part of the code or command that needs to be altered according the participant's account information are bold, red and in "**Courier New**" font. Ensure you substitute your account details where ever you see this.

Take a note of the above conventions used through these practices. These are for your convenience and to ensure there is not ambiguity or errors when you execute various statements or commands. Pay attention to these conventions.

Course Practice Environment: Security Credentials

**Practices for Lesson 1:
Introduction to Course
Scenario**

Practices for Lesson 1

There are no practices for this lesson.

**Practices for Lesson 2:
Building Blocks for High
Availability in Oracle Cloud
Infrastructure**

Practices for Lesson 2

There are no practices for this lesson.

Practices for Lesson 2: Building Blocks for High Availability in Oracle Cloud Infrastructure

Practices for Lesson 3:
Oracle Cloud Infrastructure:
Database Service Overview

Practices for Lesson 3

There are no practices for this lesson.

Practices for Lesson 4: Available DB Systems for Implementing Database High Availability in OCI

Practices for Lesson 4: Overview

Overview

In these practices, you get an overview of the course lab environment and prerequisites. You also explore the Oracle Cloud Infrastructure account assigned to you, using which you will create a 2 node Virtual Machine DB System.

Your practice environment consists of:

- A local Microsoft Windows 64-bit system, that is, Laptop or Desktop referred to as "**your local system**" or "**your local Windows system**" through the course

- Oracle Cloud Infrastructure (OCI) Compute nodes hosting your Virtual Machine DB Systems, referred to as the "**OCI VM**"

- Access to open internet connection, i.e. not connected to any VPN or working in a restricted network that blocks connection from your local system to cloud service instances

We strongly recommend wired network connection over the wireless connection for performing lab practices.

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- Create only those services that are necessary for the practices and follow the practice instructions as listed in the Activity Guide.

- You will be working on a shared Oracle Cloud domain / tenant, which is used for various classes running in parallel. You might be able to see each other's services when you log in to the Oracle Cloud console.

- Therefore, it is extremely important to add unique identifier to the services being created, so you can spot your services, instance without disturbing other's work.

- Also in the shared Oracle Cloud domain / tenant, **please do not remove other's services or instances**.

Practice 4: Available DB Systems for Implementing Database High Availability in OCI

Practice 4-1: Setting Up PuTTY on Your Local Windows System

Overview

In this practice, you will download and install PuTTY on your local Microsoft Windows 64-bit system.

Assumptions

You are working on an open Internet connection, that is, not connected to any VPN or working in a restricted network that blocks connection from your local system to cloud service instances.

Tasks: Download and Install PuTTY

1. If PuTTY software package is not available on your local Windows 64-bit system, download it before moving to the next practice.

2. You can download the latest released version of PuTTY from http://www.putty.org.

3. Download the corresponding `putty-64bit-`*`version-number`*`-installer.msi` file on to your local system.

4. Double-click the file to start installation and follow the onscreen instructions.

5. Depending on your version and setup of Microsoft Windows, an Open File - Security Warning dialog box may appear. Click Run.

6. In the "Welcome to the PuTTY Setup Wizard" dialog box, click Next.

7. In the Destination Folder dialog box, accept the default location or enter a new location to install the software. Click Next.

8. In the Product Feature dialog box, verify that all features will be installed on the local hard drive. Click Install.

9. Depending on your version and setup of Microsoft Windows, a User Account Control dialog may appear. Click Yes.

10. In the Completed the PuTTY Setup Wizard dialog box, click Finish.

Practice 4-2: Installing Oracle SQL Developer on Your Local Windows System

Overview

In this practice, you will download and install Oracle SQL Developer on your local Windows system.

Assumptions

You are working on an open Internet connection, that is, not connected to any VPN or working in a restricted network that blocks connection from your local system to cloud service instances.

Tasks

1. You need SQL Developer installed on your local system to perform the practices in this course. Follow these steps to install **SQL Developer 18.2 or higher version**, suitable for your Windows platform.

    a. Download the version of "SQL Developer" from this link
    https://www.oracle.com/technetwork/developer-tools/sql-developer/downloads/index.html by reading and accepting the license agreement.

    Note: Download the latest version of SQL Developer available with "JDK" included. As part of this lab, you use "SQL Developer 18.2 - Windows 64-bit with JDK 9 included".

    b. Install the "SQL Developer" software by following the "**Installation Notes**" in the download link.

Practice 4-3: Exploring the Oracle Cloud Infrastructure Console

Overview

In this practice, you explore the Oracle Cloud Infrastructure console, get an overview of the available service, and select your assigned compartment to be used during practices.

Assumptions

All information related to your Oracle Cloud Infrastructure (OCI) account, also referred to as Oracle Cloud account is assigned to you. Be sure to record the following:
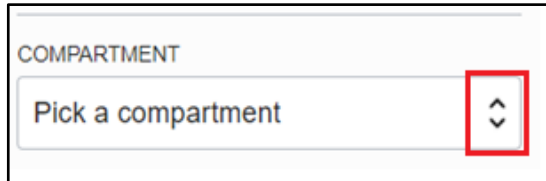
- Domain/Tenant
- Username
- Password
- Compartment to be used

Tasks

1. Launch a web browser on your local system and navigate to https://console.us-ashburn-1.oraclecloud.com or an equivalent link provided to you.

2. On the sign in page, click "**Change tenant**" if required, enter the cloud tenant or the domain assigned to you as part of your account information, and click "**Continue.**"

3. In the **Oracle Cloud Infrastructure** section, enter the cloud account *User Name* and *Password* assigned to you and click "**Sign In.**"

4. At this point, you should be logged in to **Oracle Cloud Infrastructure (OCI) Dashboard**, also called as the OCI home page.

5. Click **Menu** ☰ in the top-left corner and explore the options available services. You will use this navigation path through the practice.

6. To navigate to the page that displays the database service instance, also referred to as DB Systems, click **Bare Metal, VM, and Exadata** on the **Menu**.

7. This is the home page for **DB Systems**.
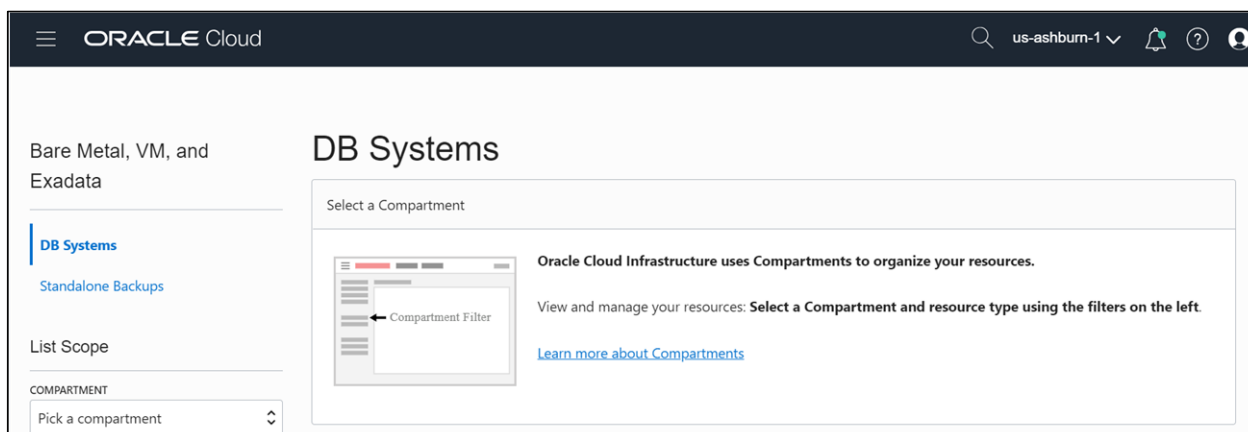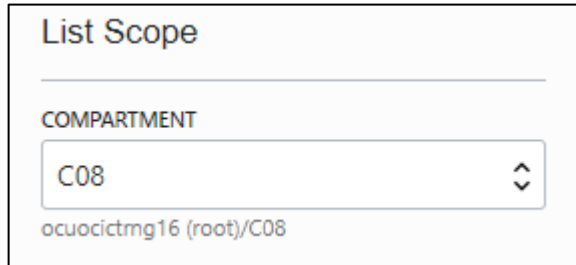
8. If this is your first login or if you have cleared your browser cache, you will need to select the **Compartment** assigned to this OCI cloud account. Expand the drop-down menu highlighted below to select Compartment.

```
COMPARTMENT

Pick a compartment                    ⌄
```

9. You will see the compartment associated with this OCI cloud account when you expand the drop-down menu. Select the compartment assigned to you as shown below:

```
List Scope

COMPARTMENT

C08                                    ⌄

ocuocictrng16 (root)/C08
```

Note: The compartment name may vary across screenshots through the course. This is because multiple accounts were used to develop this material. You can safely ignore this and use the account details assigned to you.

10. At this point you are on the **DB Systems** home page. You will see available service instances if there are any. This is the page from which you can get started and create Oracle Database Cloud Service instances.

By the end of this practice, you should have set up PuTTY utility and **SQL Developer 18.2 or higher version** on your local Windows system and gained familiarity with Oracle Cloud Infrastructure Console.

20   Practice 4: Available DB Systems for Implementing Database High Availability in OCI

Practices for Lesson 5: Deploying a 2 Node RAC Virtual Machine DB System on OCI

Practices for Lesson 5: Overview

Overview

In this practice, you will assume the role of a Cloud Database Administrator (DBA) and perform the following tasks to create a 2 Node RAC Virtual Machine DB system on Oracle Cloud Infrastructure (OCI):

- Generate SSH keys for authentication,
- Create a Virtual Cloud Network (VCN)
- Create a 2 Node RAC Virtual Machine DB System on OCI.

Important:

- All instructions in this course, unless specified otherwise, assume that you are working on a local Windows 64-bit system, that is, Laptop or Desktop.
- You are working on an open Internet connection, that is, not connected to any VPN or working in a restricted network that blocks connection from your local system to cloud service instances.

Practice 5-1: Generating SSH Keys

Overview

In this practice, you will generate SSH keys to be used later for launching a Database System on OCI. As a DBA, it is your responsibility to safeguard SSH keys and manage them.

Assumptions

- All practices from previous lessons are completed successfully.

- The screenshots used in this document might vary depending on the version of the utility you are using. Therefore, use this as a reference to perform these tasks accordingly on your system.

Tasks: Generate SSH Keys

1. Find puttygen.exe in the PuTTY folder on your computer, for example, `C:\Program Files (x86)\PuTTY`. Double-click **puttygen.exe** to open it.

2. Under the Parameters section, accept the default type of key to be generated as SSH-2 RSA or RSA and set the Number of bits in a generated key to **2048** if it is not already set.
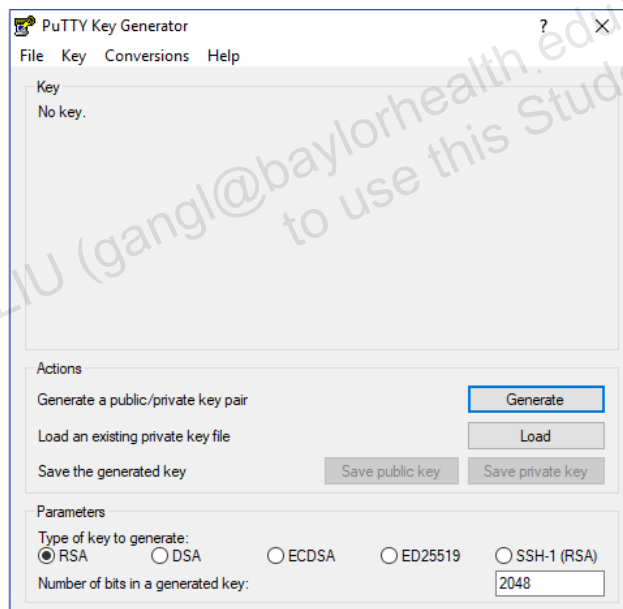
3. Click **Generate.**

4. Move your mouse around the blank area to generate random data in the key, as shown below. Wait for the process to complete.
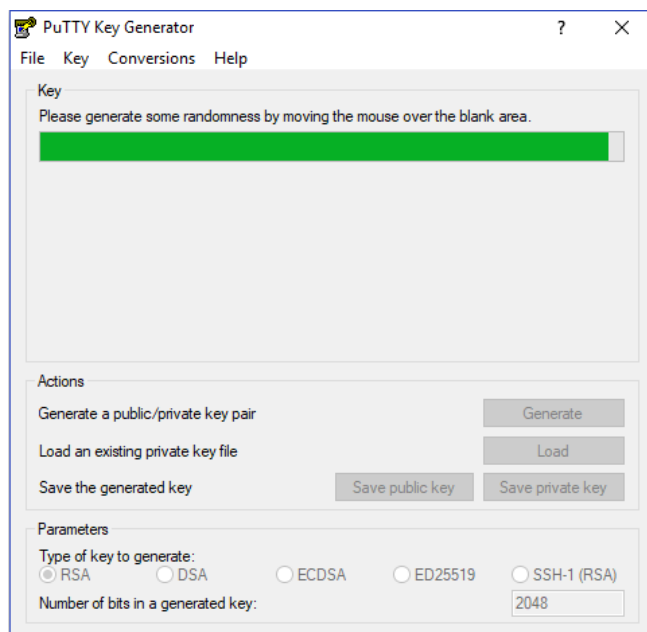
5. The generated key appears under Public key for pasting into OpenSSH authorized_keys file.

Practices for Lesson 5: Deploying a 2 Node RAC Virtual Machine DB System on OCI

6. The Key comment is generated for you, including the date and time stamp. You can keep the generated key comment or overtype it with your own more descriptive comment.

7. For the purpose of this course practices, leave the Key **passphrase** field blank.
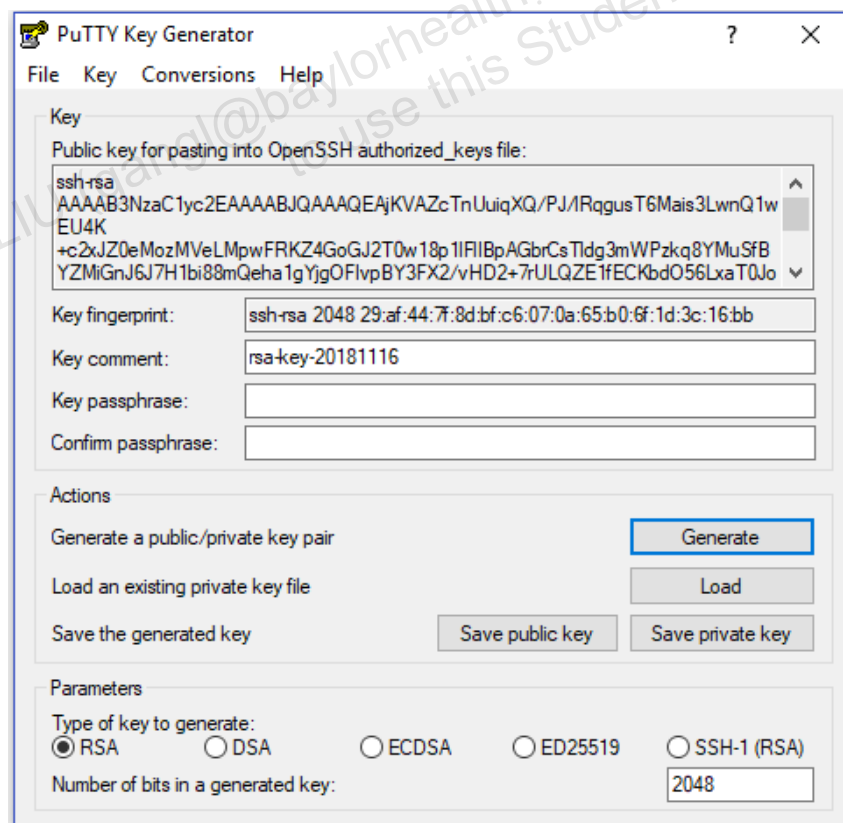
8. Click **Save private key,** click **Yes** to confirm you want to save the key without a passphrase.

9. In the "Save as Explorer" window, first navigate to a location on your local Windows system where you can save all your course files. Create a new folder named **labs**, provide a name to the SSH private key (in this example, **mykey.ppk**) and click **Save** to save the key file.

   Note: The key pair is saved in the PuTTY Private Key (PPK) format, which is a proprietary format that works only with the PuTTY tool set. You can call the key anything you want, but use the **ppk** file extension, for example, **mykey.ppk**.

10. To save the Public key:

    - First navigate to the location on your local system where you have saved the private key.
    - Open a text file using Notepad utility.
    - Name the file **mykey.pub** and save the file in the same location as the private key.
    - Ensure you remove the .txt extension and replace it with .pub file extension.
    - Back on the PuTTY Key Generator window, right-click in the "*Public key for pasting into OpenSSH authorized_keys file*" section.
    - Choose the **Select All** option to select all of the generated keys, right-click again and choose **Copy** to copy the text.
    - Back in the text file, paste the public key value and save the file.

    Important: Do not use Save public key because it does not save the key in the OpenSSH format. You can call the key anything you want, but for consistency, use the same name as the private key and a file extension of **pub**, for example, **mykey.pub**.

11. Write down the names and location of your public and private key files. You will need the public key when launching a DB system. You will need the private key to access the system via SSH.

Practice 5-2: Creating a Virtual Cloud Network (VCN)

Overview

In this practice, you will create a Virtual Cloud Network (VCN) in preparation to creating a Virtual Machine DB System in the subsequent practice.

Note: Oracle University training, *Oracle Cloud Infrastructure Fundamentals* has detailed explanation about the VCN concepts and cloud network components.

Assumptions

All practices from previous lessons are completed successfully.

Tasks

1. Open the navigation **Menu** ☰ in the top-left corner. Under **Core Infrastructure**, go to **Networking** and click **Virtual Cloud Networks**.
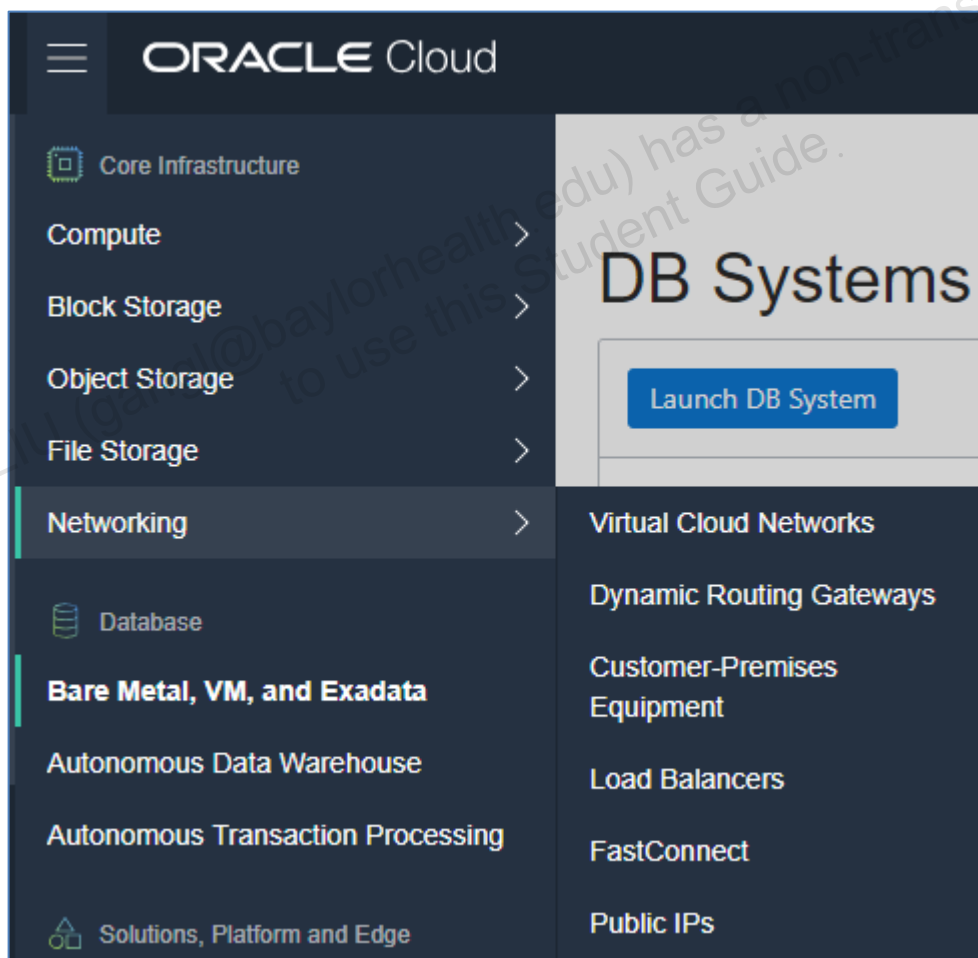
2. Ensure that the compartment assigned to you is selected on the left.

Practices for Lesson 5: Deploying a 2 Node RAC Virtual Machine DB System on OCI

3. Click **Create Virtual Cloud Network**.
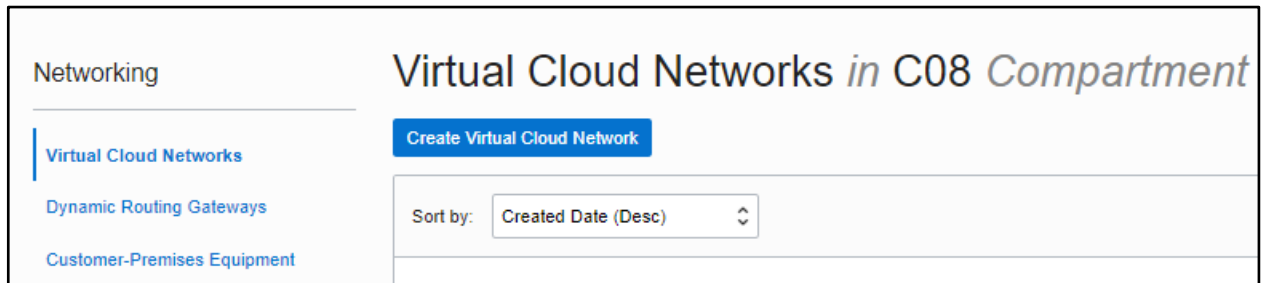
4. Enter the following:

   - **Create in Compartment:** This field defaults to your current compartment. Select the compartment you want to create the VCN in, if not already selected.

   - **Name:** Enter a name for your cloud network, for example, **<your_initials>VCN**. (In this example we will use **MYVCN**.)

   - Select: **Create Virtual Cloud Network Plus Related Resources**. The dialog box expands to list the items that will be created with your cloud network. Review the details to identify the related network resources that will be created.

   - Accept the defaults for any other fields.

5. Scroll to the bottom of the dialog box and click **Create Virtual Cloud Network**.

   A confirmation page similar to the below is displayed, with the details of the cloud network that you just created.
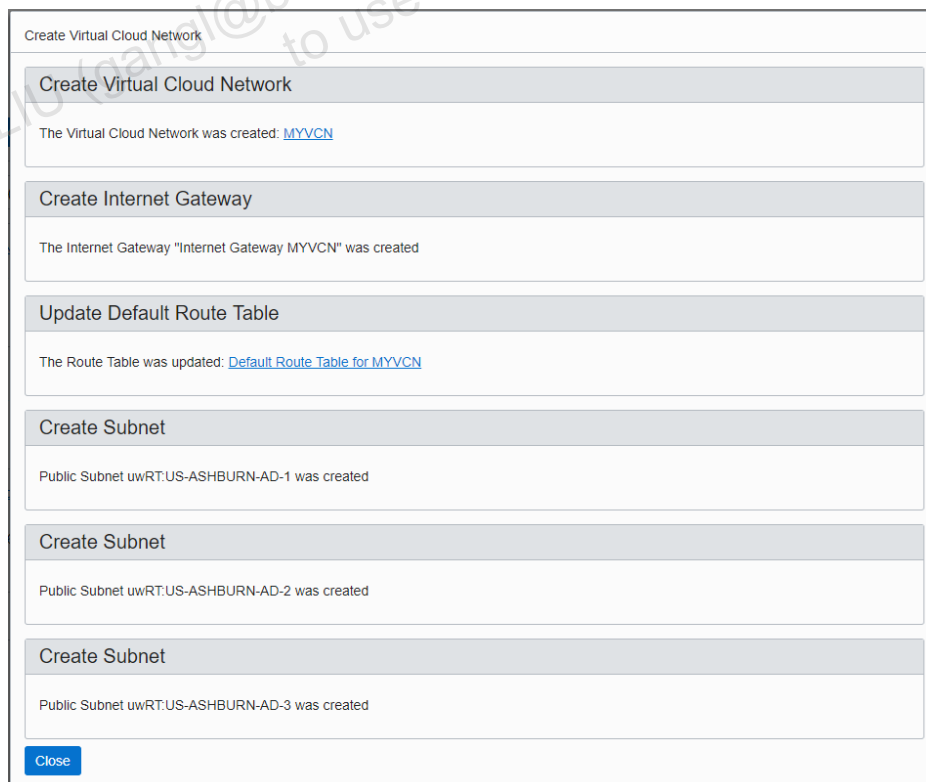
6. Note the name of the VCN you just created. You will need it in the following practices. To exit, click **Close**. Proceed to the next practice.

Practices for Lesson 5: Deploying a 2 Node RAC Virtual Machine DB System on OCI

Practice 5-3: Creating a 2 Node RAC Virtual Machine DB System

Overview

In this practice, you will launch a **2 Node RAC Virtual Machine DB System**, taking the following into consideration:

- The DB System should be named as follows: ***<student_initials>*DBVM**. (Throughout the practice, the DB System will be referred to as **MYDBVM**. In order to ensure that the service instance name is unique, ensure you substitute your initials in place of **MY** in **MY**DBVM)

- Software Release: **Oracle Database 12c Release 2**

- Software Edition: **Enterprise Edition – Extreme Performance**

- Database Type: **2 Node RAC**

- The database should be named **MYORCL** and the PDB should be named **MYPDB1**.

- Select Shape "**VM.Standard2.2**" (2 OCPU and 30 GB RAM).

Assumptions
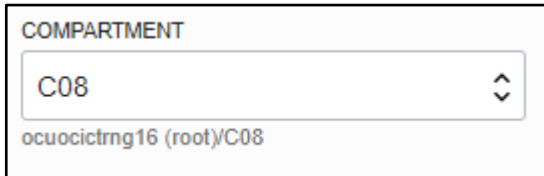
All the previous practices are completed successfully.

Tasks: Launching a 2 Node OCI VM DB System

1. Launch the web browser and navigate to https://console.us-ashburn-1.oraclecloud.com/ or an equivalent link provided to you. Log in to your assigned Cloud account.

2. Open the navigation **Menu** ☰ in the top-left corner. Under Database, click **Bare Metal, VM, and Exadata**.
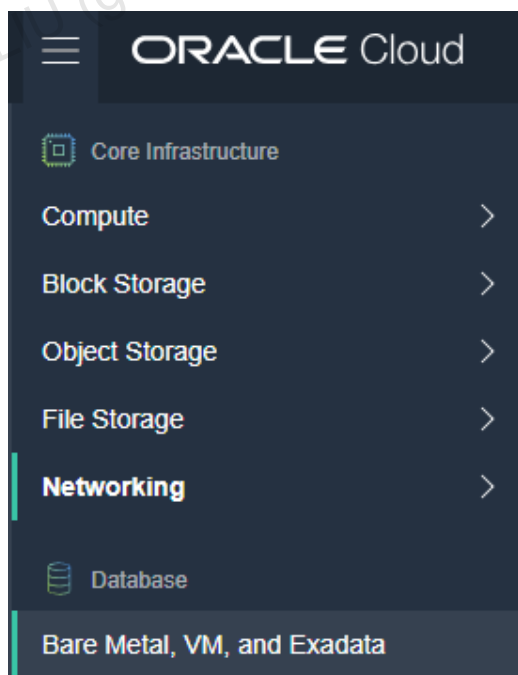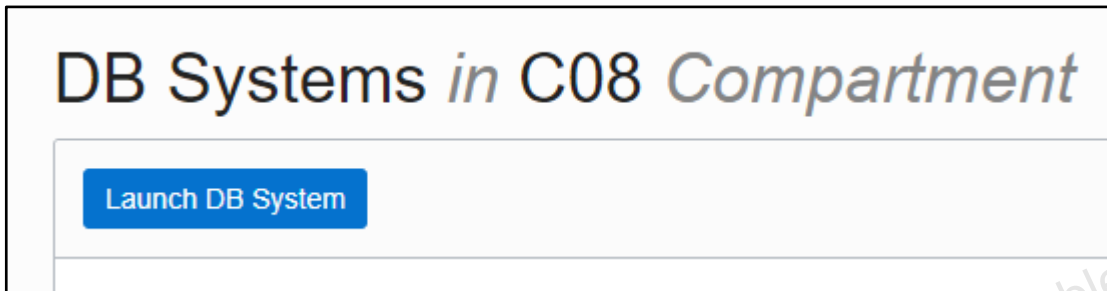
3.   Choose your Compartment in the left side pane.

COMPARTMENT

C08 ⌄

ocuocictrng16 (root)/C08

4.   Click **Launch DB System**.

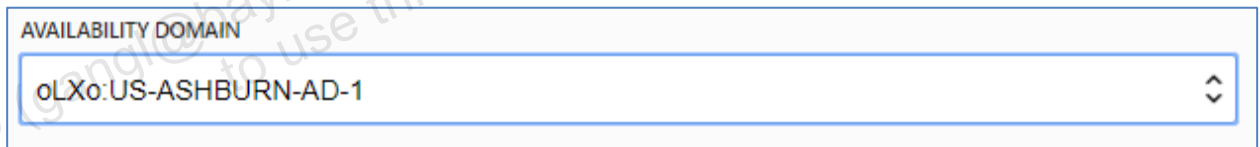DB Systems *in* C08 *Compartment*

Launch DB System

5.   Select your respective compartment and click **Launch DB System** to launch the wizard. Fill in the DB System information required to launch a DB System as listed below:

a.   DISPLAY NAME: **<student_initials>DBVM**

(Throughout the practice, the DB System will be referred to as **MYDBVM**. Remember to substitute your initials in place of **MY** in **MY**DBVM.)

b.   AVAILABILITY DOMAIN: Choose one of the available Availability Domain. (In this practice, the below domain has been selected.)

AVAILABILITY DOMAIN

oLXo:US-ASHBURN-AD-1 ⌄

c.   SHAPE TYPE: **VIRTUAL MACHINE**

d.   SHAPE: **VM.Standard 2.2**

e.   TOTAL NODE COUNT: **2**

f.   ORACLE DATABASE SOFTWARE EDITION: **Enterprise Edition Extreme Performance**

g.   AVAILABLE STORAGE SIZE (GB): **256 GB**

h.   CLUSTER NAME (optional): **<student_initials>DBCLST**

i.   LICENSE TYPE: **LICENSE INCLUDED** (Accept the default)

j.   SSH PUBLIC KEY: Select **CHOOSE SSH KEY FILES** options and browse to select the SSH public key, which was created earlier. (In this example, it is `mykey.pub`.)

k.   VIRTUAL CLOUD NETWORK: From the drop-down list, choose the Virtual Cloud Network, which was created in the previous practice. (In this example, the name of the VCN was **MYVCN**.)

l.   CLIENT SUBNET: Choose any of the available subnet from the drop-down list.

m.   HOSTNAME PREFIX: **<student_initials>HOST**

n. DATABASE NAME: **<student_initials>ORCL**

o. DATABASE VERSION: **12.2.0.1.** (Select *Display all available versions* check box, after which you can see this version in the list.)

p. PDB NAME: **<student_initials>PDB1**

q. DATABASE ADMIN PASSWORD: Enter the password to manage the SYS and SYSTEM database accounts. Ensure your password meets the required standards as specified in the wizard.

r. CONFIRM DATABASE ADMIN PASSWORD: Re-enter the password.

s. AUTOMATIC BACKUP: **Do not select this**, leave this option deselected.

t. DATABASE WORKLOAD: Choose **ON-LINE TRANSACTION PROCESSING (OLTP)**

6. Review your selection / entries and click **Launch DB System.**

7. Click the refresh page periodically until you see that your database deployment has been created.

    Note: Generally, database deployment takes around 60 to 80 minutes to complete depending on resource availability. Allow sufficient time for this to complete.

8. Once the DB system is created successfully, it is listed on the DB Systems home page with all the details. You can click the *<student_initials>***DBVM** display name to see more details.

Practices for Lesson 5: Deploying a 2 Node RAC Virtual Machine DB System on OCI

Practices for Lesson 6: Working with 2 Node RAC Virtual Machine DB System on OCI

Practices for Lesson 6: Overview

Overview

In these practices, you will connect to a 2 Node RAC Virtual Machine DB System using SSH or SQL Developer and understand how Transparent Application failover works on a 2 Node RAC Virtual Machine DB System.

Practice 6-1: Connecting to a 2 Node RAC Virtual Machine DB System Using SSH

Overview

In this practice, you will connect to the newly created 2 Node RAC DB System using SSH from your local system. As a DBA, the first task you would perform after creating a DB system is to connect to it. PuTTY SSH and Oracle SQL Developer are the most common utilities that come in handy.

To Connect Using Public IP Addresses:

You can use the node's public IP address to connect to the database if the client and database are in different VCNs, or if the database is on a VCN that has an Internet gateway. However, there are important implications to consider:

- When the client uses the public IP address, the client bypasses the SCAN listener and reaches the node listener, so server side load balancing is not available.

- When the client uses the public IP address, it cannot take advantage of the VIP failover feature. If a node becomes unavailable, new connection attempts to the node will hang until a TCP/IP timeout occurs. You can set client side sqlnet parameters to limit the TCP/IP timeout.

Assumptions

All previous practices are completed successfully.

Tasks

1. Retrieve the IP address of the **OCI VM** that gets assigned to your DB System.

    a. If you have signed out, launch the web browser and navigate to https://console.us-ashburn-1.oraclecloud.com/ or an equivalent link provided to you. Log in to your assigned Cloud account as described in the previous practice.

2. Expand the **Menu** [≡], located next to Oracle Cloud Infrastructure at the top-left corner and click **Bare Metal, VM, and Exadata** link under the **DATABASE** section.

3. At this point, you will be on the **DB Systems** page.

4. From the list of service instances, find your DB System, in this example, **MYDBVM**.
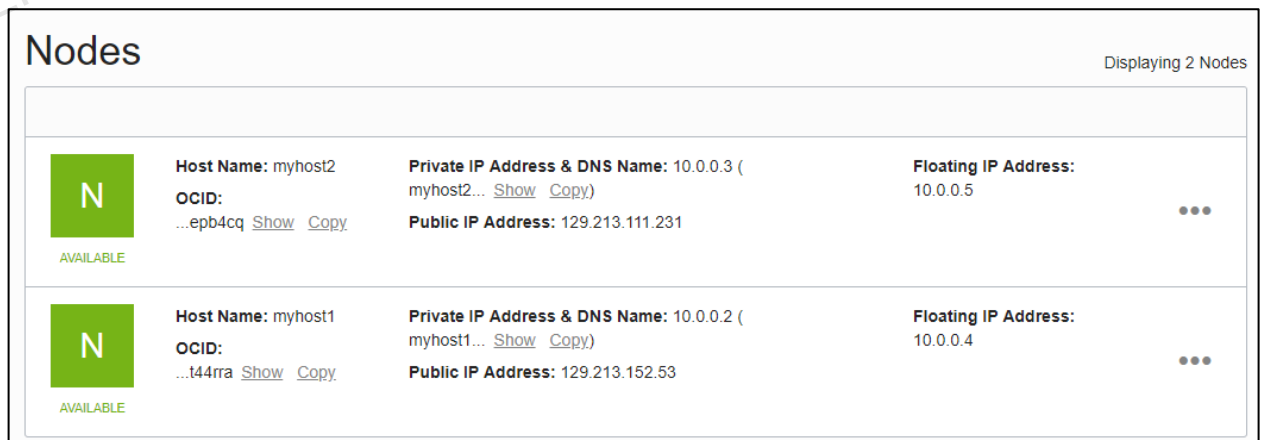
5. Click "**View DB System Details**" to view details of the system.
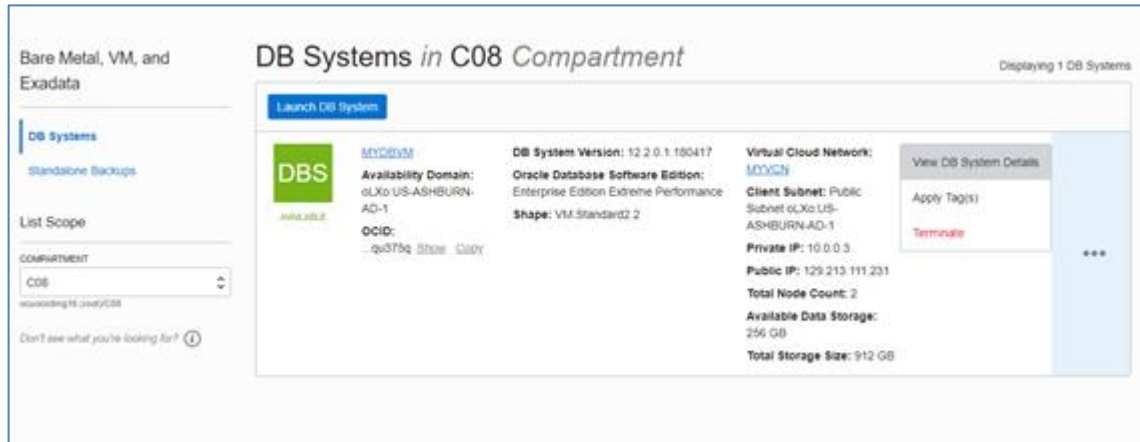
6. You will find the **SCAN** name and **SCAN IP** addresses. Make a note of the same.

7. On the bottom left side of the page, click **Nodes** to see the database nodes.

8. Make a note of the **Public IP Addresses** of each node.
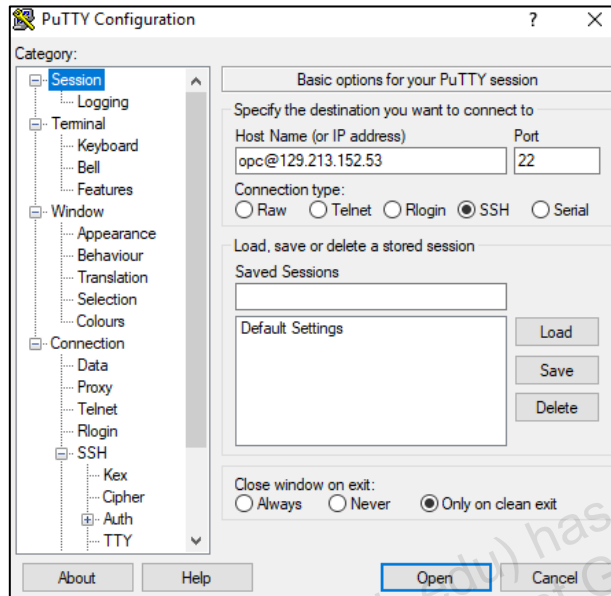   a.   (In this example: **myhost1** and **myhost2.**)


9. Open **putty.exe**.

10. **Connecting to the First Node**:

   a. In the left side Category pane, select Session and enter the following fields:

   - Host Name (or IP address): **opc@<Public IP address of First Node>**
   - Connection type: **SSH**
   - Port: **22**

   b. In the left side Category pane, expand **Connection**, expand **SSH**, and then click **Auth,** and **Browse** to select your private key. This is the **mykey.ppk** key file you had saved on your local system in the earlier practice.
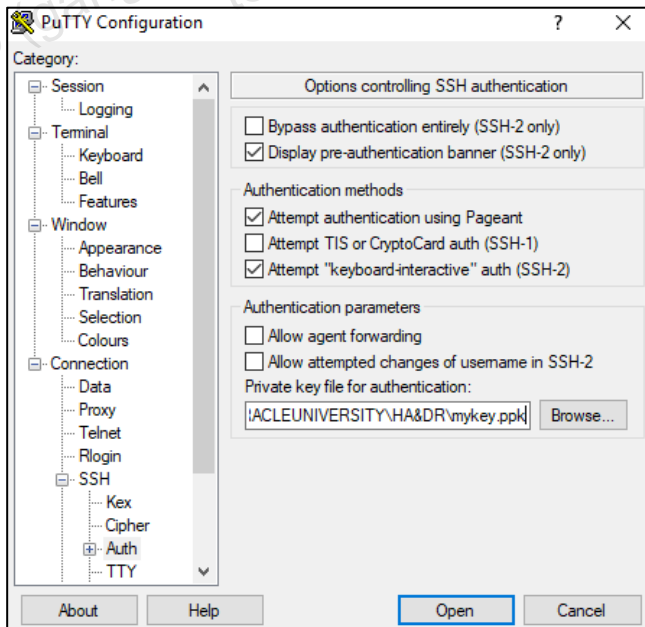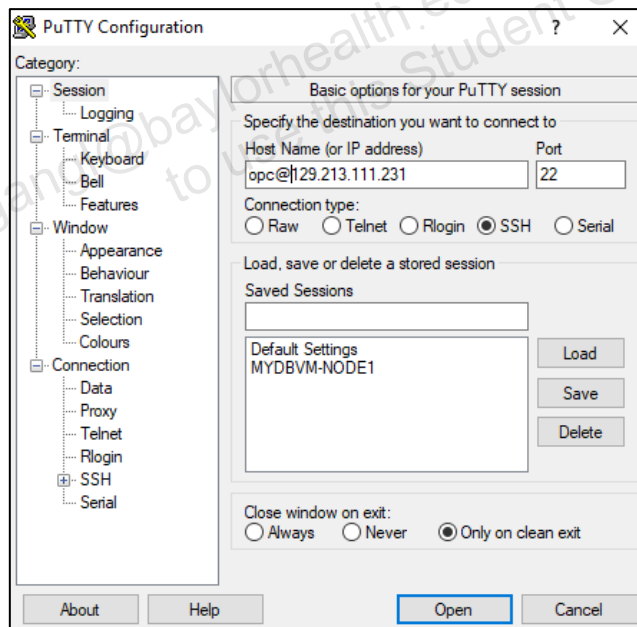
c. Return to the Session category screen, by selecting **Session** in the Category pane on the left, and save this newly created session information, which will be used through this course. Provide a meaningful name for your session and click **Save**, for example, **MYDBVM-myhost1**. This has the DB system name and the Hostname. You will use this connection whenever you want to connect to the first node of the RAC from your local Windows system.

d. Ensure you saved the session in the previous step. Click **Open** to start the session. You should get connect to the first node as the `opc` user without having to enter any password. Click **Yes** in the dialog box that appears on your first log in.

Note: If you are connected to any VPN or working on a restricted network connection, you might encounter error in connection.

11. **Connecting to the Second Node**

a. Open **putty.exe**.

b. In the Category pane on the left, select Session and enter the following fields:

- Host Name (or IP address): **opc@<Public IP address of Second Node>**

- Connection type: **SSH**

- Port: **22**

c. In the Category pane on the left, expand **Connection**, expand **SSH**, and then click **Auth**, and browse to select your private key. This is the `mykey.ppk` key file you had saved on your local system in the earlier practice.
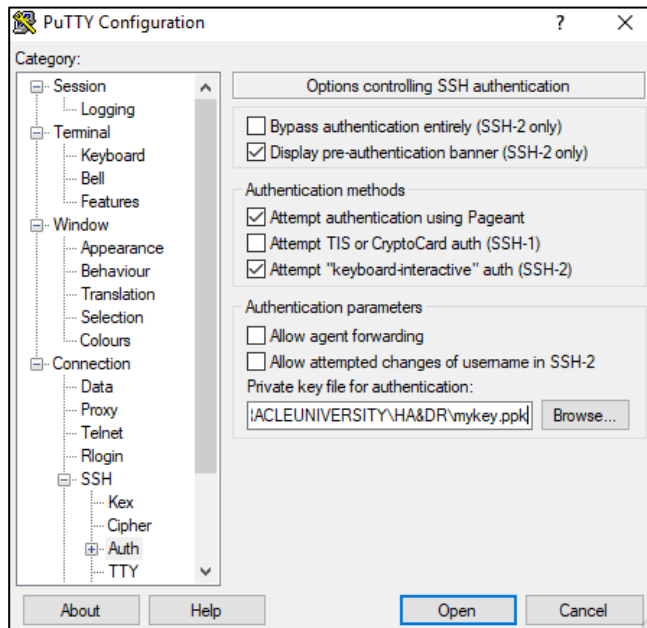
d. Return to the Session category screen, by selecting **Session** in the Category pane on the left, and save this newly created session information, which will be used through this course. Provide a meaningful name for your session and click **Save**, for example, **MYDBVM-myhost2**. This has the DB system name and the Hostname. You will use this connection whenever you want to connect to the second node of the RAC from your local Windows system.

e. Ensure you saved the session on the previous step, click **Open** to start the session, you should get connect to the second node as `opc` user without having to enter any password. Click **Yes** on the dialog box that appears on your first log in.

Note: If you are connected to any VPN or working on a restricted network connection, you might encounter error in connection.

Practice 6-2: Exploring High Availability Features

Overview

In this practice, you will explore the High Availability features of the newly created 2 Node RAC DB System.

1. Connect as the **opc** user using the instructions in the previous practice and execute the following command on **MYDBVM-myhost1**

```
[opc@myhost1 ~]$ sudo su - grid
[grid@myhost1 ~]$
```

   a. Check Clusterware status by executing the below command as **grid** user and review the output:

```
[grid@myhost1 ~]$ crsctl check crs
CRS-4638: Oracle High Availability Services is online
CRS-4537: Cluster Ready Services is online
CRS-4529: Cluster Synchronization Services is online
CRS-4533: Event Manager is online
```

   Note: This output ensures 'High Availability Services' are running.

2. Check Clusterware resources by executing the below command as **grid** user and review the output:

```
[grid@myhost1 ~]$ crsctl stat res -t
--------------------------------------------------------------
Name           Target  State          Server                   State details
--------------------------------------------------------------
Local Resources
--------------------------------------------------------------
ora.ASMNET1LSNR_ASM.lsnr
               ONLINE  ONLINE         myhost1                  STABLE
               ONLINE  ONLINE         myhost2                  STABLE
ora.DATA.COMMONSTORE.advm
               ONLINE  ONLINE         myhost1                  STABLE
               ONLINE  ONLINE         myhost2                  STABLE
ora.DATA.dg
               ONLINE  ONLINE         myhost1                  STABLE
               ONLINE  ONLINE         myhost2                  STABLE
ora.LISTENER.lsnr
               ONLINE  ONLINE         myhost1                  STABLE
               ONLINE  ONLINE         myhost2                  STABLE
ora.RECO.dg
               ONLINE  ONLINE         myhost1                  STABLE
```

```
                 ONLINE  ONLINE       myhost2                    STABLE
ora.data.commonstore.acfs
                 ONLINE  ONLINE       myhost1                    mounted on
/opt/orac

le/dcs/commonstore,S
                                                                 TABLE
                 ONLINE  ONLINE       myhost2                    mounted on
/opt/orac

le/dcs/commonstore,S
                                                                 TABLE
ora.net1.network
                 ONLINE  ONLINE       myhost1                    STABLE
                 ONLINE  ONLINE       myhost2                    STABLE
ora.ons
                 ONLINE  ONLINE       myhost1                    STABLE
                 ONLINE  ONLINE       myhost2                    STABLE
ora.proxy_advm
                 ONLINE  ONLINE       myhost1                    STABLE
                 ONLINE  ONLINE       myhost2                    STABLE
--------------------------------------------------------------
Cluster Resources
--------------------------------------------------------------
ora.LISTENER_SCAN1.lsnr
      1          ONLINE  ONLINE       myhost1                    STABLE
ora.LISTENER_SCAN2.lsnr
      1          ONLINE  ONLINE       myhost2                    STABLE
ora.LISTENER_SCAN3.lsnr
      1          ONLINE  ONLINE       myhost2                    STABLE
ora.asm
      1          ONLINE  ONLINE       myhost1                    Started,STABLE
      2          ONLINE  ONLINE       myhost2                    Started,STABLE
ora.cvu
      1          ONLINE  ONLINE       myhost2                    STABLE
ora.myhost1.vip
      1          ONLINE  ONLINE       myhost1                    STABLE
ora.myhost2.vip
      1          ONLINE  ONLINE       myhost2                    STABLE
ora.myorcl_iad1hm.db
      1          ONLINE  ONLINE       myhost1
Open,HOME=/u01/app/o

racle/product/12.2.0
                                                                 .1/dbhome_1,STABL
E
      2          ONLINE  ONLINE       myhost2
Open,HOME=/u01/app/o

racle/product/12.2.0
                                                                 .1/dbhome_1,STABL
E
```

```
ora.qosmserver
     1          OFFLINE OFFLINE                              STABLE
ora.scan1.vip
     1          ONLINE  ONLINE       myhost1                 STABLE
ora.scan2.vip
     1          ONLINE  ONLINE       myhost2                 STABLE
ora.scan3.vip
     1          ONLINE  ONLINE       myhost2                 STABLE
--------------------------------------------------------------
```

3. Check Cluster Nodes:

```
[grid@myhost1 ~]$ olsnodes -n
myhost1 1
myhost2 2
```

Note: This output displays the nodes in the 2 node RAC DB System.

4. Check SCAN Listeners

During the Oracle Grid Infrastructure installation, SCAN listeners are created for as many IP addresses as there are SCAN VIP addresses assigned to resolve to the SCAN. Oracle recommends that the SCAN resolves to three VIP addresses, to provide **high availability** and scalability. If the SCAN resolves to three addresses, then three SCAN VIPs and three SCAN listeners are created. Each SCAN listener depends on its corresponding SCAN VIP. The SCAN listeners cannot start until the SCAN VIP is available on a node.

```
[grid@myhost1 ~]$ srvctl status scan_listener
SCAN Listener LISTENER_SCAN1 is enabled
SCAN listener LISTENER_SCAN1 is running on node myhost1
SCAN Listener LISTENER_SCAN2 is enabled
SCAN listener LISTENER_SCAN2 is running on node myhost2
SCAN Listener LISTENER_SCAN3 is enabled
SCAN listener LISTENER_SCAN3 is running on node myhost2
```

5. Single Client Access Name (SCAN)

The SCAN is a domain name registered to at least one and up to three IP addresses, either in Domain Naming Service (DNS) or Grid Naming Service (GNS). When you use GNS and Dynamic Host Configuration Protocol (DHCP), Oracle Clusterware configures the Virtual IP (VIP) addresses for the SCAN name that is provided during cluster configuration. The node VIP and the three SCAN VIPs are obtained from the DHCP server when you use GNS.

If a new server joins the cluster, then Oracle Clusterware dynamically obtains the required VIP address from the DHCP server, updates the cluster resource, and makes the server accessible through GNS. The benefit of using the SCAN is that the connection information of the client does not need to change if you add or remove nodes in the cluster. Having a single name to access the cluster enables the client to use the EZConnect client and the simple JDBC thin URL to access any Database running in the cluster, independent of the active servers in the cluster. The SCAN provides load balancing and failover for client connections to the Database. The SCAN works as a cluster alias for Databases in the cluster.

```
[grid@myhost1 ~]$ srvctl config scan
SCAN name: myhost-scan.sub01161021160.myvcn.oraclevcn.com,
Network: 1
```

```
Subnet IPv4: 10.0.0.0/255.255.255.0/eth0, static
Subnet IPv6:
SCAN 1 IPv4 VIP: 10.0.0.7
SCAN VIP is enabled.
SCAN VIP is individually enabled on nodes:
SCAN VIP is individually disabled on nodes:
SCAN 2 IPv4 VIP: 10.0.0.6
SCAN VIP is enabled.
SCAN VIP is individually enabled on nodes:
SCAN VIP is individually disabled on nodes:
SCAN 3 IPv4 VIP: 10.0.0.8
SCAN VIP is enabled.
SCAN VIP is individually enabled on nodes:
SCAN VIP is individually disabled on nodes:
```

6. Database Configuration using SCAN

The SCAN is an essential part of Database configuration. So, by default,
the REMOTE_LISTENER parameter is set to the SCAN, assuming that the Database is created
using standard Oracle tools. This enables the instances to register with the SCAN Listeners as
remote listeners to provide information on what services are being provided by the instance, the
current load, and a recommendation on how many incoming connections should be directed to
the instance.

In this context, you must set the LOCAL_LISTENER parameter to the node-VIP. If you need
fully qualified domain names, then ensure that the LOCAL_LISTENER parameter is set to the
fully qualified domain name. By default, a node listener is created on each node in the cluster
during cluster configuration. With Oracle Grid Infrastructure, the node listener runs out of the
Oracle Grid Infrastructure home and listens on the node-VIP using the specified port. The
default port is 1521.

a. Execute the below commands on **MYDBVM-myhost1** to connect as '**oracle**' user.

```
[grid@myhost1 ~]$ exit
logout
[opc@myhost1 ~]$ sudo su - oracle
[oracle@myhost1 ~]$
```

b. Set database environment:

```
[oracle@myhost1 ~]$ ps -ef|grep pmon
oracle    9983     1  0 Jan16 ?        00:01:13 ora_pmon_MYORCL1
oracle   36733 31267  0 06:20 pts/0    00:00:00 grep pmon
grid     85477     1  0 Jan16 ?        00:01:06 asm_pmon_+ASM1
grid     92363     1  0 Jan16 ?        00:01:07 apx_pmon_+APX1
```

c. Connect to the Database Using SCAN Name. Also make a note of your service name from the below output as you will need it in the next step.

```
[oracle@myhost1 ~]$ cat $ORACLE_HOME/network/admin/tnsnames.ora
# tnsnames.ora Network Configuration File:
/u01/app/oracle/product/12.2.0.1/dbhome_1/network/admin/tnsnames
.ora
# Generated by Oracle configuration tools.

MYORCL_IAD1HM =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP)(HOST = myhost-
scan.sub01161021160.myvcn.oraclevcn.com)(PORT = 1521))
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME =
MYORCL_iad1hm.sub01161021160.myvcn.oraclevcn.com)
    )
  )
```

Note: The connect string used in tnsnames.ora file refers the SCAN Name. In this example, it is **myhost-scan.sub01161021160.myvcn.oraclevcn.com**.

```
[oracle@myhost1 ~]$ sqlplus system/xxxxxxxx@MYORCL_IAD1HM

SQL*Plus: Release 12.2.0.1.0 Production on Wed Jan 30 06:33:20
2019

Copyright (c) 1982, 2016, Oracle.  All rights reserved.

Last Successful login time: Mon Jan 28 2019 09:58:52 +00:00

Connected to:
```

```
Oracle Database 12c EE Extreme Perf Release 12.2.0.1.0 - 64bit
Production

SQL> select host_name from gv$instance where
instance_number=userenv('instance');

HOST_NAME
----------------------------------------------------------------
myhost1
```

Note: Now you are connected to the database using the SCAN Name. You can also query to check which node you are connected to. In this example, the connection has been established with node 1, that is, **myhost1.**

d. Check the Database parameters:

```
SQL> show parameter local_listener;

NAME                                 TYPE        VALUE
------------------------------------ ----------- ---------------
---------------
local_listener                       string
(ADDRESS=(PROTOCOL=TCP)(HOST=
10.0.0.4)(PORT=1521))
```

Note: The LOCAL_LISTENER parameter is set to the node-VIP. By default, a node listener is created on each node in the cluster during cluster configuration. With Oracle Grid Infrastructure, the node listener runs out of the Oracle Grid Infrastructure home and listens on the node-VIP using the specified port. The default port is 1521.

```
SQL> show parameter cluster;

NAME                                 TYPE        VALUE
------------------------------------ ----------- ---------------
---------------
cdb_cluster                          boolean     FALSE
cdb_cluster_name                     string      MYORCL_iad1hm
cluster_database                     boolean     TRUE
cluster_database_instances           integer     2
cluster_interconnects                string
```

Note: The parameter `cluster_database` enables a database to be started in cluster mode. In this example, this parameter is set to `TRUE`.

`CLUSTER_DATABASE_INSTANCES` is a Real Application Clusters (RAC) parameter that specifies the number of instances that are configured as part of your cluster database. In this example, it has been set to 2 as it is a 2 node RAC.

Practice 6-3: Connecting to a RAC Database Using SQL Developer

Overview

In this practice, you will connect to a 2 Node RAC DB System using Oracle SQL Developer.

Assumptions

All previous practices are completed successfully.

Tasks

1. Update the security list for the DB System to open the port 1521 for the Oracle Listener.

2. Open the navigation menu. Under **Database**, click **Bare Metal, VM, and Exadata**.

3. If not already selected, select your Compartment.

4. Locate your DB system for the list.

    a. Note your DB system's **Client Subnet** name. It will be similar to "***Public Subnet oLXo:US-ASHBURN-AD-1***" and then click the **Virtual Cloud Network** link for your DB system.

5. Locate the subnet you noted in the previous step from this list of subnets and **click** its security list link under **Security Lists**. Following is an example of what you're looking for:

6. Click **Edit All Rules** to open the list of security rules.

    a. In the **Allow Rules for Ingress** section, scroll down and click **+ Another Ingress Rule** located on the right hand side, to add a new ingress rule for listener port 1521 for enabling network connection from clients tools such as SQL*Plus and SQL Developer. Fill in the new rule as follows:

    1) SOURCE TYPE: **CIDR**

    2) SOURCE CIDR: **0.0.0.0/0**

    3) IP PROTOCOL: **TCP**

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4) SOURCE PORT RANGE: *All (Accept default)*

5) DESTINATION PORT RANGE: **1521**

Ingress Rule 4		×

Allows TCP traffic for ports: 1521

☐ STATELESS *(more information)*

SOURCE TYPE	SOURCE CIDR	IP PROTOCOL
CIDR ⇕	0.0.0.0/0	TCP ⇕
	Specified IP addresses: 0.0.0.0-255.255.255.255 (4,294,967,296 IP addresses)	*(more information)*

SOURCE PORT RANGE *(OPTIONAL)*	DESTINATION PORT RANGE *(OPTIONAL)*
All	1521
Examples: 80, 20-22 or All	Examples: 80, 20-22 or All
(more information)	*(more information)*

Review the new rule, scroll down and click **Save Security List Rules**. Back on the security list details page, you should see the new rule being listed under the **Stateful Rules** section.

Note: This task needs to be performed only once for a subnet. For all subsequent DB systems, this rule will apply if the same subnet is used.

7. Connecting to a DB System using SQL Developer.

   a. Launch SQL Developer installed on your local system and create a new connection with the following details:

   - Connection Name: **MYDBVM-Node1** (Provide a meaningful name)
   - Username: **sys**
   - Password: The Database Admin Password that was specified in the Launch DB System dialog in the Console.
   - Connection Type: **Basic** (Accept default)
   - Role: **SYSDBA**
   - Hostname: Public IP address of the DB System

DB Systems *in C08 Compartment*

Launch DB System

DBS
AVAILABLE

MYDBVM
Availability Domain:
oLXo:US-ASHBURN-AD-1

OCID:
...qu375q Show Copy

DB System Version: 12.2.0.1.180417
Oracle Database Software Edition:
Enterprise Edition Extreme Performance
Shape: VM.Standard2.2

Virtual Cloud Network:
MYVCN

Client Subnet: Public Subnet oLXo:US-ASHBURN-AD-1

Private IP: 10.0.0.3

Public IP: 129.213.111.231

Total Node Count: 2

Available Data Storage: 256 GB

Total Storage Size: 912 GB

   - Port: **1521**

- Service name: The concatenated **Database Unique Name.Host Domain Name**, for example, **MYORCL_iad1hm.sub01161021160.myvcn.oraclevcn.com**. You can find both these information in the Console by clicking the DB system display name to navigate to the DB System Details page, you will find **Database Unique Name** under the **Databases** section and **Host Domain Name** under the **DB System Information** section.

8. Click **Test** to check the connection, the status should return as success.

9. Click **Save** to save this connection for future use.

10. Click **Connect** to connect to the database.

Note: If you are connected to any VPN or working on a restricted network connection, you might encounter error in connection.

Practice 6-4: Configuring Transparent Application Failover on a 2 Node RAC

Overview

In this practice, you will configure Transparent Application Failover (TAF) feature and test highest levels of availability.

Background information

- Oracle RAC is an Oracle Database that has two or more instances accessing a shared database using cluster technology.

- A cluster is a group of machines (or nodes) that work together to perform the same task. To support this architecture, two or more machines that host the database instances are linked by a high-speed interconnect to form the cluster.

- The interconnect is a physical network used as a means of communication between each node of the cluster.

After Oracle RAC is installed, the Transparent Application Failover (TAF) feature can be configured to ensure the highest levels of availability. TAF compliments all levels of the availability hierarchy. Applications and users are automatically and transparently reconnected to another system, applications and queries continue uninterrupted, and the login context is maintained. Oracle Net Services is configured to allow the listener on each database instance of RAC to failover in case of failure.

What will you see in this practice?

This practice demonstrates a connection failover in RAC. You will perform these tasks as part of this practice:

- You connect to one of the instances in a 2 node RAC cluster, and execute a long running SELECT query.

- While the query execution is in progress, you shut down the node/instance to which the connection was made initially to simulate a node in the RAC cluster experiencing failure.

- You will observe the query pauses for a while and the connection automatically gets re-directed to the other available node till completion. This is Transparent Application Failover (TAF) feature in action.

Assumptions

All previous practices are completed successfully.

Tasks

1. Connect as the `opc` user using the instructions in the previous practice and execute "`sudo su - oracle`" command on **MYDBVM-myhost1**

    ```
    [opc@myhost1 ~]$ sudo su - oracle
    [oracle@myhost1 ~]$
    ```

    Note: In this practice, this connection will be referred to as **Primary connection**.

2. Set the database environment:

    ```
    [oracle@myhost1 ~]$ ps -ef|grep pmon
    oracle    9983     1  0 Jan16 ?        00:01:13 ora_pmon_MYORCL1
    oracle   36733 31267  0 06:20 pts/0    00:00:00 grep pmon
    grid     85477     1  0 Jan16 ?        00:01:06 asm_pmon_+ASM1
    grid     92363     1  0 Jan16 ?        00:01:07 apx_pmon_+APX1

    [oracle@myhost1 ~]$ . oraenv
    ORACLE_SID = [MYORCL1] ?
    ORACLE_HOME = [/home/oracle] ?
    /u01/app/oracle/product/12.2.0.1/dbhome_1/
    The Oracle base has been set to /u01/app/oracle
    ```

3. Configure the `tnsnames.ora` file for TAF.

4. Edit the `tnsnames.ora` file and create a database connect string to test TAF. Name the connect string `DEMO_TAF`.

5. Replace the below highlighted values as per your environment setup. The `HOST` field refers to the Virtual Host Names of each node. This can be noted from the `/etc/hosts` file as below:

    ```
    [oracle@myhost1 ~]$ cat /etc/hosts
    127.0.0.1 localhost localhost.localdomain localhost4
    localhost4.localdomain4
    ::1 localhost localhost.localdomain localhost6
    localhost6.localdomain6
    10.0.0.2 myhost1.sub01161021160.myvcn.oraclevcn.com myhost1
    192.168.16.18 myhost1-priv.sub01161021160.myvcn.oraclevcn.com
    myhost1-priv
    10.0.0.4 myhost1-vip.sub01161021160.myvcn.oraclevcn.com myhost1-
    vip
    10.0.0.3  myhost2.sub01161021160.myvcn.oraclevcn.com  myhost2
    ```

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```
192.168.16.19  myhost2-priv.sub01161021160.myvcn.oraclevcn.com
myhost2-priv
10.0.0.5   myhost2-vip.sub01161021160.myvcn.oraclevcn.com
myhost2-vip
```

Important: The TNS entry must be well formatted as show below, you will encounter error and the consecutive steps will not work as expected if the TNS entry is incorrect or is not in the below format.

Copy paste this in a text file, create your TNS entry in the below format and then add it to the file and save it, to avoid such errors.

```
[oracle@myhost1 ~]$ vi $ORACLE_HOME/network/admin/tnsnames.ora

DEMO_TAF =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP)(HOST = myhost1-
vip.sub01161021160.myvcn.oraclevcn.com)(PORT = 1521))
    (ADDRESS = (PROTOCOL = TCP)(HOST = myhost2-
vip.sub01161021160.myvcn.oraclevcn.com)(PORT = 1521))
    (LOAD_BALANCE = yes)
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME =
MYORCL_iad1hm.sub01161021160.myvcn.oraclevcn.com)
      (FAILOVER_MODE=
      (TYPE=SELECT)
      (METHOD=BASIC)
      )
    )
  )
```

Note: Service name: The concatenated **Database Unique Name.Host Domain Name**, for example, **MYORCL_iad1hm.sub01161021160.myvcn.oraclevcn.com**. You can find both these information in the Console by clicking the DB system display name to navigate to the DB System Details page, you will find this under the **Databases** section

6. Connect to the Database using the TAF connect string and verify the host name and instance name. This session will be referred to as – **Primary Connection.**

```
[oracle@myhost1 ~]$ sqlplus system/xxxxxx@DEMO_TAF

SQL*Plus: Release 12.2.0.1.0 Production on Wed Jan 30 14:38:40
2019

Copyright (c) 1982, 2016, Oracle.  All rights reserved.
```

```
Last Successful login time: Wed Jan 30 2019 11:39:53 +00:00

Connected to:
Oracle Database 12c EE Extreme Perf Release 12.2.0.1.0 - 64bit
Production

SQL> select host_name from gv$instance where
instance_number=userenv('instance');

HOST_NAME
--------------------------------------------------------------------
myhost1

SQL> select instance_name from v$instance;

INSTANCE_NAME
----------------
MYORCL1
```

Note: In this example, the connection has been established to node1, that is, `myhost1`. Make a note of the node. It is possible that you might get connect to node2 as well, which is fine, just make a note of that and move forward accordingly.

7.   Create another new connection and connect to `oracle` user to the same node `myhost1`.

   Note: In this practice, this connection will be referred to as **Secondary connection**.

```
[opc@myhost1 ~]$ sudo su - oracle
[oracle@myhost1 ~]$

[oracle@myhost1 ~]$ . oraenv
ORACLE_SID = [MYORCL1] ?
ORACLE_HOME = [/home/oracle] ?
/u01/app/oracle/product/12.2.0.1/dbhome_1/
The Oracle base has been set to /u01/app/oracle
```

8. Connect to the instance on the node – **Secondary connection**.

```
[oracle@myhost1 ~]$ sqlplus / as sysdba

SQL*Plus: Release 12.2.0.1.0 Production on Wed Jan 30 14:53:02
2019
Copyright (c) 1982, 2016, Oracle.  All rights reserved.
Connected to:
Oracle Database 12c EE Extreme Perf Release 12.2.0.1.0 - 64bit
Production

SQL> select host_name from gv$instance where
instance_number=userenv('instance');


HOST_NAME
-----------------------------------------------------------------
myhost1
```

Important: Ensure the Secondary Connection session is also connected to the same node to which you had connected in step 6. In this example it is node1 for it might be node2, which is fine. Make a note of your connections and move forward.

9. Execute a long running query using the **Primary Connection**. Proceed to the next step while this query is running.

```
SQL> select GRANTEE, OWNER, TABLE_NAME, GRANTOR from
dba_tab_privs;

GRANTEE              OWNER               TABLE_NAME
GRANTOR
-------------------- -------------------- ----------------------
-------- --------------------


SYSTEM               SYS                 ORA$BASE
SYS


PUBLIC               SYS                 DUAL
SYS


PUBLIC               SYS                 SYSTEM_PRIVILEGE_MAP
SYS


PUBLIC               SYS                 TABLE_PRIVILEGE_MAP
SYS
```

```
PUBLIC                    SYS                     USER_PRIVILEGE_MAP
SYS


PUBLIC                    SYS                     STMT_AUDIT_OPTION_MAP
SYS

.................
.................
```

10. While the query from the previous step is running, shutdown abort the same instance using the – **Secondary connection.** This is to simulate a node failure.

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


INSTANCE_NAME
----------------
MYORCL1


SQL> shutdown abort
ORACLE instance shut down.
SQL> exit
Disconnected from Oracle Database 12c EE Extreme Perf Release
12.2.0.1.0 - 64bit Production
[oracle@myhost1 ~]$
```

11. Verify Transparent Application Failover in a 2 Node RAC Virtual Machine DB System. In spite of the node failure, the query runs smoothly without any interruption and completes in the – **Primary Connection**. Below is the continuation of **Step #9** output.

```
GRANTEE              OWNER                TABLE_NAME
GRANTOR
-------------------- -------------------- ----------------------
-------- --------------------


PUBLIC                    SYS                     GLOBAL_NAME
SYS


PUBLIC               SYS
FLASHBACK_TRANSACTION_QUERY     SYS


PUBLIC                    SYS                     USER_RESUMABLE
SYS


PUBLIC                    SYS                     USER_EDITIONING_VIEWS
SYS
```

```
PUBLIC                    SYS
USER_EDITIONING_VIEWS_AE        SYS


PUBLIC                    SYS                 ALL_EDITIONING_VIEWS
SYS

...................................
...................................
```

Note: If failover is failed, **startup** the instance from **Secondary Connection** and repeat the steps #9 and #10.

12. Verify the host name and instance name at end of query execution (estimated time of query execution is around 3 to 4 minutes) using the – **Primary Connection**.

```
SQL> select host_name from gv$instance where
instance_number=userenv('instance');

HOST_NAME
--------------------------------------------------------------
myhost2


SQL> select instance_name from v$instance;


INSTANCE_NAME
----------------
MYORCL2
SQL>
SQL> exit
Disconnected from Oracle Database 12c EE Extreme Perf Release
12.2.0.1.0 - 64bit Production
[oracle@myhost1 ~]$
```

Note: The connection has automatically switched over to the active instance.

13. Shutdown and start the database using the – **Secondary connection**, where you had simulated the failure. This is to restore the RAC database back to a consistent state before proceeding to the next practice.

```
[oracle@myhost1 ~]$ srvctl stop database -d <Database Unique
Name>
[oracle@myhost1 ~]$ srvctl start database -d <Database Unique
Name>
```

```
[oracle@myhost1 ~]$ srvctl status database -d <Database Unique
Name>
```

Note: Database Unique Name: The **Database Unique Name**, for example,
MYORCL_iad1hm. You can find this information in the Console by clicking the DB system
display name to navigate to the DB System Details page, you will find this under the
Databases section.

14. Exit **Primary connection**.

```
[oracle@myhost1 ~]$ exit
logout
[opc@myhost1 ~]$ exit
```

15. Exit **Secondary connection**.

```
[oracle@myhost1 ~]$ exit
logout
[opc@myhost1 ~]$ exit
```

Practices for Lesson 7:
Revisiting Course Scenario

Practices for Lesson 7

There are no practices for this lesson.

**Practices for Lesson 8:
Introduction to Database
Disaster Recovery on OCI**

Practices for Lesson 8

There are no practices for this lesson.

Practices for Lesson 8: Introduction to Database Disaster Recovery on OCI

Practices for Lesson 9: Database Disaster Recovery Solutions on OCI

Practices for Lesson 9

There are no practices for this lesson.

Practices for Lesson 9: Database Disaster Recovery Solutions on OCI

Practices for Lesson 10: Enabling and Validating DR for a 2 Node RAC Virtual Machine DB System on OCI

Practices for Lesson 10: Overview

Overview

In this practice, you will assume the role of a Cloud Database Administrator (DBA) and perform the following tasks in order to create a 2 Node Data Guard on a Virtual Machine DB System:

- Create a 2 Node Data Guard on a Virtual Machine Database System on OCI.

- Perform Switchover, Failover and Re-instate activities on a Data Guard Association.

- Terminate a Data Guard Association on a Virtual Machine DB System

Important

- All instructions in this course, unless specified otherwise, assume that you are working on a local Windows 64-bit system, that is, Laptop or Desktop.

- You are working on an open Internet connection, that is, not connected to any VPN or working in a restricted network that blocks connection from your local system to cloud service instances.

- **At the end of each practice in this lesson, ensure your VM DB System RAC nodes are available and in a consistent state before proceeding to the next practice**.

Practice 10-1: Enabling Data Guard for a 2 Node RAC Virtual Machine DB System

Overview

In this practice, you will enable Data Guard for a 2 Node RAC Virtual Machine DB System, taking the following into consideration:

- The DB System that will host the Data Guard setup, which is the Disaster Recovery (DR) should be named as follows: ***<student_initials>*DRVM**. (Throughout the practice, the DB System will be referred to as **MYDRVM**. In order to ensure the service instance name is unique, make sure you substitute your initials in place of **MY** in **MY**DRVM)

The Console allows you to enable a Data Guard association between databases, change the role of a database in a Data Guard association using either a switchover or a failover operation, and reinstate a failed database.

When you enable Data Guard, a separate Data Guard association is created for the primary and the standby database.

Assumptions

All the previous practices are completed successfully.

Tasks: Launching a 2 Node OCI VM DB System

1. Launch the web browser and navigate to https://console.us-ashburn-1.oraclecloud.com/ or an equivalent link provided to you. Log in to your assigned Cloud account.

2. Open the navigation **Menu** ☰ in the top-left corner. Under Database, click **Bare Metal, VM, and Exadata**.
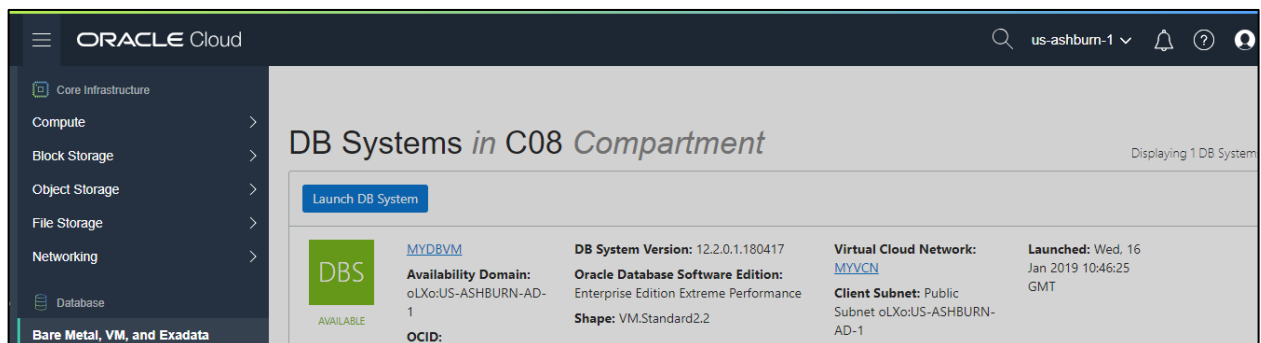
3. Choose your Compartment on the left side pane.

4. Click the name of the DB system that contains the database you want to assume the Primary role in your Data Guard setup, and then click the name of that Database.

5. Under **Resources**, click **Data Guard Associations.**

6. Click **Enable Data Guard**.

7. In the **Enable Data Guard**, fill in DB System information as listed below:

   a. DISPLAY NAME: **<student_initials>DRVM**

   (Throughout the practice, the DB System will be referred to as **MYDRVM**. Remember to substitute your initials in place of **MY** in **MYDRVM**.)

   b. AVAILABILITY DOMAIN: Choose one of the available Availability Domain

   c. VIRTUAL CLOUD NETWORK:

   (Informational) Shows the VCN in which the DB system will be launched. The VCN of the primary database and the standby database must be the same.

d. CLIENT SUBNET: The subnet to which the DB system should attach.

   Note: Do not use a subnet that overlaps with 192.168.16.16/28, which is used by the Oracle Clusterware private interconnect on the database instance. Specifying an overlapping subnet will cause the private interconnect to malfunction.

e. HOSTNAME PREFIX: **<student_initials>DRHOST**

f. HOST DOMAIN NAME: The domain name for the DB system. If the selected subnet uses the Oracle-provided Internet and VCN Resolver for DNS name resolution, this field displays the domain name for the subnet and it can't be changed.

g. HOST AND DOMAIN URL: Combines the host and domain names to display the fully qualified domain name (FQDN) for the database. The maximum length is 64 characters.

h. PROTECTION MODE: **MAXIMUM PERFORMANCE**

i. TRANSPORT TYPE: **ASYNC**

j. DATABASE ADMIN PASSWORD: Enter the password to manage the SYS and SYSTEM database accounts.

   Important: The password must be the same as the admin password for the primary database.

k. CONFIRM DATABASE ADMIN PASSWORD: Re-enter the password.

8. Click **Enable**.

9. Click the refresh page periodically until you see that your database deployment has been created. Allow sufficient time for the deployment to complete.

   Note: When the association is created, a shield icon appears next to the name of this database and its peer, and their respective roles (primary or standby) are displayed.

10. Once the DR DB system is created successfully, it is listed on the DB Systems home page with all the details. You can click the *<student_initials>***DRVM** display name to see more details.

    Note: The DR DB System creation time may range from 60 mins to 90 mins.

Practice 10-2: Connecting to the DR DB System with SSH

Overview

In this practice, you will connect to the newly created 2 Node RAC DR DB System using SSH from your local system. As a DBA, the first task you perform after creating a DR DB system is to connect to it. PuTTY SSH and Oracle SQL Developer are the most common utilities that come in handy.

To Connect Using Public IP Addresses:

You can use the node's public IP address to connect to the database if the client and database are in different VCNs, or if the database is on a VCN that has an Internet gateway. However, there are important implications to consider:

- When the client uses the public IP address, the client bypasses the SCAN listener and reaches the node listener, so server side load balancing is not available.

- When the client uses the public IP address, it cannot take advantage of the VIP failover feature. If a node becomes unavailable, new connection attempts to the node will hang until a TCP/IP timeout occurs. You can set client side sqlnet parameters to limit the TCP/IP timeout.

Assumptions

All previous practices are completed successfully.

Tasks

1. Retrieve the IP address of the OCI VM that gets assigned to your DR DB System.

   a. If you have signed out, launch the web browser and navigate to https://console.us-ashburn-1.oraclecloud.com/ or an equivalent link provided to you. Log in to your assigned Cloud account as described in the previous practice.

   b. Expand the **Menu** ☰, located next to Oracle Cloud Infrastructure at the top-left corner and click **Bare Metal, VM, and Exadata** link under the **DATABASE** section.

   c. At this point, you will be on the **DB Systems** page.

   d. From the list of service instances, find your DB System, in this example **MYDRVM**.

e. Click "**View DB System Details**" to view details of the system.

f. You will find the **SCAN** name and **SCAN IP** addresses. Make a note of the same.

g. Click **Nodes** to see the nodes of the database.

h. Make a note of the **Public IP Addresses** of each node.

i. In this example: **mydrhost1** and **mydrhost2.**

2. Open **putty.exe**.

3. **Connecting to the First Node**:

   a. In the Category pane on the left, select Session and enter the following fields:

      - Host Name (or IP address): **opc@<Public IP address of First Node>**

      - Connection type: **SSH**

      - Port: **22**
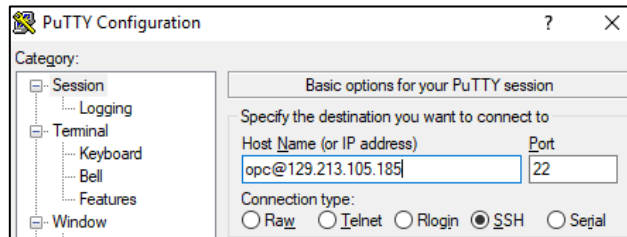
   b. In the Category pane on the left, expand **Connection**, expand **SSH**, and then click **Auth**, and browse to select your private key. This is the **mykey.ppk** key file you had saved on your local system in the earlier practice.
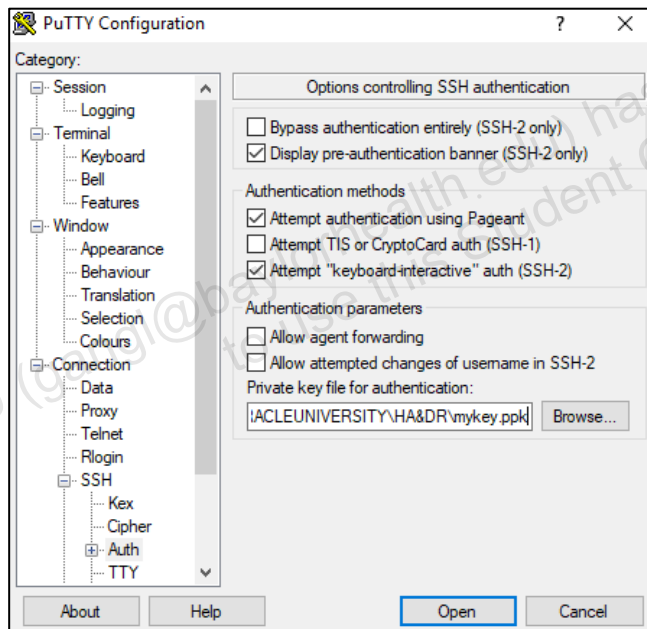
   c. Return to the Session category screen, by selecting Session on the left hand side Category pane, and save this newly created session information, which will be used through this course. Provide a meaningful name for your session and click **Save**. For example, **MYDRVM-mydrhost1**, this has the DB system name and the Hostname. You will use this connection whenever you want to connect to the first node of the RAC from your local Windows system.

   d. Ensure you saved the session in the previous step. Click **Open** to start the session. You should get connected to the first node as the `opc` user without having to enter any password. Click Yes in the dialog box that appears on your first log in.

Note: If you are connected to any VPN or working on a restricted network connection, you might encounter an error in connection.

4. **Connecting to the Second Node**:

   a. In the Category pane on the left, select Session and enter the following fields:

   - Host Name (or IP address): **opc@<Public IP address of Second Node>**
   - Connection type: **SSH**
   - Port: **22**

   b. In the Category pane on the left, expand **Connection**, expand **SSH**, and then click **Auth**, and browse to select your private key. This is the **mykey.ppk** key file you had saved on your local system in the earlier practice.
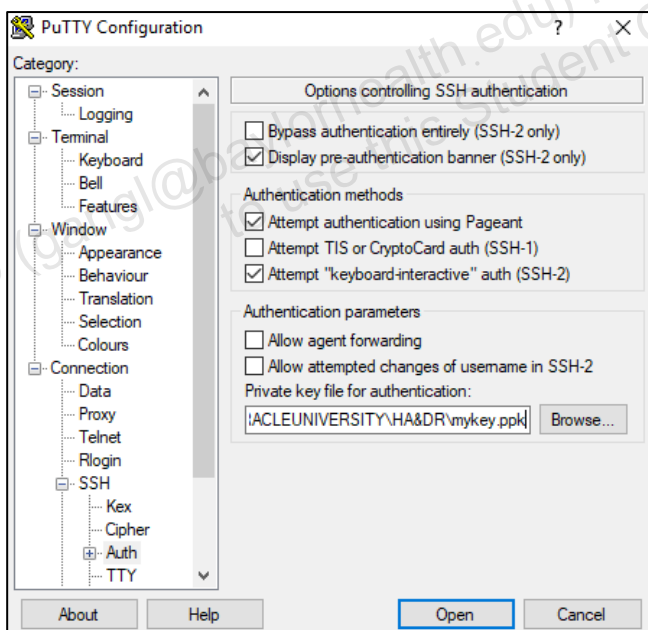
   c. Return to the Session category screen, by selecting Session in the Category pane on the left, and save this newly created session information, which will be used through this course. Provide a meaningful name for your session and click **Save**. For example, **MYDRVM-mydrhost2**, which has the DB system name and the Hostname. You will use this connection whenever you want to connect to the second node of the RAC from your local Windows system.

d. Ensure you saved the session in the previous step. Click **Open** to start the session. You should get connected to the second node as the `opc` user without having to enter any password. Click Yes in the dialog box that appears on your first log in.

Note: If you are connected to any VPN or working on a restricted network connection, you might encounter error in connection.

5. Check the Data Guard Broker Configuration on M**YDRVM-mydrhost1.**

```
[oracle@mydrhost1 ~]$ ps -ef | grep pmon
oracle   10241  9162  0 10:49 pts/0    00:00:00 grep pmon
oracle   55960     1  0 10:36 ?        00:00:00 ora_pmon_MYORCL1
grid     81488     1  0 10:18 ?        00:00:00 asm_pmon_+ASM1
grid     89966     1  0 10:19 ?        00:00:00 apx_pmon_+APX1
[oracle@mydrhost1 dbhome_1]$ . oraenv
ORACLE_SID = [oracle] ? MYORCL1
ORACLE_HOME = [/home/oracle] ?
/u01/app/oracle/product/12.2.0.1/dbhome_1/
The Oracle base has been set to /u01/app/oracle
[oracle@mydrhost1 dbhome_1]$
[oracle@mydrhost1 dbhome_1]$ dgmgrl
DGMGRL for Linux: Release 12.2.0.1.0 - Production on Tue Mar 5
10:51:39 2019


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rights reserved.


Welcome to DGMGRL, type "help" for information.
DGMGRL> connect
Username: sysdg
Password: ********
Connected to "MYORCL_iad17p"
Connected as SYSDG.
DGMGRL> show configuration


Configuration - MYORCL_iad1hm_MYORCL_iad17p


  Protection Mode: MaxPerformance
  Members:
  MYORCL_iad1hm - Primary database
    MYORCL_iad17p - Physical standby database


Fast-Start Failover: DISABLED
```

```
Configuration Status:
SUCCESS   (status updated 41 seconds ago)
DGMGRL>
DGMGRL> exit
[oracle@mydrhost1 ~]$ exit
logout
[opc@mydrhost1 ~]$ exit
```

Practice 10-3: Performing a Database Switchover

Overview

In this practice, you will initiate a switchover operation by using the Data Guard association of the primary database.
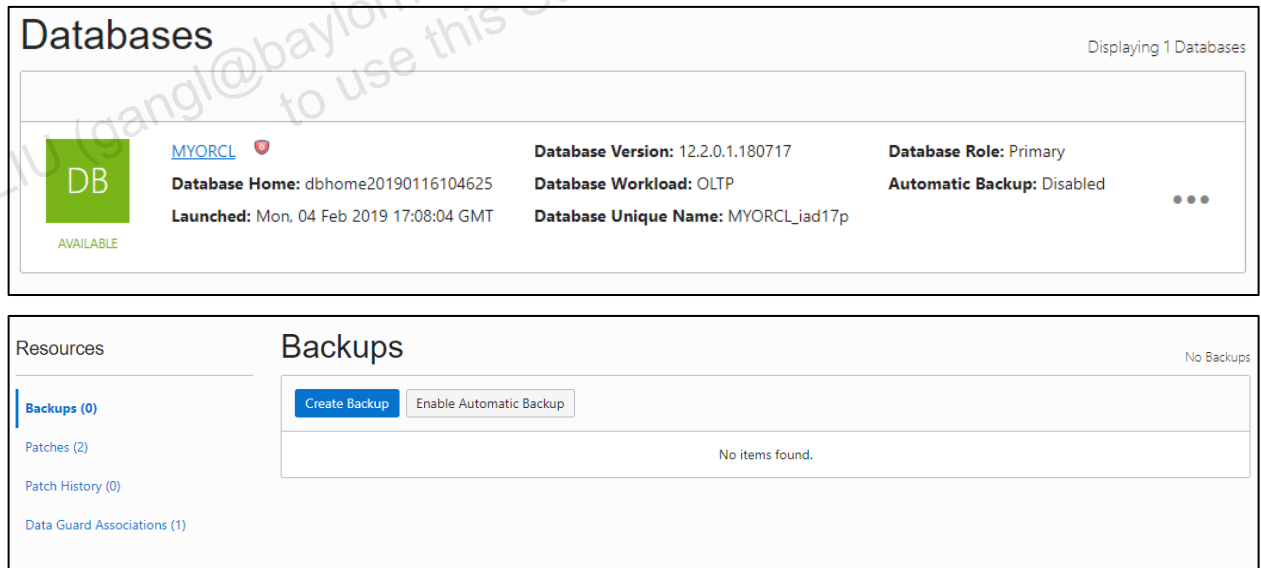
Assumptions

All previous practices are completed successfully.

Background information

You can switch a database from the primary role to the standby role, as well as from standby to primary. This is known as a database switchover, because the standby database that you specify becomes the primary database, and the original primary database becomes a standby database, with no loss of data.

This is generally a planned activity such as schedule maintenance in the Primary site or a Data Guard verification drill, which requires database switchover operation to be performed. The assumption is that, this is done for a small period of time after which the system is restored to its original state.

Tasks

1. Expand the Menu ☰ , located next to Oracle Cloud Infrastructure at the top-left corner and click **Bare Metal, VM, and Exadata** link under the **DATABASE** section.

2. Choose the **Compartment** that contains the DB system with the primary database you want to switch over.

3. Click the DB system name, and then click the name of the primary database.

Databases

DB AVAILABLE	MYORCL 🛡 **Database Home:** dbhome20190116104625 **Launched:** Wed, 16 Jan 2019 10:46:25 GMT	**Database Version:** 12.2.0.1.180417 **Database Workload:** OLTP **Database Unique Name:** MYORCL_iad1hm

4. Under **Resources**, click **Data Guard Associations**.

5. For the Data Guard association on which you want to perform a switchover, click the Actions icon (three dots), and then click **Switchover**.

6. In the **Switchover Database** dialog box, enter the database admin password, and then click **OK**.

This database should now assume the role of the standby, and the standby should assume the role of the primary in the Data Guard association. Provide sufficient time for the switchover operation to complete.

Data Guard Associations

Enable Data Guard

DB

UPDATING...

Peer Database: MYORCL
Peer Role: Standby
Peer DB System: MYDRVM

Launched: Mon, 04 Feb 2019 17:05:59 GMT
Protection Mode: Maximum Performance
Availability Domain: oLXo:US-ASHBURN-AD-1

Data Guard Associations

Displaying 1 Data Guard Association

Enable Data Guard

DB

AVAILABLE

Primary Database: MYORCL
Peer Role: Primary
Peer DB System: MYDRVM

Launched: Mon, 04 Feb 2019 17:05:59 GMT
Protection Mode: Maximum Performance
Availability Domain: oLXo:US-ASHBURN-AD-1

Apply Lag: 2 seconds
Apply Rate: 83.00 KByte/s
Transport Type: Async

...

Note: The Primary Role now points to the Peer DB System 'MYDRVM'

7. Check the database role on M**YDRVM-mydrhost1**:

```
[opc@mydrhost1 ~]$ sudo su - oracle
[oracle@mydrhost1 ~]$ ps -ef|grep pmon
grid      1214      1  0 Feb04 ?        00:00:20 apx_pmon_+APX1
oracle   54218  53810  0 05:22 pts/0    00:00:00 grep pmon
oracle   83307      1  0 Feb04 ?        00:00:19 ora_pmon_MYORCL1
grid     91847      1  0 Feb04 ?        00:00:46 asm_pmon_+ASM1
[oracle@mydrhost1 ~]$ . oraenv
ORACLE_SID = [oracle] ? MYORCL1
ORACLE_HOME = [/home/oracle] ?
/u01/app/oracle/product/12.2.0.1/dbhome_1/
The Oracle base has been set to /u01/app/oracle
[oracle@mydrhost1 ~]$ sqlplus / as sysdba
```

```
SQL*Plus: Release 12.2.0.1.0 Production on Wed Feb 6 05:22:34
2019


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Connected to:
Oracle Database 12c EE Extreme Perf Release 12.2.0.1.0 - 64bit
Production
SQL> col DATABASE_ROLE for a15
SQL> set line 150


SQL> SELECT DATABASE_ROLE, DB_UNIQUE_NAME INSTANCE, OPEN_MODE,
PROTECTION_MODE, PROTECTION_LEVEL, SWITCHOVER_STATUS FROM
GV$DATABASE;


DATABASE_ROLE    INSTANCE                          OPEN_MODE
PROTECTION_MODE      PROTECTION_LEVEL    SWITCHOVER_STATUS
--------------- -------------------------------- ---------------
---- -------------------- -------------------- -----------------
---
PRIMARY          MYORCL_iad17p                     READ WRITE
MAXIMUM PERFORMANCE  MAXIMUM PERFORMANCE  TO STANDBY
PRIMARY          MYORCL_iad17p                     READ WRITE
MAXIMUM PERFORMANCE  MAXIMUM PERFORMANCE  TO STANDBY


SQL> exit
[oracle@mydrhost1 ~]$
```

Note: The database role has changed to '**PRIMARY**' and the protection level has been set
to '**MAXIMUM PERFORMANCE**.'

8. Check the Data Guard Broker Configuration on M**YDRVM-mydrhost1.**


```
[oracle@mydrhost1 ~]$ dgmgrl
DGMGRL for Linux: Release 12.2.0.1.0 - Production on Tue Mar 5
11:05:01 2019


Copyright (c) 1982, 2017, Oracle and/or its affiliates.  All
rights reserved.


Welcome to DGMGRL, type "help" for information.
DGMGRL> connect
Username: sysdg
```

```
Password: *********
Connected to "MYORCL_iad17p"
Connected as SYSDG.
DGMGRL> show configuration


Configuration - MYORCL_iad1hm_MYORCL_iad17p

  Protection Mode: MaxPerformance
  Members:
  MYORCL_iad17p - Primary database
    MYORCL_iad1hm - Physical standby database


Fast-Start Failover: DISABLED


Configuration Status:
SUCCESS    (status updated 46 seconds ago)


DGMGRL> exit
[oracle@mydrhost1 ~]$ exit
logout
[opc@mydrhost1 ~]$ exit
```

Important: Ensure your VM DB System RAC nodes are available and in a consistent state before proceeding to the next practice.

Practice 10-4: Performing a Database Switchback

Overview

In this practice, you will initiate a switchback operation by using the Data Guard association of the present primary database.

Assumptions

All previous practices are completed successfully.

Background information

Once the schedule maintenance activity is complete the databases will be reverted to their original roles.
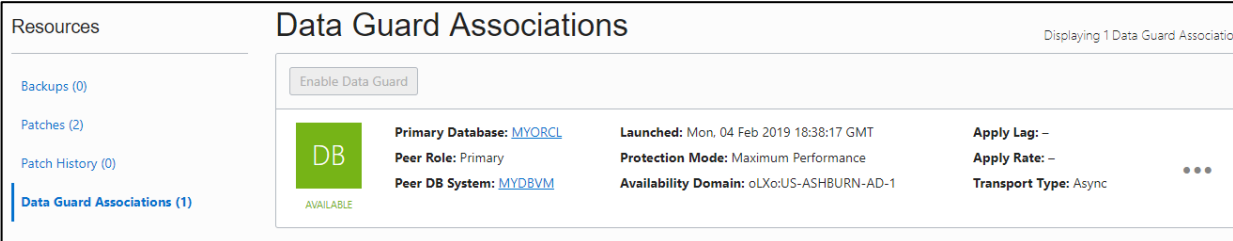
Tasks

1. Expand the Menu ☰, located next to Oracle Cloud Infrastructure at the top-left corner and click **Bare Metal, VM, and Exadata** link under the **DATABASE** section.

2. Choose the **Compartment** that contains the DB system with the primary database you want to switch over.

3. Click the DR DB system name, and then click the name of the present primary database.

Databases

Displaying 1 Databases

DB
AVAILABLE

MYORCL 🔴
Database Home: dbhome20190116104625
Launched: Mon, 04 Feb 2019 17:08:04 GMT

Database Version: 12.2.0.1.180717
Database Workload: OLTP
Database Unique Name: MYORCL_iad17p

Database Role: Primary
Automatic Backup: Disabled

•••

Resources

Backups (0)

Patches (2)

Patch History (0)

Data Guard Associations (1)

Backups

No Backups

Create Backup   Enable Automatic Backup

No items found.

4. Under **Resources**, click **Data Guard Associations**.

5. For the Data Guard association on which you want to perform a switchover, click the Actions icon (three dots), and then click **Switchover**.

6. In the **Switchover Database** dialog box, enter the database admin password, and then click **OK**.

This database should now assume the role of the standby, and the standby should assume the role of the primary in the Data Guard association.

Data Guard Associations

Displaying 1 Data Guard Association

Enable Data Guard

DB
UPDATING...

Peer Database: MYORCL
Peer Role: Standby
Peer DB System: MYDBVM

Launched: Mon, 04 Feb 2019 18:38:17 GMT
Protection Mode: Maximum Performance
Availability Domain: oLXo:US-ASHBURN-AD-1

Apply Lag: –
Apply Rate: –
Transport Type: Async

• • •

Data Guard Associations

Displaying 1 Data Guard Association

Enable Data Guard

DB
AVAILABLE

Primary Database: MYORCL
Peer Role: Primary
Peer DB System: MYDBVM

Launched: Mon, 04 Feb 2019 18:38:17 GMT
Protection Mode: Maximum Performance
Availability Domain: oLXo:US-ASHBURN-AD-1

Apply Lag: –
Apply Rate: –
Transport Type: Async

• • •

Note: The Primary Role now points to the Peer DB System 'MYDBVM'.

7. Check the database role on **MYDBVM-myhost1**:

```
[opc@myhost1 ~]$ sudo su - oracle
[oracle@myhost1 ~]$ ps -ef|grep pmon
oracle     9197     1  0 05:09 ?        00:00:00 ora_pmon_MYORCL1
oracle    56539 56434  0 05:43 pts/0    00:00:00 grep pmon
grid      85477     1  0 Jan16 ?        00:01:40 asm_pmon_+ASM1
grid      92363     1  0 Jan16 ?        00:01:42 apx_pmon_+APX1
[oracle@mydrhost1 ~]$ . oraenv
ORACLE_SID = [oracle] ? MYORCL1
ORACLE_HOME = [/home/oracle] ?
/u01/app/oracle/product/12.2.0.1/dbhome_1/
The Oracle base has been set to /u01/app/oracle
[oracle@myhost1 ~]$ sqlplus / as sysdba

SQL*Plus: Release 12.2.0.1.0 Production on Wed Feb 6 05:43:47
2019

Copyright (c) 1982, 2016, Oracle.  All rights reserved.
```

```
Connected to:
Oracle Database 12c EE Extreme Perf Release 12.2.0.1.0 - 64bit
Production


SQL> col DATABASE_ROLE for a15
SQL> set line 150
SQL> SELECT DATABASE_ROLE, DB_UNIQUE_NAME INSTANCE, OPEN_MODE,
PROTECTION_MODE, PROTECTION_LEVEL, SWITCHOVER_STATUS FROM
GV$DATABASE;


DATABASE_ROLE   INSTANCE                         OPEN_MODE
PROTECTION_MODE       PROTECTION_LEVEL    SWITCHOVER_STATUS
--------------- ---------------------------- -----------------
--- -------------------- -------------------- -------------------
--
PRIMARY         MYORCL_iad1hm                    READ WRITE
MAXIMUM PERFORMANCE   MAXIMUM PERFORMANCE  TO STANDBY
PRIMARY         MYORCL_iad1hm                    READ WRITE
MAXIMUM PERFORMANCE   MAXIMUM PERFORMANCE  TO STANDBY
SQL> exit
[oracle@myhost1 ~]$
```

Note: The database role has changed to '**PRIMARY**' and the protection level has been set
to '**MAXIMUM PERFORMANCE'.**

8. Check the Data Guard Broker Configuration on M**YDBVM-myhost1.**

```
[oracle@myhost1 ~]$ dgmgrl
DGMGRL for Linux: Release 12.2.0.1.0 - Production on Tue Mar 5
11:16:51 2019


Copyright (c) 1982, 2017, Oracle and/or its affiliates.  All
rights reserved.


Welcome to DGMGRL, type "help" for information.
DGMGRL> connect
Username: sysdg
Password: ********
Connected to "MYORCL_iad1hm"
Connected as SYSDG.
DGMGRL> show configuration


Configuration - MYORCL_iad1hm_MYORCL_iad17p
```

```
   Protection Mode: MaxPerformance
   Members:
   MYORCL_iad1hm - Primary database
     MYORCL_iad17p - Physical standby database


Fast-Start Failover: DISABLED


Configuration Status:
SUCCESS   (status updated 20 seconds ago)


DGMGRL> exit
[oracle@myhost1 ~]$ exit
logout
[opc@myhost1 ~]$ exit
```

Important: Ensure your VM DB System RAC nodes are available and in a consistent state before proceeding to the next practice.

Practice 10-5: Performing a Database Failover

Overview

In this practice, you will initiate a failover operation by using the Data Guard association of the standby database.

Assumptions
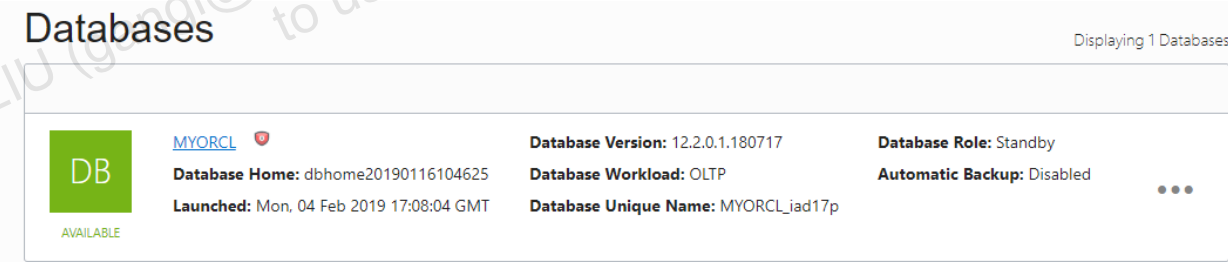
All previous practices are completed successfully.

Background information

You can convert a standby database to a primary database when the original primary database fails and there is no possibility of recovering the primary database in a timely manner. This is known as a **failover**. There may or may not be data loss depending upon whether your primary and target standby databases were synchronized at the time of the primary database failure.

Tasks

1. Expand the Menu [≡], located next to Oracle Cloud Infrastructure at the top-left corner and click **Bare Metal, VM, and Exadata** link under the **DATABASE** section.

2. Choose the **Compartment** that contains the DB system with the standby database you want to failover to.

3. Click the DR DB system name, and then click the name of the standby database.

4. Under **Resources**, click **Data Guard Associations.**

5. For the Data Guard association on which you want to perform a failover, click **Failover**.

6. In the **Failover Database** dialog box, enter the database admin password, and then click **OK**.

7. This database should now assume the role of the primary, and the old primary's role should display as **Disabled Standby**.

8. Check the Data Guard Broker Configuration on M**YDBVM-myhost1.**

```
[opc@myhost1 ~]$ sudo su – oracle
[oracle@mydrhost1 ~]$ . oraenv
ORACLE_SID = [oracle] ? MYORCL1
ORACLE_HOME = [/home/oracle] ?
/u01/app/oracle/product/12.2.0.1/dbhome_1/
The Oracle base has been set to /u01/app/oracle
[oracle@myhost1 ~]$ dgmgrl
DGMGRL for Linux: Release 12.2.0.1.0 - Production on Tue Mar 5
11:25:30 2019

Copyright (c) 1982, 2017, Oracle and/or its affiliates.  All
rights reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect
Username: sysdg
Password: **********
Connected to "MYORCL_iad1hm"
Connected as SYSDG.
DGMGRL> show configuration
ORA-16795: the standby database needs to be re-created

Configuration details cannot be determined by DGMGRL
DGMGRL> exit
[oracle@myhost1 ~]$ exit
logout
[opc@myhost1 ~]$ exit
```

9. Check the Data Guard Broker Configuration on M**YDRVM-mydrhost1.**

```
[opc@mydrhost1 ~]$ sudo su – oracle
[oracle@mydrhost1 ~]$ ps -ef|grep pmon
grid      1214     1  0 Feb04 ?        00:00:20 apx_pmon_+APX1
oracle   54218 53810  0 05:22 pts/0    00:00:00 grep pmon
oracle   83307     1  0 Feb04 ?        00:00:19 ora_pmon_MYORCL1
grid     91847     1  0 Feb04 ?        00:00:46 asm_pmon_+ASM1
[oracle@mydrhost1 ~]$ . oraenv
ORACLE_SID = [oracle] ? MYORCL1
```

Practices for Lesson 10: Enabling & Validating DR for a 2 Node RAC Virtual Machine DB System on OCI

```
ORACLE_HOME = [/home/oracle] ?
/u01/app/oracle/product/12.2.0.1/dbhome_1/
The Oracle base has been set to /u01/app/oracle
[oracle@mydrhost1 ~]$ dgmgrl
DGMGRL for Linux: Release 12.2.0.1.0 - Production on Tue Mar 5
11:27:32 2019

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rights reserved.

Welcome to DGMGRL, type "help" for information.
DGMGRL> connect
Username: sysdg
Password: ********
Connected to "MYORCL_iad17p"
Connected as SYSDG.
DGMGRL> show configuration

Configuration - MYORCL_iad1hm_MYORCL_iad17p

  Protection Mode: MaxPerformance
  Members:
  MYORCL_iad17p - Primary database
    MYORCL_iad1hm - Physical standby database (disabled)
      ORA-16661: the standby database needs to be reinstated

Fast-Start Failover: DISABLED

Configuration Status:
SUCCESS    (status updated 50 seconds ago)

DGMGRL> exit
[oracle@mydrhost1 ~]$ exit
logout
[opc@mydrhost1 ~]$ exit
```

Important: Ensure your VM DB System RAC nodes are available and in a consistent state before proceeding to the next practice.

Practice 10-6: Reinstating a Database

Overview

In this practice, you will reinstate the failed database as a functioning standby for the current primary by using its Data Guard association.

Assumptions

All previous practices are completed successfully.

Background information

After you fail over a primary database to its standby, the standby assumes the primary role and the old primary is identified as a disabled standby. After you correct the cause of failure, you can reinstate the failed database as a functioning standby for the current primary by using its Data Guard association.

Tasks

1. Before you can reinstate a version 12.2 database, you must perform some steps on the database host to stop the database or start it in MOUNT mode.

2. Connect to `oracle` user on **MYDBVM-myhost1**

    ```
    [opc@myhost1 ~]$ sudo su - oracle
    [oracle@myhost1 ~]$
    ```

3. Set your `ORACLE_UNQNAME` environment variable to the value of the Database Unique Name (as seen in the Console), and then run these commands:


    ```
    [oracle@myhost1 ~]$ export ORACLE_UNQNAME=MYORCL_iad1hm
    [oracle@myhost1 ~]$ srvctl stop database -db  MYORCL_iad1hm -
    stopoption abort
    [oracle@myhost1 ~]$ srvctl start database -db MYORCL_iad1hm -
    startoption mount
    ```

    Note: In this example, the Database Unique Name is '**MYORCL_iad1hm**'.

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4. Expand the Menu ☰, located next to Oracle Cloud Infrastructure at the top-left corner and click **Bare Metal, VM, and Exadata** link under the **DATABASE** section.

5. Choose the **Compartment** that contains the DB system with the failed database you want to reinstate.

6. Click the DR DB system name, and then click the database name.

7. Under **Resources**, click **Data Guard Associations.**

8. For the Data Guard association on which you want to reinstate this database, click the Actions icon (three dots), and then click **Reinstate**.

9. In the **Reinstate Database** dialog box, enter the database admin password, and then click **OK**.

This database should now be reinstated as the standby in the Data Guard association.

10. Check the database role on **MYDBVM-myhost1**:

```
[opc@myhost1 ~]$ sudo su - oracle
[oracle@myhost1 ~]$ ps -ef|grep pmon
oracle    21677 21528  0 06:31 pts/0    00:00:00 grep pmon
grid      85477     1  0 Jan16 ?        00:01:40 asm_pmon_+ASM1
grid      92363     1  0 Jan16 ?        00:01:42 apx_pmon_+APX1
oracle    95824     1  0 06:12 ?        00:00:00 ora_pmon_MYORCL1
[oracle@mydrhost1 ~]$ . oraenv
ORACLE_SID = [oracle] ? MYORCL1
```

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```
ORACLE_HOME = [/home/oracle] ?
/u01/app/oracle/product/12.2.0.1/dbhome_1/
The Oracle base has been set to /u01/app/oracle
[oracle@myhost1 ~]$ sqlplus / as sysdba

SQL*Plus: Release 12.2.0.1.0 Production on Wed Feb 6 06:31:33
2019

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Connected to:
Oracle Database 12c EE Extreme Perf Release 12.2.0.1.0 - 64bit
Production

SQL> col DATABASE_ROLE for a15
SQL> set line 150
SQL> SELECT DATABASE_ROLE, DB_UNIQUE_NAME INSTANCE, OPEN_MODE,
PROTECTION_MODE, PROTECTION_LEVEL, SWITCHOVER_STATUS FROM
GV$DATABASE;

DATABASE_ROLE   INSTANCE                        OPEN_MODE
PROTECTION_MODE      PROTECTION_LEVEL    SWITCHOVER_STATUS
--------------- ------------------------------- ----------------
--- ------------------ ------------------- ------------------
--
PHYSICAL STANDBY MYORCL_iad1hm                   READ ONLY WITH
APPLY MAXIMUM PERFORMANCE  MAXIMUM PERFORMANCE  NOT ALLOWED

PHYSICAL STANDBY MYORCL_iad1hm                   READ ONLY WITH
APPLY MAXIMUM PERFORMANCE  MAXIMUM PERFORMANCE  NOT ALLOWED
SQL> exit
Disconnected from Oracle Database 12c EE Extreme Perf Release
12.2.0.1.0 - 64bit Production
[oracle@myhost1 ~]$
```

Note: The database has been reinstated as a '**PHYSICAL STANDBY**'.

11. Check the Data Guard Broker Configuration on M**YDBVM-myhost1.**

```
[opc@myhost1 ~]$ sudo su – oracle
[oracle@mydrhost1 ~]$ . oraenv
ORACLE_SID = [oracle] ? MYORCL1
ORACLE_HOME = [/home/oracle] ?
/u01/app/oracle/product/12.2.0.1/dbhome_1/
```

```
The Oracle base has been set to /u01/app/oracle
[oracle@myhost1 ~]$ dgmgrl
DGMGRL for Linux: Release 12.2.0.1.0 - Production on Tue Mar 5
11:41:08 2019


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rights reserved.


Welcome to DGMGRL, type "help" for information.
DGMGRL> connect
Username: sysdg
Password: ********
Connected to "MYORCL_iad1hm"
Connected as SYSDG.
DGMGRL> show configuration


Configuration - MYORCL_iad1hm_MYORCL_iad17p


  Protection Mode: MaxPerformance
  Members:
  MYORCL_iad17p - Primary database
    MYORCL_iad1hm - Physical standby database


Fast-Start Failover: DISABLED


Configuration Status:
SUCCESS    (status updated 40 seconds ago)


DGMGRL> exit
[oracle@myhost1 ~]$ exit
logout
[opc@myhost1 ~]$ exit
```

Important: Ensure your VM DB System RAC nodes are available and in a consistent state
before proceeding to the next practice.

Practice 10-7: Performing a Database Switchback

Overview

In this practice, you will initiate a switchback operation by using the Data Guard association of the present primary database.

Assumptions

All previous practices are completed successfully.

Background information

In this practice we will be reverting to the original Data Guard setup.

Tasks

1. Expand the Menu ☰, located next to Oracle Cloud Infrastructure at the top-left corner and click **Bare Metal, VM, and Exadata** link under the **DATABASE** section.

2. Choose the **Compartment** that contains the DB system with the primary database you want to switch over.

3. Click the DR DB system name, and then click the name of the present primary database.

4. Under **Resources**, click **Data Guard Associations**.

5. For the Data Guard association on which you want to perform a switchover, click the Actions icon (three dots), and then click **Switchover**.

6. In the **Switchover Database** dialog box, enter the database admin password, and then click **OK**.

This database should now assume the role of the standby, and the standby should assume the role of the primary in the Data Guard association.

Data Guard Associations

Displaying 1 Data Guard Association

Enable Data Guard

DB
UPDATING...

Peer Database: MYORCL
Peer Role: Standby
Peer DB System: MYDBVM

Launched: Mon, 04 Feb 2019 18:38:17 GMT
Protection Mode: Maximum Performance
Availability Domain: oLXo:US-ASHBURN-AD-1

Apply Lag: –
Apply Rate: –
Transport Type: Async

• • •

Data Guard Associations

Displaying 1 Data Guard Association

Enable Data Guard

DB
AVAILABLE

Primary Database: MYORCL
Peer Role: Primary
Peer DB System: MYDBVM

Launched: Mon, 04 Feb 2019 18:38:17 GMT
Protection Mode: Maximum Performance
Availability Domain: oLXo:US-ASHBURN-AD-1

Apply Lag: –
Apply Rate: –
Transport Type: Async

• • •

Note: The Primary Role now points to the Peer DB System 'MYDBVM'.

7. Check the database role on **MYDBVM-myhost1**:

```
[opc@myhost1 ~]$ sudo su - oracle
[oracle@myhost1 ~]$ ps -ef|grep pmon
oracle    9197     1  0 05:09 ?        00:00:00 ora_pmon_MYORCL1
oracle   56539 56434  0 05:43 pts/0    00:00:00 grep pmon
grid     85477     1  0 Jan16 ?        00:01:40 asm_pmon_+ASM1
grid     92363     1  0 Jan16 ?        00:01:42 apx_pmon_+APX1
[oracle@mydrhost1 ~]$ . oraenv
ORACLE_SID = [oracle] ? MYORCL1
ORACLE_HOME = [/home/oracle] ?
/u01/app/oracle/product/12.2.0.1/dbhome_1/
The Oracle base has been set to /u01/app/oracle
[oracle@myhost1 ~]$ sqlplus / as sysdba

SQL*Plus: Release 12.2.0.1.0 Production on Wed Feb 6 05:43:47
2019

Copyright (c) 1982, 2016, Oracle.  All rights reserved.


Connected to:
```

```
Oracle Database 12c EE Extreme Perf Release 12.2.0.1.0 - 64bit
Production


SQL> col DATABASE_ROLE for a15
SQL> set line 150
SQL> SELECT DATABASE_ROLE, DB_UNIQUE_NAME INSTANCE, OPEN_MODE,
PROTECTION_MODE, PROTECTION_LEVEL, SWITCHOVER_STATUS FROM
GV$DATABASE;


DATABASE_ROLE   INSTANCE                          OPEN_MODE
PROTECTION_MODE      PROTECTION_LEVEL    SWITCHOVER_STATUS
--------------- ---------------------------- -----------------
--- ------------------- ------------------- -----------------
--
PRIMARY         MYORCL_iad1hm                     READ WRITE
MAXIMUM PERFORMANCE  MAXIMUM PERFORMANCE  TO STANDBY
PRIMARY         MYORCL_iad1hm                     READ WRITE
MAXIMUM PERFORMANCE  MAXIMUM PERFORMANCE  TO STANDBY
SQL> exit
Disconnected from Oracle Database 12c EE Extreme Perf Release
12.2.0.1.0 - 64bit Production
[oracle@myhost1 ~]$
```

Note: The database role has changed to '**PRIMARY**' and the protection level has been set to '**MAXIMUM PERFORMANCE**'.

8. Check the Data Guard Broker Configuration on M**YDBVM-myhost1.**

```
[oracle@myhost1 ~]$ dgmgrl
DGMGRL for Linux: Release 12.2.0.1.0 - Production on Tue Mar 5
11:51:00 2019


Copyright (c) 1982, 2017, Oracle and/or its affiliates.  All
rights reserved.


Welcome to DGMGRL, type "help" for information.
DGMGRL> connect
Username: sysdg
Password: ********
Connected to "MYORCL_iad1hm"
Connected as SYSDG.
DGMGRL> show configuration


Configuration - MYORCL_iad1hm_MYORCL_iad17p
```

```
    Protection Mode: MaxPerformance
    Members:
    MYORCL_iad1hm - Primary database
      MYORCL_iad17p - Physical standby database


Fast-Start Failover: DISABLED


Configuration Status:
SUCCESS    (status updated 2 seconds ago)


DGMGRL> exit
[oracle@myhost1 ~]$ exit
logout
[opc@myhost1 ~]$ exit
```

Important: Ensure your VM DB System RAC nodes are available and in a consistent state before proceeding to the next practice.

Practice 10-8: Terminating Data Guard Association on a Virtual Machine DB System
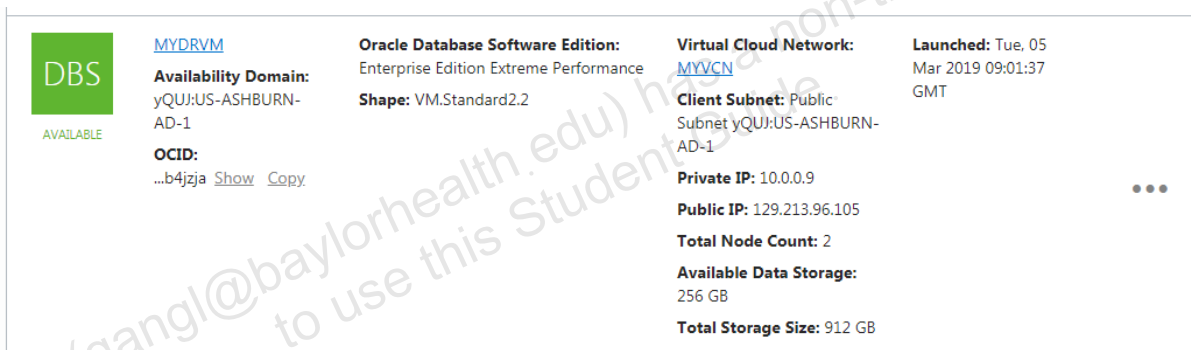
Overview

In this practice, you will remove a Data Guard association by terminating the standby DB system on a Virtual Machine DB System.

Assumptions

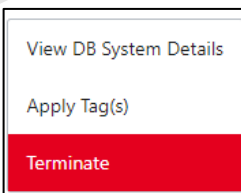All previous practices are completed successfully.

Tasks

1. Open the navigation Menu ▤. Under **Database**, click **Bare Metal, VM, and Exadata**.

2. Choose the **Compartment** that contains the **standby DB system** that you want to terminate.

3. Click the DB system name, click the Actions icon (three dots).

4. Click on **Terminate**.

5. Confirm when prompted.
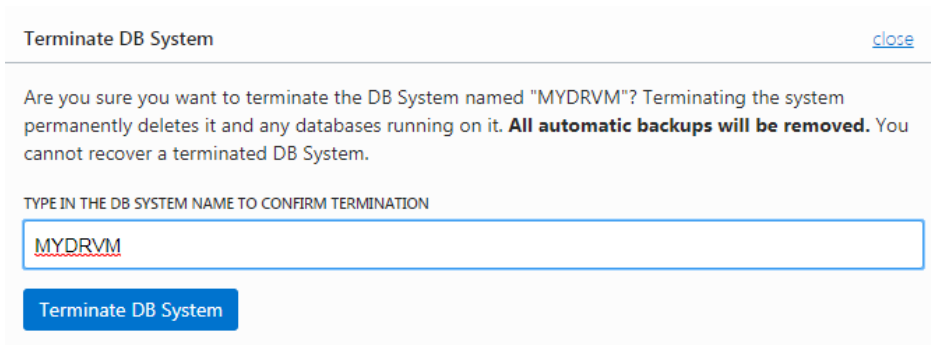
6. The DR DB system's icon indicates Terminating.

DBS
TERMINATING...

MYDRVM
Availability Domain:
yQUJ:US-ASHBURN-
AD-1

OCID:
...b4jzja Show Copy

Oracle Database Software Edition:
Enterprise Edition Extreme Performance
Shape: VM.Standard2.2

Virtual Cloud Network:
MYVCN

Client Subnet: Public
Subnet yQUJ:US-ASHBURN-
AD-1

Private IP: *Unavailable*

Public IP: *Unavailable*

Total Node Count: 2

Available Data Storage:
256 GB

Total Storage Size: 912 GB

Launched: Tue, 05
Mar 2019 09:01:37
GMT

• • •

7. The DR DB system's icon indicates Terminated.

DBS
TERMINATED

MYDRVM
Availability Domain:
yQUJ:US-ASHBURN-
AD-1

OCID:
...b4jzja Show Copy

Oracle Database Software Edition:
Enterprise Edition Extreme Performance
Shape: VM.Standard2.2

Virtual Cloud Network:
MYVCN

Client Subnet: Public
Subnet yQUJ:US-ASHBURN-
AD-1

Private IP: *Unavailable*

Public IP: *Unavailable*

Total Node Count: 2

Available Data Storage:
256 GB

Total Storage Size: 912 GB

Launched: Tue, 05
Mar 2019 09:01:37
GMT

• • •

Practice 10-9: Terminating 2 Node RAC Virtual Machine DB System
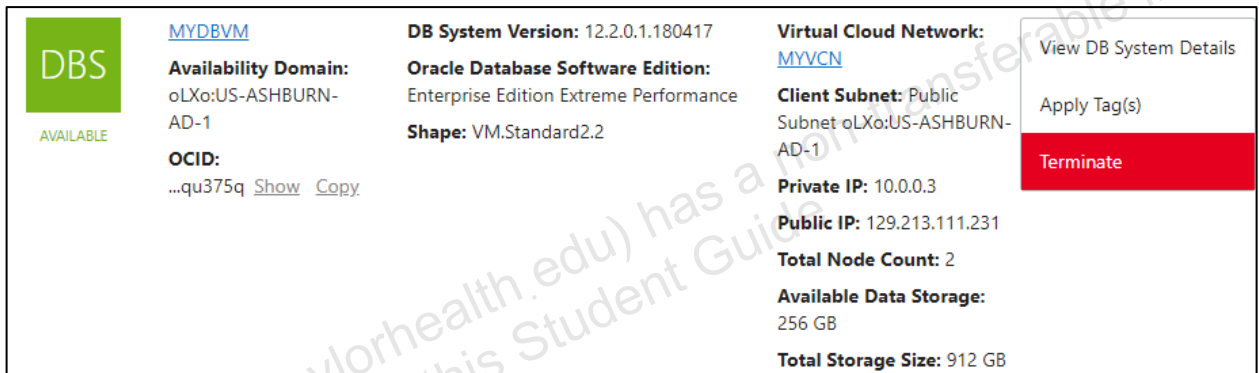
Overview

In this practice, you will remove a 2 Node RAC Virtual Machine DB System.
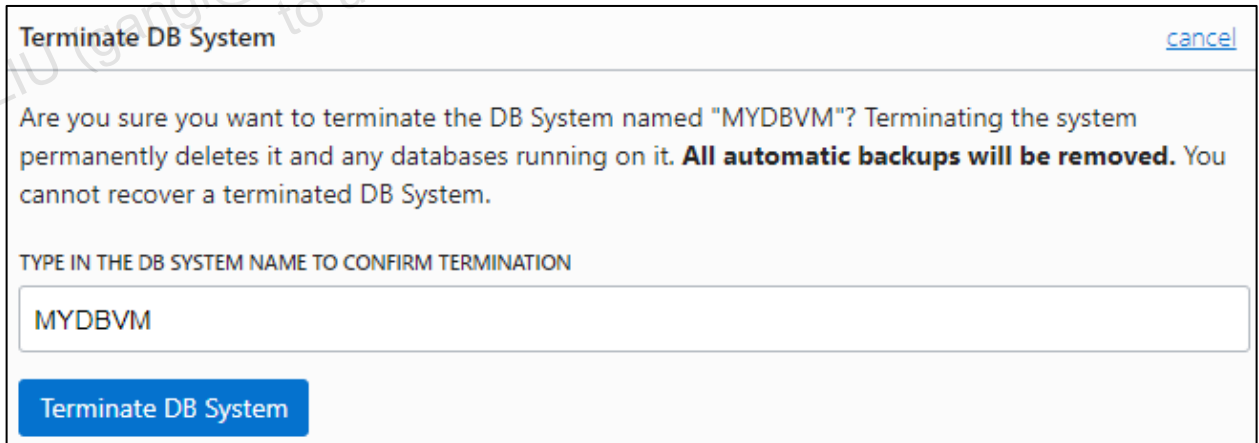
Assumptions

All previous practices are completed successfully.

Tasks

1. Open the navigation Menu ☰. Under **Database**, click **Bare Metal, VM, and Exadata**.

2. Choose the **Compartment** that contains the DB system that you want to terminate.

3. Click the DB system name, click the Actions icon (three dots), and then click **Terminate**.

DBS AVAILABLE	MYDBVM	DB System Version: 12.2.0.1.180417	Virtual Cloud Network:	View DB System Details
	Availability Domain: oLXo:US-ASHBURN-AD-1	**Oracle Database Software Edition:** Enterprise Edition Extreme Performance	MYVCN **Client Subnet:** Public Subnet oLXo:US-ASHBURN-AD-1	Apply Tag(s)
	OCID: ...qu375q Show Copy	**Shape:** VM.Standard2.2	**Private IP:** 10.0.0.3 **Public IP:** 129.213.111.231 **Total Node Count:** 2 **Available Data Storage:** 256 GB **Total Storage Size:** 912 GB	Terminate

4. Confirm when prompted.

Terminate DB System   cancel

Are you sure you want to terminate the DB System named "MYDBVM"? Terminating the system permanently deletes it and any databases running on it. **All automatic backups will be removed.** You cannot recover a terminated DB System.

TYPE IN THE DB SYSTEM NAME TO CONFIRM TERMINATION

MYDBVM

Terminate DB System

5. The DB system's icon indicates Terminated.

DBS TERMINATED	MYDBVM **Availability Domain:** oLXo:US-ASHBURN-AD-1 **OCID:** ...qu375q Show Copy	**DB System Version:** 12.2.0.1.180417 **Oracle Database Software Edition:** Enterprise Edition Extreme Performance **Shape:** VM.Standard2.2	**Virtual Cloud Network:** MYVCN **Client Subnet:** Public Subnet oLXo:US-ASHBURN-AD-1 **Private IP:** *Unavailable* **Public IP:** *Unavailable* **Total Node Count:** 2 **Available Data Storage:** 256 GB **Total Storage Size:** 912 GB	**Launched:** Wed, 16 Jan 2019 10:46:25 GMT

Practices for Lesson 10: Enabling & Validating DR for a 2 Node RAC Virtual Machine DB System on OCI

**Practices for Lesson 11:
Concluding Course Use Case
Scenario**

Practices for Lesson 11

There are no practices for this lesson.