



Integrated Cloud Applications & Platform Services

# Oracle Cloud Infrastructure Fundamentals

Activity Guide

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## **Practices for Lesson 4: Compute Service**

## Practices for Lesson 4: Compute Service - Overview

---

In this lab, you were able to quickly create a virtual network in the cloud, launch an instance, download MEAN stack on to the instance, install and configure it for running on Oracle Bare Metal Cloud platform.

Oracle has built Oracle Cloud Infrastructure (OCI) platform that can run both Oracle workloads and cloud native applications. In this hands-on lab, we will walk through getting a cloud native application stack on BMC. The purpose of this lab is to get familiar with Bare Metal Cloud primitives. At the end of this lab, you will be familiar with creating a network, launching an instance, and accessing the instance.

For this lab, we will go through installing and running MEAN (MongoDB, Express, AngularJS, and Node.js) stack that is used widely by many applications. MongoDB is a popular NoSQL document database that is used by a wide variety of applications. Express is a Node.js server-side application framework. AngularJS is the client-side web application framework, and Node.js is a JavaScript run time popular for being a web server platform.

### Prerequisites

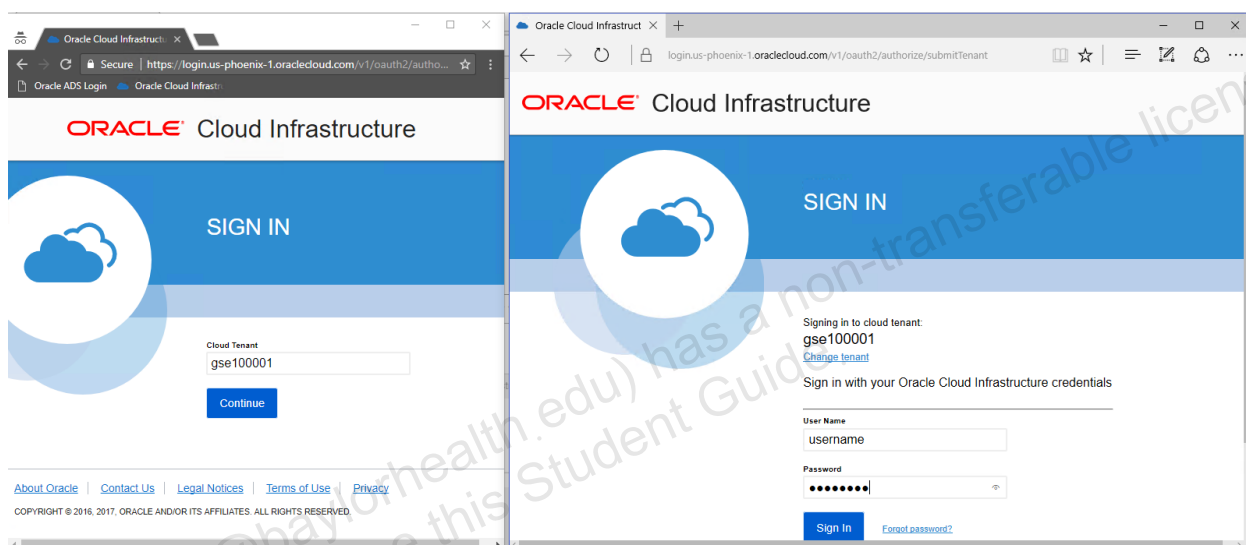
- Oracle Cloud Infrastructure account credentials (User, Password, and Tenant)
- SSH key generated and available

#### SSH key generation

If you already have a public/private key pair, you can use that for SSH. If you need to generate an SSH key, refer for additional doc here: <https://git-scm.com/book/en/v2/Git-on-the-Server-Generating-Your-SSH-Public-Key>

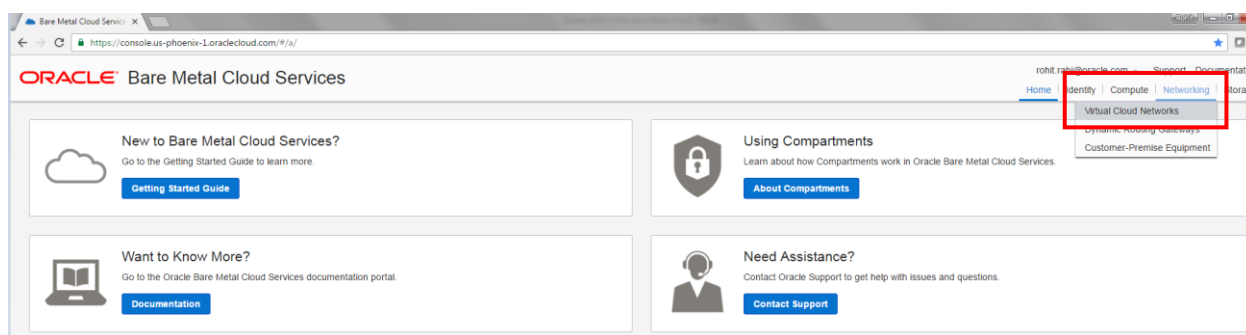
## Practices 4-1: Sign into the Console and locate your compartment

1. Obtain the user ID, password, and tenant ID to log in to Bare Metal Cloud Services.
2. Navigate to <https://console.us-phoenix-1.oraclecloud.com/>. This is the URL to access the OCI console.
3. Enter your credentials to sign in:
  - a. User: <>
  - b. Password: <>
  - c. Tenant: <>



Reach out to your room champion if you have any questions on account access.

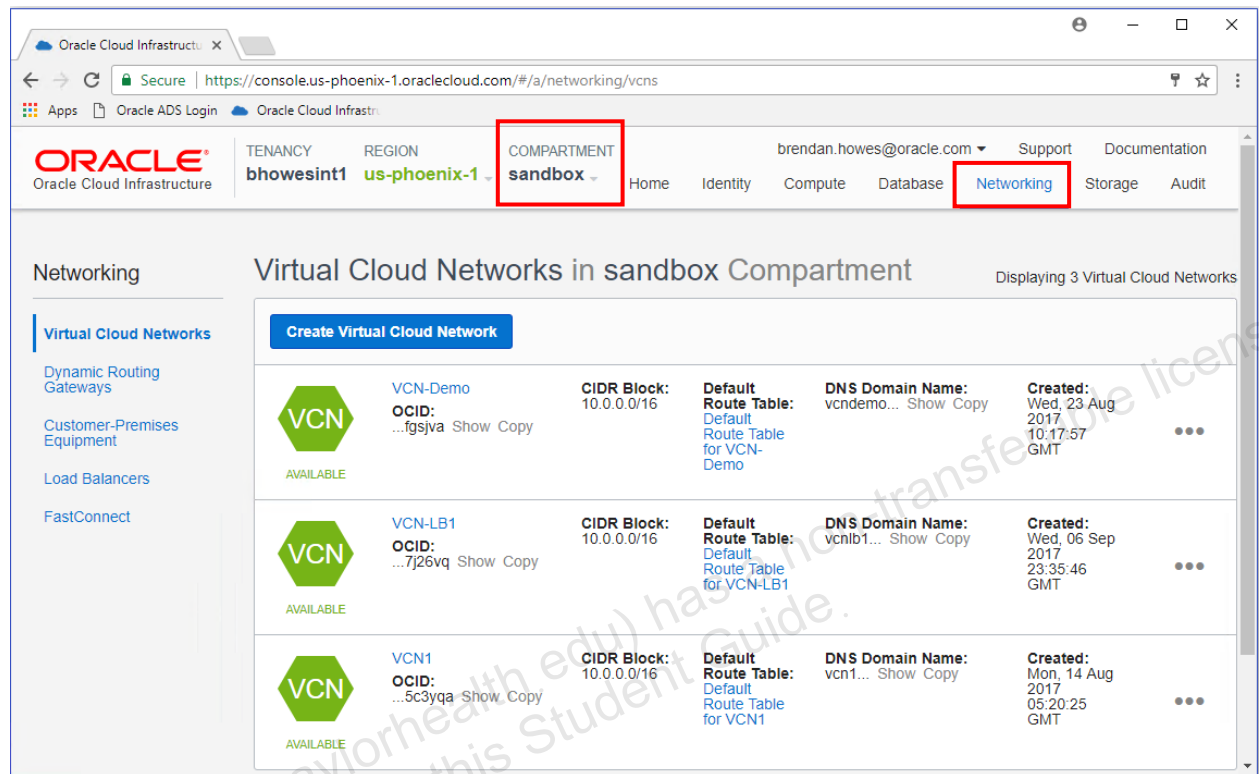
4. After you log in to the OCI console, navigate to the networking tab and select Virtual Cloud Networks.



**STOP and make sure you locate your compartment names.**

**E.g. for a user with a username such as demo.user48, the correct compartment name is c48, and so on. If you don't select the correct compartment, none of the steps below will work. You might need to scroll down under the compartment heading on**

the left navigation menu to locate your specific compartment number. In all the steps below, you will be using your specific compartment number (and not the root compartment).



5. Generate SSH keys to be used later while launching an instance.

### MAC/LINUX

- a. Generate ssh-keys for your machine if you don't have one. As long as an `id_rsa` and `id_rsa.pub` keypair is present, they can be reused. By default these are stored in

`~/.ssh/`

```
$ ssh-keygen
```

Generating public/private rsa key pair.

Enter file in which to save the key (/Users/username/.ssh/id\_rsa):

Enter passphrase (empty for no passphrase):

Enter same passphrase again:

Your identification has been saved in /Users/username/.ssh/id\_rsa.

Your public key has been saved in /Users/username/.ssh/id\_rsa.pub.

The key fingerprint is:

SHA256:tAn6nKkcZDTXI/vXRAD/pfLzdmF5rQ2948MQgz5CWe8

The key's randomart image is:

```
+---[RSA 2048]-----+
|           |
|   . o .   |
|  o o o = o . o |
| . + o * o + + . |
|  + S o o + = |
```



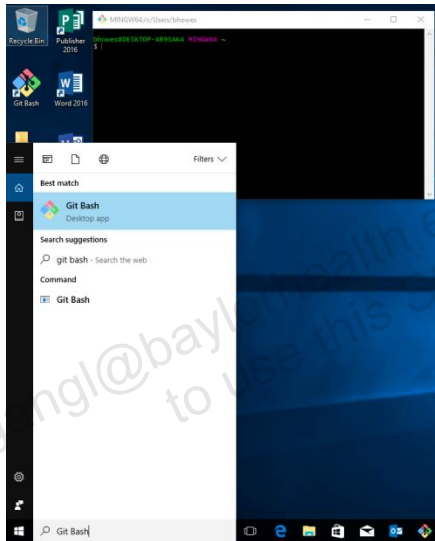
```
| o o o . + E.*+|
| . = . o B+=|
| . o . .B+|
| o . .o=|
+----[SHA256]-----+
```

- b. Make sure permissions are restricted, as sometimes ssh fails if private keys have permissive permissions.

```
$ chmod 0700 ~/.ssh
$ chmod 0600 ~/.ssh/id_rsa
$ chmod 0644 ~/.ssh/id_rsa.pub
```

#### FOR WINDOWS:

- a) Install git for windows. Download <https://github.com/git-for-windows/git/releases/download/v2.13.0.windows.1/Git-2.13.0-64-bit.exe> and install.
- b) Enter Git-bash:



- c) Generate ssh-keys by running this command in Git Bash
- ```
$ ssh-keygen
```
- Generating public/private rsa key pair  
 Enter file in which to save the key (/c/Users/username/.ssh/id\_rsa):  
 Created directory '/c/Users/username/.ssh'.  
 Enter passphrase (empty for no passphrase):  
 Enter same passphrase again:  
 Your identification has been saved in /c/Users/username/.ssh/id\_rsa.  
 Your public key has been saved in /c/Users/username/.ssh/id\_rsa.pub.

**Note:** In Git-Bash, C:\Users\username\ is shown as /c/Users/username/

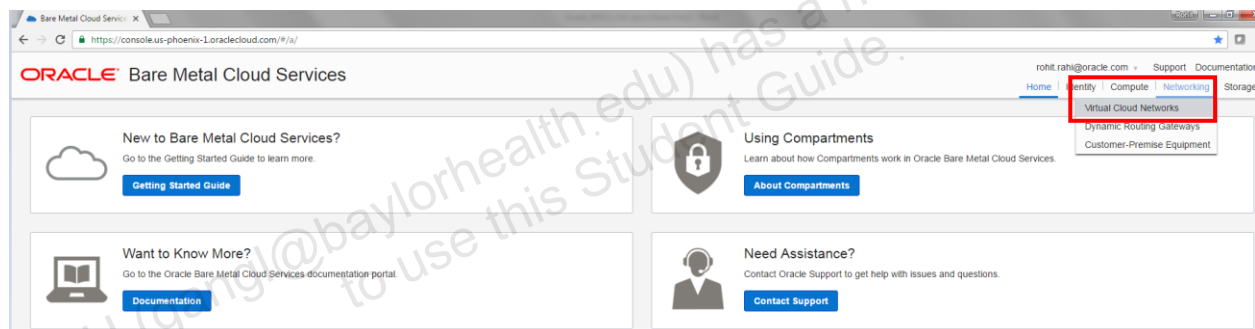
## Practices 4-2: Create a Virtual Cloud Network (VCN)

A Virtual Cloud Network (VCN) is a virtual version of a traditional network—including subnets, route tables, and gateways—on which your compute instances run. Customers can bring their network topology to the cloud with VCN. Creating a VCN involves a few key aspects such as:

- Allocate a private IP block for the cloud (CIDR range for the VCN). Customers can bring their own RFC1918 IP addresses.
- Create Subnets by partitioning the CIDR range into smaller networks (sub networks for front end, back end, database).
- Create an optional Internet Gateway to connect VCN subnet with Internet. Instances created in this subnet will have a public IP address.
- Create Route table with route rules for Internet access.

Create Security Group to allow relevant ports for ingress and egress access

Step 1: After you log in, navigate to the networking tab and click Virtual Cloud Networks.



Step 2: Create a Cloud Network by specifying a name for your VCN and selecting the “**Create VIRTUAL CLOUD NETWORK PLUS RELATED RESOURCES**” option. This will create a VCN, Subnets, Routing Table, Security Groups and Internet Gateway using a 10.0.0.0/16 CIDR range. Scroll to the bottom of the screen and click “create Virtual Cloud Network” button.

Create Virtual Cloud Network

help cancel

CREATE IN COMPARTMENT

C01

NAME OPTIONAL

MEAN-VCN

☐ CREATE VIRTUAL CLOUD NETWORK ONLY
 ☒ CREATE VIRTUAL CLOUD NETWORK PLUS RELATED RESOURCES

Automatically sets up a Virtual Cloud Network with access to the internet. You can set up firewall rules and Security Lists to control ingress and egress traffic to your instances. All related resources will be created in the same Compartment as the VCN. These actions will occur:

Create Virtual Cloud Network

DNS RESOLUTION

☒ USE DNS HOSTNAMES IN THIS VCN
 

?

Allows assignment of DNS hostname when launching an Instance

Name: MEAN-VCN

CIDR: 10.0.0.0/16

DNS Label:

DNS Domain Name:

Create Internet Gateway

Name: Internet Gateway

Update Default Route Table

Add Route Rule: 0.0.0.0/0 - Internet Gateway

Create Subnet

Name: Public Subnet jrQv:US-ASHBURN-AD-3

Security List: Default Security List

DHCP Options: Default DHCP Options

CIDR: 10.0.2.0/24; 10.0.2.0 - 10.0.2.255 (256 IP addresses)

Route Table: Default Route Table

DNS Label: Auto-generated

Create Virtual Cloud Network

☒ View detail page after this resource is created

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Practices for Lesson 4: Compute Service

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Once the VCN is created, navigating to the list of VCNs, you can see the “MEAN-VCN”, which you just created in the previous step.

Networking > Virtual Cloud Networks > Virtual Cloud Network Details

## MEAN-VCN

**Terminate**

CIDR Block: 10.0.0.0/16  
Compartment: intoracloerohit  
Created: Wed, 08 Feb 2017 19:44:34 GMT

OCID: ...ywp2a [Show](#) [Copy](#)  
Default Route Table: [Default Route Table for MEAN-VCN](#)

**Resources**

**Subnets (3)**

- Route Tables (1)
- Internet Gateways (1)
- Dynamic Routing Gateways (0)
- Security Lists (1)
- DHCP Options (1)




**Compartment**

- intoracloerohit (root)**
- CSM
- Development

### Subnets in intoracloerohit (root) Compartment

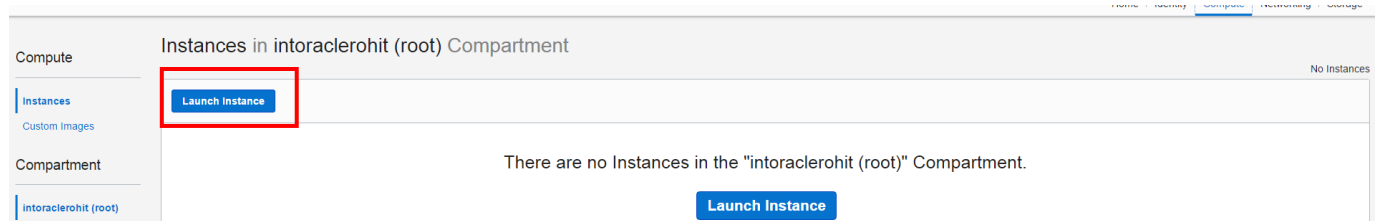
Displaying 3 Subnets

**Create Subnet**

| Icon                                                                              | Name                                                                                    | CIDR Block                                                   | Virtual Router MAC Address | Availability Domain                              | Route Table                                        | Security Lists                                    | DHCP Options     | Action |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------|----------------------------|--------------------------------------------------|----------------------------------------------------|---------------------------------------------------|------------------|--------|
|  | Public Subnet dKYS-PHX-AD-1<br>OCID: ...6Ryva <a href="#">Show</a> <a href="#">Copy</a> | 10.0.0.0/24<br>Virtual Router MAC Address: 00:00:17:AA:8E:7A | dKYS-PHX-AD-1              | <a href="#">Default Route Table for MEAN-VCN</a> | <a href="#">Default Security List for MEAN-VCN</a> | <a href="#">Default DHCP Options for MEAN-VCN</a> | <b>Terminate</b> |        |
|  | Public Subnet dKYS-PHX-AD-2<br>OCID: ...Nam3a <a href="#">Show</a> <a href="#">Copy</a> | 10.0.1.0/24<br>Virtual Router MAC Address: 00:00:17:AA:8E:7A | dKYS-PHX-AD-2              | <a href="#">Default Route Table for MEAN-VCN</a> | <a href="#">Default Security List for MEAN-VCN</a> | <a href="#">Default DHCP Options for MEAN-VCN</a> | <b>Terminate</b> |        |
|  | Public Subnet dKYS-PHX-AD-3<br>OCID: ...6956q <a href="#">Show</a> <a href="#">Copy</a> | 10.0.2.0/24<br>Virtual Router MAC Address: 00:00:17:AA:8E:7A | dKYS-PHX-AD-3              | <a href="#">Default Route Table for MEAN-VCN</a> | <a href="#">Default Security List for MEAN-VCN</a> | <a href="#">Default DHCP Options for MEAN-VCN</a> | <b>Terminate</b> |        |

## Practices 4-3: Launch a Virtual Machine (VM) Instance

Step 1: Navigate to the Compute tab and click Launch Instance. We will launch a VM instance for this lab.



Step 2: In order to launch the instance, choose an image (Oracle Linux 7.x – **Latest version**), choose a shape of the instance (VM.Standard1.1), AD to launch the instance (AD1, AD2 or AD3), the VCN network created above, subnet (in the appropriate Availability Domain) and the public SSH keys to access the instance. In this lab, we will focus on launching only a single instance VM in one AD.

If you get host out of capacity error, choose a different Availability Domain and try again. As you select a specific AD, the subnet dropdown will show you the correct subnet for the particular AD.

Launch Instance

helpcancel

Launching an Instance will take several minutes. You'll need to wait another minute for the OS to boot before you can SSH to the Instance.

Traffic on this Instance is controlled by its firewall rules in addition to the selected Subnet's Security Lists.

If the image, Virtual Cloud Network, or Subnet is in a different Compartment than the Instance, [click here](#) to enable Compartment selection for those resources.

NAME

MEAN-VM

AVAILABILITY DOMAIN

jrQv:US-ASHBURN-AD-1

IMAGE SOURCE

☒ ORACLE-PROVIDED OS IMAGE☐ CUSTOM IMAGE☐ BOOT VOLUME☐ IMAGE OCID

IMAGE OPERATING SYSTEM

Oracle Linux 7.4

SHAPE TYPE

☒ VIRTUAL MACHINE☐ BARE METAL MACHINE

SHAPE

VM.Standard1.1

Shape compatibility based on selected operating system.

IMAGE BUILD

2017.11.15-0 (latest)

Release Notes

**VIRTUAL CLOUD NETWORK**

MEAN-VM

**SUBNET**

Public Subnet jrQv:US-ASHBURN-AD-1

**PRIVATE IP ADDRESS** (Optional)

Must be within 10.0.0.2 to 10.0.0.254. Cannot be in current use.

☒ **Assign public IP address**

**HOSTNAME** (Optional)

No spaces. Only letters, numbers, and hyphens. 63 characters max.

**FULLY QUALIFIED DOMAIN NAME** (read-only)

<hostname>.sub12180928150.mppvcn.oraclevcn.com

**SSH KEYS**

☒ CHOOSE SSH KEY FILES

☐ PASTE SSH KEYS

Choose SSH Key files (.pub) from your computer:

[Browse](#)

oct fund pub

Show Advanced Options

**TAGS**

Tagging is a metadata system that allows you to organize and track resources within your tenancy. Tags are composed of keys and values which can be attached to resources.

[Learn more about tagging](#)

| TAG NAMESPACE                | TAG KEY | VALUE |
|------------------------------|---------|-------|
| None (apply a free-form tag) |         |       |

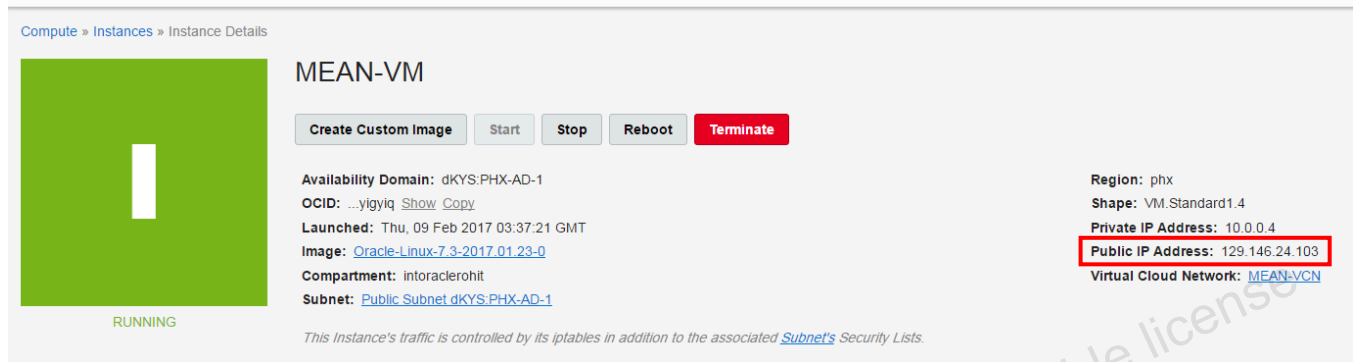
[+](#)

[Launch Instance](#) ☒ View detail page after this instance is launched

Launching an instance is simple and intuitive with few options to select. Provisioning of the compute instance will complete in less than a minute and the instance state will change from provisioning to running.

## Practices 4-4: Connect to the Instance

Step 1: Once the instance state changes to Running, you can SSH to the Public IP address of the instance. Click the MEAN-VM link and you will find the public IP address listed there.

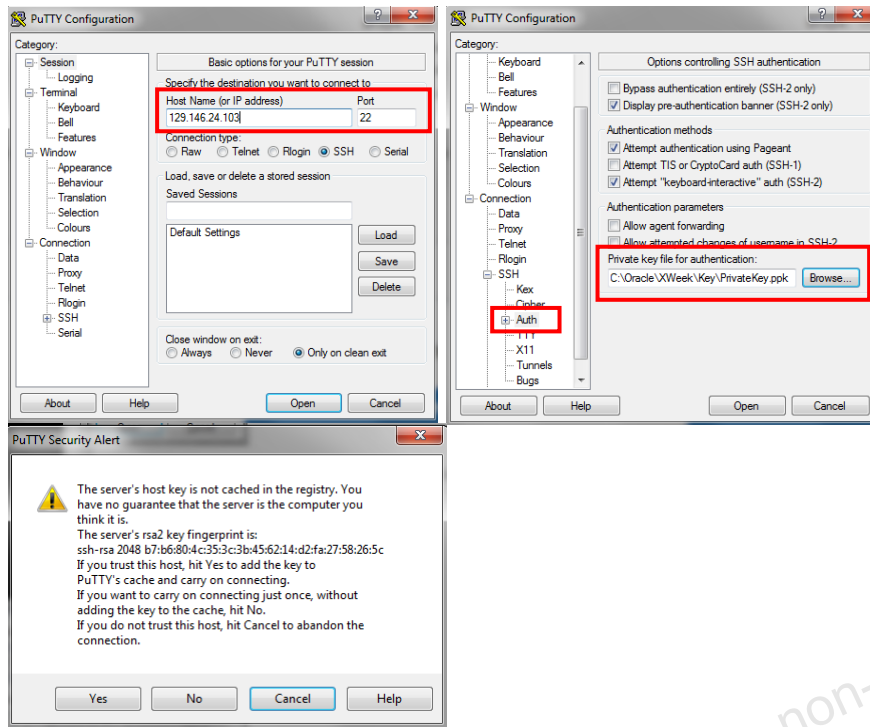


Step 2: SSH to the instance and mount the Volume as provided in the next section. You can use the following command to SSH into the OCI VM on UNIX-style system (including Linux, Solaris, BSD, and OS X).

```
$ ssh -i </path/privateKey> <PublicIP Address>
```

For Windows, use a tool like PUTTY as shown below – provide the public IP address of the OCI VM. Expand on SSH in the LHS menu and click Auth. Click Browse, and provide the Private SSH key that you had saved earlier while generating the SSH key pair. Click Yes in the PUTTY Security Alert window.





Step 3: Log in with the user name **opc** as shown below.

```
opc@MEAN-VM:~
login as: opc
Authenticating with public key "rsa-key-20161209"
[opc@MEAN-VM ~]$
```

## Practice 4-5: Create and Mount Block Volume Storage

**NOTE:** Please use the same block volume created in the Storage HOL.

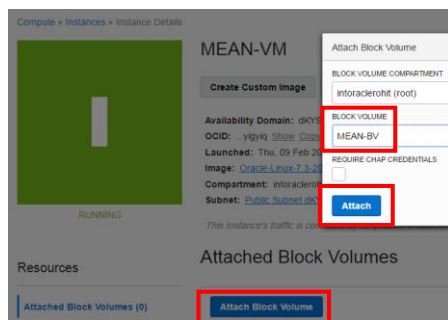
Step1: Navigate to the Storage tab on the top-right corner and click Create Block Volume.



Step 2: Click Create Block Volume that opens the window below and fill in the appropriate information as below. Make sure that your block volume is in the same AD as your instance. You can choose a 256.0 GB volume for this lab. Click Create Block Volume.

A screenshot of the 'Create Block Volume' form in the Oracle Cloud console. The form has the following fields: 'CREATE IN COMPARTMENT' (set to 'intoraclerohit (root)'), 'NAME' (set to 'MEAN-BV'), 'AVAILABILITY DOMAIN' (set to 'dKYS:PHX-AD-1'), and 'SIZE' (set to '256.0GB'). Each of these three fields is highlighted with a red box. At the bottom of the form is a blue button labeled 'Create Block Volume'.

Step 3: Once the Block Volume is created, you can attach it to the VM instance you just launched. Go to the Compute instance tab, and navigate to the VM instance and click the Attach Block Volume button. Select the block volume you created earlier from the drop down and click Attach.



**Note:** For the purpose of this lab, leave the “Require CHAP Credentials” box deselected. In customer scenarios, this provides added authentication to attach the volume with an instance.

Step 4: Once the block volume is attached, you can navigate to view the iSCSI details for the volume in order to connect to the volume. It takes a minute for the volume to complete attaching.

Click the ellipsis and then click **iSCSI Command and Information** link. Connect to the instance through SSH and **run the iSCSI commands** as provided in the iSCSI Command and Information link shown below. The first two commands are for configuring iSCSI and the last one is for logging in to iSCSI. **Do not proceed without connecting to the volume!** Run these commands one at a time.

The screenshot displays the Oracle Cloud console interface. At the top, the navigation bar includes links for Home, Identity, Compute, Database, Networking, and Storage. The main content area is titled 'MEAN-VM' and shows instance details such as Availability Domain, OCID, Launched time, Image, Compartment, and Subnet. A 'Resources' sidebar on the left lists 'Attached Block Volumes (1)'. The 'Attached Block Volumes' section shows a single volume named 'MEAN-BV' with details like Attachment Type (iscsi), Size (256.0GB), and Availability Domain. A red box highlights the 'iSCSI Commands & Information' link in the volume's actions menu. Below this, the 'iSCSI Commands & Information' panel is shown, containing the IP address and port (169.254.0.2:3260), the volume IQN (iqn.2015-12.com.oracleiaas:719a7871-3005-4b6f-8797-bbc3d7633d3f), and two sets of iSCSI commands. The first set is for configuring iSCSI to maintain a persistent connection, and the second set is for logging on to iSCSI. Both sets of commands are highlighted with red boxes.

**iSCSI Commands & Information** [close](#)

**IP ADDRESS AND PORT**

169.254.0.2:3260

[Copy](#)

**VOLUME IQN**

iqn.2015-12.com.oracleiaas:719a7871-3005-4b6f-8797-bbc3d7633d3f

[Copy](#)

Configure iSCSI to maintain a persistent connection between the Instance and this Block Volume between reboots:

```
sudo iscsiadm -m node -o new -T iqn.2015-12.com.oracleiaas:719a7871-3005-4b6f-8797-bbc3d7633d3f -p 169.254.0.2:3260
sudo iscsiadm -m node -o update -T iqn.2015-12.com.oracleiaas:719a7871-3005-4b6f-8797-bbc3d7633d3f -n node.startup -v au
```

[Copy](#)

Log on to iSCSI:

```
sudo iscsiadm -m node -T iqn.2015-12.com.oracleiaas:719a7871-3005-4b6f-8797-bbc3d7633d3f -p 169.254.0.2:3260 -l
```

[Copy](#)

Step 5: You can now format (if needed) and mount the volume. To get a list of mountable iSCSI devices on the instance, run the following command:

```
[opc@MEAN-VM ~]$ sudo fdisk -l
```

Run the following commands:

```
[opc@ MEAN-VM ~]$ sudo mkfs -t ext4 /dev/sdb  
# Press y when prompted  
[opc@ MEAN-VM ~]$ sudo mkdir /mnt/home  
[opc@ MEAN-VM ~]$ sudo mount /dev/sdb /mnt/home
```

## Practice 4-6: Download and Configure MEAN Stack

---

For this lab, we are going to use a Bitnami MEAN Stack that provides a complete development environment for MongoDB and Node.js that can be deployed in one click. It includes the latest stable release of MongoDB, Express, Angular, Node.js, Git, PHP and RockMongo.

Step1: Use the following commands to download and install the MEAN stack on Linux. The downloaded file will be named 'bitnami-mean-linux-installer.run'.

```
$ sudo yum install wget -y
$ sudo wget -O bitnami-mean-linux-installer.run
https://bitnami.com/stack/mean/download_latest/linux-x64
```

To begin the installation process, give the installer executable permissions and then execute the installation file, as shown below:

```
$ sudo chmod 755 bitnami-mean-linux-installer.run
$ ./bitnami-mean-linux-installer.run
# follow the prompts and install Python, Git, ImageMagic, RockMongo, PHP
# provide name for a root folder for MEAN (choose any name)
# provide strong password for Mongo (choose any password)
# provide yes for launching Bitnami MEAN
```

Step 2: Enable firewall to have these ports 8080 and 3000 added

```
$ sudo firewall-cmd --permanent --add-port=8080/tcp
$ sudo firewall-cmd --permanent --add-port=3000/tcp
$ sudo firewall-cmd --reload
```

Navigate to <http://<ipaddress>:8080> (the IP address of the MEAN VM) in your browser. Note that it doesn't return anything; that's because the Virtual Cloud Network needs to open certain ports for the MEAN stack to work.

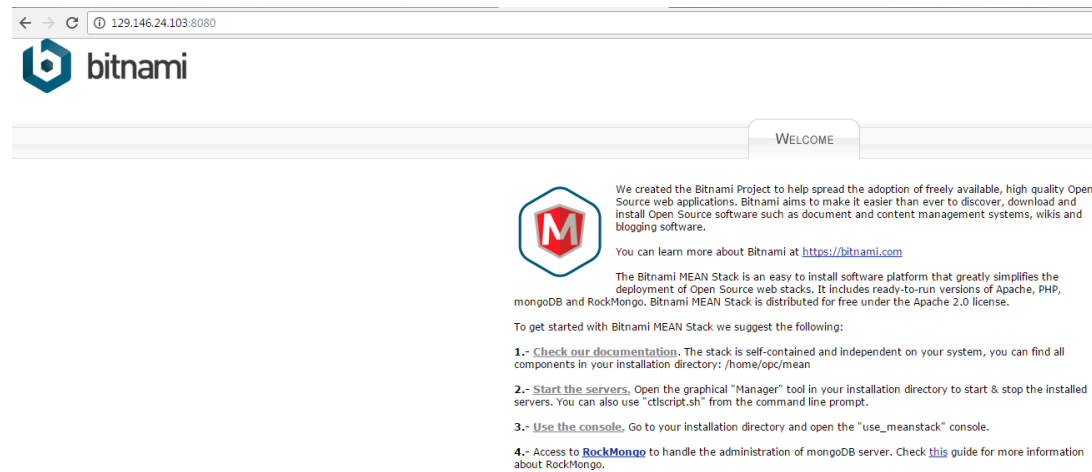
Step 3: Click Virtual Cloud Network and then the VCN you created above, named MEAN-VCN. Click on Security Lists on the left navigation bar for the VCN. Then click the Default Security List for the MEAN-VCN. Here you need to open certain ports. Click Edit all rules.

The screenshot shows the Oracle Cloud console interface. The top section displays the 'MEAN-VCN' Virtual Cloud Network details, including its CIDR block (10.0.0.0/16) and compartment (intraclerohit). Below this, the 'Subnets in intraclerohit (root) Compartment' are listed, showing two subnets: 'Public Subnet (VNIC-AD-1)' and 'Public Subnet (VNIC-AD-2)'. The 'Security Lists (1)' link is highlighted with a red box. The bottom section shows the 'Default Security List for MEAN-VCN' details, including its CIDR block (0.0.0.0/0) and compartment (intraclerohit). Below this, the 'Ingress Rules' section is shown, indicating 'No Ingress Rules' and listing 'Stateful Rules'.

Step 4: Click +Add Rule twice and add the following values as shown below under the Allow Rules for Ingress. Click Save Security List Rules at the bottom.

The screenshot shows the 'Add Rule' dialog for Ingress rules. It contains two rows of rule configuration. The first row is for a rule allowing TCP traffic for port 8080, with the 'SOURCE CIDR' field set to '0.0.0.0/0' and the 'DESTINATION PORT RANGE' field set to '8080'. The second row is for a rule allowing TCP traffic for port 3000, with the 'SOURCE CIDR' field set to '0.0.0.0/0' and the 'DESTINATION PORT RANGE' field set to '3000'. Both rows have the 'IP PROTOCOL' set to 'TCP'. Below these rows is a '+ Add Rule' button. The bottom section of the dialog is for 'Allow Rules for Egress', showing a rule allowing all traffic for all ports with the 'DESTINATION CIDR' set to '0.0.0.0/0' and the 'IP PROTOCOL' set to 'All Protocols'. A '+ Add Rule' button is also present at the bottom of the Egress section. The 'Save Security List Rules' button is highlighted with a red box at the bottom of the entire dialog.

Navigate to <http://<ipaddress>:8080> (the IP address of the MEAN VM) in your browser. Now you should see the following page:



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## **Practices for Lesson 6: Load Balancing Service**

## Practices for Lesson 6: Overview: Creating Highly Available Apps on Oracle Cloud Infrastructure

---

The Load Balancing Service provides automated traffic distribution from one entry point to multiple servers within your Virtual Cloud Network (VCN). The service offers a Public load balancer with a public IP address, provisioned bandwidth, and high availability. The Load Balancing Service provisions the public IP address across two subnets within a VCN to ensure accessibility even during an Availability Domain outage.

In this practice, you create a simple public load balancer and verify it with a basic web server application.

## Practices 6-1: SSH Keys

---

1. Generate SSH keys to be used later while launching an instance (If you already have ssh keys, please skip this step).

### MAC/LINUX

- a. Generate ssh-keys for your machine if you don't have one. As long as an id\_rsa and id\_rsa.pub keypair is present they can be reused. By default these are stored in ~/.ssh/

```
$ ssh-keygen
```

Generating public/private rsa key pair.

Enter file in which to save the key (/Users/username/.ssh/id\_rsa):

Enter passphrase (empty for no passphrase):

Enter same passphrase again:

Your identification has been saved in /Users/username/.ssh/id\_rsa.

Your public key has been saved in /Users/username/.ssh/id\_rsa.pub.

The key fingerprint is:

SHA256:tAn6nKkcZDTXI/vXRAD/pfLzdmF5rQ2948MQgz5CWe8

The key's randomart image is:

```
+---[RSA 2048]---+
```

```
|      ...  |
```

```
|    . o .  |
```

```
|  o o o = o . o |
```

```
| . + o * o + + . |
```

```
|   +   S o o + . = |
```

```
| o o o . + E . * + |
```

```
| . = . o B + = |
```

```
| . o    ..B + |
```

```
| o      .o = |
```

```
+-----[SHA256]-----+
```

- b. Make sure permissions are restricted; sometimes ssh fails if private keys have permissive permissions.

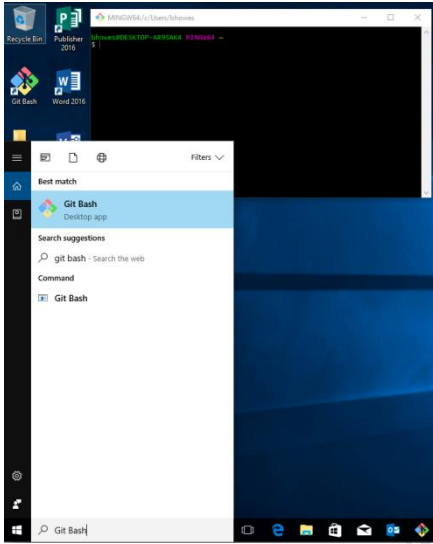
```
$ chmod 0700 ~/.ssh
```

```
$ chmod 0600 ~/.ssh/id_rsa
```

```
$ chmod 0644 ~/.ssh/id_rsa.pub
```

## **FOR WINDOWS:**

- a. Install git for windows. Download <https://github.com/git-for-windows/git/releases/download/v2.13.0.windows.1/Git-2.13.0-64-bit.exe> and install.
- b. Enter Git-bash:



Generate ssh-keys by running this command in Git Bash

```
$ ssh-keygen
```

Generating public/private rsa key pair.

Enter file in which to save the key (/c/Users/username/.ssh/id\_rsa):

Created directory '/c/Users/username/.ssh'.

Enter passphrase (empty for no passphrase):

Enter same passphrase again:

Your identification has been saved in /c/Users/username/.ssh/id\_rsa.

Your public key has been saved in /c/Users/username/.ssh/id\_rsa.pub.

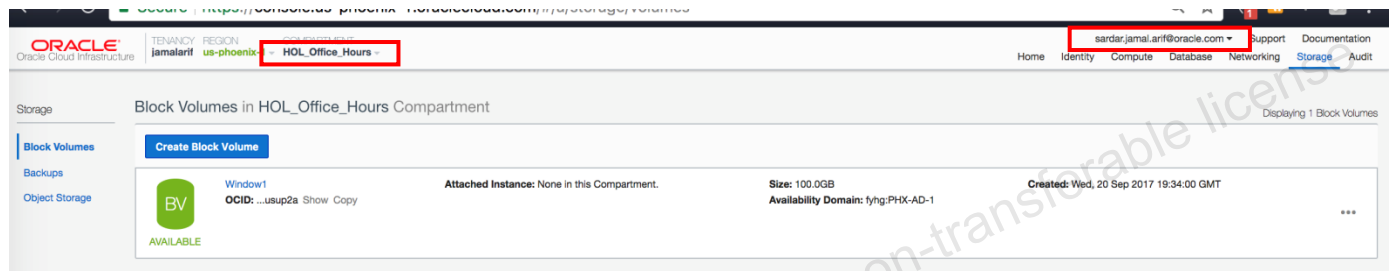
**Note:** In Git-Bash, C:\Users\username\ is shown as /c/Users/username/

2. Open up the Chrome Browser
  - a. Sign in to the console before you begin the lab. You must obtain user / password / tenant credentials.
  - b. Navigate to <https://console.us-phoenix-1.oraclecloud.com>
  - c. Enter your credentials to sign-in:
  - d. Tenant: <>
  - e. User/Password

## Practices 6-2: Compartment Overview

1. Once you log in, at the Home tab you can find the root and other compartments.

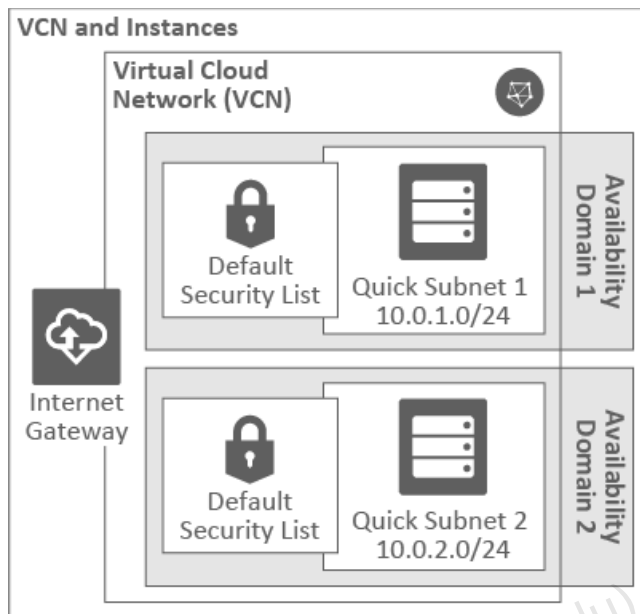
*At this moment, please STOP and make sure the correct compartment is selected for all the exercises following this. E.g., for a user with a username such as demo.user48, the correct compartment is c48, and so on. If you don't select the correct compartment, there might be issues in between different users. You might need to scroll down under the compartment heading to locate your specific compartment number.*



## Practices 6-3: Creating a VCN

### 1. Create a VCN.

The following diagram shows the prerequisite VCN and instances.



Creating a VCN automatically creates three subnets (one in each Availability Domain of a Region). In this practice, you launch instances in two of them.

- In the Console, click **Networking > Virtual Cloud Networks**.  
Ensure that your compartment is the selected compartment on the left side of the Console.
- Click **Create Virtual Cloud Network**.
- In the dialog box, enter a **Name** for your cloud network (for example, LB\_Network).
- Select **Create Virtual Cloud Network Plus Related Resources**.

The dialog box expands to list the resources that will be created with your cloud network.

The screenshot shows the 'Create Virtual Cloud Network' dialog box. At the top right are links for 'help' and 'cancel'. Below the title bar, there's a section 'CREATE IN COMPARTMENT' with a dropdown menu showing 'Compartment01'. Underneath is a 'NAME' field with the text 'LB\_Network'. Below the name field are two radio button options: 'CREATE VIRTUAL CLOUD NETWORK ONLY' (unselected) and 'CREATE VIRTUAL CLOUD NETWORK PLUS RELATED RESOURCES' (selected). At the bottom, there is a paragraph of text: 'Automatically sets up a Virtual Cloud Network with access to the internet. You can set up firewall rules and Security Lists to control ingress and egress traffic to your Instances. All related resources will be created in the same Compartment as the VCN. These actions will occur.'

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

A confirmation page displays the details of the cloud network that you created. The cloud network has the following resources and characteristics:

- 1) A CIDR block range of 10.0.0.0/16
- 2) An Internet Gateway
- 3) A route table with a route rule to enable traffic to and from the Internet Gateway. You will edit this route rule later in this practice.
- 4) A default security list. You will edit this default security list later in the practice.
- 5) A subnet in each Availability Domain

Create Virtual Cloud Network

Create Virtual Cloud Network

The Virtual Cloud Network was created: [LB\\_Network](#)

Create Internet Gateway

The Internet Gateway "Internet Gateway LB\_Network" was created

Update Default Route Table

The Route Table was updated: [Default Route Table for LB\\_Network](#)

Create Subnet

Public Subnet OBze:PHX-AD-1 was created

Create Subnet


Public Subnet OBze:PHX-AD-2 was created

Create Subnet

Public Subnet OBze:PHX-AD-3 was created

Close

Create Virtual Cloud Network



[LB\\_Network](#)  
**OCID:**  
...6m4bla [Show](#) [Copy](#)

**CIDR Block:**  
10.0.0.0/16

**Default Route Table:** [Default Route Table for LB\\_Network](#)

**DNS Domain Name:**  
lbnetwork... [Show](#) [Copy](#)

AVAILABLE

## Practices 6-4: Creating Two Web-Servers

---

In this practice, you create two instances and start a web server on each of them.

### Tasks

#### 1. Launch Two Instances

This example uses a Standard1.1 shape.

- a. In the Console, click **Compute**.
- b. Click **Launch Instance**.
- c. In the **Launch Instance** dialog box, enter the following:
  - 1) **Name:** Enter a name (for example: **Webserver1**).
  - 2) **Availability Domain:** Select the first Availability Domain in the list, AD-1.
  - 3) **Image:** Select the Oracle-Linux-7.x image. (The image name has the latest patch date appended to it.)
  - 4) **Shape:** Select VM Standard1.1.
  - 5) **Virtual Cloud Network:** Select the cloud network that you created (**LB\_Network**).
  - 6) **Subnet:** Select the subnet LB Subnet 1 in Availability Domain 1.
  - 7) **DNS name:** Leave blank.
  - 8) **SSH Keys:** Use the pub key generated in Exercise 1 to create this instance.  
**NOTE:** Make sure to use the keys that you have access too as you will use this key to ssh into the instances in next steps (The SSH keys are by default located in C:\Users\Lab\.ssh\.)
- d. Click **Launch Instance**.
- e. Repeat the previous steps, but this time enter the name **Webserver2**, select **Availability Domain AD-2**, **LB\_Network** for the VCN, and **LB Subnet 2 for the subnet**.

#### 2. Start a Web Application on Each Instance

Use ssh to access the instances and start the web server by executing the following commands on each instance:

**Note:** You can use two separate ssh sessions to execute these commands on both instances in parallel to save time.

- a. `ssh -i </path/privateKey> opc@<PublicIP_Address>`
- b. Run yum update:

```
$> sudo yum -y update
```

- c. Install the Apache HTTP Server:

```
$> sudo yum -y install httpd
```



- d. Open port 80 on the firewall to allow http and https traffic through:

```
$> sudo firewall-cmd --permanent --add-port=80/tcp
```

- e. Reload the firewall:

```
$> sudo firewall-cmd --reload
```

- f. Start the web server:

```
$> sudo systemctl start httpd
```

- g. Add an index.htm file on each instance to indicate which server it is.

On the first instance enter:

```
$> sudo su
$> echo 'WebServer1' >>/var/www/html/index.html
$> exit
```

- h. On the second instance enter:

```
$> sudo su
$> echo 'WebServer2' >>/var/www/html/index.html
$> exit
```

## Practices 6-5: Creating and Testing Load Balancer

**Note:** Your load balancer should always reside in different subnets than your application instances. This allows you to keep your application instances secured in private subnets, while allowing public Internet traffic to the load balancer in the public subnets.

### Tasks

1. Add Two Subnets to Your VCN to Host Your Load Balancer
  - a. Add a Security List.
    - 1) In the **Console**, click **Networking**, and then click **Virtual Cloud Networks**.  
This displays the list of VCNs in the current compartment.
    - 2) Click the name of the VCN that includes your application instances.
    - 3) Under **Resources**, click **Security Lists**.
    - 4) Click **Create Security List**.
      - a) **Create in Compartment:** This field defaults to the current compartment. Select the compartment you want to create the security list in, if it's not already selected.
      - b) Enter a **Name** (for example, LB Security List).
      - c) Delete the entry for the ingress rule and the entry for the egress rule.
    - Note:** The security list should have no rules. The correct rules are automatically added during the load balancer workflow.
    - d) Click **Create Security List**.
    - e) Return to your Virtual Cloud Network Details page.

Create Security List [help](#) [cancel](#)

CREATE IN COMPARTMENT

testcompartment

SECURITY LIST NAME

LB Security List

Allow Rules for Ingress

+ Add Rule

Allow Rules for Egress

+ Add Rule

Create Security List

b. Add a Route Table.

- 1) Under **Resources**, click **Route Tables**.
- 2) Click **Create Route Table**. Enter the following:
  - a) **Create in Compartment:** This field defaults to your current compartment. Select the compartment you want to create the route table in, if not already selected.
  - b) **Name:** Enter a name (for example, LB Route Table)
  - c) **CIDR Block:** Enter 0.0.0.0/0
  - d) **Target:** Select the Internet Gateway for your VCN.
  - e) Click **Create Route Table**.

Create Route Table [help](#) [cancel](#)

CREATE IN COMPARTMENT

c01

NAME

LB\_R

Route Rule

| DESTINATION CIDR BLOCK | TARGET TYPE      | TARGET COMPARTMENT | TARGET INTERNET GATEWAY |
|------------------------|------------------|--------------------|-------------------------|
| 0.0.0.0/0              | Internet Gateway | c01                | Internet Gateway VCN_LB |

Specified IP addresses: 0.0.0.0-255.255.255.255 (4,294,967,296 IP addresses)

**Important:** For a route rule that targets a Private IP, you must first enable "Skip Source/Destination Check" on the VNIC that the Private IP is assigned to.

[+](#)

Create Route Table

c. Create the first subnet.

- 1) Under **Resources**, click **Subnets**.
- 2) Click **Create Subnet**.
- 3) Enter the following:
  - a) **Name:** Enter a name (for example, LB Subnet 1).
  - b) **Availability Domain:** Choose the first Availability Domain (AD-1).
  - c) **CIDR Block:** Enter 10.0.4.0/24.
  - d) **Route Table:** Select the LB Route Table you created.
  - e) **Subnet access:** select Public Subnet
  - f) **DHCP Options:** Leave blank.
  - g) **Security Lists:** Select the **LB Security List** you created.

4) Click **Create**.

Create Subnet

[help](#)[cancel](#)

If the Route Table, DHCP Options, or Security Lists are in a different Compartment than the Subnet, [click here](#) to enable Compartment selection for those resources.

NAME *OPTIONAL*

LB Subnet 1

AVAILABILITY DOMAIN

OBze:PHX-AD-1

CIDR BLOCK

10.0.4.0/24

Specified IP addresses: 10.0.4.0-10.0.4.255 (256 IP addresses)

ROUTE TABLE

LB Route Table

SUBNET ACCESS

☐ PRIVATE SUBNET

Prohibit public IP addresses for Instances in this Subnet

☒ PUBLIC SUBNET

Allow public IP addresses for Instances in this Subnet

DNS RESOLUTION

☒
USE DNS HOSTNAMES IN THIS SUBNET

?

Allows assignment of DNS hostname when launching an Instance

DNS LABEL

lbsubnet1

Only letters and numbers, starting with a letter. 15 characters max.

DNS DOMAIN NAME (READ-ONLY)

lbsubnet1.lbnetwork.oraclevcn.com

DHCP OPTIONS

Select DHCP Options

⌵

Security Lists

×

LB Security List

⌵

+

Create

- d. Create the second subnet.
- Create a second load balancer subnet in a different Availability Domain from the subnet you previously created.
- 1) In the details page of your VCN, click **Create Subnet**.
  - 2) Enter the following:
    - a) **Name:** Enter a name (for example, LB Subnet 2).
    - b) **Availability Domain:** Choose the second Availability Domain (AD-2).
    - c) **CIDR Block:** Enter 10.0.5.0/24.
    - d) **Route Table:** Select the LB Route Table you created.
    - e) **Subnet access:** select Public Subnet
    - f) **DHCP Options:** Leave blank.
    - g) **Security Lists:** Select the **LB Security List** you created.

3) Click **Create**.

Create Subnet [help](#) [cancel](#)

If the Route Table, DHCP Options, or Security Lists are in a different Compartment than the Subnet, [click here](#) to enable Compartment selection for those resources.

NAME OPTIONAL

LB Subnet 2

AVAILABILITY DOMAIN

OBZe:PHX-AD-2

CIDR BLOCK

10.0.5.0/24

Specified IP addresses: 10.0.5.0-10.0.5.255 (256 IP addresses)

ROUTE TABLE

LB Route Table

DNS RESOLUTION

☒ USE DNS HOSTNAMES IN THIS SUBNET ?

Allows assignment of DNS hostname when launching an Instance

DNS LABEL

lbsubnet2

Only letters and numbers, starting with a letter. 15 characters max.

DNS DOMAIN NAME (READ-ONLY)

lbsubnet2.lbnetwork.oraclevcn.com

DHCP OPTIONS

Select DHCP Options

Security Lists

LB Security List

Create

2. Create a Load Balancer

When you create a load balancer, you choose its shape (size) and you specify two subnets from different Availability Domains. This ensures that the load balancer is highly available and is only active in one subnet at a time.

- a. In the Console, click **Networking**, and then click **Load Balancers**.

Ensure that the compartment designated for you is selected on the left.

- b. Click **Create Load Balancer**.

- c. Enter the following:

- 1) **Name:** Enter a name for your load balancer.
- 2) **Shape:** Select 100Mbps. This specifies the bandwidth of the load balancer. For the tutorial, use the smallest shape. Note that the shape cannot be changed later.
- 3) **Virtual Cloud Network:** Select the Virtual Cloud Network for your load balancer.
- 4) **Visibility:** select Create Public Load Balancer
- 5) **Subnet (1 of 2):** Select LB Subnet 1.
- 6) **Subnet (2 of 2):** Select LB Subnet 2. Note that the second subnet must reside in a different Availability Domain from the first.

- d. Click **Create**.

Create Load Balancer [help](#) [cancel](#)

The Load Balancing Service creates a public IP address associated with two subnets within your VCN. To connect to this address, you must add at least one backend set and listener to the load balancer.

[Learn more about Load Balancers.](#)

If your VCN or subnets are in a different compartment than your load balancer, [click here](#) to enable compartment selection for those resources.

NAME  
funLB01

SHAPE  
100Mbps

**Network Information**

Specify the VCN in which the load balancer accepts incoming traffic.

VIRTUAL CLOUD NETWORK  
LB\_Network

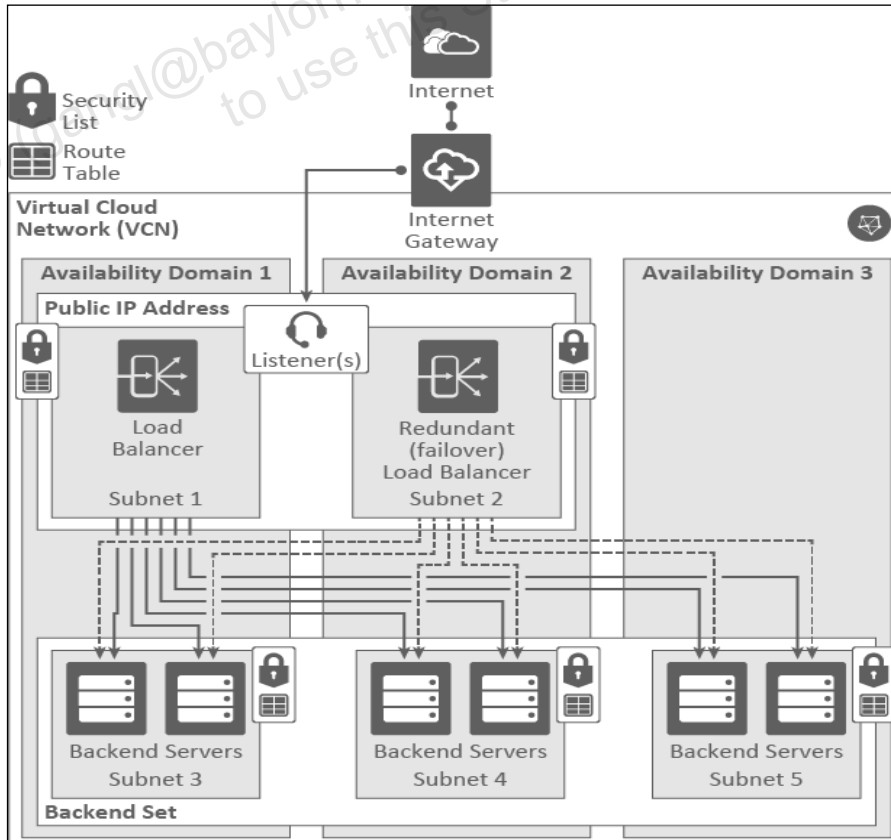
The Load Balancing Service uses two subnets to ensure high availability for your public IP address. You can use the address as a front-end for incoming traffic and to load balance that traffic across all subnets within the VCN.

SUBNET (1 OF 2)  
LB Subnet 1

SUBNET (2 OF 2)  
LB Subnet 2

**Create**

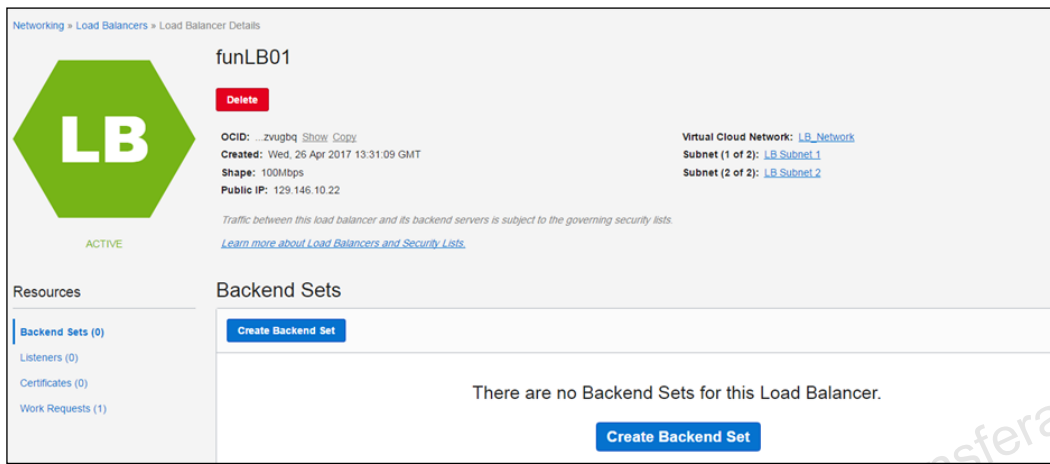
When a load balancer is created, you're assigned a public IP address to which you route all incoming traffic. The IP address is highly available, meaning it is available from both subnets that you specified. Note that it is only active in one subnet at a time.



### 3. Create a Backend Set with Health Check

A backend set is a collection of backend servers to which your load balancer directs traffic. Define the backend set policy and health check.

- a. Click the name of your load balancer to view its details.



- b. Click Create Backend Set.
- c. In the dialog box, enter:
  - 1) **Name:** Give your load balancer backend set a name. The name cannot contain spaces.
  - 2) **Policy:** Choose Weighted Round Robin.
- d. Enter the Health Check details.
  - 1) **Protocol:** Select HTTP
  - 2) **Port:** Enter 80
  - 3) **URL Path (URI):** Enter "/"



The rest of the fields are optional and can be left blank for this practice.

Create Backend Sethelpcancel

Specify a set of policies that define how the load balancer routes ingress traffic to your backend servers.

NAME  
FunBSE01

POLICY  
Weighted Round Robin

☐ USE SSL ?

☐ USE SESSION PERSISTENCE ?

Health Check

Define the health check policy the load balancer uses to confirm the health of your backend servers.

PROTOCOL  
HTTP

PORT  
80

INTERVAL IN MS (Optional)

TIMEOUT IN MS (Optional)

NUMBER OF RETRIES (Optional)

URL PATH (URI)  
/

STATUS CODE (Optional)

RESPONSE BODY REGEX (Optional)

Create

e. Click **Create**.

When the Backend Set is created, the Work Request status changes to Succeeded. Close the Work Request dialog box.

Work Request Submittedhelpclose



OCID:

...3hfcva Show Copy

Type:

CreateBackendSet

Started:

Wed, 26 Apr 2017 14:08:03 GMT

Finished:

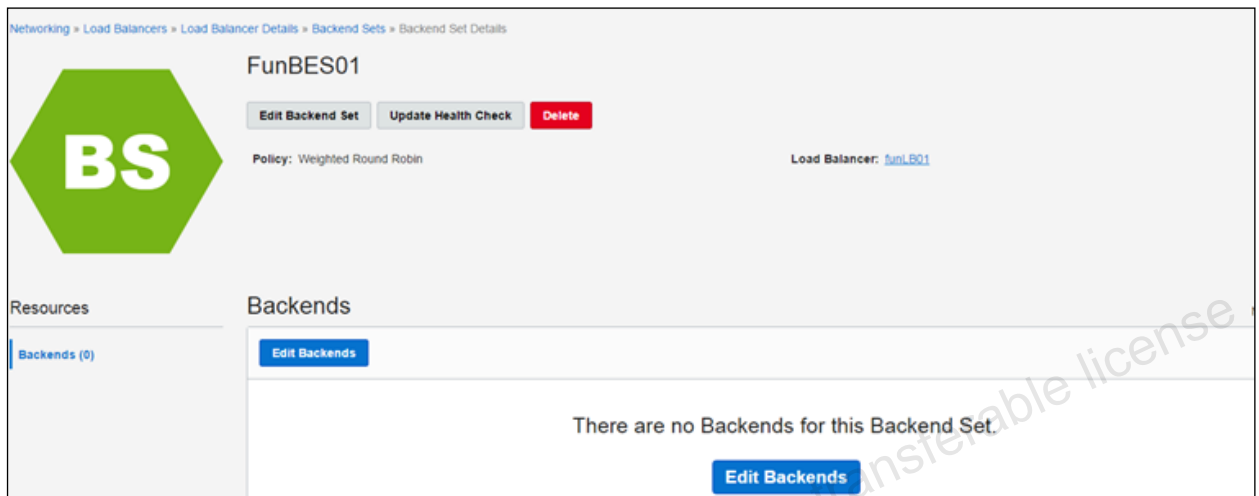
Wed, 26 Apr 2017 14:08:24 GMT

SUCCEEDED

Close

View All Work Requests

4. Add Backend Servers to Your Backend Set
  - a. On the details page of your load balancer, click **Backend Sets**. The backend set you created is displayed.
  - b. Click the name of the backend set to view its details.



- c. Click **Edit Backends**

In the dialog box, do the following:

- 1) Ensure that **Help me create proper security list rules** is selected. Steps A and B below are for information only (you don't have to create these rules).
  - a) Updates to the security list for your load balancer subnets are as follows:
    - (i) Allow egress traffic to the backend server 1 subnet (for example, Public-Subnet-AD1)
    - (ii) Allow egress traffic to the backend server 2 subnet (for example, Public-Subnet-AD2)

| Egress Rules for LB Security List |                  |                        |                            |                                    |
|-----------------------------------|------------------|------------------------|----------------------------|------------------------------------|
| Stateful Rules                    |                  |                        |                            |                                    |
| Destination: 10.0.1.0/24          | IP Protocol: TCP | Source Port Range: All | Destination Port Range: 80 | Allows: TCP traffic for ports: all |
| Destination: 10.0.0.0/24          | IP Protocol: TCP | Source Port Range: All | Destination Port Range: 80 | Allows: TCP traffic for ports: all |

- b) Updates to the security list for your backend server subnets are as follows:
- (i) Allow ingress traffic from load balancer subnet 1
  - (ii) Allow ingress traffic from load balancer subnet 2

| Ingress Rules for Default Security List |                   |                        |                            |                                                                                                         |
|-----------------------------------------|-------------------|------------------------|----------------------------|---------------------------------------------------------------------------------------------------------|
| Stateful Rules                          |                   |                        |                            |                                                                                                         |
| Source: 0.0.0.0/0                       | IP Protocol: TCP  | Source Port Range: All | Destination Port Range: 22 | Allows: TCP traffic for ports: all                                                                      |
| Source: 0.0.0.0/0                       | IP Protocol: ICMP | Type and Code: 3, 4    |                            | Allows: ICMP traffic for: 3, 4 Destination Unreachable: Fragmentation Needed and Don't Fragment was Set |
| Source: 10.0.0.0/16                     | IP Protocol: ICMP | Type and Code: 3       |                            | Allows: ICMP traffic for: 3 Destination Unreachable                                                     |
| Source: 10.0.4.0/24                     | IP Protocol: TCP  | Source Port Range: All | Destination Port Range: 80 | Allows: TCP traffic for ports: all                                                                      |
| Source: 10.0.5.0/24                     | IP Protocol: TCP  | Source Port Range: All | Destination Port Range: 80 | Allows: TCP traffic for ports: all                                                                      |

- 2) **OCID:** Paste the OCID of the first instance (Webserver1).
- a) In the dialog box, click **View Instances**.

Edit Backends
[help](#)
[cancel](#)

Specify the Compute instance OCID or private IP address and the port for the web/application backend servers you want to include in this backend set.

[View instances](#)

Traffic between this load balancer and its backend servers is subject to the governing security lists.

[Learn more about Load Balancers and Security Lists.](#)

Backend 1 *Undefined: will not be submitted with the form*

☒
HELP ME  
CREATE  
PROPER  
SECURITY  
LIST  
RULES

INSTANCE OCID

PORT

WEIGHT

Submit

This opens a new browser tab that displays the instances in the current compartment.

- b) If your instances are not in the current compartment, select the compartment to which the instance belongs (select from the list on the left side of the page). A shortened version of the instance's OCID is displayed next to each instance.
- c) Click **Copy** to copy the OCID. You can then paste it into the Instance ID field.
- 3) **Port:** Enter 80.
- 4) **Weight:** Leave blank to weight the servers evenly.

- 5) Repeat Steps 2 through 4, pasting in the OCID for the second instance (Webserver2).

**Edit Backends** [help](#) [cancel](#)

Specify the Compute instance OCID or private IP address and the port for the web/application backend servers you want to include in this backend set.

[View instances](#)

Traffic between this load balancer and its backend servers is subject to the governing security lists.

[Learn more about Load Balancers and Security Lists](#)

**Backend 1 Defined** ✕

☒ HELP ME  
CREATE  
PROPER  
SECURITY  
LIST  
RULES

INSTANCE OCID:

PORT:

WEIGHT:

**Backend 2 Defined** ✕

☒ HELP ME  
CREATE  
PROPER  
SECURITY  
LIST  
RULES

INSTANCE OCID:

PORT:

WEIGHT:

**Backend 3 Undefined: will not be submitted with the form**

☒ HELP ME  
CREATE  
PROPER  
SECURITY  
LIST  
RULES

INSTANCE OCID:

PORT:

WEIGHT:

**Submit**

- 6) Click **Submit**.
- 7) Allow the job to complete. Scroll down and click **Create Rules**

ORACLE Cloud Infrastructure

TERVANCY gsebmcs00004 REGION us-phoenix-1

demo.user01 · Support Documentation

Home | Identity | Compute | Database | **Networking** | Storage | Audit

Networking · Load Balancers · Load Balancer Details · Backend Sets · Backend Set Details

**BackendLBHOL**

[Edit Backend Set](#) [Update Health Check](#) [Delete](#)

**Backend Sets Information**

Policy: Weighted Round Robin

Load Balancer: [LB\\_HOL](#)

**Resources**

[Backends \(2\)](#)

**Backends** [Edit Backends](#)

| Backend | IP Address               | Port | Weight | Drain | Offline | Backup | Health      |
|---------|--------------------------|------|--------|-------|---------|--------|-------------|
|         | <a href="#">10.0.0.4</a> | 80   | 1      | false | false   | false  | Health:  OK |
|         | <a href="#">10.0.1.2</a> | 80   | 1      | false | false   | false  | Health:  OK |

Displaying 2 Backends

**Overall Health**

Warning

**Backends Health**

Critical

Warning

Unknown

OK

## 5. Create a Listener

A listener is an entity that checks for connection requests. The load balancer listener listens for ingress client traffic using the port you specify within the listener and the load balancer's public IP.

In this practice, you define a listener that accepts HTTP requests on port 80.

- a. On your Load Balancer Details page, click **Listeners**.



**funLB01**

**Delete**

OCID: ...zvugbq [Show Copy](#)  
 Created: Wed, 26 Apr 2017 13:31:09 GMT  
 Shape: 100Mbps  
 Public IP: 129.146.10.22

Virtual Cloud Network: [LB\\_Network](#)  
 Subnet (1 of 2): [LB\\_Subnet\\_1](#)  
 Subnet (2 of 2): [LB\\_Subnet\\_2](#)

Traffic between this load balancer and its backend servers is subject to the governing security lists.  
[Learn more about Load Balancers and Security Lists.](#)

**Resources**

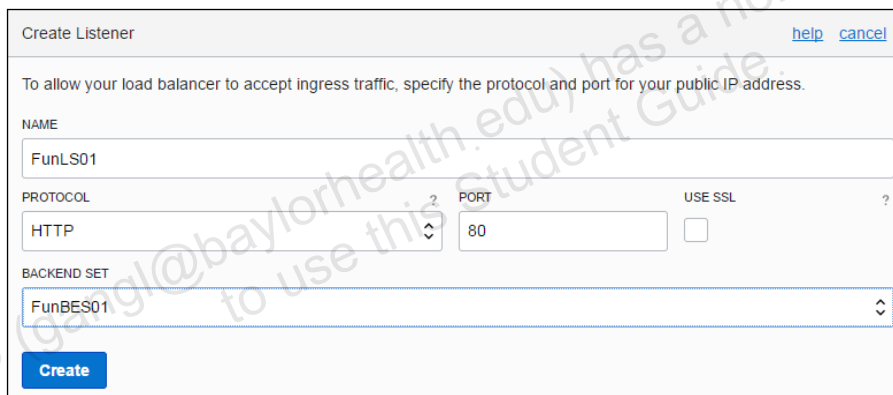
Backend Sets (1)  
**Listeners (1)**

**Create Listener**

- b. Click **Create Listener**.

- c. Enter the following:

- 1) **Name:** Enter a friendly name.
- 2) **Protocol:** Select HTTP.
- 3) **Port:** Enter 80 as the port on which to listen for incoming traffic.
- 4) **Backend Set:** Select the backend set you created.



Create Listener [help](#) [cancel](#)

To allow your load balancer to accept ingress traffic, specify the protocol and port for your public IP address.

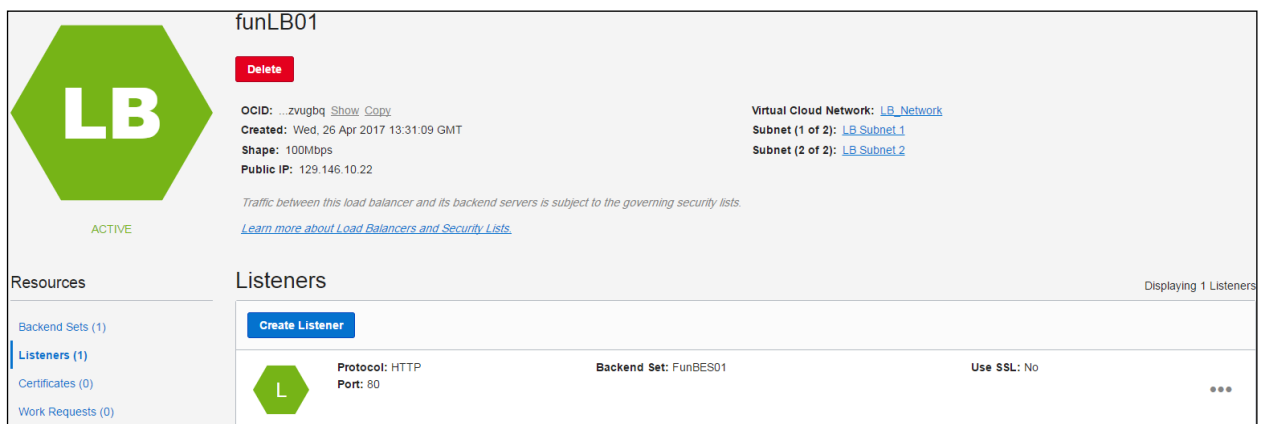
NAME  
 FunLS01

PROTOCOL PORT USE SSL  
 HTTP 80 ☐

BACKEND SET  
 FunBES01

**Create**

- d. Click **Create**.



**funLB01**

**Delete**

OCID: ...zvugbq [Show Copy](#)  
 Created: Wed, 26 Apr 2017 13:31:09 GMT  
 Shape: 100Mbps  
 Public IP: 129.146.10.22

Virtual Cloud Network: [LB\\_Network](#)  
 Subnet (1 of 2): [LB\\_Subnet\\_1](#)  
 Subnet (2 of 2): [LB\\_Subnet\\_2](#)

Traffic between this load balancer and its backend servers is subject to the governing security lists.  
[Learn more about Load Balancers and Security Lists.](#)

**Resources**

Backend Sets (1)  
**Listeners (1)**  
 Certificates (0)  
 Work Requests (0)

**Listeners** Displaying 1 Listeners

**Create Listener**

| Name | Protocol | Port | Backend Set | Use SSL | Actions |
|------|----------|------|-------------|---------|---------|
| L    | HTTP     | 80   | FunBES01    | No      | ...     |

6. Update the Load Balancer Subnet Security List to Allow Internet Traffic to the Listener  
To enable the traffic to get to the listener, update the load balancer subnet's security list.

a. Go to your VCN details page.

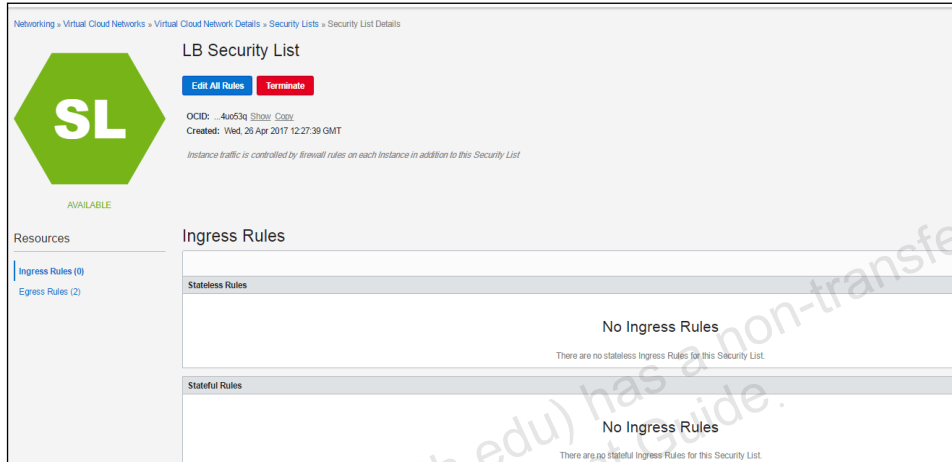
b. Click **Security Lists**.

A list of the security lists in the cloud network is displayed.

c. Click the LB Security List.

This displays the details of the LB Security List.

d. Click **Edit All Rules**.



e. Under Allow Rules for Ingress, click **Add Rule**.

f. Enter the following ingress rule:

- **Source CIDR:** Enter 0.0.0.0/0
- **IP Protocol:** Select TCP

- **Destination Port Range:** Enter 80 (the listener port).

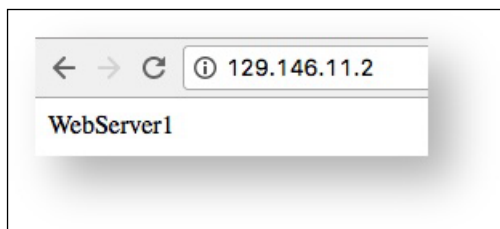
- Click **Save Security List Rules**.

## 7. Verify Your Load Balancer

Test the functionality of the load balancer by navigating to its public IP address on a web browser.

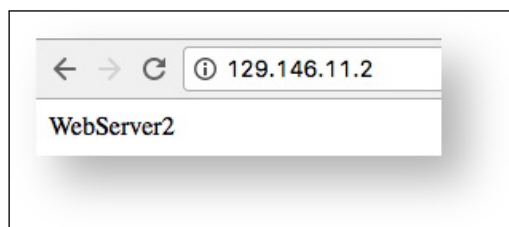
- Open a web browser.
- Enter the load balancer's public IP address.

The index.htm page from one of your web servers is displayed.



- Refresh the web page.

The index.htm page from the other web server should now be displayed. This demonstrates that the load of the web server is being shared between both instances.



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## **Practices for Lesson 7: Database Service**

## Practices for Lesson 7: Database Service - Overview

---

In this practice, you create a one-node DB System.

### Assumptions

You are familiar with the key concepts and terminology of Oracle Cloud Infrastructure and have been provisioned with a tenancy with the required access permissions.

**Note:** Some of the UIs might look a little different than the screenshots included in the instructions, but students can still use the instructions to complete the hands-on labs.

### Prerequisites

- a. The SSH public key from the key pair that you plan to use for connecting to the DB System via SSH
- b. The name of a Virtual Cloud Network (VCN) to launch the DB System in
- c. Each VCN subnet has a default security list that contains a rule to allow TCP traffic on destination port 22 (SSH) from source 0.0.0.0/0 and any source port.

**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.

## Practices for Lesson 7: Creating a Database

---

The Database Service lets you quickly launch an Oracle Database System (DB System) and create one or more databases on it.

There are two types of DB Systems:

- One-node DB Systems consist of a single server running Oracle Linux 6.8, with locally attached NVMe storage.
- Two-Node RAC DB Systems consist of two servers in a RAC configuration, running Oracle Linux 6.8, with direct-attached shared storage. The cluster provides automatic failover.

### Supported Database Editions and Versions

One- and two-node RAC DB Systems support the following Oracle Database editions:

- Standard Edition
- Enterprise Edition
- Enterprise Edition - High Performance
- Enterprise Edition - Extreme Performance (required for two-node RAC DB Systems)

The supported database versions are the following:

- Oracle Database 11g Release 2
- Oracle Database 12c Release 1
- Oracle Database 12c Release 2

### Shapes for One and Two-node RAC DB Systems

When you launch a DB System, you choose its *shape*, which determines the resources allocated to the DB System. The shape that you choose for a DB System determines its total raw storage.

The available DB System shapes are:

- **BM.HighIO1.36:** Provides a one-node DB System
- **BM.DenseIO1.36:** Provides a one-node DB System
- **BM.RACLocalStorage1.72:** Provides a two-node RAC DB System

## Task

1. Launch a DB System
  - a. Sign in to <https://console.us-phoenix-1.oraclecloud.com/>, open the Console, click **Database**, choose your **Compartment**, and then click **Launch DB System**.
  - b. In the **Launch DB System** dialog box, enter the following:

| DB System Information            |                                                                       |
|----------------------------------|-----------------------------------------------------------------------|
| Display Name                     | Enter a display name for the DB System.                               |
| Availability Domain              | Enter the Availability Domain Name in which the DB System resides.    |
| Shape                            | Select <b>VM.Standard1.4</b>                                          |
| Oracle Database Software Edition | Select <b>Enterprise Edition</b> .                                    |
| Total Node Count                 | Select the default option, 1.                                         |
| Available Storage Size           | 256 GB                                                                |
| SSH Public Key                   | Paste your ssh public key value into this field.                      |
| Network Information              |                                                                       |
| Virtual Cloud Network            | Enter the VCN in which to launch the DB System.                       |
| Client Subnet                    | Enter the subnet name to which the DB System should attach.           |
| Host Name Prefix                 | Enter your choice of host name for the DB System.<br>Example: ocldb1. |
| Database Information             |                                                                       |
| Database Name                    | Enter a name for the database (db1).                                  |
| Database Version                 | Select <b>12.2.0.1</b> .                                              |
| PDB Name                         | Enter <b>pdb1</b> .                                                   |
| Database Admin Password          | Enter <b>Welc0me2##OCIBM</b> for the SYS password.                    |
| Confirm Database Admin Password  | Enter <b>Welc0me2##OCIBM</b> .                                        |
| Database Workload                | Select <b>Online Transactional Processing</b> for this practice.      |

The following is a sample DB System Information screen:

Launch DB System
help cancel

If the Virtual Cloud Network or Subnet is in a different Compartment than the DB System, [click here](#) to enable Compartment selection for those resources.

DB System Information

DISPLAY NAME

DBSystem4DEmo

AVAILABILITY DOMAIN

GOFA:PHX-AD-1

SHAPE

VM.Standard1.4

TOTAL NODE COUNT

1

The number of Nodes. Specify a number within the range of 1 and 2.

ORACLE DATABASE SOFTWARE EDITION

Enterprise Edition Extreme Performance

AVAILABLE STORAGE SIZE (GB)

256

Scale up the available storage size for DB System up to 40960 GB.

TOTAL STORAGE SIZE (GB)

712

The total storage consumed by the DB system. Oracle charges for the storage consumed.

LICENSE TYPE

☒ LICENSE INCLUDED  
The cost of the cloud service includes the Oracle licensing.

☐ BRING YOUR OWN LICENSE (BYOL)  
You have bought the Oracle licenses directly from Oracle. The cloud provider is not responsible for charging or validating your licenses.

SSH PUBLIC KEY

☐ CHOOSE SSH KEY FILES
☒ PASTE SSH KEYS

ssh-rsa  
AAAAB3NzaC1yc2EAAAADAQABAAQDP+9AUhkNE018kpW0uCBYZ2hThAnvAYAW3ejeAuYVSokse7z7LdENFap+FKtestGgQhdLQTqr6KsJmIpH

### Network Information

**VIRTUAL CLOUD NETWORK**

VCN1

**CLIENT SUBNET**

SUB1

**HOSTNAME PREFIX**

ocibmdb

**HOST DOMAIN NAME**

sub1.vcn1.oraclevcn.com

Each part must contain only letters and numbers, starting with a letter. 63 characters max.

**HOST AND DOMAIN URL**

ocibmdb.sub1.vcn1.oraclevcn.com

### Database Information

**DATABASE NAME**

ocidb1

**DATABASE VERSION**

12.2.0.1

**PDB NAME** *(Optional)*

pdb1

**DATABASE ADMIN PASSWORD**

.....

Password must be 9 to 30 characters and contain at least 2 uppercase, 2 lowercase, 2 special, and 2 numeric characters. The special characters must be \_, #, or -.

**CONFIRM DATABASE ADMIN PASSWORD**

.....

Confirmation must match password above.

☒ **AUTOMATIC BACKUP**

Configure the service to automatically back up this database to Oracle Cloud Infrastructure Object Storage.

If you previously used RMAN or dbcli to configure backups and then you switch to using the Console or the API for backups, a new backup configuration is created and associated with your database. This means that you can no longer rely on your previously configured unmanaged backups to work.

**DATABASE WORKLOAD**

☒ **ON-LINE TRANSACTION PROCESSING (OLTP)**

Configure the database for a transactional workload, with bias towards high volumes of random data access.

☐ **DECISION SUPPORT SYSTEM (DSS)**

Configure the database for a decision support or data warehouse workload, with bias towards large data scanning operations.

Show Advanced Options

**Launch DB System**

c. Click **Launch DB System**.

## 2. Check the Status of the DB System


- Open the Console, click **Database**, and then choose your **Compartment**.
- From the list of DB Systems, find the system that you're interested in and check its icon. The color of the icon and the text below it indicates the status of the system. The available statuses and their icon colors are:
  - Provisioning:** Yellow icon
  - Available:** Green icon
  - Starting:** Yellow icon
  - Stopping:** Yellow icon
  - Stopped:** Yellow icon
  - Terminating:** Gray icon
  - Terminated:** Gray icon
  - Failed:** Red icon

|                                                                                    |                                                                                         |                                                                                                                                                                                      |                                                                                                                                     |                                                       |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|
|   | <b>DBSystem4Demo</b><br>Availability Domain: GOIA:PHX-AD-1<br>OCID: ...gzf5tq Show Copy | <b>Oracle Database Software Edition:</b> Enterprise Edition Extreme Performance<br><b>CPU Core Count:</b> 36<br><b>Shape:</b> BM.HighIO1.36                                          | <b>Virtual Cloud Network:</b> VCN1<br><b>Client Subnet:</b> SUB1<br><b>Private IP:</b> Loading...<br><b>Public IP:</b> Loading...   | <b>Launched:</b> Thu, 09 Nov 2017 22:05:00 GMT<br>... |
|  | <b>DBSystem4Demo</b><br>Availability Domain: GOIA:PHX-AD-1<br>OCID: ...m4f2aa Show Copy | <b>DB System Version:</b> 12.2.0.1.0<br><b>Oracle Database Software Edition:</b> Enterprise Edition Extreme Performance<br><b>CPU Core Count:</b> 36<br><b>Shape:</b> BM.DenseIO1.36 | <b>Virtual Cloud Network:</b> VCN1<br><b>Client Subnet:</b> SUB1<br><b>Private IP:</b> 10.0.1.2<br><b>Public IP:</b> 129.146.71.107 | <b>Launched:</b> Sun, 05 Nov 2017 22:39:14 GMT<br>... |

## 3. To Start, Stop, or Reboot a DB System:

- Open the Console, click **Database**, and then choose your **Compartment**.
- In the list of DB Systems, find the DB System that you want to stop, start, or reboot, and then click its name to display its details.

**Database** > **DB Systems** > **DB System Details** > **Nodes**


**BMDB**  

Scale Up/Down
Add SSH Keys
Terminate


**Availability Domain:** GOIA:PHX-AD-1  
**Shape:** BM.DenseIO1.36  
**Compartment:** sandbox  
**Oracle Database Software Edition:** Enterprise Edition Extreme Performance  
**Virtual Cloud Network:** VCN1  
**Client Subnet:** SUB1  
**Hostname Prefix:** dbvm1  
**License Type:** License Included

**OCID:** ...m4f2aa Show Copy  
**Created:** Sun, 05 Nov 2017 22:39:14 GMT  
**DB System Version:** 12.2.0.1.0  
**CPU Core Count:** 36  
**Disk Redundancy:** High  
**Port:** 1521  
**Host Domain Name:** sub1.vcn1.oraclevcn.com

**Resources**

**Nodes**

Nodes (1)
Databases (1)
Patches (0)
Patch History (0)


**Host Name:** dbvm1  
**OCID:** ...6yt6ua Show Copy

**Private IP Address & DNS Name:** 10.0.1.2 (dbvm1... Show Copy )  
**Public IP Address:** 129.146.71.107

Start
Stop
Reboot
...

- In the list of nodes, click the **Actions** icon (●●●) for a node, and then click one of the following actions:

- **Start:** Restarts a stopped node. After the node has restarted, the **Stop** action is enabled

The screenshot shows the 'Nodes' page with the following details:

| Node | Host Name                 | Private IP Address & DNS Name | Public IP Address | Actions       |
|------|---------------------------|-------------------------------|-------------------|---------------|
| N    | BMCSDB<br>OCID: ...t2hyha | 10.0.0.2 (bmcsdb...)          | 129.146.25.214    | Start<br>Stop |

A red arrow points to the 'Start' button.

The screenshot shows the 'Nodes' page with the following details:

| Node | Host Name                 | Private IP Address & DNS Name | Public IP Address | Actions |
|------|---------------------------|-------------------------------|-------------------|---------|
| N    | BMCSDB<br>OCID: ...t2hyha | 10.0.0.2 (bmcsdb...)          | 129.146.25.214    | ...     |

The node status is 'STARTING...'.

- **Stop:** Shuts down the node. After the node is powered off, the **Start** action is enabled.

The dialog box contains the following text:

Confirm

Are you sure you want to stop the Node named "BMCSDB"?

Buttons: Cancel, OK

The screenshot shows the 'Nodes' page with the following details:

| Node | Host Name                 | Private IP Address & DNS Name | Public IP Address | Actions |
|------|---------------------------|-------------------------------|-------------------|---------|
| N    | BMCSDB<br>OCID: ...t2hyha | 10.0.0.2 (bmcsdb...)          | 129.146.25.214    | ...     |

The node status is 'STOPPING...'.

The screenshot shows the 'Nodes' page with the following details:


| Node | Host Name                 | Private IP Address & DNS Name | Public IP Address | Actions |
|------|---------------------------|-------------------------------|-------------------|---------|
| N    | BMCSDB<br>OCID: ...t2hyha | 10.0.0.2 (bmcsdb...)          | 129.146.25.214    | ...     |

The node status is 'STOPPED'.



- **Reboot:** Shuts down the node, and then restarts it.

Nodes Displaying 1 Nodes


|                                                                                                               |                                                                              |                                                                                                                                       |                                                                                                                |     |
|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----|
| <br><small>AVAILABLE</small> | <b>Host Name:</b> BMCSDB<br><b>OCID:</b> ...t2hyha <a href="#">Show Copy</a> | <b>Private IP Address &amp; DNS Name:</b> 10.0.0.2 (bmcsdb... <a href="#">Show Copy</a> )<br><b>Public IP Address:</b> 129.146.25.214 | <b>Floating IP Address:</b><br><div> <span>Start</span><br/> <span>Stop</span><br/> <span>Reboot</span> </div> | ... |
|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|-----|

Confirm [close](#)


Are you sure you want to reboot the Node named "BMCSDB"?

Cancel
OK

Nodes Displaying 1 Nodes

|                                                                                                                   |                                                                              |                                                                                                                                       |                                |     |
|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----|
| <br><small>STOPPING...</small> | <b>Host Name:</b> BMCSDB<br><b>OCID:</b> ...t2hyha <a href="#">Show Copy</a> | <b>Private IP Address &amp; DNS Name:</b> 10.0.0.2 (bmcsdb... <a href="#">Show Copy</a> )<br><b>Public IP Address:</b> 129.146.25.214 | <b>Floating IP Address:</b> -- | ... |
|-------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----|

Nodes Displaying 1 Nodes

|                                                                                                                 |                                                                              |                                                                                                                                       |                                |     |
|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----|
| <br><small>AVAILABLE</small> | <b>Host Name:</b> BMCSDB<br><b>OCID:</b> ...t2hyha <a href="#">Show Copy</a> | <b>Private IP Address &amp; DNS Name:</b> 10.0.0.2 (bmcsdb... <a href="#">Show Copy</a> )<br><b>Public IP Address:</b> 129.146.25.214 | <b>Floating IP Address:</b> -- | ... |
|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----|

#### 4. Connect to a DB System

##### Prerequisites:

- SSH Public key that you used when the DB System was launched
- The public IP address of the DB System

- a. Connecting to a database from a Linux/UNIX-style system

1) Open a shell and run the following SSH command to access the DB System:

```
$ ssh -i <private key> opc@<DB System IP address>
```

- <private key> is the full path and name of the file that contains the private key associated with the DB System you want to access.
- Use the DB System's private or public IP address depending on your network configuration.

## 5. Accessing a Database After You Connect

- a. You have logged in as user opc, now sudo to the oracle user.

```
[opc@dbvm1 ~]$ sudo su - oracle
[oracle@dbvm1 ~]$
```

- b. Set the environment to the ocidb1 instance and Perform a SQL query.

**Note:** If you forget your database name you can grep for it as follows:

"\$ ps auxw | grep ora\_ " and look for process like:

```
oracle 12112 0.0 0.0 8830804 67248 ? Ss 20:28 0:00 ora_w000_db1
```

In this case "db1" is one of the database names on the system.

```
oracle@dbvm1 ~]$ . oraenv
ORACLE_SID = [oracle] ? db1
The Oracle base has been set to /u01/app/oracle
[oracle@dbvm1 ~]$ sqlplus / as sysdba
SQL*Plus: Release 12.2.0.1.0 Production on Mon Nov 13 20:40:27
2017
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 username from dba_users;
SQL> select * from dba_users;
SQL> select tablespace_name, table_name from all_tables;
SQL> exit
```

```

[oracle@dbvm1 ~]$ . oraenv
ORACLE_SID = [oracle] ? db1
The Oracle base has been set to /u01/app/oracle
[oracle@dbvm1 ~]$ sqlplus / as sysdba

SQL*Plus: Release 12.2.0.1.0 Production on Mon Nov 13 20:40:27 2017

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 username from dba_users;

USERNAME
-----
SYS
SYSTEM
XS$NULL
LBACSYS
OUTLN
DBSNMP

```

```

SYSTEM
UTL_RECOMP_SORTED

SYSAUX
WRI$_REPT_FORMATS

SYSAUX
WRM$_WR_SETTINGS

TABLESPACE_NAME
-----
TABLE_NAME
-----
SYSTEM
UTL_RECOMP_COMPILED

SYSAUX
WRI$_REPT_COMPONENTS

SYSTEM
JAVA$MC$

2106 rows selected.

SQL> Disconnected from Oracle Database 12c EE Extreme Perf Release 12.2.0.1.0 - 64bit Production
[oracle@dbvm1 ~]$

```

## 6. To terminate a DB System (Optional):

Terminating a DB System permanently deletes it and any databases running on it.

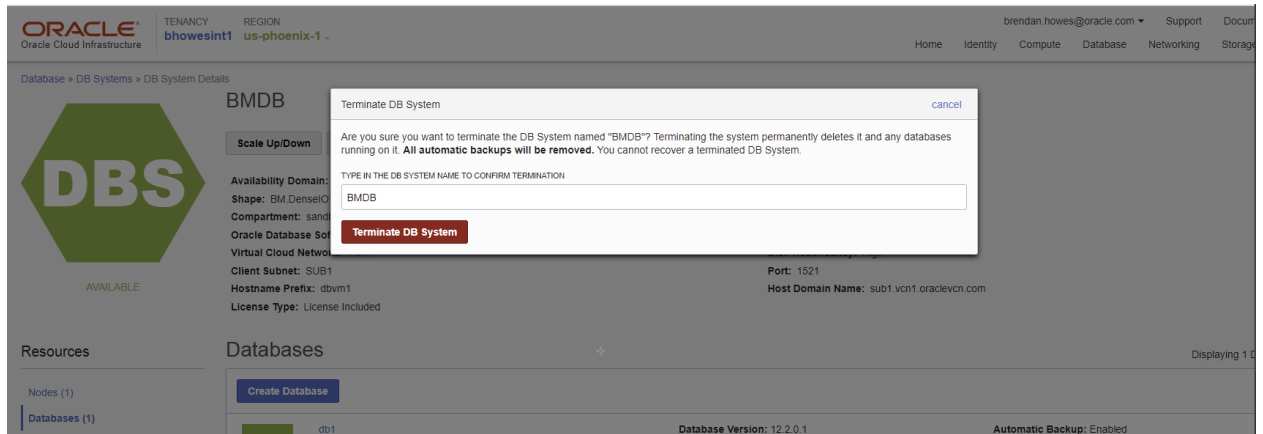
- Open the Console, click **Database**, and then choose your **Compartment**.  
A list of DB Systems is displayed.
- For the DB System that you want to terminate, click the **Actions** icon (⋮), then click **Terminate**.

The screenshot shows the Oracle Cloud Infrastructure console. The top navigation bar includes 'Database' and 'Actions'. The left sidebar shows 'DBS' and 'Resources'. The main content area displays the details of a DB System named 'BMDDB'. The details include:

- Availability Domain:** GOA/PHX-AD-1
- Shape:** BM.DenselO1.36
- Compartment:** sandbox
- Oracle Database Software Edition:** Enterprise Edition Extreme Performance
- Virtual Cloud Network:** VCN1
- Client Subnet:** SUB1
- Hostname Prefix:** dbvm1
- License Type:** License Included
- OCID:** ...m4t2aa
- Created:** Sun, 05 Nov 2017 22:39:14 GMT
- DB System Version:** 12.2.0.1.0
- CPU Core Count:** 36
- Disk Redundancy:** High
- Port:** 1521
- Host Domain Name:** sub1.vcn1.oraclevcn.com

The 'Databases' section shows a table with one database:

| DB  | Database Home                                                   | Database Version | Database Workload | Automatic Backup |
|-----|-----------------------------------------------------------------|------------------|-------------------|------------------|
| db1 | dbhome20171105213914<br>Launched: Sun, 05 Nov 2017 22:39:14 GMT | 12.2.0.1         | OLTP              | Enabled          |



c. Confirm when prompted.

The DB System's icon indicates Terminating.

At this point, you cannot connect to the system and any open connections will be terminated.