HOL 10469

Deploying and Managing a private Cloud with Oracle VM and Oracle Enterprise Manager

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1 Introduction

1.1 Lab objective

This document details all actions that we will be run during Oracle OpenWorld 2015 session Hands On Lab HOL10469.

This hands-on lab takes you through private database cloud management, also known as DBaaS (Database as a service) with Oracle VM and Oracle Enterprise Manager Cloud Control 12c (EMCC)

There are different ways of doing DBaaS:

- Instance as a Service
  - New DB instance on existing host (physical or virtual)
  - New DB instance on new host (virtual)
- Schema as a Service (new schema in existing database instance)
- Pluggable Database as a service (PDBaaS) (new pluggable database in existing container database). (DB12c only)

In this lab, you will see 2 ways:

- Instance as a Service on a new virtual host.
- Pluggable Database as a Service.

Part 1 of lab: Instance as a service:

In this part, you will

- As a Cloud administrator:
  - Configure an Oracle VM environment from EM12c
  - Import an Oracle VM assembly with Oracle Database 12c
  - Configure the infrastructure Self Service portal for some Self Services users
- As a Self Service user (developer who needs a complete environment: OS + DB)
  - Deploy a new Oracle VM virtual machine with Oracle Linux 6 and Oracle Database 12c

Part 2 of lab: Pluggable database as a service:

Given the one hour time slot of the Hands On Lab at Oracle OpenWorld, you will not have time to actually run this lab, but you may read it, and also run it at home or office.

In this part, you will:

- As a Cloud administrator, configure the database Self Service portal for PDB request
- As a Self Service user (different from user in part 1, only needing PDB), deploy a new PDB in an existing container database.

During this lab, we will use a demo environment built on a single x86 laptop and containing 3 virtual servers (Oracle VM VirtualBox virtual machines): Oracle VM Server, Oracle VM Manager and Oracle Enterprise Manager 12c.

1.2 Preparation (done before Lab)

To save time and fit in the one hour slot of Oracle OpenWorld labs, some actions were made before the actual lab.

Here is a quick list of these actions:

- Install Oracle Linux 7.1 (64 bits) on all the laptops.
- Install Oracle VM VirtualBox 5.0.4 + extensions on all the laptops.
- Install an Oracle VM Manager 3.3.3 server in an Oracle VM VirtualBox virtual machine.
- Install an Oracle VM Server 3.3.3 server in an Oracle VM VirtualBox virtual machine.
- Install an Oracle Enterprise Manager Cloud Control 12c R5 server in an Oracle VM VirtualBox virtual machine.
- Deploy an Oracle EM12c agent on the Oracle VM Manager.
- Deploy the Oracle Virtualization plugin on the Oracle EM12c server.
- Deploy the Oracle Virtualization plugin on the Oracle EM12c agent.
- Configure HTTPS/TCPS security between the Oracle EM12c server and the Oracle EM12c agent installed on the Oracle VM Manager.
- Create users in Oracle Enterprise Manager (cloud administrator and Self Service users)
- Create an Oracle VM assembly for the latest Oracle Database 12c (12.1.0.2.0) with Oracle Linux 6
- Import this Oracle VM assembly in the Oracle Enterprise Manager software library
- Pre-configure Chargeback in Oracle Enterprise Manager (charge plans and cost centers)

Note: to run this lab at home of office

Requirements: X86 machine with at least 16GB of RAM and 4 CPU cores.
Any X86 Operating System supported by Oracle VM VirtualBox is OK (Microsoft Windows, most Linux distributions, Oracle Solaris X86, Apple Mac OSX, …)
Read appendix A

1.3 Summary of steps

In this lab, you will execute the following steps in Oracle Enterprise Manager Cloud Control 12c :

1.3.1 Part 1: Instance as a Service

As the Cloud administrator, setup the Infrastructure environment:

- Discover the Oracle VM Manager.
- Discover the Oracle VM Server.
- Configure network and VNICs (Virtual Network Interface Cards).
- Create a non clustered server pool.
- Create a zone.
- Create a storage repository.
- Import an Oracle VM assembly in the repository (Oracle Linux 6 + Database 12c)
- Setup the Infrastructure Self Service portal
- Configure the Chargeback feature

As a Self Service user:

- Deploy a new Oracle VM virtual machine from the imported assembly.
- Access the new VM and database instance

1.3.2 Part 2: Pluggable Database as a Service

As the super administrator:

- Install the Oracle Enterprise Manager agent on the VM used in part 1
- Add the database 12c targets (container database and listener)

As the Cloud administrator:

- Create a PaaS infrastructure zone
- Setup the Pluggable Database Self Service portal

As a Self Service user:

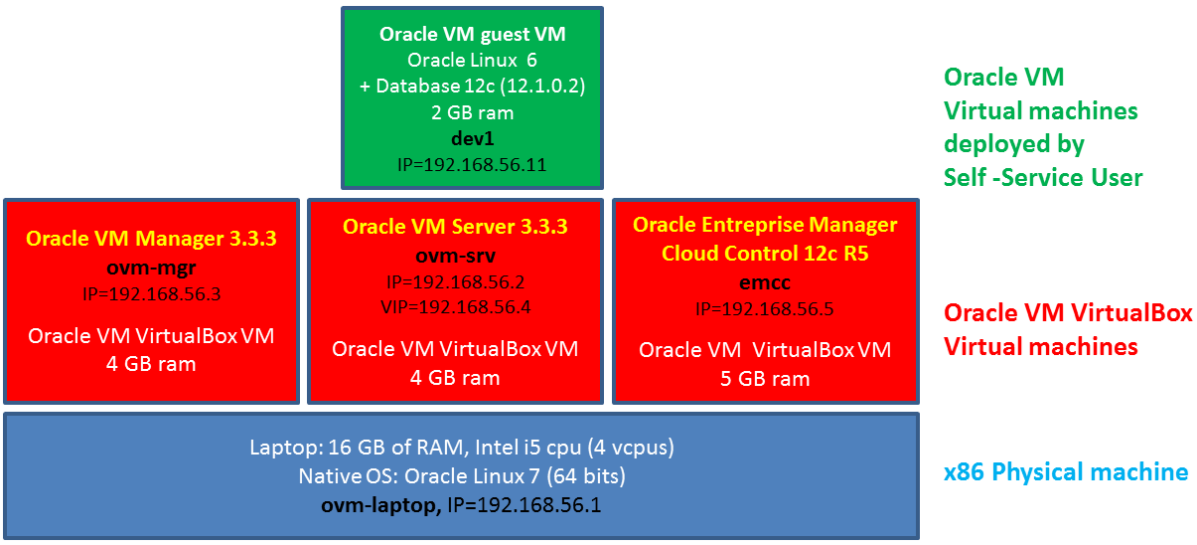
- Deploy a new pluggable database (PDB)
- Access the new PDB

Note: Operations from Oracle VM Manager desktop

To ease reusability of this lab on any X86 server with any X86 operating system, all operations can be done from the Oracle VM Manager gnome desktop (user **ovm** and password **Welcome1**).
By default, the Oracle VM Manager desktop is configured to use a us/qwerty keyboard layout. If you use a different keyboard, you can change the keyboard layout by modifying `Option "XbdLayout" "us"` line in the file `/etc/X11/xorg.conf` (for instance, replace "us" par "fr" for French keyboard layout). Then log out and log in again (user **ovm** and password **Welcome1**)

1.4 Global picture

The following picture shows all the components (VirtualBox and Oracle VM virtual machines) with their hostnames and configuration (memory, IP addresses…)



2 Configuration of the Oracle VM environment from EM

2.1 Start the 3 servers (VirtualBox VMs)

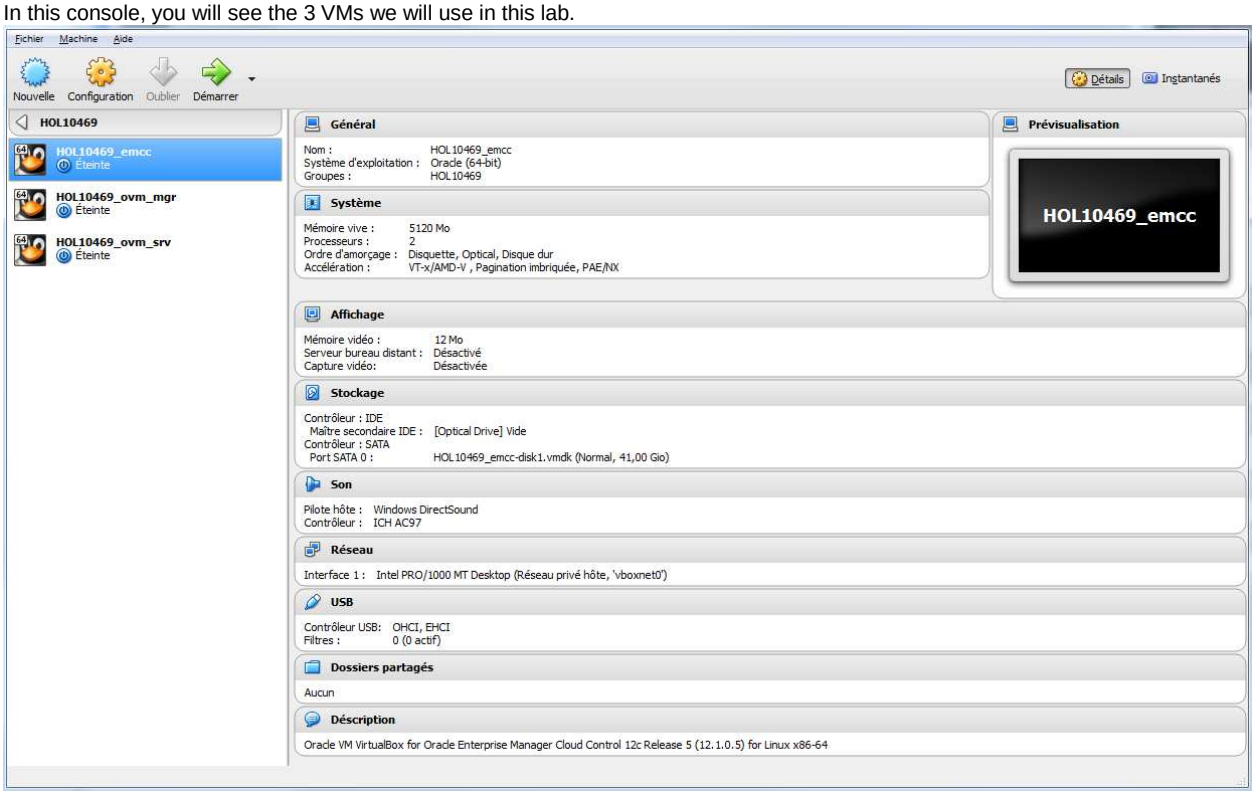
IMPORTANT: Since the VMs startup takes about 15 minutes on our laptops, we advise you to start the 3 VMs as soon as possible when you arrive in the room if they are not already started.

As previously explained, we will use Oracle VM VirtualBox to host the 3 servers (Oracle VM Server, Oracle VM Manager and Oracle Enterprise Manager Cloud Control) on a single laptop.

Those 3 servers were pre-installed and preconfigured before this lab to save time. Thus, you just have to start them here.

a) Start the Oracle VM VirtualBox console if not yet started by clicking icon 

b) In this console, you will see the 3 VMs we will use in this lab.



c) Select the 3 VMs called "**HOL10469_emcc**", "**HOL10469_ovm_mgr**" and "**HOL10469_ovm_srv**"

d) Click the icon  to start them

e) Wait for the 3 VMs to be ready (This will take several minutes)
   - Wait for the prompt "**emcc login:**" on "**HOL10469_emcc**" VM console
   - When this prompt is displayed, all VMs are ready (since EMCC is the longest to start)

Note: If running this lab at office/home on Microsoft Windows machine, you may get a warning about network configuration as the default VirtualBox Ethernet adapter is called "VirtualBox Host-Only Ethernet Adapter" instead of "vboxnet0" on non-Windows machines.

2.2 Connect to Oracle Enterprise Manager Cloud Control 12c console

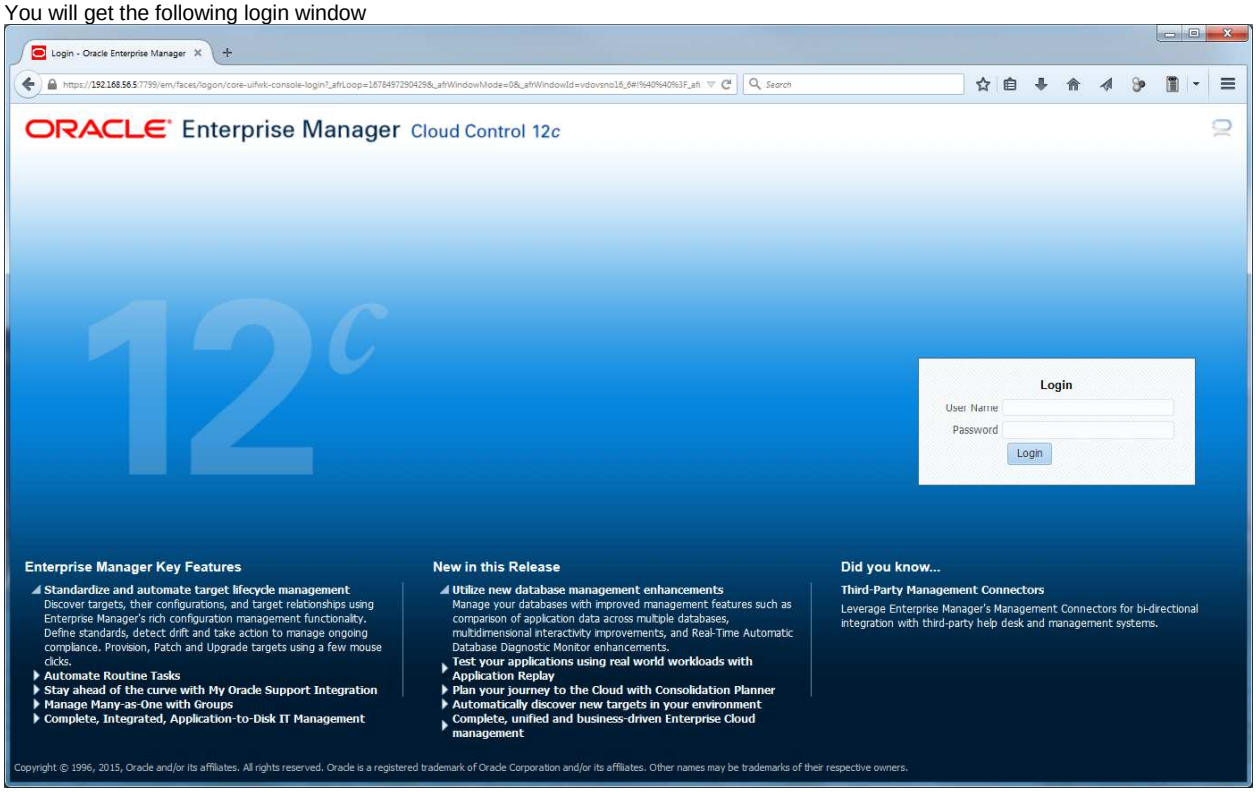
a) In the Oracle VM Manager gnome desktop (already logged as user **ovm** with password **Welcome1**):
   - Switch to Full screen in VirtualBox Console for VM Oracle VM Manager
   - Open a Firefox web browser (Applications, Internet, Firefox Web Browser)
   - Connect to **Oracle Enterprise Manager Cloud Control 12c** console using URL https://192.168.56.5:7799/em

   Note: You may also use a Firefox web browser from your native operating system (Oracle Linux 7.1 at Oracle OpenWorld)

   Note: Firefox Security warning

   Firefox might raise a security warning ("**This Connection is Untrusted**") since the SSL certificated are self-signed. If so, ignore the warning (Expand "**I understand the Risks**", then click "**Add Exception**", and then finally click "**Confirm Security Exception**").

b) You will get the following login window



c) Log in using the following credentials:
   - User Name : **cloudadm** (Oracle Enterprise Manager 12c Cloud Administrator)
   - Password : **cloud**

Note: EMCC users.

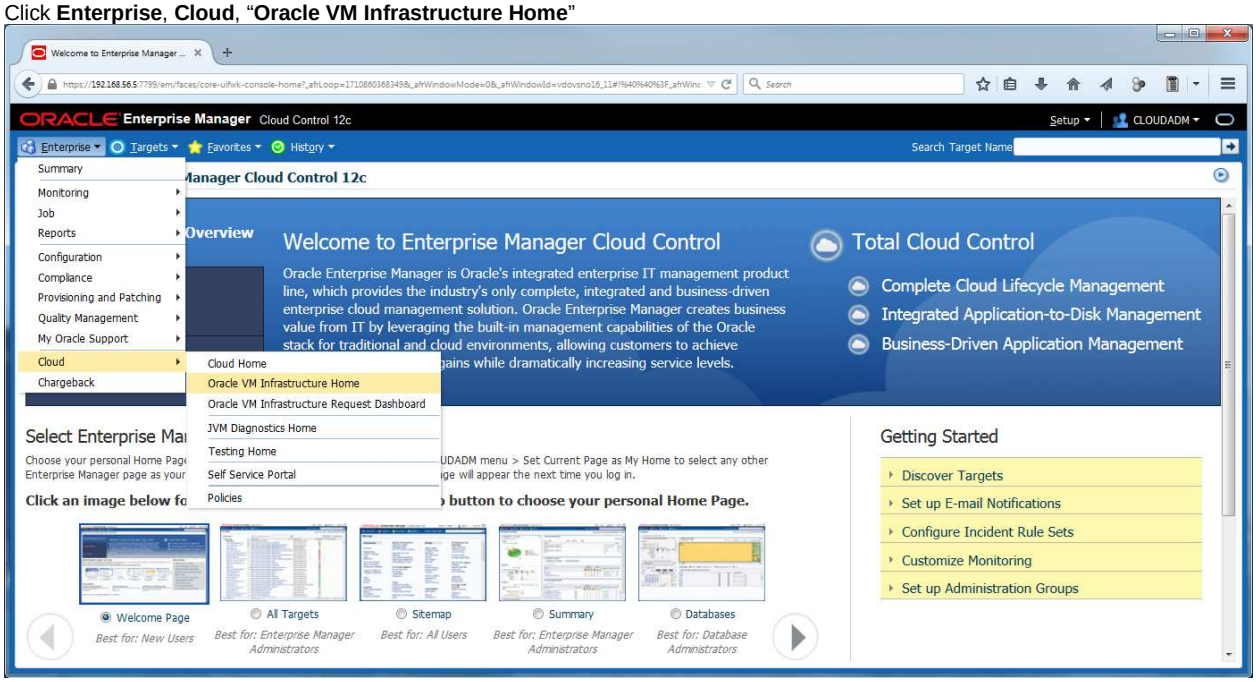
In this lab, we will use three different users in Oracle Enterprise Manager:
- **cloudadm** : the Cloud Administrator
- **dev_vm1** : a Self Service user representing a developer that will request a full virtual machine (Linux 6 + DB12c)
- **dev_pdb1** : a Self Service user representing a developer that will request a DB12c pluggable database (PDB)

Those users were created by the EMCC Super Administrator (**sysman**) during the preparation of lab environment to save time (see details in Appendix A)

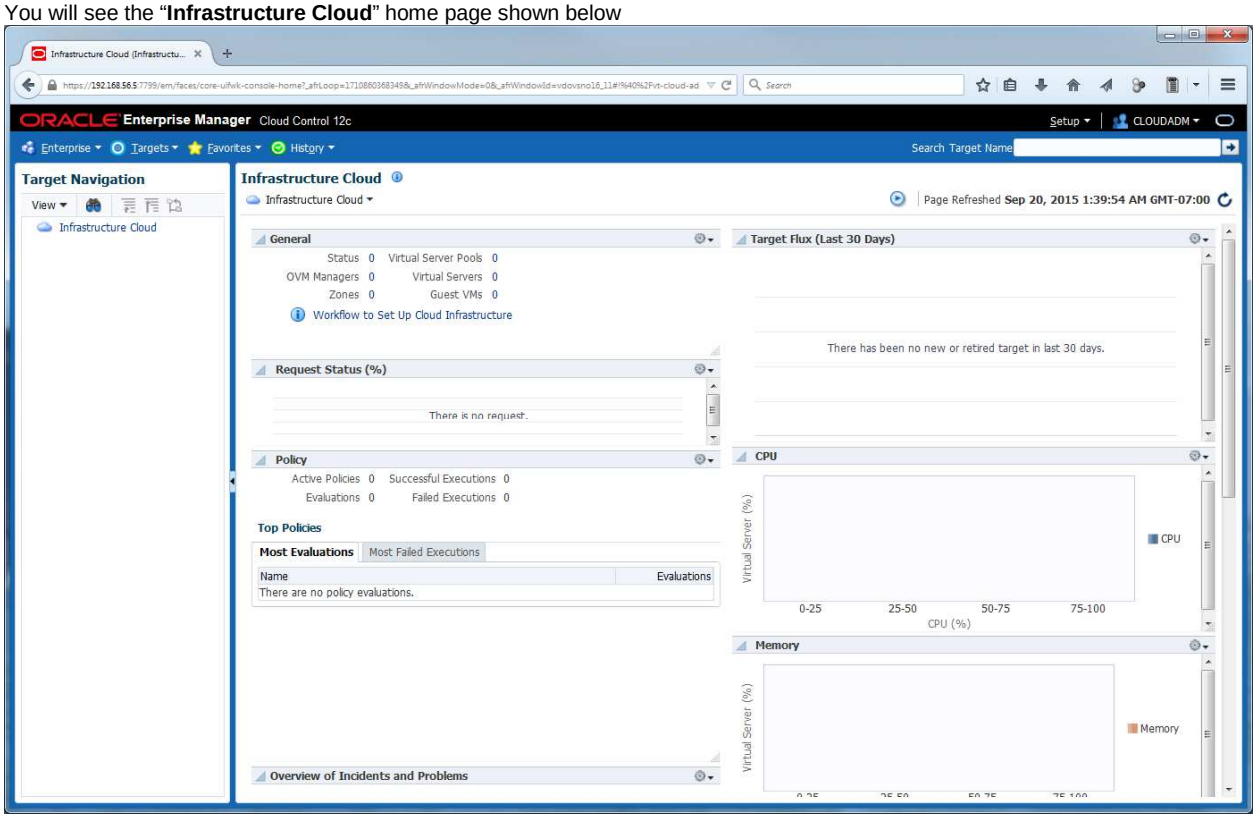
2.3 Register the Oracle VM Manager

a) Ignore "**Accessibility Preference**" by clicking "**Save and continue**"

b) Click **Enterprise**, **Cloud**, "**Oracle VM Infrastructure Home**"



You will see the "**Infrastructure Cloud**" home page shown below

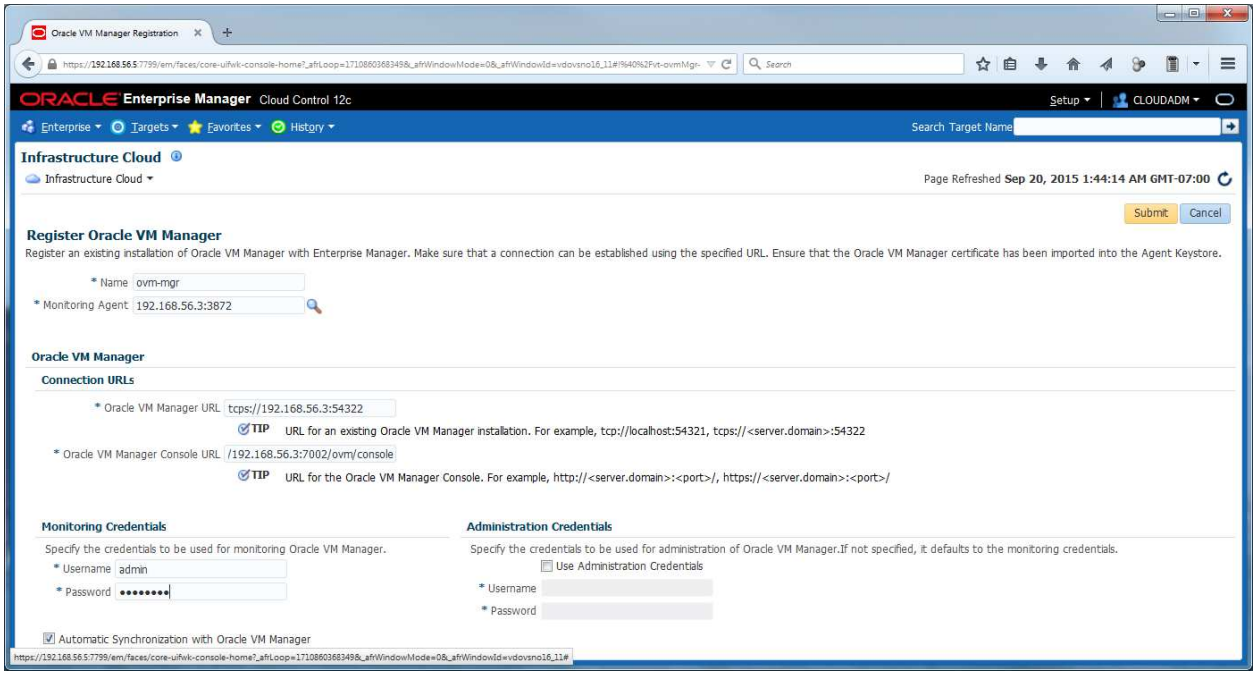


c) Right click "**Infrastructure Cloud**" then click "**Register OVM Manager**"

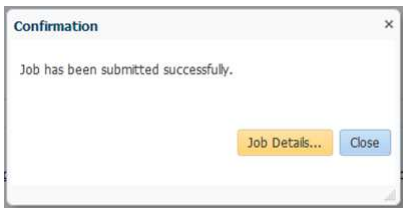
d) Enter the following information:

- Name : **ovm-mgr**
- Monitoring Agent : **192.168.56.3:3872** (click icon to select this agent)
- Oracle VM Manager URL : **tcps://192.168.56.3:54322**
- Oracle VM Manager Console URL : **https://192.168.56.3:7002/ovm/console**
- Username : **admin**
- Password : **Welcome1**

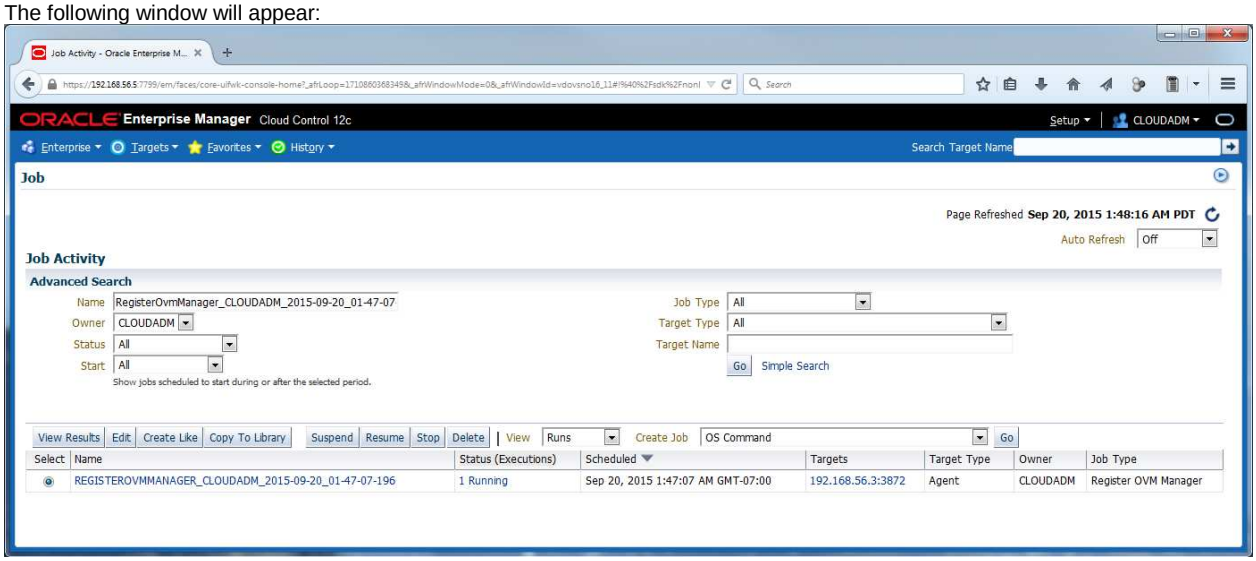
Then click "**Submit**"



e) A confirmation window will pop-up stating that a job has been successfully submitted and asking whether you want to close the window or display the job details.

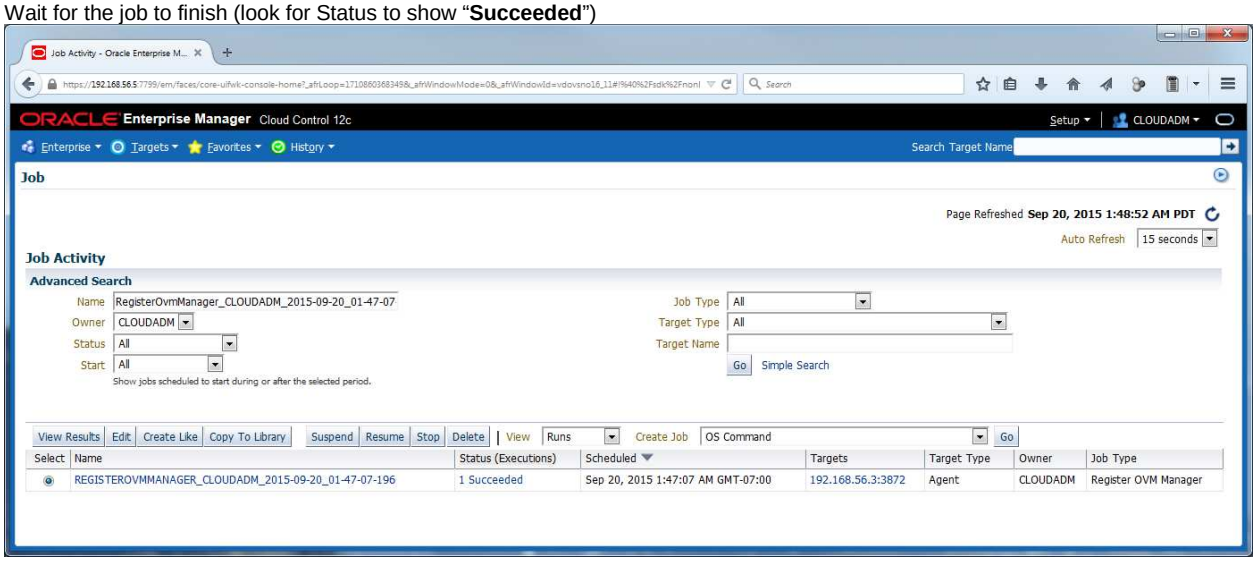


f) Click "**Job Details…**" to see the job details
The following window will appear:



g) Select "**15 seconds**" in the "**Auto Refresh**" drop down menu
(By default, this page does not refresh automatically).

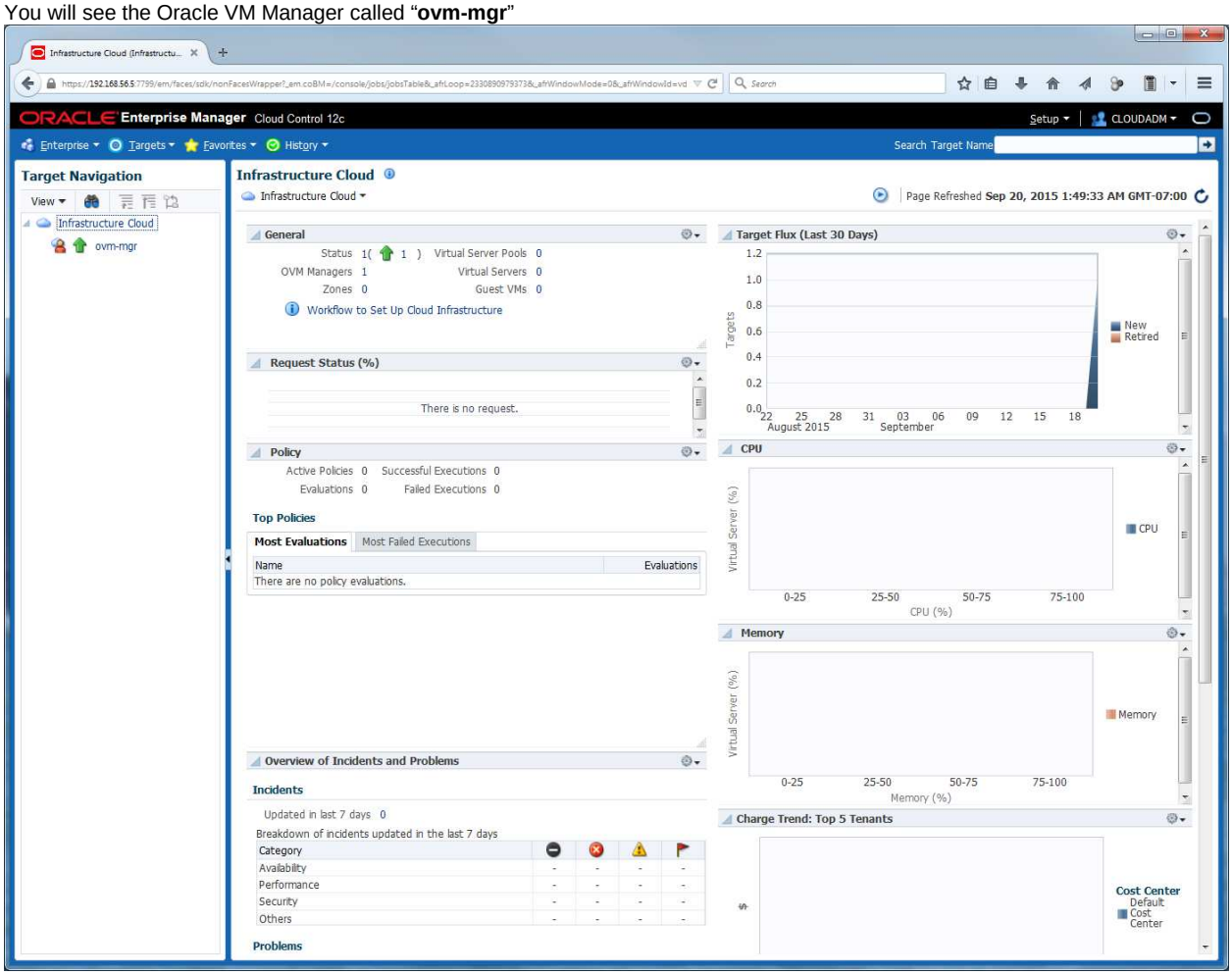
h) Wait for the job to finish (look for Status to show "**Succeeded**")



i) If it fails, start again from step a), you might have entered incorrect information.

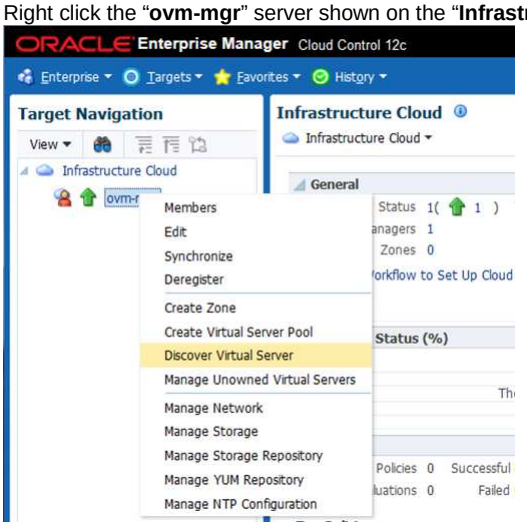
j) Click **Enterprise**, **Cloud**, "**Oracle VM Infrastructure Home**" to go back the "**Infrastructure Cloud**" home page.

You will see the Oracle VM Manager called "**ovm-mgr**"



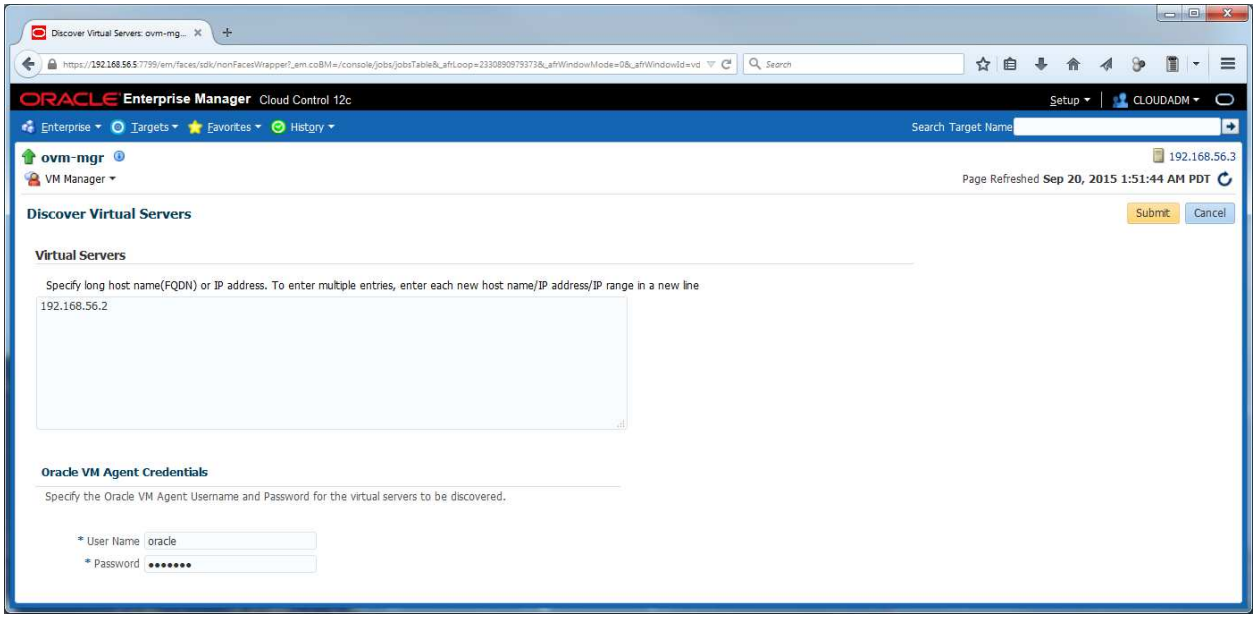
2.4 Discover the Oracle VM server

a) Right click the "**ovm-mgr**" server shown on the "**Infrastructure Cloud**" home page, then click "**Discover Virtual Server**"



b) Enter the following information in the new window:
- o Virtual Servers : **192.168.56.2**
- o Oracle VM Agent Credentials (The Oracle VM Agent runs on the Oracle VM Server)
  - User Name : **oracle**
  - Password : **ovsroot**

Then click "**Submit**"



c) In the "**Confirmation**" window, click "**Job Details…**" to see the job details.

d) Wait for the job to finish (look for Status to show "**Succeeded**")

2.5 Configure the network

A basic network configuration was automatically done during the Oracle VM Server discovery.

A single network called "**192.168.56.0**" was created with the following roles:

- Server Management
- Cluster HeartBeat
- Live Migration

The "**Storage"** role is used when accessing storage with IP protocol (NFS or ISCSI). In our case, we will use a physical disk, so we don't need the storage role.

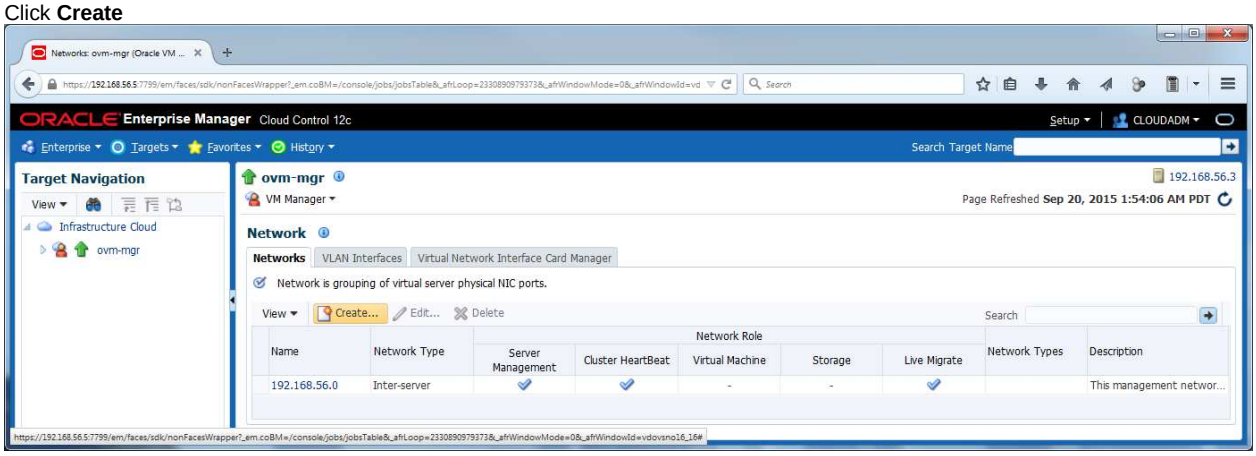
The "**Virtual Machine**" role gives access to network(s) to the virtual machines, so we need to have at least one network with this role. In our case, we will create a new network for this role, using the second Ethernet Adapter on the Oracle VM Server (**eth1**).

For simplicity here, we will use the same network **192.168.56.0** (virtual network defined in VirtualBox manager) and IP address **192.168.56.**6 for this port. In real life, it is recommended to use a different network.

a) Click **Enterprise**, **Cloud**, "**Oracle VM Infrastructure Home**" to go back the "**Infrastructure Cloud**" home page.

b) Right click "**ovm-mgr**" then click "**Manage Network**"

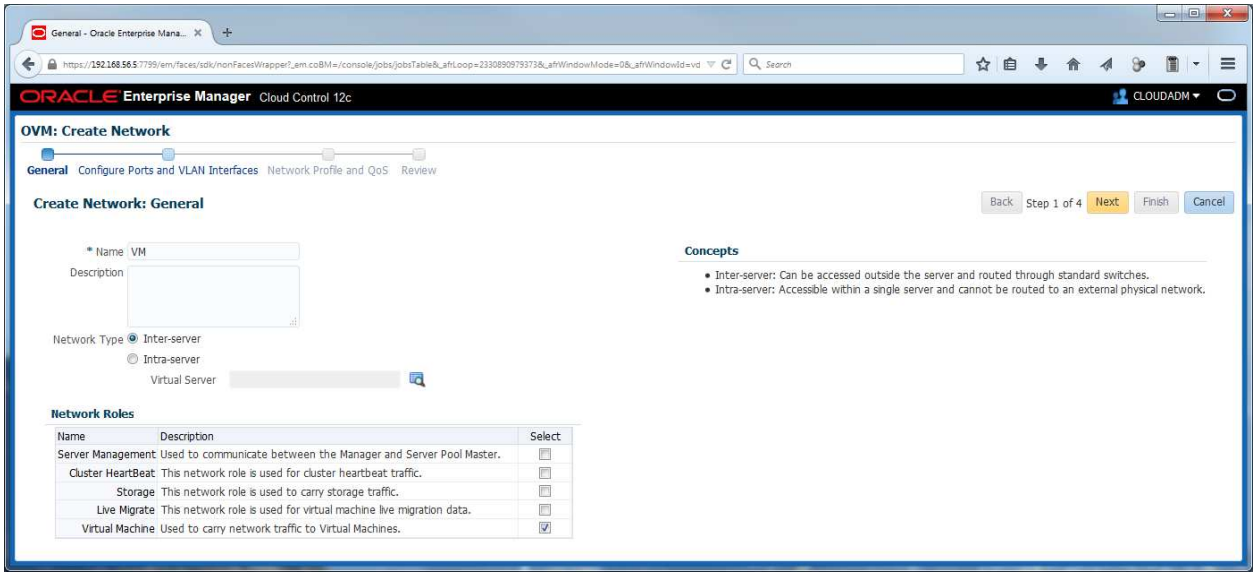
c) Click **Create**



d) Click "**Continue Network Creation**"

e) In the "Create Network: General" window,

- Enter "**VM**" for Name
- Leave default values (Network Type "**Inter-server**", and Role "**Virtual Machine**")
- Click **Next**

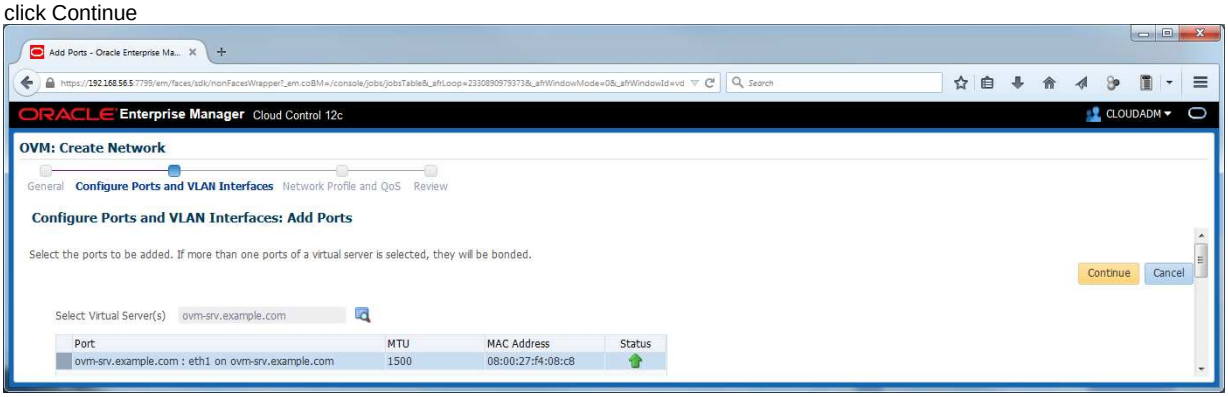


f) In the "**Create Network: Configure Ports and VLAN interfaces**" window,

- In the **Ports** panel, click **Add**

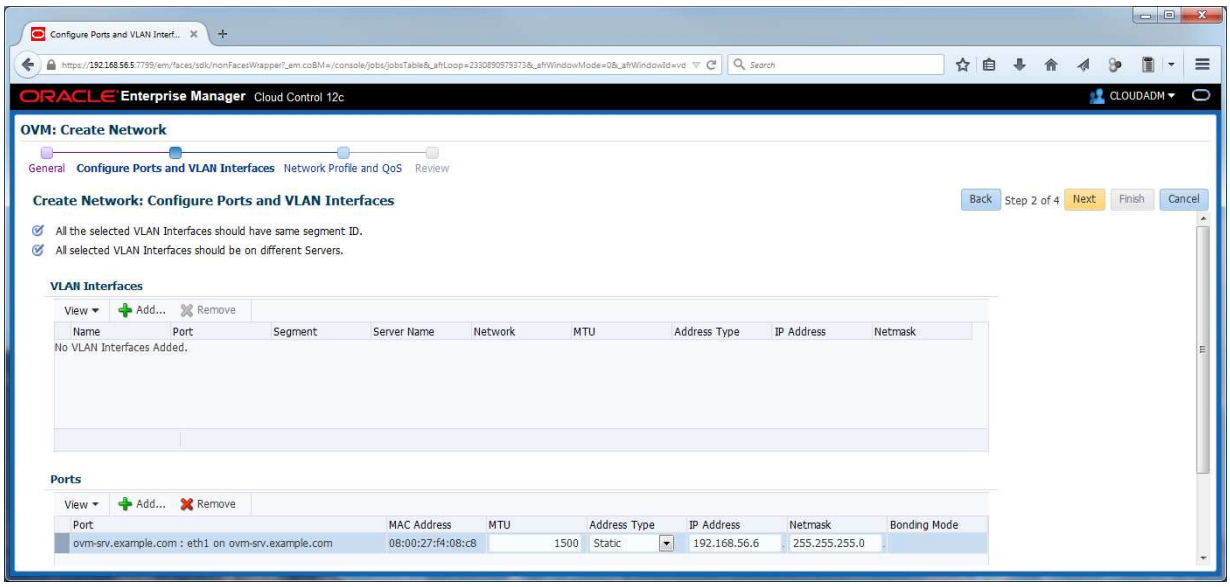
- Select Virtual Server **ovm-srv.example.com**,
  This will add line "ovm-srv.example.com: eth1 on server ovm-srv.example.com" in the Ports list

- Select port **eth1** (line **ovm-srv.example.com: eth1** on server **ovm-srv.example.com**)
- click Continue



- In the "Create Network: Configure Ports and VLAN Interfaces" window, enter IP address
  - "Adress Type" : select "**Static**"
  - "IP Address" : enter **192.168.56.6**
  - "Netmask" : enter **255.255.255.0**

  Then click **Next**

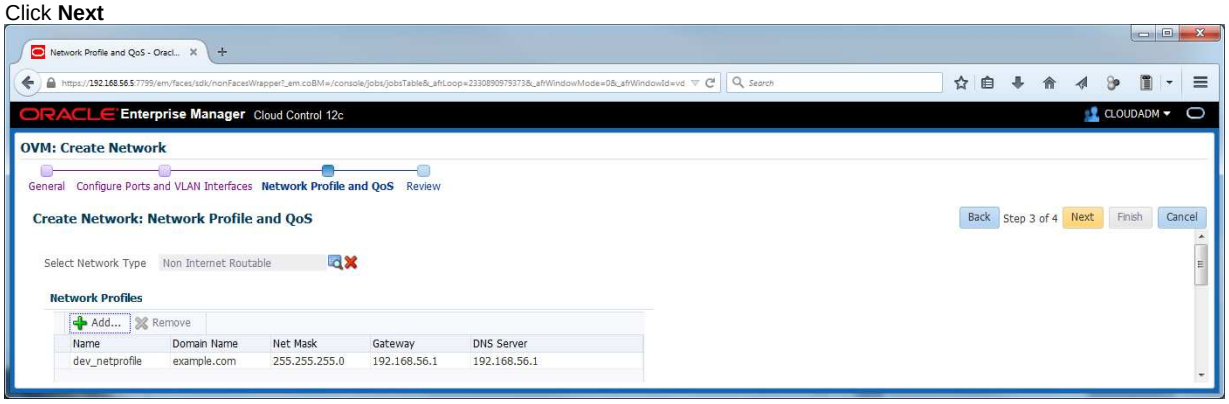


g) In the "**Create Network: Network Profile and QoS**" window:

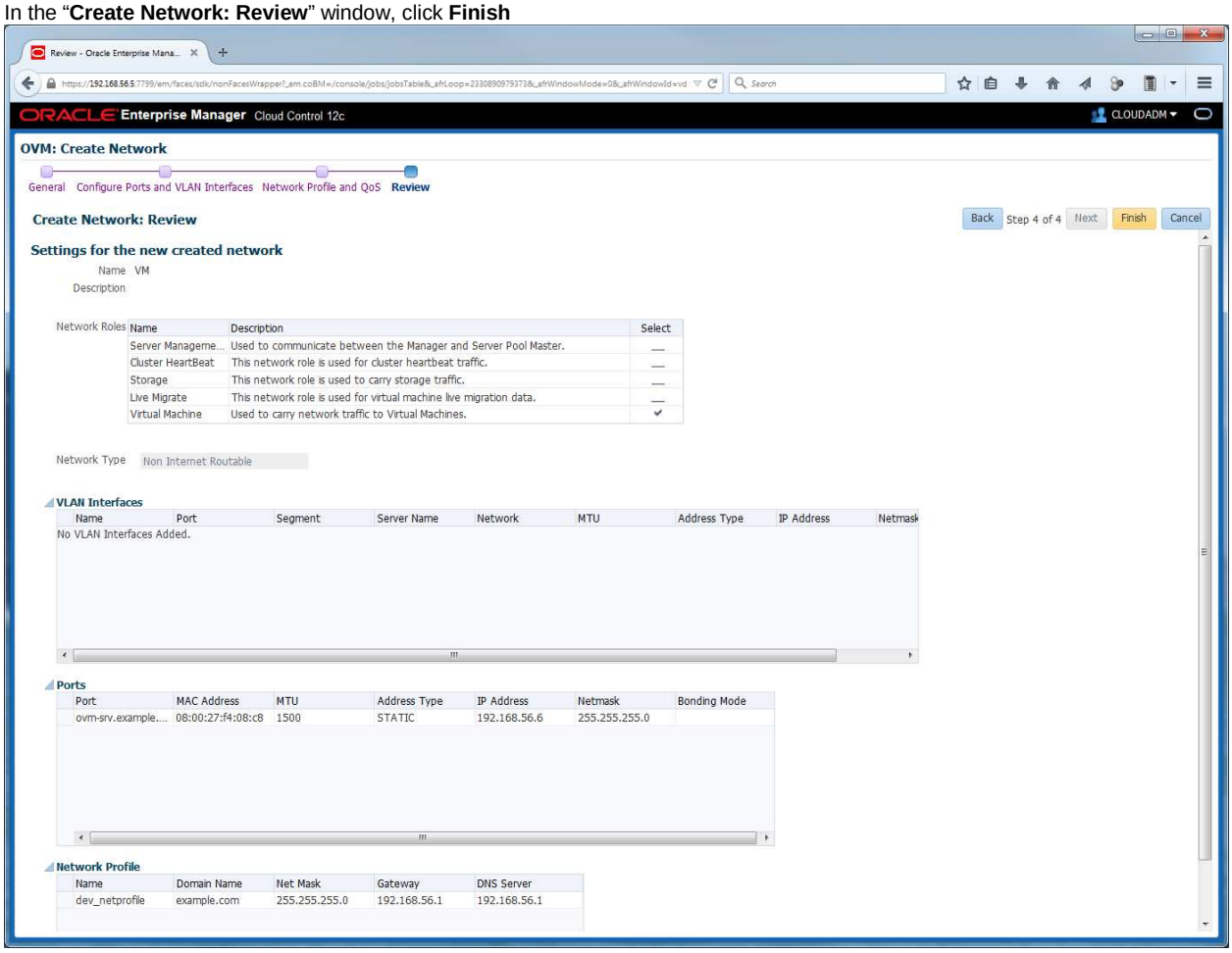
- o click icon to select the network type

- o Select "**Non Internet Routable**" and click **Select**
- o In the "**Network Profile**" section, click **Add**
- o Select the "**dev_netprofile**" profile and click **OK**

- o Click **Next**



h) In the "**Create Network: Review**" window, click **Finish**



i) In the "**Confirmation**" window, click "**Job details…**" to see the job details.

j) Make sure that "**Auto Refresh**" is set to "**15 Seconds**".

k) Wait for the job to finish (look for Status to show "**Succeeded**")

Note: network profile

A network profile is used to automate assignment of IP addresses to guest virtual machines. A network profile is a list of IP address along with host names. It defines a set of IP addresses, their associated host-names, and common networking attributes for them.

During the preparation of the lab, we created a network profile called **dev_netprofile** with the following parameters:

- IP addresses : **192.168.56.11** to **192.168.56.20** (range of 10 addresses)
- Netmask : **255.255.255.0**
- Hostnames : **dev1** to **dev10**
- Domain name : **example.com**
- Gateway : **192.168.56.1**
- DNS : **192.168.56.1**

2.6 Create the VNICs

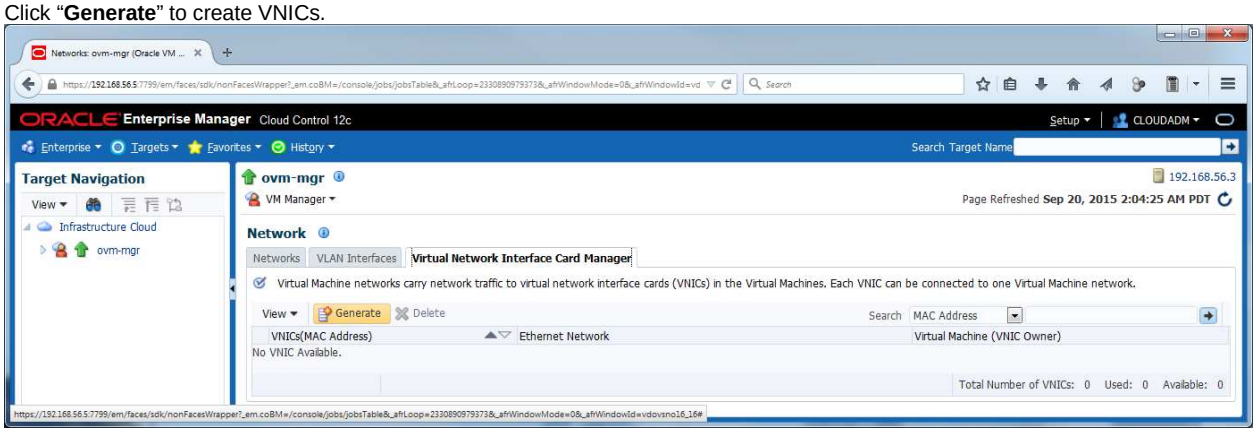
We will now create some VNICs (Virtual Network Interface Cards) that will be used later by the Oracle VM virtual machines.

a) Click **Enterprise**, **Cloud**, "**Oracle VM Infrastructure Home**" to go back the "**Infrastructure Cloud**" home page.

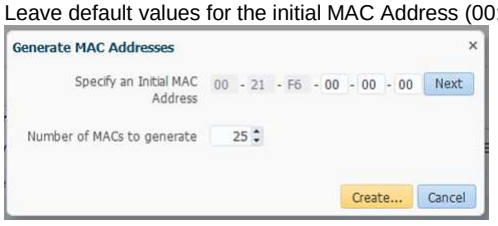
b) Right click "**ovm-mgr**" then click "**Manage Network**"

c) Click the "**Virtual Network Interface Card Manager**" tab

d) Click "**Generate**" to create VNICs.



e) Leave default values for the initial MAC Address (00:21:F6:00:00:00) and for the number of addresses (25) and click "**Create**"



Note: Since the VirtualBox virtual machines network connections are "host only", they cannot have access to external network, so we can use the same MAC addresses for the VNICs on the all laptops during Oracle OpenWorld Hands On Lab.

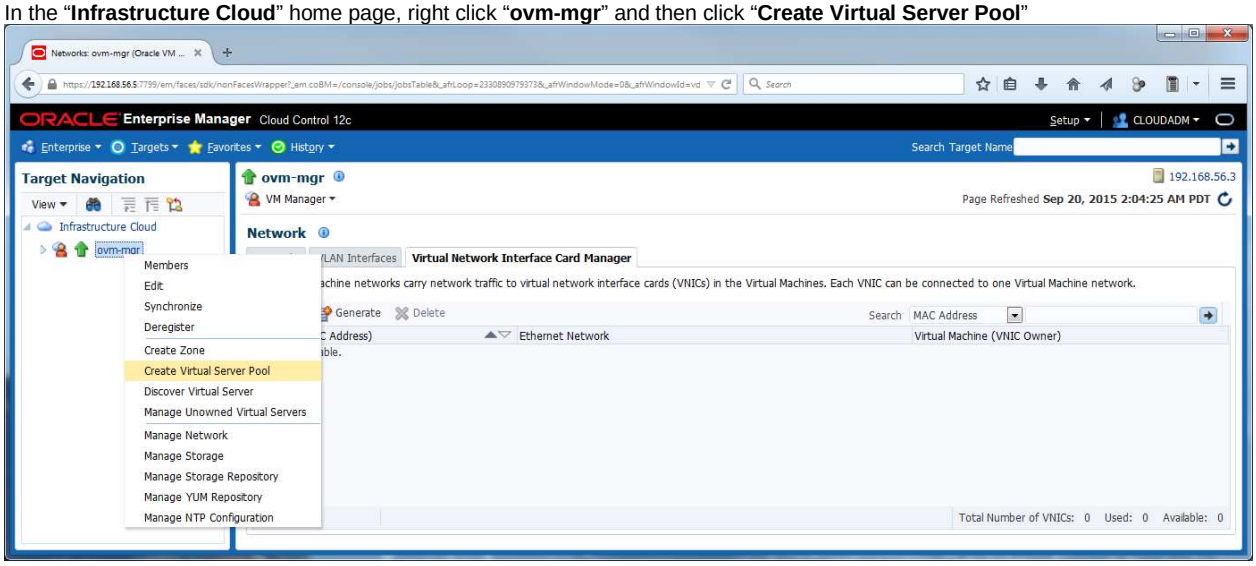
f) In the "**Confirmation**" window, click "**Close**".
(We will save time here by not looking at the job details)

2.7 Create a server pool

A **virtual server pool** contains one or more virtual servers and guest virtual machines. A virtual server can belong to one and only one virtual server pool at a time. Guest virtual machines and resources are also associated with the server pools. A **clustered server pool** may contain several virtual servers sharing a storage system. VMs within a clustered server pool may be live migrated from a virtual server to another.

We will now create a non-clustered server pool using the single Oracle VM server we have.
(we cannot create a clustered server pool since we don't have a shared storage system here).

a) In the "**Infrastructure Cloud**" home page, right click "**ovm-mgr**" and then click "**Create Virtual Server Pool**"

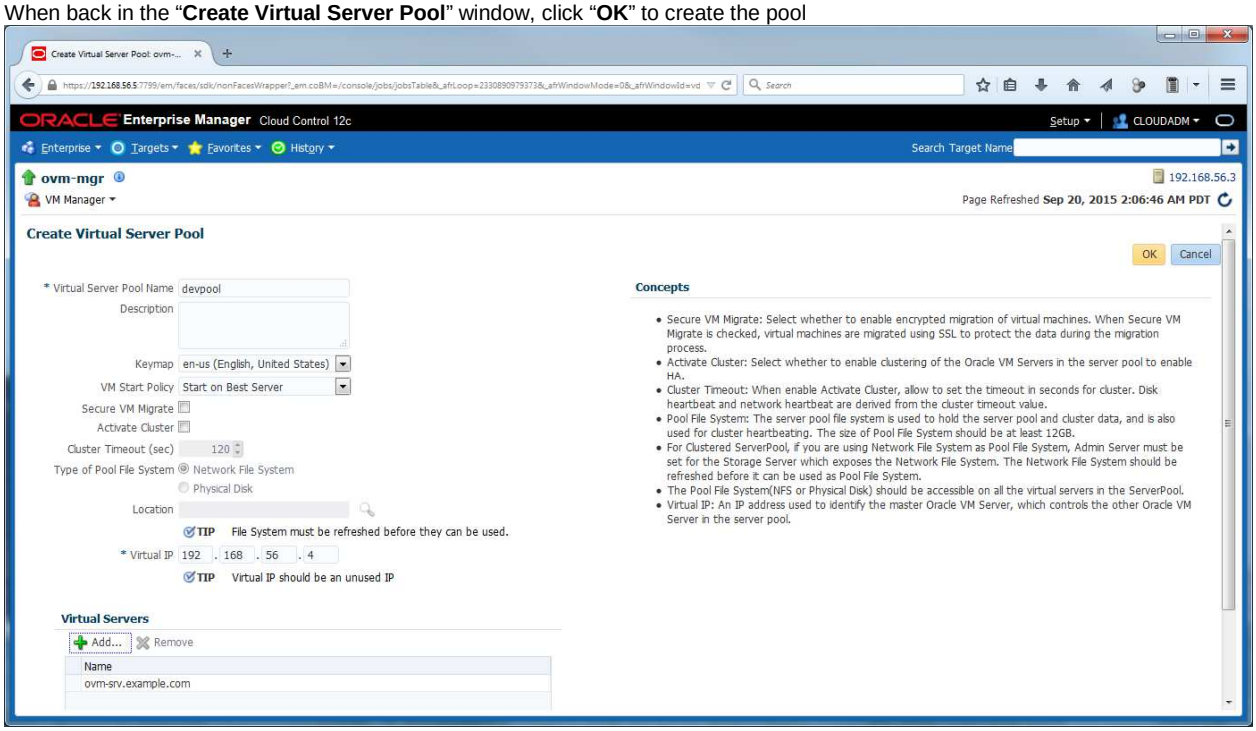


b) In the "**Create Virtual Server Pool**" window, enter the following information
- Virtual Server Pool Name : **devpool**
- Activate Cluster : **<unchecked>** (non-clustered pool)
- Virtual IP : **192.168.56.4**

c) In the "**Virtual Servers**" section, click Add... to choose the server to add to the pool

d) In the "**Select: Targets**" window, select the target "**ovm-srv.example.com"** and click "**Select**"

e) When back in the "**Create Virtual Server Pool**" window, click "**OK**" to create the pool

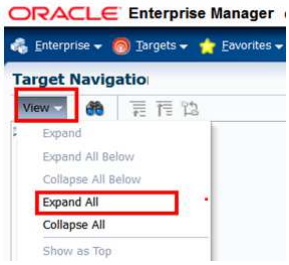


f) In the "**Confirmation**" window, click "**Job details…**" to see the job details.

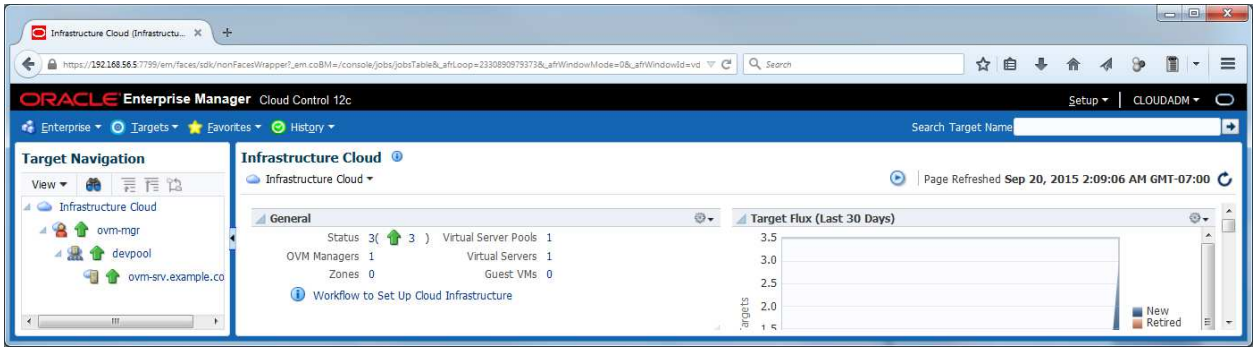
g) Make sure that "**Auto Refresh**" is set to "**15 Seconds**".
Wait for the job to finish (look for Status to show "**Succeeded**")

h) Click **Enterprise**, **Cloud**, "**Oracle VM Infrastructure Home**" to go back the "**Infrastructure Cloud**" home page.

i) Click "**View**", "**Expand All**" to see all components



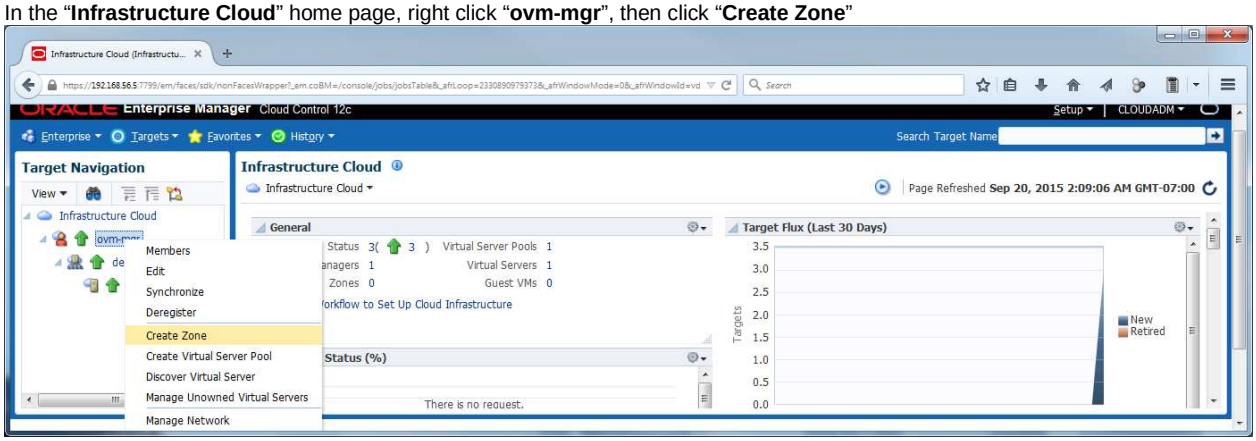
j) You should now see the newly created pool called "**devpool**"



2.8 Create a zone

A zone is used to group related cloud resources together. Cloud zones can be created based on location, software lifecycle status, for grouping resources according to a cost center or for metering and chargeback purposes. Typically, a zone can cover a department or possibly a small data center.
Note: Zones are Enterprise Manager Cloud Control objects, and thus are not known by Oracle VM Manager

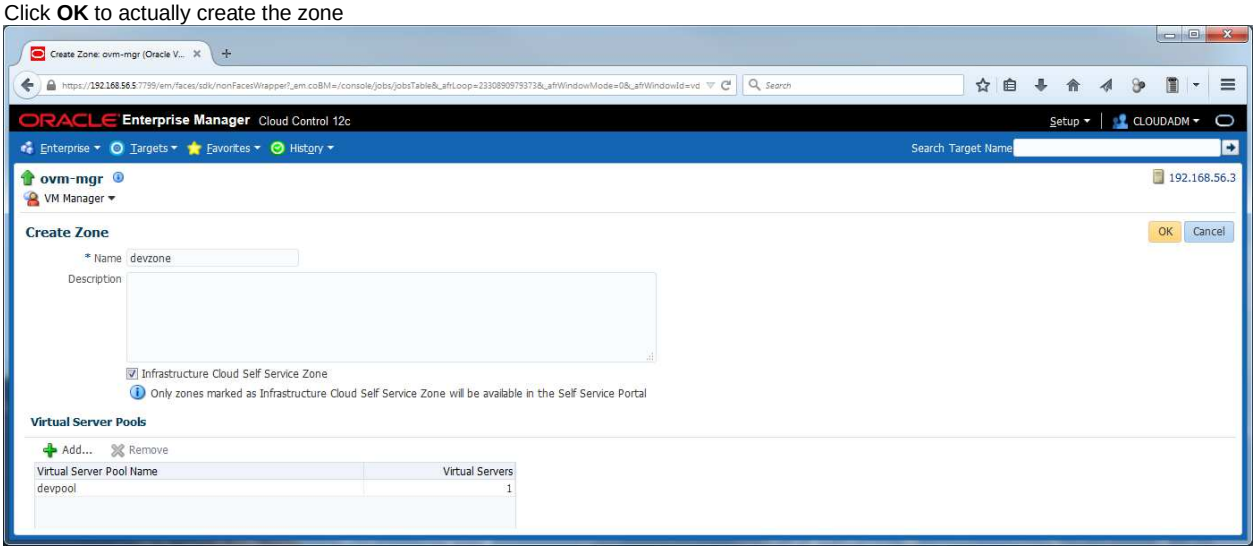
a) In the "**Infrastructure Cloud**" home page, right click "**ovm-mgr**", then click "**Create Zone**"



b) In the "**Create Zone**" window:
- Enter **devzone** as the Name
- Check the box "**Infrastructure Cloud Self Service Zone**" IMPORTANT: make sure not to forget this
- click Add… to add a pool to the zone
- In the "Select Virtual Server Pools" window:
  - Select the **devpool** line

  - Click **Select**

- Click **OK** to actually create the zone



c) In the "**Confirmation**" window, click "**Job details…**" to see the job details.

d) Wait for the job to finish (look for Status to show "Succeeded")

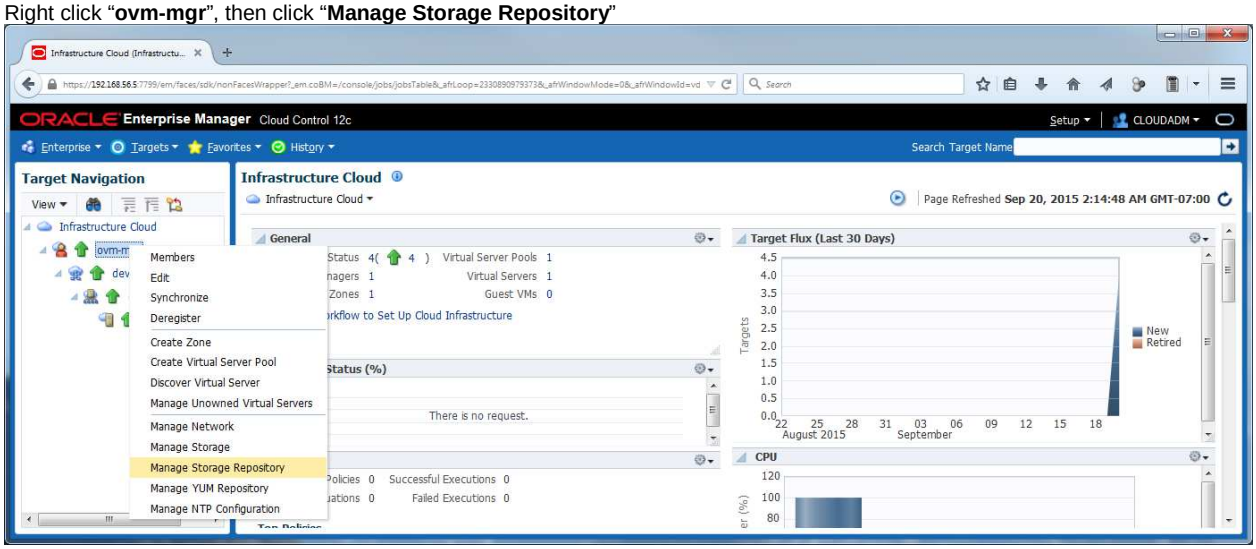
2.9 Create a storage repository

A **storage repository** is virtual disk space on top of physical storage hardware, made available to the Oracle VM Servers in a server pool or various server pools. It defines where Oracle VM resources may reside. Resources include virtual machines, templates for virtual machine creation, virtual machine assemblies, ISO images, shared virtual disks, and so on.

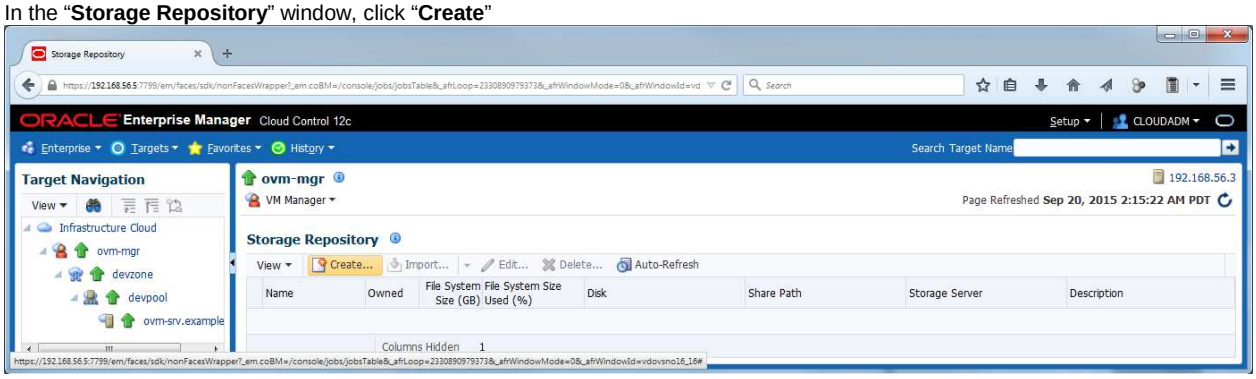
We will create a storage repository for Oracle VM on a local HDD (150 GB) on the Oracle VM Server.

a) Click **Enterprise**, **Cloud**, "**Oracle VM Infrastructure Home**" to go back the "**Infrastructure Cloud**" home page.

b) Right click "**ovm-mgr**", then click "**Manage Storage Repository**"

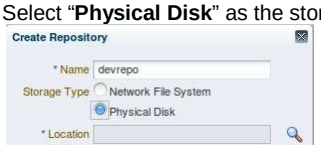


c) In the "**Storage Repository**" window, click "**Create**"

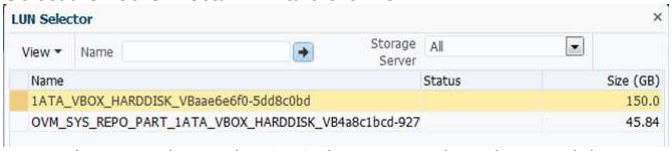


d) In the "**Create Repository**" window,

- Enter "**devrepo**" as the name of the repository
- Select "**Physical Disk**" as the storage type



- Click the icon  next to "**Location**" to choose the physical disk to use
- This will open the "**LUN Selector**" window
- Select the 150 GB local HDD and click "**OK**"

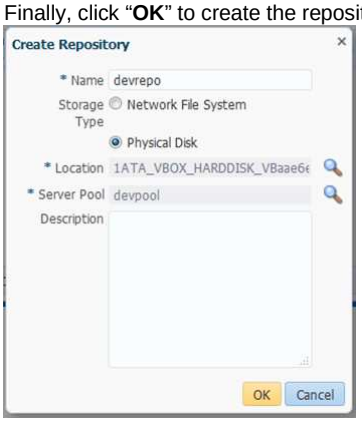


Note: The second HDD (45.84 GB) corresponds to the remaining unpartitioned space on the Oracle VM server boot disk

- Click the icon  next to "**Server Pool**" to choose the server pool to use
- This will open the "**Select: Targets**" window

- Select the target "**devpool**" and click "**Select**"

- Finally, click "**OK**" to create the repository



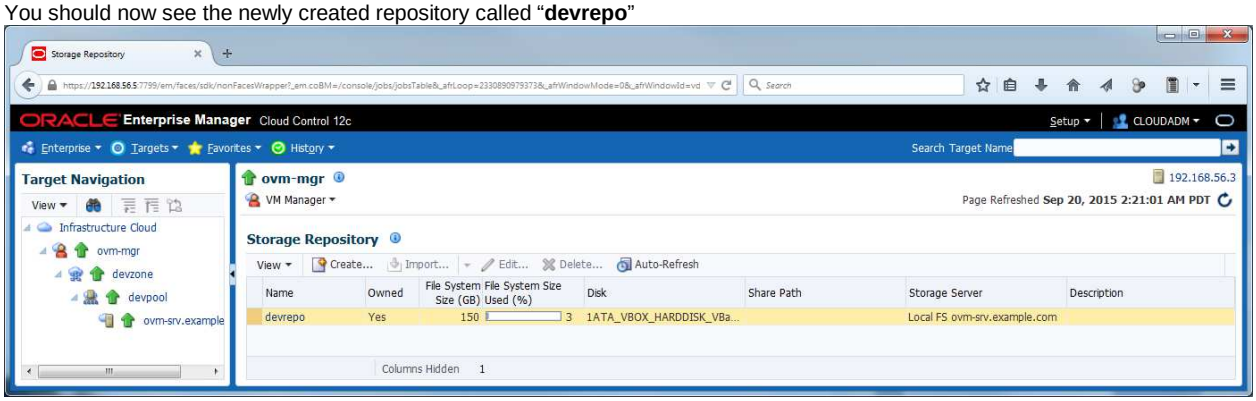
e) In the "**Confirmation**" window, click "**Job details…**" to see the job details.

f) Wait for the job to finish (look for Status to show "**Succeeded**")

g) Click **Enterprise**, **Cloud**, "**Oracle VM Infrastructure Home**" to go back the "**Infrastructure Cloud**" home page.

h) Right click "**ovm-mgr**", then click "**Manage Storage Repository**"

You should now see the newly created repository called "**devrepo**"

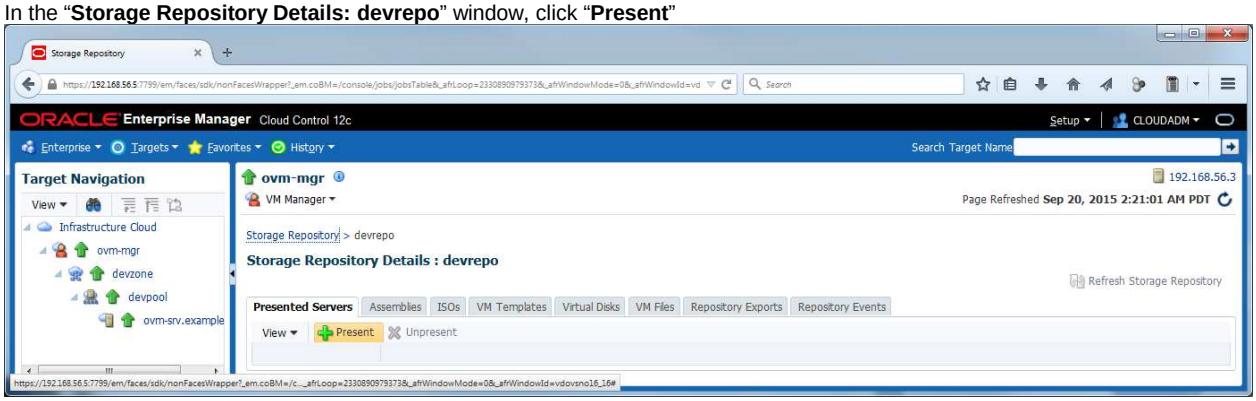


2.10 Present the repository to the Oracle VM server

Before it can be used by our Oracle VM Server, our storage repository must first be presented to this server.

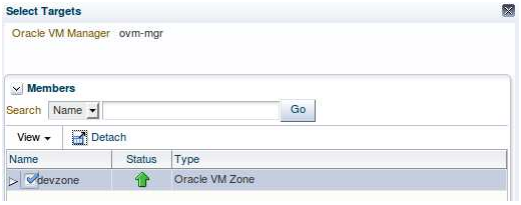
a) In the "**Storage Repository**" window, click the repository "**devrepo**"

b) In the "**Storage Repository Details: devrepo**" window, click "**Present**"



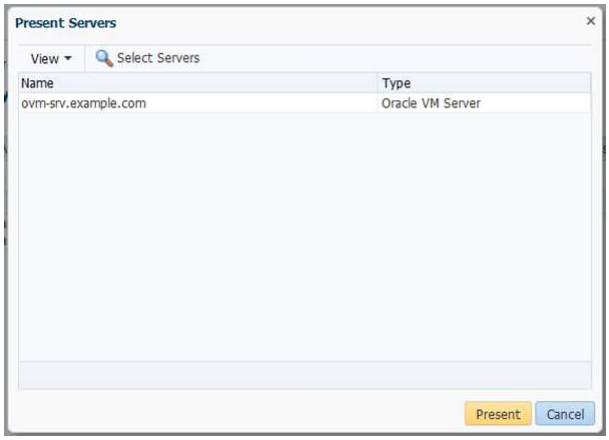
c) In the "**Present Servers**" window, click "**Select Servers**"

d) In the "**Select Targets**" window,
- Click the checkbox in front of "**devzone**" (NOTE: it may take a few seconds to display devzone)
- Then click "**Select**"



In the "**Present Servers**" window, you should now see the server "**ovm-srv.example.com**"

e) Click "**Present**"



f) In the "**Confirmation**" window, click "**Job Details…**" to see the job details.

g) Wait for the job to finish (look for Status to show "**Succeeded**")

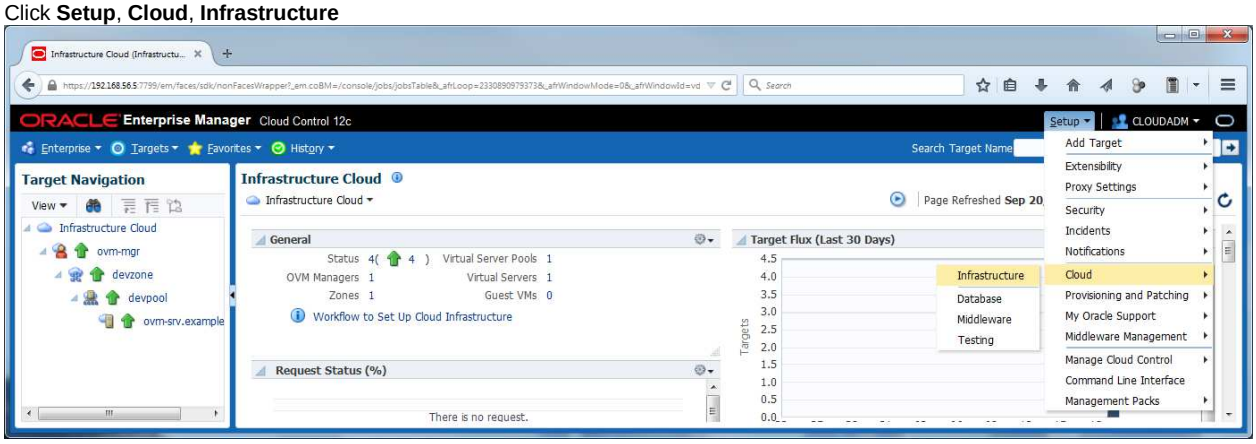
3 Instance as a Service: configuration

3.1 Request Settings

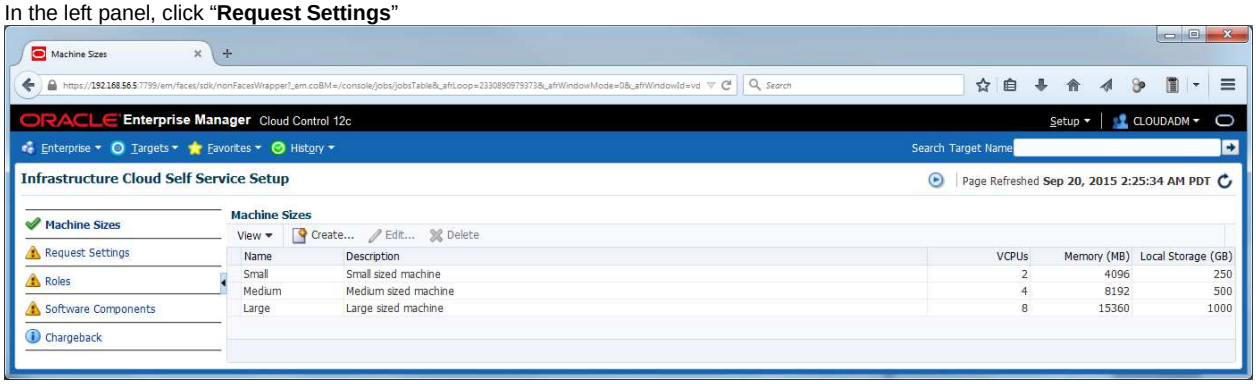
The infrastructure cloud based on Oracle VM is now setup. We will now authorize some Self Service users to deploy their own virtual machines on the zone we created using an Oracle VM assembly for Database 12c.
We will also setup some resource limits to avoid a specific user to consume all resources.

In this "**Request Settings**" section, we will configure miscellaneous settings.

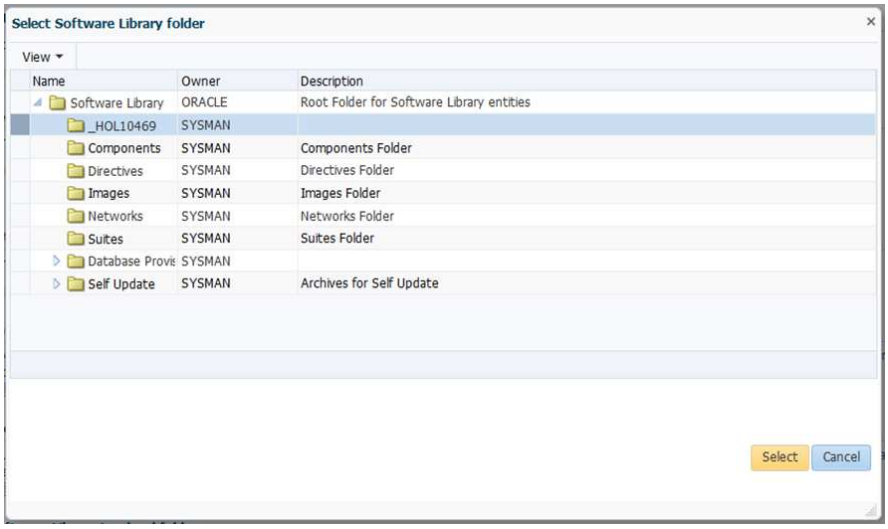
a) Click **Setup**, **Cloud**, **Infrastructure**



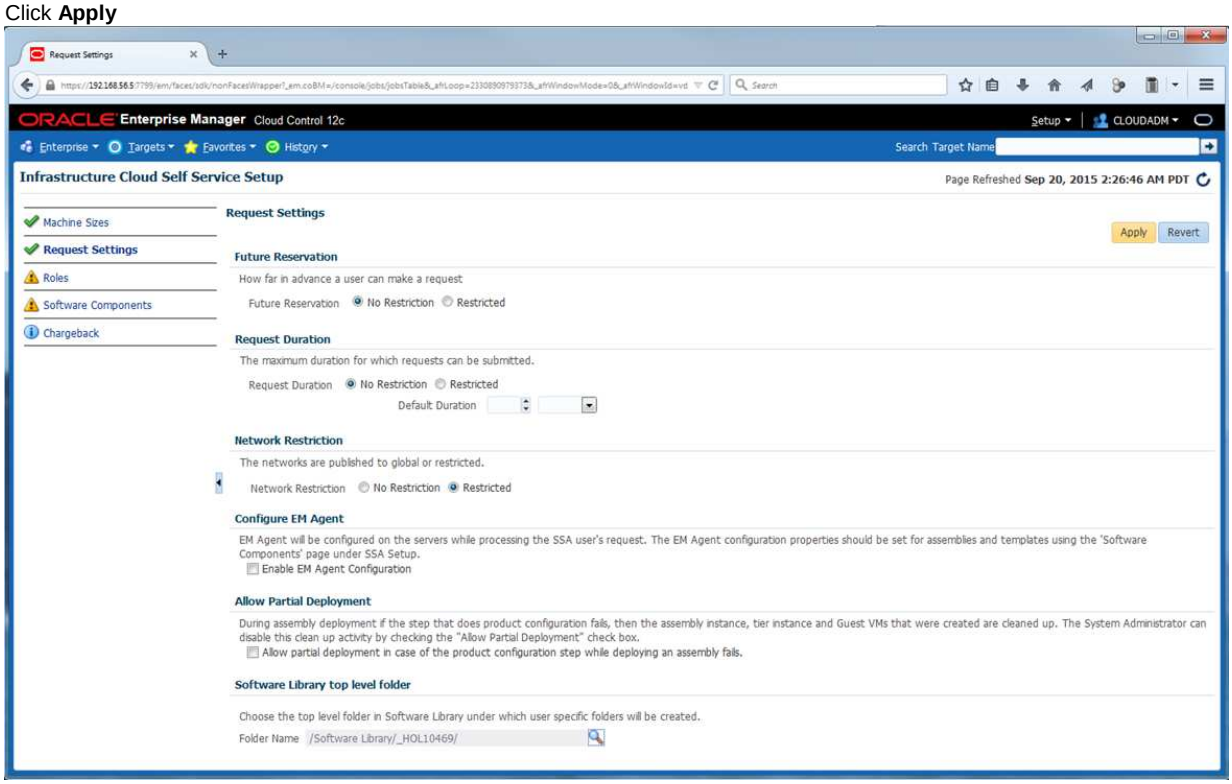
b) In the left panel, click "**Request Settings**"



c) In the "**Request Settings**" section:
- "**Future Reservation**" : Leave default value ("**No restriction**")
- "**Request Duration**" : Leave default value ("**No restriction**")
- "**Network Restriction**" : Select "**Restricted**"
- "**Configure EM Agent**" : Leave default value (**<unchecked>**)
- "**Allow Partial Deployment**" : Leave default value (**<unchecked>**)
- Click icon 🔍 next to "**Folder Name**" to select the "**Software Library top level folder**"
  - Select line **_HOL10469**
  - Click **Select**



o Click **Apply**



Note: in this lab, we chose not to deploy the Oracle EM Agent on the Guest VMs to save time. In real life, it is recommended to deploy the EM agent.

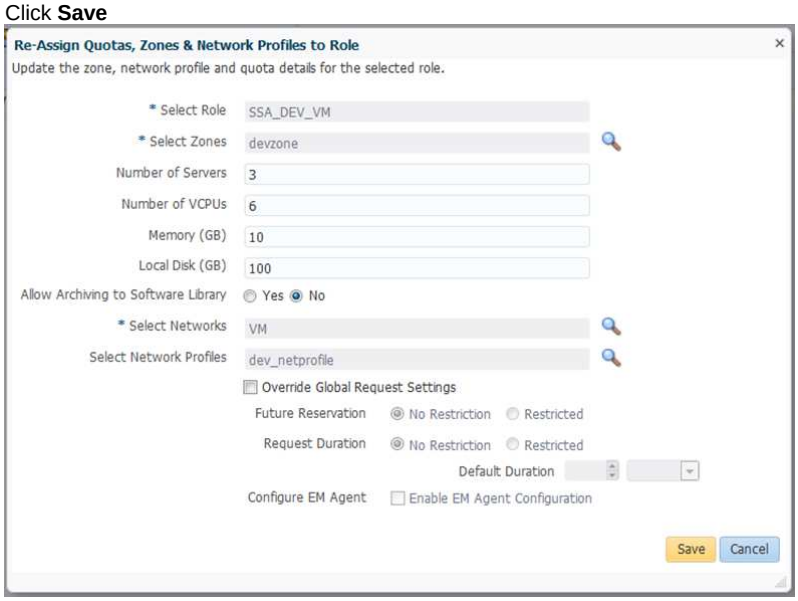
3.2 Roles

In this section, we will grant some rights and assign resources quotas to EM12c Self Service users using a specific role (**SSA_DEV_VM**)

a) In the left panel, click "**Roles**"

b) In the "**Roles**" section, click "**Assign Quota to Role**"

c) In the "**Assign Quotas, Zones & Network profiles to Role**" window:
- Select role **SSA_DEV_VM**
- Select zone **devzone**
- Enter the following information (resource limits for all Self Service users with role SSA_DEV_VM)
  - Number of Servers : **3**
  - Number of VCPUs : **6**
  - Memory (GB) : **10**
  - Local Disk (GB) : **100**
- Select Networks : select network **VM**
- Select Network Profile **dev_netprofile**
- Leave default values for others parameters
- Click **Save**

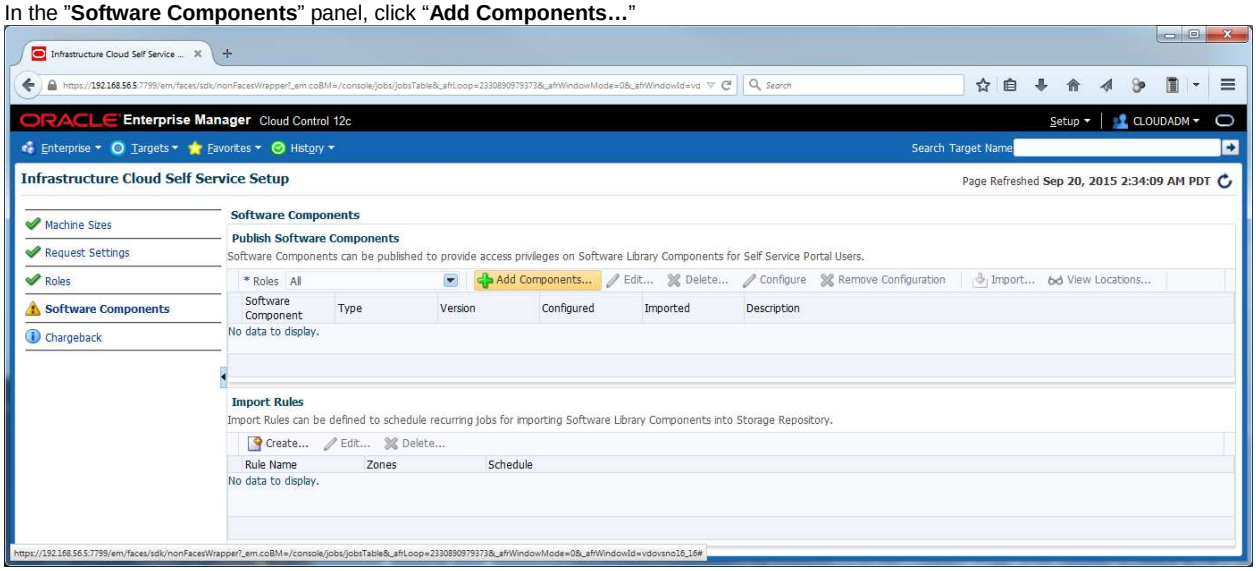


3.3 Software components

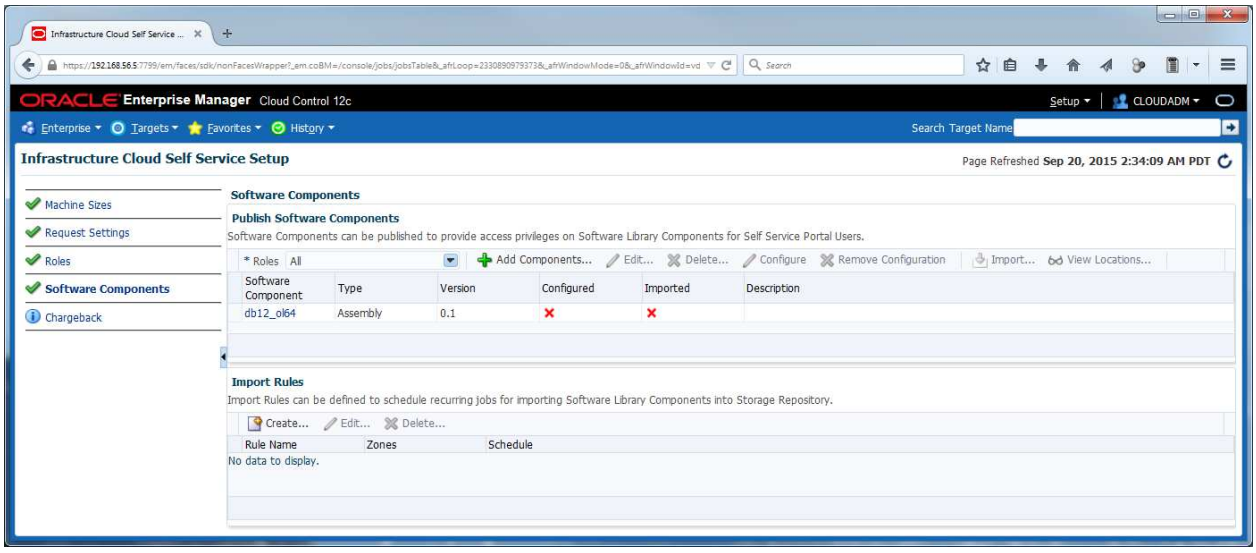
In this section, we will assign rights to deploy specific assemblies/templates (DB12c assembly) to specific roles (**SSA_DEV_VM**)

a) In the left panel, click "**Software Components**"

b) In the "**Software Components**" panel, click "**Add Components…**"



- In the "Publish Assemblies/Templates to Roles" window:
  - In the "**Select Software Components**" panel, click **Add** and select assembly "**db12_ol64**"
  - In the "**Select Roles**" panel, click **Add** and select line "**SSA_DEV_VM**"
  - Click Publish



Note: We could force the import of the Oracle VM assembly into the Oracle VM storage repository now. To save time at this step of the lab, we will not do it. The import will automatically be executed during the first request from a Self Service user.

In this section, we granted the following authorizations to all Self Service users with role SSA_DEV_VM:

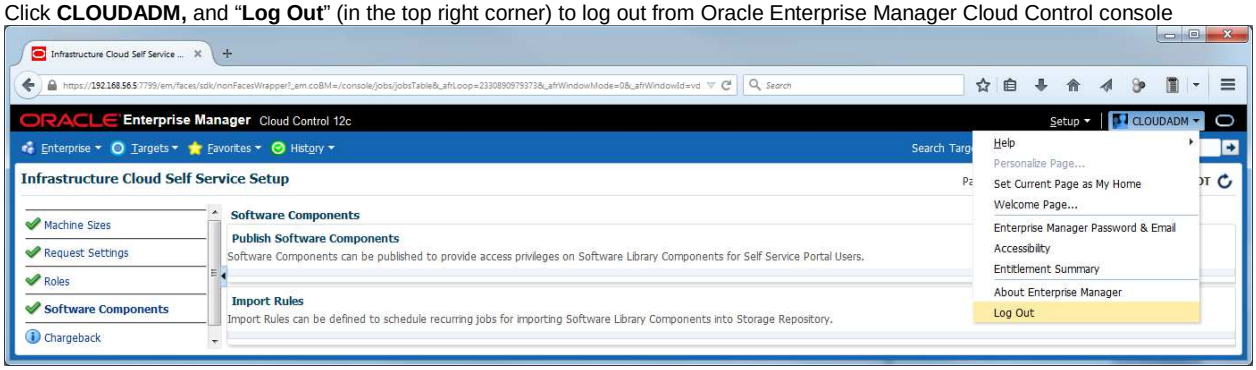
- Creation of VMs based on assembly db12_ol64 within the zone **devzone**.
- Set resources limits/quotas:
  - Maximum 3 servers
  - Maximum of 6 vcpus for all servers
  - Maximum of 10 GB of memory for all servers
  - Maximum of 100 GB of disk space for all servers

4 Instance as a Service: deployment from the Self Service portal

The configuration of the Private Cloud in IaaS mode with user cloudadm is now over.
We will now log out and log in with a Self Service user and use the Self Service Portal

4.1 Deploy a guest VM from the Oracle VM Assembly

a) Click **CLOUDADM,** and "**Log Out**" (in the top right corner) to log out from Oracle Enterprise Manager Cloud Control console



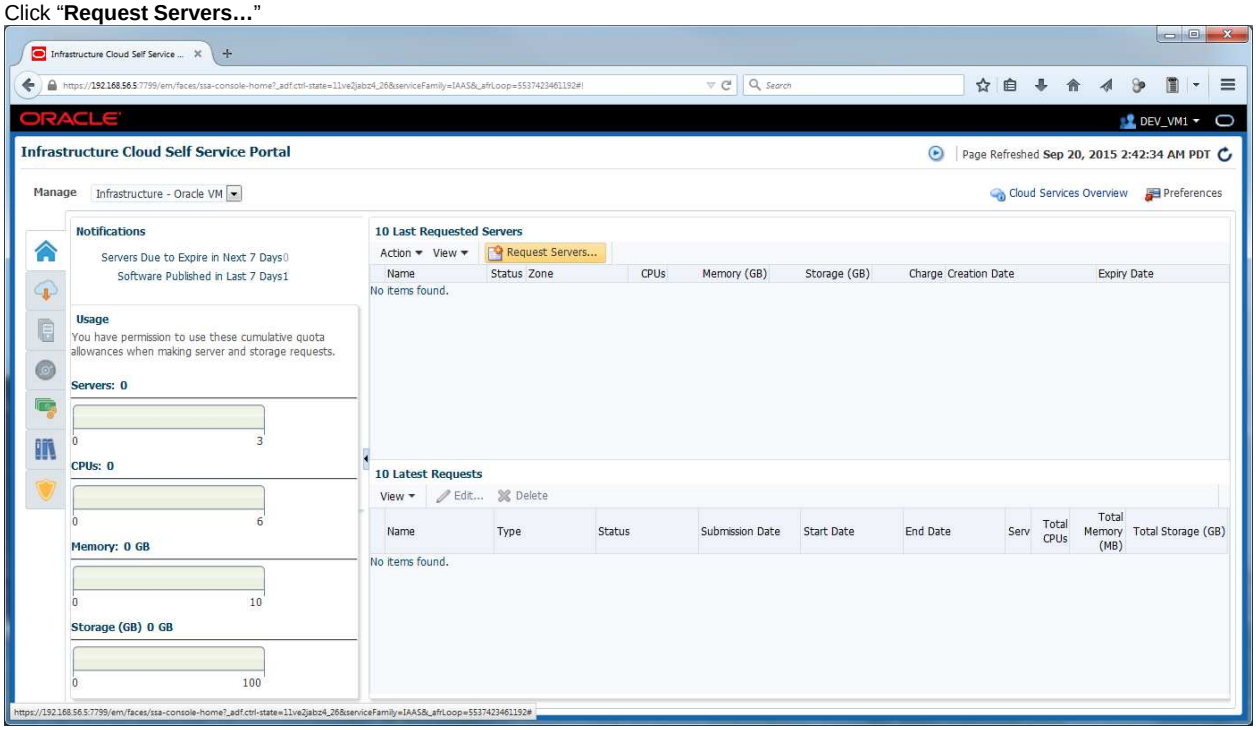
b) Log in again with a Self Service user using the following credentials:
- User Name : **dev_vm1**
- Password : **dev_vm1**

Note: Ignore "**Accessibility Preference**" by clicking "**Save and continue**"

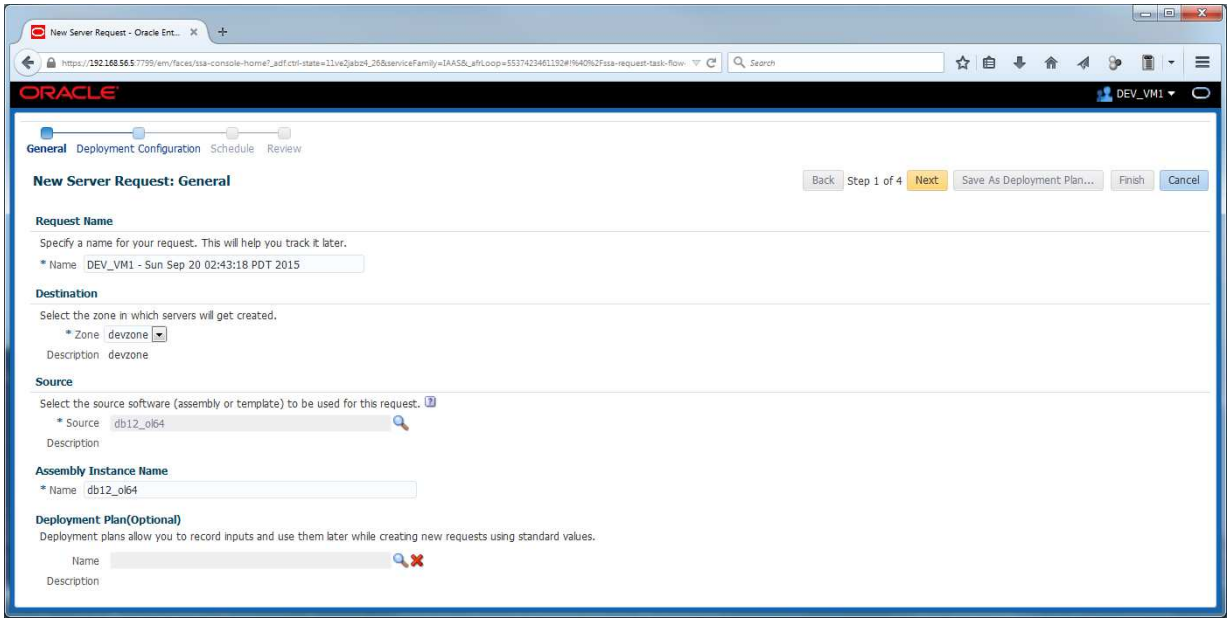
c) You should now see the "**Infrastructure Cloud Self Service**" portal

Note: On the left panel (**Usage**), you can see the resource limits previously set by the cloud administrator (3 servers, 6 vcpus, 10 GB of memory and 100 GB of disk space)

d) Click "**Request Servers…**"



e) In the "**New Server Request : General**" window:
- Select zone **devzone**
- Select source **db12_ol64**
- Click **Next**



f) In the "**New Server Request : Deployment Configuration**" window:

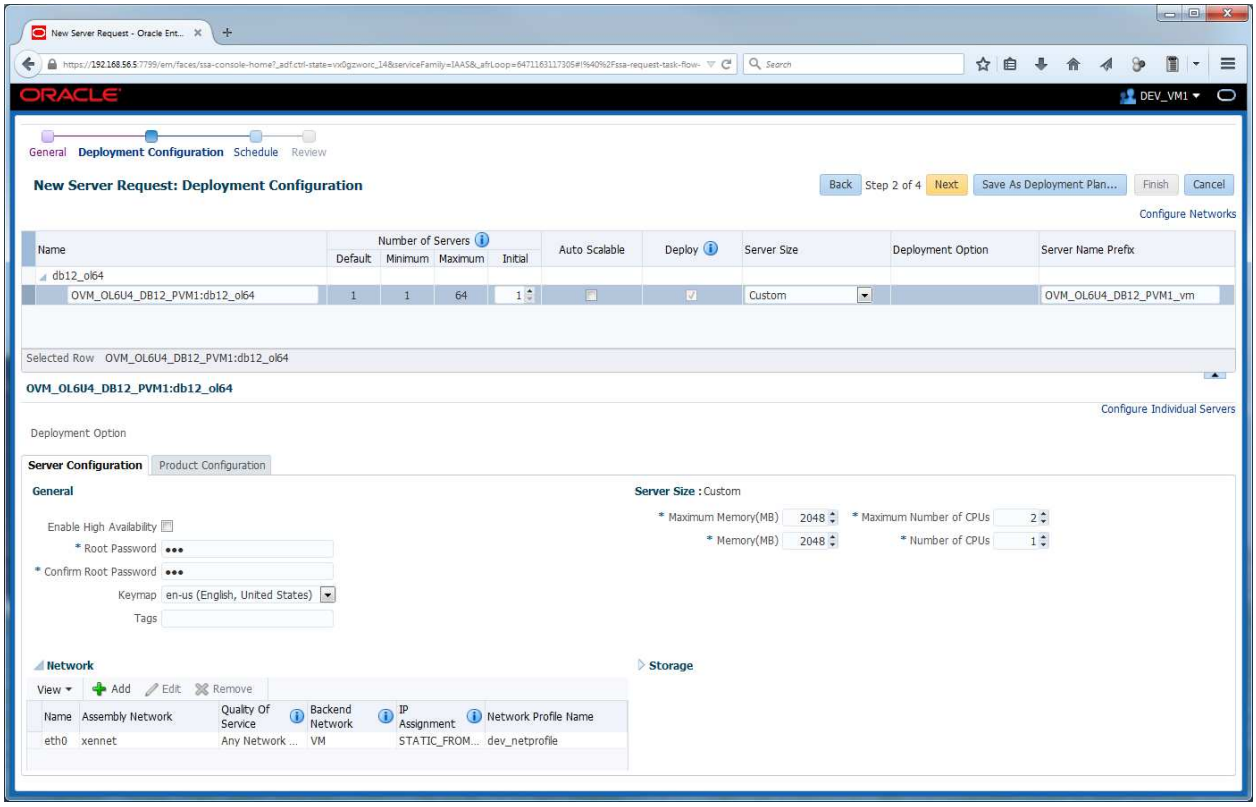
- Click line "**OVM_OL6U4_DB12_PVM1: db12_ol64**" → this will display the deployment options
- Enter "**dev**" as the root password for the future VM
- Change Number of CPUs to **1** (to save resources)

  Note: CPU here are in fact VCPUs (we have 4 VCPUs in our Oracle OpenWorld laptop: 2 cores with 2 threads)

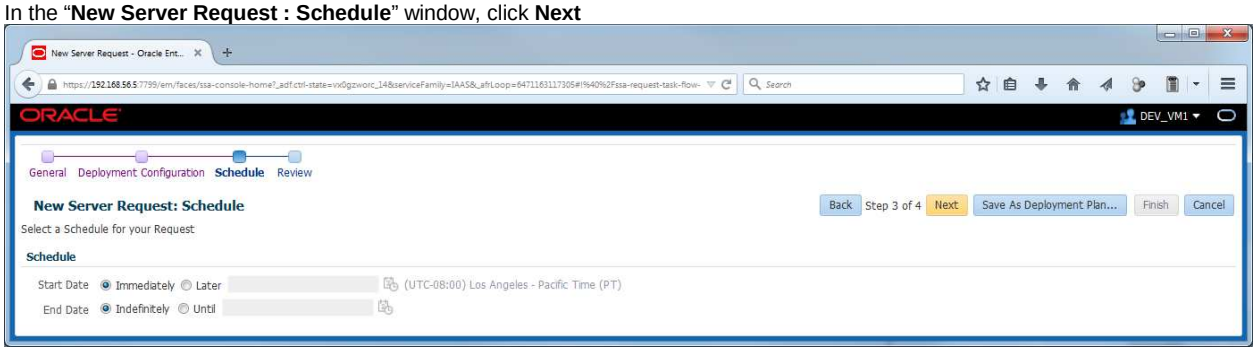
  Note: Maximum memory and Maximum Number of CPUs are used when you want to dynamically increase the number of VCPUs or the amount of memory on a virtual machine (you can increase the number of VCPUs to the maximum number of VCPUs without reboot. If you want to go beyond the maximum number of VCPUs, you need to shutdown the VM and modify the maximum number of VCPUs)

- Expand the Network options by clicking on icon in front of "**Network**"
- Select line **eth0** and click **Edit**
- In the "**Edit NIC: eth0**" window:
  - In the "**IP Assignment**" drop down menu, select "**Network Profile**"
  - In the "**Network Profile Name**", select "**dev_netprofile**"
  - Click **OK**

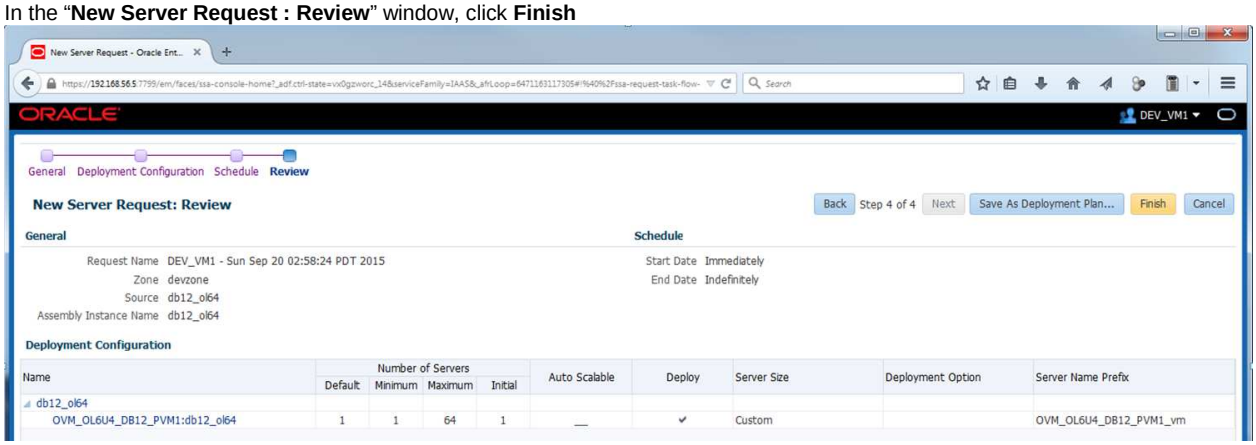
o Click **Next**



g) In the "**New Server Request : Schedule**" window, click **Next**

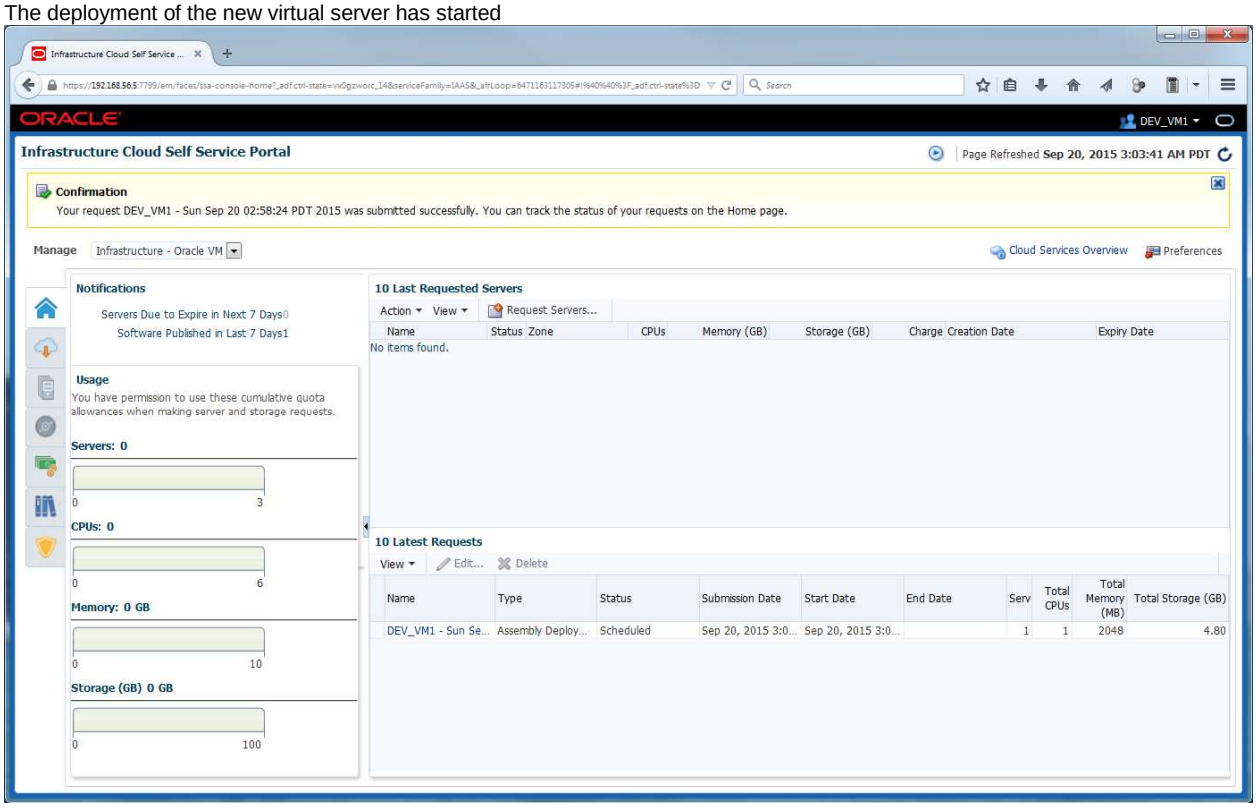


h) In the "**New Server Request : Review**" window, click **Finish**



Note: Deployment plan
The user inputs for this VM can be stored in a deployment plan.
This is useful if the user wants to request several identical servers.

The deployment of the new virtual server has started



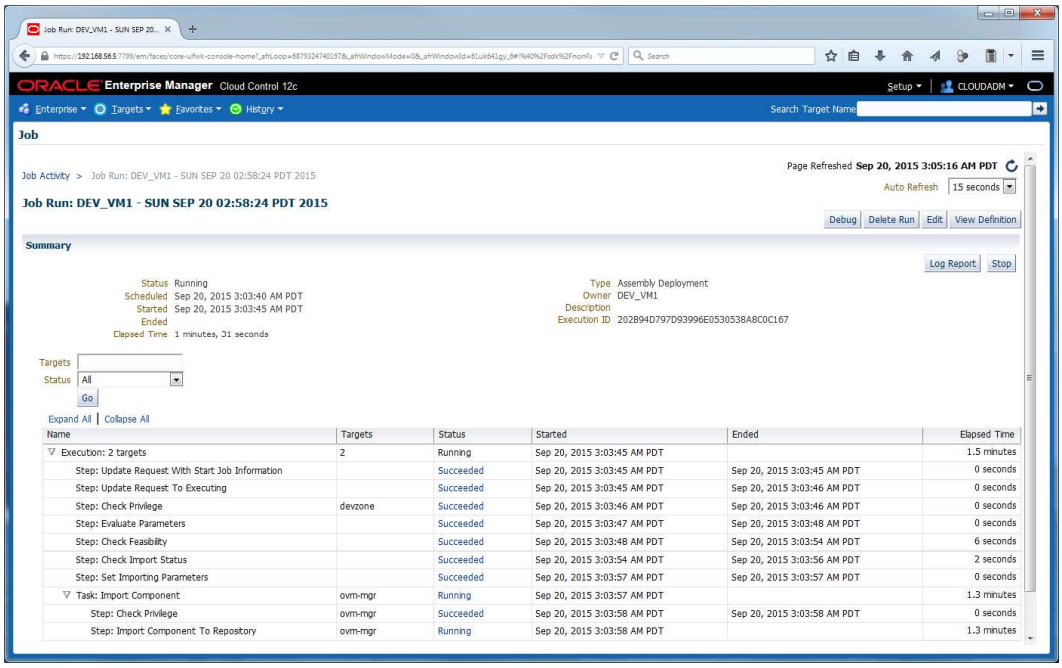
The deployment should take about 20 minutes (Click icon in the top right corner to refresh the page)

- 18 minutes to import the Oracle VM assembly into the Oracle VM storage repository (only done once)
- 2 minutes to create the new VM from this assembly

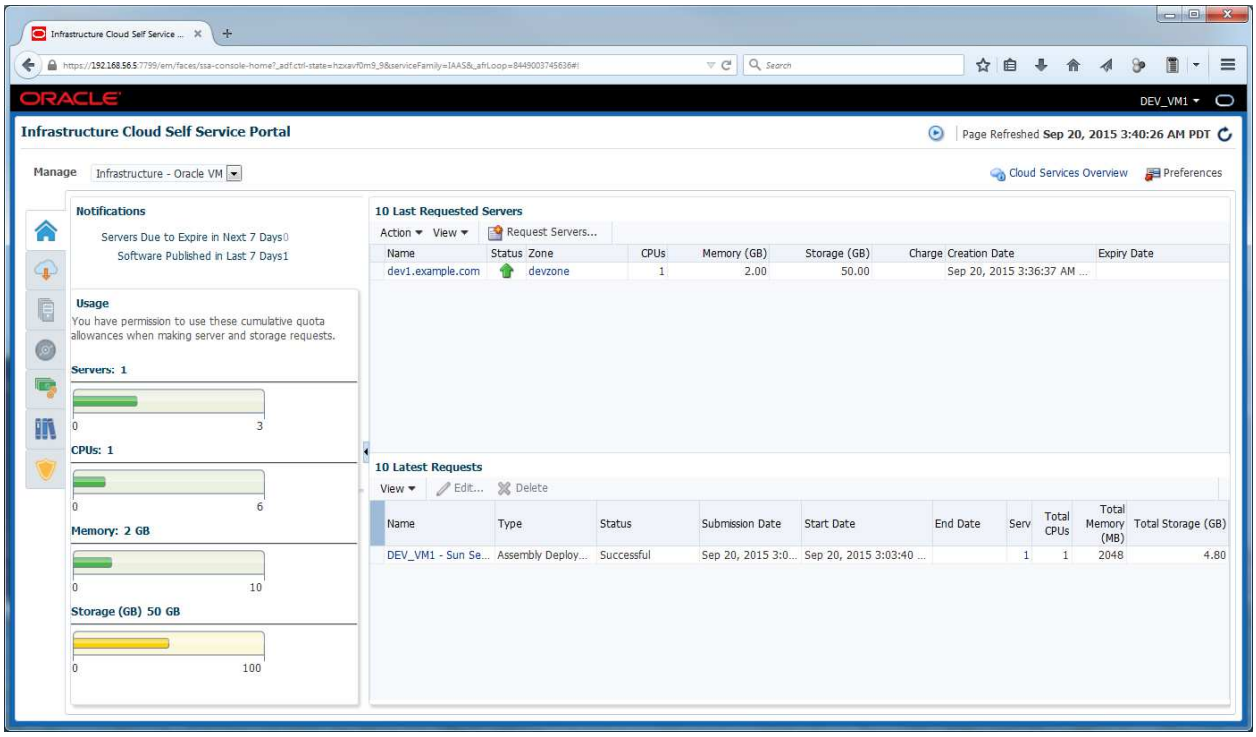
While waiting for the deployment to complete, you can read part 2 of the lab (Pluggable Database as a Service). You will not have time to actually run it at OpenWorld.

<u>If you want to see the job details:</u>

- Log out and log in again using user **cloudadm** (password **cloud**)
- Go to **Enterprise**, **Job**, **Activity**
- Click job **DEV_VM1_-_<date>**
- Set **"Auto Refresh"** to **"15 seconds"**



When the import and deployment of the VM are done, you should see the following window:



We can see here that a new server called **dev1.example.com** was deployed (hostname allocated as planned in the network profile **dev_netprofile**)

4.2 Connect to the VM

4.2.1 Access to the VM console

a) Get access to the VM console by right clicking on the **dev1.example.com** VM and choosing "**Launch VNC console**"

b) Log in using the following credentials:
- Login : **root**
- Password : **dev**

Note: Java Web Start no longer required.

In Oracle VM version 3.2.x and earlier, access to the VM consoles was done thru Java Web Start and thus required Java to be installed on the client machine. Starting with Oracle VM version 3.3.1, this is no longer required as the console use HTML5.

4.2.2 Remote access to the VM and configure Oracle Listener

a) Open a gnome terminal and connect to the VM using SSH
```
$ ssh root@192.168.56.11
```
(password is **dev**)

Note: In our network profile, the IP address corresponding to hostname **dev1** is **192.168.56.11**.

b) Make sure the Oracle Database 12c instance is running
```
# su – oracle
$ sqlplus / as sysdba
SQL> select * from v$instance;
SQL> exit
```

Notes:
- The password for the OS user **oracle** is **oracle**
- The password for the Database users **sys** and **system** is **Welcome1**

c) Configure Oracle Listener
Edit file **$ORACLE_HOME/network/admin/listener.ora** and replace **(HOST = ol64)** by **(HOST = 192.168.56.11)**

d) Start Oracle Listener
```
$ lsnrctl start
```

4.2.3 Access to the Entreprise Manager Database Express WebUI (optional)

Note: Adobe Flash Player plugin is needed (already installed)

a) Enable HTTP access (HTTPS SSL certificate not accepted)
```
$ sqlplus / as sysdba
SQL> exec dbms_xdb_config.sethttpport(5501);
SQL> exit
```

b) In Firefox, open http://192.168.56.11:5501/em

c) Connect using the following credentials
- User Name : **sys**
- Password : **Welcome1**
- As sysdba : **<checked>**

.

Congratulations !

You have successfully deployed your first virtual machine with Oracle Linux 6 and Oracle Database 12c in "DBaaS / Instance as a Service" mode.

5 Pluggable Database as a Service: configuration

You won't have time to run this second part of the lab during OpenWorld hands on lab (1h session).

Yet, you will find below lab instructions to setup "**Pluggable Database as a Service**", which is another way of doing DBaaS.

In this part, for simplicity, we use the VM and Database 12c container database that was previous installed by a Self Service user. In real life, we should use a different VM. (different users with different roles should use different VMs)

5.1 Install EM12 agent on the VM

a) Connect to the VM
`$ ssh root@192.168.56.11` (password is **dev**)

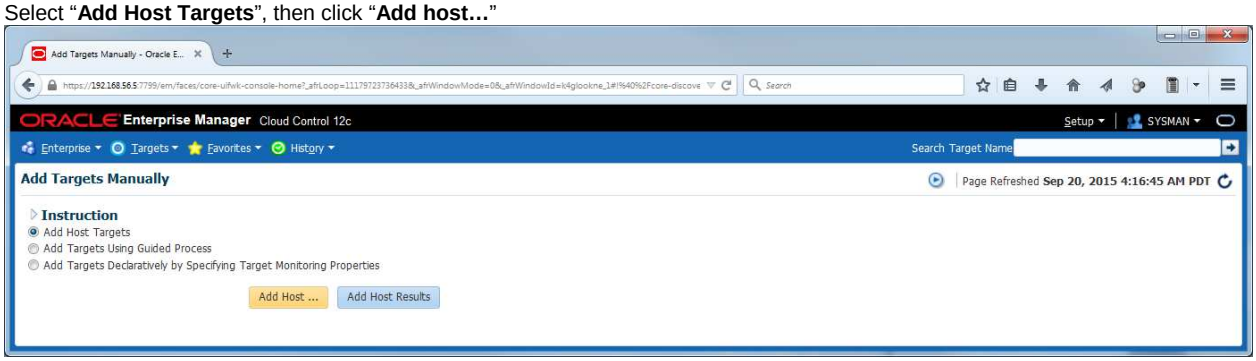
b) Edit file **`/etc/hosts`** and add the following line (since we don't have name resolution)
`192.168.56.5 emcc.example.com`

c) Create the mount point for EM agent
`# su – oracle`
`$ mkdir /u01/em_agent`

d) Log out from EM12c console and log in again with following credentials:
- User Name : **sysman** (Super Administrator)
- Password : **welcome1**

e) Click **Setup**, **Add Target**, and **Add Targets Manually**

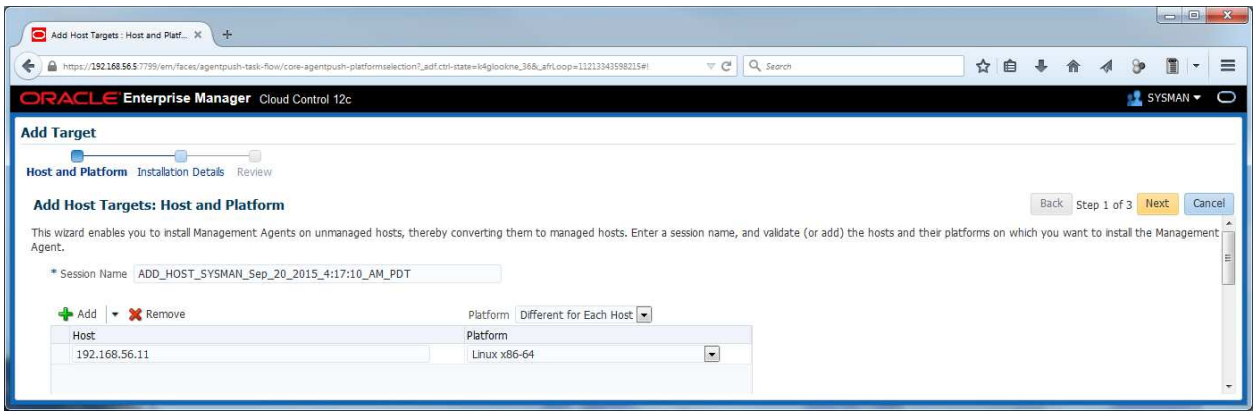
f) Select "**Add Host Targets**", then click "**Add host…**"



g) Click **Add**, then **Manually**

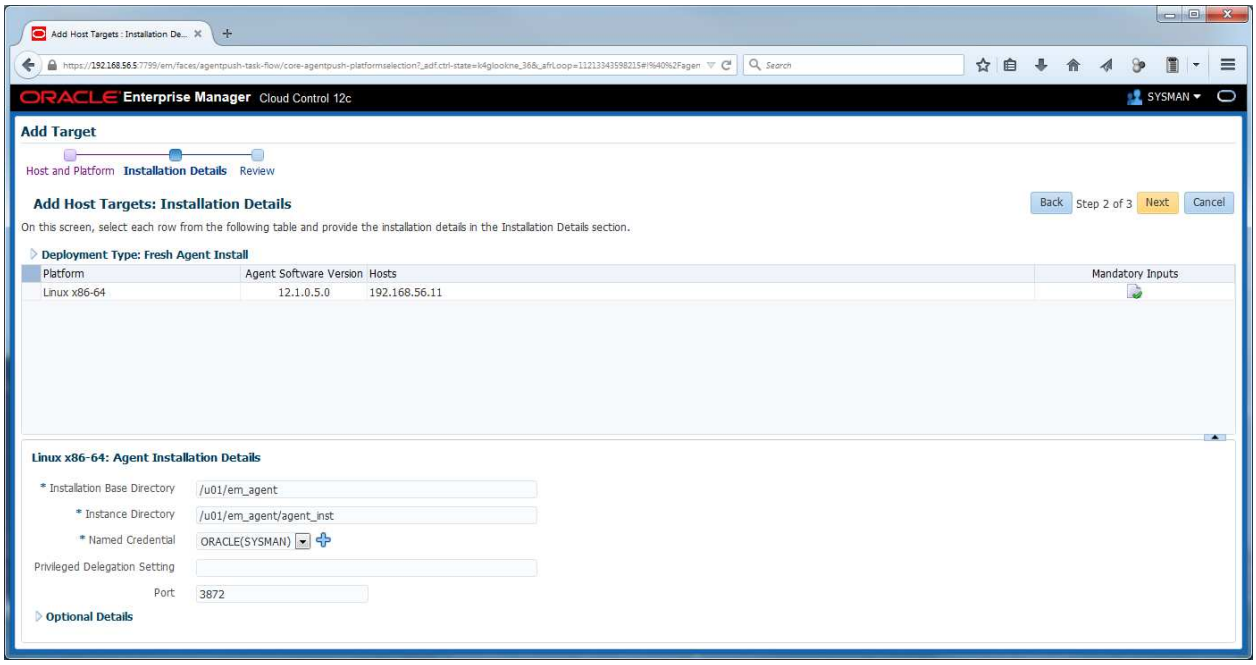
h) Enter the following information and click **Next:**
- Host : **192.168.56.11**
- Platform : **Linux x86-64**

Note: you can ignore the warning about Fully Qualify Host Names.

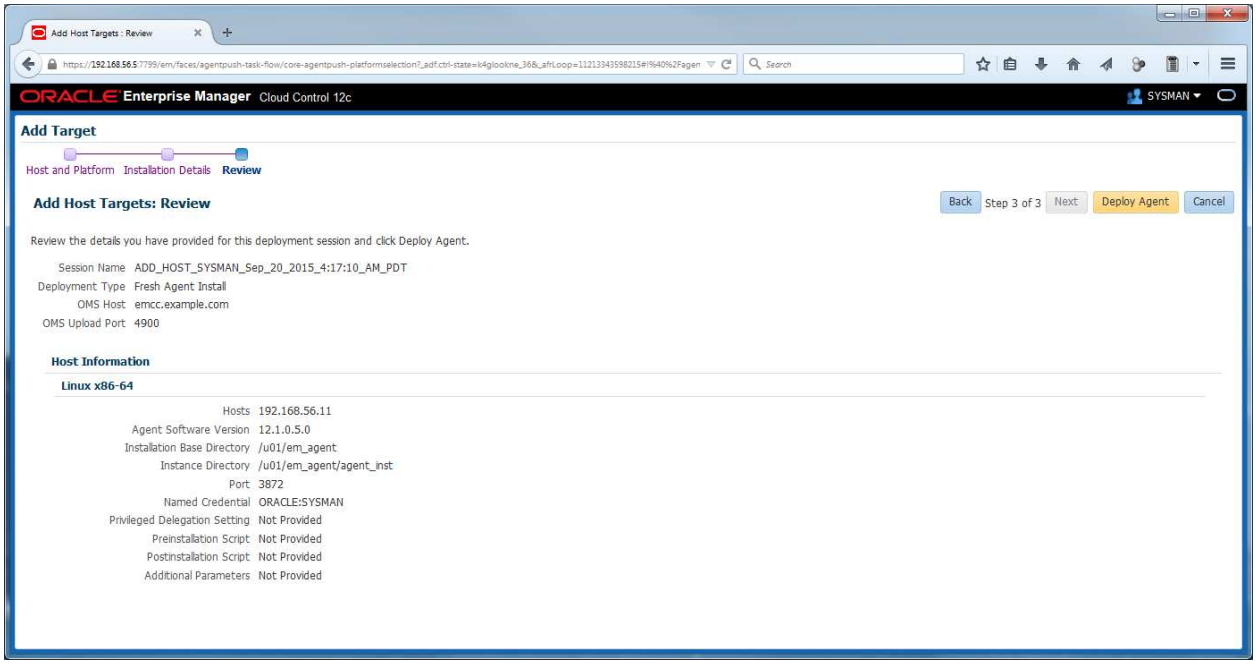


i) In the "**Add Host Targets: Installation Details**" window, enter the following information:
- Installation Base Directory : **/u01/em_agent**
- Instance Directory : **/u01/em_agent/agent_inst**
- Named Credential : **ORACLE(SYSMAN)**
- Privileged Delegation Setting : **<empty>**

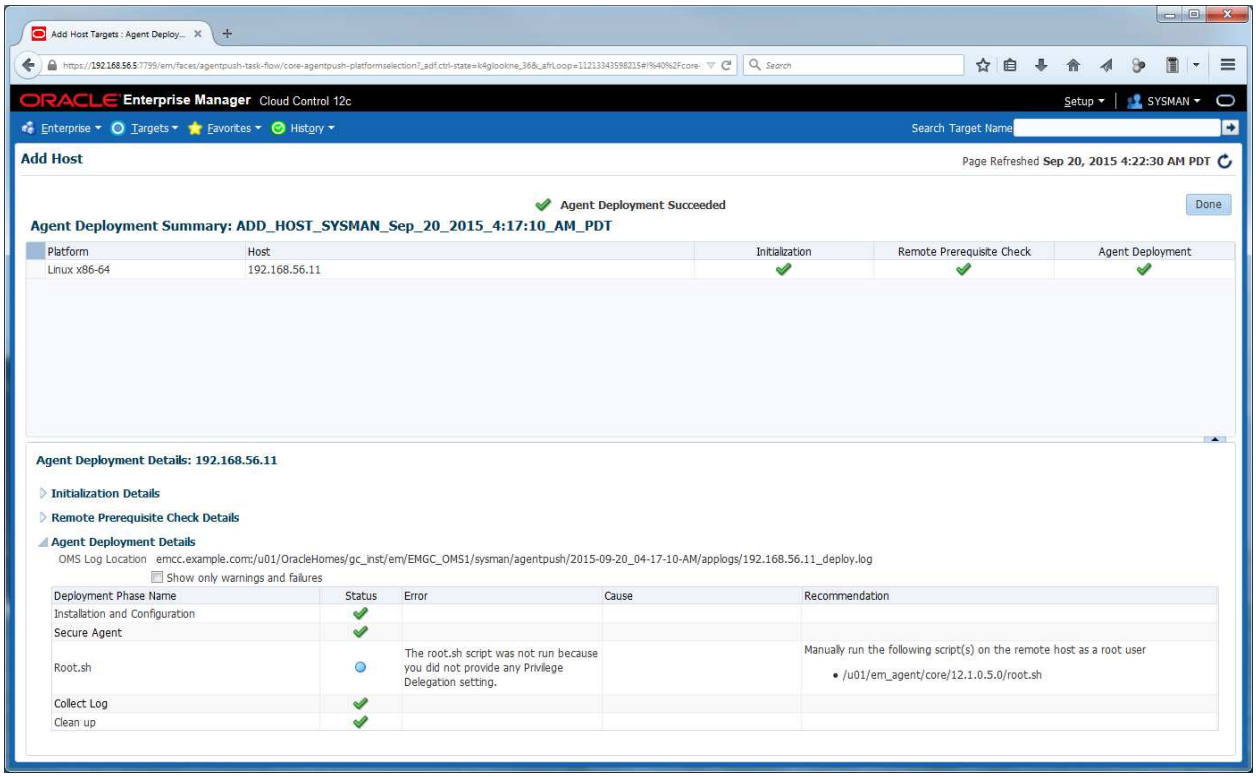
Then click **Next:**



j) **In the "Add Host Targets: Review**" window, click "**Deploy Agent**"



k) Wait for the deployment of the agent (several minutes)



l) When finished, run the mentioned script as root on the VM to complete the agent deployment
`/u01/em_agent/core/12.1.0.5/root.sh`

m) Click **Done**

The EM12 agent is now up and running on the VM

5.2 Add Database targets

Before we can deploy Pluggable Database, we must add the Database targets corresponding to database container instance and listener running on the VM.

EM12c will monitor the DB12c container instance running on the VM (called CDB1) using database user **DBSNMP.** This user is locked by default so we first need to unlock this account.

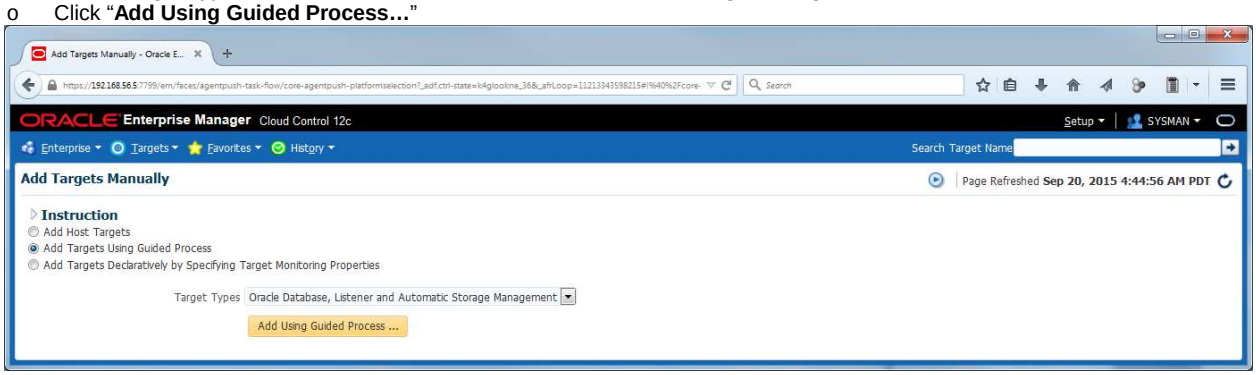
a) Unlock the DBSNMP user

```
# su – oracle
$ sqlplus / as sysdba
SQL> alter user dbsnmp account unlock identified by oracle;
SQL> quit
```

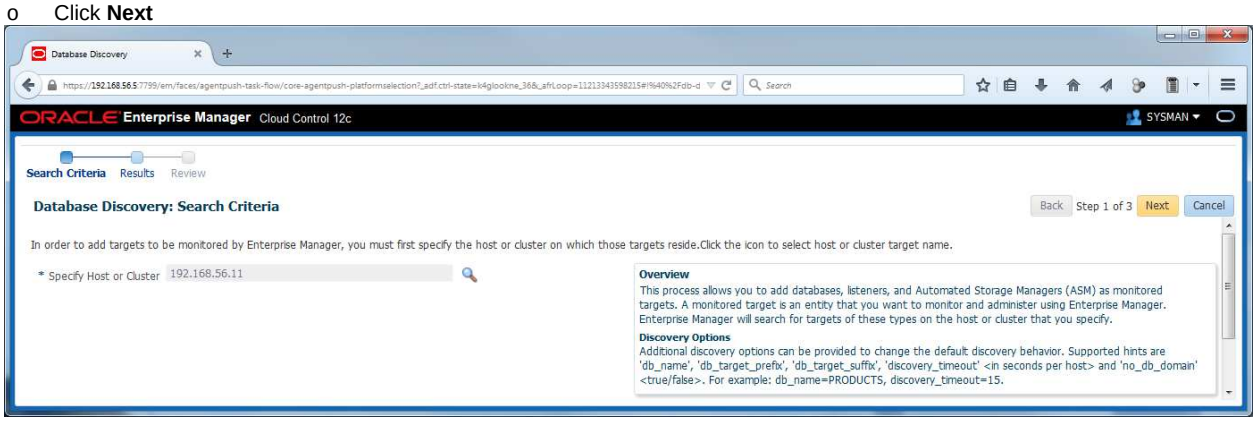
Now, let's discover the database targets in EM12c

b) In EM12c console (still logged as user sysman), click **Setup**, **Add Target**, **Add Target Manually**

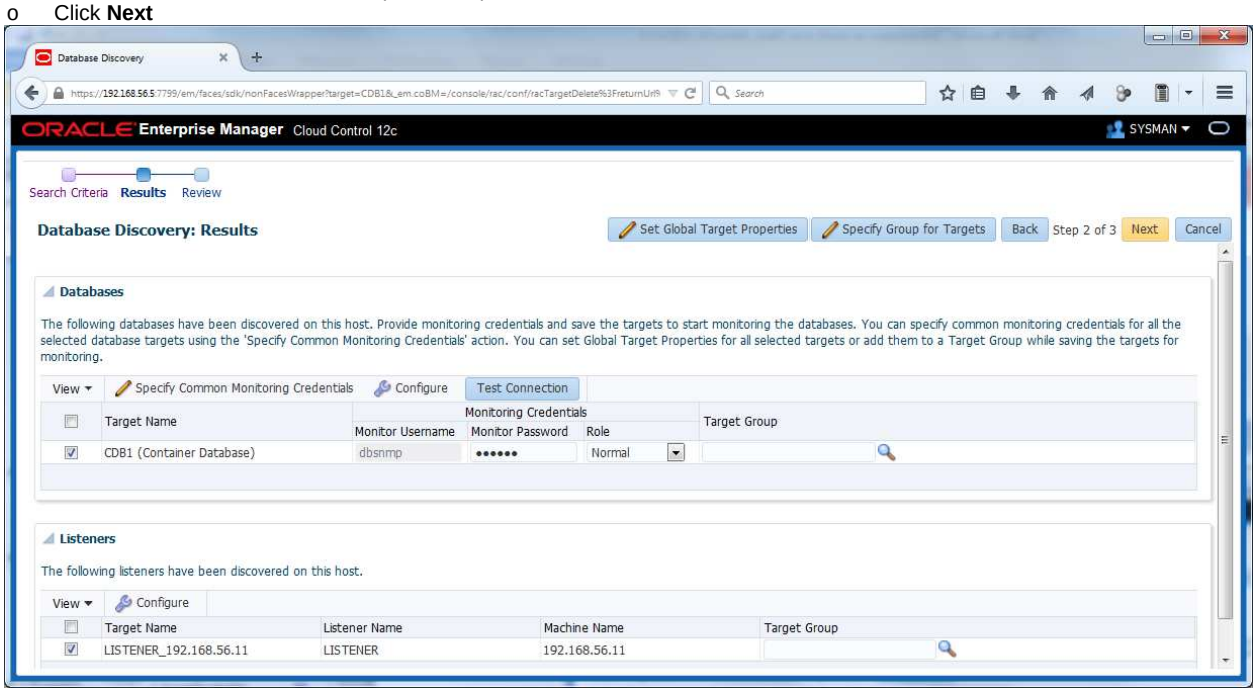
c) Start Guided Process
- Select "**Add Targets Using Guided Process**"
- Select Target Type "**Oracle Database, Listener and Automatic Storage Management**"
- Click "**Add Using Guided Process…**"



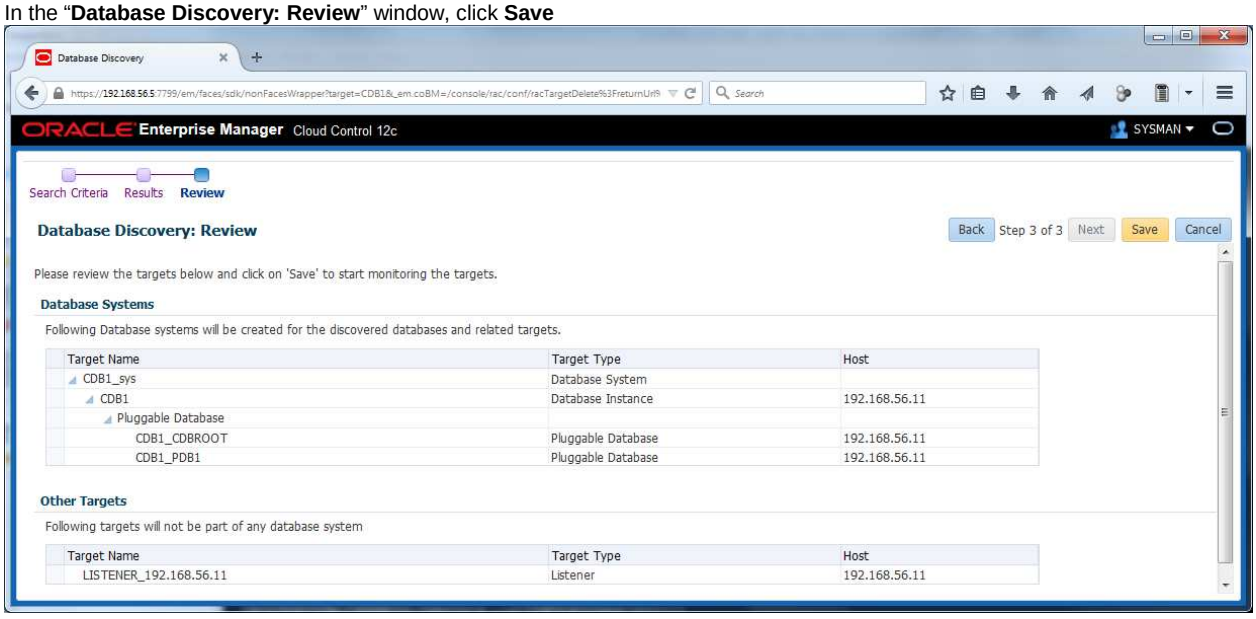
d) In the "**Database Discovery: Search Criteria**" window,
- Select Host "**192.168.56.11**" in the "**Specific Host or Cluster**" field
- Click **Next**



e) After the target discovery, in the "**Database Discovery: Results**" window,
- Enter the monitor password : **oracle**
- Check password
  - Select **CDB1** (Checkbox)
  - Click **Test Connection** and then click **OK**
- Select **LISTENER_192.168.56.11** (Checkbox)
- Click **Next**

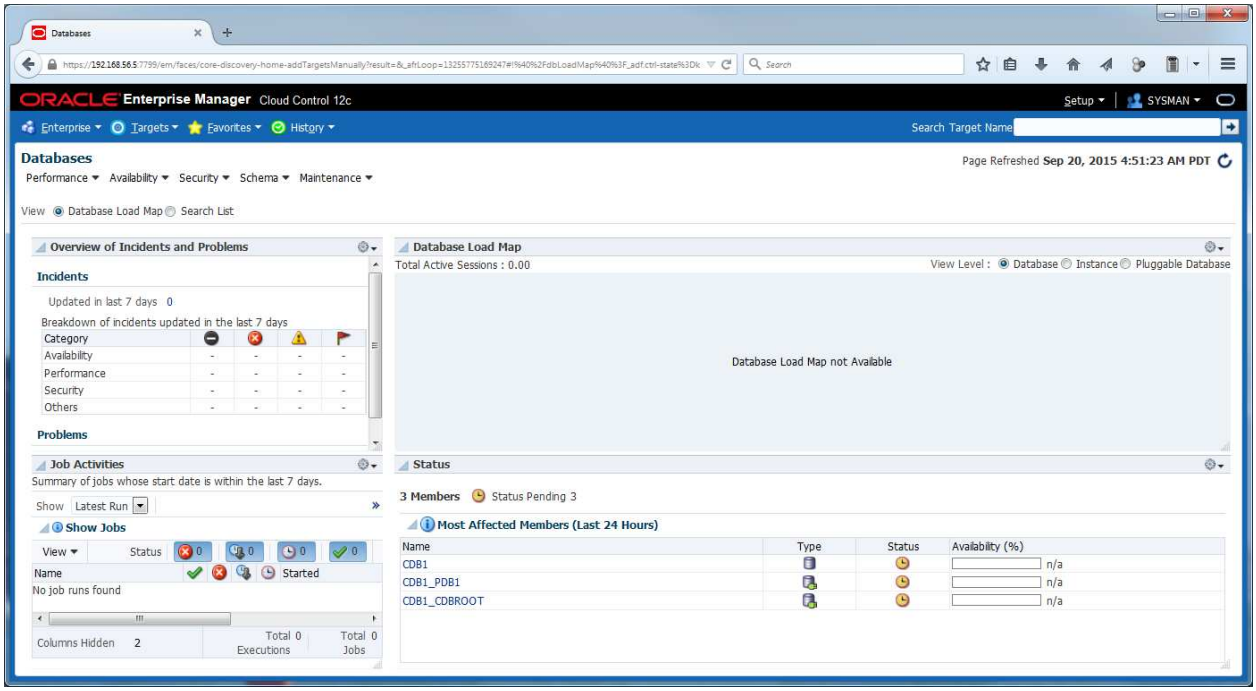


f) In the "**Database Discovery: Review**" window, click **Save**



g) Click **Close**

h) Click **Targets**, **Database**



5.3 Create a guest user on the virtual machine

We will create a guest user on our virtual machine to be used by the Self Service user later (the Self Service user is not supposed to have access to the **root** or **oracle** users).

a) From your Gnome environment, open a new terminal

b) Create the guest user

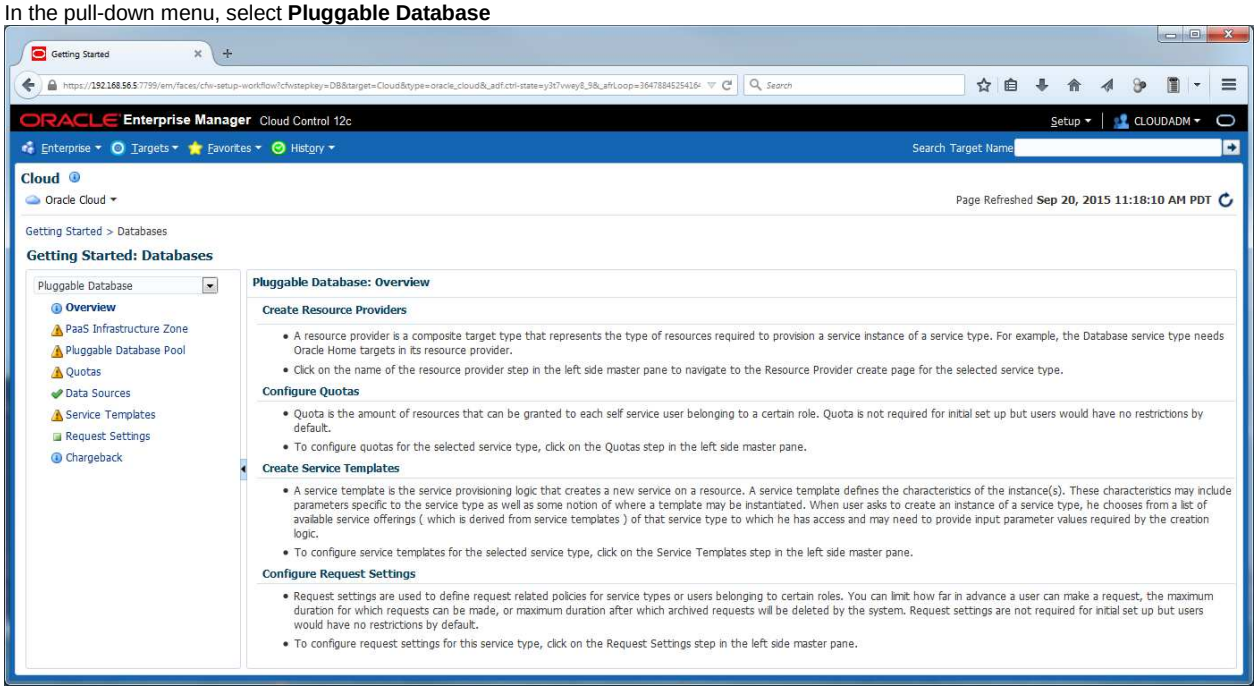
```
$ ssh root@192.168.56.11                (password is dev)
# useradd –g users guest
# passwd guest                          (set guest as password)
# cp /home/oracle/.bash_profile /home/guest
```

5.4 Create a PaaS infrastructure zone

a) Log out from EM12c console and log in again with following credentials:
   - User Name : **cloudadm** (cloud administrator)
   - Password : **cloud**

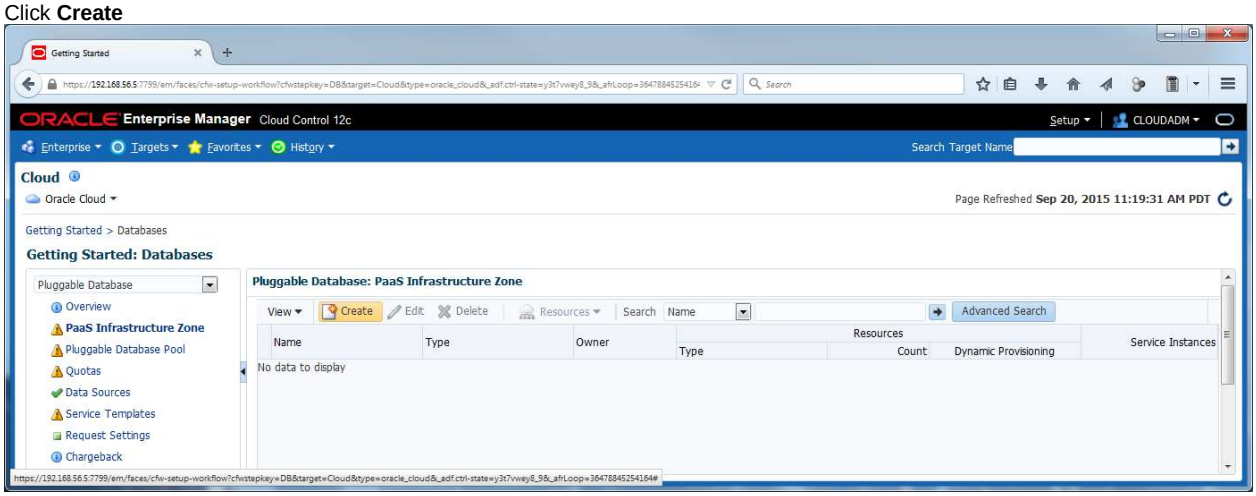
b) Click **Setup**, **Cloud**, **Database**

c) In the pull-down menu, select **Pluggable Database**



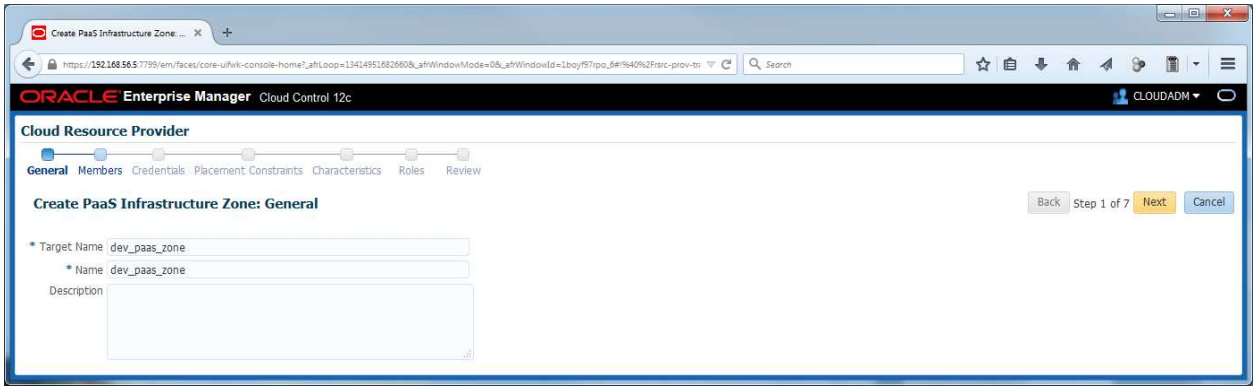
d) In the left panel, click **PaaS Infrastructure Zone**

e) Click **Create**

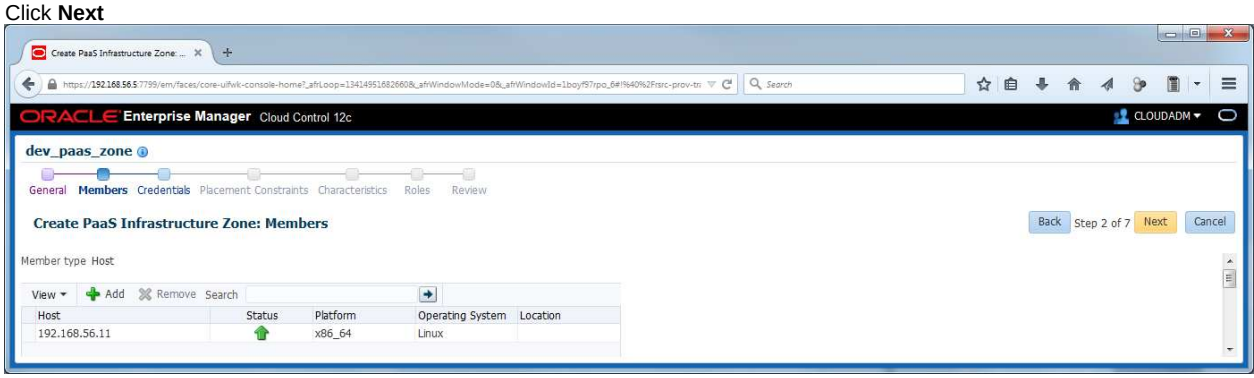


f) Enter the following information
   - Target name : **dev_paas_zone**
   - Name : **dev_paas_zone**

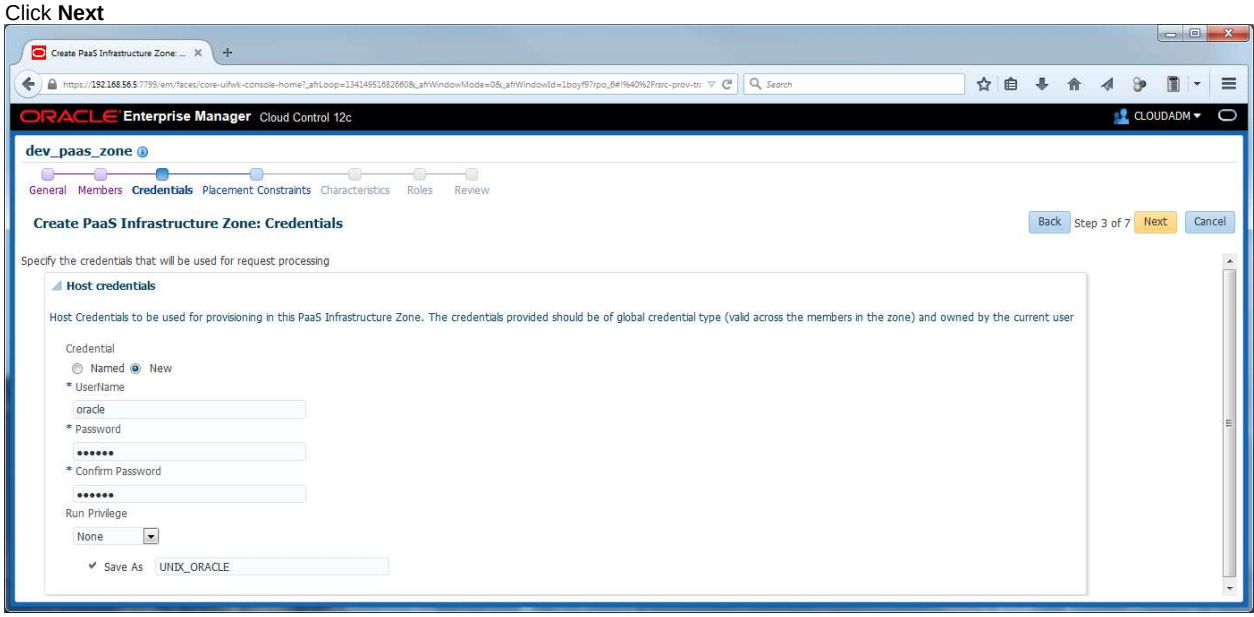
   then click **Next**



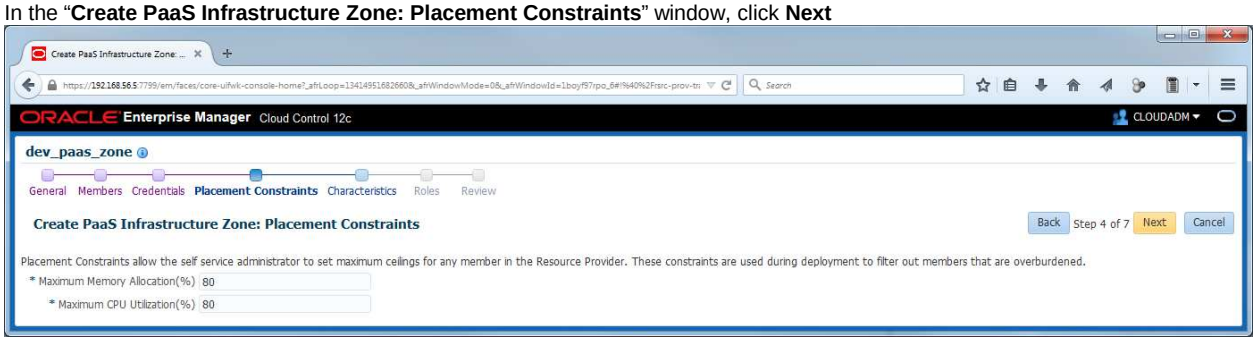
g) In the "**Create PaaS Infrastructure Zone: Members**" window,
- Click **Add**
- Select line Host **192.168.56.11** and click **Select**
- Click **Next**



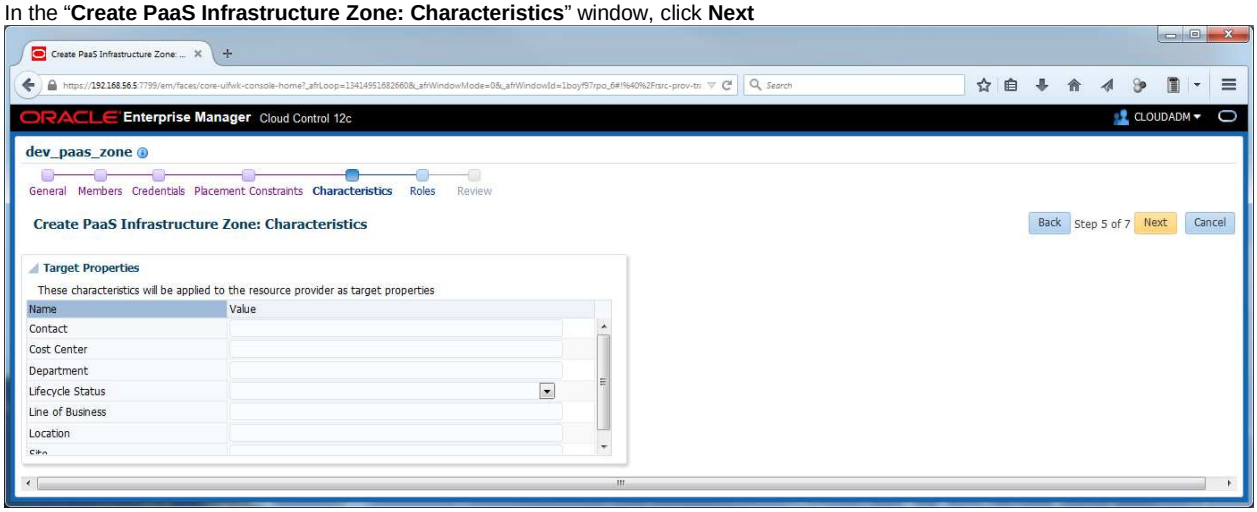
h) In the "**Create PaaS Infrastructure Zone: Credentials**" window,
- Select **New**
- Enter the following information
  - UserName : **oracle**
  - Password : **oracle**
  - Run Privilege : **none**
  - Save As : **UNIX_ORACLE**
- Click **Next**



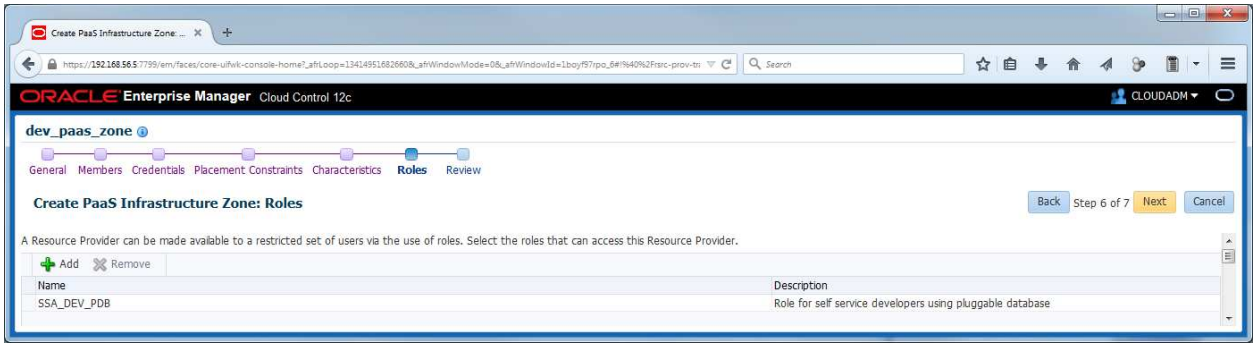
i) In the "**Create PaaS Infrastructure Zone: Placement Constraints**" window, click **Next**



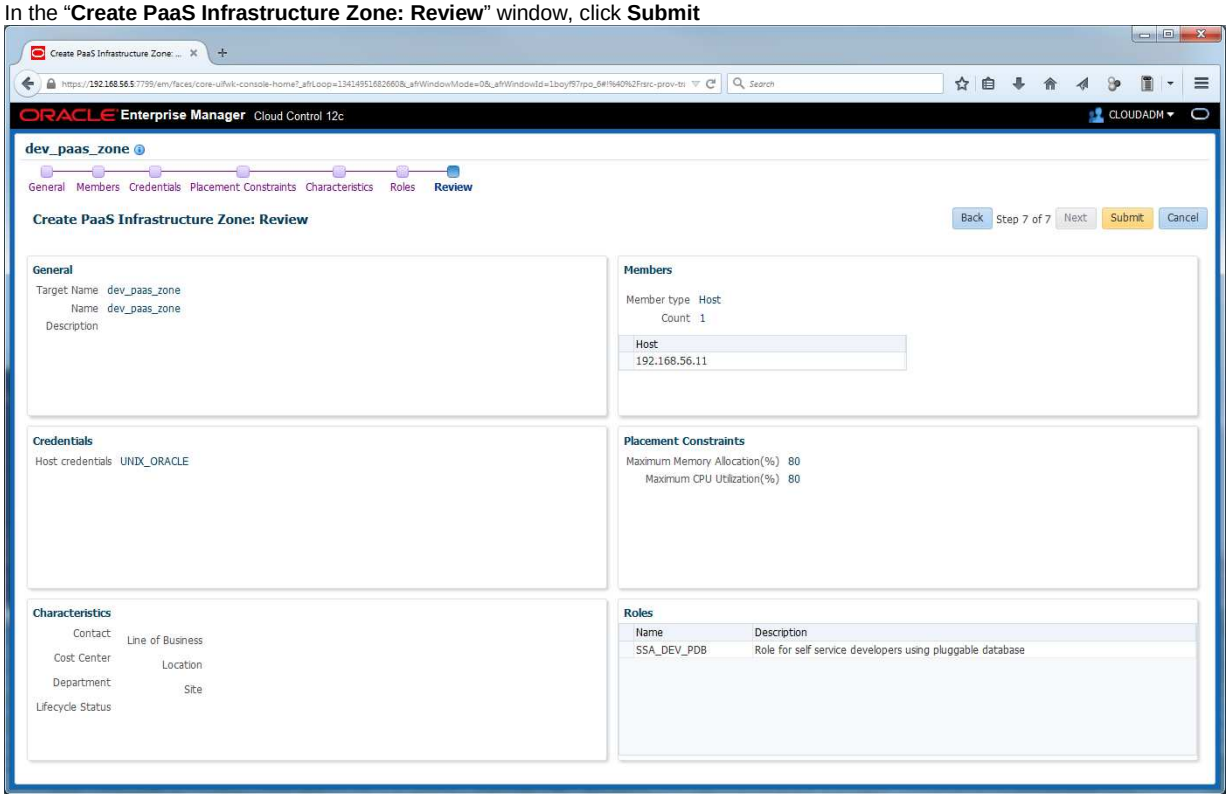
j) In the "**Create PaaS Infrastructure Zone: Characteristics**" window, click **Next**



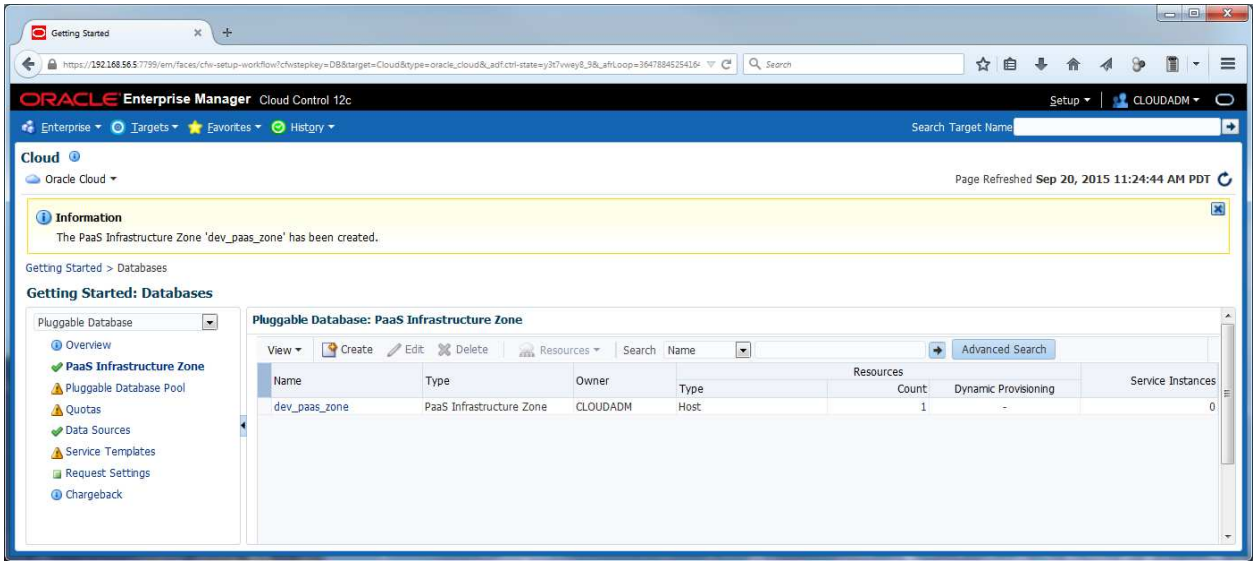
k) In the "**Create PaaS Infrastructure Zone: Roles**" window,
- Click **Add**
- In the "**Select Roles**" window:
  - Select line **SSA_DEV_PDB** and click **Select**
  - Click **Next**



l) In the "**Create PaaS Infrastructure Zone: Review**" window, click **Submit**



You should now see the newly created Paas Infrastructure zone

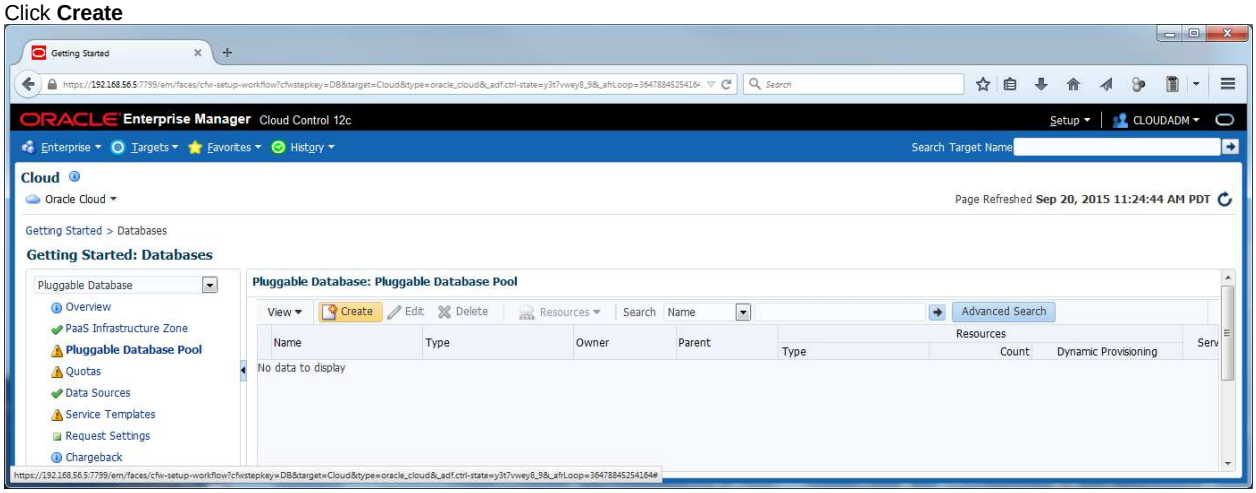


5.5 Setup the database cloud Self Service for pluggable database

5.5.1 Database pool setup

a) In the left panel, click "**Pluggable Database Pool**"

b) Click **Create**



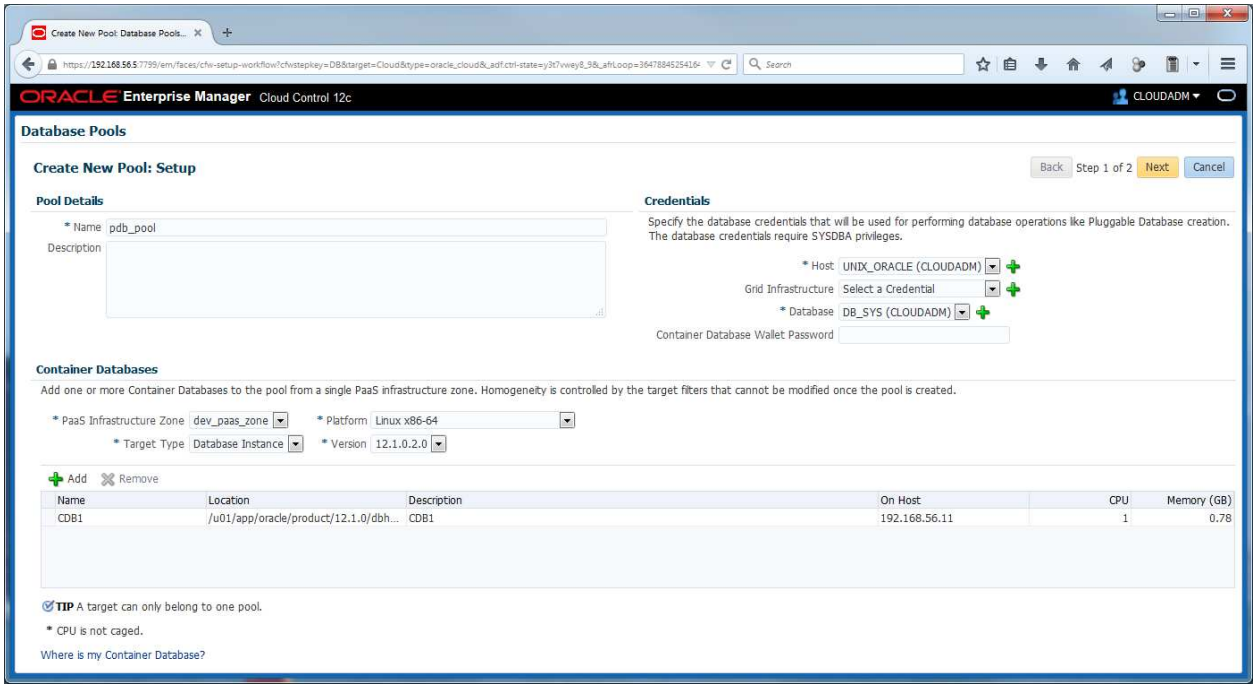
c) In the "**Create New Pool: setup**" window, enter the following information:

- Pools details:
  - Name : **pdb_pool**

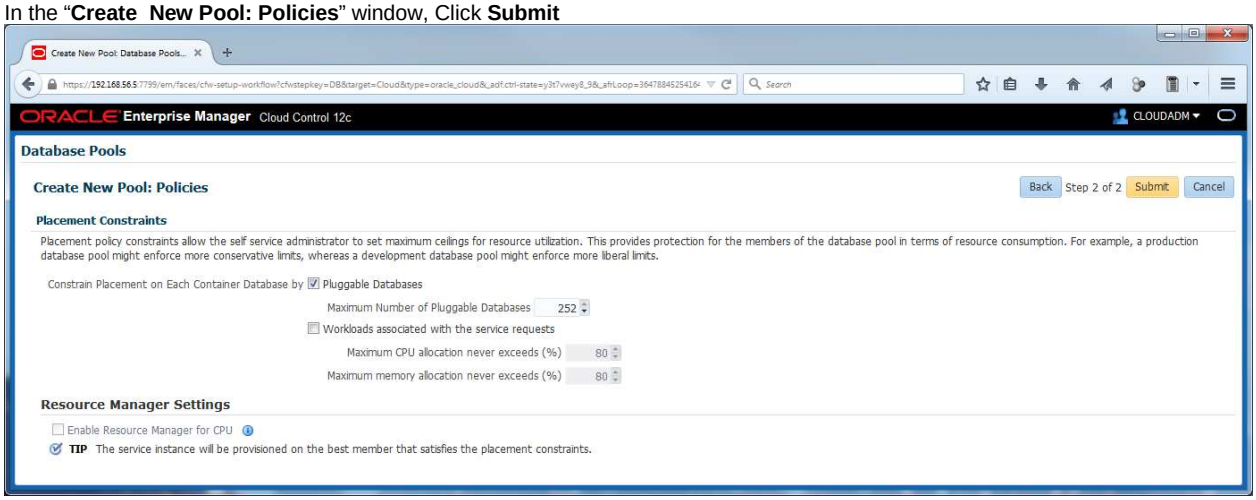
- Credentials
  - Host : **UNIX_ORACLE(CLOUDADM)**
  - Grid Infrastructure : Leave unanswered (Select a credential) as we won't need them here.
  - Database credential: Click **+**
  - Username : **sys**
  - Password : **Welcome1**
  - Role : **SYSDBA**
  - Save As : **DB_SYS**
  - Click **OK**

- Container Databases
  - PaaS Infrastructure Zone : **dev_paas_zone**
  - Platform : **Linux x86-64**
  - Database configuration : **Database instance**
  - Version : **12.1.0.2**
  - Select the container database
    - Click **Add**
    - Select line **CDB1**
    - Click **Select**

- Then click **Next**



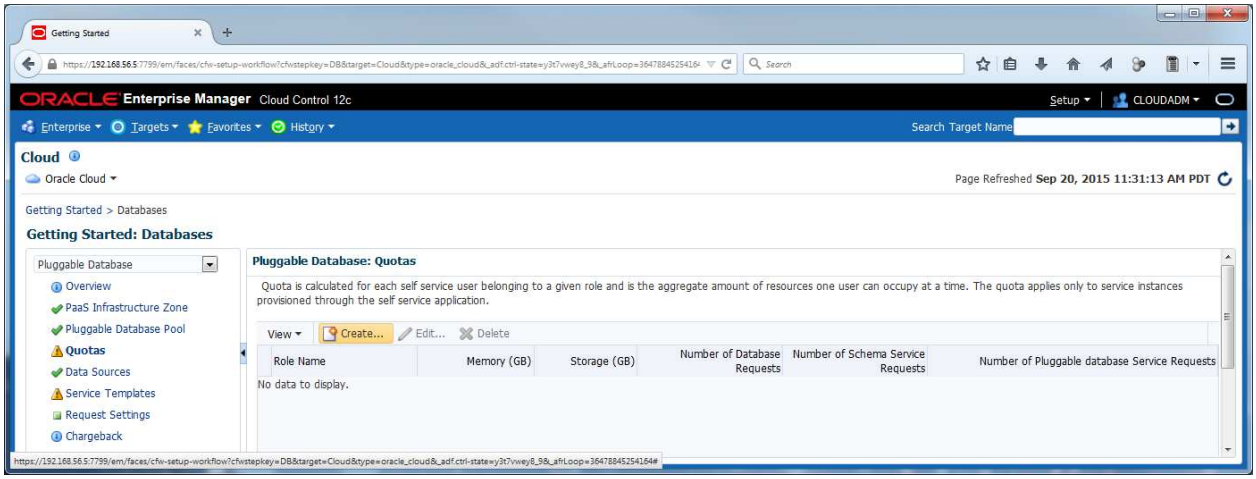
d) In the "**Create New Pool: Policies**" window, Click **Submit**



5.5.2 Quota setup

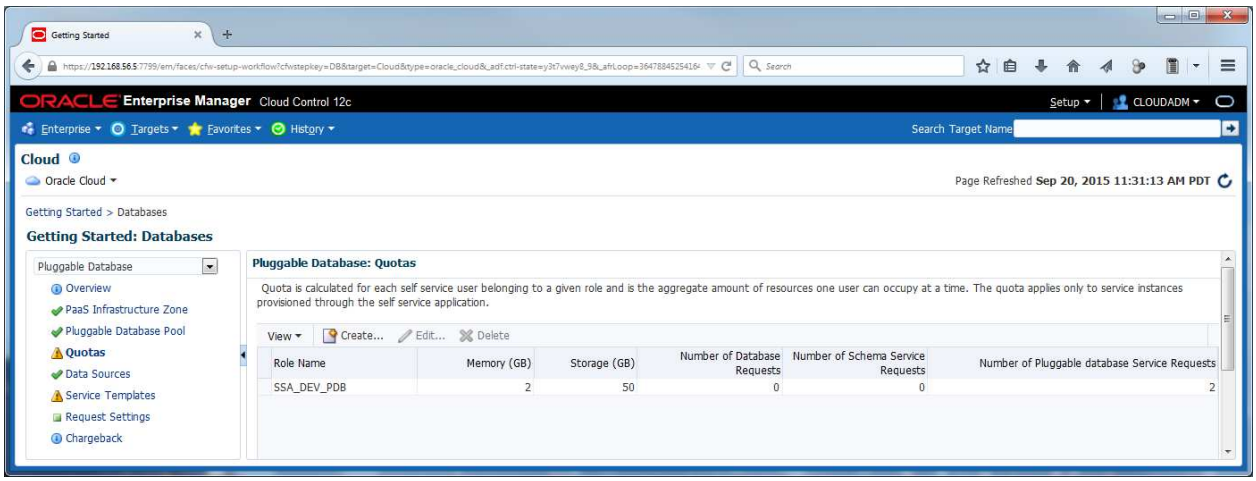
a) In the left panel, click **Quotas**

b) click **Create**



c) Enter the following information and click **OK**

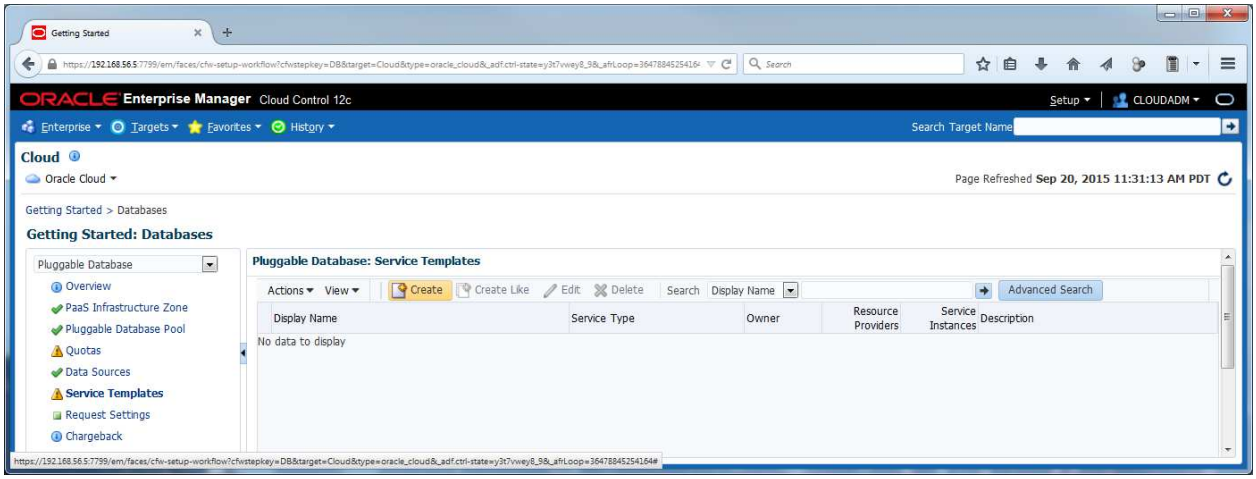
- Role Name : **SSA_DEV_PDB**
- Memory (GB) : **2**
- Storage (GB) : **50**
- Number of Database Requests : **0**
- Number of Schema Service Requests : **0**
- Number of Pluggable database Service Requests : **2**



5.5.3 Service Templates setup

a) In the left panel, click "**Services Templates**"

b) Click **Create**

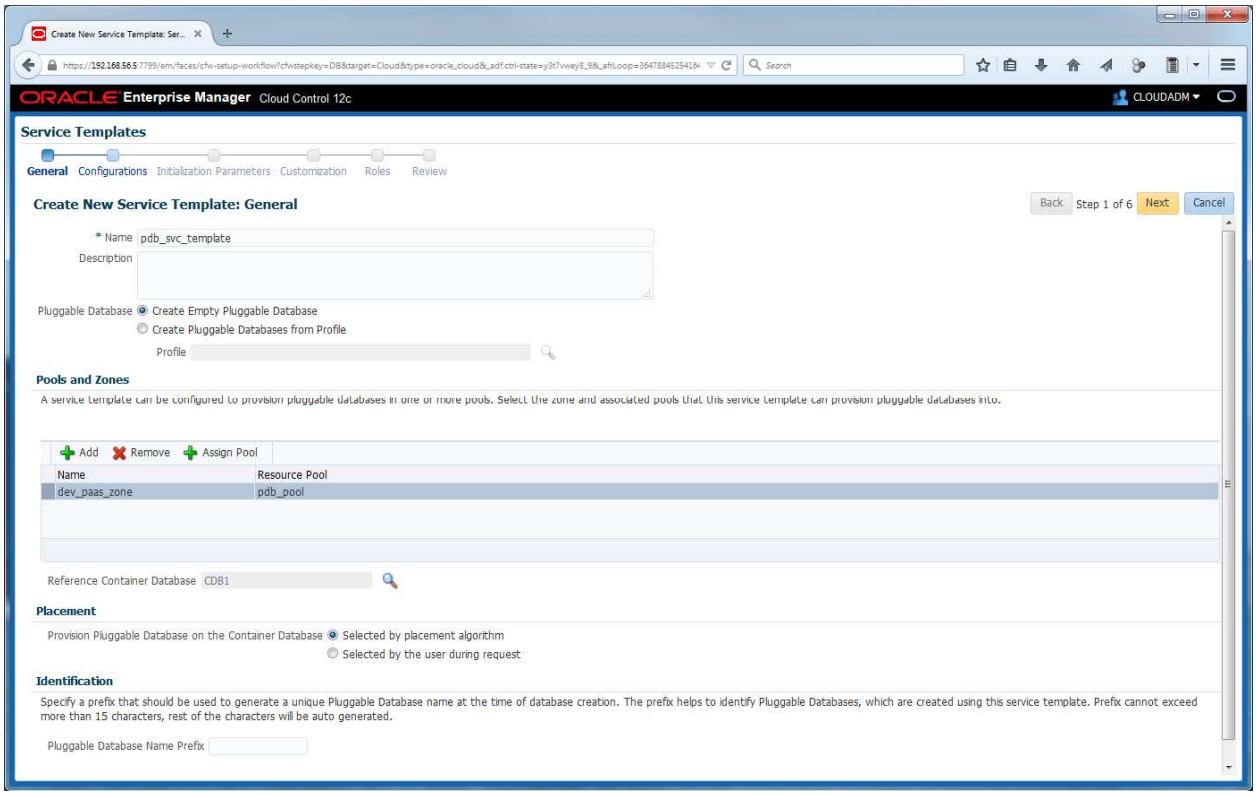


c) In the "**Create New Service Template: General**" window

- Enter the following information:
  - Name : **pdb_svc_template**
  - Pluggable Database : **Create Empty Pluggable Database**

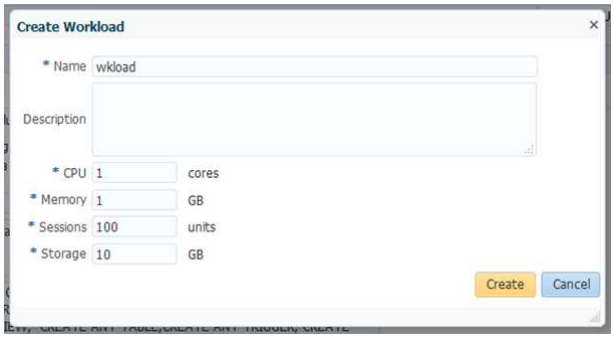
- In the **Pools and Zones** section:
  - Click **Add**
  - Select line **dev_paas_zone** and click **Select**
  - Select line **dev_paas_zone** and click **Assign Pool**
  - Select line **pdb_pool** and click **Select**

Click **Next**



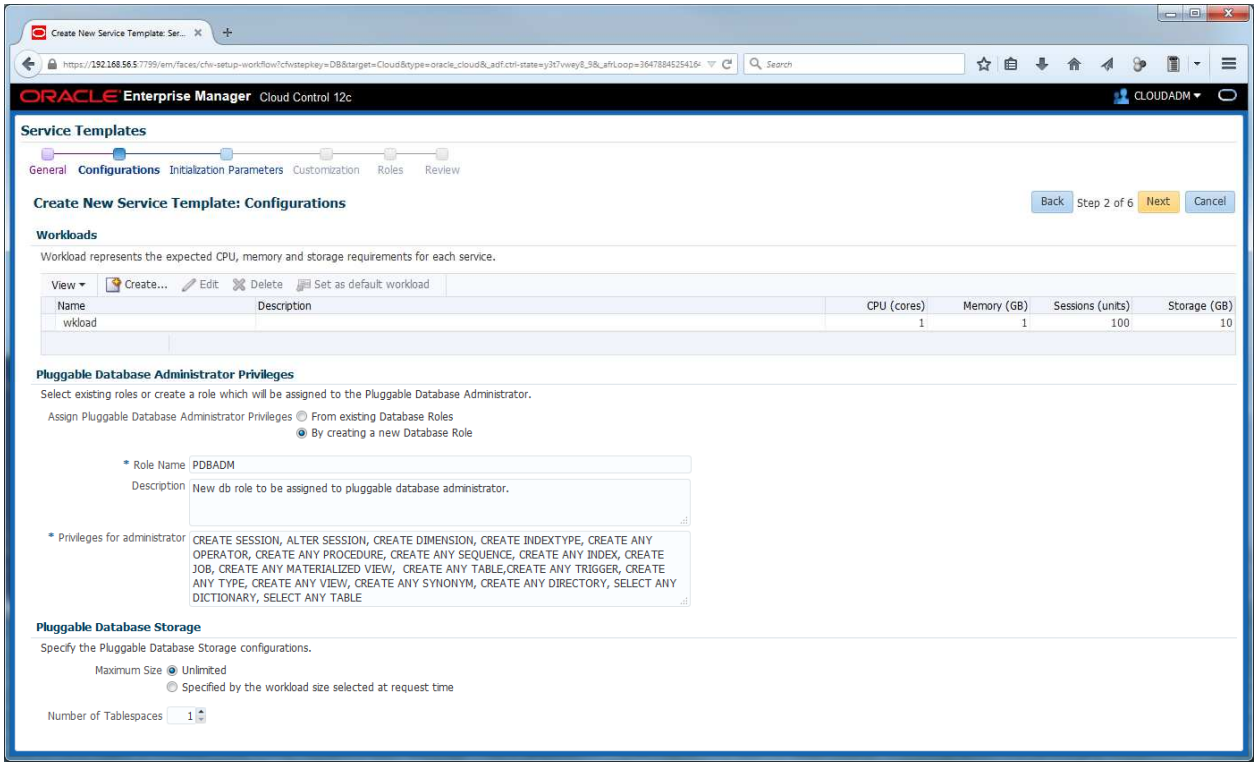
d) In the "**Create New Service Template: Configurations**" window, enter the following information

- In the **Workload** section, click **Create**
- In the "**Create Workload**" window, enter the following information and click **Create**
  - Name : **wkload**
  - CPU : **1 cores**
  - Memory : **1 GB**
  - Sessions : **100 units**
  - Storage : **10 GB**

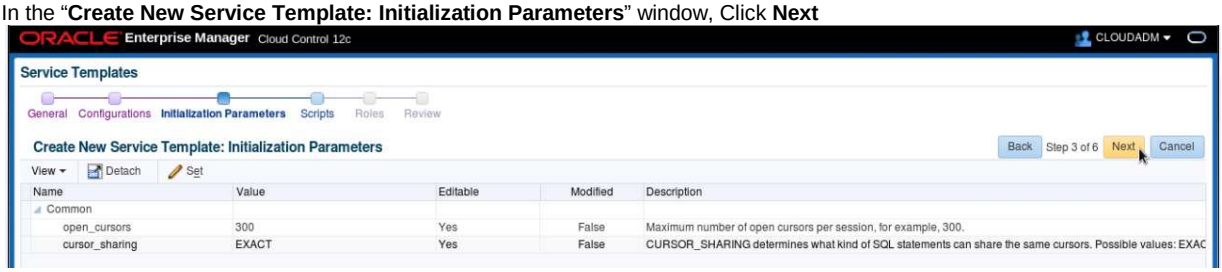


- In the "**Pluggable Database Administrator Privileges**" section,
  - Assign Pluggable Database Administrator Privileges: select "**By creating a new Database role**"
  - Role Name: **PDBADM**

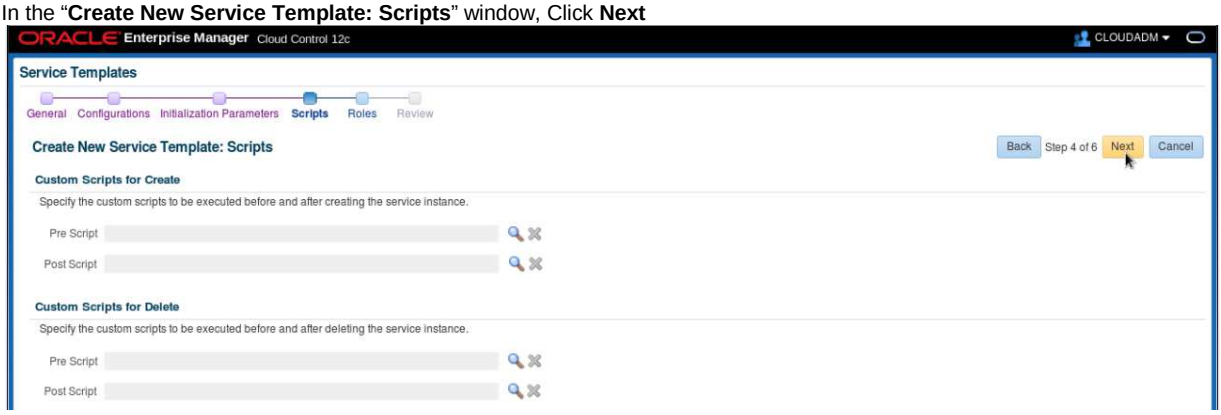
- Click **Next**



e) In the "**Create New Service Template: Initialization Parameters**" window, Click **Next**

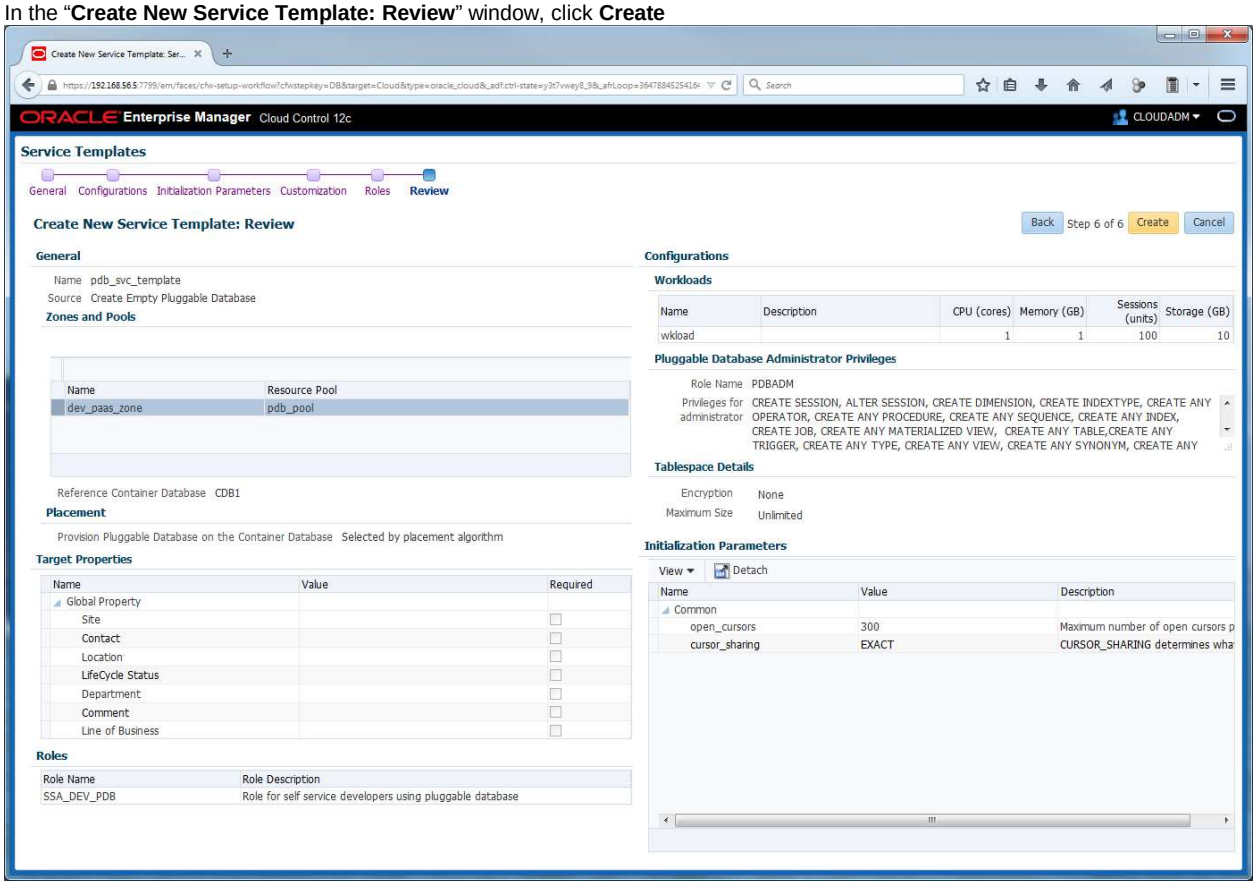


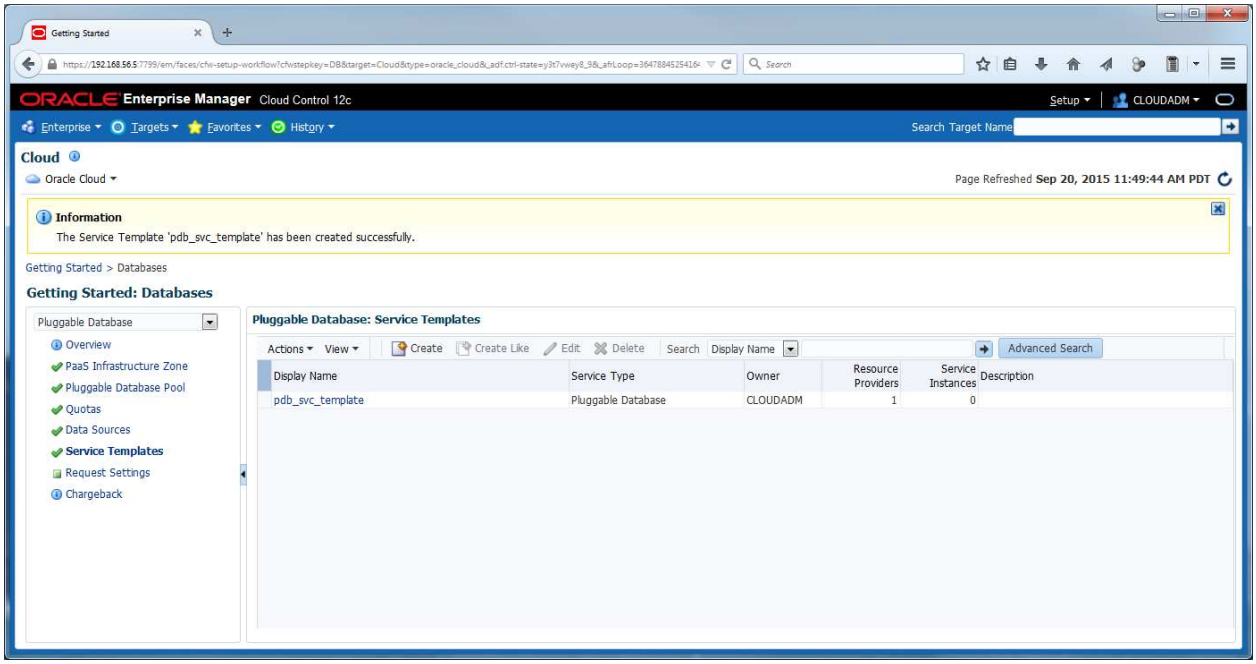
f) In the "**Create New Service Template: Scripts**" window, Click **Next**



g) In the "**Create New Service Template: Roles**" window:
- Click **Add** and select role **SSA_DEV_PDB**
- Click **Next**

h) In the "**Create New Service Template: Review**" window, click **Create**

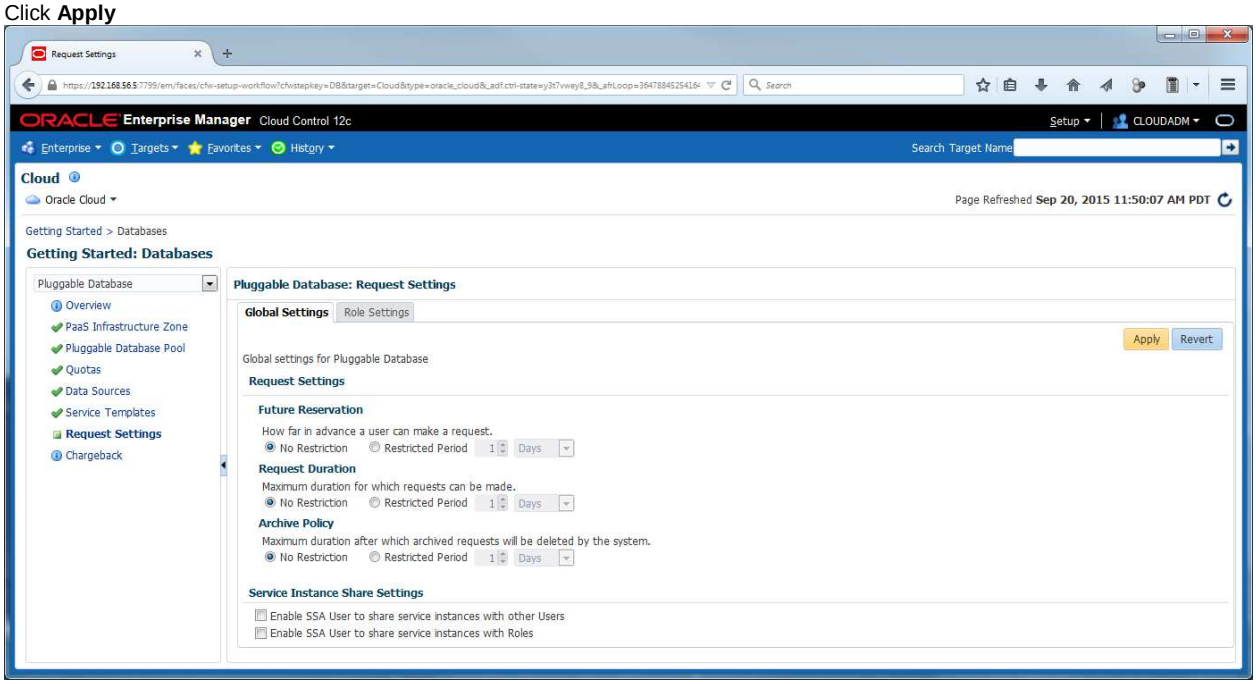




5.5.4 Request Settings setup

a) In the left panel, click "**Request Settings**"

b) Click **Apply**



6 Pluggable Database as a Service: deployment from the Self Service portal

6.1 Deploy a new PDB

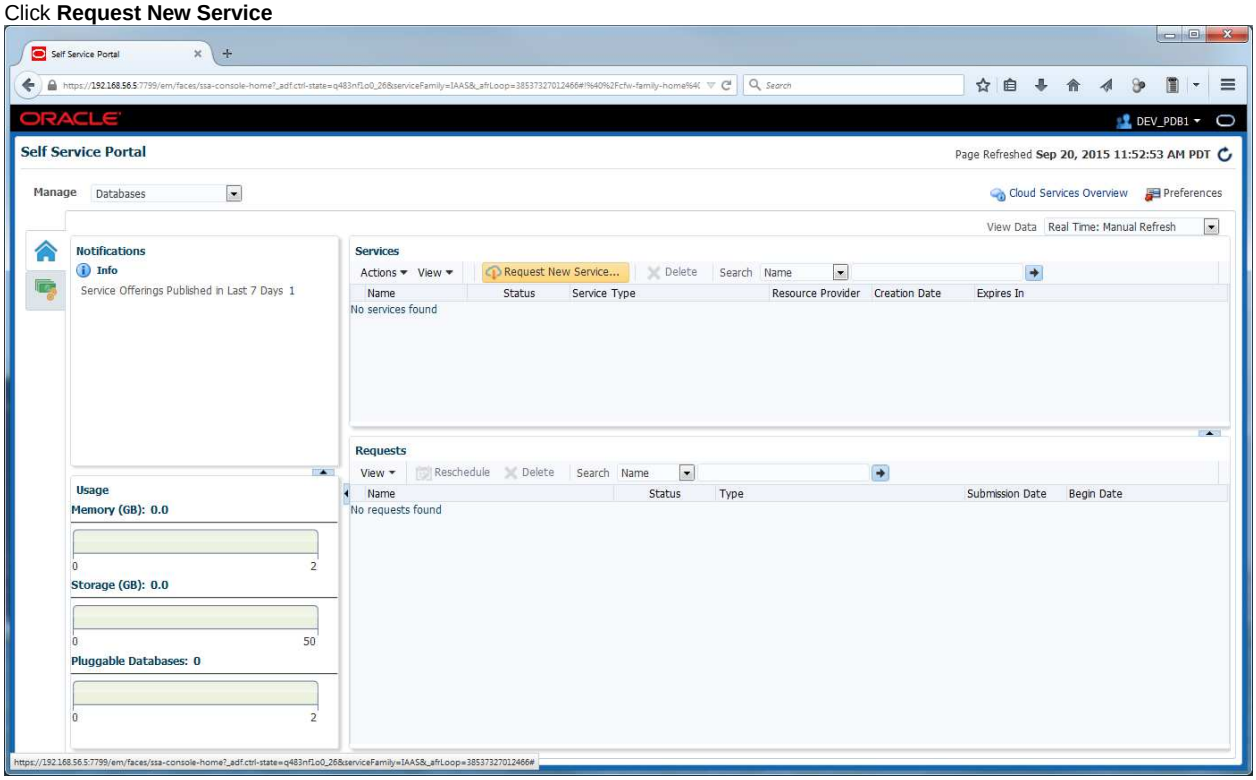
a) In Oracle Enterprise Manager 12c console, log out and log in again with a Self Service user using the following credentials:
- User Name : **dev_pdb1**
- Password : **dev_pdb1**

Ignore "**Accessibility Preferences**" by clicking "**Save and continue**"

You should now see the "**Infrastructure Cloud Self Service**" portal

b) In the **Manage** scroll down menu, select **Databases** to get the **Database Self Service portal**

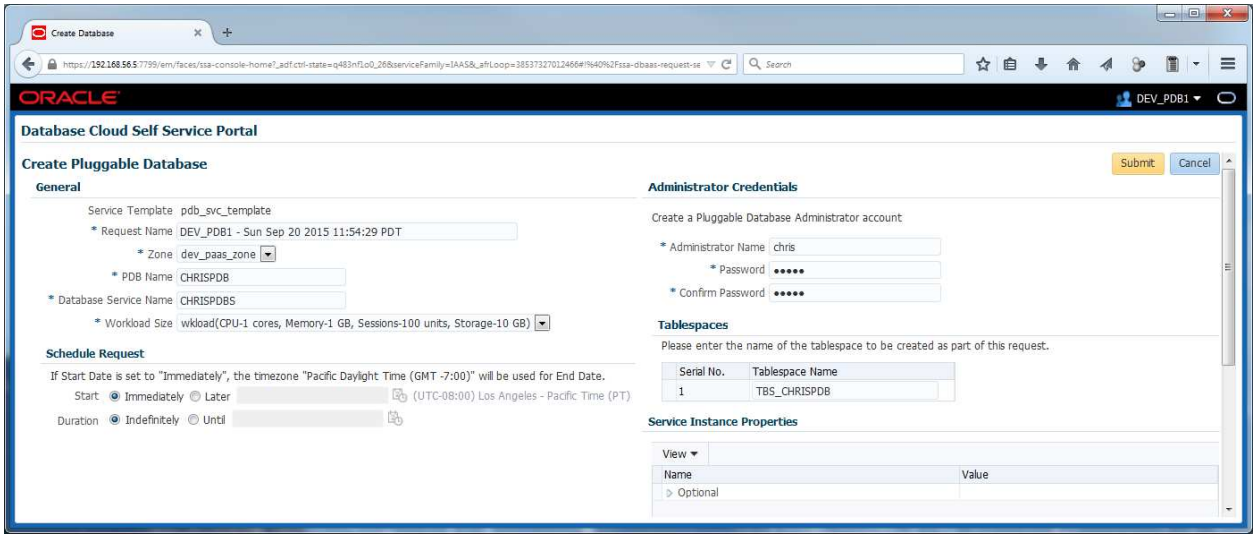
c) Click **Request New Service**



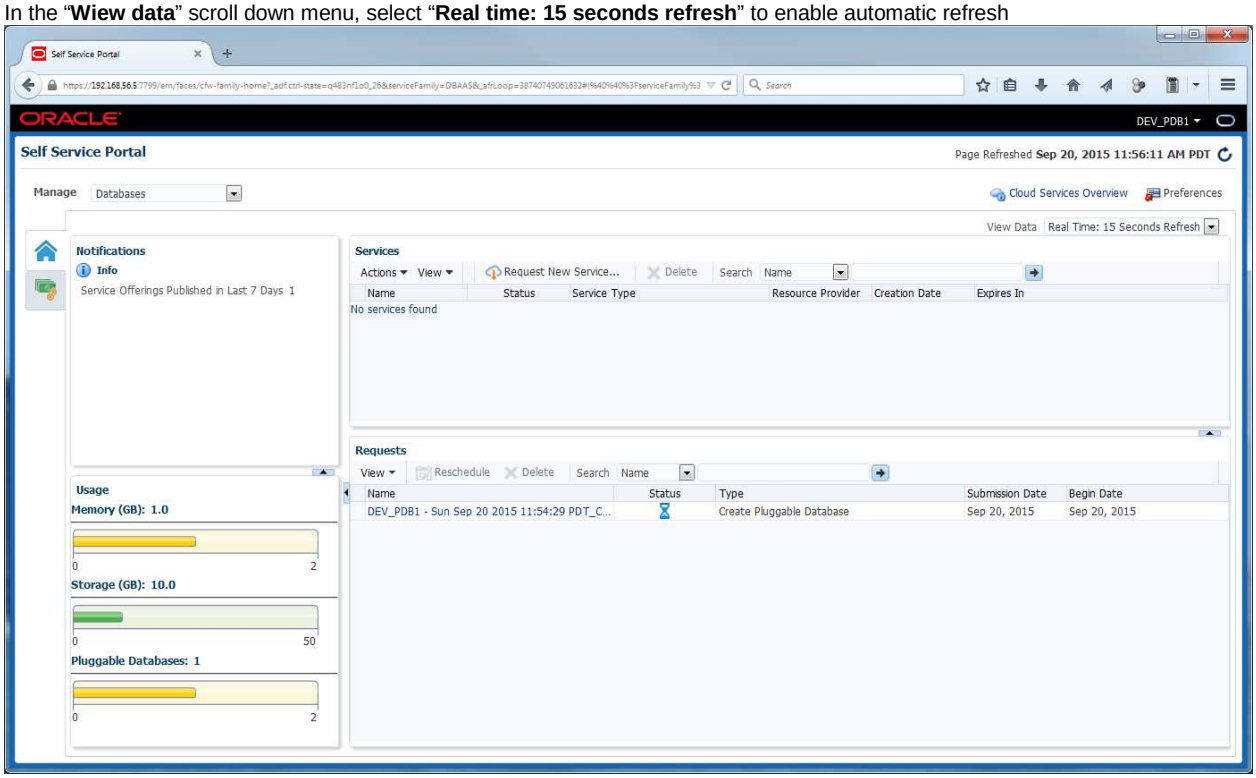
d) Select Service Template **pdb_svc_template**

e) In the "**Create Pluggable Database**" window:

- In the **General** section, enter the following information:
  - PDB Name : **CHRISPDB**
  - Database service name : **CHRISPDBS**
- In the "**Administrator Credentials**" section, enter the following information:
  - Administrator Name : **chris**
  - Password : **chris**
  - Confirm Password : **chris**
- In the "**Tablespaces**" section, enter the following information:
  - Tablespace Name : **TBS_CHRISPDB**
- Click **Submit**



f) In the "**Wiew data**" scroll down menu, select "**Real time: 15 seconds refresh**" to enable automatic refresh

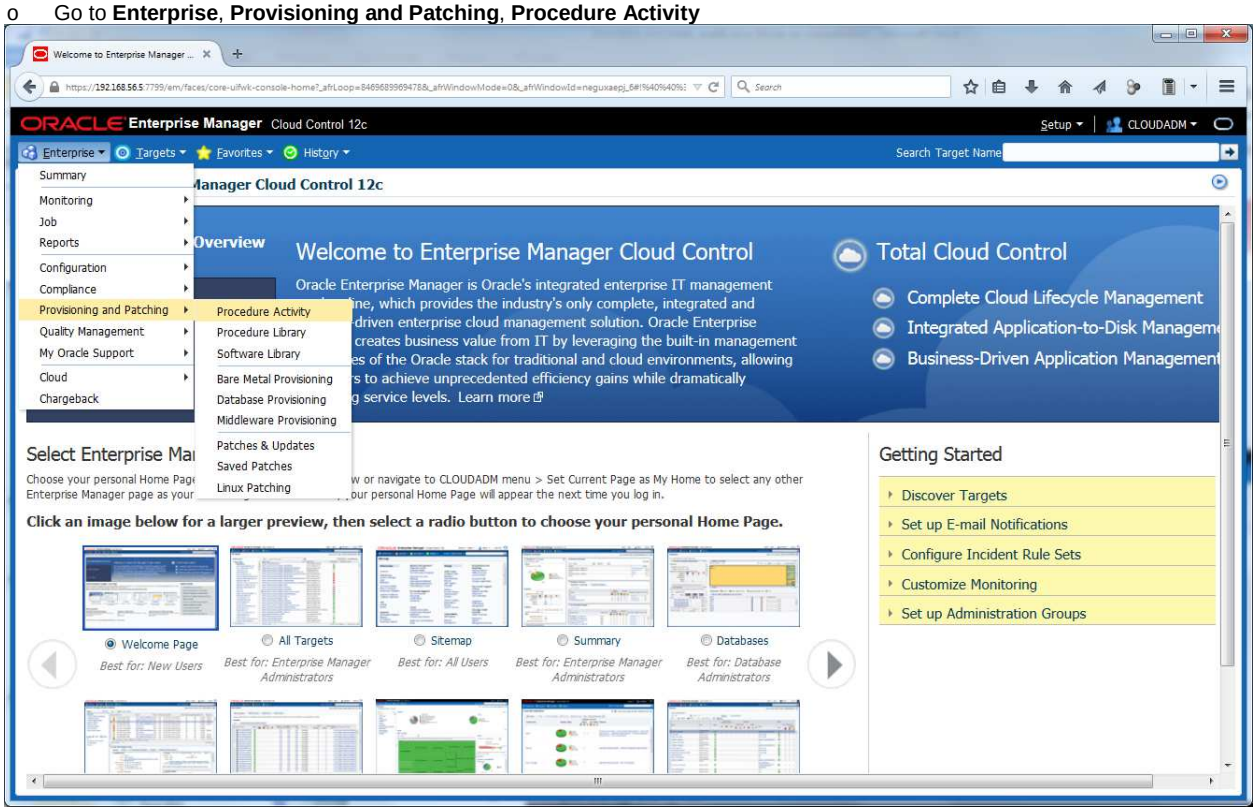


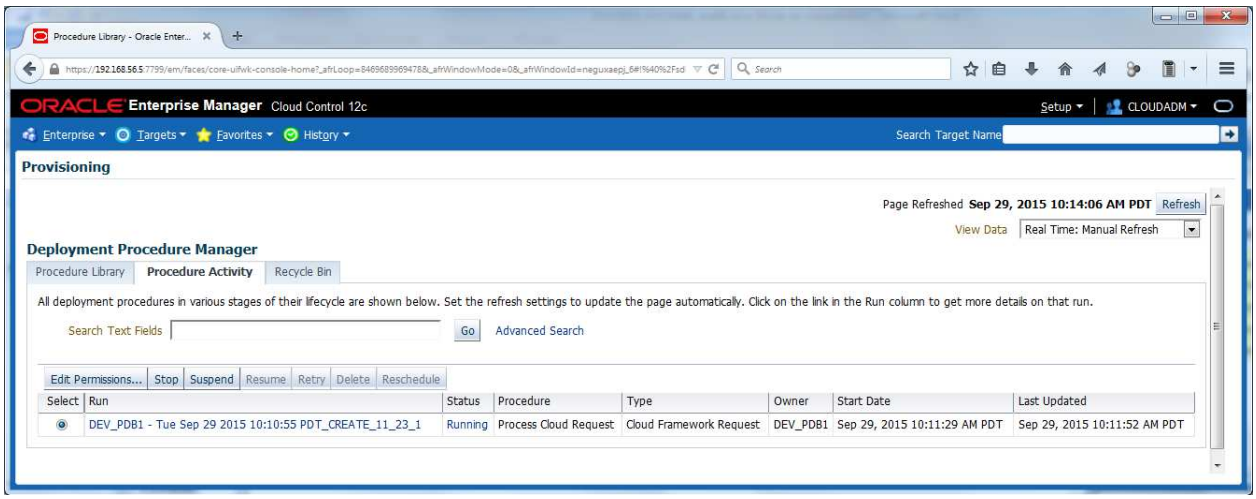
g) Wait for a few minutes to get your PDB

Note: job details

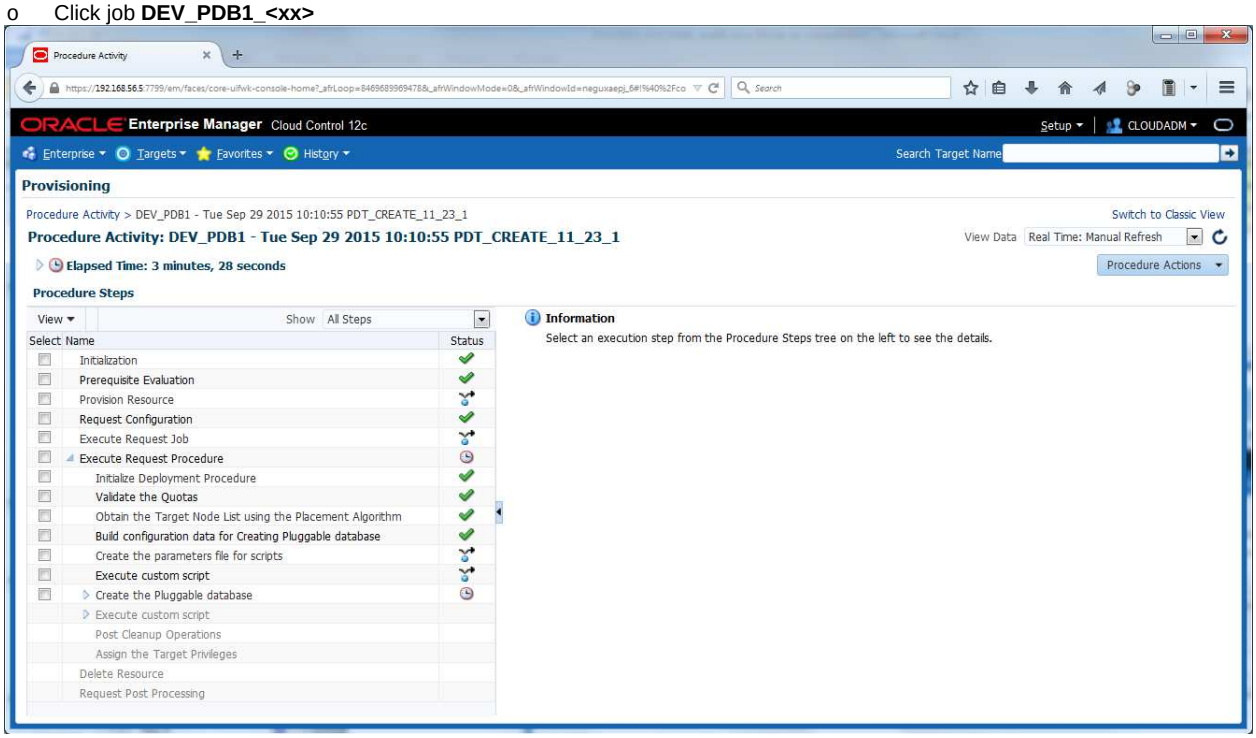
If you want to see the job details:

- Log out and log in using User Name **cloudadm** (password **cloud**)
- Go to **Enterprise**, **Provisioning and Patching**, **Procedure Activity**



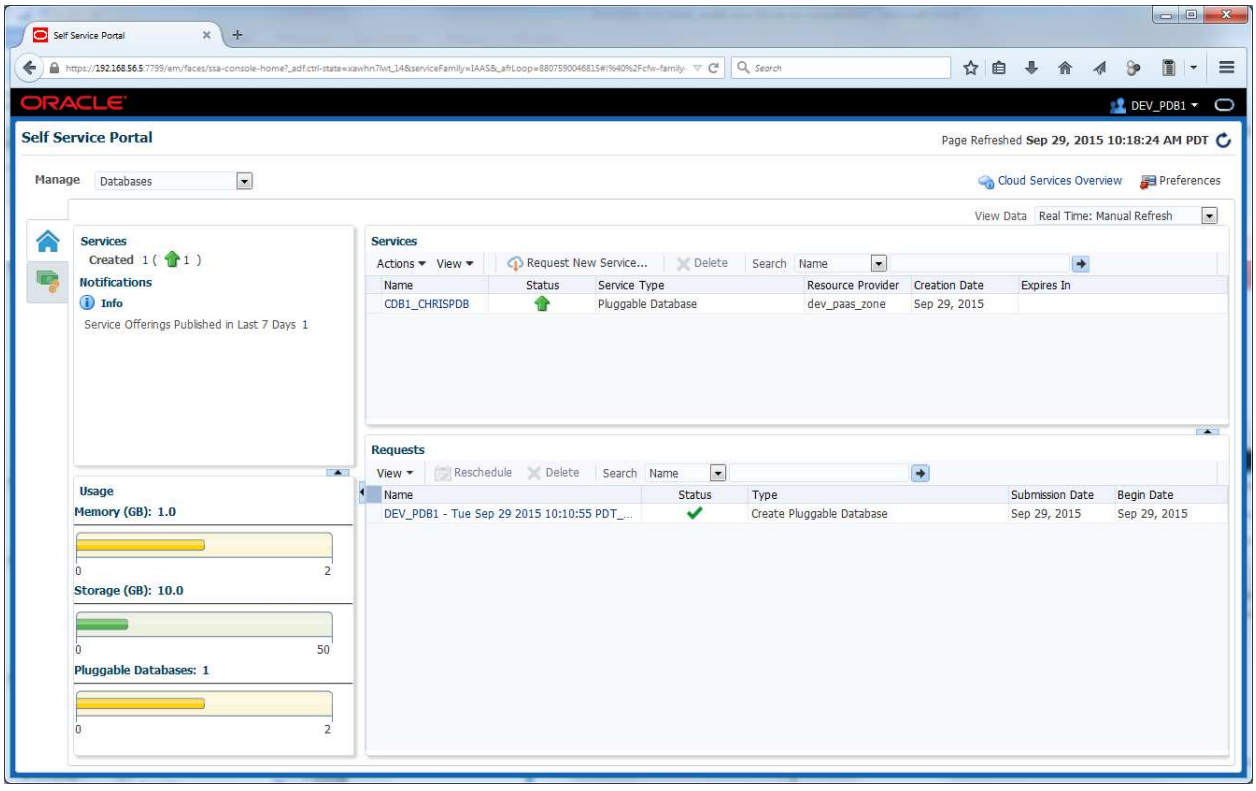


o Click job **DEV_PDB1_<xx>**

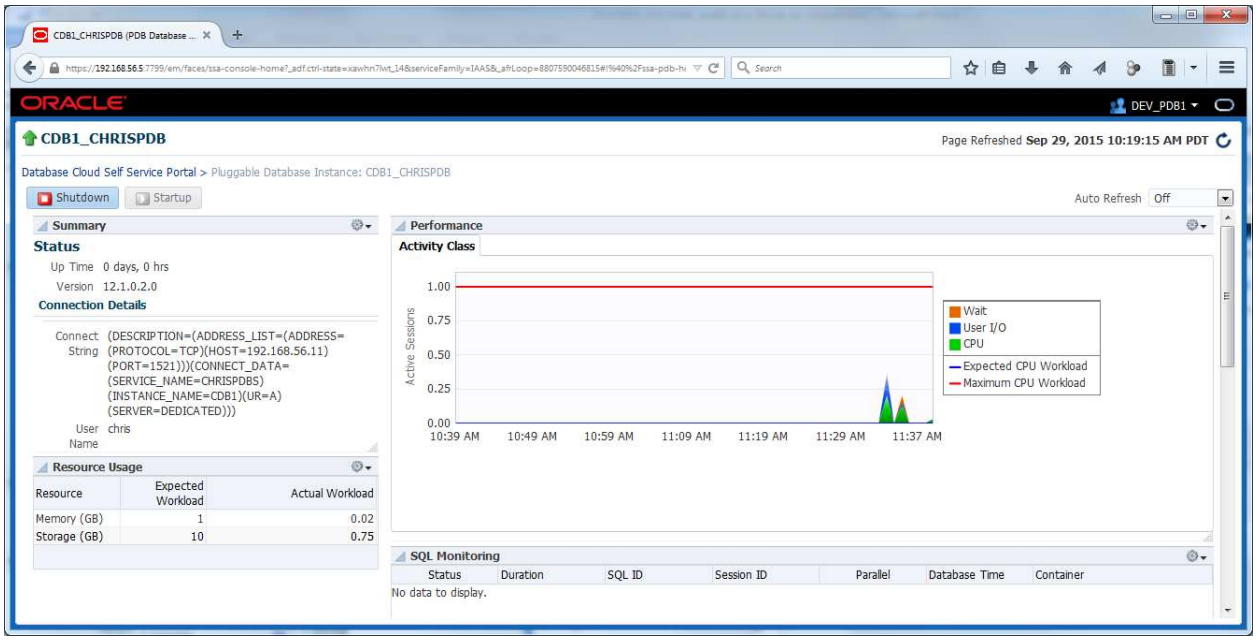


o In "**View Data**", select "**Real Time: 30 seconds Refresh**" to enable automatic refresh

h) After a few minutes, you will see your PDB



i) Click on the PDB **CDB1_CHRISPDB** to get more details



6.2 Access the PDB

6.2.1 Test with SQLPLUS

a) From a SQL client, connect to the PDB

Here, for simplicity, we use the SQL client installed on our virtual machine (**dev1.example.com**)

```
$ ssh guest@192.168.56.11                (password is guest)
$ sqlplus chris/chris@192.168.56.11:1521/chrispdb
SQL>
```

b) Try to create a table

```
SQL> create table toto (col1 varchar2(30)) tablespace TBS_CHRISPDB;
```

Notes: tablespace

- It is necessary to force tablespace because the default tablespace for this user is SYSTEM.

Congratulations !

You have successfully deployed your first pluggable database (PDB) in “DBaaS / PDB as a Service” mode.

7 Appendix A: preparation of the environment before the lab

7.1 Purpose

This section explains how to prepare the environment to run this lab. It is useful if you want to run this lab at home or office.

The first step is to find an X86 machine (server, desktop or labtop) with the required resources (4 vcpus, 16 GB of ram, and 100 GB of disk space) and install Oracle VM VirtualBox on it.

Then, there are three servers to install (three Oracle VM VirtualBox virtual machines in fact):

- Oracle VM Server
- Oracle VM Manager
- Oracle Enterprise Manager Cloud Control 12c

7.2 Download required binaries

This section lists the required binaries and explains how to download them.

For your X86 machine:

1) **Oracle Java Runtime Environment (JRE) 7**
   Download the version for your OS from http://java.com/en/download/manual.jsp

2) **Oracle VM VirtualBox 5.0.x binaries (5.0.4 during writing of this document)**
   Download the version for your OS from https://www.virtualbox.org/wiki/Downloads
   For Oracle/Redhat Linux 6 64 bits:
   Direct link: http://download.virtualbox.org/virtualbox/5.0.4/VirtualBox-5.0-5.0.4_102546_el6-1.x86_64.rpm
   Filename : `VirtualBox-5.0-5.0.4_102546_el6-1.x86_64.rpm` (size 72 MB)
   For Microsoft Windows:
   Direct link: http://download.virtualbox.org/virtualbox/5.0.4/VirtualBox-5.0.4-102546-Win.exe
   Filename : `VirtualBox-5.0.4-102546-Win.exe` (size 111 MB)
   For others…

3) **Oracle VM VirtualBox Extension Pack 5.0.x**
   Download from https://www.virtualbox.org/wiki/Downloads (same file for all OSes)
   Direct link: http://download.virtualbox.org/virtualbox/5.0.4/Oracle_VM_VirtualBox_Extension_Pack-5.0.4-102546.vbox-extpack
   Filename: `Oracle_VM_VirtualBox_Extension_Pack-5.0.4-102546.vbox-extpack` (size 16 MB)

For Oracle VM Server:

4) **Oracle VM Server 3.3.3 iso image**
   Download from My Oracle Support http://support.oracle.com (Patch **20492240)**
   Filename: `p20492240_30_Linux-x86-64.zip` (size 523 MB)

For Oracle VM Manager:

5) **Oracle VM VirtualBox template for Oracle VM Manager 3.2.4**
   Download from http://www.oracle.com/technetwork/server-storage/vm/template-1482544.html
   Direct link: http://download.oracle.com/otn/vm/OracleVMManager3.2.4-b524.ova
   Filename: OracleVMManager.3.2.4-b524.ova (size 2.75 GB)

6) **Oracle VM Manager patch for 3.3.3 (to upgrade from 3.2.4 to 3.3.3)**
   Download from My Oracle Support http://support.oracle.com (Patch **20492250)**
   Filename: `p20492250_30_Linux-x86-64.zip` (size 2.6 GB)

For Oracle Enterprise Manager Cloud Control 12c:

7) **Oracle VM VirtualBox template for Oracle Enterprise Manager 12c release 5 (12.1.0.5)**
   Download for Oracle E-delivery platform (https://edelivery.oracle.com)
   Login, filter products by "**Linux/OVM/VMs**" and enter "**cloud control**"
   Then select "**Oracle VM VirtualBox for Oracle Enterprise Manager Cloud Control**"
   Select Platform "**x86 64 bit**"
   Click continue twice
   Download the 6 files listed here
   Filenames:
   `V76836-01.zip` (size 3.4 GB)
   `V76837-01.zip` (size 3.5 GB)

`V76838-01.zip` (size 3.5 GB)
`V76839-01.zip` (size 3.5 GB)
`V76840-01.zip` (size 3.1 GB)
`V77049-01.zip` (size 2.6 KB, extraction instructions)

7.3 Installation of Oracle VM VirtualBox

1) Find an x86 machine (desktop, laptop, server) matching the following prerequisites:
   - At least 16 GB of RAM
   - X86 64 bits CPU (Intel or AMD) with at least 4 cpus threads and with Virtualization Extensions (Intel VT or AMD-V)
   - OS supported by Oracle VM VirtualBox (Microsoft Windows, Linux distributions, Oracle Solaris, Apple Mac OSX…)
   - 100 GB of disk space

2) Install the Oracle Java JRE on your OS (javaws binary needed to get the VNC console)

3) Install the Oracle VM VirtualBox binaries on your x86 machine

4) Start the Oracle VM VirtualBox console

5) If not already created, create a host only network in Oracle VM VirtualBox using the defaults IP information (IPv4 address 192.168.56.1 and Netmask 255.255.255.0 for your x86 machine).
(go to File, Preferences, Network)

6) Choose the folder you want to use to store the virtual machines files.
(go to File, Preferences, General, Default Machine Folder)

7) Install the Oracle VM VirtualBox extension Pack
(go to File, Preferences, Extensions)

7.4 Installation of Oracle VM Server

7.4.1 Installation of version 3.3.3 from ISO image

a) In the Oracle VM VirtualBox console, create a new VM
   - Name: HOL10469_ovm_srv
   - Type: Linux, Oracle (64 bits)
   - Memory Size: 4096 MB
   - Storage HDD: create 1 HDD: VDI, Dynamically allocated, 20 GB

b) Edit the VM
   - System, Processor: set 2 VCPUs
   - Storage:
     - CDROM: choose ISO image for OVM Server 3.3.3
     - HDD: create a second HDD: VDI, Dynamically allocated, 150GB (for repo)
     - Enable Host I/O cache on the SATA Controller (optional, will improve performance on laptop)
   - Network: 2 adapters enabled with Host Only adapters, vboxnet0, Promiscuous mode “Allow All”

c) Start the VM

d) Install & Configure Oracle VM Server 3.3.3
   - Set root password to **ovsroot**
   - Set Agent password to **ovsroot**
   - Configure network
     - IP address : **192.168.56.2**
     - Netmask : **255.255.255.0**
     - Gateway : **192.168.56.1**
     - DNS server : **192.168.56.1**
       (we will not use DNS, but we have to give an IP address here)
     - Hostname : **ovm-srv.example.com**
   - Reboot with installation completed

e) Open a terminal on your Unix/Linux x86 machine and connect to the VM with ssh (you can use Putty on Microsoft Windows)
   `$ ssh root@192.168.56.2` (password is **ovsroot**)

f) Add the following lines to the /etc/hosts file

```
192.168.56.3   ovm-mgr.example.com ovm-mgr
192.168.56.5   emcc.example.com emcc
192.168.56.1   os.example.com os
```

7.5 Installation of Oracle VM Manager

7.5.1 Installation of version 3.2.4 from Oracle VM VirtualBox template

a) In the Oracle VM VirtualBox console, import the VM from the Oracle VM Manager template
- Click File
- Click Import Appliance
- Select the file OracleVMManager.3.2.4-b524.ova
- Click Next
- Change the name of the Virtual System 1 from "**Oracle VM Manager 3.2.4-b524**" to "**HOL10469_ovm_mgr"**
- Click Import

b) Modify the settings of the virtual machine "**HOL10469_ovm_mgr**"
- Configure the network (Network, Adapter 1, Attached to Host only Adapter, vboxnet0)
- Memory: Set to **4096 MB**

c) Start the virtual machine "**HOL10469_ovm_mgr**"

d) Configure the virtual machine (in the VM console)
- Set root password to **ovsroot**
- Configure network
  - IP address : **192.168.56.3**
  - Netmask : **255.255.255.0**
  - Gateway : **192.168.56.1**
  - DNS server : **192.168.56.1**
    (we will not use DNS, but we have to give an IP address here)
  - Hostname : **ovm-mgr.example.com**
- Wait for the end of boot

e) Open a terminal on your Unix/Linux x86 machine and connect to the VM with ssh (you can use Putty on Microsoft Windows)
```
$ ssh root@192.168.56.3
```

f) Add the following lines to the file `/etc/hosts`
```
192.168.56.5    emcc.example.com emcc
192.168.56.2    ovm-srv.example.com ovm-srv
192.168.56.1    os.example.com os
```

7.5.2 Upgrade to version 3.3.3

a) Unzip file `p20492250_30_Linux-x86-64.zip` to get file `ovmm-3.3.3-installer-OracleLinux-b1085.iso`

b) Copy this ISO file to `/var/tmp` on the VM

c) Run the upgrade
```
# mount -o loop /var/tmp/ovmm-3.3.3-installer-OracleLinux-b1085.iso /mnt
# /mnt/runInstaller.sh
```

Choose Upgrade (2), then enter the 3 passwords asked (**Welcome1** each time)

Note: ignore the warning about Recommended memory

d) Wait for the upgrade to complete (a few minutes)

e) Cleanup
```
# cd /
# umount /mnt
# rm /var/tmp/ovmm-3.3.3-installer-OracleLinux-b1085.iso
```

7.5.3 Configuration for Oracle Enterprise Manager 12c (part 1)

a) Create the directory where we will install the EM12c agent later

```
# mkdir /u01/em_agent
# chown oracle /u01/em_agent
```

b) Change the password for the **oracle** unix user

```
# passwd oracle
```
(Choose **oracle** as the password)

c) Configure Oracle VM Manager keystore (to have a secure connection with EMCC)

```
# cd /u01/app/oracle/ovm-manager-3/bin
# ./secureOvmmTcpGenKeyStore.sh
Generate OVMM TCP over SSH key store by following steps:
Enter keystore password: Store00
Re-enter new password: Store00
What is your first and last name?
  [Unknown]:  oow
What is the name of your organizational unit?
  [Unknown]:  oow
What is the name of your organization?
  [Unknown]:  oow
What is the name of your City or Locality?
  [Unknown]:  oow
What is the name of your State or Province?
  [Unknown]:  oow
What is the two-letter country code for this unit?
  [Unknown]:  oow
Is CN=oow, OU=oow, O=oow, L=oow, ST=oow, C=oow correct?
  [no]:  yes

Enter key password for <ovmm>
        (RETURN if same as keystore password):

# ./secureOvmmTcp.sh
Enabling OVMM TCP over SSH service

Please enter the Oracle VM manager user name: admin

Please enter the Oracle VM manager user password: Welcome1

Please enter the password for TCPS key store : Store00

The job of enabling OVMM TCPS service is committed, please restart OVMM to take effect.

# service ovmm stop
# service ovmm start

# cd ..
# mkdir keystore
# chown oracle ./keystore
# /u01/app/oracle/java/bin/keytool -keystore /u01/app/oracle/ovm-manager-3/ovmmCoreTcps.ks
   -exportcert -alias ovmm -file ./keystore/export.jks
Enter keystore password:  Store00
Certificate stored in file <./keystore/export.jks>
```

Stop here in the Oracle VM Manager preparation
Go to Oracle Enterprise Manager preparation
Come back when Oracle Enterprise Manager server is ready

7.5.4 Deploy Oracle Enterprise Manager agent on the Oracle VM Manager server

a) Go to Oracle Enterprise Manager Cloud Control 12c console (open URL https://192.168.56.5:7799/em in your Web browser) Log in with user **sysman** and password **welcome1**.

b) Click **Setup**, "**Add Target**", "**Add Target Manually**"

c) Select "**Add host target**" and click "**Add Host…**"

d) Select "**Manually**" in the "**Add**" scroll down menu

e) Enter the following information
- Host : 192.168.56.3
- Platform : Linux x86-64

Then click "**Next**"

Note: Ignore Warning about Fully qualified hostnames.

f) In the "**Add Host Targets: Installation Details**" window, enter the following information, then click "**Next**"
- Installation Base Directory : **/u01/em_agent**
- Instance Directory : /u01/em_agent/agent_inst
- Named Credential
  - Click "+" to add a new credential
  - Username : **oracle**
  - Password : **welcome1**
  - Save As : **oracle**
  - Click **OK**
- Privileged Delegation Setting : **<empty>**

g) In the "**Add Host Targets: Review**" window, click "**Deploy Agent**".

h) Wait for the agent to be deployed **(several minutes)**

i) Execute the mentioned scripts as root on the Oracle VM Manager to complete deployment

```
$ ssh root@192.168.56.3
# /u01/em_agent/core/12.1.0.5.0/root.sh
# /u01/app/oraInventory/orainstRoot.sh
```

j) In the "**Agent Deployment Summary**" window, click "**Done**".

k) Install the "**Oracle Virtualization**" plug-in on the EM Agent just deployed
In Oracle Enterprise Manager Cloud Control console
- Click Setup, Extensibility, Plug-ins
- Expand "Servers, Storage and Network"
- Select "Oracle Virtualization"
- Click "Deploy On", "Management Agent…"
- Click Continue
- Select the "**192.168.56.3**" line and click **Continue**
- Click **Next**
- Click Deploy

7.5.5 Configuration for Oracle Enterprise Manager 12c (part 2)

a) Finish configuring the secure connection between Oracle VM Manager and Oracle Enterprise Coud Control

```
$ ssh oracle@192.168.56.3        (password is oracle)
oracle$ cd /u01/app/oracle/ovm-manager-3
oracle$ /u01/em_agent/agent_inst/bin/emctl secure add_trust_cert_to_jks     -trust_certs_loc
./keystore/export.jks -alias ovmm
Oracle Enterprise Manager Cloud Control 12c Release 5
Copyright (c) 1996, 2015 Oracle Corporation.  All rights reserved.
Password: welcome      (default password)

Message   :   Certificate was added to keystore
ExitStatus: SUCCESS
```

b) Enable HTTP server and copy the Database 12c Oracle VM assembly (see Appendix B on how to create this assembly)

- The Oracle VM Manager virtual machine has already an Apache HTTP server configured and running. The “Document Root” directory is `/var/www/html`

- Create a subdirectory called `files` in `/var/www/html`
  # cd /var/www/html
  # mkdir files
  # chmod 777 files

- Copy the Database 12c Oracle VM assembly (file **OVM_OL6U5_DB12_PVM.ova**) in it (use scp or WinSCP)
  # ls –lh /var/www/html/files
  total 4.8G
  -rw-r--r-- 1 root root 4.8G aug 27 08:05 OVM_OL6U4_DB12_PVM.ova

7.6 Installation of Oracle Enterprise Manager Cloud Control 12c

a) Create the Oracle Enterprise Manager Cloud Control template file from the downloaded zip files.
   - Unzip the files V76836-01.zip, V76837-01.zip , V76838-01.zip , V76839-01.zip , V76840-01.zip
   - This will create 5 files with .ova extension
   - Concatenate the 5 .ova files to create a single .ova file
     - $ cat VBox_EM12cR5*.ova > EM12cR5.ova
   - This will create a 17 GB file called **EM12cR5.ova**

b) In the Oracle VM VirtualBox console, import the VM from the Oracle Enterprise Manager Cloud Control template
   - File
   - Import Appliance
   - Select the file **EM12cR5.ova**
   - Next
   - Change the name of the Virtual System 1 to "**HOL10469_emcc**"
   - Import

c) Modify the settings of the virtual machine "**HOL10469_emcc**"
   - Configure the network (Network, Adapter 1, Attached to Host only Adapter)
   - Set the Base memory to **5120MB** instead of 3072MB (System, Motherboard)

d) Start the virtual machine "**HOL10469_emcc**"

e) On the VM graphic console, log in using user **root** and password **welcome1**

   WARNING: the VM is preconfigured with US/qwerty keyboard, if you have another keyboard make sure to press the keys corresponding to qwerty layout. Once logged, if you want, you can change the keyboard layout by clicking **System**, **Preferences** and **Keyboard**.

f) Open a terminal

g) Change the network configuration (replace DHCP par static IP address)
   To do that, modify the file `/etc/sysconfig/network-scripts/ifcfg-eth0`
   and replace line
   ```
   BOOTPROTO=dhcp
   ```
   by lines
   ```
   BOOTPROTO=static
   IPADDR=192.168.56.5
   NETMASK=255.255.255.0
   ```

h) Apply the network changes now
   ```
   # service network restart
   ```

i) Open a terminal on your Unix/Linux x86 machine and connect to the VM with ssh (you can use Putty on Microsoft Windows)
   `$ ssh root@192.168.56.5` (password is **welcome1**)

   Note: If not using US/qwerty keyboard, you will have the correct keyboard layout in this terminal.

j) Change the root password (Easier to have the same root password for all servers)
   `# passwd root` (choose **ovsroot**)

k) Disable the Linux Firewall to authorize HTTP/HTTPS traffic between the X86 machine web browser and Oracle Enterprise Manager
   ```
   # chkconfig iptables off
   # chkconfig ip6tables off
   ```

l) Edit file `/home/oracle/start_oms.sh` and set its content to the following:

   ```
   #!/bin/bash
   export ORACLE_HOSTNAME=emcc.example.com
   echo "Starting the Oracle Management Server ....."
   echo ""
   cd /u01/OracleHomes/Middleware/oms/bin
   ./emctl start oms
   ```

   Note: the original script does not start all services (to save memory). Here we need all services.

m) Edit file `/home/oracle/stop_oms.sh` and set its content to the following:

```
#!/bin/bash
export ORACLE_HOSTNAME=emcc.example.com
echo "Stopping the Oracle Management Server ....."
echo ""
cd /u01/OracleHomes/Middleware/oms/bin
./emctl stop oms
```

n) Edit file `/home/oracle/stop_db.sh` and set its content to the following:
Replace
```
shutdown
```
By
```
shutdown immediate
```

o) Create a startup script named `/etc/init.d/emcc` to automatically start EMCC at boot with following content
`#!/bin/bash`

```
case "$1" in
        start)
                echo -n "Starting Oracle Enterprise Manager 12c R5"
                su oracle -c /home/oracle/start_all.sh
                ;;
        stop)
                echo -n "Stopping Oracle Enterprise Manager 12c R5"
                su oracle -c /home/oracle/stop_all.sh
                ;;
        *)
                echo "Usage: $0 {start|stop}"
                ;;
esac
```

```
# chmod +x /etc/init.d/emcc
# ln -s /etc/init.d/emcc /etc/rc3.d/S98emcc
# ln -s /etc/init.d/emcc /etc/rc0.d/K01emcc
# ln -s /etc/init.d/emcc /etc/rc1.d/K01emcc
# ln -s /etc/init.d/emcc /etc/rc6.d/K01emcc
```

p) Change file `/etc/hosts`

- Remove `emcc.example.com` on existing lines (without deleting the lines)
- Add the following lines at the end of the file

```
192.168.56.5    emcc.example.com emcc
192.168.56.3    ovm-mgr.example.com ovm-mgr
192.168.56.2    ovm-srv.example.com ovm-srv
192.168.56.1    os.example.com os
```

q) Disable the graphic environment (Gnome) to save resources (CPU and memory)
Edit file `/etc/initab`
And replace line
```
id:5:initdefault:
```
by line
```
id:3:initdefault:
```

r) Reboot the server
```
# reboot
```

s) Wait for the end of boot and for EMCC start.
(Wait for the prompt "**emcc login:**" on the VM console)

t) Go back to "**Deploy Oracle Enterprise Manager Agent on the Oracle VM Manager server**" to finish Oracle VM Manager configuration.

7.7 Pre-configuration of Oracle Enterprise Manager 12c

Some operations were done before the Oracle OpenWorld actual lab to save time and fit in the one hour slot.

Those operations are:

- Creation of the Oracle Enterprise Manager 12c users (cloud administrator and Self Service users)
- Import of an Oracle VM assembly into the Oracle Enterprise Manager 12c software library
- Creation of a network profile
- Configuration of the chargeback feature

7.7.1 Creation of Oracle Enterprise Manager users and roles

We will create 3 users and 2 roles

- **cloudadm** user which will be in charge of cloud administration (set up Self Service portal, chargeback, …)
- **dev_vm1** user which will represent a developer using virtual machines (IaaS)
- **dev_pdb1** user which will represent a developer using pluggable databases (PDBaaS)
- ssa_dev_vm role (used by user dev_vm1)
- **ssa_dev_pdb** role (used by user **dev_pdb1**)

7.7.1.1 Creation of the cloudadm user (cloud administrator)

a) In your Web browser, connect to Oracle Enterprise Manager Cloud Control 12c console using
URL: https://192.168.56.5:7799/em
User: **sysman**
Password: **welcome1**

b) Click **Setup**, **Security**, **Administrators**

c) Click **Create**

d) Enter the following information:
- Name : **cloudadm**
- Password : **cloud**
- Confirm Password : **cloud**

e) Leave defaults values for other fields and click **Next**

f) Add role **EM_CLOUD_ADMINISTRATOR** to existing roles (EM_USER and PUBLIC) and click **Next**

g) In the "**Create Administrator cloudadm: Target Privileges**" window, click **Next**

h) In the "**Create Administrator cloudadm: EM Resource Privileges**" window, click **Next**

i) In the "**Create Administrator cloudadm: Review**" window, click **Finish**

7.7.1.2 Creation of the ssa_dev_vm role (custom role for Self Service users using virtual machines)

As explained in the section 3.3 of the "**Oracle Enterprise Manager Cloud Control 12c r5: Cloud Administration Guide**" (see Appendix C: References), we need to create a custom role for Self Service application users.

a) In Oracle Enterprise Manager Cloud Control 12c console (still logged in with the **sysman** user), click **Setup**, **Security**, **Roles**

b) Click **Create**

c) Enter the following information and click **Next**
- Name : SSA_DEV_VM
- Description : Role for Self Service developers using virtual machines

d) Add role **EM_SSA_USER** (no existing roles) and click **Next**

e) In the "**Create Role SSA_DEVELOPER: Target Privileges**" window, click **Next**

f) In the "**Create Role SSA_DEVELOPER: EM Resource Privileges**" window, click **Next**

g) In the "**Create Role SSA_DEVELOPER: Administrators**" window, click **Next**

h) In the "**Create Role SSA_DEVELOPER: Review**" window, click **Finish**

7.7.1.3 Creation of the ssa_dev_pdb role (custom role for Self Service users using pluggable databases)

a) Repeat previous steps to create a role named **SSA_DEV_PDB** with description "**Role for Self Service developers using pluggable databases**"

7.7.1.4 Creation of user for a Self Service developer using Virtual Machines

a) In Oracle Enterprise Manager Cloud Control 12c console (still logged in with the **sysman** user), click **Setup**, **Security**, **Administrators**

b) Enter the following information:
- Name : **dev_vm1**
- Password : **dev_vm1**
- Confirm Password : **dev_vm1**
- Cost Center **: DEV_VM1**
- Description : Self Service developer using virtual machines

c) Leave defaults values for other fields and click **Next**

d) Add role **SSA_DEV_VM**

e) Remove existing roles **EM_USER and PUBLIC**

f) Then click **Next**

g) In the "**Create Administrator dev_vm1: Target Privileges**" window, click **Next**

h) In the "**Create Administrator dev_vm1: EM Resource Privileges**" window, click **Next**

i) In the "**Create Administrator dev_vm1: Review**" window, click **Finish**

7.7.1.5 Creation of user for a Self Service developer using pluggable databases

a) Repeat previous operations with the following information:
- Name : dev_pdb1
- Password : **dev_pdb1**
- Confirm Password : **dev_pdb1**
- Cost Center : **DEV_PDB1**
- Description : Self Service developer using pluggable databases
- Role : SSA_DEV_PDB

7.7.2 Import of an Oracle VM Assembly into EMCC Software Library

To save disk space on the EMCC VM, we will not actually import the Oracle VM Assembly into EMCC Software Library, but rather create a link to its actual location (on a web server installed on the Oracle VM Manager).

a) In Oracle Enterprise Manager Cloud Control 12c console (still logged in with the **sysman** user), click **Setup**, **Provisioning and Patching**, **Software Library**

b) Select tab "**Referenced File Locations**"

c) Select Storage Type **HTTP** and click **Add**

d) Enter the following information and click **OK**
- Name : http_mgr
- Location : http://192.168.56.3/files

e) Click **Enterprise**, **Provisioning and Patching**, **Software Library**

f) Right click "**Software Library**", then click "**Create Folder**"

g) Enter "**_HOL10469"** as the name, and click **OK**

h) Right click "**_HOL10469**", then click "**Create Entity**", "**Virtualization**"

i) Select Subtype **Assembly** and click **Continue**

j) In the "**Create Assembly: Describe**" window,
   - Set name to **db12_ol64**
   - Click **Next**

k) In the "**Create Template: Upload Files**" window
   - Select "Refer Files"
   - Select the "Referenced File Location" (choose http_mgr)
   - Click **Add**
   - Enter the following information and click **OK**
     - Source File : OVM_OL6U4_DB12_PVM.ova
     - Name : OVM_OL6U4_DB12_PVM.ova
   - Click **Next**

l) In the "**Create Assembly: Customize**" window, click **Next**

m) In the "**Create Assembly: Review**" window, click "**Save and Upload**"

7.7.3 Creation of a network profile

A **network profile** is used to automate assignment of IP addresses to guest virtual machines. A network profile is a list or range of IP address along with host names. It defines a set of IP addresses, their associated host-names, and common networking attributes for them.

a) In Oracle Enterprise Manager Cloud Control 12c console (still logged in with the **sysman** user), click **Setup**, **Provisioning and Patching**, **Network Profile**

b) Click **Create**

c) Enter the following information:
   - Name : dev_netprofile
   - Domain name : **example.com**
   - Netmask : 255.255.255.0
   - Gateway : 192.168.56.1
   - DNS : 192.168.56.1
   - IP Address : **Range**
   - Click **Add**
     - Hostname Pattern : **dev**
     - Start Value : **1**
     - First IP Address : **192.168.56.11**
     - Last IP Address : **192.168.56.20**

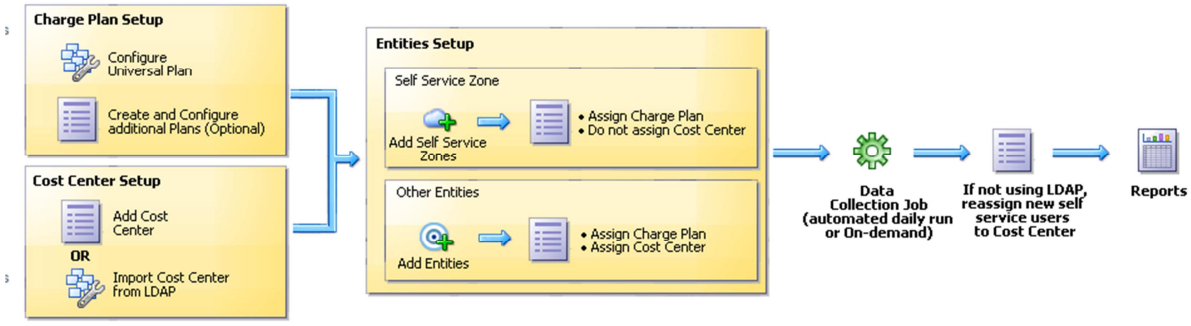
   Click **OK**

7.7.4 Configuration of Chargeback

Setup of Chargeback consists of 3 steps:

- Configure Charge Plans
  - Configure the Universal Charge Plan (set cost per CPU, Memory and Disk Space usage)
  - Optionally, define an Extended Charge Plan
- Configure Cost Centers
- Configure Entities (Charge Plan/Cost Center assignment)

The Chargeback feature is based on monthly reports. You can have different Charge Plans, Cost Centers and Targets assignment for each month.



7.7.4.1 Configure the Universal Charge Plan for current month

a) In Oracle Enterprise Manager Cloud Control 12c console (still logged in with the **sysman** user), click **Enterprise**, **Chargeback**

b) Click tab "**Charge Plans**"

c) Select "**Universal Charge Plan**"

d) Click **Create**, then **Revision** to create a new revision of the Universal Charge Plan for current month

e) Enter the following costs and **duration** for resources usage: (just an example)
- CPU Usage : **0.50** $ / CPU / **hour**
- Memory Allocation : **2.00** $ / GB / **Day**
- Storage Allocation : **0.50** $ / GB / **Day**

f) Click **Save**

7.7.4.2 Create an Extended Charge Plan

a) Click **Create**, then **Plan** to create a new Extended Charge Plan

b) Name it **dev_plan** (since it will be use to charge the developers resource consumptions)

c) In the panel "**Entity Types**", Click "**Add**"

d) Select "**Oracle Pluggable Database**" and "**Oracle VM Guest**" and click "**OK**"

The new extended plan will be based on the Universal Charge Plan using Multipliers for CPU, Memory and Storage.

e) For Oracle Pluggable Database
- Leave Multipliers to default values (1)
- Click "**Add Item**"
- Select "**Base Charge**" in the Item Name and Click **OK**
- Set the cost for the Base Charge: for instance**, 5.00 $** per **Day**

f) For Oracle VM Guest
- Leave Multipliers to default values (1)
- Click "**Add Item**"
- Select "**Base Charge**" in the Item Name and Click **OK**
- Set the cost for the Base Charge: for instance**, 10.00 $** per **Day**

g) Click **Save**

7.7.4.3 Setup the Cost Centers

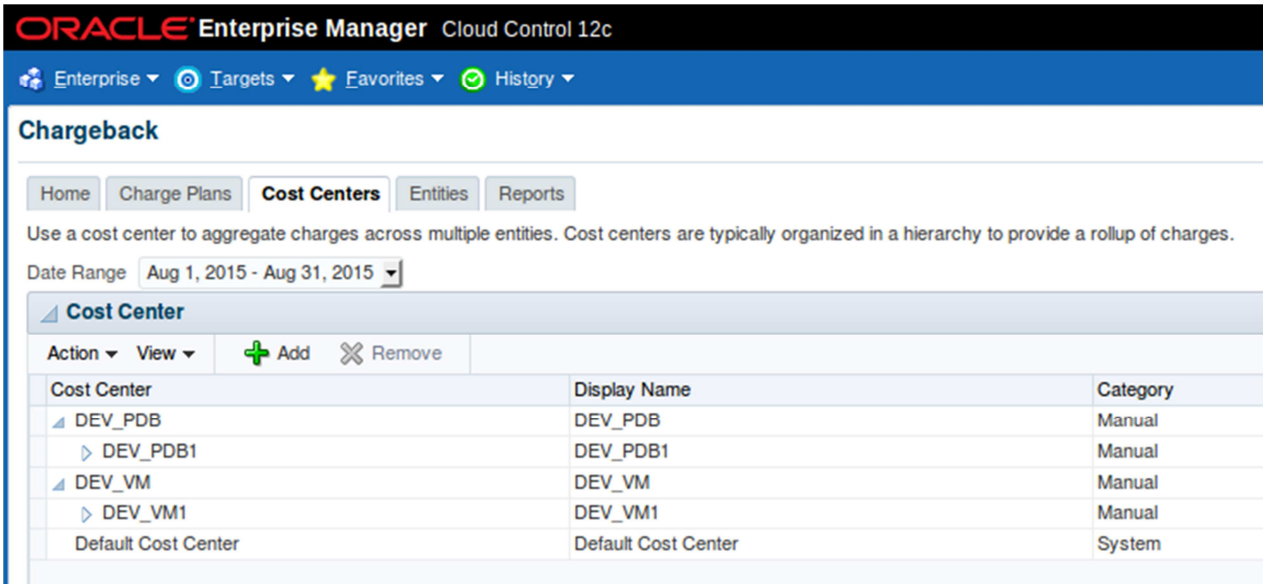
a) Click tab "**Cost Centers**"

b) Add a cost center for the developer group that will use Oracle VM guests
- Click **Add**
- Enter the following information
  - Cost Center : **DEV_VM**
  - Display Name : **DEV_VM**
  - Select the level "**Top Level (Root)**"
- Click **OK**

c) Add a cost center for the developer group that will use only Pluggable Databases
Repeat the same operations with Cost Center and Display Name set to **DEV_PDB**

d) Move cost center **DEV_VM1** as a sub-cost center for **DEV_VM**
- Select Cost Center **DEV_VM1**
- Drag and drop it over cost center **DEV_VM**
- A new window will appear ("**Move DEV_VM1 to**")
- Select "**Member of**" and "**DEV_VM**"
- Click **OK**

e) Move cost center **DEV_PDB1** as a sub-cost center for **DEV_PDB**
Repeat the same operations with cost centers **DEV_PDB1** and **DEV_PDB**



7.7.4.4 Assign the Charge Plans to Targets

Since we have not yet configured the Oracle VM infrastructure cloud (done during the lab), we don't have the Oracle VM targets (zone, pool, …) and we cannot assign the charge plans at this time. The assignment will be done during the lab.

8 Appendix B: Create Oracle VM Assembly for DB12c

In this section, we show how to create the DB12c Oracle VM assembly we use in the lab.
This creation was done before the lab during the preparation phase.
This operation can be done on any Oracle VM environment.

We create the DB12 Oracle VM assembly based on the publicly available Oracle Linux 6 update 4 Oracle VM Assembly.

The basic tasks to create this DB12c assembly are:

- Download the products (Oracle VM assembly for Oracle Linux 6u4 ISO image, Oracle Linux 6u4 ISO image and Oracle Database 12c)
- Import this assembly into an Oracle VM environment
- Create a new VM from this assembly and increase disk space
- Install Oracle DB12c binaries in this VM
- Create a DB12c container database
- Create an Oracle VM assembly from this VM

Operations are done from Oracle VM Manager (no need to use Oracle Enterprise Manager 12c here)

8.1 Download the Oracle VM assembly for Oracle Linux 6 Update 4

From your web browser, go to Oracle E-delivery Linux/Oracle VM platform (https://edelivery.oracle.com/oraclevm)

- Select Product Pack "**Oracle VM Templates**"
- Click **Go**
- Click "Oracle VM 3 Templates (OVF) for Oracle Enterprise Linux 6 Media Pack for x86_64 (64 bit)" (look for B65790)
- Click "Download" in front of "Oracle Linux 6 Update 4 template (OVF) – Paravirtualized x86_64 (64 bit)" (line V38315)
- You should get a file called **V45138-01.zip** (size 460 MB)
- Unzip it to get a file called **OVM_OL6U4_x86-64_PVM.ova** (size 513 034 240 Bytes)
- Copy this file on a web server accessible from your Oracle VM environment

8.2 Download the Oracle Linux 6 Update 4 ISO image

From your web browser, go to Oracle E-delivery Linux/Oracle VM platform (https://edelivery.oracle.com/linux)

- Select Product Pack "**Oracle Linux**"
- Select Platform "**x86 64 bit**"
- Click **Go**
- Click "Oracle Linux Release 6 Update 4 Media Pack for x86_64 (64 bit)" (look for B72264)
- Click "Download" in front of "Oracle Linux Release 6 Update 4 for x86_64 (64 bit)" (line V37084)
- You should get a file called **V37084-01.iso** (size **3.5 GB**)

8.3 Download Oracle Database 12c

From your web browser, go to Oracle E-delivery standard platform (https://edelivery.oracle.com)

- Select Product Pack "**Oracle Database**"
- Select Platform "**Linux x86 64 bit**"
- Click **Go**
- Click "Oracle Database 12c Release 1 (12.1.0.2.0) Media Pack for Linux x86_64 (64 bit)" (look for B78470)
- Click "Download" in front of "Oracle Database 12c Release 1 (12.1.0.2.0) (Part 1 of 2)" (line V46095)
- Click "Download" in front of "Oracle Database 12c Release 1 (12.1.0.2.0) (Part 2 of 2)" (line V46095)
- You should get 2 files called **V46095-01_1of2.zip** (size **1.6 GB**) and **V46095-01_2of2.zip** (size **967 MB**)

8.4 Import the Oracle VM Assembly into the storage repository

a) Open the Oracle VM Manager of your Oracle VM environment
(In Firefox open https://<IP_address>:7002/ovm/console)

b) Go to tab "**Repositories**", and select "**Assemblies**" in your repository

c) Click  (Import icon)

d) Enter the URL of the web server to access the file **OVM_OL6U4_x86-64_PVM.ova** in the "**VM Assembly download location**"

e) Click **OK**

f) Wait for the import to be completed
(status "**Completed**" in the "**Job Summary**" window)

8.5 Create a new VM from the assembly

a) Actually, VMs are not directly created from the Oracle VM assemblies but rather from the Oracle VM templates which are created from the Oracle VM assemblies.

b) Create an Oracle VM Template from the Oracle VM assembly
- Right click the assembly, then click "**Create VM Template…**"
- Choose a name for the template (for instance ol64_tpl) and Click OK
- Wait for the template to be created
(status "**Completed**" in the "**Job Summary**" window)

c) Create a new VM from the Oracle VM Template
- Go to tab "Servers and VMs"
- Right click your Oracle VM server, then click "**Create Virtual Machine**"
- Select "Clone from an existing VM Template"
- Choose a VM name (for instance **ol64**)
- Click Finish

8.6 Edit the VM

Here, we will increase the size of the virtual disk to have enough space to install DB12c.
We will also add a second virtual disk to store temporary data (to avoid increasing size of the dynamically allocated first virtual disk)

We will also configure the network and modify CPU configuration

a) Right click your VM, then click **Edit**

b) Configure the network
- Go to tab **Networks**
- Select your **Network**

c) Increase size of virtual disk
- Go to tab Disk
- Click (pen icon) to edit Virtual Disk in slot 0
- Change size from 12.0 GB to 50 GB, and click OK

d) Create a second virtual disk (temporary)
- In slot 1, select "**Virtual Disk**"
- Click icon "**+**" to create a new virtual Disk
- Set the following information
  - Virtual Disk Name : **tmp**
  - Size (GiB) : **50**
  - Allocation Type : **Sparse Allocation**
- Click OK

e) Click OK to confirm the modifications.

8.7 Start and configure the NEW VM

a) Right click your VM (ol64), then click "**Start**"

b) Right click your VM (ol64), then click "**Launch VNC console**" to get the VM console

c) In the console, enter the following information to configure network
- System host name : **ol64**
- Network device to configure : **eth0**
- Activate interface on system boot : **yes**
- Boot protocol : **static**
- IP address : **192.168.56.10**
- Netmask : **255.255.255.0**
- Gateway : **192.168.56.1**
- DNS : **192.168.56.1**
- System root password : **SunOra00**

Note: the IP addresses shown here are examples. You may need to enter different IP addresses depending on the Oracle VM environment you are using.

d) Once the VM is ready, connect to it from laptop

```
# ssh root@192.168.56.10
```

e) Change root password

```
# passwd root                    (change to ovsroot, easier to remember)
```

f) Disable Linux firewall

```
# chkconfig iptables off         (disable Linux Firewall)
```

g) Create /u01 filesystem on the virtual disk

```
# fdisk /dev/xvda
  puis n, p, 4, 12289, enter, w
# reboot

$ ssh root@192.168.56.10         (password is ovsroot)
# mkfs –t ext4 –L U01 /dev/xvda4

# vi /etc/fstab
        Add following line at the end of the file
        LABEL=U01       /u01    ext4    defaults        0 2
# mount /u01
# mkdir /u01/src
```

h) Create temporary filesystem /u02

```
# fdisk /dev/xvdb
        puis n, p, 1, enter, enter, w

# mkfs –t ext4 /dev/xvdb1
# mkdir /u02
# mount /dev/xvdb1 /u02
```

8.8 Install Oracle DB12c binaries

a) Create users and groups for Oracle Database 12c

```
# groupadd dba
# groupadd oinstall
# useradd –G dba –g oinstall –d /home/oracle –m –s /bin/bash oracle
# passwd oracle                  (set password to oracle)
# chown oracle:oinstall /u01 /u02
```

b) Install Oracle Linux 6 rpms required by Oracle Database 12c

Copy the ISO image for Oracle Linux 6u4 (file V37084-01.iso) to directory /u02 on your VM (use scp or WinSCP)

```
# mount –o loop /u02/V37084-01.iso /mnt
# cd /etc/yum.repos.d
# rm public-yum-ol6.repo
# vi iso.repo
```

Put following content

```
[iso]
name=OL6u4 iso
baseurl=file:///mnt/Server
enabled=1
```

```
# yum install unzip sysstat ksh gcc gcc-c++ libaio libaio-devel
# yum install make compat-libcap1 compat-libstdc++-33
# yum install libX11 libXext libXtst libXau libXi libxcb xorg-x11-xauth

# umount /mnt
# rm /etc/yum.repos.d/iso.repo
```

c) Copy Oracle Database 12c (12.1.0.2) distribution

Copy the 2 files for Database 12c to directory /u02 on your VM (use scp or WinSCP)

```
# cd /u02
# unzip V46095-01_1of2.zip
# unzip V46095-01_2of2.zip
```

d) Install Oracle Database 12c
From Oracle VM Manager Gnome desktop (Oracle VM VirtualBox console)
Open Gnome terminal
$ **xhost +**
$ **ssh –X –l oracle 192.168.56.10** (password is **oracle**)
$ cd **/u02/database**
$ **./runInstaller**
Uncheck "I wish to receive security updates"
Skip software updates
Install database software only
Single instance database installation
Product Language : English
Database Edition: Enterprise Edition
Oracle base : /u01/app/oracle (default)
Software location : /u01/app/oracle/product/12.1.0/dbhome_1 (default)
Inventory direction: /u01/app/oraInventory
oraInventory Group Name: oinstall
Database Administrator group: dba
Database Operator group: dba
Database Backup and Recovery group: dba
Data Guard administrative group: dba
Encryption Key Management administrative group: dba

Prerequisistes -> click "Fix and Check again"

In another terminal, run as root:
/tmp/CVU_12.1.0.2.0_oracle/runfixup.sh

Click OK to re-check Prerequisites -> only 1 warning about swap
Check "Ignore all" and click Next
Click Install

When finished, in another terminal, run as root:
/u01/app/oraInventory/orainstRoot.sh
/u01/app/oracle/product/12.1.0/dbhome_1/root.sh

Click OK and Close

8.9 Create DB12c container database and listener

a) In Oracle VM Manager gnome desktop, still logged as oracle, run the DB Configuration Assistant
$ **/u01/app/oracle/product/12.1.0/dbhome_1/bin/dbca**

b) Enter the following answers:
- Create Database
- Global Database Name: **CDB1**
- Administrative Password: **Welcome1**
- Make sure "**Create as a Container Database**" option is checked
- Pluggable Database Name: **PDB1**
- Click **Next**
- Click **Finish**

c) Wait for creation of database to be completed

d) Click OK to exit DBCA

e) Set environment variables for user oracle
$ **vi /home/oracle/.bash_profile** **(add following contents in the file)**

```
ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1
export ORACLE_HOME

ORACLE_SID=CDB1
export ORACLE_SID

PATH=$PATH:$ORACLE_HOME/bin
export PATH
```

f) Create a trigger to automatically start all PDBs with the container database
$ **sqlplus / as sysdba**
SQL> **create or replace trigger Sys.After_Startup after startup on database**

```
begin
execute immediate 'alter pluggable database all open';
end After_Startup;
SQL> exit
```

g) Disable Oracle Database users password expiration

```
$ sqlplus / as sysdba
SQL> alter profile default limit password_life_time unlimited;
SQL> exit
```

h) In Oracle VM Manager gnome desktop, still logged as oracle, run the Network Configuration Assistant

```
$ /u01/app/oracle/product/12.1.0/dbhome_1/bin/netca
```

i) In NetCA, create a new listener
- Select **Listener configuration**, then click **Next**
- Select **Add**, then click **Next**
- Enter **LISTENER** as the Listener name, then click **Next**
- Leave **TCP** as the only Selected Procotol, then click **Next**
- Use the standard port number **1521**, then click **Next**
- Answer **No** to the question "**Would you like to configure another listener**", then click **Next**
- Click **Next**, then **Finish** to exit NetCA

j) Edit the listener file `/u01/app/oracle/product/12.1.0/dbhome_1/network/admin/listener.ora` and replace `ol64` by `localhost`

k) Create scripts to startup the container database at boot

```
$ su –                                  (password is ovsroot)

# vi /etc/init.d/dbora                  (set following contents in the file)

#! /bin/sh

ORACLE_HOME=/u01/app/oracle/product/12.1.0/dbhome_1
ORACLE=oracle

case $1 in
'start')
        su - $ORACLE -c "$ORACLE_HOME/bin/dbstart $ORACLE_HOME"
        su - $ORACLE -c "$ORACLE_HOME/bin/lsnrctl start"
        ;;
'stop')
        su - $ORACLE -c "$ORACLE_HOME/bin/lsnrctl stop"
        su - $ORACLE -c "$ORACLE_HOME/bin/dbshut $ORACLE_HOME"
        ;;
*)
        echo "usage: $0 {start|stop}"
        exit
        ;;
esac

exit
```

l) Create Symbolic links to startup Container DB at boot

```
# chmod +x /etc/init.d/dbora
# ln –s /etc/init.d/dbora /etc/rc3.d/S99dbora
# ln –s /etc/init.d/dbora /etc/rc5.d/S99dbora
# ln –s /etc/init.d/dbora /etc/rc0.d/K01dbora
# vi /etc/oratab
```

Replace N by Y at end of line for CBD1

8.10 Create Oracle VM Template

a) Stop VM

```
# /etc/init.d/dbora stop
# halt
```

b) In Oracle VM manager, remove the second virtual disk (temporary)
- In Firefox, open https://192.168.56.3:7002/ovm/console
- Log in using the following credentials
  - Username : **admin**
  - Password : **Welcome1**

- Go to tab “Servers and VMs”
- Click the Oracle VM Server
- Right click your VM (ol64) and click **Edit**
- Go to tab **Disks**
- In slot 1, Click “**X**” to delete the virtual disk
  - Disk Type: Select “**Empty**”
- Click OK

c) Restart the VM
Right click your VM (ol64) and click **Start**

d) Connect to the Entreprise Manager Database Express 12c console to check everything is fine
- In Firefox, open https://192.168.56.10:5500/em
- Log in using the following credentials
  - Username : sys
  - Password : Welcome1
  - As sysdba : <checked>

e) Stop DB12c
```
# /etc/init.d/dbora stop
```

f) Run OVM template scripts and shutdown VM
```
# ovmd -s cleanup; service ovmd enable-initial-config; shutdown -h now
```

IMPORTANT: make sure to avoid typos and to type all 3 commands on a single line as the first command will shutdown the network access.

g) Go back to the Oracle VM Manager console

h) Go to tab “**Servers and VMs**”

i) Right click your VM (ol64), then click “**Clone or Move…**”

j) Select “**Create a clone of this VM**” and click **Next**

k) Enter the following information
- Clone to a : **Template**
- Clone count : **1**
- Clone Name : **db12_ol64**
- Leave default values for other

Click OK

l) Click Submit

m) Go to tab **Repositories**, Expand all, and make sure **db12_ol64** is visible in the VM Templates

8.11 Create Oracle VM assembly

An Oracle VM assembly is a TAR file with suffix .ova
In our case, this TAR file will contain 3 files:
- An .ovf file (OVF format based on XML) describing the assembly
- A System.img file containing a gzipped image of the disk.
- A .mf file containing SHA1 checksum for the previous 2 files.

a) Creation of the System.img file
```
$ ssh root@<IP_address_OVM_server>
# cd /OVS/Repositories/0004f<xxxxxx>
# more Templates/0004f<zzzz>/vm.cfg   (to know the ID 0004f<yyyy> of the Virtual Disk)
# cp VirtualDisks/0004f<yyyyy>.img System.img
# gzip System.img
# mv System.img.gz System.img
# ls –l System.img                    (to get size of file: should be 5154040064 or 4.8 GB)
```

b) Creation of the OVF file from the OVF file of the Oracle Linux 6u4 assembly
```
# tar xvf OVM_OL6U4_x86_64_PVM.ova
# mv OVM_OL6U4_x86_64_PVM.ovf OVM_OL6U4_DB12_PVM.ovf
# vi OVM_OL6U4_DB12_PVM.ovf
```
- Replace OVM_OL6U4_x86_64_PVM string by OVM_OL6U4_DB12_PVM (4 times)
- Replace size of file System.img (replace 513020299 by 5154040064 size, 2 times)

c) Creation of the Checksum file (.mf file)

```
# sha1sum System.img                    Display SHA1 checksum for System.img (xx..x)
# sha1sum OVM_OL6U4_DB12_PVM.ovf        Display SHA1 checksum for the .ovf file (yy..y)
# vi OVM_OL6U4_DB12_PVM.mf              Create file with following content
SHA1(OVM_OL6U4_DB12_PVM.ovf)= <yy..y>
SHA1(System.img)= <xx..x>
```

d) Creation of the final .ova file

```
# tar cvf OVM_OL6U4_DB12_PVM.ova OVM_OL6U4_DB12_PVM.ovf OVM_OL6U4_DB12_PVM.mf System.img
```

IMPORTANT: the .ovf file must be the first file contained in the .ova TAR file

The Oracle VM assembly OVM_OL6U4_DB12_PVM.ova is now ready to be used in any Oracle VM environment.

9 Appendix C: References

9.1 Main documents

- Entreprise Manager Cloud Control 12c R5 Cloud Administration Guide (July 2015)

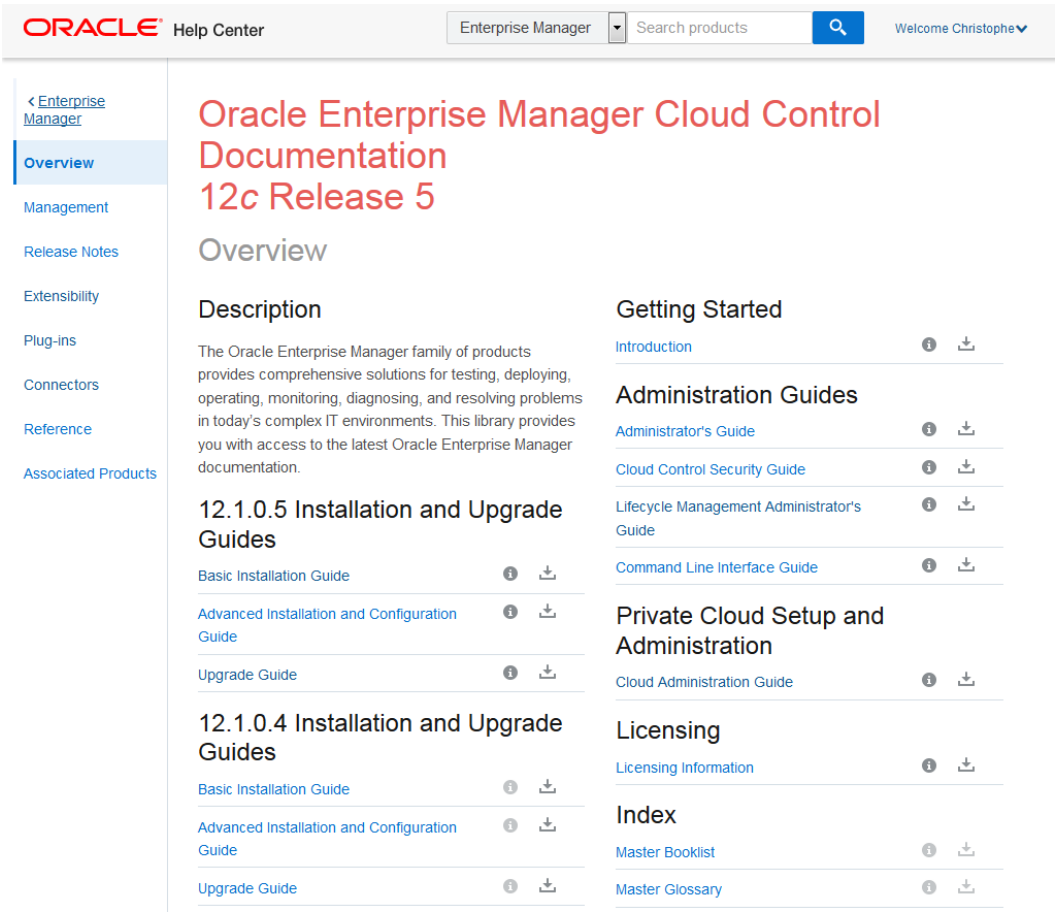
Direct link : http://docs.oracle.com/cd/E24628_01/doc.121/e28814.pdf

- Book “Building and Managing a Cloud Using Oracle Enterprise Manager 12c” (Oracle Press)

Authors: Madhup Gulati, Adeesh Fulay, Sudip Datta

9.2 Oracle Enterprise Manager Cloud Control 12c documentation

http://docs.oracle.com/cd/E24628_01/index.htm



9.3 Oracle VM documentation

http://www.oracle.com/technetwork/server-storage/vm/documentation/index.html

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