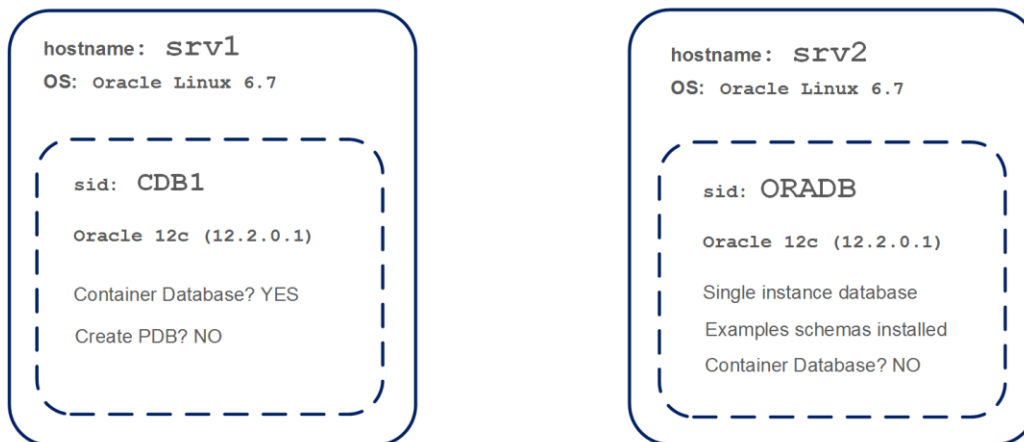# Practice 2: Creating a CDB

Practice Overview

This practice guides through creating two databases in the appliances that you created in the previous practice.

In this practice you will perform the following:

- You will create a CDB in the appliance `srv1`.
- You will create a non-CDB database in the appliance `srv2`.
- Perform the following configuration settings:
    - Enable the automatic database startup and shutdown
    - Getting the Enterprise Manager Database Express working in the VM appliance
    - Run and test the SQL Developer

Practice Environment Architecture Overview

The following figure is an overview of the appliances that you are going to create in this practice.

```
hostname: srv1
OS: Oracle Linux 6.7

    sid: CDB1

    Oracle 12c (12.2.0.1)

    Container Database? YES

    Create PDB? NO
```

```
hostname: srv2
OS: Oracle Linux 6.7

    sid: ORADB

    Oracle 12c (12.2.0.1)

    Single instance database

    Examples schemas installed

    Container Database? NO
```

Creating CDB Procedure

A. Download the Oracle Database Installation Files and copy it to `srv1`

1. Obtain Oracle Database 12c Release 2 for Linux x86-64 installation file. (link).

2. In Oracle VirtualBox, startup `srv1`

3. In `srv1`, login as `oracle` user and open a terminal window.

4. Create a directory to copy the installation files in it:

```
mkdir ~/source
```

5. In `srv1`, using WinScp utility, copy the installation file to the `source` directory.

6. Unzip the installation file.

7. (optional) Delete the zip file (just to save the disk storage)

8. (optional) In Oracle VirtualBox, create a snapshot of the machine. You will use this snapshot to roll back the state of the appliance to its initial state, in case the installation was not successful. To create the snapshot, perform the following:

   a. **Machine** -> **Take Snapshot**. "Take Snapshot of Virtual Machine" window pops up.

   b. In the **Snapshot Name** field, type "Before Oracle installation"

   c. Click on **OK**
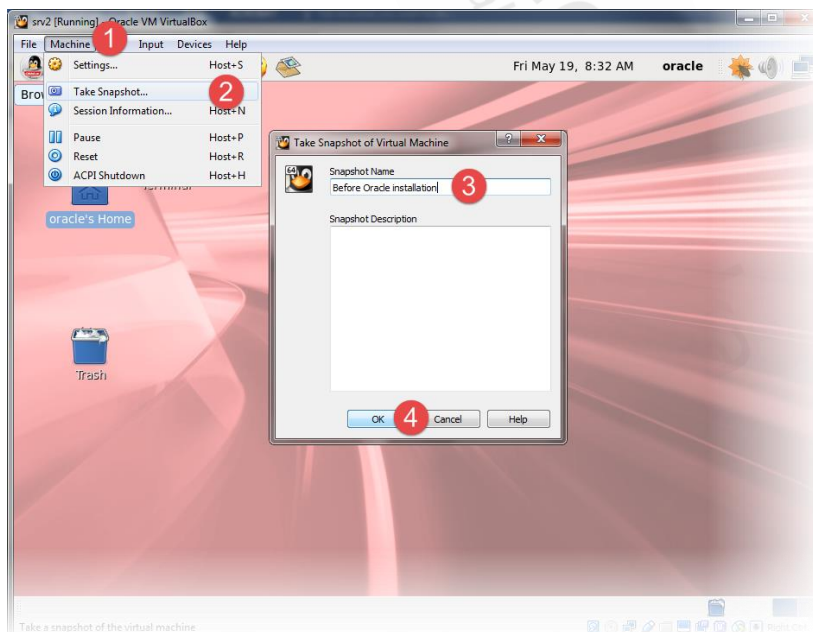
B. Install the Oracle Database software on `srv1`

9. Open a Putty session window and connect to srv1 as oracle user.

10. Edit the `.bash_profile` file and make it as follows. `source` the file after you make the
modifications on it so that the environment variables got created in the current session.

You may consider taking a backup copy of the existing file.

The last line creates a soft link to the CDB alertlog file.

```
# .bash_profile
# Get the aliases and functions
if [ -f ~/.bashrc ]; then
        . ~/.bashrc
fi
# User specific environment and startup programs
PATH=$PATH:$HOME/bin

export PATH
export ORACLE_SID=CDB1
export ORACLE_HOME=/u01/app/oracle/product/12.2.0.1/db_1
export TNS_ADMIN=/u01/app/oracle/product/12.2.0.1/db_1/network/admin
export PATH=$ORACLE_HOME/bin:$PATH
export NLS_DATE_FORMAT=dd/mm/yyyy:hh24:mi:ss
ln -sf /u01/app/oracle/diag/rdbms/cdb1/CDB1/trace/alert_CDB1.log alert
```

11. In the **VirtualBox window** of srv1, start the installer. You need to source the bash file before you
run the installer so that the OS variables that you defined in the bash file will take effect.

```
cd
source .bash_profile
cd /home/oracle/source/database
./runInstaller
```

12. Respond to the Installer windows as follows:

Window	Response
Configure Security Updates	• **Unmark** "I wish to receive security updates.." checkbox. • Click on **Next** • Confirmation Window pops up • Click on **Yes**
Installation Option	• Select "Install Database Software only"
Database Installation Options	• Select "Single instance database installation"
Database Edition	• Select "Enterprise Edition"
Installation Location	• Keep it to the default Oracle base: `/u01/app/oracle` Oracle Home: `/u01/app/oracle/product/12.2.0.1/db_1`
Operating System Groups	• Set the groups to `dba`
Install Product	• Install • When prompted, run script as `root` • When prompted, Install Oracle Trace File Analyzer
Finish	• Click on **Close** button

C. Create an Oracle CDB Database in `srv1`

In this section, you will first configure the listener then create a CDB database.

13. In `srv1`, start the Oracle Net Configuration Assistant and create a default listener

```
netca
Listener Configuraiotn -> Add -> LISTENER -> Next -> Next -> No -> Next -> Finish
```

14. In `srv1`, as oracle, start the `dbca`

15. Respond to the Installer windows as follows:

| Window	Response
Database Operation	• **Create Database**
Creation Mode	• **Advanced Configuration**
Deployment Type	• **General Purpose or Transaction processing**
Database Identification	• **Global Database Name:** CDB1.localdomain • **Sid:** CDB1 • **Mark "Create as Database Container"** • **Mark "Use Local Undo tablespaces for PDBs"** • **Create an empty Container database**
Storage Option	• **Select "**Use following for the storage attributes**"** • **Database files storage type:** File System • **Database files location:** {ORACLE_BASE}/oradata/{DB_UNIQUE_NAME} • **Mark "**Use Oracle-Managed Files (OMF)**"**
Fast Recovery Option	• **Mark** "Specify the Fast Recovery Area" • Set the "Fast Recovery Area" to: {ORACLE_BASE}/fra/{DB_UNIQUE_NAME} • Fast Recovery Area size (approx): 20480 MB • **Unmark** "Enable Archiving"
Network Configuration	• Make sure the **LISTENER** is selected
Data Vault Option	• Make sure the check boxes are unmarked
Configuration Options	• **Memory**: • Select "Use Automatic Shared Memory Management" • SG size: 1653 • PGA size: 552 **Sizing:** • Processes: 500 **Character sets:** • select "Use Unicode AL32UTF8" **Connection mode:** • Make sure the "Dedicated server mode" is selected

Management Options	• Make sure "Configure Enterprise Manager (EM) database express" is marked.
Use Credentials	• Select "User the same adminstrative password for all accounts" • Set the password (it has been set to "oracle" in my demonstrations)
Creation Option	• Make sure "Create database" is selected. • Click on the "**All Initialization Parameters**" button • Mark "**Show advanced parameters**" • Scroll down to nearly the bottom of the parameter list • Look for the parameter "**db_files**" • Set its value to `1000`
Summary	• click on **Finish**

16. Test the created CDB by connecting to it using sqlplus:

```
sqlplus system/oracle@CDB1
```

17. If all the steps above were implemented successfully, in VirtualBox, delete the VM snapshot of `srv1`. Logout from the Putty session then follow the steps as shown in the diagram below.

This step may take five minutes to finish. Meanwhile, you can go to the next step.
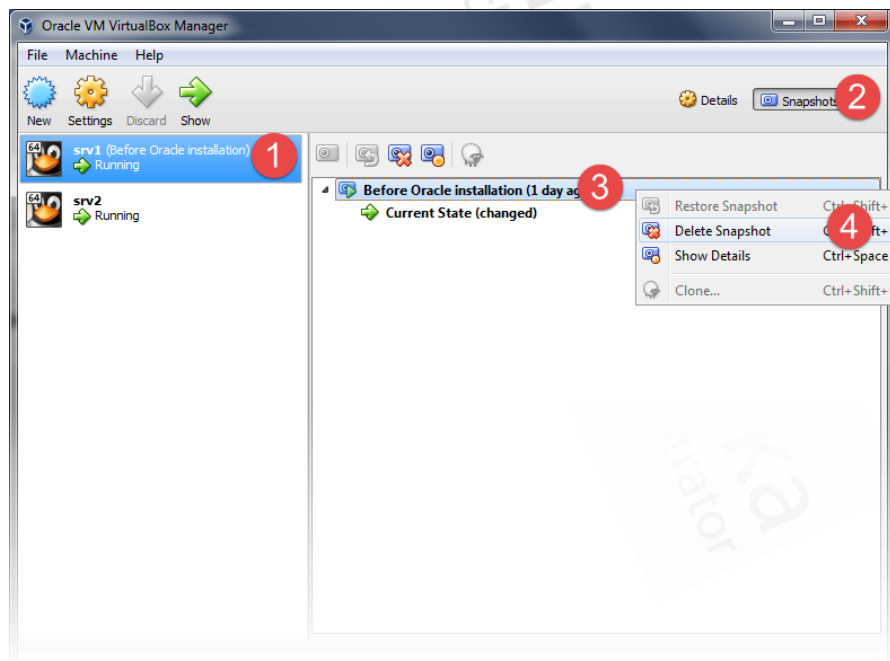
Creating a non-CDB Database Procedure

In the following steps you will create a non-CDB database in `srv2` machine.

D. Copy Oracle Database Installation files to `srv2`

18. In Oracle VirtualBox, make sure `srv2` appliance is running. Start it up, if it was shutdown.

19. In `srv2`, login as `oracle` user and open a terminal window.

20. Create a directory to copy the installation files in it:

```
mkdir ~/source
```

21. Using WinScp utility, copy the installation file to the directory

22. Unzip the installation file.

23. (optional) Delete the zip file (just to save the disk storage)

24. (optional) In Oracle VirtualBox, create a snapshot of the machine. You will use this snapshot to roll back the state of the appliance to its initial state, in case the installation was not successful. To create the snapshot, perform the following:

   a. **Machine** -> **Take Snapshot**. "Take Snapshot of Virtual Machine" window pops up.

   b. In the **Snapshot Name** field, type "Before Oracle installation"

   c. Click on **OK**

E. Install the Oracle Database software on `srv1`

25. Open a Putty session window and connect to `srv2` as `oracle` user on it.

26. Edit the `.bash_profile` file and make it as follows.

You may consider taking a backup copy of the existing file.

The last line creates a soft link to the database alertlog file.

```
# .bash_profile
# Get the aliases and functions
if [ -f ~/.bashrc ]; then
        . ~/.bashrc
fi
# User specific environment and startup programs
PATH=$PATH:$HOME/bin

export PATH
export ORACLE_SID=ORADB
export ORACLE_HOME=/u01/app/oracle/product/12.2.0.1/db_1
export TNS_ADMIN=/u01/app/oracle/product/12.2.0.1/db_1/network/admin
export PATH=$ORACLE_HOME/bin:$PATH
export NLS_DATE_FORMAT=dd/mm/yyyy:hh24:mi:ss
ln -sf /u01/app/oracle/diag/rdbms/oradb/ORADB/trace/alert_ORADB.log alert
```

27. In the VirtualBox appliance window of `srv2`, start the installer

```
cd
source .bash_profile
cd /home/oracle/source/database
./runInstaller
```

28. Respond to the Installer windows as follows:

Window	Response
Configure Security Updates	• **Unmark** "I wish to receive security updates.." checkbox. • Click on **Next** • Confirmation Window pops up • Click on **Yes**
Installation Option	• Select "Install Database Software only"
Database Installation Options	• Select "Single instance database installation"
Database Edition	• Select "Enterprise Edition"
Installation Location	• Keep it to the default Oracle base: `/u01/app/oracle` Oracle Home: `/u01/app/oracle/product/12.2.0.1/db_1`
Operating System Groups	• Set the groups to `dba`
Install Product	• Install • When prompted, run script as `root` • When prompted, Install Oracle Trace File Analyzer
Finish	• Click on **Close** button

F. Create an Oracle non-CDB Database in `srv2`

In this section, you will first configure the listener then create a non-CDB database.

29. In `srv2`, start the Oracle Net Configuration Assistant and create a default listener

```
netca
Listener Configuraiotn -> Add -> LISTENER -> Next -> Next -> No -> Next -> Finish
```

30. In `srv2`, as oracle, start the `dbca`

31. Respond to the Installer windows as follows:

Window	Response
Database Operation	• **Create Database**
Creation Mode	• **Advanced Configuration**
Deployment Type	• **General Purpose or Transaction processing**
Database Identification	• **Global Database Name:** `ORADB.localdomain` • **Sid:** `ORADB` • **UnMark "Create as Database Container"**
Storage Option	• **Select "**Use following for the storage attributes**"** • **Database files storage type:** File System • **Database files location:** `{ORACLE_BASE}/oradata/{DB_UNIQUE_NAME}` • **Mark "**Use Oracle-Managed Files (OMF)**"**
Fast Recovery Option	• **Mark** "Specify the Fast Recovery Area" • Set the "Fast Recovery Area" to: `{ORACLE_BASE}/`**`fra`**`/{DB_UNIQUE_NAME}` • Fast Recovery Area size (approx): `8016` MB • **Unmark** "Enable Archiving"
Network Configuration	• Make sure the **LISTENER** is selected
Data Vault Option	• Make sure the check boxes are unmarked
Configuration Options	• **Memory**: • Select "Use Automatic Shared Memory Management" • SG size: `1653` • PGA size: `552` **Sizing:** • Processes: `300` **Character sets:** • select "Use Unicode AL32UTF8" **Connection mode:** • Make sure the "Dedicated server mode" is selected **Sample Schemas** • **Mark** "Add sample schemas to the database"

Management Options	• Unmake "Configure Enterprise Manager (EM) database express"
Use Credentials	• Select "User the same adminstrative password for all accounts" • Set the password (it has been set to "oracle" in my demonstrations)
Creation Option	• Make sure "Create database" is selected.
Summary	• click on **Finish**

32. Test the created non-CDB by connecting to it using sqlplus:

```
sqlplus system/oracle@oradb
```

33. If all the steps above were implemented successfully, in VirtualBox, logout from the Putty session and delete the VM snapshot of `srv2`. This step may take five minutes to finish.

G. Set the tns Naming configuration

34. In **both** appliances, enable the tnsnaming and easy connect methods in the `sqlnet.ora` file.

```
vi /u01/app/oracle/product/12.2.0.1/db_1/network/admin/sqlnet.ora


NAMES.DIRECTORY_PATH= (TNSNAMES, EZCONNECT)
```

35. Edit the `tnsnames.ora` file in each system so that they can connect to each database.

Do not copy paste from the PDB file. Either copy from the downloadable `tnsnames.ora` file, or from the Putty session window itself.

```
vi $TNS_ADMIN/tnsnames.ora


CDB1 =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP)(HOST = srv1)(PORT = 1521))
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = CDB1.localdomain)
    )
  )

ORADB =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP)(HOST = srv2)(PORT = 1521))
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = ORADB.localdomain)
    )
  )
```

36. Test the configuration

```
sqlplus system/oracle@cdb1
sqlplus system/oracle@oradb
```

37. (optional) In **both** appliances, add the following sqlplus variable setting to its auto login script.

```
vi $ORACLE_HOME/sqlplus/admin/glogin.sql


set timing on
```

H. Automating Database Startup and Shutdown (optional)

In the following steps you will configure the appliances so that their databases are automatically started up when you start the appliance and automatically shut down when you shut down the appliance.

Note: this procedure is applicable in our case because the Oracle Restart has not been configured. If the Oracle Restart was configured, you would have followed different procedure.

38. Login as `root` to `srv1`

39. Edit the `oratab` file

```
vi /etc/oratab
```

40. Change the last field for the database line to `Y`

```
CDB1:/u01/app/oracle/product/12.2.0.1/db_1:Y
```

41. Create the file `/etc/init.d/dbora` and add the following code in it:

```
#! /bin/sh
# description: Oracle auto start-stop script.

ORA_HOME=/u01/app/oracle/product/12.2.0.1/db_1
ORA_OWNER=oracle

case "$1" in
'start')
    # Start the Oracle databases:
    # The following command assumes that the oracle login
    # will not prompt the user for any values
    # Remove "&" if you don't want startup as a background process.
    su - $ORA_OWNER -c "$ORA_HOME/bin/dbstart $ORA_HOME" &
    touch /var/lock/subsys/dbora
    ;;

'stop')
    # Stop the Oracle databases:
    # The following command assumes that the oracle login
    # will not prompt the user for any values
    su - $ORA_OWNER -c "$ORA_HOME/bin/dbshut $ORA_HOME" &
    rm -f /var/lock/subsys/dbora
    ;;
esac
```

42. Change the group of the `dbora` file to `dba`, and set the permissions to 750

```
chgrp dba /etc/init.d/dbora
chmod 750 /etc/init.d/dbora
```

43. Create symbolic links to the `dbora` script in the appropriate run-level script directories

```
ln -s /etc/init.d/dbora /etc/rc.d/rc0.d/K01dbora
ln -s /etc/init.d/dbora /etc/rc.d/rc3.d/S99dbora
ln -s /etc/init.d/dbora /etc/rc.d/rc5.d/S99dbora
```

44. Restart the appliances to test the configuration.

45. Verify that the database is up and running automatically after restarting the appliance:

```
sqlplus system/oracle
```

46. In `srv2`, repeat all the steps in this section.

I.   Getting the Enterprise Manager Database Express Working in the VM

You configured the Enterprise Manager Database Express when created the CDB. However, the Mozilla Firefox browser that is pre-installed in the VM machine does not have the Adobe Flash plug-in that is needed to display the EM Database Express. In this section of the practice, you will install the Adobe Flash plug-in in the browser and then open the EM Database Express.

47. In the VirtualBox window of `srv1`, login as `oracle` user.

48. Open the Mozilla Firefox browser and try opening the EM Database Express page using the following URL address:

`https://srv1:5500/em/login`

49. You will receive a warning message about trusting the URL source, as follows:
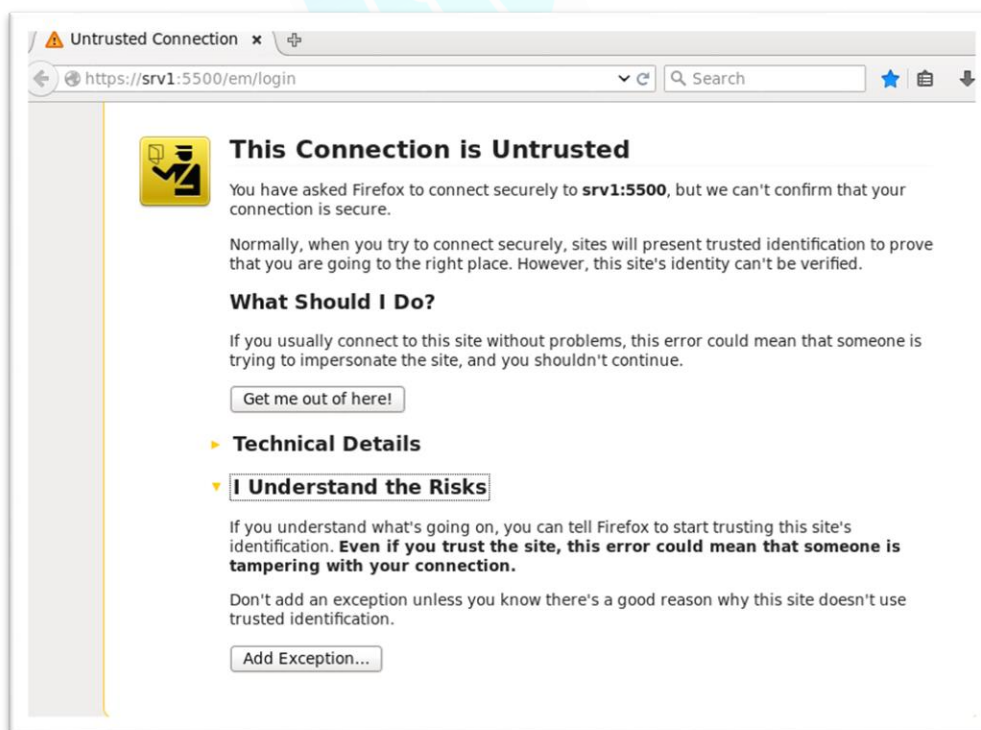
50. Click on the "**Add Exception"** button. You will see the following message popping up:

51. Click on the "**Confirm Security Exception**" button.

52. You will see the following message in the browser:

53. If your VM appliance has access to the Internet, go to next step. If you VM appliance does not have a connection to the Internet, you can install the Flash plug-in manually by performing the following steps:

a. Download the file "`flash_player_npapi_linux.x86_64.tar.gz`" from the lecture downloadable resources.

b. Copy the file `flash_player_npapi_linux.x86_64.tar.gz` to the directory `/home/oracle/source`

c. Connect via Putty to the machine `srv1` as `root`

d. Extract the file

```
tar -xvzf flash_player_npapi_linux.x86_64.tar.gz
```

e. Copy the extracted `so` file to the plug-ins directory

```
cp /home/oracle/source/libflashplayer.so /usr/lib64/mozilla/plugins
```

f. Change the permissions of the file as follows:

```
chmod 775 libflashplayer.so /usr/lib64/mozilla/plugins/libflashplayer.so
```

54. In the following steps you will download and install the Flash plug-in in the FireFox browser in srv1 machine. Those steps assume that the machine has a connection to the Internet:

a. In the message that appeared to you, click on "GetFlash" link

b. The page that follows appears in the browser. Select "**.rpm for Linux**" option from the drop list then click on **Download** button.
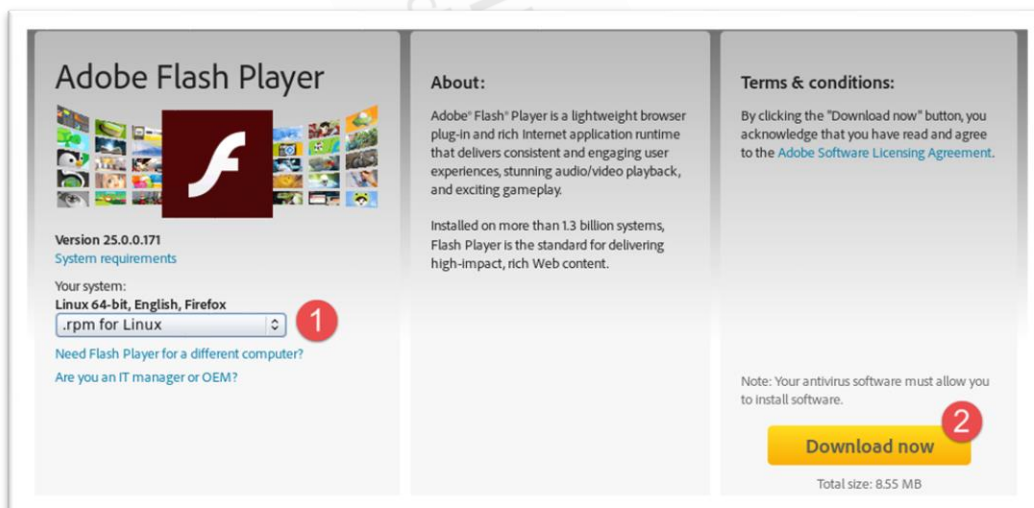
c. The following message appears to you. Click on OK button.
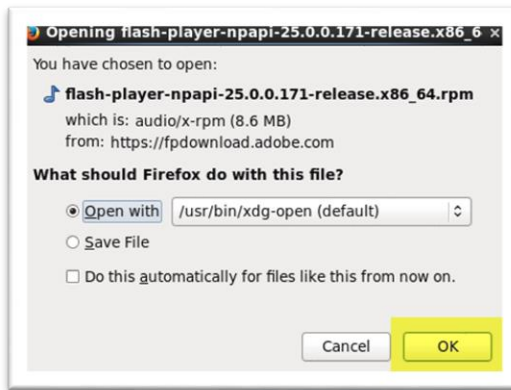
d. The following message appears to you. Click on **Install** button.
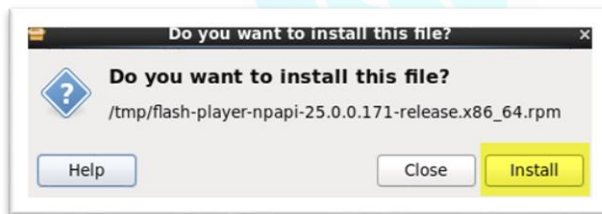
e. The following message appears to you. Enter the root password then click on **Authenticate** button
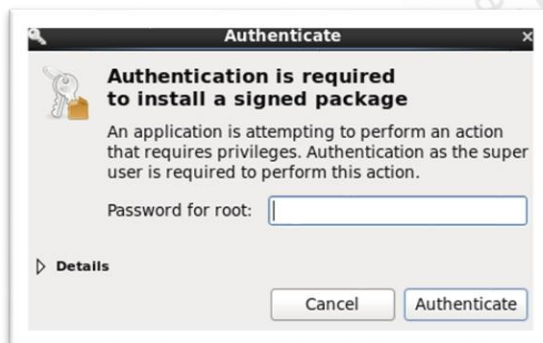
55. After the Flash plugin got installed, you should be able to see the EM Database Express page as follows. Enter the `sys` username, its password, leave the container name blank, mark the "**as sysdba**" option then click on **Login** button.
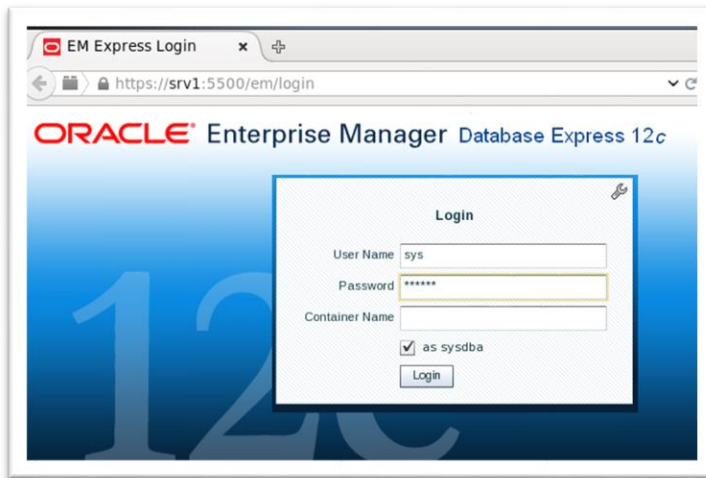
56. You should see the EM Database Express opening and displaying a page similar to the following:
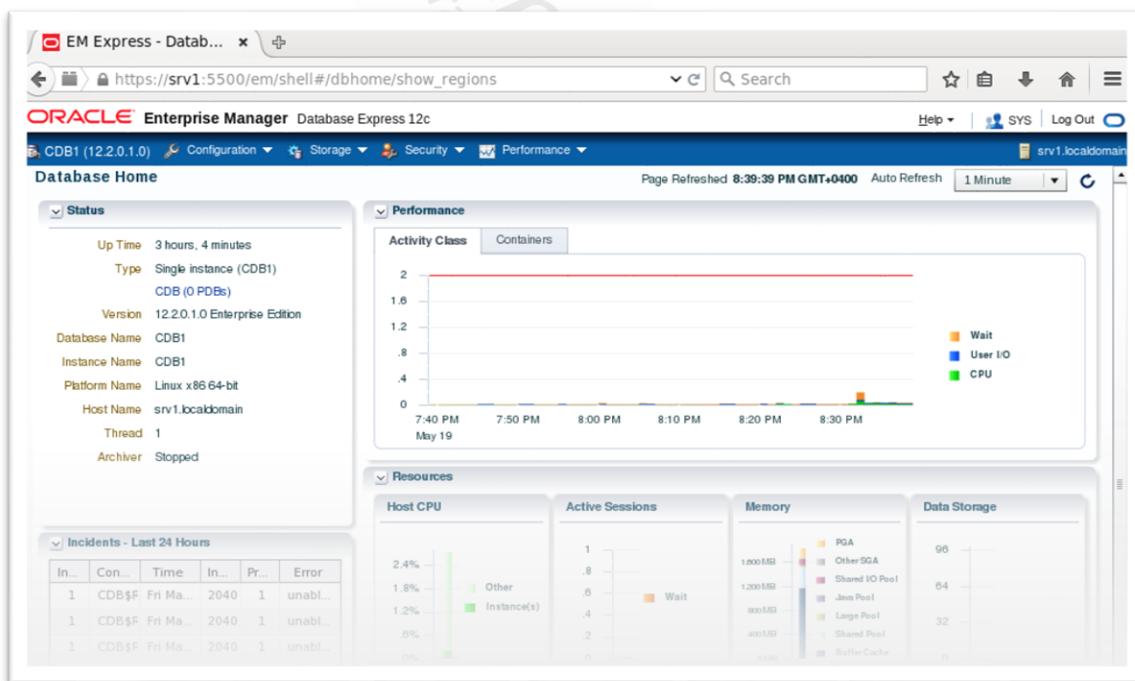
J. Running and Testing the SQL Developer

SQL Developer is a GUI interface to the database that is automatically installed with the Oracle database software. In this section of the practice you will created a shortcut of the utility on the desktop, run the utility, and test it to connect to the CDB.

57. Login to the VM appliance `srv1` in VirtualBox as `oracle`.

58. Double click on the "Computer" icon.

59. Navigate all the way to the following path:

`/u01/app/oracle/product/12.2.0.1/db_1/sqldeveloper/`

60. In the window of the "sqldeveloper", double-click on the "**sqldeveloper.sh**" file, as shown in the following screenshot:
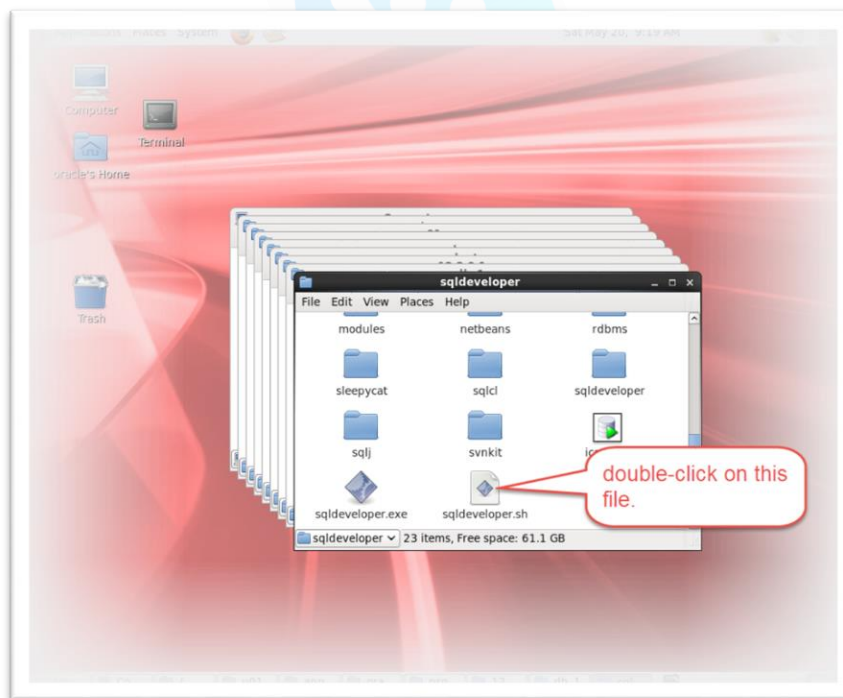
61. Double click on the icon.

62. You should see a message like the following. Click on **Run** button. The SQL Developer should start up.
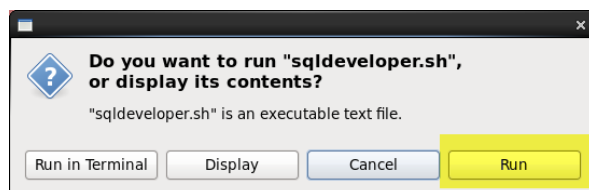
63. Right click on the **Connections** node and select "**New Connection**", as shown in the screenshot below:
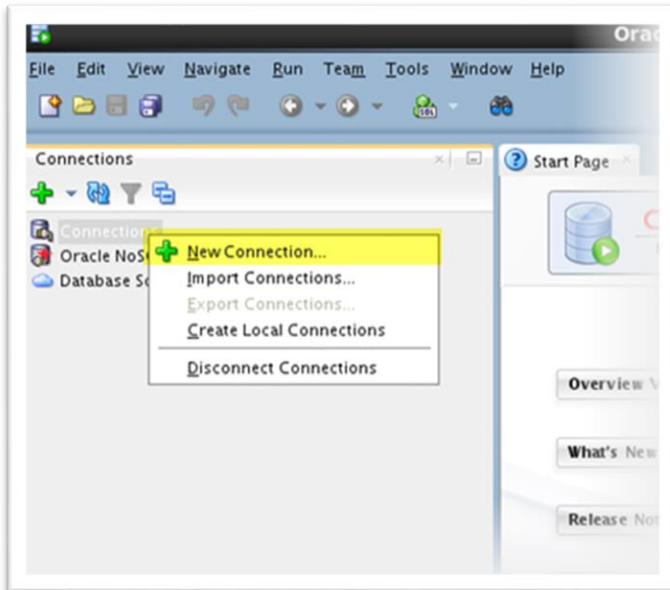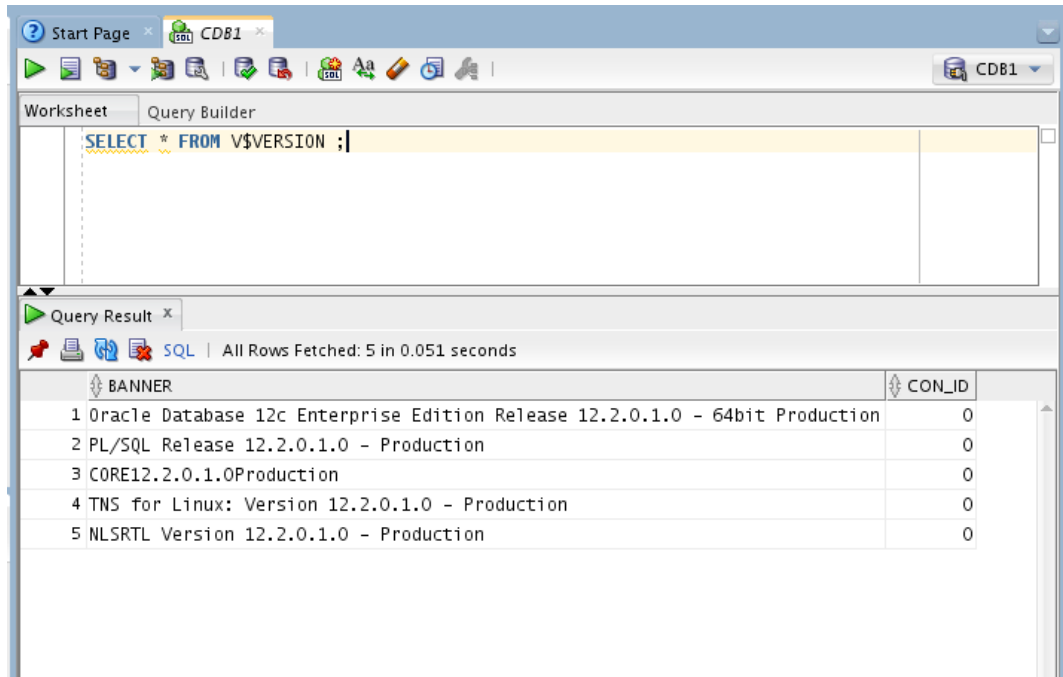

**64.** Fill in the form as shown in the following screenshot. Click on **Test** then **Save** buttons.

65. Click on **Connect** button.

66. In the Query builder windows, write the query as shown in the following screenshot. Execute it by pressing on **F9** key.

67. Create another connection to CDB1 in the **DBA** panel, as shown in the following screenshot.

If the DBA panel is not displaying, click on **View** menu then select **DBA** menu item.
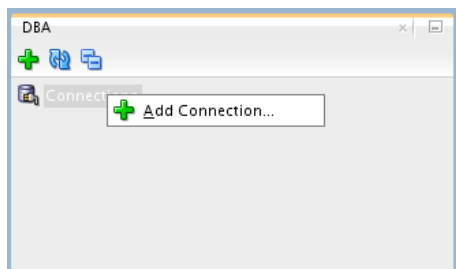
68. You should see the following message. Click on **OK** button. You should see the connection added under the connections node.

69. Close the SQL Developer

Summary

By end of this practice, you should have two Linux-based Oracle VirtualBox appliances:

- `srv1` which has an Oracle 12.2 CDB database named `CDB1` created in it. This appliance will be mainly used throughout the course practices.

- `srv2` which has an Oracle 12.2 non-CDB database named `ORADB` created in it.

You also have configured both appliances to automatically start up their databases when their appliances are rebooted.