Practice 19-b

Creating an Oracle 19c RAC Database

Practice Overview

In this practice you will create an Oracle 19c two-node RAC database on the virtual machines that you created in the previous practice. To accomplish this target, you will perform the following:

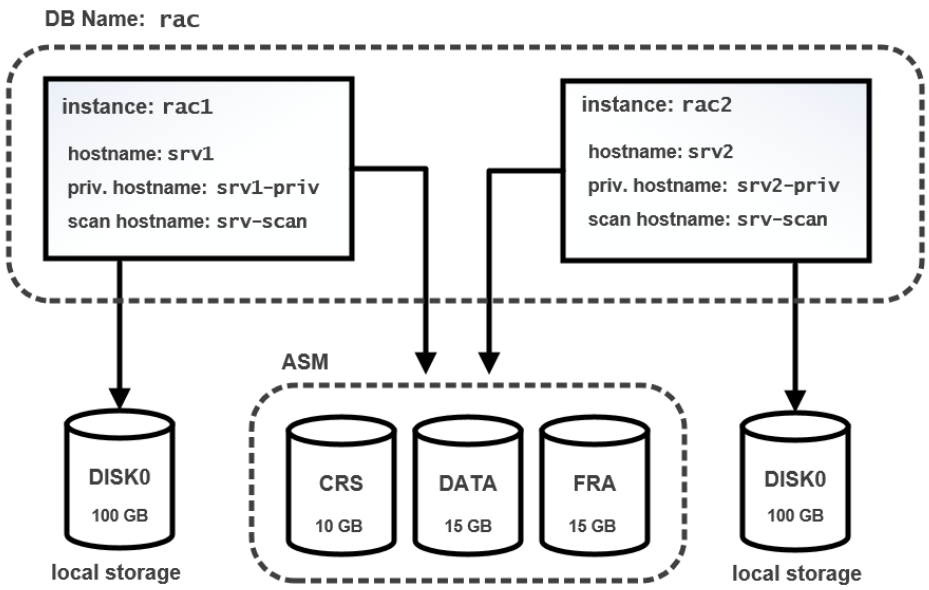
- Carry out OS preparation steps
- Install Grid Infrastructure software
- Create ASM Disk Groups
- Install Oracle Database software
- Create the Oracle RAC database

Note:

The virtual appliances created by this practice are available to download from my web site at the following link: https://www.ahmedbaraka.com/a027-oracle-rac-database-19c-on-linux-7

Practice Environment Architecture

The following diagram shows the Oracle RAC database architecture that you will create in this practice:



Practice Environment Preparation Procedure

A. Set the OS environment variables in the Oracle software user owner profiles

1. In a Putty session, login to `srv1` and `srv2` as `oracle` user. Set the OS environment variables in the `oracle` user profile:

```
su - oracle
mv ~/.bash_profile ~/.bash_profile_bk
vi ~/.bash_profile
```

```
# .bash_profile
if [ -f ~/.bashrc ]; then
. ~/.bashrc
fi

ORACLE_SID=rac1; export ORACLE_SID
ORACLE_BASE=/u01/app/oracle; export ORACLE_BASE
ORACLE_HOME=$ORACLE_BASE/product/19.0.0/db_1; export ORACLE_HOME
ORACLE_TERM=xterm; export ORACLE_TERM
NLS_DATE_FORMAT="DD-MON-YYYY HH24:MI:SS"; export NLS_DATE_FORMAT
TNS_ADMIN=$ORACLE_HOME/network/admin; export TNS_ADMIN
PATH=.:${PATH}:$ORACLE_HOME/bin
PATH=${PATH}:/usr/bin:/bin:/usr/local/bin
export PATH
LD_LIBRARY_PATH=$ORACLE_HOME/lib
LD_LIBRARY_PATH=${LD_LIBRARY_PATH}:$ORACLE_HOME/oracm/lib
LD_LIBRARY_PATH=${LD_LIBRARY_PATH}:/lib:/usr/lib:/usr/local/lib
export LD_LIBRARY_PATH
THREADS_FLAG=native; export THREADS_FLAG
export TEMP=/tmp
export TMPDIR=/tmp
export EDITOR=vi
umask 022
```

2. In the `.bash_profile` file of the `oracle` account in `srv2`, change the value assigned to `ORACLE_SID` from `rac1` to `rac2`

3. In the terminal sessions connected to `srv1` and `srv2`, switch to `grid` user.

```
su - grid
```

4. In `srv1` and `srv2`, set the OS environment variables in the `grid` user profile:

```
mv ~/.bash_profile ~/.bash_profile_bk
vi ~/.bash_profile
```

```
# .bash_profile
# OS User: grid

if [ -f ~/.bashrc ]; then
. ~/.bashrc
fi
ORACLE_SID=+ASM1; export ORACLE_SID
ORACLE_BASE=/u01/app/grid; export ORACLE_BASE
# it must not be under the ORACLE_BASE
ORACLE_HOME=/u01/app/19.0.0/grid; export ORACLE_HOME
ORACLE_TERM=xterm; export ORACLE_TERM
TNS_ADMIN=$ORACLE_HOME/network/admin; export TNS_ADMIN
PATH=.:${PATH}:$ORACLE_HOME/bin
PATH=${PATH}:/usr/bin:/bin:/usr/local/bin
export PATH
export TEMP=/tmp
export TMPDIR=/tmp
umask 022
```

5. In `.bash_profile` file of the `grid` account in `srv2`, change the value assigned to `ORACLE_SID` from `+ASM1` to `+ASM2`.

B. Set the resource limits for the Oracle software installation owners

6. In `srv1` and `srv2`, switch user to `root` and set the resource limits for the software installation owner users.

```
# take backup of existing file:
mv /etc/security/limits.conf /etc/security/limits.conf.bak

# create the file and paste the code below in it:
vi /etc/security/limits.conf
```

```
oracle soft nofile 1024
grid soft nofile 1024

oracle hard nofile 65536
grid hard nofile 65536

oracle soft nproc 16384
grid soft nproc 16384

oracle hard nproc 16384
grid hard nproc 16384

oracle soft stack 10240
grid soft stack 10240

oracle hard stack 32768
grid hard stack 32768

oracle hard memlock 134217728
grid hard memlock 134217728

oracle soft memlock 134217728
grid soft memlock 134217728

oracle hard data unlimited
grid hard data unlimited

oracle soft data    unlimited
grid soft   data    unlimited
```

C. Perform Prerequisite Actions

In the following steps, you will perform some actions that should be performed before installing Oracle software.

7. In `srv1` and `srv2`, disable avahi-daemon. This daemon should not be running with Oracle clusterware services.

```
systemctl disable avahi-daemon.socket avahi-daemon.service
systemctl mask avahi-daemon.socket avahi-daemon.service
systemctl stop avahi-daemon.socket avahi-daemon.service
```

8. In `srv1` and `srv2` as root, disable the chronyd service and rename its configuration file.

```
systemctl disable chronyd
mv /etc/chrony.conf /etc/chrony.conf.bak
```

D. Install Grid Infrastructure Software

9. Copy the Oracle Grid Infrastructure software installation file to the staging folder.

At the time of this writing, the installation file name downloaded from Oracle site is `LINUX.X64_193000_grid_home.zip`

10. In `srv1`, change the current user to grid then extract the installation file into the Oracle Grid Infrastructure software home directory

```
su - grid
unzip /media/sf_staging/LINUX.X64_193000_grid_home.zip -d $ORACLE_HOME
>/dev/null
```

11. As `root`, install the `cvuqdisk` in `srv1`

The package `cvuqdisk` must be installed before installing the Clusterware software

```
# exit to return back to the root shell:
exit

cd /u01/app/19.0.0/grid/cv/rpm/
CVUQDISK_GRP=oinstall; export CVUQDISK_GRP
rpm -iv cvuqdisk-1.0.10-1.rpm

# make a copy of the rpm file to the staging folder:
cp cvuqdisk-1.0.10-1.rpm /media/sf_staging
```

12. In `srv2`, as `root`, install the `cvuqdisk`

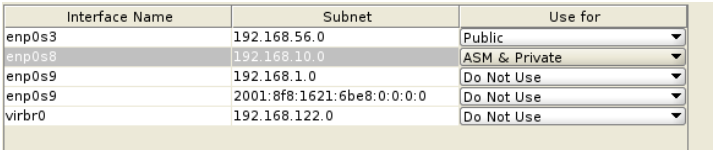
```
cd /media/sf_staging
CVUQDISK_GRP=oinstall; export CVUQDISK_GRP
rpm -iv cvuqdisk-1.0.10-1.rpm
rm cvuqdisk-1.0.10-1.rpm
```

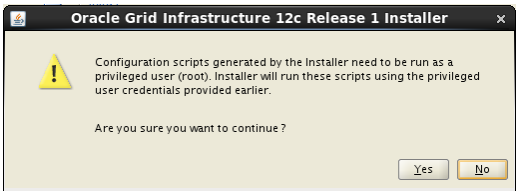
13. Login to the VirtualBox window of `srv1` as `grid`.

14. Open a terminal window, change the current directory to the Grid Infrastructure software home directory and run the `gridSetup.sh` script.

```
cd $ORACLE_HOME
./gridSetup.sh
```

15. Respond to the Installer windows as follows:

Window	Action
Configuration Option	Select the following option: "**Configure Oracle Grid Infrastructure for a New Cluster**"
Cluster Configuration	Select the following option: "**Configure an Oracle Standalone Cluster**"
Grid Plug and Play	Cluster Name: **rac** SCAN Name: **srv-scan** SCAN Port: **1521** **unmark** Configure GNS
Cluster Node Information	click on **Add** button Public Hostname: **srv2.localdomain** Virtual Hostname: **srv2-vip.localdomain** click on **OK** button click on **SSH Connectivity** button then enter the **password** click on **Setup** button click on **Test** button
Network Interface Usage	enp0s3 : **select Public** enp0s8 : **select ASM & Private** enp0s9 : **select Do Not Use** 
Storage Option	select the following option: **Use Oracle Flex ASM for Storage**
Create Oracle Grid Infrastructure Management Rep.	select **No**
Create ASM Disk Group	1. Click on **Change Discovery Path** button 2. Enter the **Discovery Path** as follows: `/dev/oracleasm/disks/*` 3. Fill in the fields as follows: Disk Group Name: **OCRDISK** Redundancy: **External** Select Disks: **OCRDISK1**

ASM Password	select "**Use same password for these accounts**" Specify Password: **oracle** Confirm Password: **oracle**
Failure Isolation	select "Do not use Intelligent Platform Management Interface (IPMI)"
Management Options	Keep the checkbox unmarked click on **Next** button
Operating System Groups	OSASM Group **asmadmin** OSDBA for ASM Group **asmdba** OSOPER for ASM Group **blank**
Installation Location	Oracle Base /u01/app/grid Software Location /u01/app/19.0.0/grid **Note**: those values taken from the OS variables
Create Inventory	Inventory Directory /u01/app/oraInventory
Root script execution	Mark "**Automatically run configuration scripts**" Enter the root password
Prerequisite Checks	The verification takes some time. Following warnings could be ignored: - Physical Memory - Task resolve.conf Integrity - DNS/NIS name service **Note**: If you receive other warnings, check their details. Resolve the issue and click on "**Check Again**" button. select **Ignore All** option Click on **Next** button
Summary	click on **Install** button
At about %80 progress	You will receive the following message:  click on **Yes** button While the script is running, the progress bar does not pass the 84% value. Do not consider this a hanging status. It takes some time and it will eventually finish.

	In the end of the installation, you will receive the following error: "Oracle Cluster Verification Utility failed" The log file has details of the error causes. The following causes can be safely ignored: - Sufficient physical memory is not available on node ... - Sufficient swap size is not available on node ... - Group of device "/dev/oracleasm/disks/DISK1" did not match the expected group - Attempt to get udev information from node ...

16. In `srv1`, as `grid`, check the status of the running clusterware resources. The state of all the resources should be ONLINE.

```
crsctl status resource -t
```

17. Ensure that all the cluster services are up and running in all the cluster nodes.

```
crsctl check cluster -all
```

Note: in real life scenario, you are always advised to apply the latest patch set on the grid software home straight away after installing it. You will learn how to apply a PSU on Oracle Grid Infrastructure later in the course.

E. Mount the ASM Disk Groups

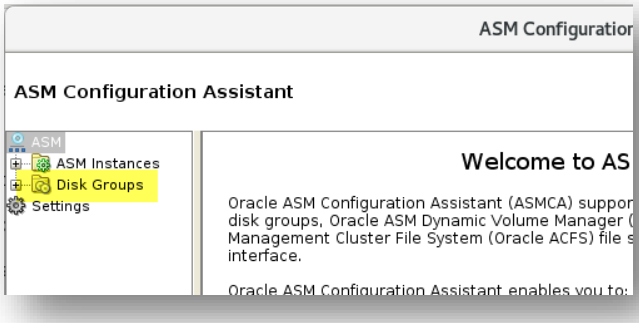
In this section of the practice, you will mount the DATA and FRA diskgroups in ASM.

18. In the Oracle VirtualBox window, make sure you are logged on as `grid` to `srv1`.

19. Open a terminal windows and start `asmca` utility.

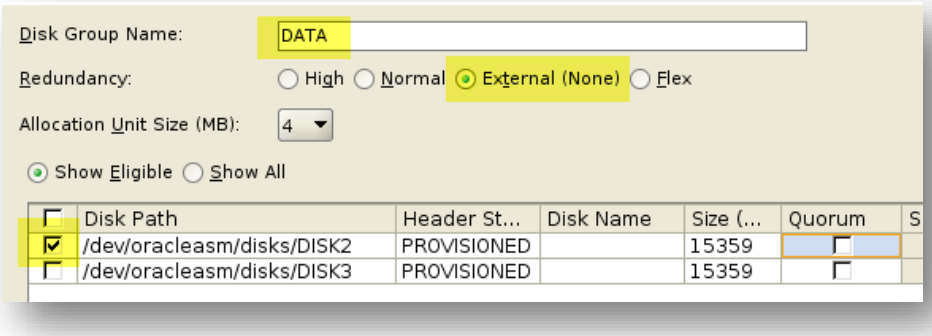
```
asmca
```

20. Click on **Disk Groups** node

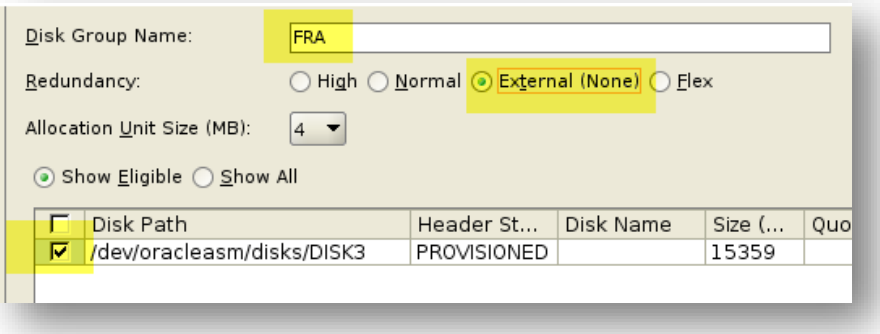


21. Click on **Create** button

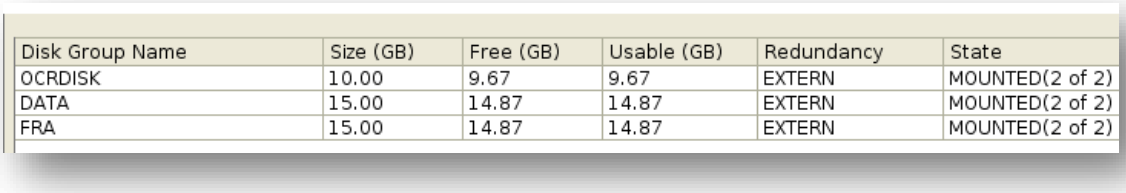
22. In the Disk Group Name field enter **DATA**, for Redundancy select "**External**", and mark **DISK2**, then click on **OK** button. You should see after a few seconds a diskgroup creation success message.



23. Similarly, create FRA diskgroup.



24. Eventually, the `asmca` window should look like the following screenshot. All the diskgroups must be mounted and see by the two nodes.



Disk Group Name	Size (GB)	Free (GB)	Usable (GB)	Redundancy	State
OCRDISK	10.00	9.67	9.67	EXTERN	MOUNTED(2 of 2)
DATA	15.00	14.87	14.87	EXTERN	MOUNTED(2 of 2)
FRA	15.00	14.87	14.87	EXTERN	MOUNTED(2 of 2)

25. Click on **Exit** button.

F. Install Oracle Database Software

26. In the Oracle VirtualBox window, logout from `srv1` and login as `oracle`.

27. Open a terminal window then create the `sqlnet.ora` file and add the following code in it.

```
mkdir -p $ORACLE_HOME/network/admin
vi $ORACLE_HOME/network/admin/sqlnet.ora
```

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

28. Copy the database installation file to the staging directory.

29. In the Putty session of `srv1`, change the current user to `oracle` then extract the installation file into the Oracle database software home directory

```
su - oracle
unzip /media/sf_staging/LINUX.X64_193000_db_home.zip -d $ORACLE_HOME >>
/dev/null
```

30. In the VirtualBox window of srv1, change the current directory to the Oracle database home directory and run the `runInstaller` script.

```
cd $ORACLE_HOME
./runInstaller
```

31. Respond to the Installer utility windows as follows:

Window	Response
Configuration Option	Select the following option: "**Set up Software Only**"
Database Installation Option	select "**Oracle Real Application Cluster database installation**" option
Grid Installation Options	select "**Oracle Real Application Clusters database installation**"
Nodes Selection	Make sure both nodes are selected. Press on **SSH Connectivity** enter **oracle** password click **Setup** button. After the SSH connectivity setup is finished, click on **Test** button to test it. click on **Next** button.

Database Edition	select **Enterprise Edition** option
Installation Location	Oracle Base /u01/app/oracle Software Location /u01/app/oracle/product/19.0.0/db_1 **Note**: those values taken from the OS variables
Operating System Groups	select **oinstall** group for all the options except OSOPER keep it blank
Root Script Execution	**Mark the checkbox** "Automatically run configuration scripts" and enter the root password
Prerequisite Checks	The following warnings could be ignored: - Single Client Access Name (SCAN) - DNS name service srv-scan **Note**: If you receive other warnings, check their details. Resolve the issue and click on "Check Again" button. Click on **Ignore All** option
Summary	click on **Install** button
Finish	Just before finishing the installation, the Installer will prompt for a message to run the configuration scripts. Just click on **Yes** button click on **Close** button

Note: as is the case with Oracle grid software, it is recommended to apply the latest patch sets on the Oracle software straight away after installing it. This is much faster than applying them after creating the database.

G. Create the Oracle RAC Database

32. In the Oracle VirtualBox window, make sure you are logged on as `oracle`.

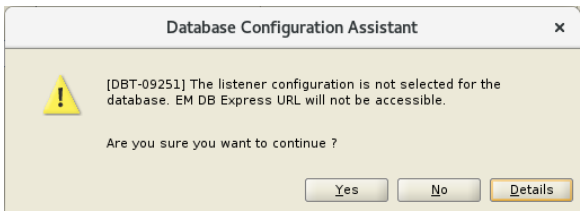
33. Start the `dbca` utility

```
dbca
```

Note: observe that you do not create a listener in oracle home. The listener starts up from the grid home and controlled by the clusterware.

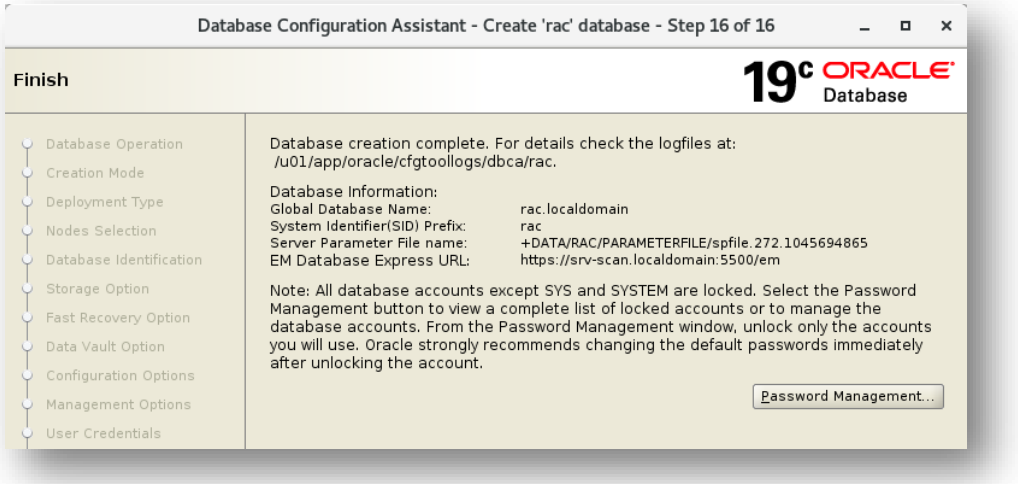
34. Respond to the `dbca` windows as follows:

Window	Response
Database Operation	select **Create Database** option
Creation Mode	select **Advanced Mode** option
Database Template	Make sure the Database Type is **Oracle Real Application Clusters (RAC) database** Change the Configuration Type to **Admin Managed** Make sure that the **General Purpose or Transaction Processing** option is selected.
Node Selection	make sure both nodes are selected
Database Identification	Global Database Name:**rac.localdomain** SID Prefix: **rac** Make sure that the "Create As Container Database" checkbox **is** marked. Make sure the checkbox "Use Local Undo Tablespaces for PDBs" **is** marked Number of PDBs: **1** PDB Name: **pdb1**
Storage Option	Change the following: Database files location: **+DATA/{DB_UNIQUE_NAME}**
Fast Recovery Option	Mark the checkbox "**Specify Fast Recovery Option**" Change the following field: Fast Recovery Area: **FRA+** Fast Recovery Area Size: **12 GB** Keep "**Enable Archiving**" checkbox unmarked
Data Vault Option	Keep the default values

Configuration Options	Make sure that **"Use Automatic Shared Memory Management"** is selected **Rise the Memory Slider** till the SGA size and the PGA size are nearly as follows: SGA Size: 3248 MB PGA Size: 1083 MB click on the **Sizing** tab Processes: **500** click on **Character Sets** tab select "**Use Unicode (AL32UTF8)**" option Sample Schemas tab **(*Optional*) Mark** the checkbox **"Add sample schemas to the database"** click on **Next** button
Management Options	Unmark the "**Run Cluster Verification Utility (CVU) Checks Periodically**" checkbox Mark the "**Configure Enterprise Manager (EM) Database Express**" checkbox If you receive the following message, click on **Yes** button: 
Database Credentials	set the password for the users
Creation Options	Make sure **"Create Database"** option is selected.
Prerequisite Checks	Ignore the following warnings: - Single Client Access Name SCAN - DNS/NIS name service 'srv-scan' click on "**Ignore All**" option click on "**Next**" button
Summary	kclick on "**Finish**" button

Database Configuration Assistant	click on "**Close**" button

In the end of the installation, you should see a message like the following:



H. First examination on the Oracle RAC database

In this section of the practice, you will perform some initial checking on the created RAC database.

35. Log in as `oracle` to `srv1` on a Putty session.

36. Make sure that the SCAN hostname replies to `ping` command.

```
ping -c 3 srv-scan
```

37. Issue the following commands and examine their output.

```
srvctl status database -d rac
srvctl config database -d rac
```

38. Login as `sysdba` to the database and examine the contents of `v$active_instances`

```
sqlplus / as sysdba
col inst_name format a50
SELECT INST_NUMBER , INST_NAME FROM V$ACTIVE_INSTANCES;

ALTER SESSION SET CONTAINER= pdb1;
SELECT COUNT(*) FROM HR.EMPLOYEES;
```

39. Make sure the `tnsnames.ora` file has been configured for connecting to `rac` database. This has automatically been done by the `dbca` utility.

```
cat $TNS_ADMIN/tnsnames.ora
```

40. In the VirtualBox window of `srv1`, start the Firefox browser and open the EM Express using the following URL

The browser returns the error "**Secure Connection Failed**". This error is generated because the listener runs as `grid` user and this user does not have the write access on the XDB wallet. You will fix this issue in the next step.

https://srv1:5500/em

Note: Following is a reference for EM Express known issues and how to resolve them:

Doc ID 1604062.1 : Troubleshooting Why EM Express is not Working

41. In srv1 and srv2, as root, run the following command to grant permission on the XDB wallet to the gird user:

XDB wallet folder can be obtained from the output of the `lsnrctl status`

```
setfacl -R -m u:grid:rwx /u01/app/oracle/product/19.0.0/db_1/admin/rac/xdb_wallet
```

42. Try opening the EM Express on the browser. Accept the warning displayed by the browser. Enter the `sys` username, its password, leave the container name blank then click on Login button.

43. Explore the EM Express. When you are done, close the browser.

44. Restart the machines and make sure the database is automatically started after the reboot.

45. Shutdown all the virtual machines.

Summary

In this practice, you performed the following:

- Carry out OS preparation steps
- Install Grid Infrastructure software
- Create ASM Disk Groups
- Install Oracle Database Software
- Create the Oracle RAC database

Note:

The virtual appliances created by this practice is available to download from my web site at the following link:

http://ahmedbaraka.com/public/download/