

CST4714 Lab 01: Oracle 11g Database Architecture

In this lab you will be getting familiar with the Oracle 11g database management system architecture.

Learning Outcome:

After this topic you will be able to identify and explain the internal DBMS architecture including the ability to:

- ✓ Explain the processes that make up a database instance
- ✓ Identify how DBMS processes use memory
- ✓ Describe how the various DBMS components interact
- ✓ Identifying and explain the components that make up the Oracle DBMS and how they interact
- ✓ Outline Oracle 11g database file architecture
- ✓ Shutdown and startup the database.

Part 1: Understanding the basics of Oracle 11g

Your virtual machine has Oracle 11g already installed for you. We're going to start by exploring the basics of that setup. One thing you need to understand is that Oracle 11g is a complex system with many moving parts / services. Our setup contains the following key components:

- Oracle Enterprise Manager (OEM) – a website for performing DBA functions and monitoring the database
- Oracle Database Instance - the actual database server itself
- Listener – a program which allows remote connections to the database. Without the listener users cannot connect.

Activity 1.a: What's running?

In this first activity we will view the running processes associated with Oracle 11g.

TODO: press **Ctrl+Shift+Esc** to bring up the windows task manager and view the running programs. Click on **Memory** to sort by memory size with the largest programs at the top.

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On your screen, find these processes (I've highlighted the key oracle processes):

Image Name	User Name	CPU	Memory (...)	Description
oracle.exe	SYSTEM	00	467,836 K	Oracle RD...
java.exe	SYSTEM	00	185,748 K	Java(TM) ...
svchost.exe	SYSTEM	00	107,968 K	Host Proc...
emagent.exe	SYSTEM	00	26,320 K	Oracle En...
WmiPrvSE.exe	SYSTEM	00	25,704 K	WMI Prov...
explorer.exe	Adminis...	00	17,292 K	Windows ...
perl.exe	SYSTEM	00	16,388 K	perl
TrustedInstall...	SYSTEM	00	15,872 K	Windows ...
svchost.exe	SYSTEM	00	11,944 K	Host Proc...
svchost.exe	LOCAL ...	00	10,916 K	Host Proc...
svchost.exe	LOCAL ...	00	10,288 K	Host Proc...
TNLSNR.EXE	SYSTEM	00	9,984 K	Oracle SQ...
mmc.exe	Adminis...	00	9,924 K	Microsoft ...
spoolsv.exe	SYSTEM	00	7,184 K	Spooler S...
svchost.exe	NETWO...	00	5,988 K	Host Proc...
vmtoolsd.exe	Adminis...	00	5,508 K	VMware T...
SearchIndexe...	SYSTEM	00	5,420 K	Microsoft ...
svchost.exe	LOCAL ...	00	5,300 K	Host Proc...
vmtoolsd.exe	SYSTEM	00	5,164 K	VMware T...
dwm.exe	Adminis...	00	4,980 K	Desktop ...

You'll notice in your running version of task manager, the memory and CPU are still going up on oracle.exe and java.exe. These processes take a while to get "up to speed" and become available to use. You'll know they're ready when the CPU and memory usage levels out.

IMPORTANT NOTE: It can take up to 5 minutes for the Oracle database and OEM services to start up. Just because you can log-on to the desktop does not guarantee the Oracle services will be available to you!

TODO: You can close task manager.

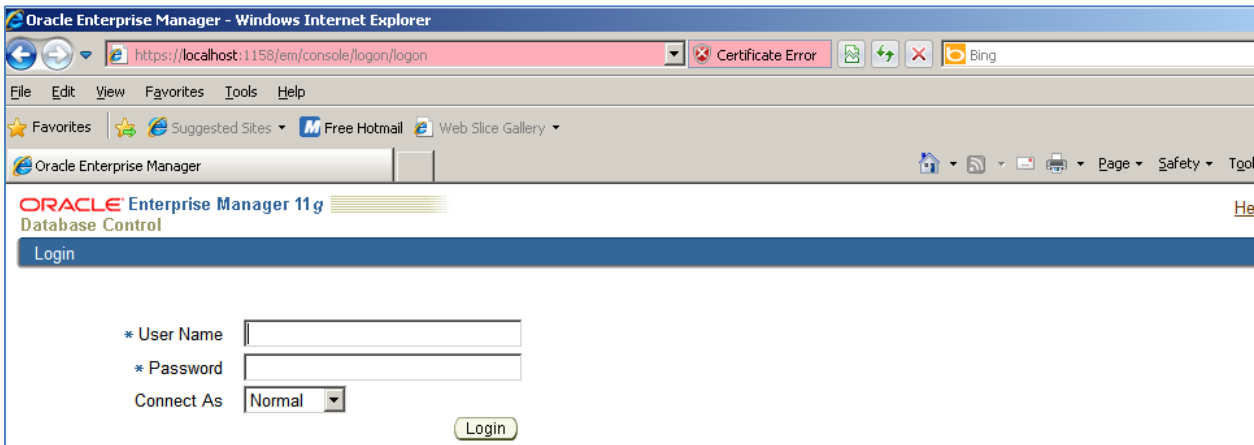
Activity 1.b: Oracle Enterprise Manager

Next we'll connect to Oracle Enterprise Manager (OEM)

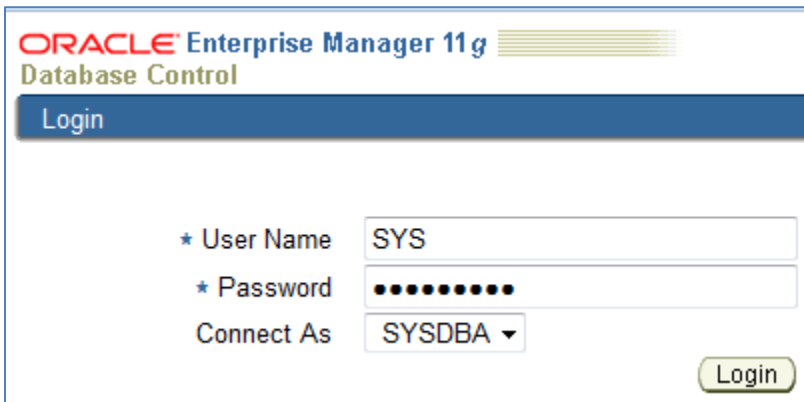
TODO: Go to the the following URL: <https://localhost:1158/em>

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You will land on the OEM login page.

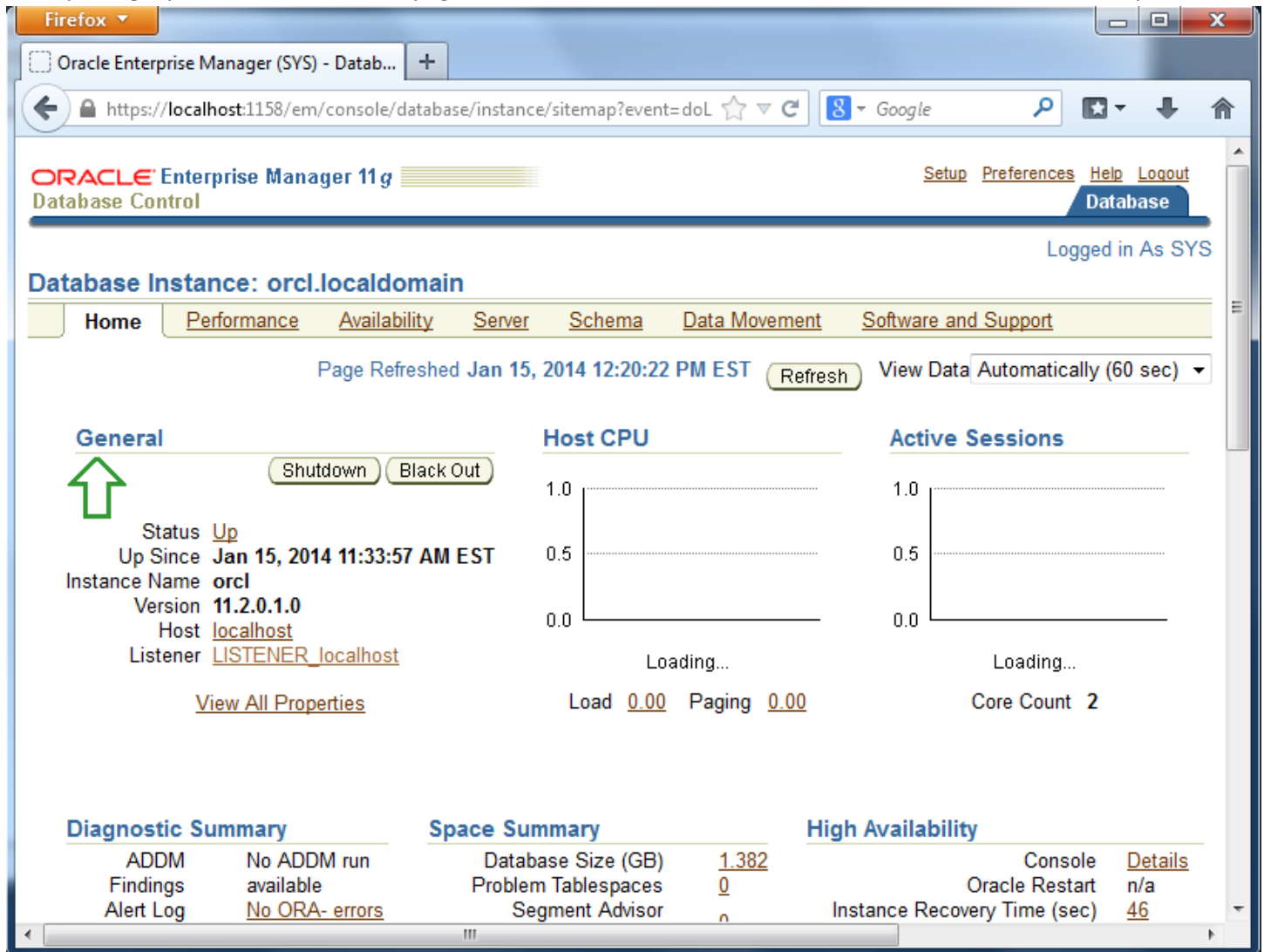


Enter the following information into the OEM login screen, as shown, then click **Login**



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After you login you should see a status page for the database instance. The instance and listener should be Up.



Activity 1.c: Bringing the instance up/down.

Next, let's learn how to bring our Oracle instance up/down. This is useful for performing essential maintenance like upgrades, patches, and backups.

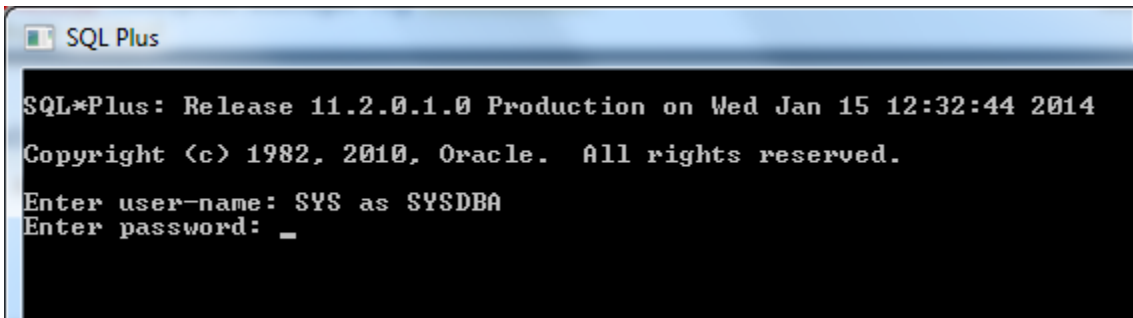
NOTE: Stay logged in to OEM so you can see how the status changes as we bring down the instance. Do not close the OEM window.

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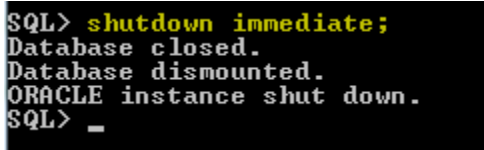
Shutdown

TODO: Run  SQL Plus from the menu. This allows us to administer the database from the command line.

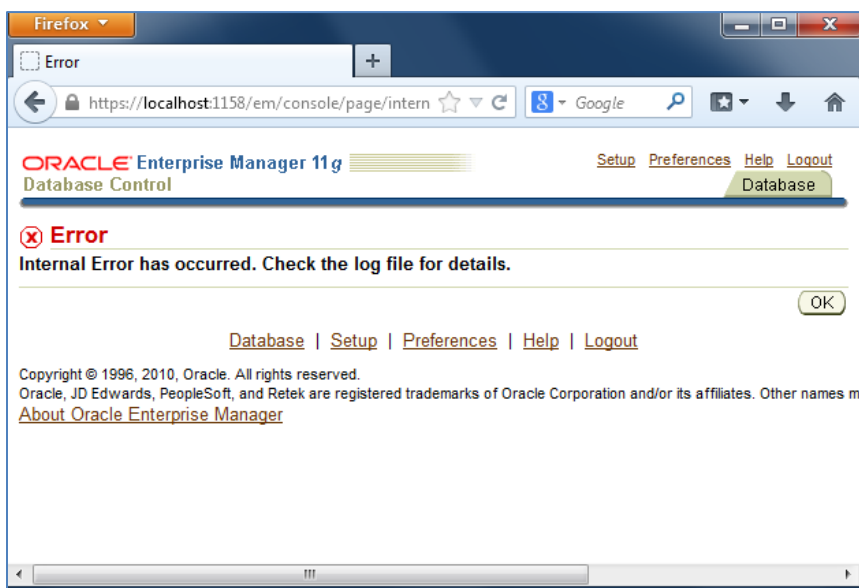
Logon to SQL Plus as shown in the screenshot.



Notice we are NOT logging on to the specific instance **localhost.ordl** but just into the server. At the SQL> prompt, enter **shutdown immediate**; and press enter to initiate an immediate shutdown of the instance.

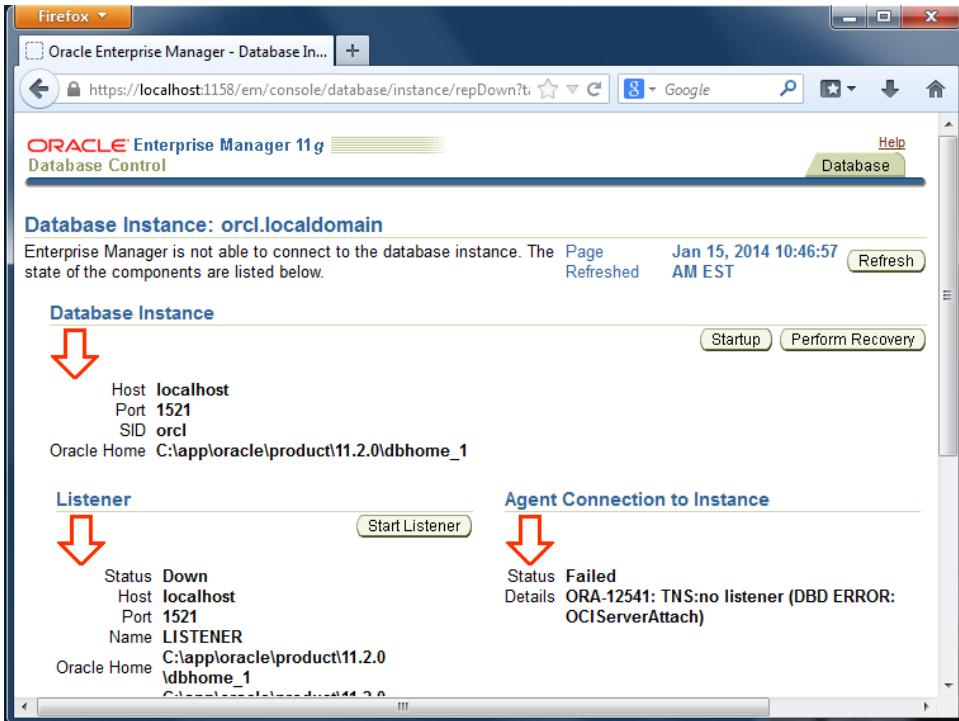


With the database now shutdown, return to your OEM screen. You should see the following:



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Click **ok** to return to the main monitoring screen in OEM. You will now see the instance and listener are in a down state:



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Startup

TODO: Return to the SQL Plus application and issue the following command from the SQL> prompt: **startup open;**

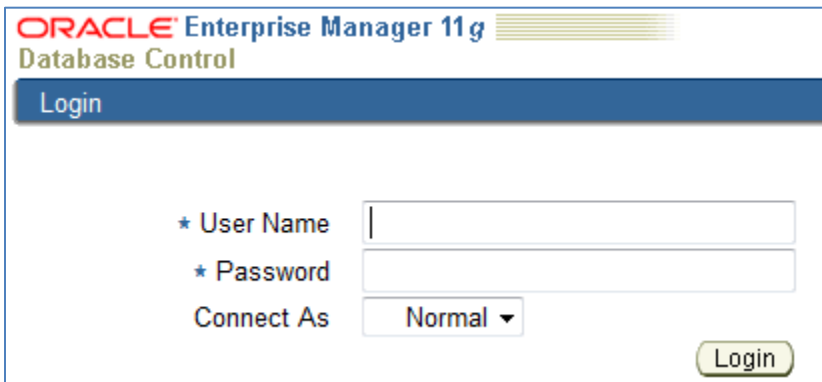
```

SQL> startup open;
ORACLE instance started.

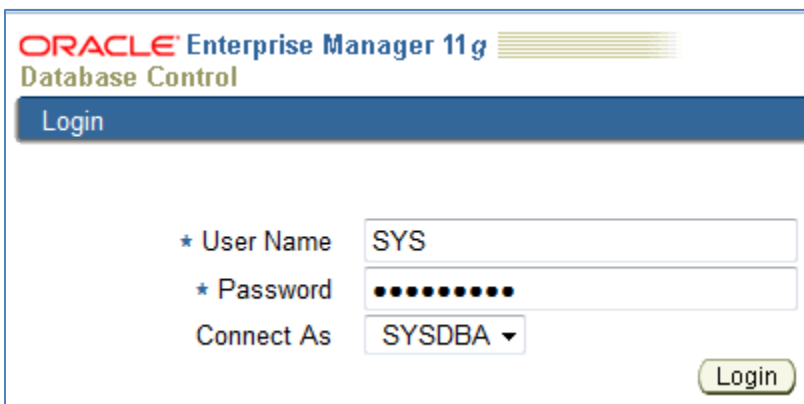
Total System Global Area 1286066176 bytes
Fixed Size                  2175408 bytes
Variable Size               889196112 bytes
Database Buffers           385875968 bytes
Redo Buffers                 8818688 bytes
Database mounted.
Database opened.
SQL>
    
```

This command starts the database back up in open mode. This allows users to access the database again.

Return to your **OEM** window and click the  button. Once again, you will see the login page:

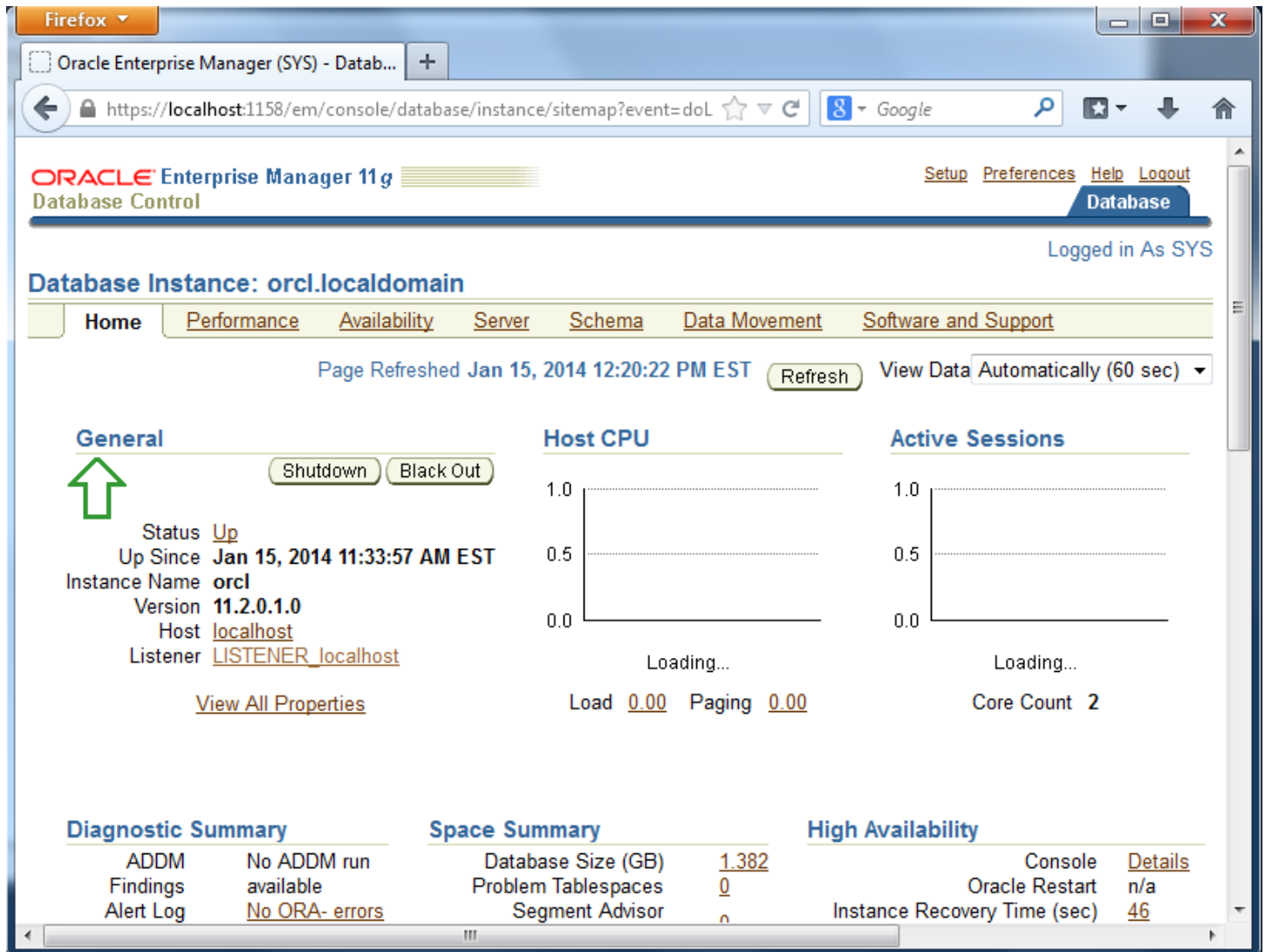


Login to OEM like you did before:



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And once again your database should be up and running!



TODO: You may close OEM and SQL Plus

Part 2: Knowing Your Oracle Install

In this next part, we'll explore what makes up your Oracle installation. You'll need to be familiar with this information as we will require knowledge of these components in future labs. It should be noted that these locations vary based on how you installed the Oracle software. Since I did the install for you, we should all have the same locations and settings. If you do your own install of Oracle at a future date, you'll need to know where these components are for reference. For

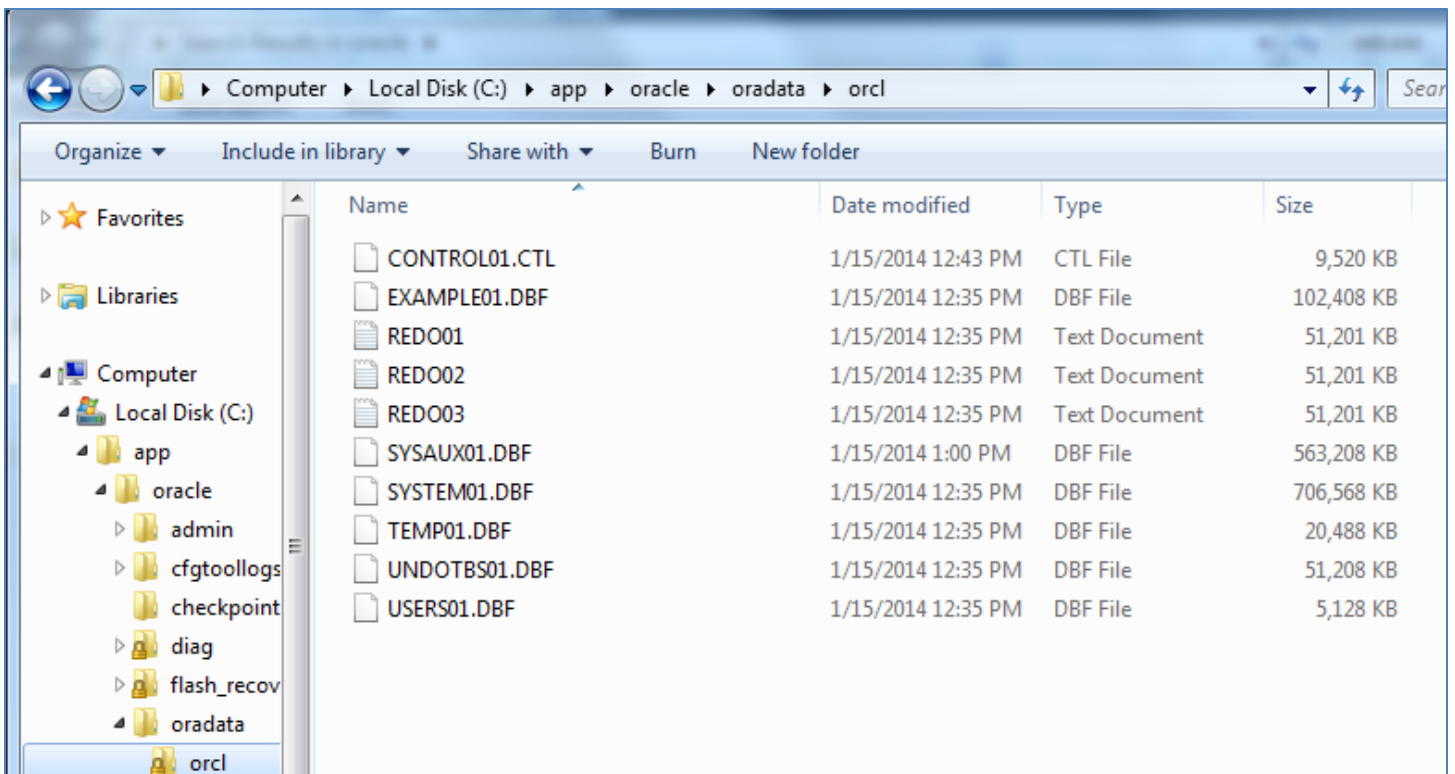
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now, I'd like to explain the concepts and get you familiar with the locations of these files/folders. There are 4 main components:

1. The data directory for the database.
2. The parameter file - init.ora
3. The Oracle home directory
4. The tnsnames.ora file.

The Oracle data directory is the default folder where the physical files which make up the table spaces and control files are stored. The name of the directory should match the database name: **orcl**

By using Windows Explorer you should be able to find the data directory here: **c:\app\oracle\oradata\orcl** Notice the file naming conventions.



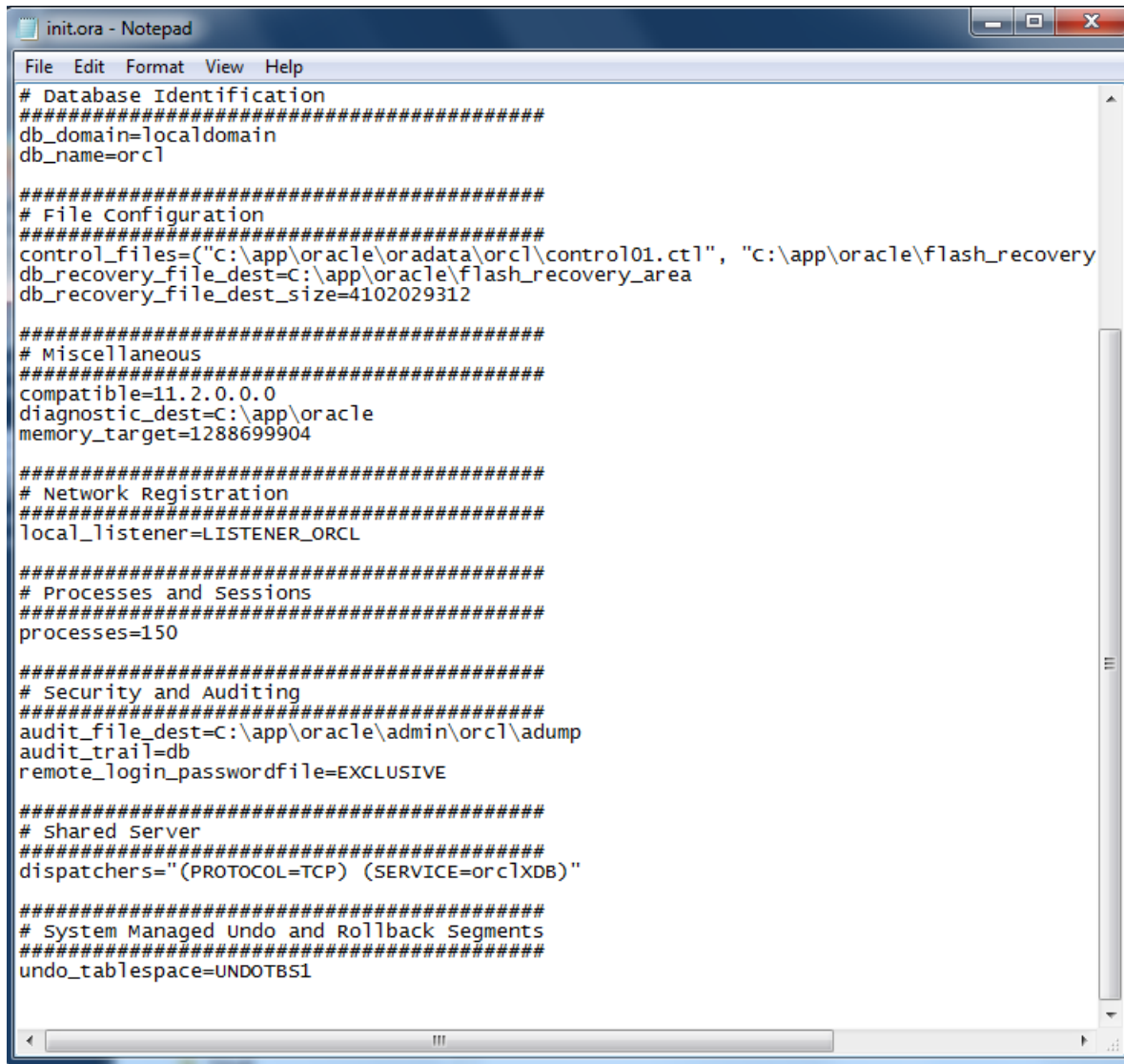
2. Parameter file – init.ora

The parameter file, called **init.ora**, contains default settings for your instance. In your install this should be located at **C:\app\oracle\admin\orcl\pfile**. The parameter file is read whenever you start the database instance. Without it you can't initiate an Oracle database instance.

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TODO: Open the **Notepad** program the open the **init.ora** file so you can view the settings.

You'll notice that there's information about the database instance here, as well as the location of the control files. See if you can find these settings.



```
init.ora - Notepad
File Edit Format View Help
# Database Identification
#####
db_domain=localhost
db_name=orcl

#####
# File Configuration
#####
control_files=( "C:\app\oracle\oradata\orcl\control01.ctl", "c:\app\oracle\flash_recovery
db_recovery_file_dest=c:\app\oracle\flash_recovery_area
db_recovery_file_dest_size=4102029312

#####
# Miscellaneous
#####
compatible=11.2.0.0.0
diagnostic_dest=C:\app\oracle
memory_target=1288699904

#####
# Network Registration
#####
local_listener=LISTENER_ORCL

#####
# Processes and Sessions
#####
processes=150

#####
# Security and Auditing
#####
audit_file_dest=C:\app\oracle\admin\orcl\adump
audit_trail=db
remote_login_passwordfile=EXCLUSIVE

#####
# Shared Server
#####
dispatchers="(PROTOCOL=TCP) (SERVICE=orclXDB)"

#####
# System Managed Undo and Rollback Segments
#####
undo_tablespace=UNDOTBS1
```

As a word of caution, do not change the contents of the parameter file. You will be able to do so by the end of the semester.

TODO: Close the file when you're done. DO NOT SAVE ANY CHANGES.

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3. Oracle Home Directory

The Oracle home is the folder which contains all of the binaries and settings for your oracle instance. Most of the time you need to know this directory when configuring 3rd party software to work with the Oracle database. Our home directory is installed here: **C:\app\oracle\product\11.2.0\dbhome_1**

4. The **tnsnames.ora** file

The **tnsnames.ora** is a configuration file that defines database addresses for establishing connections to them. This file normally resides in your oracle home directory under NETWORK\ADMIN directory.

TODO: Using **Notepad**, open your **tnsnames.ora** file from

C:\app\oracle\product\11.2.0\dbhome_1\NETWORK\ADMIN do you notice any names in this file which look familiar?

Close the file when you're done. DO NOT SAVE ANY CHANGES.

Installing the Oracle 11g DBMS**Questions**

For credit you must answer each of these questions completely, correctly and by the due date. Since you must hand in a Word document with your answers, I suggest copying these questions to a new document and saving your answers there.

1. Show screen shots for everything that I have shown (so that I know that you have installed Oracle in your system)
2. What are the three key components of our Oracle Installation?
3. Can you access the Oracle services immediately after logging on to Windows? Explain.
4. What is SQL Plus? How is it similar to and different from OEM?
5. What is the db_block_size setting in your init.ora file?
6. What is the SERVICE_NAME in your tnsnames.ora file?
7. Use SQL Plus to answer the following:
 - a. List all the Tablespace names (TABLESPACE_NAME) and their STATUS from the DBA_TABLESPACES Table.
 - b. List all the File_names and their associated Tablespace Names using the DBA_DATA_FILES
8. Execute: Select * from user_users; display the output and what does it tell you?
9. Explain the differences between Dictionary managed tablespaces and Locally managed tablespaces
10. Explain the differences between Oracle Managed Files (OMF) and User Managed Files (UMF)