



Integrated Cloud Applications & Platform Services



# Exadata Database Machine: 12c Administration Workshop

Activity Guide – Volume II

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## **Practices for Lesson 11: Migrating Databases to Exadata**

**Chapter 11**

## Practices for Lesson 11

---

### Practices Overview

In this practice you will use Oracle Recovery Manager (RMAN), in conjunction with the transportable tablespace feature of Oracle Database, to migrate data from a big-endian platform to Database Machine, a little-endian platform.

## Practice 11-1: Migrating to Databases Machine by Using Transportable Tablespaces

### Overview

In this practice, you will migrate data from an AIX platform to Database Machine. You will use Oracle Recovery Manager (RMAN) to perform endian conversion on a data file and also to load the data file into ASM. You will then use the transportable tablespace feature of Oracle Database to make the data file part of your database on Database Machine.

### Tasks

1. Establish a terminal connection to qr01db01 as the oracle user.
2. From the oracle user home directory, change directory into the TTS subdirectory under the labs directory.

```
[oracle@qr01db01 ~]$ cd labs/TTS  
[oracle@qr01db01 TTS]$
```

3. List the contents of the TTS directory. You should see two files. soe\_TTS\_AIX.dbf is a data file sourced from an Oracle database running on AIX. It contains a tablespace called SOE which houses numerous database objects belonging to a schema named SOE. expSOE\_TTS.dmp is a data pump export file, which contains the transportable tablespace metadata associated with the SOE tablespace.

```
[oracle@qr01db01 TTS]$ ls -l  
total 1230568  
-rw-r--r-- 1 oracle oinstall 565248 Oct 14 2010 expSOE_TTS.dmp  
-rw-r--r-- 1 oracle oinstall 1258299392 Oct 14 2010 soe_TTS_AIX.dbf  
[oracle@qr01db01 TTS]$
```

Note that the files associated with the transportable tablespace are staged on the file system of your database server. This arrangement is being used only to facilitate the practice in this classroom setting and is not a recommended practice for migrating data to Database Machine. For staging data files in a real-world Database Machine setting, Oracle recommends using a database file system (DBFS). Configuring DBFS on Database Machine is examined in the lesson entitled *Bulk Data Loading with Database Machine*.

4. Connect to your database with SQL\*Plus. Log in as the database administrator.

```
[oracle@qr01db01 TTS]$ sqlplus / as sysdba  
  
SQL*Plus: Release 11.2.0.3.0 Production...  
  
SQL>
```

5. Execute the following query to confirm the Database Machine platform and endian format (or execute the SQL script /home/oracle/labs/lab11-01-05.sql). Note that Database Machine is a little-endian format system.

```
SQL> select d.platform_name, endian_format
  2  from v$transportable_platform tp, v$database d
  3  where tp.platform_name = d.platform_name;

PLATFORM_NAME
-----
ENDIAN_FORMAT
-----
Linux x86 64-bit
Little

SQL>
```

6. Query V\$TRANSPORTABLE\_PLATFORM to display all the platforms supported by the transportable tablespace feature along with each platform's endian format. Note that AIX is a big-endian format system.

```
SQL> select * from v$transportable_platform;

PLATFORM_ID PLATFORM_NAME          ENDIAN_FORMAT
----- -----
 1 Solaris[tm] OE (32-bit)        Big
 2 Solaris[tm] OE (64-bit)        Big
 7 Microsoft Windows IA (32-bit) Little
10 Linux IA (32-bit)             Little
 6 AIX-Based Systems (64-bit)    Big
 3 HP-UX (64-bit)                Big
 5 HP Tru64 UNIX                 Little
 4 HP-UX IA (64-bit)             Big
11 Linux IA (64-bit)             Little
15 HP Open VMS                  Little
 8 Microsoft Windows IA (64-bit) Little
 9 IBM zSeries Based Linux      Big
13 Linux x86 64-bit              Little
16 Apple Mac OS                 Big
12 Microsoft Windows x86 64-bit Little
17 Solaris Operating System (x86) Little
18 IBM Power Based Linux        Big
19 HP IA Open VMS               Little
20 Solaris Operating System (x86-64) Little
21 Apple Mac OS (x86-64)        Little

20 rows selected.

SQL>
```

7. Exit your SQL\*Plus session. Then, launch Oracle Recovery Manager (RMAN) and connect to your database as shown below:

```
SQL> exit
Disconnected from Oracle Database 11g Enterprise Edition Release
11.2.0.3.0 - 64bit Production...
[oracle@qr01db01 TTS]$ rman target /
Recovery Manager: Release 11.2.0.3.0 - Production...
connected to target database: DBM (DBID=1290904261)

RMAN>
```

8. Use the CONVERT DATAFILE command as shown below to perform endian conversion on the AIX-based Oracle data file in your TTS directory. The command also loads the data file into ASM. Take note of the ASM file name for your converted data file.

```
RMAN> convert datafile
2> '/home/oracle/labs/TTS/soe_TTS_AIX.dbf'
3> to platform="Linux x86 64-bit"
4> from platform="AIX-Based Systems (64-bit)"
5> parallelism=1
6> format '+DATA_QR01';

Starting conversion at target at 18-JUL-13
using target database control file instead of recovery catalog
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=31 instance=dbm1 device type=DISK
channel ORA_DISK_1: starting datafile conversion
input file name=/home/oracle/labs/TTS/soe_TTS_AIX.dbf
converted datafile=+DATA_QR01/dbm/datafile/soe.270.821069105
channel ORA_DISK_1: datafile conversion complete, elapsed time:
00:02:16
Finished conversion at target at 18-JUL-13

RMAN>
```

9. Exit RMAN and connect to your database using SQL\*Plus. Log in as the database administrator.

```
RMAN> exit

Recovery Manager complete.

[oracle@qr01db01 TTS]$ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.3.0 Production...

SQL>
```

10. When a transportable tablespace is mapped into a destination database, by default, all the database objects (such as tables and indexes) are created in the same user schema as in the source database, and those users must already exist in the destination database.

Create a user named SOE and grant SOE the CONNECT and RESOURCE roles.

```
SQL> create user soe identified by soe account unlock;

User created.

SQL> grant connect,resource to soe;

Grant succeeded.

SQL>
```

11. Create a directory object that references the directory which houses your transportable tablespace export file. After the directory object is created, exit your SQL\*Plus session.

```
SQL> create directory tts as '/home/oracle/labs/TTS';

Directory created.

SQL> exit

Disconnected from Oracle Database 11g Enterprise Edition Release
11.2.0.3.0 - 64bit Production...

[oracle@qr01db01 TTS]$
```

12. Execute the data pump import utility (`impdp`) to import the transportable tablespace metadata. Use the ASM file name you obtained in step 8 in your setting for the `transport_datafiles` parameter. Use `oracle_4U` when you are prompted for a password.

```
[oracle@qr01db01 TTS]$ impdp system dumpfile=expSOE_TTS.dmp directory=tts \
> logfile=imp_SOE.log \
> transport_datafiles='+DATA_QR01/dbm/datafile/soe.270.821069105'

Import: Release 11.2.0.3.0 - Production on Thu Jul 18 03:04:23 2013

Copyright (c) 1982, 2011, Oracle and/or its affiliates. All rights reserved.
Password: <oracle_4U>

Connected to: Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 -
64bit Production
With the Partitioning, Real Application Clusters, Automatic Storage
Management, OLAP,
Data Mining and Real Application Testing options
Master table "SYSTEM"."SYS_IMPORT_TRANSPORTABLE_01" successfully
loaded/unloaded
Starting "SYSTEM"."SYS_IMPORT_TRANSPORTABLE_01": system/*********
dumpfile=expSOE_TTS.dmp directory=tts logfile=imp_SOE.log
transport_datafiles='+DATA_QR01/dbm/datafile/soe.270.821069105
Processing object type TRANSPORTABLE_EXPORT/PLUGTS_BLK
Processing object type TRANSPORTABLE_EXPORT/TABLE
Processing object type TRANSPORTABLE_EXPORT/INDEX
Processing object type TRANSPORTABLE_EXPORT/CONSTRAINT/CONSTRAINT
Processing object type TRANSPORTABLE_EXPORT/INDEX_STATISTICS
Processing object type TRANSPORTABLE_EXPORT/CONSTRAINT/REF_CONSTRAINT
Processing object type TRANSPORTABLE_EXPORT/INDEX/FUNCTIONAL_AND_BITMAP/INDEX
Processing object type
TRANSPORTABLE_EXPORT/INDEX/STATISTICS/FUNCTIONAL_AND_BITMAP/INDEX_STATISTICS
Processing object type TRANSPORTABLE_EXPORT/TABLE_STATISTICS
Processing object type TRANSPORTABLE_EXPORT/POST_INSTANCE/PLUGTS_BLK
Job "SYSTEM"."SYS_IMPORT_TRANSPORTABLE_01" successfully completed at 03:05:57

[oracle@qr01db01 TTS]$
```

13. Transportable tablespaces are generated in read-only mode. Connect to your database by using SQL\*Plus. Log in as the database administrator and restore your newly migrated SOE tablespace to read/write mode.

```
[oracle@qr01db01 TTS]$ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.3.0 Production...

SQL> alter tablespace soe read write;

Tablespace altered.

SQL>
```

14. Connect as the newly created SOE user.

```
SQL> connect soe/soe
Connected.

SQL>
```

15. Query the data dictionary (or execute the SQL script /home/oracle/labs/lab11-01-15.sql) to view a summary of the database objects belonging to SOE.

```
SQL> select segment_type,tablespace_name,count(*)
  2  from user_segments
  3  group by segment_type,tablespace_name;

SEGMENT_TYPE          TABLESPACE_NAME          COUNT (*)
-----
TABLE PARTITION        SOE                      64
INDEX                  SOE                      19
TABLE                  SOE                      3
INDEX PARTITION        SOE                      64

SQL>
```

16. Query some of the migrated data to confirm that it is available. You have completed the migration of a tablespace to Database Machine.

```
SQL> select * from warehouses;

WAREHOUSE_ID WAREHOUSE_NAME          LOCATION_ID
-----  -----
1 Southlake, Texas                      1400
2 San Francisco                         1500
3 New Jersey                            1600
4 Seattle, Washington                   1700
5 Toronto                               1800
6 Sydney                                2200
7 Mexico City                           3200
8 Beijing                               2000
9 Bombay                                2100
10 Paris                                 3240
11 Warehouse Number 11                  1252
12 Warehouse Number 12                  9176
13 Warehouse Number 13                  3766
14 Warehouse Number 14                  3766
15 Warehouse Number 15                  3766
16 Warehouse Number 16                  3766
17 Warehouse Number 17                  8971
18 Warehouse Number 18                  8971
19 Warehouse Number 19                  8971
20 Warehouse Number 20                  8971

20 rows selected.

SQL>
```

17. Exit your SQL\*Plus session.

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## **Practices for Lesson 12: Bulk Data Loading by Using Oracle DBFS**

**Chapter 12**

## Practices for Lesson 12

---

### Practices Overview

In this practice, you will perform a bulk data load on Database Machine.

## Practice 12-1: Bulk Data Loading with Database Machine

---

### Overview

In this practice, you will perform a bulk data load on Database Machine. You will configure a database file system (DBFS) and use it to stage a CSV formatted file. You will then use the external table feature of Oracle Database to reference the CSV file. Finally, you will use a CREATE TABLE AS SELECT statement to copy the CSV file data into a table in your database.

Note that this practice familiarizes students with the process required to configure DBFS in an Exadata environment using Linux as the database server OS, and some of the tasks performed during this practice are Linux-specific. Furthermore, this practice does not contain all of the optional steps for configuring DBFS on Exadata Database Machine. For information on configuring DBFS on Solaris database servers and for additional configuration options see My Oracle Support note 1054431.1.

### Tasks

- Establish a terminal connection to qr01db01 as the root user. Enter oracle when prompted for the password.
- Configure the OS to enable the oracle user to use the Linux fuse (Filesystem in User Space) kernel module.

```
[root@qr01db01 ~]# usermod -a -G fuse oracle
[root@qr01db01 ~]# echo user_allow_other > /etc/fuse.conf
[root@qr01db01 ~]# chmod 644 /etc/fuse.conf
[root@qr01db01 ~]#
```

Note that the configuration performed in this step is required on every database server where the DBFS will be mounted. In a production environment, you could repeat this step on each database server or use the dcli utility to perform the configuration at once across multiple database servers.

- Establish a terminal connection to qr01db01 as the oracle user. **It is important that you create a fresh oracle user session after you perform step 2 so that the session can inherit the newly configured group membership. If you use a previously started terminal session then you will experience problems later in the practice.**
- Connect to your database with SQL\*Plus. Log in as the database administrator.

```
[oracle@qr01db01 ~]$ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.3.0 Production...

SQL>
```

- Create a new tablespace to house your database file system (DBFS).

```
SQL> create bigfile tablespace dbfs datafile '+DBFS_DG' size 200M;

Tablespace created.

SQL>
```

Note that in this practice you will configure DBFS inside your assigned student database. This arrangement is only being used to facilitate the practice in this classroom setting and is not a recommended practice for configuring DBFS to facilitate bulk data loading on

Database Machine. For bulk data loading in a real-world Database Machine setting, Oracle recommends that you create a separate dedicated database instance for DBFS on your Database Machine. See My Oracle Support notes 1054431.1 and 1191144.1 for specific recommendations.

6. Create a new database user to support DBFS and grant the database user the required system privileges and roles as shown below:

```
SQL> create user dbfs identified by dbfs quota unlimited on dbfs;

User created.

SQL> grant create session, create table, create procedure, dbfs_role to dbfs;

Grant succeeded.

SQL>
```

7. Exit your SQL\*Plus session. Next, create a new directory named DBFS under the oracle user home directory. This directory will act as the anchor for your database file system mount point. Note that this directory needs to be created on every database server where the DBFS will be mounted.

```
SQL> exit
Disconnected from Oracle Database 11g Enterprise Edition Release
11.2.0.3.0 - 64bit Production...
[oracle@qr01db01 ~]$ mkdir DBFS
[oracle@qr01db01 ~]$
```

8. Change directory to \$ORACLE\_HOME/rdbms/admin.

```
[oracle@qr01db01 ~]$ cd $ORACLE_HOME/rdbms/admin
[oracle@qr01db01 admin]$
```

9. Connect to your database with SQL\*Plus. Log in as the newly created dbfs user.

```
[oracle@qr01db01 admin]$ sqlplus dbfs/dbfs

SQL*Plus: Release 11.2.0.3.0 Production...

SQL>
```

10. Run the `dbfs_create_filesystem` script file to create the database objects for your DBFS store. The first parameter (`dbfs`) specifies the tablespace where the DBFS store is created. The second parameter (`mydbfs`) specifies the name of the DBFS store. Exit SQL\*Plus after the script completes.

```
SQL> @dbfs_create_filesystem dbfs mydbfs
...
No errors.
-----
CREATE STORE:
begin dbms_dbfs_sfs.createFilesystem(store_name => 'FS_MYDBFS', tbl_name =>
'T_MYDBFS', tbl_tbs => 'dbfs', lob_tbs => 'dbfs', do_partition => false,
partition_key => 1, do_compress => false, compression => '', do_dedup =>
false,
do_encrypt => false); end;
-----
REGISTER STORE:
begin dbms_dbfs_content.registerStore(store_name=> 'FS_MYDBFS', provider_name
=>
'sample1', provider_package => 'dbms_dbfs_sfs'); end;
-----
MOUNT STORE:
begin dbms_dbfs_content.mountStore(store_name=>'FS_MYDBFS',
store_mount=>'mydbfs'); end;
-----
CHMOD STORE:
declare m integer; begin m := dbms_fuse.fs_chmod('/mydbfs', 16895); end;
No errors.
SQL> exit
Disconnected from Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 -
64bit Production...
[oracle@qr01db01 admin]$
```

11. Change directory back to the `oracle` user's home directory.

```
[oracle@qr01db01 admin]$ cd
[oracle@qr01db01 ~]$
```

12. Inside your student home directory, create a file named `passwd.txt`, which contains the password for your DBFS database user.

```
[oracle@qr01db01 ~]$ echo dbfs > passwd.txt
[oracle@qr01db01 ~]$
```

13. Launch the DBFS client (`dbfs_client`) by using the following command. Running `dbfs_client` in this manner mounts your database file system.

```
[oracle@qr01db01 ~]$ nohup $ORACLE_HOME/bin/dbfs_client \
> dbfs@dbm -o allow_other,direct_io \
> /home/oracle/DBFS < passwd.txt &
[1] 7009
nohup: appending output to `nohup.out'

[oracle@qr01db01 ~]$
```

Note that you have just started DBFS using the simplest and most direct method. Optional configuration steps can be performed to enable DBFS to use a wallet-based password and to enable DBFS to be managed automatically as a cluster resource. See My Oracle Support note 1054431.1 for details.

14. Use the `ps` command to locate your `dbfs_client` process.

```
[oracle@qr01db01 ~]$ ps -ef | grep dbfs_client
oracle    7009  6821  0 03:11 pts/0    00:00:00
/u01/app/oracle/product/11.2.0/dbhome_1/bin/dbfs_client dbfs@dbm
-o allow_other,direct_io /home/oracle/DBFS
oracle    7085  6821  0 03:12 pts/0    00:00:00 grep dbfs_client
[oracle@qr01db01 ~]$
```

15. Execute the `df` command. You should see that your database file system is mounted.

```
[oracle@qr01db01 ~]$ df
Filesystem      1K-blocks   Used   Available Use% Mounted on
/dev/xvda2      12223224   4435260   7167052  39% /
/dev/xvda1       101086     42137     53730  44% /boot
tmpfs           4194304   916944   3277360  22% /dev/shm
/dev/xvdb1      20153140  10675680  8453720  56% /u01
dbfs-dbfs@dbm:/ 203776        160   203616   1% /home/oracle/DBFS
[oracle@qr01db01 ~]$
```

16. Normally you would transfer files into your DBFS staging area by using a network file transfer mechanism such as SCP or FTP, or by reading them off a mass storage device (such as magnetic tape for example) attached to your Database Machine. To facilitate this practice, a CSV formatted data file is already located in the `labs/CSV` directory under the `oracle` user home directory. Copy the CSV file into your DBFS staging area as shown below. Then change directory into your DBFS staging area and confirm the presence of the CSV data file.

```
[oracle@qr01db01 ~]$ cp labs/CSV/customers.csv DBFS/mydbfs/
[oracle@qr01db01 ~]$ cd DBFS/mydbfs/
[oracle@qr01db01 mydbfs]$ ls -l
total 7376
-rw-r--r-- 1 oracle oinstall 7552705 Jul 18 03:13 customers.csv
[oracle@qr01db01 mydbfs]$
```

17. Use the head command to show the first 10 lines of data inside the CSV file.

```
[oracle@qr01db01 mydbfs] $ head customers.csv
55,"Bruce","Lange","hi","INDIA",1999,"Bruce.Lange@oracle.com",166
74,"Claude","Brown","d","SWITZERLAND",4737,"Claude.Brown@oracle.com",163
81,"Max","Capshaw","us","AMERICA",650,"Max.Capshaw@oracle.com",165
97,"Roy","Kazan","zhs","CHINA",2707,"Roy.Kazan@oracle.com",156
111,"Robert","Young","i","ITALY",4895,"Robert.Young@oracle.com",169
146,"Ridley","Schneider","th","THAILAND",3775,"Ridley.Schneider@oracle.com",16
8
245,"Matthias","Russell","i","ITALY",2839,"Matthias.Russell@oracle.com",158
252,"Edward","Hoskins","ja","JAPAN",2469,"Edward.Hoskins@oracle.com",153
262,"Grace","Sen","zhs","CHINA",500,"Grace.Sen@oracle.com",162
281,"Gtz","Peckinpah","th","THAILAND",1128,"Gtz.Peckinpah@oracle.com",151
[oracle@qr01db01 mydbfs] $
```

Your CSV data file is now staged inside DBFS. In the next section of this practice, you will create an external table to reference the staged data.

18. Connect to your database with SQL\*Plus. Log in as the database administrator.

```
[oracle@qr01db01 mydbfs] $ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.3.0 Production...

SQL>
```

19. Create a directory object that points to your DBFS staging directory.

```
SQL> create directory staging as '/home/oracle/DBFS/mydbfs';

Directory created.

SQL>
```

20. Grant read and write permissions on your newly created staging directory object to the sales user.

```
SQL> grant read, write on directory staging to sales;

Grant succeeded.

SQL>
```

21. Connect as the sales user.

```
SQL> connect sales/sales
Connected.

SQL>
```

22. Create an external table that references the data in your DBFS-staged CSV data file. You can use the command shown below without any modifications (or execute the SQL script /home/oracle/labs/lab12-01-22.sql).

```
SQL> create table ext_customers
  2  (
  3    customer_id      number(12),
  4    cust_first_name  varchar2(30),
  5    cust_last_name   varchar2(30),
  6    nls_language     varchar2(3),
  7    nls_territory    varchar2(30),
  8    credit_limit     number(9,2),
  9    cust_email       varchar2(100),
 10    account_mgr_id  number(6)
 11  )
 12 organization external
 13 (
 14   type oracle_loader
 15   default directory staging
 16   access parameters
 17   (
 18     records delimited by newline
 19     badfile staging:'custtxt%a_%p.bad'
 20     logfile staging:'custtxt%a_%p.log'
 21     fields terminated by ',' optionally enclosed by "'"
 22     missing field values are null
 23   (
 24     customer_id, cust_first_name, cust_last_name, nls_language,
 25     nls_territory, credit_limit, cust_email, account_mgr_id
 26   )
 27   )
 28   location ('customers.csv')
 29 )
 30 parallel
 31 reject limit unlimited;
```

Table created.

```
SQL>
```

23. Configure your session to display query execution plans.

```
SQL> set autotrace on explain
SQL>
```

24. Execute the following query to display the number of records in the external table. Note that the full table scan of the external table is executed in parallel.

```
SQL> select count(*) from ext_customers;

COUNT(*)
-----
100000

Execution Plan
-----
Plan hash value: 3054877561

-----
| Id  | Operation          | Name      | Rows  | Cost (%CPU) |
|---|---|---|---|---|
| 0  | SELECT STATEMENT   |           |       | 8 (0) |
| 1  |  SORT AGGREGATE    |           | 1     |           |
| 2  |  PX COORDINATOR    |           |       |           |
| 3  |    PX SEND QC (RANDOM) | :TQ10000 | 1     |           |
| 4  |    SORT AGGREGATE   |           | 1     |           |
| 5  |    PX BLOCK ITERATOR |           | 8168  | 8 (0) |
| 6  |    EXTERNAL TABLE ACCESS FULL | EXT_CUSTOMERS | 8168  | 8 (0) |
-----
```

SQL>

25. Reconfigure your session to disable automatic query plan display.

```
SQL> set autotrace off
SQL>
```

26. Use a CREATE TABLE AS SELECT command to load the external table data contained in the CSV file into a new table in your database.

```
SQL> create table loaded_customers
  2  as select * from ext_customers;

Table created.

SQL>
```

27. Query your newly loaded table to confirm the number of records that were loaded.

```
SQL> select count(*) from loaded_customers;

COUNT (*)
-----
100000

SQL>
```

28. Exit your SQL\*Plus session and then list the contents of your current directory (which should be your DBFS staging area). In addition to your CSV data file, you should now see a number of log files that were generated when you referenced the external table.

```
SQL> exit
Disconnected from Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 -
64bit Production...
[oracle@qr01db01 mydbfs]$ ls -l
total 7382
-rw-r--r-- 1 oracle oinstall 7552705 Jul 18 03:13 customers.csv
-rw-r--r-- 1 oracle asmadmin    2752 Jul 18 03:15 custxt000_28409.log
-rw-r--r-- 1 oracle asmadmin    2752 Jul 18 03:15 custxt000_7147.log
[oracle@qr01db01 mydbfs]$
```

29. Examine the contents of one of the log files.

```
[oracle@qr01db01 mydbfs]$ cat custxt000_7147.log
...
LOG file opened at 07/18/13 03:15:17

Field Definitions for table EXT_CUSTOMERS
Record format DELIMITED BY NEWLINE
Data in file has same endianness as the platform
Rows with all null fields are accepted

Fields in Data Source:

CUSTOMER_ID           CHAR (255)
Terminated by ","
Enclosed by "" and ""
Trim whitespace same as SQL Loader
CUST_FIRST_NAME        CHAR (255)
Terminated by ","
Enclosed by "" and ""
Trim whitespace same as SQL Loader
CUST_LAST_NAME         CHAR (255)
Terminated by ","
Enclosed by "" and ""
Trim whitespace same as SQL Loader
NLS_LANGUAGE            CHAR (255)
```

```

Terminated by ","
Enclosed by """ and """
Trim whitespace same as SQL Loader
NLS_TERRITORY           CHAR (255)
Terminated by ","
Enclosed by """ and """
Trim whitespace same as SQL Loader
CREDIT_LIMIT            CHAR (255)
Terminated by ","
Enclosed by """ and """
Trim whitespace same as SQL Loader
CUST_EMAIL              CHAR (255)
Terminated by ","
Enclosed by """ and """
Trim whitespace same as SQL Loader
ACCOUNT_MGR_ID          CHAR (255)
Terminated by ","
Enclosed by """ and """
Trim whitespace same as SQL Loader
[oracle@qr01db01 mydbfs] $

```

30. Change the directory back to the oracle user's home directory.

```
[oracle@qr01db01 mydbfs] $ cd
[oracle@qr01db01 ~] $
```

31. Use the fusermount -u command to unmount your database file system.

```
[oracle@qr01db01 ~] $ fusermount -u /home/oracle/DBFS
[oracle@qr01db01 ~] $
```

32. Verify that your database file system is no longer mounted, by executing the df command.

```
[oracle@qr01db01 ~] $ df
Filesystem      1K-blocks    Used   Available  Use% Mounted on
/dev/xvda2        12223224  4435260   7167052  39% /
/dev/xvda1         101086    42137    53730  44% /boot
tmpfs             4194304  916944   3277360  22% /dev/shm
/dev/xvdb1        20153140 10676648   8452752  56% /u01
[1]+  Done                  nohup $ORACLE_HOME/bin/dbfs_client dbfs@dbm -o
allow_other,direct_io /home/oracle/DBFS < passwd.txt
[oracle@qr01db01 ~] $
```

33. Unmounting your database file system terminates the dbfs\_client process you started earlier. Use the ps command to verify that your dbfs\_client process is no longer running.

```
[oracle@qr01db01 ~] $ ps -ef|grep dbfs_client
oracle    7258  6821  0 03:17 pts/0    00:00:00 grep dbfs_client
[oracle@qr01db01 ~] $
```

What do you think would happen if you referenced the external table (EXT\_CUSTOMERS) now? Try it.

34. Exit your terminal sessions.

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## **Practices for Lesson 13: Exadata Database Machine Platform Monitoring: Introduction**

**Chapter 13**

## Practices for Lesson 13

---

### Practices Overview

In this practice, you will perform a bulk data load on Database Machine.

## Practice 13-1: Environment Reconfiguration

---

### Overview

In this practice, you will reconfigure your laboratory environment in preparation for the practices associated with future lessons.

### Tasks

- Establish a terminal connection with your laboratory environment. Do not connect to any of the Database Machine servers.
- Examine the virtual machine (VM) instances currently executing in your laboratory environment. Currently, your environment should contain 4 VMs that support the three cells and one database server that you have used in the practices so far.

```
$ sudo xm list
Name                           ID   Mem  VCPUs State
Time(s)
Domain-0                        0   1024    2      r----- 87763.7
qr01cel01                      1   1200    1      -b---- 15349.1
qr01cel02                      2   1200    1      -b---- 15355.0
qr01cel03                      3   1200    1      r----- 15373.0
qr01db01                       4   3000    2      ----- 13735.2
$
```

- Examine the amount of free memory (in MB) available in your VM server environment. **If the amount of free memory reported on your system exceeds 7800 MB, proceed to step 4. If the amount of free memory on your system is less than 7800 MB, skip directly to step 10.**

```
$ sudo xm info | grep free_memory
free_memory : 8403
$
```

- Start a VM instance for the qr01db02 server.

```
$ sudo xm create qr01db02
Using config file "/etc/xen/qr01db02".
Started domain qr01db02 (id=5)
$
```

- Start a VM instance for the em12 server.

```
$ sudo xm create em12
Using config file "/etc/xen/em12".
Started domain em12 (id=6)
$
```

- Re-examine the amount of free memory after starting the VMs in steps 4 and 5.

```
$ sudo xm info | grep free_memory
free_memory : 602
$
```

7. Adjust the memory allocation for the em12 VM so that it is allocated the remaining free memory. Calculate the new memory allocation using the following formula:  
 $\text{allocation} = 4799 + \text{free memory from step 6.}$

```
$ sudo xm mem-set em12 `expr 4799 + 602`  
$
```

8. Verify the creation of your new VM instances.

Name Time(s)	ID	Mem	VCPUs	State
Domain-0	0	1024	2	r----- 87798.1
em12	6	5401	2	-b----- 22.9
qr01cel01	1	1200	1	-b----- 15445.5
qr01cel02	2	1200	1	-b----- 15451.9
qr01cel03	3	1200	1	-b----- 15470.2
qr01db01	4	3000	2	-b----- 13821.1
qr01db02	5	3000	2	-b----- 27.9
\$				

**9. Exit your terminal session and skip the remaining steps in this practice.**

10. Start a VM instance for the qr01db02 server. Set the initial memory allocation for this VM to 2000 MB.

```
$ sudo xm create qr01db02 memory=2000  
Using config file "/etc/xen/qr01db02".  
Started domain qr01db02 (id=5)  
$
```

11. Start a VM instance for the em12 server.

```
$ sudo xm create em12  
Using config file "/etc/xen/em12".  
Started domain em12 (id=6)  
$
```

12. Re-examine the amount of free memory after starting the VMs in steps 10 and 11.

```
$ sudo xm info | grep free_memory  
free_memory : 652  
$
```

13. Adjust the memory allocation for the qr01db02 VM so that it is allocated the remaining free memory. Calculate the new memory allocation using the following formula:  
 $\text{allocation} = 1999 + \text{free memory from step 12.}$

```
$ sudo xm mem-set qr01db02 `expr 1999 + 652`  
$
```

14. Verify the creation of your new VM instances.

Name	ID	Mem	VCPUs	State	
Time(s)					
Domain-0	0	1024	2	r-----	87798.1
em12	6	4800	2	-b----	22.9
qr01cel01	1	1200	1	-b----	15445.5
qr01cel02	2	1200	1	-b----	15451.9
qr01cel03	3	1200	1	-b----	15470.2
qr01db01	4	3000	2	-b----	13821.1
qr01db02	5	2651	2	-b----	27.9
\$					

15. Exit your terminal session.

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## **Practices for Lesson 14: Configuring Enterprise Manager Cloud Control 12c to Monitor Exadata Database Machine**

**Chapter 14**

## Practices for Lesson 14

---

### Practices Overview

In these practices, you will configure Enterprise Manager Cloud Control 12c to monitor Exadata Database Machine. You will also perform a selection of post-discovery configuration and verification tasks.

## Practice 14-1: Configuring Enterprise Manager Cloud Control 12c to Monitor Exadata Database Machine

### Overview

In this practice, you will configure Enterprise Manager Cloud Control 12c to monitor Exadata Database Machine. Specifically, you will:

- Deploy Management Agents to Database Machine servers
- Discover the Database Machine system components
- Discover Oracle Grid Infrastructure and Oracle Database software components
- Configure a Database Machine Services Dashboard

### Assumptions

This practice relies on the configuration activities performed in the previous practice.

### Tasks

1. Establish a terminal session connected to qr01db01 by using the oracle OS user.
2. Confirm that the dbm database is running on qr01db01 and qr01db02.

```
[oracle@qr01db01 ~]$ srvctl status database -d dbm
Instance dbm1 is running on node qr01db01
Instance dbm2 is running on node qr01db02
[oracle@qr01db01 ~]$
```

3. Establish a terminal session connected to em12 by using the oracle OS user. Ensure that you specify the -X option for ssh.

Note that you may see additional messages relating to server identities. Answer yes if you are prompted to acknowledge server authenticity.

```
$ ssh -X oracle@em12
oracle@em12 password: <oracle>
[oracle@em12 ~]$
```

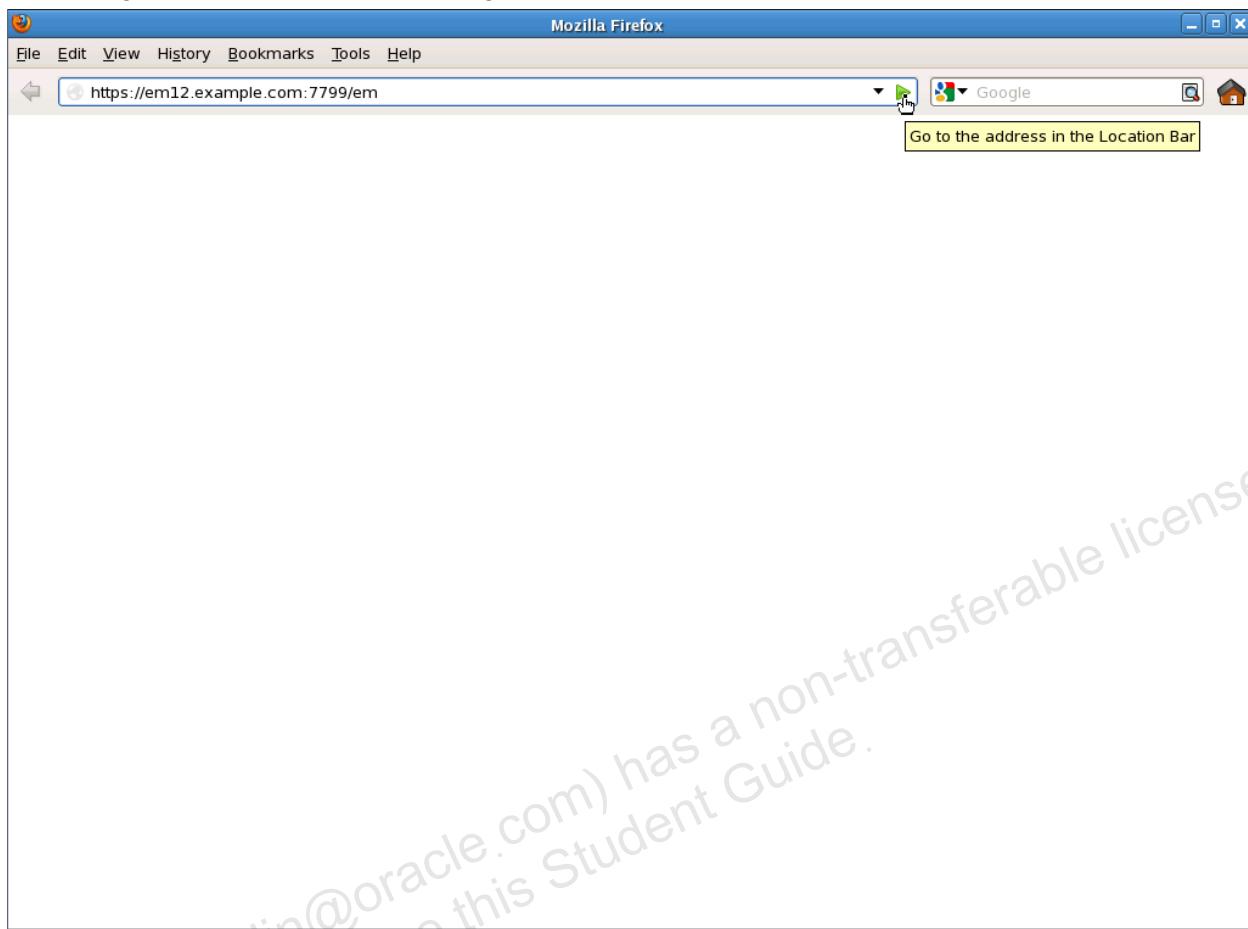
4. Verify that your Enterprise Manager environment is up and running.

```
[oracle@em12 ~]$ /u01/app/oracle/product/middleware/oms/bin/emctl status oms
Oracle Enterprise Manager Cloud Control 12c Release 3
Copyright (c) 1996, 2013 Oracle Corporation. All rights reserved.
WebTier is Up
Oracle Management Server is Up
[oracle@em12 ~]$
```

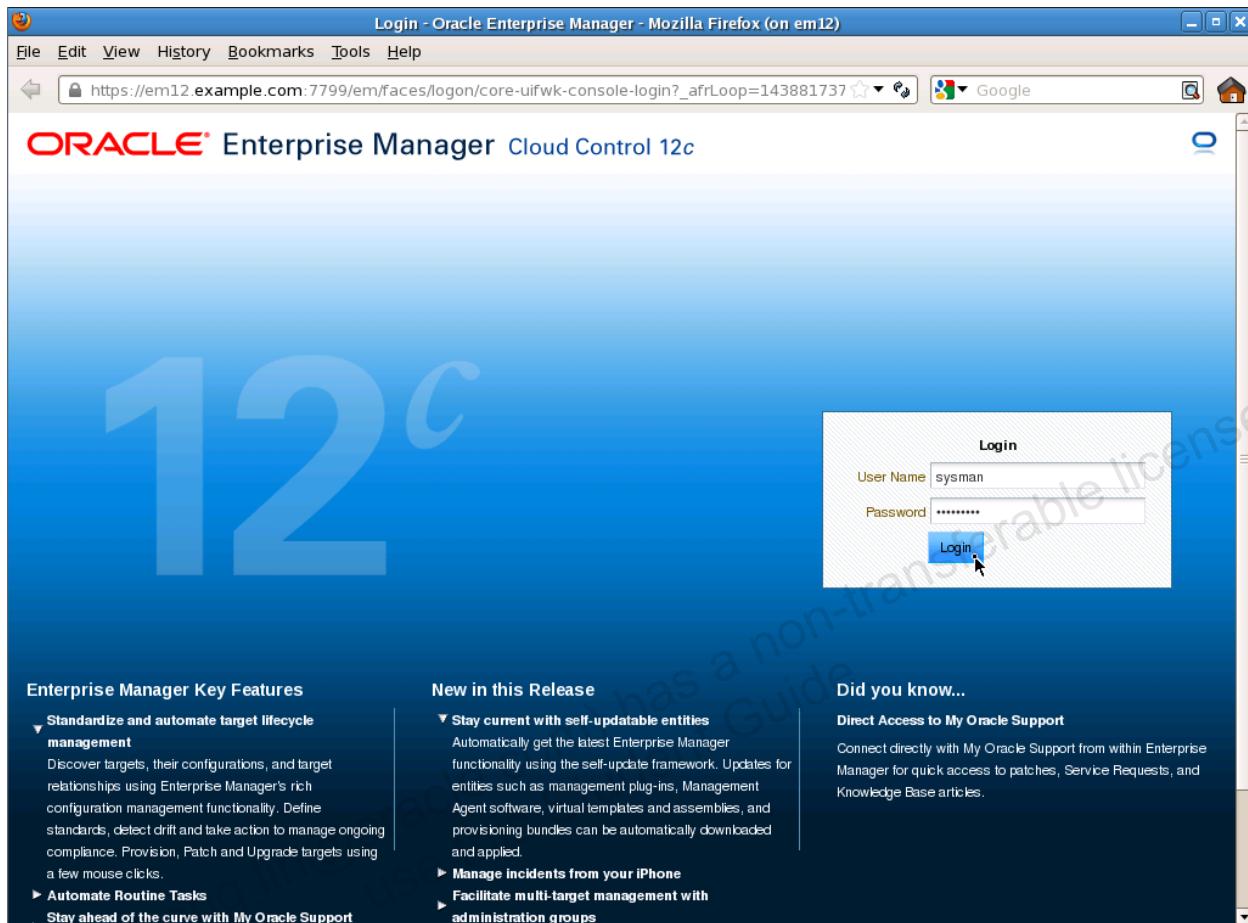
5. Start the Firefox web browser.

```
[oracle@em12 ~]$ firefox &
[1] 4953
```

6. Navigate to the Enterprise Manager console at <https://em12.example.com:7799/em>.



7. Log in to Enterprise Manager Cloud Control 12c by using the following credentials:  
- User Name: sysman  
- Password: Oracle123



- When the Enterprise Summary page appears, you should notice that all the currently defined targets are under blackout. These targets relate to the Enterprise Manager Cloud Control 12c environment that you are using and they have been intentionally blacked out to eliminate the metric collection overhead associated with these targets. Apart from this change, the Enterprise Manager Cloud Control 12c environment that you are using is essentially the same as a fresh installation.

The screenshot displays the Oracle Enterprise Manager Cloud Control 12c interface. The main header reads "Enterprise Summary - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The navigation bar includes links for Enterprise, Targets, Favorites, History, Setup, Help, SYSMAN, and Log Out. The page was last refreshed on July 21, 2013, at 11:34:07 PM UTC.

**Overview:** Shows 26 targets monitored, with 17 under blackout (100%).

**Inventory and Usage:** Displays platform information for one host: Oracle Linux Server release 5.9.

**Compliance Summary:** Shows no data to display for Frameworks and Standards.

**Least Compliant Targets:** Shows no data to display.

**Incidents:** Updated in last 7 days: 3 incidents. Breakdown: Availability (0), Performance (0), Security (0), Others (0).

**Problems:** Total Open: 0.

9. Before you commence configuring Cloud Control to monitor Exadata, confirm that the Exadata plug-in is available and ready to use. Select the Setup > Extensibility > Plug-ins menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The main menu bar includes File, Edit, View, History, Bookmarks, Tools, and Help. The URL in the address bar is https://em12.example.com:7799/em/faces/core-uiwk-console-overview?\_afrLoop=2338999317. The top right corner shows the user SYSMAN and the date/time 34:07 PM UTC. A context menu is open over the 'Extensibility' item in the top right, with 'Plug-ins' highlighted. The left sidebar has sections for Enterprise, Targets, Favorites, and History. The main content area displays the 'Enterprise Summary' dashboard, which includes sections for Overview (Targets Monitored: 26, Status: Under Blackout (17)), Incidents (Updated in last 7 days: 3), Breakdown of incidents, Problems (Total Open: 0), and Jobs. The 'Inventory and Usage' section shows Oracle Linux Server release 5.9. The 'Compliance Summary' and 'Least Compliant Targets' sections show no data to display.

10. On the Plug-ins page, expand the Engineered Systems list item and confirm that the Oracle Exadata plug-in is available and installed on the Management Server.

Name	Version			Management Agent with Plug-in	Description
	Latest Available	Latest Downloaded	On Management Server		
Exalogic Elastic Cloud Infrastru	12.1.0.2.0	12.1.0.2.0		<a href="#">View Details</a>	Elastic Cloud Infrastructure Enterprise Manager for Big Data Appliance provides comprehensive management for Oracle Big Data Appliance and related targets of Hadoop
Oracle Big Data Appliance	12.1.0.2.0	12.1.0.2.0		<a href="#">View Details</a>	Enterprise Manager for Oracle Exadata provides comprehensive management for Oracle Exadata and related targets such as Database Machine, etc.
Oracle Exadata	12.1.0.4.0	12.1.0.4.0	12.1.0.4.0	<a href="#">View Details</a>	Enterprise Manager for Oracle Exadata provides comprehensive management for Oracle Exadata and related targets such as Database Machine, etc.

**Oracle Exadata**

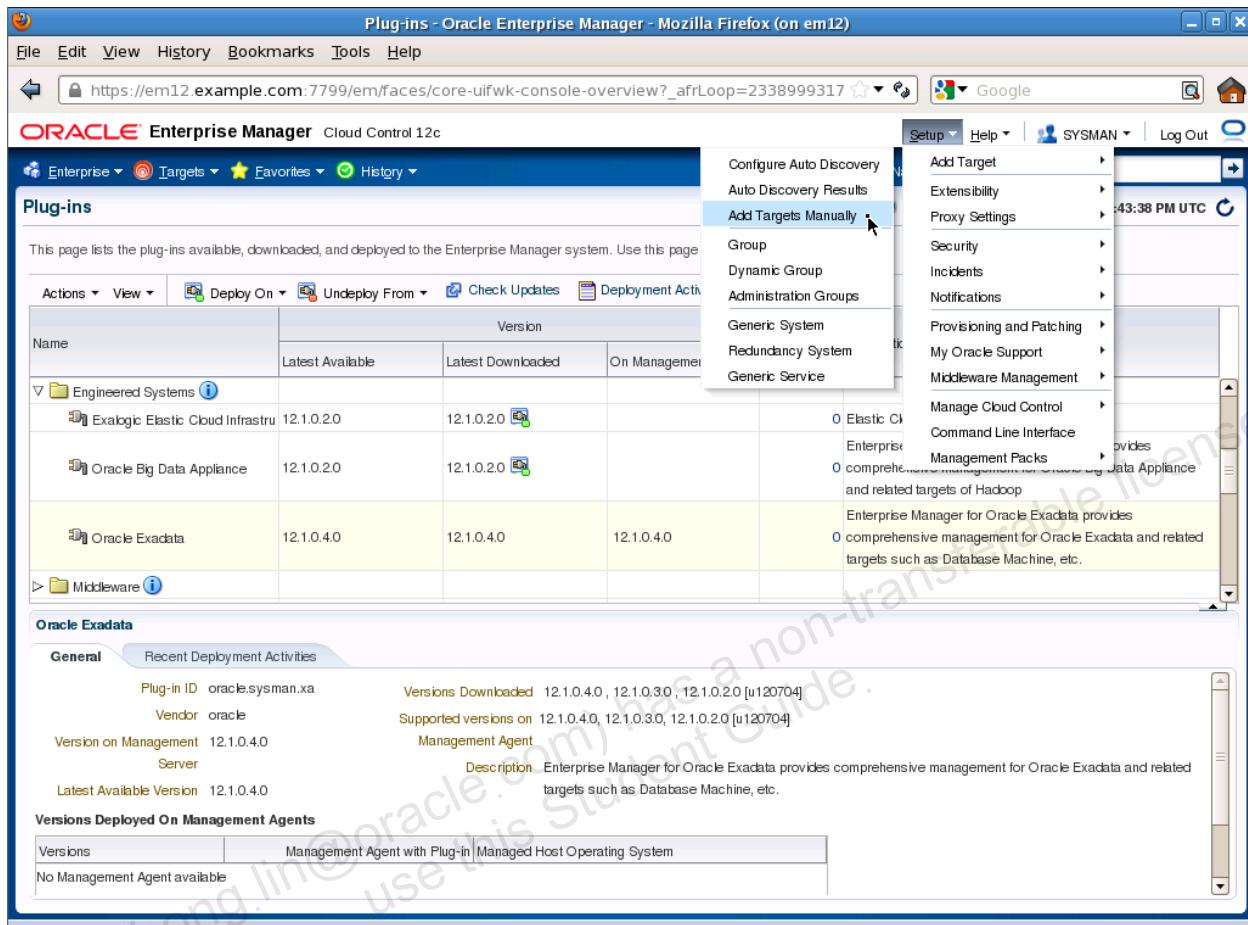
**General**

Plug-in ID: oracle.sysman.xa      Versions Downloaded: 12.1.0.4.0, 12.1.0.3.0, 12.1.0.2.0 [u120704]  
 Vendor: oracle      Supported versions on: 12.1.0.4.0, 12.1.0.3.0, 12.1.0.2.0 [u120704]  
 Version on Management Server: 12.1.0.4.0      Management Agent: Management Agent  
 Latest Available Version: 12.1.0.4.0      Description: Enterprise Manager for Oracle Exadata provides comprehensive management for Oracle Exadata and related targets such as Database Machine, etc.

**Versions Deployed On Management Agents**

Versions	Management Agent with Plug-in	Managed Host Operating System
No Management Agent available		

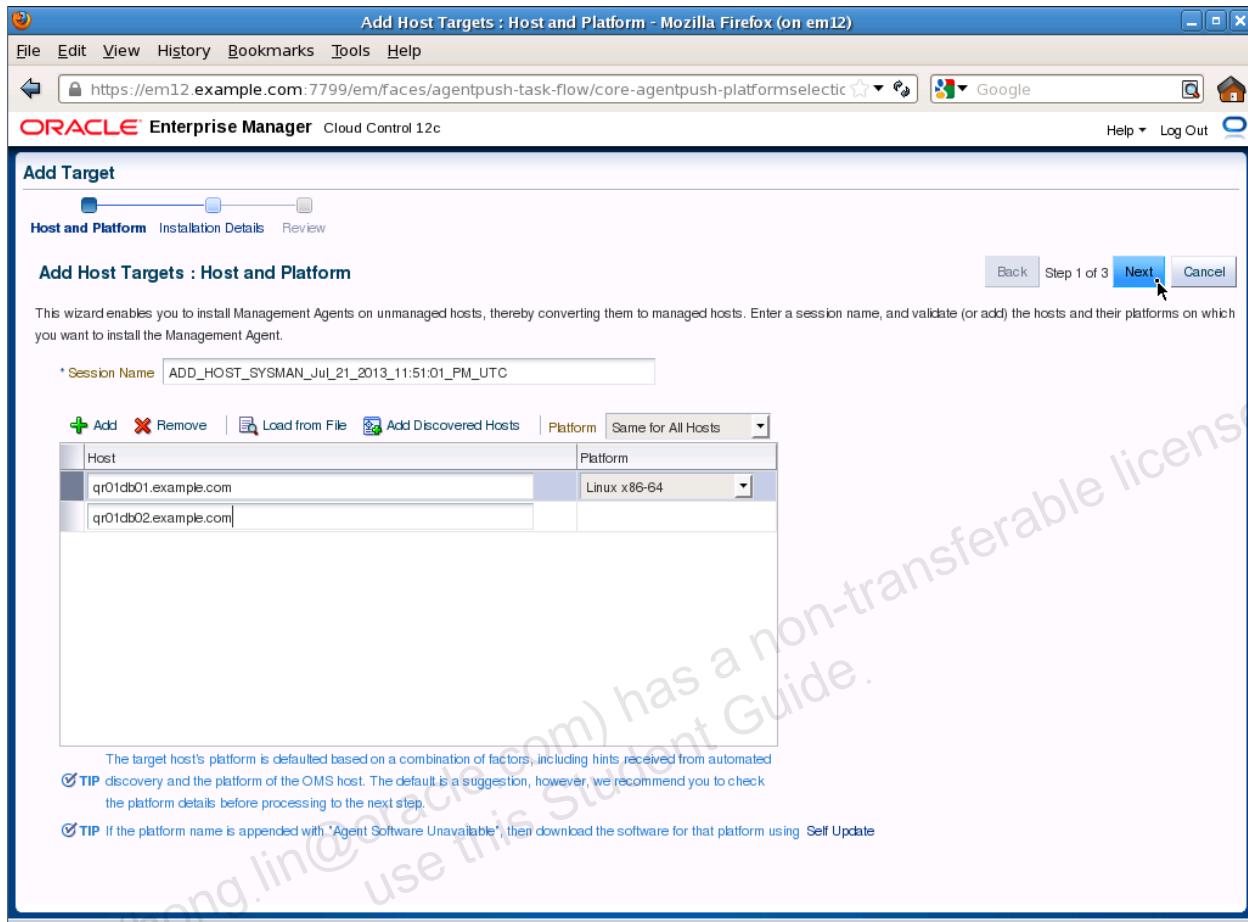
11. The first phase of configuration involves deploying the Enterprise Manager Agent to all the database server hosts on the Exadata Database Machine. To start this process, select the Setup > Add Target > Add Targets Manually menu command.



12. Ensure that the Add Host Targets option is selected and click Add Host to proceed.

The screenshot shows the 'Add Targets Manually' page in Mozilla Firefox. At the top, there's a navigation bar with links for File, Edit, View, History, Bookmarks, Tools, and Help. Below that is the Oracle Enterprise Manager header with 'Cloud Control 12c' and a 'Log Out' link. The main content area has a blue header 'Add Targets Manually'. Underneath, there's a section titled 'Instruction' with a checkmark icon. It says: 'Add targets is a process that allows you to choose targets to be monitored and managed by Enterprise Manager. Use the following to configure the targets to be monitored.' Three yellow boxes represent the workflow: 1. 'Configure Auto Discovery' with a wrench icon and two bullet points: 'Setup Network Scan Discovery' and 'Setup Discovery on Hosts'. 2. 'Add Targets from Auto Discovery Results' with a plus sign icon and two bullet points: 'Promote Discovered Targets' and 'Ignore Discovered Targets'. 3. 'Add Targets Manually' with a person icon and two bullet points: 'Add Targets with Guidance' and 'Add Targets Declaratively'. Arrows connect the boxes from left to right. Below this, there's another section titled 'Add Targets Manually' with a radio button next to 'Add Host Targets' (which is checked). There are also two other options: 'Add Targets Using Guided Process (Also Adds Related Targets)' and 'Add Targets Declaratively by Specifying Target Monitoring Properties'. At the bottom of this section are two buttons: 'Add Host...' (highlighted with a cursor) and 'Add Host Results'.

13. On the Host and Platform page, add host entries for qr01db01.example.com and qr01db02.example.com. Select “Same for All Hosts” in the Platform option list and ensure that Linux x86-64 is selected for both hosts. Finally, click Next to proceed.



14. On the Installation Details page, enter the following installation details:

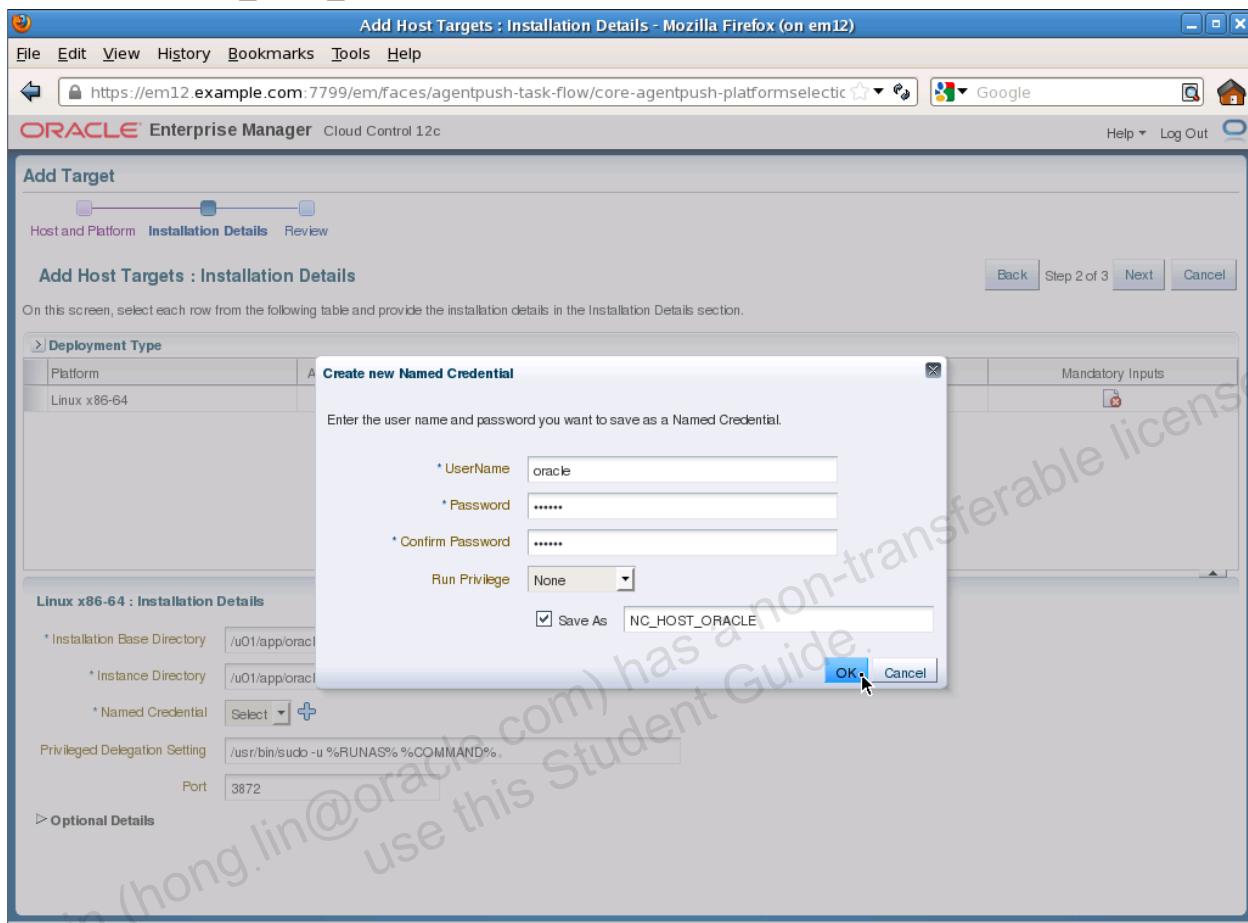
- Installation Base Directory: /u01/app/oracle/product/12.1.0/agent
- Instance Directory: /u01/app/oracle/product/12.1.0/agent/agent\_inst

Finally, click the plus icon beside the Named Credential drop-down list.

The screenshot shows the 'Add Host Targets : Installation Details' page in Oracle Enterprise Manager Cloud Control 12c. The navigation bar at the top includes File, Edit, View, History, Bookmarks, Tools, Help, and a Google search bar. The main title is 'Add Target' with tabs for Host and Platform, Installation Details, and Review. The 'Installation Details' tab is selected. A table titled 'Deployment Type' lists a single row for 'Linux x86-64' with agent software version 12.1.0.3.0 and hosts qr01db01.example.com and qr01db02.example.com. Below the table, the 'Linux x86-64 : Installation Details' section contains fields for Installation Base Directory (/u01/app/oracle/product/12.1.0/agent), Instance Directory (/u01/app/oracle/product/12.1.0/agent/agent\_inst), and Named Credential (with a 'Select' dropdown and a plus icon). Other fields include Privileged Delegation Setting (/usr/bin/sudo) and Port (3872). A link 'Add a new Named Credential' is highlighted with a yellow box. At the bottom, there is an optional details section and a URL for the page.

15. Create a new named credential with the following attributes:

- UserName: oracle
- Password: oracle
- Save As: NC\_HOST\_ORACLE



16. Notice that the icon in the Mandatory Inputs column now includes a green check mark indicating that the required installation details have been supplied. Notice also that the Privileged Delegation Setting command uses the `sudo` utility. For this command to work, you must ensure that `sudo` is appropriately configured on the Exadata database servers. Leave your Enterprise Manager session running while you perform the required configuration in the following steps.

Platform	Agent Software Version	Hosts	Mandatory Inputs
Linux x86-64	12.1.0.3.0	qr01db01.example.com, qr01db02.example.com	

17. Establish a terminal session connected to `qr01db01` as the system administrator (`root` OS user).

```
$ ssh root@qr01db01
root@qr01db01's password: <oracle>
...
[root@qr01db01 ~] #
```

18. Execute the following command to add the required `sudo` configuration entries to `/etc/sudoers`. (Alternatively, use a text editor to modify the file if you prefer.)

```
[root@qr01db01 ~] # cat << END >> /etc/sudoers
> oracle ALL=(ALL) NOPASSWD:ALL
> Defaults:oracle !requiretty
> END
[root@qr01db01 ~] #
```

19. Verify that the required sudo configuration entries are in /etc/sudoers.

```
[root@qr01db01 ~]# tail /etc/sudoers

## Allows members of the users group to mount and unmount the
## cdrom as root
# %users  ALL=/sbin/mount /mnt/cdrom, /sbin/umount /mnt/cdrom

## Allows members of the users group to shutdown this system
# %users  localhost=/sbin/shutdown -h now

oracle ALL=(ALL) NOPASSWD:ALL
Defaults:oracle !requiretty
[root@qr01db01 ~]#
```

At this point, you have configured sudo on qr01db01. In the next three steps, you will replicate the same configuration on qr01db02.

20. Establish a terminal session connected to qr01db02 as the system administrator (root OS user).

```
$ ssh root@qr01db02
root@qr01db01's password: <oracle>
...
[root@qr01db02 ~]#
```

21. Execute the following command to add the required sudo configuration entries to /etc/sudoers (alternatively, use a text editor to modify the file if you prefer).

```
[root@qr01db02 ~]# cat << END >> /etc/sudoers
> oracle ALL=(ALL) NOPASSWD:ALL
> Defaults:oracle !requiretty
> END
[root@qr01db02 ~]#
```

22. Verify that the required sudo configuration entries are in /etc/sudoers.

```
[root@qr01db02 ~]# tail /etc/sudoers

## Allows members of the users group to mount and unmount the
## cdrom as root
# %users  ALL=/sbin/mount /mnt/cdrom, /sbin/umount /mnt/cdrom

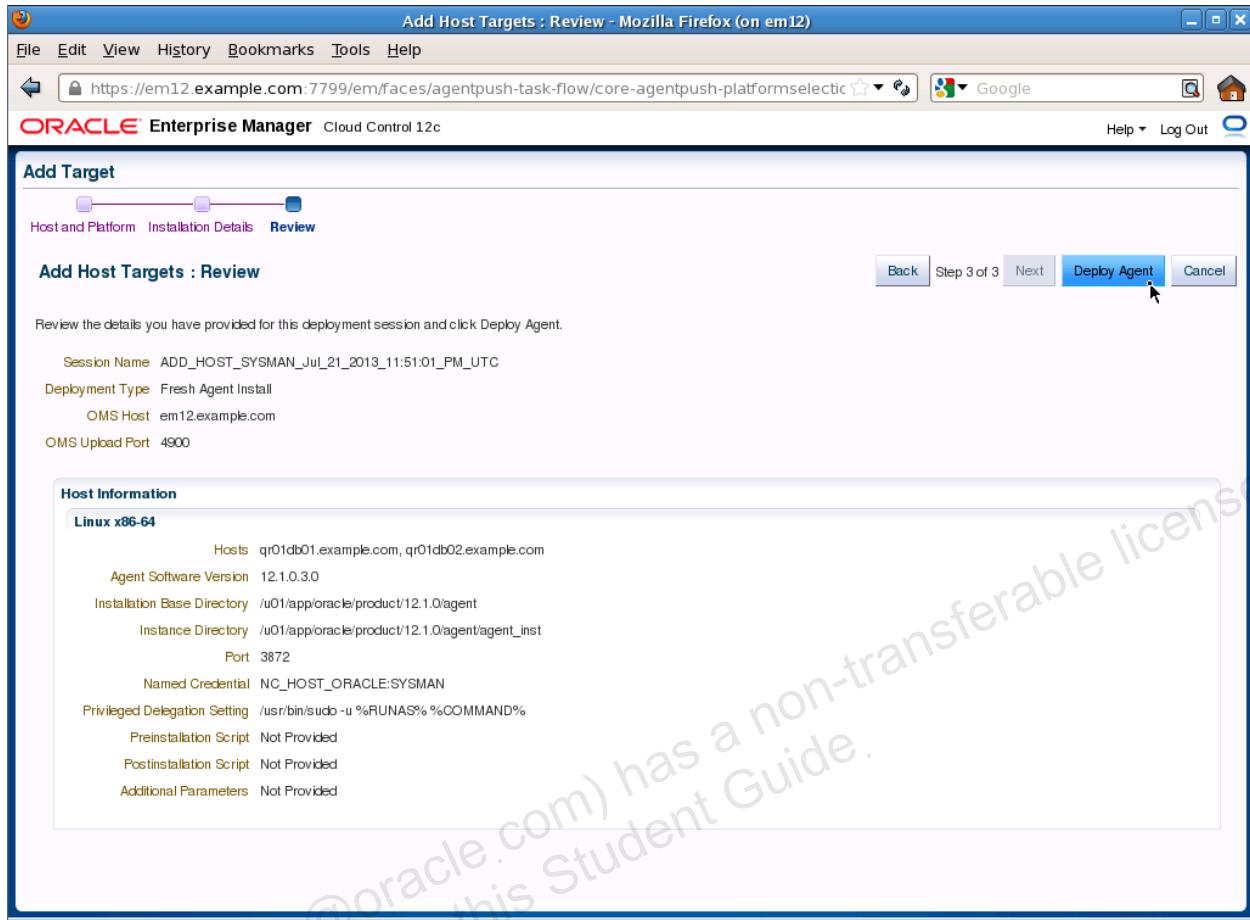
## Allows members of the users group to shutdown this system
# %users  localhost=/sbin/shutdown -h now

oracle ALL=(ALL) NOPASSWD:ALL
Defaults:oracle !requiretty
[root@qr01db02 ~]#
```

23. After the sudo configuration is complete on qr01db01 and qr01db02, return to your Enterprise Manager session and click Next to proceed.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Add Host Targets : Installation Details - Mozilla Firefox (on em12)". The main content area is titled "Add Target" and shows a progress bar at the top with three steps: "Host and Platform", "Installation Details", and "Review". The "Installation Details" step is currently selected. A sub-section titled "Add Host Targets : Installation Details" instructs the user to select rows from a table and provide installation details. The table has columns for Platform, Agent Software Version, Hosts, and Mandatory Inputs. One row is listed: "Linux x86-64" with version "12.1.0.3.0" and hosts "qr01db01.example.com, qr01db02.example.com". The "Mandatory Inputs" column contains a green checkmark icon. Below the table, the "Linux x86-64 : Installation Details" section contains several input fields with their values: "Installation Base Directory" (/u01/app/oracle/product/12.1.0/agent), "Instance Directory" (/u01/app/oracle/product/12.1.0/agent/agent\_inst), "Named Credential" (NC\_HOST\_ORACLE(SYSMAN)), "Privileged Delegation Setting" (/usr/bin/sudo -u %RUNAS% %COMMAND%), and "Port" (3872). There is also an "Optional Details" section which is currently collapsed. At the bottom right of the main content area, there are "Back", "Step 2 of 3", "Next", and "Cancel" buttons. The "Next" button is highlighted with a blue background and white text.

24. Review the agent deployment details that you provided and click Deploy Agent.



25. Agent deployment should take approximately 20 minutes in your laboratory environment. You can monitor agent deployment by using the Add Host Status page. Do not navigate away from this page during agent deployment.

Add Host Targets : Agent Deployment Details - Mozilla Firefox (on em12)

File Edit View History Bookmarks Tools Help

https://em12.example.com:7799/em/faces/agentpush-task-flow/core-agentpush-platformselectic Google

ORACLE Enterprise Manager Cloud Control 12c

Enterprise Targets Favorites History

Add Host Status

Initialization in Progress

Refresh 30 seconds Refresh Cancel

Agent Deployment Summary : ADD\_HOST\_SYSMAN\_Jul\_21\_2013\_11:51:01\_PM\_UTC

Platform	Host	Initialization	Remote Prerequisite Check	Agent Deployment
Linux x86-64	qr01db02.example.com			
Linux x86-64	qr01db01.example.com			

Agent Deployment Details : qr01db02.example.com

Initialization Details

OMS Log Location em12.example.com/u01/app/oracle/product/gc\_inst/em/EMGC\_OMS1/sysman/agentpush//2013-07-21\_23-51-01-PM/applogs/qr01db02.example.com\_deploy.log

Show only warnings and failures

Initialization Phase Name	Status	Error	Cause	Recommendation
Remote Validations				
Transferring Agent Software to Destination Host				

Remote Prerequisite Check Details

Agent Deployment Details

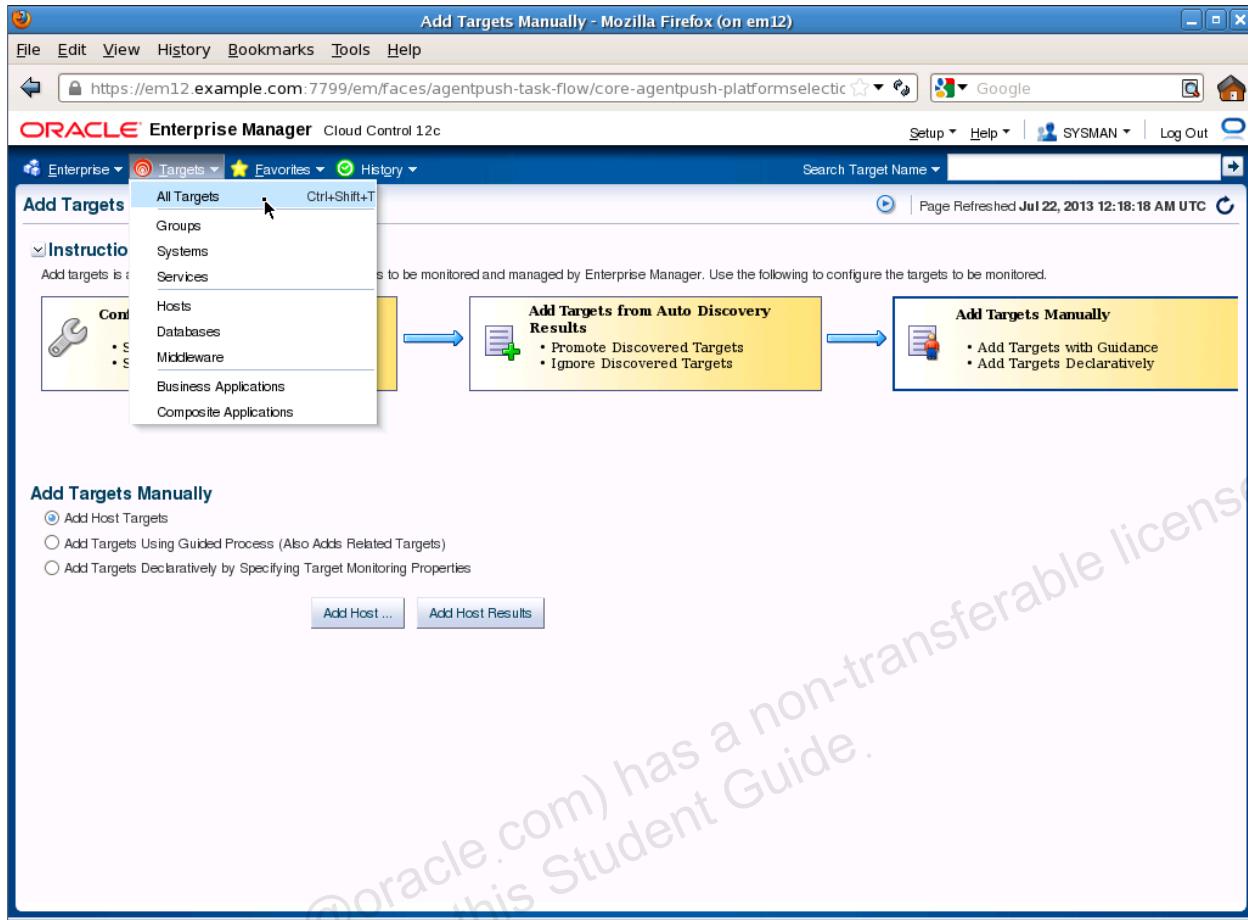
26. When you receive a notification indicating that agent deployment succeeded, click Done.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Add Host Targets : Agent Deployment Details - Mozilla Firefox (on em12)". The main content area displays the "Agent Deployment Summary" for the target "ADD\_HOST\_SYSMAN\_Jul\_21\_2013\_11:51:01\_PM\_UTC". A message at the top says "Agent Deployment Succeeded". Below it is a table showing deployment status for two hosts:

Platform	Host	Initialization	Remote Prerequisite Check	Agent Deployment
Linux x86-64	qr01db02.example.com	✓	✓	✓
Linux x86-64	qr01db01.example.com	✓	✓	✓

At the top right of the summary table is a "Done" button with a cursor pointing at it. Below the summary is a section titled "Agent Deployment Details : qr01db02.example.com" containing three expandable sections: "Initialization Details", "Remote Prerequisite Check Details", and "Agent Deployment Details". The "Agent Deployment Details" section shows deployment log information, including the OMS Log Location: "em12.example.com/u01/app/oracle/product/gc\_inst/em/EMGC\_OMS1/sysman/agentpush//2013-07-21\_23-51-01-PM/applogs/qr01db02.example.com\_deploy.log" and a checkbox for "Show only warnings and failures".

27. Select the Targets > All Targets menu command.



28. In the Refine Search pane, scroll down and select the Target Status > Up option.

Target Name	Target Type	Target Status	Pending Activation
/EMGC_GCDomain/GCDomain	Oracle WebLogic Domain	n/a	
/EMGC_GCDomain/GCDomain/EMGC_ADMINSERVER	Oracle WebLogic Server		
/EMGC_GCDomain/GCDomain/EMGC_ADMINSERVER/FMW Welcome	Application Deployment		
/EMGC_GCDomain/GCDomain/EMGC_ADMINSERVER/mds-owsm	Metadata Repository	n/a	
/EMGC_GCDomain/GCDomain/EMGC_ADMINSERVER/mds-sysman_md	Metadata Repository	n/a	
/EMGC_GCDomain/GCDomain/EMGC_OMS1	Oracle WebLogic Server		
/EMGC_GCDomain/GCDomain/EMGC_OMS1/emgc	Application Deployment		
/EMGC_GCDomain/GCDomain/EMGC_OMS1/empbs	Application Deployment		
/EMGC_GCDomain/GCDomain/EMGC_OMS1/OCMRepeater	Application Deployment		
/EMGC_GCDomain/instance1/ohs1	Oracle HTTP Server		
agent12c1_10_em12	Oracle Home	n/a	
agent12c1_3_qr01db01	Oracle Home	n/a	
agent12c1_3_qr01db02	Oracle Home	n/a	
common12c1_22_em12	Oracle Home	n/a	
EM Console Service	EM Service		
EM Jobs Service	EM Service		
EM Management Beacon	Beacon		
em12.example.com	Host		
em12.example.com:3872	Agent		
em12.example.com:4889_Management_Service	Oracle Management Service		
em12.example.com:4889_Management_Service_CONSOLE	OMS Console		
em12.example.com:4889_Management_Service_PRS	OMS Platform		

29. You should see the following targets:

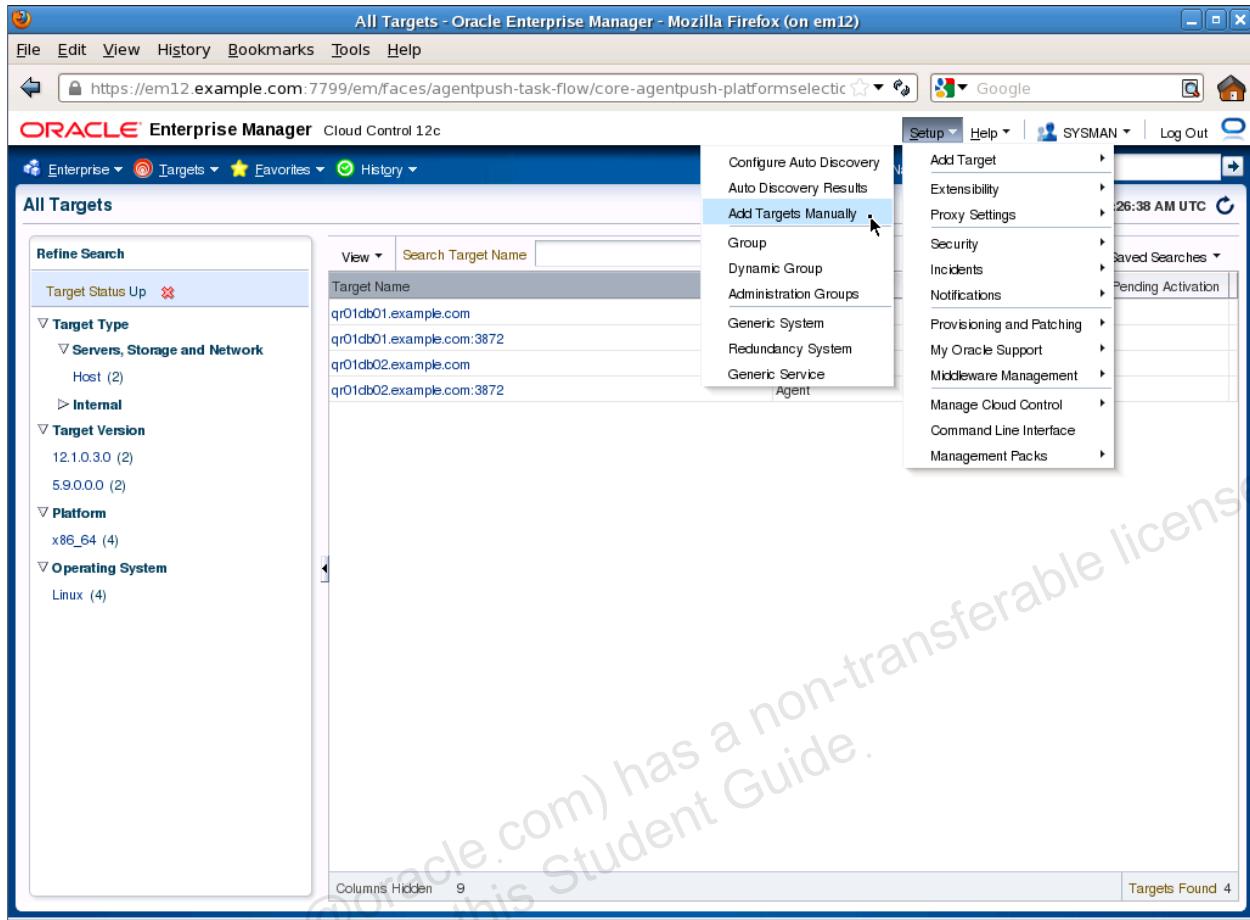
- Host: qr01db01.example.com
- Agent: qr01db01.example.com:3872
- Host: qr01db02.example.com
- Agent: qr01db02.example.com:3872

If you do not see all these targets, wait for a few moments and refresh the page. Continue to wait until all four targets are displayed.

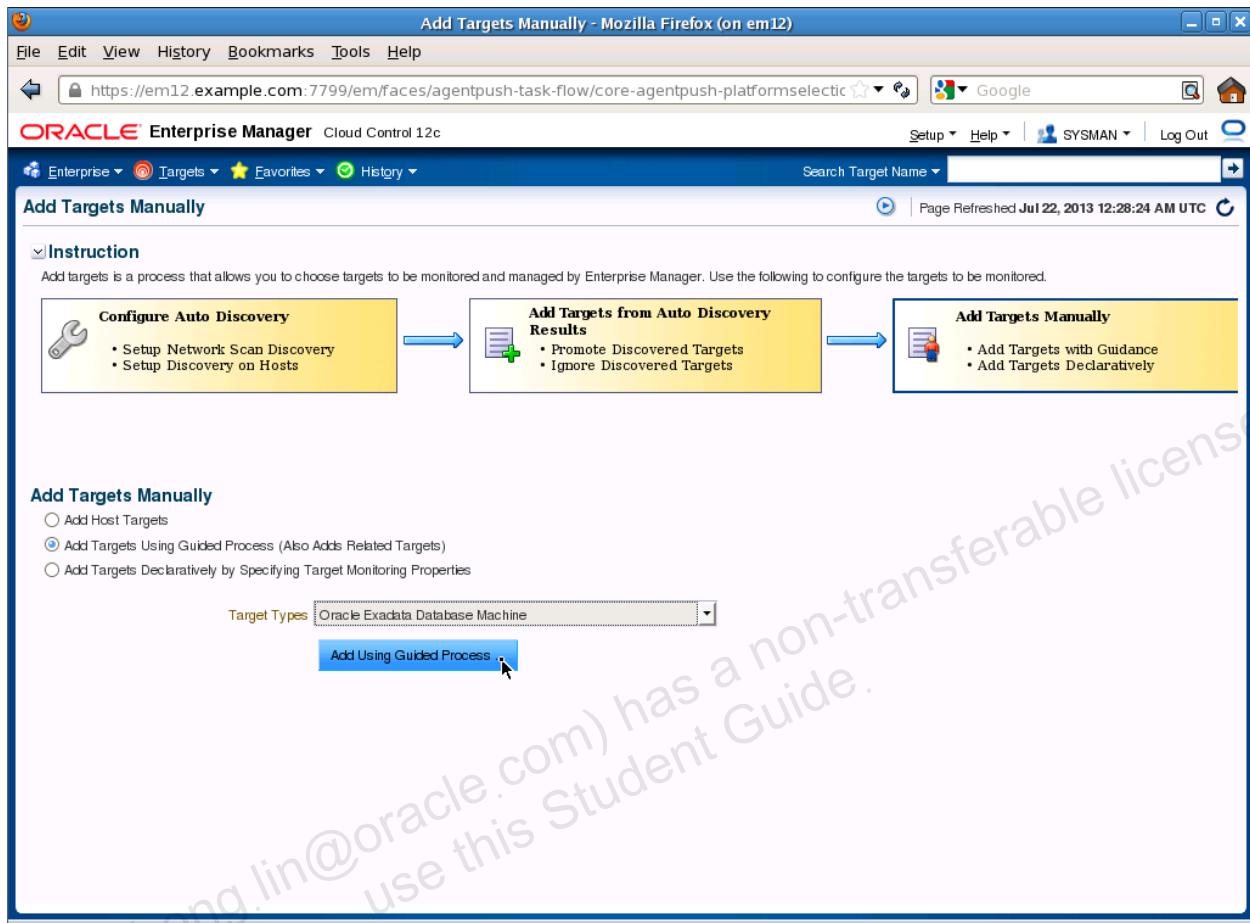
Target Name	Target Type	Target Status	Pending Activation
qr01db01.example.com	Host		
qr01db01.example.com:3872	Agent		
qr01db02.example.com	Host		
qr01db02.example.com:3872	Agent		

At this point, you have successfully deployed the Enterprise Manager Agent to all the database server hosts on the Exadata Database Machine. Next, you will discover the Exadata Database Machine.

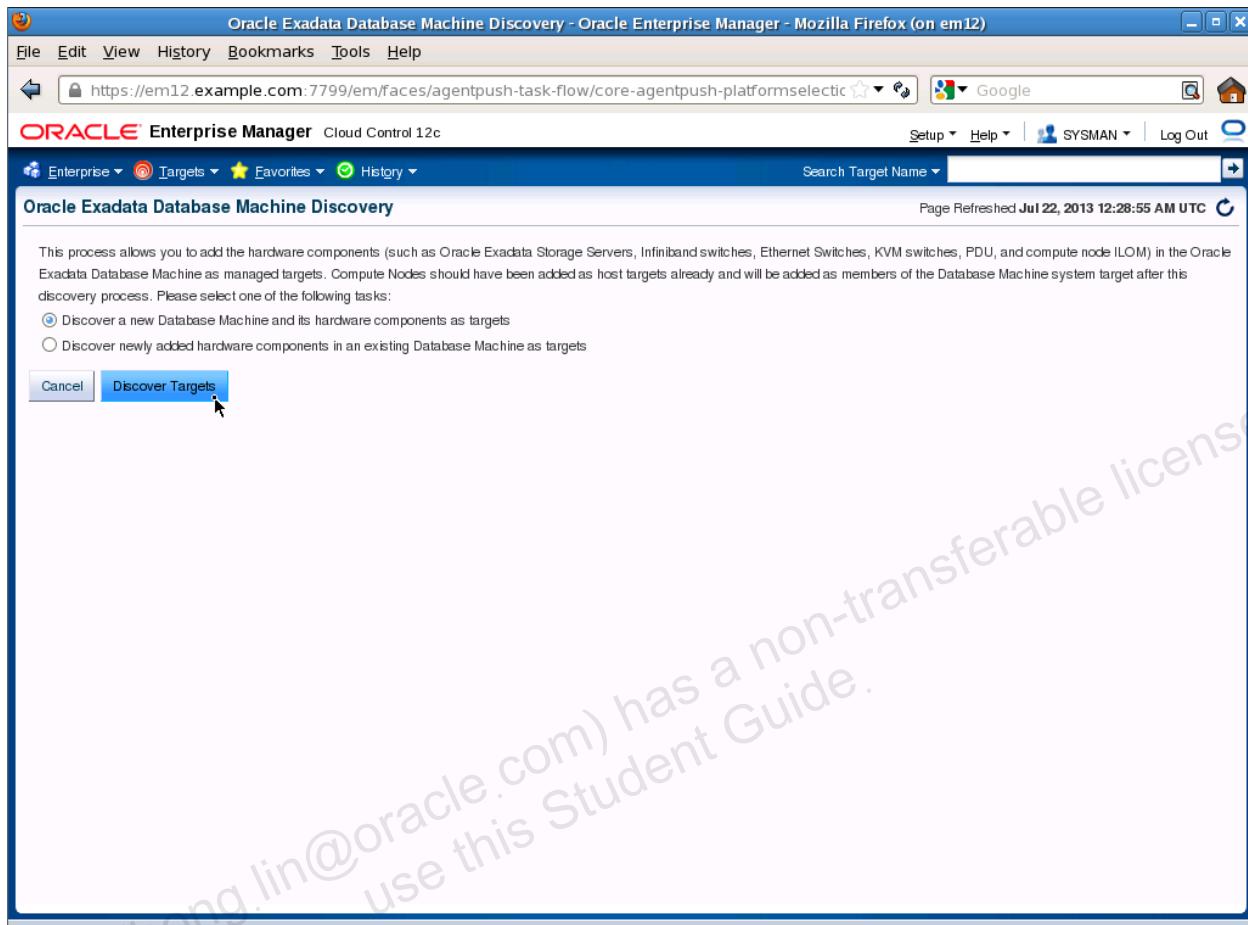
30. Select the Setup > Add Target > Add Targets Manually menu command.



31. On the Add Targets Manually page, select the Add Targets Using Guided Process option. Then select Oracle Exadata Database Machine from the Target Types drop-down list. Finally, click Add Using Guided Process to start the discovery process.



32. On the Oracle Exadata Database Machine Discovery page, select the “Discover a new Database Machine and its hardware components as targets” option and click Discover Targets to proceed.



33. On the Discovery Inputs page, in the Discovery Agent section, specify the following:

- Agent URL: <https://qr01db01.example.com:3872/emd/main/>
- Database Oracle Home: /u01/app/oracle/product/11.2.0/dbhome\_1

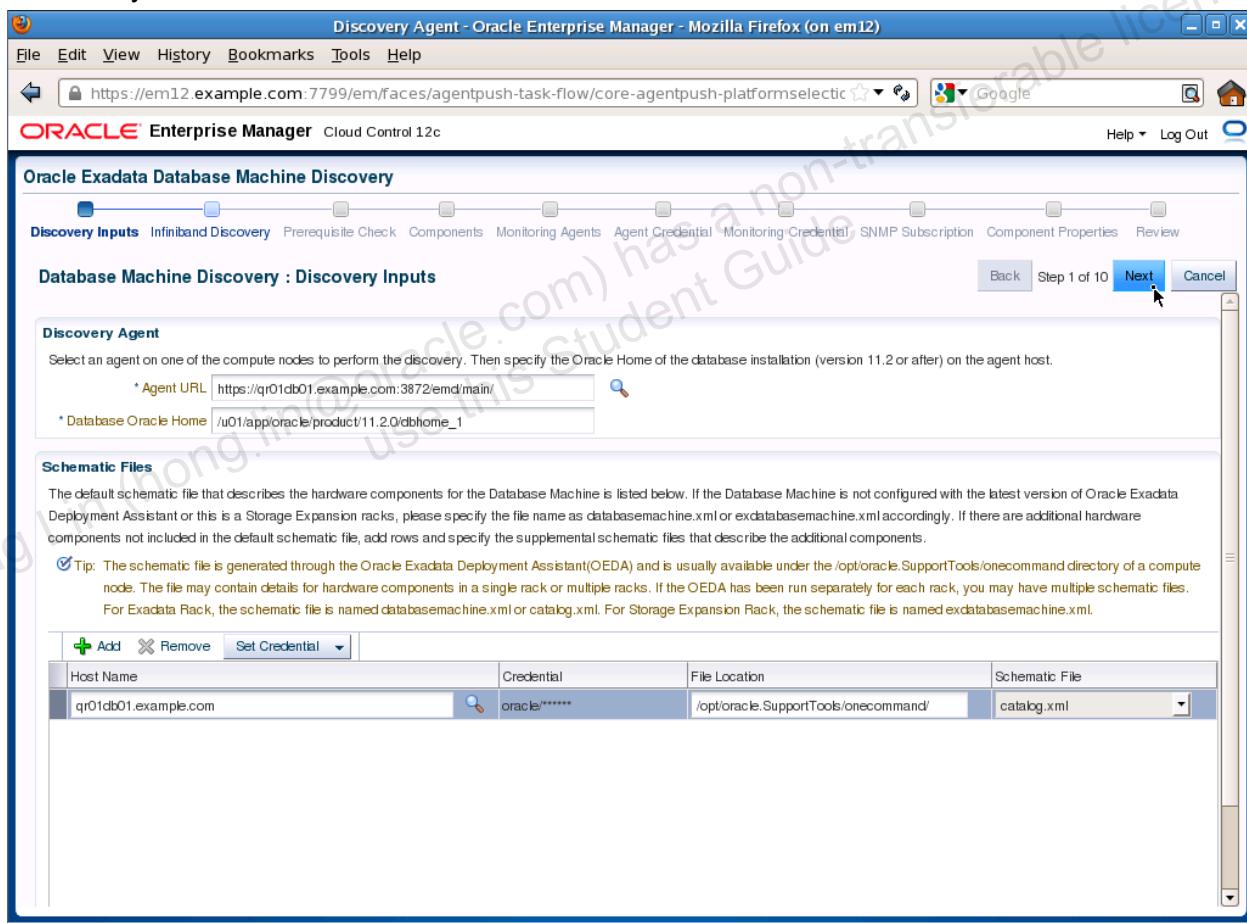
You can specify the Agent URL by clicking the magnifying glass icon and selecting the agent associated with qr01db01.example.com if you prefer.

Note that you must specify the Agent URL for a database server that contains the Database Machine schematic file (databasemachine.xml or catalog.xml), which describes the Database Machine components and configuration settings. This file is generated during the Database Machine initial configuration process, and it typically resides on the first database server under /opt/oracle.SupportTools/onemand.

The Database Oracle Home is used to locate the kfod binaries, which are used by the discovery process.

In the Schematic Files section, select catalog.xml as the Schematic File. Also, click Set Credential > All Hosts and select the named credential (NC\_HOST\_ORACLE) that you configured earlier in step 15.

Finally, click Next to continue.



34. On the Infiniband Discovery page, the IB Switch Host Name should be automatically populated by using one of the InfiniBand switches defined in the Database Machine schematic file (databaseMachine.xml or catalog.xml). Select the option to create a new credential and specify the following:

- Username: nm2user
- Password: changeme

If you want, you can click Test Connection to verify that you have entered the credentials correctly. Finally, click Next to proceed.

Infiniband Discovery - Oracle Enterprise Manager - Mozilla Firefox (on em12)

File Edit View History Bookmarks Tools Help

https://em12.example.com:7799/em/faces/agentpush-task-flow/core-agentpush-platformselectic Google Help Log Out

ORACLE Enterprise Manager Cloud Control 12c

Oracle Exadata Database Machine Discovery

Discovery Inputs Infiniband Discovery Prerequisite Check Components Monitoring Agents Agent Credential Monitoring Credential SNMP Subscription Component Properties Review

Database Machine Discovery : Infiniband Discovery

Back Step 2 of 10 Next Cancel

Infiniband Discovery

Please enter the host name of one of the Infiniband switches in this Database Machine and specify the nm2user credentials on that Infiniband switch.

\* IB Switch Host Name: qr01sw-lba0

Infiniband switch nm2user credential

Credential:  Named  New

\* Username: nm2user

\* Password: \*\*\*\*\*

Save As

Test Connection

35. Confirm that the prerequisite check status flags contain green check marks. Click Next to proceed.

The screenshot shows a Mozilla Firefox browser window titled "Prerequisite Check - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The address bar shows the URL <https://em12.example.com:7799/em/faces/agentpush-task-flow/core-agentpush-platformselect>. The page header includes the Oracle Enterprise Manager logo and "Cloud Control 12c". A navigation bar at the top has ten items: Discovery Inputs, Infiniband Discovery, Prerequisite Check (which is bolded), Components, Monitoring Agents, Agent Credential, Monitoring Credential, SNMP Subscription, Component Properties, and Review. Below the navigation bar is a progress bar with ten steps, where the third step, "Prerequisite Check", is highlighted. The main content area is titled "Database Machine Discovery : Prerequisite Check". It contains a table with two rows:

Prerequisite	Status	Error	Recommendation
KFOD executable			
Schematic File /opt/oracle/SupportTools/onecommand/catalog.xml on qr01db01.example.com			

At the bottom right of the content area are buttons for "Back", "Step 3 of 10", "Next" (which is highlighted in blue), and "Cancel".

36. The Components page shows all the components listed in the Database Machine schematic file (`databasemachine.xml` or `catalog.xml`). By default, all the components are selected. You may optionally deselect components; however, those components will not be monitored by Enterprise Manager. Ensure that all the components are selected and click Next to proceed.

The screenshot shows the 'Select Components' page in Oracle Enterprise Manager, specifically the 'Components' step of a multi-step wizard. The URL in the address bar is `https://em12.example.com:7799/em/faces/agentpush-task-flow/core-agentpush-platformselectic`. The page title is 'Oracle Exadata Database Machine Discovery'. A progress bar at the top indicates Step 4 of 10. The main content area is titled 'Database Machine Discovery : Components'. It contains several sections:

- Compute Node:** A table with 'Host Name' columns showing 'qr01db01.example.com' and 'qr01db02.example.com'.
- Compute Node ILOM:** A table with 'ILOM Name' and 'IP Address' columns showing 'qr01db01-ilom.example.com' with IP '192.0.2.106' and 'qr01db02-ilom.example.com' with IP '192.0.2.107'.
- Oracle Exadata Storage Server:** A table with 'Cell Name' and 'Management IP' columns showing 'qr01cel01.example.com' with IP '192.0.2.103', 'qr01cel02.example.com' with IP '192.0.2.104', and 'qr01cel03.example.com' with IP '192.0.2.105'.
- Infiniband Switch:** A section with the instruction: 'Please select the Infiniband switches that are part of this Oracle Exadata Database Machine target. If this DB Machine is partitioned or this is a SuperCluster, you should select all Infiniband switches'.

At the bottom right of the page, there are 'Back', 'Step 4 of 10', 'Next', and 'Cancel' buttons.

37. Inside Enterprise Manager, Database Machine components are represented as management targets. Each target is monitored by one of the available agents, and each target is assigned a backup agent in case the primary agent is unavailable. The Monitoring Agents page allows you to assign primary and backup monitoring agents for each management target. By default, the targets are spread across all the available agents. Alternatively, you can select specific agents to monitor each target. For this practice, accept the default assignments and click Next to proceed.

**Oracle Exadata Database Machine Discovery**

Discovery Inputs Infiniband Discovery Prerequisite Check Components **Monitoring Agents** Agent Credential Monitoring Credential SNMP Subscription Component Properties Review

**Database Machine Discovery : Monitoring Agents**

DB Machine guided discovery has automatically assigned agents to your targets for best performance and scalability. You may change these selections in the drop-down boxes below.

Tip: Click the Reset button to return all targets to automatic assignment.

Target Name	Monitoring Agent	Backup Monitoring Agent
DB Machine qr01.example.com	https://qr01db02.example.com:3872/emd/main/	https://qr01db01.example.com:3872/emd/main/
IB Network qr01.example.com	https://qr01db01.example.com:3872/emd/main/	https://qr01db02.example.com:3872/emd/main/

Cell Name	Monitoring Agent	Backup Monitoring Agent
qr01cel01.example.com	https://qr01db02.example.com:3872/emd/main/	https://qr01db01.example.com:3872/emd/main/
qr01cel02.example.com	https://qr01db01.example.com:3872/emd/main/	https://qr01db02.example.com:3872/emd/main/
qr01cel03.example.com	https://qr01db02.example.com:3872/emd/main/	https://qr01db01.example.com:3872/emd/main/

Infiniband Switch Name	Monitoring Agent	Backup Monitoring Agent
qr01sw-iba0.example.com	https://qr01db01.example.com:3872/emd/main/	https://qr01db02.example.com:3872/emd/main/
qr01sw-ibb0.example.com	https://qr01db02.example.com:3872/emd/main/	https://qr01db01.example.com:3872/emd/main/

Ethernet Switch Name	Monitoring Agent	Backup Monitoring Agent
qr01sw-adm0.example.com	https://qr01db01.example.com:3872/emd/main/	https://qr01db02.example.com:3872/emd/main/

ILOM Name	Monitoring Agent	Backup Monitoring Agent
qr01db01-ilom.example.com	https://qr01db02.example.com:3872/emd/main/	https://qr01db01.example.com:3872/emd/main/
qr01db02-ilom.example.com	https://qr01db01.example.com:3872/emd/main/	https://qr01db02.example.com:3872/emd/main/

Back Step 5 of 10 **Next** Cancel

38. The Agent Credential page enables you to specify the credentials used to access and control the management agents on each Exadata database server. Because you earlier used Enterprise Manager to configure the agents, the required credentials are already specified on the page. Click Next to proceed.

The screenshot shows the 'Agent Credential' configuration page in Oracle Enterprise Manager. The navigation bar at the top indicates the current step is 'Step 6 of 10'. The main title is 'Database Machine Discovery : Agent Credential'. A note below states: 'Please specify whether the agent host users and passwords are the same for all agents. The agent users and passwords are needed to set up SSH user equivalence between the agents and the targets monitored by the agents (cells and Infiniband switches) and to configure the targets.' There are two radio button options: 'Same for all agents' (selected) and 'Different for all agents'. Under 'Same for all agents', a 'Agent Host Credential' panel is displayed with a 'Credential Name' dropdown set to 'NC\_HOST\_ORACLE', and a table showing 'Attribute' (UserName) and 'Value' (oracle). A 'Test Connection' button is present. Under 'Different for all agents', a table lists two Agent URLs: 'https://qr01db02.example.com:3872/emd/main/' and 'https://qr01db01.example.com:3872/emd/main/'. Each URL has associated 'Agent Host User' and 'Agent Host Password' fields.

Agent URL	Agent Host User	Agent Host Password
https://qr01db02.example.com:3872/emd/main/		
https://qr01db01.example.com:3872/emd/main/		

39. The Monitoring Credential page enables you to specify the required credentials for Exadata Storage Servers, InfiniBand switches, and Oracle ILOM Servers.  
Specify the following Exadata Storage Server credentials:  
- Credential: New  
- Username: root  
- Password: oracle

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Monitoring Credential - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main window is titled "Oracle Exadata Database Machine Discovery" and is currently on "Monitoring Credential". A progress bar at the top indicates Step 7 of 10. The main content area is titled "Database Machine Discovery : Monitoring Credential". It has a sub-section for "Oracle Exadata Storage Server" asking if cell root passwords are the same for all cells. There are two options: "Same for all cells" (selected) and "Different for all cells". Under "Same for all cells", there is a "Cell Root Credential" form with fields for "Credential" (radio buttons for "Named" and "New" - "New" is selected), "Username" (text input field containing "root"), and "Password" (password input field containing "\*\*\*\*\*"). A "Save As" checkbox is unchecked. A "Test Connection" button is present. Under "Different for all cells", there is a table with three rows, each containing a "Cell Name" (qr01ce01.example.com, qr01ce02.example.com, qr01ce03.example.com) and a "Root Password" column. A "Test Connections" button is located above the table. Below the table, there is a section titled "Infiniband Switch" with a note about connecting to Oracle ILOM servers.

40. Scroll to the bottom of the Monitoring Credential page. Note that the InfiniBand Switch monitoring credentials are already populated with the details you supplied on the InfiniBand Discovery page. Next, specify the following ILOM credentials:

- Credential: New
- Username: oemuser
- Password: oemuser

Note that the ILOM user specified in this step must normally be created on each ILOM server before Database Machine discovery. However, because the ILOM interfaces in your laboratory environment are not fully functioning ILOM servers, you are unable to create the ILOM user, and instead the required user has been pre-created.

**Monitoring Credential - Oracle Enterprise Manager - Mozilla Firefox (on em12)**

File Edit View History Bookmarks Tools Help

https://em12.example.com:7799/em/faces/agentpush-task-flow/core-agentpush-platformselectic Google Help Log Out

**ORACLE Enterprise Manager** Cloud Control 12c

**Oracle Exadata Database Machine Discovery**

Discovery Inputs Infiniband Discovery Prerequisite Check Components Monitoring Agents Agent Credential **Monitoring Credential** SNMP Subscription Component Properties Review

**Database Machine Discovery : Monitoring Credential**

Infiniband Switch Name Nm2user Password  
qr01sw-iba0.example.com  
qr01sw-ibb0.example.com

**ILOM**  
Please specify whether the Integrated Lights Out Managers (ILOM) user names and passwords are the same for all compute nodes. The ILOM user names and passwords are needed to monitor the ILOM.

Same for all ILOM

**ILOM Credential**

Credential  Named  New  
\* UserName oemuser  
\* Password .....  
 Save As **Test Connection**

Different for all ILOM **Test Connections**

ILOM Name	ILOM Username	ILOM Password
qr01db01-ilbm.example.com		
qr01db02-ilbm.example.com		

41. The SNMP Subscription page enables you to automatically configure SNMP subscriptions for Enterprise Manager on the Exadata Storage Servers and the InfiniBand switches. Specify `public` for the Exadata Storage Server SNMP Community String. Because your laboratory environment does not contain fully functioning InfiniBand switches, deselect the option to automatically set up SNMP subscriptions for the InfiniBand switches. Finally, click Next to proceed.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "SNMP Subscription - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main navigation bar includes File, Edit, View, History, Bookmarks, Tools, and Help. Below the navigation bar, the Oracle logo and "Cloud Control 12c" are displayed. The top right corner has "Help", "Log Out", and a user icon. A progress bar at the top indicates Step 8 of 10. The main content area is titled "Oracle Exadata Database Machine Discovery". A horizontal navigation bar below the title includes "Discovery Inputs", "Infiniband Discovery", "Prerequisite Check", "Components", "Monitoring Agents", "Agent Credential", "Monitoring Credential", "SNMP Subscription" (which is highlighted in blue), "Component Properties", and "Review". The "SNMP Subscription" section contains instructions to monitor component hardware and software issues. It shows a checkbox for "Set up SNMP subscription for cells automatically" which is checked. Below this, there is a field for "SNMP Community String" with the value "public" and a tip: "Tip: This will overwrite any existing community string for the EM Agent subscription only.". The "Infiniband Switch" section asks if SNMP subscription should be set up for Infiniband switches automatically. It shows an unchecked checkbox for "Set up SNMP subscription for Infiniband switches automatically". Below this, there is a field for "SNMP Community String" with a tip: "Tip: This will overwrite any existing community string for the EM Agent subscription only.". A modal dialog box titled "IB Switch Root Credential" is open, showing options for "Credential": "Named" (radio button selected), "New", and "Different for all Infiniband switches". There is also a "Test Connection" button. At the bottom of the page, there is a "Test Connections" button.

42. The Component Properties page enables you to specify various component property settings. In your laboratory environment, the default settings will suffice. So, click Next to proceed.

Cell Name	ILOM IP Address
qr01cel01.example.com	192.0.2.108
qr01cel02.example.com	192.0.2.109
qr01cel03.example.com	192.0.2.110

Ethernet Switch Name	SNMP Timeout (seconds)	SNMP Community String
qr01sw-adm0.example.com	10	

PDU Name	PDU Module	SNMP Port	SNMP Timeout (seconds)	SNMP Community String
qr01sw-pdua0.example.com	Module1	161	10	
qr01sw-pdub0.example.com	Module1	161	10	

ILOM Name	Compute Node Host Name
qr01db01-ilom.example.com	qr01db01
qr01db02-ilom.example.com	qr01db02

43. The Review page displays the summary of the discovery session. Also, you can optionally specify customized Target Names in the System Target section. When you are satisfied, click Submit to create the Database Machine monitoring targets.

The screenshot shows the Oracle Exadata Database Machine Discovery Review page. At the top, there is a navigation bar with links for Discovery Inputs, Infiniband Discovery, Prerequisite Check, Components, Monitoring Agents, Agent Credential, Monitoring Credential, SNMP Subscription, Component Properties, and Review. The Review link is highlighted. Below the navigation bar, there is a message: "Please verify the following information. You can click on Back to revise the inputs or click on Submit to complete the discovery process." A note says: "The following options are selected: • The monitoring agents have the same credential." The System Target section lists three targets: DB Machine qr01.example.com (Oracle Exadata Database Machine), Exadata Grid qr01.example.com (Oracle Exadata Storage Server Grid), and IB Network qr01.example.com (Oracle Infiniband Network). The Compute Node section lists two host names: qr01db01.example.com and qr01db02.example.com. The Oracle Exadata Storage Server section lists one cell: qr01cel01.example.com (Management IP 192.0.2.103).

Target Name	Target Type	Monitoring Agent	Backup Monitoring Agent
DB Machine qr01.example.com	Oracle Exadata Database Machine	https://qr01db02.example.com:3872/emd/main/	https://qr01db01.example.com:3872/emd/main/
Exadata Grid qr01.example.com	Oracle Exadata Storage Server Grid	Agent not needed for repository target	Agent not needed for repository target
IB Network qr01.example.com	Oracle Infiniband Network	https://qr01db01.example.com:3872/emd/main/	https://qr01db02.example.com:3872/emd/main/

Host Name
qr01db01.example.com
qr01db02.example.com

Cell Name	Management IP	Monitoring Agent	Backup Monitoring Agent
qr01cel01.example.com	192.0.2.103	https://qr01db02.example.com:3872/emd/main/	https://qr01db01.example.com:3872/emd/main/

44. Wait while the Processing dialog box is displayed.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Confirm - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main menu includes File, Edit, View, History, Bookmarks, Tools, and Help. The address bar shows the URL <https://em12.example.com:7799/em/faces/agentpush-task-flow/core-agentpush-platformselectic>. The Oracle logo and "Enterprise Manager Cloud Control 12c" are visible. The top navigation bar has links for Help and Log Out. The main content area is titled "Oracle Exadata Database Machine Discovery". A progress bar at the top indicates Step 10 of 10. Below it, tabs for Discovery Inputs, Infiniband Discovery, Prerequisite Check, Components, Monitoring Agents, Agent Credential, Monitoring Credential, SNMP Subscription, Component Properties, and Review are shown. The "Review" tab is selected. A sub-section titled "Database Machine Discovery : Review" asks to verify information and provides a "Submit" button. A "System Target" section lists targets: DB Machine qr01.example.com (Oracle Exadata), Exadata Grid qr01.example.com (Oracle Exadata), and IB Network qr01.example.com (Oracle Infiniband). A "Compute Node" section lists nodes: qr01db01.example.com and qr01db02.example.com. An "Oracle Exadata Storage Server" section lists storage servers: qr01cel01.example.com with Management IP 192.0.2.103 and Monitoring Agent <https://qr01db02.example.com:3872/emd/main/>, and a Backup Monitoring Agent entry. A prominent "Processing" dialog box is overlaid, stating "Promoting Targets - In Progress." It contains a note: "This operation cannot be cancelled. Closing the browser window may cause the process to fail." Buttons for Back, Step 10 of 10, Next, Submit, and Cancel are visible at the bottom of the dialog.

45. When the Target Creation Summary page appears, examine it to ensure that all the targets were successfully added to Enterprise Manager.

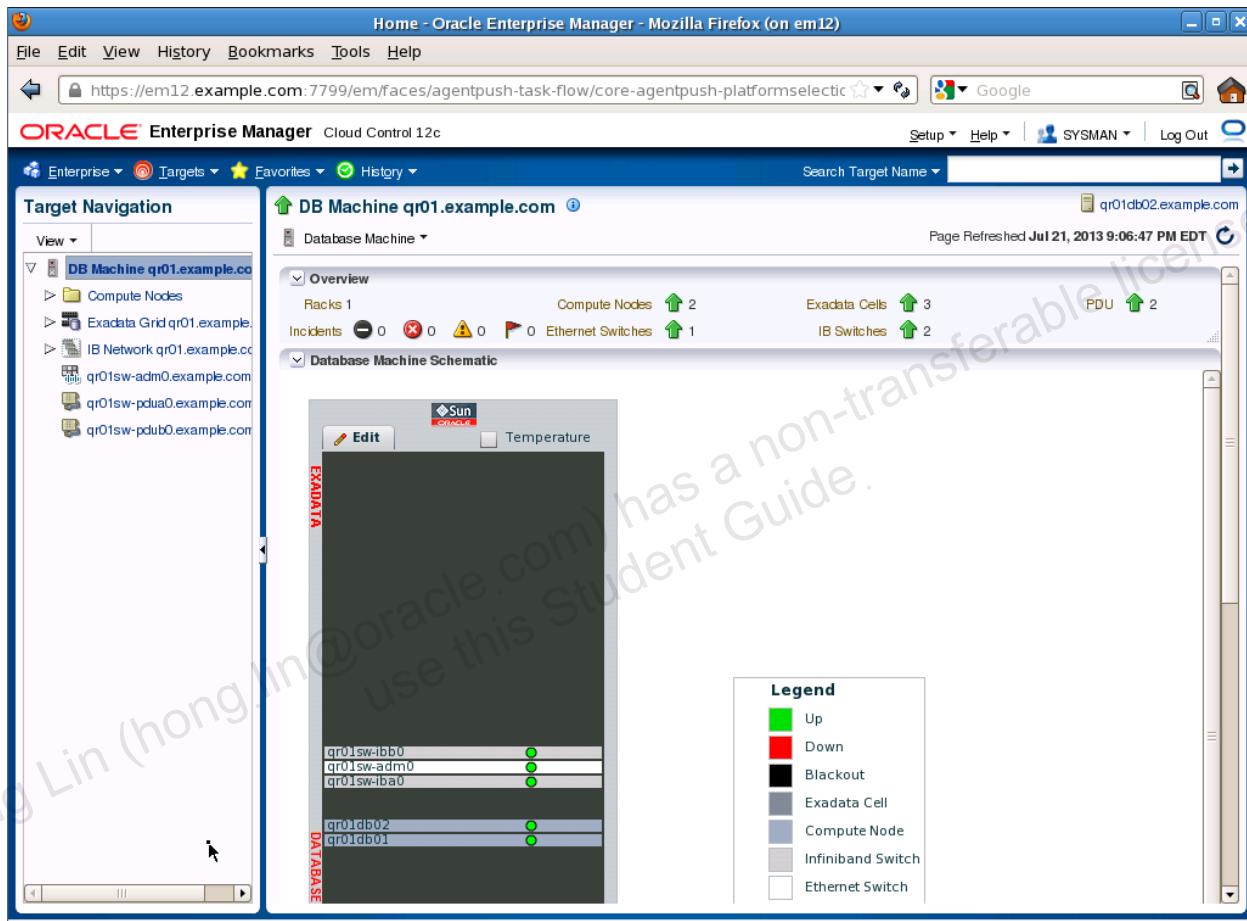
The screenshot shows the 'Target Creation Summary' page in Oracle Enterprise Manager. At the top, there's a navigation bar with links for File, Edit, View, History, Bookmarks, Tools, Help, and a search bar for 'Search Target Name'. Below the header, the Oracle logo and 'Enterprise Manager Cloud Control 12c' are displayed. A top menu bar includes 'Enterprise', 'Targets', 'Favorites', 'History', 'Setup', 'Help', 'SYSMAN', and 'Log Out'. The main content area is titled 'Target Creation Summary' and shows a message: 'Information Target promotion succeeded.' Below this, a note says: 'The tables below show the result of target creation and setup. You can click on the discovery status to see the detailed messages.' There are four sections: 'System Target' (listing DB Machine, Exadata Grid, and IB Network targets all marked as 'Successful'), 'Compute Node' (listing two hosts, qr01db01.example.com and qr01db02.example.com, both marked as 'Successful'), 'Oracle Exadata Storage Server' (listing three cells: qr01ce01.example.com, qr01ce02.example.com, and qr01ce03.example.com, all marked as 'Successful'), and 'Infiniband Switch' (listing one switch, qr01ib01.example.com, marked as 'Successful').

46. At the bottom of the Target Creation Summary page, click Launch DB Machine Home.

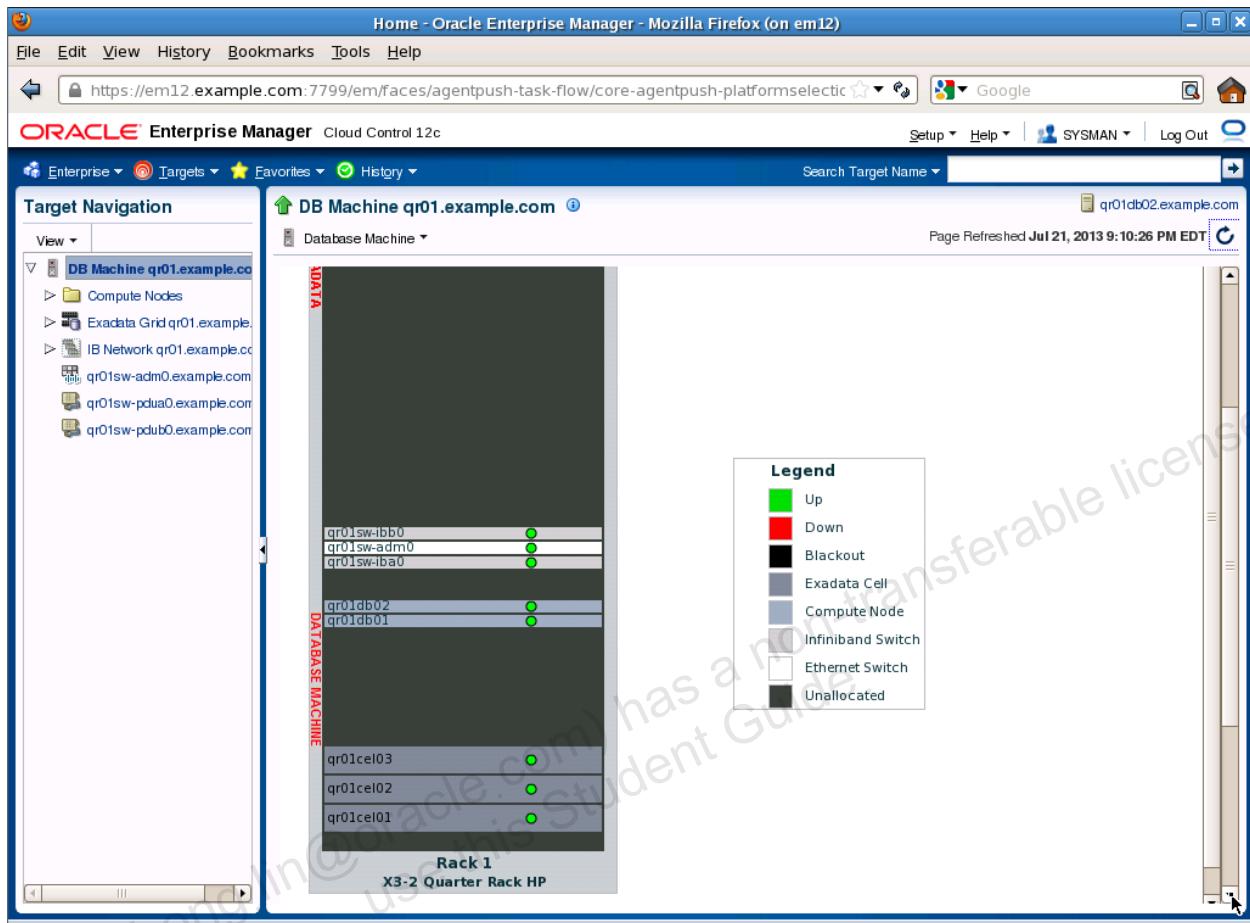
The screenshot shows the Oracle Enterprise Manager Target Creation Summary page. At the top, it displays the URL <https://em12.example.com:7799/em/faces/agentpush-task-flow/core-agentpush-platformselectic>. The main content area is titled "Target Creation Summary". It includes sections for "Information" (Target promotion succeeded), "Infiniband Switches" (two entries: qr01sw-iba0.example.com and qr01sw-ibb0.example.com, both successful), "Ethernet Switches" (one entry: qr01sw-adm0.example.com, successful), "Compute Node ILOM" (two entries: qr01db01-ibm.example.com and qr01db02-ibm.example.com, both successful), and "PDU" (two entries: qr01sw-pdua0.example.com and qr01sw-pdub0.example.com, both successful). At the bottom left, there is a blue button labeled "Launch DB Machine Home" with a cursor pointing to it.

Congratulations! At this point, you have successfully discovered your Database Machine. In the next part of this practice, you will take a brief tour of the Database Machine home page.

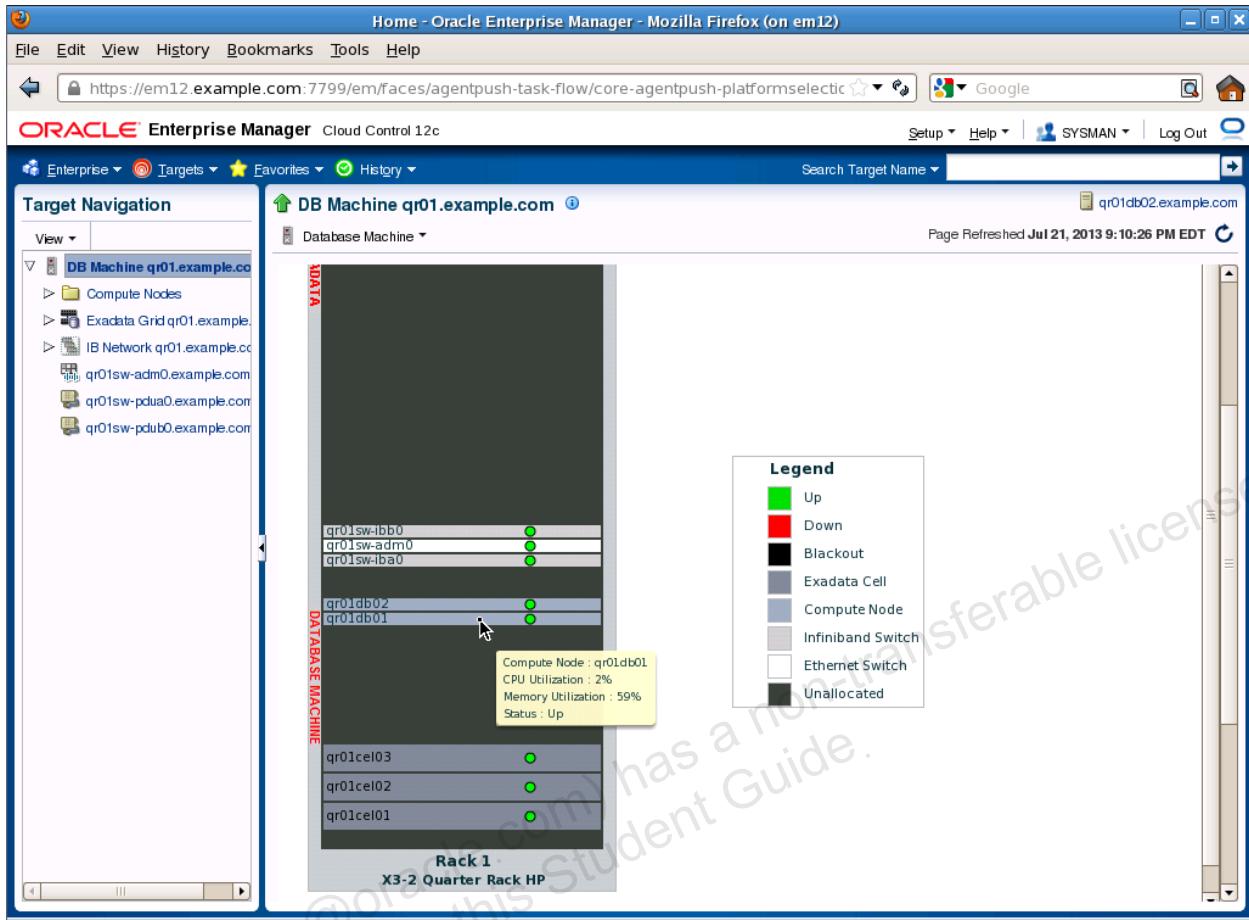
47. Examine the Database Machine home page. Notice that the various Database Machine components are organized in the Target Navigation pane. At the top of the main DB Machine pane, an Overview area summarizes any incidents and the component status. Below the overview, you will find the Database Machine Schematic, which is a diagrammatic representation of the Database Machine. Note that it will take a few minutes for Enterprise Manager to fully update the status of the Database Machine components. Therefore, if any of the components are initially listed as down, periodically refresh the page until the status of the entire Database Machine is displayed as up.



48. Scroll down until the lower half of the Database Machine Schematic diagram is displayed. Here you will see a representation of the Database Machine hardware components arranged just as they are inside the rack.



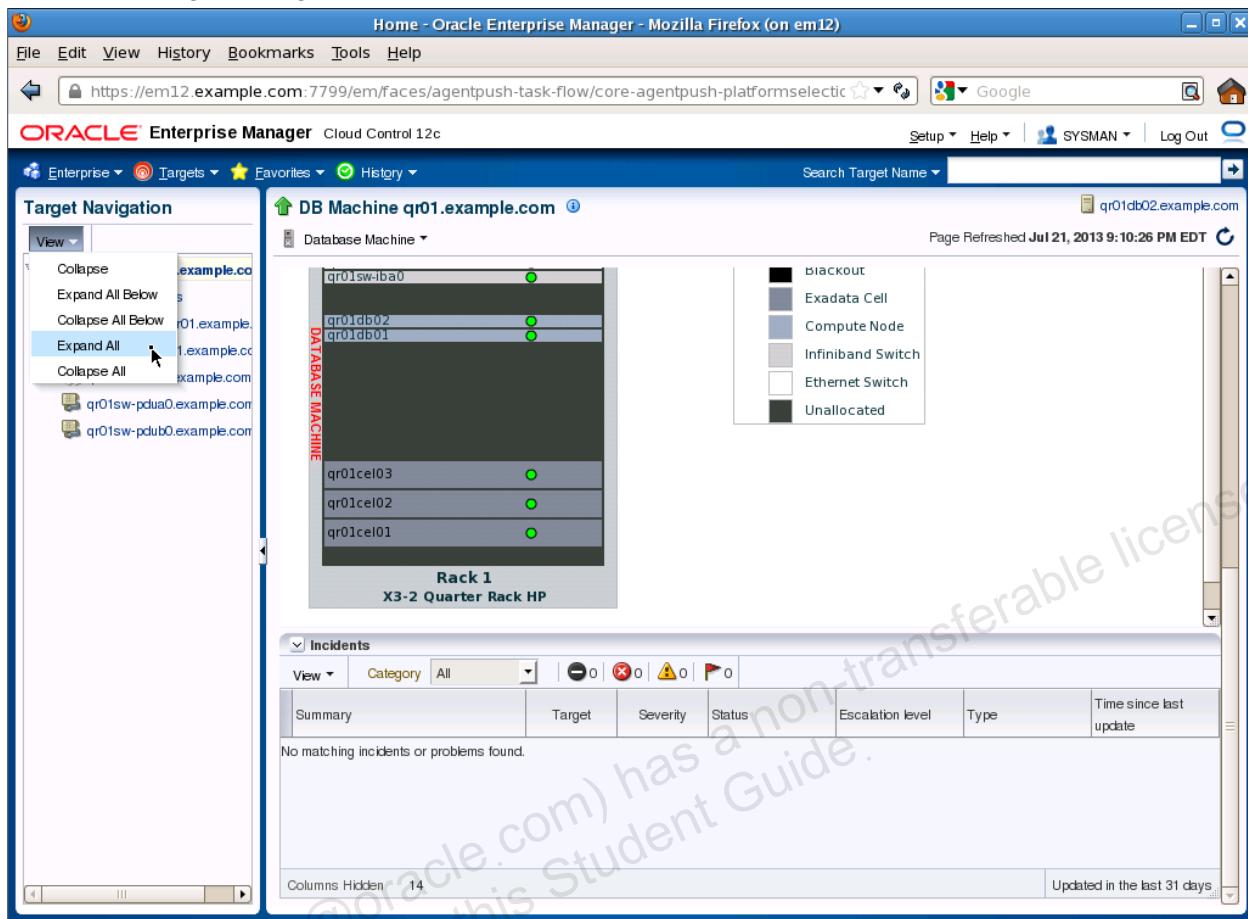
49. Hold the cursor over each component in the diagram to display key status information.



50. Scroll further down the page to reveal the Incidents area. Use the summary shown here to quickly ascertain if there are any incidents relating to the Database Machine.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The top navigation bar includes File, Edit, View, History, Bookmarks, Tools, Help, and a Google search bar. The main title is "Home - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The left sidebar, titled "Target Navigation", lists "DB Machine qr01.example.com" and its components: Compute Nodes, Exadata Grid qr01.example.com, IB Network qr01.example.com, qr01sw-adm0.example.com, qr01sw-pdua0.example.com, and qr01sw-pdub0.example.com. The central panel displays "DB Machine qr01.example.com" with a rack diagram for "Rack 1 X3-2 Quarter Rack HP". The rack contains nodes: qr01sw-iba0, qr01db02, qr01db01, qr01cel03, qr01cel02, and qr01cel01, all marked with green dots indicating they are healthy. A legend on the right identifies node types: Blackout (dark grey), Exadata Cell (medium grey), Compute Node (light grey), Infiniband Switch (white), Ethernet Switch (white), and Unallocated (black). Below the rack diagram is the "Incidents" section, which is currently empty, displaying the message "No matching incidents or problems found." The bottom status bar indicates the page was refreshed on Jul 21, 2013 at 9:10:26 PM EDT.

51. In the Target Navigation pane, select the View > Expand All menu command.



52. Now the Target Navigation pane lists all the monitoring targets associated with the Database Machine. At any time you can navigate to the target home page by clicking any of the listed targets. Click “Exadata Grid qr01.example.com.”

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar displays the 'Target Navigation' tree, which includes categories like 'Compute Nodes', 'IB Network', and 'Exadata Grid'. Under 'Exadata Grid qr01.example.com', several nodes are listed. The node 'Exadata Grid qr01.example.com' is selected, indicated by a mouse cursor. The main content area shows a detailed view of the 'DB Machine qr01.example.com'. It features a rack diagram labeled 'Rack 1 X3-2 Quarter Rack HP' containing components such as 'qr01sw-iba0', 'qr01db02', 'qr01db01', 'qr01cel03', 'qr01cel02', and 'qr01cel01'. A legend on the right identifies the colors for different hardware types: Blackout (dark grey), Exadata Cell (light blue), Compute Node (medium blue), Infiniband Switch (light grey), Ethernet Switch (white), and Unallocated (dark grey). Below the rack diagram, an 'Incidents' section is shown with a table header and a message stating 'No matching incidents or problems found.' The bottom of the interface shows a status bar with 'Updated in the last 31 days'.

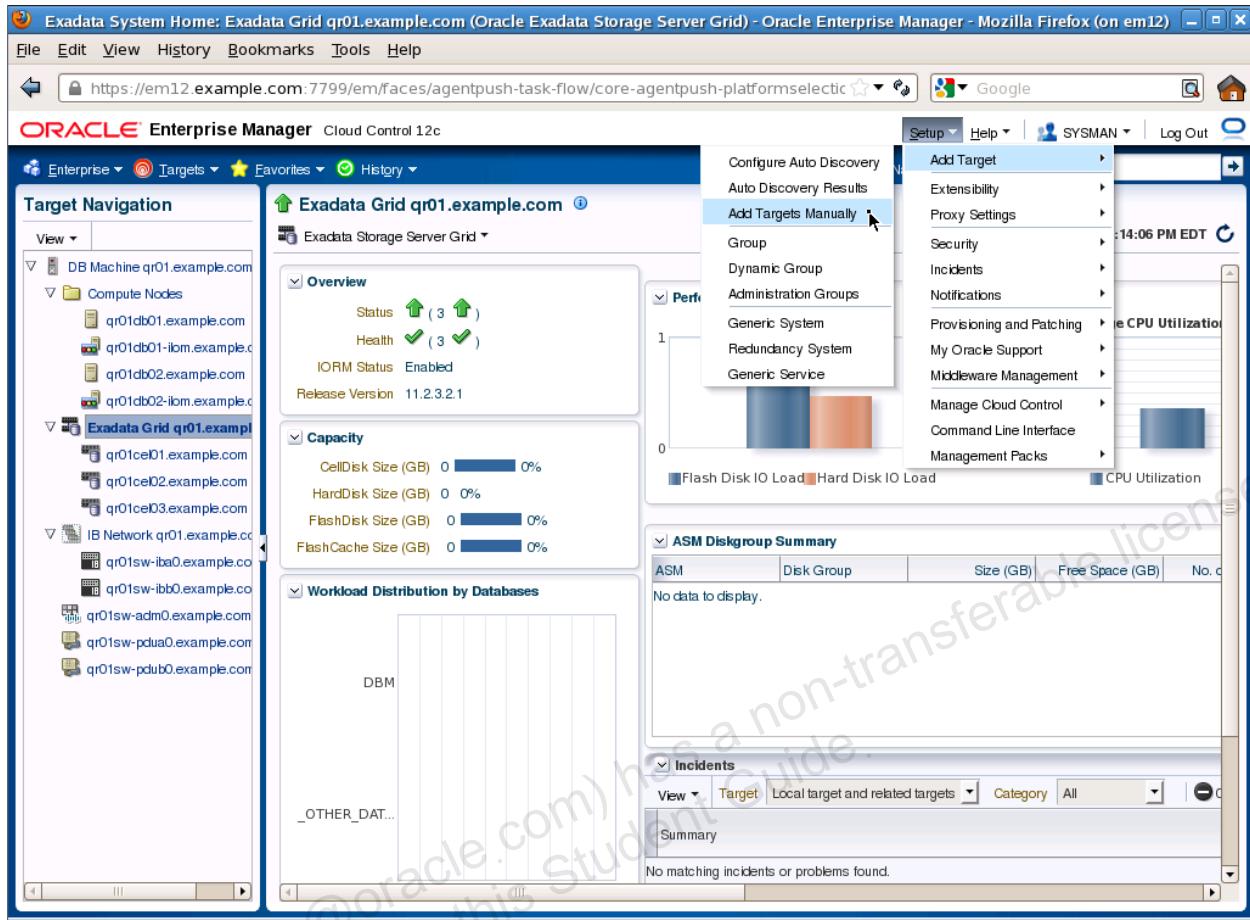
53. Now the Exadata Grid home page is displayed. This page summarizes key information about all the Exadata Storage Servers in the Database Machine. At this point, you can see that the storage grid consists of three Exadata Storage Servers. You can also notice that many of the summaries on the page are currently empty or contain zero values. Over time this will change because Enterprise Manager collects the underlying metrics and computes the summary values.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Exadata System Home: Exadata Grid qr01.example.com (Oracle Exadata Storage Server Grid) - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The left sidebar, titled "Target Navigation", lists various targets under "DB Machine qr01.example.com" and "Exadata Grid qr01.example.com". The main content area is titled "Exadata Grid qr01.example.com" and displays the following sections:

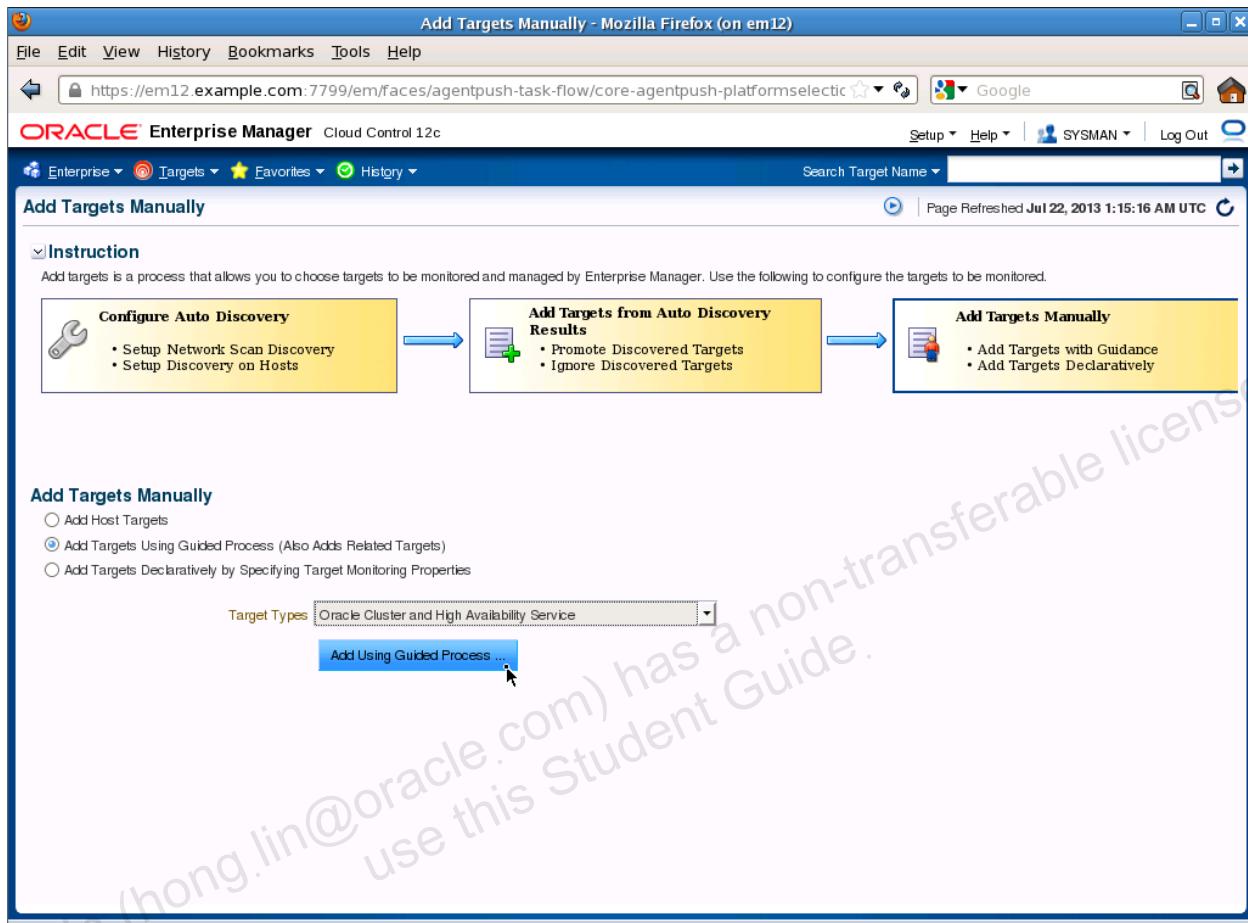
- Overview:** Status (3 green), Health (3 green), IORM Status (Enabled), Release Version (11.2.3.2.1).
- Performance:** Average IO Load chart showing Flash Disk IO Load (blue bar) and Hard Disk IO Load (orange bar). Average CPU Utilization chart showing CPU Utilization (blue bar).
- Capacity:** CellDisk Size (GB) 0 (0%), HardDisk Size (GB) 0 (0%), FlashDisk Size (GB) 0 (0%), FlashCache Size (GB) 0 (0%).
- ASM Diskgroup Summary:** No data to display.
- Workload Distribution by Databases:** DBM, OTHER\_DAT...
- Incidents:** Summary: No matching incidents or problems found.

You may have noticed that the Database Machine home page contains no information about the databases and other software services running on the Database Machine. You will discover these separately in the next part of this practice.

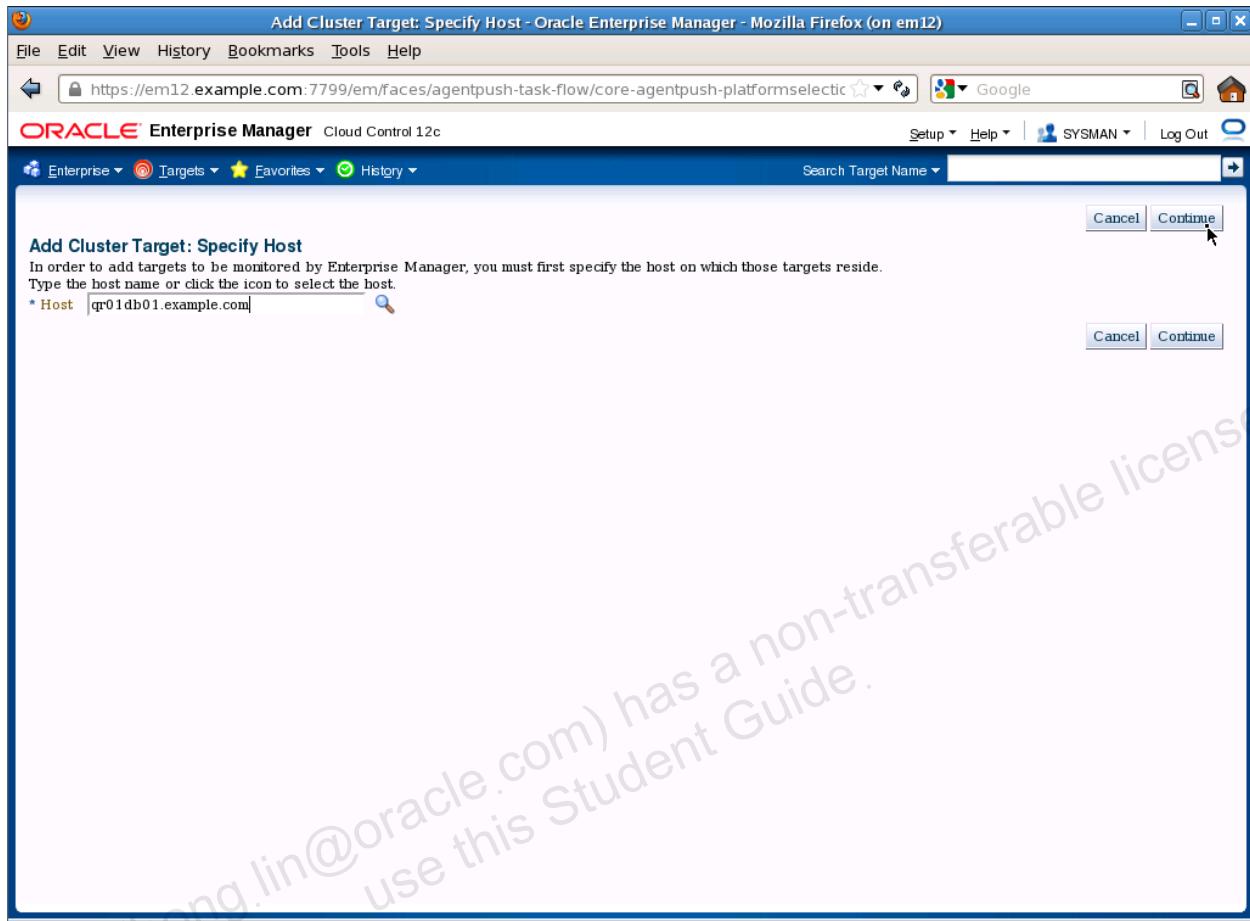
54. Select the Setup > Add Target > Add Targets Manually menu command.



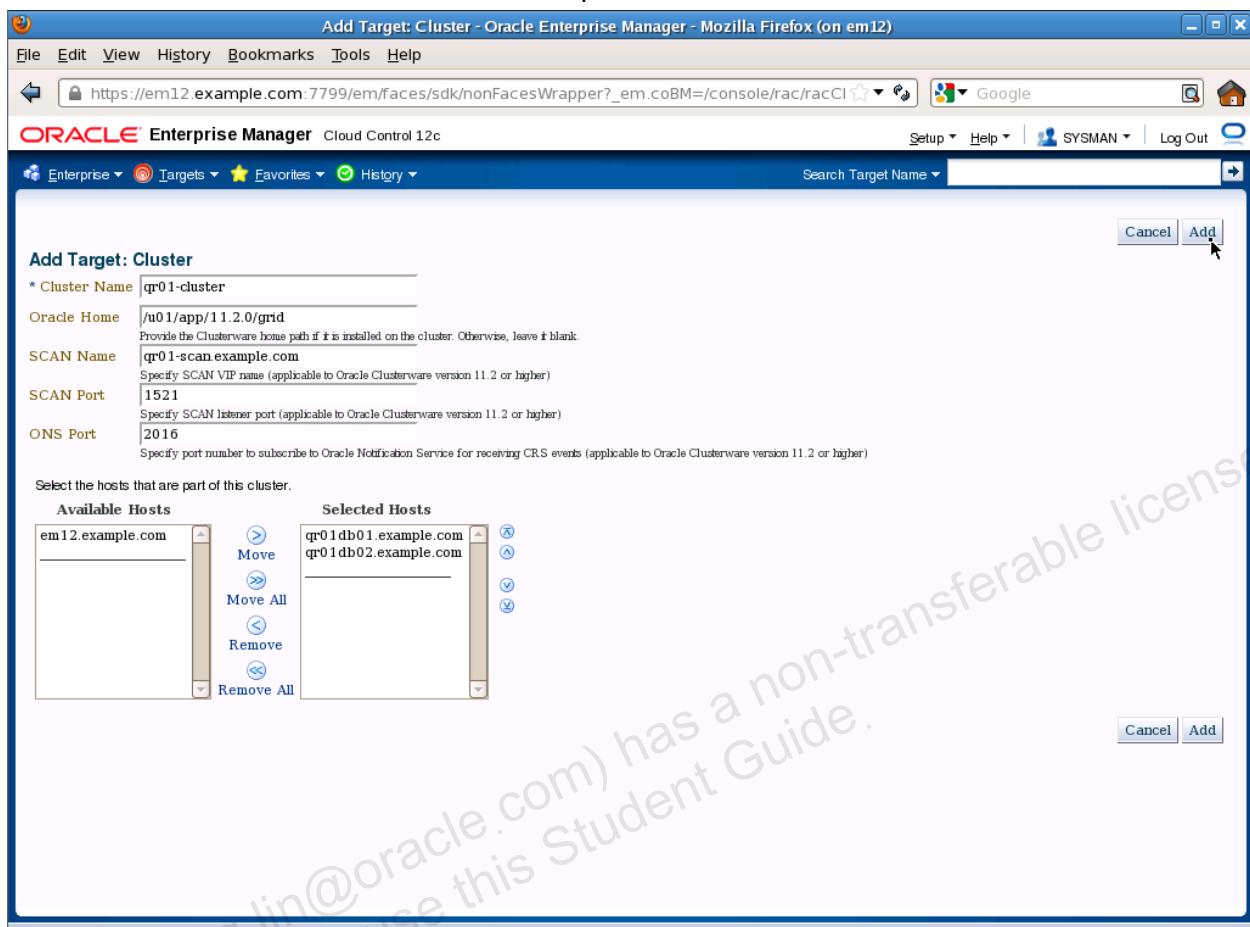
55. On the Add Targets Manually page, select the Add Targets Using Guided Process option. Then select “Oracle Cluster and High Availability Service” from the Target Types drop-down list. Finally, click Add Using Guided Process to start the cluster discovery process. Note that you must discover the cluster before you can discover any databases.



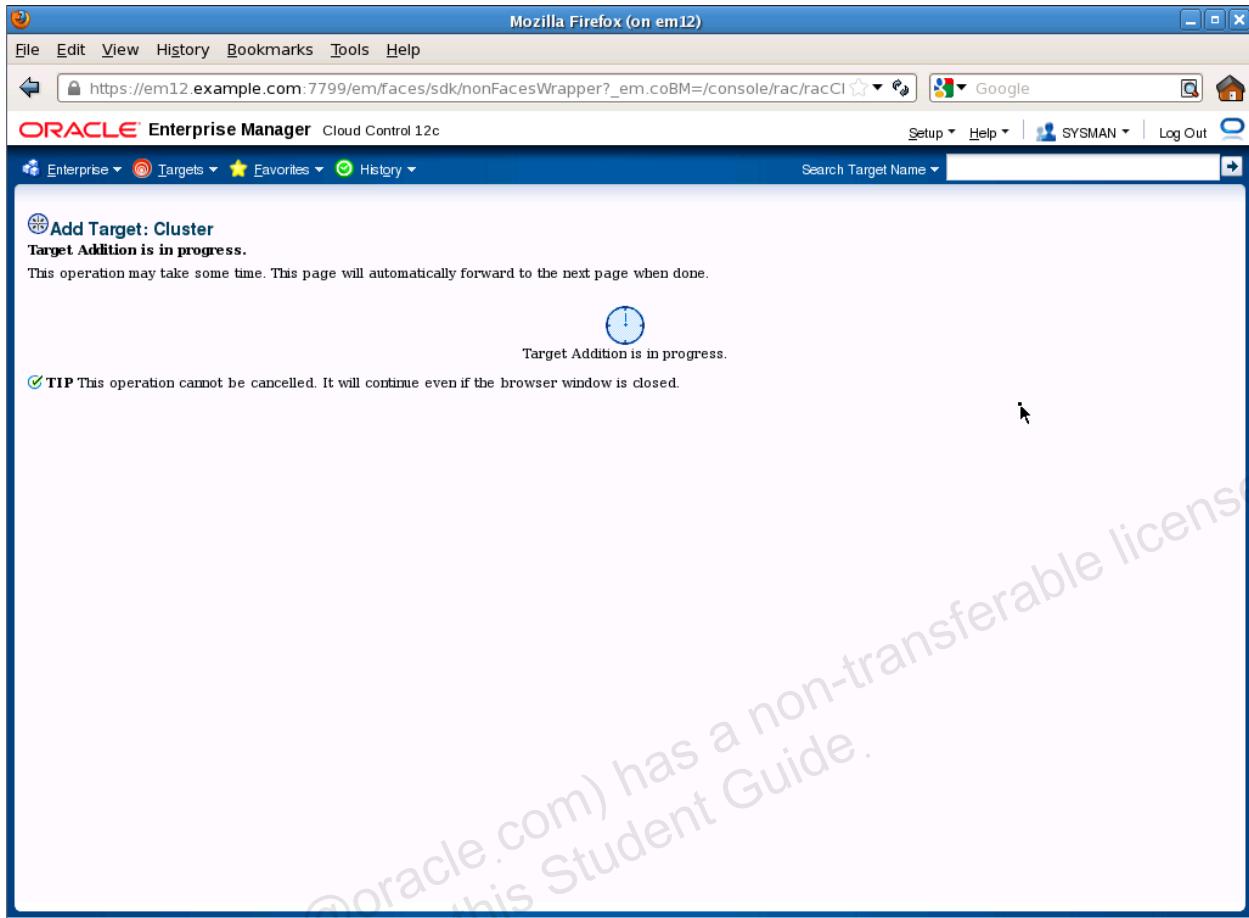
56. Enter the name of one of the database server hosts (`qr01db01.example.com`), or click the magnifying glass icon and use the resulting dialog box to specify the host. Then click Continue to proceed.



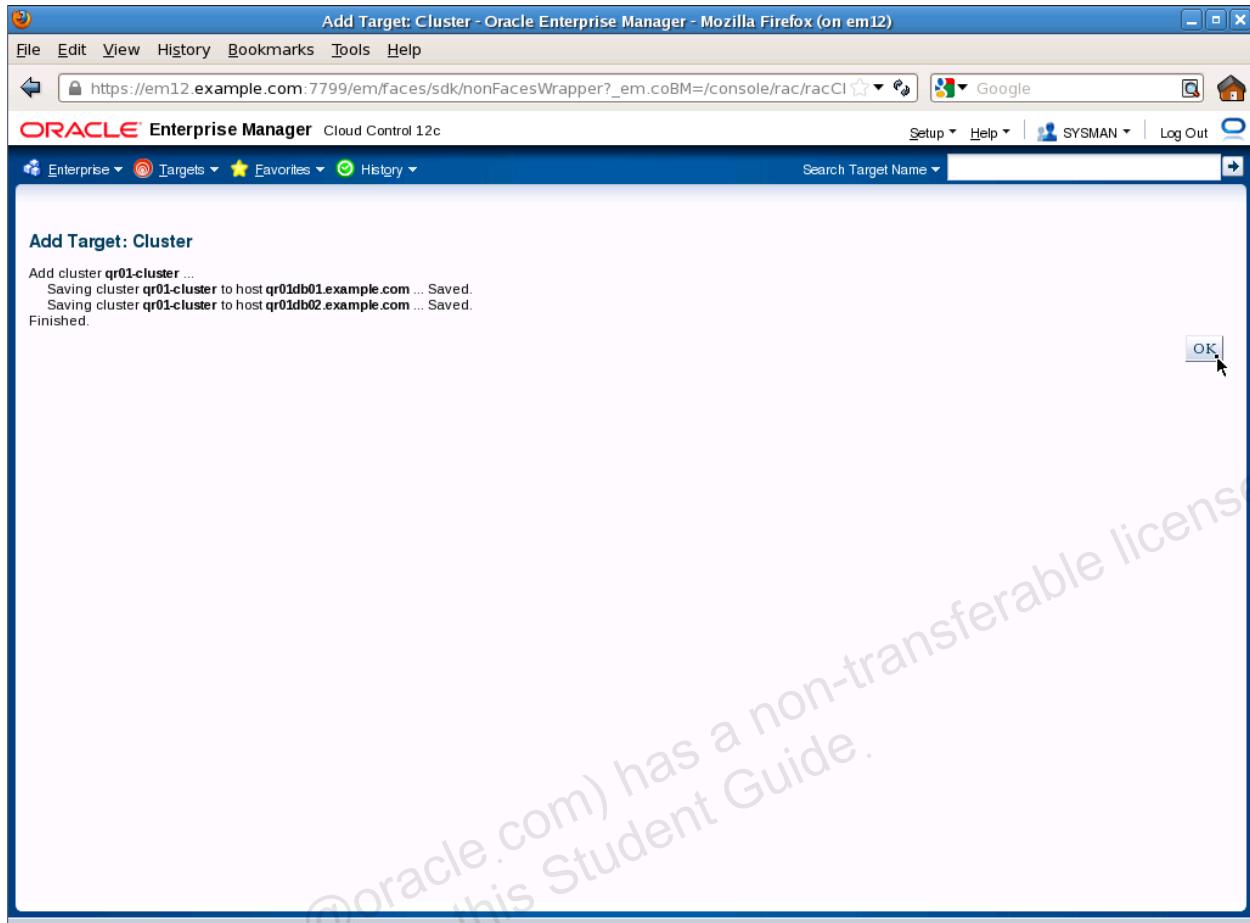
57. The Add Targets page should display various attributes of the cluster. Verify the accuracy of the cluster attributes and click Add to proceed.



58. Wait while the cluster is added to Enterprise Manager.

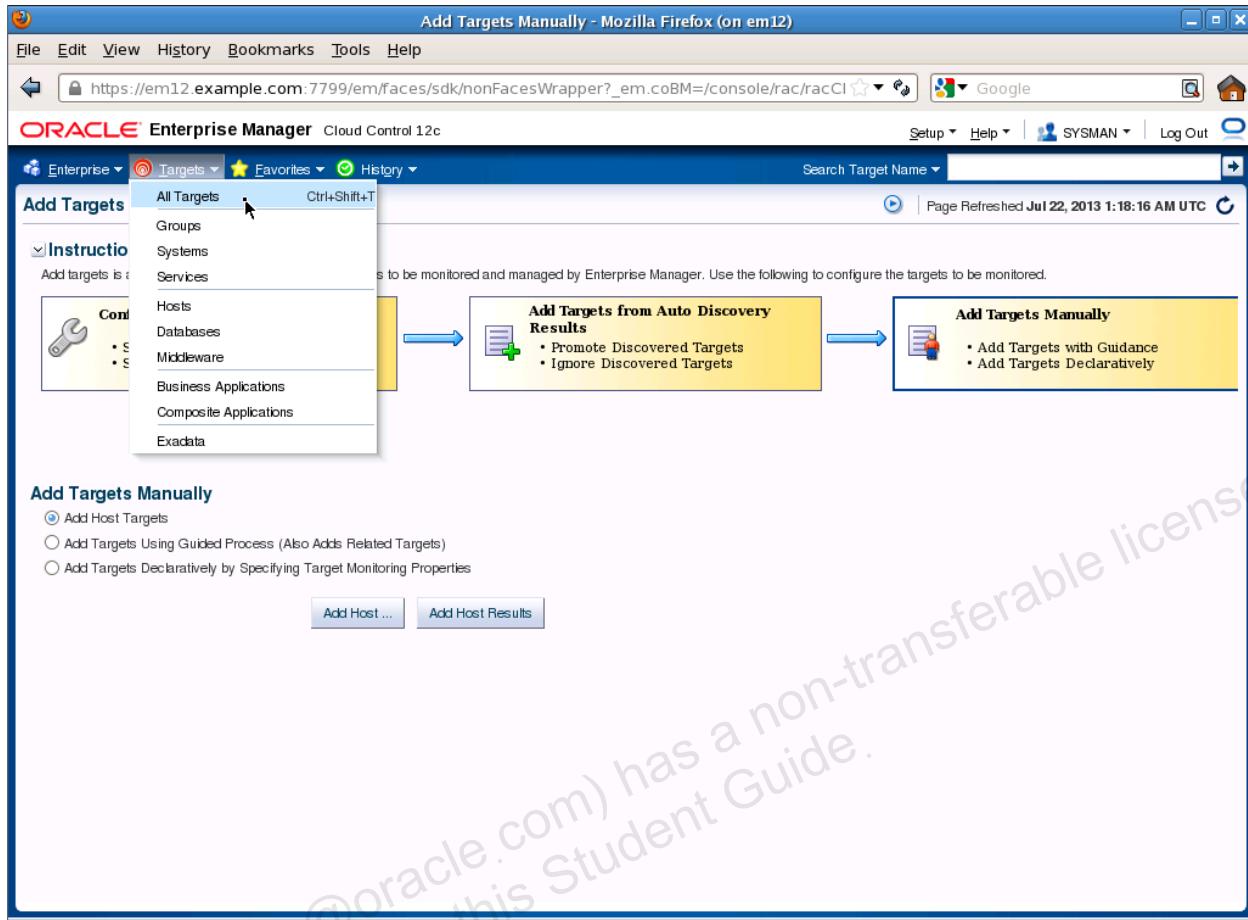


59. When the results page is displayed. Ensure that there are no errors and click OK.



At this point, the cluster has been added to Enterprise Manager. Next, you will validate that all the cluster targets are up and available.

60. Select the Targets > All Targets menu command.



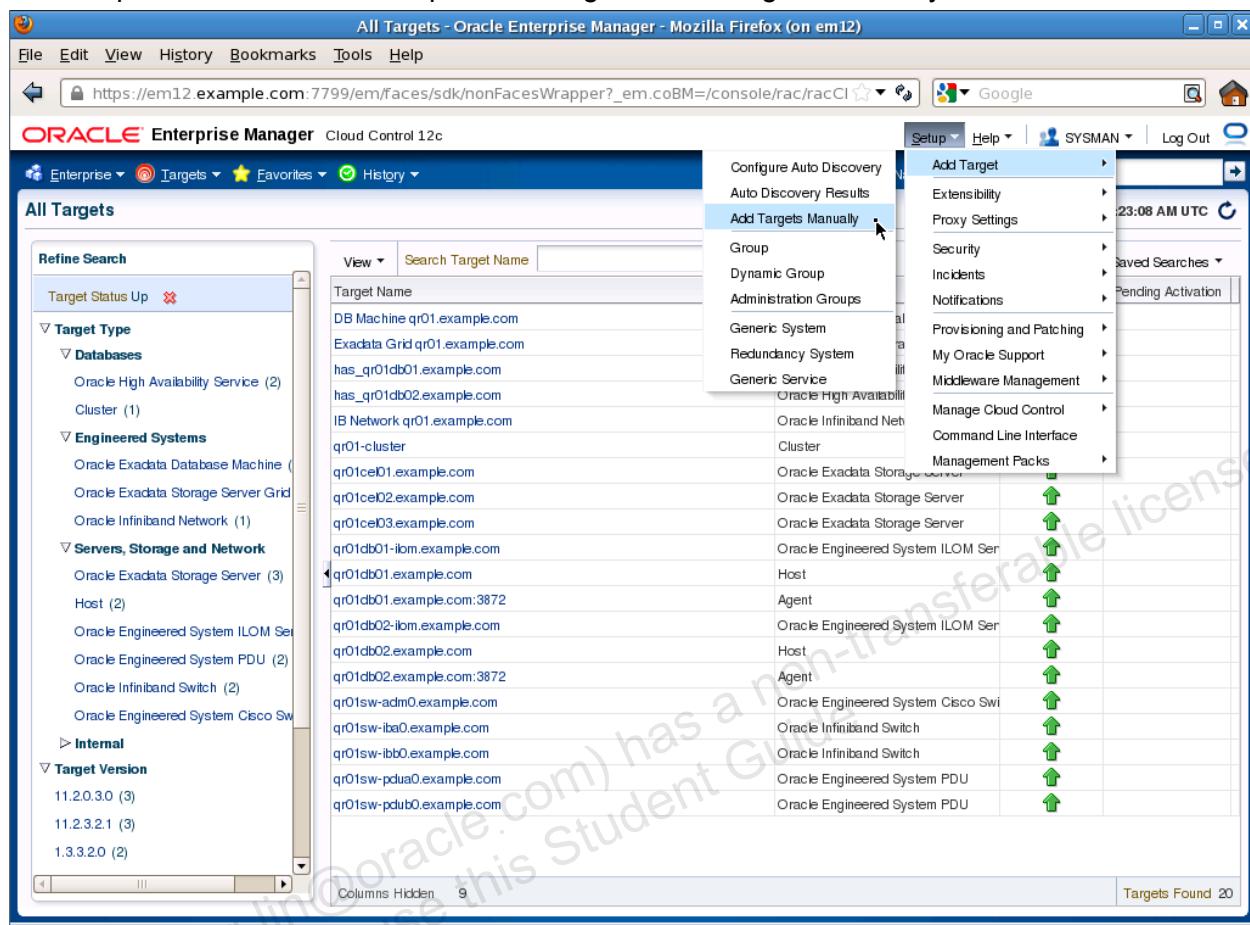
61. Examine the target list and confirm that the cluster target (qr01-cluster) and two high availability service targets (has\_qr01db01.example.com and has\_qr01db02.example.com) are up. If any of the targets are not up (as shown in the example below), click the refresh icon (beside the Page Refreshed date and time).

Target Name	Target Type	Target Status	Pending Activation
DB Machine qr01.example.com	Oracle Exadata Database Machine	Up	
Exadata Grid qr01.example.com	Oracle Exadata Storage Server Grid	Up	
IB Network qr01.example.com	Oracle Infiniband Network	Up	
qr01ce01.example.com	Oracle Exadata Storage Server	Up	
qr01ce02.example.com	Oracle Exadata Storage Server	Up	
qr01ce03.example.com	Oracle Exadata Storage Server	Up	
qr01db01-ibm.example.com	Oracle Engineered System ILOM Ser	Up	
qr01db01.example.com	Host	Up	
qr01db01.example.com:3872	Agent	Up	
qr01db02-ibm.example.com	Oracle Engineered System ILOM Ser	Up	
qr01db02.example.com	Host	Up	
qr01db02.example.com:3872	Agent	Up	
qr01sw-adm0.example.com	Oracle Engineered System Cisco Swi	Up	
qr01sw-iba0.example.com	Oracle Infiniband Switch	Up	
qr01sw-ibb0.example.com	Oracle Infiniband Switch	Up	
qr01sw-pdua0.example.com	Oracle Engineered System PDU	Up	
qr01sw-pdub0.example.com	Oracle Engineered System PDU	Up	

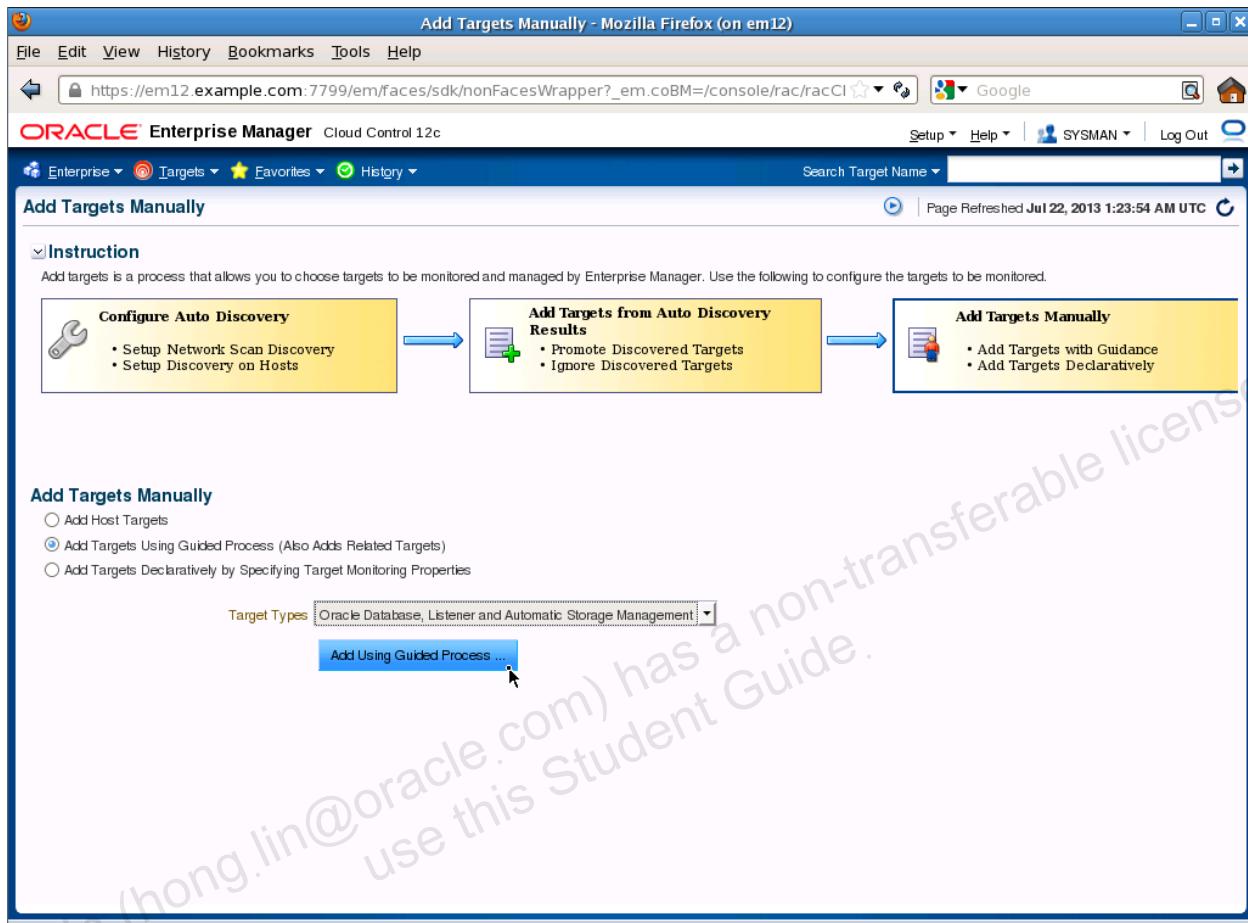
62. Periodically refresh the page until the cluster target (qr01-cluster) and the high-availability services targets on each database server (has\_qr01db01.example.com and has\_qr01db02.example.com) are listed as up.

Target Name	Target Type	Target Status	Pending Activation
DB Machine qr01.example.com	Oracle Exadata Database Machine	Up	
Exadata Grid qr01.example.com	Oracle Exadata Storage Server Grid	Up	
has_qr01db01.example.com	Oracle High Availability Service	Up	
has_qr01db02.example.com	Oracle High Availability Service	Up	
IB Network qr01.example.com	Oracle Infiniband Network	Up	
qr01-cluster	Cluster	Up	
qr01ce01.example.com	Oracle Exadata Storage Server	Up	
qr01ce02.example.com	Oracle Exadata Storage Server	Up	
qr01ce03.example.com	Oracle Exadata Storage Server	Up	
qr01db01-ibm.example.com	Oracle Engineered System ILOM Ser	Up	
qr01db01.example.com	Host	Up	
qr01db01.example.com:3872	Agent	Up	
qr01db02-ibm.example.com	Oracle Engineered System ILOM Ser	Up	
qr01db02.example.com	Host	Up	
qr01db02.example.com:3872	Agent	Up	
qr01sw-adm0.example.com	Oracle Engineered System Cisco Swi	Up	
qr01sw-iba0.example.com	Oracle Infiniband Switch	Up	
qr01sw-ibb0.example.com	Oracle Infiniband Switch	Up	
qr01sw-pdua0.example.com	Oracle Engineered System PDU	Up	
qr01sw-pdub0.example.com	Oracle Engineered System PDU	Up	

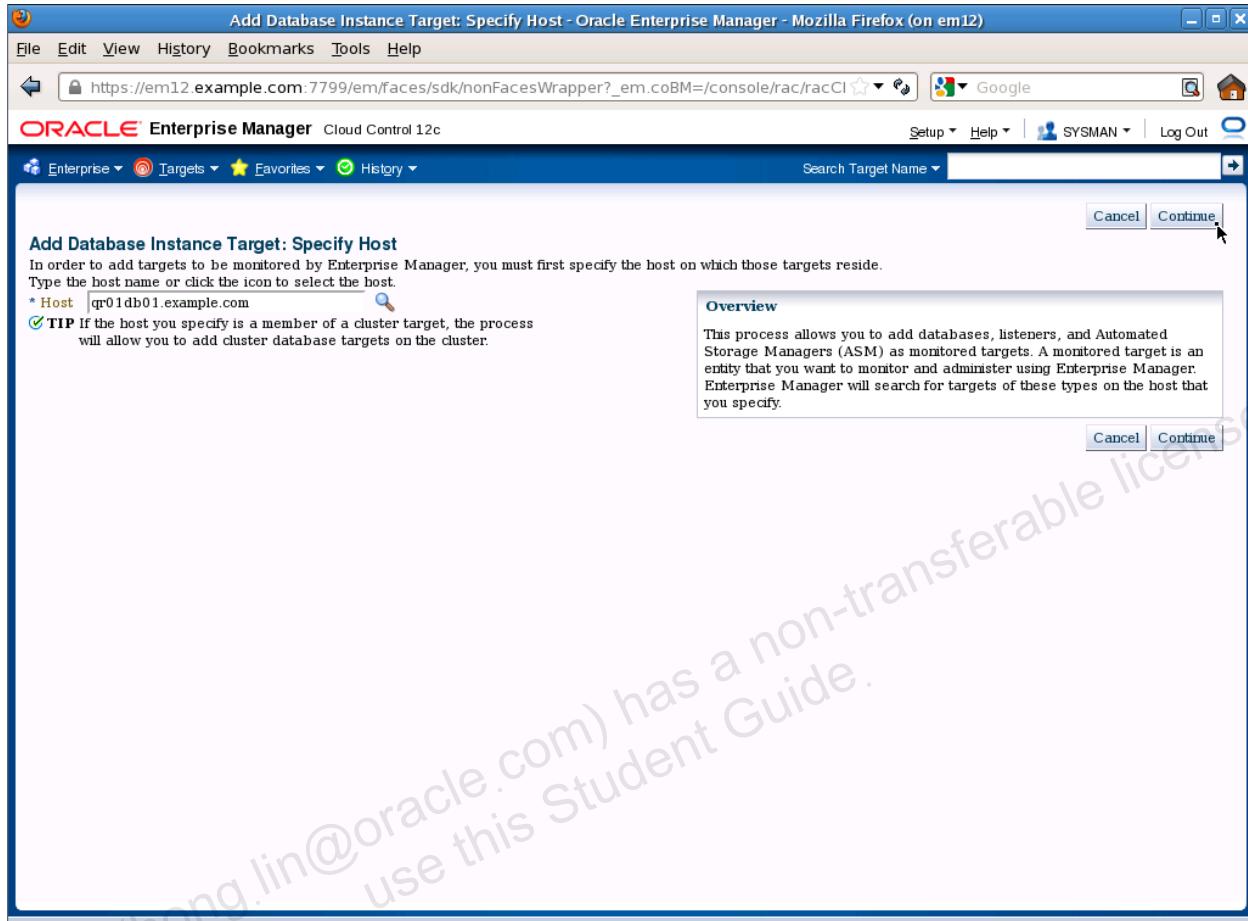
63. Now you are ready to discover the databases running on your Database Machine. To start this process, select the Setup > Add Target > Add Targets Manually menu command.



64. On the Add Targets Manually page, select the Add Targets Using Guided Process option. Then select “Oracle Database Listener and Automatic Storage Management” from the Target Types drop-down list. Finally, click Add Using Guided Process to start the discovery process.



65. Enter the name of one of the database server hosts (`qr01db01.example.com`), or click the magnifying glass icon and specify a host in the dialog box. Then click Continue to proceed.



66. At this point, you have the option to discover databases on the host specified in the previous step, or to discover databases across the cluster that contains the specified host. Select the option to discover databases on all hosts in the cluster and click Continue to proceed.

Add Database: Specify Source - Oracle Enterprise Manager - Mozilla Firefox (on em12)

File Edit View History Bookmarks Tools Help

https://em12.example.com:7799/em/faces/sdk/nonFacesWrapper?\_em.coBM=/console/database

ORACLE Enterprise Manager Cloud Control 12c

Add Target: Database > Add Database: Specify Source

**Add Database: Specify Source**

The host 'qr01db01.example.com' is a member of the cluster 'qr01-cluster'. This cluster has the following members:

- qr01db01.example.com
- qr01db02.example.com

Where would you like to look for databases to add to Enterprise Manager?

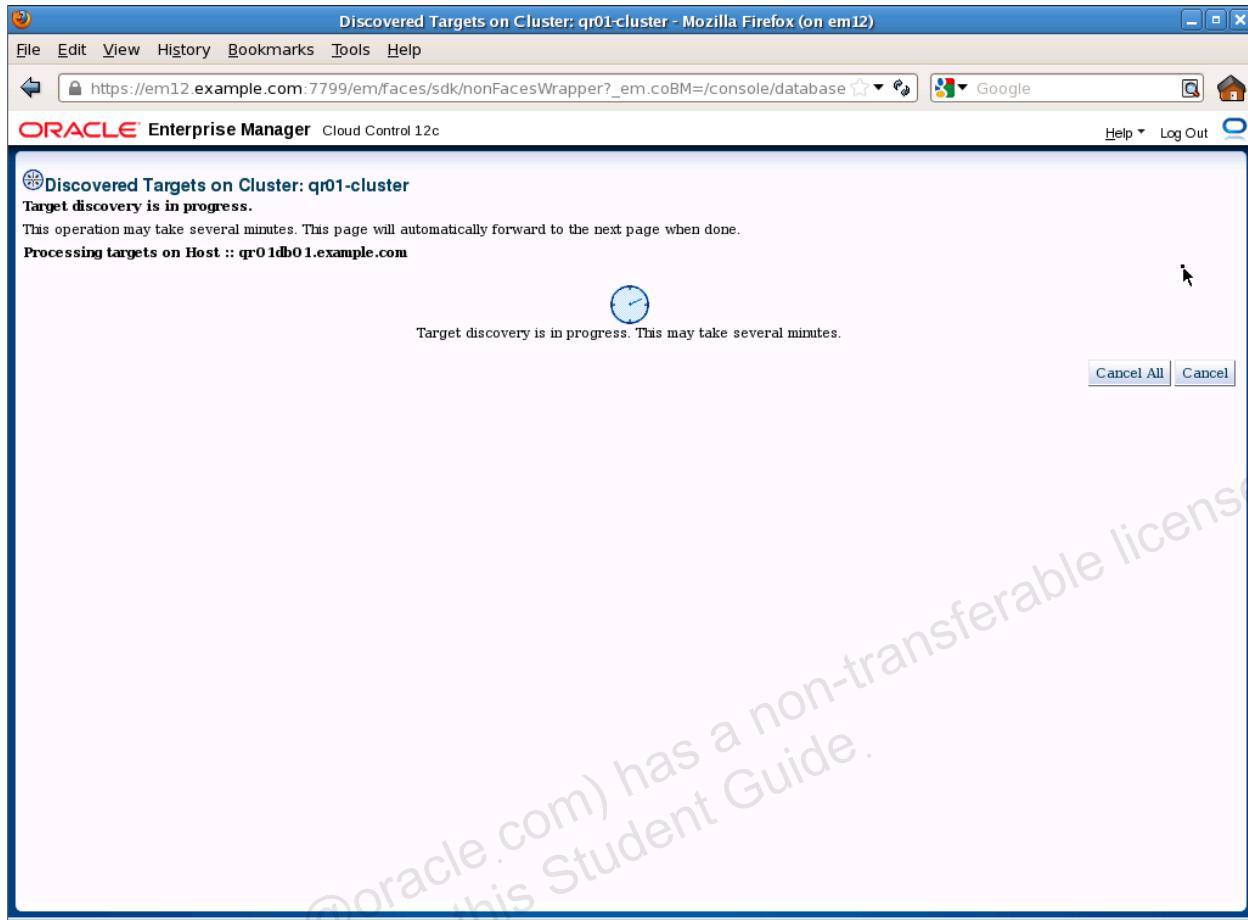
only on the host qr01db01.example.com  
Only single instance databases and listeners on the host will be discovered.

on all hosts in the cluster  
All cluster databases, storage, single instance databases and listeners on the cluster will be discovered.

**Advanced Options**

Cancel Continue

67. Wait while target discovery is in progress.



68. On the Discovered Targets page, click the configure icon for the cluster database dbm.example.com.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Discovered Targets on Cluster: qr01-cluster - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main navigation menu includes File, Edit, View, History, Bookmarks, Tools, and Help. Below the menu, there's a toolbar with various icons. The main content area is titled "Discovered Targets on Cluster: qr01-cluster". It shows a list of discovered databases under "Cluster Databases". The database "dbm.example.com" is selected, indicated by a checked checkbox. Its details are shown in a table row: "Name" is "dbm.example.com", "Database System" is "dbm.example.com\_sys", and the "Monitor Password" field contains "dbm.example.com\_sys". To the right of the password field is a magnifying glass icon and a "Configure" button. Other entries in the list include "dbm.example.com\_dbm1" and "dbm.example.com\_dbm2". Below the table, a note says "No items found" under "Single Instance Database". A tip message at the bottom states: "TIP Configuration changes will only take effect for those databases that are added as targets." At the very bottom of the page is a JavaScript footer: "javascript:iconButtonFunc( 'add', 'crl1' )".

69. On the Configure Cluster Database Properties page, enter oracle\_4U as the Monitor Password and click Next.

The screenshot shows the 'Configure Cluster Database: Properties' page in Oracle Enterprise Manager. The page title is 'Configure Cluster Database: Properties - Oracle Enterprise Manager - Mozilla Firefox (on em12)'. The URL in the address bar is [https://em12.example.com:7799/em/faces/sdk/nonFacesWrapper?\\_em.coBM=/console/database](https://em12.example.com:7799/em/faces/sdk/nonFacesWrapper?_em.coBM=/console/database). The page header includes 'File Edit View History Bookmarks Tools Help' and the Oracle logo. A progress bar at the top indicates 'Step 1 of 5'. The main form contains fields for 'Name' (dbm.example.com), 'Type' (Cluster Database), and 'Database System' (dbm.example.com\_sys). Below these are several configuration parameters:

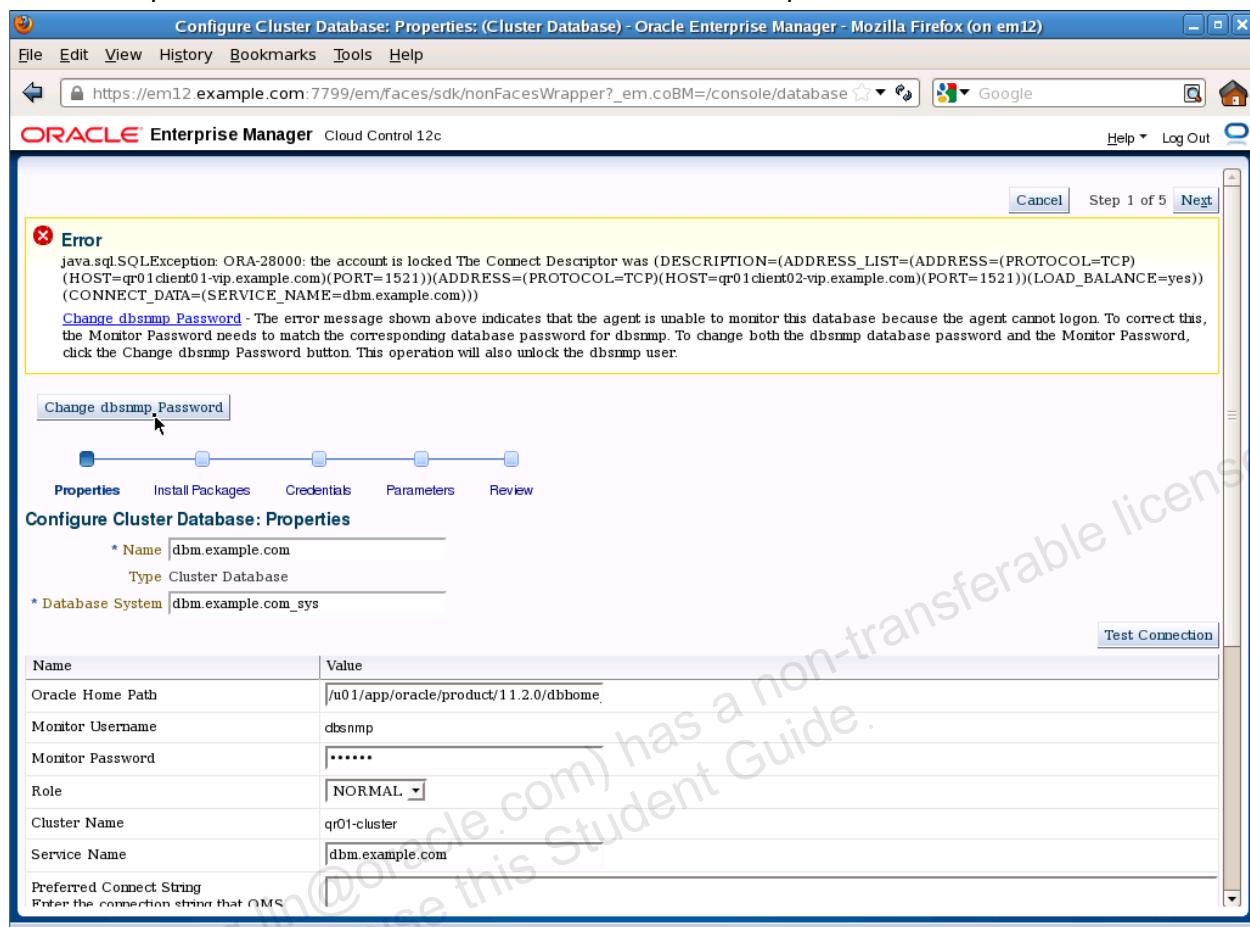
Name	Value
Oracle Home Path	/u01/app/oracle/product/11.2.0/dbhome
Monitor Username	dbsnmp
Monitor Password	[REDACTED]
Role	NORMAL
Cluster Name	qr01-cluster
Service Name	dbm.example.com

A note below the table states: 'Preferred Connect String' and 'Enter the connection string that OMS should use when connecting to the target database. If blank, the OMS would automatically construct one using the host, port, SID provided above.'

A checked checkbox says: 'TIP Service Name is used to establish the cluster database connection. It should be one of the service names the cluster database registers with the listeners.'

The 'Instances' section has an 'Add' button and a table with columns: Select, Name, Host, Listener Machine Name, Port, and SID.

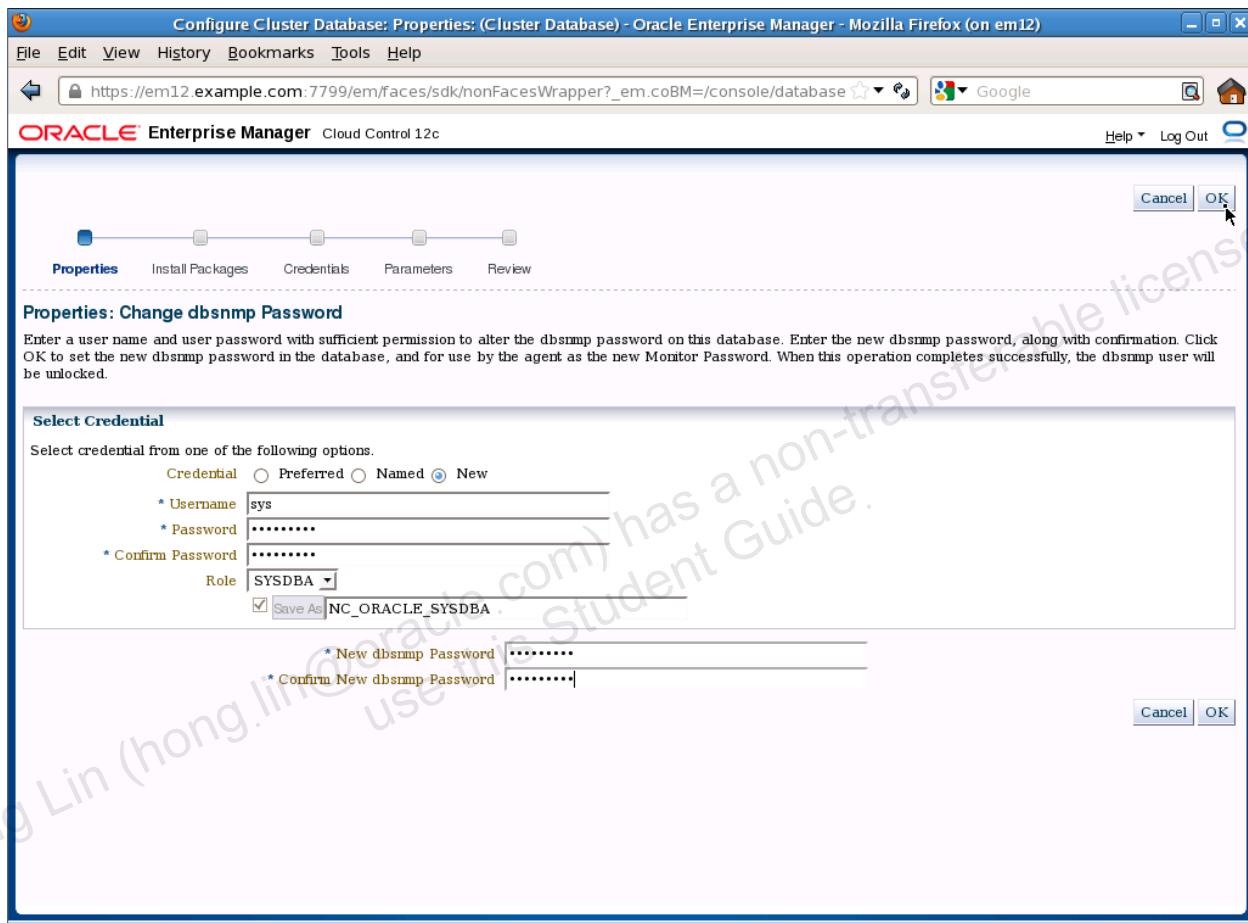
70. An error indicating that the monitor user account is locked will appear. Click “Change dbsnmp Password” to unlock the account and reset the password.



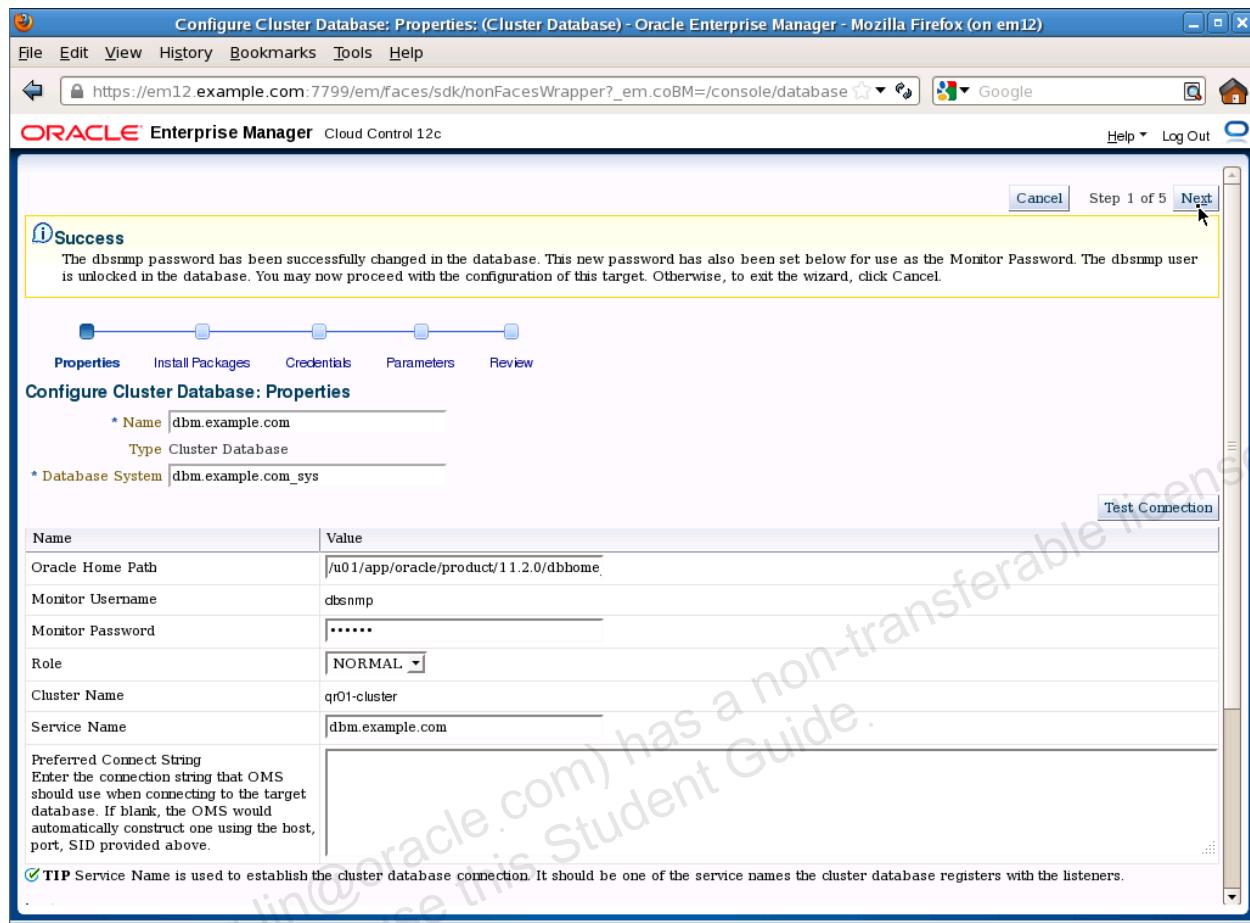
71. On the “Change dbsnmp Password” page, enter the following properties:

- Credential: New
- Username: sys
- Password/Confirm Password: oracle\_4U
- Role: SYSDBA
- Save As: NC\_ORACLE\_SYSDBA
- New dbsnmp Password/Confirm New dbsnmp Password: oracle\_4U

Finally, click OK to proceed.



72. Confirm that the dbsnmp password has been successfully changed in the database. Then click Next to proceed.



73. Examine the Configure Cluster Database Review page and click OK to proceed.

Configure Cluster Database: Review: (Cluster Database) - Oracle Enterprise Manager - Mozilla Firefox (on em12)

File Edit View History Bookmarks Tools Help

https://em12.example.com:7799/em/faces/sdk/nonFacesWrapper?\_em.coBM=/console/database

ORACLE Enterprise Manager Cloud Control 12c

Help Log Out

Properties Install Packages Credentials Parameters Review

Configure Cluster Database: Review

Review the changes made below for this database. Select "OK" when you are done, or select "Back" to edit the changes.

Name dbm.example.com  
Database System dbm.example.com\_sys

**Properties**

Name	Value
Oracle Home Path	/u01/app/oracle/product/11.2.0/dbhome_1
Monitor Username	dbsnmp
Monitor Password	*****
Role	*****
Cluster Name	qr01-cluster
Service Name	dbm.example.com
Preferred Connect String	

TIP Configuration changes will only take effect for those databases that are added as targets.

**Instances**

Name	Host	Listener Machine Name	Port	SID
dbm.example.com_dbm1	qr01db01.example.com	qr01client01-vip.example.com	1521	dbm1
dbm.example.com_dbm2	qr01db02.example.com	qr01client02-vip.example.com	1521	dbm2

**Install Monitor Objects**

Skip these steps. These metrics will remain disabled.

Cancel Back Step 5 of 5 OK

74. Scroll down the Discovered Targets page, and specify `oracle_4U` as the ASM monitor password.

**Single Instance Database**

Select	Name	Host	Database System	Monitor Password	Group	Configure
No items found						

**TIP** Configuration changes will only take effect for those databases that are added as targets.

**Cluster ASM**

The following Cluster ASM have been discovered on this cluster.

Select All | Select None | Expand All | Collapse All

Select	Name	Type	Monitor Password	Configure
<input type="checkbox"/>	Cluster ASM			
<input checked="" type="checkbox"/>	+ASM_qr01-cluster	Cluster ASM	***** *	
<input type="checkbox"/>	+ASM1_qr01db01.example.com	Automatic Storage Management		
<input type="checkbox"/>	+ASM2_qr01db02.example.com	Automatic Storage Management		

**Listeners**

The following listeners have been discovered on this cluster.

Select All | Select None

Select	Name	Host	Machine Name	Listener Name	Oracle Home	Group	Port	Listener Directory
<input checked="" type="checkbox"/>	LISTENER_qr01db01.example.com	qr01db01.example.com	qr01client01-vip.example.com	LISTENER	/u01/app/11.2.0/grid		1521	/u01/app/11.2.0/grid/network/admin
<input checked="" type="checkbox"/>	LISTENER_SCAN2_qr01-cluster	qr01db01.example.com	qr01-scan.example.com	LISTENER_SCAN2	/u01/app/11.2.0/grid		1521	/u01/app/11.2.0/grid/network/admin
<input checked="" type="checkbox"/>	LISTENER_SCAN3_qr01-cluster	qr01db01.example.com	qr01-scan.example.com	LISTENER_SCAN3	/u01/app/11.2.0/grid		1521	/u01/app/11.2.0/grid/network/admin

75. Finally, scroll to the bottom of the Discovered Targets page and click Finish.

Select	Name	Host	Machine Name	Listener Name	Oracle Home	Group	Port	Listener Directory
<input checked="" type="checkbox"/>	LISTENER_qr01db01.example.com	qr01db01.example.com	qr01client01-vip.example.com	LISTENER	/u01/app/11.2.0/grid		1521	/u01/app/11.2.0/grid/network/admin
<input checked="" type="checkbox"/>	LISTENER_SCAN2_qr01-cluster	qr01db01.example.com	qr01-scan.example.com	LISTENER_SCAN2	/u01/app/11.2.0/grid		1521	/u01/app/11.2.0/grid/network/admin
<input checked="" type="checkbox"/>	LISTENER_SCAN3_qr01-cluster	qr01db01.example.com	qr01-scan.example.com	LISTENER_SCAN3	/u01/app/11.2.0/grid		1521	/u01/app/11.2.0/grid/network/admin
<input checked="" type="checkbox"/>	LISTENER_qr01db02.example.com	qr01db02.example.com	qr01client02-vip.example.com	LISTENER	/u01/app/11.2.0/grid		1521	/u01/app/11.2.0/grid/network/admin
<input checked="" type="checkbox"/>	LISTENER_SCAN1_qr01-cluster	qr01db02.example.com	qr01-scan.example.com	LISTENER_SCAN1	/u01/app/11.2.0/grid		1521	/u01/app/11.2.0/grid/network/admin

\* indicates the Monitor User with SYSDBA role.

[Test Connection](#) [Cancel](#) [Next](#) **Finish**

76. On the summary page that appears, click Save to add the database, listener, and ASM targets to Enterprise Manager.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. At the top, there's a navigation bar with links for File, Edit, View, History, Bookmarks, Tools, and Help. Below that is a toolbar with a back arrow, a URL field containing [https://em12.example.com:7799/em/faces/sdk/nonFacesWrapper?target=&\\_em.coBM=/console/](https://em12.example.com:7799/em/faces/sdk/nonFacesWrapper?target=&_em.coBM=/console/), a search bar, and various icons. The main title is "Discovered Targets on Cluster: qr01-cluster". Below the title, there are three tabs: "Discovered Targets", "Targets Global Properties", and "Summary". The "Summary" tab is selected. A sub-header "Discovered Targets on Cluster: qr01-cluster" is followed by a "Save" button. The main content area is divided into two sections: "Database Systems" and "Other Targets".

**Database Systems**

Name	Type	Host
dbm.example.com_sys	Database System	
dbm.example.com	Cluster Database	
LISTENER_qr01db02.example.com	Listener	qr01db02.example.com
LISTENER_qr01db01.example.com	Listener	qr01db01.example.com

**Other Targets**

Name	Type	Host
LISTENER_SCAN3_qr01-cluster	Listener	qr01db01.example.com
LISTENER_SCAN2_qr01-cluster	Listener	qr01db01.example.com
LISTENER_SCAN1_qr01-cluster	Listener	qr01db02.example.com
+ASM_qr01-cluster	Cluster ASM	

77. Examine the results page to ensure that no errors are reported. Click OK to proceed.

The screenshot shows a Mozilla Firefox browser window titled "Target Configuration Results - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The URL is https://em12.example.com:7799/em/faces/sdk/nonFacesWrapper?target=&\_em.coBM=/console/. The page content is as follows:

**Target Configuration Results**

**dbm.example.com:**  
Saving ...Properties for database target have been updated.  
Database System **dbm.example.com\_sys** has been created

**+ASM\_gr01-cluster:**  
Cluster ASM target has been added.

**LISTENER\_gr01db01.example.com:**  
Listener target has been added.

**LISTENER\_SCAN2\_gr01-cluster:**  
Listener target has been added.

**LISTENER\_SCAN3\_gr01-cluster:**  
Listener target has been added.

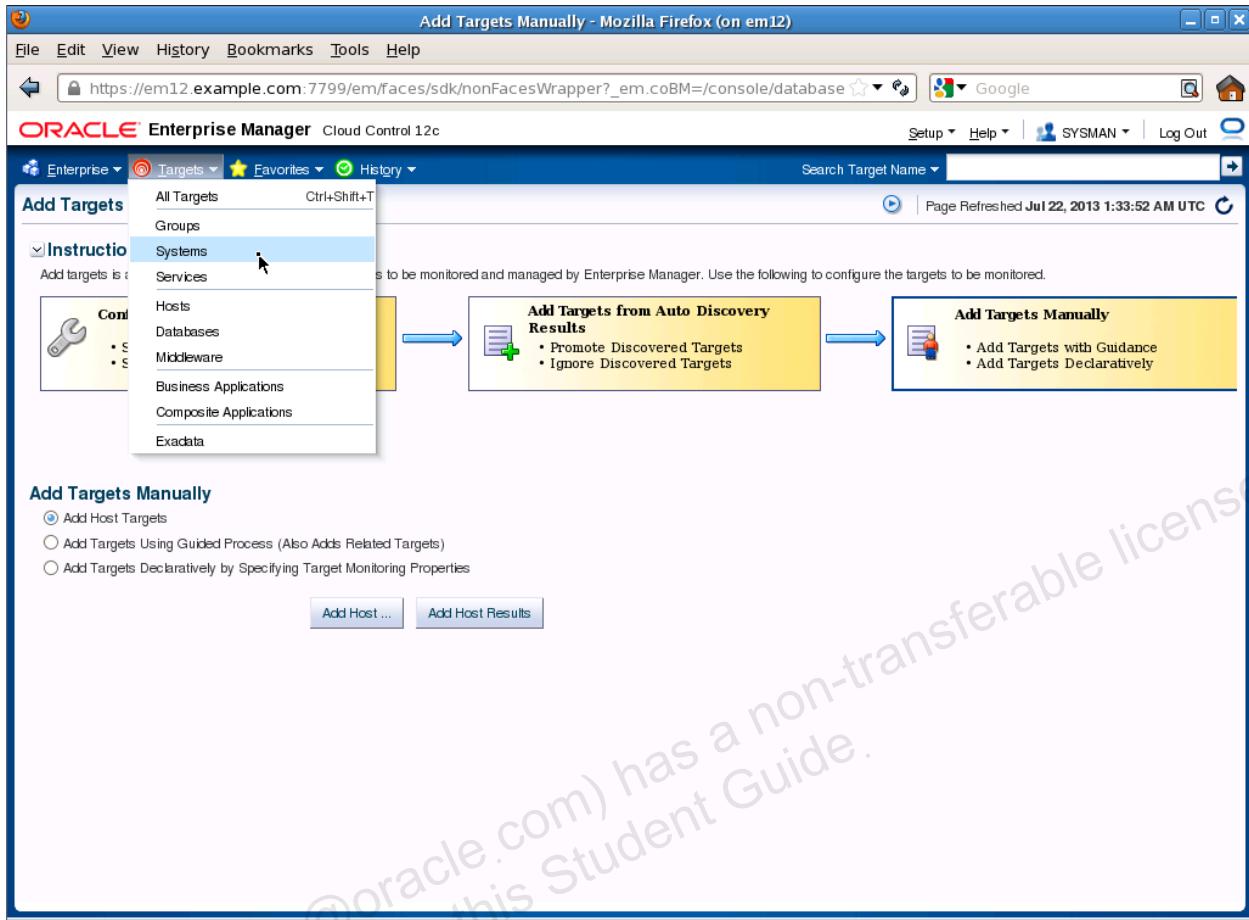
**LISTENER\_gr01db02.example.com:**  
Listener target has been added.

**LISTENER\_SCAN1\_gr01-cluster:**  
Listener target has been added.

In the top right corner of the main content area, there is an "OK" button with a cursor pointing at it. In the bottom right corner of the entire window frame, there is another "OK" button.

Notice that a Database System (dbm.example.com\_sys) is created as part of the database discovery process. In the next part of this practice, you will examine this system and complete its configuration.

78. Select the Targets > Systems menu command.



79. In Enterprise Manager, a System is a collection of related components. When you discovered the cluster database earlier in this practice, a Database System was implicitly created for you. Initially, the Database System will be associated with the cluster database and its database instances. Over time, Enterprise Manager will automatically add associations to other related entities, such as listeners and ASM. To proceed without waiting, you can also add the associations manually. To commence this process, select the row containing the dbm.example.com\_sys system and click Edit.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Systems - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area is titled "Systems". A sub-header states: "A system is a collection of related manageable entities which together provide one or more business functions. Members of any system can have well-defined relationships amongst themselves, called associations." Below this is a search bar with "Search All" and "Name" fields, and an "Advanced Search" link. The main table has columns: Name, Privilege Propagation, Type, Status, Members, Member Status Summary, and Incidents. The "dbm.example.com" row is selected, indicated by a blue border. The "Edit" button in the toolbar above the table is highlighted with a yellow box. The URL in the browser is https://em12.example.com:7799/em/faces/sdk/nonFacesWrapper?\_em.coBM=/console/database&op=241079335129038&\_afrWindowMode=0&\_afrWindowId=w5hkoni2m\_452#.

Name	Privilege Propagation	Type	Status	Members	Member Status Summary	Incidents
/EMGC_GCDoma	✓	Oracle WebLogic Domain	n/a	Application Deployment(4), Metadata Repository(2), Oracle Home(2), ... More	- - 6 - 4 - - -	- - - - - - - -
/EMGC_GCDoma	✓	Application Deployment	?		- - - - - - - -	- - - - - - - -
/EMGC_GCDoma	✓	Application Deployment	?		- - - - - - - -	- - - - - - - -
/EMGC_GCDoma	✓	Application Deployment	?		- - - - - - - -	- - - - - - - -
/EMGC_GCDoma	✓	Application Deployment	?		- - - - - - - -	- - - - - - - -
dbm.example.com	✓	Database System	?	Database Instance(2), Oracle Home(1), Listener(1), ... More	- 3 - 1 1 - - -	- - - - - - - -
EMGC_GCDoma	✓	Oracle Fusion Middleware	n/a	Application Deployment(4), Metadata Repository(2), Oracle Home(2), ... More	- - 7 - 5 - - -	- - - - - - - -
Management Serv	✗	OMS and Repository	?	Application Deployment(3), Host(1), Oracle Management Service(1), ... More	- - 8 - - - - 1	- - - - - - - -

80. Click Next.

Edit Database System - Mozilla Firefox (on em12)

File Edit View History Bookmarks Tools Help

https://em12.example.com:7799/em/faces/adf.task-flow?adf.tfDoc=%2FWEB-INF%2Fdb%2Fsystem

ORACLE Enterprise Manager Cloud Control 12c

General Members Review

Edit Database System : General

Name: dbm.example.com\_sys

Comment:

Database: dbm.example.com

Contact:

Cost Center:

Department:

Lifecycle: None

Status: Line of Business

Line of Business:

Location:

Overview

- Database system contains Primary Database and related targets such as Listener and Automatic Storage Management. This will also include Standby Databases and its related targets if Database is in Data Guard configuration.
- Databases in the system can be Single Instance or Cluster Databases.
- Database System can serve as infrastructure system and be included in higher level systems. Other systems/targets can establish availability dependencies on the database system.
- Database System can host one or more services like any other system in Enterprise Manager.

Back Step 1 of 3 Next Cancel

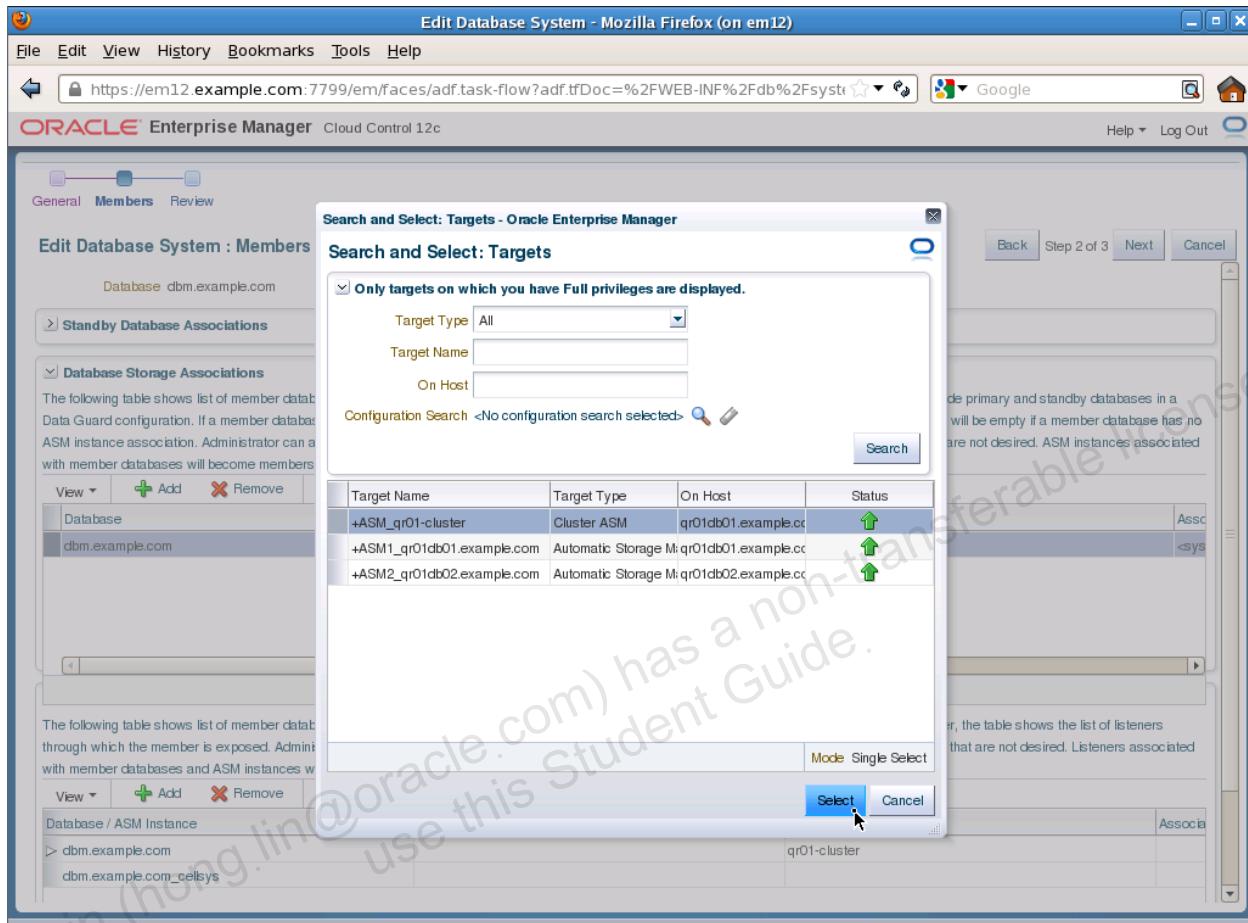
81. On the Edit Database System Members page, examine the Database Storage Associations. If +ASM\_qr01-cluster is listed under ASM, you can skip directly to step 83. If no ASM association is present, or if any value other than +ASM\_qr01-cluster is listed under ASM (as shown in the following example), select the DBM database and click Add.

Database	ASM	Host / Cluster	Assoc
dbm.example.com	dbm.example.com_cellsys	qr01db01.example.com	<sys>

Database / ASM Instance	Listener	Host / Cluster	Assoc
dbm.example.com		qr01-cluster	
dbm.example.com_cellsys			

82. In the dialog box that appears, select the cluster ASM target (+ASM\_qr01-cluster) and click Select to proceed. If the cluster ASM target (+ASM\_qr01-cluster) is not available for selection, click Cancel to exit the dialog box, click Cancel to exit the Edit Database System Members page, and go back to step 79.



83. Re-examine the Database Storage Associations and confirm that the DBM database is associated with the ASM cluster. Then click the icon to collapse the Database Storage Associations area (as shown in the following example).

**Edit Database System : Members**

Database dbm.example.com Cluster qr01-cluster

**Database Storage Associations**

Database	ASM	Host / Cluster	Assoc
dbm.example.com	+ASM_qr01-cluster	qr01-cluster	SYS

The following table shows list of member databases, ASM instances in the database system and each member's association to listeners. For each member, the table shows the list of listeners through which the member is exposed. Administrator can add associations with listeners if not discovered. Administrator can remove listener associations that are not desired. Listeners associated with member databases and ASM instances will become members of the database system.

Database / ASM Instance	Listener	Host / Cluster	Assoc
> dbm.example.com		qr01-cluster	
> +ASM_qr01-cluster		qr01-cluster	

84. In the Listener Associations area of the Edit Database System Members page, select the View > Expand All menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Edit Database System - Mozilla Firefox (on em12)". The main content area is titled "Edit Database System : Members". It displays a table of Listener associations for a database named "dbm.example.com" in a cluster named "qr01-cluster". The table has columns for Listener, Host / Cluster, and Association. Two entries are shown: "qr01-cluster" and "qr01-cluster". A context menu is open over the table, with the "Expand All" option highlighted. Other options in the menu include "View", "Add", "Remove", "Columns", "Expand", "Collapse All Below", "Collapse All Below", "Reorder Columns...", "Scroll to First" (Ctrl+Home), and "Scroll to Last" (Ctrl+End).

Listener	Host / Cluster	Association
	qr01-cluster	
	qr01-cluster	

85. Examine the expanded list entries. If your list contains all the listener associations shown in the following screenshot, you can skip directly to step 88. Otherwise, repeat steps 86 and 87 until your listener associations match the following list. If the expanded list does not contain all of the database and ASM instances shown in the following screenshot, click Cancel to exit the Edit Database System Members page, and go back to step 79.

Database / ASM Instance	Listener
▽ dbm.example.com	
▽ dbm.example.com_dbm1	LISTENER_qr01db01.example.com LISTENER_SCAN1_qr01-cluster LISTENER_SCAN2_qr01-cluster LISTENER_SCAN3_qr01-cluster
▽ dbm.example.com_dbm2	LISTENER_qr01db02.example.com LISTENER_SCAN1_qr01-cluster LISTENER_SCAN2_qr01-cluster LISTENER_SCAN3_qr01-cluster
▽ +ASM_qr01-cluster	
▽ +ASM2_qr01db02.example.com	LISTENER_qr01db02.example.com
▽ +ASM1_qr01db01.example.com	LISTENER_qr01db01.example.com

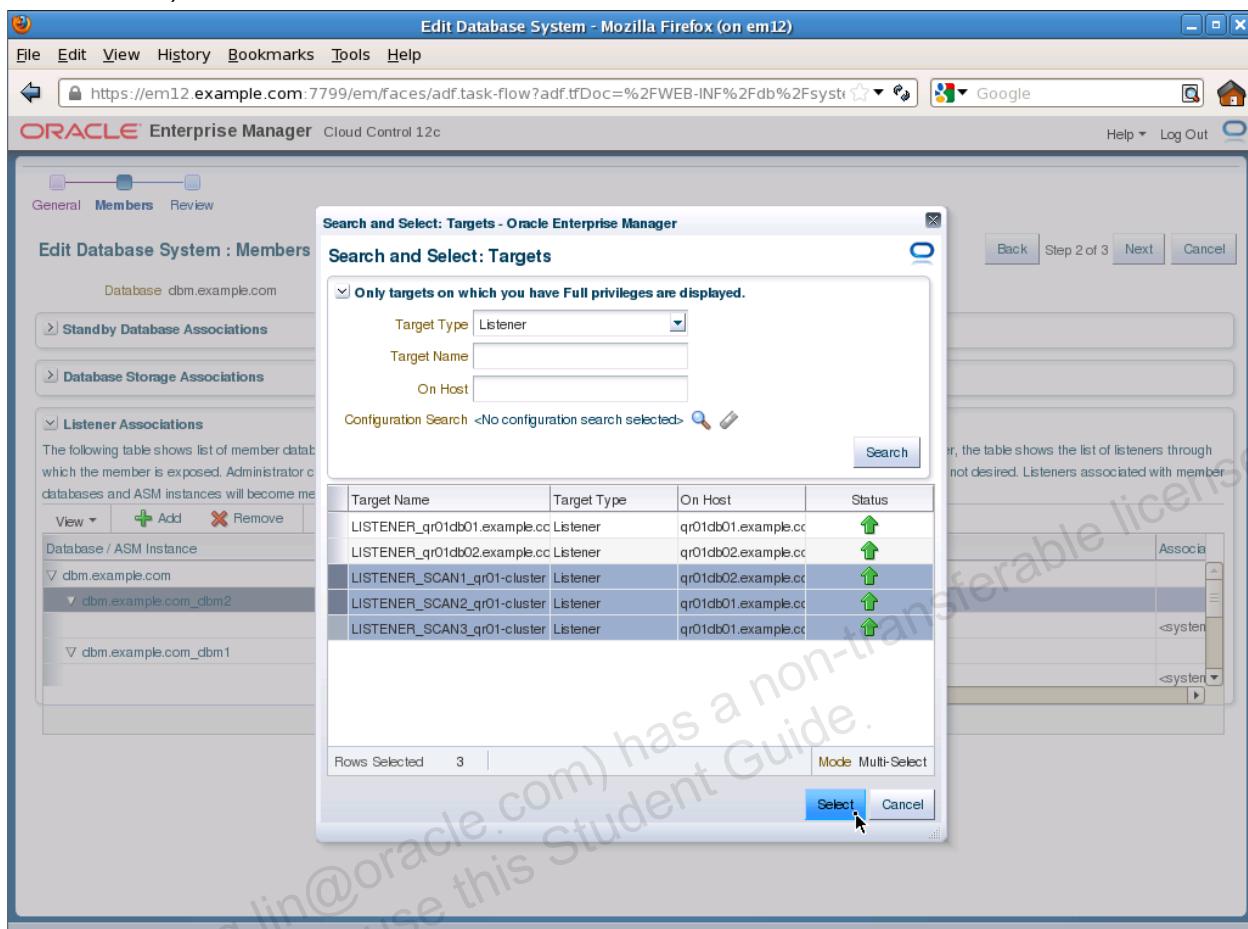
86. Listeners are associated with database instances and ASM instances. To create an association, select the desired instance and click Add.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Edit Database System - Mozilla Firefox (on em12)". The main content area is titled "Edit Database System : Members". It displays information for a database "dbm.example.com" and a cluster "qr01-cluster". The "Listener Associations" section contains a table with the following data:

Database / ASM Instance	Listener	Host / Cluster	Associations
dbm.example.com		qr01-cluster	
dbm.example.com_cdm2	LISTENER_qr01db02.example.com	qr01db02.example.com	<system>
dbm.example.com_cdm1	LISTENER_qr01db01.example.com	qr01db01.example.com	<system>

At the top of the table, there are buttons for "View", "Add" (highlighted with a cursor), and "Remove". The URL in the browser address bar is "https://em12.example.com:7799/em/faces/adf\_task-flow?adf\_tfDoc=%2FWEB-INF%2Fdb%2Fsystem&nURL=/em/faces/core-groups-allSystemsHome&\_afrLoop=241239695042931#".

87. In the dialog box that appears, select the desired listeners (Ctrl + click to select multiple listeners) and click Select.



88. Re-examine the Listener Associations and verify that your list now matches the list shown in step 85. After you ensure that the required Listener Associations are present, click Next to proceed.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Edit Database System - Mozilla Firefox (on em12)". The main content area is titled "Edit Database System : Members". A table lists listener associations for the database "dbm.example.com" in cluster "qr01-cluster". The table has columns: Database / ASM Instance, Listener, Host / Cluster, and Association. The data is as follows:

Database / ASM Instance	Listener	Host / Cluster	Association
dbm.example.com_cdm1	LISTENER_qr01db01.example.com	qr01db01.example.com	System
	LISTENER_SCAN1_qr01-cluster	qr01db02.example.com	SYSMA
	LISTENER_SCAN2_qr01-cluster	qr01db01.example.com	SYSMA
	LISTENER_SCAN3_qr01-cluster	qr01db01.example.com	SYSMA

At the top right of the page, there are "Back", "Step 2 of 3", "Next", and "Cancel" buttons. The "Next" button is highlighted with a blue background and white text.

89. Examine the review page and ensure that your member list matches all the targets shown in the following example. After you have verified the member list, click Finish.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Edit Database System - Mozilla Firefox (on em12)". The main window is titled "Edit Database System : Review". At the top, there are tabs for "General", "Members", and "Review", with "Review" being the active tab. Below the tabs, there are sections for "Name" (dbm.example.com\_sys) and "Comment". A "Availability Criteria" section indicates "Depends on Database (dbm.example.com)". The "Members" section contains a table with the following data:

Target Name	Target Type
dbm.example.com	Cluster Database
- dbm.example.com_dbm1	Database Instance
- dbm.example.com_dbm2	Database Instance
+ASM_qr01-cluster	Cluster ASM
- +ASM1_qr01db01.example.com	Automatic Storage Management
- +ASM2_qr01db02.example.com	Automatic Storage Management
LISTENER_SCAN1_qr01-cluster	Listener
LISTENER_qr01db02.example.com	Listener
LISTENER_SCAN1_qr01-cluster	Listener
LISTENER_SCAN2_qr01-cluster	Listener
LISTENER_qr01db01.example.com	Listener

On the right side of the screen, there is a "System Properties" panel with columns for "Contact", "Cost Center", "Department", "Lifecycle Status", "Line of Business", and "Location". The "Department" column lists the corresponding department for each target. The "Finish" button at the top right of the review page is highlighted with a mouse cursor.

90. On the Systems page that appears, you should see a notification regarding the successful modification of your Database System. You should also see that the Database System (dbm.example.com\_sys) now shows that 11 member targets are up.

Name	Privilege Propagation	Type	Status	Members	Member Status Summary	Incidents
> /EMGC_GCDoma	✓	Oracle WebLogic Domain	n/a	Application Deployment(4), Metadata Repository(2), Oracle Home(2), ... More	6 - 4 - - -	- - - - -
/EMGC_GCDoma	✓	Application Deployment	Up		- - - - -	- - - - -
/EMGC_GCDoma	✓	Application Deployment	Up		- - - - -	- - - - -
/EMGC_GCDoma	✓	Application Deployment	Up		- - - - -	- - - - -
/EMGC_GCDoma	✓	Application Deployment	Up		- - - - -	- - - - -
> dbm.example.com	✓	Database System	Up	Listener(5), Oracle Home(4), Database Instance(2), ... More	11 - 4 - - 5	- - - - -
> EMGC_GCDomain	✓	Oracle Fusion Middleware	n/a	Application Deployment(4), Metadata Repository(2), Oracle Home(2), ... More	7 - 5 - - -	- - - - -
> Management Serv	✗	OMS and Repository	Up	Application Deployment(3), Host(1), Oracle Management Service(1), ... More	8 - - - - 1	- - - - -

At this point, you have configured your Database Machine and related software services in Enterprise Manager. In the final part of this practice, you will configure a Database Machine Services Dashboard. The dashboard provides a one-stop overview that enables you to quickly and easily monitor the key availability and performance metrics for your Database Machine and the related software services on one page.

91. To commence the dashboard creation process, select the Enterprise > Job > Activity menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface in Mozilla Firefox. The navigation bar at the top includes links for File, Edit, View, History, Bookmarks, Tools, and Help. The address bar shows the URL [https://em12.example.com:7799/em/faces/core-groups-allSystemsHome?result=&\\_afrLoop=242](https://em12.example.com:7799/em/faces/core-groups-allSystemsHome?result=&_afrLoop=242). The main menu on the left has 'Job' expanded, with 'Activity' highlighted. A tooltip for 'Activity' states: "manageable entities which together provide one or more business functions. Members of any system can have well-defined relationships amongst themselves, called". Below the menu is a search bar with 'Name' and 'Advanced Search' buttons, and a 'Save...' button. The main content area displays a table of systems, with the first few rows shown below:

Name	Privilege Propagation	Type	Status	Members	Member Status Summary	Incidents		
/EMGC_GCDoma	✓	Oracle WebLogic Domain	n/a	Application Deployment(4)	Metadata Repository(2)	Oracle Home(2)	... More	- - 6 - 4 - - -
/EMGC_GCDoma	✓	Application Deployment	✓					- - - - - - - - -
/EMGC_GCDoma	✓	Application Deployment	✓					- - - - - - - - -
/EMGC_GCDoma	✓	Application Deployment	✓					- - - - - - - - -
/EMGC_GCDoma	✓	Database System	✓	Listener(5), Oracle Home(4), Database Instance(2), ... More				- 11 - - 4 - - 5 -
dbm.example.com	✓	Database System	✓	Listener(5), Oracle Home(4), Database Instance(2), ... More				- 11 - - 4 - - 5 -
/EMGC_GCDoma	✓	Oracle Fusion Middleware	n/a	Application Deployment(4)	Metadata Repository(2)	Oracle Home(2)	... More	- - 7 - 5 - - -
Management Serv	✗	OMS and Repository	✗	Application Deployment(3)	Host(1), Oracle Management Service(1)	Oracle Management Service(1)	... More	- - 8 - - - - 1 -

92. In the Create Job list, select the option to create a Database Machine Services Dashboard and click Go to proceed. Note that you may need to use the scroll bar along the bottom of the page to reveal the Go button.

The screenshot shows the Oracle Enterprise Manager Job Activity page. At the top, there's a navigation bar with links for File, Edit, View, History, Bookmarks, Tools, and Help. Below that is a browser header with the URL [https://em12.example.com:7799/em/faces/core-groups-allSystemsHome?result=&\\_afrLoop=242](https://em12.example.com:7799/em/faces/core-groups-allSystemsHome?result=&_afrLoop=242). The main content area is titled "Job Activity - Oracle Enterprise Manager - Mozilla Firefox (on em12)". It displays a table of scheduled jobs:

Name	Status (Executions)	Scheduled	Targets	Target Type	Owner	Job Type
RGE	1 Scheduled	Jul 23, 2013 2:00:00 AM GMT+00:00			SYSMAN	Software Library Purge
AD_CVU	1 Scheduled	Jul 23, 2013 12:00:00 AM GMT+00:00			SYSMAN	DownloadCVU
:_FROM_MY_ORACLE_SUPPORT_JOB	1 Scheduled	Jul 23, 2013 12:00:00 AM GMT+00:00			SYSMAN	Refresh From My Oracle Support
:WATCH_UPDATE_JOB	1 Scheduled	Jul 23, 2013 12:00:00 AM GMT+00:00			SYSMAN	OPatch Update
: UPDATES FROM ORACLE	1 Scheduled	Jul 22, 2013 11:34:00 PM GMT			SYSMAN	Refresh Updates
FRESHLOCSTATS	1 Scheduled	Jul 22, 2013 6:34:25 AM GMT+00:00			SYSMAN	Software Library Location Statistics Refresh
:ATUSJOB	1 Scheduled	Jul 22, 2013 4:00:00 AM GMT+00:00			SYS	MDADCStatus
PURGEJOB	1 Scheduled	Jul 22, 2013 4:00:00 AM GMT+00:00			SYS	MDADataMovementAndPurge
MOVEMENTJOB	1 Scheduled	Jul 22, 2013 4:00:00 AM GMT+00:00			SYS	MDADataMovementAndPurge

At the bottom right of the table, there's a "Go" button with a dropdown arrow. The status bar at the bottom of the browser window indicates "Page Refreshed Jul 22, 2013 2:02:08 AM UTC".

93. On the resulting page, specify QR01\_DASHBOARD as the job name. Also, add the DB Machine qr01.example.com target. (Click Add and select your Database Machine from the dialog box that appears.) Finally, click Submit to proceed.

The screenshot shows the 'Create 'Database Machine Services Dashboard' Job' dialog in Oracle Enterprise Manager. The 'General' tab is active. The 'Name' field contains 'QR01\_DASHBOARD'. The 'Target' section shows a table with one row:

Select	Name	Type	Host	Time Zone
<input type="checkbox"/>	DB Machine qr01.example.com	Oracle Exadata Database Machine	qr01db02.example.com	Eastern Daylight Time

At the bottom right of the dialog are 'Cancel', 'Save to Library', and 'Submit' buttons, with 'Submit' being the one currently highlighted.

94. On the Job Activity page, you should see a notification confirming that your dashboard creation job was submitted successfully. Click the QR01\_DASHBOARD link associated with the confirmation message.

The screenshot shows the Oracle Enterprise Manager Job Activity page. At the top, there is a confirmation message: "The job was created successfully" with a link to "QR01\_DASHBOARD". Below this, there is a search bar and a table listing scheduled jobs. The table columns include Select, Name, Status (Executions), Scheduled, Targets, Target Type, Owner, and Job Type. The listed jobs are:

Select	Name	Status (Executions)	Scheduled	Targets	Target Type	Owner	Job Type
<input checked="" type="radio"/>	SWLIBPURGE	1 Scheduled	Jul 23, 2013 2:00:00 AM GMT+00:00			SYSMAN	Software Lib
<input type="radio"/>	DOWNLOAD_CVU	1 Scheduled	Jul 23, 2013 12:00:00 AM GMT+00:00			SYSMAN	DownloadCV
<input type="radio"/>	REFRESH_PROM_MY_ORACLE_SUPPORT_JOB	1 Scheduled	Jul 23, 2013 12:00:00 AM GMT+00:00			SYSMAN	Refresh Prom
<input type="radio"/>	OPATCH_PATCH_UPDATE_JOB	1 Scheduled	Jul 23, 2013 12:00:00 AM GMT+00:00			SYSMAN	OPatch Upda
<input type="radio"/>	REFRESH_UPDATES_FROM_ORACLE	1 Scheduled	Jul 22, 2013 11:34:00 PM GMT			SYSMAN	Refresh Upd
<input type="radio"/>	SWLIBREFRESHLOCREADS	1 Scheduled	Jul 22, 2013 6:34:25 AM GMT+00:00			SYSMAN	Software Lib Statistics Re
<input type="radio"/>	MDADCSTATUSJOB	1 Scheduled	Jul 22, 2013 4:00:00 AM GMT+00:00			SYS	MDADCStat

The URL in the browser address bar is: <https://em12.example.com:7799/em/console/jobs/runDetails?execId=E210329BF49127AFE043120200C05E02>.

95. Examine the job status and periodically refresh the page until the job status is shown as Succeeded. Now the Database Machine Services Dashboard is created.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Job Run: QR01\_DASHBOARD - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area displays the "Job Run: QR01\_DASHBOARD" page. At the top, it shows the scheduled date as "Jul 22, 2013 2:06:27 AM GMT+00:00" and the target as "DB Machine qr01.example.com". The "Type" is listed as "Database Machine Services Dashboard" and the "Owner" as "SYSMAN". Below this, there is a section titled "Executions" with a table showing one execution record:

Select	Details	Targets	Status	Started	Ended	Elapsed Time
<input checked="" type="radio"/>	> Show	DB Machine qr01.example.com	Succeeded	Jul 22, 2013 2:06:32 AM GMT+00:00	Jul 22, 2013 2:06:51 AM GMT+00:00	18 seconds

At the bottom of the page, there are buttons for "Delete Run", "Create Like", "Edit", and "View Definition". A watermark across the page reads "Hong Lin (hong.lin@oracle.com) has a non-transferable license to use this Student Guide."

96. To examine the Database Machine Services Dashboard, select the Enterprise > Reports > Information Publisher Reports menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Job Run: QR01\_DASHBOARD - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The left sidebar has a "Reports" section with a dropdown arrow over "Information Publisher Reports". The main content area displays a table of job runs:

Select	Details	Targets	Status	Started	Ended	Elapsed Time
	> Show	DB Machine qr01.example.com	Succeeded	Jul 22, 2013 2:06:32 AM GMT+00:00	Jul 22, 2013 2:06:51 AM GMT+00:00	18 seconds

Below the table are buttons: Delete Run, Create Like, Edit, and View Definition. The status bar at the bottom says "Page Refreshed Jul 22, 2013 2:08:10 AM UTC". A watermark "Hong Lin (hong.lin@oracle.com) has a non-transferable license to use this Student Guide." is diagonally across the page.

97. Enter qr01 in the Title search field and click Go.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Information Publisher Report Definitions - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area is titled "Information Publisher Reports". A search bar at the top left contains "Title qr01", "Owner All", and "Target Type All". Below the search bar is a "Go" button, which is highlighted with a mouse cursor. To the right of the search bar is a "Search Target Name" input field and a "Page Refreshed Jul 22, 2013 2:10:39 AM UTC" message. The main table lists various report definitions, each with a "Select" checkbox, a "Title" column, a "Description" column, a "Date Generated" column, and an "Owner" column. The reports listed are:

Select	Title	Description	Date Generated	Owner
<input type="checkbox"/>	Information Publisher Reports			SYSMAN
<input type="checkbox"/>	Cisco			SYSMAN
<input type="checkbox"/>	Cisco Switch			SYSMAN
<input checked="" type="checkbox"/>	Network Info Switch	Network information		SYSMAN
<input type="checkbox"/>	System Health Switch	System health information		SYSMAN
<input type="checkbox"/>	Compliance			SYSMAN
<input type="checkbox"/>	Descriptions			SYSMAN
<input type="checkbox"/>	Compliance Group Library Summary	Compliance Group Library Summary		SYSMAN
<input type="checkbox"/>	Compliance Standard Library Summary	Compliance Standard Library Summary		SYSMAN
<input type="checkbox"/>	Compliance Standard Rule Summary	Compliance Standard Rule Summary		SYSMAN
<input type="checkbox"/>	Results			SYSMAN
<input type="checkbox"/>	Compliance Group evaluation Summary	Compliance Group evaluation Summary		SYSMAN
<input type="checkbox"/>	Compliance Standard Result Details	Compliance Standard Result Details		SYSMAN

98. Click the “DB Machine qr01.example.com\_DASHBOARD\_REPORT” link to run the Database Machine Services Dashboard.

The screenshot shows the Oracle Enterprise Manager Information Publisher Reports page. The URL in the address bar is [https://em12.example.com:7799/em/faces/core-groups-allSystemsHome?result=&\\_afrLoop=242](https://em12.example.com:7799/em/faces/core-groups-allSystemsHome?result=&_afrLoop=242). The page title is "Information Publisher Report Definitions - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The search bar has "qr01" in the Title field and "All" in the Target Type field. The search results table lists several reports, including "DB Machine qr01.example.com\_DASHBOARD\_REPORT" which is selected and highlighted in blue. The table columns are Select, Title, Description, Date Generated, and Owner. The "DB Machine qr01.example.com\_DASHBOARD\_REPORT" row has a description of "Dashboard for monitoring DB Machine:DB Machine qr01.example.com and its associated components" and an owner of "SYSMAN". A note at the bottom left says "indicates an Oracle-provided report. Oracle-provided reports cannot be edited, but you can use Create Like to create a report that can be edited." A related link "Enterprise Manager Information Publisher Reports" is also present.

Select	Title	Description	Date Generated	Owner
<input type="radio"/>	▼ Information Publisher Reports			
<input type="radio"/>	▼ Monitoring			
<input type="radio"/>	▼ Dashboards			
<input checked="" type="radio"/>	<a href="#">DB Machine qr01.example.com_DASHBOARD_REPORT</a>	Dashboard for monitoring DB Machine:DB Machine qr01.example.com and its associated components		SYSMAN

99. Examine the Database Machine Services Dashboard. You should be able to quickly confirm that all the Database Machine hardware and software components are currently operational. You may also notice that currently many of the metrics are empty. In a production environment, this would quickly change as the metrics are gathered and displayed by Enterprise Manager. In this laboratory environment, some of the metrics will never be displayed because the components that would normally generate the metrics are not fully functional.

Service	Status	Performance	Usage and Business Indicators	Components	Service Level		
					Last 24 Hours	Last 7 Days	Last 31 Days
DB Machine qr01.example.com-Exadata ILOM Service		No Metrics Available	No Metrics Available	2 Up	100.00%	100.00%	100.00%
DB Machine qr01.example.com-Exadata PDU Service		No Metrics Available	No Metrics Available	2 Up	100.00%	100.00%	100.00%
DB Machine qr01.example.com-Exadata Cisco Switch Service		No Metrics Available	No Data Memory Pool Usage	1 Up	100.00%	100.00%	100.00%
DB Machine qr01.example.com-Exadata Infiniband Service		No Metrics Available	No Data Average Link Through...	2 Up	100.00%	100.00%	100.00%
DB Machine qr01.example.com-Exadata Storage Servers Service		No Data Average Read Respons...	No Data Average Write Respons...	3 Up	100.00%	100.00%	100.00%
DB Machine							

100. Along with providing a one-stop monitoring overview of all the Database Machine hardware and software components, the Database Machine Services Dashboard also enables you to drill into further details by clicking various links across the entire dashboard. Click “DB Machine qr01.example.com-Exadata Storage Servers Service” to examine further details about the Exadata Database Machine storage servers.

Service	Status	Performance	Usage and Business Indicators	Components	Service Level		
					Last 24 Hours	Last 7 Days	Last 31 Days
DB Machine qr01.example.com-Exadata ILOM Service	<span style="color: green;">▲</span>	No Metrics Available	No Metrics Available	<span style="color: green;">Up</span> 2 Up	100.00%	100.00%	100.00%
DB Machine qr01.example.com-Exadata PDU Service	<span style="color: green;">▲</span>	No Metrics Available	No Metrics Available	<span style="color: green;">Up</span> 2 Up	100.00%	100.00%	100.00%
DB Machine qr01.example.com-Exadata Cisco Switch Service	<span style="color: green;">▲</span>	No Metrics Available	<div style="width: 100px; height: 10px; background-color: #ccc; margin-bottom: 5px;"></div> No Data Memory Pool Usage	<span style="color: green;">Up</span> 1 Up	100.00%	100.00%	100.00%
DB Machine qr01.example.com-Exadata Infiniband Service	<span style="color: green;">▲</span>	No Metrics Available	<div style="width: 100px; height: 10px; background-color: #ccc; margin-bottom: 5px;"></div> No Data Average Link Through...	<span style="color: green;">Up</span> 2 Up	100.00%	100.00%	100.00%
DB Machine qr01.example.com-Exadata Storage Servers Service	<span style="color: green;">▲</span>	<div style="width: 100px; height: 10px; background-color: #ccc; margin-bottom: 5px;"></div> No Data Average Read Respons...	<div style="width: 100px; height: 10px; background-color: #ccc; margin-bottom: 5px;"></div> No Data Average Write Respons...	<span style="color: green;">Up</span> 3 Up	100.00%	100.00%	100.00%
DB Machine	<span style="color: green;">▲</span>						

https://em12.example.com:7799/em/console/gensvc/view/gensvcHome?target=...xadata Storage Servers Service&type=generic\_service&ctxType=Services

101.The resulting page shows further summary information about the Database Machine storage service. Click “Exadata Grid qr01.example.com.”

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "DB Machine qr01.example.com-Exadata Storage Servers Service (generic\_service) - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area displays the "Generic Service: DB Machine qr01.example.com-Exadata Storage Servers Service" page. The "General" section shows the status as "Up" with a green arrow icon, indicating a "Black Out". Other metrics shown include "Up Since" Jul 21, 2013 9:57:33 PM, "Last Calculated" Jul 21, 2013 10:12:34 PM, "Availability (%) 100 (Last 24 Hours)", "Performance" (green checkmark), "Usage" (green checkmark), "Actual Service Level (%) 100.00 (Last 24 Hours)", and "Expected Service Level (%) 85.00". The "Key Component Summary" section shows the system as "Exadata Grid qr01.example.com (Topology)" with 3 up components and 0 incidents. The "Key Test Summary" section shows "No Test Defined.". The "All Service Incidents" section shows a table with columns: Target Name, Target Type, Severity, Message, Incident Creation Date, Incident Last updated Date, and Escalation Level. The table is currently empty, showing "No Incidents". The URL in the address bar is [https://em12.example.com:7799/em/faces/exadata\\_system\\_home?target=Exadata Grid qr01.example.com&type=oracle\\_exadata\\_grid](https://em12.example.com:7799/em/faces/exadata_system_home?target=Exadata Grid qr01.example.com&type=oracle_exadata_grid).

102.Now you have navigated back to the Exadata Grid home page, which you visited earlier in the practice.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Exadata System Home: Exadata Grid qr01.example.com (Oracle Exadata Storage Server Grid) - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area displays the "Exadata Grid qr01.example.com" dashboard. On the left, the "Target Navigation" sidebar lists targets under "DB Machine qr01.example.com", "Compute Nodes", "Exadata Grid qr01.example.com" (selected), "IB Network qr01.example.com", and "IB Network qr01sw.example.com". The main panel has several sections: "Overview" (Status: 3 up, 3 down; Health: 3 green checkmarks; IORM Status: Enabled; Release Version: 11.2.3.2.1); "Performance" (Average IO Load chart showing Flash Disk IO Load and Hard Disk IO Load, and a CPU Utilization chart); "Capacity" (CellDisk Size (GB): 68, HardDisk Size (GB): 56, FlashDisk Size (GB): 12, FlashCache Size (GB): 9, all at 100%); "ASM Diskgroup Summary" (Table showing ASM, Disk Group, Size (GB), Free Space (GB), and No. of PEs for four disk groups: DATA2\_QR01, DATA\_QR01, DBFS\_DG, and RECO\_QR01); and "Incidents" (Summary section stating "No matching incidents or problems found").

Congratulations! You have now configured Enterprise Manager Cloud Control 12c to monitor and manage Exadata Database Machine.

103.Exit your terminal sessions and log out of Enterprise Manager.

## Practice 14-2: Post-Discovery Configuration and Verification

### Overview

In this practice, you perform some of the recommended post-discovery configuration and verification tasks. Specifically, you will:

- Configure SNMP forwarding on the Database Machine servers that host the Enterprise Manager Agent.
- Verify the SNMP configuration for the Exadata Storage Servers.

Note that other recommended post-discovery tasks cannot be performed in your laboratory environment. For more information, refer to chapter 3 of the *Oracle Enterprise Manager Exadata Management Getting Started Guide Release 12.1*.

### Assumptions

This practice relies on the configuration activities performed in the previous practice.

### Tasks

SNMP is used extensively throughout Exadata Database Machine so that the various components can report monitoring information and alerts to network management systems, such as Enterprise Manager Cloud Control 12c. Enterprise Manager Agents listen for SNMP events (also known as traps) and propagate the trap information to the OMS so that it can be processed and displayed to administrators. Some Exadata components, such as the Cisco Ethernet switch, have no documented way to send SNMP traps to ports other than UDP 162. However, the Oracle Management Agent runs as the `oracle` user and cannot listen on UDP ports under 1024. Because of these restrictions, a trap forwarder must be configured so that the SNMP traps sent to port 162 are forwarded to Enterprise Manager through the Oracle Management Agent.

In the first part of this practice, you will configure SNMP forwarding on the Database Machine servers that host the Enterprise Manager Agent.

1. Establish a terminal session connected to `qr01db01` by using the `root` OS user.

```
$ ssh root@qr01db01
root@qr01db01's password: <oracle>
[root@qr01db01 ~]#
```

2. Confirm the port number used by the Enterprise Manager Agent. One way to do this is to examine the `EMD_URL` property in the `<AGENT_INST>/sysman/config/emd.properties` file. By default, the agent will listen on port 3872.

```
[root@qr01db01 ~]# grep EMD_URL= /u01/app/oracle/product/12.1.0/
agent/agent_inst/sysman/config/emd.properties
EMD_URL=https://qr01db01.example.com:3872/emd/main/
[root@qr01db01 ~]#
```

3. Using the following command, confirm that the port you identified in the previous step is currently being used to listen for UDP messages. This is an indication that the agent is listening for SNMP traps.

```
[root@qr01db01 ~]# netstat -an | grep 3872 | grep udp
udp        0      0 0.0.0.0:3872          0.0.0.0:*
```

```
[root@qr01db01 ~]#
```

4. Ensure that the snmptrapd OS service is currently stopped.

```
[root@qr01db01 ~]# service snmptrapd status
snmptrapd is stopped
[root@qr01db01 ~]#
```

5. Using the following command, configure the snmptrapd OS service so that SNMP traps received on the default port (162) are forwarded to the Enterprise Manager Agent. Note that in a production environment, if you are using SNMP community values in your network, you should alter the configuration in this step to reflect your community values rather than using the default public community. Also, ensure that the port number at the end of the forward directive matches your agent port.

```
[root@qr01db01 ~]# cat > /etc/snmp/snmptrapd.conf << END
> authcommunity log,execute,net public
> forward default udp:localhost:3872
> END
[root@qr01db01 ~]#
```

6. Configure the snmptrapd OS service so that it is automatically started whenever the server is booted.

```
[root@qr01db01 ~]# chkconfig snmptrapd on
[root@qr01db01 ~]#
```

7. Start the snmptrapd OS service.

```
[root@qr01db01 ~]# service snmptrapd start
Starting snmptrapd:                                     [ OK ]
[root@qr01db01 ~]#
```

At this point, you have configured and started SNMP forwarding on qr01db01.

8. Next, repeat the process on qr01db02.

```
$ ssh root@qr01db02
root@qr01db02's password: <oracle>
[root@qr01db02 ~]# grep EMD_URL= /u01/app/oracle/product/12.1.0/
agent/agent_inst/sysman/config/emd.properties
EMD_URL=https://qr01db02.example.com:3872/emd/main/
[root@qr01db02 ~]# netstat -an | grep 3872 | grep udp
udp        0      0 0.0.0.0:3872          0.0.0.0:*
```

```
[root@qr01db02 ~]# service snmptrapd status
```

```

snmptrapd is stopped
[root@qr01db02 ~]# cat > /etc/snmp/snmptrapd.conf << END
> authcommunity log,execute,net public
> forward default udp:localhost:3872
> END
[root@qr01db02 ~]# chkconfig snmptrapd on
[root@qr01db02 ~]# service snmptrapd start
Starting snmptrapd: [ OK ]
[root@qr01db02 ~]#

```

Earlier, when you performed the Database Machine discovery process, your Exadata Storage Servers were configured to send alerts to Enterprise Manager by using SNMP. In the final part of this practice, you will confirm the SNMP configuration on your Exadata Storage Servers.

- Establish a terminal session connected to qr01cel01 by using the celladmin OS user.

```

$ ssh celladmin@qr01cel01
celladmin@qr01cel01's password: <welcome>
[celladmin@qr01cel01 ~] $

```

- Using the following command, examine the notificationMethod storage server attribute. Seeing snmp in the notification method, confirms that SNMP notifications are enabled.

```

[celladmin@qr01cel01 ~]$ dcli -c qr01cel01,qr01cel02,qr01cel03
cellcli -e list cell attributes notificationMethod
qr01cel01: mail,snmp
qr01cel02: snmp
qr01cel03: snmp
[celladmin@qr01cel01 ~] $

```

- Using the following command, examine the snmpSubscriber storage server attribute. As shown in the example output below, your storage servers should be configured to send SNMP traps directly to all the Enterprise Manager agents. This eliminates the possibility of alert messages getting lost due to the loss or unavailability of a single agent.

```

[celladmin@qr01cel01 ~]$ dcli -c qr01cel01,qr01cel02,qr01cel03
cellcli -e list cell attributes snmpSubscriber
qr01cel01:
((host=qr01db02.example.com,port=3872,community=public), (host=qr01db01.example.com,port=3872,community=public))
qr01cel02:
((host=qr01db02.example.com,port=3872,community=public), (host=qr01db01.example.com,port=3872,community=public))
qr01cel03:
((host=qr01db02.example.com,port=3872,community=public), (host=qr01db01.example.com,port=3872,community=public))
[celladmin@qr01cel01 ~] $

```

12. Using the following command, examine the `notificationPolicy` storage server attribute. Your storage server should be configured to deliver critical alerts, warning alerts, and alert clearance notifications, as shown in the example below.

```
[celladmin@qr01cel01 ~]$ dcli -c qr01cel01,qr01cel02,qr01cel03  
cellcli -e list cell attributes notificationPolicy  
qr01cel01: critical,warning,clear  
qr01cel02: critical,warning,clear  
qr01cel03: critical,warning,clear  
[celladmin@qr01cel01 ~]$
```

13. Exit your terminal sessions.

## Practice 14-3: Environment Reconfiguration

### Overview

In this practice you will reconfigure your laboratory environment in preparation for the practices associated with the next lessons.

### Assumptions

This practice relies on the configuration activities performed in the previous practice.

### Tasks

1. Establish a terminal session connected to qr01db02 using the root OS user.

```
$ ssh root@qr01db02  
root@qr01db02's password: <oracle>  
[root@qr01db02 ~]#
```

2. Stop Cluster Ready Services (CRS) on qr01db02. This will stop Oracle Grid Infrastructure and Oracle Database processes on qr01db02.

```
[root@qr01db02 ~]# /u01/app/11.2.0/grid/bin/crsctl stop crs  
CRS-2791: Starting shutdown of Oracle High Availability  
Services-managed resources on 'qr01db02'  
CRS-2673: Attempting to stop 'ora.crsd' on 'qr01db02'  
CRS-2790: Starting shutdown of Cluster Ready Services-managed  
resources on 'qr01db02'  
...  
CRS-2673: Attempting to stop 'ora.gpnpd' on 'qr01db02'  
CRS-2677: Stop of 'ora.gpnpd' on 'qr01db02' succeeded  
CRS-2793: Shutdown of Oracle High Availability Services-managed  
resources on 'qr01db02' has completed  
CRS-4133: Oracle High Availability Services has been stopped.  
[root@qr01db02 ~]#
```

3. Exit your terminal session.

## **Practices for Lesson 15: Monitoring Exadata Storage Servers**

**Chapter 15**

## Practices for Lesson 15

---

### Practices Overview

In these practices, you will monitor Exadata Storage Server by using metrics, alerts, and active requests. You will also perform a variety of Exadata Storage Server monitoring and administration tasks by using Enterprise Manager Cloud Control 12c.

## Practice 15-1: Metrics, Alerts, and Active Requests

---

### Overview

In this practice, you will monitor Exadata Storage Server by using metrics, alerts, and active requests.

### Tasks

1. Establish a terminal connection to the qr01cel01 Exadata cell as the celladmin user.
2. Launch the Exadata cell command-line interface (CellCLI).

```
[celladmin@qr01cel01 ~] $ cellcli
CellCLI: Release 11.2.3.2.1 - Production...
CellCLI>
```

Metrics are recorded observations of important runtime properties or internal instrumentation values of the storage cell and its components, such as cell disks or grid disks.

3. Execute the LIST METRICDEFINITION command to list every metric.

```
CellCLI> list metricdefinition
CD_BY_FC_DIRTY
CD_IO_BY_R_LG
CD_IO_BY_R_LG_SEC
CD_IO_BY_R_SM
CD_IO_BY_R_SM_SEC
...
N_MB_SENT_SEC
N_NIC_KB_RCV_SEC
N_NIC_KB_TRANS_SEC
N_NIC_NW
N_RDMA_RETRY_TM

CellCLI>
```

4. Execute LIST METRICDEFINITION DETAIL to view more comprehensive information about all the metrics.

```
CellCLI> list metricdefinition detail
...
name: N_NIC_KB_TRANS_SEC
description: "Number of kilobytes transmitted by Ethernet
interfaces per second"
metricType: Rate
objectType: CELL
unit: KB/sec

name: N_NIC_NW
description: "Number of inactive network interfaces"
metricType: Instantaneous
objectType: CELL
```

```

unit: Number

name: N_RDMA_RETRY_TM
description: "Latency of the retry actions during RDMA transmission to a particular host"
metricType: Cumulative
objectType: HOST_INTERCONNECT
unit: ms

CellCLI>
```

5. Add a WHERE condition to view information about specific metrics. Note the metrics CL\_MEMUT and CL\_FSUT, which you will use later in this practice.

```

CellCLI> list metricdefinition where name like 'CL_.*' detail
...
name: CL_FSUT
description: "Percentage of total space on this file system that is currently used"
metricType: Instantaneous
objectType: CELL_FILESYSTEM
unit: %

name: CL_MEMUT
description: "Percentage of total physical memory on the cell that is currently used"
metricType: Instantaneous
objectType: CELL
unit: %

...
CellCLI>
```

6. Execute LIST METRICCURRENT to view the most current metric observations.

```

CellCLI> list metriccurrent
...
N_MB_RECEIVED qr01db01 9,140 MB
N_MB_RECEIVED qr01db02 2,886 MB
N_MB_RECEIVED_SEC qr01db01 0.018 MB/sec
N_MB_RECEIVED_SEC qr01db02 0.000 MB/sec
N_MB_RESENT qr01db01 9.145 MB
N_MB_RESENT qr01db02 3.607 MB
N_MB_RESENT_SEC qr01db01 0.000 MB/sec
N_MB_RESENT_SEC qr01db02 0.000 MB/sec
N_MB_SENT qr01db01 3,043 MB
N_MB_SENT qr01db02 159 MB
N_MB_SENT_SEC qr01db01 0.003 MB/sec
N_MB_SENT_SEC qr01db02 0.000 MB/sec
N_NIC_KB_RCV_SEC qr01cel01 20.1 KB/sec
N_NIC_KB_TRANS_SEC qr01cel01 4.2 KB/sec
N_NIC_NW qr01cel01 0
N_RDMA_RETRY_TM qr01db01 0 ms
```

```
N_RDMA_RETRY_TM      qr01db02      0 ms
CellCLI>
```

7. Add a WHERE condition to view the most current metric observations for a subset of metrics.

```
CellCLI> list metriccurrent where objecttype = 'CELL'
CL_CPUT_CS          qr01cel01    13.8 %
CL_CPUT_MS          qr01cel01    1.1 %
CL_CPUT              qr01cel01    78.2 %
CL_FANS              qr01cel01    1
CL_MEMUT_CS          qr01cel01    49.1 %
CL_MEMUT_MS          qr01cel01    17.1 %
CL_MEMUT              qr01cel01    93 %
CL_RUNQ              qr01cel01    0.9
CL_SWAP_IN_BY_SEC   qr01cel01    1.8 KB/sec
CL_SWAP_OUT_BY_SEC  qr01cel01    0.0 KB/sec
CL_SWAP_USAGE         qr01cel01    6 %
CL_TEMP              qr01cel01    0.0 C
CL_VIRTMEM_CS        qr01cel01    2,023 MB
CL_VIRTMEM_MS        qr01cel01    1,134 MB
IORM_MODE             qr01cel01    2
N_HCA_MB_RCV_SEC    qr01cel01    0.000 MB/sec
N_HCA_MB_TRANS_SEC  qr01cel01    0.000 MB/sec
N_NIC_KB_RCV_SEC    qr01cel01    20.2 KB/sec
N_NIC_KB_TRANS_SEC  qr01cel01    14.6 KB/sec
N_NIC_NW              qr01cel01    0
CellCLI>
```

8. Examine a specific metric by specifying the metric name.

```
CellCLI> list metriccurrent cl_memut
CL_MEMUT            qr01cel01    93 %

CellCLI>
```

9. Use the following command to determine if there are any metrics that are currently in an abnormal state. Normally, you should not expect any output from this command.

```
CellCLI> list metriccurrent where alertState != normal
CellCLI>
```

10. Show the current space utilization on the cell file systems that contain the cell operating system and Exadata software binaries. Note the utilization value reported for the root (/) file system because you will need this value later in the practice.

```
CellCLI> list metriccurrent cl_fsut
      CL_FSUT          "/"           24 %
      CL_FSUT          "/boot"       44 %
      CL_FSUT          "/dev/shm"    0 %

CellCLI>
```

The LIST METRICCURRENT command shows historical metric observations that are maintained in an internal repository on the cell. The retention period for metric history observations is specified by the metricHistoryDays cell attribute. The default retention period is 7 days and you can modify this setting with the CellCLI ALTER CELL command. You can display all the retained history for all the metrics by using LIST METRIC HISTORY; however, doing so will output vast amounts of data so you should always use a filter to return more specific output.

11. Use the following command to determine if, and when, any metrics were in an abnormal state during the retention period. Normally, you should not expect any output from this command. Note that it may take a few minutes for this command to complete.

```
CellCLI> list metrichistory where alertState != normal

CellCLI>
```

Alerts represent events of importance occurring within Exadata, typically indicating that cell functionality is either compromised or in danger of failure.

12. Use the LIST ALERT HISTORY command to view all the alerts maintained in the alert repository. The warning alert 1\_1 is generated because of the virtualized nature of the cell environment. You would not normally see this alert in a native Exadata cell.

```
CellCLI> list alerthistory
      1_1      2013-07-17T18:31:57-04:00      warning
      "Hugepage allocation failure in service cellsrv. Number of
      Hugepages allocated is 0, failed to allocate 110"
      2      2013-07-17T19:07:31-04:00      critical
      "RS-7445 [Serv CELLSRV is absent] [It will be restarted] [] []
      [] [] [] [] [] [] []"

CellCLI>
```

13. Use the `DROP ALERTHISTORY` command to clear out old or unwanted alerts. If you want to focus on future alerts, you can clear the entire alert history by using `DROP ALERTHISTORY ALL`. Execute the `DROP ALERTHISTORY ALL` command.

```
CellCLI> drop alerthistory all
Alert 1_1 successfully dropped
Alert 2 successfully dropped

CellCLI>
```

An alert is automatically triggered when a predefined hardware or software issue is detected, or when a metric exceeds a threshold. In the next few steps, you will define a threshold, and then create a condition which will cause an alert.

14. List the thresholds currently defined on the Exadata cell. By default, there are no thresholds defined.

```
CellCLI> list threshold

CellCLI>
```

15. The `LIST ALERTDEFINITION` command displays all available sources of the alerts on the cell. You can use this list to remind yourself which metrics can have thresholds associated with them.

```
CellCLI> list alertdefinition
ADRALert
HardwareAlert
StatefulAlert_CD_IO_BY_R_LG
StatefulAlert_CD_IO_BY_R_LG_SEC
StatefulAlert_CD_IO_BY_R_SM
...
StatefulAlert_N_NIC_KB_TRANS_SEC
StatefulAlert_N_NIC_NW
StatefulAlert_N_RDMA_RETRY_TM
Stateful_HardwareAlert
Stateful_SoftwareAlert

CellCLI>
```

16. Create a warning threshold for file system utilization on the root (/) file system. Set the warning level to a value slightly larger than the utilization you observed in step 10.

```
CellCLI> create threshold cl_fsut."/ comparison='>', warning=25
Threshold cl_fsut."/ successfully created

CellCLI>
```

17. View the newly created threshold definition.

```
CellCLI> list threshold detail
      name:          cl_fsut./
      comparison:    >
      warning:       25.0
```

```
CellCLI>
```

18. Exit CellCLI.

```
CellCLI> exit
quitting

[celladmin@qr01cel01 ~]$
```

19. Execute the following command inside the cell operating system. It creates a 512 MB file on the root file system, which will increase the utilization metric. After the metric crosses the threshold you defined in step 16, an alert will be generated.

```
[celladmin@qr01cel01 ~]$ dd if=/dev/zero of=/tmp/file.out \
> bs=1024 count=500000
500000+0 records in
500000+0 records out
512000000 bytes (512 MB) copied, 6.38047 seconds, 80.2 MB/s
[celladmin@qr01cel01 ~]$
```

20. Relaunch CellCLI.

```
[celladmin@qr01cel01 ~]$ cellcli
CellCLI: Release 11.2.3.2.1 - Production...

CellCLI>
```

21. Execute the LIST ALERTHISTORY command. Do you see an alert? If you do not see any alerts, re-execute LIST ALERTHISTORY periodically until the alert appears. Usually an alert is generated within a few minutes of a threshold being exceeded.

```
CellCLI> list alerthistory
      1_1      2013-07-21T23:11:36-04:00      warning
      "The warning threshold for the following metric has been
      crossed. Metric Name      : CL_FSUT Metric Description :
      Percentage of total space on this file system that is currently
      used Object Name      : / Current Value      : 26.0 %
      Threshold Value      : 25.0 % "
```

```
CellCLI>
```

22. List the detailed alert information associated with the alert. Note that the examinedBy attribute is empty.

```
CellCLI> list alerthistory detail
      name:          1_1
      alertMessage: "The warning threshold for the
following metric has been crossed. Metric Name : CL_FSUT
Metric Description : Percentage of total space on this file
system that is currently used Object Name : / Current
Value : 26.0 % Threshold Value : 25.0 % "
      alertSequenceID: 1
      alertShortName: CL_FSUT
      alertType: Stateful
      beginTime: 2013-07-21T23:11:36-04:00
      endTime:
      examinedBy:
      metricObjectName: "/"
      metricValue: 26.0
      notificationState: 1
      sequenceBeginTime: 2013-07-21T23:11:36-04:00
      severity: warning
      alertAction: "Examine the metric value that
is violating the specified threshold, and take appropriate
actions if needed."
CellCLI>
```

23. Modify the alert to indicate that you have examined it.

```
CellCLI> alter alerthistory 1_1 examinedby='student'
Alert 1_1 successfully altered

CellCLI>
```

24. List the detailed alert information associated with the alert. Note that the `examinedBy` attribute is now set as you specified in step 23. Notice also the `failedMail` attribute, which indicates that Exadata attempted to send an email alert to the specified address, but failed. In this case, the failure occurred because the cell contains a dummy email alert configuration. In a properly configured cell using email alerts, you would not see this attribute listed and the `notificationState` would be 1 indicating that the email alert was sent successfully.

```
CellCLI> list alerthistory detail
      name:          1_1
      alertMessage:   "The warning threshold for the
following metric has been crossed. Metric Name : CL_FSUT
Metric Description : Percentage of total space on this file
system that is currently used Object Name : / Current
Value      : 26.0 % Threshold Value     : 25.0 % "
      alertSequenceID:    1
      alertShortName:    CL_FSUT
      alertType:         Stateful
      beginTime:        2013-07-21T23:11:36-04:00
      endTime:
      examinedBy:       student
      metricObjectName: "/"
      metricValue:       26.0
      notificationState: 1
      sequenceBeginTime: 2013-07-21T23:11:36-04:00
      severity:         warning
      alertAction:       "Examine the metric value that
is violating the specified threshold, and take appropriate
actions if needed."
CellCLI>
```

25. Exit CellCLI.

```
CellCLI> exit
quitting

[celladmin@qr01cel01 ~]$
```

26. Delete the file you created in step 19. Be careful not to delete any other files.

```
[celladmin@qr01cel01 ~]$ rm /tmp/file.out
[celladmin@qr01cel01 ~]$
```

27. Relaunch CellCLI.

```
[celladmin@qr01cel01 ~]$ cellcli  
CellCLI: Release 11.2.3.2.1 - Production...  
  
CellCLI>
```

28. Examine the file system utilization and confirm that the root (/) file system utilization has fallen back below the warning threshold. If the metric still exceeds the warning threshold, re-execute the command periodically until the metric value is updated.

```
CellCLI> list metriccurrent cl_fsut  
CL_FSUT      "/"          26 %  
CL_FSUT      "/boot"      44 %  
CL_FSUT      "/dev/shm"    0 %  
  
CellCLI> list metriccurrent cl_fsut  
CL_FSUT      "/"          24 %  
CL_FSUT      "/boot"      44 %  
CL_FSUT      "/dev/shm"    0 %  
  
CellCLI>
```

29. Re-execute LIST ALERT HISTORY. Note that the alert is now listed as cleared.

```
CellCLI> list alerthistory  
1_1 2013-07-21T23:11:36-04:00 warning  
"The warning threshold for the following metric has been  
crossed. Metric Name : CL_FSUT Metric Description :  
Percentage of total space on this file system that is currently  
used Object Name : / Current Value : 26.0 %  
Threshold Value : 25.0 % "  
1_2 2013-07-21T23:13:36-04:00 clear  
"The warning threshold for the following metric has been  
cleared. Metric Name : CL_FSUT Metric Description :  
Percentage of total space on this file system that is currently  
used Object Name : / Current Value : 24.0 %  
Threshold Value : 25.0 % "  
  
CellCLI>
```

30. View the alert details to determine the period of the alert.

```
CellCLI> list alerthistory detail
      name:          1_1
      alertMessage: "The warning threshold for the following
metric has been crossed. Metric Name : CL_FSUT Metric Description :
Percentage of total space on this file system that is currently used Object
Name   : / Current Value : 26.0 % Threshold Value : 25.0 % "
      alertSequenceID: 1
      alertShortName: CL_FSUT
      alertType: Stateful
      beginTime: 2013-07-21T23:11:36-04:00
      endTime: 2013-07-21T23:13:36-04:00
      examinedBy: student
      metricObjectName: "/"
      metricValue: 26.0
      notificationState: 1
      sequenceBeginTime: 2013-07-21T23:11:36-04:00
      severity: warning
      alertAction: "Examine the metric value that is violating
the specified threshold, and take appropriate actions if needed."
      name:          1_2
      alertMessage: "The warning threshold for the following
metric has been cleared. Metric Name : CL_FSUT Metric Description :
Percentage of total space on this file system that is currently used Object
Name   : / Current Value : 24.0 % Threshold Value : 25.0 % "
      alertSequenceID: 1
      alertShortName: CL_FSUT
      alertType: Stateful
      beginTime: 2013-07-21T23:13:36-04:00
      endTime: 2013-07-21T23:13:36-04:00
      examinedBy:
      metricObjectName: "/"
      metricValue: 24.0
      notificationState: 1
      sequenceBeginTime: 2013-07-21T23:11:36-04:00
      severity: clear
      alertAction: "The threshold value is no longer violated.
No further action is required for threshold CL_FSUT.""/"."
CellCLI>
```

An active request provides a view of I/O requests that are currently being processed by a cell. In the next few steps, you will execute a database update and analyze the associated active requests.

31. Establish a separate terminal connection to qr01db01 as the oracle user. Leave your original CellCLI terminal session running in the background.
32. Connect to your database with SQL\*Plus. Log in as the sales user and configure your new session to force parallel DML.

```
[oracle@qr01db01 ~] $ sqlplus sales/sales

SQL*Plus: Release 11.2.0.3.0 Production...

SQL> alter session force parallel dml;

Session altered.

SQL>
```

33. Execute the following long-running update statement. (Use the SQL script /home/oracle/labs/lab15-01-33.sql if you prefer.) **Continue to the next step while the update statement is processing.** If the update completes before you gather the information in the next step, commit the changes and re-execute the update statement.

```
SQL> update customers
  2  set cust_credit_limit=0.9*cust_credit_limit
  3  where cust_id < 500000;
```

34. Switch back to your original terminal session and execute the CellCLI LIST ACTIVEREQUEST DETAIL command. If necessary, re-execute the command until you see an active request that exhibits the following attributes:

- The ioGridDisk matches one of your data grid disks.
- The objectNumber is a positive value.
- The sqlID is a non-zero value.

Note that you may see different types of active requests including many that relate to internal database I/O, such as recursive SQL or writes to the redo log files.

```
CellCLI> list activerequest detail
...
name: 5484
asmDiskGroupNumber: 1
asmFileIncarnation: 811641709
asmFileName: 269
consumerGroupID: 12553
consumerGroupName:
dbID: 2080757153
dbName: DBM
dbRequestID: 5484
fileType: Datafile
id: 5484
instanceNumber: 1
ioBytes: 819200
ioBytessofar: 0
ioGridDisk: DATA_QR01_CD_02_qr01cel01
ioOffset: 432128
ioReason: "BufferCache Read"
ioType: CacheGet
objectNumber: 77111
parentID: 5484
requestState: "Queued for Disk Read"
sessionID: 157
sessionSerNumber: 171
sqlID: 6fkmg917x69xs
tableSpaceNumber: 7
```

CellCLI>

35. Switch back to your SQL\*Plus session. After the update from step 33 finishes, commit the transaction. Then use the object number and tablespace number from the output in step 34 to determine the identity of the database object associated with the active request. (Use the SQL script /home/oracle/labs/lab15-01-35.sql if you prefer.) Verify that the active request information you saw earlier is associated with an action on the CUSTOMERS table.

```
499999 rows updated.

SQL> commit;

Commit complete.

SQL> select distinct object_name, tablespace_name
  2  from v$segment_statistics
  3  where dataobj#=77111 and ts#=7;

OBJECT_NAME          TABLESPACE_NAME
-----              -----
CUSTOMERS            SALES

SQL>
```

36. Query V\$SQL and use the SQLID from step 34 to verify that the active request information is in fact associated with the update you executed in step 33. (Use the SQL script /home/oracle/labs/lab15-01-36.sql if you prefer.)

```
SQL> select distinct sql_text, sql_id
  2  from v$sql where sql_id = '6fkm917x69xs';

SQL_TEXT
-----
SQL_ID
-----
update customers set cust_credit_limit=0.9*cust_credit_limit
where cust_id < 500000
6fkm917x69xs

SQL>
```

37. Exit all your SQL\*Plus and CellCLI sessions.

## Practice 15-2: Exadata Storage Server Monitoring with Enterprise Manager

### Overview

In this practice, you will exercise a variety of Exadata Storage Server monitoring and administration capabilities provided by Enterprise Manager Cloud Control 12c.

### Assumptions

The practice relies on the configurations performed in Practice 14-1.

### Tasks

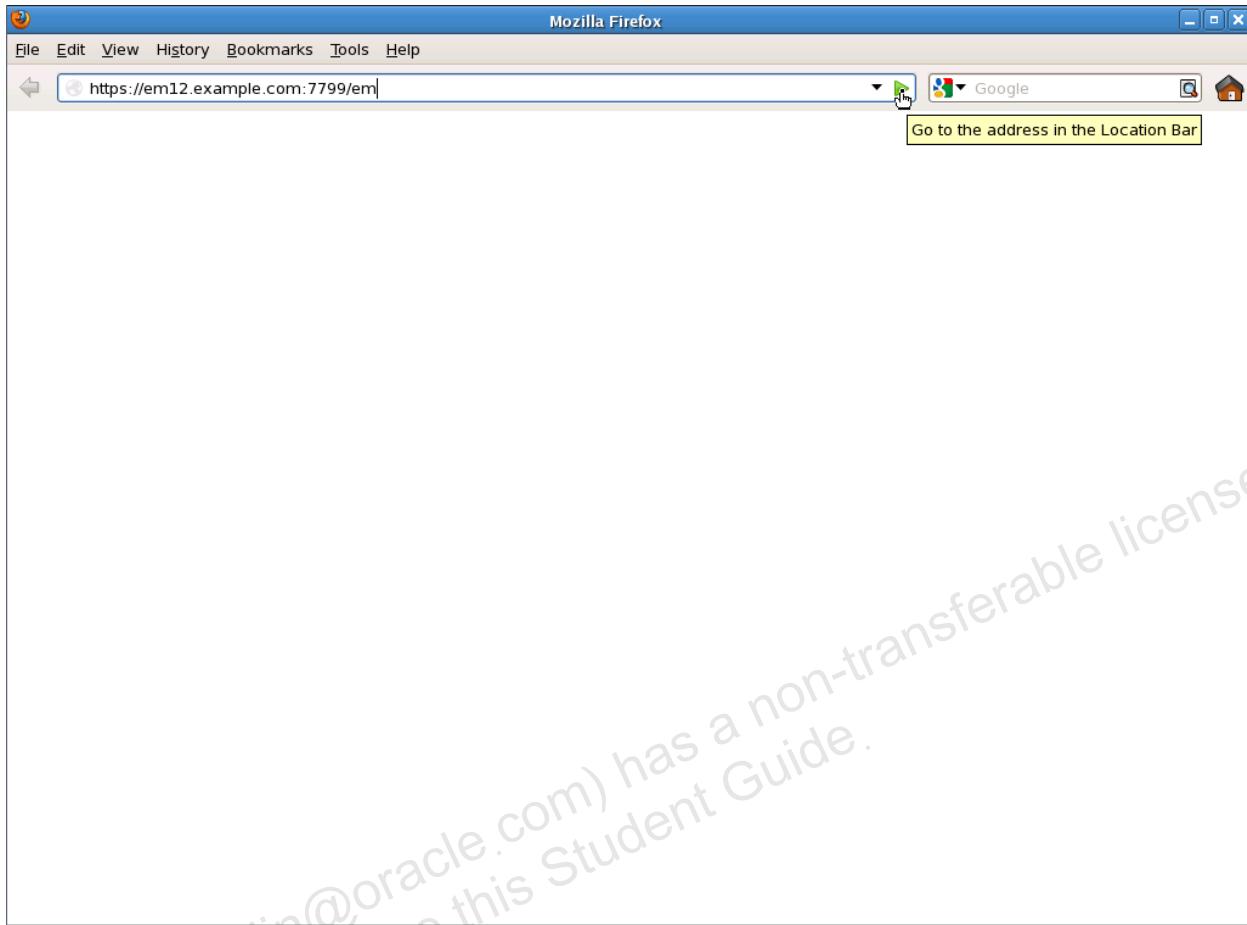
1. Establish a terminal session connected to em12 by using the oracle OS user. Ensure that you specify the -X option for ssh.

```
$ ssh -X oracle@em12  
oracle@em12 password: <oracle>  
[oracle@em12 ~]$
```

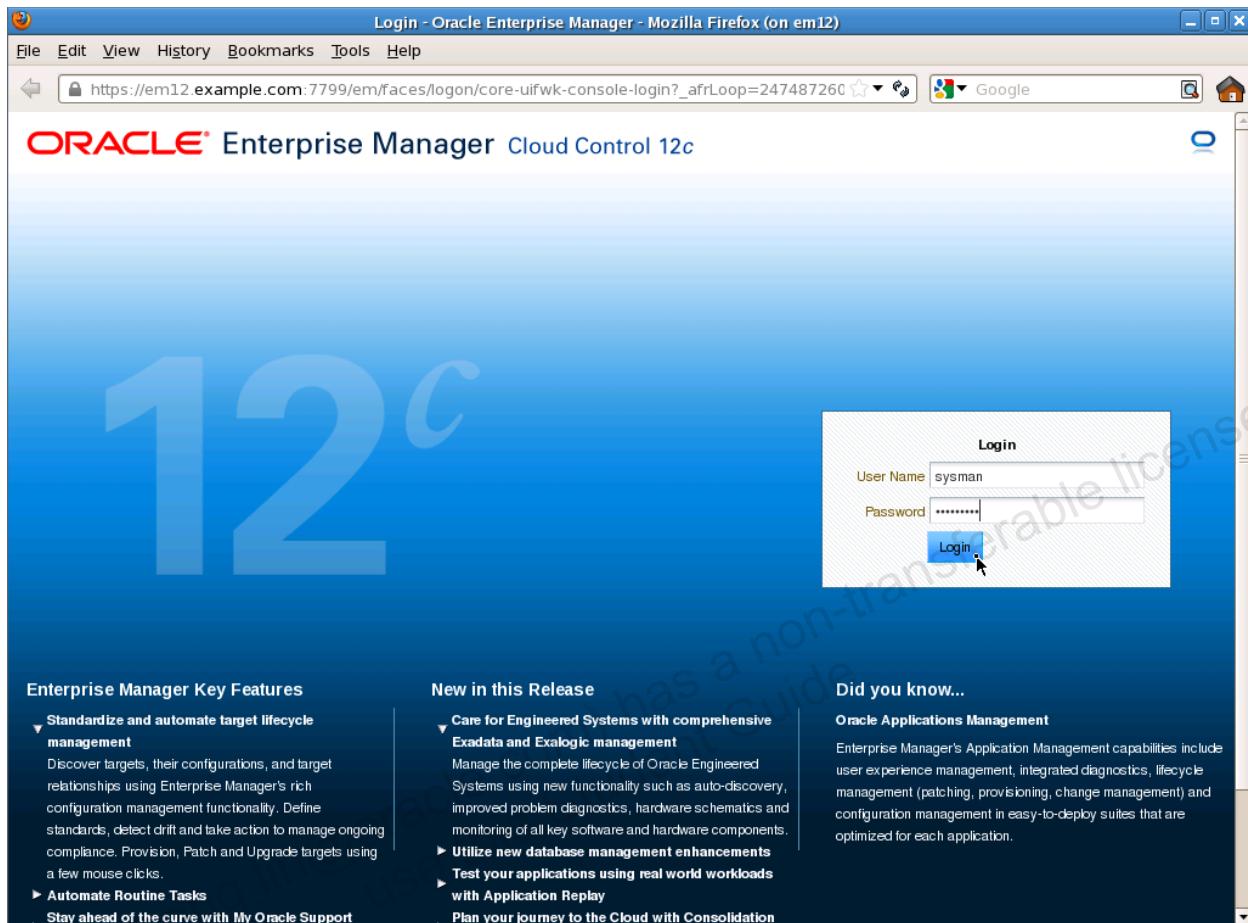
2. Start the Firefox web browser.

```
[root@em12 ~]$ firefox &  
[1] 30053
```

3. Navigate to the Enterprise Manager console at <https://em12.example.com:7799/em>.



4. Log in to Enterprise Manager Cloud Control 12c by using the following credentials:
  - User Name: sysman
  - Password: Oracle123



5. When the Enterprise Summary page appears, you should notice that some of the targets are currently down. This is to be expected because you shut down Oracle Clusterware on qr01db02 during an earlier practice.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Enterprise Summary - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area is titled "Enterprise Summary".

- Status:** Targets Monitored: 74. A pie chart shows: Up (35) 59%, Down (7) 12%, Under Blackout (17) 29%.
- Incidents:** Updated in the last 24 hours: 15; Updated in last 7 days: 18. A breakdown table shows: Availability (7, 2, -, -), Performance (-, -, -, -), Security (-, -, -, -), Others (-, 5, 1, -).
- Problems:** Total Open: 0.
- Inventory and Usage:** Shows Platform: Oracle Linux Server release 5.9, Hosts: 3.
- Compliance Summary:** Frameworks tab selected. A table shows: Name, Target Evaluations, Violations, Average Compliance Score (%). No data to display.
- Least Compliant Targets:** A table shows: Target Name, Target Type, Standard Evaluations, Violations, Average Compliance Score (%). No data to display.

6. To begin Exadata Storage Server monitoring, select the Targets > Exadata menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The top navigation bar includes File, Edit, View, History, Bookmarks, Tools, Help, and a Google search bar. The main content area is titled "Enterprise Summary - Oracle Enterprise Manager - Mozilla Firefox (on em12)".

**Enterprise Status:** A pie chart indicates the status of targets: 29% Under Blackout (17), 12% Critical (5), and 59% Normal (3).

**Targets Monitor:** A list of target types includes Groups, Systems, Services, Hosts, Databases, Middleware, Business Applications, Composite Applications, and Exadata.

**Incidents:** Updated in the last 24 hours: 15; Updated in last 7 days: 18. Breakdown of incidents updated in the last 7 days:

Category	■	■	■	■
Availability	7	2	-	-
Performance	-	-	-	-
Security	-	-	-	-
Others	-	5	1	-

**Problems:** Total Open: 0

**Inventory and Usage:** Shows hosts information for Oracle Linux Server release 5.9.

**Compliance Summary:** Frameworks and Standards sections. No data to display.

**Least Compliant Targets:** No data to display.

7. Click the link corresponding to your Exadata Database Machine (DB Machine qr01.example.com).

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Oracle Exadata Database Machines - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area is titled "Oracle Exadata Database Machines". A search bar at the top left contains the placeholder "Enter the target name to search." Below it is a table with columns: Target Name, Status, Members, Member Status Summary, and Incidents. The table has a header row and one data row. The data row for "DB Machine qr01.example.com" is highlighted with a blue background. The "Status" column for this row shows "Cluster Database(1), Oracle Infiniband Switch(2), Oracle Infiniband Net". The "Member Status Summary" column shows values 1, 16, -, -, 1, 1. The "Incidents" column shows a red exclamation mark icon. At the bottom of the table, there is a message "Columns Hidden 1" and a URL "https://em12.example.com:7799/em/faces/sdk/nonFacesWrapper?target=dbm.example.com\_sy...oop=268583326738910&\_afrWindowMode=0&\_afrWindowId=zmxm5ws9l\_396#".

8. On the Database Machine home page, expand the Exadata Grid node in the Target Navigation pane.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface in Mozilla Firefox. The URL is [https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\\_afrLoop=247516611711629&\\_afrWindowMode=0&\\_afrWindowId=8soc1cf0f\\_1#](https://em12.example.com:7799/em/faces/core-uifwk-console-overview?_afrLoop=247516611711629&_afrWindowMode=0&_afrWindowId=8soc1cf0f_1#).  
The Target Navigation pane on the left has an 'Expand' button next to the 'DB Machine qr01.example.com' node, which is highlighted with a yellow box.  
The main content area shows the 'DB Machine qr01.example.com' overview. It includes:

- Racks 1
- Compute Nodes: 2 (Up)
- PDU: 2 (Up)
- IB Switches: 2 (Up)
- Exadata Cells: 3 (Up)
- Ethernet Switches: 1 (Up)

A legend on the right defines the status colors:

- Green: Up
- Red: Down
- Black: Blackout
- Dark Blue: Exadata Cell
- Light Blue: Compute Node
- Grey: Infiniband Switch
- White: Ethernet Switch

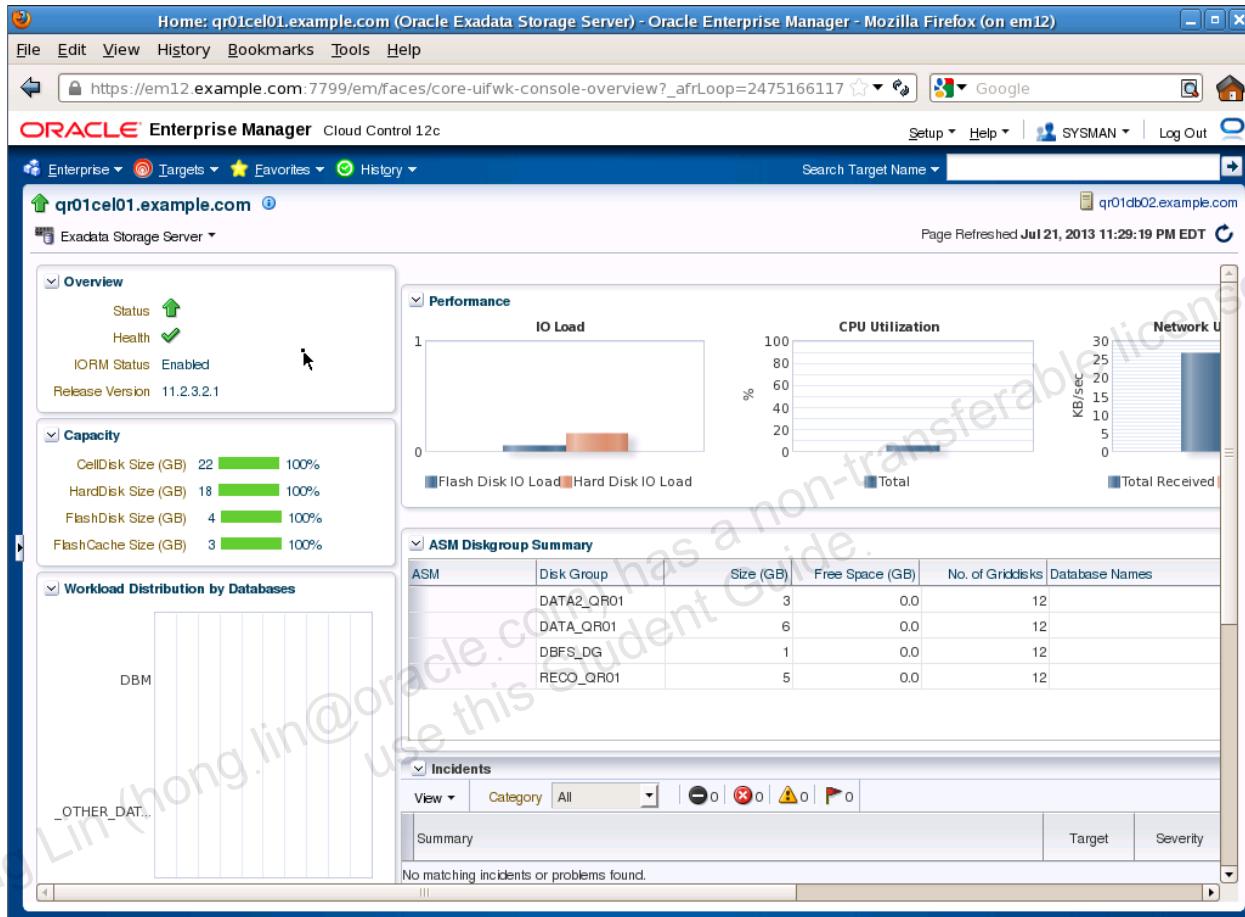
9. Now the Target Navigation pane shows the three Exadata Storage Servers contained in this Database Machine. Click the name of the first storage server (qr01cel01.example.com).

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. In the Target Navigation pane on the left, under the Exadata Grid section, the node 'qr01cel01.example.com' is selected and highlighted with a mouse cursor. The main content area displays the 'DB Machine qr01.example.com' schematic. The schematic shows a single rack labeled 'Rack 1'. Inside the rack, there are two Compute Nodes (qr01ce02.example.com and qr01ce03.example.com), one PDU, and two IB Switches (qr01db02.example.com and qr01db01.example.com). A legend on the right side of the schematic defines the colors and symbols used for different components: green for Up, red for Down, black for Blackout, dark grey for Exadata Cell, light blue for Compute Node, light grey for Infiniband Switch, and white for Ethernet Switch.

10. On the Exadata Storage Server home page for qr01cel01, collapse the Target Navigation pane.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface for an Exadata Storage Server named qr01cel01. The URL in the browser is [https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\\_afrLoop=247516611711629&\\_afrWindowMode=0&\\_afrWindowId=8soc1cf0f\\_1#](https://em12.example.com:7799/em/faces/core-uifwk-console-overview?_afrLoop=247516611711629&_afrWindowMode=0&_afrWindowId=8soc1cf0f_1#). The Target Navigation pane on the left is collapsed, showing a tree view of DB Machine, Compute Nodes, Exadata Grid, IB Network, and other components. The main content area includes sections for Overview (Status: Up, Health: Enabled), Performance (IO Load and CPU Utilization charts), Capacity (disk sizes), ASM Diskgroup Summary (listing DATA2\_QR01, DATA\_QR01, DBFS\_DG, and RECO\_QR01), and Incidents (no matching incidents found).

11. Take a moment to examine the Exadata Storage Server home page. Notice that the Overview area provides a quick visual indication of the status and health of the storage server. The other areas provide summary information relating to capacity, performance, and utilization of the cell. At the bottom of the page, the Incidents area displays alerts relating to the cell. You will investigate this area later in the practice. Note that the Size values reported on this page are accurate for your laboratory environment; however, they do not reflect the capacity of a real Exadata Storage Server.



The Exadata Storage Server menu provides access to the other monitoring and administration functions provided by Enterprise Manager. In the next part of this practice, you will explore a number of these capabilities, starting with performance monitoring.

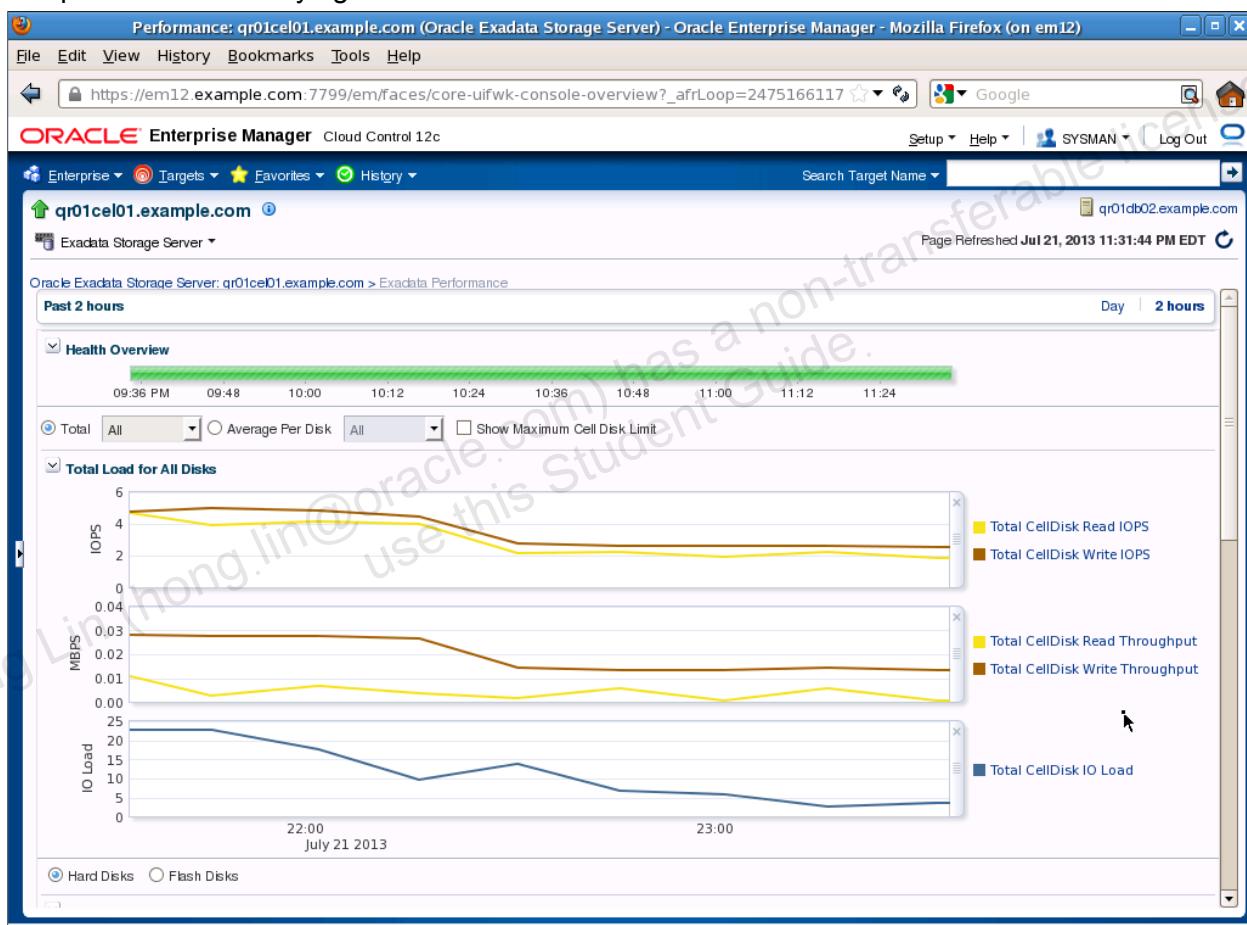
12. Select the Exadata Storage Server > Performance menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar is titled "Exadata Storage Server" and contains a "Performance" link which is currently selected. The main content area displays several performance metrics:

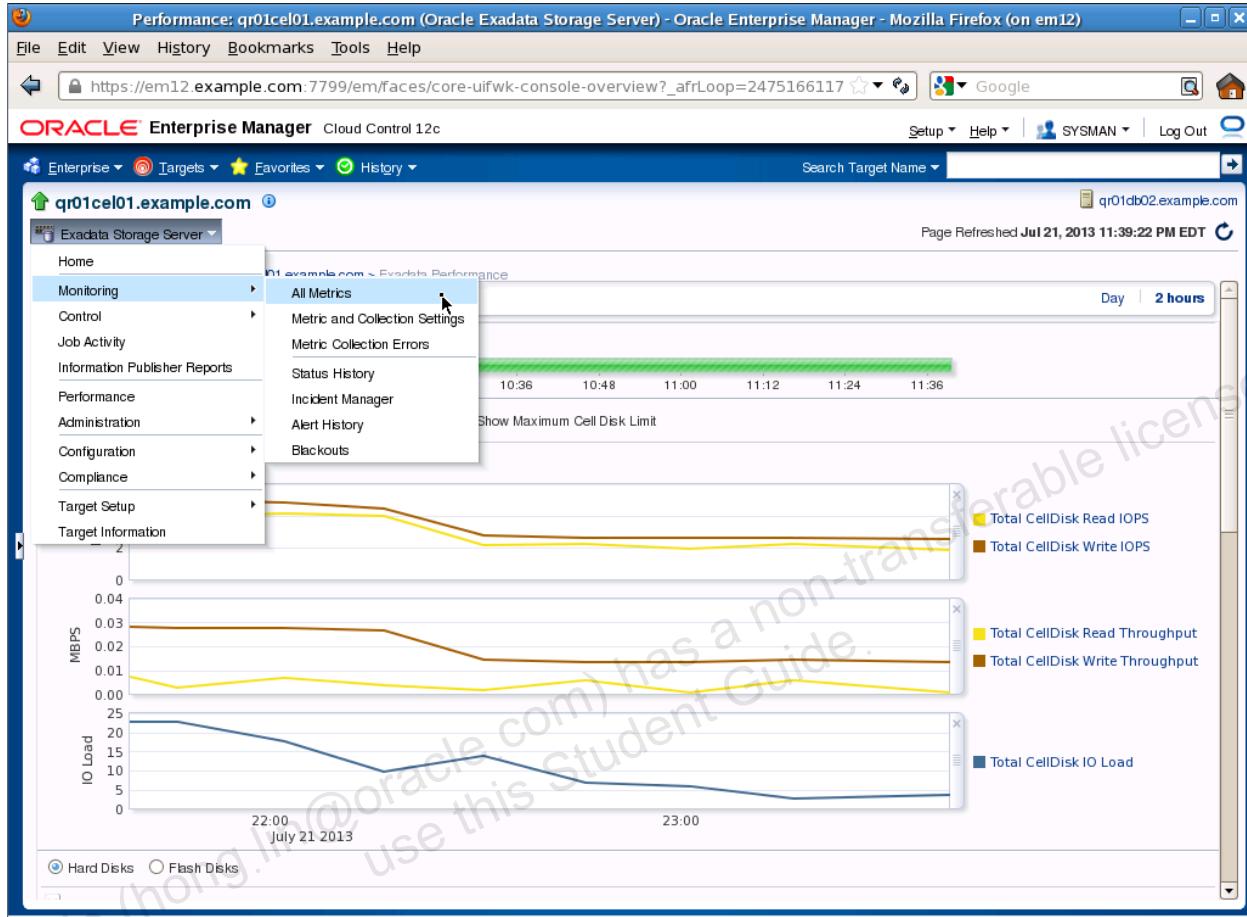
- IO Load**: A bar chart comparing Flash Disk IO Load (blue) and Hard Disk IO Load (orange). The Hard Disk IO Load is approximately 10%.
- CPU Utilization**: A bar chart showing CPU utilization for "Total" (blue), with values around 5%.
- Network Utilization**: A bar chart showing Network Utilization for "Total Received" (blue), with values around 25 KB/sec.
- ASM Diskgroup Summary**: A table showing ASM disk group details:

ASM	Disk Group	Size (GB)	Free Space (GB)	No. of Gridisks	Database Names
DATA2_QR01		3	0.0	12	
DATA_QR01		6	0.0	12	
DBFS_DG		1	0.0	12	
RECO_QR01		5	0.0	12	
- Incidents**: A summary section indicating "No matching incidents or problems found."

13. You should now see the Exadata Storage Server Performance page for qr01cel01. This page shows various performance metrics leading up to the current time. By default, you will see performance information relating to the past two hours. At the top of the page, you will see a visual indication of the cell health. A green band indicates a healthy cell over the corresponding time period. Below the Health Overview, a series of charts display key performance metrics associated with the cell. Take a moment to scroll down the page and examine all the performance charts. Note that the legend labels associated with each metric are links, which navigate to pages that contain more detailed information about the metric. Typically, administrators will gather an understanding of what this page should look like during normal system operation. Then they will check this page for abnormalities that could point to the underlying cause of an issue.



14. The Performance page gathers key cell performance metrics on a single page. However, these are not all the cell metrics gathered by Enterprise Manager. Select the Exadata Storage Server > Monitoring > All Metrics menu command to navigate to the All Metrics page.



15. The All Metrics page provides an interface for administrators to examine the metrics associated with a monitoring target. For Exadata Storage Servers, this page provides access to more than 100 metrics associated with each cell. The metrics are organized into groups, which are displayed in a hierarchical list on the left side of the page. Click the Aggregated Exadata CellDisk Metric group.

The screenshot shows the Oracle Enterprise Manager interface for monitoring an Exadata Storage Server. The title bar indicates the session is on em12. The navigation bar includes links for Enterprise, Targets, Favorites, History, Setup, Help, SYSMAN, and Log Out. The current target is qr01cel01.example.com, specifically an Exadata Storage Server. The main content area is titled 'All Metrics'. On the left, a tree view lists various metric categories under 'qr01cel01.example.com', with 'Aggregated Exadata CellDisk Metric' currently selected. To the right of the tree view are two tables. The first table, 'Open Metric Events', has columns for Metric Name, Severity, Message, and Last Collected Timestamp, with a note stating 'No data to display.' The second table, 'Top 5 alerting metrics (Last 7 days)', also has columns for Metric Name, Critical, and Warning, with a similar note. The status bar at the bottom right shows the page was refreshed on July 21, 2013, at 11:40:21 PM EDT.

16. Now you should be able to see the aggregated cell disk metrics. Notice that these metrics are collected every 15 minutes by default. Click the Average CellDisk Read Response Time metric.

**All Metrics: qr01cel01.example.com (Oracle Exadata Storage Server) - Oracle Enterprise Manager - Mozilla Firefox (on em12)**

File Edit View History Bookmarks Tools Help

https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\_afrLoop=247516611711629&\_afrWindowMode=0&\_afrWindowId=8soc1cf0f\_1#

ORACLE Enterprise Manager Cloud Control 12c

Enterprise Targets Favorites History Search Target Name

qr01cel01.example.com

Exadata Storage Server

Page Refreshed Jul 22, 2013 12:06:37 AM EDT

Oracle Exadata Storage Server: qr01cel01.example.com > All Metrics

All Metrics

Search

View

Aggregated Exadata CellDisk Metric

Collection Schedule Every 15 Minutes Modify

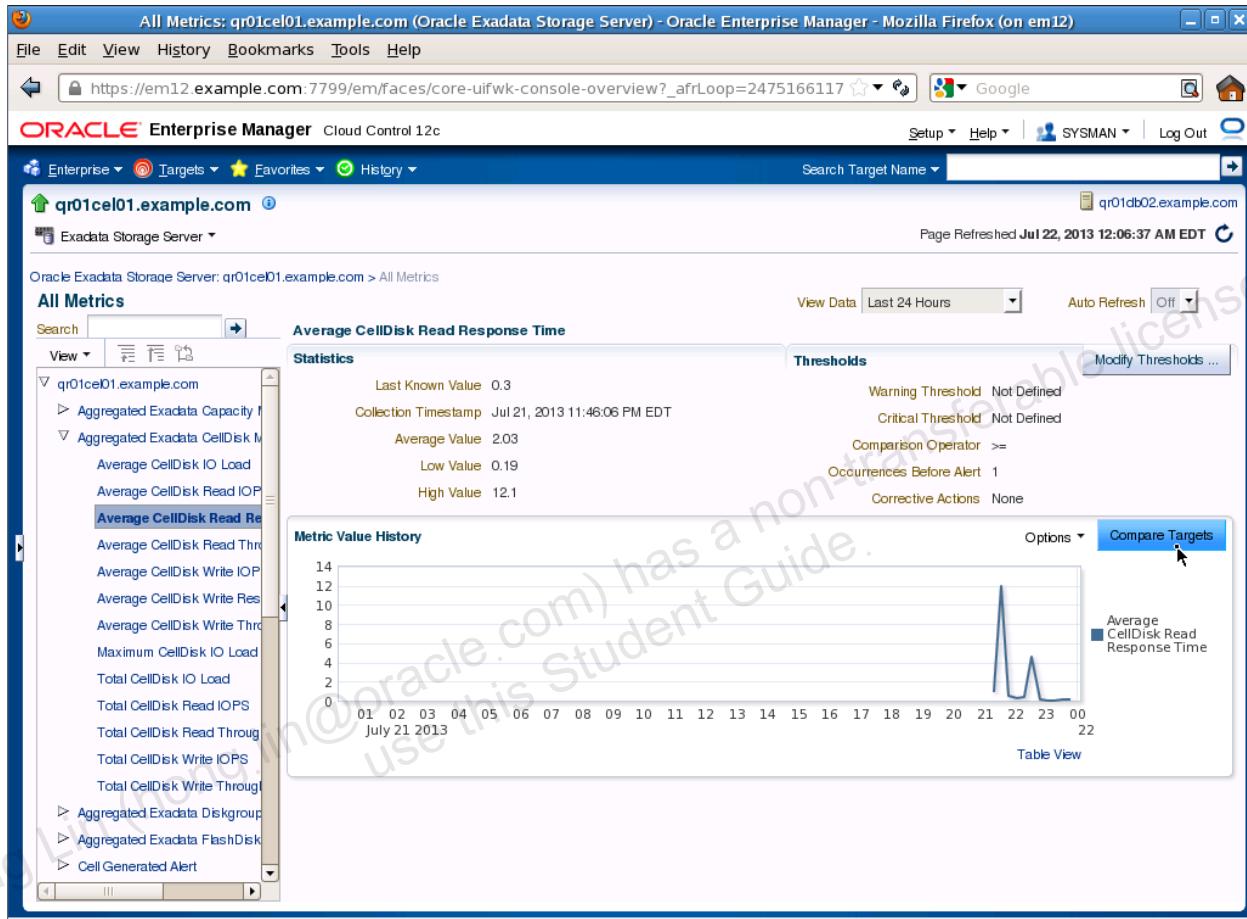
Last Upload Jul 21, 2013 11:46:06 PM EDT

Metric	Thresholds	Real Time Value
Average CellDisk IO Load	Not Set	0.07
Average CellDisk Read IOPS	Not Set	0.07
<u>Average CellDisk Read Response Time</u>	Not Set	0.2
Average CellDisk Read Throughput	Not Set	0
Average CellDisk Write IOPS	Not Set	0.09
Average CellDisk Write Response Time	Not Set	0.2
Average CellDisk Write Throughput	Not Set	0
Maximum CellDisk IO Load	Not Set	1
Total CellDisk IO Load	Not Set	2
Total CellDisk Read IOPS	Not Set	1.98
Total CellDisk Read Throughput	Not Set	0
Total CellDisk Write IOPS	Not Set	2.63
Total CellDisk Write Throughput	Not Set	0.01

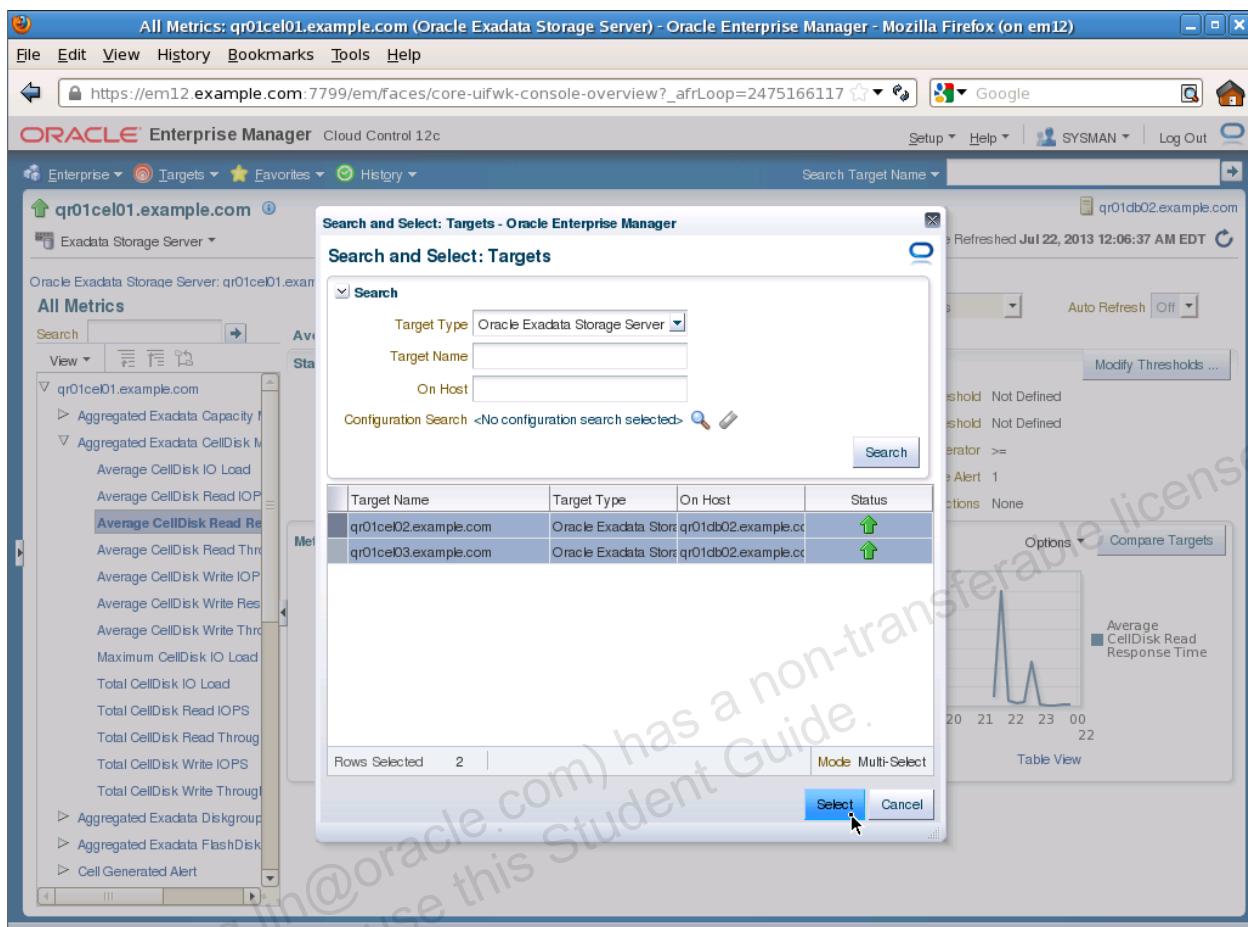
Data shown in above table is collected in real time.

https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\_afrLoop=247516611711629&\_afrWindowMode=0&\_afrWindowId=8soc1cf0f\_1#

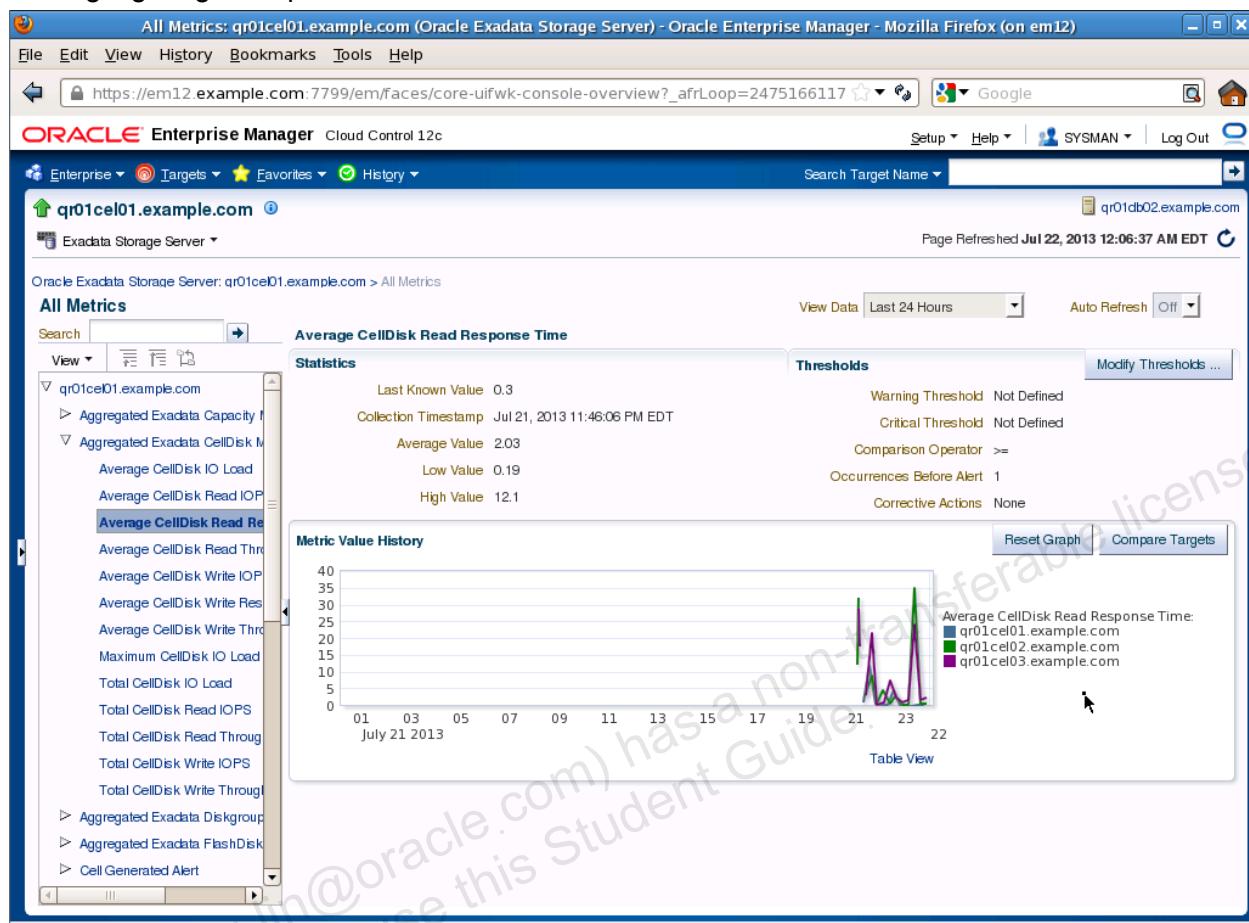
17. When you select an individual metric, you are provided with detailed information about the metric. For Average CellDisk Read Response Time, you can see various statistics along with the thresholds relating to the metric. From this page, you can also modify the threshold settings. A chart, graphing the metric value over time, is also provided. This chart also contains a useful function that enables administrators to compare the metric observation on this cell with the observations on other cells. Click Compare Targets to initiate the comparison.



18. In the dialog box that appears, select both the cells (qr01cel02 and qr01cel03) and click Select.

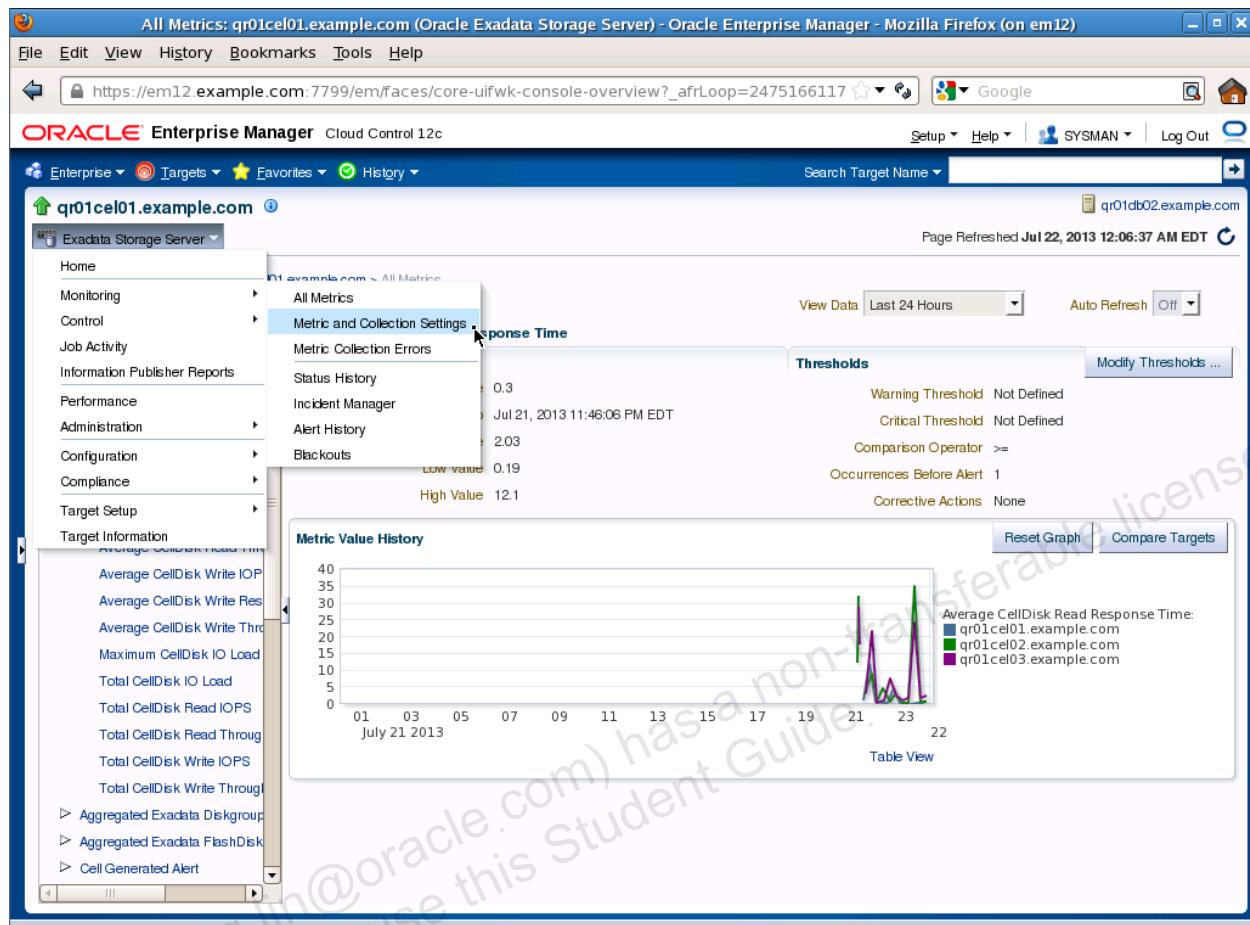


19. Now the chart displays the metric observations for all three cells. This can be very useful for highlighting cell-specific metric anomalies.



So far, you have seen the storage server performance page and interacted with storage server metrics. In the next part of this practice, you will modify some metric threshold settings.

20. Select the Exadata Storage Server > Monitoring > “Metric and Collection Settings” menu command.



21. By default, the Metric and Collection Settings page shows the metrics that have associated threshold definitions. Select the option to view all metrics.

The screenshot shows the Oracle Enterprise Manager interface for managing metrics and collections. The title bar reads "Metric and Collection Settings: qr01cel01.example.com (Oracle Exadata Storage Server) - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area is titled "Metric and Collection Settings". A dropdown menu under "View" is open, showing options: "Metrics with thresholds" (selected), "All metrics", and "Metrics with alerts". The main table lists various metrics categorized by source (qr01cel01.example.com) and type (Cell Generated Alert, HCA Port Configuration Monitor, HCA Port Errors, HCA Port State, Response). Each row includes columns for Metric name, Comparison Operator, Warning Threshold, Critical Threshold, Corrective Actions, Collection Schedule, and Edit/OK buttons. The "Collection Schedule" column for most rows shows "Every 15 Minutes". The "Edit" button for the first row (Cell Generated Alert) shows a warning icon.

Metric	Comparison Operator	Warning Threshold	Critical Threshold	Corrective Actions	Collection Schedule	Edit
qr01cel01.example.com						
Cell Generated Alert	=	WARNING	CRITICAL	None	Every 15 Minutes	
HCA Port Configuration Monitor					Every 15 Minutes	
Is this port disconnected(yes/no)	Matches		yes	None	Every 15 Minutes	
HCA Port Errors					Every 15 Minutes	
Total errors	>=	10		None	Every 15 Minutes	
HCA Port State					Every 15 Minutes	
Is the link degraded? (active speed or width less than enabled)	=		1	None	Every 15 Minutes	
HCA Port State (For Alerts)					Every 15 Minutes	
Is port disabled?	=		1	None	Every 5 Minutes	
Is port in 'polling' state?	=		1	None	Every 5 Minutes	
Response						

22. Scroll down until you see the group of metrics associated with Host Interconnect Statistics. Set the warning threshold to zero (0) for Host MB Dropped Per Sec and Host RDMA MB Dropped Per Sec. This setting will cause a warning to be generated if packets are dropped on the InfiniBand network. Click Every 15 Minutes to adjust the collection schedule for the Host Interconnect Statistics group of metrics.

Metric and Collection Settings: qr01cel01.example.com (Oracle Exadata Storage Server) - Oracle Enterprise Manager - Mozilla Firefox (on em12)					
File	Edit	View	History	Bookmarks	Tools
<a href="https://em12.example.com:7799/em/faces/core-uifwk-console-overview?_afrLoop=2475166117">https://em12.example.com:7799/em/faces/core-uifwk-console-overview?_afrLoop=2475166117</a> <span style="float: right;">Setup Help SYSMAN Log Out</span>					
<b>ORACLE Enterprise Manager</b> Cloud Control 12c					
Enterprise Targets Favorites History Search Target Name					
qr01cel01.example.com qr01db02.example.com					
Exadata Storage Server					
<b>HCA Port State (For Alerts)</b>					
Is port disabled? = [ ] 1 None Every 15 Minutes					
Is port in 'polling' state? = [ ] 1 None					
<b>Host Interconnect Statistics</b>					
Cell Name					
Host MB Dropped Per Sec > [0] None					
Host MB Received Per Sec > [ ] None					
Host MB Resent Per Sec > [ ] None					
Host MB Sent Per Sec > [ ] None					
Host RDMA MB Dropped Per Sec > [0] None					
Host RDMA Retry Latency (msec) > [ ] None Every 5 Minutes					
<b>Response</b>					
Mgmt Network Ping Status					
MS Status					
Response Status = Down None					
<b>TIP</b> Empty Thresholds will disable alerts for that metric.					
<b>Related Links</b>					
<a href="#">Past Apply Operations</a> <a href="#">Pending Apply Operations</a>					
<input type="button" value="Cancel"/> <input type="button" value="OK"/>					
<a href="https://em12.example.com:7799/em/console/metrics/target/metricThresh...oad&amp;target=qr01cel01.example.com&amp;type=oracle_exadata&amp;_em.coIFR=true#">https://em12.example.com:7799/em/console/metrics/target/metricThresh...oad&amp;target=qr01cel01.example.com&amp;type=oracle_exadata&amp;_em.coIFR=true#</a>					

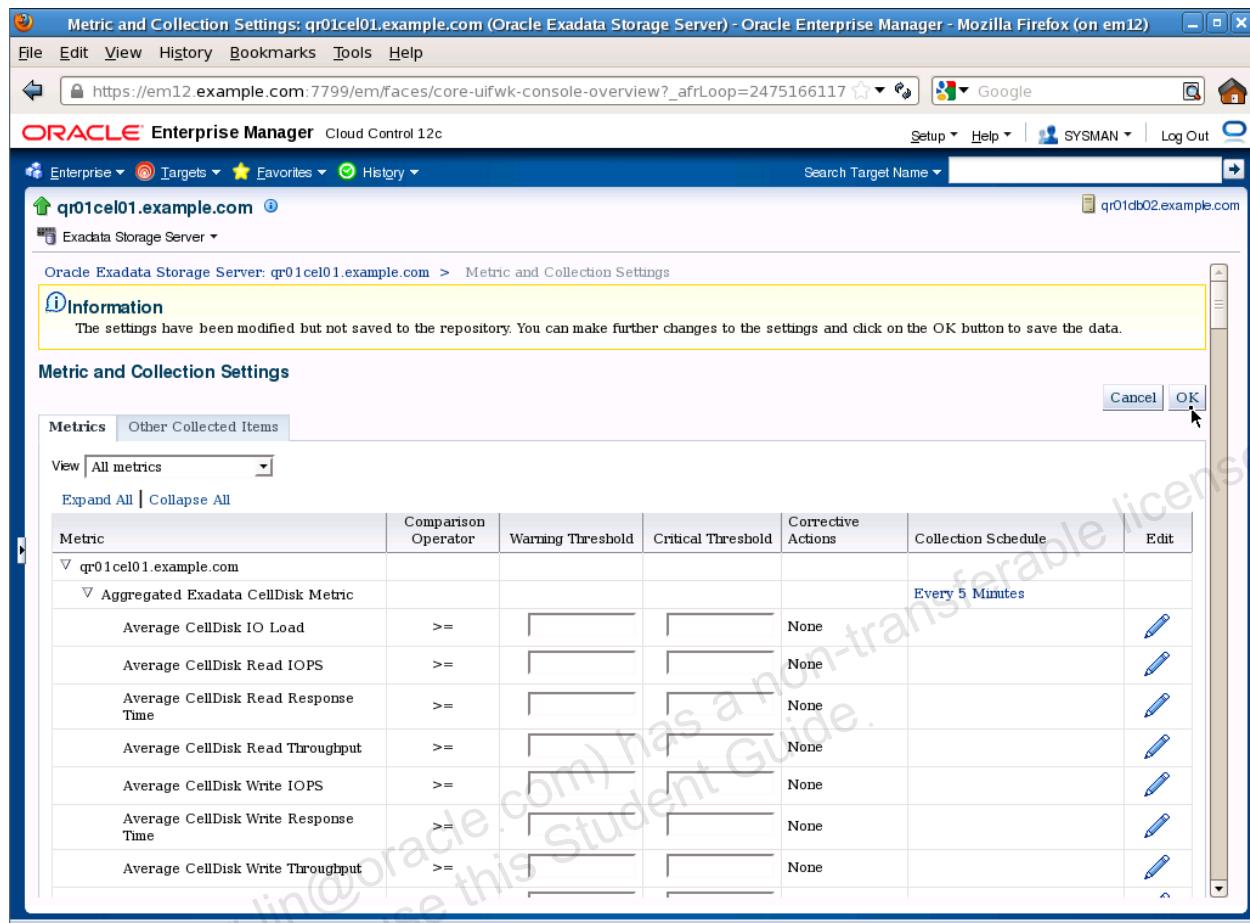
23. Make the following adjustments to the collection schedule:

- Repeat Every 5 Minutes
- Upload Interval 3 Collections

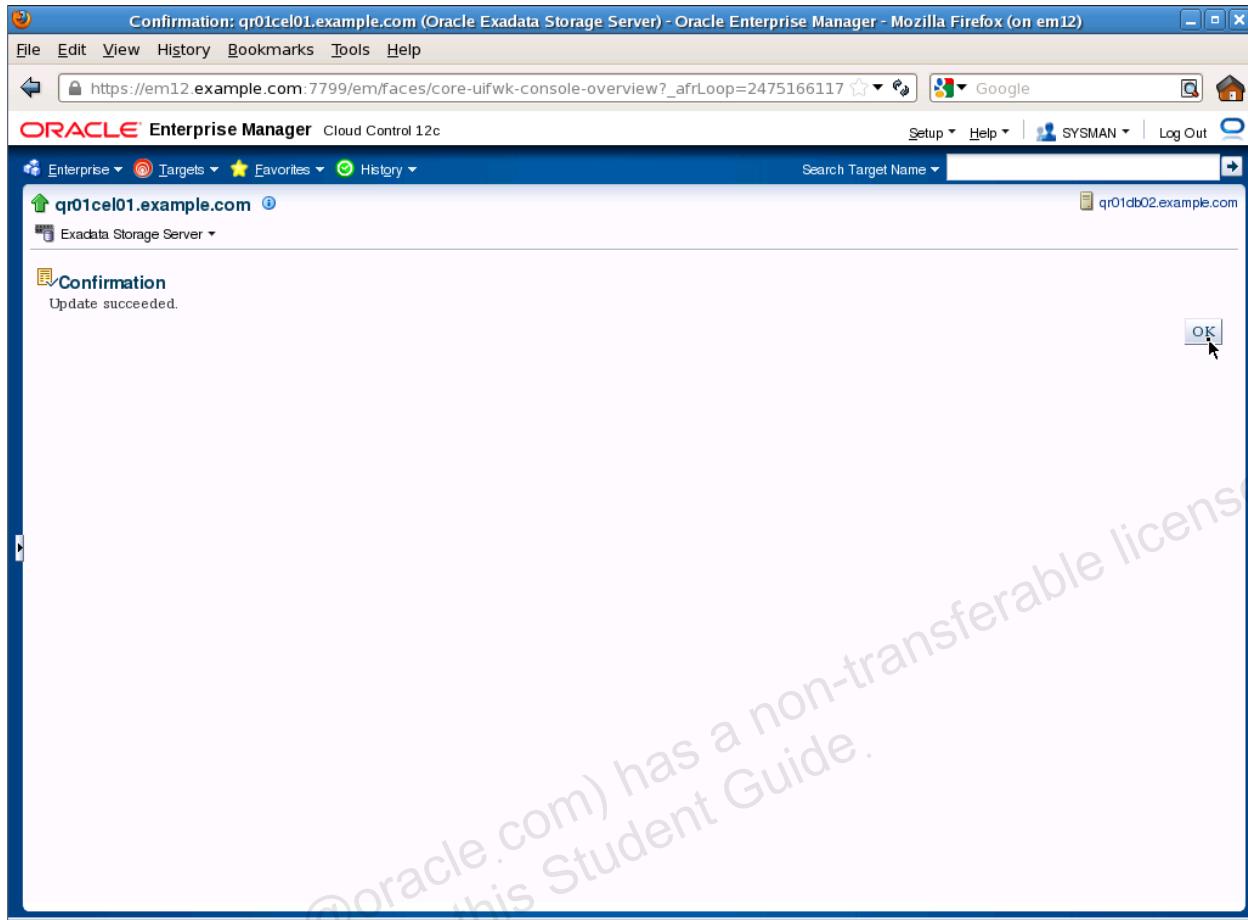
These settings will cause the metrics to be collected every 5 minutes and uploaded to the Management Repository every 15 minutes. Finally, click Continue to proceed.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Edit Collection Settings: Host Interconnect Statistics: qr01cel01.example.com (Oracle Exadata Storage Server) - Oracle Enterprise Manager - Mozilla Firefox". The main content area is titled "Edit Collection Settings: Host Interconnect Statistics". It contains several sections: "Collection Schedule" (Data Collection Enabled: Disable), "Collection Frequency" (Default Frequency: Every 15 Minutes), "Frequency Type" (By Minutes), "Repeat Every" (5 Minutes), "Use of Metric Data" (Alerting and Historical Trending selected, Upload Interval: 3 Collections), and "Affected Metrics" (Aggregated Exadata CellDisk Metric, Aggregated Exadata FlashDisk and HardDisk Metric, Exadata Cell Metric, Exadata CellDisk Load Imbalance, Exadata CellDisk Metric). A tooltip for the Upload Interval explains that it determines how often a metric value is uploaded to the Management Repository. The "Continue" button is highlighted with a mouse cursor.

24. Click OK to save the thresholds and collection schedule settings, which you made in the previous steps.



25. Click OK to acknowledge the update confirmation.



You have just seen how to adjust the Enterprise Manager thresholds and metric collection settings for one Exadata Storage Server. However, what if you have to replicate these settings across numerous Exadata Storage Servers? That is where Monitoring Templates can help. In the next part of this practice, you will examine Monitoring Templates and how they relate to Exadata Storage Servers. You will first create a monitoring template based on one of your existing cells, and then you will apply the template to your other cells.

26. Select the Enterprise > Monitoring > Monitoring Templates menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar has a tree view with 'Monitoring' expanded, and 'Monitoring Templates' is highlighted with a mouse cursor. The main content area displays various performance metrics and summary tables. A large watermark reading 'Hong Lin (hong.lin@oracle.com) has a non-transferable license to use this Student Guide.' is overlaid across the page.

Home: qr01cel01.example.com (Oracle Exadata Storage Server) - Oracle Enterprise Manager - Mozilla Firefox (on em12)

File Edit View History Bookmarks Tools Help

https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\_afrLoop=2475166117

ORACLE Enterprise Manager Cloud Control 12c

Enterprise Targets Favorites History Search Target Name

Incident Manager Ctrl+Shift+I

Logs

Blackouts

Corrective Actions

Metric Extensions

Monitoring Templates

Support Workbench

Template Collections

Capacity

- CellDisk Size (GB) 22 100%
- HardDisk Size (GB) 18 100%
- FlashDisk Size (GB) 4 100%
- FlashCache Size (GB) 3 100%

Workload Distribution by Databases

ASM	Disk Group	Size (GB)	Free Space (GB)	No. of Griddisks	Database Names
DATA2_QR01		3	0.0	12	
DATA_QR01		6	0.0	12	
DBFS_DG		1	0.0	12	
RECO_QR01		5	0.0	12	

IO Load

CPU Utilization

Network U

ASD Diskgroup Summary

ASM	Disk Group	Size (GB)	Free Space (GB)	No. of Griddisks	Database Names
DATA2_QR01		3	0.0	12	
DATA_QR01		6	0.0	12	
DBFS_DG		1	0.0	12	
RECO_QR01		5	0.0	12	

Incidents

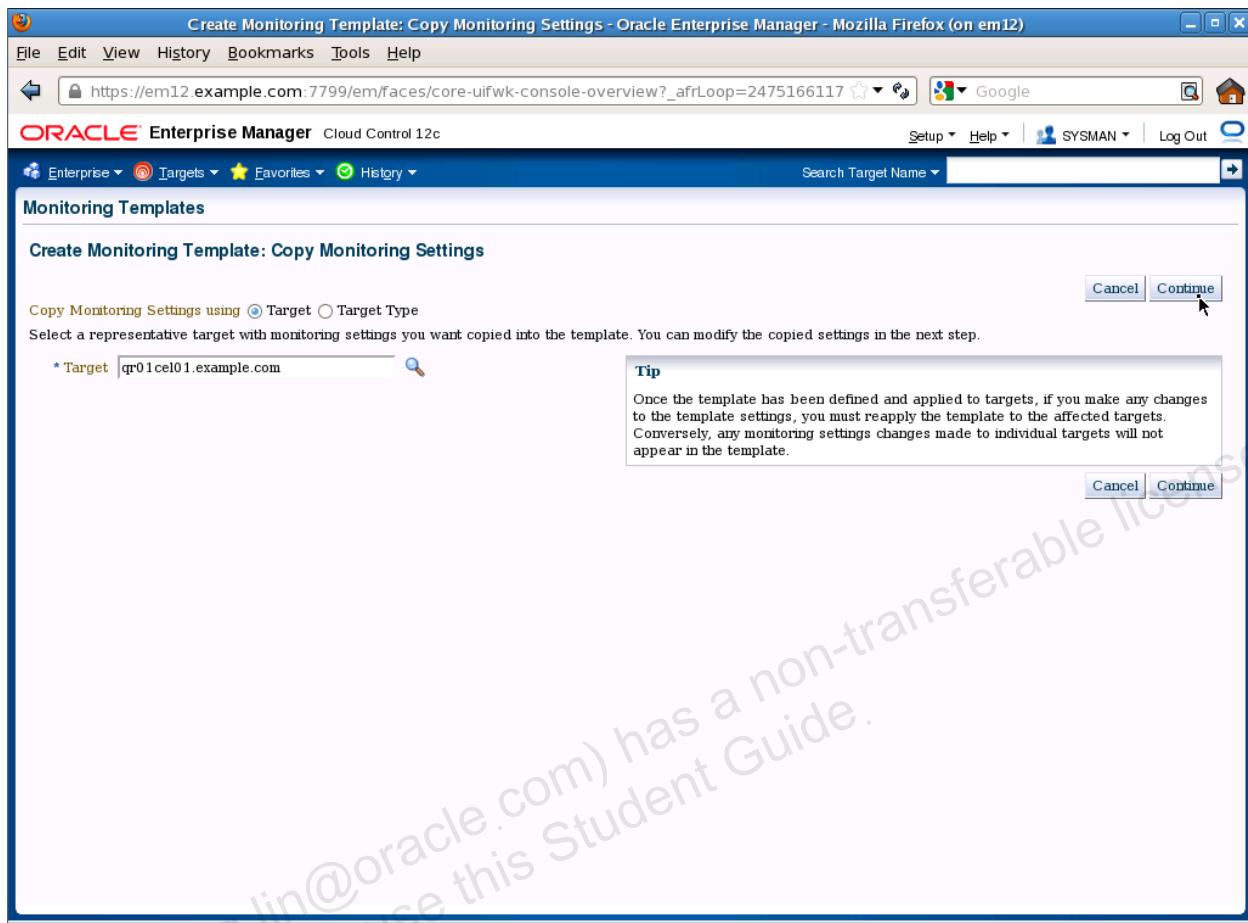
View	Category	All	- 0	X 0	W 0	P 0
Summary						

No matching incidents or problems found.

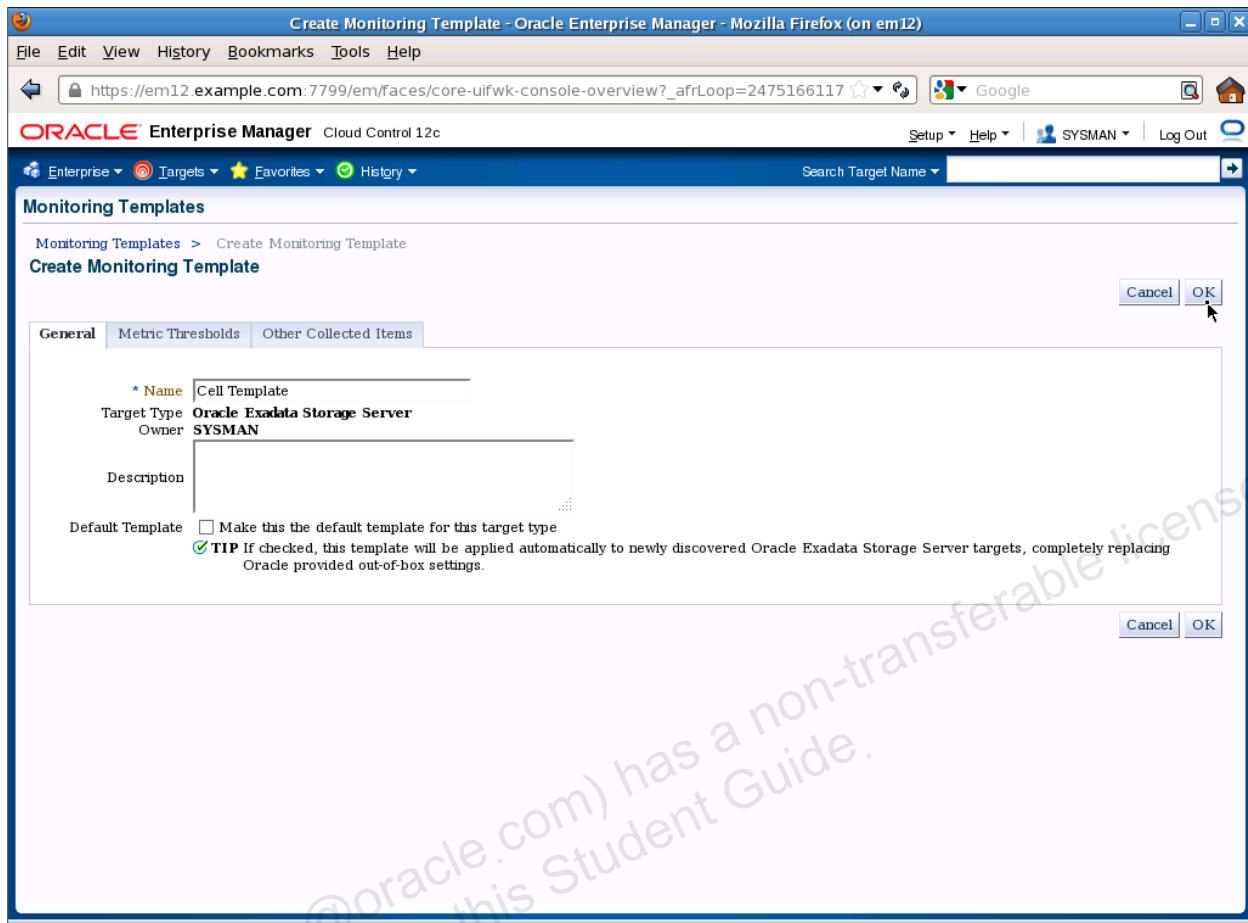
27. Click Create.

The screenshot shows the 'Monitoring Templates' page in Oracle Enterprise Manager. At the top, there's a search bar with 'Template Name' and 'Target Type' dropdowns set to 'All'. Below the search is a table titled 'Pending Apply Operations' with one row: 'No data'. At the bottom of the page, there are three buttons: 'Create' (highlighted with a mouse cursor), 'Set Default Templates', and 'Import'. A note below the buttons says: 'Default Template for a target type. This template will be applied automatically to newly discovered targets in Enterprise Manager.' Another note says: 'TIP Oracle Certified templates contain the subset of monitoring settings pertaining to a specific functional area for the target type.' On the left, there's a 'Related Links' section with 'Default Templates' and 'Past Apply Operations'.

28. Specify the Exadata Storage Server `qr01cel01.example.com` as the target and click Continue.



29. Specify Cell Template as the template name and click OK.



30. At this point, a confirmation message appears indicating the successful creation of your monitoring template. Based on the Exadata Storage Server `qr01ce101`, this template includes the thresholds and metric collection settings that you customized earlier in the practice. Click **Apply** to start the process of applying this template to your other storage servers.

**Monitoring Templates - Oracle Enterprise Manager - Mozilla Firefox (on em12)**

**ORACLE Enterprise Manager** Cloud Control 12c

**Monitoring Templates**

**Confirmation**  
Template Cell Template successfully created.

Monitoring Templates can be used to apply a subset of monitoring settings to multiple targets. This allows you to standardize monitoring across your enterprise. When a template is applied to a target, any monitoring settings not specified in the template remain unaffected on the target.

Page Refreshed Jul 22, 2013 4:15:12 AM UTC Refresh

**Search**

Template Name	<input type="text"/>
Target Type	All
<input type="checkbox"/> Display Oracle Certified templates	
<input type="button" value="Go"/>	

Pending Apply Operations 0

<input type="button" value="Apply"/>	<input type="button" value="View"/>	<input type="button" value="Edit"/>	<input type="button" value="Create Like"/>	<input type="button" value="Delete"/>	<input type="button" value="Compare Settings"/>	<input type="button" value="Export"/>	<input type="button" value="Create"/>	<input type="button" value="Set Default Templates"/>	<input type="button" value="Import"/>
Select	Name	Target Type			Pending Apply Operations	Owner	Last Modified By	Last Modified	
<input checked="" type="radio"/>	Cell Template	Oracle Exadata Storage Server			0	SYSMAN	SYSMAN	Jul 22, 2013 4:15:11 AM UTC	

**Default Template for a target type. This template will be applied automatically to newly discovered targets in Enterprise Manager.**

**TIP** Oracle Certified templates contain the subset of monitoring settings pertaining to a specific functional area for the target type.

**Related Links**

- [Default Templates](#)
- [Past Apply Operations](#)

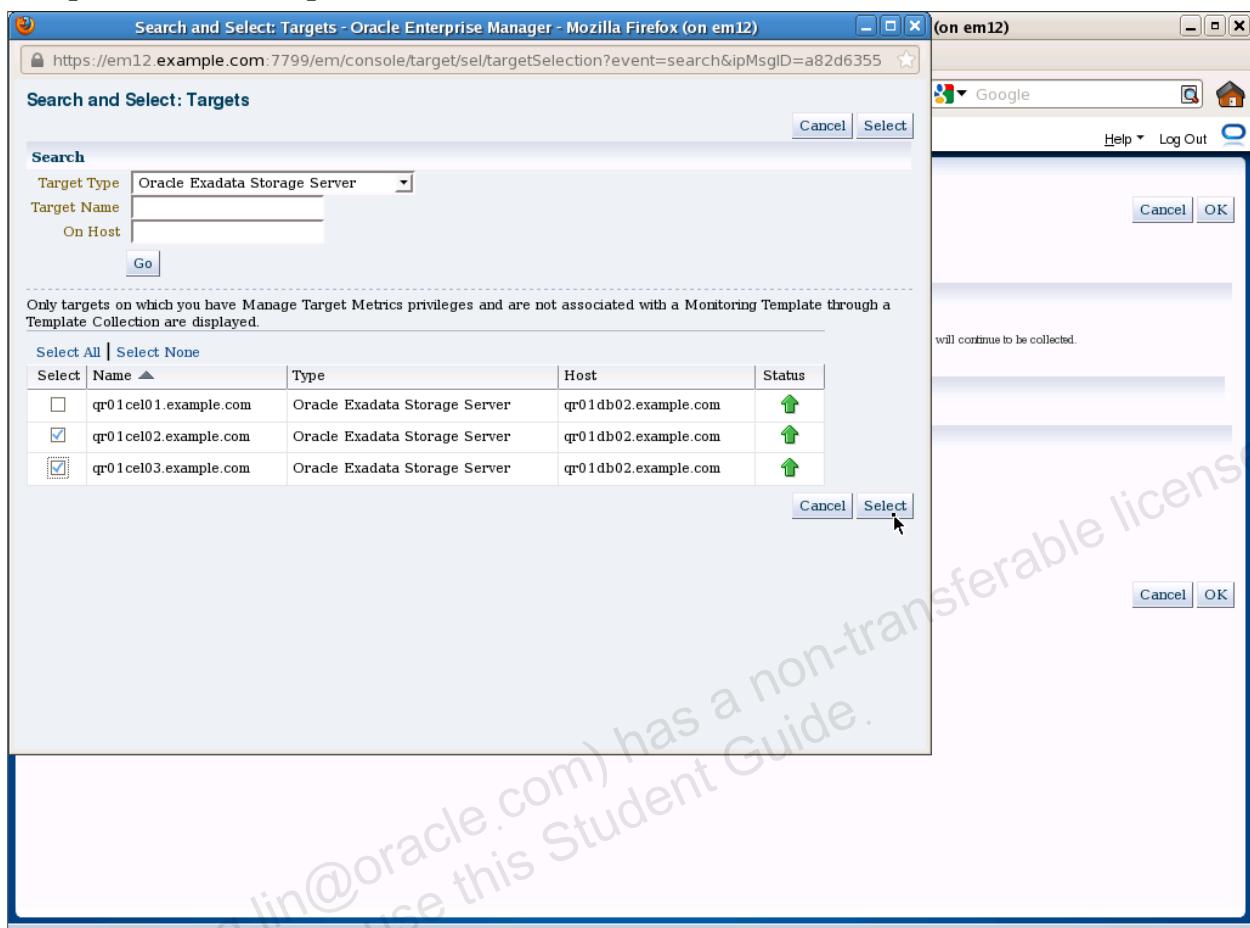
31. Click Add to specify the destination targets.

The screenshot shows the 'Apply Monitoring Template Cell Template: General' dialog box in Oracle Enterprise Manager. At the top, it displays the source template information: 'Source Template Cell Template', 'Target Type Oracle Exadata Storage Server', and 'Owner SYSMAN'. Below this, the 'Apply Options' section contains two radio button options: 'Template will completely replace all metric settings in the target' (unchecked) and 'Template will only override metrics that are common to both template and target' (checked). A note below the second option states: 'Applying the template removes the thresholds of the metrics that are present in the target, but not included in the template. This disables alert functionality for these metrics. Metric data will continue to be collected.' Under the 'Metrics with Key Value Settings' section, there is a link labeled 'Metrics with Key Value Settings'. The 'Destination Targets' section contains a table with the following data:

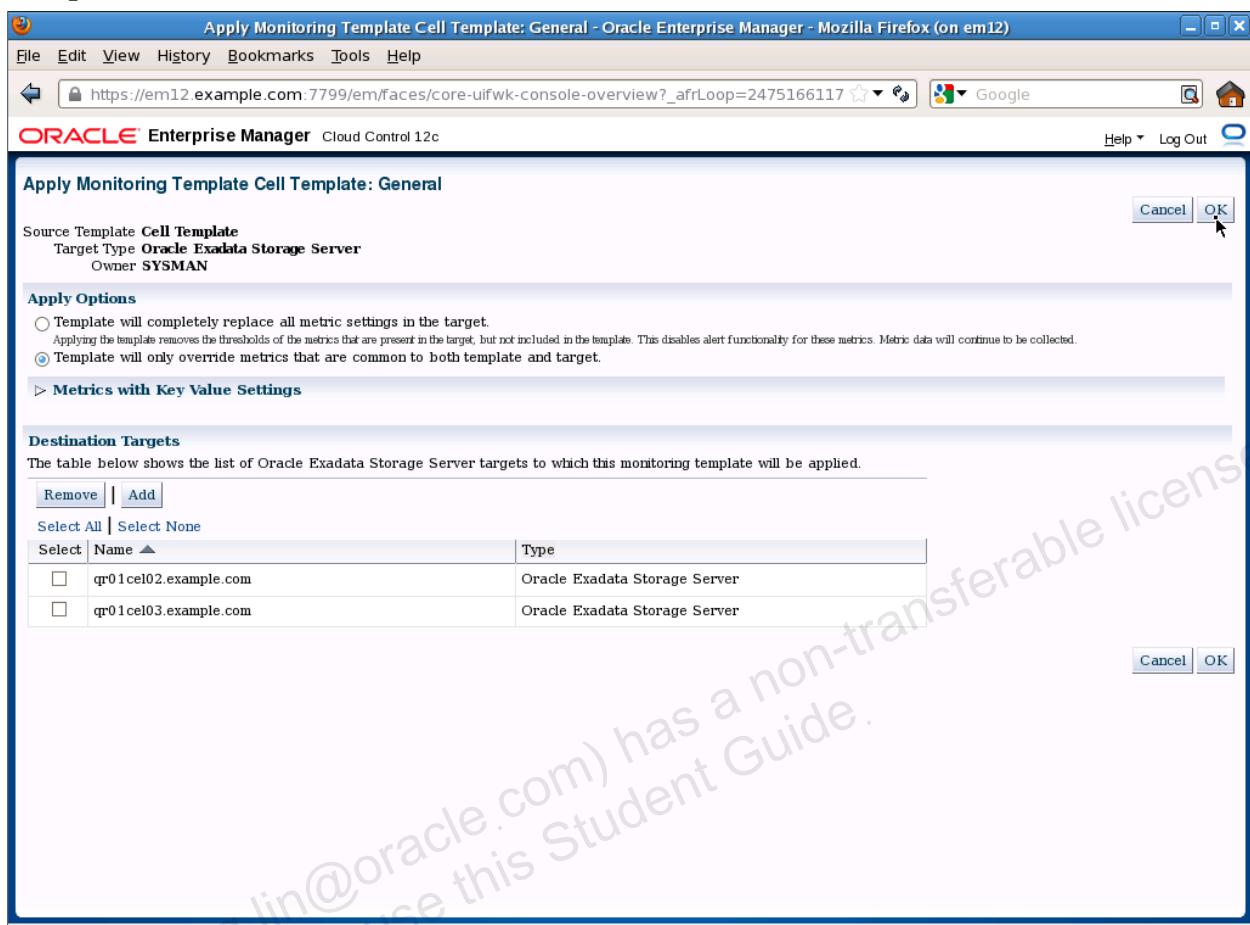
Add	Name	Type
	No data	

At the bottom right of the dialog box are 'Cancel' and 'OK' buttons.

32. Select the Exadata Storage Servers `qr01cel02.example.com` and `qr01cel03.example.com`, and then click **Select**.



33. Click OK to apply your monitoring template (based on qr01cel01) to qr01cel02 and qr01cel03.



34. Application of the monitoring template occurs as a background task. Periodically, click Refresh while Pending Apply Operations shows a value greater than zero.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Monitoring Templates - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area is titled "Monitoring Templates". A yellow-bordered "Confirmation" box states: "The apply of monitoring template Cell Template has been successfully submitted. There may be a delay before the template is applied to all targets. The Pending Apply Operations column indicates how many targets have not yet been updated." Below this, a text box says: "Monitoring Templates can be used to apply a subset of monitoring settings to multiple targets. This allows you to standardize monitoring across your enterprise. When a template is applied to a target, any monitoring settings not specified in the template remain unaffected on the target." To the right, it says "Page Refreshed Jul 22, 2013 4:17:18 AM UTC" and there is a "Refresh" button. A search section includes fields for "Template Name" and "Target Type" (set to "All"), with a "Go" button. A table titled "Pending Apply Operations 4" lists one entry:

Select	Name	Target Type	Pending Apply Operations	Owner	Last Modified By	Last Modified
<input checked="" type="radio"/>	Cell Template	Oracle Exadata Storage Server	2	SYSMAN	SYSMAN	Jul 22, 2013 4:15:11 AM UTC

Below the table are two tips: "Default Template for a target type. This template will be applied automatically to newly discovered targets in Enterprise Manager." and "TIP Oracle Certified templates contain the subset of monitoring settings pertaining to a specific functional area for the target type." A "Related Links" section includes "Default Templates" and "Past Apply Operations".

35. When Pending Apply Operations shows zero, the application process is finished.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Monitoring Templates - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area is titled "Monitoring Templates". A sub-header states: "Monitoring Templates can be used to apply a subset of monitoring settings to multiple targets. This allows you to standardize monitoring across your enterprise. When a template is applied to a target, any monitoring settings not specified in the template remain unaffected on the target." To the right, it says "Page Refreshed Jul 22, 2013 4:17:36 AM UTC" and "Refresh". Below the sub-header, there's a "Search" section with fields for "Template Name" and "Target Type" (set to "All"). There's also a checkbox for "Display Oracle Certified templates" and a "Go" button. A table titled "Pending Apply Operations 0" is shown, containing one row: "Cell Template" (Oracle Exadata Storage Server), "Pending Apply Operations" (0), "Owner" (SYSMAN), and "Last Modified By" (SYSMAN) with a timestamp of "Jul 22, 2013 4:15:11 AM UTC". Below the table, there are two informational messages: a blue info icon followed by "Default Template for a target type. This template will be applied automatically to newly discovered targets in Enterprise Manager." and a green checkmark icon followed by "TIP Oracle Certified templates contain the subset of monitoring settings pertaining to a specific functional area for the target type." At the bottom left, there's a "Related Links" section with "Default Templates" and "Past Apply Operations".

36. To confirm the application of the monitoring template, you can examine the cell threshold settings on qr01cel02 and verify that they match the settings from qr01cel01. To commence this process, enter qr01cel in the Search Target Name field and click the Search button.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Monitoring Templates - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The address bar shows the URL: [https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\\_afrLoop=2475166117](https://em12.example.com:7799/em/faces/core-uifwk-console-overview?_afrLoop=2475166117). The top navigation bar includes links for File, Edit, View, History, Bookmarks, Tools, Help, Setup, Help, SYSMAN, Log Out, and a search bar set to "qr01cel". The main content area is titled "Monitoring Templates". It displays a search form with fields for "Template Name" (containing "qr01cel") and "Target Type" (set to "All"). Below the search form is a table titled "Pending Apply Operations". The table has columns: Select, Name ▾, Target Type, Pending Apply Operations, Owner, Last Modified By, and Last Modified. One row is visible: "Cell Template" (selected), "Oracle Exadata Storage Server", "0", "SYSMAN", "SYSMAN", and "Jul 22, 2013 4:15:11 AM UTC". There are also two informational messages at the bottom: "Default Template for a target type. This template will be applied automatically to newly discovered targets in Enterprise Manager." and "TIP Oracle Certified templates contain the subset of monitoring settings pertaining to a specific functional area for the target type." A "Related Links" section includes "Default Templates" and "Past Apply Operations". The bottom of the page shows the URL again: [https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\\_afrLoop=247516611711629&\\_afrWindowMode=0&\\_afrWindowId=8soc1cf0f\\_1#](https://em12.example.com:7799/em/faces/core-uifwk-console-overview?_afrLoop=247516611711629&_afrWindowMode=0&_afrWindowId=8soc1cf0f_1#).

37. Click `qr01cel02.example.com` to navigate to the Exadata Storage Server home page for `qr01cel02`.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "All Targets - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The address bar shows the URL `https://em12.example.com:7799/em/faces/core-uifwk-console-overview?_afrLoop=2475166117`. The main content area is titled "All Targets". On the left, there is a "Refine Search" sidebar with dropdown menus for Target Type (Servers, Storage and Network), Target Status (Up), Target Version (11.2.3.2.1), Platform (x86\_64), and Operating System (Linux). The main table has columns for Target Name, Target Type, Target Status, and Pending Activation. The table shows three entries:

Target Name	Target Type	Target Status	Pending Activation
qr01cel01.example.com	Oracle Exadata Storage Server	Up	
qr01cel02.example.com	Oracle Exadata Storage Server	Up	
qr01cel03.example.com	Oracle Exadata Storage Server	Up	

At the bottom right of the table, it says "Targets Found 3". The URL in the address bar is also visible: `https://em12.example.com:7799/em/faces/core-uifwk-console-overview?_afrLoop=247516611711629&_afrWindowMode=0&_afrWindowId=8soc1cf0f_1#`.

38. Select the Exadata Storage Server > Monitoring > Metric and Collection Settings menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar has a tree view with 'Exadata Storage Server' selected. Under 'Monitoring', the 'Metric and Collection Settings' option is highlighted. The main content area displays several charts: 'IO Load' (Flash Disk IO Load, Hard Disk IO Load), 'CPU Utilization' (Total), and 'Network Utilization' (Total Received). Below these charts is a table titled 'ASM Diskgroup Summary' with the following data:

ASM	Disk Group	Size (GB)	Free Space (GB)	No. of Gridisks	Database Names
DATA2_QR01		3	0.0	12	
DATA_QR01		6	0.0	12	
DBFS_DG		1	0.0	12	
RECO_QR01		5	0.0	12	

At the bottom, there is a section for 'Incidents' with a summary table showing 0 matching incidents or problems found.

39. Scroll down the page until you see the thresholds associated with the metrics Host MB Dropped Per Sec and Host RDMA MB Dropped Per Sec. These threshold settings were created when the monitoring template was applied to this cell. Notice also that the collection schedule for these metrics is Every 5 Minutes, rather than the default (Every 15 Minutes). This is another consequence of applying the monitoring template.

Alert Type	=	WARNING	CRITICAL	None	
HCA Port Configuration Monitor					Every 15 Minutes
Is this port disconnected(yes/no)	Matches		yes	None	
HCA Port Errors					Every 15 Minutes
Total errors	>=	10		None	
HCA Port State					Every 15 Minutes
Is the link degraded? (active speed or width less than enabled)	=		1	None	
HCA Port State (For Alerts)					Every 15 Minutes
Is port disabled?	=		1	None	
Is port in 'polling' state?	=		1	None	
Host Interconnect Statistics					Every 5 Minutes
Host MB Dropped Per Sec	>	0		None	
Host RDMA MB Dropped Per Sec	>	0		None	
Response					Every 5 Minutes
Response Status	=			Down None	

TIP Empty Thresholds will disable alerts for that metric.

Related Links  
[Past Apply Operations](#)   [Pending Apply Operations](#)

[Cancel](#) [OK](#)

In the next part of this practice, you will examine the difference between thresholds set in the Exadata Storage Server and thresholds set in Enterprise Manager. You will also examine the different alerts generated when these thresholds are crossed. First, you will examine cell-based thresholds and how the associated alerts are propagated to Enterprise Manager.

40. Establish a terminal connection to the qr01cel01 Exadata cell as the celladmin user.

```
$ ssh celladmin@qr01cel01
celladmin@qr01cel01's password: <welcome>
[celladmin@qr01cel01 ~]$
```

41. Launch the Exadata cell command-line interface (CellCLI).

```
[celladmin@qr01cel01 ~]$ cellcli
CellCLI: Release 11.2.3.2.1 - Production...

CellCLI>
```

42. Examine the current value of the metric relating to storage server memory utilization (cl\_memut).

```
CellCLI> list metriccurrent cl_memut
CL_MEMUT          qr01cel01      92 %
```

CellCLI>

43. Create a cell-based threshold for cl\_memut. Configure the threshold so that a critical alert is generated when memory utilization exceeds 10% (which will always be the case in your laboratory environment).

```
CellCLI> create threshold cl_memut comparison='>', critical=10
Threshold cl_memut successfully created

CellCLI>
```

44. Execute the LIST ALERT HISTORY command. You should see an alert related to the threshold you created in the previous step. If you cannot see the expected alert, periodically re-execute the LIST ALERT HISTORY command until the alert is visible. After the alert becomes visible, leave your CellCLI session running and proceed to the next step.

```
CellCLI> list alerthistory
...
2_1      2013-07-22T00:22:37-04:00      critical
"The critical threshold for the following metric has been
crossed. Metric Name      : CL_MEMUT Metric Description :
Percentage of total physical memory on the cell that is
currently used Object Name      : qr01cel01 Current Value
: 96.0 % Threshold Value     : 10.0 % "
```

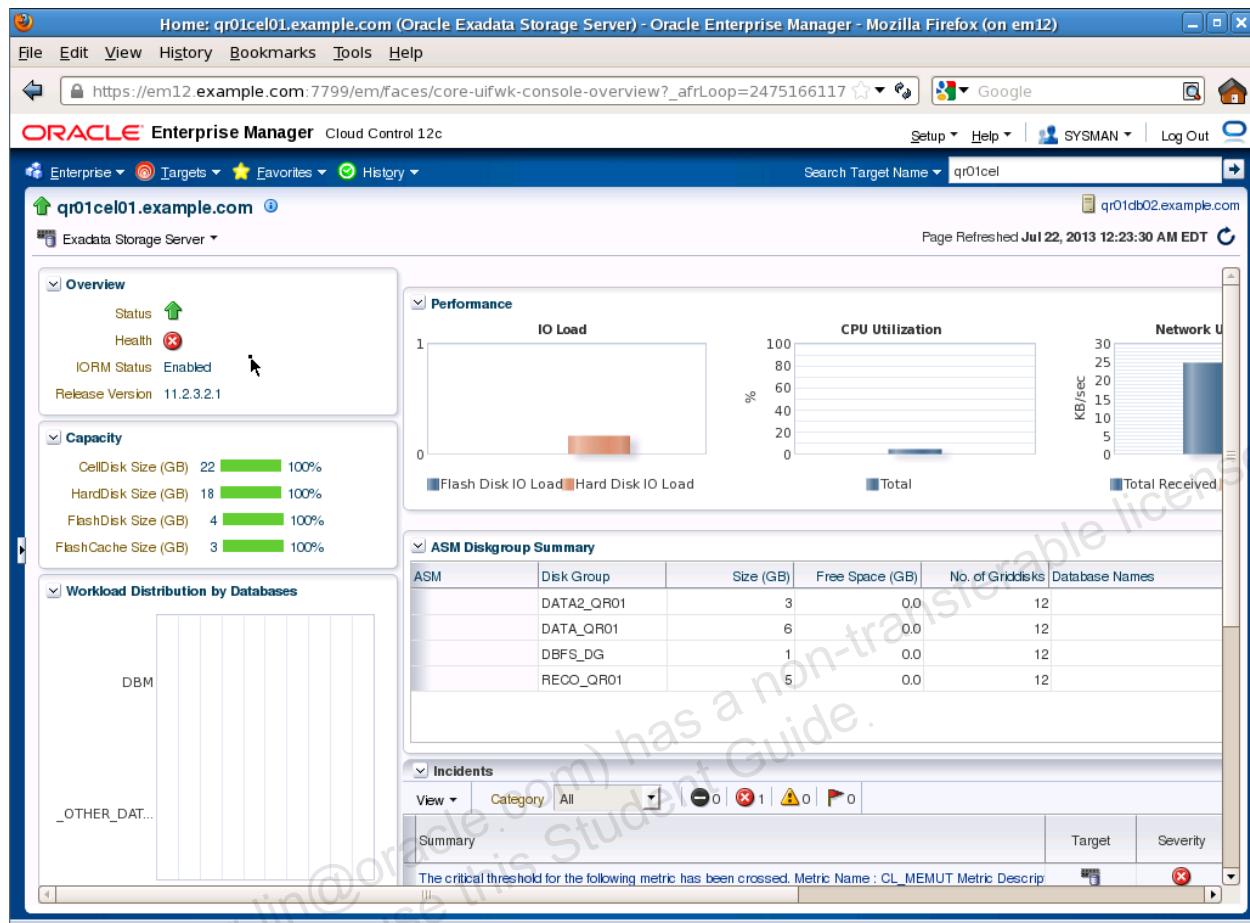
CellCLI>

45. Back in your Enterprise Manager session, use the History menu to navigate back to the home page for qr01cel01.example.com.

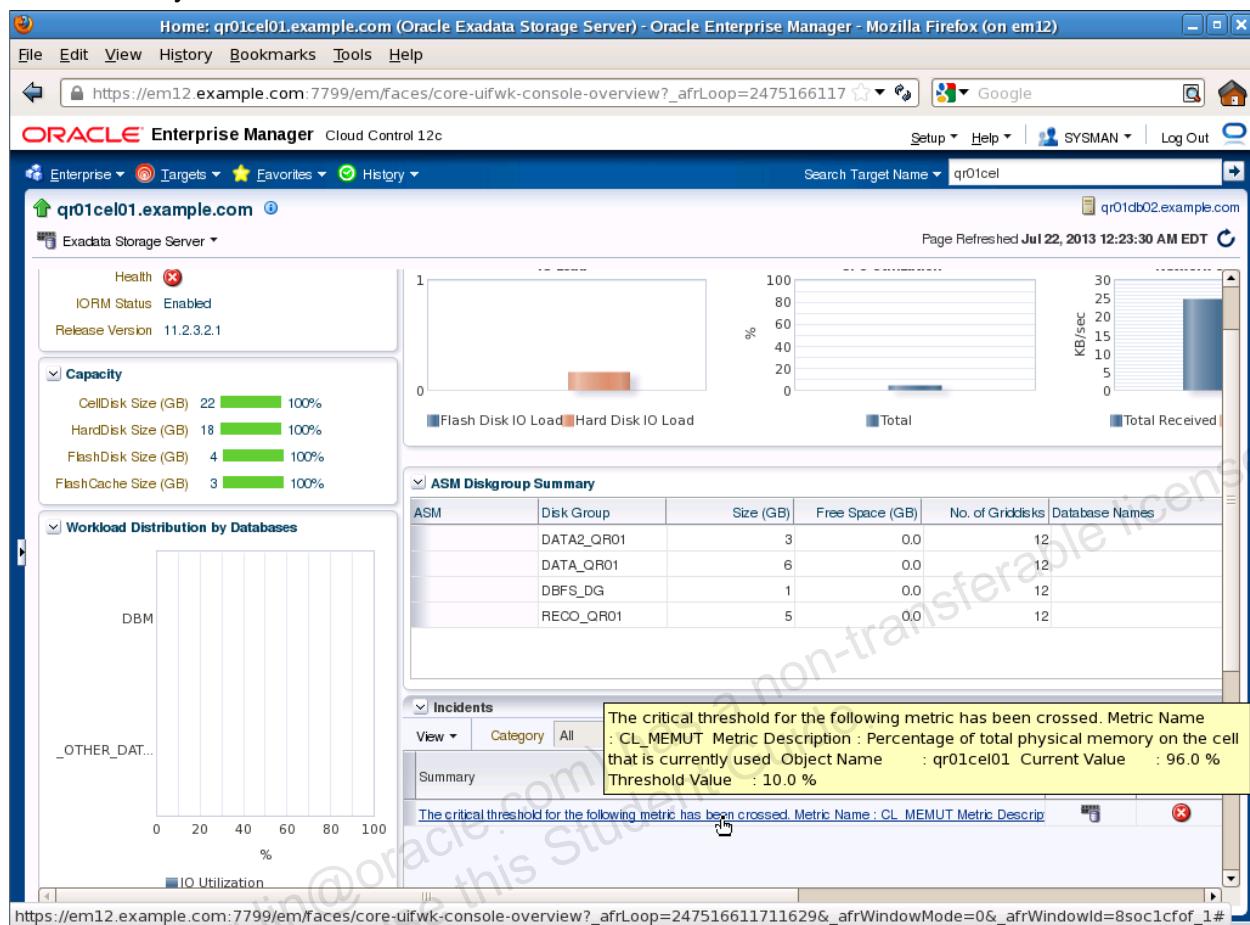
The screenshot shows the Oracle Enterprise Manager interface for managing metrics and collections. The title bar reads "Metric and Collection Settings: qr01cel02.example.com (Oracle Exadata Storage Server) - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The left sidebar lists targets: "qr01cel02.example.com" (selected), "qr01cel01.example.com" (highlighted), "Exadata Storage Server", "Alert Type", and "HCA Port Configuration Monitor". Under "HCA Port Configuration Monitor", there is a section for "Is this port disconnected(yes/n)". The main pane displays a table of metrics with their current status, threshold values, and collection intervals. A tip message at the bottom left says "TIP Empty Thresholds will disable alerts for that metric." At the bottom, there are "Related Links" for "Past Apply Operations" and "Pending Apply Operations", and buttons for "Cancel" and "OK".

Metric	Current Status	Threshold	Collection Interval	Action
DB Machine qr01.example.com	None		Every 15 Minutes	
dbm.example.com_cellsys	None		Every 15 Minutes	
Exadata Grid qr01.example.com	None		Every 15 Minutes	
DB Machine qr01.example.com-Exadata Storage Servers Service	None		Every 15 Minutes	
Total errors	>=	10	None	
Is the link degraded? (active speed or width less than enabled)	=	1	None	
Is port disabled?	=	1	None	
Is port in 'polling' state?	=	1	None	
Host MB Dropped Per Sec	>	0	None	
Host RDMA MB Dropped Per Sec	>	0	None	
Response Status	=	Down	Every 5 Minutes	

46. You should immediately notice that the Cell Health indicator is now showing a red alert icon.



47. Scroll to the bottom of the page and you should see an entry in the Incidents area. Click the Summary link to examine the incident details.



48. Examine the incident details. Note that the incident is associated with the cell-generated alert that was triggered earlier.

The screenshot shows the Oracle Enterprise Manager interface with the title "Incident Details - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The URL is https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\_afrLoop=2475166117. The page displays an incident for metric CL\_MEMUT, which has crossed the critical threshold. The incident details include:

- General:** ID: 664, Metric: Alert Type, Metric Group: Cell Generated Alert, Alert Name: CL\_MEMUT, Alert Sequence: 2, Target: qr01cel01.example.com (Oracle Exadata Storage Server), Incident Created: Jul 22, 2013 12:22:38 AM EDT, Last Updated: Jul 22, 2013 12:22:38 AM EDT.
- Tracking:** Escalated: No, Priority: None, Status: New, Owner: -, Acknowledged: No. A note states: "Last Incident created by rule (Name = Incident management rule set for all targets, Create incident for Comment critical metric alerts [System generated rule]): on Jul 22, 2013 12:22:38 AM EDT". A checkbox is checked: "This incident will be automatically cleared when the underlying issue is resolved".
- Guided Resolution:** Diagnostics: View topology, View recent configuration changes, View Metric Help. Actions: Reevaluate Alert, Edit Thresholds.

49. Return to your CellCLI session and alter the cl\_memut threshold. Set the critical threshold to 100%. This will clear the alert associated with the cl\_memut metric.

```
CellCLI> alter threshold cl_memut comparison='>', critical=100
Threshold cl_memut successfully altered

CellCLI>
```

50. Execute the LIST ALERTHISTORY command. You should see an entry indicating that the alert has cleared. If you cannot see the expected entry, periodically re-execute the LIST ALERTHISTORY command until it is visible. After the alert clearance becomes visible, leave your CellCLI session running and proceed to the next step.

```
CellCLI> list alerthistory
...
2_1      2013-07-22T00:22:37-04:00      critical
"The critical threshold for the following metric has been
crossed. Metric Name      : CL_MEMUT Metric Description :
Percentage of total physical memory on the cell that is
currently used Object Name      : qr01cel01 Current Value
: 96.0 % Threshold Value      : 10.0 % "
```

```

2_2      2013-07-22T00:26:36-04:00      clear
"The critical threshold for the following metric has been
cleared. Metric Name          : CL_MEMUT Metric Description :
Percentage of total physical memory on the cell that is
currently used Object Name     : qr01cel01 Current Value
: 93.0 % Threshold Value    : 100.0 % "

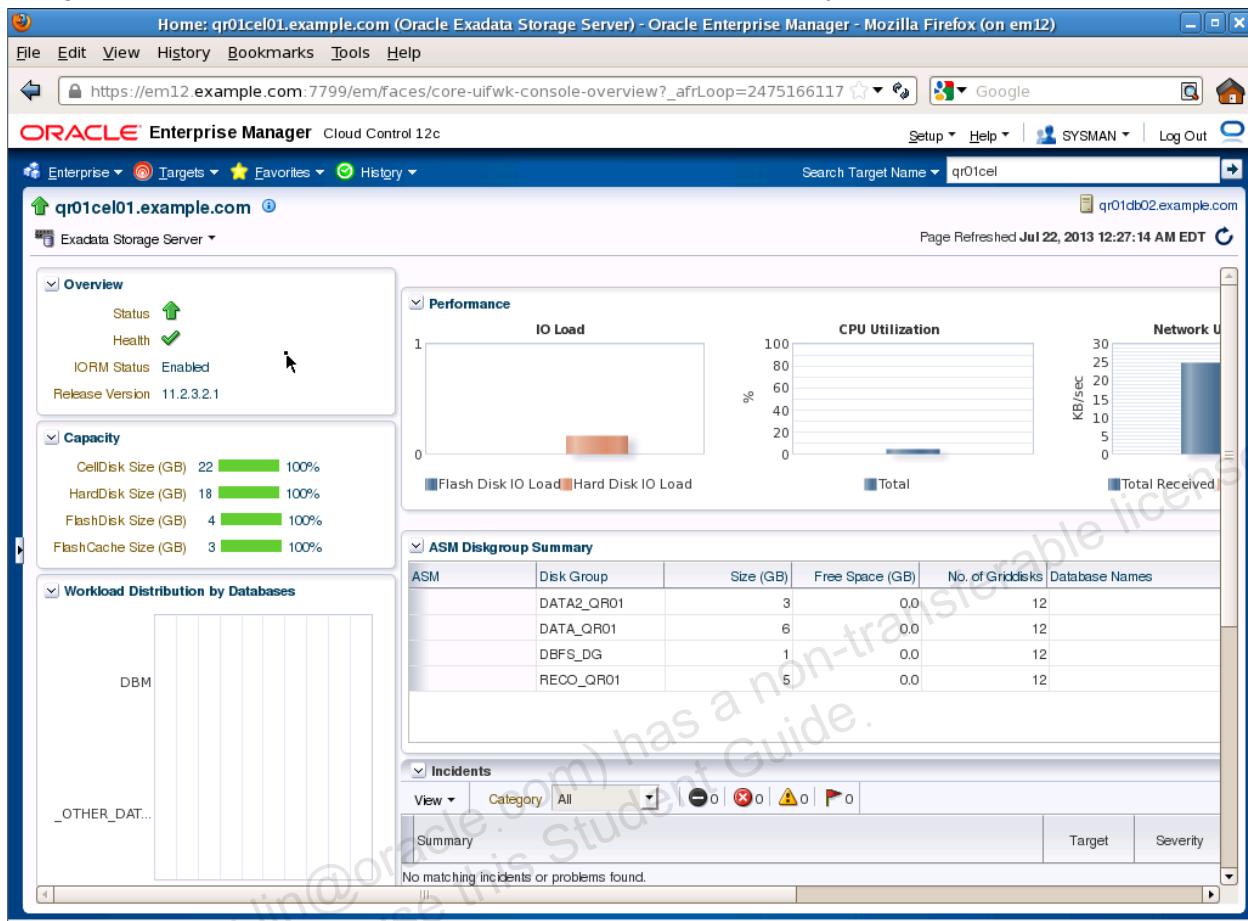
```

CellCLI>

51. Back in your Enterprise Manager session, use the History menu to again navigate to the home page for qr01cel01.example.com.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Incident Details - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area displays an incident for ID 664, which is an "Unassigned, Not acknowledged" alert. The alert type is "Metric Alert" for the metric "CL\_MEMUT". The summary states: "The critical threshold for the following metric has been crossed. Metric Name : CL\_MEMUT Metric Description : Percentage of total physical memory on the cell that is currently used Object Name : qr01cel01 Current Value : 93.0 % Threshold Value : 100.0 %". The tracking section shows the incident was created on Jul 22, 2013 at 12:22:38 AM EDT and last updated at the same time. The status is "New". The guided resolution section includes links to "View topology", "View recent configuration changes", and "View Metric Help". A sidebar on the left lists targets: qr01cel01.example.com, qr01cel02.example.com, DB Machine qr01.example.com, dbm.example.com\_celsys, Exadata Grid qr01.example.com, and DB Machine qr01.example.com-Exadata Storage Servers Service. A search bar at the top right shows "Search Target Name: qr01cel".

52. Now that the alert has cleared, you should notice that the Cell Health indicator shows a green check mark. Also, the Incidents area should be empty.



You have just seen how cell-generated alerts are propagated to Enterprise Manager and how they can appear as incidents in Enterprise Manager. Normally, this process is very reliable; however, various problems could disrupt the process. Because of this, it is recommended that administrators who primarily use Enterprise Manager should also periodically check the cell alert history for undelivered alerts.

53. If an Exadata Storage Server cannot deliver an alert using any of the configured delivery channels, the notificationState for the alert will be set to 1. Back in your CellCLI session, use the following command to list any undelivered and previously unexamined alerts on this cell (qr01cel01).

```
CellCLI> list alerthistory where notificationState != 1 and
examinedBy = ''
```

```
CellCLI>
```

54. Exit CellCLI.

```
CellCLI> exit
quitting

[celladmin@qr01cel01 ~]$
```

55. Use the following command to check for undelivered and previously unexamined alerts across all your Exadata Storage Servers. Notice that the command returns some alerts from qr01cel02 and qr01cel03. Notice also that the alert timestamps indicate that these alerts were generated before you configured Enterprise Manager to monitor your Database Machine environment. This explains why these alerts are not visible in Enterprise Manager.

```
[celladmin@qr01cel01 ~]$ dcli -c qr01cel01,qr01cel02,qr01cel03
cellcli -e "list alerthistory where notificationState != 1 and
examinedBy = ''"
qr01cel02: 1_1 2013-07-17T18:33:30-04:00 warning
" Hugepage allocation failure in service cellsrv. Number of
Hugepages allocated is 0, failed to allocate 110"
qr01cel03: 1_1 2013-07-17T18:33:41-04:00 warning
" Hugepage allocation failure in service cellsrv. Number of
Hugepages allocated is 0, failed to allocate 110"
[celladmin@qr01cel01 ~]$
```

In the next part of this practice, you will configure a threshold in Enterprise Manager and watch as an Incident is generated by using the threshold.

56. Back in your Enterprise Manager session, select the Exadata Storage Server > Monitoring > Metric and Collection Settings menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar navigation bar has 'Monitoring' selected under 'All Metrics'. A dropdown menu is open over the 'Metric and Collection Settings' option, showing 'Metric Collection Errors', 'Status History', 'Incident Manager', 'Alert History', and 'Blackouts'. The main content area displays various monitoring dashboards and tables. One dashboard shows 'IO Load' with a chart comparing 'Flash Disk IO Load' (blue) and 'Hard Disk IO Load' (orange). Another chart shows 'CPU Utilization' with a single blue bar at approximately 5%. A third chart shows 'Network Utilization' with a blue bar at approximately 25 KB/sec. Below these charts is a table titled 'ASM Diskgroup Summary' with four rows:

ASM	Disk Group	Size (GB)	Free Space (GB)	No. of Griddisks	Database Names
	DATA2_OR01	3	0.0	12	
	DATA_OR01	6	0.0	12	
	DBFS_DG	1	0.0	12	
	RECO_OR01	5	0.0	12	

At the bottom of the interface, there is an 'Incidents' section with a table showing 'Summary' and 'Target' and 'Severity' columns. The message 'No matching incidents or problems found.' is displayed.

57. Select the option to view all metrics.

The screenshot shows the Oracle Enterprise Manager interface for Cloud Control 12c. The title bar indicates the session is on qr01cel01.example.com (Oracle Exadata Storage Server). The main menu includes File, Edit, View, History, Bookmarks, Tools, and Help. The browser address bar shows https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\_afrLoop=2475166117. The Oracle logo and 'Enterprise Manager' text are visible at the top. A search bar for 'Search Target Name' contains 'qr01cel'. The page header shows 'ORACLE Enterprise Manager' and 'Cloud Control 12c'. Below the header, there are navigation links for 'Enterprise', 'Targets', 'Favorites', 'History', and a search bar for 'qr01cel'. The main content area is titled 'Metric and Collection Settings' for 'Exadata Storage Server > Oracle Exadata Storage Server: qr01cel01.example.com > Metric and Collection Settings'. A sub-tab 'Metrics' is selected. A dropdown menu 'View' is open, showing options: 'Metrics with thresholds' (selected), 'All metrics' (highlighted with a mouse cursor), and 'Metrics with thresholds'. The main table lists various metrics with their configuration details:

Metric	Comparison Operator	Warning Threshold	Critical Threshold	Corrective Actions	Collection Schedule	Edit
qr01cel01 example.com	=	WARNING	CRITICAL	None	Every 15 Minutes	
Cell Generated Alert	Matches		yes	None	Every 15 Minutes	
HCA Port Configuration Monitor	>=	10		None	Every 15 Minutes	
Is this port disconnected(yes/no)	=		1	None	Every 15 Minutes	
HCA Port Errors				None	Every 15 Minutes	
Total errors				None	Every 15 Minutes	
HCA Port State				None	Every 15 Minutes	
Is the link degraded? (active speed or width less than enabled)	=		1	None	Every 15 Minutes	
HCA Port State (For Alerts)	=		1	None	Every 5 Minutes	
Is port disabled?	=		1	None	Every 5 Minutes	
Is port in 'polling' state?	=		1	None	Every 5 Minutes	
Host Interconnect Statistics	/	0		None	Every 5 Minutes	
Host MR Dropped Per Sec						

58. Scroll down to the group of Exadata cell metrics. Click Every 5 Minutes to adjust the collection schedule for the Exadata Cell Metric group of metrics.

The screenshot shows the Oracle Enterprise Manager interface for Cloud Control 12c. The URL in the address bar is [https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\\_afrLoop=2475166117](https://em12.example.com:7799/em/faces/core-uifwk-console-overview?_afrLoop=2475166117). The page displays a table of metrics and their collection schedules. The 'Exadata Cell Metric' group is expanded, showing various metrics like Average Maximum CellDisk IO Load for DWH, Average Maximum CellDisk IO Load for OLTP, etc., all set to 'Every 5 Minutes'. Other metrics like Small Read Response Time, Small Write Bytes, etc., have 'None' selected. The interface includes a navigation bar with links for Enterprise, Targets, Favorites, History, Setup, Help, SYSMAN, and Log Out.

Metric	Collection Schedule
Small Read Response Time	None
Small Write Bytes	>=
Small Write Requests	>=
Small Write Response Time	None
Write IOPS	None
Write Response Time	None
Write Throughput (MBPS)	None
Exadata Cell Metric	
Average Maximum CellDisk IO Load for DWH	Every 5 Minutes
Average Maximum CellDisk IO Load for OLTP	Every 5 Minutes
Average Maximum CellDisk Read IOPS	Every 5 Minutes
Average Maximum CellDisk Read Throughput	Every 5 Minutes
Average Maximum FlashDisk IO Load for DWH	Every 5 Minutes
Average Maximum FlashDisk IO Load for OLTP	Every 5 Minutes
Average Maximum FlashDisk Read IOPS	Every 5 Minutes
Average Maximum FlashDisk Read Throughput	Every 5 Minutes
Average Maximum HardDisk IO Load	None

59. Make the following adjustments to the collection schedule:

- Repeat Every 1 Minutes
- Upload Interval 1 Collections

These settings will cause the metrics to be collected and uploaded every minute. Normally this would not be a recommended setting; however, you should use them for this practice to avoid waiting up to 5 minutes for the incident to be generated. Finally, click Continue to proceed.

**Edit Collection Settings: Exadata Cell Metric: qr01cel01.example.com (Oracle Exadata Storage Server) - Oracle Enterprise Manager - Mozilla Firefox (on)**

File Edit View History Bookmarks Tools Help

https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\_afrLoop=2475166117

ORACLE Enterprise Manager Cloud Control 12c

Enterprise Targets Favorites History

Search Target Name: qr01cel

qr01cel01.example.com

Exadata Storage Server

qr01db02.example.com

Oracle Exadata Storage Server: qr01cel01.example.com > Metric and Collection Settings > Edit Collection Settings: Exadata Cell Metric

**Edit Collection Settings: Exadata Cell Metric**

Editing the collection settings of a metric will also affect the collection settings of other metrics that are based on those metrics. The affected metrics are listed in the Affected Metrics section.

**Collection Schedule**

Data Collection Enabled: Disable

**Collection Frequency**

Default Frequency: Every 15 Minutes

Frequency Type: By Minutes

Repeat Every: 1 Minutes

**Use of Metric Data**

Alerting and Historical Trending

Upload Interval: 1 Collections

Once an alert is detected, data will be uploaded to the repository immediately.

Alerting Only

Alert history will be saved.

The Upload Interval determines how often a metric value is uploaded to the Management Repository. For example, if a metric value is collected every 5 minutes, and the Upload Interval is set to 6 (every 6th collection), the metric value is uploaded every 30 minutes.

**Affected Metrics**

Affected Metrics

Aggregated Exadata CellDisk Metric

Aggregated Exadata FlashDisk and HardDisk Metric

Exadata Cell Metric

Exadata CellDisk Load Imbalance

Exadata CellDisk Metric

60. Click Continue to acknowledge the warning message and proceed.

The screenshot shows a Mozilla Firefox browser window for Oracle Enterprise Manager. The URL is [https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\\_afrLoop=2475166117](https://em12.example.com:7799/em/faces/core-uifwk-console-overview?_afrLoop=2475166117). The page title is "Edit Collection Settings: Exadata Cell Metric: qr01cel01.example.com (Oracle Exadata Storage Server) - Oracle Enterprise Manager - Mozilla Firefox (on)". The main content area is titled "Edit Collection Settings: Exadata Cell Metric". A yellow warning box contains the text: "The repeat interval set is very low. This will cause additional load on the agent and the repository database. To proceed, press Continue after completing your changes." Below the warning, there are sections for "Collection Schedule" (Data Collection Enabled: Disable), "Collection Frequency" (Default Frequency: Every 15 Minutes, Frequency Type: By Minutes, Repeat Every: 1 Minutes), "Use of Metric Data" (Alerting and Historical Trending selected, Upload Interval: 1 Collections, Once an alert is detected, data will be uploaded to the repository immediately; Alerting Only selected, Alert history will be saved), and "Affected Metrics" (Affected Metrics: Aggregated Exadata CellDisk Metric). At the top right of the form are "Cancel" and "Continue" buttons, with "Continue" being highlighted with a mouse cursor.

61. Scroll down the page and set the Critical Threshold for the Memory Utilization metric to 10.

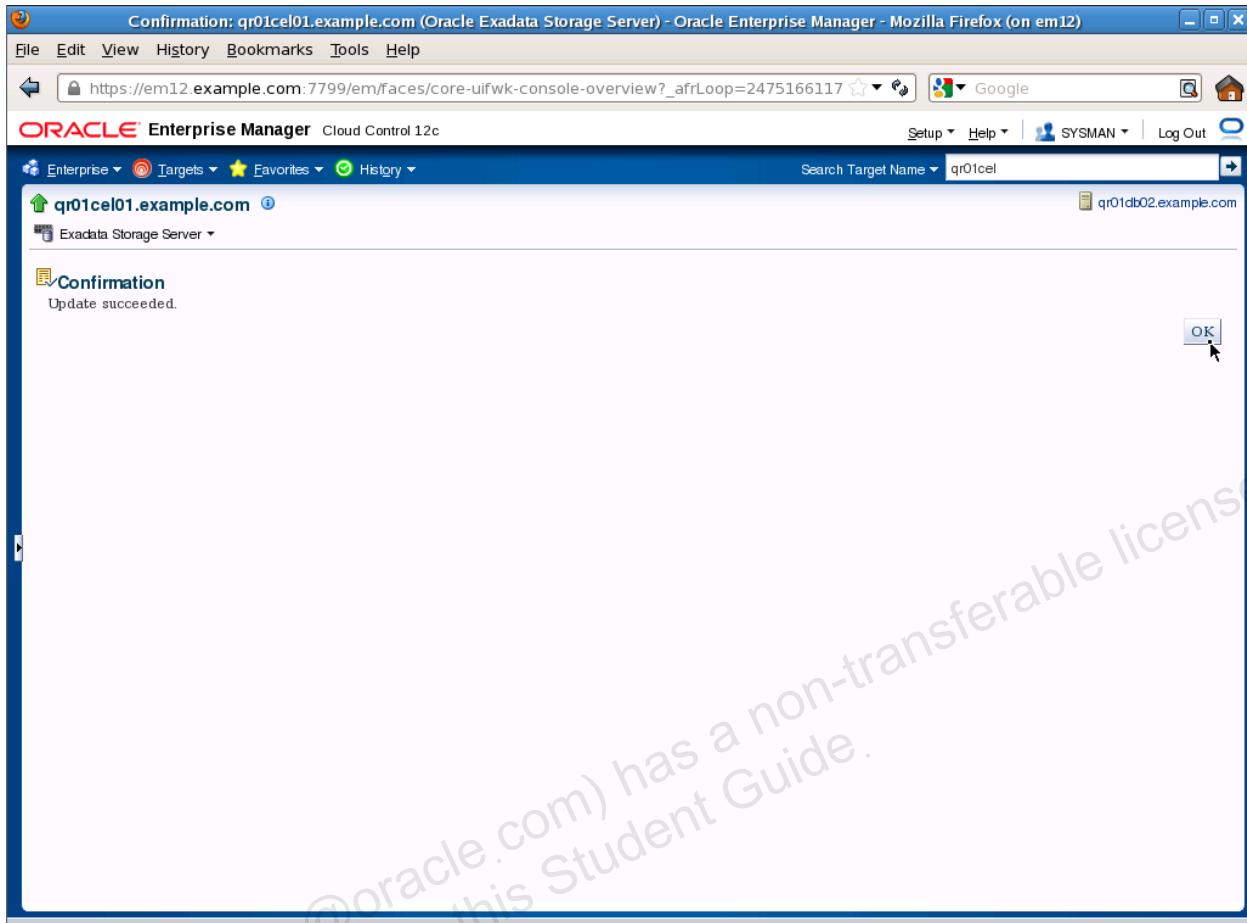
The screenshot shows the Oracle Enterprise Manager interface for managing metrics on the target host qr01cel01.example.com. The 'Metric and Collection Settings' page is displayed, specifically for the Exadata Storage Server component. A table lists various metrics with their current thresholds. The 'Memory Utilization' metric is highlighted, showing its current threshold is set to 10. A tooltip 'Critical Threshold - Exadata Cell Metric: Memory Utilization' is visible over the threshold input field.

Metric	Operator	Current Threshold	None	Action
Disk I/O Objective	>			
Exadata Run Queue Length	>			
Exadata Temperature Lower Threshold	<=			
Exadata Temperature Reading				
Exadata Temperature Upper Threshold	>=			
LED Status				
Memory Utilization	>=	10		
Network Received				
Network Sent				
Total FlashDisk				
Total HardDisk				
Total Maximum CellDisk IO Load for DWH				
Total Maximum CellDisk IO Load for OLTP				
Total Maximum CellDisk Read IOPS				
Total Maximum CellDisk Read Throughput				
Total Maximum FlashDisk IO Load for DWH				
Total Maximum FlashDisk IO Load for OLTP				
Total Maximum FlashDisk Read IOPS				

62. Scroll to the bottom of the page and click OK to save the metric and collection settings.

The screenshot shows the Oracle Enterprise Manager interface for Cloud Control 12c. The title bar reads "Metric and Collection Settings: qr01cel01.example.com (Oracle Exadata Storage Server) - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area displays configuration for an Exadata Storage Server. It includes sections for HCA Port State (For Alerts), Host Interconnect Statistics, and Response metrics. Each metric has a threshold value, a comparison operator (= or >), and a polling interval (e.g., Every 15 Minutes, Every 1 Minute, Every 5 Minutes). A note at the bottom left says "TIP Empty Thresholds will disable alerts for that metric." At the bottom right, there are "Cancel" and "OK" buttons, with "OK" being highlighted by a cursor. A watermark across the page reads "Hong Lin (hong.lin@oracle.com) has a non-transferable license to use this Student Guide."

63. Click OK to acknowledge the update confirmation.



64. Examine the Incidents area on the Exadata Storage Server home page for qr01cel01. Periodically, refresh the page until an incident appears.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface for an Exadata Storage Server named qr01cel01. The top navigation bar includes links for File, Edit, View, History, Bookmarks, Tools, Help, Setup, Help, SYSMAN, and Log Out. A search bar at the top right shows the target name qr01cel. The main content area is divided into several sections:

- Health:** Shows IORM Status Enabled and Release Version 11.2.3.2.1, with a green checkmark icon.
- Capacity:** Displays disk sizes:
  - CellDisk Size (GB): 22 (100% utilization)
  - HardDisk Size (GB): 18 (100% utilization)
  - FlashDisk Size (GB): 4 (100% utilization)
  - FlashCache Size (GB): 3 (100% utilization)
- Workload Distribution by Databases:** A chart showing IO Utilization (%) for DBM and OTHER\_DATABASES. The DBM database has the highest utilization.
- ASM Diskgroup Summary:** A table listing ASM disk groups and their characteristics:

ASM	Disk Group	Size (GB)	Free Space (GB)	No. of Gridisks	Database Names
DATA2_QR01		3	0.0	12	
DATA_QR01		6	0.0	12	
DBFS_DG		1	0.0	12	
RECO_QR01		5	0.0	12	
- Incidents:** A section titled "No matching incidents or problems found."

65. Click the Summary link to examine the incident details.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface for an Exadata Storage Server. The top navigation bar includes File, Edit, View, History, Bookmarks, Tools, Help, and a search bar for 'qr01cel'. The main content area displays various monitoring metrics and configurations:

- Health:** IORM Status Enabled, Release Version 11.2.3.2.1.
- Capacity:** CellDisk Size (GB) 22 (100%), HardDisk Size (GB) 18 (100%), FlashDisk Size (GB) 4 (100%), FlashCache Size (GB) 3 (100%).
- Workload Distribution by Databases:** A chart showing IO Utilization for DBM and \_OTHER\_DATA... databases.
- ASM Diskgroup Summary:** A table listing ASM disk groups with their sizes, free space, and database names.
- Incidents:** A section showing an incident for Memory Utilization.

The URL in the browser is [https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\\_afrLoop=247516611711629&\\_afrWindowMode=0&\\_afrWindowId=8soc1cf0f\\_1#](https://em12.example.com:7799/em/faces/core-uifwk-console-overview?_afrLoop=247516611711629&_afrWindowMode=0&_afrWindowId=8soc1cf0f_1#).

66. Examine the incident details. You should observe that the incident is associated with the metric threshold you just created in Enterprise Manager and that it is very similar to the incident associated with the cell-generated alert that you saw earlier in the practice.

The screenshot shows the Oracle Enterprise Manager Incident Details page. The URL is https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\_afrLoop=2475166117. The page title is "Incident Details - Oracle Enterprise Manager - Mozilla Firefox (on em12)".

**Incident Manager** > Incident Details

**Memory Utilization for qr01cel01.example.com:OFF:qr01cel01 is 91, crossed warning ( ) or critical (10) threshold.**

**Unassigned, Not acknowledged**

**General** Events My Oracle Support Knowledge Updates Related Events

**Incident Details**

- ID: 665
- Metric: Memory Utilization
- Metric Group: Exadata Cell Metric
- Target: qr01cel01.example.com (Oracle Exadata Storage Server)
- Incident Created: Jul 22, 2013 12:52:12 AM EDT
- Last Updated: Jul 22, 2013 12:52:12 AM EDT
- Summary: Memory Utilization for qr01cel01.example.com:OFF:qr01cel01 is 91, crossed warning ( ) or critical (10) threshold.
- Internal Event: Cell\_Metric:memory\_utilization
- Name:
- Event Type: Metric Alert
- Category: Capacity

**Metric Data**

**Warning**: There is currently a collection error collecting this metric group.  
Last attempted at: Jul 22, 2013 12:52:12 AM EDT.

Critical Threshold: 10  
Warning Threshold: Not Defined  
Number of Occurrences: 1

**Tracking**

- Escalated: No
- Priority: None
- Status: New
- Last Comment: Incident created by rule (Name = Incident management rule set for all targets, Create incident for critical metric alerts [System generated rule]). on Jul 22, 2013 12:52:12 AM EDT
- This incident will be automatically cleared when the underlying issue is resolved.

**Acknowledge** Add Comment... Manage... More

**Guided Resolution**

**Diagnostics**

- View topology
- View recent configuration changes
- View Metric Help

**Actions**

- Reevaluate Alert
- Edit Thresholds

67. Use the History menu to return to the home page for qr01cel01.example.com.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Incident Details - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main navigation bar includes File, Edit, View, History, Bookmarks, Tools, and Help. The URL in the address bar is https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\_afrLoop=2475166117. The search bar at the top right contains "qr01cel". The page header says "ORACLE Enterprise Manager Cloud Control 12c" and "Page Refreshed Jul 22, 2013 4:54:45 AM UTC". A dropdown menu under "History" shows recent targets: qr01cel01.example.com (selected), qr01cel02.example.com, DB Machine qr01.example.com, dbm.example.com\_cellsys, Exadata Grid qr01.example.com, and DB Machine qr01.example.com-Exadata Storage Servers Service. The main content area displays an incident for "Memory Utilization for qr01cel01.example.com". The incident ID is 665, metric is Memory Utilization, and the target is qr01cel01.example.com (Oracle Exadata Storage Server). The incident was created on Jul 22, 2013, at 12:52:12 AM EDT, and last updated at the same time. The summary states: "Memory Utilization for qr01cel01.example.com:OFF:qr01cel01 is 91, crossed warning () or critical (10) threshold." The internal event is Cell\_Metric:memory\_utilization, name is Metric Alert, and category is Capacity. The tracking section shows Escalated: No, Priority: None, Status: New, and Last Comment: "Create incident for critical metric alerts [System generated rule] on Jul 22, 2013 12:52:12 AM EDT". There is a checkbox for "This incident will be automatically cleared when the underlying issue is resolved." The guided resolution section includes diagnostics (View topology, View recent configuration changes, View Metric Help) and actions (Reevaluate Alert, Edit Thresholds). The metric data section shows a warning: "There is currently a collection error collecting this metric group. Last attempted at: Jul 22, 2013 12:52:12 AM EDT." It also lists Critical Threshold: 10, Warning Threshold: Not Defined, and Number of Occurrences: 1.

68. Select the Exadata Storage Server > Monitoring > Metric and Collection Settings menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar navigation bar has 'Monitoring' selected under 'Exadata Storage Server'. A mouse cursor is hovering over the 'Metric and Collection Settings' link under the 'Monitoring' menu. The main content area displays various monitoring dashboards, including 'IO Load' (with Flash Disk IO Load, Hard Disk IO Load, and Total metrics), 'CPU Utilization' (with % utilization and KB/sec metrics), and an 'ASM Diskgroup Summary' table:

ASM	Disk Group	Size (GB)	Free Space (GB)	No. of Gridisks	Database Names
DATA2_QR01		3	0.0	12	
DATA_QR01		6	0.0	12	
DBFS_DG		1	0.0	12	
RECO_QR01		5	0.0	12	

Below the table is an 'Incidents' section showing 0 errors, 1 warning, and 0 critical incidents. A status message at the bottom indicates 'Memory Utilization for qr01cel01.example.com:OFF:qr01cel01 is 91, crossed warning ( ) or critical (10) threshold'.

69. Clear the Critical Threshold value associated with the Memory Utilization metric. Then click Every 1 Minute to adjust the collection schedule for the Exadata Cell Metric group of metrics.

The screenshot shows the Oracle Enterprise Manager interface for managing metrics and collection settings. The URL in the address bar is [https://em12.example.com:7799/em/faces/core-uiwk-console-overview?\\_afrLoop=2475166117](https://em12.example.com:7799/em/faces/core-uiwk-console-overview?_afrLoop=2475166117). The page title is "Metric and Collection Settings".

**Metric and Collection Settings**

**Metrics** Other Collected Items

View Metrics with thresholds

Expand All | Collapse All

Metric	Comparison Operator	Warning Threshold	Critical Threshold	Corrective Actions	Collection Schedule	Edit
qr01cel01.example.com	=	WARNING	CRITICAL	None	Every 1 Minute	
Cell Generated Alert	=					
Exadata Cell Metric	>=			None	Every 15 Minutes	
Memory Utilization	>=			None	Every 15 Minutes	
HCA Port Configuration Monitor	Matches		yes	None	Every 15 Minutes	
Is this port disconnected(yes/no)					Every 15 Minutes	
HCA Port Errors	>=	10		None	Every 15 Minutes	
Total errors	>=				Every 15 Minutes	
HCA Port State	=		1	None	Every 15 Minutes	
Is the link degraded? (active speed or width less than enabled)	=				Every 15 Minutes	
HCA Port State (For Alerts)	=		1	None	Every 15 Minutes	
Is port disabled?	=				Every 15 Minutes	

Cancel OK

https://em12.example.com:7799/em/console/metrics/target/metricThresh...oad&target=qr01cel01.example.com&type=oracle\_exadata&\_em.colFR=true#

70. Make the following adjustments to revert the collection schedule to the default settings:
- Repeat Every 5 Minutes
  - Upload Interval 3 Collections
- Then, click Continue to proceed.

The screenshot shows the Oracle Enterprise Manager interface for managing collection settings. The title bar reads "Edit Collection Settings: Exadata Cell Metric: qr01cel01.example.com (Oracle Exadata Storage Server) - Oracle Enterprise Manager - Mozilla Firefox (on)". The main content area is titled "Edit Collection Settings: Exadata Cell Metric". A warning message in a yellow box states: "The repeat interval set is very low. This will cause additional load on the agent and the repository database. To proceed, press Continue after completing your changes." Below the warning, there are sections for "Collection Schedule" (Data Collection Enabled: Disable), "Collection Frequency" (Default Frequency: Every 15 Minutes, Frequency Type: By Minutes, Repeat Every: 5 Minutes), "Use of Metric Data" (Alerting and Historical Trending selected, Upload Interval: 3 Collections), and "Affected Metrics" (Affected Metrics: Aggregated Exadata CellDisk Metric). At the bottom right of the dialog are "Cancel" and "Continue" buttons, with "Continue" being the active button.

71. Click OK to save the threshold and collection schedule settings.

**Metric and Collection Settings: qr01cel01.example.com (Oracle Exadata Storage Server) - Oracle Enterprise Manager - Mozilla Firefox (on em12)**

File Edit View History Bookmarks Tools Help

https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\_afrLoop=2475166117

ORACLE Enterprise Manager Cloud Control 12c

Enterprise Targets Favorites History Search Target Name: qr01cel

qr01cel01.example.com Exadata Storage Server

Oracle Exadata Storage Server: qr01cel01.example.com > Metric and Collection Settings

**Information**  
The settings have been modified but not saved to the repository. You can make further changes to the settings and click on the OK button to save the data.

**Metric and Collection Settings**

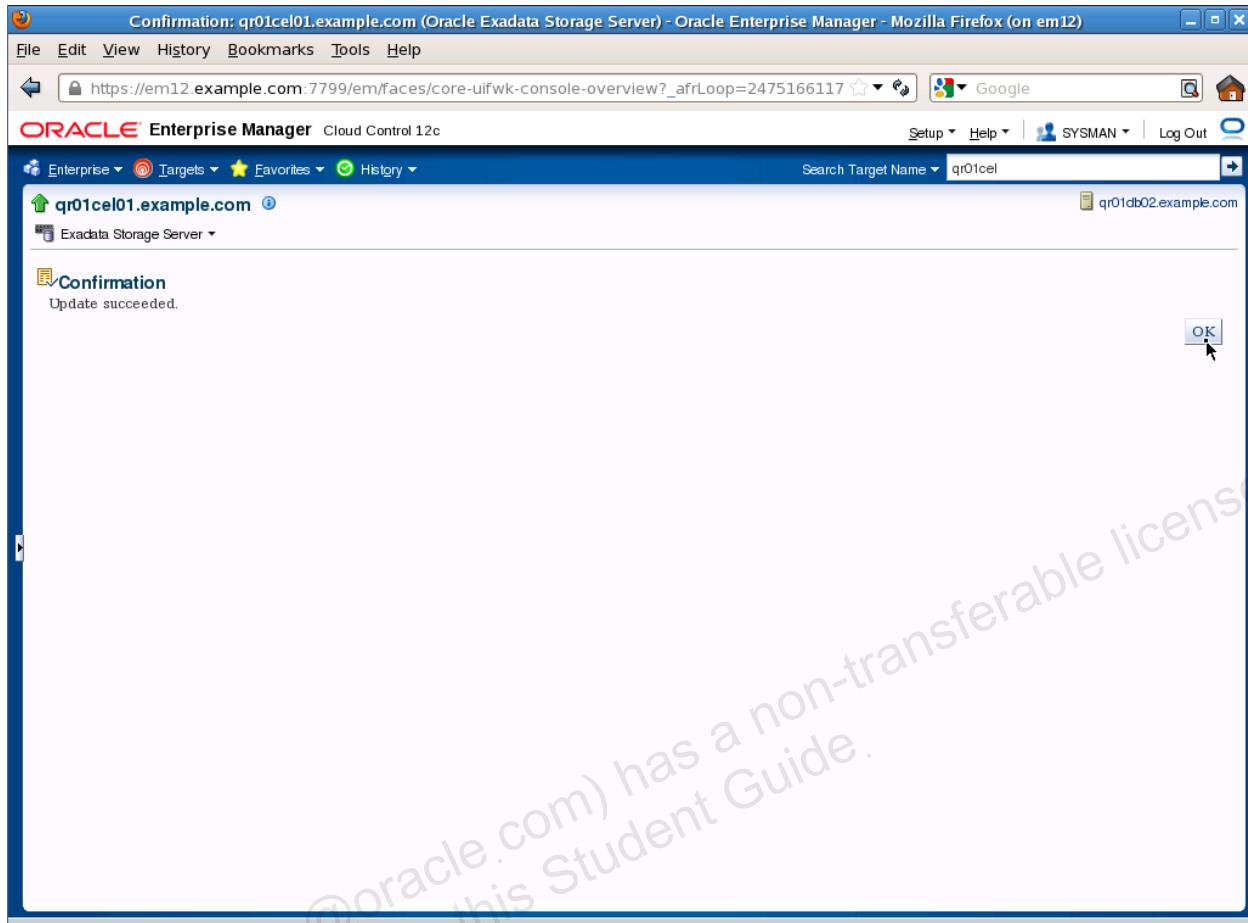
**Metrics** Other Collected Items

View Metrics with thresholds

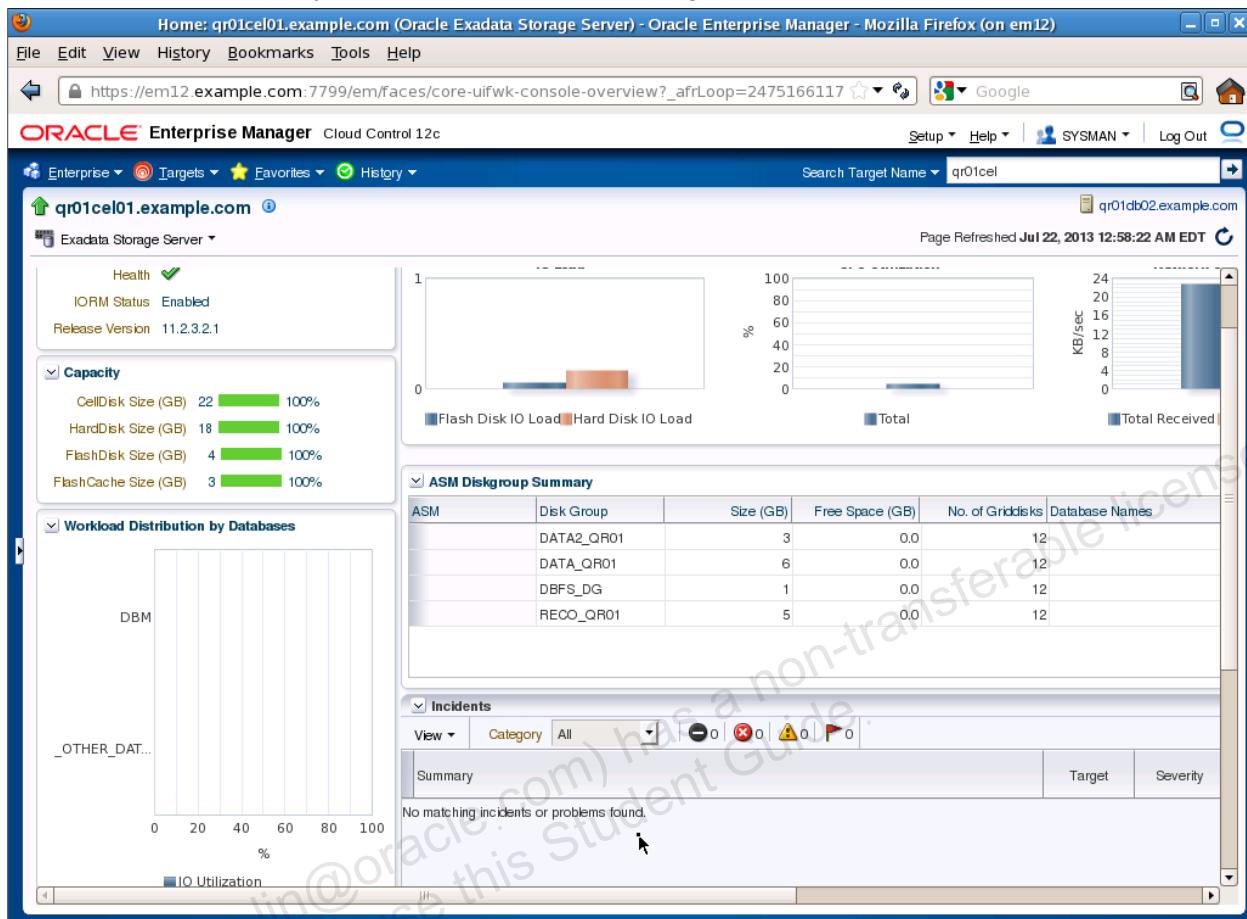
Expand All | Collapse All

Metric	Comparison Operator	Warning Threshold	Critical Threshold	Corrective Actions	Collection Schedule	Edit
qr01cel01.example.com	=	WARNING	CRITICAL	None	Every 15 Minutes	
Cell Generated Alert						
Alert Type	=					
HCA Port Configuration Monitor						
Is this port disconnected(yes/no)	Matches		yes	None	Every 15 Minutes	
HCA Port Errors						
Total errors	>=	10		None	Every 15 Minutes	
HCA Port State						
Is the link degraded? (active speed or width less than enabled)	=		1	None	Every 15 Minutes	
HCA Port State (For Alerts)						
Is port disabled?	=		1	None	Every 15 Minutes	

72. Click OK to acknowledge the update confirmation.



73. When you return to the Exadata Storage Server home page for qr01cel01, you should see that the memory utilization incident is no longer visible.



You have now seen cell-based and Enterprise Manager–based metrics, thresholds, alerts, and incidents in action. In the next part of this practice, you will exercise the configuration management capabilities in Enterprise Manager and you will see how they can be used to ensure that all of your Exadata Storage Servers have consistent configurations.

74. In the celladmin terminal session, which you started earlier in the practice, launch the Exadata cell command-line interface (CellCLI).

```
[celladmin@qr01cel01 ~]$ cellcli
CellCLI: Release 11.2.3.2.1 - Production...
CellCLI>
```

75. Examine the IORM plan on qr01cel01. Notice that by default, the IORM objective is set to basic.

```
CellCLI> list iormplan detail
      name:          qr01cel01_IORMPLAN
      catPlan:
      dbPlan:
      objective:     basic
      status:        active

CellCLI>
```

76. Alter the IORM plan and set the IORM object to balanced.

```
CellCLI> alter iormplan objective=balanced
IORMPLAN successfully altered

CellCLI>
```

77. Verify that the IORM objective is set to balanced on qr01cel01.

```
CellCLI> list iormplan detail
      name:          qr01cel01_IORMPLAN
      catPlan:
      dbPlan:
      objective:     balanced
      status:        active

CellCLI>
```

78. Back in your Enterprise Manager session, select the Exadata Storage Server > Configuration > Last Collected menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar navigation bar has 'Exadata Storage Server' selected. A context menu is open over the 'Configuration' item, with 'Last Collected' highlighted. The main content area displays three charts: 'Flash Disk IO Load' (blue bar), 'Hard Disk IO Load' (orange bar), and 'Total' (blue bar). Below the charts is a table titled 'Diskgroup Summary' with four rows:

	Disk Group	Size (GB)	Free Space (GB)	No. of Griddisks	Database Names
	DATA2_QR01	3	0.0	12	
	DATA_QR01	6	0.0	12	
	DBFS_DG	1	0.0	12	
	RECO_QR01	5	0.0	12	

Below the table is an 'Incidents' section with a summary table showing 'No matching incidents or problems found.'

79. You should now see the configuration browser page for qr01cel01.example.com. The configuration browser allows administrators to examine the configuration settings associated with a management target. It is similar to the All Metrics page that you examined earlier. The main difference between metrics and configuration settings is that metric values are expected to constantly vary over time while configuration settings should be more stable. You can use the hierarchical list on the left side of the page to examine different groups of configuration settings.

The screenshot shows the Oracle Enterprise Manager Configuration Browser interface. The title bar reads "Configuration Browser: qr01cel01.example.com (Oracle Exadata Storage Server) - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The left sidebar shows a tree view of configuration categories under "qr01cel01.example.com". The main pane displays the "Latest Configuration" for the target. At the top of the main pane, there is a toolbar with "Actions" dropdown, "Configuration Properties", "Immediate Relationship", "Member Of", "Uses", and "Used By" buttons. Below this is a status bar showing "Collected Jul 21, 2013 9:06:15 PM". The main content area is a table titled "Configuration Properties" with the following data:

Property Name	Property Value
Cell Name	qr01cel01
ILOM IP Address	192.0.2.108
Management IP Address	192.0.2.103
Operating System	Linux
Platform	x86_64
Target Version	11.2.3.2.1

At the bottom right of the main pane, it says "Total Number of Rows 6".

80. Select the Actions > Refresh menu command. This will cause Enterprise Manager to re-examine the storage server and refresh its configuration information.
- Tip:** If you cannot see the Actions > Refresh menu command, it is most likely because you are not viewing the top-level storage server configuration parameters. To remedy the situation, click the storage server name (`qr01cel01.example.com`) at the top of the hierarchical list on the left side of the page.

The screenshot shows the Oracle Enterprise Manager Configuration Browser interface. The URL in the address bar is `https://em12.example.com:7799/em/faces/core-uifwk-console-overview?_afrLoop=2475166117`. The main content area displays the 'Latest Configuration' for the storage server `qr01cel01.example.com`. A context menu is open over a table row, with the 'Refresh' option highlighted. The menu also includes options like Go to Homepage, Save Latest..., Export..., Topology, Compare, Search, History, and Refresh. The table below shows various configuration properties for the storage server.

Property Name	Prop
Cell Name	qr01
ILOM IP Address	192
Management IP Address	192.0.2.103
Operating System	Linux
Platform	x86_64
Target Version	11.2.3.2.1

81. Wait until you see a message indicating that the configuration information has been refreshed.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Configuration Browser: qr01cel01.example.com (Oracle Exadata Storage Server) - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area displays a "Confirmation" message: "Refresh operation for target qr01cel01.example.com succeeded, and the refreshed configuration data is displayed." Below this, the "Latest Configuration" section is expanded, showing various configuration categories for the target server. On the right, a detailed view of the "qr01cel01.example.com" configuration properties is shown, including fields like Cell Name (qr01cel01), ILOM IP Address (192.0.2.108), Management IP Address (192.0.2.103), Operating System (Linux), Platform (x86\_64), and Target Version (11.2.3.2.1). A watermark across the page reads "Hong Lin (hong.lin@oracle.com) has a non-transferable license to use this Student Guide."

82. Click CELL IORM Configuration in the hierarchical list on the left side of the page.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar displays a tree view of configuration items under 'qr01cel01.example.com'. The 'CELL IORM Configuration' node is selected and highlighted with a blue border. The main content area is titled 'CELL IORM Configuration' and contains a table of properties. The table has two columns: 'Property Name' and 'Property Value'. The data in the table is as follows:

Property Name	Property Value
Cell Name	qr01cel01
ILOM IP Address	192.0.2.108
Management IP Address	192.0.2.103
Operating System	Linux
Platform	x86_64
Target Version	11.2.3.2.1

A confirmation message at the top of the main content area states: 'Refresh operation for target qr01cel01.example.com succeeded, and the refreshed configuration data is displayed.'

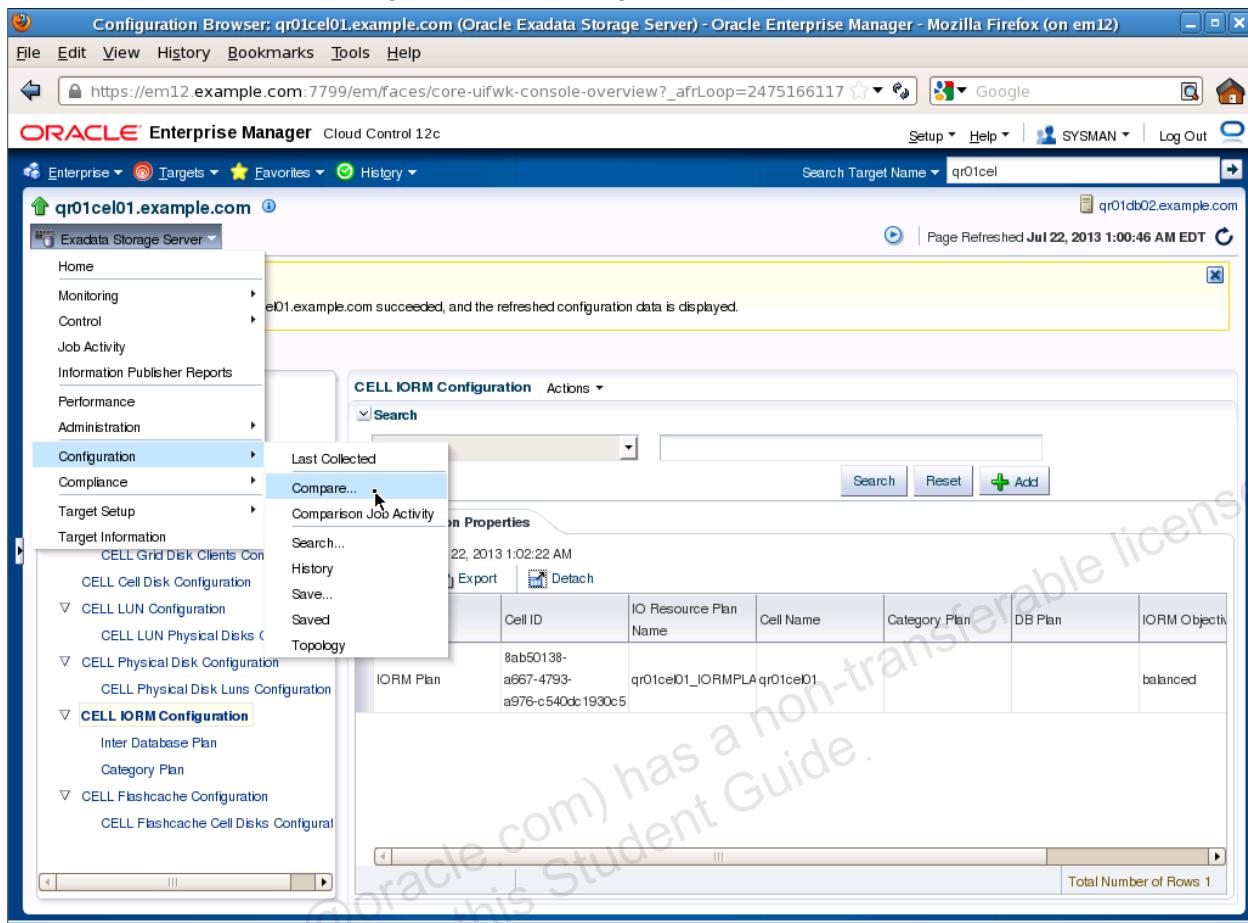
83. Examine the CELL IORM Configuration. Verify that the IORM Objective is listed as balanced.

The screenshot shows the Oracle Enterprise Manager interface for target qr01cel01.example.com. On the left, a navigation tree shows various configuration sections under qr01cel01.example.com. The 'CELL IORM Configuration' section is selected. The main panel displays a 'Confirmation' message: 'Refresh operation for target qr01cel01.example.com succeeded, and the refreshed configuration data is displayed.' Below this is a 'Latest Configuration' section with a table titled 'CELL IORM Configuration'. The table has columns for Config Key, Cell ID, IO Resource Plan Name, Cell Name, Category Plan, DB Plan, and IORM Objective. One row is visible, showing the 'IORM Plan' with a long identifier and the 'Cell Name' qr01cel01\_IORMPLA qr01cel01. The 'IORM Objective' column shows the value 'balanced'.

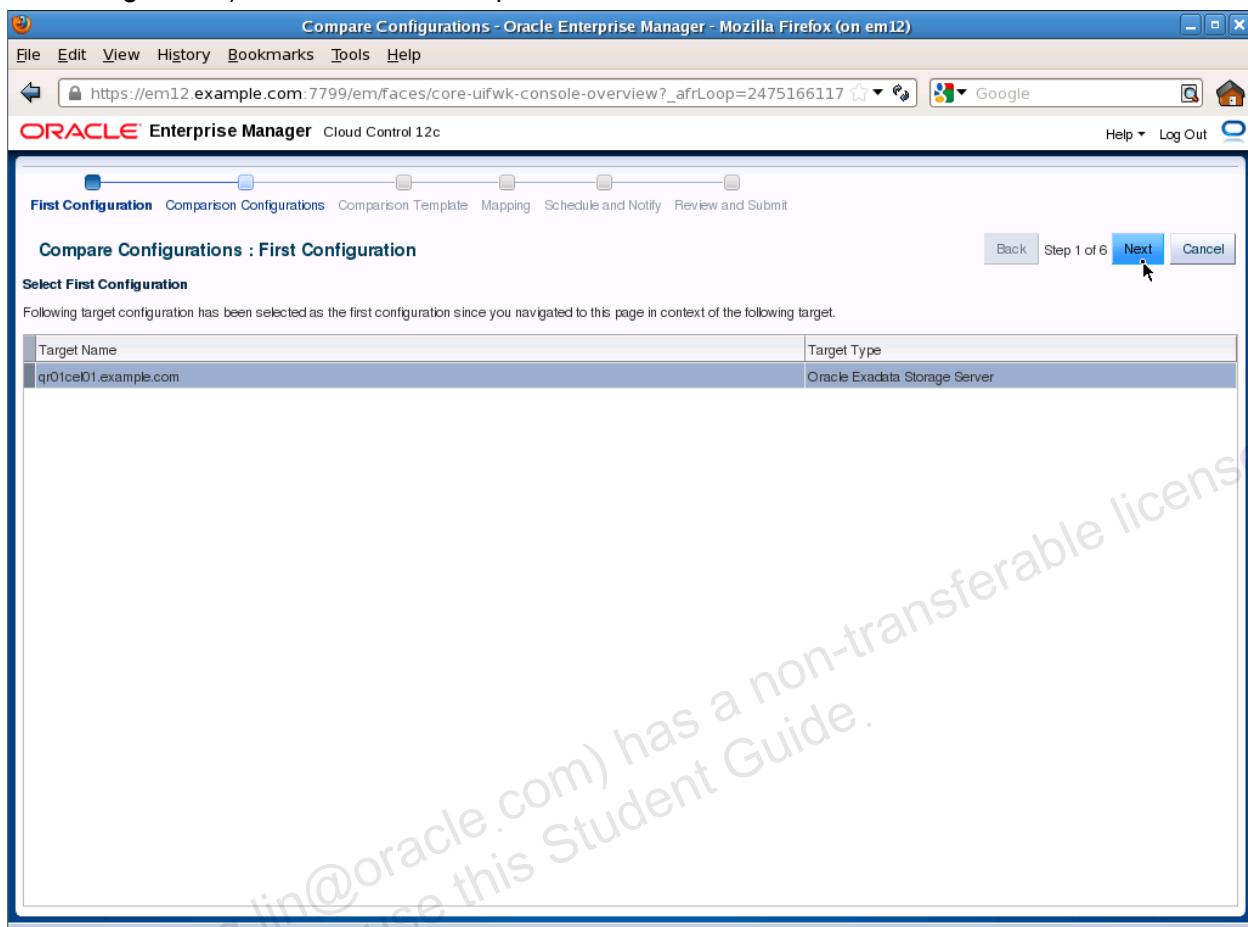
Config Key	Cell ID	IO Resource Plan Name	Cell Name	Category Plan	DB Plan	IORM Objective
IORM Plan	8ab50138-a687-4793-a976-c540dc1930c5	qr01cel01_IORMPLA qr01cel01				balanced

At this point, you have adjusted the IORM objective on one cell (qr01cel01) and you have verified that the adjusted setting is visible in Enterprise Manager. Next, you will compare the configuration of qr01cel01 with your other cells to identify if there are any differences.

84. Select the Exadata Storage Server > Configuration > Compare... menu command.



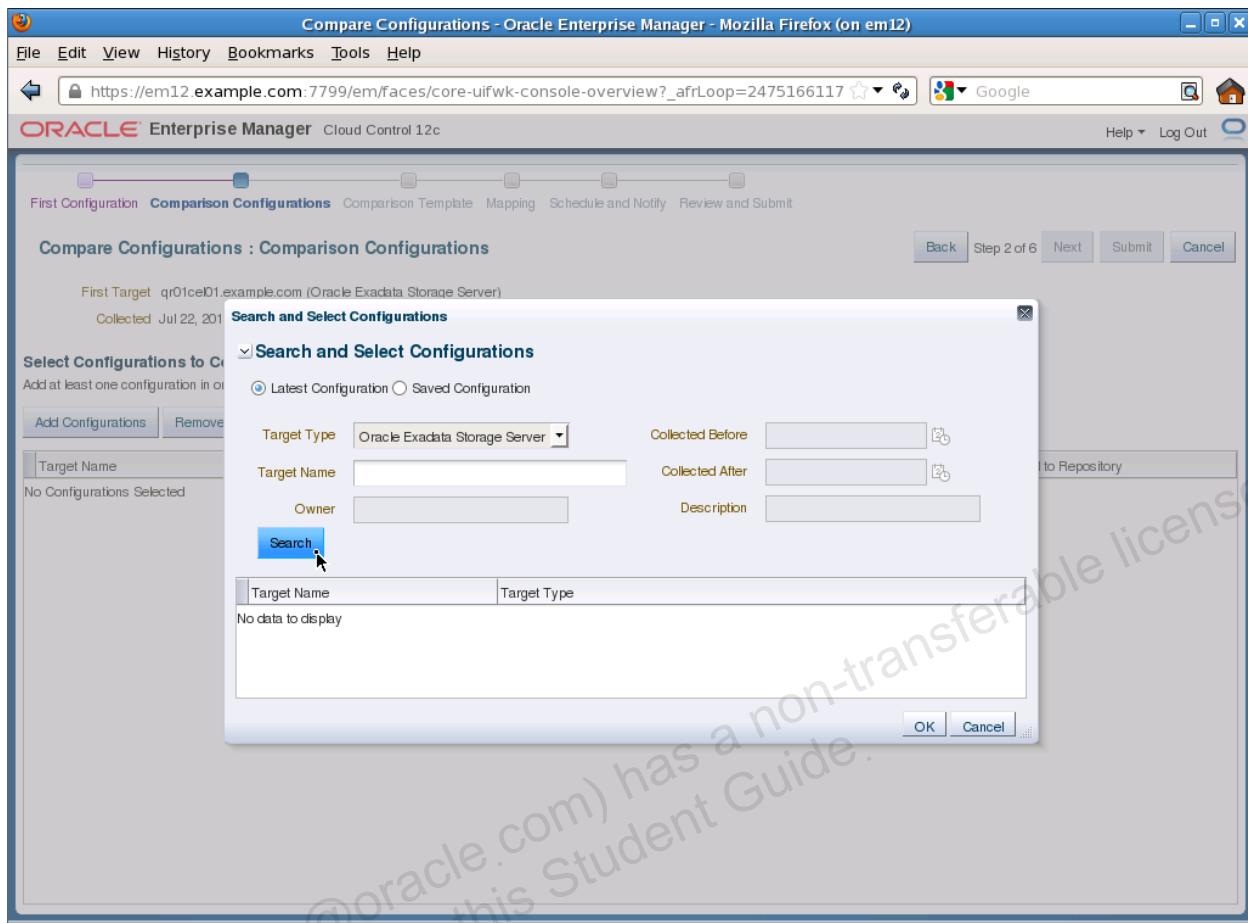
85. Confirm that qr01cel01.example.com is selected as the comparison baseline (first configuration). Then click Next to proceed.



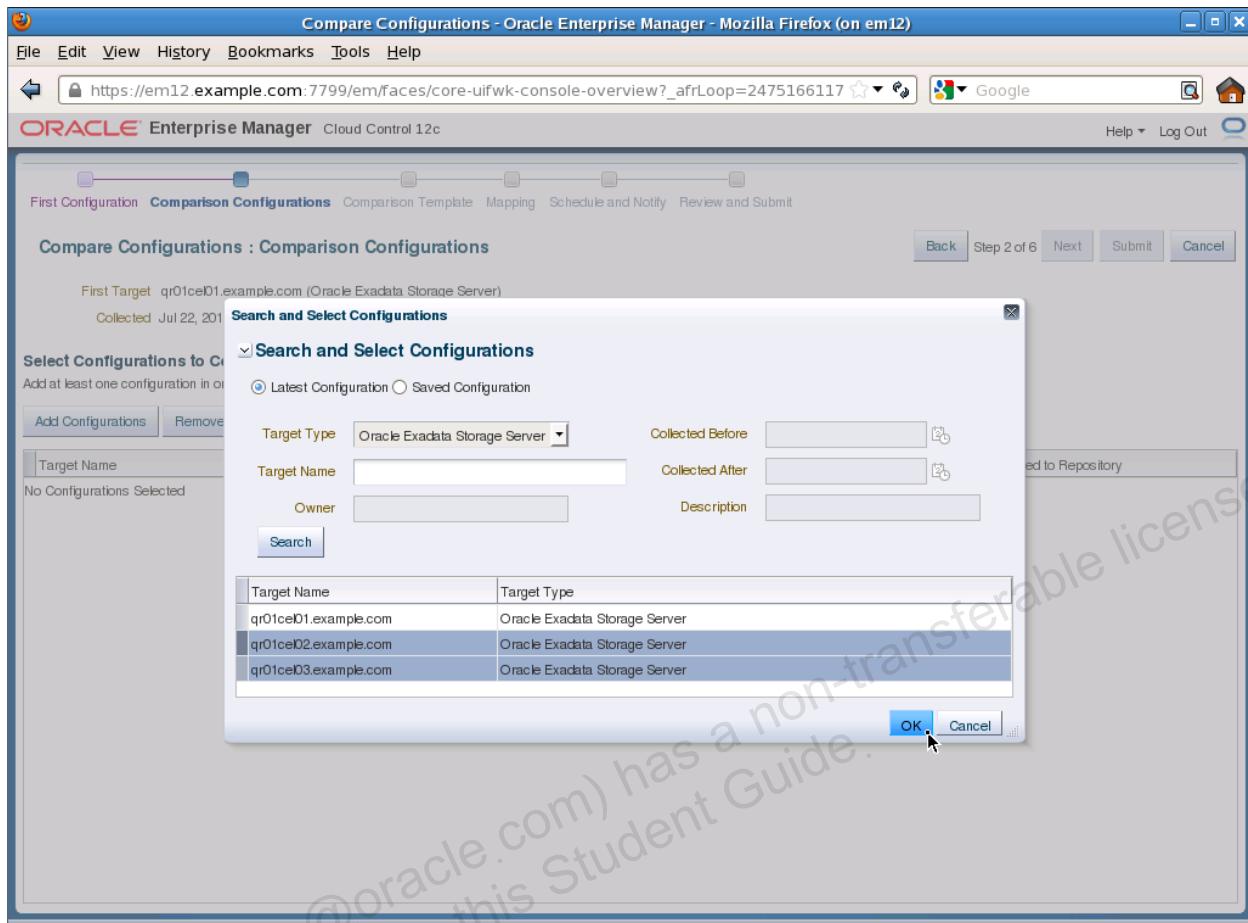
86. Click Add Configurations.

The screenshot shows the 'Compare Configurations' interface in Oracle Enterprise Manager. The title bar reads 'Compare Configurations - Oracle Enterprise Manager - Mozilla Firefox (on em12)'. The main navigation menu includes File, Edit, View, History, Bookmarks, Tools, and Help. The address bar shows the URL: https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\_afrLoop=2475166117. The Oracle logo and 'Enterprise Manager Cloud Control 12c' are visible. A horizontal navigation bar at the top has tabs: First Configuration, Comparison Configurations (which is selected), Comparison Template, Mapping, Schedule and Notify, and Review and Submit. Below this is a sub-navigation bar for 'Compare Configurations : Comparison Configurations' with buttons for Back, Step 2 of 6, Next, Submit, and Cancel. The main content area displays the 'First Target' as qr01cel01.example.com (Oracle Exadata Storage Server) and the collection date as Jul 22, 2013 1:02:22 AM (Latest Configuration). A section titled 'Select Configurations to Compare with the First' instructs the user to add at least one configuration. It features a table with columns: Target Name, Target Type, Collected, Owner, and Saved to Repository. A button labeled 'Add Configurations' is highlighted with a mouse cursor. The message 'No Configurations Selected' is displayed below the table. A watermark across the page reads 'Hong Lin (hong.lin@oracle.com) has a non-transferable license to use this Student Guide.'

87. Click Search.



88. Select qr01cel02.example.com and qr01cel03.example.com, and click OK.



89. Confirm that qr01cel02.example.com and qr01cel03.example.com are selected as the comparison configurations. Then click Submit to proceed.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Compare Configurations - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area is titled "Compare Configurations : Comparison Configurations". A progress bar at the top indicates "Step 2 of 6". The "Comparison Configurations" tab is active. Below it, a table lists two targets:

Target Name	Target Type	Collected	Owner	Saved to Repository
qr01cel02.example.com	Oracle Exadata Storage Server	Jul 21, 2013 9:06:20 PM		
qr01cel03.example.com	Oracle Exadata Storage Server	Jul 21, 2013 9:06:18 PM		

Buttons for "Add Configurations" and "Remove" are visible above the table. The "Submit" button is highlighted in blue at the bottom right of the form.

90. On the resulting Job Run page, examine the Comparison Result. If the comparison is In Progress, periodically refresh the page until it completes.

The screenshot shows the 'Comparison Job Activity' page in Oracle Enterprise Manager. The page header includes the URL <https://em12.example.com:7799/em/faces/core-ecm-compare-activity?jobExeId=E213ABB1AA>, the Oracle logo, and the text 'ORACLE Enterprise Manager Cloud Control 12c'. The top navigation bar has links for File, Edit, View, History, Bookmarks, Tools, Help, Setup, Help, SYSMAN, Log Out, and a search bar for 'Search Target Name' with the value 'qr01cel'. The main content area is titled 'Comparison Job Activity' and shows a table of comparison results. The table has columns: Comparison Name, Comparison Result, Target Type, First Target, Second Target, Owner, Status, Scheduled Start, and Comparison Run Date. There are three rows, all of which are in the 'In Progress' state. The first row's details are: Comparison Name 'CONFIGURATION', Comparison Result 'In Progress', Target Type 'Oracle Exadata', First Target 'qr01ce01.example.com', Second Target 'qr01ce01.example.com', Owner 'SYSMAN', Status 'Running', Scheduled Start 'Jul 22, 2013 5:08:44', and Comparison Run Date 'Jul 22, 2013 5:08:47 AM'. The other two rows have identical details.

Comparison Name	Comparison Result	Target Type	First Target	Second Target	Owner	Status	Scheduled Start	Comparison Run Date
CONFIGURATION	In Progress	Oracle Exadata	qr01ce01.example.com	qr01ce01.example.com	SYSMAN	Running	Jul 22, 2013 5:08:44	Jul 22, 2013 5:08:47 AM
	In Progress	Oracle Exadata	qr01ce01.example.com	qr01ce01.example.com	SYSMAN	Running	Jul 22, 2013 5:08:44	Jul 22, 2013 5:08:47 AM
	In Progress	Oracle Exadata	qr01ce01.example.com	qr01ce01.example.com	SYSMAN	Running	Jul 22, 2013 5:08:44	Jul 22, 2013 5:08:47 AM

91. When the comparison completes, you should see that the Comparison Result is Different. Click the Expand icon beside the Comparison Name.

The screenshot shows the 'Comparison Job Activity' page in Oracle Enterprise Manager. The URL is <https://em12.example.com:7799/em/faces/core-ecm-compare-activity?jobExeId=E213ABB1AA>. The page displays a table of comparison results. One row is highlighted in blue, indicating it has been expanded. The expanded row shows details for a configuration comparison job named 'CONFIGURATION'. The result is marked as 'Different'. The first target is 'Oracle Exadata Sqr01ce01.example.com' and the second target is 'SYSMAN'. The status is 'Succeeded' with a timestamp of 'Jul 22, 2013 5:08:44'. The scheduled start was 'Jul 22, 2013 5:08:47 AM'. The comparison run date was also 'Jul 22, 2013 5:08:47 AM'. An 'Expand' button is visible at the bottom left of the expanded row.

Comparison Name	Comparison Result	Target Type	First Target	Second Target	Owner	Status	Scheduled Start	Comparison Run Date
CONFIGURATION	Different	Oracle Exadata Sqr01ce01.example.com	Sqr01ce01.example.com	SYSMAN	SYSMAN	Succeeded	Jul 22, 2013 5:08:44	Jul 22, 2013 5:08:47 AM

92. Click one of the available Different links.

The screenshot shows the 'Comparison Job Activity' page in Oracle Enterprise Manager. The URL is <https://em12.example.com:7799/em/faces/core-ecm-compare-activity?jobExecId=E213ABB1AA>. The page displays a table of comparison results for three jobs. The third job, titled 'CONFIGURATION', has a 'Comparison Result' of 'Different'. A link labeled 'Different' is highlighted with a cursor, indicating it is the target for the click action described in the question. The table columns include: Comparison Name, Comparison Result, Target Type, First Target, Second Target, Owner, Status, Scheduled Start, and Comparison Run Date.

Comparison Name	Comparison Result	Target Type	First Target	Second Target	Owner	Status	Scheduled Start	Comparison Run Date
CONFIGURATION	Different	Oracle Exadata	qr01ce01.example.com	qr01ce	SYSMAN	Succeeded	Jul 22, 2013 5:08:44	Jul 22, 2013 5:08:47 AM
	Different	Oracle Exadata	qr01ce01.example.com	qr01ce	SYSMAN	Succeeded	Jul 22, 2013 5:08:44	Jul 22, 2013 5:08:47 AM
	Different	Oracle Exadata	qr01ce01.example.com	qr01ce	SYSMAN	Succeeded	Jul 22, 2013 5:08:44	Jul 22, 2013 5:08:47 AM

93. On the Compare Result page, you should immediately notice a difference in the Cell IORM Configuration as indicated by the red inequality icon. Click Cell IORM Configuration.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Compare Result: Different - Mozilla Firefox (on em12)". The main content area is titled "Compare Result" and shows a "Result for job CONFIGURATION COMPARISON JOB MON JUL 22 2013 05:08:44 UTC". Under "Job Details", there are checkboxes for "Show Differences Only" and "Show Ignored". The left sidebar has a tree view with nodes like "Infiniband HCA Configuration", "Cell Configuration", and "CELL IORM Configuration". The "CELL IORM Configuration" node is expanded, and a red exclamation mark icon is visible next to it. Below this, a table titled "Configuration Properties" compares the "Channel Adapter Display Name" for both configurations, showing "HCA-1" for both.

Result	Configuration Property Name	First	Second
	Channel Adapter Display Name	HCA-1	HCA-1

94. Examine the comparison result. You should see that the IORM Objective for the first configuration (qr01cel01) is balanced, while it is listed as basic (the default setting) in the other cell.

**Comparison Details**

Template	Default Exadata Cell (Modified : Jul 9, 2013 5:02:15 AM)	First Configuration	qr01cel01.example.com (Oracle Exadata Storage Server)	Second Configuration	qr01cel03.example.com (Oracle Exadata Storage Server)
Collected	Jul 22, 2013 1:02:22 AM (Latest Configuration)	Collected	Jul 22, 2013 1:02:22 AM (Latest Configuration)	Collected	Jul 21, 2013 9:06:18 PM (Latest Configuration)

**Job Details**

Show Differences Only  Show Ignored

**Infiniband HCA Configuration**

Result	Config Key
	IORM Plan

**Cell Configuration**

Result	Configuration Property Name	First	Second
	Config Key	IORM Plan	IORM Plan
	IORM Objective	balanced	basic
	IORM Status	active	active

In the final part of this practice, you will use the IORM administration capabilities in Enterprise Manager to return your cells to a consistent configuration.

95. Select the Targets > Exadata menu command.

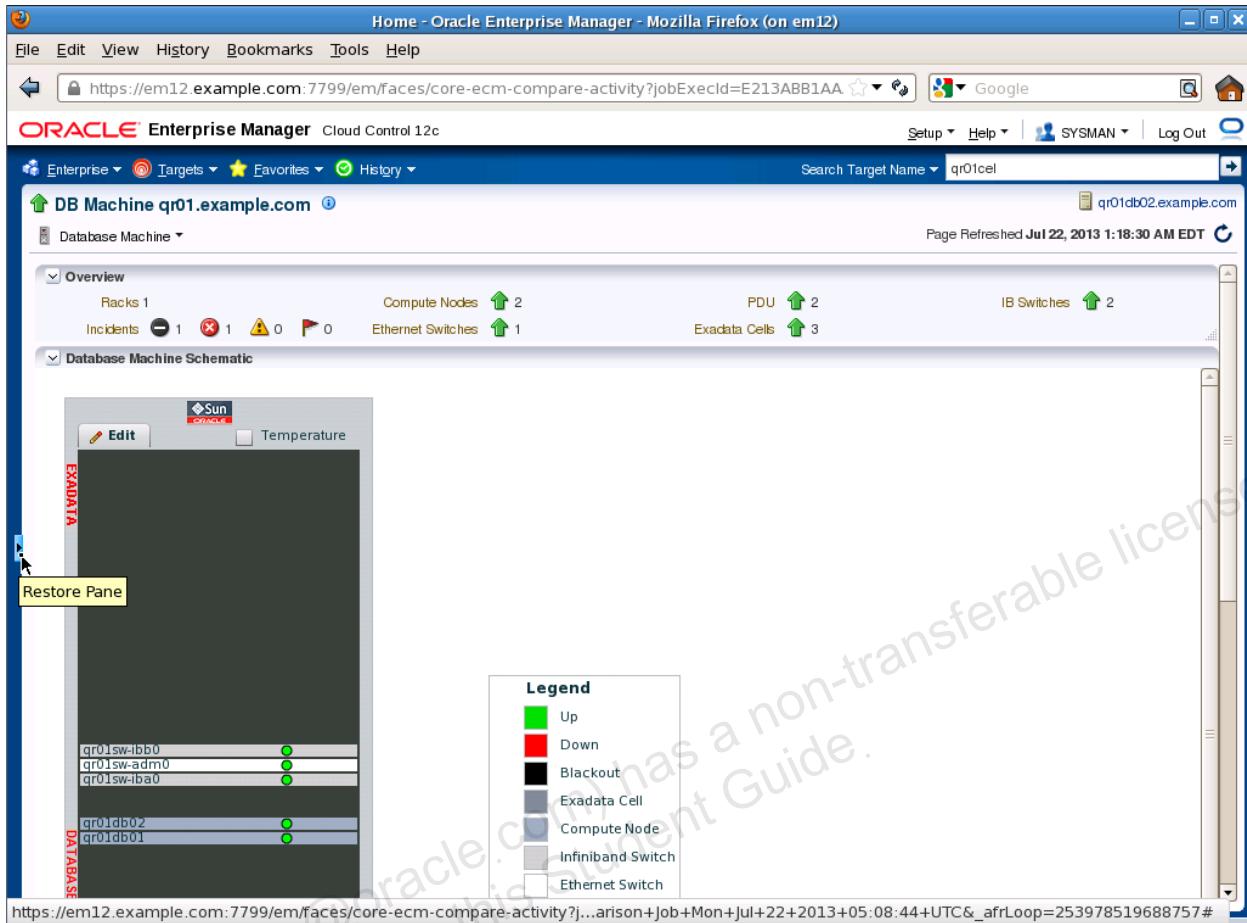
The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Compare Result: Different - Mozilla Firefox (on em12)". The left sidebar has a tree view with nodes like "Compare Results", "Result for", "Comparison Job", "Compare", "Template", "First Configuration", and "Job Data". The "Job Data" node is currently selected. The main content area displays a job log entry for "ARISON JOB MON JUL 22 2013 05:08:44 UTC". Below the log, there are two tables: "Result" and "Configuration Properties". The "Result" table shows a single row for "IORM Plan". The "Configuration Properties" table shows three rows: "Config Key" (IORM Plan), "IORM Objective" (balanced), and "IORM Status" (active). A watermark "Hong Lin (hong.lin@oracle.com) has a non-transferable license to use this Student Guide." is diagonally across the page.

Result	Configuration Property Name	First	Second
Config Key	IORM Plan	IORM Plan	IORM Plan
IORM Objective	balanced	basic	basic
IORM Status	active	active	active

96. Click the link corresponding to your Exadata Database Machine (DB Machine qr01.example.com).

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Oracle Exadata Database Machines - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area is titled "Oracle Exadata Database Machines". A search bar at the top right contains the text "qr01cel". Below the search bar is a table with the following columns: Target Name, Status, Members, Member Status Summary, and Incidents. One row is selected, showing "DB Machine qr01.example.com" in the Target Name column, "Cluster Database(1), Oracle Infiniband Switch(2), Oracle Infiniband Net" in the Members column, and "1 16 - - - 1 1" in the Member Status Summary column. The URL in the browser's address bar is "https://em12.example.com:7799/em/faces/core-ecm-compare-activity?jobExecId=E213ABB1AA".

## 97. Restore the Target Navigation pane.



98. In the Target Navigation pane, click “Exadata Grid qr01.example.com”.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface in Mozilla Firefox. The URL is <https://em12.example.com:7799/em/faces/core-ecm-compare-activity?jobExecId=E213ABB1AA>. The Target Navigation pane on the left lists various targets, including 'DB Machine qr01.example.com' which is selected and highlighted with a blue border. The main content area displays the 'DB Machine qr01.example.com' details. It includes an 'Overview' section with metrics like Racks 1, Compute Nodes (2), PDU (2), IB Switches (2), and Exadata Cells (3). Below this is a 'Database Machine Schematic' diagram showing a rack with four server nodes labeled 'qr01sw-lbb0', 'qr01sw-adm0', 'qr01sw-lba0', and 'qr01db02'. The legend indicates that green dots represent 'Up' status, while black dots represent 'Down' status. The schematic also shows the 'EXADATA' and 'DATABASE' labels. The top right corner of the page shows the date and time: 'Page Refreshed Jul 22, 2013 1:18:30 AM EDT'.

99. You should now see the Exadata Storage Server Grid home page. This page is very similar to the home page for each individual Exadata Storage Server. However, the information presented on this page covers all the storage servers in the Exadata Database Machine.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface for the Exadata Grid qr01.example.com. The left sidebar shows 'Target Navigation' with nodes like DB Machine qr01.example.com, Compute Nodes, Exadata Grid qr01.example.com, IB Network qr01.example.com, and others. The main content area displays the following sections:

- Overview:** Status (2 up, 3 down), Health (3 green checkmarks), IORM Status (Enabled), Release Version (11.2.3.2.1).
- Performance:** Average IO Load chart comparing Flash Disk IO Load (blue) and Hard Disk IO Load (orange). Average CPU Utilization chart.
- Capacity:** CellDisk Size (GB): 68 (100%), HardDisk Size (GB): 56 (100%), FlashDisk Size (GB): 12 (100%), FlashCache Size (GB): 9 (100%).
- ASM Diskgroup Summary:** A table showing ASM disk groups and their details:

ASM	Disk Group	Size (GB)	Free Space (GB)	No. of Disks
DATA2_OR01		11	0.0	2
DATA_OR01		20	0.0	4
DBFS_DG		5	0.0	1
RECO_OR01		16	0.0	3
- Workload Distribution by Databases:** A grid showing workload distribution across DBM and OTHER\_DATA databases.
- Incidents:** Summary section stating "No matching incidents or problems found."

100. Select the Exadata Storage Server Grid > Administration > Manage IO Resource menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. In the left sidebar under 'Target Navigation', the 'Exadata Storage Server Grid' target is selected. The 'Administration' menu is expanded, and the 'Manage IO Resource' option is highlighted with a mouse cursor. The main content area displays performance metrics like 'Average IO Load' and 'Average CPU Utilization', and an 'ASM Diskgroup Summary' table:

ASM	Disk Group	Size (GB)	Free Space (GB)	No. of
DATA2_QR01		11	0.0	
DATA_QR01		20	0.0	
DBFS_DG		5	0.0	
RECO_QR01		16	0.0	

101.The resulting page provides administrators with an interface to manage IORM configuration settings across all the Exadata Storage Servers in the Exadata Database Machine. Notice that the page indicates a difference in the IORM objective across the cells.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar displays 'Target Navigation' with sections for DB Machine, Compute Nodes, and Exadata Grid. The main content area is titled 'Exadata Grid qr01.example.com'. It shows the 'I/O Resource Manager (IORM) Settings' section, which includes a table of targets (qr01cel01, qr01cel02, qr01cel03) all set to 'Active'. A note states 'Disk I/O Objective: Common objective is not set on all cells'. Below this is an 'Inter-Database Plan' section with a note that 'DbPlan is not configured on Exadata Storage Servers'. There is also a 'Database Resource Management Settings' section and a time selector for 'Past day'.

102. Select Balanced as the IORM objective for all your cells.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar shows 'Target Navigation' with 'Exadata Grid qr01.example.com' selected. The main content area is titled 'Exadata Grid qr01.example.com'. It displays 'I/O Resource Manager (IORM) Settings' for three targets: qr01cel01.example.com, qr01cel02.example.com, and qr01cel03.example.com, all of which are 'Active'. A dropdown menu under 'Select' shows options: Basic, Auto, Low Latency, **Balanced**, and High Throughput. A tip at the bottom states: 'Tip: Oracle recommends the same IORM settings for the group of cells used by the same set of databases. Click on Update All button to change the setting for all cells.' Below the table, there's a 'Database Resource Management Settings' section with a 'Past day' time range and a 'Slider' for monitoring.

103.Click Update All to update the IORM objective across all your cells.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar displays 'Target Navigation' with nodes like DB Machine qr01.example.com, Compute Nodes, and Exadata Grid qr01.example.com. The main content area is titled 'Exadata Grid qr01.example.com' and shows 'I/O Resource Manager (IORM) Settings'. A tooltip indicates that the 'IORM objective is not set on all cells'. The 'Update All' button is highlighted with a blue arrow pointing to it. The table below shows three targets: qr01cel01.example.com, qr01cel02.example.com, and qr01cel03.example.com, all listed as Active. Below the table, there's a note about DbPlan and a section for 'Database Resource Management Settings' with a 'Past day' history.

Target	Status
qr01cel01.example.com	Active
qr01cel02.example.com	Active
qr01cel03.example.com	Active

104.Verify that the command matches your expectation. Then click Next to proceed.

The screenshot shows a browser window for Oracle Enterprise Manager Cloud Control 12c. The title bar reads "Exadata Cell Administration: Exadata Grid qr01.example.com (Oracle Exadata Storage Server Grid) - Oracle Enterprise Manager - Mozilla Firefox (on en)". The main content area is titled "Exadata Grid qr01.example.com". A navigation bar at the top includes "Command", "Admin Credentials", "Schedule", "Review", and "Job Status". Below this, a sub-header says "Exadata Cell Administration : Command". A progress bar indicates Step 1 of 5. The main panel contains a section titled "Cell Control Command-Line Interface (CellCLI)" with the sub-section "Commands to be Executed". It shows the command "alter iormplan objective = 'balanced'". At the bottom right of the panel are buttons for "Back", "Step 1 of 5", "Next", and "Cancel".

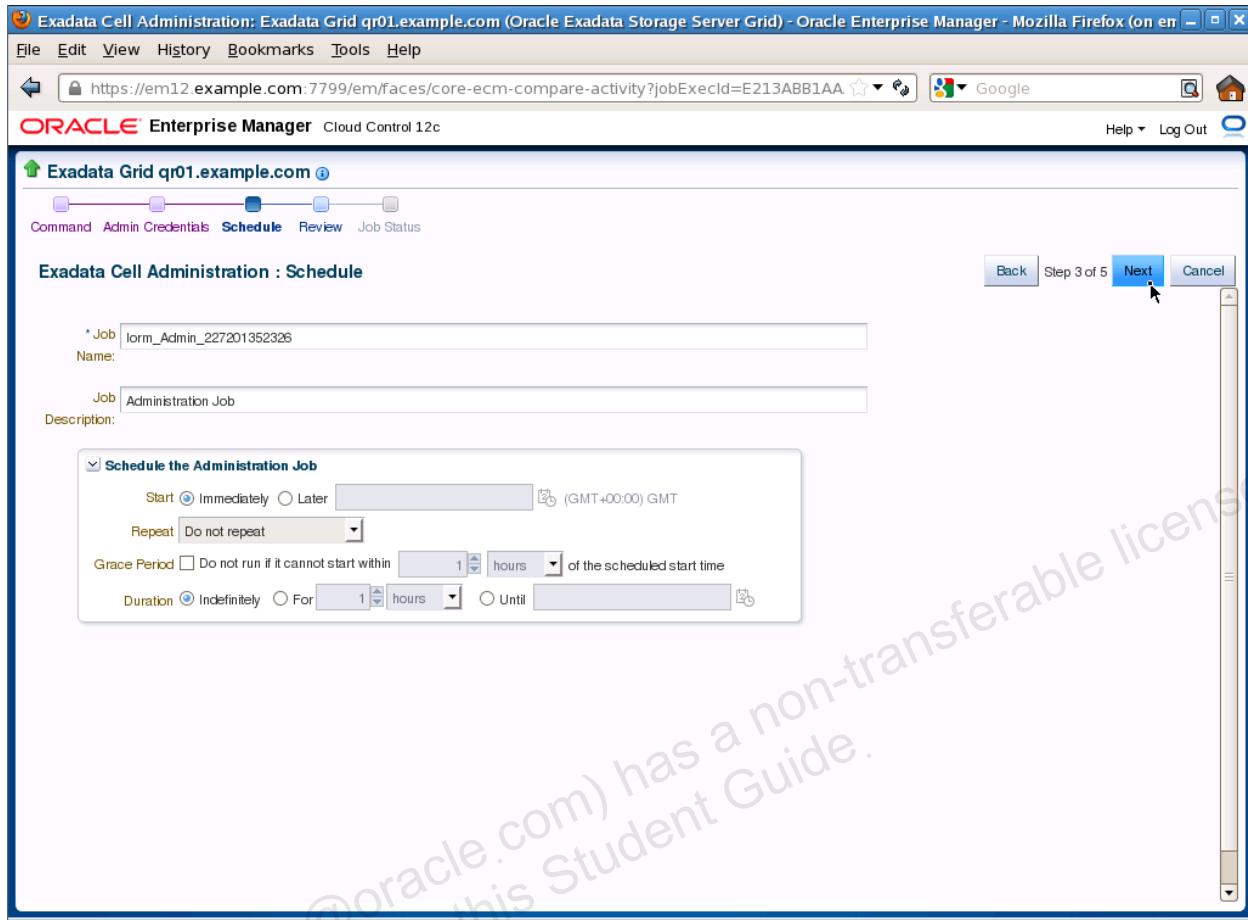
105.Enter the following Exadata Cell credentials:

- Credential: New
- Username: celladmin
- Password/Confirm Password: welcome
- Save As: NC\_CELLADMIN

Finally, click Next to proceed.

The screenshot shows the Oracle Enterprise Manager interface for Exadata Cell Administration. The title bar reads "Exadata Cell Administration: Exadata Grid qr01.example.com (Oracle Exadata Storage Server Grid) - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main menu includes File, Edit, View, History, Bookmarks, Tools, and Help. The address bar shows the URL "https://em12.example.com:7799/em/faces/core-ecm-compare-activity?jobExecId=E213ABB1AA". The Oracle logo and "Enterprise Manager Cloud Control 12c" are visible. A navigation bar at the top has tabs for Command, Admin Credentials, Schedule, Review, and Job Status. The "Admin Credentials" tab is active. Below it, the "Exadata Cell Administration : Admin Credentials" page is displayed. It has a section titled "Exadata Cell credentials" with a note: "Select or Enter the credentials to perform administration on selected cells. These credentials will be used while submitting administration operation". There are three radio buttons for "Credential": "Preferred" (unchecked), "Named" (unchecked), and "New" (checked). The "Username" field contains "celladmin", "Password" and "Confirm Password" both contain ".....", and the "Save As" checkbox is checked with the value "NC\_CELLADMIN". At the bottom right, there are "Back", "Step 2 of 5", "Next", and "Cancel" buttons, with "Next" being the one currently highlighted.

106.Accept the default schedule settings and click Next.



107. Review the “Job submit summary” and click Submit Command.

The screenshot shows a browser window for Oracle Enterprise Manager, specifically the Exadata Cell Administration module. The URL is https://em12.example.com:7799/em/faces/core-ecm-compare-activity?jobExecId=E213ABB1AA. The page title is "Exadata Grid qr01.example.com (Oracle Exadata Storage Server Grid) - Oracle Enterprise Manager - Mozilla Firefox (on en)". The navigation bar includes File, Edit, View, History, Bookmarks, Tools, and Help. The main menu bar has tabs for Command, Admin Credentials, Schedule, Review (which is selected), and Job Status. A sub-menu for "Exadata Cell Administration : Review" is open, showing the "Job submit summary" step. The step number is Step 4 of 5. The "Submit Command" button is highlighted with a blue border and a cursor arrow pointing to it. The "Back" and "Cancel" buttons are also visible. The "Job submit summary" form contains the following details:

<input checked="" type="checkbox"/> Job submit summary
Job Name: iorm_Admin_227201352326
Job Description: Administration Job
Command to Execute: alter iormplan objective = 'balanced'
Job Scheduled: immediate
Target Name
Selected Cells:
qr01celD1.example.com
qr01celD2.example.com
qr01celD3.example.com

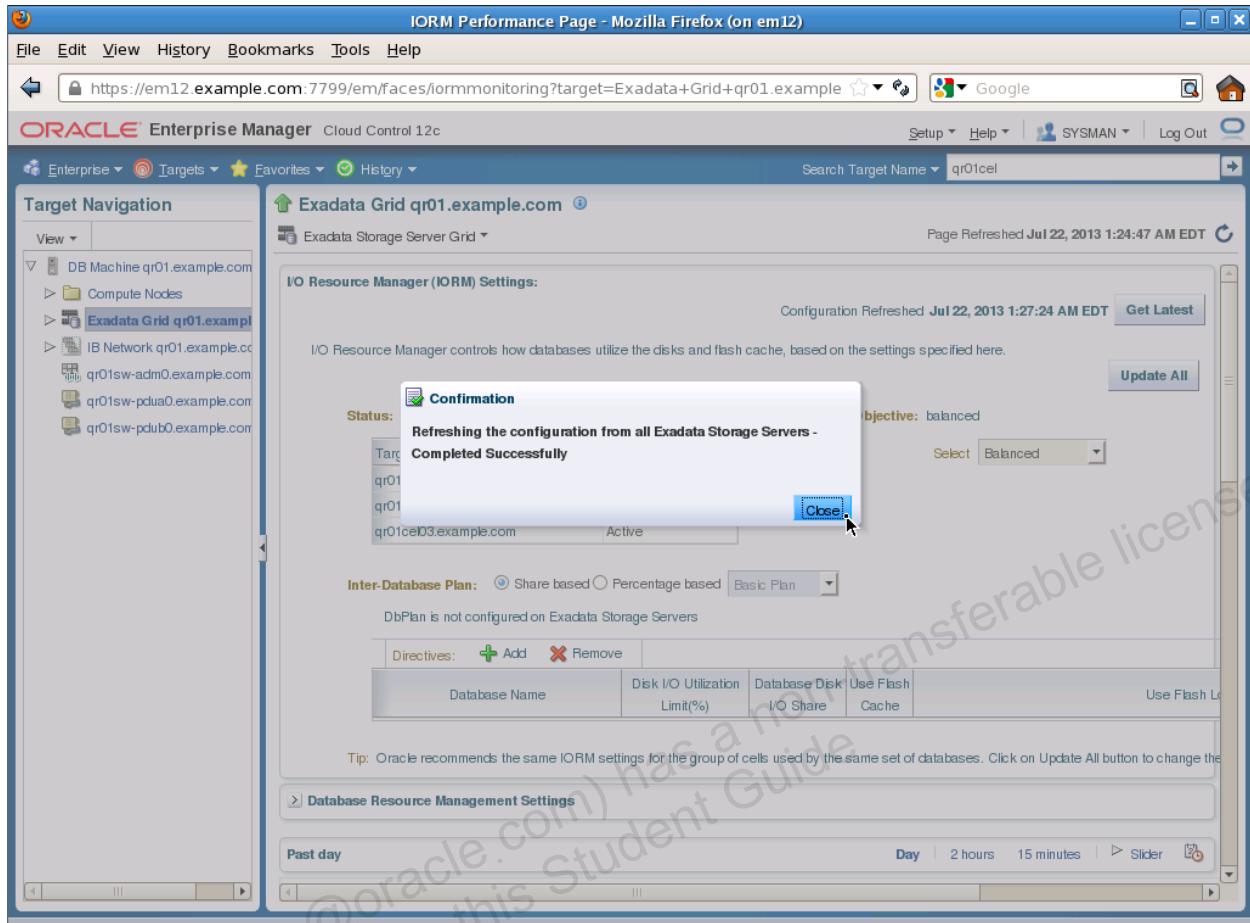
108. Confirm that job submission succeeded and click Return.

The screenshot shows a browser window for Oracle Enterprise Manager, specifically the Exadata Cell Administration interface. The title bar reads "Exadata Cell Administration: Exadata Grid qr01.example.com (Oracle Exadata Storage Server Grid) - Oracle Enterprise Manager - Mozilla Firefox (on en)". The main content area is titled "Exadata Grid qr01.example.com". A navigation bar at the top includes links for Command, Admin Credentials, Schedule, Review, and Job Status. The "Job Status" link is highlighted. Below the navigation is a yellow-highlighted box containing an "Information" icon and the message "Job submission succeeded!". At the bottom of the page, there is a "Job Status" section with the message: "Job lorm\_Admin\_227201352326 is submitted. To view the latest IORM settings, please wait for the job to complete and click on the 'Get Latest' button on the IORM page administration section. Use the link to launch the Job Run details page -- lorm\_Admin\_227201352326". Navigation buttons "Back", "Step 5 of 5", and "Return" are visible at the bottom right.

109. When you are returned to the IORM Settings page, you should notice that it still indicates that the Disk IO Objective is not common across all the cells. To update this page, click Get Latest.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar has a 'Target Navigation' tree with nodes like DB Machine qr01.example.com, Compute Nodes, Exadata Grid qr01.example.com, IB Network qr01.example.com, qr01sw-adm0.example.com, qr01sw-pdua0.example.com, and qr01sw-pdub0.example.com. The main content area is titled 'Exadata Grid qr01.example.com'. It displays the 'I/O Resource Manager (IORM) Settings' section. A message at the top right says 'Configuration Refreshed Jul 21, 2013 9:06:18 PM EDT'. There is a blue button labeled 'Get Latest' with a cursor hovering over it. Below this, a note states 'Disk I/O Objective: Common objective is not set on all cells'. A table shows database status: qr01cel01.example.com, qr01cel02.example.com, and qr01cel03.example.com are all Active. An 'Update All' button is also present. The 'Inter-Database Plan' section shows 'DbPlan is not configured on Exadata Storage Servers'. A 'Directives' table allows adding or removing rules for Database Name, Disk I/O Utilization Limit(%), Database Disk I/O Share, Use Flash Cache, and Use Flash Log. A tip at the bottom suggests using the 'Update All' button to change settings for multiple databases. The bottom part of the screen shows a 'Database Resource Management Settings' section and a time selector for 'Past day'.

110.Click Close to dismiss the confirmation dialog box.



111.Verify that the Disk I/O Objective is now listed as balanced. This confirms that the setting has been consistently applied across all your cells.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar displays 'Target Navigation' with nodes like DB Machine, Compute Nodes, and Exadata Grid. The main content area is titled 'Exadata Grid qr01.example.com'. Under 'I/O Resource Manager (IORM) Settings', it shows the 'Disk I/O Objective' is set to 'balanced'. A table lists three targets (qr01cel01, qr01cel02, qr01cel03) all in 'Active' status. Below this, there's a section for 'Inter-Database Plan' and a 'Database Resource Management Settings' section. A tip at the bottom suggests using the same IORM settings for multiple cells. The page is dated Jul 22, 2013, 1:28:37 AM EDT.

Congratulations! You have performed a variety of storage server monitoring and administration tasks by using Enterprise Manager Cloud Control 12c.

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## **Practices for Lesson 16: Monitoring Exadata Database Machine Database Servers**

**Chapter 16**

## Practices for Lesson 16

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### Practices Overview

In this practice, you will be introduced to the Exadata-specific database monitoring capabilities provided by Enterprise Manager Cloud Control 12c.

## Practice 16-1: Exadata Database Monitoring with Enterprise Manager

### Overview

Using Enterprise Manager to monitor Oracle databases on Exadata Database Machine is essentially the same as using it to monitor databases outside of Exadata. However, for Oracle databases running on Exadata Database Machine, Enterprise Manager does include some additional Exadata-specific information. In this practice you will be introduced to the Exadata-specific database monitoring capabilities provided by Enterprise Manager Cloud Control 12c.

### Assumptions

The practice relies on the configurations performed in Practice 14-1.

### Tasks

- Establish a terminal session connected to qr01db01 using the oracle OS user.

```
$ ssh oracle@qr01db01
oracle@c01n01's password: <oracle>
[oracle@qr01db01 ~]$
```

- Change to the swingbench directory.

```
[oracle@qr01db01 ~]$ cd swingbench
[oracle@qr01db01 swingbench]$
```

- Source the environment file swingbench.env.

```
[oracle@qr01db01 swingbench]$ . swingbench.env
[oracle@qr01db01 swingbench]$
```

- Change to the bin directory.

```
[oracle@qr01db01 swingbench]$ cd bin
[oracle@qr01db01 bin]$
```

- Use the following command to execute a workload against your database. The workload consists of several long-running queries. Leave your terminal alone so that the workload can run to completion, which will take approximately 5 minutes.

```
[oracle@qr01db01 bin]$ ./charbench -c sales.xml -rt 00:05
Author : Dominic Giles
Version : 2.4.0.845

Results will be written to results.xml.
Hit Return to Terminate Run...

Time          Users    TPM      TPS
7:29:20 PM     1        0        0
```

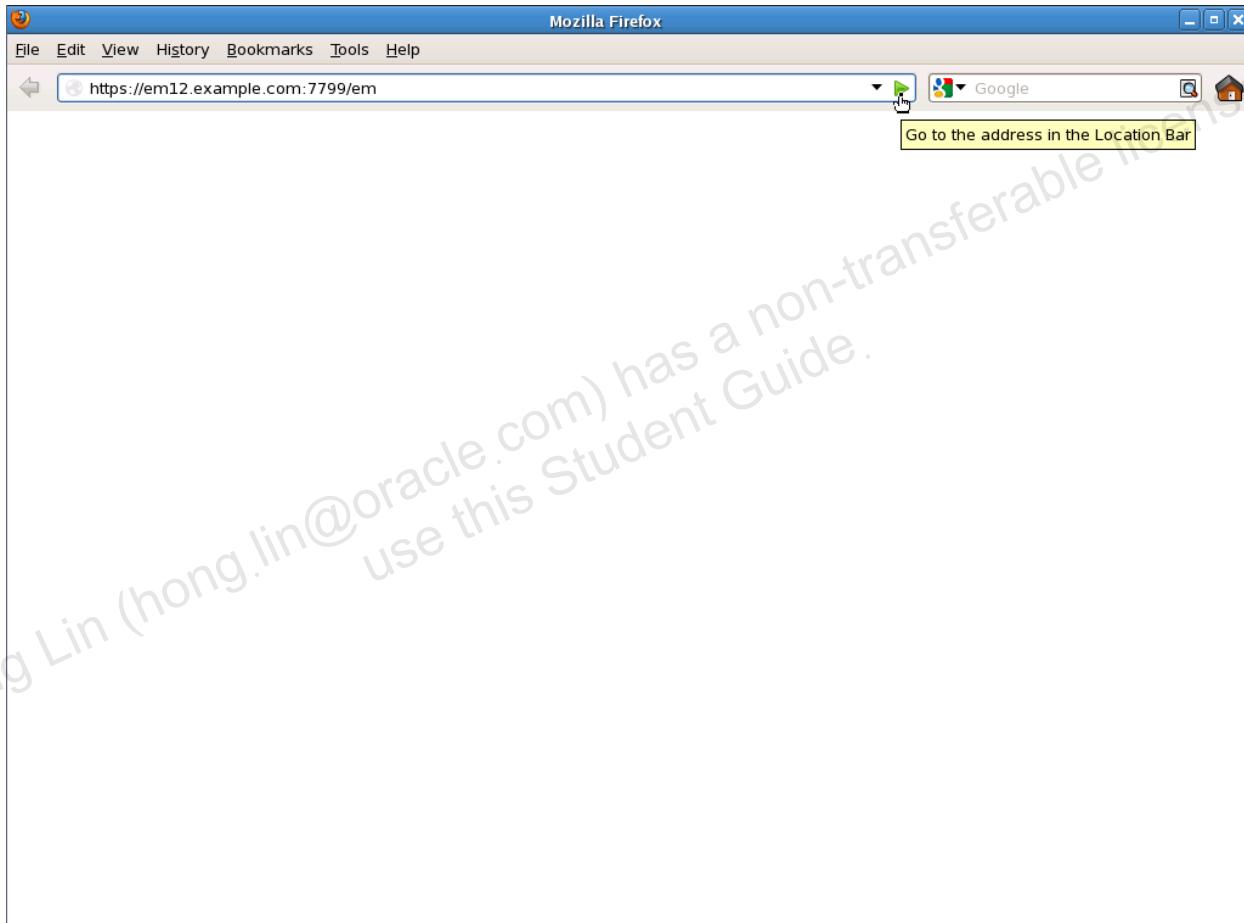
6. Establish another terminal session connected to em12 using the oracle OS user. Ensure that you specify the -x option for ssh.

```
$ ssh -X oracle@em12  
oracle@em12 password: <oracle>  
[oracle@em12 ~]$
```

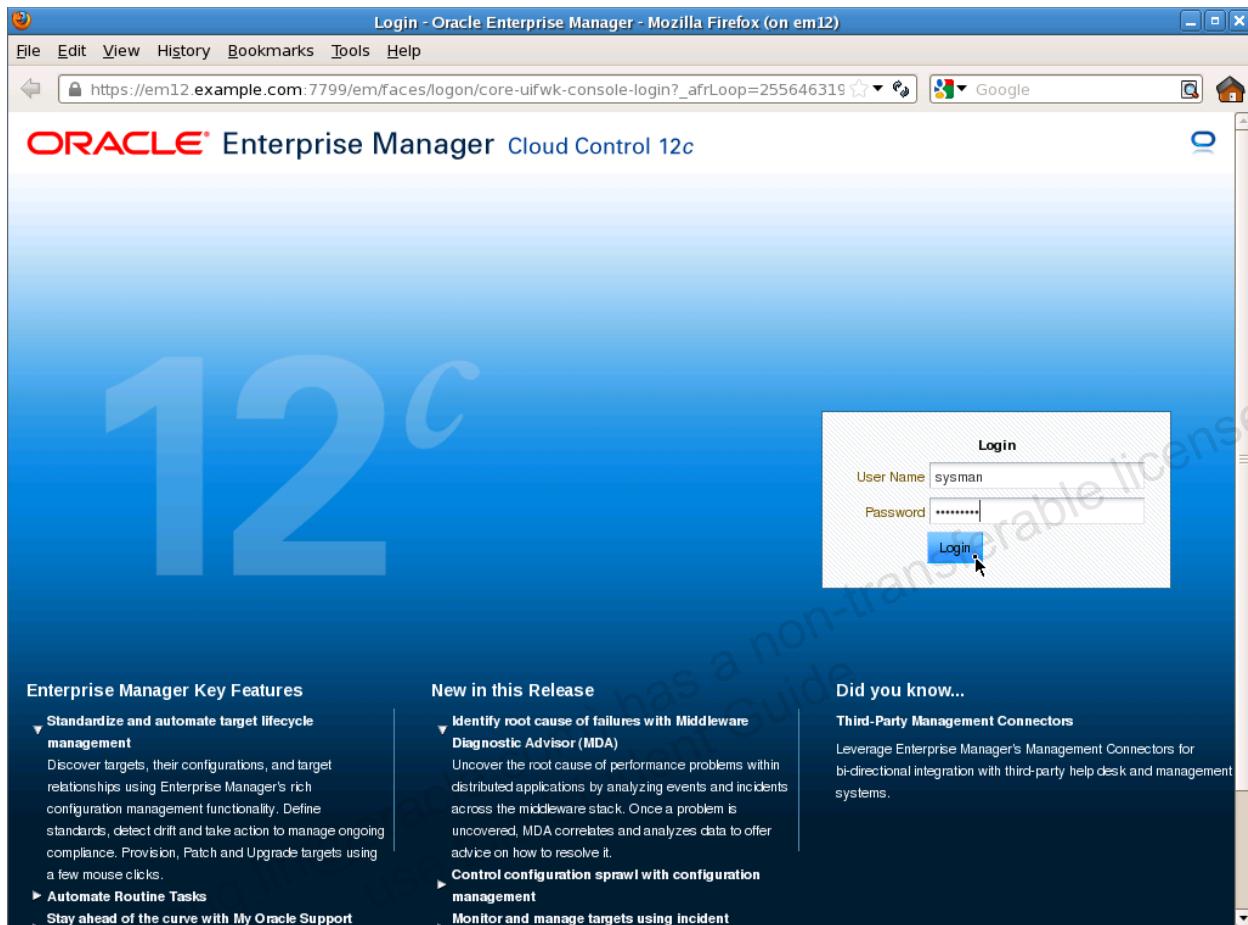
7. Start the Firefox web browser.

```
[root@em12 ~]$ firefox &  
[1] 21592
```

8. Navigate to the Enterprise Manager console at https://em12.example.com:7799/em.



9. Log in to Enterprise Manager Cloud Control 12c by using the following credentials:
  - User Name: sysman
  - Password: Oracle123



10. On the Enterprise Summary page, click the Up legend entry beside the target status chart.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The main navigation bar includes File, Edit, View, History, Bookmarks, Tools, Help, and a browser address bar showing https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\_afrLoop=3201312492. The top right features links for Setup, Help, SYSMAN, and Log Out. The main content area is titled 'Enterprise Summary' and includes the following sections:

- Status:** Targets Monitored: 74. Status breakdown: Up (59%), Down (12%), Under Blackout (29%).
- Incidents:** Updated in the last 24 hours: 19. Updated in last 7 days: 22. Breakdown of incidents updated in the last 7 days:

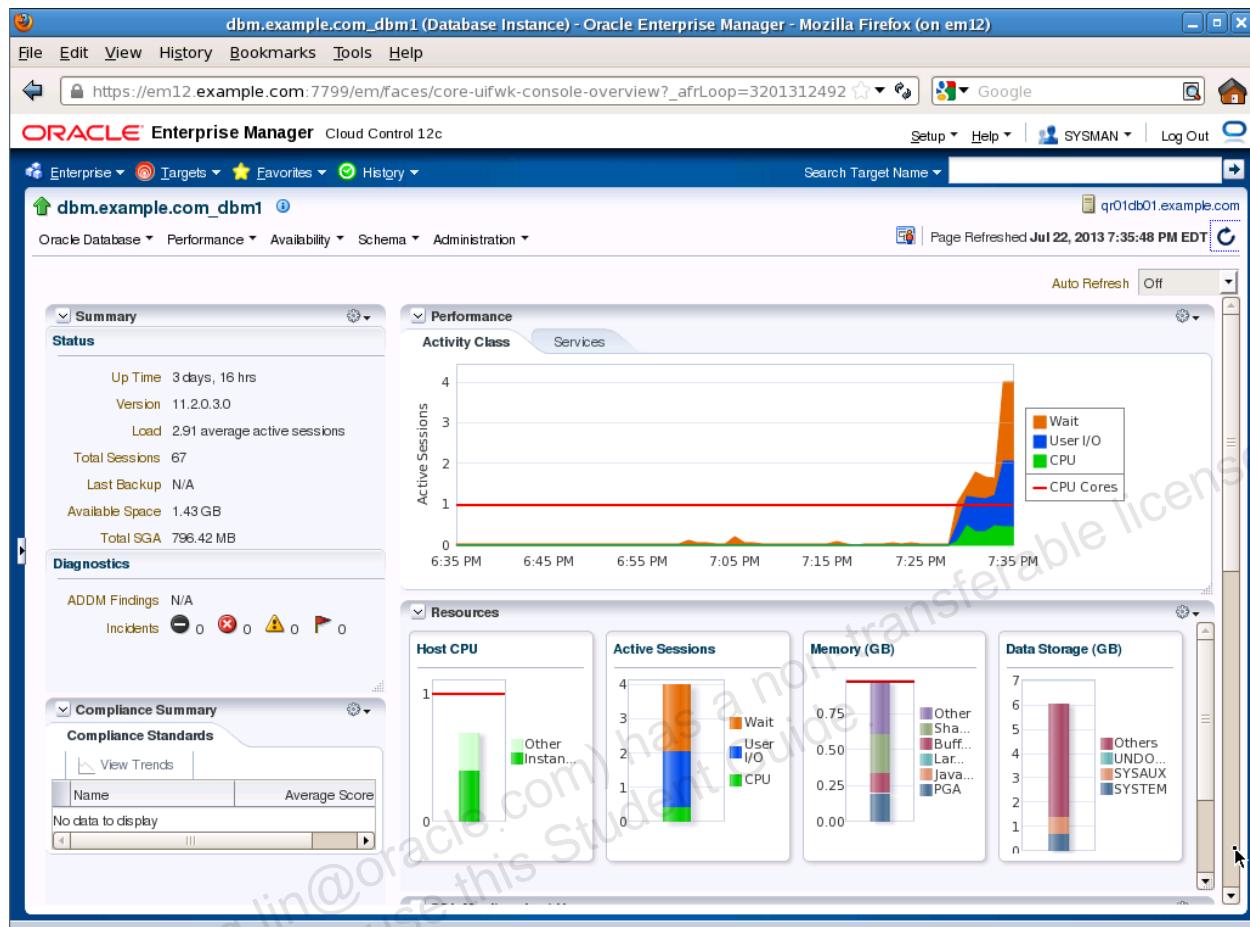
Category	-	✗	⚠	!
Availability	7	2	-	-
Performance	-	-	-	-
Security	-	-	-	-
Others	-	9	1	-

- Problems:** Total Open: 0.
- Inventory and Usage:** Shows Hosts: Oracle Linux Server release 5.9.
- Compliance Summary:** Frameworks tab selected, showing 'No data to display'.
- Least Compliant Targets:** Shows 'No data to display'.

11. On the resulting target list, click the link associated with the database instance dbm.example.com\_dbm1.

Target Name	Target Type	Target Status	Pending Activation
+ASM1_qr01db01.example.com	Automatic Storage Management	Up	
+ASM_qr01-cluster	Cluster ASM	Up	
DB Machine qr01.example.com	Oracle Exadata Database Machine	Up	
DB Machine qr01.example.com-Exadata Cisco Switch Service	Generic Service	Up	
DB Machine qr01.example.com-Exadata Host Service	Generic Service	Up	
DB Machine qr01.example.com-Exadata ILOM Service	Generic Service	Up	
DB Machine qr01.example.com-Exadata Infiniband Service	Generic Service	Up	
DB Machine qr01.example.com-Exadata PDU Service	Generic Service	Up	
DB Machine qr01.example.com-Exadata Storage Servers Service	Generic Service	Up	
dbm.example.com	Cluster Database	Up	
dbm.example.com_cellsys	Oracle Database Exadata Storage Se	Up	
<b>dbm.example.com_dbm1</b>	<b>Database Instance</b>	<b>Up</b>	
dbm.example.com_sys	Database System	Up	
Exadata Grid qr01.example.com	Oracle Exadata Storage Server Grid	Up	
has_qr01db01.example.com	Oracle High Availability Service	Up	
IB Network qr01.example.com	Oracle Infiniband Network	Up	
LISTENER_qr01db01.example.com	Listener	Up	
LISTENER_SCAN1_qr01-cluster	Listener	Up	
LISTENER_SCAN2_qr01-cluster	Listener	Up	
LISTENER_SCAN3_qr01-cluster	Listener	Up	
qr01-cluster	Cluster	Up	
qr01cell01.example.com	Oracle Exadata Storage Server	Up	

12. On the database instance home page, scroll down the page until you can see the “SQL Monitor - Last Hour” area.

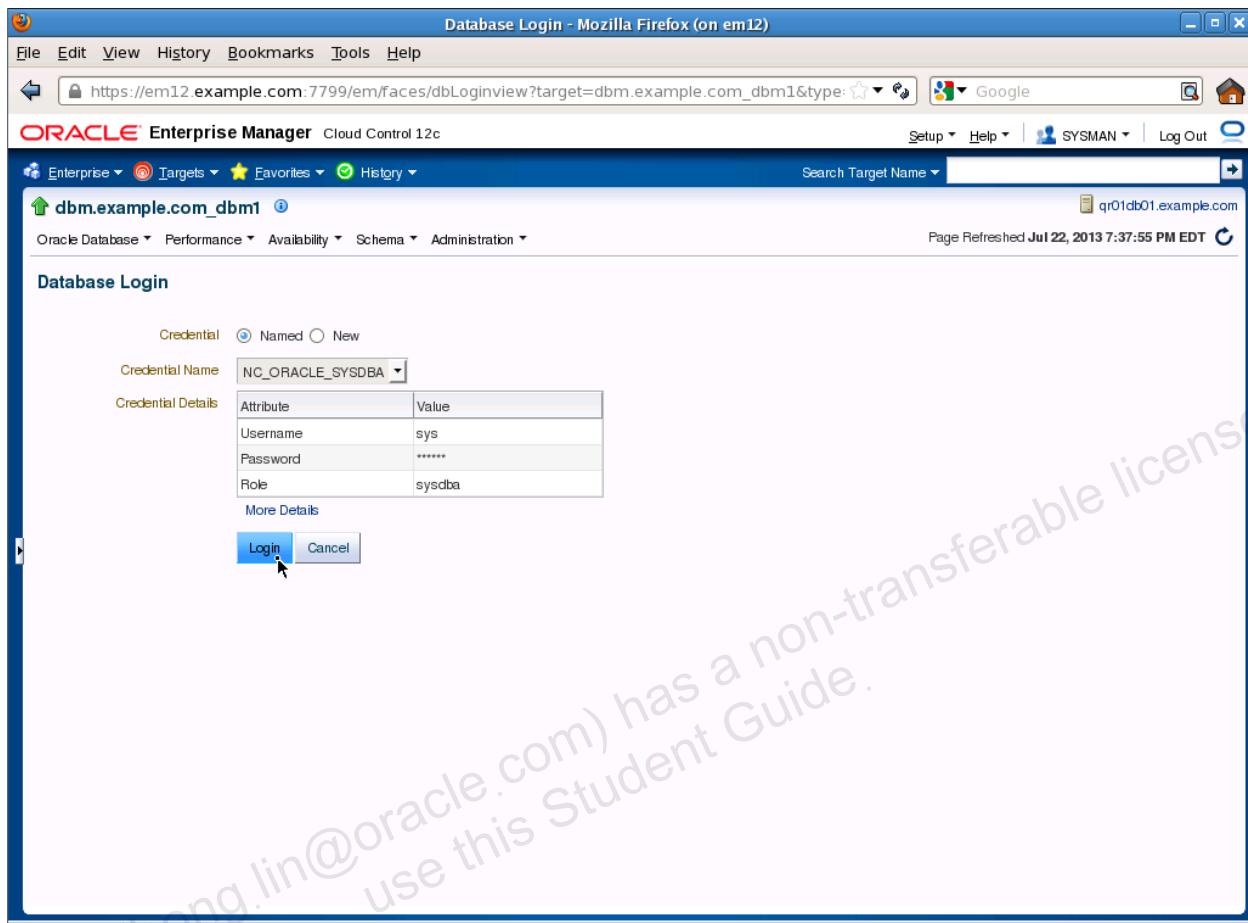


13. In the SQL Monitor - Last Hour area, you should see a list of SQL statements. Most of these statements should belong to the workload you executed at the beginning of this practice. Hover your mouse pointer over the SQL ID links in the list to reveal the SQL statement associated with each entry in the list. Find an interesting looking query that is based on the sales schema you have been using throughout all the practices in this course. Click the link associated with your selected query.

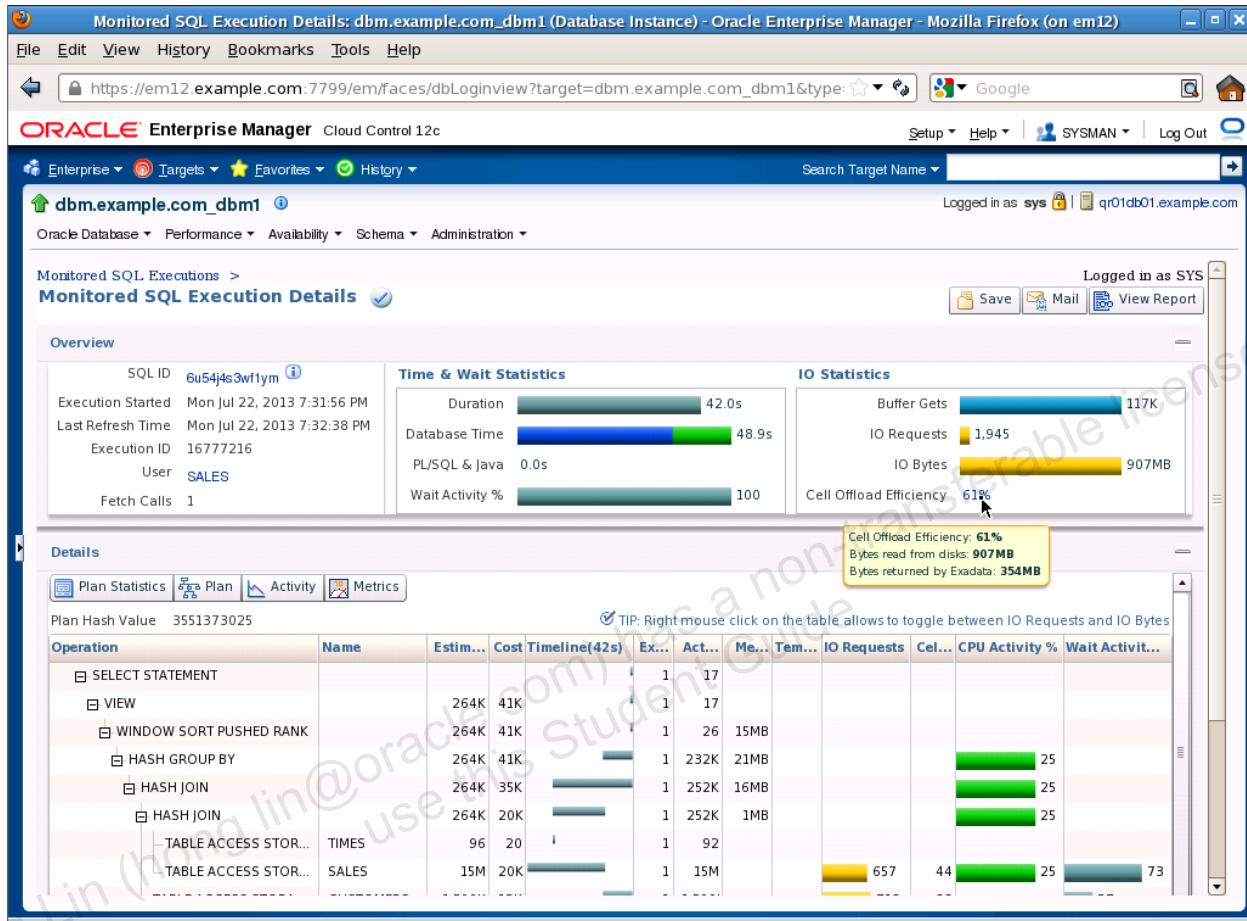
The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The main window displays various monitoring dashboards. On the right side, the "SQL Monitor - Last Hour" section is expanded, showing a table of recent SQL statements. The table has columns for Status, Duration, and SQL ID. The SQL IDs listed are 6p6q06zhi, 158fb5n0y, fdhwzpu1, 9q7zhj62r, 6w8831mwwquhr, 6u54j4s3wf1ym, a9pbny11zsnpp, and afqq0m1xt60n0. The duration for each statement is listed next to the SQL ID. A large yellow callout box highlights the SQL statement for the row with SQL ID 9q7zhj62r, which is:

```
SELECT *  
FROM  
(SELECT times.calendar_quarter_desc,  
customers.cust_first_name,  
customers.cust_last_name,  
customers.cust_id,  
SUM(sales.amount_sold),  
rank() over(PARTITION BY times.calendar_quarter_desc  
ORDER BY SUM(amount_sold) DESC) AS  
rank_within_quarter  
FROM sales,  
customers,  
times  
WHERE sales.cust_id = customers.cust_id  
AND times.calendar_quarter_desc = '2004-3'  
AND times.time_id = sales.time_id  
GROUP BY customers.cust_id,  
customers.cust_first_name,  
customers.cust_last_name,  
customers.cust_id,  
times.calendar_quarter_desc)  
WHERE rank_within_quarter < 16
```

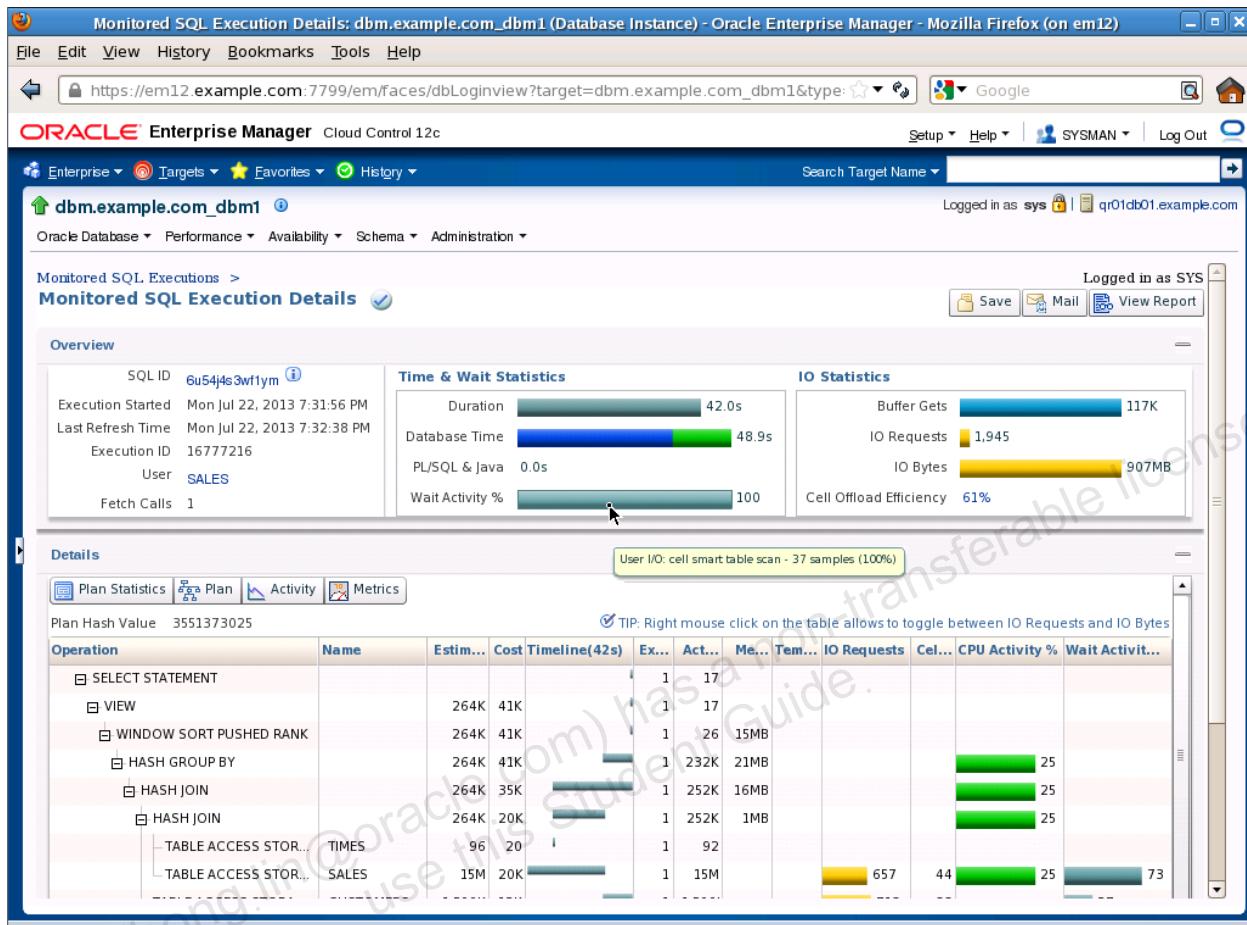
14. Select the option to log in to the database using the named credential (NC\_ORACLE\_SYSDBA) that you configured in an earlier practice. Then click Login to proceed.



15. On the Monitored SQL Execution Details page, you will see detailed information relating to your selected query. When the database resides on Exadata, some additional Exadata-specific information is also presented. Notice the Cell Offload Efficiency cell I/O statistic. Hover your mouse pointer over the Cell Offload Efficiency value to reveal more detailed information.



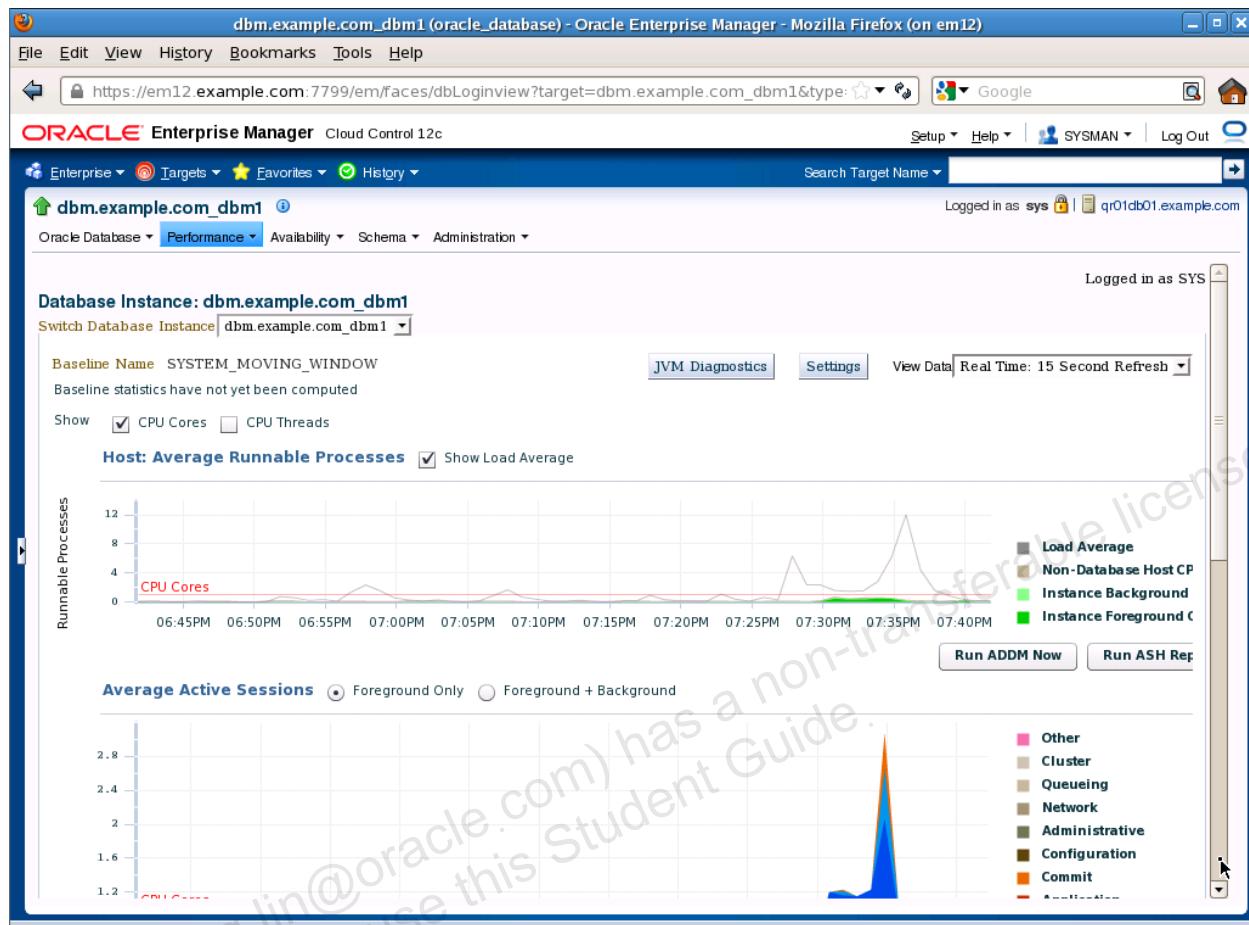
16. Hover your mouse pointer over the Wait Activity % bar and you should also see Exadata-specific wait event information. Finally, examine the query execution plan and take note of the Smart Scan operations that are included within it.



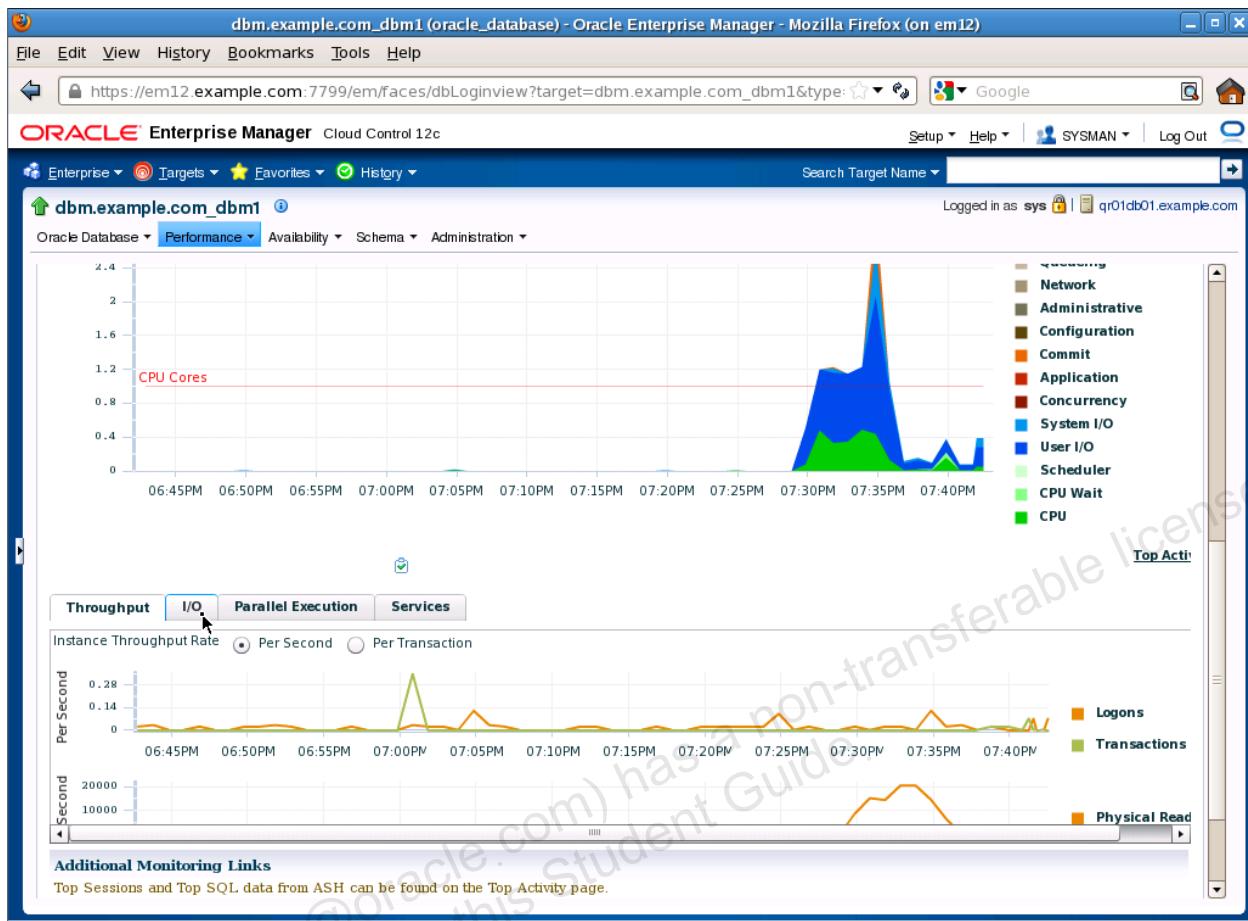
17. Select the Performance > Performance Home menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar has 'Monitored SQL E' expanded, with 'Performance Home' selected from the 'Performance' dropdown. The main content area displays 'TIME & WAIT STATISTICS' and 'IO STATISTICS' with various metrics and bar charts. Below these are sections for 'Metrics' and 'Operation' (showing SQL execution details like SELECT STATEMENT, VIEW, etc.). A tip at the bottom of the table says: 'TIP: Right mouse click on the table allows to toggle between IO Requests and IO Bytes'.

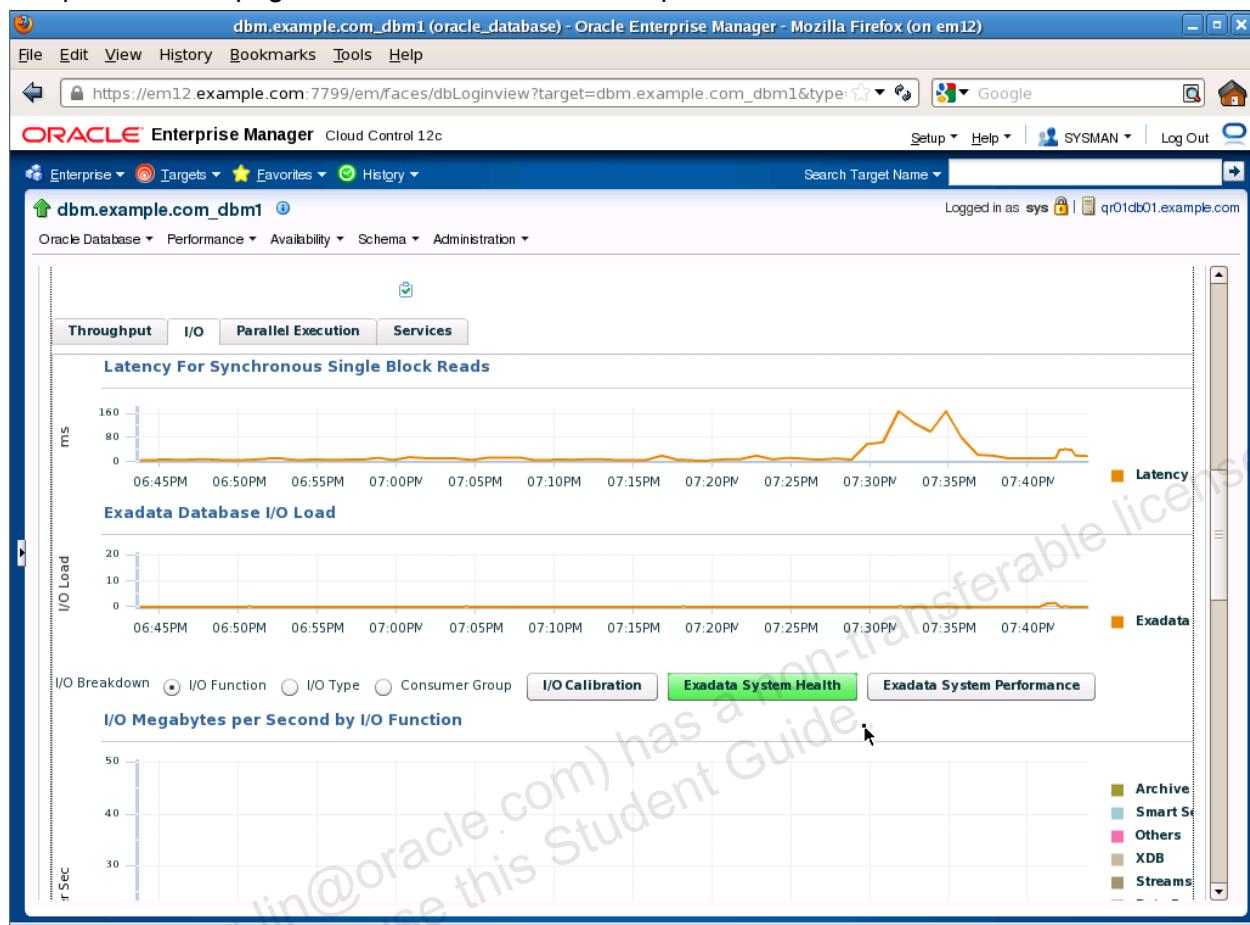
18. On the Database Instance Performance home page, scroll down the page until you can see a series of tabs that include a tab labeled I/O.



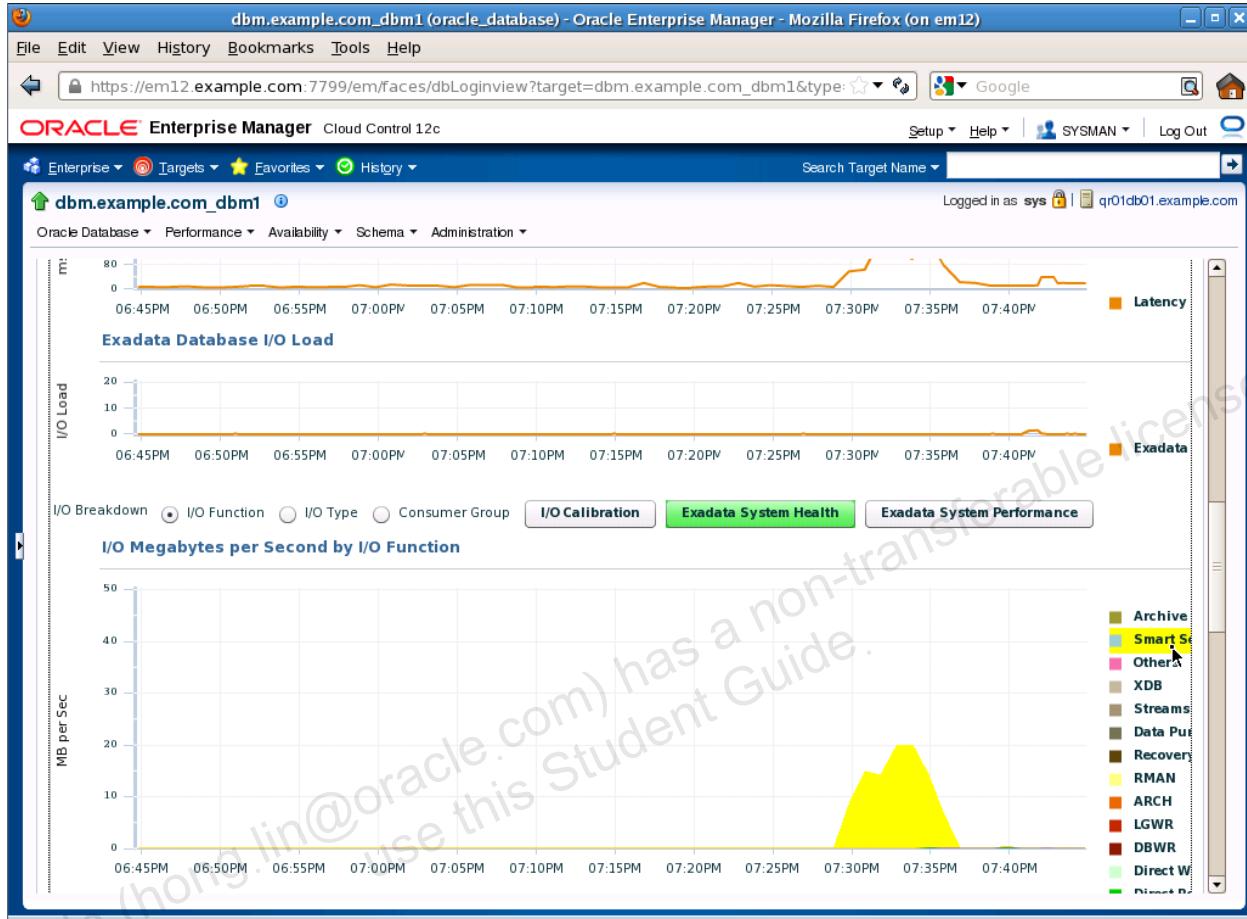
19. Click the I/O tab.



20. Notice that the I/O performance information presented on the Database Instance performance page contains various Exadata-specific elements.



21. Hover your mouse pointer over the Smart Scan legend entry of the I/O Megabytes per Second by I/O Function chart. This will highlight the Smart Scan activity performed by the database instance and should clearly illustrate the amount of Smart Scan versus other IO operations on the instance.

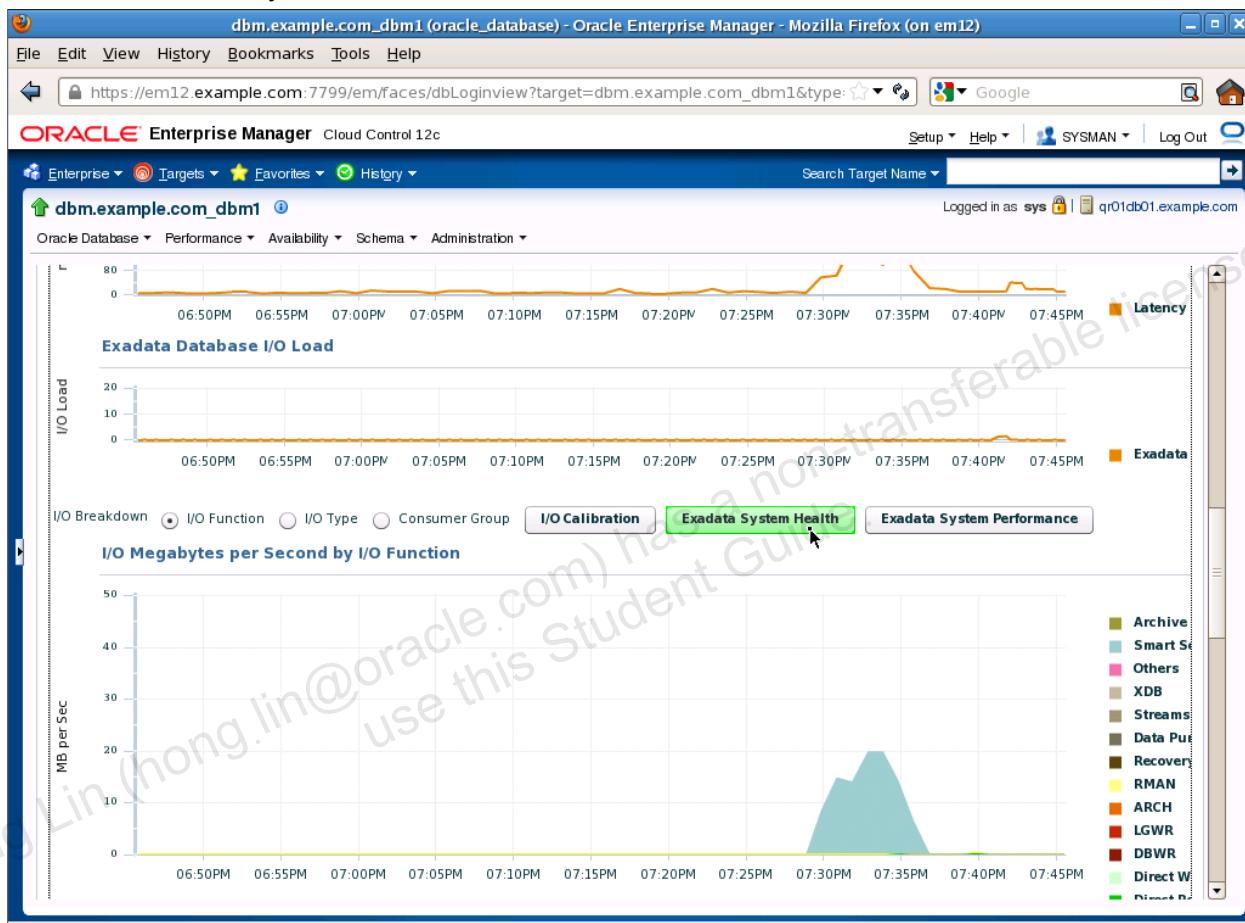


22. Notice also the two Exadata-specific buttons above the I/O Megabytes per Second by I/O Function chart.

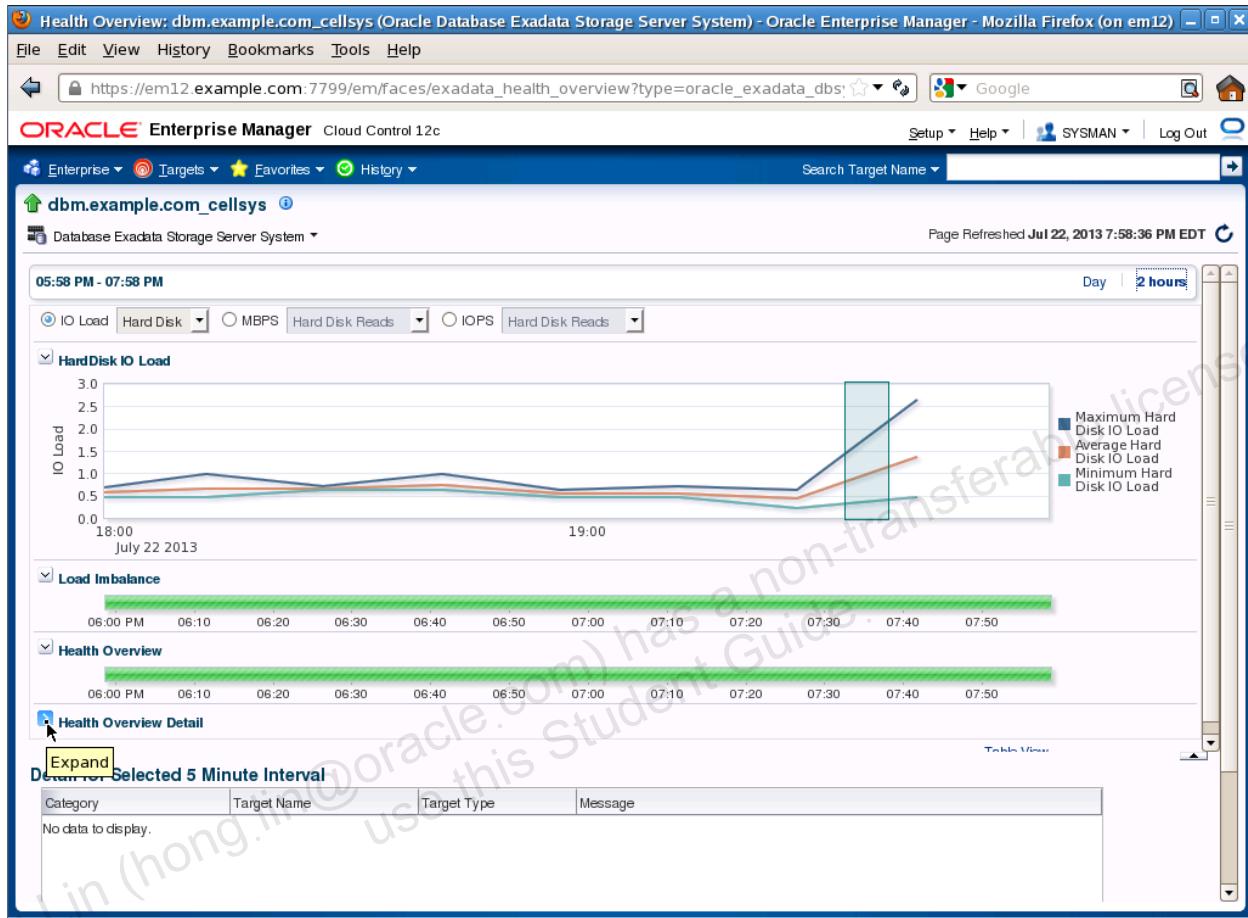
The Exadata System Health button provides a visual indication of the health of the storage servers associated with the database. If the button appears green (as shown below) then the cells are in a healthy state.

The Exadata System Performance button can be used to navigate to a performance overview page for the storage servers associated with the database.

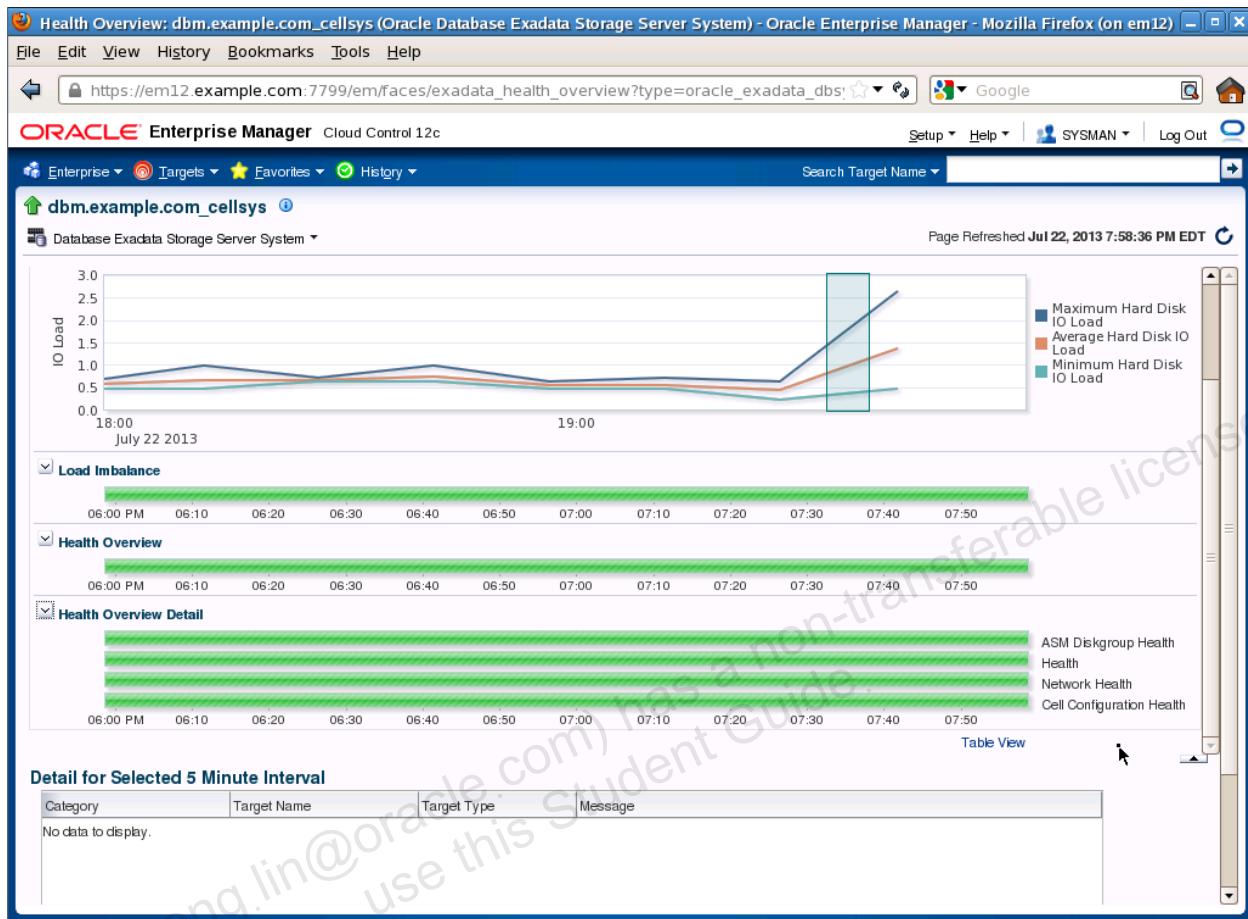
Click Exadata System Health.



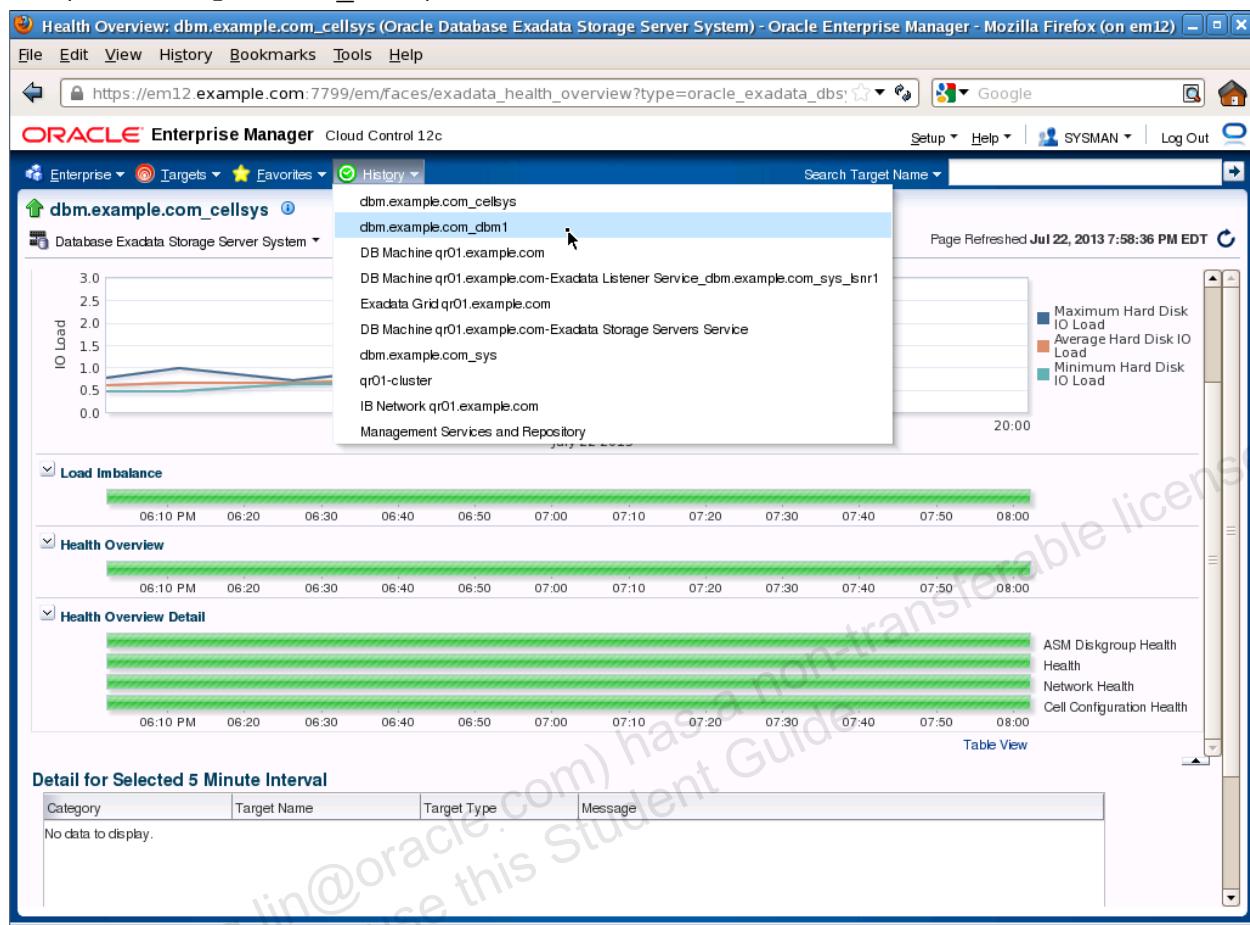
23. Examine the Exadata System Health page. Because your laboratory environment is not supporting a large user workload, you should expect to see green bars in the timelines for Load Imbalance and Health Overview. These green bars indicate that the storage servers associated with your database are not reporting any problems. Expand the Health Overview Detail area.



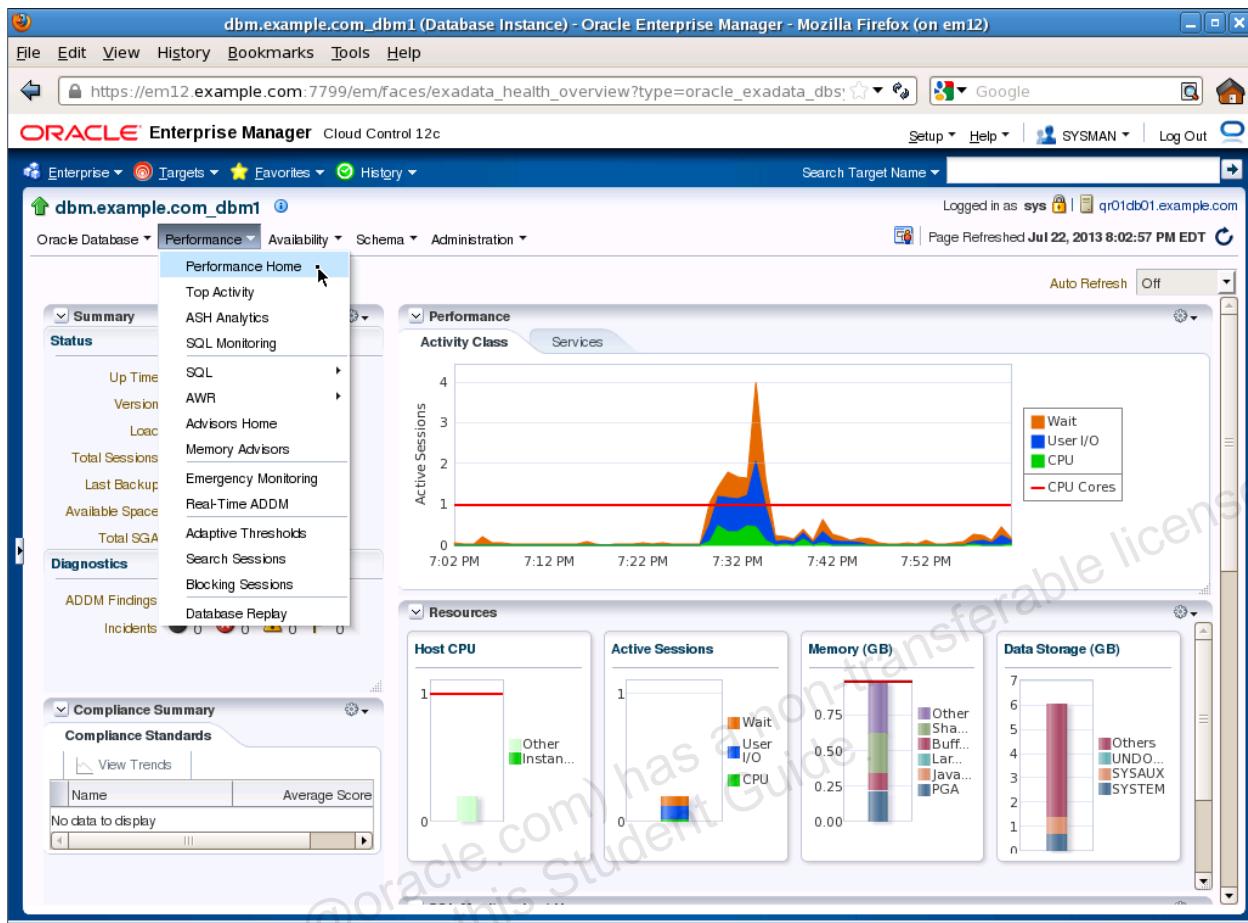
24. The Health Overview Detail area shows timelines and visual health indicators for key storage server components. Any area in these timelines that is not green indicates a warning or alert condition.



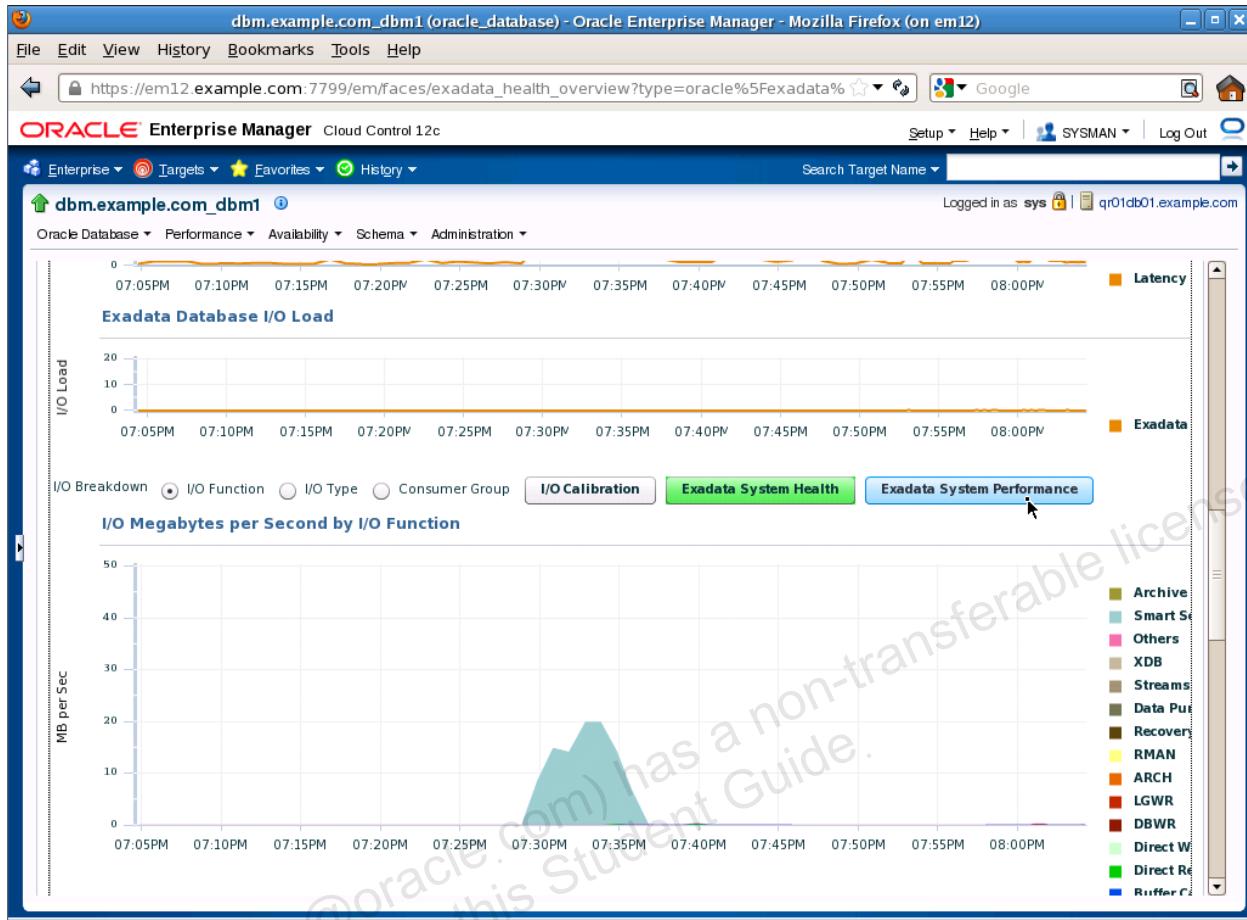
25. Use the History menu to navigate back to the database instance home page (dbm.example.com\_dbm1).



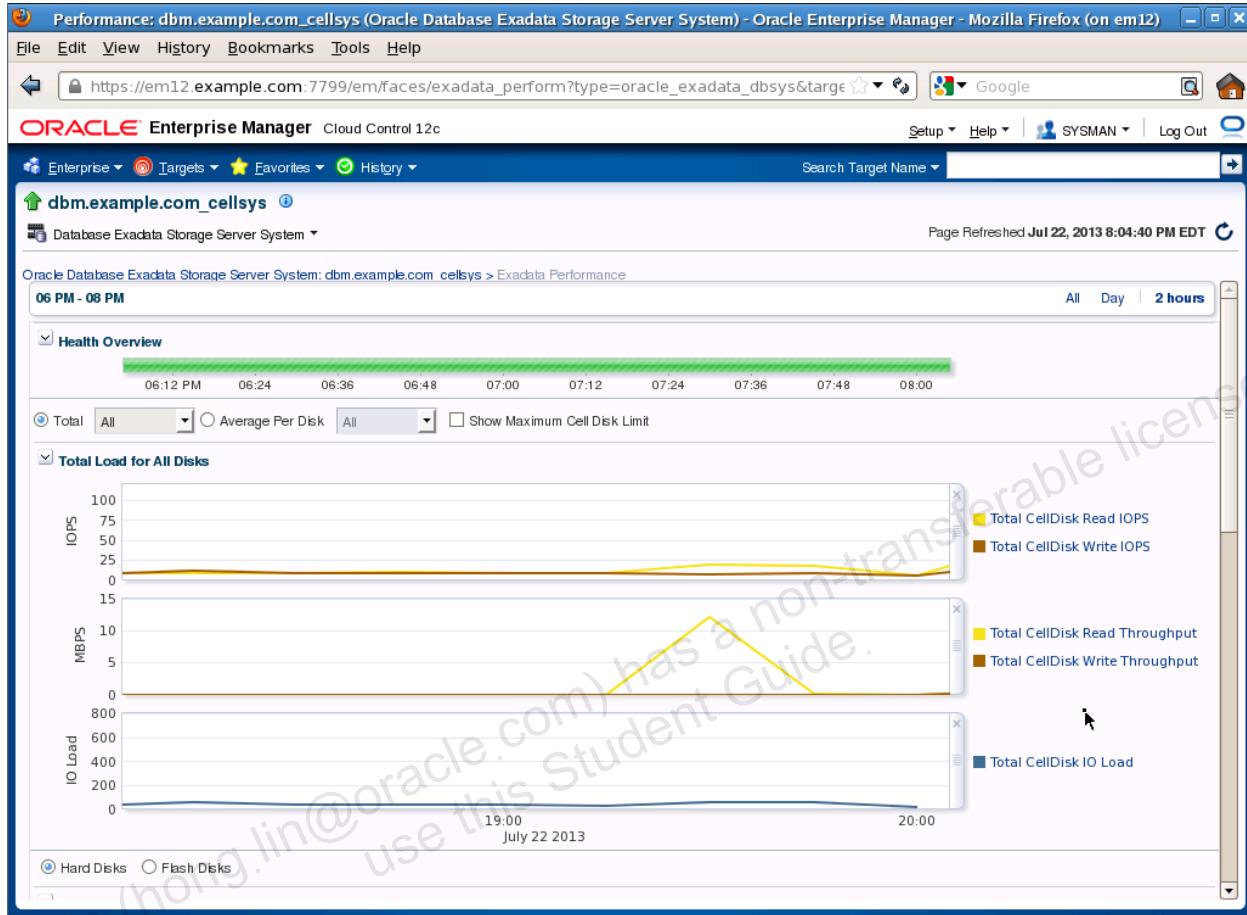
26. Select the Performance > Performance Home menu command.



27. Scroll down the database performance home page and click Exadata System Performance.



28. Here is the performance overview page for the storage servers associated with the database. It provides a series of charts that plot key Exadata Storage Server performance metrics over time for the storage servers associated with the database. It is very similar to the Exadata Storage Server Performance page that you examined in a previous practice.



Congratulations! You have examined various Exadata-specific database monitoring capabilities provided by Enterprise Manager Cloud Control 12c.

## **Practices for Lesson 17: Monitoring the InfiniBand Network**

**Chapter 17**

## Practices for Lesson 17

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### Practices Overview

In this practice, you will examine the Exadata InfiniBand monitoring and administration capabilities provided by Enterprise Manager Cloud Control 12c.

## **Practice 17-1: Exadata InfiniBand Monitoring with Enterprise Manager**

### **Overview**

In this practice, you will examine the Exadata InfiniBand monitoring and administration capabilities provided by Enterprise Manager Cloud Control 12c.

### **Assumptions**

The practice relies on the configurations performed in Practice 14-1.

### **Tasks**

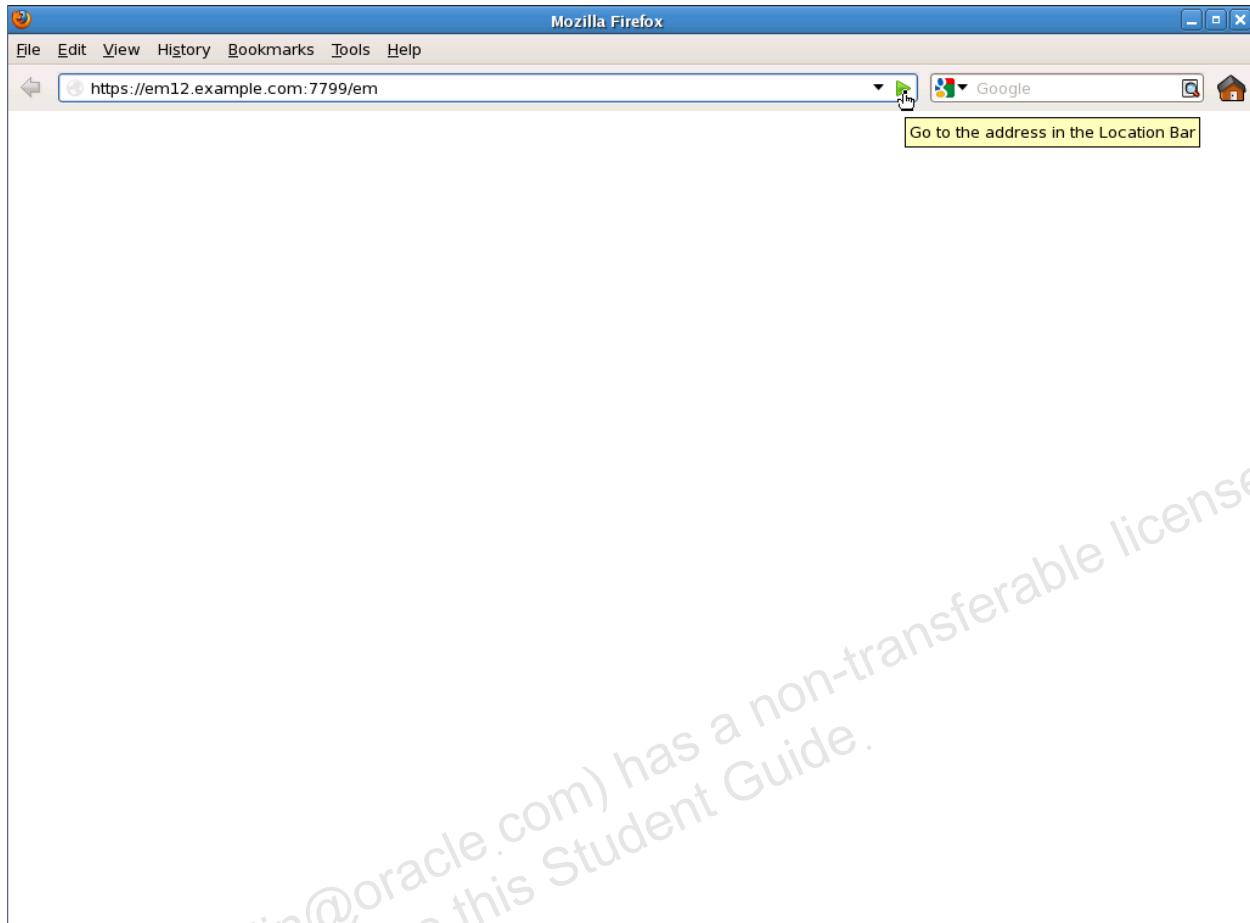
1. Establish a terminal session connected to em12 by using the oracle OS user. Ensure that you specify the -X option for ssh.

```
$ ssh -X oracle@em12  
oracle@em12 password: <oracle>  
[oracle@em12 ~]$
```

2. Start the Firefox web browser.

```
[root@em12 ~]$ firefox &  
[1] 30345
```

3. Navigate to the Enterprise Manager console at <https://em12.example.com:7799/em>.



4. Log in to Enterprise Manager Cloud Control 12c by using the following credentials:
  - User Name: sysman
  - Password: Oracle123



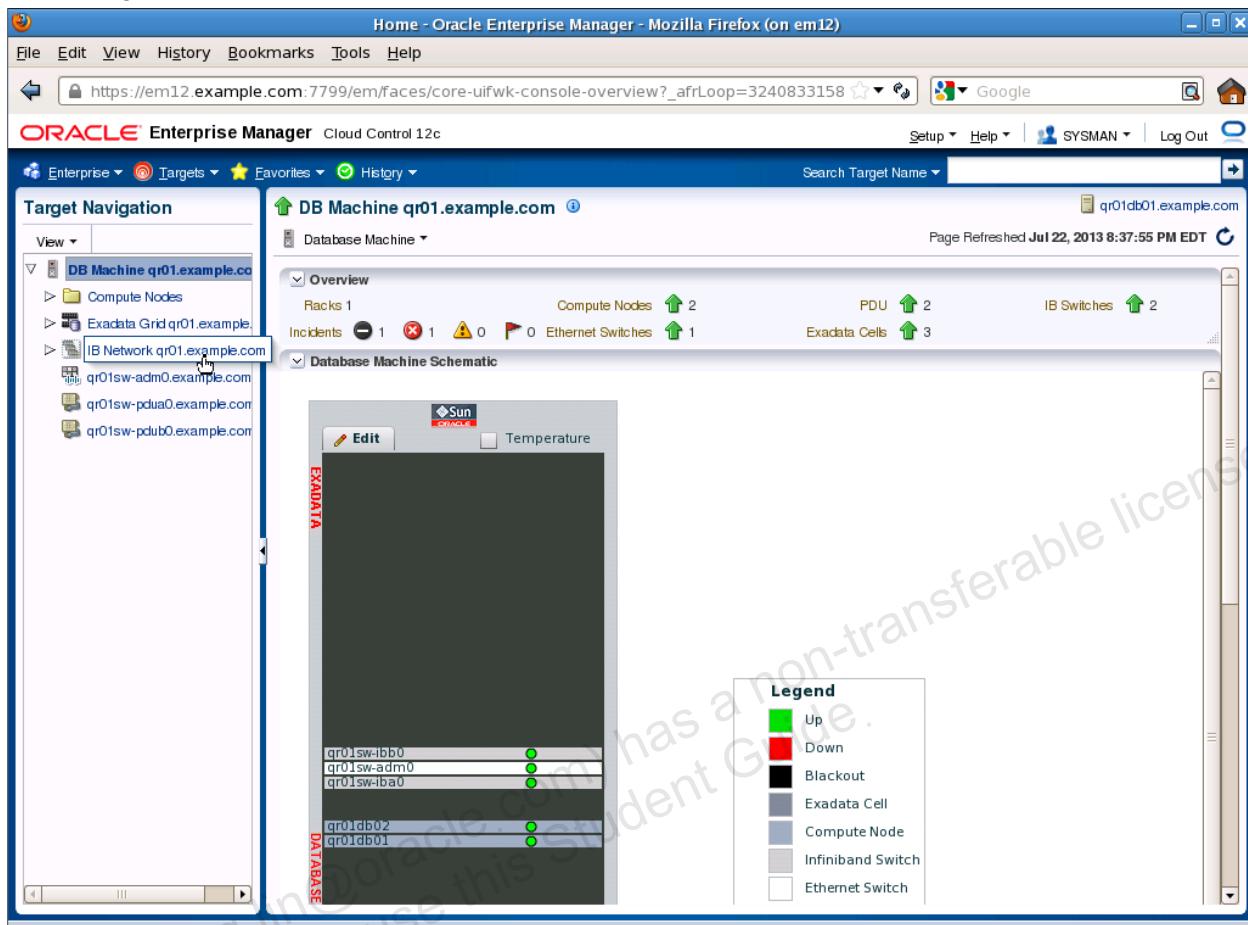
5. On the Enterprise Summary page, select the Targets > Exadata menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Enterprise Summary - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The left sidebar has a "Targets" dropdown menu open, with "Exadata" highlighted. The main content area includes sections for "Inventory and Usage" (Platform: Oracle Linux Server release 5.9, Hosts: 3), "Compliance Summary" (No data to display), and "Least Compliant Targets" (No data to display). A pie chart at the bottom left indicates 29% for one category and 59% for another.

6. Click the link corresponding to your Exadata Database Machine (DB Machine qr01.example.com).

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Oracle Exadata Database Machines - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area is titled "Oracle Exadata Database Machines". A search bar at the top left has the placeholder "Enter the target name to search." Below it is a table with columns: Target Name, Status, Members, Member Status Summary, and Incidents. The first row in the table is highlighted in blue and contains the text "DB Machine qr01.example.com". A cursor is positioned over this link. The status column shows "Cluster Database(1), Oracle Infiniband Switch(2), Oracle Infiniband Net". The member status summary shows values 1, 16, -, -, - and incidents show 1, 1, -. The bottom of the page displays the URL "https://em12.example.com:7799/em/faces/core-uifwk-console-overview...rLoop=32408331585886&\_afrWindowMode=0&\_afrWindowId=1803obt413\_1#".

7. On the Database Machine home page, click “IB Network qr01.example.com” in the Target Navigation pane.



8. On the IB Network home page, collapse the Target Navigation pane.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface for monitoring an Infiniband network. The URL in the browser is [https://em12.example.com:7799/em/faces/core-uifwk-console-overview?\\_afrLoop=3240833158](https://em12.example.com:7799/em/faces/core-uifwk-console-overview?_afrLoop=3240833158). The main content area is titled "IB Network qr01.example.com". It includes sections for "Overview" (Status: green, Subnet Manager on Switch: qr01sw-iba0.example.com, Switches: 2, Compute Nodes: 2, Cells: 3), "Throughput" (Total Network: 0 Mbps), "Switches" (listing qr01sw-iba0.example.com and qr01sw-ibb0.example.com, both in Normal status), and "Nodes" (listing qr01ce03.example.com, an Oracle Exadata Storage Server HCA-1, IP Address: 192.168.1.105). The "Target Navigation" pane on the left is collapsed, showing a tree view of the network hierarchy: DB Machine qr01.example.com, Compute Nodes, Exadata Grid qr01.example.com, IB Network qr01.example.com, qr01sw-admin0.example.com, qr01sw-pdua0.example.com, and qr01sw-pdub0.example.com.

9. Take a moment to examine the IB Network home page. The Overview area provides a quick visual indication of the status and health of the InfiniBand network, including the switches, interfaces on the compute nodes (database servers), and cells (storage servers). The Throughput area summarizes the InfiniBand Network throughput. Below these lie areas that contain more detailed information about the InfiniBand switches and network interfaces. You will investigate these areas in greater detail later in the practice. At the bottom of the page, the Incidents area displays alerts related to the InfiniBand Network. **Note:** Your laboratory environment does not actually contain any InfiniBand switches or network interfaces. Therefore, to facilitate this practice, your laboratory environment has been seeded with information from a real quarter-rack Exadata Database Machine. As a result, some parts of the Enterprise Manager InfiniBand monitoring and administration interfaces will contain incomplete data. For example, the Throughput area on the IB Network home page will always contain zero values in your laboratory environment.

**IB Network qr01.example.com**

**Switches**

Refresh	Name	Status	Type	Port Details																																				
↻	qr01sw-iba0.example.com	⬆️	Normal	<table border="1"> <tr><td>20</td><td>22</td><td>24</td><td>26</td><td>28</td><td>30</td><td>35</td><td>33</td><td>31</td><td>14</td><td>16</td><td>18</td><td>11</td><td>9</td><td>7</td><td>5</td><td>3</td><td>1</td></tr> <tr><td>19</td><td>21</td><td>23</td><td>25</td><td>27</td><td>29</td><td>36</td><td>34</td><td>32</td><td>13</td><td>15</td><td>17</td><td>12</td><td>10</td><td>8</td><td>6</td><td>4</td><td>2</td></tr> </table>	20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1	19	21	23	25	27	29	36	34	32	13	15	17	12	10	8	6	4	2
20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1																							
19	21	23	25	27	29	36	34	32	13	15	17	12	10	8	6	4	2																							
↻	qr01sw-ibb0.example.com	⬆️	Normal	<table border="1"> <tr><td>20</td><td>22</td><td>24</td><td>26</td><td>28</td><td>30</td><td>35</td><td>33</td><td>31</td><td>14</td><td>16</td><td>18</td><td>11</td><td>9</td><td>7</td><td>5</td><td>3</td><td>1</td></tr> <tr><td>19</td><td>21</td><td>23</td><td>25</td><td>27</td><td>29</td><td>36</td><td>34</td><td>32</td><td>13</td><td>15</td><td>17</td><td>12</td><td>10</td><td>8</td><td>6</td><td>4</td><td>2</td></tr> </table>	20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1	19	21	23	25	27	29	36	34	32	13	15	17	12	10	8	6	4	2
20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1																							
19	21	23	25	27	29	36	34	32	13	15	17	12	10	8	6	4	2																							

**Nodes**

Refresh	Name	Status	Type	HCA	IP Address	Port Details		
↻	qr01cel03.example.com	⬆️	Oracle Exadata Storage Server HCA-1		192.168.1.105	<table border="1"><tr><td>1</td><td>2</td></tr></table>	1	2
1	2							
↻	qr01cel02.example.com	⬆️	Oracle Exadata Storage Server HCA-1		192.168.1.104	<table border="1"><tr><td>1</td><td>2</td></tr></table>	1	2
1	2							

10. Scroll down the IB Network home page to display the Switches and Nodes areas. Note that these areas provide a visual representation of the InfiniBand network ports on the InfiniBand switches and Host Channel Adapters (HCAs). Grey colored ports indicate ports that are in use and functioning normally. White colored ports are available ports that are not connected to anything else. If a problem is detected, the corresponding port will be colored red.

**Switches**

Refresh	Name	Status	Type	Port Details																																				
	qr01sw-iba0.example.com		Normal	<table border="1"> <tr><td>20</td><td>22</td><td>24</td><td>26</td><td>28</td><td>30</td><td>35</td><td>33</td><td>31</td><td>14</td><td>16</td><td>18</td><td>11</td><td>9</td><td>7</td><td>5</td><td>3</td><td>1</td></tr> <tr><td>19</td><td>21</td><td>23</td><td>25</td><td>27</td><td>29</td><td>36</td><td>34</td><td>32</td><td>13</td><td>15</td><td>17</td><td>12</td><td>10</td><td>8</td><td>6</td><td>4</td><td>2</td></tr> </table>	20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1	19	21	23	25	27	29	36	34	32	13	15	17	12	10	8	6	4	2
20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1																							
19	21	23	25	27	29	36	34	32	13	15	17	12	10	8	6	4	2																							
	qr01sw-ibb0.example.com		Normal	<table border="1"> <tr><td>20</td><td>22</td><td>24</td><td>26</td><td>28</td><td>30</td><td>35</td><td>33</td><td>31</td><td>14</td><td>16</td><td>18</td><td>11</td><td>9</td><td>7</td><td>5</td><td>3</td><td>1</td></tr> <tr><td>19</td><td>21</td><td>23</td><td>25</td><td>27</td><td>29</td><td>36</td><td>34</td><td>32</td><td>13</td><td>15</td><td>17</td><td>12</td><td>10</td><td>8</td><td>6</td><td>4</td><td>2</td></tr> </table>	20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1	19	21	23	25	27	29	36	34	32	13	15	17	12	10	8	6	4	2
20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1																							
19	21	23	25	27	29	36	34	32	13	15	17	12	10	8	6	4	2																							

**Nodes**

Refresh	Name	Status	Type	HCA	IP Address	Port Details		
	qr01cel03.example.com		Oracle Exadata Storage Server HCA-1		192.168.1.105	<table border="1"><tr><td>1</td><td>2</td></tr></table>	1	2
1	2							
	qr01cel02.example.com		Oracle Exadata Storage Server HCA-1		192.168.1.104	<table border="1"><tr><td>1</td><td>2</td></tr></table>	1	2
1	2							
	qr01db02.example.com		Host	HCA-1	192.0.2.102	<table border="1"><tr><td>1</td><td>2</td></tr></table>	1	2
1	2							
	qr01cel01.example.com		Oracle Exadata Storage Server HCA-1		192.168.1.103	<table border="1"><tr><td>1</td><td>2</td></tr></table>	1	2
1	2							

11. When you hold the cursor over the port diagram, a callout that contains detailed information about the port appears. If the port is in use, the callout also includes the details of the Peer Port; that is, the port at the other end of the connection. Using this information, you can determine the InfiniBand network topology. Hold the cursor over some of the switch ports. Can you determine which ports are connected to each of the database servers and Exadata Storage Servers? Can you determine which ports interconnect the switches?

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface for monitoring an InfiniBand network. The main window displays two tables: 'Switches' and 'Nodes'. The 'Switches' table lists two entries: 'qr01sw-iba0.example.com' and 'qr01sw-ibb0.example.com', both in 'Normal' status. The 'Nodes' table lists four entries: 'qr01cel03.example.com', 'qr01cel02.example.com', 'qr01db02.example.com', and 'qr01cel01.example.com', all in 'Normal' status. A tooltip is displayed over the port 17A of the first switch, providing detailed information: 'Port Connector 17A', 'Peer Port Oracle Exadata Storage Server qr01cel02.example.com: Port 1', 'Errors 0', 'Throughput 0.0 Mbps', and 'State Normal'. The tooltip also shows a diagram of the port's connection to another port on the same switch.

12. Hold the cursor over the database server and storage server HCA ports. Can you determine which switch each port is connected to? Verify that the information associated with each port matches its peer port. For example, if port 1 on qr01sw-iba0 displays port 1 on qr01cel02 as its peer port (as shown above), verify that port 1 on qr01cel02 displays port 1 on qr01sw-iba0 as its peer port (as shown below).

Refresh	Name	Status	Type	Port Details		
	qr01sw-iba0.example.com		Normal	20 22 24 26 28 30 35 33 31 14 16 18 11 9 7 5 3 1 19 21 23 25 27 29 36 34 32 13 15 17 12 10 8 6 4 2		
	qr01sw-ibb0.example.com		Normal	20 22 24 26 28 30 35 33 31 14 16 18 11 9 7 5 3 1 19 21 23 25 27 29 36 34 32 13 15 17 12 10 8 6 4 2		

Refresh	Name	Status	Type	HCA	IP Address	Port Details
	qr01cel03.example.com		Oracle Exadata Storage Server HCA-1		192.168.1.105	 
	qr01cel02.example.com		Oracle Exadata Storage Server HCA-1		192.168.1.104	   
	qr01db02.example.com		Host			
	qr01cel01.example.com		Oracle Exadata			

13. Scroll to the bottom of the IB Network home page to reveal the Incidents area. This is where you will see notification relating to problems and issues that are detected on the InfiniBand network.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface for monitoring an InfiniBand network. At the top, the title bar reads "Infiniband Home - Mozilla Firefox (on em12)". The main content area displays the "IB Network qr01.example.com" configuration. On the left, there's a tree view with "Infiniband Network" selected. The central part shows a table of ports (20-36) with their status (Normal). Below this is a "Nodes" table listing four hosts: qr01cel03.example.com, qr01cel02.example.com, qr01db02.example.com, and qr01cel01.example.com, each with two ports (1 and 2) shown as green up arrows. At the bottom, the "Incidents" section is visible, showing a summary table with columns for Target, Severity, Status, Escalation level, Type, and Time since last update. A message states "No matching incidents or problems found." The URL in the browser is [https://em12.example.com:7799/em/faces/core-uiwk-console-overview?\\_afrLoop=3240833158](https://em12.example.com:7799/em/faces/core-uiwk-console-overview?_afrLoop=3240833158).

14. Select the Infiniband Network > Performance menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Infiniband Home - Mozilla Firefox (on em12)". The main navigation bar includes File, Edit, View, History, Bookmarks, Tools, Help, ORACLE Enterprise Manager, Cloud Control 12c, Setup, Help, SYSMAN, Log Out, and a search bar for "Search Target Name".

The left sidebar menu is expanded, showing:

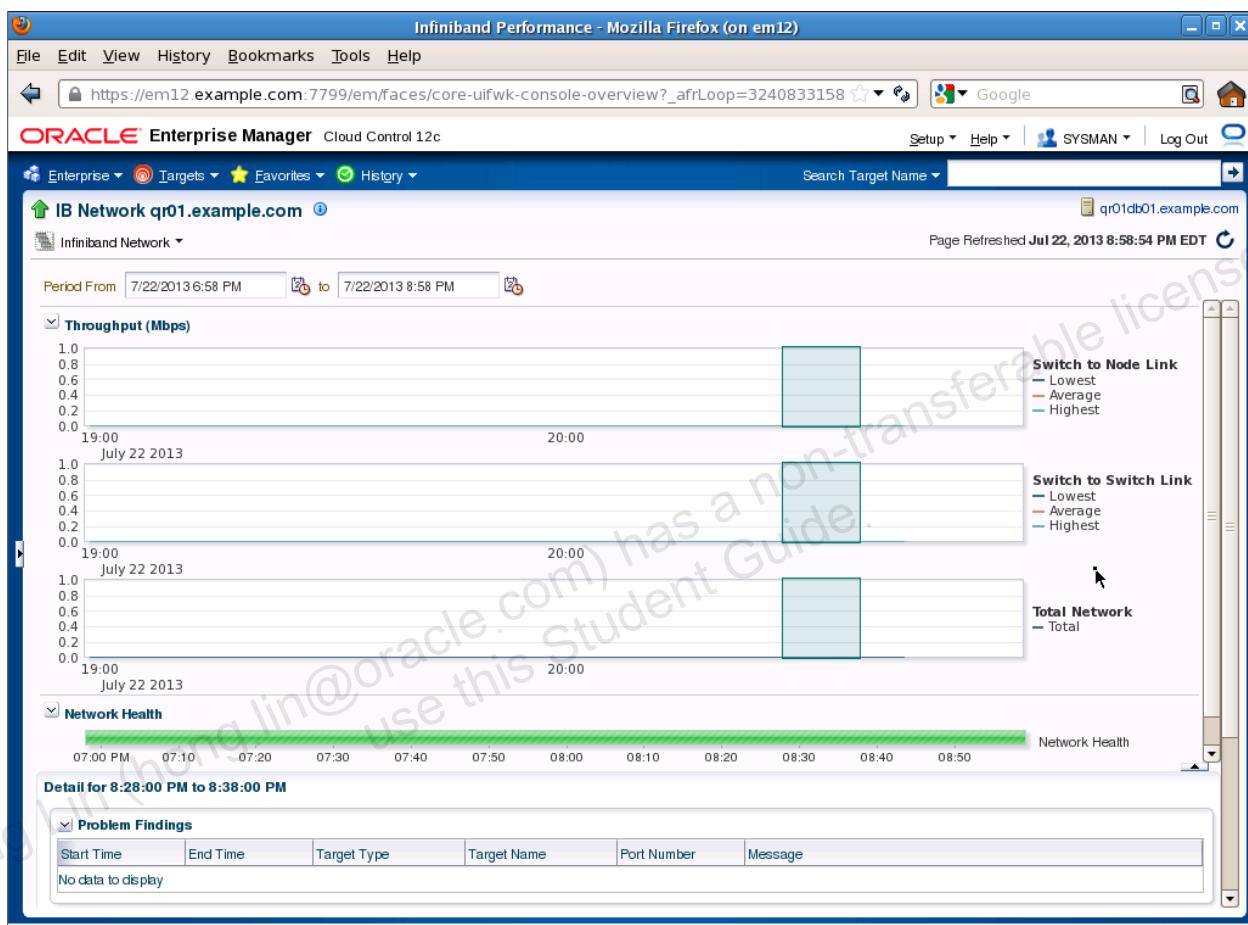
- IB Network qr01.example.com
- Infiniband Network (selected)
- Monitoring
- Control
- Job Activity
- Information Publisher Reports
- Members
- Performance (selected)
- Topology
- Administration
- Configuration
- Compliance
- Target Setup
- Target Information

The main content area displays the "Performance" section for the Infiniband Network. It includes a summary table with columns for Port Number (19-12), Status (Normal), and Type (Host). Below this is a detailed table for "Host" targets, showing IP Address (192.0.2.102), Port Details (1, 2), and a legend for Normal Ports (gray), Ports with Errors (red), and Available Ports (white).

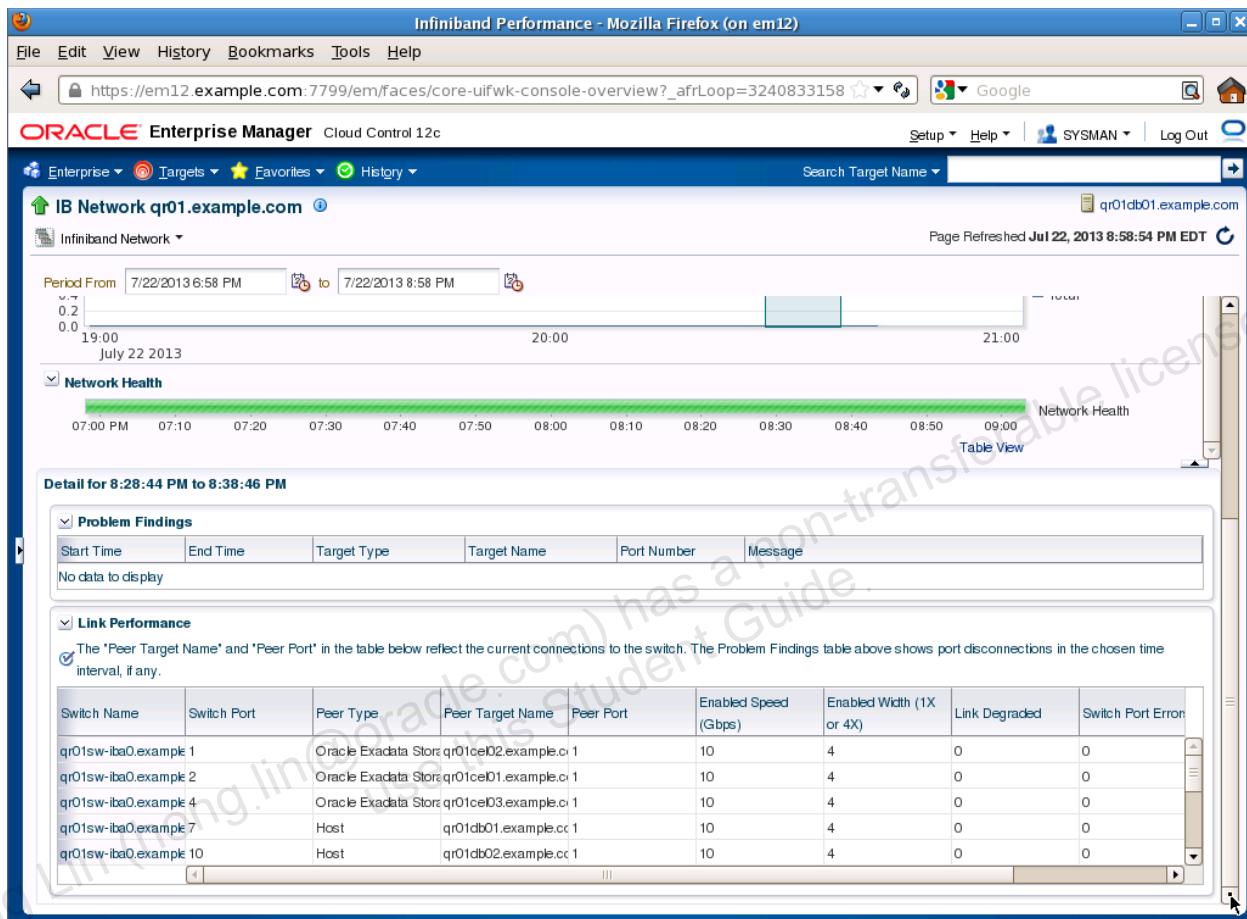
At the bottom, there is an "Incidents" section with a summary table and a message stating "No matching incidents or problems found."

15. The InfiniBand network performance page displays a series of charts that plot InfiniBand network throughput over time. In your laboratory environment, these charts are essentially empty; however, in a production environment, administrators would use these charts to quickly identify if there is a significant variation in throughput on different parts of the network. Such a variation could indicate a problem with a network component or indicate an imbalance within the environment.

The InfiniBand network performance page also contains a visual indicator of the network health over time.



16. Scroll down the InfiniBand network performance page to reveal the details area. This area contains information related to the time interval highlighted in the throughput charts. If the throughput charts identify a significant variation, administrators can highlight a portion of the chart and investigate the details area to see if there are any associated problem findings, or if any of the links are degraded or showing errors. Note: If you see no data in the details area then try moving the highlighted area in the throughput charts.

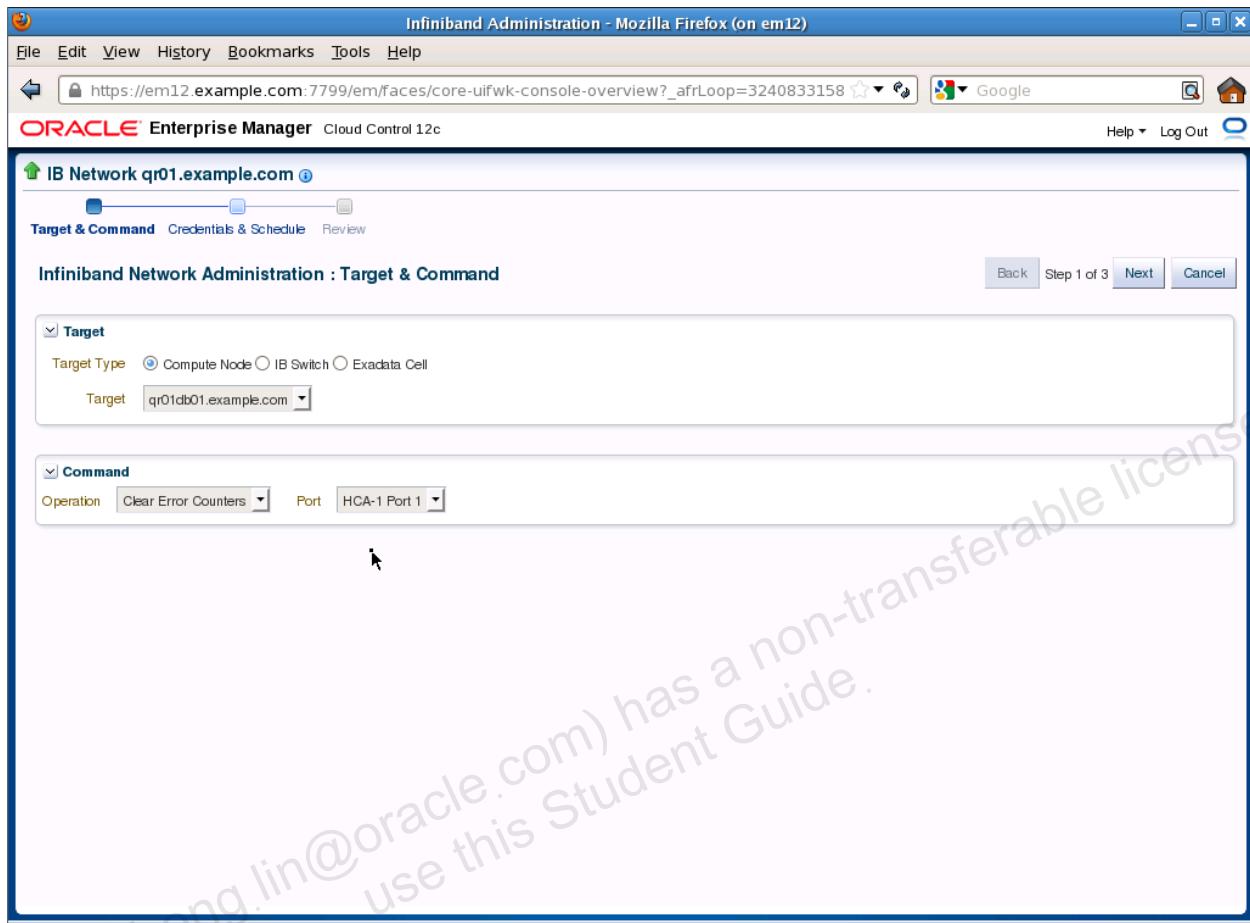


17. Select the Infiniband Network > Administration menu command.

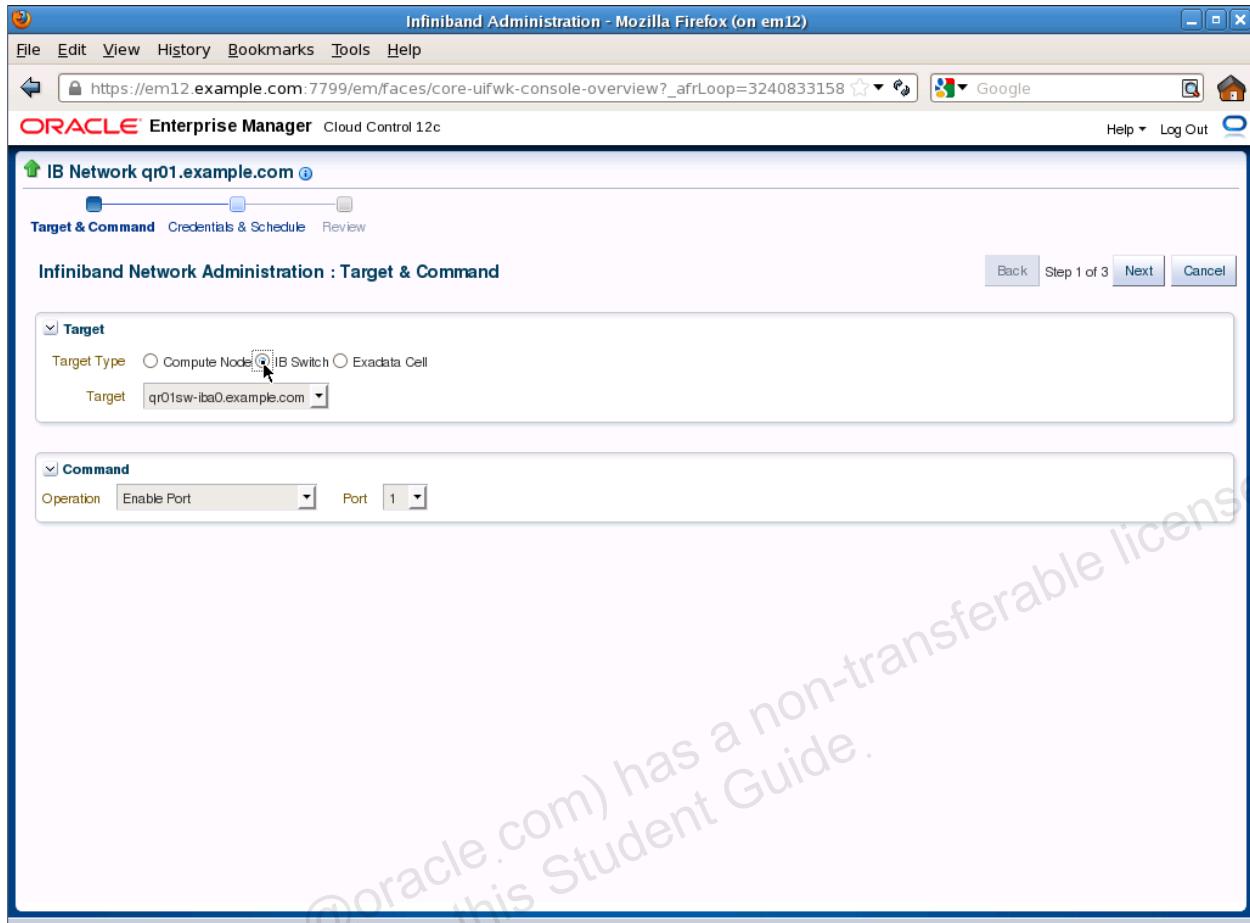
The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface for monitoring an Infiniband network. The left sidebar lists navigation options: Home, Monitoring, Control, Job Activity, Information Publisher Reports, Members, Performance, Topology, Administration (which is selected), Configuration, Compliance, Target Setup, and Target Information. Below the sidebar is a timeline from 07:30 to 09:00, with a green bar indicating 'Network Health' from 07:30 to 08:45. A table titled 'Link Performance' displays network connection details for various switches and hosts. The table has columns: Switch Name, Switch Port, Peer Type, Peer Target Name, Peer Port, Enabled Speed (Gbps), Enabled Width (1X or 4X), Link Degraded, and Switch Port Error. The data is as follows:

Switch Name	Switch Port	Peer Type	Peer Target Name	Peer Port	Enabled Speed (Gbps)	Enabled Width (1X or 4X)	Link Degraded	Switch Port Error
qr01sw-iba0.example.com	1	Oracle Exadata Storage	qr01ce02.example.com	1	10	4	0	0
qr01sw-iba0.example.com	2	Oracle Exadata Storage	qr01ce01.example.com	1	10	4	0	0
qr01sw-iba0.example.com	4	Oracle Exadata Storage	qr01ce03.example.com	1	10	4	0	0
qr01sw-iba0.example.com	7	Host	qr01db01.example.com	1	10	4	0	0
qr01sw-iba0.example.com	10	Host	qr01db02.example.com	1	10	4	0	0

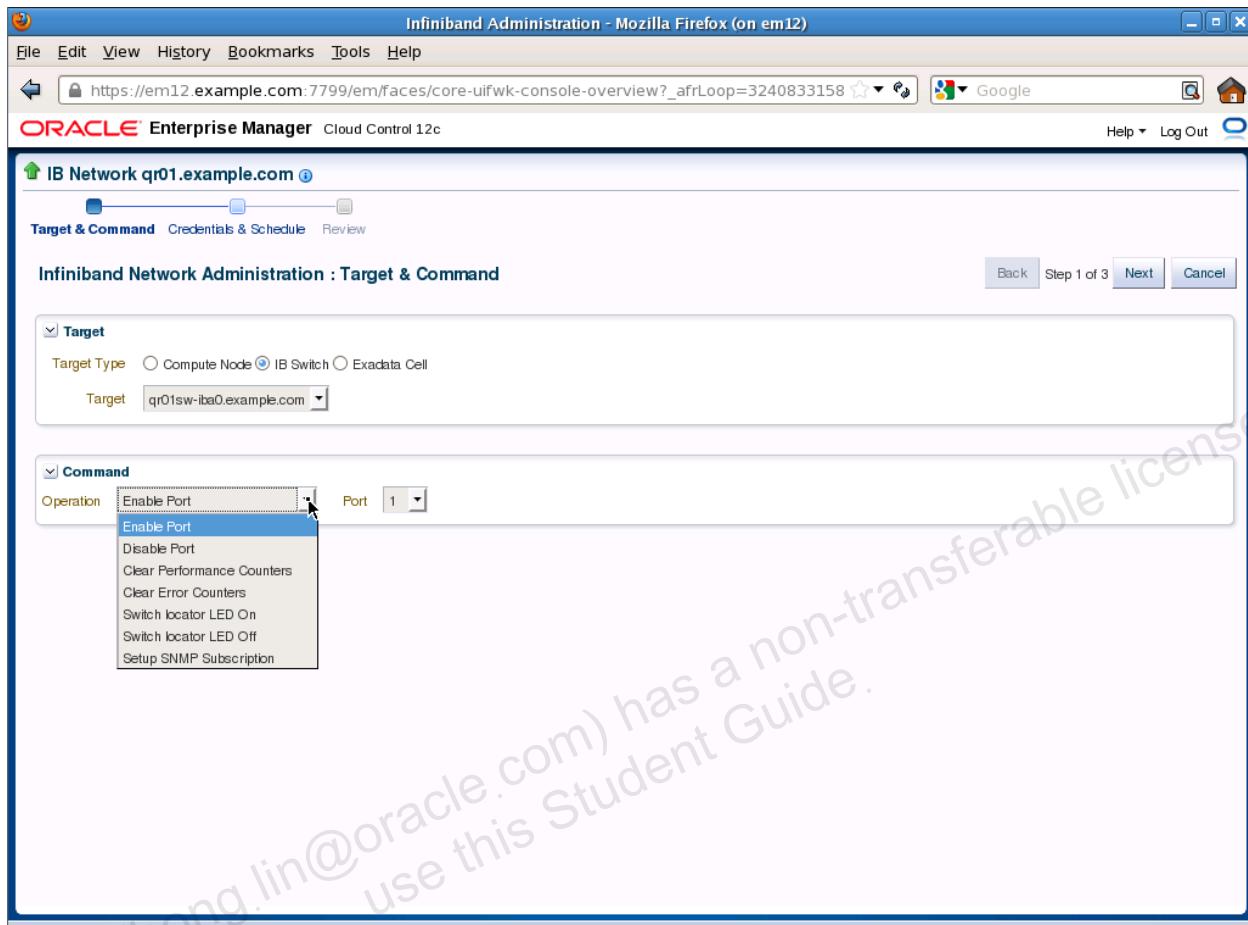
18. The first page of the Infiniband Network Administration Wizard appears. Using this wizard, you can perform an InfiniBand network administration task on an InfiniBand switch or server HCA.



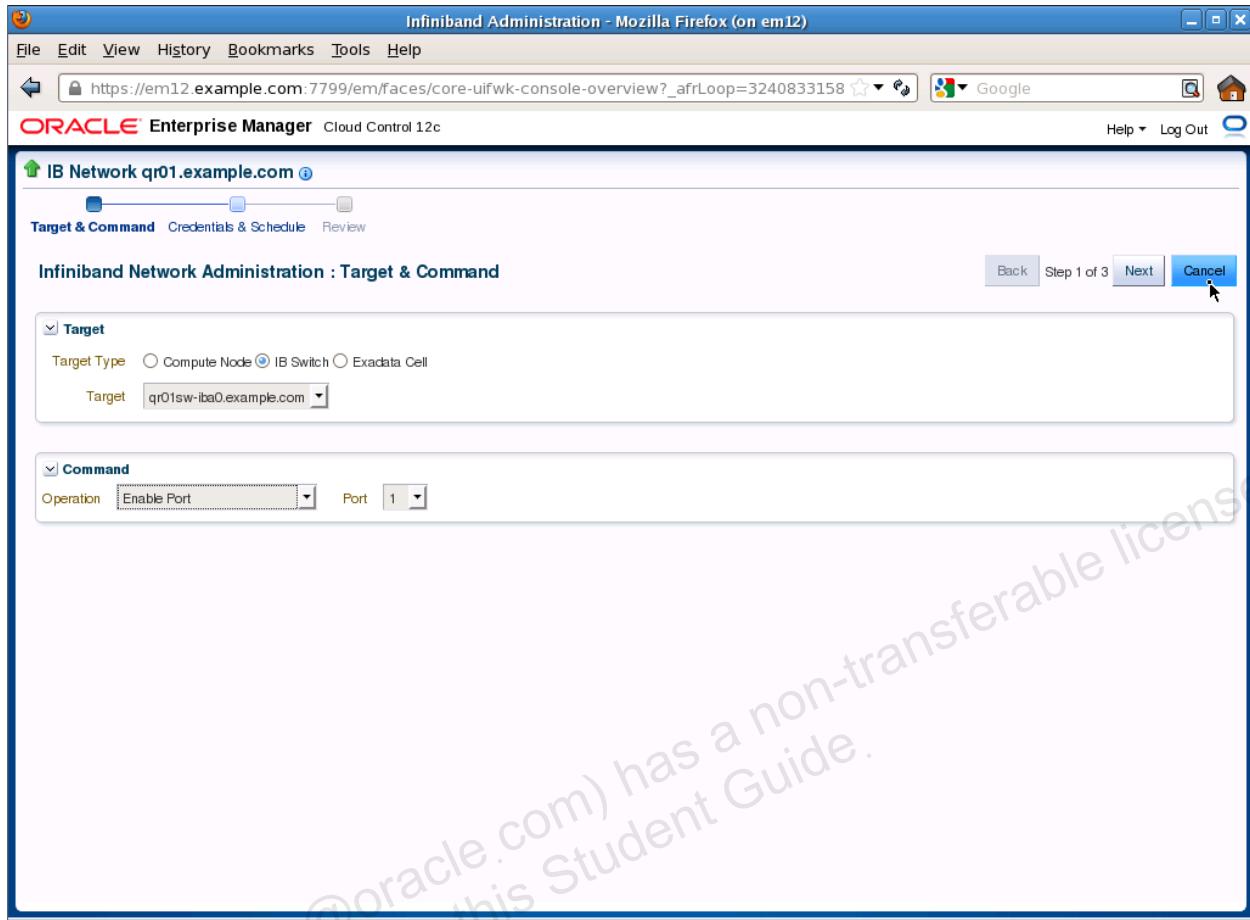
19. Select IB Switch as the Target Type.



20. Click the Operation drop-down list and examine the list of available options. This gives you an idea of the administration tasks that you can perform on InfiniBand switch ports by using the InfiniBand Network Administration Wizard.



21. Click Cancel to exit the Infiniband Network Administration Wizard.



22. Select the Infiniband Network > Configuration > Last Collected menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface for monitoring an Infiniband network. The main window displays throughput statistics and port details for two nodes: qr01sw-iba0.example.com and qr01sw-ibb0.example.com. The 'Configuration' menu is open, and the 'Last Collected' option is highlighted with a cursor. The URL in the browser bar is https://em12.example.com:7799/em/faces/core-infiniband-home?target=IB Network qr01.example.com.

**Throughput**

Link Type	Average (Mbps)	Lowest (Mbps)	Highest (Mbps)
Switch to Node Link	0.0	0.0	C
Switch to Switch Link	0.0	0.0	C

**Port Details**

Port Number	20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1
qr01sw-iba0.example.com	20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1
qr01sw-ibb0.example.com	19	21	23	25	27	29	36	34	32	13	15	17	12	10	8	6	4	2

Port Number	20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1
qr01cel03.example.com	19	21	23	25	27	29	36	34	32	13	15	17	12	10	8	6	4	2

**Nodes**

Refresh	Name	Status	Type	HCA	IP Address	Port Details
qr01cel03.example.com	Up	Oracle Exadata Storage Server HCA-1	192.168.1.105	1 2		

23. You should now see the configuration browser page for the InfiniBand network.

The screenshot shows a Mozilla Firefox browser window displaying the Oracle Enterprise Manager Configuration Browser. The URL is <https://em12.example.com:7799/em/faces/core-infiniband-home?target=IB Network qr01.example.com>. The page title is "Configuration Browser: IB Network qr01.example.com (Oracle Infiniband Network) - Oracle Enterprise Manager - Mozilla Firefox (on em12)".

The main content area displays the "Latest Configuration" for the "IB Network qr01.example.com". On the left, there is a tree view showing the network structure:

- IB Network qr01.example.com
  - Infiniband Network Connections
  - Members
    - Oracle Infiniband Switch Members
      - qr01sw-lba0.example.com
      - qr01sw-lbb0.example.com

On the right, the "Configuration Properties" tab is selected, showing the following properties:

Property Name	Property Value
Infiniband Network ID	qr01.example.com
Operating System	Linux
Platform	x86_64

Below the table, it says "Total Number of Rows 3".

24. Click Infiniband Network Connections in the hierarchical list on the left of the page. This will display a table, which contains information about the InfiniBand network connections. This is the information that supports the port diagrams on the IB Network home page. Take a moment to examine the InfiniBand Network Connections along with any of the other available configuration information.

The screenshot shows the Oracle Enterprise Manager interface for an Infiniband network. On the left, a navigation tree under 'IB Network qr01.example.com' shows 'Infiniband Network Connections' selected. The main panel displays a table titled 'Infiniband Network Connections' with the following columns: Switch GUID, Port Number, GUID on the other end of the link, Node/Port. Node GUID if the other port is a Switch, Port GUID otherwise, and Switch/Cell/Compute Node. Type of the entity to which this port is connected. The table lists 26 rows of data, with the last row indicating a total of 26 rows.

Switch GUID	Port Number	GUID on the other end of the link	Node/Port. Node GUID if the other port is a Switch, Port GUID otherwise.	Port number of the other port	Switch/Cell/Compute Node. Type of the entity to which this port is connected.
0x002128469324a0a 0				null	
0x002128469324a0a 1		0x0021280001a16cd Port		2	Cell
0x002128469324a0a 2		0x0021280001a16d0 Port		2	Cell
0x002128469324a0a 4		0x0021280001a1570 Port		2	Cell
0x002128469324a0a 7		0x0021280001a13b2 Port		2	Compute Node
0x002128469324a0a 10		0x0021280001a12c8 Port		2	Compute Node
0x002128469324a0a 13		0x0021286ccc4ca0a Switch		14	Switch
0x002128469324a0a 14		0x0021286ccc4ca0a Switch		13	Switch
0x002128469324a0a 15		0x0021286ccc4ca0a Switch		16	Switch
0x002128469324a0a 16		0x0021286ccc4ca0a Switch		15	Switch
Total Number of Rows 26					

25. Select the Infiniband Network > Home menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar has a tree view with 'Infiniband Network' selected. Under 'Infiniband Network', 'Home' is highlighted. The main content area is titled 'Infiniband Network Connections'. It includes a search bar with 'Switch GUID' and buttons for 'Search', 'Reset', and '+ Add'. Below the search bar is a table titled 'Configuration Properties' with the following columns: Switch GUID, Port Number, GUID on the other end of the link, Node/Port. Node GUID if the other port is a Switch, Port GUID otherwise, Port number of the other port, and Switch h/Cell/Compute Node. Type of the entity to which this port is connected. The table contains 26 rows of data. A watermark 'Hong Lin (hong.lin@oracle.com) - use this stamp on transferred license to' is diagonally across the page.

Switch GUID	Port Number	GUID on the other end of the link	Node/Port. Node GUID if the other port is a Switch, Port GUID otherwise.	Port number of the other port	Switch h/Cell/Compute Node. Type of the entity to which this port is connected.
0x002128469324a0a 0				null	
0x002128469324a0a 1		0x0021280001a16cd Port	2		Cell
0x002128469324a0a 2		0x0021280001a16d0 Port	2		Cell
0x002128469324a0a 4		0x0021280001a1570 Port	2		Cell
0x002128469324a0a 7		0x0021280001a13b2 Port	2		Compute Node
0x002128469324a0a 10		0x0021280001a12c8 Port	2		Compute Node
0x002128469324a0a 13		0x0021286ccc4ca0a Switch	14		Switch h
0x002128469324a0a 14		0x0021286ccc4ca0a Switch	13		Switch h
0x002128469324a0a 15		0x0021286ccc4ca0a Switch	16		Switch h
0x002128469324a0a 16		0x0021286ccc4ca0a Switch	15		Switch h
Total Number of Rows 26					

26. As you have already seen, the IB Network home provides an overview of the Database Machine InfiniBand network. In addition to this, each InfiniBand switch also has a home page associated with it. Click the link associated with the InfiniBand switch `qr01sw-iba0.example.com`.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface for managing an InfiniBand network. The main title bar reads "Infiniband Home - Mozilla Firefox (on em12)". The URL in the address bar is `https://em12.example.com:7799/em/faces/core-infiniband-home?target=IB Network qr01.example.com&type=oracle_ibnetwork&_afrLoop=325867988127941#`. The top navigation bar includes File, Edit, View, History, Bookmarks, Tools, Help, Setup, Help, SYSMAN, and Log Out.

The main content area is titled "IB Network qr01.example.com". It features several sections:

- Overview:** Shows the status of the subnet manager on the switch (`qr01sw-iba0.example.com`), which is up. It also lists the number of switches (2), compute nodes (2), and cells (3).
- Throughput:** A table titled "Total Network 0 Mbps" showing link types, average, lowest, and highest Mbps for Switch to Node Link and Switch to Switch Link.
- Switches:** A table listing two switches:
 

Refresh	Name	Status	Type	Port Details																																				
	<a href="#">qr01sw-iba0.example.com</a>		Normal	<table border="1"> <tr><td>20</td><td>22</td><td>24</td><td>26</td><td>28</td><td>30</td><td>35</td><td>33</td><td>31</td><td>14</td><td>16</td><td>18</td><td>11</td><td>9</td><td>7</td><td>5</td><td>3</td><td>1</td></tr> <tr><td>19</td><td>21</td><td>23</td><td>25</td><td>27</td><td>29</td><td>36</td><td>34</td><td>32</td><td>13</td><td>15</td><td>17</td><td>12</td><td>10</td><td>8</td><td>6</td><td>4</td><td>2</td></tr> </table>	20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1	19	21	23	25	27	29	36	34	32	13	15	17	12	10	8	6	4	2
20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1																							
19	21	23	25	27	29	36	34	32	13	15	17	12	10	8	6	4	2																							
	<a href="#">qr01sw-ibb0.example.com</a>		Normal	<table border="1"> <tr><td>20</td><td>22</td><td>24</td><td>26</td><td>28</td><td>30</td><td>35</td><td>33</td><td>31</td><td>14</td><td>16</td><td>18</td><td>11</td><td>9</td><td>7</td><td>5</td><td>3</td><td>1</td></tr> <tr><td>19</td><td>21</td><td>23</td><td>25</td><td>27</td><td>29</td><td>36</td><td>34</td><td>32</td><td>13</td><td>15</td><td>17</td><td>12</td><td>10</td><td>8</td><td>6</td><td>4</td><td>2</td></tr> </table>	20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1	19	21	23	25	27	29	36	34	32	13	15	17	12	10	8	6	4	2
20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1																							
19	21	23	25	27	29	36	34	32	13	15	17	12	10	8	6	4	2																							

Legend: Normal Ports (Grey), Ports with Errors (Red), Available Ports (White)

- Nodes:** A table listing one node:
 

Refresh	Name	Status	Type	HCA	IP Address	Port Details		
	<a href="#">qr01cel03.example.com</a>		Oracle Exadata Storage Server HCA-1		192.168.1.105	<table border="1"> <tr><td>1</td><td>2</td></tr> </table>	1	2
1	2							

27. The InfiniBand switch home page for `qr01sw-iba0.example.com` appears. Like the IB Network home page, this page contains overview and throughput information, along with a port diagram for the switch. Below the port diagram, there is an area that lists port details, which administrators can use to quickly find information about a specific port.

The screenshot shows the Oracle Enterprise Manager interface for an InfiniBand switch. The top navigation bar includes File, Edit, View, History, Bookmarks, Tools, Help, Setup, Help, SYSMAN, and Log Out. The URL in the address bar is `https://em12.example.com:7799/em/faces/core-infiniband-home?target=IB Network qr01.example.com`. The main content area is titled "Infiniband Switch Home - Mozilla Firefox (on em12)".

**Overview:**

- Status: Up
- Subnet Manager: Yes
- Switch Type: Normal
- Version: 1.3.3-2
- Number of connected ports: 12
- Number of ports with errors: 0
- Front temperature: 39

**Throughput:**

Link Type	Average (Mbps)	Lowest (Mbps)	Highest (Mbps)
Switch to Node Link	0.0	0.0	0.0
Switch to Switch Link	0.0	0.0	0.0

**Port Overview:**

A grid showing port numbers 20 through 1. Port 10 is highlighted. A tooltip for Port 10 indicates it is connected to Peer Port 1 of Host qr01db02.example.com via Port Connector 13B.

20	22	24	26	28	30	35	33	31	14	16	18	11	9	7	5	3	1
19	21	23	25	27	29	36	34	32	13	15	17	12	10	8	6	4	2

**Port Details:**

Port Number	Peer Target Name	Peer Type	Peer Port	Link Degraded	Active V
1	qr01cel02.example.com	Oracle Exadata Storage Server	1	No	
2	qr01cel01.example.com	Oracle Exadata Storage Server	1	No	
3	N/A	N/A	N/A	No	
4	qr01cel03.example.com	Oracle Exadata Storage Server	1	No	
5	N/A	N/A	N/A	No	
6	N/A	N/A	N/A	No	
7	qr01db01.example.com	Host	1	No	
8	N/A	N/A	N/A	No	
9	N/A	N/A	N/A	No	
10	qr01db02.example.com	Host	1	No	

**Port 10 Details:**

Port 10 is connected to Peer Port 1 of Host qr01db02.example.com via Port Connector 13B. The port has 0 errors and 0 Mbps throughput. The state is Normal.

Symbol Errors	Received Packets with Errors	Errors
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

28. Select the Infiniband Switch > Monitoring > All Metrics menu command.

Port Number	Peer Target Name	Peer Type	Peer Port	Link Degraded	Active Width (1X or 4X)	Enabled Width (1X or 4X)	Active Speed (Gbps)	Enabled Speed (Gbps)	Symbol Errors	Received Packets with Errors	Other Errors
1	qr01cel02.example.com	Oracle Exadata Storage Server	1	No	4	4	10	10	0	0	0
2	qr01cel01.example.com	Oracle Exadata Storage Server	1	No	4	4	10	10	0	0	0
3	N/A	N/A	N/A	No	4	4	2.5	10	0	0	0
4	qr01cel03.example.com	Oracle Exadata Storage Server	1	No	4	4	10	10	0	0	0
5	N/A	N/A	N/A	No	4	4	2.5	10	0	0	0
6	N/A	N/A	N/A	No	4	4	2.5	10	0	0	0
7	qr01db01.example.com	Host	1	No	4	4	10	10	0	0	0
8	N/A	N/A	N/A	No	4	4	2.5	10	0	0	0
9	N/A	N/A	N/A	No	4	4	2.5	10	0	0	0
10	qr01db02.example.com	Host	1	No	4	4	10	10	0	0	0

29. The All Metrics page provides an interface for administrators to examine the metrics associated with a monitoring target. For InfiniBand switches, this page provides access to numerous metrics and sensors associated with each switch. The metrics are organized into groups, which are displayed in a hierarchical list on the left side of the page.

The screenshot shows the Oracle Enterprise Manager interface for monitoring an InfiniBand switch. The title bar reads "All Metrics: qr01sw-iba0.example.com (Oracle Infiniband Switch) - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area is titled "All Metrics". On the left, there is a navigation tree under "qr01sw-iba0.example.com" with the following items:

- Aggregate Sensors
- Fan Speed Sensor Alerts
- Response
- Switch Performance Summary
- Switch Port Configuration Monitor
- Switch Port Errors
- Switch Port Performance
- Switch Port State
- Switch Port State (For Alerts)
- Switch State Summary
- Switch Temperatures
- Temperature Sensor Alerts
- Voltage Sensor Alerts
- Other collected items

On the right, there are two sections:

- Open Metric Events:** A table with columns "Metric Name", "Severity", "Message", and "Last Collected Timestamp". It displays the message "No data to display.".
- Top 5 alerting metrics (Last 7 days):** A table with columns "Metric Name", "Critical", and "Warning". It displays the message "No data to display.".

A large watermark reading "Hong Lin (hong.lin@oracle.com) has a non-transferable license to use this Student Guide." is diagonally across the page.

30. Click the Switch Port Performance metric group. Examine the available switch port performance metrics. Remember that administrators can set thresholds for these metrics, so that they will be alerted when certain conditions exist.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar shows a tree view of metrics under 'qr01sw-iba0.example.com > All Metrics'. The 'Switch Port Performance' node is selected, highlighted with a blue border. The main content area displays a table titled 'Switch Port Performance' with the following columns: Port number, Link Throughput: bytes transmitted and received per sec (KBPS), Number of bytes received per sec (KBPS), Number of bytes transmitted per sec (KBPS), Number of packets received per sec, and Number of packets transmitted per sec. The table contains 30 rows, each corresponding to a port number from 33 down to 20. All values in the table are currently 0.

Port number	Link Throughput: bytes transmitted and received per sec (KBPS)	Number of bytes received per sec (KBPS)	Number of bytes transmitted per sec (KBPS)	Number of packets received per sec	Number of packets transmitted per sec
33	0	0	0	0	0
32	0	0	0	0	0
21	0	0	0	0	0
7	0	0	0	0	0
26	0	0	0	0	0
17	0	0	0	0	0
2	0	0	0	0	0
1	0	0	0	0	0
18	0	0	0	0	0
30	0	0	0	0	0
16	0	0	0	0	0
27	0	0	0	0	0
25	0	0	0	0	0
28	0	0	0	0	0
20	0	0	0	0	0

31. Click the Switch Temperatures metric group. The temperature readings are provided by various sensors contained inside the switch.

The screenshot shows the Oracle Enterprise Manager interface for monitoring an InfiniBand switch. The left sidebar lists various metrics under 'All Metrics'. The 'Switch Temperatures' group is selected, indicated by a blue border around its name. The main content area displays the 'Switch Temperatures' configuration, including a collection schedule of 'Every 5 Minutes', an upload interval of 'Every Collection', and a last upload time of 'Jul 22, 2013 9:15:43 PM EDT'. A table lists four temperature metrics with their current values:

Metric	Thresholds	Real Time Value
Back of switch temperature	Not Set	38
Front of switch temperature	Not Set	39
Switch I4 chip temperature	Not Set	50
Switch Service Processor temperature	Not Set	53

A checked checkbox at the bottom indicates that the data in the table is collected in real time.

32. Select the Infiniband Switch > Configuration > Last Collected menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The URL in the address bar is <https://em12.example.com:7799/em/faces/core-infiniband-home?target=IB Network qr01.example.com>. The page title is "All Metrics: qr01sw-iba0.example.com (Oracle Infiniband Switch) - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main navigation bar includes File, Edit, View, History, Bookmarks, Tools, and Help. The top right has links for Setup, Help, SYSMAN, and Log Out. The left sidebar under "Infiniband Switch" has a tree view with Home, Monitoring, Control, Job Activity, Information Publisher Reports, Configuration (which is expanded), Compliance, Target Setup, Target Information, and several port-related sections like Port Configuration Monitor, Port Errors, Port Performance, Port State, Port State (For Alerts), State Summary, and Switch Temperatures. The "Switch Temperatures" section is currently selected. A context menu is open over this section, with "Last Collected" highlighted. The main content area displays "Switch Temperatures" with a collection schedule of "Every 5 Minutes" and a "Modify" button. It shows a table with four rows of temperature data:

Sensor Type	Thresholds	Real Time Value
Temperature 1	Not Set	38
Temperature 2	Not Set	39
Temperature 3	Not Set	50
Processor temperature	Not Set	53

A note below the table states: "Temperature data is collected in real time."

33. You should now see the configuration browser page for `qr01sw-iba0.example.com`. The configuration browser allows administrators to examine the configuration settings associated with a management target. It is similar to the All Metrics page that you just examined. The main difference between metrics and configuration settings is that metric values are expected to constantly vary over time while configuration settings should be more stable.

The screenshot shows a Mozilla Firefox browser window displaying the Oracle Enterprise Manager Configuration Browser. The URL in the address bar is `https://em12.example.com:7799/em/faces/core-infiniband-home?target=IB Network qr01.example.com`. The page title is "Configuration Browser: qr01sw-iba0.example.com (Oracle Infiniband Switch) - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The left sidebar shows a tree view with nodes: qr01sw-iba0.example.com, Infiniband Switch Version, Infiniband Switch Configuration Summary, and Infiniband HCA Port Configuration. The main content area is titled "Latest Configuration" for "qr01sw-iba0.example.com". It displays a table of configuration properties:

Property Name	Property Value
Operating System	Linux
Platform	x86_64
Target Version	1.3.3.2.0
Infiniband GUID	0021286ccc4ca0a0
Host Name	qr01sw-iba0.example.com
Number of Ports	36
Vendor ID	0x2c9
Device ID	0xb036
Description	SUN DCS 36P QDR

At the bottom right of the table, it says "Total Number of Rows 9".

34. Click Infiniband Switch Version in the hierarchical list on the left side of the page and examine the available configuration attributes.

The screenshot shows the Oracle Enterprise Manager Configuration Browser interface. The title bar reads "Configuration Browser: qr01sw-iba0.example.com (Oracle Infiniband Switch) - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The left sidebar shows a tree view with "qr01sw-iba0.example.com" expanded, and "Infiniband Switch Version" selected, indicated by a blue border. The main content area is titled "Infiniband Switch Version Actions ▾". It displays "Configuration Properties" and a table of configuration details. The table has two columns: "Name" and "Value". The data is as follows:

Name	Value
Model Name	SUN DCS 36p
Model Version	1.3.3-2
Serial Number	'NCD570116'
Hardware Revision	0x0005
Firmware Revision	0x0000

At the bottom right of the main content area, it says "Total Number of Rows 5". The status bar at the bottom right shows "Page Refreshed Jul 22, 2013 9:19:36 PM EDT".

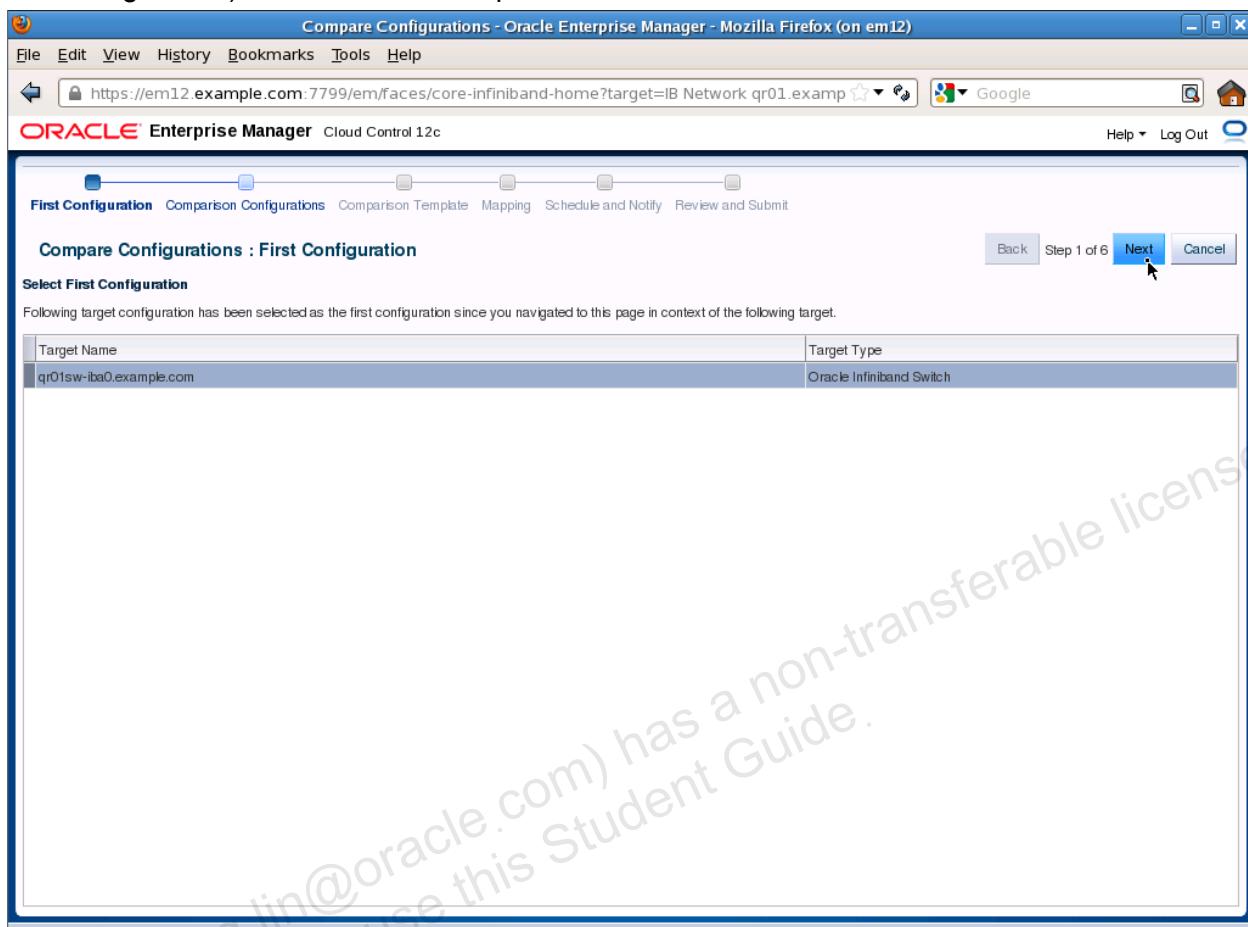
35. In a previous practice, you compared the configuration of your Exadata Storage Servers to ensure consistency across them. You can perform a similar check across the InfiniBand switches. To commence this process, select the Infiniband Switch > Configuration > Compare menu command.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The left sidebar is titled 'Infiniband Switch' and contains the following navigation items: Home, Monitoring, Control, Job Activity, Information Publisher Reports, Configuration (which is selected and highlighted in blue), Compliance, Target Setup, and Target Information. The main content area is titled 'Infiniband Switch Version' and displays 'Configuration Properties'. It shows a table with the following data:

Last Collected	Value
Collected	Jul 22, 2013 12:36:20 PM
Model	SUN DCS 36p
Revision	1.3.3-2
Serial Number	'NCD570116'
Software Revision	0x0005
Hardware Revision	0x0000

A context menu is open over the 'Configuration Properties' section, with the 'Compare...' option highlighted. Other options in the menu include 'Export' and 'Detach'. The status bar at the bottom right indicates 'Total Number of Rows 5'.

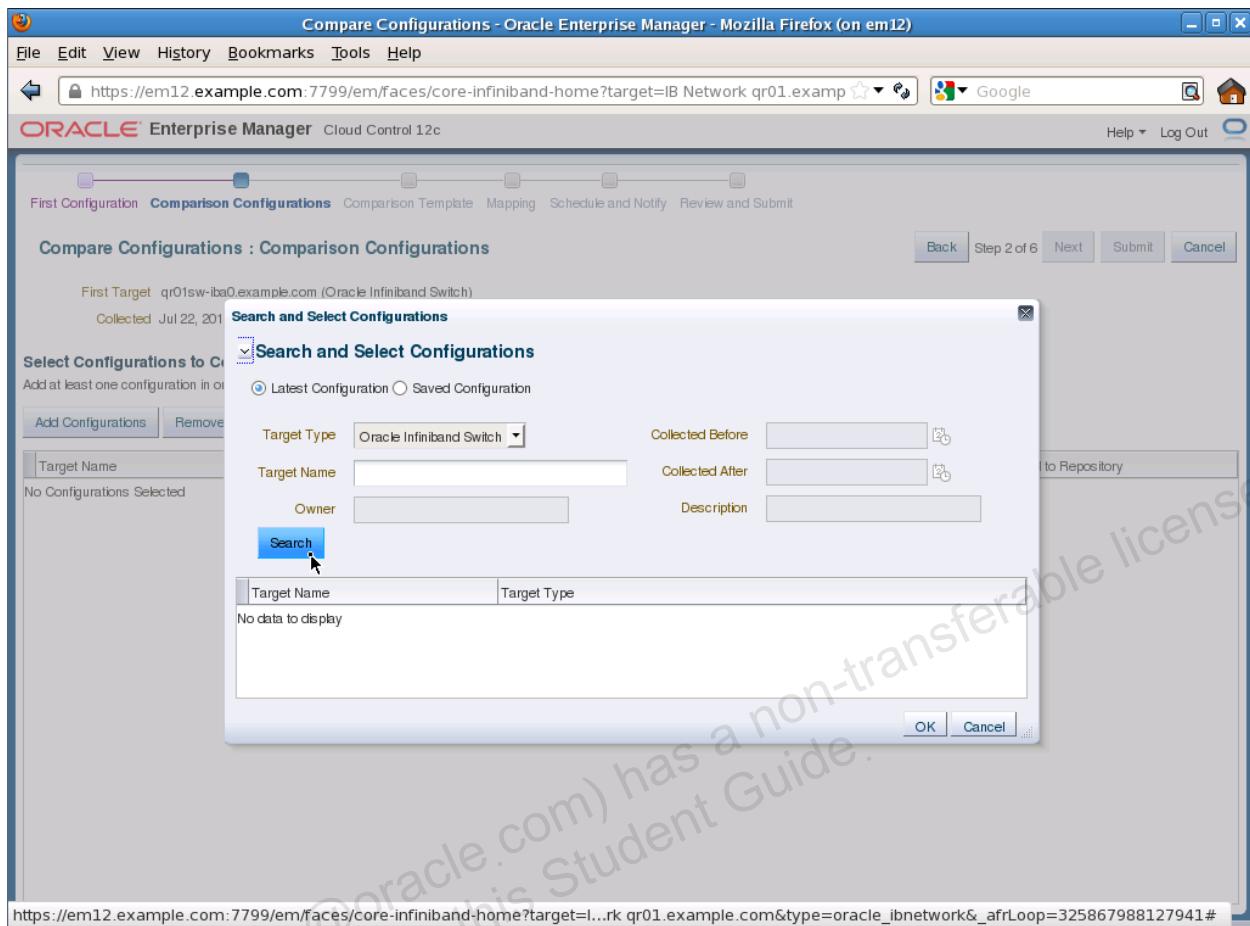
36. Confirm that `qr01sw-iba0.example.com` is selected as the comparison baseline (first configuration). Then click Next to proceed.



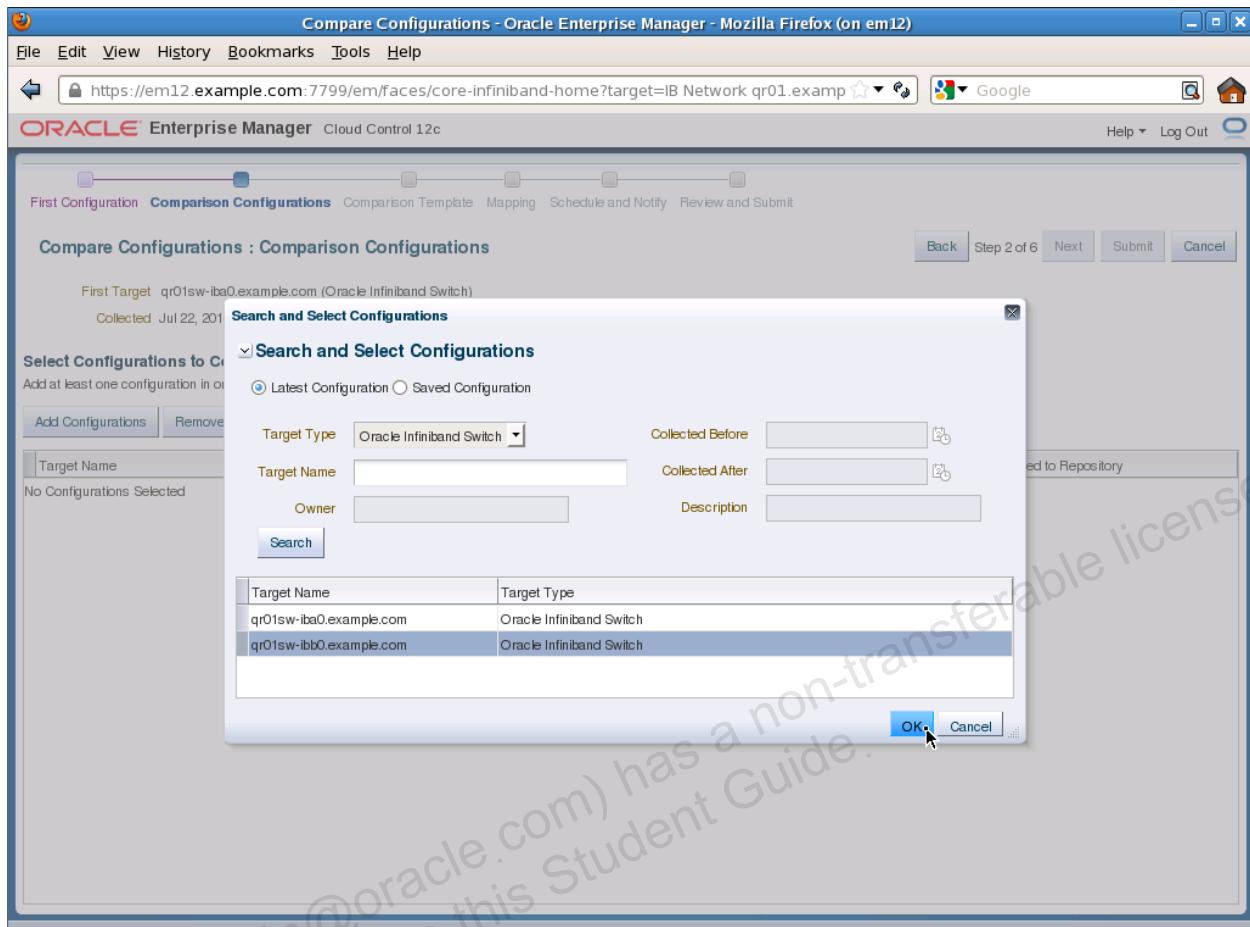
37. Click Add Configurations.

The screenshot shows the 'Compare Configurations' interface in Oracle Enterprise Manager. The title bar reads 'Compare Configurations - Oracle Enterprise Manager - Mozilla Firefox (on em12)'. The URL in the address bar is <https://em12.example.com:7799/em/faces/core-infiniband-home?target=IB Network qr01.example.com>. The main content area is titled 'Compare Configurations : Comparison Configurations'. It displays the 'First Configuration' (qr01sw-iba0.example.com, Oracle Infiniband Switch) and the 'Comparison Configurations' tab is selected. Below this, it shows the 'First Target' (qr01sw-iba0.example.com) and the collection date ('Collected Jul 22, 2013 12:36:20 PM (Latest Configuration)'). A section titled 'Select Configurations to Compare with the First' instructs the user to add at least one configuration. A table header is shown with columns: Target Name, Target Type, Collected, Owner, and Saved to Repository. The table body displays the message 'No Configurations Selected'. At the bottom right of the page, there are buttons for Back, Step 2 of 6, Next, Submit, and Cancel.

38. Click Search.



39. Select qr01sw-ibb0.example.com and click OK.



40. Confirm that `qr01sw-ibb0.example.com` is selected as the comparison configuration and click Next to proceed.

The screenshot shows the Oracle Enterprise Manager interface for comparing configurations. The title bar reads "Compare Configurations - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main navigation bar includes File, Edit, View, History, Bookmarks, Tools, and Help. Below the navigation is a toolbar with icons for back, forward, search, and other functions. The main content area has a progress bar at the top with steps: First Configuration, Comparison Configurations, Comparison Template, Mapping, Schedule and Notify, and Review and Submit. The "Comparison Configurations" step is currently active. The sub-page title is "Compare Configurations : Comparison Configurations". It displays the "First Target" as `qr01sw-ibb0.example.com (Oracle Infiniband Switch)`, which was "Collected Jul 22, 2013 12:36:20 PM (Latest Configuration)". Below this, there's a section titled "Select Configurations to Compare with the First" with the instruction "Add at least one configuration in order to move to the next step." Two buttons are present: "Add Configurations" and "Remove". A table lists the configuration details:

Target Name	Target Type	Collected	Owner	Saved to Repository
qr01sw-ibb0.example.com	Oracle Infiniband Switch	Jul 22, 2013 12:46:07 PM		

At the bottom right of the main content area, there are buttons for Back, Step 2 of 6, Next, Submit, and Cancel. The "Next" button is highlighted with a blue background and white text.

41. The comparison template defines how the comparison is performed. In the default comparison template for InfiniBand switches, serial number differences are ignored, which makes sense because the serial number should be unique for every switch.

The screenshot shows the Oracle Enterprise Manager Cloud Control 12c interface. The title bar reads "Compare Configurations - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main content area is titled "Compare Configurations : Comparison Template". A sub-header says "Target Type Oracle Infiniband Switch". Below this, a message says "Select the comparison template to be used for this comparison." A dropdown menu shows "Comparison Template Default Infiniband Switch". A note says "Template Owner SYSMAN".

The "Template Settings" section contains a table:

	Exclude from Comparison
> Infiniband Switch	<input type="checkbox"/>
> Infiniband Switch	<input type="checkbox"/>
> Infiniband HCA P	<input type="checkbox"/>
> Target Properties	<input type="checkbox"/>

The "Property Settings" section has three tabs: "Property Settings", "Rules for Matching Instances", and "Rules for Ignoring Instances". The "Property Settings" tab shows a table:

Property Name	Ignore Differences	Notify on Differences	Value Constraints
Firmware Revision	<input type="checkbox"/>	<input type="checkbox"/>	
Hardware Revision	<input type="checkbox"/>	<input type="checkbox"/>	
Model Name	<input type="checkbox"/>	<input type="checkbox"/>	
Model Version	<input type="checkbox"/>	<input type="checkbox"/>	
Serial Number	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

At the bottom of the page, there are "Back", "Step 3 of 6", "Next", "Submit", and "Cancel" buttons.

42. Click InfiniBand Switch Configuration Summary in the Template Settings area on the left side of the page.

The screenshot shows the 'Compare Configurations - Oracle Enterprise Manager - Mozilla Firefox (on em12)' window. The title bar includes the URL <https://em12.example.com:7799/em/faces/core-infiniband-home?target=IB Network qr01.example.com>. The main content area is titled 'Compare Configurations : Comparison Template'. It displays a 'Template Settings' table with several rows. One row, 'Infiniband Switch Configuration Summary', is highlighted with a yellow background and has a red arrow pointing to it from the left. The table has four columns: 'Property Name', 'Ignore Differences', 'Notify on Differences', and 'Value Constraints'. The 'Ignore Differences' column contains checkboxes, and the 'Notify on Differences' column contains checkboxes. The 'Value Constraints' column is empty. The 'Property Name' column lists hardware revision, model name, model version, and serial number. The 'Ignore Differences' column has checkboxes for hardware revision, model name, and model version, but not for serial number. The 'Notify on Differences' column has checkboxes for hardware revision, model name, and model version, but not for serial number. The 'Value Constraints' column is empty.

43. Here you can see that the default comparison template ignores a number of other differences. Depending on the goal of your comparison, this may make sense, or you may choose to modify the template and report the differences for a specific configuration property.

Property Settings				
		Rules for Matching Instances		Rules for Ignoring Instances
	Property Name	Ignore Differences	Notify on Differences	Value Constraints
	Is subnet manager switch or not?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Number of ports connected with a cable	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Spine or Normal switch. A spine switch is a switch th	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

44. Take a moment to examine the rest of the comparison template. When you are ready, click Submit.

The screenshot shows the 'Compare Configurations - Oracle Enterprise Manager - Mozilla Firefox' window. The title bar includes the URL 'https://em12.example.com:7799/em/faces/core-infiniband-home?target=IB Network qr01.example.com'. The main content area is titled 'Compare Configurations : Comparison Template'. It displays a 'Template Settings' table with several rows, some of which are checked for exclusion from comparison. To the right of this table is a 'Property Settings' section containing three rows of rules for matching instances. The first row is 'Is subnet manager switch or not?' with checkboxes for 'Ignore Differences' and 'Notify on Differences'. The second row is 'Number of ports connected with a cable' with similar checkboxes. The third row is 'Spine or Normal switch. A spine switch is a switch th' with similar checkboxes. At the top right of the main content area, there are buttons for 'Back', 'Step 3 of 6', 'Next', 'Submit' (which is highlighted in blue), and 'Cancel'. The status bar at the bottom of the browser window shows 'Hong Lin (hong.lin@oracle.com) has a non-transferable license to use this Student Guide.'

45. Wait while the comparison is in progress.

The screenshot shows the Oracle Enterprise Manager interface for comparing configurations. The title bar reads "Compare Configurations - Oracle Enterprise Manager - Mozilla Firefox (on em12)". The main menu includes File, Edit, View, History, Bookmarks, Tools, and Help. The address bar shows the URL <https://em12.example.com:7799/em/faces/core-infiniband-home?target=IB Network qr01.example>. The Oracle logo and "Enterprise Manager Cloud Control 12c" are visible. A navigation bar at the top has steps: First Configuration, Comparison Configurations, Comparison Template (highlighted in blue), Mapping, Schedule and Notify, Review and Submit. Below the navigation is a toolbar with Back, Step 3 of 6, Next, Submit, and Cancel buttons. A "Template Settings" table on the left lists items like Infiniband Switch, Infiniband HCA P, and Target Properties, each with an "Exclude from Comparison" checkbox. A "Properties" panel is partially visible. A central "Processing" dialog box titled "Comparison - In Progress." contains a message: "Comparison cannot be cancelled and can take some time to complete. You can click close to exit this progress dialog and this comparison can be monitored on the comparison job activity page." It also features a "Close" button. The background shows a table for "Value Instances" with columns "Notify on Differences" and "Value Constraints".

46. When the comparison completes, the Compare Result page appears. Examine the comparison result. Verify that the displayed configuration attributes are the same for both switches.

Compare Result: Same - Mozilla Firefox (on em12)

File Edit View History Bookmarks Tools Help

https://em12.example.com:7799/em/faces/core-ecm-compare-result?jobExecId=E224ACF21F8C

ORACLE Enterprise Manager Cloud Control 12c

Enterprise Targets Favorites History

Search Target Name

Compare Result

Result for job CONFIGURATION COMPARISON JOB TUE JUL 23 2013 01:25:59 UTC

Comparison Job Activity >

Comparison Details

Template Default Infiniband Switch (Modified : Jul 9, 2013 5:02:16 AM)

First Configuration qr01sw-iba0.example.com (Oracle Infiniband Switch) Collected Jul 22, 2013 12:36:20 PM (Latest Configuration)

Second Configuration qr01sw-ibb0.example.com (Oracle Infiniband Switch) Collected Jul 22, 2013 12:46:07 PM (Latest Configuration)

Job Details

Show Ignored

Infiniband Switch Version

Result	Configuration Property Name	First	Second
Model Name		SUN DCS 36p	SUN DCS 36p
Model Version		1.3.3-2	1.3.3-2
Hardware Revision		0x0005	0x0005
Firmware Revision		0x0000	0x0000

47. Click Target Properties. Again, verify that the displayed configuration attributes are the same for both switches.

The screenshot shows a Firefox browser window titled "Compare Result: Same - Mozilla Firefox (on em12)". The address bar shows the URL: <https://em12.example.com:7799/em/faces/core-ecm-compare-result?jobExecId=E224ACF21F80>. The page header includes "ORACLE Enterprise Manager Cloud Control 12c", "Setup", "Help", "SYSMAN", and "Log Out". The main content area is titled "Compare Result" and displays the "Result for job CONFIGURATION COMPARISON JOB TUE JUL 23 2013 01:25:59 UTC". It shows a comparison between two configurations:

Result	Property Name	Property Value	Second Configuration
First Configuration	Description	SUN DCS 36P QDR	SUN DCS 36P QDR
	Device ID	0xbd36	0xbd36
	Number of Ports	36	36
	Vendor ID	0x2c9	0x2c9
	Operating System	Linux	Linux
	Platform	x86_64	x86_64
	Target Version	1.3.3.2.0	1.3.3.2.0

48. Select the option to show ignored comparisons. Now the results include additional properties (Host Name and Infiniband GUID) that do not match. However, because these properties were ignored, the differences do not affect the result of the comparison.

Result	Property Name	Property Value
First Configuration	Second Configuration	
	Host Name	qr01sw-iba0.example.com
	Infiniband GUID	0021286ccc4ca0a0
	Description	SUN DCS 36P QDR
	Device ID	0xb0d36
	Number of Ports	36
	Vendor ID	0x2c9
	Operating System	Linux
	Platform	x86_64
	Target Version	1.3.3.2.0

Congratulations! You have examined the Exadata InfiniBand monitoring and administration capabilities provided by Enterprise Manager Cloud Control 12c.

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## **Practices for Lesson 18: Monitoring Other Exadata Database Machine Components**

**Chapter 18**

## Practices for Lesson 18

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### Practices Overview

There is no practice for Lesson 18.

## **Practices for Lesson 19: Other Useful Monitoring Tools**

**Chapter 19**

## Practices for Lesson 19

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### Practices Overview

There is no practice for Lesson 19.

## **Practices for Lesson 20: Backup and Recovery**

**Chapter 20**

## Practices for Lesson 20

---

### Practices Overview

In these practices, you will examine the backup and recovery optimizations that are enabled when Oracle Recovery Manager (RMAN) is used in conjunction with Exadata storage.

## Practice 20-1: Environment Reconfiguration

---

### Overview

In this practice, you will reconfigure your laboratory environment in preparation for the following practices.

### Tasks

- Establish a terminal connection to your laboratory environment. Do not connect to any of the Database Machine servers.
- Examine the virtual machine (VM) instances currently executing in your laboratory environment.

```
$ sudo xm list
Name                                     ID   Mem  VCPUs  State
Time (s)
Domain-0                                 0   1024    2      r----- 102663.4
em12                                    6   5401    2      -b----- 26385.4
qr01cel01                               1   1200    1      -b----- 90497.9
qr01cel02                               2   1200    1      r----- 90814.7
qr01cel03                               3   1200    1      -b----- 90989.3
qr01db01                                4   3000    2      -b----- 90322.2
qr01db02                                5   3000    2      -b----- 45634.0
$
```

- Stop the VM instance for the qr01db02 server.

```
$ sudo xm destroy qr01db02
$
```

- Stop the VM instance for the em12 server.

```
$ sudo xm destroy em12
$
```

- Verify that VM instances for qr01db02 and em12 are no longer running.

```
$ sudo xm list
Name                                     ID   Mem  VCPUs  State
Time (s)
Domain-0                                 0   1024    2      r----- 102680.4
qr01cel01                               1   1200    1      -b----- 90584.0
qr01cel02                               2   1200    1      -b----- 90951.9
qr01cel03                               3   1200    1      r----- 91079.8
qr01db01                                4   3000    2      -b----- 90434.1
$
```

- Exit your terminal session.

## Practice 20-2: Backup Optimization

### Overview

In this practice, you will see how Exadata optimizes the read I/O for an RMAN incremental backup.

### Tasks

1. Establish a terminal connection to qr01db01 as the oracle user.
2. Connect to your database with SQL\*Plus. Log in as the database administrator.

```
[oracle@qr01db01 ~] $ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.3.0 Production...

SQL>
```

3. Enable block change tracking in your database and then query V\$BLOCK\_CHANGE\_TRACKING to confirm the setting.

```
SQL> alter database enable block change tracking;

Database altered.

SQL> select status, filename from v$block_change_tracking;

STATUS
-----
FILENAME
-----
ENABLED
+DATA_QR01/dbm/changetracking/ctf.271.821482583

SQL>
```

4. Configure your database into archivelog mode by using the following sequence of commands:

```
SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.

SQL> startup mount
ORACLE instance started.

Total System Global Area  835104768 bytes
Fixed Size                  2232960 bytes
Variable Size                624954752 bytes
Database Buffers            201326592 bytes
Redo Buffers                 6590464 bytes
Database mounted.

SQL> alter database archivelog;

Database altered.

SQL> alter database open;

Database altered.

SQL>
```

5. Establish a second terminal connection to qr01db01 as the oracle user.
6. Inside your second terminal, launch Oracle Recovery Manager (RMAN) and connect to your database as shown below:

```
[oracle@qr01db01 ~] $ rman target /
Recovery Manager: Release 11.2.0.3.0 - Production...
connected to target database: DBM (DBID=1290904261)

RMAN>
```

7. Configure RMAN to use two parallel execution channels as the default setting for backup and recovery commands.

```
RMAN> configure device type disk parallelism 2;

using target database control file instead of recovery catalog
new RMAN configuration parameters:
CONFIGURE DEVICE TYPE DISK PARALLELISM 2 BACKUP TYPE TO
BACKUPSET;
new RMAN configuration parameters are successfully stored

RMAN>
```

8. Execute a level 0 incremental backup of the SH tablespace.

In this practice, you will perform backups on a single-file tablespace. It is not required to perform all backups this way on Database Machine. All the concepts in this practice apply to backups with different scopes, such as full database backups, and so on.

```
RMAN> backup as backupset incremental level 0 tablespace sales;

Starting backup at 23-JUL-13
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=29 instance=dbm1 device type=DISK
allocated channel: ORA_DISK_2
channel ORA_DISK_2: SID=155 instance=dbm1 device type=DISK
channel ORA_DISK_1: starting incremental level 0 datafile backup set
channel ORA_DISK_1: specifying datafile(s) in backup set
input datafile file number=00007
name=+DATA_QR01/dbm/datafile/sales.269.811641709
channel ORA_DISK_1: starting piece 1 at 23-JUL-13
channel ORA_DISK_1: finished piece 1 at 23-JUL-13
piece
handle=+RECO_QR01/dbm/backupset/2013_07_23/nnndn0_tag20130723t005029_0.262.821
494231 tag=TAG20130723T005029 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:03:56
Finished backup at 23-JUL-13

RMAN>
```

9. Use the LIST BACKUP command to view details about the backup operation you just executed. Note the size of the backup and the amount of time required to perform the backup.

```
RMAN> list backup;

List of Backup Sets
=====

BS Key  Type LV Size      Device Type Elapsed Time Completion Time
-----  ---- -  -----   -----
1       Incr 0  1.56G      DISK        00:03:49    23-JUL-13
      BP Key: 4  Status: AVAILABLE  Compressed: NO  Tag: TAG20130723T005029
      Piece Name:
+RECO_QR01/dbm/backupset/2013_07_23/nndn0_tag20130723t005029_0.262.821494231
      List of Datafiles in backup set 4
      File LV Type Ckp SCN      Ckp Time  Name
      ----- -  -----   -----
      7     0  Incr 14108808  23-JUL-13
+DATA_QR01/dbm/datafile/sales.269.811641709

RMAN>
```

10. Leave your RMAN session running and return to your SQL\*Plus terminal. Execute the following query (or execute the SQL script /home/oracle/labs/lab20-02-10.sql) to show a selection of statistics relating to your RMAN session. You should see similar values for physical read total bytes and physical write total bytes because the level 0 incremental backup you executed in step 8 is essentially a full backup of the SALES tablespace.

```
SQL> select a.name, sum(b.value/1024/1024) MB
  2  from v$sysstat a, v$sesstat b, v$session c
  3  where a.statistic# = b.statistic# and
  4  b.sid = c.sid and
  5  upper(c.program) like 'RMAN%' and
  6  (a.name in ('physical read total bytes',
  7  'physical write total bytes',
  8  'cell IO uncompressed bytes')
  9  or a.name like 'cell phy%')
 10 group by a.name;

NAME                                MB
-----
cell physical IO bytes eligible for predicate offload          0
cell physical IO interconnect bytes                         4875.0752
cell physical IO bytes saved during optimized file creation      0
cell physical IO interconnect bytes returned by smart scan      0
physical write total bytes                           1617.81299
cell physical IO bytes saved during optimized RMAN file restore      0
cell physical IO bytes saved by storage index                  0
```

```

cell IO uncompressed bytes 0
physical read total bytes 1654.94922
cell physical IO bytes sent directly to DB node to balance CPU 0

10 rows selected.

SQL>

```

11. Execute the following UPDATE command (or execute the SQL script /home/oracle/labs/lab20-02-11.sql) to modify a small subset of the customer records. Commit the changes once the UPDATE statement completes.

```

SQL> update sales.customers set
  2  cust_credit_limit=0.9*cust_credit_limit
  3  where cust_id < 1000 or
  4  cust_id between 10000 and 11000 or
  5  cust_id between 20000 and 21000;

3001 rows updated.

SQL> commit;

Commit complete.

SQL>

```

12. Back in your RMAN terminal, exit your current RMAN session and launch a fresh one. This will enable you to examine a fresh set of session statistics later in the practice.

```

RMAN> exit

Recovery Manager complete.
[oracle@qr01db01 ~]$ rman target /

Recovery Manager: Release 11.2.0.3.0 - Production...

connected to target database: DBM (DBID=1290904261)

RMAN>

```

13. Execute a level 1 incremental backup of the SALES tablespace.

```

RMAN> backup as backupset incremental level 1 tablespace sales;

Starting backup at 23-JUL-13
using target database control file instead of recovery catalog
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=155 instance=dbm1 device type=DISK
allocated channel: ORA_DISK_2
channel ORA_DISK_2: SID=30 instance=dbm1 device type=DISK
channel ORA_DISK_1: starting incremental level 1 datafile backup set
channel ORA_DISK_1: specifying datafile(s) in backup set

```

```

input datafile file number=00007
name=+DATA_QR01/dbm/datafile/sales.269.811641709
channel ORA_DISK_1: starting piece 1 at 23-JUL-13
channel ORA_DISK_1: finished piece 1 at 23-JUL-13
piece
handle=+RECO_QR01/dbm/backupset/2013_07_23/nnndn1_tag20130723t005847_0.263.821
494731 tag=TAG20130723T005847 comment=NONE
channel ORA_DISK_1: backup set complete, elapsed time: 00:00:07
Finished backup at 23-JUL-13

RMAN>

```

14. As before, use the LIST BACKUP command to view details about the backup operation you just executed. Note the size of the backup and the amount of time required to perform the backup.

```

RMAN> list backup;

List of Backup Sets
=====
-----



BS Key  Type LV Size      Device Type Elapsed Time Completion Time
-----  -----
1       Incr 0   1.56G     DISK      00:03:49    23-JUL-13
      BP Key: 4   Status: AVAILABLE  Compressed: NO  Tag: TAG20130723T005029
      Piece Name:
+RECO_QR01/dbm/backupset/2013_07_23/nnndn0_tag20130723t005029_0.262.821494231
      List of Datafiles in backup set 4
      File LV Type Ckp SCN      Ckp Time   Name
-----  -----
7       0   Incr 14108808  23-JUL-13
+DATA_QR01/dbm/datafile/sales.269.811641709

BS Key  Type LV Size      Device Type Elapsed Time Completion Time
-----  -----
2       Incr 1   1.24M     DISK      00:00:06    23-JUL-13
      BP Key: 5   Status: AVAILABLE  Compressed: NO  Tag: TAG20130723T005847
      Piece Name:
+RECO_QR01/dbm/backupset/2013_07_23/nnndn1_tag20130723t005847_0.263.821494731
      List of Datafiles in backup set 5
      File LV Type Ckp SCN      Ckp Time   Name
-----  -----
7       1   Incr 14109087  23-JUL-13
+DATA_QR01/dbm/datafile/sales.269.811641709

RMAN>

```

15. Leave your RMAN session running and return to your SQL\*Plus terminal. As you did in step 10, execute the following query (or execute the SQL script /home/oracle/labs/lab20-02-10.sql) to show a selection of statistics relating to your current RMAN session.

This time the value for physical read total bytes will be a small fraction of the value you observed in step 10. This is mainly because block change tracking enables RMAN to concentrate its read requests on areas that have changed since the last backup. In addition, you should see that Exadata Smart Scan further optimized the RMAN reads. Compare cell physical IO bytes eligible for predicate offload with cell physical IO interconnect bytes returned by smart scan to determine the effect of Smart Scan on your backup.

```
SQL> select a.name, sum(b.value/1024/1024) MB
  2  from v$sysstat a, v$sesstat b, v$session c
  3  where a.statistic# = b.statistic# and
  4  b.sid = c.sid and
  5  upper(c.program) like 'RMAN%' and
  6  (a.name in ('physical read total bytes',
  7  'physical write total bytes',
  8  'cell IO uncompressed bytes')
  9  or a.name like 'cell phy%')
 10 group by a.name;

NAME                                MB
-----
cell physical IO bytes eligible for predicate offload      9.484375
cell physical IO interconnect bytes                      70.8330078
cell physical IO bytes saved during optimized file creation      0
cell physical IO interconnect bytes returned by smart scan      1.2109375
physical write total bytes                         21.0942383
cell physical IO bytes saved during optimized RMAN file restore      0
cell physical IO bytes saved by storage index                  0
cell IO uncompressed bytes                            0
physical read total bytes                          52.6679688
cell physical IO bytes sent directly to DB node to balance CPU      0

10 rows selected.

SQL>
```

16. Examine V\$BACKUP\_DATAFILE by using the following query (or execute the SQL script /home/oracle/labs/lab20-02-16.sql). The BLOCKS\_SKIPPED\_IN\_CELL value associated with the level 1 incremental backup provides another view of the effect of Exadata Smart Scan on your backup.

```
SQL> select file#,incremental_level,datafile_blocks,
  2   blocks,blocks_read,blocks_skipped_in_cell
  3   from v$backup_datafile;

      FILE# INCREMENTAL_LEVEL DATAFILE_BLOCKS      BLOCKS BLOCKS_READ
----- -----
BLOCKS_SKIPPED_IN_CELL
-----
          7           0        256000     204504      205952
          0
          7           1        256000      156         156
          1059

SQL>
```

17. Exit your SQL\*Plus and RMAN sessions.

## Practice 20-3: Recovery Optimization

---

### Overview

In this practice, you will exercise the recovery optimization that is provided by Exadata in conjunction with RMAN.

### Assumptions

Before beginning this practice, you must complete Practice 20-2. Your ability to complete this practice depends on the existence of the backups that are created in practice 20-2.

### Tasks

1. Establish a terminal connection to qr01db01 as the oracle user.
2. Connect to your database with SQL\*Plus. Log in as the database administrator.

```
[oracle@qr01db01 ~] $ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.3.0 Production...

SQL>
```

3. Offline the SALES tablespace and exit your SQL\*Plus session.

```
SQL> alter tablespace sales offline;

Tablespace altered.

SQL> exit
Disconnected from Oracle Database 11g Enterprise Edition Release
11.2.0.3.0 - 64bit Production...
[oracle@qr01db01 ~]$
```

4. Use the following su command to launch the ASM command tool (ASMCMD) using the privileges of the grid OS user.

```
[oracle@qr01db01 ~] $ su - grid -c "asmcmd -p"
Password: <oracle>
ASMCMD [+] >
```

5. Navigate to the directory inside ASM that houses your database files.

```
ASMCMD [+] > cd +DATA_QR01/dbm/datafile
ASMCMD [+DATA_QR01/dbm/datafile] >
```

6. List your database files using the `ls` command. Note the name of the data file associated with the `SALES` tablespace.

```
ASMCMD [+DATA_QR01/dbm/datafile] > ls
EXAMPLE.264.809384111
SALES.269.811641709
SOE.270.821069105
SYSAUX.257.809383679
SYSTEM.256.809383677
UNDOTBS1.258.809383679
UNDOTBS2.265.809384799
USERS.259.809383679
ASMCMD [+DATA_QR01/dbm/datafile] >
```

7. Delete the data file associated with the `SALES` tablespace and exit ASMCMD.

```
ASMCMD [+DATA_QR01/dbm/datafile] > rm SALES.269.811641709
ASMCMD [+DATA_QR01/dbm/datafile] > exit
[oracle@qr01db01 ~] $
```

8. Launch Oracle Recovery Manager (RMAN) and connect to your database as shown below:

```
[oracle@qr01db01 ~] $ rman target /
Recovery Manager: Release 11.2.0.3.0 - Production...
connected to target database: DBM (DBID=1290904261)
RMAN>
```

9. Restore the SALES tablespace.

```
RMAN> restore tablespace sales;

Starting restore at 23-JUL-13
using target database control file instead of recovery catalog
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=155 instance=dbm1 device type=DISK
allocated channel: ORA_DISK_2
channel ORA_DISK_2: SID=17 instance=dbm1 device type=DISK

channel ORA_DISK_1: starting datafile backup set restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup set
channel ORA_DISK_1: restoring datafile 00007 to
+DATA_QR01/dbm/datafile/sales.269.811641709
channel ORA_DISK_1: reading from backup piece
+RECO_QR01/dbm/backupset/2013_07_23/nnndn0_tag20130723t005029_0.262.821494231
channel ORA_DISK_1: piece
handle=+RECO_QR01/dbm/backupset/2013_07_23/nnndn0_tag20130723t005029_0.262.821
494231 tag=TAG20130723T005029
channel ORA_DISK_1: restored backup piece 1
channel ORA_DISK_1: restore complete, elapsed time: 00:08:16
Finished restore at 23-JUL-13

RMAN>
```

10. Recover the SALES tablespace.

```
RMAN> recover tablespace sales;

Starting recover at 23-JUL-13
using channel ORA_DISK_1
using channel ORA_DISK_2
channel ORA_DISK_1: starting incremental datafile backup set restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup set
destination for restore of datafile 00007:
+DATA_QR01/dbm/datafile/sales.269.821495051
channel ORA_DISK_1: reading from backup piece
+RECO_QR01/dbm/backupset/2013_07_23/nnndn1_tag20130723t005847_0.263.821494731
channel ORA_DISK_1: piece
handle=+RECO_QR01/dbm/backupset/2013_07_23/nnndn1_tag20130723t005847_0.263.821
494731 tag=TAG20130723T005847
channel ORA_DISK_1: restored backup piece 1
channel ORA_DISK_1: restore complete, elapsed time: 00:00:01

starting media recovery
media recovery complete, elapsed time: 00:00:03

Finished recover at 23-JUL-13

RMAN>
```

11. Leave your RMAN session running and establish a second terminal connection to your database server.
12. In your second terminal session, connect to your database with SQL\*Plus. Log in as the database administrator.

```
[oracle@qr01db01 ~]$ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.3.0 Production...

SQL>
```

13. Execute the following query (or execute the SQL script /home/oracle/labs/lab20-03-13.sql) to show a selection of statistics relating to your RMAN recovery session. You should see a value for cell physical IO bytes saved during optimized RMAN file restore. When RMAN restores a file, any blocks in the file that have not been altered since the file was first formatted can be re-created by Exadata. This optimization removes the need to transport empty formatted blocks across the storage network. Rather, RMAN is able to instruct Exadata to conduct the I/O on its behalf in the same way that optimized file creation is performed.

```
SQL> select a.name, sum(b.value/1024/1024) MB
  2  from v$sysstat a, v$sesstat b, v$session c
  3 where a.statistic# = b.statistic# and
  4   b.sid = c.sid and
  5   upper(c.program) like 'RMAN%' and
  6   (a.name in ('physical read total bytes',
  7   'physical write total bytes',
  8   'cell IO uncompressed bytes')
  9   or a.name like 'cell phy%')
 10  group by a.name;

NAME                                MB
-----
cell physical IO bytes eligible for predicate offload      5
cell physical IO interconnect bytes                  5627.14307
cell physical IO bytes saved during optimized file creation    0
cell physical IO interconnect bytes returned by smart scan    0
physical write total bytes                   2006.17969
cell physical IO bytes saved during optimized RMAN file restore    5
cell physical IO bytes saved by storage index    0
cell IO uncompressed bytes                  0
physical read total bytes                  1622.37744
cell physical IO bytes sent directly to DB node to balance CPU    0

10 rows selected.

SQL>
```

14. Bring the SALES tablespace back online.

```
SQL> alter tablespace sales online;
```

```
Tablespace altered.
```

15. Exit your SQL\*Plus and RMAN sessions.

## **Practices for Lesson 21: Exadata Database Machine Maintenance Tasks**

**Chapter 21**

## **Practices for Lesson 21**

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### **Practices Overview**

There is no practice for Lesson 21.

## **Practices for Lesson 22: Patching Exadata Database Machine**

**Chapter 22**

## **Practices for Lesson 22**

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### **Practices Overview**

There is no practice for Lesson 22.

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# **Practices for Lesson 23: Exadata Database Machine Automated Support Ecosystem**

**Chapter 23**

## Practices for Lesson 23

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### Practices Overview

There is no practice for Lesson 23.