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Rac11gR2OnLinux

1. Introduction

Note: This RAC Guide is not meant to replace or supplant the Oracle Documentation set, but rather, it is meant as a supplement to the same. It is imperative that the Oracle Documentation be read, understood, and referenced to provide answers to any questions that may not be clearly addressed by this Guide.

1.1. Overview of new concepts in 11gR2 Grid Infrastructure

1.1.1. SCAN

The single client access name (SCAN) is the address used by all clients connecting to the cluster. The SCAN name is a domain name registered to three IP addresses, either in the domain name service (DNS) or the Grid Naming Service (GNS). The SCAN name eliminates the need to change clients when nodes are added to or removed from the cluster. Clients using SCAN names can also access the cluster using EZCONNECT.

- The Single Client Access Name (SCAN) is a domain name that resolves to all the addresses allocated for the SCAN name. Three IP addresses should be provided (in DNS) to use for SCAN name mapping as this ensures high availability. During Oracle Grid Infrastructure installation, listeners are created for each of the SCAN addresses, and Oracle Grid Infrastructure controls which server responds to a SCAN address request.
- The SCAN addresses need to be on the same subnet as the VIP addresses for nodes in the cluster.
- The SCAN domain name must be unique within your corporate network.

1.1.2. GNS

In the past, the host and VIP names and addresses were defined in the DNS or locally in a hosts file. GNS can simplify this setup by using DHCP. To use GNS, DHCP must be configured in the subdomain in which the cluster resides.

1.1.3. OCR and Voting on ASM storage

The ability to use ASM (Automatic Storage Management) diskgroups for Clusterware OCR and Voting disks is a new feature in the Oracle Database 11g Release 2 Grid Infrastructure. If you choose this option and ASM is not yet configured, OUI launches ASM configuration assistant to configure ASM and a diskgroup.

1.1.4. Passwordless Automatic SSH Connectivity

If SSH has not been configured prior to the Installation, you can prompt the installer to do this for you. The configuration can be tested as well.

1.1.5. Intelligent Platform Management interface (IPMI)

Intelligent Platform Management Interface (IPMI) provides a set of common interfaces to computer hardware and firmware that administrators can use to monitor system health and manage the system.

With Oracle Database 11g Release 2, Oracle Clusterware can integrate IPMI to provide failure isolation support and to ensure cluster integrity. You must have the following hardware and software configured to

enable cluster nodes to be managed with IPMI:

- Each cluster member node requires a Baseboard Management Controller (BMC) running firmware compatible with IPMI version 1.5, which supports IPMI over LANs, and is configured for remote control.
- Each cluster member node requires an IPMI driver installed on each node.
- The cluster requires a management network for IPMI. This can be a shared network, but Oracle recommends that you configure a dedicated network.
- Each cluster node's ethernet port used by BMC must be connected to the IPMI management network.

If you intend to use IPMI, then you must provide an administration account username and password when prompted during installation.

1.1.6. Time Sync

Oracle Clusterware 11g release 2 (11.2) requires time synchronization across all nodes within a cluster when Oracle RAC is deployed. To achieve this you should have your OS configured network time protocol (NTP). The new Oracle Cluster Time Synchronization Service is designed for organizations whose Oracle RAC databases are unable to access NTP services.

1.1.7. Clusterware and ASM share the same Oracle Home

The clusterware and ASM share the same home thus it is known as the Grid Infrastructure home (prior to 11gR2, ASM and RDBMS could be installed either in the same Oracle home or in separate Oracle homes).

1.1.8. Hangchecktimer and oprocd are replaced

Oracle Clusterware 11g release 2 (11.2) replaces the oprocd and Hangcheck processes with the cluster synchronization service daemon Agent and Monitor to provide more accurate recognition of hangs and to avoid false termination.

1.1.9. Rebootless Restart

The fencing mechanism has changed in 11gR2. Oracle Clusterware aims to achieve a node eviction without rebooting a node. CSSD starts a graceful shutdown mechanism after seeing a failure. Thereafter, OHASD will try to restart the stack. It is only if the cleanup (of a failed subcomponent) fails that the node is rebooted in order to perform a forced cleanup.

1.1.10. HAIP

In 11.2.0.2 the new HAIP (redundant Interconnect) facility is active and multiple interface selection will support load balancing and failover. You can select more than 4 interfaces for private interconnect at install time or add them dynamically using oifcfg.

1.2. System Requirements

1.2.1. Hardware Requirements

- Physical memory (at least 1.5 gigabyte (GB) of RAM)
- An amount of swap space equal the amount of RAM for systems up to 32GB of RAM, for systems having greater than 32GB of RAM the requirement is 32GB of swap

- Temporary space (at least 1 GB) available in /tmp
- A processor type (CPU) that is certified with the version of the Oracle software being installed
- At minimum of 1024 x 786 display resolution, so that Oracle Universal Installer (OUI) displays correctly
- All servers that will be used in the cluster have the same chip architecture, for example, all 32-bit processors or all 64-bit processors
- Disk space for software installation locations: You will need at least 4.5 GB of available disk space for the Grid Infrastructure home directory, which includes both the binary files for Oracle Clusterware and Oracle Automatic Storage Management (Oracle ASM) and their associated log files, and at least 4 GB of available disk space for the Oracle Database home directory.
- Shared disk space: An Oracle RAC database is a shared everything database. All data files, control files, redo log files, and the server parameter file (SPFILE) used by the Oracle RAC database must reside on shared storage that is accessible by all Oracle RAC database instances. The Oracle RAC installation that is described in this guide uses Oracle ASM for the shared storage for Oracle Clusterware and Oracle Database files. The amount of shared disk space is determined by the size of your database.

1.2.2. Network Hardware Requirements

- Each node must have at least two network interface cards (NIC), or network adapters.
- Public interface names must be the same for all nodes. If the public interface on one node uses the network adapter eth0, then you must configure eth0 as the public interface on all nodes.
- Private interface names should be the same for all nodes as well. If eth1 is the private interface name for the first node, then eth1 should be the private interface name for your second node.
- The network adapter for the public interface must support TCP/IP.
- The network adapter for the private interface must support the user datagram protocol (UDP) using high-speed network adapters and a network switch that supports TCP/IP (Gigabit Ethernet or better).
- For the private network, the end points of all designated interconnect interfaces must be completely reachable on the network. Every node in the cluster should be able to connect to every private network interface in the cluster.
- The host name of each node must conform to the RFC 952 standard, which permits alphanumeric characters. Host names using underscores ("_") are not allowed.

1.2.3. IP Address Requirements



- One public IP address for each node
- One virtual IP address for each node
- Three single client access name (SCAN) addresses for the cluster

1.2.4. Installation method

This document details the steps for installing a 3-node Oracle 11gR2 RAC cluster on Linux:

- The Oracle Grid home binaries are installed on the local disk of each of the RAC nodes.
- The files required by Oracle Clusterware (OCR and Voting disks) are stored in ASM
- The installation is explained without GNS and IPMI (additional Information for installation with GNS and IPMI are explained)

2. Prepare the cluster nodes for Oracle RAC

The guides include hidden sections, use the  and  image for each section to show/hide the section or you can Expand all or Collapse all by clicking these buttons. This is implemented using the [Twisty Plugin](#) which requires Java Script to be enabled on your browser.

2.1. User Accounts

NOTE: We recommend different users for the installation of the Grid Infrastructure (GI) and the Oracle RDBMS home. The GI will be installed in a separate Oracle base, owned by user 'grid.' After the grid install the GI home will be owned by root, and inaccessible to unauthorized users.

1. Create OS groups using the command below. Enter these commands as the 'root' user:

```
#/usr/sbin/groupadd -g 501 oinstall
#/usr/sbin/groupadd -g 502 dba
#/usr/sbin/groupadd -g 504 asmadmin
#/usr/sbin/groupadd -g 506 asmdba
#/usr/sbin/groupadd -g 507 asmoper
```

2. Create the users that will own the Oracle software using the commands:

```
#/usr/sbin/useradd -u 501 -g oinstall -G asmadmin,asmdba,asmoper grid
#/usr/sbin/useradd -u 502 -g oinstall -G dba,asmdba oracle
```

3. Set the password for the oracle account using the following command. Replace password with your own password.

passwd oracle

Changing password for user oracle.

*New UNIX password: **password***

*retype new UNIX password: **password***

passwd: all authentication tokens updated successfully.

passwd grid

Changing password for user oracle.

*New UNIX password: **password***

*retype new UNIX password: **password***

passwd: all authentication tokens updated successfully.

4. Repeat Step 1 through Step 3 on each node in your cluster.

2.2. Networking

NOTE: This section is intended to be used for installations NOT using GNS.

1. Determine your cluster name. The cluster name should satisfy the following conditions:

2. Prepare the cluster nodes for Oracle RAC

- The cluster name is globally unique throughout your host domain.
- The cluster name is at least 1 character long and less than 15 characters long.
- The cluster name must consist of the same character set used for host names: single-byte alphanumeric characters (a to z, A to Z, and 0 to 9) and hyphens (-).

2. Determine the public host name for each node in the cluster. For the public host name, use the primary host name of each node. In other words, use the name displayed by the `hostname` command for example: `racnode1`.

- It is recommended that redundant NICs are configured with the Linux bonding driver. Active/passive is the preferred bonding method due to its simplistic configuration.

3. Determine the public virtual hostname for each node in the cluster. The virtual host name is a public node name that is used to reroute client requests sent to the node if the node is down. Oracle recommends that you provide a name in the format `<public hostname>-vip`, for example: `racnode1-vip`. The virtual hostname must meet the following requirements:

- The virtual IP address and the network name must not be currently in use.
- The virtual IP address must be on the same subnet as your public IP address.
- The virtual host name for each node should be registered with your DNS.

4. Determine the private hostname for each node in the cluster. This private hostname does not need to be resolvable through DNS and should be entered in the `/etc/hosts` file. A common naming convention for the private hostname is `<public hostname>-pvt`.

- The private IP should NOT be accessible to servers not participating in the local cluster.
- The private network should be on standalone dedicated switch(es).
- The private network should NOT be part of a larger overall network topology.
- The private network should be deployed on Gigabit Ethernet or better.
- It is recommended that redundant NICs are configured with the Linux bonding driver. Active/passive is the preferred bonding method due to its simplistic configuration.

5. Define a SCAN DNS name for the cluster that resolves to three IP addresses (round-robin). SCAN IPs must NOT be in the `/etc/hosts` file, the SCAN name must be resolved by DNS.

6. Even if you are using a DNS, Oracle recommends that you add lines to the `/etc/hosts` file on each node, specifying the public IP, VIP and private addresses. Configure the `/etc/hosts` file so that it is similar to the following example:

NOTE: The SCAN IPs MUST NOT be in the `/etc/hosts` file. This will result in only 1 SCAN IP for the entire cluster.

```
#eth0 - PUBLIC
192.0.2.100 racnode1.example.com racnode1
192.0.2.101 racnode2.example.com racnode2
#VIP
192.0.2.102 racnode1-vip.example.com racnode1-vip
192.0.2.103 racnode2-vip.example.com racnode2-vip
#eth1 - PRIVATE
172.0.2.100 racnode1-pvt
172.0.2.101 racnode2-pvt
```

7. If you configured the IP addresses in a DNS server, then, as the root user, change the hosts search order in `/etc/nsswitch.conf` on all nodes as shown here:

Old:
hosts: files nis dns
New:
hosts: dns files nis

8. After modifying the nsswitch.conf file, restart the nscd daemon on each node using the following command:

/sbin/service nscd restart

After you have completed the installation process, configure clients to use the SCAN to access the cluster. Using the previous example, the clients would use docrac-scan to connect to the cluster.

The fully qualified SCAN for the cluster defaults to cluster_name-scan.GNS_subdomain_name, for example docrac-scan.example.com. The short SCAN for the cluster is docrac-scan. You can use any name for the SCAN, as long as it is unique within your network and conforms to the RFC 952 standard.

2.3. Synchronizing the Time on ALL Nodes

Ensure that the date and time settings on all nodes are set as closely as possible to the same date and time. Time may be kept in sync with NTP with the -x option or by using Oracle Cluster Time Synchronization Service (ctssd). Instructions on configuring NTP with the -x option can be found in My Oracle Support [ExtNote:551704.1](#).

2.4. Configuring Kernel Parameters

1. As the root user add the following kernel parameter settings to /etc/sysctl.conf. If any of the parameters are already in the /etc/sysctl.conf file, the higher of the 2 values should be used.

kernel.shmmni = 4096
kernel.sem = 250 32000 100 128
fs.file-max = 6553600
net.ipv4.ip_local_port_range = 9000 65500
net.core.rmem_default = 262144
net.core.rmem_max = 4194304
net.core.wmem_default = 262144
net.core.wmem_max = 1048576

NOTE: The latest information on kernel parameter settings for Linux can be found in My Oracle Support [ExtNote:169706.1](#).

2. Run the following as the root user to allow the new kernel parameters to be put in place:

#/sbin/sysctl -p

3. Repeat steps 1 and 2 on all cluster nodes.

NOTE: OUI checks the current settings for various kernel parameters to ensure they meet the minimum requirements for deploying Oracle RAC.

2.5. Set shell limits for the oracle user

To improve the performance of the software on Linux systems, you must increase the shell limits for the oracle user

1. Add the following lines to the /etc/security/limits.conf file:

```
grid soft nproc 2047
grid hard nproc 16384
grid soft nofile 1024
grid hard nofile 65536
oracle soft nproc 2047
oracle hard nproc 16384
oracle soft nofile 1024
oracle hard nofile 65536
```

2. Add or edit the following line in the /etc/pam.d/login file, if it does not already exist:

```
session required pam_limits.so
```

3. Make the following changes to the default shell startup file, add the following lines to the /etc/profile file:

```
if [ $USER = "oracle" ] || [ $USER = "grid" ]; then
if [ $SHELL = "/bin/ksh" ]; then
ulimit -p 16384
ulimit -n 65536
else
ulimit -u 16384 -n 65536
fi
umask 022
fi
```

For the C shell (csh or tcsh), add the following lines to the /etc/csh.login file:

```
if ( $USER = "oracle" || $USER = "grid" ) then
limit maxproc 16384
limit descriptors 65536
endif
```

4. Repeat this procedure on all other nodes in the cluster.

2.6. Create the Oracle Inventory Directory

To create the Oracle Inventory directory, enter the following commands as the root user:

```
# mkdir -p /u01/app/oraInventory
# chown -R grid:oinstall /u01/app/oraInventory
# chmod -R 775 /u01/app/oraInventory
```


2.7. Creating the Oracle Grid Infrastructure Home Directory

To create the Grid Infrastructure home directory, enter the following commands as the root user:

```
# mkdir -p /u01/11.2.0/grid  
# chown -R grid:oinstall /u01/11.2.0/grid  
# chmod -R 775 /u01/11.2.0/grid
```

2.8. Creating the Oracle Base Directory

To create the Oracle Base directory, enter the following commands as the root user:

```
# mkdir -p /u01/app/oracle  
# mkdir /u01/app/oracle/cfgtoollogs --needed to ensure that dbca is able to run after the rdbms installation.  
# chown -R oracle:oinstall /u01/app/oracle  
# chmod -R 775 /u01/app/oracle
```

2.9. Creating the Oracle RDBMS Home Directory

To create the Oracle RDBMS Home directory, enter the following commands as the root user:

```
# mkdir -p /u01/app/oracle/product/11.2.0/db_1  
# chown -R oracle:oinstall /u01/app/oracle/product/11.2.0/db_1  
# chmod -R 775 /u01/app/oracle/product/11.2.0/db_1
```

2.10. Stage the Oracle Software

It is recommended that you stage the required software onto a local drive on Node 1 of your cluster. Ensure that you use only 32 bit versions of the Oracle Software on 32bit operating systems and 64 bit versions of the Oracle Software on 64bit operating systems.

Starting with the first patch set for Oracle Database 11g Release 2 (11.2.0.2), Oracle Database patch sets are full installations of the Oracle Database software. In past releases, Oracle Database patch sets consisted of sets of files that replaced files in an existing Oracle home. Beginning with Oracle Database 11g Release 2, patch sets are full (out-of-place) installations that replace existing installations. This simplifies the installation since you may simply install the latest patch set (version). You are no longer required to install the base release, and then apply the patch set. The 11.2.0.2.2 Patch Set is available for download via My Oracle Support under Patch 10098816. Reference My Oracle Support ExtNote:1189783.1 for more information on 'Important Changes to Oracle Database Patch Sets Starting With 11.2.0.2.'

It is highly recommended that the latest Grid Infrastructure Patch Set Update (PSU) be installed prior to running root.sh (or rootupgrade.sh). At the time of this writing the latest Grid Infrastructure PSU is 11.2.0.2.2 (GI PSU #2), therefore the content provided in this RAC Guide will demonstrate the installation of GI 11.2.0.2.2 to the Grid Infrastructure home prior to running root.sh on each node in the cluster. The 11.2.0.2.2 GI PSU can be found under Patch 12311357 on My Oracle Support. Information on the latest PSUs for 11.2.0.2 can be found under My Oracle Support ExtNote:756671.1.

2.11. Check OS Software Requirements

The OUI will check for missing packages during the install and you will have the opportunity to install them at that point during the prechecks. Nevertheless you might want to validate that all required packages have been installed prior to launching the OUI.

NOTE: These Requirements are for 64-bit versions of Oracle Enterprise Linux 5 and RedHat? Enterprise Linux 5. Requirements for other supported platforms can be found in My Oracle Support ExtNote:169706.1.

binutils-2.15.92.0.2
compat-libstdc++-33-3.2.3
compat-libstdc++-33-3.2.3 (32 bit)
elfutils-libelf-0.97
elfutils-libelf-devel-0.97
expat-1.95.7
gcc-3.4.6
gcc-c++-3.4.6
glibc-2.3.4-2.41
glibc-2.3.4-2.41 (32 bit)
glibc-common-2.3.4
glibc-devel-2.3.4
glibc-headers-2.3.4
libaio-0.3.105
libaio-0.3.105 (32 bit)
libaio-devel-0.3.105
libaio-devel-0.3.105 (32 bit)
libgcc-3.4.6
libgcc-3.4.6 (32-bit)
libstdc++-3.4.6
libstdc++-3.4.6 (32 bit)
libstdc++-devel 3.4.6
make-3.80
pdksh-5.2.14
sysstat-5.0.5
unixODBC-2.2.11
unixODBC-2.2.11 (32 bit)
unixODBC-devel-2.2.11
unixODBC-devel-2.2.11 (32 bit)

The following command can be run on the system to list the currently installed packages:

```
rpm -q --qf '%{NAME}-%{VERSION}-%{RELEASE} (%{ARCH})\n' binutils \  
compat-libstdc++-33 \  
elfutils-libelf \  
elfutils-libelf-devel \  
gcc \  
gcc-c++ \  
glibc \  
glibc-common \  
glibc-devel \  
glibc-headers \  
ksh \  
libaio \  
libaio-devel \  
libgcc \  
libstdc++ \  
libstdc++-devel \  
make \  
sysstat \  
unixODBC \  

```

Any missing RPM from the list above should be added using the "--aid" of "/bin/rpm" option to ensure all dependent packages are resolved and installed as well.

NOTE: Be sure to check on all nodes that the Linux Firewall and SELinux is disabled.

3. Prepare the shared storage for Oracle RAC

This section describes how to prepare the shared storage for Oracle RAC

Each node in a cluster requires external shared disks for storing the Oracle Clusterware (Oracle Cluster Registry and voting disk) files, and Oracle Database files. To ensure high availability of Oracle Clusterware files on Oracle ASM, you need to have at least 2 GB of disk space for Oracle Clusterware files in three separate failure groups, with at least three physical disks. Each disk must have at least 1 GB capacity to ensure that there is sufficient space to create Oracle Clusterware files. Use the following guidelines when identifying appropriate disk devices:

- All of the devices in an Automatic Storage Management diskgroup should be the same size and have the same performance characteristics.
- A diskgroup should not contain more than one partition on a single physical disk device.
- Using logical volumes as a device in an Automatic Storage Management diskgroup is not supported with Oracle RAC.
- The user account with which you perform the installation (typically, 'oracle') must have write permissions to create the files in the path that you specify.

3.1. Shared Storage

For this example installation we will be using ASM for Clusterware and Database storage on top of SAN technology. The following Table shows the storage layout for this implementation:

Block Device	ASMLib Name	Size	Comments
/dev/sda	OCR_VOTE01	1 GB	ASM Diskgroup for OCR and Voting Disks
/dev/sdb	OCR_VOTE02	1 GB	ASM Diskgroup for OCR and Voting Disks
/dev/sdc	OCR_VOTE03	1 GB	ASM Diskgroup for OCR and Voting Disks
/dev/sdd	ASM_DATA01	2 GB	ASM Data Diskgroup
/dev/sde	ASM_DATA02	2 GB	ASM Data Diskgroup
/dev/sdf	ASM_DATA03	2 GB	ASM Data Diskgroup
/dev/sdg	ASM_DATA04	2 GB	ASM Data Diskgroup
/dev/sdh	ASM_DATA05	2 GB	ASM Flash Recovery Area Diskgroup
/dev/sdi	ASM_DATA06	2 GB	ASM Flash Recovery Area Diskgroup
/dev/sdj	ASM_DATA07	2 GB	ASM Flash Recovery Area Diskgroup
/dev/sdk	ASM_DATA08	2 GB	ASM Flash Recovery Area Diskgroup

3.1.1. Partition the Shared Disks

1. Once the LUNs have been presented from the SAN to ALL servers in the cluster, partition the LUNs from one node only, run fdisk to create a single whole-disk partition with exactly 1 MB offset on each LUN to be used as ASM Disk.

Tip: From the fdisk prompt, type "u" to switch the display unit from cylinder to sector. Then create a single primary partition starting on sector 2048 (1MB offset assuming sectors of 512 bytes per unit). See below

example for /dev/sda:

fdisk /dev/sda

*Command (m for help): **u***

Changing display/entry units to sectors

*Command (m for help): **n***

Command action

e extended

p primary partition (1-4)

p

*Partition number (1-4): **1***

*First sector (61-1048575, default 61): **2048***

Last sector or +size or +sizeM or +sizeK (2048-1048575, default 1048575):

Using default value 1048575

*Command (m for help): **w***

The partition table has been altered!

Calling ioctl() to re-read partition table.

Syncing disks.

2. Load the updated block device partition tables by running the following on ALL servers participating in the cluster:

#!/sbin/partprobe

3.1.2. Installing and Configuring ASMLib

The ASMLib is highly recommended for those systems that will be using ASM for shared storage within the cluster due to the performance and manageability benefits that it provides. Perform the following steps to install and configure ASMLib on the cluster nodes:

NOTE: ASMLib automatically provides LUN persistence, so when using ASMLib there is no need to manually configure LUN persistence for the ASM devices on the system.

1. Download the following packages from the ASMLib OTN page, if you are an Enterprise Linux customer you can obtain the software through the Unbreakable Linux network.

NOTE: The ASMLib kernel driver **MUST** match the kernel revision number, the kernel revision number of your system can be identified by running the "uname -r" command. Also, be sure to download the set of RPMs which pertain to your platform architecture, in our case this is x86_64.

oracleasm-support-2.1.3-1.el5x86_64.rpm

oracleasmlib-2.0.4-1.el5.x86_64.rpm

oracleasm-2.6.18-92.1.17.0.2.el5-2.0.5-1.el5.x86_64.rpm

2. Install the RPMs by running the following as the root user:

***# rpm -ivh oracleasm-support-2.1.3-1.el5x86_64.rpm ***

***oracleasmlib-2.0.4-1.el5.x86_64.rpm ***

oracleasm-2.6.18-92.1.17.0.2.el5-2.0.5-1.el5.x86_64.rpm

3. Configure ASMLib by running the following as the root user:

NOTE: If using user and group separation for the installation (as documented here), the ASMLib driver interface owner is 'grid' and the group to own the driver interface is 'asmadmin'. These groups were created in section 2.1. If a more simplistic installation using only the Oracle user is performed, the owner will be 'oracle' and the group owner will be 'dba'.

#/etc/init.d/oracleasm configure

Configuring the Oracle ASM library driver.

This will configure the on-boot properties of the Oracle ASM library driver. The following questions will determine whether the driver is loaded on boot and what permissions it will have. The current values will be shown in brackets ('[]'). Hitting <ENTER> without typing an answer will keep that current value. Ctrl-C will abort.

*Default user to own the driver interface []: **grid**
Default group to own the driver interface []: **asmadmin**
Start Oracle ASM library driver on boot (y/n) [n]: **y**
Scan for Oracle ASM disks on boot (y/n) [y]: **y**
Writing Oracle ASM library driver configuration: **done**
Initializing the Oracle ASMLib driver: [**OK**]
Scanning the system for Oracle ASMLib disks: [**OK**]*

4. Repeat steps 2 - 4 on ALL cluster nodes.

3.1.3. Using ASMLib to Mark the Shared Disks as Candidate Disks

To create ASM disks using ASMLib:

1. As the root user, use oracleasm to create ASM disks using the following syntax:

/usr/sbin/oracleasm createdisk disk_name device_partition_name

In this command, disk_name is the name you choose for the ASM disk. The name you choose must contain only ASCII capital letters, numbers, or underscores, and the disk name must start with a letter, for example, DISK1 or VOL1, or RAC_FILE1. The name of the disk partition to mark as an ASM disk is the device_partition_name. For example:

*# /usr/sbin/oracleasm createdisk OCR_VOTE01 /dev/sda1
/usr/sbin/oracleasm createdisk OCR_VOTE02 /dev/sdb1
/usr/sbin/oracleasm createdisk OCR_VOTE03 /dev/sdc1
/usr/sbin/oracleasm createdisk ASMDATA01 /dev/sdd1
/usr/sbin/oracleasm createdisk ASMDATA02 /dev/sde1
/usr/sbin/oracleasm createdisk ASMDATA03 /dev/sdf1
/usr/sbin/oracleasm createdisk ASMDATA04 /dev/sdg1
/usr/sbin/oracleasm createdisk ASMDATA05 /dev/sdh1
/usr/sbin/oracleasm createdisk ASMDATA06 /dev/sdi1
/usr/sbin/oracleasm createdisk ASMDATA07 /dev/sdj1
/usr/sbin/oracleasm createdisk ASMDATA08 /dev/sdk1*

If you need to unmark a disk that was used in a createdisk command, you can use the following syntax as the

root user:

```
# /usr/sbin/oracleasm deletedisk disk_name
```

2. Repeat step 1 for each disk that will be used by Oracle ASM.

3. After you have created all the ASM disks for your cluster, use the listdisks command to verify their availability:

```
# /usr/sbin/oracleasm listdisks  
OCR_VOTE01  
OCR_VOTE02  
OCR_VOTE03  
ASMDATA01  
ASMDATA02  
ASMDATA03  
ASMDATA04  
ASMDATA05  
ASMDATA06  
ASMDATA07  
ASMDATA08
```

4. On all the other nodes in the cluster, use the scandisks command as the root user to pickup the newly created ASM disks. You do not need to create the ASM disks on each node, only on one node in the cluster.

```
# /usr/sbin/oracleasm scandisks  
Scanning system for ASM disks [ OK ]
```

5. After scanning for ASM disks, display the available ASM disks on each node to verify their availability:

```
# /usr/sbin/oracleasm listdisks  
OCR_VOTE01  
OCR_VOTE02  
OCR_VOTE03  
ASMDATA01  
ASMDATA02  
ASMDATA03  
ASMDATA04  
ASMDATA05  
ASMDATA06  
ASMDATA07  
ASMDATA08
```

4. Oracle Grid Infrastructure Install

4.1. Basic Grid Infrastructure Install (without GNS and IPMI)

As the grid user (Grid Infrastructure software owner) start the installer by running *"runInstaller"* from the staged installation media.

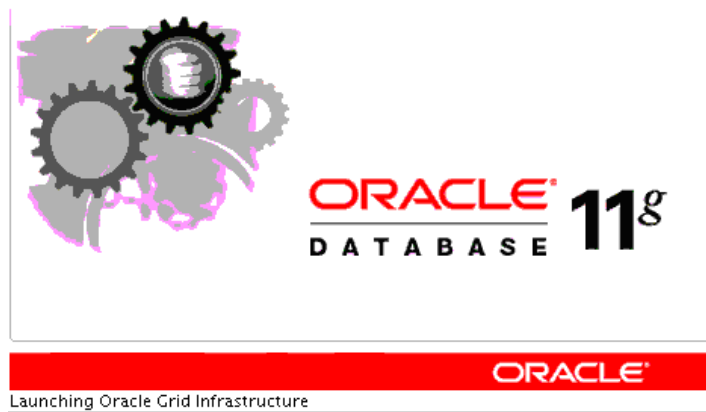
NOTE: Be sure the installer is run as the intended software owner, the only supported method to change the software owner is to reinstall.

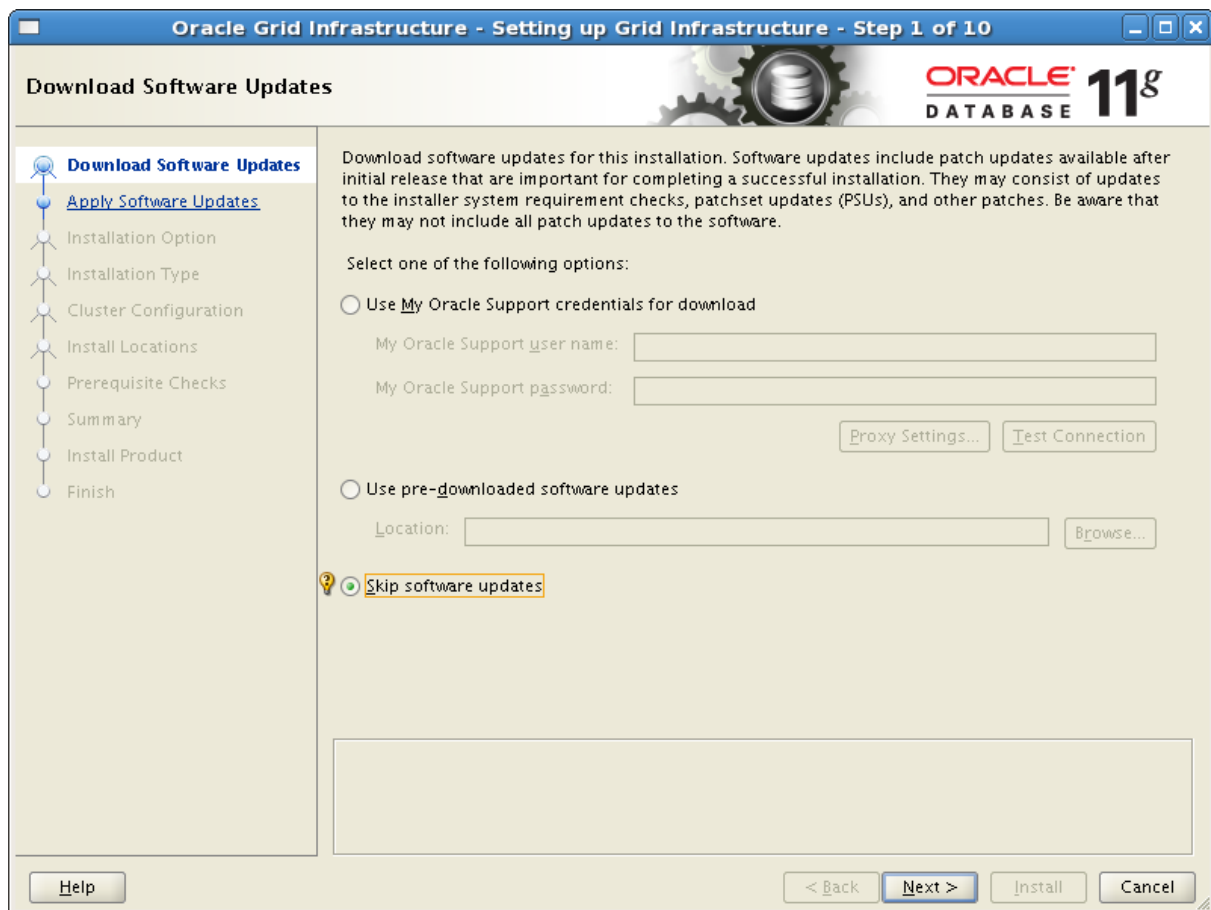
#xhost +

#su - grid

cd into the folder where you staged the Grid Infrastructure software

./runInstaller



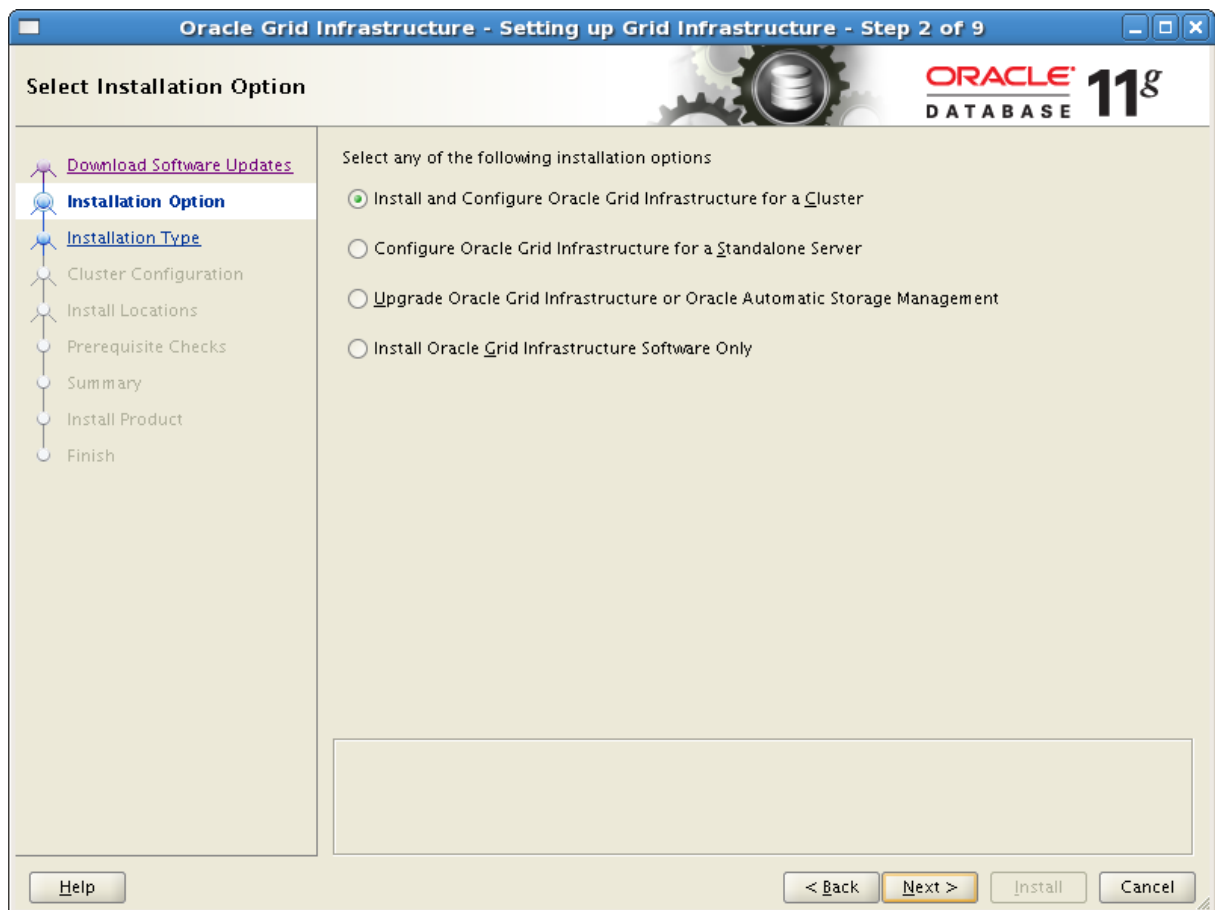


NOTE: This feature allows the installer to download mandatory patches for itself as well as for the base product at installation time so that they do not need to be applied later. It also helps resolve installation issues at the middle of a release without either recutting the media or deferring the bug fix to a later release.

Currently, when there is a bug in the base installation, you have to wait until the next release before it can be fixed. This feature helps resolve installation issues at the middle of a release without either recutting the media or deferring the bug fix to a later release. The feature also applies mandatory patches for the base product, thereby creating more certified installations out-of-box.

Action:

For this guide we skip the software updates.



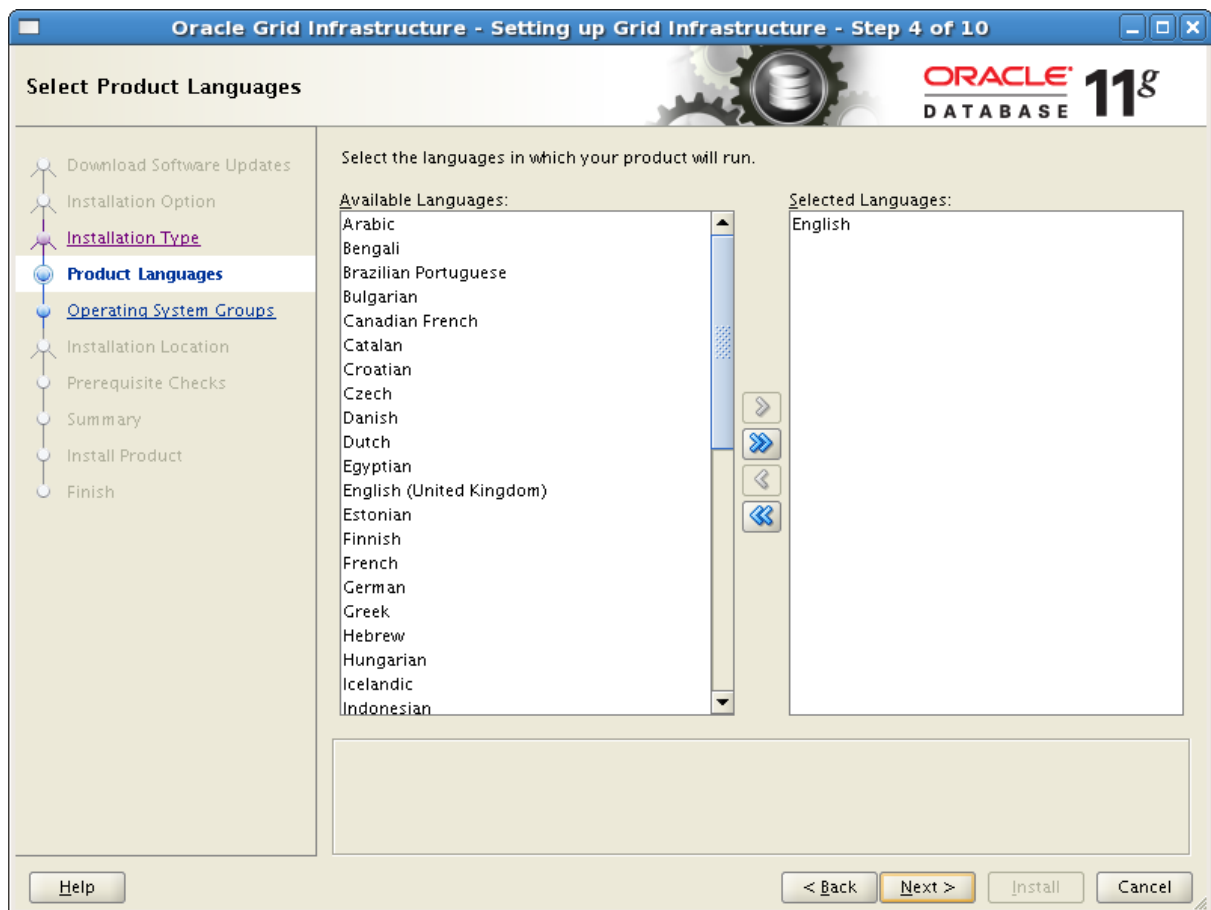
Action:

Select radio button 'Install and Configure Grid Infrastructure for a Cluster' and click 'Next> '



Action:

Select radio button 'Advanced Installation' and click 'Next> '



Action:

Accept 'English' as language' and click ' Next> '

Oracle Grid Infrastructure - Setting up Grid Infrastructure - Step 5 of 16

Grid Plug and Play Information

Single Client Access Name (SCAN) allows clients to use one name in connection strings to connect to the cluster as a whole. Client connect requests to the SCAN name can be handled by any cluster node.

Cluster Name:

SCAN Name:

SCAN Port:

☐ **Configure GNS**

GNS Sub Domain:
For example: grid.example.com

GNS VIP Address:

Help < Back Next > Install Cancel

Action:

Specify your cluster name and the SCAN name you want to use and click 'Next>'

Note:

Make sure 'Configure GNS' is NOT selected.

Oracle Grid Infrastructure - Setting up Grid Infrastructure - Step 6 of 16

Cluster Node Information

Provide the list of nodes to be managed by Oracle Grid Infrastructure with their Public Node Name and Virtual Host Name.
If Oracle Grid Naming Service (GNS) has been selected and DHCP is enabled, then the Virtual Host Name is automatically configured for each Public Node.

Hostname	Virtual IP Name
ratlnx01	ratlnx01-vip
ratlnx02	ratlnx02-vip

SSH Connectivity... Use Cluster Configuration File... Add... Edit... Remove

Help < Back Next > Install Cancel

Action:

Use the Edit and Add buttons to specify the node names and virtual IP addresses you configured previously in your /etc/hosts file. Use the 'SSH Connectivity' button to configure/test the passwordless SSH connectivity between your nodes.

SSH Connectivity... Use Cluster Configuration File... Add... Edit... Remove

OS Username: grid OS Password: *****

☐ User home is shared by the selected nodes

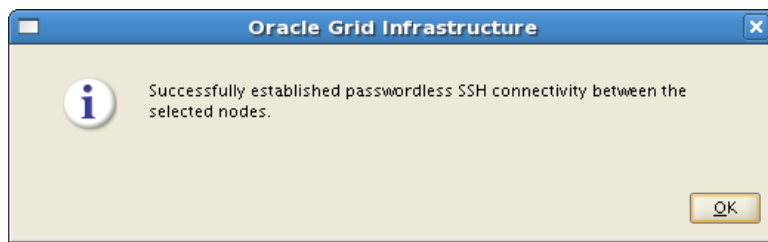
☐ Reuse private and public keys existing in the user home

Test Setup

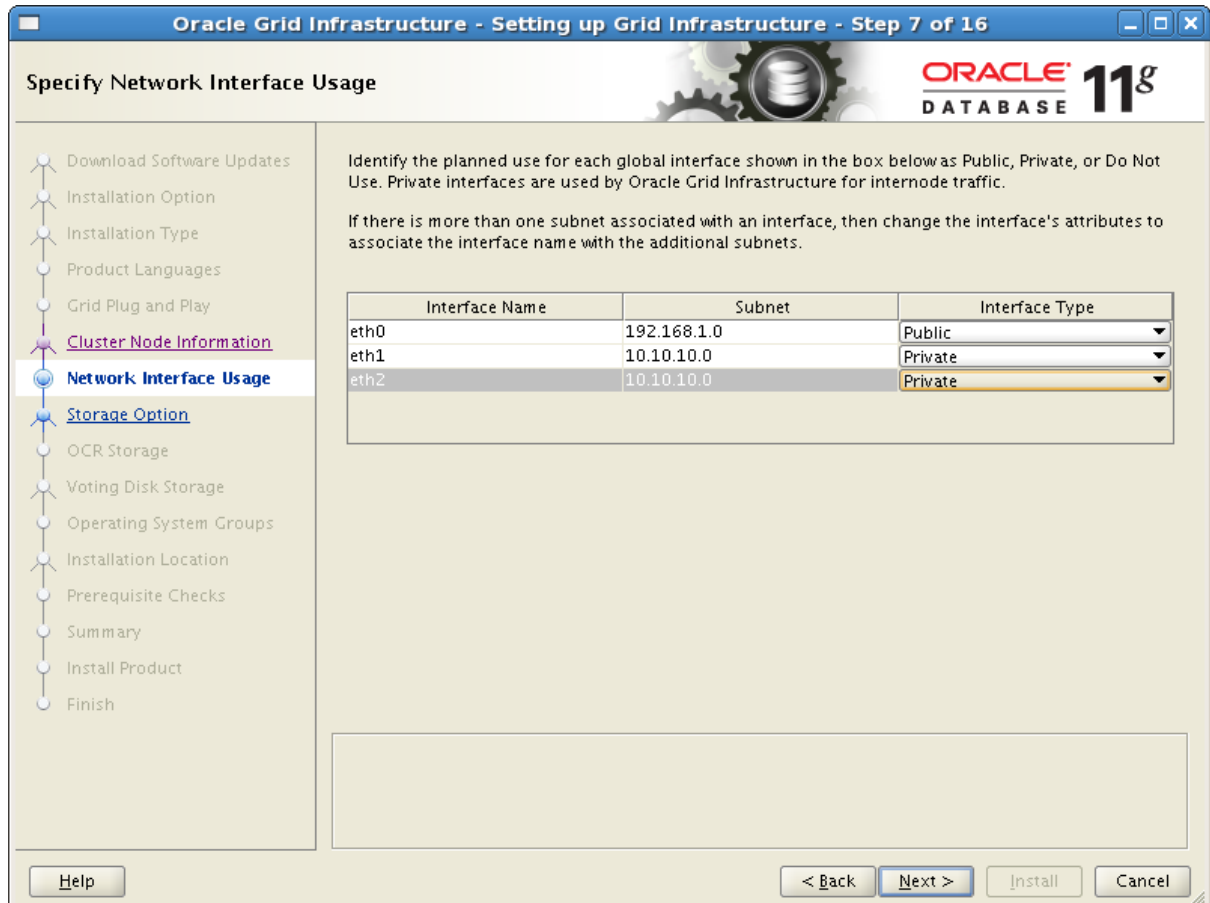
< Back Next > Finish Cancel

ACTION:

Type in the OS password for the user 'grid' and press 'Setup'

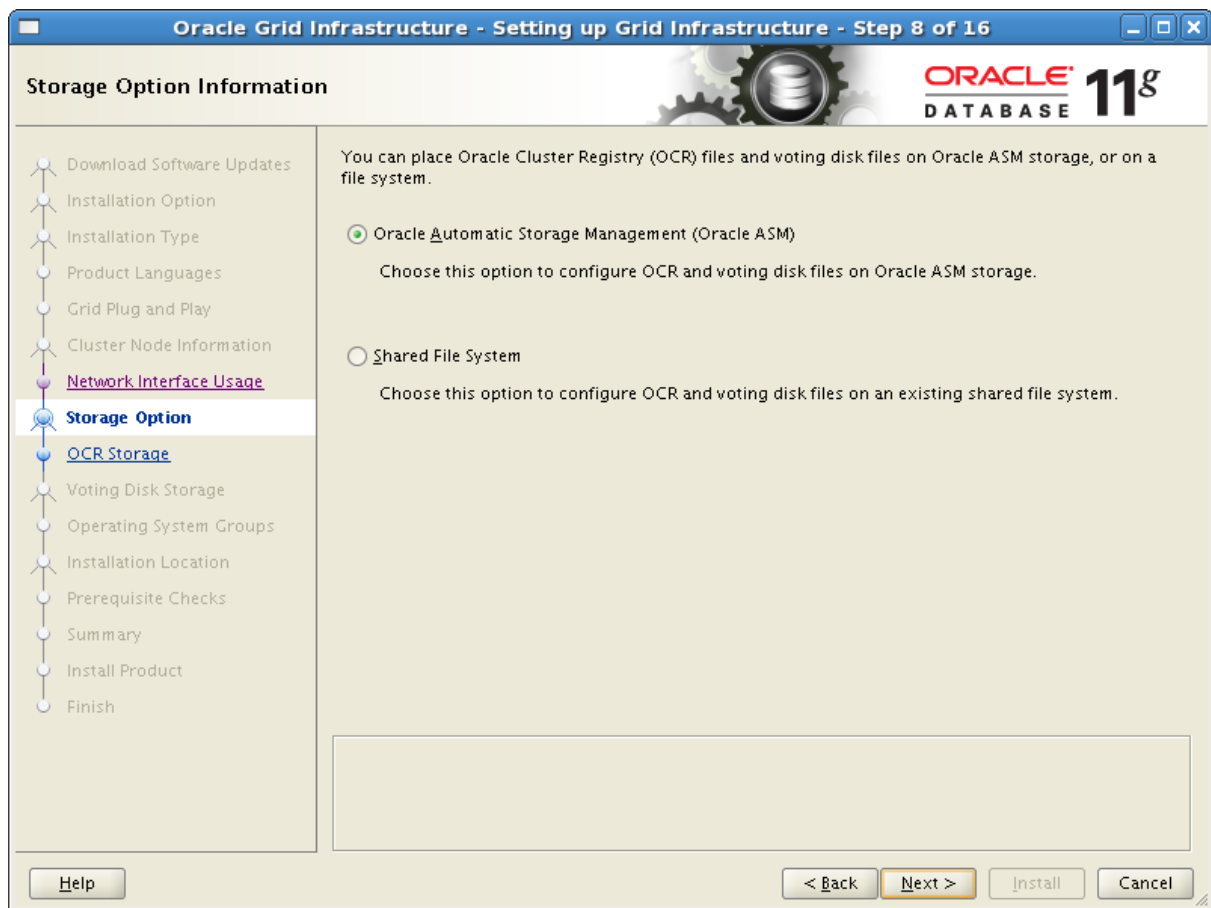


After click ' OK '



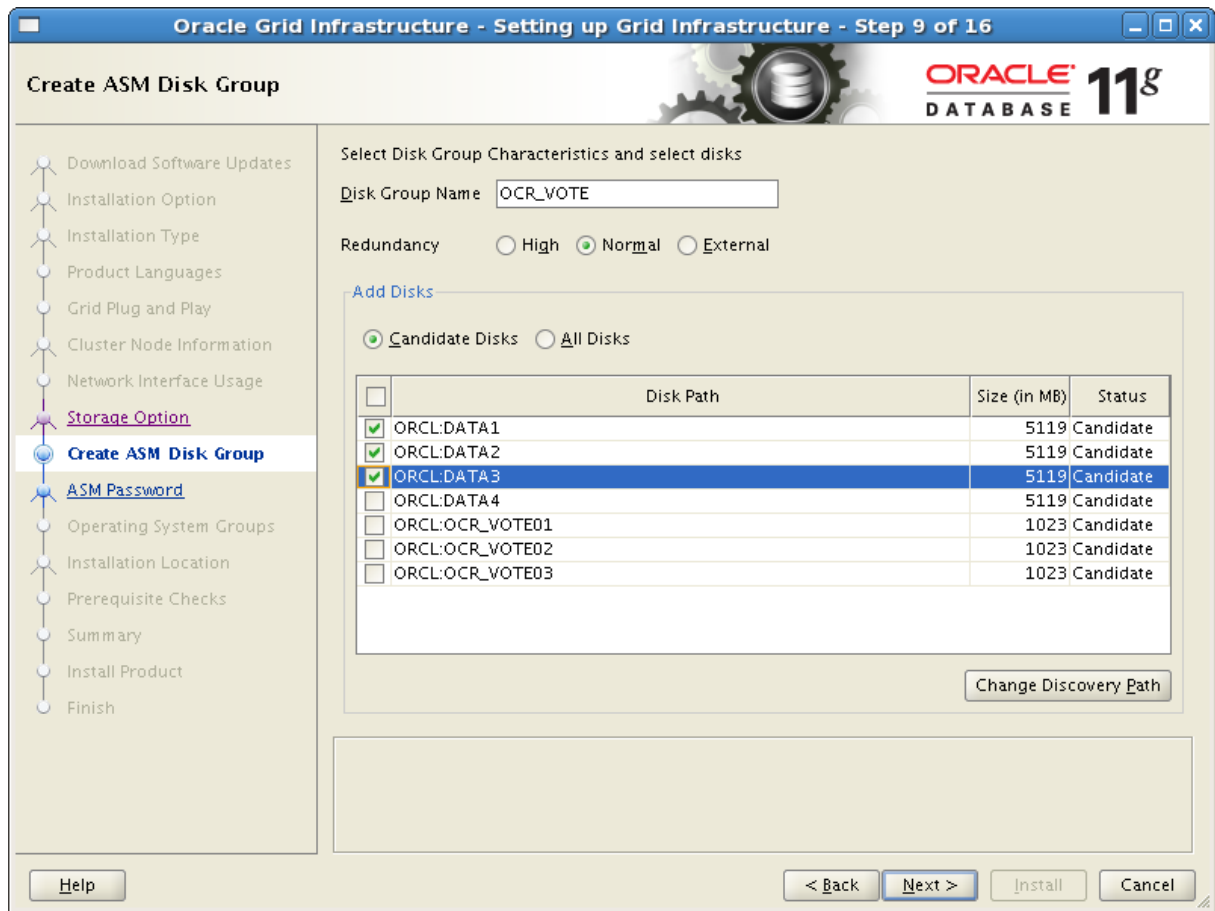
Action:

Click on 'Interface Type' next to the Interfaces you want to use for your cluster and select the correct values for 'Public', 'Private' and 'Do Not Use' . When finished click ' Next> '



Action:

Select radio button 'Automatic Storage Management (ASM)' and click 'Next> '

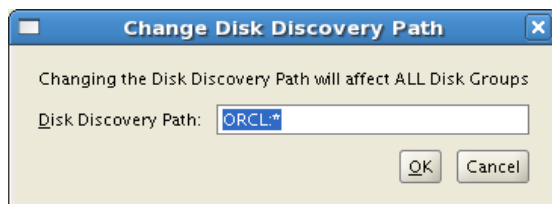


Action:

Select the 'DiskGroup Name' specify the 'Redundancy' and tick the disks you want to use, when done click 'Next>'

NOTE: The number of voting disks that will be created depend on the redundancy level you specify: EXTERNAL will create 1 voting disk, NORMAL will create 3 voting disks, HIGH will create 5 voting disks.

NOTE: If you see an empty screen for your candidate disks it is likely that ASMLib has not been properly configured. If you are sure that ASMLib has been properly configured click on 'Change Discovery Path' and provide the correct destination. See example below:



Oracle Grid Infrastructure - Setting up Grid Infrastructure - Step 10 of 16

Specify ASM Password

The new Oracle Automatic Storage Management (Oracle ASM) instance requires its own SYS user with SYSASM privileges for administration. Oracle recommends that you create a less privileged ASMSNMP user with SYSDBA privileges to monitor the ASM instance.

Specify the password for these user accounts.

☐ Use different passwords for these accounts

	Password	Confirm Password
SYS	<input type="text"/>	<input type="text"/>
ASMSNMP	<input type="text"/>	<input type="text"/>

☒ Use same passwords for these accounts

Specify Password: Confirm Password:

Action:

Specify and conform the password you want to use and click 'Next>'

Oracle Grid Infrastructure - Setting up Grid Infrastructure - Step 11 of 17

Failure Isolation Support

Download Software Updates

Installation Option

Installation Type

Product Languages

Grid Plug and Play

Cluster Node Information

Network Interface Usage

Storage Option

Create ASM Disk Group

ASM Password

Failure Isolation

Operating System Groups

Installation Location

Prerequisite Checks

Summary

Install Product

Finish

Choose one of the following Failure Isolation Support options.

☐ Use Intelligent Platform Management Interface (IPMI)

To ensure successful installation with IPMI enabled, ensure your IPMI drivers are properly installed and enabled.

User Name :

Password :

☒ Do not use Intelligent Platform Management Interface (IPMI)

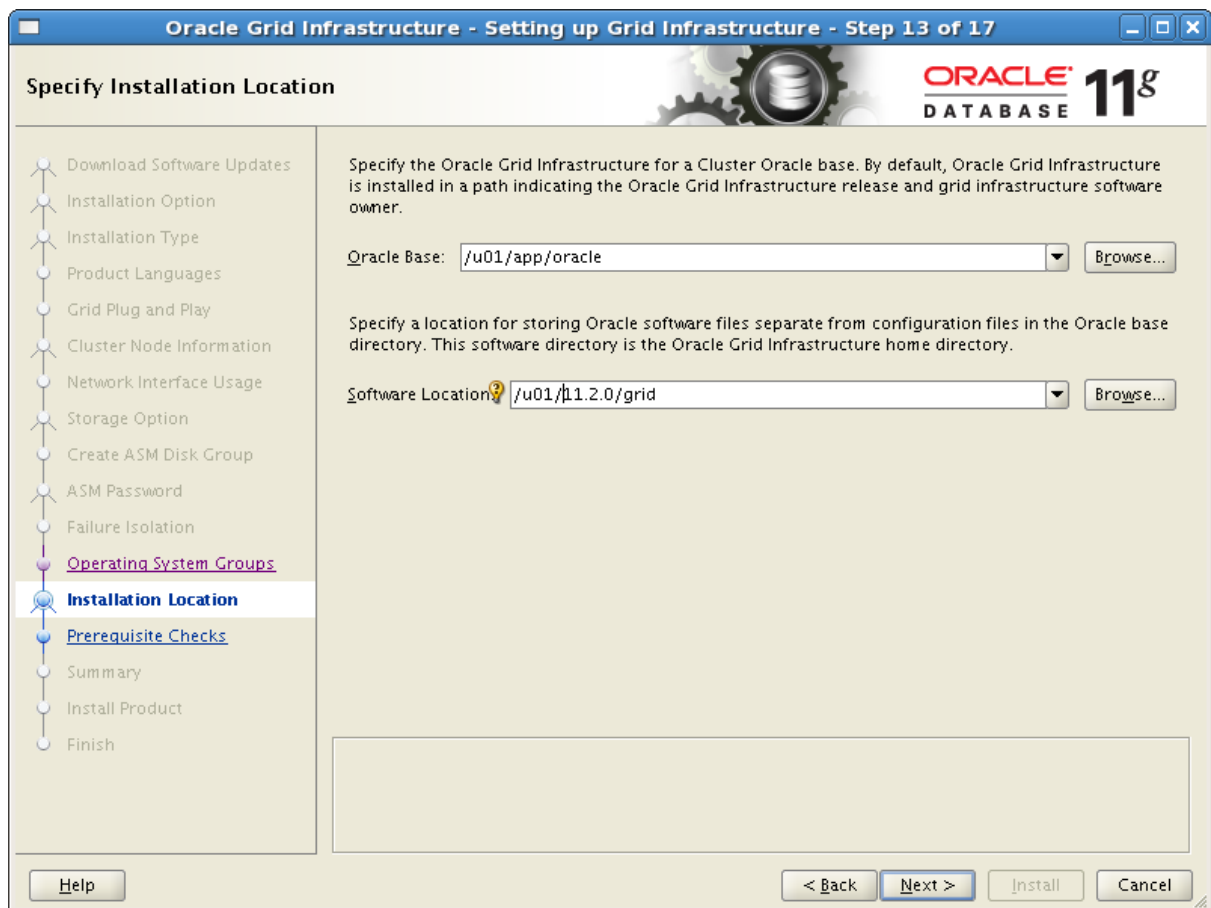
Action:

Select NOT to use IPMI and click ' Next> '



Action:

Assign the correct OS groups for OS authentication and click 'Next>'



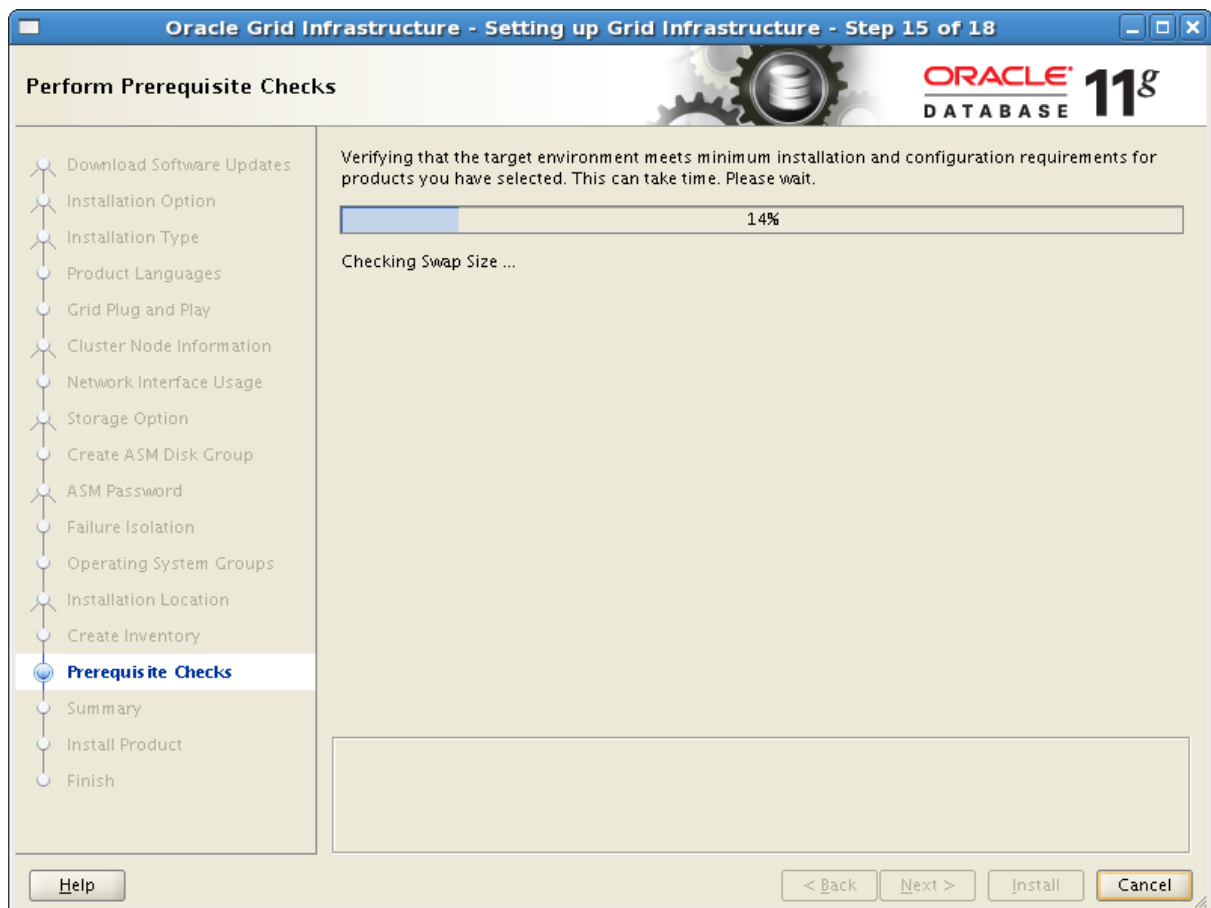
Action:

Specify the locations for your ORACLE_BASE and for the Software location and click ' Next> '



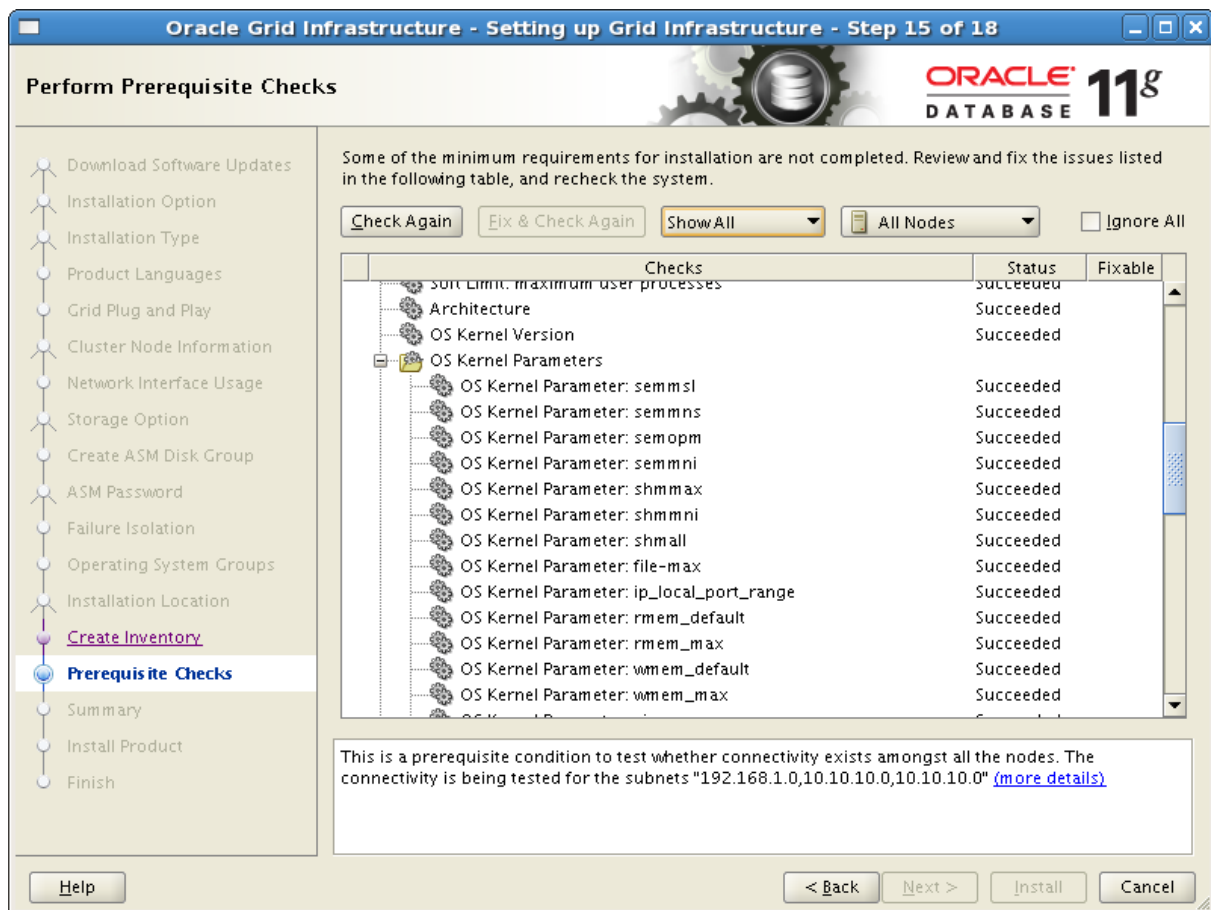
Action:

Specify the locations for your Inventory directory and click 'Next>'



Note:

OUI performs certain checks and comes back with the screen below

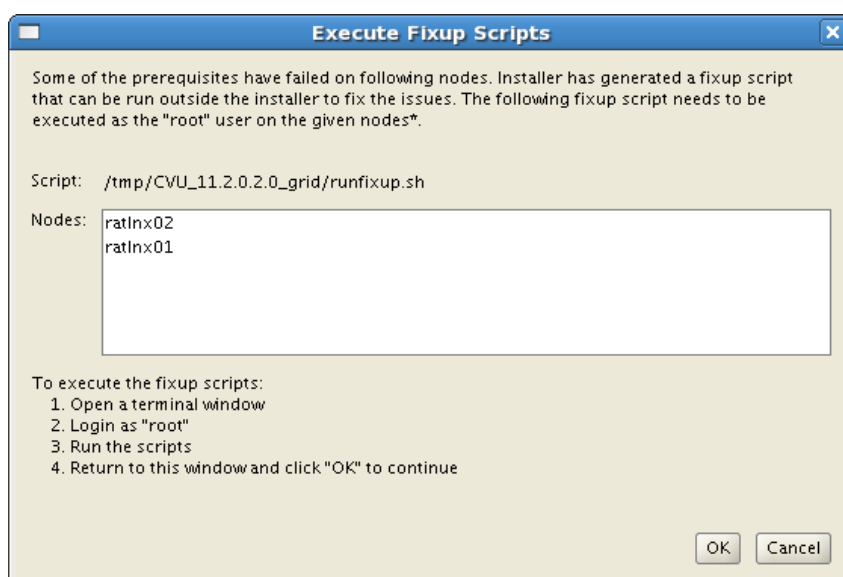


Action:

Check that status of all checks is Succeeded and click 'Next>'

Note:

If you have failed checks marked as 'Fixable' click 'Fix & Check again'. This will bring up the window below:



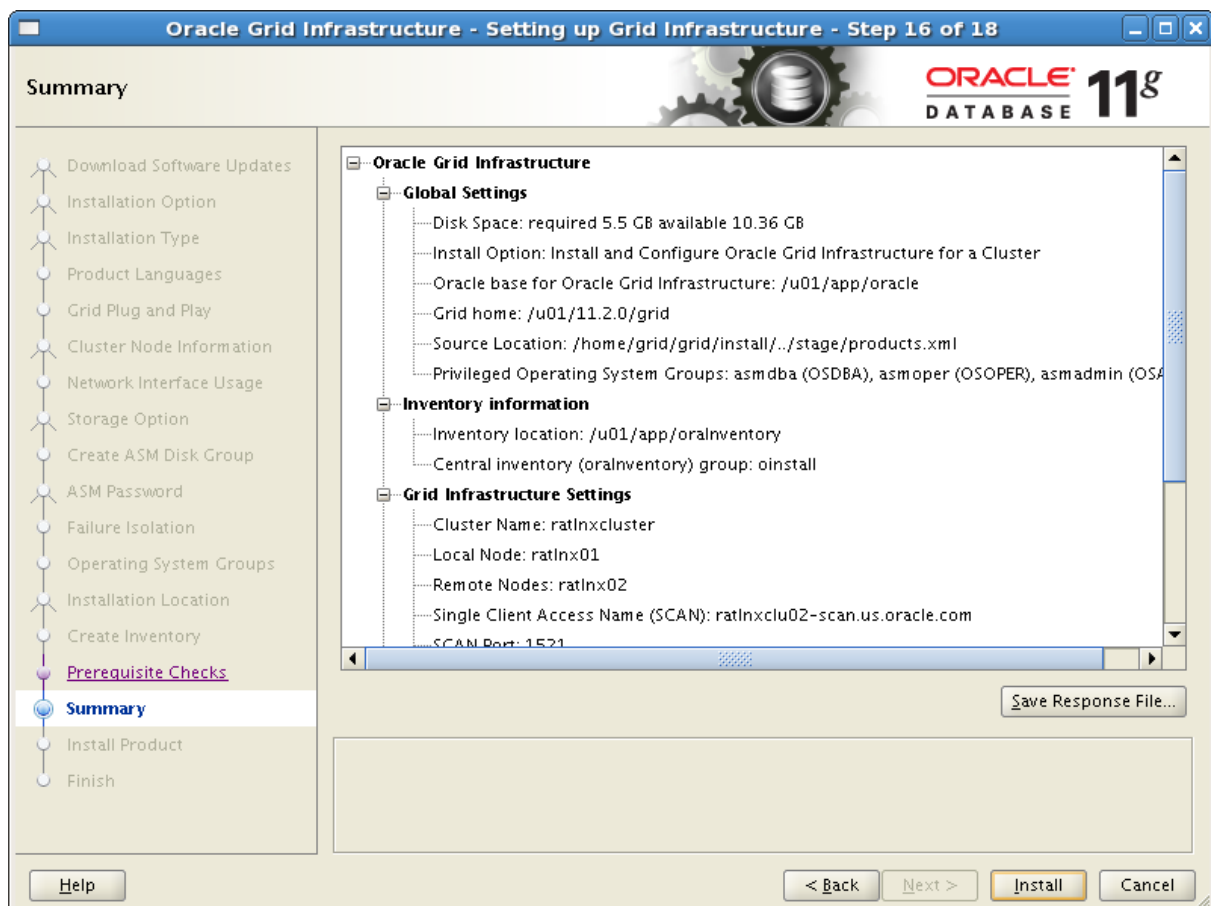
Action:

Execute the runfixup.sh script as described on the screen as root user.

```
root@ratlnx01:/u01/app
File Edit View Terminal Tabs Help
[root@ratlnx01 ~]# cd /u01/app/
[root@ratlnx01 app]# mkdir oraInventory
[root@ratlnx01 app]# chmod -R 775 /u01/app/oraInventory
[root@ratlnx01 app]# chown -R grid:oinstall /u01/app/oraInventory
[root@ratlnx01 app]# /tmp/CVU_11.2.0.2.0_grid/runfixup.sh
/usr/bin/id
Response file being used is :/tmp/CVU_11.2.0.2.0_grid/fixup.response
Enable file being used is :/tmp/CVU_11.2.0.2.0_grid/fixup.enable
Log file location: /tmp/CVU_11.2.0.2.0_grid/orarun.log
Setting Kernel Parameters...
fs.file-max = 51200
fs.file-max = 6815744
fs.aio-max-nr = 1048576
Installing Package /tmp/CVU_11.2.0.2.0_grid/cvuqdisk-1.0.9-1.rpm
Preparing... ##### [100%]
1:cvuqdisk ##### [100%]
[root@ratlnx01 app]#
```

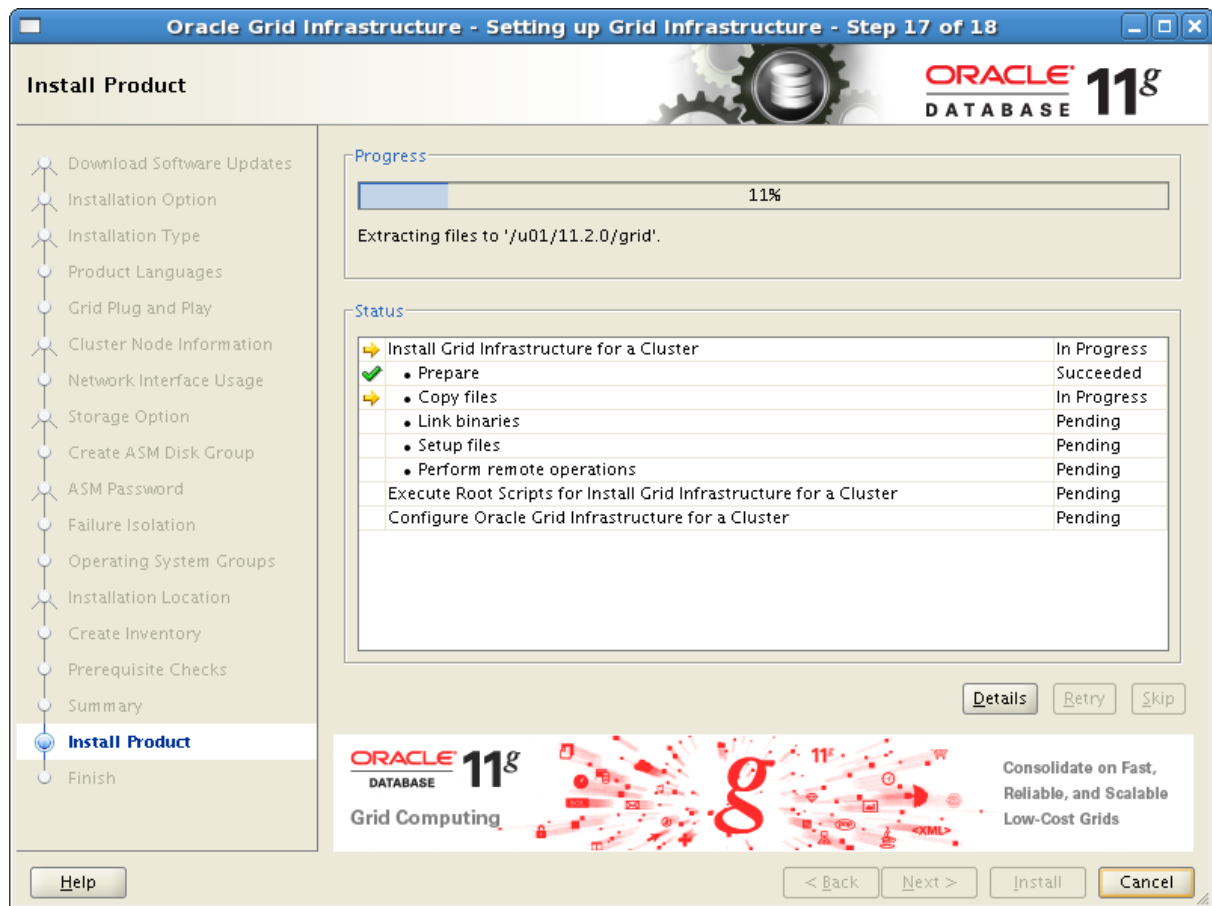
Action:

Install packages that might be missing and correct all other failed checks. If you are sure that the proper configuration is in place for a successful installation, the unsuccessful checks can be ignored. Tick the box 'Ignore All' before you click 'Next>'



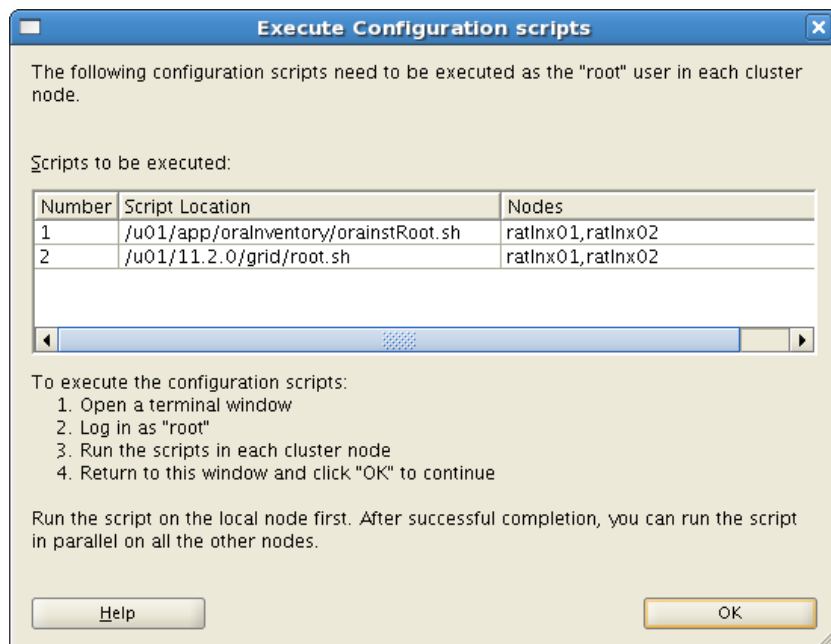
Action:

Click 'Install'



Action:

Wait for the OUI to complete its tasks



Action:

At this point you may need to run oraInstRoot.sh on all cluster nodes (if this is the first installation of an Oracle product on this system).

NOTE: DO NOT run root.sh at this time, we must first install the 11.2.0.2.2 GI PSU (Patch 12311357).

Action:

To apply the 11.2.0.2.2 GI PSU prior to running root.sh the following steps must be performed on EVERY node in the cluster independently. These steps are specific to applying the 11.2.0.2.2 GI PSU prior to running root.sh, this procedure is NOT documented in the 11.2.0.2.2 PSU README. If you have already run root.sh (or rootupgrade.sh) and completed the installation, the PSU must be installed per the instructions provided in the README.

1. Install the latest version of OPatch 11.2 (available under Patch 6880880) into the GI Home:

```
# unzip -d <11.2.0.2GI_HOME> p6880880_112000_Linux-x86-64.zip
```

2. Create an EMPTY directory to stage the GI PSU as the GI software owner (our example uses a directory named gipsu):

```
# mkdir /u01/stage/gipsu
```

3. Extract the GI PSU into the empty stage directory as the GI software owner:

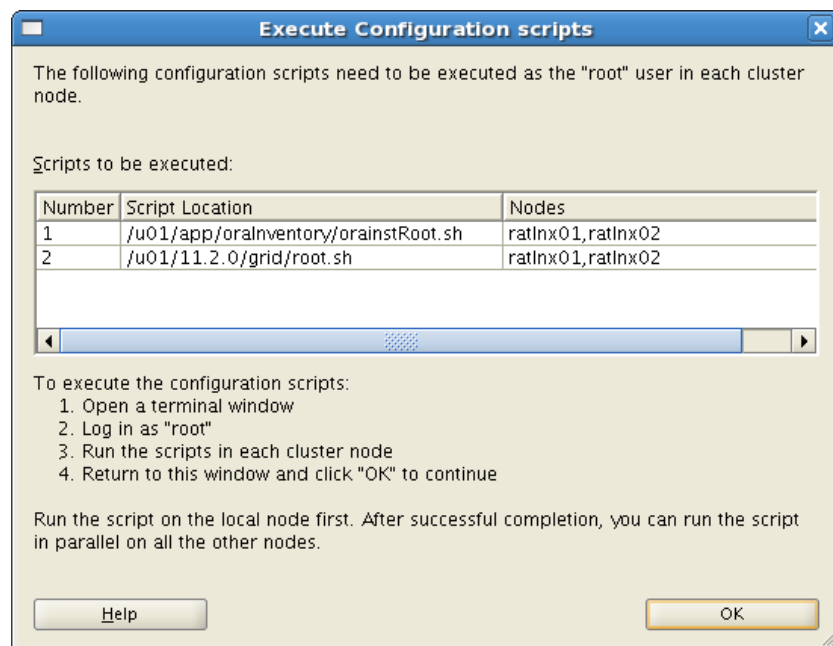
```
# unzip -d /u01/stage/gipsu p12311357_112020_Linux-x86-64.zip
```

4. Apply the GI PSU portion of the patch to the newly installed 11.2.0.2.2 GI Home as the GI software owner using OPatch napply:

```
# <11.2.0.2GI_HOME>/OPatch/patch napply -oh <11.2.0.2GI_HOME> -local /u01/stage/gipsu/12311357
```

```
# <11.2.0.2GI_HOME>/OPatch/patch napply -oh <11.2.0.2GI_HOME> -local /u01/stage/gipsu/11724916
```

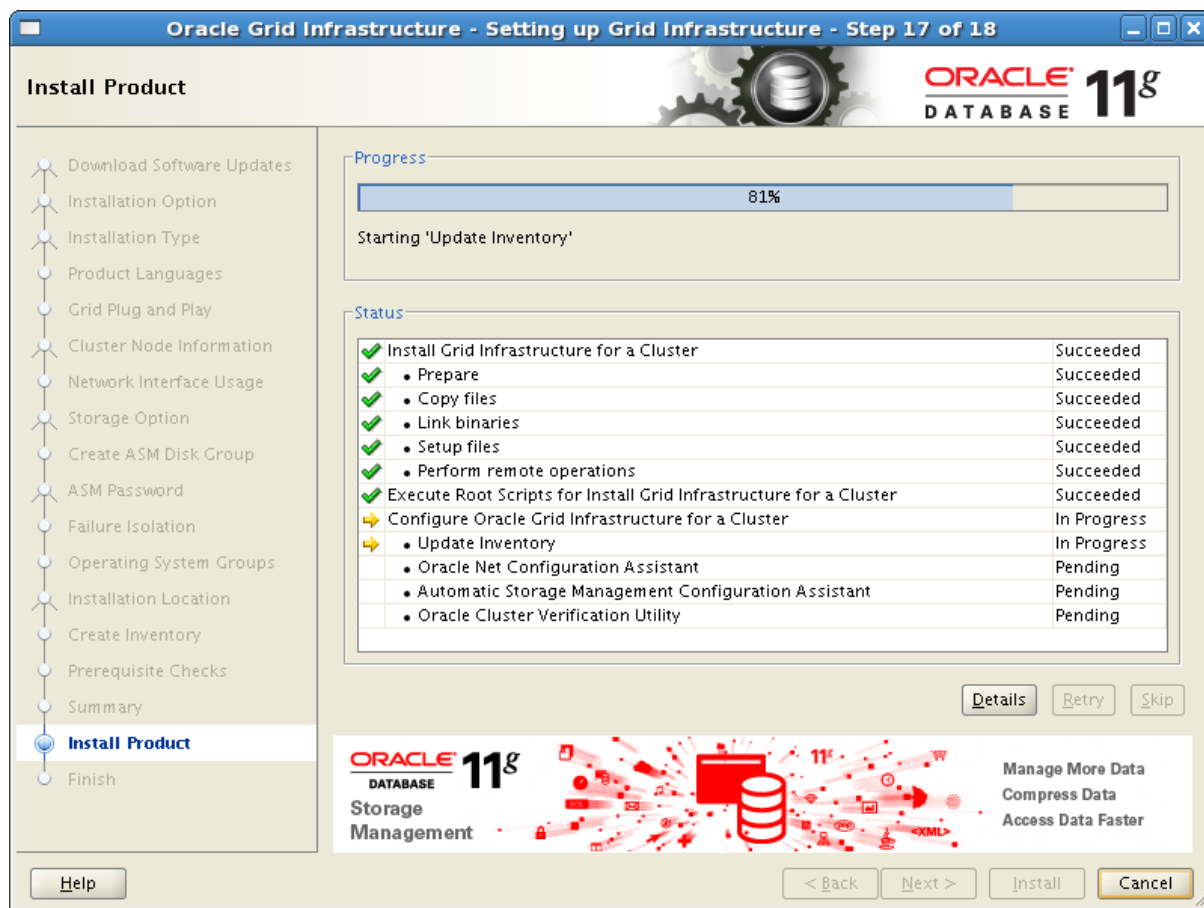
5. Repeat the above steps 1-4 on all cluster nodes



Action:

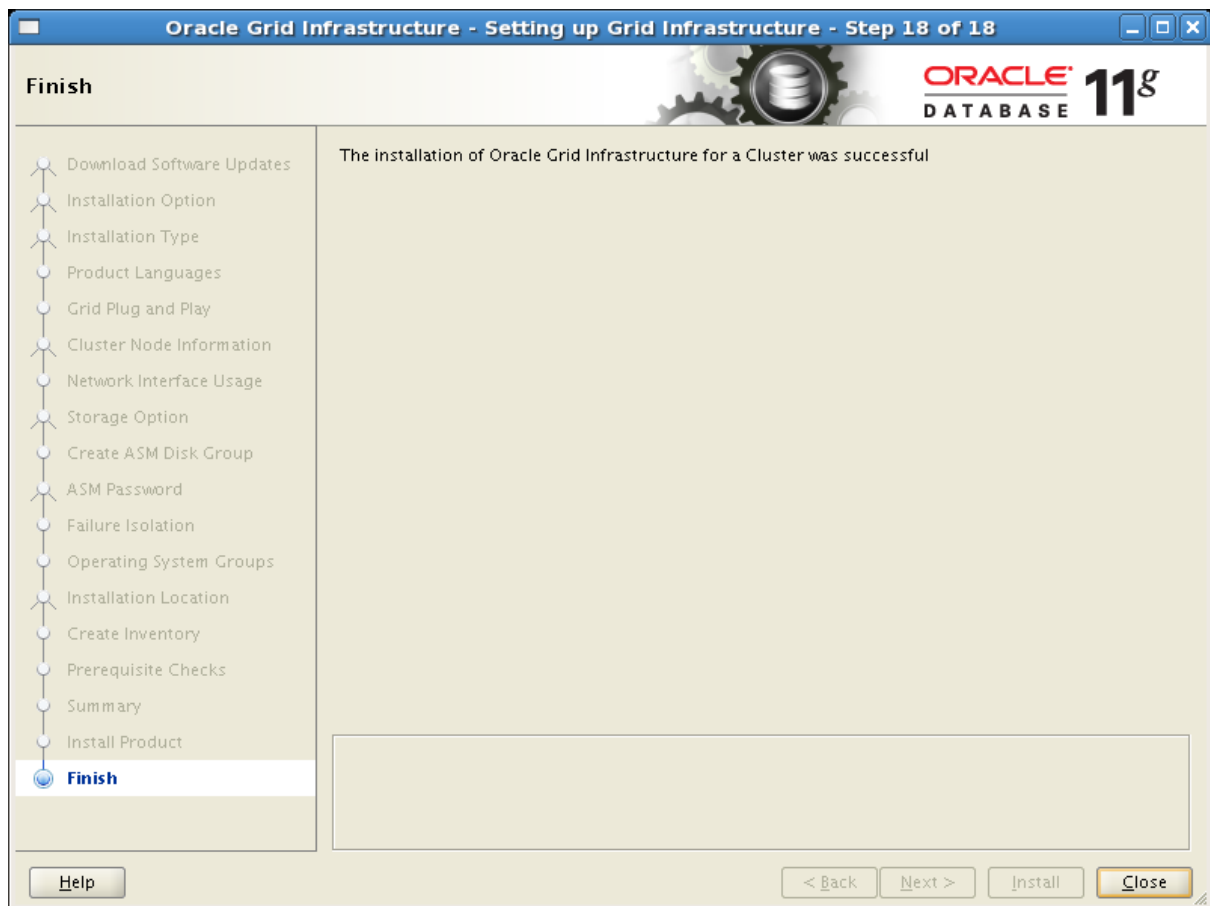
Once the 11.2.0.2.2 GI PSU has been applied to the newly installed GI Home, you can now execute root.sh one node at a time (allowing the current node to complete prior to moving on to the next) as instructed in the

OUI popup window.



Action:

Wait for the OUI to finish the cluster configuration.



Action:

You should see the confirmation that installation of the Grid Infrastructure was successful. Click 'Close' to finish the install.

5. Grid Infrastructure Home Patching

Assuming this RAC Guide was followed, the 11.2.0.2.2 Grid Infrastructure PSU (GI PSU #2) was installed during the Grid Infrastructure 11.2.0.2 install process. For installation of future PSUs (on a configured Grid Infrastructure Installation) you must follow the installation instructions that are contained within that respective PSU README. Information on the latest available PSUs as well as other recommended patches can be found in My Oracle Support ExtNote:756671.1.

6. RDBMS Software Install

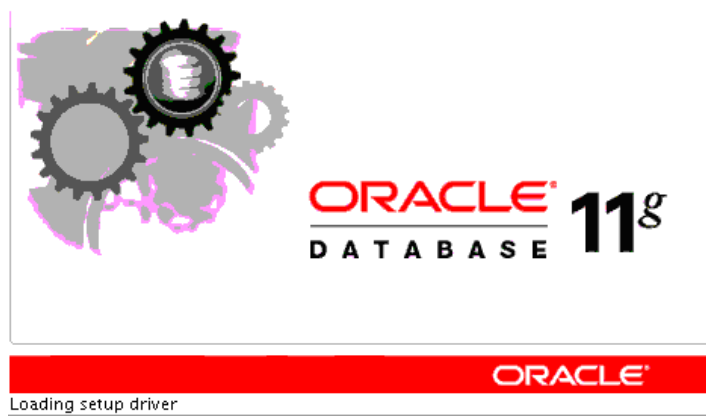
As the oracle user (rdbms software owner) start the installer by running "runInstaller" from the staged installation media.

NOTE: Be sure the installer is run as the intended software owner, the only supported method to change the software owner is to reinstall.

#su - oracle

change into the directory where you staged the RDBMS software

./runInstaller



Oracle Database 11g Release 2 Installer - Installing database - Step 1 of 11

Configure Security Updates

Provide your email address to be informed of security issues, install the product and initiate configuration manager. [View details.](#)

Email:

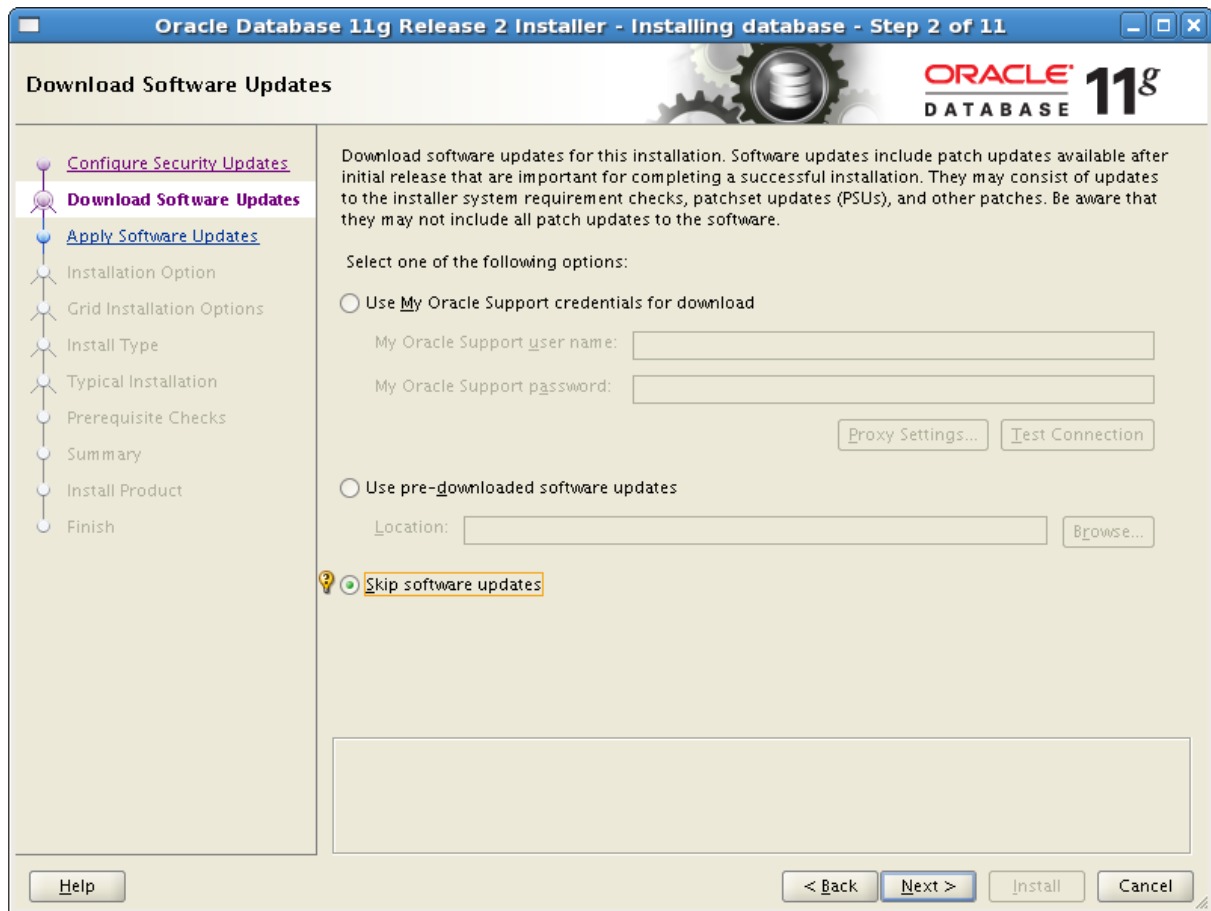
Easier for you if you use your My Oracle Support email address/username.

☐ I wish to receive security updates via My Oracle Support.

My Oracle Support Password:

Action:

Provide your e-mail address, tick the check box and provide your Oracle Support Password if you want to receive Security Updates from Oracle Support and click ' Next> '

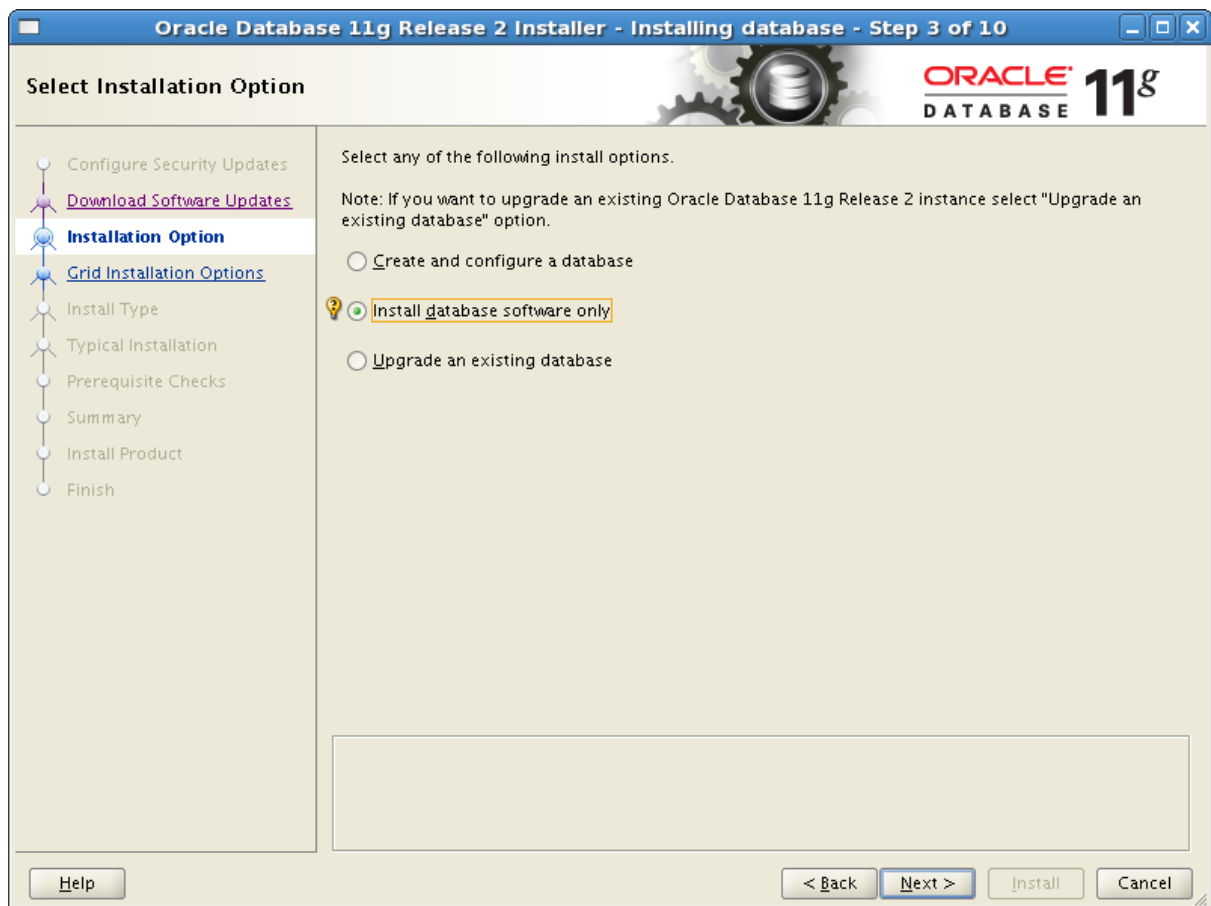


NOTE: This feature allows the installer to download mandatory patches for itself as well as for the base product at installation time so that they do not need to be applied later. It also helps resolve installation issues at the middle of a release without either recutting the media or deferring the bug fix to a later release.

Currently, when there is a bug in the base installation, you have to wait until the next release before it can be fixed. This feature helps resolve installation issues at the middle of a release without either recutting the media or deferring the bug fix to a later release. The feature also applies mandatory patches for the base product, thereby creating more certified installations out-of-box.

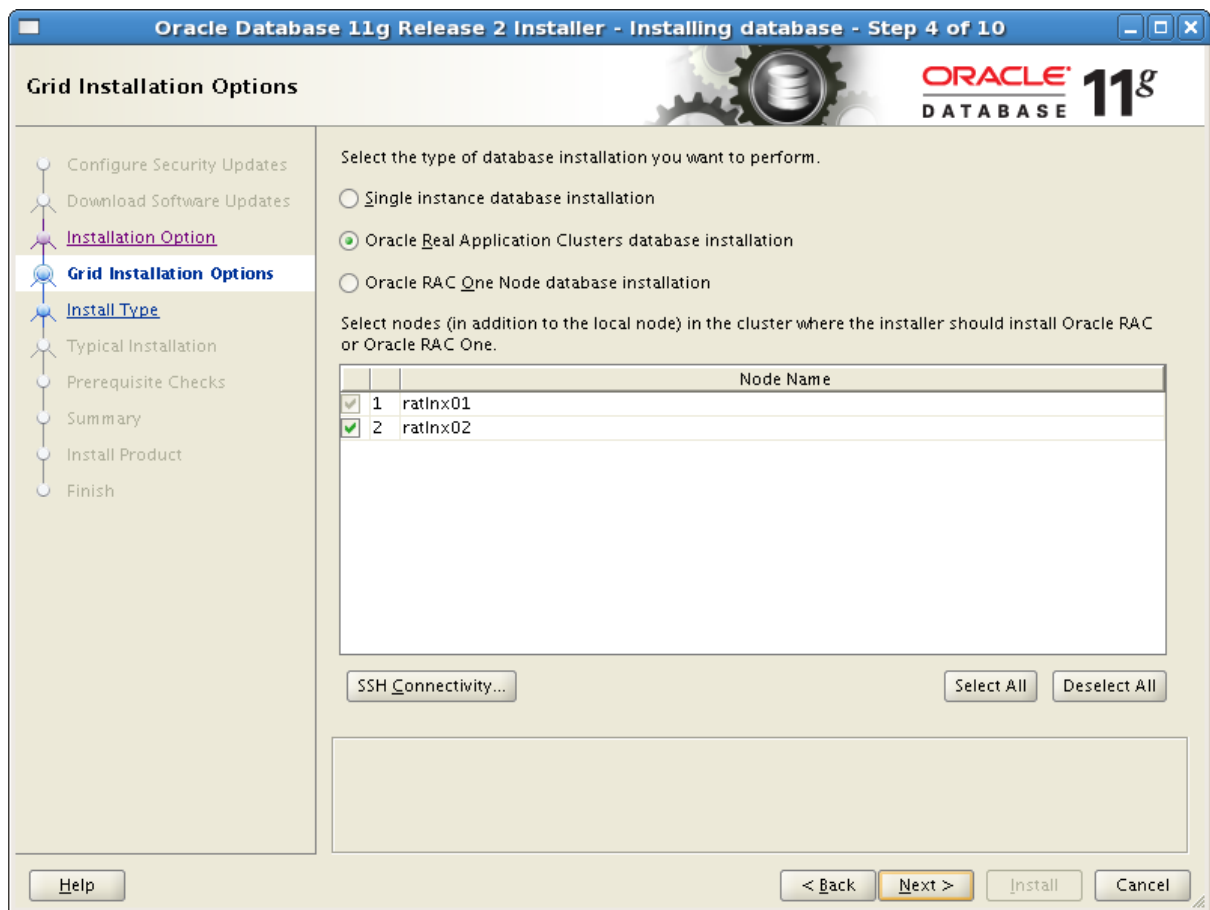
Action:

For this guide we skip the software updates.



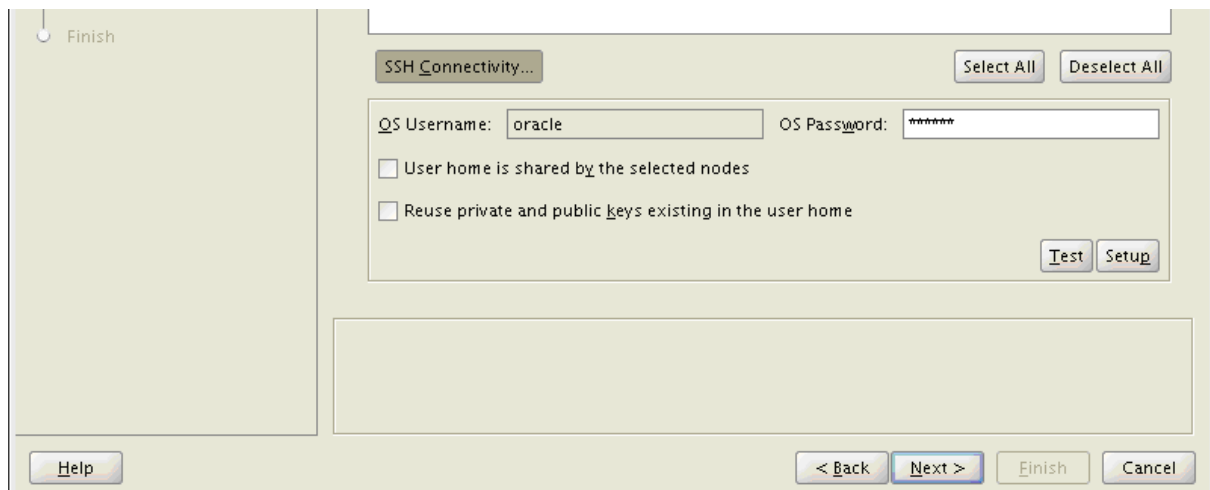
Action:

Select the option 'Install Database software only' and click 'Next> '



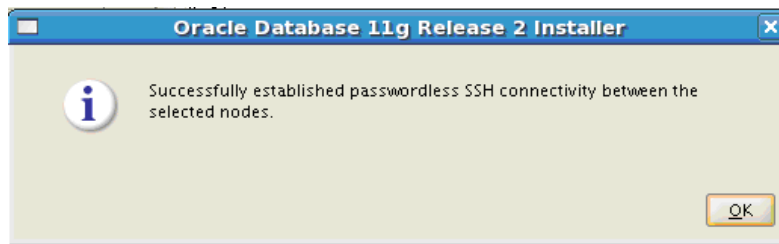
Action:

Select 'Real Application Clusters database installation', and select all nodes. Use the 'SSH Connectivity' button to configure/test the passwordless SSH connectivity between your nodes '



Action:

Type in the OS password for the oracle user and click 'Setup'



Action:

click 'OK' and 'Next'



Action:

To confirm English as selected language click 'Next> '



Action:

Make sure radio button 'Enterprise Edition' is ticked, click 'Next> '



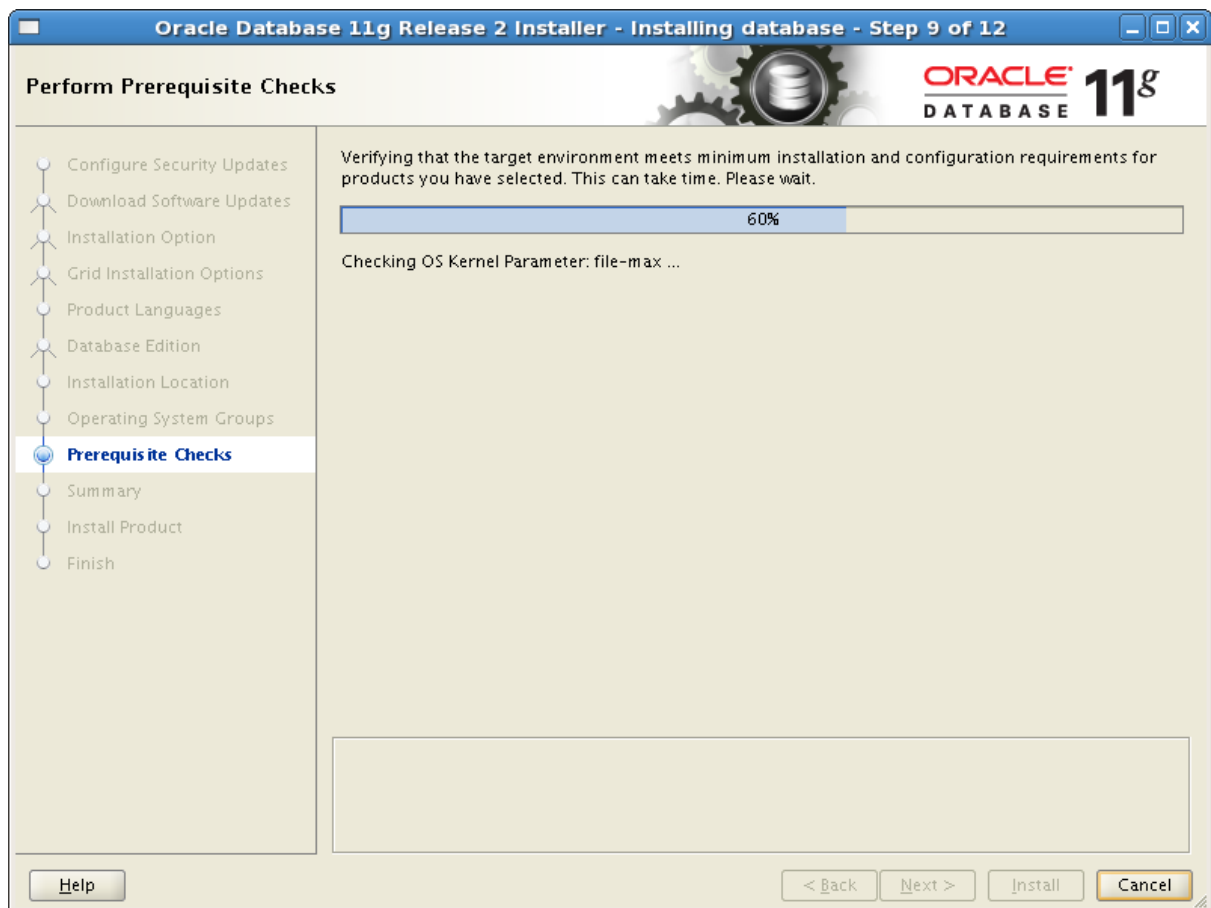
Action:

Specify path to your Oracle Base and below to the location where you want to store the software (Oracle home). Click 'Next>'



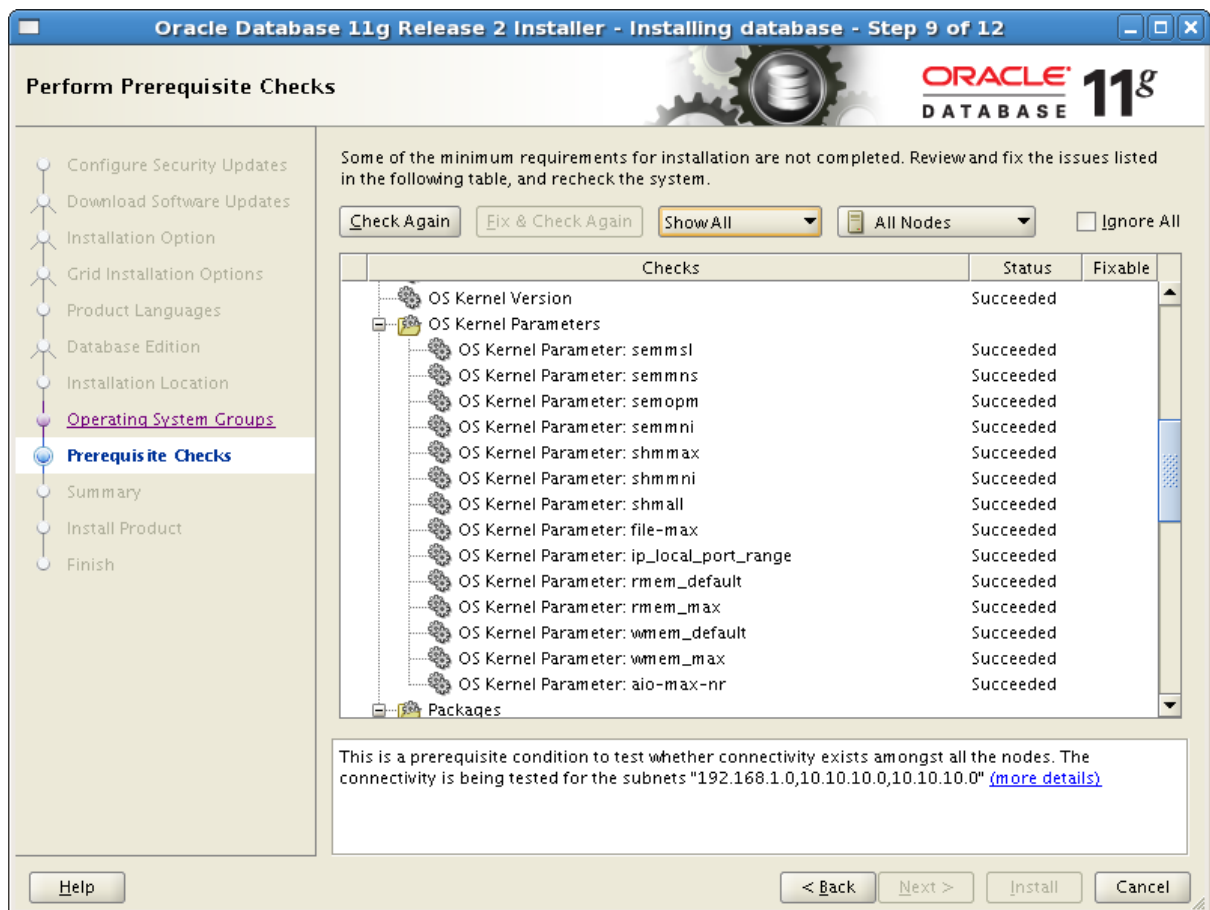
Action:

Use the drop down menu to select the names of the Database Administrators and Database Operators group and click ' Next> '



Note:

Oracle Universal Installer performs prerequisite checks.

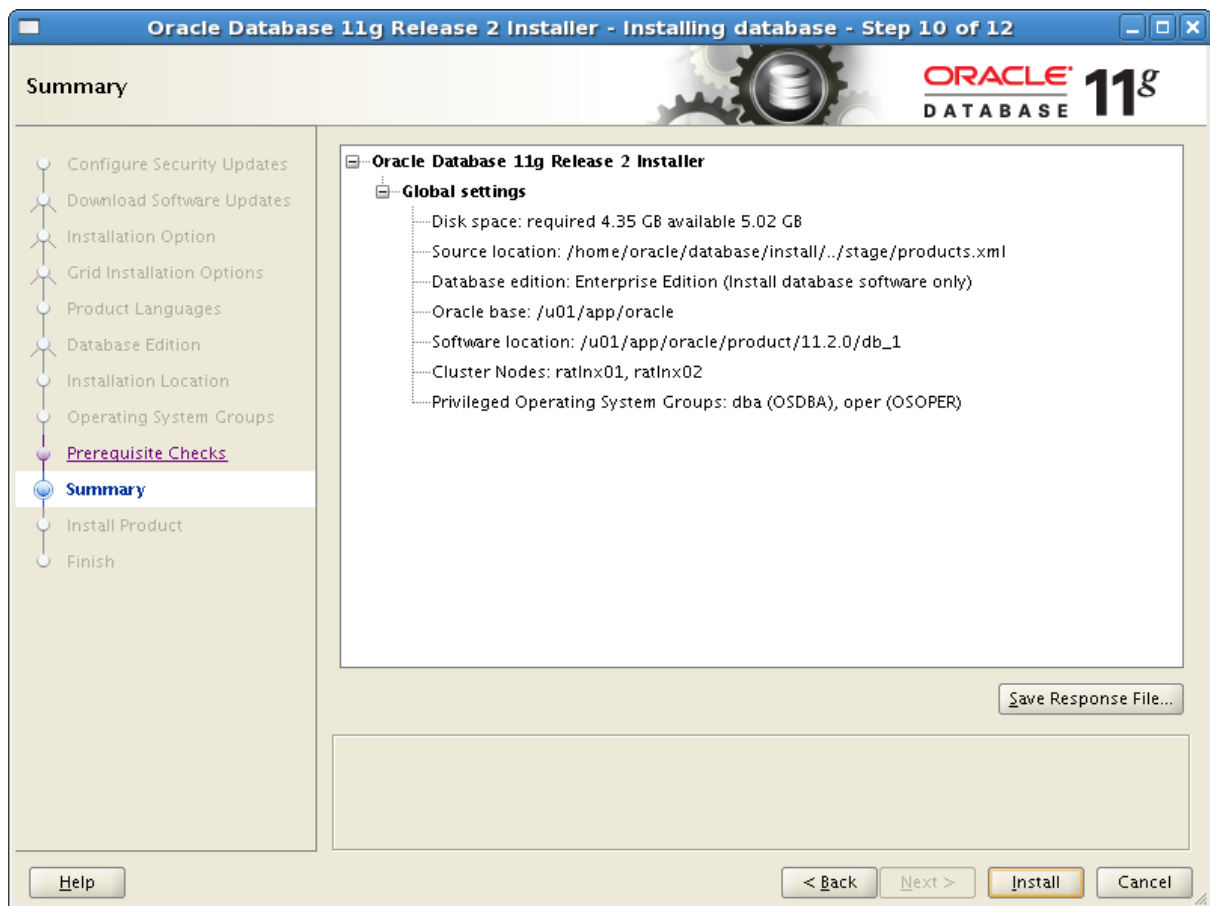


Action:

Check that the status of all checks is 'Succeeded' and click 'Next>'

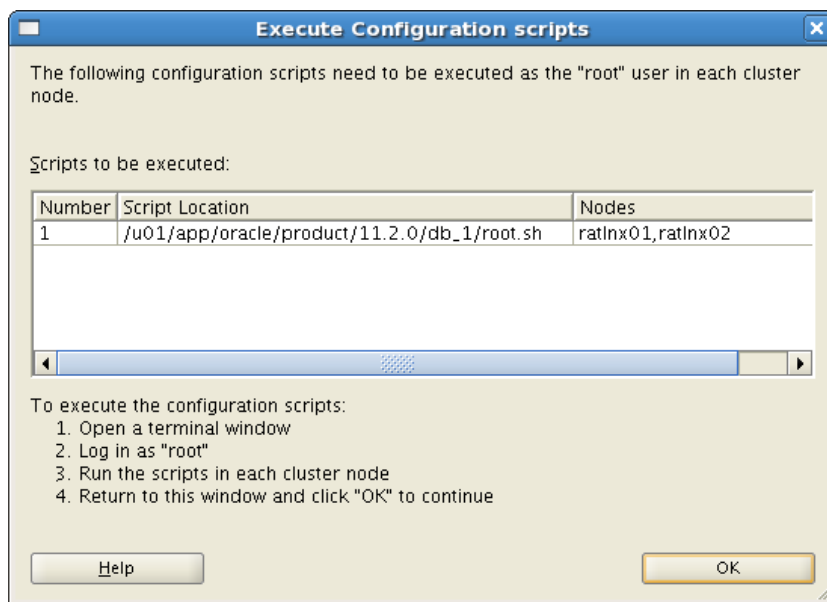
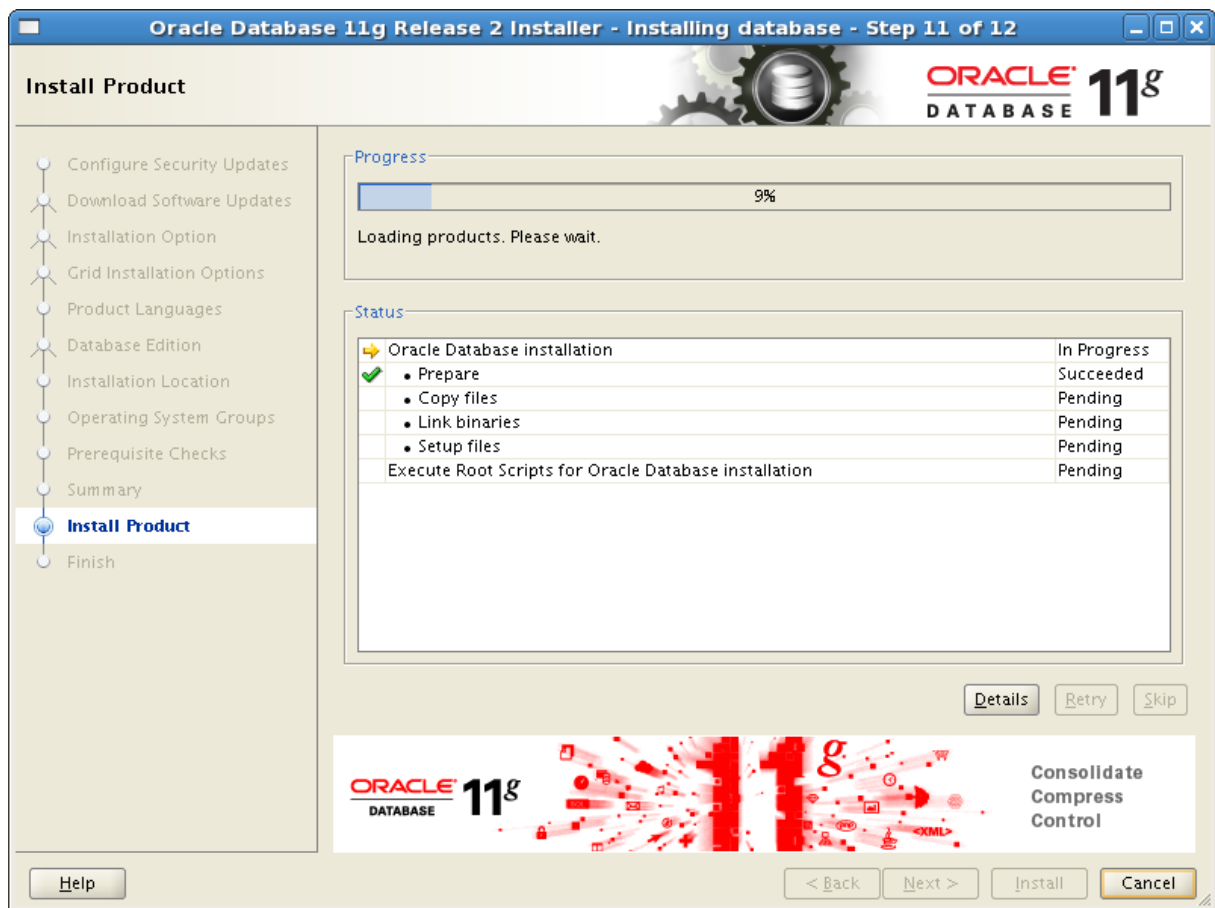
Note:

If you are sure the unsuccessful checks can be ignored tick the box 'Ignore All' before you click 'Next>'



Action:

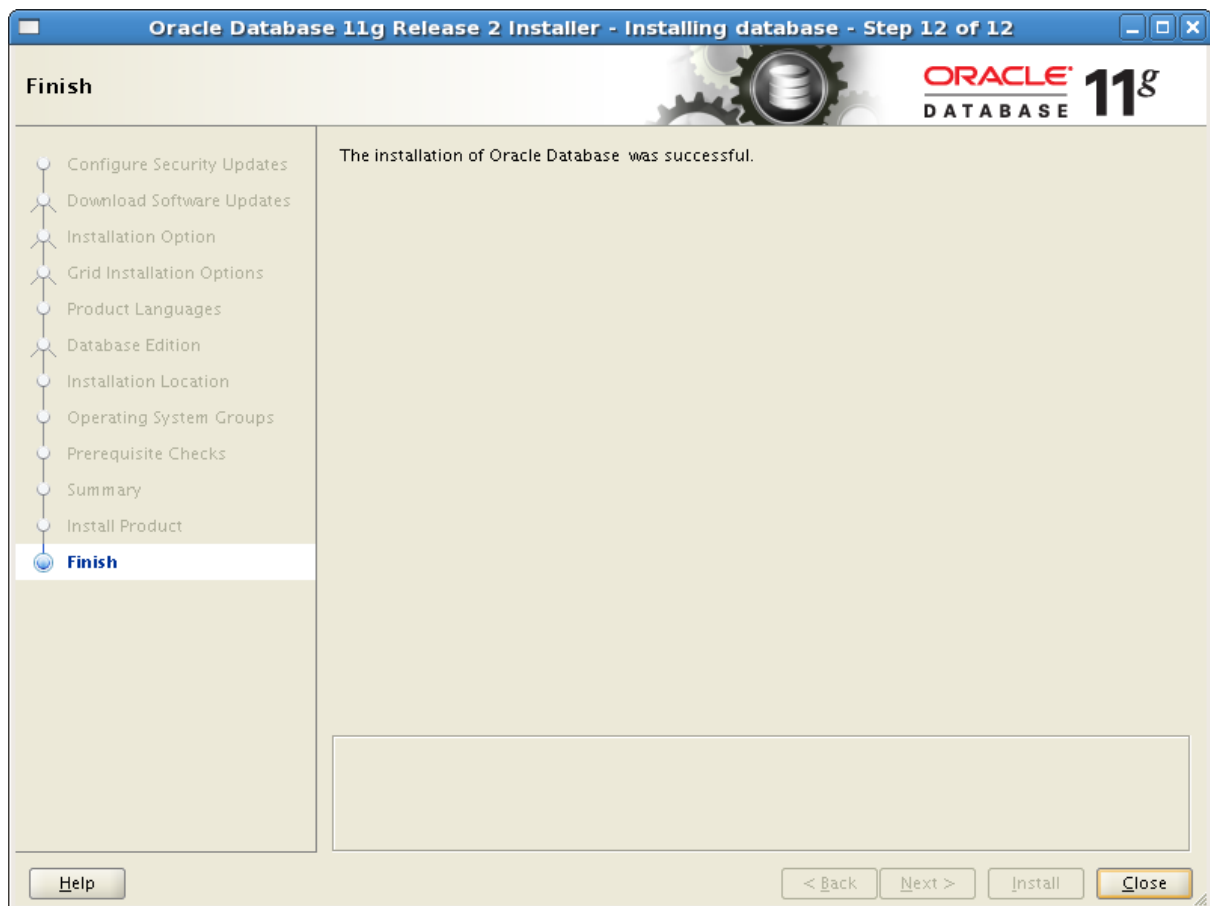
Perform a last check that the information on the screen is correct before you click ' Finish '



Action:

Log in to a terminal window as root user and run the root.sh script on the first node. When finished do the same for all other nodes in your cluster as well. When finished click 'OK'

NOTE: root.sh should be run on one node at a time.



Action:

Click 'Close' to finish the installation of the RDBMS Software.

7. RAC Home Patching

Once the Database software is installed, you will need to apply the 11.2.0.2.2 GI PSU (includes the Database PSU) to the 11.2.0.2 Database Home following the instructions in the GI PSU README. Specifically you will follow section 2 - "Patch Installation and Deinstallation" - Case 2: Patching Oracle RAC Database Homes.

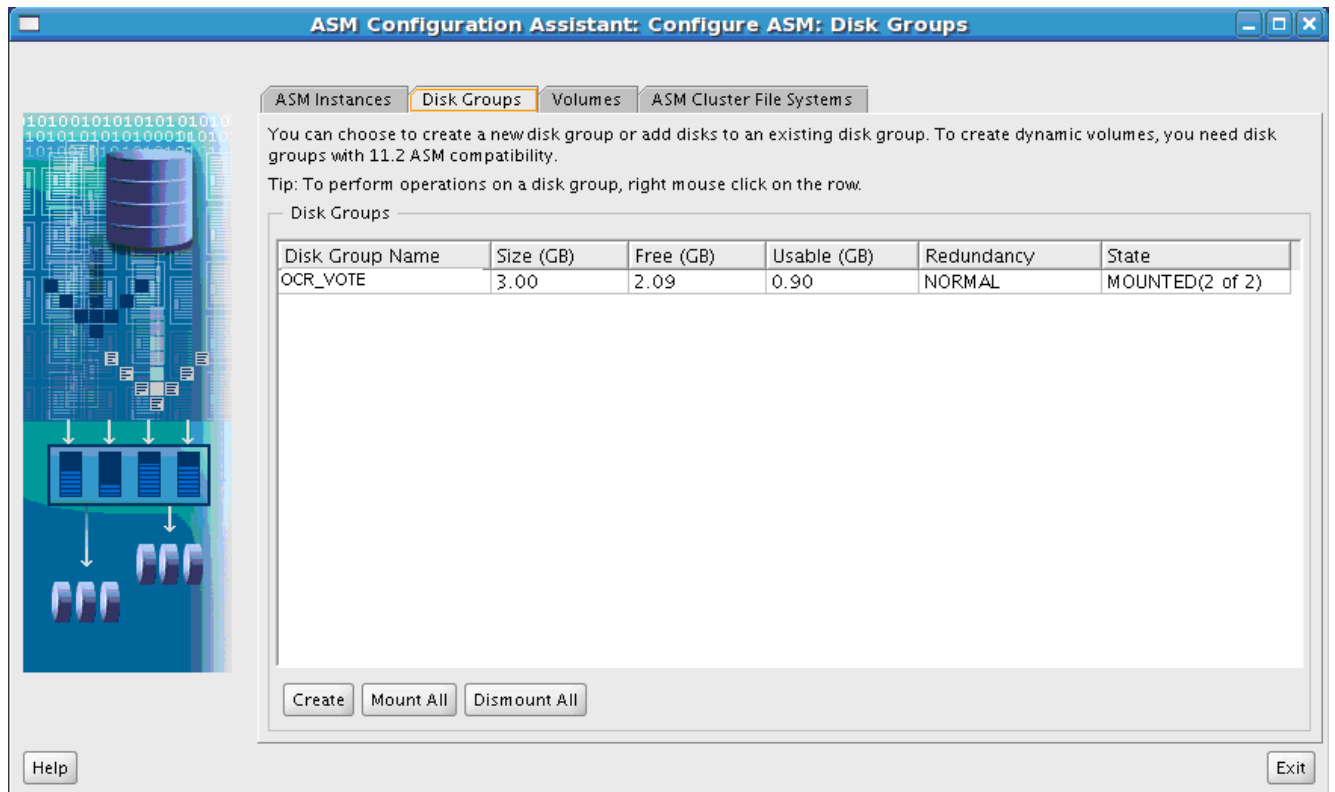
8. Run ASMCA to create diskgroups

As the grid user start the ASM Configuration Assistant (ASMCA)

```
#su - grid
```

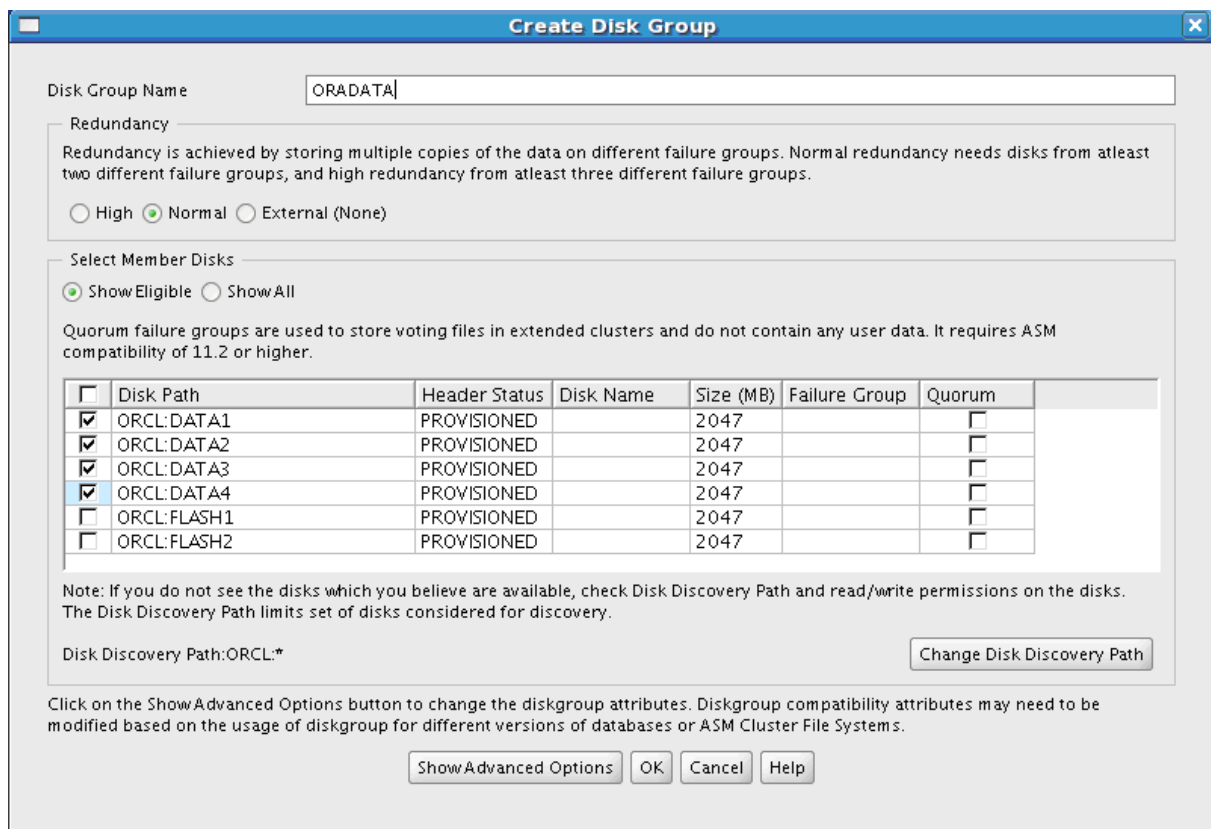
```
cd /u01/11.2.0/grid/bin
```

```
./asmca
```



Action:

Click 'Create' to create a new diskgroup



Action:

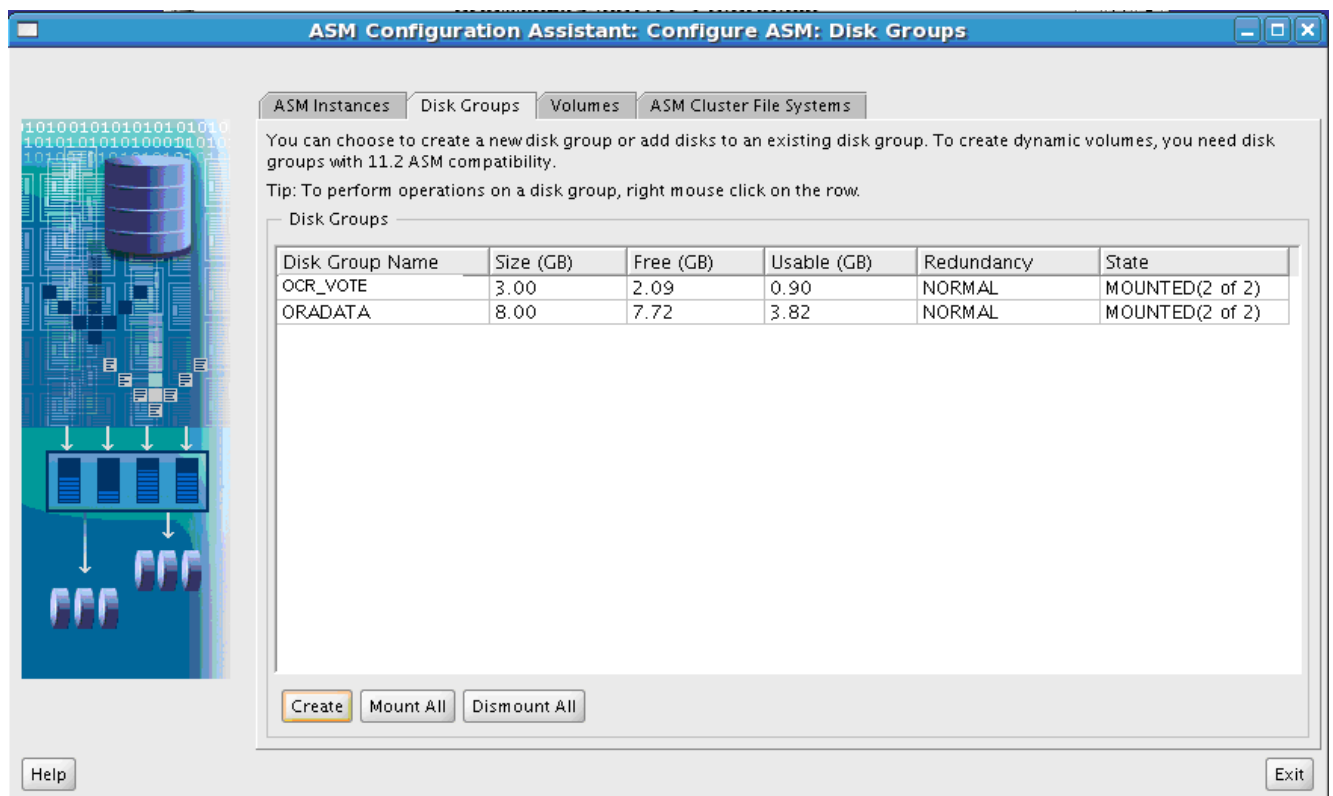
8. Run ASMCA to create diskgroups

Type in a name for the diskgroup, select the redundancy you want to provide and mark the tick box for the disks you want to assign to the new diskgroup.



Action:

Click 'OK'



Action:

Click 'Create' to create the diskgroup for the flash recovery area

Create Disk Group

Disk Group Name:

Redundancy

Redundancy is achieved by storing multiple copies of the data on different failure groups. Normal redundancy needs disks from atleast two different failure groups, and high redundancy from atleast three different failure groups.

☐ High ☒ Normal ☐ External (None)

Select Member Disks

☒ Show Eligible ☐ Show All

Quorum failure groups are used to store voting files in extended clusters and do not contain any user data. It requires ASM compatibility of 11.2 or higher.

<input type="checkbox"/>	Disk Path	Header Status	Disk Name	Size (MB)	Failure Group	Quorum
<input checked="" type="checkbox"/>	ORCL:FLASH1	PROVISIONED		2047		<input type="checkbox"/>
<input checked="" type="checkbox"/>	ORCL:FLASH2	PROVISIONED		2047		<input type="checkbox"/>

Note: If you do not see the disks which you believe are available, check Disk Discovery Path and read/write permissions on the disks. The Disk Discovery Path limits set of disks considered for discovery.

Disk Discovery Path: ORCL:* Change Disk Discovery Path

Click on the Show Advanced Options button to change the diskgroup attributes. Diskgroup compatibility attributes may need to be modified based on the usage of diskgroup for different versions of databases or ASM Cluster File Systems.

Show Advanced Options OK Cancel Help

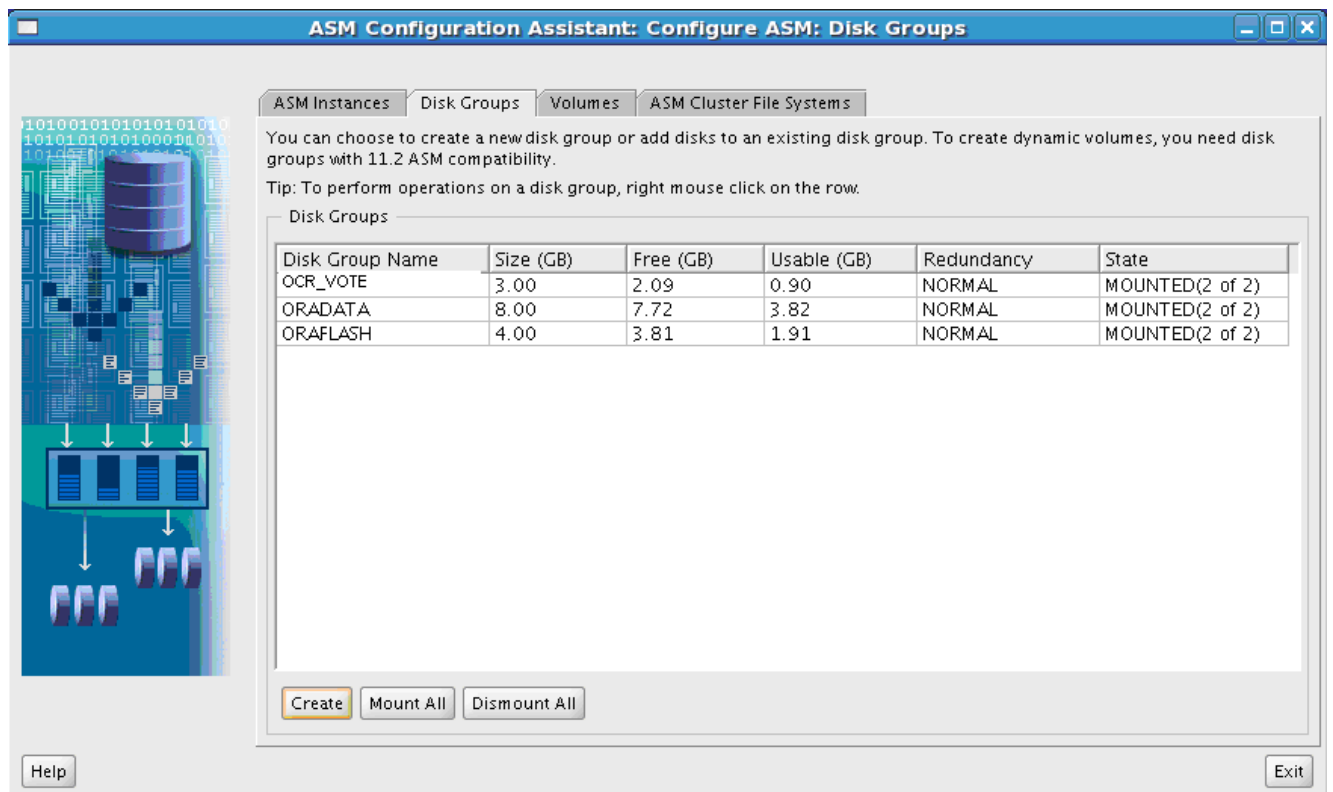
Action:

Type in a name for the diskgroup, select the redundancy you want to provide and mark the tick box for the disks you want to assign to the new diskgroup.



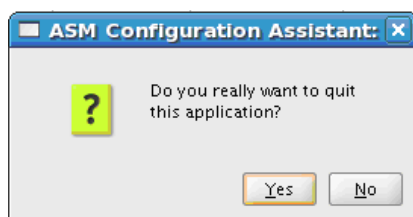
Action:

Click 'OK'



Action:

Click 'Exit'



Action:

Click 'Yes'

Note:

It is Oracle's Best Practice to have an OCR mirror stored in a second diskgroup. To follow this recommendation add an OCR mirror. Mind that you can only have one OCR in a diskgroup.

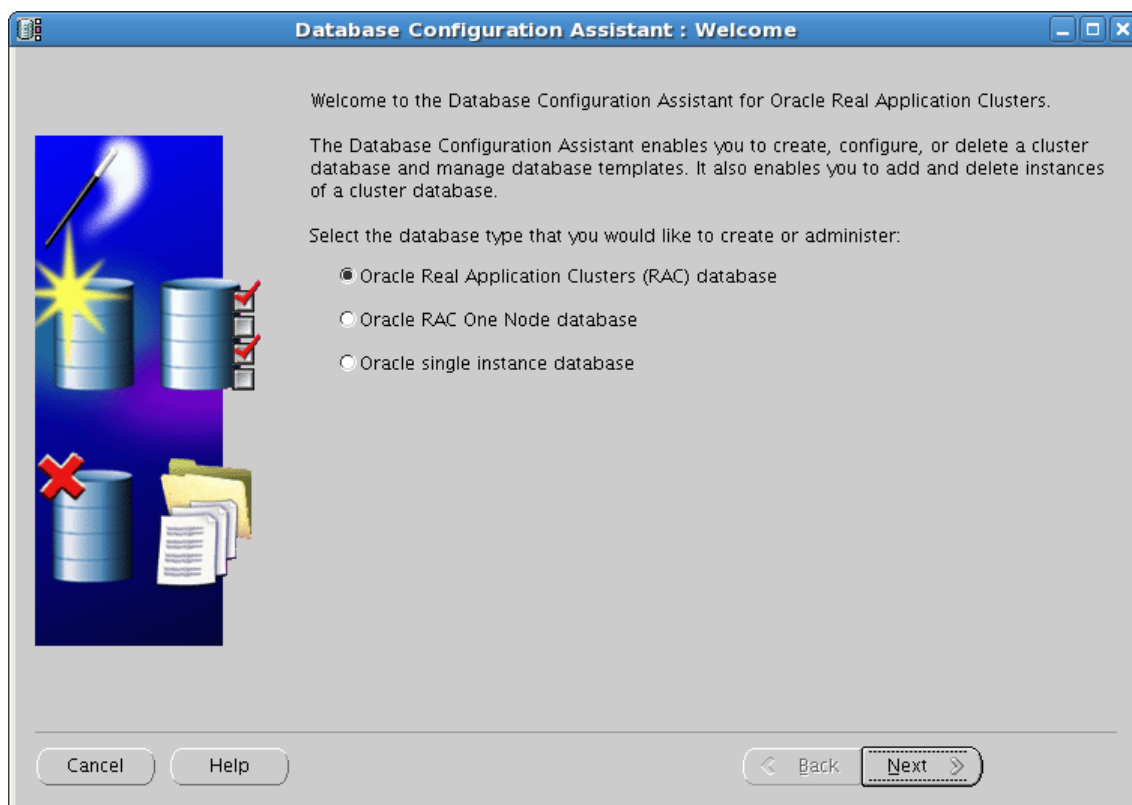
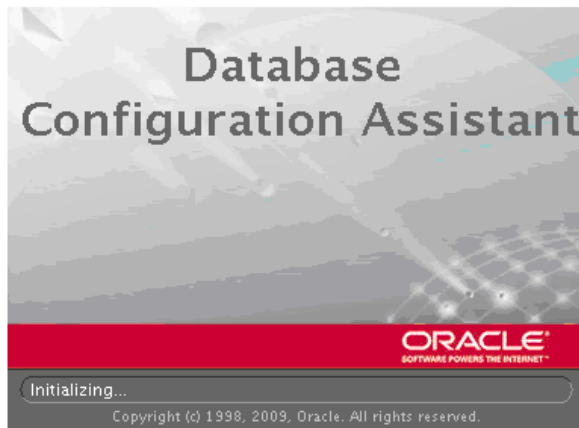
Action:

1. To add OCR mirror to an Oracle ASM diskgroup, ensure that the Oracle Clusterware stack is running and run the following command as root from the GridInfrastructureHome? /bin directory:
2. # ocrconfig -add +ORADATA
3. # ocrcheck

9. Run DBCA to create the database

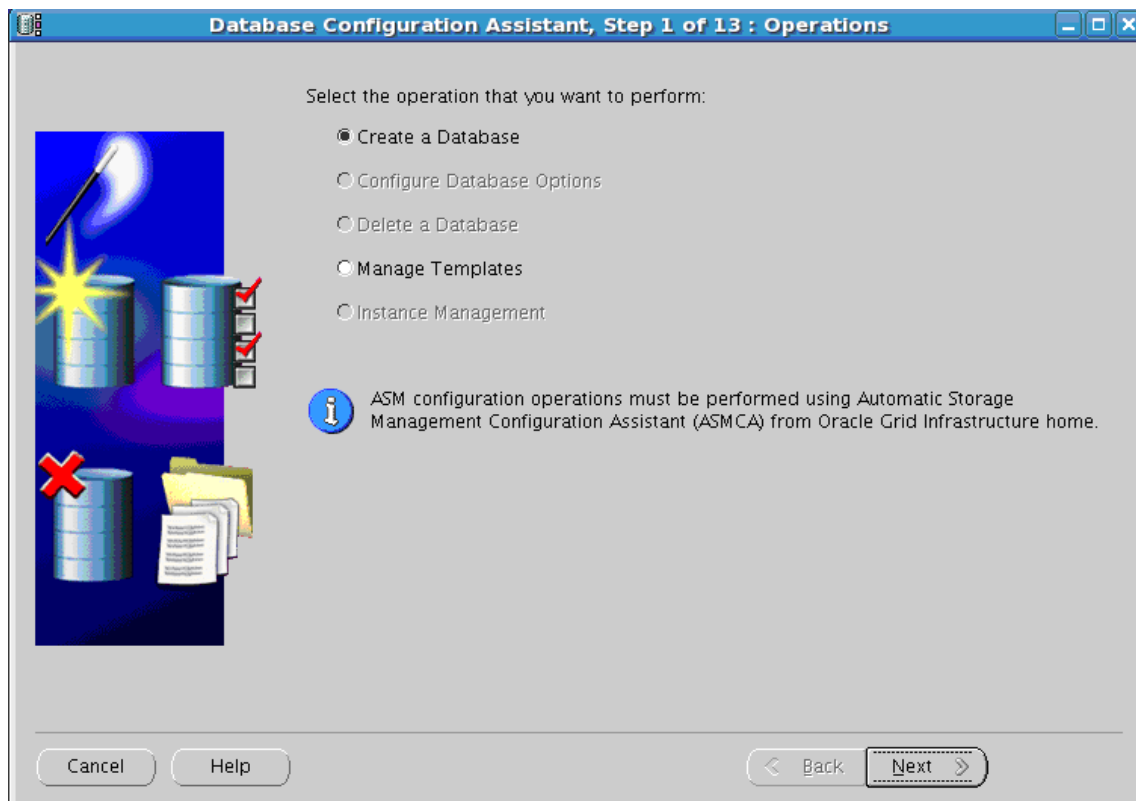
As the oracle user start the Database Configuration Assistant (DBCA)

```
#su - oracle  
cd /u01/app/oracle/product/11.2.0/db_1/bin  
./dbca
```



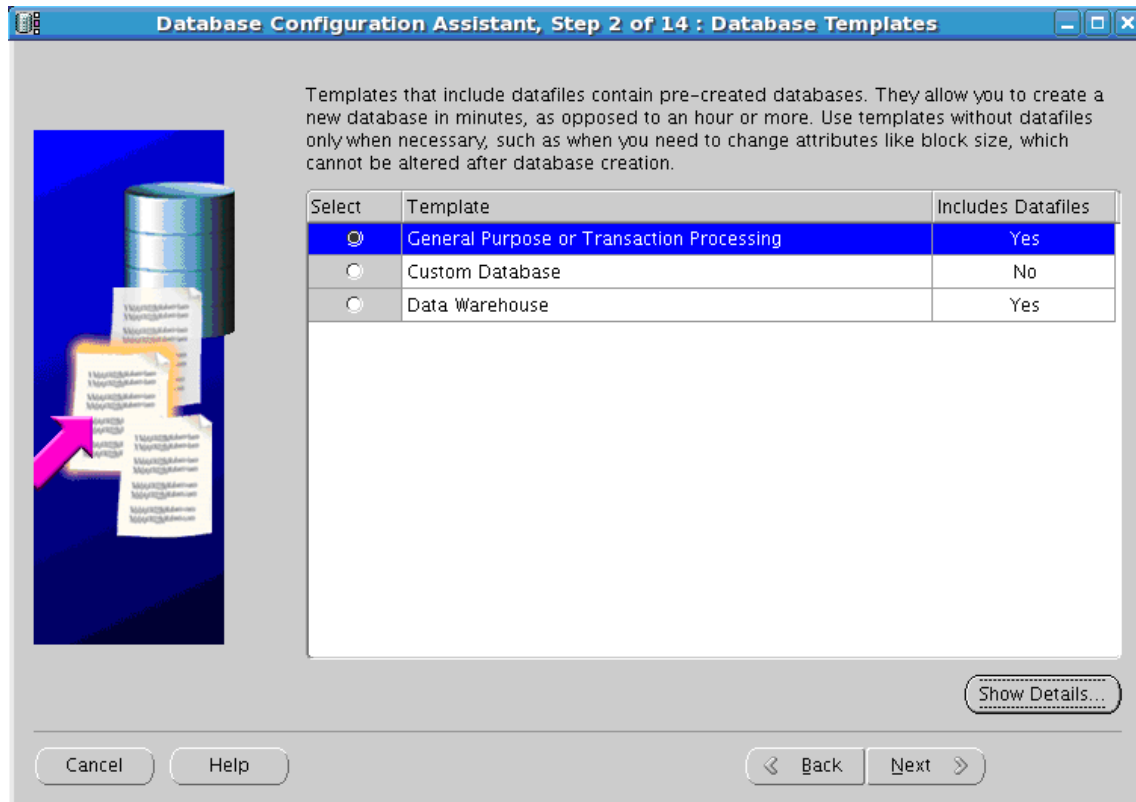
Action:

Select 'Oracle Real Application Clusters database' and click 'Next'



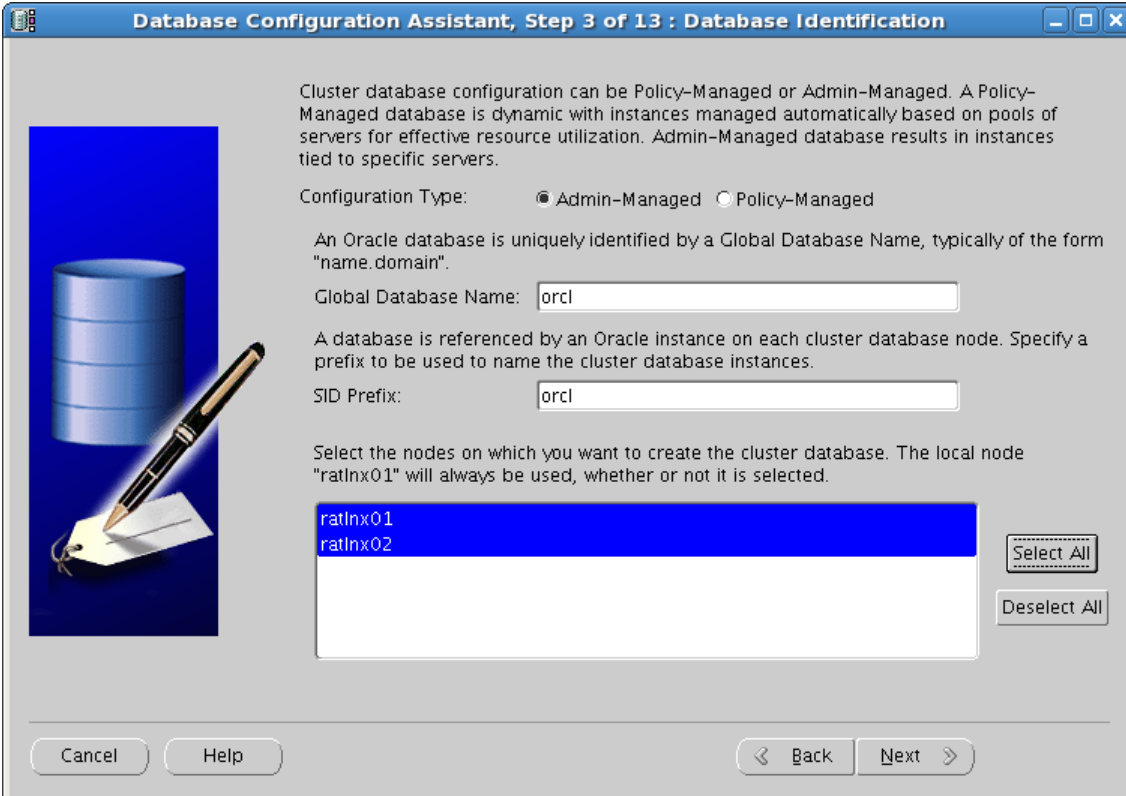
Action:

choose option 'Create a Database' and click 'Next'



Action:

Select the database template that you want to use for your database and click 'Next'



Cluster database configuration can be Policy-Managed or Admin-Managed. A Policy-Managed database is dynamic with instances managed automatically based on pools of servers for effective resource utilization. Admin-Managed database results in instances tied to specific servers.

Configuration Type: ☒ Admin-Managed ☐ Policy-Managed

An Oracle database is uniquely identified by a Global Database Name, typically of the form "name.domain".

Global Database Name:

A database is referenced by an Oracle instance on each cluster database node. Specify a prefix to be used to name the cluster database instances.

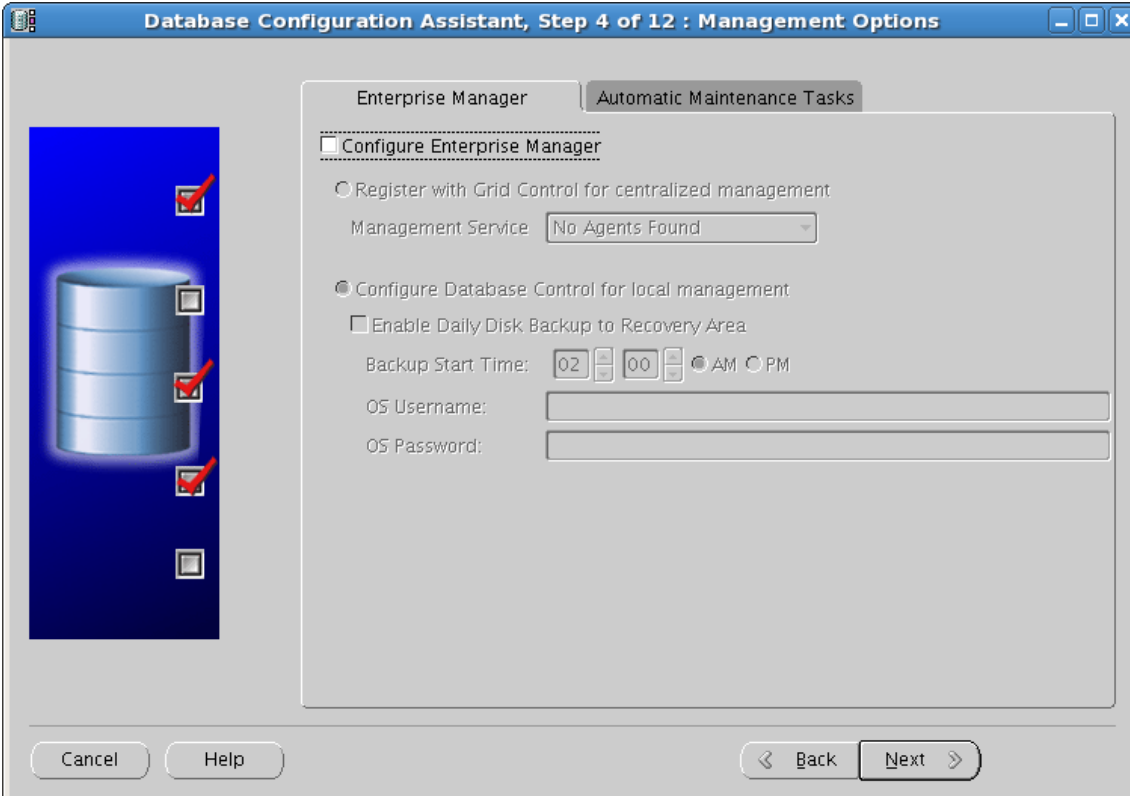
SID Prefix:

Select the nodes on which you want to create the cluster database. The local node "ratlnx01" will always be used, whether or not it is selected.

ratlnx01	<input checked="" type="checkbox"/>
ratlnx02	<input checked="" type="checkbox"/>

Action:

Type in the name you want to use for your database and select all nodes before you click 'Next'



Enterprise Manager **Automatic Maintenance Tasks**

☐ Configure Enterprise Manager

☐ Register with Grid Control for centralized management

Management Service:

☒ Configure Database Control for local management

☐ Enable Daily Disk Backup to Recovery Area

Backup Start Time: ☒ AM ☐ PM

OS Username:

OS Password:

Action:

select the options you want to use to manage your database and click 'Next'

Database Configuration Assistant, Step 5 of 12 : Database Credentials

For security reasons, you must specify passwords for the following user accounts in the new database.

☐ Use Different Administrative Passwords

User Name	Password	Confirm Password
SYS		
SYSTEM		

☒ Use the Same Administrative Password for All Accounts

Password:

Confirm Password:

Cancel Help < Back Next >

Action:

Type in the passwords you want to use and click 'Next'

Database Configuration Assistant, Step 6 of 12 : Database File Locations

Specify storage type and locations for database files.

Storage Type:

Storage Locations:


☐ Use Database File Locations from Template

☐ Use Common Location for All Database Files

Database Files Location: Browse...

☒ Use Oracle-Managed Files

Database Area: Browse...

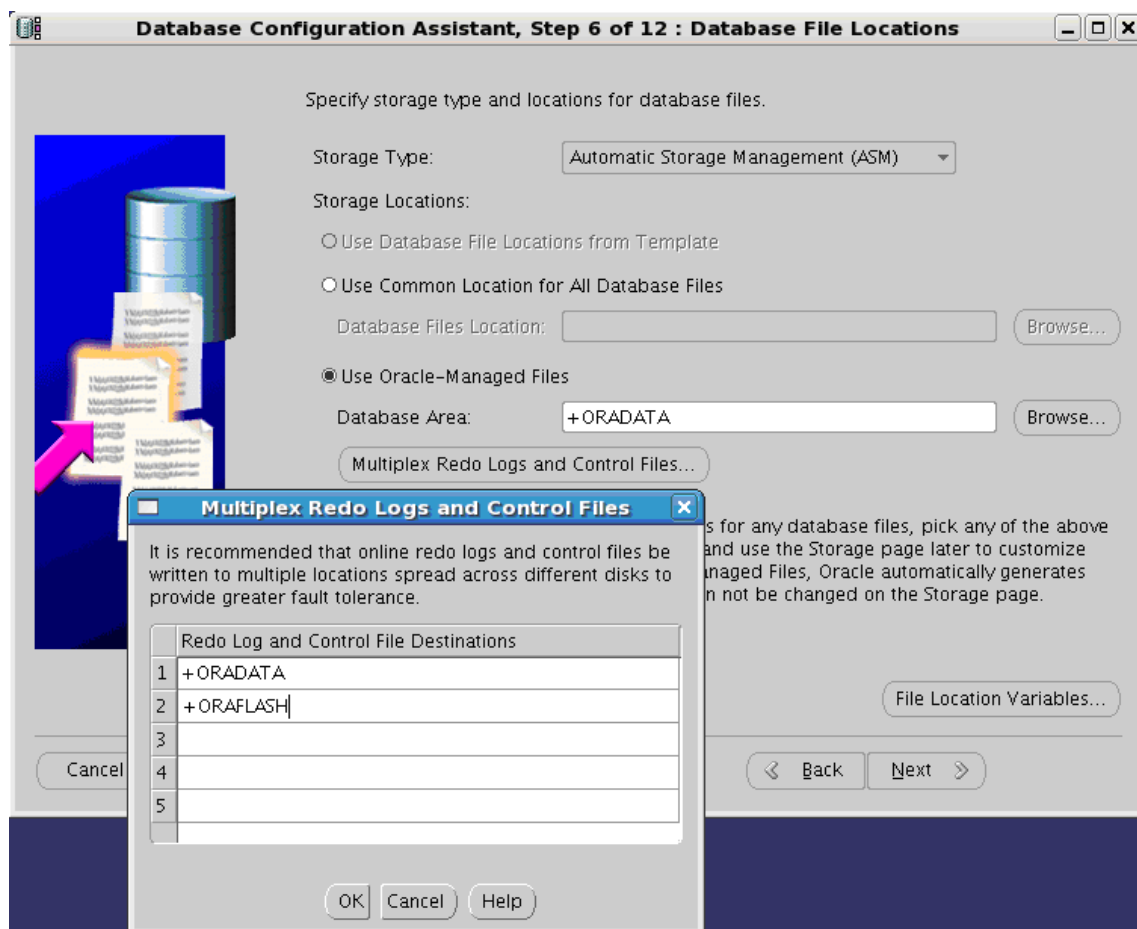
 If you want to specify different locations for any database files, pick any of the above options except Oracle-Managed Files and use the Storage page later to customize each file location. If you use Oracle-Managed Files, Oracle automatically generates the names for database files, which can not be changed on the Storage page.

File Location Variables...

Cancel Help < Back Next >

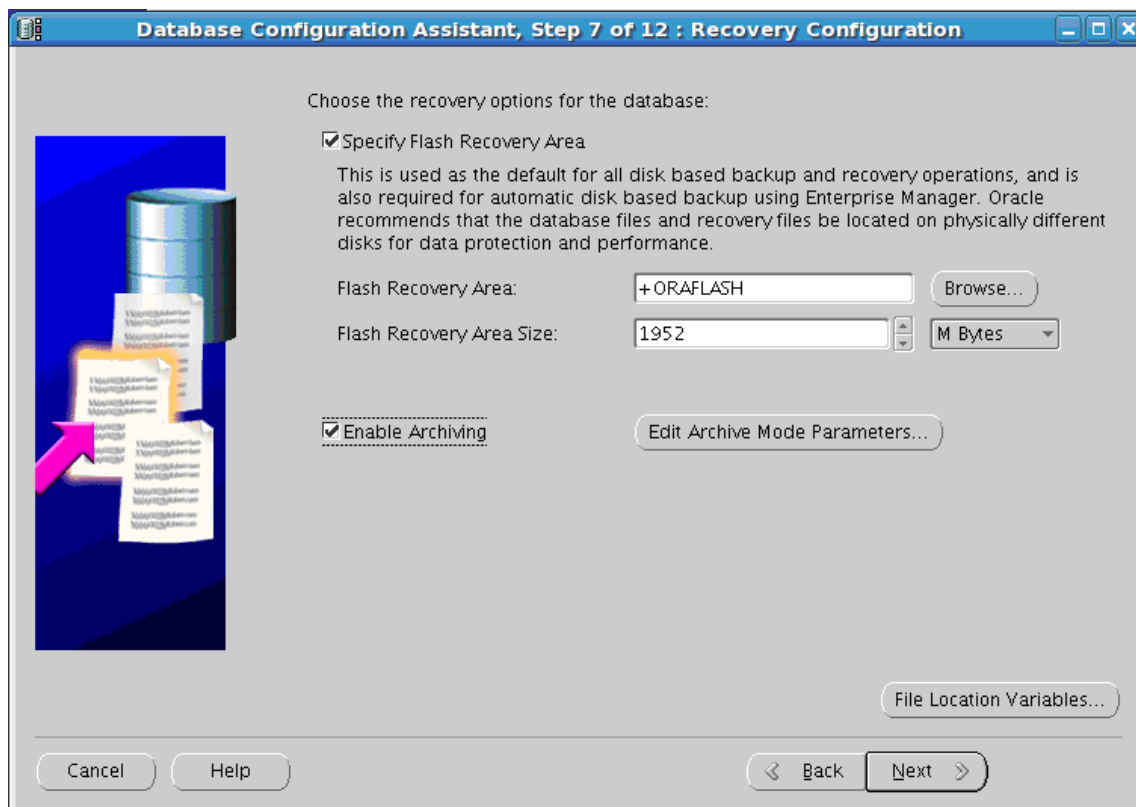
Action:

Select the diskgroup you created for the database files and click 'Multiplex Redo Logs and Control Files'. In the popup window define the diskgroup that should contain controlfiles and redo logfiles and the diskgroup that should contain the mirrored files.



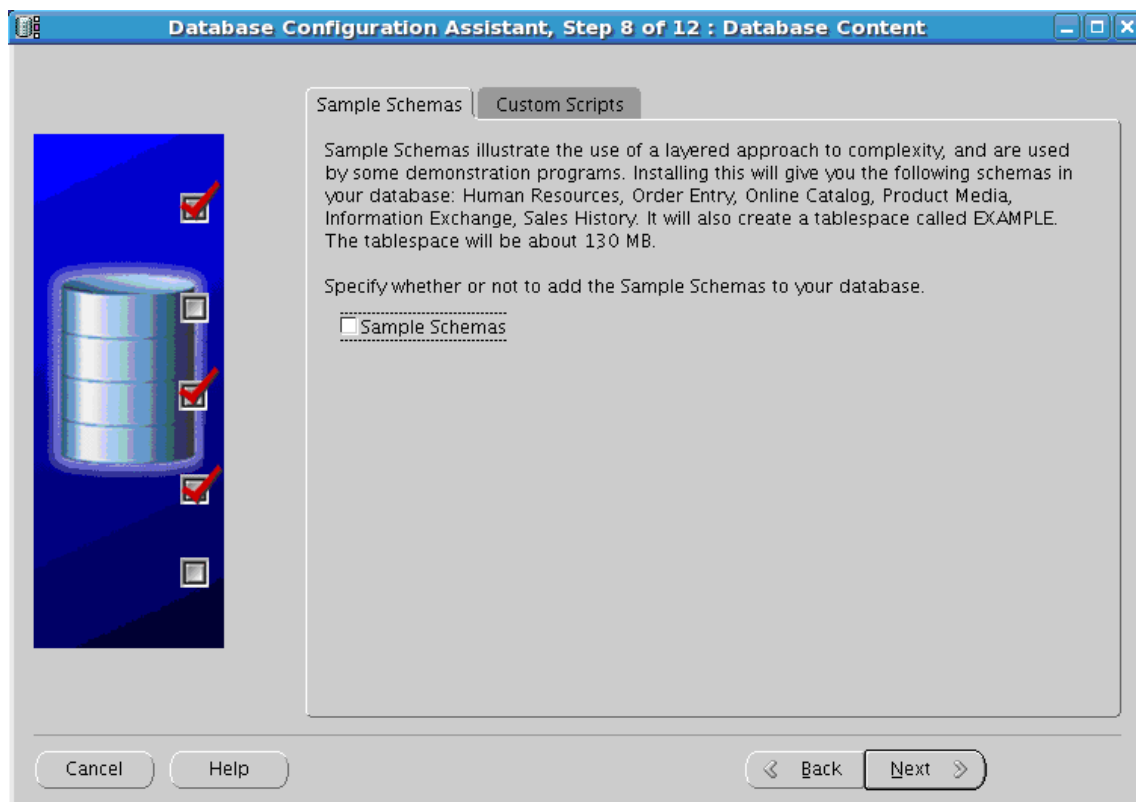
Action:

When all file destinations are correct click 'Next'



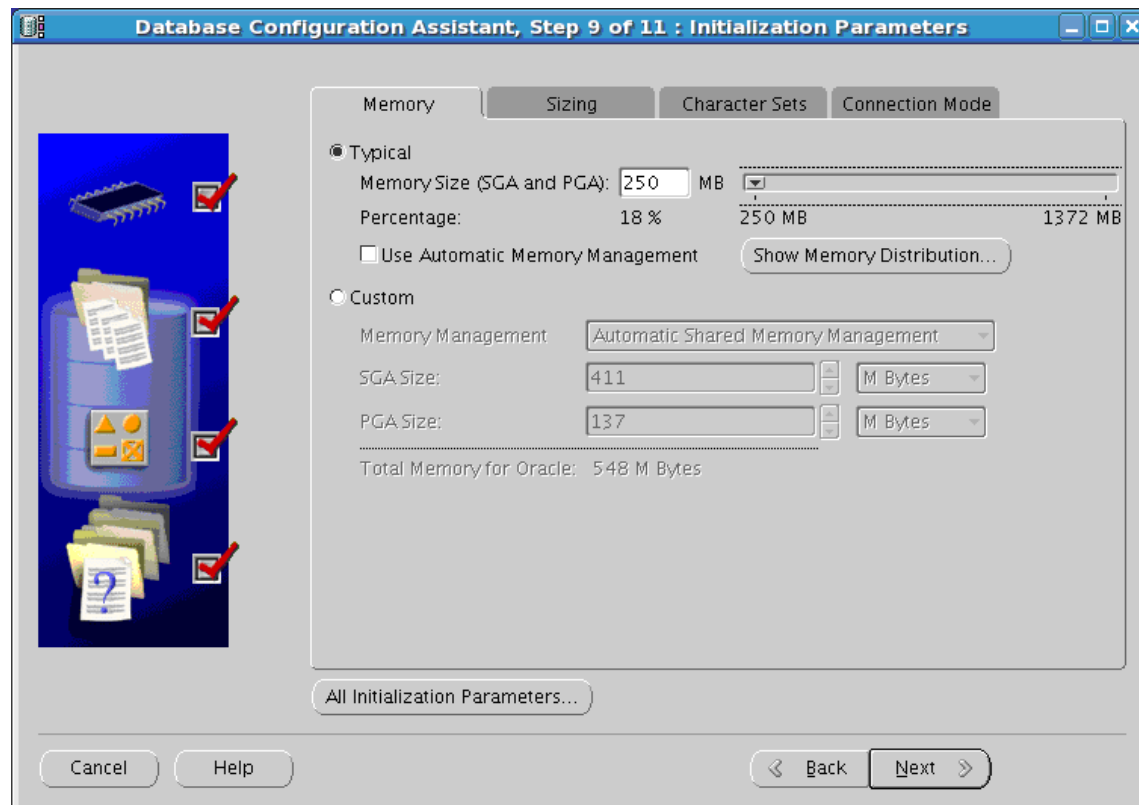
Action:

Specify the diskgroup that was created for the flash recovery area and define the size. If the size is smaller than recommended a warning will popup.



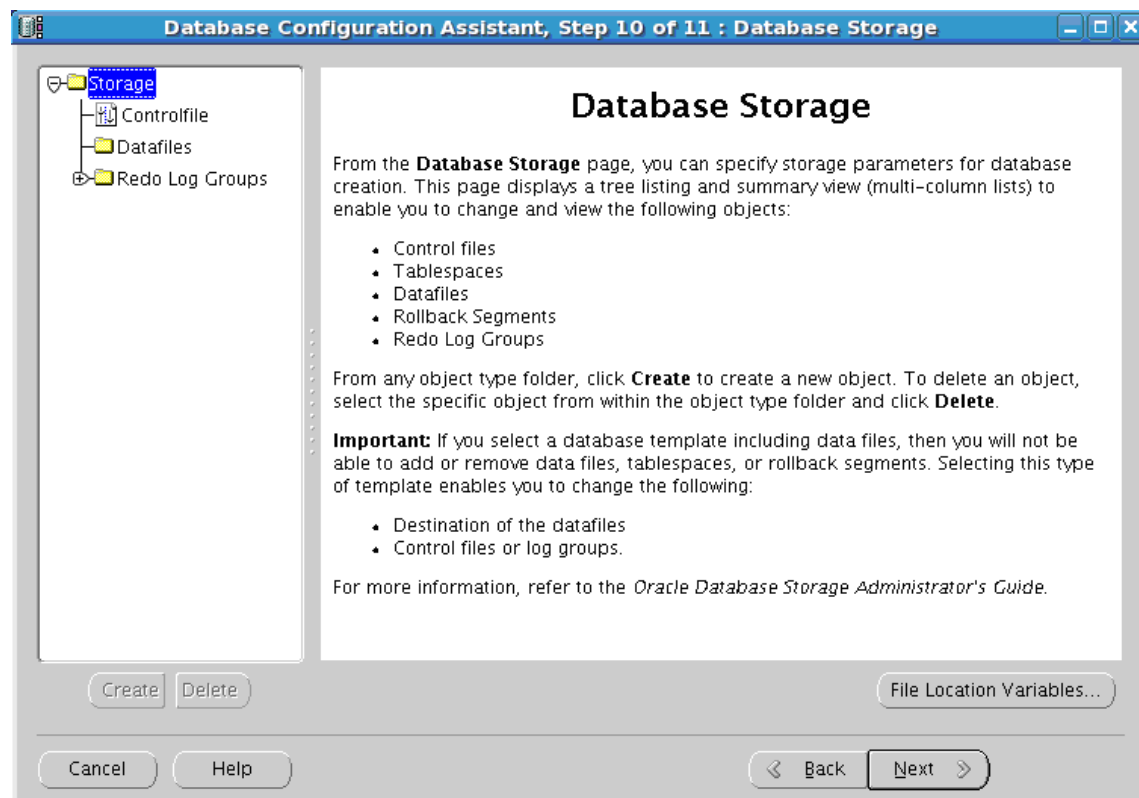
Action:

Select if you want to have sample schemas created in your database and click 'Next'



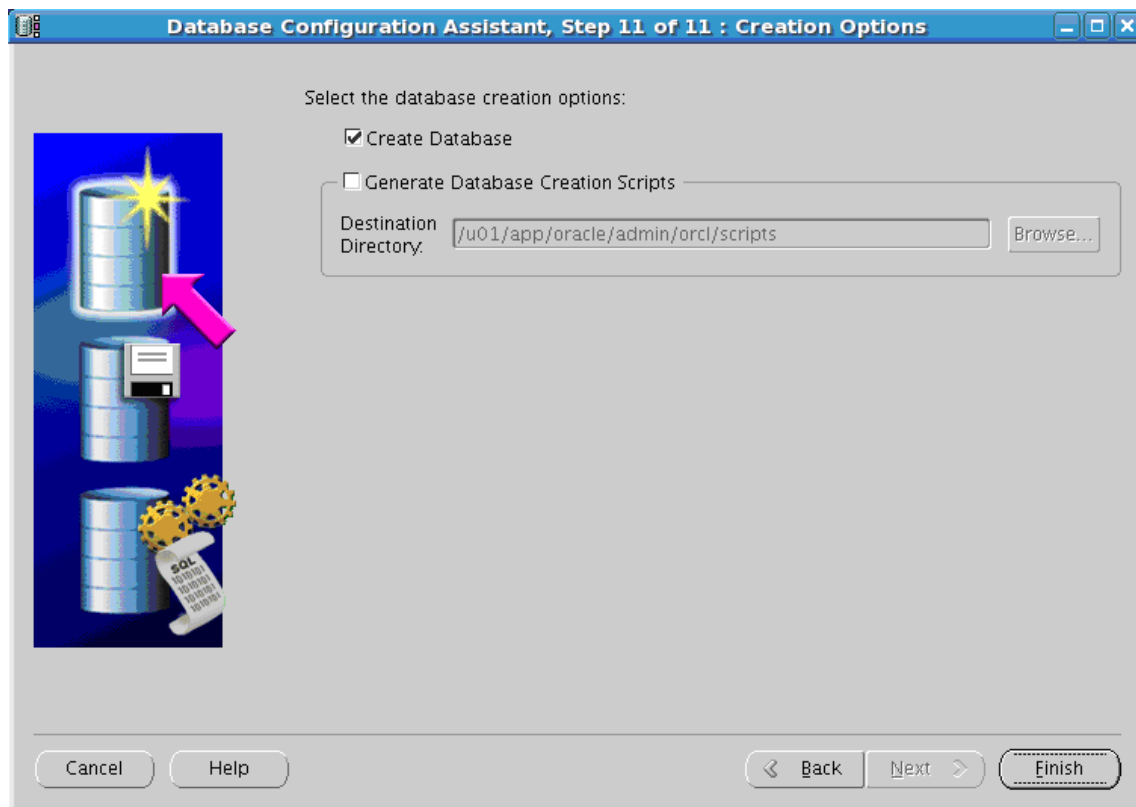
Action:

Review and change the settings for memory allocation, characterset etc. according to your needs and click 'Next'



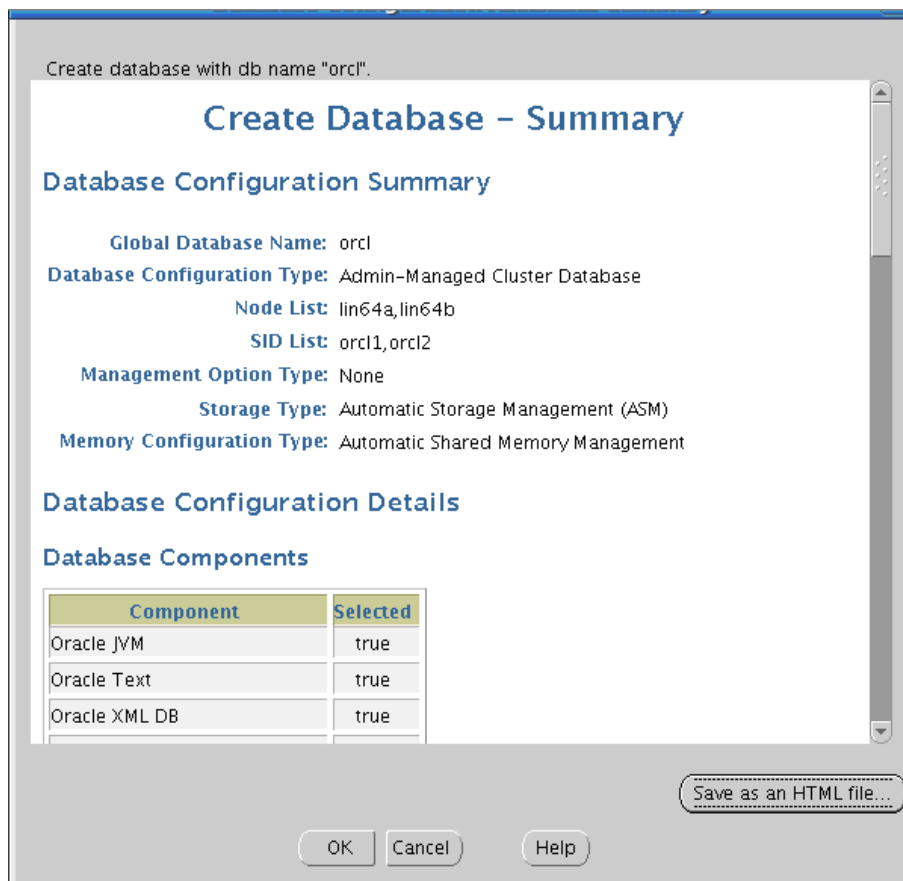
Action:

Review the database storage settings and click 'Next'



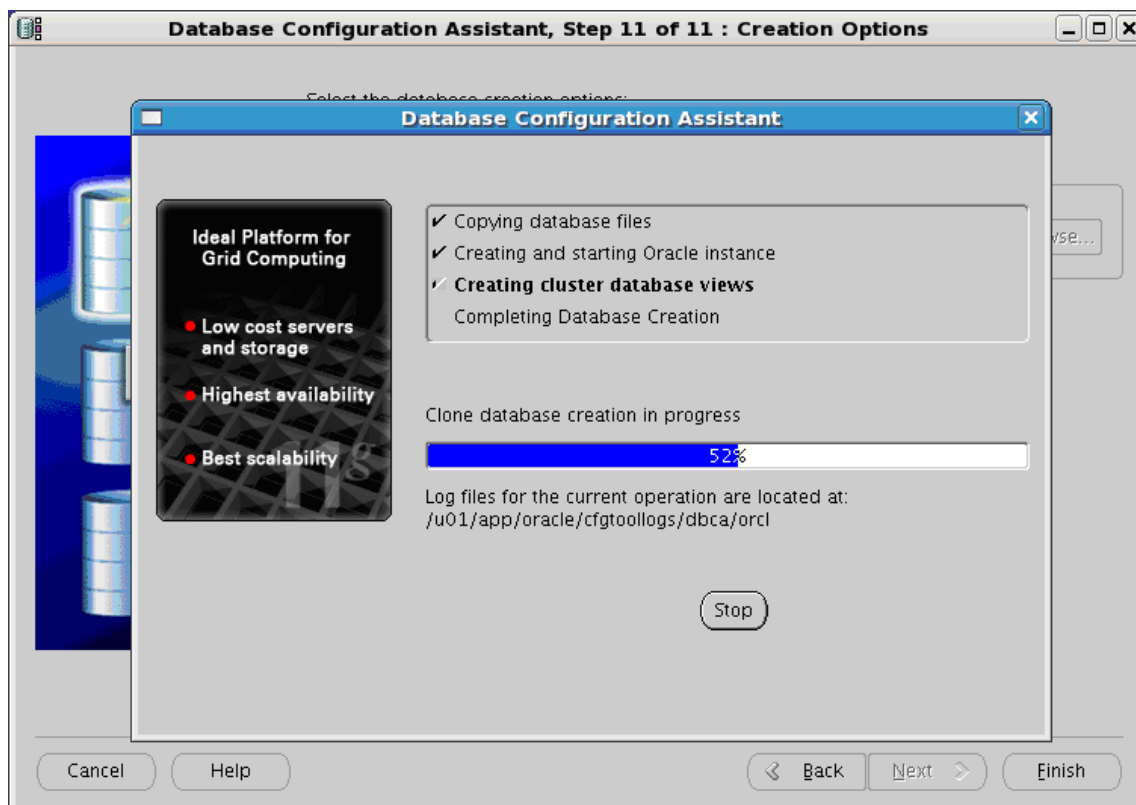
Action:

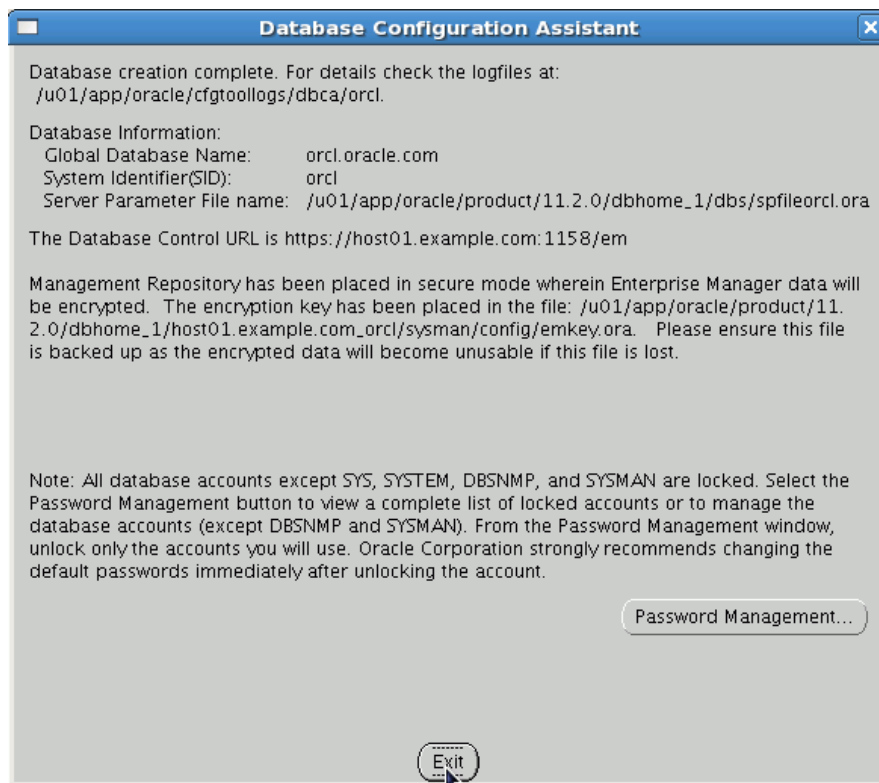
Make sure the tickbox 'Create Database' is ticked and click 'Finish'



Action:

Review the database configuration details again and click 'OK'





Action:

The database is now created, you can either change or unlock your passwords or just click Exit to finish the database creation.