Oracle 11g R2 Grid Infrastructure installation on 2 node cluster using Virtualbox

Introduction

Since its inception in Oracle 9i, the Oracle RAC (Real Application Clusters) technology has been an active topic of discussion in the community. Oracle 11gR2 RAC offers high availability, scalability (scaling out capability), manageability, reduced ownership cost, and cloud architecture platform. The RAC technology allows the establishment of multiple instances to a single database server which hosts an enterprise application.

Oracle 11g R2 RAC system necessarily works on grid architecture. The master RAC node must have grid infrastructure installed with the remaining nodes replicated accordingly. The Oracle 11gR2 grid infrastructure installation integrates oracle clusterware and oracle ASM. Oracle Clusterware is responsible for High Availability framework, process monitoring, event management and group membership. On the other hand, oracle ASM suffices the need of a conventional file system while offering multiple add-on features like online disk manipulation, auto I/O load balancing, stripping and mirroring of data and finally ease the data storage management.

The RAC customers/users often report their difficulties and issues in the installation phase. Before planning the grid infrastructure installation, it has to be prepared appropriately so that it suffices all the requirements of a clusterware and memory management. There are multiple areas to be looked upon before the grid installation like network, system kernel parameters, NTPD settings, node connectivity, and ASM disk setup. The document describes the prerequisites of a system to be planned for gird installation. Please note that the document is not a guide for RAC installation but a reference to provide hands-on with RAC installation on oracle virtualbox.

Approach

The document illustrates the installation of Oracle 11gR2 grid infrastructure and 2 node RAC database on virtualbox. The two virtualbox machine images installed with OEL, would serve as the cluster nodes. Initially, we will create only one virtual machine image and do all sorts of configurations required for the grid installation. The master node would be then cloned to create the second node participating in the cluster.

Memory requirements

The host system running the two virtual machine images must have sufficient memory to run both images simultaneously. RAM above 4GB would be best suited for the demo.

Software Requirement

Following software can be procured from Oracle Technology Network in order to follow this demonstration

a) Oracle Virtualbox 4.2
b) Oracle Enterprise Linux 5.6
c) Oracle 11gR2 Grid Infrastructure (64 bit)
d) Oracle 11gR2 Database (64 bit)

System setup

Create a virtualbox machine image and install Oracle Enterprise Linux on the same. Recommended base memory (RAM) and startup disk size is shown in the below screenshots.

a) RAM sizing

Colored and Colored		? <mark> </mark>
Create New Virtual Machin	ne	
Memory		
Select the amount of base mer	nory (RAM) in megabytes to be allocated to the virtual machine.	
The recommended base memo	ry size is 512 MB.	
Base Memory Size		
· · · · · · · · · · · · · · · · · · ·		2048 MB
4 MB	8192 MB	
	(<u>N</u> ext)	Cancel

b) Virtual disk sizing

View of state file							
Virtual disk file	location and	size					
Please type the name create the file in.	of the new virtual	l disk file into	the box belo	w or click on	the folder id	on to select a c	lifferent folder (
Location							
rac1							C C
Coloct the size of the		abutas. This s	يتع بينا العربة	parted to the	Cuest OS		cine of this wist
Select the size of the	virtual disk in medi	advies, inis s	ize will be re	Dorted to the	e Guest US (as the maximum	i size of this virt
disk.	virtual disk in mega	abytes, miss	aze wili de re	ported to the	Guest OS	as the maximum	I SIZE OF UNIS VIEW
	virtual disk in mega	abytes. This s	aze will be re		Guest OS	as the maximum	
disk.				-0			20.00 G
disk. Size				-0			20.00 G
disk. Size				-0		1 1	20.00 G
Size				-0		1 1	20.00 0

c) Network adaptor setting - Enable two adaptors for bridged networking and one for NAT. Bridged adaptor would serve for public and private network interfaces respectively.



Once the virtual machine image has been created, start the OEL installation using Enterprise-R5-U5-Server-x86_64-dvd.iso disk file.

Select the default settings in all the wizards. Disable the SELinux and firewalls. Do not create additional account as user creation and permissions would be part of a separate activity. Install the virtualbox guest additions to enable the sharing of grid and database software files from host OS location.

Note that the package kernel-uek-devel-2.6.32-300.32.2.el5uek.rpm must be updated for the proper enablement of virtualbox guest additions.

Oracle Installation prerequisites

Let us now look upon the steps to verify and prepare the VM image for grid installation.

a) Mount the shared memory filesystem (/tmpfs) and ensure that it has enough size for automatic memory management.

```
[root@rac1 ~]# umount tmpfs
[root@rac1 ~]# mount -t tmpfs shmfs -o size=1500m /dev/shm
[root@rac1 ~]# vi /etc/fstab
tmpfs /dev/shm tmpfs size=1500m 0 0
```

b) Install the oracle-validated rpm package

```
[root@rac1 ~] # cd /etc/yum.repos.d/
[root@rac1 yum.repos.d]# wget <u>http://public-yum.oracle.com/public-yum-el5.repo</u>
--2012-09-23 07:57:10-- http://public-yum.oracle.com/public-yum-el5.repo
Resolving public-yum.oracle.com... 141.146.44.34
Connecting to public-yum.oracle.com|141.146.44.34|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 3974 (3.9K) [text/plain]
Saving to: `public-yum-el5.repo'
100%[======] 3,974 --.-K/s in 0.01s
2012-09-23 07:57:11 (315 KB/s) - `public-yum-el5.repo' saved [3974/3974]
[root@rac1 yum.repos.d]# yum install oracle-validated
Loaded plugins: security
el5 latest
                                                  | 1.4 kB
                                                             00:00
el5 latest/primary
                                                  | 11 MB
                                                              03:27
el5 latest
                                                              9533/9533
Setting up Install Process
Resolving Dependencies
--> Running transaction check
<<Output Truncated>>
Dependencies Resolved
```

Package	Arch	Version	Repository	Size
Installing:				
oracle-validated	x86 64	1.1.0-15.el5	el5 latest	24 k
Updating:	_		—	
udev	x86 64	095-14.27.0.3.el5 7.1	el5 latest	2.4 M
Installing for dependencies:	_	—	_	
device-mapper-multipath-libs	x86 64	0.4.9-46.0.5.el5	el5 latest	168 k
iscsi-initiator-utils	x86_64	6.2.0.872-13.0.1.el5	el5 latest	1.0 M
kernel-uek	x86_64	2.6.32-300.32.2.el5uek	el5 latest	26 M
kernel-uek-firmware		2.6.32-300.32.2.el5uek	el5 latest	3.7 M
libXp	i386	1.0.0-8.1.el5	el5 latest	22 k
libaio-devel	i386	0.3.106-5	el5 latest	12 k
libaio-devel	x86 64	0.3.106-5	el5 [_] latest	11 k
oraclelinux-release	x86_64	5-8.0.2	el5 latest	2.7 k
ql2xxx-firmware		1.01.01-0.2.el5	el5 latest	442 k
sysstat	x86 64	7.0.2-11.el5	el5 latest	187 k
unixODBC	x86_64	2.2.11-10.el5	el5 latest	291 k
unixODBC-devel		2.2.11-10.el5	el5 latest	
unixODBC-devel	x86 64	2.2.11-10.el5	el5 latest	
unixODBC-libs		2.2.11-10.el5	el5 [_] latest	
unixODBC-libs		2.2.11-10.el5	el5 [_] latest	
Updating for dependencies:	—		_	
device-mapper-multipath	x86 64	0.4.9-46.0.5.el5	el5 latest	97 k
irqbalance		2:0.55-17.el5	el5 [_] latest	
kexec-tools		1.102pre-154.0.3.el5 8.1	el5 latest	602 k
kpartx		0.4.9-46.0.5.el5	el5 latest	
libbdevid-python	_	5.1.19.6-75.0.9.el5	el5 [_] latest	
mkinitrd	_	5.1.19.6-75.0.9.el5	el5 [_] latest	482 k
mkinitrd		5.1.19.6-75.0.9.el5	el5 [_] latest	
nash		5.1.19.6-75.0.9.el5	el5 latest	1.4 M
util-linux		2.13-0.59.0.1.el5	el5 [_] latest	1.9 M
	_		_	
Transaction Summary				
	=======			

Install 16 Package(s) Upgrade 10 Package(s)

Total download size: 42 M Is this ok [y/N]:y <<Output truncated>>

c) Edit the /etc/hosts file to add public ip, private ip and virtual ip addresses for the proposed two nodes. Here note that we are including the network configuration for the second node as well. The reason for the pre configuration is to sync the network settings at both the nodes.

[root@rac1 ~]# cat /etc/hosts/ # Do not remove the following line, or various programs # that require network functionality will fail. 127.0.0.1 localhost.localdomain localhost ::1 localhost6.localdomain6 localhost6 #Public 192.168.1.100 rac1.oracle.com rac1 192.168.1.200 rac2.oracle.com rac2 #Private 10.177.240.100 rac1-priv.oracle.com rac1-priv 10.177.240.200 rac2-priv.oracle.com rac2-priv

```
#Virtual
192.168.1.10 rac1-vip.oracle.com rac1-vip
192.168.1.11 rac2-vip.oracle.com rac2-vip
```

In addition, manually set the public and private ip for eth0 and eth1 network interfaces as shown in the below screen dump.

Ethernet Device	Ethernet Device
General Route Hardware Device	General Route Hardware Device
Nickname: eth0	Nickname: ethl
☑ Activate device when computer starts	☑ Activate device when computer starts
Allow all users to enable and disable the device	
Enable IPv <u>6</u> configuration for this interface	Enable IPv <u>6</u> configuration for this interface
O Automatically obtain IP address settings with: dhcp 💠	O Automatically obtain IP address settings with: dhcp 🜩
DHCP Settings-	DHCP Settings
Hostname (optional):	H <u>o</u> stname (optional):
Automatically obtain DNS information from provider	Automatically obtain DNS information from provider
Statically set IP addresses:	Statically set IP addresses:
Manual IP Address Settings	Manual IP Address Settings
Address: 192.168.1.100	A <u>d</u> dress: 10.177.240.100
Subnet mask: 255.255.255.0	Subnet mask: 10.177.240.0
Default ga <u>t</u> eway address:	Default gateway address:
Set MTU to: 0	Set MTU to: 0
Set MRU to: 0	Set MRU to: 0
X Cancel	X Cancel

Restart the network service.

[root@rac1 ~]# service network restart			
Shutting down interface eth0:	[OK]
Shutting down interface eth1:	[OK]
Shutting down interface eth2:	[OK]
Shutting down loopback interface:	[OK]
Bringing up loopback interface:	[OK]
Bringing up interface eth0:	[OK]
Bringing up interface eth1:	[OK]
Bringing up interface eth2:			
Determining IP information for eth2 done.			
	[OK]

d) Verify the system kernel requirements. The oracle-validated installation would reset the parameters as required for the oracle database installation.

```
[root@rac1 ~]# /sbin/sysctl -p
net.ipv4.ip_forward = 0
net.ipv4.conf.default.rp_filter = 1
net.ipv4.conf.default.accept_source_route = 0
kernel.core_uses_pid = 1
net.ipv4.tcp_syncookies = 1
fs.file-max = 6815744
kernel.msgmni = 2878
```

```
kernel.msgmax = 8192
kernel.msgmnb = 65536
kernel.sem = 250 32000 100 142
kernel.shmmni = 4096
kernel.shmall = 1073741824
kernel.shmmax = 4398046511104
kernel.sysrq = 1
net.core.rmem_default = 262144
net.core.rmem_max = 4194304
net.core.wmem_default = 262144
net.core.wmem_max = 1048576
fs.aio-max-nr = 3145728
net.ipv4.ip_local_port_range = 9000 65500
vm.min free kbytes = 51200
```

e) Verify the limits.conf values. Like kernel parameters, these values are too set by oracle-validated package.

[root@rac1 ~]# cat /etc/security/limits.conf # Oracle-Validated setting for nofile soft limit is 131072 oracle soft nofile 131072 # Oracle-Validated setting for nofile hard limit is 131072 oracle hard nofile 131072 # Oracle-Validated setting for nproc soft limit is 131072 oracle soft nproc 131072 # Oracle-Validated setting for nproc hard limit is 131072 oracle hard nproc 131072 # Oracle-Validated setting for core soft limit is unlimited oracle soft core unlimited # Oracle-Validated setting for core hard limit is unlimited oracle hard core unlimited # Oracle-Validated setting for memlock soft limit is 50000000 oracle soft memlock 5000000 # Oracle-Validated setting for memlock hard limit is 50000000 oracle hard memlock 5000000

f) Verify the /etc/pam.d/login values. Include the entry [highlighted below as bold]

[root@rac1 ~]# cat /etc/pam.d/login

```
auth [user_unknown=ignore success=ok ignore=ignore default=bad] pam_securetty.so
auth include system-auth
account required pam_nologin.so
account include system-auth
password include system-auth
# pam_selinux.so close should be the first session rule
session required pam_selinux.so close
session optional pam_keyinit.so force revoke
session required pam_loginuid.so
session include system-auth
```

session optional pam_console.so
pam_selinux.so open should only be followed by sessions to be executed in the
user context
session required pam_selinux.so open
session required pam_limits.so

g) Verify whether SELinux has been disabled.

```
[root@rac1 ~] # cat /etc/selinux/config
# This file controls the state of SELinux on the system.
# SELINUX= can take one of these three values:
#
       enforcing - SELinux security policy is enforced.
        permissive - SELinux prints warnings instead of enforcing.
#
       disabled - SELinux is fully disabled.
#
SELINUX=disabled
# SELINUXTYPE= type of policy in use. Possible values are:
        targeted - Only targeted network daemons are protected.
#
#
        strict - Full SELinux protection.
SELINUXTYPE=targeted
```

h) Synchronization setup for NTPD and restart. Include "-x" in the OPTIONS to enable the server synchronization.

```
[root@rac1 ~]# service ntpd stop
Shutting down ntpd: [FAILED]
[root@rac1 ~]# chkconfig ntpd off
[root@rac1 ~]# rm /var/run/ntpd.pid
[root@rac1 ~]# vi /etc/sysconfig/ntpd
OPTIONS="-x -u ntp:npt -p /var/run/ntpd.pid"
[root@rac1 ~]# service ntpd restart
```

i) Create groups and users. Note that "oracle" user is part of oinstall and dba groups

```
[root@rac1 ~]# groupadd -g 500 oinstall
[root@rac1 ~]# groupadd -g 501 dba
[root@rac1 ~]# groupadd -g 502 oper
[root@rac1 ~]# groupadd -g 503 asmadmin
[root@rac1 ~]# useradd -u 1000 -g oinstall -G dba,oper,asmadmin oracle
```

j) Create the grid home and oracle home directories

```
[root@rac1 ~]# mkdir -p /u01/app/11.2.0/grid
[root@rac1 ~]# mkdir -p /u01/app/oracle/product/11.2.0/dbhome_1
[root@rac1 ~]# chown -R oracle:oinstall /u01
[root@rac1 ~]# chmod -R 775 /u01
```

k) Edit the .bash_profile of "oracle" user.

fi

#ORACLE SETTINGS
TMP=/tmp; export TMP
TMPDIR=\$TMP; export TMPDIR

```
ORACLE HOSTNAME=rac1.oracle.com; export ORACLE HOSTNAME
ORACLE UNQNAME=RAC1; export ORACLE UNQNAME
ORACLE BASE=/u01/app/oracle; export ORACLE BASE
ORACLE HOME=$ORACLE BASE/product/11.2.0/dbhome 1; export ORACLE HOME
ORACLE SID=rac1; export ORACLE SID
ORACLE TERM=term; export ORACLE TERM
PATH=/usr/sbin:$PATH; export PATH
PATH=$ORACLE HOME/bin:$PATH; export PATH
LD LIBRARY PATH=$ORACLE HOME/lib:/lib:/usr/lib; export LD LIBRARY PATH
CLASSPATH=$ORACLE HOME/JRE:$ORACLE HOME/jlib:$ORACLE HOME/rdbms/jlib; export
CLASSPATH
if [ $USER = "oracle" ]; then
   if [ $SHELL = "/bin/ksh" ]; then
     ulimit -p 16384
     ulimit -n 65336
  else
     ulimit -u 16384 -n 65336
    fi
fi
# User specific environment and startup programs
PATH=$PATH:$HOME/bin
export PATH
umask 0022
echo ORACLE HOME = $ORACLE HOME
echo ORACLE SID = $ORACLE SID
```

I) Note the "umask" of "oracle" user is set to default as "0022". If not add the default umask in .bash_profile and .bashrc also

[oracle@rac1 ~]\$ umask
0022

m) Shutdown the virtualmachine

[oracle@rac1 ~]\$ shutdown now

n) Create the sharable disks under "Storage". Create three new hard disks of fixed size. By default, they will be created as "Normal". Edit the disk properties from virtual manager and make them "Sharable".

🔅 rac1 - Settings		2 ×
 General System Display Storage Audio Network Serial Ports USB Shared Folders 	Storage Tree TDE Controller VBoxGuestAdditions.iso SATA Controller SATA Controller asmdisk1.vdi asmdisk2.vdi asmdisk3.vdi	Attributes Name: IDE Controller Type: PIIX4 ✓ Use host I/O cache
	Select a settings category from the list on to item to get more information.	he left-hand side and move the mouse over a settings OK Cancel Help
Modify mediu	um attributes	<u>୧</u> ×
IDC\VirtualBox	cVMs\rac1\asmdisk1.vdi.	al disk located in C:\Users\spgupta.ST- nd press OK to proceed or Cancel
Choose medium	type:	
Normal		
 Immutable Writethroug 	ab	
 Writedilloug Shareable 	g.,	
Multi-attack	ı	
		ОК Cancel

o) Restart the virtual machine RAC1. Check the installation of ASM packages. The rpm packages "oracleasmlib", "oracleasm-support" and "oracleasm" are mandatory for the ASM configuration. The packages "oracleasm-support" and "oracleasm" are available in the oracle-validated installation package. The package "oracleasmlib" has to be downloaded from OTN corresponding to the kernel version.

[root@rac1 ~] yum list installed oracleasm*
oracleasm-2.6.18-308.el5.x86_64 2.0.5-1.el5 installed
oracleasm-support.x86_64 2.1.7-1.el5 installed

2.0.4-1.el5

p) Configure oracleasm

[root@rac1 ~] # /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 []: oracle Default group to own the driver interface []: dba 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

[root@rac1 ~]# /etc/init.d/oracleasm status Checking if ASM is loaded: yes Checking if /dev/oracleasm is mounted: yes

q) Create the ASM disks

[root@rac1 ~]# ls /dev/sd* /dev/sda1 /dev/sda /dev/sda2 /dev/sdb /dev/sdc /dev/sdd [root@rac1 ~] # cd /dev [root@rac1 dev]# fdisk sdb Device contains neither a valid DOS partition table, nor Sun, SGI or OSF disklabel Building a new DOS disklabel. Changes will remain in memory only, until you decide to write them. After that, of course, the previous content won't be recoverable. Warning: invalid flag 0x0000 of partition table 4 will be corrected by w(rite) Command (m for help): n Command action e extended p primary partition (1-4) р Partition number (1-4): 1First cylinder (1-652, default 1): Using default value 1 Last cylinder or +size or +sizeM or +sizeK (1-652, default 652): Using default value 652 Command (m for help): w The partition table has been altered! Calling ioctl() to re-read partition table. Syncing disks. [root@rac1 dev]# fdisk sdc <<Similar operation as done in /dev/sdb>> [root@rac1 dev]# fdisk sdd <<Similar operation as done in /dev/sdb>> [root@rac1 ~]# /etc/init.d/oracleasm createdisk ASM1 /dev/sdb1 Marking disk "ASM1" as an ASM disk: [OK] [root@rac1 ~]# /etc/init.d/oracleasm createdisk ASM2 /dev/sdc1 Marking disk "ASM2" as an ASM disk: [OK]

```
[root@rac1 ~]# /etc/init.d/oracleasm createdisk ASM3 /dev/sdd1
Marking disk "ASM3" as an ASM disk: [OK]
[root@rac1 ~]# /etc/init.d/oracleasm listdisks
ASM1
ASM2
ASM3
[root@rac1 ~]# /etc/init.d/oracleasm scandisks
Scanning the system for Oracle ASMLib disks: [ OK ]
[root@rac1 ~]# /etc/init.d/oracleasm querydisk ASM1
Disk "ASM1" is a valid ASM disk
```

r) Unzip the Grid Infrastructure folder. Change ownership of "grid" folder to "oracle:oinstall" Install the RPM package "cvuqdisk" from the /install/grid/rpm folder

s) Shutdown Node RAC1

t) Clone the RAC1 to RAC2. It might take up some time. Once the cloned image RAC2 is done, remove the additional sharable disks from RAC2 image under the "Storage" attribute. Add the existing sharable disks (from RAC1 image).

u) Start RAC2 node. Edit the eth0 and eth1 ip addresses. Change the hostname, Edit the /home/oracle/.bash_profile.

v) Go to node RAC1 and establish the ssh connectivity. The user "oracle" must have a password so as to establish passwordless connectivity between the two nodes. The script asks for the "oracle" user passwords and updates the "authorized_keys", "id_rsa" keys, and "known_hosts" files at /home/oracle/.ssh location.

[root@rac1 sshsetup]\$ sh sshUserSetup.sh -user oracle -hosts "rac1 rac2"
-noPromptPassphrase

w) Verify the cluster setup using cluvfy.sh. The cluster verification utility verifies the nodes for ssh connectivity, user equivalence, free memory, kernel parameters, package existence, and ntpd clock synchronization. Note that the cluster verification utility is employed in the pre-cluster installation stage (-pre crsinst).

```
[root@rac1 ~]# sh cluvfy.sh stage -pre crsinst -n rac1,rac2 -verbose >
ClusterVerify.log
```

<<Output truncated>> Pre-check for cluster services setup was successful.

Oracle Grid Infrastructure Installation

The prerequisite checks and validations required for the Oracle software installation is now complete. Now, we shall move ahead to install the oracle grid infrastructure software.

a) Execute "xhost +" as the root user for xwindow configuration.
[root@rac1 grid] # xhost +
access control disabled, clients can connect from any host

b)Switch to Oracle user and run the software Installer

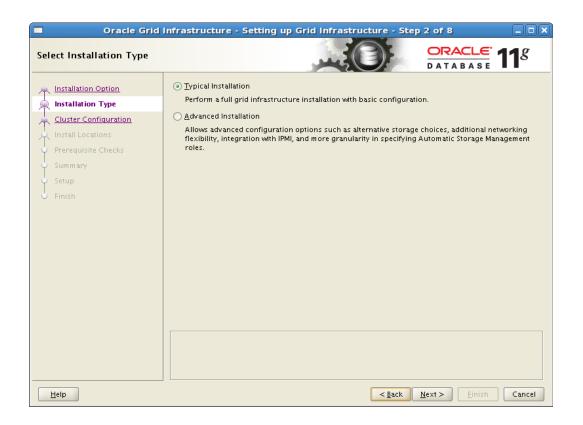
[root@rac1 grid]# su oracle
[oracle@rac1 grid]# sh runInstaller

Checking Temp space: must be greater than 120 MB. Actual 8213 MB Passed Checking swap space: must be greater than 150 MB. Actual 3999 MB Passed Checking monitor: must be configured to display at least 256 colors. Actual 16777216 Passed Preparing to launch Oracle Universal Installer from /tmp/OraInstall2012-09-23_05-16-40PM. Please wait ...

c) The installer open the wizard to select the "Installation Option". Select "Install and Configure Grid Infrastructure for a Cluster" and click "Next".

Oracle Grid I	nfrastructure - Setting up Grid Infrastructure - Step 1 of 8
Select Installation Option	
Q Installation Option	Select any of the following installation options
Installation Type	Install and Configure Grid Infrastructure for a Cluster
Cluster Configuration	\bigcirc Install and <u>C</u> onfigure Grid Infrastructure for a Standalone Server
Prerequisite Checks	○ <u>U</u> pgrade Grid Infrastructure
 Summary 	○ Install <u>C</u> rid Infrastructure Software Only
- Setup	
o Finish	
Help	<back next=""> Einish Cancel</back>

d) The next wizard prompts for the selection for "Installation Type". Select "Typical Installation" to prioritize default settings and click "Next". The "Advanced Installation" options lets you to select the language, different passwords and GNS settings for SCAN cluster name.



e) The third wizard does the "Cluster Configuration". It will show a default, but modifiable SCAN name and only the master RAC node i.e. RAC1 here.

Click "Add" button to add the other participating nodes (public hostname and virtual hostname) in the cluster. Here, rac2.oracle.com (public) and rac2-vip.oracle.com (virtual hostname) is added.

Click "SSH Connectivity" to setup and test the SSH connectivity between the cluster nodes. Provide the "oracle" user password and click "Test"/"Setup".

Specify Cluster Configura	d Infrastructure - Setting up Grid	Infrastructure - Step 3 of 8
Thistallation Option	Specify basic configuration information fo	DATABASE
Cluster Configuration	SCAN Name: rac-scan Hostname	Virtual IP Name
Prerequisite Checks Summary	rac1.oracle.com rac2.oracle.com	rac1-vip.oracle.com rac2-vip.oracle.com
ý Setup V Finish	Establishing SSH connectivity b nodes. This may take several m	inutes. Please wait
		Identify network interfaces
Help		< Back Next > Finish Cancel

f) The "Install Location" wizard provides you to select the locations for "Oracle Base", "Software Location" or grid home, "Cluster Registry Storage Type", SYSASM Password and OSASM group. Select the appropriate values and click "Next".

Note that the selection of correct OSASM group is required to list the ASM disks in the next wizards.

Oracle Grid	Infrastructure - Setting up Gr	id Infrastructure - Step 4	4 of 8 📃 🗖
Specify Install Locations			ORACLE 118
Installation Option Installation Type	Specify locations for Oracle base, when Registry (OCR), and which UNIX group Storage Management.		
😠 Install Locations	Oracle Ba <u>s</u> e:	/u01/app/oracle	Browse
Prerequisite Checks Summary	Software <u>L</u> ocation: Cluster Registry Storage <u>T</u> ype:	/u01/app/11.2.0/grid Automatic Storage Managemen	Br <u>o</u> wse
y Setup			
o Finish	<u>C</u> luster Registry Location:	/dev/sdb/storage	Browse
	S <u>Y</u> SASM Password:	****	
	Confirm <u>P</u> assword:	·····	
	OSASM <u>a</u> roup:	asmadmin 💌	
Help		< <u>B</u> ack <u>N</u>	ext > Einish Cancel

g) The "ASM Disk Group" wizard lists the configured ASM disks. "DATA" is the default Disk Group Name". Select "External" redundancy to avoid mirroring of disks in the failure groups during demonstrations (though it is required in the production RAC setups). Check all the participating disks and click "Next".

If the ASM disks are not getting listed, try to change the location by specifying correct location in "Change Discovery Path".

Oracle Grid	nfrastructure - Setting up Grid Infrastructure - Step	5 of 9	
Create ASM Disk Group		ORACLE DATABASE	11 ^g
Installation Option Installation Type Cluster Configuration Install Locations ASM Disk Group Prerequisite Checks Summary Setup Finish	Select Disk Group Characteristics and select disks Disk Group Name DATA Redundancy High Normal External Add Disks C_andidate Disks All Disks Disk Path ORCL:ASM1 ORCL:ASM2 ORCL:ASM3	5114	Candidate Candidate Candidate
Help	< <u>B</u> ack	<u>N</u> ext > <u>E</u> inish	Cancel

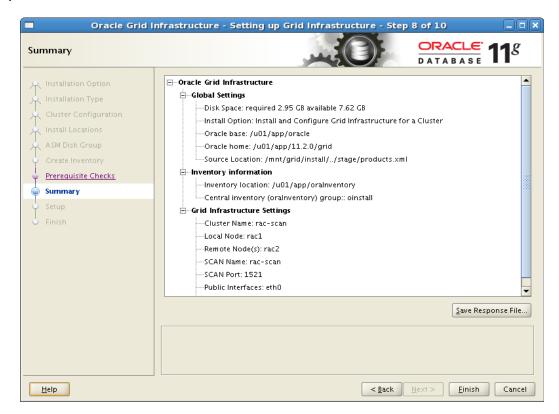
h) The next wizard "Create Inventory" specifies the default location for the storage of installation files. It is required for the first installation only.



I) The next wizard "Prerequisite Checks" would check the system setup for the grid installation. The checks would be same as the one which we validated in the last section. After the verification, the wizard would be directed to "Summary" wizard.

Oracle Grid I	nfrastructure - Setting up Grid Infrastructure - Step 7 of 10
Perform Prerequisite Chec	
Installation Option Installation Type Cluster Configuration ASM Disk Group Create Inventory Prerequisite Checks Summary Setup Finish	Verifying that the target environment meets minimum installation and configuration requirements for products you have selected. This can take time. Please wait. 40% Checking Run Level
Help	<pre>< Back Next > Einish Cancel</pre>

j) The "Summary" wizard will list the summary of the prerequisite check performed by the installer. If the check is successful, the below screen appears. If any of the checks are failed, the page lists the failed checks, fixable or not fixable recommendation, and 'ignore' option. If the failed checks can be fixed, it must be resolved before further proceedings. If the failed checks are ignorable, select the 'ignore' option. Click "Finish" to move ahead.



k) The "Setup" wizard shows the installation tasks and the progress bar.

Oracle Grid	Infrastructure - Setting up Grid Infrastructure - Step 9 of 10	
Setup		
Installation Option Installation Type Cluster Configuration Install Locations ASM Disk Group Create Inventory Prerequisite Checks Summary Setup Finish	Progress 8% Extracting files to '/u01/app/11.2.0/grid'. Status	In Progress Succeeded In Progress Pending Pending Pending Pending Pending
		etails Retry Ski Consolidate Compress Control
Help	<pre></pre>	Einish Cance

I) In between of the installation (stage "Execute Root Scripts for Install Grid Infrastructure for a Cluster"), below dialog box pops-up and prompts for the execution of two scripts on all the nodes in the cluster. The scripts starts the Oracle High Availability Services, cluster processes and configures oracle grid infrastructure for the cluster. In addition, it also creates (and starts) ASM service and diskgroup DATA.

Execute Configuration scripts			
The following configuration scripts need to be executed as the "root" user in each cluster node.			
Number Script Location	Nodes		
1 /u01/app/oralnventory/orainstRoot.sh	rac1,rac2		
2 /u01/app/11.2.0/grid/root.sh	rac1,rac2		
To execute the configuration scripts: 1. Open a terminal window 2. Log in as "root" 3. Run the scripts in each cluster node 4. Return to this window and click "OK" to continue	2		
Run the script on the local node first. After successful completion, you can run the script in parallel on all the other nodes.			
Help	ОК		

Execute both the scripts on the master node RAC1 first. Upon the successful execution of the scripts, execute the scripts on the remaining nodes. Sample output of the script execution is as below

```
[root@racl ~]# /u01/app/oraInventory/orainstRoot.sh
Changing permissions of /u01/app/oraInventory.
Adding read,write permissions for group.
Removing read,write,execute permissions for world.
Changing groupname of /u01/app/oraInventory to oinstall.
The execution of the script is complete.
[root@racl ~]# /u01/app/11.2.0/grid/root.sh
Running Oracle 11g root.sh script...
The following environment variables are set as:
    ORACLE_OWNER= oracle
    ORACLE_HOME= /u01/app/11.2.0/grid
Enter the full pathname of the local bin directory: [/usr/local/bin]:
    Copying dbhome to /usr/local/bin ...
    Copying oraenv to /usr/local/bin ...
    Copying coraenv to /usr/local/bin ...
```

Creating /etc/oratab file...

Entries will be added to the /etc/oratab file as needed by Database Configuration Assistant when a database is created Finished running generic part of root.sh script. Now product-specific root actions will be performed. 2012-09-23 18:06:35: Parsing the host name 2012-09-23 18:06:35: Checking for super user privileges 2012-09-23 18:06:35: User has super user privileges Using configuration parameter file: /u01/app/11.2.0/grid/crs/install/crsconfig params Creating trace directory LOCAL ADD MODE Creating OCR keys for user 'root', privgrp 'root'.. Operation successful. root wallet root wallet cert root cert export peer wallet profile reader wallet pa wallet peer wallet keys pa wallet keys peer cert request pa cert request peer cert pa cert peer root cert TP profile reader root cert TP pa root cert TP peer pa cert TP pa peer cert TP profile reader pa cert TP profile reader peer cert TP peer user cert pa user cert Adding daemon to inittab CRS-4123: Oracle High Availability Services has been started. ohasd is starting acfsroot: ACFS-9301: ADVM/ACFS installation can not proceed: acfsroot: ACFS-9302: No installation files found at /u01/app/11.2.0/grid/install/usm/EL5/x86 64/2.6.18-8/2.6.18-8.el5uek-x86 64/bin. CRS-2672: Attempting to start 'ora.gipcd' on 'racl' CRS-2672: Attempting to start 'ora.mdnsd' on 'rac1' CRS-2676: Start of 'ora.gipcd' on 'rac1' succeeded CRS-2676: Start of 'ora.mdnsd' on 'rac1' succeeded CRS-2672: Attempting to start 'ora.gpnpd' on 'rac1' CRS-2676: Start of 'ora.gpnpd' on 'rac1' succeeded CRS-2672: Attempting to start 'ora.cssdmonitor' on 'rac1' CRS-2676: Start of 'ora.cssdmonitor' on 'rac1' succeeded CRS-2672: Attempting to start 'ora.cssd' on 'rac1' CRS-2672: Attempting to start 'ora.diskmon' on 'rac1' CRS-2676: Start of 'ora.diskmon' on 'rac1' succeeded CRS-2676: Start of 'ora.cssd' on 'rac1' succeeded CRS-2672: Attempting to start 'ora.ctssd' on 'rac1' CRS-2676: Start of 'ora.ctssd' on 'rac1' succeeded

ASM created and started successfully.

DiskGroup DATA created successfully.

clscfg: -install mode specified Successfully accumulated necessary OCR keys. Creating OCR keys for user 'root', privgrp 'root'.. Operation successful. CRS-2672: Attempting to start 'ora.crsd' on 'rac1' CRS-2676: Start of 'ora.crsd' on 'rac1' succeeded CRS-4256: Updating the profile Successful addition of voting disk 35ab9a01644a4fa1bfd2c1b1c28cfb32. Successfully replaced voting disk group with +DATA. CRS-4256: Updating the profile CRS-4266: Voting file(s) successfully replaced ## STATE File Universal Id File Name Disk group __ ____ _____ _____ ___ 1. ONLINE 35ab9a01644a4fa1bfd2c1b1c28cfb32 (ORCL:ASM1) [DATA] Located 1 voting disk(s). CRS-2673: Attempting to stop 'ora.crsd' on 'rac1' CRS-2677: Stop of 'ora.crsd' on 'rac1' succeeded CRS-2673: Attempting to stop 'ora.asm' on 'rac1' CRS-2677: Stop of 'ora.asm' on 'rac1' succeeded CRS-2673: Attempting to stop 'ora.ctssd' on 'rac1' CRS-2677: Stop of 'ora.ctssd' on 'rac1' succeeded CRS-2673: Attempting to stop 'ora.cssdmonitor' on 'rac1' CRS-2677: Stop of 'ora.cssdmonitor' on 'rac1' succeeded CRS-2673: Attempting to stop 'ora.cssd' on 'rac1' CRS-2677: Stop of 'ora.cssd' on 'rac1' succeeded CRS-2673: Attempting to stop 'ora.gpnpd' on 'rac1' CRS-2677: Stop of 'ora.gpnpd' on 'racl' succeeded CRS-2673: Attempting to stop 'ora.gipcd' on 'rac1' CRS-2677: Stop of 'ora.gipcd' on 'rac1' succeeded CRS-2673: Attempting to stop 'ora.mdnsd' on 'rac1' CRS-2677: Stop of 'ora.mdnsd' on 'rac1' succeeded CRS-2672: Attempting to start 'ora.mdnsd' on 'rac1' CRS-2676: Start of 'ora.mdnsd' on 'racl' succeeded CRS-2672: Attempting to start 'ora.gipcd' on 'rac1' CRS-2676: Start of 'ora.gipcd' on 'rac1' succeeded CRS-2672: Attempting to start 'ora.gpnpd' on 'rac1' CRS-2676: Start of 'ora.gpnpd' on 'rac1' succeeded CRS-2672: Attempting to start 'ora.cssdmonitor' on 'rac1' CRS-2676: Start of 'ora.cssdmonitor' on 'rac1' succeeded CRS-2672: Attempting to start 'ora.cssd' on 'rac1' CRS-2672: Attempting to start 'ora.diskmon' on 'rac1' CRS-2676: Start of 'ora.diskmon' on 'rac1' succeeded CRS-2676: Start of 'ora.cssd' on 'rac1' succeeded CRS-2672: Attempting to start 'ora.ctssd' on 'rac1' CRS-2676: Start of 'ora.ctssd' on 'rac1' succeeded CRS-2672: Attempting to start 'ora.asm' on 'rac1' CRS-2676: Start of 'ora.asm' on 'rac1' succeeded CRS-2672: Attempting to start 'ora.crsd' on 'rac1' CRS-2676: Start of 'ora.crsd' on 'rac1' succeeded CRS-2672: Attempting to start 'ora.evmd' on 'rac1' CRS-2676: Start of 'ora.evmd' on 'rac1' succeeded CRS-2672: Attempting to start 'ora.asm' on 'rac1' CRS-2676: Start of 'ora.asm' on 'rac1' succeeded CRS-2672: Attempting to start 'ora.DATA.dg' on 'rac1' CRS-2676: Start of 'ora.DATA.dg' on 'rac1' succeeded

rac1 2012/09/23 18:12:00

```
/u01/app/11.2.0/grid/cdata/rac1/backup_20120923_181200.olr
Configure Oracle Grid Infrastructure for a Cluster ... succeeded
Updating inventory properties for clusterware
Starting Oracle Universal Installer...
Checking swap space: must be greater than 500 MB. Actual 3928 MB Passed
The inventory pointer is located at /etc/oraInst.loc
The inventory is located at /u01/app/oraInventory
'UpdateNodeList' was successful.
```

Similar output can be observed while executing the scripts on the other nodes also. The message 'UpdateNodeList' was successful confirms the successful execution of the script.

Oracle Grid Infrastructure - Setting up Grid Infrastructure - Step 9 of 10 ORACLE 118 Setup Progress Г 100% Oracle Cluster Verification Utility failed Status Install Grid Infrastructure for a Cluster
 Prepare
 Copy files
 Link binaries
 Setup files
 Perform remote operations
 Execute Root Scripts for Install Grid Infrastructure for a Cluster
 Configure Oracle Grid Infrastructure for a Cluster
 Ornifigure Inter Infrastructure for a Cluster Succeeded Succeeded Succeeded Succeeded Setup Succeeded Succeeded Succeeded Finish Succeeded Oracle Net Configuration Assistant Succeeded Automatic Net Comparation Assistant
 Automatic Storage Management Configuration Assistant
 Oracle Private Interconnect Configuration Assistant
 Oracle Cluster Verification Utility Succeeded Succeeded Ignored Details Retry Skip Control Data Access Classification, Security and Encryption and Compliance 🔒 📕 < Back Next > Einish Close Help

m) The installation is complete. Click "Next" to move to the "Finish" wizard

n) The "Finish" wizard confirms the successful installation of the Oracle Grid Infrastructure software



Oracle Database Software Installation

Once the oracle grid infrastructure is installed successfully, oracle database software installation can be initiated. The step by step listing and related description is as follows.

a) Unzip the database software zipped files as "root" user. Modify the owner and group details of the "database" folder.

[root@rac1 install]# unzip linux.x64_11gR2_database_2of2.zip [root@rac1 install]# unzip linux.x64_11gR2_database_2of2.zip [root@rac1 install]# cd ./database [root@rac1 database]# chown -R oracle:oinstall *

b) Execute "xhost +" as root to configure xwindows. Run the Installer utility

[root@rac1 database]# xhost +
access control disabled, clients can connect from any host
[root@rac1 database]# su oracle
[oracle@rac1 database]\$ sh runInstaller
Starting Oracle Universal Installer...

Checking Temp space: must be greater than 120 MB. Actual 4870 MB Passed Checking swap space: must be greater than 150 MB. Actual 3999 MB Passed Checking monitor: must be configured to display at least 256 colors. Actual 16777216 Passed Preparing to launch Oracle Universal Installer from /tmp/OraInstall2012-09-24_05-28-58AM. Please wait ...

c) The "Configure Security Updates" asks for the email contact to sync in the security updates to the user. Since its not mandatory, uncheck the option and click "Next".

Oracle Databa	ase 11g Release 2 Installe	r - Installing database - Ste	plof9 _ 🗆 🗙
Configure Security Updates	5		DATABASE 11 ^g
Configure Security Updates	Provide your email address to be and initiate configuration manage	informed of security issues, install the rr. <u>View details</u> .	product
Installation Option Grid Options Install Type	E <u>m</u> ail:	Easier for you if you use your My Orac address/username.	le Support email
Yppical Installation Prerequisite Checks Summary Install Product	My Oracle Support Password:	tes via My Oracle Support.	
- Finish			
Help		< <u>B</u> ack	vext > Einish Cancel

d) In the wizard "Installation Option", select the option "Install database software only" and click "Next". It implies that we shall create the database separately using the "dbca" utility.

Oracle Datab	ase 11g Release 2 Installer - Installing database - Step 2 of 9
Select Installation Option	
Configure Security Updates Installation Option Crid Options Install Type Typical Installation Prerequisite Checks Summary Install Product Finish	Select any of the following install options. Create and configure a database Output Create and configure a database Output Create an existing database
Help	Sack Next > Einish Cancel

e) Under the "Grid Options" wizard, the "Real Application Clusters database installation" is selected by default due to detection of the clusterware by the installer. Note that both the nodes i.e. RAC1 and RAC2 are listed and check by default.

However, "Single instance database installation" option allows to create a conventional database with a single instance connecting to a single database.

Oracle Databa	ase 11g Release 2 Installer - Installing database - Step 3 of 9
Node Selection	
Configure Security Updates	Select the type of database installation you want to perform. <u>Single instance database installation</u>
Grid Options	<u> <u> R</u>eal Application Clusters database installation </u>
📕 Install Type	Select nodes (in addition to the local node) in the cluster where the installer should install Oracle RAC.
Y Typical Installation	Node Name
Prerequisite Checks	V racl
Summary	✓ rac2
 Install Product 	
O Finish	
	SSH <u>C</u> onnectivity Select All Deselect All
Help	< <u>Back</u> <u>Next</u> Einish Cancel

f) The "Product Languages" wizard allows you to select the language supported by the database product.

Oracle Databas	se 11g Release 2 Installer -	Installing data	abase - Ste	ep 4 of 11	
Select Product Languages				ORACLE D A T A B A S E	11 ^g
Configure Security Updates Installation Option Grid Options Product Languages Database Edition Installation Location Operating System Groups Prerequisite Checks Summary Install Product Finish	Select the languages in which your Available Languages: Arabic Bengali Brazilian Portuguese Bulgarian Canadian French Catalan Croatian Czech Danish Dutch Egyptian English (United Kingdom) Estonian Finnish French German Greek Hebrew Hungarian Icelandic Indonesian		Selected Lang English	uages:	
Help			< <u>B</u> ack	<u>N</u> ext > <u>Einish</u>	Cancel

g) The "Database Edition" wizard allows you to select the appropriate edition to be installed. For

demonstration purposes, we select "Enterprise Edition" and click "Next" to move further.



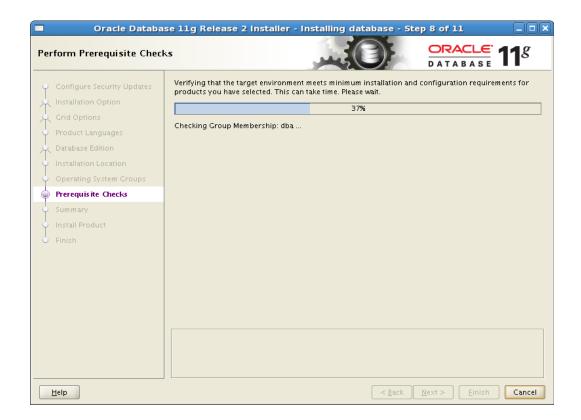
h) The "Installation Location" wizard allows the user to select the "Oracle Base" and "Software Location" on the server.

Oracle Databas	e 11g Release 2 Installer - Installing database - Step 6 of	11 – 🗆 🗙
Specify Installation Locatio		ACLE 118
Configure Security Updates	Specify an Oracle base path to place all Oracle software and configuration-rela is the Oracle base directory. Oracle Base: /u01/app/oracle Specify a location for storing Oracle software files. This location is the Oracle	Browse
Installation Location	Software Location: //u01/app/oracle/product/11.2.0/dbhome_2	▼ Bro <u>w</u> se
Operating System Groups Prerequisite Checks Summary Install Product Finish		
Help	< <u>B</u> ack <u>N</u> ext >	Einish Cancel

I) The wizard "Operating System Groups" select the OSDBA abd OSOPER groups.

Oracle Databa	se 11g Release 2 Installer - Installing database - Step 7 of 11
Privileged Operating Syste	
Configure Security Updates Installation Option Grid Options Product Languages Database Edition Installation Location Operating System Groups Prerequisite Checks Summary Install Product Finish	SYSDBA and SYSOPER privileges are required to create a database using operating system (OS) authentication. Membership in OSDBA grants the SYSDBA privilege, and membership in OSOPER grants the SYSOPER privilege, which is a subset of SYSDBA privileges. Select the name of the OSDBA group to grant the SYSDBA privilege. You must be a member of this group. Database <u>A</u> dministrator (OSDBA) Group: dba • Database <u>Operator (OSOPER) Group: oper •</u>
Help	< <u>Back</u> <u>Next</u> <u>Finish</u> Cancel

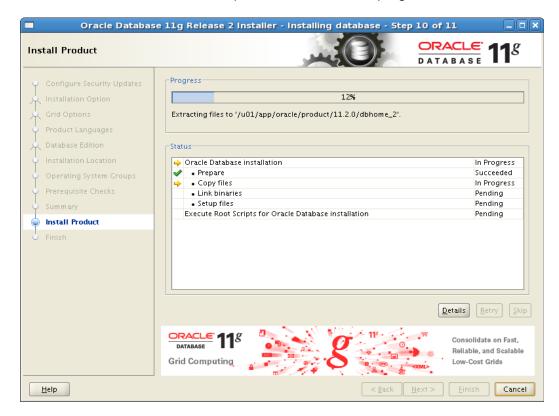
j) In the "Prerequisite Checks" wizard, the installer performs the prerequisite checks.



k) Once the prerequisite checks are performed, the "Summary" wizard lists the summary of validations and verifications. Click "Finish' to kick off the installation.

Oracle Databa	se 11g Release 2 Installer - Installing database - Step 9 of 11
Summary	
Configure Security Updates Installation Option Grid Options Product Languages Database Edition Installation Location Operating System Groups Prerequisite Checks Summary Install Product Finish	Oracle Database 11g Release 2 Installer Global settings —Disk space: required 4.29 GB available 4.36 GB —Source location: /mnt/database/install//stage/products.xml —Install method: Typical installation —Database edition: Enterprise Edition (Install database software only) —Oracle base: /u01/app/oracle —Software location: /u01/app/oracle/product/11.2.0/dbhome_2 —OSDBA group: dba
	Save Response File
Help	< <u>Back</u> <u>Mext</u> > <u>Einish</u> Cancel

I) The "Install Product" wizard shows the stepwise installation and progress bar



m) Similar to grid installation, a dialog pops up to prompt the execution of Root scripts for Database Installation. Execute the scripts on both the nodes RAC1 and RAC2 respectively

```
[root@rac1 /]# /u01/app/oracle/product/11.2.0/dbhome 2/root.sh
Running Oracle 11g root.sh script...
The following environment variables are set as:
    ORACLE OWNER= oracle
    ORACLE HOME= /u01/app/oracle/product/11.2.0/dbhome 2
Enter the full pathname of the local bin directory: [/usr/local/bin]:
The file "dbhome" already exists in /usr/local/bin. Overwrite it? (y/n)
[n]: y
   Copying dbhome to /usr/local/bin ...
The file "oraenv" already exists in /usr/local/bin. Overwrite it? (y/n)
[n]: y
   Copying oraenv to /usr/local/bin ...
The file "coraenv" already exists in /usr/local/bin. Overwrite it? (y/n)
[n]: y
   Copying coraenv to /usr/local/bin ...
Entries will be added to the /etc/oratab file as needed by
Database Configuration Assistant when a database is created
Finished running generic part of root.sh script.
Now product-specific root actions will be performed.
```

Finished product-specific root actions.

n) The "Finish" wizard confirms the successful installation of Oracle database software.

Oracle Databas	se 11g Release 2 Installer - Installing database - Stej	p 11 of 11	
Finish		ORACLE DATABASE	11 ^g
Configure Security Updates Installation Option Grid Options Product Languages Database Edition Installation Location Operating System Groups Prerequisite Checks Summary Install Product	The installation of Oracle Database was successful.		
Finish			
<u>H</u> elp	< <u>B</u> ack	Next > Einish	<u>C</u> lose