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## Oracle Database 11g Release 2 (11.2.0.3.0) RAC On Oracle Linux 6.3 Using VirtualBox

This article describes the installation of Oracle Database 11g release 2 (11.2.0.3 64-bit) RAC on Linux (Oracle Linux 6.3 64-bit) using VirtualBox (4.2.6) with no additional shared disk devices.

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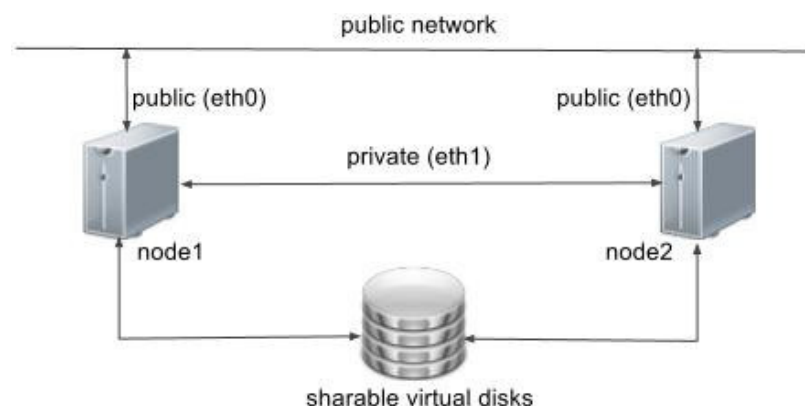
Related articles.

- [Oracle Database 11g Release 2 RAC On Oracle Linux 5.8 Using VirtualBox](#)
- [Oracle Database 11g Release 2 RAC On Windows 2008 Using VirtualBox](#)

### Introduction

One of the biggest obstacles preventing people from setting up test RAC environments is the requirement for shared storage. In a production environment, shared storage is often provided by a SAN or high-end NAS device, but both of these options are very expensive when all you want to do is get some experience installing and using RAC. A cheaper alternative is to use a FireWire disk enclosure to allow two machines to access the same disk(s), but that still costs money and requires two servers. A third option is to use virtualization to fake the shared storage.

Using VirtualBox you can run multiple Virtual Machines (VMs) on a single server, allowing you to run both RAC nodes on a single machine. In addition, it allows you to set up shared virtual disks, overcoming the obstacle of expensive shared storage.



[Przetłumacz](#)

Before you launch into this installation, here are a few things to consider.

- The finished system includes the host operating system, two guest operating systems, two sets of Oracle Grid Infrastructure (Clusterware + ASM) and two Database instances all on a single server. As you can imagine, this requires a significant amount of disk space, CPU and memory.
- Following on from the last point, the VMs will each need at least 3G of RAM, preferably 4G if you don't want the VMs to swap like crazy. As you can see, 11gR2 RAC requires much more memory than 11gR1 RAC. Don't assume you will be able to run this on a small PC or laptop. You won't.
- This procedure provides a bare bones installation to get the RAC working. There is no redundancy in the Grid Infrastructure installation or the ASM installation. To add this, simply create double the amount of shared disks and select the "Normal" redundancy option when it is offered. Of course, this will take more disk space.
- During the virtual disk creation, I always choose not to preallocate the disk space. This makes virtual disk access slower during the installation, but saves on wasted disk space. The shared disks must have their space preallocated.
- This is not, and should not be considered, a production-ready system. It's simply to allow you to get used to installing and using RAC.
- The Single Client Access Name (SCAN) should be defined in the DNS or GNS and round-robin between one of 3 addresses, which are on the same subnet as the public and virtual IPs. Prior to 11.2.0.2 it could be defined as a single IP address in the "/etc/hosts" file, which is wrong and will cause the cluster verification to fail, but it allowed you to complete the install without the presence of a DNS. This does not seem to work for 11.2.0.2 onward.
- The virtual machines can be limited to 2Gig of swap, which causes a prerequisite check failure, but doesn't prevent the installation working. If you want to avoid this, define 3+Gig of swap.
- This article uses the 64-bit versions of Oracle Linux and Oracle 11g Release 2.
- When doing this installation on my server, I split the virtual disks on to different physical disks ("/u02", "/u03", "/u04"). This is not necessary, but makes things run a bit faster.

## Download Software

Download the following software.

- [Oracle Linux 6.3](#)
- ~~[VirtualBox](#)~~ **4**
- ~~[Oracle 11g Release 2 \(11.2.0.3\) Software \(64 bit\)](#)~~

## VirtualBox Installation

First, install the VirtualBox software. On RHEL and its clones you do this with the following type of command as the root user.

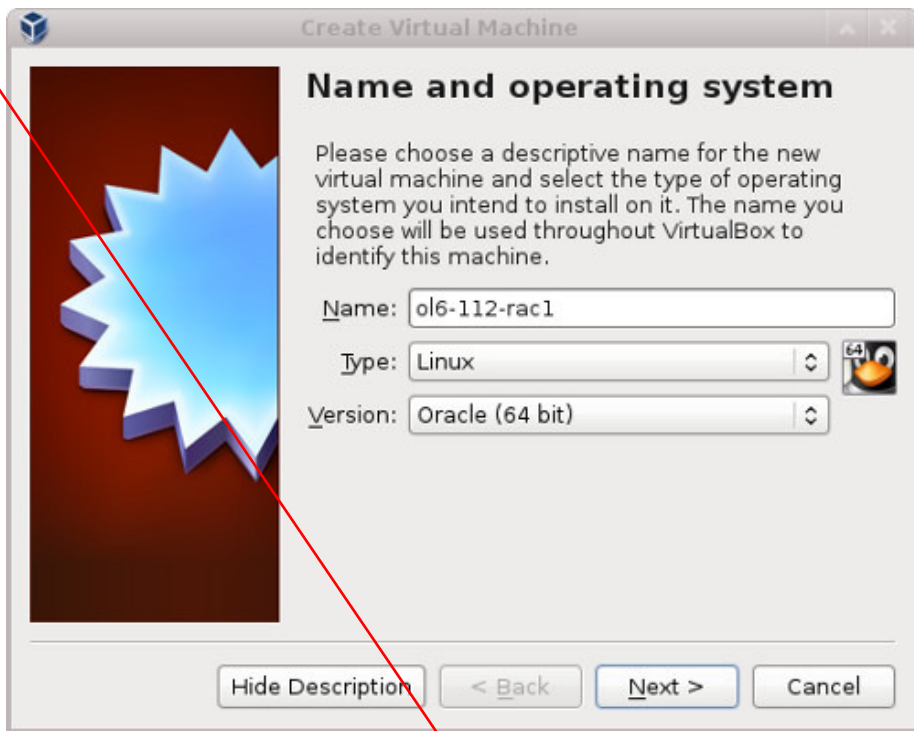
```
# rpm -Uvh VirtualBox-4.2-4.2.6_82870_fedora17-1.x86_64.rpm
```

The package name will vary depending on the host distribution you are using. Once complete, VirtualBox is started from the "Applications > System Tools > Oracle VM VirtualBox" menu option.

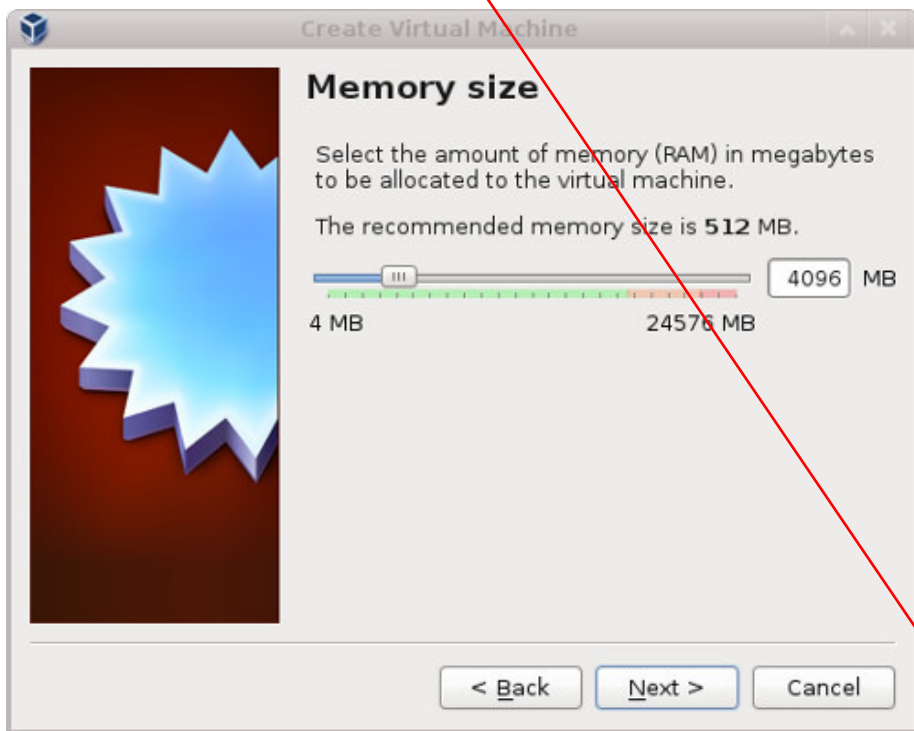
## Virtual Machine Setup

Now we must define the two virtual RAC nodes. We can save time by defining one VM, then cloning it when it is installed.

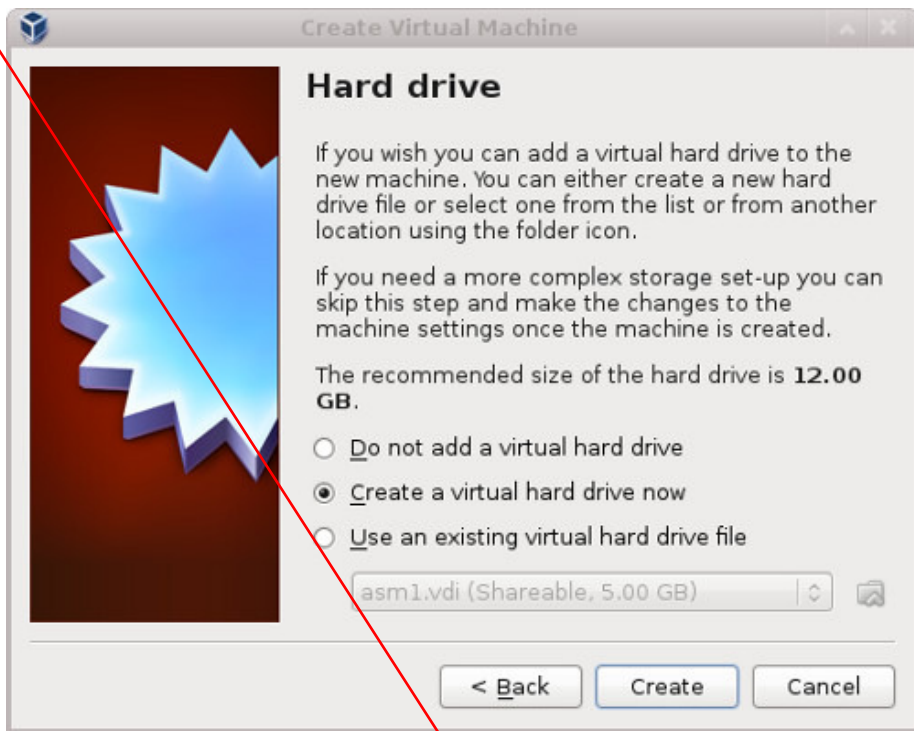
Start VirtualBox and click the "New" button on the toolbar. Enter the name "ol6-112-rac1", OS "Linux" and Version "Oracle (64 bit)", then click the "Next" button.



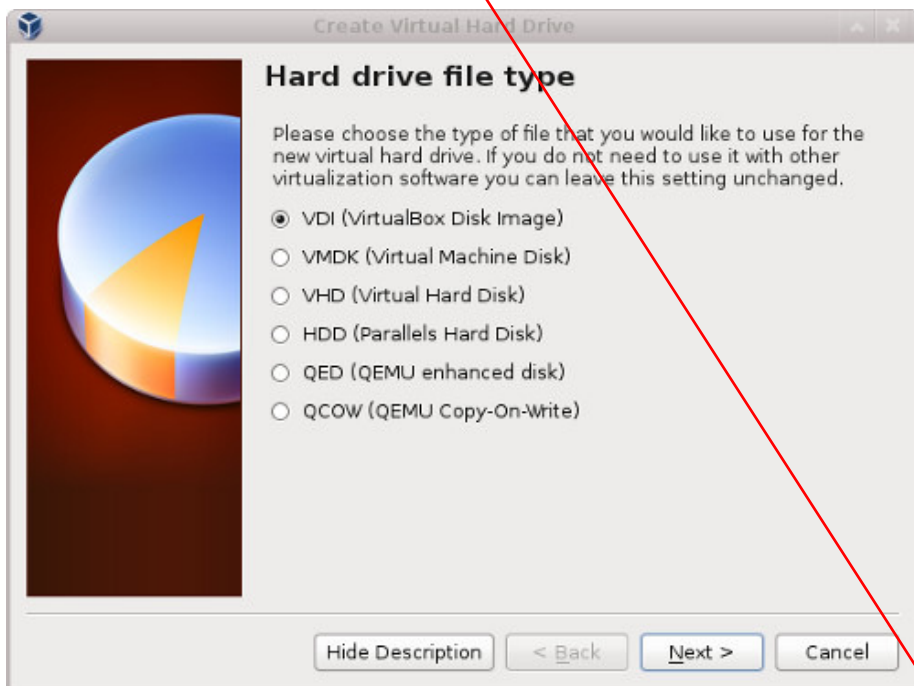
Enter "4096" as the base memory size, then click the "Next" button.



Accept the default option to create a new virtual hard disk by clicking the "Create" button.



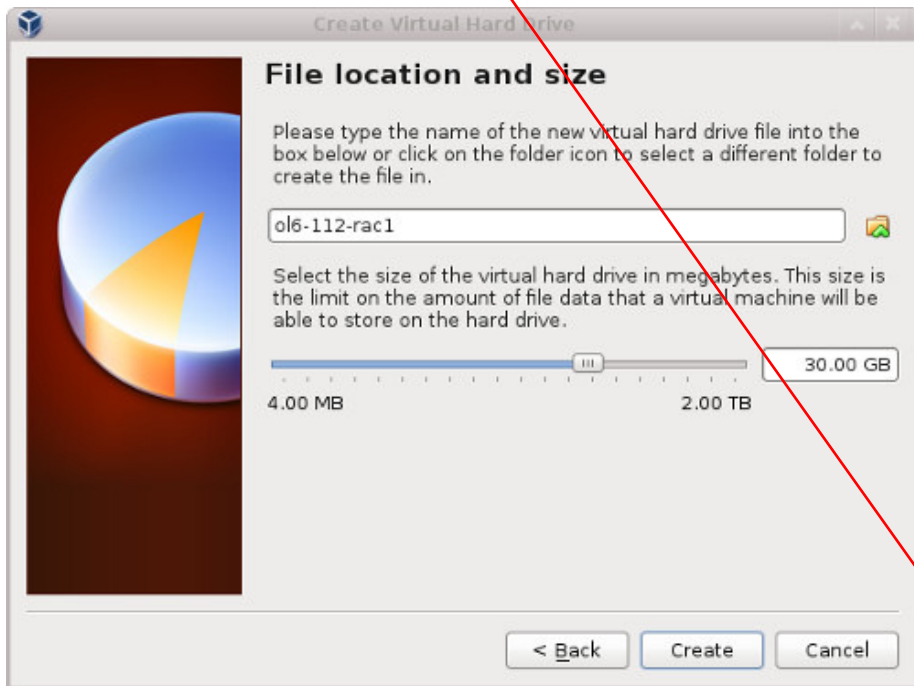
Accept the default hard drive file type by clicking the "Next" button.



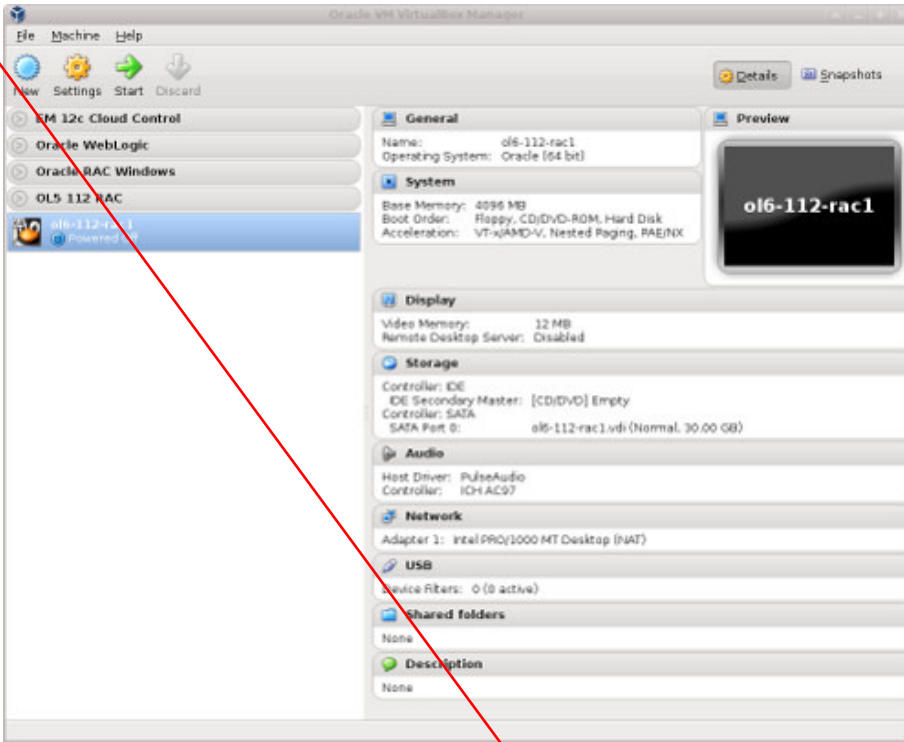
Accept the "Dynamically allocated" option by clicking the "Next" button.



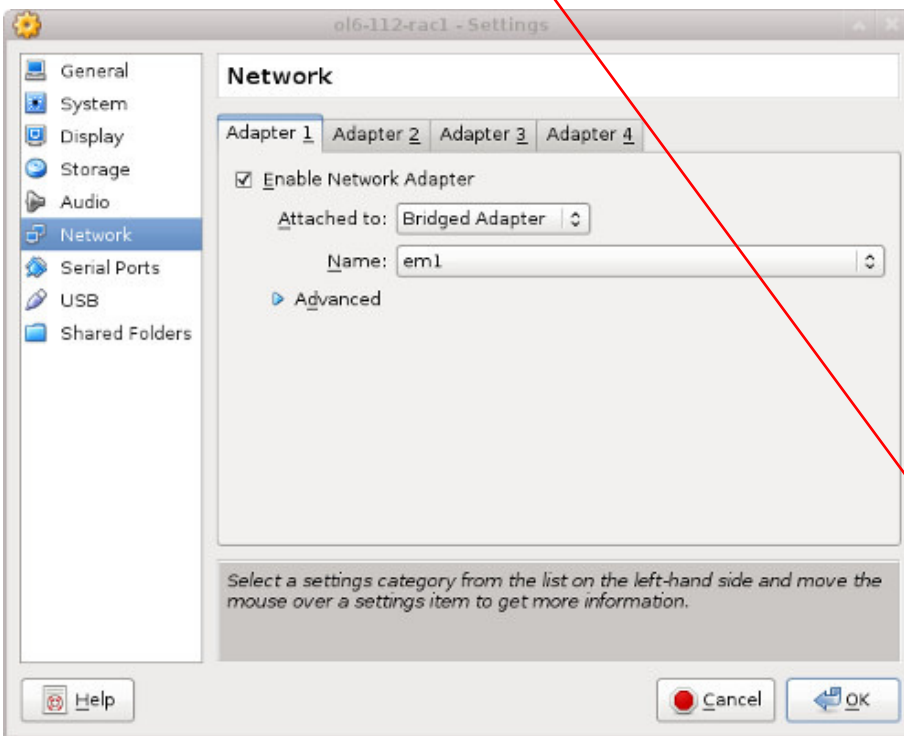
Accept the default location and set the size to "30G", then click the "Create" button. If you can spread the virtual disks onto different physical disks, that will improve performance.



The "ol6-112-rac1" VM will appear on the left hand pane. Scroll down the "Details" tab on the right and click on the "Network" link.

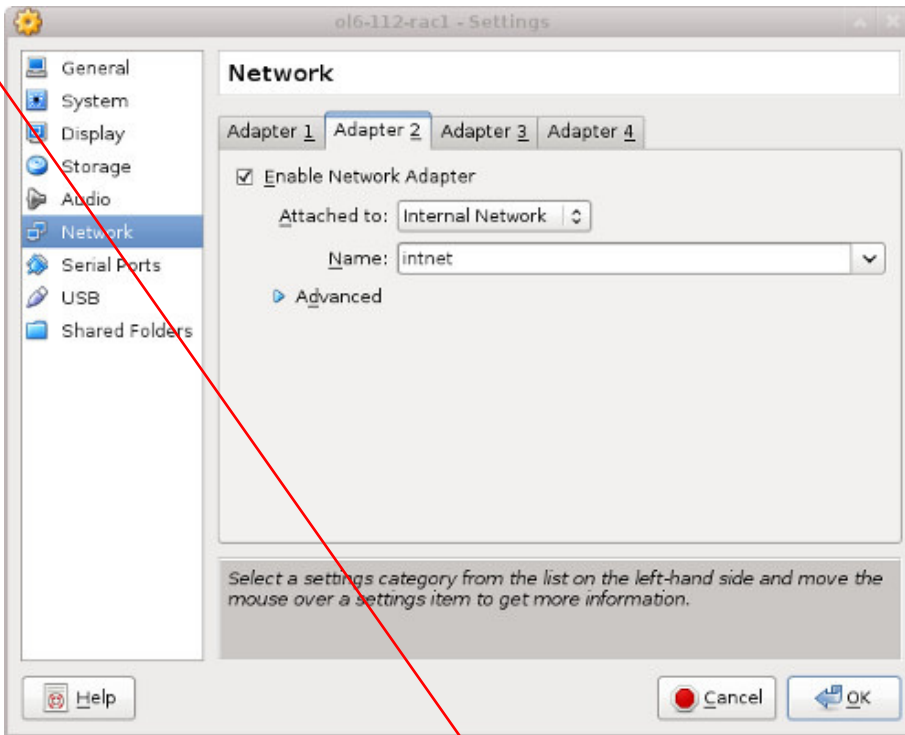


Make sure "Adapter 1" is enabled, set to "Bridged Adapter", then click on the "Adapter 2" tab.

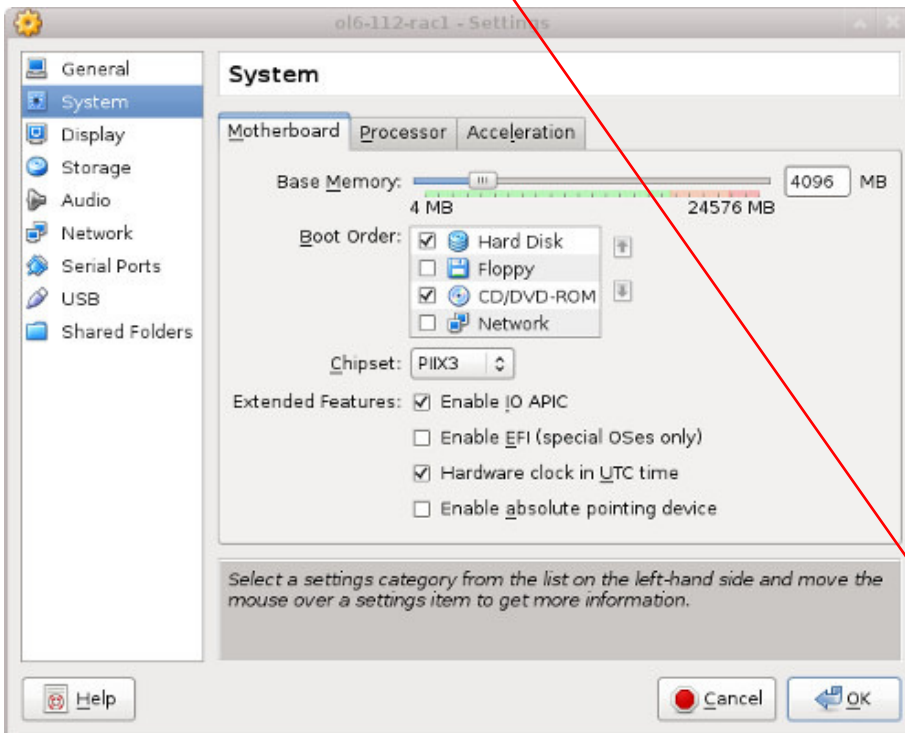


Make sure "Adapter 2" is enabled, set to "Bridged Adapter" or "Internal Network", then click on the "System" section.





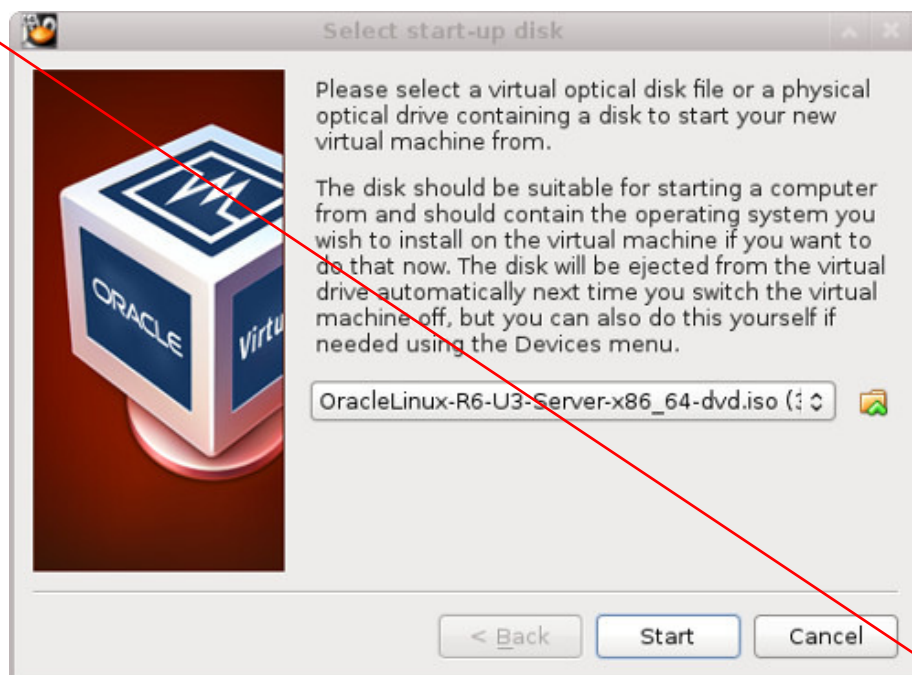
Move "Hard Disk" to the top of the boot order and uncheck the "Floppy" option, then click the "OK" button.



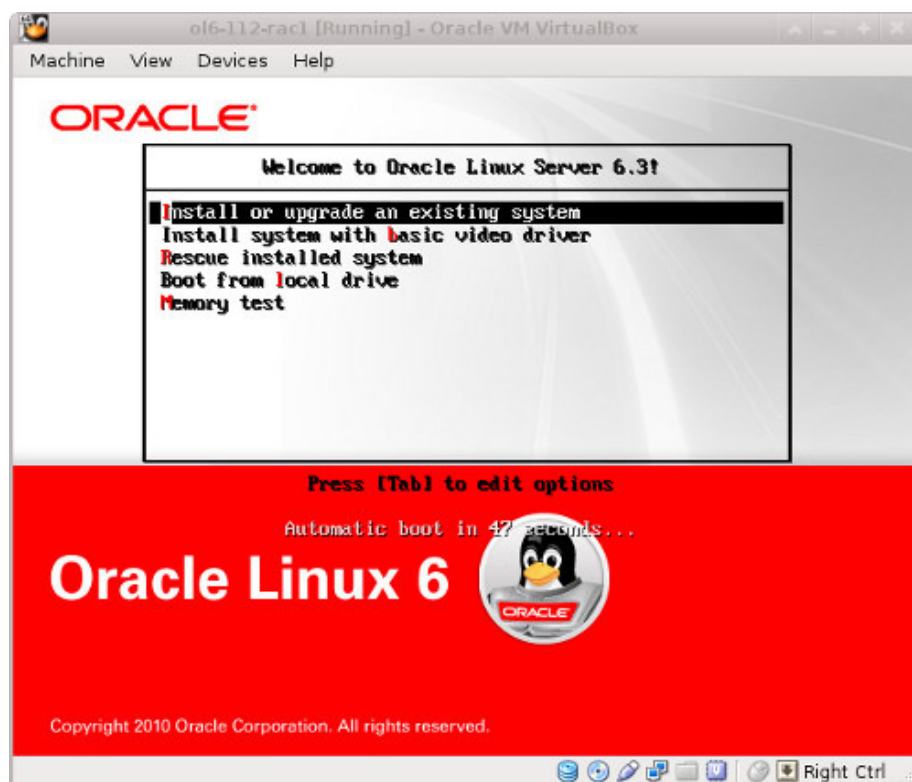
The virtual machine is now configured so we can start the guest operating system installation.

**Guest Operating System Installation**

With the new VM highlighted, click the "Start" button on the toolbar. On the "Select start-updisk" screen, choose the relevant Oracle Linux ISO image and click the "Start" button.



The resulting console window will contain the Oracle Linux boot screen.



Continue through the Oracle Linux 6 installation as you would for a basic server. A general pictorial guide to the installation can be found [here](#). More specifically, it should be a server installation with a minimum of 4G+ swap, firewall disabled, SELinux set to permissive and the following package groups installed:

- Base System > Base
- Base System > Client management tools
- Base System > Compatibility libraries
- Base System > Hardware monitoring utilities
- Base System > Large Systems Performance
- Base System > Network file system client
- Base System > Performance Tools
- Base System > Perl Support
- Servers > Server Platform
- Servers > System administration tools
- Desktops > Desktop
- Desktops > Desktop Platform

Podany zestaw grup pakietów instalacyjnych należy traktować informacyjnie, ponieważ na obydwu maszynach wirtualnych zostały już zainstalowane odpowiednie grupy pakietów systemu operacyjnego Linux. Proszę porównać ten punkt instrukcji z odpowiednim punktem instrukcji podanej w suplemencie do wykładów 1 - 3.



- Desktops > Fonts
- Desktops > General Purpose Desktop
- Desktops > Graphical Administration Tools
- Desktops > Input Methods
- Desktops > X Window System
- Applications > Internet Browser
- Development > Additional Development
- Development > Development Tools

Gdy na interfejsie sieciowym eth0 nie został ustawiony globalny adres IP, a jedynie 192.168.xxx.111, to wystarczy jeszcze tylko jeden interfejs sieciowy eth1 dla prywatnego adresu IP, który w roku 2016 ma być zdefiniowany wg wzorca ustalonego w głównej części wyk. 11 - 13. Jest to bardzo ważne, aby uniknąć konfliktu adresów IP !!!

To be consistent with the rest of the article, the following information should be set during the installation:

- hostname: ol6-112-rac1.localdomain
- IP Address eth0: 192.168.0.111 (public address)
- Default Gateway eth0: 192.168.0.1 (public address)
- IP Address eth1: 192.168.1.111 (private address)
- Default Gateway eth1: none

Zastosować nazwę domenową i adres IP wg wzorców ustalonych w głównej części wykładu !!!!

You are free to change the IP addresses to suit your network, but remember to stay consistent with those adjustments throughout the rest of the article.

## Oracle Installation Prerequisites

Perform either the Automatic Setup or the Manual Setup to complete the basic prerequisites. The Additional Setup is required for all installations.

### Automatic Setup

If you plan to use the "oracle-rdbms-server-11gR2-preinstall" package to perform all your prerequisite setup, follow the instructions at <http://public-yum.oracle.com> to setup the yum repository for OL, then perform the following command.

```
# yum install oracle-rdbms-server-11gR2-preinstall
```

All necessary prerequisites will be performed automatically.

It is probably worth doing a full update as well, but this is not strictly speaking necessary.

```
# yum update
```

### Manual Setup

If you have not used the "oracle-rdbms-server-11gR2-preinstall" package to perform all prerequisites, you will need to manually perform the following setup tasks.

In addition to the basic OS installation, the following packages must be installed whilst logged in as the root user. This includes the 64-bit and 32-bit versions of some packages. The commented out packages are those already installed if you have followed the suggested package selection.

```
# From Oracle Linux 6 DVD
cd /media/cdrom/Server/Packages
#rpm -Uvh binutils-2.*
#rpm -Uvh compat-libstdc++-33*
#rpm -Uvh elfutils-libelf-0.*
#rpm -Uvh libaio-0.*
rpm -Uvh libaio-devel-0.*
#rpm -Uvh sysstat-9.*
#rpm -Uvh glibc-2.*
#rpm -Uvh glibc-common-2.*
#rpm -Uvh glibc-devel-2.* glibc-headers-2.*
rpm -Uvh ksh-2*
#rpm -Uvh make-3.*
#rpm -Uvh libgcc-4.*
#rpm -Uvh libstdc++-4.*
rpm -Uvh libstdc++-4.*i686*
#rpm -Uvh libstdc++-devel-4.*
#rpm -Uvh gcc-4.*x86_64*
#rpm -Uvh gcc-c++-4.*x86_64*
#rpm -Uvh --allfiles elfutils-libelf-0*x86_64* elfutils-libelf-devel-0*x86_64*
rpm -Uvh elfutils-libelf-0*i686* elfutils-libelf-devel-0*i686*
rpm -Uvh libtool-ltdl*i686*
rpm -Uvh ncurses*i686*
```

```
rpm -Uvh readline*i686*
rpm -Uvh unixODBC*
cd /
eject
```

Add or amend the following lines to the "/etc/sysctl.conf" file.

```
fs.aio-max-nr = 1048576
fs.file-max = 6815744
#kernel.shmall = 2097152
#kernel.shmmax = 1054504960
kernel.shmmni = 4096
# semaphores: semmsl, semmns, semopm, semmni
kernel.sem = 250 32000 100 128
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=1048586
```

Run the following command to change the current kernel parameters.

```
/sbin/sysctl -p
```

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

```
oracle          soft    nproc    2047
oracle          hard    nproc    16384
oracle          soft    nofile   4096
oracle          hard    nofile   65536
oracle          soft    stack    10240
```

Te parametry powinny być już wprowadzone w skopiowanych maszynach, ale należy je zweryfikować.

Add the following lines to the "/etc/pam.d/login" file, if it does not already exist.

```
session    required    pam_limits.so
```

Create the new groups and users.

```
groupadd -g 1000 oinstall
groupadd -g 1200 dba
useradd -u 1100 -g oinstall -G dba oracle
passwd oracle
```

Użytkownik oracle oraz grupy oinstall i dba powinny być już utworzone w skopiowanych maszynach, ale należy to zweryfikować. Oczywiście liczbowe identyfikatory użytkownika oraz grup nie muszą być takie same jak w niniejszej instrukcji.

### Additional Setup

Perform the following steps whilst logged into the "ol6-112-rac1" virtual machine as the root user.

Set the password for the "oracle" user.

```
passwd oracle
```

Hasło powinno być takie samo na obydwu węzłach i tak powinno być w skopiowanych maszynach, ale należy to zweryfikować.

Install the following package from the Oracle grid media after you've defined groups.

Poniższą instalację na obydwu węzłach należy wykonać z pakietu Oracle Grid Infrastructure

```
cd /your/path/to/grid/rpm
rpm -Uvh cvuqdisk*
```

If you are not using DNS, the "/etc/hosts" file must contain the following information.

```
127.0.0.1          localhost.localdomain  localhost
# Public
192.168.0.111     ol6-112-rac1.localdomain  ol6-112-rac1
192.168.0.112     ol6-112-rac2.localdomain  ol6-112-rac2
# Private
192.168.1.111     ol6-112-rac1-priv.localdomain  ol6-112-rac1-priv
```

Zastosować nazwy domenowe swoich hostów na maszynach wirtualnych i swoje adresy IP zgodne z ustaleniami!!!

```

192.168.1.112 ol6-112-rac2-priv.localdomain ol6-112-rac2-priv
# Virtual
192.168.0.113 ol6-112-rac1-vip.localdomain ol6-112-rac1-vip
192.168.0.114 ol6-112-rac2-vip.localdomain ol6-112-rac2-vip
# SCAN
192.168.0.115 ol6-112-scan.localdomain ol6-112-scan
192.168.0.116 ol6-112-scan.localdomain ol6-112-scan
192.168.0.117 ol6-112-scan.localdomain ol6-112-scan

```

Należy zarówno skonfigurować wpisy do /etc/hosts , jaki DNS zgodnie z punktem 1 instrukcji przedstawionej w głównej części wykł. 11 - 13 !!!

Note. Even with the SCAN address defined in the hosts file, it still needs to be defined on the DNS to round-robin between 3 addresses on the same subnet as the public IPs. The DNS configuration is described [here](#). Having said that, I normally include everything except the SCAN entries when using DNS.

Amend the "/etc/security/limits.d/90-nproc.conf" file as described below. See [MOS Note \[ID 1487773.1\]](#)

```

# Change this
*          soft          nproc          1024

# To this
* - nproc 16384

```

Change the setting of SELinux to permissive by editing the "/etc/selinux/config" file, making sure the SELINUX flag is set as follows.

```
SELINUX=permissive
```

If you have the Linux firewall enabled, you will need to disable or configure it, as shown [here](#) or [here](#). The following is an example of disabling the firewall.

```

# service iptables stop
# chkconfig iptables off

```

Firewall powinien być wyłączony w skopiowanych maszynach, ale należy to zweryfikować.

Either configure NTP, or make sure it is not configured so the Oracle Cluster Time Synchronization Service (ctssd) can synchronize the times of the RAC nodes. If you want to deconfigure NTP do the following.

```

# service ntpd stop
Shutting down ntpd: [ OK ]
# chkconfig ntpd off
# mv /etc/ntp.conf /etc/ntp.conf.orig
# rm /var/run/ntpd.pid

```

If you want to use NTP, you must add the "-x" option into the following line in the "/etc/sysconfig/ntpd" file.

```
OPTIONS="-x -u ntp:ntp -p /var/run/ntpd.pid"
```

Then restart NTP.

```
# service ntpd restart
```

Create the directories in which the Oracle software will be installed.

```

mkdir -p /u01/app/11.2.0.3/grid
mkdir -p /u01/app/oracle/product/11.2.0.3/db_1
chown -R oracle:oinstall /u01
chmod -R 775 /u01/

```

Jeśli na skopiowanych maszynach posiadamy już pewną strukturę podkatalogów w /u01 , to należy ją uporządkować zgodnie z tą instrukcją i usunąć wszystkie pliki poza plikami pakietów instalacyjnych.

Log in as the "oracle" user and add the following lines at the end of the "/home/oracle/.bash\_profile" file.

Proszę zastosować swoją nazwę domenową hosta i swoje ścieżki dostępu

```

# Oracle Settings
TMP=/tmp; export TMP
TMPDIR=$TMP; export TMPDIR

```

W ustawieniach zmienny środowiskowych proszę się wzorować na instrukcji umieszczonej w podpunkcie C punktu 2 i 3 wykł. 11 - 13.

```

ORACLE_HOSTNAME=ol6-112-rac1.localdomain; export ORACLE_HOSTNAME
ORACLE_UNQNAME=RAC; export ORACLE_UNQNAME

```

```

ORACLE_BASE=/u01/app/oracle; export ORACLE_BASE
GRID_HOME=/u01/app/11.2.0.3/grid; export GRID_HOME
DB_HOME=$ORACLE_BASE/product/11.2.0.3/db_1; export DB_HOME
ORACLE_HOME=$DB_HOME; export ORACLE_HOME
ORACLE_SID=RAC1; export ORACLE_SID
ORACLE_TERM=xterm; export ORACLE_TERM
BASE_PATH=/usr/sbin:$PATH; export BASE_PATH
PATH=$ORACLE_HOME/bin:$BASE_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 65536
    else
        ulimit -u 16384 -n 65536
    fi
fi

alias grid_env='. /home/oracle/grid_env'
alias db_env='. /home/oracle/db_env'

```

Create a file called "/home/oracle/grid\_env" with the following contents.

```

ORACLE_SID=+ASM1; export ORACLE_SID
ORACLE_HOME=$GRID_HOME; export ORACLE_HOME
PATH=$ORACLE_HOME/bin:$BASE_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

```

Create a file called "/home/oracle/db\_env" with the following contents.

```

ORACLE_SID=RAC1; export ORACLE_SID
ORACLE_HOME=$DB_HOME; export ORACLE_HOME
PATH=$ORACLE_HOME/bin:$BASE_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

```

Once the "/home/oracle/grid\_env" has been run, you will be able to switch between environments as follows.

```

$ grid_env
$ echo $ORACLE_HOME
/u01/app/11.2.0.3/grid
$ db_env
$ echo $ORACLE_HOME
/u01/app/oracle/product/11.2.0.3/db_1
$

```

We've made a lot of changes, so it's worth doing a reboot of the VM at this point to make sure all the changes have taken effect.

```
# shutdown -r now
```

## ~~Install Guest Additions~~

~~Click on the "Devices > Install Guest Additions" menu option at the top of the VM screen. If you get the option to auto-run take it. If not, then run the following commands.~~

```

cd /media/VBOXADDITIONS_4.2_6_82870
sh ./VBoxLinuxAdditions.run

```

~~The VM will need to be restarted for the additions to be used properly. The next section requires a shutdown so no additional restart is needed at this time.~~

## Create Shared Disks

Shut down the "ol6-112-rac1" virtual machine using the following command.

```
# shutdown -h now
```

On the host server, create 4 sharable virtual disks and associate them as virtual media using the following commands. You can pick a different location, but make sure they are outside the existing VM directory.

```
$ mkdir -p /u04/VirtualBox/ol6-112-rac
$ cd /u04/VirtualBox/ol6-112-rac
$
$ # Create the disks and associate them with VirtualBox as virtual media.
$ VBoxManage createhd --filename asm1.vdi --size 5120 --format VDI --variant Fixed
$ VBoxManage createhd --filename asm2.vdi --size 5120 --format VDI --variant Fixed
$ VBoxManage createhd --filename asm3.vdi --size 5120 --format VDI --variant Fixed
$ VBoxManage createhd --filename asm4.vdi --size 5120 --format VDI --variant Fixed
$
$ # Connect them to the VM.
$ VBoxManage storageattach ol6-112-rac1 --storagectl "SATA" --port 1 --device 0 --type
  --medium asm1.vdi --mtype shareable
$ VBoxManage storageattach ol6-112-rac1 --storagectl "SATA" --port 2 --device 0 --type
  --medium asm2.vdi --mtype shareable
$ VBoxManage storageattach ol6-112-rac1 --storagectl "SATA" --port 3 --device 0 --type
  --medium asm3.vdi --mtype shareable
$ VBoxManage storageattach ol6-112-rac1 --storagectl "SATA" --port 4 --device 0 --type
  --medium asm4.vdi --mtype shareable
$
$ # Make shareable.
$ VBoxManage modifyhd asm1.vdi --type shareable
$ VBoxManage modifyhd asm2.vdi --type shareable
$ VBoxManage modifyhd asm3.vdi --type shareable
$ VBoxManage modifyhd asm4.vdi --type shareable
```

Start the "ol6-112-rac1" virtual machine by clicking the "Start" button on the toolbar. When the server has started, log in as the root user so you can configure the shared disks. The current disks can be seen by issuing the following commands.

```
# cd /dev
# ls sd*
sda sda1 sda2 sdb sdc sdd sde
#
```

We wszystkich poniżej opisanych operacjach na dyskach należy stosować swoje nazwy urządzeń przygotowanych dla systemu składowania Oracle ASM i oprzeć się na instrukcji przedstawionej w podpunkcie B punktów 2 i 3 głównej części wykł. 11 - 13 !!!

Use the "fdisk" command to partition the disks sdb to sde. The following output shows the expected fdisk output for the sdb disk.

```
# fdisk /dev/sdb
Device contains neither a valid DOS partition table, nor Sun, SGI or OSF disklabel
Building a new DOS disklabel with disk identifier 0x62be91cf.
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)

WARNING: DOS-compatible mode is deprecated. It's strongly recommended to
switch off the mode (command 'c') and change display units to
sectors (command 'u').

Command (m for help): n
Command action
  e   extended
  p   primary partition (1-4)
p
Partition number (1-4): 1
First cylinder (1-652, default 1):
Using default value 1
Last cylinder, +cylinders or +size{K,M,G} (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.
#

```

In each case, the sequence of answers is "n", "p", "1", "Return", "Return" and "w".

Once all the disks are partitioned, the results can be seen by repeating the previous "ls" command.

```

# cd /dev
# ls sd*
sda sda1 sda2 sdb sdb1 sdc sdc1 sdd sdd1 sde sde1
#

```

Configure your UDEV rules, as shown [here](#).

Add the following to the "/etc/scsi\_id.config" file to configure SCSI devices as trusted. Create the file if it doesn't already exist.

```
options==g
```

The SCSI ID of my disks are displayed below.

```

# /sbin/scsi_id -g -u -d /dev/sdb
1ATA_VBOX_HARDDISK_VB348c4cfc-e3924169
# /sbin/scsi_id -g -u -d /dev/sdc
1ATA_VBOX_HARDDISK_VB5a922b63-bdda991a
# /sbin/scsi_id -g -u -d /dev/sdd
1ATA_VBOX_HARDDISK_VB4bcd7321-f022a60f
# /sbin/scsi_id -g -u -d /dev/sde
1ATA_VBOX_HARDDISK_VBec4843fc-6004ae11
#

```

Using these values, edit the "/etc/udev/rules.d/99-oracle-asmdevices.rules" file adding the following 4 entries. All parameters for a single entry must be on the same line.

```

KERNEL=="sd?1", BUS=="scsi", PROGRAM=="/sbin/scsi_id -g -u -d /dev/$parent", RESULT=="",
NAME="asm-disk1", OWNER="oracle", GROUP="dba", MODE="0660"
KERNEL=="sd?1", BUS=="scsi", PROGRAM=="/sbin/scsi_id -g -u -d /dev/$parent", RESULT=="",
NAME="asm-disk2", OWNER="oracle", GROUP="dba", MODE="0660"
KERNEL=="sd?1", BUS=="scsi", PROGRAM=="/sbin/scsi_id -g -u -d /dev/$parent", RESULT=="",
NAME="asm-disk3", OWNER="oracle", GROUP="dba", MODE="0660"
KERNEL=="sd?1", BUS=="scsi", PROGRAM=="/sbin/scsi_id -g -u -d /dev/$parent", RESULT=="",
NAME="asm-disk4", OWNER="oracle", GROUP="dba", MODE="0660"

```

Load updated block device partition tables.

```

# /sbin/partprobe /dev/sdb1
# /sbin/partprobe /dev/sdc1
# /sbin/partprobe /dev/sdd1
# /sbin/partprobe /dev/sde1

```

Test the rules are working as expected.

```
# /sbin/udevadm test /block/sdb/sdb1
```

Reload the UDEV rules and start UDEV.

```

# /sbin/udevadm control --reload-rules
# /sbin/start_udev

```

The disks should now be visible and have the correct ownership using the following command. If they are not visible, your UDEV configuration is incorrect and must be fixed before you proceed.



```
# ls -al /dev/asm*
brw-rw---- 1 oracle dba 8, 17 Oct 12 14:39 /dev/asm-disk1
brw-rw---- 1 oracle dba 8, 33 Oct 12 14:38 /dev/asm-disk2
brw-rw---- 1 oracle dba 8, 49 Oct 12 14:39 /dev/asm-disk3
brw-rw---- 1 oracle dba 8, 65 Oct 12 14:39 /dev/asm-disk4
#
```

The shared disks are now configured for the grid infrastructure.

## Clone the Virtual Machine

Later versions of VirtualBox allow you to clone VMs, but these also attempt to clone the shared disks, which is not what we want. Instead we must manually clone the VM.

Shut down the "ol6-112-rac1" virtual machine using the following command.

```
# shutdown -h now
```

Manually clone the "ol6-112-rac1.vdi" disk using the following commands on the host server.

```
$ mkdir -p /u03/VirtualBox/ol6-112-rac2
$ VBoxManage clonehd /u01/VirtualBox/ol6-112-rac1/ol6-112-rac1.vdi /u03/VirtualBox/ol6
```

Create the "ol6-112-rac2" virtual machine in VirtualBox in the same way as you did for "ol6-112-rac1", with the exception of using an existing "ol6-112-rac2.vdi" virtual hard drive.



Remember to add the second network adaptor as you did on the "ol6-112-rac1" VM. When the VM is created, attach the shared disks to this VM.

```
$ cd /u04/VirtualBox/ol6-112-rac
$
$ VBoxManage storageattach ol6-112-rac2 --storagectl "SATA" --port 1 --device 0 --type
--medium asm1.vdi --mtype shareable
$ VBoxManage storageattach ol6-112-rac2 --storagectl "SATA" --port 2 --device 0 --type
--medium asm2.vdi --mtype shareable
$ VBoxManage storageattach ol6-112-rac2 --storagectl "SATA" --port 3 --device 0 --type
--medium asm3.vdi --mtype shareable
$ VBoxManage storageattach ol6-112-rac2 --storagectl "SATA" --port 4 --device 0 --type
--medium asm4.vdi --mtype shareable
```

Start the "ol6-112-rac2" virtual machine by clicking the "Start" button on the toolbar. Ignore any network errors during the

startup.

Interfejsy sieciowe węzła RAC2 powinny być już skonfigurowane zgodnie z punktem 1 instrukcji podanej w głównej części wykł. 11 - 13, ale warto to zweryfikować wykorzystując informacje zawarte w górnej połowie tej strony.

Log in to the "ol6-112rac2" virtual machine as the "root" user so we can reconfigure the network settings to match the following.

- hostname: ol6-112-rac2.localdomain
- IP Address eth0: 192.168.0.112 (public address)
- Default Gateway eth0: 192.168.0.1 (public address)
- IP Address eth1: 192.168.1.112 (private address)
- Default Gateway eth1: none

Zastosować zgodnie z ustaleniami nazwę domenową hosta i adresy IP na swojej drugiej maszynie wirtualnej !!!!

Amend the hostname in the "/etc/sysconfig/network" file.

```
NETWORKING=yes
HOSTNAME=ol6-112-rac2.localdomain
```

We wszystkich opisanych tutaj konfiguracjach sieciowych stosować zgodnie z ustaleniami swoje nazwy domenowe hostów i swoje adresy IP !!!

Check the MAC address of each of the available network connections. Don't worry that they are listed as "eth2" and "eth3". These are dynamically created connections because the MAC address of the "eth0" and "eth1" connections is incorrect.

```
# ifconfig -a | grep eth
eth2      Link encap:Ethernet  HWaddr 08:00:27:95:ED:33
eth3      Link encap:Ethernet  HWaddr 08:00:27:E3:DA:B6
#
```

Edit the "/etc/sysconfig/network-scripts/ifcfg-eth0", amending only the IPADDR and HWADDR settings as follows and deleting the UUID entry. Note, the HWADDR value comes from the "eth2" interface displayed above.

```
HWADDR=08:00:27:95:ED:33
IPADDR=192.168.0.112
```

Edit the "/etc/sysconfig/network-scripts/ifcfg-eth1", amending only the IPADDR and HWADDR settings as follows and deleting the UUID entry. Note, the HWADDR value comes from the "eth3" interface displayed above.

```
HWADDR=08:00:27:E3:DA:B6
IPADDR=192.168.1.112
```

Edit the "/home/oracle/.bash\_profile" file on the "ol6-112-rac2" node to correct the ORACLE\_SID and ORACLE\_HOSTNAME values.

```
ORACLE_SID=RAC2; export ORACLE_SID
ORACLE_HOSTNAME=ol6-112-rac2.localdomain; export ORACLE_HOSTNAME
```

Also, amend the ORACLE\_SID setting in the "/home/oracle/db\_env" and "/home/oracle/grid\_env" files.

Restart the "ol6-112-rac2" virtual machine and start the "ol6-112-rac1" virtual machine. When both nodes have started, check they can both ping all the public and private IP addresses using the following commands.

```
ping -c 3 ol6-112-rac1
ping -c 3 ol6-112-rac1-priv
ping -c 3 ol6-112-rac2
ping -c 3 ol6-112-rac2-priv
```

At this point the virtual IP addresses defined in the "/etc/hosts" file will not work, so don't bother testing them.

Check the UDEV rules are working on both machines. In previous versions of OL6 the "/etc/udev/rules.d/99-oracle-asmdevices.rules" file copied between servers during the clone without any issues. For some reason, this doesn't seem to happen on my OL6.3 installations, so you may need to repeat the UDEV configuration on the second node if the output of the following command is not consistent on both nodes.

```
# ls -al /dev/asm*
brw-rw----. 1 oracle dba 8, 17 Jan 12 20:16 /dev/asm-disk1
brw-rw----. 1 oracle dba 8, 33 Jan 12 20:16 /dev/asm-disk2
brw-rw----. 1 oracle dba 8, 49 Jan 12 20:16 /dev/asm-disk3
brw-rw----. 1 oracle dba 8, 65 Jan 12 20:16 /dev/asm-disk4
```

# Konfigurację połączenia ssh między węzłami RAC użytkowników oracle systemów operacyjnych Linux tych węzłów w celu zapewnienia tzw. równoważności ssh dla użytkowników oracle wszystkich węzłów RAC najlepiej wykonać zgodnie z instrukcją podaną w podpunkcie A punktów 2 i 3 głównej części wykł. 11 - 13.

Prior to 11gR2 we would probably use the "runcluvfy.sh" utility in the clusterware root directory to check the prerequisites have been met. If you are intending to configure SSH connectivity using the installer this check should be omitted as it will always fail. If you want to setup SSH connectivity manually, then once it is done you can run the "runcluvfy.sh" with the following command.

```
/mountpoint/clusterware/runcluvfy.sh stage -pre crsinst -n ol6-112-rac1,ol6-112-rac2 -
```

If you get any failures be sure to correct them before proceeding.

The virtual machine setup is now complete.

~~Before moving forward you should probably shut down your VMs and take snapshots of them. If any failures happen beyond this point it is probably better to switch back to those snapshots, clean up the shared drives and start the grid installation again. An alternative to cleaning up the shared disks is to back them up now using zip and just replace them in the event of a failure.~~

```
$ cd /u04/VirtualBox/ol6-112-rac
$ zip PreGrid.zip *.vdi
```

## Install the Grid Infrastructure

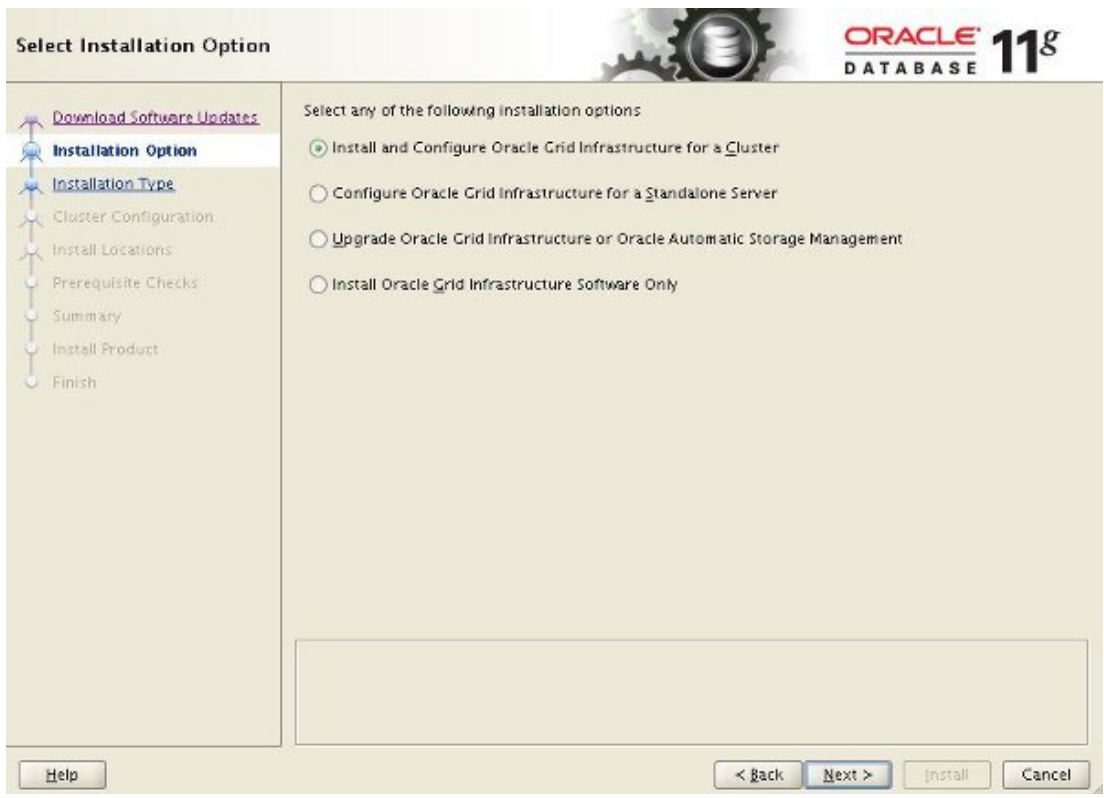
Make sure both virtual machines are started, then login to "ol6-112-rac1" as the oracle user and start the Oracle installer.

```
$ cd /host/software/oracle/11gR2/11.2.0.3.0/linux64_grid
$ ./runInstaller
```

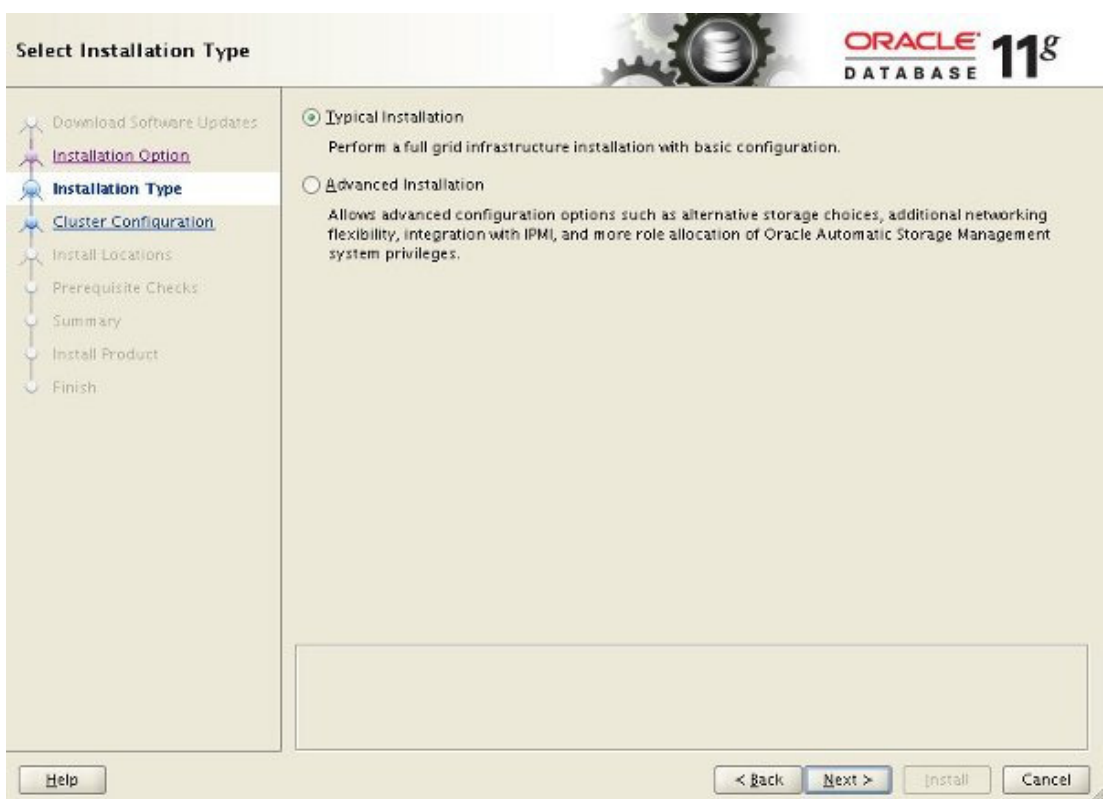
Instalację Grid Infrastructure najlepiej przeprowadzić na podstawie pliku GI\_installation.pdf, do którego link znajduje się w podpunkcie D punktów 2 i 3 głównej części wykł. 11 - 13.

Select the "Skip software updates" option, then click the "Next" button.

Select the "Install and Configure Oracle Grid Infrastructure for a Cluster" option, then click the "Next" button.



Select the "Typical Installation" option, then click the "Next" button.



On the "Specify Cluster Configuration" screen, enter the correct SCAN Name and click the "Add" button.



Enter the details of the second node in the cluster, then click the "OK" button.



Click the "SSH Connectivity..." button and enter the password for the "oracle" user. Click the "Setup" button to to configure SSH connectivity, and the "Test" button to test it once it is complete.

**Specify Cluster Configuration**

Specify basic configuration information for the grid infrastructure.

SCAN Name:

Public Hostname	Virtual Hostname
ol6-112-rac1.localdomain	ol6-112-rac1-wip.localdomain
ol6-112-rac2.localdomain	ol6-112-rac2-wip.localdomain

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

OS Username:  OS Password:

User home is shared by the selected nodes

Reuse private and public keys existing in the user home

Test Setup

Identify network interfaces...

Help < Back Next > Install Cancel

Click the "Identify network interfaces..." button and check the public and private networks are specified correctly. Once you are happy with them, click the "OK" button and the "Next" button on the previous screen.

Identify the planned use for each global interface shown in the box below as Public, Private, or Do Not Use. Private interfaces are used by Oracle Grid Infrastructure for internode traffic.

If there is more than one subnet associated with an interface, then change the interface's attributes to associate the interface name with the additional subnets.

Interface Name	Subnet	Interface Type
eth0	192.168.0.0	Public
eth1	192.168.1.0	Private

OK Cancel

Enter "/u01/app/11.2.0.3/grid" as the software location and "Automatic Storage Manager" as the cluster registry storage type. Enter the ASM password, select "dba" as the group and click the "Next" button.



### Specify Install Locations

Specify locations for Oracle base, where to install the software, where to place the Oracle Cluster Registry (OCR), and which operating system group should be given the administrative privileges (SYSASM) for Oracle Automatic Storage Management.

Oracle Base:

Software Location:

Cluster Registry Storage Type:

Cluster Registry Location:

SYSASM Password:

Confirm Password:

OSASM group:

Set the redundancy to "External", click the "Change Discovery Path" button and set the path to "/dev/asm\*". Return the main screen and select all 4 disks and click the "Next" button.

### Create ASM Disk Group

Select Disk Group Characteristics and select disks

Disk Group Name:

Redundancy:  High  Normal  External

AU Size:  MB


Add Disks:  Candidate Disks  All Disks

	Disk Path	Size (In MB)	Status
<input checked="" type="checkbox"/>	/dev/asm-disk1	5114	Candidate
<input checked="" type="checkbox"/>	/dev/asm-disk2	5114	Candidate
<input checked="" type="checkbox"/>	/dev/asm-disk3	5114	Candidate
<input checked="" type="checkbox"/>	/dev/asm-disk4	5114	Candidate

AU (allocation units) Size can be 1, 2, 4, 8, 16, 32, or 64MB. Larger AU sizes typically provide performance advantages for data warehouse applications that use large sequential reads

Accept the default inventory directory by clicking the "Next" button.

## Create Inventory



You are starting your first installation on this host. Specify a directory for installation files. This directory is called the "inventory directory". The installer automatically sets up subdirectories for each product to contain inventory data. The subdirectory for each product typically requires 150 kilobytes of disk space.


Inventory Directory:

Members of the following operating system group (the primary group) will have write permission to the inventory directory (orainventory).

orainventory Group Name: oinstall

Wait while the prerequisite checks complete. If you have any issues, either fix them or check the "Ignore All" checkbox and click the "Next" button.

## Perform Prerequisite Checks



Some of the minimum requirements for installation are not completed. Review and fix the issues listed in the following table, and recheck the system.

Ignore All

Checks	Status	Fixable
<ul style="list-style-type: none"> <li>Device Checks for ASM</li> </ul>	Ignored	No

This is a pre-check to verify if the specified devices meet the requirements for configuration through the Oracle Universal Storage Manager Configuration Assistant. [more details](#)

Check Failed on Nodes: [ol6-112-rac2, ol6-112-rac1]

If you are happy with the summary information, click the "Install" button.

**Summary**

- Download Software Updates
- Installation Option
- Installation Type
- Cluster Configuration
- Install Locations
- Create ASM Disk Group
- Create Inventory
- Prerequisite Checks
- Summary**
- Install Product
- Finish

**Oracle Grid Infrastructure**

- Global Settings**
  - Disk Space: required 5.5 GB available 20.04 GB
  - Install Option: Install and Configure Oracle Grid Infrastructure for a Cluster
  - Oracle base for Oracle Grid Infrastructure: /u01/app/oracle
  - Grid home: /u01/app/11.2.0.3/grid
  - Source Location: /host/software/oracle/11gR2/11.2.0.3.0/linux64\_grid/install/./stage/p
  - Privileged Operating System Groups: dba (OSDBA), dba (OSOPER), dba (OSASM)
- Inventory information**
  - Inventory location: /u01/app/orainventory
  - Central inventory (orainventory) group: oinstall
- Grid Infrastructure Settings**
  - Cluster Name: ol6-112-scan
  - Local Node: ol6-112-rac1
  - Remote Nodes: ol6-112-rac2
  - Single Client Access Name (SCAN): ol6-112-scan
  - SCAN Port: 1521

Save Response File...

Help < Back Next > Install Cancel

Wait while the setup takes place.

**Install Product**

- Download Software Updates
- Installation Option
- Installation Type
- Cluster Configuration
- Install Locations
- Create ASM Disk Group
- Create Inventory
- Prerequisite Checks
- Summary
- Install Product**
- Finish

**Progress**

8%

Extracting files to '/u01/app/11.2.0.3/grid'.

**Status**

Install Grid Infrastructure for a Cluster	In Progress
• Prepare	Succeeded
• Copy files	In Progress
• Link binaries	Pending
• Setup files	Pending
• Perform remote operations	Pending
Execute Root Scripts	Pending
Configure Oracle Grid Infrastructure for a Cluster	Pending

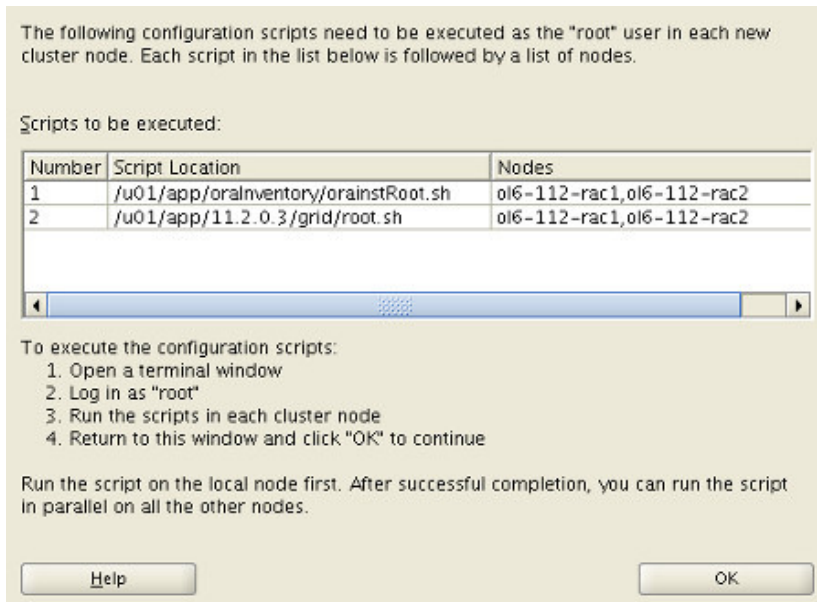
Details Retry Skip

ORACLE 11g DATABASE Grid Computing

Consolidate on Fast, Reliable, and Scalable Low-Cost Grids

Help < Back Next > Install Cancel

When prompted, run the configuration scripts on each node.



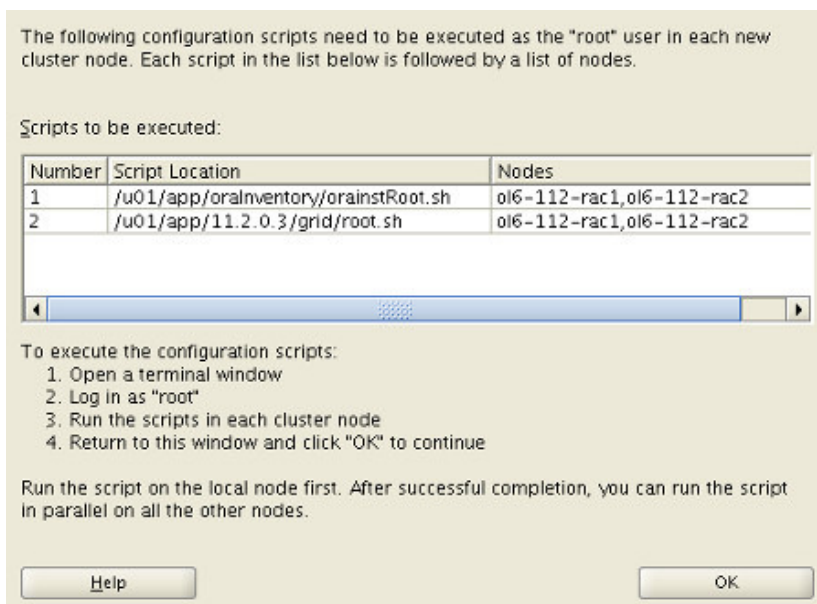
The output from the "orainstRoot.sh" file should look something like that listed below.

```
# cd /u01/app/orainventory
# ./orainstRoot.sh
Changing permissions of /u01/app/orainventory.
Adding read,write permissions for group.
Removing read,write,execute permissions for world.

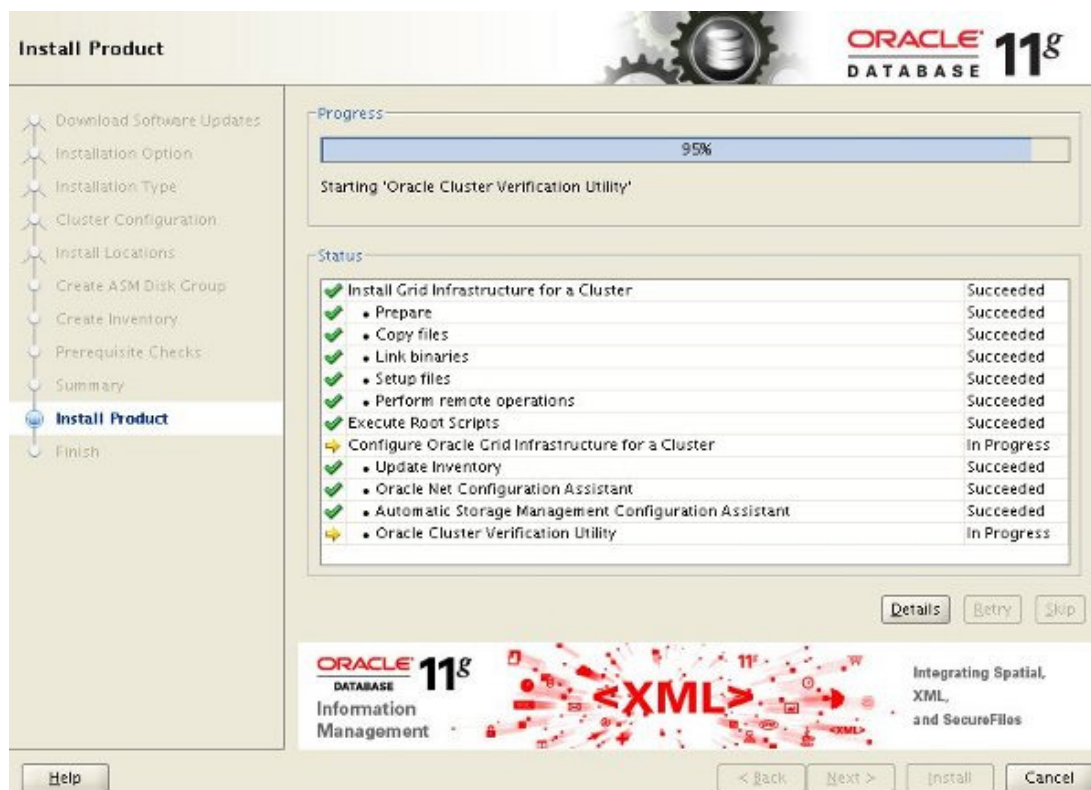
Changing groupname of /u01/app/orainventory to oinstall.
The execution of the script is complete.
#
```

The output of the root.sh will vary a little depending on the node it is run on. Example output can be seen here ([Node1](#), [Node2](#)).

Once the scripts have completed, return to the "Execute Configuration Scripts" screen on "rac1" and click the "OK" button.



Wait for the configuration assistants to complete.



We expect the verification phase to fail with an error relating to the SCAN, assuming you are not using DNS.

```

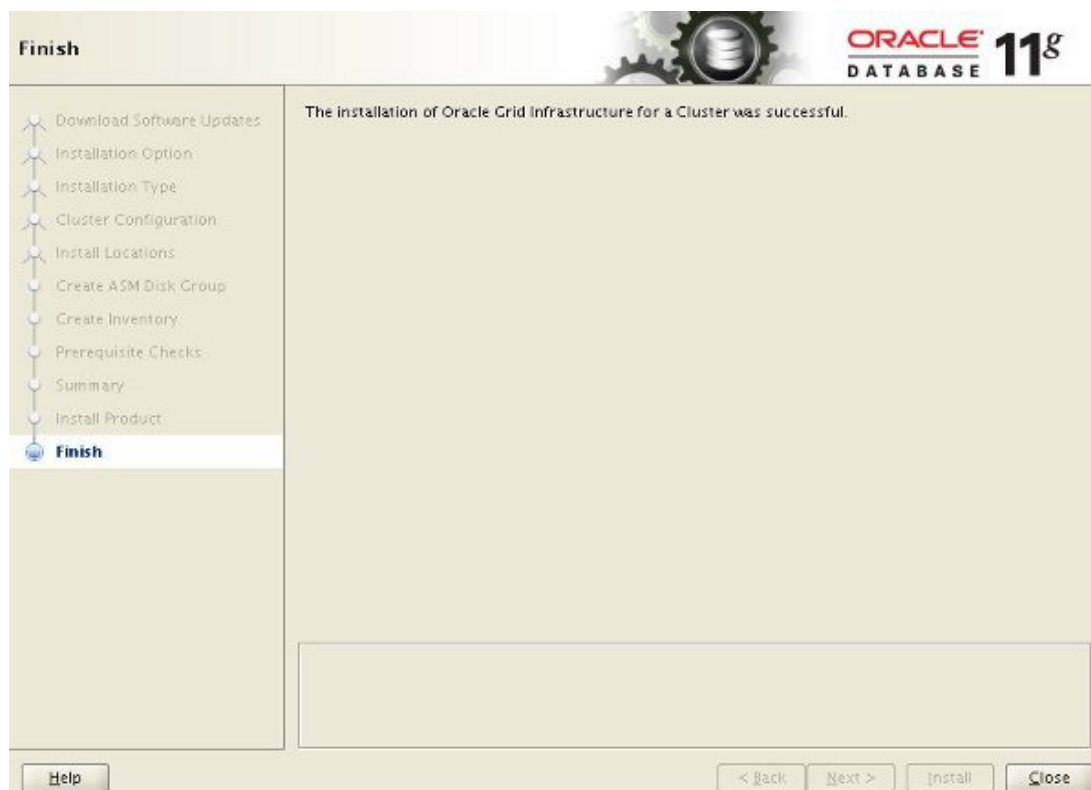
INFO: Checking Single Client Access Name (SCAN)...
INFO: Checking name resolution setup for "rac-scan.localdomain"...
INFO: ERROR:
INFO: PRVF-4664 : Found inconsistent name resolution entries for SCAN name "rac-scan.l
INFO: ERROR:
INFO: PRVF-4657 : Name resolution setup check for "rac-scan.localdomain" (IP address:
INFO: ERROR:
INFO: PRVF-4664 : Found inconsistent name resolution entries for SCAN name "rac-scan.l
INFO: Verification of SCAN VIP and Listener setup failed

```

Provided this is the only error, it is safe to ignore this and continue by clicking the "Next" button.

Click the "Close" button to exit the installer.





The grid infrastructure installation is now complete.

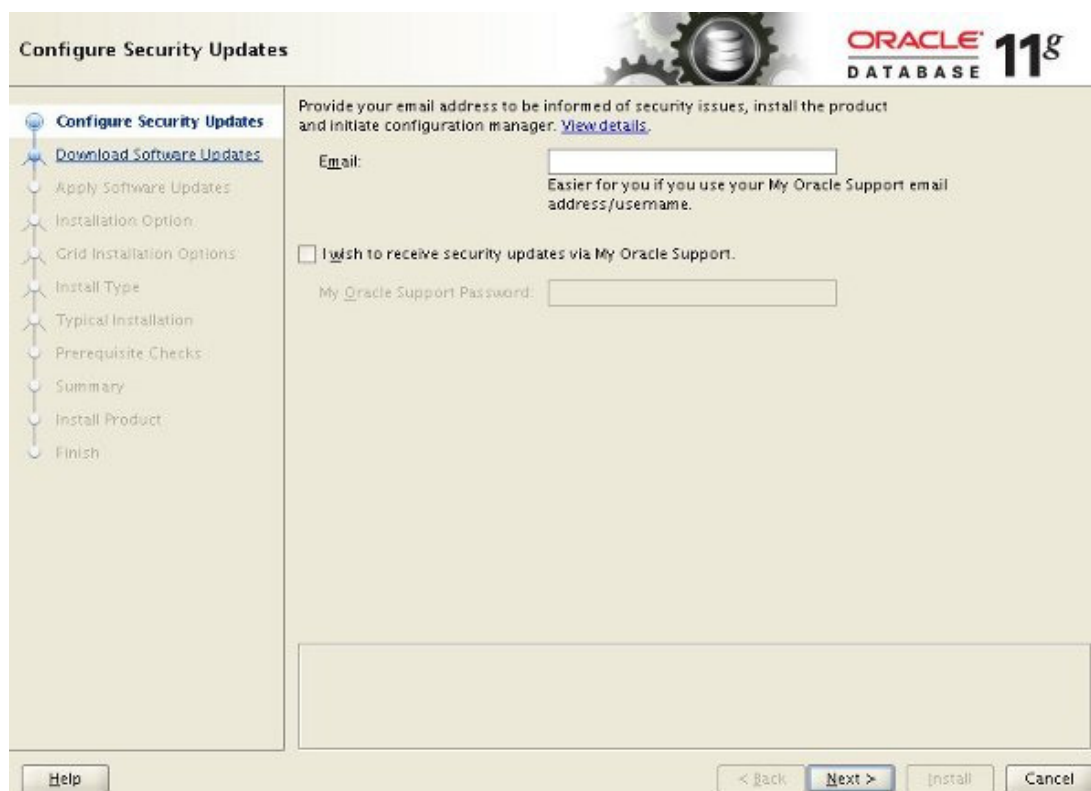
## Install the Database

Make sure the "ol6-112-rac1" and "ol6-112-rac2" virtual machines are started, then login to "ol6-112-rac1" as the oracle user and start the Oracle installer.

Chociaż poniższy opis jest właściwy, należy utworzyć bazę na ASM za pomocą wcześniej zainstalowanego dbca, tworząc najpierw jej szablon, tzn. tak jak zostało to zaprezentowane w wykł. 11 - 13 w punkcie 4 z uwzględnieniem poprzedzających go podpunktów F i G.

```
$ cd /host/software/oracle/11gR2/11.2.0.3.0/linux64_database
$ ./runInstaller
```

Uncheck the security updates checkbox and click the "Next" button and "Yes" on the subsequent warning dialog.



Check the "Skip software updates" checkbox and click the "Next" button.



**Download Software Updates**

Download software updates for this installation. Software updates consist of recommended updates to the installer, system requirement checks, patchset updates (PSUs), and other recommended patches.

Select one of the following options:

Use My Oracle Support credentials for download

My Oracle Support user name:

My Oracle Support password:

Use pre-downloaded software updates

Location:

Skip software updates

Accept the "Create and configure a database" option by clicking the "Next" button.

**Select Installation Option**

Select any of the following install options.

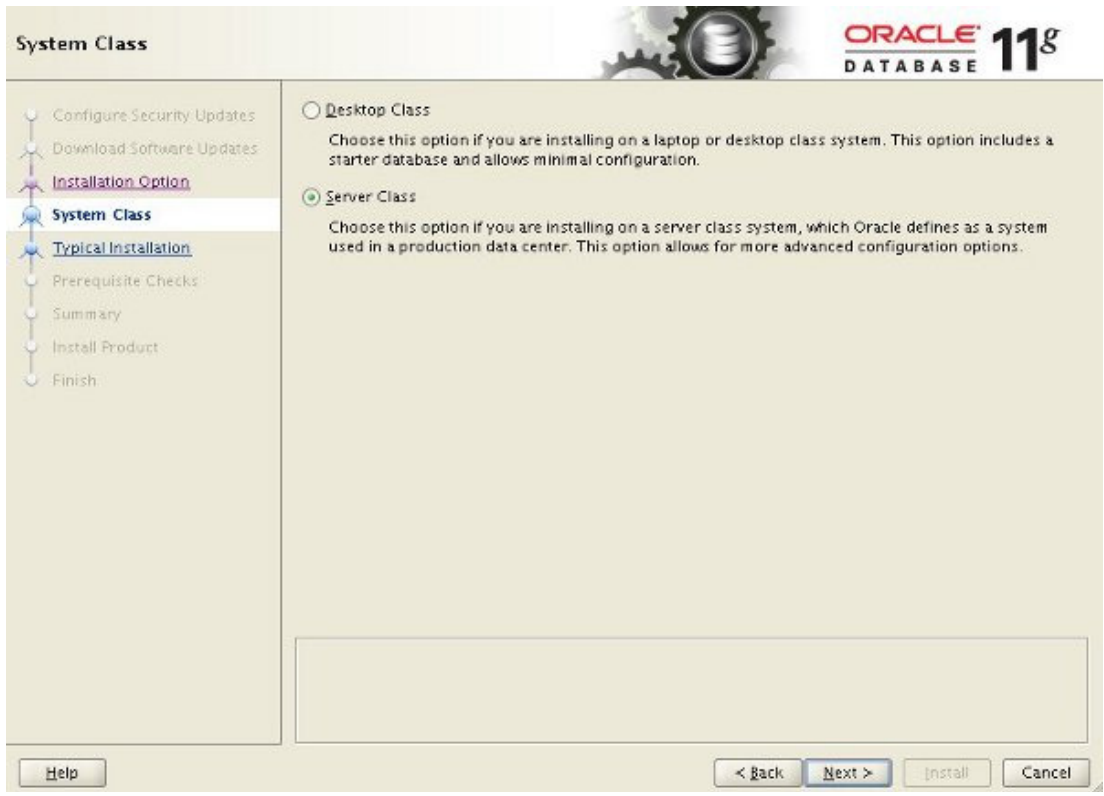
Note: If you want to upgrade an existing Oracle Database 11g Release 2 instance select "Upgrade an existing database" option.

Create and configure a database

Install database software only

Upgrade an existing database

Accept the "Server Class" option by clicking the "Next" button.



Make sure both nodes are selected, then click the "Next" button.



Accept the "Typical install" option by clicking the "Next" button.

**Select Install Type**

ORACLE DATABASE 11g

Configure Security Updates  
Download Software Updates  
Installation Option  
System Class  
Grid Installation Options  
**Install Type**  
Typical Installation  
Prerequisite Checks  
Summary  
Install Product  
Finish

**Typical install**  
Perform full Oracle Database installation with basic configuration.

**Advanced install**  
Allows advanced selections such as different passwords for the SYS, SYSMAN, SYSTEM and DBSNMP accounts, database character set, product languages, automated backups, custom installation, and alternative storage options such as Oracle Automatic Storage Management.

Help < Back Next > Install Cancel

Enter "/u01/app/oracle/product/11.2.0.3/db\_1" for the software location. The storage type should be set to "Automatic Storage Manager". Enter the appropriate passwords and database name, in this case "RAC.localdomain".

**Typical Install Configuration**

ORACLE DATABASE 11g

Configure Security Updates  
Download Software Updates  
Installation Option  
System Class  
Grid Installation Options  
**Install Type**  
Typical Installation  
Prerequisite Checks  
Summary  
Install Product  
Finish

Perform full Database installation with basic configuration.

Oracle base: /u01/app/oracle Browse

Software location: /u01/app/oracle/product/11.2.0.3/db\_1 Browse

Storage Type: Oracle Automatic Storage Management

Database file location: DATA Browse

ASM/SNMP Password: \*\*\*\*\*

Database edition: Enterprise Edition (4.5GB)

OSDBA Group: dba

Global database name: RAC.localdomain

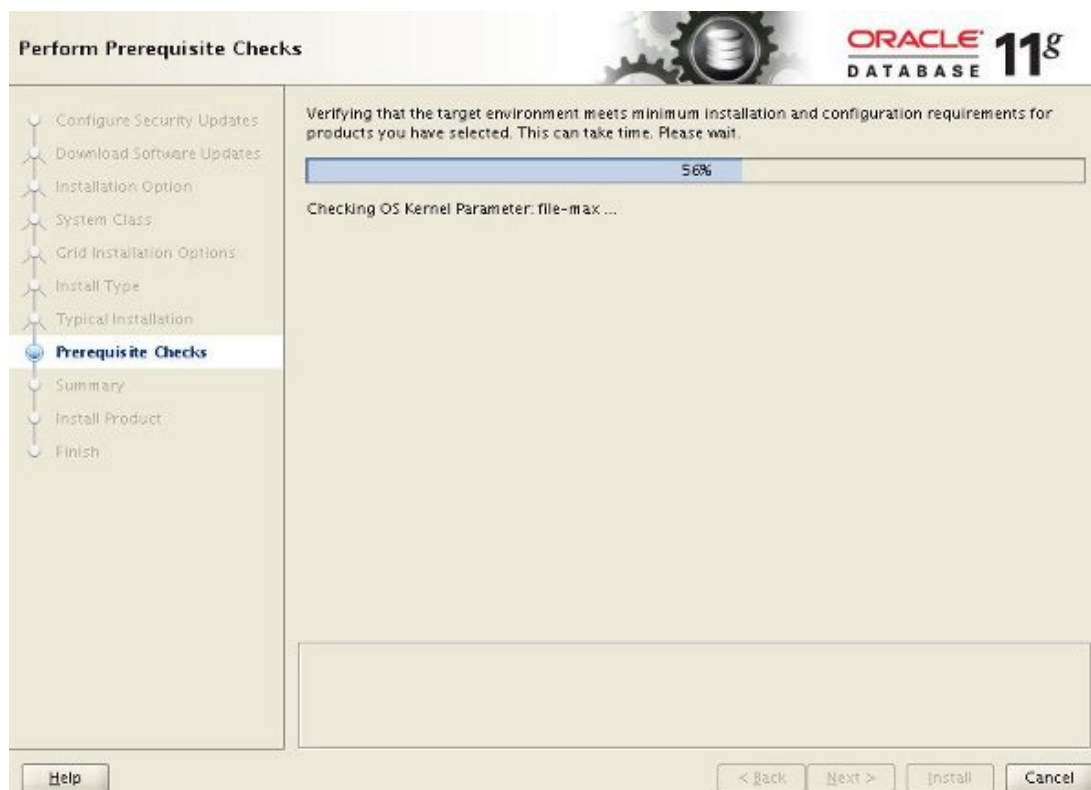
Administrative password: \*\*\*\*\*

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

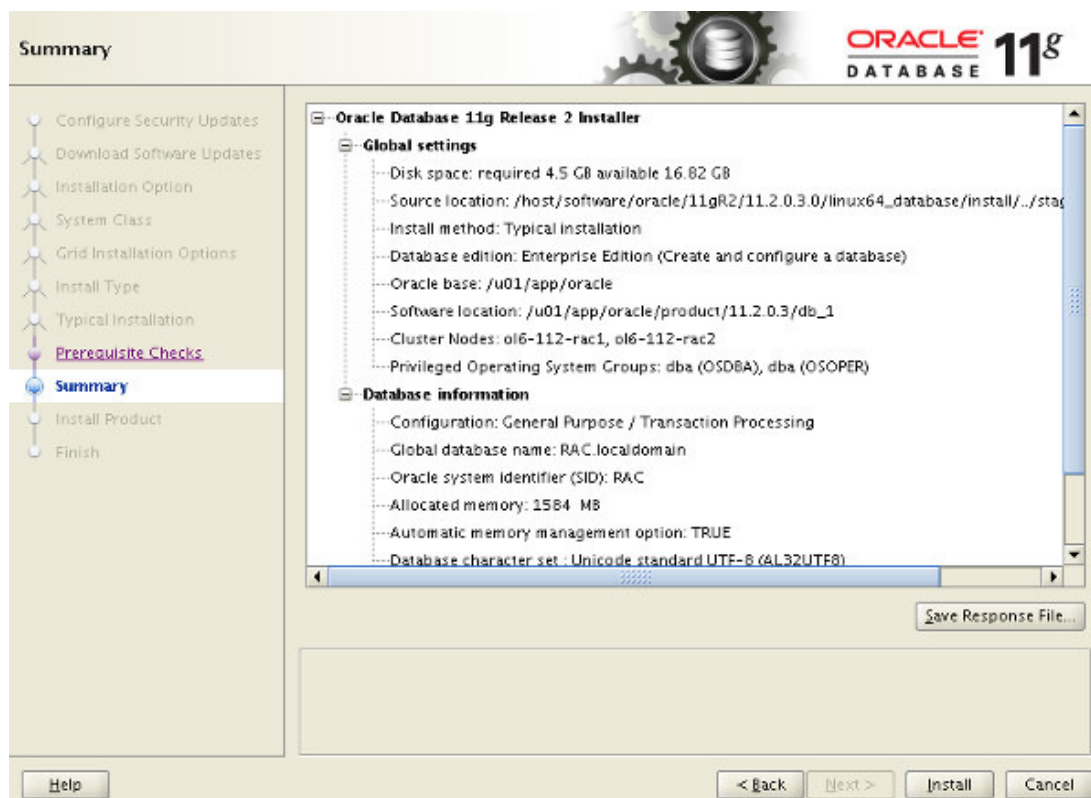
Service Name: ?

Help < Back Next > Install Cancel

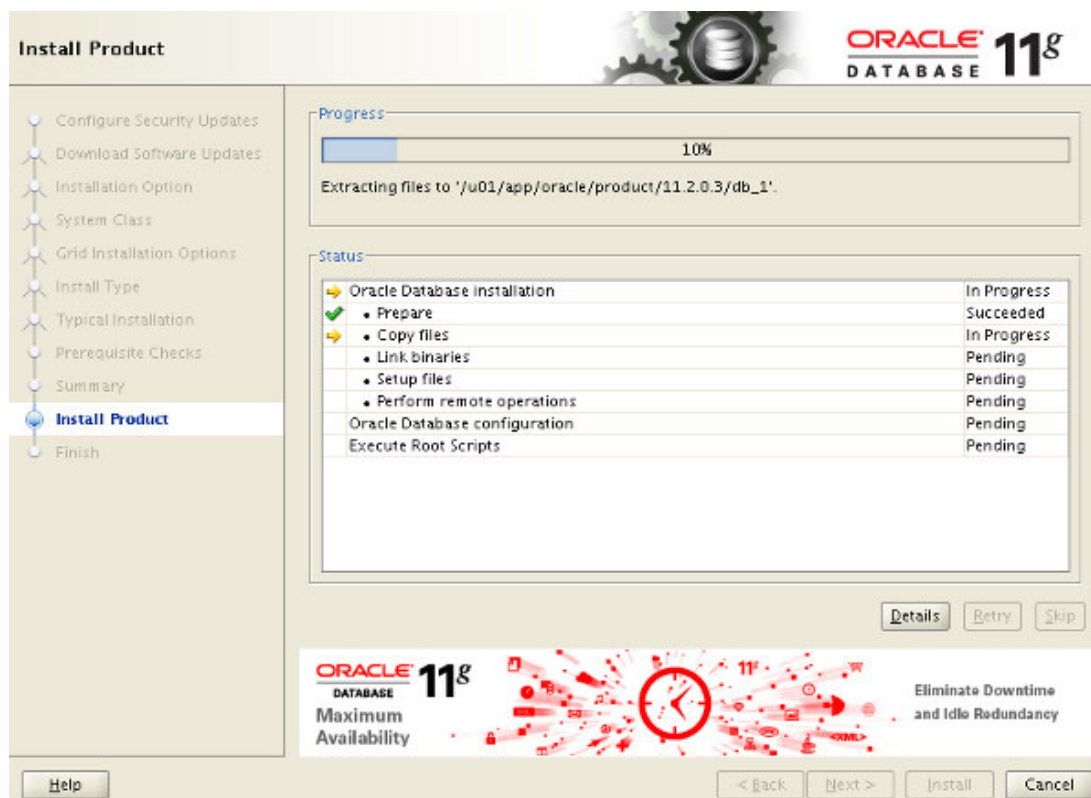
Wait for the prerequisite check to complete. If there are any problems either fix them, or check the "Ignore All" checkbox and click the "Next" button.



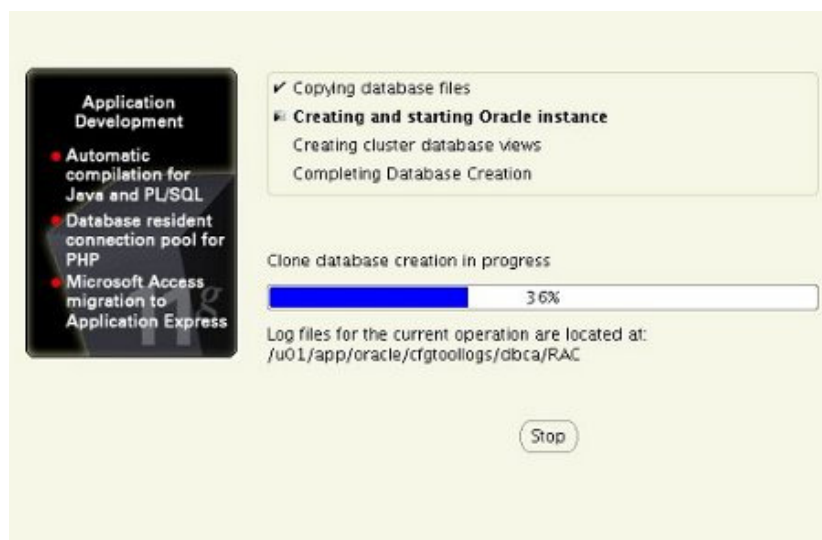
If you are happy with the summary information, click the "Install" button.



Wait while the installation takes place.

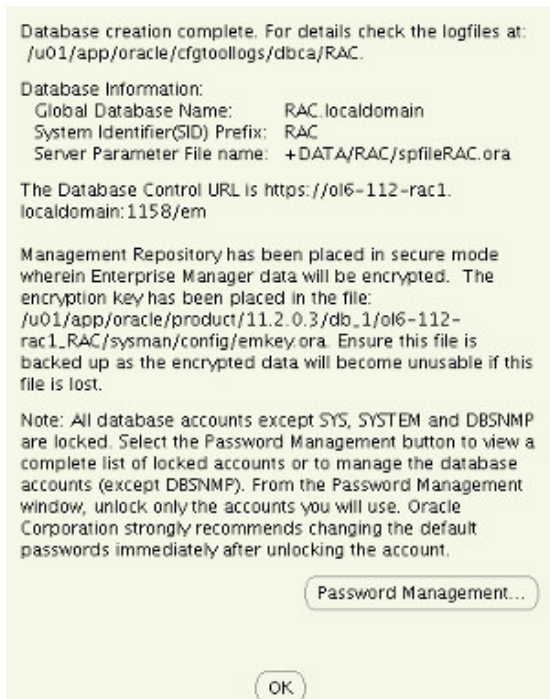


Once the software installation is complete the Database Configuration Assistant (DBCA) will start automatically.

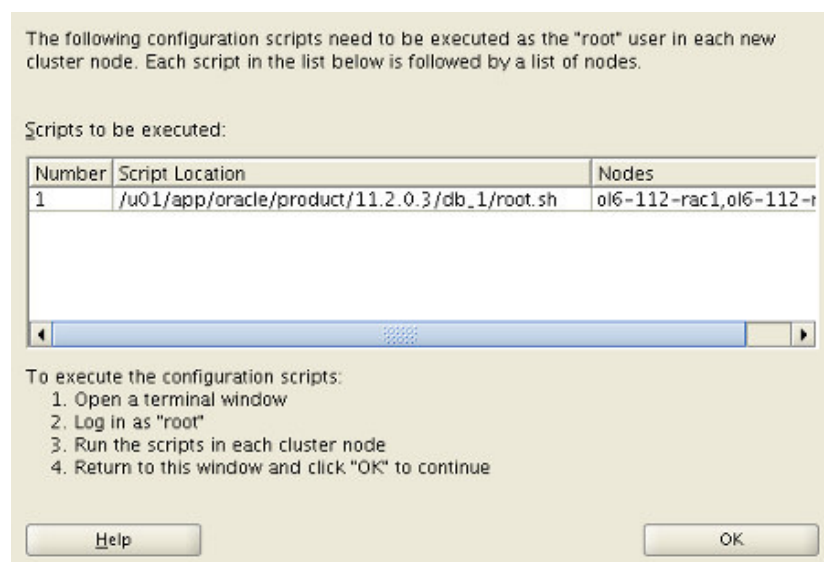


Once the Database Configuration Assistant (DBCA) has finished, click the "OK" button.





When prompted, run the configuration scripts on each node. When the scripts have been run on each node, click the "OK" button.



Click the "Close" button to exit the installer.





The RAC database creation is now complete.

### Check the Status of the RAC

There are several ways to check the status of the RAC. The `srvctl` utility shows the current configuration and status of the RAC database.

```
$ srvctl config database -d RAC
Database unique name: RAC
Database name: RAC
Oracle home: /u01/app/oracle/product/11.2.0.3/db_1
Oracle user: oracle
Spfile: +DATA/RAC/spfileRAC.ora
Domain: localdomain
Start options: open
Stop options: immediate
Database role: PRIMARY
Management policy: AUTOMATIC
Server pools: RAC
Database instances: RAC2,RAC1
Disk Groups: DATA
Mount point paths:
Services:
Type: RAC
Database is administrator managed
$

$ srvctl status database -d RAC
Instance RAC1 is running on node ol6-112-rac1
Instance RAC2 is running on node ol6-112-rac2
$
```

The `V$ACTIVE_INSTANCES` view can also display the current status of the instances.

```
$ sqlplus / as sysdba

SQL*Plus: Release 11.2.0.3.0 Production on Tue Sep 27 22:20:14 2011

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Connected to:
```

```

Oracle Database 11g Enterprise Edition Release 11.2.0.3.0 - 64bit Production
With the Partitioning, Real Application Clusters, Automatic Storage Management, OLAP,
Data Mining and Real Application Testing options

SQL> SELECT inst_name FROM v$instance;

INST_NAME
-----
ol6-112-rac1.localdomain:RAC1
ol6-112-rac2.localdomain:RAC2

SQL>
    
```

If you have configured Enterprise Manager, it can be used to view the configuration and current status of the database using a URL like "https://ol6-112-rac1.localdomain:1158/em".

The screenshot displays the Oracle Enterprise Manager 11g Database Control interface for a RAC database. Key sections include:

- General:** Status Up, 2 instances, Availability 100%, Database Name RAC, Version 11.2.0.3.0.
- Host CPU:** Stacked bar chart showing CPU usage for RAC and Other, with a current load of 2.84.
- Active Sessions:** Stacked bar chart showing sessions for Wait, User I/O, and CPU, with a maximum of 2.
- Diagnostic Summary:** Interconnect Alerts (0), ADDM Findings (No ADDM run available), Active Incidents (0), Key SQL Profiles (Unavailable).
- Space Summary:** Database Size (GB) Unavailable, Problem Tablespace (0), Segment Advisor (0), Recommendations (0), Policy Violations (0).
- Alerts:** One warning alert: 'RAC localdomain\_RAC1 Database Instance User Audit Audited User' triggered on Jan 12, 2013 10:43:27 PM.
- Policy Violations:** All rules violated, Critical Rules Violated (2), Compliance Score (%) 88.
- Security:** Last Security Evaluation on Jan 12, 2013 10:43:06 PM GMT, Compliance Score (%) 88.
- Job Activity:** Create Job OS Command, Job executions scheduled to start no more than 7 days ago.
- Critical Patch Advisories:** Patch Advisories (0), Affected Oracle Homes (0), Oracle MetaLink Credentials (Not Configured).

For more information see:

- [Grid Infrastructure Installation Guide for Linux](#)
- [Real Application Clusters Installation Guide for Linux and UNIX](#)
- [Oracle Database 11g Release 2 RAC On Oracle Linux 5.8 Using VirtualBox](#)
- [Oracle Database 11g Release 2 RAC On Windows 2008 Using VirtualBox](#)

Hope this helps. Regards Tim...

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