

# **RAC Attack - Oracle Cluster Database at Home**

A Project of the Oracle Professional Community\*

Wikibooks.org

\* Visit [racattack.org/12c](http://racattack.org/12c) and [racattack.org/list](http://racattack.org/list)

September 4, 2013

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# 1. Introduction

## Warning

The development of the new version of the book is in progress. Do you want to contribute? Find out how<sup>1</sup>.

## 1.1. Overview

RAC Attack is a free curriculum and platform for hands-on learning labs related to Oracle RAC (cluster database). We believe that the best way to learn about RAC is with a lot of hands-on experience. This curriculum has been used by individuals at home and by instructors in classes since 2008.

The original contributors were Jeremy Schneider, Dan Norris and Parto Jalili. The handbook was published at <http://www.ardentperf.com> for several years before its migration to this wikibook. All RAC Attack content was released under the CC-BY-SA license in May 2011 when this project was initiated.

To learn about upcoming RAC Attack events or to organize one yourself, visit the [Events](#) page. You can use the shortcut <http://racattack.org/events> to access this page at any time.

The goal of this workbook is to help students learn about Oracle RAC cluster databases through guided examples. It can be used by organizers of events, by instructors in classes or by individuals at home.

RAC Attack differs in depth from other tutorials currently available.

- Every keystroke and mouse click is carefully documented here.
- The process is covered from the very beginning to the very end - from the very first installation of the Virtual Hypervisor on your laptop to various experiments on your running cluster database... with everything in between.
- The labs in the main workbook have been tested thoroughly and repeatedly.

## 1.2. Architecture

To better understand the RAC Installation, this picture illustrates the architecture that is implemented when following the book.

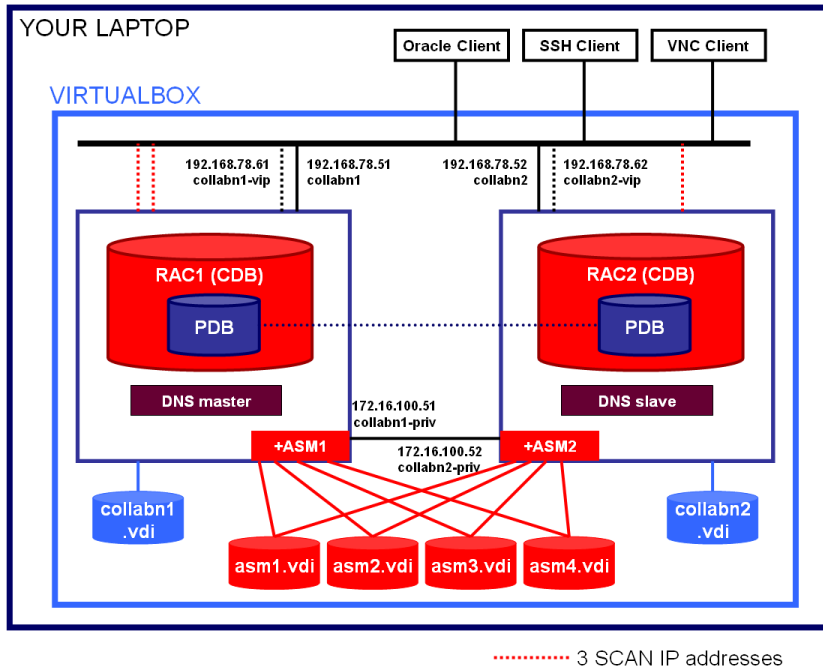


Figure 1 RAC Attack 12c architecture

## 1.3. IP Addresses

In order to install a fully functional RAC, the following IP addresses are required:

- 2 public IPs, one for each node, for the primary OS network interface
- 2 public IPs, one for each node, for the Virtual IP
- 3 public IPs, one for each SCAN listener
- 2 private IPs, one for each node, for the cluster private interconnect

In the book, the public addresses belong to the network **192.178.78.0/24**, and the private addresses belong to the network **172.16.100.0/24**.

### ⚠ Warning

If your laptop connects to networks using these IP addresses, **replace every occurrence in the document with new addresses to avoid conflicts.**



## 1.4. Technical choices

The book aims to provide instructions as simple as possible to get a basic RAC installation on your laptop.

There are many, many advanced topologies and topics that aren't covered here. If you are curious about technical possibilities, just ask a volunteer, he/she will be glad to explain you something more.



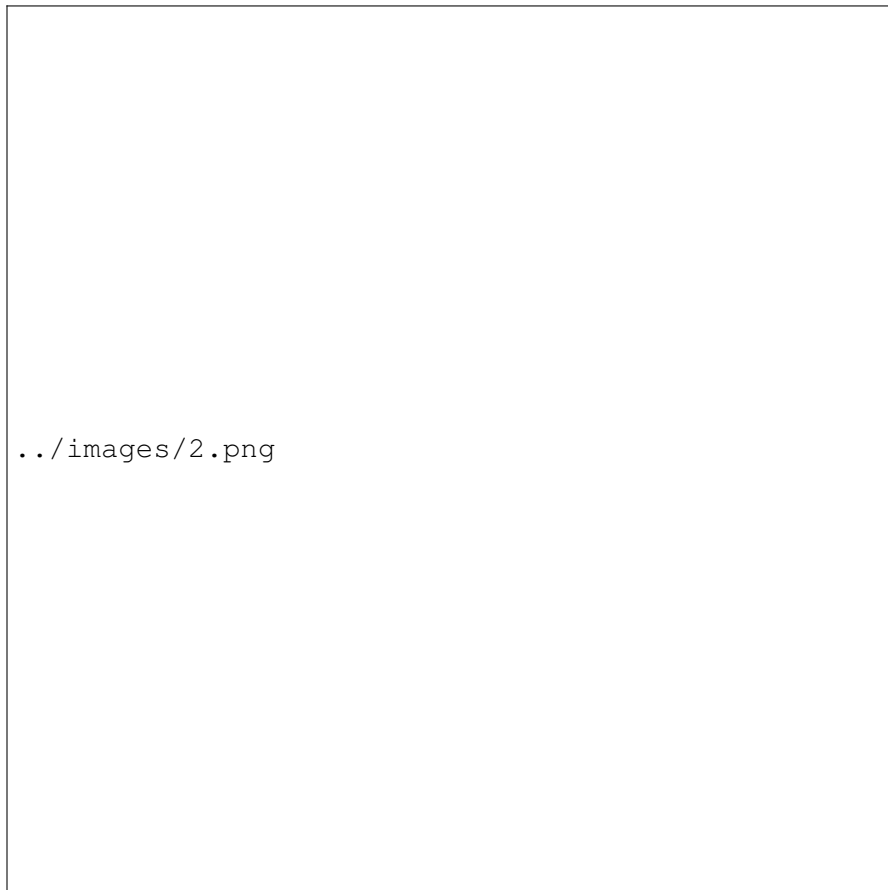
**Part I.**  
**Setting Up RAC**



## 2. Hardware Requirements

This handbook will walk you through the process of creating a two-node Oracle RAC cluster on your own laptop or desktop computer.

A detailed explanation of virtualization is beyond the scope of this lab but here is a simple overview of what we are building:



**Figure 2**

### 2.0.1. Hardware Minimum Requirements

Most modern laptop and desktop computers should be powerful enough to run a two-node virtual RAC cluster. In a nutshell, these are the recommended minimums:

- Modern CPU (most of laptops produced after 2011 should be ok)
- 8Gb memory
- 40Gb of free disk space
  - 9Gb Software Staging
  - 29Gb - 2VMs + 2 ASM disks
- Windows 64bit (XP, Vista or 7) (*Linux & Mac are not directly covered in these instructions*)

** Information**

If your laptop or desktop does not meet these minimum requirements then it is not recommended to try completing the RAC Attack labs. Although it is possible to complete these labs with smaller configurations, there are many potential problems.

## 3. Software Components

Before starting you need to know what software will be installed. If attending an event, would be a good idea to download the software in advance to your laptop in order to avoid the download during the labs. The copyrighted software isn't distributable so the volunteers won't give you some software components.

### 3.1. Windows 7 64 bit

This book covers Windows 7 64 bit as host even if all operating systems that can run VirtualBox 64bit can be used. 64 bits are mandatory since Oracle 12c for Linux 32bit is not available.

The differences between Windows and OS X are highlighted in information boxes like this one.

### 3.2. VirtualBox

This book uses VirtualBox as many Oracle specialists consider it as a mature and free virtualization solution, fully compatible with Oracle Software: <https://www.virtualbox.org/>. The VirtualBox versions from 4.2.12 up to 4.2.16 have been tested successfully with OEL6 and Oracle 12c.

### 3.3. Putty

One of the preferred SSH clients for Windows. You can download it here:

```
http://the.earth.li/~sgtatham/putty/latest/x86/putty.exe
```

OS X and Linux hosts can use their native ssh command.

## 3.4. Vnc Viewer

The servers will be installed without X server, so you'll need VNC to get the graphics:

<http://www.realvnc.com/download/get/1295/>

OS X and Linux hosts can use XQuartz and X Windows respectively instead of VNC. You just need to connect to your servers using `ssh -X` to enable X tunneling. Windows can also use X Windows emulation programs like Xming, provided that you're comfortable to install it and use it. This book however covers VNC as preferred method.

## 3.5. Oracle Software

### 3.5.1. Oracle Enterprise Linux 6.4

Can be downloaded from <http://edelivery.oracle.com/linux>.

1. Login to: <http://edelivery.oracle.com/linux> with your Oracle Account
2. On the **Media Pack Search** page, select:  
Product pack: **Oracle Linux**  
Platform: **x86 64 bit**  
Click **GO**

**Figure 3** Linux Media Pack Search

3. Click on: **Oracle Linux Release 6 Update 4 Media Pack for x86\_64 (64 bit)**

Select	Description	Release	Part Number	Updated	# Parts / Size
<input checked="" type="radio"/>	<a href="#">Oracle Linux Release 6 Update 4 Media Pack for x86_64 (64 bit)</a>	6.4.0.0.0	872264-01	MAY-23-2013	5 / 8.9G

**Figure 4** Linux Media Pack Search Results



## 4. Click on the download button at the first line:

Oracle Linux Release 6 Update 4 Media Pack v1 for x86\_64 (64 bit)

[Readme](#) [View Digest](#)

Select	Name	Part Number	Size (Bytes)
<a href="#">Download</a>	Oracle Linux Release 6 Update 4 for x86_64 (64 Bit)	V37084-01	3.5G
<a href="#">Download</a>	Oracle Linux Release 6 Update 4 Boot iso image for x86_64 (64 bit)	V37088-01	197M
<a href="#">Download</a>	Oracle Linux Release 6 Update 4 UEK Boot ISO image for x86_64 (64 bit)	V37090-01	196M
<a href="#">Download</a>	Oracle Linux Release 6 Update 4 source DVD 1	V37086-01	3.1G
<a href="#">Download</a>	Oracle Linux Release 6 Update 4 source DVD 2	V37087-01	1.9G
<b>Total: 5</b>			

Figure 5 Linux Media Pack Download

5. Once the download of the file **V37084-01.iso** is finished, rename it to **Oracle\_Linux\_6\_64.iso** to distinguish it easily from other Oracle files.

## 3.5.2. Oracle Grid Infrastructure and Database 12c (12.1.0.1)

Can be downloaded from <http://edelivery.oracle.com/>.

1. Login to: <http://edelivery.oracle.com/> with your Oracle Account
2. On the **Media Pack Search** page, select:  
Product pack: **Oracle Database**  
Platform: **Linux x86-64**  
Click **GO**

Media Pack Search

[Instructions](#)

1. Review the [License List](#) to determine which Product Pack or Packs you need to download.
2. Select the Product Pack and Platform and click "Go".
3. If there is only one result, you will see the download page. If there are multiple results, select one and click "Continue".

Select a Product Pack

Platform

Figure 6 Database Media Pack Search

3. Click on: **Oracle Database 12c Release 1 (12.1.0.1.0) Media Pack for Linux x86-64**

Results

Select	Description	Release	Part Number	Updated	# Parts / Size
<input type="radio"/>	<a href="#">Oracle Audit Vault and Database Firewall 12.1.1 Media Pack for Linux x86-64</a>	12.1.1.0.0	B73420-01	JUN-17-2013	3 / 5.2G
<input checked="" type="radio"/>	<a href="#">Oracle Database 12c Release 1 (12.1.0.1.0) Media Pack for Linux x86-64</a>	12.1.0.1.0	B73458-02	JUL-26-2013	24 / 23G
<input type="radio"/>	<a href="#">Oracle Audit Vault and Database Firewall 12.1.0 Media Pack for Linux x86-64</a>	12.1.0.0.0	B71269-01	DEC-18-2012	3 / 6.4G
<input type="radio"/>	<a href="#">Oracle Retail Data Model 11.3.2.0.0 Media Pack</a>	11.3.2.0.0	B72133-01	FEB-11-2013	1 / 2.0G
<input type="radio"/>	<a href="#">Oracle Airlines Data Model 11.3.1.0.0 Media Pack for Linux x86-64</a>	11.3.1.0.0	B65618-01	DEC-15-2011	1 / 173M
<input type="radio"/>	<a href="#">Oracle Communications Data Model</a>	11.3.1.0.0	B67443-01	MAY-29-2012	1 /

**Figure 7** Database Media Pack Search Results

4. Click on the download button for the following four packs:

- Oracle Database 12c Release 1 (12.1.0.1.0) for Linux x86-64 (Part 1 of 2)
- Oracle Database 12c Release 1 (12.1.0.1.0) for Linux x86-64 (Part 2 of 2)
- Oracle Database 12c Release 1 Grid Infrastructure (12.1.0.1.0) for Linux x86-64 (Part 1 of 2)
- Oracle Database 12c Release 1 Grid Infrastructure (12.1.0.1.0) for Linux x86-64 (Part 2 of 2)

Oracle Database 12c Release 1 (12.1.0.1.0) Media Pack v2 for Linux x86-64

[Readme](#) [View Digest](#)

Select	Name	Part Number	Size (Bytes)
<a href="#">Download</a>	Oracle Database 12c Release 1 (12.1.0.1.0) for Linux x86-64 (Part 1 of 2)	V38500-01 Part 1 of 2	1.3G
<a href="#">Download</a>	Oracle Database 12c Release 1 (12.1.0.1.0) for Linux x86-64 (Part 2 of 2)	V38500-01 Part 2 of 2	1.1G
<a href="#">Download</a>	Oracle Database 12c Release 1 Grid Infrastructure (12.1.0.1.0) for Linux x86-64 (Part 1 of 2)	V38501-01 Part 1 of 2	1.7G
<a href="#">Download</a>	Oracle Database 12c Release 1 Grid Infrastructure (12.1.0.1.0) for Linux x86-64 (Part 2 of 2)	V38501-01 Part 2 of 2	192M

**Figure 8** Database Media Pack Download

5. The following files are downloaded:

- V38501-01\_1of2.zip
- V38501-01\_2of2.zip
- V38500-01\_1of2.zip
- V38500-01\_2of2.zip

After uncompressing them, there will be two folders : "grid" and "database" containing the full installation.

## 4. Prepare Host

### 4.1. VirtualBox Setup

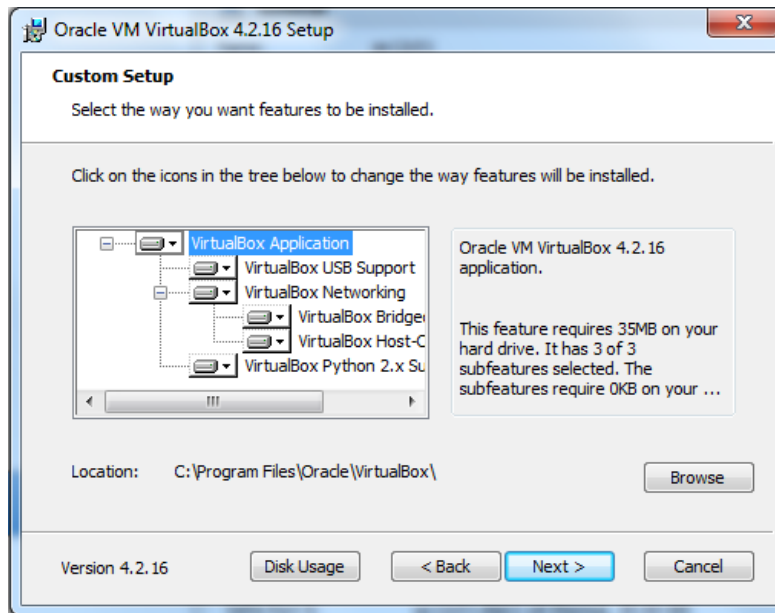
The procedure for installing a new VirtualBox or updating an existing installation is the same. If updating, close your Virtualbox Windows and stop the virtual machines.

1. Run Oracle VM VirtualBox 4.2.16 Setup.
2. On the welcome page, click **Next**:



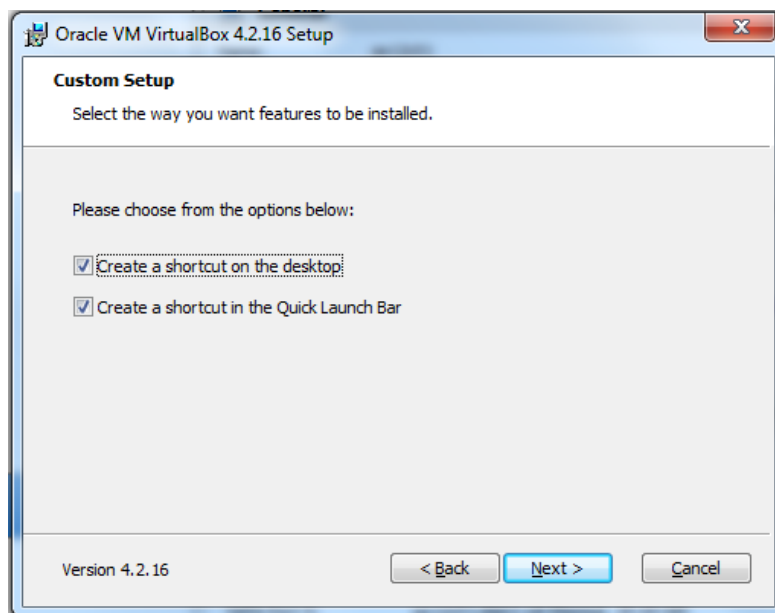
**Figure 9** Vbox install welcome

3. Leave the default component selection, click **Next**:



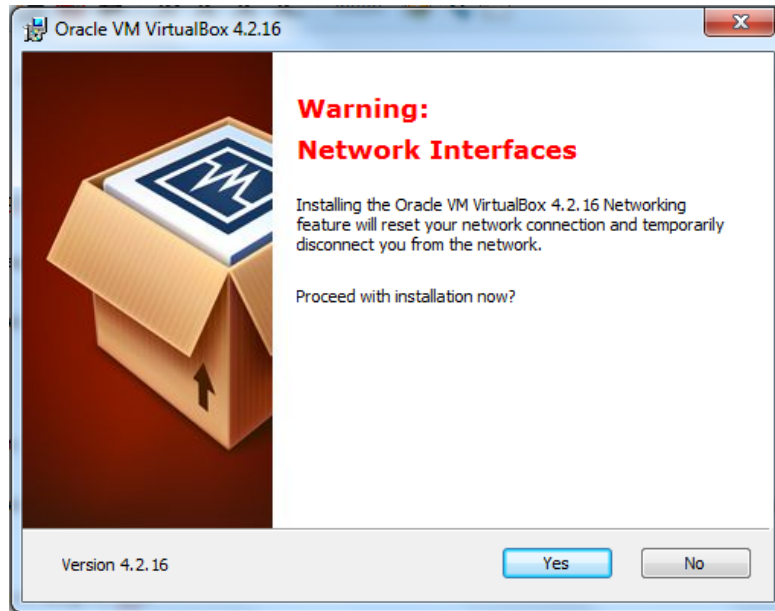
**Figure 10** Vbox install component selection

4. Click **Next**:



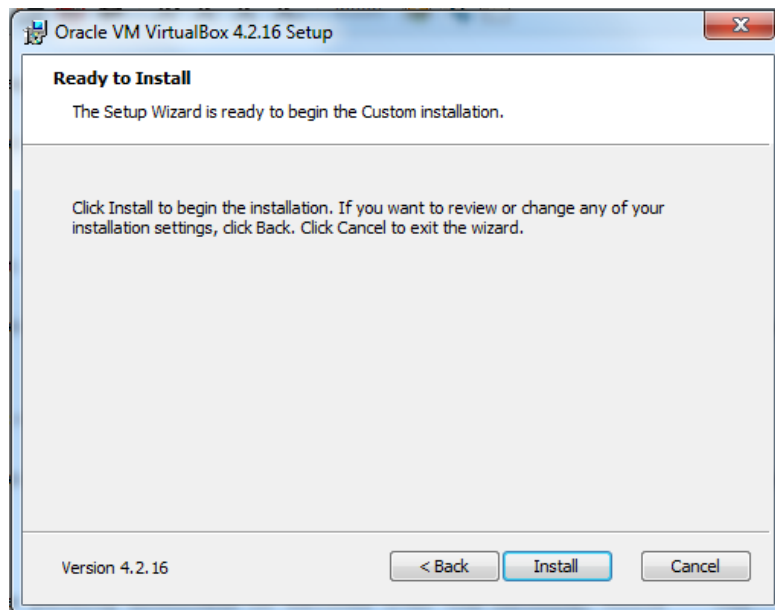
**Figure 11** Vbox install create shortcuts

5. If you don't have pending downloads or batches over the network, click **Yes**:



**Figure 12** Vbox install network reset

6. Click **Install**:



**Figure 13** Vbox install ready to install

7. The installation is completed. Click **Finish** to open VirtualBox:

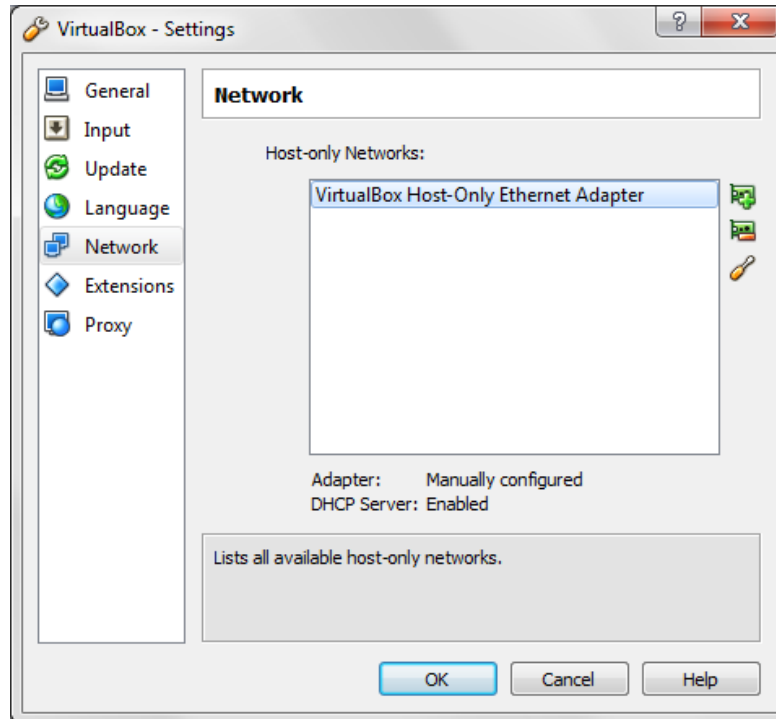


**Figure 14** Vbox install completed

## 4.2. VirtualBox Network Configuration

1. Run VirtualBox Manager.

- From the main screen, choose **File > Preferences > Network**.

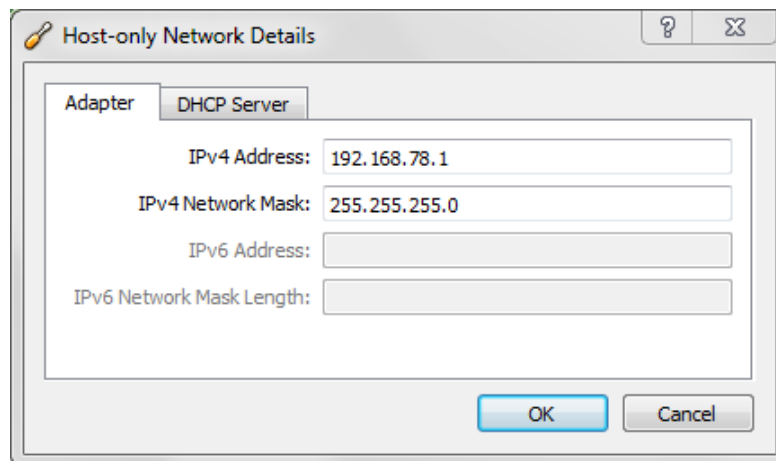


**Figure 15** Network\_adapter\_preferences

- Double click on **VirtualBox Host-Only Ethernet Adapter**. Update the settings as shown and click **Ok** twice.

**IPv4 Address:** 192.168.78.1

**IPv4 Network Mask:** 255.255.255.0



**Figure 16** Network\_adapter\_1\_address

On OS X and Linux the **VirtualBox Host-Only Ethernet Adapter** is called **vboxnet0**.



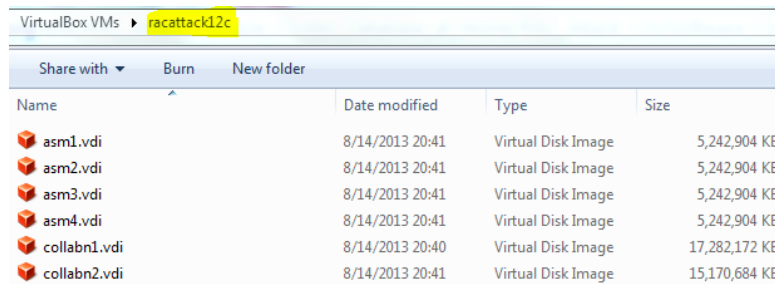


# 5. Install Linux

## 5.1. Create VirtualBox VM

1. On your computer, create a new folder **racattack12c** on a location of your choice that will contain all the virtual disks.

At the end of the installation the files will look like this:



Name	Date modified	Type	Size
asm1.vdi	8/14/2013 20:41	Virtual Disk Image	5,242,904 KB
asm2.vdi	8/14/2013 20:41	Virtual Disk Image	5,242,904 KB
asm3.vdi	8/14/2013 20:41	Virtual Disk Image	5,242,904 KB
asm4.vdi	8/14/2013 20:41	Virtual Disk Image	5,242,904 KB
collabn1.vdi	8/14/2013 20:40	Virtual Disk Image	17,282,172 KB
collabn2.vdi	8/14/2013 20:41	Virtual Disk Image	15,170,684 KB

Figure 17 RA-Windows\_7-Create Directory

2. In VirtualBox, from the main screen, click the **New** icon in the upper left hand corner.

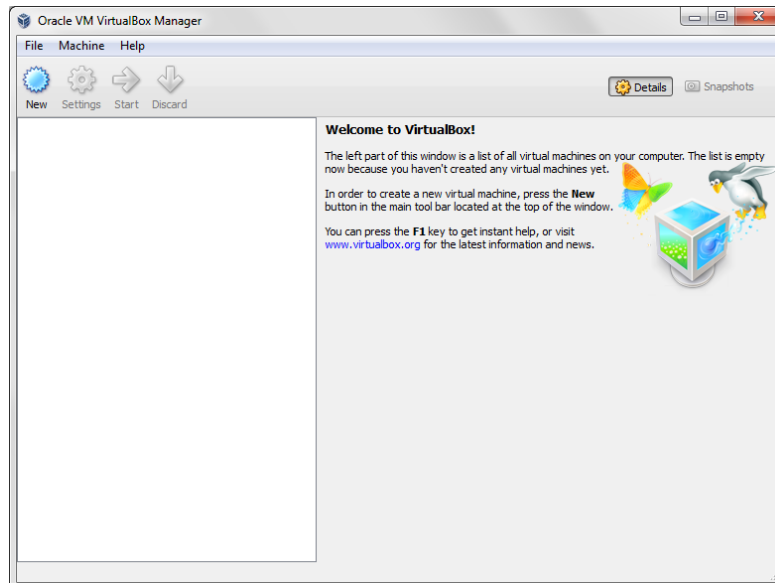
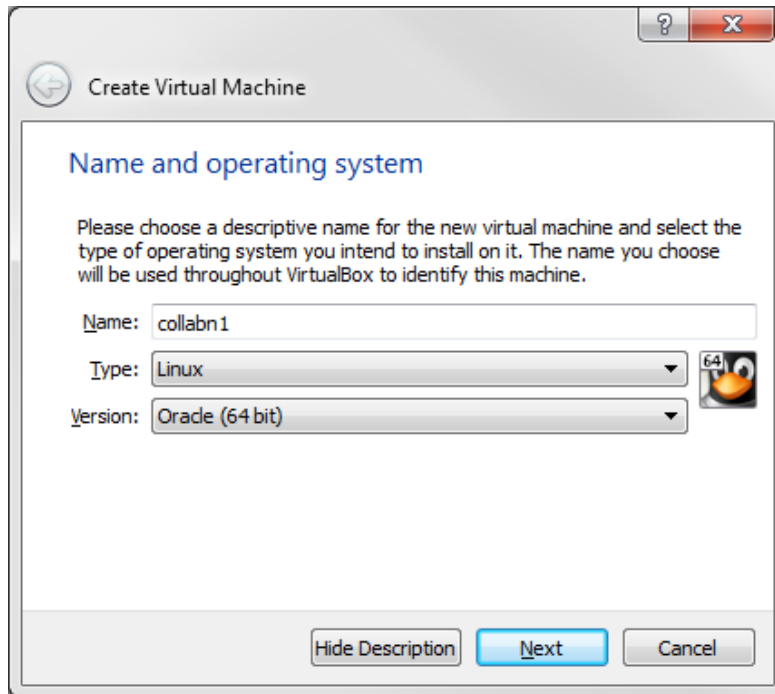


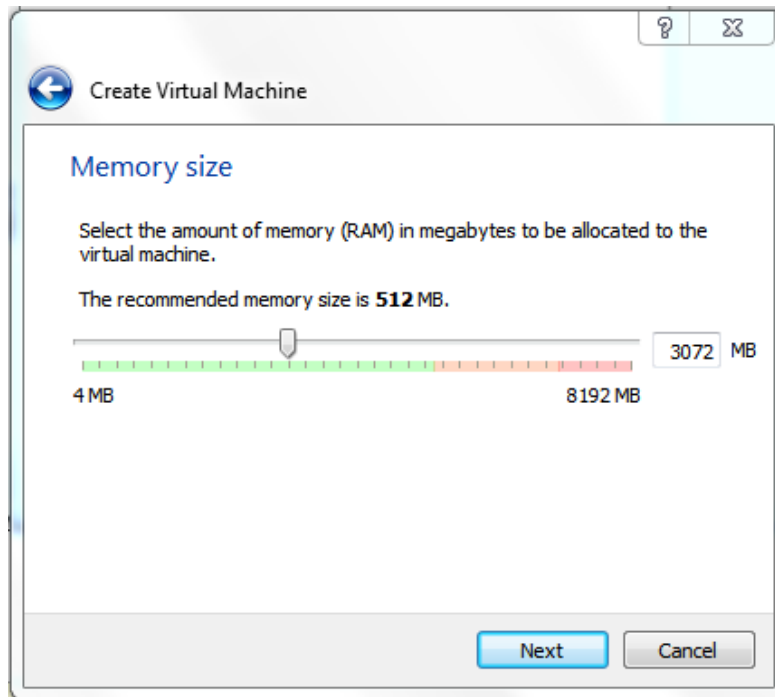
Figure 18 VirtualBox Manager Home

3. Type in **collabn1** for the **Name** of the VM. Choose **Linux** for the **Type** and **Oracle (64 bit)** for the **Version** and click **Next**.



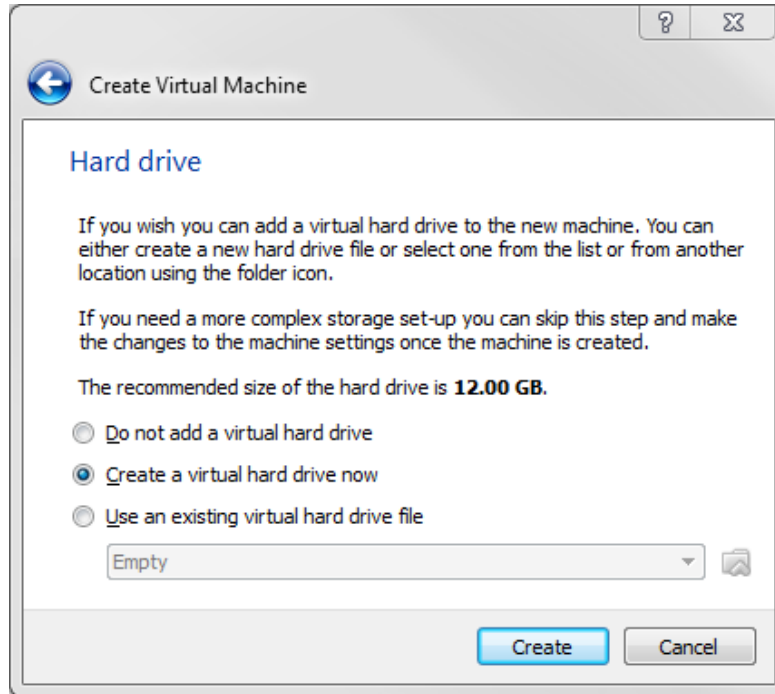
**Figure 19** RA-vbox 4214-create vm-name and os

4. Type **3072** in the **Size** field and click **Next**.



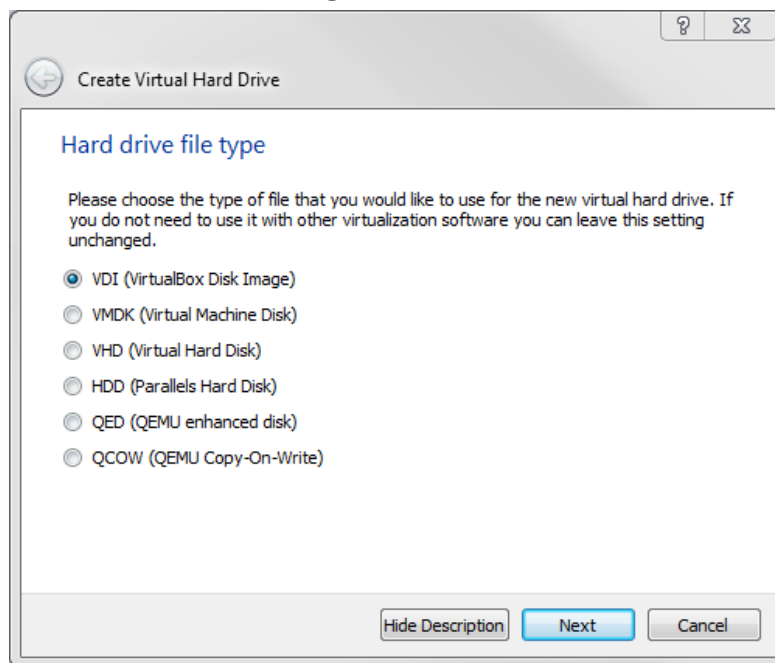
**Figure 20** RA-vbox 4214-create vm-vm memory

5. Leave **Create a virtual hard drive now** selected and click **Create**.



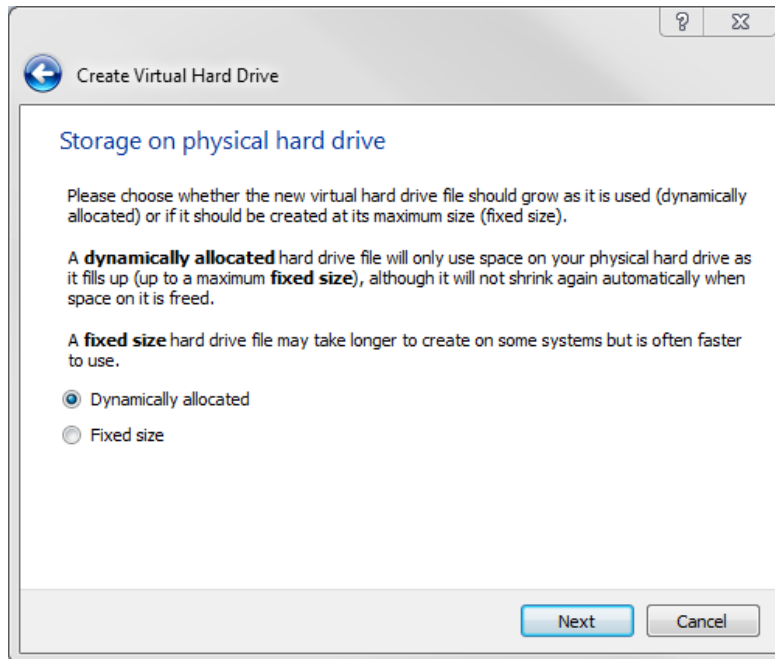
**Figure 21** RA-vbox 4214-create vm-create primary hard disk

6. Leave **VDI (VirtualBox Disk Image)** selected and click **Next**.



**Figure 22** RA-vbox 4214-create vm-primary hard disk type

7. Leave **Dynamically allocated** selected and click **Next**.



**Figure 23** RA-vbox 4214-create vm-storage on drive

8. Type in the full path or choose through the browse icon the **Location** for the disk file to be created.  
It's better to use the common folder **racattack12c** previously created for all the virtual disks.  
The file should be named **collabn1.vdi**.

Type in **30.00 GB** in the **Size** field and click **Create**.

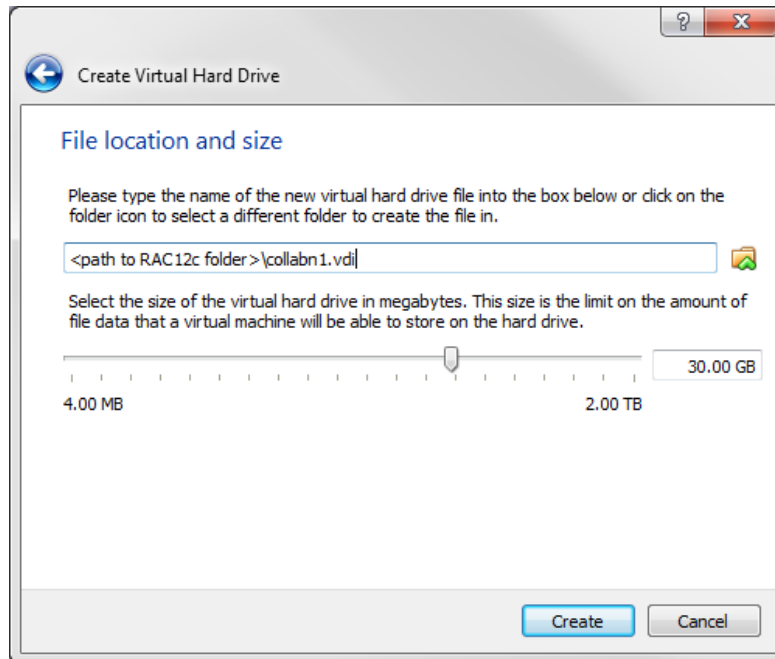


Figure 24 RA-vbox 4214-create vm-file location and size

## 5.2. VirtualBox VM Settings

1. From the main screen, select the virtual machine **collab1** and click the **Settings** icon in the upper left hand corner.

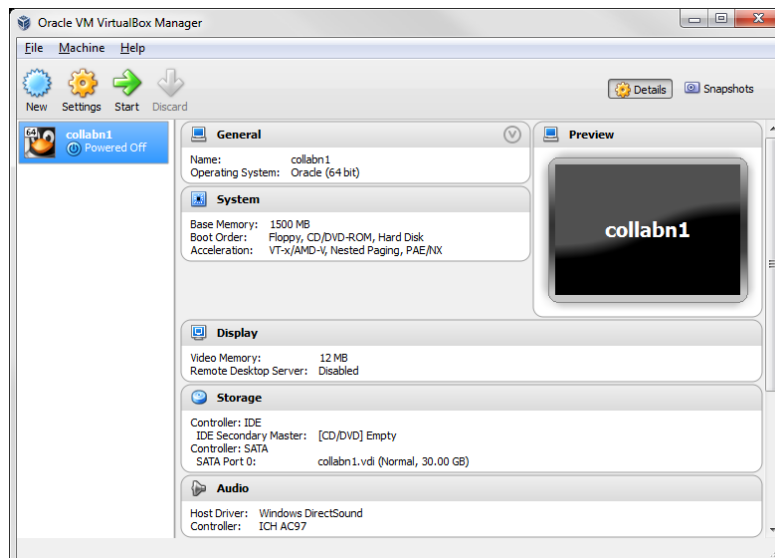
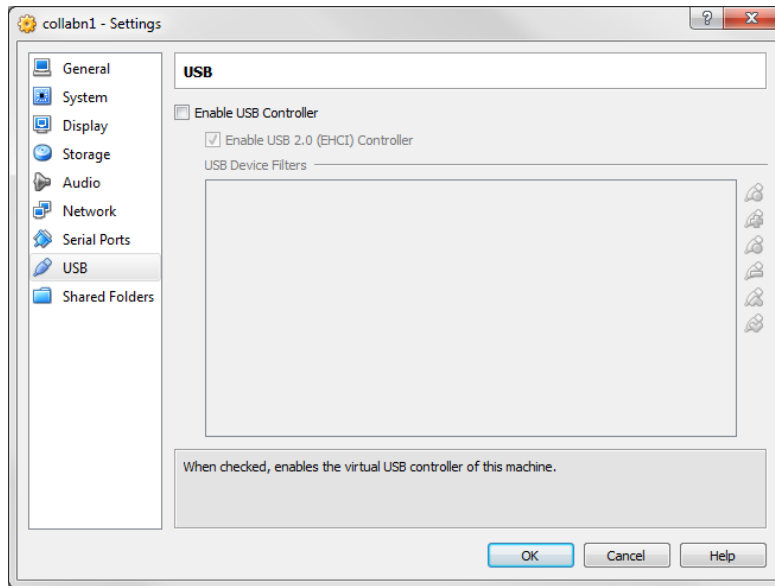


Figure 25 RA-vbox 4214-create vm-finished vm

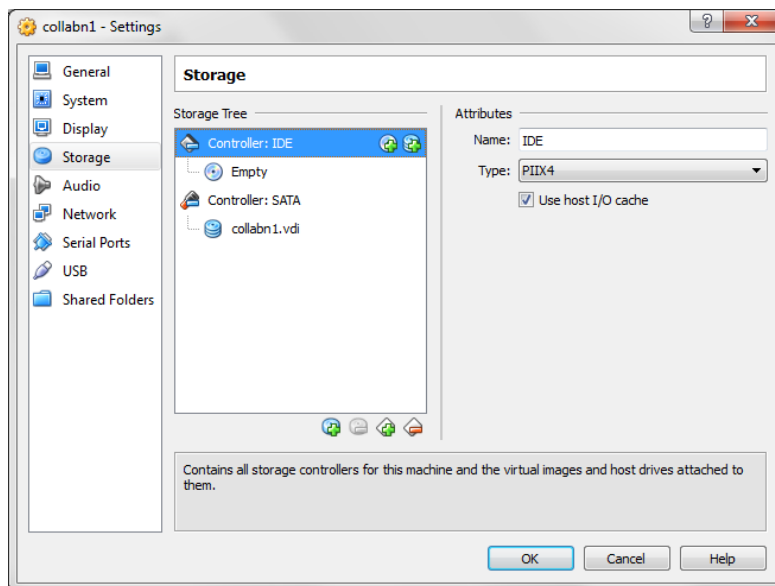
2. Open the **USB** sub-menu. Uncheck the **Enable USB Controller** check box.

On OS X the sub-menu is **Ports** and you'll need to select the USB tab there.



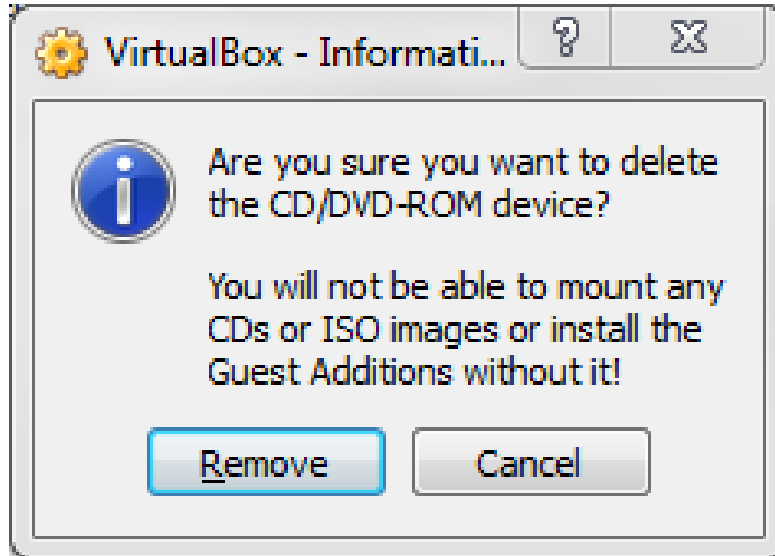
**Figure 26** RA-vbox 4214-create vm-usb settings

3. Open the **Storage** sub-menu. Delete the **Empty** disk under the **IDE Controller**.



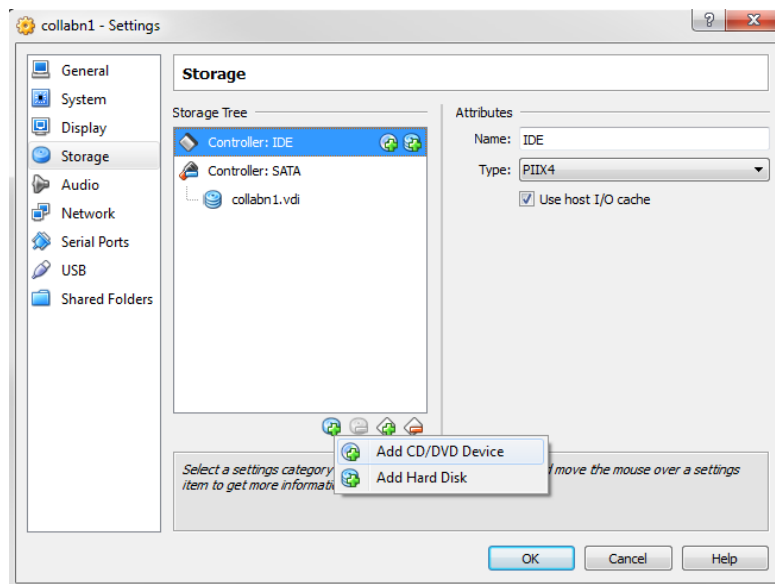
**Figure 27** RA-vbox 4214-create vm-delete empty ide

- Click on **Remove** to confirm.



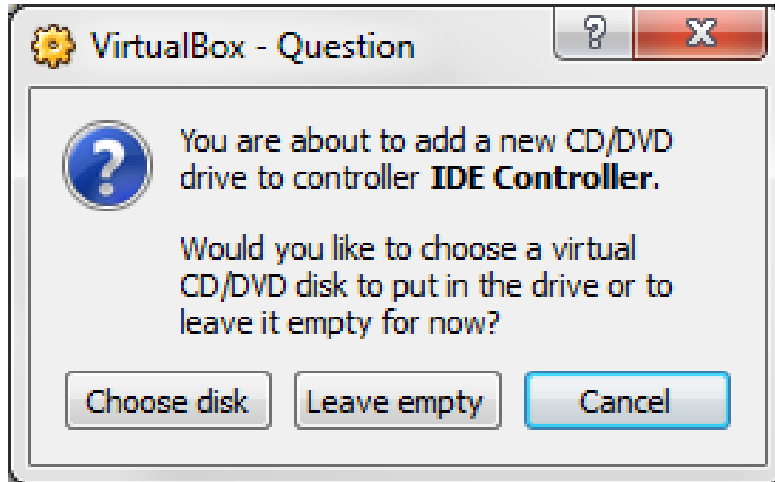
**Figure 28** RA-vbox 4214-create vm-delete ide

- Click on the **Add CD/DVD Device**.



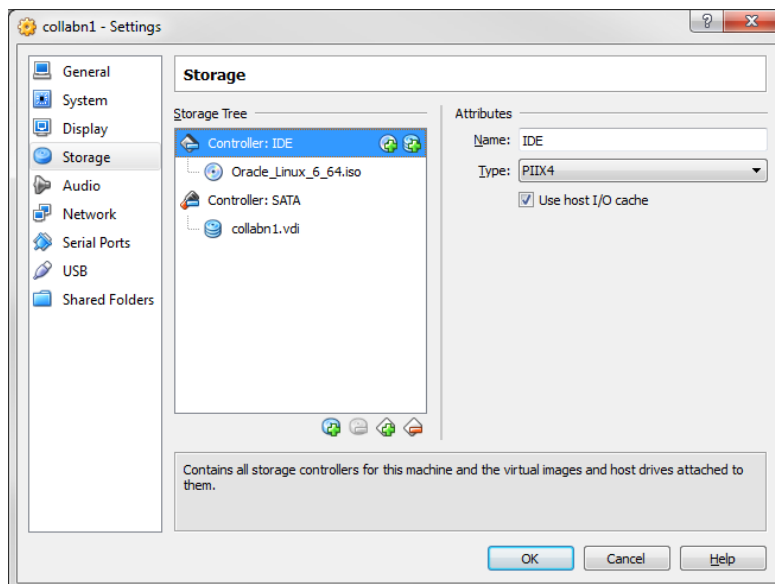
**Figure 29** RA-vbox 4214-create vm-add iso

6. Click on the **Choose disk**.



**Figure 30** VirtualBox New VM Settings New IDE

7. Locate and open the **Oracle\_Linux\_6\_64.iso** file.



**Figure 31** RA-vbox 4214-create vm-oracle linux 6 iso added



- Open the **Network** sub-menu. Under the **Adapter 1** tab, change the **Attached to:** dropdown to **Host-only Adapter**.

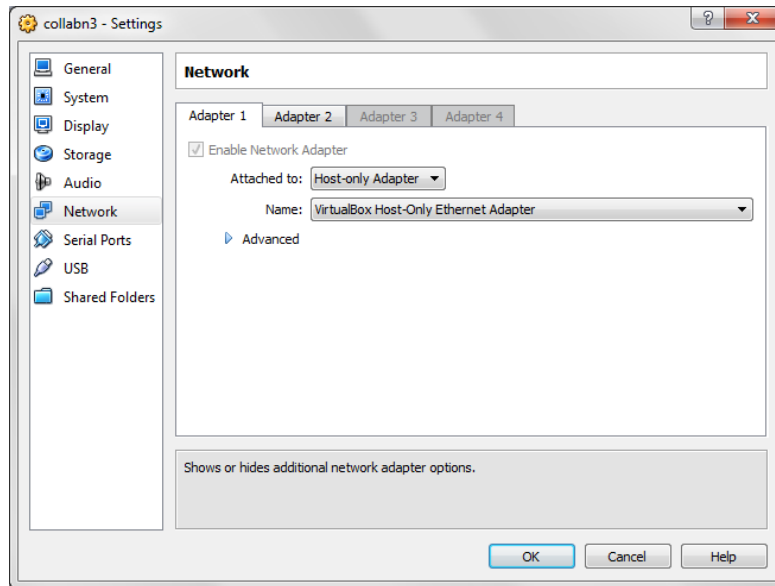


Figure 32 VirtualBox\_Settings\_Network\_Adapter\_1

- Choose the **Adapter 2** tab. Check the box for **Enable Network Adapter**. Change the **Attached to:** dropdown to **Internal Network** and type the name **rac-priv** in the **Name** field.

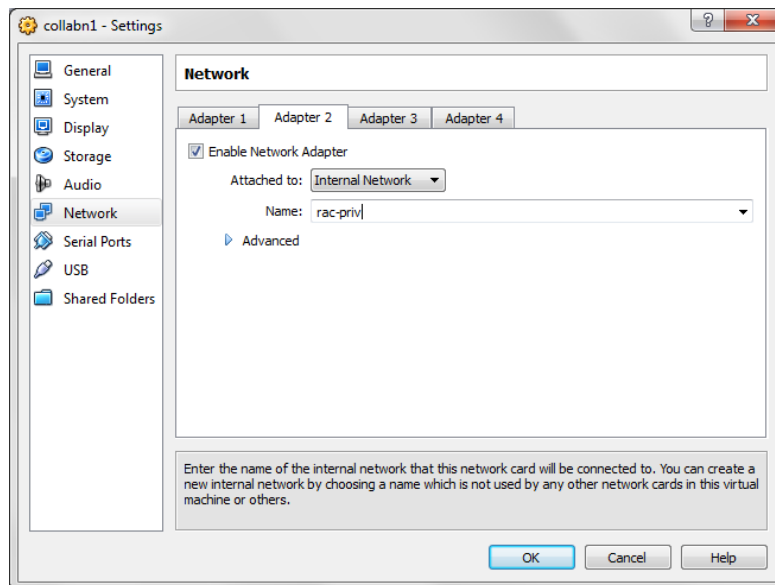
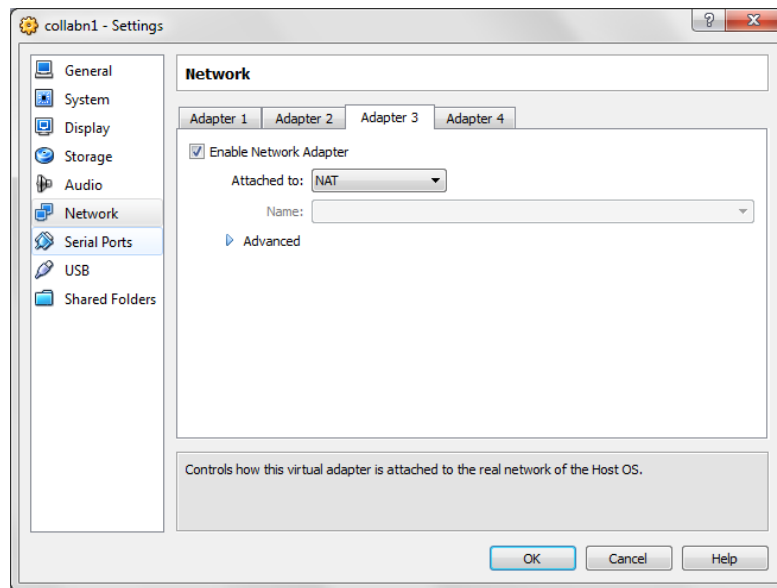


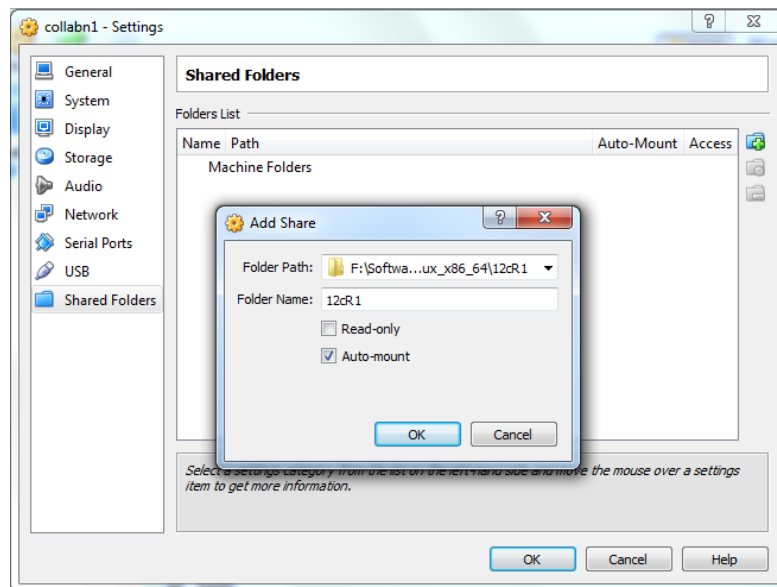
Figure 33 VirtualBox\_New\_VM\_Settings\_Network\_Adapter\_2

10. Choose the **Adapter 3** tab. Check the box for **Enable Network Adapter**. Change the **Attached to:** dropdown to **NAT**.



**Figure 34** VirtualBox\_New\_VM\_Settings\_Network\_Adapter\_3

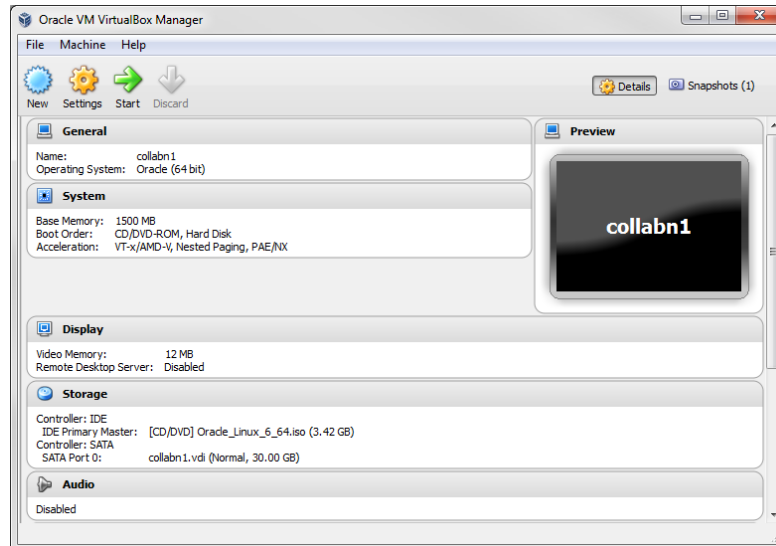
11. Select the **Shared Folders** tab. Click **Add Shared Folder**. Enter the path where you've downloaded the Oracle installation media and enter a name for your folder. Check **Auto-mount** and click **OK**.



**Figure 35** VirtualBox\_New\_VM\_Settings\_Shared folder

12. Click on **Ok** to save the modifications.

13. Review the summary of the new virtual machine.



**Figure 36** RA-vbox 4214-create vm-complete vm settings

### 5.3. OS Installation

s

1. Click on **Start** to boot the virtual machine. If asked to select a start-up disk, choose **Oracle\_Linux\_6\_64.iso** and click **Start** again.



**Figure 37** RA-Oracle\_Linux\_6\_64bit-Install\_OS-select boot iso

2. The Oracle Linux install screen will automatically come up. Hit enter to begin the install.

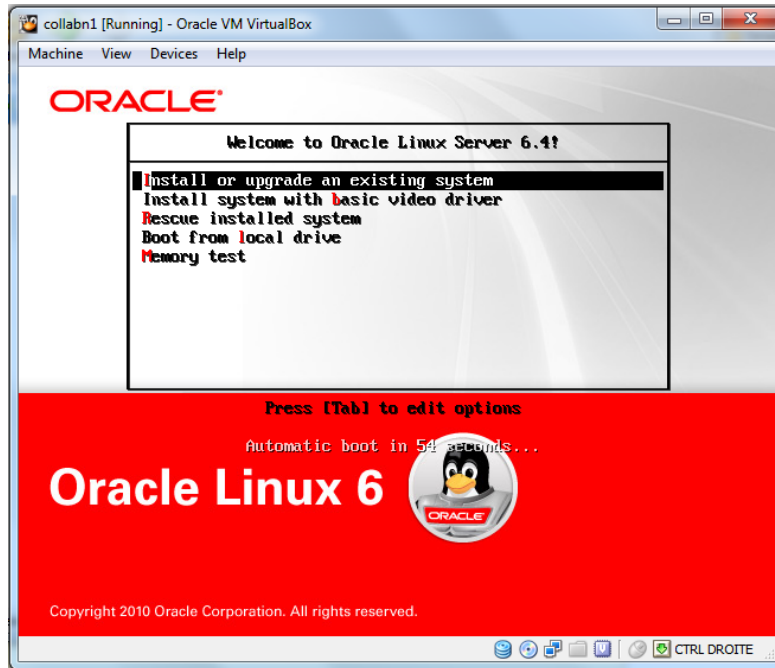


Figure 38 RA-Oracle\_Linux\_6\_64bit-Install\_OS-boot menu

3. Skip the CD testing by pressing the right arrow key and press enter.

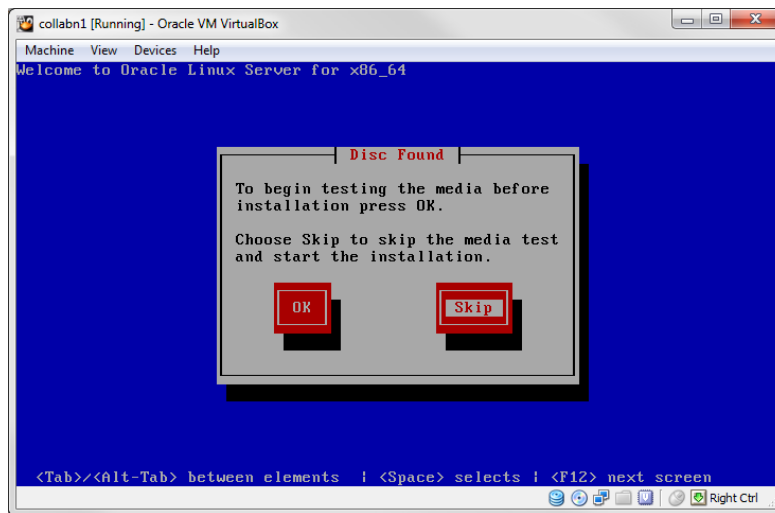
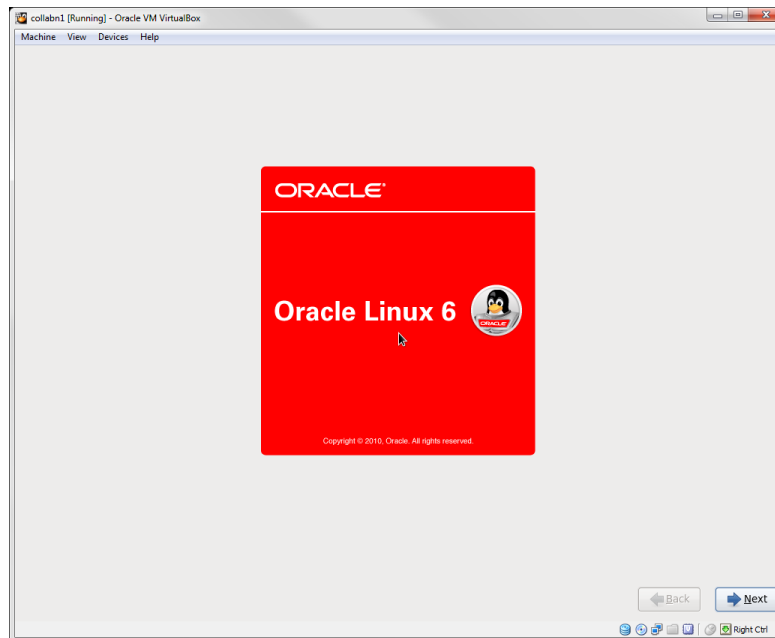


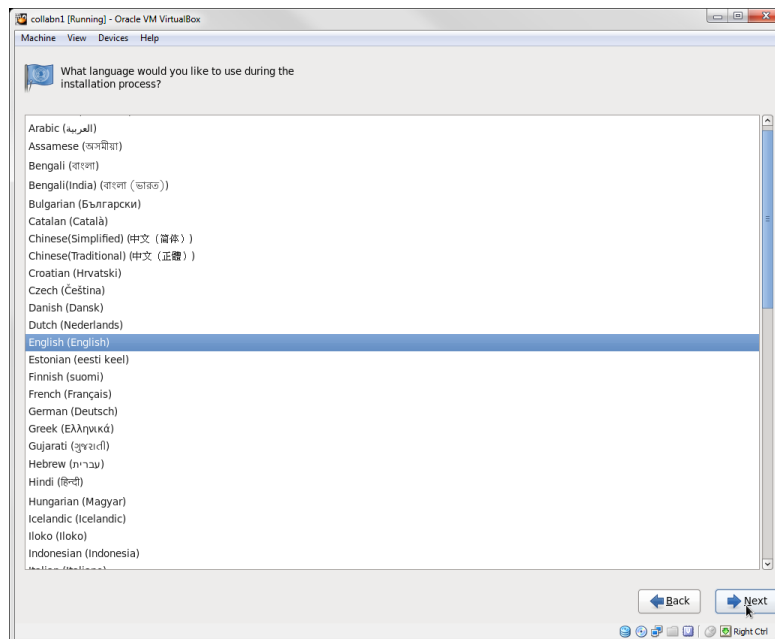
Figure 39 RA-Oracle\_Linux\_6\_64bit-Install\_OS-media test

- From this point on you can use the mouse to navigate. To unlock the mouse and keyboard from the VM, hit the right **Ctrl** key. Click **Next**.



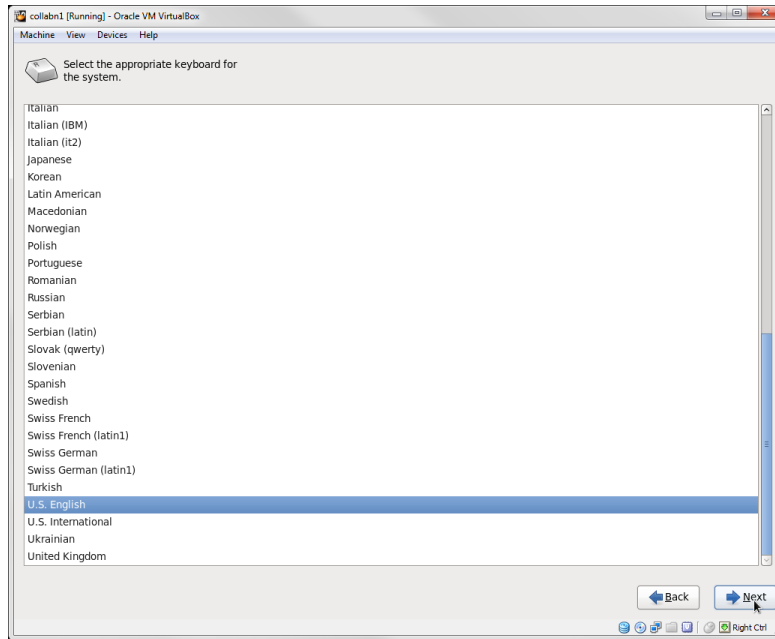
**Figure 40** RA-Oracle\_Linux\_6\_64bit-Install\_OS-splash start

- Leave **English (English)** selected and click **Next**.



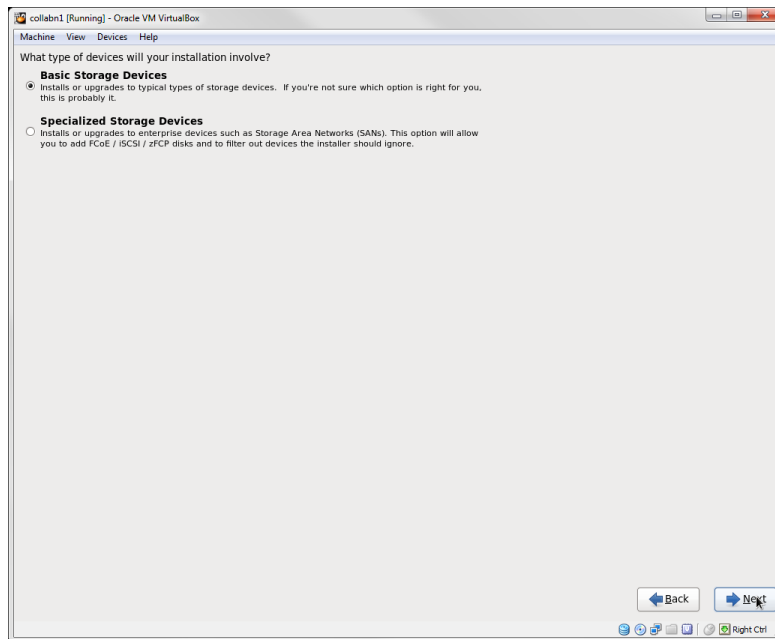
**Figure 41** RA-Oracle\_Linux\_6\_64bit-Install\_OS-choose language

6. Leave **U.S. English** selected and click **Next** (unless you have a really preferred keyboard layout).



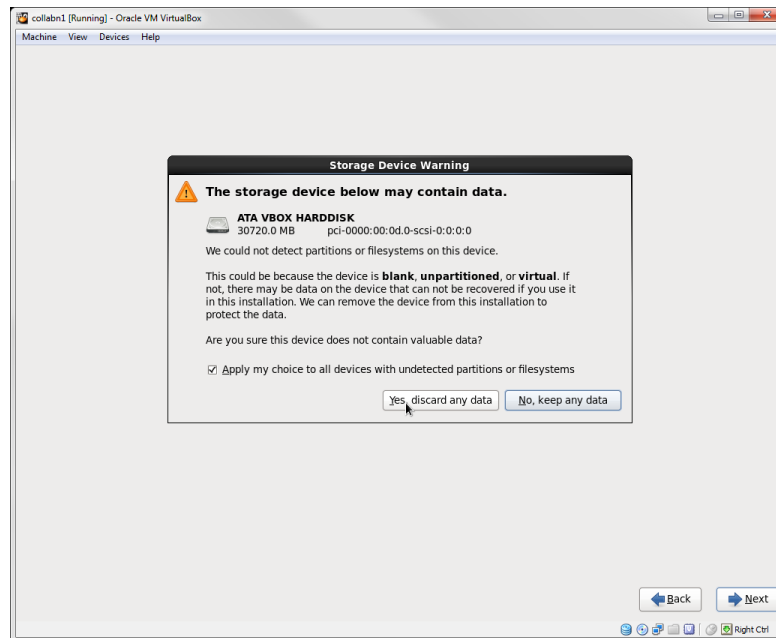
**Figure 42** RA-Oracle\_Linux\_6\_64bit-Install\_OS-choose keyboard

7. Leave **Basic Storage Devices** selected and click **Next**.



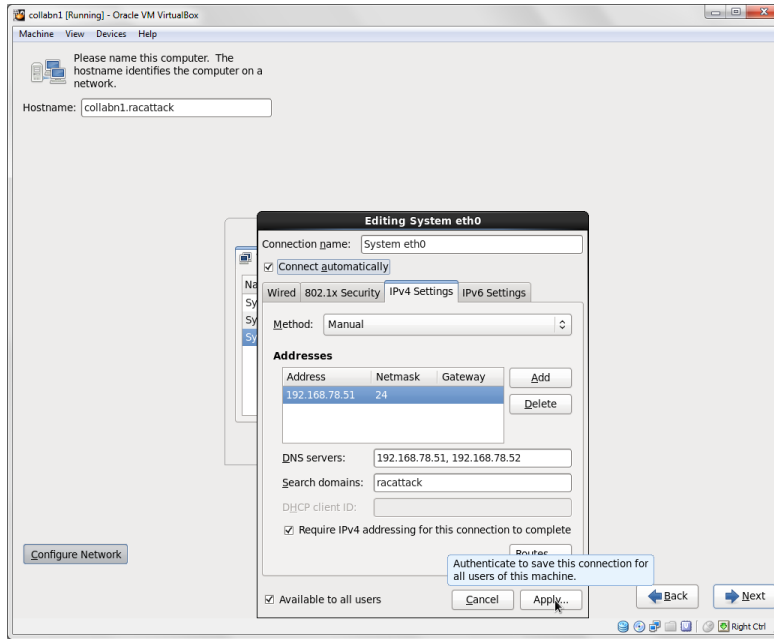
**Figure 43** RA-Oracle\_Linux\_6\_64bit-Install\_OS-install device

- Click **Yes, discard any data** for the warning box stating **The storage device below may contain data.**



**Figure 44** RA-Oracle\_Linux\_6\_64bit-Install\_OS-storage device warning

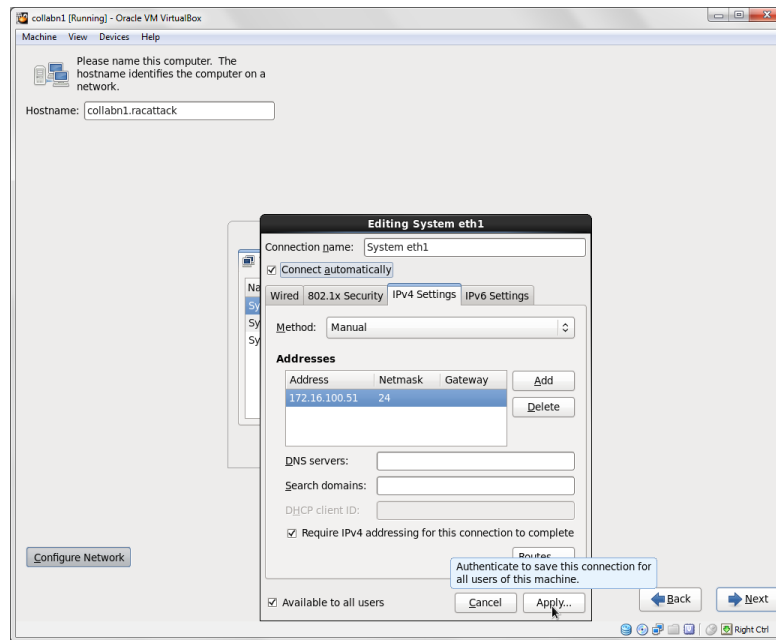
- In the hostname field, type **collabn1.racattack**.
  - Click **Configure Network** in the bottom left corner.
  - Highlight **System eth0** and click the **Edit...** button.
  - Click the **Connect automatically** checkbox.
  - Click the **IPv4 Settings** tab.
  - Click the **Method:** dropdown and select **Manual**.
  - Click **Add** and type **192.168.78.51** for the address.
  - Leave **Netmask** at **24**.
  - In the **DNS servers:** box, type **192.168.78.51, 192.168.78.52**.
  - In the **Search domains:** box, type **racattack**.
  - Click the **Apply** button.



**Figure 45** RA-Oracle\_Linux\_6\_64bit-Install\_OS-eth0 ipv4 settings

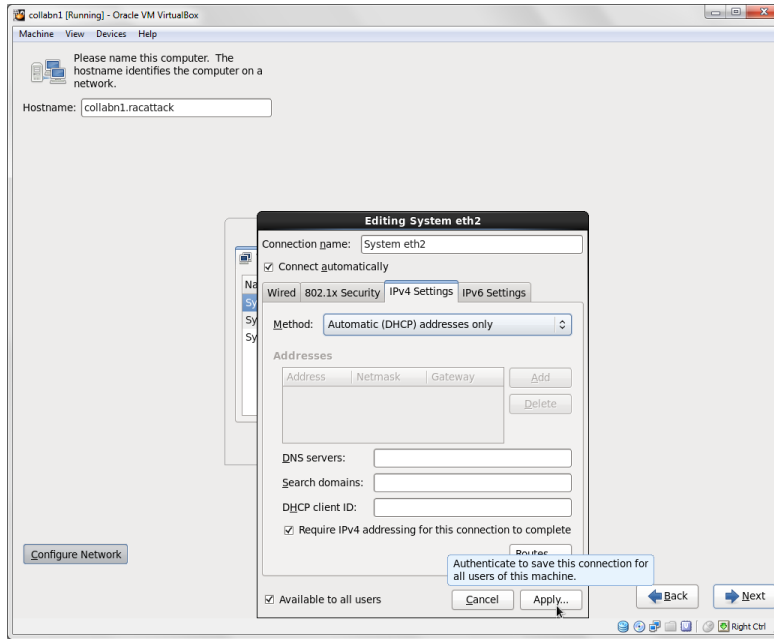
10. Highlight **System eth1** and click the **Edit...** button.
  - Click the **Connect automatically** checkbox.
  - Click the **IPv4 Settings** tab.
  - Click the **Method:** dropdown and select **Manual**.
  - Click **Add** and type **172.16.100.51**.
  - Change **Netmask** to **24**.
  - Click the **Apply** button.





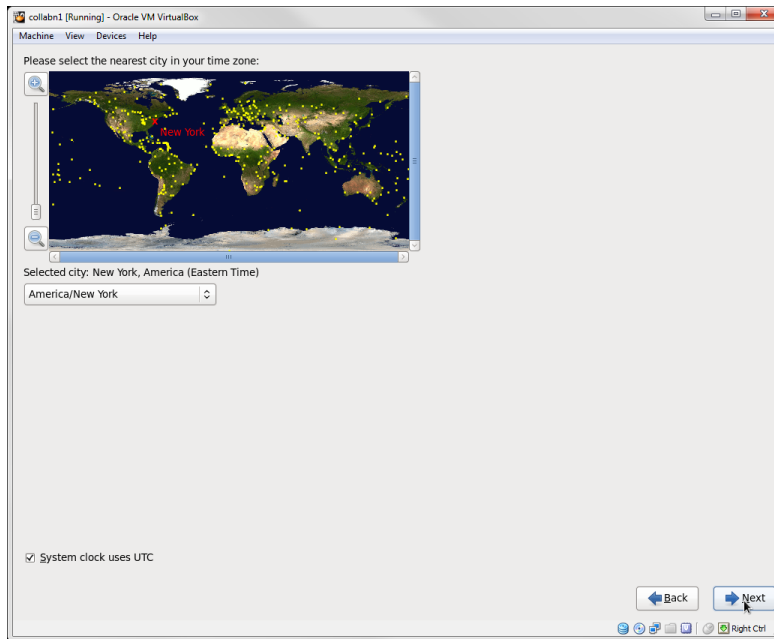
**Figure 46** RA-Oracle\_Linux\_6\_64bit-Install\_OS-eth1 ipv4 settings

11. Highlight **System eth2** and click the **Edit...** button.
  - Click the **Connect automatically** checkbox.
  - Click the **IPv4 Settings** tab.
  - Click the **Method:** dropdown and select **Automatic (DHCP) addresses only**.
  - Click the **Apply** button.
  - Click **Close** to close the network configuration menu and click **Next**.



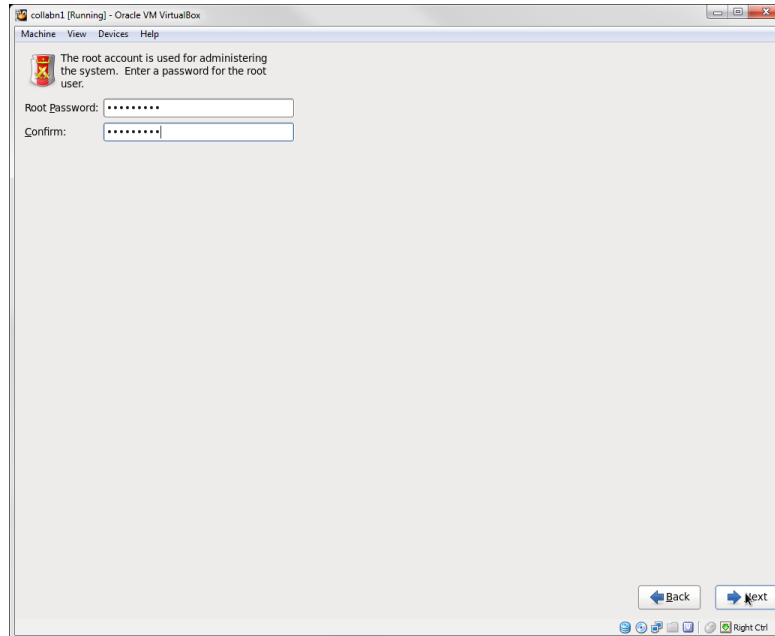
**Figure 47** RA-Oracle\_Linux\_6\_64bit-Install\_OS-eth2 ipv4 settings

12. Leave the timezone settings as they are and click **Next**.



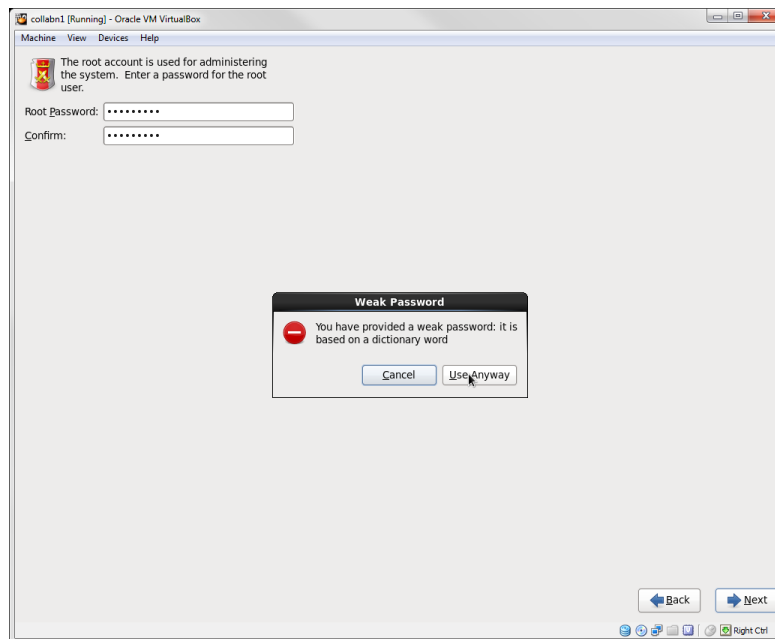
**Figure 48** RA-Oracle\_Linux\_6\_64bit-Install\_OS-time zone

13. Enter the **Root Password** as **racattack** and click **Next**.



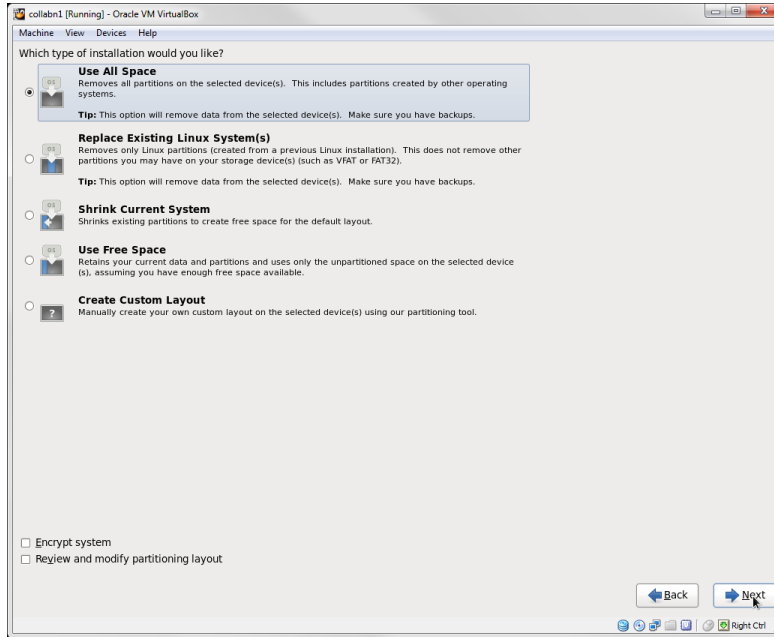
**Figure 49** RA-Oracle\_Linux\_6\_64bit-Install\_OS-root password

14. Click **Use Anyway** when warned about the weak password.



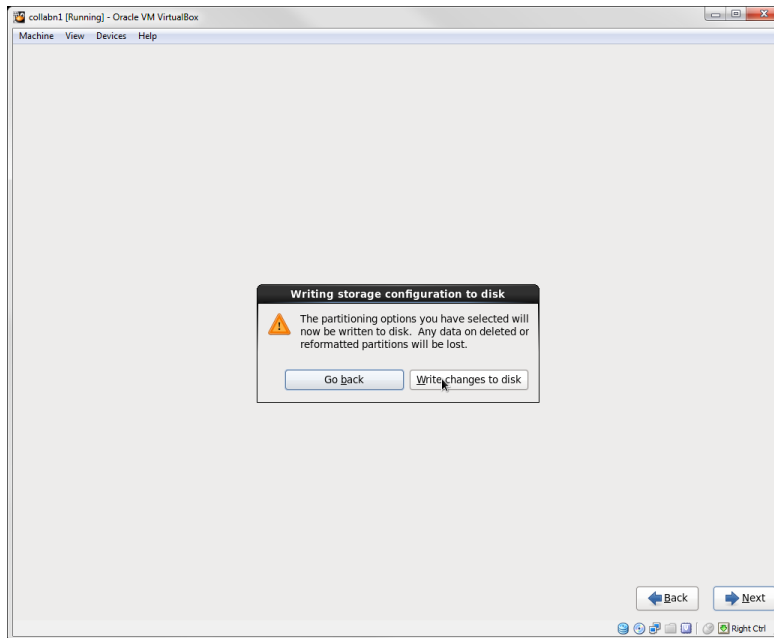
**Figure 50** RA-Oracle\_Linux\_6\_64bit-Install\_OS-root password confirm

15. Click **Use All Space** for the installation type and click **Next**.



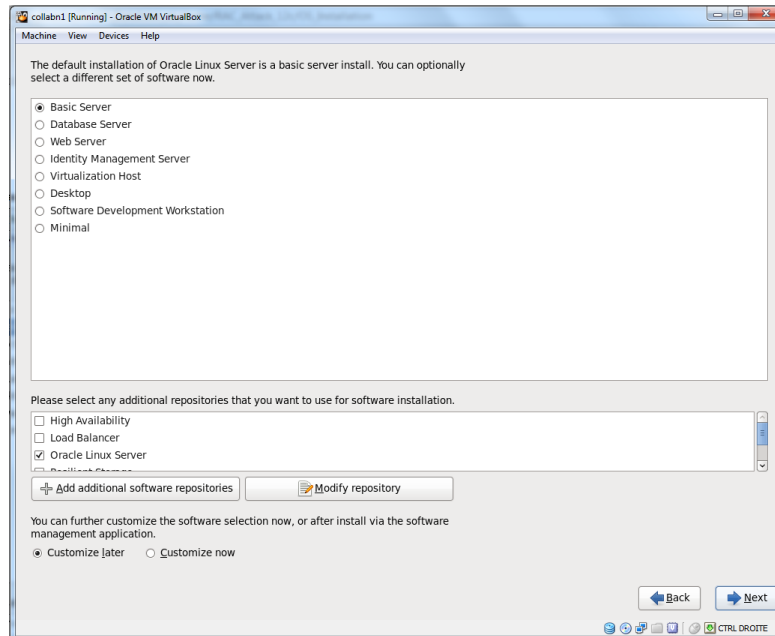
**Figure 51** RA-Oracle\_Linux\_6\_64bit-Install\_OS-use all disk space

16. Click **Write changes to disk** when warned about **Writing storage configuration to disk**.



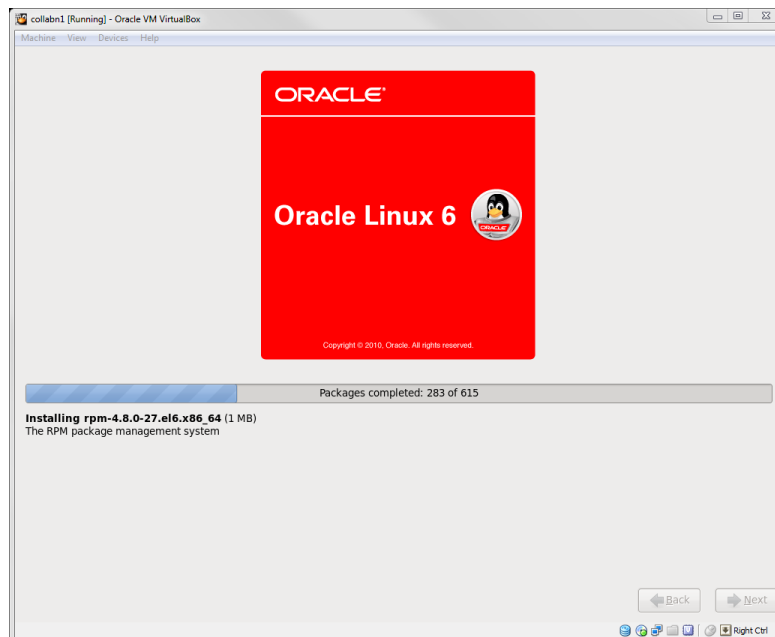
**Figure 52** RA-Oracle\_Linux\_6\_64bit-Install\_OS-write changes to disk confirm

17. Leave **Basic Server** as the default installation type. Click **Next**.



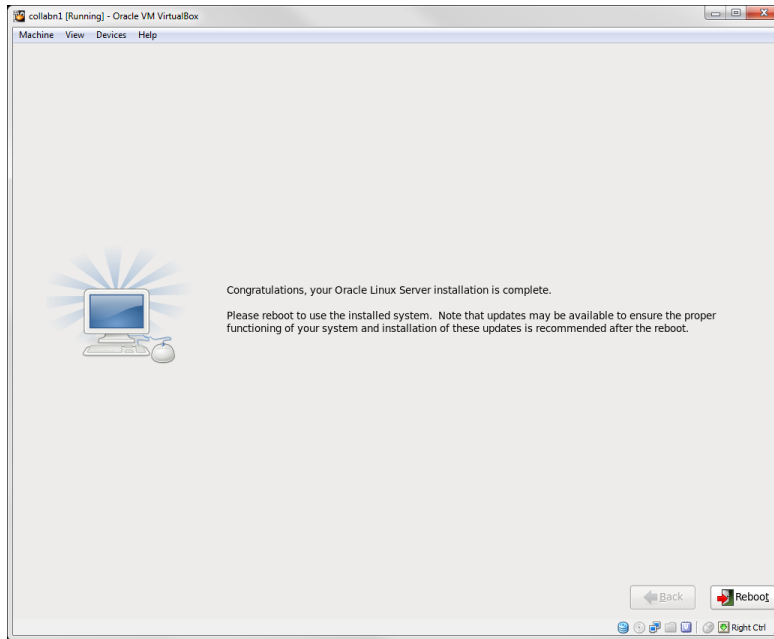
**Figure 53** RA-Oracle\_Linux\_6\_64bit-Install\_OS-default installation type

18. The operating system will take a while to install.



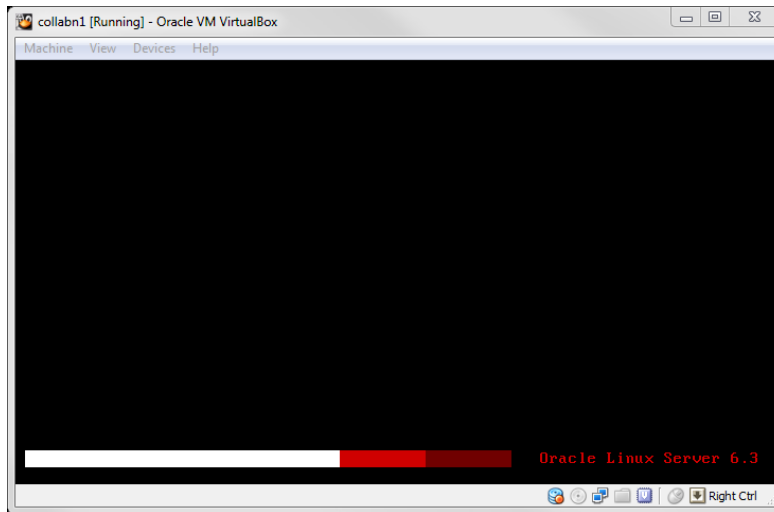
**Figure 54** RA-Oracle\_Linux\_6\_64bit-Install\_OS-install progressing

19. When the installation is complete, click **Reboot**.



**Figure 55** RA-Oracle\_Linux\_6\_64bit-Install\_OS-complete congrats

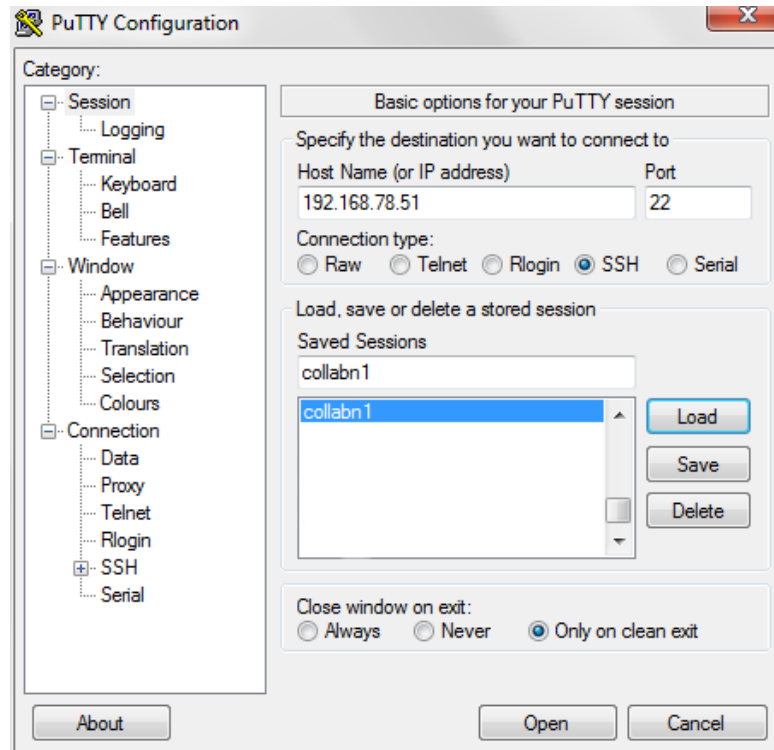
20. The reboot no longer shows messages, just a progress bar.
- You can see the progress by hitting **F8** while the server is booting.
  - The system should boot to a command line login prompt.



**Figure 56** RA-Oracle\_Linux\_6\_64bit-Install\_OS-post install reboot progress

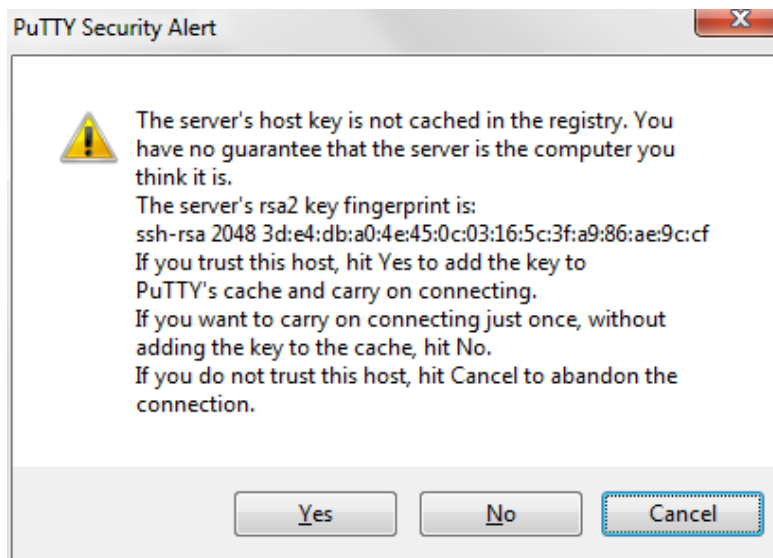
## 5.4. Linux Post Installation

1. To connect to the new created virtual machine, create a connection in Putty for the new VM called **collabn1** with the **IP Address** of **192.168.78.51**.
  - Optionally, create another connection for **collabn2** with the **IP Address** of **192.168.78.52** that will be created later as a clone of **collabn1**.



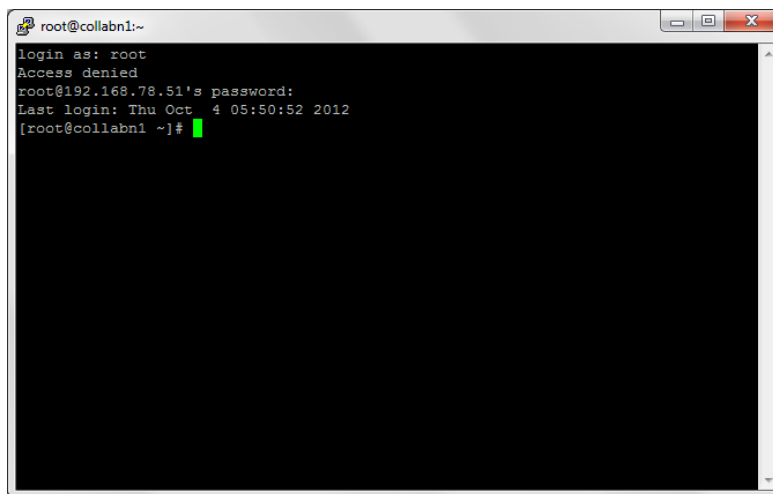
**Figure 57** Putty connection screen

2. Open the **collabn1** connection by clicking **Open**.
  - Click **Yes** on the **Security Alert** dialog box.



**Figure 58** Putty security alert

3. Enter **root** at the **login as:** prompt and **racattack** at the **password:** prompt.



**Figure 59** Putty connected

4. Turn off and disable the firewall **IPTables**.

```
[root@collabn1 ~]# service iptables stop
iptables: Flushing firewall rules:          [ OK ]
iptables: Setting chains to policy ACCEPT: filter [ OK ]
iptables: Unloading modules:                [ OK ]
```

```
[root@collabn1 ~]# chkconfig iptables off
```

```
[root@collabn1 ~]# chkconfig --list iptables
iptables    0:off  1:off  2:off  3:off  4:off  5:off
6:off
```



5. Disable **SELinux**. Open the config file and change the **SELINUX** variable from **enforcing** to **disabled**.

```
[root@collabn1 ~]# vim /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 - No SELinux policy is loaded.
SELINUX=disabled
# SELINUXTYPE= can take one of these two values:
#   targeted - Targeted processes are protected,
#   mls - Multi Level Security protection.
SELINUXTYPE=targeted
```

6. Verify that all the network interfaces are up.

```
[root@collabn1 ~]# ip l
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 16436 qdisc noqueue state UNKNOWN
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast
    state UP qlen 1000
    link/ether 08:00:27:4f:8a:0b brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast
    state UP qlen 1000
    link/ether 08:00:27:99:7e:95 brd ff:ff:ff:ff:ff:ff
4: eth2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast
    state UP qlen 1000
    link/ether 08:00:27:e2:63:7f brd ff:ff:ff:ff:ff:ff
```

7. If you have configured eth2 to connect to the internet, verify that you can ping a website on the internet.

```
[root@collabn1 ~]# ping www.racattack.org
PING www.racattack.org (173.236.152.108) 56(84) bytes of data:
64 bytes from apache2-goo.seoul.dreamhost.com (173.236.152.108):
icmp_seq=1 ttl=48 time=204 ms
64 bytes from apache2-goo.seoul.dreamhost.com (173.236.152.108):
icmp_seq=2 ttl=48 time=225 ms
64 bytes from apache2-goo.seoul.dreamhost.com (173.236.152.108):
icmp_seq=3 ttl=48 time=247 ms
64 bytes from apache2-goo.seoul.dreamhost.com (173.236.152.108):
icmp_seq=4 ttl=48 time=272 ms
```

8. If you are connecting to internet with a proxy, you need to add these lines in your **/etc/yum.conf** file:

```
proxy=http://<yourproxyaddress>:<port>
proxy_username=<value>
proxy_password=<value>
```

9. If you cannot connect to internet (because of network restrictions), you'll need to add the DVD as repository.  
Add the DVD device to the server **Device -> CD/DVD Devices -> Oracle\_Linux\_6\_41.iso**  
Run the following commands:

```
mount -o loop -t iso9660 /dev/sr0 /media/
cd /etc/yum/yum.repos.d
mkdir /tmp/old.yum.repos.d
mv * /tmp/old.yum.repos.d

cat <<EOF > ol64.repo
[OL64]
name=Oracle Linux 6.4 x86_64
baseurl=file:///media
gpgkey=file:///etc/pki/rpm-gpg/RPM-GPG-KEY
gpgcheck=1
enabled=1
EOF
```

10. Install the database preinstall package **oracle-rdbms-server-12cR1-preinstall**.

- This package installs all the **package requirements** for Oracle 12c, configures **kernel parameters**, creates oracle **user and groups** and sets the user **limits**.
- The total download size is 43M for the packages plus 40M for the package list update from the yum repository. The time taken depends on how fast is the internet connection.

 **Warning**

If you're using the DVD repository you may not find the 12cR1 package. Install instead the 11gR2 version (replace 12cR1 with 11gR2 in the name of the package).

```
[root@collabn1 ~]# yum install -y oracle-rdbms-server-12cR1-preinstall
....
Transaction Summary
===
-----
Install      21 Package(s)
Upgrade      2 Package(s)

Total download size: 43 M

....

Installed:
  oracle-rdbms-server-12cR1-preinstall.x86_64 0:1.0-8.el6

....

Complete!
```

11. Install additional RPMs that will be used to install and administer the servers.

 **Warning**

If you're using the DVD repository you must install the kernel-uek-devel package manually with: **rpm -ivh /media/Packages/kernel-uek-devel-\$(uname -r).rpm**.

```
[root@collabn1 ~]# yum install -y tigervnc-server.x86_64 xclock man
kernel-uek-devel-$(uname -r) parted.x86_64 unzip.x86_64 xterm lsof bind
xorg-x11-twm
Install      12 Package(s)
....
```

```
Total download size: 22 M
....
Complete!
```

## 12. Uninstall NTP.

```
[root@collabn1 ~]# yum remove -y ntp
....
Removed:
  ntp.x86_64 0:4.2.4p8-3.el6
....
Complete!
```

## 13. Optionally, update all your packages to the latest version. **Don't do it during a RAC Attack event, it may take too much time to be completed within the session.**

```
[root@collabn1 ~]# yum update -y
....
Install      5 Package(s)
Upgrade     117 Package(s)

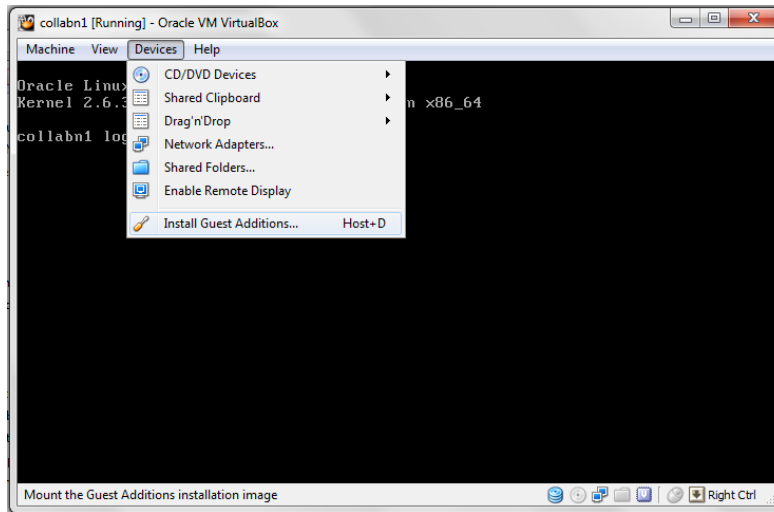
Total download size: 199 M
....
Complete!
```

## 14. If you've used the DVD repository to install the packages, you need to umount the DVD before continue with the next steps.

```
[root@collabn1 ~]# umount /media
```

## 5.5. Install VirtualBox Addons

1. Make the VirtualBox guest additions available to the OS by clicking **Devices->Install Guest Additions**.



**Figure 60** RA-Oracle\_Linux\_6\_64bit-Configure\_OS-install guest additions

2. Mount the virtual CD-Rom created by VirtualBox.

```
mount /dev/cdrom /media
mount: block device /dev/sr0 is write-protected, mounting read-only
```

3. Install the VirtualBox Guest Additions. The error related to the step **Installing the Window System drivers** is ok to ignore.

```
sh /media/VBoxLinuxAdditions.run
Verifying archive integrity... All good.
Uncompressing VirtualBox 4.2.14 Guest Additions for
Linux.....
VirtualBox Guest Additions installer
Removing installed version 4.2.14 of VirtualBox Guest Additions...
Copying additional installer modules ...
Installing additional modules ...
Removing existing VirtualBox non-DKMS kernel modules      [ OK ]
Building the VirtualBox Guest Additions kernel modules
The headers for the current running kernel were not found. If the
following
module compilation fails then this could be the reason.
The missing package can be probably installed with
yum install kernel-uek-devel-2.6.39-400.17.1.el6uek.x86_64

Building the main Guest Additions module                  [ OK ]
Building the shared folder support module                 [ OK ]
Building the OpenGL support module                       [ OK ]
Doing non-kernel setup of the Guest Additions            [ OK ]
You should restart your guest to make sure the new modules are
actually used

Installing the Window System drivers                      [FAILED]
(Could not find the X.Org or XFree86 Window System.)
```

4. Dismount the cdrom.

```
umount /media
```

## 5.6. Configure Bind DNS

1. Enable BIND DNS to start at boot time.

```
chkconfig named on
```

2. Change **named** directory permissions.

```
touch /var/named/racattack
chmod 664 /var/named/racattack
chgrp named /var/named/racattack
chmod g+w /var/named
chmod g+w /var/named/racattack
```

3. Backup the **BIND** configuration file.

```
cp /etc/named.conf /etc/named.conf.org
```

4. Run the following command or edit the **/etc/named.conf** file to change the **named** configuration manually.

```
sed -i -e 's/listen-on ./listen-on port 53 { 192.168.78.51; };/' \
-e 's/allow-query ./allow-query { 192.168.78.0/24; localhost; };\n allow-transfer { 192.168.78.0/24; };'\n \
forwarders { 194.168.1.1; };/' \
-e '$azone "racattack" {\n type master;\n file "racattack";\n};\n\nzone "in-addr.arpa" {\n type master;\n file "in-addr.arpa";\n};' \
/etc/named.conf
```

- In **bold** the lines that have been modified from the default.

```
options {
    listen-on port 53 { 192.168.78.51; };
    listen-on-v6 port 53 { ::1; };
    directory "/var/named";
    dump-file "/var/named/data/cache_dump.db";
    statistics-file "/var/named/data/named_stats.txt";
    memstatistics-file "/var/named/data/named_mem_stats.txt";
    allow-query { 192.168.78.0/24; localhost; };
    allow-transfer { 192.168.78.0/24; };
    forwarders { 194.168.1.1; };
    recursion yes;

    dnssec-enable yes;
    dnssec-validation yes;
    dnssec-lookaside auto;

    /* Path to ISC DLV key */
    bindkeys-file "/etc/named.iscdlv.key";

    managed-keys-directory "/var/named/dynamic";
};

logging {
    channel default_debug {
        file "data/named.run";
```

```

        severity dynamic;
    };
};

zone "." IN {
    type hint;
    file "named.ca";
};

include "/etc/named.rfc1912.zones";
include "/etc/named.root.key";

zone "racattack" {
    type master;
    file "racattack";
};

zone "in-addr.arpa" {
    type master;
    file "in-addr.arpa";
};

```

### 5. Create the zone file for the **racattack** domain on **collabn1**.

```

echo '$TTL 3H
@      IN SOA  collabn1      hostmaster      (
                                101  ; serial
                                1D   ; refresh
                                1H   ; retry
                                1W   ; expire
                                3H ) ; minimum

      NS     collabn1
      NS     collabn2
localhost  A     127.0.0.1
collabn1   A     192.168.78.51
collabn1-vip  A   192.168.78.61
collabn1-priv A   172.16.100.51
collabn2   A     192.168.78.52
collabn2-vip A   192.168.78.62
collabn2-priv A  172.16.100.52
collabn-cluster-scan  A   192.168.78.251
collabn-cluster-scan  A   192.168.78.252
collabn-cluster-scan  A   192.168.78.253' \
> /var/named/racattack

```

### 6. Create the reverse zone file on **collabn1**.

```

echo '$TTL 3H
@      IN SOA  collabn1.racattack.      hostmaster.racattack.
(
                                101  ; serial
                                1D   ; refresh
                                1H   ; retry
                                1W   ; expire
                                3H ) ; minimum

      NS     collabn1.racattack.
      NS     collabn2.racattack.

51.78.168.192 PTR    collabn1.racattack.
61.78.168.192 PTR    collabn1-vip.racattack.
51.100.16.172  PTR    collabn1-priv.racattack.
52.78.168.192 PTR    collabn2.racattack.
62.78.168.192 PTR    collabn2-vip.racattack.
52.100.16.172 PTR    collabn2-priv.racattack.

```

```

251.78.168.192 PTR      collabn-cluster-scan.racattack.
252.78.168.192 PTR      collabn-cluster-scan.racattack.
253.78.168.192 PTR      collabn-cluster-scan.racattack.' \
> /var/named/in-addr.arpa

```

## 7. Generate the `rndc.key` file.

```

rndc-confgen -a -r /dev/urandom
wrote key file "/etc/rndc.key"

```

```

chgrp named /etc/rndc.key
chmod g+r /etc/rndc.key

```

## 8. Restart the `named` service.

```

service named restart
Stopping named: [ OK ]
Starting named: [ OK ]

```

## 9. Check that the parameter `PEERDNS` is set to `no` in `/etc/sysconfig/networking/devices/ifcfg-eth2` (or `/etc/sysconfig/network-scripts/ifcfg-eth2`) to prevent the `resolv.conf` from being overwritten by the `dhcp` client:

```

DEVICE=eth2
TYPE=Ethernet
UUID=xxxxxxxx-xxxx-xxxx-xxxx-xxxxxxxxxxxx
ONBOOT=yes
NM_CONTROLLED=yes
BOOTPROTO=dhcp
HWADDR=xx:xx:xx:xx:xx
DEFROUTE=yes
PEERDNS=no
PEERROUTES=yes
IPV4_FAILURE_FATAL=yes
IPV6INIT=no
NAME="System eth2"
USERCTL=no

```

## 10. If it was set to `yes` previously, restart the network and verify that the file `/etc/resolv.conf` contains now the correct nameservers:

```

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: [ OK ]
Determining IP information for eth2... done. [ OK ]

```

## 11. `/etc/resolv.conf` should contain:

```

cat /etc/resolv.conf
; generated by /sbin/dhclient-script
nameserver 192.168.78.51
nameserver 192.168.78.52
search racattack

```

## 12. Check that the master DNS on `collabn1` is working.

```
nslookup collabn-cluster-scan.racattack
Server:      192.168.78.51
Address:     192.168.78.51#53

Name:   collabn-cluster-scan.racattack
Address: 192.168.78.251
Name:   collabn-cluster-scan.racattack
Address: 192.168.78.252
Name:   collabn-cluster-scan.racattack
Address: 192.168.78.253
```

## 5.7. Prepare Linux for Oracle

1. Modify the pam.d login file to use limits.

```
sed -i -e '/session    required    pam_selinux.so open/i\
session    required    \/lib64\/security\/pam_limits.so\
session    required    pam_limits.so' /etc/pam.d/login
```

2. Change the password for the **oracle** user to **racattack**.

```
passwd oracle
Changing password for user oracle.
New password:
BAD PASSWORD: it is based on a dictionary word
Retype new password:
passwd: all authentication tokens updated successfully.
```

3. Create and change the ownership of the directories for Clusterware and the Database installations.

```
mkdir -p /u01/app
chown oracle:oinstall /u01/app
```

4. Modify the Oracle user so that it belongs to the vboxsf group.

```
usermod -G oinstall,dba,vboxsf oracle
id oracle
uid=54321(oracle) gid=54321(oinstall)
groups=54321(oinstall),54322(dba),54323(vboxsf)
```



## 6. Create Cluster

### 6.1. Create VirtualBox Shared Storage

1. Shutdown the server:

```
shutdown -h now
```

```
Broadcast message from root@collabn1.racattack  
(/dev/pts/0) at 9:06 ...
```

The system is going down for halt NOW!

2. In the VirtualBox Manager, select the machine **collabn1**, click **Settings** -> **Storage**. Select **Controller SATA** and click on the **Add Hard Disk** button:

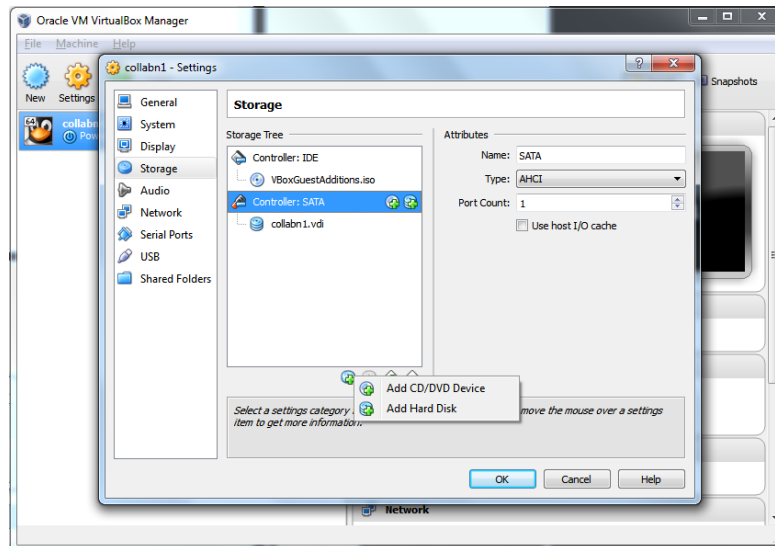
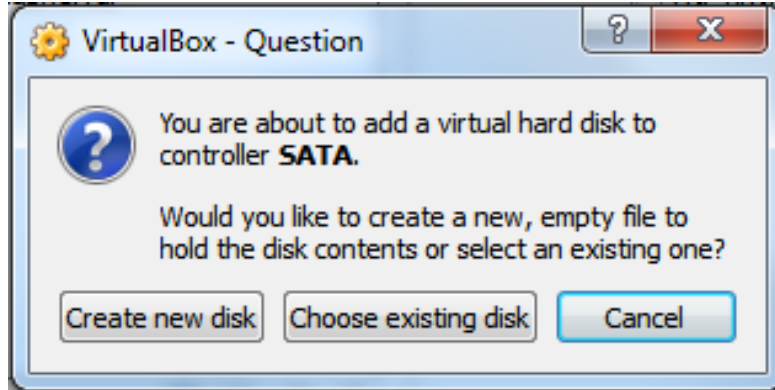


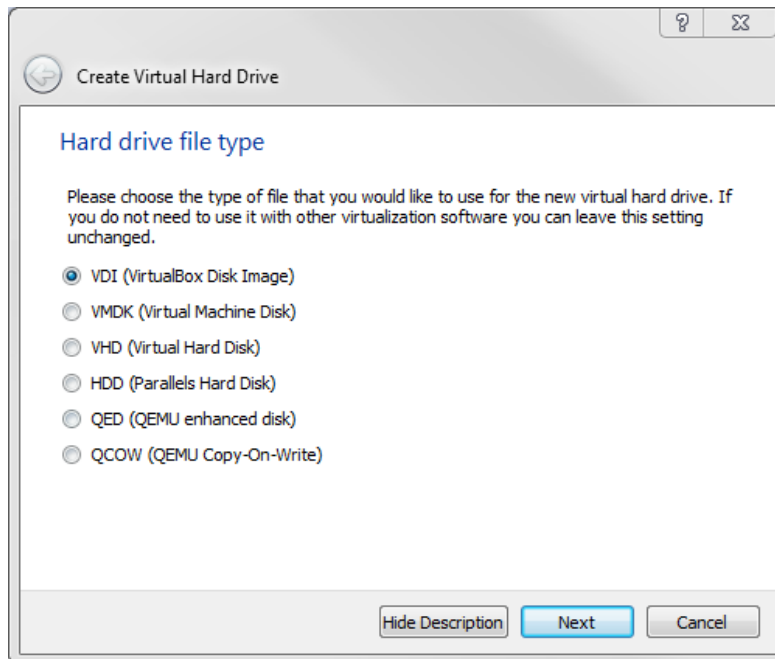
Figure 61 Virtualbox 4: Create Shared Storage - Add Hard Disk

Click on **Create New Disk**:



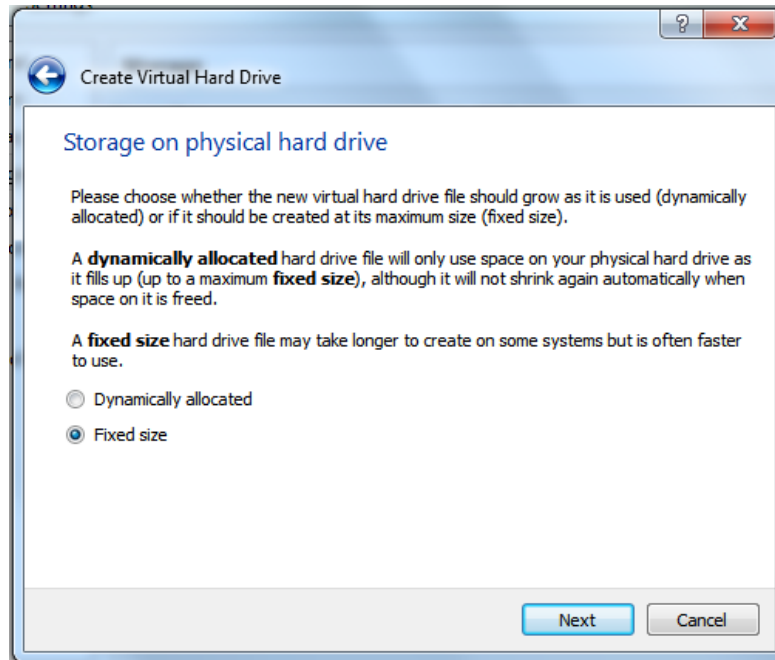
**Figure 62** Virtualbox 4: Create Shared Storage - Select New Disk

3. Leave **VDI (VirtualBox Disk Image)** selected and click **Next**.



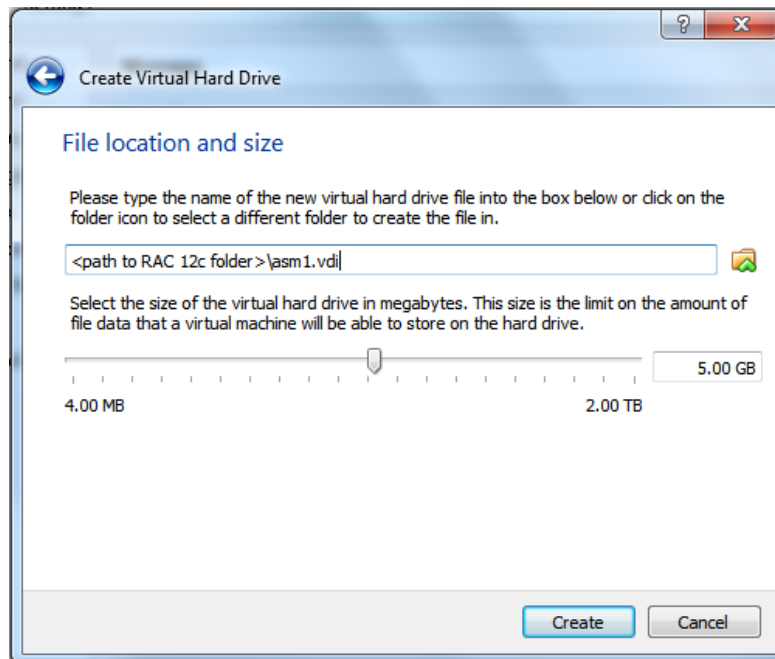
**Figure 63** RA-vbox 4214-create vm-primary hard disk type

- For the shared storage, select **Fixed size** and click **Next**.



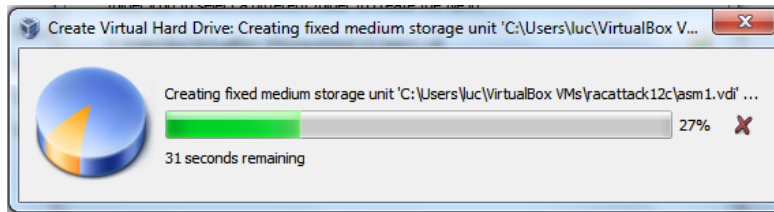
**Figure 64** Virtualbox 4: Create Shared Storage - Fixed Size

- Change the location of the file to the folder **racattack12** previously created.  
Enter `asm1.vdi` as disk name.  
Enter 5.00Gb as disk size.  
Click **Create**.



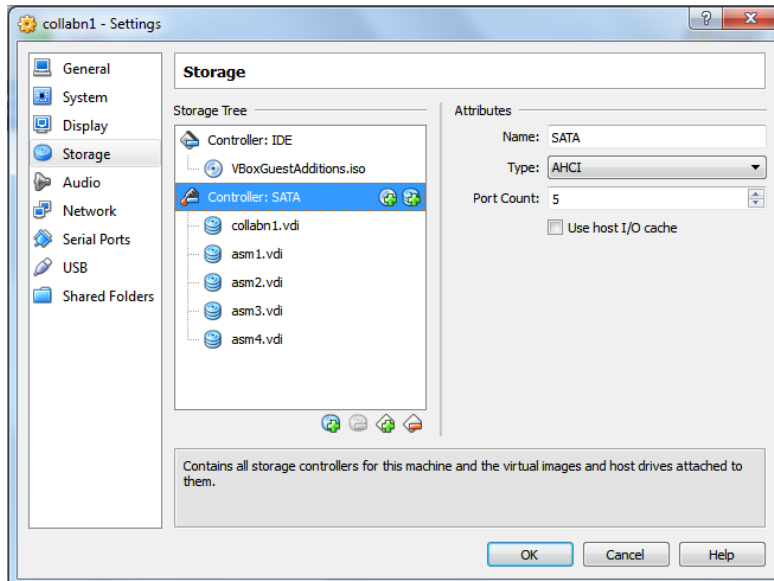
**Figure 65** Virtualbox 4: Create Shared Storage - Disk Name and Size

6. Now the disk is physically created with a size of 5Gb, so it can take more time to complete.



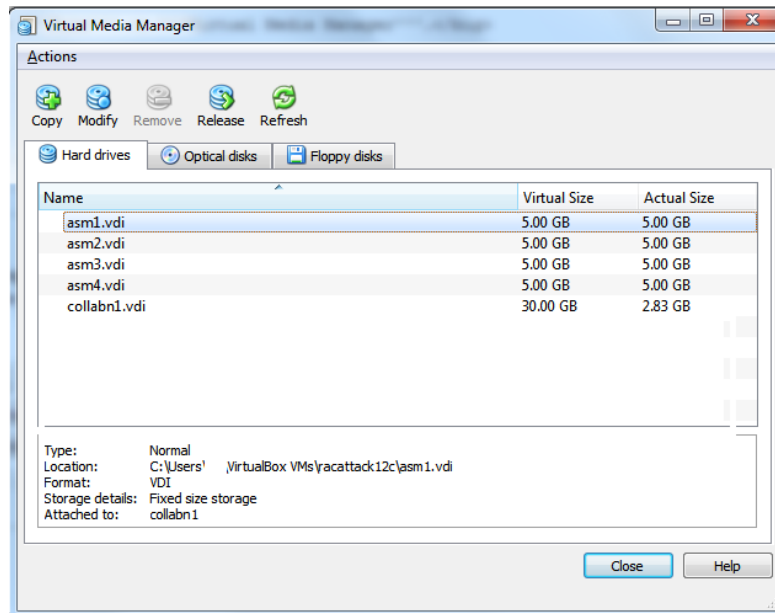
**Figure 66** Virtualbox 4: Create Shared Storage - Creation in progress

7. **Repeat the steps** to create three more disks:
  - asm2.vdi (5.00GB)
  - asm3.vdi (5.00GB)
  - asm4.vdi (5.00GB)
8. Finally, four virtual disks should have been created for asm. Click **OK**.



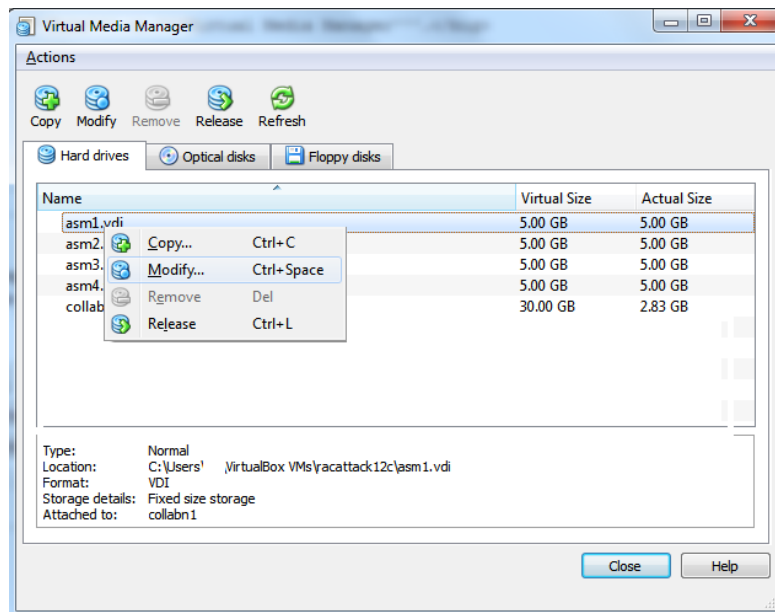
**Figure 67** Virtualbox 4: Create Shared Storage - 4 disks created

9. Make all the asm devices sharable: from VirtualBox Manager, click **File -> Virtual Media Manager**.



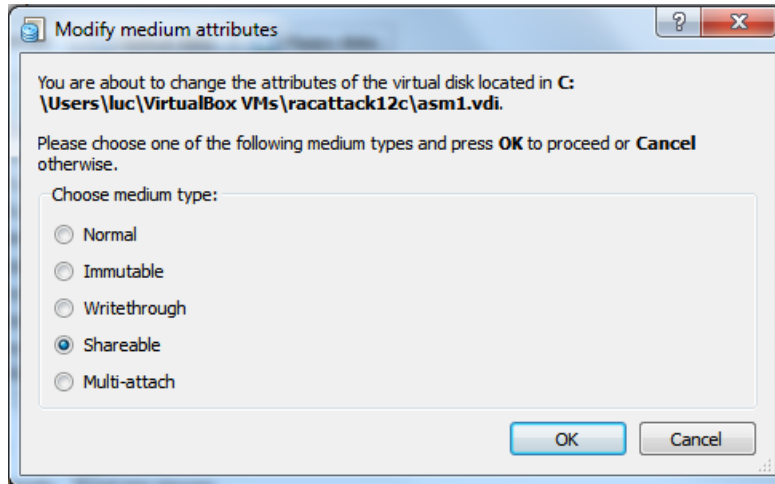
**Figure 68** Virtualbox 4: Create Shared Storage - virtual media manager

10. For each asm devices: right-click -> **Modify**:



**Figure 69** Virtualbox 4: Create Shared Storage - virtual media manager modify

11. Select **Shareable** and click **OK**. Do it for the four asm devices.



**Figure 70** Virtualbox 4: Create Shared Storage - virtual media manager shareable

12. Start the machine **collabn1**.

You should see now four more disks named `/dev/sd*`:

```
ls -l /dev/sd*
brw-rw----. 1 root disk 8,  0 Jul 28 10:16 /dev/sda
brw-rw----. 1 root disk 8,  1 Jul 28 10:16 /dev/sda1
brw-rw----. 1 root disk 8,  2 Jul 28 10:16 /dev/sda2
brw-rw----. 1 root disk 8, 16 Jul 28 10:16 /dev/sdb
brw-rw----. 1 root disk 8, 32 Jul 28 10:16 /dev/sdc
brw-rw----. 1 root disk 8, 48 Jul 28 10:16 /dev/sdd
brw-rw----. 1 root disk 8, 64 Jul 28 10:16 /dev/sde
```

## 6.2. Configure Storage Persistent Naming

1. Once the new disks are visible by the server, add a primary partition on each of them with **fdisk**.

```
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 0x97cc9f57.
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): <enter>
Using default value 1
Last cylinder, +cylinders or +size{K,M,G} (1-652, default 652): <enter>
Using default value 652

Command (m for help): w
The partition table has been altered!

Calling ioctl() to re-read partition table.
Syncing disks.

```

- Repeat the same step for **sdc**, **sdd** and **sde**.  
When finished, all disks have at least a partition:

```

ls -l /dev/sd?1
brw-rw---- 1 root disk 8,  1 Jul 28 10:16 /dev/sda1
brw-rw---- 1 root disk 8, 17 Jul 28 10:23 /dev/sdb1
brw-rw---- 1 root disk 8, 33 Jul 28 10:27 /dev/sdc1
brw-rw---- 1 root disk 8, 49 Jul 28 10:27 /dev/sdd1
brw-rw---- 1 root disk 8, 65 Jul 28 10:27 /dev/sde1

```

- Configure the option **-g** for the **scsi\_id** command to expect an UUID from the shared devices.

```

ls -l /etc/scsi_id.config
ls: cannot access /etc/scsi_id.config: No such file or directory
echo "options=-g" > /etc/scsi_id.config

```

- Prepare the file **/etc/udev/rules.d/99-oracle-asmdevices.rules** by running the following script:

```

i=1
cmd="/sbin/scsi_id -g -u -d"
for disk in sdb sdc sdd sde ; do
    cat <<EOF >> /etc/udev/rules.d/99-oracle-asmdevices.rules
KERNEL=="sd?1", BUS=="scsi", PROGRAM=="$cmd /dev/\$parent", \
RESULT=="`$cmd /dev/$disk`, NAME="asm-disk$i", OWNER="oracle",
GROUP="dba", MODE="0660"
EOF
    i=$((i+1))
done

```

- Once completed, the file should like the following (except for the scsi UUID).  
**Note:** The lines beginning with "KERNEL" should not be splitted.

```

cat /etc/udev/rules.d/99-oracle-asmdevices.rules
KERNEL=="sd?1", BUS=="scsi", PROGRAM=="/sbin/scsi_id -g -u -d
/dev/$parent", RESULT=="1ATA_VBOX_HARDDISK_VB2216c54a-825b4598",
NAME="asm-disk1", OWNER="oracle", GROUP="dba", MODE="0660"
KERNEL=="sd?1", BUS=="scsi", PROGRAM=="/sbin/scsi_id -g -u -d
/dev/$parent", RESULT=="1ATA_VBOX_HARDDISK_VB83dd4d7f-d052e72c",
NAME="asm-disk2", OWNER="oracle", GROUP="dba", MODE="0660"
KERNEL=="sd?1", BUS=="scsi", PROGRAM=="/sbin/scsi_id -g -u -d
/dev/$parent", RESULT=="1ATA_VBOX_HARDDISK_VB636da22f-87dc2f88",
NAME="asm-disk3", OWNER="oracle", GROUP="dba", MODE="0660"
KERNEL=="sd?1", BUS=="scsi", PROGRAM=="/sbin/scsi_id -g -u -d

```

```
/dev/$parent", RESULT=="1ATA_VBOX_HARDDISK_VB86aaf297-60dcda74",
NAME="asm-disk4", OWNER="oracle", GROUP="dba", MODE="0660"
```

6. Reload the udev rules and restart udev:

```
/sbin/partprobe /dev/sdb1 /dev/sdc1 /dev/sdd1 /dev/sde1
/sbin/udevadm test /block/sdb/sdb1
/sbin/udevadm test /block/sdc/sdc1
/sbin/udevadm test /block/sdd/sdd1
/sbin/udevadm test /block/sde/sde1
/sbin/udevadm control --reload-rules
/sbin/start_udev
Starting udev: [OK]
```

7. The new disks are ready for use:

```
ls -l /dev/asm*
brw-rw----. 1 oracle dba 8, 17 Jul 30 16:17 /dev/asm-disk1
brw-rw----. 1 oracle dba 8, 33 Jul 30 16:17 /dev/asm-disk2
brw-rw----. 1 oracle dba 8, 49 Jul 30 16:17 /dev/asm-disk3
brw-rw----. 1 oracle dba 8, 65 Jul 30 16:17 /dev/asm-disk4
```

### 6.3. Clone VirtualBox VM

1. Shutdown the VM.

```
shutdown -h now

Broadcast message from root@collabn1.racattack
(/dev/pts/0) at 8:42 ...

The system is going down for halt NOW!
```

2. Clone the disk **collabn1.vdi**: from VirtualBox Manager, click **File -> Virtual Media Manager**.

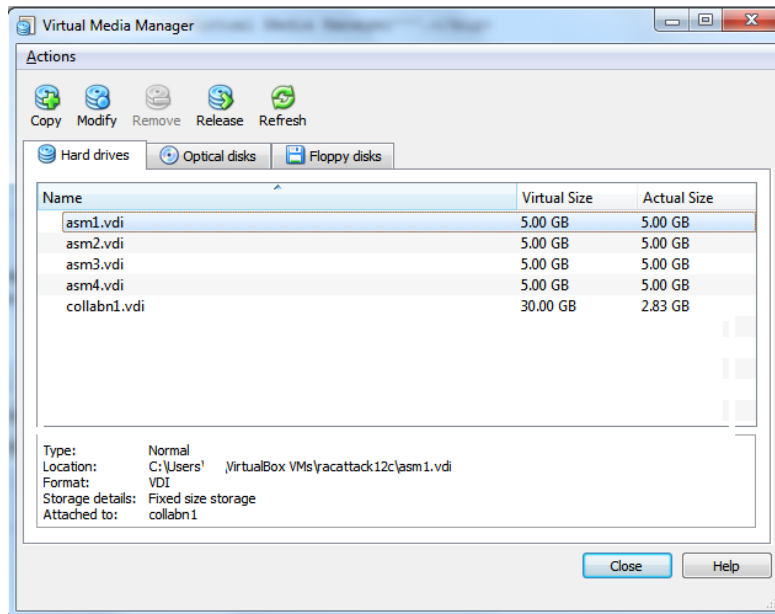
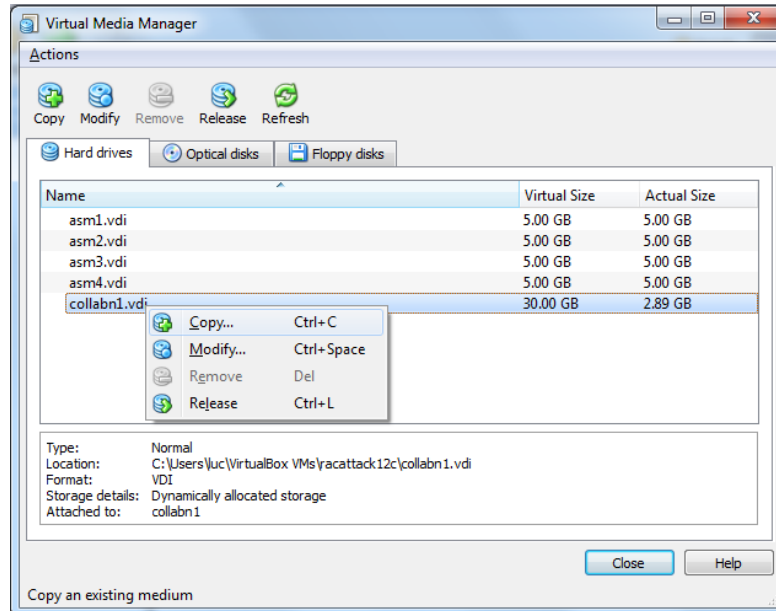


Figure 71 Virtualbox 4: Virtual box manager

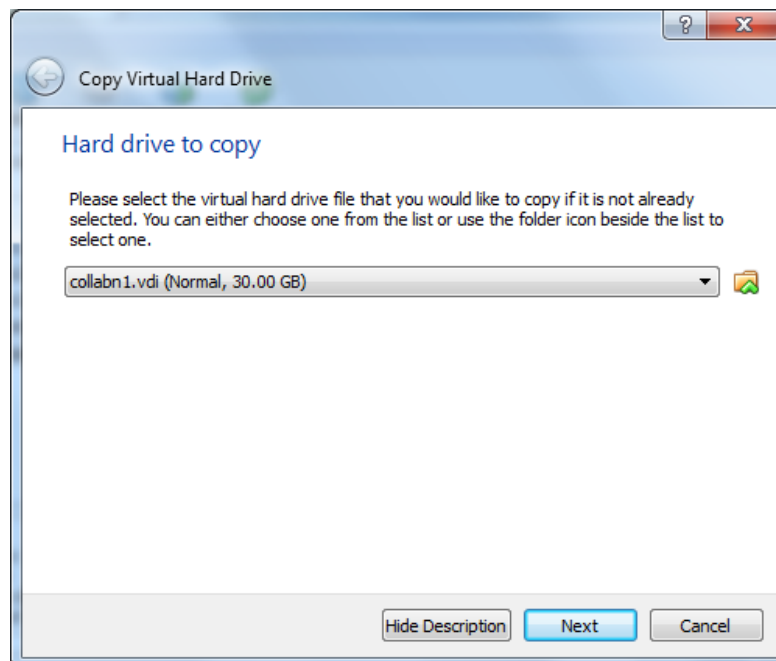


3. Right-click on the disk **collabn1.vdi** and click **Copy...**



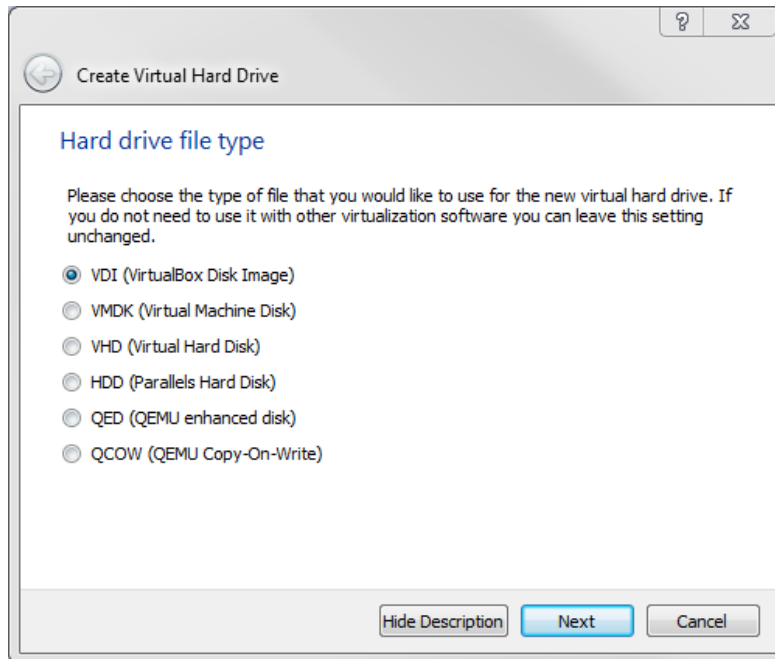
**Figure 72** Virtualbox 4: Clone Disk - Virtual Media Manager copy

4. Leave the file **collabn1.vdi**, click **Next**.



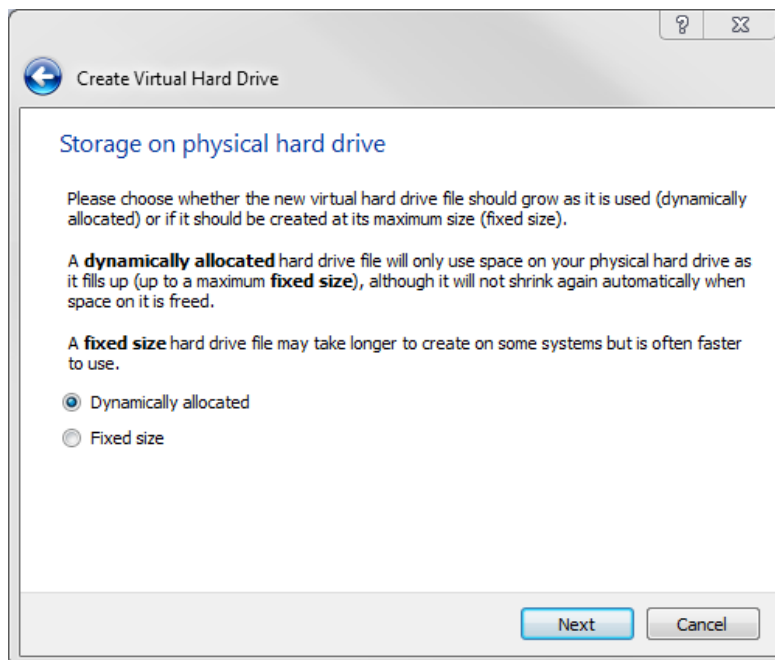
**Figure 73** Virtualbox 4: Clone Disk - Virtual Media Manager HD to copy

5. Leave **VDI** as file type. Click **Next**.



**Figure 74** Virtualbox 4: Clone Disk - HD type

6. Leave **Dinamically allocated**. Click **Next**.



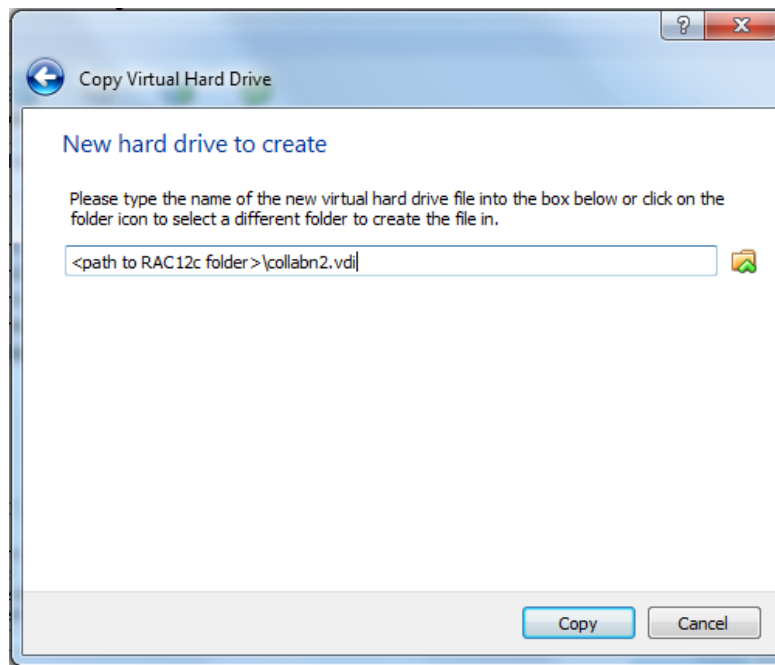
**Figure 75** Virtualbox 4: Clone Disk - allocation type

7. Type in the full path or choose through the browse icon the **Location** for the disk file to be created.

Again, it's better to use the common folder **racattack12c** previously created for all the virtual disks.

The file should be named **collabn2.vdi**.

Click **Copy**.



**Figure 76** Virtualbox 4: Clone Disk - new disk name

8. Click **Close** to exit from the Virtual Media Manager.

## 6.4. Create Second VirtualBox VM

1. In VirtualBox, click **New** icon in the upper left corner to create the new VM.

2. Type in **collabn2** for the **Name** of the VM. Choose **Linux** for the **Type** and **Oracle (64 bit)** for the **Version** and click **Next**.

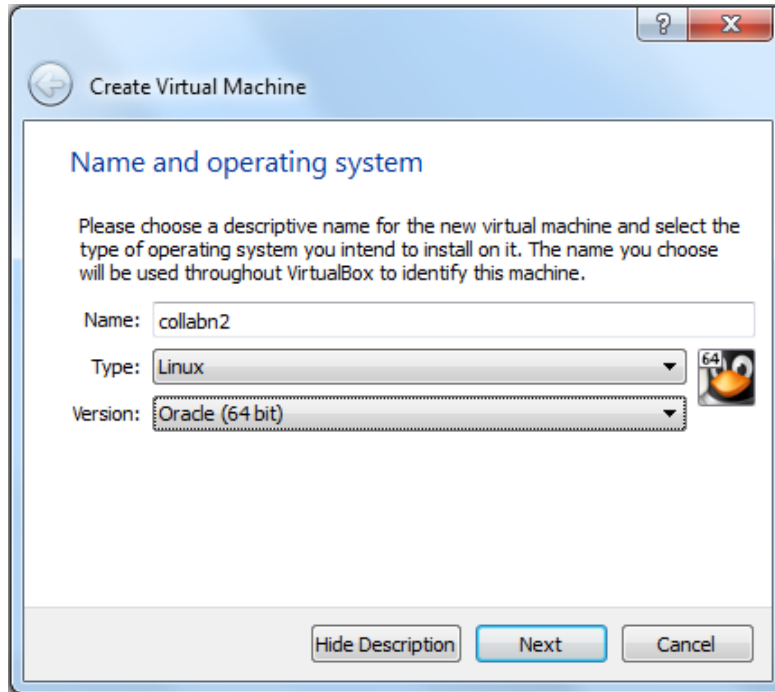


Figure 77 Virtualbox 4: Second VM Name and OS

3. Type **3072** in the **Size** field and click **Next**.

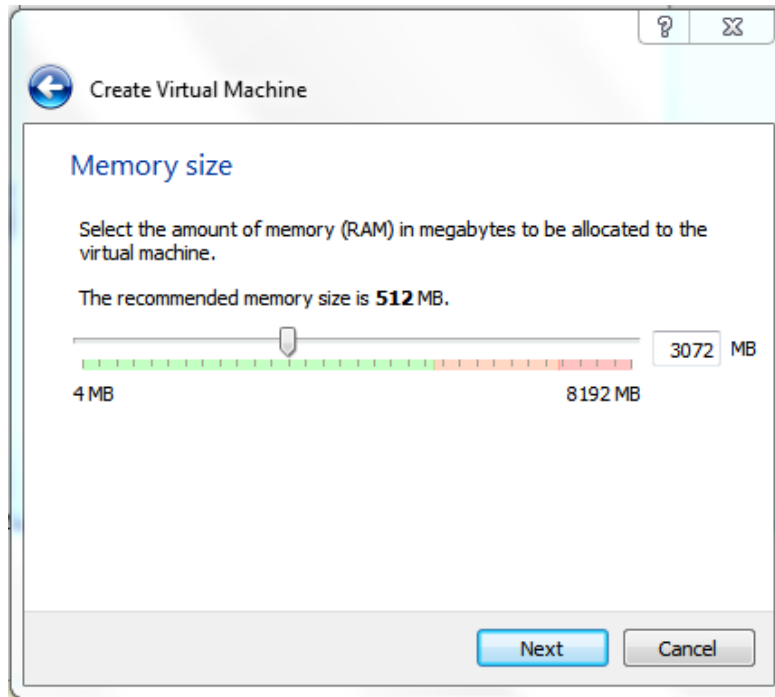
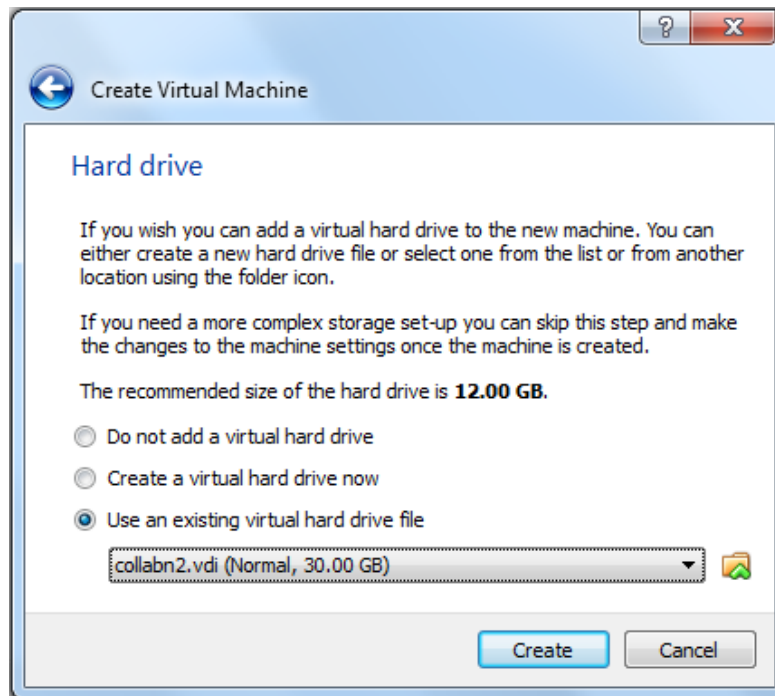


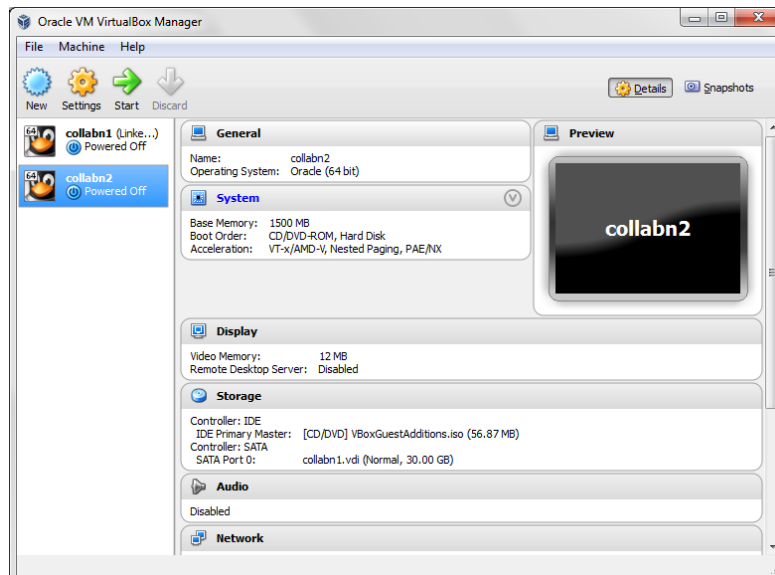
Figure 78 RA-vbox 4214-create vm-vm memory

4. Select **Use an existing virtual hard drive file** and use the folder icon to locate the file **collabn2.vdi** previously created.  
Click **Create** to complete the creation of the second VM.



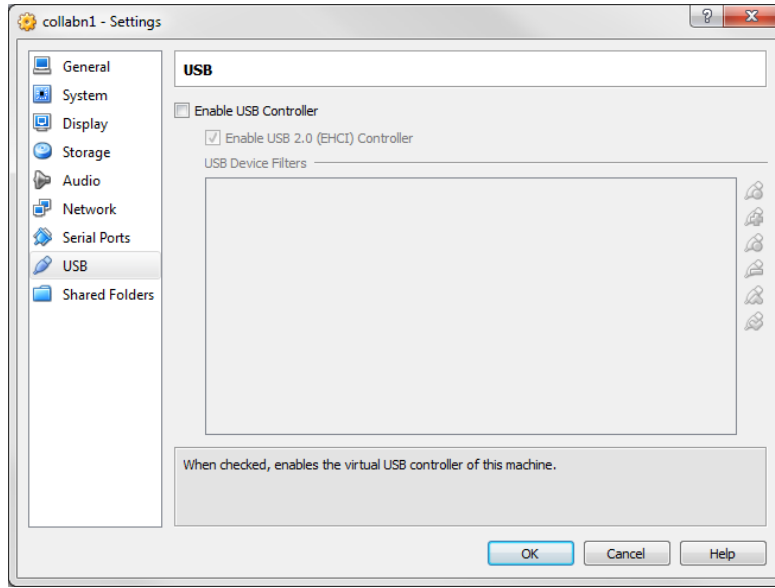
**Figure 79** Virtualbox 4: Create second vm - Use existing HD

5. There are now two virtual machines; **collabn2** being a clone of **collabn1**.  
From the main screen, select the virtual machine **collabn2** and click the **Settings** icon in the upper left hand corner.



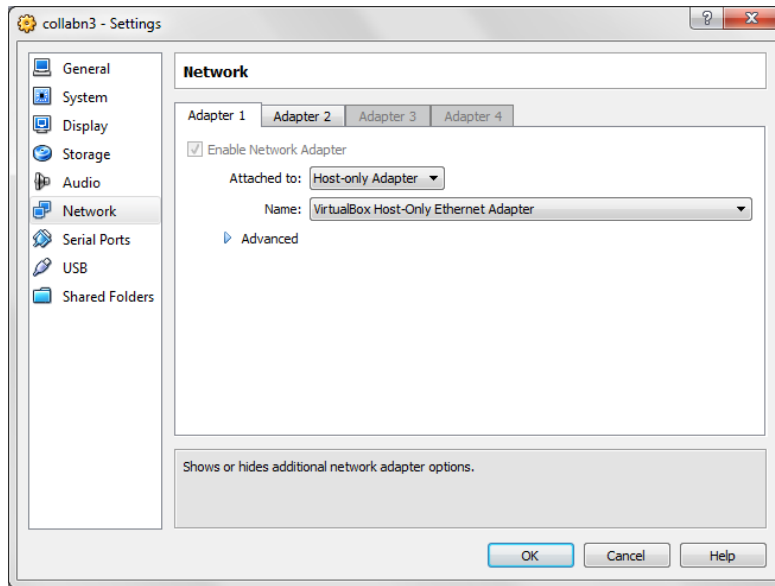
**Figure 80** RA-Oracle\_Linux\_6\_64bit-Configure\_OS-finished cloning

6. Open the **USB** sub-menu. Uncheck the **Enable USB Controller** check box.



**Figure 81** RA-vbox 4214-create vm-usb settings

7. Open the **Network** sub-menu. Under the **Adapter 1** tab, change the **Attached to:** dropdown to **Host-only Adapter**.



**Figure 82** VirtualBox\_Settings\_Network\_Adapter\_1

8. Choose the **Adapter 2** tab. Check the box for **Enable Network Adapter**. Change the **Attached to:** dropdown to **Internal Network** and type the name **rac-priv** in the **Name** field.

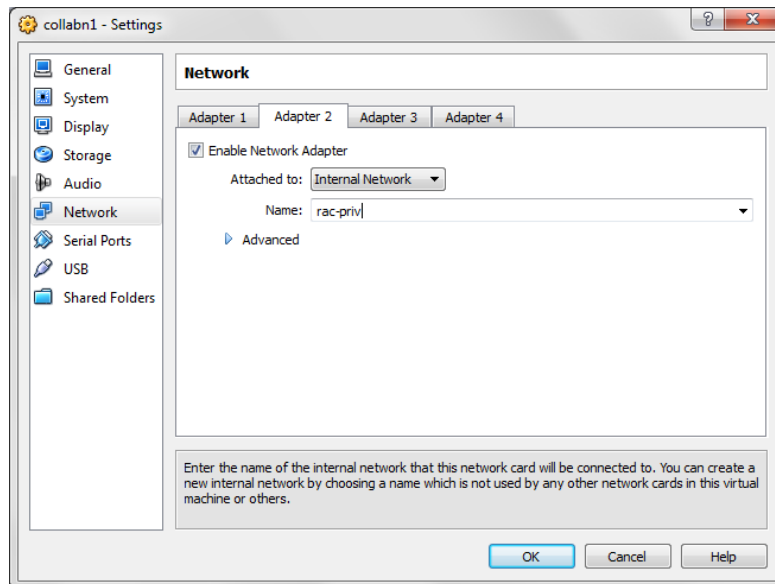


Figure 83 VirtualBox\_New\_VM\_Settings\_Network\_Adapter\_2

9. Choose the **Adapter 3** tab. Check the box for **Enable Network Adapter**. Change the **Attached to:** dropdown to **NAT**.

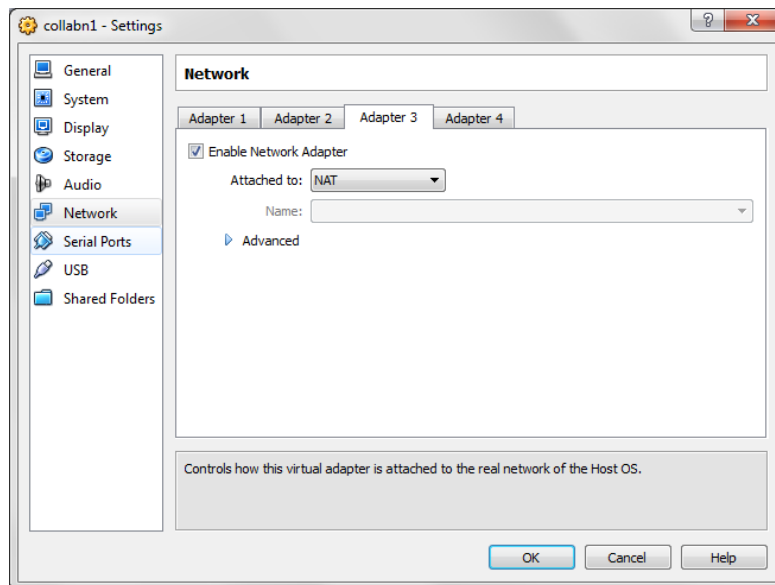
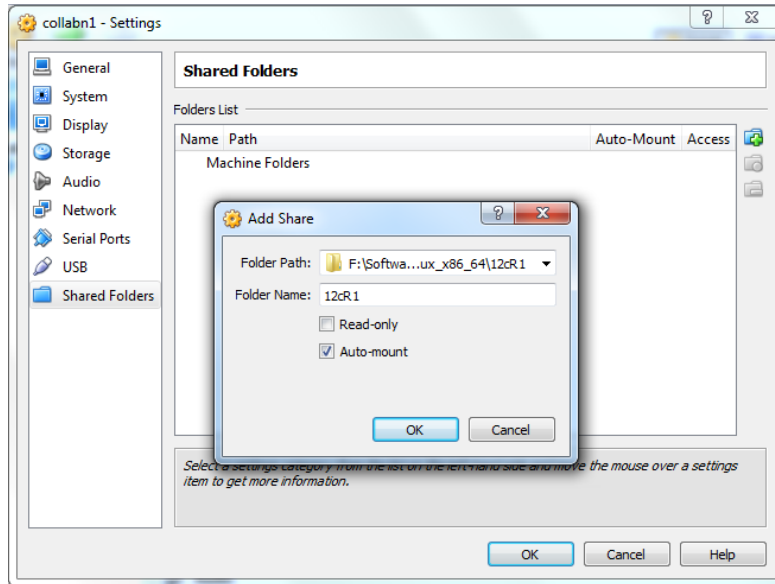


Figure 84 VirtualBox\_New\_VM\_Settings\_Network\_Adapter\_3

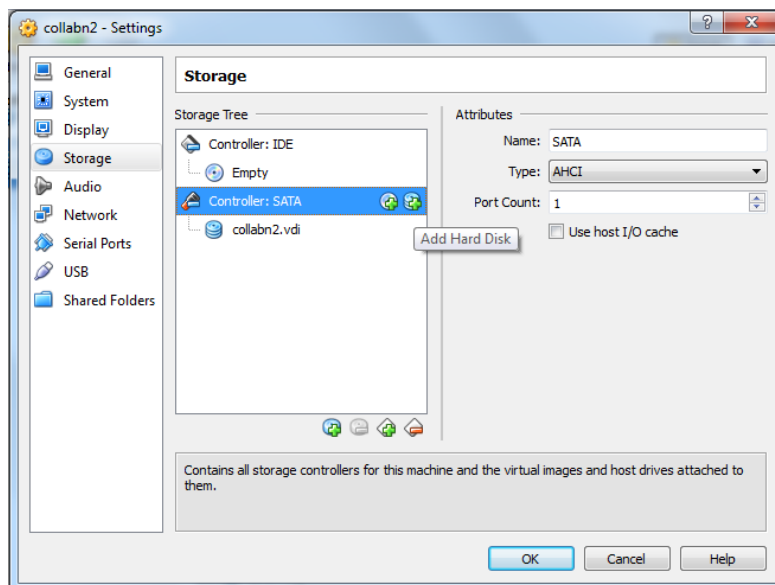
10. Select the **Shared Folders** tab. Click **Add Shared Folder**. Enter the path where you've downloaded the Oracle installation media and enter a name for your folder.

Check **Auto-mount** and click **OK**.



**Figure 85** VirtualBox\_New\_VM\_Settings\_Shared folder

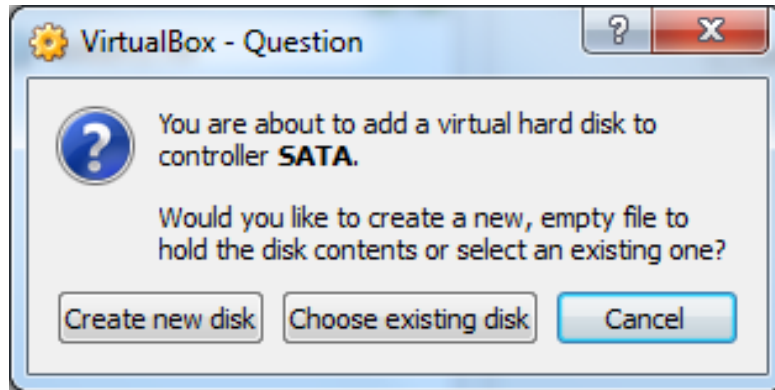
11. Open the Storage sub-menu.  
Click on **Controller SATA** and then on **Add Disk**:



**Figure 86** VirtualBox New VM Settings - Add shared storage

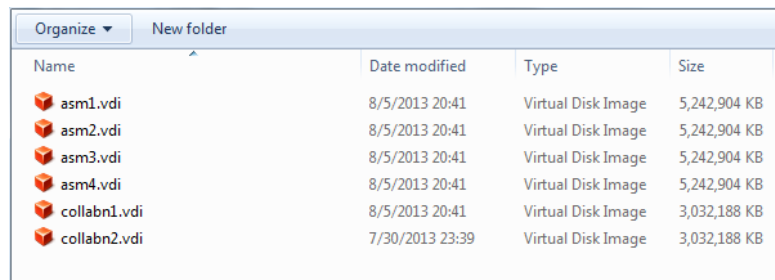


12. Click on **Choose existing disk**:



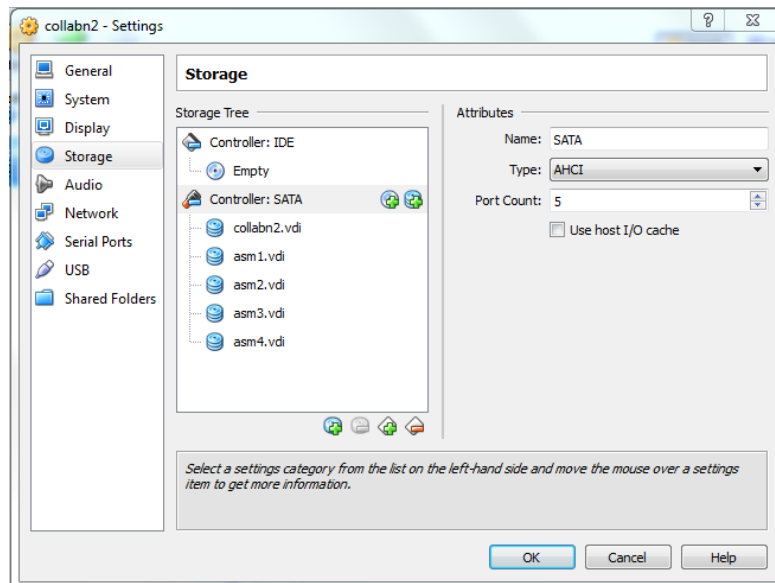
**Figure 87** VirtualBox New VM Settings - Choose existing disk

13. Select the disk **asm1.vdi** and click **Open**.



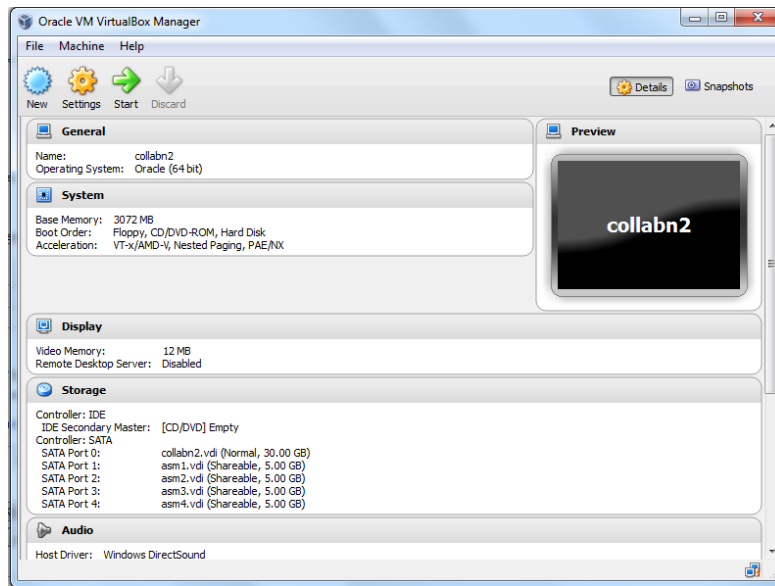
**Figure 88** VirtualBox New VM Settings - Choose existing disk ASM

14. Repeat the operation to add all remaining asm disks.



**Figure 89** VirtualBox New VM Settings - Storage added

15. Click on **Ok** to save the modifications.
16. Review the summary of the new virtual machine.

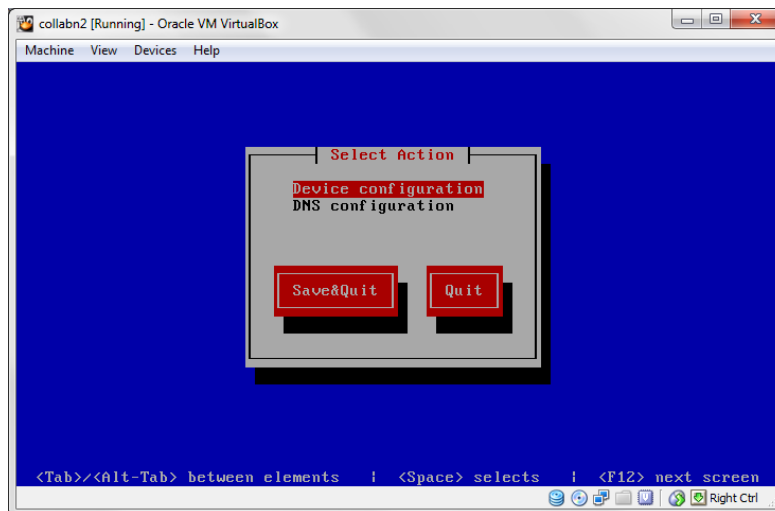


**Figure 90** VBox 4: Create Second VM - complete VM settings

17. Start the **collabn2** VM.

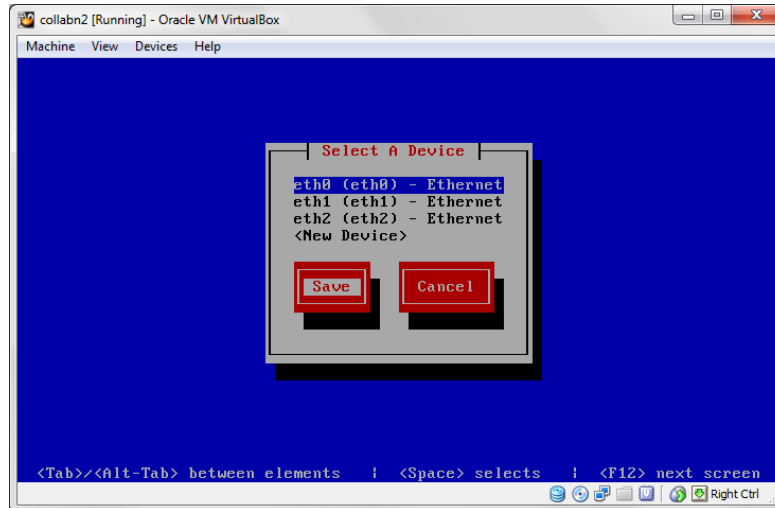
## 6.5. Configure Second Linux VM

1. The network won't be available yet because we reinitialized the network adapters so the following changes will need to be done in the VM. Log in as **root/racattack**. Type the command **system-config-network**. **Device configuration** is already highlighted. Press **Enter**.



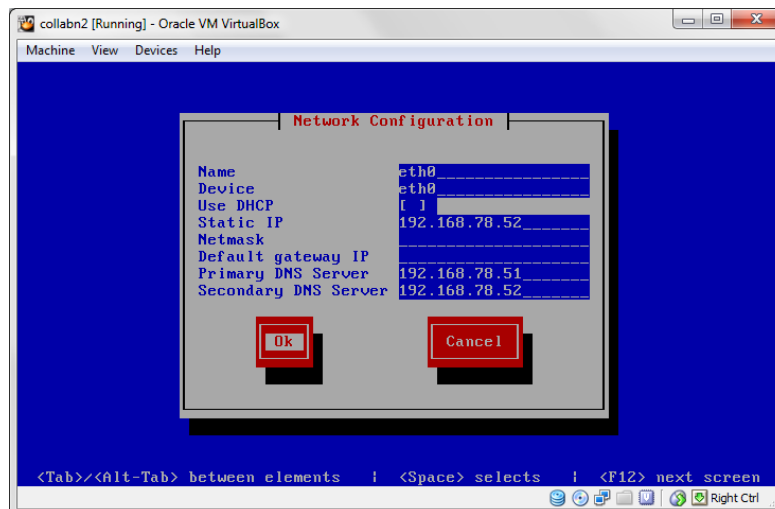
**Figure 91** RA-Oracle\_Linux\_6\_64bit-Configure\_OS-post clone network change

2. **eth0 (eth0) - Ethernet** is already highlighted. Press **Enter**.



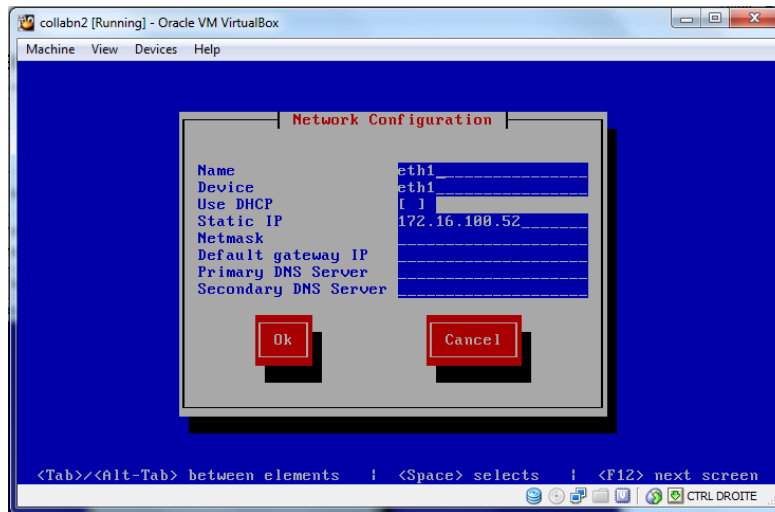
**Figure 92** RA-Oracle\_Linux\_6\_64bit-Configure\_OS-post clone network save devices

3. Go down to the **Static IP** line. Change the IP to **192.168.78.52**. Go down to **Ok** and press **Enter**.



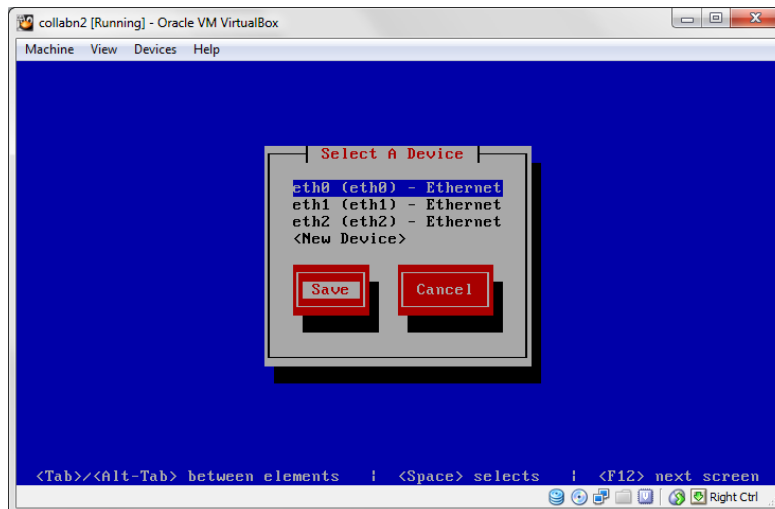
**Figure 93** RA-Oracle\_Linux\_6\_64bit-Configure\_OS-post clone network eth0

4. Select **eth1 (eth1) - Ethernet** and press **Enter**. Go down to the **Static IP** line. Change the IP to **172.16.100.52**. Go down to **Ok** and press **Enter**.



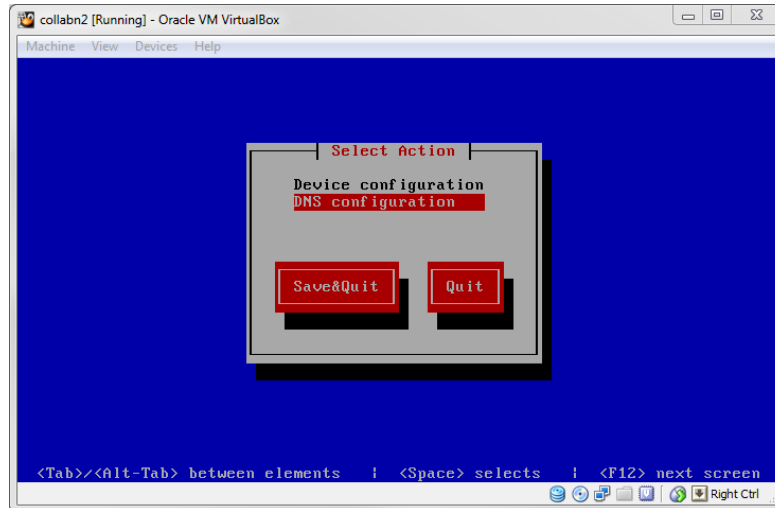
**Figure 94** RA-Oracle\_Linux\_6\_64bit-Configure\_OS-post clone network eth1

5. Tab down to **Save** and press **Enter**.



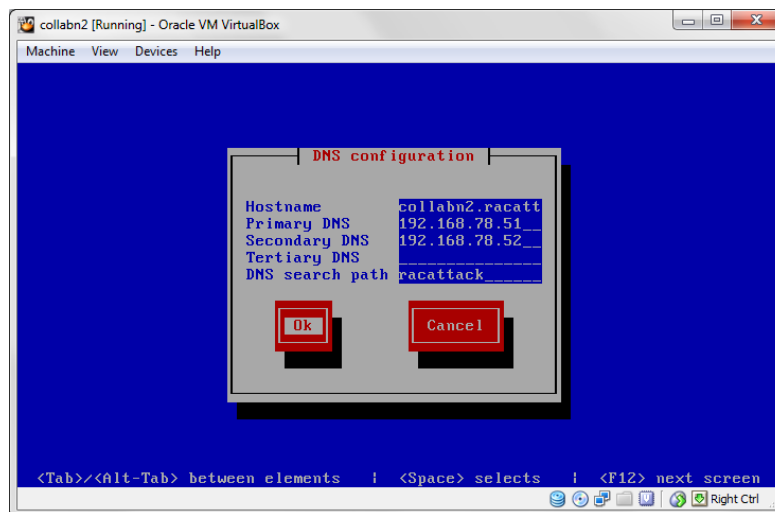
**Figure 95** RA-Oracle\_Linux\_6\_64bit-Configure\_OS-post clone network save devices

6. Arrow down to **DNS configuration** and press **Enter**.



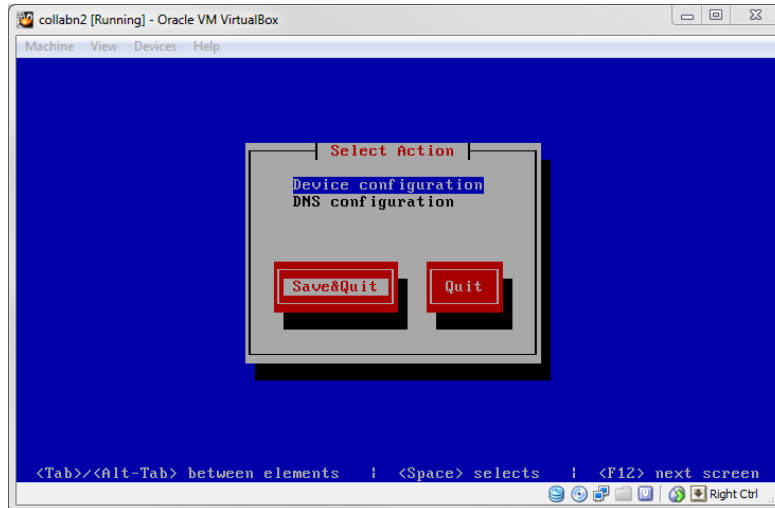
**Figure 96** RA-Oracle\_Linux\_6\_64bit-Configure\_OS-post clone DNS configuration

7. In the **Hostname** field, change to **collabn2.racattack**. Tab down to **Ok** and press **Enter**.



**Figure 97** RA-Oracle\_Linux\_6\_64bit-Configure\_OS-post clone network dns change

8. Tab down to **Save&Quit** and press **Enter**.



**Figure 98** RA-Oracle\_Linux\_6\_64bit-Configure\_OS-post clone network save quit

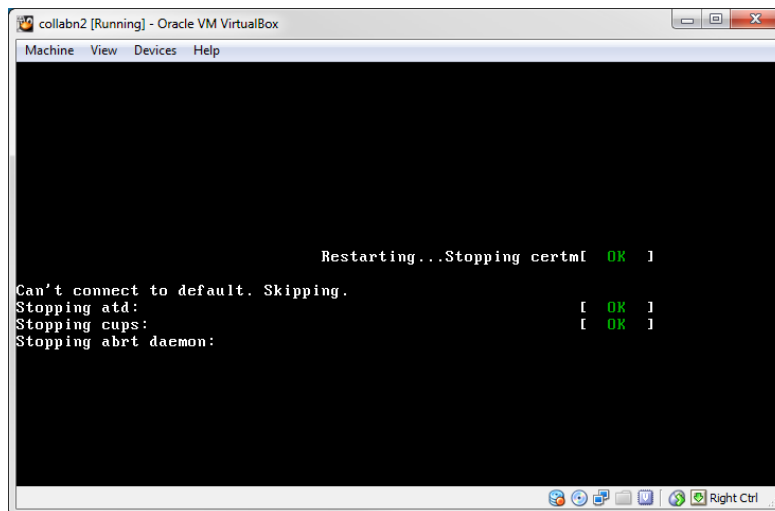
9. Remove the udev network rules file. It will be regenerated on the next reboot with the new MAC addresses.

```
rm -f /etc/udev/rules.d/70-persistent-net.rules
```

10. Remove the **HWADDR** and **UUID** lines in the network adapter configuration files.

```
sed -i -e '/HWADDR/d' -e '/UUID/d'  
/etc/sysconfig/network-scripts/ifcfg-eth[0-2]
```

11. Reboot the **collabn2** VM by typing **reboot**.  
Start the **collabn1** VM as well and start Putty sessions for both.



**Figure 99** RA-Oracle\_Linux\_6\_64bit-Configure\_OS-collabn1 reboot

12. Verify that all the network interfaces are up.

```
[root@collabn2 ~]# ip l
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 16436 qdisc noqueue state UNKNOWN
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast
    state UP qlen 1000
    link/ether 08:00:27:c9:39:d3 brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast
    state UP qlen 1000
    link/ether 08:00:27:33:bd:a8 brd ff:ff:ff:ff:ff:ff
4: eth2: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast
    state UP qlen 1000
    link/ether 08:00:27:5f:61:29 brd ff:ff:ff:ff:ff:ff
```

### 13. Verify that all the ASM devices are visible.

```
[root@collabn2 ~]# ls -l /dev/asm*
brw-rw----. 1 oracle dba 8, 17 Aug  5 15:40 /dev/asm-disk1
brw-rw----. 1 oracle dba 8, 33 Aug  5 15:40 /dev/asm-disk2
brw-rw----. 1 oracle dba 8, 49 Aug  5 15:40 /dev/asm-disk3
brw-rw----. 1 oracle dba 8, 65 Aug  5 15:40 /dev/asm-disk4
```

## 6.6. Complete DNS Setup

1. Open a session on **collabn2**.
2. Stop the DNS service.

```
[root@collabn2 ~]# service named stop
Stopping named: . [ OK ]
```

3. Remove the actual DNS files.

```
[root@collabn2 ~]# rm /var/named/racattack /var/named/in-addr.arpa
rm: remove regular file '/var/named/racattack'? y
rm: remove regular file '/var/named/in-addr.arpa'? y
```

4. Modify the file `/etc/named.conf` so that it looks like this one:

```
options {
    listen-on port 53 { 192.168.78.52; };
    listen-on-v6 port 53 { ::1; };
    directory "/var/named";
    dump-file "/var/named/data/cache_dump.db";
    statistics-file "/var/named/data/named_stats.txt";
    memstatistics-file "/var/named/data/named_mem_stats.txt";
    allow-query { 192.168.78.0/24; localhost; };
    allow-transfer { 192.168.78.0/24; };
    recursion yes;

    dnssec-enable yes;
    dnssec-validation yes;
    dnssec-lookaside auto;

    /* Path to ISC DLV key */
    bindkeys-file "/etc/named.iscdlv.key";

    managed-keys-directory "/var/named/dynamic";
};
```

```

logging {
    channel default_debug {
        file "data/named.run";
        severity dynamic;
    };
};

zone "." IN {
    type hint;
    file "named.ca";
};

include "/etc/named.rfc1912.zones";
include "/etc/named.root.key";

zone "racattack" {
    type slave;
    file "racattack";
    masters { 192.168.78.51; };
};

zone "in-addr.arpa" {
    type slave;
    file "in-addr.arpa";
    masters { 192.168.78.51; };
};

```

#### 5. Start the **named** service.

```

[root@collabn2 ~]# service named start
Starting named: [ OK ]

```

#### 6. Check that both the master on **collabn1** and slave on **collabn2** DNS servers are working. Run all the following statements to verify the correct configuration of both DNS servers:

```

[root@collabn2 ~]# dig @collabn1 collabn1.racattack
[root@collabn2 ~]# dig @collabn1 collabn2.racattack
[root@collabn2 ~]# dig @collabn1 collabn1-vip.racattack
[root@collabn2 ~]# dig @collabn1 collabn2-vip.racattack
[root@collabn2 ~]# dig @collabn1 collabn1-priv.racattack
[root@collabn2 ~]# dig @collabn1 collabn2-priv.racattack
[root@collabn2 ~]# dig @collabn1 collabn-cluster-scan.racattack

[root@collabn2 ~]# dig @collabn2 collabn1.racattack
[root@collabn2 ~]# dig @collabn2 collabn2.racattack
[root@collabn2 ~]# dig @collabn2 collabn1-vip.racattack
[root@collabn2 ~]# dig @collabn2 collabn2-vip.racattack
[root@collabn2 ~]# dig @collabn2 collabn1-priv.racattack
[root@collabn2 ~]# dig @collabn2 collabn2-priv.racattack
[root@collabn2 ~]# dig @collabn2 collabn-cluster-scan.racattack

```

## 6.7. VNC Server Setup

1. Configure VNC Server with the oracle account (passwords won't be displayed):



```
[root@collabn1 ~]# su - oracle
[oracle@collabn1 ~]$ vncserver :1

You will require a password to access your desktops.

Password: racattack
Verify: racattack
xauth: creating new authority file /home/oracle/.Xauthority

New 'collabn1.racattack:1 (oracle)' desktop is collabn1.racattack:1

Creating default startup script /home/oracle/.vnc/xstartup
Starting applications specified in /home/oracle/.vnc/xstartup
Log file is /home/oracle/.vnc/collabn1.racattack:1.log
```

2. Open a vncviewer on your laptop and fill the ip address of **collabn1** followed by **:1**.

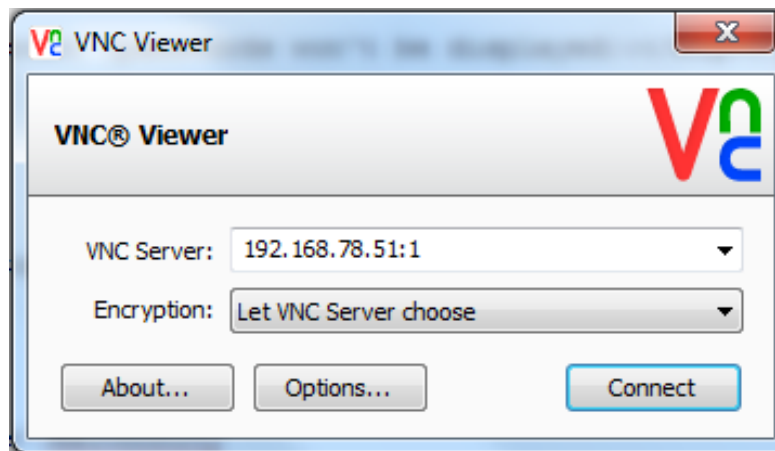


Figure 100 RA-VNCViewer-Connect form

3. Enter the password **racattack** when prompted:

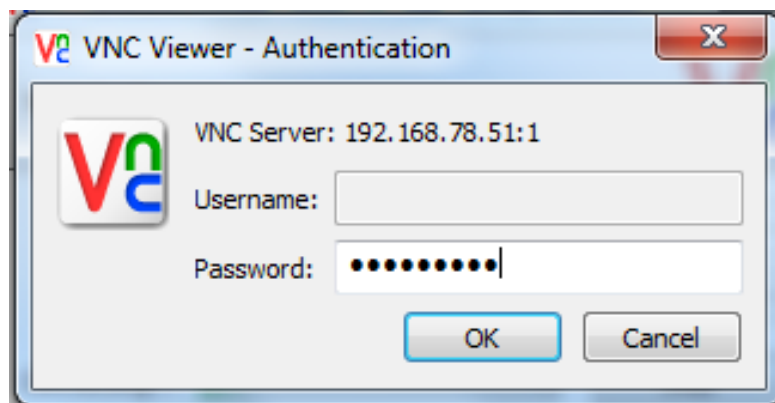
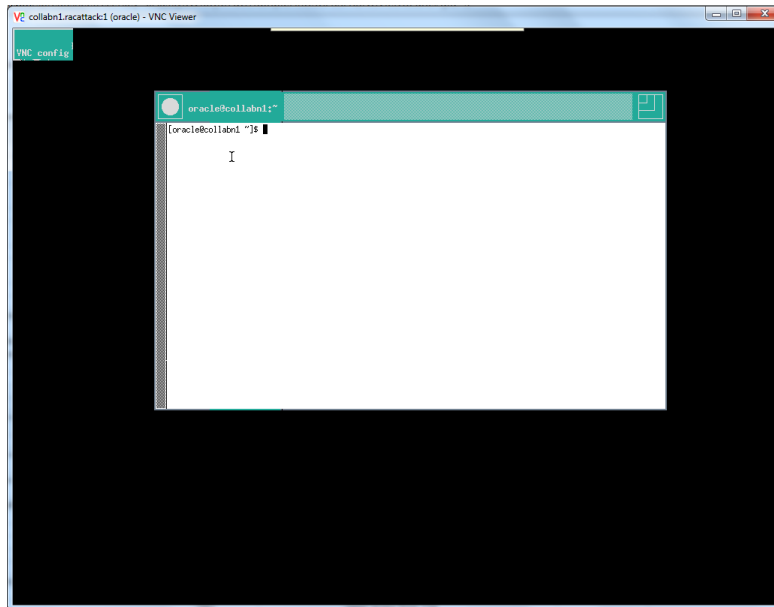


Figure 101 RA-VNCViewer-Password form

4. The graphical interface is ready for the Grid Infrastructure Installation.



**Figure 102** RA-VNCViewer-Connected

## 7. Download Oracle Enterprise Linux

Before starting you need to know what software will be installed. If attending an event, would be a good idea to download the software in advance to your laptop in order to avoid the download during the labs. The copyrighted software isn't distributable so the volunteers won't give you some software components.

### 7.1. Windows 7 64 bit

This book covers Windows 7 64 bit as host even if all operating systems that can run VirtualBox 64bit can be used. 64 bits are mandatory since Oracle 12c for Linux 32bit is not available.

The differences between Windows and OS X are highlighted in information boxes like this one.

### 7.2. VirtualBox

This book uses VirtualBox as many Oracle specialists consider it as a mature and free virtualization solution, fully compatible with Oracle Software: <https://www.virtualbox.org/>. The VirtualBox versions from 4.2.12 up to 4.2.16 have been tested successfully with OEL6 and Oracle 12c.

### 7.3. Putty

One of the preferred SSH clients for Windows. You can download it here:

<http://the.earth.li/~sgtatham/putty/latest/x86/putty.exe>

OS X and Linux hosts can use their native ssh command.

### 7.4. Vnc Viewer

The servers will be installed without X server, so you'll need VNC to get the graphics:

<http://www.realvnc.com/download/get/1295/>

OS X and Linux hosts can use XQuartz and X Windows respectively instead of VNC. You just need to connect to your servers using `ssh -X` to enable X tunneling. Windows can also use X Windows emulation programs like Xming, provided that you're comfortable to install it and use it. This book however covers VNC as preferred method.

## 7.5. Oracle Software

### 7.5.1. Oracle Enterprise Linux 6.4

Can be downloaded from <http://edelivery.oracle.com/linux>.

1. Login to: <http://edelivery.oracle.com/linux> with your Oracle Account
2. On the **Media Pack Search** page, select:  
 Product pack: **Oracle Linux**  
 Platform: **x86 64 bit**  
 Click **GO**

Media Pack Search

Select the Product Pack and Platform and click "Go".

Select a Product Pack

Platform

Results

Select	Description	Release	Part Number	Updated	# Parts / Size
*** No search conducted ***					

**Figure 103** Linux Media Pack Search

3. Click on: **Oracle Linux Release 6 Update 4 Media Pack for x86\_64 (64 bit)**

Results

Select	Description	Release	Part Number	Updated	# Parts / Size
<input checked="" type="radio"/>	<a href="#">Oracle Linux Release 6 Update 4 Media Pack for x86_64 (64 bit)</a>	6.4.0.0.0	872264-01	MAY-23-2013	5 / 8.9G

**Figure 104** Linux Media Pack Search Results

- Click on the download button at the first line:

Oracle Linux Release 6 Update 4 Media Pack v1 for x86\_64 (64 bit)

[Readme](#) [View Digest](#)

Select	Name	Part Number	Size (Bytes)
<a href="#">Download</a>	Oracle Linux Release 6 Update 4 for x86_64 (64 Bit)	V37084-01	3.5G
<a href="#">Download</a>	Oracle Linux Release 6 Update 4 Boot iso image for x86_64 (64 bit)	V37088-01	197M
<a href="#">Download</a>	Oracle Linux Release 6 Update 4 UEK Boot ISO image for x86_64 (64 bit)	V37090-01	196M
<a href="#">Download</a>	Oracle Linux Release 6 Update 4 source DVD 1	V37086-01	3.1G
<a href="#">Download</a>	Oracle Linux Release 6 Update 4 source DVD 2	V37087-01	1.9G
<b>Total: 5</b>			

**Figure 105** Linux Media Pack Download

- Once the download of the file **V37084-01.iso** is finished, rename it to **Oracle\_Linux\_6\_64.iso** to distinguish it easily from other Oracle files.

### 7.5.2. Oracle Grid Infrastructure and Database 12c (12.1.0.1)

Can be downloaded from <http://edelivery.oracle.com/>.

- Login to: <http://edelivery.oracle.com/> with your Oracle Account
- On the **Media Pack Search** page, select:  
Product pack: **Oracle Database**  
Platform: **Linux x86-64**  
Click **GO**

Media Pack Search

[Instructions](#)

- Review the [License List](#) to determine which Product Pack or Packs you need to download.
- Select the Product Pack and Platform and click "Go".
- If there is only one result, you will see the download page. If there are multiple results, select one and click "Continue".

Select a Product Pack

Platform

**Figure 106** Database Media Pack Search

3. Click on: **Oracle Database 12c Release 1 (12.1.0.1.0) Media Pack for Linux x86-64**

Results

Select	Description	Release	Part Number	Updated	# Parts / Size
<input type="radio"/>	<a href="#">Oracle Audit Vault and Database Firewall 12.1.1 Media Pack for Linux x86-64</a>	12.1.1.0.0	B73420-01	JUN-17-2013	3 / 5.2G
<input checked="" type="radio"/>	<a href="#">Oracle Database 12c Release 1 (12.1.0.1.0) Media Pack for Linux x86-64</a>	12.1.0.1.0	B73458-02	JUL-26-2013	24 / 23G
<input type="radio"/>	<a href="#">Oracle Audit Vault and Database Firewall 12.1.0 Media Pack for Linux x86-64</a>	12.1.0.0.0	B71269-01	DEC-18-2012	3 / 6.4G
<input type="radio"/>	<a href="#">Oracle Retail Data Model 11.3.2.0.0 Media Pack</a>	11.3.2.0.0	B72133-01	FEB-11-2013	1 / 2.0G
<input type="radio"/>	<a href="#">Oracle Airlines Data Model 11.3.1.0.0 Media Pack for Linux x86-64</a>	11.3.1.0.0	B65618-01	DEC-15-2011	1 / 173M
<input type="radio"/>	<a href="#">Oracle Communications Data Model</a>	11.3.1.0.0	B67443-01	MAY-29-2012	1 /

**Figure 107** Database Media Pack Search Results

4. Click on the download button for the following four packs:

- Oracle Database 12c Release 1 (12.1.0.1.0) for Linux x86-64 (Part 1 of 2)
- Oracle Database 12c Release 1 (12.1.0.1.0) for Linux x86-64 (Part 2 of 2)
- Oracle Database 12c Release 1 Grid Infrastructure (12.1.0.1.0) for Linux x86-64 (Part 1 of 2)
- Oracle Database 12c Release 1 Grid Infrastructure (12.1.0.1.0) for Linux x86-64 (Part 2 of 2)

Oracle Database 12c Release 1 (12.1.0.1.0) Media Pack v2 for Linux x86-64

[Readme](#) [View Digest](#)

Select	Name	Part Number	Size (Bytes)
<a href="#">Download</a>	Oracle Database 12c Release 1 (12.1.0.1.0) for Linux x86-64 (Part 1 of 2)	V38500-01 Part 1 of 2	1.3G
<a href="#">Download</a>	Oracle Database 12c Release 1 (12.1.0.1.0) for Linux x86-64 (Part 2 of 2)	V38500-01 Part 2 of 2	1.1G
<a href="#">Download</a>	Oracle Database 12c Release 1 Grid Infrastructure (12.1.0.1.0) for Linux x86-64 (Part 1 of 2)	V38501-01 Part 1 of 2	1.7G
<a href="#">Download</a>	Oracle Database 12c Release 1 Grid Infrastructure (12.1.0.1.0) for Linux x86-64 (Part 2 of 2)	V38501-01 Part 2 of 2	192M

**Figure 108** Database Media Pack Download

5. The following files are downloaded:

- V38501-01\_1of2.zip
- V38501-01\_2of2.zip
- V38500-01\_1of2.zip
- V38500-01\_2of2.zip

After uncompressing them, there will be two folders : "grid" and "database" containing the full installation.

## 8. Install Grid Infrastructure

### 8.1. Prepare for GI Install

1. Verify that the VirtualBox Shared folder containing the installation media is mounted correctly and that Oracle has access to it:

```
[root@collabn1 ~]# su - oracle
[oracle@collabn1 ~]$ df -k
Filesystem                1K-blocks      Used Available Use% Mounted on
/dev/mapper/vg_collabn1-lv_root
                           27407400    2798080  23217092  11% /
tmpfs                      1544640         0   1544640   0% /dev/shm
/dev/sdal                  495844       55641   414603  12% /boot
12cR1 976728060 863308936 113419124 89% /media/sf_12cR1
[oracle@collabn1 ~]$ ls -l /media/sf_12cR1
total 6295549
-rwxrwx---. 1 root vboxsf 1361028723 Jun 27 16:21
linuxamd64_12c_database_1of2.zip
-rwxrwx---. 1 root vboxsf 1116527103 Jun 27 16:12
linuxamd64_12c_database_2of2.zip
-rwxrwx---. 1 root vboxsf 1750478910 Jun 27 16:27
linuxamd64_12c_grid_1of2.zip
-rwxrwx---. 1 root vboxsf 201673595 Jun 27 15:23
linuxamd64_12c_grid_2of2.zip
```

2. You can decide to unzip it from your laptop (using Windows native functionalities, WinZip, 7-Zip or other tools or directly from the server.

```
[oracle@collabn1 ~]$ cd /media/sf_12cR1
[oracle@collabn1 sf_12cR1]$ unzip linuxamd64_12c_database_1of2.zip
Archive:  linuxamd64_12c_database_1of2.zip
  creating: database/                OK
  inflating: database/welcome.html   OK
  creating: database/response/       OK
  inflating: database/response/db_install.rsp  OK
  inflating: database/response/netca.rsp  OK
  inflating: database/response/dbca.rsp  OK
  creating: database/sshsetup/       OK
  inflating: database/sshsetup/sshUserSetup.sh  OK
  creating: database/rpm/            OK
  inflating: database/rpm/cvuqdisk-1.0.9-1.rpm  OK
  [...]
[oracle@collabn1 sf_12cR1]$ unzip linuxamd64_12c_database_2of2.zip
  [...]
[oracle@collabn1 sf_12cR1]$ unzip linuxamd64_12c_grid_1of2.zip
  [...]
[oracle@collabn1 sf_12cR1]$ unzip linuxamd64_12c_grid_2of2.zip
  [...]
```

3. Once the package decompression is completed, you'll end up with two directories, **grid** and **database** containing the installation files.

```
[oracle@collabn1 sf_12cR1]$ ls -l
total 6295549
drwxrwx---. 1 root vboxsf 0 Jul 3 06:38 database
drwxrwx---. 1 root vboxsf 0 Jun 10 08:15 grid
-rwxrwx---. 1 root vboxsf 1361028723 Jun 27 16:21
linuxamd64_12c_database_1of2.zip
-rwxrwx---. 1 root vboxsf 1116527103 Jun 27 16:12
linuxamd64_12c_database_2of2.zip
-rwxrwx---. 1 root vboxsf 1750478910 Jun 27 16:27
linuxamd64_12c_grid_1of2.zip
-rwxrwx---. 1 root vboxsf 201673595 Jun 27 15:23
linuxamd64_12c_grid_2of2.zip
```

4. Install the *cvuqdisk* package as **root**:

```
[root@collabn1 ~]# rpm -Uvh /media/sf_12cR1/grid/rpm/cvuqdisk-1.0.9-1.rpm
Preparing...
##### [100%]
Using default group oinstall to install package
 1:cvuqdisk
##### [100%]
[root@collabn1 ~]#
```

5. Do the same on node **collabn2**:

```
[root@collabn2 ~]# rpm -Uvh /media/sf_12cR1/grid/rpm/cvuqdisk-1.0.9-1.rpm
Preparing...
##### [100%]
Using default group oinstall to install package
 1:cvuqdisk
##### [100%]
[root@collabn2 ~]#
```

## 8.2. Install Grid Infrastructure

UNKNOWN TEMPLATE RA/NO-ETOC

---- ---- *Prev: Create Cluster*<sup>1</sup>

UNKNOWN TEMPLATE RA/Chapter

Install Grid Infrastructure

1. Prepare for GI install<sup>2</sup>
2. Install Grid Infrastructure<sup>3</sup>

---

1 Chapter 5.6 on page 53

2 Chapter 7.5.2 on page 83

3 <http://en.wikibooks.org/wiki/..%2FInstall%20Grid%20Infrastructure%20%28ASM%29>



3. Check Cluster Status After GI Install<sup>4</sup>
4. ASM Configuration<sup>5</sup>

UNKNOWN TEMPLATE RA/NO-ETOC

---- Next: Install Database Software<sup>6</sup>

### 8.3. Check Cluster Status After GI Install

1. Once your Grid Infrastructure installation is finished, you can get the status of the cluster components:

```
[oracle@collabn1 ~]$ crsctl stat res -t
-----
Name                Target  State        Server                State
-----
Local Resources
-----
ora.DATA.dg
    ONLINE ONLINE      collabn1              STABLE
    ONLINE ONLINE      collabn2              STABLE
ora.LISTENER.lsnr
    ONLINE ONLINE      collabn1              STABLE
    ONLINE ONLINE      collabn2              STABLE
ora.asm
    Started,STABLE ONLINE ONLINE      collabn1
    Started,STABLE ONLINE ONLINE      collabn2
ora.net1.network
    ONLINE ONLINE      collabn1              STABLE
    ONLINE ONLINE      collabn2              STABLE
ora.ons
    ONLINE ONLINE      collabn1              STABLE
    ONLINE ONLINE      collabn2              STABLE
-----
Cluster Resources
-----
ora.LISTENER_SCAN1.lsnr
    1      ONLINE ONLINE      collabn2              STABLE
ora.LISTENER_SCAN2.lsnr
    1      ONLINE ONLINE      collabn1              STABLE
ora.LISTENER_SCAN3.lsnr
    1      ONLINE ONLINE      collabn1              STABLE
ora.collabn1.vip
    1      ONLINE ONLINE      collabn1              STABLE
```

4 Chapter 8.3 on page 85

5 Chapter 8.4 on page 87

6 Chapter 9 on page 93

```

ora.collabn2.vip
  1      ONLINE  ONLINE      collabn2      STABLE
ora.cvu
  1      ONLINE  ONLINE      collabn1      STABLE
ora.oc4j
  1      OFFLINE OFFLINE      collabn1      STABLE
ora.scan1.vip
  1      ONLINE  ONLINE      collabn2      STABLE
ora.scan2.vip
  1      ONLINE  ONLINE      collabn1      STABLE
ora.scan3.vip
  1      ONLINE  ONLINE      collabn1      STABLE
-----
-----

```

2. **Optional step:** in order to increase the resistance of your nodes to the huge latency of a Virtualbox environment, you can increase the timeout of CRS before it causes a fencing (restart) of the node.

You'll need to stop the second node while applying the configuration to the first node.

```

[oracle@collabn1 ~]$ ssh collabn2
[oracle@collabn2 ~]$ su -
Password:
[root@collabn2 ~]# . oraenv
ORACLE_SID = [root] ? +ASM2
The Oracle base has been set to /u01/app/oracle
[root@collabn2 ~]# crsctl stop crs
CRS-2791: Starting shutdown of Oracle High Availability
Services-managed resources on 'collabn2'
CRS-2673: Attempting to stop 'ora.crsd' on 'collabn2'
CRS-2790: Starting shutdown of Cluster Ready Services-managed
resources on 'collabn2'
CRS-2673: Attempting to stop 'ora.DATA.dg' on 'collabn2'
...
CRS-2677: Stop of 'ora.gipcd' on 'collabn2' succeeded
CRS-2793: Shutdown of Oracle High Availability Services-managed
resources on 'collabn2' has completed
CRS-4133: Oracle High Availability Services has been stopped.
[root@collabn2 ~]# exit
logout
[oracle@collabn2 ~]$ exit
logout
Connection to collabn2 closed.
[oracle@collabn1 ~]$ su -
Password:
[root@collabn1 ~]# . oraenv
ORACLE_SID = [root] ? +ASM1
The Oracle base has been set to /u01/app/oracle
[root@collabn1 ~]# crsctl get css misscount
CRS-4678: Successful get misscount 30 for Cluster Synchronization
Services.
[root@collabn1 ~]# crsctl set css misscount 90
CRS-4684: Successful set of parameter misscount to 90 for Cluster
Synchronization Services.
[root@collabn1 ~]# crsctl get css disktimeout
CRS-4678: Successful get disktimeout 200 for Cluster Synchronization
Services.
[root@collabn1 ~]# crsctl set css disktimeout 600
CRS-4684: Successful set of parameter disktimeout to 600 for Cluster
Synchronization Services.

```

```
[root@collabn1 ~]# ssh collabn2
root@collabn2's password:
Last login: Tue Aug 6 16:19:56 2013 from 192.168.78.51
[root@collabn2 ~]# . oraenv
ORACLE_SID = [root] ? +ASM2
The Oracle base has been set to /u01/app/oracle
[root@collabn2 ~]# crsctl start crs
CRS-4123: Oracle High Availability Services has been started.
```

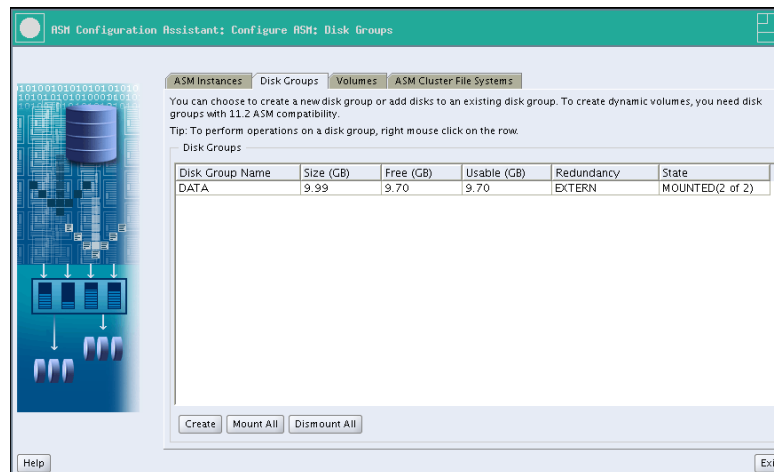
The start command returns the prompt in few seconds. However it can take minutes before the whole stack is started entirely.

## 8.4. ASM Configuration

1. From a VNC session, run the **ASM Configuration Assistant**:

```
[oracle@collabn1 ~] . oraenv
ORACLE_SID = [oracle] ? +ASM1
The Oracle base has been set to /u01/app/oracle
[oracle@collabn1 ~]$ asmca
```

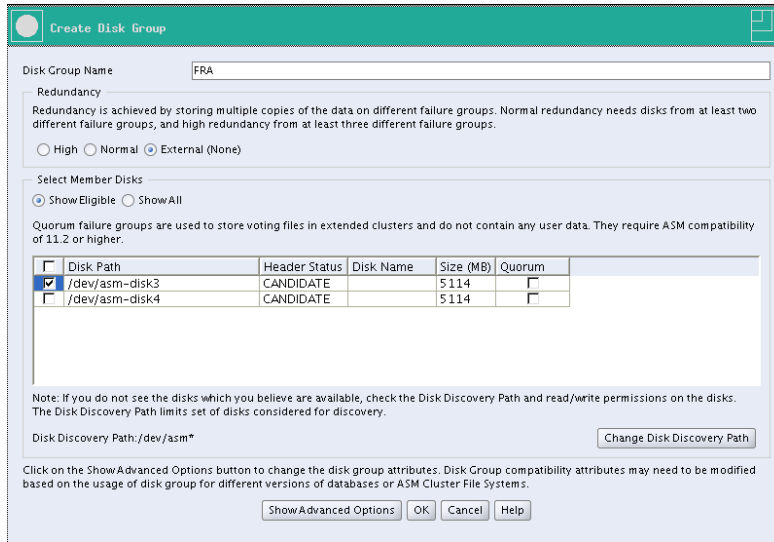
2. The asmca opens on the Disk Groups tab, showing the DATA diskgroup created by the installer. Click on **Create**.



**Figure 109** RA-Oracle\_GI\_12101-asmca-diskgroups

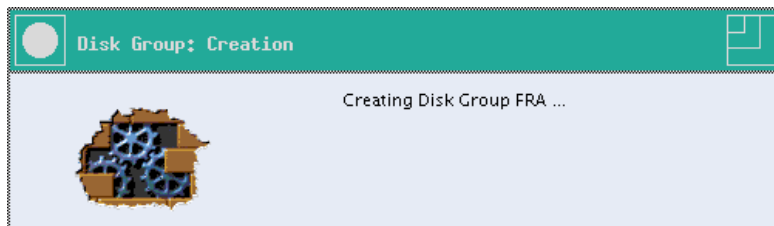
3. Enter **FRA** as the disk group name.  
Choose **external (none)** redundancy.  
Check one disk to create a 5Gb diskgroup.

Click **OK**.



**Figure 110** RA-Oracle\_GI\_12101-asmca-add\_diskgroups

4. The diskgroup is being created.



**Figure 111** RA-Oracle\_GI\_12101-asmca-Creating diskgroup

5. The diskgroup is created.

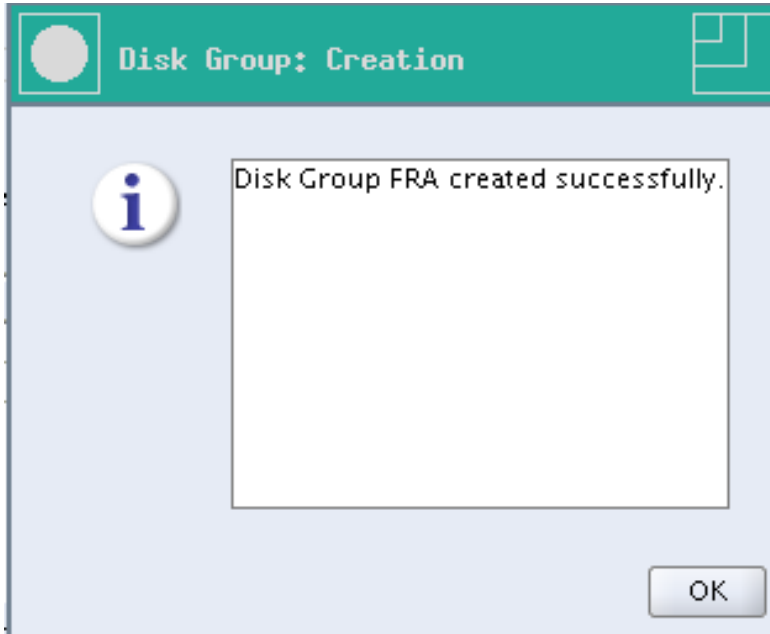


Figure 112 RA-Oracle\_GI\_12101-asmca-Diskgroup created

6. Click on the **Volumes** tab, then on **Create**.  
 Enter **SHARED** as the volume name.  
 Choose the diskgroup **DATA**.  
 The size will be irrelevant in our labs, so enter 1.  
 Click **OK**.

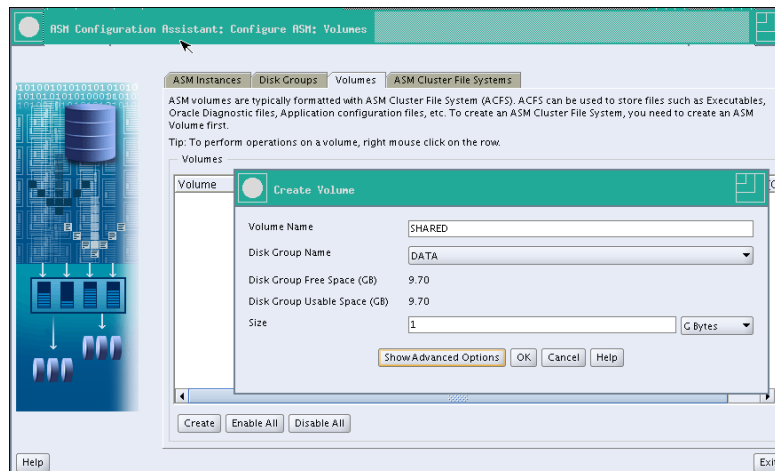
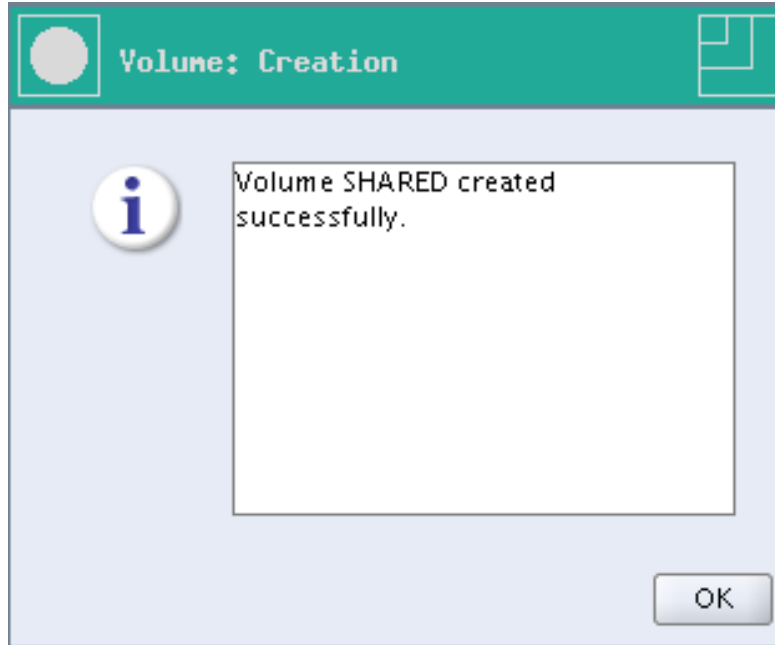


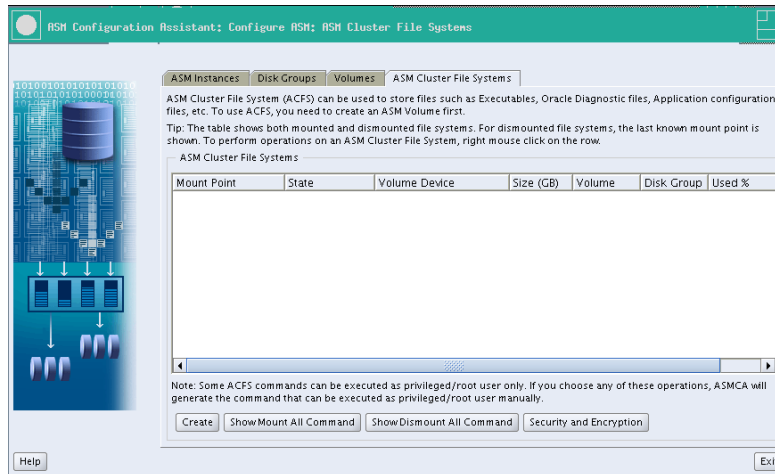
Figure 113 RA-Oracle\_GI\_12101-asmca-Creating volume

7. The volume is created.



**Figure 114** RA-Oracle GI 12101-asmca-Volume created

8. Select the **ASM Cluster File Systems** tab.  
Click **Create**.



**Figure 115** RA-Oracle\_GI\_12101-asmca-Filesystems

9. Select **Cluster File System**.

Mountpoint: **/shared**

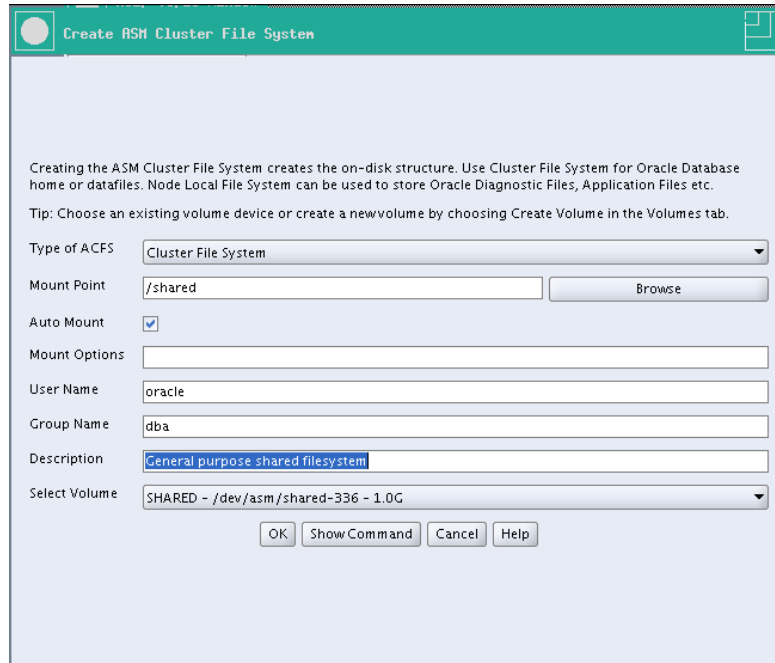
Check **Automount**.

User Name: **oracle**

Group Name: **dba**

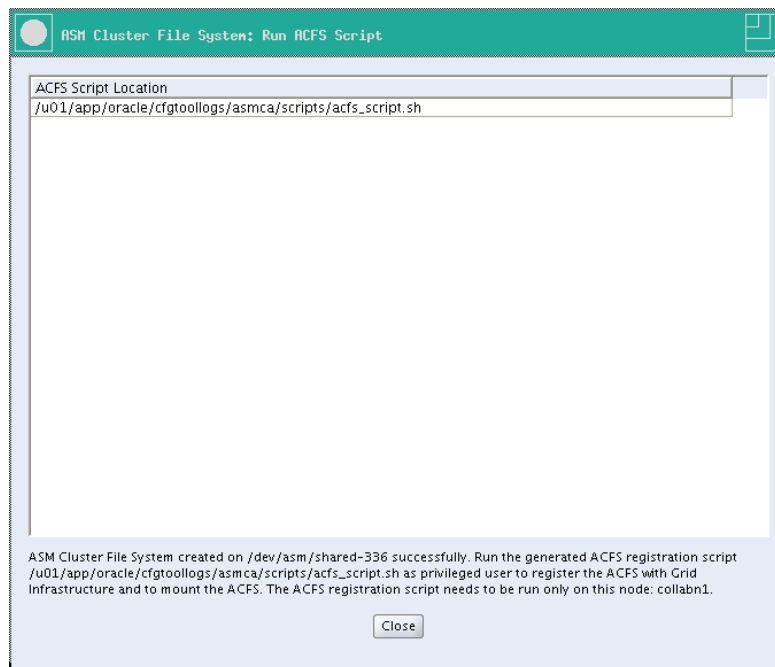
Volume: **SHARED**

Click **OK**.



**Figure 116** RA-Oracle\_GI\_12101-asmca-Creating Filesystem

10. To complete the filesystem creation, run this script as root.



**Figure 117** RA-Oracle\_GI\_12101-asmca-Creating Filesystem acfs script

```
[root@collabn1 ~]# /u01/app/oracle/cfgtoollogs/asmca/scripts/acfs_script.sh
ACFS file system /shared is mounted on nodes collabn1
ACFS file system /shared is mounted on nodes collabn2
```

### 11. Finally, the filesystem is mounted on both nodes.

```
[root@collabn1 ~]# df -k
Filesystem            1K-blocks      Used Available Use% Mounted on
/dev/mapper/vg_collabn1-lv_root
27407400      8778184  17236988   34% /
tmpfs                1544640      653576    891064   43% /dev/shm
/dev/sda1             495844        55641    414603   12% /boot
12cR1                 976728060  863308972 113419088   89%
/media/sf_12cR1
/dev/asm/shared-336 1048576 80176 968400 8% /shared

[root@collabn2 ~]# df -k
Filesystem            1K-blocks      Used Available Use% Mounted on
/dev/mapper/vg_collabn1-lv_root
27407400      8883544  17131628   35% /
tmpfs                1544640      653576    891064   43% /dev/shm
/dev/sda1             495844        55641    414603   12% /boot
/dev/asm/shared-336 1048576 80176 968400 8% /shared
```



## 9. Install Database Software

1. In a VNC session, run the installer as oracle user.

```
[oracle@collabn1 ~]$ /media/sf_12cR1/database/runInstaller
Starting Oracle Universal Installer...

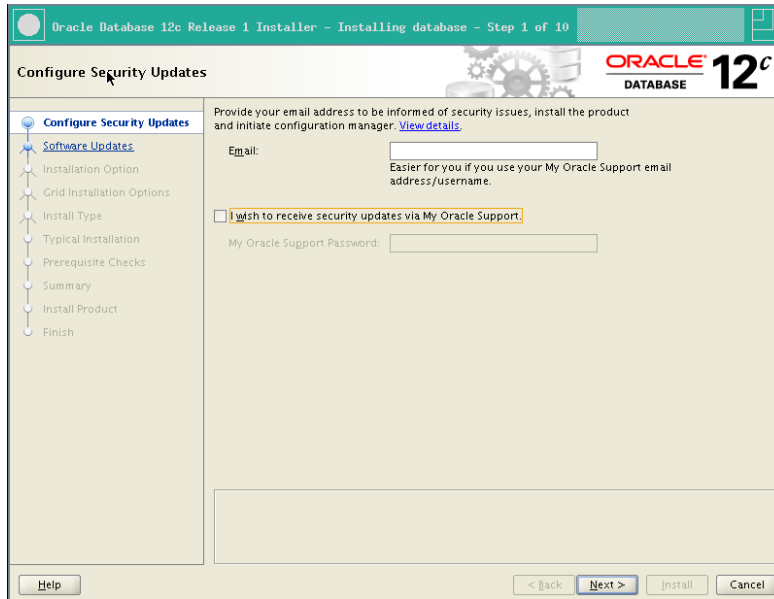
Checking Temp space: must be greater than 500 MB.   Actual 16829 MB
    Passed
Checking swap space: must be greater than 150 MB.   Actual 3023 MB
    Passed
Checking monitor: must be configured to display at least 256 colors.
    Actual 16777216   Passed
Preparing to launch Oracle Universal Installer from
/tmp/OraInstall2013-08-08_06-27-48PM. Please wait ...
```

2. The splash screen appears.



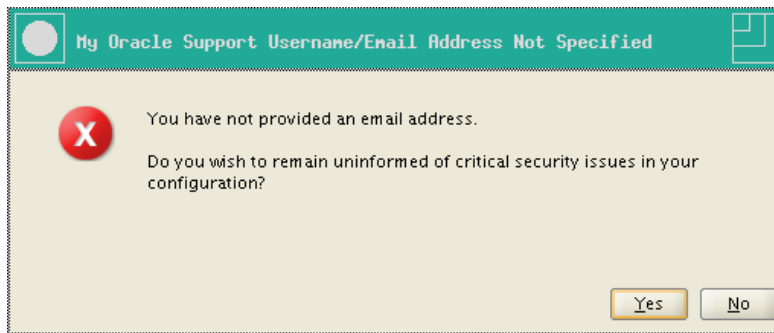
**Figure 118** RA-Oracle\_RAC\_12101-Install-Splash

3. Uncheck **I wish to receive security updates via My Oracle Support** and click **Next**.



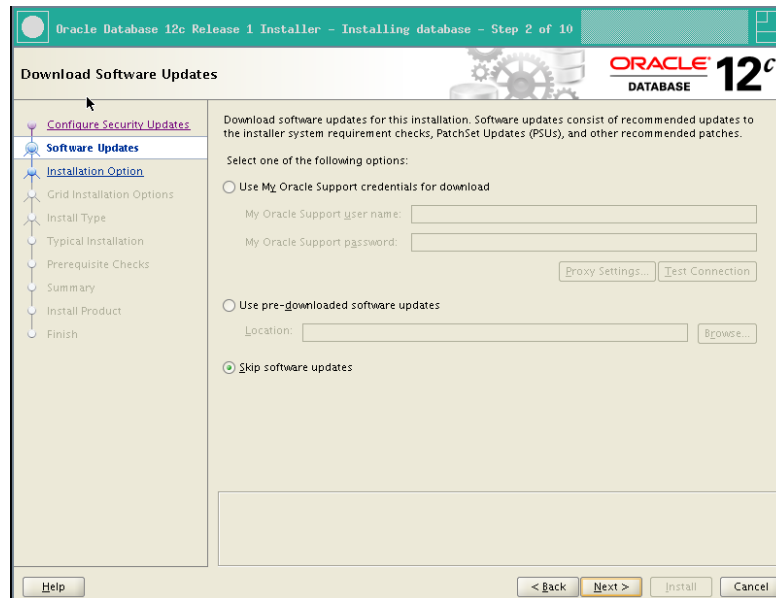
**Figure 119** RA-Oracle\_RAC\_12101-Install-Security\_updates

4. Click **Yes** to confirm that you don't want to be informed about security updates.



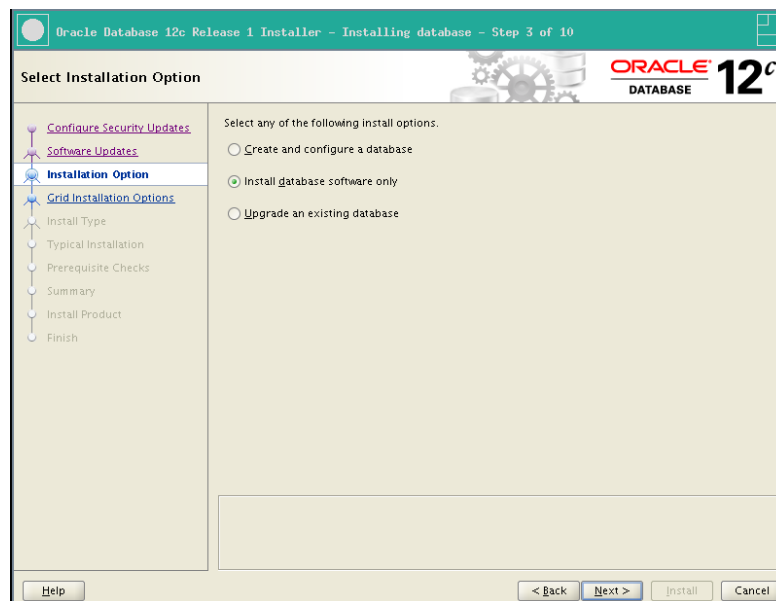
**Figure 120** RA-Oracle\_RAC\_12101-Install-Address not specified

5. Select **Skip software updates** and click **Next**.



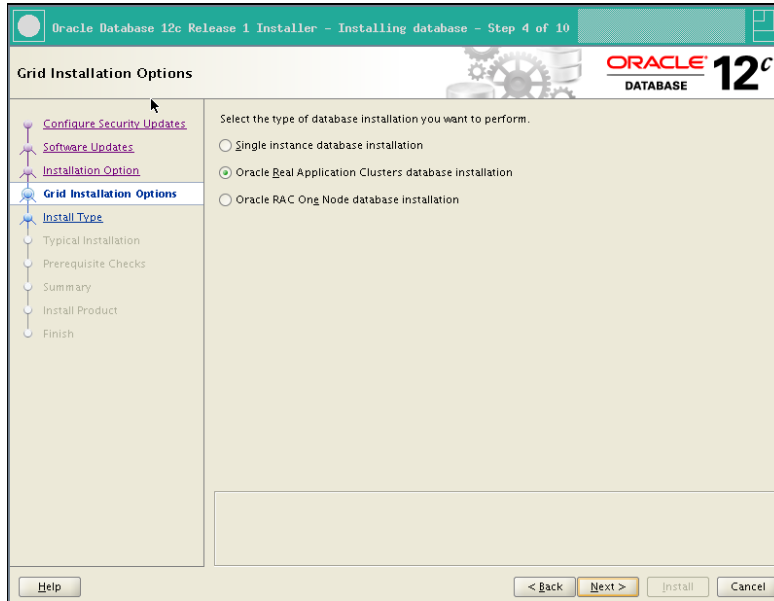
**Figure 121** RA-Oracle\_RAC\_12101-Install-Software\_updates

6. Select **Install database software only** and click **Next**.



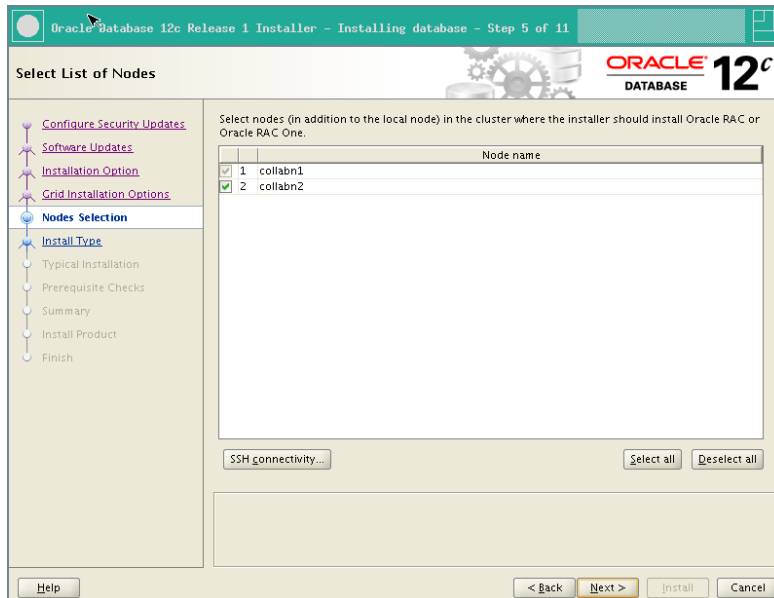
**Figure 122** RA-Oracle\_RAC\_12101-Install-Installation option

7. Select **Oracle Real Application Clusters database installation** and click **Next**.



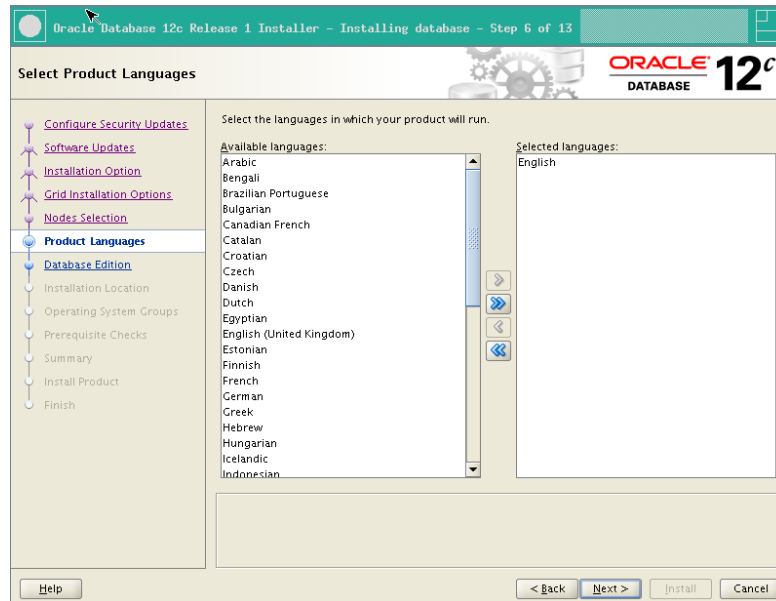
**Figure 123** RA-Oracle\_RAC\_12101-Install-Grid Installation option

8. Verify that all nodes are selected and click **Next**.



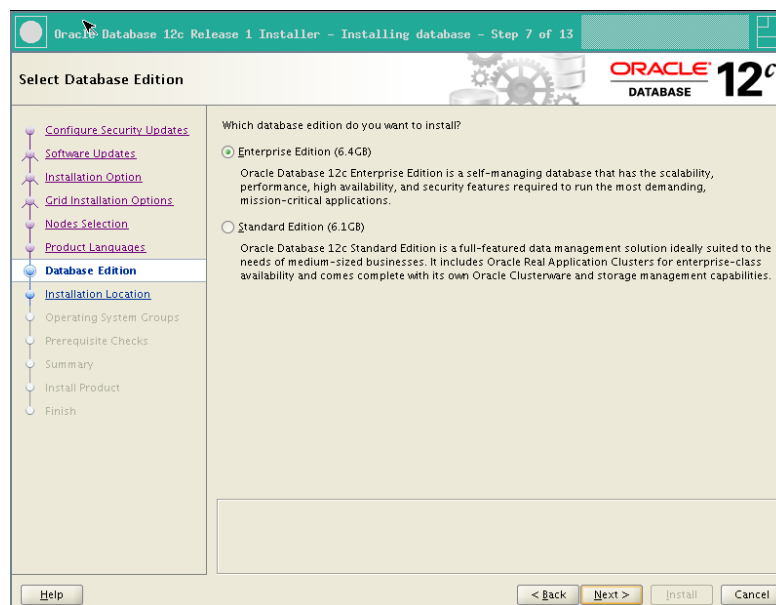
**Figure 124** RA-Oracle\_RAC\_12101-Install-Node selection

9. Click **Next** to accept the default language selection.



**Figure 125** RA-Oracle\_RAC\_12101-Install-Product languages

10. Select **Enterprise Edition** and click **Next**.



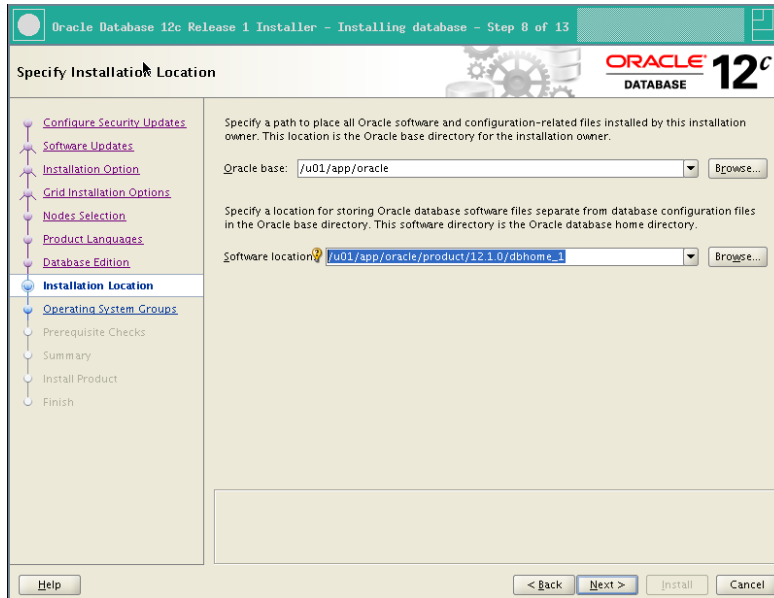
**Figure 126** RA-Oracle\_RAC\_12101-Install-Database edition

11. If you have previously created the ACFS 1Gb filesystem, you'll need to specify another location now.

Oracle Base: /u01/app/oracle

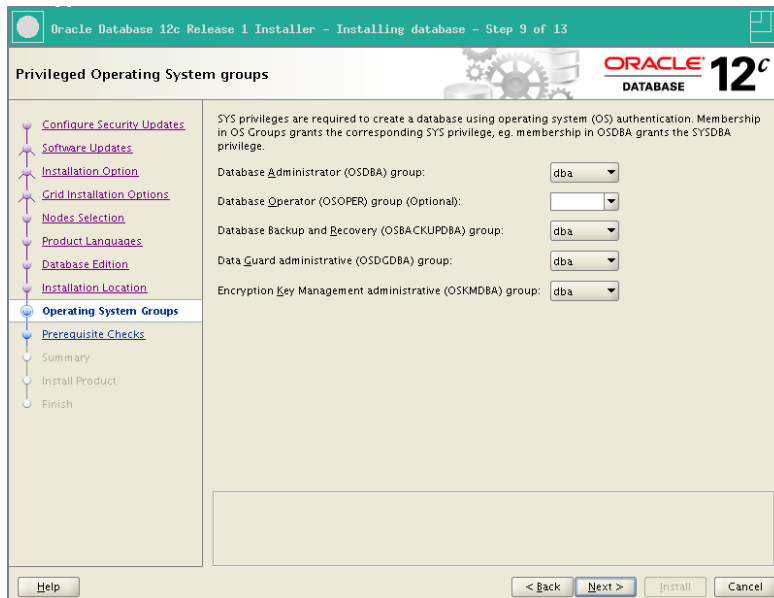
Software location: /u01/app/oracle/product/12.1.0/dbhome\_1

Click **Next**.



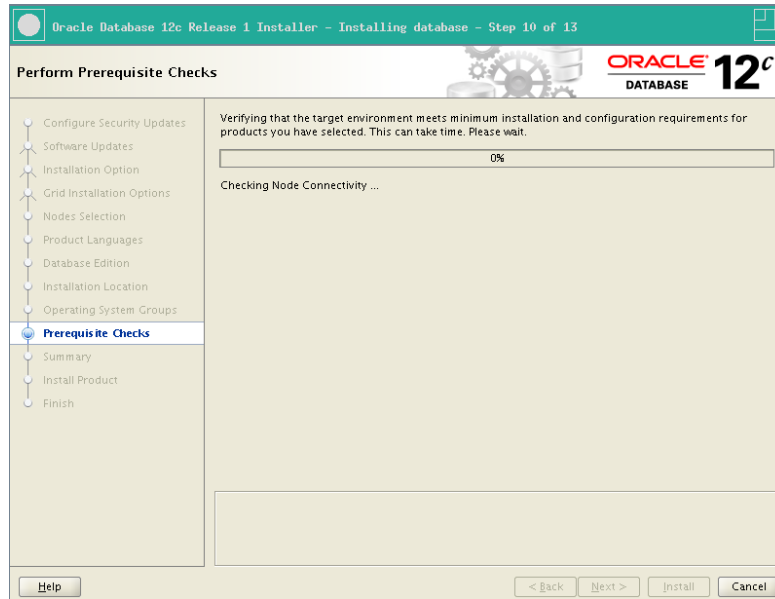
**Figure 127** RA-Oracle\_RAC\_12101-Install-Installation location

12. Leave **dba** for all groups except for the OSOPER group (leave it empty) and click **Next**.



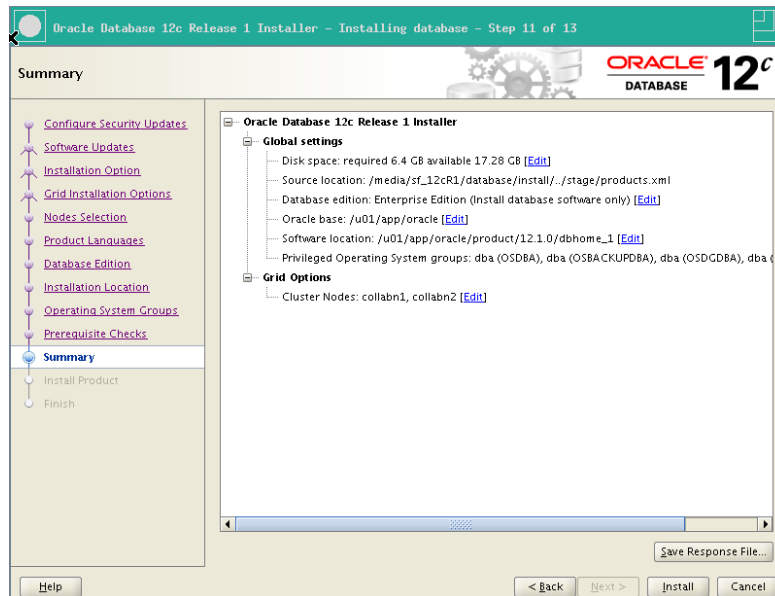
**Figure 128** RA-Oracle\_RAC\_12101-Install-Operating system groups

13. The installer checks all prerequisites.



**Figure 129** RA-Oracle\_RAC\_12101-Install-Prerequisite checks

14. Review the installation summary, optionally save a response file, and click **Install**.



**Figure 130** RA-Oracle\_RAC\_12101-Install-Summary

15. The installation can take half an hour on common laptop configurations.

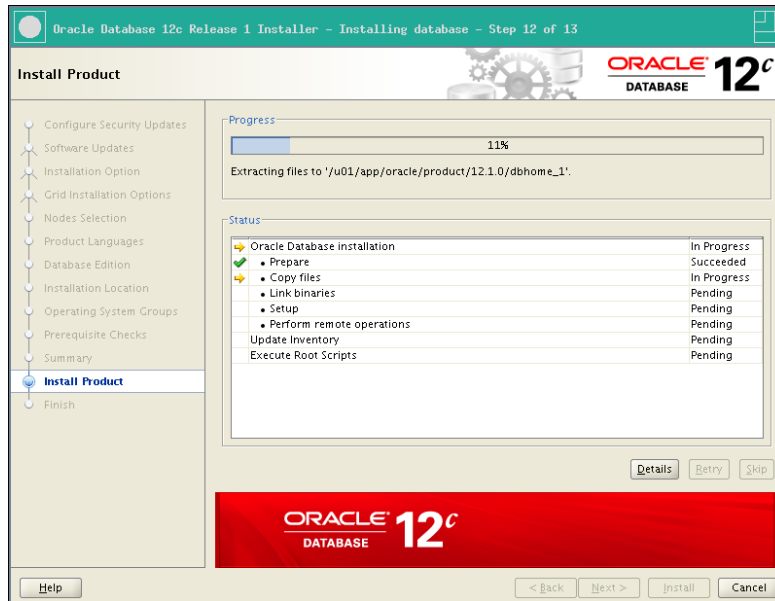


Figure 131 RA-Oracle\_RAC\_12101-Install-Installation progress

16. right before completing, the installer ask to run a script on both nodes as root. **Don't click OK.**

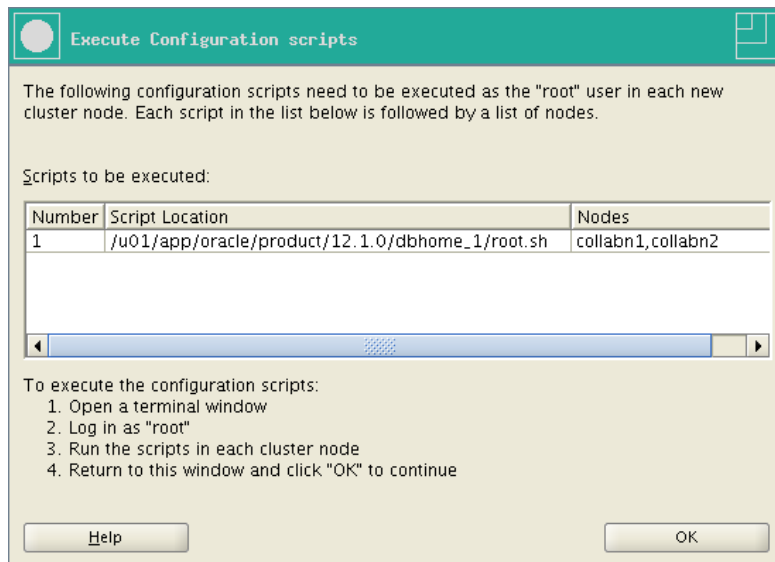


Figure 132 RA-Oracle\_RAC\_12101-Install-Execute root scripts

17. Execute the script on both nodes as root.

```
[root@collabn1 ~]# /u01/app/oracle/product/12.1.0/dbhome_1/root.sh
Performing root user operation for Oracle 12c

The following environment variables are set as:
```



```

ORACLE_OWNER= oracle
ORACLE_HOME= /u01/app/oracle/product/12.1.0/dbhome_1

Enter the full pathname of the local bin directory:
[/usr/local/bin]:
The contents of "dbhome" have not changed. No need to overwrite.
The contents of "oraenv" have not changed. No need to overwrite.
The contents of "coraenv" have not changed. No need to overwrite.

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 script.
Now product-specific root actions will be performed.
[root@collabn1 ~]# ssh collabn2
root@collabn2's password:
Last login: Thu Aug  8 16:54:49 2013 from 192.168.78.1
[root@collabn2 ~]# /u01/app/oracle/product/12.1.0/dbhome_1/root.sh
Performing root user operation for Oracle 12c

The following environment variables are set as:
ORACLE_OWNER= oracle
ORACLE_HOME= /u01/app/oracle/product/12.1.0/dbhome_1

```

```

Enter the full pathname of the local bin directory:
[/usr/local/bin]:
The contents of "dbhome" have not changed. No need to overwrite.
The contents of "oraenv" have not changed. No need to overwrite.
The contents of "coraenv" have not changed. No need to overwrite.

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 script.
Now product-specific root actions will be performed.

```

18. Click **OK** on the previous window, then click **Close** to exit the Installer.

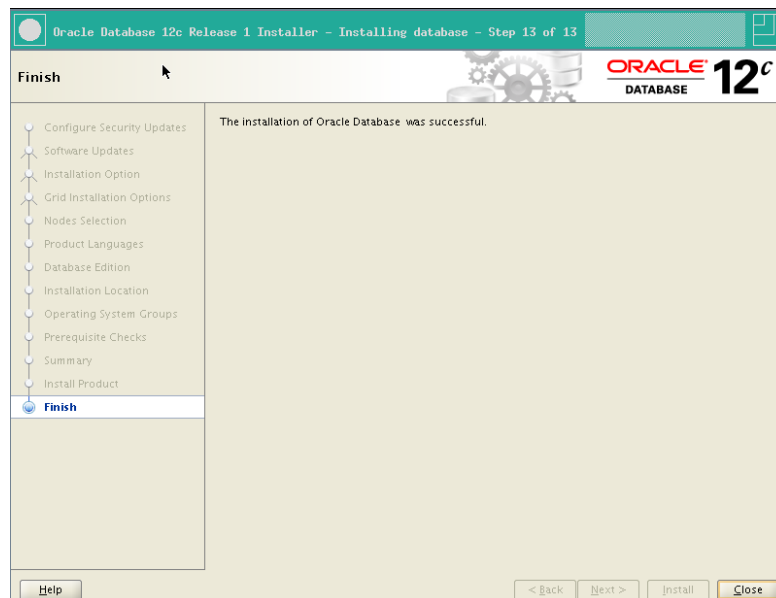


Figure 133 RA-Oracle\_RAC\_12101-Install-Completed

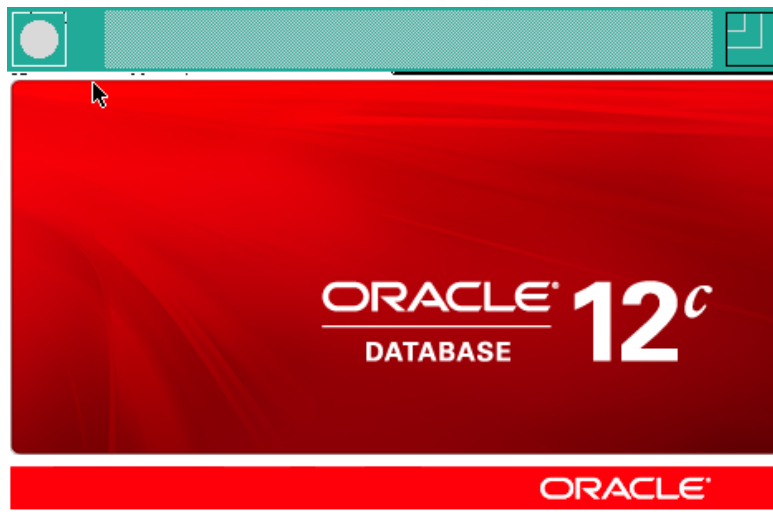


## 10. Create Database

1. Run the **Database Configuration Assistant**:

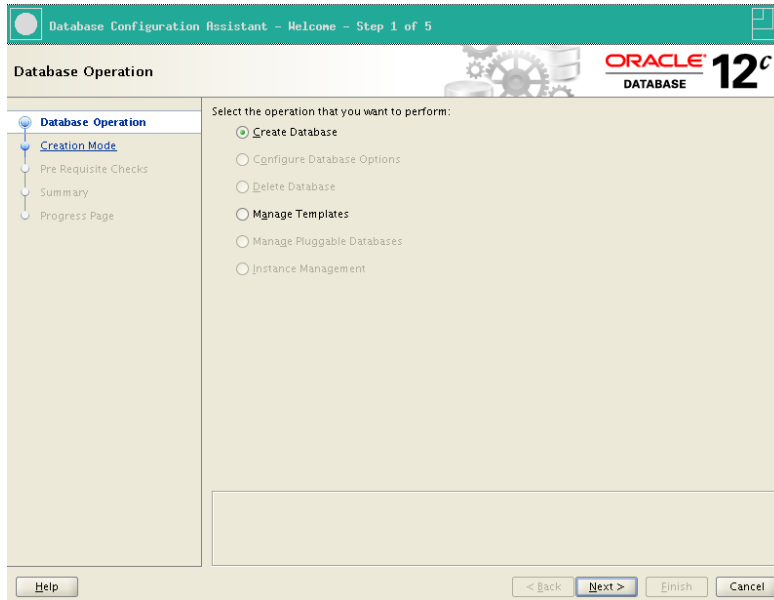
```
[oracle@collabn1 ~]$ /u01/app/oracle/product/12.1.0/dbhome_1/bin/dbca
```

2. The splash screen appears.



**Figure 134** RA-Oracle\_RAC\_12101-DBCA Splash

3. Select **Create Database** and click **Next**.



**Figure 135** RA-Oracle\_RAC\_12101-DBCA Database Operation

4. Select **Create a database with default configuration**.

Global Database Name: **RAC.racattack**

Storage Type: **Automatic Storage Management (ASM)**

Database Files Location: **+DATA**

Fast Recovery Area: **+FRA**

Database Character Set: **AL32UTF8 - Unicode UTF-8 Universal character set**

Administrative password: **racattack**

Check **Create As Container Database**

Pluggable Database Name: **PDB (\*)**

**Warning**

(\*) There are a large number of differences between a Container Database (CDB) and a standard Database (non-CDB). If you are not ready to experiment with too many new technologies together, just leave unchecked **Create As Container Database**.

Click Next.

Figure 136 RA-Oracle\_RAC\_12101-DBCA Creation mode

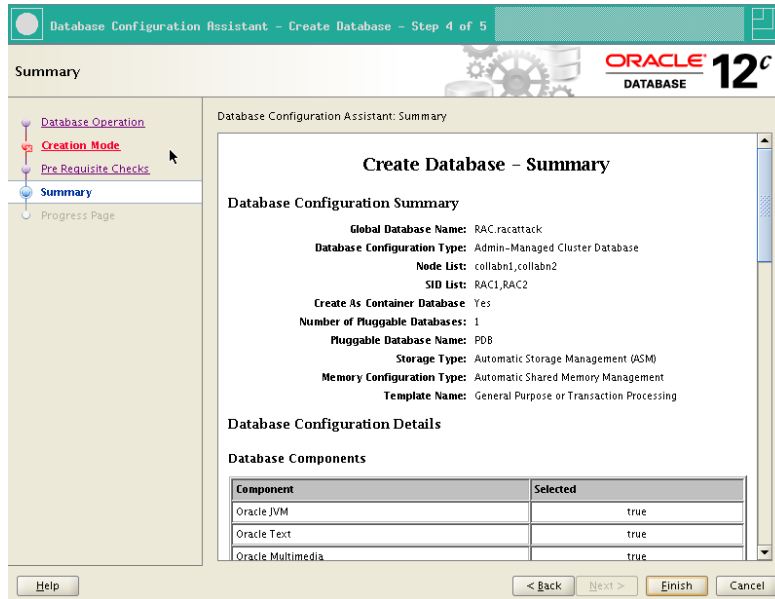
5. A warning is shown because the password is weak. Click **Yes** to continue.
6. The prerequisite checks may fail due to space requirements. It's safe to ignore by checking **Ignore all**.  
Click Next.

Validation	Severity
Database Validation Checks	✓
Cluster Validation Checks	✓
Storage Checks	⚠
Shared storage check	✓
Disk space check	⚠
File validity check	✓

Disk space check  
 +FRA does not have enough space. Required space is 5025 MB, available space is 5018 MB.  
 +DATA has enough space. Required space is 3545 MB, available space is 8902 MB.

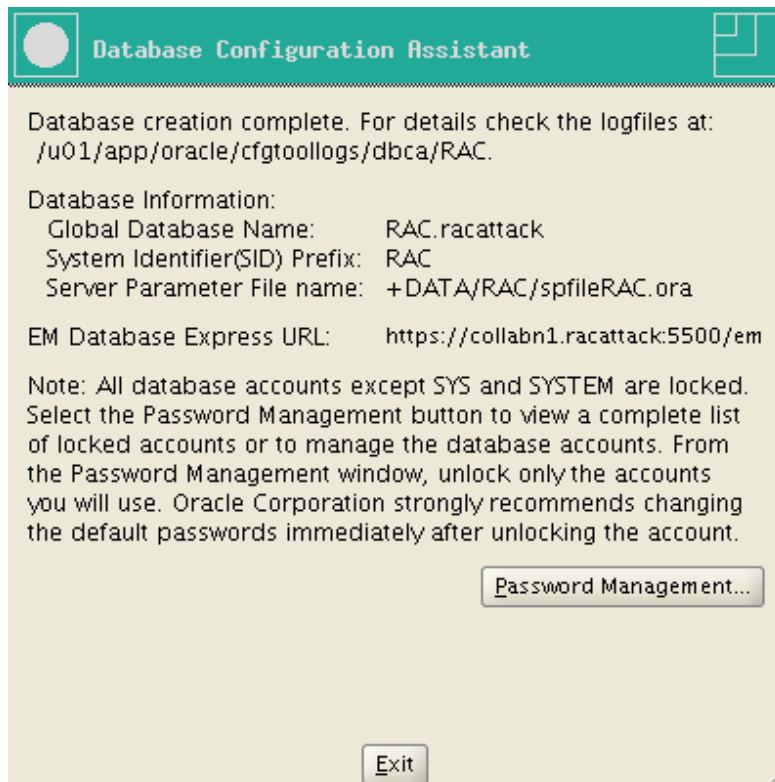
Figure 137 RA-Oracle\_RAC\_12101-DBCA Prerequisite checks

7. Review the summary page and click **Finish**.



**Figure 138** RA-Oracle\_RAC\_12101-DBCA Summary

8. The database creation is finished. Click **Exit**, then **Close**.



**Figure 139** RA-Oracle\_RAC\_12101-DBCA Database Created

**Part II.**

**Exploring RAC**





# 11. Cluster Testing

## 11.1. Node Fencing

## 11.2. Clusterware Callouts

The goal of this lab is to demonstrate Oracle Fast Application Notification (FAN) Callouts. In versions prior to 11g, these were also known as Oracle Clusterware Callouts.

This feature is a relatively little-known capability for Oracle Clusterware to fire a script (or a whole directory full of them) to perform whatever tasks you may want performed when a cluster-wide event happens.

For more information, consult the documentation here: [http://docs.oracle.com/cd/E16655\\_01/rac.121/e17887/hafeats.htm#BABHAJAH](http://docs.oracle.com/cd/E16655_01/rac.121/e17887/hafeats.htm#BABHAJAH)

For this exercise, we'll configure some FAN callout scripts on each node and then trigger various cluster events to see how each one triggers the callout script.

1. Start with a normal, running cluster with both nodes up and running.
2. From a shell prompt (logged in as oracle) on each server, navigate to **/u01/app/12.1.0/grid/racg/usrco**. Create file there called **callout1.sh** using vi (or your favorite editor). The contents of the file should be this:

```
#!/bin/ksh
umask 022
FAN_LOGFILE=/tmp/`hostname`_uptime.log
echo $* "reported=" `date` >> $FAN_LOGFILE &
```

### Warning

Note the use of backticks around the hostname and date commands.

3. Make sure that the permissions on the file are set to 755 using the following command:

```
[oracle@<node_name> ~]$ chmod 755 /u01/app/12.1.0/grid/racg/usrco/callout1.sh
```

4. Monitor the logfiles for clusterware on each node. On each node, start a new window and run the following command:

```
[oracle@<node_name> ~]$ tail -f /u01/app/12.1.0/grid/log/'hostname
-s`/crsd/crsd.log
```

5. Next, we need to trigger an event that will cause the callout to fire. One such event is node shutdown. Shutdown the clusterware on node **collabn2**.

```
[root@collabn2 ~]# crsctl stop crs
CRS-2791: Starting shutdown of Oracle High Availability
Services-managed resources on 'collabn2'
CRS-2673: Attempting to stop 'ora.crsd' on 'collabn2'
CRS-2790: Starting shutdown of Cluster Ready Services-managed
resources on 'collabn2'
CRS-2673: Attempting to stop 'ora.rac.db' on 'collabn2'
CRS-2673: Attempting to stop 'ora.DATA.SHARED.advm' on 'collabn2'
CRS-2673: Attempting to stop 'ora.LISTENER.lsnr' on 'collabn2'
...
CRS-2793: Shutdown of Oracle High Availability Services-managed
resources on 'collabn2' has completed
CRS-4133: Oracle High Availability Services has been stopped.
```

6. Following this command, watch the logfiles you began monitoring in step 2 above. Because we set long timeouts on our test cluster, you might have to wait for a few minutes before you see anything.
- You should eventually observe entries noting that the node has failed and shortly following that, you should observe an entry placed in the /tmp/<hostname>\_uptime.log file indicating that the node is down.
  - Note which members run the clusterware callout script. (A surviving member could run commands to notify clients and/or application servers that one of the cluster nodes has died.)

You should see these messages in the /tmp/\*.log files:

```
NODE VERSION=2.0 host=collabn2 status=nodedown reason=public_nw_down
incarn=0 timestamp=2013-08-13 12:15:51 timezone=-04:00 vip_ips=
reported= Tue Aug 13 12:15:51 EDT 2013
INSTANCE VERSION=1.0 service=rac.racattack database=rac
instance=RAC2 host=collabn2 status=down reason=USER
timestamp=2013-08-13 12:15:51 timezone=-04:00 db_domain=racattack
reported= Tue Aug 13 12:15:51 EDT 2013
```

```
NODE VERSION=2.0 host=collabn2 status=nodedown reason=public_nw_down
incarn=0 timestamp=2013-08-13 12:15:51 timezone=-04:00 vip_ips=
reported= Tue Aug 13 12:15:52 EDT 2013
NODE VERSION=1.0 host=collabn2 status=nodedown reason=member_leave
incarn=271826344 timestamp=2013-08-13 12:17:23 timezone=-04:00
reported= Tue Aug 13 12:17:23 EDT 2013
NODE VERSION=1.0 host=collabn2 incarn=271826344 status=down
reason=member_leave timestamp=13-Aug-2013 12:17:23 reported= Tue Aug
13 12:17:24 EDT 2013
```

7. Restart the clusterware. Is there a node up event?

```
[root@collabn2 bin]# crsctl start crs
```

8. Try powering off one of the virtual machines – is there an difference from the previous test? What if you disable a linux network interface or VMware network card?
9. You may conduct more testing, if you wish. Another interesting event is a database instance going down unexpectedly. Come back to this lab after installing a database to test that situation.

```
[oracle@collabn2 ~]$sqlplus "/ as sysdba"

SQL*Plus: Release 12.1.0.1.0 Production on Tue Aug 13 12:34:52 2013

Copyright (c) 1982, 2013, Oracle. All rights reserved.

Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 - 64bit
Production
With the Partitioning, Real Application Clusters, Automatic Storage
Management, OLAP,
Advanced Analytics and Real Application Testing options

SQL> shutdown abort;
ORACLE instance shut down.
SQL>
```

### Information

One popular use for clusterware callouts is to notify administrators (possibly via email) that a cluster event has occurred. You may use the arguments to the script (you'll see the arguments in the logfile we've created) to conditionally perform notification as well. For example, you may not want to notify anyone unless a node crashes unexpectedly. By testing some of these arguments, you may be able to send notifications only when desired.



## 12. Services, Failover and Load Balancing

### 12.1. Configure Oracle Client

*In order to test failover it would be best to connect from a client outside the cluster, so we'll start by downloading and installing Oracle's Basic Instant Client (English-only) and the Instant Client SQLPlus package. Then we'll configure the DNS resolution and the local TNS naming to use the SCAN addresses.*

#### **Warning**

Some steps in this chapter are specific for Windows Hosts. You should be able to do the same if you have a Linux or Mac laptop.

1. Download Oracle's Basic (English-only) Instant Client and Oracle's Instant Client SQLPlus package from Oracle's website here:

<http://www.oracle.com/technetwork/topics/winx64soft-089540.html>

You can omit the Instant Client installation if you already have an Oracle 12c Client installed on your laptop.

The two files you need are:

- instantclient-basiclite-windows.x64-12.1.0.1.0.zip
  - instantclient-sqlplus-windows.x64-12.1.0.1.0.zip
2. Each archive contains a folder named "instantclient\_12\_1". Extract this folder (from both archives) into C:\. (In Explorer you can drag-and-drop or you can choose "Extract All" from the File menu.)
  3. Open the Windows Network Settings (Control Panel -> Network and Internet -> **Network and Sharing Center**).

Click on **VirtualBox Host-Only Network**

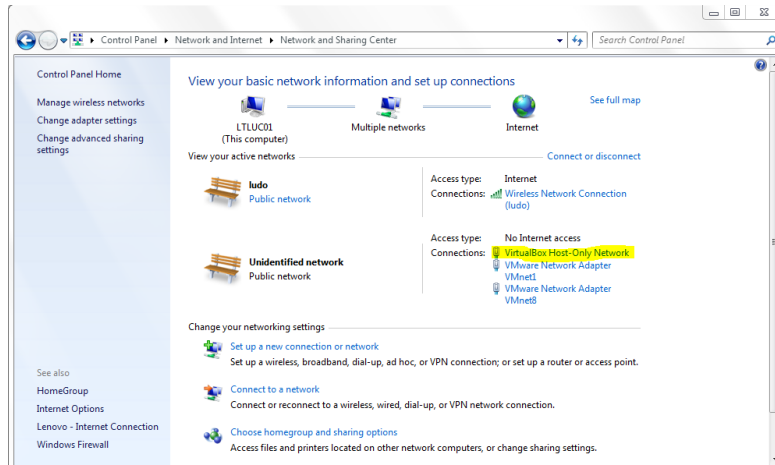


Figure 140 RA-Windows\_7-Network Settings

4. Click on **Properties**

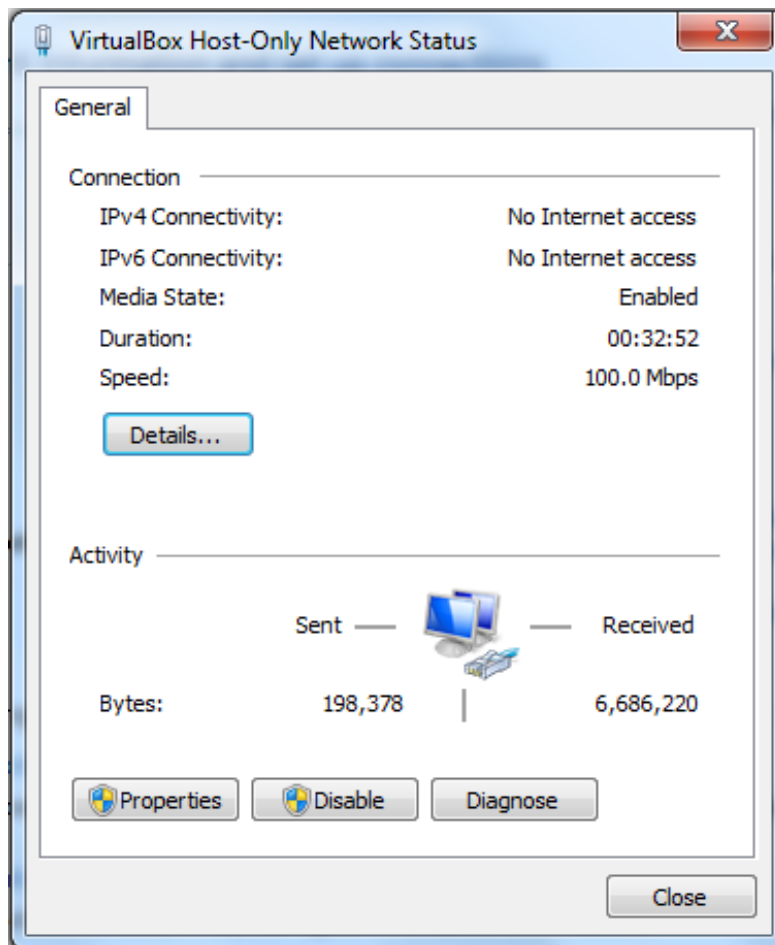
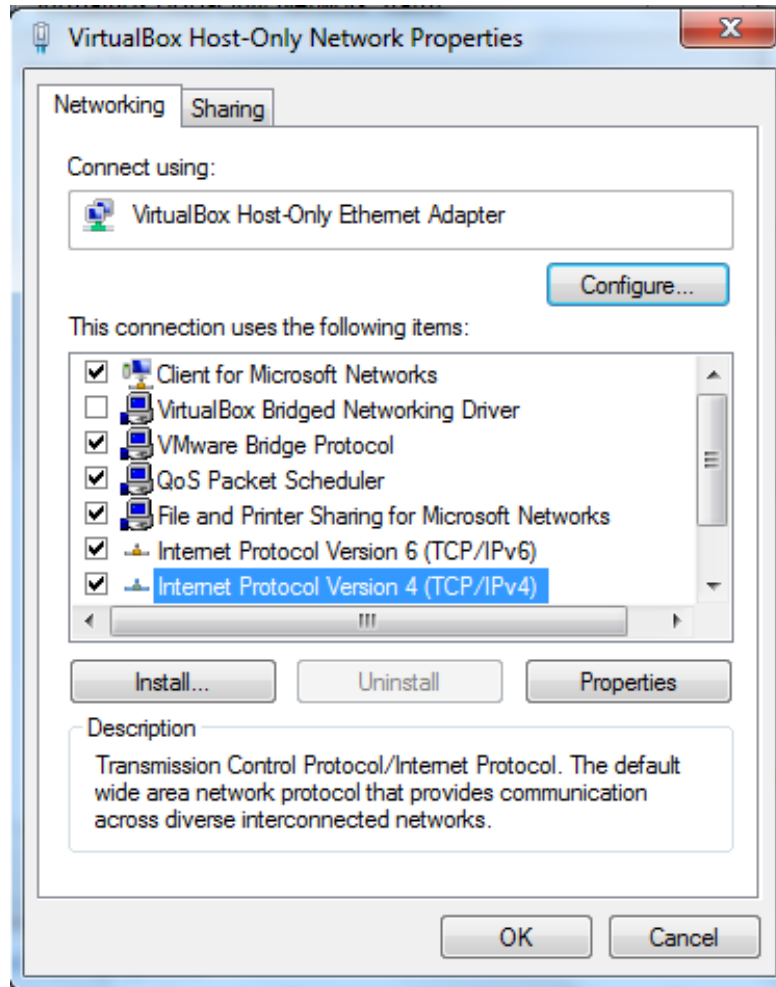


Figure 141 RA-Windows\_7-Network Status

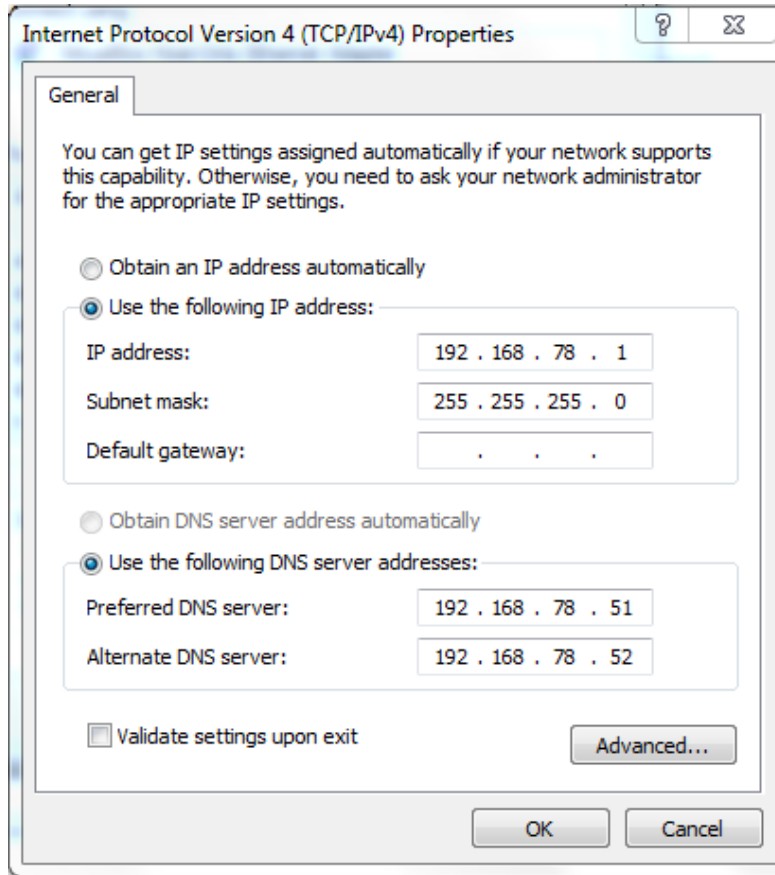
5. Select **Internet Protocol Version 4 (TCP/IPv4)** and click **Properties**.



**Figure 142** RA-Windows\_7-Network Properties

6. Select **Use the following DNS server addresses:** and enter the addresses of the two virtual machines:
  - Preferred DNS server: **192.178.78.51**
  - Alternate DNS server: **192.178.78.52**

Click on **Advanced...**

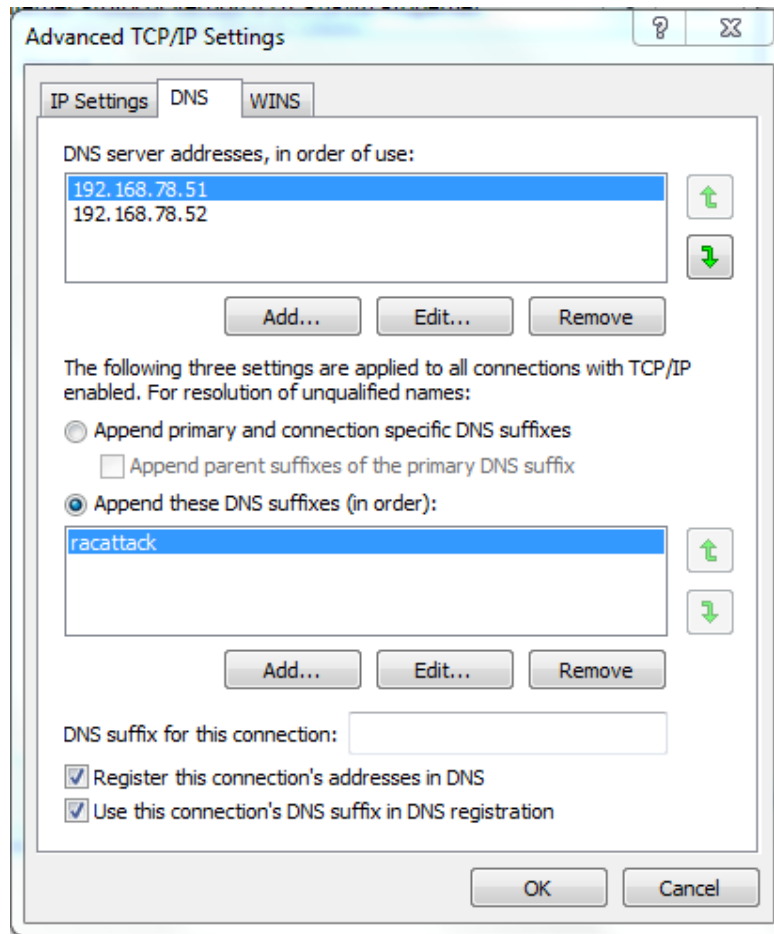


**Figure 143** RA-Windows\_7-Network IPV4 Properties

7. Select the **DNS** tab. Select **Append these DNS suffixes (in order):**, click **Add...** and enter **racattack** in the **Domain suffix** field that appears. Click **Add**. Check both **Register the connection's addresses in DNS** and **Use this connection's DNS suffix in DNS registration**.



Click **OK** and/or **Close** until you exit from the Network configuration.



**Figure 144** RA-Windows\_7-Network IPV4 Advanced Properties

8. Open a **Command prompt** and check that the DNS resolution is working properly on your laptop:

```
C:\Users\luc> nslookup - 192.168.78.51
Default Server: collabn1.racattack
Address: 192.168.78.51

> collabn-cluster-scan
Server: collabn1.racattack
Address: 192.168.78.51

Name: collabn-cluster-scan.racattack
Addresses: 192.168.78.252
           192.168.78.253
           192.168.78.251

> ^C
C:\Users\luc>
```

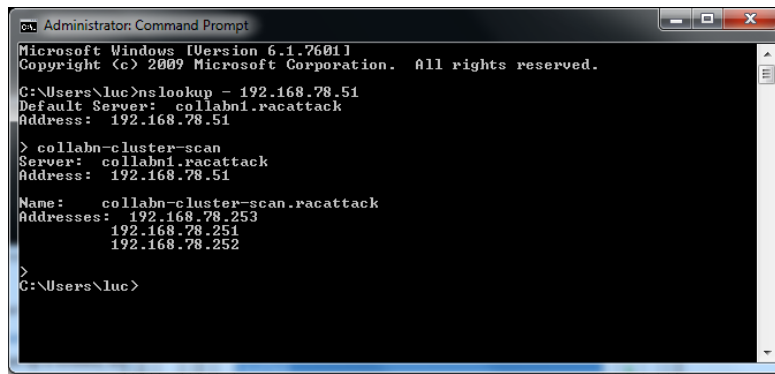


Figure 145 RA-Windows\_7-Nslookup Scan

9. Test your Instant Client installation by connecting to the database.

```

C:\instantclient_12_1> sqlplus system/racattack@//collabn-cluster-scan/RAC.racattack

SQL*Plus: Release 12.1.0.1.0 Production on Wed Aug 14 13:34:24 2013
Copyright (c) 1982, 2013, Oracle. All rights reserved.

Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 - 64bit
Production
With the Partitioning, Real Application Clusters, Automatic Storage
Management, OLAP,
Advanced Analytics and Real Application Testing options

SQL> select instance_name from v$instance;

INSTANCE_NAME
-----
RAC1

SQL>
    
```

10. Let's open and test our Pluggable Database PDB (it isn't opened by default).

```

SQL> connect sys/racattack@//collabn-cluster-scan/RAC.racattack as sysdba
Connected.
SQL> alter pluggable database PDB open;

Pluggable database altered.

SQL> connect system/racattack@//collabn-cluster-scan/PDB.racattack
Connected.
SQL> show con_name

CON_NAME
-----
PDB

SQL>
    
```

11. Create a TNSNAMES files and copy the RAC entry from either cluster database node. Also create a similar entry for the PDB service.

```
C:\instantclient_12_1> notepad C:\instantclient_12_1\tnsnames.ora
```

```
RAC =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP) (HOST =
collabn-cluster-scan.racattack) (PORT = 1521))
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = RAC.racattack)
    )
  )
)
```

```
PDB =
  (DESCRIPTION =
    (ADDRESS = (PROTOCOL = TCP) (HOST =
collabn-cluster-scan.racattack) (PORT = 1521))
    (CONNECT_DATA =
      (SERVER = DEDICATED)
      (SERVICE_NAME = PDB.racattack)
    )
  )
)
```

12. Test your TNSNAMES by setting the TNS\_ADMIN environment variable and running SQLPLUS.

```
C:\instantclient_12_1> set TNS_ADMIN=c:\instantclient_12_1
```

```
C:\instantclient_12_1> sqlplus system/racattack@RAC
```

```
SQL*Plus: Release 12.1.0.1.0 Production on Wed Aug 14 14:21:24 2013
```

```
Copyright (c) 1982, 2013, Oracle. All rights reserved.
```

```
Last Successful login time: Wed Aug 14 2013 14:20:59 +02:00
```

```
Connected to:
```

```
Oracle Database 12c Enterprise Edition Release 12.1.0.1.0 - 64bit
```

```
Production
```

```
With the Partitioning, Real Application Clusters, Automatic Storage
```

```
Management, OLAP,
```

```
Advanced Analytics and Real Application Testing options
```

```
SQL> connect system/racattack@PDB
```

```
Connected.
```

```
SQL>
```

## 12.2. Service Failover

1. Login to **collabn1** as the **oracle** user. Create a new service **svctest** with RAC1 as a preferred instance and RAC2 as an available instance. This means that it will normally run on the RAC1 instance but will failover to the RAC2 instance if RAC1 becomes unavailable.

If you haven't created a container database, omit the `-pdb` parameter.

```
collabn1:/home/oracle[RAC1]$ srvctl add service -d RAC -pdb PDB -s svctest -r RAC1
-a RAC2 -P BASIC
collabn1:/home/oracle[RAC1]$ srvctl start service -d RAC -s svctest
```

2. Examine where the service is running by checking `lsnrctl` on both nodes and looking at the `SERVICE_NAMES` init parameter on both nodes.

```
collabn1:/home/oracle[RAC1]$ srvctl status service -d RAC -s svctest
Service svctest is running on instance(s) RAC1

collabn1:/home/oracle[RAC1]$ lsnrctl services
...
Service "svctest.racattack" has 1 instance(s).
Instance "RAC1", status READY, has 1 handler(s) for this
service...
Handler(s):
"DEDICATED" established:1 refused:0 state:ready
LOCAL SERVER
```

```
collabn2:/home/oracle[RAC2]$ lsnrctl services
```

```
SQL> col value format a60
SQL> SQL> select name, pdb, inst_id from gv$services;

NAME                                PDB
INST_ID
-----
svctest                              PDB
1
pdb.racattack                        PDB
1
pdb.racattack                        PDB
2
```

3. Use `SHUTDOWN ABORT` to kill the instance where service `svctest` is running.

```
SQL> show user
USER is "SYS"
SQL> select instance_name from v$instance;

INSTANCE_NAME
-----
RAC1

SQL> shutdown abort;
ORACLE instance shut down.
SQL>
```

4. Wait a few moments and then repeat step 2. What has happened?

```
collabn1:/home/oracle[RAC1]$ srvctl status service -d RAC -s svctest
```

5. Restart the instance that you killed.

### **i** Information

This does not initiate any instance recovery at all. Do you know why?

```
collabn1:/home/oracle[RAC1]$ srvctl status database -d RAC
Instance RAC1 is not running on node collabn1
Instance RAC2 is running on node collabn2
collabn1:/home/oracle[RAC1]$ srvctl start instance -d RAC -i RAC1
collabn1:/home/oracle[RAC1]$ srvctl status database -d RAC
Instance RAC1 is running on node collabn1
Instance RAC2 is running on node collabn2
collabn1:/home/oracle[RAC1]$
```

6. Repeat step 2. Where is the service running now?

```
collabn1:/home/oracle[RAC1]$ srvctl status service -d RAC -s svctest
```

7. Manually failover the service. Confirm where it is now running. Note that this does not disconnect any current sessions

```
collabn1:/home/oracle[RAC1]$ srvctl relocate service -d RAC -s svctest -i RAC2 -t
RAC1
collabn1:/home/oracle[RAC1]$ srvctl status service -d RAC -s svctest
```



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Version 3, 29 June 2007

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