

RAC Attack - Oracle Cluster Database at Home/RAC Attack 12c/Print Book

RAC Attack - Oracle Cluster Database 12c at Home

Introduction

Overview

RAC Attack is a free curriculum and platform for hands-on learning labs related to Oracle RAC (cluster database), motivated by the belief that the best way to learn RAC is through lots of hands-on experience. The original contributors were Jeremy Schneider, Dan Norris and Parto Jalili. This curriculum has been used since 2008 by organizers of events, by instructors in classes and by individuals at home. Its goal is to help students learn about Oracle RAC cluster databases through guided examples.

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.

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.

12c Overview

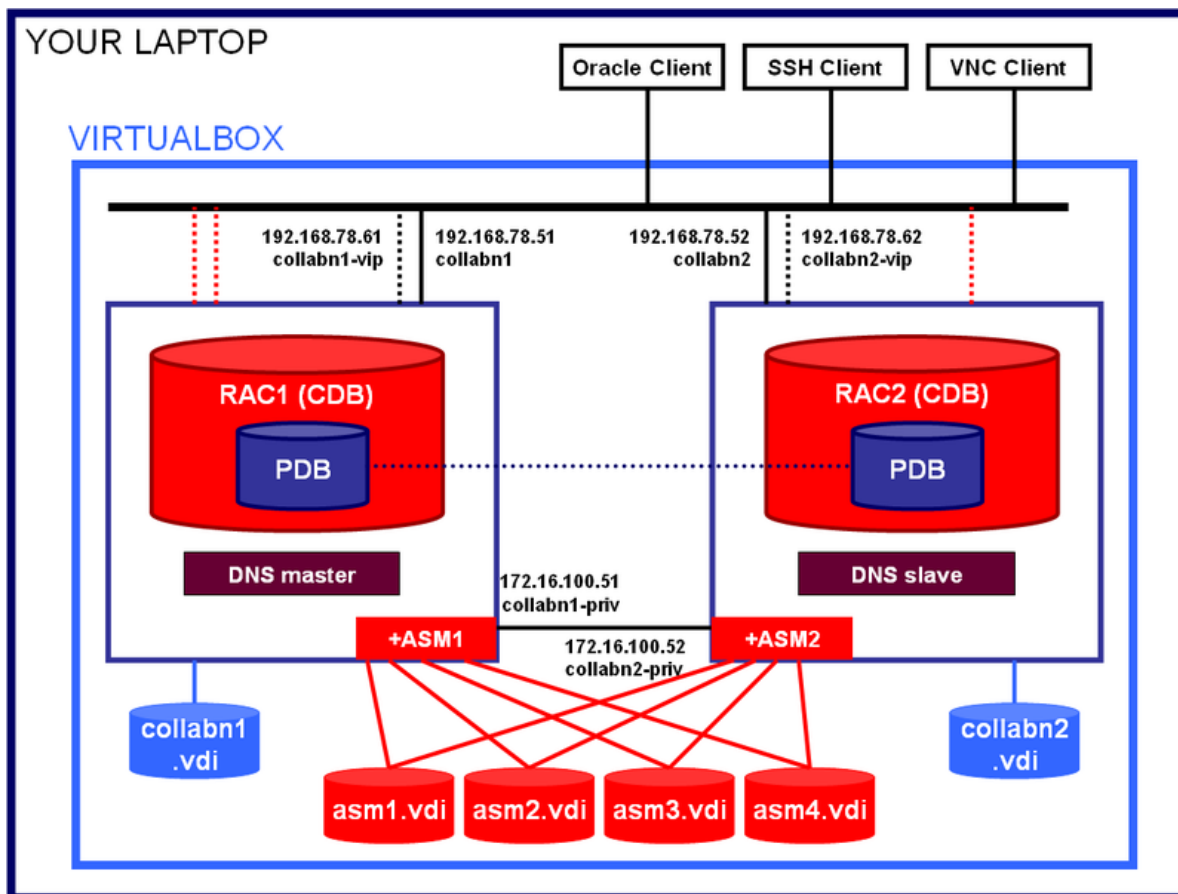
The 12c version of RAC Attack was written collaboratively by many authors all around the world. A full list of contributors is available by clicking the "history" tab on any wiki page or at the end of the print book. Note that Seth Miller's contributions are undercounted; he wrote almost all of the original instructions up to the first node config but many of his initial edits were on a set of draft pages whose content was copied here. Ludovico Caldara and Bjoern Rost also made extraordinary contributions to the book as reflected in the contributor lists.

Additionally, credit goes to the many volunteer testers who reported issues with the first draft of instructions. Many of their names can be seen in the mailing list archives at <http://racattack.org/list> during August and September of 2013.

And most importantly, we can't give enough credit to the entire Oracle Openworld 2013 team. Especially Yury Velikanov who not only led the organization of officers and assignments but kept the energy and excitement level at stratospheric levels! Without the excitement of presenting at OpenWorld, we'd never have maintained such great momentum for finishing the first 12c revision so quickly!

Architecture

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



..... 3 SCAN IP addresses

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**.

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 are not covered here. If you are curious about technical possibilities, just ask a volunteer, he/she will be glad to explain you something more.

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.

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 have been tested aswell and differences to the Windows instructions are included in the book*)

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 is not distributable so the volunteers will not be able to give you all the required software components. But organizers may have set up a proxy server to speed up downloads or provide at least the free software.

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.

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 4.2.18 have been tested successfully with OEL6 and Oracle 12c.

Putty

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

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

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/
```

Oracle Software

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 *** | | | | | |

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"/> | Oracle Linux Release 6 Update 4 Media Pack for x86_64 (64 bit) | 6.4.0.0.0 | B72264-01 | MAY-23-2013 | 5 / 8.9G |

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

Oracle Linux Release 6 Update 4 Media Pack v1 for x86_64 (64 bit)

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

Total: 5

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.

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

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

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

| Select | Name | Part Number | Size (Bytes) |
|---|---|--------------------------|--------------|
| <input type="button" value="Download"/> | 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 |
| <input type="button" value="Download"/> | 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 |
| <input type="button" value="Download"/> | 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 |
| <input type="button" value="Download"/> | 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 |

5. The following files are downloaded:

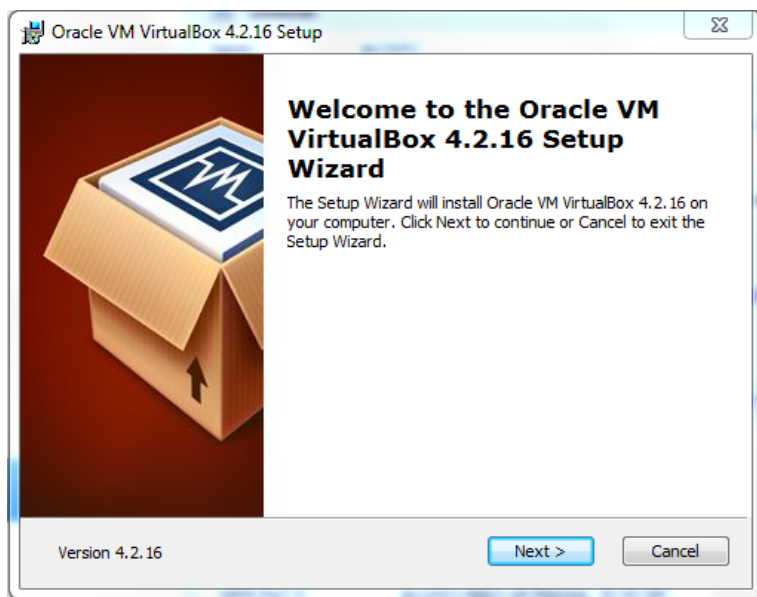
- V38501-01_1of2.zip
- V38501-01_2of2.zip
- V38500-01_1of2.zip
- V38500-01_2of2.zip

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

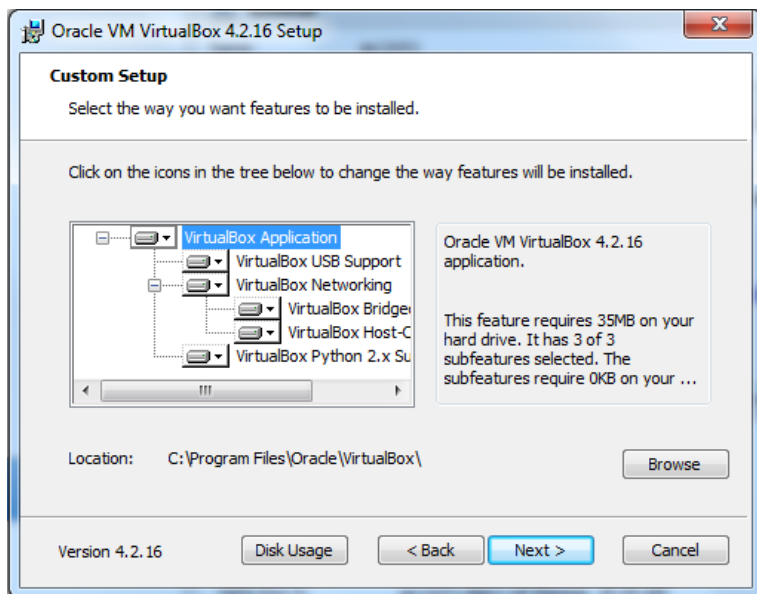
Prepare Host

VirtualBox Setup

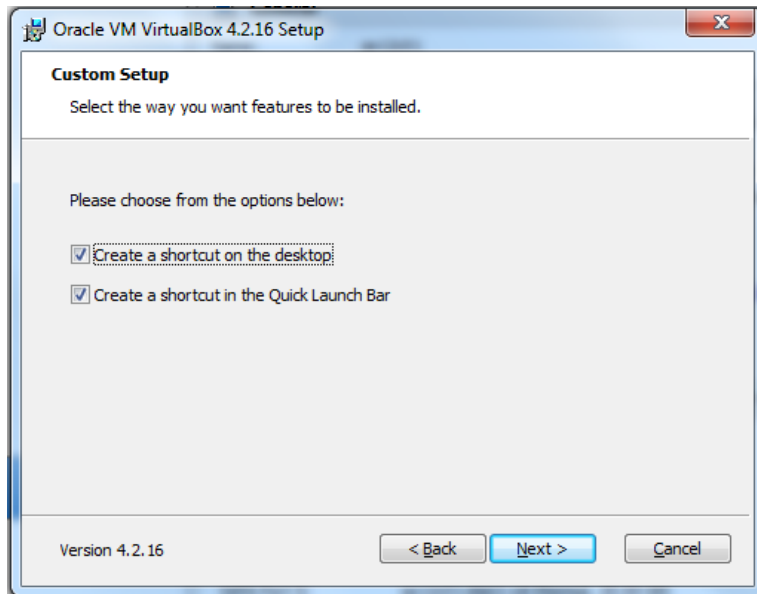
1. Run Oracle VM VirtualBox 4.2.16 Setup.
2. On the welcome page, click **Next**:



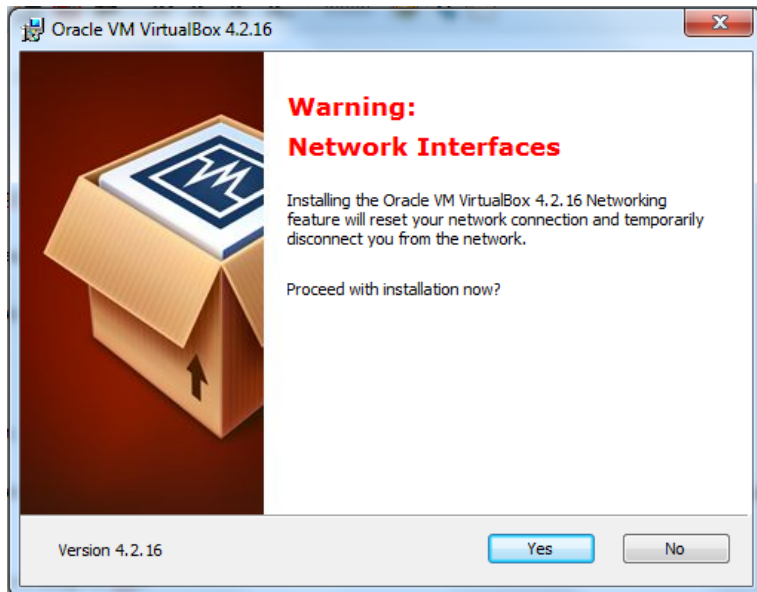
3. Leave the default component selection, click **Next**:



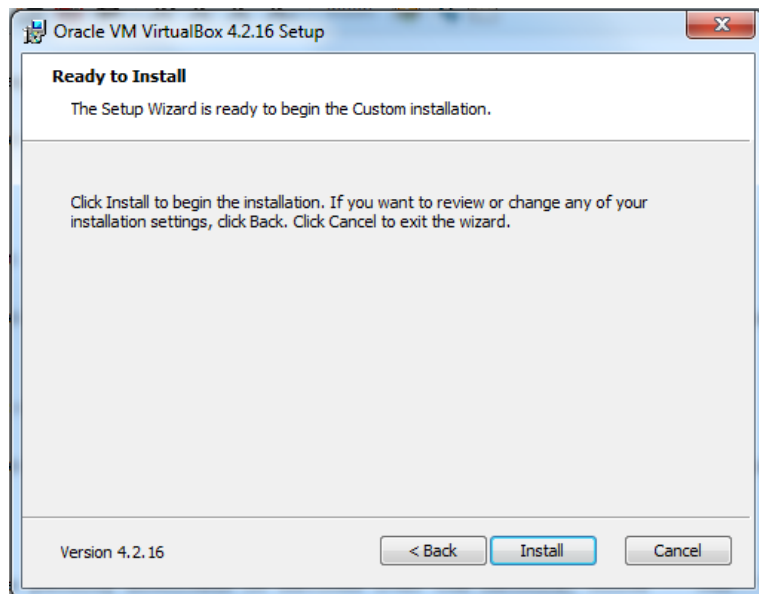
4. Click **Next**:



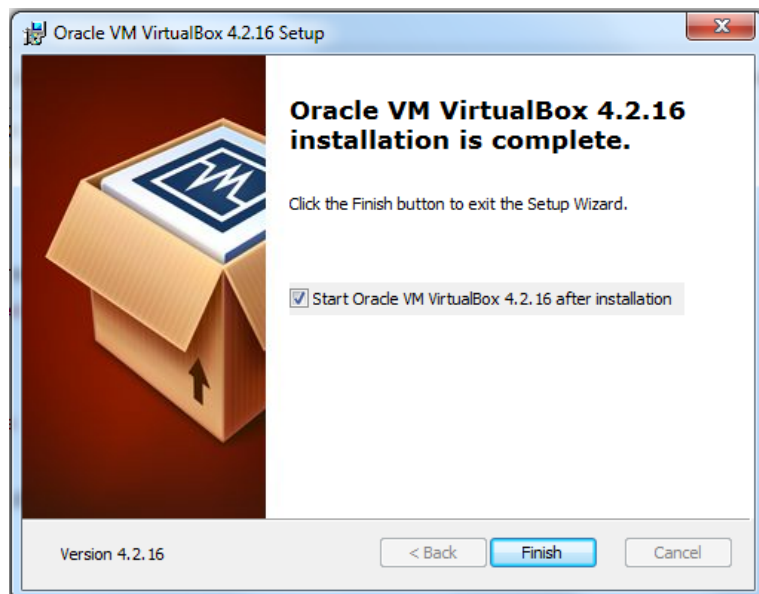
5. Unless you have pending downloads or batches over the network, click **Yes**:



6. Click **Install**:

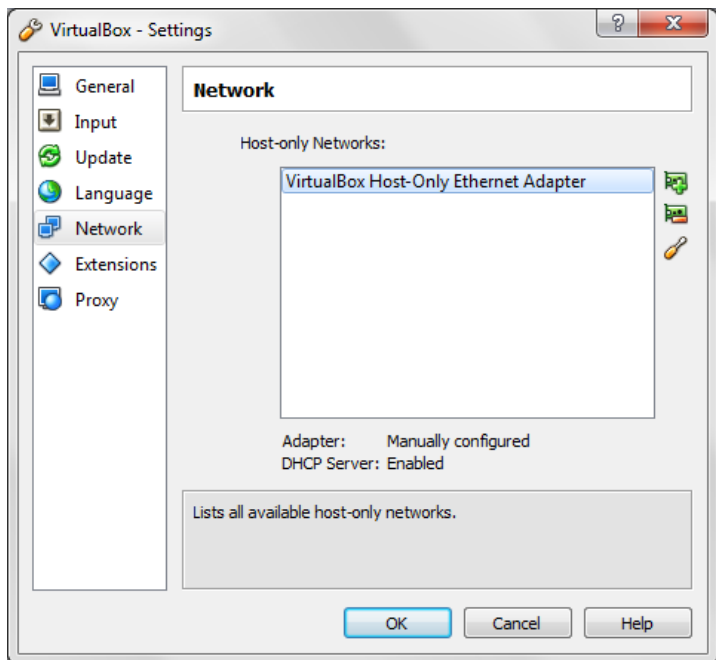


7. The installation is completed. Click **Finish** to open VirtualBox:



VirtualBox Network Configuration

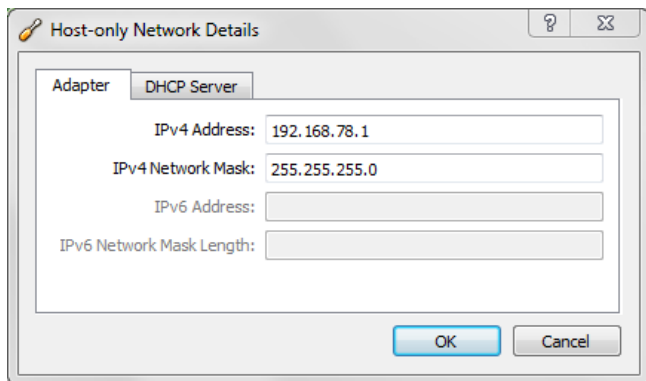
1. Run VirtualBox Manager.
2. From the main screen, choose **File > Preferences > Network**.



3. 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

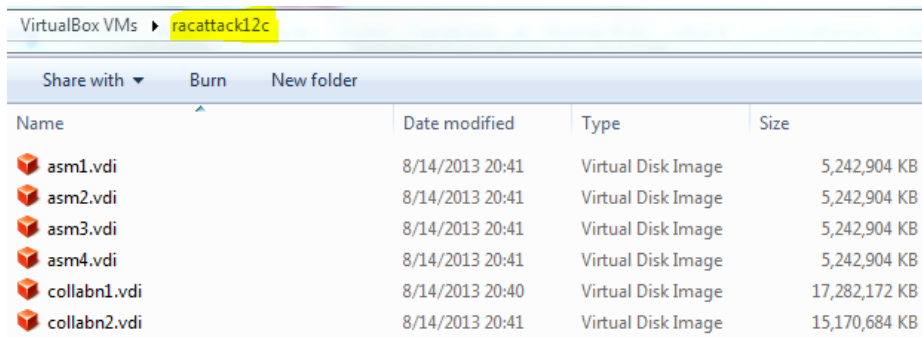


Install Linux

Create VirtualBox VM

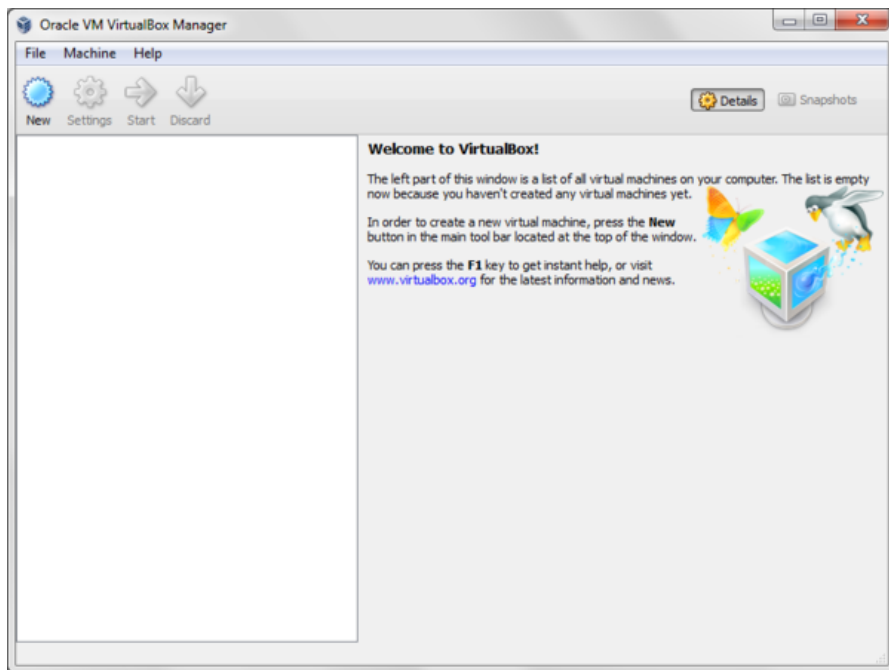
1. On your computer, create a new folder **racattack12c** on a location of your choice that will contain all the virtual disks.

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

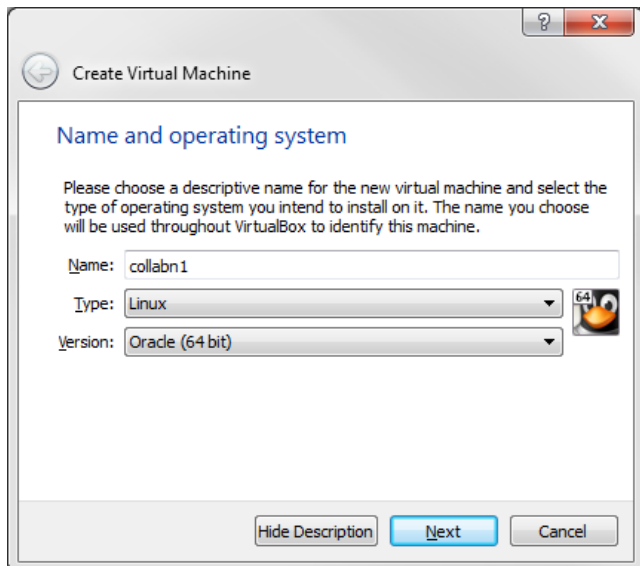


| Name | Date modified | Type | Size |
|--------------|-----------------|--------------------|---------------|
| asm1.vdi | 8/14/2013 20:41 | Virtual Disk Image | 5,242,904 KB |
| asm2.vdi | 8/14/2013 20:41 | Virtual Disk Image | 5,242,904 KB |
| asm3.vdi | 8/14/2013 20:41 | Virtual Disk Image | 5,242,904 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 |

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



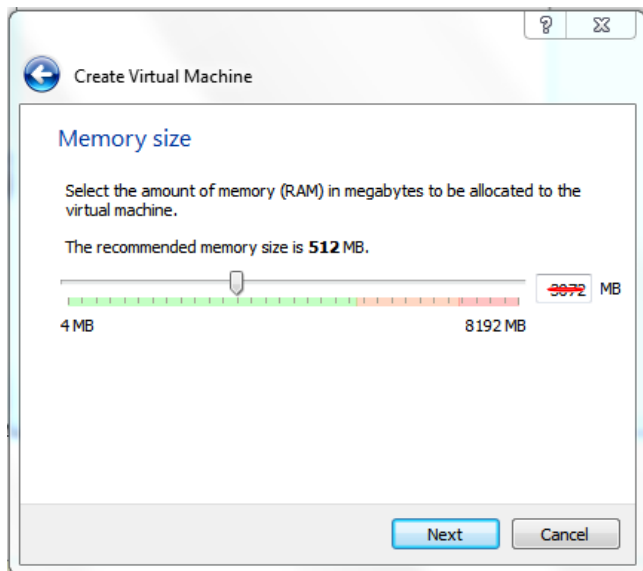
3. Type in **collabn1** for the **Name** of the VM. Choose **Linux** for the **Type** and **Oracle (64 bit)** for the **Version** and click **Next**.



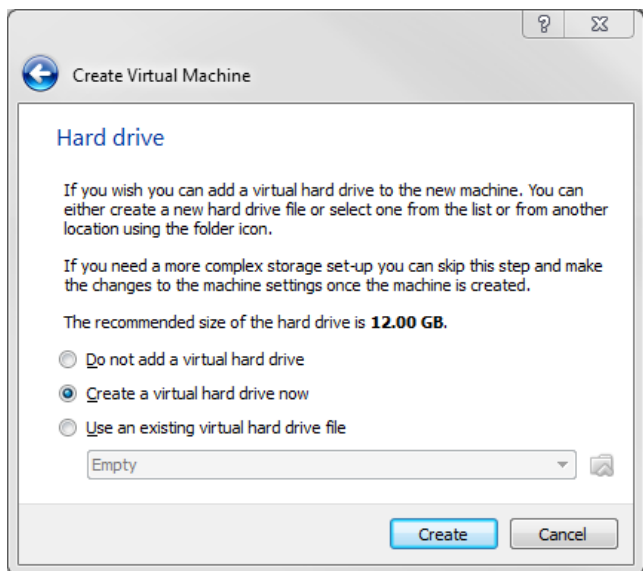
If your laptop only has 8G of RAM allocate 1536MB of RAM to each VM (not 3072MB).

1536 MB

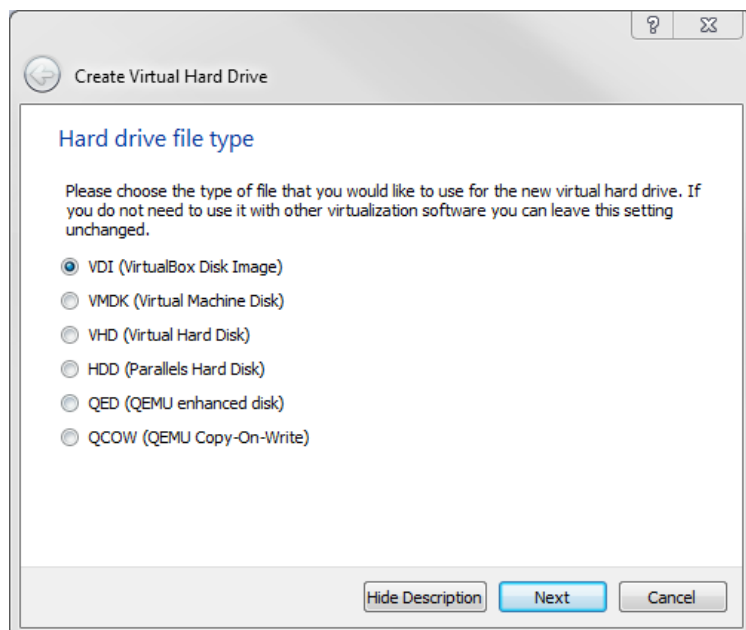
4. Type 1536 in the Size field and click Next.



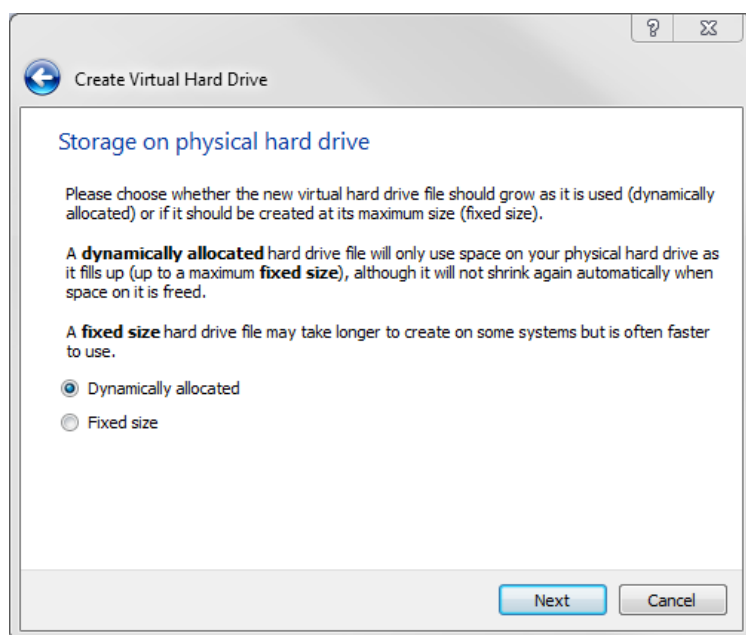
5. Leave **Create a virtual hard drive now** selected and click **Create**.



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



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

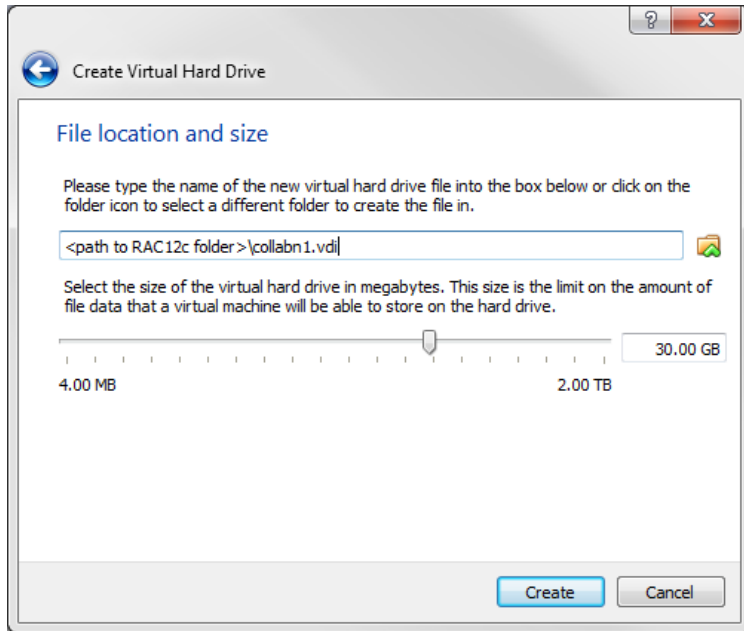


8. Type in the full path or choose through the browse icon the **Location** for the disk file to be created.

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

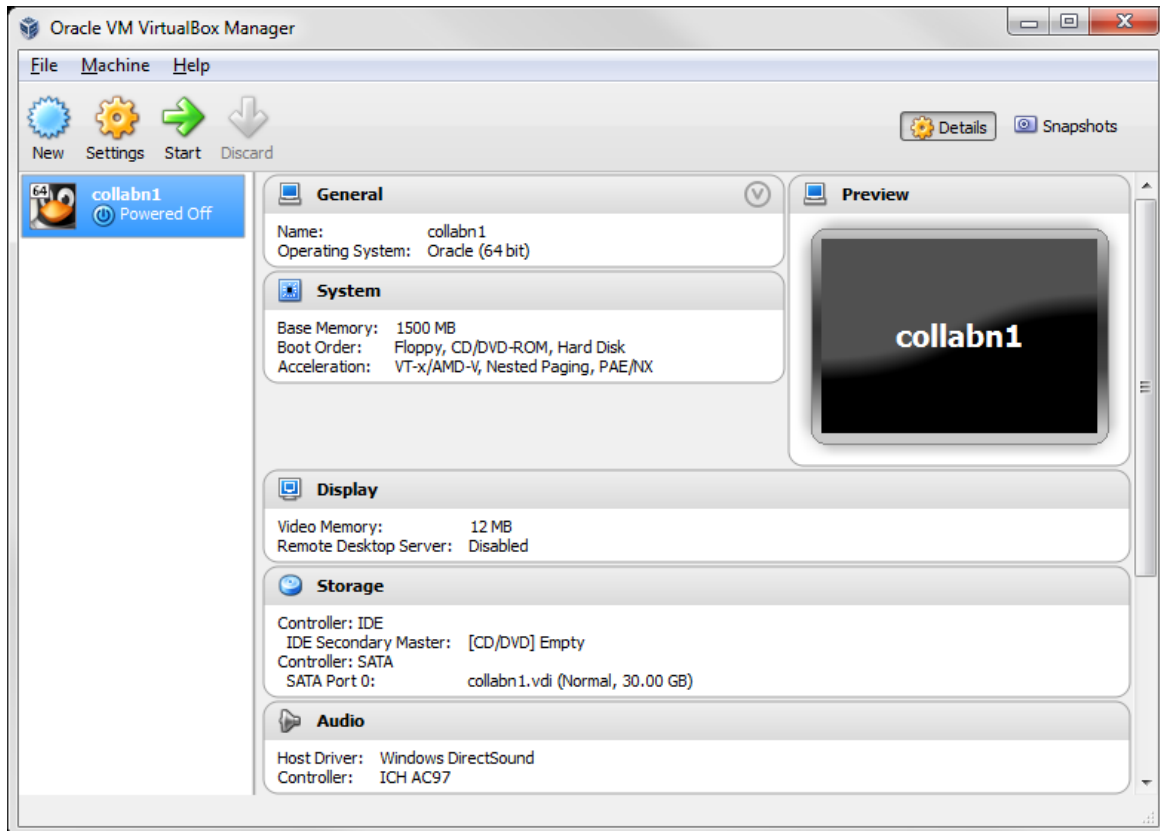
The file should be named **collabn1.vdi**.

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

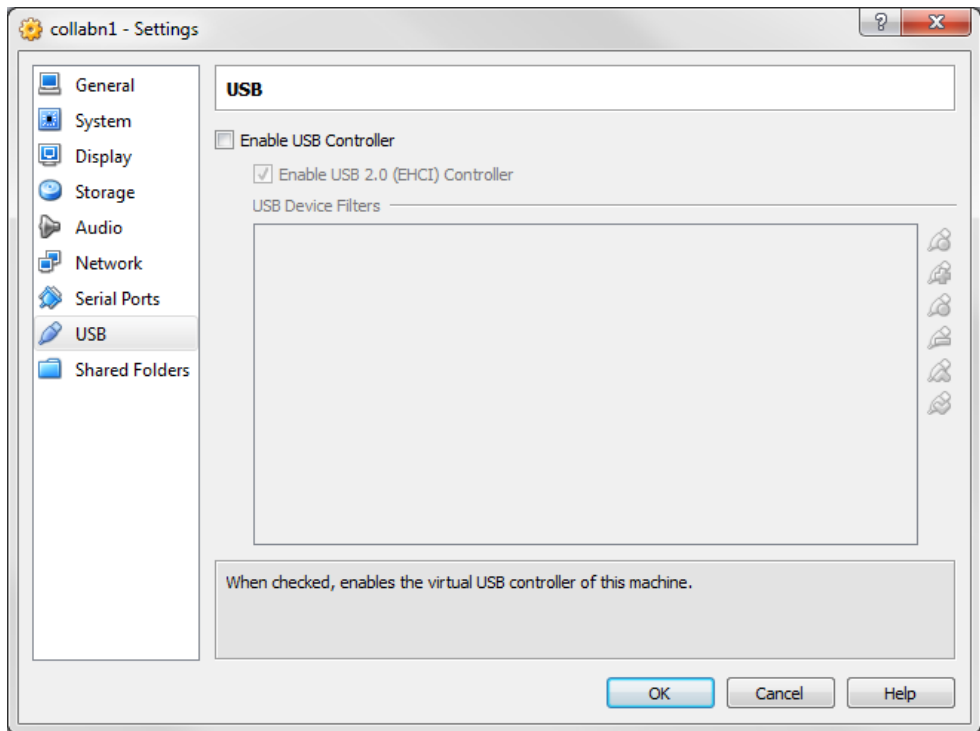


VirtualBox VM Settings

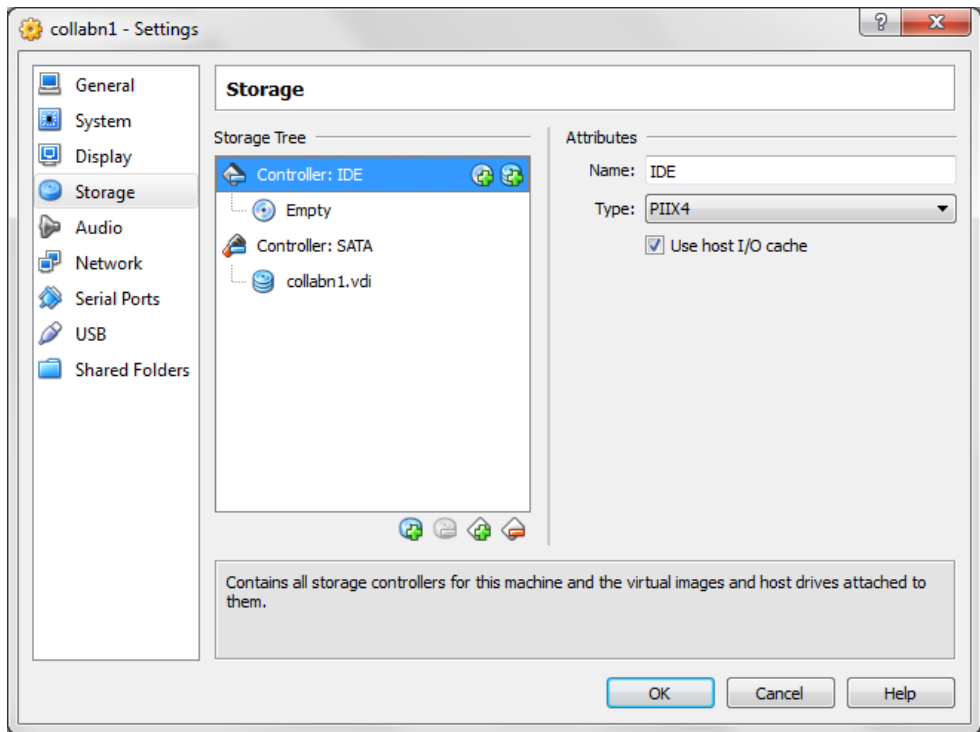
1. From the main screen, select the virtual machine **collabn1** and click the **Settings** icon in the upper left hand corner.



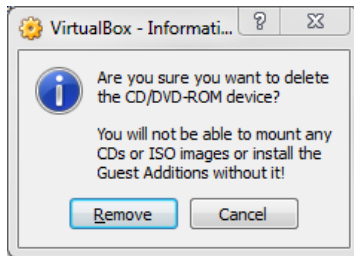
2. Open the **USB** sub-menu. Uncheck the **Enable USB Controller** check box.



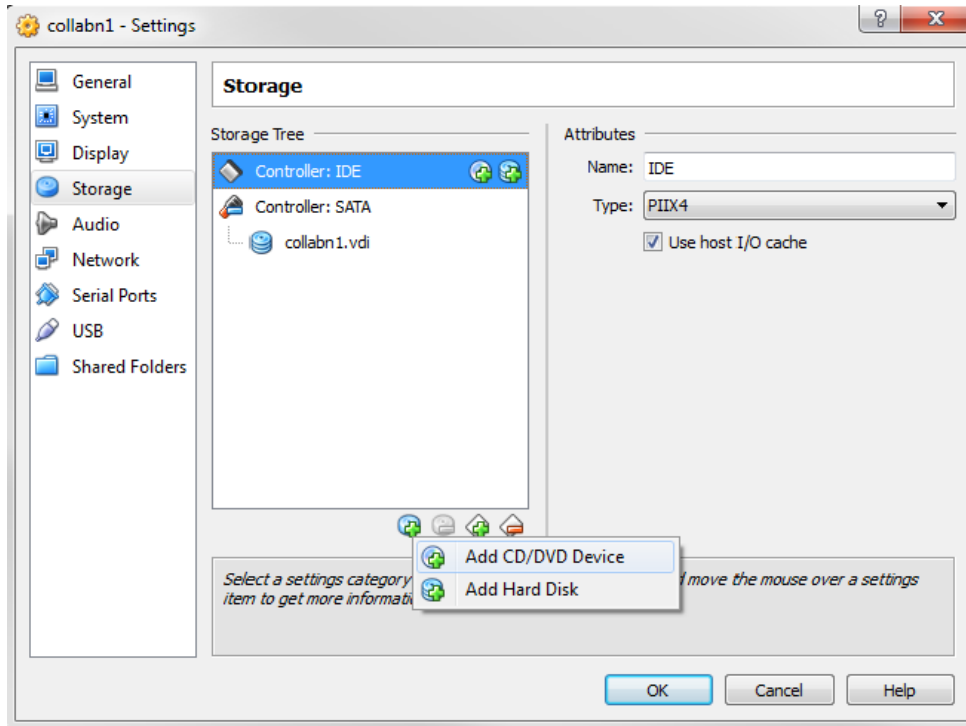
3. Open the **Storage** sub-menu. Delete the **Empty** disk under the **IDE Controller**.



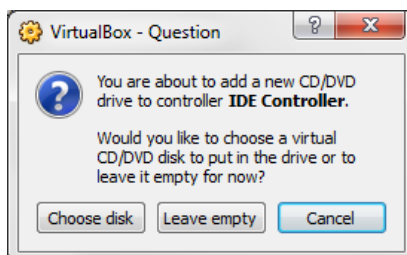
4. Click on **Remove** to confirm.



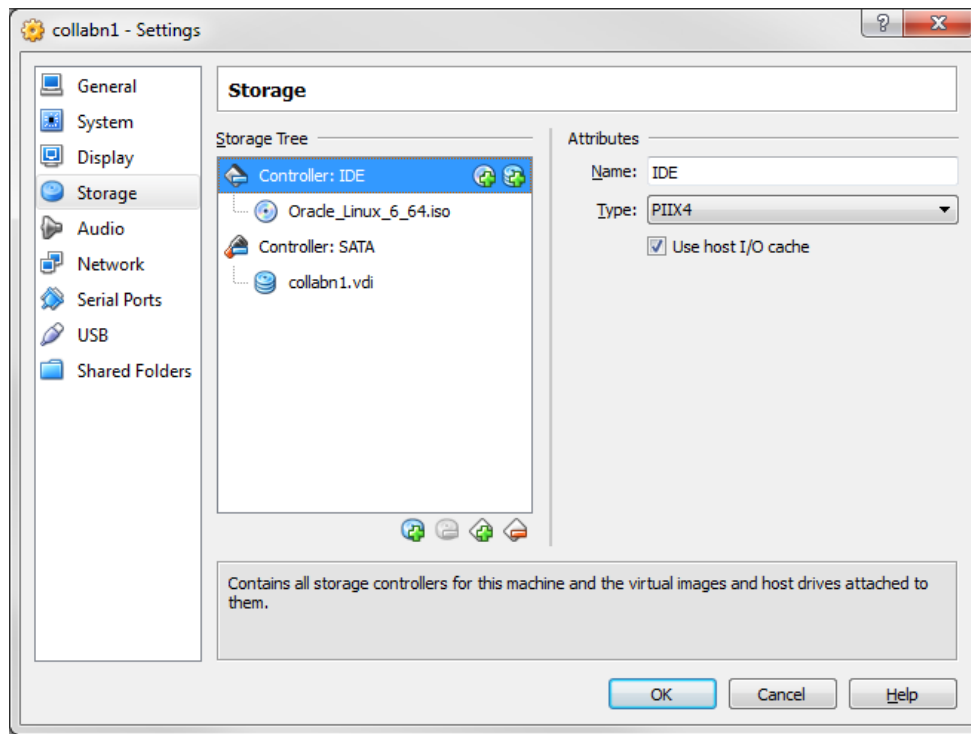
5. Click on the **Add CD/DVD Device**.



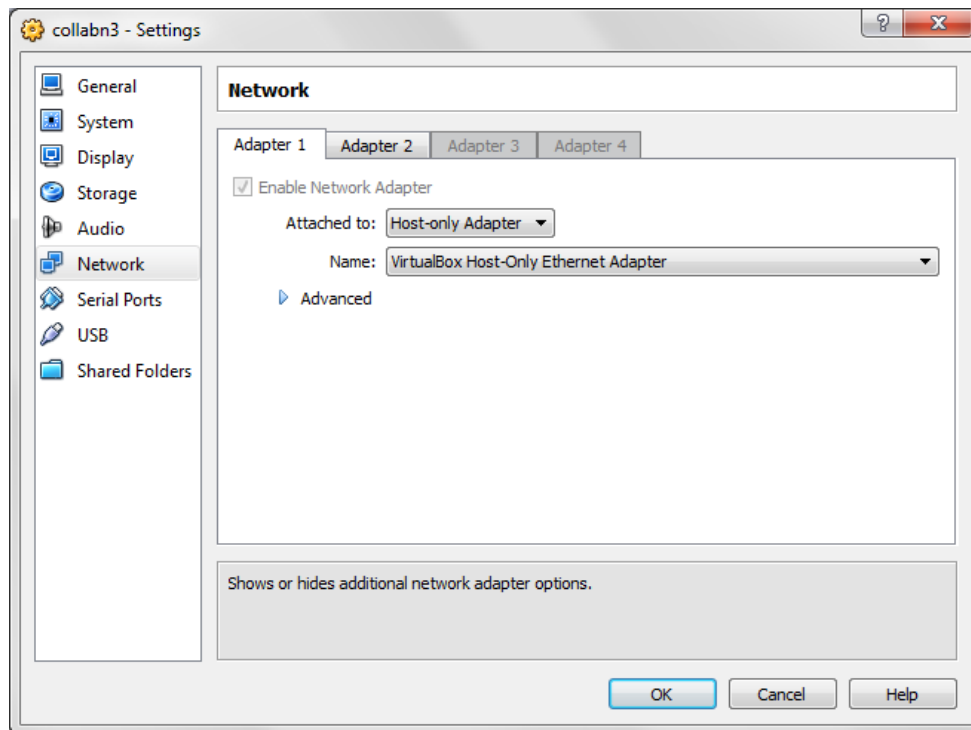
6. Click on the **Choose disk**.



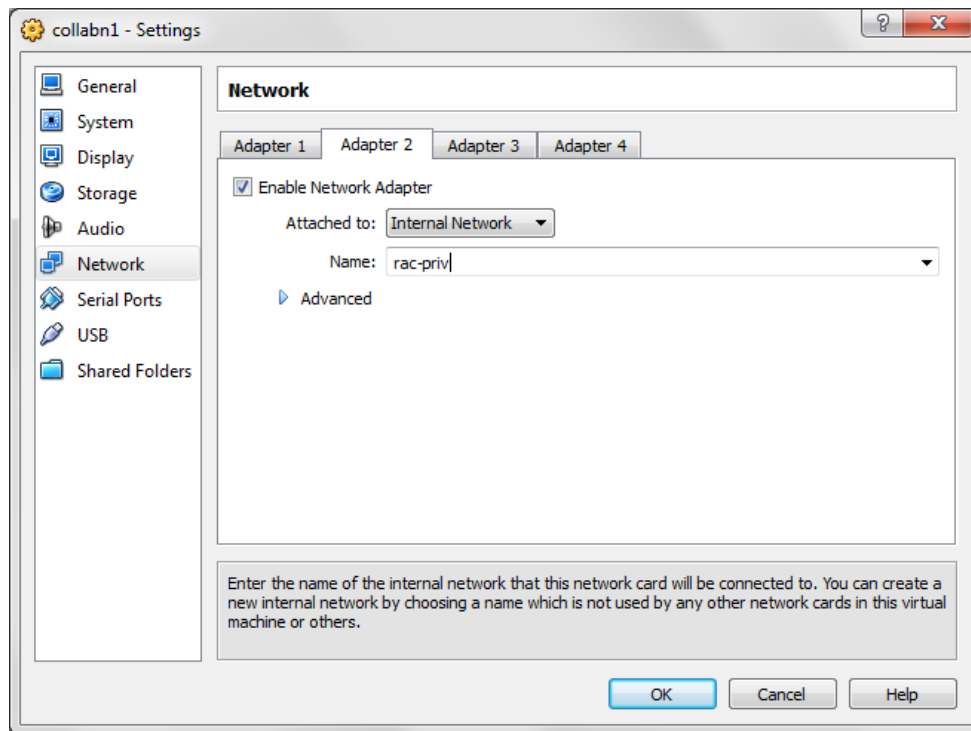
7. Locate and open the **Oracle_Linux_6_64.iso** file.



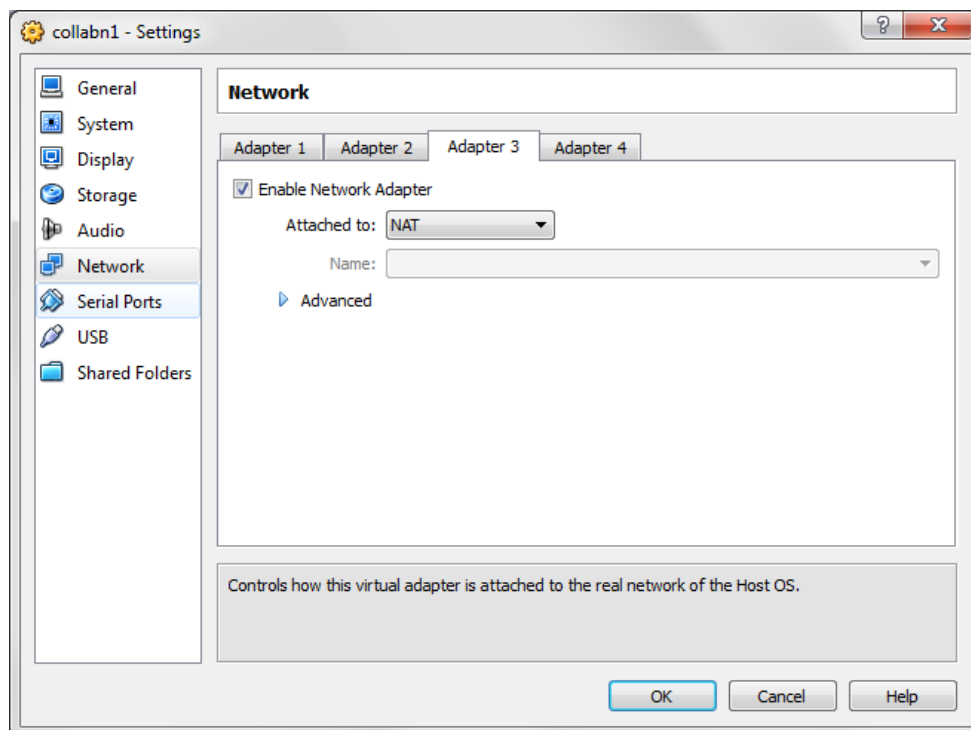
8. Open the **Network** sub-menu. Under the **Adapter 1** tab, change the **Attached to:** dropdown to **Host-only Adapter**.



9. 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.



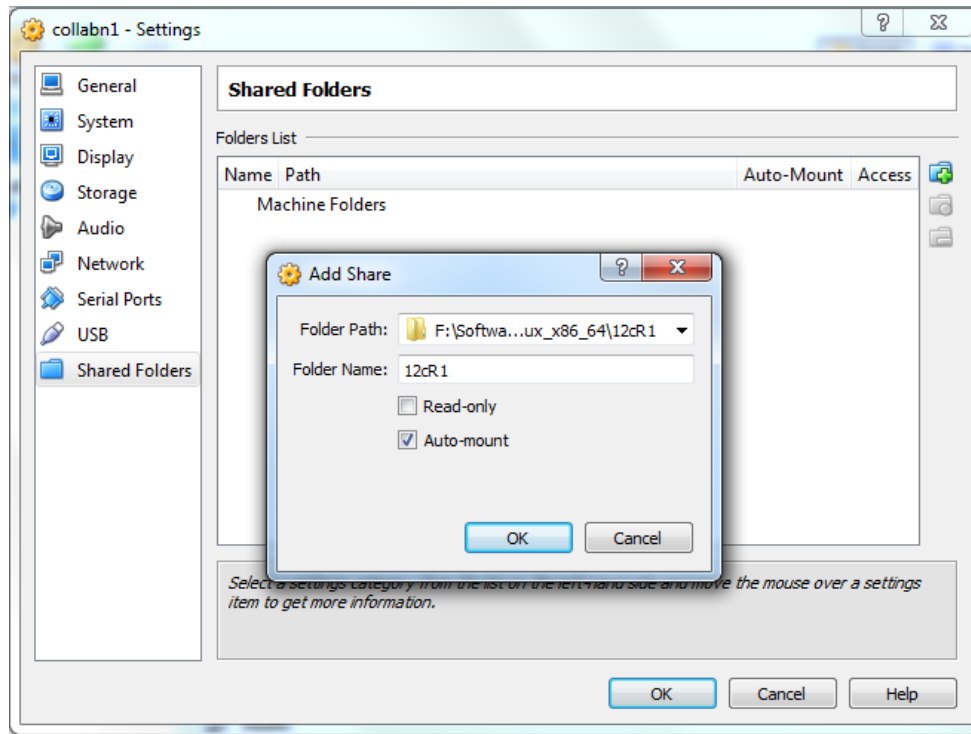
10. Choose the **Adapter 3** tab. Check the box for **Enable Network Adapter**. Change the **Attached to:** dropdown to **NAT**.



11. Select the **Shared Folders** tab. Click **Add Shared Folder**.

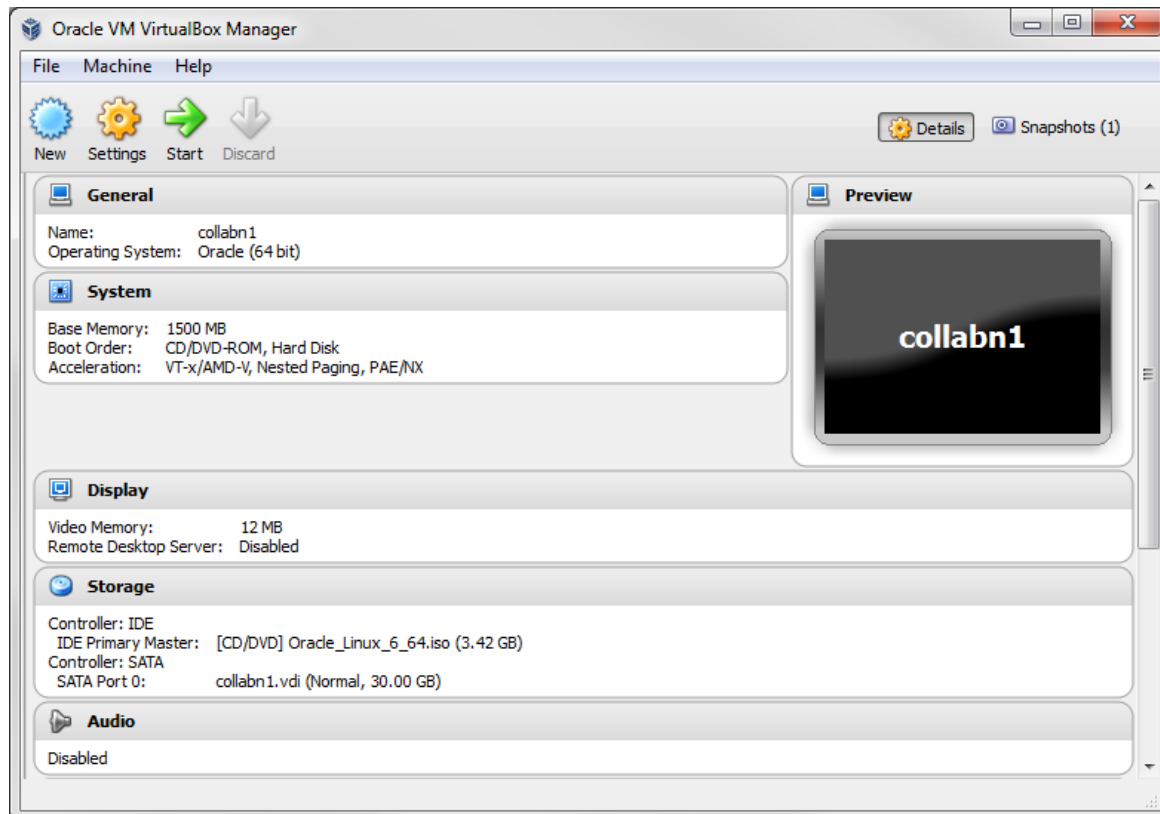
Enter the path where you have downloaded the Oracle installation media and enter a name for your folder.

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



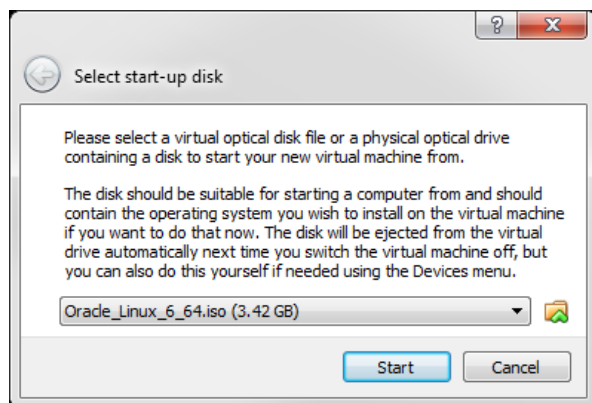
12. Click on **Ok** to save the modifications.

13. Review the summary of the new virtual machine.

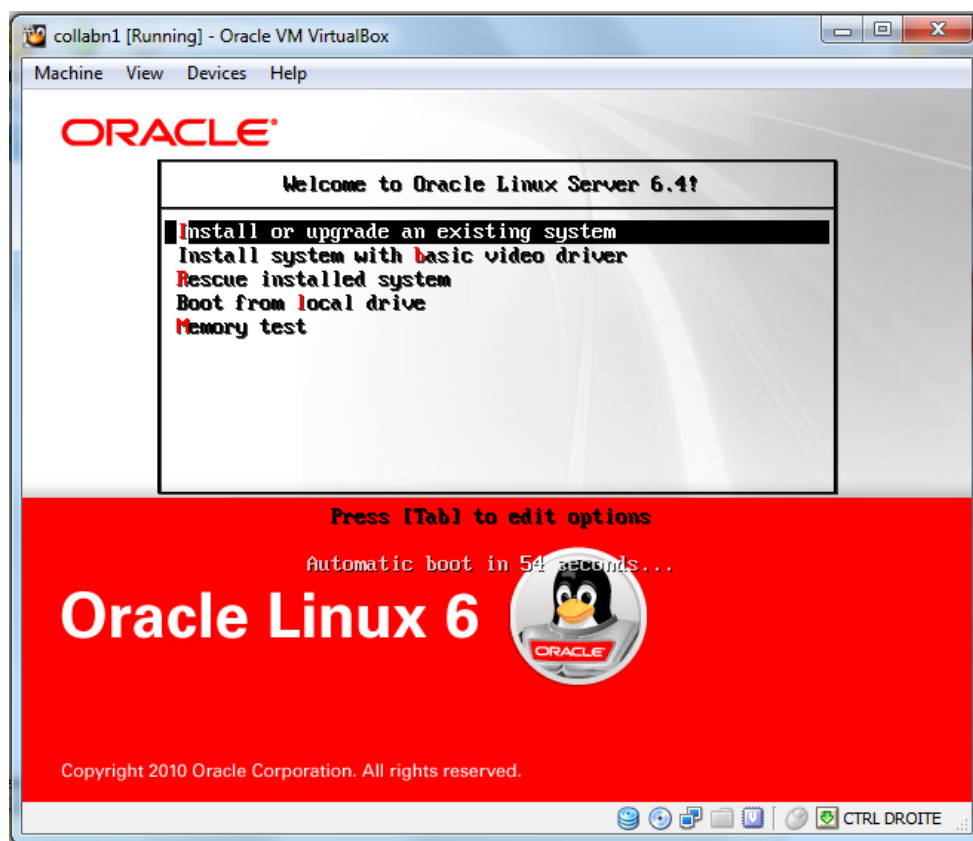


OS Installation

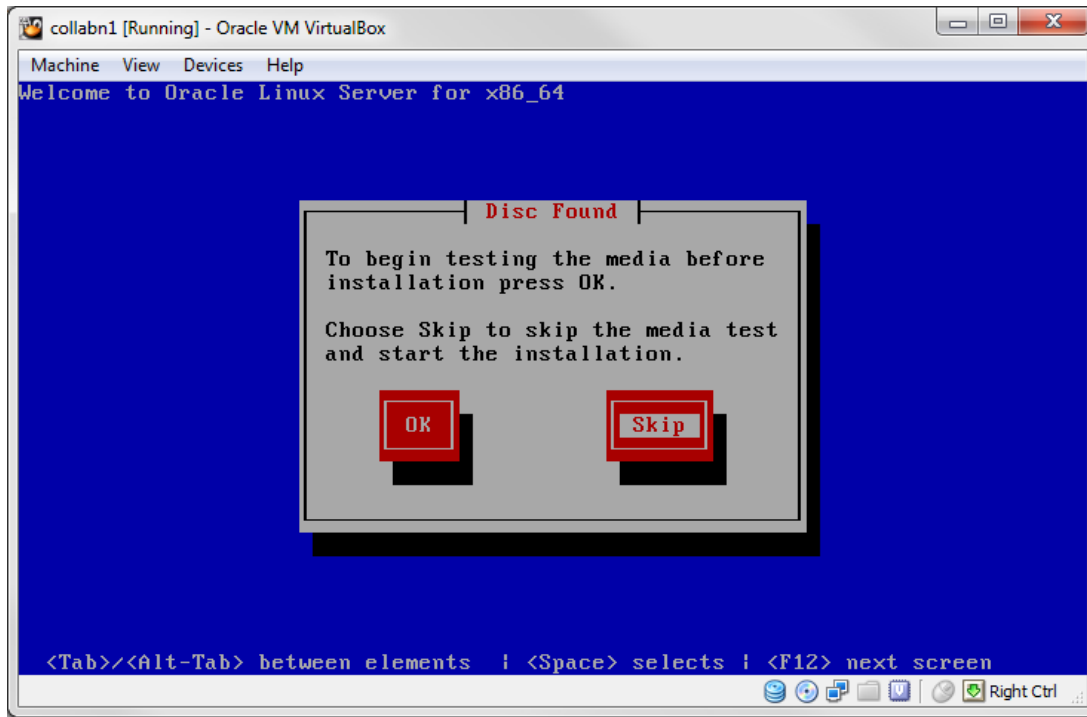
1. Click on **Start** to boot the virtual machine. If asked to select a start-up disk, choose **Oracle_Linux_6_64.iso** and click **Start** again.



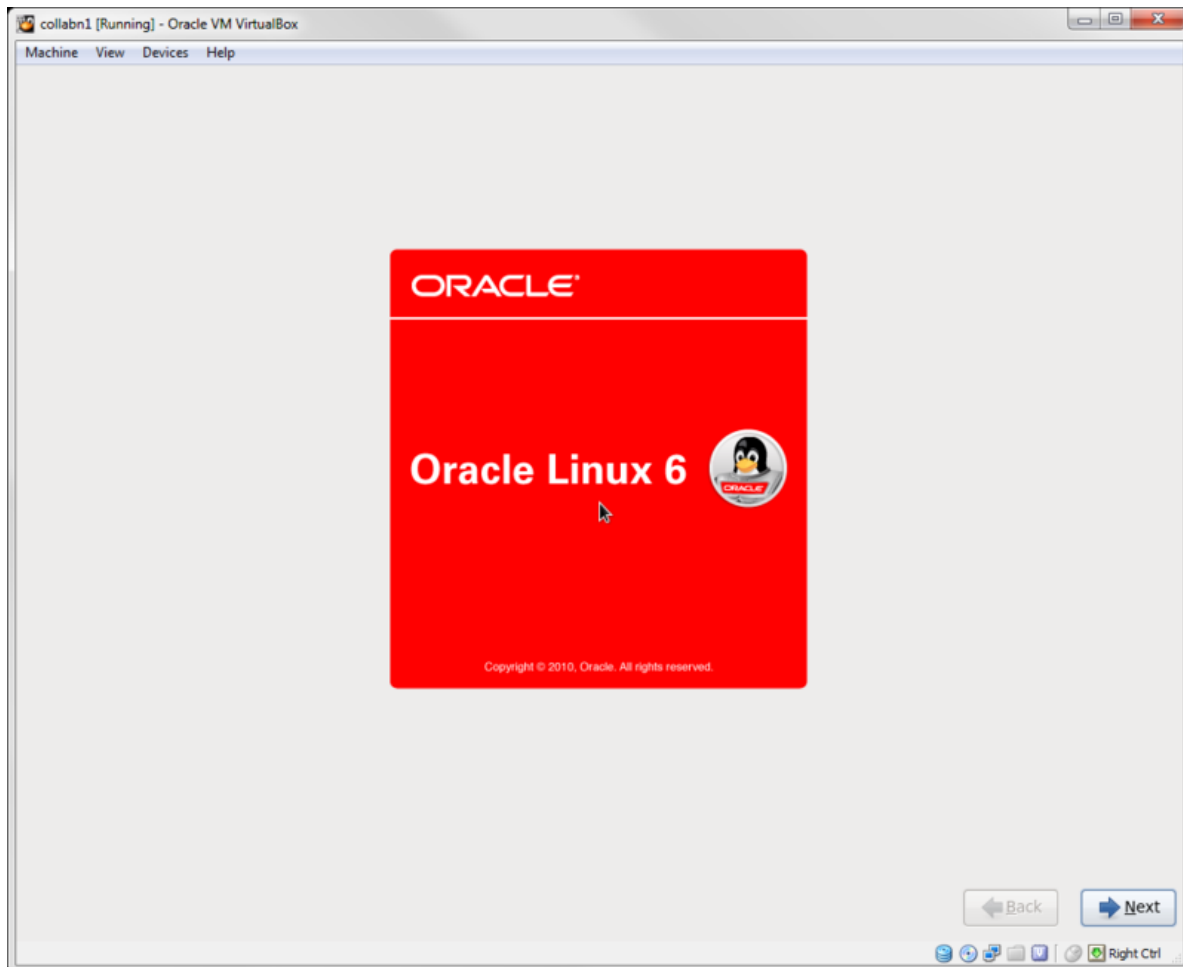
2. The Oracle Linux install screen will automatically come up. Hit **enter** to begin the install.



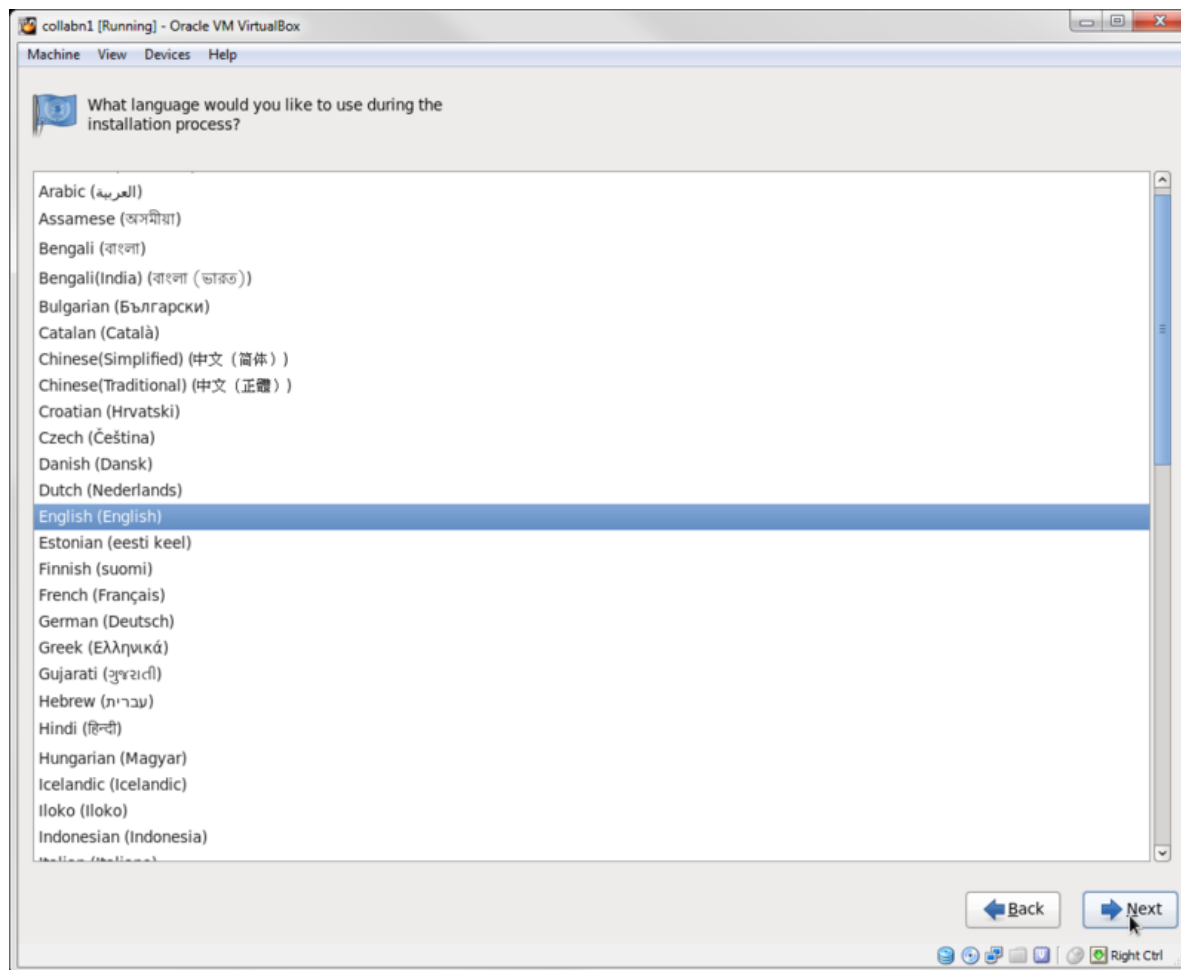
3. Skip the CD testing by pressing the right arrow key and press **enter**.



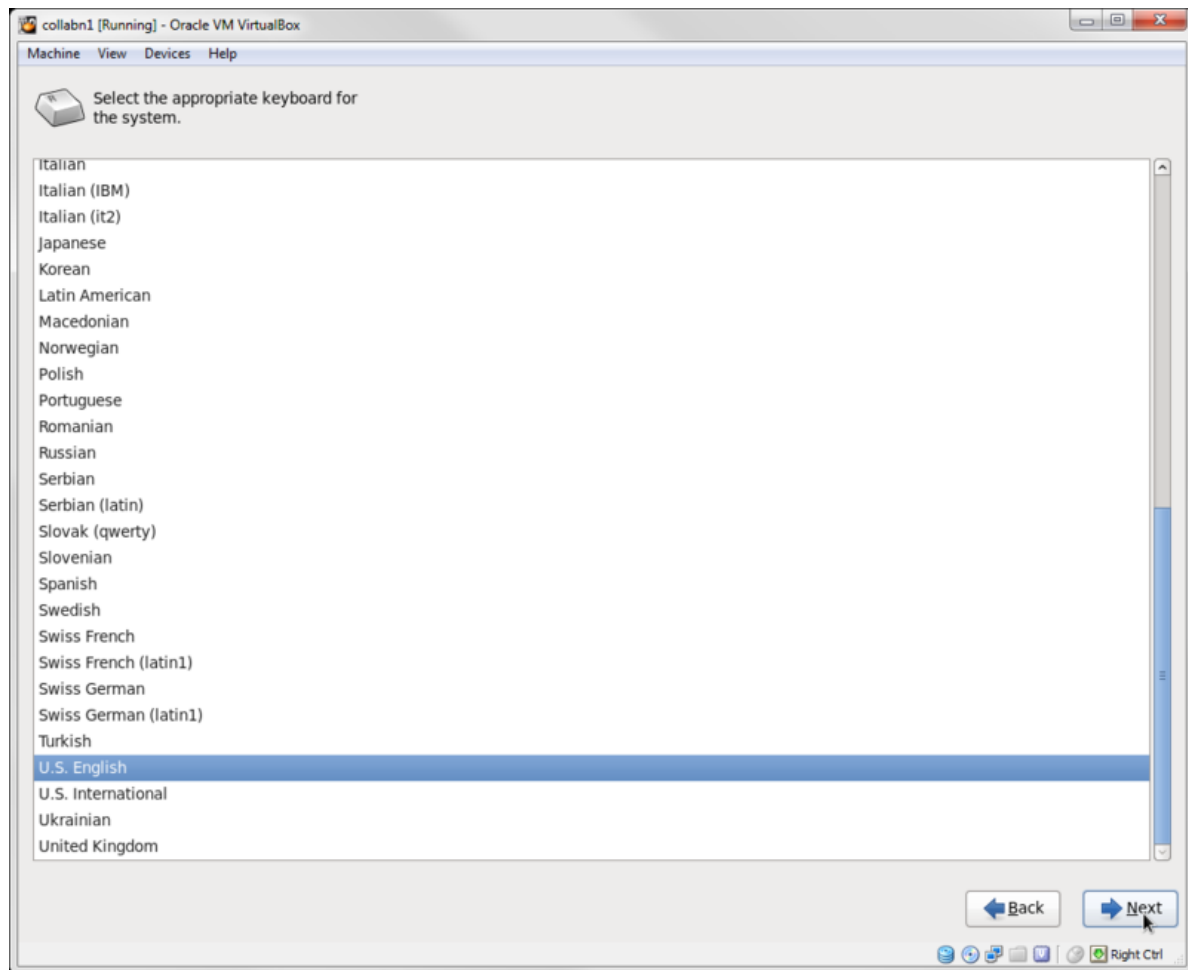
- 4. From this point on you can use the mouse to navigate. To unlock the mouse and keyboard from the VM, hit the right **Ctrl** key. Click **Next**.



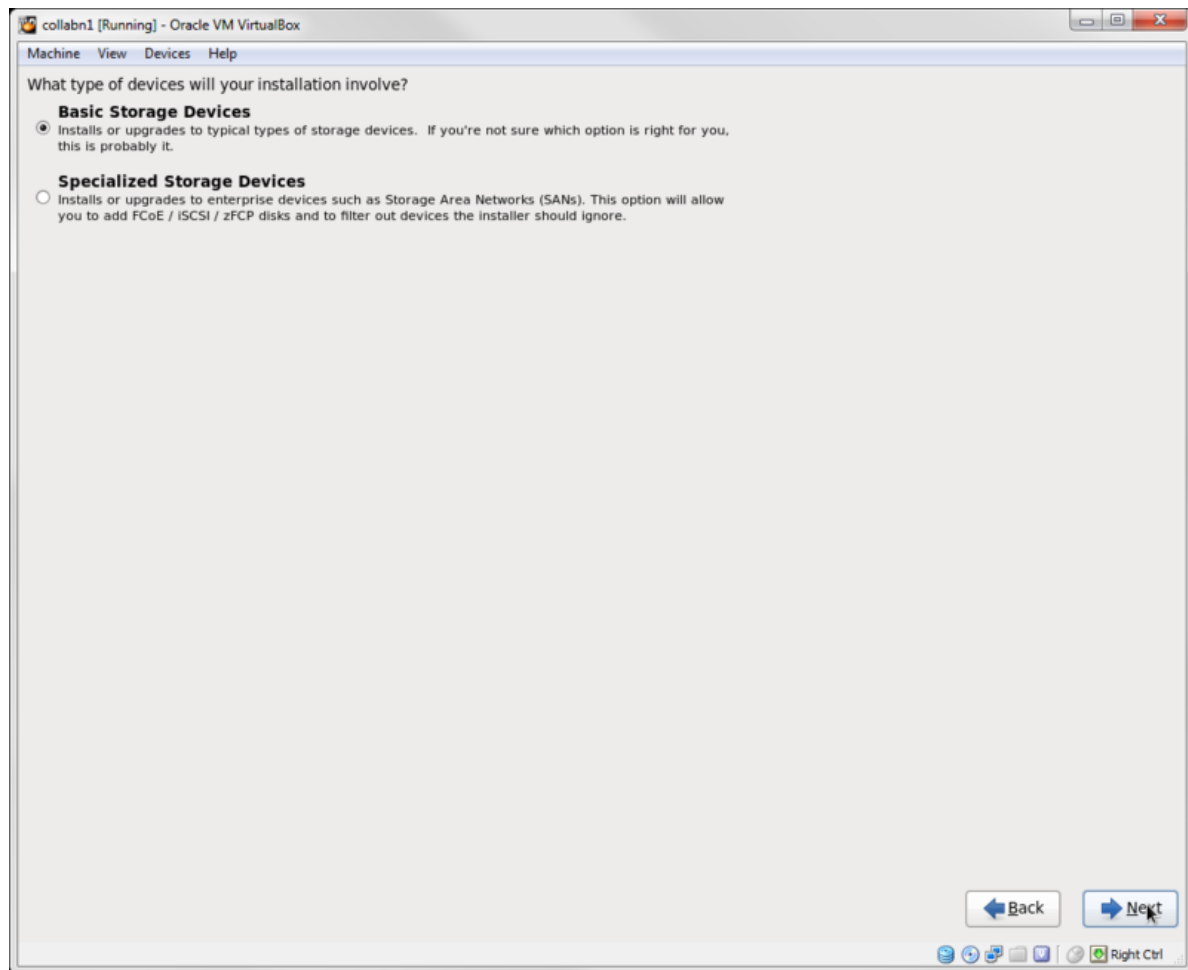
5. Leave **English (English)** selected and click **Next**.



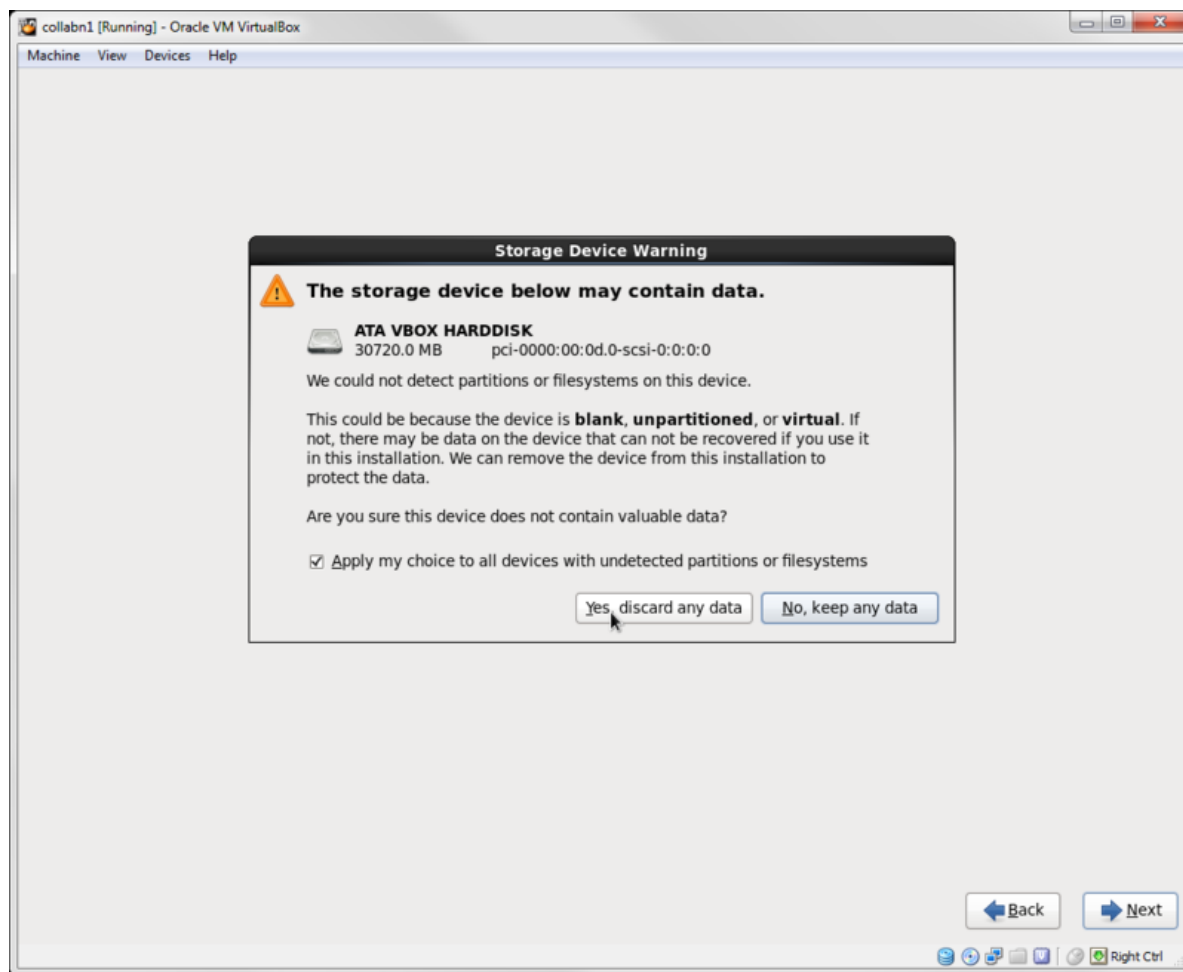
6. Leave **U.S. English** selected and click **Next** (unless you have another preferred keyboard layout).



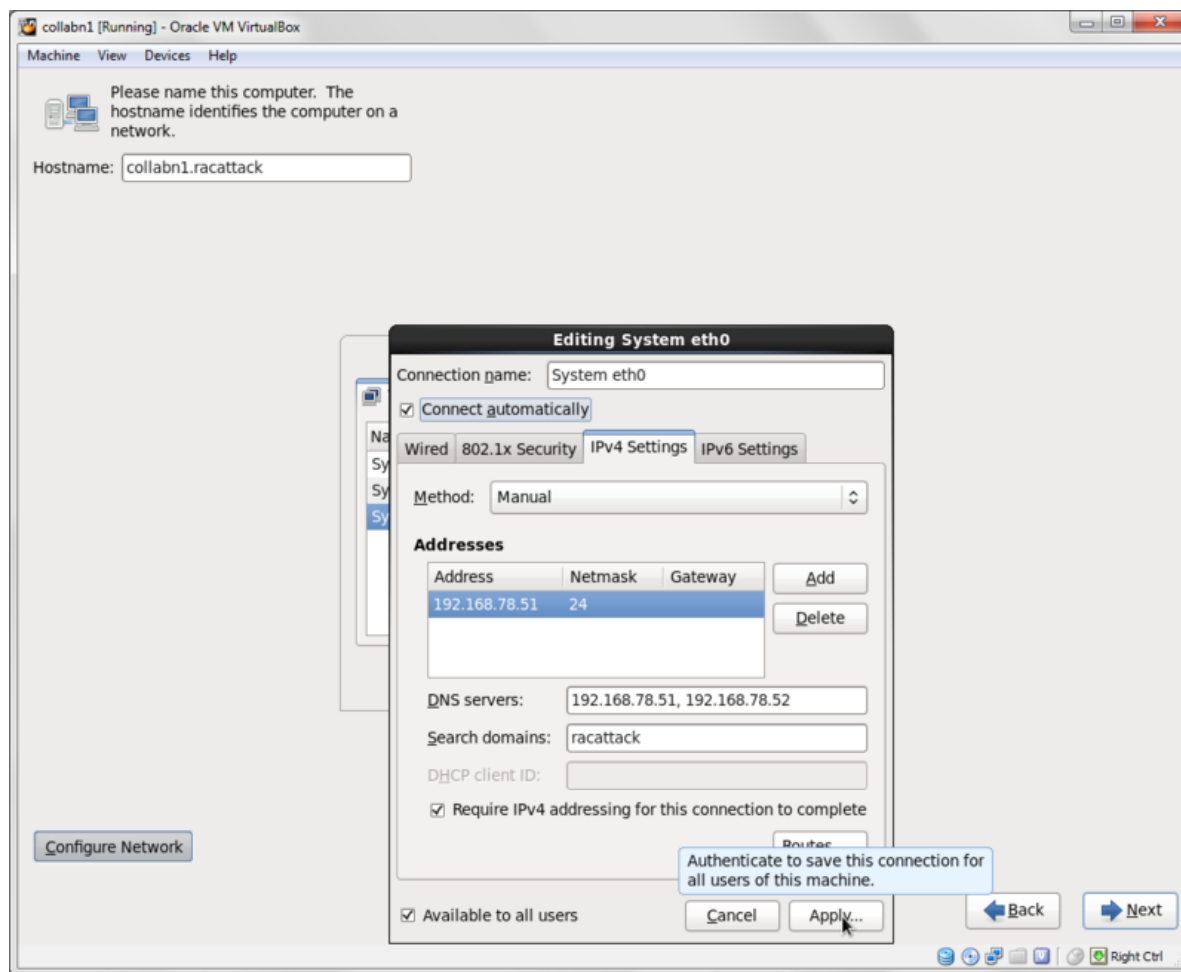
7. Leave **Basic Storage Devices** selected and click **Next**.



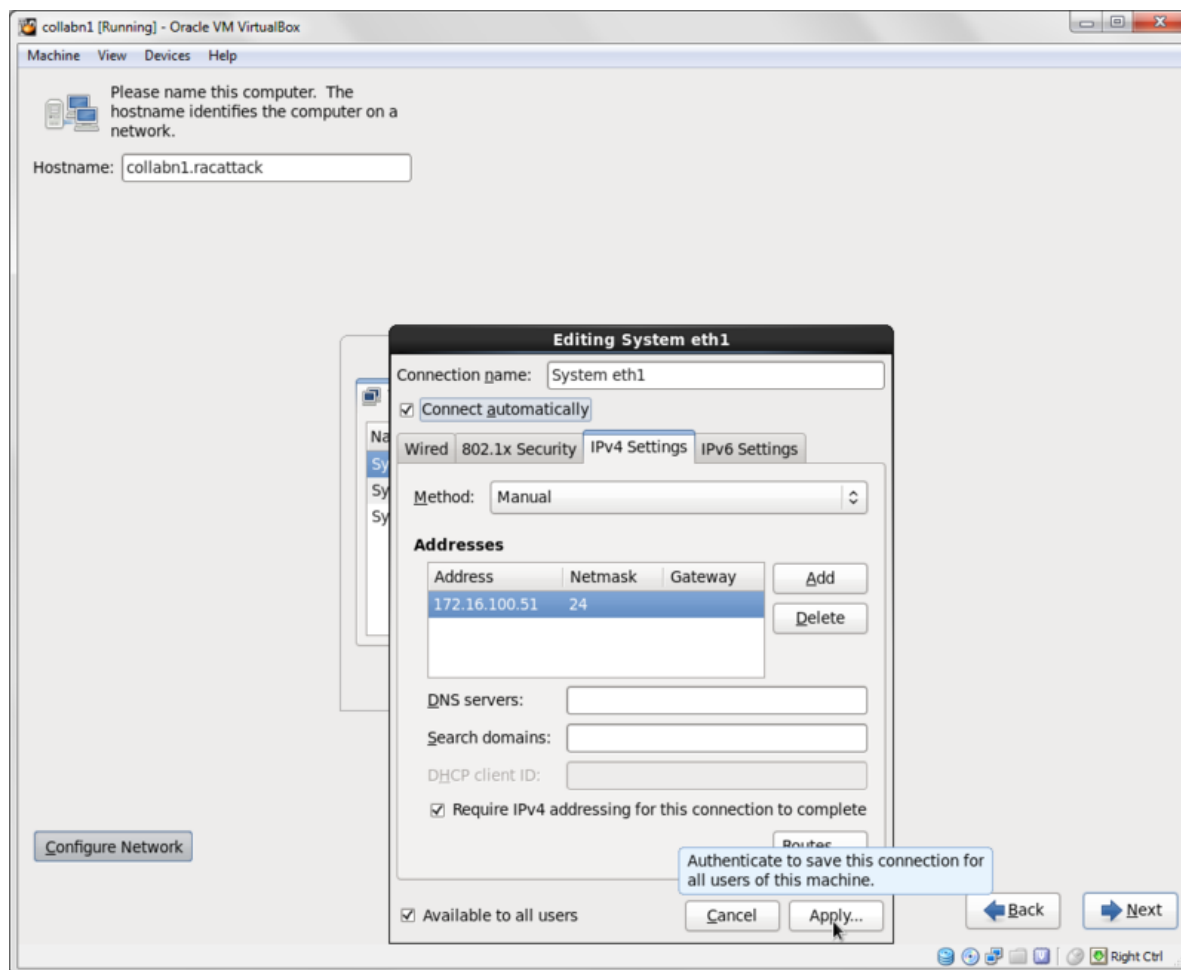
8. Click **Yes, discard any data** for the warning box stating **The storage device below may contain data**.



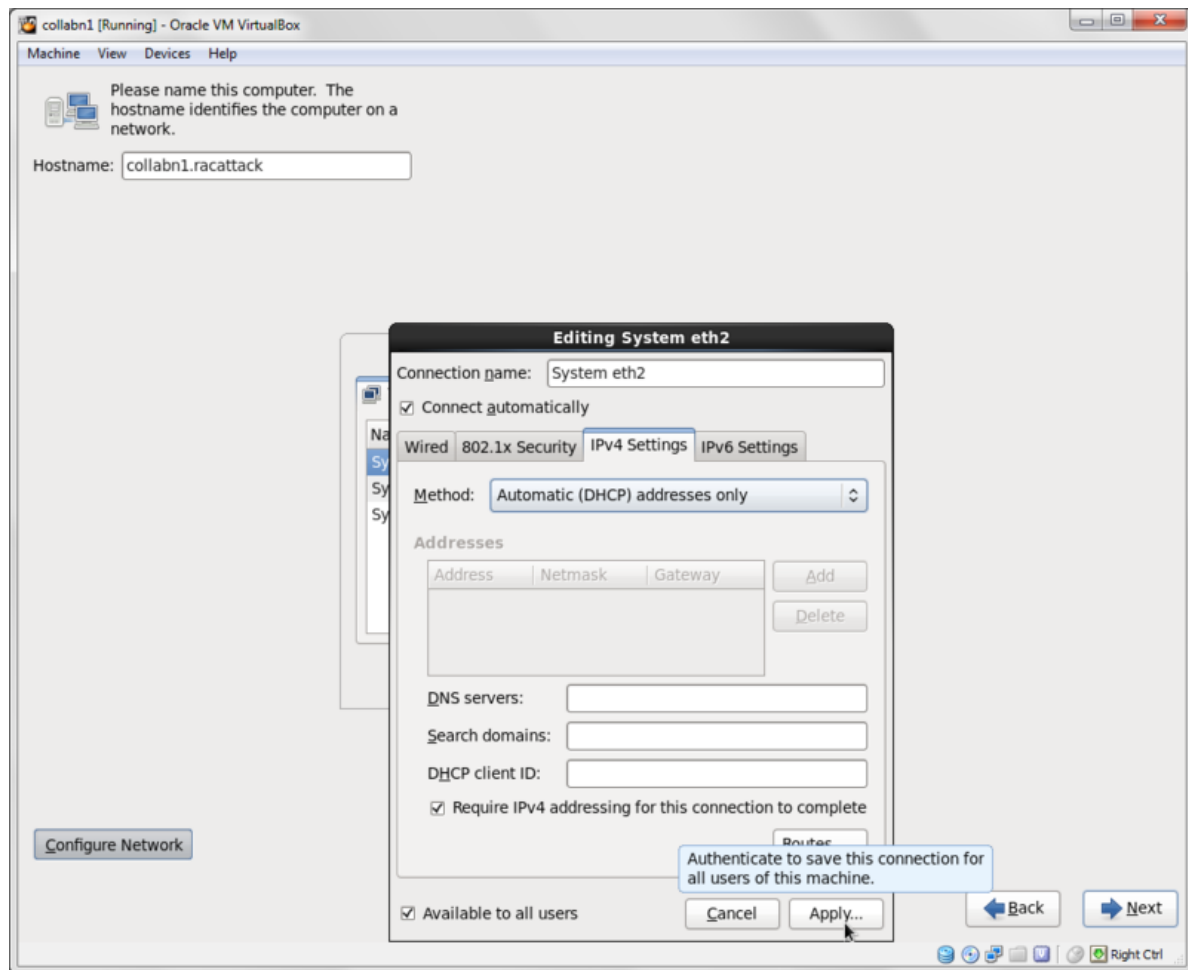
9. In the hostname field, type **collabn1.racattack**.
 - Click **Configure Network** in the bottom left corner.
 - Highlight **System eth0** and click the **Edit...** button.
 - Click the **Connect automatically** checkbox.
 - Click the **IPv4 Settings** tab.
 - Click the **Method:** dropdown and select **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.



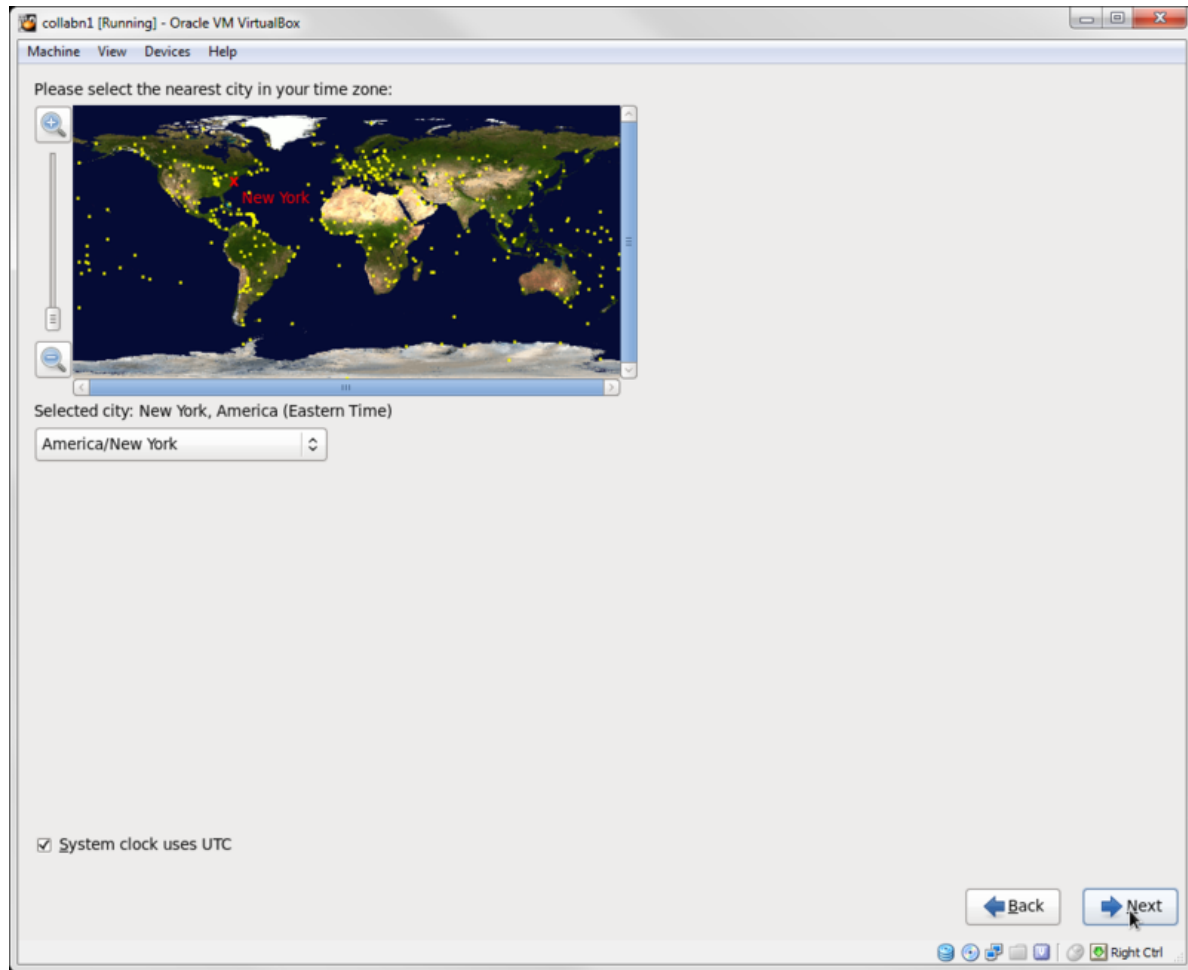
10. Highlight **System eth1** and click the **Edit...** button.
 - Click the **Connect automatically** checkbox.
 - Click the **IPv4 Settings** tab.
 - Click the **Method:** dropdown and select **Manual**.
 - Click **Add** and type **172.16.100.51**.
 - Change **Netmask** to **24**.
 - Click the **Apply**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



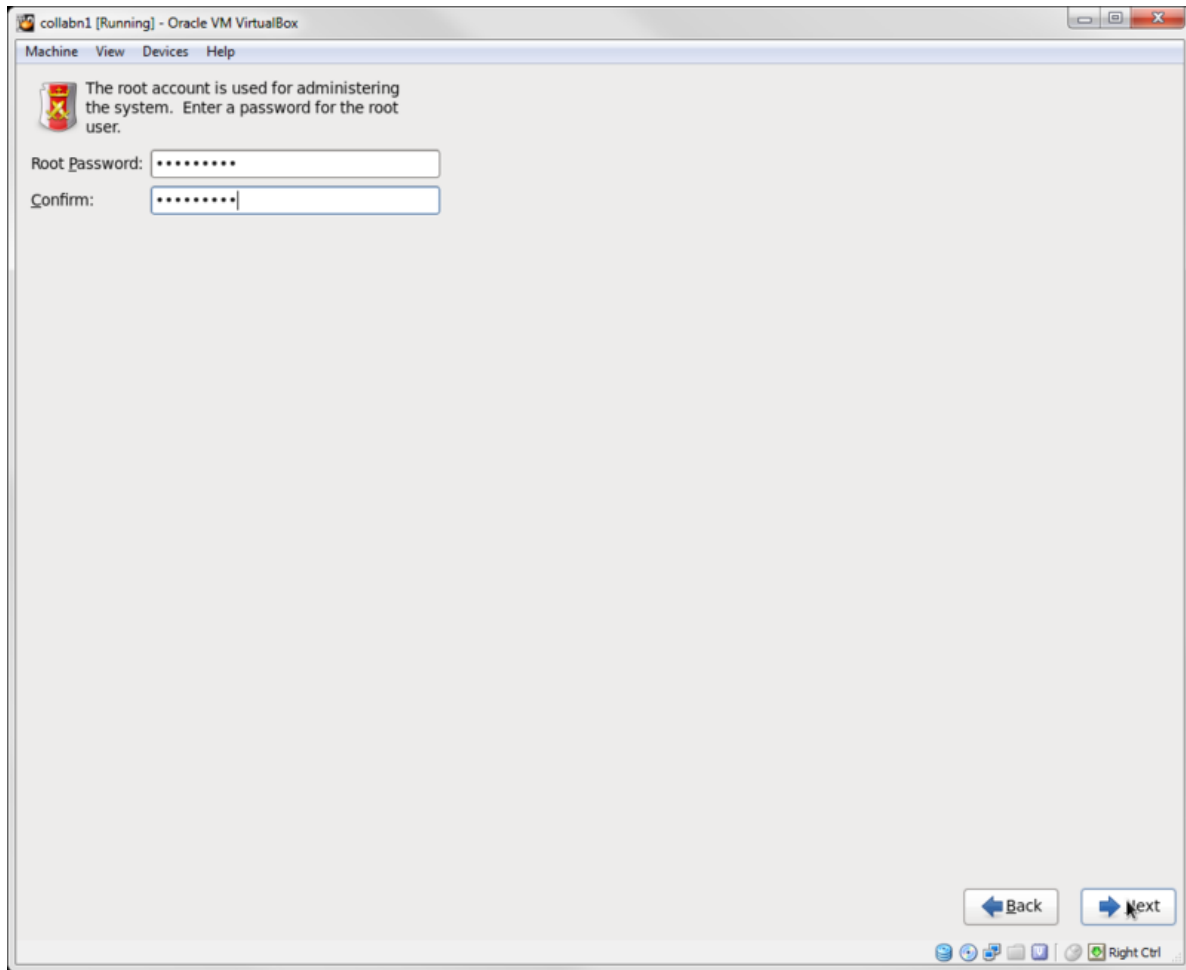
11. Highlight **System eth2** and click the **Edit...** button.
 - Click the **Connect automatically** checkbox.
 - Click the **IPv4 Settings** tab.
 - Click the **Method:** dropdown and select **Automatic (DHCP) addresses only**.
 - Click the **Apply** button.
 - Click **Close** to close the network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



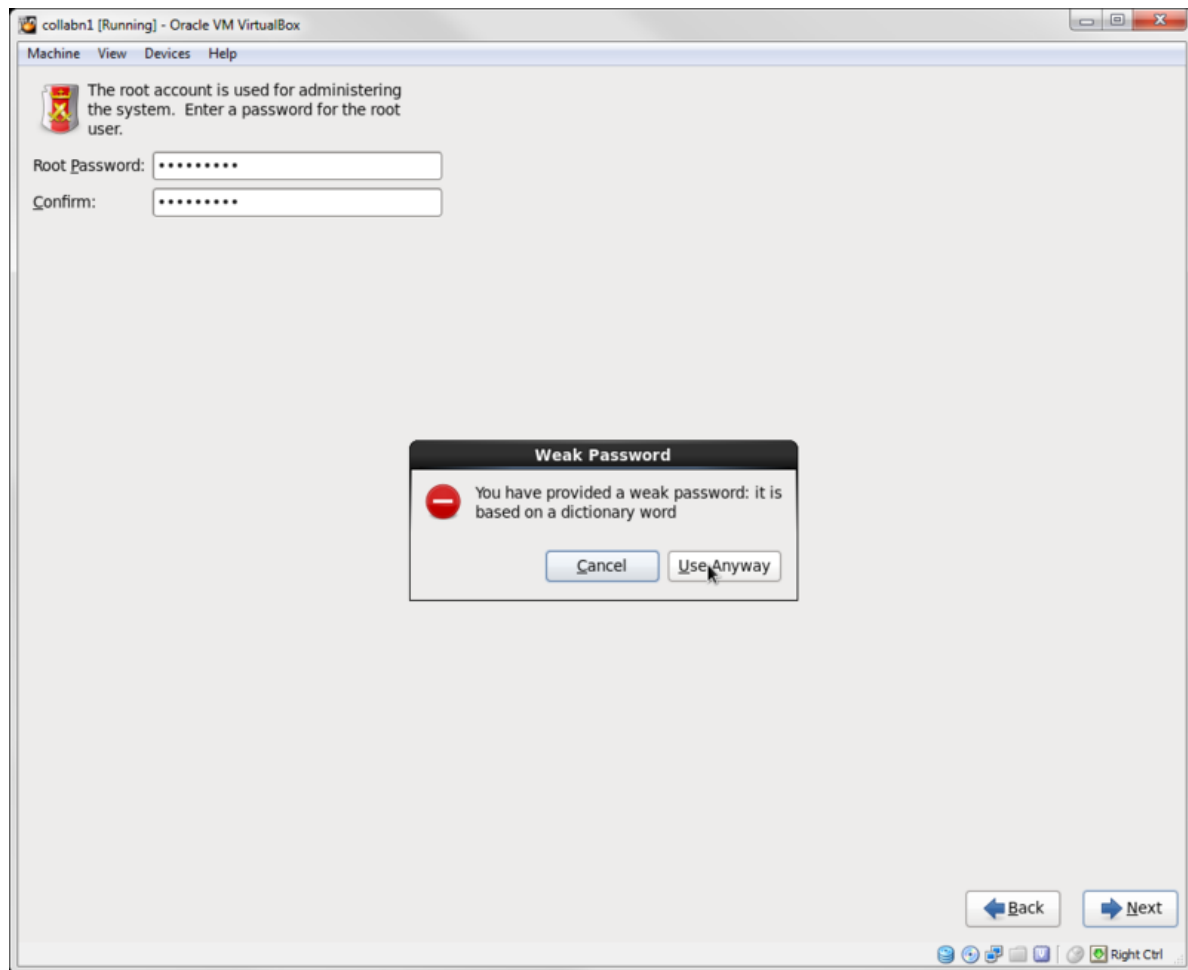
12. Leave the timezone settings as they are and click **Next**.



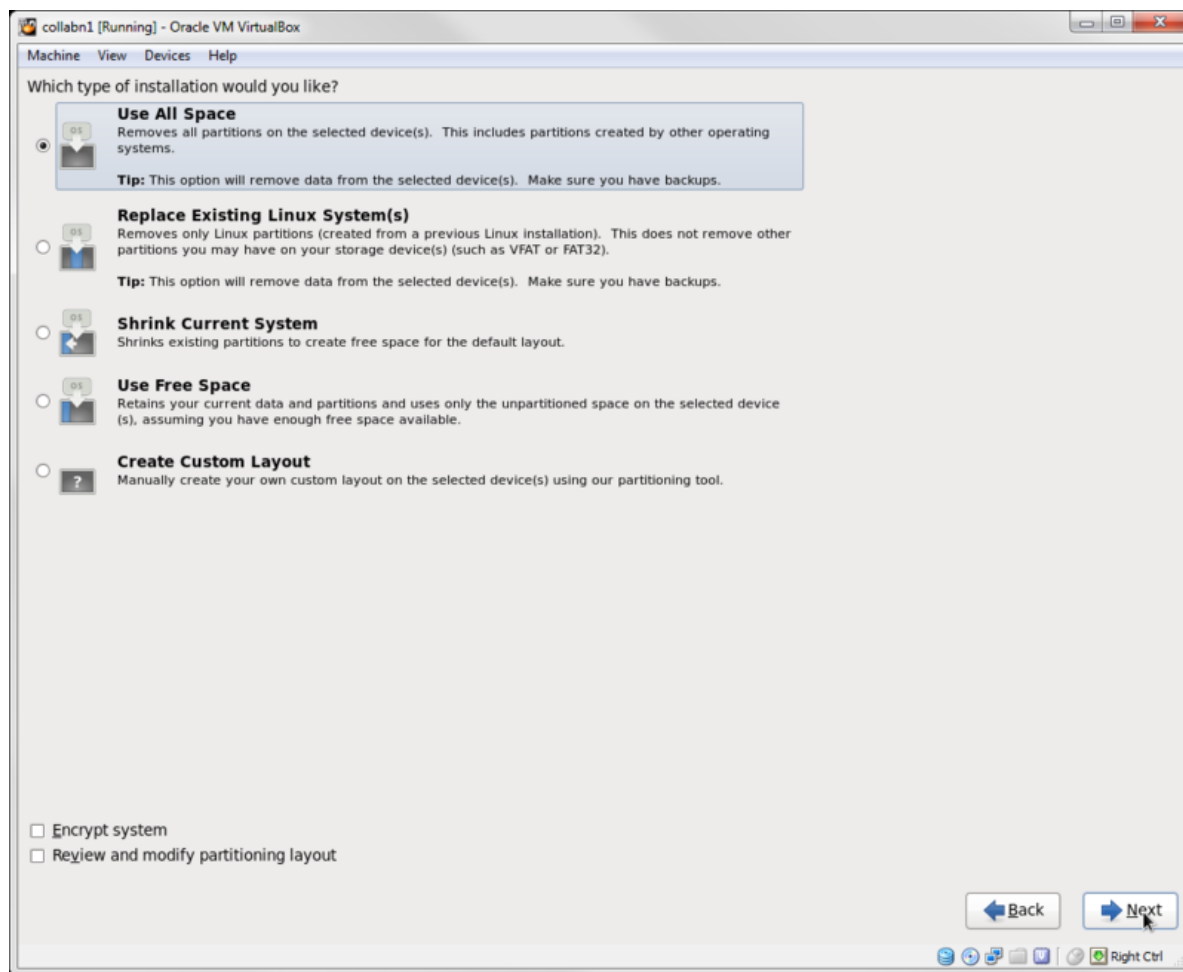
13. Enter the **Root Password** as **racattack** and click **Next**.



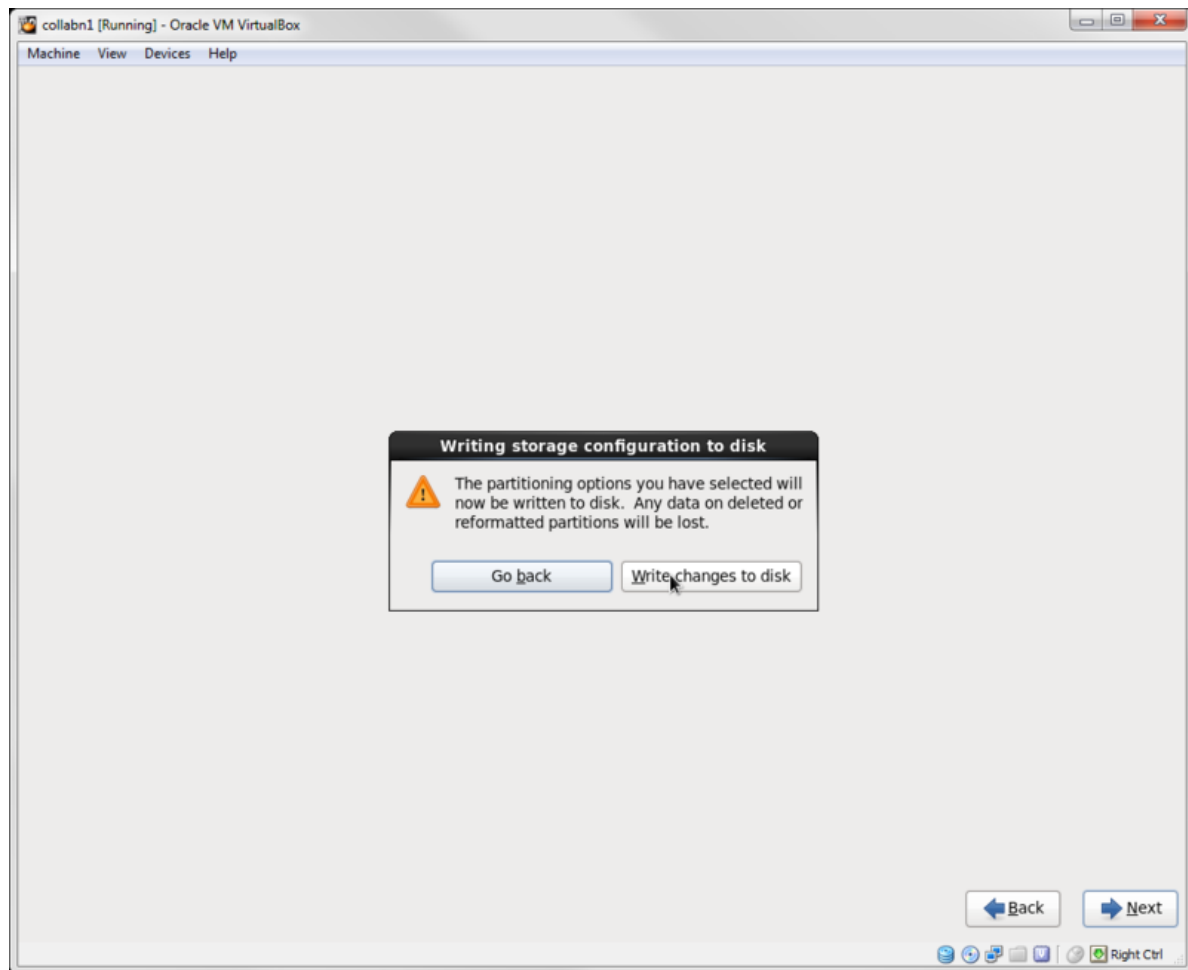
14. Click **Use Anyway** when warned about the weak password.



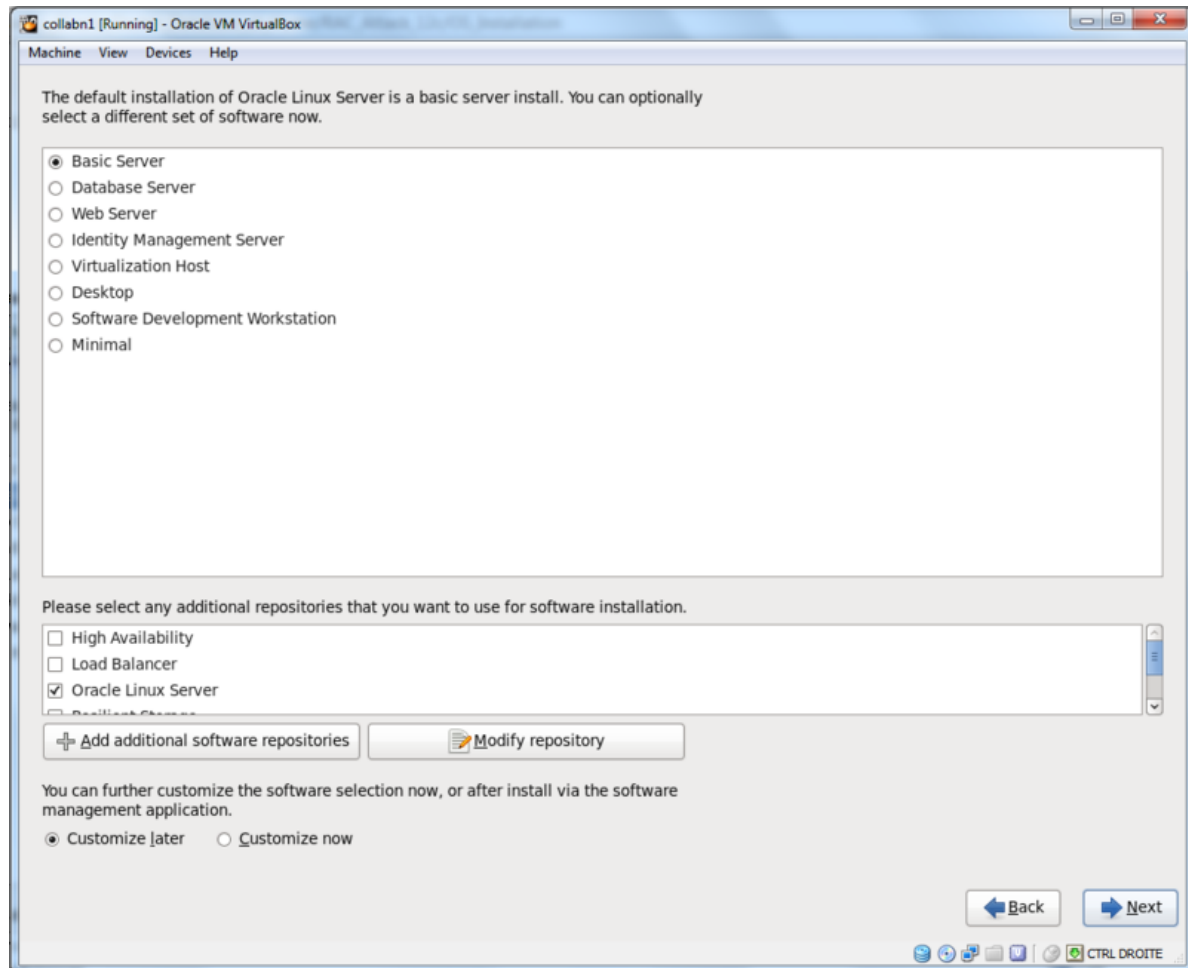
15. Click **Use All Space** for the installation type and click **Next**.



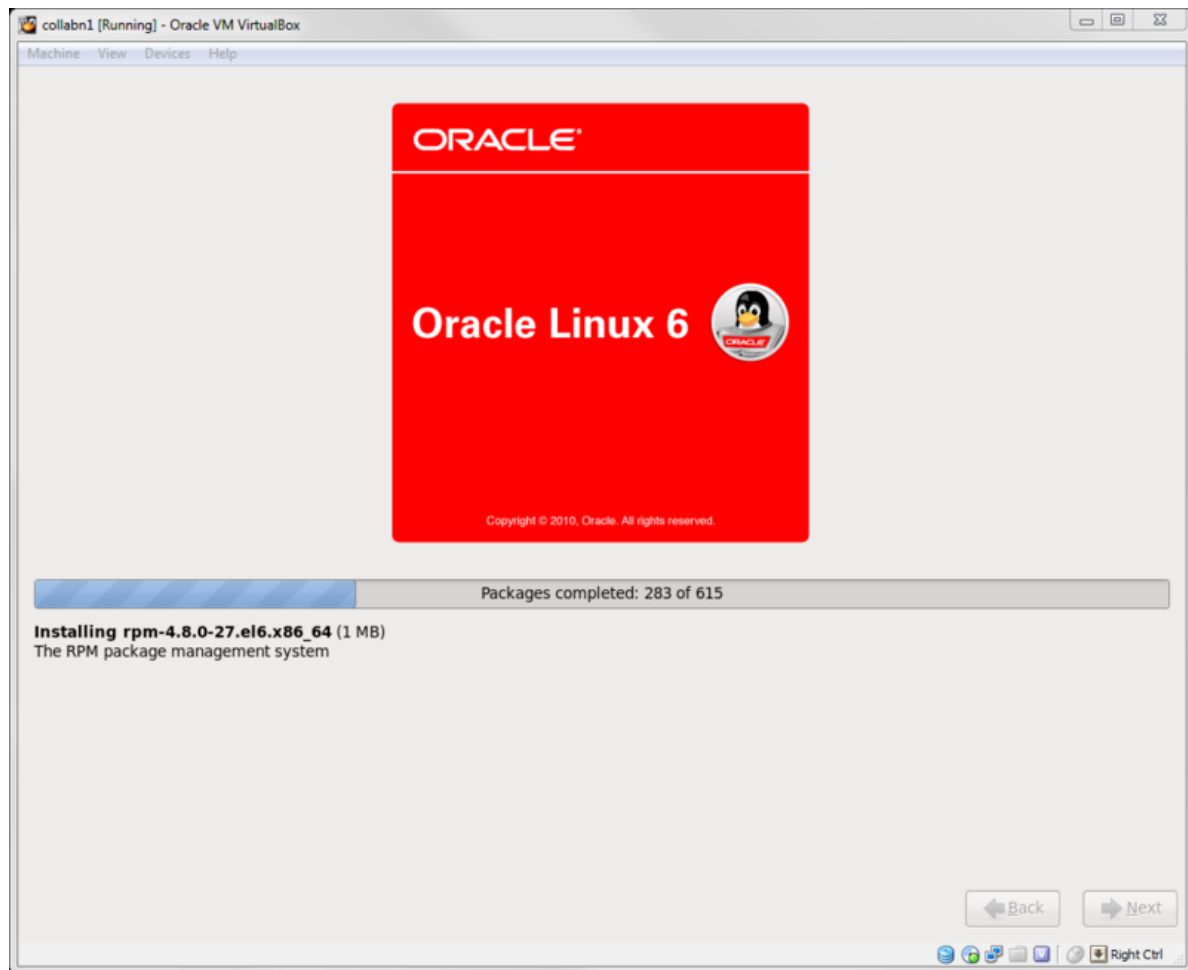
16. Click **Write changes to disk** when warned about **Writing storage configuration to disk**.



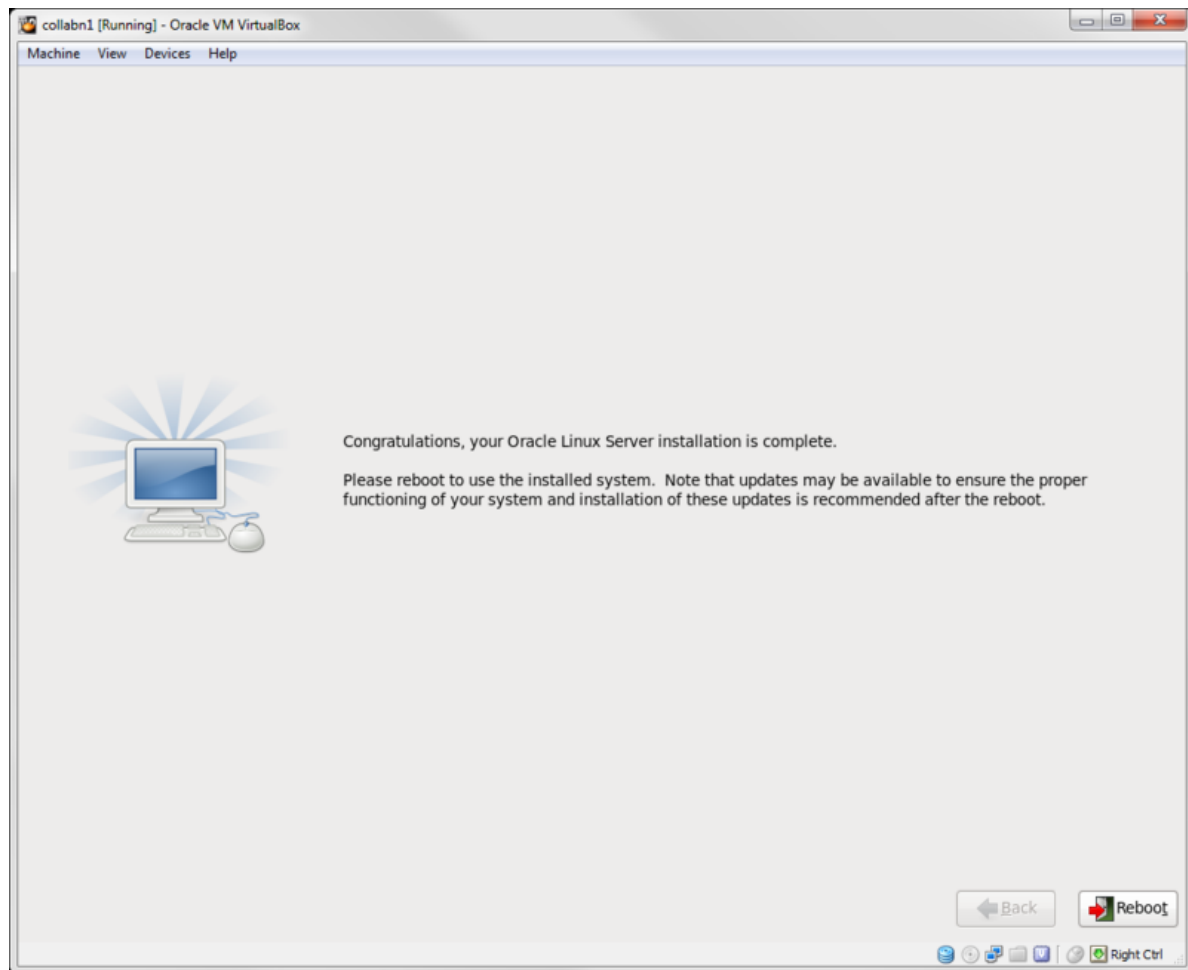
17. Leave **Basic Server** as the default installation type. Click **Next**.



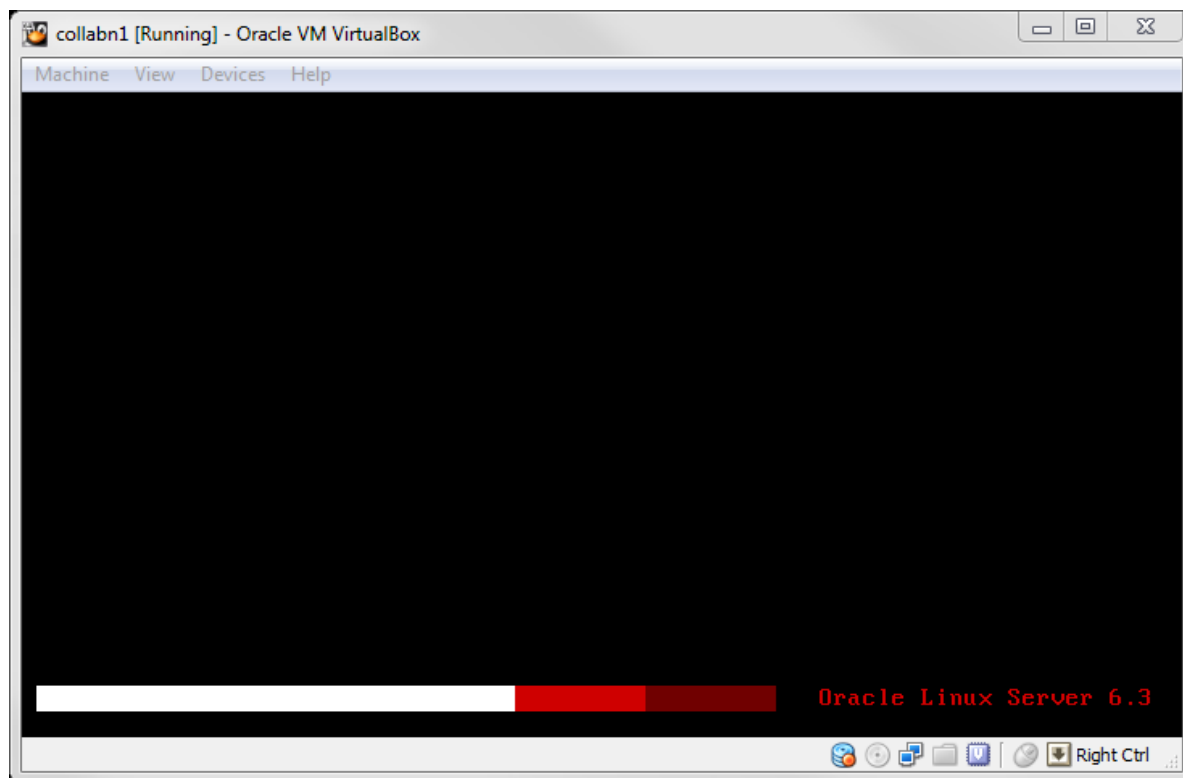
18. The operating system will take a while to install.



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

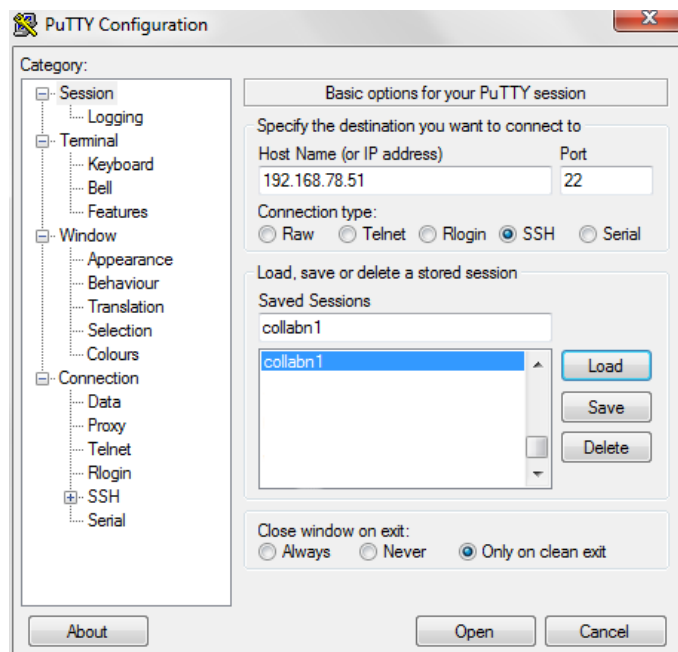


20. The reboot no longer shows messages, just a progress bar.
 - You can see the progress by hitting **F8** while the server is booting.
 - The system should boot to a command line login prompt.

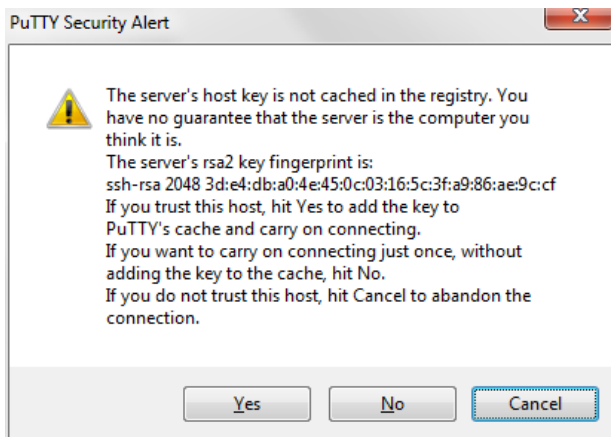


Linux Post Installation

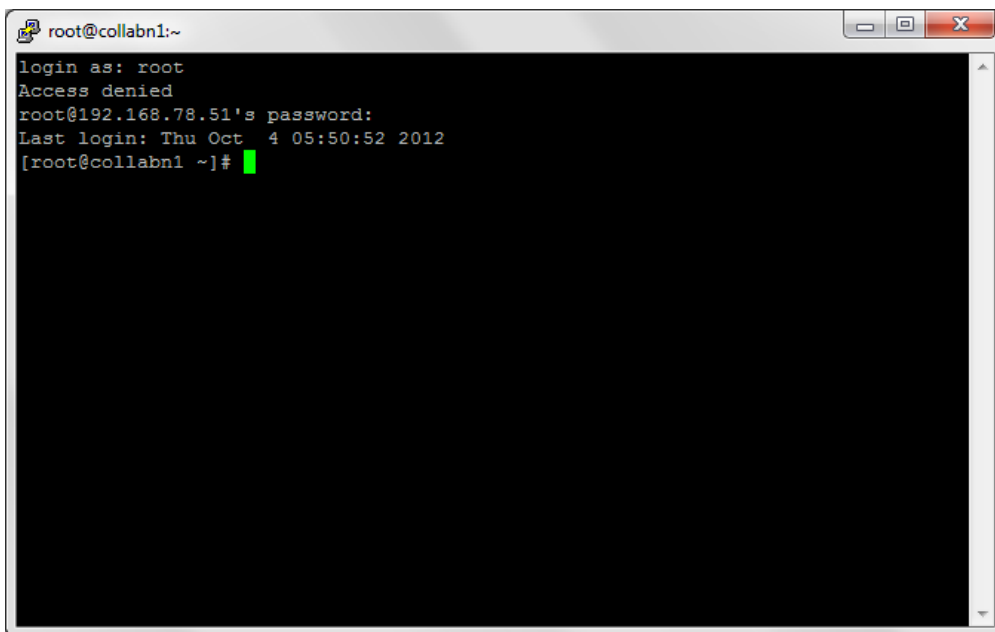
1. To connect to the new created virtual machine, create a connection in Putty for the new VM called **collabn1** with the **IP Address** of **192.168.78.51**.
 - Optionally, create another connection for **collabn2** with the **IP Address** of **192.168.78.52** that will be created later as a clone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



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



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



- 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
```

- 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. Add the DVD as repository.

Add the DVD device to the server **Device** -> **CD/DVD Devices** -> **Oracle_Linux_6_4.iso**

Run the following commands:

```
mount -o loop -t iso9660 /dev/sr0 /media/
cd /etc/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
```

8. Install the database preinstall package **oracle-rdbms-server-11gR2-preinstall**.

- This package installs all the **package requirements** for Oracle 11g (but will work also for 12c), configures **kernel parameters**, creates oracle **user and groups** and sets the user **limits**.

```
[root@collabn1 ~]# yum install -y oracle-rdbms-server-11gR2-preinstall
....
Transaction Summary
=====
Install      21 Package(s)
Upgrade      2 Package(s)

Total download size: 43 M
....
Installed:
  oracle-rdbms-server-11gR2-preinstall.x86_64 0:1.0-8.el6
....
Complete!
```

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

```
[root@collabn1 ~]# rpm -ivh /media/Packages/kernel-uek-devel-$(uname -r).rpm
....
[root@collabn1 ~]# yum install -y tigervnc-server.x86_64 xclock man parted.x86_64 unzip.x86_64 xterm lsof bind xorg-x11-twm
```

```

Install      12 Package(s)
.....
Total download size: 22 M
.....
Complete!
    
```

10. Uninstall NTP.

```

[root@collabn1 ~]# yum remove -y ntp
.....
Removed:
ntp.x86_64 0:4.2.4p8-3.e16
.....
Complete!
    
```

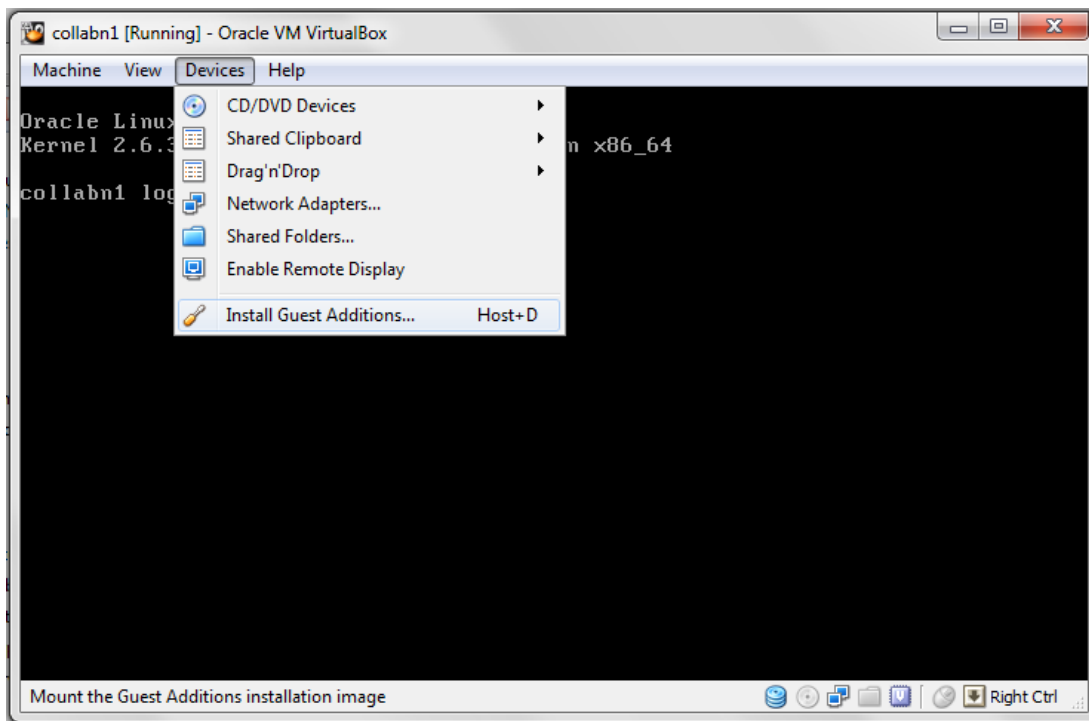
11. Unmount the DVD before continuing with the next steps.

```

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

Install VirtualBox Addons

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



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

```

[root@collabn1 ~]# 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.

```
[root@collabn1 ~]# 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.

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

Configure Bind DNS

1. Enable BIND DNS to start at boot time.

```
[root@collabn1 ~]# chkconfig named on
```

2. Change **named** directory permissions.

```
[root@collabn1 ~]# touch /var/named/racattack
[root@collabn1 ~]# chmod 664 /var/named/racattack
[root@collabn1 ~]# chgrp named /var/named/racattack
[root@collabn1 ~]# chmod g+w /var/named
[root@collabn1 ~]# chmod g+w /var/named/racattack
```

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

```
[root@collabn1 ~]# 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; };/' \
-e '$azone "racattack" {\n type master;\n file "racattack";\n};\n\nzone "in-addr.arpa" {\n type master;\n file "in-addr.a
/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; };
    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** by running the following command:

(Copy & Paste the whole box)

```

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**.

(Copy & Paste the whole box)

```

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.

```
[root@collabn1 ~]# 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.

```
[root@collabn1 ~]# 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:

```
[root@collabn1 ~]# 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:

```
[root@collabn1 ~]# 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.

```
[root@collabn1 ~]# 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
```

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**.

```
[root@collabn1 ~]# 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.

```
[root@collabn1 ~]# mkdir -p /u01/app
[root@collabn1 ~]# chown oracle:oinstall /u01/app
```

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

```
[root@collabn1 ~]# usermod -G oinstall,dba,vboxsf oracle
[root@collabn1 ~]# id oracle
uid=54321(oracle) gid=54321(oinstall) groups=54321(oinstall),54322(dba),54323(vboxsf)
```

Create Cluster

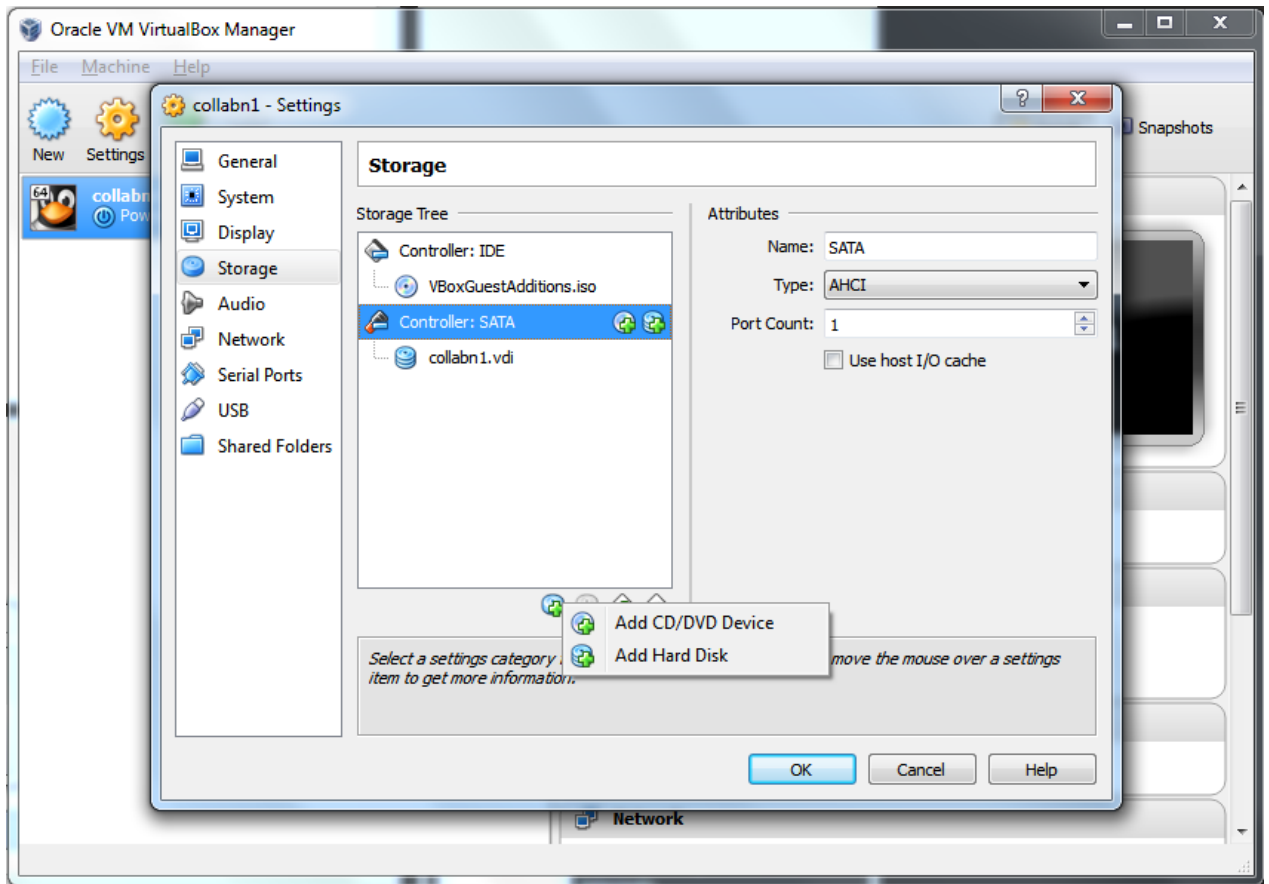
Create VirtualBox Shared Storage

1. Shutdown the server:

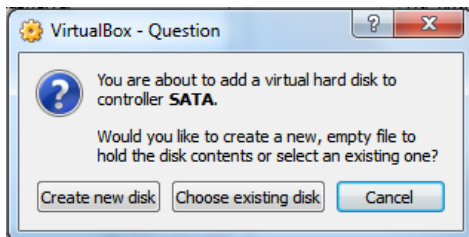
```
[root@collabn1 ~]# shutdown -h now
Broadcast message from root@collabn1.racattack
(/dev/pts/0) at 9:06 ...
The system is going down for halt NOW!
```

2. In the VirtualBox Manager, select the machine **collabn1**, click **Settings** -> **Storage**.

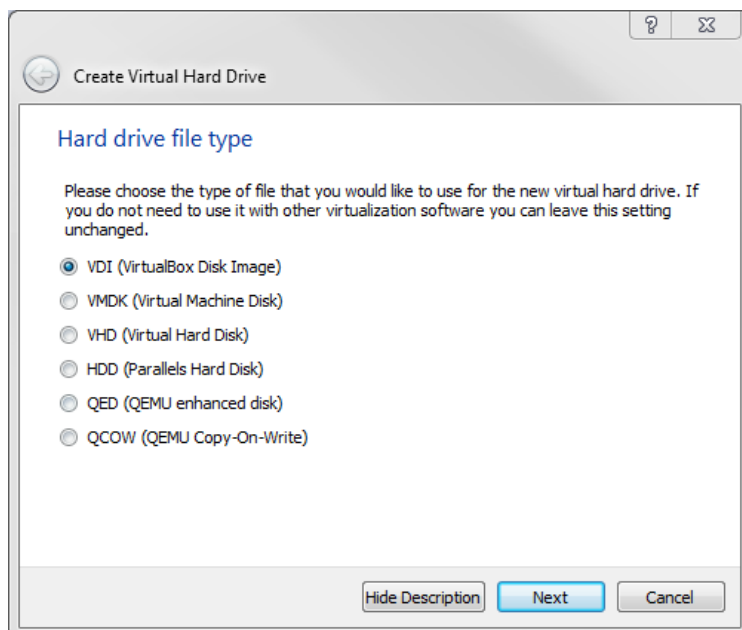
Select **Controller SATA** and click on the **Add Hard Disk** button:



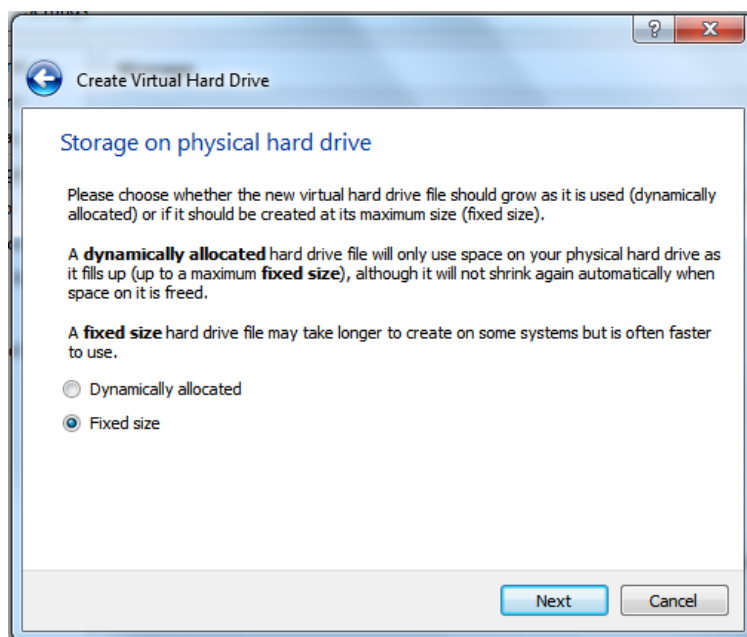
Click on **Create New Disk**:



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



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

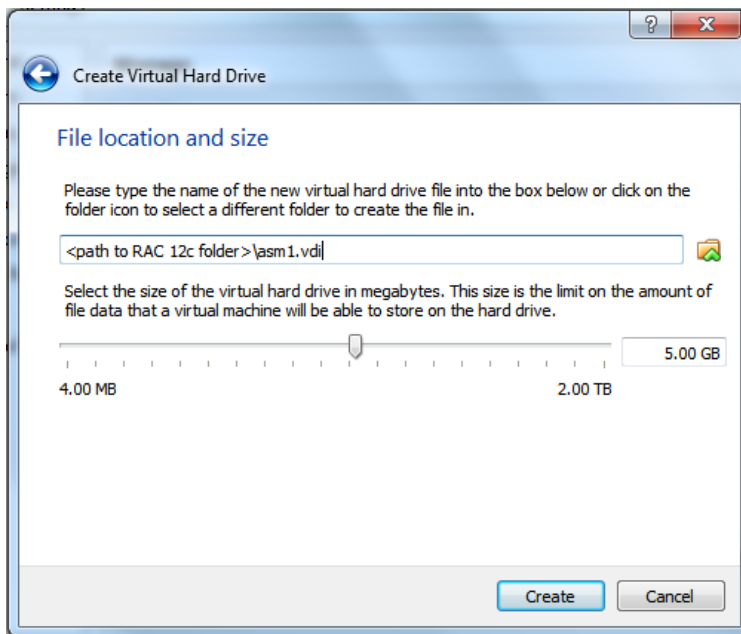


5. Change the location of the file to the folder **racattack12** previously created.

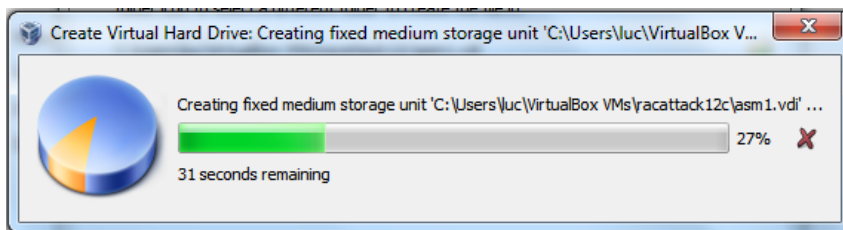
Enter asm1.vdi as disk name.

Enter 5.00Gb as disk size.

Click **Create**.



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

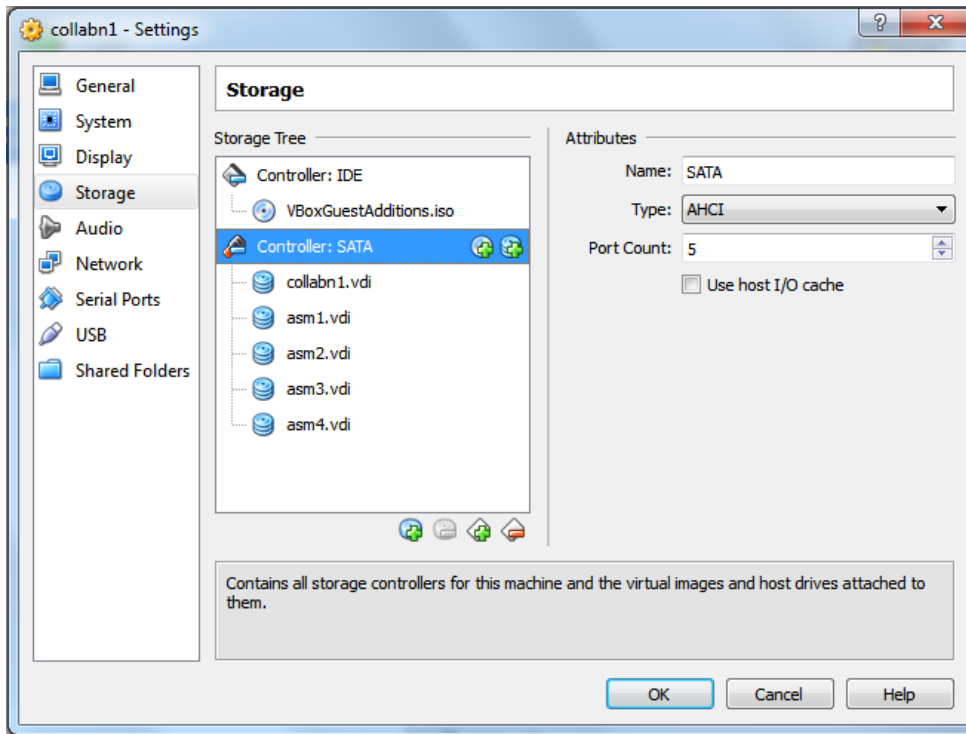


7. **Repeat the steps** to create three more disks:

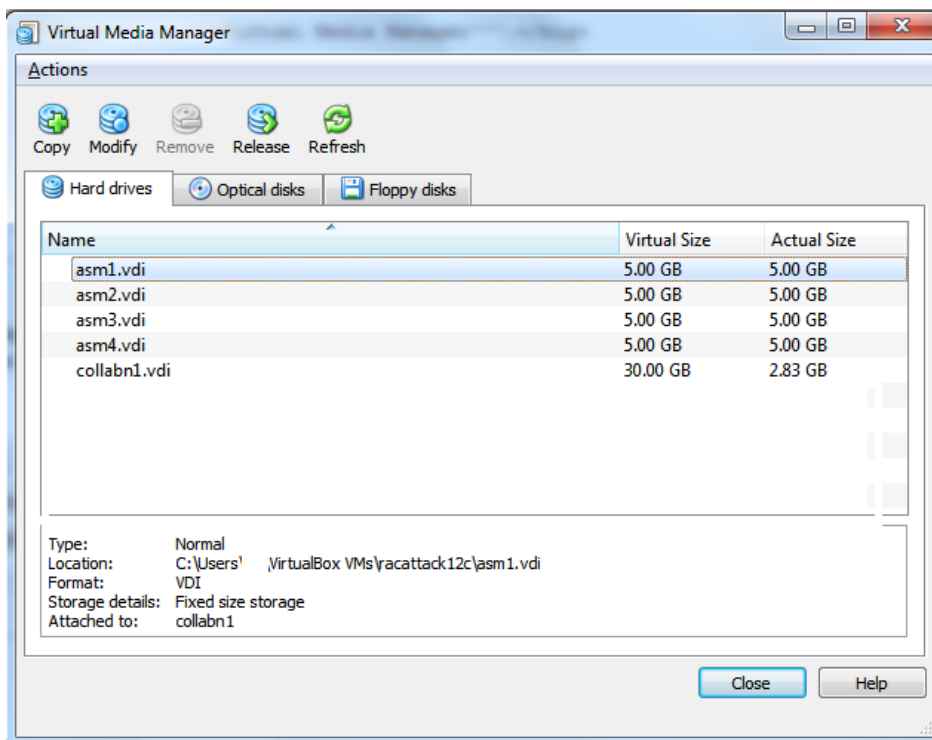
- asm2.vdi (5.00GB)
- asm3.vdi (5.00GB)
- asm4.vdi (5.00GB)

8. Finally, four virtual disks should have been created for asm.

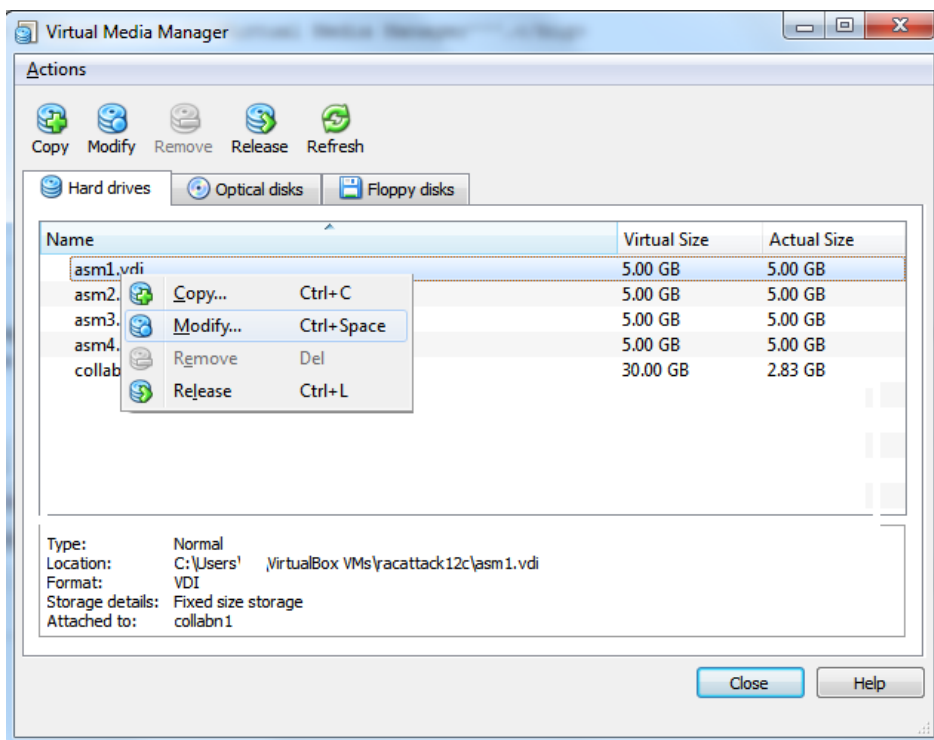
Click **OK**.



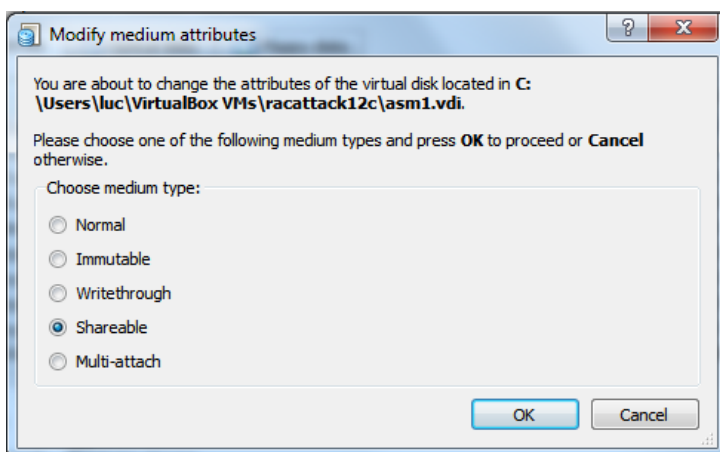
9. Make all the asm devices sharable: from VirtualBox Manager, click **File -> Virtual Media Manager**.



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



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



12. Start the machine **collabn1**.

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

```
[root@collabn1 ~]# 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
```

Configure Storage Persistent Naming

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

```
[root@collabn1 ~]# 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.

```

2. Repeat the same step for `sd`, `sdd` and `sde`.

When finished, all disks have at least a partition:

```

[root@collabn1 ~]# 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

```

3. Configure the option `-g` for the `scsi_id` command to expect an UUID from the shared devices.

```

[root@collabn1 ~]# ls -l /etc/scsi_id.config
ls: cannot access /etc/scsi_id.config: No such file or directory
[root@collabn1 ~]# echo "options=-g" > /etc/scsi_id.config

```

4. 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

```

5. Once completed, the file should like the following (except for the `scsi` UUID).

Note: The lines beginning with "KERNEL" should not be splitted.

```

[root@collabn1 ~]# cat /etc/udev/rules.d/99-oracle-asmdevices.rules
KERNEL=="sd?1", BUS=="scsi", PROGRAM=="/sbin/scsi_id -g -u -d /dev/$parent", RESULT=="1ATA_VBOX_HARDDISK_VB2216c54a-825b4598"
KERNEL=="sd?1", BUS=="scsi", PROGRAM=="/sbin/scsi_id -g -u -d /dev/$parent", RESULT=="1ATA_VBOX_HARDDISK_VB83dd4d7f-d052e72c"
KERNEL=="sd?1", BUS=="scsi", PROGRAM=="/sbin/scsi_id -g -u -d /dev/$parent", RESULT=="1ATA_VBOX_HARDDISK_VB636da22f-87dc2f88"
KERNEL=="sd?1", BUS=="scsi", PROGRAM=="/sbin/scsi_id -g -u -d /dev/$parent", RESULT=="1ATA_VBOX_HARDDISK_VB86aaf297-60dcda74"

```

6. Reload the udev rules and restart udev:

```
[root@collabn1 ~]# /sbin/partprobe /dev/sdb1 /dev/sdc1 /dev/sdd1 /dev/sde1
[root@collabn1 ~]# /sbin/udevadm test /block/sdb/sdb1
[root@collabn1 ~]# /sbin/udevadm test /block/sdc/sdc1
[root@collabn1 ~]# /sbin/udevadm test /block/sdd/sdd1
[root@collabn1 ~]# /sbin/udevadm test /block/sde/sde1
[root@collabn1 ~]# /sbin/udevadm control --reload-rules
[root@collabn1 ~]# /sbin/start_udev
Starting udev: [OK]
```

7. The new disks are ready for use:

```
[root@collabn1 ~]# 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
```

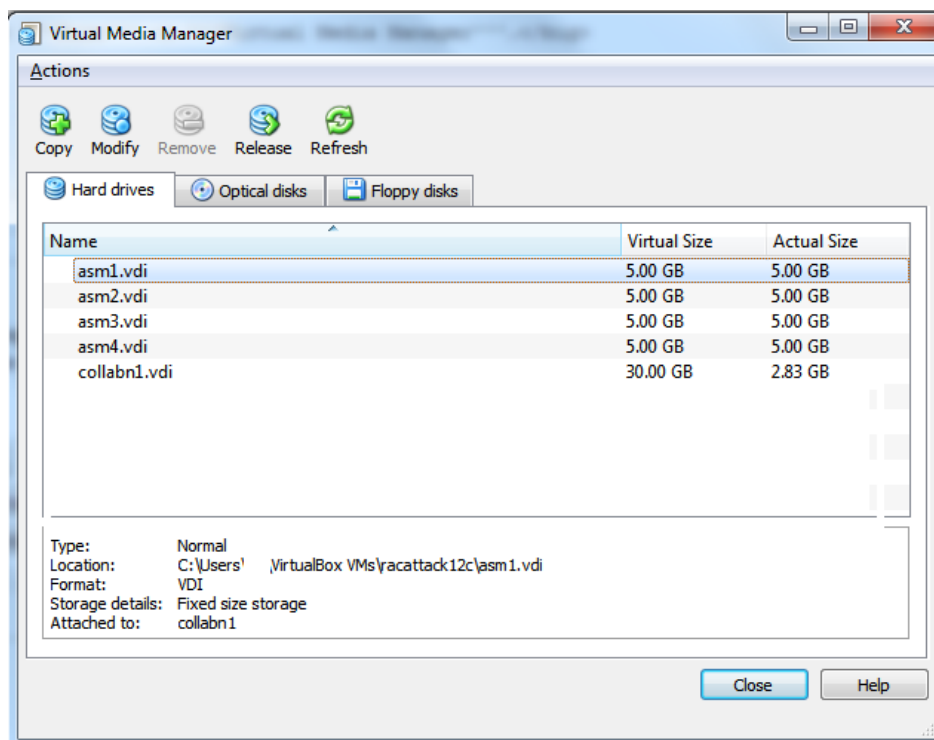
Clone VirtualBox VM

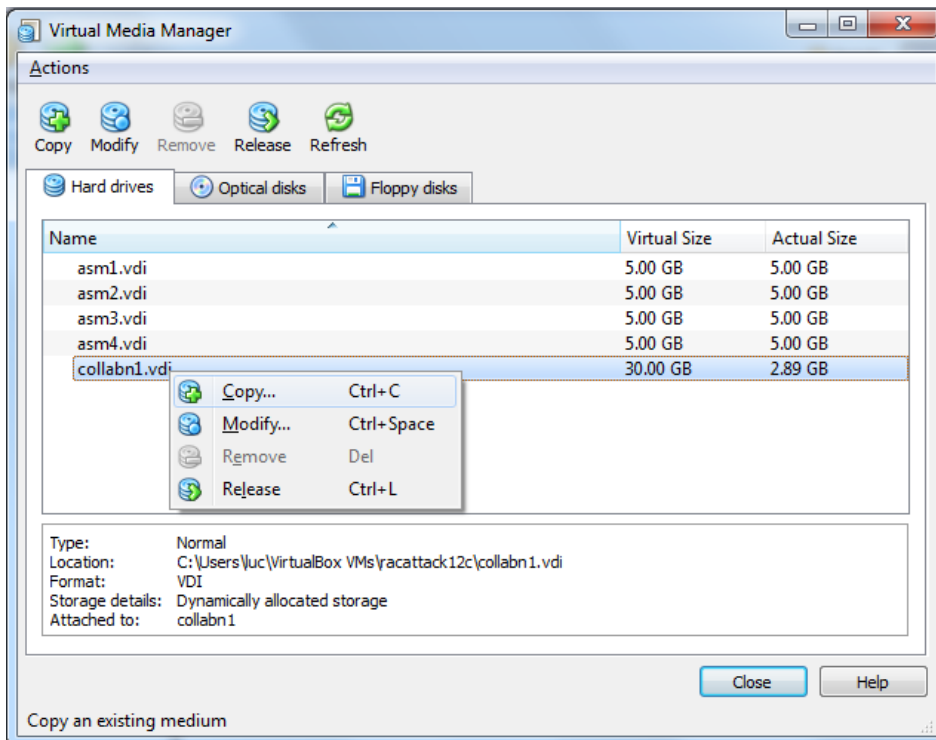
1. Shutdown the VM.

```
[root@collabn1 ~]# shutdown -h now

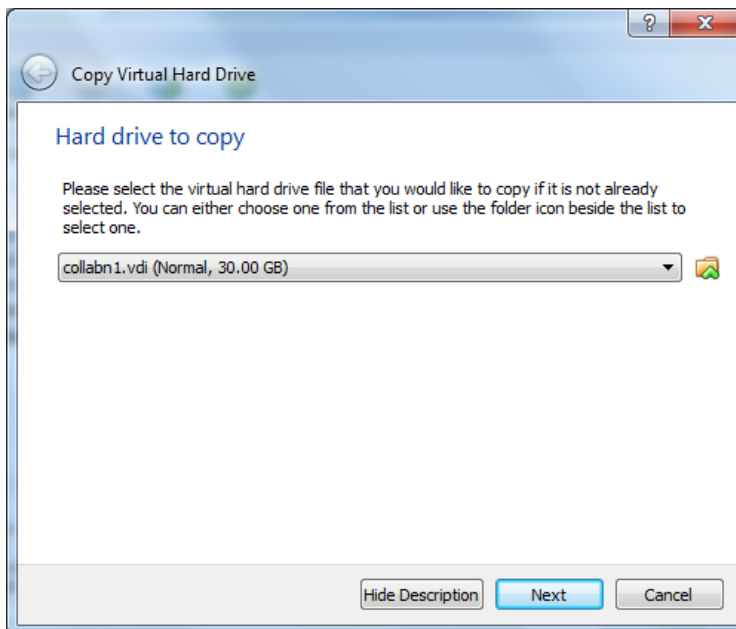
Broadcast message from root@collabn1.racattack
(/dev/pts/0) at 8:42 ...

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

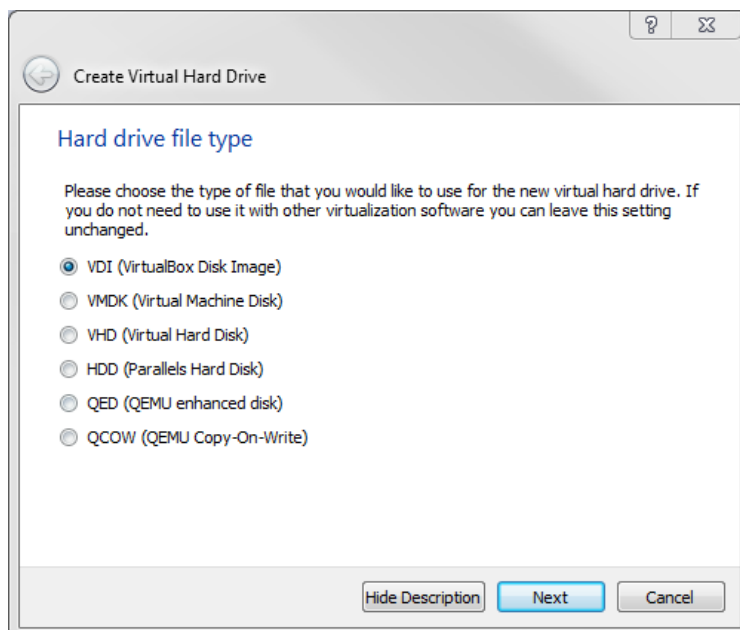
2. Clone the disk **collabn1.vdi**: from VirtualBox Manager, click **File** -> **Virtual Media Manager**.3. Right-click on the disk **collabn1.vdi** and click **Copy...**



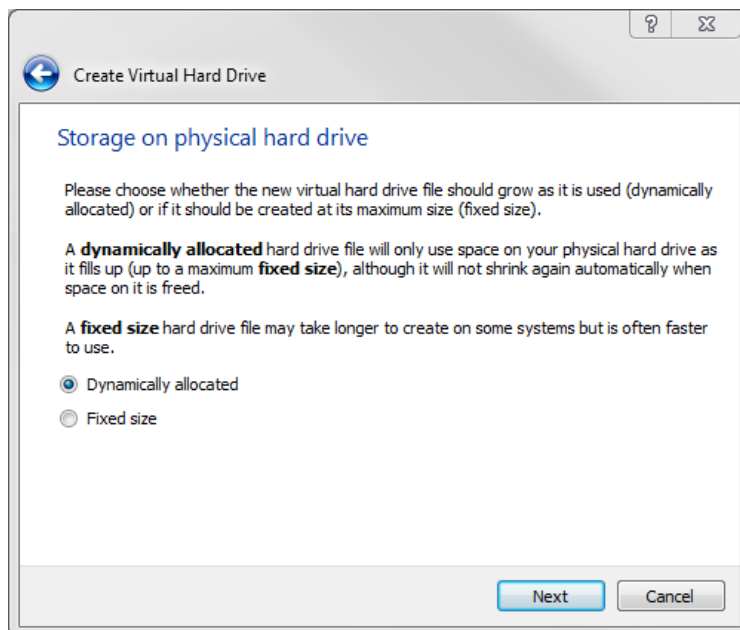
4. Leave the file collabn1.vdi, click **Next**.



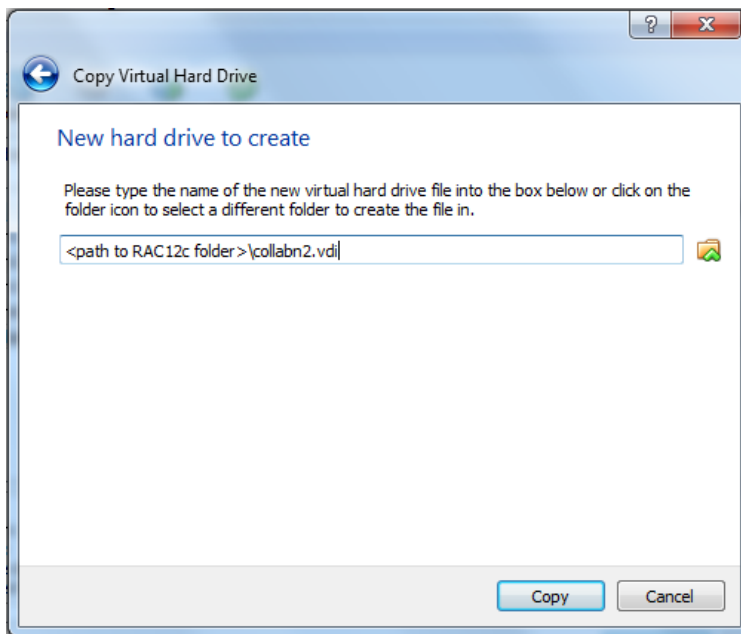
5. Leave **VDI** as file type. Click **Next**.



6. Leave **Dynamically allocated**. Click **Next**.



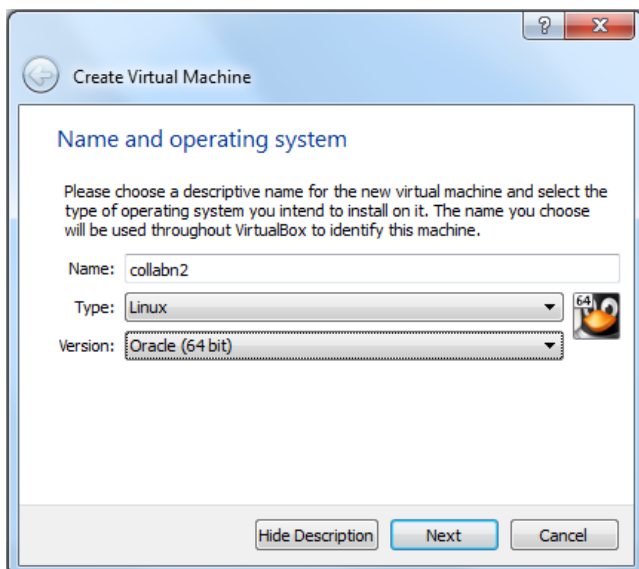
7. Type in the full path or choose through the browse icon the **Location** for the disk file to be created. Again, it's better to use the common folder **racattack12c** previously created for all the virtual disks. The file should be named **collabn2.vdi**. Click **Copy**.



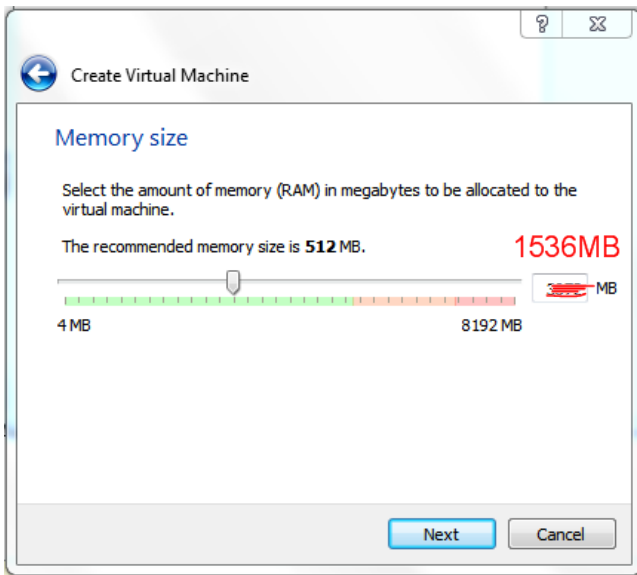
8. Click **Close** to exit from the Virtual Media Manager.

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**.



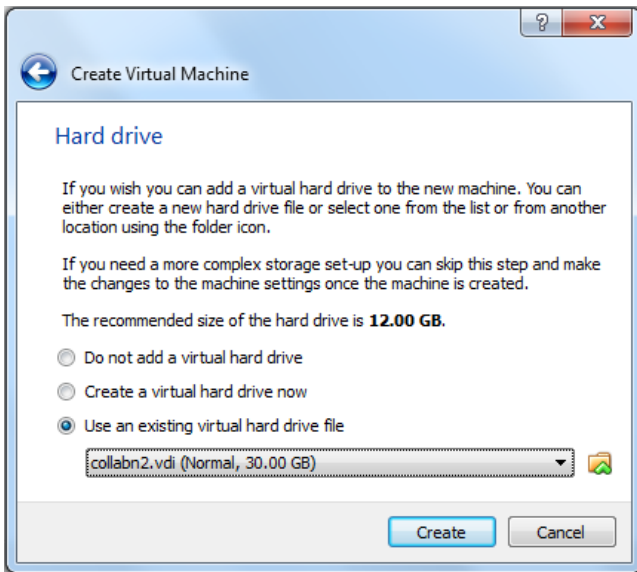
3. Type **3072** in the **Size** field and click **Next**.



If your laptop only has 8G of RAM allocate 1536MB of RAM to each VM (not 3072MB).

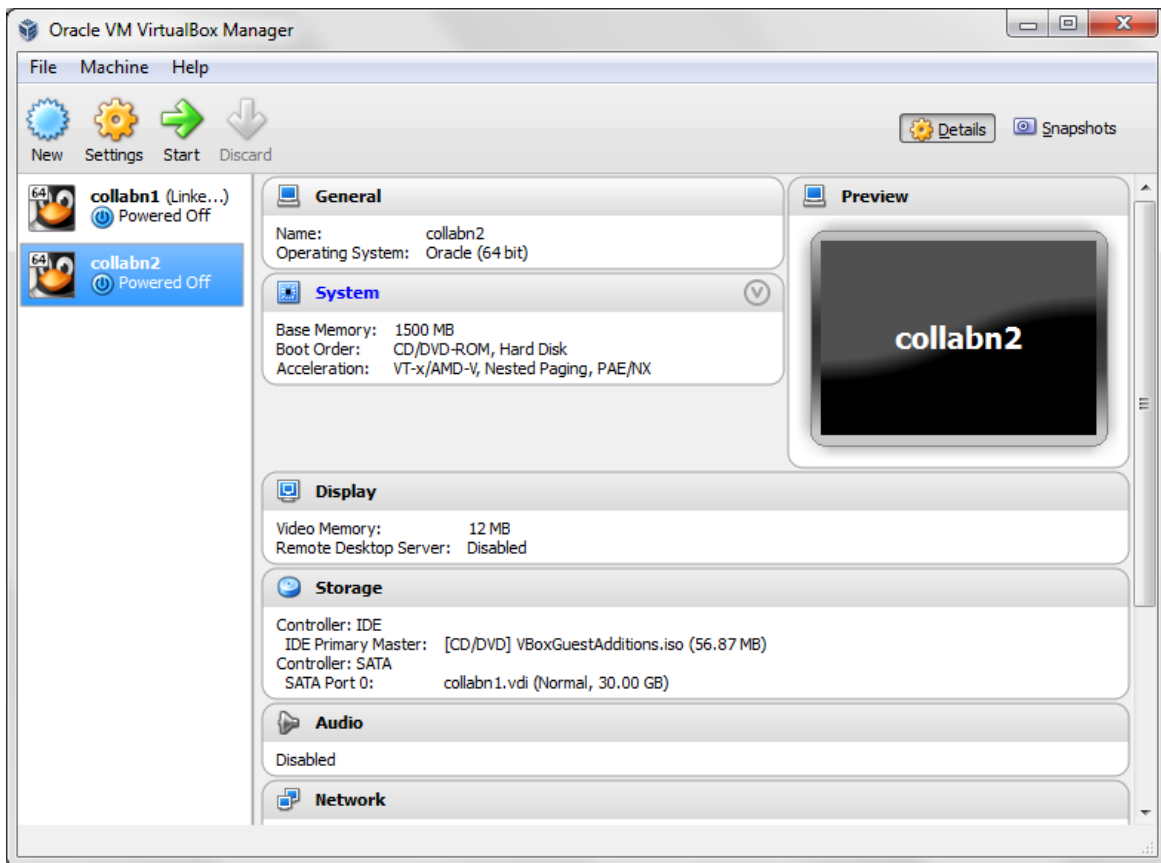
4. Select **Use an existing virtual hard drive file** and use the folder icon to locate the file **collabn2.vdi** previously created.

Click **Create** to complete the creation of the second VM.

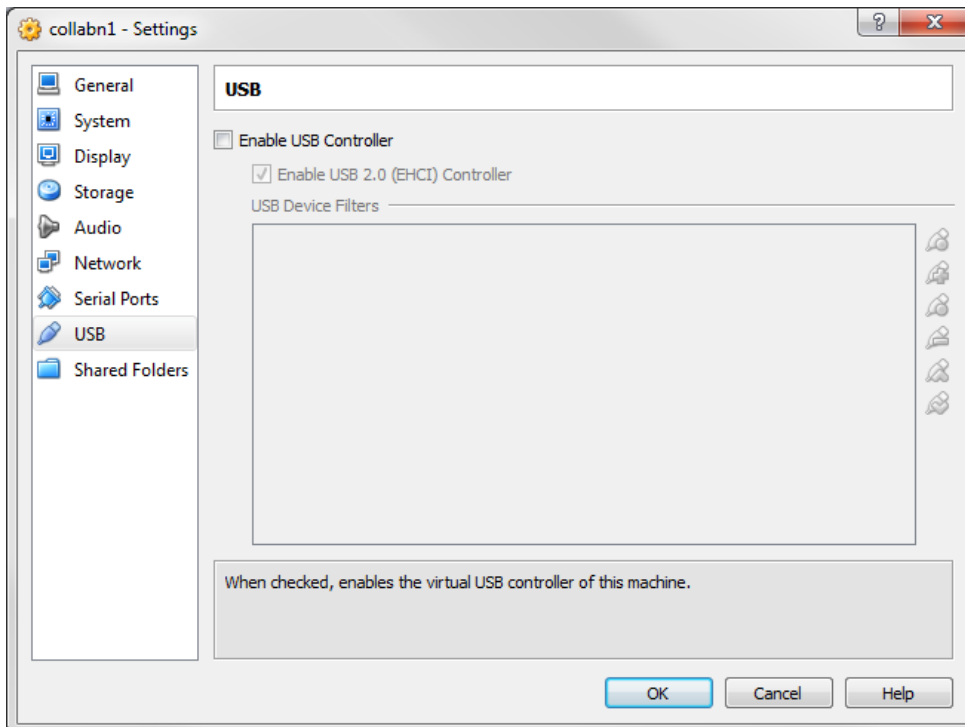


5. There are now two virtual machines; **collabn2** being a clone of **collabn1**.

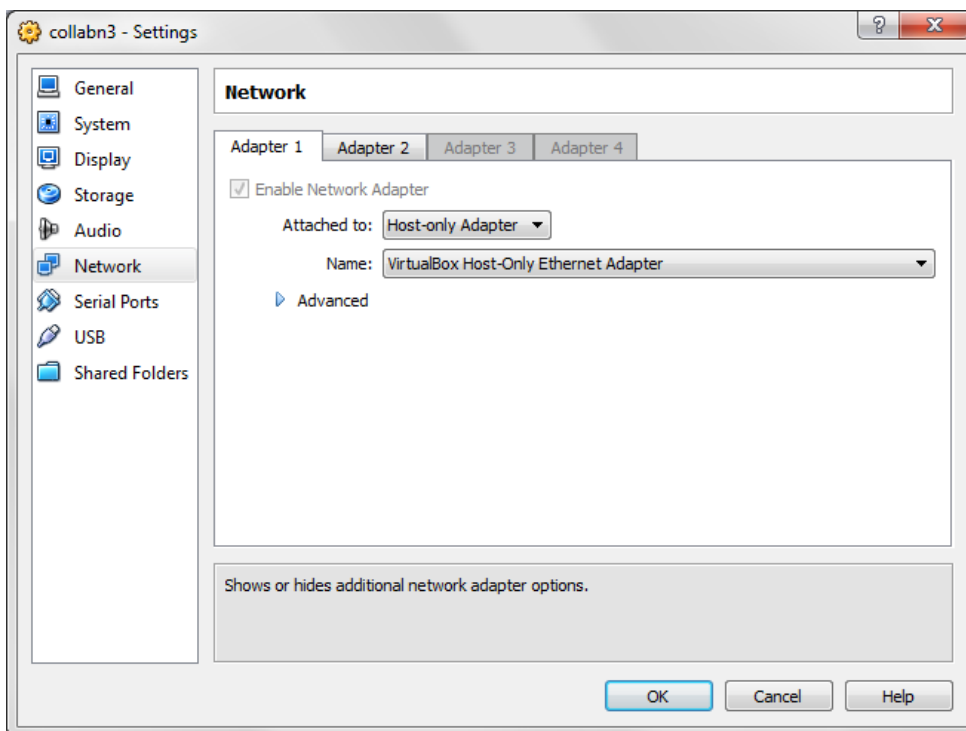
From the main screen, select the virtual machine **collabn2** and click the **Settings** icon in the upper left hand corner.



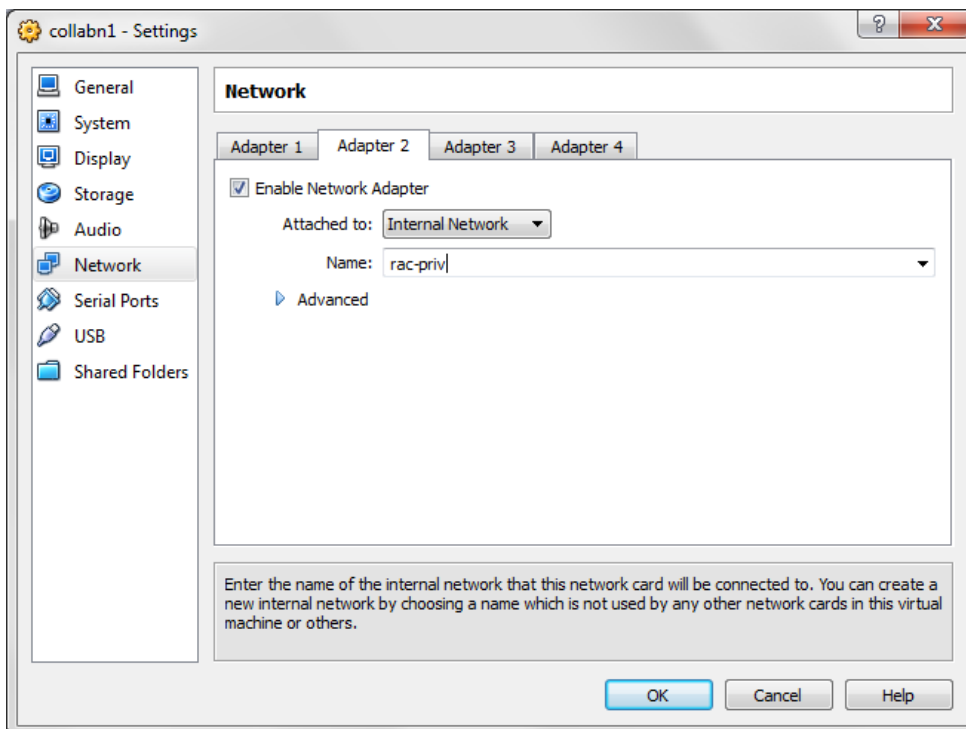
6. Open the **USB** sub-menu. Uncheck the **Enable USB Controller** check box.



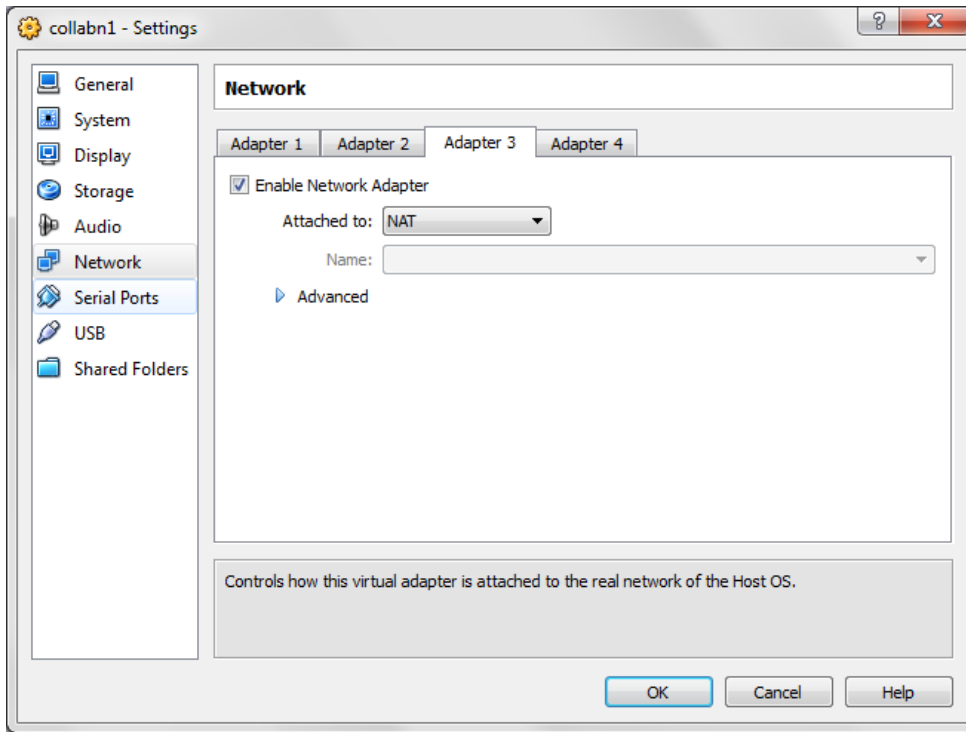
7. Open the **Network** sub-menu. Under the **Adapter 1** tab, change the **Attached to:** dropdown to **Host-only Adapter**.



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.



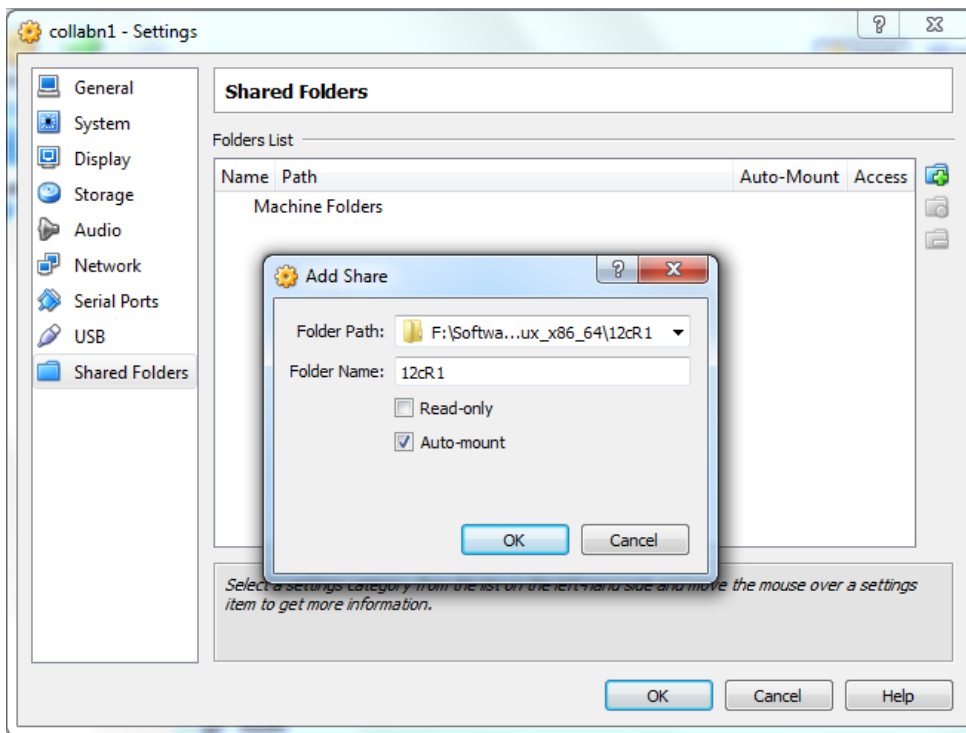
9. Choose the **Adapter 3** tab. Check the box for **Enable Network Adapter**. Change the **Attached to:** dropdown to **NAT**.



10. Select the **Shared Folders** tab. Click **Add Shared Folder**.

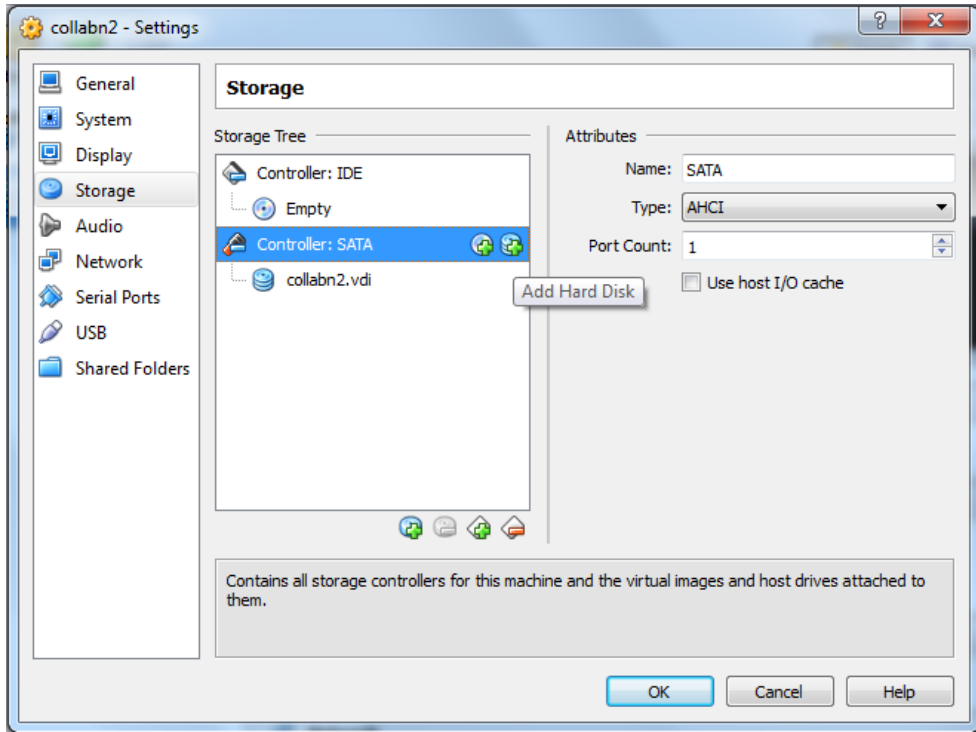
Enter the path where you've downloaded the Oracle installation media and enter a name for your folder.

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

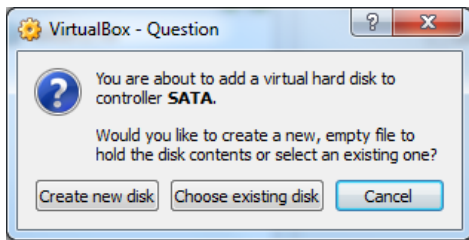


11. Open the Storage sub-menu.

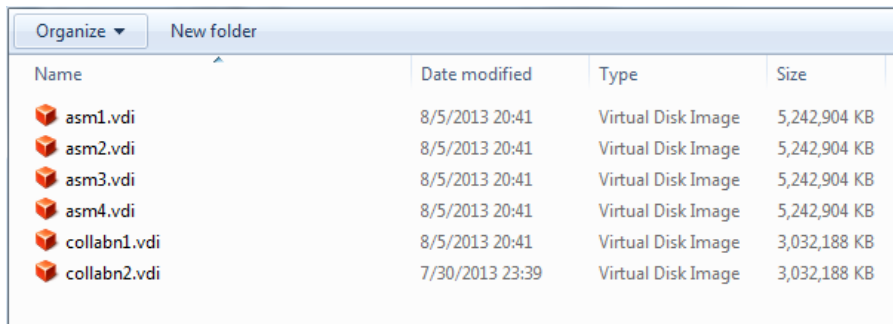
Click on **Controller SATA** and then on **Add Disk**:



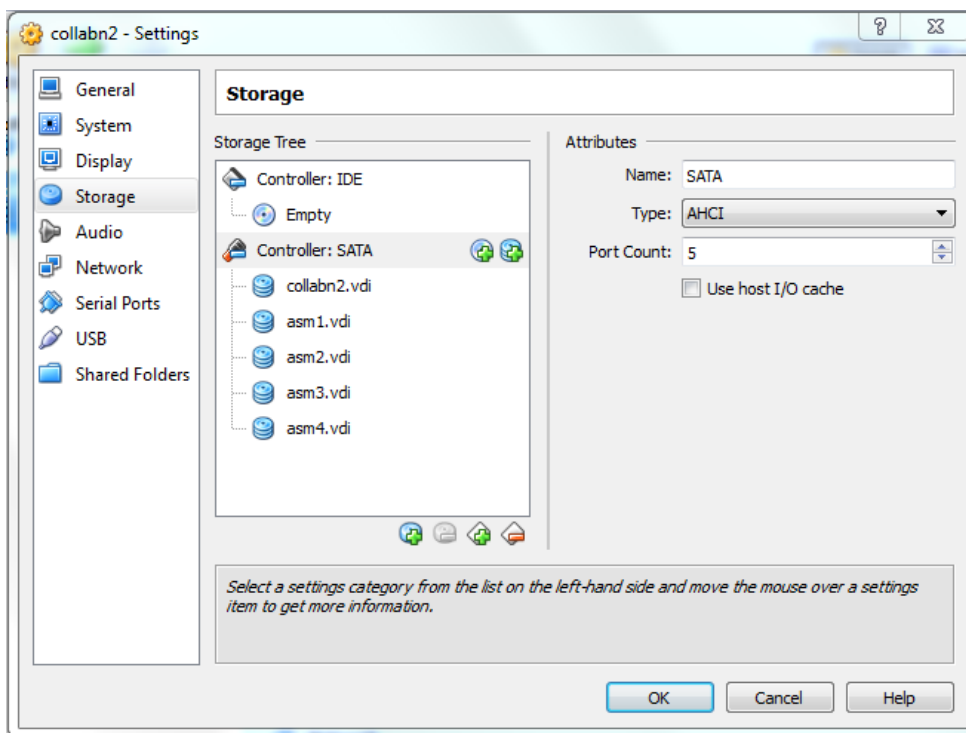
12. Click on **Choose existing disk:**



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

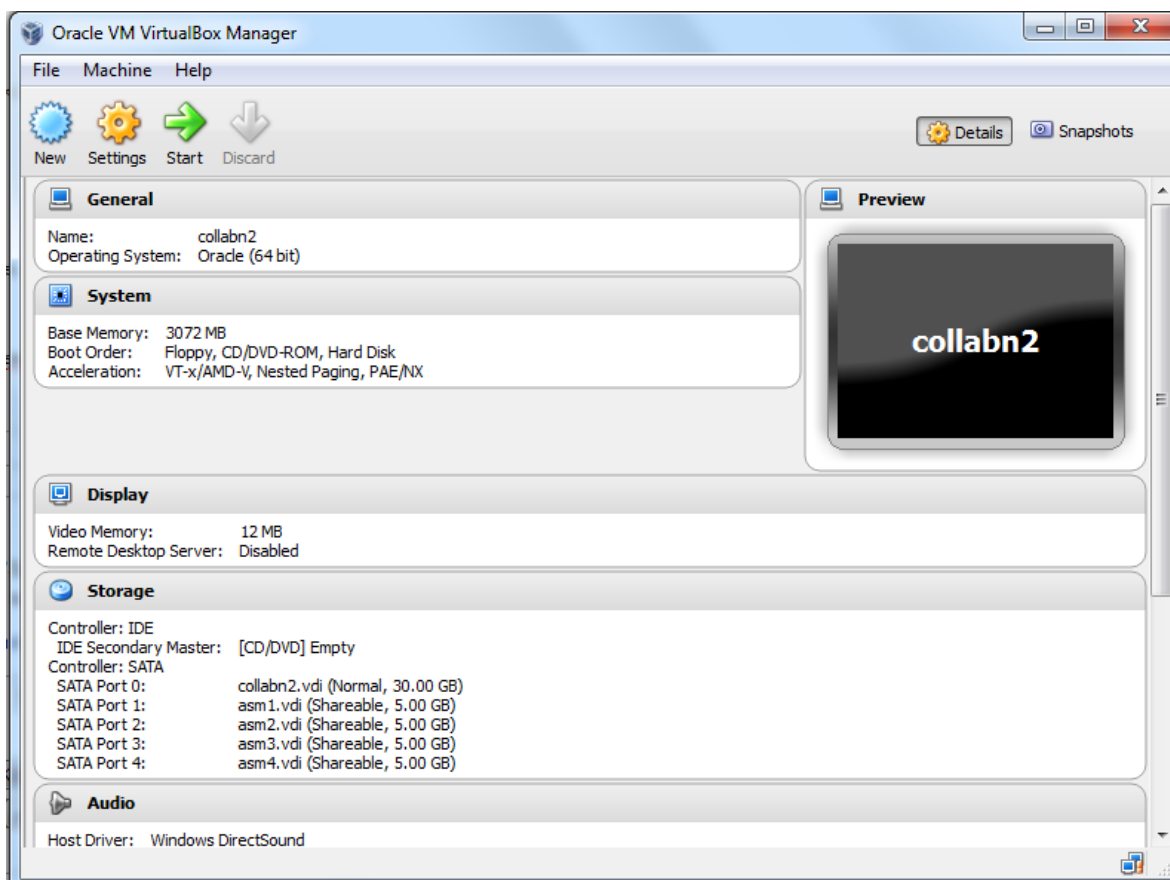


14. Repeat the operation to add all remaining asm disks.



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

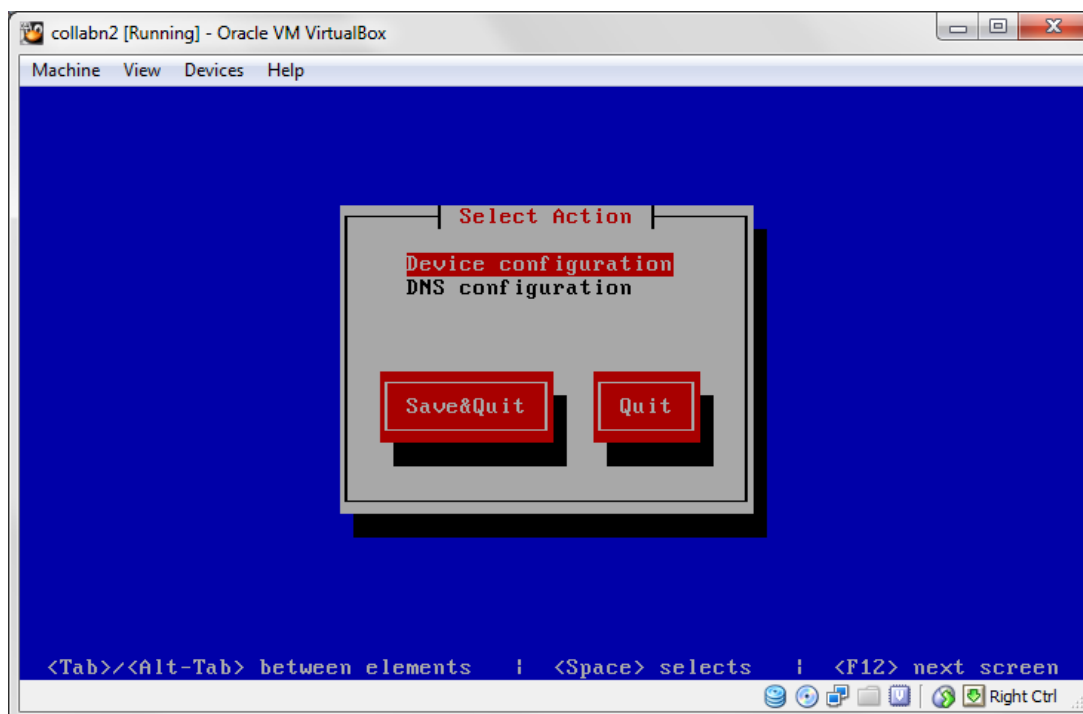
16. Review the summary of the new virtual machine.



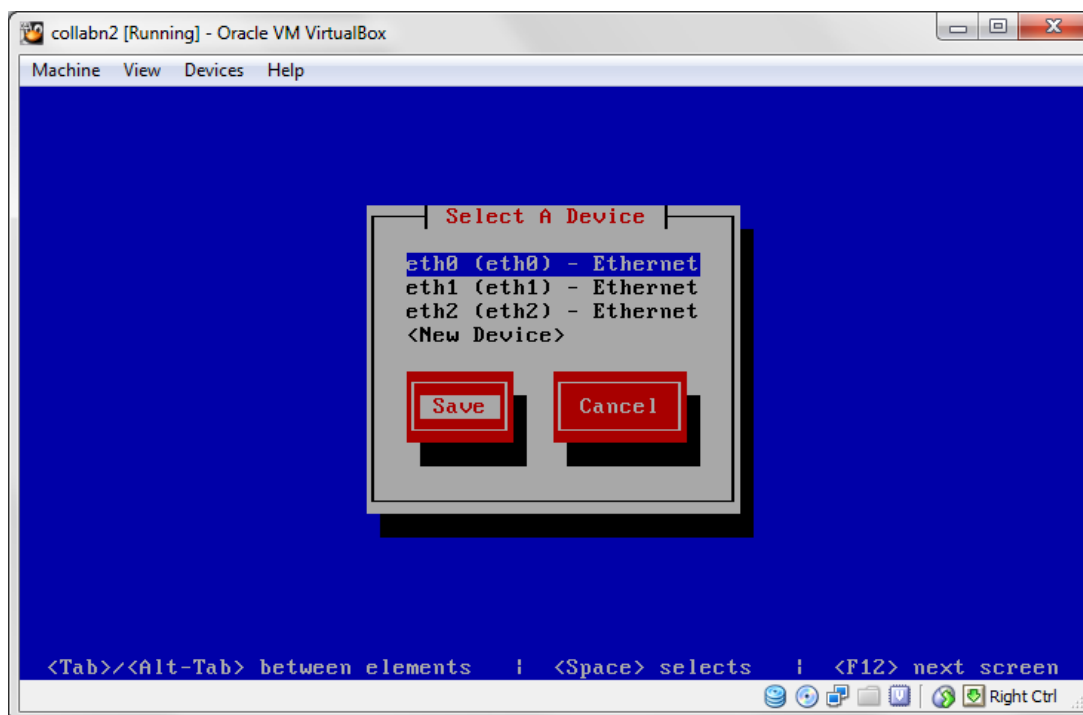
17. Start the **collabn2** VM.

Configure Second Linux VM

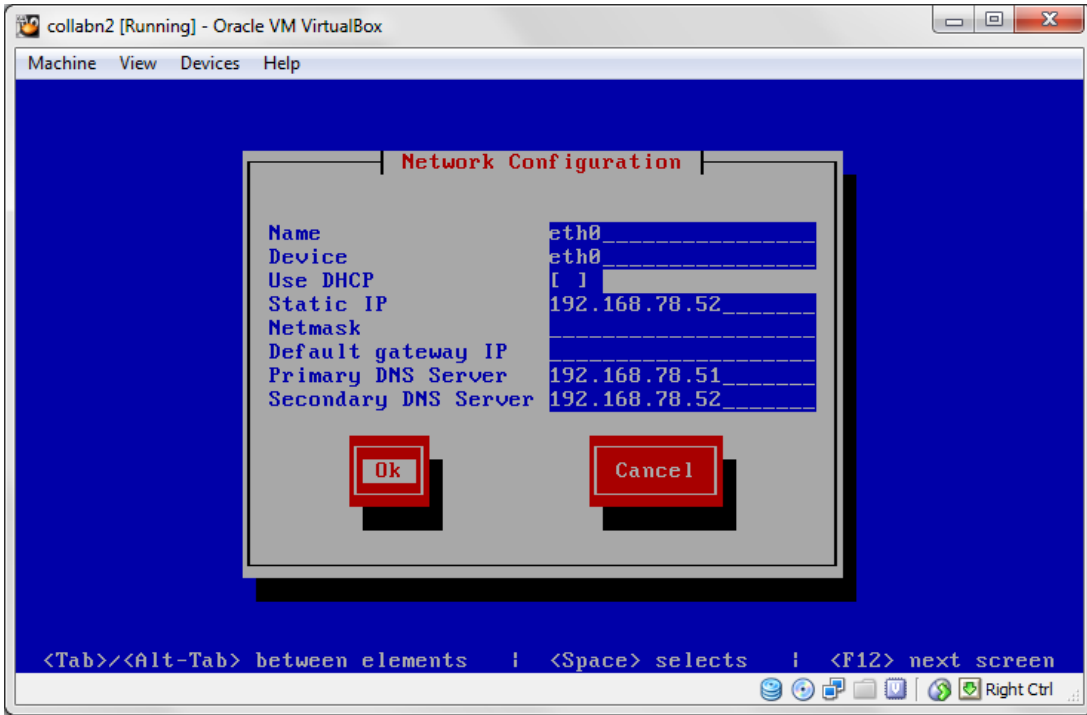
1. The network won't be available yet because we reinitialized the network adapters so the following changes will need to be done in the VM. Log in as **root/racattack**. Type the command **system-config-network**. **Device configuration** is already highlighted. Press **Enter**.



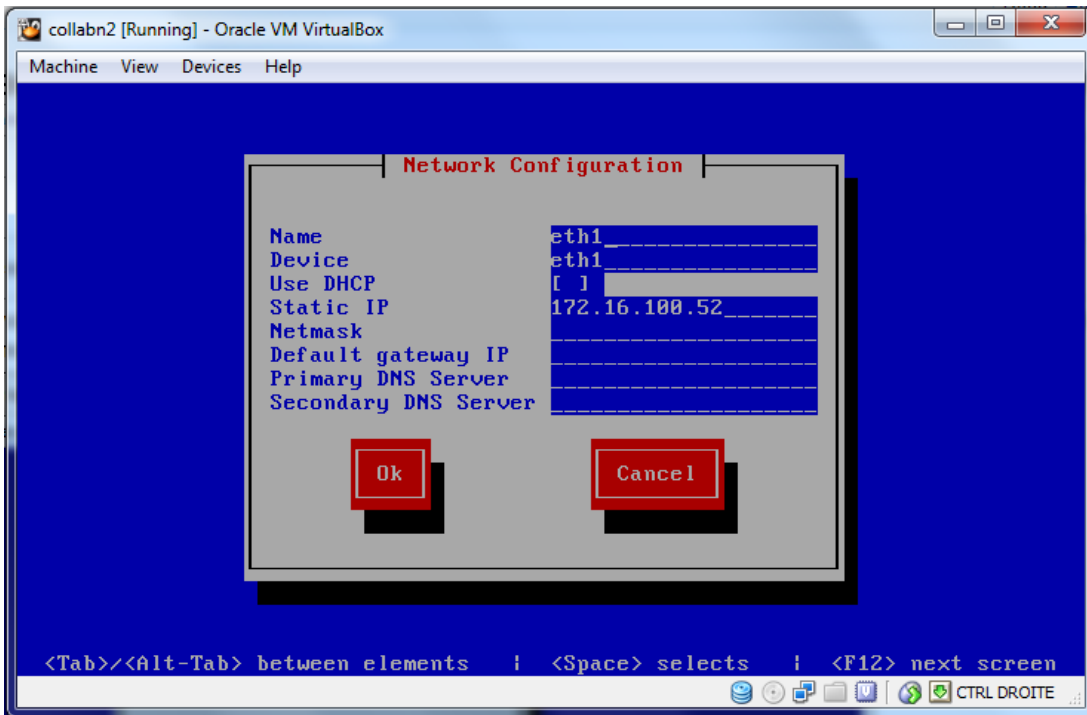
2. **eth0 (eth0) - Ethernet** is already highlighted. Press **Enter**.



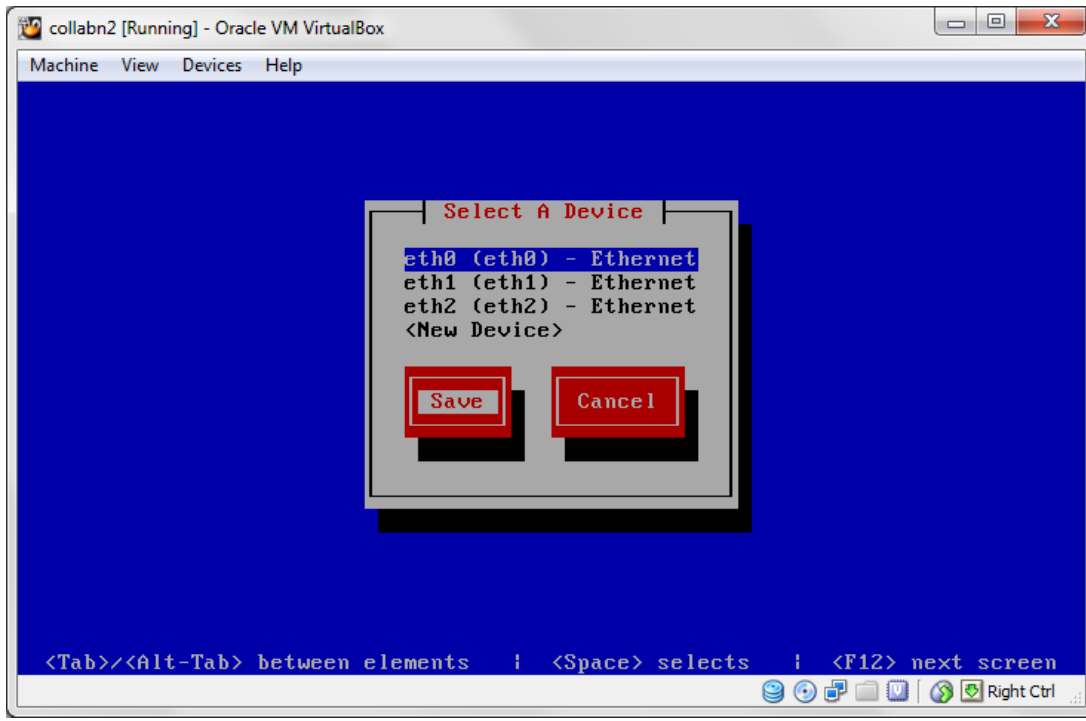
3. Go down to the **Static IP** line. Change the IP to **192.168.78.52**. Go down to **Ok** and press **Enter**.



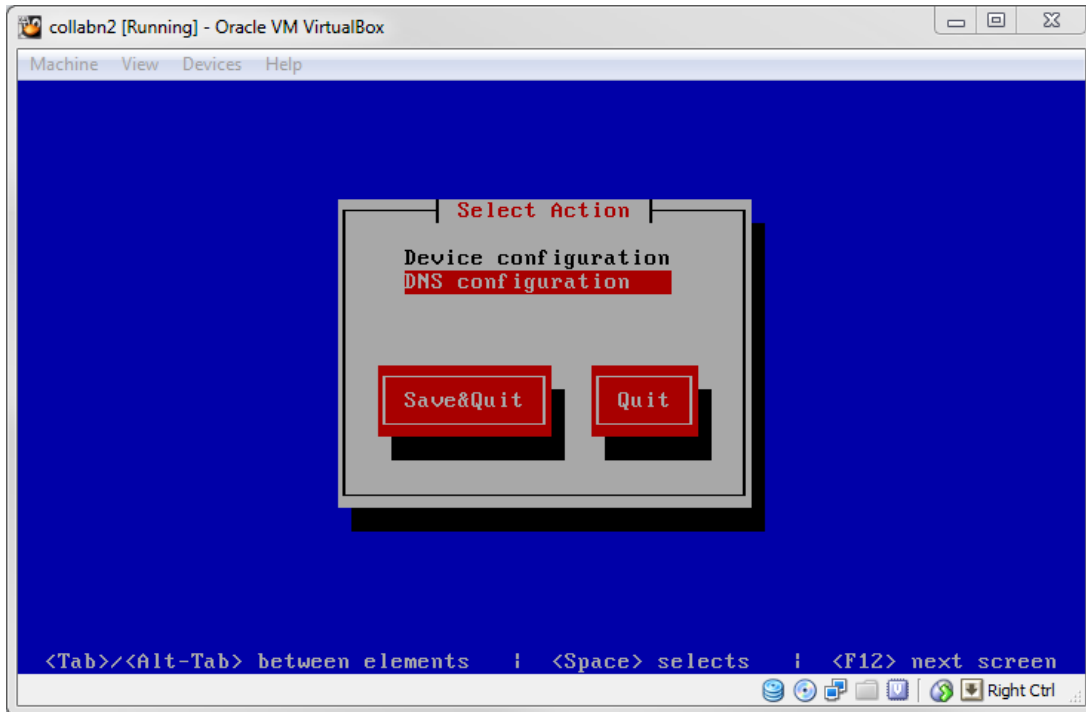
- 4. Select **eth1 (eth1) - Ethernet** and press **Enter**. Go down to the **Static IP** line. Change the IP to **172.16.100.52**. Go down to **Ok** and press **Enter**.



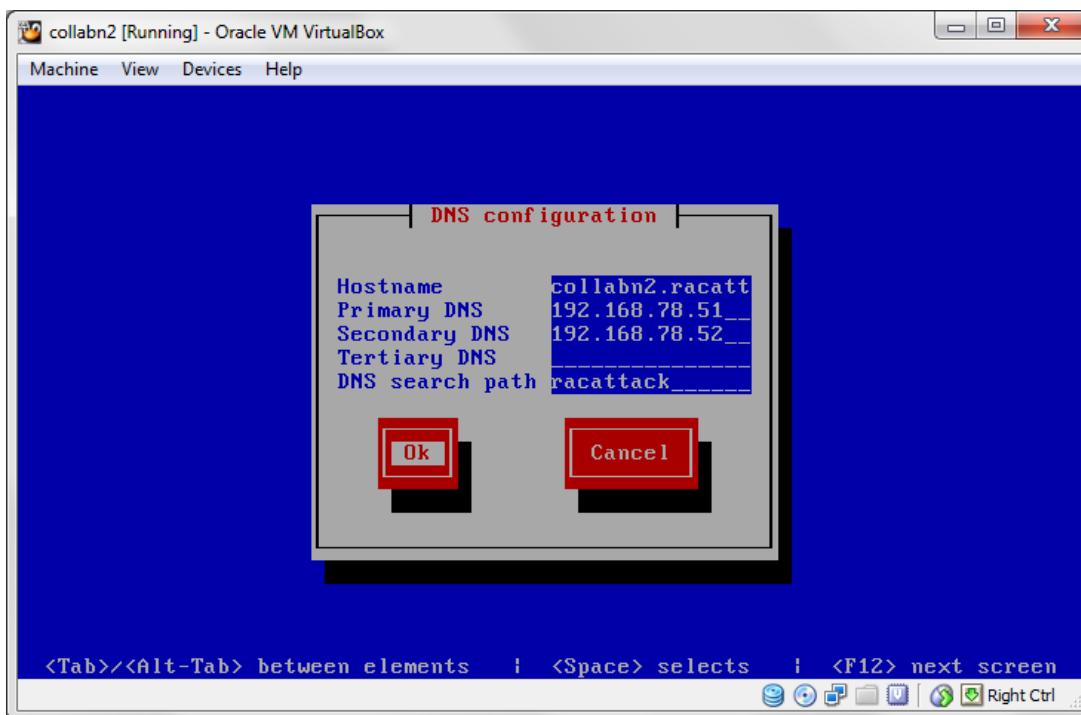
- 5. Tab down to **Save** and press **Enter**.



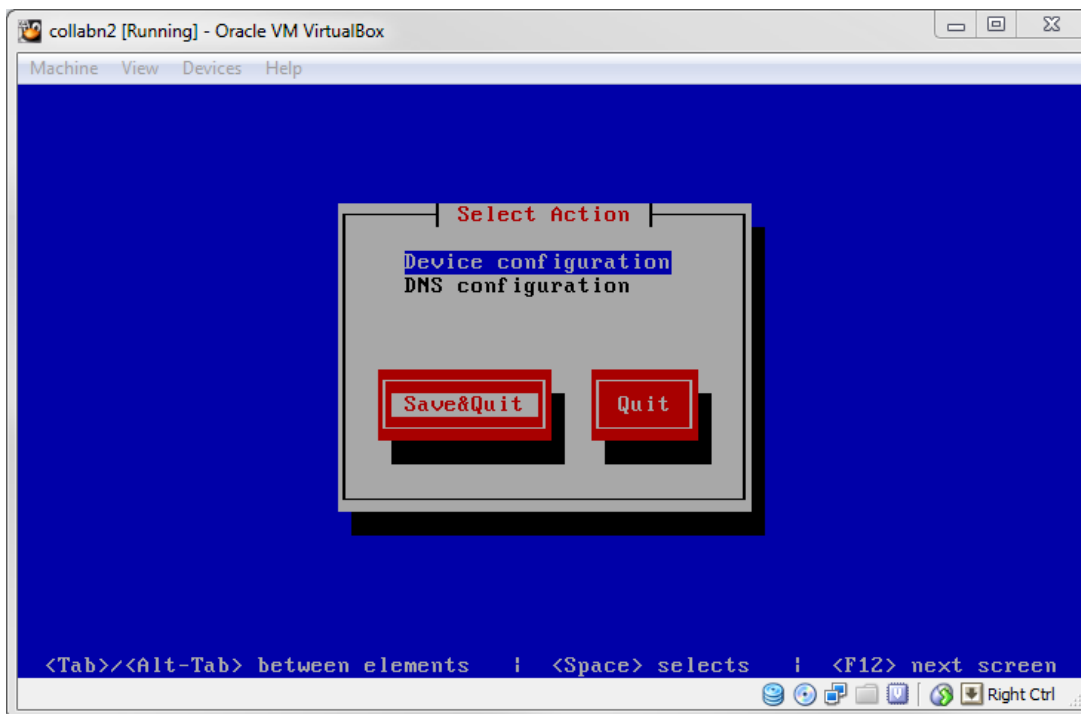
6. Arrow down to **DNS configuration** and press **Enter**.



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



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



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

```
[root@collabn2 ~]# rm -f /etc/udev/rules.d/70-persistent-net.rules
```

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

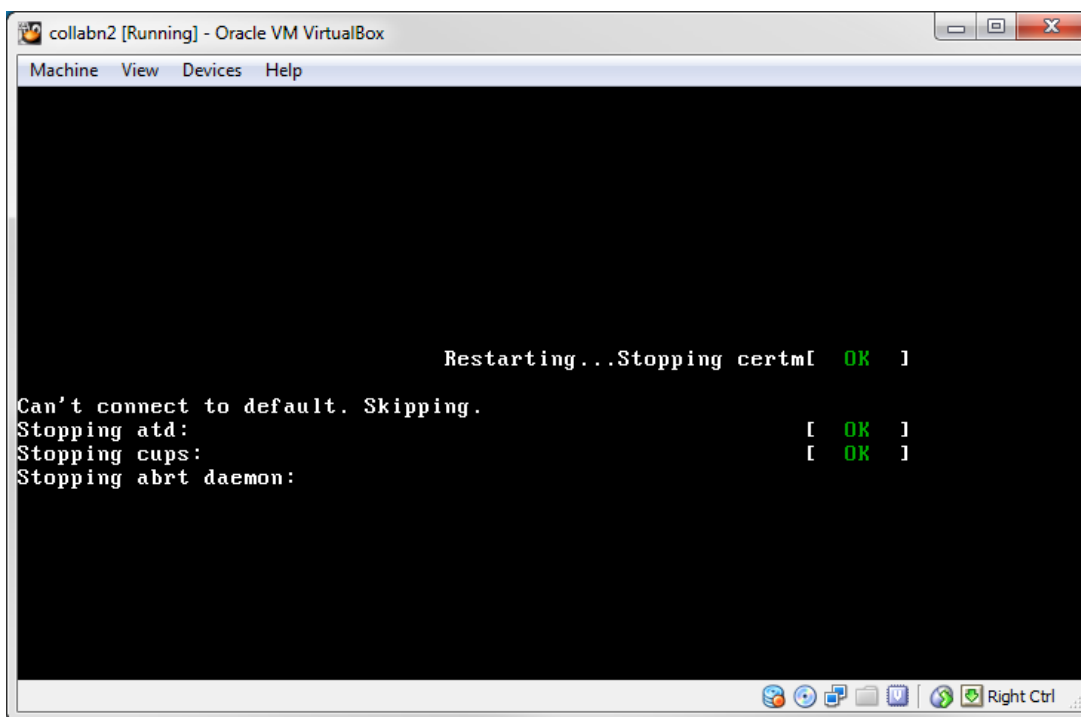
```
[root@collabn2 ~]# sed -i -e '/HWADDR/d' -e '/UUID/d' /etc/sysconfig/network-scripts/ifcfg-eth[0-2]
```

Perform the following edit

vim /etc/sysconfig/network-scripts/ifcfg-eth2 and change PEERDNS=no

11. Reboot the **collabn2** VM by typing **reboot**.

Start the **collabn1** VM as well and start Putty sessions for both.



12. Verify that all the network interfaces are up.

```
[root@collabn2 ~]# ip 1
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
```

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 -f /var/named/racattack /var/named/in-addr.arpa
```

4. Modify the file /etc/named.conf by using the following command:

```
sed -i -e 's/listen-on ./listen-on port 53 { 192.168.78.52; };/' \
-e 's/type master;/type slave;\n masters {192.168.78.51; };/' \
/etc/named.conf
```

so that at the end 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;
    masters { 192.168.78.51; };
    file "racattack";
};

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

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
```

VNC Server Setup

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

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

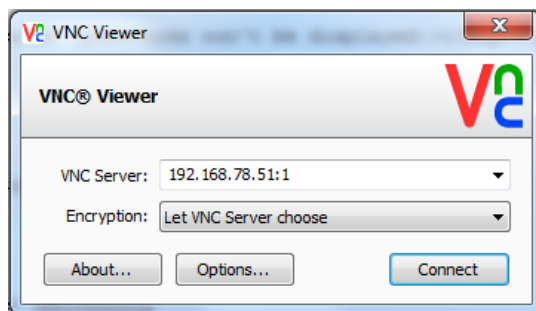
You will require a password to access your desktops.

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

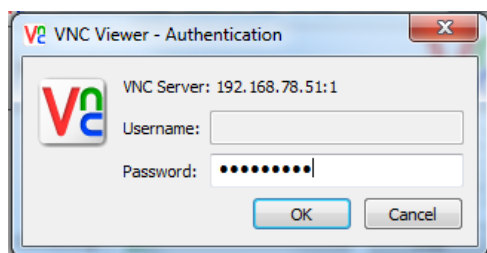
New 'collabn1.racattack:1 (oracle)' desktop is collabn1.racattack:1

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
```

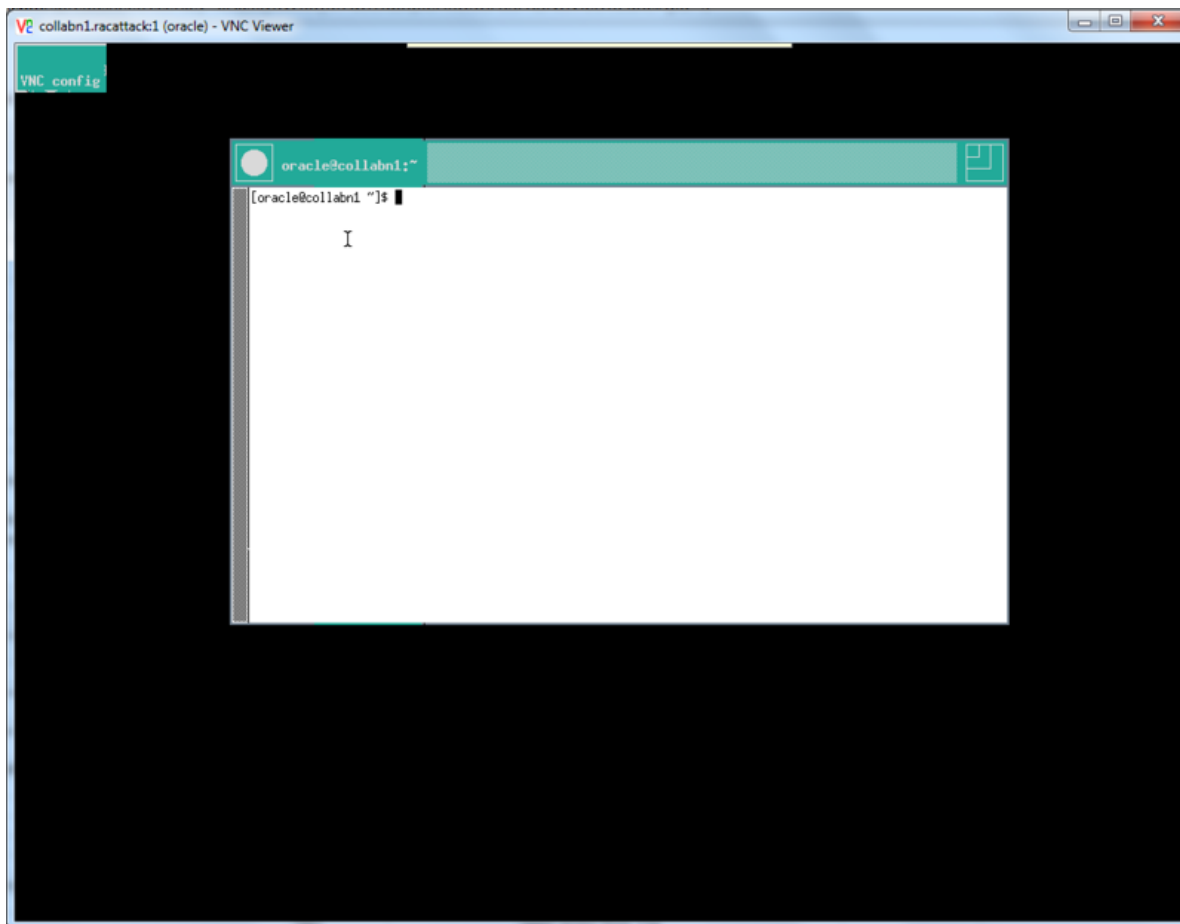
2. Open a vncviewer on your laptop and fill the ip address of **collabn1** followed by **:1**.



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



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



Install Grid Infrastructure

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. big>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 ~]#

```

Install Grid Infrastructure

1. From the VNC remote session, run the installation of **Grid Infrastructure** as **oracle**:

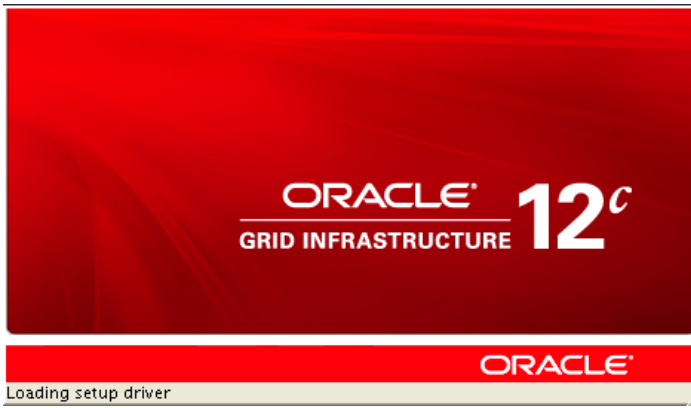
```

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

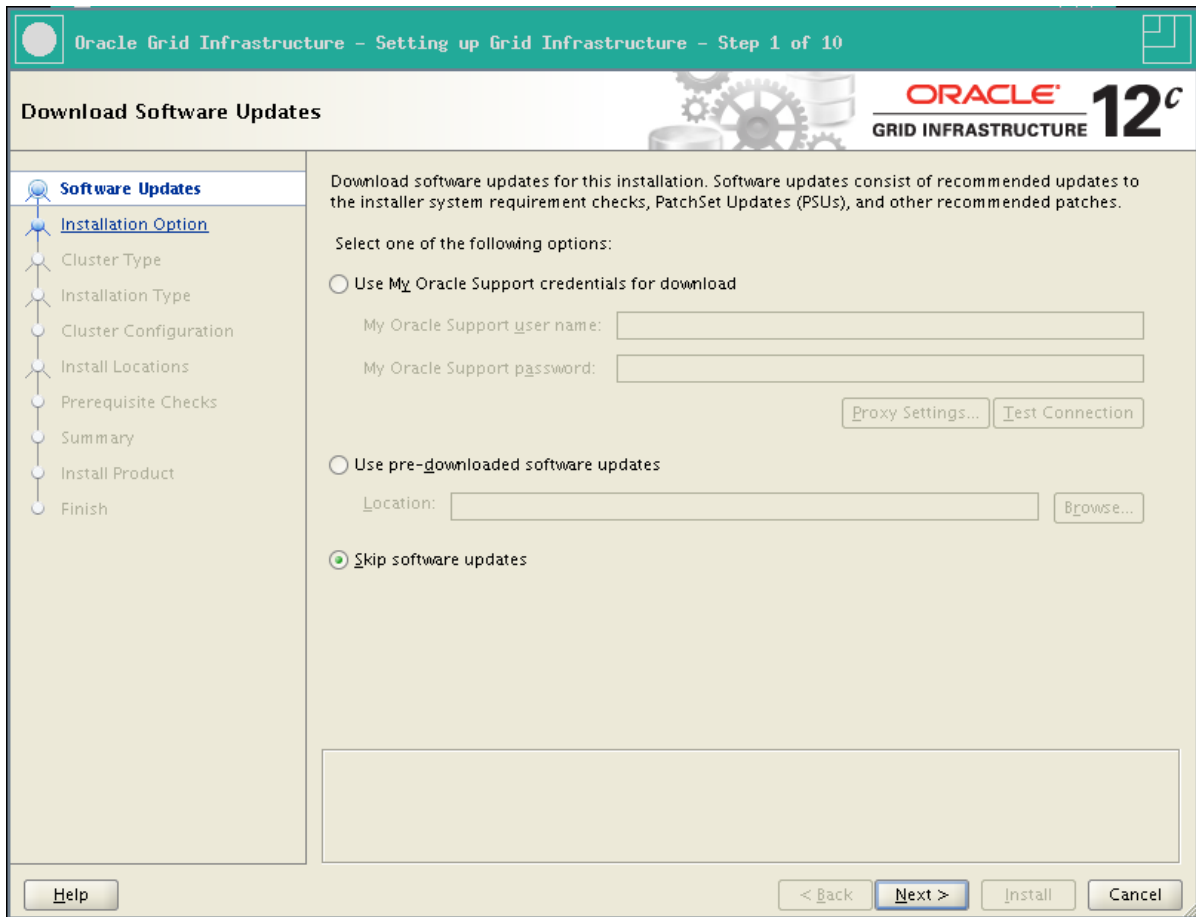
Checking Temp space: must be greater than 120 MB.   Actual 22670 MB   Passed
Checking swap space: must be greater than 150 MB.   Actual 3023 MB   Passed
Checking monitor: must be configured to display at least 256 colors.   Actual 16777216   Passed
Preparing to launch Oracle Universal Installer from /tmp/OraInstall2013-08-06_04-25-00PM. Please wait ...[oracle@collabn1 ~]$
[oracle@collabn1 ~]$

```

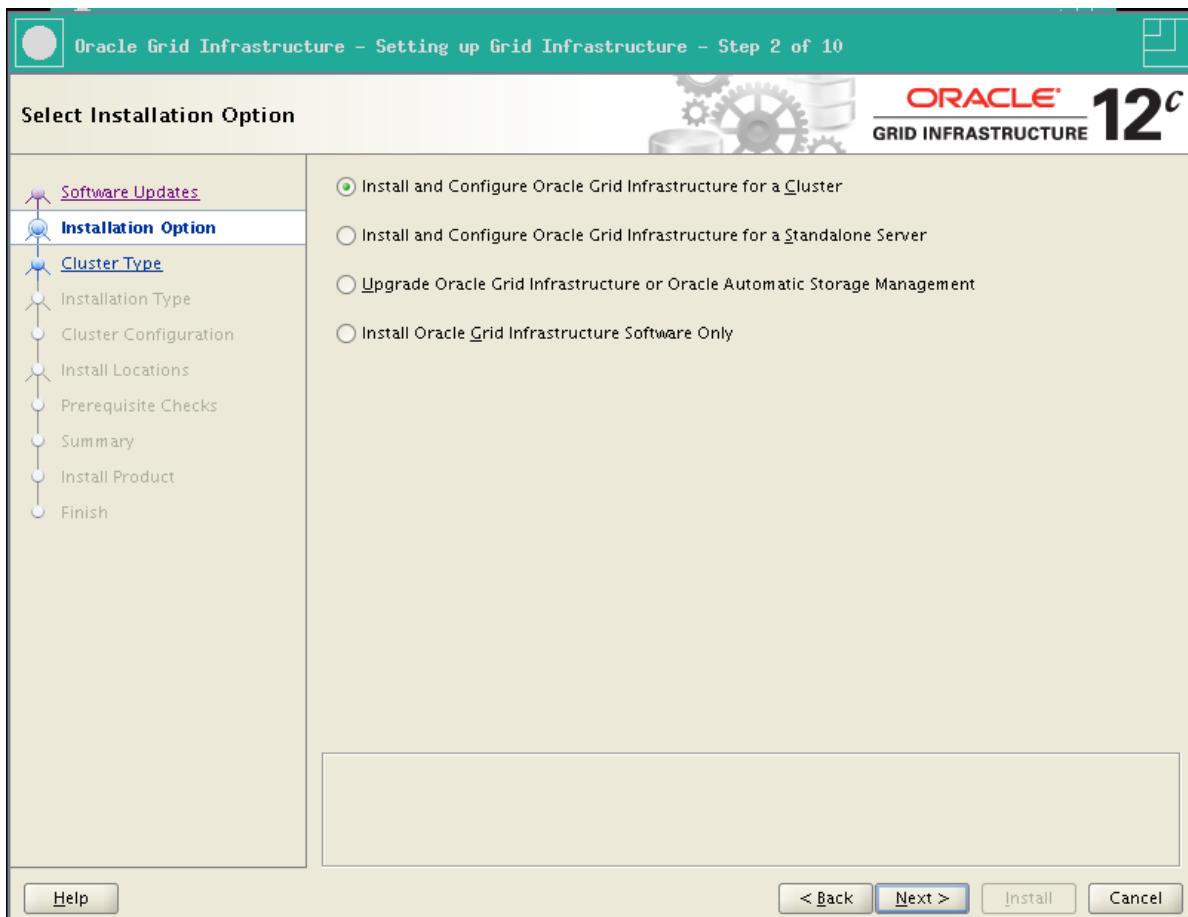
2. The Installation starts displaying a Splash Screen:



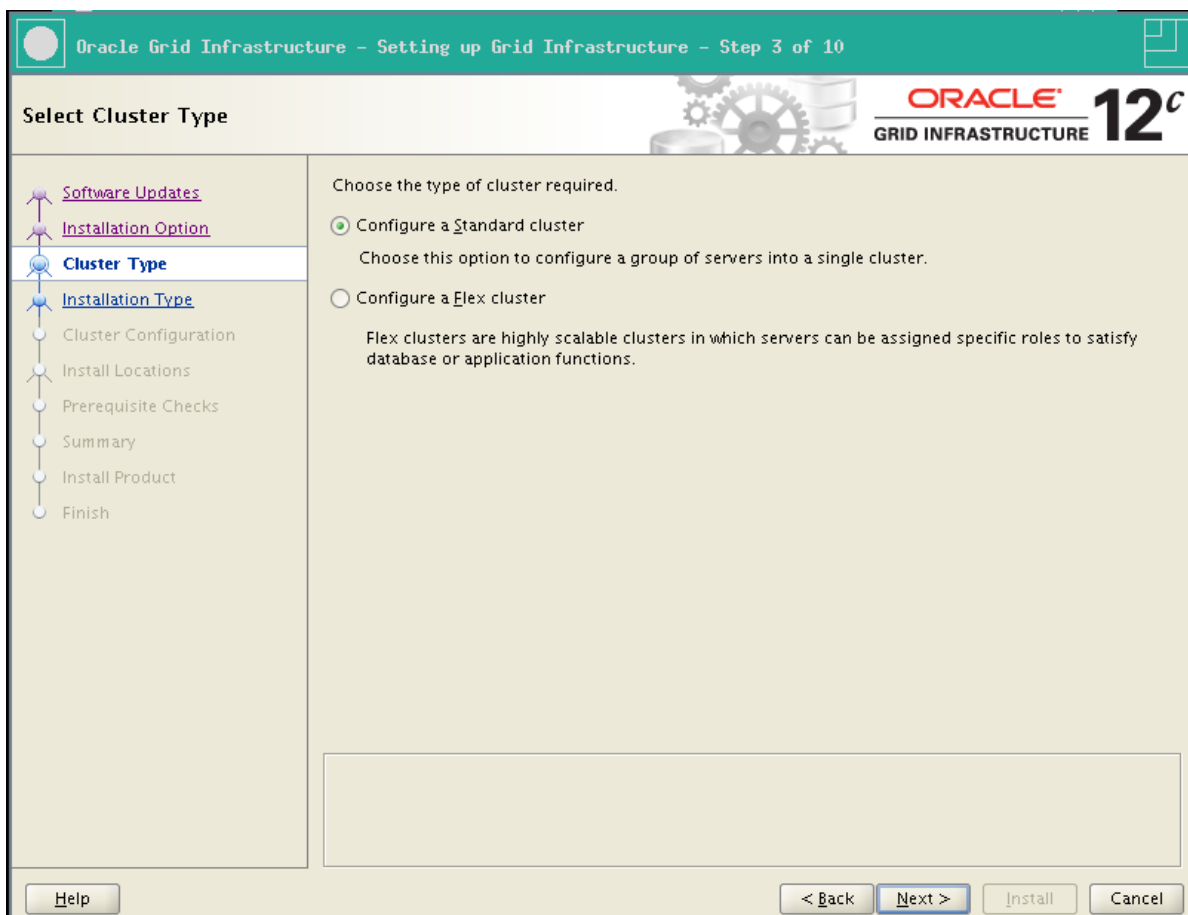
3. Leave **Skip software updates** and click **Next**:



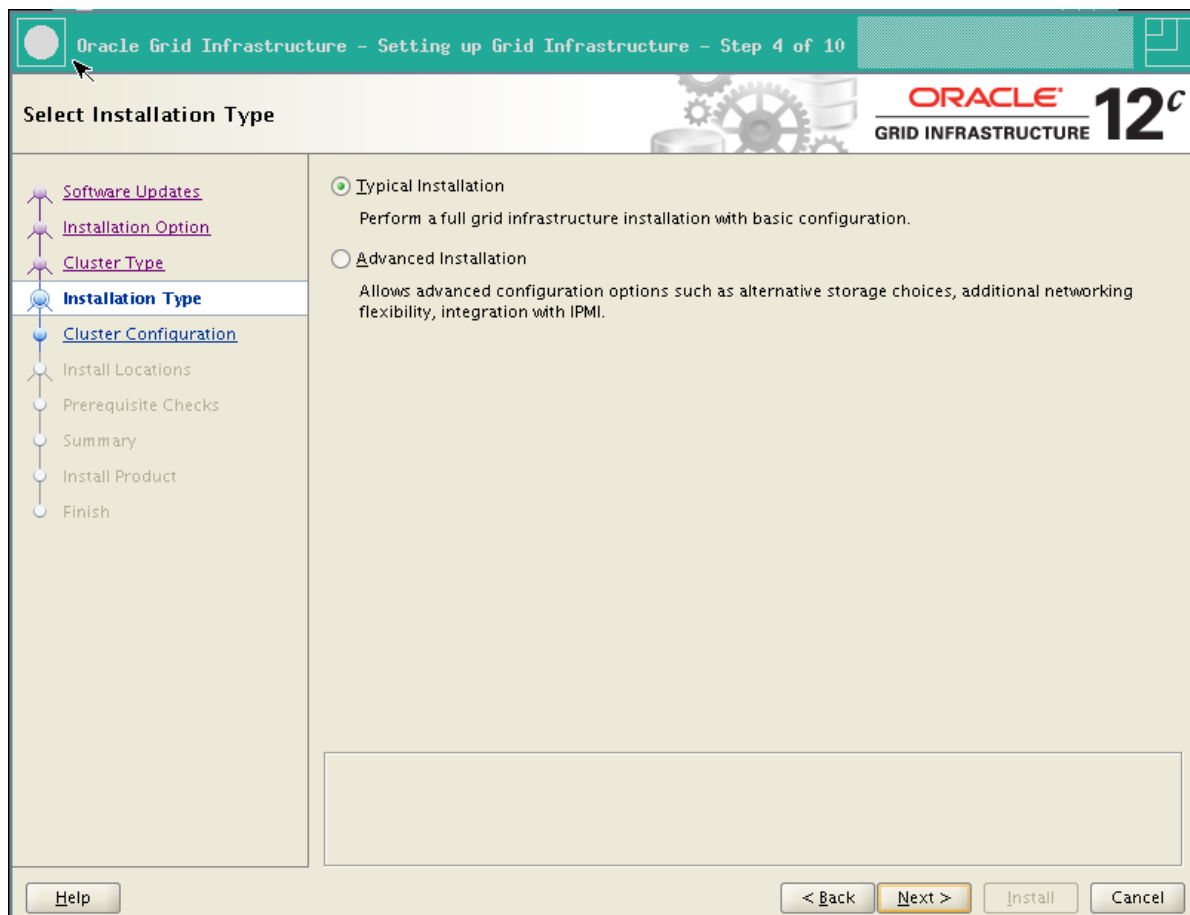
4. Leave **Install and Configure Oracle Grid Infrastructure for a Cluster** and click **Next**:



5. Leave **Configure a Standard Cluster** and click **Next**:



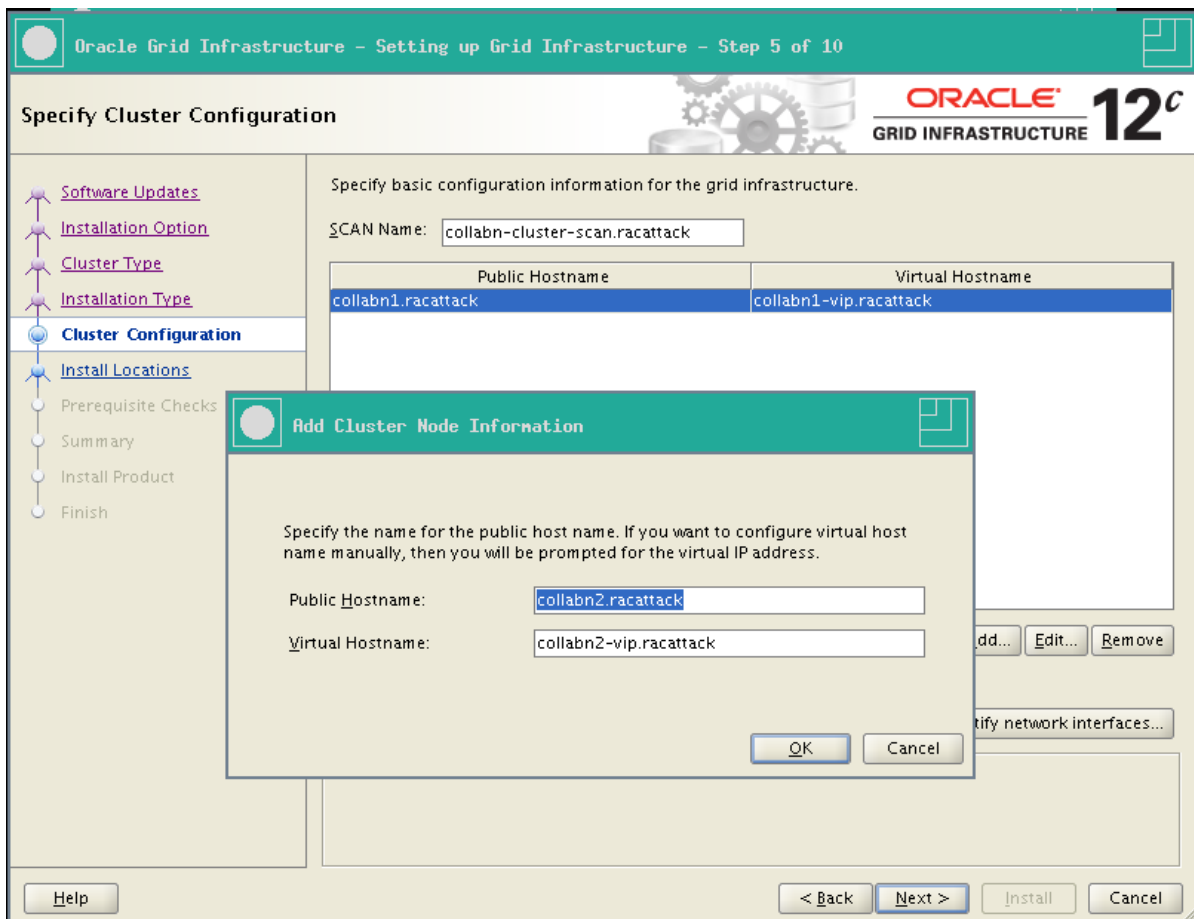
6. Leave **Typical Installation** and click **Next**:



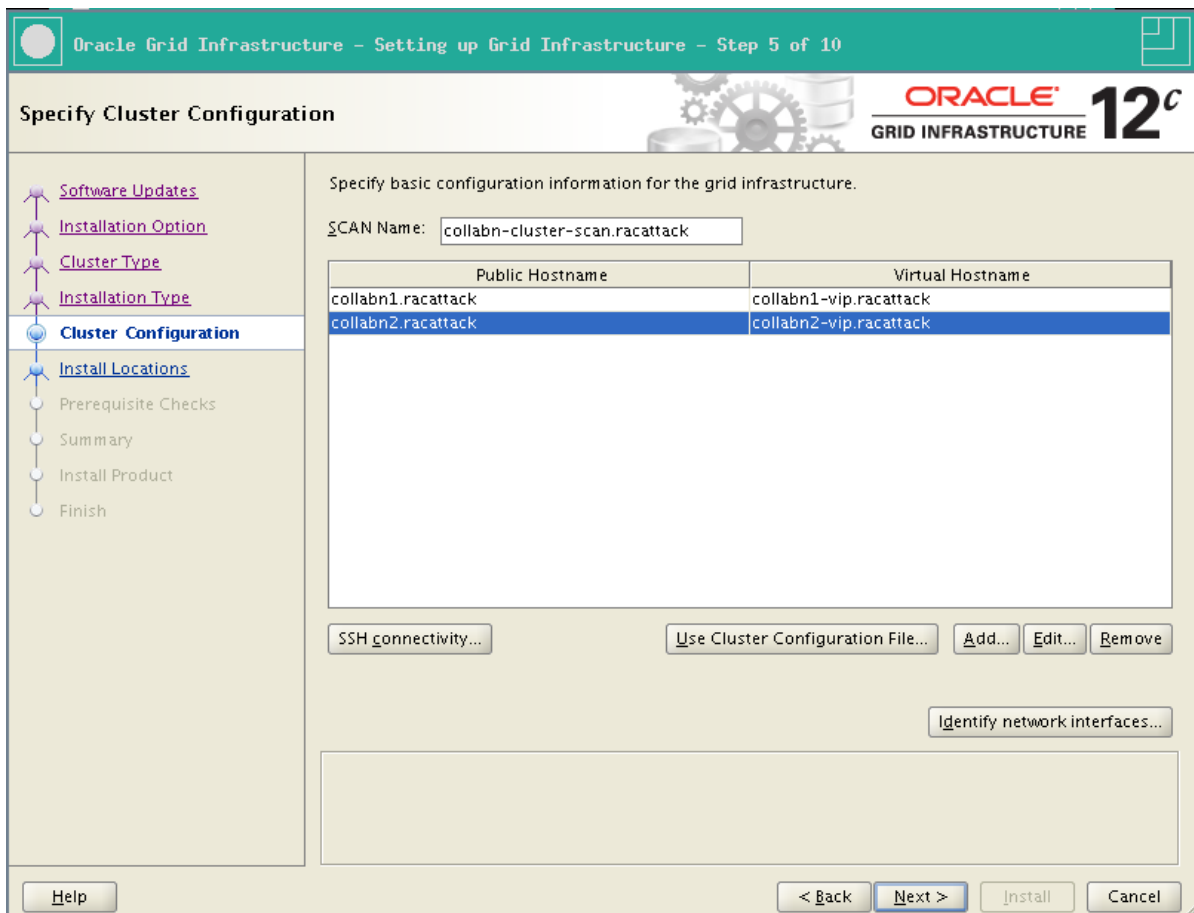
7. In the **SCAN Name** box, enter **collabn-cluster-scan.racattack**

In the central box, only the first node is displayed. Click **Add...** and enter the network names of the second node:

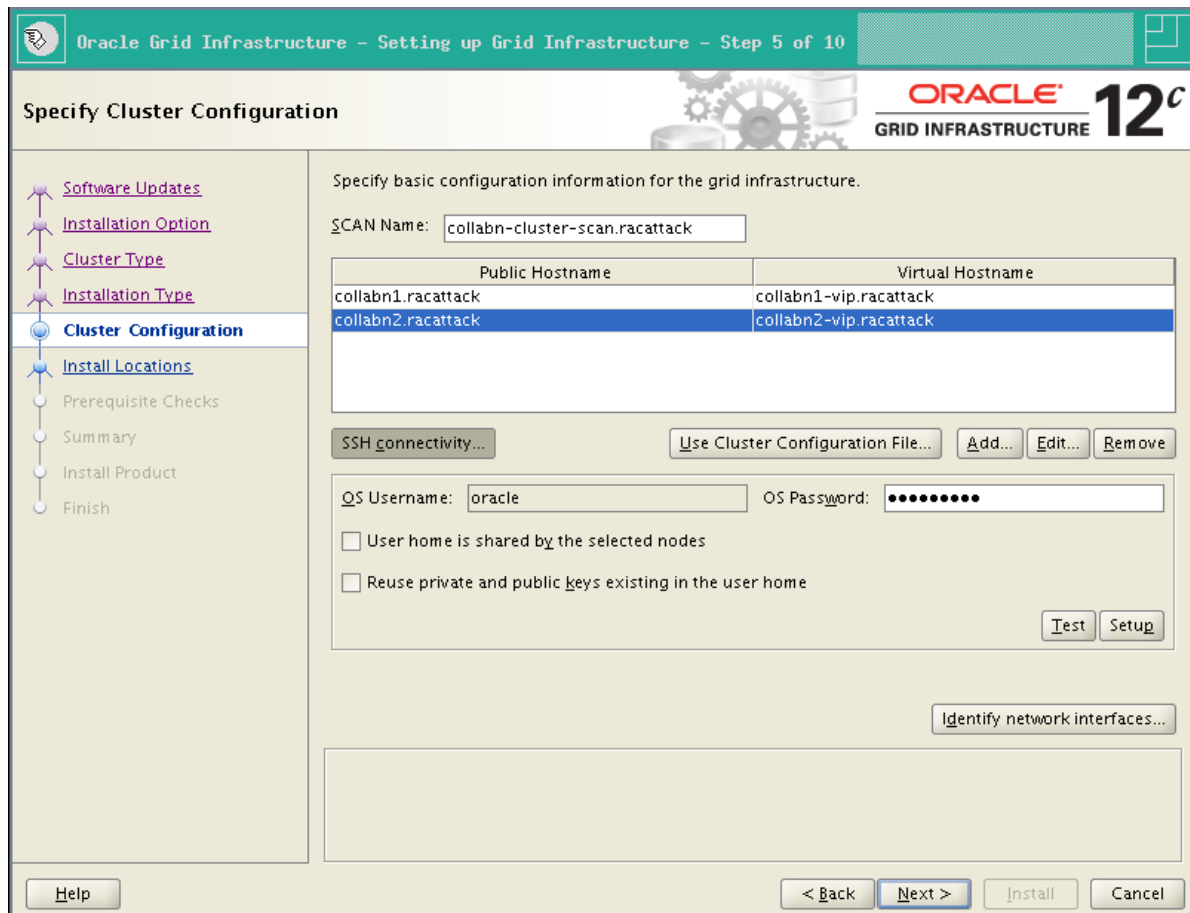
- Public Hostname: **collabn2.racattack**
- Virtual Hostname: **collabn2-vip.racattack**



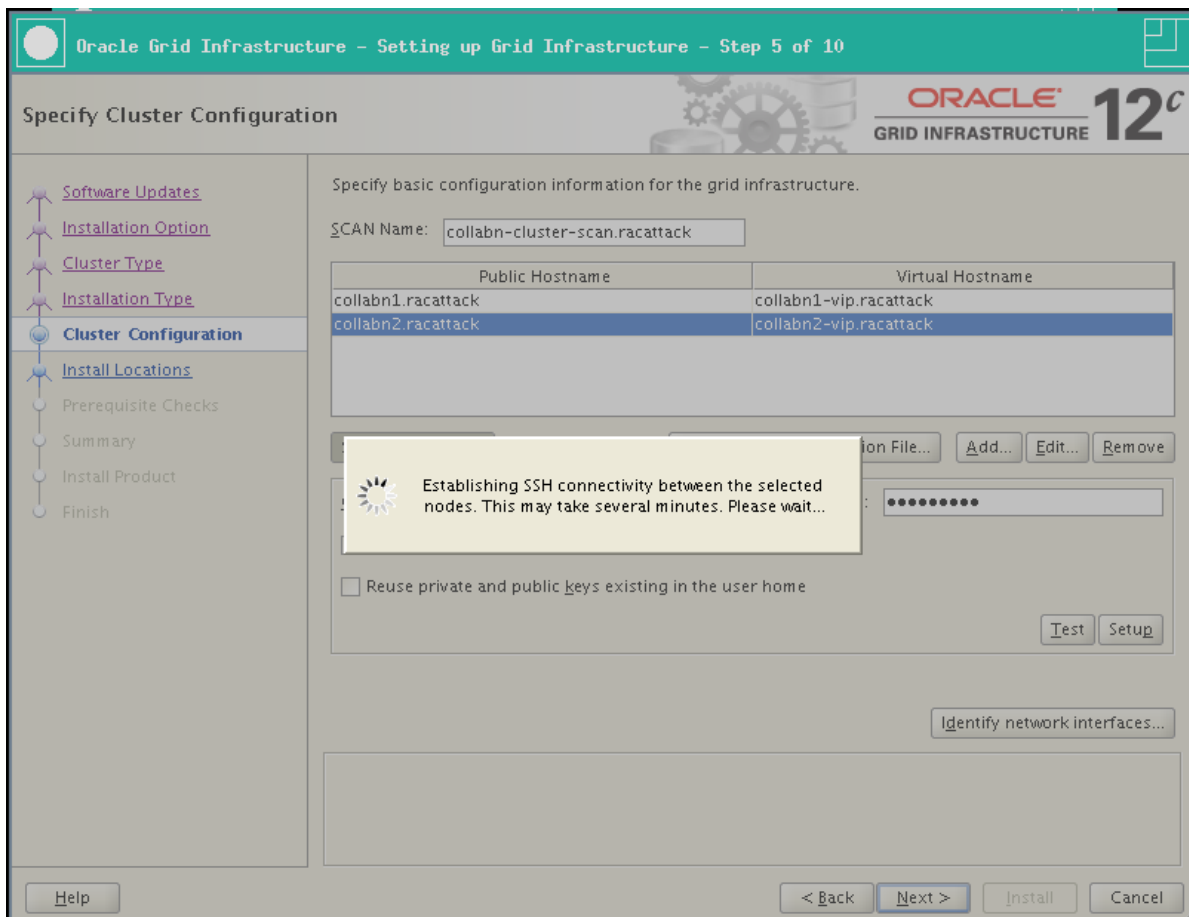
8. Click SSH connectivity...



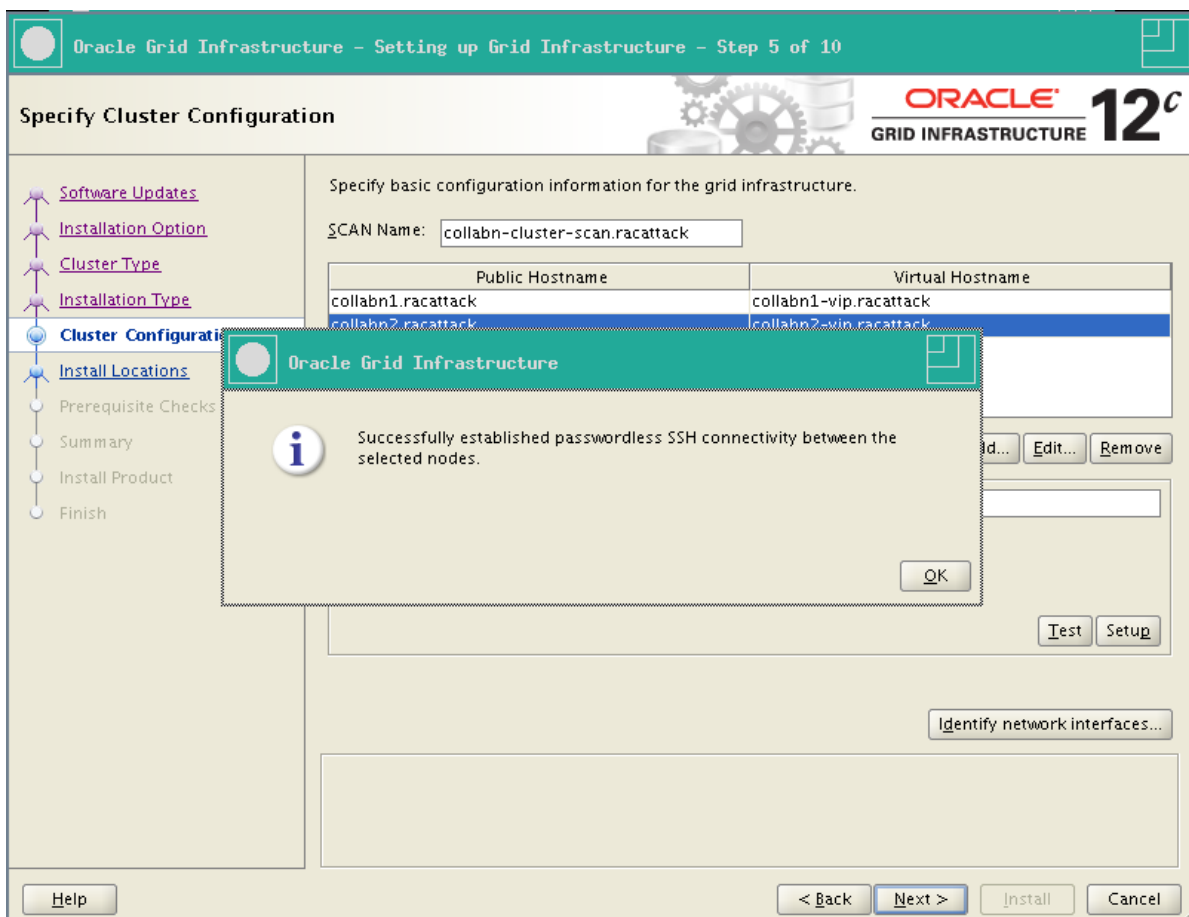
9. Enter **racattack** as the password of oracle user and click **Setup**.



10. The setup of SSH equivalency is initiated.



11. Click **OK** when it's completed.



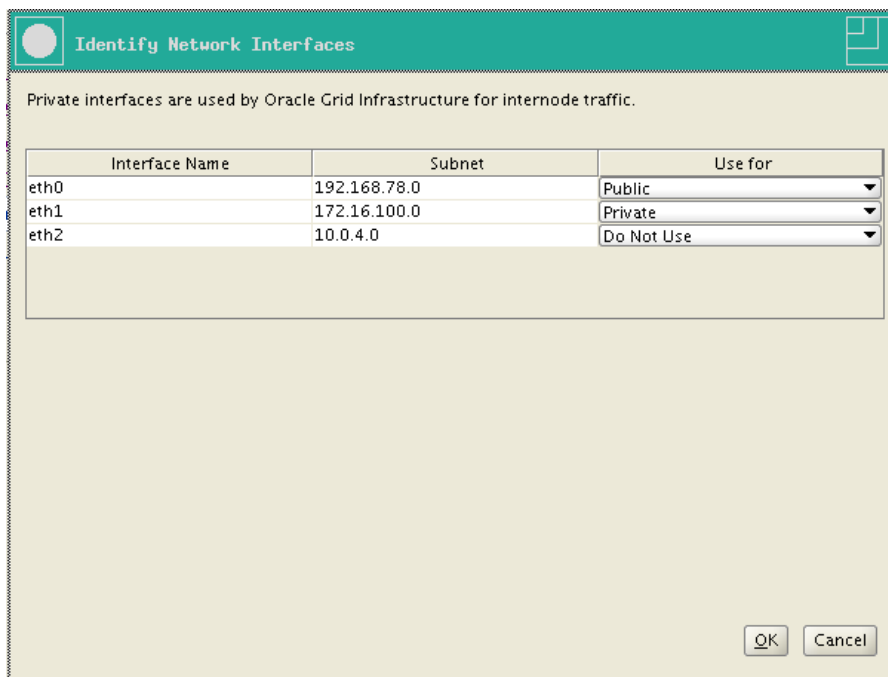
12. Click on **Identify Network Interfaces...**

Check that the correct addresses are set:

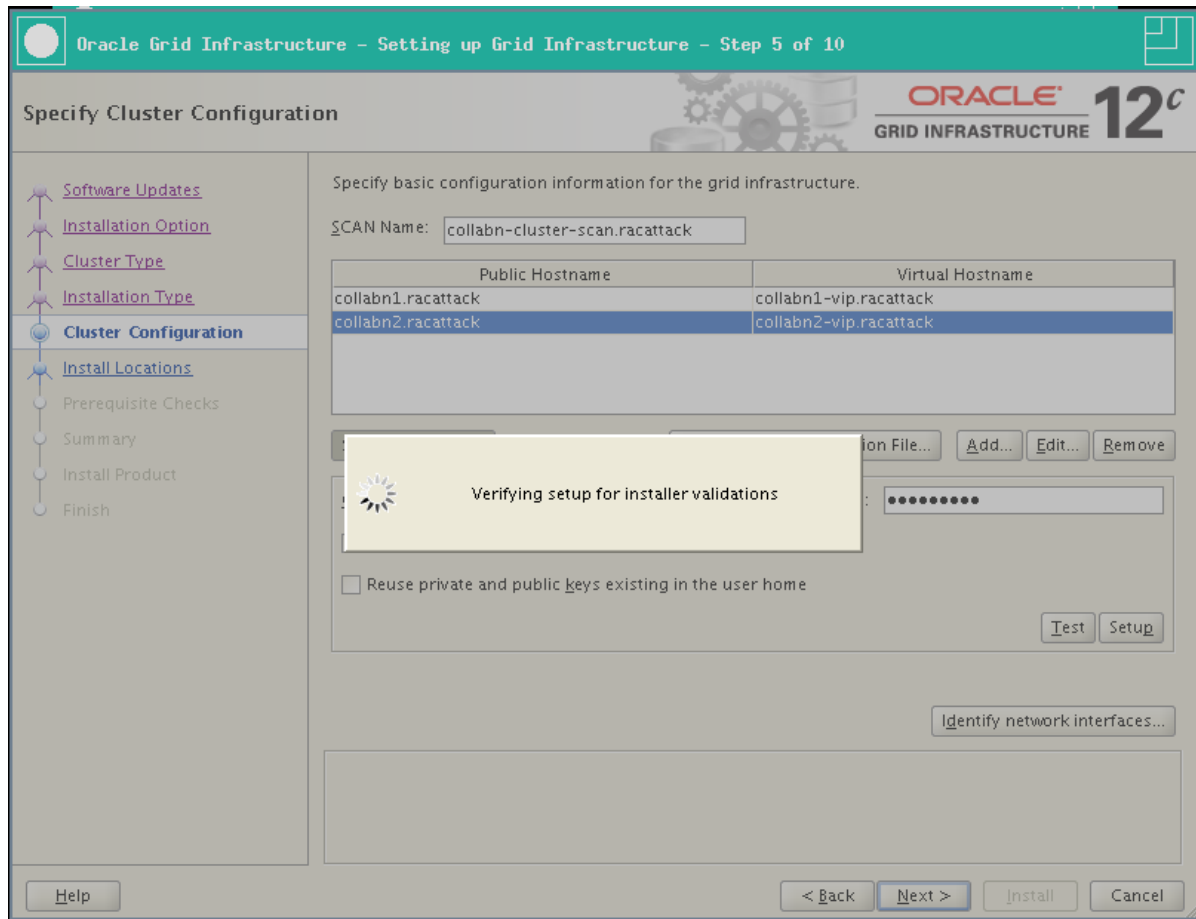
- **eth0** is marked as **Public**
- **eth1** is marked as **Private**
- **eth2** is marked as **Do Not Use**

Click **OK** to close the **Identify Network Interfaces** window.

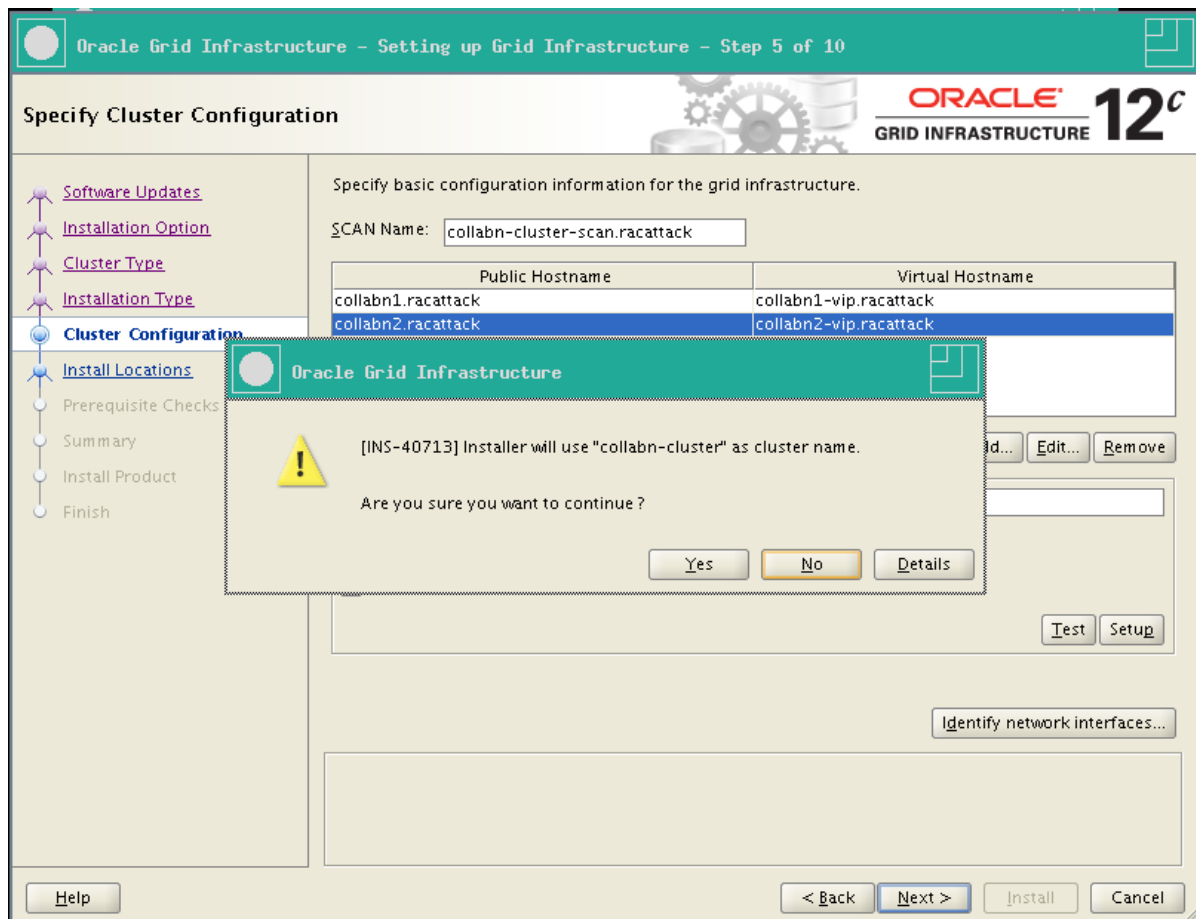
Finally, click **Next**



13. Some prerequisite validation is done at this step. It can require some minutes to complete.



14. Since the SCAN Name chosen is too long (more than 15 chars.) Oracle proposes a different name as the Cluster Name. Click **Yes**.



15. Leave the default Oracle Base and Software Location.

In the **Cluster Registry Storage Type** combo box, select **Oracle Automatic Storage Management**

Enter **racattack** as the SYSASM password.

Select **dba** as OSASM group.

Click **Next**.

Oracle Grid Infrastructure - Setting up Grid Infrastructure - Step 6 of 10

Specify Install Locations

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

Oracle Base: Browse...

Software Location: Browse...

Cluster Registry Storage Type: Oracle Automatic Storage Management


Cluster Registry Location: Browse...

SYSASM Password:

Confirm Password:

OSASM group: dba


Messages:

 SYSASM Password:[INS-30011] The SYS password entered does not conform to the Oracle recommended standards.

Help < Back Next > Install Cancel

16. **racattack** is a weak password and Oracle raise an alert. Click **Yes** to continue:

Oracle Grid Infrastructure

 [INS-30011] The SYSASM password entered does not conform to the Oracle recommended standards.

Are you sure you want to continue?

Yes No Details

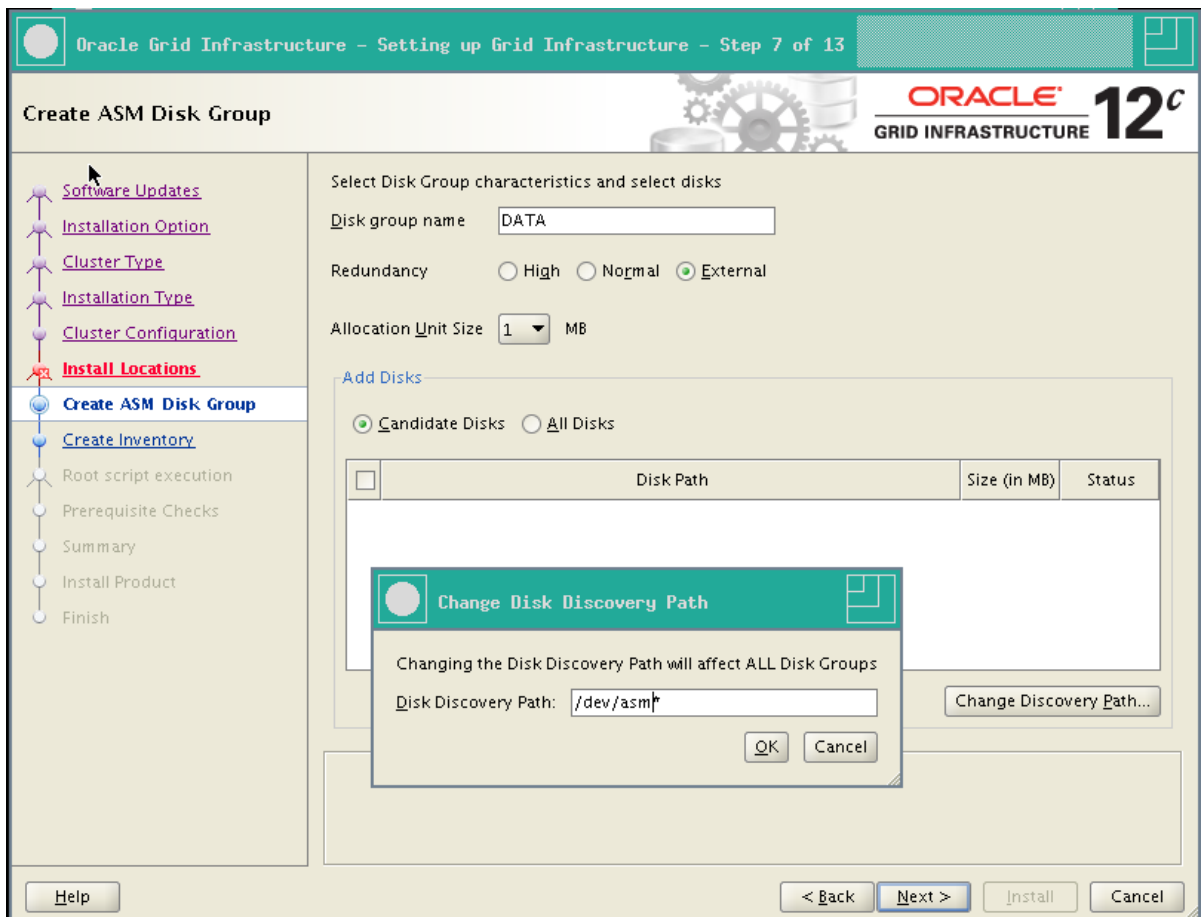
17. Leave **DATA** as Disk Group Name.

Select **External redundancy** (it is safe to do this in a RAC Attack event!).

The *Candidate Disks* list is empty. Click on **Change Discovery Path...**

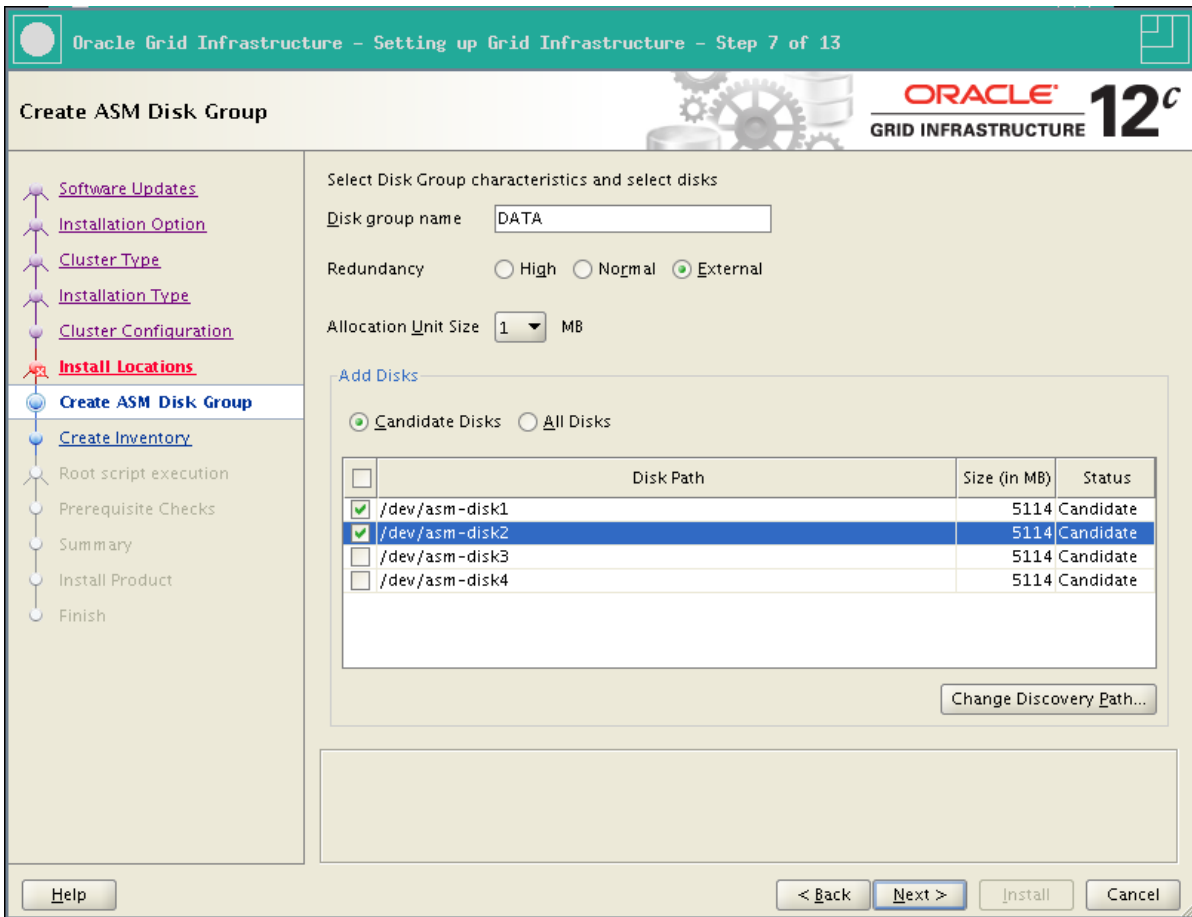
Enter **/dev/asm*** in the **Disk Discovery Path** text field.

Click **Ok**.

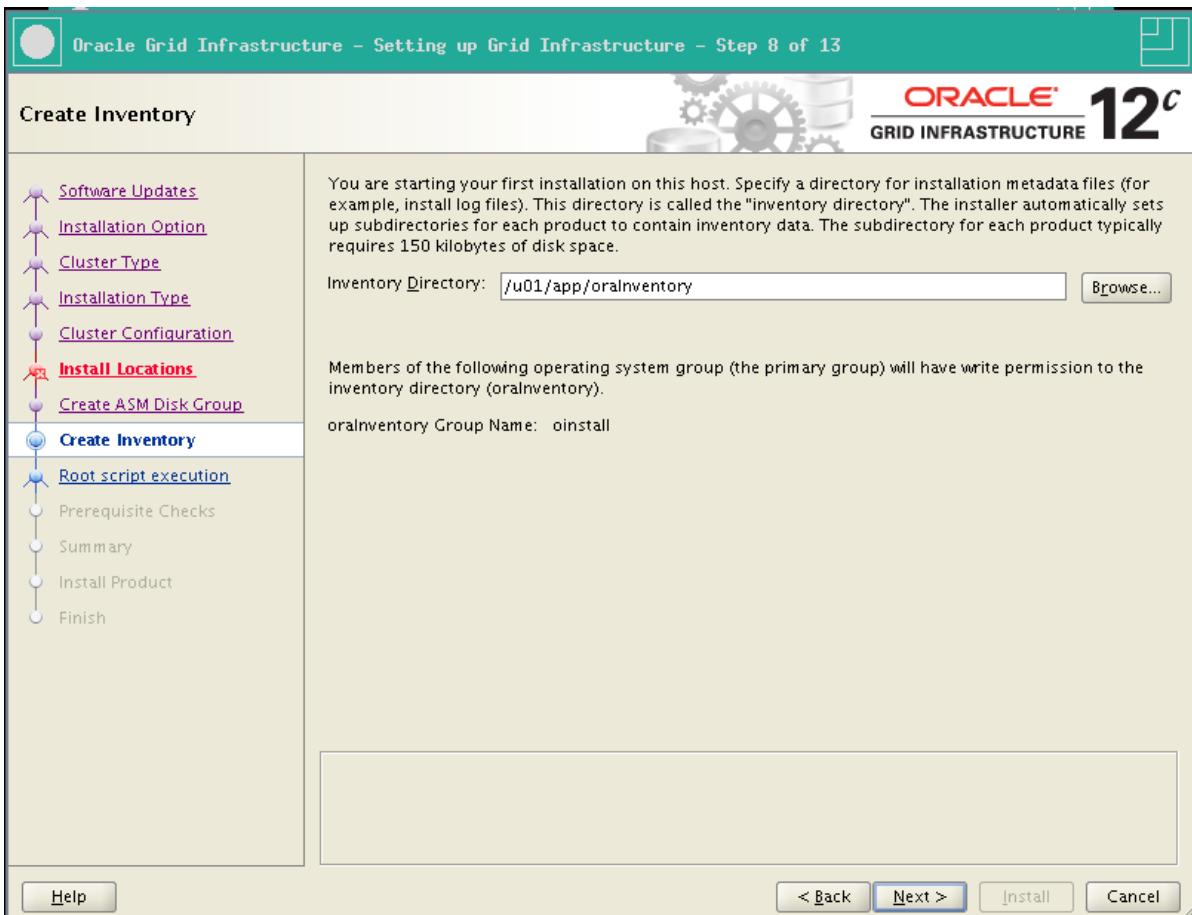


18. Check two disks that will be immediately allocated to the new disk group.

Click **Next**



19. Leave the default Inventory Directory. Click Next.

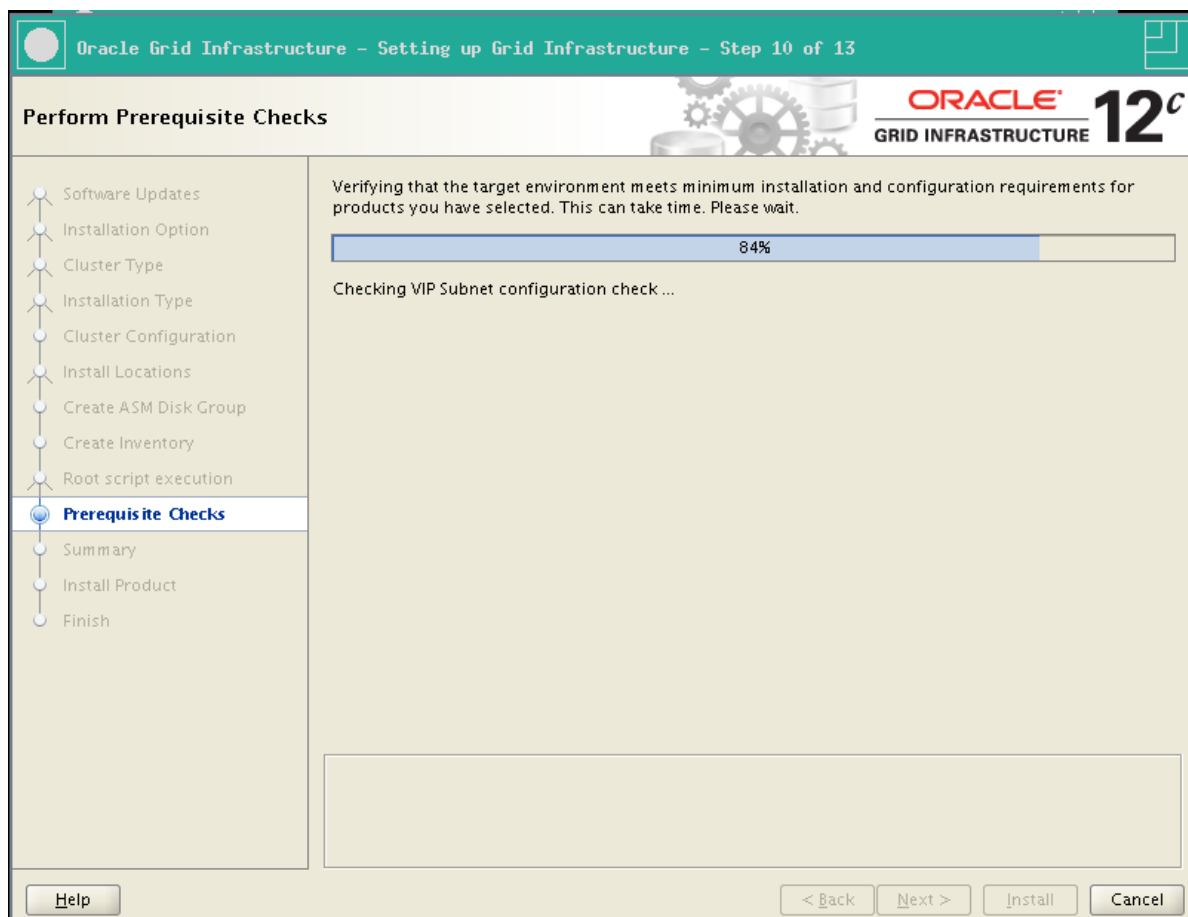


20. Check **Automatically run configuration script** and then **Use "root" user credentials**.

Enter **racattack** as the password of **root** and click **Next**.

The screenshot shows the Oracle Grid Infrastructure 12c installation wizard at Step 9 of 13, titled "Root script execution configuration". The left sidebar contains a navigation tree with the following items: Software Updates, Installation Option, Cluster Type, Installation Type, Cluster Configuration, Install Locations (highlighted in red), Create ASM Disk Group, Create Inventory, Root script execution (highlighted in blue), Prerequisite Checks, Summary, Install Product, and Finish. The main content area has a heading "Root script execution configuration" and a sub-heading "ORACLE GRID INFRASTRUCTURE 12c". Below the heading, there is a text box explaining that certain operations must be performed as the "root" user and that the installer can perform these automatically. There are two radio button options: "Automatically run configuration scripts" (checked) and "Use 'root' user credential" (selected). Under "Use 'root' user credential", there is a "Password:" field with a masked password of ten dots. Under "Use sudo", there is a "Program path:" field with the value "/usr/local/bin/sudo" and a "Browse..." button, a "User name:" field with the value "oracle", and a "Password:" field. At the bottom of the wizard, there are buttons for "Help", "< Back", "Next >", "Install", and "Cancel".

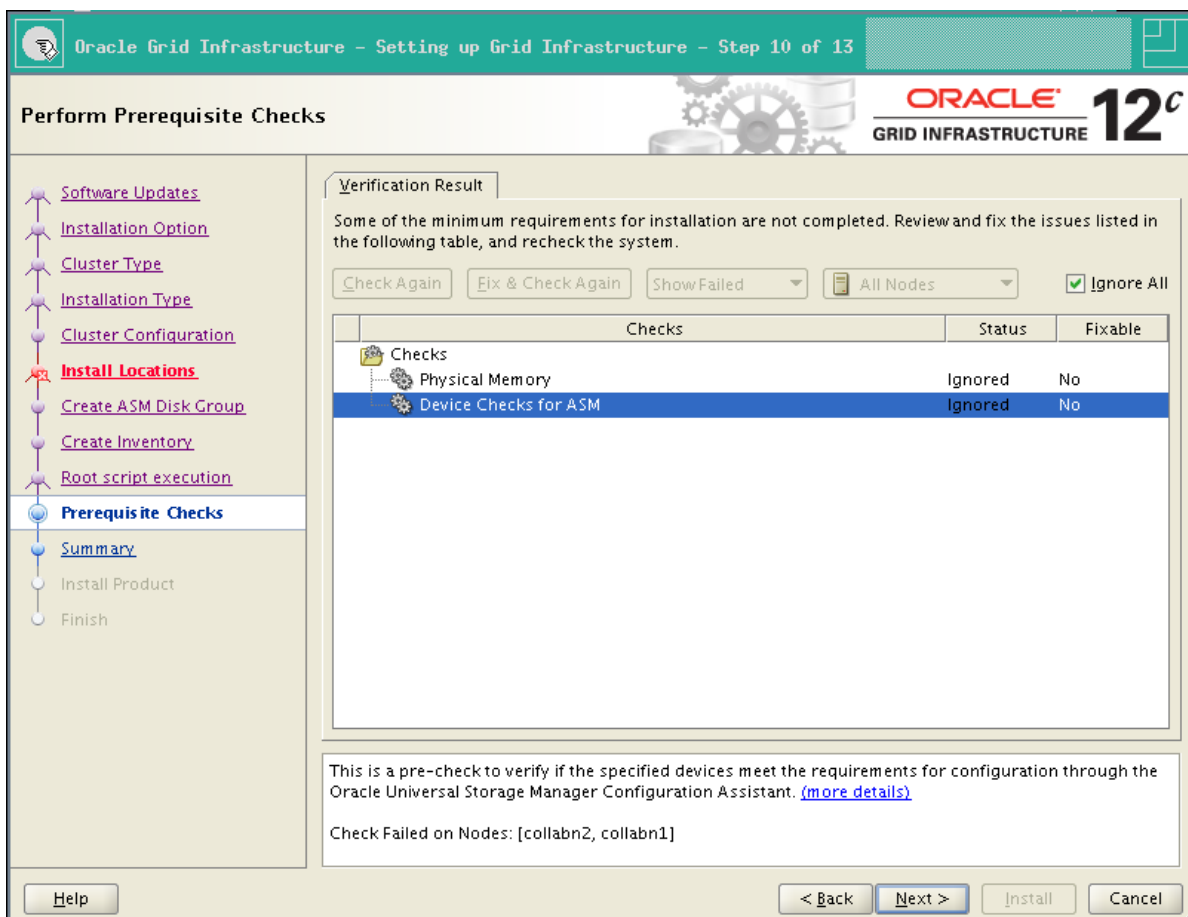
21. It takes some time to complete the prerequisite checks.



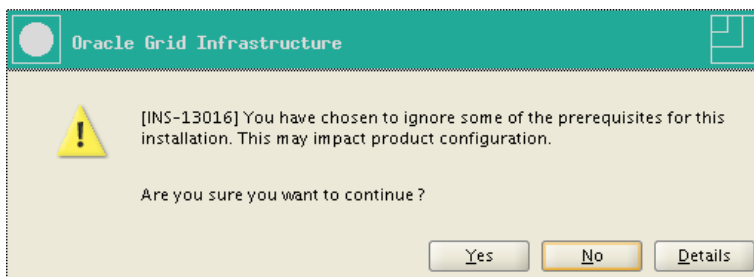
22. If everything is correct, you will notice two checks that have failed:

- Physical Memory
- Device Checks for ASM

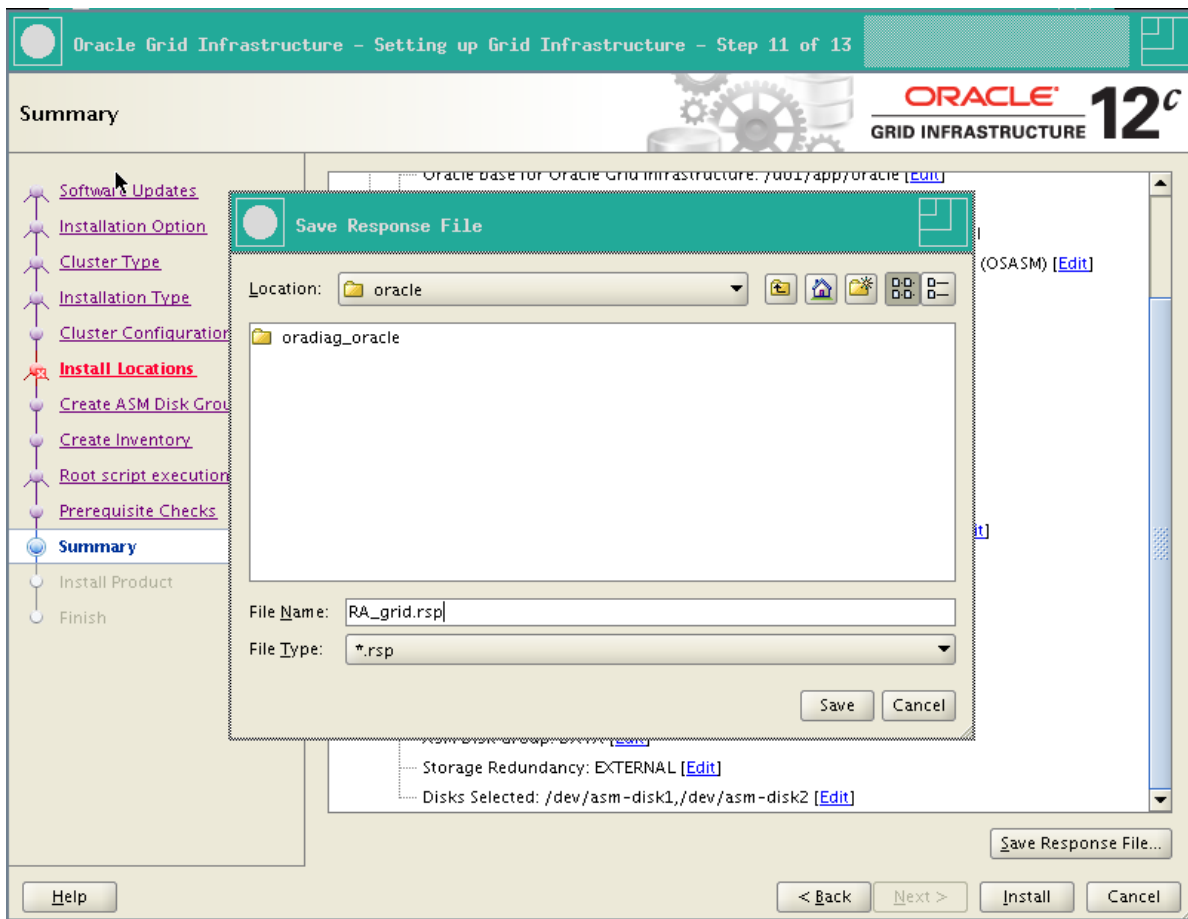
Check "Ignore All" and click **Next**.



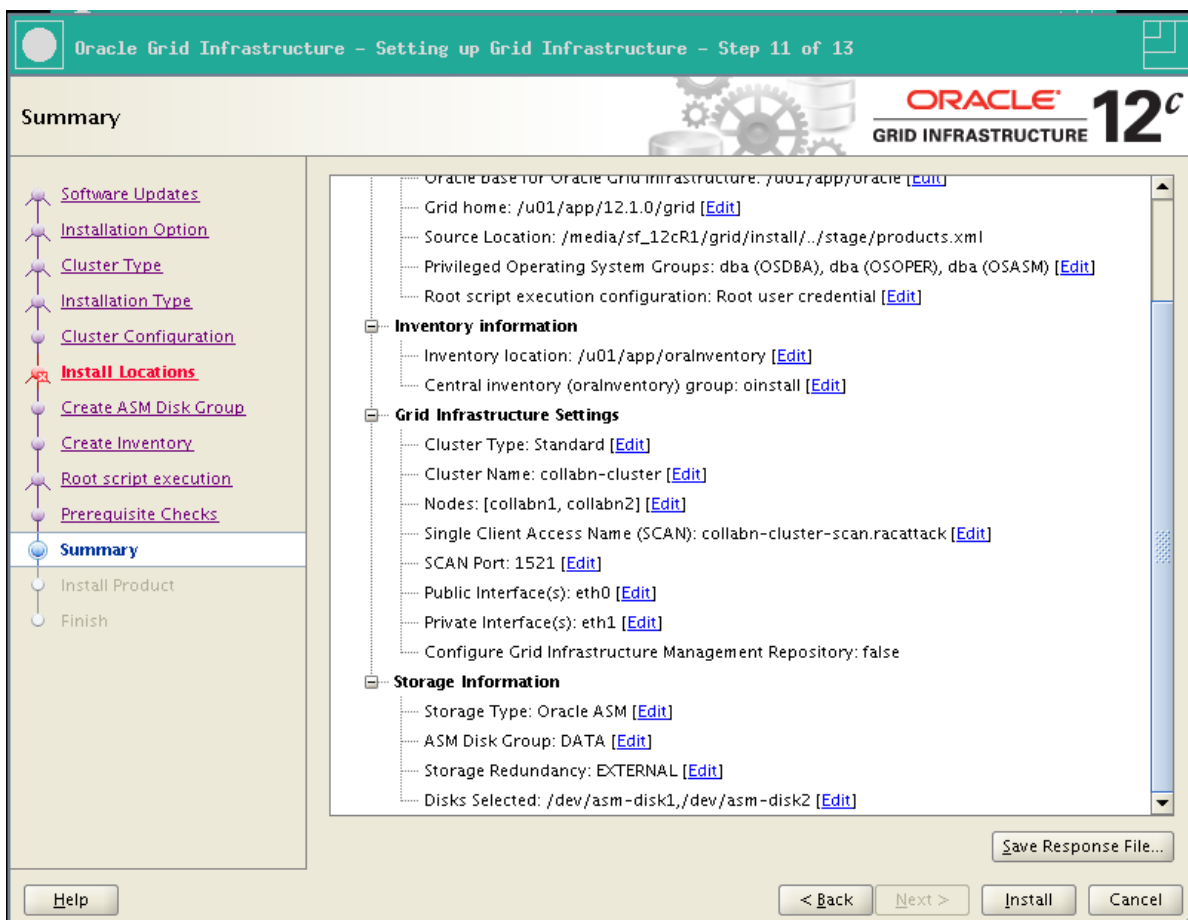
23. Click **Yes** to confirm that you want to skip some prerequisites.



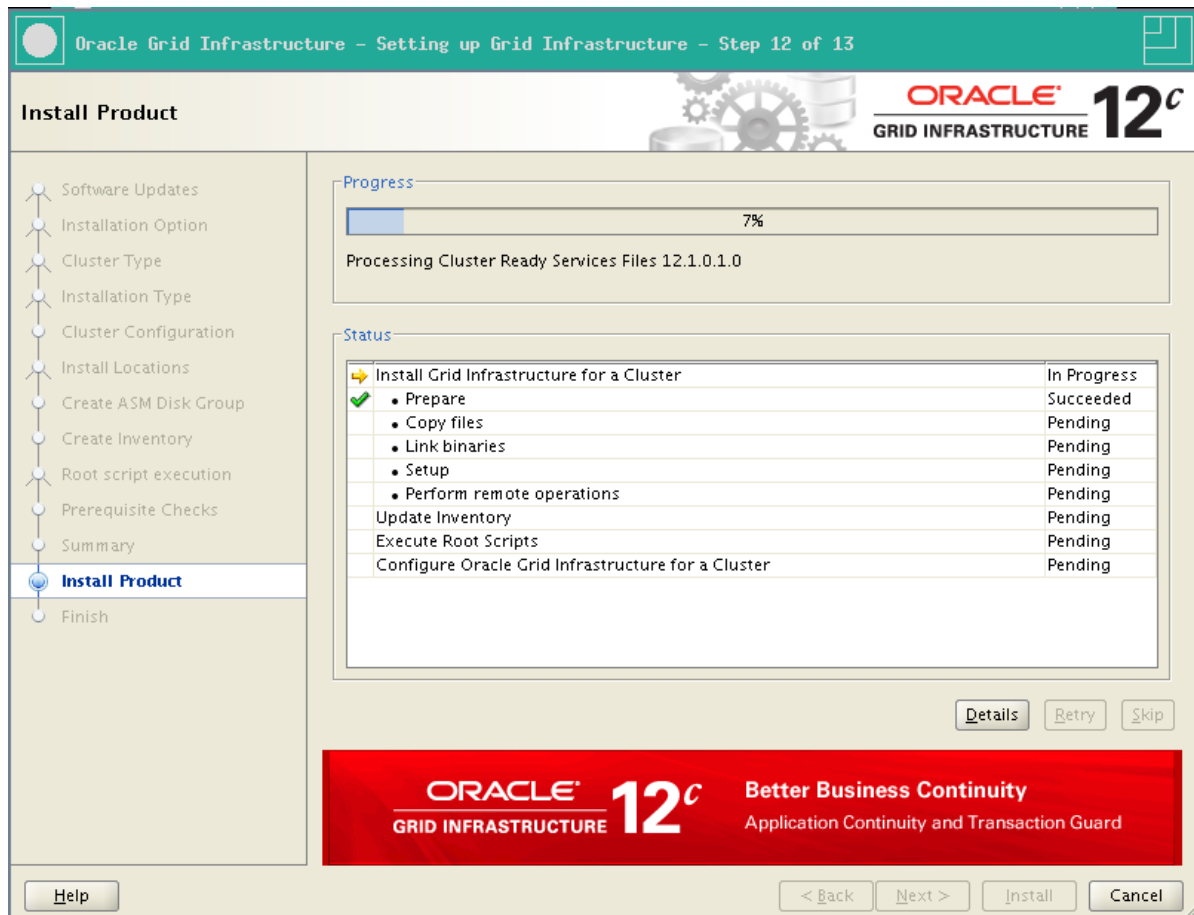
24. The summary page appears. Optionally, click **Save Response File** and choose a location to have the response file saved for this installation session.



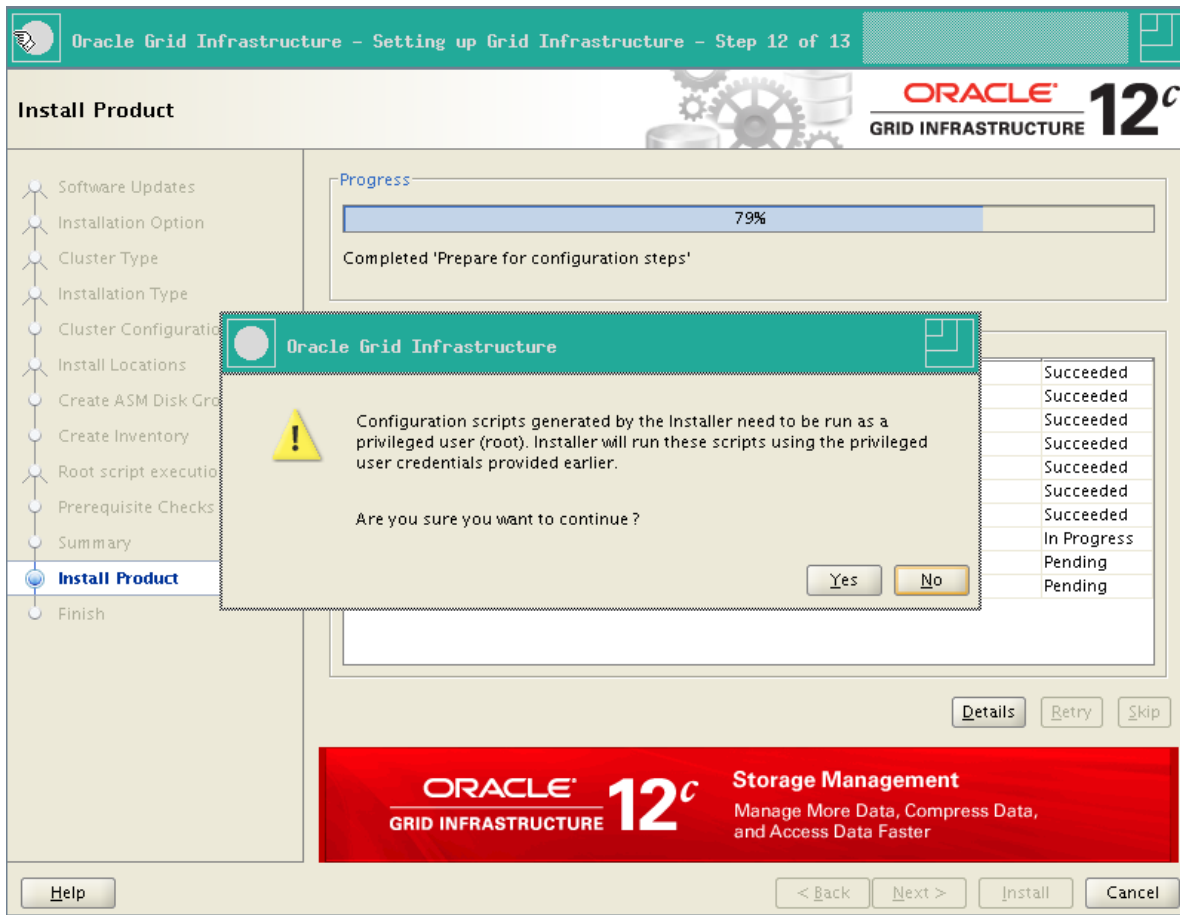
25. Review the summary and click **Install** to start the installation.



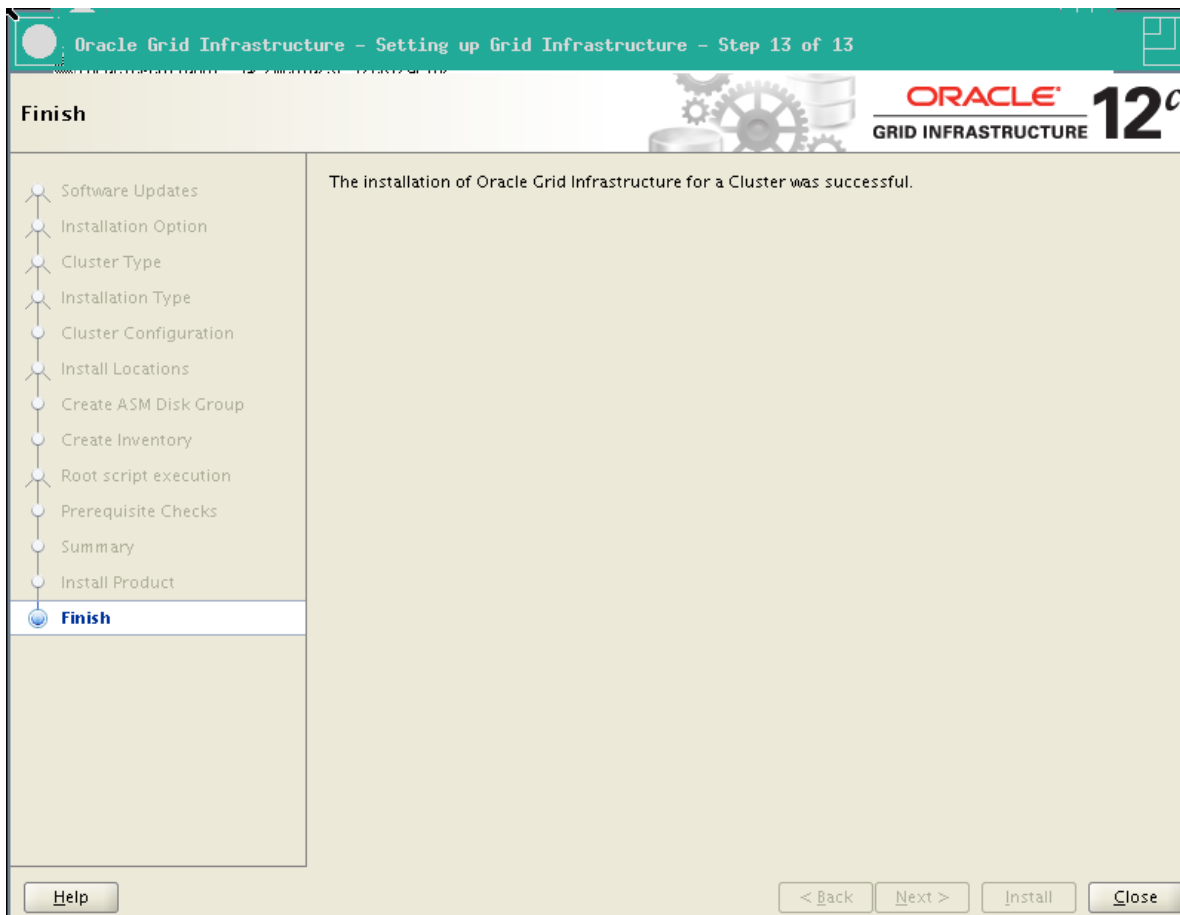
26. The installation starts. It may take more than an hour, depending on your laptop hardware.



27. After a while, the installation asks a confirmation before running some scripts as root. Click **Yes** to continue.



28. The installation continues, again, it may take longtime to complete. Once it's finished, click on **Close** to exit.



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 details
-----
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
    ONLINE ONLINE      collabn1        Started,STABLE
    ONLINE ONLINE      collabn2        Started,STABLE
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
ora.collabn2.vip
    1      ONLINE ONLINE      collabn2        STABLE
ora.cvu
    1      ONLINE ONLINE      collabn1        STABLE
ora.oc4j
    1      OFFLINE OFFLINE      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.

ASM Configuration

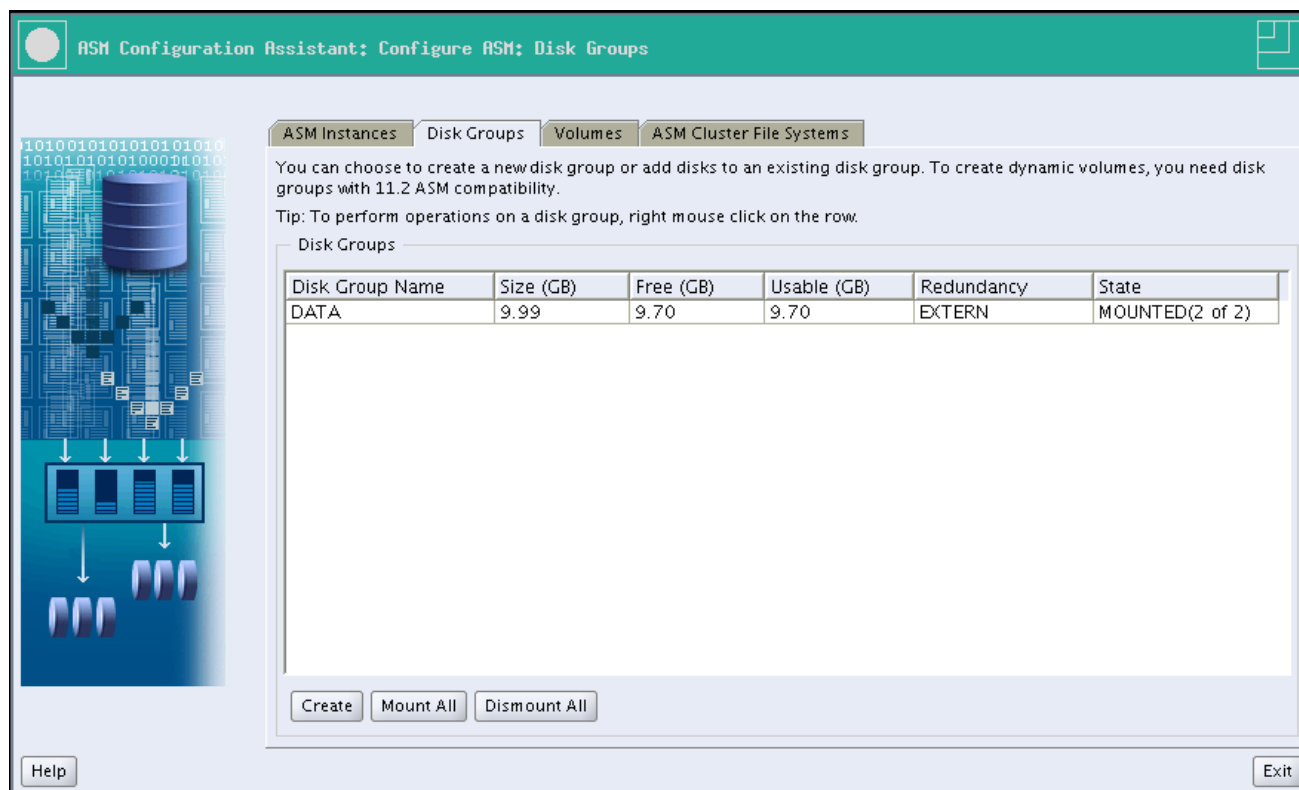
1. From a VNC session, run the **ASM Configuration Assistant**:

```

[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**.



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

Create Disk Group

Disk Group Name:

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

High Normal External (None)

Select Member Disks
 Show Eligible Show All

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

| <input type="checkbox"/> | Disk Path | Header Status | Disk Name | Size (MB) | Quorum |
|-------------------------------------|----------------|---------------|-----------|-----------|--------------------------|
| <input checked="" type="checkbox"/> | /dev/asm-disk3 | CANDIDATE | | 5 114 | <input type="checkbox"/> |
| <input type="checkbox"/> | /dev/asm-disk4 | CANDIDATE | | 5 114 | <input type="checkbox"/> |

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

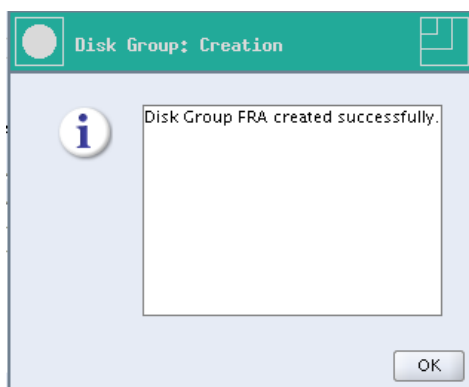
Disk Discovery Path: /dev/asm*

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

4. The diskgroup is being created.



5. The diskgroup is created.



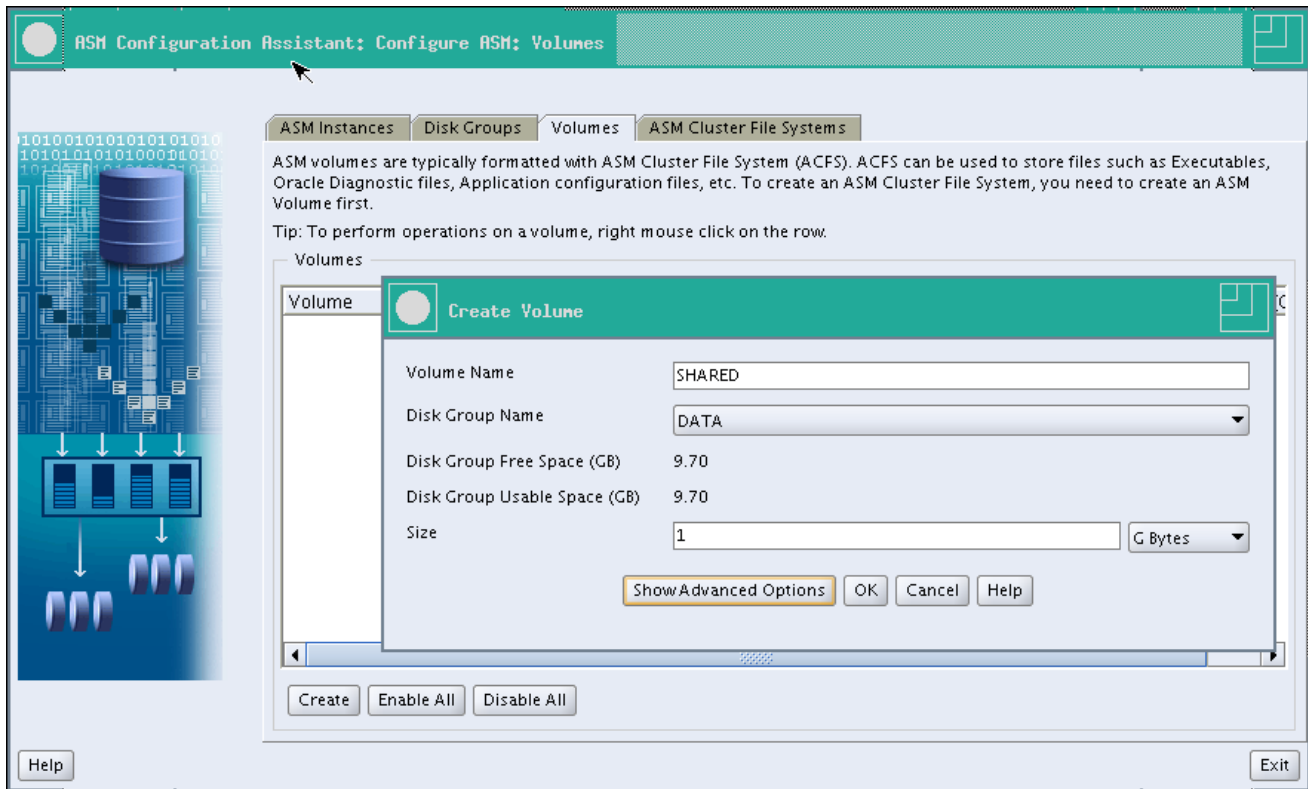
6. Click on the **Volumes** tab, then on **Create**.

Enter **SHARED** as the volume name.

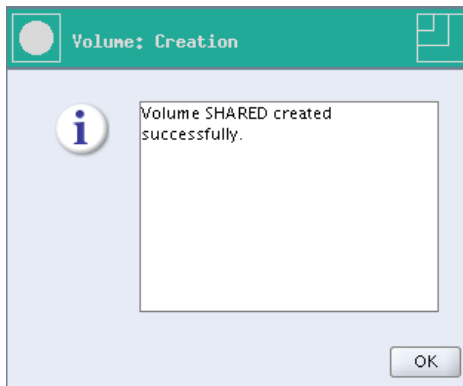
Choose the diskgroup **DATA**.

The size will be irrelevant in our labs, so enter 1.

Click **OK**.

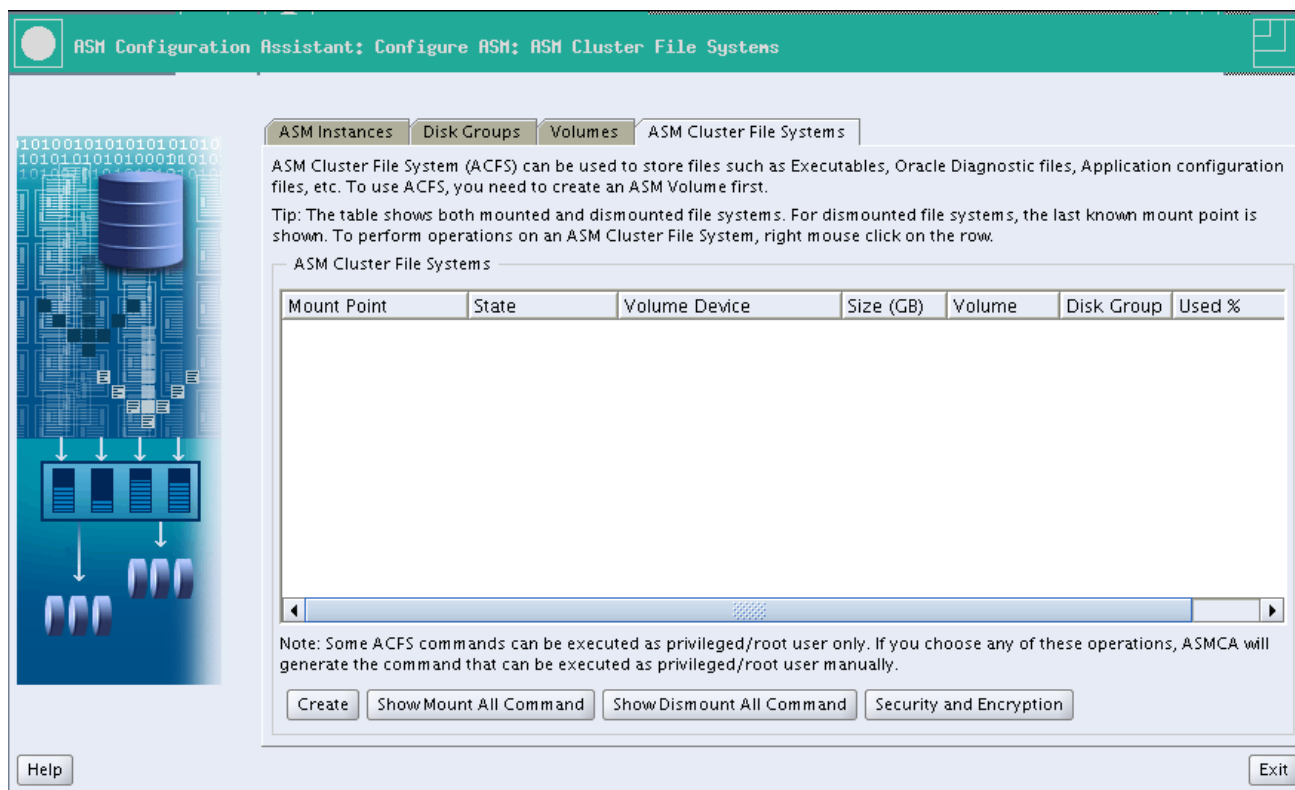


7. The volume is created.



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

Click **Create**.



9. Select **Cluster File System**.

Mountpoint: **/shared**

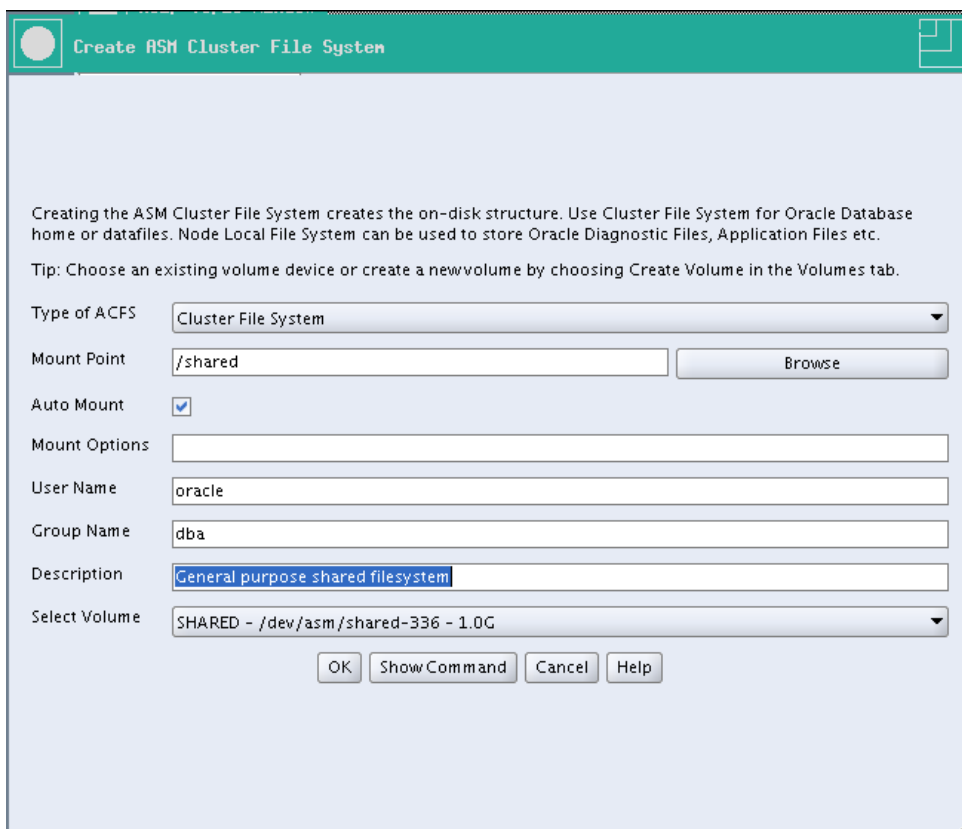
Check **Automount**.

User Name: **oracle**

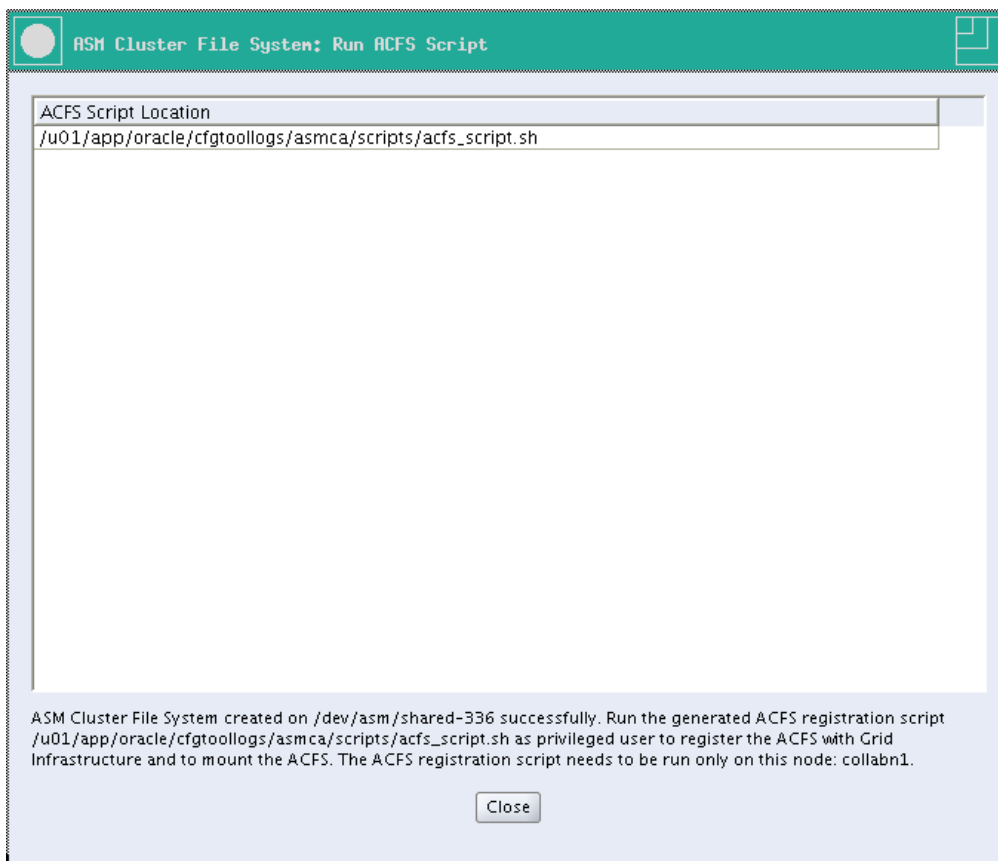
Group Name: **dba**

Volume: **SHARED**

Click **OK**.



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



```
[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
```

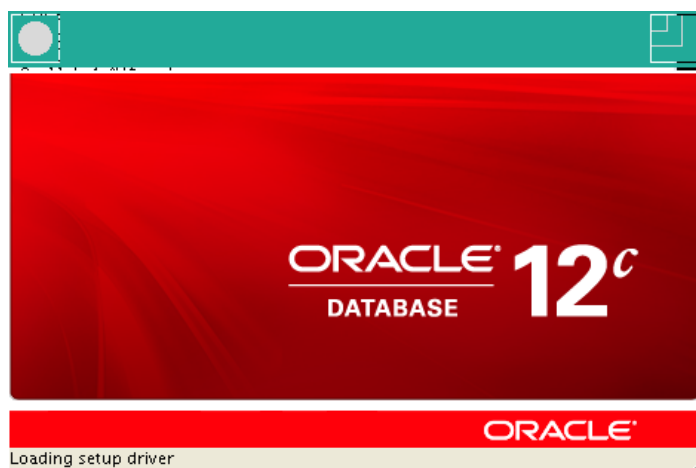
Install Database Software

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

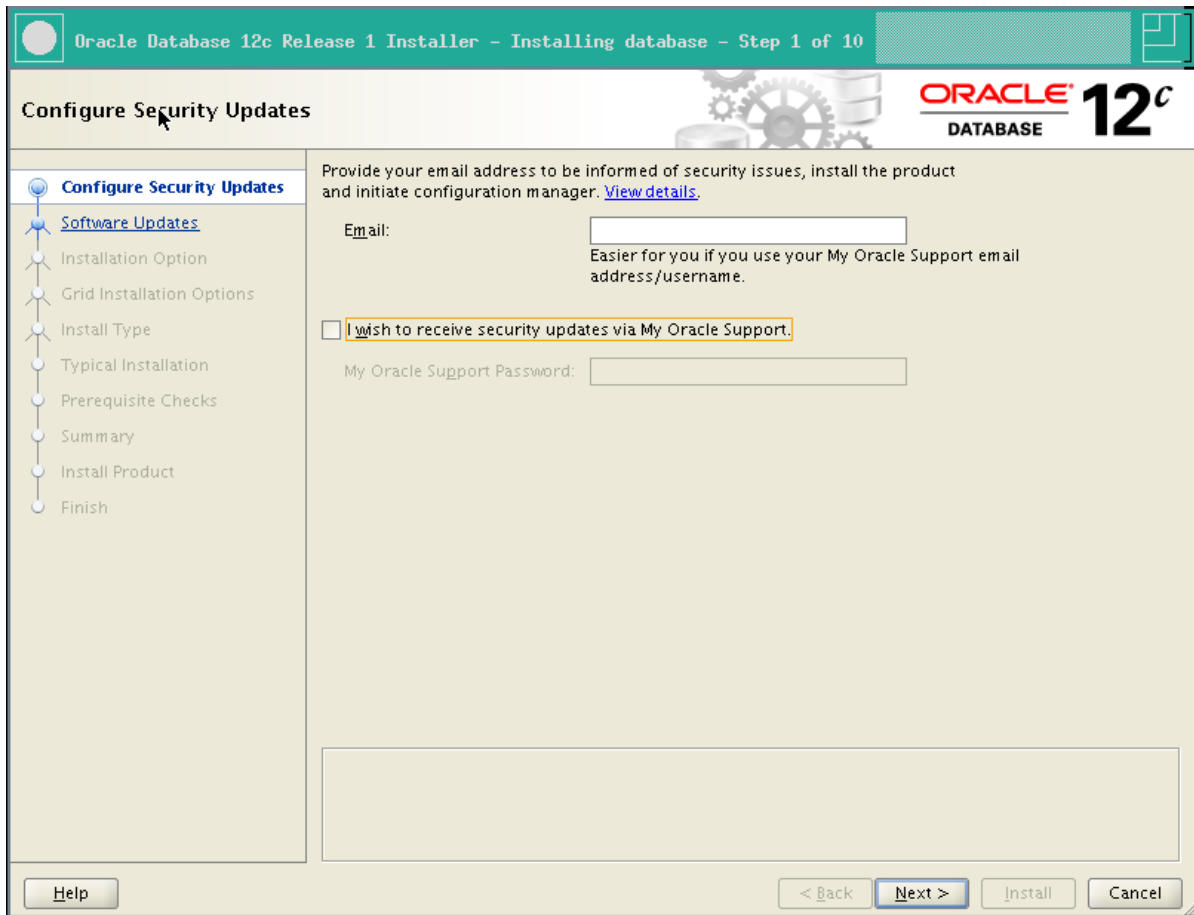
```
[oracle@collabn1 ~]$ /media/sf_12cR1/database/runInstaller
Starting Oracle Universal Installer...

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 ...
```

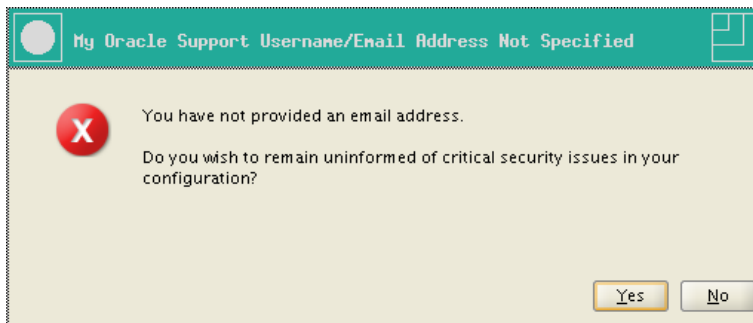
2. The splash screen appears.



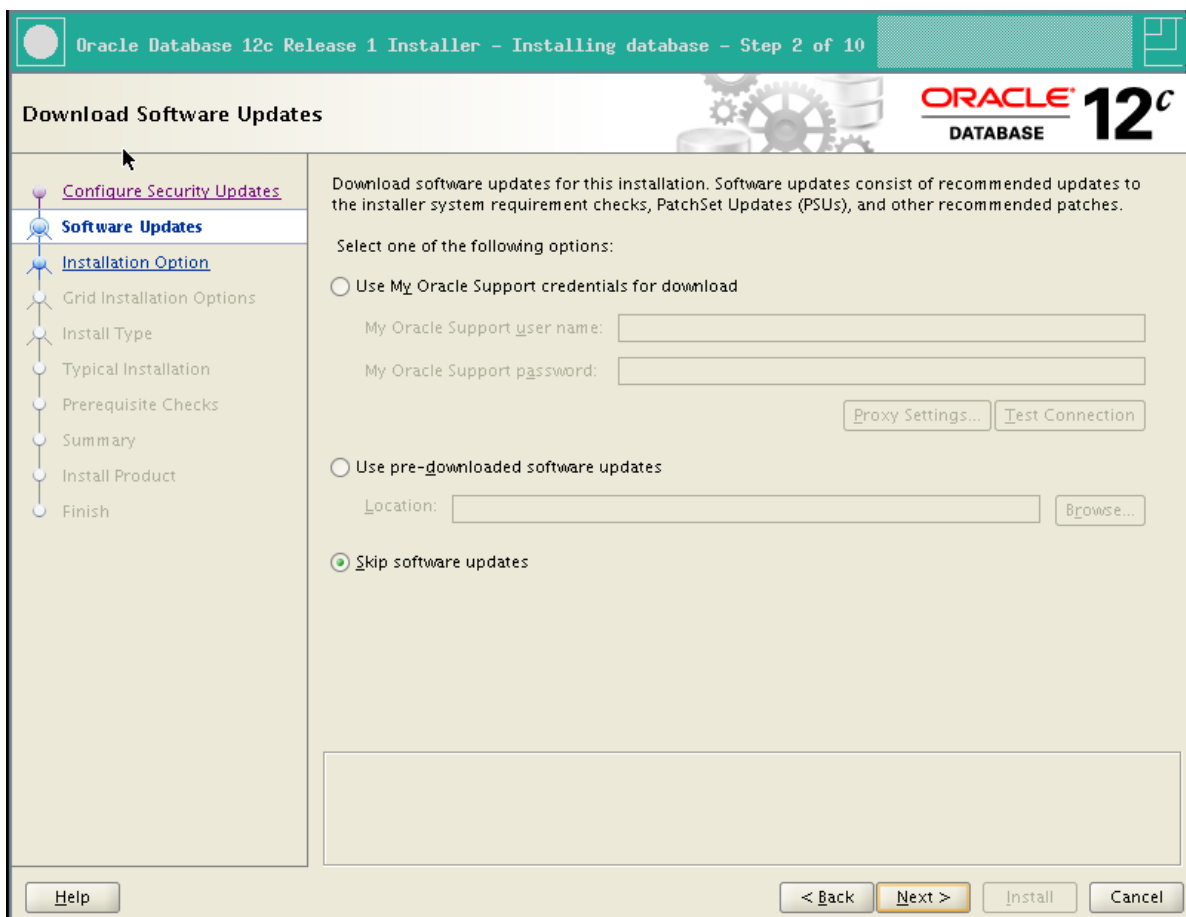
3. Uncheck **I wish to receive security updates via My Oracle Support** and click **Next**.



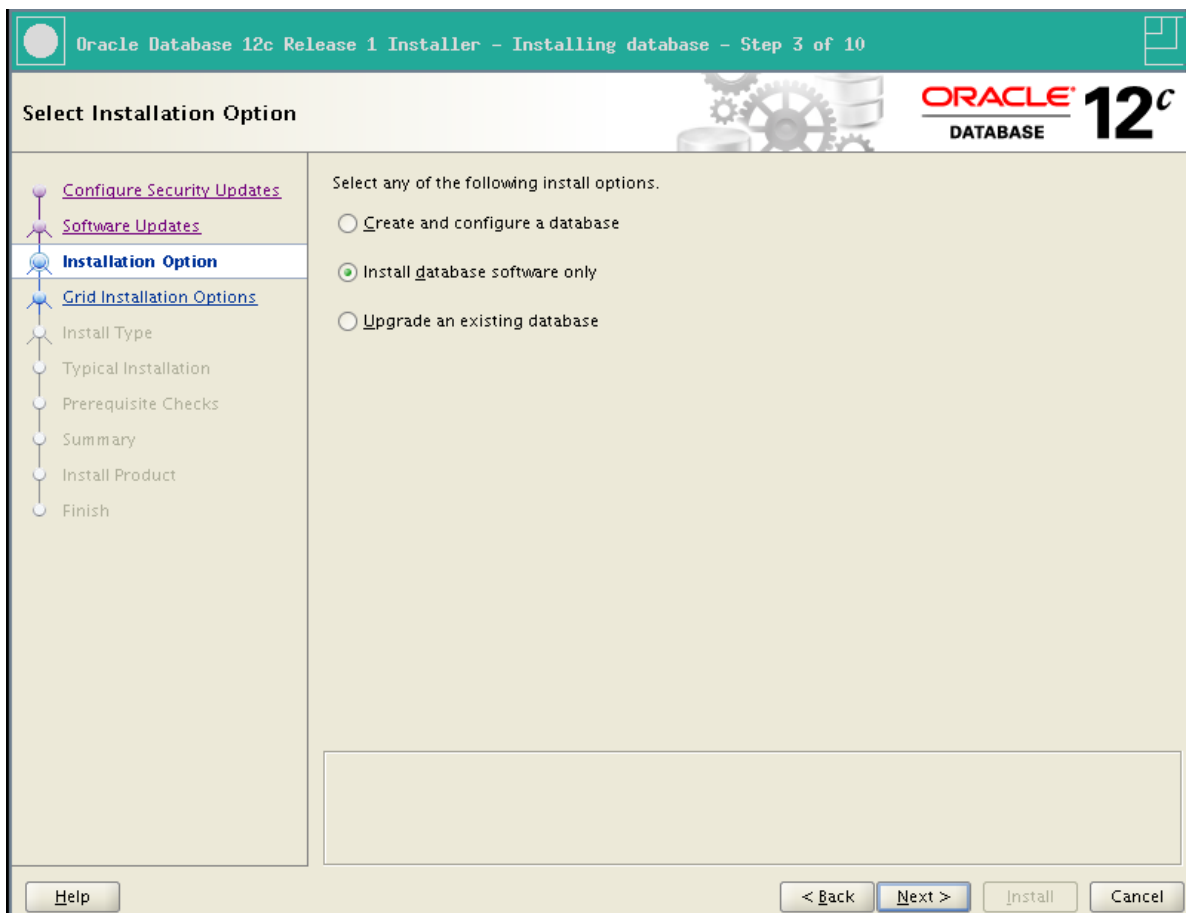
4. Click **Yes** to confirm that you don't want to be informed about security updates.



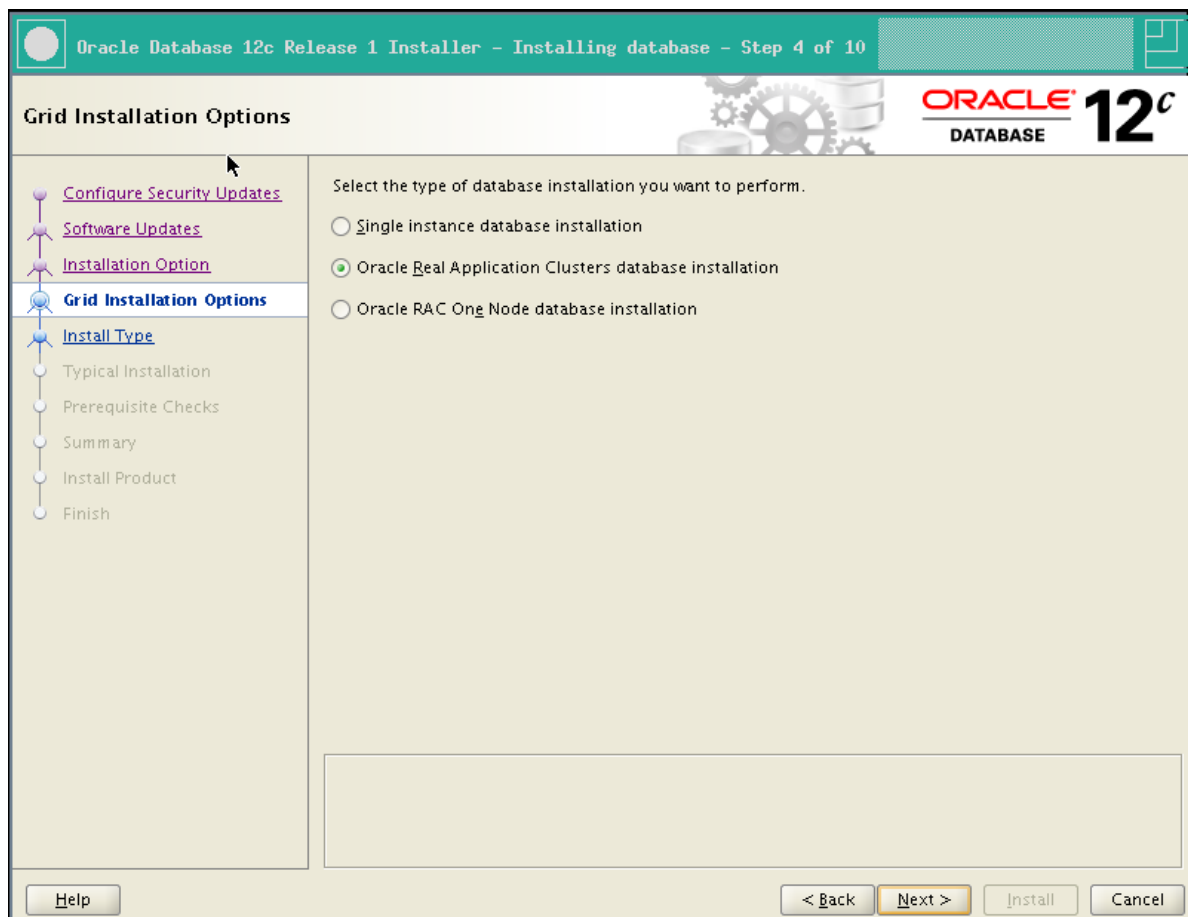
5. Select **Skip software updates** and click **Next**.



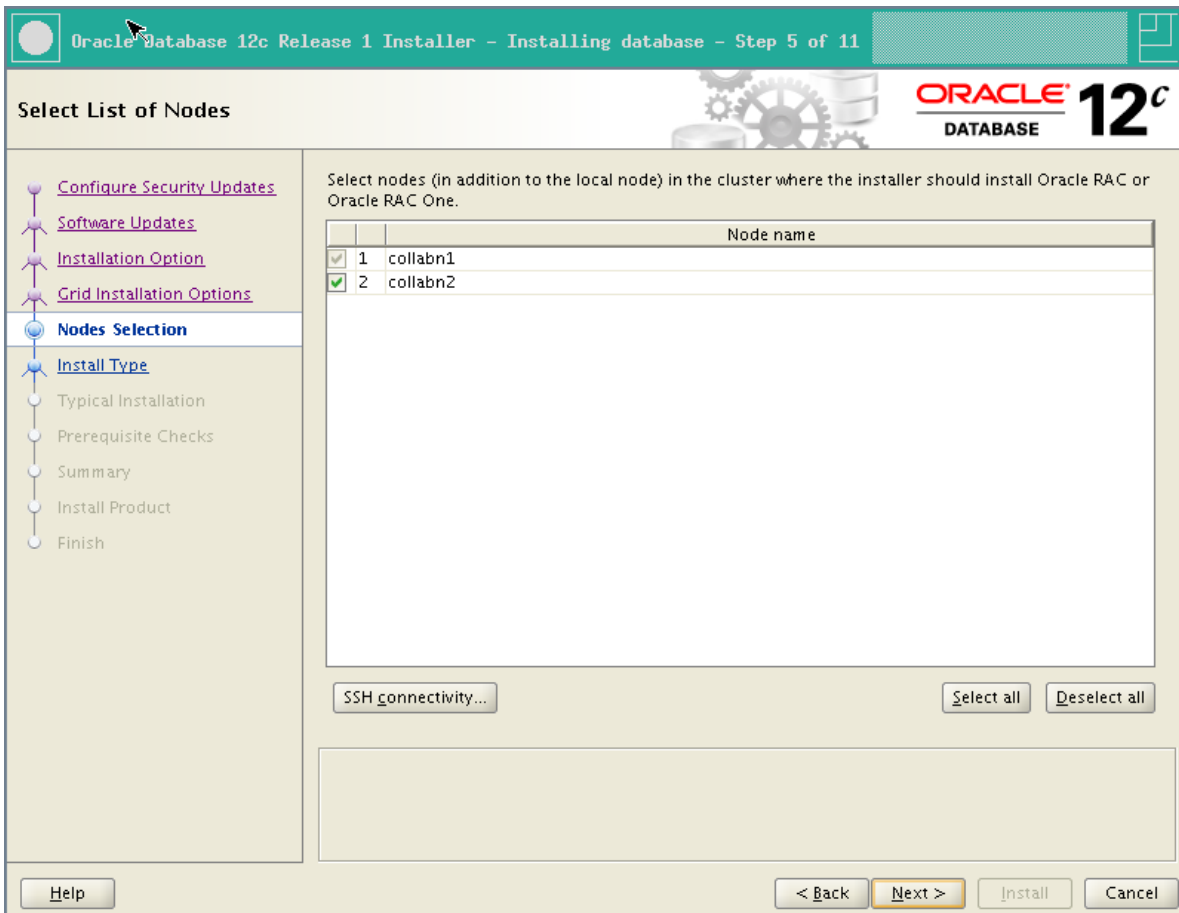
6. Select **Install database software only** and click **Next**.



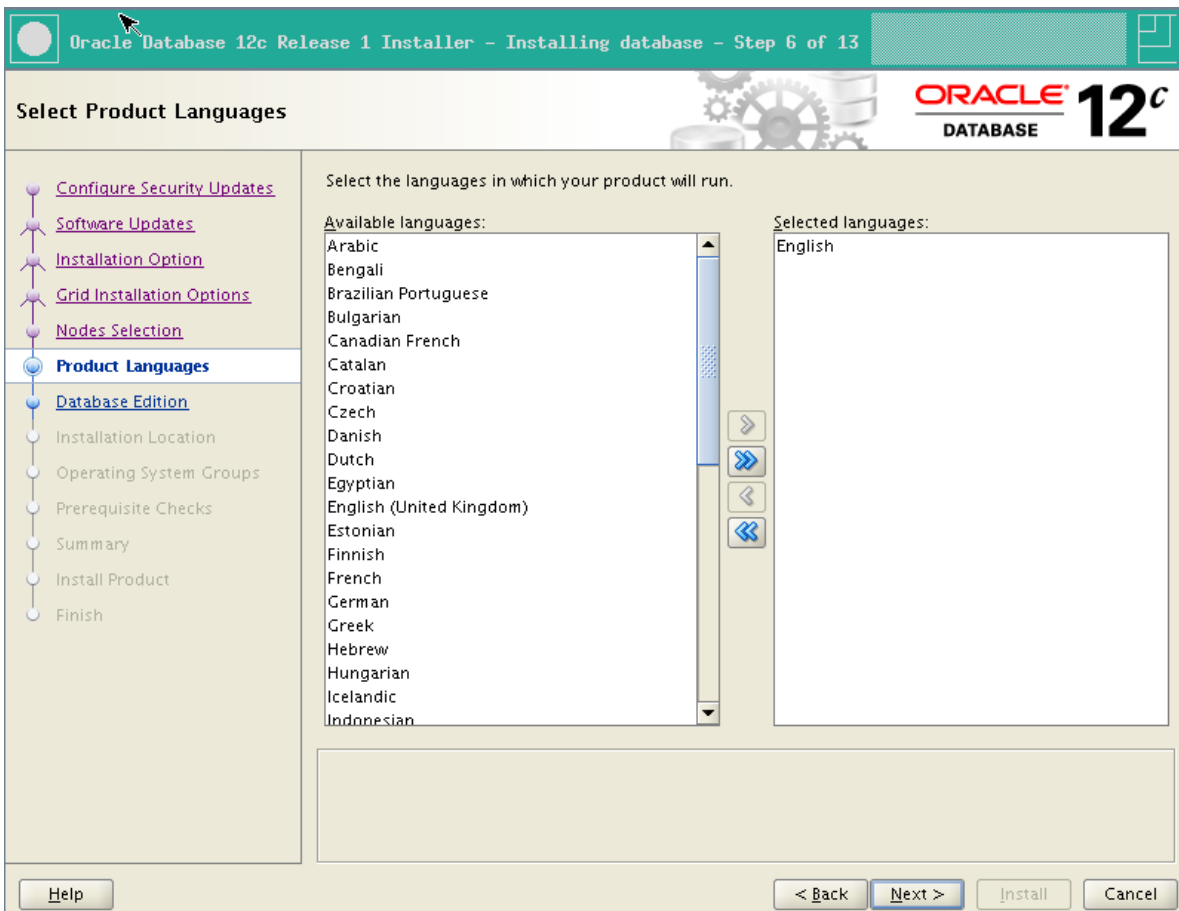
7. Select **Oracle Real Application Clusters database installation** and click **Next**.



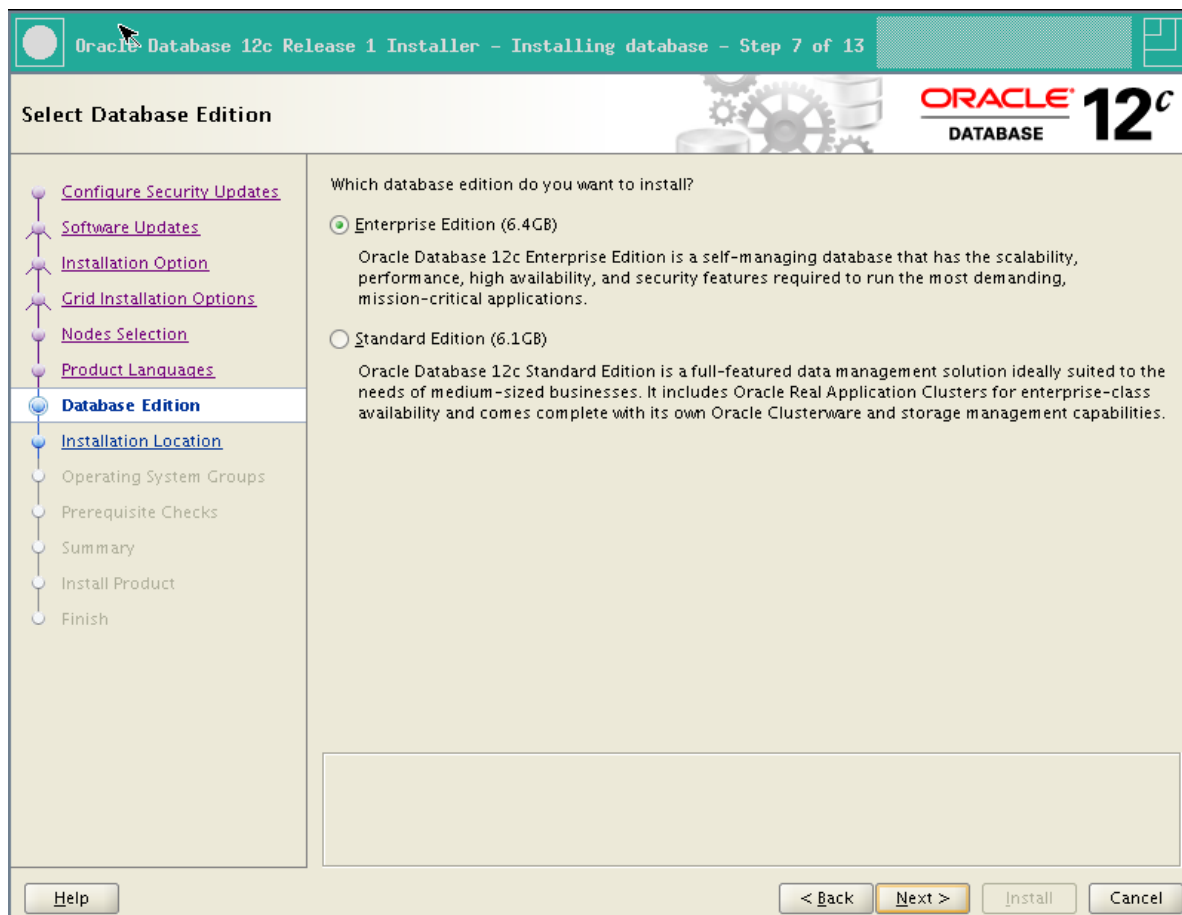
8. Verify that all nodes are selected and click **Next**.



9. Click Next to accept the default language selection.



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

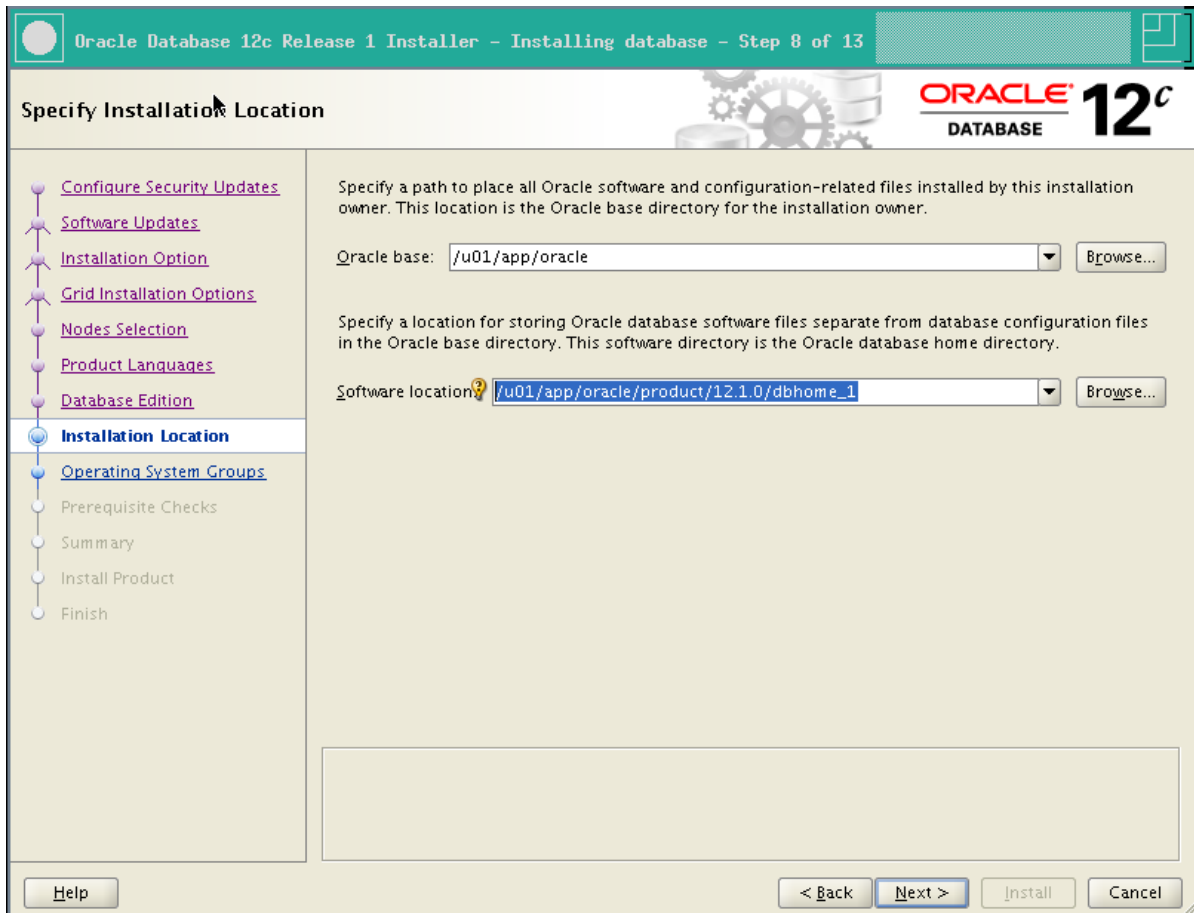


11. If you have previously created the ACFS 1Gb filesystem, you'll need to specify another location now.

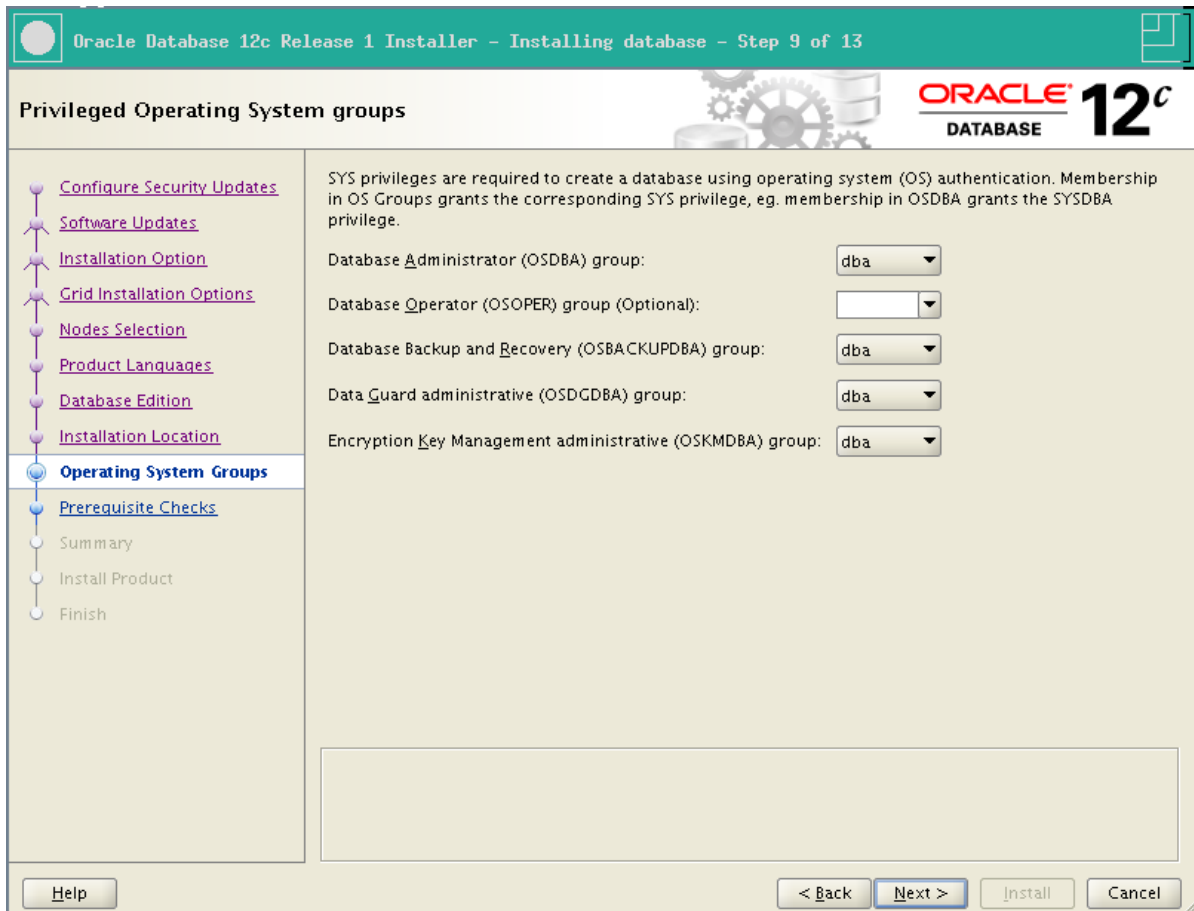
Oracle Base: /u01/app/oracle

Software location: /u01/app/oracle/product/12.1.0/dbhome_1

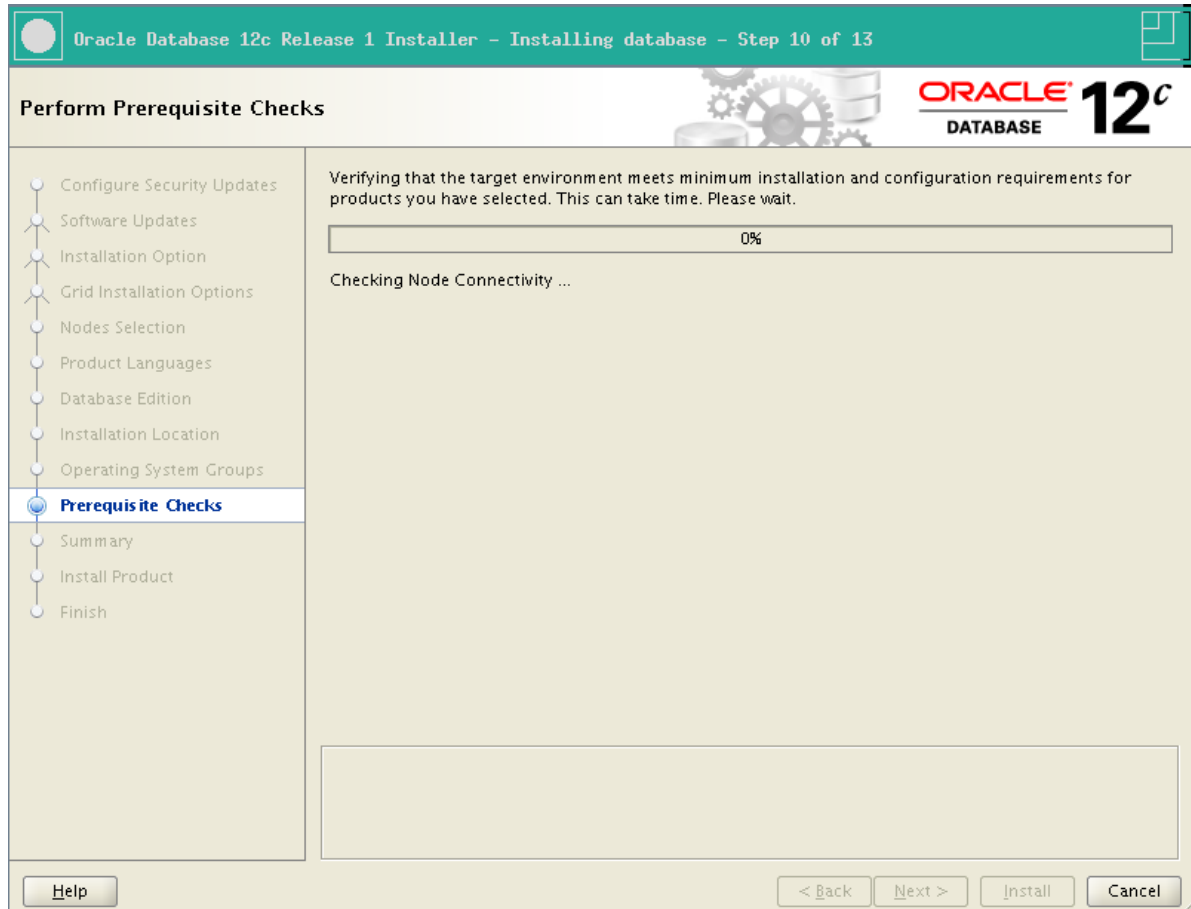
Click **Next**.



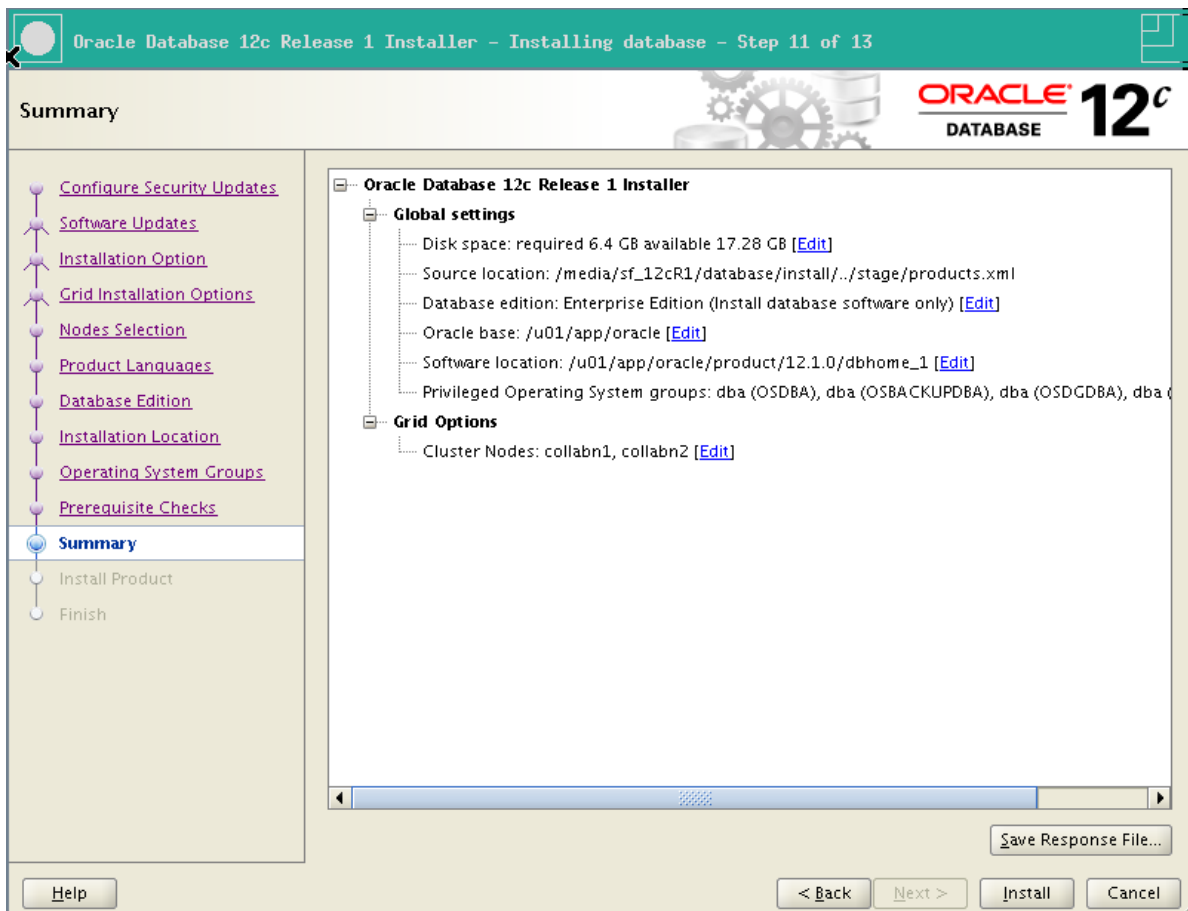
12. Leave **dba** for all groups except for the OSOPER group (leave it empty) and click **Next**.



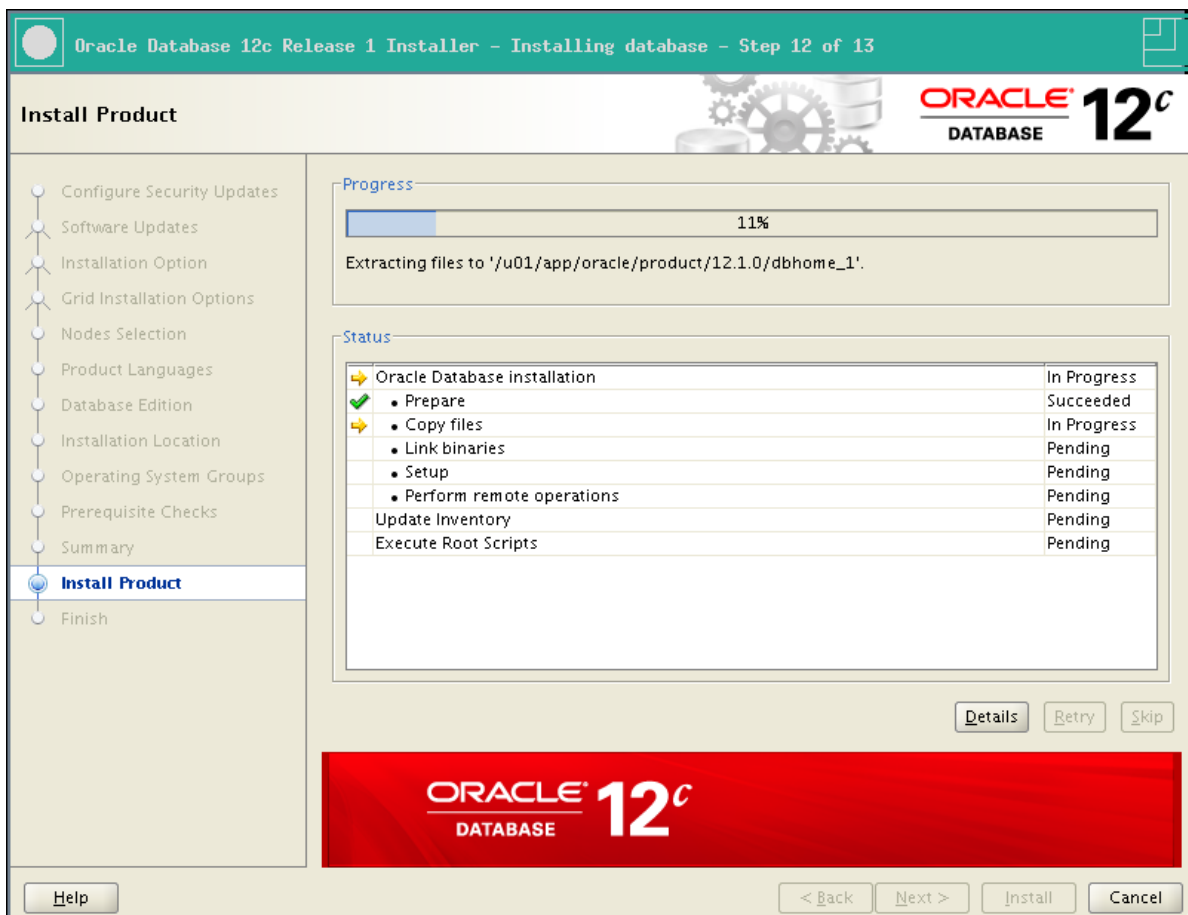
- The installer checks all prerequisites.



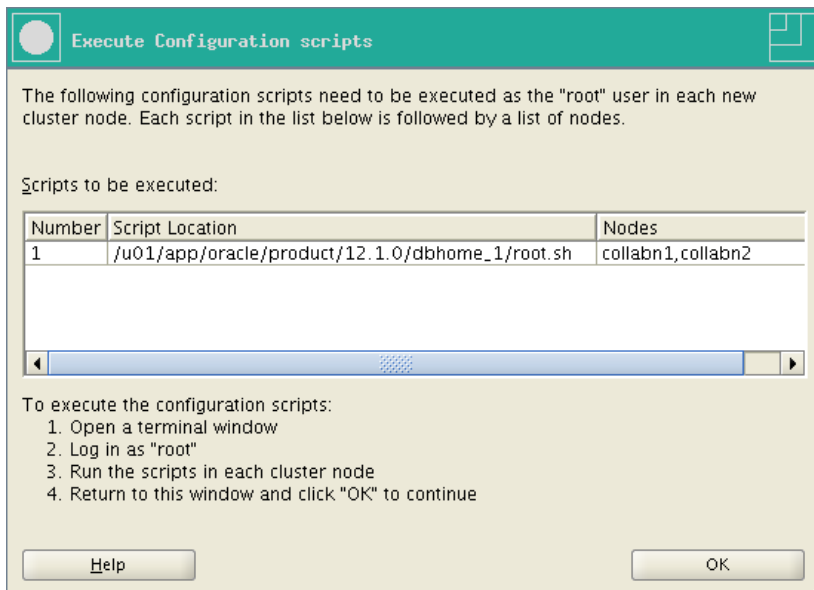
- Review the installation summary, optionally save a response file, and click **Install**.



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



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



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.

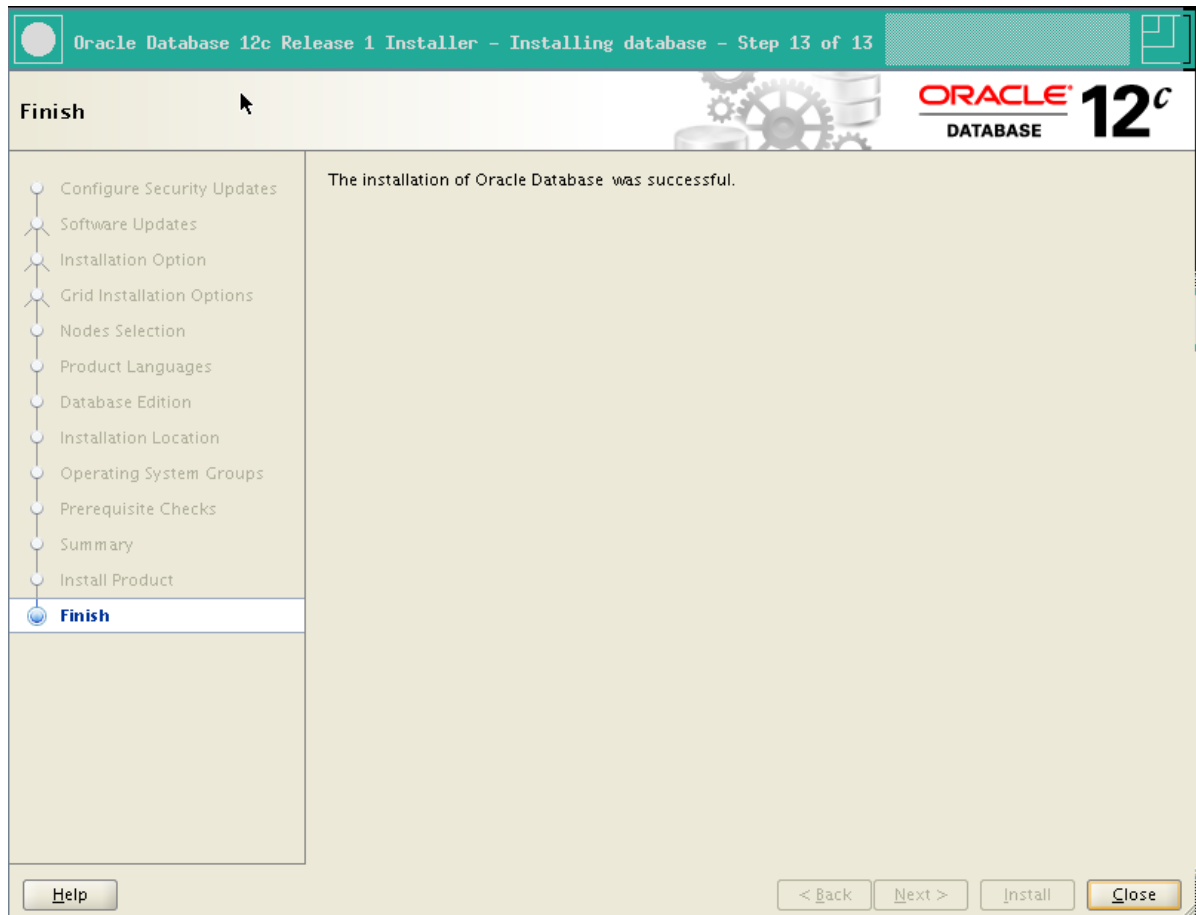
Entries will be added to the /etc/oratab file as needed by
Database Configuration Assistant when a database is created
Finished running generic part of root script.
Now product-specific root actions will be performed.
[root@collabn1 ~]# ssh collabn2
root@collabn2's password:
Last login: Thu Aug 8 16:54:49 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.

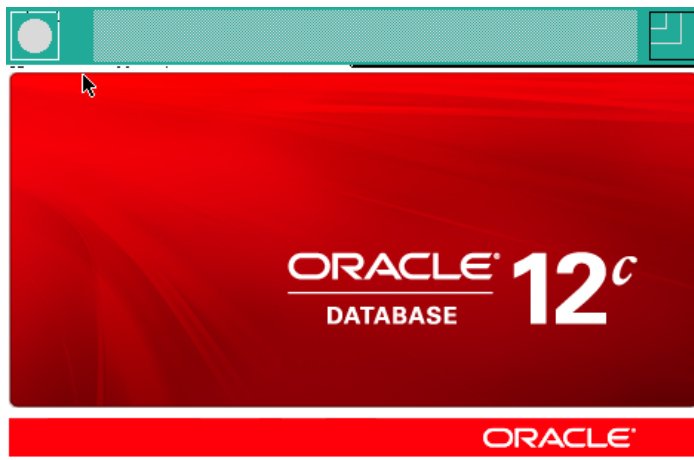


Create Database

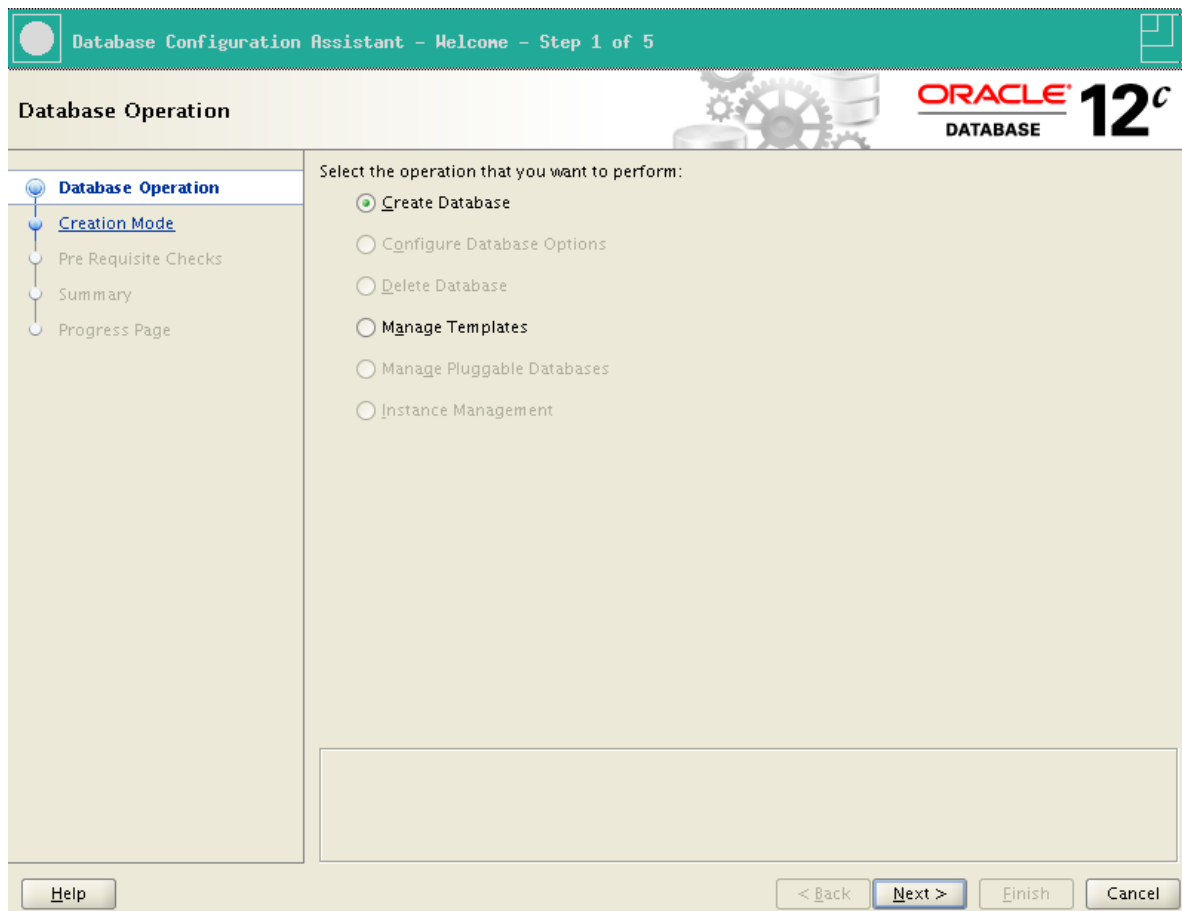
1. Run the **Database Configuration Assistant**:

```
oracle@collabn1 ~1$ /u01/app/oracle/product/12.1.0/dbhome_1/bin/dbca
```

2. The splash screen appears.



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



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 (*)**

Click **Next**.

Database Configuration Assistant - Create Database - Step 2 of 5

Creation Mode

ORACLE 12c DATABASE

Database Operation

Creation Mode

Pre Requisite Checks

Summary

Progress Page

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 :

Confirm Password:

Create As Container Database

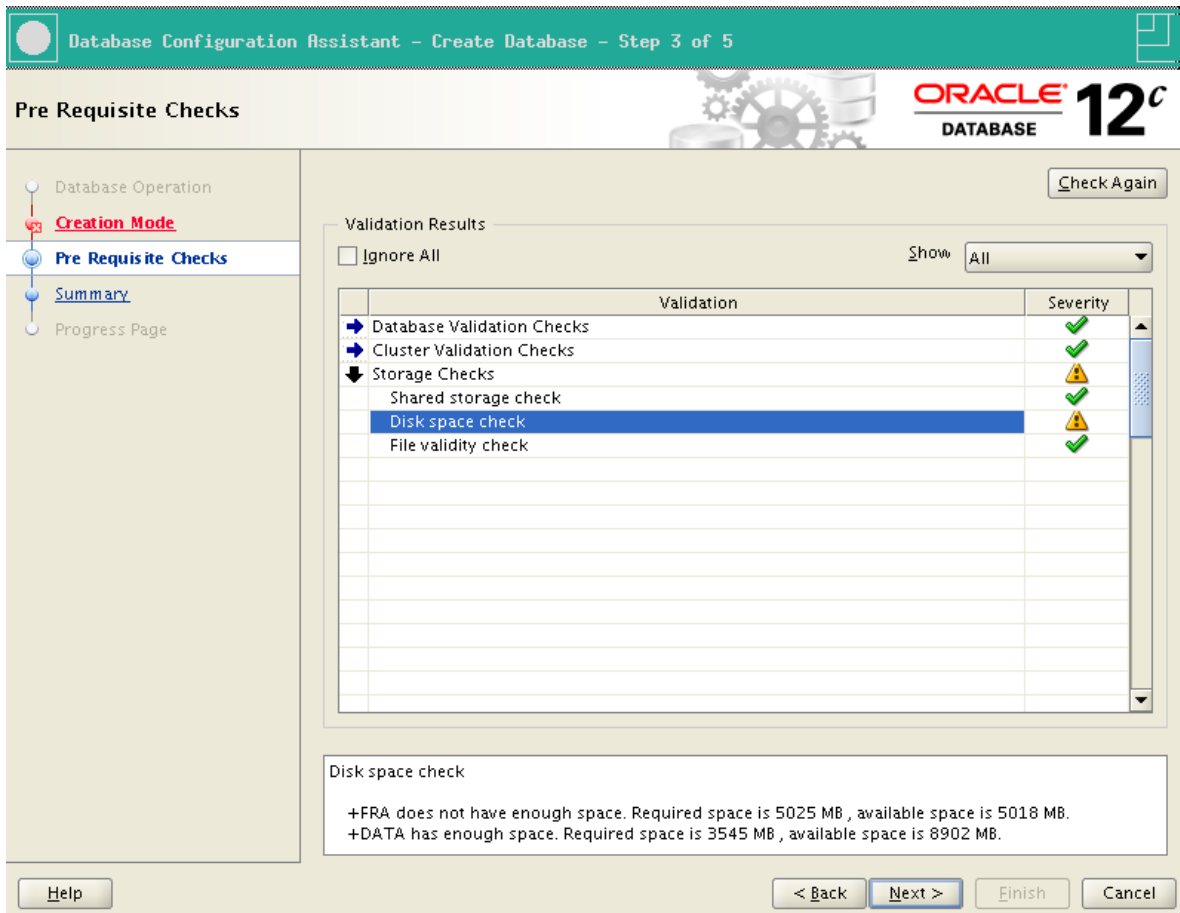
Pluggable Database Name: PDB

Advanced Mode

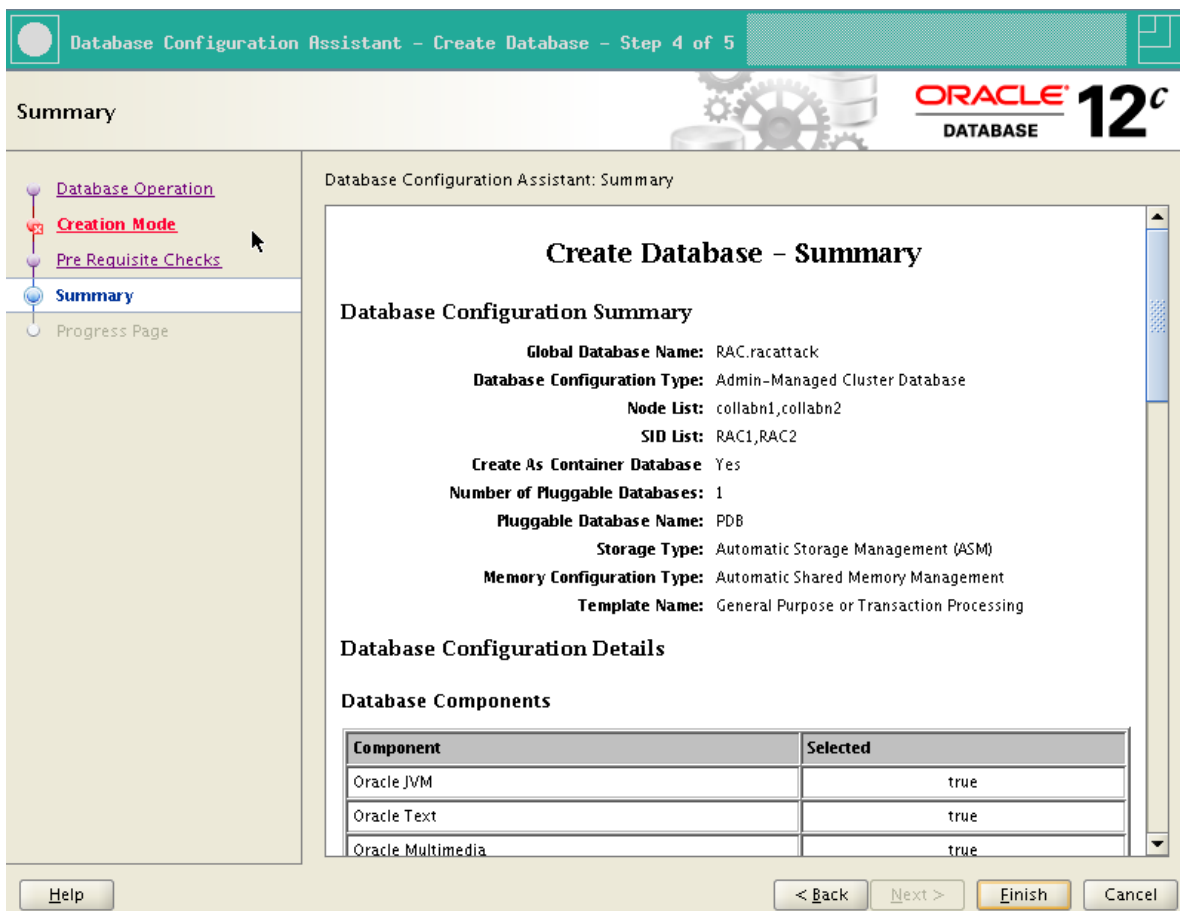
Messages:

Administrative Password : The password entered does not conform to the Oracle recommended standards. A password should have minimum of 8 characters in length. In addition, the password must contain at least one upper case character, one lower case character and one digit.

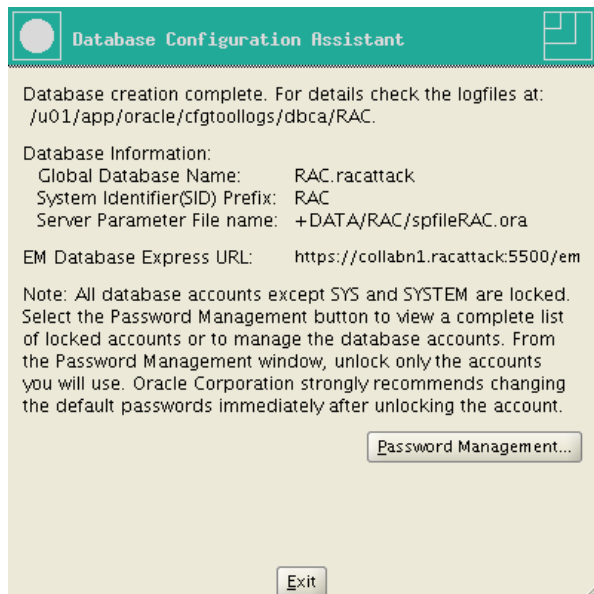
5. A warning is shown because the password is weak. Click **Yes** to continue.
6. The prerequisite checks may fail due to space requirements. It's safe to ignore by checking **Ignore all**. Click **Next**.



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



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



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