installing Linux

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lt-2.0

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Chapter 1. installing Debian 8

This module is a step by step demonstration of an actual installation of **Debian 8** (also known as **Jessie**).

We start by downloading an image from the internet and install **Debian 8** as a virtual machine in **Virtualbox**. We will also do some basic configuration of this new machine like setting an **ip address** and fixing a **hostname**.

This procedure should be very similar for other versions of **Debian**, and also for distributions like **Linux Mint**, **xubuntu/ubuntu/kubuntu** or **Mepis**. This procedure can also be helpful if you are using another virtualization solution.

Go to the next chapter if you want to install **CentOS, Fedora, Red Hat Enterprise Linux, ...**.

1.1. Debian

Debian is one of the oldest Linux distributions. I use Debian myself on almost every computer that I own (including **raspbian** on the **Raspberry Pi**).

Debian comes in **releases** named after characters in the movie **Toy Story**. The **Jessie** release contains about 36000 packages.

Table 1.1. Debian releases

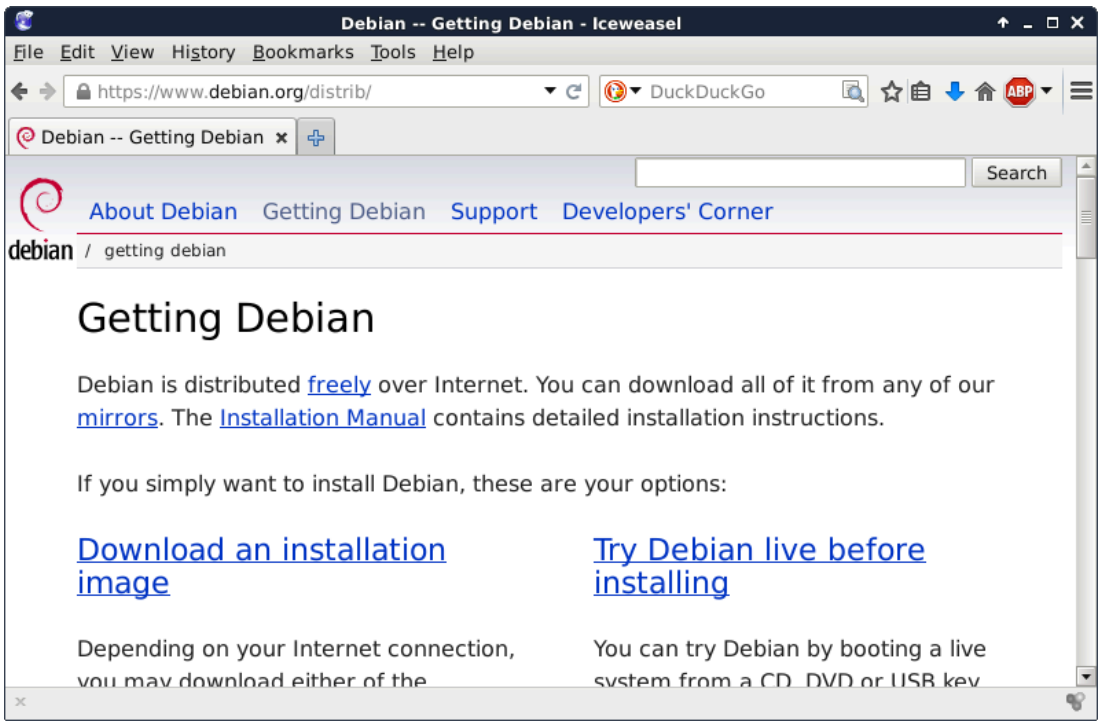
name	number	year
Woody	3.0	2002
Sarge	3.1	2005
Etch	4.0	2007
Lenny	5.0	2009
Squeeze	6.0	2011
Wheezy	7	2013
Jessie	8	2015

There is never a fixed date for the next **Debian** release. The next version is released when it is ready.

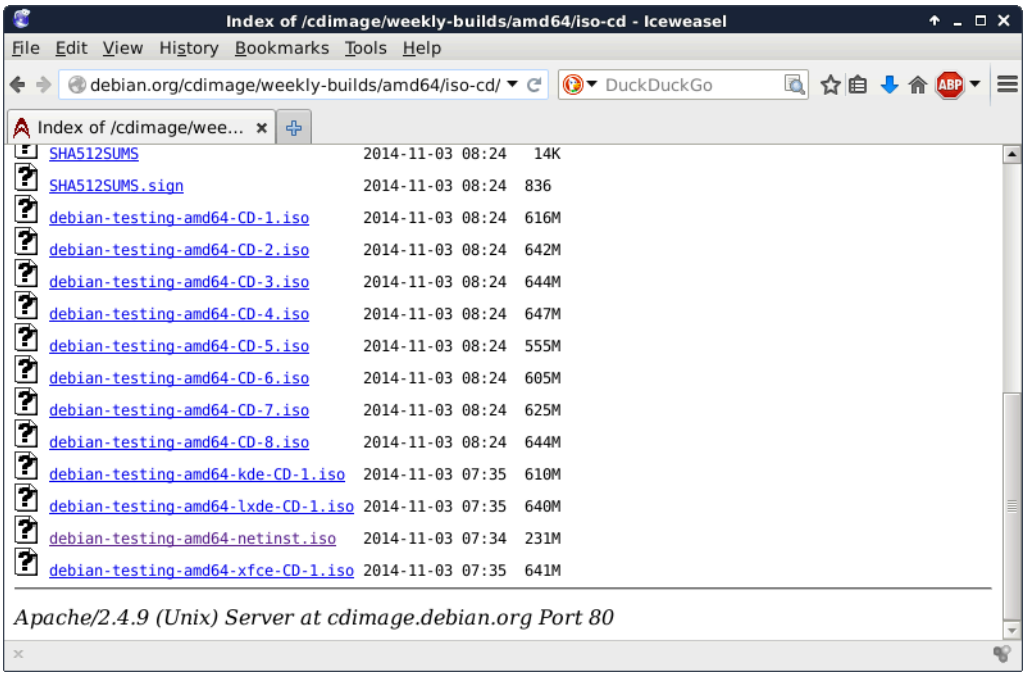
1.2. Downloading

All these screenshots were made in November 2014, which means **Debian 8** was still in 'testing' (but in 'freeze', so there will be no major changes when it is released).

Download Debian here:

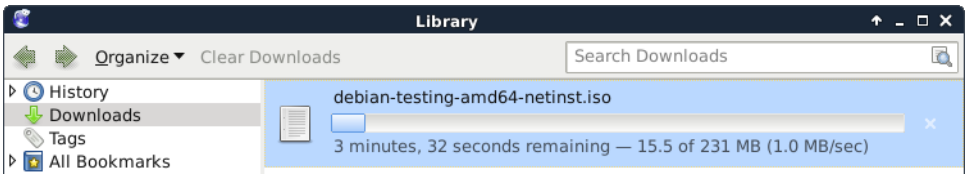


After a couple of clicks on that website, I ended up downloading **Debian 8** (testing) here. It should be only one click once **Debian 8** is released (somewhere in 2015).



You have many other options to download and install **Debian**. We will discuss them much later.

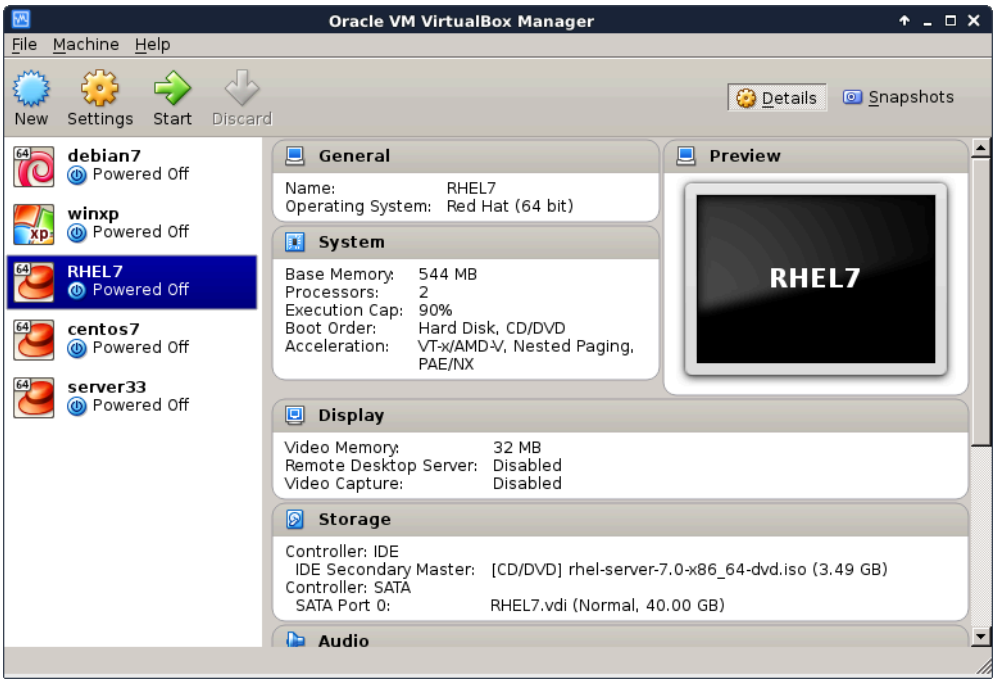
This small screenshot shows the downloading of a **netinst** .iso file. Most of the software will be downloaded during the installation. This also means that you will have the most recent version of all packages when the install is finished.



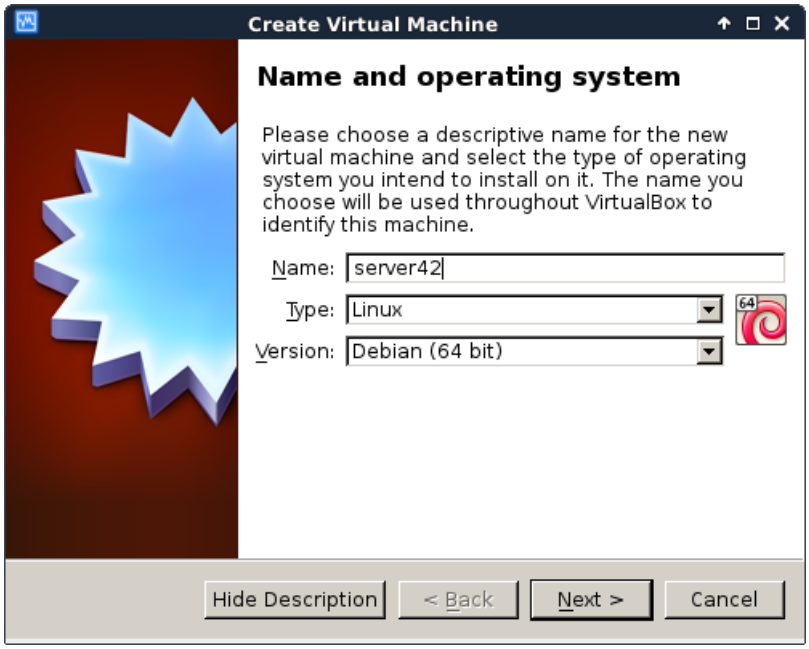
I already have Debian 8 installed on my laptop (hence the **paul@debian8** prompt). Anyway, this is the downloaded file just before starting the installation.

```
paul@debian8:~$ ls -hl debian-testing-amd64-netinst.iso
-rw-r--r-- 1 paul paul 231M Nov 10 17:59 debian-testing-amd64-netinst.iso
```

Create a new virtualbox machine (I already have five, you might have zero for now). Click the **New** button to start a wizard that will help you create a virtual machine.

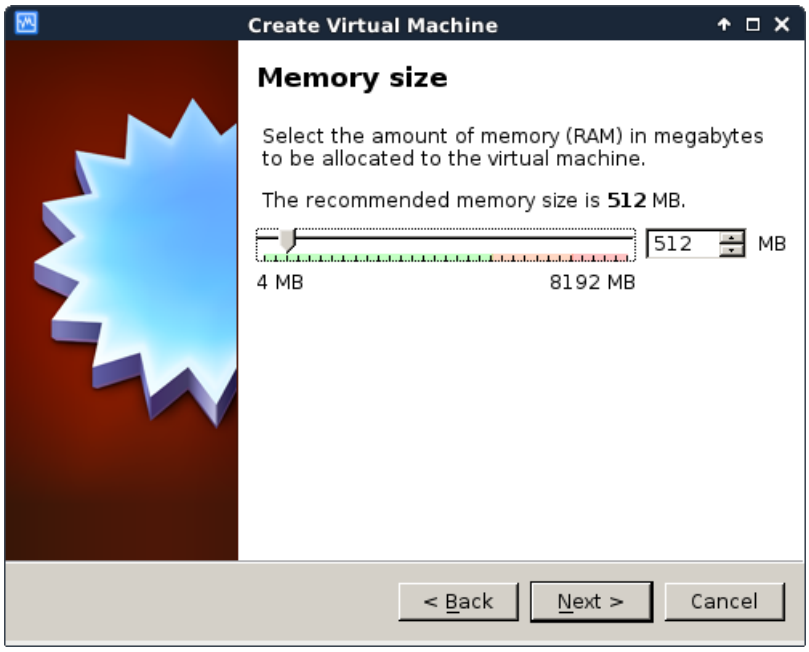


The machine needs a name, this screenshot shows that I named it **server42**.

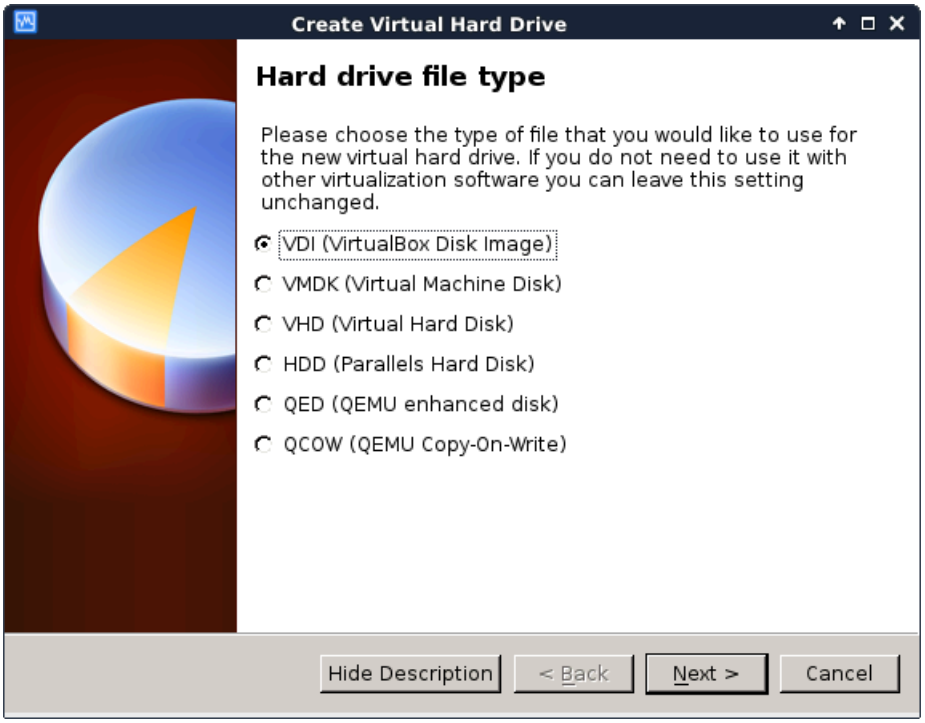


Most of the defaults in Virtualbox are ok.

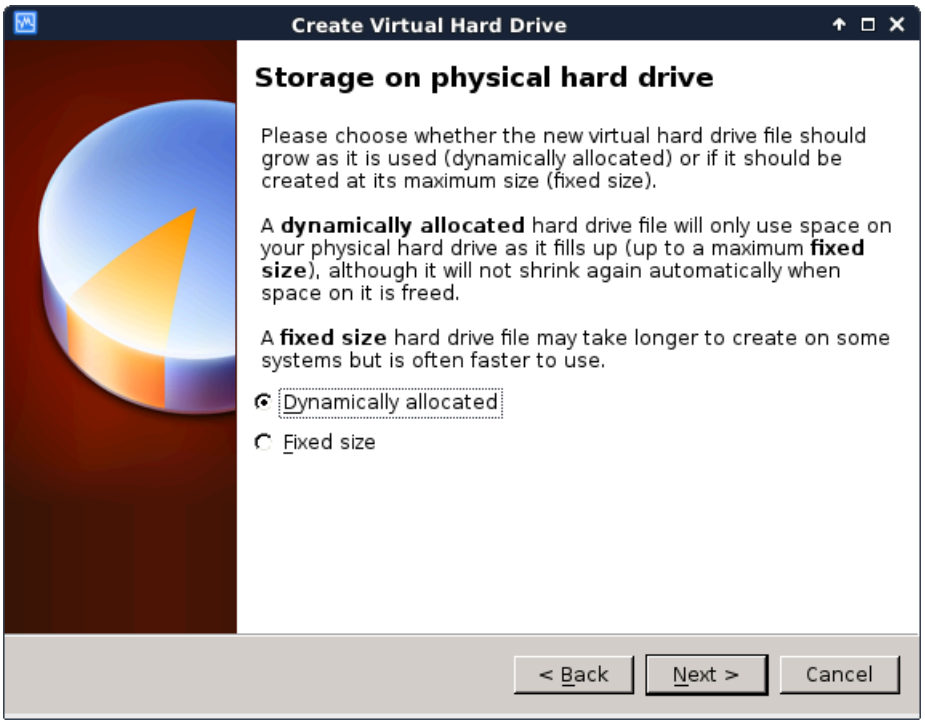
512MB of RAM is enough to practice all the topics in this book.



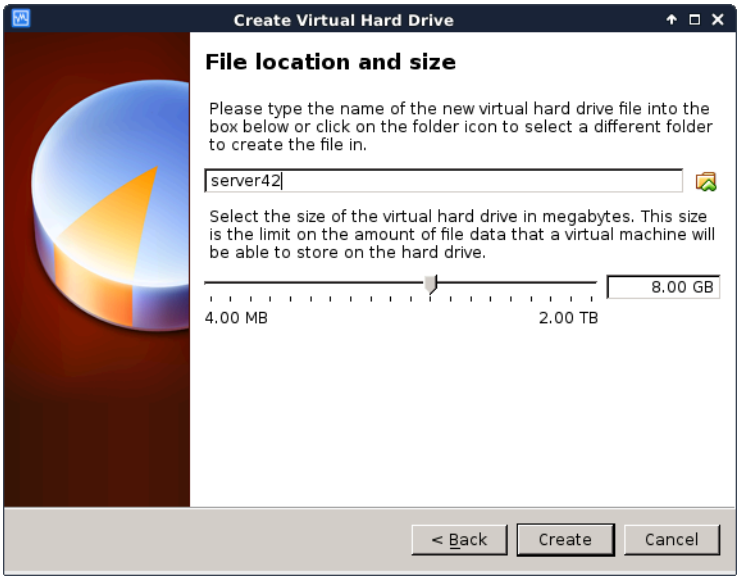
We do not care about the virtual disk format.



Choosing **dynamically allocated** will save you some disk space (for a small performance hit).

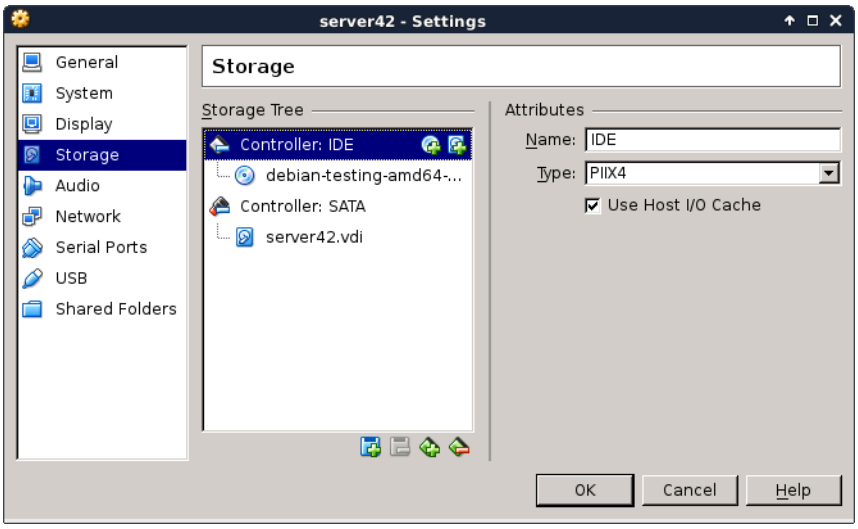


8GB should be plenty for learning about Linux servers.



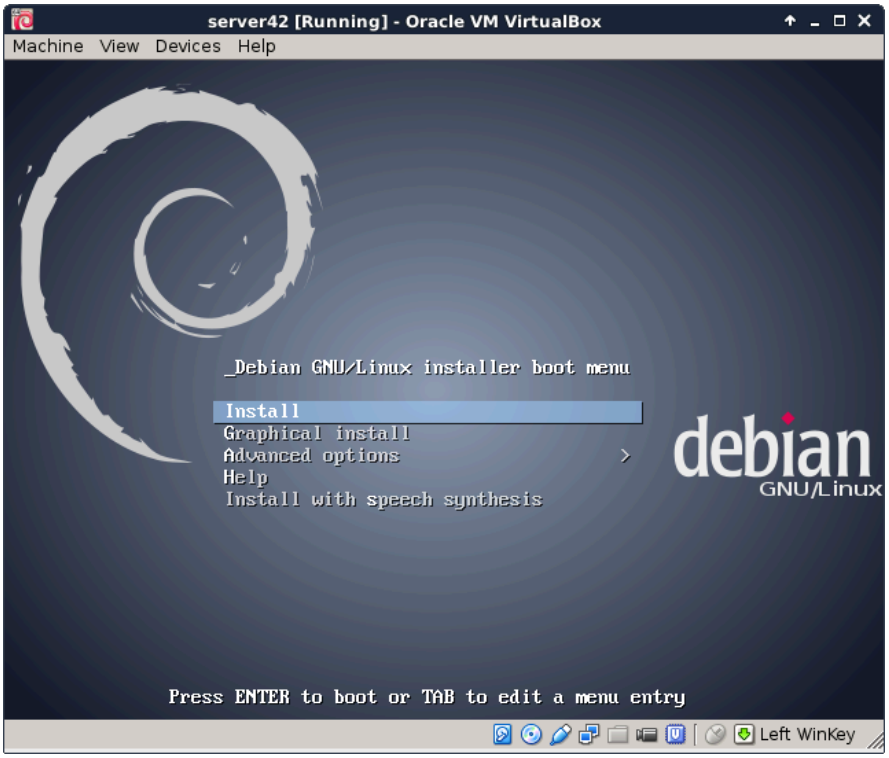
This finishes the wizard. You virtual machine is almost ready to begin the installation.

First, make sure that you attach the downloaded .iso image to the virtual CD drive. (by opening **Settings**, **Storage** followed by a mouse click on the round CD icon)

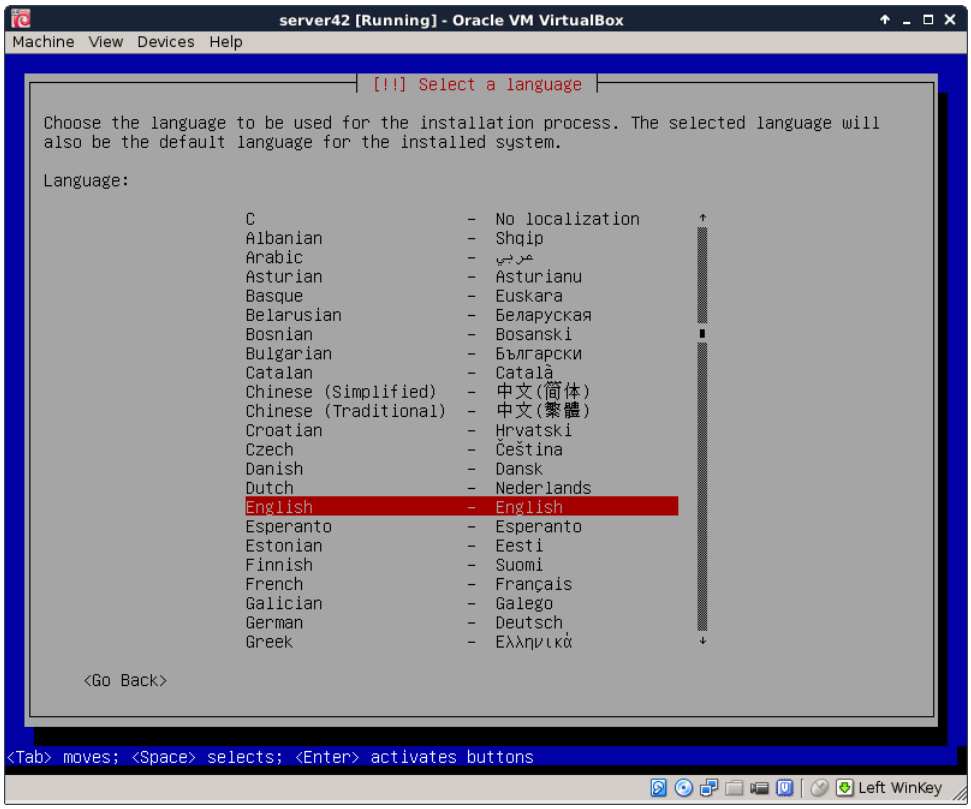


Personally I also disable sound and usb, because I never use these features. I also remove the floppy disk and use a PS/2 mouse pointer. This is probably not very important, but I like the idea that it saves some resources.

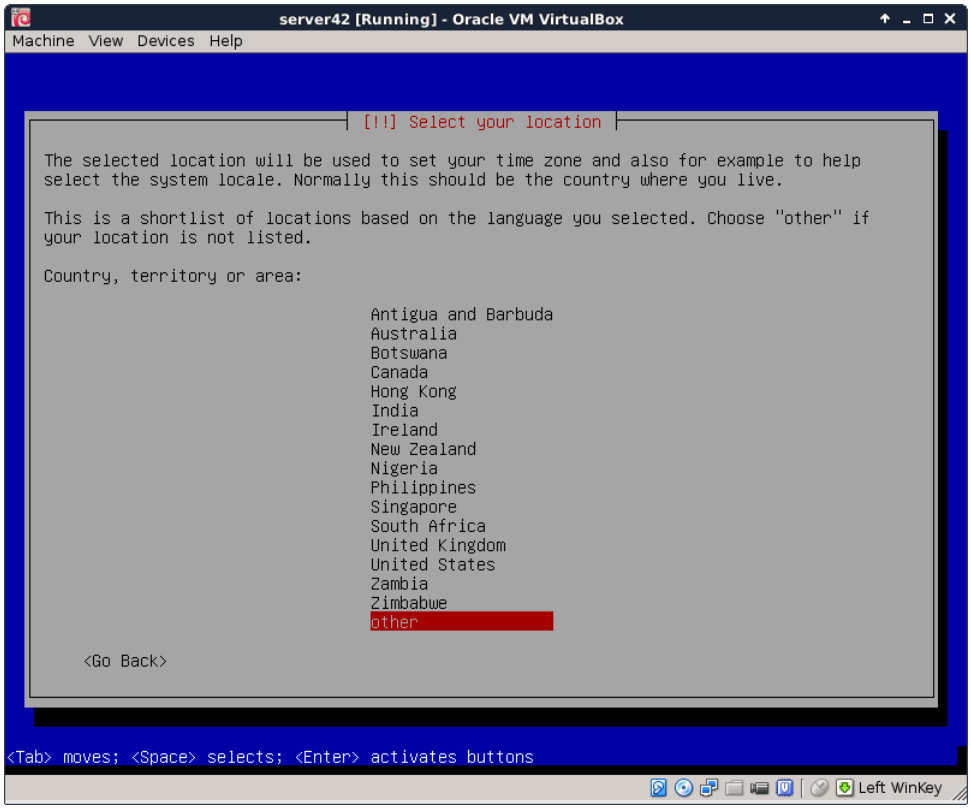
Now boot the virtual machine and begin the actual installation. After a couple of seconds you should see a screen similar to this. Choose **Install** to begin the installation of Debian.



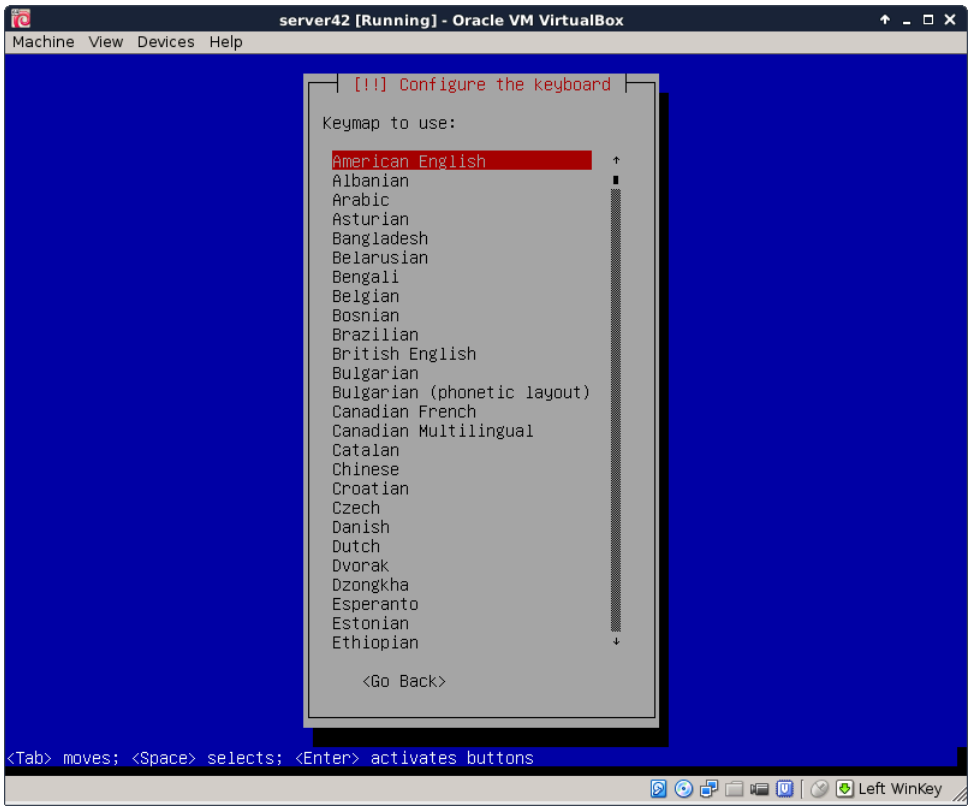
First select the language you want to use.



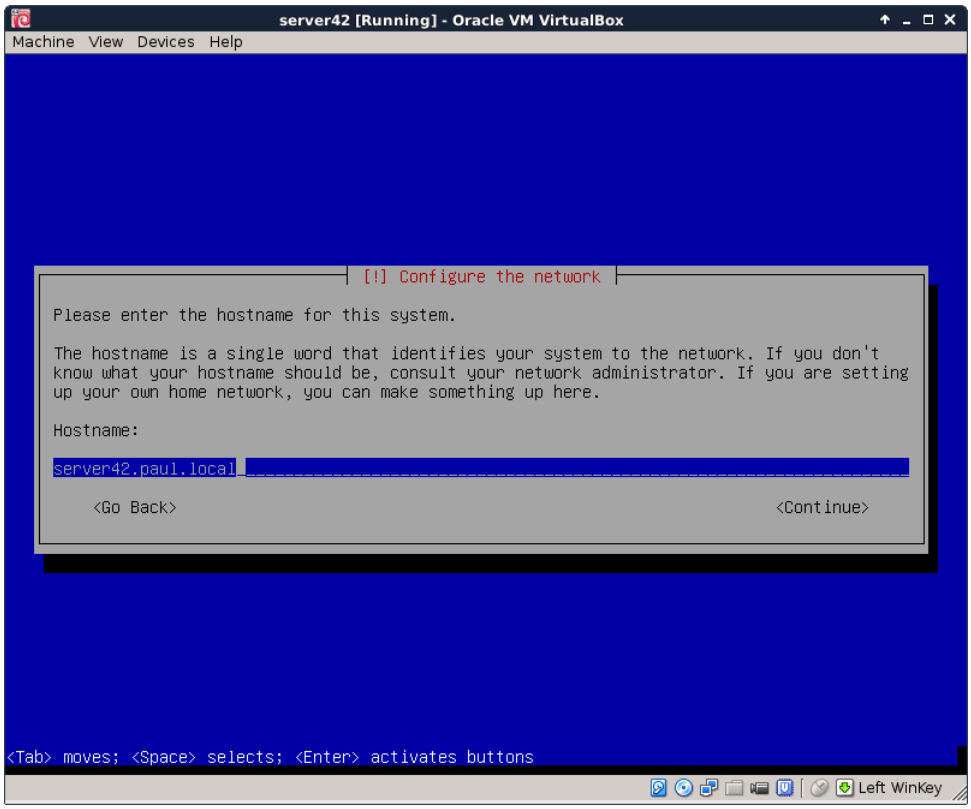
Choose your country. This information will be used to suggest a download mirror.



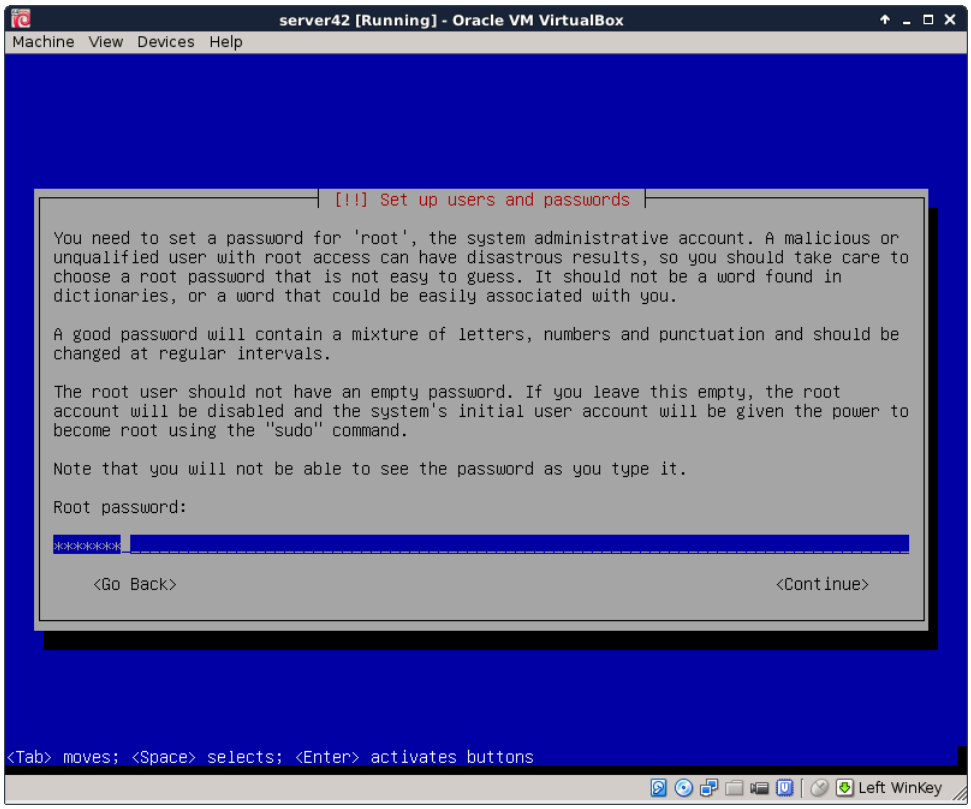
Choose the correct keyboard. On servers this is of no importance since most servers are remotely managed via **ssh**.



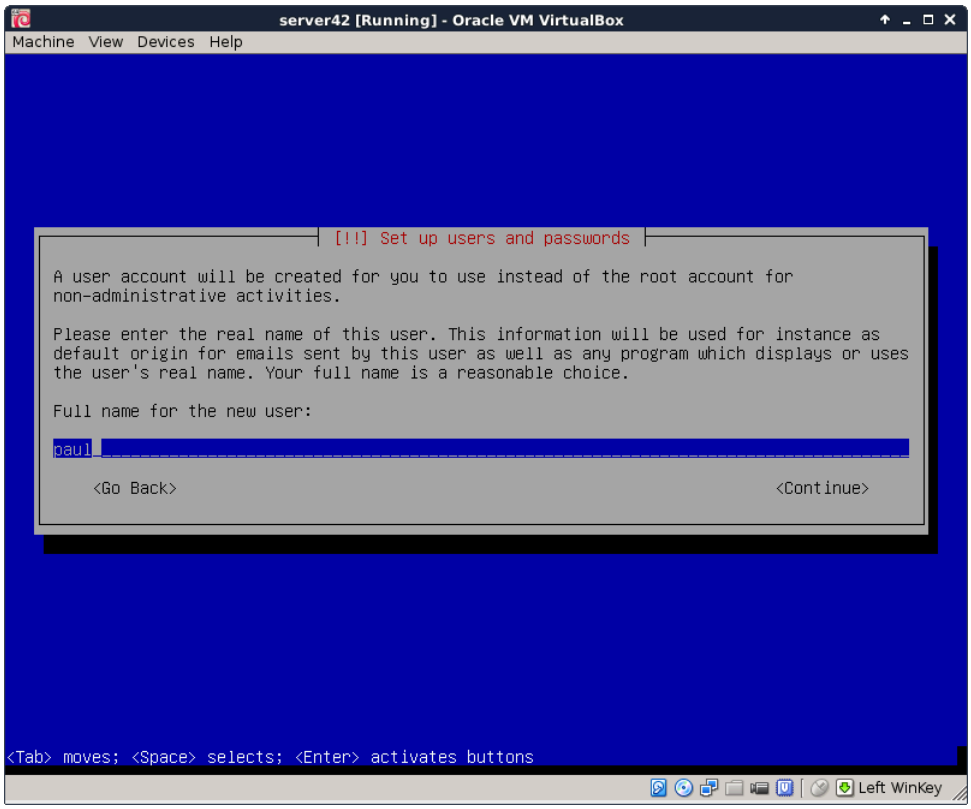
Enter a **hostname** (with **fqdn** to set a **dnsdomainname**).



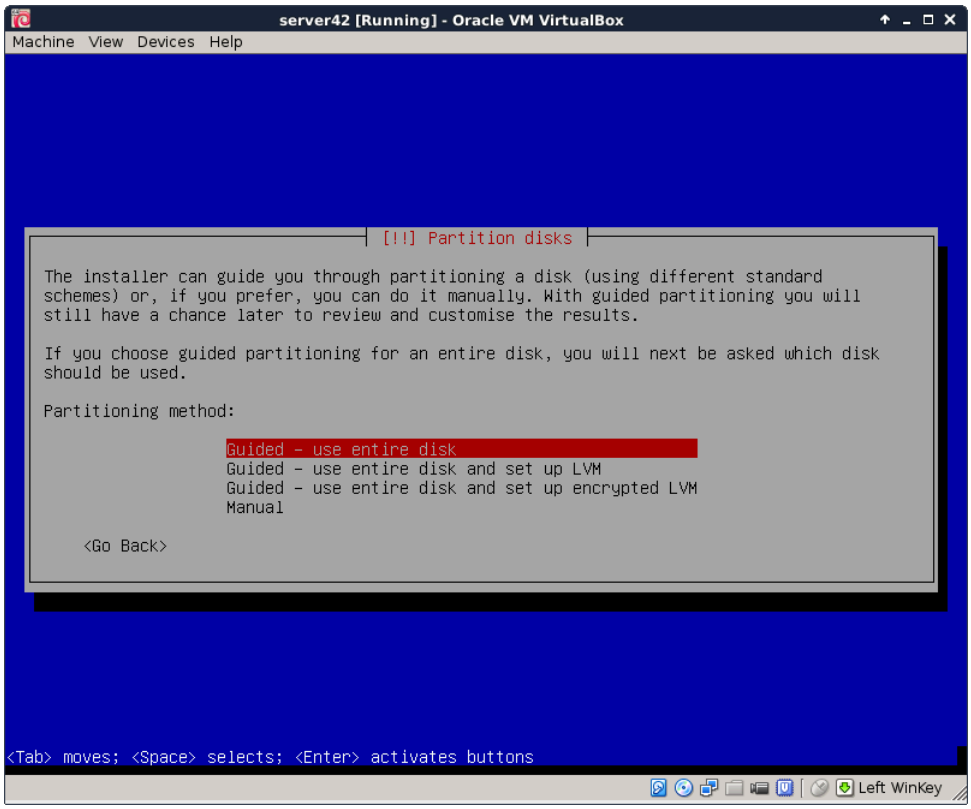
Give the **root** user a password. Remember this password (or use **hunter2**).



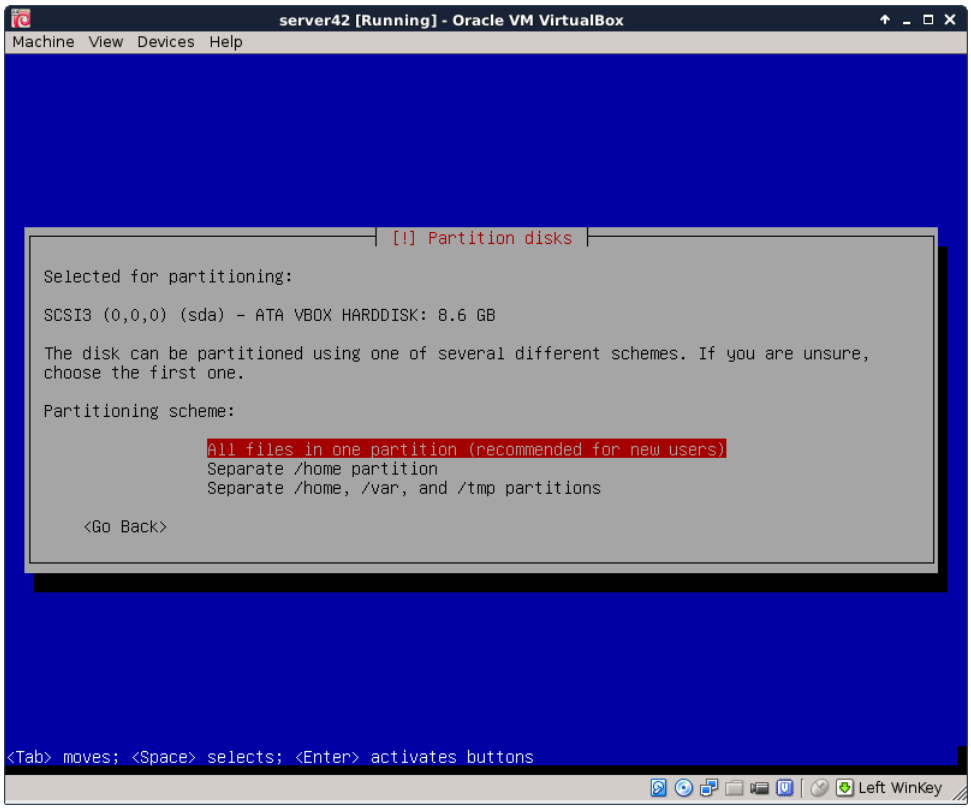
It is adviced to also create a normal user account. I don't give my full name, Debian 8 accepts an identical username and full name **paul**.



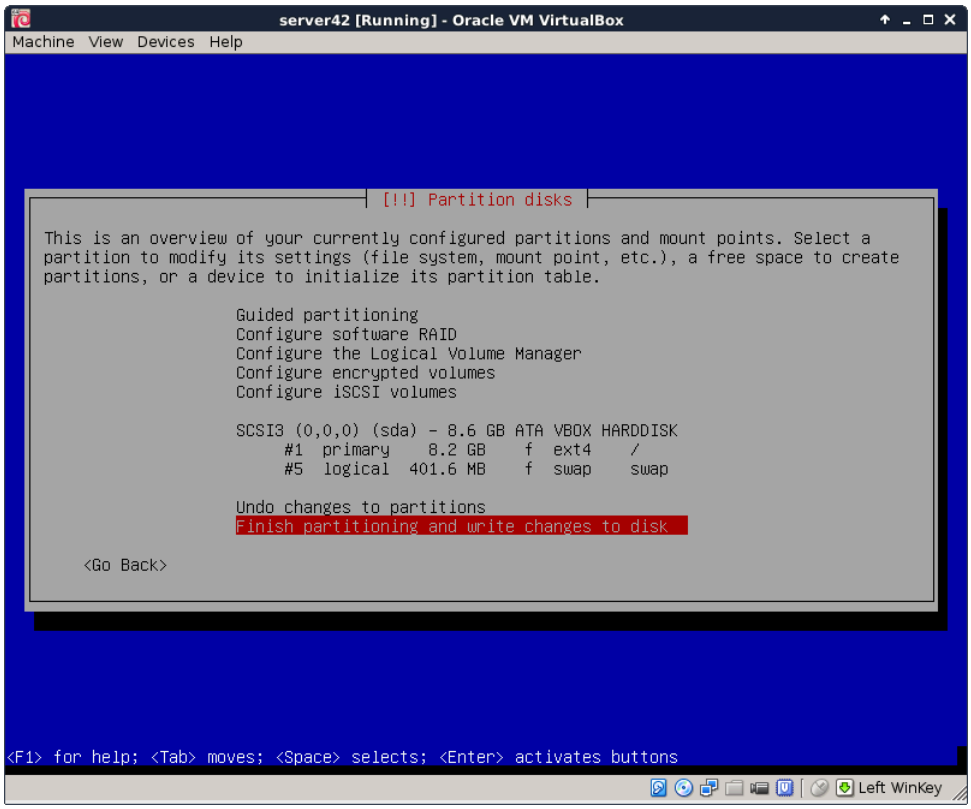
The **use entire disk** refers to the **virtual disk** that you created before in **Virtualbox**..



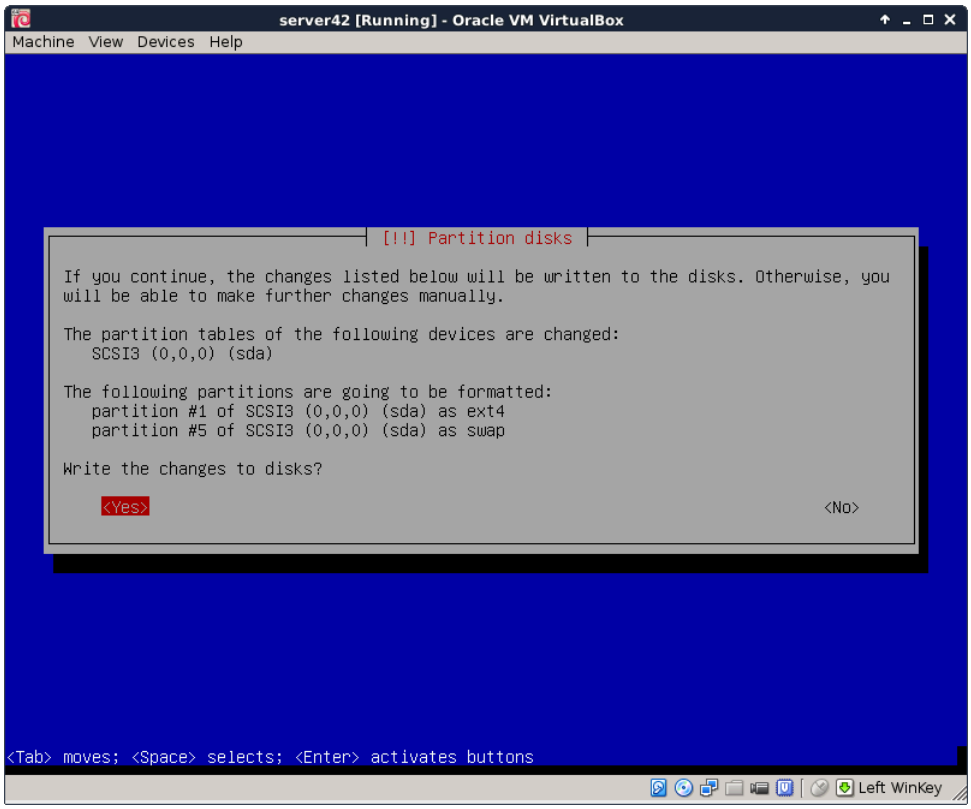
Again the default is probably what you want. Only change partitioning if you really know what you are doing.



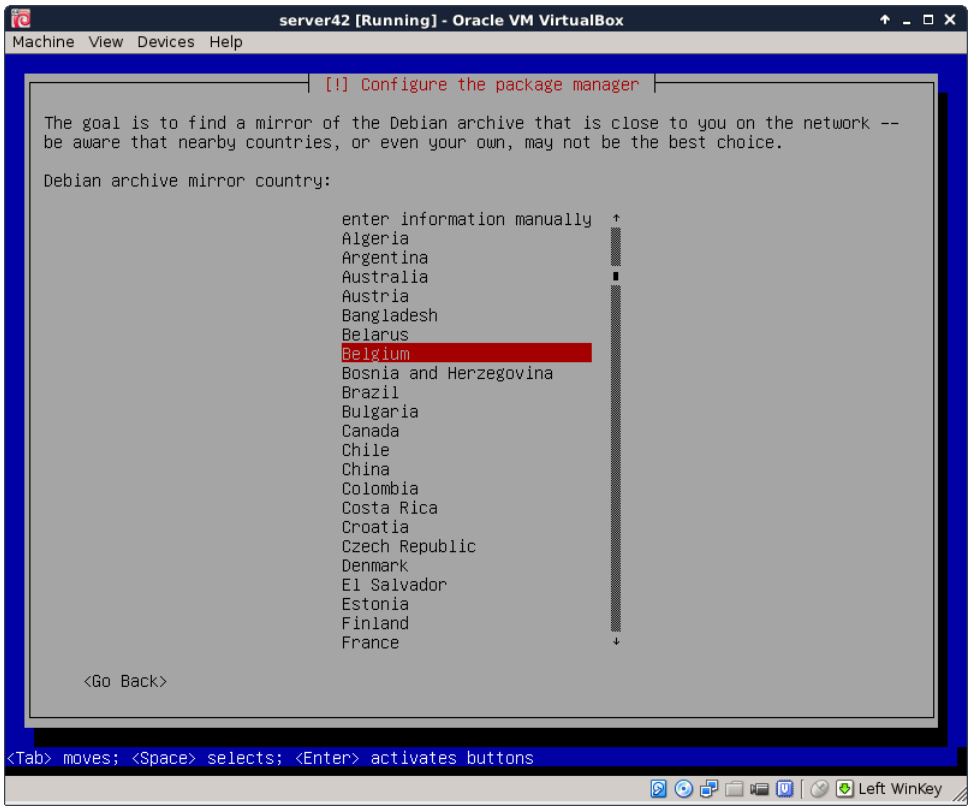
Accept the partition layout (again only change if you really know what you are doing).



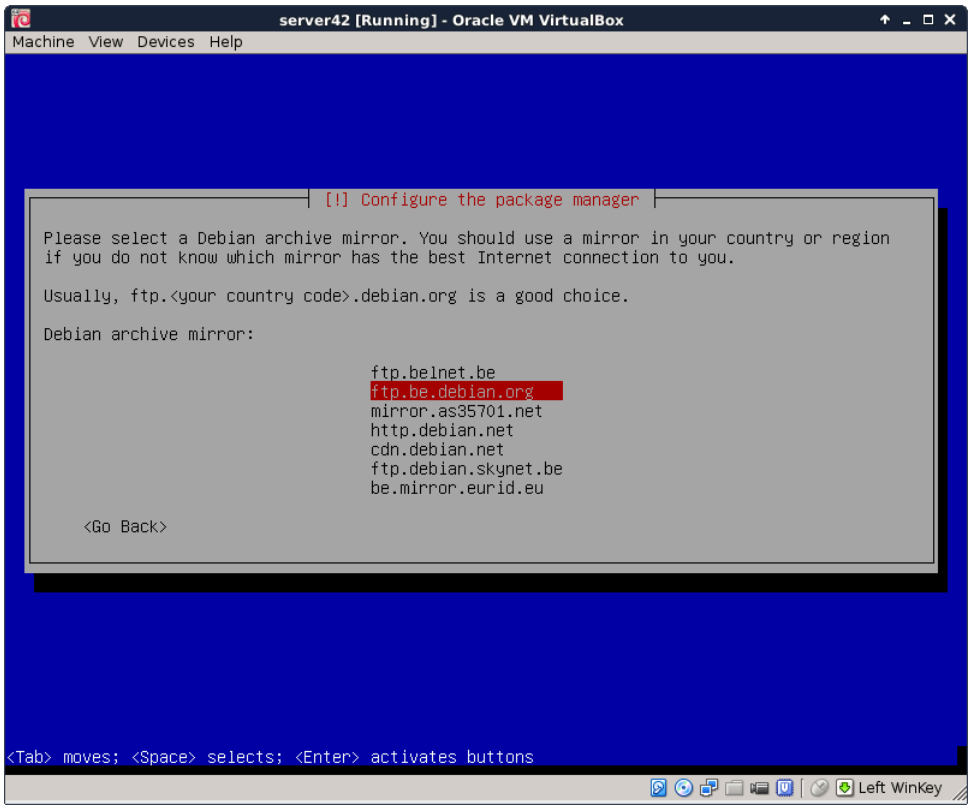
This is the point of no return, the magical moment where pressing **yes** will forever erase data on the (virtual) computer.



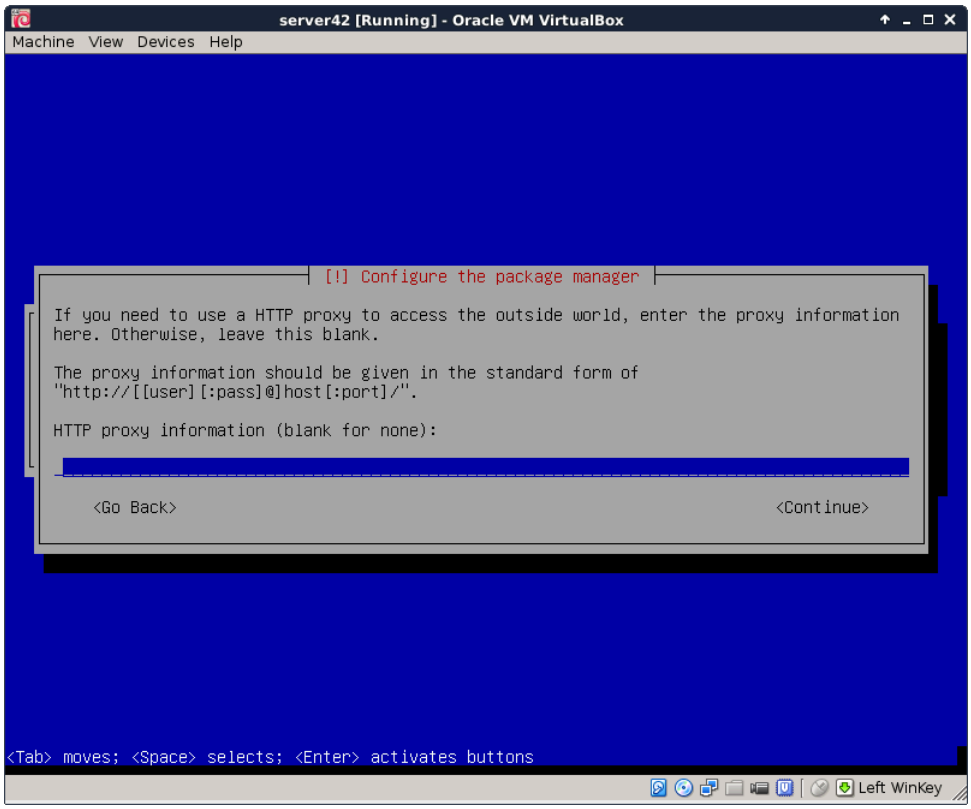
Software is downloaded from a mirror repository, preferably choose one that is close by (as in the same country).



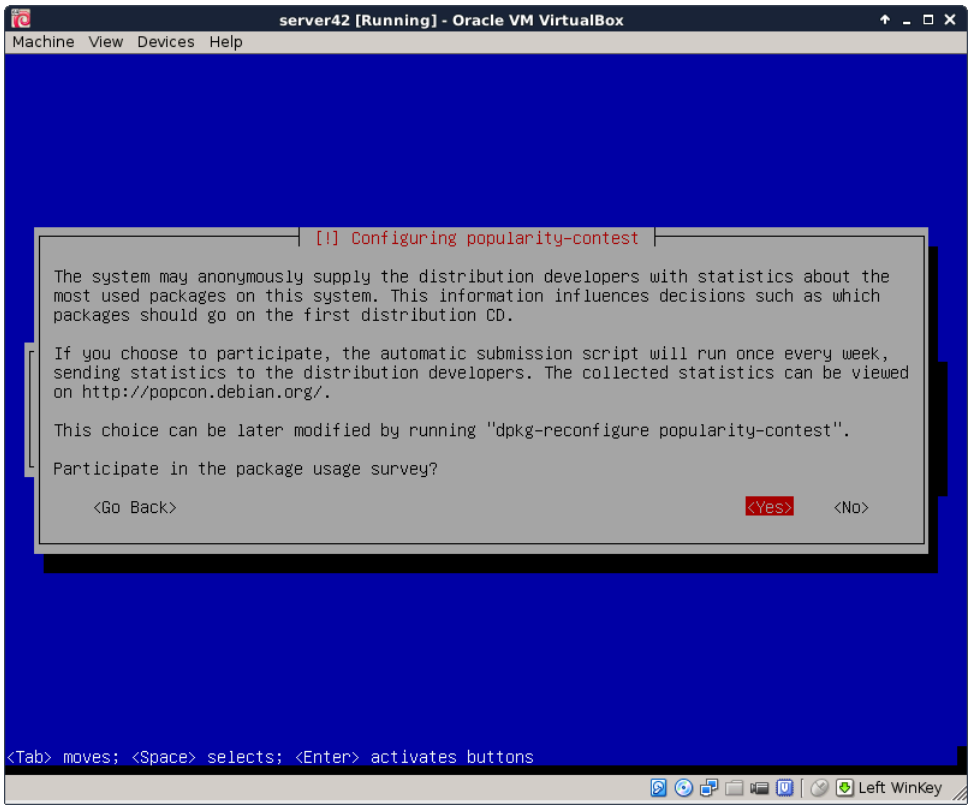
This setup was done in Belgium.



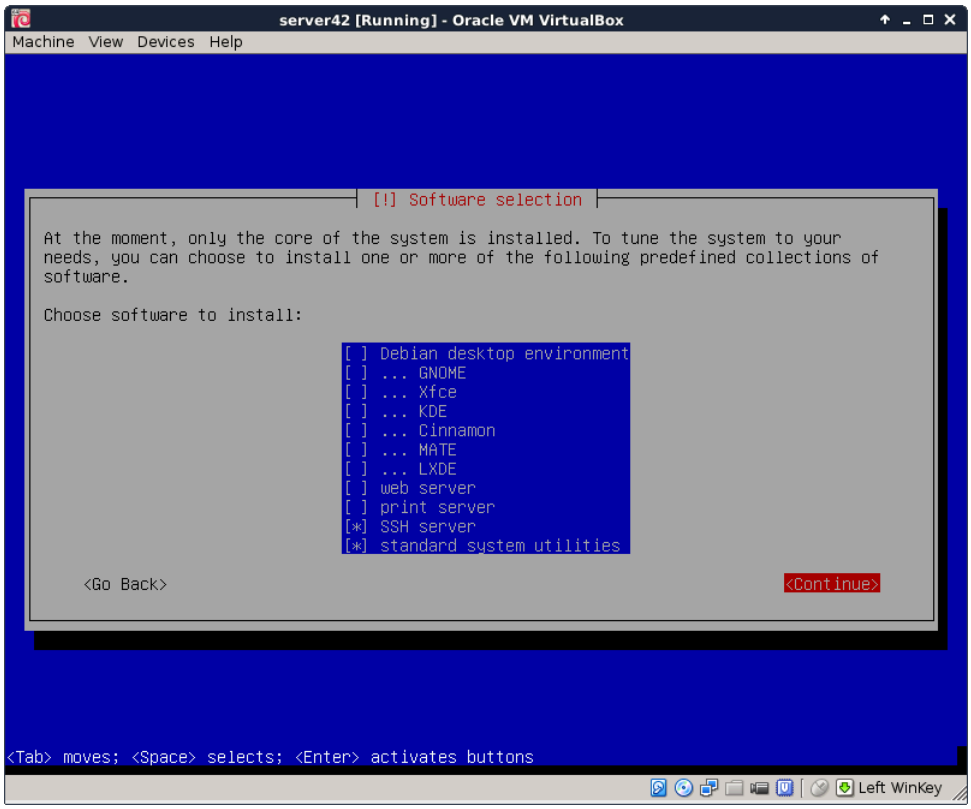
Leave the proxy field empty (unless you are sure that you are behind a proxy server).



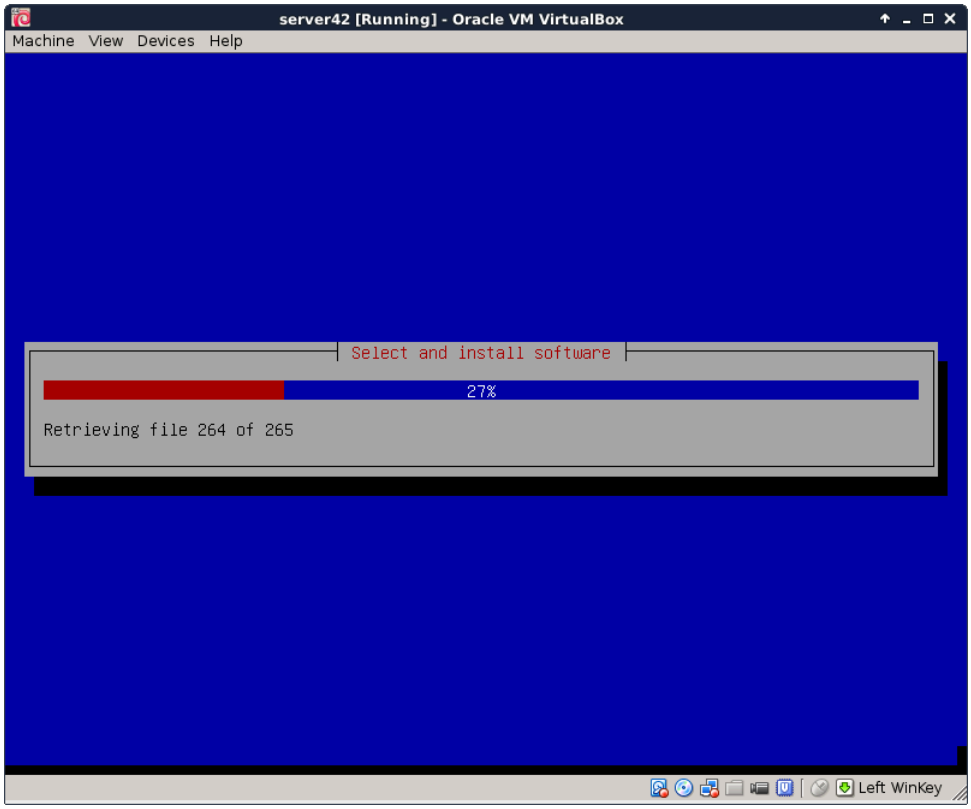
Choose whether you want to send anonymous statistics to the Debian project (it gathers data about installed packages). You can view the statistics here **http://popcon.debian.org/**.



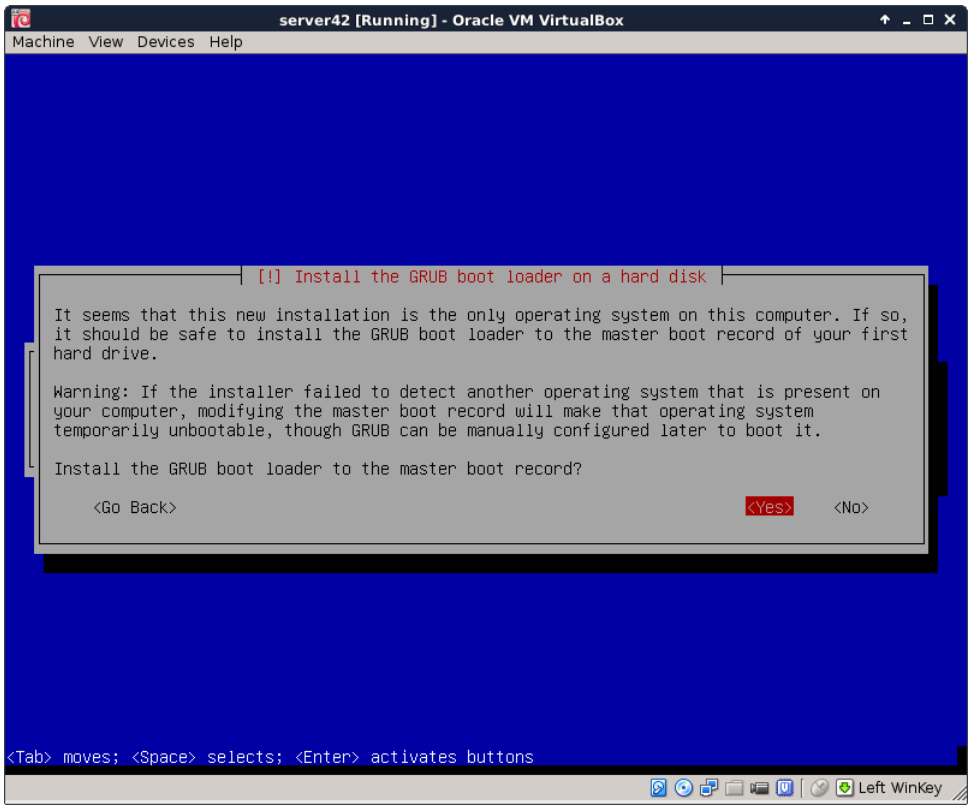
Choose what software to install, we do not need any graphical stuff for this training.



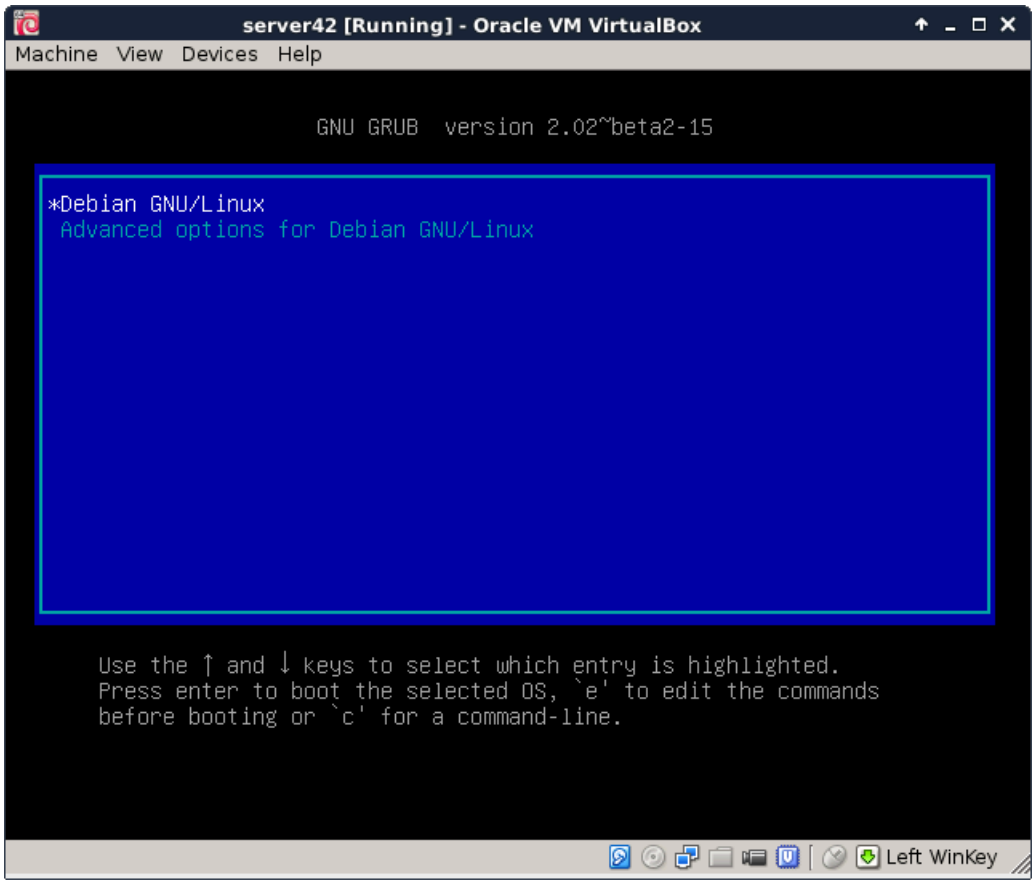
The latest versions are being downloaded.



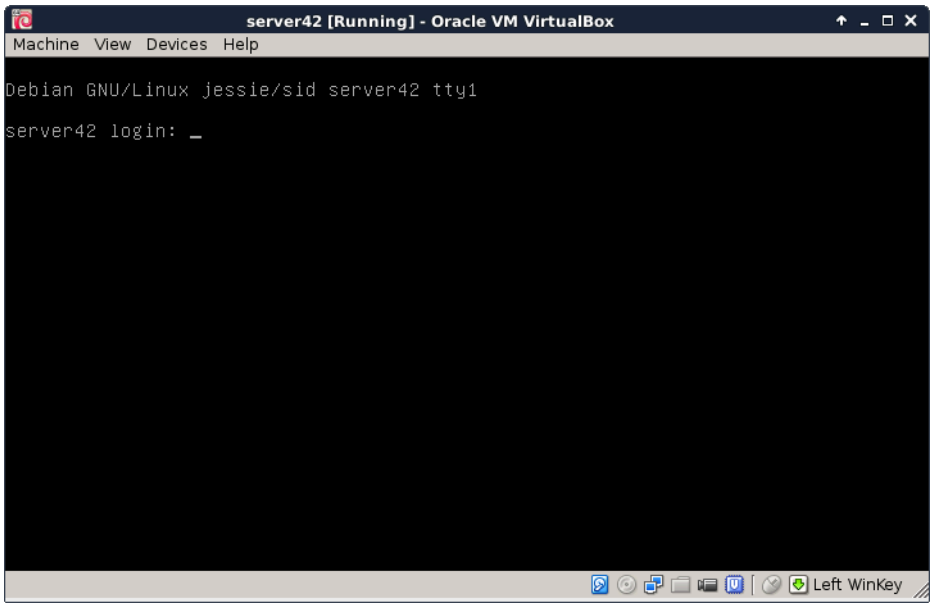
Say yes to install the bootloader on the virtual machine.



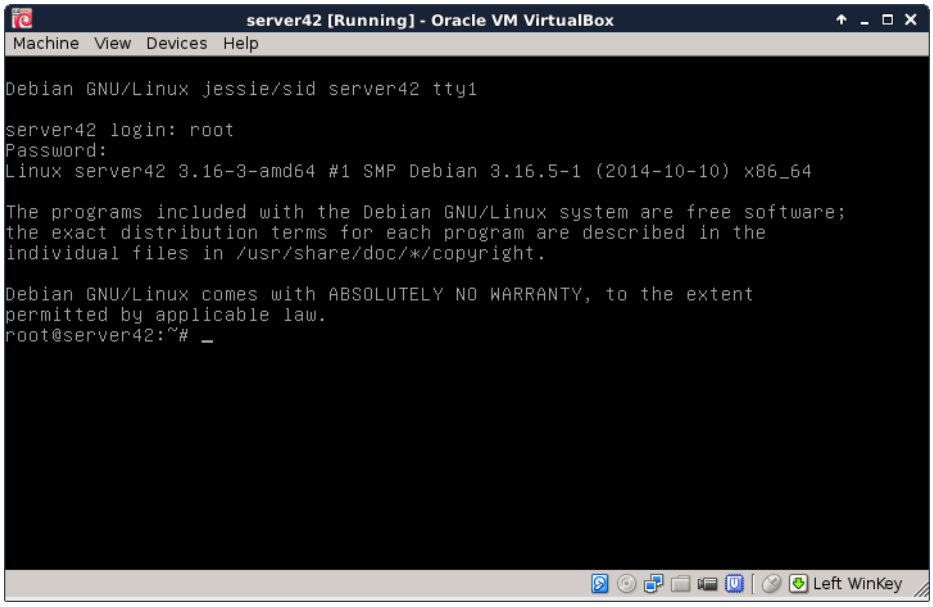
Booting for the first time shows the grub screen



A couple seconds later you should see a lot of text scrolling of the screen (**dmesg**). After which you are presented with this **getty** and are allowed your first logon.



You should now be able to log on to your virtual machine with the **root** account. Do you remember the password ? Was it **hunter2** ?



The screenshots in this book will look like this from now on. You can just type those commands in the terminal (after you logged on).

```
root@server42:~# who am i
root     tty1         2014-11-10 18:21
root@server42:~# hostname
server42
root@server42:~# date
Mon Nov 10 18:21:56 CET 2014
```

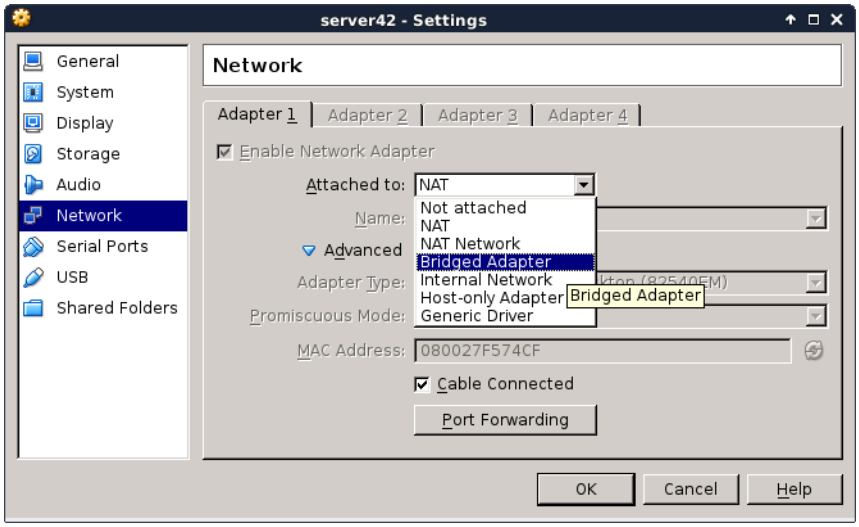
1.3. virtualbox networking

You can also log on from remote (or from your Windows/Mac/Linux host computer) using **ssh** or **putty**. Change the **network** settings in the virtual machine to **bridge**. This will enable your virtual machine to receive an ip address from your local dhcp server.

The default virtualbox networking is to attach virtual network cards to **nat**. This screenshiot shows the ip address **10.0.2.15** when on **nat**:

```
root@server42:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 08:00:27:f5:74:cf
          inet addr:10.0.2.15  Bcast:10.0.2.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:fef5:74cf/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:11 errors:0 dropped:0 overruns:0 frame:0
          TX packets:19 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:2352 (2.2 KiB)  TX bytes:1988 (1.9 KiB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)
```



By shutting down the network interface and enabling it again, we force Debian to renew an ip address from the bridged netwrok.

```
root@server42:~# # do not run ifdown while connected over ssh!
root@server42:~# ifdown eth0
Killed old client process
Internet Systems Consortium DHCP Client 4.3.1
Copyright 2004-2014 Internet Systems Consortium.
All rights reserved.
For info, please visit https://www.isc.org/software/dhcp/

Listening on LPF/eth0/08:00:27:f5:74:cf
Sending on   LPF/eth0/08:00:27:f5:74:cf
```

```
Sending on   Socket/fallback
DHCPRELEASE on eth0 to 10.0.2.2 port 67
root@server42:~# # now enable bridge in virtualbox settings
root@server42:~# ifup eth0
Internet Systems Consortium DHCP Client 4.3.1
Copyright 2004-2014 Internet Systems Consortium.
All rights reserved.
For info, please visit https://www.isc.org/software/dhcp/

Listening on LPF/eth0/08:00:27:f5:74:cf
Sending on   LPF/eth0/08:00:27:f5:74:cf
Sending on   Socket/fallback
DHCPDISCOVER on eth0 to 255.255.255.255 port 67 interval 8
DHCPDISCOVER on eth0 to 255.255.255.255 port 67 interval 8
DHCPREQUEST on eth0 to 255.255.255.255 port 67
DHCPOFFER from 192.168.1.42
DHCPACK from 192.168.1.42
bound to 192.168.1.111 -- renewal in 2938 seconds.
root@server42:~# ifconfig eth0
eth0      Link encap:Ethernet  HWaddr 08:00:27:f5:74:cf
          inet addr:192.168.1.111  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:fef5:74cf/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:15 errors:0 dropped:0 overruns:0 frame:0
          TX packets:31 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:3156 (3.0 KiB)  TX bytes:3722 (3.6 KiB)
root@server42:~#
```

Here is an example of **ssh** to this freshly installed computer. Note that **Debian 8** has disabled remote root access, so i need to use the normal user account.

```
paul@debian8:~$ ssh paul@192.168.1.111
paul@192.168.1.111's password:

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
paul@server42:~$
paul@server42:~$ su -
Password:
root@server42:~#
```

TODO: putty screenshot here...

1.4. setting the hostname

The hostname of the server is asked during installation, so there is no need to configure this manually.

```
root@server42:~# hostname
server42
root@server42:~# cat /etc/hostname
server42
root@server42:~# dnsdomainname
paul.local
root@server42:~# grep server42 /etc/hosts
127.0.1.1       server42.paul.local     server42
root@server42:~#
```

1.5. adding a static ip address

This example shows how to add a static ip address to your server.

You can use **ifconfig** to set a static address that is active until the next **reboot** (or until the next **ifdown**).
a

```
root@server42:~# ifconfig eth0:0 10.104.33.39
```

Adding a couple of lines to the **/etc/network/interfaces** file to enable an extra ip address forever.

```
root@server42:~# vi /etc/network/interfaces
root@server42:~# tail -4 /etc/network/interfaces
auto eth0:0
iface eth0:0 inet static
address 10.104.33.39
netmask 255.255.0.0
root@server42:~# ifconfig
eth0      Link encap:Ethernet  HWaddr 08:00:27:f5:74:cf
          inet addr:192.168.1.111  Bcast:192.168.1.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:fef5:74cf/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:528 errors:0 dropped:0 overruns:0 frame:0
          TX packets:333 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:45429 (44.3 KiB)  TX bytes:48763 (47.6 KiB)

eth0:0    Link encap:Ethernet  HWaddr 08:00:27:f5:74:cf
          inet addr:10.104.33.39  Bcast:10.255.255.255  Mask:255.0.0.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:0
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

root@server42:~#
```

1.6. Debian package management

To get all information about the newest packages form the online repository:

```
root@server42:~# aptitude update
Get: 1 http://ftp.be.debian.org jessie InRelease [191 kB]
Get: 2 http://security.debian.org jessie/updates InRelease [84.1 kB]
Get: 3 http://ftp.be.debian.org jessie-updates InRelease [117 kB]
Get: 4 http://ftp.be.debian.org jessie-backports InRelease [118 kB]
Get: 5 http://security.debian.org jessie/updates/main Sources [14 B]
Get: 6 http://ftp.be.debian.org jessie/main Sources/DiffIndex [7,876 B]
... (output truncated)
```

To download and apply all updates for all installed packages:

```
root@server42:~# aptitude upgrade
Resolving dependencies...
The following NEW packages will be installed:
  firmware-linux-free{a} irqbalance{a} libnuma1{a} linux-image-3.16.0-4-amd64{a}
The following packages will be upgraded:
  busybox file libc-bin libc6 libexpat1 libmagic1 libpaper-utils libpaper1 libsqlite3-0
  linux-image-amd64 locales multiarch-support
12 packages upgraded, 4 newly installed, 0 to remove and 0 not upgraded.
Need to get 44.9 MB of archives. After unpacking 161 MB will be used.
Do you want to continue? [Y/n/?]
... (output truncated)
```

To install new software (**vim** and **tmux** in this example):

```
root@server42:~# aptitude install vim tmux
The following NEW packages will be installed:
  tmux vim vim-runtime{a}
0 packages upgraded, 3 newly installed, 0 to remove and 0 not upgraded.
Need to get 6,243 kB of archives. After unpacking 29.0 MB will be used.
Do you want to continue? [Y/n/?]
Get: 1 http://ftp.be.debian.org/debian/ jessie/main tmux amd64 1.9-6 [245 kB]
Get: 2 http://ftp.be.debian.org/debian/ jessie/main vim-runtime all 2:7.4.488-1 [5,046 kB]
Get: 3 http://ftp.be.debian.org/debian/ jessie/main vim amd64 2:7.4.488-1 [952 kB]
```

Refer to the **package management** chapter in LinuxAdm.pdf for more information.

Chapter 2. installing CentOS 7

This module is a step by step demonstration of an actual installation of **CentOS 7**.

We start by downloading an image from the internet and install **CentOS 7** as a virtual machine in **Virtualbox**. We will also do some basic configuration of this new machine like setting an **ip address** and fixing a **hostname**.

This procedure should be very similar for other versions of **CentOS**, and also for distributions like **RHEL** (Red Hat Enterprise Linux) or **Fedora**. This procedure can also be helpful if you are using another virtualization solution.

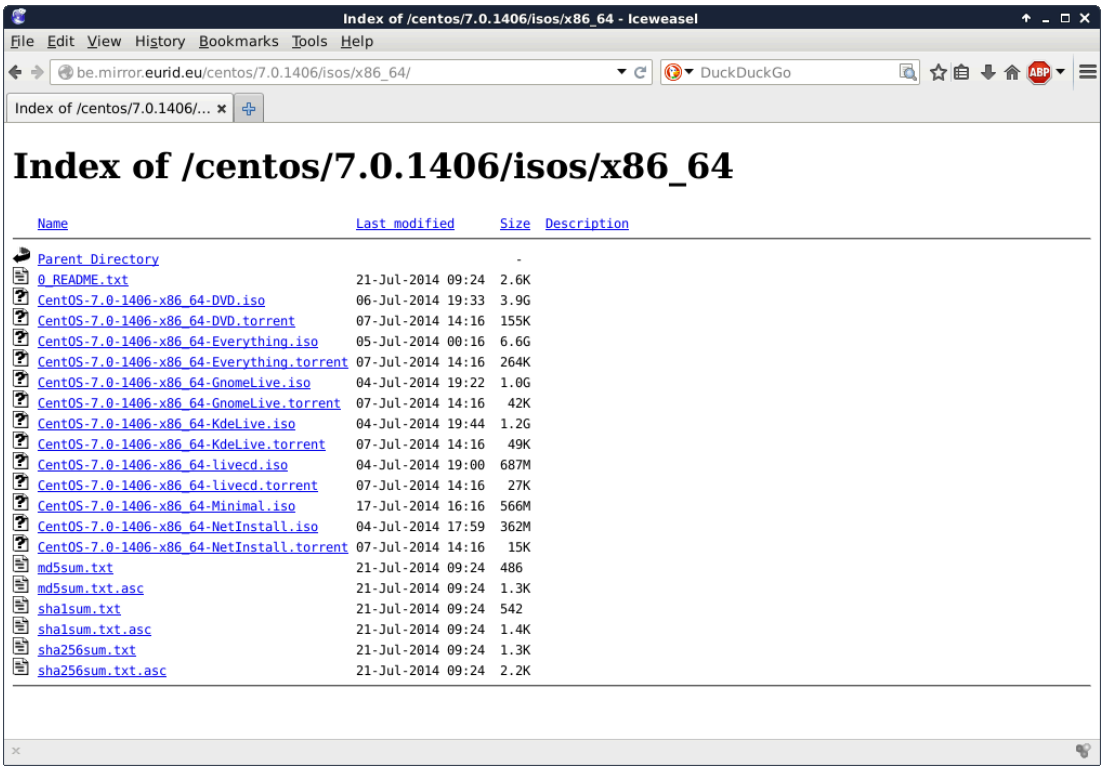
2.1. download a CentOS 7 image

This demonstration uses a laptop computer with **Virtualbox** to install **CentOS 7** as a virtual machine. The first task is to download an **.iso** image of **CentOS 7**.

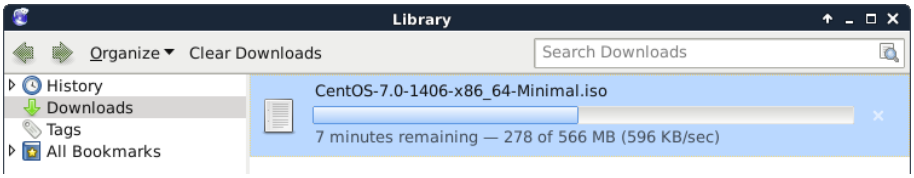
The **CentOS 7** website looks like this today (November 2014). They change the look regularly, so it may look different when you visit it.

You can download a full DVD, which allows for an off line installation of a graphical **CentOS 7** desktop. You can select this because it should be easy and complete, and should get you started with a working **CentOS 7** virtual machine.

But I clicked instead on 'alternative downloads', selected **CentOS 7** and **x86_64** and ended up on a **mirror list**. Each mirror is a server that contains copies of **CentOS 7** media. I selected a Belgian mirror because I currently am in Belgium.



There is again the option for full DVD's and more. This demonstration will use the **minimal** .iso file, because it is much smaller in size. The download takes a couple of minutes.



Verify the size of the file after download to make sure it is complete. Probably a right click on the file and selecting 'properties' (if you use Windows or Mac OSX).

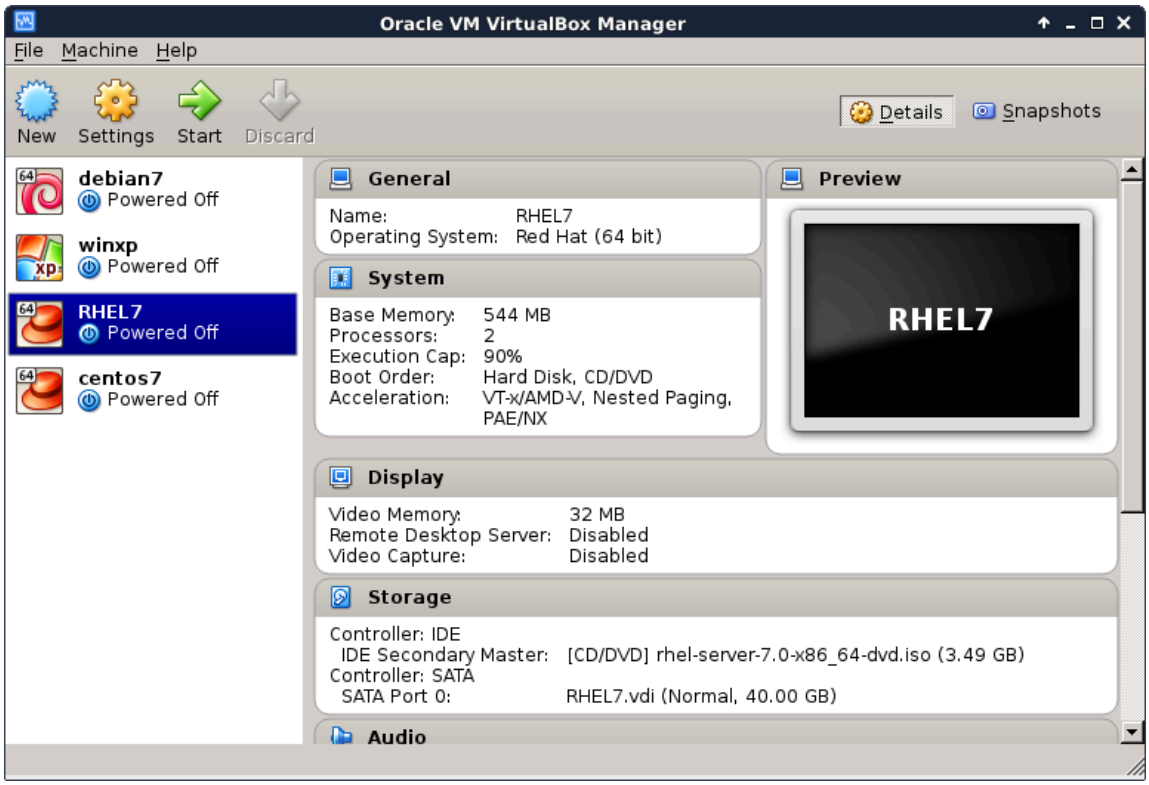
I use Linux on the laptop already:

```
paul@debian8:~$ ls -lh CentOS-7.0-1406-x86_64-Minimal.iso
-rw-r--r-- 1 paul paul 566M Nov  1 14:45 CentOS-7.0-1406-x86_64-Minimal.iso
```

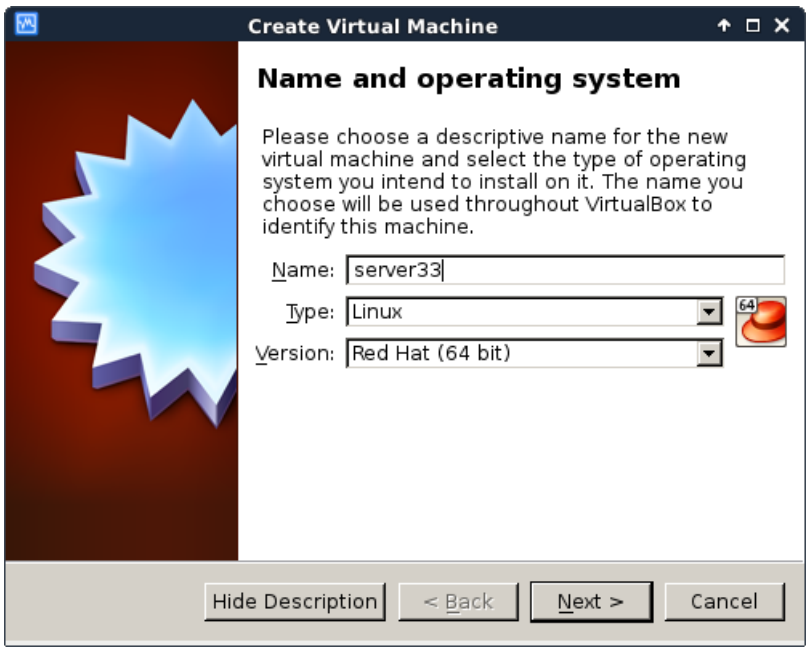
Do not worry if you do no understand the above command. Just try to make sure that the size of this file is the same as the size that is mentioned on the **CentOS 7** website.

2.2. Virtualbox

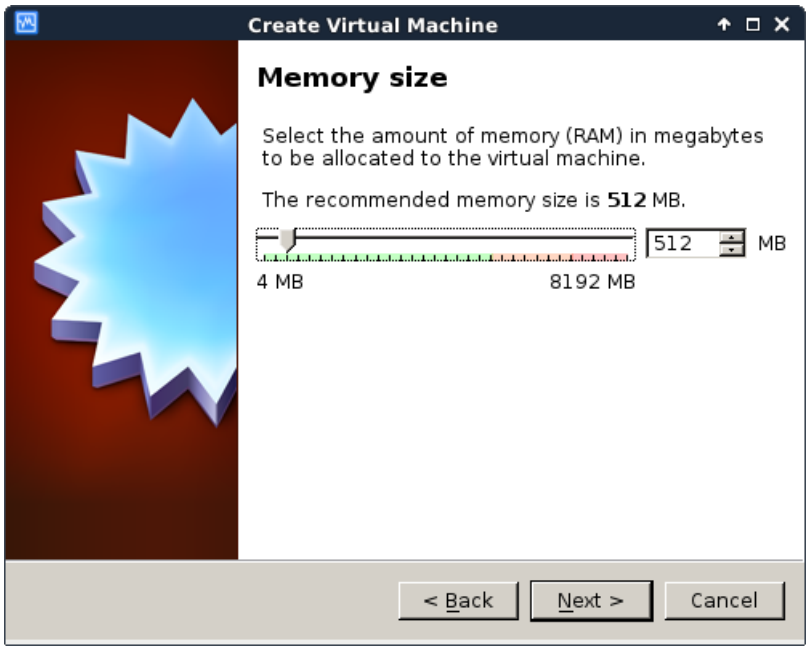
This screenshot shows up when I start Virtualbox. I already have four virtual machines, you might have none.



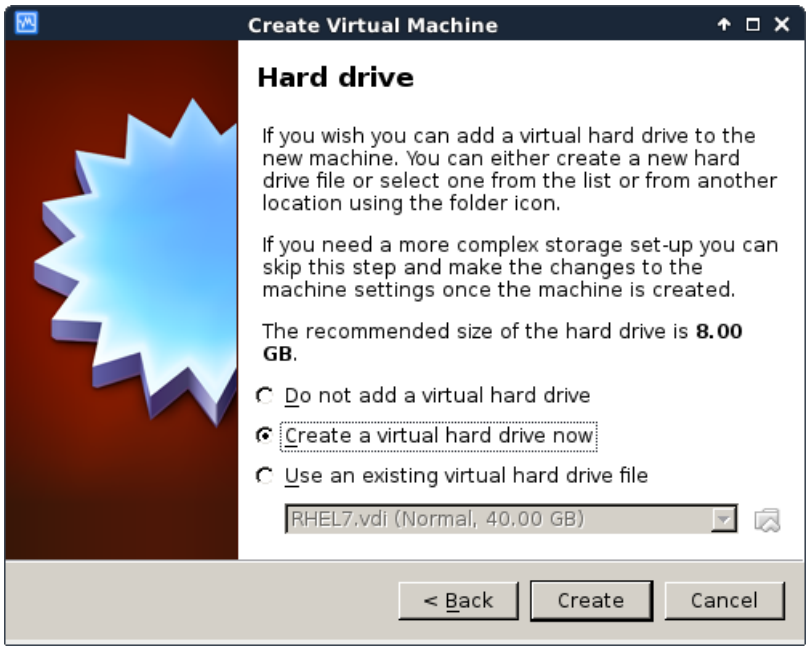
Below are the steps for creating a new virtual machine. Start by clicking **New** and give your machine a name (I chose **server33**). Click **Next**.



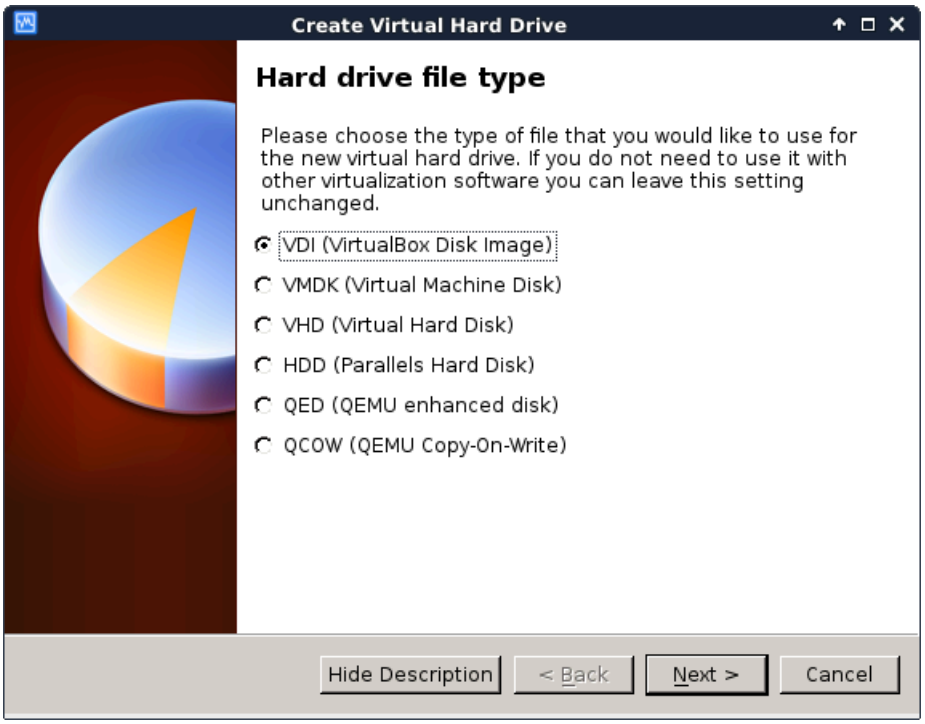
A Linux computer without graphical interface will run fine on **half a gigabyte** of RAM.



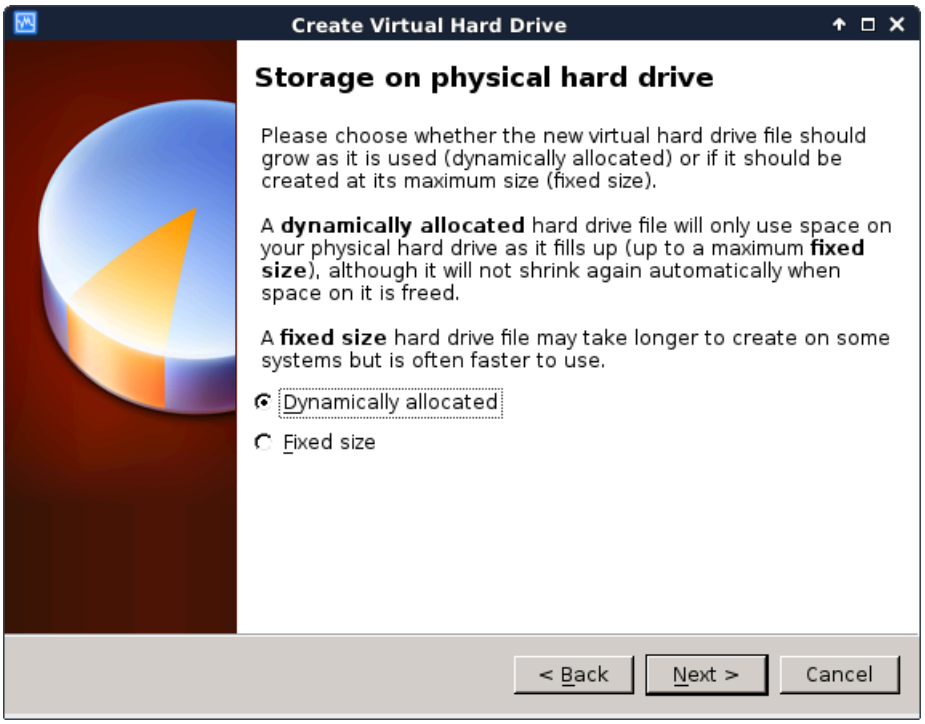
A Linux virtual machine will need a **virtual hard drive**.



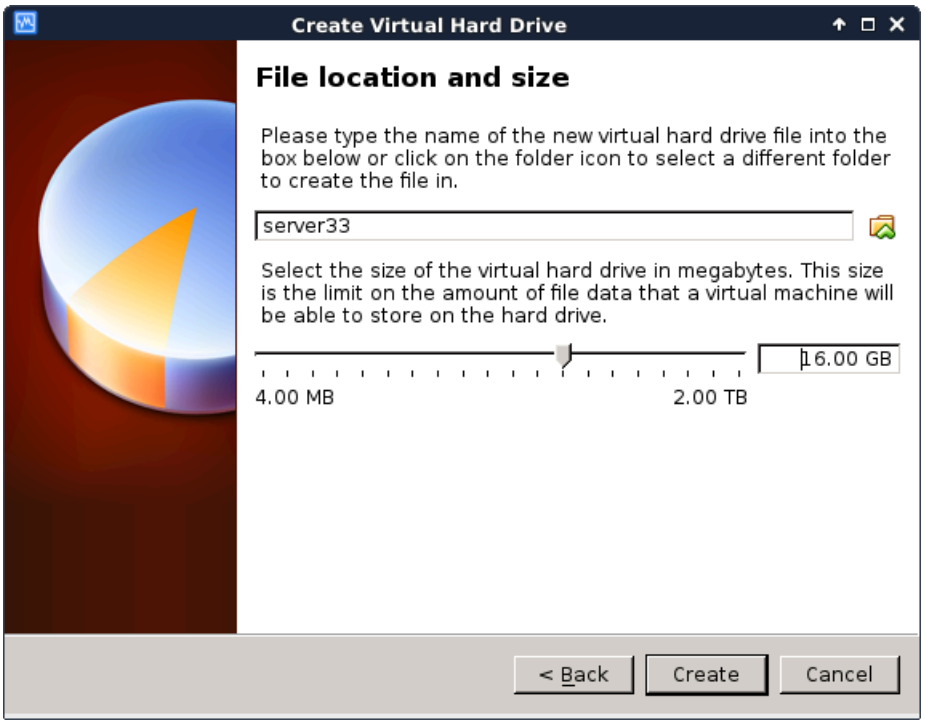
Any format will do for our purpose, so I left the default **vdi**.



The default **dynamically allocated** type will save disk space (until we fill the virtual disk up to 100 percent). It makes the virtual machine a bit slower than **fixed size**, but the **fixed size** speed improvement is not worth it for our purpose.

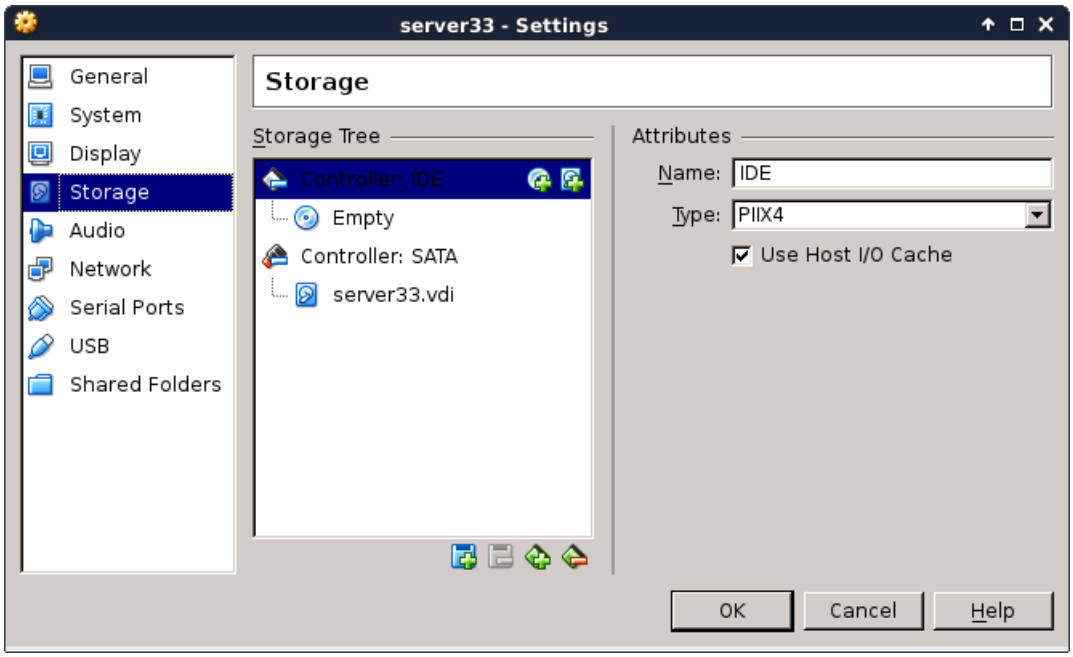


The name of the virtual disk file on the host computer will be **server33.vdi** in my case (I left it default and it uses the vm name). Also 16 GB should be enough to practice Linux. The file will stay much smaller than 16GB, unless you copy a lot of files to the virtual machine.

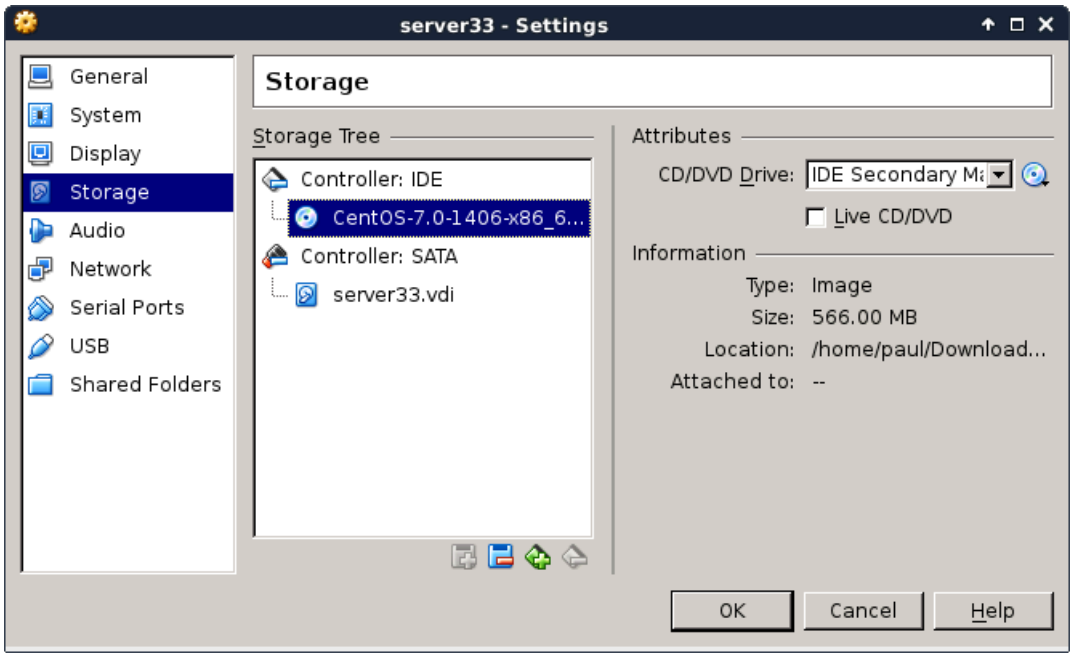


You should now be back to the start screen of **Virtualbox**. If all went well, then you should see the machine you just created in the list.

After finishing the setup, we go into the **Settings** of our virtual machine and attach the **.iso** file we downloaded before. Below is the default screenshot.



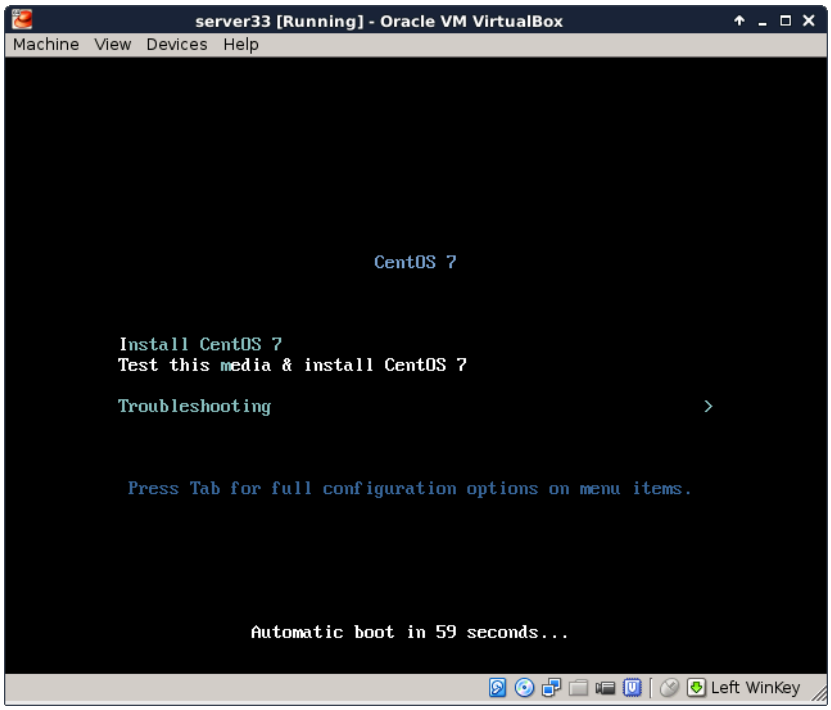
This is a screenshot with the **.iso** file properly attached.



2.3. CentOS 7 installing

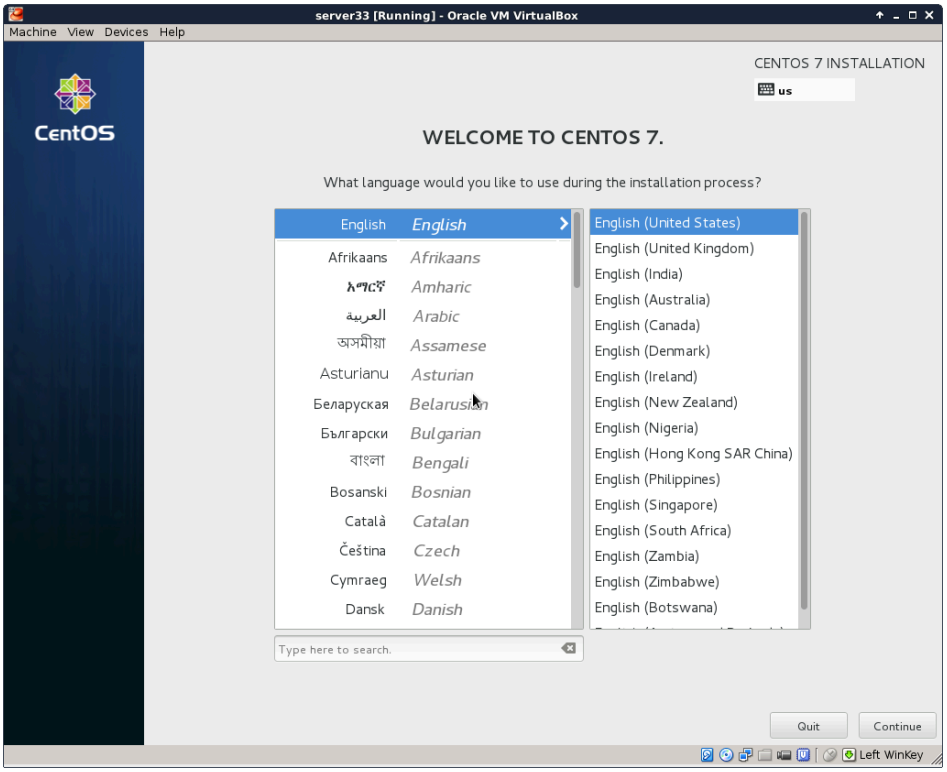
The screenshots below will show every step from starting the virtual machine for the first time (with the .iso file attached) until the first logon.

You should see this when booting, otherwise verify the attachment of the .iso file form the previous steps. Select **Test this media and install CentOS 7**.

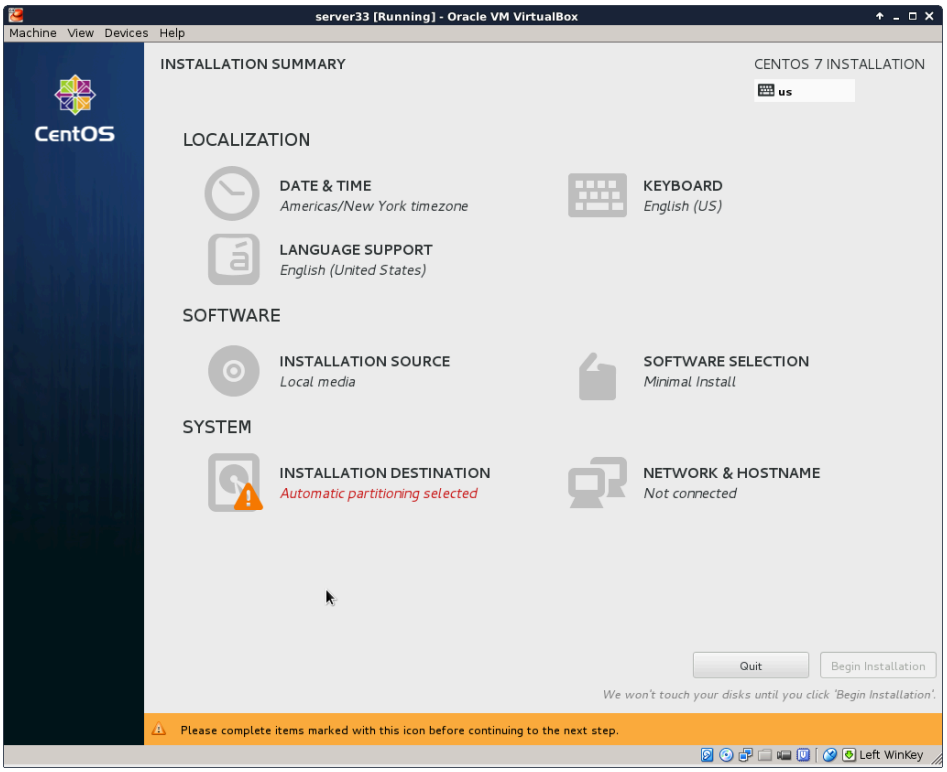


Carefully select the language in which you want your **CentOS**. I always install operating systems in English, even though my native language is not English.

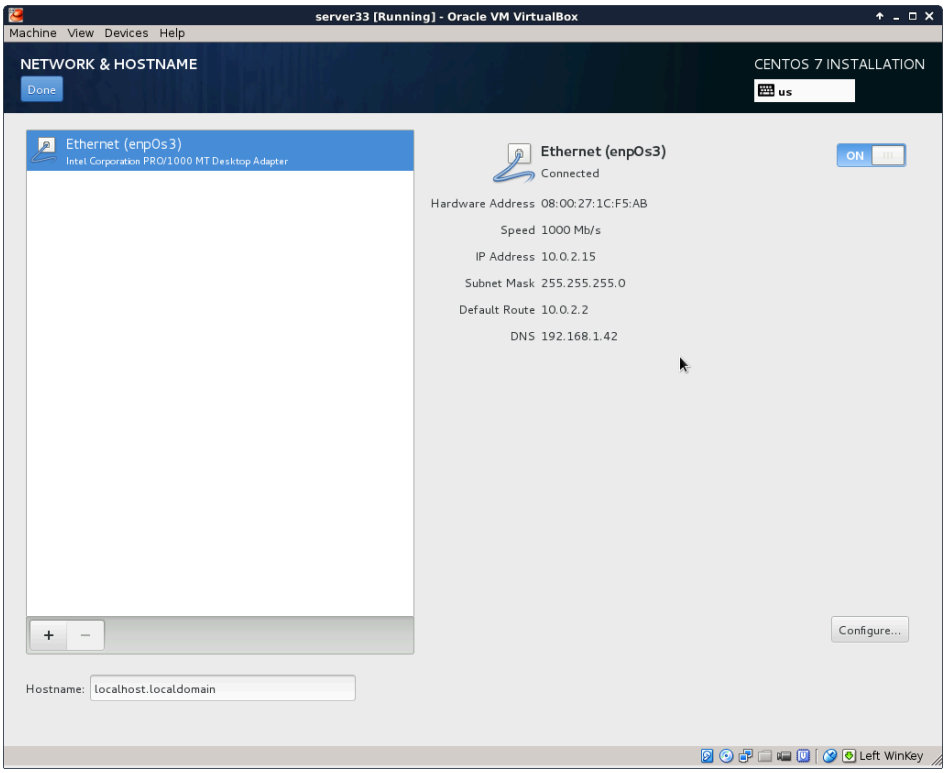
Also select the right keyboard, mine is a US qwerty, but yours may be different.



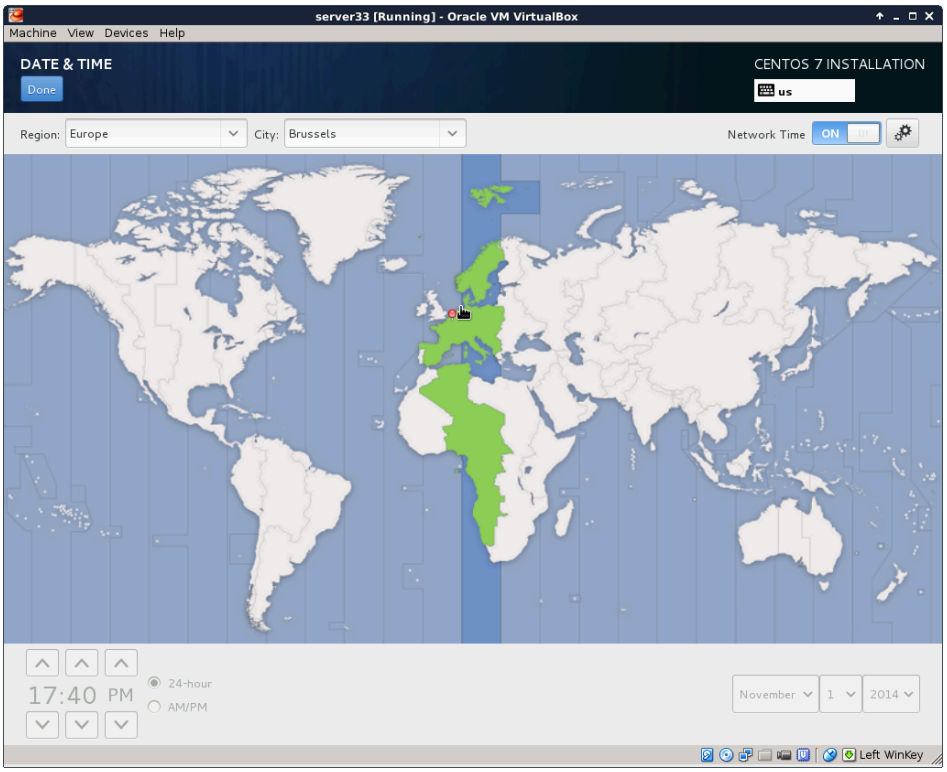
You should arrive at a summary page (with one or more warnings).



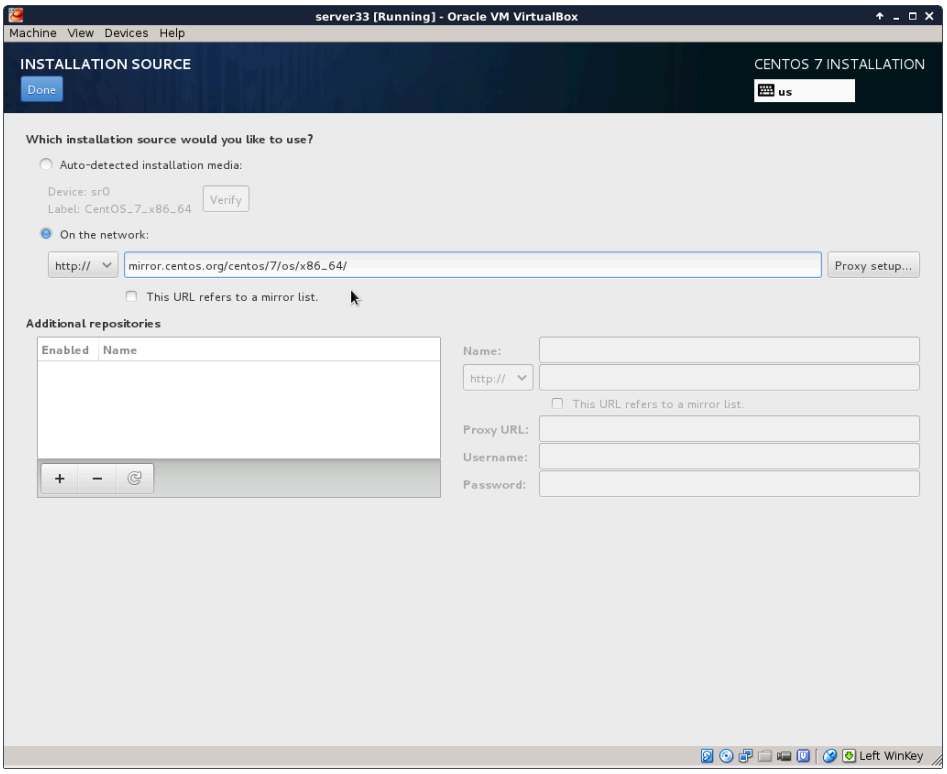
Start by configuring the network. During this demonstration I had a DHCP server running at 192.168.1.42, yours is probably different. Ask someone (a network administator ?) for help if this step fails.



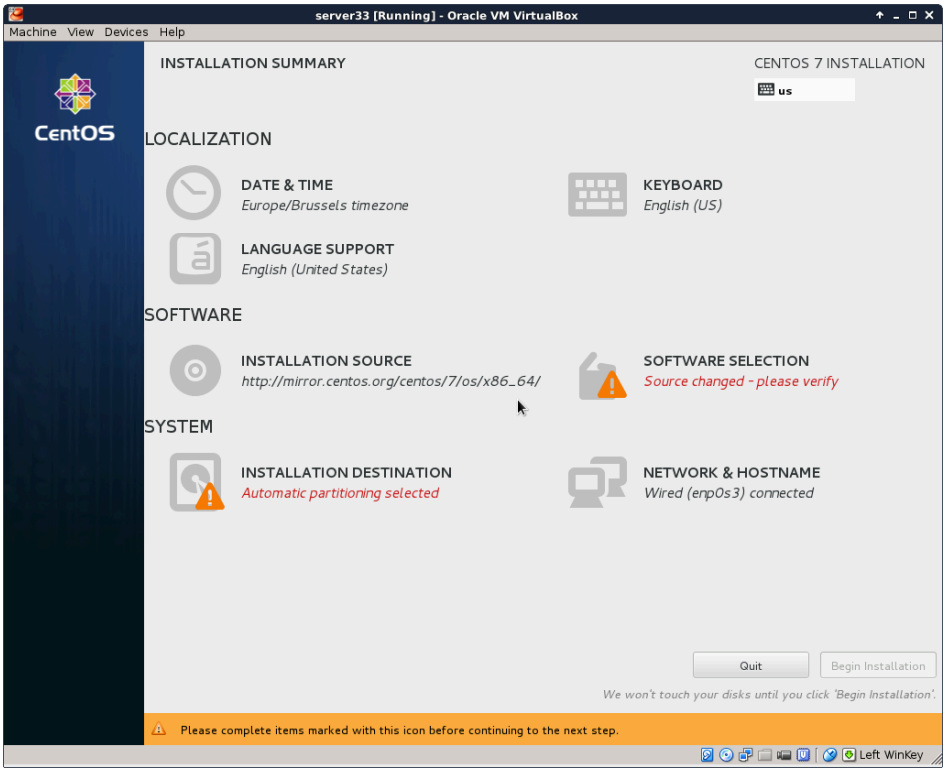
Select your time zone, and activate **ntp**.



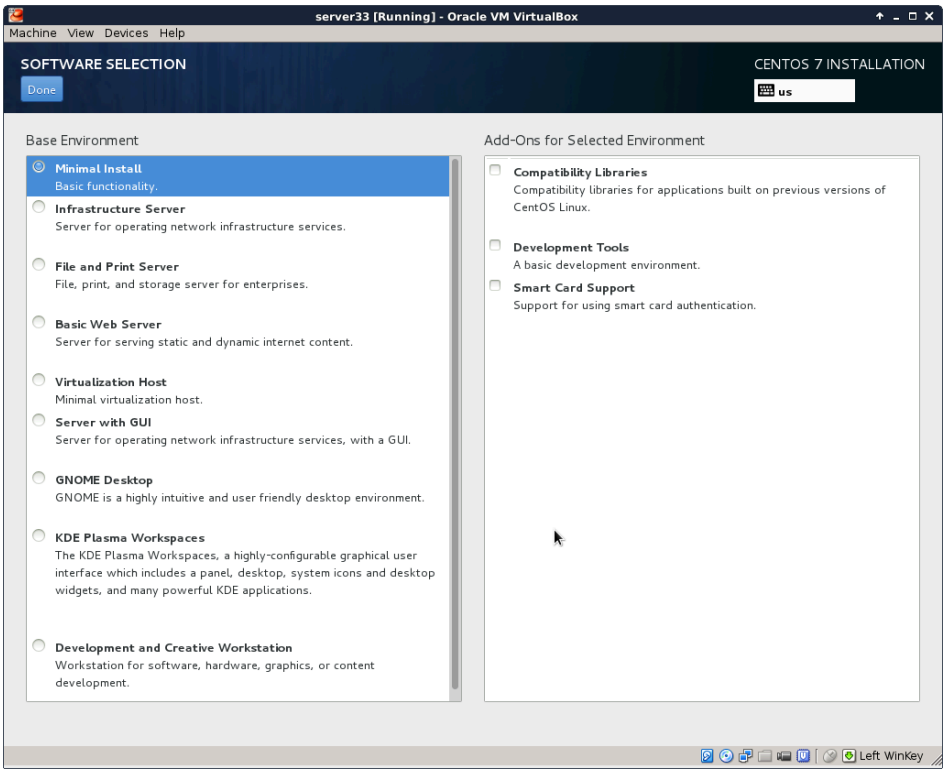
Choose a mirror that is close to you. If you can't find a local mirror, then you can copy the one from this screenshot (it is a general **CentOS** mirror).



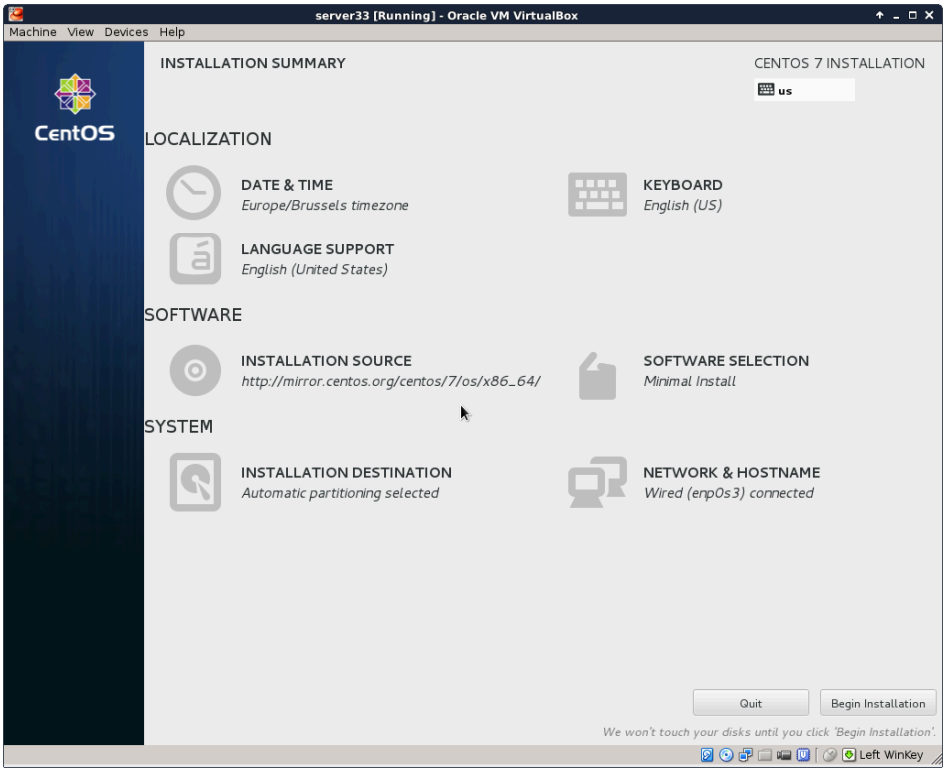
It can take a couple of seconds before the mirror is verified.



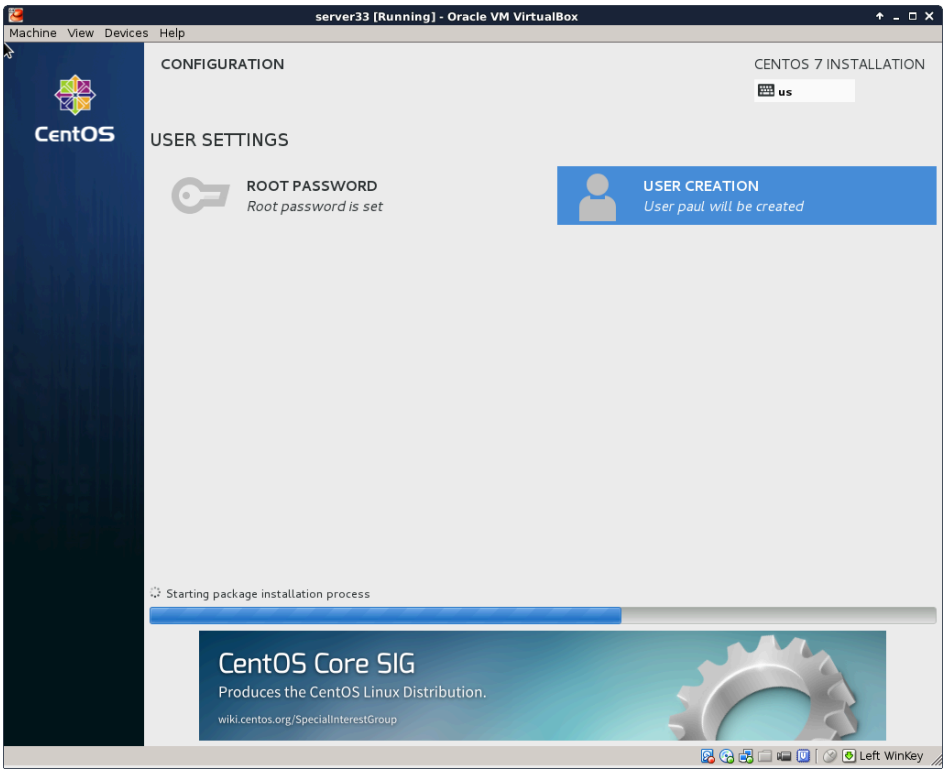
I did not select any software here (because I want to show it all in this training).



After configuring network, location, software and all, you should be back on this page. Make sure there are no warnings anymore (and that you made the correct choice everywhere).

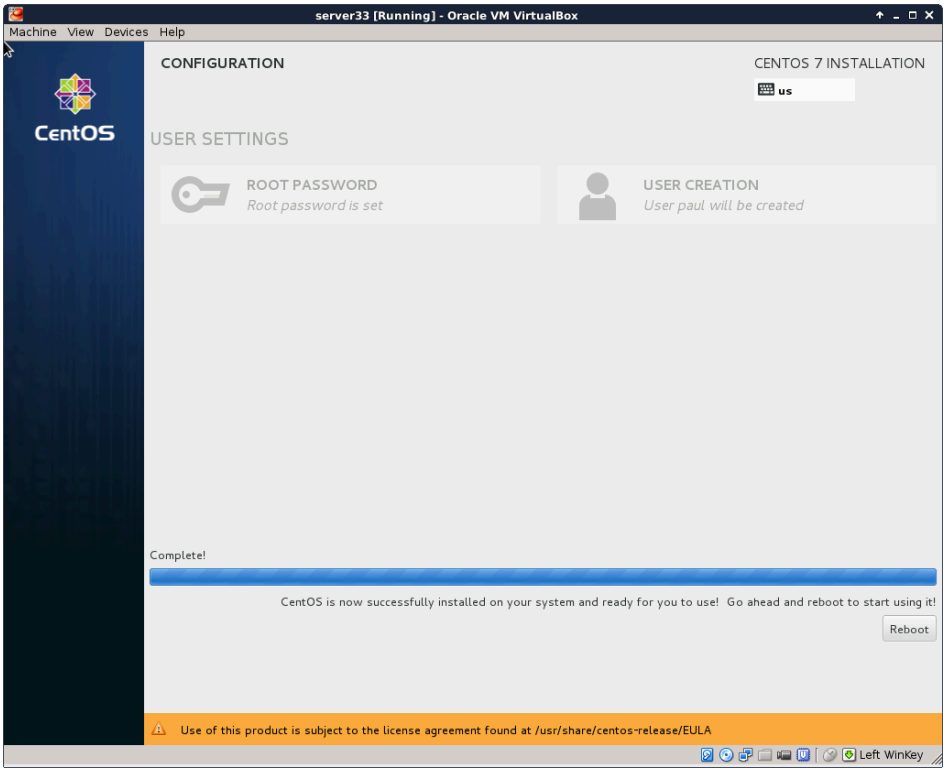


You can enter a **root password** and create a **user account** while the installation is downloading from the internet. This is the longest step, it can take several minutes (or up to an hour if you have a slow internet connection).

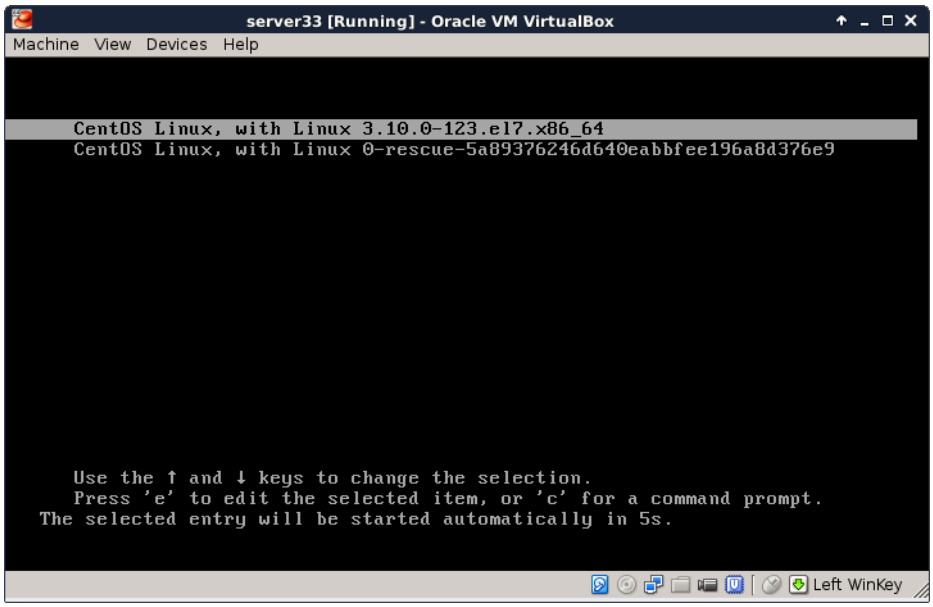


If you see this, then the installation was successful.

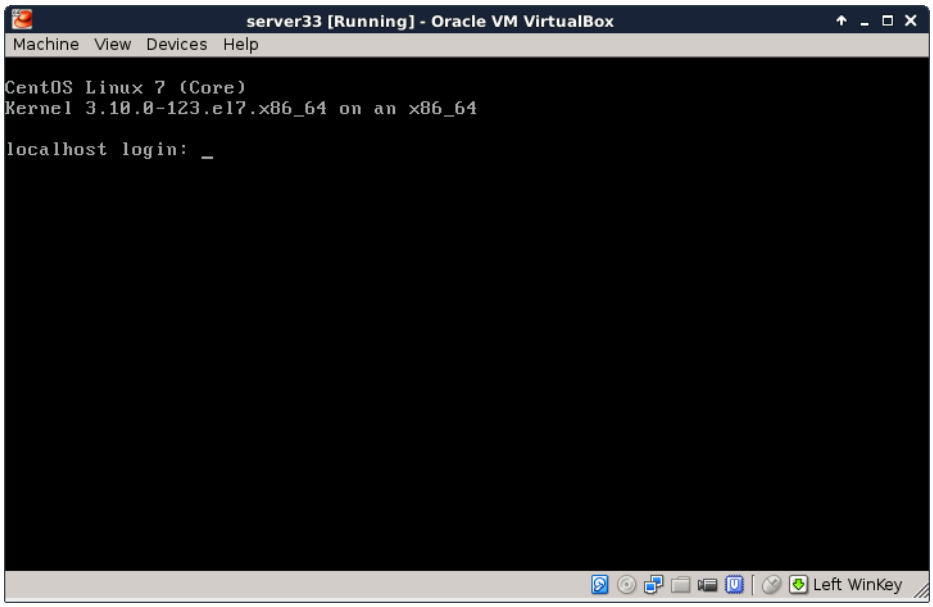
Time to reboot the computer and start **CentOS 7** for the first time.



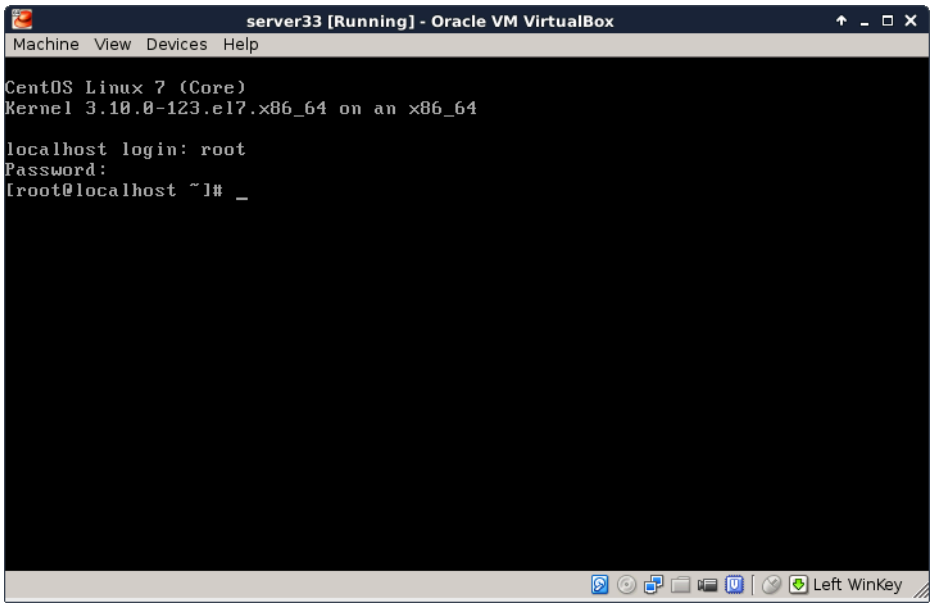
This screen will appear briefly when the virtual machines starts. You don't have to do anything.



After a couple of seconds, you should see a logon screen. This is called a **tty** or a **getty**. Here you can type **root** as username. The **login process** will then ask your password (nothing will appear on screen when you type your password).



And this is what it looks like after logon. You are logged on to your own Linux machine, very good.



All subsequent screenshots will be text only, no images anymore.

For example this screenshot shows three commands being typed on my new CentOS 7 install.

```
[root@localhost ~]# who am i
root     pts/0        2014-11-01 22:14
[root@localhost ~]# hostname
localhost.localdomain
[root@localhost ~]# date
Sat Nov  1 22:14:37 CET 2014
```

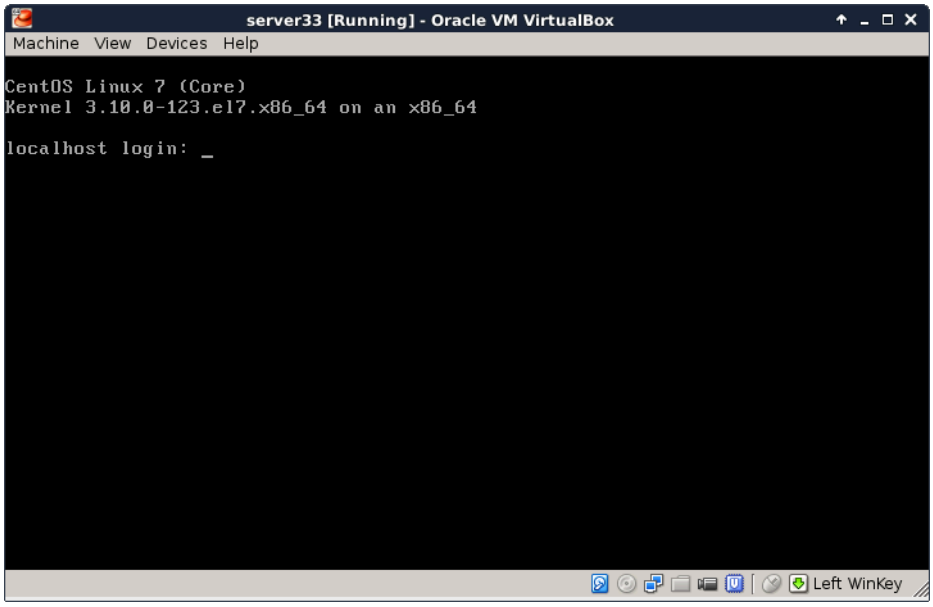
When using **ssh** the same commands will give this screenshot:

```
[root@localhost ~]# who am i
root     pts/0        2014-11-01 21:00 (192.168.1.35)
[root@localhost ~]# hostname
localhost.localdomain
[root@localhost ~]# date
Sat Nov  1 22:10:04 CET 2014
[root@localhost ~]#
```

If the last part is a bit too fast, take a look at the next topic **CentOS 7 first logon**.

2.4. CentOS 7 first logon

All you have to log on, after finishing the installation, is this screen in Virtualbox.



This is workable to learn Linux, and you will be able to practice a lot. But there are more ways to access your virtual machine, the next chapters discuss some of these and will also introduce some basic system configuration.

2.4.1. setting the hostname

Setting the hostname is a simple as changing the **/etc/hostname** file. As you can see here, it is set to **localhost.localdomain** by default.

```
[root@localhost ~]# cat /etc/hostname
localhost.localdomain
```

You could do **echo server33.netsec.local > /etc/hostname** followed by a **reboot**. But there is also the new **CentOS 7** way of setting a new hostname.

```
[root@localhost ~]# nmtui
```

The above command will give you a menu to choose from with a **set system hostname** option. Using this **nmtui** option will edit the **/etc/hostname** file for you.

```
[root@localhost ~]# cat /etc/hostname
server33.netsec.local
[root@localhost ~]# hostname
server33.netsec.local
[root@localhost ~]# dnsdomainname
netsec.local
```

For some reason the documentation on the **centos.org** and **docs.redhat.com** websites tell you to also execute this command:

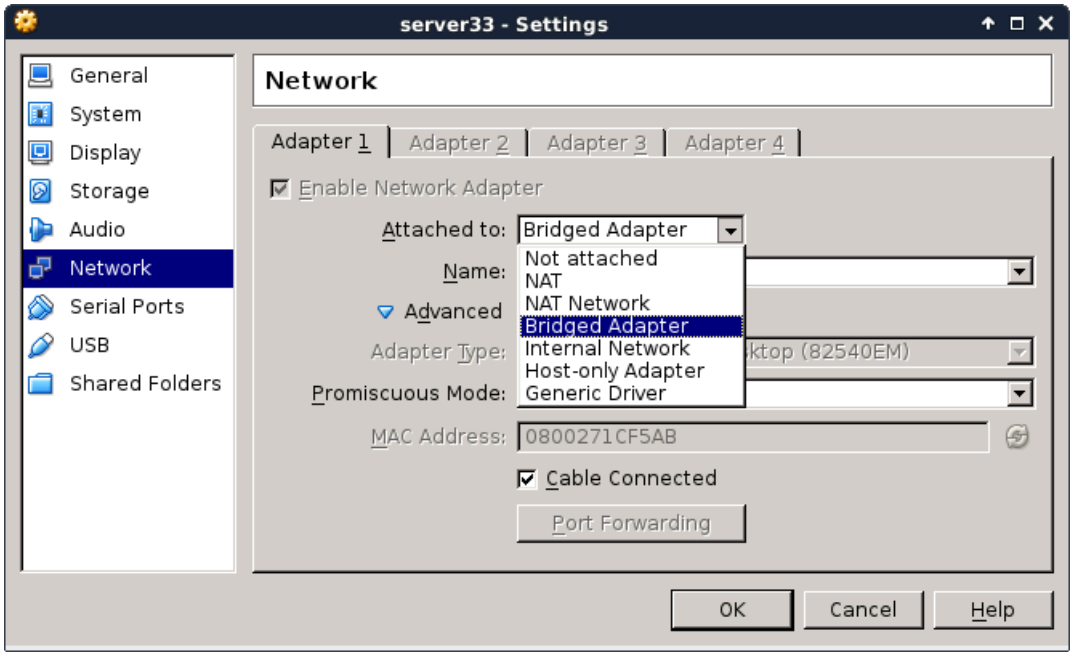
```
[root@localhost ~]# systemctl restart systemd-hostnamed
```

2.5. Virtualbox network interface

By default **Virtualbox** will connect your virtual machine over a **nat** interface. This will show up as a 10.0.2.15 (or similar).

```
[root@server33 ~]# ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast s\
tate UP qlen 1000
    link/ether 08:00:27:1c:f5:ab brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic enp0s3
       valid_lft 86399sec preferred_lft 86399sec
    inet6 fe80::a00:27ff:fe1c:f5ab/64 scope link
       valid_lft forever preferred_lft forever
```

You can change this to **bridge** (over your wi-fi or over the ethernet cable) and thus make it appear as if your virtual machine is directly on your local network (receiving an ip address from your real dhcp server).



You can make this change while the vm is running, provided that you execute this command:

```
[root@server33 ~]# systemctl restart network
[root@server33 ~]# ip a s dev enp0s3
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast s\
tate UP qlen 1000
    link/ether 08:00:27:1c:f5:ab brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.110/24 brd 192.168.1.255 scope global dynamic enp0s3
       valid_lft 7199sec preferred_lft 7199sec
    inet6 fe80::a00:27ff:fe1c:f5ab/64 scope link
       valid_lft forever preferred_lft forever
[root@server33 ~]#
```

2.6. configuring the network

The new way of changing network configuration is through the **nmtui** tool. If you want to manually play with the files in **/etc/sysconfig/network-scripts** then you will first need to verify (and disable) **NetworkManager** on that interface.

Verify whether an interface is controlled by **NetworkManager** using the **nmcli** command (connected means managed bu NM).

```
[root@server33 ~]# nmcli dev status
DEVICE  TYPE      STATE      CONNECTION
enp0s3  ethernet  connected  enp0s3
lo      loopback  unmanaged  --
```

Disable **NetworkManager** on an interface (enp0s3 in this case):

```
echo 'NM_CONTROLLED=no' >> /etc/sysconfig/network-scripts/ifcfg-enp0s3
```

You can restart the network without a reboot like this:

```
[root@server33 ~]# systemctl restart network
```

Also, forget **ifconfig** and instead use **ip a**.

```
[root@server33 ~]# ip a s dev enp0s3 | grep inet
    inet 192.168.1.110/24 brd 192.168.1.255 scope global dynamic enp0s3
    inet6 fe80::a00:27ff:fe1c:f5ab/64 scope link
[root@server33 ~]#
```

2.7. adding one static ip address

This example shows how to add one static ip address to your computer.

```
[root@server33 ~]# nmtui edit enp0s3
```

In this interface leave the IPv4 configuration to automatic, and add an ip address just below.

```
          IPv4 CONFIGURATION <Automatic>                          <Hide>
          Addresses 10.104.33.32/16_________ <Remove>
```

Execute this command after exiting **nmtui**.

```
[root@server33 ~]# systemctl restart network
```

And verify with **ip** (not with **ifconfig**):

```
[root@server33 ~]# ip a s dev enp0s3 | grep inet
    inet 192.168.1.110/24 brd 192.168.1.255 scope global dynamic enp0s3
    inet 10.104.33.32/16 brd 10.104.255.255 scope global enp0s3
    inet6 fe80::a00:27ff:fe1c:f5ab/64 scope link
[root@server33 ~]#
```

2.8. package management

Even with a network install, **CentOS 7** did not install the latest version of some packages. Luckily there is only one command to run (as root). This can take a while.

```
[root@server33 ~]# yum update
Loaded plugins: fastestmirror
Loading mirror speeds from cached hostfile
 * base: centos.weepeetelecom.be
 * extras: centos.weepeetelecom.be
 * updates: centos.weepeetelecom.be
Resolving Dependencies
--> Running transaction check
---> Package NetworkManager.x86_64 1:0.9.9.1-13.git20140326.4dba720.el7 \
will be updated
... (output truncated)
```

You can also use **yum** to install one or more packages. Do not forget to run **yum update** from time to time.

```
[root@server33 ~]# yum update -y && yum install vim -y
Loaded plugins: fastestmirror
Loading mirror speeds from cached hostfile
 * base: centos.weepeetelecom.be
... (output truncated)
```

Refer to the package management chapter for more information on installing and removing packages.

2.9. logon from Linux and MacOSX

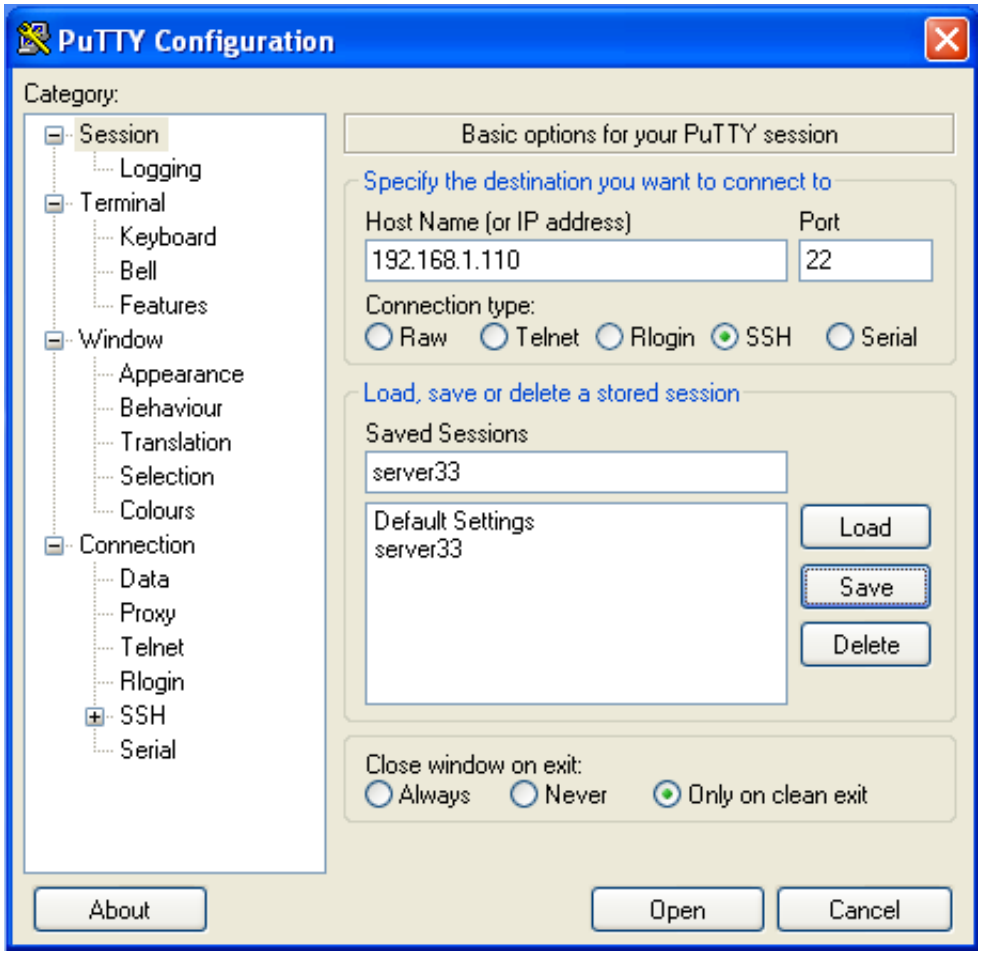
You can now open a terminal on Linux or MacOSX and use **ssh** to log on to your virtual machine.

```
paul@debian8:~$ ssh root@192.168.1.110
root@192.168.1.110's password:
Last login: Sun Nov  2 11:53:57 2014
[root@server33 ~]# hostname
server33.netsec.local
[root@server33 ~]#
```

2.10. logon from MS Windows

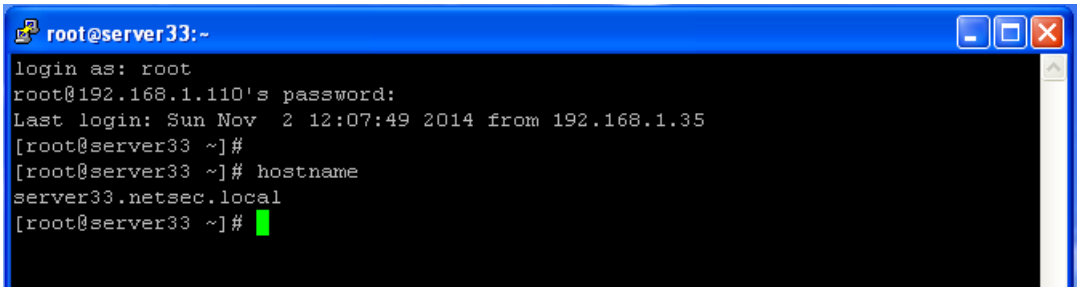
There is no **ssh** installed on MS Windows, but you can download **putty.exe** from **http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html** (just Google it).

Use **putty.exe** as shown in this screenshot (I saved the ip address by giving it a name 'server33' and presing the 'save' button).



The first time you will get a message about keys, accept this (this is explained in the ssh chapter).

Enter your userid (or root) and the correct password (nothing will appear on the screen when typing a password).



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