EEE 4482 Server Installation and Programming

Worksheet 1 – Installation of Linux

Objective: To familiarize the steps in installing Linux

Tools: Windows PC (must be 64 bit OS)

Software: Oracle VM Virtual Box version 6.1.12
               CentOS 7

Topics covered:
● Installation of virtual machine (VM)
● Installation of Linux in a virtual machine

Component list:
None

1. 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 do some basic configuration of this new machine like setting an **ip address** and setting a **hostname**.

1.1. 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** from the Moodle.

Mark down where your downloaded iso file is saved (usually in Download directory). This will be referenced in later.

1.2. Oracle VM Virtualbox

Download Oracle VM Virtualbox from the website https://www.virtualbox.org/wiki/Downloads. From the time I prepare this document, the latest version is 6.1.12. You can try to use the latest version available. We download the Windows version. Therefore, we click "Windows hosts" to download as shown below. After downloading the file, execute the file to install it and follow the on screen instructions.
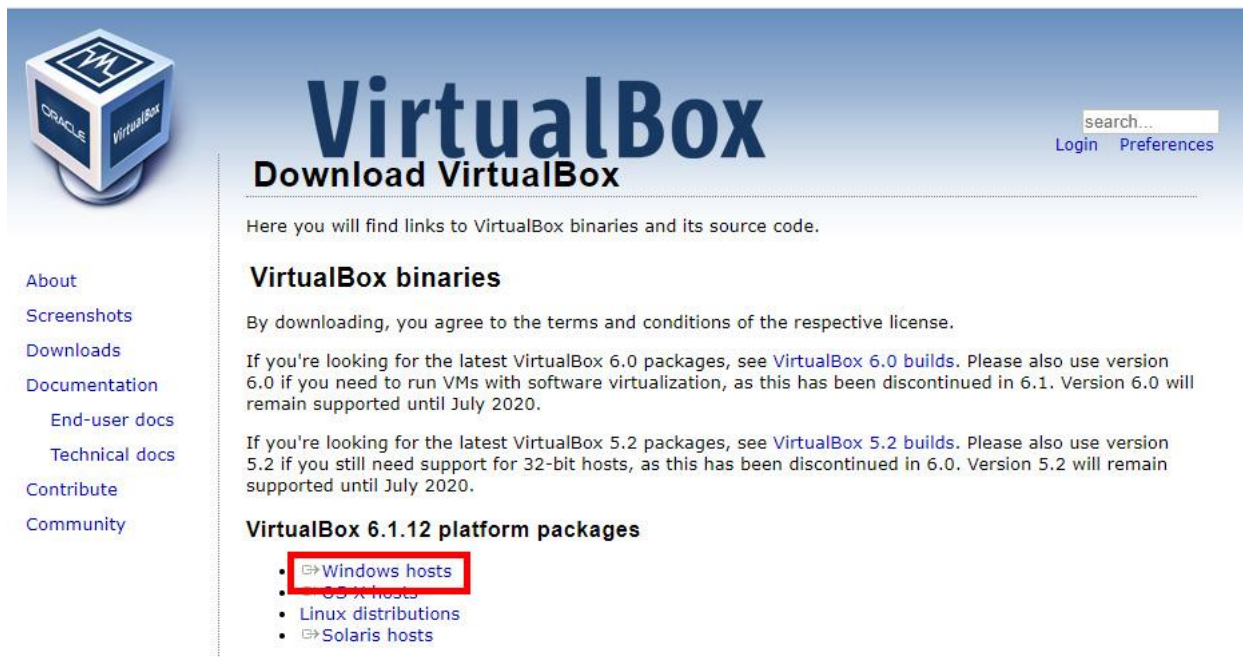
After installation, run the Oracle VM VirtualBox. Click the "New" button to create a new virtual machine.
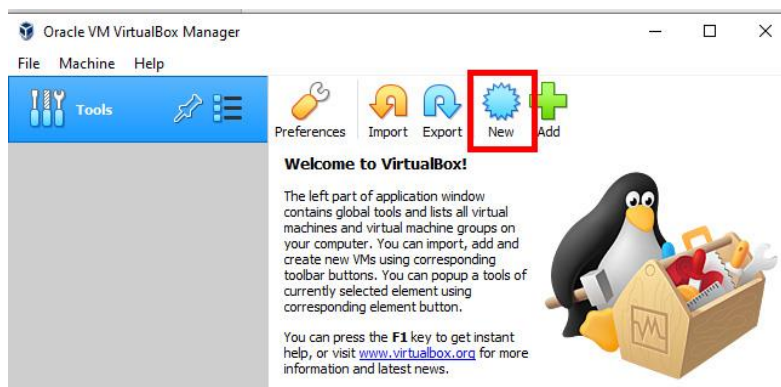
Set a name for the new virtual machine (VM). Set the type to "Linux" and Version to "Red Hat (64-bit)" as shown below. Click "Next" to continue.

← Create Virtual Machine

Name and operating system

Please choose a descriptive name and destination folder for the new virtual machine and select the type of operating system you intend to install on it. The name you choose will be used throughout VirtualBox to identify this machine.

Name: mCentos7min-trial01

Machine Folder: C:\Users\student\VirtualBox VMs

Type: Linux

Version: Red Hat (64-bit)

Expert Mode   Next   Cancel

A Linux computer without graphical interface will run fine on **1024 MB** of RAM. Click "Next" button to continue.

← Create Virtual Machine

Memory size

Select the amount of memory (RAM) in megabytes to be allocated to the virtual machine.

The recommended memory size is **1024** MB.

1024 MB

4 MB   16384 MB

Next   Cancel

A Linux virtual machine will need a **virtual hard drive**. Select "Create a virtual hard drive now" and click "Create" button as shown below.

←   Create Virtual Machine

Hard disk

If you wish you can add a virtual hard disk to the new machine. You can either create a new hard disk file or select one from the list or from another location using the folder icon.

If you need a more complex storage set-up you can skip this step and make the changes to the machine settings once the machine is created.

The recommended size of the hard disk is **8.00 GB**.

○ Do not add a virtual hard disk

◉ Create a virtual hard disk now

○ Use an existing virtual hard disk file

Empty

[Create]   [Cancel]

Any format will do for our purpose, so I choose the default **VDI**. Click "Next" to continue.

←   Create Virtual Hard Disk

Hard disk file type

Please choose the type of file that you would like to use for the new virtual hard disk. If you do not need to use it with other virtualization software you can leave this setting unchanged.

◉ VDI (VirtualBox Disk Image)

○ VHD (Virtual Hard Disk)

○ VMDK (Virtual Machine Disk)

[Expert Mode]   [Next]   [Cancel]

We need to select the type of the virtual hard drive. 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. Click "Next" button to continue.

← Create Virtual Hard Disk

Storage on physical hard disk

Please choose whether the new virtual hard disk file should grow as it is used
(dynamically allocated) or if it should be created at its maximum size (fixed
size).

A **dynamically allocated** hard disk file will only use space on your physical
hard disk as it fills up (up to a maximum **fixed size**), although it will not shrink
again automatically when space on it is freed.

A **fixed size** hard disk file may take longer to create on some systems but is
often faster to use.

◉ Dynamically allocated
○ Fixed size

[Next]   [Cancel]

The name of the virtual disk file uses the default name. For the size of the virtual hard disk,
8 GB should be enough to practice Linux. The file will stay much smaller than 8GB, unless
you copy a lot of files to the virtual machine. Click "Create" button to continue.

← Create Virtual Hard Disk

File location and size

Please type the name of the new virtual hard disk file into the box below or click
on the folder icon to select a different folder to create the file in.

sers\student\VirtualBox VMs\mCentos7min-trial01\mCentos7min-trial01.vdi 🗁

Select the size of the virtual hard disk in megabytes. This size is the limit on the
amount of file data that a virtual machine will be able to store on the hard disk.

8.00 GB

4.00 MB   2.00 TB

[Create]   [Cancel]

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. Click the "Settings" button as shown below.
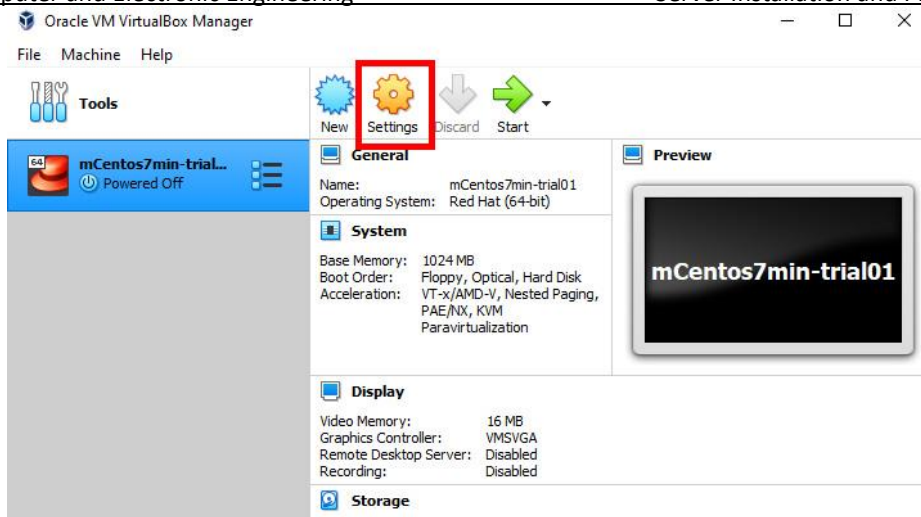
In the "Settings" box, select the "Storage" tab. Click the disk icon next to "Empty" as shown below. Click the disk button in the "Optical Drive" as shown below. A sub-manual pops up. Click the "Choose a disk file…".
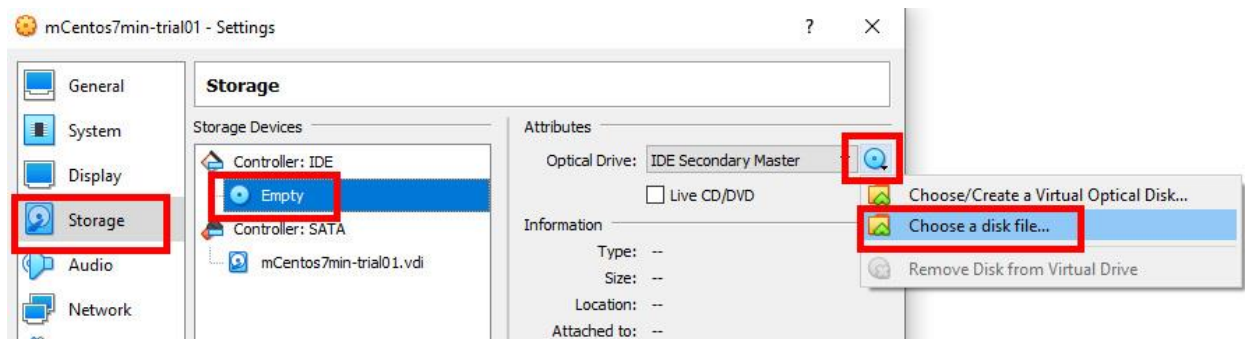

A dialog box pops up asking you the ISO file of the disk. Select the CentOS ISO file that you downloaded before. This action attaches the ISO file to the optical drive so that we can install the CentOS from the ISO file. Click the "OK" button to continue.
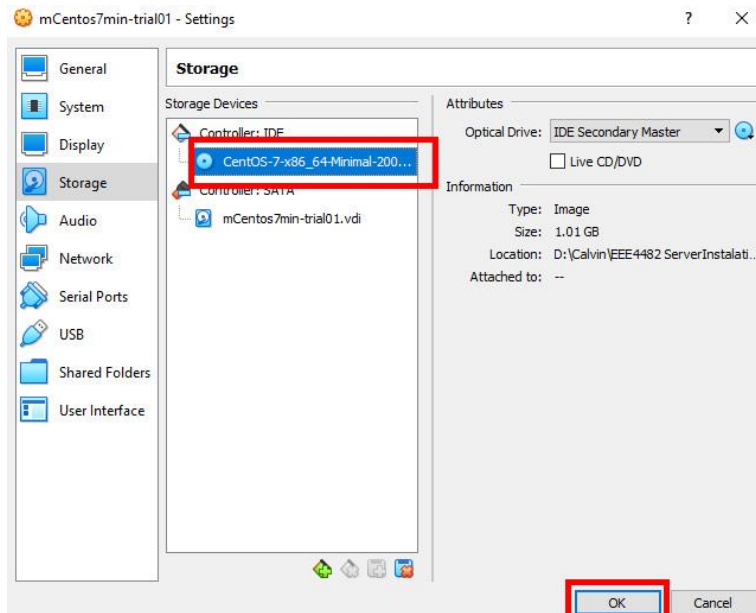
Finally, click the "Start" button to start the VM and start installing the CentOS.
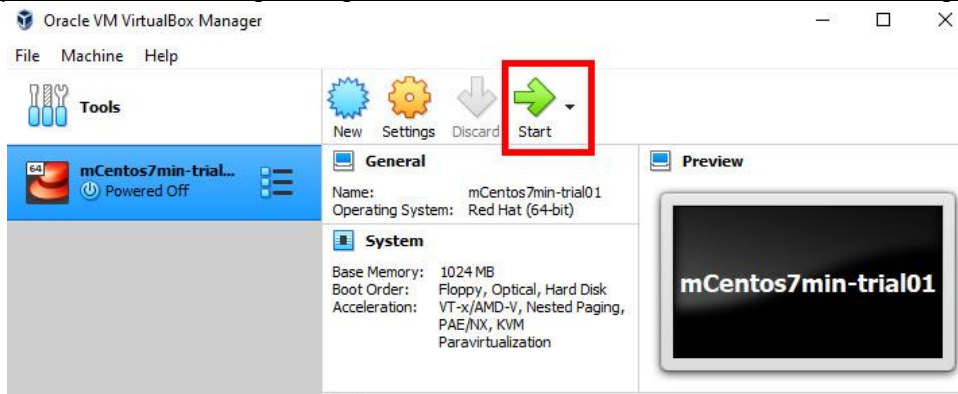
A dialog pops up asking you to select the start-up disk. Use the default selection and simply click "Start" button.
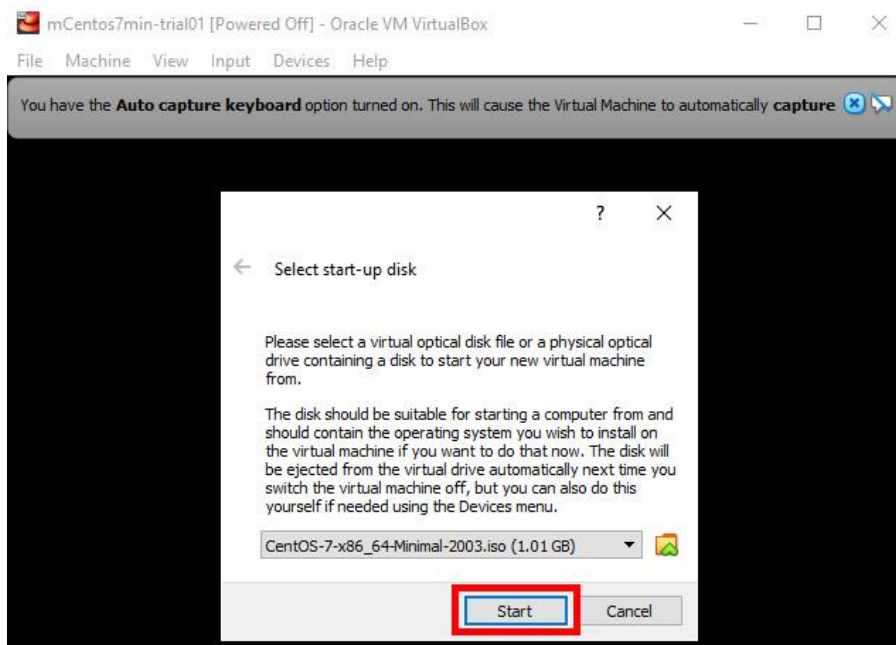

1.3. CentOS 7 installing

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 from the previous steps. Select **Install CentOS 7**. Press "I" and "Enter" on your keyboard to start installation.
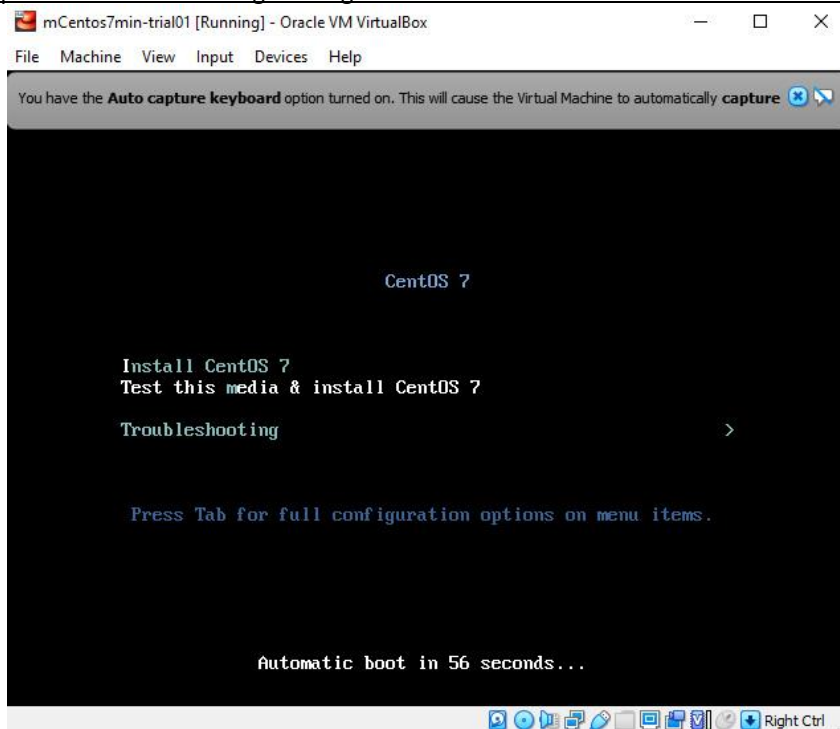
Note that when you are using the VM, there is sometime the mouse cannot come out of the virtual machine window. If you want to move your mouse outside the window, click the right Ctrl button on your keyboard.

If you click your mouse inside the virtual machine window, the following box pops up. Simply click "Capture" button. The PC allows you to use the mouse to control the content of the virtual machine.
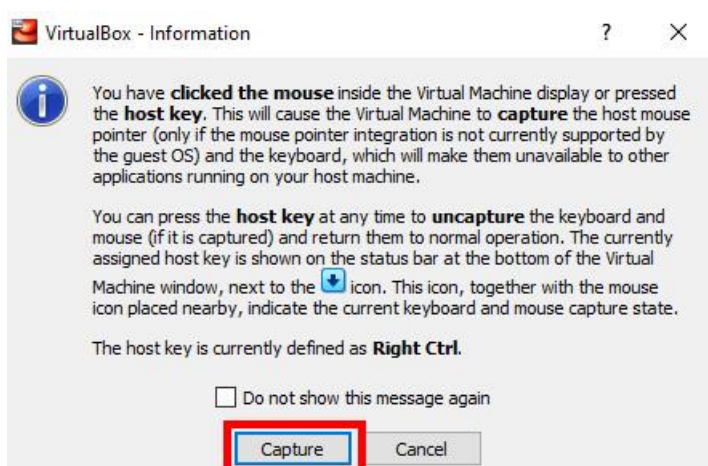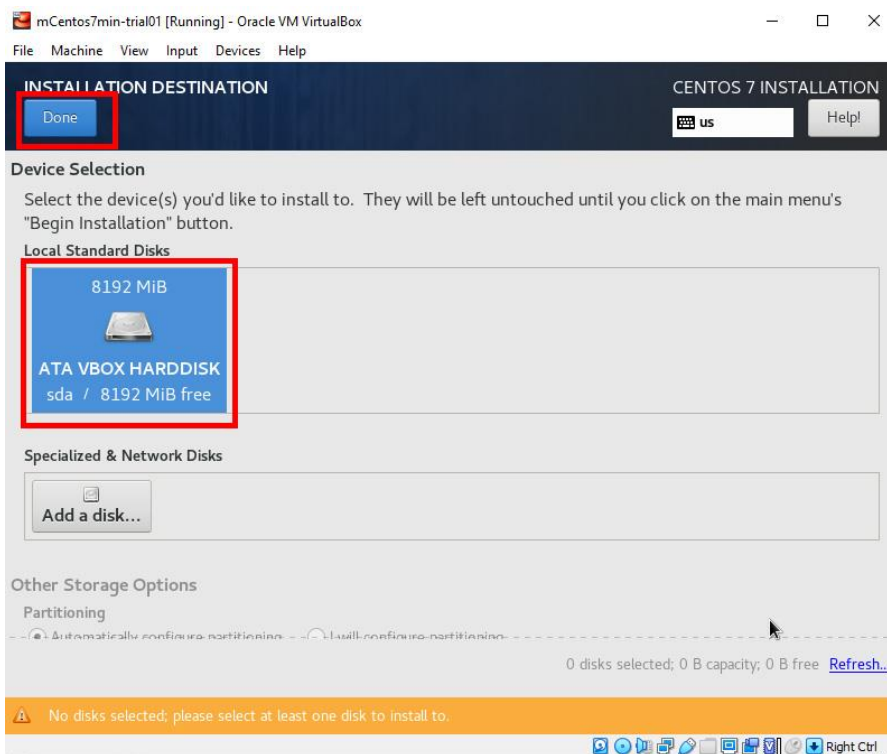

Select the English language in the box as shown below. Click "Continue" button to continue.
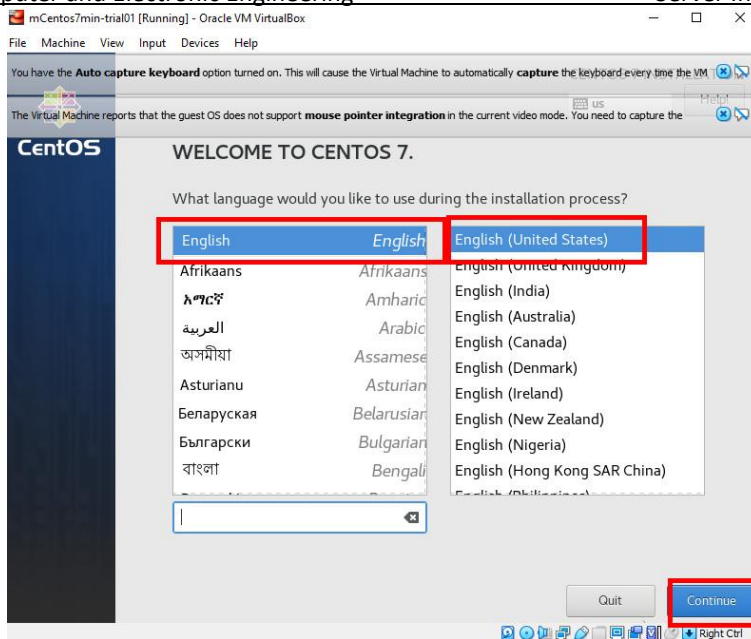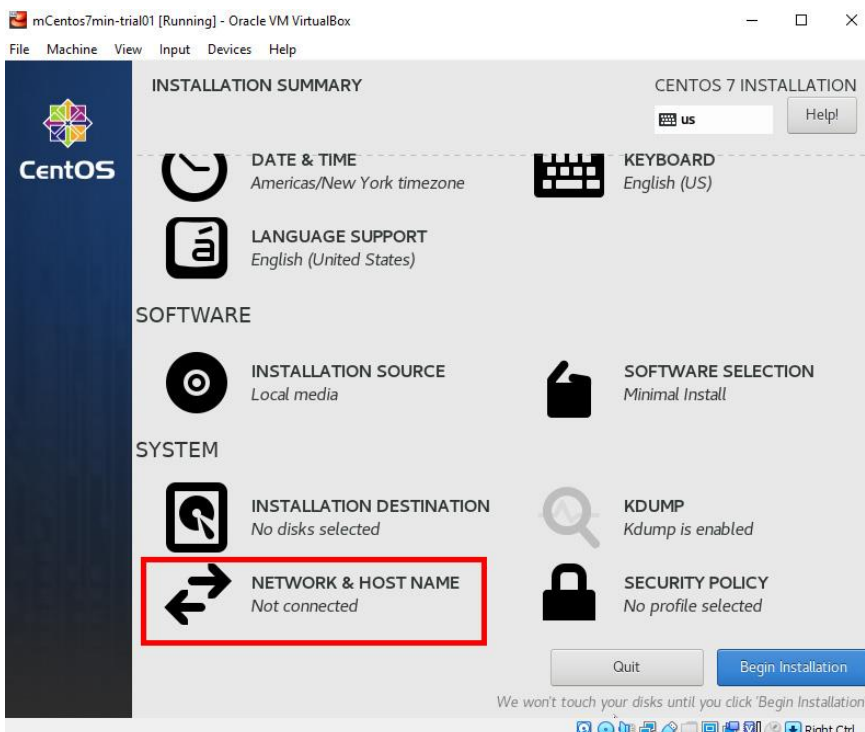
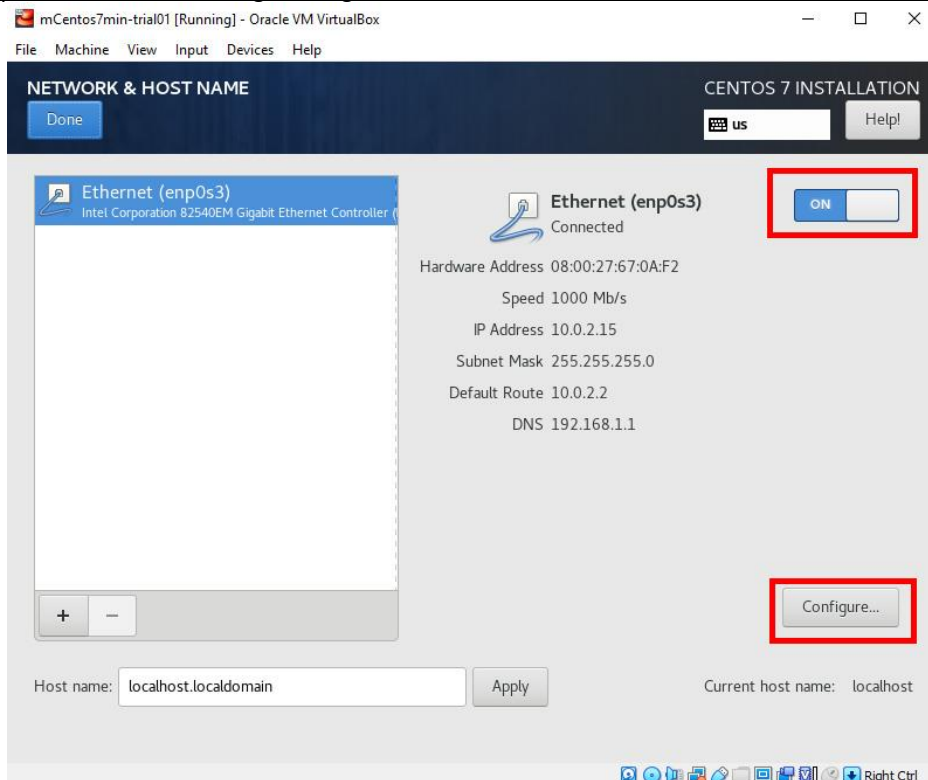You should arrive at a summary page (with one or more warnings). Click the "Installation destination.
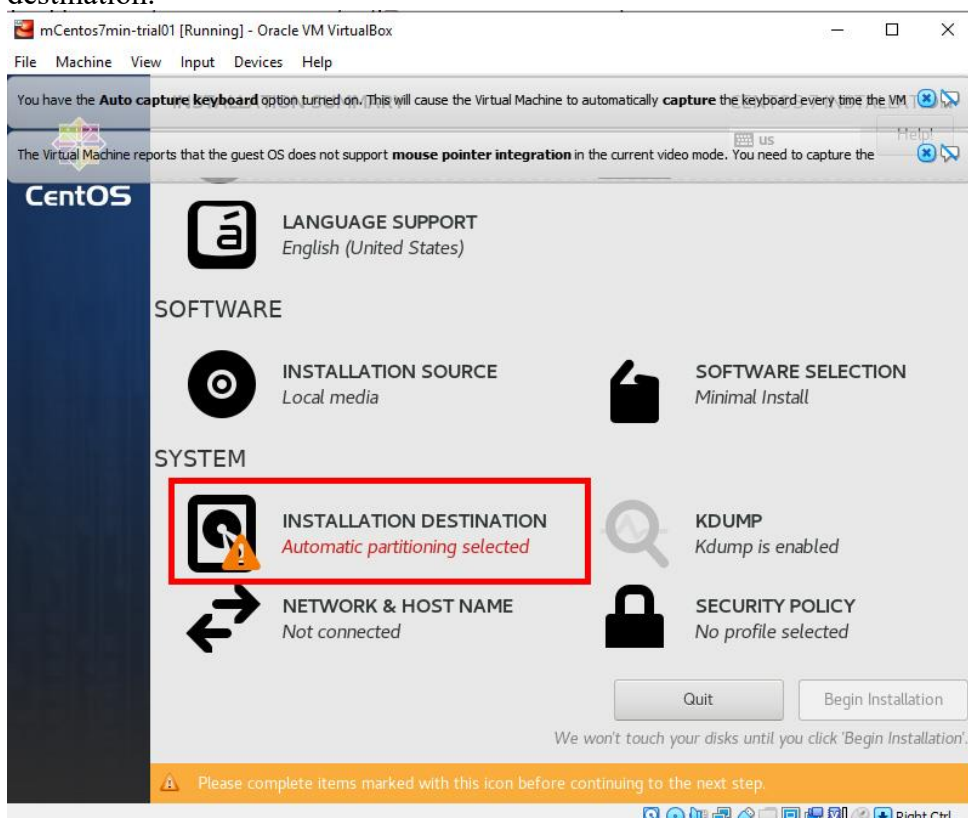
The "Installation destination" window appears. Click to select the 8G virtual hard drive and click the "Done" button as shown below.
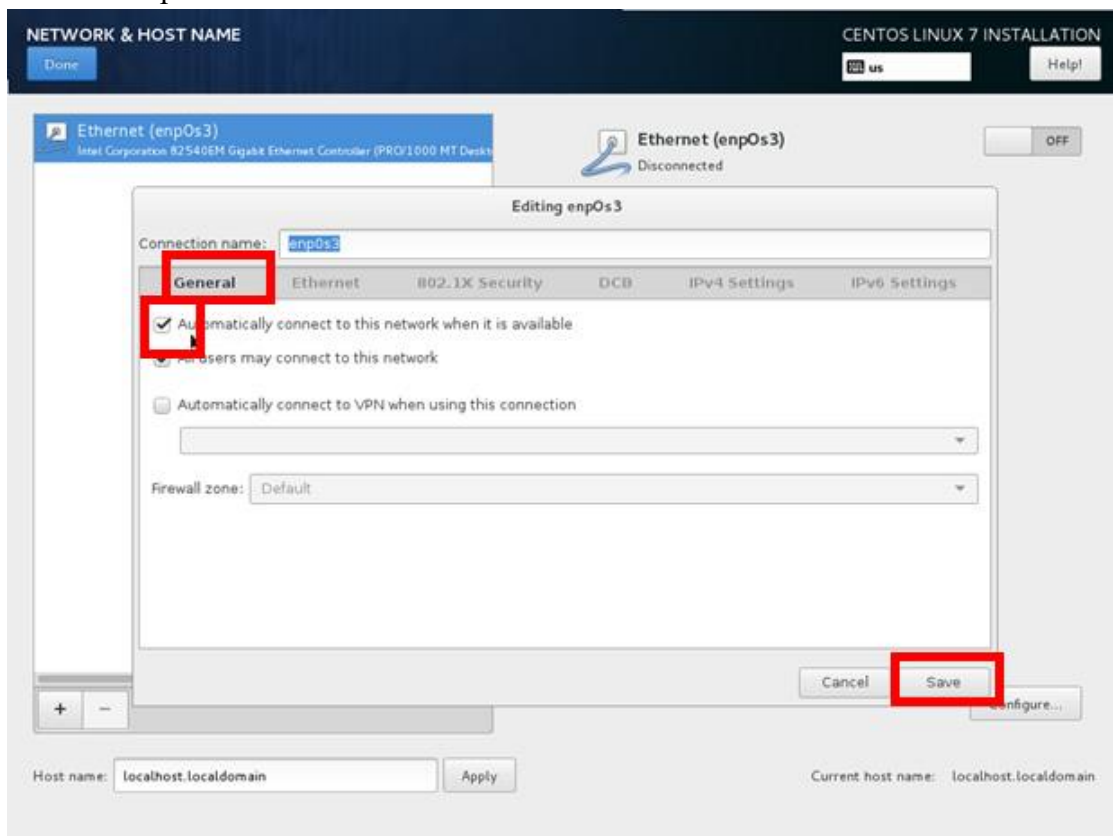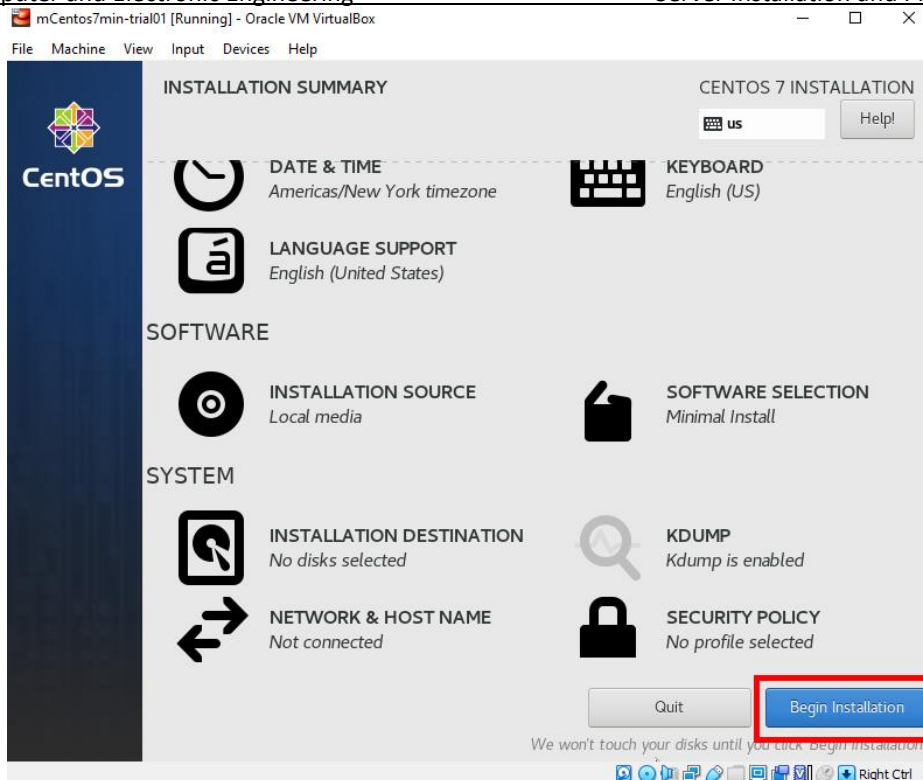

Click the "Nework & Host Name"

Click to turn ON the network interface as shown below. Click the "Configure…" button.
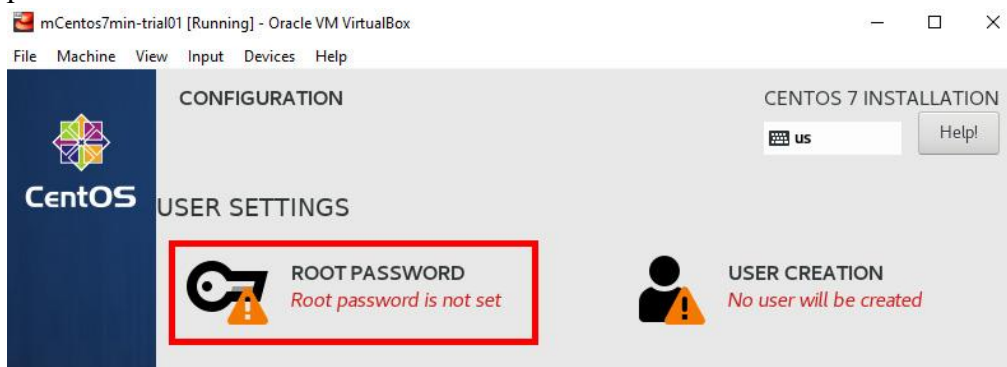
Click the "General" tab. Check the "Automatically connect to this network when it is available" option. Click the "Save" button.
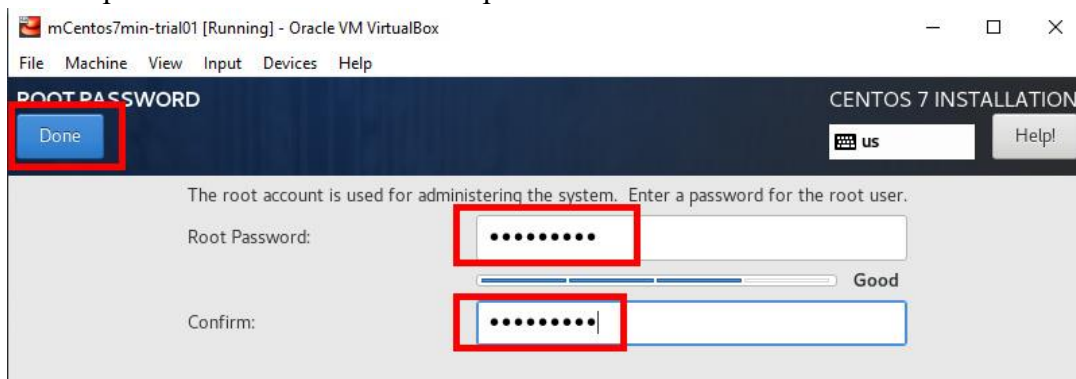

Finally, click the "Begin Installation" button. This starts the installation process.

After a few minutes of installation, you come to the following page. Click the "Root password".

Set the password as "netlab123" and press "Done" button as shown below.

Click the "User Creation" button.
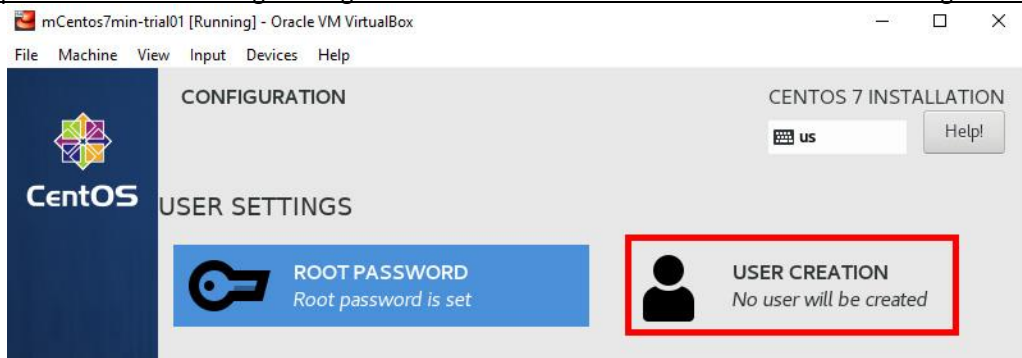
Create a new user with name "sysadmin" and the password as "netlab123". Press "Done" button to continue.
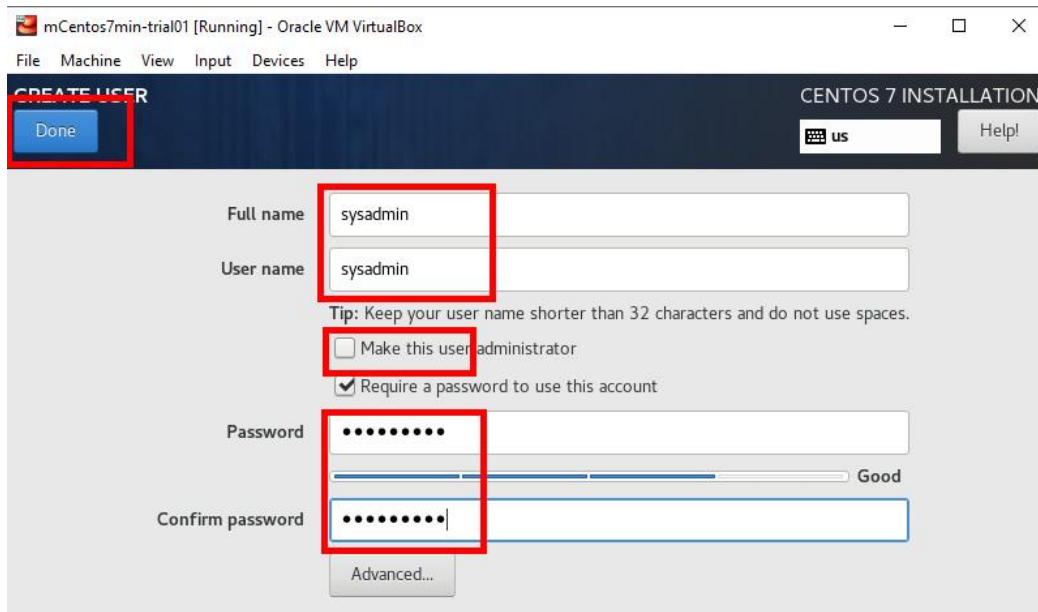
Account	root	sysadmin
Password	netlab123	netlab123
Make this user administrator	Yes (default)	No

Click the "Finish Configuration" button to continue.
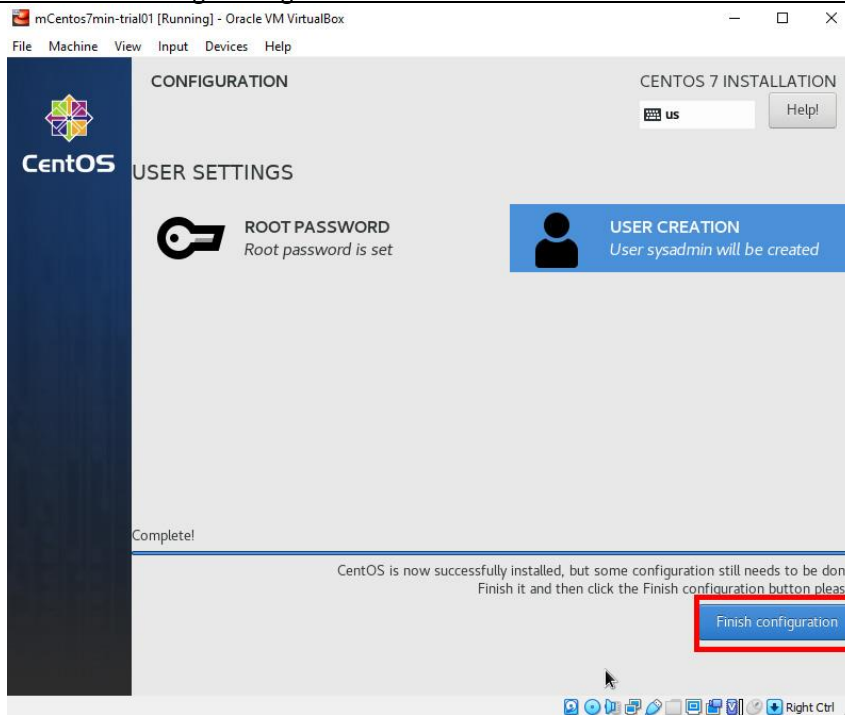
After a few minutes, you come to the following page. Click "Reboot" button to reboot the VM.

This screen will appear when the virtual machine 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).
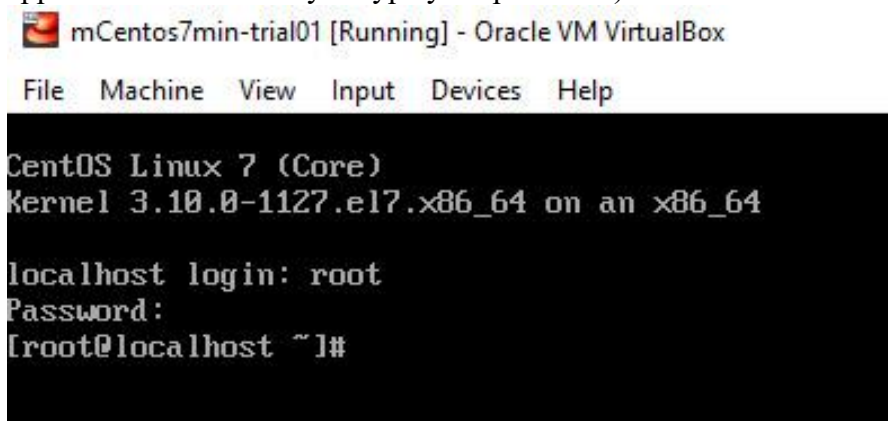
You are logged on to your own Linux machine, very good.

1.4. CentOS 7 first logon
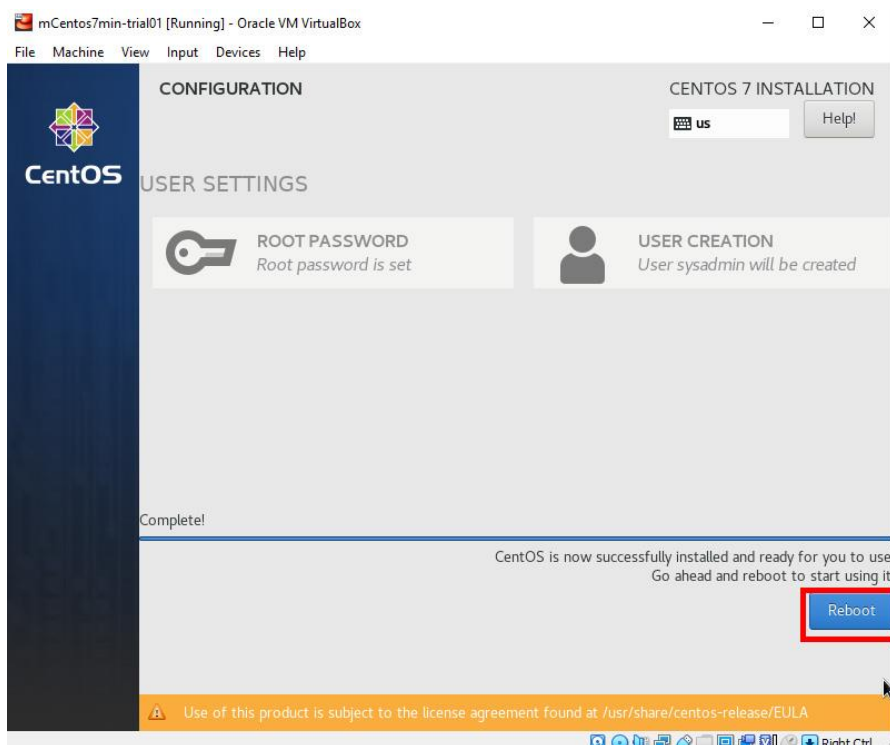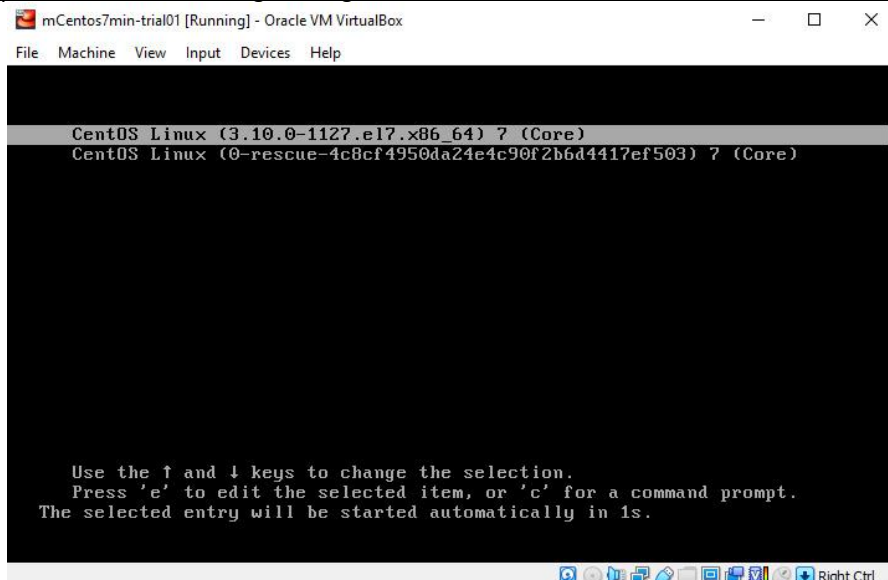
1.4.1. setting the hostname

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. "Cat" is a command to print the contents of a file.

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

To write a new hostname to the file, you could do **echo server33.netsec.local > /etc/hostname.** Then, you need to **reboot the VM** (Type command "reboot"). Alternatively, there is a 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.

 The following commands show you the hostname of the system after rebooting (use command "reboot").

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

1.5. Virtualbox network interface

By default **Virtualbox** will connect your virtual machine over a **nat** interface. The example below show that the IP is 10.0.2.15.

[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 should change this to **bridge** (over the ethernet cable) and thus make it appears as if your virtual machine is directly on our local network (receiving an ip address from our real DHCP server). In the window, click "Machine > Settings…".
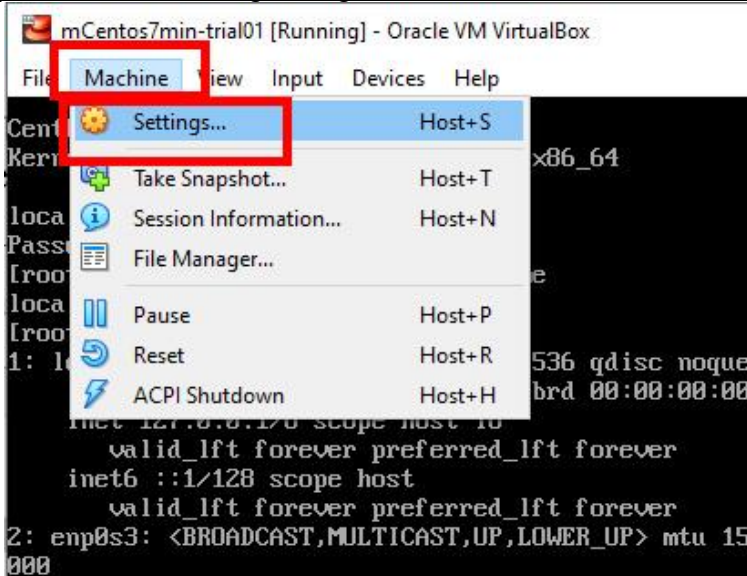
In the "Network" tab, select "Bridged Adapter" in the "Attached to:".
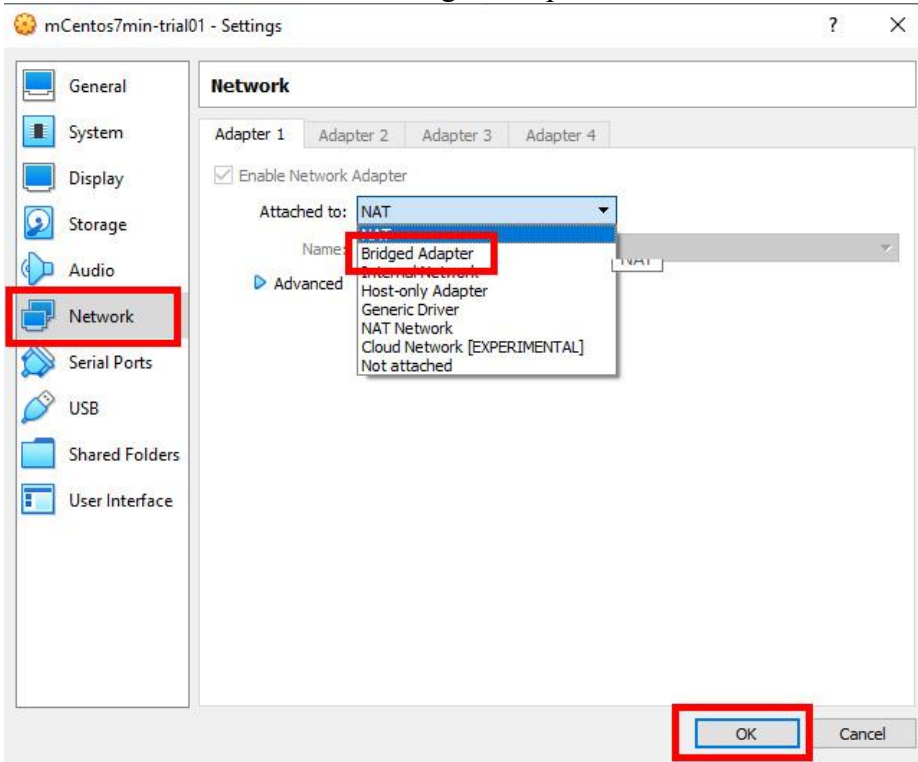
You can make this change while the VM is running, provided that you execute these commands:
(Command "ip a s dev enp0s3" means display network information only for device enp0s3.)

```
[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 ~]#
```

a=addr,
s=show

1.6. 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 by 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
```

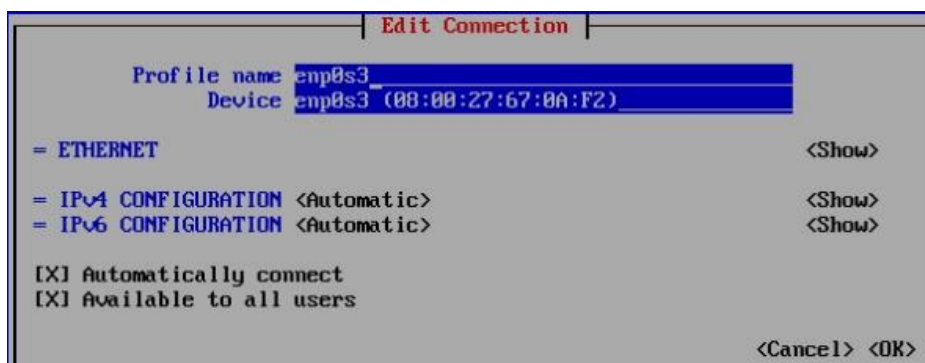Use **ip a** to display the address.

```
[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 ~]#
```

1.7. adding one static ip address
(ask lecturer for static ip address before doing this part)

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

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

```
┌────────────────┤ Edit Connection ├────────────────┐

     Profile name enp0s3_
          Device enp0s3 (08:00:27:67:0A:F2)_

  = ETHERNET                                          <Show>

  = IPv4 CONFIGURATION <Automatic>                    <Show>
  = IPv6 CONFIGURATION <Automatic>                    <Show>

  [X] Automatically connect
  [X] Available to all users

                                          <Cancel> <OK>
```

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**:

[root@server33 ~]# **ip a s dev enp0s3 | grep inet**

   inet **10.104.33.32/16** brd 10.104.255.255 scope global enp0s3 noprefixroute enp0s3

   inet 192.168.1.80/24 brd 192.168.1.255 scope global noprefixroute dynamic enp0s3

   inet6 fe80::a00:27ff:fe1c:f5ab/64 scope link noprefixroute

[root@server33 ~]#

1.8. 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.

1.9. logon from Linux and MacOSX

If you are using Linux or MacOSX, you can now open a terminal on Linux or MacOSX and use **ssh** to log on to your virtual machine. Assume your vm has ip 192.168.1.110

```
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 ~]#
```

1.10. logon from MS Windows

If you are using 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 .

Run **putty.exe** as shown in this screenshot. Type the IP of your VM (in my case 192.168.1.80). Set Port to 22. Select "SSH". Type "server33" in "Saved Sessions". Click "Save" button.
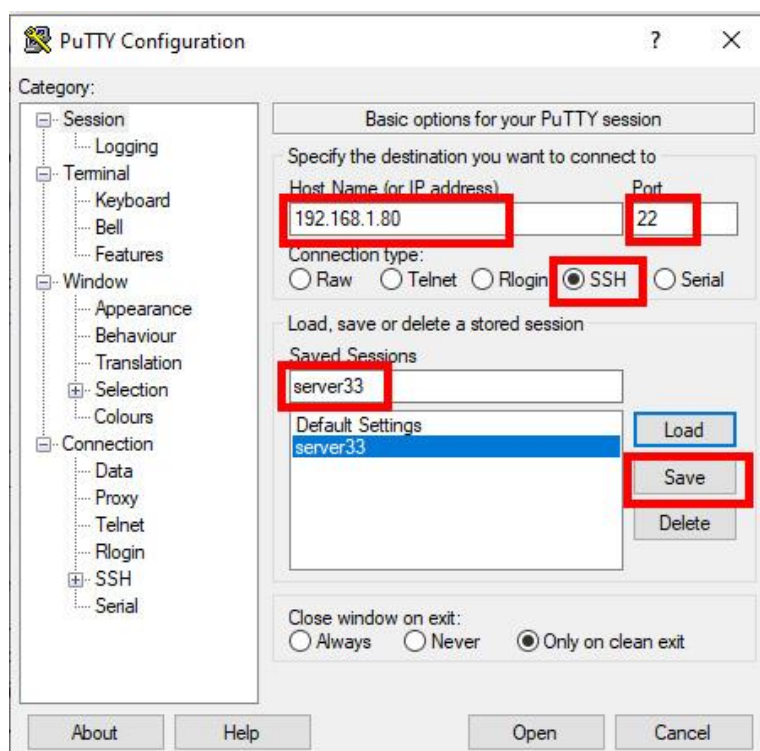
Click "server33" and press "Load" button to load the information. Click "Open" to connect to the VM.
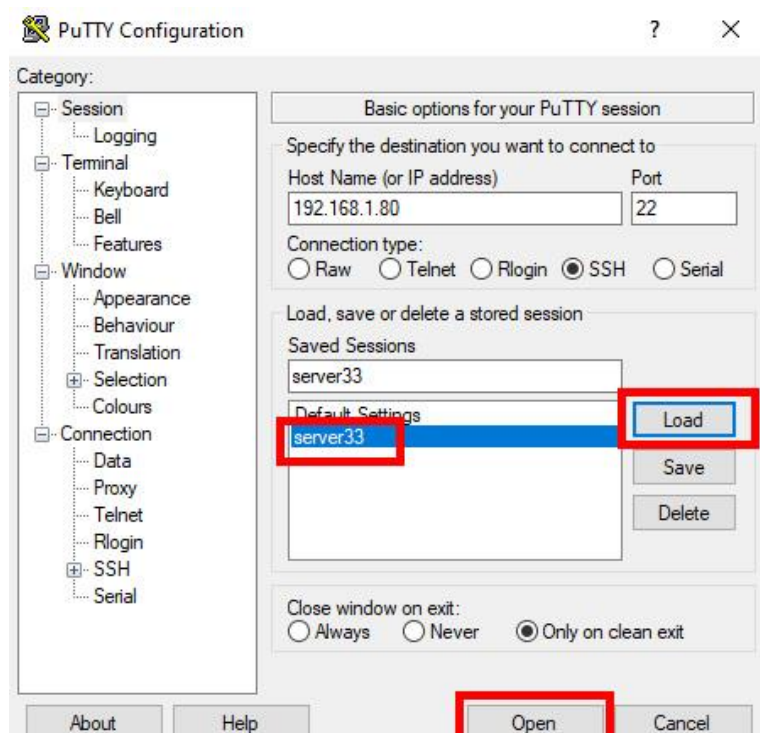
The first time you will get a message about keys, accept this. Click "Yes" button.

Enter your userid (or root) and the correct password (nothing will appear on the screen when typing a password). You can see that you are connecting to the machine with hostname "server33". You can control the machine remotely through this connection.
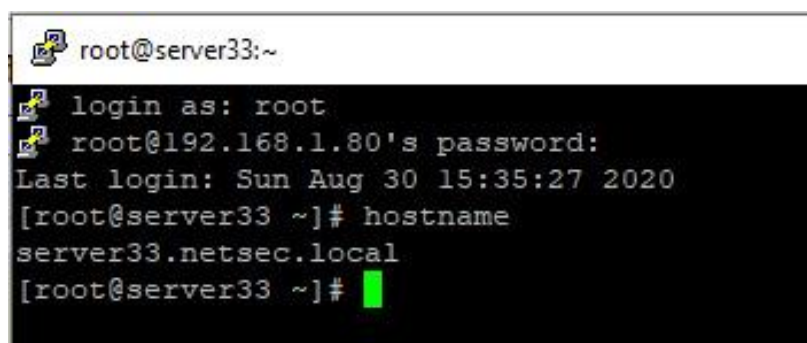
Finally, you can save your virtual machine by copying the folder "mCentos7min-trial01" in the path "C:\Users\Calvin\VirtualBox VMs\".