



Mininet Lab 1

COEN 366

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Introduction to Mininet

Mininet is a virtual testbed enabling the development and testing of network tools and protocols. With a single command, Mininet can create a realistic virtual network on any type of machine (Virtual Machine (VM), cloud-hosted, or native). Therefore, it provides an inexpensive solution and streamlined development running in line with production networks.

Mininet offers the following features

- Fast prototyping for new networking protocols.
- Simplified testing for complex topologies without the need of buying expensive hardware.
- Realistic execution as it runs real code on the Unix and Linux kernels.
- Open-source environment backed by a large community contributing extensive documentation

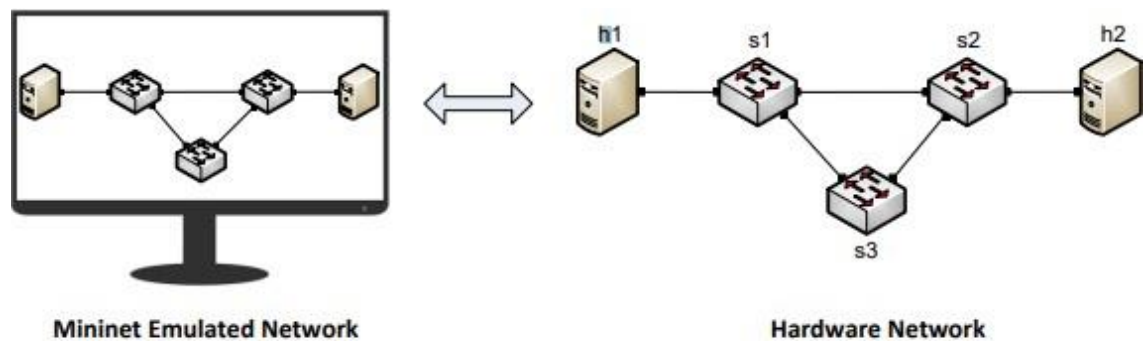


Figure 1. Hardware network vs. Mininet emulated network.

Why use Mininet?

Mininet is useful for development, teaching, and research as it is easy to customize and interact with it through the CLI or the GUI. Mininet was originally designed to experiment with OpenFlow² and Software-Defined Networking (SDN)³.

Main components of Mininet:

- Mininet's **logical nodes** can be connected into networks. These nodes are sometimes called containers, or network namespaces.
- Network namespaces consume sufficiently fewer resources than networks of over a thousand nodes have created, running on a single laptop.
- A Mininet network namespace is a process (or group of processes) that no longer has access to all the host system's native network interfaces.
- Namespaces are then assigned virtual Ethernet interfaces, which are connected to other namespaces through a virtual switch4.
- Mininet connects a host and a switch using a virtual Ethernet (veth) link.
- Each network namespace is independent and has a lightweight virtualization feature that provides individual processes with separate network interfaces, routing tables, and Address Resolution Protocol (ARP) tables.
- The veth link is analogous to a wire connecting two virtual interfaces, as illustrated below

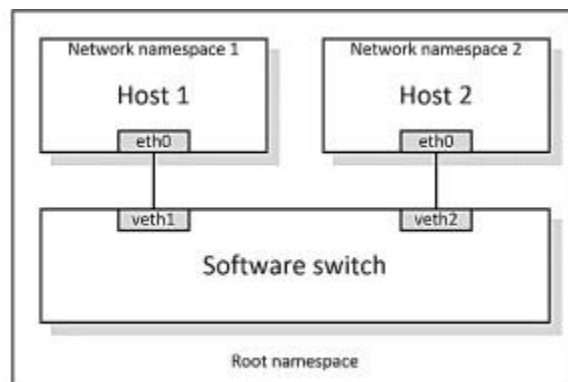


Figure 2. Network namespaces and virtual Ethernet links.

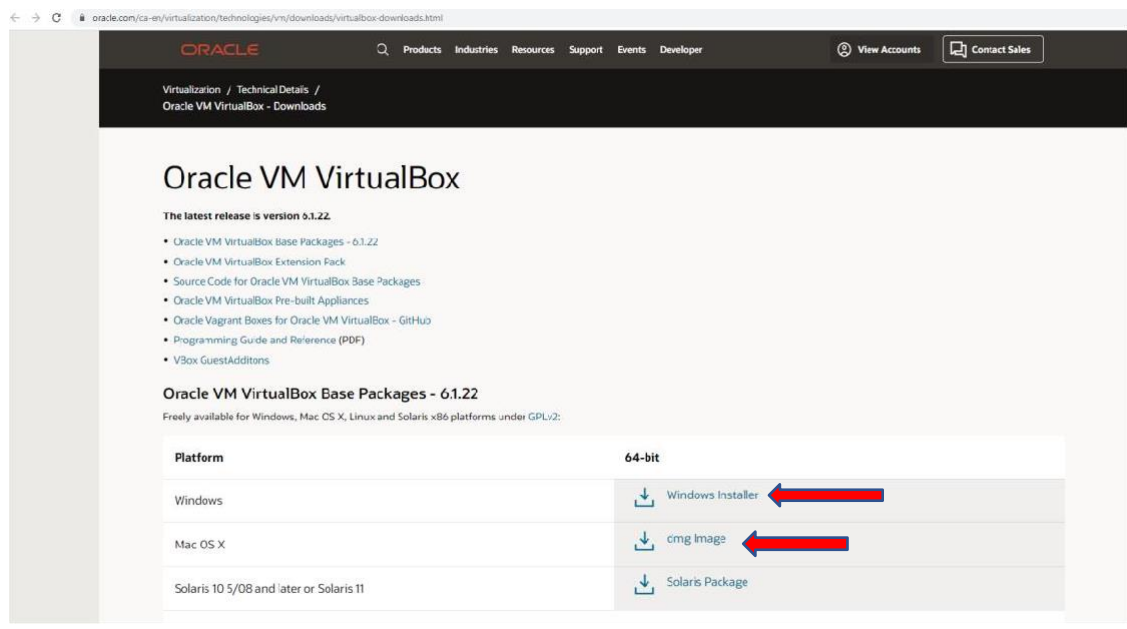
Difference between Mininet Emulation vs Network Simulation

Mininet Emulation: Mininet provides network emulation which allows all network software at any layer to be simply run as is; i.e. nodes run the native network software of the physical machine.

Network Simulation: On the other hand, in a simulated environment applications and protocol implementations need to be ported to run within the simulator before they can be used.

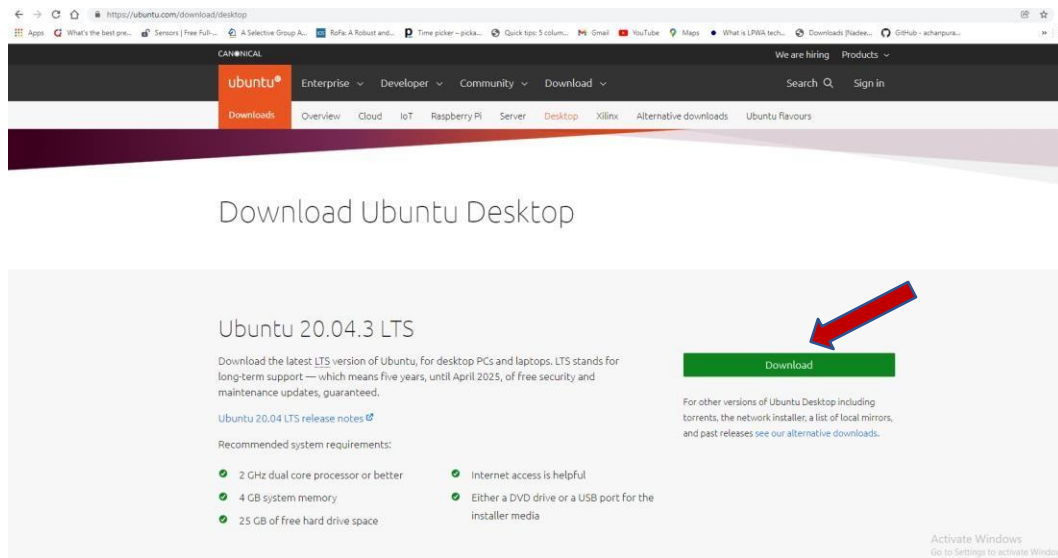
How to install Mininet?

- Download VirtualBox from the following link:
<https://www.oracle.com/ca-en/virtualization/technologies/vm/downloads/virtualbox-downloads.html>

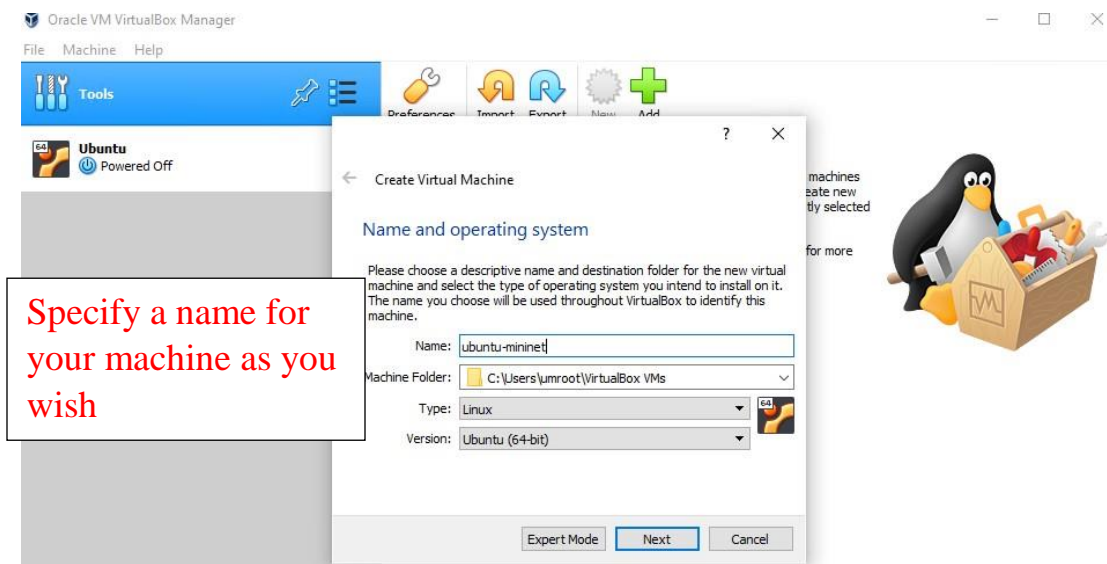


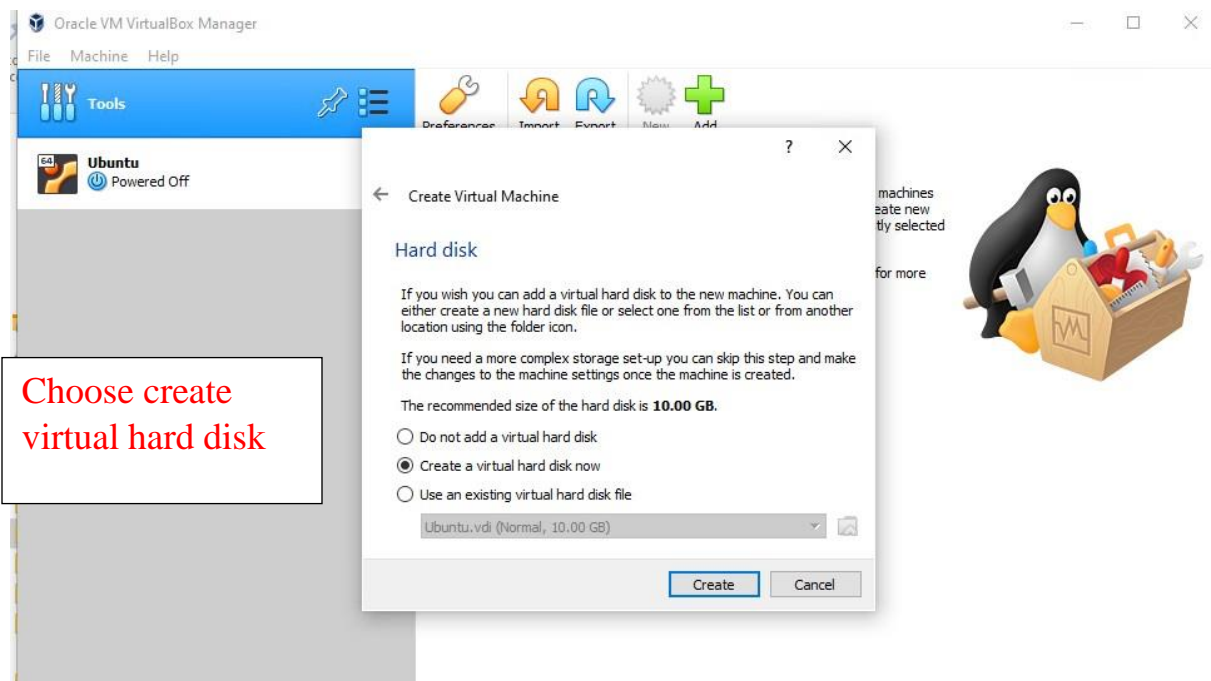
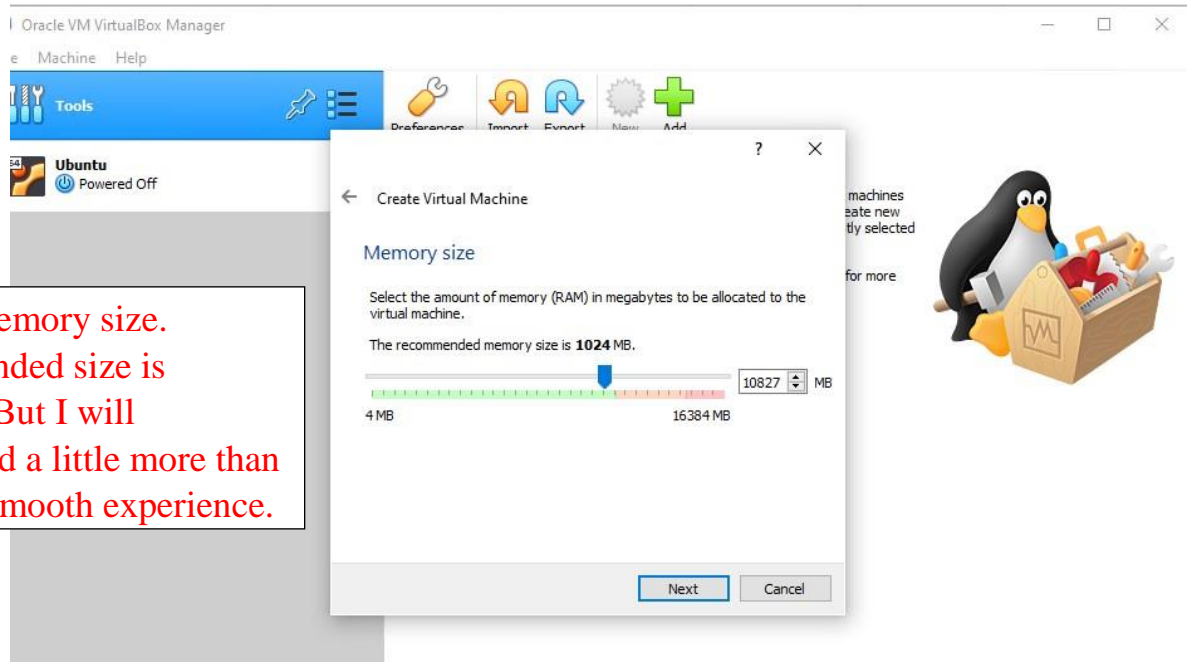
- Download the file as the **red arrow** indicates.
For Windows users, download the first file.
For MAC users, download the second file.
- Install the VirtualBox.

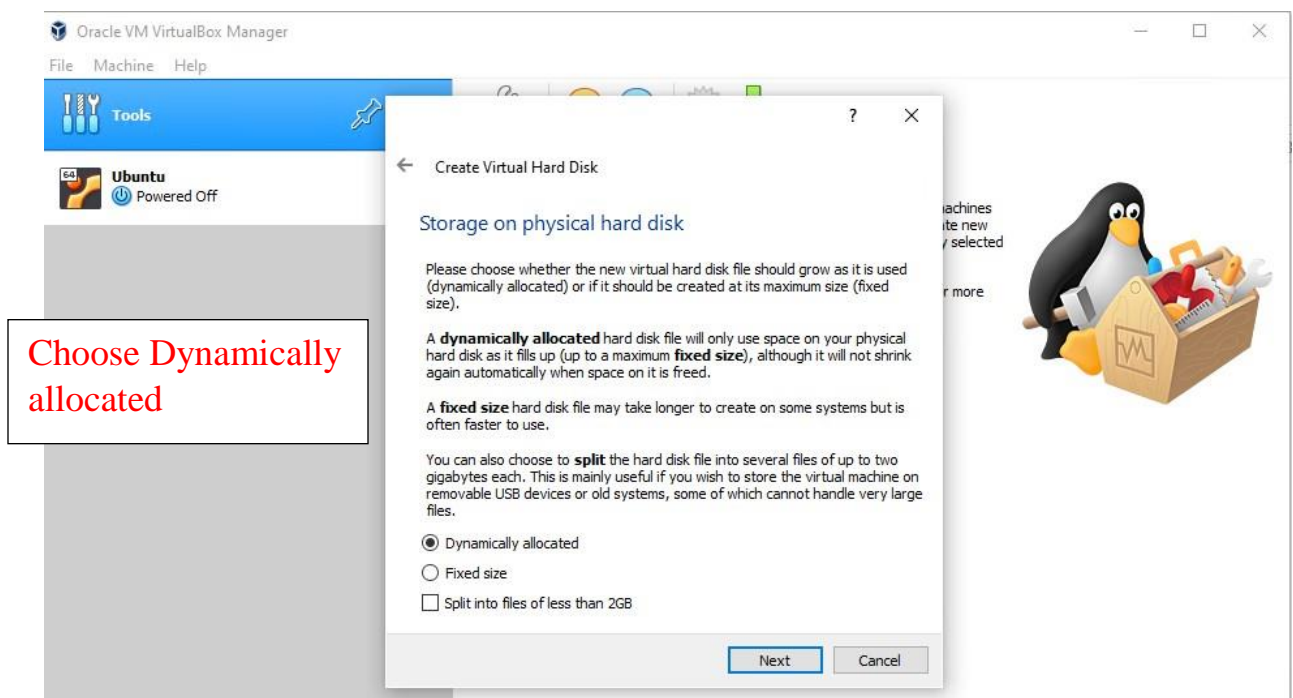
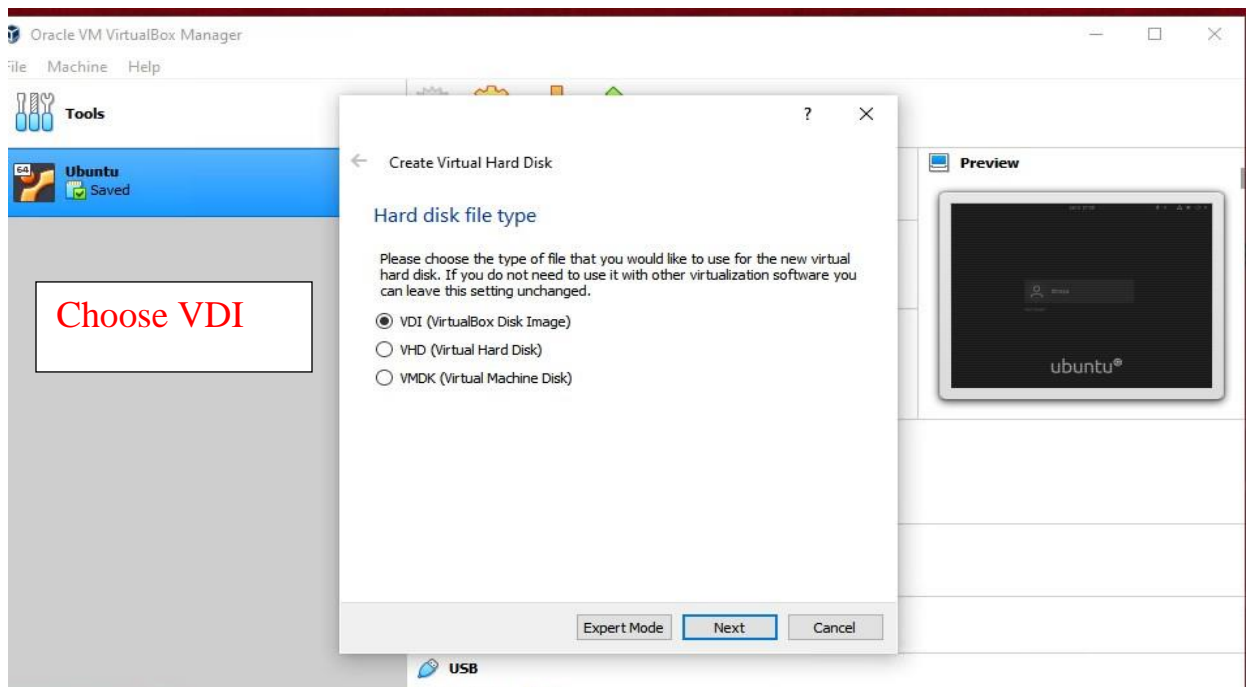
- Download Ubuntu (disk image) from the following link <https://ubuntu.com/download/desktop>
- The above link will take you to the following website and download the Ubuntu by clicking the “Download” button.



- You will download a file with “.iso” extension. Keep it for later use.
- Open the VirtualBox and create a new machine by following the below steps shown in the picture:

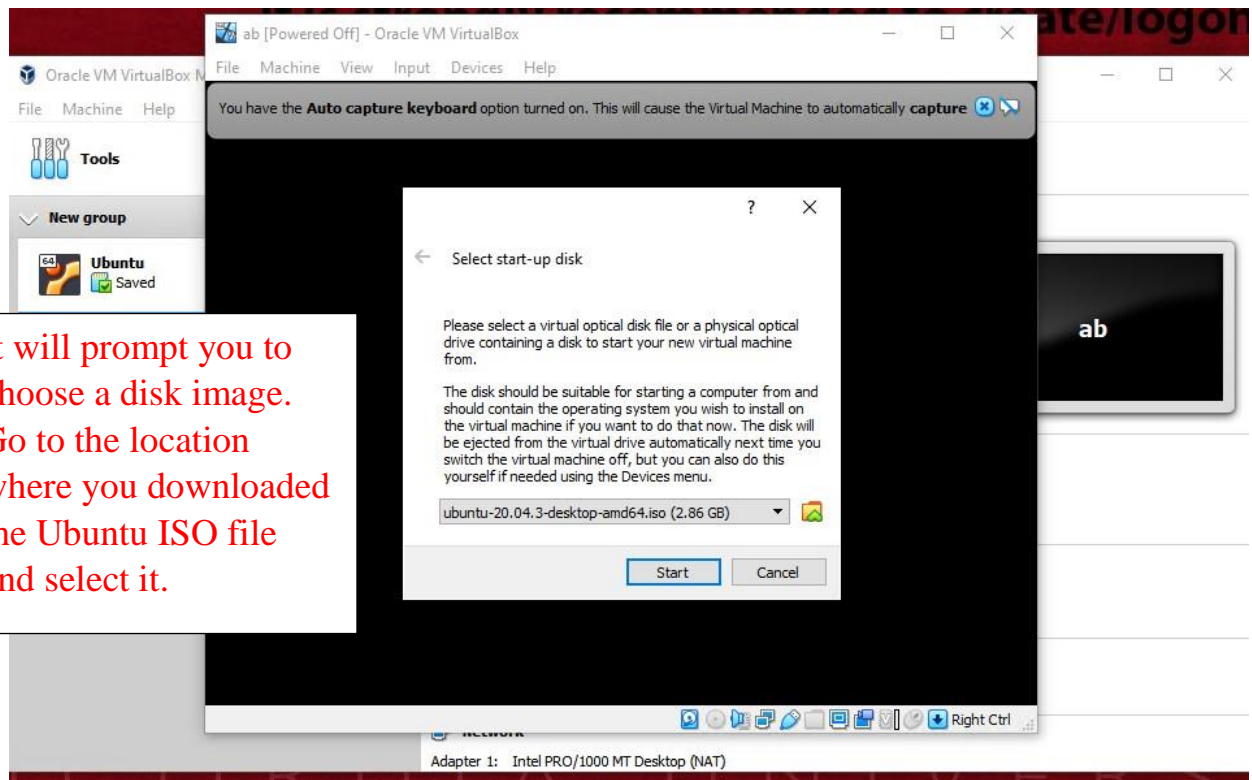
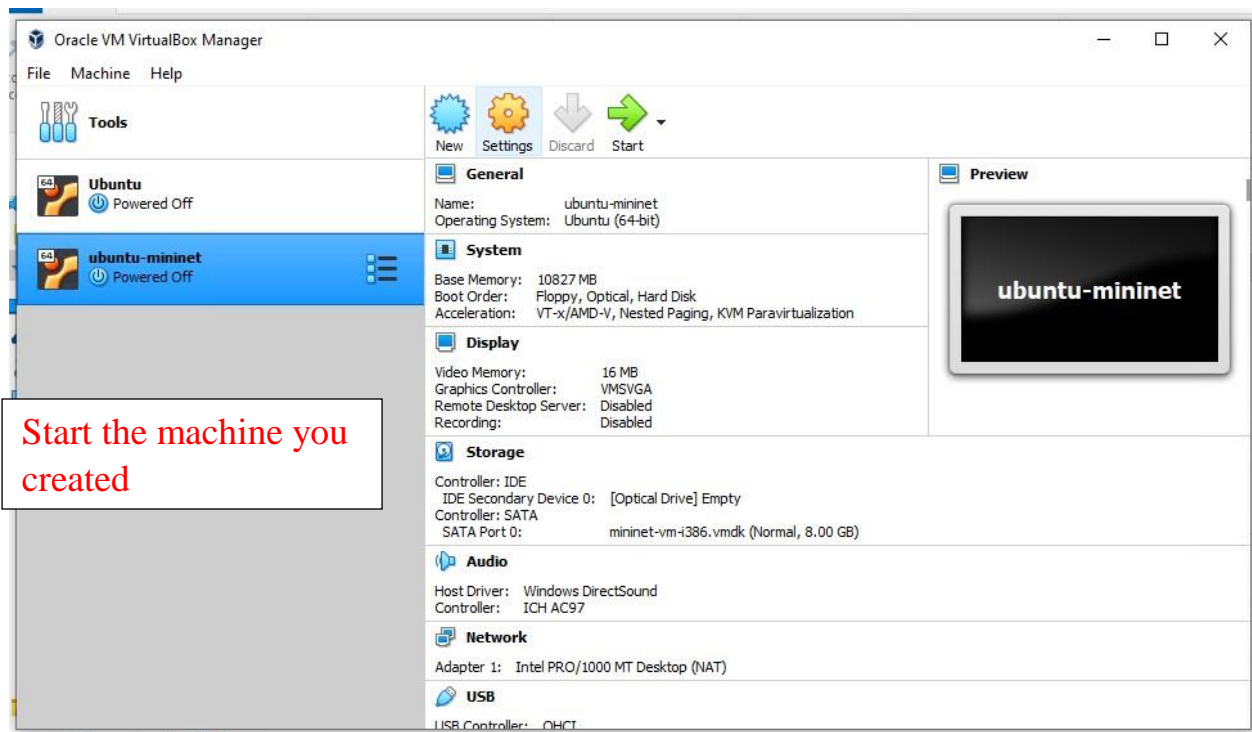






Congrats!! You have successfully created a Virtual Machine.

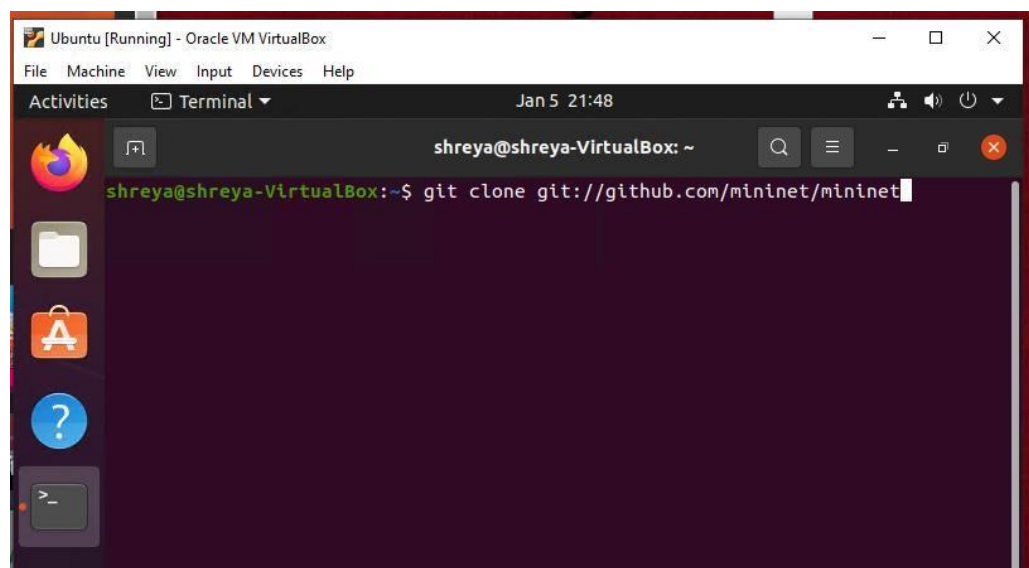
- Now import the Ubuntu ISO image to VirtualBox by following steps:



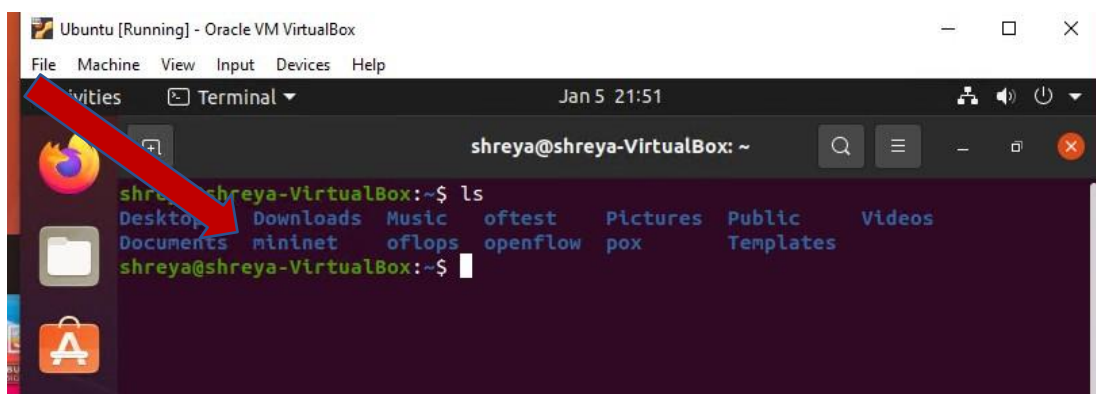
- Now click start and your virtual machine will boot up with the Ubuntu system and follow the instruction that is shown on the screen.
- After successfully booting up your machine, write the following command in terminal to download Mininet

`git clone git://github.com/mininet/mininet`

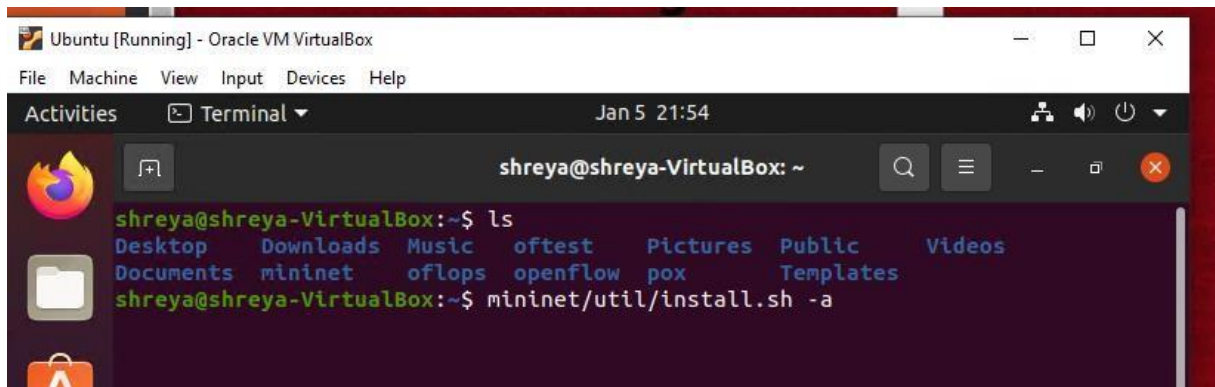
- The command is shown in the picture below:



- If you successfully install Mininet, you will see the Mininet in the list by typing “ls” as shown in the picture:



- Now type the command “mininet/util/install.sh -a” in the terminal as follows:

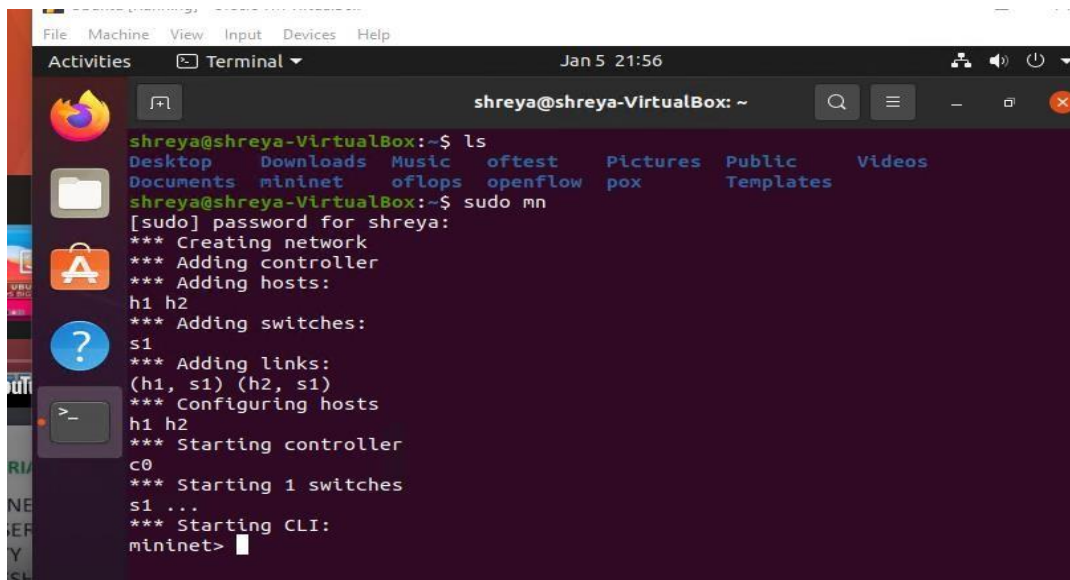


```
shreya@shreya-VirtualBox: ~  
shreya@shreya-VirtualBox:~$ ls  
Desktop Downloads Music oftest Pictures Public Videos  
Documents mininet oflops openflow pox Templates  
shreya@shreya-VirtualBox:~$ mininet/util/install.sh -a
```

It will take a while to install.

Congratulations! You have successfully installed Mininet in your virtual machine.

- Now to check if Mininet is working or not. You can run a simple command:
- `sudo mn`
- You will see a similar picture as below if the Mininet is successfully installed.



```
shreya@shreya-VirtualBox: ~  
shreya@shreya-VirtualBox:~$ ls  
Desktop Downloads Music oftest Pictures Public Videos  
Documents mininet oflops openflow pox Templates  
shreya@shreya-VirtualBox:~$ sudo mn  
[sudo] password for shreya:  
*** Creating network  
*** Adding controller  
*** Adding hosts:  
h1 h2  
*** Adding switches:  
s1  
*** Adding links:  
(h1, s1) (h2, s1)  
*** Configuring hosts  
h1 h2  
*** Starting controller  
c0  
*** Starting 1 switches  
s1 ...  
*** Starting CLI:  
mininet>
```

Now it's your time to explore and play with Mininet. 🏆