CCT College Dublin

Assessment Cover Page

Module Title:	Network Services & Virtualization
Assessment Title:	Proof of Concept: Linux & Windows Virtual Network Project
Lecturer Name:	Michael Weiss
Student Full Name:	Muhammad Sajjad Haider
Student Number:	2021384
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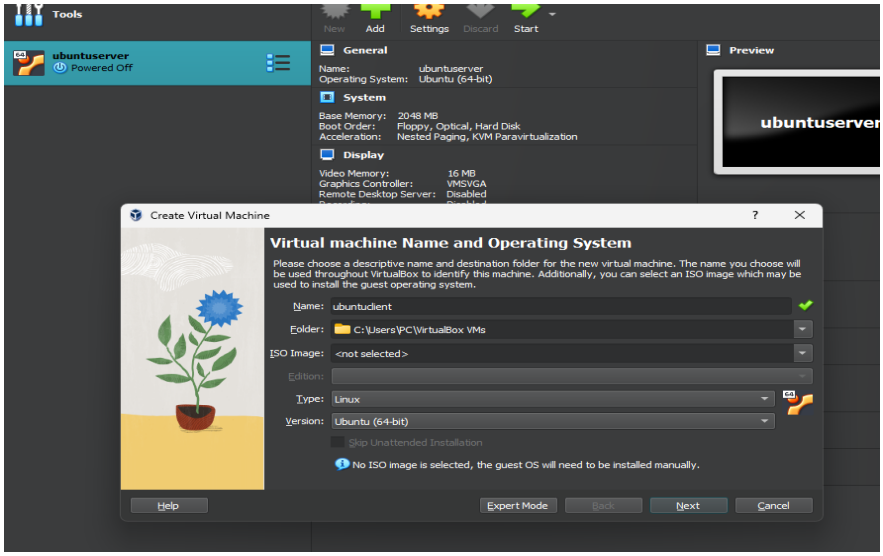
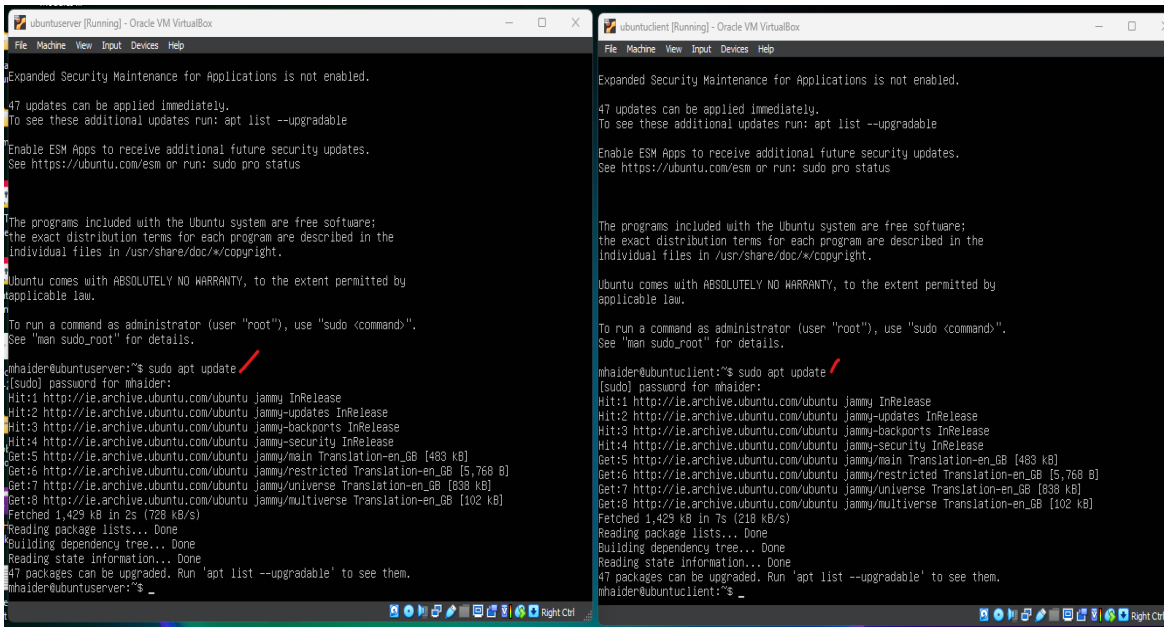
Part 1: Virtual Linux Network and Web server setup

- I made two Linux virtual machines with the same procedure, one of them is **ubuntuserver** and other one is **ubuntuclient**.
- I made them in **version ubuntu(64-bit)** as shown below:



- After it, I have set the **network adapters** of both machines by using **two adapters** of **both** machines such as **Adapter 1** and **Adapter 2** and I **attached Adapter 1** of both machines with Host-Only Network while **Adapter 2** with **NAT.**
- Then, I **obtained** Linux **updates** in **both** machines by using the command:

sudo apt update



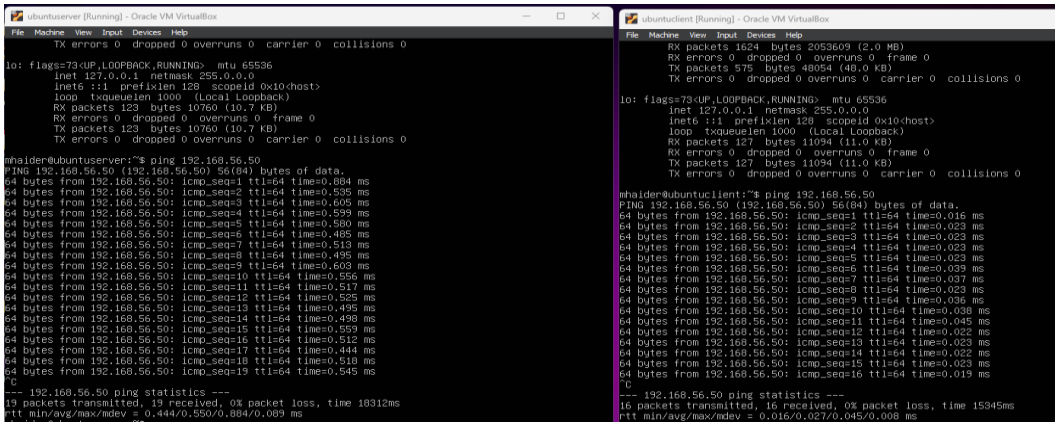
- After that I Installed **ifconfig** in **both** of virtual machines by using command:

  sudo apt install net-tools

- I gave **IP addresses** in both machines by using commands:

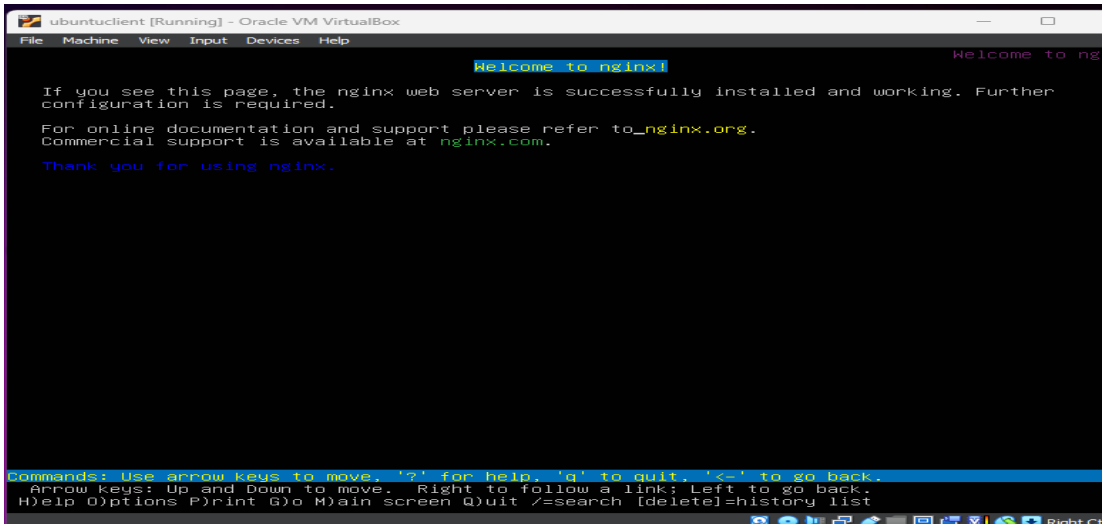
  sudo ifconfig enp0s3 192.168.56.25 netmask 255.255.255.0 in **ubuntuserver** and **sudo ifconfig enp0s3 192.168.56.50 netmask 255.255.255.0** in **ubuntuclient**.

- Screenshot below showed that **both** machines are **pinging** each other successfully.

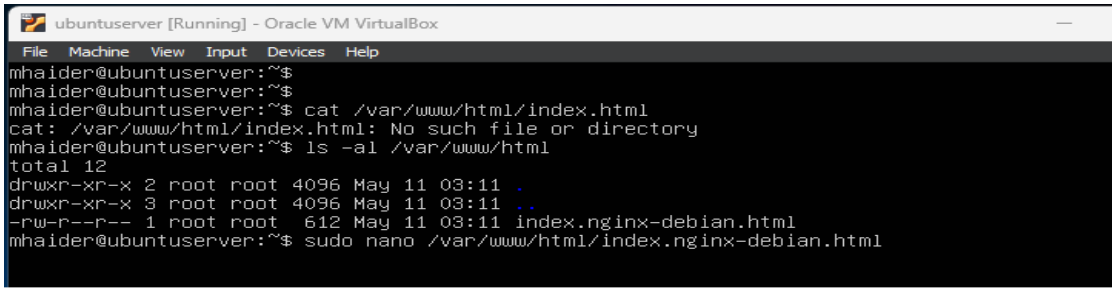


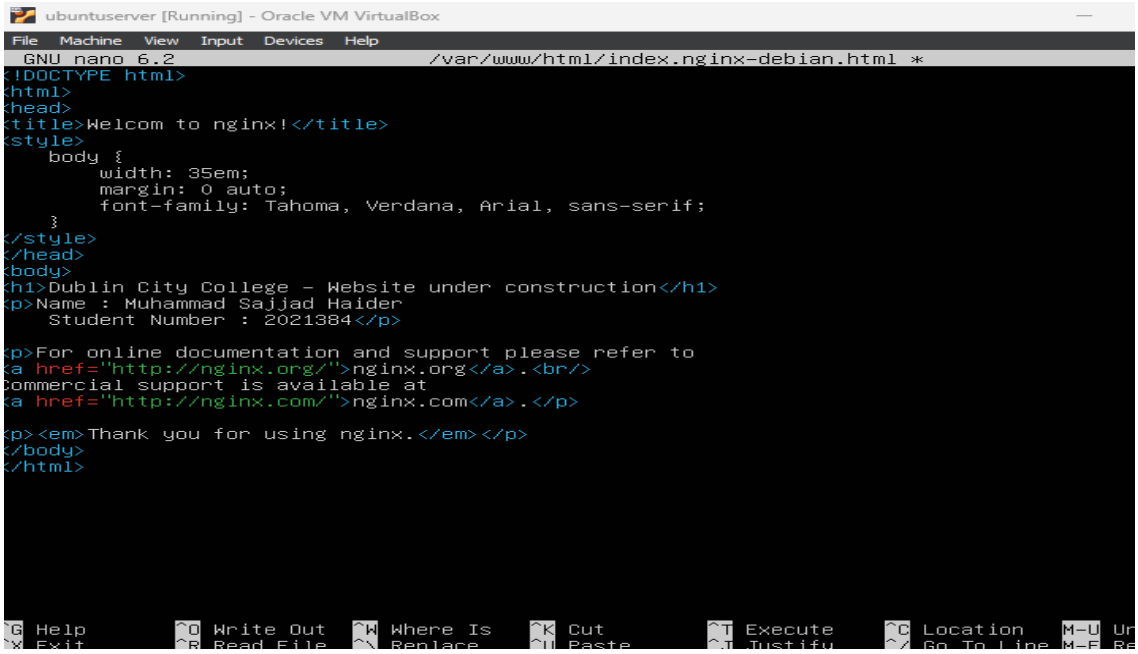
- After Installing **lynx** in **ubuntuclient** with the command **sudo apt install lynx -y** and Installing **NGINX** in **ubuntuserver** with the command **sudo apt install nginx.**

- View of **NGINX html page** through the text editor **Lynx** in **ubuntuclient** with the command **Lynx 192.168.56.25**.

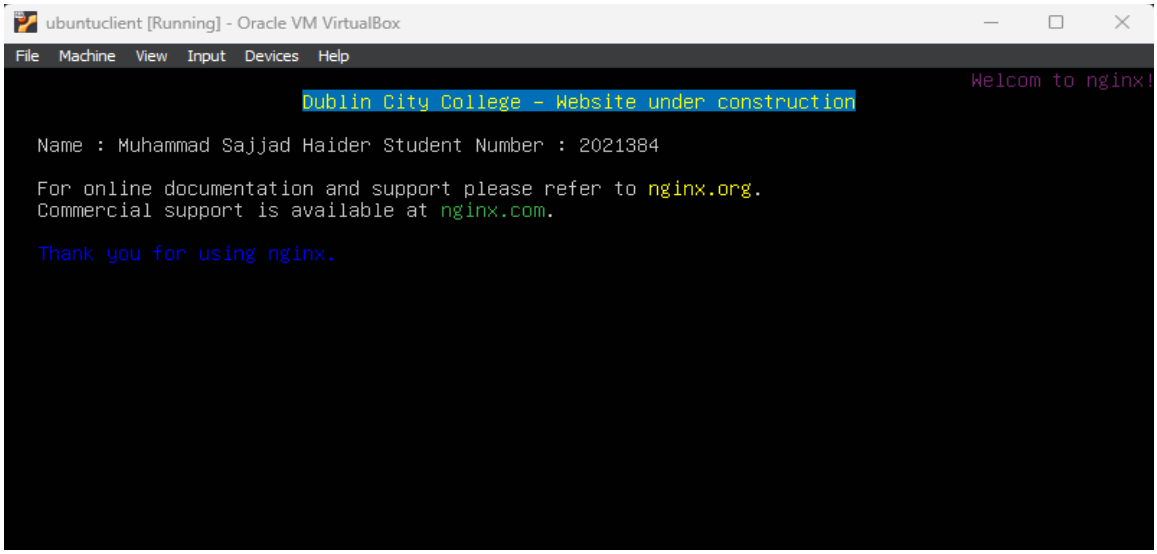


- Editing **NGINX page** in **ubuntuserver** with **"**Dublin City College – Website Under Construction**"** page along with name and student number by using **nano** command as shown below in shots.





- View of **Dublin City College** modified home page that is hosted on **NGINX** through **Lynx** in **ubuntuclient**.

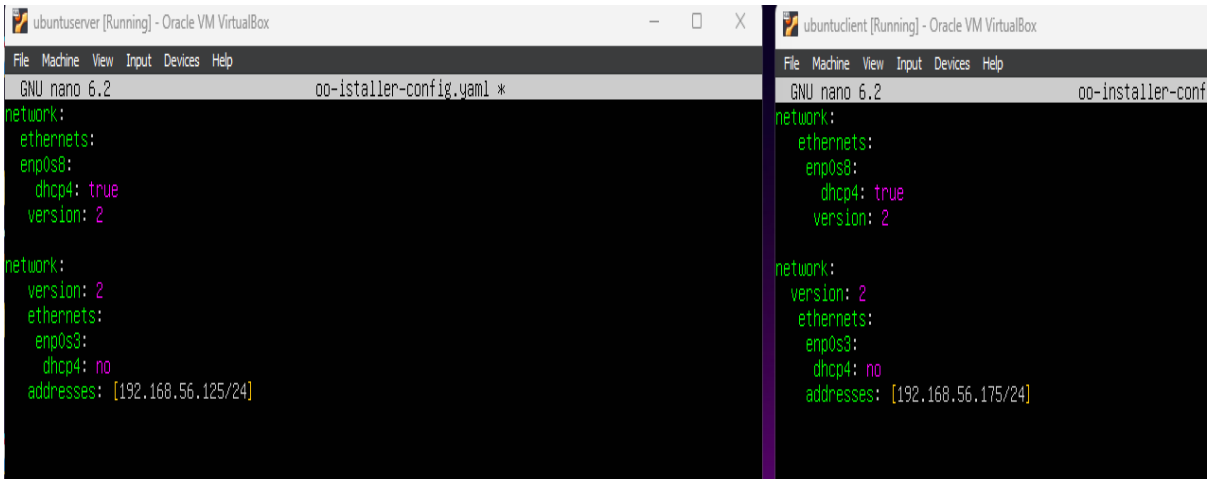


Reference of NGINX

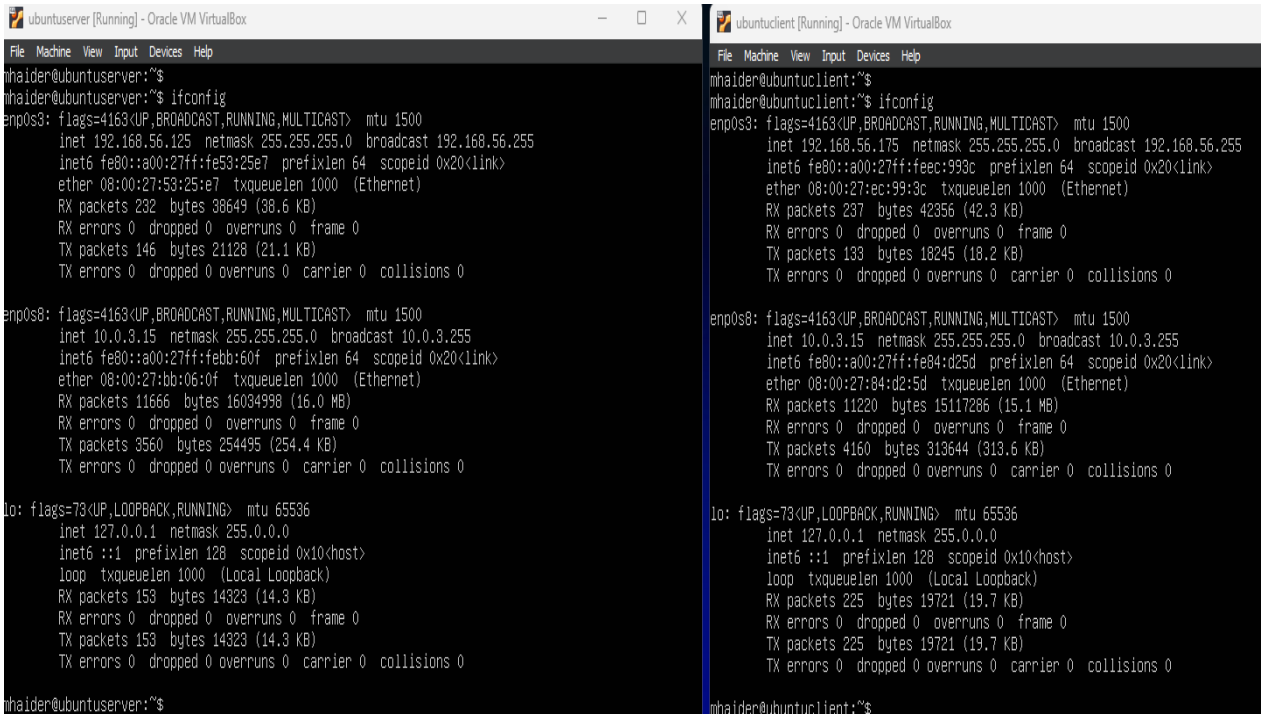
Cherry Servers. (n.d.). *How to Install and Configure Nginx on Ubuntu 20.04 | Step–by-Step Tutorial*. [online] Available at: https://www.cherryservers.com/blog/how-to-install-and-configure-nginx-on-ubuntu-20-04.

PART 2: IP ADDRESS MANAGEMENT

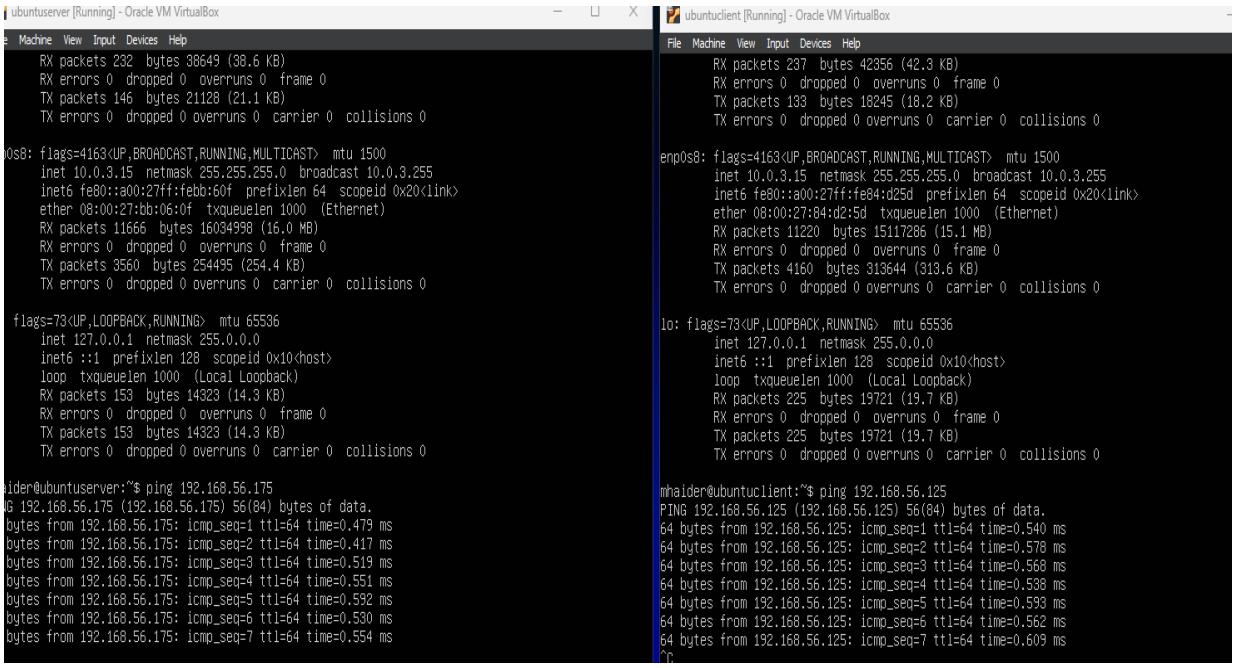
- **I configured** for **enp0s3** as a **permanent address** such as **192.168.56.125/24** and **192.168.56.175/24** in **ubuntuserver** and **ubuntuclient,** respectively**.**



- After applying **netplan** command **sudo netplan apply, Ip addresses** have **set permanently** in **both** ubuntu **machines.**

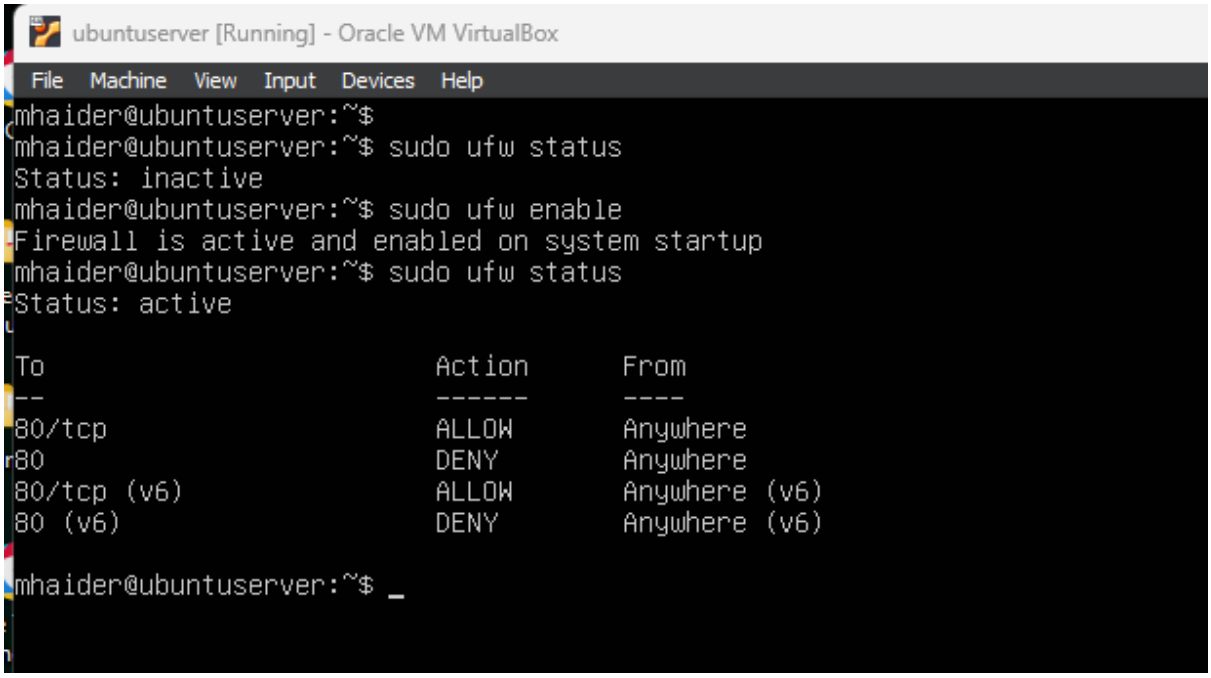


- It can be seen that **both** machines **ping** each other with **new** Ip addresses.

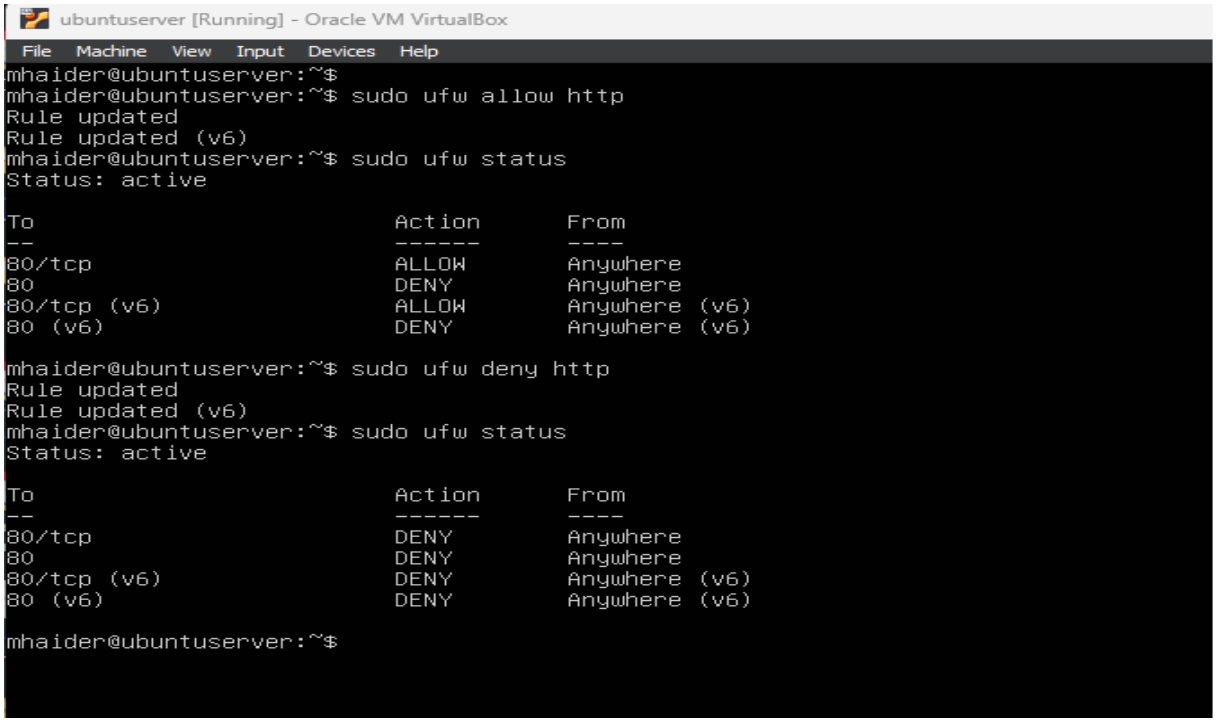


PART 3: FIREWALL

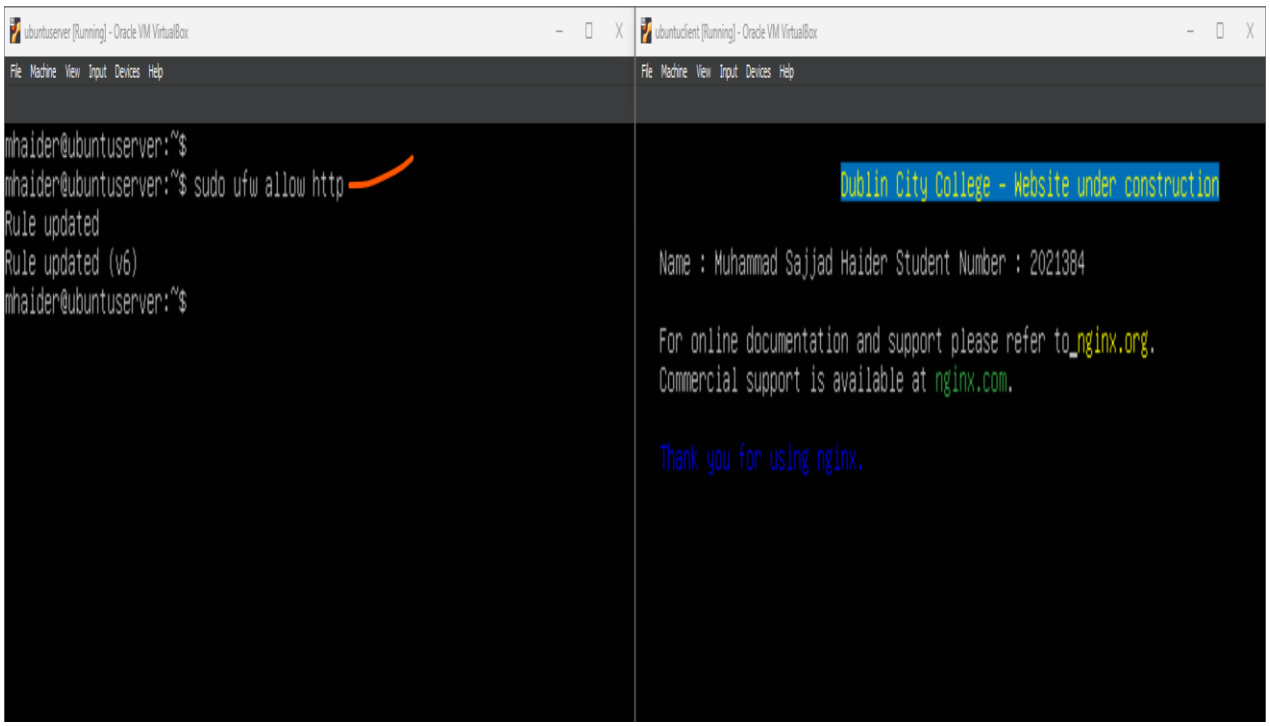
- Firstly, I used the command **sudo ufw status** for checking the **status** of **fire-wall** in **ubuntuserver.**
- It depicted **inactive**, then I used the command **sudo ufw enable** for **enabling** the **status** to **active.**



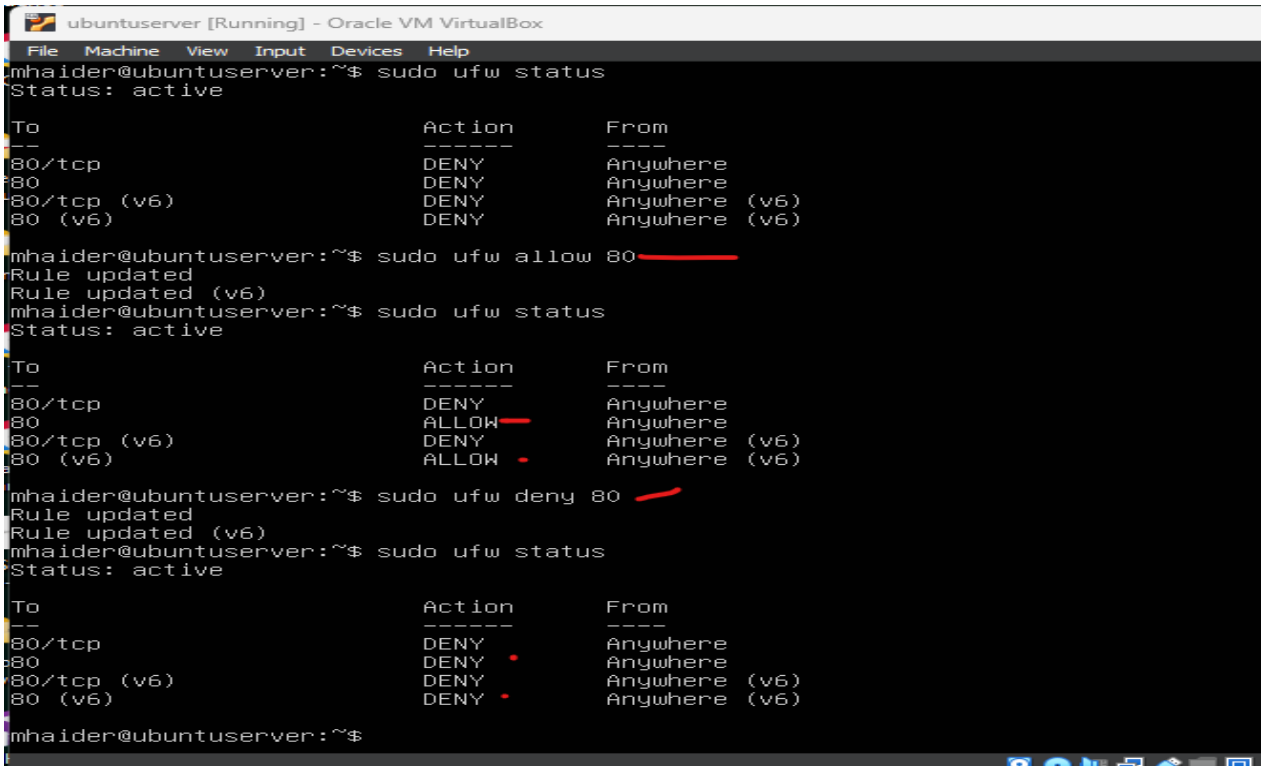
- After that, I used command such as **sudo ufw allow http**, allowing the web **traffic** through the **firewall** and **block traffic** of **HTTP** by using command **sudo ufw deny http.**



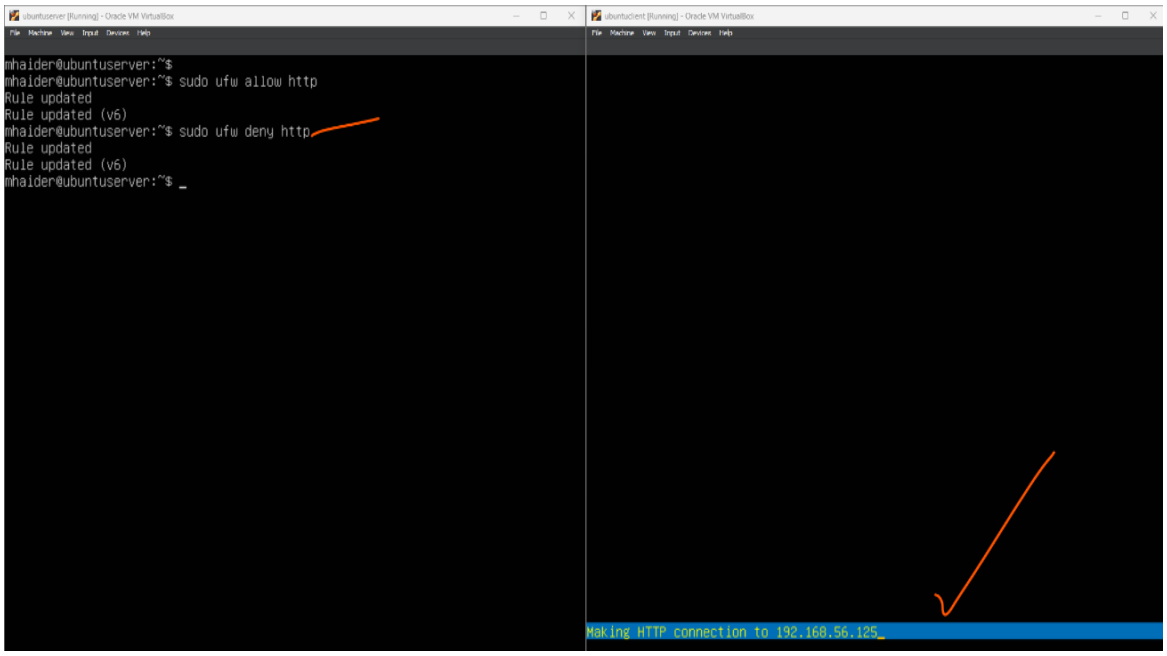
- I can **access nginx page** while **allowing http through ufw** as shown below:



- Meanwhile, I permitted and **blocked traffic** of **HTTP** through **ufw** by using **port number** of **HTTP** with commands **sudo ufw allow 80** and **sudo ufw deny 80** as shown below.



- **Nginx page** cannot be **accessed** while **blocking http through ufw** as shown below:



PART 4: Docker Container

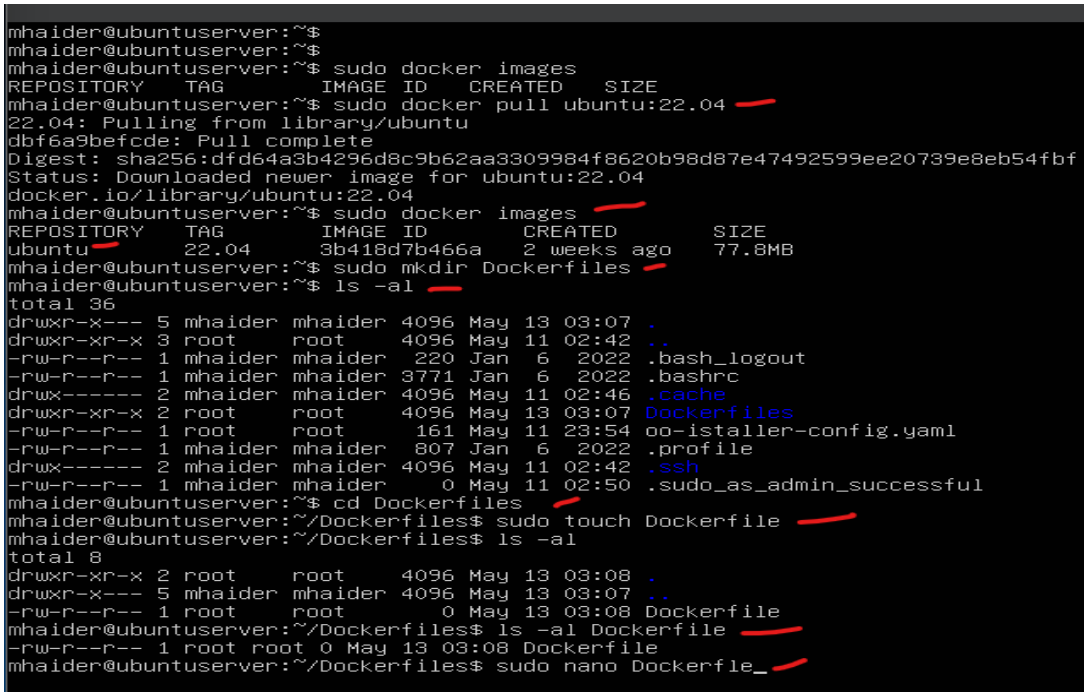
- First of all, I used the **update** command **sudo apt update**.
- Then, **installed Docker** by **using** command **sudo apt install docker.io -y**.

```
mhaider@ubuntuserver:~$
mhaider@ubuntuserver:~$ sudo apt update
[sudo] password for mhaider:
Hit:1 http://ie.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://ie.archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Get:3 http://ie.archive.ubuntu.com/ubuntu jammy-backports InRelease [108 kB]
Get:4 http://ie.archive.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Get:5 http://ie.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [57
Get:6 http://ie.archive.ubuntu.com/ubuntu jammy-updates/main Translation-en [16
Get:7 http://ie.archive.ubuntu.com/ubuntu jammy-updates/main amd64 c-n-f Metada
Get:8 http://ie.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages
Get:9 http://ie.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packag
Get:10 http://ie.archive.ubuntu.com/ubuntu jammy-updates/multiverse Translation
Get:11 http://ie.archive.ubuntu.com/ubuntu jammy-security/main amd64 Packages [
Get:12 http://ie.archive.ubuntu.com/ubuntu jammy-security/main Translation-en [
Get:13 http://ie.archive.ubuntu.com/ubuntu jammy-security/main amd64 c-n-f Meta
Get:14 http://ie.archive.ubuntu.com/ubuntu jammy-security/universe amd64 Packag
Fetched 3,217 kB in 2s (1,911 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
47 packages can be upgraded. Run 'apt list --upgradable' to see them.
mhaider@ubuntuserver:~$ sudo apt install docker.io -y
```

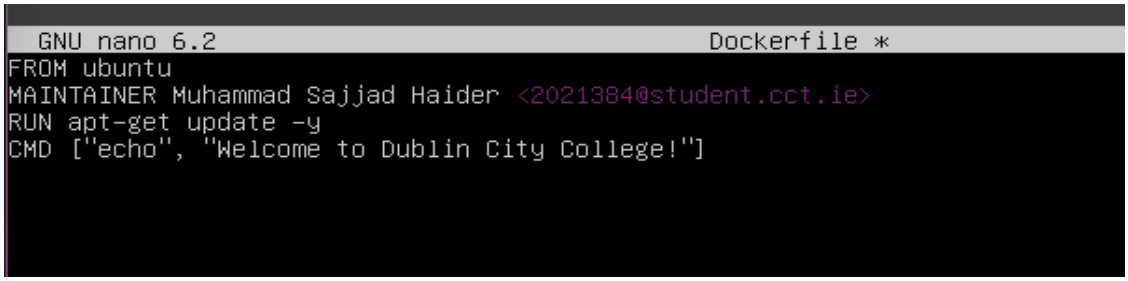
- After installing Docker, I **gave** commands **sudo systemctl start docker** and **sudo systemctl enable docker** for **starting** and **enabling** docker.
- **sudo docker images** showed that there is **no** any **image yet** in the **shot** below:
- **sudo groupadd docker** showed docker group **already existed.**
- I used my **username** for becoming **user** by using the command **sudo usermode -aG docker mhaider** and have also set **password pass1234!** with the command **sudo passwd mhaider**.

```
Adding group `docker' (GID 119) ...
Done.
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service
ker.service.
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /l
socket.
Processing triggers for dbus (1.12.20-2ubuntu4.1) ...
Processing triggers for man-db (2.10.2-1) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
mhaider@ubuntuserver:~$ sudo systemctl start docker
mhaider@ubuntuserver:~$ sudo systemctl enable docker
mhaider@ubuntuserver:~$ sudo docker images
REPOSITORY   TAG       IMAGE ID   CREATED   SIZE
mhaider@ubuntuserver:~$
mhaider@ubuntuserver:~$
mhaider@ubuntuserver:~$
mhaider@ubuntuserver:~$
mhaider@ubuntuserver:~$
mhaider@ubuntuserver:~$ sudo groupadd docker
groupadd: group 'docker' already exists
mhaider@ubuntuserver:~$ sudo usermod -aG docker mhaider
mhaider@ubuntuserver:~$ sudo passwd mhaider
New password:
Retype new password:
passwd: password updated successfully
mhaider@ubuntuserver:~$
```

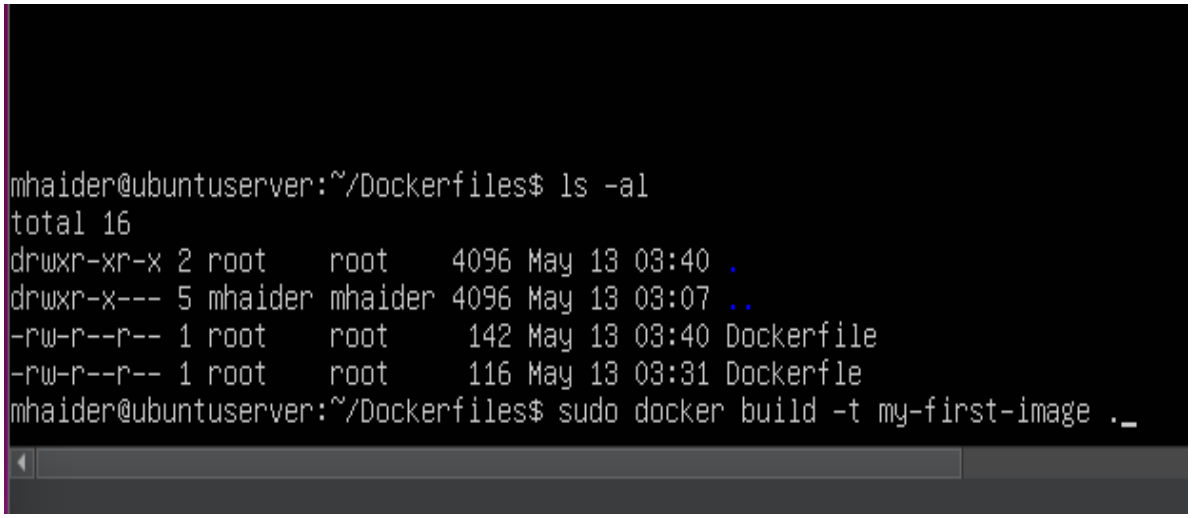
- **sudo docker pull ubuntu:22.04** used for **downloading** the **ubuntu**.
- **sudo docker images** showed **ubuntu image** in list.
- **sudo mkdir Dockerfiles** used for **creating directory**.
- **ls -al** showed that **docker image** exists.
- **cd Dockerfiles** used to go **inside** the **directory**.
- **sudo touch Dockerfile** command used for **creating** the **new file** inside the directory with the name of **Dockerfile**.
- **ls -al Dockerfile** command showed that the **new file** has **created** inside.
- **sudo nano Dockerfile** used for **writing inside** the **newly** created **Dockerfile**.



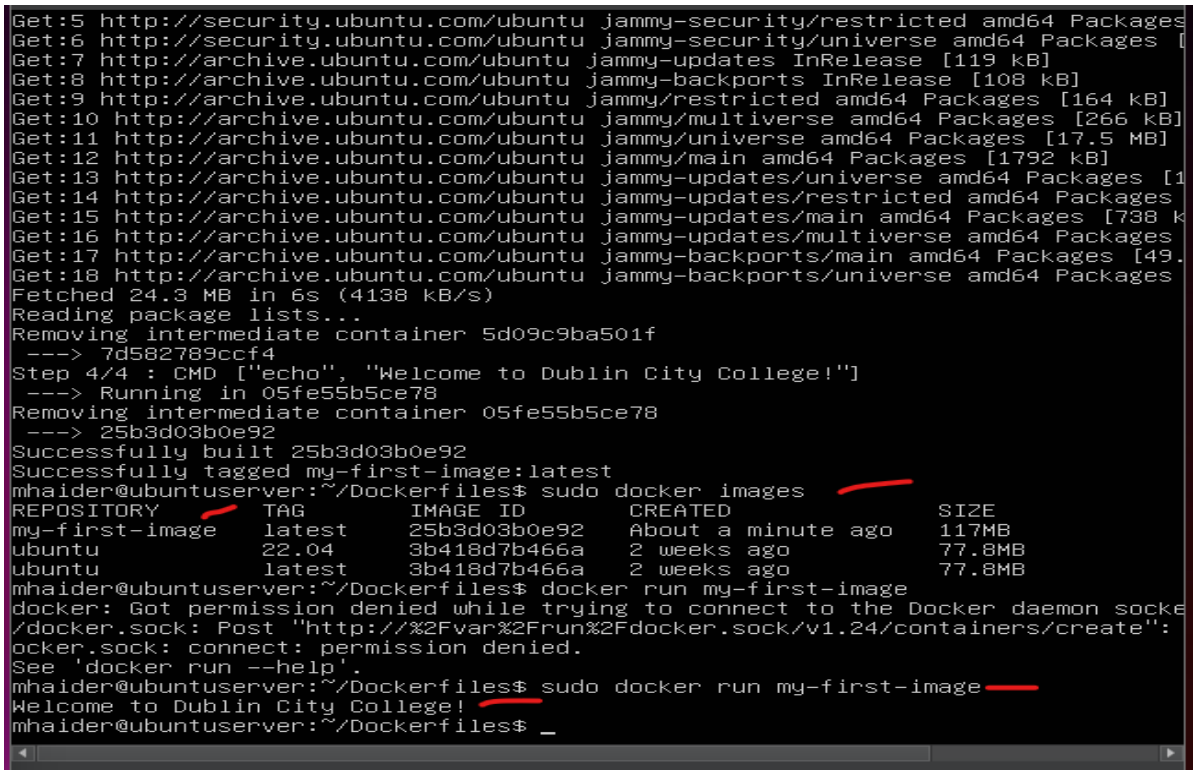
- I have written my **name** followed by **student email address** as a **Maintainer** inside the **Docker file** and **wrote** a message **"Welcome to Dublin City College!"** in **CMD**.



- **Docker container** named **my-first-image** has **built** by using the command **sudo docker build -t my-first-image .** (**Note**: **Dot** is **necessary** at the **end** of command).

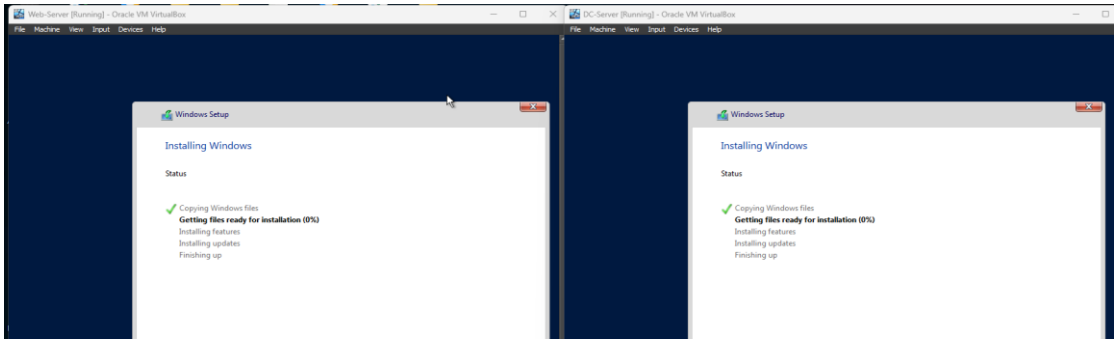


- **sudo docker images** showed **my-first-image** docker container in the list.
- This docker container had **run** by using the command **sudo docker run my-first-image** which showed the message **"Welcome to Dublin City College!"**.

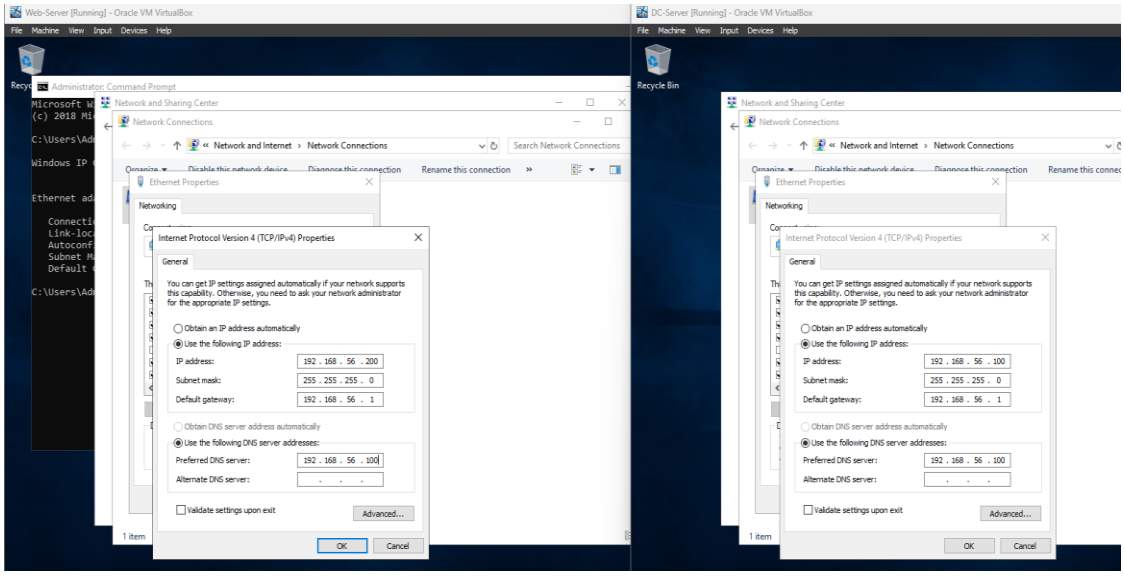


PART 5: Creation of Web and DC servers, Setting up IP and RAID arrays:

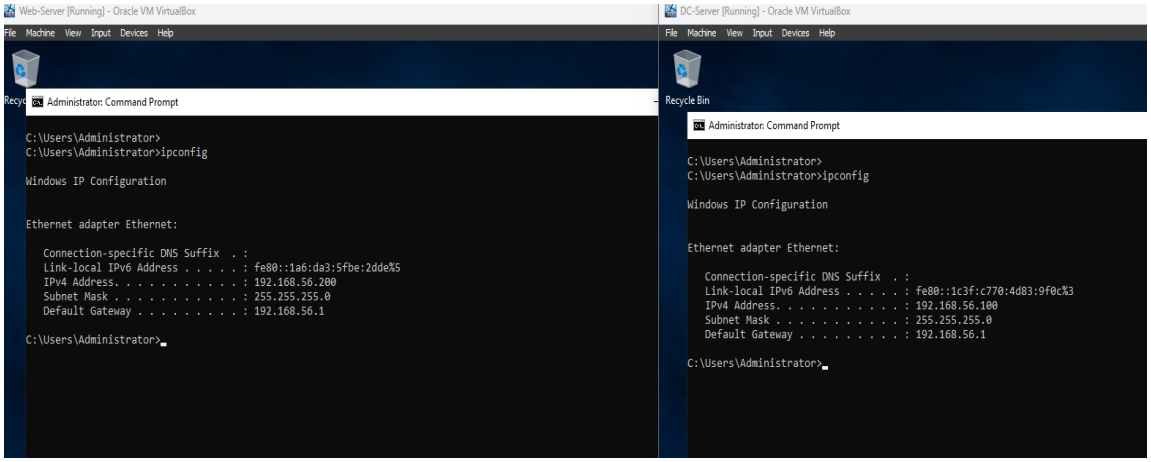
- First of all, I have **created two** new **virtual machines** with the names **Web-Server** and **DC-Server** as shown below:



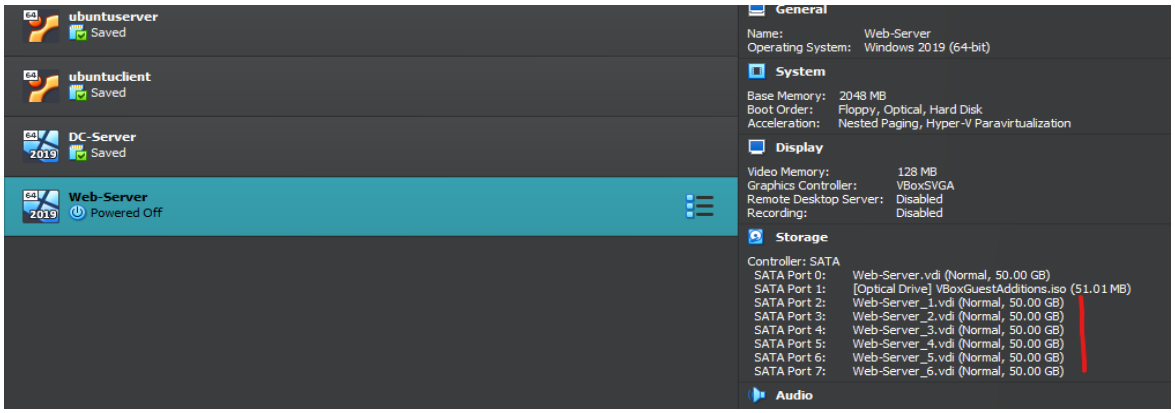
- **Setup Ip addresses**, **subnet mask**, **default gateway** and **DNS** in **both** machines which have given in the assessment.



- **Everything** has **setup successfully** as shown below:



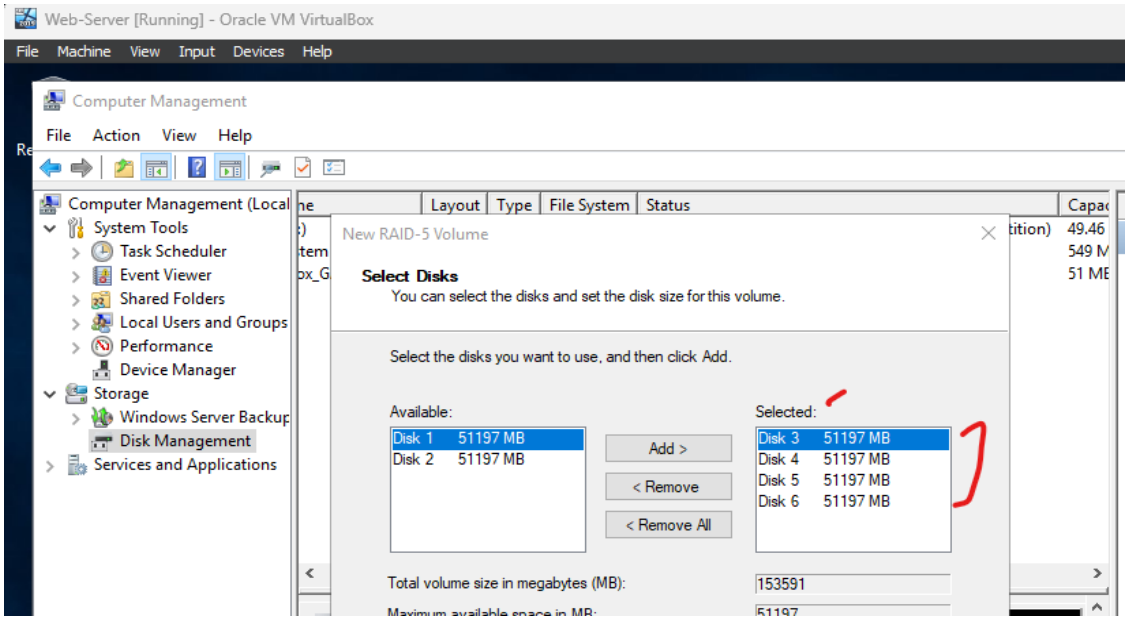
- First, I create total 6 hard disks for my Web-Server such as 4 for RAID 5 and 2 for RAID 1.



- I have set both RAIDS in my Web-Server by using **Disk Management** within the **Computer Management**.
- After installing **disk drives,** All the new disk are showing as **Unknown** and convert all disks to **dynamic** by using right-click on the **Unknown disk**.

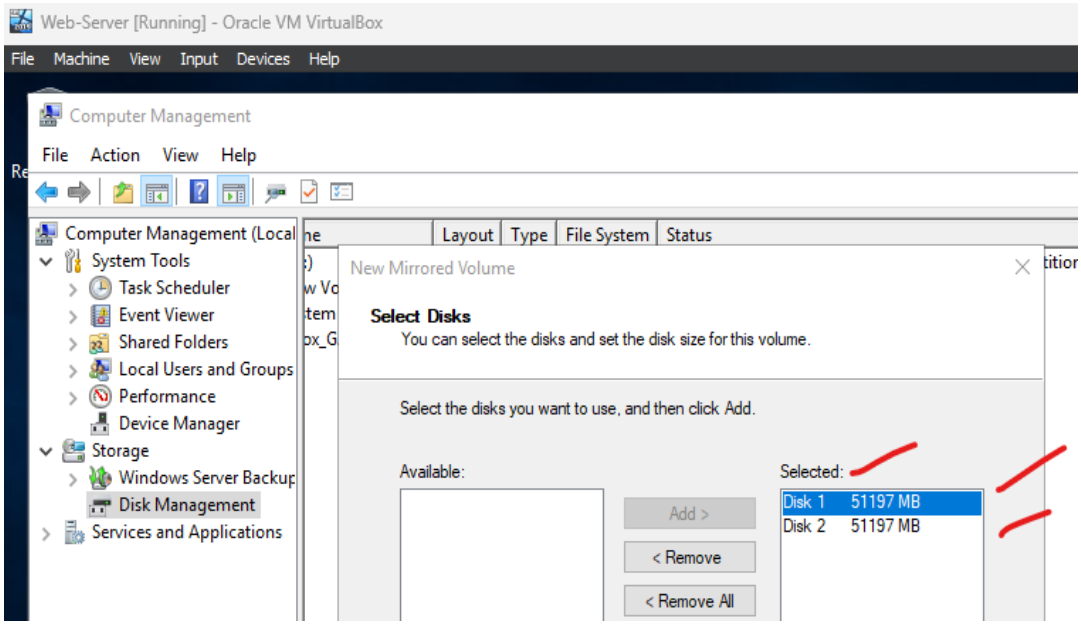
A: 4 disks for RAID 5 volume Drive E

- Right click on **Disk 4** and select **Volume**.
- In **wizard**, click **Next** and add **Disk 3, Disk 4, Disk 5 and Disk 6**.
- Select **Volume Name E.**
- Tick on **quick format**.

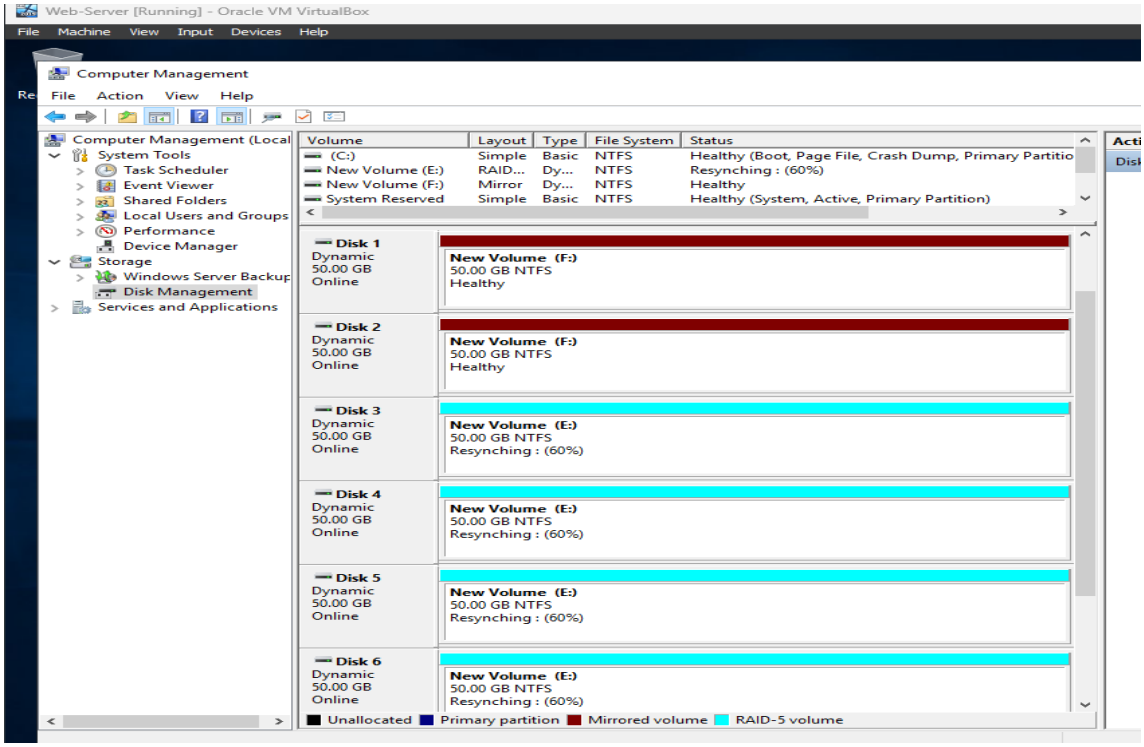


B: 2 disks for RAID 1 Mirrored Drive F

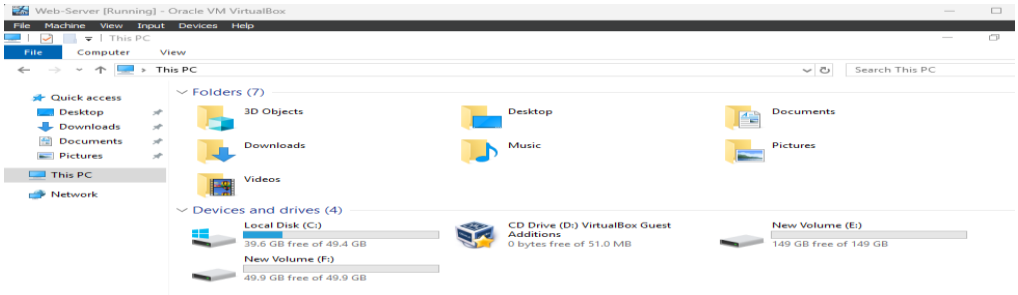
- Right click on **Disk 1** and select **Mirrored Volume**.
- In **wizard**, click **Next** and add **Disk 2 with Disk 1**.
- Select **Volume Name F.**
- Tick on **quick format**.



- Setup **RAIDS** successfully.



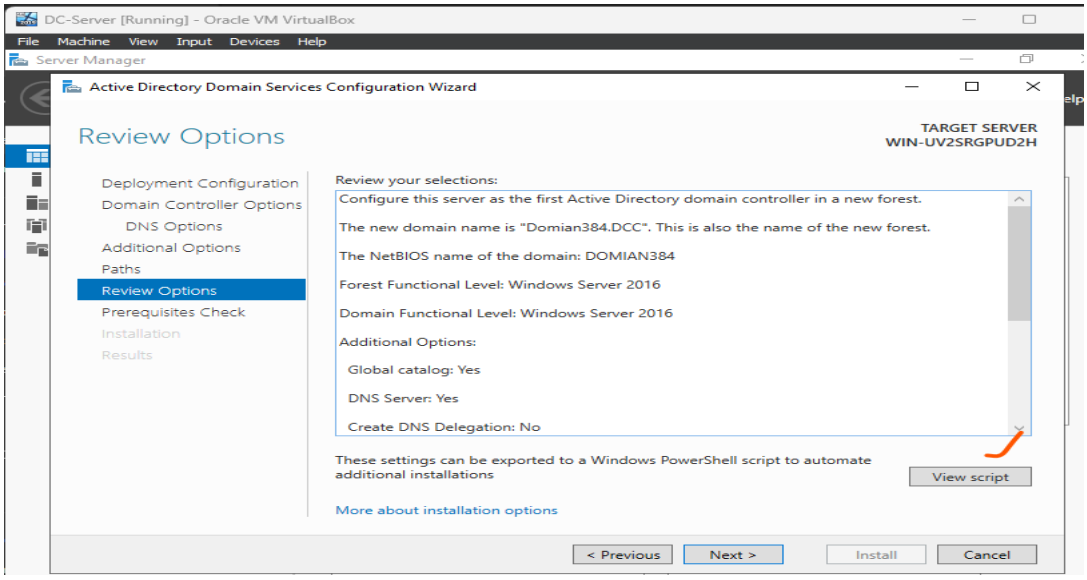
- **Disc E** and **F** showed in **This PC** also.



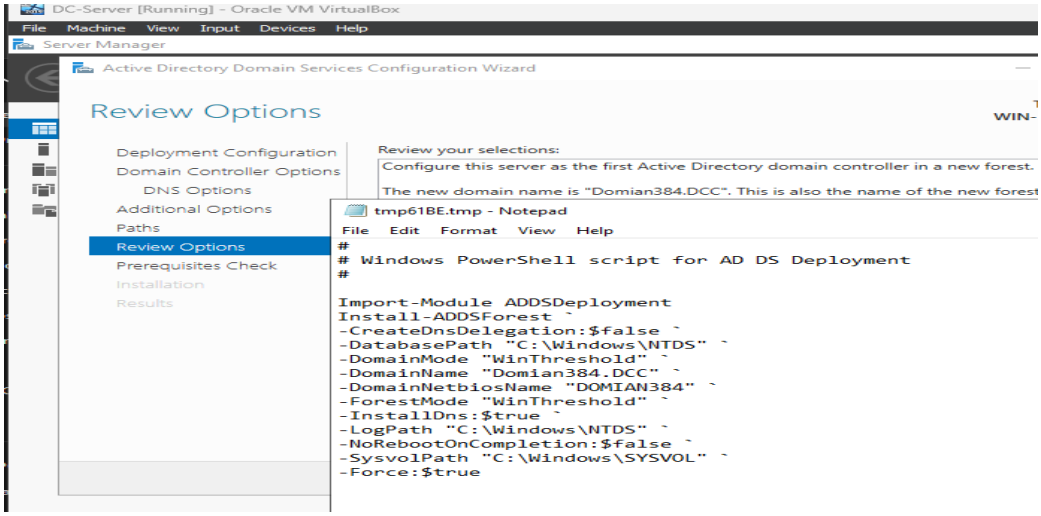
PART 6: Windows PowerShell scripting

10a. Convert the Windows Server into a Domain Controller

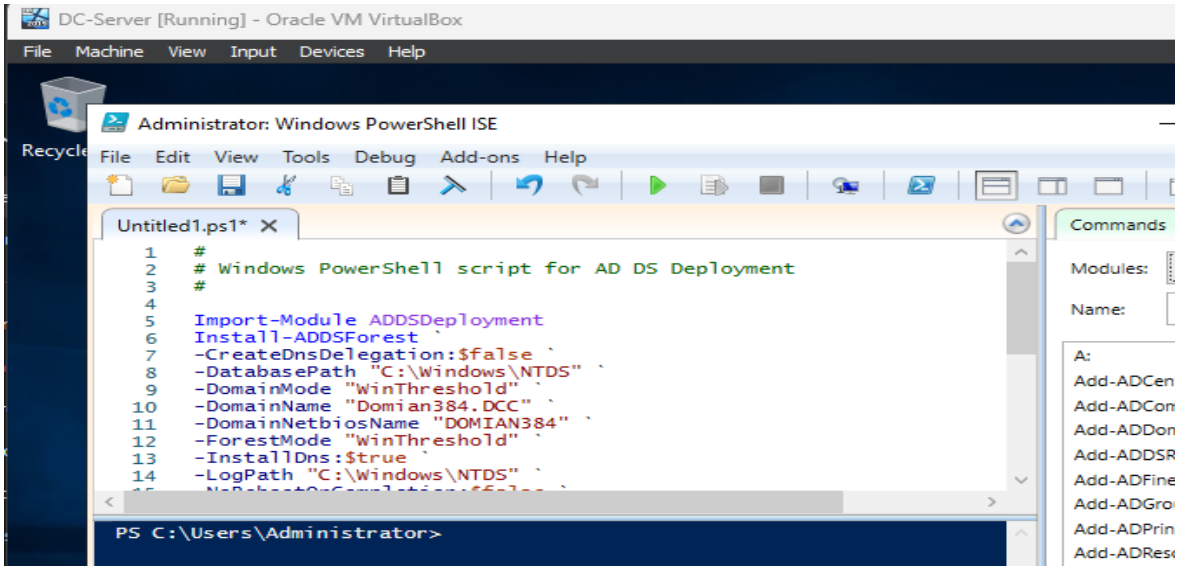
- Firstly, In **Server manager,** open **Add role and features.**
- Select **Role-based installation.**
- Select **Active Directory Domain Services** in **Server role** and **Add features** will **tick** the box and just hit next on other steps and **install**.
- After that go to **yellow flag mark** and click **Promote this server to a domain controller.**
- In new popping up screen, click on **Add new forest** and I gave the root **domain name** is **Domian384.DCC**. (**Note**: Spell mistake of Domain but worked properly).
- I have set password **Pass1234!** for **domain controller**.
- Hit **next** until reach **Review options** and click on **view script** from left bottom.



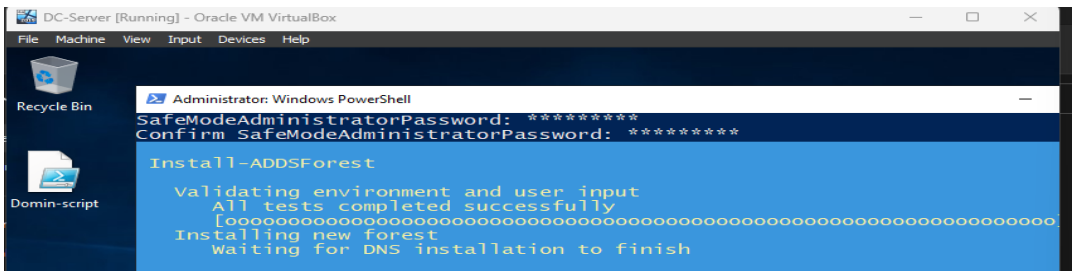
- A **script** opened, which will convert **DC-Server** into **Domain Controller** through **PowerShell**.



- I **copied** the **script** and **pasted** it in **Windows PowerShell ISE** as shown below:

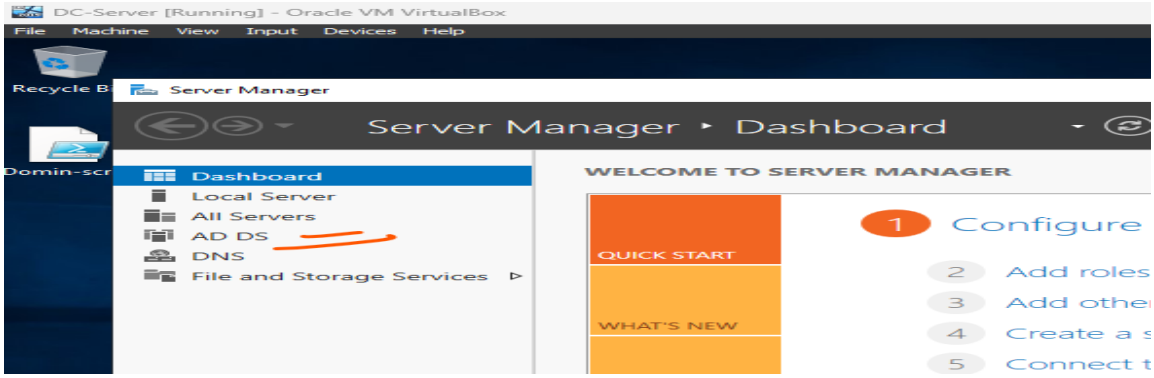


- **Saved** this **script** on **Desktop** with the **name** of **Domin-script**.
- **Run** this **script** with **PowerShell** by using **right-click** and it **can** be **seen** that **Domain Controlling** is **installing** in the shot below:



- **Login** screen of **DC-Server** as a **Domian384.DCC**.

- **DNS** showed in **Server manager**.

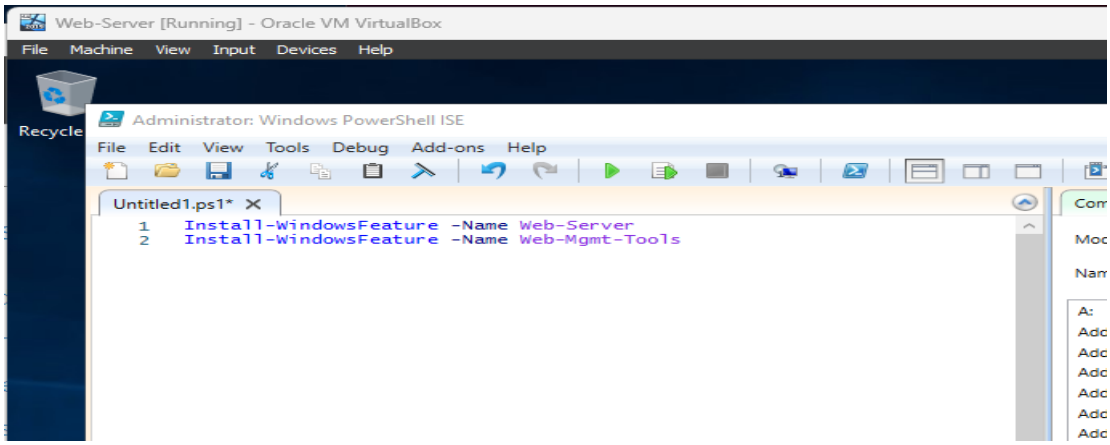


10b. Installing the IIS Web service using PowerShell script

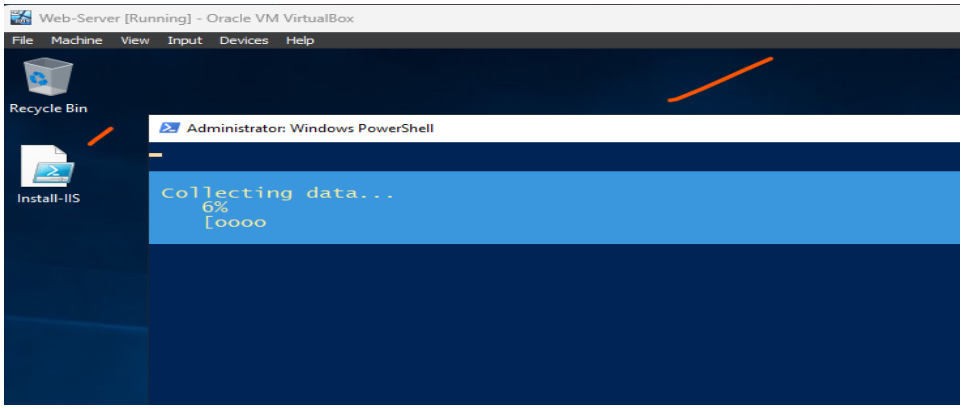
- First of all, I opened **Windows PowerShell ISE** in **Web-Server** and **wrote** a **script**:

Install-WindowsFeature -Name Web-Server

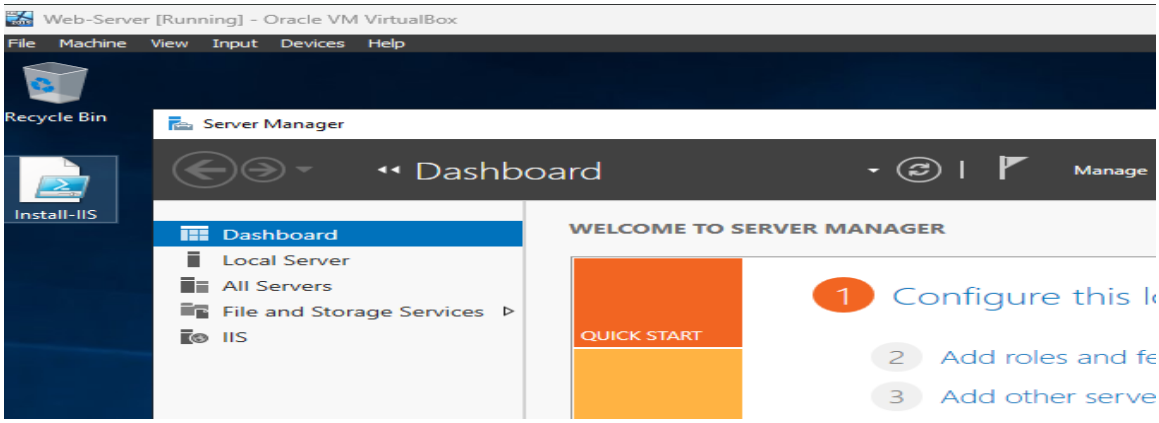
Install-WindowsFeature -Name Web-Mgmt-Tools



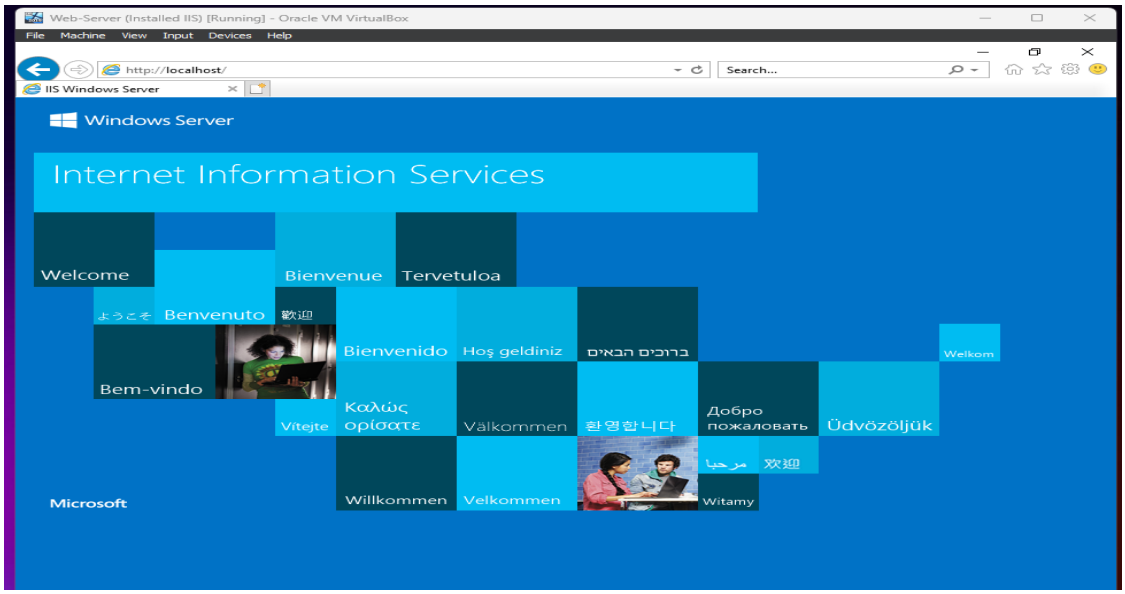
- **Saved** this **script** on **Desktop** with the name **Install-IIS**.
- It can be seen in the screen cast below that **IIS** is **installing** by **running** with **PowerShell**.



- **IIS** showed in **Server manager**.

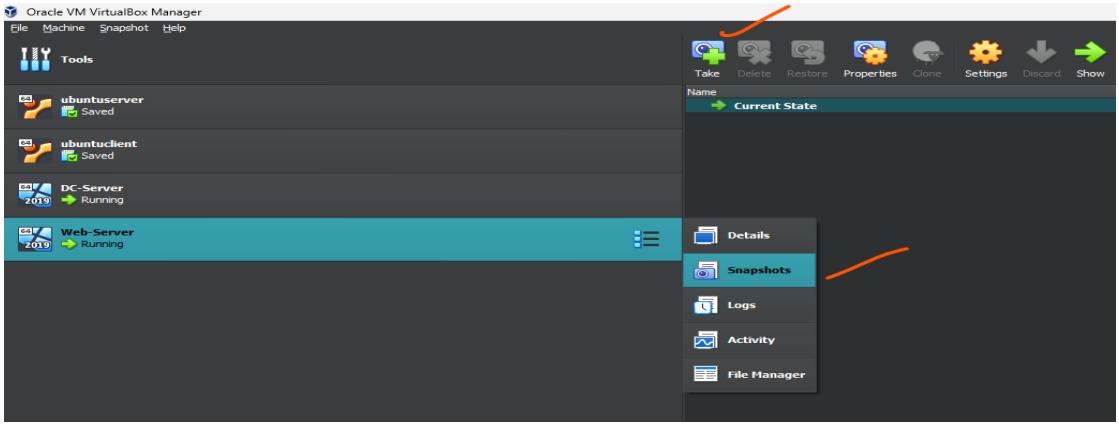


- **IIS** page **Web-Server** virtual machine by using **Internet Explorer**.

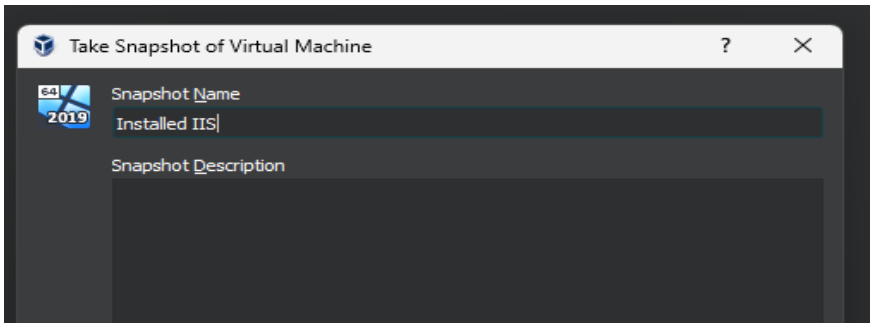


Use of V-Box Snapshot

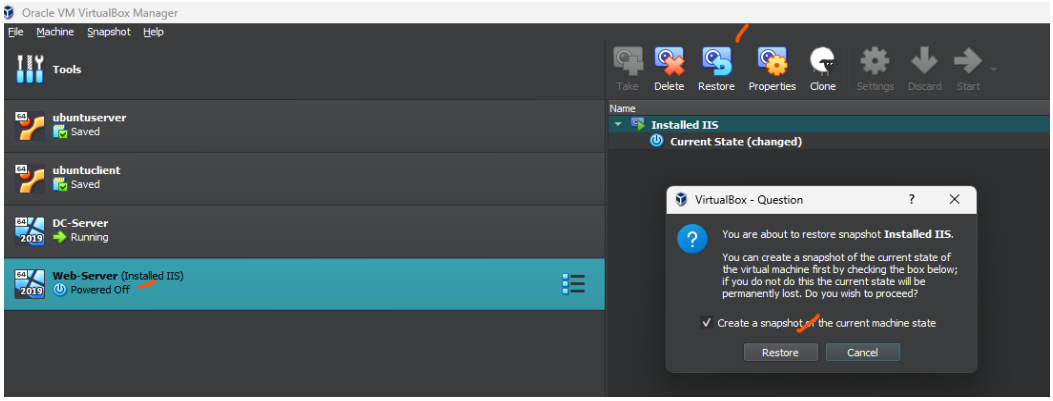
- **Click** on **three lines** which are **left** on the **Web-Server** in Oracle V-Box.
- Select **Snapshot** and click on **Take**.



- I took a **snapshot** of **current state** of **Web-Server** with the **name** of **Installed IIS**.
- **Take Snapshot** save the **current state** of **Virtual Box** while machine is **running**.



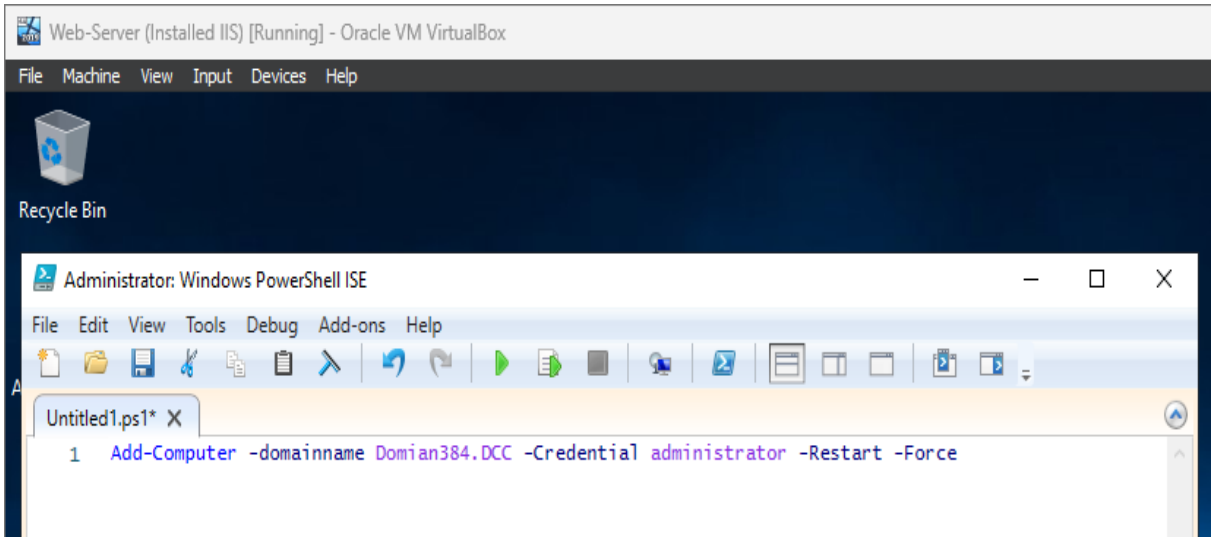
- It can be seen in the shot below that the **snapshot** has **taken** of **Web-Server**.
- Right click on **current state** and click on **restore**.
- When the **machine** is **restored** to the **exact state** in which **machine** is **running** and the **current state** will **lose**.



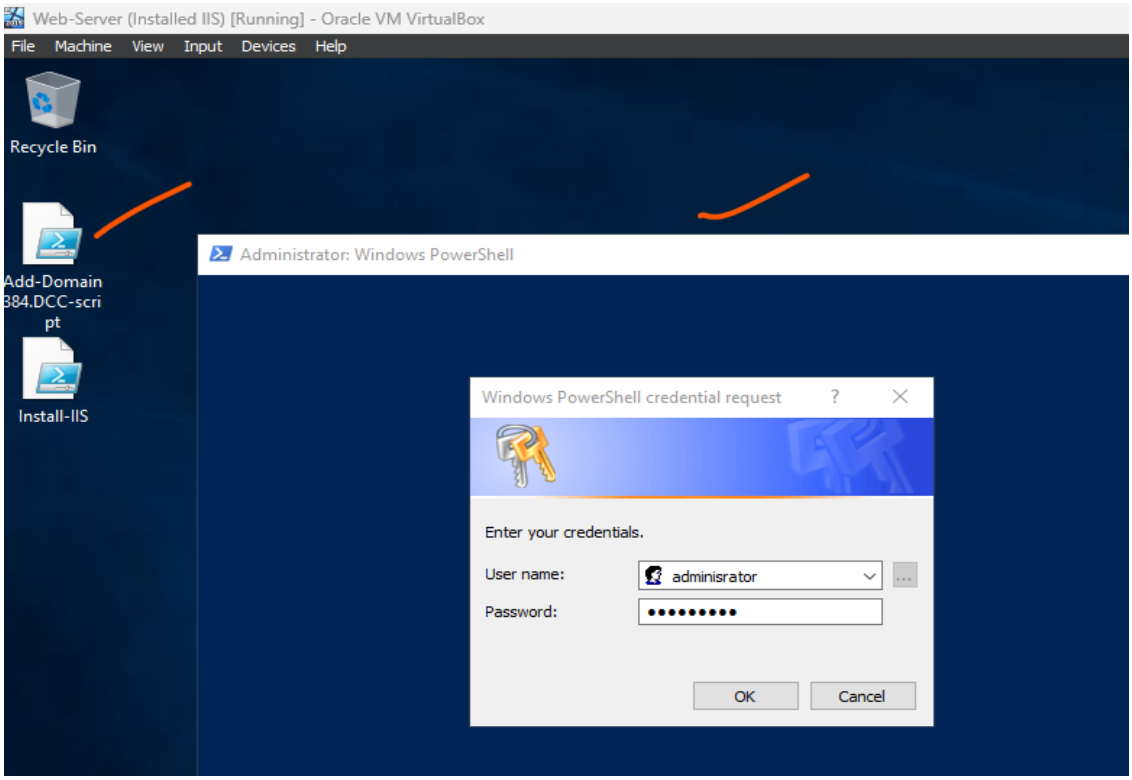
10c. Add Web-Server to Domian384.DCC using PowerShell script

- I opened **Windows PowerShell ISE** in **Web-Server** and **wrote** a **script**:

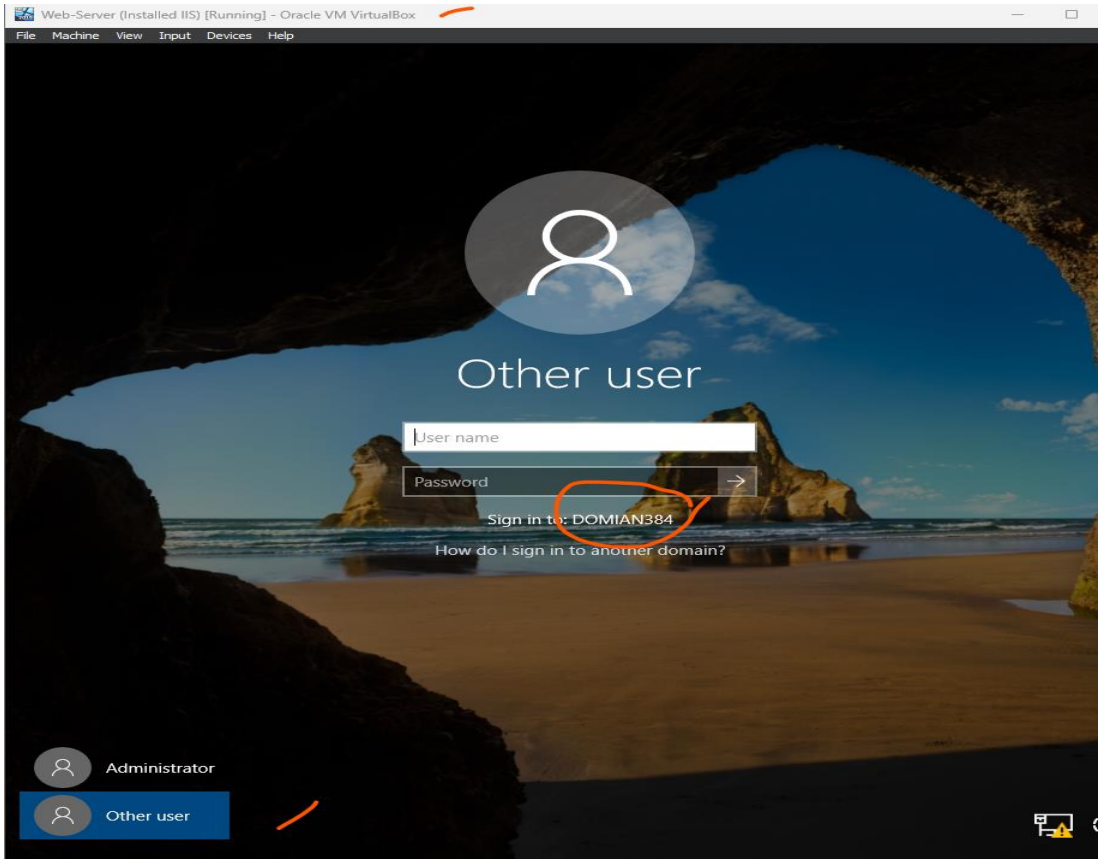
  Add-Computer -domainname Domian384.DCC -Credential administrator -Restart -Force



- I **saved** this **script** on **Desktop** with the name **Add-Domain384.DCC-script**.
- Screenshot below showed that **Domain controller** asked password for is **installing** by **running** with **PowerShell**.



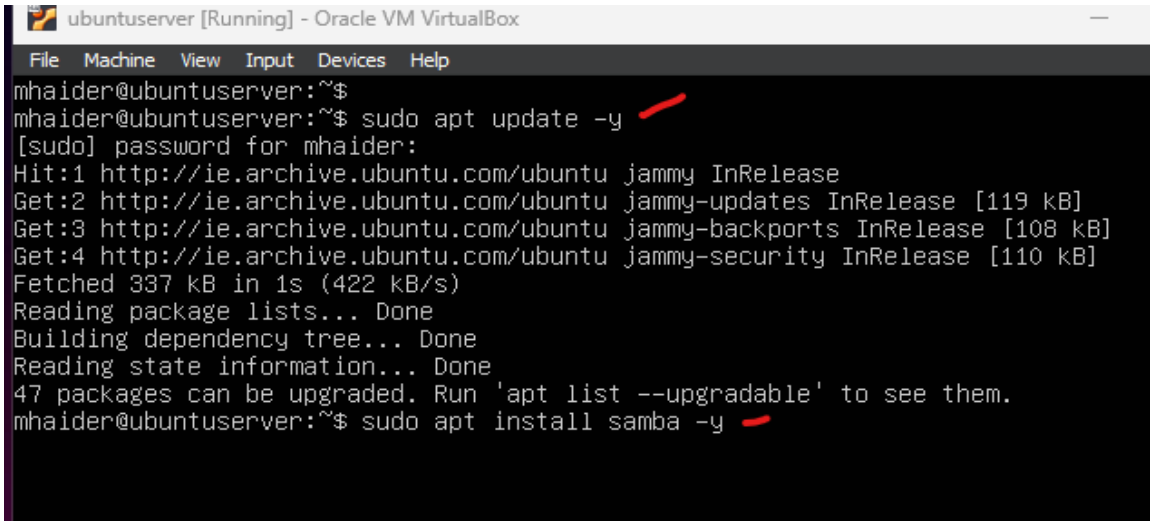
- **Login** screen of **Web-Server** showed as sign in **Domian384.DCC**.



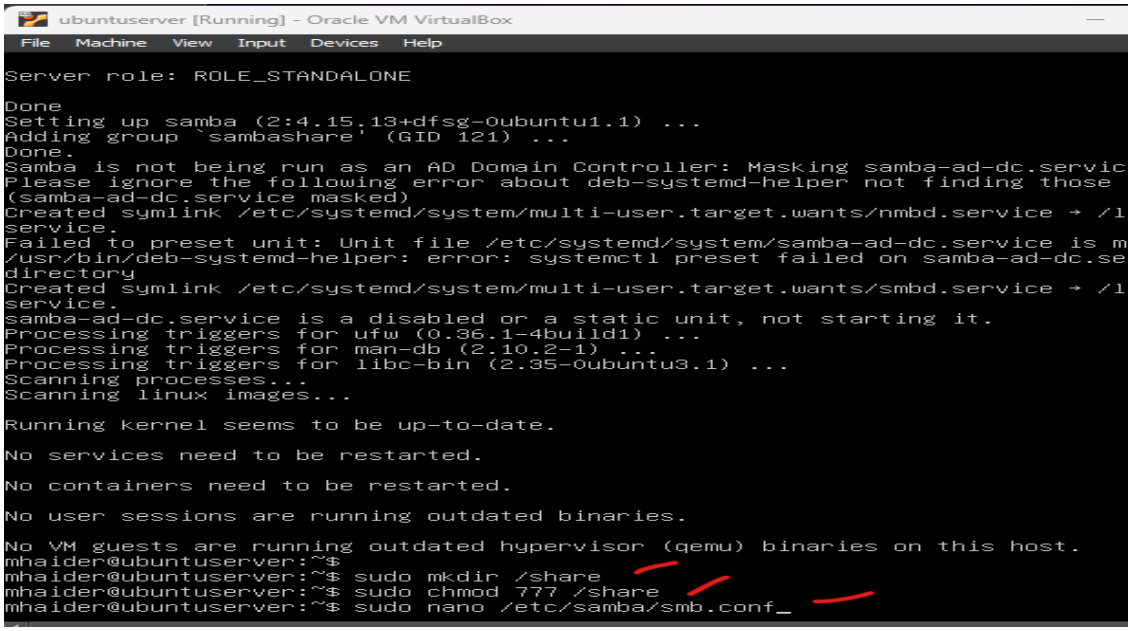
PART 7: RESEARCH AND CHALLENGE ACTIVITIES

Q11. Samba File Server

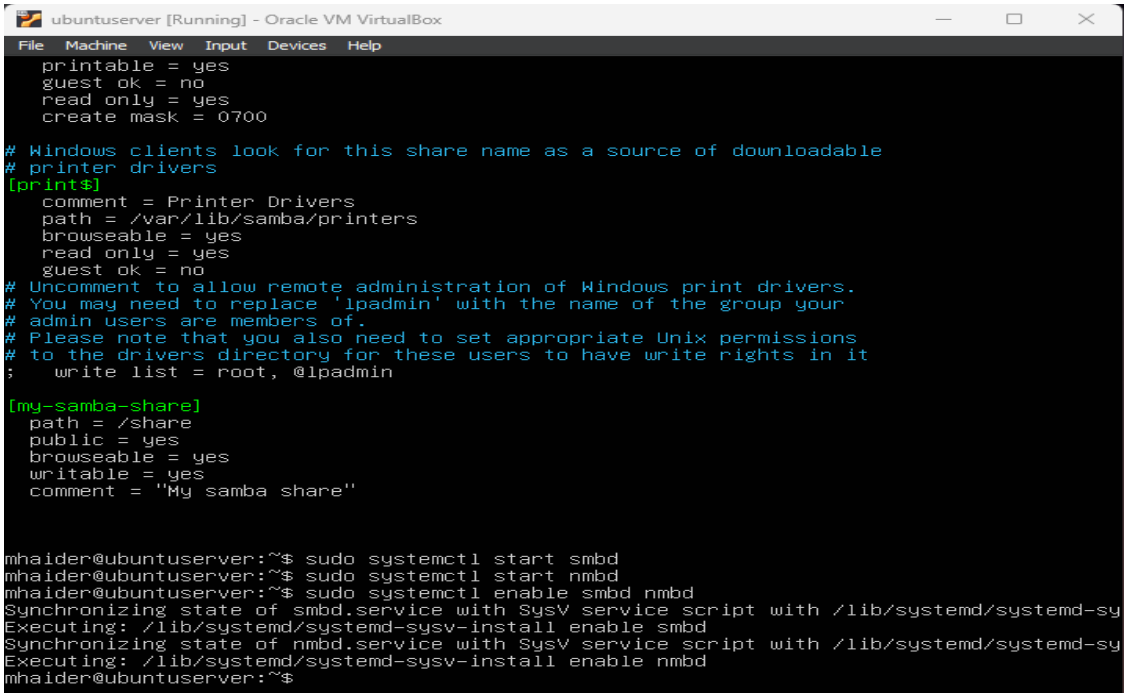
- After **updating** by using command **sudo apt update**, I used command **sudo apt install samba -y** for **installing the samba** as shown below:



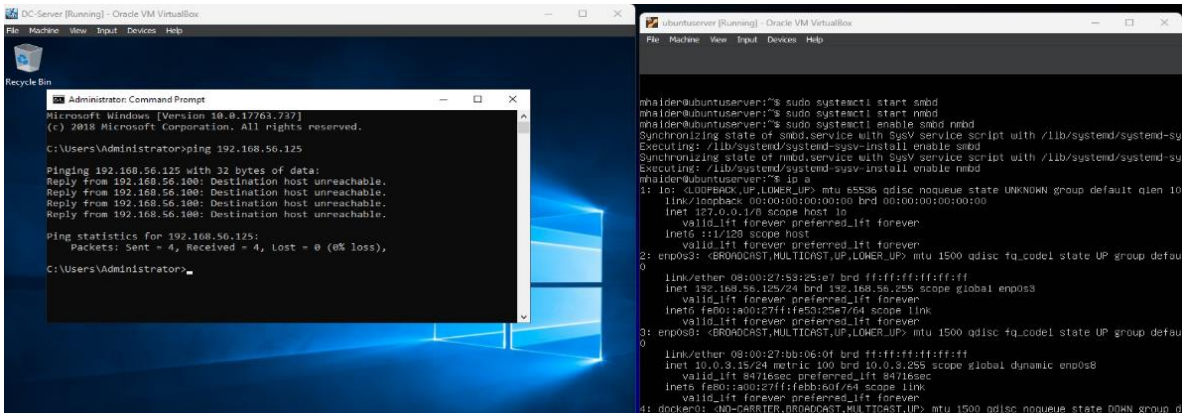
- **sudo mkdir /share** used for creating the **share directory.**
- **sudo chmod 777 /share** for setting this directory to **777** and **sudo nano /etc/samba/smb.conf** for the **configuration** of **samba** share **file**.



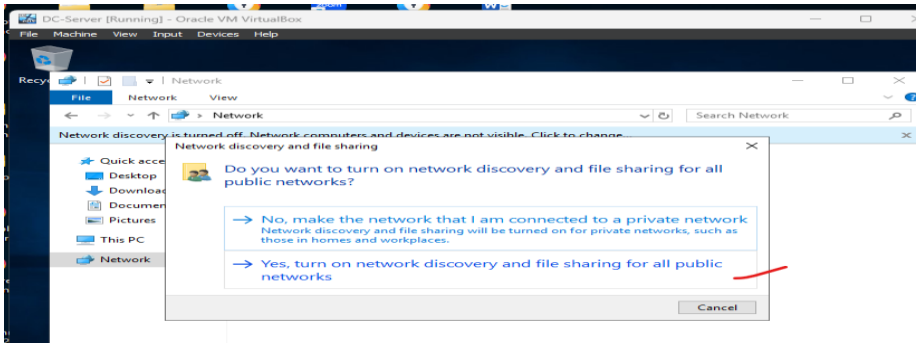
- I configured **new share directory** with the **name** of **[my-samba-share]** and **started** the **services** of **samba** and **NetBIOS** by using commands **sudo systemctl start smbd** for **samba** and **sudo systemctl start nmbd** for **NetBIOS**.
- Then, I used **sudo systemctl start smbd** for **enabling** them**.**



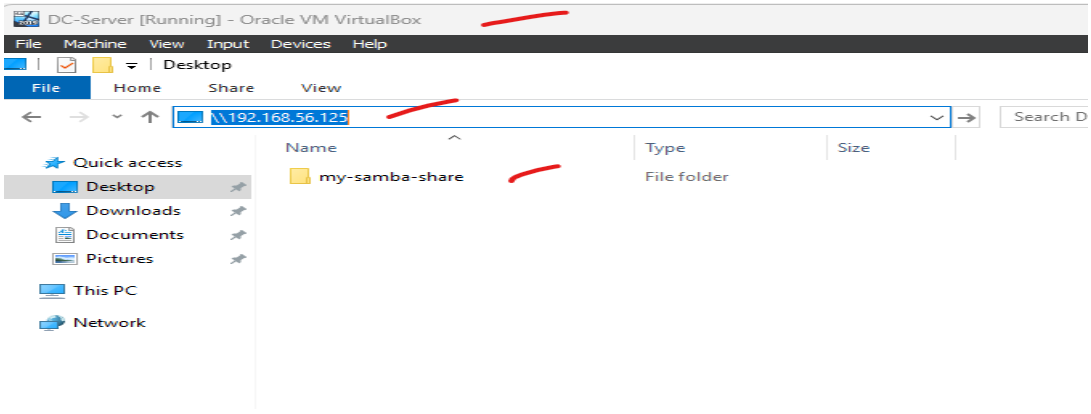
- After that I **went** to DC-**Server** which I **used** as **Client window** for this **task**.
- First of all, I **checked** that **ping** is **successful** between ubuntu **host** and window **client** because it **must ping** each other for **sharing** the file.
- I used **command prompt** of **DC-Server** with the command **ping 192.168.56.125** for **pinging** the **ubuntu host**.



- I **turned on network discovery** in **DC-Server** for **all public** networks.



- After that I searched the samba file through file explore with the Ip address of host machine such as **\\192.168.56.125** in DC-Server.
- It showed the file **my-samba-share** as shown below:



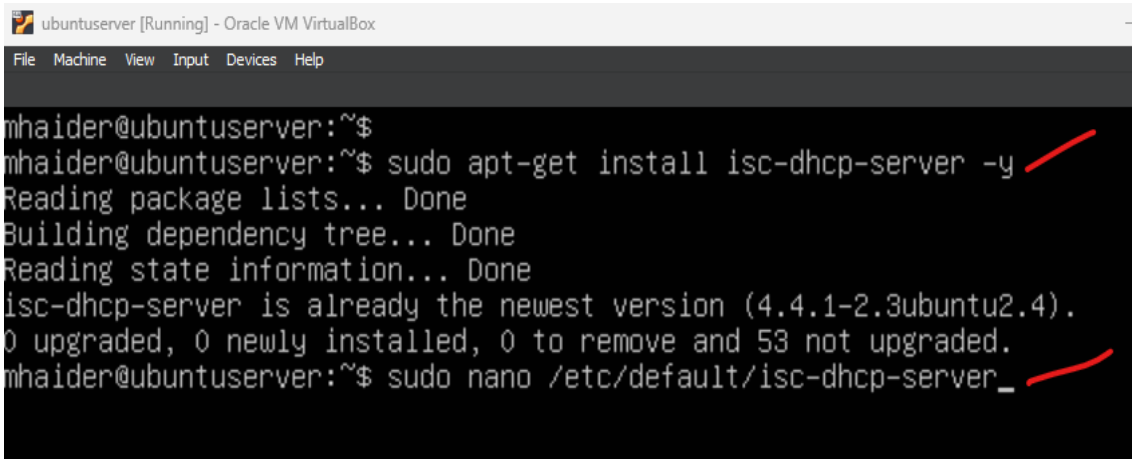
Reference:

(Old Experience of assignment 2 of semester 2, Subject: Operating System)

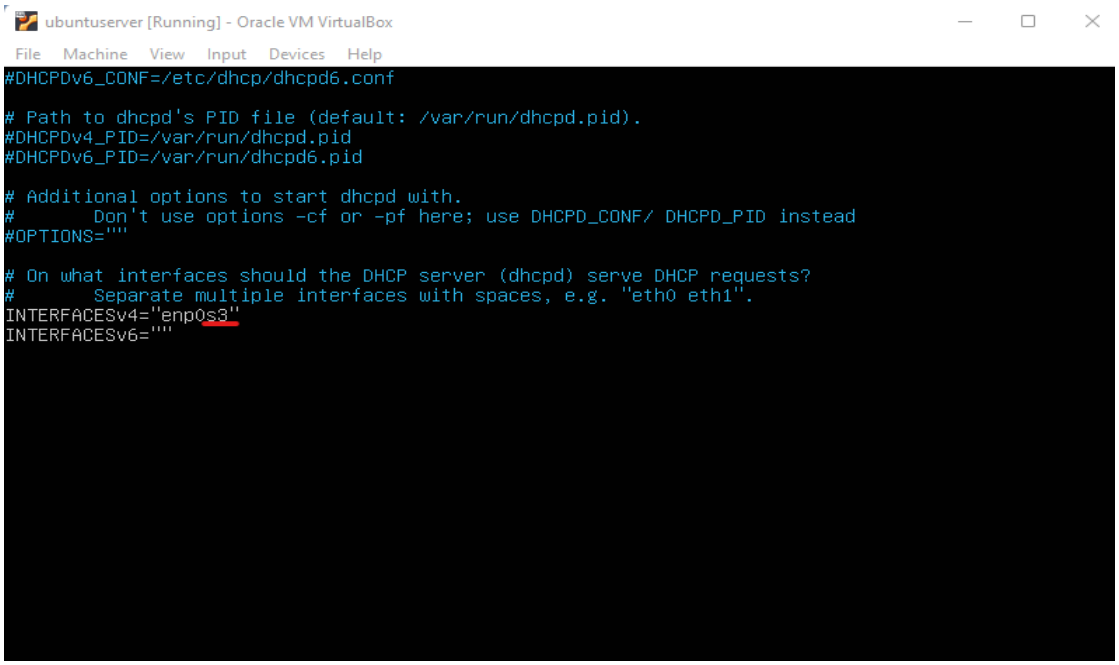
linuxize.com. (2019). *How to Install and Configure Samba on Ubuntu 18.04*. [online] Available at: https://linuxize.com/post/how-to-install-and-configure-samba-on-ubuntu-18-04/#connecting-to-a-samba-share-from-linux.

Q12. Setup DHCP server

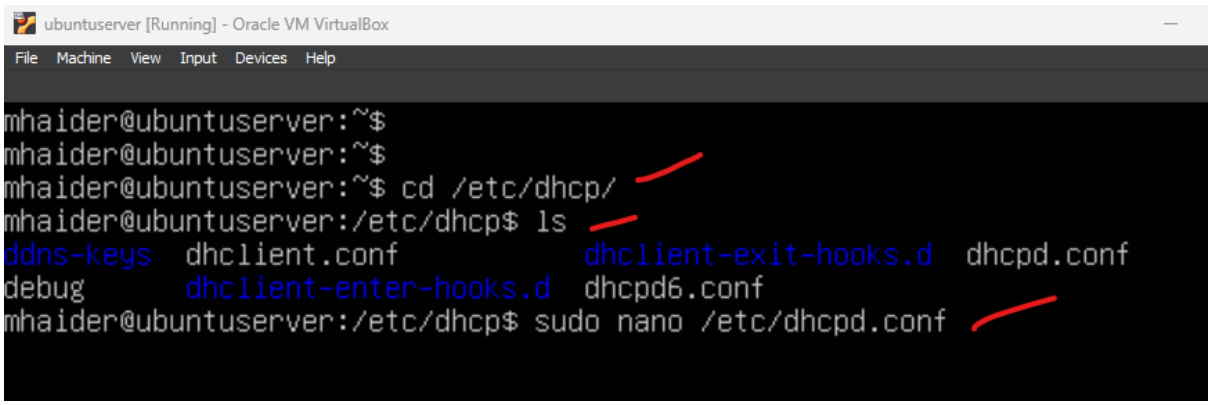
- **sudo apt-get install isc-dhcp-server** command used for **installing** the **DHCP** in **ubuntuserver**.
- Then, I gave command **sudo nano /etc/default/isc-dhcp-server** for the **configuration**.



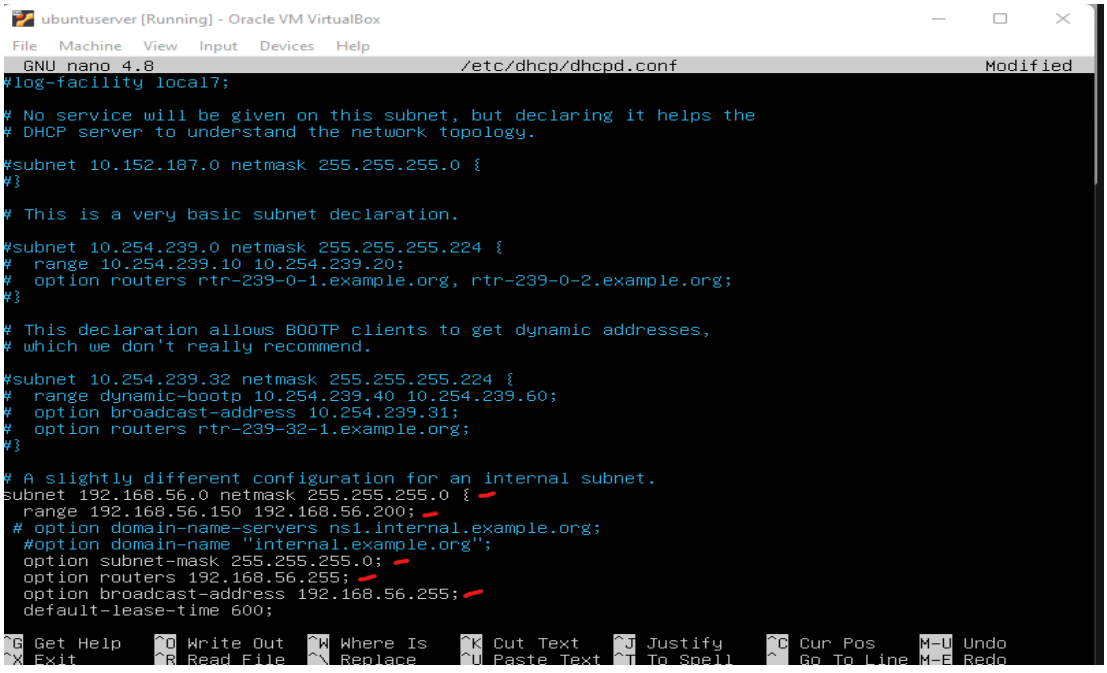
- Then, I have set the **adapter** name **enp0s3** as **interfacesv4**.



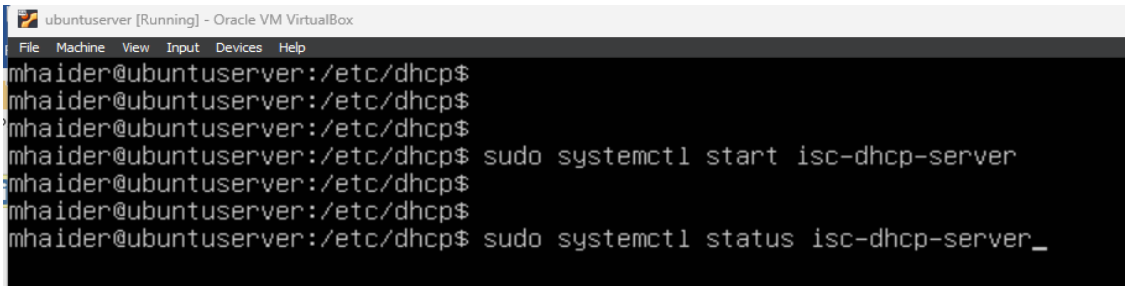
- After that I used commands **Cd /etc/dhcp** and **sudo nano /etc/dhcp/dhcpd.conf** for **configuring** the main **dhcp** file.



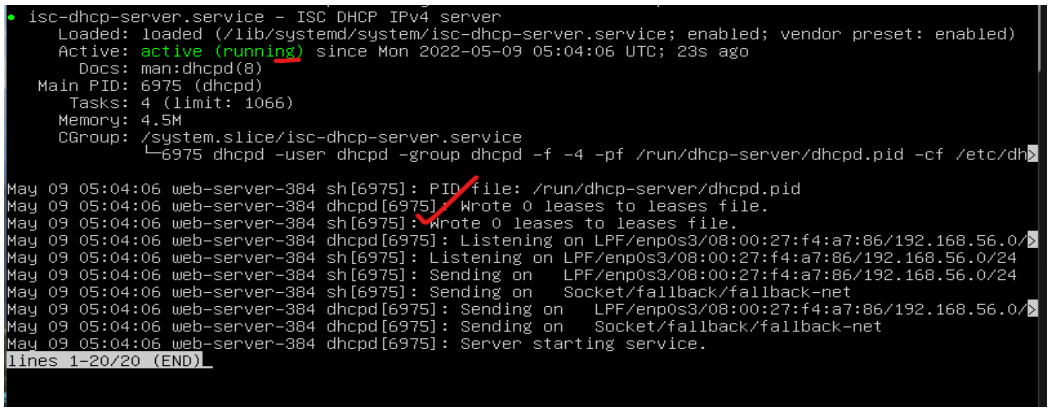
- In **configuration**, I **uncommented** the using options
- I gave **subnet 192.168.56.0** and **netmask 255.255.255.0**
- I set **range** from **192.168.56.150** to **192.168.56.200**



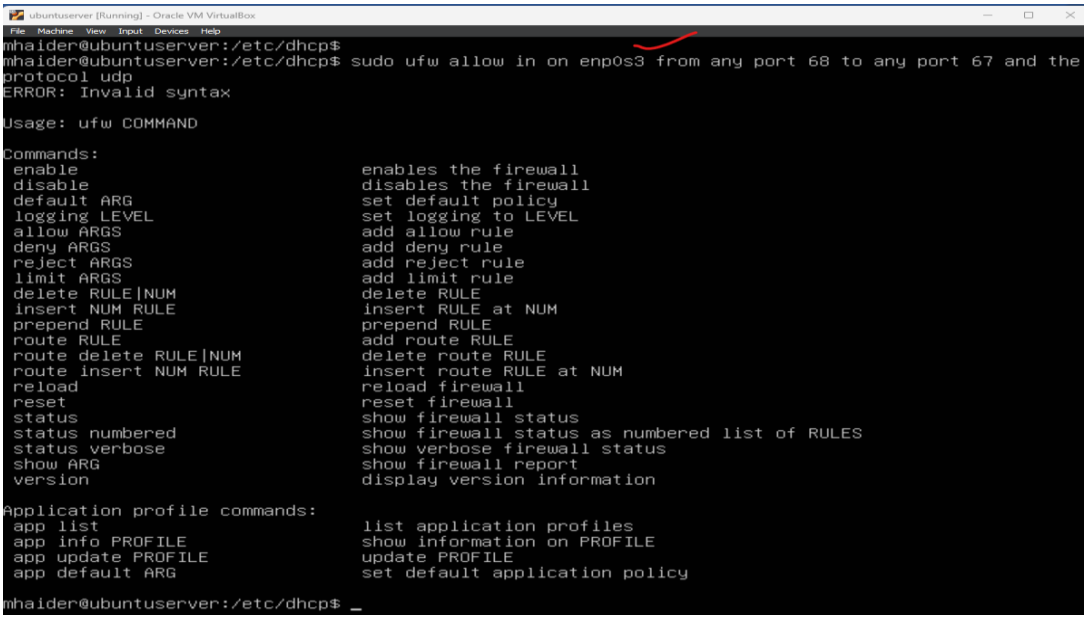
- I started dhcp by using commands **sudo systemctl start isc-dhcp-server.**



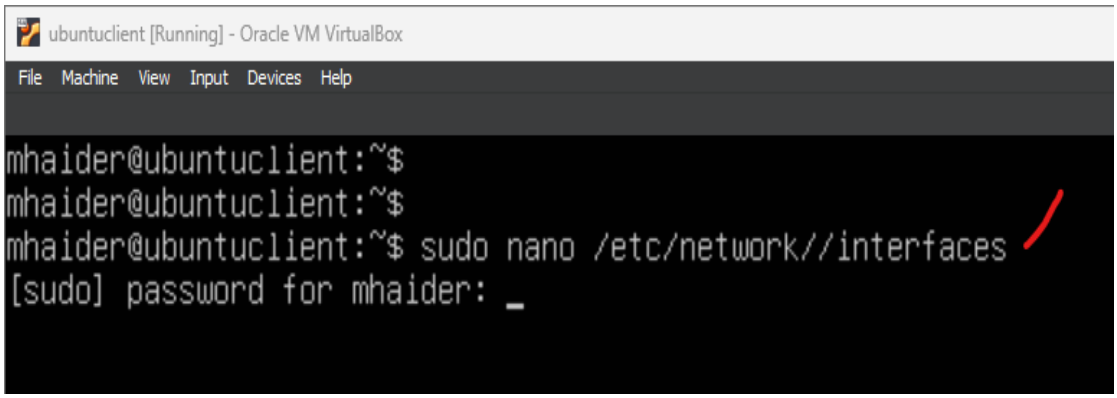
- I checked status by using commands **sudo systemctl status isc-dhcp-server** and it showed **active**.



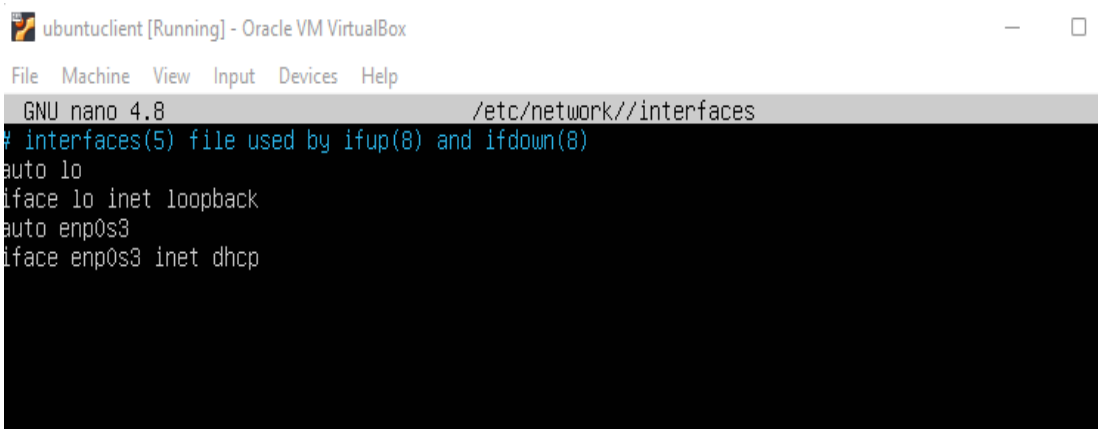
- I used command **sudo ufw allow in on enp0s3 from any port 68 to any port 67 and the protocol udp** for trying to **allow enp0s3** through **firewall**.



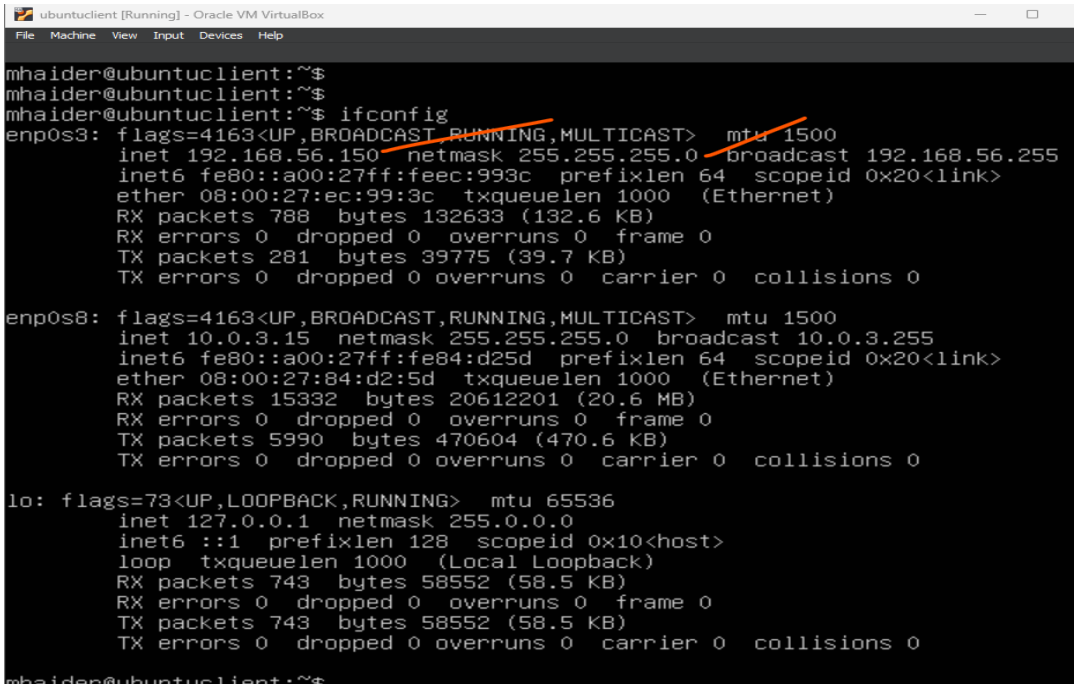
- In **ubuntuclient,** I used command **sudo nano /etc/network//interfaces** for configuration.



- I configured **enp0s3** in **ubuntuclient** as shown below:



- Finally, **ubuntuclient** received **first Ip** address **192.168.56.150** with the **net-mask 255.255.255.0** as shown below:



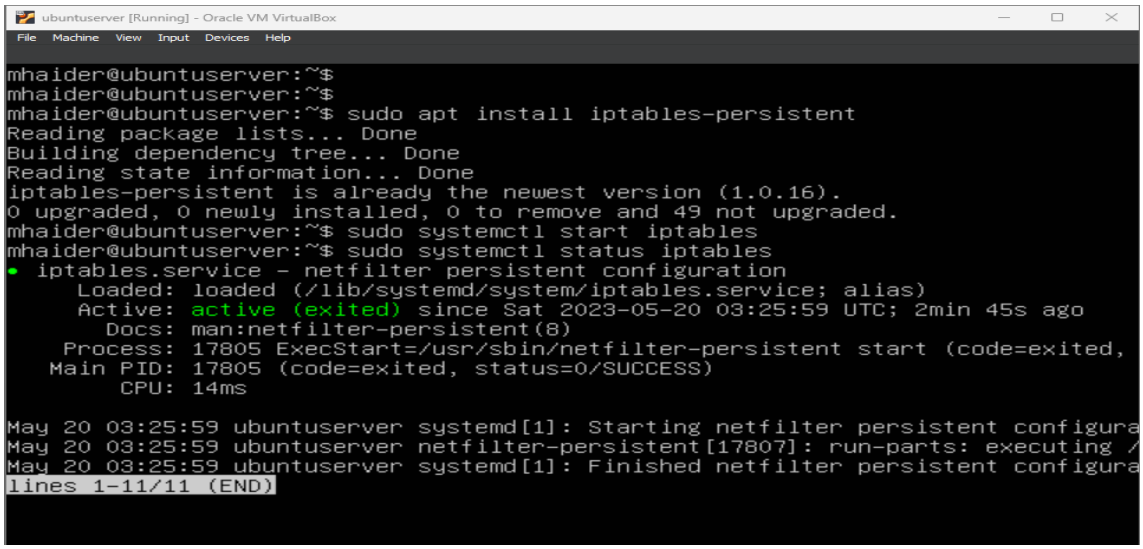
Reference:

(Old Experience of assignment 2 of semester 2, Subject: Operating System)

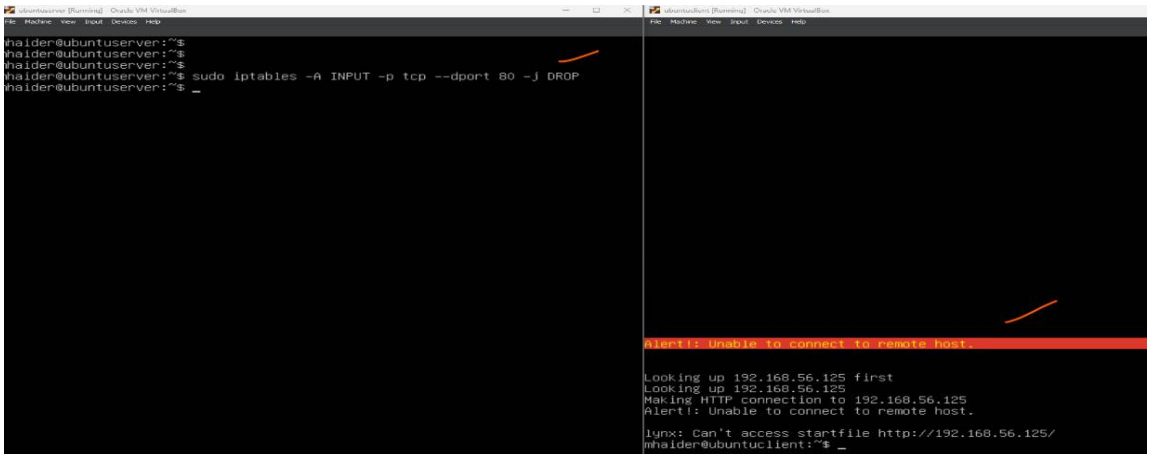
www.youtube.com. (n.d.). *How to configure DHCP Server in Ubuntu Linux 18.04 (Complete Server & client)*. [online] Available at: https://www.youtube.com/watch?v=j3wsYskgdAs [Accessed 13 May 2022].

Q13. Iptables for allow and block Http traffic

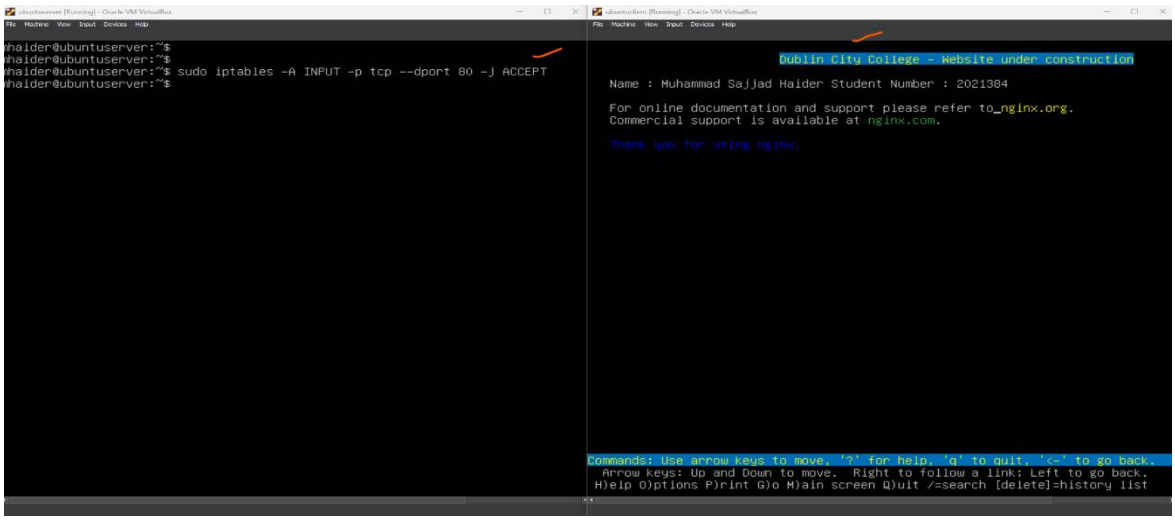
- Firstly, I **installed persistent package** of **iptables** by using command **sudo apt install iptables-persistent**.
- After that I **started** the services of **iptables** by using command **sudo systemctl start iptables**.
- Then, I checked **status** with the command **sudo apt systemctl status iptab**les and it showed **active (exited)** as shown below in screen saver:



- After setting rules and services of **iptables**, I **used** command **sudo iptables -A INPUT -p tcp –dport 80 -j DROP** for **blocking** the **HTTP** traffic.
- And **sudo service iptables save** used for **save** the **iptables rule**.
- It can be seen that **NGINX** page **couldn’t** be **accessed** from **ubuntuclient** by using command **lynx 192.168.56.125**.



- I **used** command **sudo iptables -A INPUT -p tcp –dport 80 -j ACCEPT** for **allowing** the **HTTP** traffic.
- And **sudo service iptables save** used for **save** the **iptables rule**.
- It can be seen that **NGINX** page **can** be **accessed** from **ubuntuclient** by using command **lynx 192.168.56.125**.

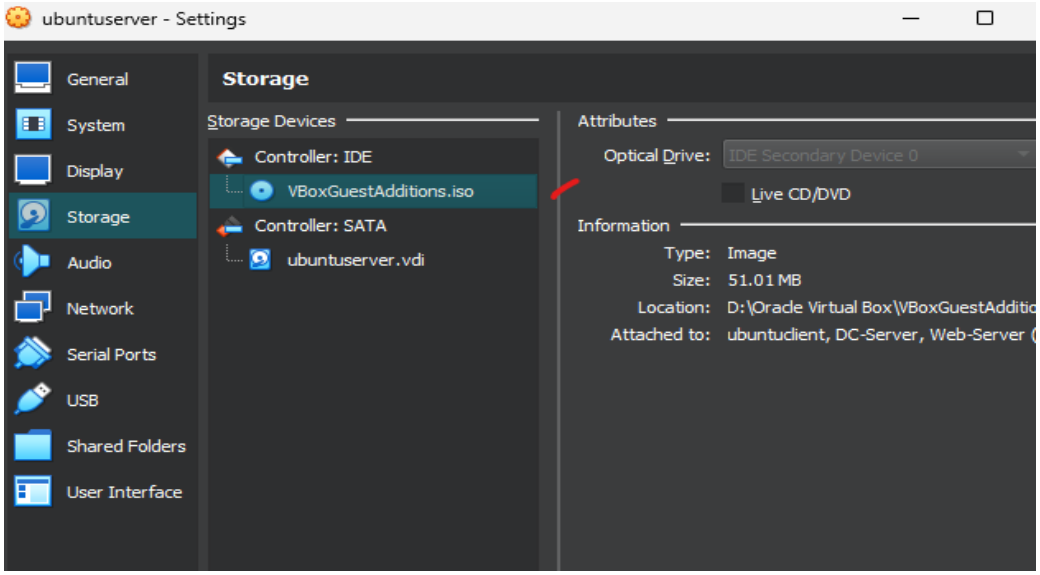


Reference

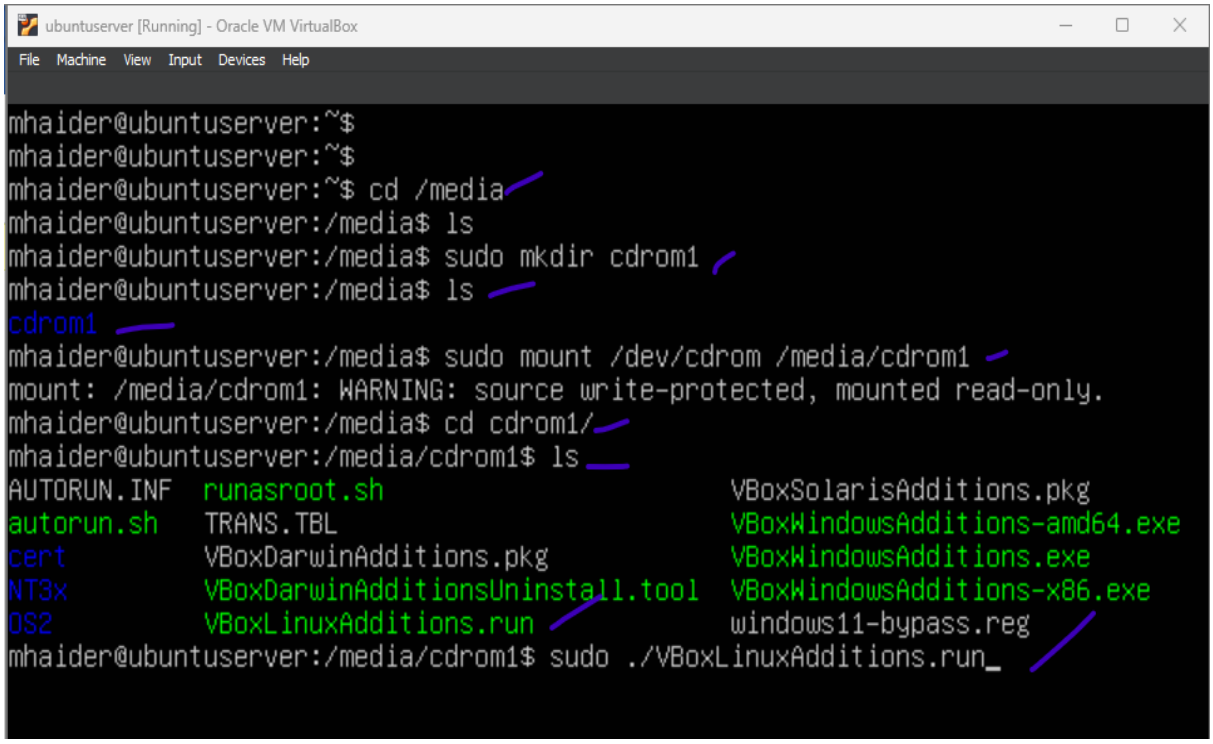
Anicas, M. (2015). *Iptables Essentials: Common Firewall Rules and Commands*. [online] Digitalocean.com. Available at: https://www.digitalocean.com/community/tutorials/iptables-essentials-common-firewall-rules-and-commands.

Q15. Install the V-Box Guest Additions onto the ubuntuserver

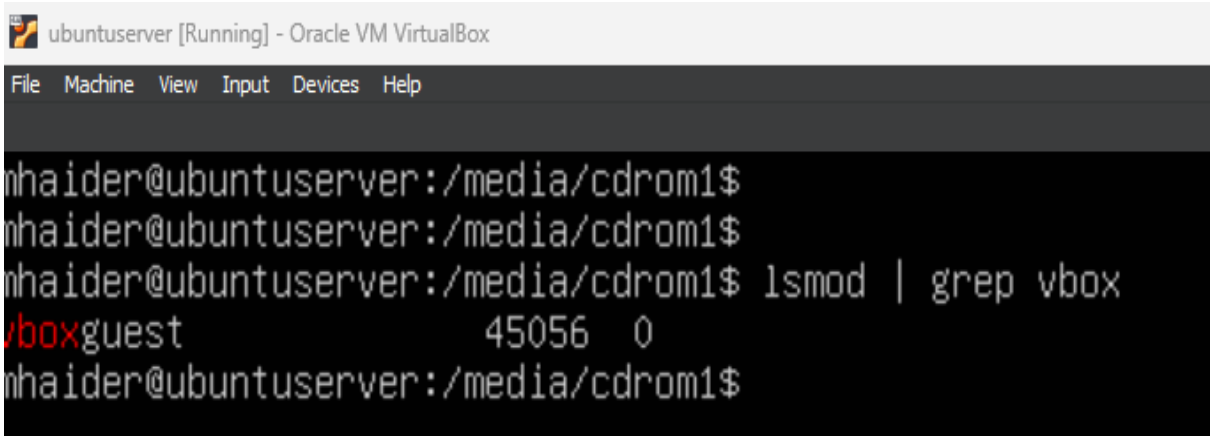
- It can be seen that **VirtualBox Guest Additions CD drive** has already **attached** with **ubuntuserver**.



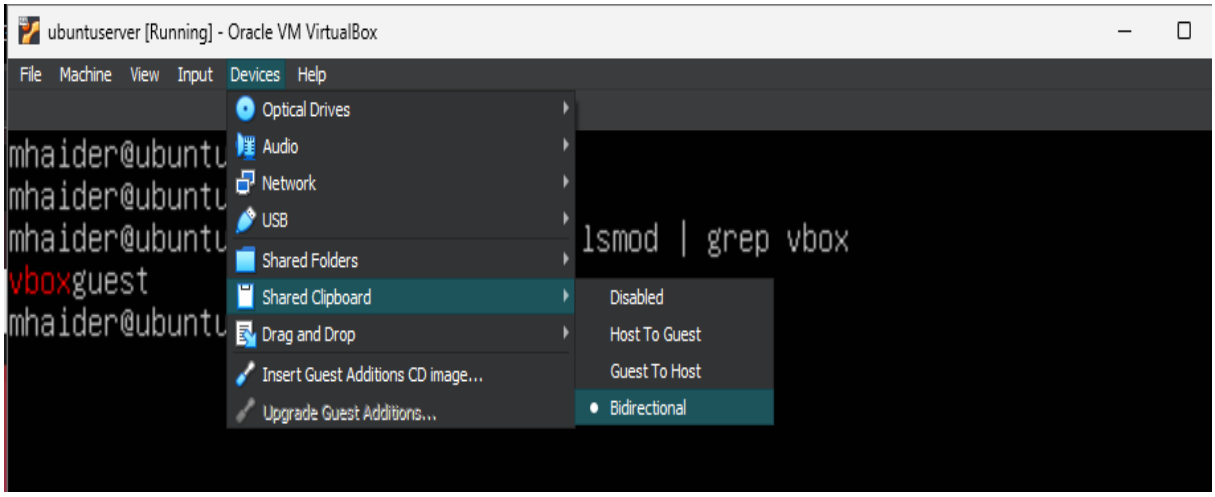
- I used **cd /media** for creating **new directory** with command **sudo mkdir cdrom1** in **media** and **mount cd** with the command **sudo mount /dev/cdrom /media/cdrom1.**
- I used command **sudo ./VBoxLinuxAdditions.run** for **installing** the V-Box.



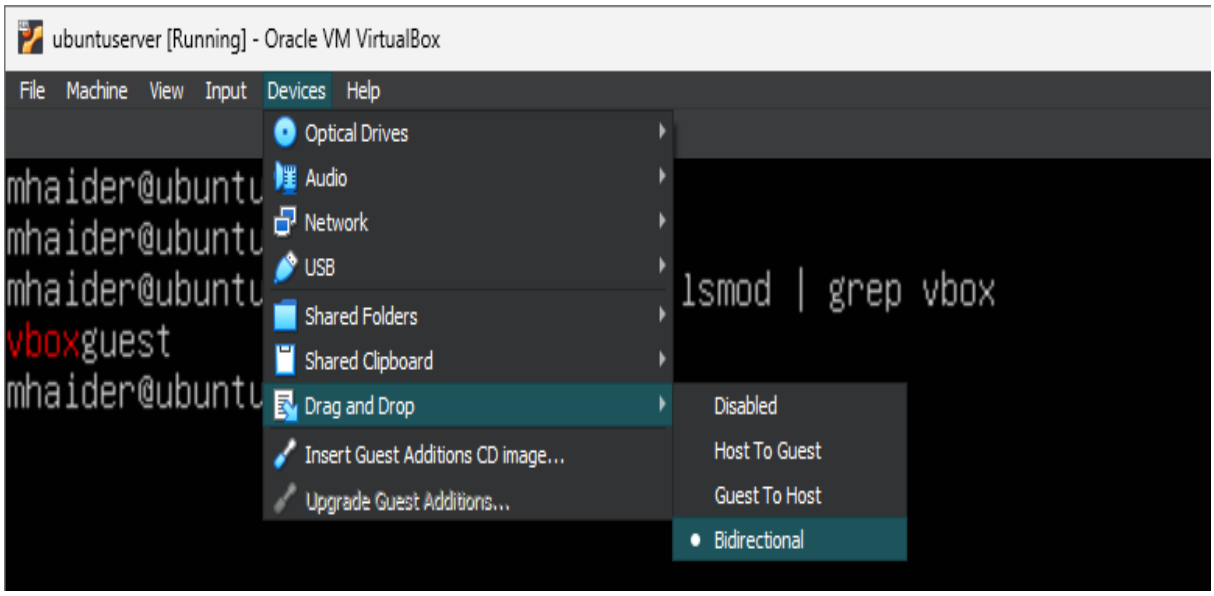
- After that I used sudo **reboot** command for rebooting the machine and **lsmod | grep vbox** command for showing **V-Boxguest** is **successfully** installed.



- Go to **Devices**, click **shared clipboard** and set it on **Bidirectional**.



- Go to **Devices**, click **Drag and Drop** and set it on **Bidirectional**.



Reference:

(Old Experience of assignment 2 of semester 2, Subject: Operating System)

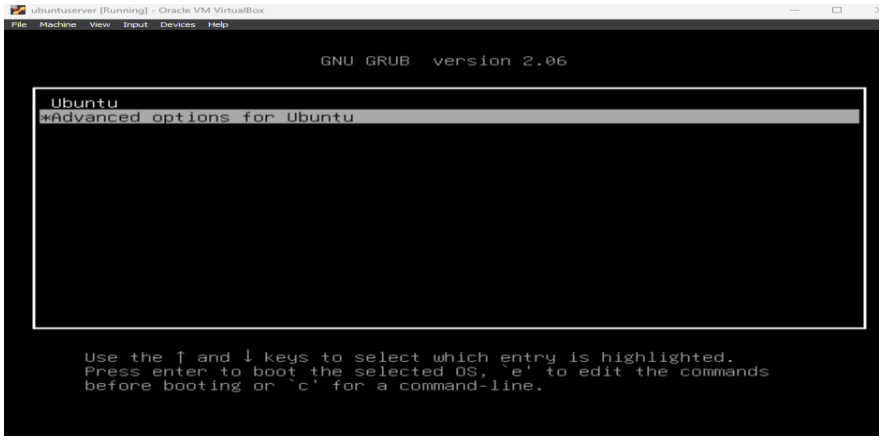
Website title: Youtube.com

URL: https://www.youtube.com/watch?v=WiYNrx1Grak

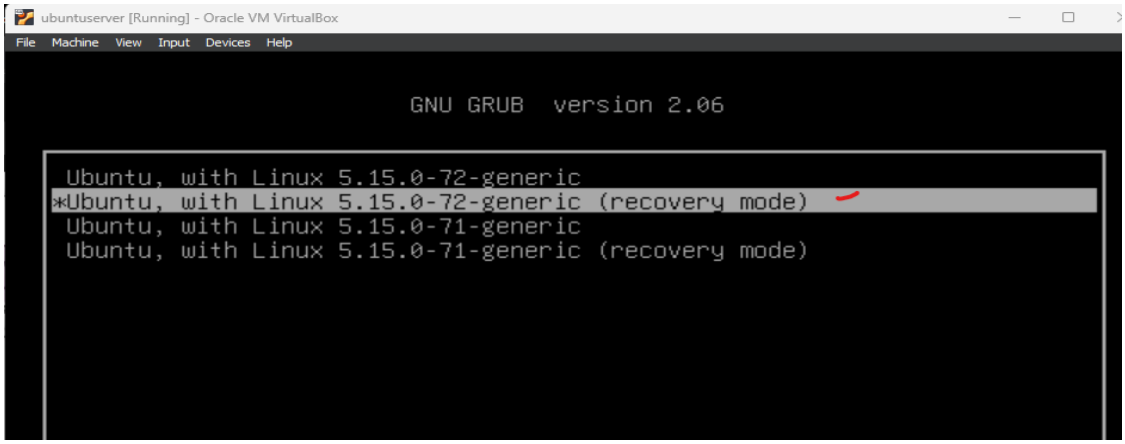
Q17. Reset Password

Linux

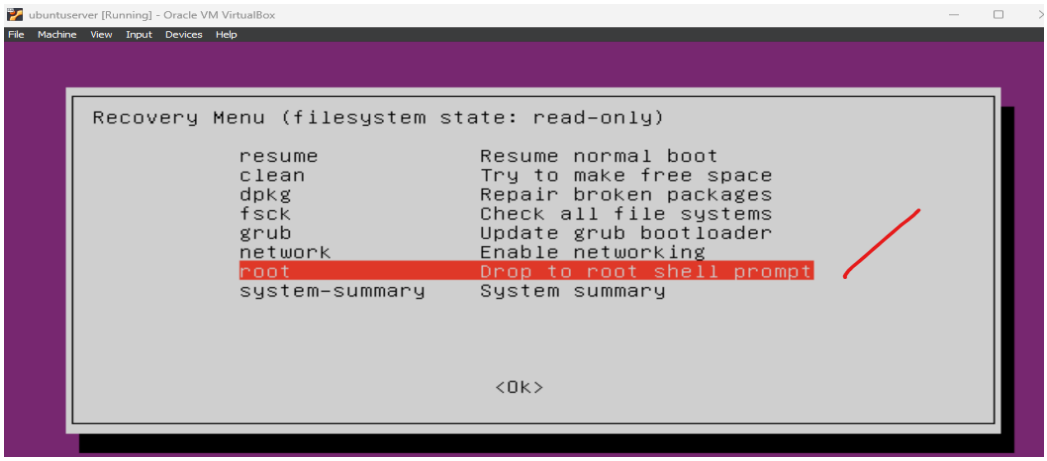
- I **started ubuntuserver** for **resetting** the **password** and **press** and **hold Shift key until** the **GNU GRUB** appeared.
- **Selected** second option **Advanced options for ubuntu**.



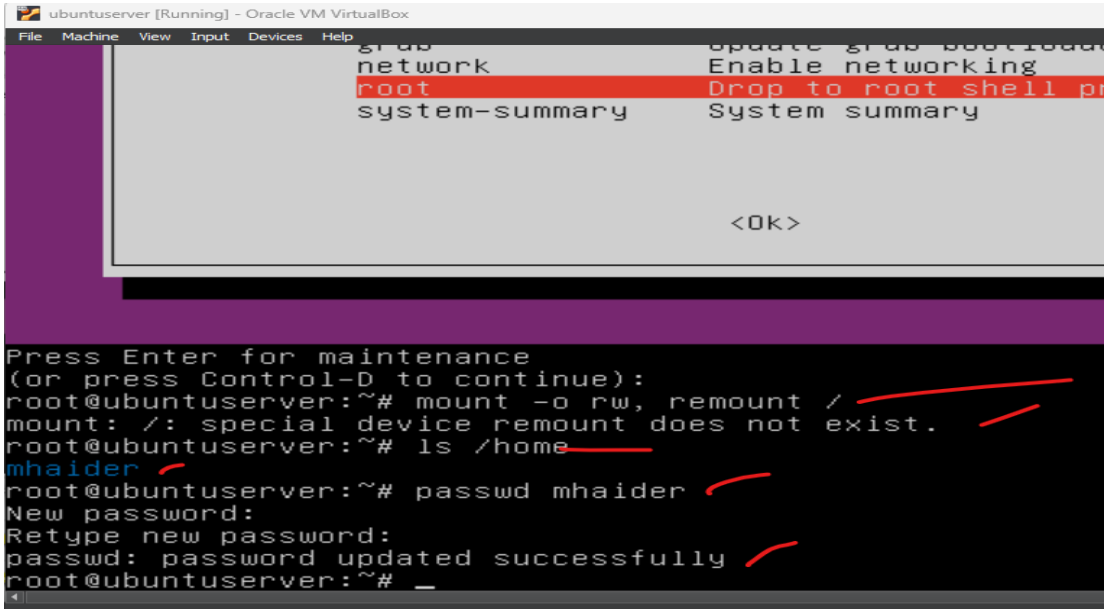
- Then, select **ubuntu 5.15.0-72 (recovery mode).**



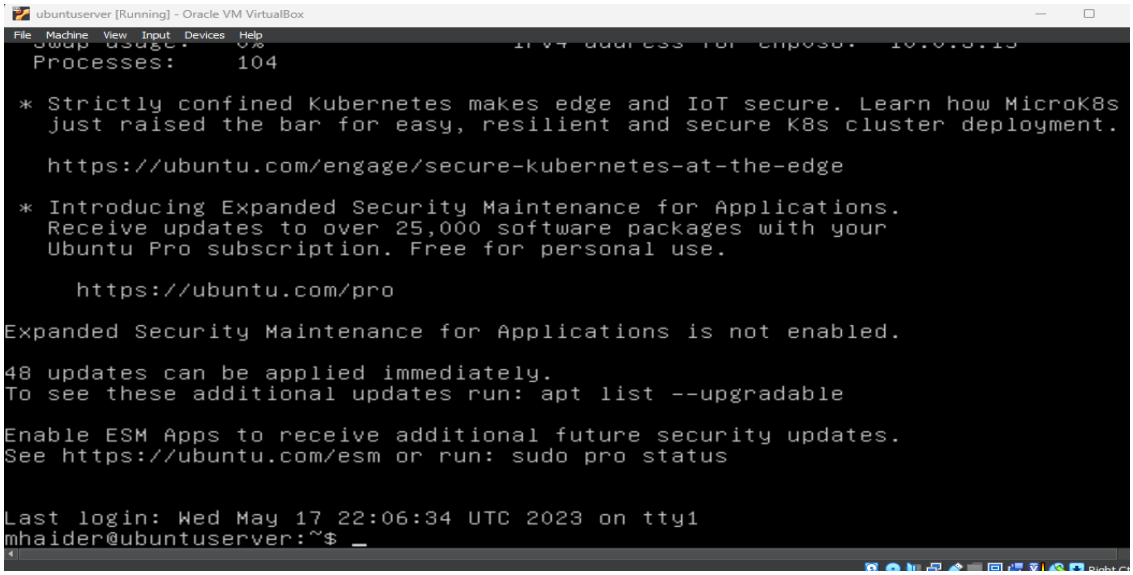
- Now, in **Recovery menu**, select **seventh** option **root**.



- **Press Enter** first and then I **tried** to **use** command such as **mount -o rw, re-mount /** for **remounting**.
- Then, I **used** command **ls / home** and it showed me the **username** of **ubuntuserver**.
- After that, I **used** command **passwd mhaider** for setting **new password** in **ubuntuserver**.
- I **gave** new password **haider12!** and it can be seen that **password has reset successfully** in the screen shot below:



- **Login** with **new password**.

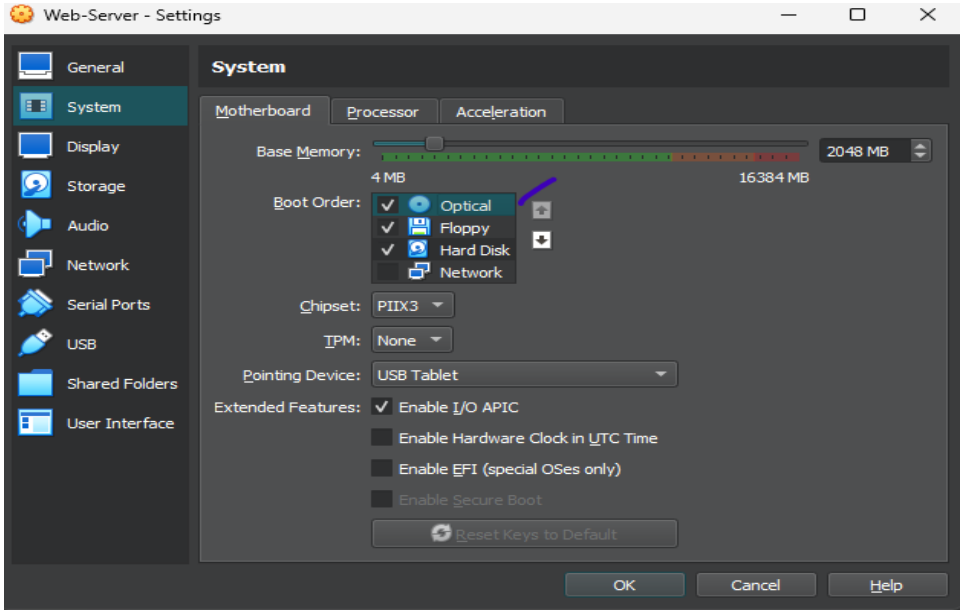


Reference

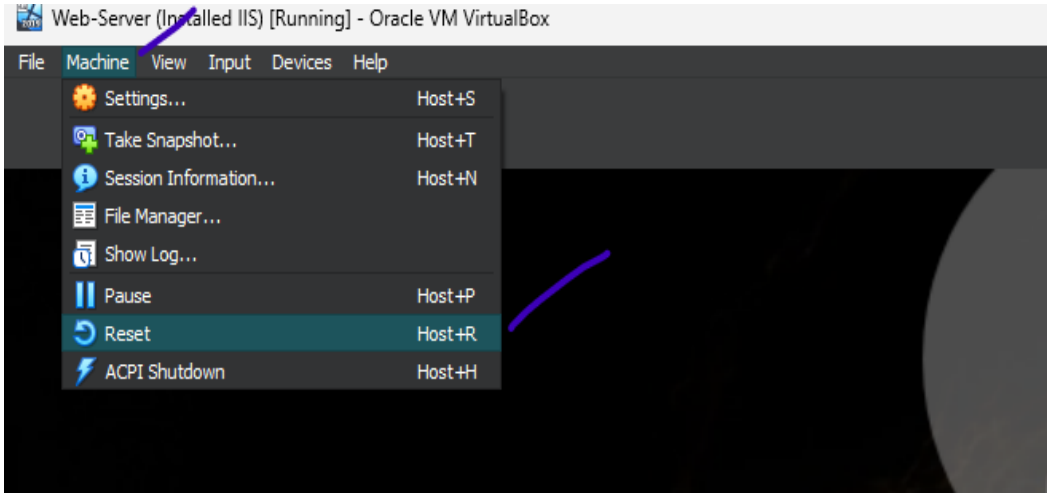
www.youtube.com. (n.d.). *How to reset ubuntu password in virtualbox || 2 min fix*. [online] Available at: https://www.youtube.com/watch?v=b8U7UCLccUg [Accessed 17 May 2023].

Windows

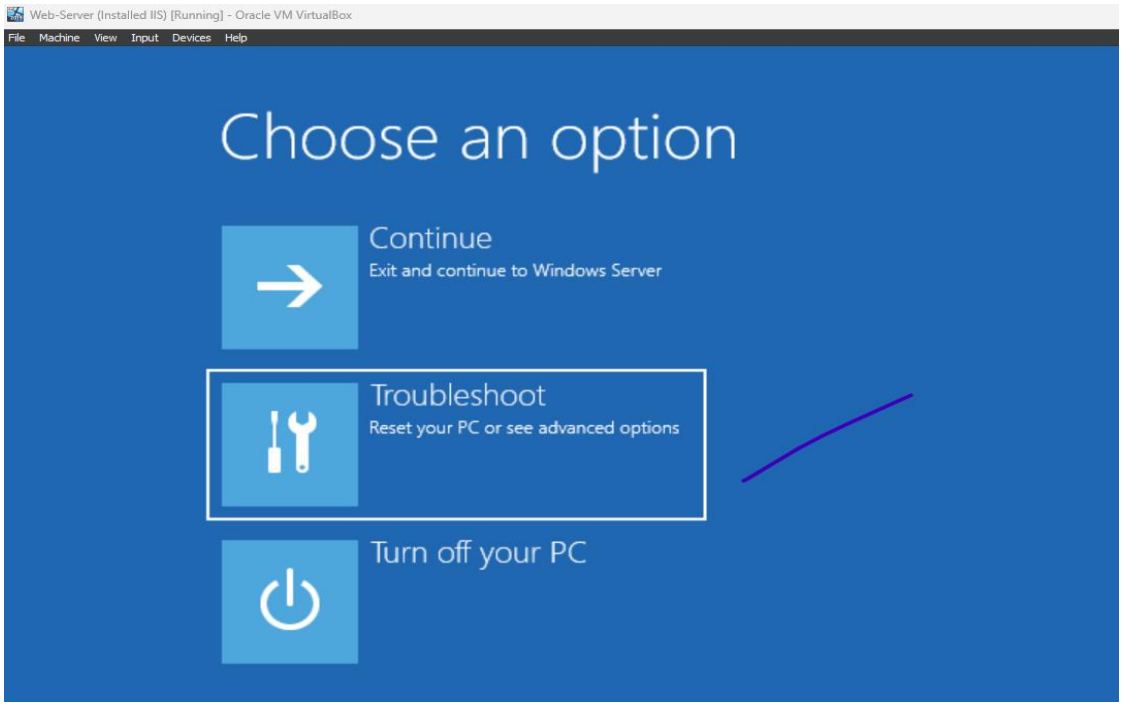
- Move **optical disc** to **first up** in **system setting** of **Web-Server**.



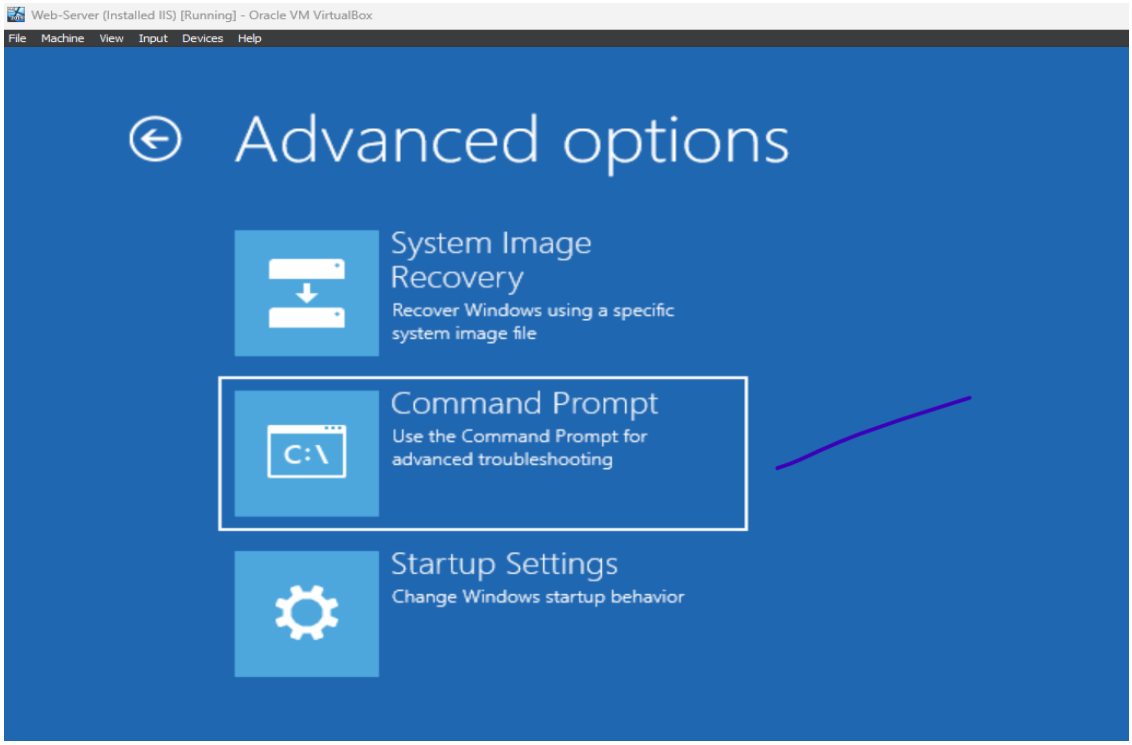
- In **Machine**, click on **Reset**.



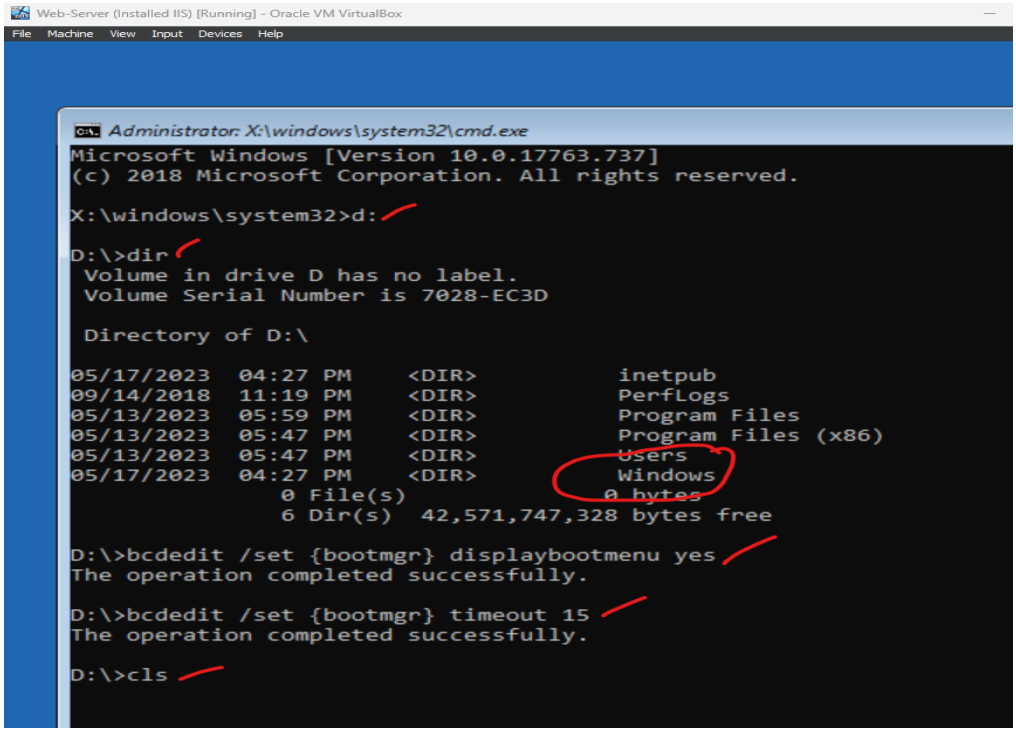
- Press **F12** while **resetting** or **Enter key** until **Advance setting** page appeared and select **Troubleshoot**.



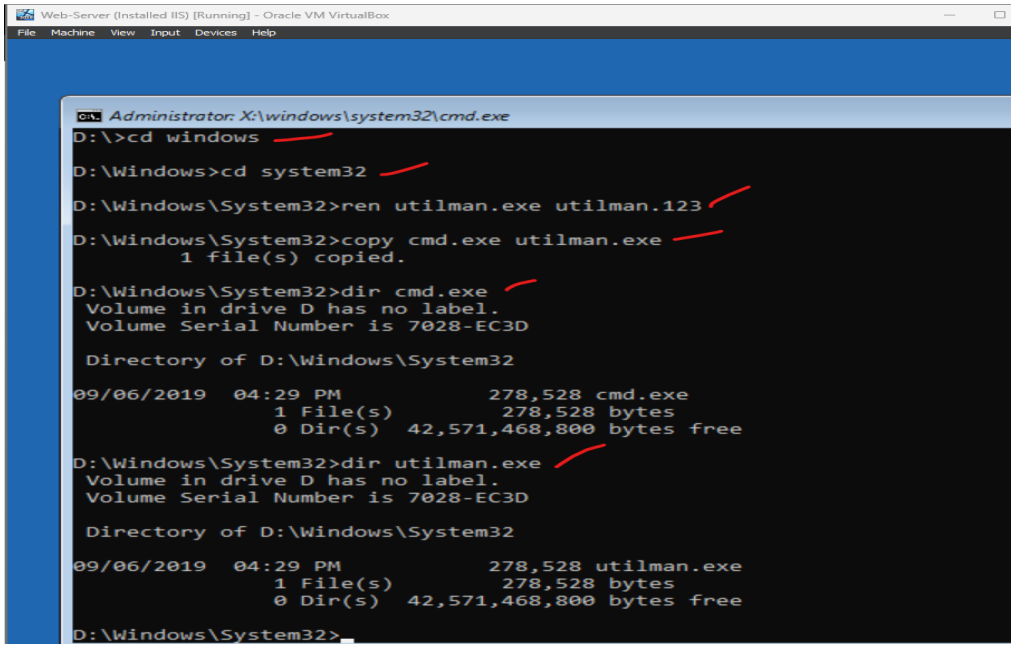
- Select **Command Prompt**.



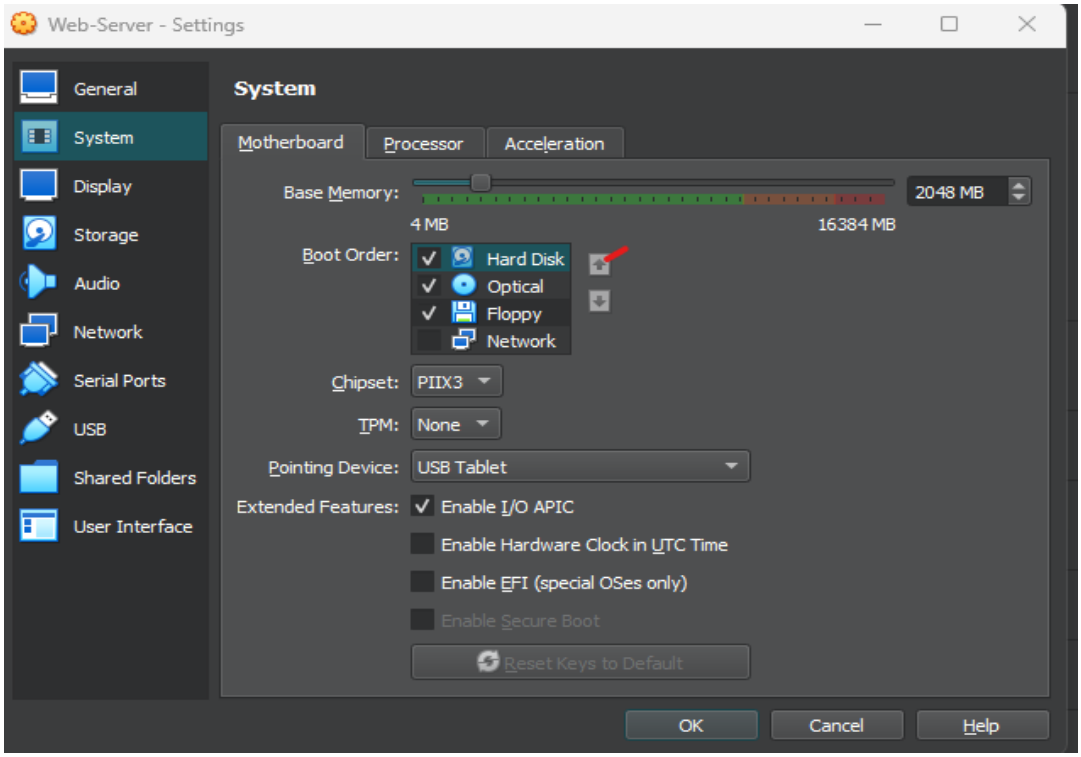
- Commands **d:** and then **dir** for checking **windows availability** inside.
- Then I **gave boot commands** and which showed **operation successfully completed** and **cls** to **clear page**.



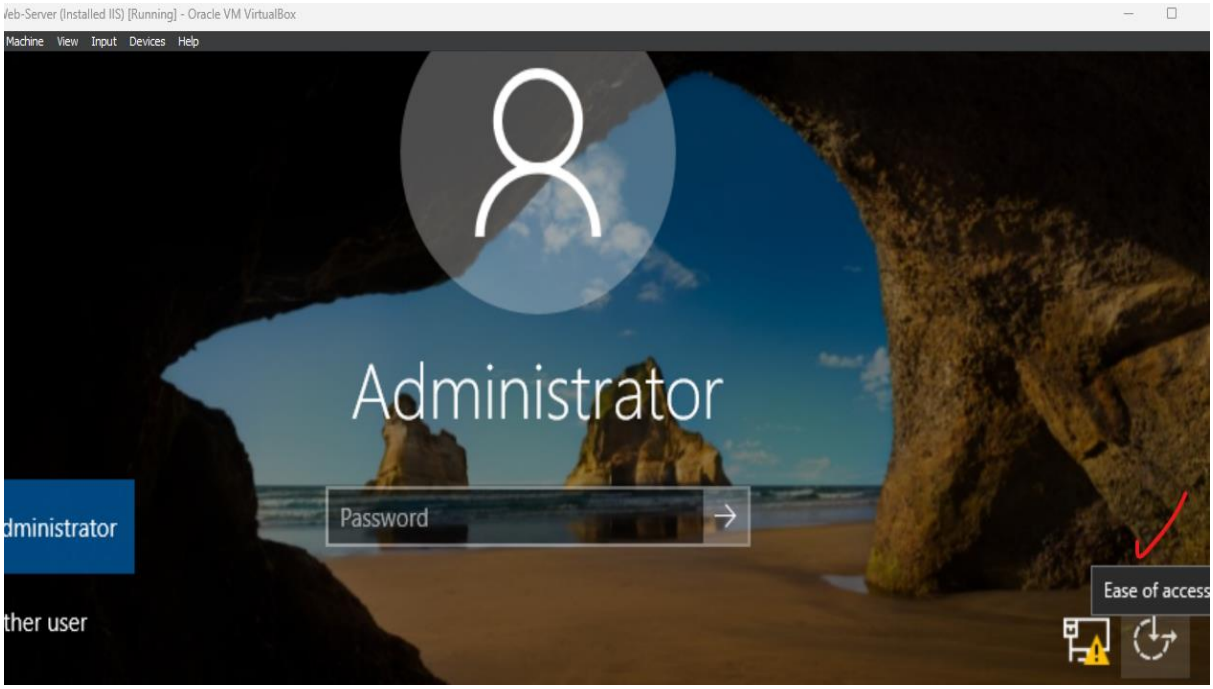
- I **went inside** in **windows\system32>** and **used** commands **ren utilman.exe utilman.123** and **copy cmd.exe utilman.exe** for **renaming** and **copy**.
- **dir** commands showed the **operation setup**.



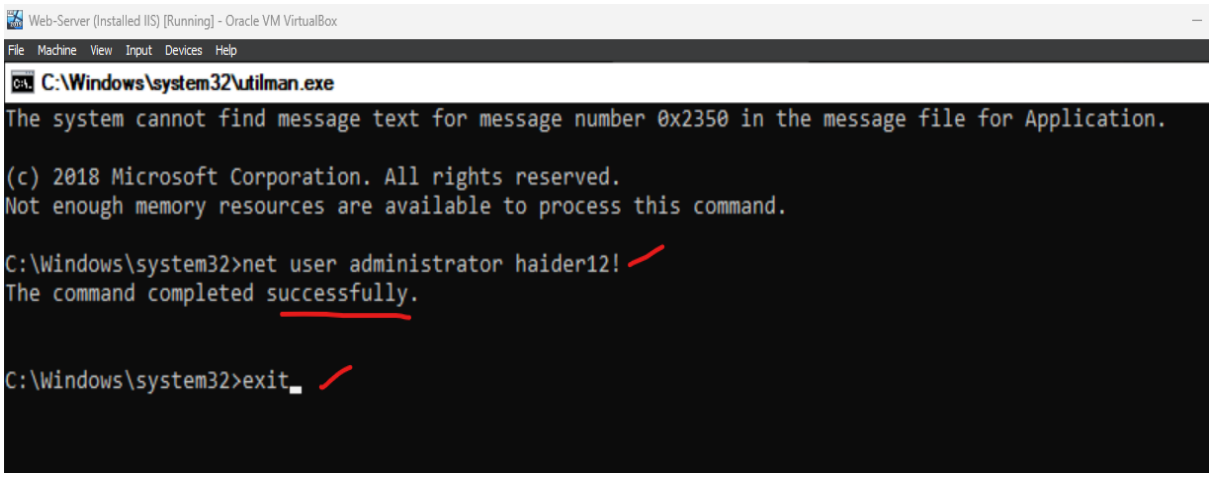
- Moved **Hard Disc** again to **first up.**



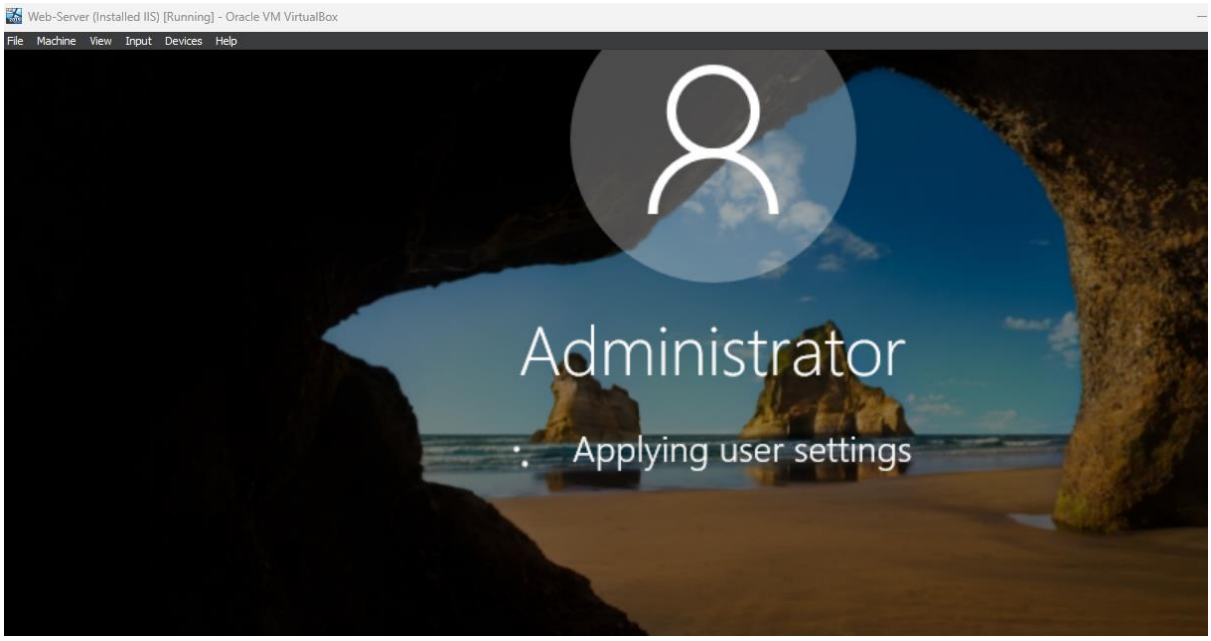
- Click on **ease of access** and **command prompt** will **open**.



- I used command **net user administrator haider12!** for **setting new password** as **haider12!** and it can be seen that **password** has **reset successfully**.



- **Administrator welcoming page** with the **new password**.

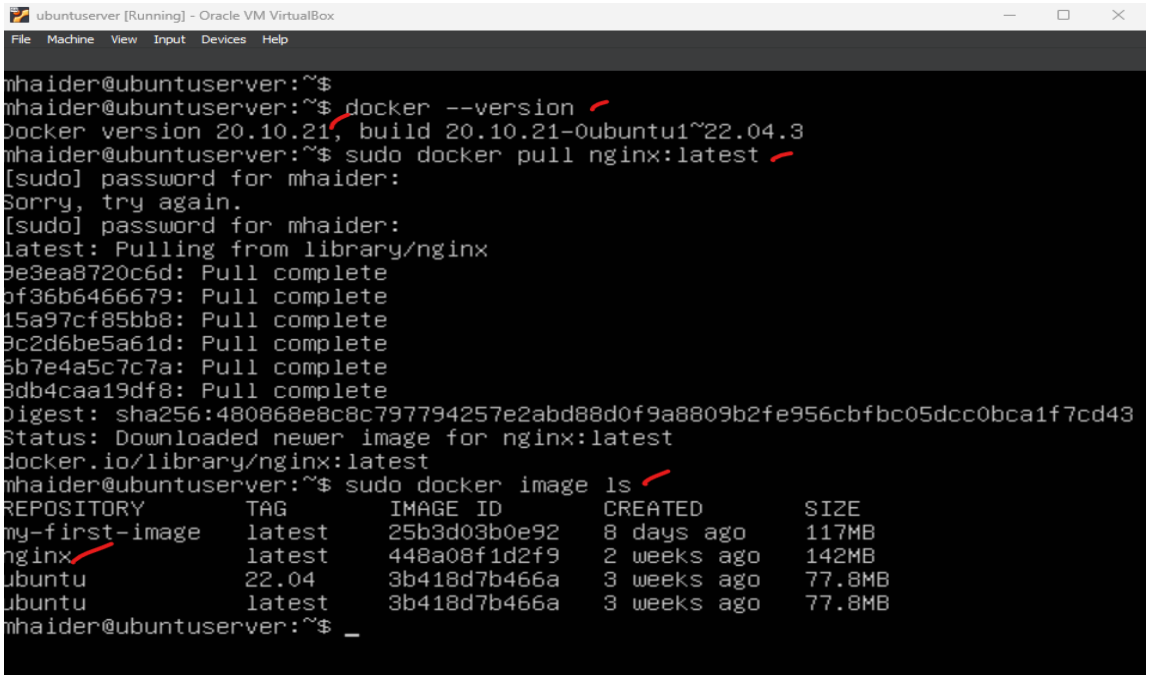


Reference

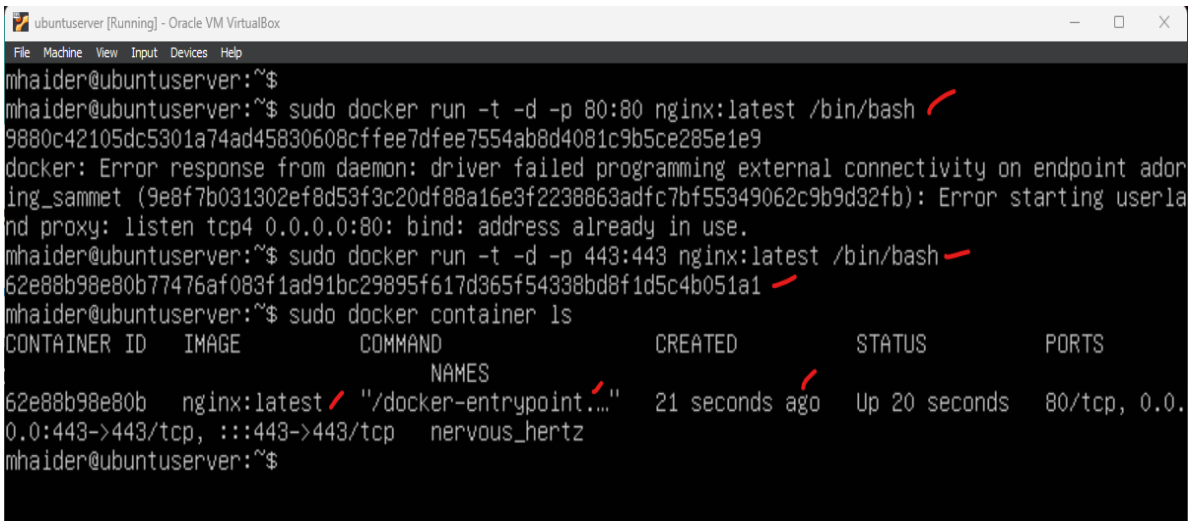
www.youtube.com. (n.d.). *How to reset a lost administrator password in Windows Server 2019*. [online] Available at: https://www.youtube.com/watch?v=j5FFrxb9vwg [Accessed 21 May 2023].

Q16. Docker Container For Web Page

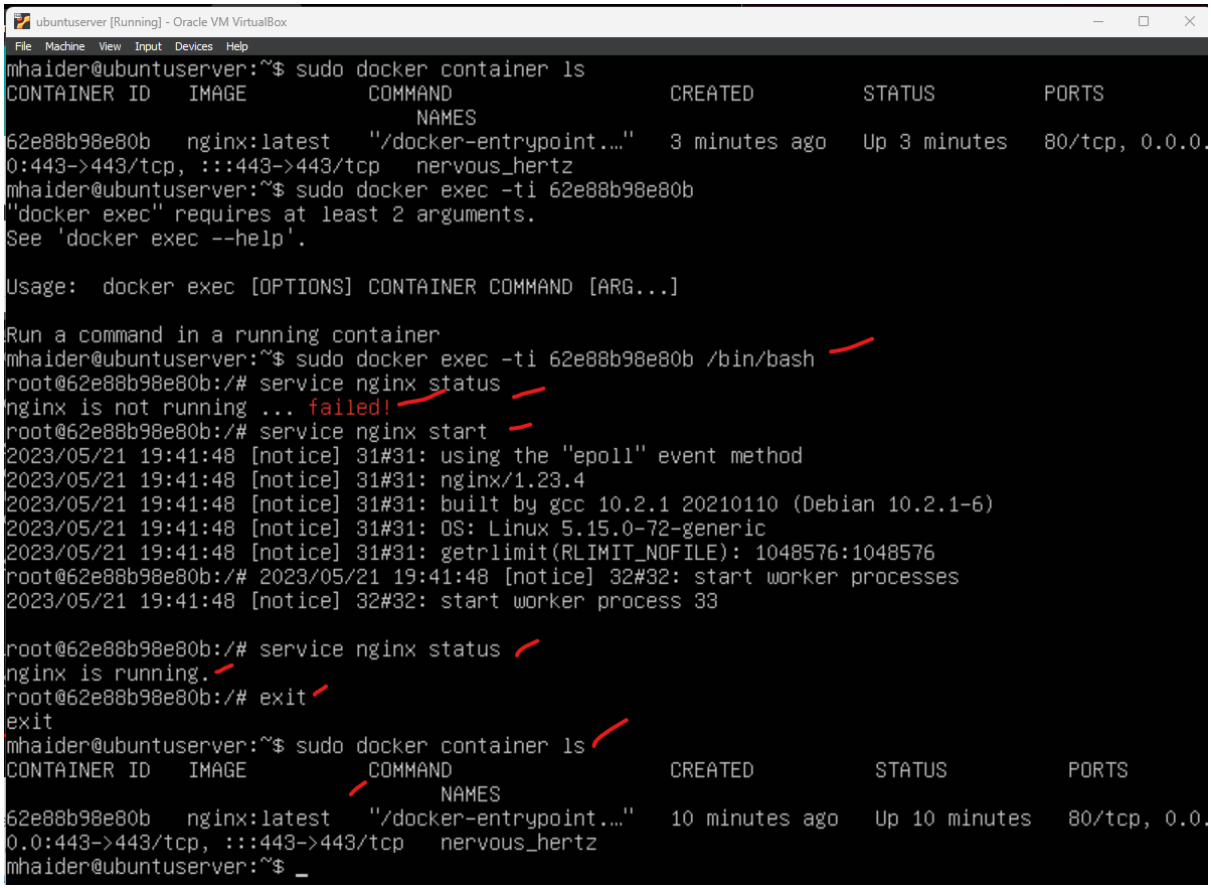
- Firstly, checked **Docker version** which is **latest** installed **20.10.21**.
- Then, **used** command **sudo docker pull nginx:latest** for **pulling docker** with **nginx**.
- **sudo docker image ls** showed **nginx docker image** has **created** in the shot below:



- After that I **run docker** with **/bin/bash** on **the port 443** because **port 80** was **already used** in **above task** with the command **sudo docker run -t -d -p 443:443 nginx:latest /bin/bash** and it **successfully running** with **nginx:latest** as shown below:



- Now, I run docker container with the command **sudo docker exec -ti <nginx image ID> /bin/bash** and **went inside** the **container.**
- **Inside container,** I checked **nginx** is **not running** with command **service nginx status** and **activated nginx** with the command **service nginx start.**
- **sudo docker image** ls **showed** that **docker container** is **running properly**.



Reference

www.techtarget.com. (n.d.). *Easily spin up a Docker Ubuntu container | TechTarget*. [online] Available at: https://www.techtarget.com/searchdatacenter/video/Easily-spin-up-a-Docker-Ubuntu-container [Accessed 21 May 2023].