OLD DOMINION UNIVERSITY

CYSE 270 LINUX SYSTEM FOR CYBERSECURITY

Assignment #13 Advanced Network Configurations

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Scenario: You, as a network admin, are going to set up your Ubuntu VM as a gateway toprovide Internet access to another client Ubuntu VM. The client VM needs to be in the same internal network as the gateway (**as shown in Figure 1**). Once the connection is ready, you need to configure the firewall to secure the network properly. The following requirements need to be satisfied to receive full credits.

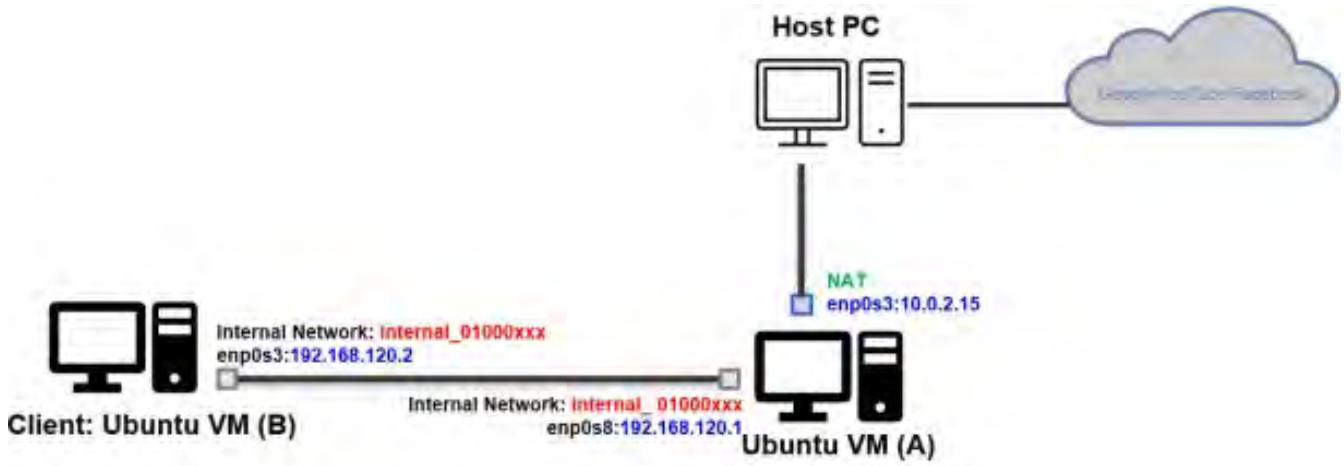


Figure 1 Desired Network Topology

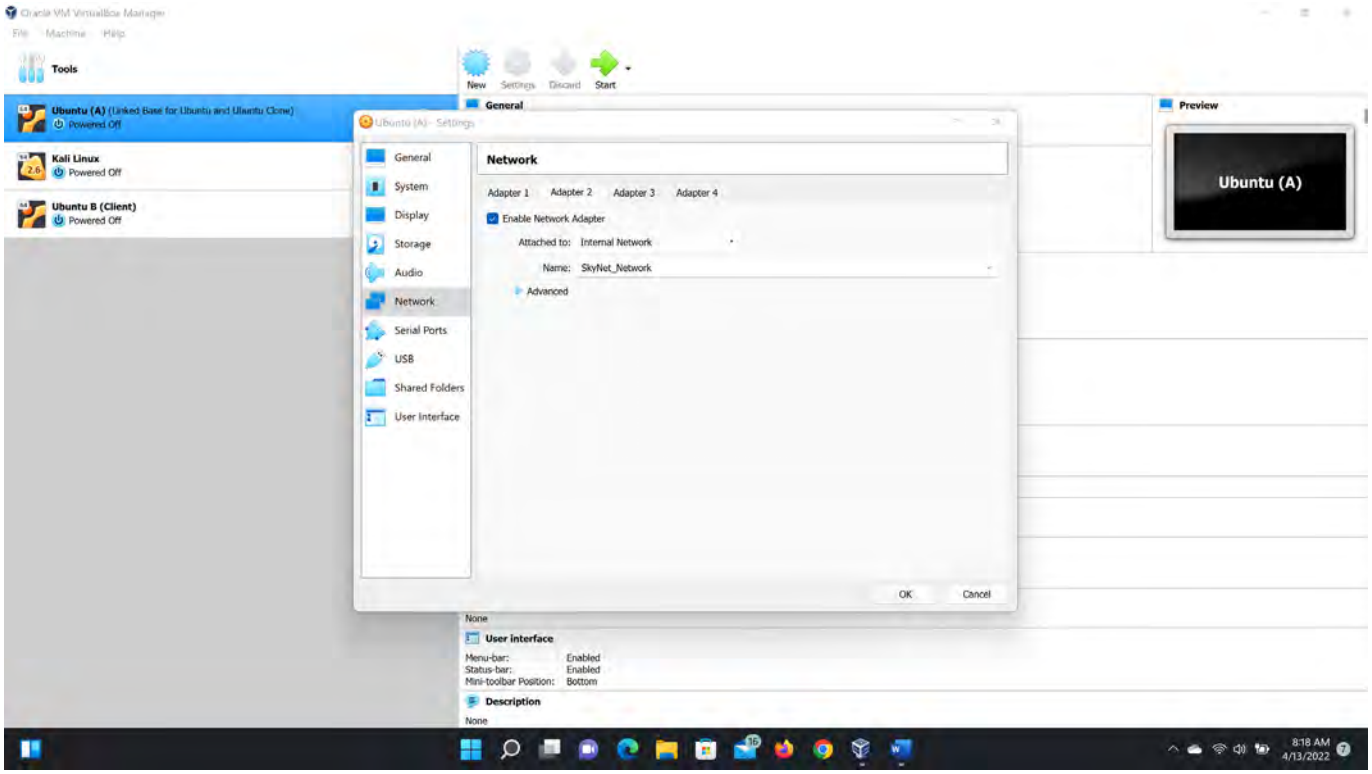
Please note that you need to customize the value in the fields marked in RED above.

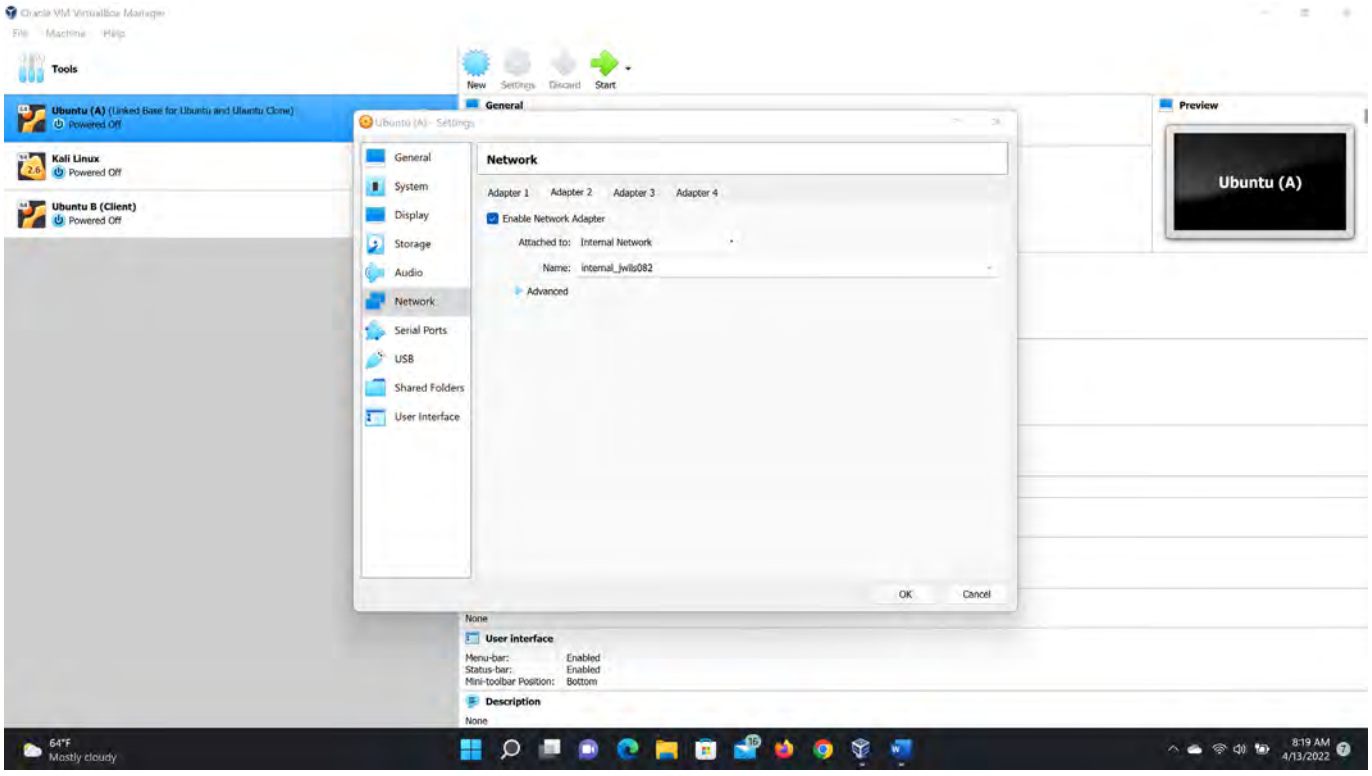
Please configure the network with the following requirement:

Task A –Network Configuration (**60 points**)

1. In the virtual box setting, connect two VMs in the same internal network, “internal_{UIN}”.

Replace {UIN} with your real UIN.





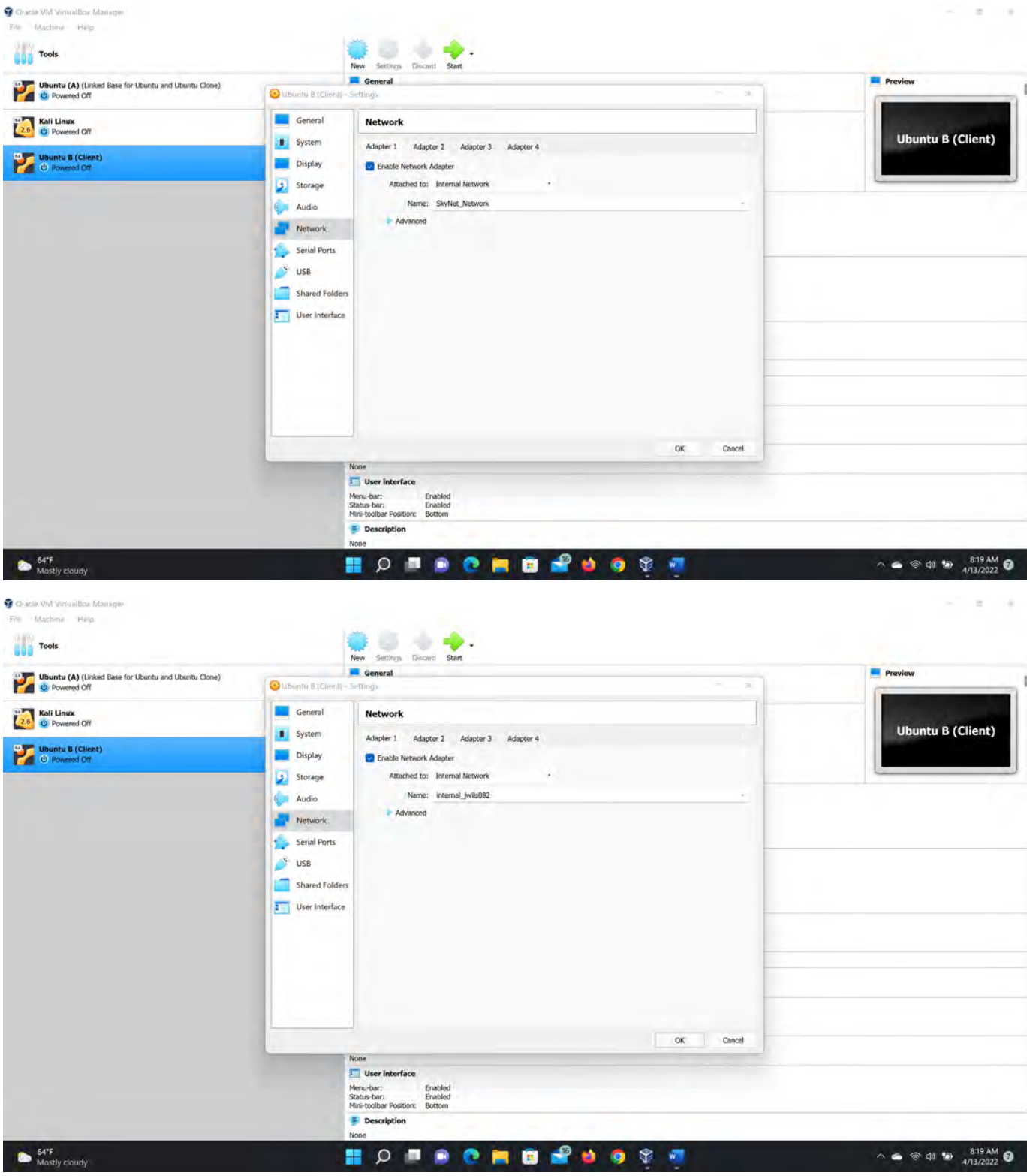
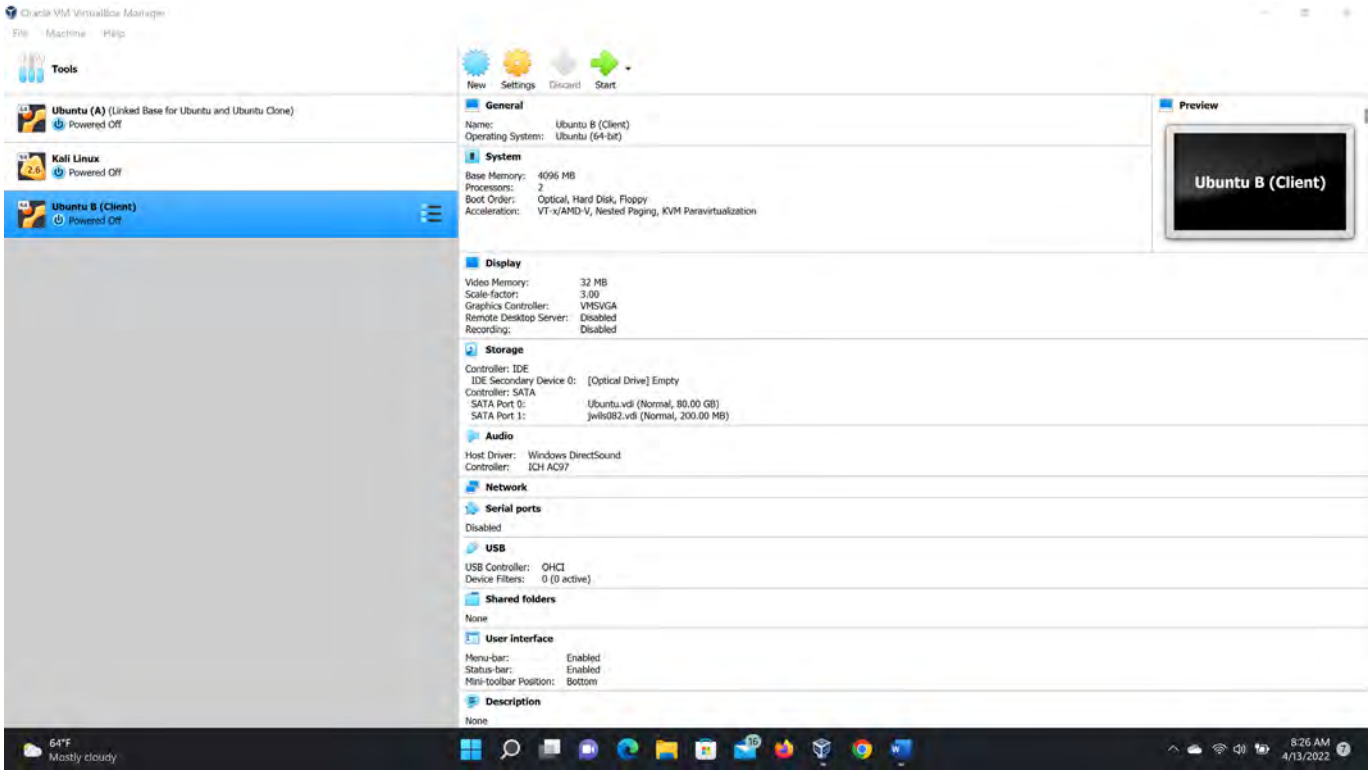


Figure 1 Screenshots of JWILS082 Computer to Step 1.

Above are the screen shots changing both Ubuntu systems (A) and (B) internal network name from "SkyNet_Network" to "internal_jwils082".

2. Change the hostname of the Client VM to "{MIDAS}-Client." **Replace {MIDAS} with your real MIDAS.**



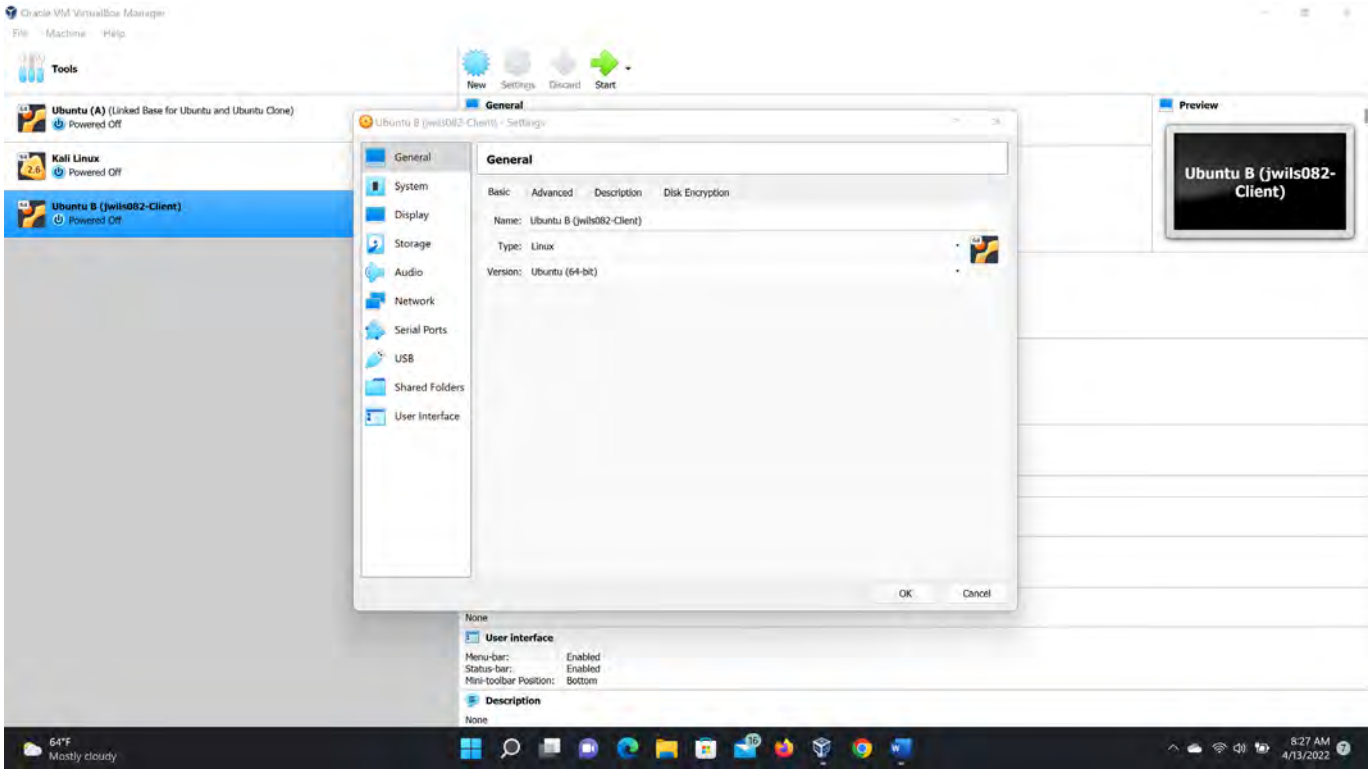
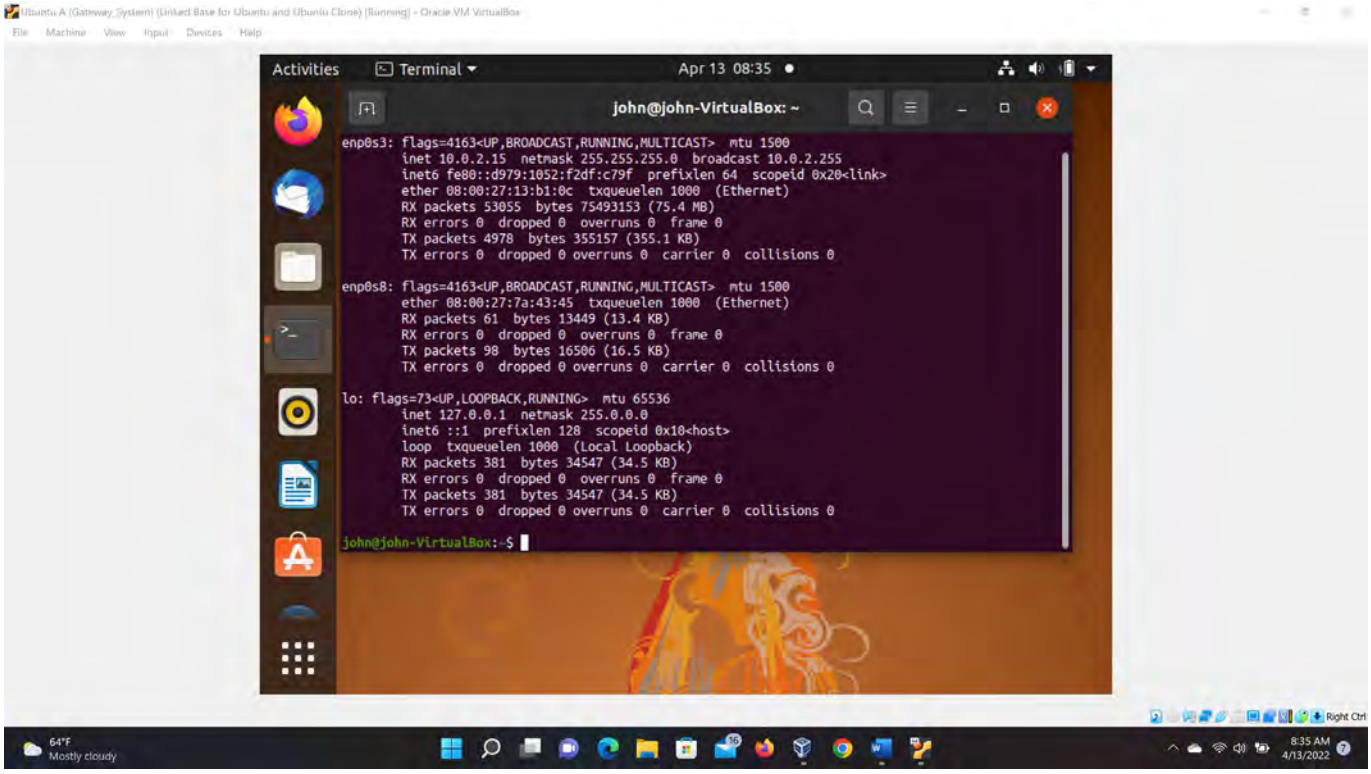


Figure 2 Screenshots of JWILS082 Computer to Step 2.

Above are the screeshots changing Ubuntu B (Client) machine name to Ubuntu B (jwils082-Client) through the settings menu.

3. Configure the temporary IP address on the Gateway Ubuntu, as shown in Figure 1.



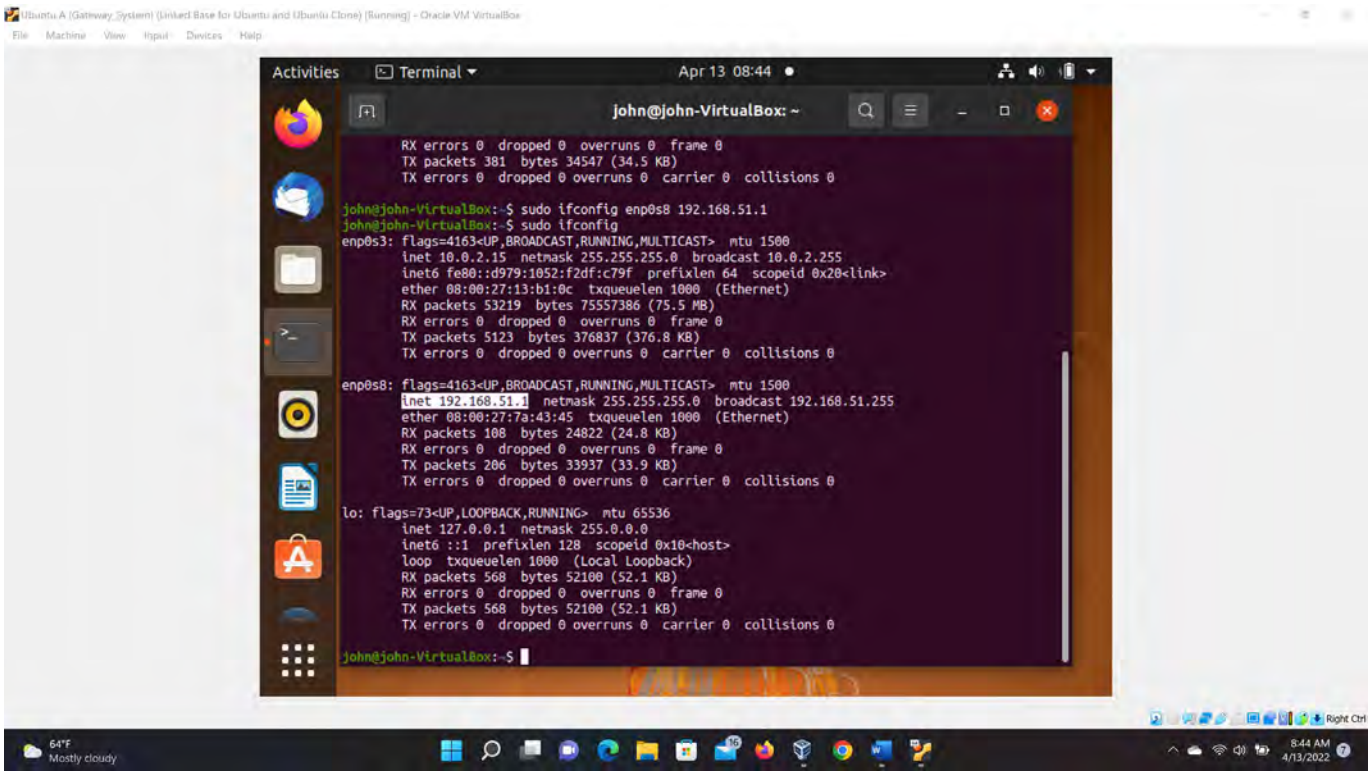
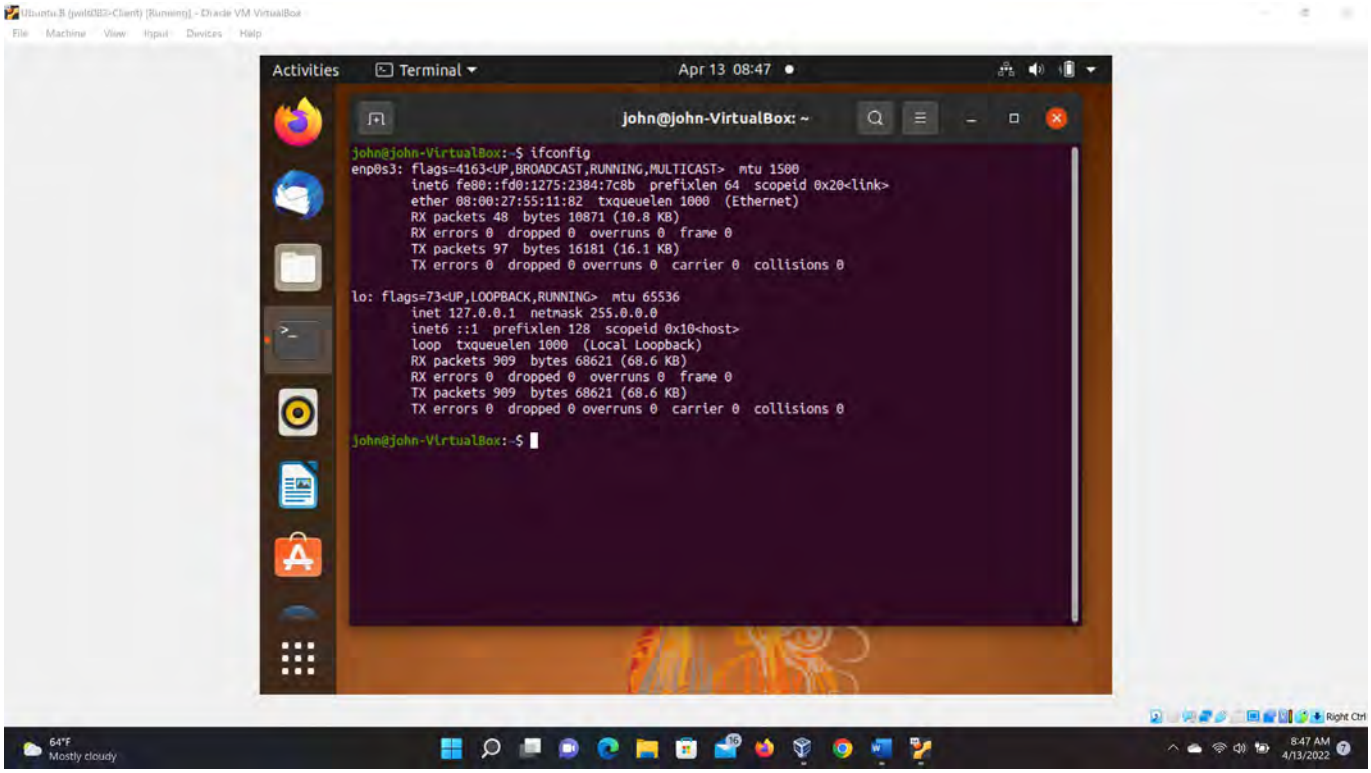


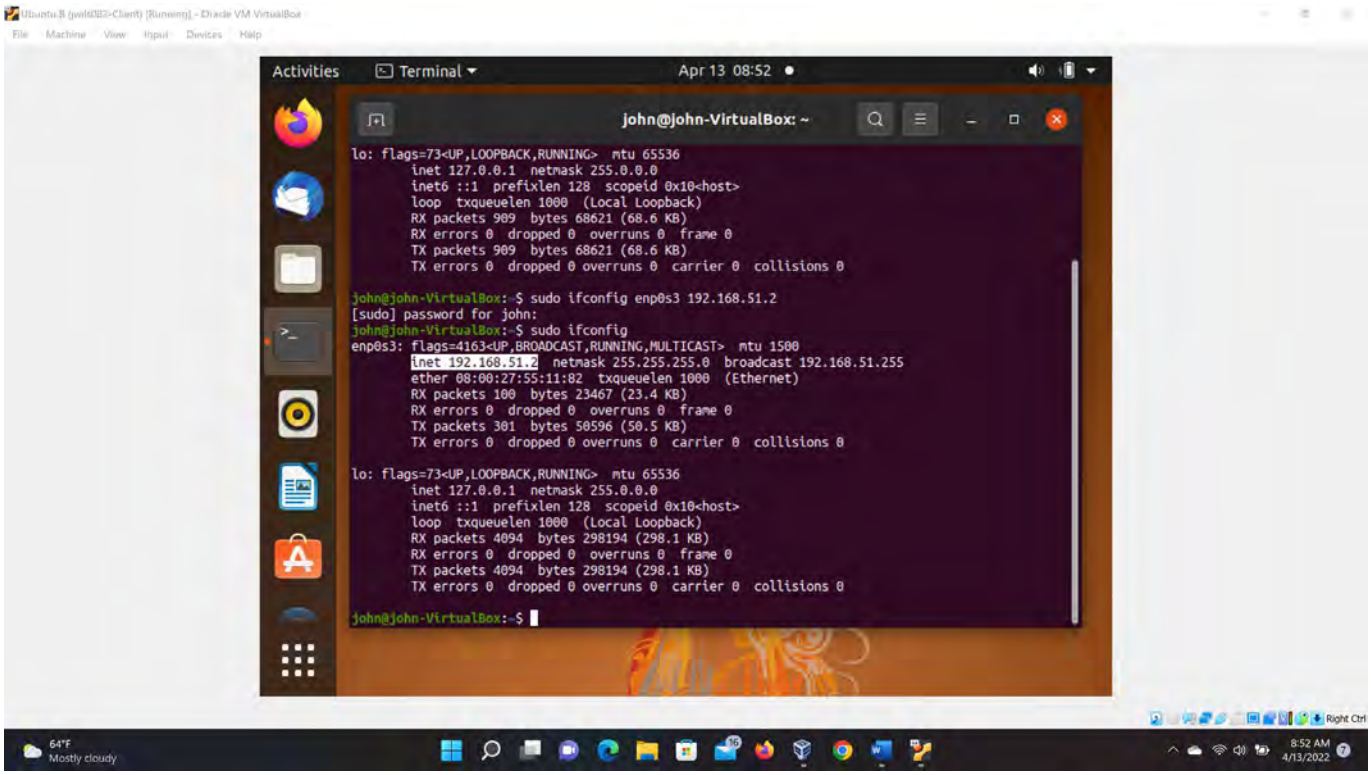
Figure 3 Screenshots of JWILS082 Computer to Step 3.

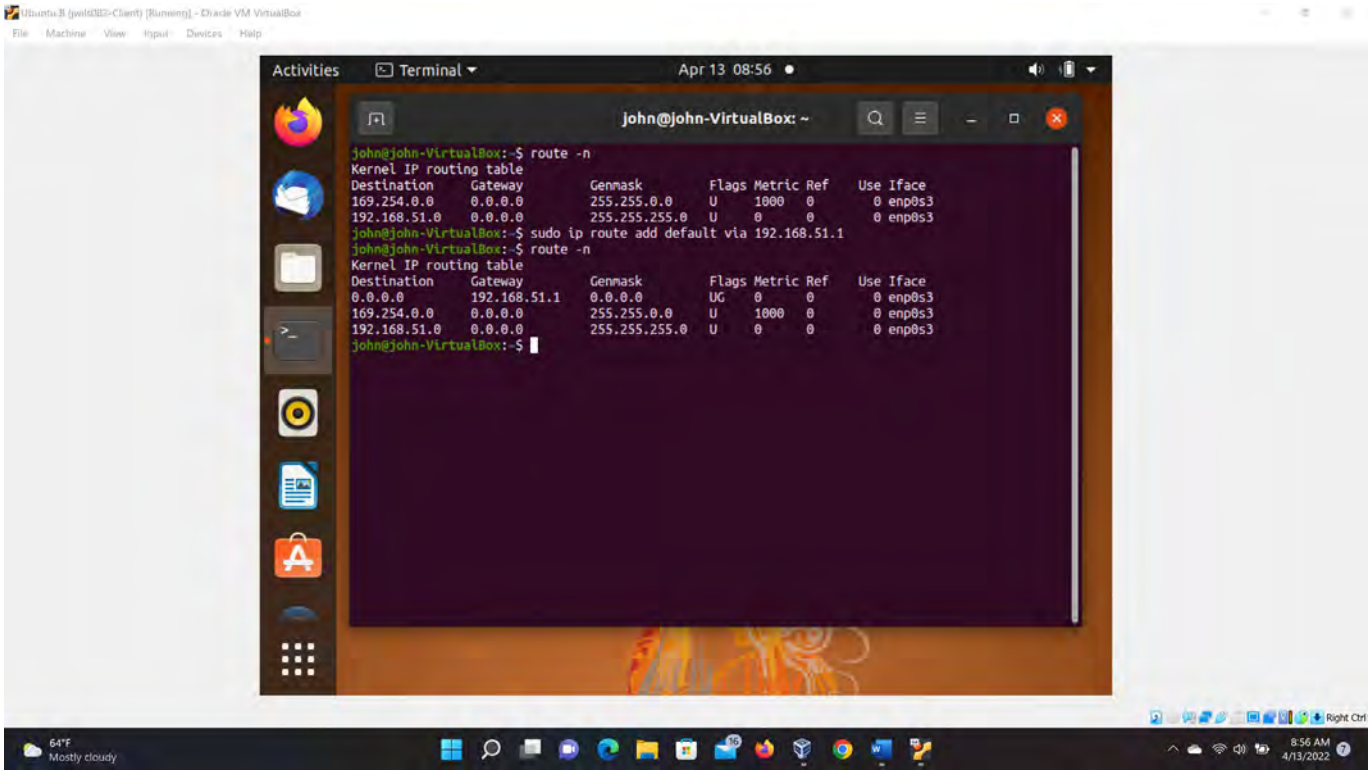
Above is the screen shot of using the command “ifconfig” that displays the information on current network configuration information, ip address, netmask, or broadcast address to a network interface, creating an alias for the network interface, setting up hardware address, and enable or disable network interfaces. This is to make sure I have an internet connection and that I have the two networks running enp0s3 (is my gateway to the web) and enp0s8 (which is the internal network). You can see that en0s8 has no IP address listed.

In the second screen shot is using the command “sudo ifconfig enp0s8 192.168.51.1” which provides an IP address (highlighted) for the internal network to talk. Additionally, I used the “sudo ifconfig” to affirm the change to network enp0s8 had an IP address added.

4. Configure the temporary IP address, routing table, and DNS server on Client VM as shown in Figure 1.







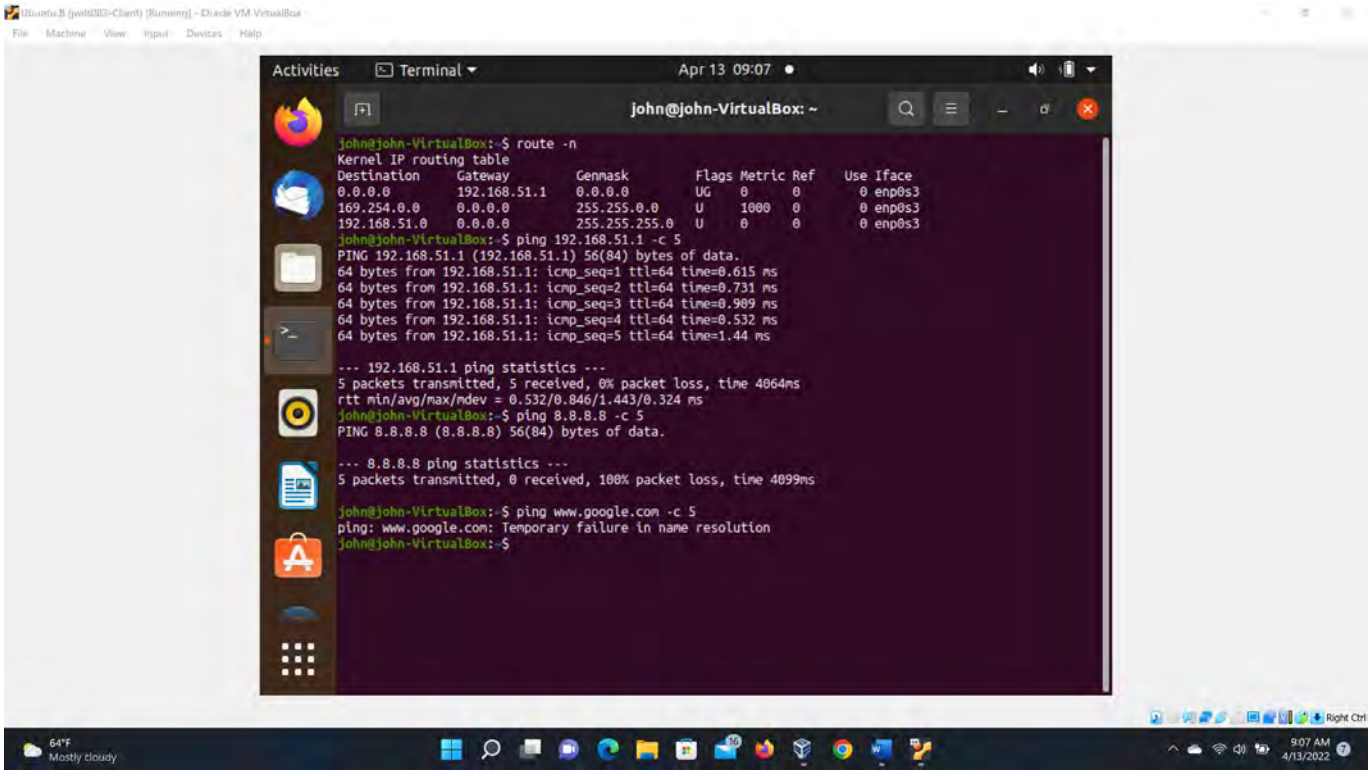


Figure 4 Screenshots of JWILS082 Computer to Step 4.

Above is the screen shot of using the command “ifconfig” that displays the information on current network configuration information, ip address, netmask, or broadcast address to a network interface, creating an alias for the network interface, setting up hardware address, and enable or disable network interfaces. This is to illustrate that I

have only one network on the client system and that it has no IP address assigned. As you can see the enp0s3 is the only one and it has no network IP address.

In the second screen shot is using the command “sudo ifconfig enp0s3 192.168.51.2” which provides an IP address (highlighted) for the internal network to talk. Additionally, I used the “sudo ifconfig” to affirm the change to network enp0s8 had an IP address added.

In the third screenshot I used the command “sudo ip route add default via 192.168.51.1” to confiure the routing table. In other words I added the default IP address for the client machine to talk to the gateway machine.

On the fourth screen shot I used the command “ping 192.168.51.1 -c 5” to test the connection between the client and the gateway machine. As you can see the client machine can talk to the gateway machine. After this I tried to test the client machine to gain access to the internet and as you can see it failed. At this point I can talk between the client and gateway machines within a local network; however, the client machine still cannot talk outside the local network.

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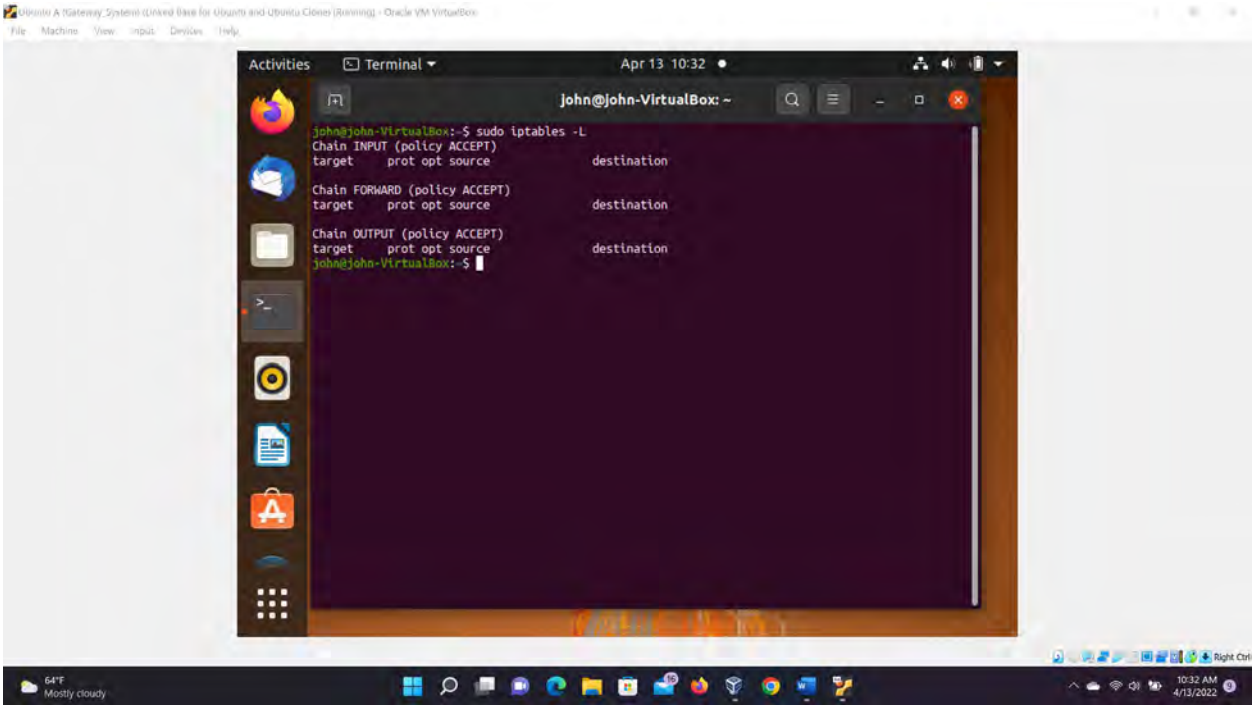
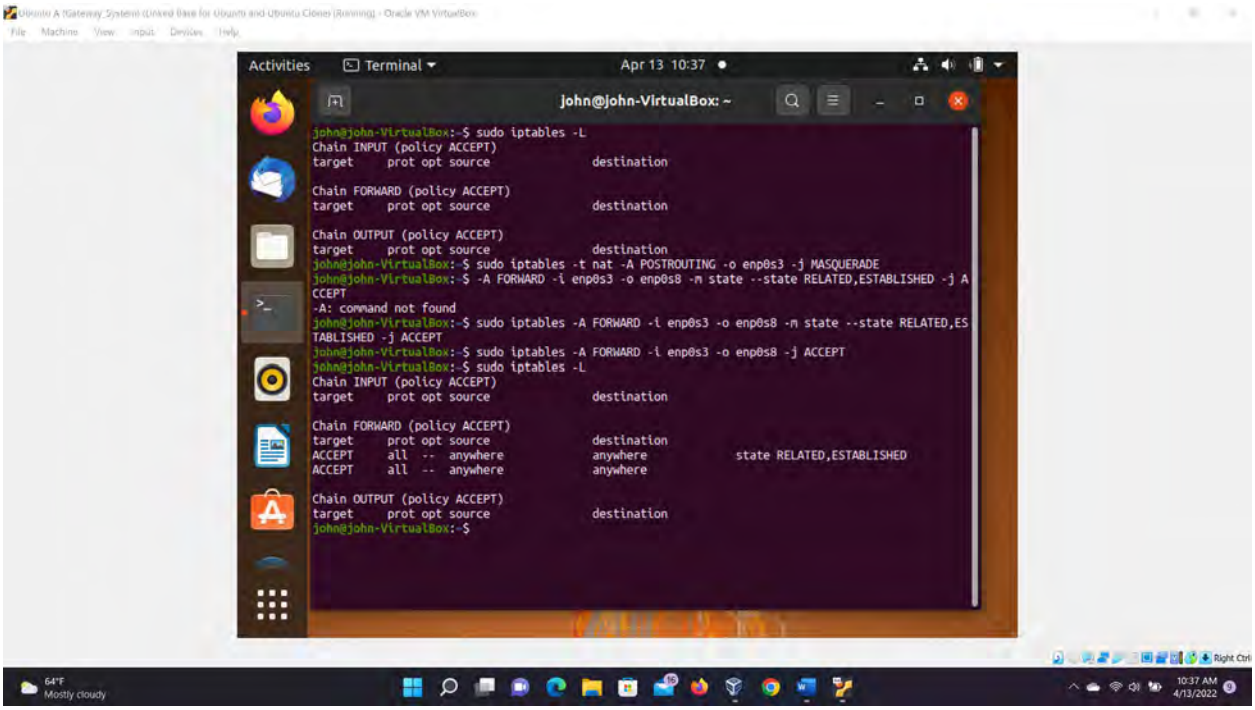
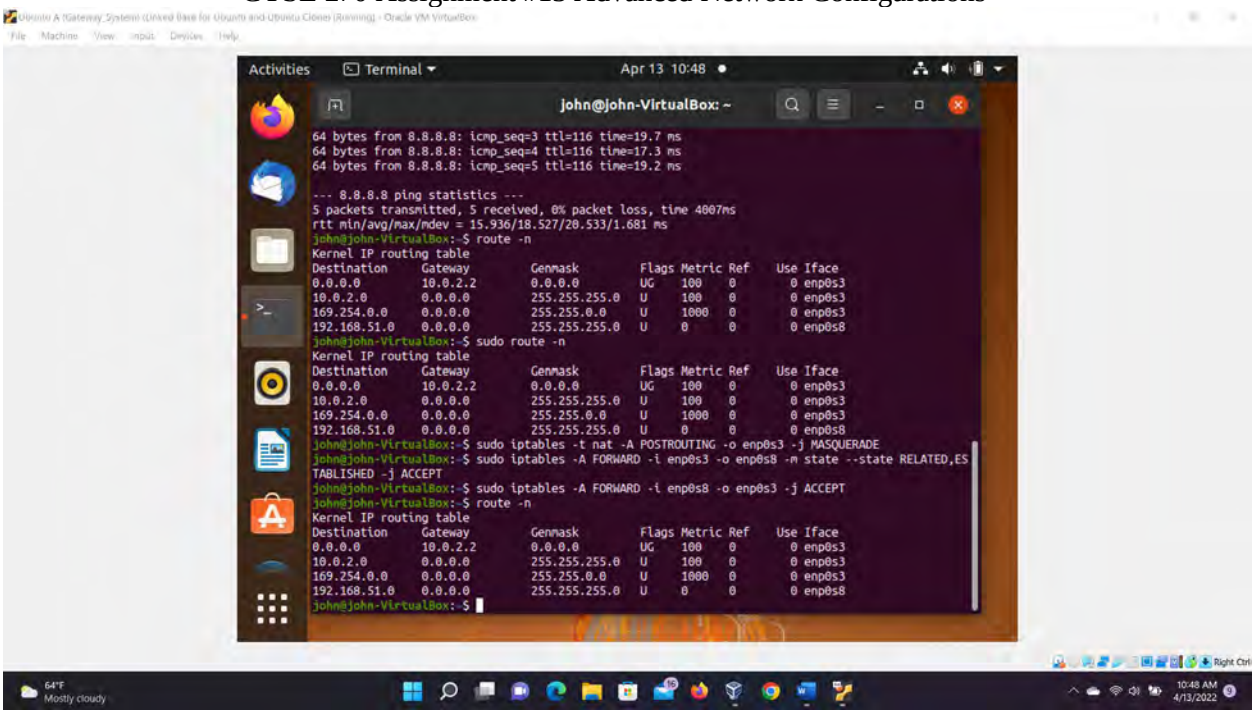
5. Configure gateway Ubuntu to forward the traffic from the Client to the Internet.







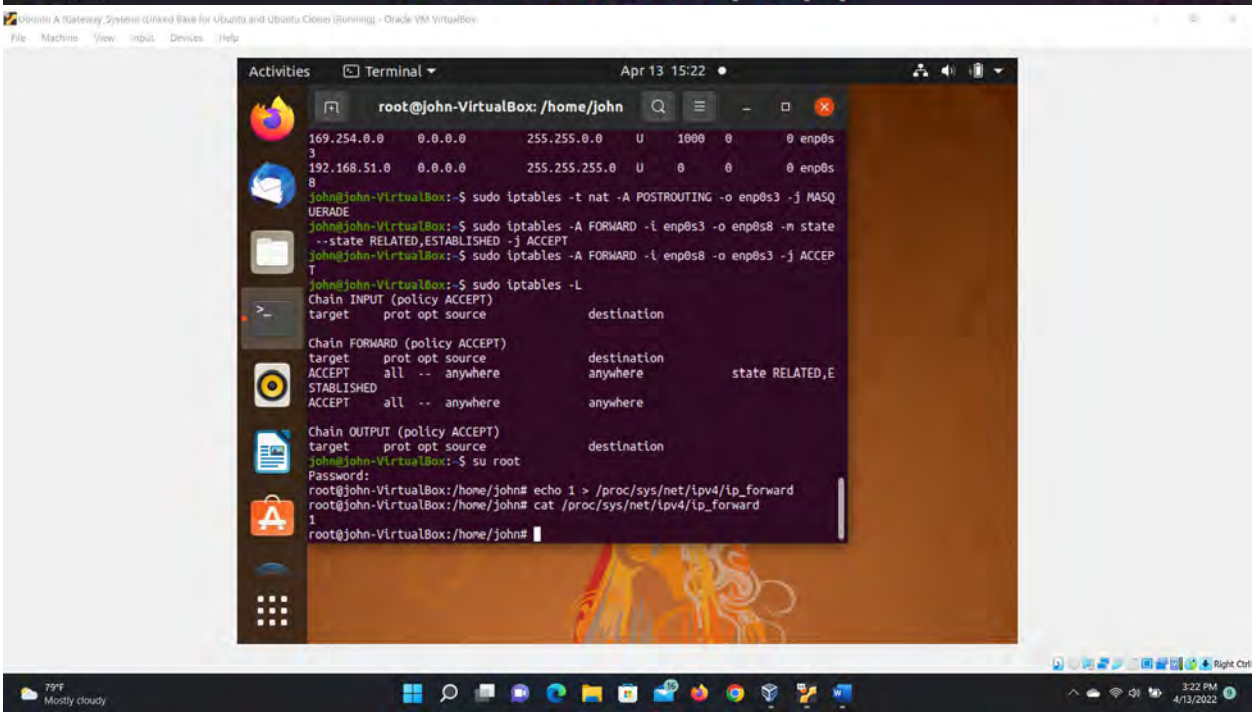


Figure 5 Screenshots of JWILS082 Computer to Step 5.

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4/18/22

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Above is the screen shot using the command “sudo iptables -L” to show how the iptables look prior to the forwarding commands.

Additionally, I used the command“sudo iptables -t nat -A POSTROUTING -o enp0s3 -j MASQUERADE” which manipulates the IP table. Basically this sets the rules for the WAN interface. “sudo” is the command that allows you to change things. “iptables -t nat -A” is the command that will alter packets that create a connection used for the Network Address Translation (NAT). “POSTROUTING” is the altering the IP packet after the routing is complete. “-o enp0s3” is the output name and in this case the output name is enp0s3. “-j” is the target. “MASQUERADE” is used when you have an internet network with dynamically assigned private IP addresses; this funnels the traffic access to a live ip address through a single system (i.e. the gateway machine).

In the second screenshot I used the commands “sudo iptables -A FORWARD -i enp0s3 -o enp0s8 -m state –state RELATED,ESTABLISHED -j ACCEPT”

I also used the command “sudo iptables -A FORWARD -i enp0s8 -o enp0s3 -j ACCEPT”. I made a typing mistake in the second screenshot and corrected this in the third screenshot. I had incorrectly input the network names (enp0s3 and enp0s8). This was fixed.

I then used the command “sudo iptables -L” to affirm the changes that were made. Additionally, I have to forward the traffic through the gatway by chainging to the root account “su root” then using the commands “echo 1 > /proc/sys/net/ipv4/ip_forward” and then pressing enter. I then used the commands “ cat `/proc/sys/net/ipv4/ip_forward” to show that it opened up. The number 1 means everything is good to go (the ip is forwarding).

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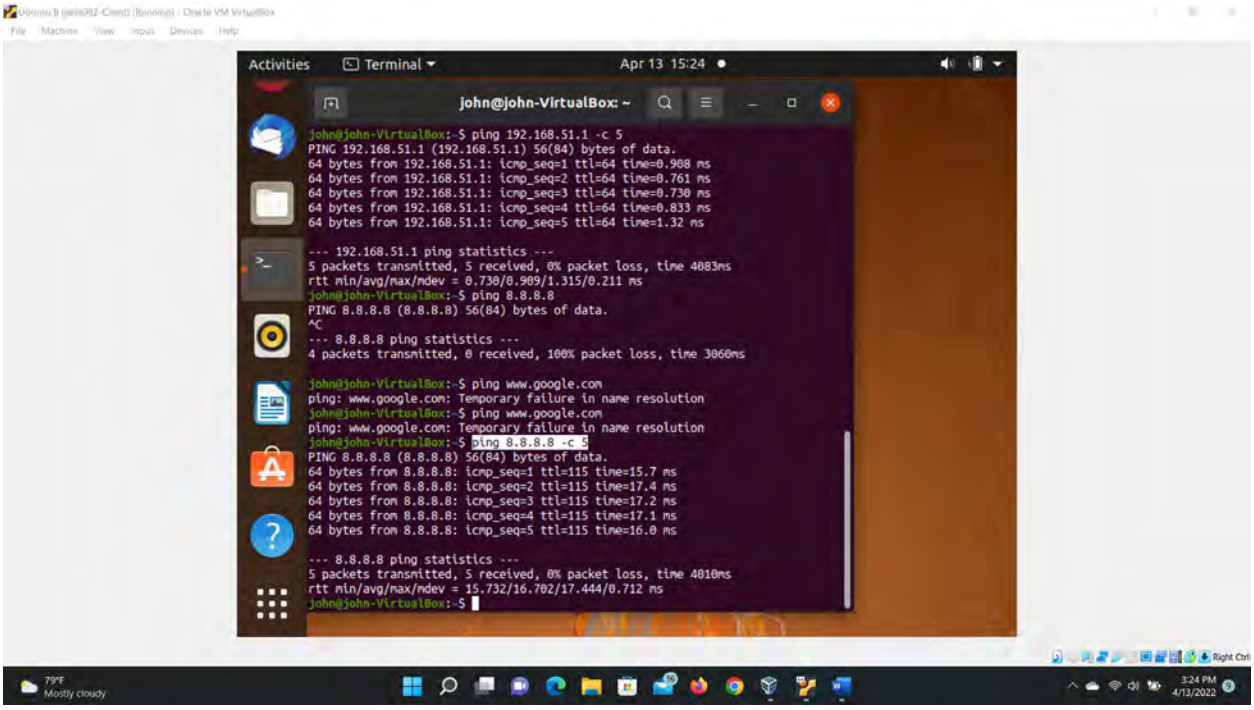
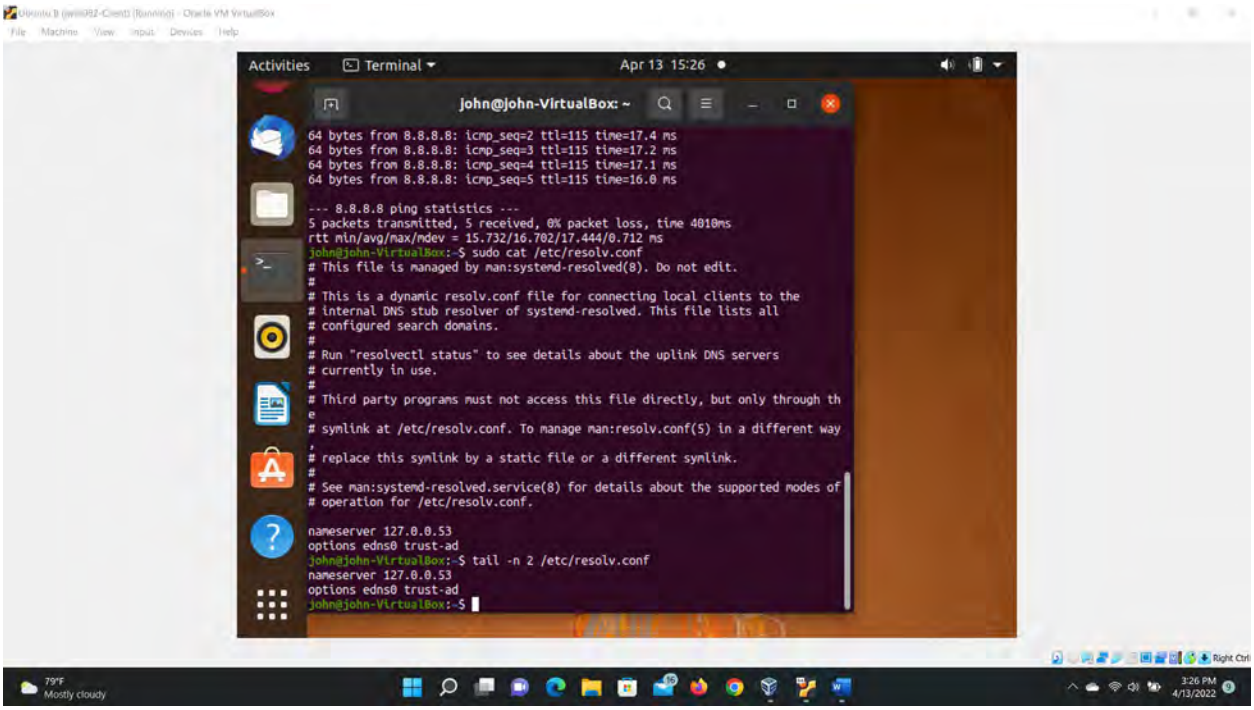
6. Test your ping connection to 8.8.8.8 and www.google.com, respectively.





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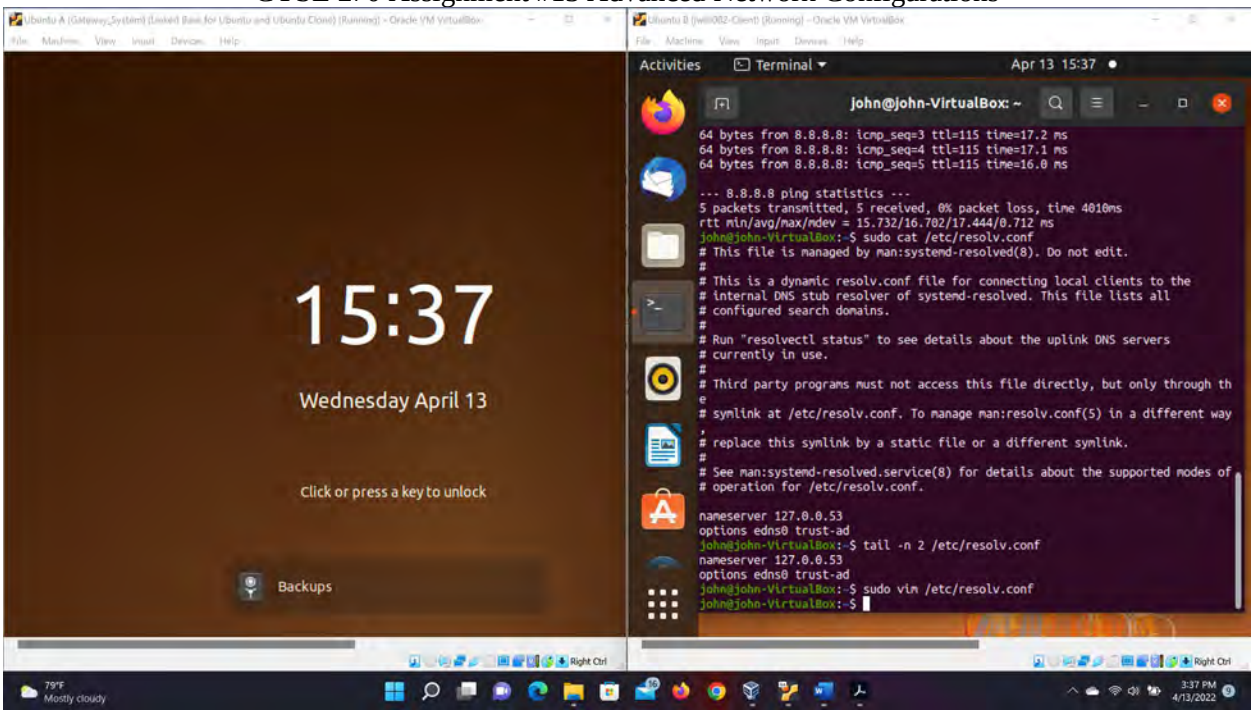

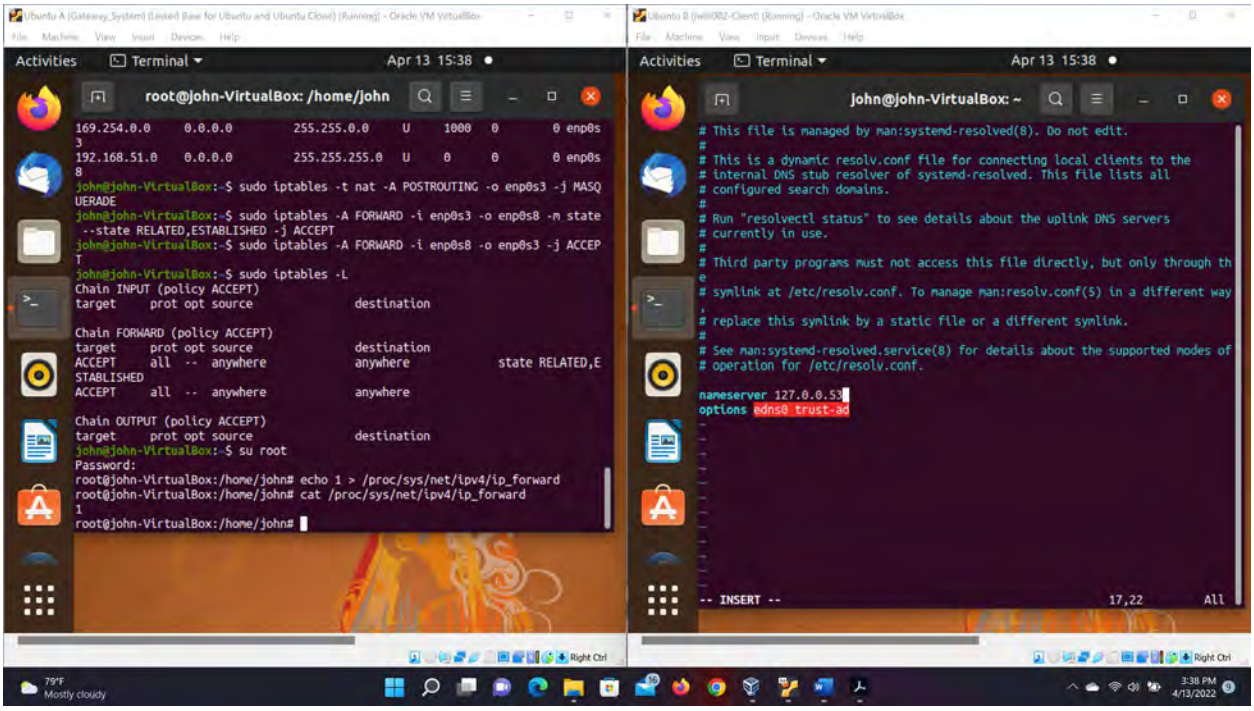

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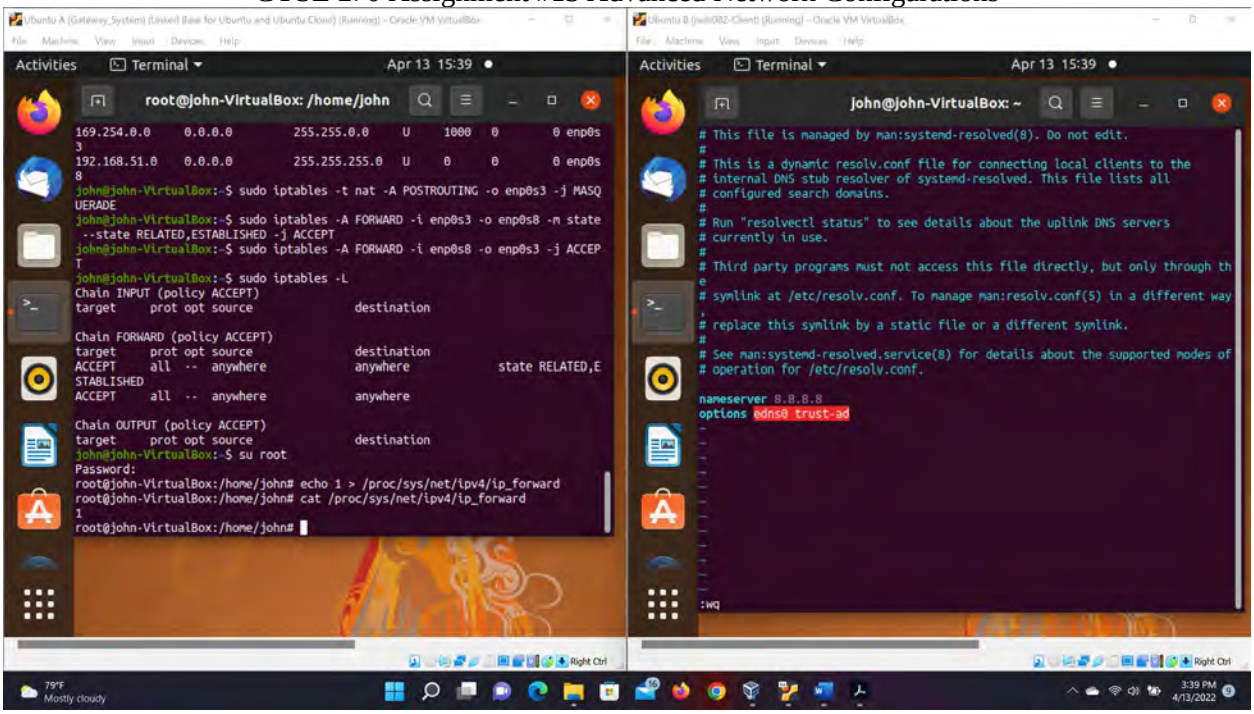

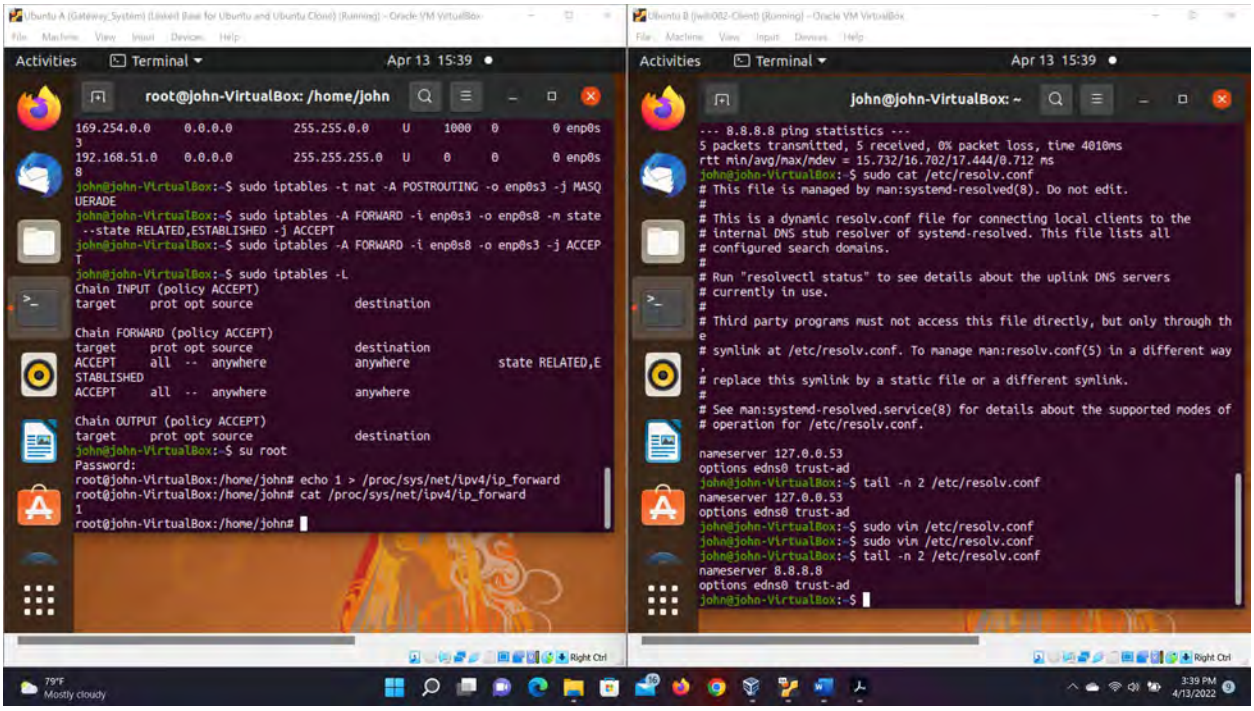

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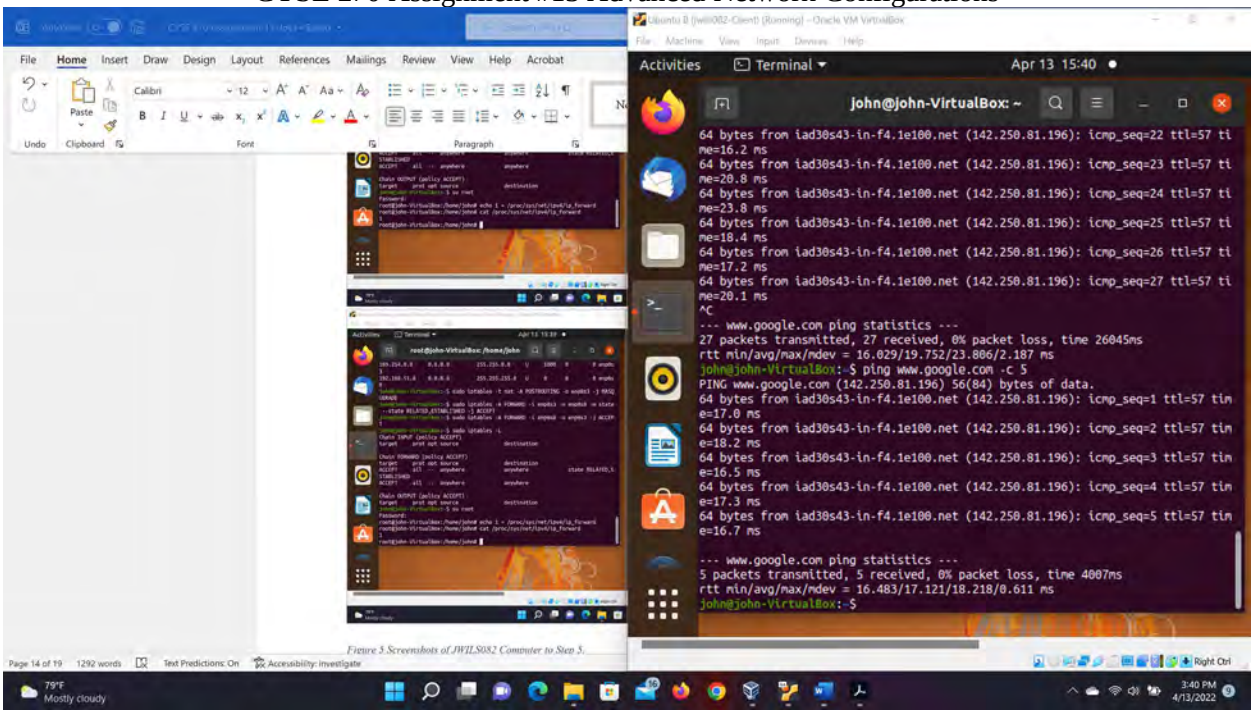

Figure 6 Screenshots of JWILS082 Computer to Step 6.

Above are the screen shots pinging a ip address and a URL. As you can see the Ip address worked fine; however the URL did not so I am going to have to configure the /etc/resolv.conf file through VIM to make this work.

And as you can see the url now works with no problem after editing the /etc/resolv.conf file through VIM.

I also wanted to apologise for the last couple of screenshots as I was double screening the VM machines so that I could quickly observe things to trouble shoot. It looks messy but the work is there.

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Task B –Firewall Configuration (**40 points**)

1. Configure the iptables on the gateway Ubuntu to block all the inbound ICMP packets from the Client VM.

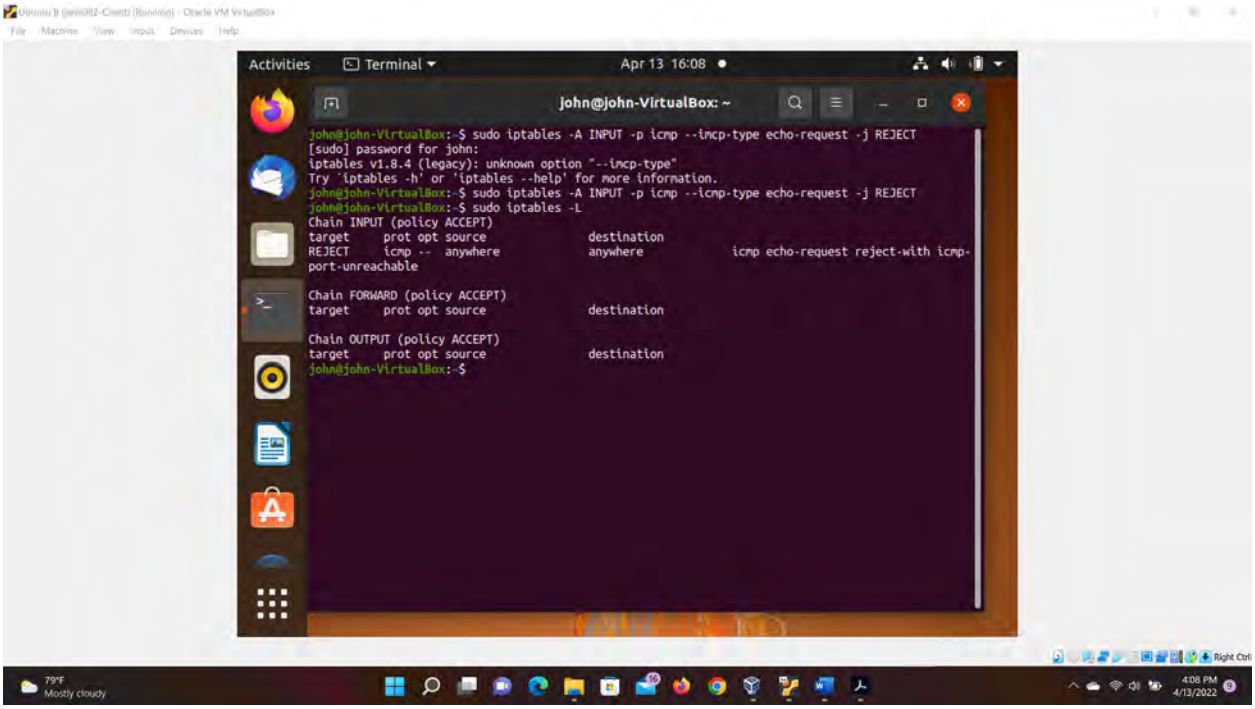

Figure 1 Screenshots of JWILS082 Computer to Step 1.

Above is the screen shot using the command “sudo iptables -A INPUT -p icmp –icmp-type echo-request -j REJECT” that will block all the inbound ICMP packets from the client machine.

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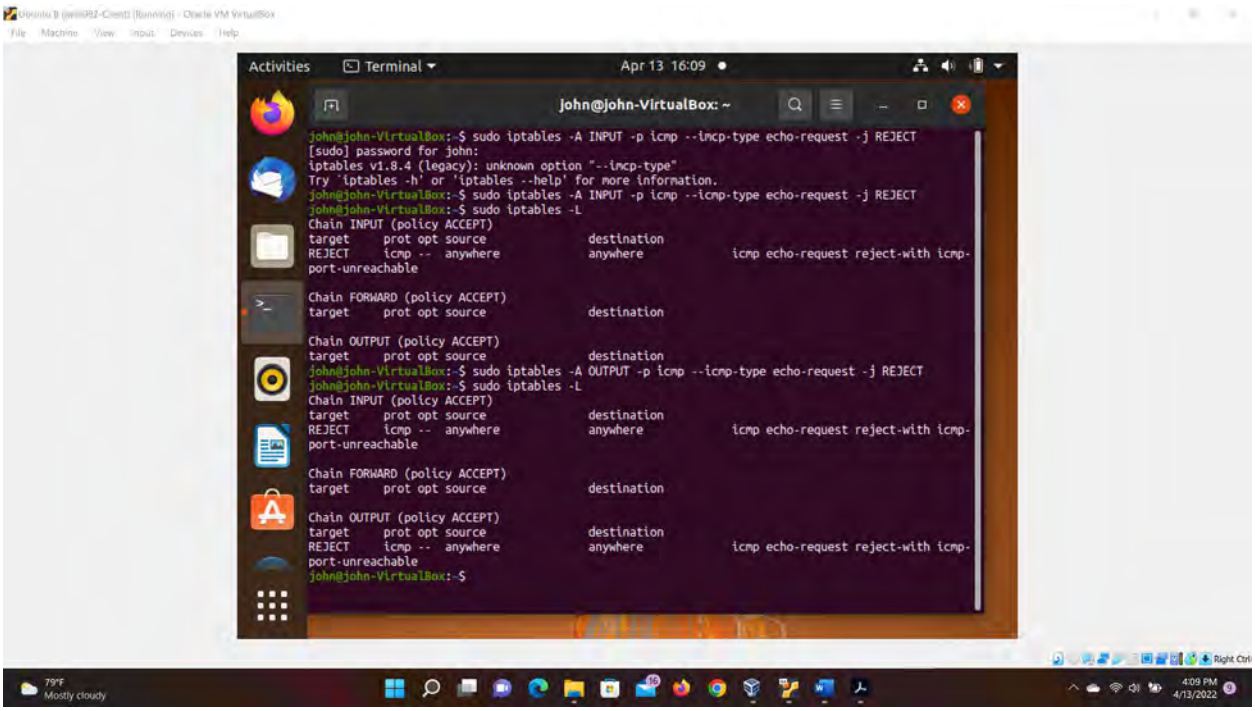
2. Configure the iptables on the gateway Ubuntu to block all the outbound ICMP packets that originated from the gateway Ubuntu itself.



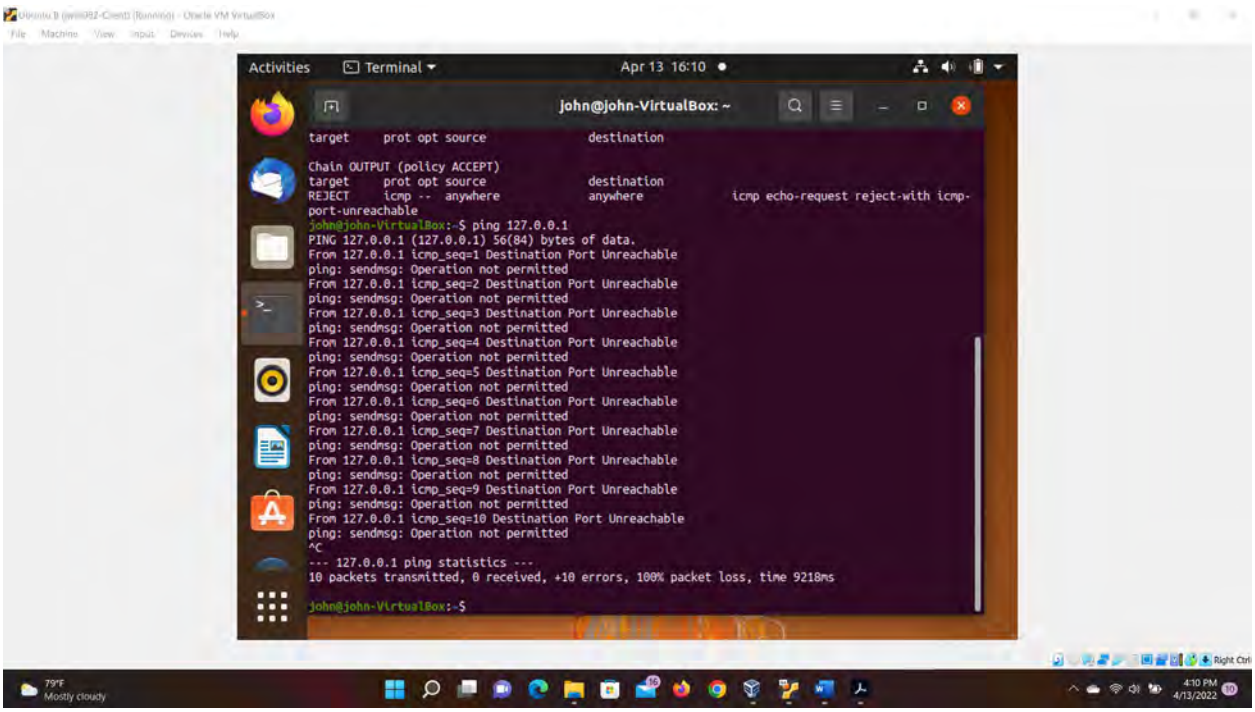


Figure 2 Screenshots of JWILS082 Computer to Step 2.

Above is the screen shot using the command “sudo iptables -A OUTOUT -p icmp –icmp-type echo-request -j REJECT” that will block all the outbound ICMP packets from the client machine.

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I also wanted to make sure that you could not ping a icmp address so checked it by sending a ping to address 127.0.01 and it was denied. So it seems the changes to the iptables worked.

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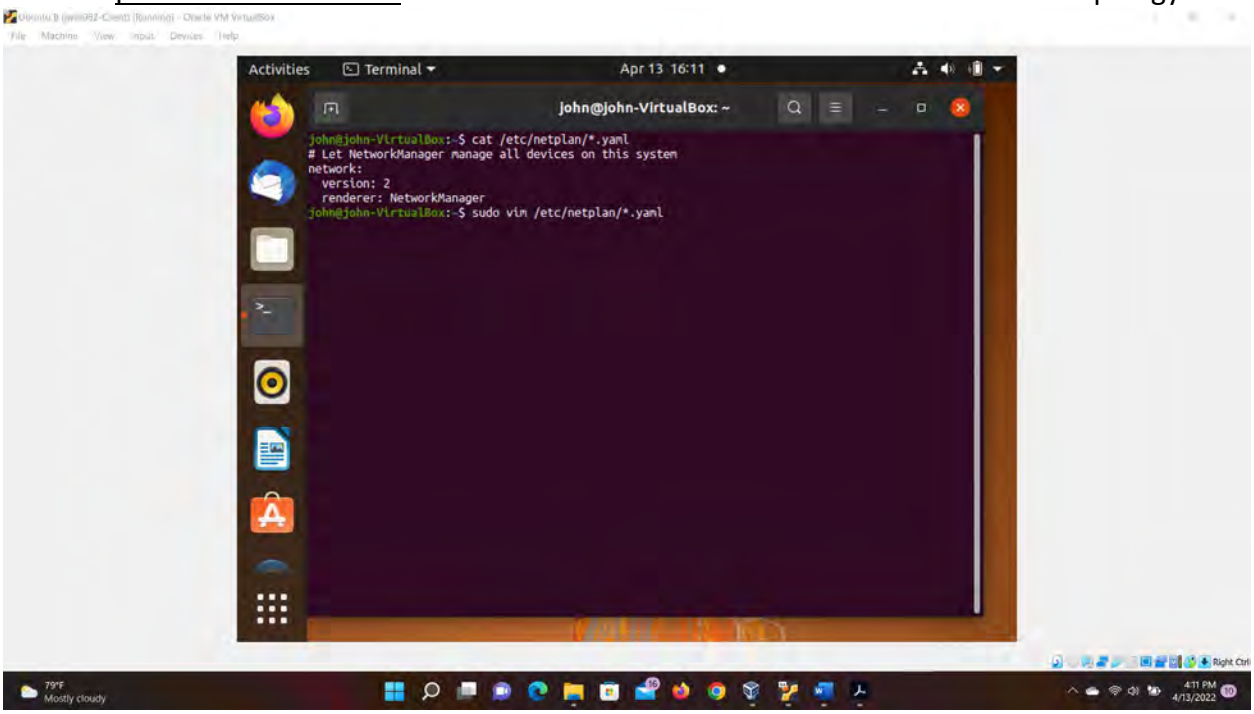
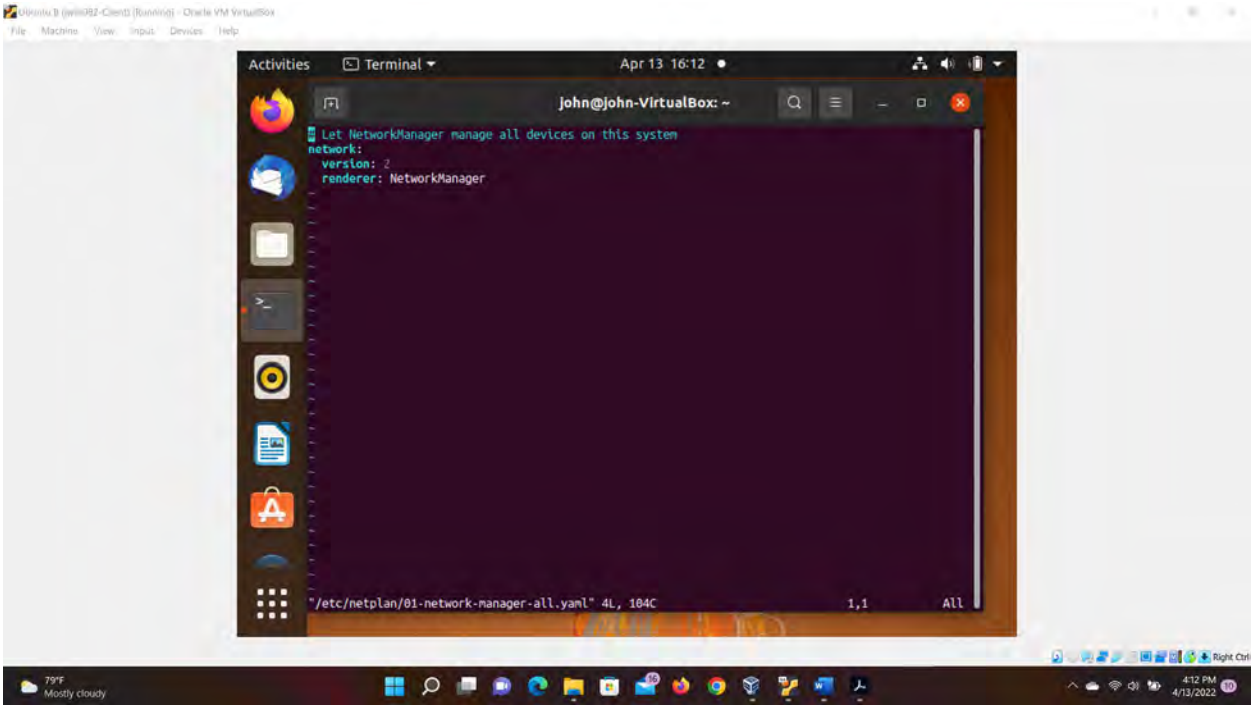
Extra credit:

Set the permanent IP address on the Client Ubuntu based on the above network topology.





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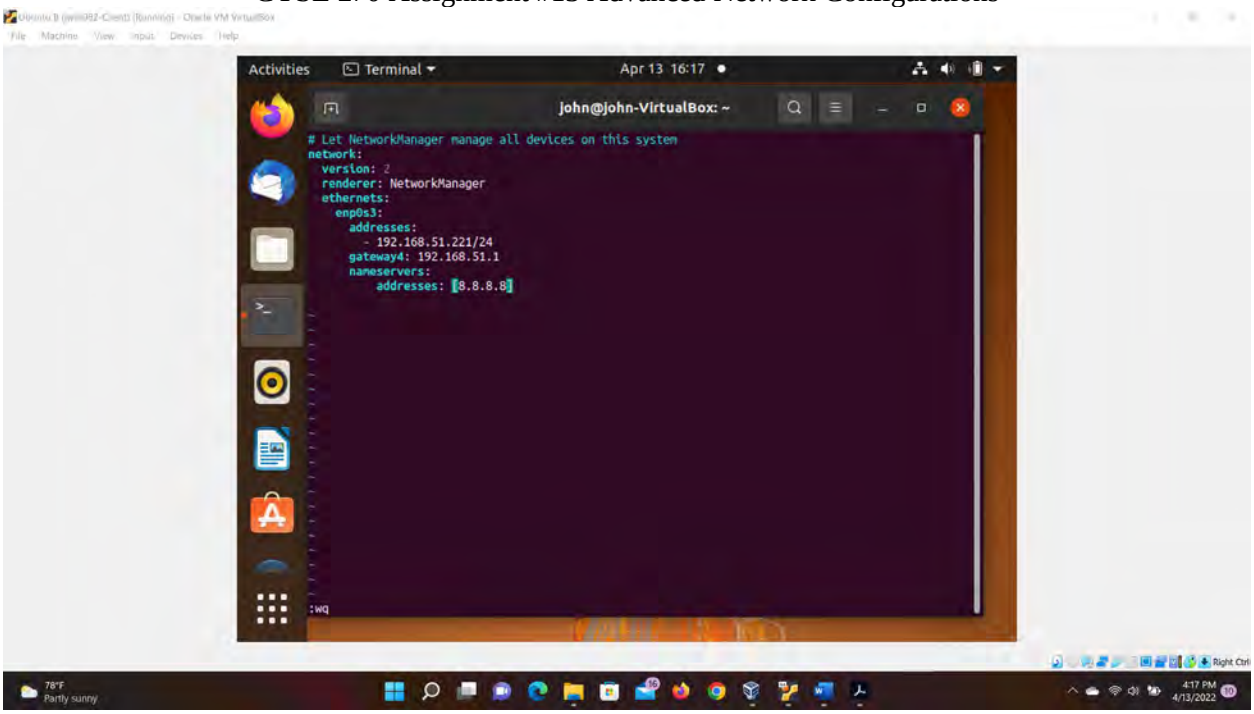

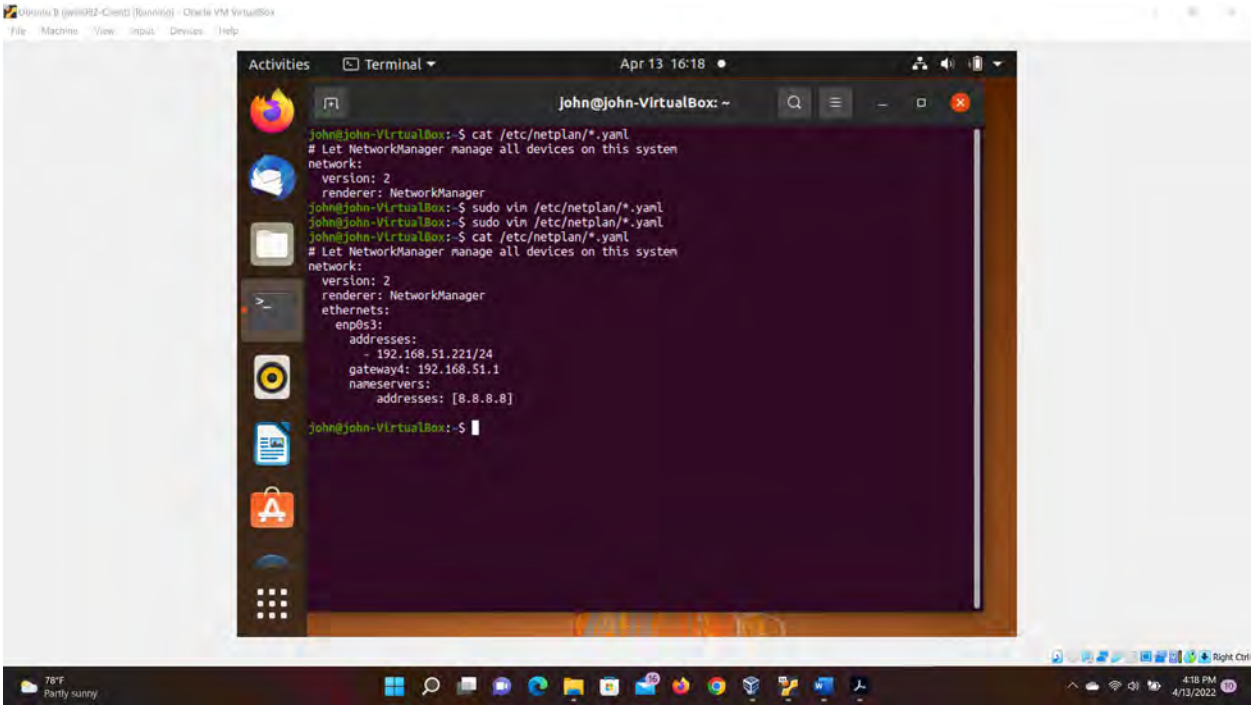

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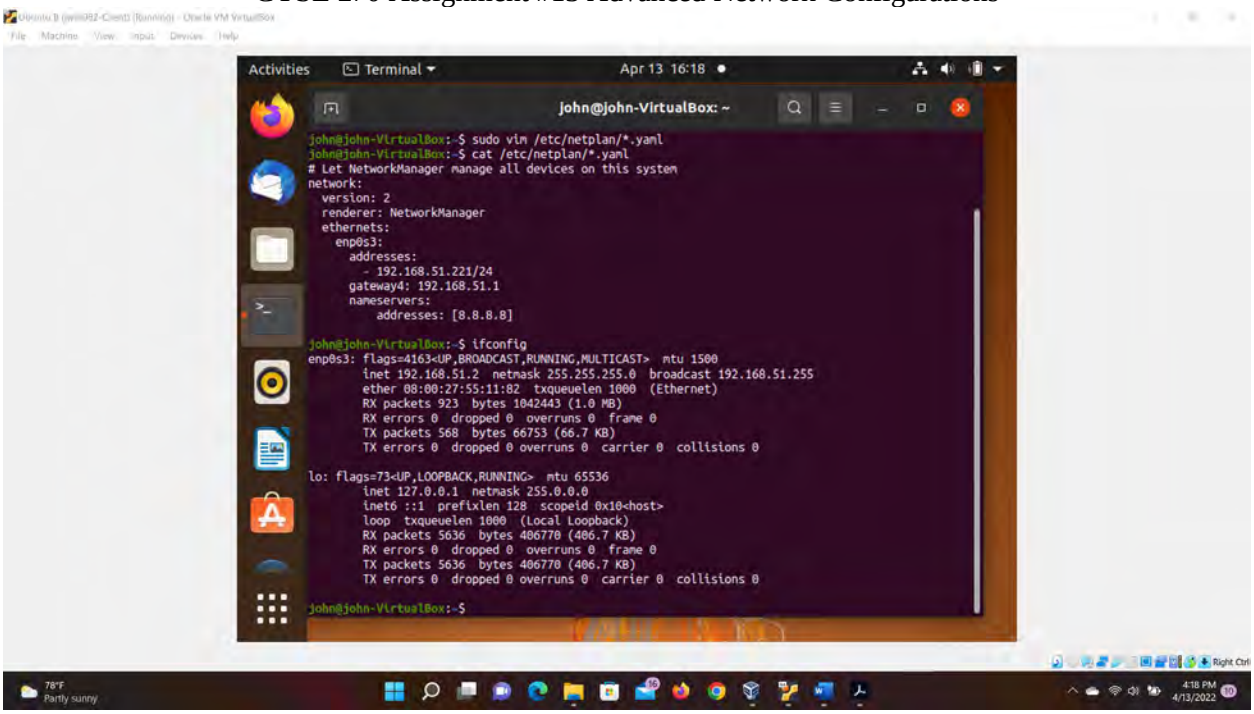

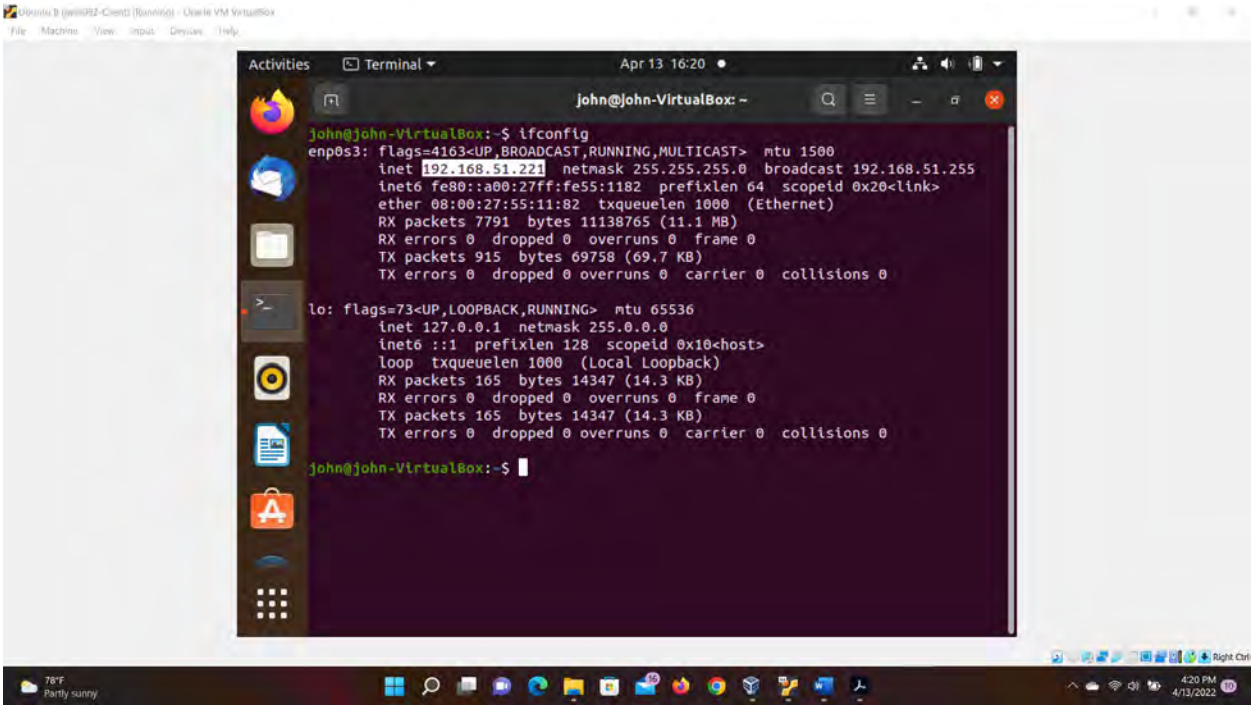

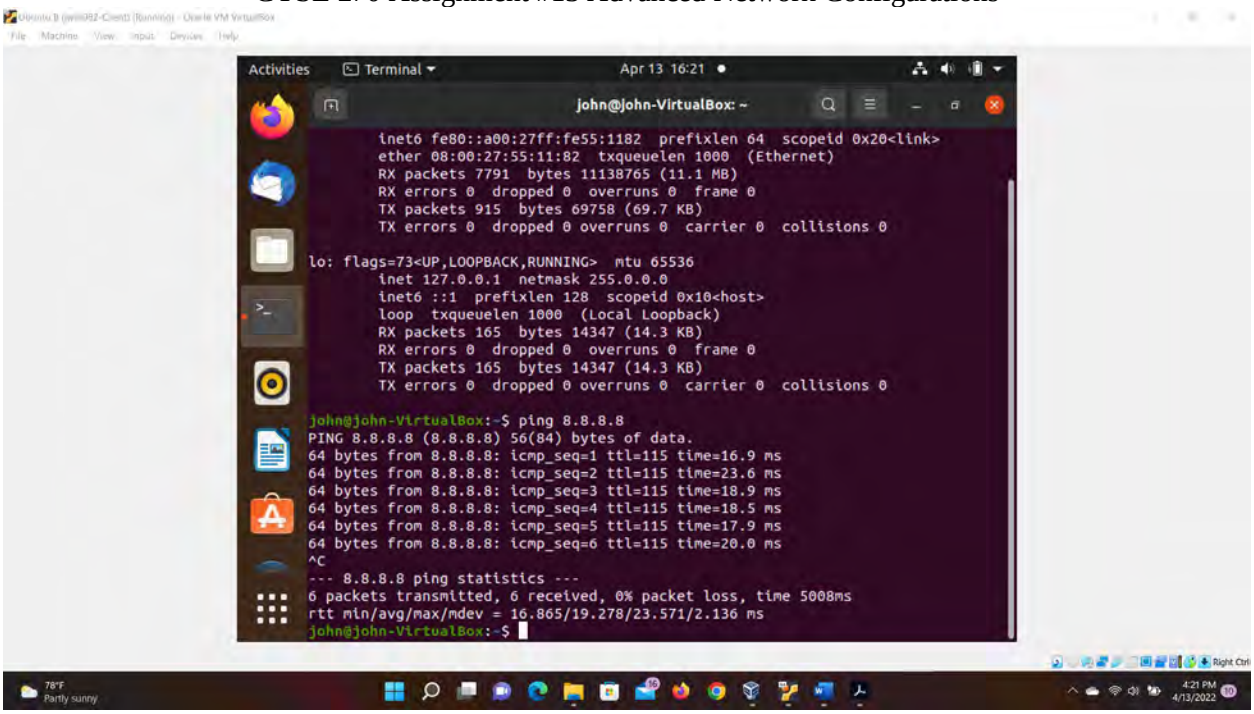

Figure 1 Screenshots of JWILS082 Computer to Step Extra Credit.

Above are the screenshots of changing the ip address from temporary to permant. What I did was look at the file using the command “cat /etc/netplan/*.yaml” to see what was listed as commands or directions. There was a general commands listed with no directions to change the ip address permanetely.

Next I needed to edit the file in VIM by using the commands “sudo vim /etc/netplan/*.yaml”. I added the necessary information saved and exited VIM. The information I entered in to the .yaml file is as follows:

```
network:
  version: 2
  renderer: NetworkManager
  ethernets:
    enp0s3:
      dhcp4: no
      addresses:
        - 192.168.51.221/24
      gateway4: 192.168.151.1
      nameservers:
          addresses: [8.8.8.8]
```

To check that the changes were made I ran ifconfig and found that the former ip address of 192.168.51.2 was still attached to the network. I decided to restart the machine to see if the new ip address would take effect and low-and-behold it did as you can see from thescreenshot.

Just to see if I still had conectivitey I sent a ping to 8.8.8.8 and it seems to work. (well it will until I shut down the gateway machine because I have not set that ip address permanently.

References

15 Useful "ifconfig" Commands to Configure Network in Linux. (n.d.). Www.tecmint.com. https://www.tecmint.com/ifconfig-command-examples/

How to Configure Static IP Address on Ubuntu 20.04. (2020, September 15). Linuxize.com. https://linuxize.com/post/how-to-configure-static-ip-address-on-ubuntu-20-04/

How to block/allow ping using iptables in Ubuntu. (2019, March 13). VITUX. https://vitux.com/how-to-block-allow-ping-using-iptables-in-ubuntu/