

NETW191 Final Course Project

Introduction

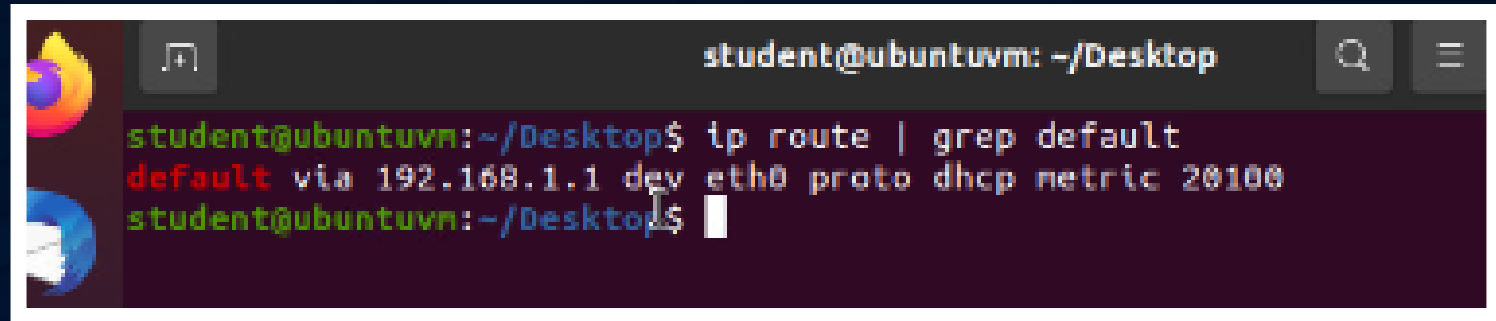
This project covers the fundamentals of networking that plays a vital role in the world of IoT. The design and development process of building a network includes SOHO router configurations, subnetting, connectivity testing, network documentation, and SOHO wireless network security.

Preparation Stage

In the early stages I learned to interact with a virtualized network environment utilizing principles of technology

Preparation

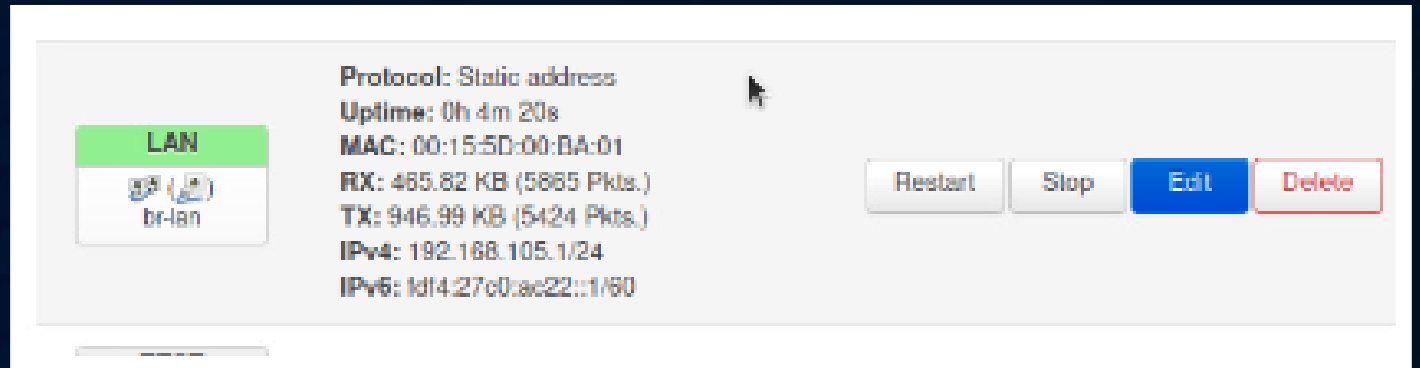
This screenshot includes the terminal window that shows the default gateway IP address.



```
student@ubuntuvm: ~/Desktop
student@ubuntuvm:~/Desktop$ ip route | grep default
default via 192.168.1.1 dev eth0 proto dhcp metric 20100
student@ubuntuvm:~/Desktop$
```

IPv4 Address Assignment

This screenshot includes the *Interfaces* page that shows the new IPv4 address on the LAN interface.

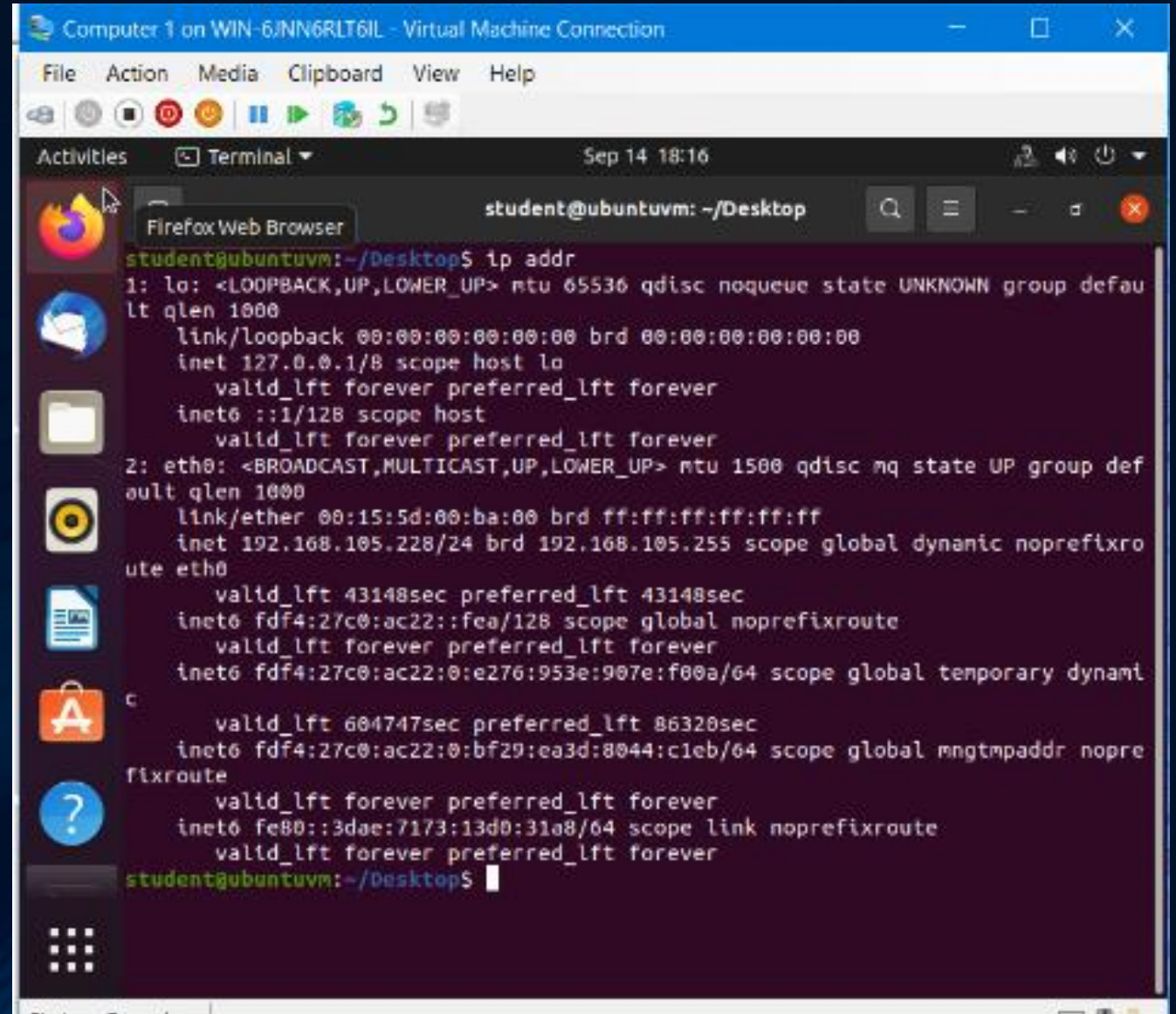


Next Stage

Consisted of setting up and troubleshooting a network

Dynamic IP Address Assignment

This screenshot shows the
IPv4 address of the
Computer 1 VM

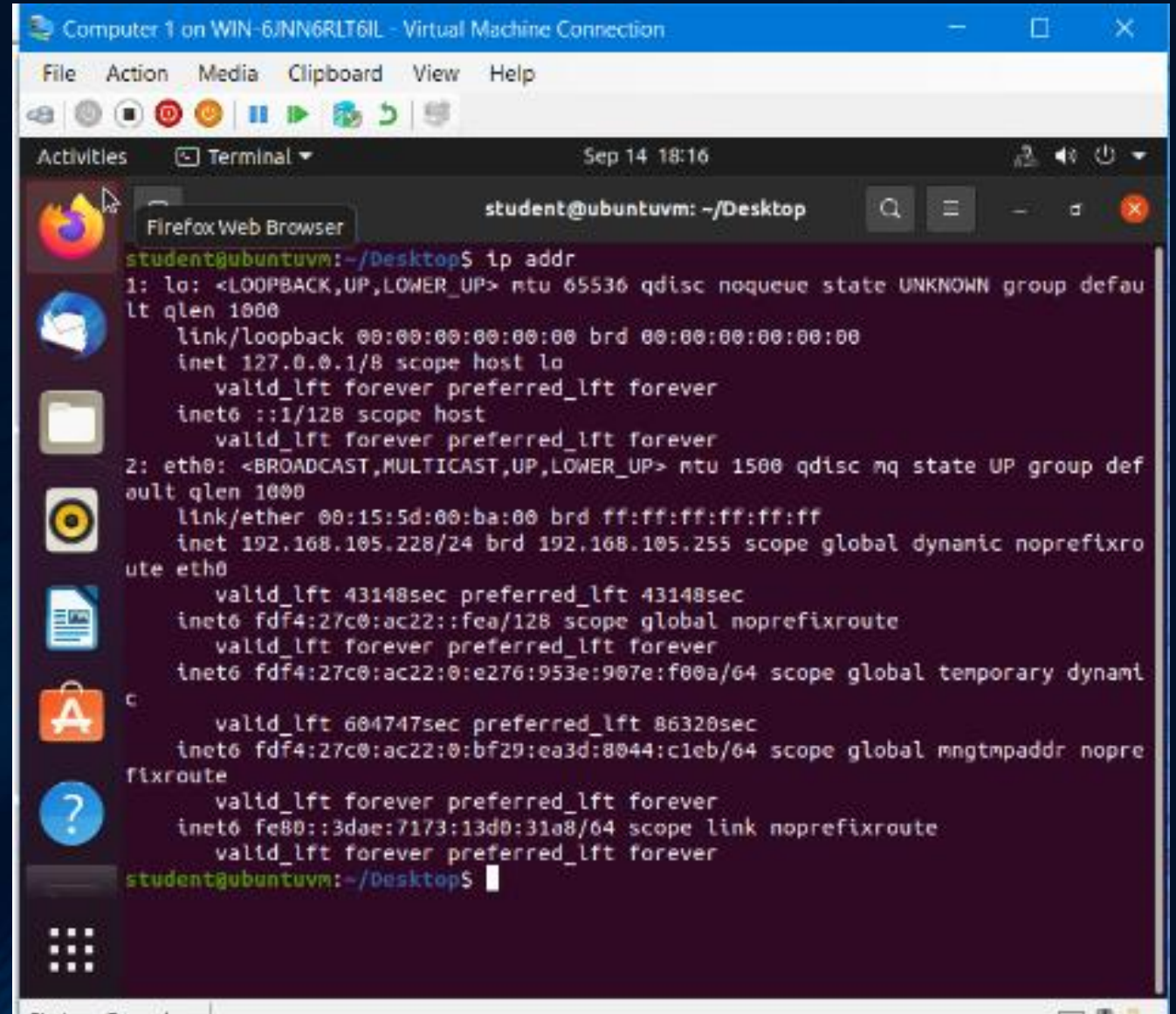


The screenshot shows a terminal window titled "Computer 1 on WIN-6/NN6RLT6IL - Virtual Machine Connection". The terminal displays the output of the command `ip addr` for the user `student@ubuntuvm` in the directory `~/Desktop`. The output shows the configuration for the loopback interface `lo` and the ethernet interface `eth0`.

```
student@ubuntuvm:~/Desktop$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    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: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:15:5d:00:ba:00 brd ff:ff:ff:ff:ff:ff
    inet 192.168.105.228/24 brd 192.168.105.255 scope global dynamic noprefixroute eth0
        valid_lft 43148sec preferred_lft 43148sec
    inet6 fd4:27c0:ac22::fea/128 scope global noprefixroute
        valid_lft forever preferred_lft forever
    inet6 fd4:27c0:ac22::e276:953e:907e:f00a/64 scope global temporary dynamic
        valid_lft 604747sec preferred_lft 86320sec
    inet6 fd4:27c0:ac22::bf29:ea3d:8044:c1eb/64 scope global mngtmpaddr noprefixroute
        valid_lft forever preferred_lft forever
    inet6 fe80::3dae:7173:13d0:31a8/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
student@ubuntuvm:~/Desktop$
```

Dynamic IP Address Assignment

This screenshot shows the
IPv4 address of the
Computer 2 VM.

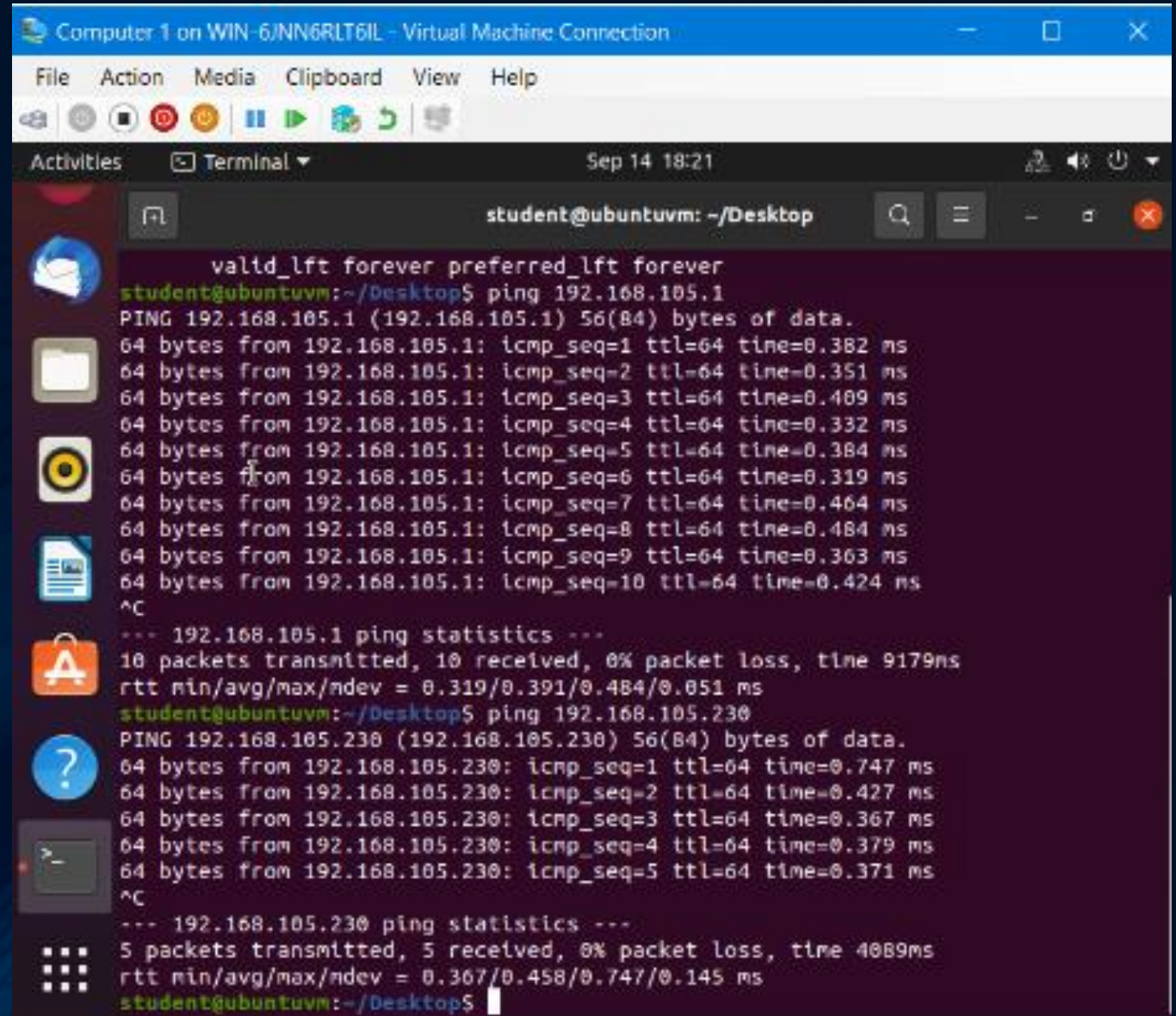


The screenshot shows a terminal window titled "Computer 1 on WIN-6/NN6RLT6IL - Virtual Machine Connection". The terminal displays the output of the command `ip addr` executed by the user `student@ubuntuvm` in the `~/Desktop` directory. The output shows the configuration for the loopback interface `lo` and the Ethernet interface `eth0`. The `eth0` interface is configured with a dynamic IPv4 address `192.168.105.228`.

```
student@ubuntuvm:~/Desktop$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    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: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:15:5d:00:ba:00 brd ff:ff:ff:ff:ff:ff
    inet 192.168.105.228/24 brd 192.168.105.255 scope global dynamic noprefixroute eth0
        valid_lft 43148sec preferred_lft 43148sec
    inet6 fd4:27c0:ac22::fea/128 scope global noprefixroute
        valid_lft forever preferred_lft forever
    inet6 fd4:27c0:ac22::e276:953e:907e:f00a/64 scope global temporary dynamic
        valid_lft 604747sec preferred_lft 86320sec
    inet6 fd4:27c0:ac22::bf29:ea3d:8044:c1eb/64 scope global mngtmpaddr noprefixroute
        valid_lft forever preferred_lft forever
    inet6 fe80::3dae:7173:13d0:31a8/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
student@ubuntuvm:~/Desktop$
```


Connectivity Test

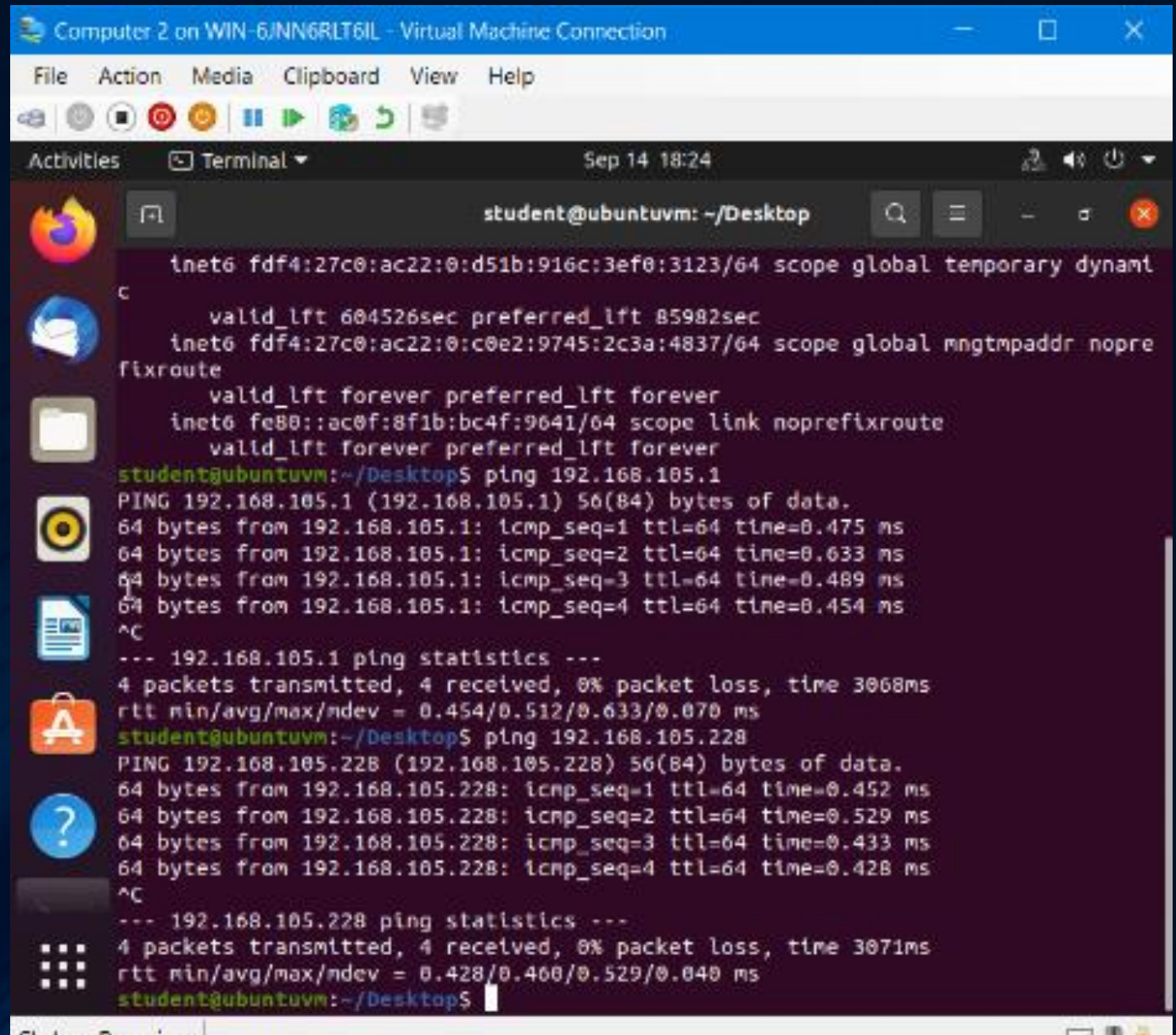
This screenshot shows the connectivity tests between the *Computer 1* VM and the other two devices (i.e., the *SOHO Router* VM and *Computer 2* VM).



```
Computer 1 on WIN-6/NN6RLT6IL - Virtual Machine Connection
File Action Media Clipboard View Help
Activities Terminal Sep 14 18:21
student@ubuntuv: ~/Desktop
valid_lft forever preferred_lft forever
student@ubuntuv:~/Desktop$ ping 192.168.105.1
PING 192.168.105.1 (192.168.105.1) 56(84) bytes of data:
64 bytes from 192.168.105.1: icmp_seq=1 ttl=64 time=0.382 ms
64 bytes from 192.168.105.1: icmp_seq=2 ttl=64 time=0.351 ms
64 bytes from 192.168.105.1: icmp_seq=3 ttl=64 time=0.409 ms
64 bytes from 192.168.105.1: icmp_seq=4 ttl=64 time=0.332 ms
64 bytes from 192.168.105.1: icmp_seq=5 ttl=64 time=0.384 ms
64 bytes from 192.168.105.1: icmp_seq=6 ttl=64 time=0.319 ms
64 bytes from 192.168.105.1: icmp_seq=7 ttl=64 time=0.464 ms
64 bytes from 192.168.105.1: icmp_seq=8 ttl=64 time=0.484 ms
64 bytes from 192.168.105.1: icmp_seq=9 ttl=64 time=0.363 ms
64 bytes from 192.168.105.1: icmp_seq=10 ttl=64 time=0.424 ms
^C
--- 192.168.105.1 ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9179ms
rtt min/avg/max/ndev = 0.319/0.391/0.484/0.051 ms
student@ubuntuv:~/Desktop$ ping 192.168.105.230
PING 192.168.105.230 (192.168.105.230) 56(84) bytes of data:
64 bytes from 192.168.105.230: icmp_seq=1 ttl=64 time=0.747 ms
64 bytes from 192.168.105.230: icmp_seq=2 ttl=64 time=0.427 ms
64 bytes from 192.168.105.230: icmp_seq=3 ttl=64 time=0.367 ms
64 bytes from 192.168.105.230: icmp_seq=4 ttl=64 time=0.379 ms
64 bytes from 192.168.105.230: icmp_seq=5 ttl=64 time=0.371 ms
^C
--- 192.168.105.230 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4089ms
rtt min/avg/max/ndev = 0.367/0.458/0.747/0.145 ms
student@ubuntuv:~/Desktop$
```

Connectivity Test

This screenshot shows the connectivity tests between the *Computer 2* VM and the other two devices (i.e., the *SOHO Router* VM and *Computer 1* VM).



The screenshot shows a terminal window titled "Computer 2 on WIN-6/NN6RLT6IL - Virtual Machine Connection". The terminal displays network configuration for the interface 'eth0' and the results of two ping tests. The first test is to 192.168.105.1, showing 4 successful packets with 0% loss. The second test is to 192.168.105.228, also showing 4 successful packets with 0% loss.

```
Computer 2 on WIN-6/NN6RLT6IL - Virtual Machine Connection
File Action Media Clipboard View Help
Activities Terminal Sep 14 18:24
student@ubuntuvm: ~/Desktop

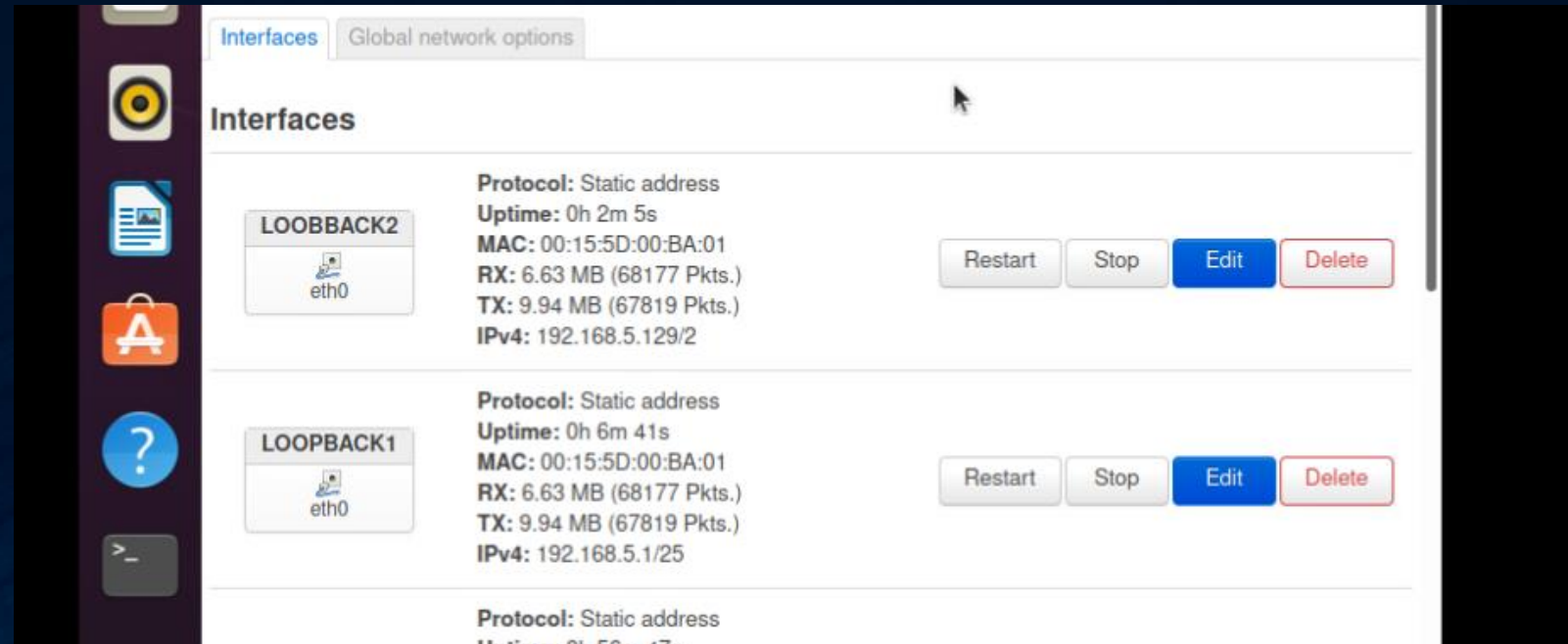
inet6 fdf4:27c0:ac22:0:d51b:916c:3ef0:3123/64 scope global temporary dynami
c
    valid_lft 604526sec preferred_lft 85982sec
inet6 fdf4:27c0:ac22:0:c0e2:9745:2c3a:4837/64 scope global mngtmpaddr nopre
fixroute
    valid_lft forever preferred_lft forever
inet6 fe80::ac0f:8f1b:bc4f:9641/64 scope link noprefixroute
    valid_lft forever preferred_lft forever
student@ubuntuvm:~/Desktop$ ping 192.168.105.1
PING 192.168.105.1 (192.168.105.1) 56(84) bytes of data:
64 bytes from 192.168.105.1: icmp_seq=1 ttl=64 time=0.475 ms
64 bytes from 192.168.105.1: icmp_seq=2 ttl=64 time=0.633 ms
64 bytes from 192.168.105.1: icmp_seq=3 ttl=64 time=0.489 ms
64 bytes from 192.168.105.1: icmp_seq=4 ttl=64 time=0.454 ms
^C
--- 192.168.105.1 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3068ms
rtt min/avg/max/ndev = 0.454/0.512/0.633/0.070 ms
student@ubuntuvm:~/Desktop$ ping 192.168.105.228
PING 192.168.105.228 (192.168.105.228) 56(84) bytes of data:
64 bytes from 192.168.105.228: icmp_seq=1 ttl=64 time=0.452 ms
64 bytes from 192.168.105.228: icmp_seq=2 ttl=64 time=0.529 ms
64 bytes from 192.168.105.228: icmp_seq=3 ttl=64 time=0.433 ms
64 bytes from 192.168.105.228: icmp_seq=4 ttl=64 time=0.428 ms
^C
--- 192.168.105.228 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3071ms
rtt min/avg/max/ndev = 0.428/0.460/0.529/0.040 ms
student@ubuntuvm:~/Desktop$
```


System Testing

In this stage of the project I learned about loopback interfaces and ping testing.

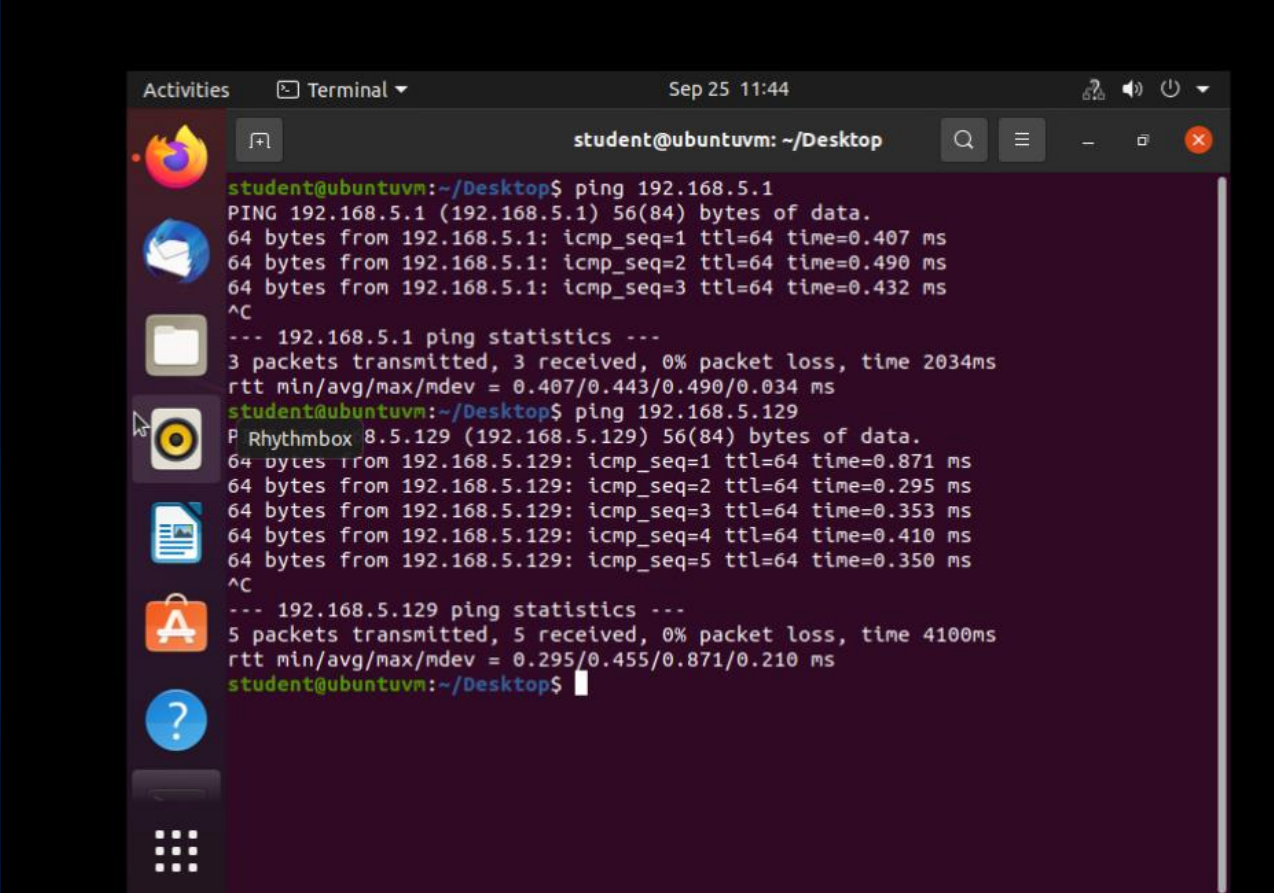
Loopback Interfaces

This screenshot shows both Loopback1 and Loopback2 interfaces and their correct IPv4 addresses.



Connectivity Tests

This screenshot shows two successful ping tests from the *Computer 1* VM to the *Loopback 1* and *Loopback 2* interfaces.

A screenshot of a terminal window titled 'student@ubuntuvm: ~/Desktop' with a timestamp of 'Sep 25 11:44'. The terminal shows two ping commands and their results. The first command is 'ping 192.168.5.1', which returns three successful responses with times around 0.4 ms. The second command is 'ping 192.168.5.129', which returns five successful responses with times around 0.3 to 0.9 ms. Both tests show 0% packet loss. The terminal window has a dark background and a sidebar on the left with various application icons.

```
student@ubuntuvm:~/Desktop$ ping 192.168.5.1
PING 192.168.5.1 (192.168.5.1) 56(84) bytes of data.
64 bytes from 192.168.5.1: icmp_seq=1 ttl=64 time=0.407 ms
64 bytes from 192.168.5.1: icmp_seq=2 ttl=64 time=0.490 ms
64 bytes from 192.168.5.1: icmp_seq=3 ttl=64 time=0.432 ms
^C
--- 192.168.5.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2034ms
rtt min/avg/max/mdev = 0.407/0.443/0.490/0.034 ms
student@ubuntuvm:~/Desktop$ ping 192.168.5.129
P Rhythmbox 8.5.129 (192.168.5.129) 56(84) bytes of data.
64 bytes from 192.168.5.129: icmp_seq=1 ttl=64 time=0.871 ms
64 bytes from 192.168.5.129: icmp_seq=2 ttl=64 time=0.295 ms
64 bytes from 192.168.5.129: icmp_seq=3 ttl=64 time=0.353 ms
64 bytes from 192.168.5.129: icmp_seq=4 ttl=64 time=0.410 ms
64 bytes from 192.168.5.129: icmp_seq=5 ttl=64 time=0.350 ms
^C
--- 192.168.5.129 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4100ms
rtt min/avg/max/mdev = 0.295/0.455/0.871/0.210 ms
student@ubuntuvm:~/Desktop$
```

Subnetting & SOHO

- Identifying and Analyzing unknown problems utilizing mathematical and scientific methods
- SOHO quiz

Subnetting Table

This table includes two /25 subnets, listing the subnet notation, network address, first usable host address, last usable host address, and broadcast address of each subnet.

| Subnet | Subnet Notation | Network Address | First Usable Host Address | Last Useable Host Address | Broadcast Address |
|-------------------|---------------------------|-----------------|---------------------------|---------------------------|----------------------|
| The First Subnet | 255.255.255.128/25 | 192.168.5.0 | 192.168.5.1 | 192.168.5.126 | 192.168.5.255 |
| The Second Subnet | 192.168.5.127/25 | 192.168.5.128 | 192.168.5.129 | 192.168.5.254 | 192.168.5.255 |

SOHO Wireless Network Security

1. What are the factory default username and password of a TP-Link router? Why is it important to change the default username and password of a SOHO router?

Answer: admin for both username and password , and would change these for security reasons.

2. To protect a SOHO wireless network with a small number of devices, which address management method provides more control, configuring the device IP addresses manually (static IP) or using a DHCP server (dynamic IP)? Why?

Answer: There are still security concerns with both but DHCP seems to be the better option, with the IP address because the change with each session or login.

3. What does MAC filtering do? If needed, when would you use deny filtering rules and when would you use allow filtering rules? What happens to devices that want to connect, if the “Allow the stations specified by any enabled entries in the list to access” function is enabled but there are no entries in the list?

Answer: MAC address filtering allows you to block traffic coming from certain known machines or devices.

You deny filtering rules if you wanted to prevent unwanted access and allow would only let certain people access the network.

The devices wont be able to connect, MAC filtering policy doesn't override firewall rule that directs incoming traffic to a host

SOHO Wireless Network Security

1. What wireless security settings are displayed on the Wireless Security page? Which one is recommended by the vendor? Why?

Answer: WPA/WPA2, for network security

2. Among the configurations you explored in this module, which one is a true security function? Why?

Answer: WPA2/WPA2 because it ensures data sent or received over your wireless network is encrypted

3. What would you do to protect your wireless network at home? Why?

Answer: Make sure my network is using WPA2.

References

1.brain

2.https://www.cisco.com/assets/sol/sb/RV18oW_Emulators/RV18oW_Emulator_v1.0.3.14/help/en_US/firewall11.htm

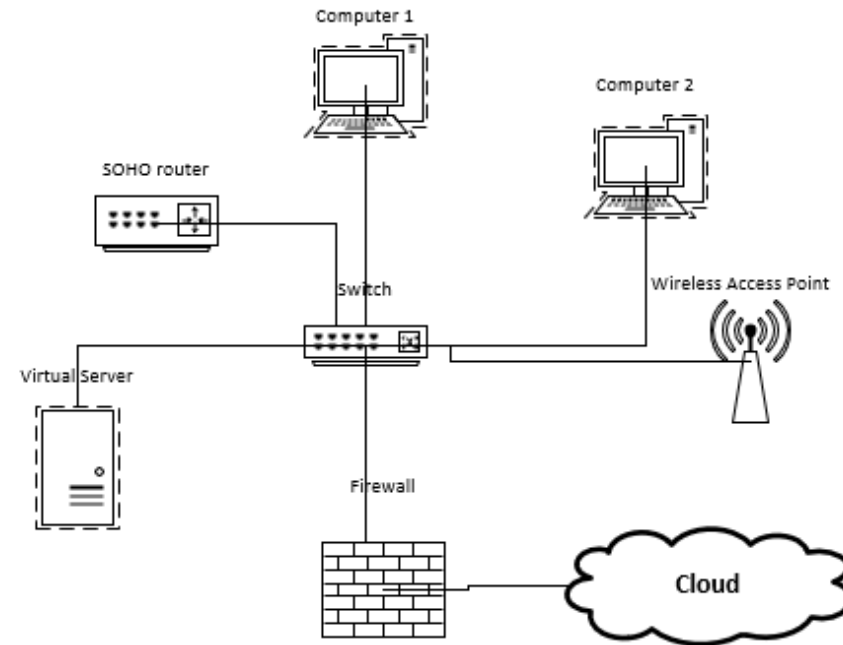
3. https://emulator.tp-link.com/go2AC_US_Emulator/Emulator_Router/index.htm

Microsoft Visio Network Diagram

Creating my own Microsoft Visio network diagram

Microsoft Visio Network Diagram

This diagram illustrates the interconnection of the *Computer 1* VM, the *Computer 2* VM, and the *SOHO Router* VM.



Challenges

Ran into issues with subnetting, had trouble understanding it.

Career skills obtained

- Creating and troubleshooting a network
- Identifying unknown problems utilizing mathematical and scientific methods
- Professional communication amongst peers and superiors

Conclusion

- This project encompasses the many areas of Networking and virtual environments
- Will help prepare me for this emerging industry with lots of exciting prospects