

# Network 191 Final Course Project

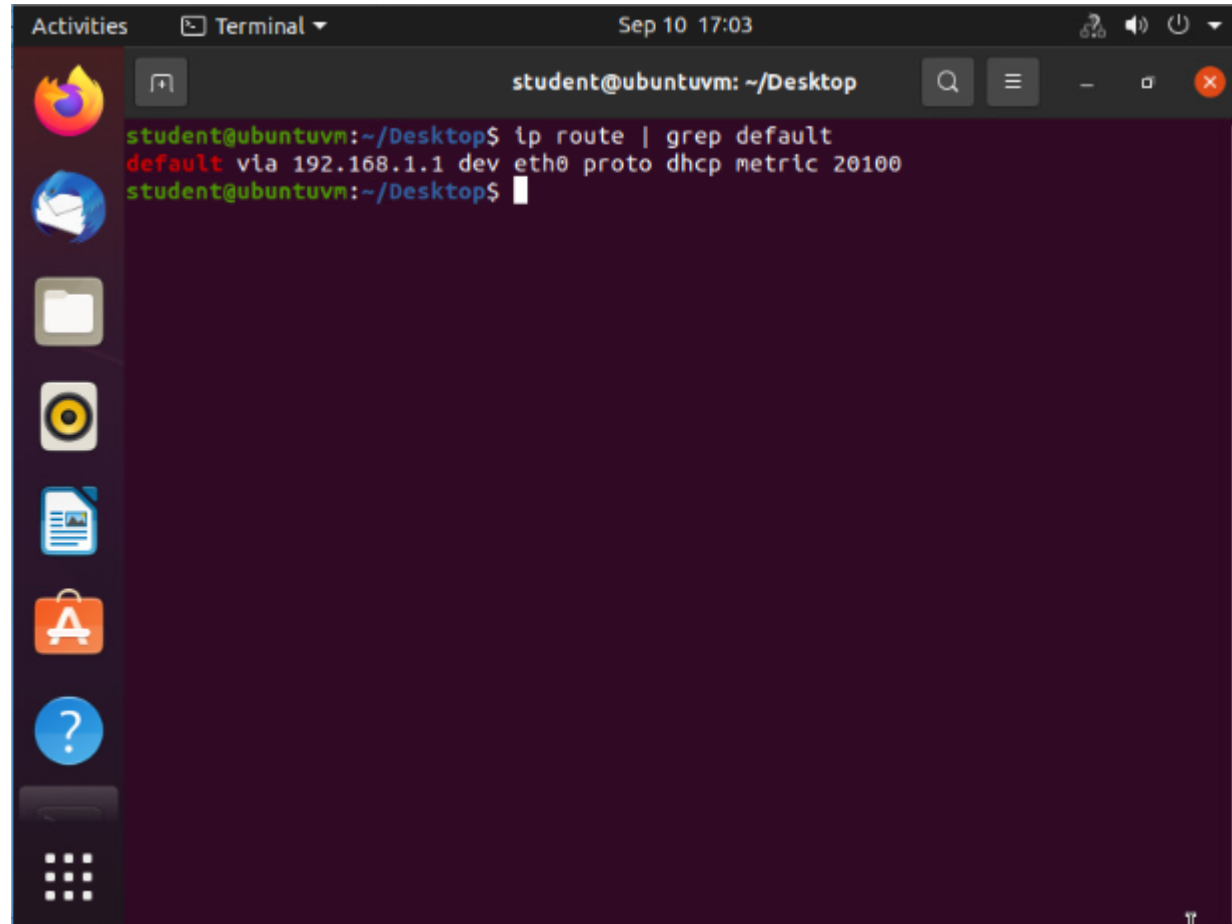
Thomas Race

# Final project objective:

- I'm presenting this project to showcase my accomplishments in this course.
- I've learned about creating networks using Cisco Packet Tracer tool.
- I've learned about creating network diagrams using Microsoft Visio.

# Preparation

This screenshot should include 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

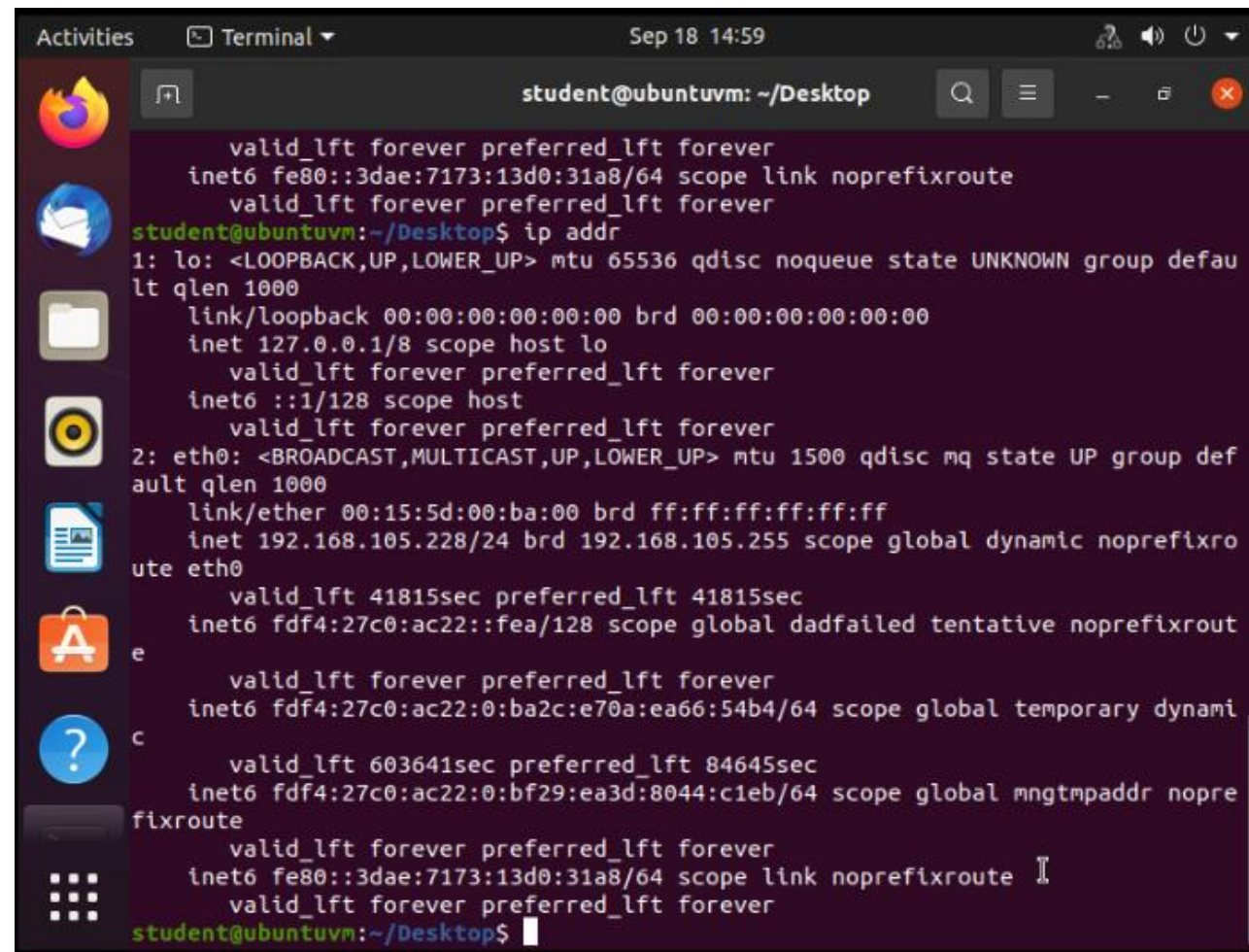
This screenshot should include the *Interfaces* page that shows the new IPv4 address on the LAN interface.

The screenshot displays the OpenWrt LuCI web interface for network configuration. The browser address bar shows the URL `192.168.105.1/cgi-bin/luci/admin/network/network`. The page title is "Interfaces" and it includes a "REFRESHING" indicator. The main content area lists several network interfaces:

Interface	Protocol	Uptime	RX	TX	IPv4	IPv6	Actions
LAN (br-lan)	Static address	0h 5m 54s	624.25 KB (7638 Pkts.)	1.14 MB (7233 Pkts.)	192.168.105.1/24	fdf4:27c0:ac22::1/60	Restart, Stop, Edit, Delete
TEST (Alias of "lan")	Alias Interface (Static address)	0h 5m 54s			192.168.100.1/24		Restart, Stop, Edit, Delete
WAN (eth1)	DHCP client		0 B (0 Pkts.)	0 B (0 Pkts.)			Restart, Stop, Edit, Delete
WAN6	DHCPv6 client						

# Dynamic IP Address Assignment

This screenshot should show the IPv4 address of the *Computer 1* VM.

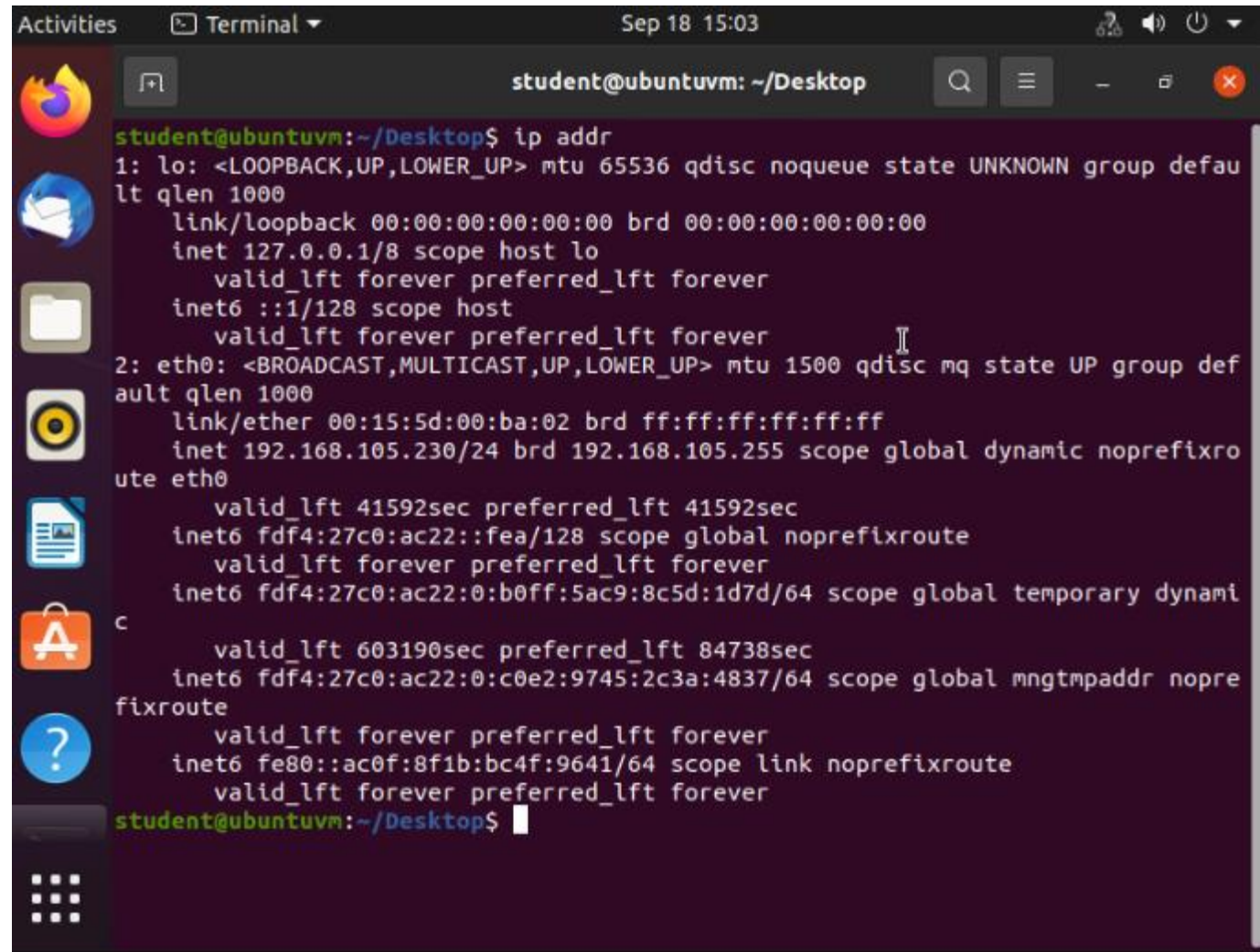


```
Activities Terminal Sep 18 14:59
student@ubuntuvm: ~/Desktop
valid_lft forever preferred_lft forever
inet6 fe80::3dae:7173:13d0:31a8/64 scope link noprefixroute
valid_lft forever preferred_lft forever
student@ubuntuvm:~/Desktop$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state 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 41815sec preferred_lft 41815sec
    inet6 fdf4:27c0:ac22::fea/128 scope global dadfailed tentative noprefixroute
        valid_lft forever preferred_lft forever
    inet6 fdf4:27c0:ac22:0:ba2c:e70a:ea66:54b4/64 scope global temporary dynamic
        valid_lft 603641sec preferred_lft 84645sec
    inet6 fdf4:27c0:ac22:0:bf29:ea3d:8044:c1eb/64 scope global mngtppaddr 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$
```

`inet 192.168.105.228/24 brd 192.168.105.255`

# Dynamic IP Address Assignment

This screenshot should show the IPv4 address of the *Computer 2* VM.



```
student@ubuntuv: ~/Desktop
student@ubuntuv:~/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:02 brd ff:ff:ff:ff:ff:ff
    inet 192.168.105.230/24 brd 192.168.105.255 scope global dynamic noprefixroute eth0
        valid_lft 41592sec preferred_lft 41592sec
    inet6 fdf4:27c0:ac22::fea/128 scope global noprefixroute
        valid_lft forever preferred_lft forever
    inet6 fdf4:27c0:ac22:0:b0ff:5ac9:8c5d:1d7d/64 scope global temporary dynamic
        valid_lft 603190sec preferred_lft 84738sec
    inet6 fdf4:27c0:ac22:0:c0e2:9745:2c3a:4837/64 scope global mngtmpaddr noprefixroute
        valid_lft forever preferred_lft forever
    inet6 fe80::ac0f:8f1b:bc4f:9641/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
student@ubuntuv:~/Desktop$
```

`inet 192.168.105.230/24 brd 192.168.105.255`

# Connectivity Test

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

```
student@ubuntuvvm:~/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=0.431 ms
64 bytes from 192.168.105.1: icmp_seq=2 ttl=64 time=0.380 ms
64 bytes from 192.168.105.1: icmp_seq=3 ttl=64 time=0.368 ms
64 bytes from 192.168.105.1: icmp_seq=4 ttl=64 time=0.356 ms
64 bytes from 192.168.105.1: icmp_seq=5 ttl=64 time=0.330 ms
^C
--- 192.168.105.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4103ms
rtt min/avg/max/mdev = 0.330/0.373/0.431/0.033 ms
student@ubuntuvvm:~/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=0.745 ms
64 bytes from 192.168.105.230: icmp_seq=2 ttl=64 time=0.385 ms
64 bytes from 192.168.105.230: icmp_seq=3 ttl=64 time=0.432 ms
64 bytes from 192.168.105.230: icmp_seq=4 ttl=64 time=0.396 ms
64 bytes from 192.168.105.230: icmp_seq=5 ttl=64 time=0.383 ms
^C
--- 192.168.105.230 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4075ms
rtt min/avg/max/mdev = 0.383/0.468/0.745/0.139 ms
student@ubuntuvvm:~/Desktop$ ^C
student@ubuntuvvm:~/Desktop$
```

# Connectivity Test

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

```
student@ubuntuvn:~/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=0.327 ms
64 bytes from 192.168.105.1: icmp_seq=2 ttl=64 time=0.312 ms
64 bytes from 192.168.105.1: icmp_seq=3 ttl=64 time=0.349 ms
64 bytes from 192.168.105.1: icmp_seq=4 ttl=64 time=0.350 ms
64 bytes from 192.168.105.1: icmp_seq=5 ttl=64 time=0.354 ms
^C
--- 192.168.105.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4104ms
rtt min/avg/max/mdev = 0.312/0.338/0.354/0.016 ms
student@ubuntuvn:~/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=0.410 ms
64 bytes from 192.168.105.228: icmp_seq=2 ttl=64 time=0.404 ms
64 bytes from 192.168.105.228: icmp_seq=3 ttl=64 time=0.382 ms
64 bytes from 192.168.105.228: icmp_seq=4 ttl=64 time=0.382 ms
64 bytes from 192.168.105.228: icmp_seq=5 ttl=64 time=0.407 ms
^C
--- 192.168.105.228 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4104ms
rtt min/avg/max/mdev = 0.382/0.397/0.410/0.012 ms
```



# Subnetting Table




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

	Subnet ID	Network Mask (/prefix)	Network Mask (Dotted decimal)	Network Address	First Usable Host Address	Last Useable Host Address	Broadcast Address
The First Subnet	0	/25	<b>255.255.255.128</b>	192.168.5.1	192.168.5.1	<b>192.168.1.127</b>	192.168.5.127
The Second Subnet	1	<b>/25</b>	255.255.255.128	<b>192.168.5.129</b>	192.168.5.129	192.168.5.254	<b>192.168.5.255</b>

# Loopback Interfaces

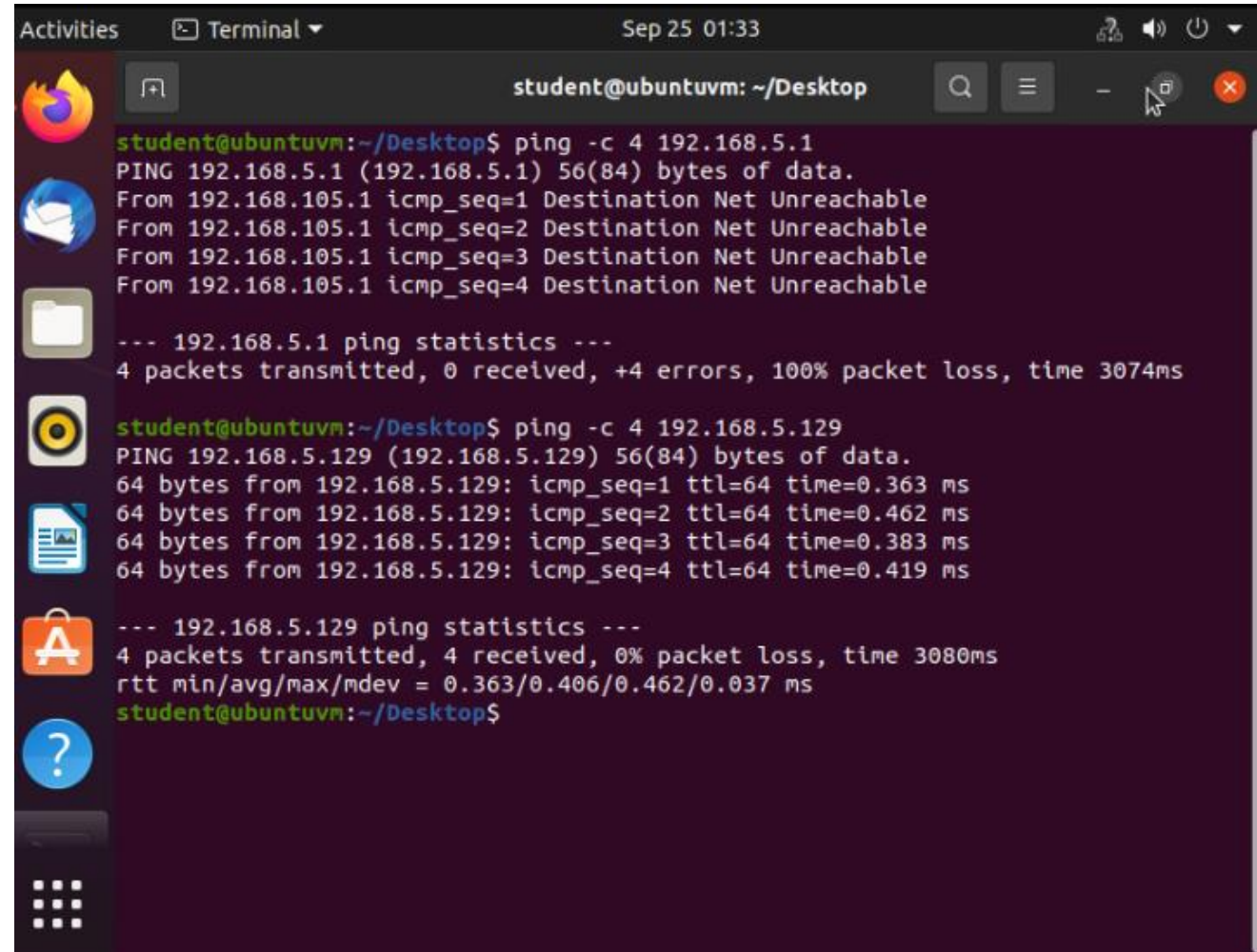
This screenshot should show both Loopback1 and Loopback2 interfaces and their correct IPv4 addresses.

## Interfaces

<b>LOOPBACK1</b>  eth0	<b>Protocol:</b> Static address <b>Uptime:</b> 0h 8m 25s <b>MAC:</b> 00:15:5D:00:BA:01 <b>RX:</b> 10.67 MB (113209 Pkts.) <b>TX:</b> 11.74 MB (109147 Pkts.) <b>IPv4:</b> 102.168.5.1/25	<input type="button" value="Restart"/> <input type="button" value="Stop"/>
<b>LOOPBACK2</b>  eth0	<b>Protocol:</b> Static address <b>Uptime:</b> 0h 0m 49s <b>MAC:</b> 00:15:5D:00:BA:01 <b>RX:</b> 10.67 MB (113209 Pkts.) <b>TX:</b> 11.74 MB (109147 Pkts.) <b>IPv4:</b> 192.168.5.129/25	<input type="button" value="Restart"/> <input type="button" value="Stop"/>
<b>LAN</b>  br-lan	<b>Protocol:</b> Static address <b>Uptime:</b> 1h 2m 37s <b>MAC:</b> 00:15:5D:00:BA:01 <b>RX:</b> 9.09 MB (113188 Pkts.) <b>TX:</b> 11.74 MB (109140 Pkts.)	<input type="button" value="Restart"/> <input type="button" value="Stop"/>

# Connectivity Tests

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



```
Activities Terminal Sep 25 01:33
student@ubuntuv: ~/Desktop
student@ubuntuv:~/Desktop$ ping -c 4 192.168.5.1
PING 192.168.5.1 (192.168.5.1) 56(84) bytes of data.
From 192.168.105.1 icmp_seq=1 Destination Net Unreachable
From 192.168.105.1 icmp_seq=2 Destination Net Unreachable
From 192.168.105.1 icmp_seq=3 Destination Net Unreachable
From 192.168.105.1 icmp_seq=4 Destination Net Unreachable

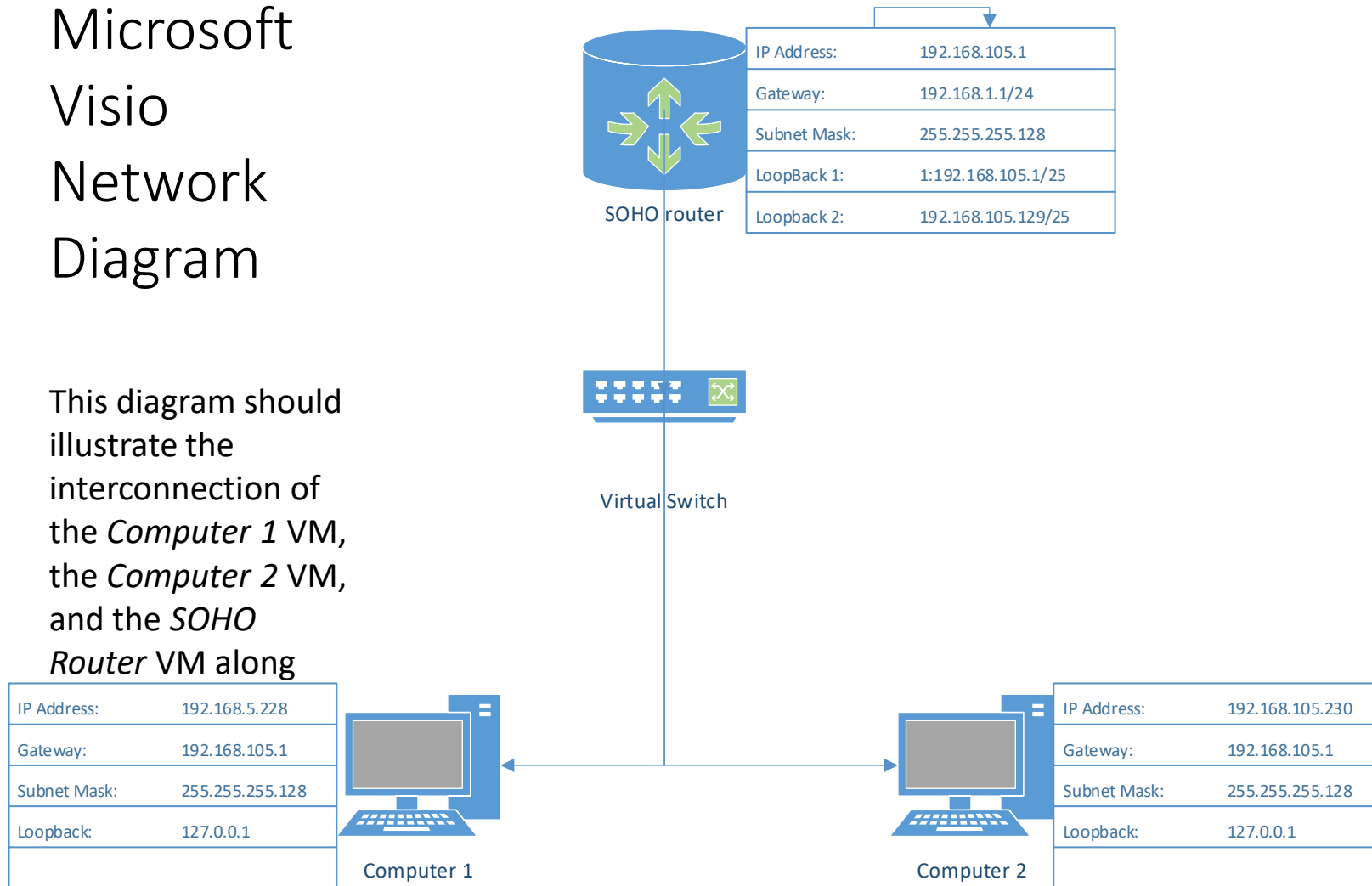
--- 192.168.5.1 ping statistics ---
4 packets transmitted, 0 received, +4 errors, 100% packet loss, time 3074ms

student@ubuntuv:~/Desktop$ ping -c 4 192.168.5.129
PING 192.168.5.129 (192.168.5.129) 56(84) bytes of data.
64 bytes from 192.168.5.129: icmp_seq=1 ttl=64 time=0.363 ms
64 bytes from 192.168.5.129: icmp_seq=2 ttl=64 time=0.462 ms
64 bytes from 192.168.5.129: icmp_seq=3 ttl=64 time=0.383 ms
64 bytes from 192.168.5.129: icmp_seq=4 ttl=64 time=0.419 ms

--- 192.168.5.129 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3080ms
rtt min/avg/max/mdev = 0.363/0.406/0.462/0.037 ms
student@ubuntuv:~/Desktop$
```

# Microsoft Visio Network Diagram

This diagram should illustrate the interconnection of the *Computer 1* VM, the *Computer 2* VM, and the *SOHO Router* VM along



# 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, admin.

It is important to change the default password because malicious individuals will use automation or intuition to guess passwords. If they can compromise your router, they would be in complete control of your network traffic.

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:** More control – Static IPs, in theory, you could set a small subnet or a small address pool, and occupy all addresses, then you would see errors if a device was added which were manually set to occupy an already assigned address. DHCP with MAC filtering would be acceptable, however, mac addresses are trivial to spoof, especially for an attacker.

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 filtering prevents or permits devices with specified MAC addresses to communicate. If I were to consider setting up rules based on MAC filtering, they would be based on the devices purpose, for example, a voip phone should not be requesting google.com. I would deny devices with a voip OUI from utilizing HTTP or HTTPS. If there are no entries, then the request should be denied.

# 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:** It is strongly recommended to enable wireless security and select WPA2-PSK AES encryption for network security.

This is a mathematically difficult-to-break encryption, the other options can be broken with less computational effort from an attacker.

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

**Answer:** All of the configurations in this module true security functions; however, many are relatively inexpensive to bypass or exploit. Static IPs with WPA2-PSK AES and MAC filtering would create a great deal of opportunity for a defender to identify an active attack.

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

**Answer:** I use whatever my ISP configuration is, shipped. I do this because I keep my personal computer secure. I entirely manage this based on good habits. I don't install random software; I keep my software updated and focus on my habits. Due to private addressing on my network, it is exceedingly difficult for an attacker to make progress from the internet. If an attacker wanted to make any progress attacking my equipment, they would need physical access to my home or my housemate's computers. I expect my housemate's computers to be malicious so I treat my home network like its dangerous.

# Challenges

- This semester, I faced dealing with my son getting pretty sick, his mom getting sick, me getting laid off, and then finding a new job with entirely new responsibilities and potentially another new role in the very near future.
- This class presented a unique challenge; I've taken the same class in the past, the equivalent CompTIA Network+ certification course, and I'd discovered that a lot has changed, forcing me to let go of my assumptions early on.
- I found that our instructors are quite good at what they do, and have developed a course that is challenging but not insurmountable.

# Career Skills

- The new skill I appreciate immediately is advancing my knowledge in Microsoft Visio, I'd had limited experience with it as a process flow tool and understood that it was helpful, but in this course, I learned about plugins or icon packages and other features I was not aware of which will be helpful for a lot in the future.
- More experience with the Cisco Packet Tracer tool. I have used this in the past when it was freely available and had found it neat at that time, but since it has grown exponentially in ways I never would have imagined. I look forward to using it again soon.
- I will be using some of the learned skills in my new role, where I will be helping to deploy about 600 Cisco switches and assisting with configuration and testing.



# Conclusion

- In this course, I learned a lot, I've worked in networking and in technical roles for over 20 years and still I found this class to be very challenging and quite valuable. I am very grateful to the passionate instructors at DeVry University for sharing their expertise.
- I will immediately be using this in my career and look forward to seeing how it helps me in the future.