

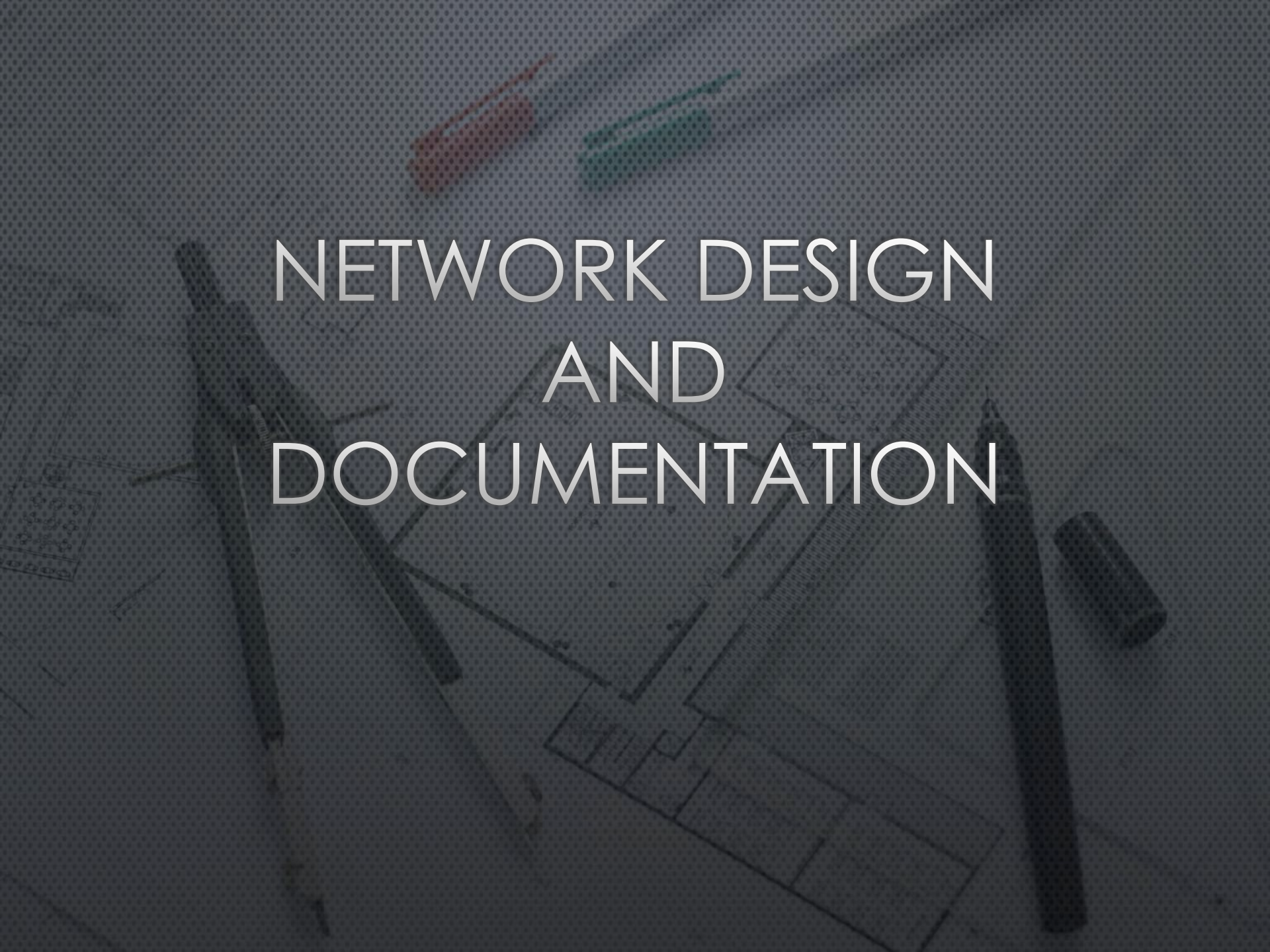
NETW191 FINAL PROJECT

PROFESSOR: NABEEL BAIG

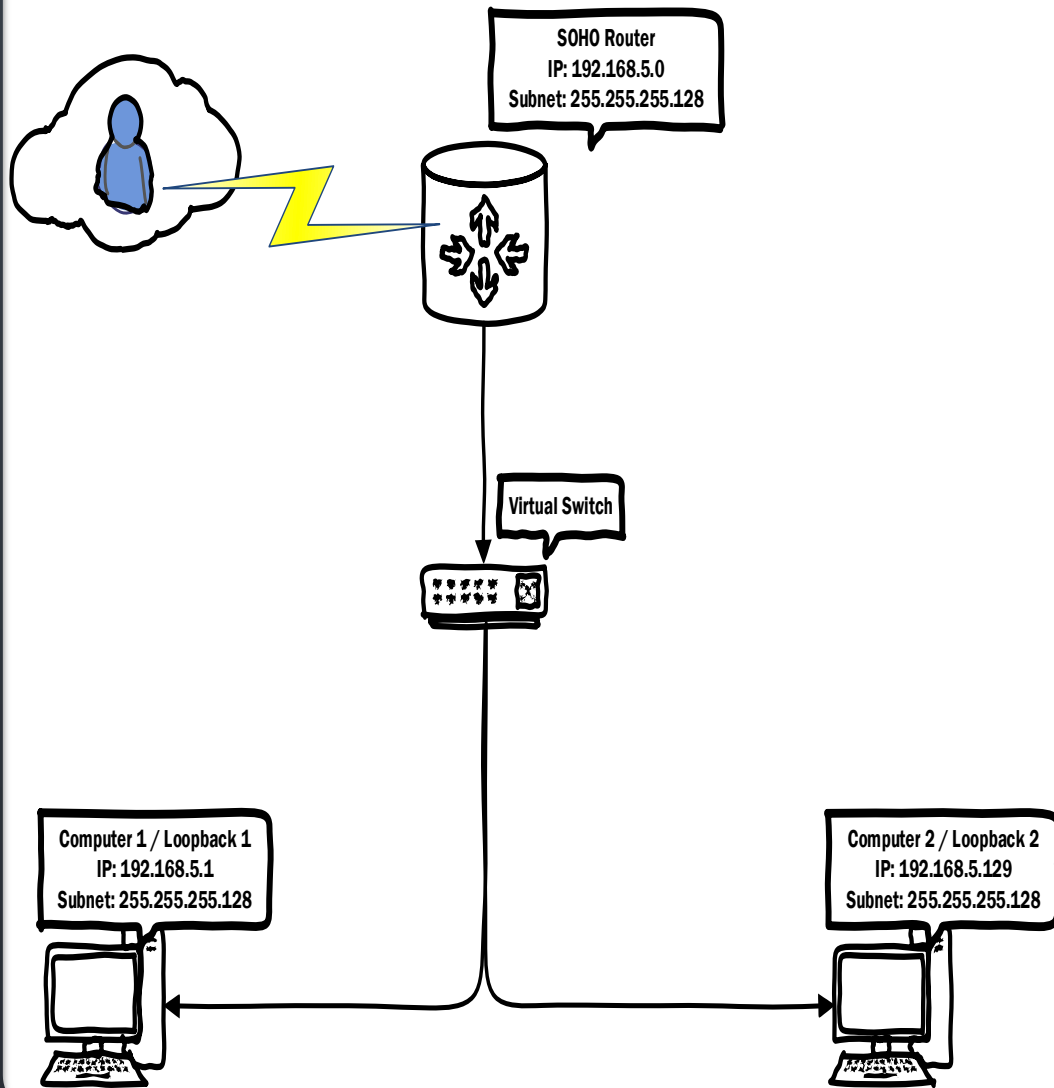
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INTRODUCTION

- THE PURPOSE OF THIS PROJECT:
 - DOCUMENT INFRASTRUCTURE DESIGN
 - SET UP TWO-SUBNET NETWORK WITH SUBNETTING TABLE DEFINITIONS
 - IMPLEMENT NETWORK AS DOCUMENTED IN THE DESIGN PHASE
 - TEST THE HARDWARE/VIRTUAL MACHINES TO ENSURE IPV4 ADDRESS ASSIGNMENT FOR SUCCESS
 - TEST ALL HARDWARE/VIRTUAL MACHINES TO ENSURE PROPER COMMUNICATION
 - DOCUMENT CHALLENGES DURING NETWORK DESIGN AND IMPLEMENTATION WITH THE SKILLSETS GAINED AS A RESULT



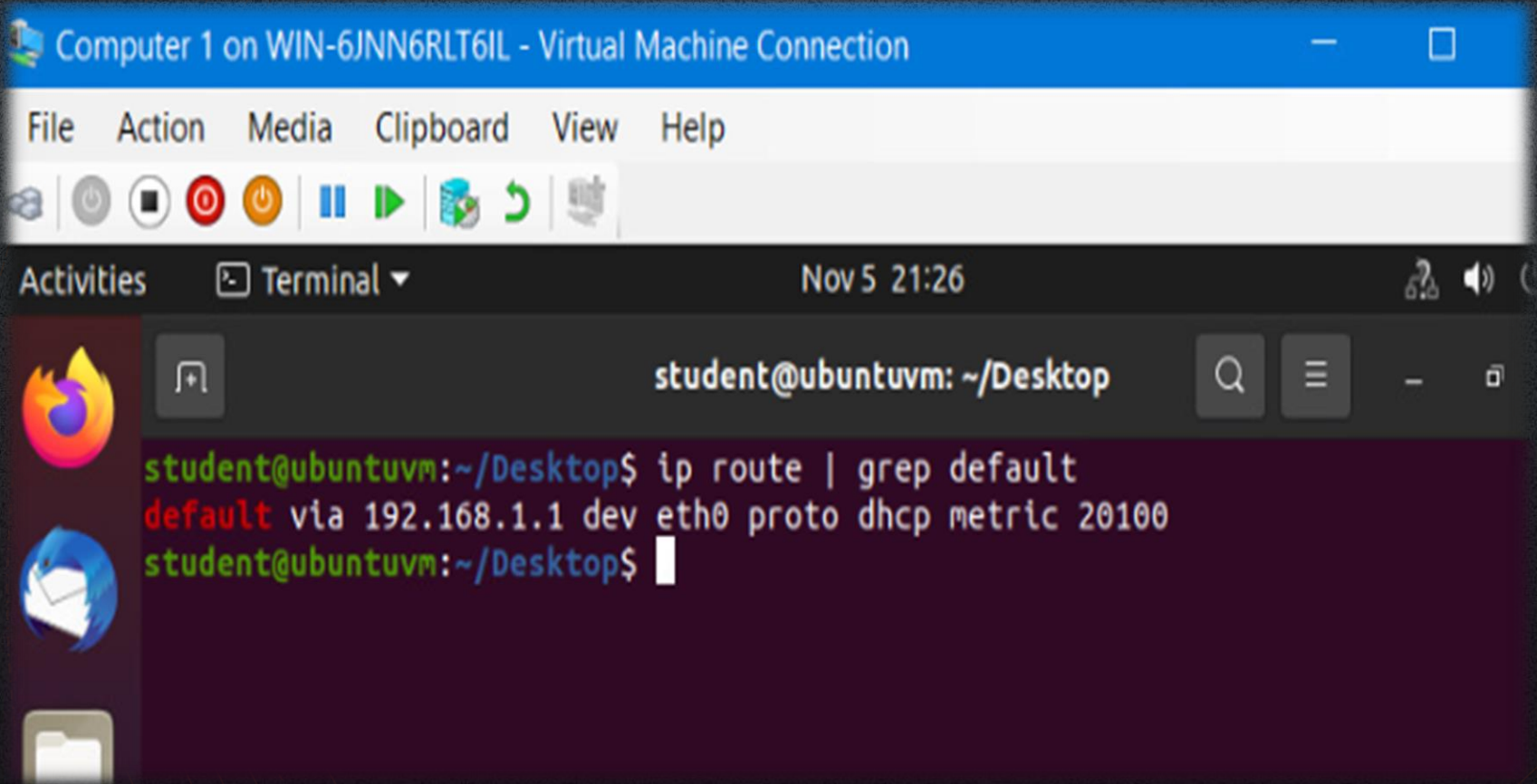
NETWORK DESIGN AND DOCUMENTATION



MICROSOFT VISIO NETWORK DIAGRAM

Documenting default network IP for default gateway

Screenshot of Computer 1 terminal window showing default gateway IP address.



The screenshot shows a terminal window titled "Computer 1 on WIN-6JNN6RLT6IL - Virtual Machine Connection". The terminal prompt is "student@ubuntuvm: ~/Desktop". The command "ip route | grep default" has been executed, resulting in the output "default via 192.168.1.1 dev eth0 proto dhcp metric 20100".

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

Subnetting Table

Subnet	Subnet Notation	Network Address	First Usable Host Address	Last Useable Host Address	Broadcast Address
Subnet 1	255.255.255.128/25	192.168.5.0	192.168.5.1	192.168.5.126	192.168.5.127
Subnet 2	192.168.5.128/25	192.168.5.128	192.168.5.129	192.168.5.254	192.168.5.255



NETWORK IMPLEMENTATION

IPv4 Address Assignment for SOHO Router

Screenshot shows the *Interfaces* page with the new IPv4 address on the LAN interface.

The screenshot displays the OpenWrt LuCI web interface in a Firefox browser window. The browser's address bar shows the URL `192.168.105.1/cgi-bin/luci/admin/network/network`. The page title is "OpenWrt - Interfaces - LuCI". The navigation menu includes "Status", "System", "Network", and "Logout". A "REFRESHING" button is visible in the top right corner. The main content area shows the "Interfaces" section with a sub-tab for "Global network options". The "LAN" interface is highlighted in green and shows the following configuration:

- Protocol:** Static address
- Uptime:** 0h 6m 36s
- MAC:** 00:15:5D:00:BA:01
- RX:** 977.05 KB (11410 Pkts.)
- TX:** 1.47 MB (9987 Pkts.)
- IPv4:** 192.168.105.1/24
- IPv6:** fd4:27c0:ac22::1/60

Control buttons for the LAN interface include "Restart", "Stop", "Edit", and "Delete". The interface name "br-lan" is also visible below the LAN icon.

Loopback Interfaces

Screenshot shows IPv4 address of Loopback1 and Loopback 2

The screenshot displays the OpenWrt 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 "OpenWrt - Interfaces - Lu". The interface shows a list of network interfaces with the following details:

Interface	Protocol	Uptime	MAC	RX	TX	IPv4	Actions
LOOPBACK1 eth0	Static address	0h 2m 50s	00:15:5D:00:BA:01	2.84 MB (28807 Pkts.)	3.54 MB (27883 Pkts.)	192.168.5.1/2	Restart Stop Edit Delete
LOOPBACK2 eth0	Static address	0h 0m 5s	00:15:5D:00:BA:01	2.84 MB (28807 Pkts.)	3.54 MB (27883 Pkts.)	192.168.5.129/16	Restart Stop Edit Delete
TEST Alias of "lan"	Alias Interface (Static address)	0h 7m 52s				192.168.100.1/24	Restart Stop Edit Delete
WAN eth1	DHCP client			0 B (0 Pkts.)	0 B (0 Pkts.)	Error: Network device is not present	Restart Stop Edit Delete

TESTING: NEW IPV4 ASSIGNMENT

Dynamic IP Address - Computer 1 VM

Screenshot shows IPv4 address of Computer 1 VM after IP address change

DeVry-Hyper-V-2

Popout

View Fullscreen

Send Ctrl+Alt+Delete

Reboot



Computer 1 on WIN-6JNN6RLT6IL



```
Activities Terminal Nov 13 12:49
student@ubuntuvm: ~/Desktop
Firefox Web Browser student@ubuntuvm: ~/Desktop
student@ubuntuvm:~/Desktop$ ip ddr
Object "ddr" is unknown, try "ip help".
student@ubuntuvm:~/Desktop$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defau
lt 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 def
ault 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 noprefixro
ute eth0
        valid_lft 43143sec preferred_lft 43143sec
    inet6 fdf4:27c0:ac22::fea/128 scope global noprefixroute
        valid_lft forever preferred_lft forever
    inet6 fdf4:27c0:ac22:0:e063:6ff9:6243:94ff/64 scope global temporary dynami
c
        valid_lft 604742sec preferred_lft 86276sec
    inet6 fdf4:27c0:ac22:0:bf29:ea3d:8044:c1eb/64 scope global mngtmpaddr nopre
fixroute
        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 - Computer 2 VM

Screenshot shows IPv4 address of Computer 2 VM after IP address change

DeVry-Hyper-V-2

Popout

View Fullscreen

Send Ctrl+Alt+Delete

Reboot

Computer 2 on WIN-6JNN6RLT6IL

```
Activities Terminal Nov 13 12:52 student@ubuntuvm: ~/Desktop
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: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 42831sec preferred_lft 42831sec
    inet6 fdf4:27c0:ac22::fea/128 scope global dadfailed tentative noprefixroute
        valid_lft forever preferred_lft forever
    inet6 fdf4:27c0:ac22:0:9a82:eb70:f8bb:a185/64 scope global temporary dynamic
        valid_lft 604431sec preferred_lft 85671sec
    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@ubuntuvm:~/Desktop$
```



TESTING: CONNECTIVITY

Connectivity Test – Computer 1 VM

Screenshot shows Computer 1 VM can communicate with Computer 2 and the SOHO Router.

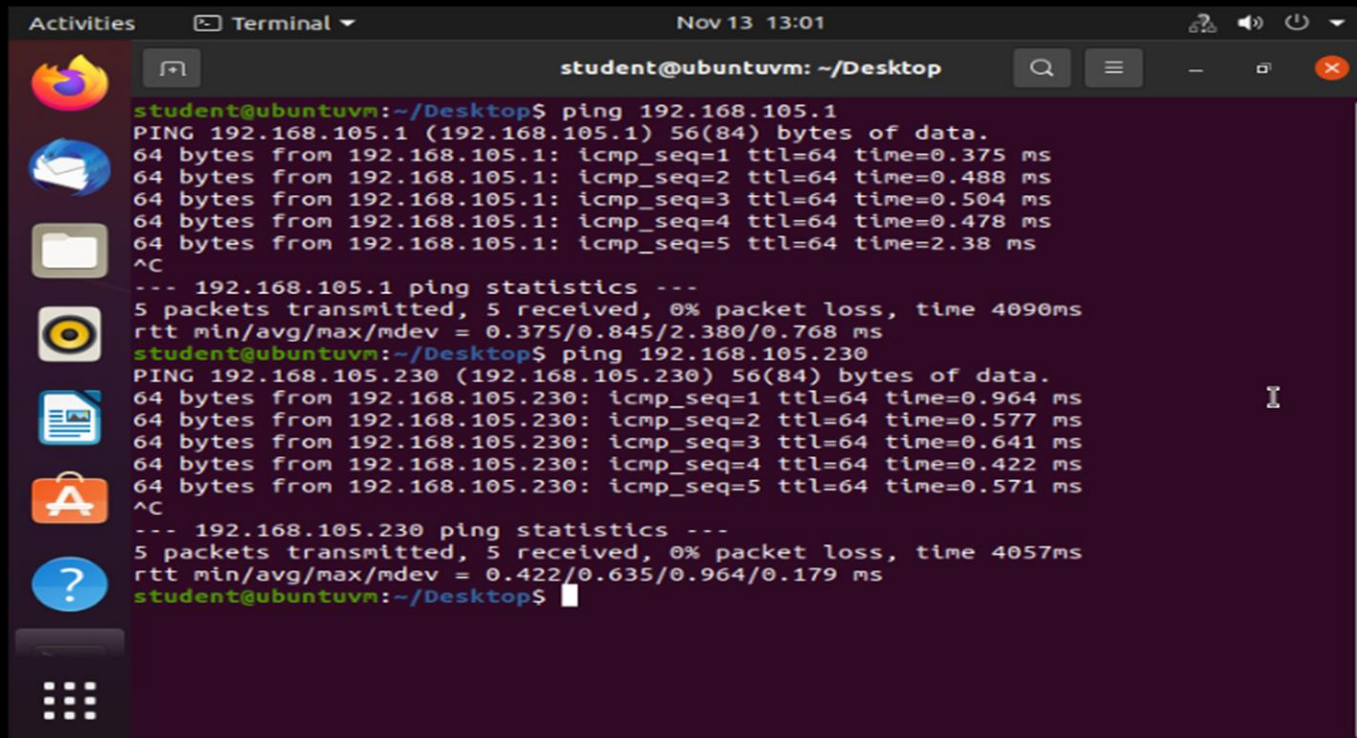
DeVry-Hyper-V-2

Popout

View Fullscreen

Send Ctrl+Alt+Delete

Reboot



The screenshot shows a terminal window titled "student@ubuntuvm: ~/Desktop" with a timestamp of "Nov 13 13:01". The terminal displays the results of two ping tests. The first test is to 192.168.105.1, showing 5 successful pings with varying response times (0.375ms to 2.38ms) and a summary of 5 packets transmitted with 0% loss. The second test is to 192.168.105.230, also showing 5 successful pings with response times between 0.422ms and 0.964ms, and a summary of 5 packets transmitted with 0% loss. The terminal prompt is currently at "student@ubuntuvm:~/Desktop\$".

```
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=0.375 ms
64 bytes from 192.168.105.1: icmp_seq=2 ttl=64 time=0.488 ms
64 bytes from 192.168.105.1: icmp_seq=3 ttl=64 time=0.504 ms
64 bytes from 192.168.105.1: icmp_seq=4 ttl=64 time=0.478 ms
64 bytes from 192.168.105.1: icmp_seq=5 ttl=64 time=2.38 ms
^C
--- 192.168.105.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4090ms
rtt min/avg/max/mdev = 0.375/0.845/2.380/0.768 ms
student@ubuntuvm:~/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=0.964 ms
64 bytes from 192.168.105.230: icmp_seq=2 ttl=64 time=0.577 ms
64 bytes from 192.168.105.230: icmp_seq=3 ttl=64 time=0.641 ms
64 bytes from 192.168.105.230: icmp_seq=4 ttl=64 time=0.422 ms
64 bytes from 192.168.105.230: icmp_seq=5 ttl=64 time=0.571 ms
^C
--- 192.168.105.230 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4057ms
rtt min/avg/max/mdev = 0.422/0.635/0.964/0.179 ms
student@ubuntuvm:~/Desktop$
```

Connectivity Test – Computer 2 VM

Screenshot shows Computer 2 VM can communicate with Computer 1 and the SOHO Router.

DeVry-Hyper-V-2

Popout

View Fullscreen

Send Ctrl+Alt+Delete

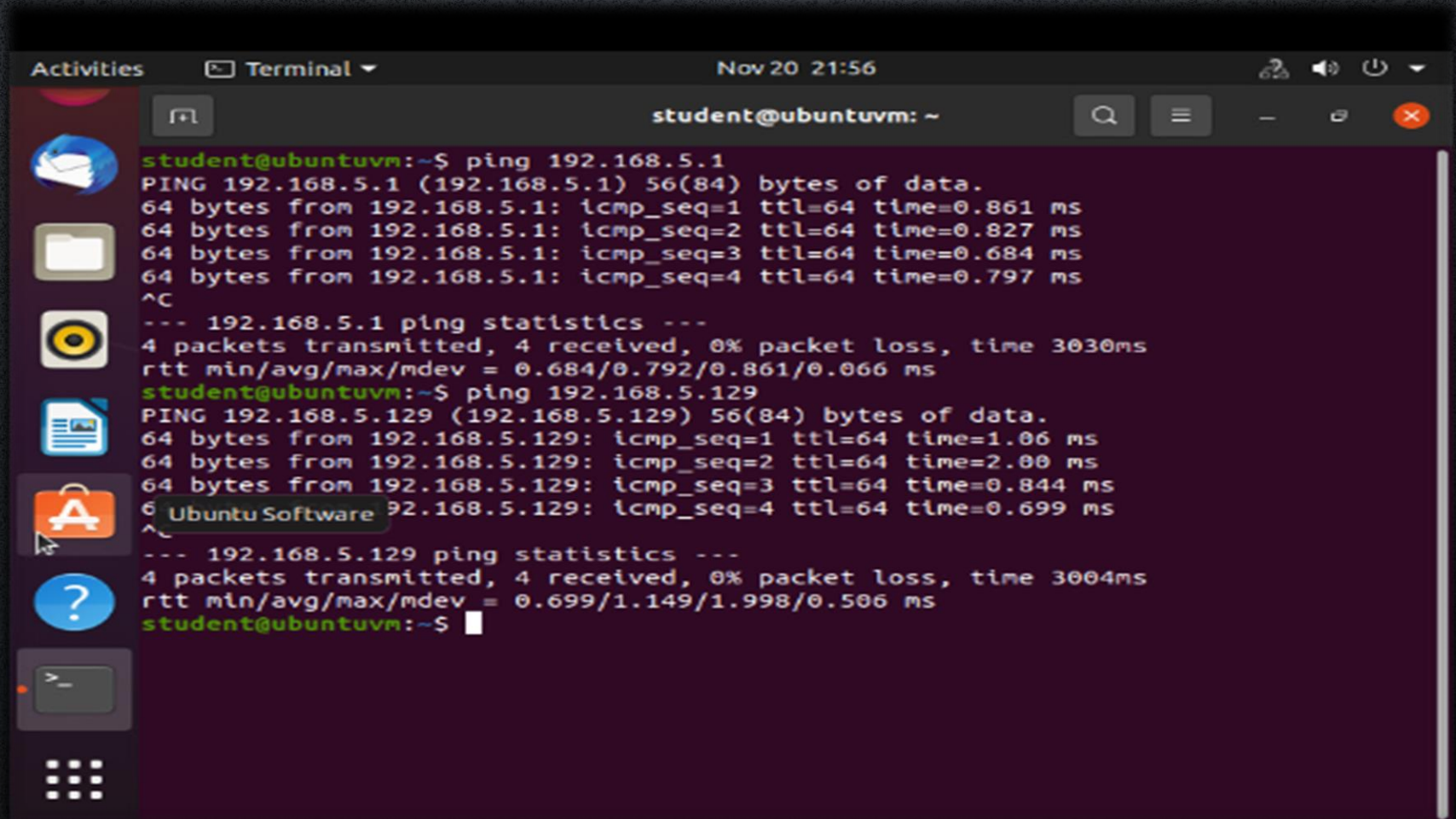
Reboot

Computer 2 on WIN-6JNN6RLT6IL

```
Activities Terminal Nov 13 13:03
student@ubuntuv: ~/Desktop
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=0.995 ms
64 bytes from 192.168.105.1: icmp_seq=2 ttl=64 time=0.921 ms
64 bytes from 192.168.105.1: icmp_seq=3 ttl=64 time=0.783 ms
64 bytes from 192.168.105.1: icmp_seq=4 ttl=64 time=0.581 ms
64 bytes from 192.168.105.1: icmp_seq=5 ttl=64 time=0.691 ms
^C
--- 192.168.105.1 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 4053ms
rtt min/avg/max/mdev = 0.581/0.794/0.995/0.150 ms
student@ubuntuv:~/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=0.398 ms
64 bytes from 192.168.105.228: icmp_seq=2 ttl=64 time=0.496 ms
64 bytes from 192.168.105.228: icmp_seq=3 ttl=64 time=1.23 ms
64 bytes from 192.168.105.228: icmp_seq=4 ttl=64 time=0.498 ms
64 bytes from 192.168.105.228: icmp_seq=5 ttl=64 time=0.492 ms
64 bytes from 192.168.105.228: icmp_seq=6 ttl=64 time=0.386 ms
^C--- 192.168.105.228 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5085ms
rtt min/avg/max/mdev = 0.386/0.583/1.230/0.292 ms
student@ubuntuv:~/Desktop$
```

Connectivity Test - Loopback

Screenshot shows Computer 1 VM can communicate with Loopback 1 and 2 interfaces.



```
student@ubuntuvvm: ~  
student@ubuntuvvm:~$ 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=0.861 ms  
64 bytes from 192.168.5.1: icmp_seq=2 ttl=64 time=0.827 ms  
64 bytes from 192.168.5.1: icmp_seq=3 ttl=64 time=0.684 ms  
64 bytes from 192.168.5.1: icmp_seq=4 ttl=64 time=0.797 ms  
^C  
--- 192.168.5.1 ping statistics ---  
4 packets transmitted, 4 received, 0% packet loss, time 3030ms  
rtt min/avg/max/mdev = 0.684/0.792/0.861/0.066 ms  
student@ubuntuvvm:~$ ping 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=1.06 ms  
64 bytes from 192.168.5.129: icmp_seq=2 ttl=64 time=2.00 ms  
64 bytes from 192.168.5.129: icmp_seq=3 ttl=64 time=0.844 ms  
64 bytes from 192.168.5.129: icmp_seq=4 ttl=64 time=0.699 ms  
^C  
--- 192.168.5.129 ping statistics ---  
4 packets transmitted, 4 received, 0% packet loss, time 3004ms  
rtt min/avg/max/mdev = 0.699/1.149/1.998/0.506 ms  
student@ubuntuvvm:~$
```




SECURITY CONSIDERATIONS

SOHO WIRELESS NETWORK SECURITY

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?

- TP link username 'admin' and the password is 'admin' all lower case. If you do not change the username and password from the default settings, you leave your entire home network open to anyone to access, update and exploit.

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?

- It is easier to allow DHCP to assign IP addresses. Static IPs require manual intervention for every new device that is added to the network

SOHO WIRELESS NETWORK SECURITY

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?

- MAC filtering allows the network administrator to restrict access to the network based on the MAC address of the devices' NIC card. You would deny access to all devices that are not part of the explicit approved list. If you have no entries, no device will be able to connect to your network

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

- WPA/WPA2 - Enterprise, WEP, WPA/WPA2 - Personal(Recommended). The personal version is recommended because it uses one passkey that all can use to access the network.

SOHO WIRELESS NETWORK SECURITY

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

- WPA2 is the true security function. It requires that users enter a passkey to connect to the network. If you do not have the passkey, you are unable to access the network or devices on the network.

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

- The first thing I would do is alter the main IP address of the router from 192.168.1.0 to 192.168.XXX.0. I would ensure the admin username and password are changed to a strong password and a different username. I would then enable WPA/WPA2 Personal and create a unique and long passkey that is hard to guess. I would do this to make sure that my personal data is protected from unauthorized users.

LESSONS LEARNED



CHALLENGES

- CREATING THE SUBNETTING TABLE WAS THE LARGEST CHALLENGE FACED DURING THE PROJECT SETUP
- I USED THE FOLLOWING WEBSITES WHEN ATTEMPTING TO CREATE THE TABLE:
 - [HTTPS://WWW.SITE24X7.COM/TOOLS/IPV4-SUBNETCALCULATOR.HTML](https://www.site24x7.com/tools/ipv4-subnetcalculator.html)
 - [HTTPS://CIDR.XYZ](https://cidr.xyz)
 - [HTTPS://WWW.AELIUS.COM/NJH/SUBNET_SHEET.HTML](https://www.aelius.com/njh/subnet_sheet.html)

CAREER SKILLS

- UNDERSTANDING HOW TO SEGMENT NETWORKS
- DEMONSTRATING THE ABILITY TO FIND INFORMATION THAT IS NOT ALREADY KNOWN AND APPLYING TO CURRENT SITUATIONS

CONCLUSION

- THIS PROJECT HELPED ME TO UNDERSTAND:
 - HOW TO CREATE A NETWORK FROM START TO FINISH
 - HOW TO PROPERLY DOCUMENT A NETWORK
 - UNDERSTANDING HOW TO SET UP SECURITY AND WHY SECURITY FOR A NETWORK IS OF THE HIGHEST IMPORTANCE

REFERENCES

- [HTTPS://WWW.TP-LINK.COM/US/SUPPORT/FAQ/426/#:~:TEXT=THE%20DEFAULT%20IP%20ADDRESS%20IS,ADMIN%20\(ALL%20LOWER%20CASE\)](https://www.tp-link.com/us/support/faq/426/#:~:text=The%20default%20IP%20address%20is,admin%20(all%20lower%20case))
- [HTTPS://EMULATOR.TP-LINK.COM/902AC_US_EMULATOR/EMULATOR_ROUTER/INDEX.HTM](https://emulator.tp-link.com/902AC_US_EMULATOR/EMULATOR_ROUTER/INDEX.HTM)
- [HTTPS://WWW.KASPERSKY.COM/RESOURCE-CENTER/DEFINITIONS/WEP-VS-WPA](https://www.kaspersky.com/resource-center/definitions/wep-vs-wpa)
- [HTTPS://WWW.SITE24X7.COM/TOOLS/IPV4-SUBNETCALCULATOR.HTML](https://www.site24x7.com/tools/ipv4-subnetcalculator.html)
- [HTTPS://CIDR.XYZ](https://cidr.xyz)
- [HTTPS://WWW.AELIUS.COM/NJH/SUBNET_SHEET.HTML](https://www.aelius.com/njh/subnet_sheet.html)