

# Networking

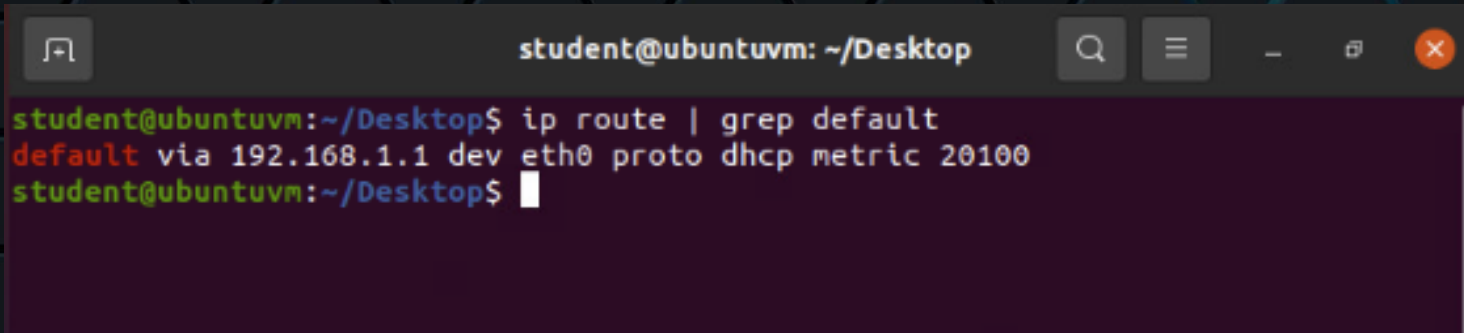
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# IPv4 Addressing

- Preparation
- IPv4 address assignment

# Preparation

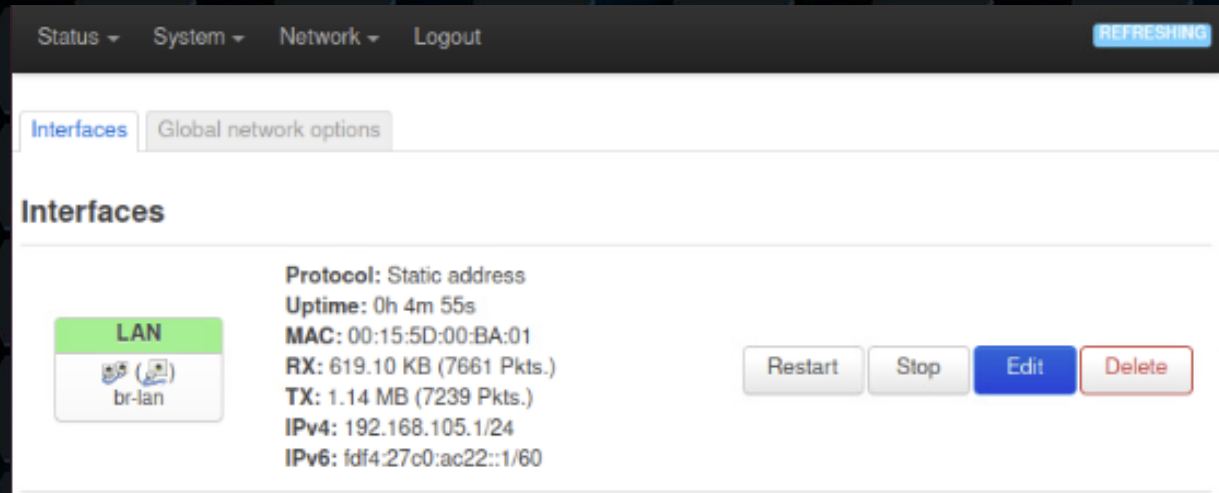
- Retrieve gateway IP address

A terminal window titled 'student@ubuntuvm: ~/Desktop' with standard window controls. The terminal shows a command being executed to find the default gateway.

```
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

- Displaying LAN interface with new IPv4 address



The screenshot displays a network management dashboard. At the top, there is a navigation bar with links for 'Status', 'System', 'Network', and 'Logout', along with a 'REFRESHING' button. Below this, there are two tabs: 'Interfaces' (selected) and 'Global network options'. The main section is titled 'Interfaces'. On the left, there is a card for the 'LAN' interface, labeled 'br-lan', with a green header and a network icon. To the right of this card, the following details are listed: 'Protocol: Static address', 'Uptime: 0h 4m 55s', 'MAC: 00:15:5D:00:BA:01', 'RX: 619.10 KB (7661 Pkts.)', 'TX: 1.14 MB (7239 Pkts.)', 'IPv4: 192.168.105.1/24', and 'IPv6: fd4:27c0:ac22::1/60'. At the bottom right of the interface details, there are four buttons: 'Restart', 'Stop', 'Edit', and 'Delete'.

Interface	Protocol	Uptime	MAC	RX	TX	IPv4	IPv6	Actions
LAN (br-lan)	Static address	0h 4m 55s	00:15:5D:00:BA:01	619.10 KB (7661 Pkts.)	1.14 MB (7239 Pkts.)	192.168.105.1/24	fd4:27c0:ac22::1/60	Restart, Stop, Edit, Delete



# Connectivity Test

- Dynamic IP address assignment
- Connectivity test

# Dynamic IP Address Assignment

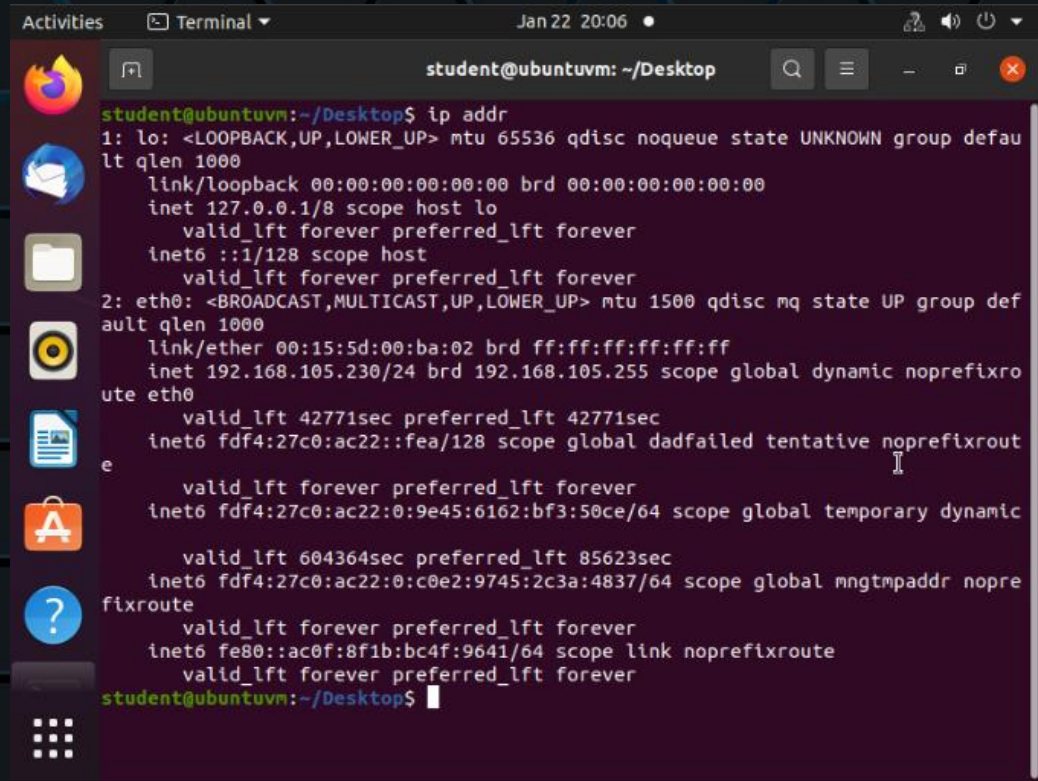
- Computer 1 VM IPv4 address

```
Activities Terminal Jan 22 20:04 student@ubuntuvm: ~/Desktop

valid_lft forever preferred_lft forever
student@ubuntuvm:~/Desktop$ sudo ip link set eth0 down
[sudo] password for student:
student@ubuntuvm:~/Desktop$ sudo ip link set eth0 up
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 43197sec preferred_lft 43197sec
        inet6 fd4:27c0:ac22::fea/128 scope global tentative noprefixroute
            valid_lft forever preferred_lft forever
        inet6 fd4:27c0:ac22:0:a01d:4833:4847:d5b/64 scope global temporary tentati
ve dynamic
            valid_lft 604799sec preferred_lft 86074sec
        inet6 fd4:27c0:ac22:0:bf29:ea3d:8044:c1eb/64 scope global mngtmpaddr nopro
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 Assignment Cont.

- Computer 2 VM IPv4 address



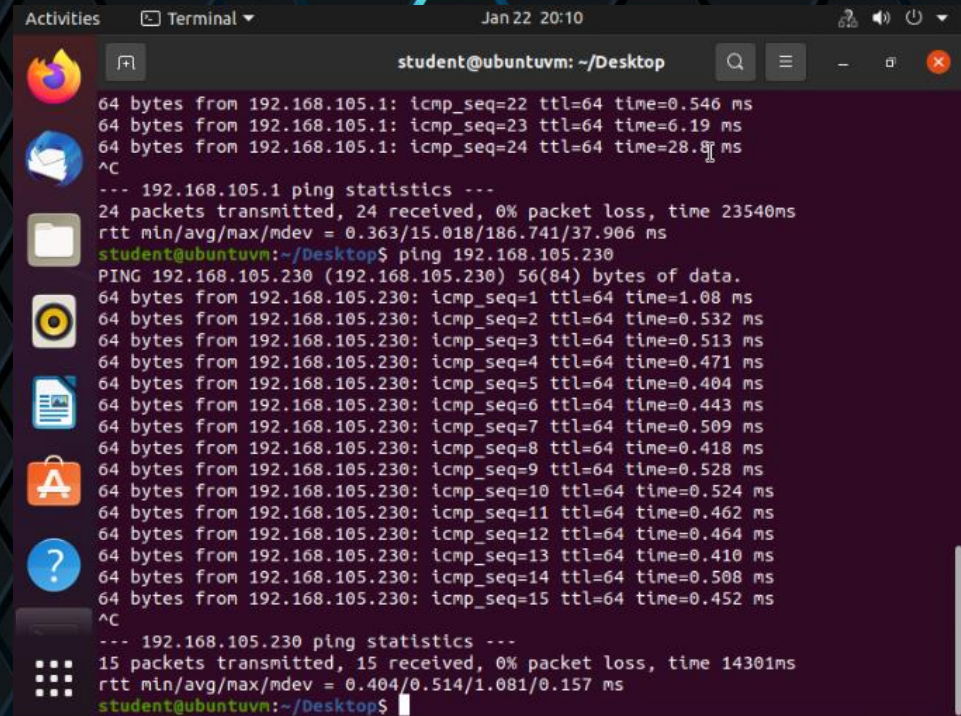
A terminal window titled 'Terminal' with a date and time of 'Jan 22 20:06'. The window shows the output of the 'ip addr' command. The output details the configuration for the loopback interface 'lo' and the ethernet interface 'eth0'. For 'lo', it shows an IPv4 address of 127.0.0.1 and an IPv6 address of ::1. For 'eth0', it shows an IPv4 address of 192.168.105.230 and an IPv6 address of fd4:27c0:ac22::fea. The terminal window has a sidebar with application icons and a top bar with window controls.

```
student@ubuntuvm: ~/Desktop
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:02 brd ff:ff:ff:ff:ff:ff
    inet 192.168.105.230/24 brd 192.168.105.255 scope global dynamic noprefixro
ute eth0
        valid_lft 42771sec preferred_lft 42771sec
    inet6 fd4:27c0:ac22::fea/128 scope global dadfailed tentative noprefixrout
e
        valid_lft forever preferred_lft forever
    inet6 fd4:27c0:ac22:0:9e45:6162:bf3:50ce/64 scope global temporary dynamic
        valid_lft 604364sec preferred_lft 85623sec
    inet6 fd4:27c0: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$
```



# Connectivity Test

- Tests between Computer 1 VM, Computer 2 VM and the SOHO Router



The screenshot shows a terminal window titled 'student@ubuntuvn: ~/Desktop' with a search icon, menu icon, and window controls. The terminal output displays the results of two ping tests. The first test is to 192.168.105.1, showing 24 packets transmitted and received with 0% packet loss and a time of 23540ms. The second test is to 192.168.105.230, showing 15 packets transmitted and received with 0% packet loss and a time of 14301ms. The terminal text is as follows:

```
student@ubuntuvn: ~/Desktop
64 bytes from 192.168.105.1: icmp_seq=22 ttl=64 time=0.546 ms
64 bytes from 192.168.105.1: icmp_seq=23 ttl=64 time=6.19 ms
64 bytes from 192.168.105.1: icmp_seq=24 ttl=64 time=28.8 ms
^C
--- 192.168.105.1 ping statistics ---
24 packets transmitted, 24 received, 0% packet loss, time 23540ms
rtt min/avg/max/mdev = 0.363/15.018/186.741/37.906 ms
student@ubuntuvn:~/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=1.08 ms
64 bytes from 192.168.105.230: icmp_seq=2 ttl=64 time=0.532 ms
64 bytes from 192.168.105.230: icmp_seq=3 ttl=64 time=0.513 ms
64 bytes from 192.168.105.230: icmp_seq=4 ttl=64 time=0.471 ms
64 bytes from 192.168.105.230: icmp_seq=5 ttl=64 time=0.404 ms
64 bytes from 192.168.105.230: icmp_seq=6 ttl=64 time=0.443 ms
64 bytes from 192.168.105.230: icmp_seq=7 ttl=64 time=0.509 ms
64 bytes from 192.168.105.230: icmp_seq=8 ttl=64 time=0.418 ms
64 bytes from 192.168.105.230: icmp_seq=9 ttl=64 time=0.528 ms
64 bytes from 192.168.105.230: icmp_seq=10 ttl=64 time=0.524 ms
64 bytes from 192.168.105.230: icmp_seq=11 ttl=64 time=0.462 ms
64 bytes from 192.168.105.230: icmp_seq=12 ttl=64 time=0.464 ms
64 bytes from 192.168.105.230: icmp_seq=13 ttl=64 time=0.410 ms
64 bytes from 192.168.105.230: icmp_seq=14 ttl=64 time=0.508 ms
64 bytes from 192.168.105.230: icmp_seq=15 ttl=64 time=0.452 ms
^C
--- 192.168.105.230 ping statistics ---
15 packets transmitted, 15 received, 0% packet loss, time 14301ms
rtt min/avg/max/mdev = 0.404/0.514/1.081/0.157 ms
student@ubuntuvn:~/Desktop$
```



# IP Subnetting and Loopback Interfaces

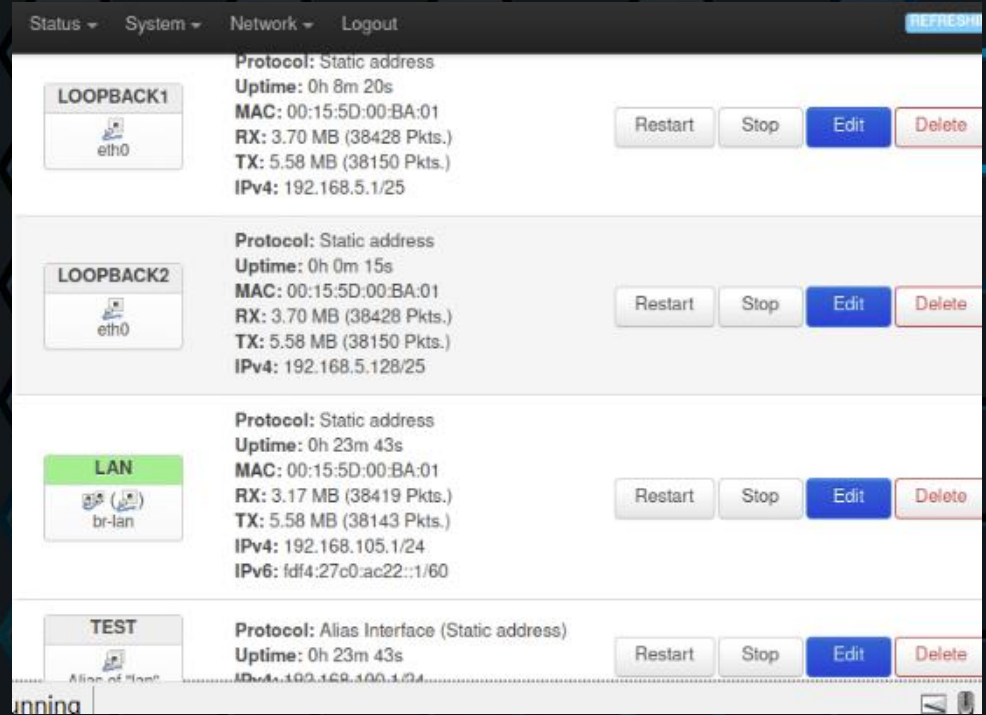
- IP subnetting
- Loopback interfaces
- Connectivity tests

# Subnetting Table

	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	255.255.255.128	192.168.5.0	192.168.5.1	192.168.5.126	192.168.5.127
The Second Subnet	1	/25	255.255.255.128	192.168.5.128	192.168.5.129	192.168.5.254	192.168.5.255

# Loopback Interfaces

- Loopback 1 and Loopback 2 with corresponding IPv4 addresses



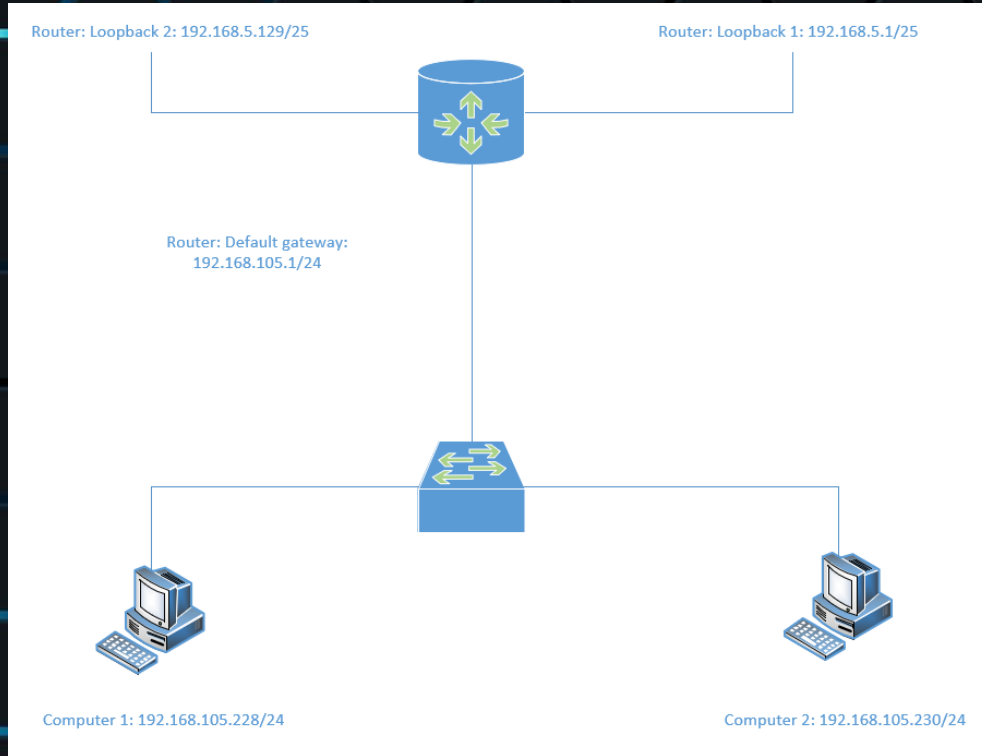


# Connectivity Tests

- Ping tests from Computer 1 VM to Loopback 1 and Loopback 2 interfaces

```
student@ubuntuvm: ~  
54 bytes from 192.168.5.1: icmp_seq=1 ttl=64 time=0.468 ms  
54 bytes from 192.168.5.1: icmp_seq=2 ttl=64 time=0.681 ms  
54 bytes from 192.168.5.1: icmp_seq=3 ttl=64 time=0.398 ms  
54 bytes from 192.168.5.1: icmp_seq=4 ttl=64 time=0.358 ms  
54 bytes from 192.168.5.1: icmp_seq=5 ttl=64 time=6.51 ms  
54 bytes from 192.168.5.1: icmp_seq=6 ttl=64 time=0.437 ms  
54 bytes from 192.168.5.1: icmp_seq=7 ttl=64 time=0.530 ms  
54 bytes from 192.168.5.1: icmp_seq=8 ttl=64 time=0.322 ms  
54 bytes from 192.168.5.1: icmp_seq=9 ttl=64 time=2.12 ms  
54 bytes from 192.168.5.1: icmp_seq=10 ttl=64 time=472 ms  
^C  
--- 192.168.5.1 ping statistics ---  
10 packets transmitted, 10 received, 0% packet loss, time 9150ms  
rtt min/avg/max/mdev = 0.322/48.406/472.243/141.290 ms  
student@ubuntuvm:~$ ping 192.168.5.128  
PING 192.168.5.128 (192.168.5.128) 56(84) bytes of data.  
54 bytes from 192.168.5.128: icmp_seq=1 ttl=64 time=2.15 ms  
54 bytes from 192.168.5.128: icmp_seq=2 ttl=64 time=0.373 ms  
54 bytes from 192.168.5.128: icmp_seq=3 ttl=64 time=0.378 ms  
54 bytes from 192.168.5.128: icmp_seq=4 ttl=64 time=0.595 ms  
54 bytes from 192.168.5.128: icmp_seq=5 ttl=64 time=0.381 ms  
54 bytes from 192.168.5.128: icmp_seq=6 ttl=64 time=0.449 ms  
54 bytes from 192.168.5.128: icmp_seq=7 ttl=64 time=0.440 ms  
54 bytes from 192.168.5.128: icmp_seq=8 ttl=64 time=0.394 ms  
^C  
--- 192.168.5.128 ping statistics ---  
8 packets transmitted, 8 received, 0% packet loss, time 7126ms  
rtt min/avg/max/mdev = 0.373/0.644/2.147/0.571 ms  
student@ubuntuvm:~$
```

# Network Diagram

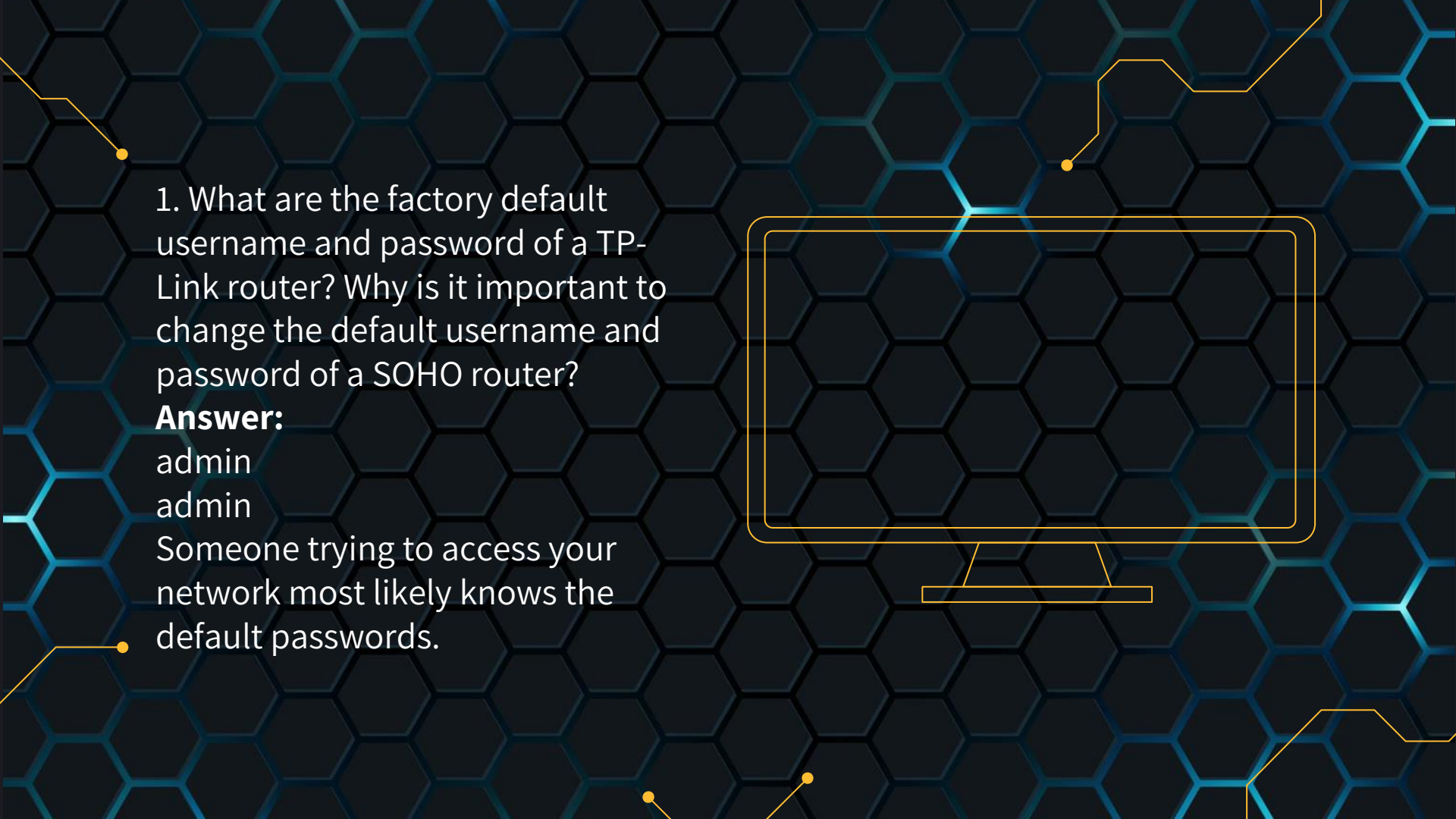


- Interconnection of Computer 1 VM, Computer 2 VM and SOHO Router VM

# SOHO Wireless Network Security

- Answering various network related questions





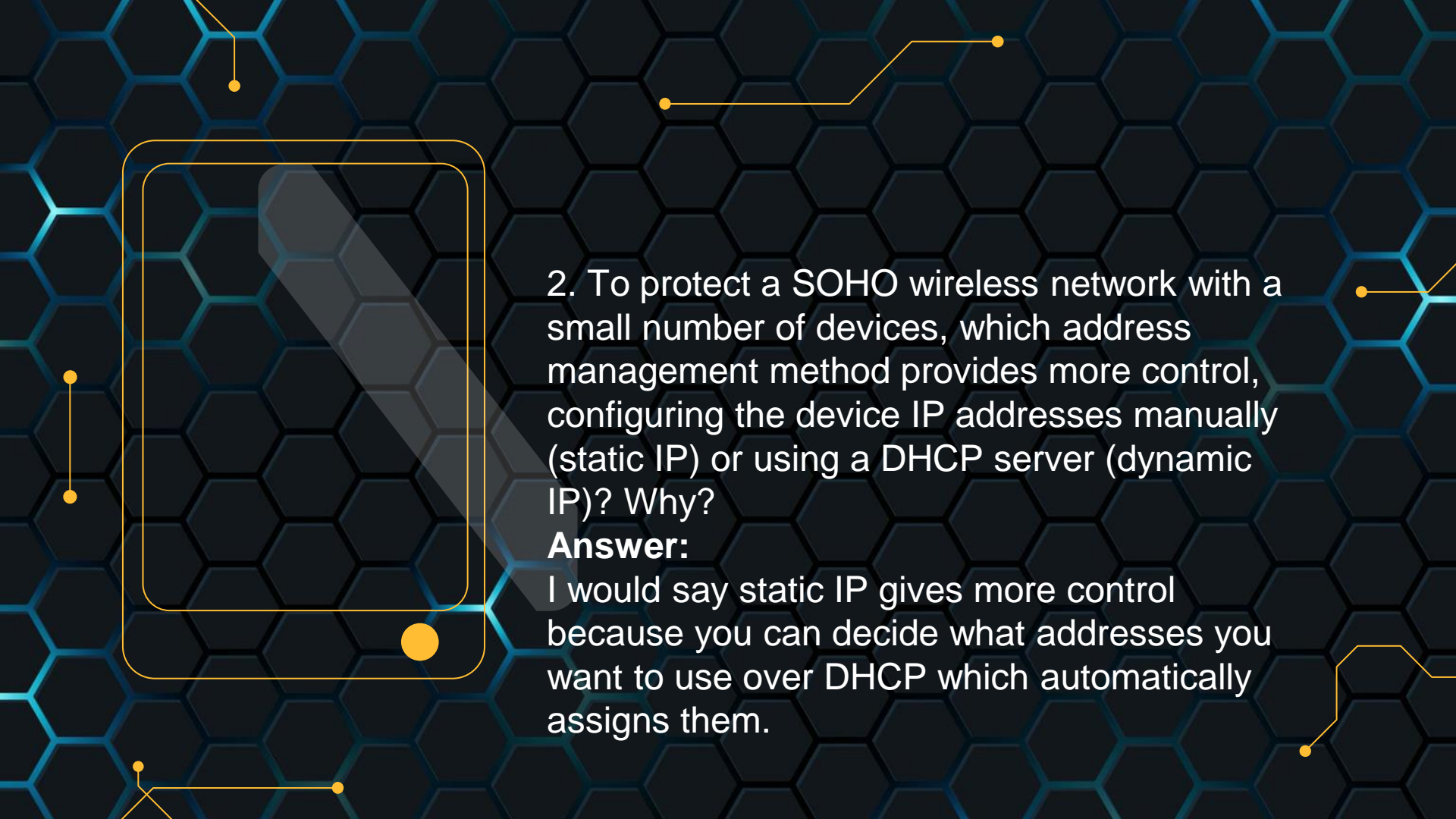
1. What are the factory default username and password of a TP-Link router? Why is it important to change the default username and password of a SOHO router?

**Answer:**

admin

admin


Someone trying to access your network most likely knows the default passwords.



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:**

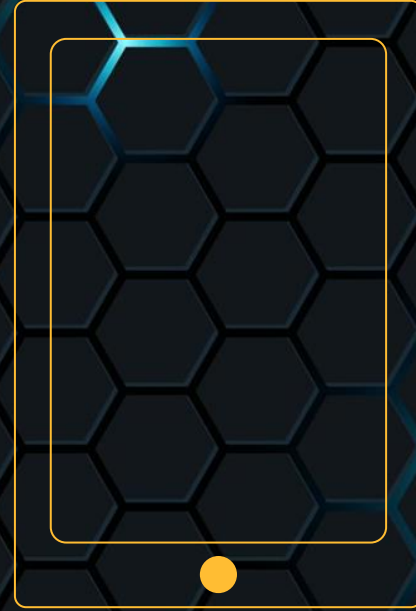
I would say static IP gives more control because you can decide what addresses you want to use over DHCP which automatically assigns them.



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:**

Allows control of wireless access. You would use deny filtering rules for addresses outside of your company or project group. Allow filtering would be used for addresses within your company or project group. That device will not have access.







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

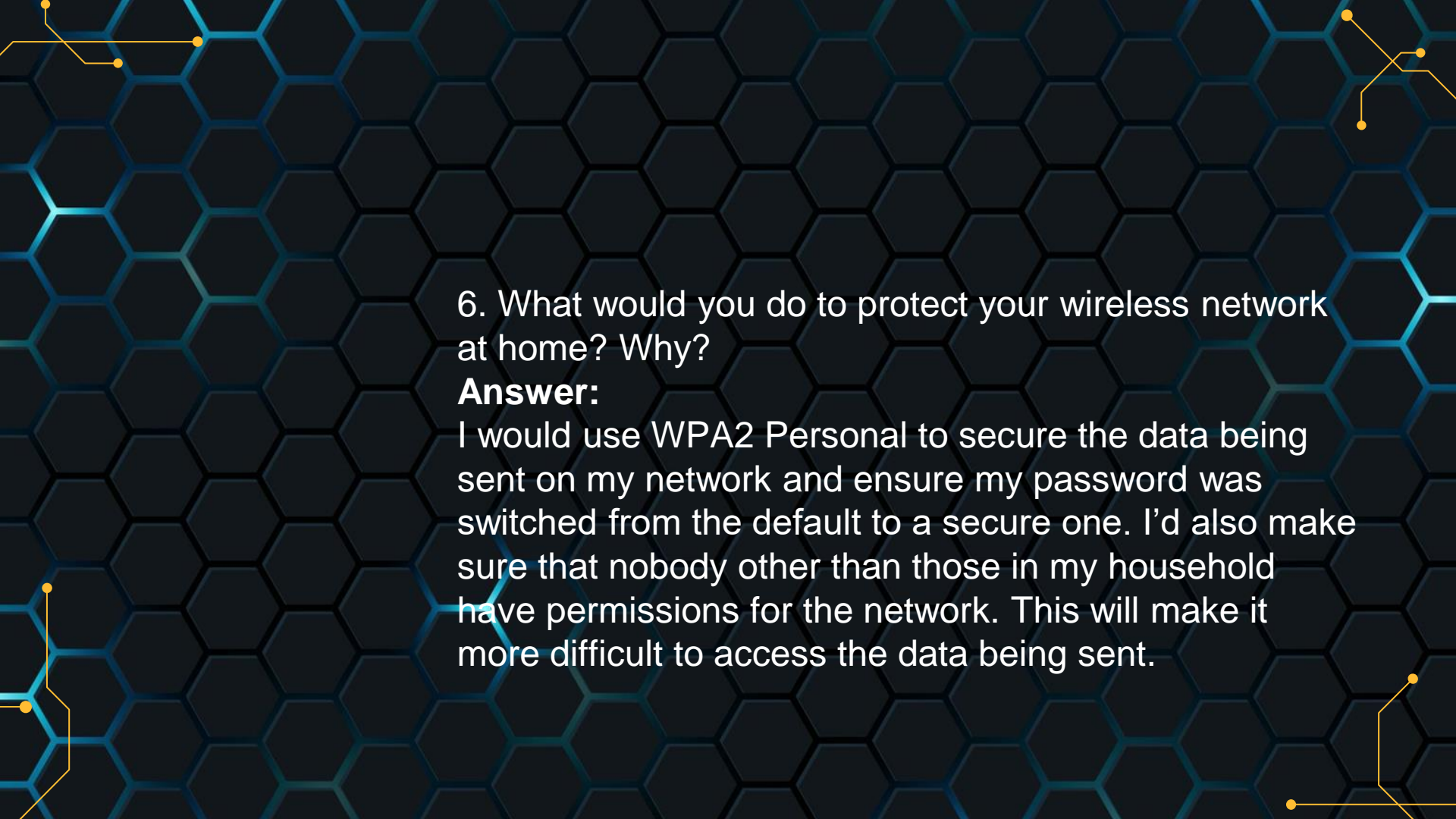
**Answer:**

Disable wireless security, WPA/WPA2-Personal, WPA/WPA2-Enterprise, and WEP. WPA/WPA2-Personal is the vendor recommendation for security. It has more advanced encryption than TKIP.

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

**Answer:**

Wireless security, it protects the network from unwanted users and encrypts the data being sent within the network.



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

**Answer:**

I would use WPA2 Personal to secure the data being sent on my network and ensure my password was switched from the default to a secure one. I'd also make sure that nobody other than those in my household have permissions for the network. This will make it more difficult to access the data being sent.



# Challenges

Keeping track of  
addresses

OSI model layers

# Career Skills

- Explaining network reference models
- Setup a network to specification
- Describing IP addressing conventions
- Network protocols and routing
- Identify transmission media and their characteristics
- Assess security devices and security controls on a network
- Differentiate WAN technologies

# References

1. <https://www.lifewire.com/changing-default-password-on-wifi-network-816567>
2. [https://emulator.tp-link.com/902AC\\_US\\_Emulator/Emulator\\_Router/index.htm](https://emulator.tp-link.com/902AC_US_Emulator/Emulator_Router/index.htm)
3. <https://www.dni.gov/files/NCSC/documents/campaign/NSA-guide-Keeping-Home-Network-Secure.pdf>





# THANKS!

Do you have any questions?  
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