Assignment 11 Basic Network Configuration
Task A – Explore Network Configurations (8 * 5 = 40 Points)
{{{{{{{{{Connect your VM in the NAT mode}}}}}}}}}
1. Use the correct ifconfig command to display the current network configuration. Highlight your IP address, MAC address, and the network mask.
Ip a
inet 10.0.2.15/24
link/ether 08:00:27:42:b5:d6
/24

```
prescott-kowalski@CYSE270Linux:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defaul
t 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 noprefixroute
       valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP gr
oup default qlen 1000
    link/ether 08:00:27:42:b5:d6 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
       valid_lft 84084sec preferred_lft 84084sec
    inet6 fe80::a00:27ff:fe42:b5d6/64 scope link
       valid_lft forever preferred_lft forever
```

2. Use the correct route command to display the current routing table.
Ip route show

```
prescott-kowalski@CYSE270Linux:~$ ip route show
default via 10.0.2.2 dev enp0s3 proto dhcp src 10.0.2.15 metric 100
10.0.2.0/24 dev enp0s3 proto kernel scope link src 10.0.2.15 metric 100
```

3. Use the netstat command to list current TCP connections.
ss -t

```
prescott-kowalski@CYSE270Linux:~$ ss -t
State       Recv-Q       Send-Q             Local Address:Port             Peer Address:Port       Process
```

4. Use the ping command to determine if the ubuntu.com system is accessible via the network. (Use the correct option to send 10 ping requests only.)
ping -c 10 ubuntu.com

```
prescott-kowalski@CYSE270Linux:~$ ping -c 10 ubuntu.com
PING ubuntu.com (185.125.190.21) 56(84) bytes of data.

--- ubuntu.com ping statistics ---
10 packets transmitted, 0 received, 100% packet loss, time 10548ms
```

5. Use the host command to perform a DNS query on www.odu.edu
host www.odu.edu

```
prescott-kowalski@CYSE270Linux:~$ host www.odu.edu
www.odu.edu has address 35.170.140.174
```

6. Use the cat command to display the contents of the file that contains the system's hostname.

cat /etc/hostname

```
prescott-kowalski@CYSE270Linux:~$ cat /etc/hostname
CYSE270Linux
```

7. Use the cat command to display the contents of the file that contains the DNS servers for this System.

cat /etc/resolv.conf

```
prescott-kowalski@CYSE270Linux:~$ cat /etc/resolv.conf
# This is /run/systemd/resolve/stub-resolv.conf managed by man:systemd-resolved(8).
# Do not edit.
#
# This file might be symlinked as /etc/resolv.conf. If you're looking at
# /etc/resolv.conf and seeing this text, you have followed the symlink.
#
# This is a dynamic resolv.conf file for connecting local clients to the
# internal DNS stub resolver of systemd-resolved. This file lists all
# configured search domains.
#
# Run "resolvectl status" to see details about the uplink DNS servers
# currently in use.
#
# Third party programs should typically not access this file directly, but only
# through the symlink at /etc/resolv.conf. To manage man:resolv.conf(5) in a
# different way, replace this symlink by a static file or a different symlink.
#
# See man:systemd-resolved.service(8) for details about the supported modes of
# operation for /etc/resolv.conf.

nameserver 127.0.0.53
options edns0 trust-ad
search .
```

8. Edit the same file you display in the previous step, set the system's hostname to your MIDAS ID permanently. Reboot system and repeat step 6.

sudo nano /etc/hostname

cat /etc/hostname

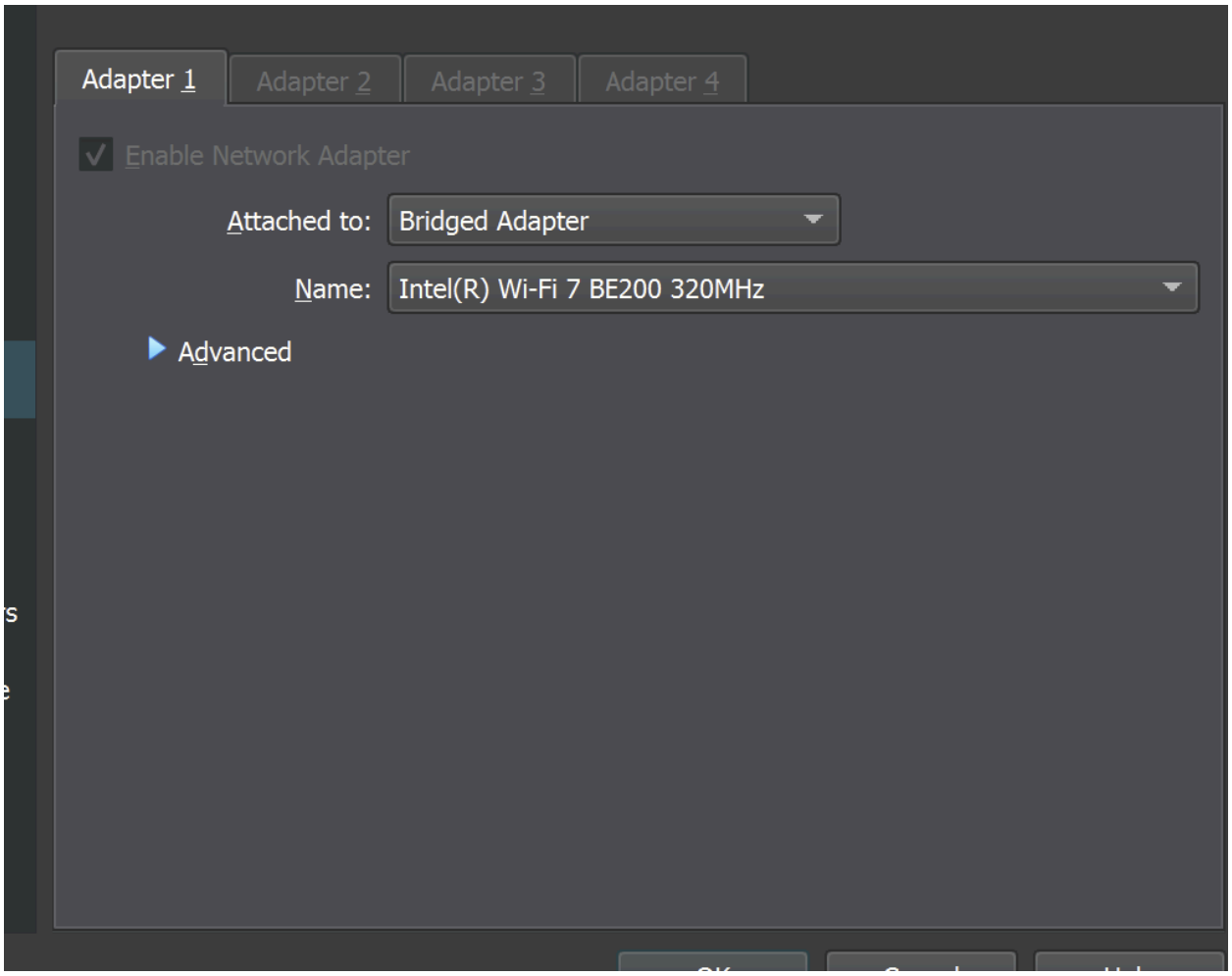
```
prescott-kowalski@CYSE270Linux:~$ sudo nano /etc/hostname
[sudo] password for prescott-kowalski:
prescott-kowalski@CYSE270Linux:~$
```

```
prescott-kowalski@Pkowa002:~$ cat /etc/hostname
Pkowa002
```

Task B – A Different Network Setting (3 * 20 = 60 Points)

1. Change the VM network connection from NAT to the bridge mode (you will lose your Internet

connection if you are connected to the ODU campus Wi-Fi network, but it is okay).



2. Reboot your system, then repeat Steps 1 – 7 in Task A.

```
prescott-kowalski@Pkowa002:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defaul
t 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 noprefixroute
       valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP gr
oup default qlen 1000
    link/ether 08:00:27:42:b5:d6 brd ff:ff:ff:ff:ff:ff
    inet 192.168.50.210/24 brd 192.168.50.255 scope global dynamic noprefixroute
 enp0s3
       valid_lft 86336sec preferred_lft 86336sec
    inet6 fe80::a00:27ff:fe42:b5d6/64 scope link
       valid_lft forever preferred_lft forever
```

```
prescott-kowalski@Pkowa002:~$ ip route show
default via 192.168.50.1 dev enp0s3 proto dhcp src 192.168.50.210 metric 100
192.168.50.0/24 dev enp0s3 proto kernel scope link src 192.168.50.210 metric 100
```

```
prescott-kowalski@Pkowa002:~$ ss -t
State       Recv-Q       Send-Q             Local Address:Port             Peer Address:Port       Process
```

```
prescott-kowalski@Pkowa002:~$ ping -c 10 ubuntu.com
PING ubuntu.com (185.125.190.21) 56(84) bytes of data.

--- ubuntu.com ping statistics ---
10 packets transmitted, 0 received, 100% packet loss, time 9220ms
```

```
prescott-kowalski@Pkowa002:~$ host www.odu.edu
www.odu.edu has address 35.170.140.174
prescott-kowalski@Pkowa002:~$
```

```
prescott-kowalski@Pkowa002:~$ cat /etc/hostname
Pkowa002
```

```
prescott-kowalski@Pkowa002:~$ cat /etc/resolv.conf
# This is /run/systemd/resolve/stub-resolv.conf managed by man:systemd-resolved(8).
# Do not edit.
#
# This file might be symlinked as /etc/resolv.conf. If you're looking at
# /etc/resolv.conf and seeing this text, you have followed the symlink.
#
# This is a dynamic resolv.conf file for connecting local clients to the
# internal DNS stub resolver of systemd-resolved. This file lists all
# configured search domains.
#
# Run "resolvectl status" to see details about the uplink DNS servers
# currently in use.
#
# Third party programs should typically not access this file directly, but only
# through the symlink at /etc/resolv.conf. To manage man:resolv.conf(5) in a
# different way, replace this symlink by a static file or a different symlink.
#
# See man:systemd-resolved.service(8) for details about the supported modes of
# operation for /etc/resolv.conf.

nameserver 127.0.0.53
options edns0 trust-ad
```

3. Highlight the differences at the end of each step and discuss what do you find.

Step One:

IP Address Change:

In NAT mode, the IP address was 10.0.2.15, which is part of a virtual private network created by the VM.
In bridged mode, the IP changed to 192.168.50.210, which comes directly from the physical LAN. This means the VM is now treated like a regular device on the local network.
Network Visibility:
NAT mode isolates the VM behind a virtual router, so it's hidden from other devices on the LAN.
Bridged mode exposes the VM to the same network as the host machine, allowing direct communication with other devices.
MAC Address:
The MAC address stayed the same (08:00:27:42:b5:d6) because it's tied to the virtual network adapter, not the IP configuration.
Subnet Mask:
Both modes used /24, which equals 255.255.255.0, but the subnet itself changed — from 10.0.2.0/24 in NAT to 192.168.50.0/24 in bridged.

Step Two:
Default Gateway Change:
In NAT mode, the default gateway was 10.0.2.2.
In bridged mode, it changed to 192.168.50.1.
This shows that NAT routes traffic through a virtual gateway managed by the hypervisor, while bridged mode uses the actual physical router on your LAN.
Source IP Change:
NAT mode used src 10.0.2.15.
Bridged mode uses src 192.168.50.210.
This reflects the shift from a virtual IP to a real LAN IP assigned by your network's DHCP server.
Subnet Route Change:
NAT mode had a route for 10.0.2.0/24.
Bridged mode has a route for 192.168.50.0/24.
This confirms the VM is now part of a different subnet — one that matches your physical network.

Step Three:
Connection State:
In both NAT and bridged mode, the ss -t output showed no active TCP connections at the time of the command. This means the system wasn't communicating over TCP with any remote hosts during the snapshot.
Expected Differences (if connections were present):
In NAT mode, the local address would show an IP like 10.0.2.15.
In bridged mode, it would show 192.168.50.210.
This reflects the change in how the VM identifies itself on the network ; NAT hides it behind a virtual IP, while bridged mode exposes its real LAN IP.

Visibility:
Even though no connections were active, bridged mode would allow other devices on the same LAN to initiate TCP connections to the VM directly, which isn't possible in NAT mode without port forwarding.

Step Four:
NAT Mode:
Ping to ubuntu.com failed with 100% packet loss.
This suggests that outbound ICMP traffic may be blocked by the NAT configuration or filtered by the host network.
Bridged Mode:
Ping also failed with 100% packet loss.

Step Five:
NAT Mode:
The host command successfully resolved www.odu.edu to its IP address.
This confirms that DNS resolution works correctly through the virtual NAT interface.
Bridged Mode:
The host command also resolved www.odu.edu without issues.
This shows that the bridged network is correctly passing DNS queries to the LAN's DNS server.

Step Six:
Name changed to Pkowa002

Step 7:
NAT Mode:
The file shows nameserver 127.0.0.53, which is a local stub resolver managed by systemd-resolved.
This means DNS queries are forwarded internally and then routed through the NAT's virtual DNS setup.
Bridged Mode:
The file also shows nameserver 127.0.0.53, still using the same stub resolver.
This confirms that even in bridged mode, the system relies on systemd-resolved to handle DNS, but the uplink DNS servers behind it may differ.
Key Insight:
The visible configuration didn't change, but the actual DNS servers used (which you can view with resolvectl status) likely shifted from the NAT's virtual DNS to the LAN's real DNS
Conclusion:
The stub resolver masks changes in upstream DNS, so /etc/resolv.conf looks the same in both modes, but the underlying DNS path is different.