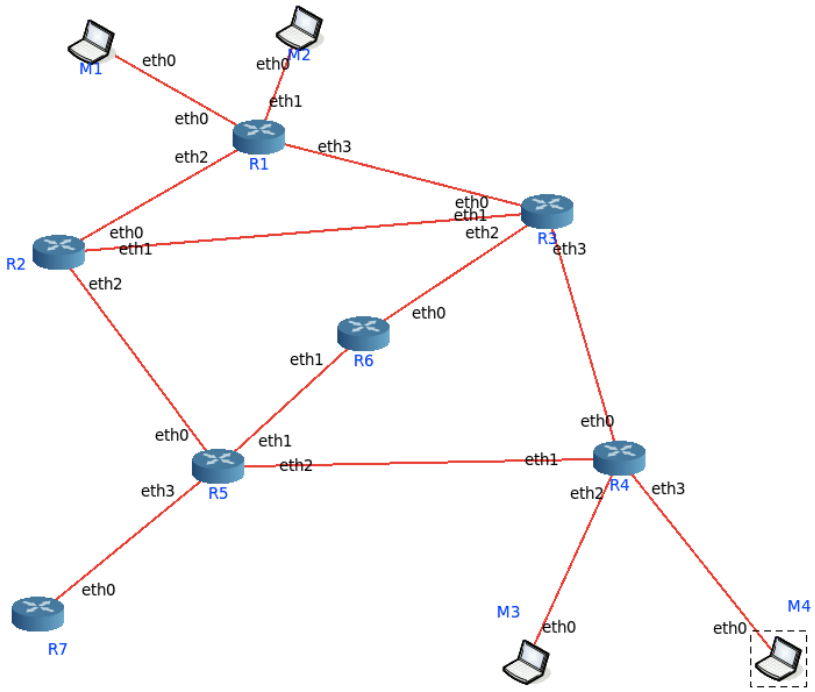
TASK 1

Include a copy of the completed table in your report with the port numbers for each device interface.

Router	Port	Cable	IPv4 Address	IPv4 Netmask	IPv6 Address
R1	ETH2	c1	10.10.1.1	255.255.255.0	2404:2000:2002:101::1/64
R1	ETH3	c2	10.10.2.1	255.255.255.0	2404:2000:2002:102::1/64
R1	ETH0	c10	10.10.10.1	255.255.255.0	2404:2000:2002:110::1/64
R1	ETH1	c11	10.10.11.1	255.255.255.0	2404:2000:2002:111::1/64
R2	ETH0	c1	10.10.1.2	255.255.255.0	2404:2000:2002:101::2/64
R2	ETH2	c8	10.10.8.1	255.255.255.0	2404:2000:2002:108::1/64
R2	ETH1	c9	10.10.9.1	255.255.255.0	2404:2000:2002:109::1/64
R3	ETH2	c7	10.10.7.1	255.255.255.0	2404:2000:2002:107::1/64
R3	ETH0	c2	10.10.2.2	255.255.255.0	2404:2000:2002:102::2/64
R3	ETH3	c3	10.10.3.1	255.255.255.0	2404:2000:2002:103::1/64
R3	ETH1	c9	10.10.9.2	255.255.255.0	2404:2000:2002:109::2/64
R4	ETH3	c13	10.10.13.1	255.255.255.0	2404:2000:2002:113::1/64
R4	ETH0	c3	10.10.3.2	255.255.255.0	2404:2000:2002:103::2/64
R4	ETH1	c4	10.10.4.1	255.255.255.0	2404:2000:2002:104::1/64
R4	ETH2	c12	10.10.12.1	255.255.255.0	2404:2000:2002:112::1/64
R5	ETH3	c6	10.10.6.2	255.255.255.0	2404:2000:2002:106::2/64
R5	ETH2	c4	10.10.4.2	255.255.255.0	2404:2000:2002:104::2/64
R5	ETH1	c5	10.10.5.1	255.255.255.0	2404:2000:2002:105::1/64
R5	ETH0	c8	10.10.8.2	255.255.255.0	2404:2000:2002:108::2/64
R6	ETH1	c5	10.10.5.2	255.255.255.0	2404:2000:2002:105::2/64
R6	ETH0	c7	10.10.7.2	255.255.255.0	2404:2000:2002:107::2/64
R7	ETH0	c6	10.10.6.1	255.255.255.0	2404:2000:2002:106::1/64
m1	eth0	c10	10.10.10.2	255.255.255.0	2404:2000:2002:110::2/64
m2	eth0	c11	10.10.11.2	255.255.255.0	2404:2000:2002:111::2/64
m3	eth0	c12	10.10.12.2	255.255.255.0	2404:2000:2002:112::2/64
m4	eth0	c13	10.10.13.2	255.255.255.0	2404:2000:2002:113::2/64



QUESTIONS

1. Why do the IPv4 addresses all start with 10.10?

The way the IPv4 address is interpreted is determined by the subnet mask.

The net-mask is 255.255.255.0 which is 32 bits and consists of four 8-bit octets.
The “255” address is always assigned to a broadcast address, and the “0” address is always assigned to a network address.
With our subnet mask the network portion is the first three octets with the hosts and subnets in just the remaining 8 bits of octet 4 (e.g 10.10.10.X).

As the first two numbers identify the network as it is apart of the private network range. The IPv4 will be the same for all the local computers and routers as they are all under one network.
In our example, all of them start with 10.10.

2. What is the IPv6 equivalent?
The prefix-length in IPv6 is the equivalent of the subnet mask in IPv4. However, rather than being expressed in four octets like it is in IPv4, it is expressed as an integer between 1 through 128.

Network address - the first three groupings of numbers (first 48 bits) in the subnet mask
Subnet address - the fourth grouping of numbers (the 49th through 64th bits) in the subnet mask
Device address - the last four groupings of numbers (the last 64 bits) in the subnet mask

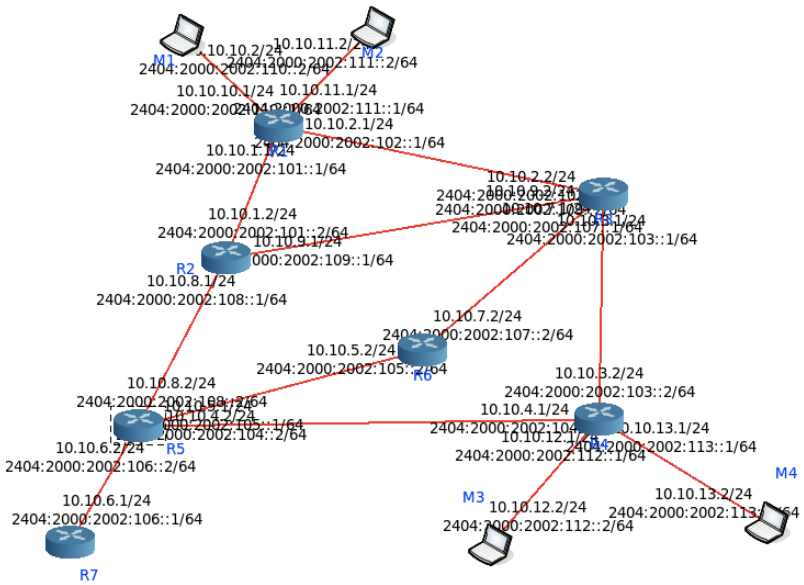
The network address in the project is 2404:2000:2002 and the subnet address ranges from 101 to 111.
The first 3 groupings of number are the same for all the local computers and routers as they are all under one network as observed in IPv4 where all addresses starts with 10.10 to indicate the same thing.

3. What is a netmask and why does IPv4 need one?
All IP addresses are divided into portions. One part identifies the network (the network number) and the other part identifies the specific machine or host within the network (the host number). The net mask splits the IP address into the host and network addresses, thereby defining which part of the IP address belongs to the device and which part belongs to the network.

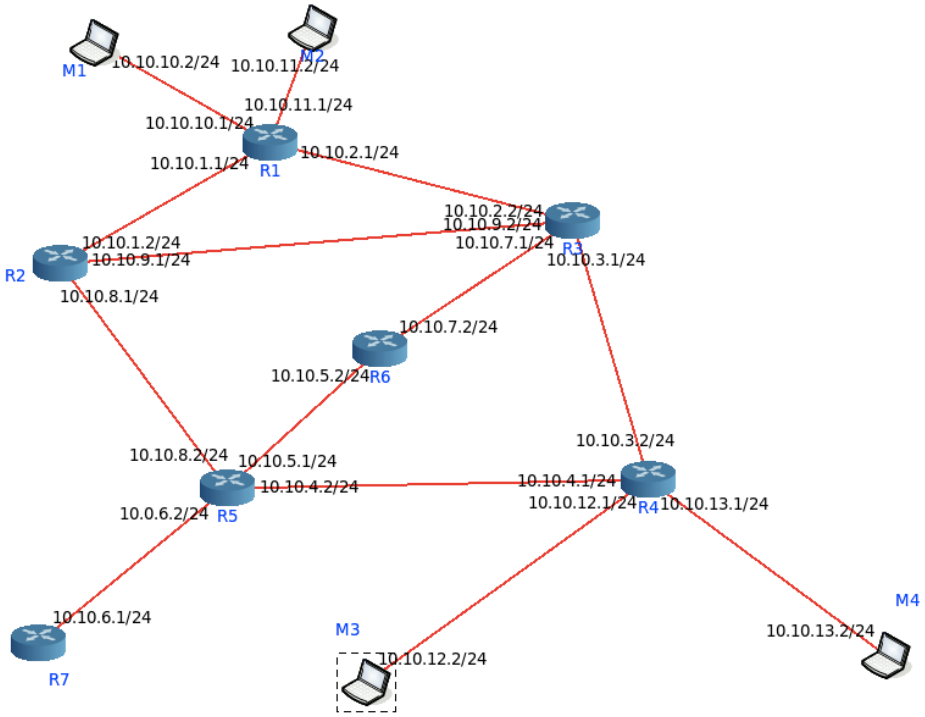
An IPv4 needs a net mask to identify which parts of the IP belongs to the network and which part belongs to the host, this is because a net-mask for IPv4 determines the broadcast address using the numbers of ‘225’ and network address using the numbers of ‘0’.

TASK 2

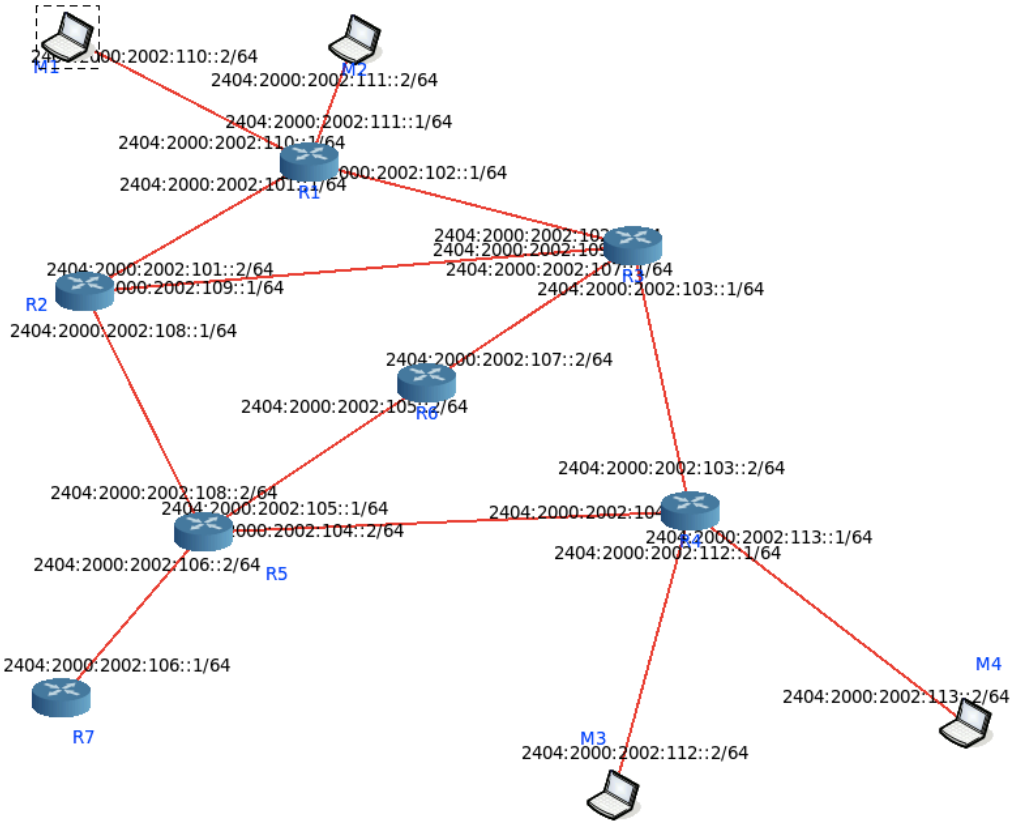
Include a copy of YOUR network diagram in your report. The screenshot should include visible IPv4 and IPv6 addresses. For the sake of readability,



Seperate IPv4 (included for readability)



Seperate IPv6 (included for readability)


M1
2404:2000:2002:110::2/64
M2
2404:2000:2002:111::2/64
2404:2000:2002:111::1/64
2404:2000:2002:110::1/64
R1
2404:2000:2002:102::1/64
2404:2000:2002:101::1/64
2404:2000:2002:101::2/64
2404:2000:2002:109::1/64
R2
2404:2000:2002:108::1/64
2404:2000:2002:107::1/64
2404:2000:2002:103::1/64
2404:2000:2002:107::2/64
2404:2000:2002:105::2/64
R6
2404:2000:2002:103::2/64
2404:2000:2002:108::2/64
2404:2000:2002:105::1/64
2404:2000:2002:104::2/64
R5
2404:2000:2002:106::2/64
2404:2000:2002:113::1/64
2404:2000:2002:112::1/64
2404:2000:2002:106::1/64
R7
M4
2404:2000:2002:113::2/64
M3
2404:2000:2002:112::2/64

TASK 3

Record your tests in your report.

R1 C1 & R1 C2

```
root@R1:/tmp/pycore.34845/R1.conf# ping -c 3 10.10.1.1
PING 10.10.1.1 (10.10.1.1) 56(84) bytes of data.
64 bytes from 10.10.1.1: icmp_seq=1 ttl=64 time=0.037 ms
64 bytes from 10.10.1.1: icmp_seq=2 ttl=64 time=0.034 ms
64 bytes from 10.10.1.1: icmp_seq=3 ttl=64 time=0.146 ms

--- 10.10.1.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2033ms
rtt min/avg/max/mdev = 0.034/0.072/0.146/0.052 ms
root@R1:/tmp/pycore.34845/R1.conf# ping6 -c 3 2404:2000:2002:101::1
PING 2404:2000:2002:101::1(2404:2000:2002:101::1) 56 data bytes
64 bytes from 2404:2000:2002:101::1: icmp_seq=1 ttl=64 time=0.157 ms
64 bytes from 2404:2000:2002:101::1: icmp_seq=2 ttl=64 time=0.171 ms
64 bytes from 2404:2000:2002:101::1: icmp_seq=3 ttl=64 time=0.264 ms

--- 2404:2000:2002:101::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2056ms
rtt min/avg/max/mdev = 0.157/0.197/0.264/0.047 ms
root@R1:/tmp/pycore.34845/R1.conf#
```

```
root@R1:/tmp/pycore.34845/R1.conf# ping -c 3 10.10.2.1
PING 10.10.2.1 (10.10.2.1) 56(84) bytes of data.
64 bytes from 10.10.2.1: icmp_seq=1 ttl=64 time=0.026 ms
64 bytes from 10.10.2.1: icmp_seq=2 ttl=64 time=0.052 ms
64 bytes from 10.10.2.1: icmp_seq=3 ttl=64 time=0.041 ms

--- 10.10.2.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2054ms
rtt min/avg/max/mdev = 0.026/0.039/0.052/0.010 ms
root@R1:/tmp/pycore.34845/R1.conf# ping6 -c 3 2404:2000:2002:102::1
PING 2404:2000:2002:102::1(2404:2000:2002:102::1) 56 data bytes
64 bytes from 2404:2000:2002:102::1: icmp_seq=1 ttl=64 time=0.133 ms
64 bytes from 2404:2000:2002:102::1: icmp_seq=2 ttl=64 time=0.061 ms
64 bytes from 2404:2000:2002:102::1: icmp_seq=3 ttl=64 time=0.070 ms

--- 2404:2000:2002:102::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2012ms
rtt min/avg/max/mdev = 0.061/0.088/0.133/0.032 ms
root@R1:/tmp/pycore.34845/R1.conf#
```

R1 C10 & R1 C11

```
root@R1:/tmp/pycore.34845/R1.conf# ping -c 3 10.10.10.1
PING 10.10.10.1 (10.10.10.1) 56(84) bytes of data.
64 bytes from 10.10.10.1: icmp_seq=1 ttl=64 time=0.020 ms
64 bytes from 10.10.10.1: icmp_seq=2 ttl=64 time=0.047 ms
64 bytes from 10.10.10.1: icmp_seq=3 ttl=64 time=0.051 ms

--- 10.10.10.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2043ms
rtt min/avg/max/mdev = 0.020/0.039/0.051/0.013 ms
root@R1:/tmp/pycore.34845/R1.conf# ping6 -c 3 2404:2000:2002:110::1
PING 2404:2000:2002:110::1(2404:2000:2002:110::1) 56 data bytes
64 bytes from 2404:2000:2002:110::1: icmp_seq=1 ttl=64 time=0.035 ms
64 bytes from 2404:2000:2002:110::1: icmp_seq=2 ttl=64 time=0.062 ms
64 bytes from 2404:2000:2002:110::1: icmp_seq=3 ttl=64 time=0.061 ms

--- 2404:2000:2002:110::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2036ms
rtt min/avg/max/mdev = 0.035/0.052/0.062/0.012 ms
root@R1:/tmp/pycore.34845/R1.conf#
```

```
root@R1:/tmp/pycore.34845/R1.conf# ping -c 3 10.10.11.1
PING 10.10.11.1 (10.10.11.1) 56(84) bytes of data.
64 bytes from 10.10.11.1: icmp_seq=1 ttl=64 time=0.023 ms
64 bytes from 10.10.11.1: icmp_seq=2 ttl=64 time=0.040 ms
64 bytes from 10.10.11.1: icmp_seq=3 ttl=64 time=0.051 ms

--- 10.10.11.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2026ms
rtt min/avg/max/mdev = 0.023/0.038/0.051/0.011 ms
root@R1:/tmp/pycore.34845/R1.conf# ping6 -c 3 2404:2000:2002:111::1
PING 2404:2000:2002:111::1(2404:2000:2002:111::1) 56 data bytes
64 bytes from 2404:2000:2002:111::1: icmp_seq=1 ttl=64 time=0.036 ms
64 bytes from 2404:2000:2002:111::1: icmp_seq=2 ttl=64 time=0.062 ms
64 bytes from 2404:2000:2002:111::1: icmp_seq=3 ttl=64 time=0.064 ms

--- 2404:2000:2002:111::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2031ms
rtt min/avg/max/mdev = 0.036/0.054/0.064/0.012 ms
root@R1:/tmp/pycore.34845/R1.conf#
```

R2 C1 & R2 C8

```
root@R2:/tmp/pycore.40487/R2.conf# ping -c 3 10.10.1.2
PING 10.10.1.2 (10.10.1.2) 56(84) bytes of data.
64 bytes from 10.10.1.2: icmp_seq=1 ttl=64 time=0.024 ms
64 bytes from 10.10.1.2: icmp_seq=2 ttl=64 time=0.050 ms
64 bytes from 10.10.1.2: icmp_seq=3 ttl=64 time=0.041 ms

--- 10.10.1.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2046ms
rtt min/avg/max/mdev = 0.024/0.038/0.050/0.010 ms
root@R2:/tmp/pycore.40487/R2.conf# ping6 -c 3 2404:2000:2002:101::2
PING 2404:2000:2002:101::2(2404:2000:2002:101::2) 56 data bytes
64 bytes from 2404:2000:2002:101::2: icmp_seq=1 ttl=64 time=0.037 ms
64 bytes from 2404:2000:2002:101::2: icmp_seq=2 ttl=64 time=0.059 ms
64 bytes from 2404:2000:2002:101::2: icmp_seq=3 ttl=64 time=0.048 ms

--- 2404:2000:2002:101::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2036ms
rtt min/avg/max/mdev = 0.037/0.048/0.059/0.009 ms
root@R2:/tmp/pycore.40487/R2.conf#
```

```
root@R2:/tmp/pycore.40487/R2.conf# ping -c 3 10.10.8.1
PING 10.10.8.1 (10.10.8.1) 56(84) bytes of data.
64 bytes from 10.10.8.1: icmp_seq=1 ttl=64 time=0.018 ms
64 bytes from 10.10.8.1: icmp_seq=2 ttl=64 time=0.040 ms
64 bytes from 10.10.8.1: icmp_seq=3 ttl=64 time=0.049 ms

--- 10.10.8.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2033ms
rtt min/avg/max/mdev = 0.018/0.035/0.049/0.013 ms
root@R2:/tmp/pycore.40487/R2.conf# ping6 -c 3 2404:2000:2002:108::1
PING 2404:2000:2002:108::1(2404:2000:2002:108::1) 56 data bytes
64 bytes from 2404:2000:2002:108::1: icmp_seq=1 ttl=64 time=0.027 ms
64 bytes from 2404:2000:2002:108::1: icmp_seq=2 ttl=64 time=0.055 ms
64 bytes from 2404:2000:2002:108::1: icmp_seq=3 ttl=64 time=0.061 ms

--- 2404:2000:2002:108::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2053ms
rtt min/avg/max/mdev = 0.027/0.047/0.061/0.014 ms
root@R2:/tmp/pycore.40487/R2.conf#
```

R2 C9 & R3 C7

```
root@R2:/tmp/pycore.40487/R2.conf# ping -c 3 10.10.9.1
PING 10.10.9.1 (10.10.9.1) 56(84) bytes of data.
64 bytes from 10.10.9.1: icmp_seq=1 ttl=64 time=0.033 ms
64 bytes from 10.10.9.1: icmp_seq=2 ttl=64 time=0.059 ms
64 bytes from 10.10.9.1: icmp_seq=3 ttl=64 time=0.043 ms

--- 10.10.9.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2003ms
rtt min/avg/max/mdev = 0.033/0.045/0.059/0.010 ms
root@R2:/tmp/pycore.40487/R2.conf# ping -c 3 2404:2000:2002:109::1
PING 2404:2000:2002:109::1(2404:2000:2002:109::1) 56 data bytes
64 bytes from 2404:2000:2002:109::1: icmp_seq=1 ttl=64 time=0.034 ms
64 bytes from 2404:2000:2002:109::1: icmp_seq=2 ttl=64 time=0.048 ms
64 bytes from 2404:2000:2002:109::1: icmp_seq=3 ttl=64 time=0.060 ms

--- 2404:2000:2002:109::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2030ms
rtt min/avg/max/mdev = 0.034/0.047/0.060/0.010 ms
root@R2:/tmp/pycore.40487/R2.conf#
```

```
root@R3:/tmp/pycore.40487/R3.conf# ping -c 3 10.10.7.1
PING 10.10.7.1 (10.10.7.1) 56(84) bytes of data.
64 bytes from 10.10.7.1: icmp_seq=1 ttl=64 time=0.022 ms
64 bytes from 10.10.7.1: icmp_seq=2 ttl=64 time=0.050 ms
64 bytes from 10.10.7.1: icmp_seq=3 ttl=64 time=0.037 ms

--- 10.10.7.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2029ms
rtt min/avg/max/mdev = 0.022/0.036/0.050/0.011 ms
root@R3:/tmp/pycore.40487/R3.conf# ping6 -c 3 2404:2000:2002:107::1
PING 2404:2000:2002:107::1(2404:2000:2002:107::1) 56 data bytes
64 bytes from 2404:2000:2002:107::1: icmp_seq=1 ttl=64 time=0.037 ms
64 bytes from 2404:2000:2002:107::1: icmp_seq=2 ttl=64 time=0.060 ms
64 bytes from 2404:2000:2002:107::1: icmp_seq=3 ttl=64 time=0.048 ms

--- 2404:2000:2002:107::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2026ms
rtt min/avg/max/mdev = 0.037/0.048/0.060/0.009 ms
root@R3:/tmp/pycore.40487/R3.conf#
```

R3 C2 & R3 C3

```
root@R3:/tmp/pycore.40487/R3.conf# ping -c 3 10.10.3.1
PING 10.10.3.1 (10.10.3.1) 56(84) bytes of data.
64 bytes from 10.10.3.1: icmp_seq=1 ttl=64 time=0.018 ms
64 bytes from 10.10.3.1: icmp_seq=2 ttl=64 time=0.049 ms
64 bytes from 10.10.3.1: icmp_seq=3 ttl=64 time=0.041 ms

--- 10.10.3.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2046ms
rtt min/avg/max/mdev = 0.018/0.036/0.049/0.013 ms
root@R3:/tmp/pycore.40487/R3.conf# ping6 -c 3 2404:2000:2002:103::1
PING 2404:2000:2002:103::1(2404:2000:2002:103::1) 56 data bytes
64 bytes from 2404:2000:2002:103::1: icmp_seq=1 ttl=64 time=0.030 ms
64 bytes from 2404:2000:2002:103::1: icmp_seq=2 ttl=64 time=0.059 ms
64 bytes from 2404:2000:2002:103::1: icmp_seq=3 ttl=64 time=0.048 ms

--- 2404:2000:2002:103::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2048ms
rtt min/avg/max/mdev = 0.030/0.045/0.059/0.011 ms
root@R3:/tmp/pycore.40487/R3.conf#
```

```
root@R3:/tmp/pycore.40487/R3.conf# ping -c 3 10.10.2.2
PING 10.10.2.2 (10.10.2.2) 56(84) bytes of data.
64 bytes from 10.10.2.2: icmp_seq=1 ttl=64 time=0.032 ms
64 bytes from 10.10.2.2: icmp_seq=2 ttl=64 time=0.051 ms
64 bytes from 10.10.2.2: icmp_seq=3 ttl=64 time=0.051 ms

--- 10.10.2.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2043ms
rtt min/avg/max/mdev = 0.032/0.044/0.051/0.009 ms
root@R3:/tmp/pycore.40487/R3.conf# ping6 -c 3 2404:2000:2002:102::2
PING 2404:2000:2002:102::2(2404:2000:2002:102::2) 56 data bytes
64 bytes from 2404:2000:2002:102::2: icmp_seq=1 ttl=64 time=0.029 ms
64 bytes from 2404:2000:2002:102::2: icmp_seq=2 ttl=64 time=0.048 ms
64 bytes from 2404:2000:2002:102::2: icmp_seq=3 ttl=64 time=0.049 ms

--- 2404:2000:2002:102::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2041ms
rtt min/avg/max/mdev = 0.029/0.042/0.049/0.009 ms
root@R3:/tmp/pycore.40487/R3.conf#
```

R3 C9 & R4 C13

```
root@R3:/tmp/pycore.40487/R3.conf# ping -c 3 10.10.9.2
PING 10.10.9.2 (10.10.9.2) 56(84) bytes of data.
64 bytes from 10.10.9.2: icmp_seq=1 ttl=64 time=0.023 ms
64 bytes from 10.10.9.2: icmp_seq=2 ttl=64 time=0.050 ms
64 bytes from 10.10.9.2: icmp_seq=3 ttl=64 time=0.050 ms

--- 10.10.9.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2056ms
rtt min/avg/max/mdev = 0.023/0.041/0.050/0.012 ms
root@R3:/tmp/pycore.40487/R3.conf# ping6 -c 3 2404:2000:2002:109::2
PING 2404:2000:2002:109::2(2404:2000:2002:109::2) 56 data bytes
64 bytes from 2404:2000:2002:109::2: icmp_seq=1 ttl=64 time=0.022 ms
64 bytes from 2404:2000:2002:109::2: icmp_seq=2 ttl=64 time=0.043 ms
64 bytes from 2404:2000:2002:109::2: icmp_seq=3 ttl=64 time=0.042 ms

--- 2404:2000:2002:109::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2052ms
rtt min/avg/max/mdev = 0.022/0.035/0.043/0.009 ms
root@R3:/tmp/pycore.40487/R3.conf#
```

```
root@R4:/tmp/pycore.40487/R4.conf# ping -c 3 10.10.13.1
PING 10.10.13.1 (10.10.13.1) 56(84) bytes of data.
64 bytes from 10.10.13.1: icmp_seq=1 ttl=64 time=0.028 ms
64 bytes from 10.10.13.1: icmp_seq=2 ttl=64 time=0.051 ms
64 bytes from 10.10.13.1: icmp_seq=3 ttl=64 time=0.049 ms

--- 10.10.13.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2036ms
rtt min/avg/max/mdev = 0.028/0.042/0.051/0.010 ms
root@R4:/tmp/pycore.40487/R4.conf# ping6 -c 3 2404:2000:2002:113::1
PING 2404:2000:2002:113::1(2404:2000:2002:113::1) 56 data bytes
64 bytes from 2404:2000:2002:113::1: icmp_seq=1 ttl=64 time=0.024 ms
64 bytes from 2404:2000:2002:113::1: icmp_seq=2 ttl=64 time=0.049 ms
64 bytes from 2404:2000:2002:113::1: icmp_seq=3 ttl=64 time=0.343 ms

--- 2404:2000:2002:113::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2051ms
rtt min/avg/max/mdev = 0.024/0.138/0.343/0.144 ms
root@R4:/tmp/pycore.40487/R4.conf#
```

R4 C3 & R4 c4

```
root@R4:/tmp/pycore.37275/R4.conf# ping -c 3 10.10.3.2
PING 10.10.3.2 (10.10.3.2) 56(84) bytes of data.
64 bytes from 10.10.3.2: icmp_seq=1 ttl=64 time=0.041 ms
64 bytes from 10.10.3.2: icmp_seq=2 ttl=64 time=0.069 ms
64 bytes from 10.10.3.2: icmp_seq=3 ttl=64 time=0.042 ms

--- 10.10.3.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2041ms
rtt min/avg/max/mdev = 0.041/0.050/0.069/0.013 ms
root@R4:/tmp/pycore.37275/R4.conf# ping6 -c 3 2404:2000:2002:103::2
PING 2404:2000:2002:103::2(2404:2000:2002:103::2) 56 data bytes
64 bytes from 2404:2000:2002:103::2: icmp_seq=1 ttl=64 time=0.027 ms
64 bytes from 2404:2000:2002:103::2: icmp_seq=2 ttl=64 time=0.045 ms
64 bytes from 2404:2000:2002:103::2: icmp_seq=3 ttl=64 time=0.061 ms

--- 2404:2000:2002:103::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2041ms
rtt min/avg/max/mdev = 0.027/0.044/0.061/0.013 ms
root@R4:/tmp/pycore.37275/R4.conf#
```

```
root@R4:/tmp/pycore.37275/R4.conf# ping -c 3 10.10.4.1
PING 10.10.4.1 (10.10.4.1) 56(84) bytes of data.
64 bytes from 10.10.4.1: icmp_seq=1 ttl=64 time=0.018 ms
64 bytes from 10.10.4.1: icmp_seq=2 ttl=64 time=0.053 ms
64 bytes from 10.10.4.1: icmp_seq=3 ttl=64 time=0.042 ms

--- 10.10.4.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2049ms
rtt min/avg/max/mdev = 0.018/0.037/0.053/0.014 ms
root@R4:/tmp/pycore.37275/R4.conf# ping6 -c 3 2404:2000:2002:104::1
PING 2404:2000:2002:104::1(2404:2000:2002:104::1) 56 data bytes
64 bytes from 2404:2000:2002:104::1: icmp_seq=1 ttl=64 time=0.037 ms
64 bytes from 2404:2000:2002:104::1: icmp_seq=2 ttl=64 time=0.062 ms
64 bytes from 2404:2000:2002:104::1: icmp_seq=3 ttl=64 time=0.061 ms

--- 2404:2000:2002:104::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2032ms
rtt min/avg/max/mdev = 0.037/0.053/0.062/0.011 ms
root@R4:/tmp/pycore.37275/R4.conf#
```

R4 C12 & R5 C6

```
root@R4:/tmp/pycore.37275/R4.conf# ping -c 3 10.10.12.1
PING 10.10.12.1 (10.10.12.1) 56(84) bytes of data.
64 bytes from 10.10.12.1: icmp_seq=1 ttl=64 time=0.022 ms
64 bytes from 10.10.12.1: icmp_seq=2 ttl=64 time=0.040 ms
64 bytes from 10.10.12.1: icmp_seq=3 ttl=64 time=0.049 ms

--- 10.10.12.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2049ms
rtt min/avg/max/mdev = 0.022/0.037/0.049/0.011 ms
root@R4:/tmp/pycore.37275/R4.conf# ping6 -c 3 2404:2000:2002:112::1
PING 2404:2000:2002:112::1(2404:2000:2002:112::1) 56 data bytes
64 bytes from 2404:2000:2002:112::1: icmp_seq=1 ttl=64 time=0.026 ms
64 bytes from 2404:2000:2002:112::1: icmp_seq=2 ttl=64 time=0.063 ms
64 bytes from 2404:2000:2002:112::1: icmp_seq=3 ttl=64 time=0.064 ms

--- 2404:2000:2002:112::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2054ms
rtt min/avg/max/mdev = 0.026/0.051/0.064/0.017 ms
root@R4:/tmp/pycore.37275/R4.conf#
```

```
root@R5:/tmp/pycore.37275/R5.conf# ping -c 3 10.10.6.2
PING 10.10.6.2 (10.10.6.2) 56(84) bytes of data.
64 bytes from 10.10.6.2: icmp_seq=1 ttl=64 time=0.029 ms
64 bytes from 10.10.6.2: icmp_seq=2 ttl=64 time=0.052 ms
64 bytes from 10.10.6.2: icmp_seq=3 ttl=64 time=0.051 ms

--- 10.10.6.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2042ms
rtt min/avg/max/mdev = 0.029/0.044/0.052/0.010 ms
root@R5:/tmp/pycore.37275/R5.conf# ping6 -c 3 2404:2000:2002:106::2
PING 2404:2000:2002:106::2(2404:2000:2002:106::2) 56 data bytes
64 bytes from 2404:2000:2002:106::2: icmp_seq=1 ttl=64 time=0.043 ms
64 bytes from 2404:2000:2002:106::2: icmp_seq=2 ttl=64 time=0.063 ms
64 bytes from 2404:2000:2002:106::2: icmp_seq=3 ttl=64 time=0.052 ms

--- 2404:2000:2002:106::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2040ms
rtt min/avg/max/mdev = 0.043/0.052/0.063/0.008 ms
root@R5:/tmp/pycore.37275/R5.conf#
```

R5 C4 & R5 C5

```
root@R5:/tmp/pycore.37275/R5.conf# ping -c 3 10.10.4.2
PING 10.10.4.2 (10.10.4.2) 56(84) bytes of data.
64 bytes from 10.10.4.2: icmp_seq=1 ttl=64 time=0.020 ms
64 bytes from 10.10.4.2: icmp_seq=2 ttl=64 time=0.059 ms
64 bytes from 10.10.4.2: icmp_seq=3 ttl=64 time=0.059 ms

--- 10.10.4.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2052ms
rtt min/avg/max/mdev = 0.020/0.046/0.059/0.018 ms
root@R5:/tmp/pycore.37275/R5.conf# ping6 -c 3 2404:2000:2002:104::2
PING 2404:2000:2002:104::2(2404:2000:2002:104::2) 56 data bytes
64 bytes from 2404:2000:2002:104::2: icmp_seq=1 ttl=64 time=0.034 ms
64 bytes from 2404:2000:2002:104::2: icmp_seq=2 ttl=64 time=0.045 ms
64 bytes from 2404:2000:2002:104::2: icmp_seq=3 ttl=64 time=0.233 ms

--- 2404:2000:2002:104::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2039ms
rtt min/avg/max/mdev = 0.034/0.104/0.233/0.091 ms
root@R5:/tmp/pycore.37275/R5.conf#
```

```
root@R5:/tmp/pycore.39245/R5.conf# ping -c 3 10.10.5.1
PING 10.10.5.1 (10.10.5.1) 56(84) bytes of data.
64 bytes from 10.10.5.1: icmp_seq=1 ttl=64 time=0.028 ms
64 bytes from 10.10.5.1: icmp_seq=2 ttl=64 time=0.049 ms
64 bytes from 10.10.5.1: icmp_seq=3 ttl=64 time=0.040 ms

--- 10.10.5.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2046ms
rtt min/avg/max/mdev = 0.028/0.039/0.049/0.008 ms
root@R5:/tmp/pycore.39245/R5.conf# ping6 -c 3 2404:2000:2002:105::1
PING 2404:2000:2002:105::1(2404:2000:2002:105::1) 56 data bytes
64 bytes from 2404:2000:2002:105::1: icmp_seq=1 ttl=64 time=0.149 ms
64 bytes from 2404:2000:2002:105::1: icmp_seq=2 ttl=64 time=0.062 ms
64 bytes from 2404:2000:2002:105::1: icmp_seq=3 ttl=64 time=0.048 ms

--- 2404:2000:2002:105::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2032ms
rtt min/avg/max/mdev = 0.048/0.086/0.149/0.044 ms
root@R5:/tmp/pycore.39245/R5.conf#
```

R5 C8 & R6 C5

```
root@R5:/tmp/pycore.39245/R5.conf# ping -c 3 10.10.8.2
PING 10.10.8.2 (10.10.8.2) 56(84) bytes of data.
64 bytes from 10.10.8.2: icmp_seq=1 ttl=64 time=0.021 ms
64 bytes from 10.10.8.2: icmp_seq=2 ttl=64 time=0.036 ms
64 bytes from 10.10.8.2: icmp_seq=3 ttl=64 time=0.051 ms

--- 10.10.8.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2046ms
rtt min/avg/max/mdev = 0.021/0.036/0.051/0.012 ms
root@R5:/tmp/pycore.39245/R5.conf# ping6 -c 3 2404:2000:2002:108::2
PING 2404:2000:2002:108::2(2404:2000:2002:108::2) 56 data bytes
64 bytes from 2404:2000:2002:108::2: icmp_seq=1 ttl=64 time=0.040 ms
64 bytes from 2404:2000:2002:108::2: icmp_seq=2 ttl=64 time=0.047 ms
64 bytes from 2404:2000:2002:108::2: icmp_seq=3 ttl=64 time=0.060 ms

--- 2404:2000:2002:108::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2029ms
rtt min/avg/max/mdev = 0.040/0.049/0.060/0.008 ms
root@R5:/tmp/pycore.39245/R5.conf# x
```

```
root@R6:/tmp/pycore.39245/R6.conf# ping -c 3 10.10.5.2
PING 10.10.5.2 (10.10.5.2) 56(84) bytes of data.
64 bytes from 10.10.5.2: icmp_seq=1 ttl=64 time=0.032 ms
64 bytes from 10.10.5.2: icmp_seq=2 ttl=64 time=0.050 ms
64 bytes from 10.10.5.2: icmp_seq=3 ttl=64 time=0.048 ms

--- 10.10.5.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2025ms
rtt min/avg/max/mdev = 0.032/0.043/0.050/0.008 ms
root@R6:/tmp/pycore.39245/R6.conf# ping6 -c 3 2404:2000:2002:105::2
PING 2404:2000:2002:105::2(2404:2000:2002:105::2) 56 data bytes
64 bytes from 2404:2000:2002:105::2: icmp_seq=1 ttl=64 time=0.025 ms
64 bytes from 2404:2000:2002:105::2: icmp_seq=2 ttl=64 time=0.063 ms
64 bytes from 2404:2000:2002:105::2: icmp_seq=3 ttl=64 time=0.058 ms

--- 2404:2000:2002:105::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2043ms
rtt min/avg/max/mdev = 0.025/0.048/0.063/0.016 ms
root@R6:/tmp/pycore.39245/R6.conf#
```

R6 C7 & R7 C6

```
root@R6:/tmp/pycore.39245/R6.conf# ping -c 3 10.10.7.2
PING 10.10.7.2 (10.10.7.2) 56(84) bytes of data.
64 bytes from 10.10.7.2: icmp_seq=1 ttl=64 time=0.031 ms
64 bytes from 10.10.7.2: icmp_seq=2 ttl=64 time=0.040 ms
64 bytes from 10.10.7.2: icmp_seq=3 ttl=64 time=0.064 ms

--- 10.10.7.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2039ms
rtt min/avg/max/mdev = 0.031/0.045/0.064/0.013 ms
root@R6:/tmp/pycore.39245/R6.conf# ping6 -c 3 2404:2000:2002:107::2
PING 2404:2000:2002:107::2(2404:2000:2002:107::2) 56 data bytes
64 bytes from 2404:2000:2002:107::2: icmp_seq=1 ttl=64 time=0.028 ms
64 bytes from 2404:2000:2002:107::2: icmp_seq=2 ttl=64 time=0.058 ms
64 bytes from 2404:2000:2002:107::2: icmp_seq=3 ttl=64 time=0.057 ms

--- 2404:2000:2002:107::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2034ms
rtt min/avg/max/mdev = 0.028/0.047/0.058/0.013 ms
root@R6:/tmp/pycore.39245/R6.conf#
```

```
root@R7:/tmp/pycore.43431/R7.conf# ping -c 3 10.10.6.1
PING 10.10.6.1 (10.10.6.1) 56(84) bytes of data.
64 bytes from 10.10.6.1: icmp_seq=1 ttl=64 time=0.023 ms
64 bytes from 10.10.6.1: icmp_seq=2 ttl=64 time=0.055 ms
64 bytes from 10.10.6.1: icmp_seq=3 ttl=64 time=0.048 ms

--- 10.10.6.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2032ms
rtt min/avg/max/mdev = 0.023/0.042/0.055/0.013 ms
root@R7:/tmp/pycore.43431/R7.conf# ping6 -c 3 2404:2000:2002:106::1
PING 2404:2000:2002:106::1(2404:2000:2002:106::1) 56 data bytes
64 bytes from 2404:2000:2002:106::1: icmp_seq=1 ttl=64 time=0.027 ms
64 bytes from 2404:2000:2002:106::1: icmp_seq=2 ttl=64 time=0.044 ms
64 bytes from 2404:2000:2002:106::1: icmp_seq=3 ttl=64 time=0.046 ms

--- 2404:2000:2002:106::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2048ms
rtt min/avg/max/mdev = 0.027/0.039/0.046/0.008 ms
root@R7:/tmp/pycore.43431/R7.conf#
```

M1

```
root@M1:/tmp/pycore.36071/M1.conf# ping -c 3 10.10.10.2
PING 10.10.10.2 (10.10.10.2) 56(84) bytes of data.
64 bytes from 10.10.10.2: icmp_seq=1 ttl=64 time=0.028 ms
64 bytes from 10.10.10.2: icmp_seq=2 ttl=64 time=0.051 ms
64 bytes from 10.10.10.2: icmp_seq=3 ttl=64 time=0.040 ms

--- 10.10.10.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2037ms
rtt min/avg/max/mdev = 0.028/0.039/0.051/0.009 ms
root@M1:/tmp/pycore.36071/M1.conf# ping6 -c 3 2404:2000:2002:110::2
PING 2404:2000:2002:110::2(2404:2000:2002:110::2) 56 data bytes
64 bytes from 2404:2000:2002:110::2: icmp_seq=1 ttl=64 time=0.025 ms
64 bytes from 2404:2000:2002:110::2: icmp_seq=2 ttl=64 time=0.045 ms
64 bytes from 2404:2000:2002:110::2: icmp_seq=3 ttl=64 time=0.057 ms

--- 2404:2000:2002:110::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2035ms
rtt min/avg/max/mdev = 0.025/0.042/0.057/0.013 ms
root@M1:/tmp/pycore.36071/M1.conf#
```

M2

```
root@M2:/tmp/pycore.36071/M2.conf# ping -c 3 10.10.11.2
PING 10.10.11.2 (10.10.11.2) 56(84) bytes of data.
64 bytes from 10.10.11.2: icmp_seq=1 ttl=64 time=0.024 ms
64 bytes from 10.10.11.2: icmp_seq=2 ttl=64 time=0.051 ms
64 bytes from 10.10.11.2: icmp_seq=3 ttl=64 time=0.057 ms

--- 10.10.11.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2049ms
rtt min/avg/max/mdev = 0.024/0.044/0.057/0.014 ms
root@M2:/tmp/pycore.36071/M2.conf# ping6 -c 3 2404:2000:2002:111::2
PING 2404:2000:2002:111::2(2404:2000:2002:111::2) 56 data bytes
64 bytes from 2404:2000:2002:111::2: icmp_seq=1 ttl=64 time=0.032 ms
64 bytes from 2404:2000:2002:111::2: icmp_seq=2 ttl=64 time=0.045 ms
64 bytes from 2404:2000:2002:111::2: icmp_seq=3 ttl=64 time=0.057 ms

--- 2404:2000:2002:111::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2053ms
rtt min/avg/max/mdev = 0.032/0.044/0.057/0.010 ms
root@M2:/tmp/pycore.36071/M2.conf#
```

M3

```
root@M3:/tmp/pycore.36071/M3.conf# ping -c 3 10.10.12.2
PING 10.10.12.2 (10.10.12.2) 56(84) bytes of data.
64 bytes from 10.10.12.2: icmp_seq=1 ttl=64 time=0.029 ms
64 bytes from 10.10.12.2: icmp_seq=2 ttl=64 time=0.041 ms
64 bytes from 10.10.12.2: icmp_seq=3 ttl=64 time=0.041 ms

--- 10.10.12.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2053ms
rtt min/avg/max/mdev = 0.029/0.037/0.041/0.005 ms
root@M3:/tmp/pycore.36071/M3.conf# ping6 -c 3 2404:2000:2002:112::2
PING 2404:2000:2002:112::2(2404:2000:2002:112::2) 56 data bytes
64 bytes from 2404:2000:2002:112::2: icmp_seq=1 ttl=64 time=0.029 ms
64 bytes from 2404:2000:2002:112::2: icmp_seq=2 ttl=64 time=0.058 ms
64 bytes from 2404:2000:2002:112::2: icmp_seq=3 ttl=64 time=0.206 ms

--- 2404:2000:2002:112::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2046ms
rtt min/avg/max/mdev = 0.029/0.097/0.206/0.077 ms
root@M3:/tmp/pycore.36071/M3.conf#
```

M4

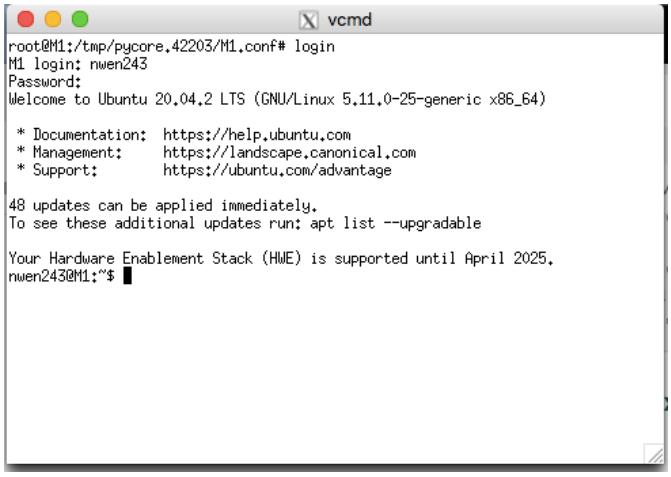
```
root@M4:/tmp/pycore.36071/M4.conf# ping -c 3 10.10.13.2
PING 10.10.13.2 (10.10.13.2) 56(84) bytes of data.
64 bytes from 10.10.13.2: icmp_seq=1 ttl=64 time=0.023 ms
64 bytes from 10.10.13.2: icmp_seq=2 ttl=64 time=0.051 ms
64 bytes from 10.10.13.2: icmp_seq=3 ttl=64 time=0.049 ms

--- 10.10.13.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2046ms
rtt min/avg/max/mdev = 0.023/0.041/0.051/0.012 ms
root@M4:/tmp/pycore.36071/M4.conf# ping6 -c 3 2404:2000:2002:113::2
PING 2404:2000:2002:113::2(2404:2000:2002:113::2) 56 data bytes
64 bytes from 2404:2000:2002:113::2: icmp_seq=1 ttl=64 time=0.029 ms
64 bytes from 2404:2000:2002:113::2: icmp_seq=2 ttl=64 time=0.058 ms
64 bytes from 2404:2000:2002:113::2: icmp_seq=3 ttl=64 time=0.057 ms

--- 2404:2000:2002:113::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2024ms
rtt min/avg/max/mdev = 0.029/0.048/0.058/0.013 ms
root@M4:/tmp/pycore.36071/M4.conf#
```

QUESTIONS

4. What is a default gateway?

A default gateway makes it possible for devices in one network to communicate with devices in another network. The default gateway is the path used to pass information when the device doesn't know where the destination is. Specifically, a default gateway is a router that connects your host to remote network segments.

TASK 4



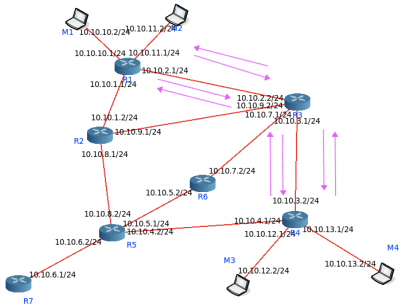
QUESTION

5. What is the mechanism for IPv6 that corresponds to ARP? Briefly describe this in your report.

In IPv6, the Address Resolution Protocol (ARP) has been replaced by the Neighbor Discovery Protocol (NDP).
IPv6 hosts do not need to navigate the routing protocols to find a router. IPv4 uses ARP, ICMP router discovery, and ICMP redirect for router discovery.
IPv6 router advertisements carry link-local addresses. No additional packet exchange is needed to resolve the router's link-local address.

6. How many static routes would you need to add to allow m1, m2, m3 and m4 to talk to each other? Explain how you reached your answer.

8 static routes



To allow m1, m2, m3 and m4 to talk to each other, 8 static routes need be configured at minimum.
2 connections are required at R4
4 connections are required at R3
2 connections are required at R1

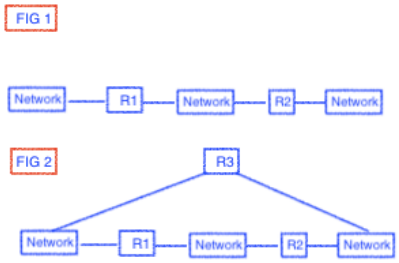
7. In a number of places there is a choice of paths. How would you decide which path to use?

In networks, determining the best path involves the evaluation of multiple paths to the same destination network and selecting the shortest path to reach that network.
The best path is chosen by a routing protocol based on the value it uses to determine the distance to reach that network. The best path to that network is the route with lowest value.

For example, from m1 to R2, multiple paths are available as follows:
m1 - R2
m1 - R1 - R3 - R2
Etc.
So among all the available paths, shortest path will be selected.

8. What would happen if one or more of your links failed?
Without static routing when a link between nodes failed they would not be able to communicate. However, if assuming static routes have been implemented, static routes will be used to transmit the data across the network. As we know, static routing is a compliment to dynamic routing. It is used to provide backup in case of dynamic route failure.
E.g if link R2 to R3 failed they would not be able to ping but with a static route to R1, R2 and R3 would be able to communicate through R1

9. What happens if you add an additional router?
Routers are the nodes that connects networks to each other. If an additional router is added, it provides reliability.
For example, consider the following diagrams:



In fig 1, network 1, 2 and 3 are connected by routers R1 and R2.
In fig 2, router R3 is added which is directly connecting network 1 and 3.
R3 is a redundant path between network 1 and 3 which improves reliability of network in case of failure of other paths.

10. Should we need to use NAT in an IPv6 only network? Explain why or why not.
The purpose of NAT is to avoid ip shortages.
The need for NATs as a way to share public IP addresses will be gone with IPv6 as the unique combination of IPv6 makes the likelihood of duplicate addresses much lower, but NATs may still have some uses for security reasons.

TASK 5

M1 & M2

```
root@M1:/tmp/pycore.36071/M1.conf# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.10.10.0      0.0.0.0         255.255.255.0   U     0      0        0 eth0
root@M1:/tmp/pycore.36071/M1.conf# route -6
Kernel IPv6 routing table
Destination                    Next Hop                   Flag Met Ref Use If
2404:2000:2002:110::/64        [::]                       U    256 1     0 eth0
fe80::/64                      [::]                       U    256 1     0 eth0
[::]/0                         [::]                       !n   -1  1     0 lo
ip6-localhost/128              [::]                       Un   0   4     0 lo
2404:2000:2002:110::/128       [::]                       Un   0   3     0 eth0
2404:2000:2002:110::2/128      [::]                       Un   0   3     0 eth0
fe80::/128                     [::]                       Un   0   3     0 eth0
fe80::200:ff:feaa:13/128       [::]                       Un   0   3     0 eth0
ip6-mcastprefix/8              [::]                       U    256 3     0 eth0
[::]/0                         [::]                       !n   -1  1     0 lo
root@M1:/tmp/pycore.36071/M1.conf#
```

```
root@M2:/tmp/pycore.36071/M2.conf# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.10.11.0      0.0.0.0         255.255.255.0   U     0      0        0 eth0
root@M2:/tmp/pycore.36071/M2.conf# route -6
Kernel IPv6 routing table
Destination                    Next Hop                   Flag Met Ref Use If
2404:2000:2002:111::/64        [::]                       U    256 1     0 eth0
fe80::/64                      [::]                       U    256 1     0 eth0
[::]/0                         [::]                       !n   -1  1     0 lo
ip6-localhost/128              [::]                       Un   0   4     0 lo
2404:2000:2002:111::/128       [::]                       Un   0   3     0 eth0
2404:2000:2002:111::2/128      [::]                       Un   0   3     0 eth0
fe80::/128                     [::]                       Un   0   3     0 eth0
fe80::200:ff:feaa:15/128       [::]                       Un   0   3     0 eth0
ip6-mcastprefix/8              [::]                       U    256 3     0 eth0
[::]/0                         [::]                       !n   -1  1     0 lo
root@M2:/tmp/pycore.36071/M2.conf#
```

R1 & R2

```
root@R1:/tmp/pycore.36071/R1.conf# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.10.1.0       0.0.0.0         255.255.255.0   U     0      0        0 eth2
10.10.2.0       0.0.0.0         255.255.255.0   U     0      0        0 eth3
10.10.10.0      0.0.0.0         255.255.255.0   U     0      0        0 eth0
10.10.11.0      0.0.0.0         255.255.255.0   U     0      0        0 eth1
root@R1:/tmp/pycore.36071/R1.conf# route -6
Kernel IPv6 routing table
Destination                    Next Hop                   Flag Met Ref Use If
2404:2000:2002:101::/64        [::]                       U    256 3     0 eth2
2404:2000:2002:102::/64        [::]                       U    256 1     0 eth3
2404:2000:2002:110::/64        [::]                       U    256 2     0 eth0
2404:2000:2002:111::/64        [::]                       U    256 1     0 eth1
fe80::/64                      [::]                       U    256 1     0 eth2
fe80::/64                      [::]                       U    256 1     0 eth3
fe80::/64                      [::]                       U    256 1     0 eth0
fe80::/64                      [::]                       U    256 1     0 eth1
[::]/0                         [::]                       !n   -1  1     0 lo
ip6-localhost/128              [::]                       Un   0   4     0 lo
2404:2000:2002:101::/128       [::]                       Un   0   3     0 eth2
2404:2000:2002:101::1/128      [::]                       Un   0   5     0 eth2
2404:2000:2002:102::/128       [::]                       Un   0   3     0 eth3
2404:2000:2002:102::1/128      [::]                       Un   0   3     0 eth3
2404:2000:2002:110::/128       [::]                       Un   0   3     0 eth0
2404:2000:2002:110::1/128      [::]                       Un   0   4     0 eth0
2404:2000:2002:111::/128       [::]                       Un   0   3     0 eth1
2404:2000:2002:111::1/128      [::]                       Un   0   3     0 eth1
fe80::/128                     [::]                       Un   0   3     0 eth2
fe80::/128                     [::]                       Un   0   3     0 eth3
fe80::/128                     [::]                       Un   0   3     0 eth0
fe80::/128                     [::]                       Un   0   3     0 eth1
fe80::200:ff:feaa:0/128        [::]                       Un   0   5     0 eth2
fe80::200:ff:feaa:2/128        [::]                       Un   0   2     0 eth3
fe80::200:ff:feaa:12/128       [::]                       Un   0   3     0 eth0
fe80::200:ff:feaa:14/128       [::]                       Un   0   2     0 eth1
ip6-mcastprefix/8              [::]                       U    256 3     0 eth2
ip6-mcastprefix/8              [::]                       U    256 2     0 eth3
ip6-mcastprefix/8              [::]                       U    256 2     0 eth0
ip6-mcastprefix/8              [::]                       U    256 2     0 eth1
[::]/0                         [::]                       !n   -1  1     0 lo
root@R1:/tmp/pycore.36071/R1.conf#
```

```
root@R2:/tmp/pycore.36071/R2.conf# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.10.1.0       0.0.0.0         255.255.255.0   U     0      0        0 eth0
10.10.8.0       0.0.0.0         255.255.255.0   U     0      0        0 eth2
10.10.9.0       0.0.0.0         255.255.255.0   U     0      0        0 eth1
root@R2:/tmp/pycore.36071/R2.conf# route -6
Kernel IPv6 routing table
Destination                    Next Hop                   Flag Met Ref Use If
2404:2000:2002:101::/64        [::]                       U    256 2     0 eth0
2404:2000:2002:108::/64        [::]                       U    256 1     0 eth2
2404:2000:2002:109::/64        [::]                       U    256 2     0 eth1
fe80::/64                      [::]                       U    256 1     0 eth0
fe80::/64                      [::]                       U    256 1     0 eth1
fe80::/64                      [::]                       U    256 1     0 eth2
[::]/0                         [::]                       !n   -1  1     0 lo
ip6-localhost/128              [::]                       Un   0   4     0 lo
2404:2000:2002:101::/128       [::]                       Un   0   3     0 eth0
2404:2000:2002:101::2/128      [::]                       Un   0   4     0 eth0
2404:2000:2002:108::/128       [::]                       Un   0   3     0 eth2
2404:2000:2002:108::1/128      [::]                       Un   0   4     0 eth2
2404:2000:2002:109::/128       [::]                       Un   0   3     0 eth1
2404:2000:2002:109::1/128      [::]                       Un   0   3     0 eth1
fe80::/128                     [::]                       Un   0   3     0 eth0
fe80::/128                     [::]                       Un   0   3     0 eth1
fe80::/128                     [::]                       Un   0   3     0 eth2
fe80::200:ff:feaa:1/128        [::]                       Un   0   4     0 eth0
fe80::200:ff:feaa:4/128        [::]                       Un   0   3     0 eth1
fe80::200:ff:feaa:6/128        [::]                       Un   0   2     0 eth2
ip6-mcastprefix/8              [::]                       U    256 3     0 eth0
ip6-mcastprefix/8              [::]                       U    256 2     0 eth1
ip6-mcastprefix/8              [::]                       U    256 2     0 eth2
[::]/0                         [::]                       !n   -1  1     0 lo
root@R2:/tmp/pycore.36071/R2.conf#
```

R3 & R4

```
root@R3:/tmp/pycore.36071/R3.conf# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.10.2.0       0.0.0.0         255.255.255.0   U     0      0        0 eth0
10.10.3.0       0.0.0.0         255.255.255.0   U     0      0        0 eth3
10.10.7.0       0.0.0.0         255.255.255.0   U     0      0        0 eth2
10.10.9.0       0.0.0.0         255.255.255.0   U     0      0        0 eth1
root@R3:/tmp/pycore.36071/R3.conf# route -6
Kernel IPv6 routing table
Destination                    Next Hop                   Flag Met Ref Use If
2404:2000:2002:102::/64        [::]                       U    256 4     0 eth0
2404:2000:2002:103::/64        [::]                       U    256 1     0 eth3
2404:2000:2002:107::/64        [::]                       U    256 1     0 eth2
2404:2000:2002:109::/64        [::]                       U    256 1     0 eth1
fe80::/64                      [::]                       U    256 1     0 eth0
fe80::/64                      [::]                       U    256 1     0 eth1
fe80::/64                      [::]                       U    256 1     0 eth2
fe80::/64                      [::]                       U    256 1     0 eth3
[::]/0                         [::]                       !n   -1  1     0 lo
ip6-localhost/128              [::]                       Un   0   4     0 lo
2404:2000:2002:102::/128       [::]                       Un   0   3     0 eth0
2404:2000:2002:102::2/128      [::]                       Un   0   6     0 eth0
2404:2000:2002:103::/128       [::]                       Un   0   3     0 eth3
2404:2000:2002:103::1/128      [::]                       Un   0   3     0 eth3
2404:2000:2002:107::/128       [::]                       Un   0   3     0 eth2
2404:2000:2002:107::1/128      [::]                       Un   0   3     0 eth2
2404:2000:2002:109::/128       [::]                       Un   0   3     0 eth1
2404:2000:2002:109::2/128      [::]                       Un   0   3     0 eth1
fe80::/128                     [::]                       Un   0   3     0 eth0
fe80::/128                     [::]                       Un   0   3     0 eth1
fe80::/128                     [::]                       Un   0   3     0 eth2
fe80::/128                     [::]                       Un   0   3     0 eth3
fe80::200:ff:feaa:3/128        [::]                       Un   0   5     0 eth0
fe80::200:ff:feaa:5/128        [::]                       Un   0   2     0 eth1
fe80::200:ff:feaa:8/128        [::]                       Un   0   3     0 eth2
fe80::200:ff:feaa:c/128        [::]                       Un   0   2     0 eth3
ip6-mcastprefix/8              [::]                       U    256 3     0 eth0
ip6-mcastprefix/8              [::]                       U    256 2     0 eth1
ip6-mcastprefix/8              [::]                       U    256 2     0 eth2
ip6-mcastprefix/8              [::]                       U    256 2     0 eth3
[::]/0                         [::]                       !n   -1  1     0 lo
root@R3:/tmp/pycore.36071/R3.conf#
```

```
root@R4:/tmp/pycore.36071/R4.conf# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.10.3.0       0.0.0.0         255.255.255.0   U     0      0        0 eth0
10.10.4.0       0.0.0.0         255.255.255.0   U     0      0        0 eth1
10.10.12.0      0.0.0.0         255.255.255.0   U     0      0        0 eth2
10.10.13.0      0.0.0.0         255.255.255.0   U     0      0        0 eth3
root@R4:/tmp/pycore.36071/R4.conf# route -6
Kernel IPv6 routing table
Destination                    Next Hop                   Flag Met Ref Use If
2404:2000:2002:103::/64        [::]                       U    256 3     0 eth0
2404:2000:2002:104::/64        [::]                       U    256 1     0 eth1
2404:2000:2002:112::/64        [::]                       U    256 2     0 eth2
2404:2000:2002:113::/64        [::]                       U    256 1     0 eth3
fe80::/64                      [::]                       U    256 1     0 eth0
fe80::/64                      [::]                       U    256 1     0 eth1
fe80::/64                      [::]                       U    256 1     0 eth2
fe80::/64                      [::]                       U    256 1     0 eth3
[::]/0                         [::]                       !n   -1  1     0 lo
ip6-localhost/128              [::]                       Un   0   4     0 lo
2404:2000:2002:103::/128       [::]                       Un   0   3     0 eth0
2404:2000:2002:103::2/128      [::]                       Un   0   5     0 eth0
2404:2000:2002:104::/128       [::]                       Un   0   3     0 eth1
2404:2000:2002:104::1/128      [::]                       Un   0   3     0 eth1
2404:2000:2002:112::/128       [::]                       Un   0   3     0 eth2
2404:2000:2002:112::1/128      [::]                       Un   0   4     0 eth2
2404:2000:2002:113::/128       [::]                       Un   0   3     0 eth3
2404:2000:2002:113::1/128      [::]                       Un   0   3     0 eth3
fe80::/128                     [::]                       Un   0   3     0 eth0
fe80::/128                     [::]                       Un   0   3     0 eth1
fe80::/128                     [::]                       Un   0   3     0 eth2
fe80::/128                     [::]                       Un   0   3     0 eth3
fe80::200:ff:feaa:d/128        [::]                       Un   0   5     0 eth0
fe80::200:ff:feaa:f/128        [::]                       Un   0   2     0 eth1
fe80::200:ff:feaa:16/128       [::]                       Un   0   3     0 eth2
fe80::200:ff:feaa:18/128       [::]                       Un   0   2     0 eth3
ip6-mcastprefix/8              [::]                       U    256 3     0 eth0
ip6-mcastprefix/8              [::]                       U    256 2     0 eth1
ip6-mcastprefix/8              [::]                       U    256 2     0 eth2
ip6-mcastprefix/8              [::]                       U    256 2     0 eth3
[::]/0                         [::]                       !n   -1  1     0 lo
root@R4:/tmp/pycore.36071/R4.conf#
```

R5 & R6

```
root@R5:/tmp/pycore.36323/R5.conf# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.0.6.0        0.0.0.0         255.255.255.0   U     0      0        0 eth3
10.10.4.0       0.0.0.0         255.255.255.0   U     0      0        0 eth2
10.10.5.0       0.0.0.0         255.255.255.0   U     0      0        0 eth1
10.10.8.0       0.0.0.0         255.255.255.0   U     0      0        0 eth0
root@R5:/tmp/pycore.36323/R5.conf# route -6
Kernel IPv6 routing table
Destination                    Next Hop                   Flag Met Ref Use If
2404:2000:2002:104::/64        [::]                       U    256 1     0 eth2
2404:2000:2002:105::/64        [::]                       U    256 3     0 eth1
2404:2000:2002:106::/64        [::]                       U    256 1     0 eth3
2404:2000:2002:108::/64        [::]                       U    256 2     0 eth0
fe80::/64                      [::]                       U    256 1     0 eth0
fe80::/64                      [::]                       U    256 1     0 eth1
fe80::/64                      [::]                       U    256 1     0 eth2
fe80::/64                      [::]                       U    256 1     0 eth3
[::]/0                         [::]                       !n   -1  1     0 lo
ip6-localhost/128              [::]                       Un   0   4     0 lo
2404:2000:2002:104::/128       [::]                       Un   0   3     0 eth2
2404:2000:2002:104::2/128      [::]                       Un   0   3     0 eth2
2404:2000:2002:105::/128       [::]                       Un   0   3     0 eth1
2404:2000:2002:105::1/128      [::]                       Un   0   5     0 eth1
2404:2000:2002:106::/128       [::]                       Un   0   3     0 eth3
2404:2000:2002:106::2/128      [::]                       Un   0   3     0 eth3
2404:2000:2002:108::/128       [::]                       Un   0   3     0 eth0
2404:2000:2002:108::2/128      [::]                       Un   0   4     0 eth0
fe80::/128                     [::]                       Un   0   3     0 eth0
fe80::/128                     [::]                       Un   0   3     0 eth1
fe80::/128                     [::]                       Un   0   3     0 eth2
fe80::/128                     [::]                       Un   0   3     0 eth3
fe80::200:ff:feaa:7/128        [::]                       Un   0   5     0 eth0
fe80::200:ff:feaa:b/128        [::]                       Un   0   3     0 eth1
fe80::200:ff:feaa:e/128        [::]                       Un   0   2     0 eth2
fe80::200:ff:feaa:10/128       [::]                       Un   0   2     0 eth3
ip6-mcastprefix/8              [::]                       U    256 3     0 eth0
ip6-mcastprefix/8              [::]                       U    256 2     0 eth1
ip6-mcastprefix/8              [::]                       U    256 2     0 eth2
ip6-mcastprefix/8              [::]                       U    256 2     0 eth3
[::]/0                         [::]                       !n   -1  1     0 lo
root@R5:/tmp/pycore.36323/R5.conf#
```

```
root@R6:/tmp/pycore.36323/R6.conf# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.10.5.0       0.0.0.0         255.255.255.0   U     0      0        0 eth1
10.10.7.0       0.0.0.0         255.255.255.0   U     0      0        0 eth0
root@R6:/tmp/pycore.36323/R6.conf# route -6
Kernel IPv6 routing table
Destination                    Next Hop                   Flag Met Ref Use If
2404:2000:2002:105::/64        [::]                       U    256 1     0 eth1
2404:2000:2002:107::/64        [::]                       U    256 2     0 eth0
fe80::/64                      [::]                       U    256 1     0 eth0
fe80::/64                      [::]                       U    256 1     0 eth1
[::]/0                         [::]                       !n   -1  1     0 lo
ip6-localhost/128              [::]                       Un   0   4     0 lo
2404:2000:2002:105::/128       [::]                       Un   0   3     0 eth1
2404:2000:2002:105::2/128      [::]                       Un   0   3     0 eth1
2404:2000:2002:107::/128       [::]                       Un   0   3     0 eth0
2404:2000:2002:107::2/128      [::]                       Un   0   4     0 eth0
fe80::/128                     [::]                       Un   0   3     0 eth0
fe80::/128                     [::]                       Un   0   3     0 eth1
fe80::200:ff:feaa:9/128        [::]                       Un   0   4     0 eth0
fe80::200:ff:feaa:a/128        [::]                       Un   0   2     0 eth1
ip6-mcastprefix/8              [::]                       U    256 3     0 eth0
ip6-mcastprefix/8              [::]                       U    256 2     0 eth1
[::]/0                         [::]                       !n   -1  1     0 lo
root@R6:/tmp/pycore.36323/R6.conf#
```

R7 & M4

```
root@R7:/tmp/pycore.36323/R7.conf# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.10.6.0       0.0.0.0         255.255.255.0   U     0      0        0 eth0
root@R7:/tmp/pycore.36323/R7.conf# route -6
Kernel IPv6 routing table
Destination                    Next Hop                   Flag Met Ref Use If
2404:2000:2002:106::/64        [::]                       U    256 1     0 eth0
fe80::/64                      [::]                       U    256 1     0 eth0
[::]/0                         [::]                       !n   -1  1     0 lo
ip6-localhost/128              [::]                       Un   0   4     0 lo
2404:2000:2002:106::/128       [::]                       Un   0   3     0 eth0
2404:2000:2002:106::1/128      [::]                       Un   0   3     0 eth0
fe80::/128                     [::]                       Un   0   3     0 eth0
fe80::200:ff:feaa:11/128       [::]                       Un   0   3     0 eth0
ip6-mcastprefix/8              [::]                       U    256 3     0 eth0
[::]/0                         [::]                       !n   -1  1     0 lo
root@R7:/tmp/pycore.36323/R7.conf#
```

```
root@M4:/tmp/pycore.36323/M4.conf# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.10.13.0      0.0.0.0         255.255.255.0   U     0      0        0 eth0
root@M4:/tmp/pycore.36323/M4.conf# route -6
Kernel IPv6 routing table
Destination                    Next Hop                   Flag Met Ref Use If
2404:2000:2002:113::/64        [::]                       U    256 1     0 eth0
fe80::/64                      [::]                       U    256 1     0 eth0
[::]/0                         [::]                       !n   -1  1     0 lo
ip6-localhost/128              [::]                       Un   0   4     0 lo
2404:2000:2002:113::/128       [::]                       Un   0   3     0 eth0
2404:2000:2002:113::2/128      [::]                       Un   0   3     0 eth0
fe80::/128                     [::]                       Un   0   3     0 eth0
fe80::200:ff:feaa:19/128       [::]                       Un   0   3     0 eth0
ip6-mcastprefix/8              [::]                       U    256 3     0 eth0
[::]/0                         [::]                       !n   -1  1     0 lo
root@M4:/tmp/pycore.36323/M4.conf#
```

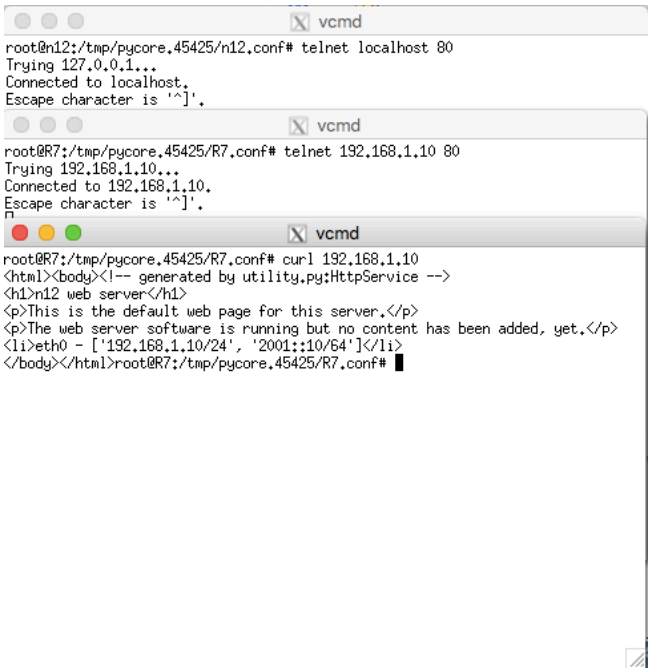
M3

```
root@M3:/tmp/pycore.36323/M3.conf# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.10.12.0      0.0.0.0         255.255.255.0   U     0      0        0 eth0
root@M3:/tmp/pycore.36323/M3.conf# route -6
Kernel IPv6 routing table
Destination                    Next Hop                   Flag Met Ref Use If
2404:2000:2002:112::/64        [::]                       U    256 1     0 eth0
fe80::/64                      [::]                       U    256 1     0 eth0
[::]/0                         [::]                       !n   -1  1     0 lo
ip6-localhost/128              [::]                       Un   0   4     0 lo
2404:2000:2002:112::/128       [::]                       Un   0   3     0 eth0
2404:2000:2002:112::2/128      [::]                       Un   0   3     0 eth0
fe80::/128                     [::]                       Un   0   3     0 eth0
fe80::200:ff:feaa:17/128       [::]                       Un   0   3     0 eth0
ip6-mcastprefix/8              [::]                       U    256 3     0 eth0
[::]/0                         [::]                       !n   -1  1     0 lo
root@M3:/tmp/pycore.36323/M3.conf#
```

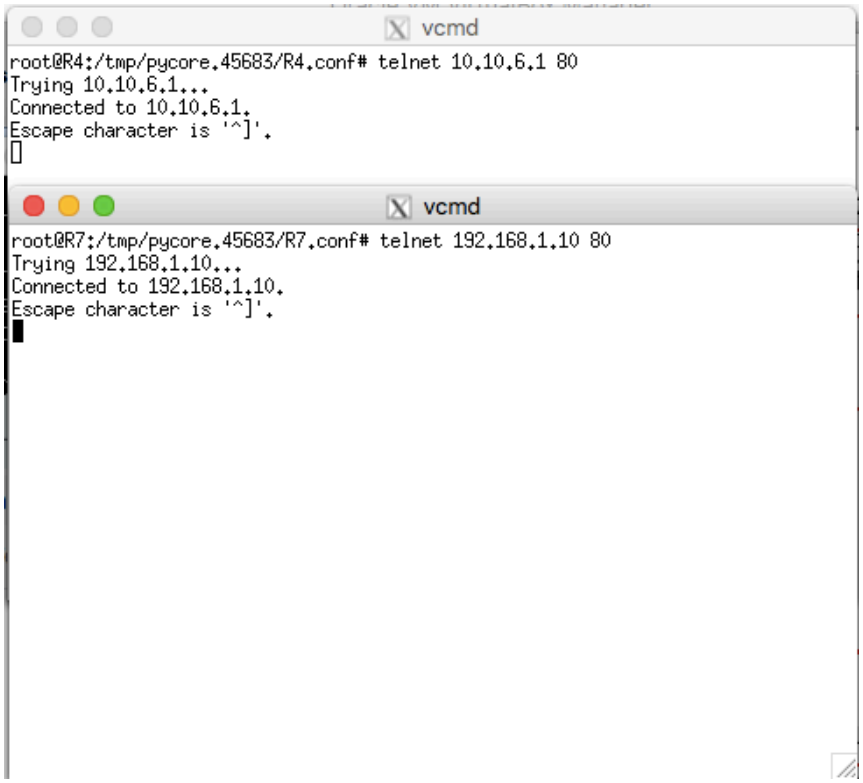
R2 ADJUSTMENT

```
root@R2:/tmp/pycore.45425/R2.conf# route
Kernel IP routing table
Destination     Gateway         Genmask         Flags Metric Ref    Use Iface
10.10.1.0       0.0.0.0         255.255.255.0   U     0      0        0 eth0
10.10.7.0       10.10.9.2       255.255.255.0   UG    0      0        0 eth1
10.10.8.0       0.0.0.0         255.255.255.0   U     0      0        0 eth2
10.10.9.0       0.0.0.0         255.255.255.0   U     0      0        0 eth1
root@R2:/tmp/pycore.45425/R2.conf# route -6
Kernel IPv6 routing table
Destination                    Next Hop                   Flag Met Ref Use If
2404:2000:2002:101::/64        [::]                       U    256 3     0 eth0
2404:2000:2002:107::/64        2404:2000:2002:109::2      UG   1024 1     0 eth1
2404:2000:2002:108::/64        [::]                       U    256 1     0 eth2
2404:2000:2002:109::/64        [::]                       U    256 2     0 eth1
fe80::/64                      [::]                       U    256 1     0 eth0
fe80::/64                      [::]                       U    256 1     0 eth1
fe80::/64                      [::]                       U    256 1     0 eth2
[::]/0                         [::]                       !n   -1  1     0 lo
ip6-localhost/128              [::]                       Un   0   4     0 lo
2404:2000:2002:101::/128       [::]                       Un   0   3     0 eth0
2404:2000:2002:101::2/128      [::]                       Un   0   4     0 eth0
2404:2000:2002:108::/128       [::]                       Un   0   3     0 eth2
2404:2000:2002:108::1/128      [::]                       Un   0   4     0 eth2
2404:2000:2002:109::/128       [::]                       Un   0   3     0 eth1
2404:2000:2002:109::1/128      [::]                       Un   0   3     0 eth1
fe80::/128                     [::]                       Un   0   3     0 eth0
fe80::/128                     [::]                       Un   0   3     0 eth1
fe80::/128                     [::]                       Un   0   3     0 eth2
fe80::200:ff:feaa:1/128        [::]                       Un   0   4     0 eth0
fe80::200:ff:feaa:4/128        [::]                       Un   0   3     0 eth1
fe80::200:ff:feaa:6/128        [::]                       Un   0   2     0 eth2
ip6-mcastprefix/8              [::]                       U    256 3     0 eth0
ip6-mcastprefix/8              [::]                       U    256 2     0 eth1
ip6-mcastprefix/8              [::]                       U    256 2     0 eth2
[::]/0                         [::]                       !n   -1  1     0 lo
root@R2:/tmp/pycore.45425/R2.conf#
```

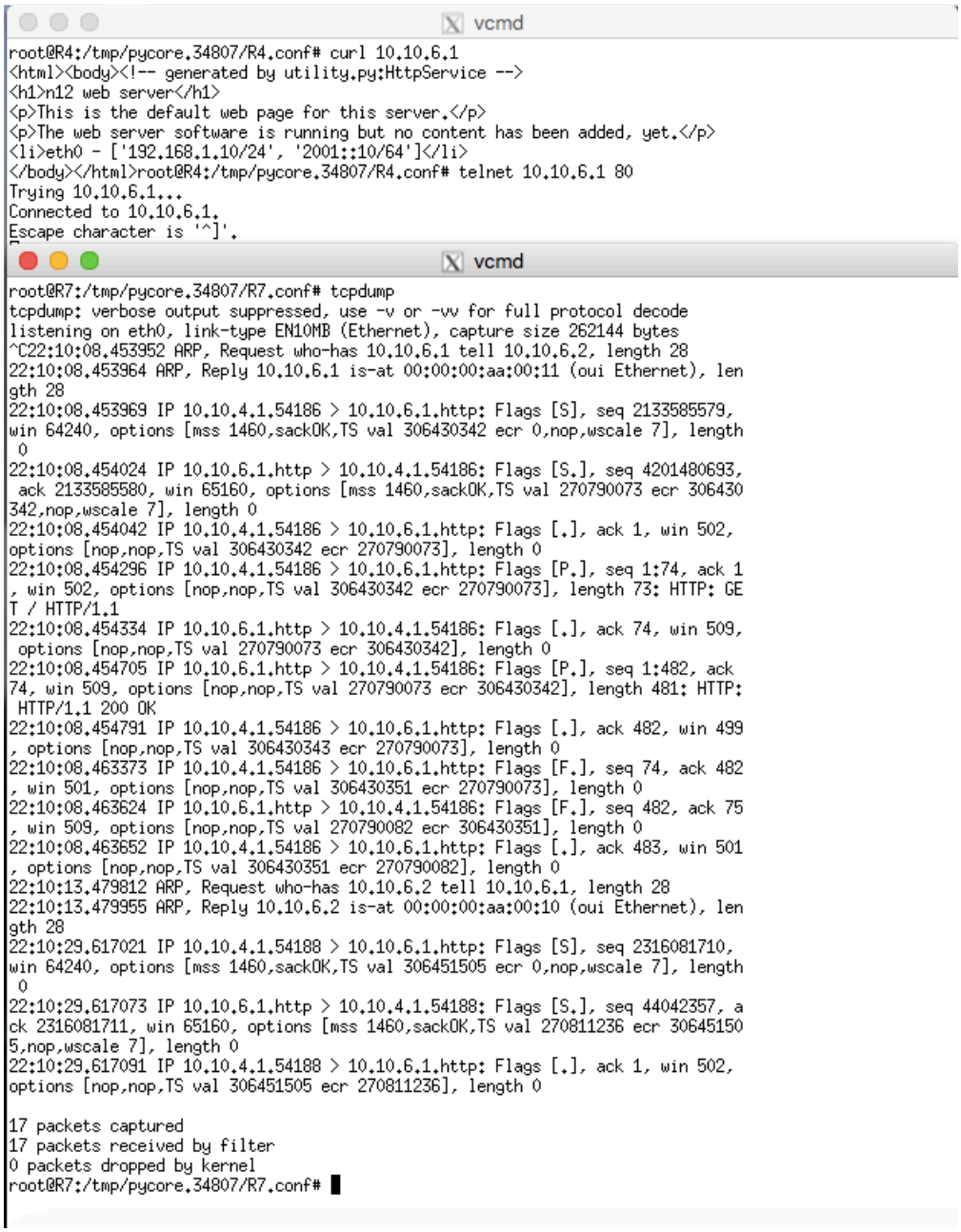
TASK 6


vcmd
root@n12:/tmp/pycore.45425/n12.conf# telnet localhost 80
Trying 127.0.0.1...
Connected to localhost.
Escape character is '^]'.
vcmd
root@R7:/tmp/pycore.45425/R7.conf# telnet 192.168.1.10 80
Trying 192.168.1.10...
Connected to 192.168.1.10.
Escape character is '^]'.
vcmd
root@R7:/tmp/pycore.45425/R7.conf# curl 192.168.1.10
<html><body><!-- generated by utility.py:HttpService -->
<h1>n12 web server</h1>
This is the default web page for this server.
The web server software is running but no content has been added, yet.
eth0 - ['192.168.1.10/24', '2001::10/64']
</body></html>root@R7:/tmp/pycore.45425/R7.conf#

TASK 7


vcmd
root@R4:/tmp/pycore.45683/R4.conf# telnet 10.10.6.1 80
Trying 10.10.6.1...
Connected to 10.10.6.1.
Escape character is '^]'.
vcmd
root@R7:/tmp/pycore.45683/R7.conf# telnet 192.168.1.10 80
Trying 192.168.1.10...
Connected to 192.168.1.10.
Escape character is '^]'.

TASK 8



QUESTIONS

11. Explain the purpose of NAT in the configuration that you have created.

The NAT (R7) in the networking configuration serves the purpose of exposing its private host's to the rest of the network. This configuration ensures that any inbound & outbound connection from the host to the rest of the network must go through the NAT as a 'gateway'. A valid reason to use a NAT for this purpose would be to set up security measures to the host's connection.

In the configuration, NAT allows HTTP connections to be accepted in port 80(R7) and forwards them to port 80 on the Host. This means content on HTTP can be access from other routers (e.g R4) when connected to R7. It effectively acts as a proxy. Without it, the host could not be accessed by any other part of the network.

12. If you had multiple hosts behind R7 that all had services running on the same port, how could you configure R7 to enable them all to be accessible from the public Internet?

To configure these hosts so that they are available to the public, we need to route them to the IP of the NAT. But with these host's having different IP but running under the same port, we would have to map each host to a different port of the NAT's public IP. This is similar process to port forwarding.
For an example, lets say we have 3 IP addresses (e.g. 192.168.10.1, 192.168.10.2, 192.168.10.3… with the same port of 443), we will have to map them to the ports of 8000, 8001 & 8002 of the NATS public IP address.

The process will be similar to how we added the HTTP host, we would need to add IP rules for forwarding the IPv4 via NAT service.
Additionally, to configure the NAT in R7 these two lines would allow the router to forward the data through the LAN:
Iptables -A FORWARD -i eth0 -j ACCEPT
Iptables -A FORWARD -o eth0 -j ACCEPT

13. Run tcpdump on the 10.10.6.1 interface of R7. Use telnet or CURL to connect from R4 (or one of the laptops connected to R4) to the HTTP server running on the host you created that is connected to R7. Explain why the destination IP and port is 10.10.6.1:80, and not 192.168.1.10:80.
The destination IP is 10.10.6.1 instead of 192.168.1.10 as the address of the HTTP host is unknown to outside routers. The NAT configurations done previously, allows HTTP connections to be accepted on port 80 (R7).

This means the destination address is port 80 (R7), R7 forwards the HTTP connection to port 80 on the host.

14. Where you see a response from the HTTP server, explain why the source IP and port shows as 10.10.6.1:80, and not 192.168.1.10:80. Answer the question thinking about NAT and public/ private IPv4 addresses.
192.168.1.10:80 is the IP address and port of the private host, and 10.10.6.1:80 is the IP & Port of the NAT which is public. We see the HTTP response's source IP to be the NAT's and thats because the NAT serves as the 'gateway' for the host. 192.168.1.10:80 shows up as 10.10.6.1:80 because it is the public IP for the network, hiding the private one.

A NAT's purpose is to map the IP addresses of its host(s) into another IP address when being transported through a router. We see this in effect as we try to access the host, but en route, the response from the host goes through the NAT and the IP's gets mapped to the NAT's configured IP address.

NATs are a powerful tool serving as "Gateways" of private hosts of 1, or many, in "intranet connections" to the global public. They serve as a line of security for these private hosts when properly configured, which is why they are preferred by enterprises or organisation which rely on security (such as schools, hospitals, banks, etc). Furthermore they help to reduce the amount of IP's used in the global network due to there are on a finite combinations of existing IP addresses possible, as 1 IP address of a NAT can be the proxy for an entire network.