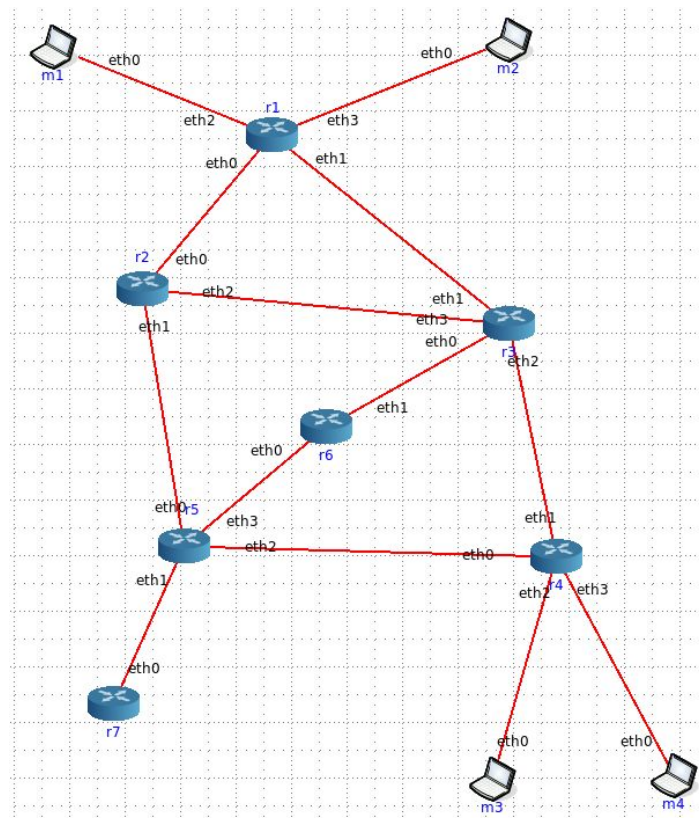


## NWEN 302 Lab 2 part A report



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

These all belong to private IP address space, and are used within private networks to assign IPs, these are the IP addresses that never interact with the wider internet, and are only used within a local network and communicate with the wider internet through the use of NAT.

### 2. What is the IPv6 equivalent?

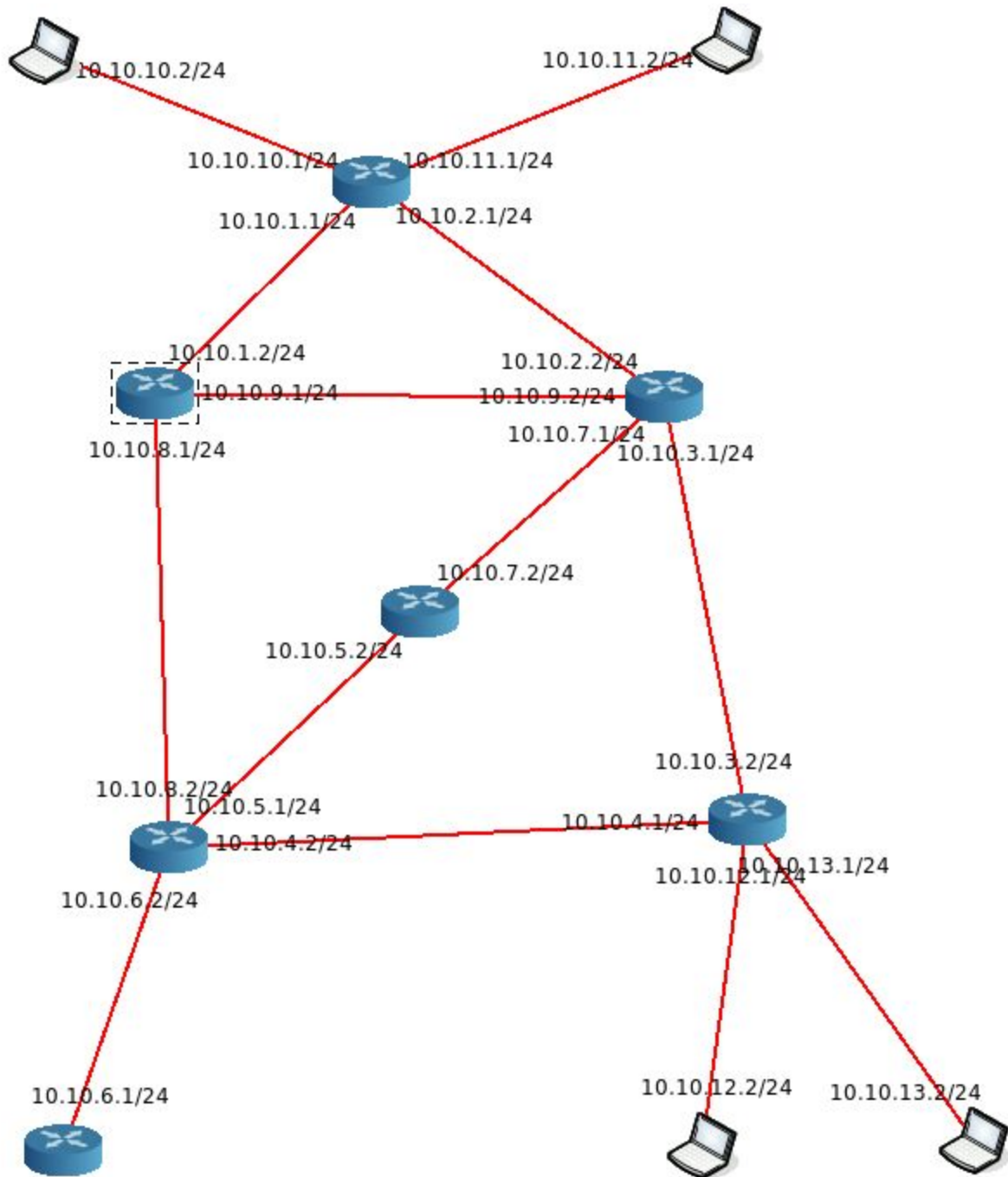
fc00::/7 is reserved for local use for IPv6 space, but guidelines must be followed to make them a unique local IP range network. Because of the large amount of possible IPv6 addresses, private IP ranges are not needed in the same way as IPv4.

### 3. What is a netmask and why does IPv4 need one?

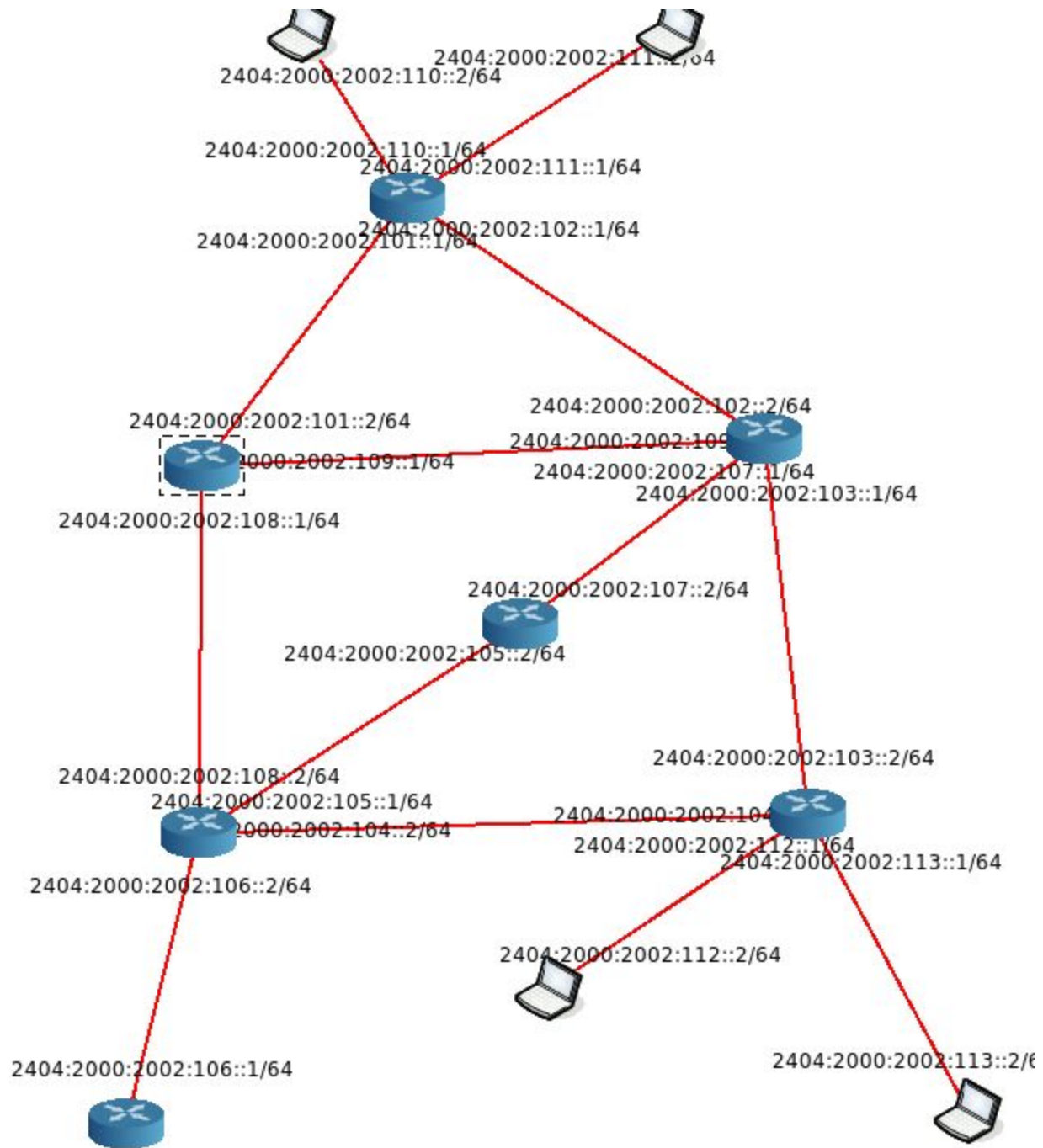
The netmask is used to define an IP address into subnets and specify the network's hosts. This defines the limitations of the addresses on the network and if they are allowed to communicate. IPv4 addresses don't give any information on the size of a network, thus the subnet mask helps define this.

Split this next bit into 2 separate images to help with readability.

## IPv4:



## IPv6:



```

root@r1:/tmp/pycore.43247/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=0.024 ms
64 bytes from 10.10.1.1: icmp_seq=2 ttl=64 time=0.039 ms
64 bytes from 10.10.1.1: icmp_seq=3 ttl=64 time=0.033 ms

--- 10.10.1.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.024/0.032/0.039/0.006 ms
root@r1:/tmp/pycore.43247/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=0.015 ms
64 bytes from 2404:2000:2002:101::1: icmp_seq=2 ttl=64 time=0.058 ms
64 bytes from 2404:2000:2002:101::1: icmp_seq=3 ttl=64 time=0.069 ms

--- 2404:2000:2002:101::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.015/0.047/0.069/0.023 ms
root@r1:/tmp/pycore.43247/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=0.024 ms
64 bytes from 10.10.2.1: icmp_seq=2 ttl=64 time=0.015 ms
64 bytes from 10.10.2.1: icmp_seq=3 ttl=64 time=0.037 ms

--- 10.10.2.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.015/0.025/0.037/0.009 ms
root@r1:/tmp/pycore.43247/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=0.018 ms
64 bytes from 2404:2000:2002:102::1: icmp_seq=2 ttl=64 time=0.054 ms
64 bytes from 2404:2000:2002:102::1: icmp_seq=3 ttl=64 time=0.060 ms

--- 2404:2000:2002:102::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.018/0.044/0.060/0.018 ms
root@r1:/tmp/pycore.43247/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=0.031 ms
64 bytes from 10.10.10.1: icmp_seq=2 ttl=64 time=0.036 ms
64 bytes from 10.10.10.1: icmp_seq=3 ttl=64 time=0.028 ms

--- 10.10.10.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.028/0.031/0.036/0.007 ms
root@r1:/tmp/pycore.43247/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=0.020 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=0.060 ms

--- 2404:2000:2002:110::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.020/0.047/0.062/0.020 ms
root@r1:/tmp/pycore.43247/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=0.015 ms
64 bytes from 10.10.11.1: icmp_seq=2 ttl=64 time=0.032 ms
64 bytes from 10.10.11.1: icmp_seq=3 ttl=64 time=0.037 ms

--- 10.10.11.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.015/0.028/0.037/0.009 ms

```

**R1:**



```

root@r1:/tmp/pycore.43247/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=0.025 ms
64 bytes from 2404:2000:2002:111::1: icmp_seq=2 ttl=64 time=0.056 ms
64 bytes from 2404:2000:2002:111::1: icmp_seq=3 ttl=64 time=0.059 ms

--- 2404:2000:2002:111::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.025/0.046/0.059/0.017 ms
root@r1:/tmp/pycore.43247/r1.conf# █

```

## R2:

```

root@r2:/tmp/pycore.43247/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=0.026 ms
64 bytes from 10.10.1.2: icmp_seq=2 ttl=64 time=0.029 ms
64 bytes from 10.10.1.2: icmp_seq=3 ttl=64 time=0.036 ms

--- 10.10.1.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.026/0.030/0.036/0.006 ms
root@r2:/tmp/pycore.43247/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=0.059 ms
64 bytes from 2404:2000:2002:101::2: icmp_seq=2 ttl=64 time=0.062 ms
64 bytes from 2404:2000:2002:101::2: icmp_seq=3 ttl=64 time=0.056 ms

--- 2404:2000:2002:101::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1999ms
rtt min/avg/max/mdev = 0.056/0.059/0.062/0.002 ms
root@r2:/tmp/pycore.43247/r2.conf# █

```

```

root@r2:/tmp/pycore.43247/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=0.033 ms
64 bytes from 10.10.8.1: icmp_seq=2 ttl=64 time=0.042 ms
64 bytes from 10.10.8.1: icmp_seq=3 ttl=64 time=0.051 ms

--- 10.10.8.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.033/0.042/0.051/0.007 ms
root@r2:/tmp/pycore.43247/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=0.057 ms
64 bytes from 2404:2000:2002:108::1: icmp_seq=2 ttl=64 time=0.086 ms
64 bytes from 2404:2000:2002:108::1: icmp_seq=3 ttl=64 time=0.074 ms

--- 2404:2000:2002:108::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2001ms
rtt min/avg/max/mdev = 0.057/0.072/0.086/0.013 ms
root@r2:/tmp/pycore.43247/r2.conf# █

```

```

root@r2:/tmp/pycore.43247/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=0.024 ms
64 bytes from 10.10.9.1: icmp_seq=2 ttl=64 time=0.030 ms
64 bytes from 10.10.9.1: icmp_seq=3 ttl=64 time=0.030 ms

--- 10.10.9.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.024/0.028/0.030/0.003 ms
root@r2:/tmp/pycore.43247/r2.conf# ping6 -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=0.020 ms
64 bytes from 2404:2000:2002:109::1: icmp_seq=2 ttl=64 time=0.056 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 1998ms
rtt min/avg/max/mdev = 0.020/0.045/0.060/0.018 ms
root@r2:/tmp/pycore.43247/r2.conf# █

```

### R3:

```
root@r3:/tmp/pycore.43247/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=0.023 ms
64 bytes from 10.10.7.1: icmp_seq=2 ttl=64 time=0.027 ms
64 bytes from 10.10.7.1: icmp_seq=3 ttl=64 time=0.031 ms

--- 10.10.7.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.023/0.027/0.031/0.003 ms
root@r3:/tmp/pycore.43247/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=0.020 ms
64 bytes from 2404:2000:2002:107::1: icmp_seq=2 ttl=64 time=0.043 ms
64 bytes from 2404:2000:2002:107::1: icmp_seq=3 ttl=64 time=0.056 ms

--- 2404:2000:2002:107::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.020/0.039/0.056/0.016 ms
root@r3:/tmp/pycore.43247/r3.conf#
```

```
root@r3:/tmp/pycore.43247/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=0.037 ms
64 bytes from 10.10.2.2: icmp_seq=3 ttl=64 time=0.041 ms

--- 10.10.2.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.032/0.036/0.041/0.007 ms
root@r3:/tmp/pycore.43247/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=0.024 ms
64 bytes from 2404:2000:2002:102::2: icmp_seq=2 ttl=64 time=0.079 ms
64 bytes from 2404:2000:2002:102::2: icmp_seq=3 ttl=64 time=0.080 ms

--- 2404:2000:2002:102::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.024/0.061/0.080/0.026 ms
root@r3:/tmp/pycore.43247/r3.conf#
```

```
root@r3:/tmp/pycore.43247/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=0.042 ms
64 bytes from 10.10.3.1: icmp_seq=2 ttl=64 time=0.041 ms
64 bytes from 10.10.3.1: icmp_seq=3 ttl=64 time=0.044 ms

--- 10.10.3.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.041/0.042/0.044/0.005 ms
root@r3:/tmp/pycore.43247/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=0.020 ms
64 bytes from 2404:2000:2002:103::1: icmp_seq=2 ttl=64 time=0.046 ms
64 bytes from 2404:2000:2002:103::1: icmp_seq=3 ttl=64 time=0.082 ms

--- 2404:2000:2002:103::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.020/0.049/0.082/0.026 ms
root@r3:/tmp/pycore.43247/r3.conf#
```

```

root@r3:/tmp/pycore.43247/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=0.024 ms
64 bytes from 10.10.9.2: icmp_seq=2 ttl=64 time=0.029 ms
64 bytes from 10.10.9.2: icmp_seq=3 ttl=64 time=0.037 ms

--- 10.10.9.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.024/0.030/0.037/0.005 ms
root@r3:/tmp/pycore.43247/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=0.026 ms
64 bytes from 2404:2000:2002:109::2: icmp_seq=2 ttl=64 time=0.064 ms
64 bytes from 2404:2000:2002:109::2: icmp_seq=3 ttl=64 time=0.061 ms

--- 2404:2000:2002:109::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1999ms
rtt min/avg/max/mdev = 0.026/0.050/0.064/0.018 ms
root@r3:/tmp/pycore.43247/r3.conf# █

```

#### R4:

```

root@r4:/tmp/pycore.43247/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=0.022 ms
64 bytes from 10.10.13.1: icmp_seq=2 ttl=64 time=0.032 ms
64 bytes from 10.10.13.1: icmp_seq=3 ttl=64 time=0.031 ms

--- 10.10.13.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.022/0.028/0.032/0.006 ms
root@r4:/tmp/pycore.43247/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=0.023 ms
64 bytes from 2404:2000:2002:113::1: icmp_seq=2 ttl=64 time=0.069 ms
64 bytes from 2404:2000:2002:113::1: icmp_seq=3 ttl=64 time=0.034 ms

--- 2404:2000:2002:113::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.023/0.042/0.069/0.019 ms
root@r4:/tmp/pycore.43247/r4.conf# █

```

```

root@r4:/tmp/pycore.43247/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=0.022 ms
64 bytes from 10.10.13.1: icmp_seq=2 ttl=64 time=0.032 ms
64 bytes from 10.10.13.1: icmp_seq=3 ttl=64 time=0.031 ms

--- 10.10.13.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.022/0.028/0.032/0.006 ms
root@r4:/tmp/pycore.43247/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=0.023 ms
64 bytes from 2404:2000:2002:113::1: icmp_seq=2 ttl=64 time=0.069 ms
64 bytes from 2404:2000:2002:113::1: icmp_seq=3 ttl=64 time=0.034 ms

--- 2404:2000:2002:113::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.023/0.042/0.069/0.019 ms
root@r4:/tmp/pycore.43247/r4.conf# █

```



```
root@r4:/tmp/pycore.43247/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=0.059 ms
64 bytes from 10.10.4.1: icmp_seq=2 ttl=64 time=0.044 ms
64 bytes from 10.10.4.1: icmp_seq=3 ttl=64 time=0.041 ms

--- 10.10.4.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.041/0.048/0.059/0.007 ms
root@r4:/tmp/pycore.43247/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=0.020 ms
64 bytes from 2404:2000:2002:104::1: icmp_seq=2 ttl=64 time=0.077 ms
64 bytes from 2404:2000:2002:104::1: icmp_seq=3 ttl=64 time=0.077 ms

--- 2404:2000:2002:104::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.020/0.058/0.077/0.026 ms
root@r4:/tmp/pycore.43247/r4.conf#
```

```
root@r4:/tmp/pycore.43247/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=0.030 ms
64 bytes from 10.10.12.1: icmp_seq=2 ttl=64 time=0.043 ms
64 bytes from 10.10.12.1: icmp_seq=3 ttl=64 time=0.045 ms

--- 10.10.12.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.030/0.039/0.045/0.008 ms
root@r4:/tmp/pycore.43247/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=0.074 ms
64 bytes from 2404:2000:2002:112::1: icmp_seq=2 ttl=64 time=0.126 ms
64 bytes from 2404:2000:2002:112::1: icmp_seq=3 ttl=64 time=0.090 ms

--- 2404:2000:2002:112::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.074/0.096/0.126/0.024 ms
root@r4:/tmp/pycore.43247/r4.conf#
```

## R5:

```
root@r5:/tmp/pycore.43247/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=0.023 ms
64 bytes from 10.10.6.2: icmp_seq=2 ttl=64 time=0.029 ms
64 bytes from 10.10.6.2: icmp_seq=3 ttl=64 time=0.033 ms

--- 10.10.6.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.023/0.028/0.033/0.006 ms
root@r5:/tmp/pycore.43247/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=0.027 ms
64 bytes from 2404:2000:2002:106::2: icmp_seq=2 ttl=64 time=0.061 ms
64 bytes from 2404:2000:2002:106::2: icmp_seq=3 ttl=64 time=0.065 ms

--- 2404:2000:2002:106::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.027/0.051/0.065/0.017 ms
root@r5:/tmp/pycore.43247/r5.conf#
```



```
root@r5:/tmp/pycore.43247/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=0.029 ms
64 bytes from 10.10.4.2: icmp_seq=2 ttl=64 time=0.049 ms
64 bytes from 10.10.4.2: icmp_seq=3 ttl=64 time=0.049 ms

--- 10.10.4.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1999ms
rtt min/avg/max/mdev = 0.029/0.042/0.049/0.010 ms
root@r5:/tmp/pycore.43247/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=0.018 ms
64 bytes from 2404:2000:2002:104::2: icmp_seq=2 ttl=64 time=0.088 ms
64 bytes from 2404:2000:2002:104::2: icmp_seq=3 ttl=64 time=0.095 ms

--- 2404:2000:2002:104::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.018/0.067/0.095/0.034 ms
root@r5:/tmp/pycore.43247/r5.conf#
```

```
root@r5:/tmp/pycore.43247/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=0.025 ms
64 bytes from 10.10.5.1: icmp_seq=2 ttl=64 time=0.029 ms
64 bytes from 10.10.5.1: icmp_seq=3 ttl=64 time=0.036 ms

--- 10.10.5.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.025/0.030/0.036/0.004 ms
root@r5:/tmp/pycore.43247/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=0.368 ms
64 bytes from 2404:2000:2002:105::1: icmp_seq=2 ttl=64 time=0.063 ms
64 bytes from 2404:2000:2002:105::1: icmp_seq=3 ttl=64 time=0.060 ms

--- 2404:2000:2002:105::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.060/0.163/0.368/0.145 ms
root@r5:/tmp/pycore.43247/r5.conf#
```

```
root@r5:/tmp/pycore.43247/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=0.025 ms
64 bytes from 10.10.5.1: icmp_seq=2 ttl=64 time=0.029 ms
64 bytes from 10.10.5.1: icmp_seq=3 ttl=64 time=0.036 ms

--- 10.10.5.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.025/0.030/0.036/0.004 ms
root@r5:/tmp/pycore.43247/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=0.368 ms
64 bytes from 2404:2000:2002:105::1: icmp_seq=2 ttl=64 time=0.063 ms
64 bytes from 2404:2000:2002:105::1: icmp_seq=3 ttl=64 time=0.060 ms

--- 2404:2000:2002:105::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.060/0.163/0.368/0.145 ms
root@r5:/tmp/pycore.43247/r5.conf#
```

## R6:

```
root@r6:/tmp/pycore.43247/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=0.031 ms
64 bytes from 10.10.5.2: icmp_seq=2 ttl=64 time=0.043 ms
64 bytes from 10.10.5.2: icmp_seq=3 ttl=64 time=0.051 ms

--- 10.10.5.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.031/0.041/0.051/0.011 ms
root@r6:/tmp/pycore.43247/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=0.053 ms
64 bytes from 2404:2000:2002:105::2: icmp_seq=2 ttl=64 time=0.072 ms
64 bytes from 2404:2000:2002:105::2: icmp_seq=3 ttl=64 time=0.072 ms

--- 2404:2000:2002:105::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2001ms
rtt min/avg/max/mdev = 0.053/0.065/0.072/0.012 ms
root@r6:/tmp/pycore.43247/r6.conf# █
```

```
root@r6:/tmp/pycore.43247/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=0.032 ms
64 bytes from 10.10.7.2: icmp_seq=2 ttl=64 time=0.045 ms
64 bytes from 10.10.7.2: icmp_seq=3 ttl=64 time=0.045 ms

--- 10.10.7.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.032/0.040/0.045/0.009 ms
root@r6:/tmp/pycore.43247/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=0.020 ms
64 bytes from 2404:2000:2002:107::2: icmp_seq=2 ttl=64 time=0.070 ms
64 bytes from 2404:2000:2002:107::2: icmp_seq=3 ttl=64 time=0.032 ms

--- 2404:2000:2002:107::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.020/0.040/0.070/0.022 ms
root@r6:/tmp/pycore.43247/r6.conf# █
```

## R7:

```
root@r7:/tmp/pycore.43247/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=0.031 ms
64 bytes from 10.10.6.1: icmp_seq=2 ttl=64 time=0.032 ms
64 bytes from 10.10.6.1: icmp_seq=3 ttl=64 time=0.035 ms

--- 10.10.6.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.031/0.032/0.035/0.006 ms
root@r7:/tmp/pycore.43247/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=0.018 ms
64 bytes from 2404:2000:2002:106::1: icmp_seq=2 ttl=64 time=0.050 ms
64 bytes from 2404:2000:2002:106::1: icmp_seq=3 ttl=64 time=0.055 ms

--- 2404:2000:2002:106::1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.018/0.041/0.055/0.016 ms
root@r7:/tmp/pycore.43247/r7.conf# █
```

#### 4. What is a default gateway?

The default gateway is the gateway in which all traffic that is otherwise unspecified in the routing table for that device is sent. Only the hosts on the network should have the default gateway. The device at the default gateway address is usually the intermediate jump between a local network and the internet/a larger subnet.

**M1:**

```
root@m1:/tmp/pycore.43247/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=0.031 ms
64 bytes from 10.10.10.2: icmp_seq=2 ttl=64 time=0.034 ms
64 bytes from 10.10.10.2: icmp_seq=3 ttl=64 time=0.034 ms

--- 10.10.10.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.031/0.033/0.034/0.001 ms
root@m1:/tmp/pycore.43247/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=0.020 ms
64 bytes from 2404:2000:2002:110::2: icmp_seq=2 ttl=64 time=0.058 ms
64 bytes from 2404:2000:2002:110::2: icmp_seq=3 ttl=64 time=0.054 ms

--- 2404:2000:2002:110::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1999ms
rtt min/avg/max/mdev = 0.020/0.044/0.058/0.017 ms
root@m1:/tmp/pycore.43247/m1.conf#
```

**M2:**

```
root@m2:/tmp/pycore.43247/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=0.026 ms
64 bytes from 10.10.11.2: icmp_seq=2 ttl=64 time=0.033 ms
64 bytes from 10.10.11.2: icmp_seq=3 ttl=64 time=0.034 ms

--- 10.10.11.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.026/0.031/0.034/0.003 ms
root@m2:/tmp/pycore.43247/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=0.018 ms
64 bytes from 2404:2000:2002:111::2: icmp_seq=2 ttl=64 time=0.049 ms
64 bytes from 2404:2000:2002:111::2: icmp_seq=3 ttl=64 time=0.073 ms

--- 2404:2000:2002:111::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.018/0.046/0.073/0.023 ms
root@m2:/tmp/pycore.43247/m2.conf#
```



### M3:

```
root@m3:/tmp/pycore.43247/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=0.031 ms
64 bytes from 10.10.12.2: icmp_seq=2 ttl=64 time=0.045 ms
64 bytes from 10.10.12.2: icmp_seq=3 ttl=64 time=0.052 ms

--- 10.10.12.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.031/0.042/0.052/0.011 ms
root@m3:/tmp/pycore.43247/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=0.020 ms
64 bytes from 2404:2000:2002:112::2: icmp_seq=2 ttl=64 time=0.073 ms
64 bytes from 2404:2000:2002:112::2: icmp_seq=3 ttl=64 time=0.079 ms

--- 2404:2000:2002:112::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1998ms
rtt min/avg/max/mdev = 0.020/0.057/0.079/0.027 ms
root@m3:/tmp/pycore.43247/m3.conf# █
```

### M4:

```
root@m4:/tmp/pycore.43247/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=0.033 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=0.048 ms

--- 10.10.13.2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1999ms
rtt min/avg/max/mdev = 0.033/0.044/0.051/0.007 ms
root@m4:/tmp/pycore.43247/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=0.031 ms
64 bytes from 2404:2000:2002:113::2: icmp_seq=2 ttl=64 time=0.074 ms
64 bytes from 2404:2000:2002:113::2: icmp_seq=3 ttl=64 time=0.079 ms

--- 2404:2000:2002:113::2 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1999ms
rtt min/avg/max/mdev = 0.031/0.061/0.079/0.022 ms
root@m4:/tmp/pycore.43247/m4.conf# █
```

### 5. What is the mechanism for IPv6 which corresponds to ARP?

NDP is the equivalent mechanism for IPv6, however it is not equal, as NDP is a combination of multiple protocols including ARP, and addresses issues that ARP has, such as a protocol or mechanism for neighbor unreachability detection.

### 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.

I would need to add 2 static routes to each of the routers directly connected to the host machines (r1 and r4), and add 4 static routes to any router in between these routers (r3)

This is because each router in the connection should have an entry in its routing table to know where to send packets bound for any of the 4 machines, the directly connected routers already know 2 of the 4 needed, and the intermediate routers know none .

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

Knowing the network topology, I would choose the route with the least amount of jumps to reduce the chance of packet loss, other factors to consider would be bandwidth, transfer speed and time to live (TTL).

8. What would happen if one or more of your links failed?

With only static routing in place then the connection would not work, the packets would be lost.

9. What happens if you add an additional router?

The new router would need the static routes to each host added to its routing table, depending on how many of the hosts it already has a direct connection to, this would be between 0-4 static routes added.