

Exercise 0.

• Breakdown IP Block 192.168.2.0/24 in 4 IP blocks with the following sizes (Number of hosts):

- A = 20
- B = 40
- C = 60
- D = 12

1. Round each to next integral power of 2
2. Compute total and round to next integral power of 2
3. Sort the blocks in non-increasing order of sizes:
C, B, A, D
4. Assign the first IP address in all encompassing IP block 192.168.2.0/24 to IP Block C
5. Compute initial IP address of block B by adding the size of C to the initial address of C
6. Repeat for the next block until all blocks are processed

Exercise 1.

- Use **ifconfig** or **ip link** for obtaining the net configurations to R2 and R3.
- ping to 192.168.2.194 from paloalto internal (192.168.1.88) should fail now

Exercise 2.

- ping to R1, R2 and R3 must run ok
- ping to 192.168.2.194 should fail

Exercise 3.

```
root@tunnel-ssh:/home/administrator/utils# ping 192.168.2.194
PING 192.168.2.194 (192.168.2.194) 56(84) bytes of data.
```

```
--- 192.168.2.194 ping statistics ---
70 packets transmitted, 0 received, 100% packet loss, time 719ms
```

```
root@tunnel-ssh:/home/administrator/ip# route -n
Kernel IP routing table
Destination      Gateway          Genmask         Flags Metric Ref
Use Iface
0.0.0.0          192.168.1.1     0.0.0.0         UG    0      0
0 eno1
192.168.1.0      0.0.0.0         255.255.255.0   U      0      0
0 eno1
```

```
root@tunnel-ssh:/home/administrator/ip# route add -net 192.168.2.192
netmask 255.255.255.224 gw 192.168.1.99
```

```
root@tunnel-ssh:/home/administrator/ip# route -n
Kernel IP routing table
Destination      Gateway          Genmask         Flags Metric Ref
Use Iface
0.0.0.0          192.168.1.1     0.0.0.0         UG    0      0
0 eno1
192.168.1.0      0.0.0.0         255.255.255.0   U      0      0
0 eno1
192.168.2.192    192.168.1.99    255.255.255.224 UG    0      0
0 eno1
```

```
root@tunnel-ssh:/home/administrator/utils# ping 192.168.2.194
PING 192.168.2.194 (192.168.2.194) 56(84) bytes of data.
```

```
--- 192.168.2.194 ping statistics ---
70 packets transmitted, 0 received, 100% packet loss, time 719ms
```

Exercise 4.

In host 192.168.1.99, check whether the kernel is doing IP forwarding at the moment:

```
networks@protocol:~/ip$ sysctl net.ipv4.ip_forward
net.ipv4.ip_forward = 0
```

```
networks@protocol:~/ip$ su
```

```
root@protocol:/home/networks/ip# sysctl -w net.ipv4.ip_forward=1
```

Check ping to 192.168.1.194 again from paloalto:

```
root@tunnel-ssh:/home/administrator# ping 192.168.2.194
PING 192.168.2.194 (192.168.2.194) 56(84) bytes of data.
64 bytes from 192.168.2.194: icmp_seq=1 ttl=64 time=0.704 ms
64 bytes from 192.168.2.194: icmp_seq=2 ttl=64 time=0.686 ms
64 bytes from 192.168.2.194: icmp_seq=3 ttl=64 time=0.698 ms
64 bytes from 192.168.2.194: icmp_seq=4 ttl=64 time=0.643 ms
64 bytes from 192.168.2.194: icmp_seq=5 ttl=64 time=0.689 ms
```

Exercise 5.

In host 192.168.1.99 (paloalto, internal), check IP connectivity with 192.168.2.2 in network 192.168.2.0/25:

```
root@tunnel-ssh:/home/administrator/utills# ping 192.168.2.2
PING 192.168.2.2 (192.168.2.2) 56(84) bytes of data.
From 185.179.107.225 icmp_seq=1 Destination Net Unreachable
From 185.179.107.225 icmp_seq=2 Destination Net Unreachable
From 185.179.107.225 icmp_seq=3 Destination Net Unreachable
From 185.179.107.225 icmp_seq=4 Destination Net Unreachable
^C
--- 192.168.2.2 ping statistics ---
4 packets transmitted, 0 received, +4 errors, 100% packet loss, time
7ms
```

In host 192.168.1.99 (paloalto), create a route to network 192.168.2.0/25 through gateway 192.168.1.99, and check again:

```
root@tunnel-ssh:/home/administrator/utills# route add -net 192.168.2.0
netmask 255.255.255.128 gw 192.168.1.99
```

```
root@tunnel-ssh:/home/administrator/utills# ping 192.168.2.2
PING 192.168.2.2 (192.168.2.2) 56(84) bytes of data.
64 bytes from 192.168.2.2: icmp_seq=1 ttl=64 time=0.731 ms
64 bytes from 192.168.2.2: icmp_seq=2 ttl=64 time=0.714 ms
64 bytes from 192.168.2.2: icmp_seq=3 ttl=64 time=0.713 ms
64 bytes from 192.168.2.2: icmp_seq=4 ttl=64 time=0.710 ms
^C
--- 192.168.2.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 82ms
rtt min/avg/max/mdev = 0.710/0.717/0.731/0.008 ms
```

Exercise 6.

```
# sysctl -w net.ipv4.ip_forward=0
```

- Check that ping to 192.168.2.194 and to 192.168.2.2 both fail because R1 is not doing IP fwd.

- Restore IP fwd:

```
# sysctl -w net.ipv4.ip_forward=0
```

Exercise 7.

In paloalto check IP connectivity with 192.168.2.129 in network 192.168.2.0/25:

```
root@tunnel-ssh:/home/administrator/utills# route -n
Kernel IP routing table
Destination      Gateway          Genmask          Flags Metric Ref
Use Iface
0.0.0.0          192.168.1.1     0.0.0.0         UG    0     0
0 enol
192.168.1.0     0.0.0.0         255.255.255.0   U     0     0
0 enol
192.168.2.0     192.168.1.99   255.255.255.128 UG    0     0
0 enol
192.168.2.128  192.168.1.99   255.255.255.192 UG    0     0
0 enol
192.168.2.192   192.168.1.99   255.255.255.224 UG    0     0
0 enol
```

```
root@tunnel-ssh:/home/administrator/utills# ping 192.168.2.129
PING 192.168.2.129 (192.168.2.129) 56(84) bytes of data.
From 192.168.1.99: icmp_seq=1 Redirect Host(New nexthop: 192.168.1.1)
From 185.179.107.225 icmp_seq=1 Destination Net Unreachable
From 185.179.107.225 icmp_seq=2 Destination Net Unreachable
From 185.179.107.225 icmp_seq=3 Destination Net Unreachable
^C
--- 192.168.2.129 ping statistics ---
3 packets transmitted, 0 received, +3 errors, 100% packet loss, time
6ms
```

```
root@tunnel-ssh:/home/administrator/utills# ping 192.168.2.130
PING 192.168.2.130 (192.168.2.130) 56(84) bytes of data.
From 192.168.1.99: icmp_seq=1 Redirect Host(New nexthop: 192.168.1.1)
From 185.179.107.225 icmp_seq=1 Destination Net Unreachable
From 185.179.107.225 icmp_seq=2 Destination Net Unreachable
From 185.179.107.225 icmp_seq=3 Destination Net Unreachable
^C
--- 192.168.2.130 ping statistics ---
3 packets transmitted, 0 received, +3 errors, 100% packet loss, time
6ms
```

- Add a route to network 192.168.2.128/26 via 192.168.2.194:

```
# route add -net 192.168.2.128 netmask 255.255.255.192 gw
192.168.2.194
```

- Set IP FWD on R3 with sysctl as we did above

- In R1 (192.168.1.99), check IP connectivity with 192.168.2.129 in network 192.168.2.0/25