**Networking contd.**

We have three possible subnet masks

255.255.255.0 => 256

255.255.0.0 => 65536

255.0.0.0 => 16777216

* To Create networks, we have two addressing mechanisms
  + Classful
  + Classless
* Classful:
  + In this mechanism all the IPv4 addresses are divided into 5 classes
    - A
    - B
    - C
    - D
    - E

| Points | **Class A** | **Class B** | **Class C** |
| --- | --- | --- | --- |
| Address Range | 0.0.0.0-127.255.255.255 | 128.0.0.0-192.255.255.255 | 192.0.0.0 – 223.255.255.255 |
| Default Subnet Mask | 255.0.0.0 | 255.255.0.0 | 255.255.255.0 |
| Maximum Number of Hosts | 16777214 | 65534 | 254 |
| private address range | 10.0.0.0 – 10.255.255.255 | 172.16.0.0 – 172.31.255.255 | 192.168.0.0 – 192.168.255.255 |

* Private networks vs public networks:
  + Public network is accessible from the internet
  + Private network cannot be accessed from internet and is designed for internal communication.
* Classless Inter-Domain Routing (CIDR):
  + Was introduced in 1993 to replace the classful addressing. It uses Variable length subnet masks
  + It has CIDR Notation which helps in representing subnet masks and ip ranges

192.168.0.0/24

192.168.0.x

255.255.255.0

192.168.0.0/16

192.168.x.x

255.255.0.0

10.0.0.0/8

10.x.x.x

255.0.0.0

Advantage of viewing subnet mask as binary

200 devices

(254, 65534, 16777214)

255.255.255.0 (decimal representation)

11111111.11111111.11111111.00000000 (8 zeros) => 2^8 -2 => 256-2 => 254

11111111.11111111.11111110.00000000 (9 zeros) => 2^9-2 => 512-2 => 510

11111111.11111111.11111100.00000000 (10 zeros)

11111111.11111111.11111000.00000000 (11 zeros)

Let’s assume we want to have a network with 2000 devices

2^11 ~= 2000

we need 11 bits for host id

So my subnet mask will be

11111111.11111111.11111000.00000000

255.255.248.0

We need to create a network with 9000 devices

2^14 = 16384

i.e 14 bits for host id

11111111.11111111.11000000.00000000

255.255.192.0

Exercise: We need to create a network with 100 devices

2^7 ~= 126

i.e 7 bits for host id and 32-7 (25) bits for network id

11111111.11111111.11111111.10000000

255.255.255.128

Possible SM’s in a octet

11111111 => 255

11111110 => 254

11111100 => 252

11111000 => 248

11110000 => 240

11100000 => 224

11000000 => 192

10000000 => 128

Lets look at the following cidr notation

192.168.0.0/25

SM: 11111111.11111111.11111111.10000000

IP: 11000000.10101000.00000000.00000000

11000000.10101000.00000000.0 xxxxxx

11000000.10101000.00000000.0 0000000 => 192.168.0.0

11000000.10101000.00000000.0 1111111 => 192.168.0.127

192.168.128.0/22

SM: 11111111.11111111.11111100.00000000

IP: 11000000.10101000.10000000.00000000

11000000.10101000.100000 xx.xxxxxxx

11000000.10101000.100000 00.00000000 => 192.168.128.0

11000000.10101000.100000 11.11111111 => 192.168.131.255

10.10.0.0/18

SM: 11111111.11111111.11000000.00000000 => 255.255.192.0

IP: 00001010.00001010.00000000.00000000

IP: 00001010.00001010.00111111.11111111

00001010.00001010.00000000.00000000 => 10.10.0.0

00001010.00001010.00111111.11111111 =>10.10.63.255

Note: 10.10.0.0 => Network id

10.10.0.255 => Broadcast id.

Note:

1. The IP address number 0.0.0.0 is a nonroutable IPv4 address with several uses, primarily as a default or placeholder.
2. 255.255. 255.255 – Represents the broadcast address, or place to route messages to be sent to every device within a network