DAY 6 - IPv4

Purinat33

IPv4 Addresses

- 32 bits addresses.
- Separated into 4 octets of 8 bits each.
- Written in dotted decimal notation

192	168	1	254
11000000	10101000	00000001	11111110

Each octet have values from 0-255.

Network and Host portion:

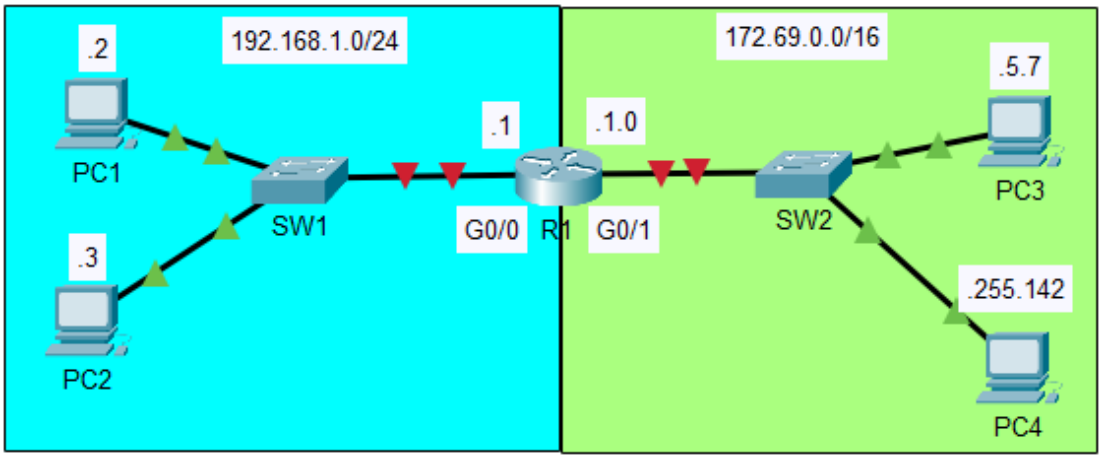
eg. `192.168.1.2` / `24`

- `/24` bits netmask signifies **How many bits are used to identified the network portion** (Which network the IP belongs to).
  - **192.168.1**.0 Network.
  - 192.168.1.**2** Host
  - `24` bits are used to identify the Network.
  - 32- `24` = `8` bits are used to identify the Host.

Netmask

- How many bits are used to identified the network portion.
  eg.
- `/8`
  - 8 bits network portion.
  - `11111111` .00000000.00000000.00000000
  - `255` .0.0.0
- `/16`
  - 16 bits network portion.
  - `11111111` . `11111111` .00000000.00000000

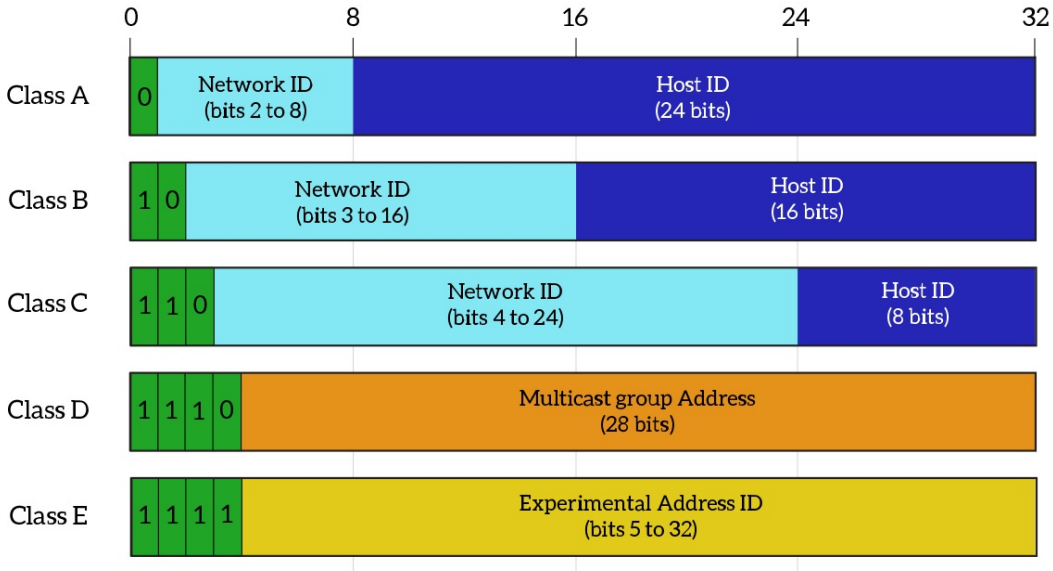
  - `255` . `255` .0.0
- `/24`
  - 24 bits network portion.
  - `11111111` . `11111111` . `11111111` .00000000
  - `255` . `255` . `255` .0
- `/21`
  - 21 bits network portion.
  - `11111111` . `11111111` . `11111000` .00000000
  - `255` . `255` . `248` .0



- `192.168.1.0/24` Network
  - PC1: `192.168.1.2`
  - PC2: `192.168.1.3`
  - R1's G0/0 Interface: `192.168.1.1`
- `172.69.0.0/16` Network
  - PC3: `172.69.5.7`
  - PC4: `172.69.255.142`
  - R1's G0/1 Interface: `172.69.1.0`

IPv4 Address Classes:

Class	1st octet of IP address	Default Subnet Mask	Network / Host	Number of networks	Maximum nodes in a network
A	1 - 126	255.0.0.0	N.H.H.H	126	16,777,214
B	128 - 191	255.255.0.0	N.N.H.H	16,384	65,534
C	192 - 223	255.255.255.0	N.N.N.H	2,097,152	254
D	224 - 239				
E	240 - 254				



What is Loopback Address:

- Notice Class A nor B have `127.x.x.x` .
- This is because `127.x.x.x` ranges are used for **Loopback Addressing**
- Address used to test the network model on the local device.

```
C:\Users\User>ping 127.0.0.1

Pinging 127.0.0.1 with 32 bytes of data:
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128

Ping statistics for 127.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

Important IP Addresses in each network:

1. **Network Address**: When all host's bits == `0`
2. **Broadcast Address**: When all host's bits == `1`
   (These cannot be used as host/device's IP Addresses)

eg. `192.168.6.4/24`

- **Network Address** = 192.168.6. `00000000` (192.168.6.*0*)
- **Broadcast Address** = 192.168.6. `11111111` (192.168.6.*255*)

3. **First Usable Host Address** = The IP address *after* the network address.
4. **Last Usable Host Address** = The IP address *before* the broadcast address.

eg. `192.168.6.4/24`

- **Network Address** = 192.168.6. `00000000` (192.168.6.*0*)
- **Broadcast Address** = 192.168.6. `11111111` (192.168.6.*255*)
- **First Host** = 192.168.6.1
- **Last Host** = 192.168.6.254

5. **Number of usable hosts**: `pow(2, 32-netmask) - 2`

eg. `192.168.6.4/24`

- **Network Address** = 192.168.6. `00000000` (192.168.6.*0*)
- **Broadcast Address** = 192.168.6. `11111111` (192.168.6.*255*)
- **First Host** = 192.168.6.1
- **Last Host** = 192.168.6.254
- **Usable Hosts** = `pow(2 , 32-24) - 2` = 256 - 2 = 254

Summary

IPv4 Address Classification:

Class	1st octet of IP address	Default Subnet Mask	Network / Host	Number of networks	Maximum nodes in a network
A	1 - 126	255.0.0.0	N.H.H.H	126	16,777,214
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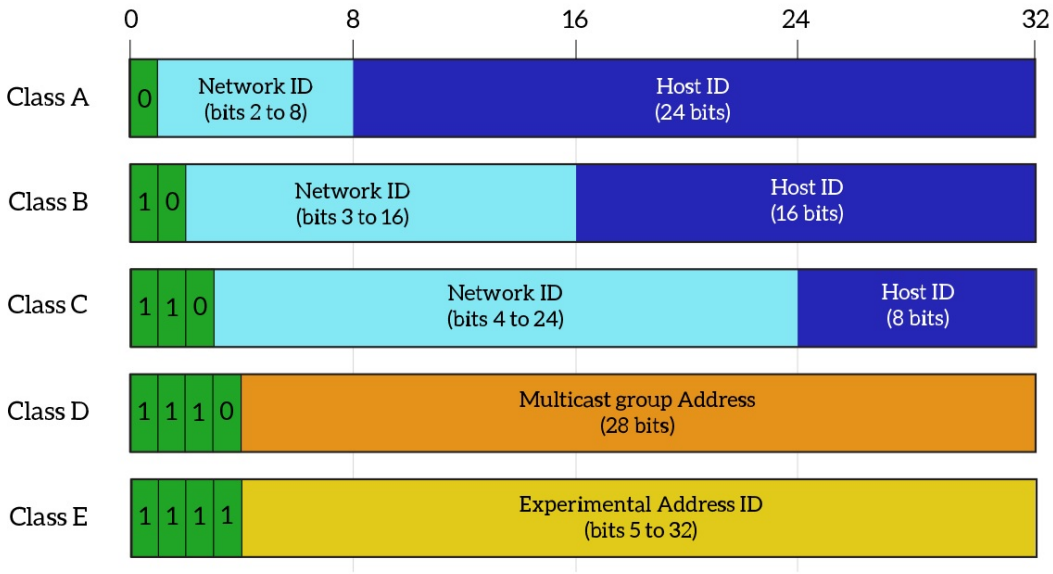

- `127.x.x.x` : **Loopback Address**, for testing networking on the local device.

IP Address:

- Separated in 4 Octets of 8 bits each.
- Each octet can have value between `0` to `255` .
- `x.x.x.x/y` with `/y` netmask denoting how many *bits* are part of the *Network* identifier, while the remaining bits identify the unique *host* within that Network.
- **Important IP Address** given an IP:
  - **Network IP**: The identifier of *the Network* itself.
    - All Host bits = `0`
  - **Broadcast IP**: The broadcast address of that network.

    - All Host bits = `1`

eg: Given a **Class B** IP address of `172.16.59.4/16` :

1. **Netmask**: `/16`
2. **Network Portion**: `172.16` .59.4
3. **Host Portion**: 172.16. `59.4`
4. ***Network Address***: `172.16.0.0`
5. ***Broadcast Address***: `172.16.255.255`
6. **First Usable Address**: `172.16.0.1`
7. **Last Usable Host**: `172.16.255.254`

Fast identifying important IPs will be in a separate note
