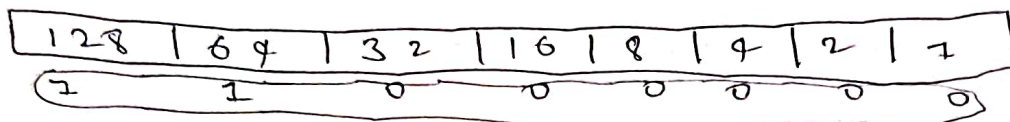# IPV4 Address

- IP Address is a logical address, which enables machine to communicate with other machines
- IPV4 is a 32 bit address. Divided into 4 octets separated by ".". [00110000 11000000 01000010 10000001]
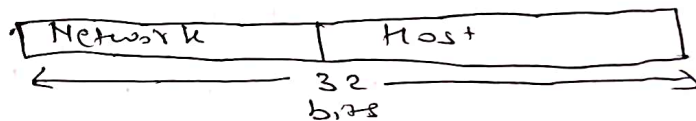
8 bit octet chart

128	64	32	16	8	4	2	1
1	1	0	0	0	0	0	0

128 + 64 = 192.

[In any octet the value will be b/w 0-255]

Basic IP address example ⇒ 10.65.255-8

IPV4 Address classes

- IP address class is determined by Ist octet of IP address.
- IP address having 0 in first octet is not valid IP.
- IP address having 127 in Ist octet also not valid (Because it is reserved for loopback.)

class	Range
A	1 - 126
B	128 - 191
C	192 - 223
D	224 - 239
E	240 - 255

Network	Host

← 32 bits →
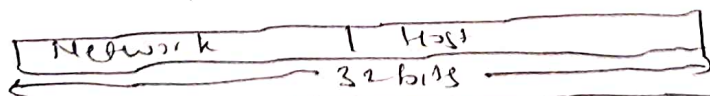
N/w ID ⇒ Common part - helps in identifying LAN

Host ID ⇒ Unique Part - helps in Identifying the host within LAN

Subnet Mask

- Subnet Mask is 32 bits in size.
- It is continous 1's followed by 0's
- It tells us which portion of IP address belongs to N/w Id and Host ID

1's: N/w portion | 0's: Host Portion

Network	Host

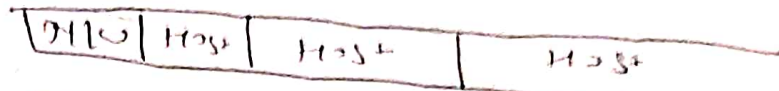← 32 bits →

N/w Portion

In Binary   11111111.11111111.11111111.00000000

Decimal Notation   255.255.255.0

Slash Notation or prefix length - /24

Host Portion
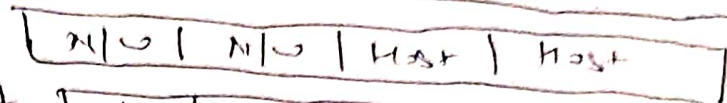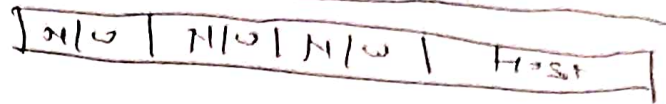
Subnet mask

class A - 255.0.0.0 or /8

N/w	Host	Host	Host

class B - 255.255.0.0 or /16

N/w	N/w	Host	Host

class C - 255.255.255.0 or /24

N/w	N/w	N/w	Host

Note

1) Network Address ⇒ used to represent the whole n/w.
   → It is an address having all 0's in host portion

example ⇒ i) 192.168.1.10/24 for this the network address
   is 192.168.1.0 (last 8 bits)

ii) 192.168.1.65/26 for this the n/w address
   is 192.168.1.64 (last 6 bits)

2) **Broadcast Address** ⇒ The address used to send data to all hosts in the n/w.
   → It is an address having all 1's in host portion.
   → It is not host assignable.

Example ⇒ 192.168.1.65/26 for this Broadcast address is 192.168.1.127 (last 6 bit)

Example to illustrate

192.168.0.0/24

N 24	N 8

N/w address ⇒ 192.168.0.0

Broadcast address ⇒ 192.168.0.255

Number of hosts ⇒ $2^8 - 2 = 254$

Available Host IP address Range
   ↓
192.168.0.1 - 192.168.0.254

Power of 2	Value
0	1
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256
9	512
10	1024
11	2048
12	4096
13	8192
14	16384
15	32768

Example 1: Subnetting 48 hosts in a LAN

given 192.168.0.0/24

M	S	H	=32
24	2	6	

i) Class of IP address [C]

which covers 48 hosts

ii) Write bits

$H = 6$ for 48 hosts (because $2^6 = 64$)

[refer previous power table]

$S = 32 - (N+H)$
$= 32 - (24 + 6)$
$= 32 - 30 \Rightarrow 2$

iii) Subnet mask $\Rightarrow 32 - H$
$= 32 - 6 = 26$ or $\begin{matrix} N+S \\ 24+2=26 \end{matrix}$

iv) Write Subnet mask in binary

11111111	11111111	11111111	11000000

Find Increment — [64] (last bit whis is 1 in subnet
Find 0.0.0.7   [4th]   mask)

v) Ranges of IP Subnet and Broadcast Address

Subnet	Broad Cast Address	First IP	Last IP
192.168.0.0	192.168.0.63	192.168.0.1	192.168.0.62
192.168.0.64	192.168.0.127	192.168.0.65	192.168.0.126
192.168.0.128	192.168.0.191	192.168.0.129	192.168.0.190
192.168.0.192	192.168.0.255	192.168.0.193	192.168.0.254

Example 2   given 172.16.0.0/16

Do same as above, but for
10 subnets instead of hosts.

M	S	H
16	4	12

$\rightarrow 2^4 = 16$ (which covers
10 subnets)