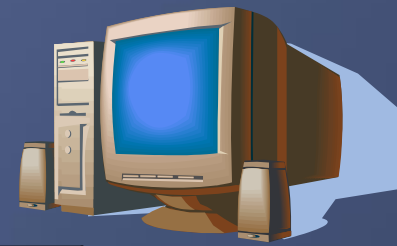# IP ADDRESS

Definition : It is a unique address used to identify a device (like computer, smart phone, router, IP based phone, network printer etc) in network

IP Address	
IP v4	IP v6
Decimal Format	Hexadecimal Format
32 Bits address	128 Bits address

IP V4

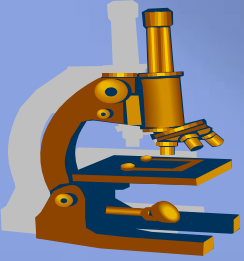- It is 32 bits address divided into 4 octet.
- This 32 bits address is having Network ID and Host ID.

192	168	1	1
11000000	10101000	00000001	00000001
8 bits	8 bits	8 bits	8 bits
Network ID →		← Host ID	

8 bits = 2 x power 8 = 256 (We can write – 0,1,2....................upto 255) only

32 bits = 2 x power 32 = Around 4.2 billions numbers

IP v4	
Classfull	Classless
1) Class A – Used for large network	Subnetting and Supernetting
2) Class B – Used for medium network	
3) Class C – Used for small network	
4) Class D – Used for multicasting	
5) Class E – Reserved for Research and Development	

Q: Which organization is responsible for managing IP addresses

IANA (Internet Assigned Number Authority).

IANA created some range to distribute these IP based on use.

IP Address Class Range		
Class	Starting IP	Ending IP
A	1.0.0.0	126.255.255.255
B	128.0.0.0	191.255.255.255
C	192.0.0.0	223.255.255.255
D	224.0.0.0	239.255.255.255
E	240.0.0.0	255.255.255.255

Note : 127.0.0.1 is reserved for local host and called loopback address.

Range: 127.0.0.1 – 127.255.255.254

To Remember	
Class	Range
A	1 - 126
B	128 – 191
C	192 – 223
D	224 – 239
E	240 – 255

Network bits and Host bits

Class A:

8	8	8	8

Network Bits (N) = 8

Host Bits (H) = 24

Subnet Mask :

11111111	00000000	00000000	00000000
255	0	0	0

Class B:

8	8	8	8

Network Bits (N) = 16

Host Bits (N) = 16

Subnet Mask

11111111	11111111	00000000	00000000
255	255	0	0

Class C:

8	8	8	8

Network Bits (N) = 24

Host Bits (N) = 08

Subnet Mask

11111111	11111111	11111111	00000000
255	255	255	0

Condition to communicate

Class	SYSTEM - 1	SYSTEM -2
1) Class A	A B C D	A X Y Z
2) Class B	A B C D	A B Y Z
3) Class C	A B C D	A B C Z

Note: To communicate 2 PC the network id must be same in both pc.

Calculation

No of network $= 2^{N-R}$

No of host/network $= 2^{H}$

N – Network bits,   R- Reserved bits ,   H – Host bits

Class A : N=8,   R=1, H=24

No of network = 2 xpower N-R = 2 x power 7= 128

No of host/network = 2 x power H = 2 x power 24 =   16,777,216

Class B : N=16, R=2, H =16

No of network = 2 xpower N-R = 2 x power 14 =16,384

No of host/network = 2 x power H = 2 x power 16 = 65,536

Class C : N=24, R=3, H=8

No of network = 2 xpower N-R = 2 x power 21 = 2,097,152

No of host/network = 2 x power H = 2 x power 8 = 256

700 PC -- Class C IP

192.168.1.0 — network id
192.168.1.1
192.168.1.2
......
....
.....
192.168.1.254
192.168.1.255 — BC id

— 254 valid host

192.168.2.0 — network id
192.168.2.1
192.168.2.2
......
....
.....
192.168.2.254
192.168.2.255 — BC id

— 254 valid host

192.168.3.0 — network id
192.168.3.1
192.168.3.2
......
....
.....
192.168.3254
192.168.3.255 — BC id

— 254 valid host

3.192 --- our last IP

Router 1

Router 2
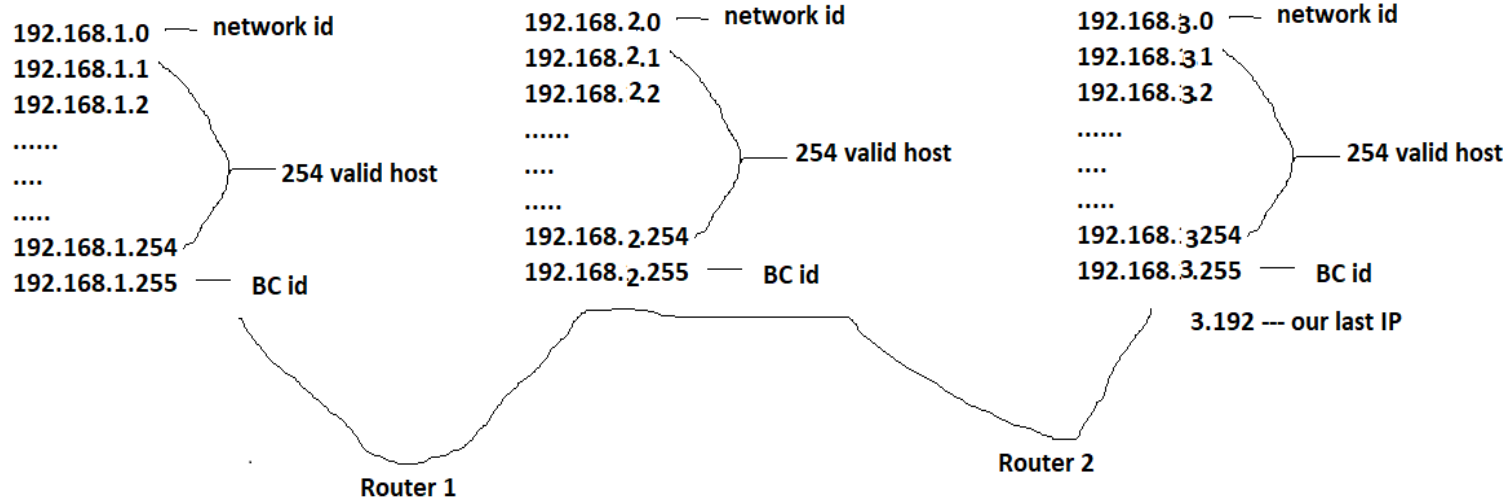
Public IP and Private IP
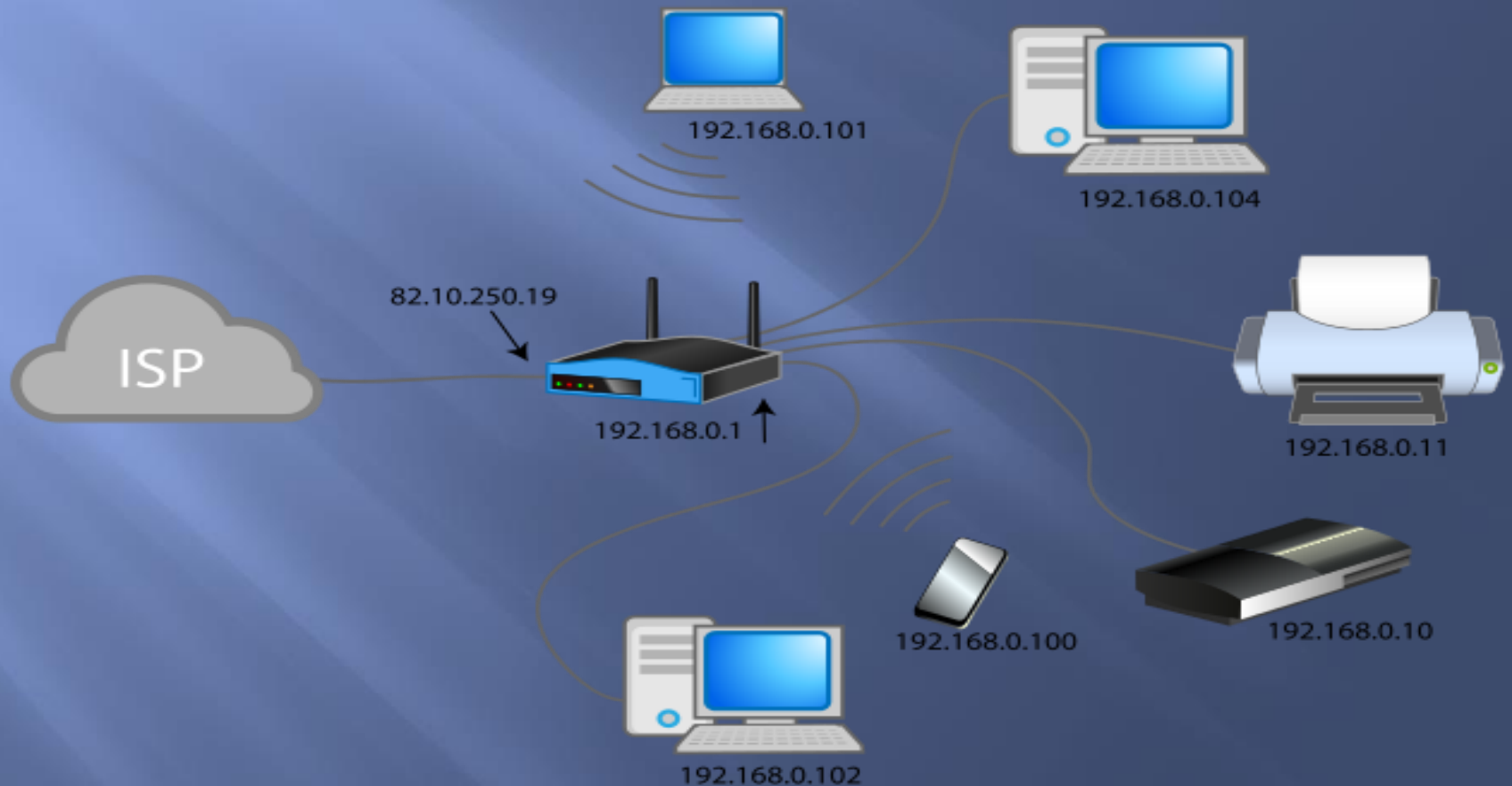
Differences

PUBLIC IP	PRIVATE IP
A) Assigned by ISP B) Used to connect Internet C) Can be directly accessed through internet	A) Assigned by user from a given range B) Used to share Internet connection C) Cannot be accessed through Internet

Private IP address range		
Class	Starting	Ending
A	10.0.0.0	10.255.255.255
B	172.16.0.0	172.31.255.255
C	192.168.0.0	192.168.255.255

Types of address

Casting	Description
Unicast	One to one sending
	Sender -1, Receiver - 1
Multicast	One to many sending
	Sender -1, Receiver - many
Broadcast	One to all
	Sender -1, Receiver- all of that network

IP Address assigning method

1) Static or Manually

2) Dynamically

- through DHCP or through APIPA

- DHCP: DHCP is a centralized server used to assign IP address automatically to all client systems

- APIPA: Automatic Private IP Addressing (**APIPA**) is a feature in operating systems (such as Windows) that enables computers to automatically self-configure an IP address and subnet mask when their DHCP server isn't reachable.

- The IP address range is 169.254.0.1 through 169.254.255.254.

That's all

Thank you

Subnetting

Subnetting enables the network administrator to further divide the host part of the address into two or more subnets.

The subnetting process allows the administrator to divide a single Class A, Class B, or Class C network number into smaller portions. The subnets can be subnetted again into sub-subnets.

CIDR

192 . 168 . 1 . 0 /24

255 . 255. 255. 0

NW bits

Host bits

Total 32 bits

N = 24

H = 8

Requirement

1 NW - 50 PC

2 x power 8 = 256   -----1 Network -- 256 host/NW   (x.x.x.x/24)

128   128   2 Network --> 128   (x.x.x.x/25)
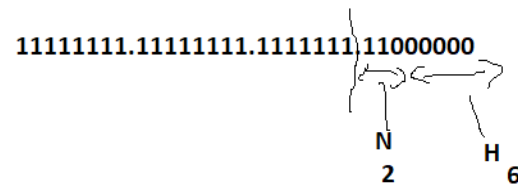   host/network

64   64   64   64   ----- 4 network --> 64 host/network   (x.x.x.x/26)

192.168.1.0/24

255.255.255.0

11111111.1111111.1111111.0000000

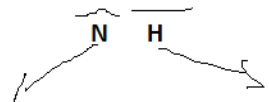192.168.1.0/26

No of nw bits increase ---no of host bits decrease

11111111.11111111.1111111.11000000

N
2

H
6

2 X power 2 -4 subnetwork

2 X power 6 --> 64 host/network

192.168.1.0/27

11111111.1111111.1111111.1110000 0

N   H

2 x power 3 - 8 subnetwork   2 X power 5 = 32 host /network

Readymade calculation(B-D)
1 bits --128
2 bits - 192
3 bits - 224
4 bits -- 240
5 bits -- 248
6 bits - 254

Most preferred Subnetting

10.100.0.0/16 - Main Network

10.100.1.0/24
10.100.2.0/24
10.100.3.0/24
10.100.4.0/24 → Subnetwork(sub division)
....
....
....
10.100.254.0/24

---

10 . 100 . 0 . 0 /16

16 bits network   16 bits host

2 X Power 16 = 65534

2 X Power 16 = 16384

10 . 100 . 1 . 0 /24

2 X Power 8 = 256 host/network

2 X Power 24 =

usable/valid host per
network --254

(Vnet or VPC ID)

172.16.0.0/16

(Network bits:16, Host bits : 16)
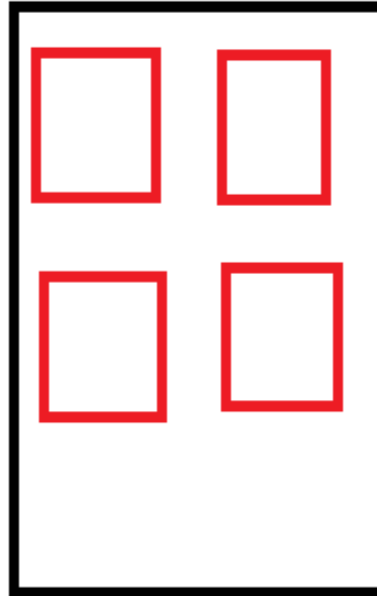
Subnet 1(172.16.1.0/24)

Network bits: 24 , Host bits: 08

Subnet 2(172.16.2 .0/24)

Network bits: 24 , Host bits: 08

Subnet 3(172.16.3.0/24)

Network bits: 24 , Host bits: 08