Network

Network is nothing but is a group of two or more interfaces connected together, means group of multiple interfaces connected together.

A devices connected together in order to communicate one device to another device.

IP Address : A point of contact to talk the particular device.

Network we have 2 types of networks are there.

1. Ipv4
2. Ipv6

IP --→ Internet Protocal address

Ipv4 :

Let us take an example I want to communicate between 2 devices says two computers like above

Ipv4 ----- 32 bit size ---- 11111111.11111111.11111111.11111111 (maximum)

00000000.00000000.00000000.00000000 (minimum)

11111111 ---- $2^7+2^6+2^5+2^4+2^3+2^2+2^1+2^0$

128+64+32+16+8+4+2+1   =   256   (0 to 255)

Ipv4 range ---- (0 to 255)

Ipv4 has been devided into 5 classess

ClassA

ClassB

ClassC

ClassD

ClassE

Class D and Class E is used for R & D.

InterNIC : This is the company where they are selling the IP addresses. ISP providers neds to be purchage IP address from this particular website. So here Class D and E are not selling by InterNIC using for R & DB and ISP providers cannot use those addresses only it can be used by milataries NASA people ISRO research and development people they will use these type of addresses.

Classfication of IP addresses classes:

Ipv4 (0 -255)   Class A --- 0 === 127

                          Class B --- 128 == 191

                          Class C --- 192 == 223

So By looking at first block ip address we can identify which class is belongs to rest of the class we don't use

Class A ip address range

(0.0.0.0 to 127.255.255.255)

Class B ip address range

(128.0.0.0 to 191.255.255.255)

Class C ip address range

(192.0.0.0 to 223.255.255.255)

Class D ip address range (224 to 239)

Class E ip address range (240 to 254)

We can identify the class of IP address by seeing the first block of ip address. Sp IP address means assigning some name or number to your device (computer) so that other people can reach to your device

Let us say If want to reach from source PC to destination pc we have to assign a IP address here like below using just LAN cable

192.168.56.2   192.168.56.3

Source PC   Destination PC

Here we can LAN cable or HUB or Switch or routers to communicate.

Initially we have started with HUB later started with Switch, in switch we have 2 types one is manageable switch and unmanageable switch and then after we have router.

Here how you find out subnet and what is subnet here.

Subnet :

Among our IP addresses what are all ip addresses we cannot use :

Not usable ip addresses : (apart from Class D and Class E)

0.0.0.0

127.0.0.0 – 127.255.255.255   (Loop back ip addresses)

255.255.255.255

Suppose if we want to transfer or communicate from one place device to another place device we cant use or assign above ip addresses like to access from any geographical locations.

Example one device is available In India and one more computer is available in US if we want to send the data in the form of packets from India to US device we should not give these ip addresses we have to give public ip address not even private ip address also.

We can assign ip to computer via NIC card or wifi services. PC can have more than one NIC card and all the ones can be connected to your device mother board al the NIC cards can be connected via cables.

2 types of ip addresses and why we need to go for it

1. Private IP address : IP address which can be accessed within the LAN or organization

2. Public IP address : IP address which can be accessed internally and globally from any geographical location.
   Example : google.com we can access from any where since it has public IP.

NAT --- Network address translation

135.12.16.10   192.168.56.10
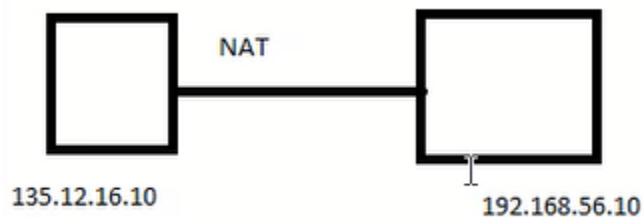
We can assign multiple devices to router and we will get internet for multiple devices when we connect cable to router. Because in single cable we can connect to only single device, but here single ip we are connecting to router and we are getting an internet connection to multiple devices.

Here NAT is taking particuallar advantage it will convert your private ip into public ip address that's the first advantage in NAT.

The disadvantage of NAT when we assign ip to your device with NAT if you try to communicate with your pc from outside of your router you cant communicate. So Incoming packages are not allowed in NAT only outgoing packats are allowed.

Example we have 2 routers there diff devices connected to different routers so we cant communicate between the routers.

Private IP address range for classes

Class A   ---   (10.0.0.0 --- 10.255.255.255)

Class B ---   (172.16.0.0 --- 172.31.255.255)

Class C --- (192.168.0.0 --- 192.168.255.255)

What is netmask/subnetmask and GATEWAY :

NetMask : It is also represented using IPv4 addrss format and Netmask will decide how many pcs can connect to this network. So using NetMask we can identify how many devices connected to network.

Before this we will have to get knowledge about CIDR (Classless Inter Domain Resource)

For example : CIDR value wil be like below

192.168.56.0/24   ----- CIDR value

 From this we have to identify of whats our ip netmask and subnetmask

Network ----- 192.168.56.0

Netmask ----- 255.255.255.0 --- 11111111.11111111.11111111.00000000 ---- 24

Range   ----- 192.168.56.0 ---- 192.168.56.255

Network ID --- 192.168.56

Host ID ----> 1 -255

GATEWAY ---> 192.168.56.1

BROADCAST ---> 192.168.56.255

192.168.245.93

Subnet Masks
IP 192.168.1.10
SM 255.255.255.0

Network address – 192.168.1.0
First IP – 192.168.1.1 (Gateway)
Second IP – 192.168.1.2
Last IP – 192.168.1.254
Broadcast IP – 192.168.1.255

IP 172.16.0.10
SM 255.255.0.0

Network Address 172.16.0.0
First usable IP 172.16.0.1
Last usable IP 172.16.255.254
Broadcast address 172.16.255.255

IP Subnet Calculator

IPv4 Subnet Calculator

Result

IP Address:	172.16.0.10
Network Address:	172.16.0.0
Usable Host IP Range:	172.16.0.1 - 172.16.255.254
Broadcast Address:	172.16.255.255
Total Number of Hosts:	65,536
Number of Usable Hosts:	65,534
Subnet Mask:	255.255.0.0
Wildcard Mask:	0.0.255.255
Binary Subnet Mask:	11111111.11111111.00000000.00000000
IP Class:	B
CIDR Notation:	/16
IP Type:	Private
Short:	172.16.0.10 /16
Binary ID:	10101100000100000000000000001010
Integer ID:	2886729738
Hex ID:	0xac10000a
in-addr.arpa:	10.0.16.172.in-addr.arpa
IPv4 Mapped Address:	::ffff:ac10.0a
6to4 Prefix:	2002:ac10.0a::/48
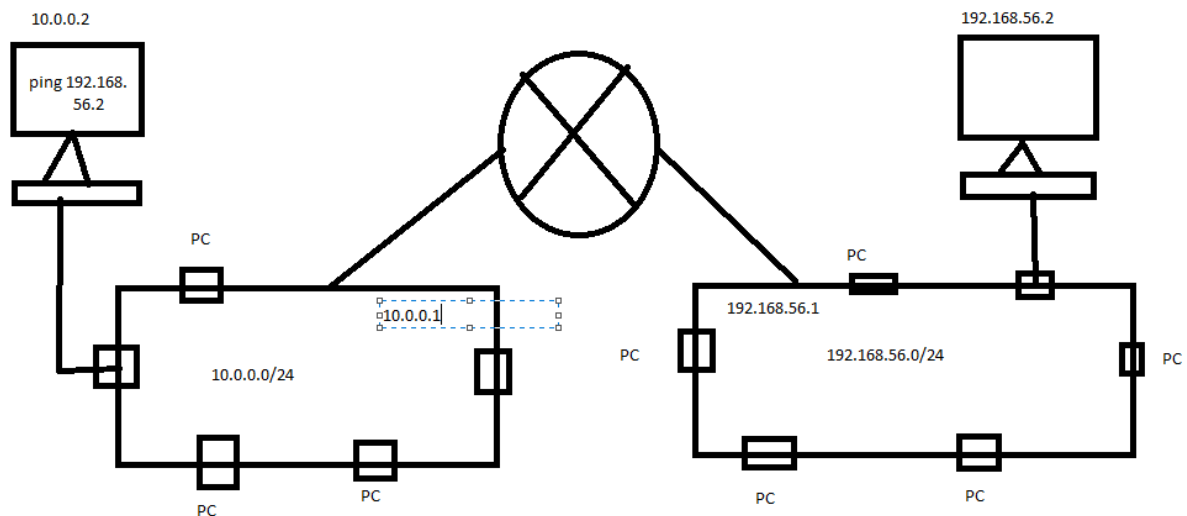
Switch : Why we need switch here means because with single cable we can connect only 2 PCs, now there 10 PCs to connect to single network then we need to use switch or a HUB.

Router : Why need a router in order to communicate one network to another network we need to have a router, in switch it is not possible. Unmanageable swith is not possible but in manageable switch can be possible.

HUB :
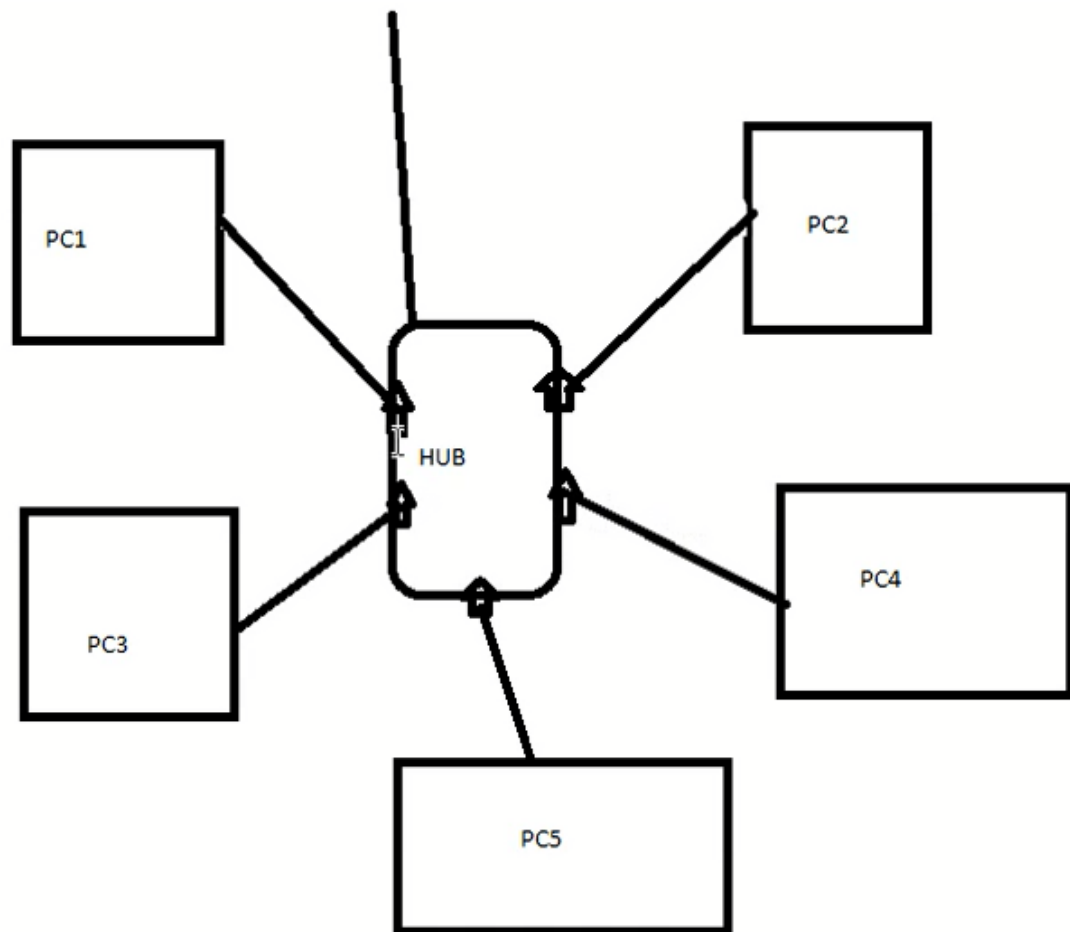
Advantage of HUB : If we want to make communication between multiple PCs more than 2 we will go with HUB and we will distribute the packets.

Packet : It is nothing but form a data which is encrypted and sending through your internet connection.

Disadvantages of HUB :

Unnecessarly we are sending the data to all PCs though it is not actual PC first time it knows which one is actual PC but second time also it sends to all PCs which is unnecessary

Unnecessarly we are wasting our packets, here problem is it can hack the data from remaining PCs

And wasting our time as well. There is delay in the response.That's the reason we have been moved to switch

SWITCH :
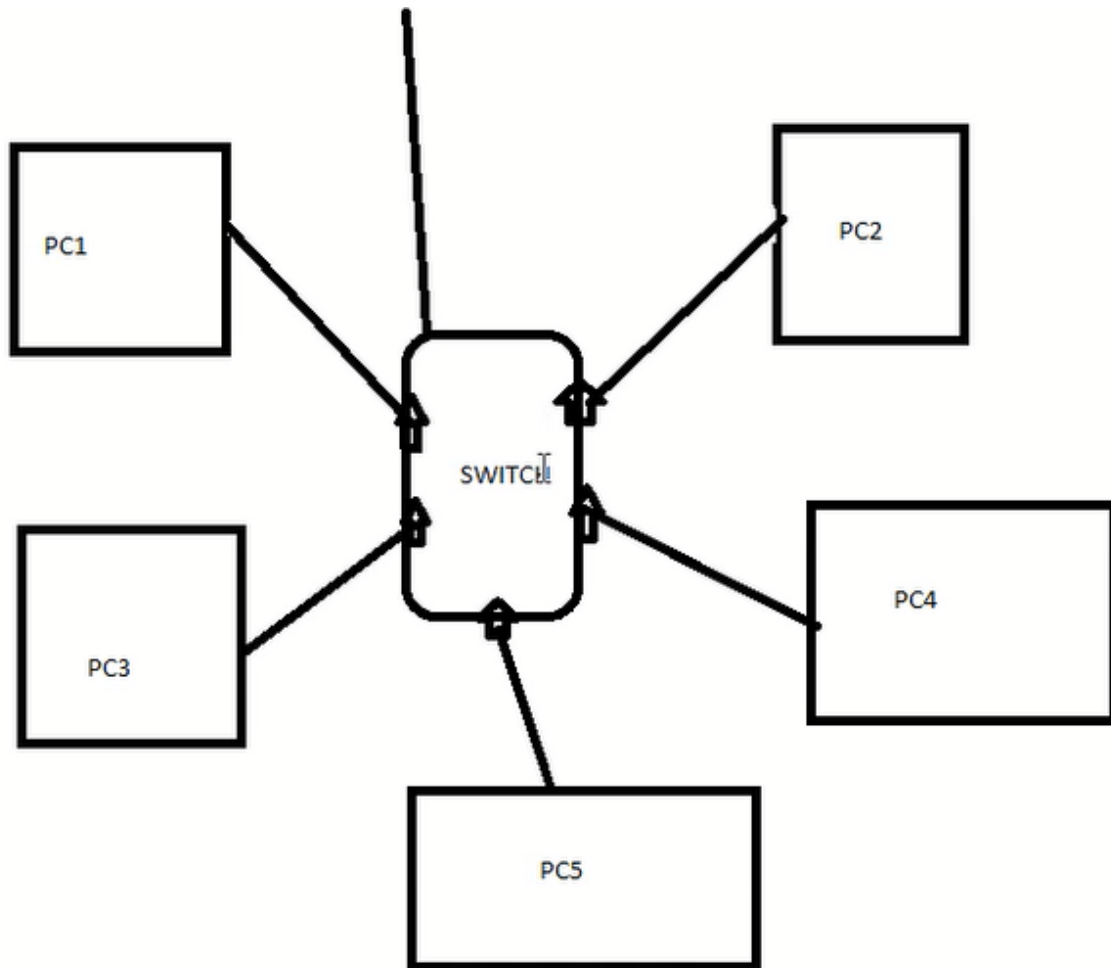
Here we are doing same thing for the first time same like HUB. Then we are having table called ARP table.

Port	MAC address	IP address
1 4	89:ed:1 78:pi:3r:	192.168.56.10 192.168.56.11

We are storing all the details so that next time it can not send packets to all PCs.

Why router needed about the switches

10.0.0.0/24   192.168.56.1   192.168.56.0/24   NIC --> Network Interface Card

10.0.0.1   192.168.56.10

ping 192.168.56.10

192.168.56.11

PC13

192.168.56.255

PC1   192.168.56.1   PC2

PC11

192.168.56.12

SWITCH   SWITCH   PC4

PC3

PC12   192.168.56.14   192.168.56.13

PC5