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**Welcome
To
Network for you
IP Addressing**



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IP (Internet Protocol):

IP Addresses are divided into 5 Classes, These are divided by IANA: - Internet Assigned Number authority.

We are using two type of version

- IPV4
- IPV6

So let start first discussing IP V4.

- IP uses packets called IP packets to carry information. Every IP packet should have address.
- The IP address (IPV4) is 32 bit and consists of 2 parts, the network part and the host part.

Example:

192	168	1	1
8 Bit	8 Bit	8 Bit	8 Bit
N	N	N	H

The IP address is 32 bit but we write it into 4 block of **8 bit** as given above.

IP Addresses are divided into 5 Classes, There are divided by IANA:- Internet Assigned Number Authority.

Class A 1-126

Class B 128-191

Class C 192-223

Class D 224-239 - Multicast

Class E 240-255 - Reserved

So we are only using Class A,B & C IP address

Subnet Mask: It's an address used to identify the network and host portion of the IP address

Class A	N.H.H.H	255.0.0.0	/8
Class B	N.N.H.H	255.255.0.0	/16
Class C	N.N.N.H	255.255.255.0	/24

Remember 255 represent Network bit and 0 represent Host bit.

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Class A = /8 = 2^{24} (16,600,000) Addresses for hosts

Class B = /16 = 2^{16} (65,000) Addresses for hosts

Class C = /24 = 2^8 (256) Addresses for hosts

Class A's default mask is 255.0.0.0, or /8

Class B's default mask is 255.255.0.0, or /16

Class C's default mask is 255.255.255.0, or /24

255.0.0.0 in binary is 11111111 00000000 00000000 00000000.

255.255.0.0 in binary is 11111111 11111111 00000000 00000000.

255.255.255.0 in binary is 11111111 11111111 11111111 00000000.

We have Private IP and Public IP let discuss what that is.

Private IP:

- It use within the Organization.
- It is Free
- It is Unregister IP
- It is Unique with the network
- It not recognized on Internet

Public IP:

It use in Public Network

It is not free (Need to Pay ISP or IANA to get)

It is Register IP

It is Globally Unique

It recognized on Internet

Please find the below **private IP** address.

Class A 10.0.0.0 to 10.255.255.255

Class B 172.16.0.0 to 172.31.255.255

Class C 192.168.0.0 to 192.168.255.255

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Public IP Address Classes range

Class	1st Octet DEC range	1st Octet BIN	Start address	Finish address	1st Octet High order Bits	Network/ Host	Default Subnet Mask
A	1-126	00000001-01111110	0.0.0.0	126.255.255.255	0	N.H.H.H	255.0.0.0
B	128-191	10000000-10111111	128.0.0.0	191.255.255.255	10	N.N.H.H	255.255.0.0
C	192-223	11000000-11011111	192.0.0.0	223.255.255.255	110	N.N.N.H	255.255.255.0
D	224-239	11100000-11101111	224.0.0.0	239.255.255.255	1110		
E	240-255	11110000-11111111	240.0.0.0	254.255.255.255	11110		

Note: Class A address 127.0.0.0 - 127.255.255.255 cannot be used and is for LOOPBACK and diagnostic

Private IP Address Classes range

Class	1st Octet DEC range	1st Octet BIN	Start address	Finish address	1st Octet High order Bits	Network/ Host	Default Subnet Mask
A	10	00001010	10.0.0.0	10.255.255.255	0	N.H.H.H	255.0.0.0
B	172	10101100	172.16.0.0	172.31.255.255	10	N.N.H.H	255.255.0.0
C	192	11000000	192.168.0.0	192.168.255.255	110	N.N.N.H	255.255.255.0

Loopback Address:

- Address beginning with 127 is not assign to any network device.
- From 127.0.0.0 to 127.255.255.255 is fully reserved for loopback Purpose.
- We use loopback IP to check our LAN Card is working or not.
- Loopback addresses are used for checking and troubleshooting purpose.

Example:

Ping 127.0.0.1 –if reply is coming mean our LAN Card is working.

```
C:\Users\mustafa>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
```

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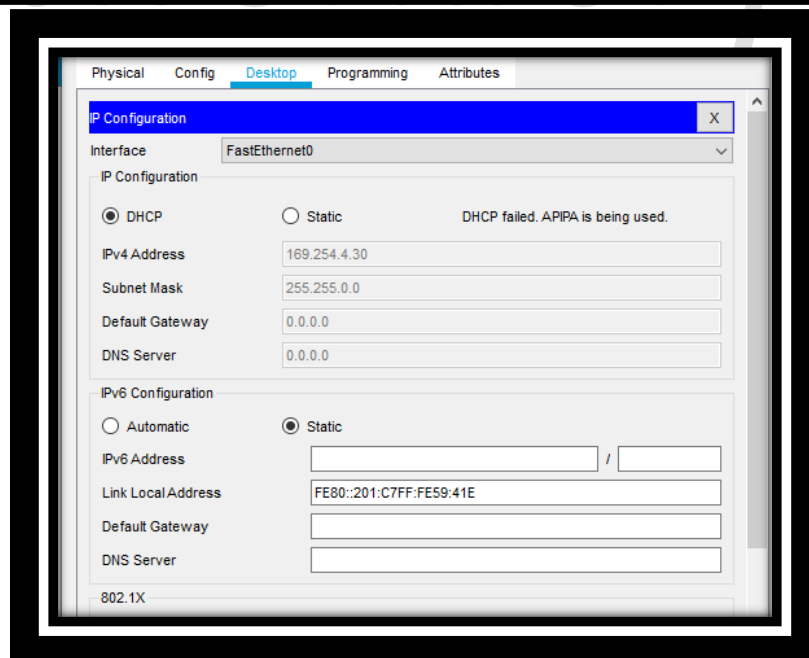
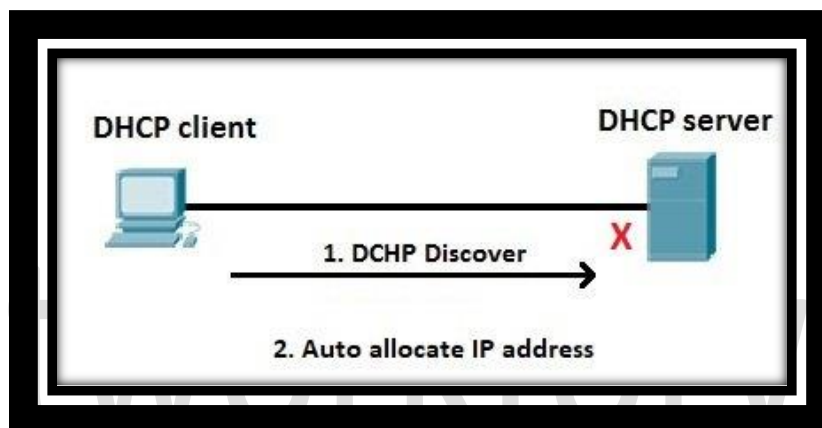
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APIPA:

- APIPA stand for Automatic Private IP Addressing.
- 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 for APIPA is 169.254.0.1 to 169.254.255.254, with the subnet mask of 255.255.0.0
- In other words we can say Windows computer assign itself an IP address if a DHCP is not available.
- We can say when DHCP Fail then APIPA feature is use to get IP address to computer.



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Class Full IP Address:

- This IPv4 address which use default subnet mask is called Class Full IP address.

Class	IP Address	Subnet Mask
A	10.0.1.2	255.0.0.0
B	172.16.0.3	255.255.0.0
C	192.168.0.6	255.255.255.0

Classless IP Address:

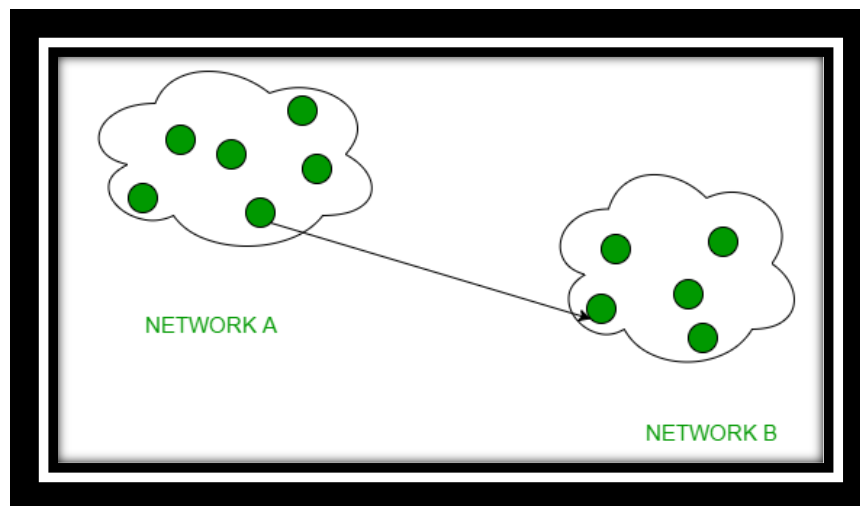
- This IPv4 address which not use default subnet mask is called Class less IP address.
- IPv4 addresses which sub netting are use.

Class	IP Address	Subnet Mask
A	10.0.1.2	255.255.0.0
B	172.16.0.3	255.255.255.0
C	192.168.0.6	255.255.0.0

Unicast Address Type:

- One to one communication is called Unicast communication.
- In Unicast data is send from one computer to another computer.
- It is a one-to-one transmission.

For example, a device having IP address 192.168.1.2 in a network wants to send the traffic stream (data packets) to the device with IP address 192.168.4.2 in the other network, and then unicast comes into picture. This is the most common form of data transfer over the networks.



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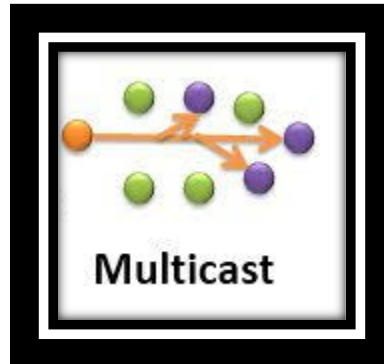
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Multicast Address Types:

- One to a specific group communication is called Multicast Communication.
- Type of communication where multicast traffic addressed for a group of devices.
- IP v4 class D network is reserved for Multicasting (244.0.0.0 to 255.255.255.255 cannot assignment to network hosts).
- In Multicast, the sender transmits only one copy of data and delivered many devices.



Broadcast Address Types:

- One to all communication is called Broadcast Communication.
- Type of communication where data is sent from one PC and copy to all devices.
- In Broadcast, there is only one sender and the data is sent only once, However the Broadcast data is delivered to all connected devices.
- As we know switches do broadcast and Router drop the broadcast traffic.

