

## **6.7 Explores how the multiple networks are interconnected to form the Internet**

### **Gateway**

A gateway is a router equipped with all the information which leads to route packets to the destination host.

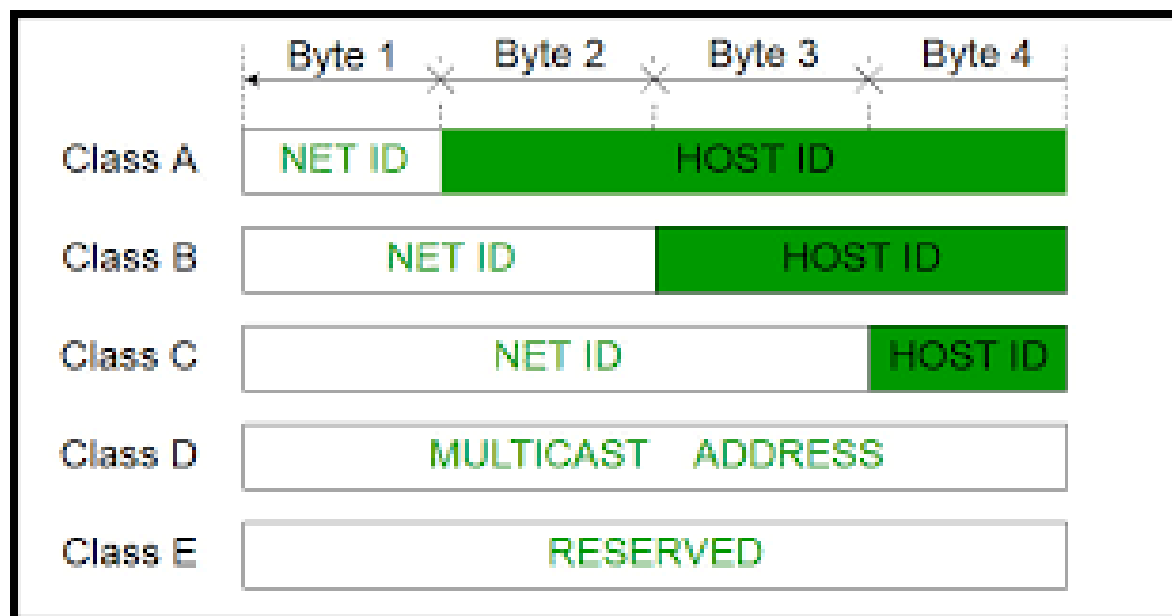
**IP Address** - IP addresses are unique addresses assigned to each device on the network to identify the location of the device.

- IP Version 4 (IPv4) is 32 bits long and can address up to 4 billion devices.
- IP Version 6 (IPv6) is 128 bits long and is plenty enough to address a huge number of networkable devices.

### **Dotted decimal notation**

- for human convenience the IP address is written in dotted decimal notation
- The 32-bit address is divided into 4 groups of 8 bits (an octet or a byte)
- Each octet is written as a decimal number ranging from 0 to 255
- The decimal numbers are separated by periods, or dots  
eg. 11000000 10100000 00100000 0000101  
192.160.32.5

Above mentioned 4 billion IPV4 version IP addresses can be divided in to 5 classes.



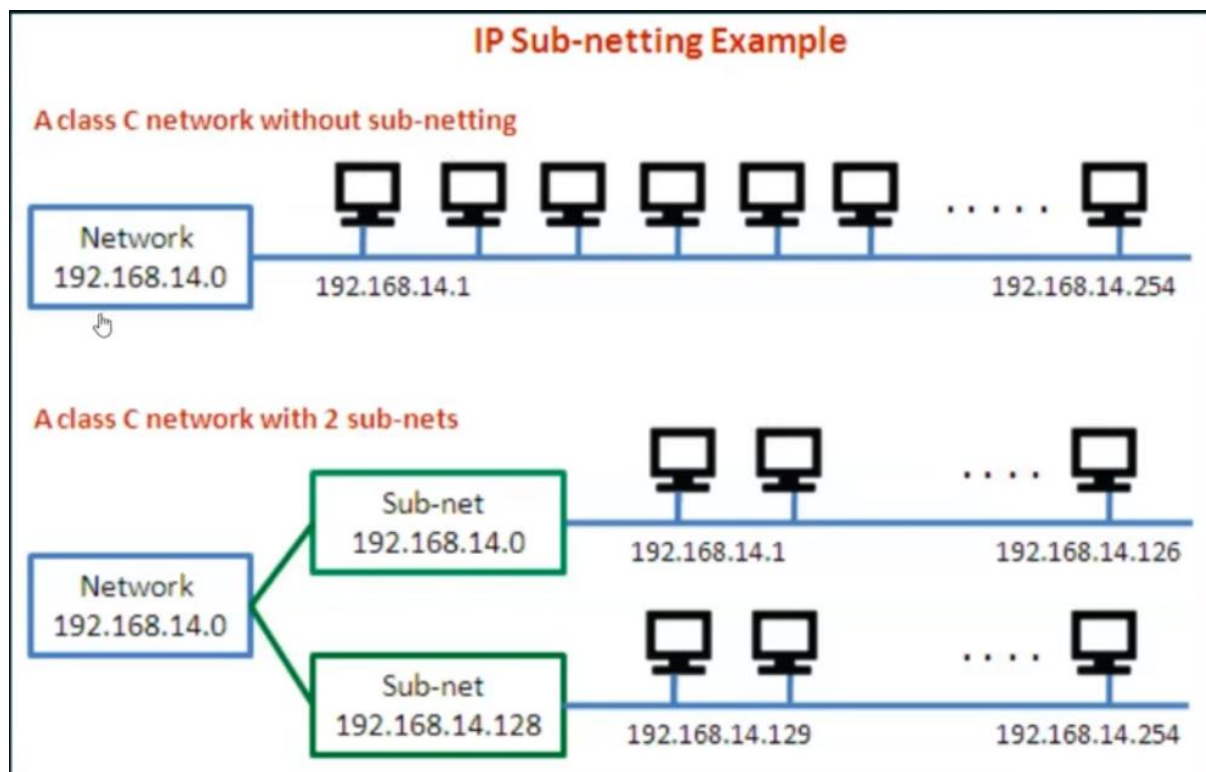
CLASSES OF IPV4 ADDRESS					
Address Class	1st Octet range in decimal	1st Octet bits (Blue Dots do not change)	Network (N) and Host (H) Portion	Default mask (Decimal)	Number of possible networks and hosts per network
A	0-127	00000000 - 01111111	N.H.H.H	255.0.0.0	128 Nets ( $2^7$ ) 16,777,214 hosts ( $2^{24}-2$ )
B	128-191	10000000 - 10111111	N.N.H.H	255.255.0.0	16,384 Nets ( $2^{14}$ ) 65,534 hosts ( $2^{16}-2$ )
C	192-223	11000000 - 11011111	N.N.N.H	255.255.255.0	2,09,150 Nets ( $2^{21}$ ) 254 hosts ( $2^8-2$ )
D	224-239	11100000 - 11101111	NA (Multicast)	-	-
E	240-255	11110000 - 11111111	NA (Experimental)	-	-

## Assignment of IP addresses:

All hosts in the same network are assigned the same address prefix. Address prefixes are assigned by central authority and are obtained from ISPs. Within a network each host is assigned a unique suffix locally by the network administrator.

## Sub-netting:

- A subnet is a logical subdivision of an IP network.
- The process of dividing a network into two or more networks is called subnetting.
- Purpose of subnetting
  - To help relieve network congestion
  - Improve network performance
  - Enhance security
  - to overcome the problem of depletion of network address of a 32-bit addressing scheme.
- In sub-netting each physical network is assigned 32-bit address mask, which is used to identify networks among other networks. All machines in the subnet should have the same subnet mask.



## Example

Subnet the IP address 216.21.5.0 into 30 hosts in each subnet.

## **Classless Inter Domain Routing (CDIR):**

Instead of full class A, B or C networks, organizations can be allocated any number of addresses using this scheme. This scheme can help reducing the growth of the router tables.

## **The vanishing IP address space:**

IPv4 has only  $2^{32}$  addresses. With the ever-increasing demand for public IP addresses for Internet accesses, Internet would run out of available IP addresses. IPV6 is proposed to fix the problem of the limited address space of IPV4.

## **Private IPs:**

Three sets of address ranges are used for private use.

10.0.0.0 – 10.255.255.255 (10.0.0.0/8) – 16M addresses

172.16.0.0 – 172.31.255.255 (172.16.0.0/12) – 1M addresses

192.168.0.0 – 192.168.255.255 (192.168.0.0/16) – 64k addresses

## **Dynamic Host Configuration Protocol (DHCP) server:**

DHCP is a protocol used to assign IP addresses to arriving hosts. Rather than a network administrator manually assigning an IP address to each arriving host, the DHCP will assign IP addresses automatically.

## **Finding path to the Destination:**

When data leaves the source towards the destination, it needs to be routed through a series of networking devices to reach the destination. Routers take care of the job of routing the data from the source to destinations. Routing is the process of finding an efficient path from a source to a given destination through the network. Routers are special networking devices that are capable of communicating with similar devices over the network, collaborate among themselves and find paths for arriving data. Routers maintain a table of reachable destinations through them and these tables are called routing tables.

Routers exchange these routing tables with other routers in the network from time to time to update the route details.

**Packet Switching:**

When a message is generated at the source it is broken down into smaller chunks called packets. Each packet is assigned unique information to identify itself, switching information is added in the header of each packet and the transmitted independent of other packets.

Reference

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