



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

An Autonomous Institution



Accredited by NBA – AICTE and Accredited by NAAC – UGC
with 'A+' Grade

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University, Chennai

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

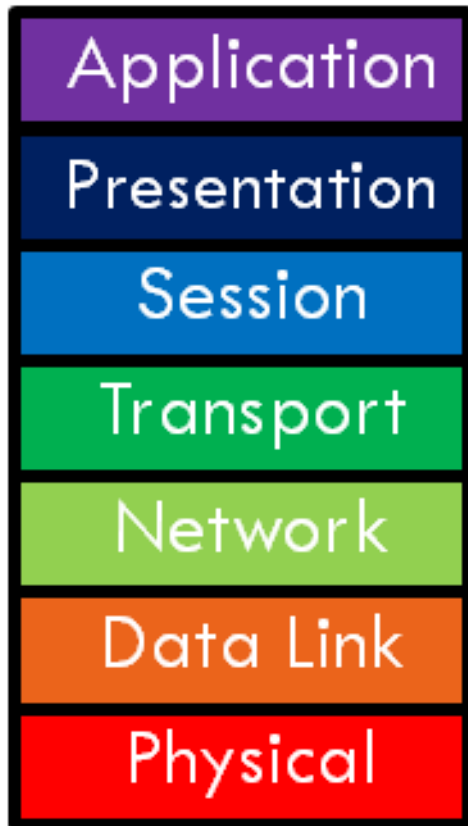
19ECT301- COMMUNICATION NETWORKS

III YEAR/ V SEMESTER

UNIT 2 –DATA-LINK LAYER & NETWORK LAYER

TOPIC 7 – NETWORK LAYER IN THE INTERNET (IPV4 AND IPV6)

❖ Network Layer



□ Function:

- Route packets end-to-end on a network, through multiple hops

□ Key challenge:

- How to represent addresses
- How to route packets
 - Scalability
 - Convergence

❖ What is IP address ?

- An IP address is an identifier for a particular machine on a particular network. It is part of a scheme to identify computers on the internet.
- IP address are also referred to as IP number and internet address.

- ◉ The network portion of the IP address is allocated to internet service provider(ISP) by the InterNIC, under authority of the internet assigned number authority(IANA).
- ◉ ISPs then assign the host portion of the IP address to the machines on the networks that they operate.

- ◉ Which section of the IP address represent the network & which sections represent the machine will depend on what “class” of IP address is assigned to a network.

❖ IPv4

- It is 32 bit number represented in 4 decimal number where each decimal number is of 8 bit (octet) is separated by a dot(.).
- Thus representation known as doted decimal representation.
- IP address consists of 2 components the network id and the host id.

❖ IPv4 cont...

- Network id:-it is the number assigned to a network in the internet.

Host id:- it represents the id assigned to a host in the network.

- IPv4 allows 2^{32} (4294967296) unique address which section of IP address show the network id & which section show the machine or host id depend on the class network.

❖ IPv4 cont...

- There are five classes of IP addresses:-
 - Class A
 - Class B
 - Class C
 - Class D
 - Class E

❖ IPv4 cont...

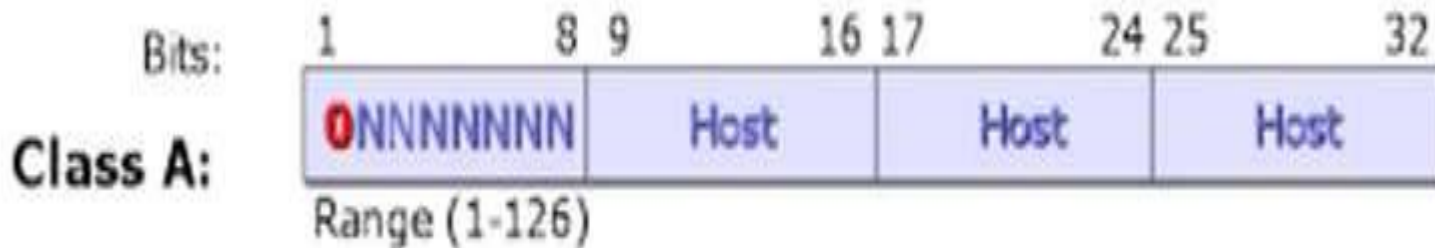
Class A:-

- The first byte is a network id (8 bits) & the last 3 bytes are for host id (24 bits).
- The first bit is '0'.
- Range of network number-1.0.0.0 to 126.0.0.0
- Number of possible networks-127(1-126 usable, 127 is reserved)

❖ IPv4 cont...

Class A:-

- Number of possible values in the host portion-16,777,216
- It is used for large network.



❖ IPv4 cont...

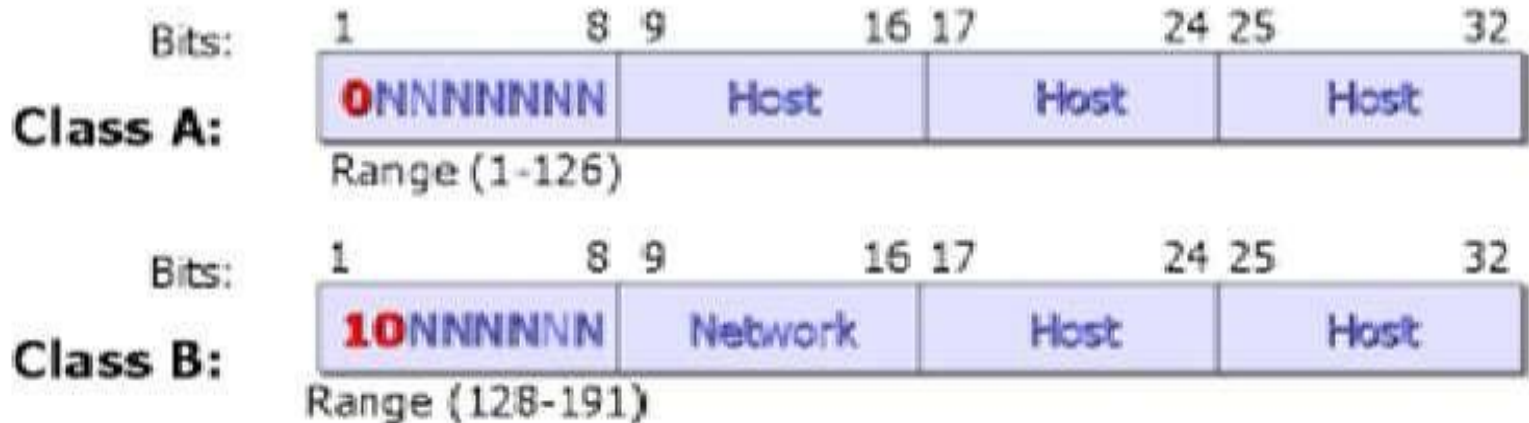
Class B:-

- The first 2 bytes are a network id (16 bits) & the last 2 bytes are for host id (16 bits).
- The first 2 bits are '10'.
- Range of network number- 128.0.0.0 to 191.255.0.0
- Number of possible networks- 16,384

❖ IPv4 cont...

Class B:-

- Number of possible values in the host portion- 65536
- Used for medium size network.



❖ IPv4 cont...

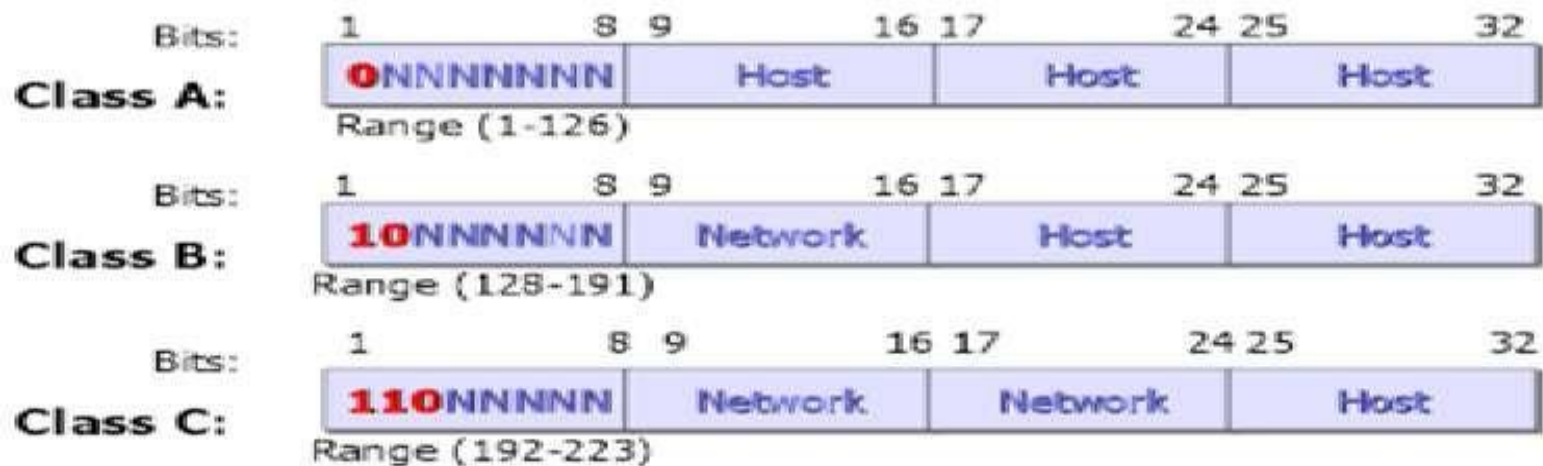
Class C:-

- The first 3 bytes are a network id (24 bits) & the last 1 byte are for host id (8 bit).
- The first 3 bits are '110'.
- Range of network number- 192.0.0.0 to 223.255.255.0
- Number of possible networks- 2,097,152

❖ IPv4 cont...

Class C:-

- Number of possible values in the host portion- 256
- Used in local area network(LAN).



❖ IPv4 cont...

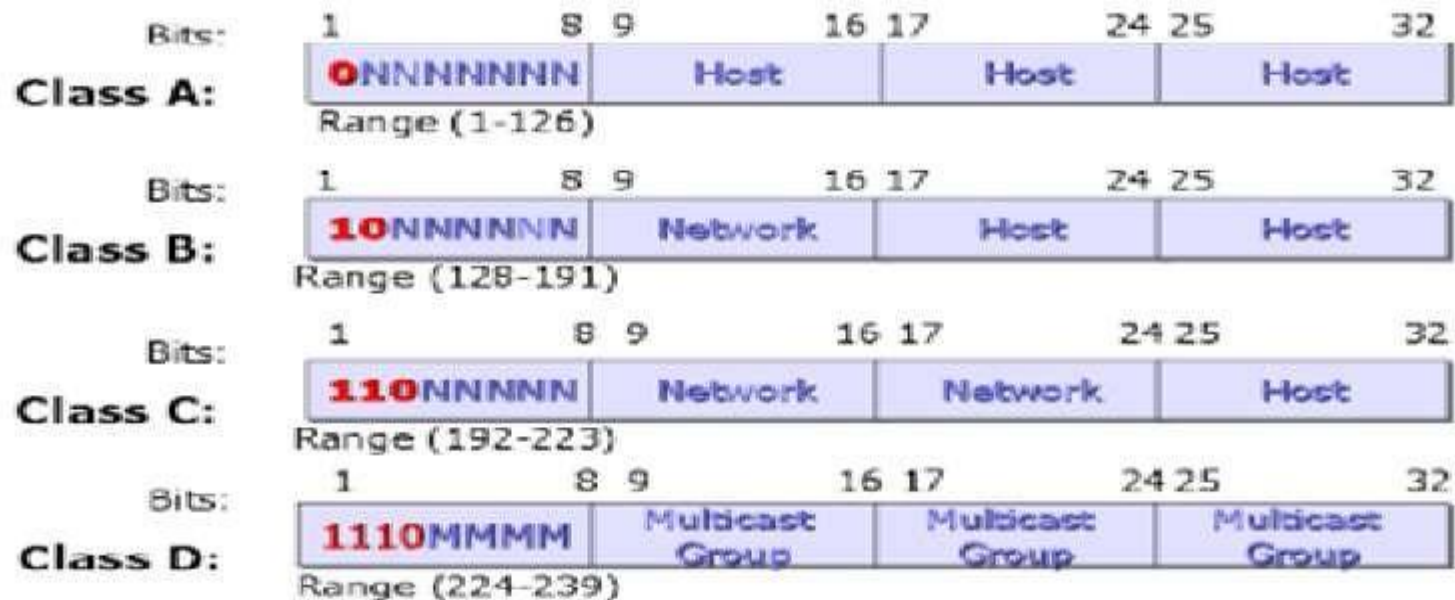
Class D:-

- An IP address which belong to class D has the first octet has its 4bit set to '1110'.
- Range of network number- 224.0.0.0 to 239.255.255.255

❖ IPv4 cont...

Class D:-

- Used for multicasting

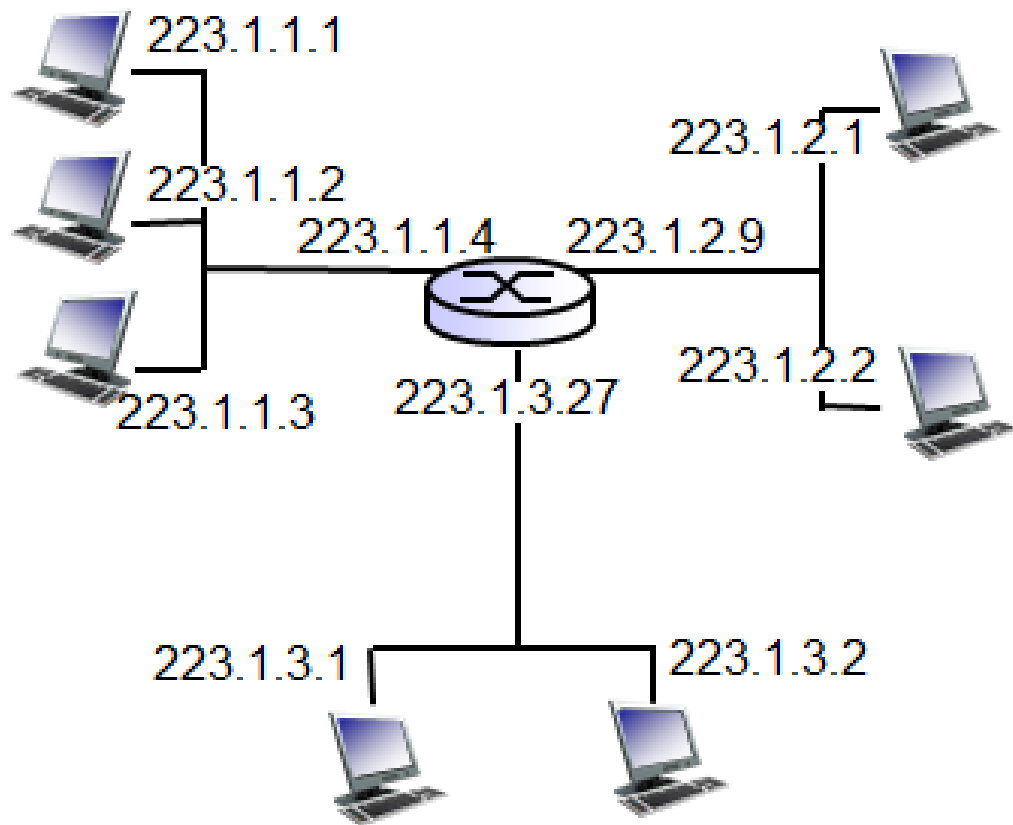


❖ IPv4 cont...

Class E:-

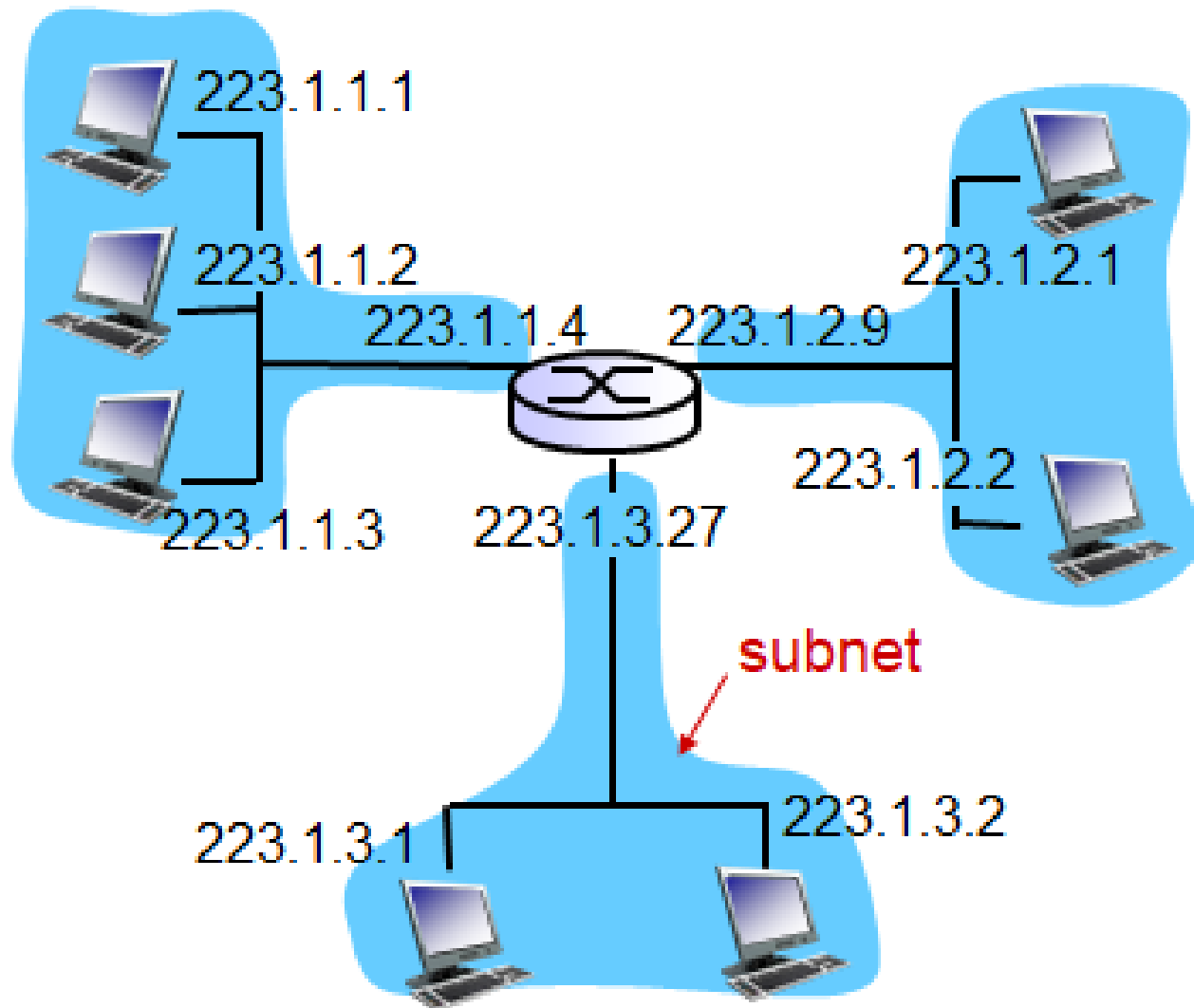
- It reserved for experimental & for future testing purpose.
- Range of network number- 240.0.0.0 to 255.255.255.254

r
d



223.1.1.1 = 11011111 00000001 00000001 00000001

223 1 1 1



network consisting of 3 subnets

❖ define IPv6

- IPv6 will make use of 128 bit IP address.
- An IPv6 address is represented as 8 groups of 4 hexadecimal digits, each group representing 16 bits (2 octets). The groups are separated by colons(:).
- E.g.-
2001:0db8.85a3:0000:0000:8a2e:0370
:7334

❖ difference between IPv4 and IPv6

<u>S.N</u>	<u>IPv4</u>	<u>IPv6</u>
1.	Addresses are 32 bits (4 bytes) long.	Addresses are 128 bits (16 bytes) long.
2.	Both routers & sending host fragment the packets.	Routers don't fragment the packets but sending host fragment the packets.
3.	Header includes a checksum.	Header doesn't include a checksum.

❖ difference between IPv4 and IPv6 cont...

<u>S.N</u>	<u>IPv4</u>	<u>IPv6</u>
4.	Classes of addressing are A, B, C, D, E.	Classes of addressing are unicast, anycast, multicast.
5.	Configure either manually or through DHCP.	Doesn't require manual configuration.
6.	Must support a 576 byte packet size.	Must support 1208 byte packet size.

❖ difference between IPv4 and IPv6 cont...

<u>S.N</u>	<u>IPv4</u>	<u>IPv6</u>
7.	IPv4 address uses the dot-decimal notation.	IPv6 address are represented in a hexadecimal, colon-separated notation.
8.	Not suitable for mobile networks.	IPv6 is better suited to mobile networks.
9.	Address space is small (2^{32}).	Larger address space (2^{128}).

❖ difference between IPv4 and IPv6 cont...

<u>S.N</u>	<u>IPv4</u>	<u>IPv6</u>
10.	Internet protocol security(IPSec) is mandatory in this.	IPSec is optional.
11.	An IP address is made up of 4 bytes of information expressed as 4 number between 0 & 255 shown separated by periods. e.g.- 238.17.159.4	An IPv6 address is represented by 8 group of 16 bit hexadecimal values separated by colons (:). e.g.- 2001:0db8:85a3:0000:0000:8a2e:0370:7334