Lecture 11
IP v4 Addressing

Topics Covered

- Finding the address class
- Finding the class in decimal notation
- Network Addresses
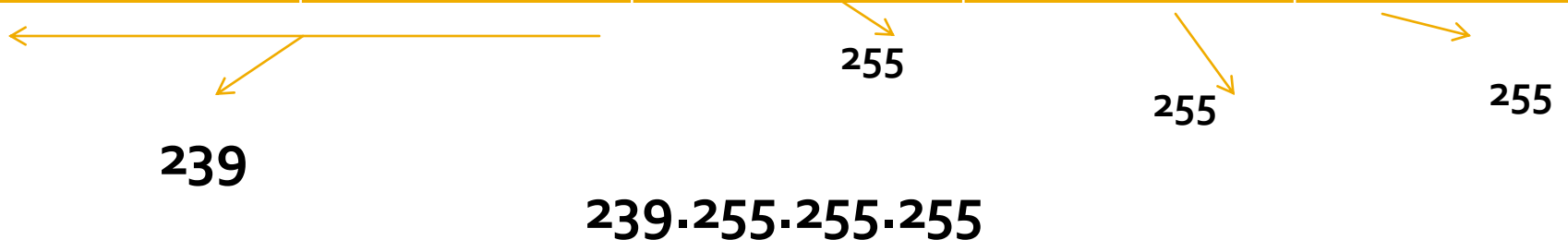- Network and Host Addresses
- Masking concept
- Applications

Class D address

1110	Multicast ID

1 1 1 0	4 bit	8 bit	8 bit	8 bit

2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0

1 1 1 0	0 0 0 0	00000000	0000000	0000000

224

0

0

0

224.0.0.0

2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0

1 1 1 0	1 1 1 1	11111111	11111111	11111111

255

255

255

239

239.255.255.255

Note

*Class D addresses
are used for multicasting;
there is only
one block in this class.*

Class E address

1 1 1 1	4 bit	8 bit	8 bit	8 bit

2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0

1 1 1 1	0 0 0 0	00000000	0000000	0000000

240

0

0

0

240.0.0.0

2^7 2^6 2^5 2^4 2^3 2^2 2^1 2^0

1 1 1 1	1 1 1 1	11111111	11111111	11111111

255

255

255

255

255.255.255.255
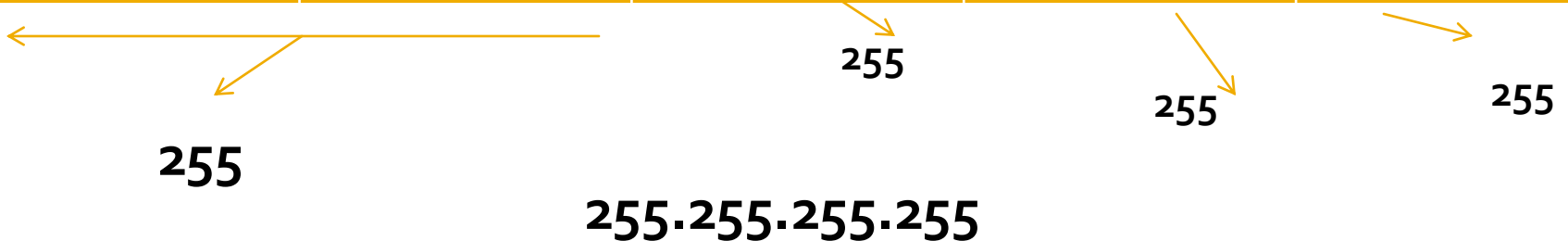
Note

Class E addresses are reserved for special purposes; most of the block is wasted.

Finding the address class

Start → 1st Bit? —1→ 2nd Bit? —1→ 3rd Bit? —1→ 4th Bit? —1→ Class: E

1st Bit? —0→ Class: A

2nd Bit? —0→ Class: B

3rd Bit? —0→ Class: C

4th Bit? —0→ Class: D
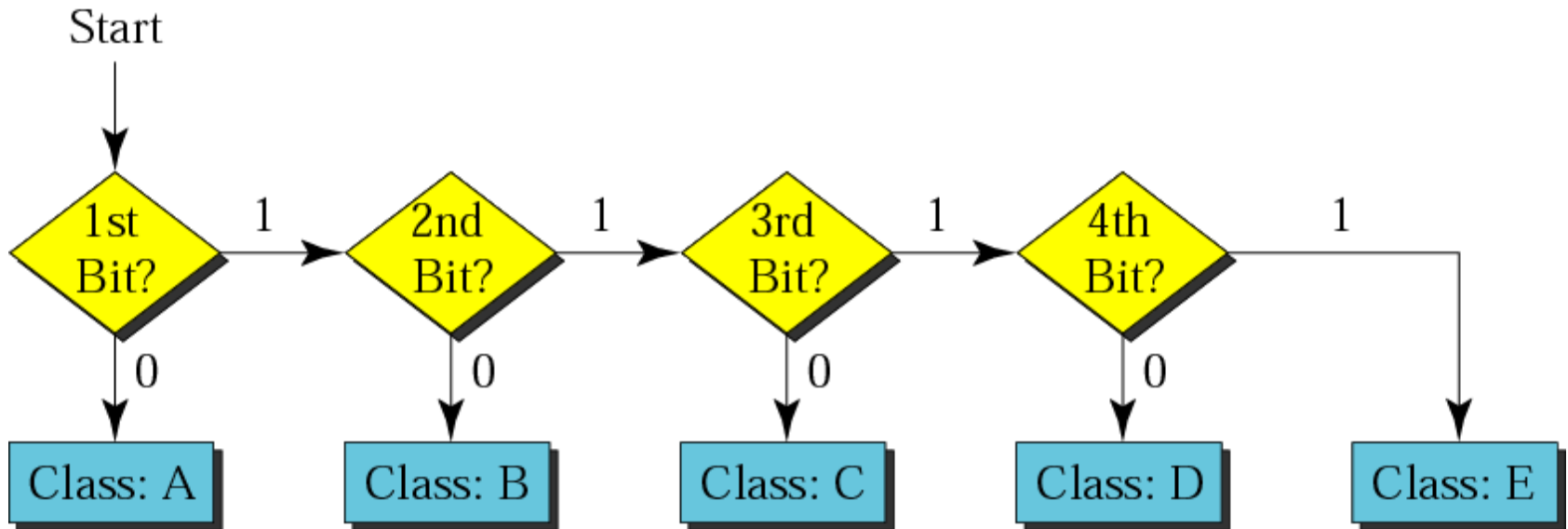
Example 6

Find the class of the address:

00000001 00001011   00001011 11101111

Solution

The first bit is 0.
This is a class A address.

Example 6 (Continued)

Find the class of the address:

11000001   10000011   00011011 11111111

The first 2 bits are 1; the third bit is 0.
This is a class C address.

Finding the class in decimal notation

	First byte	Second byte	Third byte	Fourth byte
Class A	**0 to 127**			
Class B	**128 to 191**			
Class C	**192 to 223**			
Class D	**224 to 239**			
Class E	**240 to 255**			

Example 7

Find the class of the address:

227.12.14.87

Example 7 (Continued)

Find the class of the address:

193.14.56.22

Solution

Solution

The first byte is 227 (between 224 and 239); the class is D.

The first byte is 193 (between 192 and 223); the class is C.

Network Addresses

The network address is the first address.

The network address defines the network to the rest of the Internet.

Given the network address, we can find the class of the address, the block, and the range of the addresses in the block

**In classful addressing,
the network address
(the first address in the block)
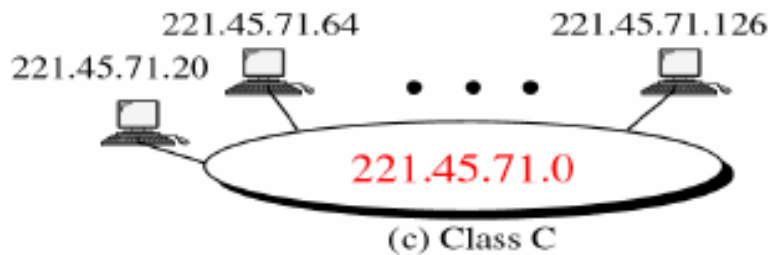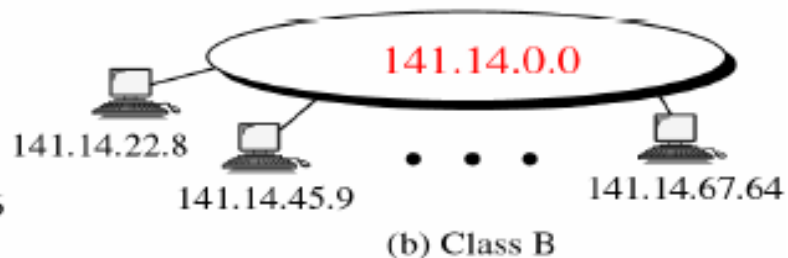is the one that is assigned
to the organization.**

Example 9

Given the network address 17.0.0.0, find the class, the block, and the range of the addresses.

Solution

The class is A because the first byte is between 0 and 127. The block has a netid of 17. The addresses range from 17.0.0.0 To 17.255.255.255.

Example 10

Given the network address 132.21.0.0, find the class, the block, and the range of the addresses.

The class is B because the first byte is between 128 and 191. The block has a netid of 132.21. The addresses range from 132.21.0.0 to 132.21.255.255
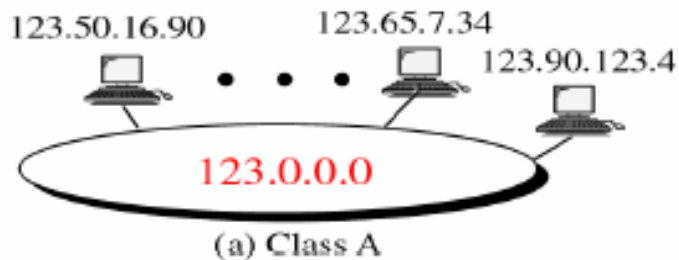
Example 11

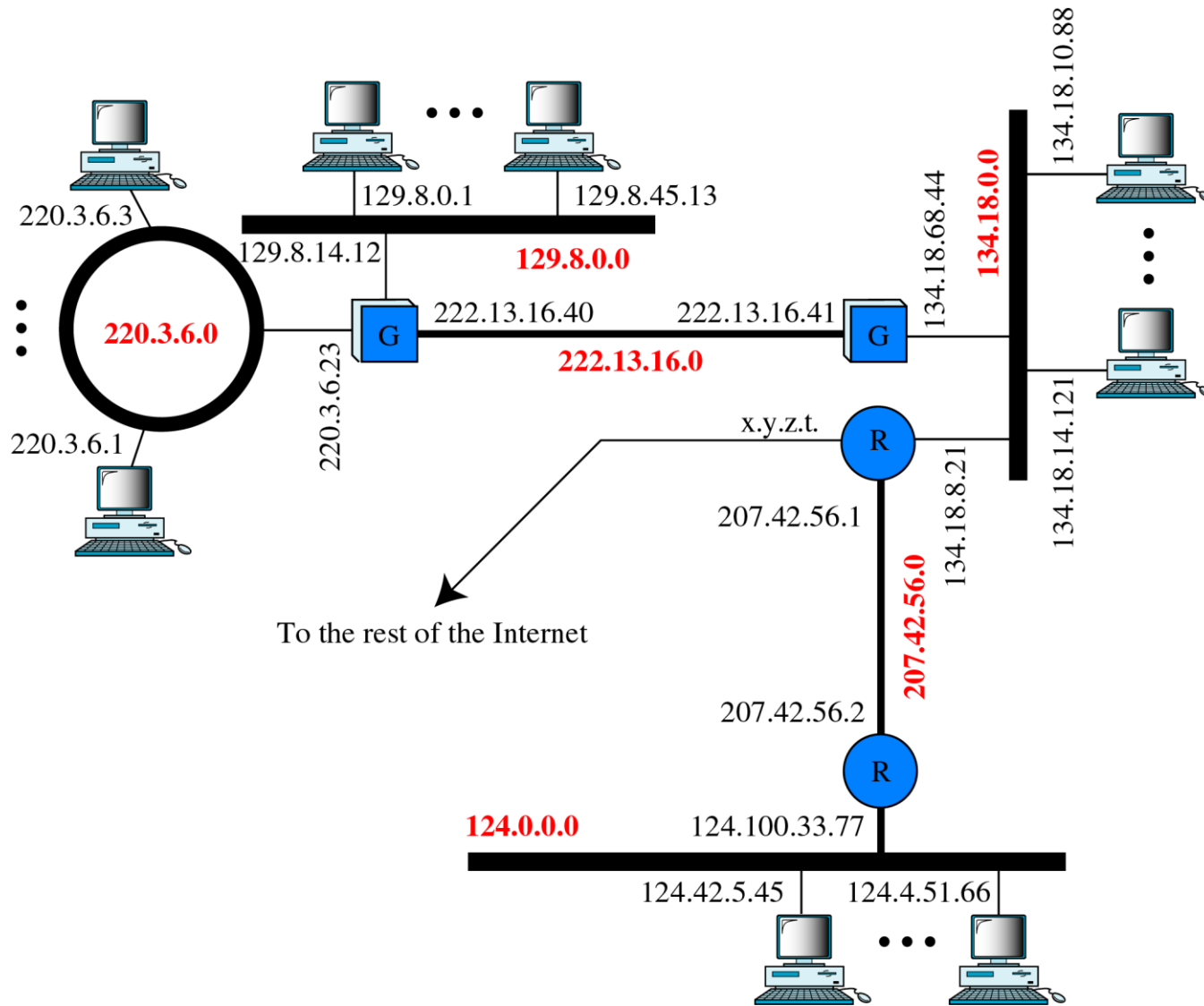Given the network address 220.34.76.0, find the class, the block, and the range of the addresses.

The class is C because the first byte is between 192 and 223. The block has a netid of 220.34.76. The addresses range from 220.34.76.0 to 220.34.76.255.
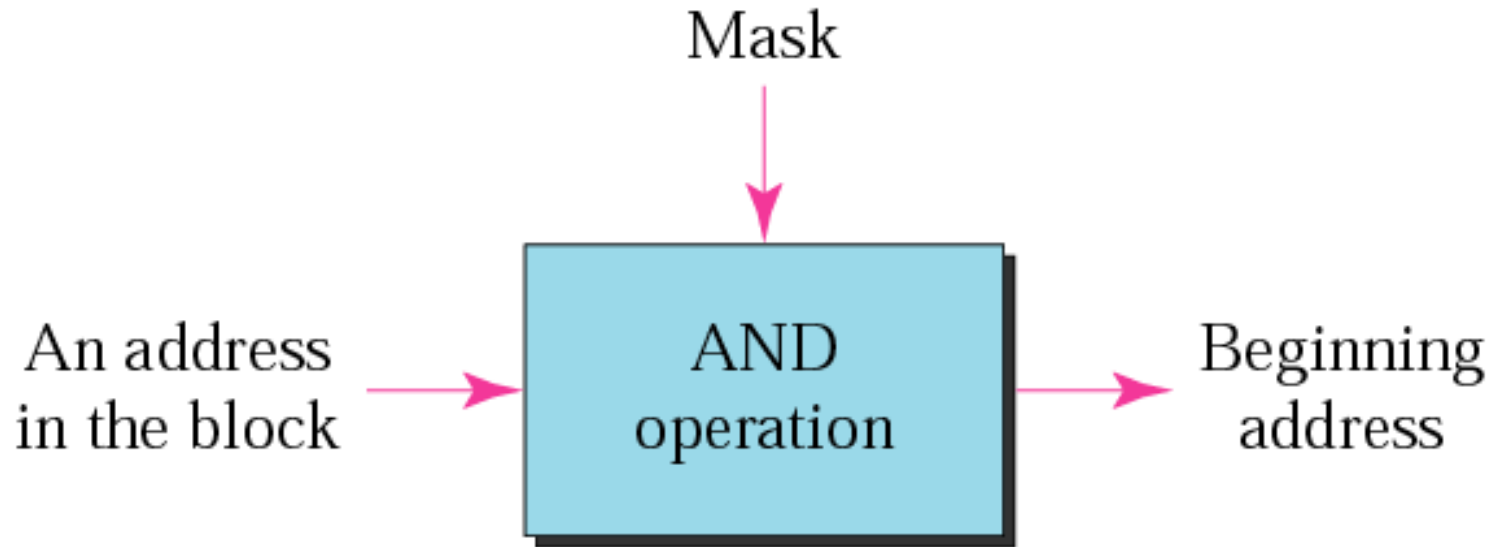
Network Address

Netid	Hostid
Specific	All 0s

123.50.16.90   123.65.7.34
                123.90.123.4

123.0.0.0

(a) Class A

141.14.0.0

141.14.22.8
141.14.45.9   141.14.67.64

(b) Class B

221.45.71.64   221.45.71.126
221.45.71.20

221.45.71.0

(c) Class C

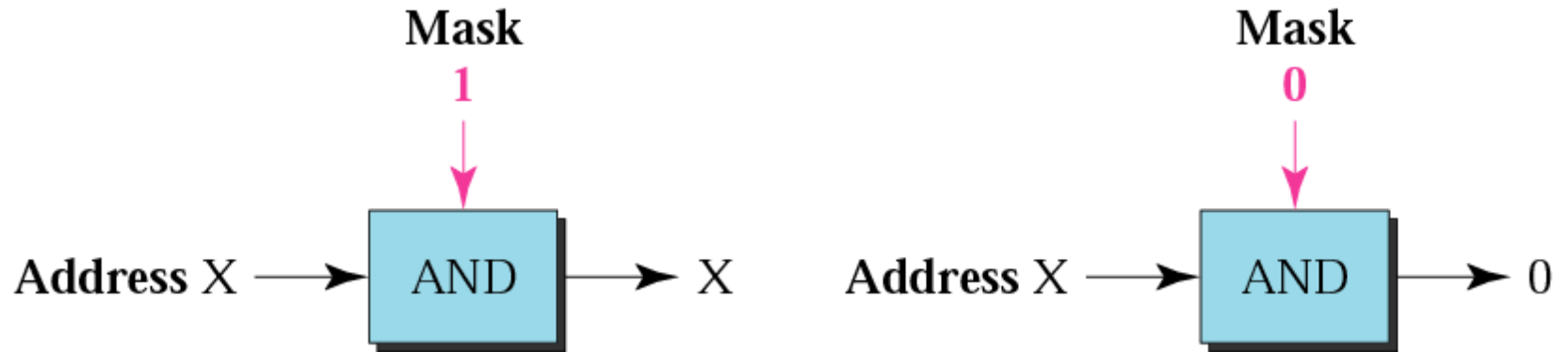# Network and Host Addresses

Masking concept

Mask

A mask is a 32-bit binary number that gives the first address in the block (the network address) when bitwise AND with an address in the block. An address mask determines which portion of the IP address is identify the network and which identify the host.
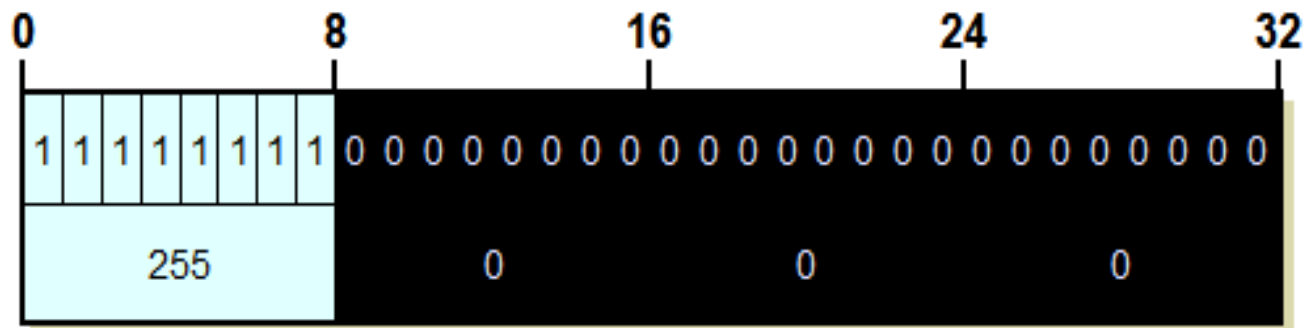
AND operation

The network address is the beginning address of each block. It can be found by applying the default mask to any of the addresses in the block (including itself). It retains the netid of the block and sets the hostid to zero.
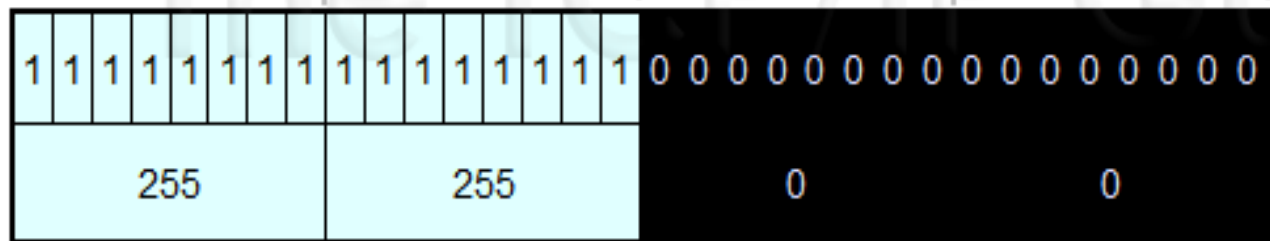
Default masks

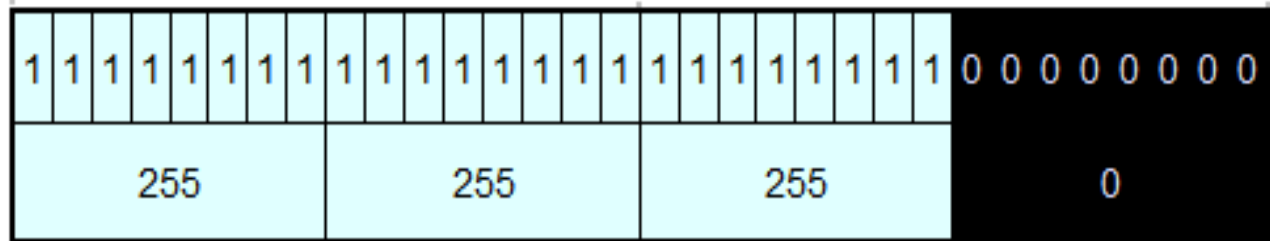| Class	Binary	Dotted-Decimal
A	11111111 0000000 0000000 0000000	255.0.0.0
B	11111111 11111111 0000000 0000000	255.255.0.0
C	11111111 11111111 11111111 0000000	255.255.255.0

0	8	16	24	32

Class A Default Subnet Mask (255.0.0.0)

1 1 1 1 1 1 1 1 — 255
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 — 0 0 0

Class B Default Subnet Mask (255.255.0.0)

1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 — 255 255
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 — 0 0

Class C Default Subnet Mask (255.255.255.0)

1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 — 255 255 255
0 0 0 0 0 0 0 0 — 0

Example 12

Given the address 23.56.7.91 and the default class A mask, find the beginning address (network address).

The default mask is 255.0.0.0, which means that only the first byte is preserved and the other 3 bytes are set to 0s. The network address is 23.0.0.0.

Example 13

Given the address 132.6.17.85 and the default class B mask, find the beginning address (network address).

The default mask is 255.255.0.0, which means that the first 2 bytes are preserved and the other 2 bytes are set to 0s. The network address is 132.6.0.0.

Example 14

Given the address 201.180.56.5 and the class C default mask, find the beginning address (network address).

The default mask is 255.255.255.0, which means that the first 3 bytes are preserved and the last byte is set to 0. The network address is 201.180.56.0.

**We must not
apply the default mask
of one class to
an address belonging
to another class.**

Applications

- To identify the Networks and hosts.
- To communicate with hosts belonging to different networks.
- To resolve the issues related with PACKET LOSSES.

Scope of Research

- Geolocating IP Addresses on 3G Networks
- New Formats for IP Addressing with the increasing of Networks

Assignment

1. Your Organization is currently having 200 hosts in the network. Which class of IP addresses will be assigned to each host in the network?

2. Under certain circumstances, if number of hosts are increased to 500; how those IP addresses will be managed? Whether we need to change the class of Addressing (Yes/No) and Why?

- **Given the ip 130.11.200.1**
- Find
  - Which class it belongs to?
  - Netid of this ip address
  - Range of ip addresses in the network
  - What is the subnet mask?

Applications

- IPv4 addressing is needed to uniquely identify each node on the network. This addressing provides a logical address to each node in the network.

Scope of Research

- Dynamic addressing in mobile domain