CS & IT ENGINEERING

COMPUTER NETWORKS

IPv4 Addressing

Lecture No-05

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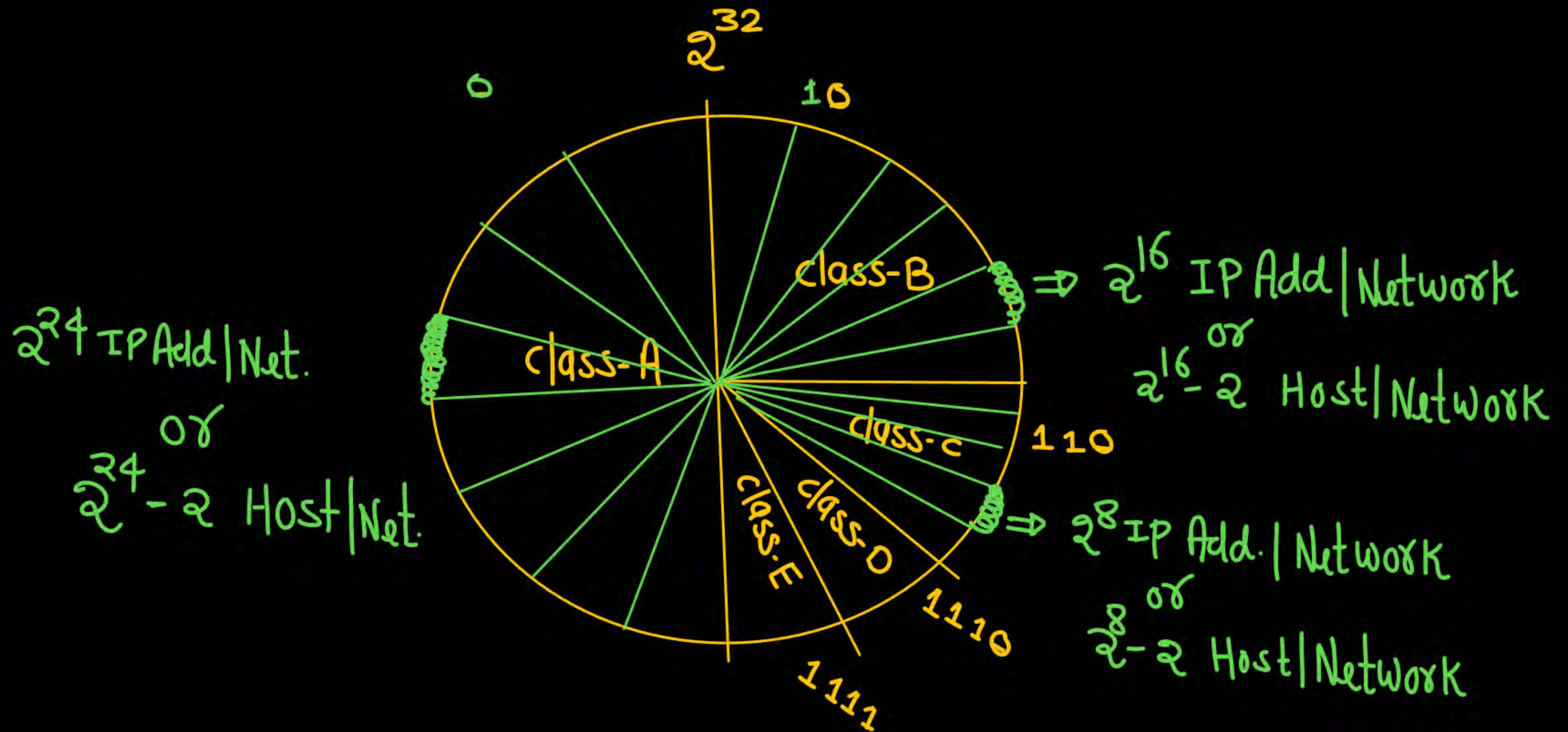
TOPICS TO BE COVERED

Problems in Computer Network

Q. In classful addressing, a large part of the available addresses are _____.

H.W

A. Dispersed

B. Blocked

C. Wasted

D. Reserved

ClassFul Addressing

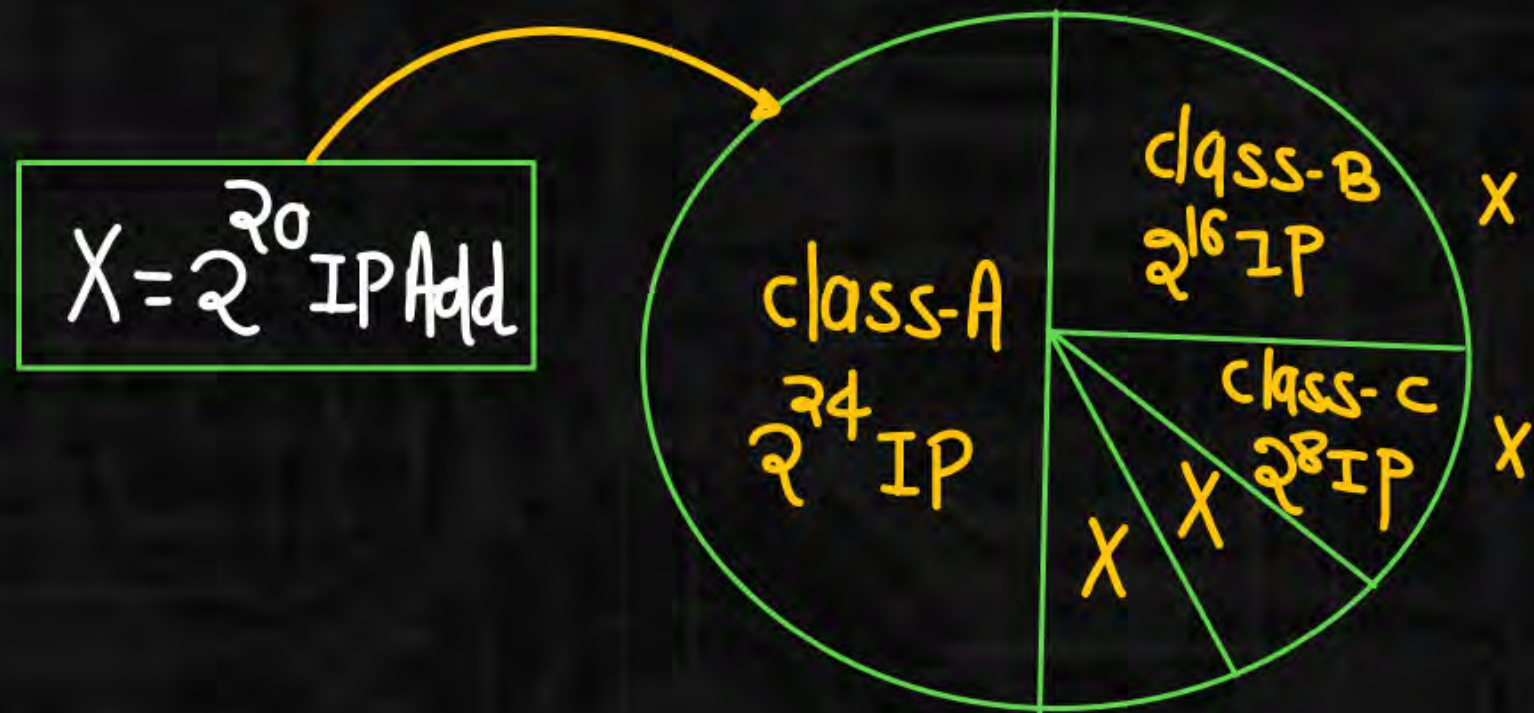2^{32}

0

10

class-B

$\Rightarrow$ 2^{16} IP Add | Network
or
$2^{16}-2$ Host | Network

2^{24} IP Add | Net.
or
$2^{24}-2$ Host | Net.

class-A

class-C

110

class-E

class-D

1110

$\Rightarrow$ 2^8 IP Add. | Network
or
2^8-2 Host | Network

1111

ClassA $\to 2^{24}$ IP Addresses in one N/w

Class-B $\to 2^{16}$ IP Addresses in one N/w

Class-C $\to 2^{8}$ IP Addresses in one N/w

I : organization X need $\to 2^{20}$ IP Addresses

$\boxed{X = 2^{20} \text{ IP Add}}$

IP Address wasted

$= 2^{24} - 2^{20}$

$= 2^{4} \times 2^{20} - 2^{20}$

$= 16 \times 2^{20} - 2^{20}$

$= 15 \times 2^{20}$

$= 15 M$

$= 15,728,640$

II organization Y Need $\to 2^{10}$ IP Addresses

class-A
2^{24} IP

class-B
2^{16} IP

class-C
2^8 IP

X X X X

$Y = 2^{10}$ IP Add
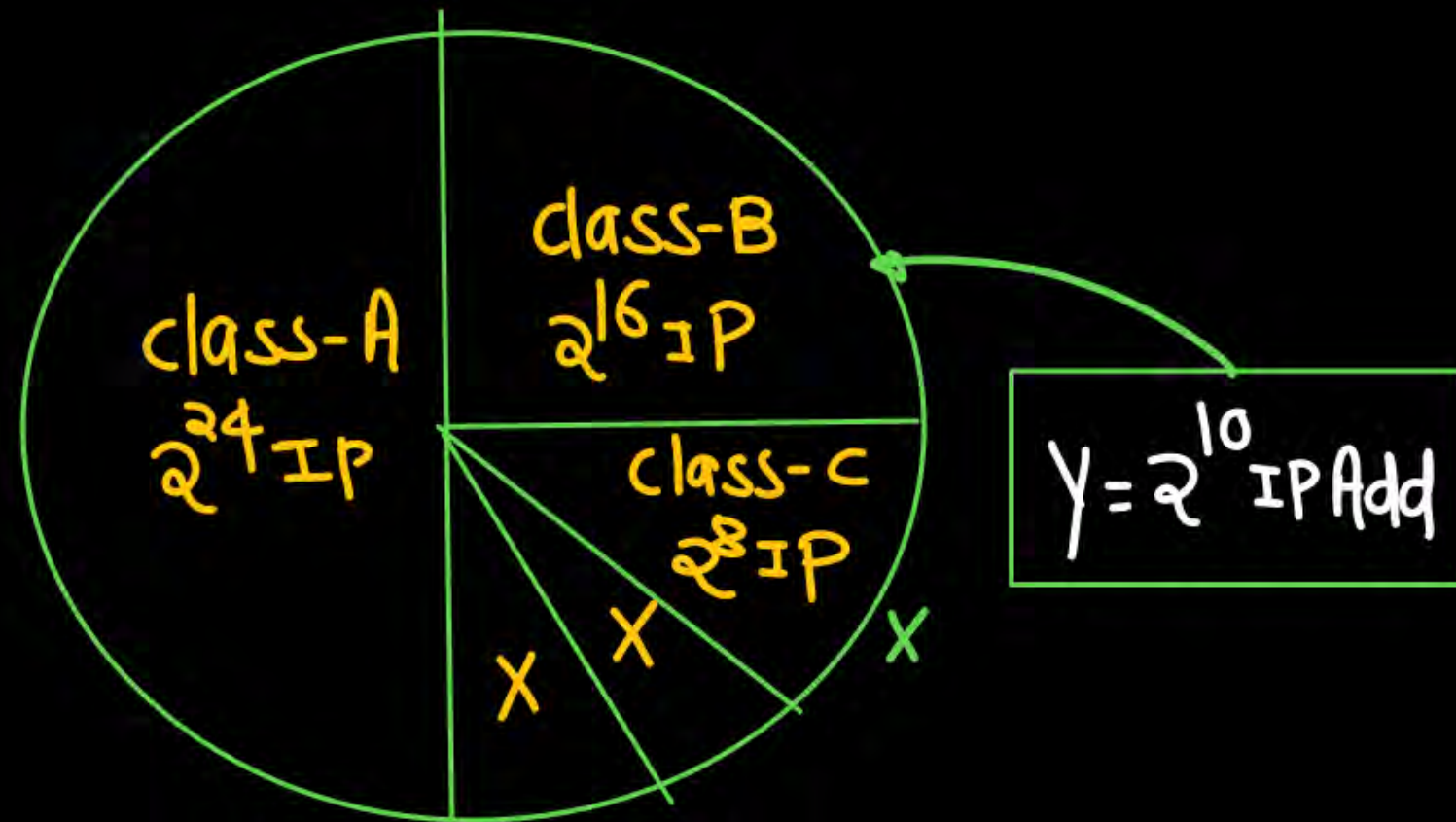
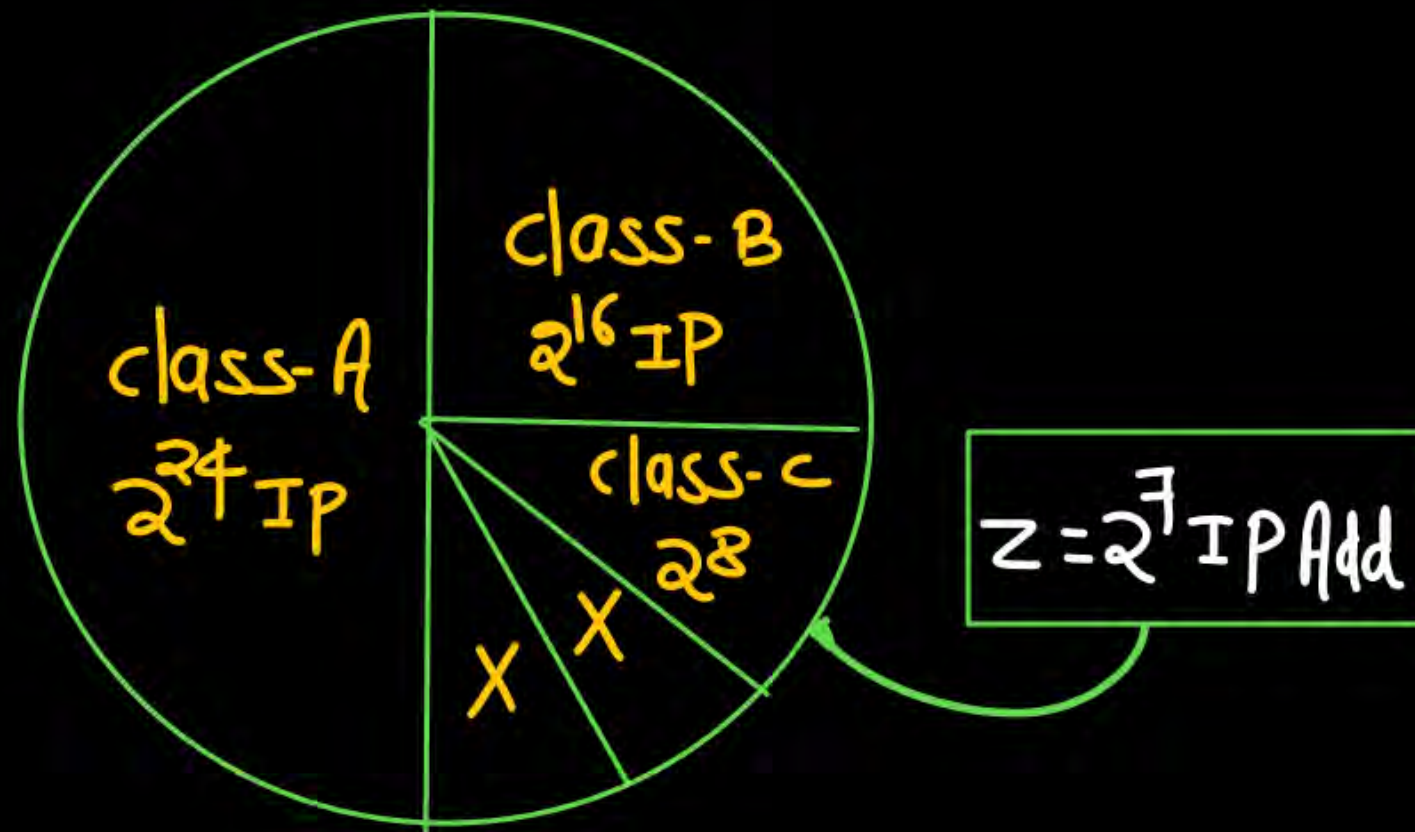No. of IP Addresses
wasted = $2^{16} - 2^{10}$

$= 2^6 * 2^{10} - 2^{10}$

$= 64 * 2^{10} - 2^{10}$

$= 63 * 2^{10}$

$= 63 K$

$= 64,512$

III organization Z need = 2^7 IP Addresses

No. of IP Addresses
Wasted = $2^8 - 2^7$

$2^1 * 2^7 - 2^7$

$2^7 = 128$

class-A
2^{24} IP

class-B
2^{16} IP

class-C
2^8

X X

$Z = 2^7$ IP Add

Problems in Computer Network

1. Communication Problem.
2. Identification Problem.
3. Connection Problem.

Communication Problem

Language ?

Meaning ?

Response ?

① <u>Language ?</u>

INDIA
(HL)

UsA
(EL)
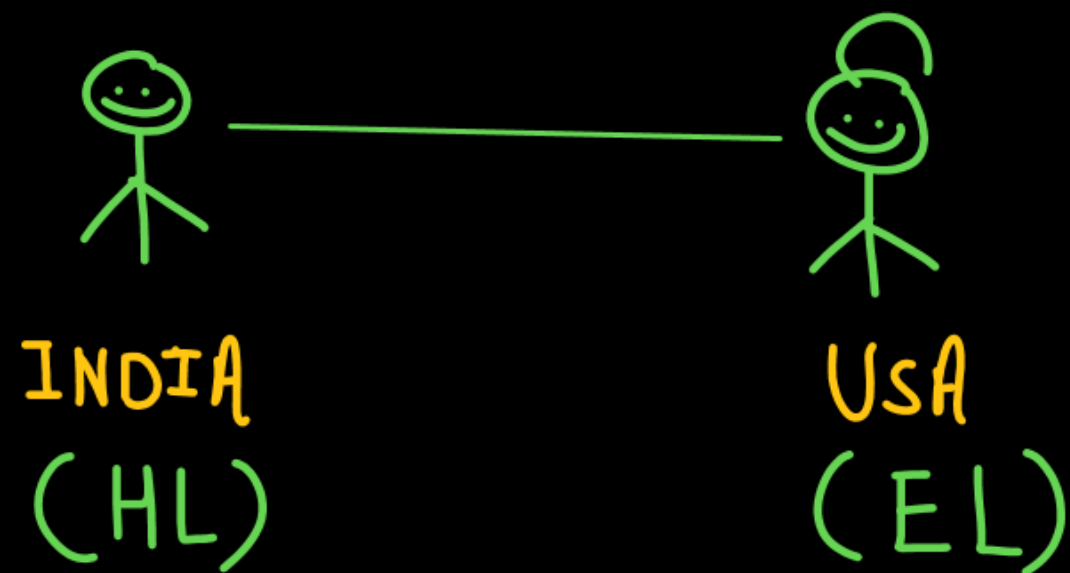
No communication

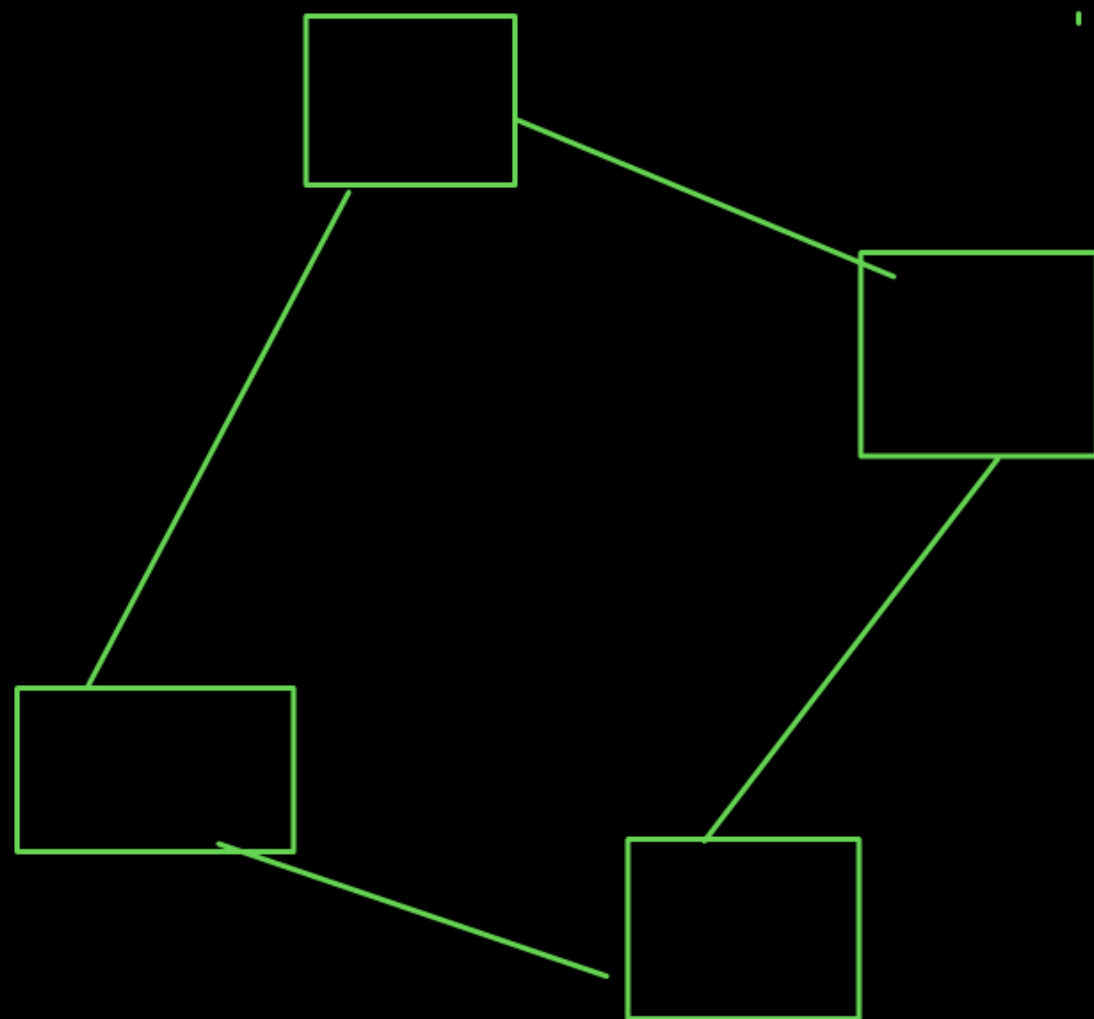② meaning ?

(EL)   (EL)

No communication

③ Response ?

Hi

No. communication

Communication Problems: communication problem can be solved by using protocols.

A Protocol is a set of <u>rule</u>s that govern data communication

Protocol defines:

What is communicated ? ✓

How it is communicated ? ✓

When it is communicated ? ✓

1. Syntax
2. Semantics
3. Timing

Syntax: The term syntax refers to the structure or format of data, meaning the order in which they are presented.

Accept

For example: some protocol might ~~accept~~ the first 8 bit of data to be the Address of sender, the second 8 bit to be the address of receiver and rest of the stream to be the message itself.

8 bit   8 bit   Message
| 10010001 | 0010 100 1 | 10 10 10010101010010101001010 |
SA   DA   ✓
X   X
X
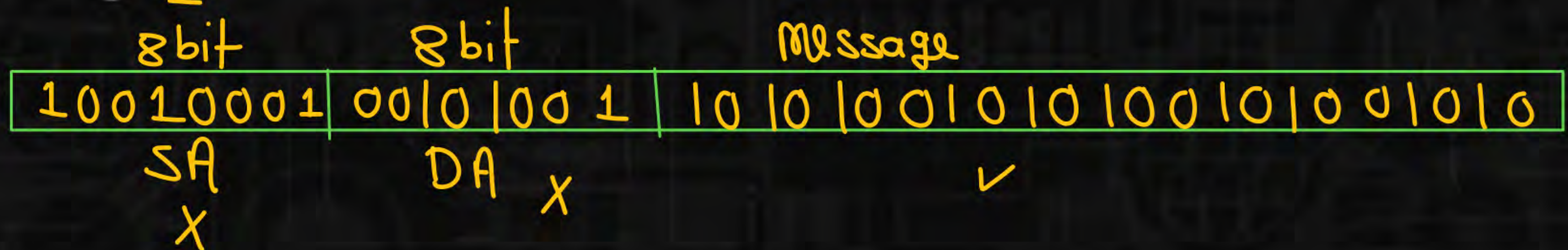
Semantics: The word semantics refers to the meaning of each section of bits.

Timing: The term timing refers of two characteristics when data should be sent and How fast they can be sent.

For example: If a sender produces data at 100 Mbps but receiver can process data at any 1 mbps, the transmission will overload the receiver and some data will be lost.

Ⓢ ———————————————————— Ⓡ

100mbps   1mbps

class-A → (1-126)

$\frac{N}{1} \quad \frac{HID}{0 \cdot 0 \cdot 0}$ $\frac{N}{2} \quad \frac{H}{0 \cdot 0 \cdot 0}$ $\frac{N}{3} \quad \frac{H}{0 \cdot 0 \cdot 0}$ $\frac{N}{4} \quad \frac{H}{0 \cdot 0 \cdot 0}$ $\frac{N}{126} \quad \frac{H}{0 \cdot 0 \cdot 0}$

○   ○   ○   ○ · · · · · · · · ○

When ever we have all 0's in HID part of any IP address , that IP address represent the NID of entire network this is the reason we can't assign this IP address to any host. (computer)

Identification Problem

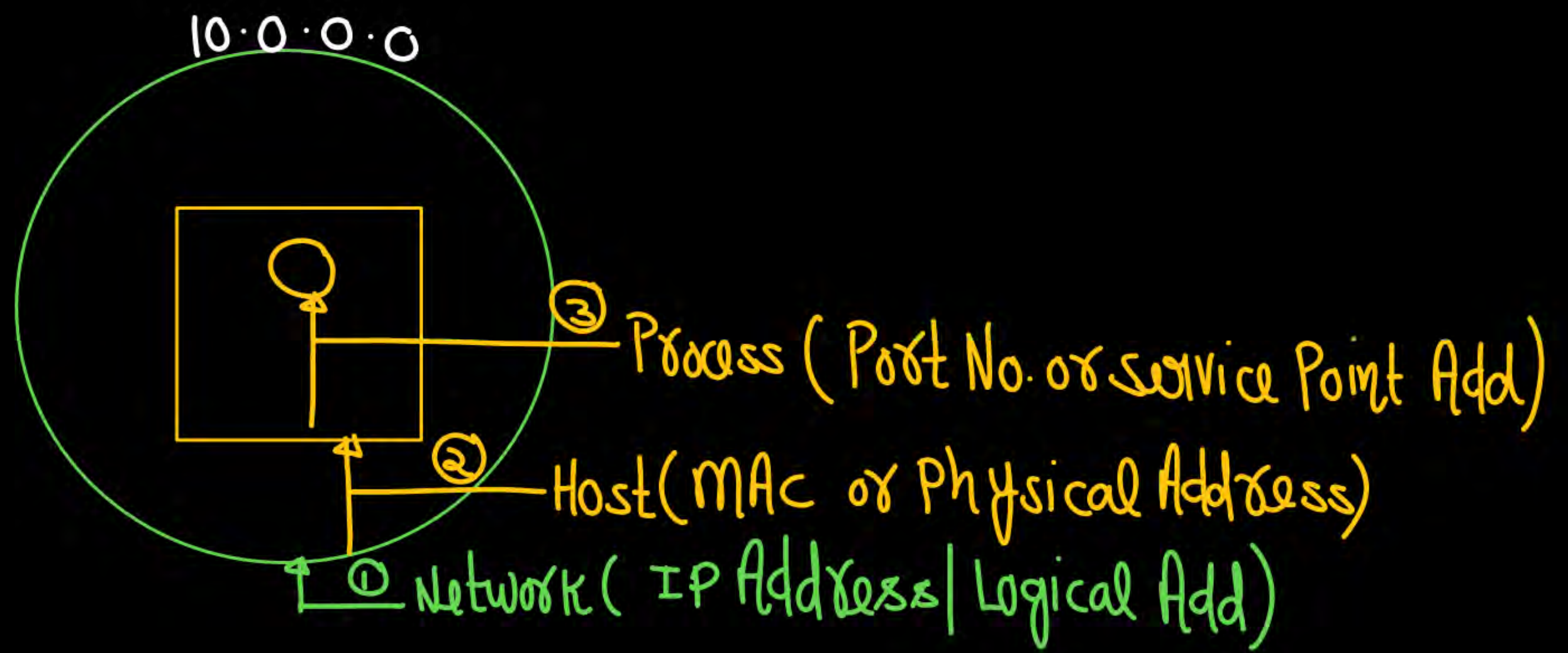To send a packet from source to destination we need 3 identification steps.

a. Identify the Network

b. Identify the host with in the network i.e. among all computer one computer is Identified.

c. Identify the process with in the Host.

a. Solution for identification of network is IP Address or logical Address. Now we get destination IP using DNS.

b. Solution For Identification of Host within the Network is physical Address or MAC Address. given an IP Address we get MAC address using ARP (Address Resolution protocol).

c. Solutions for the identification of process within the Host is Port Number
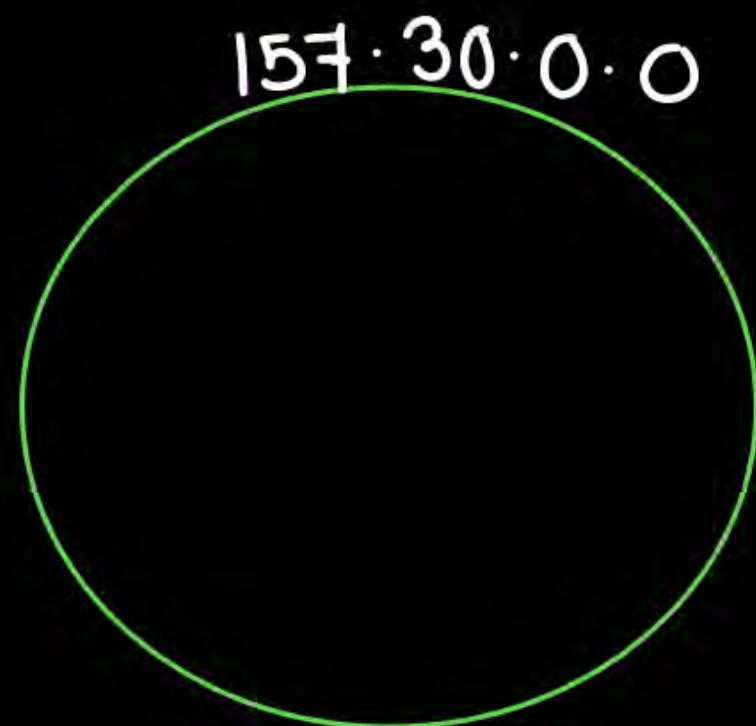
SIP   DIP
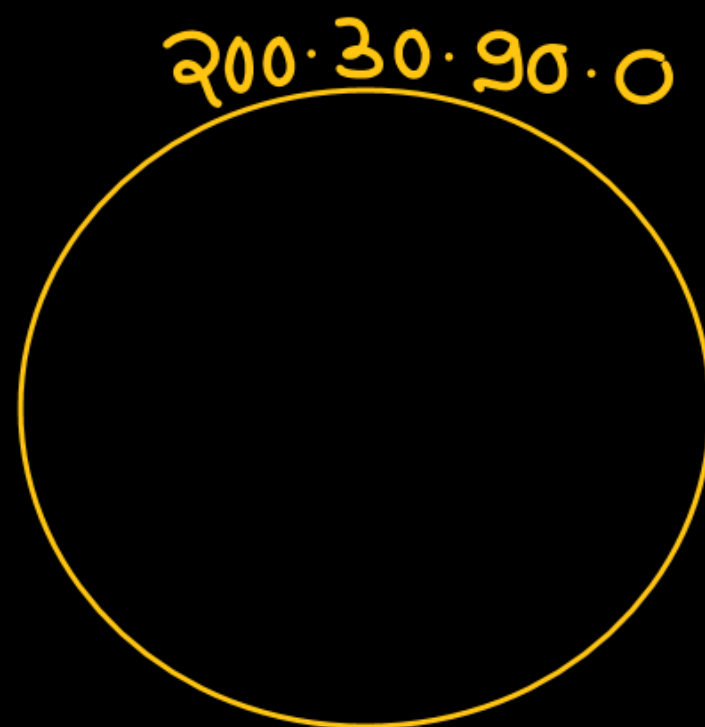
1.   ?   10 · 32 · 15 · 7 3

            NID   HID

NID = 10 · 0 · 0 · 0

10 · 0 · 0 · 0

③ Process (Port No. or Service Point Add)

② Host (MAc or Physical Address)

① Network (IP Address/ Logical Add)

2.

SIP	DIP
—	157.30.90.32

NID   HID

$$HID = 157.30.0.0$$

157.30.0.0

3.

SIP	DIP
—	200.30.90.223

NID _____ HID

NID = 200.30.90.0

200.30.90.0

ARP
Request

IpAdd	MAc Add
10.32.15.73	?

Note: ARP request is Broadcasting

ARP reply is unicasting

ARP → Address Resolution Protocal

① IP Add → 32 bit → $\boxed{8}$. $\boxed{8}$. $\boxed{8}$. $\boxed{8}$

② MAc Add = 48 bit → 3A:2B:F3:D4:7B:A3

$$\boxed{00111010}$$

③ Port No = 16 bit

Range → 0 to $2^{16} - 1$

0 to 65,535

0
↓
1023 } Well known Port No
———————
Assigned and
Control by IANA

SMTP → 25
HTTP → 80
FTP $\begin{bmatrix} 20 \\ 21 \end{bmatrix}$
DNS → 53
POP → 110
ImAP → 143

Hyd

Hi,
Janu........
. . . .
. . . .

To
Rani, Flat No - 902
Supertech ecocity
CP, Delhi

Delhi

Flat No
902

Connection Problem

There are various ways to connect the system

(i)   Bus topology

(ii)   Ring topology

(iii) Mesh topology

(iv)   Tree topology

(v)   Star topology