

CS & IT ENGINEERING

COMPUTER NETWORKS

IPv4 Addressing

Lecture No-07



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TOPICS TO
BE
COVERED



Introduction to
Subnetting



class- A

Q.

100.86.95.75,

class- B

157.192.190.253

class- C

,200.1.56.97,

10.34.87.95. Which of the following is common for all
these IP Addresses.
class-A

DBA

- A. Class of IP address
- B. Limited broadcast address
- C. Network address
- D. Direct broadcast address

classA → N. 255.255.255

class-B → N. N. 255.255

class-C → N. N. N. 255



Q.

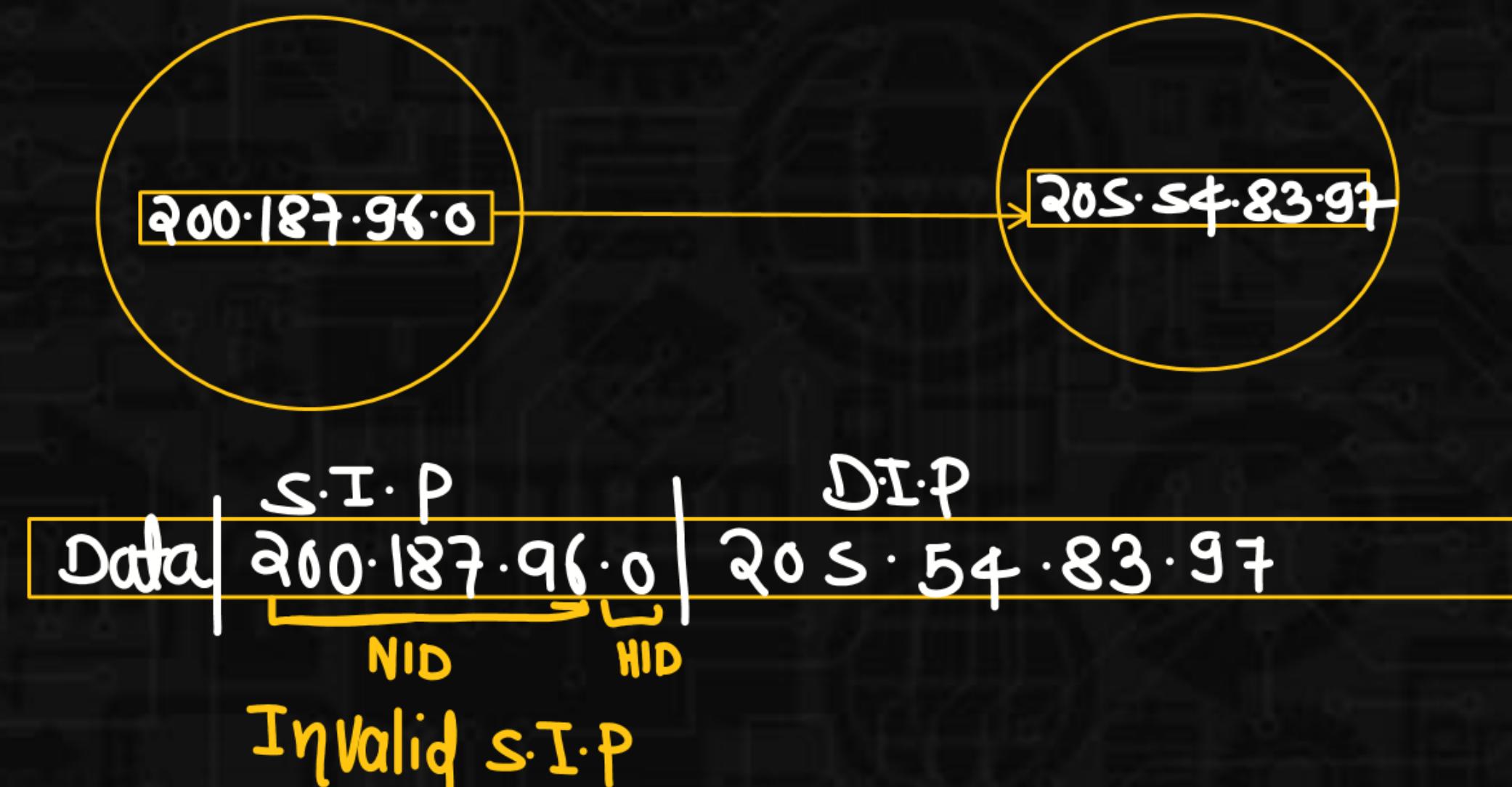
For the IP Addresses 132.54.78.98 identify the Class ,and Limited broadcast Address

- A. IP address belong to class A, Limited broadcast address = 255.255.255.255
- B. IP address belong to class B, Limited broadcast address = 130.255.255.255
- C. IP address belong to class B, Limited broadcast address = 255.255.255.255
- D. IP address belong to class A, Limited broadcast address = 130.54.255.255

Q.

One host having IP address 200.187.96.0, sends a message to a host with IP address 205.54.83.97, what will be the destination address attached to message by source?

- A. ~~205.54.83.97~~
- B. 205.54.83.255
- C. 205.54.83.0
- D. Not possible



Q.

Which of the following can be used as a source IP as well as destination IP ?

- A. $23.0.0.97$
- B. $255.255.255.255$ LBA will Always be used as a D.I.P
- C. $\frac{157.54}{NID} \frac{255.255}{HID}$ DBA will Always be used as a D.I.P
- D. $\frac{15.255}{N} \frac{255.255}{HID}$ DBF will Always be used as a D.I.P

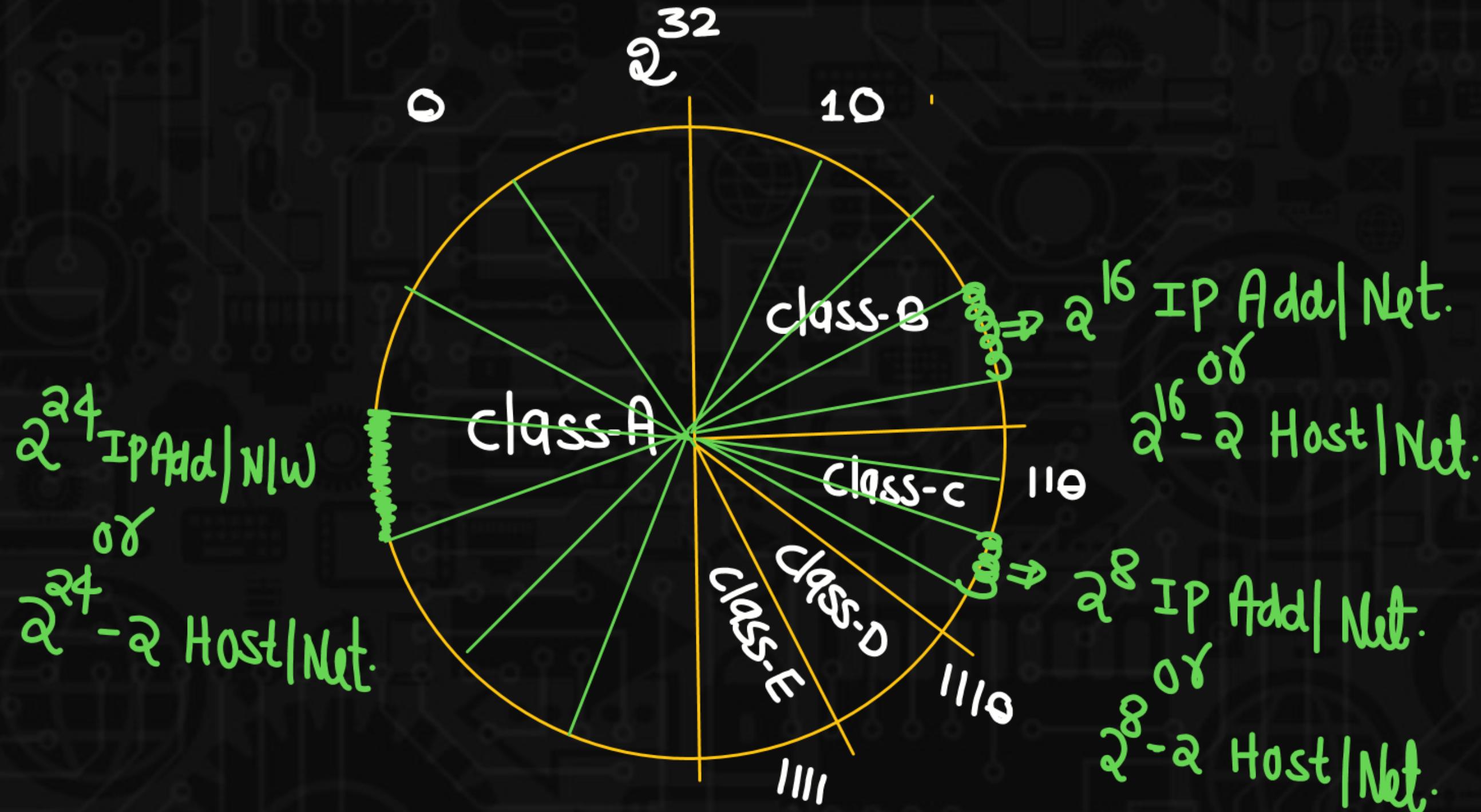


Q.

Which of the following IP address can be given to a computer as a host?

- A. ~~32.0.0.0~~ → NID of entire N/w
 $\frac{\text{N}}{\text{NID}} \frac{\text{HID}}{\text{HID}}$
- B. ~~255.255.255.255~~ → LBA
- C. ~~157.54.255.254~~
 $\frac{\text{NID}}{\text{NID}} \frac{\text{HID}}{\text{HID}}$
- D. ~~172.15.0.0~~ → NID of entire N/w
 $\frac{\text{NID}}{\text{NID}} \frac{\text{HID}}{\text{HID}}$

classFull Addressing



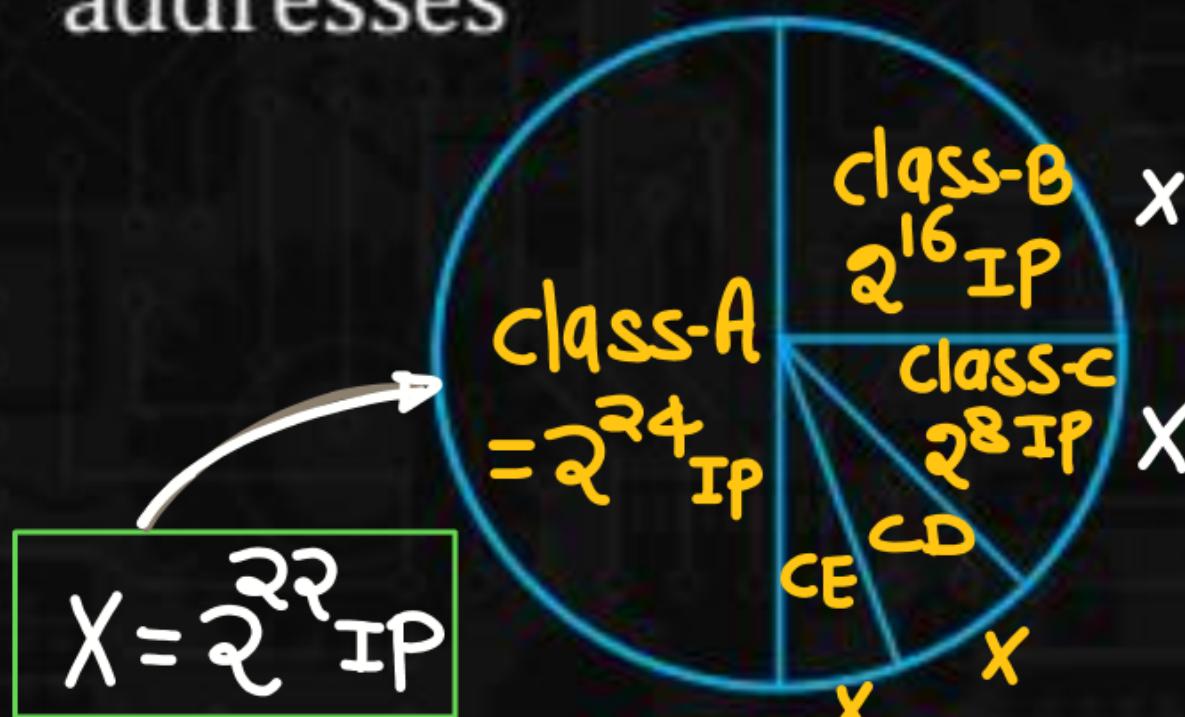
Classful Addressing

Class A → 2^{24} IP Addresses in one network

Class B → 2^{16} IP Addresses in one network

Class C → 2^8 IP Addresses in one network

I: Organization X need = 2^{22} IP addresses



$$\begin{aligned} X &= 2^{22} \\ A &= 2^{22} \\ B &= 2^{22} \\ C &= 2^{22} \\ \hline & 4 * 2^{22} \end{aligned}$$

IP addresses wasted = $2^{24} - 2^{22}$

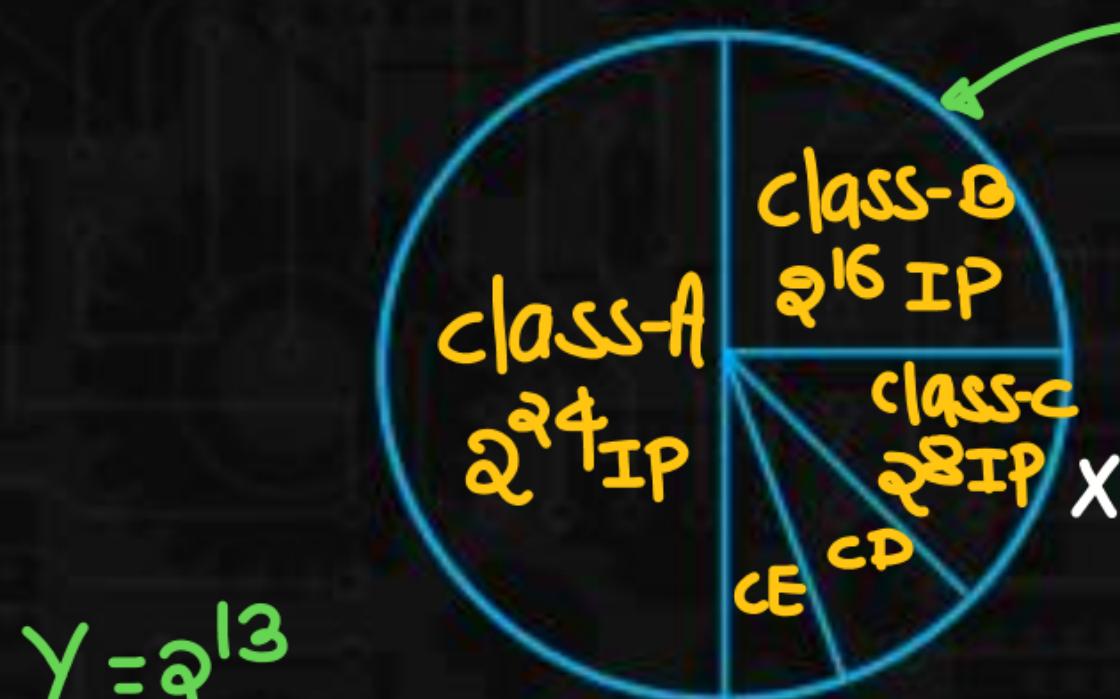
$$\begin{aligned} &= 2^2 * 2^{22} - 2^{22} \\ &= 4 * 2^{22} - 2^{22} \\ &= 3 * 2^{22} \\ &= 3 * 2^2 * 2^{20} \\ &= 12 * 2^{20} \\ &= 12M \\ &= 12,582,912 \end{aligned}$$



$$\frac{2^4}{4} = \frac{2^{24}}{4} = 2^{24-2} = 2^{22}$$

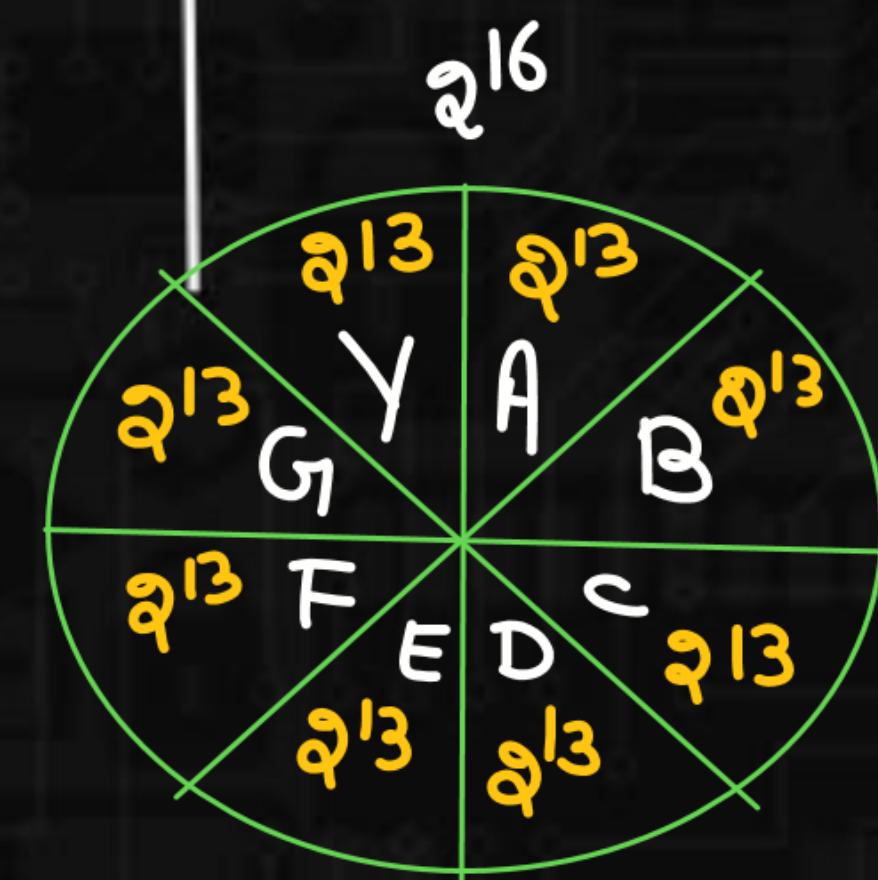
$$2^4 * 2^{22} - 2^{24}$$

II: Organization Y need = 2^{13} IP addresses



$$\begin{aligned} Y &= 2^{13} \\ A &= 2^{13} \\ B &= 2^{13} \\ C &= 2^{13} \\ D &= 2^{13} \\ E &= 2^{13} \\ F &= 2^{13} \\ G &= 2^{13} \end{aligned}$$

$$8 * 2^{13} = 8 * 8^{13} = 2^{16}$$



IP addresses wasted = $2^{16} - 2^{13}$

$$= 2^3 * 2^{13} - 2^{13}$$

$$= 8 * 2^{13} - 2^{13}$$

$$= 7 * 2^{13}$$

$$= 7 * 2^3 * 2^{10}$$

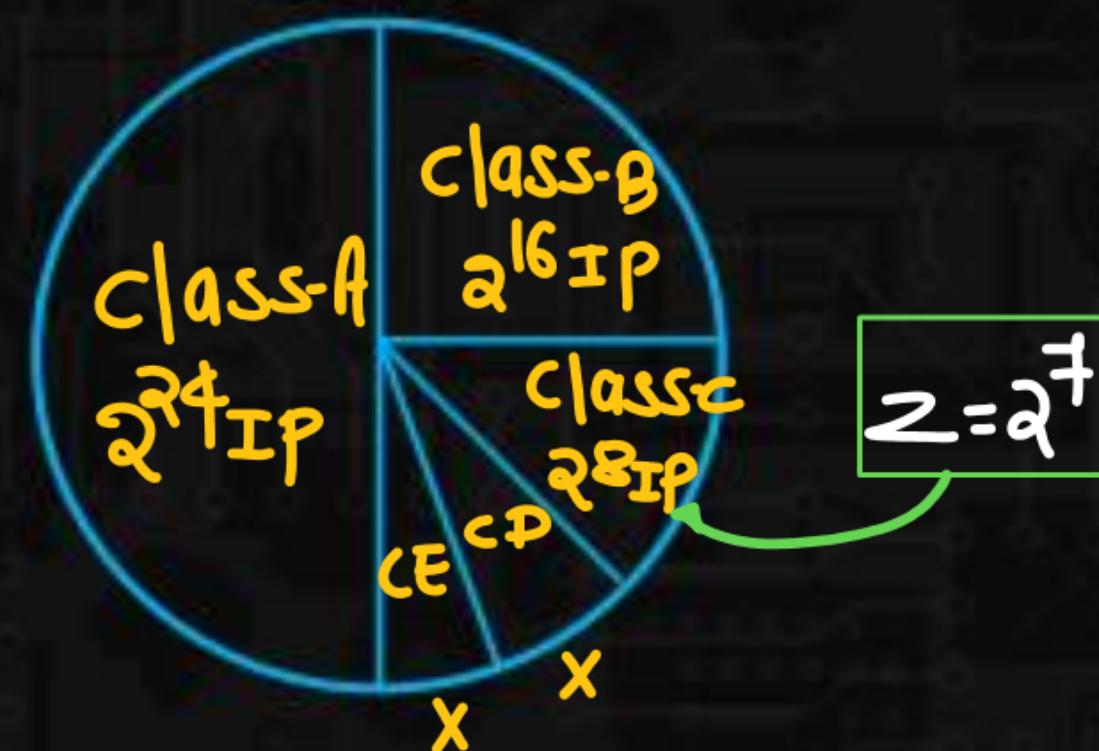
$$= 56 * 2^{10}$$

$$= 56K$$

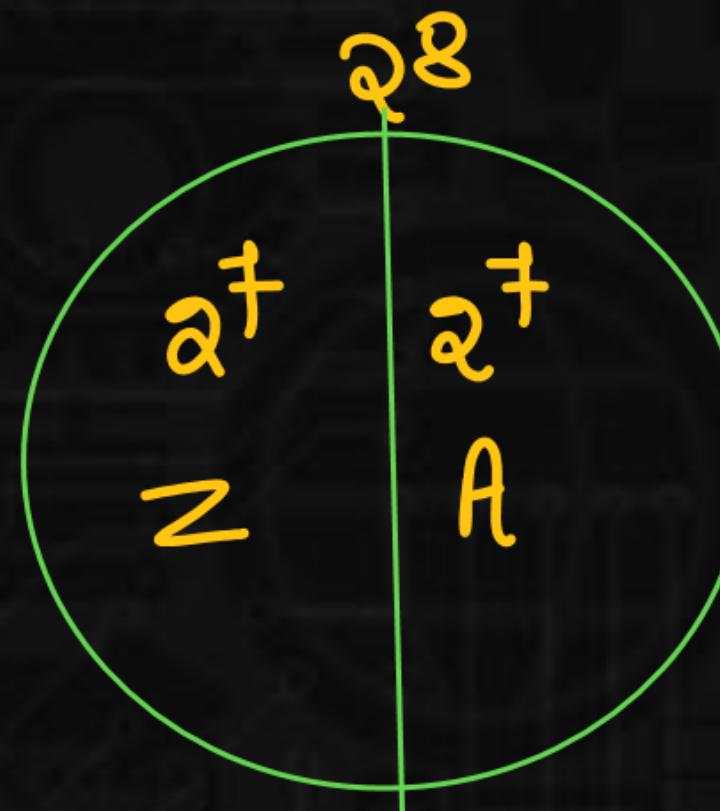
$$= 57,344$$

$$\frac{2^{16}}{8} = \frac{2^{16}}{2^3} = 2^{16-3} = 2^{13}$$

III: Organization Z need = 2^7 IP addresses



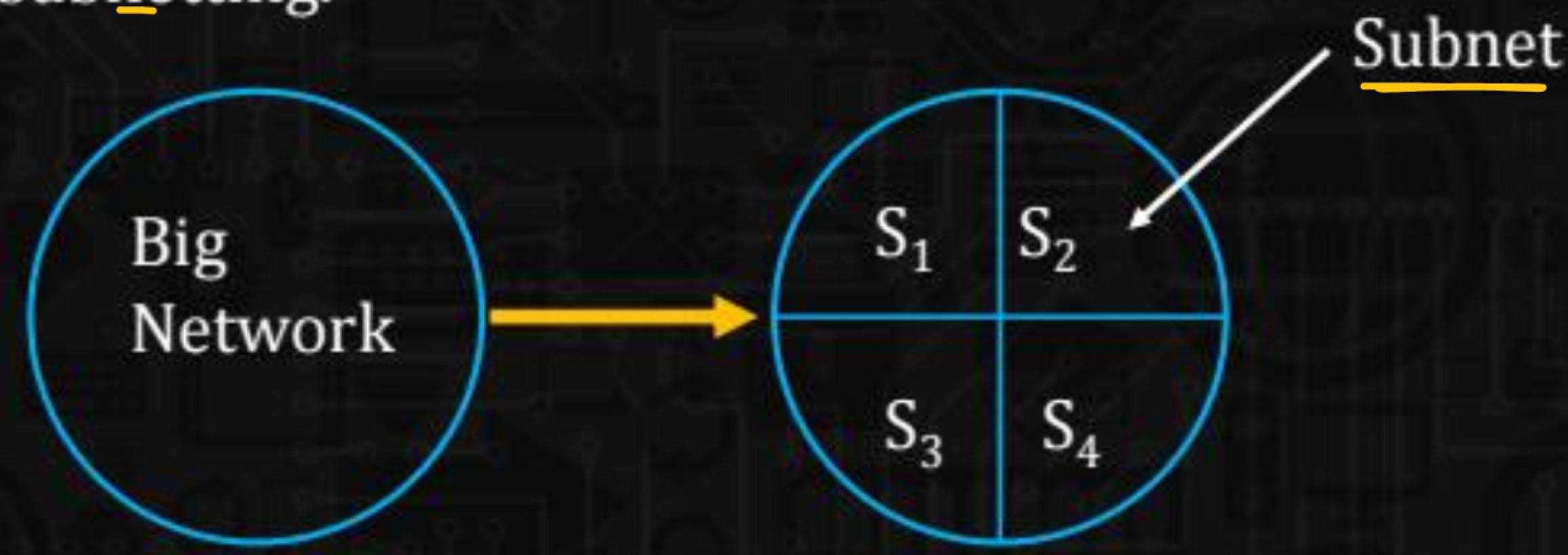
IP addresses wasted = $2^8 - 2^7$
= 128



$$\begin{aligned} Z &= 2^7 \\ A &= 2^7 \\ 2^7 \times 2^7 &= 2^8 \end{aligned}$$

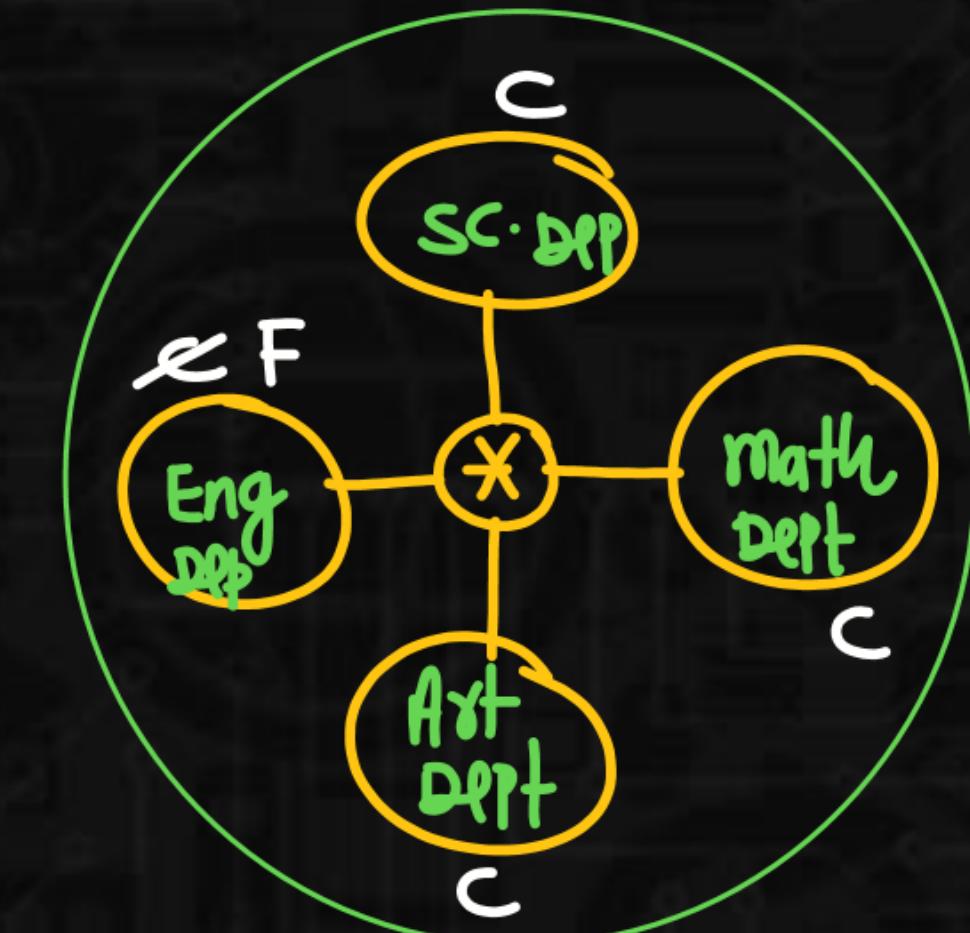
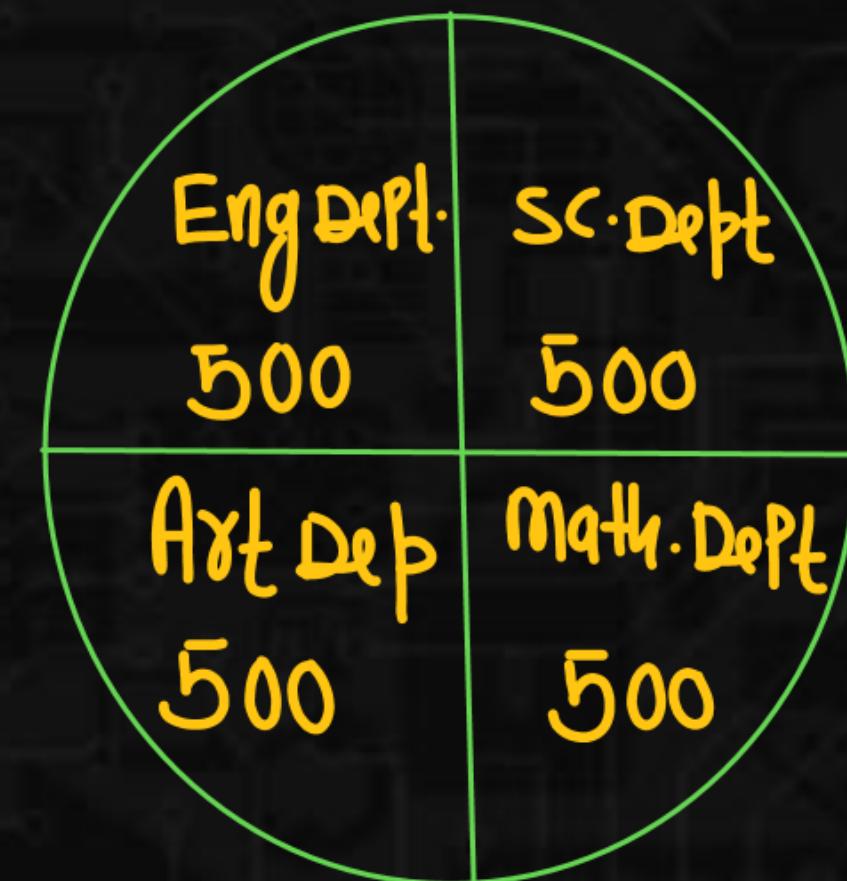
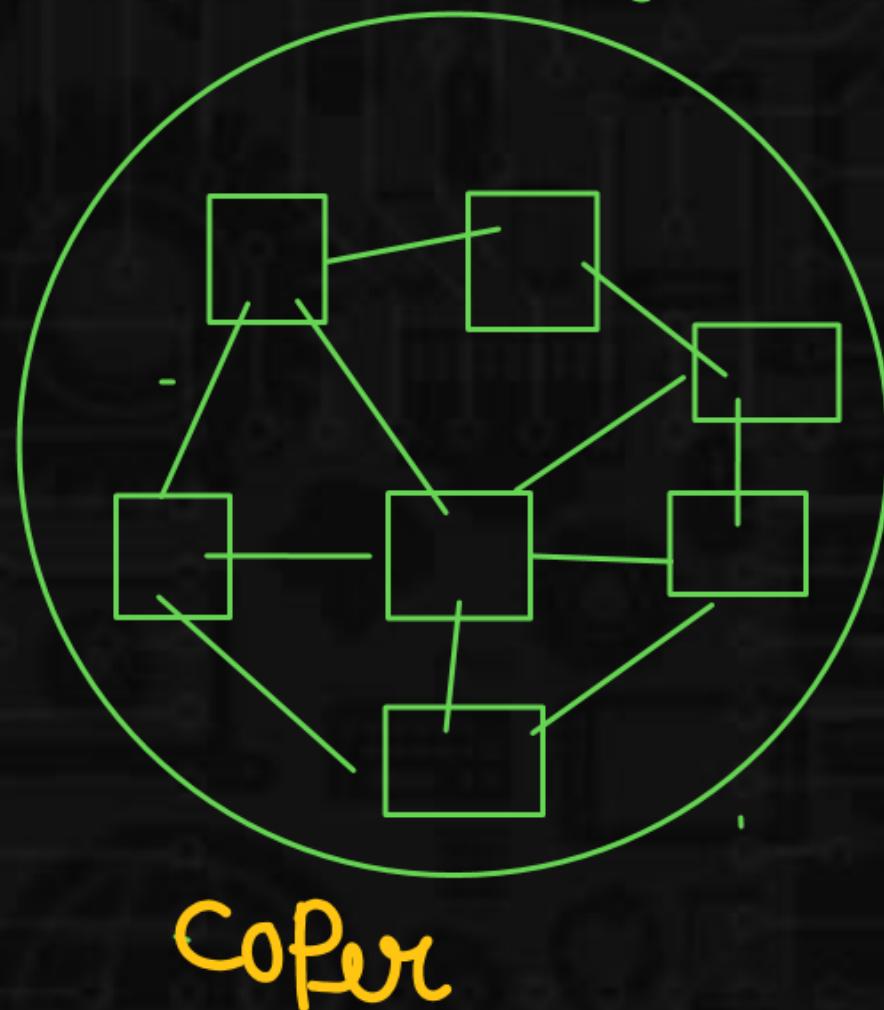
Subnetting

The process of dividing a big network to many smaller subnet is called as subnetting.



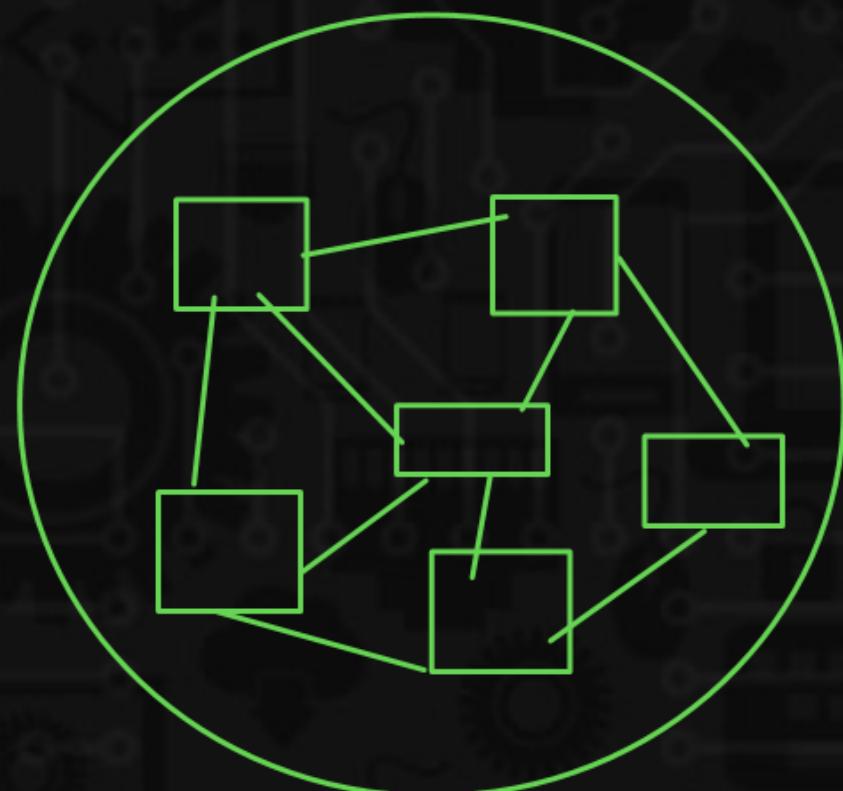
Subnetting

JNU - 2000



Q.

IBM-Q000



Advantage of Subnetting

1. Maintenance and Administration is simple and easy.
2. It provides security to one Network from another Network.

Example: Code of developer department must not be accessed by another department.

Disadvantage of subnetting

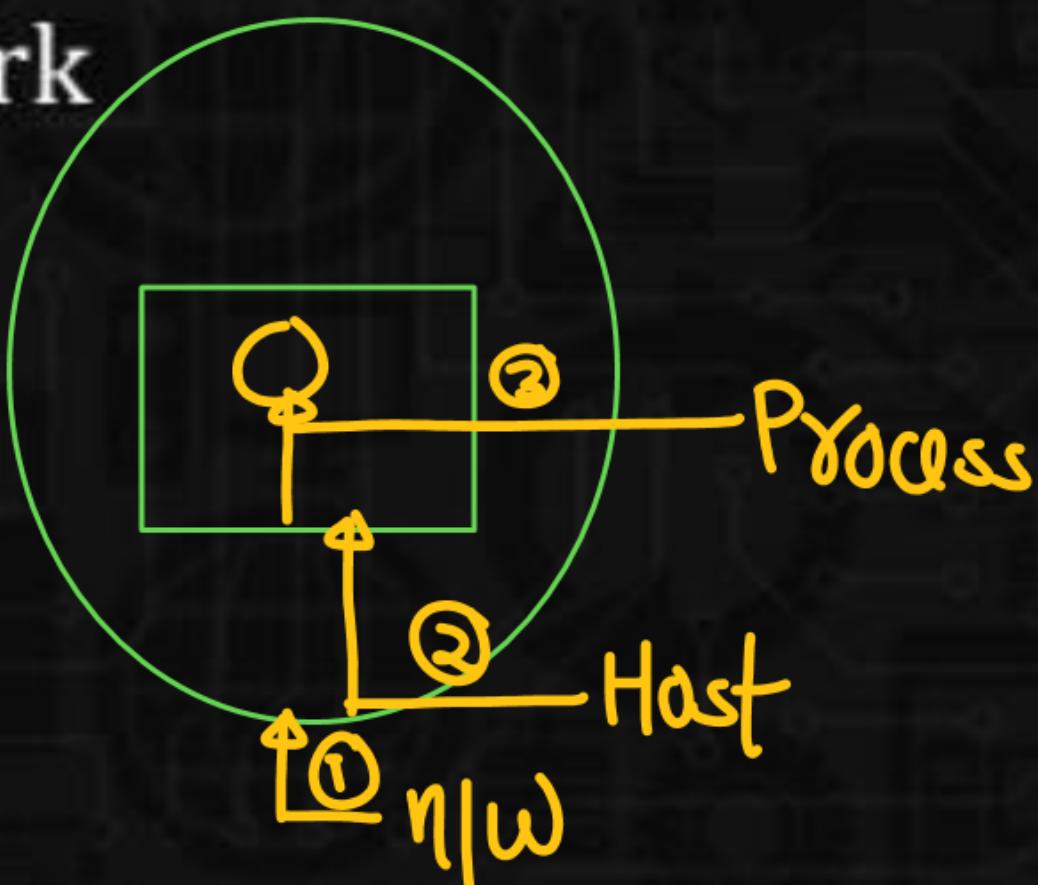
1. Subnetting complicates the communication process. Instead of 3 step procedure now it becomes 4 step procedure

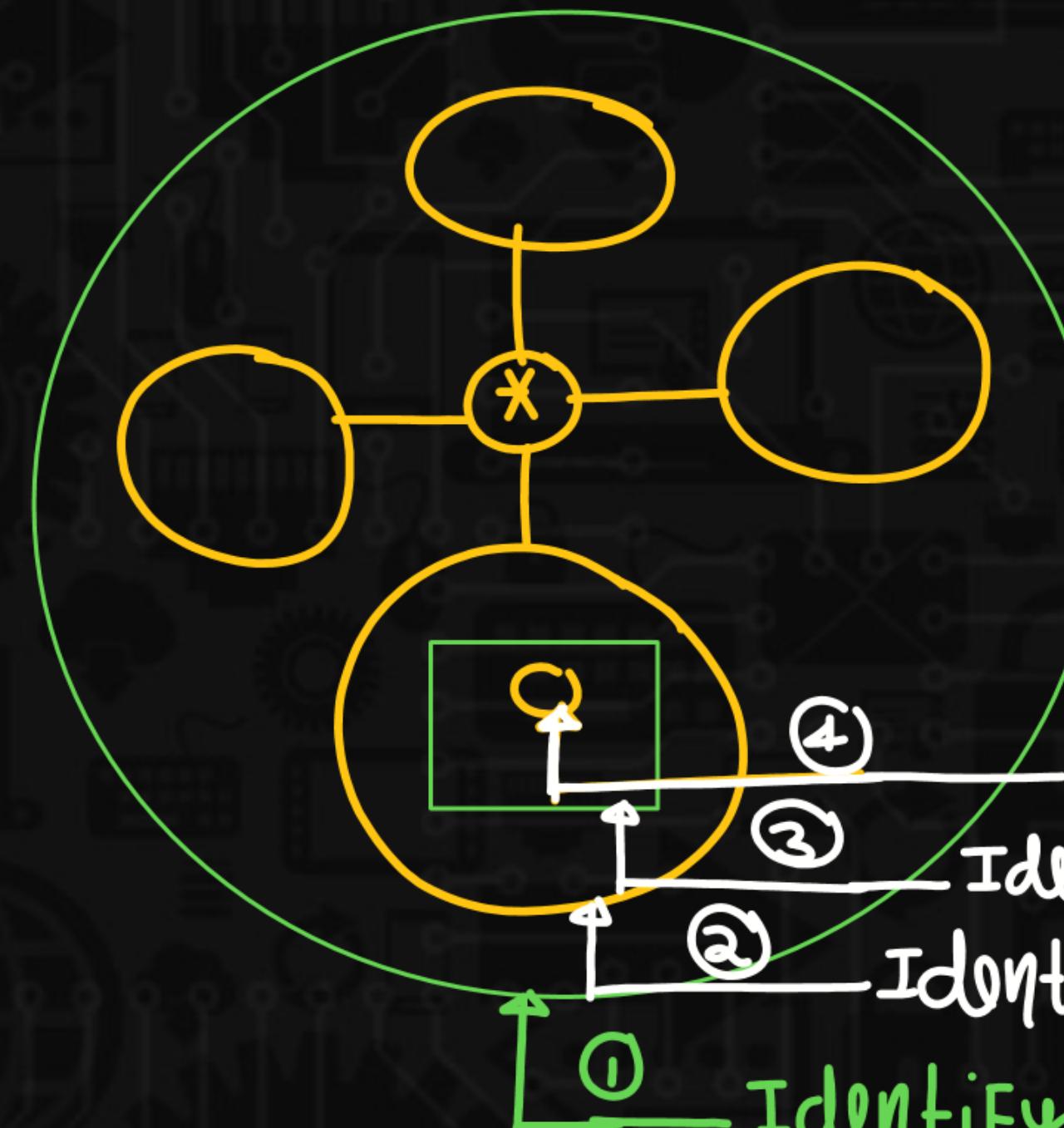
Step 1: Identify the Network

Step 2: Identify the Subnet within the network

Step 3: Identify the host within the Subnet.

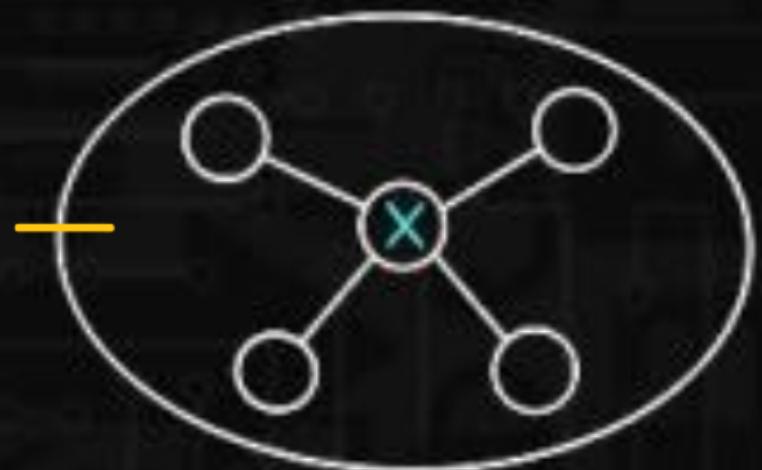
Step 4: Identify the process within the Host.





- ① Identify the Network
- ② Identify the subnet with in the Network
- ③ Identify the Host with in the subnet
- ④ Identify the Process with in the Host

2. In case of single Network only two IP addresses are wasted to represent Network id and direct Broadcast Address but in case of Subnetting two IP Addresses are wasted for each subnet.
3. Cost of overall Network also increase. Subnetting requires Internal routers, Switches, Hub, Bridges etc. which are very costly.



4. Subnetting and Network management require an experienced Network administrator. This adds to the overall cost as well.

Note:

- ① The process of Borrowing bits from HID to generate the subnet ID is also called as Subnetting
- ② Number of bit Borrowed depends on our requirement.

1

$$\frac{\text{NID}}{200 \cdot 200 \cdot 200} \cdot \frac{\text{HID}}{0}$$



class-C

$$\frac{\text{NID}}{2^4} \quad \frac{\text{HID}}{8}$$

4 subnet

$$2^2 = 4 \text{ subnet}$$

$\frac{2}{\text{SID}} \quad \frac{6}{\text{HID}}$

$2^6 - 2 = 62 \text{ Host} \mid \text{subnet}$

$S_1 \rightarrow 00$
 $S_2 \rightarrow 01$
 $S_3 \rightarrow 10$
 $S_4 \rightarrow 11$



P
W

Q.

NID HID
157 · 153 · 0 · 0



class-B

NID HID
16 16

512 Subnet

9 7
SID HID
 $2^9 = 512 \text{ Subnet}$ $2^7 - 2 = 126 \text{ Host/subnet}$

