

CS & IT ENGINEERING

COMPUTER NETWORKS

IPv4 Addressing

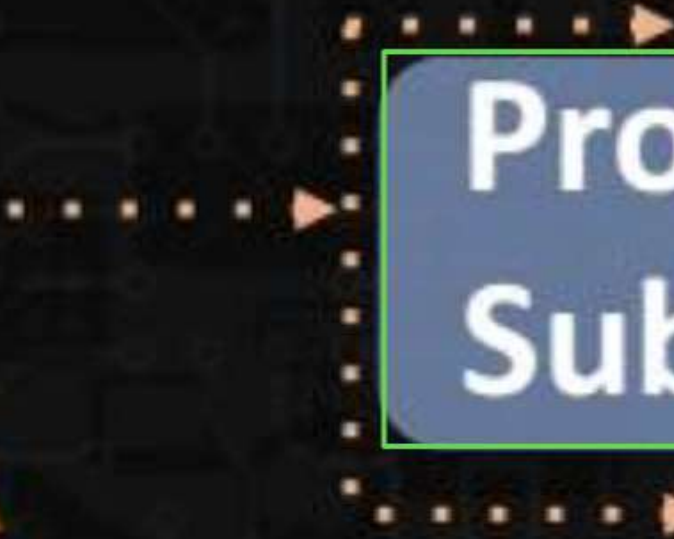
Lecture No-16



By- Ankit Doyla Sir

A stylized laptop with a blue screen and an orange base. The screen displays the text 'TOPICS TO BE COVERED'.

TOPICS TO
BE
COVERED

A dotted orange arrow pointing from the laptop screen to the subnetting box.

**Problem Solving on
Subnetting**

Problem Solving on Subnetting Part – 1

Q.1

If subnet mask is 255.255.224.0 then number of subnets are:

MSQ

☒ A.

2^{11}

||||||| · ||||| · ||00000 · 00000000

class-A

☐ B.

2^5

—————

class-A

☐ C.

2^{15}

☒ D.

2^3

(A, D)

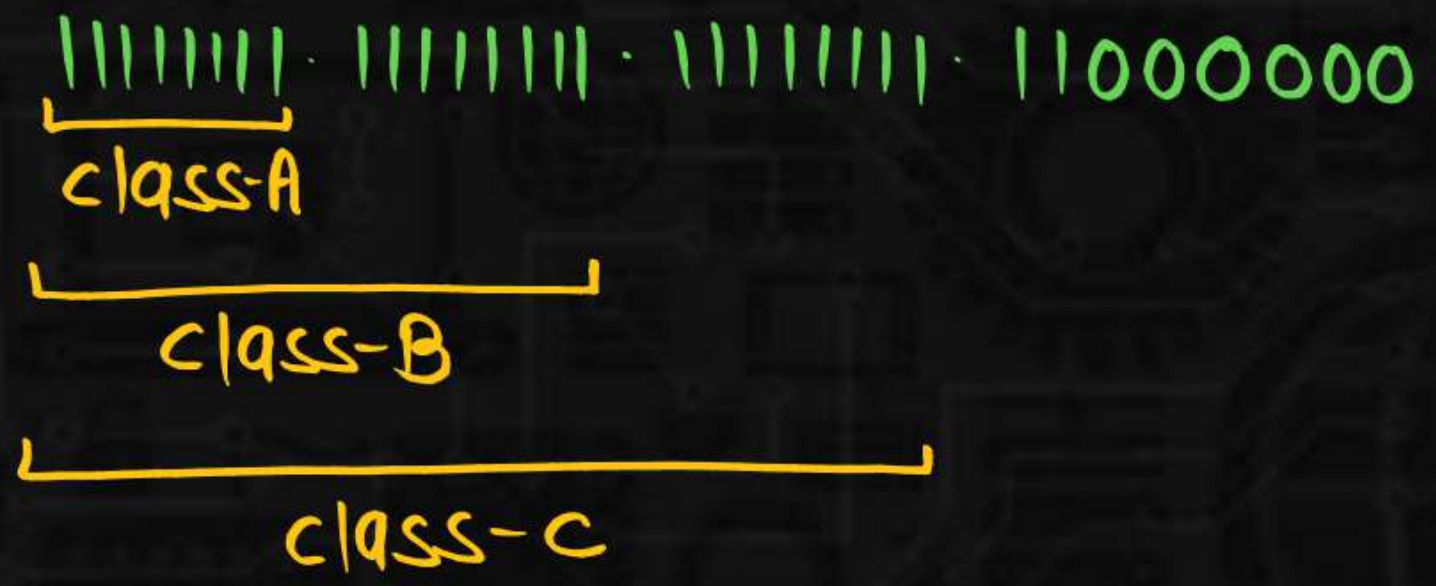
Q.2

If subnet mask is 255.255.255.192 then number of subnets are:

Msc

✓ A.

2^{18}



B.

2^5

✓ C.

2^{10}

✓ D.

2^2

(A, C, D)

Q.3

IP address in a block = 200.200.200.60 and the subnet
Mask = 255.255.255.224 then find

$$\rightarrow 32+16+8+4$$



$$\rightarrow 128+64+32$$

AD Rule

(i) Subnet id = 200.200.200.32

(ii) Subnet number 2nd subnet

Soln:

$$\begin{array}{r} \text{IP Add} = 200.200.200.00111100 \\ \text{AND} \quad \quad \text{AND} \\ \text{SM} = 255.255.255.11100000 \\ \hline \text{SID} = 200.200.200.00100000 \\ \text{SID} = 200.200.200.32 \end{array}$$

0	← dual	0 0 0	→ 1 st subnet
1	←	0 0 1	→ 2 nd "
2	←	0 1 0	→ 3 rd "
3	←	0 1 1	→ 4 th "
4	←	1 0 0	→ 5 th "
5	←	1 0 1	→ 6 th "
6	←	1 1 0	→ 7 th "
7	←	1 1 1	→ 8 th "

$$SM = \underbrace{255.255.255}_{NID} \cdot \underbrace{11100000}_{SID} \quad \text{OR} \quad \underbrace{11100000}_{HID}$$

$$200.200.200 \cdot \underbrace{00111100}_{SID} \quad \underbrace{11100}_{HID}$$

$$200.200.200 \cdot \underbrace{001}_{SID} \quad \underbrace{-----}_{HID}$$

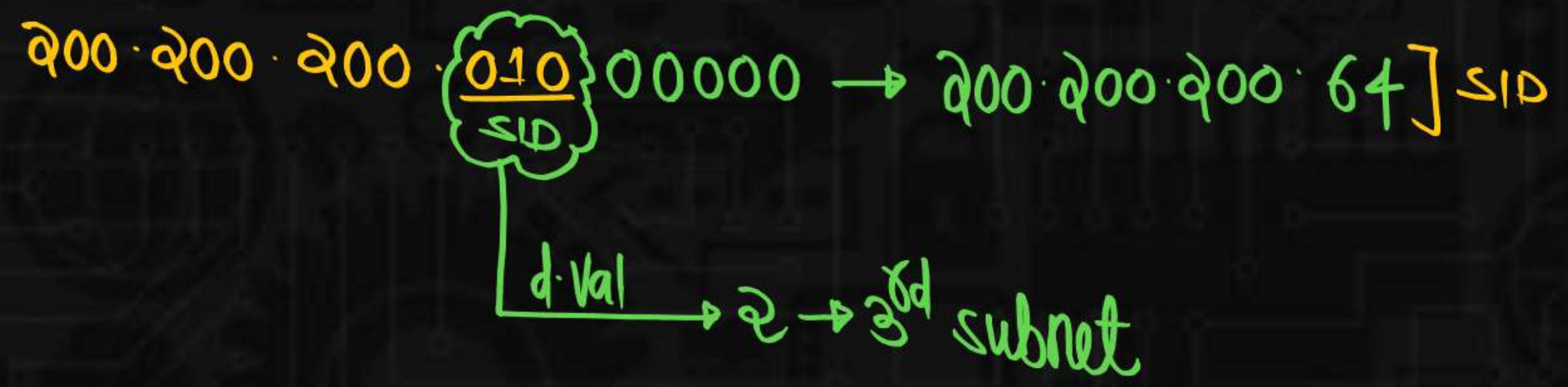
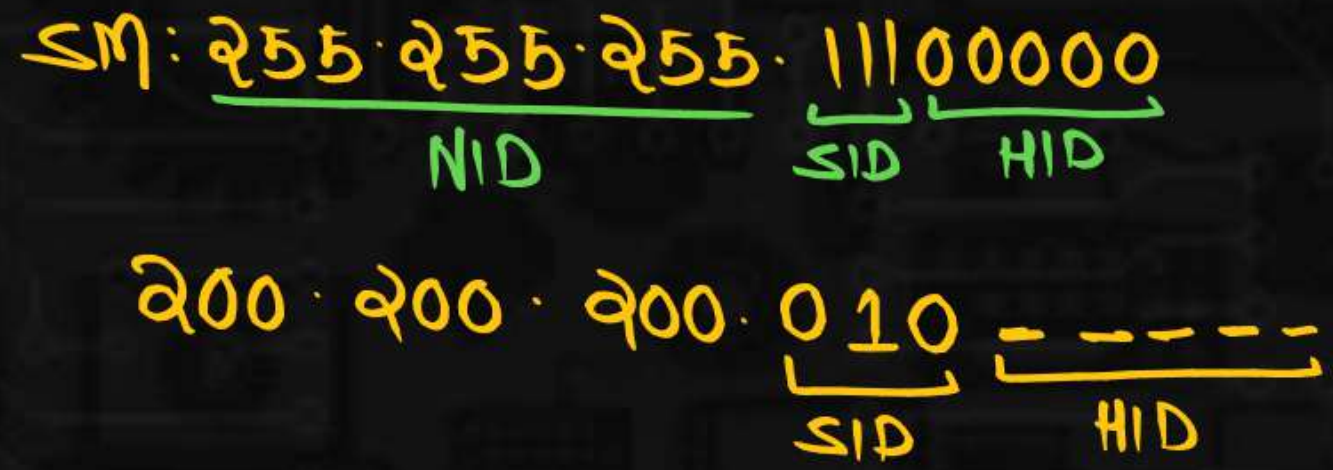
$$200.200.200 \cdot \underbrace{001}_{SID} 000000 \rightarrow 200.200.200.32 \text{ SID}$$

d.val $\rightarrow 1 \rightarrow 2^{nd}$ subnet

Q.4

IP address in a block= 200.200.200.80 and the subnet
Mask = 255.255.255.224 then find

- (i) Subnet id = 200.200.200.64
- (ii) Subnet number 3rd subnet



Q.5

IP address in a block = 200.200.200.122 and the subnet
Mask = 255.255.255.240 then find

- (i) Subnet id ____
- (ii) Subnet number ____

SM: 255.255.255. 1111 0000
 NID SID HID

200.200.200. 0111 -----
 SID HID

200.200.200. 0111 0000 → 200.200.200. [12] SID
 SID
 d.val → 7 → 8th subnet

Q.6

IP address in a block = 157.157.52.80 and the subnet
Mask = 255.255.224.0 then find

→ Class-B



(i) Subnet id = 157.157.32.0

SM: 255.255.111.00000 00000000
NID SID HID

(ii) First host = 157.157.32.1

(iii) Last host = 157.157.63.254

(iv) Direct broadcast address = 157.157.63.255

157.157. 001 -----
SID HID

157.157. 001 00000. 00000000 → 157.157.32.0] SID

157.157. 001 00000. 00000001 → 157.157.32.1] First Host

⋮

157.157. 001 11111. 11111110 → 157.157.63.254] Last Host

157.157. 001 11111. 11111111 → 157.157.63.255] DBA

Q.7

→ class-B



IP address in a block = 157.157.52.80 and the subnet
Mask = 255.255.192.0 then find

(i) Subnet id _____

(ii) First host _____

(iii) Last host _____

(iv) Direct broadcast address _____.

SM: 255.255.11000000.00000000
NID SID HID

157.157. 00 _ _ _ _ _
HID

157.157. 00 000000.00000000 → 157.157.0.0] SID

157.157. 00 000000.00000001 → 157.157.0.1] First Host

157.157. 00 111111.11111110 → 157.157.63.254] last Host

157.157. 00 111111.11111111 → 157.157.63.255] DBA

Q.8

IP address in a block = 100.160.50.60 and the subnet
Mask = 255.252.0.0 then find

H.W

- (i) Subnet id _____
- (ii) First host _____
- (iii) Last host _____
- (iv) Direct broadcast address _____.

Q.9

class-C



IP address in a block = 200.200.200.90 and the subnet
Mask = 255.255.255.224 then find

- (i) 3rd Subnet id = 200.200.200.64 SM: 255.255.255.11100000
NID SID HID
- (ii) 7th Subnet id = 200.200.200.192 {AD Rule}

AD Rule 2.0

128 64 32

3rd subnet id: 0 1 0 → 64

7th subnet id: 1 1 0 → 192

128 64 32

0 0 0 → 0 → 1st subnet-id

0 0 1 → 32 → 2nd "

0 1 0 → 64 → 3rd

0 1 1 → 96 → 4th

1 0 0 → 128 → 5th

1 0 1 → 160 → 6th

1 1 0 → 192 → 7th

1 1 1 → 224 → 8th

Q.10

IP address in a block= 200.200.200.90 and the subnet
Mask = 255.255.255.240 then find

(i) 4th Subnet id _____

(ii) 6th Subnet id _____

SM: 255.255.255.11110000
 NID SID HID

 128 64 32 16
4th subnet id : 0 0 1 1 → 48
6th subnet id : 0 1 0 1 → 80

Problem Solving on Subnetting Part – 2

Q.1

→ class-A



IP address in a block = 125.200.100.90 and the subnet
Mask = 255.252.0.0 then Find

- (i) 3rd host in 2nd Subnet _____
- (ii) 4th host in 3rd Subnet _____
- (iii) 1st host in 4th Subnet _____

SM: 255.1111100.00000000.00000000
NID SID HID

ADRule: 2nd subnet 3rd Host

125. ----- -----
SID HID

125. 00000100 00000000.00000011 → 125.4.0.13
SID HID

(ii) 3rd subnet 4th Host

$$125 \cdot \underbrace{000010}_{SID} \underbrace{00 \cdot 00000000 \cdot 00000100}_{HID} \rightarrow 125 \cdot 8 \cdot 0 \cdot 4$$

(iii) 4th subnet 1st Host

$$125 \cdot \underbrace{000011}_{SID} \underbrace{00 \cdot 00000000 \cdot 00000001}_{HID} \rightarrow 125 \cdot 12 \cdot 0 \cdot 1$$

Q.2

IP address in a block= 157.157.100.90 and the subnet
Mask = 255.255.224.0 then Find

- (i) 3rd host in 2nd Subnet = 157.157.32.3
- (ii) 4th host in 3rd Subnet = 157.157.64.4
- (iii) 1st host in 4th Subnet = 157.157.96.1

Q.3

IP address in a block= 200.200.200.90 and the subnet
Mask = 255.255.255.240 then Find

H.W

- (i) 3rd host in 2nd Subnet _____
- (ii) 4th host in 3rd Subnet _____
- (iii) 1st host in 4th Subnet _____

Q.4

class-B



Consider three machines M, N, and P with IP addresses 157.157.38.90, 157.157.48.90, and 157.157.68.90 respectively. The subnet mask is set to 255.255.192.0 for all the three machines. Which one of the following is true?

SM: 255.255.11.0000000.00000000
NID SID HID

A. M, N, and P belong to three different subnets

B. Only N and P belong to the same subnet

☒ C. Only M and N belong to the same subnet

D. M, N, and P all belong to the same subnet

ADRule

M: 38: ^{128 64 32 16 8 4 2 1}
00100110
N: 48: 00110000
P: 68: 01000100
M & N belong to same subnet

AD Rule 2.0

$\begin{array}{r} \text{12864} \\ \hline \text{M : 38 : } \underline{00} \\ \text{N : 48 : } \underline{00} \\ \text{P : 68 : 0 1} \end{array}$

\rangle M & N belong to
same subnet

Q.5



Consider three machines M, N, and P with IP addresses 157.157.38.90, 157.157.48.90, and 157.157.68.90 respectively. The subnet mask is set to 255.255.240.0 for all the three machines. Which one of the following is true?

SM: 255.255.11110000.00000000
NID SID HID

☒ A. M, N, and P belong to three different subnets

☐ B. Only N and P belong to the same subnet

☐ C. Only M and N belong to the same subnet

☐ D. M, N, and P all belong to the same subnet

AD Rule 20

128 64 32 16

M: 38: 0 0 1 0

N: 48: 0 0 1 1

P: 68: 0 1 0 0

M, N, P
belong
to 3
diff. sub.

Q.6

class-A
Consider three machines M, N, and P with IP addresses 100.40.38.90, 100.92.48.90, and 100.80.68.90 respectively. The subnet mask is set to 255.224.0.0 for all the three machines. Which one of the following is true?

SM: 255 · 11100000 · 00000000 · 00000000
NID SID HID

A. M, N, and P belong to three different subnets

☒ B. Only N and P belong to the same subnet

C. Only M and N belong to the same subnet

D. M, N, and P all belong to the same subnet

ADRule 2.0

128 64 32

M: 40: 0 0 1

N: 92: 0 1 0

P: 80: 0 1 0

*N & P
belong to
same subnet*

Q.7 Consider three machines M, N, and P with IP addresses

M = 200.40.38.50,

N = 200.92.48.40,

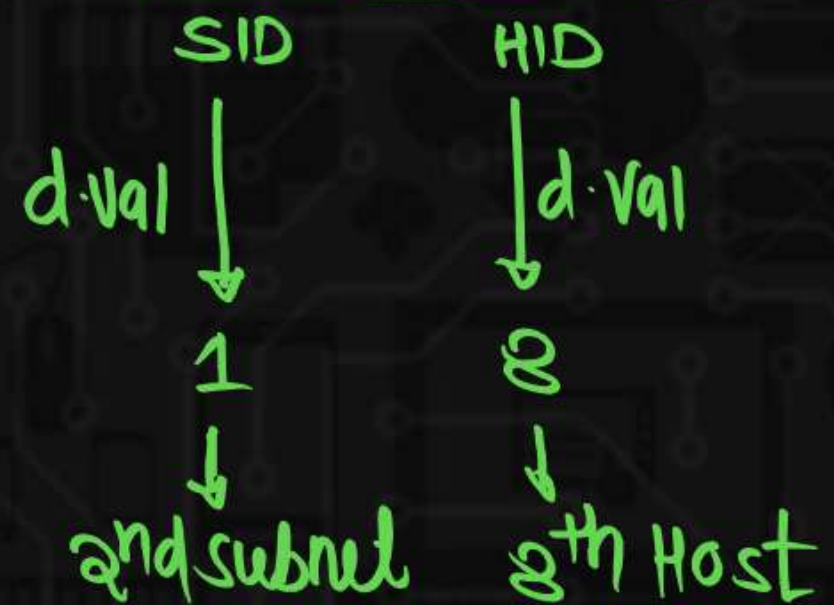
P = 200.80.68.60,

subnet mask = 255.255.255.224, then find which host of which subnet

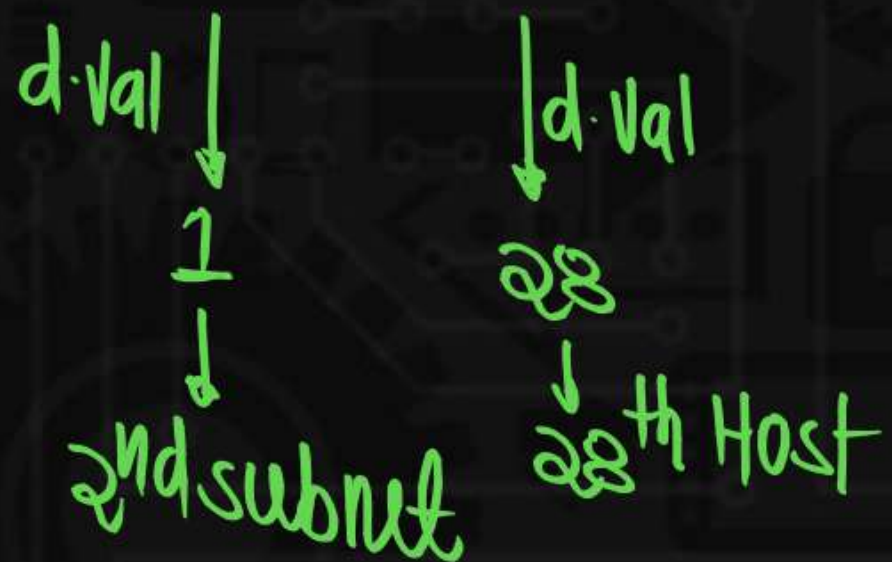
SM: 255.255.255.11100000
 NID SID HID

M: 200.40.38. 00110010 $\xrightarrow{\text{d.Val}} 18 \rightarrow 18^{\text{th}} \text{ Host}$
 SID HID
 $\xrightarrow{\text{d.Val}} 1 \rightarrow 2^{\text{nd}} \text{ subnet}$

N: 200.92.48. 00101000



P: 200.80.68. 00111100



Q.8

Consider three machines M, N, and P with IP addresses

M=157.157.40.50,

N= 157.157.48.40,

P= 157.157.80.60,

subnet mask= 255.255.252.0, then find which host of which subnet

H.W

SM: 255.255.11111000.00000000
 NID SID HID

M: 157.157.00101000.00110010
 SID HID
 d.Val ↓ d.Val ↓
 10 50 → 50th Host
 ↓
 11th subnet

Q.9

Consider three machines M, N, and P with IP addresses

M = 100.40.0.10,

N = 100.96.0.22,

P = 200.80.0.15,

subnet mask = 255.252.0.0, then find which host of which subnet

H.W

Q.10

Consider three machines M, N, and P with IP addresses 100.10.5.2, 100.10.5.5, and 100.10.5.6 respectively. The subnet mask is set to 255.255.255.252 for all the three machines. Which one of the following is true?

SM: 255.255.255.11111000

[GATE CS 2019]

A. M, N, and P belong to three different subnets

B. Only N and P belong to the same subnet

C. Only M and N belong to the same subnet

D. M, N, and P all belong to the same subnet

AD Rule 2.0

128 64 32 16 8 4

M: 2: 00 0 0 0 0

N: 5: 0000 01

P: 6: 0000 01

> N & P
belong
to same subnet

