CS & IT ENGINEERING

COMPUTER NETWORKS

IPv4 Addressing

Lecture No-09

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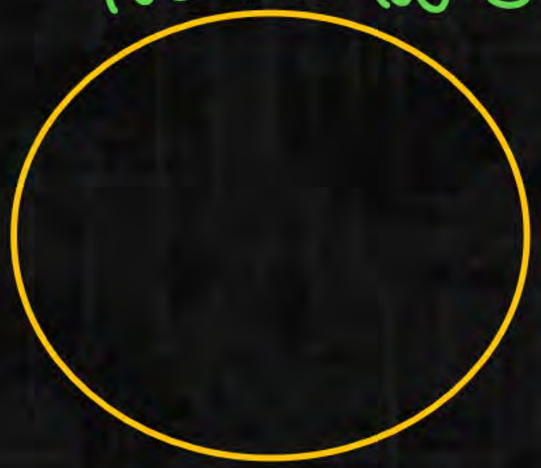
Subnetting Part-2

2. NID | HID

200.200.200.0



Class- C

NID (24) | HID (8)

8 subnet

SID (3) | HID (5)

No. of subnet = $2^3 = 8$

No. of IP Add/subnet = $2^5 = 32$

No. of Host/subnet = $2^5 - 2 = 30$

$\frac{2^8}{8} = \frac{2^8}{2^3} = 2^{8-3} = 2^5$ IP in one subnet

SID = 3bit

0 ← d ← 000 → 1st subnet

1 ← d ← 001 → 2nd subnet

2 ← d ← 010 → 3rd "

3 ← d ← 011 → 4th "

4 ← d ← 100 → 5th "

5 ← d ← 101 → 6th "

6 ← d ← 110 → 7th "

7 ← d ← 111 → 8th "

1st subnet → 200.200.200.000 ----- (HID)

200.200.200.00000000 → 200.200.200.0] SID

200.200.200.00000001 → 200.200.200.1 → First Host

200.200.200.00011110 → 200.200.200.30 → Last Host

200.200.200.00011111 → 200.200.200.31] DBA

1st subnet [SID : 200.200.200.0
DBA : 200.200.200.31]

2nd subnet [SID : 200.200.200.32
DBA : 200.200.200.63]

3rd subnet
- SID 200.200.200.64
- DBA 200.200.200.95

4th subnet
- SID 200.200.200.96
- DBA 200.200.200.127

5th subnet
- SID 200.200.200.128
- DBA 200.200.200.159

6th subnet
- SID 200.200.200.160
- DBA 200.200.200.191

7th subnet
- SID 200.200.200.192
- DBA 200.200.200.223

8th subnet
- SID 200.200.200.224
- DBA 200.200.200.255

200.200.200.0

i) 4th subnet-ID

ii) 7th subnet-id

class-C

NID	HID
24	8

8 subnet

3	5
SID	HID

200.200.200. (128 64 32) (- - -) (- - - - -)

SID HID

ADRule

{ 4th subnet id → 200.200.200.01100000

→ 200.200.200.96

ADRule 2.0

4th subnet-id → (128 64 32) 0 1 1 → 96

7th subnet id → 128 64 32
1 1 0 → 192

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ii) 4th subnet
- SID : 200.200.200.01100000 → 200.200.200.96
- DBA : 200.200.200.011 11111 → 200.200.200.127

iii) 7th subnet
- SID : 200.200.200.110 00000 → 200.200.200.192
- DBA : 200.200.200.110 11111 → 200.200.200.223

3.

Class-A

NID	HID
8	24

64 subnet

SID	HID
6	18

No. of subnet $= 2^6 = 64$

No. of IP Add/subnet $= 2^{18}$

No. of Host/subnet $= 2^{18} - 2$

i) 3rd Host in 2nd subnet

ii) 4th Host in 3rd subnet

iii) 1st Host in 4th subnet

iv) 64th Host in 61th subnet

ii) 2nd subnet 3rd Host

125. 00000100. 00000000. 00000011 → 125.4.0.3

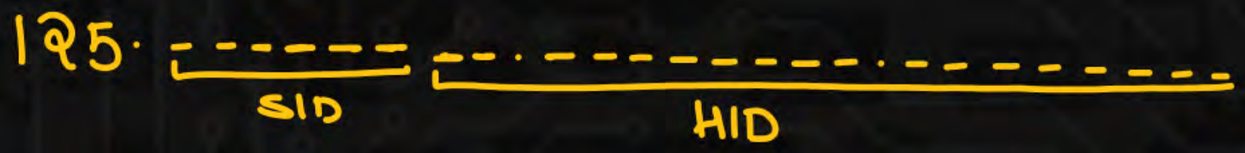
iii) 3rd subnet 4th Host

125. 00001000. 00000000. 00000100 → 125.8.0.4

iiii) 4th subnet 1st Host

125. 00001100. 00000000. 00000001 → 125.12.0.1

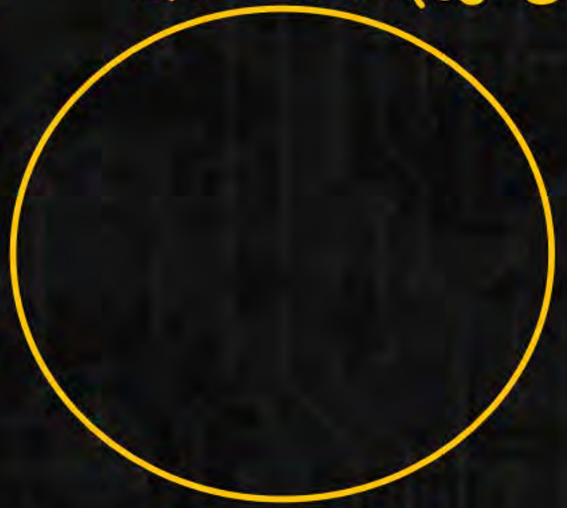
iv) 61th subnet 64th Host



195. 11110000.00000000.01000000 → 195.240.0.64

4. 200·200·200·0

ISRO



class-C

NID	HID
24	8

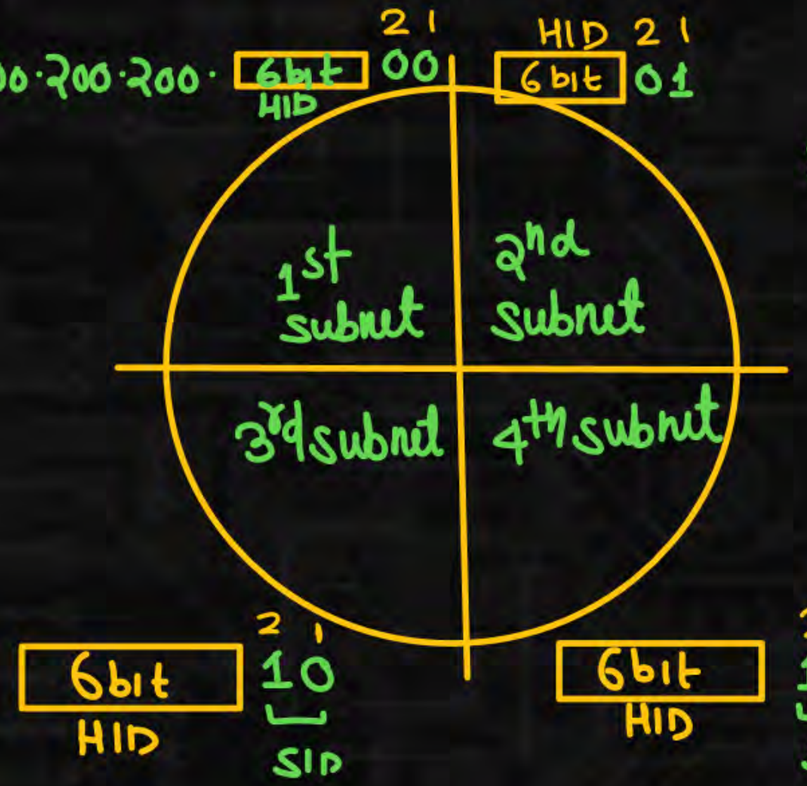
4 subnet

6	2
HID	SID

No·OF IP/subnet = 2^6

No·OF Host/subnet = $2^6 - 2$

→ No·OF subnets = $2^2 = 4$



1st subnet
- SID: 200·200·200·0
- DBA: 200·200·200·253

2nd subnet
- SID: 200·200·200·1
- DBA: 200·200·200·253

3rd subnet
- SID: 200·200·200·2
- DBA: 200·200·200·254

4th subnet
- 200·200·200·3
- 200·200·200·255

1st subnet

200.200.200. ------ 00
HID SID

200.200.200. 000000 00 → 200.200.200.0] SID
200.200.200. 000001 00 → 200.200.200.4
200.200.200. 000010 00 → 200.200.200.8
200.200.200.000011 00 → 200.200.200.12
.
.
.
200.200.200.111110 00 → 200.200.200.248
200.200.200.111111 00 → 200.200.200.252] DBA

SID = 2 bit

X 00
01
10
X 11

Valid subnet

No. of subnet = $2^2 - 2$
= 2

SID = 3 bit

000 X
001
010
011
100
101
110
111 X

Valid subnet

No. of subnets = $2^3 - 2 = 6$

Subnetting Category 1

Note:

In the past, there were limitations to the use of a subnet 0 (all subnet bits are set to zero) and all ones subnet (all subnet bits set to one). Some devices would not allow the use of these subnets.

Subnetting Category 1

Problems with Subnet Zero and the All-Ones Subnet:

Traditionally, it was strongly recommended that subnet zero and the all-ones subnet not be used for addressing. This means the values of all zeros and all ones in the subnet field should not be assigned to actual (physical) subnets." This is the reason why network engineers required to calculate the number of subnets obtained by borrowing three bits would calculate $2^3 - 2(6)$ and not 2^3 (8). The -2 takes into account that subnet zero and the all-ones subnet are not used traditionally

Subnetting Category 1

" Today, the use of subnet zero and the all-ones subnet is generally accepted and most vendors support their use. However, on certain networks, particularly the ones using legacy software, the use of subnet zero and the all-ones subnet can lead to problems".

Subnetting Category 2

Subnetting Category 2

Subnet Mask

It is a 32 bit number used to indicate number of bits borrowed from host –id and there positions based on the following rules:

Rule1: Number of 1's in the subnet mask indicate NID + SID
Rule2: Number of 0's in the subnet mask indicate HID part

Default subnet Mask

class-A : 255.0.0.0

class-B : 255.255.0.0

class-C : 255.255.255.0

For class-A

255.0.0.0

11111111.00000000.00000000.00000000

No. of 1's = 8

NID + SID = 8

8 + SID = 8

SID = 0 bit

No. of 0's = 24

HID = 24 bit

Q. If NID = 200.200.200.0 and the subnet Mask = 255.255.255.192 then identify:

→ class-C , NID=24 bit, HID=8 bit

I. Number of bit borrowed from Host-id.

Ans: 2

II. Number of subnet possible and their subnet id's.

Ans: 4

III. Number of Host/subnet. Ans: 62

SM: 255.255.255.192

11111111.11111111.11111111.11000000

NID | SID | HID

No. of 1's = 26

NID + SID = 26

24 + SID = 26

SID = 2 bit

No. of Subnet = $2^2 = 4$

No. of 0's = 6

HID = 6

No. of Host/subnet = $2^6 - 2 = 62$

Subnet id's

200.200.200. SID HID

128 64

200.200.200.00 000000 → 200.200.200.0

200.200.200.01 000000 → 200.200.200.64

200.200.200.10 000000 → 200.200.200.128

200.200.200.11 000000 → 200.200.200.192

ADRule

128 64

00 → 0

01 → 64

10 → 128

11 → 192

subnet id's

Q.

⇒ class-C, NID=24, HID=8

If NID = 200.200.200.0 and the subnet Mask = 255.255.255.224 then identify:

I. Number of bit borrowed from Host-id.

Ans: 3

II. Number of Subnet possible and their subnet id's.

Ans: 8

III. Number of Host/Subnet. Ans: 30

SM: 11111111.11111111.11111111.111 00000

NID | SID | HID

SID = 3 bit

No. of subnet = $2^3 = 8$

HID = 5 bit

No. of Host/subnet = $2^5 - 2 = 30$

AD Rule

SID = 3 bit

128 64 32

□ □ □

000 → 0
001 → 32
010 → 64
011 → 96
100 → 128
101 → 160
110 → 192
111 → 224

} Subnet id's

Q.

H.W

If NID = 200.200.200.0 and the subnet Mask = 255.255.255.44 then identify

I. Number of bit borrowed from Host-id

II. Number of subnet possible and their subnet id's

III. Number of Host/subnet

Q. If NID = 200.200.200.0 and the subnet Mask = 255.255.255.200 then identify

H.W

I. Number of bit borrowed from Host-id

II. Number of subnet possible and their subnet id's

III. Number of Host/subnet

Q.

H.W

If NID = 173.173.0.0 and the subnet Mask = 255.255.128.128 then identify

I. Number of bit borrowed from Host-id

II. Number of subnet possible and their subnet id's

III. Number of Host/subnet

Q.

H.W

If NID = 173.173.0.0 and the subnet Mask = 255.255.255.0 then identify

I. Number of bit borrowed from Host-id

II. Number of subnet possible and their subnet id's

III. Number of Host/subnet


THANK YOU
GW
SOLDIERS !