CS & IT ENGINEERING

COMPUTER NETWORKS

IPv4 Addressing

Lecture No- 10

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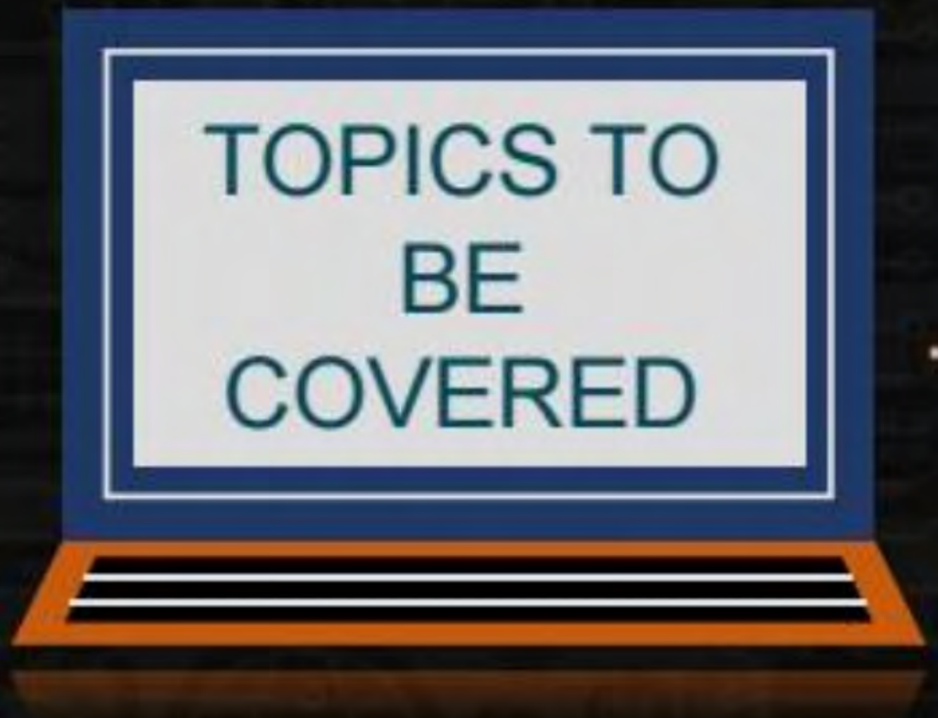

Subnetting Part-3

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

Q.1

If NID = 200.200.200.0 and the subnet Mask = 255.255.255.192 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.2 If NID = 200.200.200.0 and the subnet Mask = 255.255.255.224 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.3

H.W

∴ class-C, NID = 24, HID = 8bit

If NID = 200.200.200.0 and the subnet Mask = 255.255.255.44 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: 11111111.11111111.11111111.00101100

NID

32 16 8 4 2 1

H H S H S S H H

No. of 1's = 27

NID + SID = 27

24 + SID = 27

SID = 3 bit

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

No. of 0's = 5

HID = 5 bit

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

Subnet id's

AD Rule

32 8 4

0 00 → 0
0 01 → 4
0 10 → 8
0 11 → 12
100 → 32
101 → 36
110 → 40
111 → 44

subnet id

२००.२००.२००.0
२००.२००.२००.4
२००.२००.२००.8
२००.२००.२००.12

⋮

२००.२००.२००.44

Q.4

→ class-C

If NID = 200.200.200.0 and the subnet Mask = 255.255.255.200 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 $2^5 - 2 = 30$

SM: 11111111.11111111.11111111.11001000

128 64 8

S S H H S H H H

NID

Subnet id's

128 64 8

000 → 0
001 → 8
010 → 64
011 → 72
100 → 128
101 → 136
110 → 192
111 → 200

Q.5

→ class-B, NID = 16, HID = 16

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

SM: 11111111.11111111.10000000.10000000

128 128

NID | SID HID | SID HID

No. of 1's = 18

NID + SID = 18

16 + SID = 18

SID = 2 bit

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

No. of 0's = 14

HID = 14 bit

No. of Host/subnet = $2^{14} - 2$

Subnet id's

173.173.□ -------- . □ --------
S HID S HID

173.173.0 0000000 . 0 0000000 → 173.173.0.0

.0 0000000 . 1 0000000 → 173.173.0.128

.1 0000000 . 0 0000000 → 173.173.128.0

.1 0000000 . 1 0000000 → 173.173.128.128

AD Rule

128	128
□	□
0	0 → 0.0
0	1 → 0.128
1	0 → 128.0
1	1 → 128.128

Q.6

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

I. Number of bit borrowed from Host-id

Ans: 8

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

Ans: 256

III. Number of Host/subnet Ans: 254

SM: 11111111.11111111.11111111.00000000

NID | SID | HID

No. of 1's = 24

NID+SID = 24

16+SID = 24

SID = 8 bit

No. of subnet = $2^8 = 256$

No. of 0's = 8

HID = 8 bit

No. of Host/subnet = $2^8 - 2$

Subnet id's

173.173. ---------- . ----------

SID HID

173.173. 00000000 . 00000000 → 173.173.0.0

173.173. 00000001 . 00000000 → 173.173.1.0

.00000010 . 00000000 → 173.173.2.0

.00000011 . 00000000 → 173.173.3.0

.

.

.

.

.

173.173. 11111111 . 00000000 → 173.173.255.0

Problem Solving

Q. Which of the following is the default mask for the address 198.0.46.201? (Assuming Classful addressing scheme is followed)

Class-C (192-223)

A. 255.0.0.0

B. 255.255.255.0 ✓

C. 255.255.0

D. 255.255.255.255

Default Subnet Mask
255.255.255.0

Q. If a class B network on the Internet has a subnet mask of 255.255.248.0. What is the maximum number of hosts per subnet? (Assuming Classful addressing scheme is followed)

GATE 2008

A. 1022

B. 1023

C. 2046 ✓

D. 2047

class-B

11111111.11111111.11111000.00000000

HID = 11 bit

Max. No. of Host/subnet = $2^{11} - 2$

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

$= 2 * 1024 - 2$

$= 2048 - 2$

$= 2046$

Q. A subnet has assigned a subnet mask of 255.255.255.192. What is the maximum number of hosts that can belong to this subnet ?

GATE 2004

A. 14

B. 30

C. 62 ✓

D. 126

11111111.11111111.11111111.11000000

HID = 6 bit

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

= 62

Q. In a class B network on the Internet has a subnet mask of 255.255.240.0. What is the maximum number of hosts per subnet? (Assuming Classful addressing scheme is followed)

ISRO

A. 4096

B. 4094 ✓

C. 4092

D. 4090

11111111.11111111.1111 0000.00000000

HID = 12 bit

Max No. of Host/Subnet = $2^{12} - 2$

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

$4 * 1024 - 2$

$4096 - 2$

$= 4094$

Q. An organization has a class B network and wishes to form subnets for 64 departments. The subnet mask would be:

GATE 2005

A. 255.255.0.0

B. 255.255.64.0

C. 255.255.128.0

D. 255.255.252.0 ✓

Class-B

NID	HID
16	16

64 subnet

16	6	10
NID	SID	HID

No. of 1's in the SM = NID + SID = 16 + 6 = 22

No. of 0's in the S.M = HID = 10

11111111.11111111.11111100.00000000

255.255.252.0

Q. Consider default subnet mask for a network is 255.255.255.0.
How many number of hosts per subnet possible if 'm' bits are borrowed from Host ID (HID)

A. $2^{HID-m}-2$

B. 2^{HID}

C. $2^{HID} - m$

D. 2^{m}

Class-C

NID HID

m / SID HID-m / HID

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

Q. A university has LANs with 100 hosts in each LAN. If it uses class B then the subnet mask in Dotted Decimal Notation is _____.

No. of 1's in the SM = NID+SID
= 16+9 = 25

Class-B

NID	HID
16	16

No. of 0's in the S.M = HID = 7

11111111.11111111.11111111.10000000
255.255.255.128

100 Host in each LAN

NID	SID	HID
16	9	7

Q. A university has 150 LANs. Use Class B address and then the subnet mask in Doted Decimal notation is _____

subnet

class-B

SM = 11111111.11111111.11111111.00000000

255.255.255.0

NID	HID
16	16

150 LAN's or subnet

16	8	8
NID	SID	HID

No. OF 1's in the S.M = NID+SID = 16+8 = 24

" " 0's " " " = HID = 8


THANK YOU
GW
SOLDIERS !