CS & IT ENGINEERING

COMPUTER NETWORKS

IPv4 Addressing

Lecture No-25

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Topics to be Covered..

Problem Solving
On
Supernetting

Q.3

Consider routing table of an organization's router shown below:

Gate-2022-2m | MSQ

Subnet number	Subnet Mask	Next Hop
12.20.164.0	255.255.252.0	R1
12.20.170.0	255.255.254.0	R2
12.20.168.0	255.255.254.0	Interface 0
12.20.166.0	255.255.254.0	Interface 1
Default		R3

Which of the following prefixes in CIDR notation can be collectively used to correctly aggregate all of the subnets in the routing table?

A. 12.20.164.0/21

B. 12.20.164.0/22

C. 12.20.168.0/22

D. 12.20.164.0/20

I 12.20.164.0/22 [12.20.164.0 – 12.20.167.255]

II 12.20.170.0/23 [12.20.170.0 – 12.20.171.255]

III 12.20.168.0/23 [12.20.168.0 – 12.20.169.255]

IV 12.20.166.0/23 [12.20.166.0 – 12.20.167.255]

Soln: I 12.20.164.0/22, NID = 22 bit, HID = 10 bits

12.20.101001 | ----------

NID | HID

12.20.10100100.00000000 → 12.20.164.0

⋮

12.20.10100111.11111111 → 12.20.167.255

II 192.20.170.0/23

192.20.10101010.----------

NID HID

192.20.10101010.00000000 → 192.20.170.0

⋮

192.20.10101011.11111111 → 192.20.171.255

III 192.20.168.0/23, NID=23 bit, HID=9 bit

192.20.10101000.----------

HID

192.20.10101000.00000000 → 192.20.168.0

⋮

192.20.10101001.11111111 → 192.20.169.255

IV 12.20.166.0/23, NID=23bit, HID=9bit

12.20.1010011_.---------

NID HID

12.20.10100110.00000000 → 12.20.166.0

⋮

12.20.10100111.11111111 → 12.20.167.255

Network IV is the Part of Network I. So we can just ignore network IV

I : 12.20.164.0/22

II : 12.20.170.0/23

III : 12.20.168.0/23

12.20.164.0/22
12.20.168.0/23
12.20.170.0/23

① Contiguous (True)

② same size = 2^9 & No. of n/w's = $2 = 2^1$ (T)

③ Total size of supernet = $2^9 + 2^9 = 2^{10}$

12.20.10101000.00000000 | 210 (T)

Rom or HID

Total size of supernet = 2^{10}

HID = 10bit, NID = 32-10 = 22bit

12.20.164.0/22
12.20.168.0/22

① Contiguous (True)

② same size = 2^{10} & No. of n/w's = $2 = 2^1$

③ Total size of subnet = $2^{10} + 2^{10} = 2^{11}$

12.20.10100100.00000000 | 2^{11} (False)

Rem 08 HID

Supernetting in Classfull addressing

Q.1

A company needs 600 addresses. Which of the following set of class C blocks can be used to form a supernet for this company?

A) 198.47.32.0 198.47.33.0 198.47.50.0

B) 198.47.32.0 198.47.42.0 198.47.52.0 198.47.62.0

C) 198.47.31.0 198.47.32.0 198.47.33.0 198.47.52.0

D) 198.47.32.0 198.47.33.0 198.47.34.0 198.47.35.0

① Contiguous (True)

② Same size $= 2^8$ & No. of N/w's $= 4$ (True)

③ Total size of subnet $= 2^8 + 2^8 + 2^8 + 2^8 = 2^{10}$

198.47.32.0

198.47.00100000.00000000 | 2^{10} (True)

Rem of HID

Q.2

Consider 4 networks 199.202.0.0, 199.202.1.0, 199.202.2.0, 199.202.3.0 and perform CIDR aggregation to select one of the following supernet mask.

class-c

(A) 255.255.252.0

(B) 255.255.255.252

(C) 255.255.252.255

(D) None of these

① contiguous (True)

② same size = 2^8 & No. of n/w's = 4 = 2^2 (T)

③ Total size of supernet = $2^8+2^8+2^8+2^8$ = 2^{10}

199.202.00000000.00000000 | 2^{10} (T)

Rest or HID

Total size of supernet = 2^{10}

HID = 10 bit, NID = 32 − 10 = 22 bit

supernet mask = 11111111.11111111.11111100.00000000

255.255.252.0

No. OF 1's = 22

Q.3

The mask is 255.255.252.0 can probably be used in class A ,Class C ,Class B respectively.

Subnet mask Supernet mask Subnet mask

(A) Subnet mask ,supernet mask ,subnet mask

(B) Subnet mask ,subnet mask ,supernet mask

(C) Supernet mask ,subnetnet mask ,subnet mask

(D) Subnet mask ,subnet mask ,subnet mask

Q.4 In class C, if supernet mask is 255.255.224.0 then the number of class C networks combined to from supernet is

class-C

Supernet mask = 11111111.11111111.11100000.00000000

NID | HID

Supernet bits = 5

No. of n/w's that must be combined = $2^5 = 32$

Default subnet Mask (For class-C)

11111111.11111111.11111111.00000000

NID | HID

A. 16

B. 32

C. 64

D. 22

Q.5 In class C, if supernet Mask is 255.255.252.0. How many number of networks that can be joined ___4___

class-c

NID | HID

Supernet Mask = 11111111.11111111.11111100.00000000

Supernet bits = 2

No. of n/w's that can be Joined = $2^2 = 4$

Q.6

One of the address of a supernet is given as IP- 201.99.89.113 and Supernet mask is 255.255.252.0

What will be the range of supernet?

64+16+8+1

IPAdd = 201.99.89.113

AND

Supernet Mask = 255.255.252.0

128+64+32+16+8+4

Supernet-id = 201.99.88.0

AND

(A) ✓ 201.99.88.0 - 201.99.91.255

(B) 201.99.81.0- 201.99.92.254

(C) 201.99.255.255- 201.99.0.0

(D) None of the Above

Subnet Mask = 11111111.11111111.111111|00.00000000

NID | HID

Subnet bits = 2

No. of N|w's must be combined = $2^2 = 4$

201.99.010110__.__ __ __ __ __ __ __ __

__ : Subnet bits

__ __ __ __ __ __ __ __ : HID

N_1 : 00

N_2 : 01

N_3 : 10

N_4 : 11

N_1: २०१.१९.०१०११०<u>००</u>.०००००००० → २०१.१९.४४.०

२०१.१९.०१०११०<u>००</u>.११११११११ → २०१.१९.४४.२५५

N_2: २०१.१९.०१०११०<u>०१</u>.०००००००० → २०१.१९.४९.०

२०१.१९.०१०११०<u>०१</u>.११११११११ → २०१.१९.४९.२५५

N_3: २०१.१९.०१०११०<u>१०</u>.०००००००० → २०१.१९.९०.०

२०१.१९.०१०११०<u>१०</u>.११११११११ → २०१.१९.९०.२५५

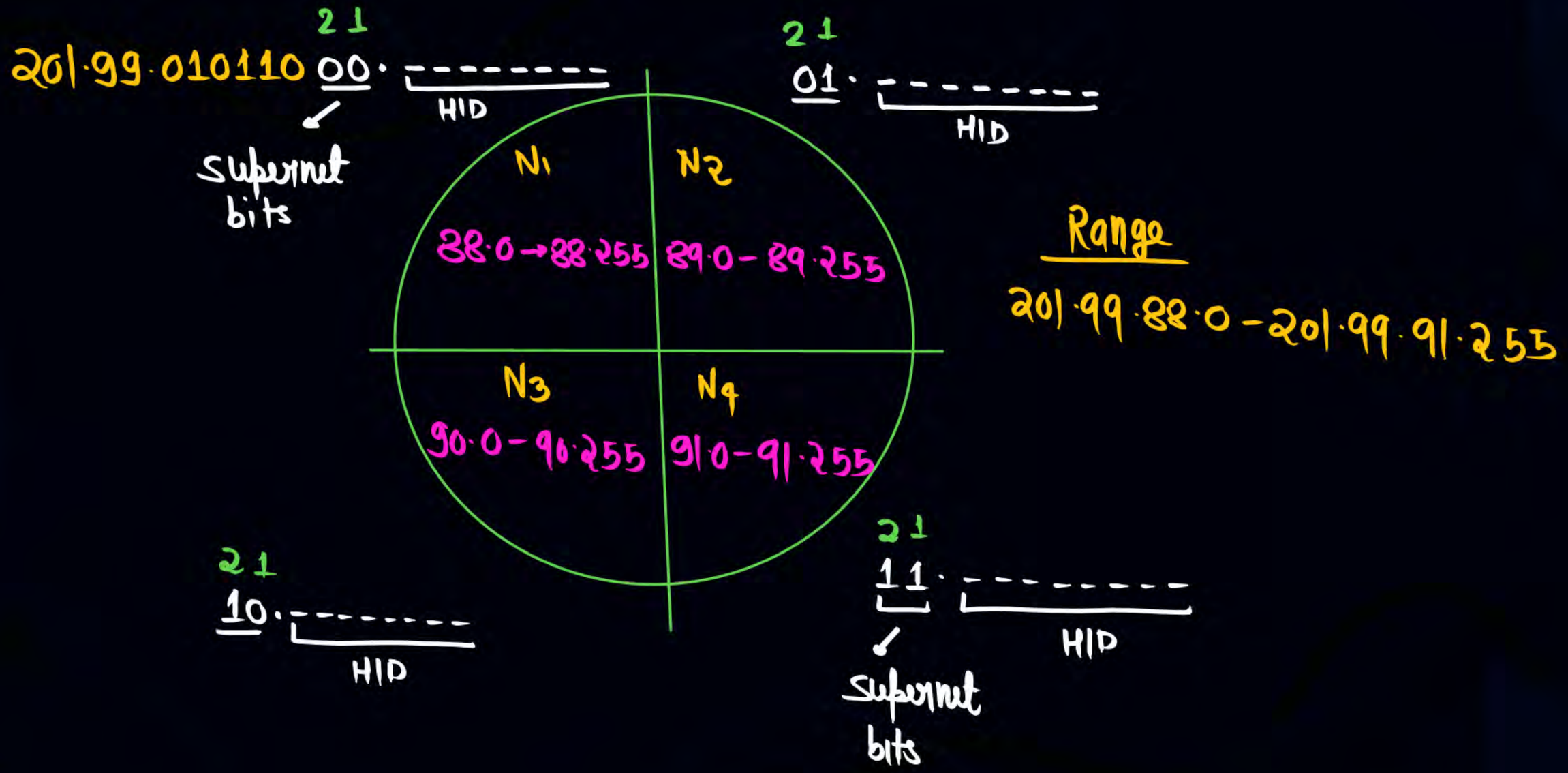
N4: २०|.९९.०१० ११० ११.०००००००→ २०|.९९.३|.०

:

२०|.९९.०१० ११० ११.११११११११ → २०|.९९.३|.२५५

Range → २०|.९९.४४.० → २०|.९९.३|.२५५

OR



Range

201.99.88.0 - 201.99.91.255

Q.7

If default subnet mask for a network is 255.255.255.0 and if 'm' bits are borrowed from the Network ID (NID), then what could be its supernet mask?

NID | HID

11111111.11111111.11111111.00000000

M=4

A. $255.255.(2^{8-m}-1) \times 2^{m}.0$

B. $255.255.(2^{8-m}) \times 2^{m}.0$

C. $255.255.(2^{8-m-1}) \times 2^{m-1}.0$

D. $255.255.(2^{8-m}) \times 2^{m-1}.0$

Supernet Mask = 11111111.11111111.1111|0000.00000000

Supernet bits = 4

= 255.255.240.0

(a) $(2^{8-M}-1)*2^{M}$

$(2^{8-4}-1)*2^{4} = 15*16 = 240$

(b) $(2^{8-m}) * 2^{m}$

$(2^{8-4}) * 2^{4}$

$2^{4} * 2^{4} = 2^{8} = 256$

(c) $2^{(8-m-1)} * 2^{m-1}$

$2^{(8-4-1)} * 2^{4-1}$

$2^{3} * 2^{3} = 2^{6} = 64$

MCQ

An organization requires a range of IP addresses to assign one to each of its 1500 computers. The organization has approached an Internet Service Provider (ISP) for this task. The ISP uses CIDR and serves the requests from the available IP address space 202.61.0.0/17. The ISP wants to assign an address space to the organization, which will minimize the number of routing entries in the ISP's router using route aggregation. Which of the following address spaces are potential candidates from which the ISP can allot any one to the organization?

I. 202.61.84.0/21
II. 202.61.104.0/21
III. 202.61.64.0/21
IV. 202.61.144.0/21

[GATE-2020-CN: 2M]

A. I and II only
B. II and III only
C. III and IV only
D. I and IV only

202.61.0.0/17

NID = 17 bits, HID = 32 - 17 = 15 bits

202.61.0 | 00000000.00000000

8 + 8 + 1

NID | HID

HID

201.61.0 | ---------.---------

201.61.0 | 0000000.00000000 → 201.61.0.0

⋮

201.61.0 | 1111111.11111111 → 201.61.127.255

X I: 201.61.84.0/21 , NID = 21 bit, HID = 32-21 = 11 bit, Block size = 2^{11}

201.61.01010 100.00000000 / 2^{11}

Rem of HID

First IP Address of the Block must be div. by size of the Block

1500 computers we need HID minimum 11 bits

✓ II 201.61.104.0/21 , NID = 21 bit , HID = 11 bit

201.61.01101 000.00000000 / 2^{11}

Rem of HID

III ✓ 201.61.64.0/21, NID = 21 bit, HID = 11 bit

201.61.01000000.00000000/211

Rem of HID

THANK YOU!