CS & IT ENGINEERING

COMPUTER NETWORKS

IPv4 Addressing

Lecture No-24

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Topics to be Covered..

Problem Solving
On
Supernetting

Q.1 Perform CIDR aggregation on the following IP addresses

57.6.96.0/21, HID=11 bit

57.6.104.0/21, HID=11 bit

57.6.112.0/21, HID=11 bit

57.6.120.0/21, HID=11 bit

① NID must be contiguous (True)

② same size = 2^{11} ⇐ No. of n/w's = $4 = 2^2$ (T)

③ Total size of subnet = $2^{11}+2^{11}+2^{11}+2^{11}$
$= 4*2^{11} = 2^{13}$

56.6.011 00000.00000000 | 2^{13} (T)

Rem of HID

(A) 57.6.96.0/21

(B) 57.6.96.0/20

(C) 57.696.0/19 ✓

(D) 57.6.96.0/18

Supernet id = 1st IP Address Always

= 57.6.96.0

Total size of supernet = 2^{13}

HID = 13 bit, NID = 32 - 13 = 19

Final Ans: 57.6.96.0/19

Supernet Mask = 11111111.11111111.11100000.00000000 = 255.255.224.0

Q.2

Perform CIDR aggregation on the following IP addresses

194.24.0.0/21, HID=11bit, (3+8)

194.24.8.0/21, HID=11bit, (3+8)

194.24.16.0/20, HID=12bit,

① NID must be contiguous (True)

② same size (False)

A. 194.24.0.0/19

B. 194.24.0.0/21

C. 194.24.0.0/20

D. 194.24.0.0/22

194.24.0.0/21
194.24.8.0/21
194.24.16.0/20

① Contiguous (True)

② Same size = 2^{11} & No of n/w's = 2 = 2^1 (T)

③ Total size of supernet = $2^{11}+2^{11} = 2*2^{11} = 2^{12}$

194.24.0000 0000.00000000 | 2^{12} (T)

Rem or HID

Subnet id = 194.24.0.0

Total size of supernet = $2^{11}+2^{11} = 2^{12}$

HID = 12 bit, NID = 20 bit

194.24.0.0/20 → HID = 12 bit

194.24.16.0/20 → HID = 12 bit

① Contiguous (True)

② Same size = 2^{12} & No of n/w's = 2 = 2^1

Total size of subnet = $2^{12} + 2^{12} = 2^{13}$

194.24.0000000.00000000 | 2^{13}

Rem or HID

Subnet id = 194.24.0.0

Total size of subnet = 2^{13}

HID = 13 bit, NID = 32 - 13 = 19 bit

Final Ans: 194.24.0.0/19

Q.3

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

H·W

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

12·20 164·0 | 22
12·20 170·0 | 23
12·20 168·0 | 23
12·20 166·0 | 23

21
22

Supernetting in Classfull addressing

Ex – 1

N_1: 200.96.86.0 (N | H)

N_2: 200.96.87.0 (N | H)

N_3: 200.96.88.0 (NID | H)

N_4: 200.96.89.0 (NID | H)

Soln: class-C

NID	HID
24	8

① NID must be contiguous

② same size $= 2^8$ & No. of n/w's $= 4 = 2^2$

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

200.96.010101 | 10.00000000 | 2^{10} (F)

Rem of HID

Supernetting Not possible

Ex – 2

N_1: 198.47.32.0 (N | H)

N_2: 198.47.33.0 (N | H)

N_3: 198.47.34.0 (N)

N_4: 198.47.35.0 (N)

Class-C

NID	HID
24	8

① NID must be contiguous (True)

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

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

198.47.00100000.00000000 | 2^{10} (T)

Rem of HID

Supernet id = 198.47.32.0

Total size of supernet = 2^{10}

HID = 10 bit, NID = 32 − 10 = 22 bit

NID HID

Subnet Mask = 11111111.11111111.111111|00.00000000 = 255.255.252.0

Subnet bit = 2

No. of Networks that must be combined = $2^2 = 4$

Class-C

Default subnet Mask: 255.255.255.0

NID HID

11111111.11111111.11111111.00000000

NID HID

Ex – 3

128.56.24.0
NID HID

128.56.25.0
NID HID

128.56.26.0
NID HID

128.56.27.0
NID HID

Class-B

NID	HID
16	16

We can't apply supernetting on single N|w

Ex – 4

128.56.0.0
N H
128.57.0.0
N H
128.58.0.0
N H
128.59.0.0
N H

Class-B

NID	HID
16	16

① NID must be contiguous (True)

② same size = 2^{16} & No. of n/w's = 4 = 2^2

③ Total size of supernet = $2^{16}+2^{16}+2^{16}+2^{16}$
$= 4*2^{16} = 2^{18}$

128.00111000.0000000.00000000 | 2^{18} (True)

Rem or HID

Supernet id = 198.56.0.0

Total size of supernet = 2^{18}
HID = 18 bit, NID = 14 bit

NID HID

Subnet Mask = 11111111 · 111111|00 · 00000000 · 00000000 = 255 · 252 · 0 · 0

Subnet bits = 2

No of n/w's must be Combined = $2^2 = 4$

Class-B

Default subnet Mask = 255 · 255 · 0 · 0 (NID | HID)

11111111 · 11111111 · 00000000 · 00000000 (NID | HID)

Subnet Mask	Supernet Mask
(1) No. of 1's in the subnet Mask either equal to NID bits or more than NID bits	(1) No. of 1's in the supernet mask always less than NID bits
(2) Subnet mask is applicable for single n/w OR subnetting is Applicable For single n/w	(2) Supernet mask is applicable for two or more network OR supernetting is applicable For two or more n/w
(3) In subnetting we borrowed from Host ID	(3) In supernetting we borrowed from network-ID
Default Subnet Mask (N)	

ClassA: 255.0.0.0
Class-B: 255.255.0.0
Class-C: 255.255.255.0

255.192.0.0 (No. of 1's = 10)

11111111.11000000.00000000.00000000

NID SID

Class-A → subnet mask

Address	class-A	class-B	class-C
255.0.0.0 → 8 → 1's	Subnet mask	Supernet mask	Supernet mask
255.255.252.0 → 22	Subnet mask	Subnet mask	Supernet mask
255.255.255.0 → 24	Subnet mask	Subnet mask	Subnet mask
255.255.255.224 → 27	Subnet mask	Subnet mask	Subnet mask

THANK YOU!