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BCSE308L
Computer Networks
Digital Assignment -2

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1. An organization is granted the block 16.0.0.0/8. The administrator wants to create 500 fixed-length subnets.

a. Find the subnet mask.
b. Find the number of adresses in each subnet.
c. Find the first and last addresses in subnet 1.
d. Find the first and last addresses in subnet 500.

Solution;

a) $\log_2 500 = 8.95$

Extra 1s = 9

$2^9 = 512$, meaning possible subnets : 512

Mask = 8 + 9 = 17

b) $2^{32-17} = 2^{15} = 32,768$ addresses per subnet.

c) The first address in address in the beginning addresses of the block or 16.0.0.0. To find the last address, we need to write 32,767 (one less than the number of addresses in each subnet) in base 256 (0.0.127.255) and add it to the first address (in base 256)

First address in subnet 1: 16.0.0.0
Number of addresses : 0.0.127.255
Last address in subnet 1: 16.0.127.255

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d) Subnet 500:

500 is last subnet used by the organization.

499 × 32,768 in base 256.

16.0.0.0 + 0.249.128.0

= 16.249.128.0

First address in subnet 500 : 16.249.128.0
Number of addresses : 0.0.127.255
Last address in subnet 500 : 16.249.255.255

2. An organization is granted the Block 211.17.180.0/24
The administrator wants to create 32 subnets

a) Find the subnet mask
b) Find the number of addresses in each subnet.
c) Find the first and last addresses in subnet 1
d) Find the first and last addresses in subnet 32.

Solution;

a) $\log_2 32 = 5$ Extra 1s = 5 Possible subnets = 32
Mask = 24+5 = 29

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b) $2^{32-29} = 2^3 = 8$ Addresses per subnet.

c) Subnet 1:

block beginning addresses : 211.17.180.0
one less than 8 = 7

First address in subnet 1: 211.17.180.0
Number of addresses : 0.0.0.7
Last addresses in subnet 1: 211.17.180.7

d) Subnet 32.

31×8 = 248 in base 256.

0.0.0.248.

Meaning first address:

211.17.180.248

last address:
211.17.180.255 (+7).

3. An ISP is granted a block of addresses starting with 150.80.0.0/16. The ISP wants to distribute these blocks to 2600 customers as follows:

a) The first group has 200 medium sized businesses; each needs 128 addresses.
b) The second group has 400 small businesses; each needs 16 addresses.
c) The third group has 2000 household, each needs 4 addresses
Design the subblocks and give the slash notation for each subblock.
Find out how many addresses are still available after these allocations.

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Solution;

Total number of addresses in this block is $2^{32-16} = 65536$

Divided in groups.

Group 1.
- 200 businesses
we augment to 256

total number of address is 256×128
$= 32768$

each customer needs 128 address.

$\log_2 128 = 7.$

prefix length $= 32 - 7 = 25$

1st customer : 150.80.0.0/25 to 150.80.0.127/25
2nd customer : 150.80.0.128/25 to 150.80.0.255/25
⋮
200th customer : 150.80.99.128/25 to 150.80.99.255/25

Unused addresses : 150.80.100.0 to 150.80.127.255

we address = $200 \times 128 = 25600$

56 reserved

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Group 2.

400 businesses.

augment till 512

total number of addresses is 512×16
$= 8192$.

$\log_2 16 = 4$

prefix length $= 32 - 4 = 28$

1st customer: 150.80.128.0/28 to 150.80.128.15/28.

2nd customer: 150.80.128.16/28 to 150.80.128.31/28

⋮

400th customer: 150.80.152.240/28 to 150.80.152.255/28

Used $= 400 \times 16 = 6400$

1792 reserved.

Group 3.

2000 households.
augment till 2048.
total number of addresses $= 2048 \times 4$
$= 8192$
each customer needs 4 addresses.
$\log_2 4 = 2$

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The prefix length 32-2 = 30

1st customer: 150.80.160.0/30 to 150.80.160.3/30
2nd customer: 150.80.160.4/30 to 150.80.160.7/30

.
.

~~Last~~.
2000th customer: 150.80.191.60/30 to 150.80.191.63/30

Unused addresses 150.80.191.64 to 150.80.191.255

Used = 2000 × 4 = 8000

Reserved = 192

In reserved range, in total, there are 16384 addresses totally unused.

4. Can you explain why the vulnerable time in ALOHA depends on T_{pf}' but in CSMA depends on T_p.

Solution;

In an ALOHA network, the "vulnerable time" is the period during which a packet is at risk of collision with another packet transmission. For ALOHA, this vulnerable time is related to the packet transmission time (T_{pf}'). The reason is that ALOHA does not sense the channel before transmitting; it simply transmits whenever a node has data to send.

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Consequently, the vulnerable time becomes twice the packet duration ($2 * T_{pf}$), since a collision can occur if another node starts transmitting within a period of one packet transmission time before or after the start of the current transmission.

On the other hand, CSMA networks attempt to avoid collisions by sensing the channel before transmitting. The vulnerable time in CSMA depends on the propagation delay (T_p). This delay (T_p) is the time it takes for a signal to travel between the nodes in the network. In CSMA, a collision can only occur if another node starts transmitting within the propagation delay. Therefore, the critical window where collisions are possible is equivalent to the propagation delay rather than the packet duration.