CSE 5004

COMPUTER NETWORKS

Assessment – 4

L1+L2 | SJT418

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by

SHARADINDU ADHIKARI

19BCE2105

sharadindu.adhikari2019@vitstudent.ac.in

Question 1

1) Subnet the IP address 205.11.2.0 (Class C) into 30 subnets.
   - What is the maximum number of hosts' subnet mask?
   - What is the maximum number of hosts per subnet?
   - What is host 3's IP address on subnet 2?

Solution:

A1) Given,

class C IP address = 205.11.2.0

No. of subnets = 30

- we know that in class C, 24 bits are given to the network ID part and 8 bits are given to the host ID part.

No. of bits required for subnetting = $\text{ceil}(\log_2 30)$

No. of bits required for subnetting = 5 bits

Now, 29 bits will be given to network ID and subnet ID part and 3 bits will be given to the host ID part.

Calculating subnet mask:

Given IP address in binary = 11001101. 00001011. 00000010. 00000000

Putting all 1s in network ID part and subnet ID part and all 0's in host ID part, we get:

Subnet mask in binary as = 11111111. 11111111. 11111111. 11111000

∴ subnet mask = 255. 255. 255. 248

- Calculating the no. of hosts on each subnet:

we've 3 bits for host ID, no. of hosts with 3 bits

$= 2^3 - 2$

$= 6$

- Calculating IP address of hosts 3 on subnet 2 :

Subnet 2 bits = 00010

Hosts 3 bits = 011

IP address = 11001101. 00001011. 00000010. 00010011

∴ IP address = 205.11.2.19

I've explained each & every step / part with the help of statements attached to it.

Question 2

2) Provided the 255.255.255.192 subnet mask. What are the hosts and subnet addresses for the IP address 197.1.2.67?

Solution:

A2.

IP address = 197.1.2.67

Subnet mask = 255.255.255.192

= /26

⇒ 197.1.2.67 /26

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

No. of hosts per subnet = $2^6 - 2 = 64 - 2 = 62$

192 in binary = 11000000

67 in binary = 01000011

Host range : 197.1.2.65 – 197.1.2.126

Broadcast address = 197.1.2.127

Subnet mask = 11111111.11111111.11111111.11000000

192 → 11 000000

67 → 01 0000 11

bits are:
00, 01, 10, 11
1 3

∴ Subnet = 1

and Host address = 3

Question 3

3) Use the subnet mask 255.255.254.0 on the following IP addresses, and then convert them to CIDR forms:
(a) 191.168.6.0
(b) 173.168.28.45
(c) 139.189.91.190

Solution:

A3. ⓐ Convert to CIDR:

Given subnet mask = 255.255.254.0

Subnet mask is used to identify network address of an IP address by performing bitwise AND operation on the netmask.

A subnet mask is a 32-bit number that masks an IP address and divides the IP address, network address and host address.

CIDR: classless Inter-Domain Routing is an alternating to a traditional subnetting.

Bit representation of the given subnet mask:

11111111. 11111111. 11111110. 00000000

No. of 1s = 23.

(a) 191.168.6.0 / 23

This means that first 23 bits of the IP address given are for Network Routing.

Similarly,

(b) 173.168.28.45 / 23

(c) 139.189.91.190 / 23

Question 4

4) A subnet with the prefix 143.117.30.128/26 belongs to a specific business.
(a) Provide an example of an IP address used by the company.
(b) Assume the company needs to downsize and intends to partition its IP address block into three new subnets, each with the same number of IP addresses.

Solution:

A4. 143.117.30.128 /26

This given IP address is Classless Inter-domain routing, known as CIDR.

According to CIDR, the above IP address tells us that this IP's first 26 bits are its Network ID and we can't change those.

This is, IF we convert it to binary form, it will look like

143.117.30.128 ⟹ **10001111.01110101.00011110.10000000**

In bold, 26 bits are network ID; we can't change them.

(a) So, one IP address from this range is:

10001111.01110101.00011110.10000000

we can put any combination of 0 and 1 in non-bold part, except all 0s and all 1s [those are used as network address and broadcast address respectively].

In this case, we choose: **10001111.01110101.00011110.10001011**

Converting it into decimal format, we get:

143.117.30.139 /26

(b) So currently, we've :-

Subnet address	Netmask	Range of addresses	Useable IPs	MAX hosts	Join
143.117.30.128/26	255.255.255.192	143.117.30.128 to 143.117.30.191	143.117.30.129 to 143.117.30.190	62	/26

From the remaining 6 bits, if we choose 1 bit as subnet ID, we can create only $2^1 = 2$ equal-sized subnets.

But, we need 3 subnets ; as we need all equal sized subnets, we've to use **2 bits as host ID** but it will create $2^2 = 4$ equal sized subnets. which are :-

Subnet address	Netmask	Range of addresses	Useable IPs	Hosts	Join
143.117.30.128/28	255.255.255.240	143.117.30.128 to 143.117.30.143	143.117.30.129 to 143.117.30.142	(14)	/28 /27 /26
143.117.30.144/28	255.255.255.240	143.117.30.144 to 143.117.30.159	143.117.30.145 to 143.117.30.158	(14)	/28
143.117.30.160/28	255.255.255.240	143.117.30.160 to 143.117.30.175	143.117.30.161 to 143.117.30.174	(14)	/28 /27
143.117.30.176/28	255.255.255.240	143.117.30.176 to 143.117.30.191	143.117.30.177 to 143.117.30.190	(14)	/28

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So, if we use 3 equal size subnets, we waste 1 subnet.