Lab 05B – Subnetting

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INTRODUCTION

The purpose of this lab is to allow the user to practice subnetting a network. Moreover, to outline the subnet's characteristics.

PROCESS

Below is the target IP address I will be using for this lab (*Figure 1*).

New Problem	Target IP address	219 . 132 . 124 . 229 / 26

	IP address	Check/Show	Answer	Correct?
Network	. . .	Check Show	. . .	
First Host	. . .	Check Show	. . .	
Last Host	. . .	Check Show	. . .	
Broadcast	. . .	Check Show	. . .	
Next Subnet	. . .	Check Show	. . .	
Check or Show ALL		Check Show		

Figure 1: My target IP address

Here, using an online converter from *rapidtables.com* [1], I translated the four octets into binary:

`11011011.10000100.01111100.11100101`

Using a Cheat Sheet obtained from *practicalnetworking.net* (*Figure 2*), I determined my subnet mask was `255.255.255.192` by observing for the **Subnet** associated with **CIDR /26** of my target IP address [2].

Group Size	128	64	32	16	8	4	2	1
Subnet	128	192	224	240	248	252	254	255
CIDR	/25	/26	/27	/28	/29	/30	/31	/32

Figure 2: Cheat Sheet from practicalnetworking.net

`255.255.255.192` converted to binary: `11111111.11111111.11111111.11000000`
(Binary Subnet Mask)

To mask the first 25 bits, I used the binary Target IP address and Subnet Mask.

Target IP Address:	11011011	10000100	01111100	11100101
Mask:	11111111	11111111	11111111	11000000
Subnet:	11011011	10000100	01111100	11000000

Resulting in binary subnet: 11011011.10000100.01111100.11000000

11011011.10000100.01111100.11000000 converted into IPv4 is 219.132.124.192.

In order to figure out my First Host, Network, Broadcast, Last Host, and Next Subnet addresses I needed to recall the Cheat Sheet I obtained from *practicalnetworking.net* (*Figure 3*). Observing **CIDR /26**, I determined that the **Group Size** was **64**; therefore, I would start with ".0" and increase by .64 until I passed my **Target IP Subnet**, **192**, to figure out the aforementioned IP addresses.

Group Size	128	64	32	16	8	4	2	1
Subnet	128	192	224	240	248	252	254	255
CIDR	/25	/26	/27	/28	/29	/30	/31	/32

Figure 3: Cheat Sheet from practicalnetworking.net

Target IP:	219	.	132	.	124	.	229	/	26	
	219	.	132	.	124	.	0			
	219	.	132	.	124	.	64			
	219	.	132	.	124	.	128			
Network:	219	.	132	.	124	.	192			
	~~219~~	.	~~132~~	.	~~124~~	.	~~256~~			
Next Subnet:	219	.	132	.	125	.	0			

Here, based on the Cheat Sheet, I increased by **Group Size**, **64**, until I passed the **Target IP**.

Based upon the above results I know my network address is 219.132.124.192.

To find my First Host I simply +1 to last octet of the network address, which would be 219.132.124.193, which is also the number after the Network IP.

Observing the above results, I ran into an erroneous result ending in .256. .256 is not a valid IP address. Each octet in an IP address can only from 0 to .255. So, .256 becomes .0 and I had to increase the next octet from .124 to .125, which creates the Next Subnet address 219.132.125.0

Next, I determined the Broadcast address by determining the IP right before the Next Subnet, which is 219.132.124.255.

Lastly, I determined the Last Host, which is the number before the Broadcast IP, `219.132.124.254`. I simply `-1` from the last octet of the Broadcast address.

Below is the screen shot of the IP address table from *subnetipv4.com* to validate my results from above (*Figure 4*).

New Problem	Target IP address	219 . 132 . 124 . 229 / 26

	IP address	Check/Show	Answer	Correct?
Network	219 . 132 . 124 . 192	Check Show	219 . 132 . 124 . 192	YES
First Host	219 . 132 . 124 . 193	Check Show	219 . 132 . 124 . 193	YES
Last Host	219 . 132 . 124 . 254	Check Show	219 . 132 . 124 . 254	YES
Broadcast	219 . 132 . 124 . 255	Check Show	219 . 132 . 124 . 255	YES
Next Subnet	219 . 132 . 125 . 0	Check Show	219 . 132 . 125 . 0	YES
Check or Show ALL		Check Show		

Figure 4: Completed target IP address table

To figure out how many IP addresses are usable in my subnet I performed the following calculations:

There are 32 bits in all IP addresses. The number of host bits is equal to the number of network bits. In my case, this is `32 - 26 = 6`

The first address and last address are reserved. So, I can use the formula $2^{\text{number of host bits}} - 2$

$2^6 - 2 = 62$

Therefore, there are `62` IP addresses that are usable in my subnet.

According to *techrepublic.com*, to determine the number of subnets, use the 2^x-2, where the x exponent is the number of subnet bits in the mask. Moreover, I used a chart (*Figure 5*) sourced from the same site to determine what masks can be used with Class C networks. [3]

Mask	Binary	# Subnet bits	# Host bits	Subnets	Hosts
255.255.255.128	10000000	1	7	2	126
255.255.255.192	11000000	2	6	2	62
255.255.255.224	11100000	3	5	6	30
255.255.255.240	11110000	4	4	14	14
255.255.255.248	11111000	5	3	30	6
255.255.255.252	11111100	6	2	62	2

Figure 5: Only masks that can be used with Class C networks

Therefore, $2^2 - 2 = 2$ subnets available in my network.

LIMITATIONS/CONCLUSION

The lab's difficulty was fairly simple. I do not assess there were any limitations because everything was executed in a live environment versus a controlled environment. Moreover, there were plenty of online resources to guide the user. This biggest takeaway from the lab was learning how to take a network and dividing it into sub-networks.

REFERENCES

[1] RapidTables [Online]. "Online Calculators & Tools". Available: https://www.rapidtables.com/convert/numeber/decimal-to-binary.html [Accessed: 09-Oct-2022].

[2] Harmoush [Online]. "Subnetting Mastery", September 21, 2021. Available: https://www.practicalnetworking.net/stand-alone/subnetting-mastery/ [Accessed: 09-Oct-2022].

[3] Toddlammie, *Networking* [Online]. "Subnetting a Class C network address, May 24, 2001. Available: https://www.techrepublic.com/article/subnetting-a-class-c-network-address/ [Accessed: 09-Oct-2022].

COLLABORATION

The entirety of this lab was executed independently by the author. No additional collaboration to report.