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Course : CSEC 600 Introduction to Cyber Security

Title : Networking 1

Lab : 3

Chapter : 6(TCP/IP Basics)

Exercise 1 :

Step 1 :

IP address

192 = 11000000
168 = 10101000
5 = 00000101
1 = 00000001

Subnet mask

255 = 11111111
255 = 11111111
255 = 11111111
0 = 00000000

Step 2 :

IP address

10 = 00001010
1 = 00000001
52 = 00110100
7 = 00000111

Subnet mask

255 = 11111111
0 = 00000000
0 = 00000000
0 = 00000000

Ip address

172 = 10101100
16 = 00010000
213 = 11010101
111 = 01101111

Subnet mask

255 = 11111111
255 = 11111111
0 = 00000000
0 = 00000000

Step 3 :

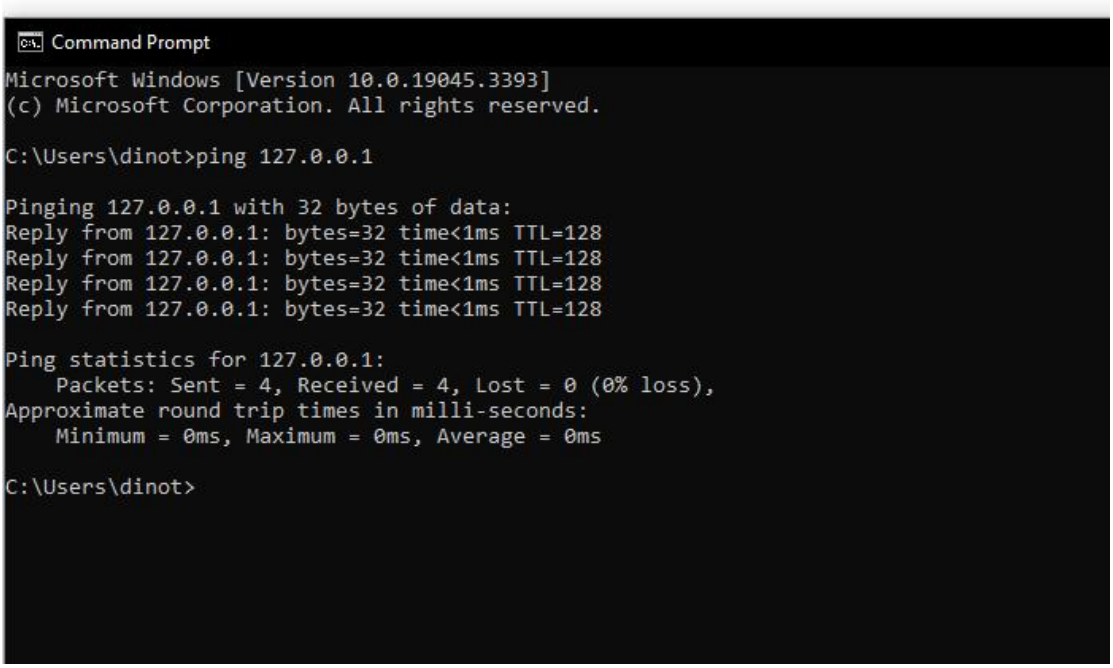
Ip address	Ip address Range	Purpose
Class A	1.0.0.0 - 126.255.255.255	Government
Class B	128.0.0.0 - 191.255.255.255	Medium computing
Class C	192.0.0.0 - 223.255.255.255	Small Computing

Class D	224.0.0.0 - 239.255.255.255	Research purpose
Class E	240.0.0.0 - 254.255.255.255	Experiment

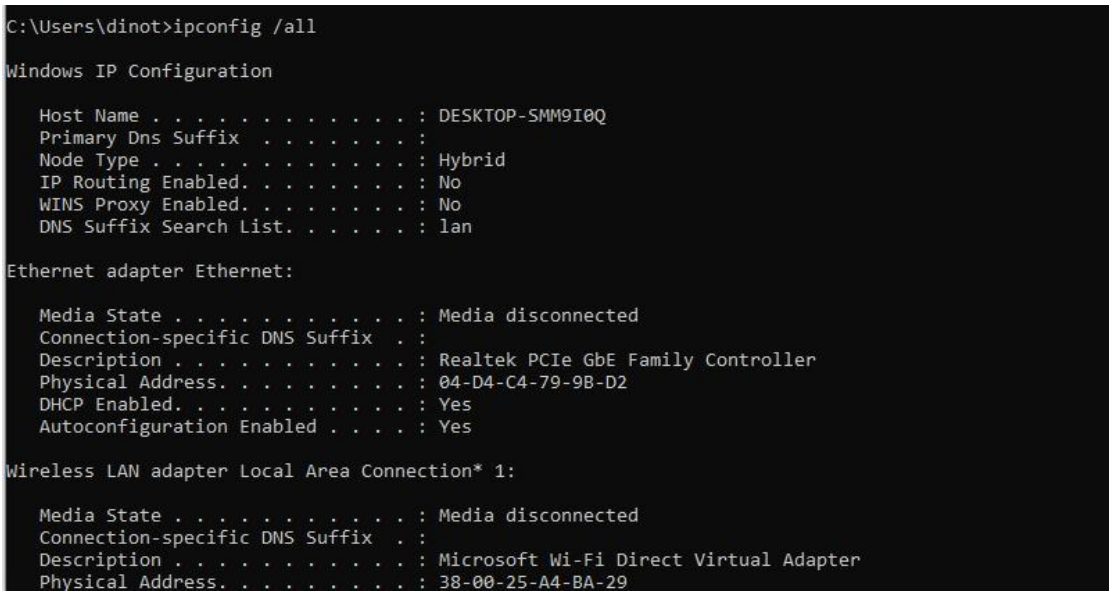
Step 4 :

Private Ip range	Prefix	Purpose
10.0.0.0 - 10.255.255.255	10/8	It is default private address
172.16.0.0 - 172.31.255.255	172.16/12	It is internal address (private)
192.168.0.0 - 192.168.255.255	192.168/16	It is Broadcast address

Step 5



Step 6



Step 7
Subnet mask is used to divide the IP address into two parts one is network id and host id. It is used to know the destination whether the IP is on same network or another network.

Step 8

IP address Class	Default subnet mask
Class A	255.0.0.0
Class B	255.255.0.0
Class C	255.255.255.0

Step 9

IP address	IP class	Network ID	Host ID
192.168.1.1	C	192.168.1.0	0.0.0.1
131.194.192.3	B		
45.200.49.201	A		
194.39.110.183	C		
208.154.191.9	C		
126.9.54.172	A		

Step 10

IP address Class	Number of networks	Number of Hosts per Network
Class A	16 Million	127
Class B	65000	16000 Networks
Class C	254	2 Million Networks

Exercise 2 :
Step 1

This Subnet mask has 16 bits of 0, as per the formula 2^16 - 2 = Total host will use this network ID.
2^16 - 2 = 65,534

Step 2
I) For atleast 50 subnets we should borrow 6 bits atleast which is 2^6 = 64 subnets.
II) If we borrow 6 bits from host 0 it will become 11111111.11111111.11111100.00000000 which equals to 255.255.252.0
III) 2^10 - 2 = 1022 Total host this subnet will support

Step 3

Subnet host	Decimal and binary value	No of subnet	No of class A host	No of class B host	No of class C host
Two bits	.192(11000000)	2^2 = 4	4,194,302	16,382	62
Three bits	.224(11100000)	2^3 = 8	2,097,150	8,190	30
Four bits	.240(11110000)	2^4 = 16	1,048,574	4,094	14
Five bits	.248(11111000)	2^5 = 32	524,286	2,046	6
Six bits	.252(11111100)	2^6 = 64	262,142	1,022	2
Seven bits	.254(11111110)	2^7 = 128	131,070	510	0 (No host)
Eight bits	.255(11111111)	2^8 = 256	65,534	254	-2 (No host)

Step 4

CIDR needed as there were three problems aroused because of IPv4 demerits and its limited IP addresses which are listed below :
1. Scaling was the main problem for example limitation of class B which is not enough for organization and wasting lot of IPs if we switch for next class which created problem for scaling IP address for organizations.
2. As Network grows faster as need of routers and increasing routers means, more storage at routing tables created problem to manage the data's in routing table as the hardware and software support was not enough.
3. Eventually the IPv4 32 bit address offers limited spots, particularly in the growing world of IOT devices and other automated devices, handling lot of IP's is important which easily depleted IPv4.

Solution for these problem given by CIDR :
1. Using Variable Length subnet masking, we can extend the subnet mask and able to handle and scale the IP address well .
2. Using the concept of supernetting the second problem was solved, that having separate IP points for particular countries to handle and allow such traffics.
3. Third problem is easily solved using IPv6 which offer 128 bits so that we can operate multiple devices and future proof.

Step 5 :
As subnet mask has 8 host bits only we will determine the IP match with first 8 bits for example
1. Invalid, because the Network ID should match with 192.168.5.0
2. Valid
3. Invalid, Because IP address should be unique at Network
4. Valid
5. Invalid, Network ID not matching
6. Invalid, Because it is Broadcast address.
7. Invalid, Network ID not matching
8. Invalid, Network ID not matching
9. Invalid, It is not assigned to host 192.168.5.1 is assigned.

Step 6
A) 4 bits should be borrowed , 2^4 = 16
B) 16 subnets
C) 2^4 - 2 = 14
D) Custom mask is 255.255.255.240

Step 7
For getting atleast 5 Subnet we need 2^3 = 8 so we need to borrow 3 more bits so custom subnet mask is 255.255.255.224, remaining 0s at subnet is 5 so number of host per subnet would be 2^5 - 2 = 30 hosts

Subnet ID	First Host Address	Last Host Address	Broadcast Address
192.168.5.0/27	192.168.5.1	192.168.5.30	192.168.5.31
192.168.5.32/27	192.168.5.33	192.168.5.63	192.168.5.64
192.168.5.65/27	192.168.5.66	192.168.5.96	192.168.5.97
192.168.5.98/27	192.168.5.99	192.168.5.129	192.168.5.130
192.168.5.131/27	192.168.5.132	192.168.5.162	192.168.5.163

We can add three subnets more.

Exercise 3 :

Step 1

Subnet mask is 255.255.240.0 as we have /20 as prefix

Source IP

1011 1100	1111 1110	1100 1000	0000 1101
1111 1111	1111 1111	1111 0000	0000 0000
1011 1100	1111 1110	1100 0000	0000 0000

Result is 188.254.192.0

Destination IP

1011 1100	1111 1110	1001 1101	0000 1001
1111 1111	1111 1111	1111 0000	0000 0000
1011 1100	1111 1110	1001 0000	0000 0000

There are not matching so it is remote connection

Step 2

1. Remote
2. Remote
3. Local
4. Local
5. Remote

Step 3

Router or Default Gateway.