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Lab

FOR EDUCATIONAL PURPOSE ONLY

IPv4 and NMAP

Networking

3/2024

For Internal Circulation only

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A. GENERAL

1. Objective

- Learn about Ipv4 and use NMAP to identify the network

2. Environment

- Students need to prepare a Windows/Linux computer/laptop with an Internet connection.

B. HANDS-ON

1. Convert IPv4 Addresses from Dotted Decimal to Binary

Task 1: Convert decimal numbers to their binary equivalent.

Fill in the following table by converting the decimal number to an 8-bit binary number. The first number has been completed for your reference. Recall that the eight binary bit values in an octet are based on the powers of 2, and from left to right are 128, 64, 32, 16, 8, 4, 2, and 1.

Decimal	Binary
192	11000000
168	
10	
255	
2	

Task 2: Convert the IPv4 addresses to their binary equivalent.

An IPv4 address can be converted using the same technique you used above. Fill in the table below with the binary equivalent of the addresses provided. To make your answers easier to read, separate the binary octets with a period.

Decimal	Binary
192.168.10.10	11000000.10101000.00001010.00001010
172.16.18.183	
10.86.252.17	
255.255.255.128	
255.255.192.0	

2. Use Bitwise ANDing Operation to Determine Network Addresses

You will use the bitwise ANDing operation to calculate the network address for the provided host addresses. You will first need to convert an IPv4 decimal address and subnet mask to their binary equivalent. Once you have the binary form of the network address, convert it to its decimal form.

Note: The ANDing process compares the binary value in each bit position of the 32-bit host IP with the corresponding position in the 32-bit subnet mask. If there two 0s or a 0 and a 1, the ANDing result is 0. If there are two 1s, the result is a 1, as shown in the example here.

Task 3: Determine the number of bits to use to calculate the network address.

Description	Decimal	Binary
IP Address	192.168.10.131/26	11000000.10101000.00001010.10000011
Subnet Mask	255.255.255.192	11111111.11111111.11111111.11 000000
Network Address	192.168.10.128	11000000.10101000.00001010.10000000

In the example above, how many bits are used to calculate the network address?

Task 4: Use the ANDing operation to determine the network address.

- Enter the missing information into the table below:

Description	Decimal	Binary
IP Address	172.16.145.29	
Subnet Mask	255.255.0.0	
Network Address		

b. Enter the missing information into the table below:

Description	Decimal	Binary
IP Address	192.168.10.10	
Subnet Mask	255.255.255.0	
Network Address		

3. Apply Network Address Calculations

Task 5: Using command **ipconfig** to show the IP address of your computer and ask for IP address of your friend's computer (provide the figure of your IP information)

What is IP address for your PC? _____

What is the network address for your PC? _____

What is IP address for your phone? _____

What is the network address for your phone? _____

Will these PCs be able to communicate directly with each other? _____

What is the highest address that can be given to a PC that allows it to be on the same network as your PC? _____

What is the default gateway address for your PC?

4. Identify IPv4 Addresses

Task 6: Analyze the table shown below and identify the network portion and host portion of the given IPv4 addresses.

The first two rows show examples of how the table should be completed.

Key for table:

N = all 8 bits for an octet are in the network portion of the address

n = a bit in the network portion of the address

H = all 8 bits for an octet are in the host portion of the address

h = a bit in the host portion of the address

IP Address/Prefix	Network/Host N,n = Network, H,h = Host	Subnet Mask	Network Address
192.168.10.10/24	N.N.N.H	255.255.255.0	192.168.10.0
10.101.99.17/22			
209.165.200.227/27			
172.31.45.252/24			
10.1.8.200/26			
94.16.117.77/14			
10.1.1.130/25			
209.165.202.140/28			
192.168.28.45/29			

Task 7: Analyze the table below and list the range of host and broadcast addresses given a network/prefix mask pair.

The first row shows an example of how the table should be completed.

IP Address/Prefix	First Host Address	Last Host Address	Broadcast Address
192.168.10.10/24	192.168.10.1	192.168.10.254	192.168.10.255
10.101.99.17/22			
209.165.200.227/27			
172.31.45.252/24			
10.1.8.200/26			
94.16.117.77/14			
10.1.1.130/25			
209.165.202.140/28			
192.168.28.45/29			

5. Classify IPv4 Addresses

Task 8: Analyze the table shown below and identify the type of address (network, host, multicast, or broadcast address).

The first row shows an example of how the table should be completed.

IP Address	Subnet Mask	Address Type
10.1.1.1	255.255.255.252	host
192.168.33.63	255.255.255.192	
239.192.1.100	255.252.0.0	
172.25.12.52	255.255.128.0	
10.255.0.0	255.0.0.0	
172.16.128.48	255.255.255.240	
209.165.202.159	255.255.255.224	
172.16.0.255	255.255.0.0	

Task 9: Analyze the table shown below and identify the address as public or private.

IP Address/Prefix	Public or Private
209.165.201.30/27	
192.168.255.253/24	
172.30.1.100/28	
192.31.7.11/24	
10.100.11.103/16	

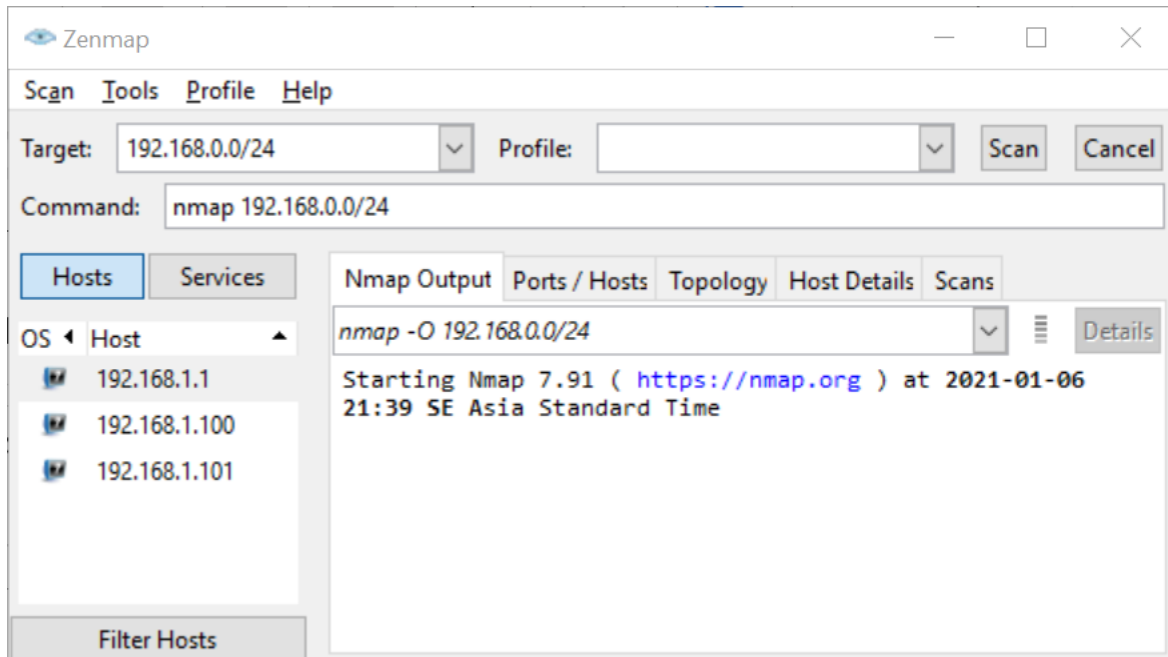
Task 10: Analyze the table shown below and identify whether the address/prefix pair is a valid host address.

IP Address/Prefix	Valid Host Address?	Reason
127.1.0.10/24	No	Loopback
172.16.255.0/16		
241.19.10.100/24		
224.0.0.5/16		
192.168.0.254/24		
192.31.7.255/24		
64.102.255.255/14		

6. Use NMAP to identify the network (Bonus)

NMAP is a port-scanning tool. It is designed to scan the ports of a network host and determine which ports are “open”. That is which ports have network services listening on them. Download NMAP official page and install it on your machine, you might want to

install ZENMAP too, it's a graphical tool bundled with NMAP. You need to refer to NMAP webpage documents for scanning basics www.nmap.org.



Bonus 1: Do a scan to determine all running hosts in your network.

Choosing the Profile Quick scan

How many hosts are running?

Please list all the IP addresses.

Bonus 2: Identify the operating system of all running host.

Using the command “nmap -O 192.168.1.0/24”.

List the Operating system corresponding to the IP address

IP address	Operating system

Bonus 3: Identify the IP address of the default gateway. Find out what ports and corresponding services are open on the default gateway?

Port	Service

C. REQUIREMENTS & ASSESSMENTS

- Students learn and practice according to instructions, in registered groups.
- Report content includes answers, explanations, code, screenshots, or video demos.
- Report file:
 - File .PDF.
 - File name format: [Classcode]-LabX_StudentID1_StudentID2.
 - Ví dụ: [CS4283. O21.CTTT.1]-Lab1_1852xxxx_1852yyyy.
 - Do not copy.

D. REFERENCES

The lab is based on Wireshark Lab: Getting Started - Supplement to Computer Networking: A Top-Down Approach, 7th ed., J.F Kurose and K.W Ross.

END!