Lab No. 10

IPv4 Address Subnetting (Part 1)

LEARNING OBJECTIVES

Upon completion of this activity, you will be able to determine network information for a given IP address and network mask.

Background

This activity is designed to teach how to compute network IP address information from a given IP address.

Scenario

When given an IP address and network mask, you will be able to determine other information about the IP address such as:

- Network address
- Network broadcast address
- Total number of host bits
- Number of hosts

Task 1: For a given IP address, Determine Network Information.

Given:

Host IP Address	**172.25.114.250**
Network Mask	**255.255.0.0 (/16)**

Find:

Network Address	
Network Broadcast Address	
Total Number of Host Bits	
Number of Hosts	

Step 1: Translate Host IP address and network mask into binary notation.

Convert the host IP address and network mask to binary:

	172	**25**	**114**	**250**
IP Address	10101100	00011001	01110010	11111010
Network Mask	11111111	11111111	00000000	00000000
	255	**255**	**0**	**0**

Step 2: Determine the network address.

1. Draw a line under the mask.

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2. Perform a bit-wise AND operation on the IP address and the subnet mask.

   Note: 1 AND 1 results in a 1; 0 AND anything results in a 0.

3. Express the result in dotted decimal notation.
4. The result is the network address for this host IP address, which is **172.25.0.0**.

Option 2 if you are vision impaired:

Look at the network mask and convert it to binary if necessary to determine how many bits are in network portion of address.
Convert this many bits of the ip address to binary by converting byte for byte and leaving in leading and trailing zeros.
You should always end up with 32-bits.
You can and the netmask in binary with the ip address in binary; the jaws notepad scripts may be good for this.
Remember 1 and 1 is 1,
Anything and 0 is zero.

Set the remaining bits to 0 and convert this back to dotted decimal to get network address.
Network address is an ip address where all the host bits are set to zero.

	172	**25**	**114**	**250**
IP Address	10101100	00011001	01110010	11111010
Subnet Mask	11111111	11111111	00000000	00000000
Network Address	10101100	00011001	00000000	00000000
	172	**25**	**0**	**0**

Step 3: Determine the broadcast address for the network address

The network mask separates the network portion of the address from the host portion. The network address has all 0s in the host portion of the address and the broadcast address has all 1s in the host portion of the address.

Option 2: set all the host bits to 1 and convert this to decimal to find out broadcast address for the network.

Leave the network bits alone.

	172	**25**	0	**0**
Network Add.	10101100	00011001	00000000	00000000
Mask	11111111	11111111	00000000	00000000
Broadcast.	10101100	00011001	11111111	11111111
	172	**25**	**255**	**255**

By counting the number of host bits, we can determine the total number of usable hosts for this network.
Host bits: 16
Total number of hosts:

$2^{16} = 65,536$

65,536 – 2 = 65,534 (addresses that cannot use the *all 0s* address, network address, or the *all 1s* address, broadcast address.)

Add this information to the table:

Option 2: If we know how many bits we have for network address then h=32-n where n is number of network bits. If we have 16 network bits, then 32-16=16 host bits.
2 to the power of h minus 2 will give us the number of hosts where h is the number of host bits.

Host IP Address	**172.25.114.250**
Network Mask	**255.255.0.0 (/16)**
Network Address	172.25.0.0
Network Broadcast Address	172.25.255.255
Total Number of Host Bits Number of Hosts	16 bits or 2_{16} or 65,536 total hosts 65,536 – 2 = 65,534 usable hosts

Task 2: Challenge

For all problems:

Create a Subnetting Worksheet to show and record all work for each problem.

Problem 1

Host IP Address	**172.30.1.33**
Network Mask	**255.255.0.0**
Network Address	**172.30.1.33**
Network Broadcast Address	**172.30.255.255**
Total Number of Host Bits	**16**
Number of Hosts	**65.534**

Problem 2

Host IP Address	**172.30.1.33**
Network Mask	**255.255.255.0**
Network Address	**172.30.1.0**
Network Broadcast Address	**172.30.1.255**
Total Number of Host Bits	**8**
Number of Hosts	**254**

Problem 3

Host IP Address	**192.168.10.234**
Network Mask	**255.255.255.0**
Network Address	**192.168.10.0**
Network Broadcast Address	**192.168.1.255**
Total Number of Host Bits	**8**
Number of Hosts	**254**

Problem 4

Host IP Address	**172.17.99.71**
Network Mask	**255.255.0.0**
Network Address	**172.17.0.0**
Network Broadcast Address	**172.17.255.255**
Total Number of Host Bits	**16**
Number of Hosts	**65,534**

Problem 5

Host IP Address	**192.168.3.219**
Network Mask	**255.255.0.0**
Network Address	**192.168.0.0**
Network Broadcast Address	**192.168.255.255**
Total Number of Host Bits	**16**
Number of Hosts	**65,534**

Problem 6

Host IP Address	**192.168.3.219**
Network Mask	**255.255.255.224**
Network Address	**192.168.3.323**
Network Broadcast Address	**192.168.3.223**
Total Number of Host Bits	**5**
Number of Hosts	**30**