Seneca | SCHOOL OF INFORMATION AND COMMUNICATIONS TECHNOLOGY

Lab Activity 04 – Understanding IPv4 Addresses

Objectives

Part 1: Convert IPv4 Addresses from Dotted Decimal to Binary

Part 2: Use Bitwise ANDing Operation to Determine Network Addresses

Part 3: Apply Network Address Calculations

Background / Scenario

Every IPv4 address is comprised of two parts: a network portion and a host portion. The network portion of an address is the same for all devices that reside in the same network. The host portion identifies a specific host within a given network. The subnet mask is used to determine the network portion of an IP address. Devices on the same network can communicate directly; devices on different networks require an intermediary Layer 3 device, such as a router, to communicate.

To understand the operation of devices on a network, we need to look at addresses the way devices do—in binary notation. To do this, we must convert the dotted decimal form of an IP address and its subnet mask to binary notation. After this has been done, we can use the bitwise ANDing operation to determine the network address.

This lab provides instructions on how to determine the network and host portion of IP addresses by converting addresses and subnet masks from dotted decimal to binary, and then using the bitwise ANDing operation. You will then apply this information to identify addresses in the network.

Part 1: Convert IPv4 Addresses from Dotted Decimal to Binary

In Part 1, you will convert decimal numbers to their binary equivalent. After you have mastered this activity, you will convert IPv4 addresses and subnet masks from dotted decimal to their binary form.

Step 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	10101000
10	00001010
255	11111111
2	00000010

Step 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
209.165.200.229	11010001.10100101.11001000.11100101
172.16.18.183	10101100.00010000.00010010.10110111
10.86.252.17	00001010.01010110.11111100.00010001
255.255.255.128	11111111.11111111.11111111.10000000
255.255.192.0	11111111.11111111.11000000.00000000

Part 2: Use Bitwise ANDing Operation to Determine Network Addresses

In Part 2, 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.

Step 1: Determine the number of bits to use to calculate the network address.

Description	Decimal	Binary
IP Address	192.168.10.131	11000000.10101000.00001010.10000011
Subnet Mask	255.255.255.192	11111111.11111111.11111111.11000000
Network Address	192.168.10.128	11000000.10101000.00001010.10000000

How do you determine what bits to use to calculate the network address?

__while calculating the network address of an IPV4 address the subnet mask determine the bits used to calculate the network address. In the subnet mask those bits that are set to 1 are used to calculate the network address.

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

_in the above example, the count of 1s is 26 in the subnet mask, so 26 bits are used to calculate the address. ____________

Step 2: Use the ANDing operation to determine the network address.

a. Enter the missing information into the table below:

Description	Decimal	Binary
IP Address	172.16.145.29	10101100.00010000.10010001.00011101
Subnet Mask	255.255.0.0	11111111.11111111.00000000.00000000
Network Address	172.16.0.0	10101100.00010000.00000000.00000000

b. Enter the missing information into the table below:

Description	Decimal	Binary
IP Address	192.168.10.10	11000000.10101000.00001010.00001010
Subnet Mask	255.255.255.0	11111111.11111111.11111111.00000000
Network Address	192.168.10.0	11000000.10101000.00001010.00000000

c. Enter the missing information into the table below:

Description	Decimal	Binary
IP Address	192.168.68.210	11000000.10101000.01000100.11010010
Subnet Mask	255.255.255.128	11111111.11111111.11111111.10000000
Network Address	192.168.68.128	11000000.10101000.01000100.10000000

d. Enter the missing information into the table below:

Description	Decimal	Binary
IP Address	172.16.188.15	10101100.00010000.10111100.00001111
Subnet Mask	255.255.240.0	11111111.11111111.11110000.00000000
Network Address	172.16.176.0	10101100.00010000.10110000.00000000

e. Enter the missing information into the table below:

Description	Decimal	Binary
IP Address	10.172.2.8	00001010.10101100.00000010.00001000
Subnet Mask	255.224.0.0	11111111.11100000.00000000.00000000
Network Address	10.160.0.0	00001010.10100000.00000000.00000000

Part 3: Apply Network Address Calculations

In Part 3, you must calculate the network address for the given IP addresses and subnet masks. After you have the network address, you should be able to determine the responses needed to complete the lab.

Step 1: Determine whether IP addresses are on same network.

a. You are configuring two PCs for your network. PC-A is given an IP address of 192.168.1.18, and PC-B is given an IP address of 192.168.1.33. Both PCs receive a subnet mask of 255.255.255.240.

What is the network address for PC-A? _192.168.1.16____________________________

What is the network address for PC-B? _192.168.1.32____________________________

Will these PCs be able to communicate directly with each other? No, these PCs will not be able to communicate to each other. ________

What is the highest address that can be given to PC-B that allows it to be on the same network as PC-A?

___192.168.1.30_ is the highest address that can be given to PC-B that allows it to be on the same network as PC-A __________________________

b. You are configuring two PCs for your network. PC-A is given an IP address of 10.0.0.16, and PC-B is given an IP address of 10.1.14.68. Both PCs receive a subnet mask of 255.254.0.0.

What is the network address for PC-A? ________10.0.0.0______________________

What is the network address for PC-B? _______10.0.0.0_______________________

Will these PCs be able to communicate directly with each other? __yes, both PCs will be able to talk to each other. _____

What is the lowest address that can be given to PC-B that allows it to be on the same network as PC-A?

____10.0.0.1_ is the lowest address that can be given to PC-B that allows it to be on the same network as PC-A _________________________

Reflection

Why is the subnet mask important in determining the network address?

__while calculating the network address, the main role is played by subnet mask, solo IP address cannot be used to calculate the network address, because the bits used for calculating network address are provided by subnet mask. so, it can be said that without subnet mask calculation of network address is impossible.
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Grading

Submit the following file to Blackboard:

1. DCF255_Lab04_<YourSenecaID>.pdf – answers to questions posed in this lab.

The Lab will be marked out of 38 (1 Mark for each question).