COMP 311 – Computer Networks

Problem Set # 5

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1. In a block of addresses, we know the IP address of one host is 182.44.82.16/27.

a. Calculate the total number of available addresses.

$2^{32-n} = 2^{32-27} = 32$

b. What is the sub-net mask for the given block of addresses?

27(8+8+8+3) = 11100000 = 255.255.255.224

c. What are the first address (network address) and the last address in this block? Also identify the complete range of addresses.

First Address = (182.44.82.16) AND (255.255.255.224)

= 00010000 AND 11100000 = 00000000 = 182.44.82.0

Last Address = (182.44.82.16) OR (NOT(subnet) = 0.0.0.31)

= 00010000 OR 00011111 = 00011111

broadcast address = 182.44.82.31

Thus, the range of addresses is from 182.44.82.0 to 182.44.82.31.

The usable addresses for hosts are from 182.44.82.1 to 182.44.82.30.

2. Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix 223.1.17/24. Also suppose that Subnet 1 is required to support at least 100 interfaces, Subnet 2 is to support at least 50 interfaces, and Subnet 3 is to support at least 24 interfaces. Provide three network addresses (of the form a.b.c.d/x) that satisfy these constraints and complete range of addresses for three subnets.

24(8+8+8+0)

This network address = 223.1.17.0

Broadcast address = 223.1.17.255

This network can accommodate host addresses from 223.1.17.1 to 223.1.17.254

Subnet 1:

Require 100 addresses so $2^7 = 128$

Subnet mask = 32 – 7 = 25(8+8+8+1) = 10000000 = 255.255.255.128

Network address: 223.1.17.0/25

Address range: 223.1.17.0 to 223.1.17.127

Usable host addresses: 223.1.17.1 to 223.1.17.126

Subnet 2:

Require 50 addresses so $2^6 = 64$

Subnet mask = 32 – 6 = 26(8+8+8+2) = 11000000 = 255.255.255.192

Network address: 223.1.17.128/26 (starts at 128 because the previous subnet took up the first 128 addresses)

Address range: 223.1.17.128 to 223.1.17.191

Usable host addresses: 223.1.17.129 to 223.1.17.190

Subnet 3:

Require 24 addresses so $2^5 = 32$

Subnet mask = 32 – 5 = 27(8+8+8+3) = 11100000 = 255.255.255.224

Network address: 223.1.17.192/27 (starts at 192 because the previous subnet took up the first 192 addresses)

Address range: 223.1.17.192 to 223.1.17.223

Usable host addresses: 223.1.17.193 to 223.1.17.222