# Homework 10 – Background Information (see below for specs)

A network can be represented in CIDR notation as **IPaddress/n**, where 1 ≤ n ≤ 31. To answer some things about these networks or subnets, let’s use 198.101.32.0/20 as an example:

The N**etwork mask** (or subnet mask) is said to be “/20”, but is also written in its full IP address form as:

255.255.240.00 - 11111111 11111111 11110000 00000000

**Host addresses** on the same network (or subnet) have the first n-bits in common:

198.101.32.10 - 11000110 01100101 00100000 00001010 (www.graceland.edu)

198.101.32.135 - 11000110 01100101 00100000 10000111 (mail.graceland.edu)

198.101.34.23 - 11000110 01100101 00100010 00010111 (trinity.graceland.edu)

198.101.34.26 - 11000110 01100101 00100010 00011010 (acadfs.graceland.edu)

The **Wire Address** is the first address in the range of addresses (all of its host bits are 0):

198.101.32.0 - 11000110 01100101 00100000 00000000

The **Broadcast Address** is the last address in the range of addresses (all of its host bits are 1):

198.101.47.255 - 11000110 01100101 00101111 11111111

The **first and last VALID host addresses**, respectively, for this network are given below:

198.101.32.1 - 11000110 01100101 00100000 00000001

198.101.47.254 - 11000110 01100101 00101111 11111110

The **maximum number of hosts** for this network (exclude the wire and broadcast addresses):

232-20 - 2 = 212 - 2 = 4096 - 2 = 4094 valid host addresses

**Subnetting** – extending the subnet mask to further divide a network

Suppose we want to subdivide our network into 8 subnets of equal size

Extend it by 3-bits (for 8 subnets): 255.255.254.0 or “/23” is the subnet mask

232-23 - 2 = 510 valid host addresses in each of the 8 subnets

There is a different wire address, broadcast address, and first/last valid host address for each,

e.g., wire address are 198.101.32.0, 198.101.34.0, 198.101.36.0, 198.101.38.0,

198.101.40.0, 198.101.42.0, 198.101.44.0, 198.101.46.0

*Note: we added 2 to the 3rd byte of the address as a subnet interval*

# Homework assignment specifications – Due December 4 (Friday)

Type up your answers to these questions in a Word doc and submit it (perhaps similar to above).

1. Suppose you have a class B network 172.16.0.0/16 that you further subdivide using a /20 mask:

What is the /20 subnet mask written in its full IP address form

How many subnets will we have?

What is the maximum number of valid hosts for each of these subnets?

What is the Wire, First, Last, and Broadcast addresses for the FIRST, SECOND, and LAST subnets

1. Now assume that the SECOND subnet above is even further subdivided into two equal size subnets. What is the IP address form for the mask, what is the max number of valid hosts for each subnet, and what is the Wire/First-valid/Last-valid/Broadcast addresses for each of these two subnets.