CS168 Fall 2014 Discussion 4

IP Addressing, IP Fragmentation, IPv4/IPv6… basically IP

Q0 - Warm Up

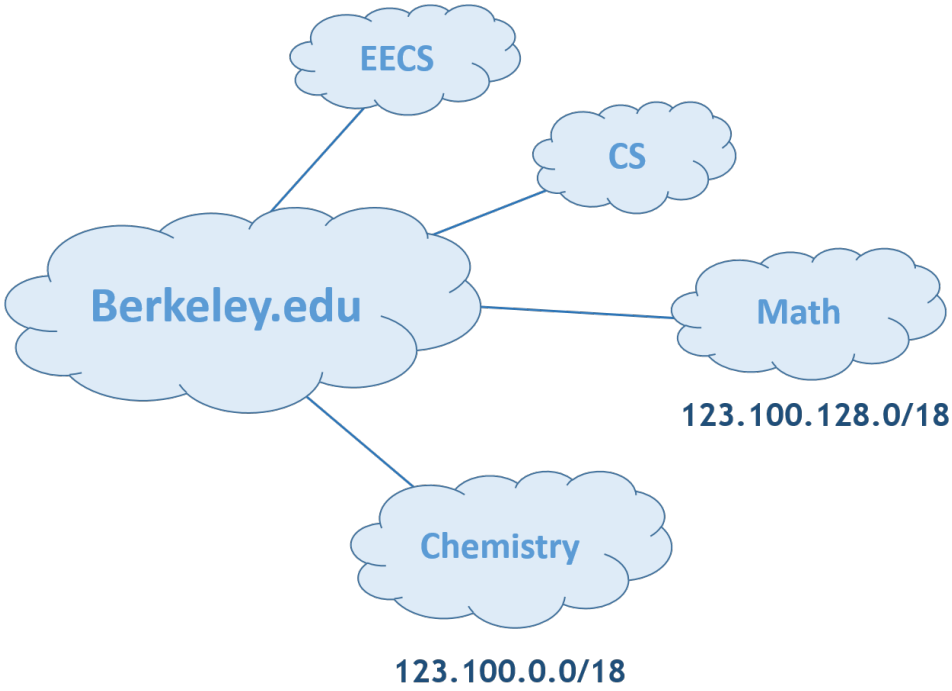
Find the binary representation, subnet mask, and address range of 192.168.0.0/13.

Which of the following addresses are part of this subnet?

123.100.0.5 192.128.69.5 192.168.244.8 192.175.100.0 192.176.3.4

Q1 - IP Addressing

Berkeley.edu is the Provider AS for EECS, CS, Math, and Chemistry. Assume that the CIDR (Classless InterDomain Routing) addressing scheme is used.



a) What range of addresses does Math hold? How many addresses are in this range?

b) 123.100.192.0/18 is reserved for EECS and CS. Assign equal halves of this address space to the two departments.

c) What is the longest prefix for Berkeley.edu that encompasses all of Chemistry, Math, EECS and CS?

d) You want to start a new department Floriology, but you foresee that no more than 50 people will enroll. Assuming one address per person, what prefix would you assign to it?

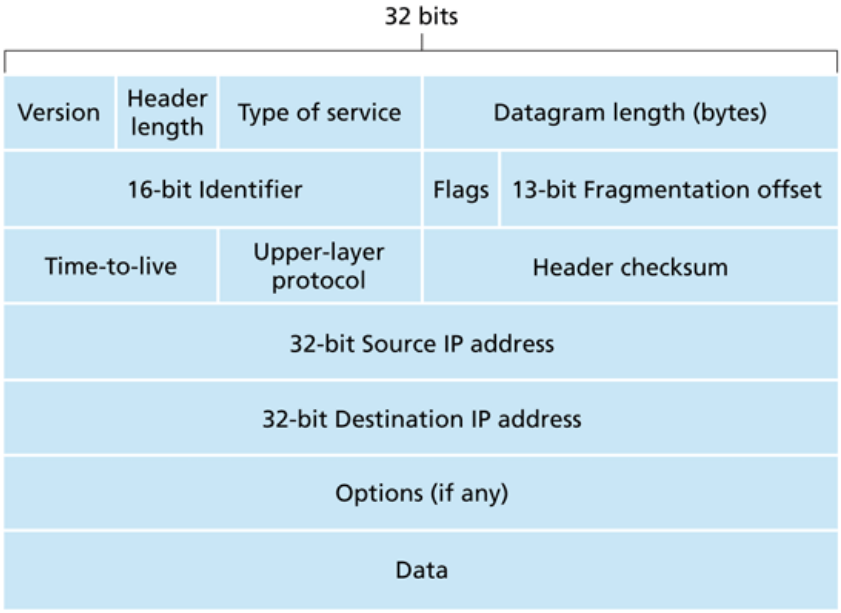
e) Your friend came up with the brilliant idea of starting yet another (slightly redundant) department, Mathematical Floriology (123.100.64.0/29), which is ***multi-homed*** from the existing Math and Floriology departments.

Why might it be a good idea for Mathematical Floriology to be multi-homed, instead of directly attached to only Math or Floriology?

How does this affect Berkeley.edu?

Q2 - IPv4

The following is the structure of an IP header, taken directly from your textbook.



a) Which header fields must be updated before the router sends out a packet?

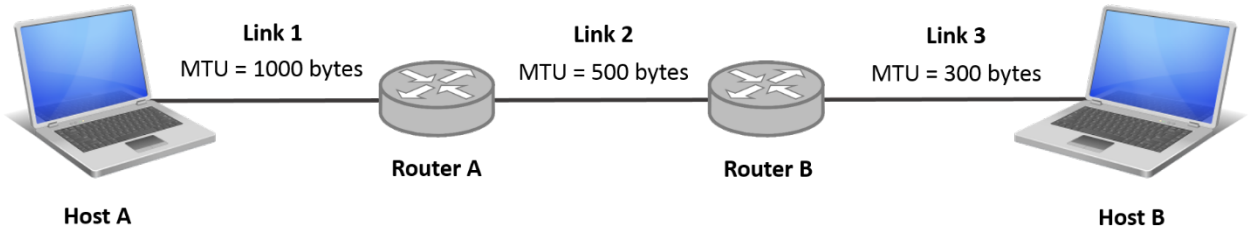
b) Suppose there is a bug in the IP router such that it no longer updates the time-to-live field. What problems might this cause?

c) Suppose vendor A designs its routers such that it no longer updates the checksum. Its rationale is that end points commonly compute their own checksum anyway. What problems might this cause?

d) To accelerate packet forwarding, vendor A decides to always parse the last 4 bytes of the header for the destination address. What problems might this cause?

Q3 – IP Fragmentation

Maximum Transmission Unit (MTU) is the size of the largest packet that a link can carry. Host A sends an **600 byte** IP packet (including header) to Host B, which is fragmented along the way. Assume the typical IP header length of 20 bytes.



Recall that fragmentation flags occupy 3-bits in the format of R|DF|MF, which means <*reserved*, *don't fragment*, and *more fragments coming*>. Fragmentation offsets are in terms of 8-byte units.

a) The packet fits within the MTU of Link 1 and arrives at Router A. What are the resulting fragments that traverse Link 2? For each fragment, identify the total length (including header), flags, and offset.

b) The fragments arrive at Router B. What are the resulting fragments that traverse Link 3?

c) Why is the MF flag needed?

d) Why can't we just number our fragments instead of keeping track of fragmentation offsets?

f) IP fragmentation is removed altogether in IPv6. Why might this be?