Section 4

Saturday, June 15, 2019 10:41 PM

cs168-disc4-ip

CS168 Fall 2015 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.

- Binary rep: 11000000.10101000.00000000.00000000/13
- Subnet mask: 1100000.10101xxx.xxxxxxxx.xxxxxxxx
- Address range
  - Start: 1100000.10101000.00000000.00000000
  - End : 1100000.10101111.11111111.11111111

Which of the following addresses are part of this subnet?

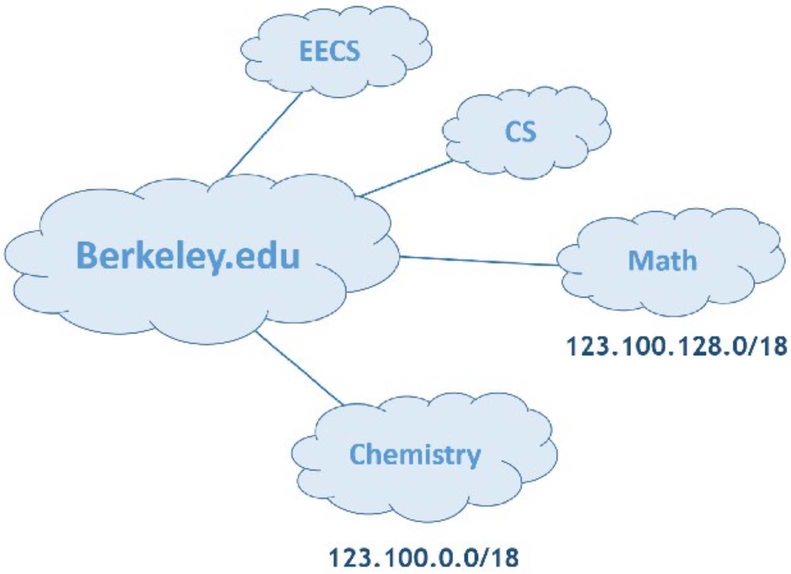
123.100.0.5 192.128.69.5 192.168.244.8 192.175.100.0 192.176.3.4

128+32+8 = 168

Q1 - IP Addressing

Autonomous system: manages it's own forwarding tables within it's intranet

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?

2^14 = 16,384

123.100.128.x to 123.100.191.x. . This is 256 * (191 - 128 + 1) = 16,384

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

EECS: 123.100.192.0/19
CS: 123.100.224.0/19

2^6 = 64

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

123.100
After that EECS wants the next bit to be 128, chemsitry wants the next bit to be 0

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?

123.100.64.0 / 26

00xxxxxx
10xxxxxx
11xxxxxx

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?

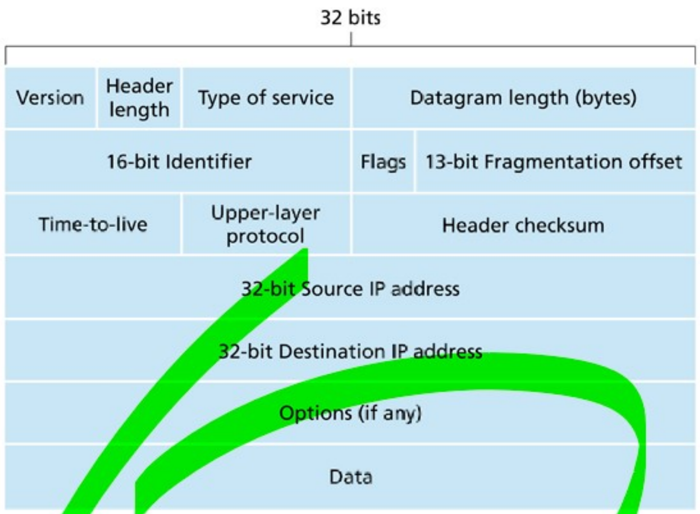
It will receive broadcasts in those subnets

How does this affect Berkeley.edu?

Redundancy/waste. Not only is it harder to aggregate (the point is to have as small as FT as possible

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?

TTL, checksum

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?

If a loop exists, you might have zombie packets haunting your network forever

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?

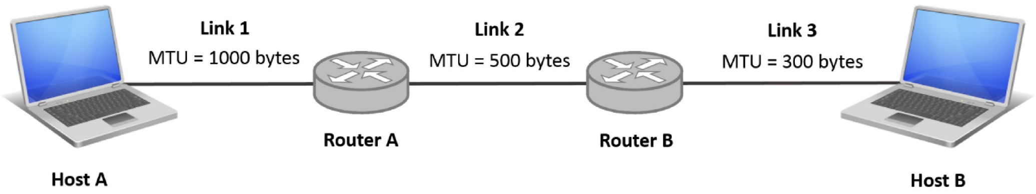
Checksum checks over TTL. Next router will faill its checksum

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?

Seems wasteful. Might not need that much data?

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.

Need at least 3 packets w/ 20 bytes of header.
Flags = 001, expect more, offset 0

1 500 byte packet and another 120 byte packet
Flags = 000, all done, offset 60th byte

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

Second packet goes unsplit
First packet
Split into 1 300 byte packet and another 220 byte packet
First packet has offset 0, second packet has offset 280 /8 = 35

c) Why is the MF flag needed?

At least the final router needs to know to wait longer

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

Still don't know when we can send it up to transport layer

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

Lot of complexity in the middle.

Let the ends worry about appropriate packet sizing