

Problem Set 3 (due Monday, November 8)

1. (8 points) IP fragmentation

Suppose a TCP message that contains 2048 bytes of data and 20 bytes of TCP header is passed to IP for delivery across two networks of the Internet (i.e., from the source host to a router to the destination host). The first network has an MTU (maximum transmission unit) of 1024 bytes while the second has an MTU of 512 bytes. Give the sizes and offsets of the sequence of fragments delivered to the network layer at the destination host. Assume all IP headers are 20 bytes.

2. (8 points) Allocation of IP addresses

An organization has a network with the allocated range of IP addresses being 200.1.1/24, and wants to form subnets for four departments, with hosts as follows: subnet A with 72 hosts, subnet B with 35 hosts, subnet C with 20 hosts, and subnet D with 18 hosts. Thus, there are 145 hosts in all.

- (a) Give a possible arrangement of subnet masks to make this possible.
- (b) Suggest what the organization might do if department D grows to 34 hosts.

3. (8 points) Routing tables with CIDR addressing

Suppose X, Y, and Z are network service providers (ISPs), with respective CIDR address allocations (in hexadecimal form) C1.0.0.0/8, C2.0.0.0/8, and C3.0.0.0/8. Each provider's customers receive address allocations that are a subset of the providers.

ISP X has two customers: XA, with allocation C1.B2.0.0/16, and XB, with allocation C1.B0.0.0/16.

ISP Y also has two customers: YA with allocation C2.0A.10.0/20, and YB with allocation C2.0B.0.0/16.

Suppose X is connected to Y and Y to Z. Give routing tables for X, Y, and Z. Each routing table has 2 fields: one is the network/masklength (in CIDR format), and the other is the nexthop. In the nexthop field, you can simply write the name of the ISP or the customer on the next hop.

4. (8 points) NAT and P2P applications

Problem 18 of Chapter 4, page 407.

5. (9 points) Dijkstra's shortest path algorithm

Problem 21 of Chapter 4, page 408.

6. (9 points) Distance vector algorithm

Problem 26 of Chapter 4, page 409.