158.235 Tutorial 4 – Answers

1. What does the network layer do?

The network layer transports segments from sending to receiving host.

2. Suppose a web browser sends an HTTP request, which is 100 bytes long. What is the percentage overhead introduced by TCP and IP headers in making the packet?

Generally, the IP header adds 20 bytes overhead, and so does the TCP header. This means 40 bytes out of the 100 bytes request is overhead, which computes to 40% overhead.

3. Suppose datagrams are limited to 1,500 bytes (including header) between source Host A and destination Host B. Assuming a 20-byte IP header, how many datagrams would be required to send an MP3 consisting of 5 million bytes? Explain how you computed your answer.

How many? Let’s see.

Original datagram is 5 million bytes = 5,000,000 bytes (40 bytes overhead – TCP + IP)

Divide the actual number of data bytes held by the original datagram by the actual number of data bytes able to held by the MTU and calculate the remainder as well.

[original # of data bytes] / [# of data bytes MTU] = 4,999,960 / 1460 = 3424 R 920

That’s 3,425 datagram fragments.

4. What is the difference between routing and forwarding?

Routing is planning which route the packet will take to its final destination, while forwarding means moving the packet to its next stop on that route.

5. Compare and contrast unicast, broadcast, and multicast messages.

Unicasting means sending a message (from one host) to another host, broadcasting means sending it to all hosts in that network, and multicasting means sending it to a group of hosts.

6. Describe how packet loss can occur at input ports. Describe how packet loss at input ports can be eliminated (without using infinite buffers).

Packet loss can occur at input ports when queues grow too large for the router’s memory to handle. Ideally, the switching rate of the fabric should be equal to the line rate times the number of input ports or higher to eliminate packet loss. So, if there are 2 input ports and packets are arriving at a rate of 100Mbs, then switching rate should be at least 200Mbps.

3. Suppose there are three routers between a source host and a destination host. Ignoring fragmentation, an IP datagram sent from the source host to the destination host will travel over how many interfaces? How many forwarding tables will be indexed to move the datagram from the source to the destination?

8 interfaces (one for each host, 2 for each router), 3 forwarding tables indexed (at each router).

Suppose Host A sends Host B a TCP segment encapsulated in an IP datagram. When Host B receives the datagram, how does the network layer in Host B know it should pass the segment (that is, the payload of the datagram) to TCP rather than to UDP or to something else?

This is defined in the upper-layer protocol field of the IP header. A value of 6 indicates that the payload should be transferred to TCP, while 17 means transfer to UDP.

9. What is the Subnet portion of the IP address and what is the subnet mask for the following:

a) 120.140.0.0/16

Subnet portion: 120.140.0.0, Subnet mask: 255.255.0.0

b) 133.144.155.0/24

Subnet portion (i.e. network address): 133.144.155.0, Subnet mask: 255.255.255.0

c) 202.100.1.0/26

Subnet portion: 202.100.1.0, Subnet mask: 255.255.255.192