

Homework 2 – Internet Applications and Whirlwind Intro

Assigned: Tuesday, September 15, 2009

Due: Thursday, September 24, 2009 *at the beginning of class*

Note: All homework assignments must be done on your own, and your answers should be in your own words. The lecture notes may be used, but you should not copy verbatim from either of them. *Use of previous years' assignments/solutions is **not** permitted.*

Review Questions (75 pts - 3 pts each)

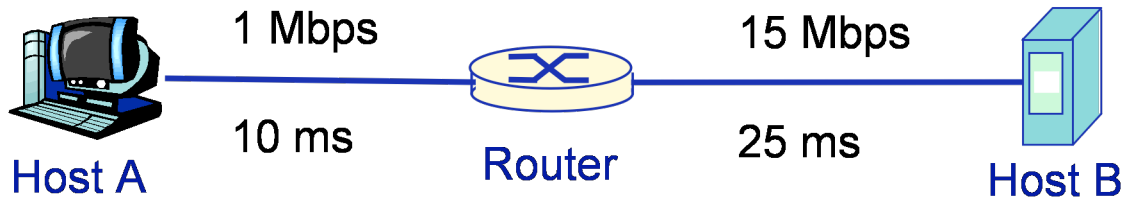
1. What is phishing?
2. What is the difference between a virus and a worm?
3. What are some differences between a distribution list that is maintained by your email client and an electronic mailing list?
4. List one of the general guidelines we discussed for sending emails to professors.
5. As of Jun 2008, what was the most popular social networking application?
6. What are some differences between a wiki and a blog?
7. Describe a situation in which it might be useful to use Google Documents.
8. What is an end system? List some examples of end systems.
9. How many bits per second are in 2 Mbps?
10. How many milliseconds are in 3.5 seconds?
11. What is a network protocol and why are protocols important?
12. Describe how a client and server interact in the client-server networking model.
13. What are three different transmission rates of Ethernet LANs?
14. Out of dial-up modems, cable modems, and DSL modems, which provide dedicated access?
15. Satellite wireless links have a large transmission rate. What is the disadvantage to using satellite links?
16. Suppose users share a 2 Mbps link. Also suppose each user requires 1 Mbps when transmitting, but each user transmits only 30% of the time.
 - a. When circuit switching is used, how many users can be supported?
 - b. If packet switching is used, can more users be supported than with circuit switching? How?

17. Explain why it is more efficient to break large messages into packets when sending data in a packet-switched network than to keep the messages as single entities.
18. Explain how packets using datagram routing over a packet-switched network can arrive to the destination in a different order than they were sent.
19. Consider the delays that a single packet encounters from a source host to a destination host over a fixed route. List the delay components in the end-to-end delay. Which of these delays are constant (*i.e.*, do not change over time) and which are variable (*i.e.*, could change over time)?
20. What is the difference between propagation delay and propagation speed?
21. Does transmission delay occur when a packet is sent, received, or both?
22. What does the bandwidth-delay product represent?
23. List the five Internet protocol layers (top to bottom).
24. Does a distributed DoS attack use one computer or many as attackers? Explain.
25. In what year was the SMTP email protocol defined?

Problems (25 pts)

26. **[5 pts]** Consider two hosts, A and B, connected by a single link of rate R bps. Suppose that the two hosts are separated by m meters and that the propagation speed along the link is s meters/sec. Host A is to send a packet of size L bits to Host B.
 - a. Express the propagation delay, d_{prop} , in terms of m and s .
 - b. Determine the transmission time of the packet, d_{trans} , in terms of L and R .
 - c. Ignoring processing and queuing delays, give an expression for the end-to-end delay.
 - d. Suppose Host A begins to transmit the packet at time $t = 0$. At time $t = d_{trans}$, where is the last bit of the packet?
 - e. Suppose d_{prop} is greater than d_{trans} . At time $t = d_{trans}$, where is the first bit of the packet (at Host A, in the network, or at Host B)?
27. **[5 pts]** Suppose two hosts, A and B, are separated by 7,500 kilometers and are connected by a direct link of $R = 10$ Mbps. Suppose the propagation speed over the link is 2.5×10^8 meters/sec.
 - a. Calculate the bandwidth-delay product, $R * d_{prop}$.
 - b. Consider sending a file of 500,000 bits from Host A to Host B. Suppose the file is sent continuously as one big message. What is the maximum number of bits that will be in the link at any given time?

- c. Assuming the file is sent continuously, how long does it take before the receiver has received the entire 500,000-bit file?
28. [5 pts] Perform a `traceroute` between a source and far-away destination at three different hours of the same day. Use `traceroute.org` if needed.
- Give the IP address of the source and the time of day each traceroute was run. Submit a printout of the output of the three traceroutes.
 - How many routers were in the path at each of the three hours? Did the paths change between any of the hours?
29. [10 pts] Consider the following network. Host A sends a 1500-byte packet to Host B. You may assume that the transmission time for a single bit is negligible (but you must still compute transmission delays for the entire packet). **Hint:** When working this problem, don't forget to look back at your answers for Problem 26.



- Compute the transmission delay of the packet from Host A to the router.
- Compute the transmission delay of the packet from the router to Host B.
- Assume Host A sends the packet at time 0. When will the *first* bit arrive at Host B? **Hint:** Remember that the network is store-and-forward.
- Assume Host A sends the packet at time 0. When will the *last* bit arrive at Host B (*i.e.*, what is the end-to-end delay)? **Hint:** Remember that the network is store-and-forward.