

ECE 360 – Computer Networks

Assignment 1

1. Imagine that you have trained your St. Bernard, Bernie, to carry a box of three 8mm tapes instead of a flask of brandy. (When your disk fills up, you consider that an emergency.) These tapes each contain 7 gigabytes. The dog can travel to your side, wherever you may be, at 18 km/hour. For what range of distances does Bernie have a higher data rate than a transmission line whose data rate (excluding overhead) is 150 Mbps?
2. Besides bandwidth and latency, what other parameter is needed to give a good characterization of the quality of service offered by a network used for digitized voice traffic?
3. A client-server system uses a satellite network, with the satellite at a height of 40,000 km. What is the best-case delay in response to a request?
4. A collection of five routers is to be connected in a point-to-point subnet. Between each pair of routers, the designers may put a high-speed line, a medium-speed line, a low speed line, or no line. If it takes 100 ms of computer time to generate and inspect each topology, how long will it take to inspect all of them?
5. What are two reasons for using layered protocols?
6. Two networks each provide reliable connection-oriented service. One of them offers a reliable byte stream and the other offers a reliable message stream. Are these identical? If so, why is the distinction made? If not, give an example of how they differ.
7. What does "negotiation" mean when discussing network protocols? Give an example.
8. Which of the OSI layers handles each of the following:
 - a. Dividing the transmitted bit stream into frames.
 - b. Determining which route through the subnet to use.
9. Why does ATM use small, fixed-length cells?
10. An image is 1024 x 768 pixels with 3 bytes/pixel. Assume the image is uncompressed. How long does it take to transmit it over a 56-kbps modem channel? Over a 1-Mbps cable modem? Over a 10-Mbps Ethernet? Over 100-Mbps Ethernet?
11. List two advantages and two disadvantages of having international standards for network protocols.
12. The ping program allows you to send a test packet to a given location and see how long it takes to get there and back. Try using ping to see how long it takes to get from your location to several known locations. From this data, plot the one-way transit time over the Internet as a function of distance. It is best to use universities since the location of their servers is known very accurately. For example, berkeley.edu is in Berkeley, California, mit.edu is in Cambridge, Massachusetts, vu.nl is in Amsterdam.