

CS 4514 Computer Networks Written Homework 1
C Term 2006

Due: Tuesday, January 24, 2006 (in-class)

1. (Problem 1.1 from text) 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. (Problem 1.12 from text) The president of Specialty Pain Corp. gets the idea to work with a local beer brewer to produce an invisible beer can (as an anti-litter measure). The president tells her legal department to look into it, and they in turn ask engineering for help. As a result, the chief engineer calls his counterpart at the other company to discuss the technical aspects of the project. The engineers then report back to their respective legal departments, which then confer by telephone to arrange the legal aspects. Finally, the two corporate presidents discuss the financial side of the deal. Is this an example of a multiplayer protocol in the sense of the OSI model?
3. (Problem 1.24 from text) The Internet is roughly doubling in size every 18 months. Although no one really knows for sure, one estimate put the number of hosts on it at 100 million in 2001. Use these data to compute the expected number of Internet hosts in the year 2010. Do you believe this? Explain why or not.
4. (Problem 1.28 from text) 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?
5. (Problem 2.3 from text) Television channels are 6 MHz wide. How many bits/sec can be sent if four-level digital signals are used? Assume a noiseless channel.
6. (Problem 2.4 from text) If a binary signal is sent over a 3-kHz channel whose signal-to-noise ratio is 20 dB, what is the maximum achievable data rate?
7. (Problem 2.11 from text) Radio antennas often work best when the diameter of the antenna is equal to the wavelength of the radio wave. Reasonable antennas range from 1 cm to 5 meters in diameter. What frequency range does this cover?
8. (Problem 2.18 from text) A simple telephone system consists of two end offices and a single toll office to which each end office is connected by a 1-MHz full-

duplex trunk. The average telephone is used to make four calls per 8-hour workday. The mean call duration is 6 min. Ten percent of the calls are long-distance. (i.e. pass through the toll office). What is the maximum number of telephones an end office can support? (Assume 4 kHz per circuit.)