ELEC3500/6500/SENG6400 TELECOMMUNICATIONS NETWORKS

Question Set – 1

This question set consists of conceptual and numerical questions.

1-0. What is the difference between a host and an end system? List several different type of end systems. Is a Web server an end system?

1-1. List six access technologies. Classify each one as home access, enterprise access, or wide-area wireless access. Explain the main role of the access technology.

1-2. What access network technologies would be most suitable for providing Internet access in rural areas?

1-3. What are some of the physical media that Ethernet can run over?

1-4. Compare the circuit and packet switching technologies as used in communication networks. What advantages does a circuit switched network have over a packet switched network?

1-5. The propagation delay is the time required for an electrical signal to propagate from one point to another. Assume the propagation speed of signal is $3x10^8$ meters/sec.

a. Find the propagation delay for a signal traversing the following networks at the speed of light in cable:

i.	A circuit board	10 cm
ii.	A room	10 m
iii.	A building	100 m
iv.	A city	100 km
v.	A continent	5000 km
vi.	Up and down a geostationary satellite	2×36000 Km

Answer: [$3.33x10^{-10}$, $3.33x10^{-8}$ sec, $3.33x10^{-7}$sec, $3.33x10^{-4}$ sec, 0.0166 sec, 0.24 sec]

1-6. A user can directly connect to a server through either a long range wireless or a twisted pair cable for transmitting a 3000 bytes file. The transmission rates of the wireless and wired mediums are 2 and 100 Mbps, respectively. Assume the propagation of speed in air is $3x10^8$ m/s while the twisted pair speed is $2x10^8$ m/s. If the user is located 1 km distance away from the server, what is the file transfer delay when these two transmission links are used?

Answer [12.003 ms, 0.245 ms]

1-7. Suppose end system A wants to send a large file to end system B. At a very high level, describe how end system A creates packet for the file. When one of these packets arrives to a router, what information in the packet does the router use to determine the link onto which the packet is forwarded?

Why is packet switching in the Internet analogous to driving from one city to another and asking directions along the way?

1-8. Suppose host A wants to send a large file to host B. The path from A to B has three links, of rates R_1 = 500 kbps, R_2 = 2 Mbps, and R_3 = 1 Mbps.

a. Assuming no other traffic in the network, what is the throughput for the file transfer?

b. Suppose the file size is $4x10^6$ bytes. Ignoring the propagation delay, how long the file will take to transfer to host B? Recalculate by considering the propagation delay using a link distance of 100 km.

c. Assume that file is transmitted in the form of packets. Packet size 20000 bytes which includes 60 bytes of header. Calculate i) how many packets required to the transfer of the file, ii) considering the propagation delay the total file transfer delay.

Answer [a: 500 kbps, b: 64.0003 sec c: i):201, ii): 64.38 sec]

1-9. Which layers in the Internet protocol stack does a router process? Which layers does a link layer switch process? Which layers does a host process?

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