Broc Nickodemus

R18) How long does it take a packet of length 1,000 bytes to propagate over a link of distance 2,500 km, propagation speed 2.5 · 10^8 m/s, and transmission rate 2 Mbps? More generally, how long does it take a packet of length L to propagate over a link of distance d, propagation speed s , and transmission rate R bps? Does this delay depend on packet length? Does this delay depend on transmission rate?

distance/sec = (2,500km\*1,000bytes)/ (2.5\*10^8) = 10 msec

This delay does not depend on the packet length and does not depend on the transmission rate.

R19) Suppose Host A wants to send a large file to Host B. The path from Host A to Host B has three links, of rates R1 = 500 kbps, R2 = 2 Mbps, and R3 = 1 Mbps.

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

Assuming no other traffic, the minimum throughput is 500 kbps

b. Suppose the file is 4 million bytes. Dividing the file size by the throughput, roughly how long will it take to transfer the file to Host B?

4,000k \* 8bits / 500k = 64 sec

c. Repeat (a) and (b), but now with R2 reduced to 100 kbps.

c.a) the min throughput is now 100 kbps

c.b) 4,000k \* 8bits / 100k = 320 sec or 5 times longer

P5) Review the car-caravan analogy in Section 1.4. Assume a propagation speed

of 100 km/hour.

a. Suppose the caravan travels 150 km, beginning in front of one tollbooth,

passing through a second tollbooth, and finishing just after a third tollbooth.

What is the end-to-end delay?

propagation delay = distance / prop speed = 150kmphr/100km = 1.5 hours \* 10 cars = 15 hours

end to end delay = 15 hours for 10 cars

b. Repeat (a), now assuming that there are eight cars in the caravan instead of ten.

propagation = 150kmphr/100km = 1.5 hours \* 8 cars = 12 hours

end to end delay = 12 hours for 8 cars

P7) In this problem, we consider sending real-time voice from Host A to Host B over a packet-switched network (VoIP). Host A converts analog voice to a digital 64 kbps bit stream on the fly. Host A then groups the bits into 56-byte packets. There is one link between Hosts A and B; its transmission rate is 2 Mbps and its propagation delay is 10 msec. As soon as Host A gathers a packet, it sends it to Host B. As soon as Host B receives an entire packet, it converts the packet’s bits to an analog signal.

How much time elapses from the time a bit is created (from the original analog signal at Host A) until the bit is decoded (as part of the analog signal at Host B)?

transmission = L/R

((56 \* 8bits/byte) / 64kb/s) \* 1000ms = 7ms

dend-to-end = dprop + dtrans

dend-to-end = 7ms + 10ms = 17ms