

Problem Set 1 (due September 23)

1. (10 points) Propagation and transmission delays

Problem 6, page 64.

2. (10 points) File transfer time

Calculate the total time required to transfer a 1000 KB file in the following cases, assuming an RTT of 100 ms, a packet size of 1 KB data, and an initial $2 \times \text{RTT}$ of “handshaking” before data is sent. Assume that the RTT time includes both propagation and queuing delays. The file transmission is complete when the entire file is received at the receiver.

- (a) The bandwidth is 1.5 Mbps, and data packets are sent continuously.
- (b) The bandwidth is 1.5 Mbps, but we send only one packet per RTT; that is, after we finish sending each data packet we must wait one RTT before sending the next.
- (c) The bandwidth is infinite, meaning that we take transmit time to be zero, and up to 20 packets can be sent per RTT.
- (d) The bandwidth is infinite, and during the first RTT we can send one packet (2^0), during the second RTT we can send two packets (2^1), during the third we can send four packets (2^2), and so on. That is, in the i th RTT, we can send 2^{i-1} packets.

3. (10 points) Message segmentation

Problem 20, pages 66-67.

4. (10 points) Traceroute

Problem 13, page 65. Attach outputs of your traceroutes and the times they were executed. For generating the routes, you may use the website www.traceroute.org, or the traceroute command: `traceroute` in Unix/Linux, `tracert` in Windows.