

2003 Paper 8 Question 3

Digital Communication II

Two hosts are connected to two separate 100 Mbps local area networks. One is a user's machine with a web browser, the other is a web server. The networks are connected via a pair of routers and a long haul, point-to-point link with the following characteristics: 640 kbps, 50 ms delay, and a Maximum Packet Size of 1 k bytes. The routers have 8 kbytes of packet buffer memory.

- (a) Assuming standard TCP behaviour (slow start, congestion control, and fast retransmit/recovery), approximately how long does it take to download a file of 8 Kbytes of data? You may assume that packet headers and store-and-forward times are insignificant. You may find it easier to illustrate your answer with a time-sequence diagram of the packet exchanges. [5 marks]
- (b) How long, approximately, does it take to download a file of 8 Mbytes from one computer to the other using TCP? [5 marks]
- (c) Illustrate your answer to the previous section with a diagram showing TCP's behaviour over time, indicating the two important stages and transitions between them. [5 marks]
- (d) What would happen qualitatively if the routers had only 4 Kbytes of packet buffer memory? [5 marks]