COMPSCI 314 S2T Assignment 2
2009
Flow Control

Department of Computer Science
The University of Auckland

*This assignment contributes **5%** of your overall course mark. Submit your assignment in **PDF** format to the **Assignment Drop Box**. Include all **workings** and **explanations**. Marks will be deducted for ambiguous solutions. Zero marks are awarded if the answers contain no explanation. Also, refer to the Departmental Policy on Cheating on Assignments.*

***Assignment Drop Box** (https://adb.ec.auckland.ac.nz/adb/).*
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[Total: 50 marks]

Q1. Stop and wait. [20 marks]

Consider a data link from Auckland to Invercargill, using an optical fibre connection. Assume the distance is 1200 km (1.2×10^6 m), and that the speed of an optical signal is 2×10^8 m/s. Assume that the transmission capacity of the link is 10 Gb/s (10^{10} bits/s), and that the frame size is 1000 bytes.

a) What is the one-way delay for a data frame to travel between Auckland and Invercargill? [5 marks]

b) Do we also need to consider the time taken for a computer to output a frame at 10 Gb/s? [5 marks]

c) Consider a stop-and-wait protocol sending 1000 byte frames and waiting for an ACK after each frame. Assuming no frames or ACKs are lost, calculate the achieved bit rate in b/s and the efficiency of the protocol. [5 marks]

d) Calculate the bandwidth-delay product for the link, in megabytes. [5 marks]

Q2. Fixed window [20 marks]

For the same link, now assume that a "window" of N frames is allowed on the link at one time.

a) What is the efficiency for N=10, N=1000, N=10,000, N=100,000? [10 marks]

c) For a sliding window protocol to use this link with high efficiency, what is a suitable window size (measured as a number of frames)? [5 marks]

d) Assume the protocol has a go-back-N feature. What will happen to the efficiency if one packet is lost? [5 marks]

Q3. Shared link [10 marks]

We have assumed so far that there is a single user on the link. Now assume there are many users.

a) If a large number of users are sharing the link, should they each use the window size you found in Q2 c). Explain your answer. [5 marks]

b) If a user's frames are not all the same length, should their window size be based on the smallest, the average, or the largest packet in use? Explain your answer. [5 marks]