COMPSCI 314 S2 C Assignment 2

Department of Computer Science
The University of Auckland
Due Monday 17 September 07, 9:00 am

This assignment will contribute 1/3 of your coursework mark, and 5% to your overall course mark.

Submit your assignment via the DropBox, as a .pdf file.

Answer the following questions

Where the question asks you to *explain* or *comment on* something, your answer should be about one or two sentences long. If you are quoting something, you *must* give a refernce for it. Where you are asked to compute values, you should show your working, i.e. make it clear how you arrived at each answer. Take care with your layout – you may loose marks if your layout is ambiguous or confusing!

1. **Stop-and-Wait protocol** [10 marks]
   Assume that you are sending a long sequence of 1500-byte data frames over a 5 Mb/s link from Auckland to Wellington, a distance of 600 km. You may assume that the receiver sends back 64-byte ACK messages, and that signals travel in the link with a velocity of 2×10^8 m/s. Compute
   (a) the time it takes to send a data frame and an ACK frame
   (b) the transit time for a bit to go from one end of the link to the other
   (c) the link's effective bit rate while transferring a large file
   (d) the link's percentage utilisation, as a percentage of its specified data rate
   (e) the time it will take to send a 1 MB file

2. **Bandwidth-Delay Product** [10 marks]
   (a) What is meant by the term 'Bandwidth-Delay Product,' (BDP) for a network link?
   (b) What effect on the performance of a given link would you expect if its flow control uses a window (i.e. buffer) size that is one-half of the link's BDP?
   (c) What difference would it make if the buffer size were twice the BDP?
   (d) Suggest an effective alogrithm for choosing the buffer size for a link.

3. **Handling Packet Collisions** [10 marks]
   (a) Briefly describe the Carrier Sense Multiple Access protocol (CSMA)
   (b) How does CSMA differ from the earlier 'pure Aloha' protocol?
   (c) What changes are needed to add Collision Detection to the CSMA protocol?
   (d) How does Collision Detection help to make more efficient use of a communications link?

CONTINUED

4. **Ethernet on Unshielded Twisted Pair links** [10 marks]

   (a) Compare the wiring topologies used for 10BaseT Ethernet, and 10Base2

   (b) List three advantages of using 10BaseT rather than 10Base2, and one possible disadvantage

5. **100Mb/s Ethernet** [10 marks]

   (a) Explain how 100BaseTX encodes data as a 4-bit 'nibbles' rather than as a stream of single bits

   (b) What advantage does 100BaesTX gain by using this encoding scheme?

   (c) Why does 100BaseTX use MLT-3 signal encoding, instead of Manchester encoding (as used by 10BaseT)?

   (d) How does the MLT-3 signal provide information so that a receiver can recover its timing information?