

CPSC 441: Computer Communications (Winter 2005)

Assignment 4

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Total: 30 marks (accounts for 7.5% of your final mark in the course)

Due Date: By 23:55 hours on April 15, 2005

Submission Method:

- Use the “submit” system to electronically submit your work; and,
- Also provide a “hard copy” of your work in the “Drop Off” box for this course in the Math Sciences Building.

1. **TCP Tahoe.** Consider transmission of segments, numbered 0 through 35, using the TCP Tahoe congestion control algorithm. Give a detailed sketch of the algorithm assuming that the first transmission of segment 10 is lost.

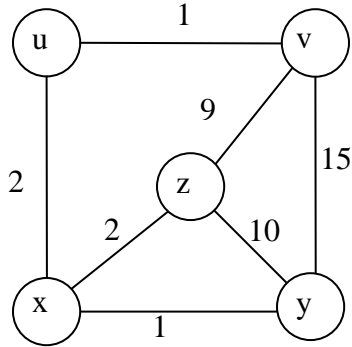
Your detailed sketch of the working of the algorithm should be in terms of “rounds”. A round begins with back-to-back transmission of W segments, where W is the current TCP congestion window size, and ends when an acknowledgement is received for one of these back-to-back transmissions. Note that the duration of a round equals the RTT. For each round, you should list the segments transmitted, the acknowledgements received, the congestion window size, the slow start threshold parameter, and invocation of Fast Retransmit/Fast Recovery events (if any). Also, indicate when slow start is exited or entered.

Assume that the segments/acknowledgements transmitted, if not lost, are always received in the order they were sent. Also assume that the flow starts in slow start with a congestion window of one with the slow start threshold parameter initially set to a very large number (i.e., initially, slow start is exited only when a segment loss is detected).

Refer to your textbook (pages 547-550 in the Tanenbaum book; pages 264-270 in the Kurose & Ross textbook) for a discussion of the TCP congestion control algorithm. (6 marks)

2. **Wireless.** Suppose that an 802.11b station is configured to always reserve the channel with the RTS/CTS sequence. Suppose that this station wants to transmit 1000 bytes of data, and all other stations are idle at this time. As a function of SIFS and DIFS, ignoring propagation delay, and assuming no bit errors, calculate the time required to transmit the frame and receive the acknowledgement. (3 marks)

3. **Network Layer Routing.** Consider the network shown below. With the indicated link costs, use Dijkstra's link-state routing algorithm to compute the shortest path from z to all network nodes. (6 marks)



4. **ALOHA.** Show that the maximum efficiency of pure ALOHA is $1/(2e)$. (4 marks)
5. **Ethernet.** The Ethernet frame structure includes a 7-byte preamble. Why? (2 marks)
6. **CSMA.** Outline the *similarities* and *differences* between the multiple access protocols used by IEEE 802.11b and Ethernet. (5 marks)
7. **Integrated Services.** The Integrated Services (IntServ) architecture is being developed by the IETF to provide quality of service to individual application sessions. Briefly discuss the salient features of this architecture. (4 marks)