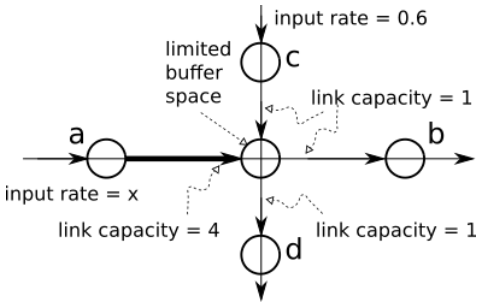
CSC0056 Homework 7

- Submit your work to Moodle before **9PM, Jan. 15th, Friday**.
- This is a bonus homework assignment - we will count the six highest scores out of your seven homework submissions. Also, consider this as a review for the final exam.

1. **(15 points)** Review Sec. 6.1.2 in the textbook. Following Example 6.1 and consider the following configuration instead:

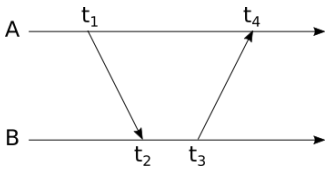


   Explain why the total throughput will converge toward 1.25 as *x* increases.

2. **(15 points)** Review Sec. 6.2.1. For the end-to-end window flow control, where the transmission time of a single packet is 0.1ms. Suppose that we want to send packets from a sensor to our server, using the window size of 20 packets. If the round-trip delay is no larger than 1.7ms, will the flow control throttle the transmission rate of the sensor? Explain.

3. **(20 points)** Consider the leaky bucket scheme, where permits are generated on a per packet basis. With bucket size *W*=2, what is the average delay for a packet to obtain a permit? Suppose that packets arrive according to a Poisson process with rate λ=2 packets/second and that a permit arrives with rate *r*=3 permits/second.

4. **(20 points)** Consider the following time-lines, with t_1=80, t_2=100, t_3=115, and t_4=140, and compute the mean time offset between hosts A and B using the NTP protocol:



5. **(15 points)** Consider the CAN protocol (lecture 10), with a *wired-AND* implementation of the bus. For the following three encoding for the IDENTIFIER field (from MSB to LSB), rank their priority levels according to the multiaccess arbitration of the CAN bus:

   IDENTIFIER field of message A: 0 0 0 1 0 1 0 1 1 1 1

   IDENTIFIER field of message B: 0 1 0 1 0 1 0 1 1 0 0

   IDENTIFIER field of message C: 0 0 0 1 1 0 0 1 0 1 1

6. **(15 points)** In the slotted multiaccess model (Sec. 4.2.1), we have two alternative assumptions: (1) *no-buffering assumption*, and (2) *infinite set of nodes assumption*. Explain why using the first assumption the analysis provides a lower bound to the delay, and why using the second assumption the analysis provides an upper bound to the delay.