Low Extra Delay Background Transport (LEDBAT)
CISC 856: TCP/IP and Upper Layer Protocols
Due: Thursday, November 1st, 2011
Contact: jbricker@udel.edu (Joel Bricker)

1. The goal of LEDBAT is to minimize network congestion created by a long-running file transfer.

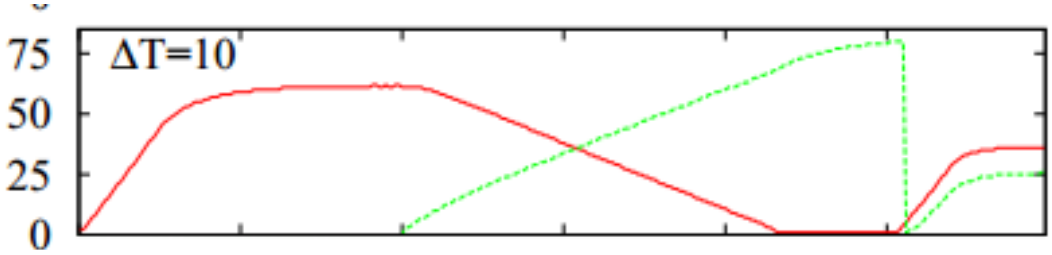
    a. What is the motivation for this goal?

    b. TCP has something called congestion control. Why is TCP's congestion control not good enough?

2. uTP operates in the application layer with UDP as its transport layer protocol and implements most of the features of TCP. Why is it necessary for uTP to use UDP rather that to use the features of TCP?

3. Why is it necessary for LEDBAT to estimate the One Way Delay rather than use existing algorithms for estimating RTT?

4. Describe the late-comer advantage and offer one potential solution (hint: Dario Rossi offered a potential solution in his paper based on his observation of the results of the experiment depicted in the following picture).



5.

    a. When does the LEDBAT congestion window increase in size?

    b. When does the LEDBAT congestion window decrease in size?

6. A data transmitter (host A) has a calculated base delay of 50 milliseconds and a TARGET queuing delay of 10 milliseconds. Host A transmits a uTP-PDU to the data receiver (host B) with a timestamp of 1500 milliseconds. When host B receives the uTP-PDU sent by host a its local timestamp is 1570 milliseconds. Host B calculates the timestamp difference and then sends a uTP-ACK-PDU to host A.

a. What is the timestamp difference in the uTP-ACK-PDU sent from host B to host A?

b. What is the queuing delay calculated at host A after it receives the ACK from host B?

c. What is the value of “off_target” calculated by host A after it receives the ACK from host B?

d. Does host A's congestion window increase or decrease?