

Problem Set #5

ENEE 426, Spring 2008

Due: Thursday, April 24

Complete the following problems (5 points each):

1. Problem 5.12
2. Assume an end-to-end link has an average latency of 10ms and a jitter of 1ms. This means the latency for an individual packet has a Gaussian distribution with mean 10ms and variance 1ms.
 - a. What is the probability distribution for the round-trip time of the link (RTT)?
 - b. To what should the TCP timeout be set to ensure with probability 0.9 a packet has been delivered before being retransmitted (assume TCP Tahoe, with no Fast Retransmit)
3. Problem 6.6
4. Consider two files are transmitted, one at time $t=0$ and one at time $t=5$. Each file requires 30 packets to transmit.
 - a. Assume fair queuing is used and the user is only allowed to send 10 packets per second.
 - i. At what time is the first packet completely transmitted?
 - ii. At what time is the second packet completely transmitted?
 - iii. What is the average transmit rate in packets per second from time $t=0$ until the end of the second packet transmission
 - b. Assume token bucket flow control is used. At $t=0$ the bucket is empty. Tokens enter the bucket at a rate of 10 tokens per second, and the bucket can hold 30 tokens.
 - i. At what time is the first packet completely transmitted?
 - ii. At what time is the second packet completely transmitted?
 - iii. What is the average transmit rate in packets per second from time $t=0$ until the end of the second packet transmission?
5. Problem 6.26
6. Problem 6.38