EECS 489 – Computer Networks
HOMEWORK 2

DUE DATE Wed, 4/14/2010, midnight.

Leave outside 4629 CSE or email zmao@umich.edu

QUESTION 1

Consider a reliable data transfer protocol that uses only negative acknowledgements. Suppose the sender sends data only infrequently. Would a NACK-only protocol be preferable to a protocol that uses ACKs? Why?

Now suppose the sender has a lot of data to send and the end-to-end connection experiences few losses. In this second case, would a NACK-only protocol be preferable to a protocol that uses ACKs? Why?

QUESTION 2

Consider transferring an enormous file of L bytes from Host A to Host B. Assume an MSS (Maximum Segment Size) of 536 bytes.

(a) What is the maximum value of L such that the TCP sequence numbers are not exhausted? Recall that the TCP sequence number field has 4 bytes.

(b) For the L you obtain in (a), find how long it takes to transmit the file. Assume that a total of 66 bytes of transport, network, and data-link header are added to each segment before the resulting packet is sent out over a 155 Mbps link. Ignore flow control and congestion control so A can pump out the segments back to back and continuously.

QUESTION 3

Host A and B are directly connected with a 100 Mbps link. There is one TCP connection between the two hosts, and Host A is sending to Host B an enormous file over this connection. Host A can send its application data into its TCP socket at a rate as high as 120 Mbps but Host B can read out of its TCP receive buffer at a maximum rate of 60 Mbps. Describe the effect of TCP flow control.

QUESTION 4

Suppose two connections share a path through a router R. The router's queue size is six segments; each connection has a stable congestion window of three segments. In trying to be greedy, these connections decide to ignore dropped packets instead of using them to change their congestion window sizes. A third connection is now attempted, also through R. The third connection does not use dropped packet to change its congestion window either. Describe a scenario in which, for at least a while, the third connection gets none of the available bandwidth, and the first two connections proceed with 50% each. Does it matter if the third connection uses slow start? How does actual TCP congestion control on the part of the first two connections help solve this?

QUESTION 5

We investigate whether either UDP or TCP provides a degree of end-point authentication.

1) Consider a server that receives a request within a UDP packet and responds to that request within a UDP packet (e.g., as done by a DNS server). If a client with IP address X spoofs its address with address Y, where will the server send its response?

2) Suppose a server receives a SYN with IP source address Y, and after responding with a SYNACK, receives an ACK with IP source address Y with the correct acknowledgement number. Assuming the server chooses a random initial sequence number and there is no "man in the middle" attack. Can the server be certain that the client is indeed at Y (and not at some other address X that is spoofing Y)?

QUESTION 6

1. Assume that we are in the middle of an audio transmission: sample delay estimate is 4ms and average deviation of delay is 10ms. Assume that the sample generation rate is 5 ms/pkt and that the first packet of the next talkspurt was sent with timestamp=2000 ms. Calculate the playback times for the next 5 packets following this first packet in the same talkspurt.
2. Assume that an audio packet of 500 bytes is sent once every 100ms with silence suppression. Consider a case where 8 packets are sent with a silence of 200ms and 300ms after the 3rd and the 6th packet. Show the table describing the RTP sequence number and the timestamps of these packets.