Assignment 1

"Course 1-02-327 and 1-01-051: Introduction to Networks"

Due April 7, 2010 at 11:59pm

Instructions

Answer the following questions in Hebrew or English. Use exact values for MB, KB, and Mbps. Assume a transmission is completed when the last bit arrives at the recipient.

1 File Transfer (8 points / 2 points each)

Calculate the total time required to transfer a 2.5MB file in the following cases, assuming an RTT of 150 ms, a packet size of 1 KB and an initial 2× RTT of "handshaking" before data is sent.

(a) The bandwidth is 1.7 Mbps, and data packets can be sent continuously.

(b) The bandwidth is 1.7 Mbps, but after we finish sending each data packet we must wait one RTT before sending the next.

(c) The bandwidth is "infinite," meaning that we take transmit time to be zero, and up to 15 packets can be sent per RTT.

(d) The bandwidth is infinite, and during the first RTT we can send one packet (2^{1-1}), during the second RTT we can send two packets (2^{2-1}), during the third we can send four (2^{3-1}), and so on.

2 Transmission Time (3 points)

How long does it take to transmit x MB over a y-Mbps link with a $z$ms RTT? Give your answer as a ratio of x, y, and z.

3 CRC (6 points / 3 points each)

Suppose we want to transmit the message 0110 1011 1111 and protect it from errors using the CRC polynomial $x^3 + x^2 + 1$.

(a) Use polynomial long division to determine the message that should be transmitted. Write down the *entire message*.

(b) Suppose the leftmost bit of the message is inverted due to noise on the transmission link. What is the result of the receivers CRC calculation? How does the receiver know that an error has occurred?

4 HDLC (4 points)

Suppose the following sequence of bits arrive over an HDLC link:

01101011110101111101001111111011001111110

Show the resulting frame after any stuffed bits have been removed. Indicate (1) any errors that might have been introduced into the frame and (2) any inclusion of the end sentinel.

5 Sliding Window (8 points / 4 points each)

Draw a timeline diagram for the sliding window algorithm with SWS = 4 and RWS = 3 with 8 frames for the following two situations. Use a timeout interval of about 2× RTT.

(a) Frames 3 and 7 are lost.

(b) Frames 1, 4, 6 are lost.

What to turn in

You may work in groups of up to three (3) students. Turn in your submission for the above assignment including:

- Names of all students in the group
- Total number of hours spent on the assignment
- Date of submission
- All work, including calculations and graphs as appropriate

Turn in the above via email to `ise327@gmail`, in person before the above date (or in my drawer in the Engineering School office, or via fax to 04-665-3661.

Note: Do not send work submissions to my personal email – use the `ise327` email. Do not send me ODT or RAR files. I cannot deal with them.