

P538 Computer Networks

Homework 2

Due online March 9, 2018

Instructions: You may discuss the questions with your classmates, but not your answers. Please explain all answers and show all work.

- 1) [10 pts] Suppose within your Web browser you click on a link to obtain a Web page. The IP address for the associated URL is not cached in your local host, so a DNS lookup is necessary to obtain the IP address. Suppose that n DNS servers are visited before your host receives the IP address from DNS; the successive visits incur a RTT of RTT_1, \dots, RTT_n . Further suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text. Let RTT_0 denote the RTT between the local host and the server containing the object. Assuming zero transmission time of the object, how much time elapses from when the client clicks on the link until the client receives the object?
- 2) [10 pts] Referring to Problem 1, suppose the HTML file references eight very small objects on the same server. Neglecting transmission times, how much time elapses with:
 - a. Non-persistent HTTP with no parallel TCP connections?
 - b. Non-persistent HTTP with the browser configured for 5 parallel connections?
 - c. Persistent HTTP?
- 3) [10 pts]
 - a. Suppose you have the following 2 bytes 01011100 and 01100101. What is the 1s complement of the sum of these 2 bytes?
 - b. Suppose you have the following 2 bytes: 11011010 and 01100101. What is the 1s complement of the sum of these two bytes?
 - c. For the bytes in part (a), give an example where one bit is flipped in each of the 2 bytes and yet the 1s complement doesn't change.
- 4) [10 pts] Consider transferring an enormous file of L bytes from Host A to Host B. Assume an MSS of 536 bytes.
 - a. What is the maximum value of L such that 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.