National University of Computer and Emerging Sciences, Lahore Campus

Computer Networks (Code: CS3001)

Assignment 2 [Section BCS 5A] Fall 2024

Due Date: Sep 19, 2024

Time: At the start of class **Marks: 73**

Please note the following:

1. No exceptions to the above date and time will be allowed. Inability to submit the assignment by the required time will result in zero marks.
2. To ensure self-completion of assignments and discourage plagiarism, the instructor or the relevant TA may randomly contact you and ask for an explanation of your answers. Where plagiarism and/or cheating is evident, you will be referred to the departmental disciplinary committee. In extreme cases of plagiarism, an F may be awarded immediately with further referral to the university disciplinary committee.
3. All solutions must be **handwritten.**
4. **Assignment Solution Submission:** Each student will submit the hard copy of the handwritten assignment's solution to the Instructor / TA directly in case classes are conducted **on the campus (The current scenario)**. Otherwise, in the case of **online classes (exceptional scenario)**, handwritten assignments will be scanned into one PDF document and submitted online via **Google Classroom**. The file or folder name should contain your roll number and assignment number, i.e. **(##L-####_A#)**. If you are making multiple submissions, write "Updated" at the end, i.e. (##L-####_A#_Updated).

Part I: Review Question from the book (53 Marks) [CLO 1]

Use the following text for completion of this part of the assignment:
Computer Networking - A Top-Down Approach 8th Edition by Kurose & Ross.
Chapter 2 Exercise Questions

Review questions: R6, R10, R13, R15, R18, R19 **(6 x 3=18 marks)**

Problems: P4, P5, P7, P8, P10, P11, P20 **(7 x 5=35 marks)**

Part II: Solve the following by showing the necessary working: (10 x 2 = 20 Marks) [CLO 1]

Q1: 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 four DNS servers are visited before your host receives the IP address from DNS. The first DNS server visited is the local DNS cache, with an RTT delay of RTT0 = 1 msecs. The second, third and fourth DNS servers contacted have RTTs of 50, 4, and 5 msecs, respectively. Initially, let's suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text. Suppose the RTT between the local host and the Web server containing the object is

RTTHTTP = 82 msecs.
Considering the above scenario and given values, answer the following questions:
(A) Assuming zero transmission time for the HTML object, how much time (in msec) elapses from when the client clicks on the link until the client receives the object?
(B) Now suppose the HTML object references 4 very small objects on the same server. Neglecting transmission times, how much time (in msec) elapses from when the client clicks on the link until the base object and all 4 additional objects are received from web server at the client, assuming non-persistent HTTP and no parallel TCP connections?
(C) Suppose the HTML object references 4 very small objects on the same server but assume that the client is configured to support a maximum of 4 parallel TCP connections, with non-persistent HTTP. how much time (in msec) elapses from when the client clicks on the link until the base object and all 4 additional objects are received from web server at the client?
(D). Suppose the HTML object references 4 very small objects on the same server, which are requested after the base HTML file is responded. Assume that the reference small objects are requested one after another without waiting for response for an object (i.e., persistent HTTP with pipelining).
(E). Suppose the HTML object references 4 very small objects on the same server, but assume that the client is configured with persistent HTTP and does not support any parallel TCP connections (without Pipelining

Q2 : Suppose that the local DNS server caches all information coming in from all root, TLD, and authoritative DNS servers for 20 time units. (Thus, for example, when a root server returns the name and address of a TLD server for .com, the cache remembers that this is the TLD server to use to resolve a .com name). Assume also that the local cache is initially empty, that iterative DNS queries are always used, that DNS requests are just for name-to-IP-address translation, that 1 time unit is needed for each server-to-server or host-to-server (one way) request or response, and that there is only one authoritative name server (each) for any .edu or .com domain.

Consider the following DNS requests, made by the local host at the given times:
• t=0, the local host requests that the name gaia.cs.umass.edu be resolved to an IP address.
• t=1, the local host requests that the name icann.org be resolved to an IP address.
• t=5, the local host requests that the name cs.umd.edu be resolved to an IP address. (Hint: be careful!)
• t=10, the local host again requests that the name gaia.cs.umass.edu be

resolved to an IP address.

- t=12, the local host requests that the name cs.mit.edu be resolved to an IP address.
- t=30, the local host again requests that the name gaia.cs.umass.edu be resolved to an IP address. (Hint: be careful!)

Which of the given DNS requests require 8-time units to be resolved? Which of the above DNS requests require 6-time units to be resolved? Justify your answers.