FAST - National University of Computer & Emerging Sciences, Karachi

Computer Network (CS 3001)

Instructor: Dr. Aqsa Aslam
Email: aqsa.aslam@nu.edu.pk

Assignment no. 2

Max. Marks: 2.5
Section: CS-7A & SE-5A
Date: 1st Oct 2021

Assignment Instructions:

1. Assignment no: 2 is from chapter 2 of the textbook, the material is provided on google classroom.
2. Write the roll no: and name on the front page of your assignment.
3. The assignment must be submitted in handwritten form on Google Classroom. Use your name and roll number as your file name when saving pdf.
4. Explain your answer with the help of a figure and with a detailed explanation. Please show all the steps involved in obtaining your answer.
5. The marks of the assignment is depending on the class test, which will conduct after the submission of assignment no. 2.
6. No Plagiarism!

Deadline to submit the assignment no: 1 is 15th Oct 2021 at 12: 00 am

1. True or false?
   a. A user requests a Web page that consists of some text and three images. For this page, the client will send one request message and receive four response messages.
   b. Two distinct Web pages (for example, www.mit.edu/research .html and www.mit.edu/students.html) can be sent over the same persistent connection.
   c. With non-persistent connections between browser and origin server, it is possible for a single TCP segment to carry two distinct HTTP request messages.
   d. The Date: header in the HTTP response message indicates when the object in the response was last modified.
   e. HTTP response messages never have an empty message body.

2. SMS, iMessage, Wechat, and WhatsApp are all smartphone real-time messaging systems. After doing some research on the Internet, for each of these systems write one paragraph about the protocols they use. Then write a paragraph explaining how they differ.

3. Consider an HTTP client that wants to retrieve a Web document at a given URL. The IP address of the HTTP server is initially unknown. What transport and application-layer protocols besides HTTP are needed in this scenario?

4. Consider the following string of ASCII characters that were captured by Wireshark when the browser sent an HTTP GET message (i.e., this is the actual content of an HTTP GET message). The characters <cr><lf> are carriage return and line-feed characters (that is, the italized character string <cr> in the text below represents the single carriage-return character that was contained at that point in the HTTP header). Answer the following questions, indicating where in the HTTP

GET message below you find the answer with explanation that why you think that should be the answer?

GET /cs453/index.html HTTP/1.1<cr><lf>Host: gai a.cs.umass.edu<cr><lf>User-Agent: Mozilla/5.0 (Windows;U; Windows NT 5.1; en-US; rv:1.7.2) Gec ko/20040804 Netscape/7.2 (ax) <cr><lf>Accept:ex t/xml, application/xml, application/xhtml+xml, text /html;q=0.9, text/plain;q=0.8,image/png,*/*;q=0.5 Encoding: zip,deflate<cr><lf>Accept-Charset: ISO -8859-1,utf-8;q=0.7,*;q=0.7<cr><lf>Keep-Alive: 300<cr> <lf>Connection:keep-alive<cr><lf><cr><lf>

a. What is the URL of the document requested by the browser?
b. What version of HTTP is the browser running?
c. Does the browser request a non-persistent or a persistent connection?
d. What is the IP address of the host on which the browser is running? E What type of browser initiates this message? Why is the browser type needed in an HTTP request message?

5. The text below shows the reply sent from the server in response to the HTTP GET message in the question above. Answer the following questions, indicating where in the message below you find the answer.

   HTTP/1.1 200 OK<cr><lf>Date: Tue, 07 Mar 2008 12:39:45GMT<cr><lf>Server: Apache/2.0.52 (Fedora) <cr><lf>Last-Modified: Sat, 10 Dec2005 18:27:46 GMT<cr><lf>ETag: ”526c3-f22-a88a4c80”<cr><lf>Accept- Ranges: bytes<cr><lf>Content-Length: 3874<cr><lf> Keep-Alive: timeout=max=100<cr><lf>Connection: Keep-Alive<cr><lf>Content-Type: text/html; charset= ISO-8859-1<cr><lf><cr><lf><!doctype html public ”- //w3c//dtd html 4.0transitional//en”><lf><html><lf> <head><lf> <meta http-equiv=”Content-Type” content=”text/html; charset=iso-8859-1”><lf> <meta name=”GENERATOR” content=”Mozilla/4.79 [en] (Windows NT 5.0; U) Netscape]”><lf> <title>CMPSCI 453 / 591 / NTU-ST550ASpring 2005 homepage</title><lf></head><lf> <much more document text following here (not shown)>

   a. Was the server able to successfully find the document or not? What time was the document reply provided?
   b. When was the document last modified?
   c. How many bytes are there in the document being returned?
   d. d. What are the first 5 bytes of the document being returned? Did the server agree to a persistent connection?

6. 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 an RTT of RTT1, . . . , RTTn. Further suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text. Let RTT0 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?

7. Consider Figure 2.12, for which there is an institutional network connected to the Internet. Suppose that the average object size is 1,000,000 bits and that the average request rate from the institution’s browsers to the origin servers is 16 requests per second. Also suppose that the amount of time it takes from when the router on the Internet side of the access link forwards an HTTP request until it receives the response is three seconds on average (see Section 2.2.5). Model the total average response time as the sum of the average access delay (that is, the delay from Internet router to institution router) and the average Internet delay. For the average access delay, use !/(1 - !b), where

! is the average time required to send an object over the access link and b is the arrival rate of objects to the access link. a. Find the total average response time. b. Now suppose a cache is installed in the institutional LAN. Suppose the miss rate is 0.4. Find the total response time.

8. Suppose you can access the caches in the local DNS servers of your department. Can you propose a way to roughly determine the Web servers (outside your department) that are most popular among the users in your department? Explain.

9. Suppose that your department has a local DNS server for all computers in the department. You are an ordinary user (i.e., not a network/system administrator). Can you determine if an external Web site was likely accessed from a computer in your department a couple of seconds ago? Explain.

10. Consider distributing a file of F = 20 Gbits to N peers. The server has an upload rate of us = 30 Mbps, and each peer has a download rate of di = 2 Mbps and an upload rate of u. For N = 10, 100, and 1,000 and u = 300 Kbps, 700 Kbps, and 2 Mbps, prepare a chart giving the minimum distribution time for each of the combinations of N and u for both client server distribution and P2P distribution.

11. Consider distributing a file of F bits to N peers using a client-server architecture. Assume a fluid model where the server can simultaneously transmit to multiple peers, transmitting to each peer at different rates, as long as the combined rate does not exceed us.

    a. Suppose that u_s/N … d_{min}. Specify a distribution scheme that has a distribution time of NF/u_s.
    b. Suppose that u_s/N Ú d_{min}. Specify a distribution scheme that has a distribution time of F/dmin.
    c. Conclude that the minimum distribution time is in general given by max5NF/us, F/dmin6.

Best of Luck!