NTNU
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TTM4100
Communication – Services and Networks

Assignment for Chapter 2: "Application Layer"

Deadline of submission: **29.01.2017**

The assignment questions are mostly based on the Problems of Chapter 2 in the textbook: J. F. Kurose and K. W. Ross. *Computer Networking: A Top-Down Approach (International Edition, 6/e)*. Please note that there are modifications to the questions in the textbook, the questions in this document are to be used if there are differences.

For each question or sub-question, several choices are provided and only one of them is correct. Submit your answers to the Its Learning system.

For Questions 1-4, two or more choices are provided for each of their sub-questions, and one of them is correct. Submit your answers to the Its Learning system. Questions 5 and 6 are for self-practice (no Its Learning submission).

1. True or false?

1.a) A user requests a Web page that consists of some text and two images. For this page, the client will send one request message and receive three response messages.

1.a.1 true
1.a.2 false

1.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.

1.b.1 true
1.b.2 false

1.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.

1.c.1 true
1.c.2 false

1.d) The Date: header in the HTTP response message indicates when the object in the response was last modified.

1.d.1 true
1.d.2 false

2. Consider the following string of ASCII characters that were captured by Ethereal when the browser sent an HTTP GET message (i.e., this is the actual content of an HTTP GET). 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. (Problem P4, Chapter 2, page 171.**)**

GET /cs453/index.html HTTP/1.1<cr><lf>Host: gaia.cs.umass.edu<cr><lf>User-Agent: Mozilla/5.0(Windows;U; Windows NT 5.1; en-US; rv:1.7.2) Gecko/20040804 Netscape/7.2 (ax) <cr><lf>Accept: ext/xml, application/xml, application/xhtml+xml, text/html; q=0.9, text/plain; q=0.8, image/png, */*; q=0.5 <cr><lf>Accept-Language: en-us, en; q=0.5<cr><lf>Accept-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>

2.a) What is the URL of the document requested by the browser?

2.a.1 http://gaia.cs.umass.edu/cs453/index.html
2.a.2 http://gaia.cs.umass.edu/
2.a.3 http://gaia.cs.umass.edu/cs453/
2.a.4 http://cs.ntnu.no/

2.b) What version of HTTP is the browser running?

2.b.1 1.0
2.b.2 1.1
2.b.3 5.0
2.b.4 5.2

2.c) Does the browser request a non-persistent or a persistent connection?

2.c.1 persistent
2.c.2 non-persistent

2.d) What is the IP address of the host on which the browser is running?

2.d.1 gaia.cs.umass.edu
2.d.2 cs.umass.edu
2.d.3 cs.ntnu.edu
2.d.4 It cannot be decided from the given information.

3. The text below shows the reply sent from a server in response to the HTTP GET message in the question 2. Answer the following questions, indicating whether in the message below you find the answer. (Problem P5, Chapter 2, page 171**.)**

HTTP/1.1 200 OK<cr><lf>Date: Tue, 07 Mar 2006 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 4.0 transitional//en" ><lf><html><lf><head><lf> <meta http-equiv=" Content-Type" Content=" text/html; charset=iso-8859-1" ><lf> <meta name=" GENERATOR" Content = " Mozilla/4.97 [en] (Windows NT 5.0; U) Netscape] " ><lf> <title>CMPSCI 453 / 591 / NTU-ST550A Spring 2005 homepage</title><lf></head><lf> <*much more document text following here (not shown*) **>**

3.a) Was the server able to successfully find the document or not? What time was the document reply provided?

3.a.1 It was not successful.
3.a.2 It was successful and the time was on Sat, 10 Dec 2005 18:27:46 GMT.
3.a.3 It was successful and the time was on Tue, 07 Mar 2006 12:39:45 GMT.
3.a.4 It was successful and the time was on Tue, 07 Mar 2006 12:39:45 CET (Central European Time).

3.b) When was the document last modified?

3.b.1 Cannot be decided from the given information.
3.b.2 The document was not modified.
3.b.3 The document was modified on Sat, 10 Dec 2005 18:27:46 CET.
3.b.4 The document was modified on Sat, 10 Dec 2005 18:27:46 GMT.

3.c) How many bytes are there in the document being returned ?

3.c.1 Cannot be decided from the given information.
3.c.2 3874
3.c.3 200
3.c.4 8859

3.d) What are the first 5 bytes of the document being returned? Did the server agree to a persistent connection?

3.d.1 The first five bytes of the returned document are: 526c3. The server did not agree to a persistent connection.
*3.d.2 The first five bytes of the returned document are: 526c3. The server agreed to a persistent connection.*cs.umass.edu
3.d.3 The first five bytes of the returned document are: <!doc. The server agreed to a persistent connection.
3.d.4 The answer cannot be decided from the given information.

4. 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 or RTT_1,…, 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 link until the client receives the object? (Problem P7, Chapter 2, textbook, page 173.**)**

4.1 RTT_0

4.2 $RTT_1 + RTT_2 + \cdots + RTT_n$

4.3 $RTT_0 + RTT_1 + RTT_2 + \cdots + RTT_n$

4.4 $2RTT_0 + RTT_1 + RTT_2 + \cdots + RTT_n$

5. Write a simple TCP program for a server that accepts lines of input from a client and prints the lines onto the server's standard output. (You can do this by modifying the TCPServer.py program in the text.) Compile and execute your program. On any other machine that contains a Web browser, set the proxy server in the browser to the host that is running your server program; also configure the port number appropriately. Your browser should now send its GET request messages to your server, and your server should display the messages on its standard output. Use this platform to determine whether your browser generates conditional GET messages for objects that are locally cached. (*Problem P12, Chapter 2, page 174: This is a self-practice problem and no submission is needed.***)**

6. Consider accessing your e-mail with POP3. (*Problem P17, Chapter 2, page 175. This is also a self-practice problem and no submission is needed.***)**

6.a) Suppose you have configured your POP mail client to operate in the download-and-delete mode. Complete the following transaction:

C: `list`
S: `1 498`
S: `2 912`
S: .
C: `retr 1`
S: `blah blah ...`
S: `.......... blah`
S: .
?
?

6.b) Suppose you have configured your POP mail client to operate in the download-and-keep mode. Complete the following transaction:

C: `list`
S: `1 498`
S: `2 912`
S: .
C: `retr 1`
S: `blah blah ...`
S: `..........blah`
S: .
?

6.c) Suppose you have configured your POP mail client to operate in the download-and-keep mode. Using your transcript in part (6.b), suppose you retrieve messages 1 and 2, exit POP, and then five minutes later you again access POP to retrieve new e-mail. Suppose that in the five-minute interval no new messages have been sent to you. Provide a transcript of this second POP session.