# ECE358: Tutorial Set 2

**Problem 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.

**Problem 2.** 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.

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,t ext/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>

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?

**Problem 3.** 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 4.0 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/4.79 [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) >

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

**Problem 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 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?

**Problem 5.** Consider a short, 10-meter link, over which a sender can transmit at a rate of 150 bits/sec in both directions. Suppose that packets containing data are 100,000 bits long, and packets containing only control (e.g., ACK or handshaking) are 200 bits long. Assume that N parallel connections each get 1/N of the link bandwidth. Now consider the HTTP protocol, and suppose that each downloaded object is 100 Kbits long, and that the initial downloaded object contains 10 referenced objects from the same sender. Would parallel downloads via parallel instances of non-persistent HTTP make sense in this case? Now consider persistent HTTP. Do you expect significant gains over the non-persistent case? Justify and explain your answer.

**Problem 6.** Consider the scenario introduced in the previous problem. Now suppose that the link is shared by Bob with four other users. Bob uses parallel instances of non-persistent HTTP, and the other four users use non-persistent HTTP without parallel downloads.
a. Do Bob’s parallel connections help him get Web pages more quickly? Why or why not?
b. If all five users open five parallel instances of non-persistent HTTP, then would Bob’s parallel connections still be beneficial? Why or why not?