ECE/CS 356: Computer Network Architecture

Homework 2 (100 Points)

Problem 1 (5*5=25)

True or false? (and brief reasoning)

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.
False. Send 4 receive 4.

b) Two distinct Web pages (for example, www.duke.edu/research.html and www.duke.edu/students.html) can be sent over the same persistent connection.
True. Persistent HTTP leaves connection open.

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.
False. Each TCP segment can only carry one request.

d) The Date: header in the HTTP response message indicates when the object in the response was last modified.
False. Date is request generation time.

e) HTTP response messages never have an empty message body.
False. 204 No Content. (May give credit if answer was True with explanation on 404 Not Found)

Problem 2 (4*5=20)

Consider the following ASCII characters I have captured from the network:

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..Accept-Encoding: zip,deflate<cr><lf>Accept-Charset: ISO-8859-1,utf-8;q=0.7,*;q=0.7..Keep-Alive: 300<cr><lf>Connection:keep-alive<cr><lf><cr><lf>

a) What is the URL of the document requested by the browser? Make sure you give the hostname and the file name parts of the URL.
gaia.cs.umass.edu/cs453/index.html

b) What version of HTTP is the browser running?
HTTP 1.1

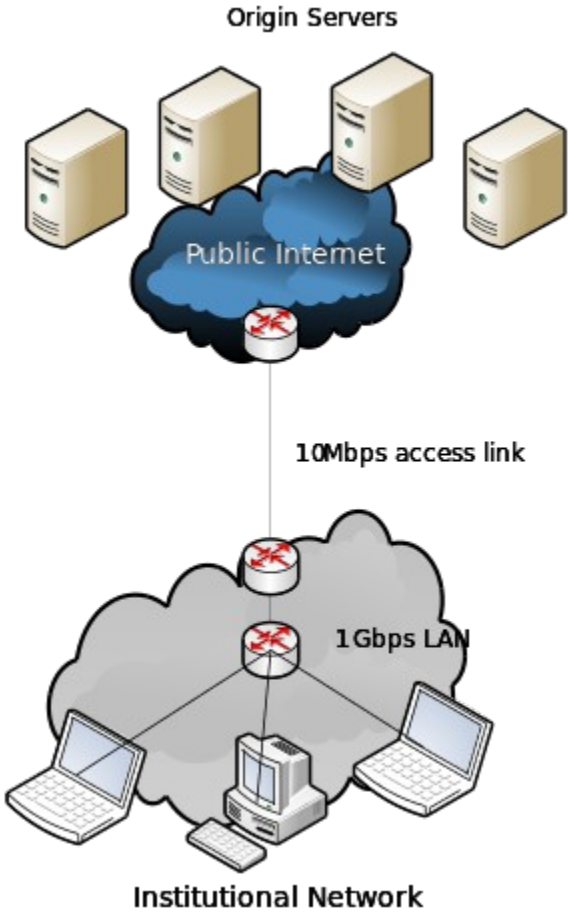
c) Is a Netscape or an Internet Explorer browser making the request?
Netscape

d) Is the browser requesting a non-persistent or a persistent connection?
Persistent

e) What is the IP address of the computer on which the browser is running?
Can’t tell

Problem 3 (5*4=20)

Assume the following scenario already presented



Assume the following information:

- Avg object size: 5Mbits
- Avg request rate from browsers to origin servers: 15 request/sec
- RTT from institutional router to any origin server: 2 sec
- Access link rate: 10 Mbps

1. Calculate:
    - LAN utilization **(5Mbps * 15 / 1Gbps = 7.5%)**
    - Access Link utilization **(5Mbps * 15 / 10Mps = 750%) (100%)**

Now, consider that we have installed a web cache (Proxy server) in our institutional network. Assume the following information:

a. suppose cache hit rate is 0.4
    i. 40% requests satisfied at cache
    ii. 60% requests satisfied at origin

2. Calculate:
    i. LAN utilization **(5Mbps * 15 / 1Gbps = 7.5%)**

ii. Access Link utilization **(5Mbps * 15 * 0.6 / 10Mbps = 450%) (100%)**

Problem 4 (5*7=35)

Short questions:

1) What information is used by a process running on one host to identify a process running on another host?
   Socket (IP + port)

2) Suppose you wanted to do a transaction from a remote client to a server as fast as possible. Would you use UDP or TCP? Why?
   UDP (faster). (OK if answered TCP and talked about high reliability requirement of the transaction)

3) For a communication session between a pair of processes, which process is the client and which is the server?
   The process that initiates the communication is the client. The process that waits to be contacted is the server.

4) For a P2P file sharing application, do you agree with the statement: "There is no notion of client and server sides of a communication session"? Why or why not?
   No. The receiver is the client, the sender is the server.

5) Why do HTTP, FTP, SMTP, and POP3 run on top of TCP rather than on UDP?
   Reliability, in-order transmission.

6) How an e-commerce site can keep a purchase record for each customer?
   Unique ID stored in cookie on user's machine.

7) Why is it said that FTP sends control information "out of band"?
   FTP passes control information on a separate connection.