**CSCE 560 Homework / Wireshark Lab 2**

**Chapter 2 – Application Layer**

**Fall 18**

**2d Lt James Marvin**

**Assigned: Monday, 15 Oct**

**Due: Wednesday, 24 Oct, 1400**

**Problem 1**. Chapter 2, R.1

List five nonproprietary Internet applications and the application-layer protocols that they use.

**Electronic mail: SMTP**

**Remote terminal access: Telnet**

**Web: HTTP**

**File Transfer: FTP**

**Internet Telephony: SIP, RTP, or proprietary**

**Problem 2**. Chapter 2, R.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 labeled as the client. The process that waits to be contacted to begin the session is the server.**

**Problem 3**. Chapter 2, R.5

What information is used by a process running on one host to identify a process running on another host?

**In order for a process running on one host to send packets to a process running on another host, the receiving process needs to have an addresss. To identify the receiving process, two pieces of information need to be specified: the adress of the host and an identifier that specifies the receiving process in the destination host. For most networked applications the identifier for the receiving process is a port number.**

**Problem 4**. Chapter 2, R.10

What is meant by a handshaking protocol?

**The client and server exchange transport-layer control information with each other before the application-level messages begin to flow. This allows them to prepare for incoming packets. After the handshaking process is complete, a connection is established between the sockets.**

**Problem 5**. Chapter 2, R.12

Consider an e-commerce site that wants to keep a purchase record for each of its customers. Describe how this can be done with cookies. [Describe how the cookies are created and exchanged between the computers. Discuss how and which headers are modified.]

**In order to get cookies to perform this task, there must be a cookie header in the HTTP response message; a cookie header line in the HTTP request message; a cookie file kept on the user’s end system and maged by the user’s browser; and a back-end database at the e-commerce site. The interaction plays out like this. When the request comes in at the e-commerce site server, the server creates a unique identifier (the cookie) and creates an entry in its database that is idexed by the identification number. The e-commerce server responds to the client’s browser, including in the HTTP response a Set-cookie: header, which contains the indentification number. When the client’s browser recieves the HTTP response message, it sees the Set-cookie: header. The browser then appends a line to the special cookie file that it manages. The line includes the hostname of the server and the identification number in the Set-cookie: header. Each time the client requests a web page, the client’s browser consults the cookie file, extracts the identification number, and puts the cookie header line in the HTTP request. Because this number is being tracked on both sides of the client-server relationshipped the website knows that it is the same client that visited before.**

**Problem 6**. Chapter 2, R.16

Suppose Alice with a Web-based e-mail account (such as Yahoo! mail or Hotmail) sends a message to Bob, who accesses his mail from his mail server using POP3. Discuss how the message gets from Alice's host to Bob's host. Be sure to list the series of application-layer protocols that are used to move the message between the two hosts.

**Alice’s user agent (in this case her Web-based e-mail account) sends the email message to her own mail server using SMTP. Her own mail server then sends the message to Bob’s mail server using SMTP. Then Bob retrieves the message from his mail server to his agent via the POP3 protocol.**

**Problem 7**. Chapter 2, R.18

From a user's perspective, what is the difference between the *download-and-delete mode* and the *download-and-keep mode* in POP3? [How do these modes affect the user?]

**In the donwload-and-delete mode the messages are deleted from your mail server after you read them. In the download-and-keep mode the messages are kept on your server even after you read them. The problem with download-and-delete is that you will not be able to access the messages again from a different device. In the download-and-keep the messages are still on the mail server and you can access the messages again at a later time and even on a different device.**

**Problem 8**. Chapter 2, P1

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.

**False, the user will send mutliple requests (one for each object)**

*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.

**True**

*c.* With nonpersistent connections between browser and origin server, it is possible for a single TCP segment to carry two distinct HTTP request messages.

**Fasle, each TCP connection is closed after the server sends an object. Each TCP connection transports exactly one request message and one response message.**

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

**False, Date indicates the time when the HTTP response was created and sent by the server.**

**Problem 9**. Chapter 2, P7 **(this problem has been modified)**

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 that 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, a small amount of HTML text. Let RTT0 denote the RTT between the local host and the server containing the object. Assuming a transmission time of t1 ­for the object, how much time elapses from when the client clicks on the link until the client receives the object?

**You need to have twice the quantity of RTT0 in the equation because there is the time for the request and the response.**

**Problem 10**. Chapter 2, P9

Consider Figure 2.12, for which there is an institutional network connected to the Internet. Suppose that the average object size is **850,000 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 – ), where  is the average time required to send an object over the access link and  is the arrival rate of objects to the access link. [You may assume the response time for a cache hit (i.e., LAN delay) is 0 seconds.]

*a.* Find the total average response time.

**Total= (time from institutional network client to LAN router) + (time from LAN router to public internet router) + (time for response from servers)**

**Network client to lan router= 0 seconds (given in problem)**

**Lan router to internet router=(850,000 bits/15e6 bps)/(1-(850,000/15e6 bps)16)**

**Response from servers= 3 seconds**

**Total time= 3.607 seconds**

*b.* Now suppose a cache is installed in the institutional LAN. Suppose the **miss** rate is 0.4. Find the total response time.

**Total response time= .4(total time when it goes to internet)+.6(0 second delay for cache)**

**Total response time = .4(3.607)**

**Total response time = 1.4428 seconds**

**Problem 11**. Chapter 2, Supplemental Question 1

What is the difference between persistent HTTP with pipelining and persistent HTTP without pipelining? [What event causes the requests to be sent?] Which of the two is used by HTTP/1.1?

**In HTTP without pipelining you have to wait for the server to respond before the client can send another request. With pipelining the client can send multiple requests without waiting for the replies to each request. HTTP/1.1 uses pipelining.**

**Problem 12**. Chapter 2, Supplemental Question 2

Why is it said that FTP sends control information “out-of-band”?

**It sends the control messages in a separate TCP connection from the TCP connection that sends data messages.**

**Wireshark Lab**

Complete the lab in 02 - Wireshark\_HTTP.pdf.

The last page of this lab instructs you to go to <http://www.motobit.com/util/base64-decoder-encoder.asp> in order to decode a string. Another good website is <http://www.opinionatedgeek.com/dotnet/tools/base64decode/> , paste the string in the box then click the Decode button.