1. 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.

   For each customer, the browser assigns a cookie number. The browser sends the cookie number to the site each time the user accesses the site. The site uses this number to keep track of the user.

2. 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. The Web document at the URL has one embedded GIF image that resides at the same server as the original document. What transport and application-layer protocols besides HTTP are needed in this scenario?

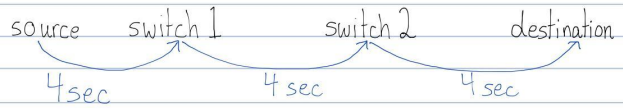
Purpose	Application Protocol	Transport Protocol
Obtains host name and IP address	DNS	UDP
Connects to the server	HTTP	TCP

3. In modern packet-switched networks, including the Internet, the source host segments long, application-layer message (for example, an image or a music file) into smaller packets and sends the packets into the network. The receiver then reassembles the packets back into the original message. We refer to this process as message segmentation. The following figure illustrates the end-to-end transport of a message with and without message segmentation. Consider a message that is 8x106 bits long that is to be sent from source to destination in the figure. Suppose each link in the figure is 2Mbps. Ignore propagation, queuing, and processing delays.

   a. Consider sending the message from source to destination without message segmentation. How long does it take to move the message from the source host to the first packet switch? Keeping in mind that each switch uses store-and-forward packet switching, what is the total time to move the message from source host to destination host?
   b. Now suppose that the message is segmented into 800 packets, with each packet being 10,000 bits long. How long does it take to move the first packet from source host to the first switch? When the first packet is being sent from the first switch to the second switch, the second packet is being sent from the source host to the first switch. At what time will the second packet be fully received at the first switch?

   c. How long does it take to move the file from source host to destination host when message segmentation is used? Compare this result with your answer in part (a) and comment.

A) $\frac{8\times10^6 \text{ bits}}{2\times10^6 \text{ bits/sec}} = 4 \text{ sec}$ from source to switch 1



12 sec total

B) packet 1 from source to switch 1

$\frac{1\times10^4 \text{ bits}}{2\times10^6 \text{ bits/sec}} = 5$ miliseconds

2nd packet at switch 1 = 1st package at switch 2 = $2\times5_{msec} = 10$ miliseconds.

C) 1 packet to destination = $5\times3 = 15$ miliseconds

after 1 packet recieved every 5 msec

15 miliseconds + 799×5 miliseconds = 4.01 sec

Using message segmentation, the delay is 1/3 of what it is without message segmentation

d. In addition to reducing delay, what are reasons to use message segmentation?

Message segmentation allows for there to be a single bit error without having to retransmit the entire message. It also allows for huge messages to be sent into the network.

e. Discuss the drawbacks of message segmentation.

Because of message segmentation, packets have to be put in order at the destination. Since message segmentation requires many smaller packets and the header is the same size for all packets, message segmentation causes there to be an increase in the total amount of header bytes.

4. In Section 2.7, the UDP server described needed only one socket, whereas the TCP server needed two sockets. Why? If the TCP server were to support n simultaneous connections, each from a different client host, how many sockets would the TCP server need?

The UDP server, has all data from different clients entering the server through a single socket. When it comes to the TCP server, there is an additional welcoming server. Because of this, for n simultaneous connections, a TCP server needs n+1 sockets.

5. What is an overlay network? Does it include routers? What are the edges in the overlay network?

An overlay network is a file sharing system between two people which consists of the nodes that are part of the file sharing system and the logical links between

the nodes. There are no routers in an overly network. The logical links between two nodes are what are considered edges in the overlay network.

6. Look over your received emails and examine the header of a message sent from a user with an .edu email address. Is it possible to determine from the header the IP address of the host from which the message was sent? Do the same for a message sent from a gmail account.

   For the user with an .edu email address, you will be able to see the sender's IP address, however, you will not have access to this information with a gmail email address.

7. Telnet into a Web server and send a multiline request message. Include in the request message the If-modified-since: header line to force a response message with the 304 Not Modified status code. Show your process and output.

   Into the command prompt enter "telnet webserver 80" where webserver is the webserver you wish to access in order to start telnet. Next, enter the HTTP GET message. It should look similar to

   GET /index.html HTTP/1.1
   Host: utopia.poly.edu
   If-modified-since: Fri, 3 April 2018 09:23:24 GMT
   HTTP/1.1 304 Not Modified
   Date: Mon, 5 April 2018 15:20:05 GMT
   Server: Apache/1.3.9 (Unix)
   ETag: "1631-3a3-3c6d478b'

   Since the last modified date of the page on the webserver is before the date the command was issued, the server will return "304 Not Modified".