Assignment 2

R1. List five nonproprietary Internet applications and the application-layer protocols that they use.

* Web; HTTP
* Remote Login; Telnet
* Network News; NNTP
* E-Mail; SMTP
* File Transfer; FTP

R2. What is the difference between network architecture and application architecture?

Network architecture refers to the organization of the communication process while application architecture is the structure of the application.

R3. For a communication session between a pair of processes, which process is the client and which is the server?

Client initiates the communication while the server is contacted.

R4. 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, because in a P2P file-sharing application, the receiver is the client and the sender is the server.

R5. What information is used by a process running on one host to identify a process running on another host?

The IP of the destination host and the port number of the socket in the destination process.

R6. 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, since the transaction is completed in a roundtrip time. The client sends the request and the server sends the reply back through the UDP socket.

R7. Referring to Figure 2.4 , we see that none of the applications listed in Figure 2.4 requires both no data loss and timing. Can you conceive of an application that requires no data loss and that is also highly time-sensitive?

One example is remote word processing with Google docs, since it runs over the internet and timing changes are not the best.

R8. List the four broad classes of services that a transport protocol can provide. For each of the service classes, indicate if either UDP or TCP (or both) provides such a service.

* Reliable data transfer; TCP only
* Security; Neither
* Guarantee delivered within a time; Neither
* Guarantee maintain throughput; Neither

R9. Recall that TCP can be enhanced with SSL to provide process-to-process security services, including encryption. Does SSL operate at the transport layer or the application layer? If the application developer wants TCP to be enhanced with SSL, what does the developer have to do?

SSL operates at the application layer. To enhance TCP, the developer would include the SSL code in the application.

R10. What is meant by a handshaking protocol?

The two communicating entities exchange control packets to then see if to send the data or not.

R11. Why do HTTP, SMTP, and POP3 run on top of TCP rather than on UDP?

Applications associated with these protocols require all application data to be received in the correct order, which TCP provides.

R12. 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.

When the user first visits a site, the server makes a unique ID number, an entry in its backend database, and returns the number as a cookie number. This number is stored on the user’s host and is managed by the browser.

R13. Describe how Web caching can reduce the delay in receiving a requested object. Will Web caching reduce the delay for all objects requested by a user or for only some of the objects? Why?

It brings the desired content closer to the user and reduces the delay for all objects by reducing the traffic on links.

R14. 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.

Telnet is not available in Windows 7 by default. to make it available, go to Control Panel, Programs and Features, Turn Windows Features On or Off, Check Telnet client. To start Telnet, in Windows command prompt, issue the following command > telnet webserverver 80

where "webserver" is some webserver. After issuing the command, you have established a TCP connection between your client telnet program and the web server. Then type in an HTTP GET message. An example is given below:

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GET /index.html HTTP/1.1

Host: utopia.poly.edu

If-modified-since: Fri, 18 May 2007 09:23:24 GMT

HTTP/1.1 304 Not Modified

Date: Mon, 21 May 2007 15:20:05 GMT

Server: Apache/1.3.9 (Unix)

ETag: "1631-3a3-3c6d478b'

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Since the index.html page in this web server was not modified since Fri, 18 May 2007 09:23:34 GMT, and the above commands were issued on Sat, 19 May 2007, the server returned "304 Not Modified". Note that the first 4 lines are the GET message and header lines inputed by the user, and the next 4 lines (starting from HTTP/1.1 304 Not Modified) is the response from the web server.

R15. List several popular messaging apps. Do they use the same protocols as SMS?

* WhatsApp
* Facebook Messenger
* Snapchat

These apps use different protocols.

R16. Suppose Alice, with a Web-based e-mail account (such as Hotmail or Gmail), 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.

The message is sent from Alice’s host too her mail server over HTTP. The server then sends the message to Bob’s server over SMTP, to then transfer to the host over POP3.

R17. Print out the header of an e-mail message you have recently received. How many Received: header lines are there? Analyze each of the header lines in the message.

MessageId YrjkYjVCR6eqJx15pc7spg@ismtpd0051p1mdw1.sendgrid.net

Created at: 5/16/2020, 4:03:59 PM EDT (Delivered after 30 sec)

From: Trim <info@asktrim.com>

To: myemail@gmail.com

Subject: Daniel, Get paid up to 2 days early :white\_check\_mark:

SPF: pass

DKIM: pass

R18. From a user’s perspective, what is the difference between the download-and-delete mode and the download-and-keep mode in POP3?

After a user retrieves its messages from a POP server, the messages are deleted with download and delete. This can be a problem since you may want to access messages from many different machines. Download and keep does not do this and allows the user to store the messages.

R19. Is it possible for an organization’s Web server and mail server to have exactly the same alias for a hostname (for example, foo.com)? What would be the type for the RR that contains the hostname of the mail server?

Yes, they can have the same alias for a host name since the MX record is used to map the mail server’s host name.

R20. Look over your received e-mails, and examine the header of a message sent from a user with a .edu e-mail 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.

You should be able to see the sender’s IP address, but not for Gmail.

R21. In BitTorrent, suppose Alice provides chunks to Bob throughout a 30-second interval. Will Bob necessarily return the favor and provide chunks to Alice in this same interval? Why or why not?

It is not necessary since Alice has to be in the top 4 neighbors of Bob to send out chunks to her. If Alice provides chunks to Bob throughout a 30-second interval, this might not even occur.

R22. Consider a new peer Alice that joins BitTorrent without possessing any chunks. Without any chunks, she cannot become a top-four uploader for any of the other peers, since she has nothing to upload. How then will Alice get her first chunk?

Since a peer picks a random peer to unchoke, Alice will be eventually unchoked by one of her neighbors, where she will receive chunks.

R23. What is an overlay network? Does it include routers? What are the edges in the overlay network?

The overlay network is a P2P file sharing system consisting of nodes and logical links. These links are edges and connect node A to node B if there is a semi-permanent TCP connection. This network does not include routers though.

R24. CDNs typically adopt one of two different server placement philosophies. Name and briefly describe them.

Enter Deep: Deploy server clusters in access ISPs to reduce delays and increase throughput between end users.

Bring Home: Bring the ISPs home by building CDN server clusters at a smaller number of sites, which lowers maintenance and management cost.

R25. Besides network-related considerations such as delay, loss, and bandwidth performance, there are other important factors that go into designing a CDN server selection strategy. What are they?

Other factors include load-balancing, diurnal effects, variations across DNS servers, and the need to alleviate hot-spots.

R26. 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?

UDP has no welcoming socket, which means all the data enters through one socket. TCP has a welcoming socket, which is created when a new connection is created.

R27. For the client-server application over TCP described in Section 2.7, why must the server program be executed before the client program? For the client-server application over UDP, why may the client program be executed before the server program?

The server program must be executed first to initiate a TCP connection with the server, as opposed to UDP where the client does not initiate connections upon execution.