



Indian Institute of Technology, Guwahati
CS341 - Computer Networks
ASSIGNMENT 2

Answer all questions

1. 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?
2. Why do HTTP, SMTP, and IMAP run on top of TCP rather than on UDP?
3. 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 IMAP. 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.
4. 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?
5. What is an overlay network? Does it include routers? What are the edges in the overlay network?
6. Obtain the HTTP/1.1 specification (RFC 2616). Answer the following questions:
 - (a) Explain the mechanism used for signaling between the client and server to indicate that a persistent connection is being closed. Can the client, the server, or both signal the close of a connection?
 - (b) Can a client open three or more simultaneous connections with a given server?
 - (c) Either a server or a client may close a transport connection between them if either one detects the connection has been idle for some time. Is it possible that one side starts closing a connection while the other side is transmitting data via this connection? Explain.

7. Write down the major differences between Apache and Nginx servers?
8. What is DNS? What are the different types of DNS servers involved in handling a DNS query? How does DNS resolution work?
9. What is HTTP/2 Server Push? How does it differ from HTTP/1.1. Briefly explain its workflow.
10. 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 RTT_1, \dots, RTT_n . Further suppose that the Web page associated with the link contains exactly one object, consisting of a small amount of HTML text. Let RTT_0 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?
11. Consider distributing a file of $F = 10$ Gbits to N peers. The server has an upload rate of $u_s = 50$ Mbps, and each peer has a download rate of $d_i = 2$ Mbps and an upload rate of u . For $N = 10, 1000$, and $1,500$ and $u = 700$ Kbps, 1 Mbps, and 2 Mbps, prepare a chart giving the minimum distribution time for each of the combinations of N and u for both client-server distribution and P2P distribution.
12. Consider a short, 10-meter link, over which a sender can transmit at a rate of 300 bits/sec in both directions. Suppose that packets containing data are 200,000 bits long, and packets containing only control (e.g., ACK or handshaking) are 100 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 200 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.

Best wishes