

Homework 2

Due date: April 29th midnight 11:59pm

Question 1: please circle a single best answer

1.1 For HTTP with non-persistent connections:

- (a) each object suffers a delivery delay of one RTT
- (b) each object suffers a delivery delay of two RTTs
- (c) the server leaves the TCP connection open after sending a response
- (d) the server opens a new TCP connection to send a response

Answer - b

1.2 From a UNCC computer, a student requests the page at URL <http://www.ieee.org/>. A bit later, another student requests the same page from another machine. Most probably, the URL of that second request will be resolved by

- (a) the DNS server installed on the first student machine
- (b) the DNS server installed on the second student machine
- (c) the local DNS server of UNCC
- (d) one of the root name servers

Answer - c

1.3 As a transport layer protocol DNS mostly uses:

- (a) TCP because it is reliable
- (b) UDP because it is reliable
- (c) TCP because it is faster than UDP
- (d) UDP because it has smaller overhead
- (e) none of the above

Answer – d

1.4. The TCP:

- (a) provides logical communication between hosts.
- (b) provides bandwidth-guaranteed logical communication between processes.
- (c) provides delay-guaranteed logical communication between processes.
- (d) provides reliable logical communication between processes.

Answer - d

1.5. The UDP:

- (a) provides bandwidth-guaranteed logical communication.
- (b) provides delay-guaranteed logical communication.
- (c) provides reliable logical communication between processes
- (d) none of above

Answer - d

1.6. In the reliable data transfer protocol, the countdown timer:

- (a) is used at the receiver
- (b) is used at the sender
- (c) is introduced to solve the problem of lossy channels
- (d) both B and C
- (e) all of the above

Answer - d

Question 2 (HTTP): 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?

Answer:

- Web caching is a temporary storage mechanism that speeds the delivery of web content to end users.
- Web cache retains copies of newly demanded content in the storage including audio, video, images and static text for later retrieval.
- If the object requested by client browser is present in the web cache storage then that object is sent to browser, which reduces the delay in receiving requested object.
- If the requested object is not present in web cache storage, then it is retrieved from original web server and stored in the web cache storage.

Yes, web cache will reduce delay for all objects.

Web cache reduces the traffic on links and speeds the delivery of web content which results in reduction of delay for all the objects.

Question 3 (DNS): What is the difference between recursive queries and iterative queries of DNS servers, in terms of the DNS performance (discuss this in terms of the number of messages needed and the corresponding delay)?

Answer:

- A query in which the DNS server does all the fetching and give back the result is known as a recursive query.
- In recursive query, DNS client should get response from a DNS server with either resource queried or an error message.
- If DNS server is not able to fetch the query then it forwards this query to another DNS server until the result is received, or the query fails.
- In recursive query, the client does not need to send multiple queries to the server. Once a query has been received by the server, the server keeps on trying to fetch the result either from its own cache or from the cache of another server by forwarding the query which results in reduction of message sent from client-side.
- Also, there is a reduction in communication delay on client side as most of the work is accomplished by the server.
- Since server must query other servers in order to fetch the results, so there might be some delay at server-side.
- In an iterative query, answer for a query is not fetched by a DNS server. If the server does not have answer, then it will give back referrals to other DNS servers which might have the answer. Then DNS client can query the DNS server which it obtained from referrals. This process goes on until DNS client locates the DNS server with answer to required query or until it gets an error or timeout.
- In iterative query, the client must send multiple messages as it has to query multiple servers to get the required answer.

Question 4 (Email): When we retrieve emails from email servers, can we use SMTP? (Please justify your answers).

Answer:

No, SMTP is not used for retrieving emails from email servers.

- SMTP is used for sending emails to email servers by clients and it is also used by servers to push emails to other servers.
- At the receiving end of emails, SMTP has limited ability as compared to POP and IMAP which are specifically designed to be used at the reception end of emails.

Question 5 (TCP): problem P37 (textbook chapter 3, scanned version is attached)

Answer:

- a. There are two slow-start intervals first is occurring at interval 1-6, second is occurring at interval 23-26
- b. TCP congestion avoidance phase is operating in interval 6-23
- c. After 16th transmission round segment loss is detected by triple duplicate ACK.
- d. After 22nd transmission round segment loss is detected by timeout.
- e. The initial value of ssthresh at the first transmission round 32.
- f. The value of ssthresh at the 18th transmission round 21.
- g. The value of ssthresh at the 24th transmission round 13.
- h. During 7 transmission round 70th segment is sent.
- i. If a packet loss is detected after the 26th round by the receipt of a triple duplicate ACK, then the value will be 4.
- j. Suppose TCP Tahoe is used and assuming that triple duplicate ACKs are received at 16th round, then ssthresh and the congestion window size at 19th round will be 1.
- k. Suppose TCP Tahoe is used and there is a timeout event at 22nd round, then 52 packets would be sent out from 17th round and 22nd round.

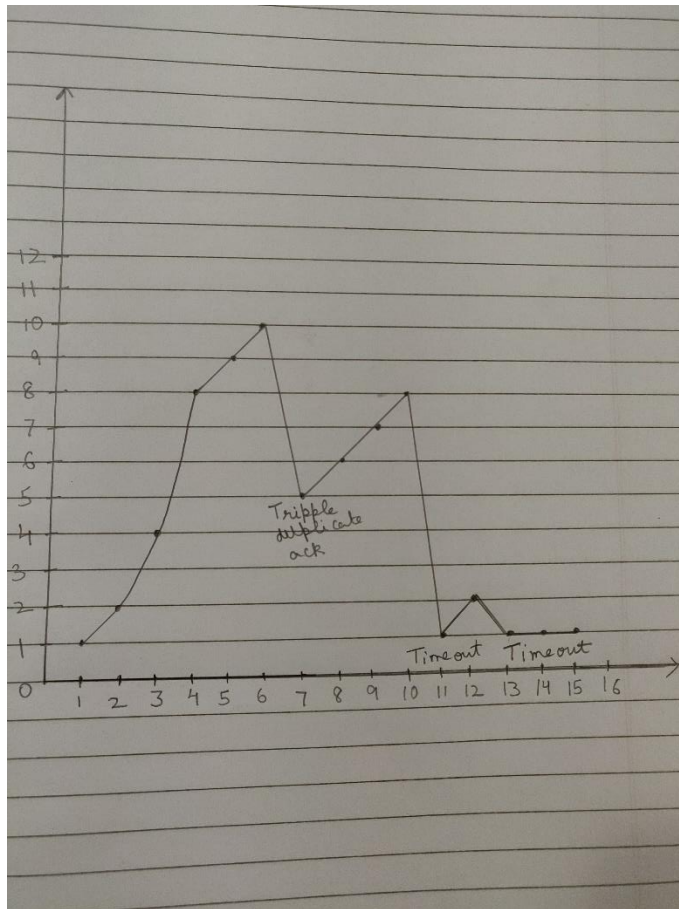
Question 6 (Congestion Control): Consider sending a large file from one host to another over a TCP connection that has no loss.

- (a) Suppose the slow start threshold (ssthresh) is 8. Assuming approximately constant round-trip (RTT) times, how long does it take for ConWin to increase from 1 MSS to 5 MSS (assuming no loss events and constant RTT)?
- (b) Please draw the congestion window dynamics as RRT proceeds till 15th RTT. Initially, slow start threshold (ssthresh) is 8. Assume first, sender receives duplicate ACKs at 6th RTT, then, experiences timeout event at 10th RTT, and finally experience another timeout event at 12th round.

Answer:

- (a) The total time taken is 3-4 seconds.

(b)



References:

Class Notes and Course Textbook