# Sample Questions on Application Layer

Q1) Why is SMTP not used for transferring e-mail messages from the recipient's mail server to the recipient's personal computer?

Q2) Consider the figure below, for which there is an institutional network connected to the Internet. Suppose that the average object size is 900,000 bits and that that the average request rate from the institution's browsers to the origin server is 1.5 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 a HTTP request until it receives the response is 2 seconds on average. Model the total average response time as the sum of the average access delay and the average Internet delay. For the average access delay, use A/(1-AB) where A is the average time required to send an object over the access link and B is the arrival rate of objects to the access link. Note that the delay on the institutional LAN is to be neglected.
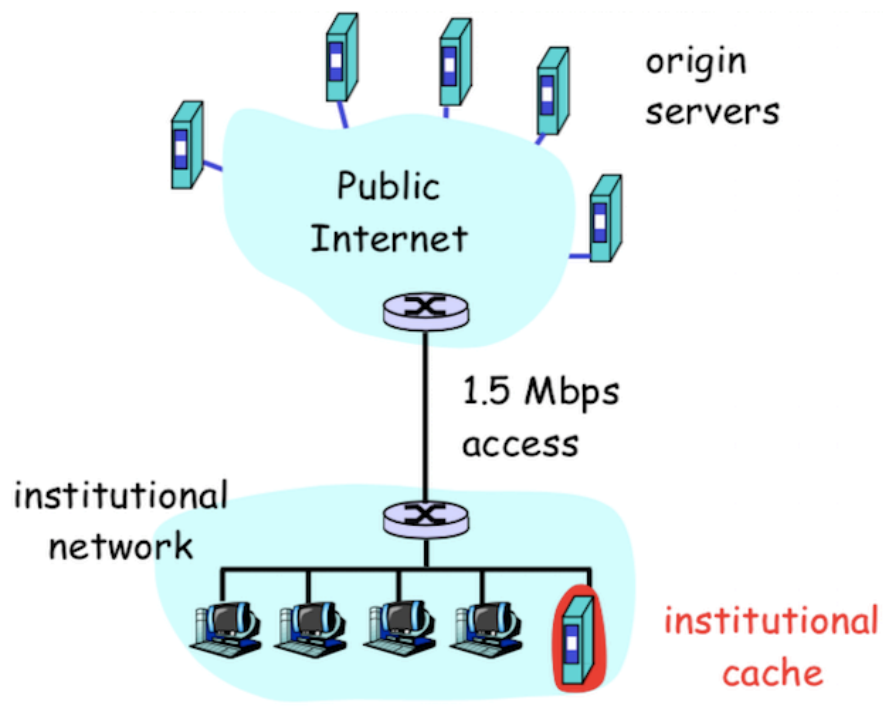
(a) Find the total average response time.

(b) Now suppose a cache is installed in the institutional LAN. Suppose the hit rate is 0.4. Find the total response time.

Q3) Why do you think DNS uses UDP, instead of TCP, for its query and response messages?

Q4) Suppose you are sending an email from your Hotmail account to your friend, who reads his/her e-mail from his/her mail server using IMAP. Briefly describe how your email travels from your host to your friend's host. Also, what are the application-layer protocols involved?

Q5) How can iterated DNS queries improve the overall performance?

Q6) Suppose you needed to use HTTP to download a web page with three embedded images. Draw diagrams, similar to those from the lecture slides, depicting the main interactions between the client and server when using non-persistent HTTP, persistent HTTP without pipelining, and persistent HTTP with pipelining.

Q7) 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 look-up is necessary to obtain the IP address. Suppose that n DNS servers are visited before your host receives the IP address from DNS and that iterative queries are used. Let the successive visits to the DNS servers incur an RTT of RTT_1, ..., 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? (EXAM PROBLEM FROM PAST SESSIONS)

Q8) Multiple Choice Questions – Choose one from the possible choices:

A) In the lecture we solved a problem, which involved finding the total delay incurred in downloading objects assuming that the web cache hit ratio was 40%. Now assume that the cache hit rate is 50% (i.e. 50% of the requests are satisfied locally from the web cache). The rest of the parameters are the same as in that problem. The average delay to download the objects is:

      (i) between 1.2 and 1.3 seconds

      (ii) greater than two seconds

      (iii) between 1.0 and 1.1 seconds

      (iv) none of the above

B) Suppose a client sends an HTTP request message with the *If-modified-since:* header. Suppose the object in the server has not changed since the last time that client retrieved the object. Then the server will send a response message with the status

code:

    (i) 304 Not Modified

    (ii) 404 Not Found

    (iii) 200 OK

    (iv) 403 Permission Denied

C) HTTP request and response messages are not humanly readable

    (i) True

    (ii) False

D) All SMTP e-mail messages must be in 8-bit ASCII

    (i) True

    (ii) False