

RAT Test Run

Question 1: Consider downloading a HTML file and associated objects (all in the same server), using HTTP, and select the correct option:

- A With non-persistent connections the client (1) initiates a TCP connection, (2) sends a request via the associated client socket, (3) repeats step 2 until all objects are retrieved, (4) closes the connection.
- B With persistent connections the client (1) sends a request via an open client socket, (2) repeats step 1 until all objects are retrieved and never closes the connection.
- C With non-persistent connections the client (1) initiates a TCP connection, (2) sends a request via the associated client socket, (3) closes the connection, (4) repeats all the steps until all objects are retrieved.
- D With persistent connections the client (1) initiates a TCP connection, (2) sends a request via the associated client socket, (3) closes the connection, (4) repeats all the steps until all objects are retrieved.

Question 2: Assuming similar network conditions, the time for retrieving a single webpage without associated objects is:

- A The same for persistent and non-persistent HTTP connections if the propagation delay is the same.
- B Higher if we use a persistent HTTP connection.
- C Lower if we use a persistent HTTP connection.
- D The same for persistent and non-persistent HTTP connections because we only retrieve 1 file.

Question 3: HTTP is:

- A a stateless protocol because it uses UDP, which a connectionless protocol.
- B a stateless protocol even though mechanisms can be used for tracking users.
- C a stateful protocol because certain mechanisms allow web sites to track users.
- D a stateful protocol because it uses TCP, which is connection-oriented protocol.

Question 4: What are the main entities involved in HTTP communications:

- A a user agent and a server.
- B at least two servers.
- C a client and a server.
- D at least two clients.

Question 5: A web cache, or proxy server, can:

- A reply to a client with a conditional GET to inform when the content was last modified.
- B reduce the request time for a server HTTP response and reduce the traffic in the access link of an institution.
- C reduce the response time for a client HTTP request and reduce the traffic in the access link of an institution.
- D be used by a client for storing his/her files on the premises of an ISP.

Question 6: The main components of Email are:

- A TCP, SMTP and IMAP.
- B HTTP and IMAP.
- C HTTP, user agents and mail servers.
- D SMTP, user agents and mail servers.

Question 7: Comparing HTTP to SMTP:

- A SMTP can be used for retrieving emails between mail servers.
- B HTTP is mainly a pull protocol, while SMTP is primarily a push protocol.
- C SMTP is mainly a pull protocol, while HTTP is primarily a push protocol.
- D HTTP can be used for retrieving emails between mail servers.

Question 8: When using HTTP with persistent connections:

- A a web cache is required to allow HTTP pipelining (back-to-back object requests without needing to wait).
- B a web cache can still reduce access time to web pages.
- C a web cache is useless because the access time is already reduced after the TCP connection setup (handshake).
- D a web cache can only reduce access time to pages with multiple associated objects.

Question 9: Suppose *Client A* wants to retrieve a large file of 6 MiB from *Server B* using HTTP. The path from *Client A* to *Server B* has three consecutive links of rates $R_1 = 1$ Mbit/s, $R_2 = 2$ Mbit/s, $R_3 = 800$ kbit/s (i.e. $A \leftarrow 1\text{Mbit/s} \rightarrow R \leftarrow 2\text{Mbit/s} \rightarrow R \leftarrow 800\text{kbit/s} \rightarrow B$). Assume there's no other traffic in the network, **how long does it take** to complete the file transfer?

- A RTT + exactly 1 min
- B RTT + slightly more than 7.5 s
- C 2RTT + slightly more than 1 min
- D 2RTT + exactly 1 min

Question 10: A small departmental website serves one HTML page plus 18 additional objects (images/CSS), all from the same host over HTTP/1.1. Current server settings: Persistent connections are disabled (non-persistent HTTP). Static files have no Cache-Control. Clients are not configured to use any proxy (forward cache). RTT to the server is about 100 ms, with negligible loss. Which change will most reduce the total completion time of the initial page load for typical users under these constraints?

- A Enable cookie-based sessions so the server can maintain state across object requests.
- B Enable HTTP persistent connections (keep-alive) so the browser can reuse one TCP connection for multiple object requests.
- C Add Cache-Control (e.g., max-age) and validators (ETag/Last-Modified) to all static objects.
- D Stand up a forward web cache (proxy) near the server, but keep client browsers unchanged.