CSC358 Tutorial 3

Question 1: Concept Review

(a) What happens to the user agents and the SMTP server when Alice sends an email to Bob?

(b) What's the difference between "`RCPT TO:`" and "`TO:`" in SMTP?

(c) What is at each level of the hierarchical structure of DNS? Why is it designed as a hierarchical structure?

(d) Why do we say "P2P is more scalable than client-server"?

(e) What's the point of "rarest-first" and "tit-for-tat"?

(f) Describe, as detailed as possible, everything that's happening behind the scene when you watch a movie on a video-streaming service such as Netflix.

Question 2: All the RTT

Suppose you just unboxed a brand new laptop and are using a vanilla web browser (no browser cache, no parallel requests) to visit a new start-up's web page that has not been visited by anyone in the world yet. The web page consists of one HTML file containing references to one CSS file, one Javascript file, and 10 image files, all hosted on the same web server as the HTML file. Assume that the end-to-end delay for transmitting any application-layer request or response is a constant T. What is the total delay until you see the complete web page in your browser? Try to take **everything** happening behind the scene (as far as we have learned) into consideration. Discuss with the TA and others in the tutorial.

Question 3: File Distribution in P2P

Consider distributing a file of F bits to N peers using a P2P architecture. Assume the "fluid model", i.e., the server (where the file is initially) can simultaneously transmit to multiple peers, transmitting to each peer at different rates, as long as the combined rate does not exceed the server upload bandwidth, u_s. For simplicity, assume that the peer download bandwidth, $d_{\min}$, is very large so that it is never a bottleneck. Let u_c be the peer upload bandwidth of each of the N peers.

(a) Suppose that $u_s \leq u_c N/(N-1)$. Specify a distribution scheme (e.g., dividing the file in a certain way and sending certain parts to certain peers, etc.) that has a file distribution time (the time until every peer has a complete copy of the file) of

$$t = \frac{F}{u_s}$$

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(b) Suppose that $u_s \geq u_c N/(N-1)$. Specify a distribution scheme that has a file distribution time of

$$t = \frac{NF}{u_s + Nu_c}$$

(c) **Challenge Question**: What if each peer has a different upload bandwidth? Let u_i be the upload bandwidth of peer i where $1 \leq i \leq N$. Rethink Part (a) and (b). How would the file distribution scheme change?