

1. Explain how you would set up alternative DNS servers that allows *both* standard DNS top-level domains (since you don't want users of your DNS server to not be able to reach well-known Internet sites) as well as custom TLDs that you've created to be resolved?
2. Cascading Style Sheets (CSS) are a way to describe the appearance of items on a webpage. CSS data is often stored in separate files that are referenced from a webpage. A piece of advice given to web designers to speed up page loading is to combine the contents of multiple CSS files page into a single one.
 - (a) Why does this advice speed up the loading process?
 - (b) If the CSS file is very small, another recommendation is to include the CSS data directly in the HTML file itself. However, this is not recommended when the CSS file is larger. What is the rationale for this recommendation?
3. Many streaming services implement "geo-blocking", which restricts content to users coming from a specific region or country.
 - (a) Given what you know about the structure of the Internet, how does checking a client's IP give a coarse estimate about where a client is located?
 - (b) Interestingly, for some websites, simply changing the DNS server one uses, rather than changing one's IP address, is enough to bypass the blocks. Hypothesize about how blocking is being implemented in this case.
4. A friend claims that the fastest way to retrieve all of the contents of a web page is to open lots of simultaneous TCP connections to download all of the resources in the page in parallel. Under what circumstances is that claim true? Under what circumstances is this false? What are the disadvantages of doing this?
5. Your computer is connected via a 50 Mbps link to server C, which is a HTTP cache server. Server C is connected via a 1 Gbps link to the web server with the actual content. Assuming the version of TCP you are using allows an MSS of unlimited size and the TCP SYN/ACK and HTTP request packets have negligible size:
 - (a) How long does it take for you to retrieve a 125KB file from C if the file is already in the cache if the RTT between your computer and C is 40ms and RTT between C and the web server is 400ms.

- (b) How long does it take for you to retrieve the same file if the file is not present in the cache?
- 6.
- (a) In what situations would head-of-line (HOL) blocking occur in HTTP/1.1?
 - (b) Why is HOL blocking especially undesirable when it occurs for web pages?
 - (c) What is the main technique that HTTP/2 and QUIC employ to address HOL blocking?