

Quiz 7 solution

Write your name on the exam. Write something for every question. Students who do not write something for everything lose out over students who write down wild guesses. You will get some points if you attempt a solution but nothing for a blank sheet of paper. Write something down, even wild guesses. Problems take long to read but can be answered concisely.

Problem	Maximum	Score
1	12	
2	8	
Total	20	

Problem 1 – Network performance

This problem asks you to answer some questions about the performance of network transfers. You should assume that the link with the lowest data rate is the one connecting the client to the network. Also assume that the network carries no traffic other than the transfer discussed in the problem.

- a) (6 points) Describe the two measures of the performance of the network path and discuss how they combine to give the latency of downloading a document.

The propagation delay and the data rate influence the latency. Latency = propagation delay + document size/data rate. The propagation delay is the sum of the propagation delays for all the links along the path. The ratio document size/data rate is called transmission delay and it measures the time it takes to send the document on the slowest link along the path.

- b) (3 points) In-network caching close to the client helps improve performance when one of these two measures is the main cause of latency. Which one? Explain briefly.

Caching reduces the propagation delay as the cache is closer to the client than the server. When propagation delay (the roundtrip time) is the larger of the two terms that compose latency, reducing it by using a cache has a big impact on the latency.

- c) (3 points) Compressing the document helps improve performance when one of these two measures is the main cause of latency. Which one? Explain briefly.

Compressing a document reduces the transmission delay. When the data rate is small, the transmission delay dominates the latency, so reducing the transmission delay by compressing the documents has a big impact.

Problem 2 – Web cookies and privacy

a) (4 points) Explain what cookies are and how they work.

Cookies are small strings that web servers store at web clients. The web server takes the initiative of sending a cookie to the client. Depending on its parameters, the cookie is discarded after the browser is closed, or it is stored on disk and discarded at a later date. Each cookie is associated with the site that gave it to the client and the browser includes all cookies from a given site in all the HTTP requests it makes to that site.

b) (4 points) The web client does not send all cookies to all sites. Explain how it is possible for a site serving advertisements to track your browsing behavior across multiple sites you visit. Assume that all web pages are plain HTML (no JavaScript) and that all advertisements are plain images.

The advertising agency runs a web server that stores the images of the advertisements. The sites link to the images on the agency's server. Thus irrespective which site the user is browsing, client retrieves the ads from the agency's server and sends it the cookies associated with that server. By naming the images in a way that encodes the site the user comes from, the ad agency can track the browsing history of the user for multiple sites.