Solutions to Homework Set 2

Homework Problems

1.

Some name lookups return multiple addresses since there are multiple servers for the given name, typically with websites with high traffic volume.

The HEADER field tells details about the type of request (whether it was a query etc), whether recursion was allowed, the number of questions and answers that it got etc. The QUESTIONS field shows the name of the site for which the IP address was requested, the type of query (A = address) etc. The ANSWERS field lists all the answers that it got. AUTHORITY RECORDS gives the names of the name servers which authorirated for the IP addresses of the name we were looking at.

2.

This is an open ended question and the students are expected to think and suggest some possible way of doing this. We were not specifically looking only for those things which already exists in DNS or HTTP (though they are valid answers) and students could propose changes to DNS and HTTP to get the desired functationality.

(a) With HTTP, one of the simplest possibilities is to use a proxy server. The proxy server will cache all requests that pass through it. Once a user requests a web page the proxy goes all the way to the server and gets the page and also cached. All subsequent requests to that web site are served directly from the cache (as long as it is not too old). Yet another option is the "redirect" capability in HTTP and students can use their schemes to use this. (12.5 pts)

(b) With DNS, one possibility could be to modify DNS so that when the DNS server gets multiple responses to a query, it can send pings etc to the servers to find the one

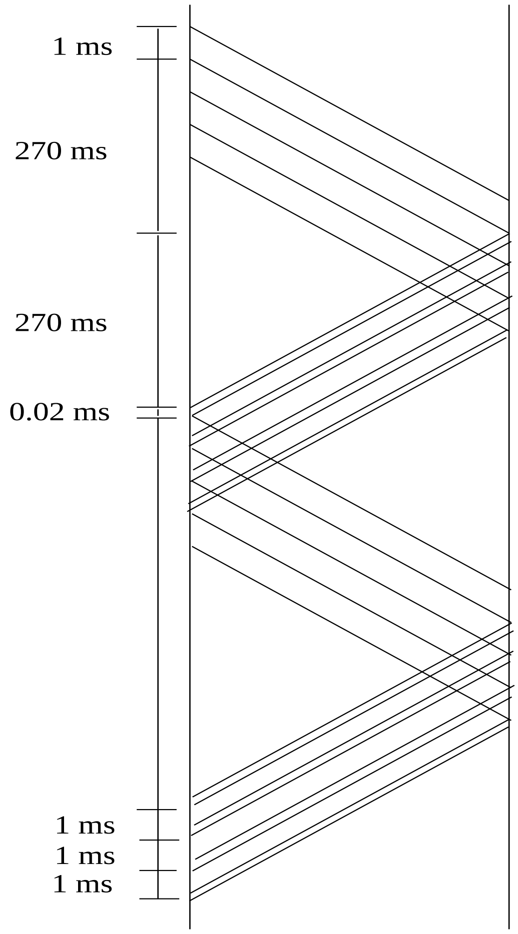

Figure 1: Figure showing the details of the calculation

with the shortest distance. It then forwards the address corresponding to the server with the lowest distance to the user who sent the query. And so on. The students do not have to give detailed descriptions of how the scheme will work. If you think that the idea is reasonable, then it is fine. (12.5 pts)

Please note that other answers to this question are possible.

3. Please see the figure for details

(a) The time to complete the transfer

$$
\begin{aligned}
T_{trans} &= \frac{128}{4}\left[\frac{5600}{5600000} + .27 + \frac{112}{5600000} + .27\right] + 3\frac{5600}{5600000} \\
&= 17.31564\text{sec}
\end{aligned}
$$

(15 pts)

(b) The first 4 packets are retransmitted. The retransmission begins at 0.54102 seconds (541.02 msec) when the NAK for the first packet is received. (10 pts)

$$
\begin{aligned}
T_{trans} &= \left[\frac{5600}{5600000} + .27 + \frac{112}{5600000} + .27\right] + \frac{128}{4}\left[\frac{5600}{5600000} + .27 + \frac{112}{5600000} + .27\right] \\
&\quad +3\frac{5600}{5600000} \\
&= 17.85666\text{sec}
\end{aligned}
$$

(10 pts)

Additional questions for 600 level students

1. (25pts)

In the simplest implementation, the sender keeps sending packets till it receives a NAK. A NAK is generated for packet n only if all packets till $n-1$ have been correctly received. That is n is always the smallest sequence number for a packet that is yet to be received. When the sender gets a NAK for packet n, it simply begins sending again from packet n onwards. Here, since packets are not ACKed, the sender does not know how many packets are unacked. Therefore we do not have to fix any value for N. Whenever we get a NAK, we go back there and start transmitting again. If you were to have a fixed N, then you would have to wait for a timeout before you transmitted the next window of packets even though all the packets were received correctly. Thus to remove this inefficiency, it is better not to have any fixed N. (20 pts)

The gain in using NAKs is that we do not have to wait for ACKs to arrive before new packets are transmitted, increasing the efficiency. On the other hand, in the presence of losses and large RTTs or when the data rate is low, the loss will be noticed after a long time and may result in a lot of retransmissions. With go back N, generally all out of sequence packets are discarded. Hence a selective ACK does not achieve any specific improvements in the efficiency since all packets in the window after the lost packet are retransmitted anyway. Cumulative ACKs work just as well in reporting the losses in the case of go-back-N. (10 pts)