HW 1
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Resources. (All people, books, articles, web pages, etc. that have been consulted when producing your answers to this homework)

Textbooks and instructor's slides.

On my honor, as an Aggie, I have neither given nor received any unauthorized aid on any portion of the academic work included in this assignment. Furthermore, I have disclosed all resources (people, books, web sites, etc.) that have been used to prepare this homework. This work is my own and is written in my own words.

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Problem 1. Exercise 14.4

Solution.

The client should set its time using the third times, whose RTT is 20 ms, since these times could minimum the errors happened when synchronizing the clock. The time that it sets should be $t + (RTT/2) = 10 : 54 : 28.352$. The accuracy is around $\pm 10ms$. If the time between sending and receiving messages is at least 8ms, then the accuracy will improve. New accuracy will be $\pm 2ms$.

Problem 2. Exercise 14.7

Solution.

The offset is estimated as $(tr_1 - ts_1 + ts_2 - tr_2)/2 = 10.0125s$. The accuracy should be $\pm(tr_1 - ts_1 + tr_2 - ts_2)/2 = \pm 0.0375s$.

Problem 3. Exercise 14.13

Solution.

If evens e and e' are concurrent, then we can tell that there exists i and j, which are between 1 and N, such that $V_e(i) > V_{e'}(i)$ and $V_e(j) < V_{e'}(j)$. In this case we can't decide whether $V(e) > V(e')$ or not.
And if $V(e) < V(e')$, there must be $V_e(i) \leq V_{e'}(i)$ for all i = 1,2,... N. In this scenario we can say that e $\rightarrow e'$.

Problem 4. Exercise 14.14

Solution.

1. P is the initiator. It will record the local state as 101, send out markers to Q and turn on recording on channel C_{PQ}.
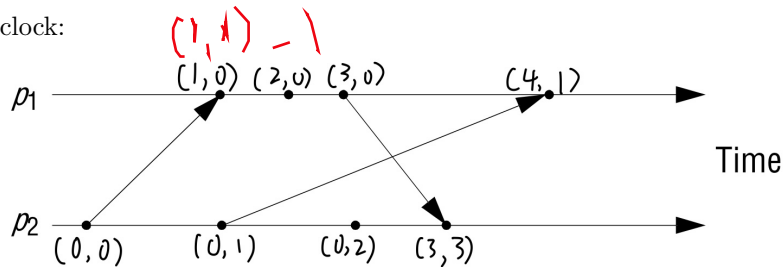2. Q receives the marker message. Since this is the first marker message Q is seeing, it will mark the channel C_{PQ} as empty and record its own state as 102. Then it will send out Markers to P.
3. P will receive the Marker message and mark the channel channel C_{PQ} as the message received.

Problem 5. Exercise 14.15

Solution.

Vector clock:

Lamport timestamp:

Time