TECHNISCHE UNIVERSITÄT DARMSTADT

TK1: Distributed Systems - Programming & Algorithms

8. Theory Assignment
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Task 1: Correctness in distributed systems (2P)

Mention (at least) two criteria for the correctness in distributed systems. Explain the criteria in one to two sentences and describe (at least) one example of the realization of the criterion.

Task 2: Time synchronization using the algorithm by Christian (4P)

A client *C* wants to synchronize with a timeserver *S* in the intranet (assume an ideal minimum transmission delay of zero milliseconds). The runtime behavior of its messages (round-trip time) and the resulting timestamp of *S* are both stored by *C* in the following table:

Round-trip (ms)	Time (HH:MM:SS)
20	15:38:24.765
18	15:38:36.580
22	15:38:49.698

Refer to the algorithm by Christian to answer the following questions:

a) Which entry in the depicted table should *C* select to set its local clock?

b) How accurate is the time estimate of *C* in relation to *S*?

c) Which time should *C* set to its local clock?

d) The transmission of a message between *C* and *S* takes at least 4ms (for each direction). How does this change the answers for a-c?

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Task 3: Time synchronization using NTP (4P)

Let A and B be two NTP-servers which both synchronize over a (unspecified) network. Server B receives a message from server A with a timestamp 15:32:56.210 at 15:32:56.400. Thereafter, server B sends an answer to server A, and server A receives the answer at 15:32:56.960 with the timestamp 15:32:56:690.

Determine the offset of the clocks of A and B and the accuracy of the estimation (cf. TK1-3.2-DistAlgo-Synchronization-WS14_Part1, p. 13 et seqq.).