TK1 Exercise 8

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Task 1 : Correctness in distributed systems

Safety - Safety properties are kept throughout the computation and are always true.
Example:
Mutual Exclusion : Ensure that no two different process are in the same critical region at the same time.

Liveness - Guarantees progress in computation.
Example:
Livelock prevention : Ensure that processes don't end up in a live lock, waiting for resources from one another and thus not making any progress forever.

Task 2: Time synchronization using the algorithm by Christian

	Round trip(ms)	Time(HH:MM:SS)
1	20	15:38:24.765
2	18	15:38:36.580
3	22	15:38:49.698

a. C uses the lowest round trip time. In this case d = 18 ms (entry 2 in table)

b. Accuracy is +/-(T_{Round}/2 - min) and min in ideal case is 0
   So, accuracy is +/- 9ms

c. C will set local time to 15:38:36.580 + 0.009 = 15:38:36.589

d. Min transmission delay 4ms (for each direction)
   i. a remains unchanged

ii. b changes. Accuracy is +/-(T_{Round}/2 - min) = +/-(18/2 - 4) = +/- 5ms
iii. c remains unchanged

Task 3: Time synchronization using NTP

T_{i-3} = 15:32:56.210
T_{i-2} = 15:32:56.400
T_{i-1} = 15:32:56.690
T_i = 15:32:56.960

Delay, d_i = T_{i-2} - T_{i-3} + T_i - T_{i-1}
= 15:32:56.400 - 15:32:56.210 +15:32:56.960 - 15:3256.690
d_i = 0.460 ms
Clocks offset, o_i = (T_{i-2} - T_{i-3} +T_{i-1} - T_i) / 2
= (15:32:56.400 - 15:32:56.210 +15:32:56.690 - 15:32:56.960) / 2
= -0.080 / 2
o_i = -0.040 ms

Accuracy is o_i - d_i/2 <= o <= o_i + d_i/2

Minimum Accuracy = - 0.27 ms
Maximum Accuracy= 0.19 ms