

## Exercise C – Real-time Architectures

This exercise concerns the synchronization of clocks in a distributed system consisting of several machines connected by a network. This problem is discussed in the lecture on May 20<sup>th</sup>. Additional information for this exercise can be found at the following places.

- [www.win.tue.nl/~johanl/educ/2Q341/CDS.04-Synchronization.ppt](http://www.win.tue.nl/~johanl/educ/2Q341/CDS.04-Synchronization.ppt) gives an introduction.
- [www.win.tue.nl/~johanl/educ/2Q341/Clocks synchronization](http://www.win.tue.nl/~johanl/educ/2Q341/Clocks_synchronization) is a directory with papers. Of these, the [overview article by Ramanathan](#) should be studied as well as [Cristian's article](#).

The problem statement is as follows.

- Implement a clock synchronization algorithm for synchronizing the clocks in a distributed system consisting of at least three machines.
- Do not use a reference time but use the average as the time to converge towards.
- Make it fault tolerant
  - not centralized
  - deal with machine and link failure
- Address the performance through a trade-off between frequency of synchronization, accuracy and overhead. In order to determine an accuracy, assume a maximal drift.
- Simulate clocks with different drifts: slow, regular and fast clocks.

You may implement your solution in the language of your choice. It is perhaps most practical to use a simulated clock that is synchronized with the real clock on the system you use. In this synchronization you can simulate different drifts. In your report describe your solution, how you tested it and what the performance is. Also, make the assumptions explicit and indicate the achieved accuracy under these assumptions.