Distributed system simulation can increase performance, re-usability and modularity in model-based product development. This thesis investigates four aspects of distributed simulation: multi-threaded simulations, simulation tool coupling, distributed equation solvers and parallel optimization algorithms.

Multi-threaded simulation makes it possible to split up the workload over several processing units. This reduces simulation time, which can save both time and money during the product development cycle. The transmission line element method (TLM) is used to decouple models to independent sub-models.

Different simulation tools are suitable for different problems. Tool coupling makes it possible to use the best suited tool for simulating each part of the whole product. Models from different tools can then be coupled into one aggregated simulation model. An emerging standard for tool coupling is the Functional Mock-up Interface (FMI). It is investigated how this can be used in conjunction with TLM.

Equation-based object-oriented languages (E0Ots) are becoming increasingly popular. A logical approach is to let the equation solvers maintain the same structure that was used in the modelling process. Methods for achieving this using TLM and FMI are implemented and evaluated.

In addition to parallel simulations, it is also possible to use parallel optimization algorithms. This introduces parallelism on several levels. For this reason, an algorithm for profile-based multi-level scheduling is proposed.
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