

Modeling and Simulation of Distributed Message Queues

In this thesis, you will work on a method for modeling distributed systems for exchanging messages between in and between systems. (so called “message-oriented middleware” (MOM)). In particular, their influence on the performance of a software system will be investigated. The developed method will then be evaluated on an example. For this purpose, you will extend an existing tool for the simulation of software architectures regarding its ability to model and simulate such middleware.

In particular, you will:

- Instrument an existing example system, for which a model and simulation already exist (for example mRUBiS [1]) and adapt the system so it communicates with two different messaging systems, e.g. two that use the Java Messaging Service (JMS) interface.
- Benchmark the two implemented solutions under different load situations.
- Model the resulting systems and their performance with the existing modeling and performance prediction toolbench Palladio [2]. Document workarounds or current shortcomings of the approach regarding the modeling of this kind of system.
- Define different factors that can influence the resource consumption and runtime behavior of the middleware, e.g. the data stream, number of different channels, configuration.

We assume that the existing techniques can be improved in two ways:

- The quality of the performance model by explicitly expressing resources and the configuration of a MOM. To this end, you will (in close cooperation with the supervisor) map the behavior of the MOM to architecture modeling primitives and existing behavior descriptions. Together, we will evaluate the system with measurements from the implemented system.
- The understandability and expressiveness of the models can be improved by regarding the middleware as a first-class entity and making it exchangeable as a whole in the model.

We offer:

- A current and relevant topic and work with state-of-the-art and innovative technologies.
- Good working environment and intensive supervision.

If you are interested in the topic or have any questions, please feel free to contact me.

[1] <https://www.hpi.uni-potsdam.de/giese/public/mdelab/mdelab-projects/case-studies/mrubis/>

[2] https://sdqweb.ipd.kit.edu/wiki/Palladio_Component_Model