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DISSERTATION TITLE: *Executable Modeling of Deployment Decisions for Resource-Aware Distributed Applications*

New business models in computing technology, such as the renting of computing resources known as cloud computing, are recently gaining importance in the market. With these business models, instead of buying or renting physical hardware, companies can nowadays rent virtual infrastructures through cloud computing services. Cloud computing services centrally supply computing resources to companies to run their software applications. In contrast to hardware, these services are flexible and scalable, which means that companies can instantly rent more computing resources on-demand for running their applications, for example, when there is an unexpected rush of clients accessing their software applications. How do we design software applications that can automatically adjust the amount of computing resources they use, in order to preserve quality of service for their clients?

This thesis proposes a framework for designing software applications that can adapt to changes in client traffic. The framework extends a concurrent and object-oriented modeling language to make it easy to express the management of computing resources. The framework can be used to design and compare different resource management strategies for software applications running on flexible and scalable virtual infrastructures. Such comparisons allow a better understanding of the trade-offs between the operational cost and the quality of service of software applications. This means that we can make better design decisions early in the software development life cycle. The framework combines mathematical semantics with a user-friendly Java-like syntax and tool support.