

The Applicability of Palladio for Assessing the Quality of Cloud-based Microservice Architectures

Extended Abstract

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A prominent approach that advocates the modeling of the system architecture and through simulations predicting the performance of the system is the Palladio approach. The Palladio approach comes with a good tool-support for architects and engineers for performance predictions based on the architectural model of the system. It has been evaluated in several studies for its feasibility to predict the performance of software systems based on their architectural model. However, no evidence exists that shows that Palladio applies to a context where microservices and the latest cloud technologies are adopted.

We conduct a case study at a partner company to assess the applicability of Palladio in such a context. The company is a high-tech company from Germany and provides manufacturing solutions in the fields of machine tools, laser technology, electronics, and Industry 4.0. The goal of the case study is twofold:

- to assess how accurately we could predict the performance of Microservices using Palladio and report possible influence factors and shortcomings while modeling the system;
- and to evaluate the feasibility of analyzing emerging quality attributes like the scalability, elasticity, and cost-efficiency of the software system.

Results show that Palladio can simulate and provide sufficient or at least acceptable prediction results for cloud-based microservice architectures. However, when the number of users increases, the accuracy of performance predictions drops.

Further, we provide evidence on the feasibility of Palladio to analyze scenarios that subsume scalability, elasticity, and cost-efficiency. With Palladio, we could analyze scalability scenarios; however, for situations related to cost-efficiency and elasticity, Palladio requires workarounds. For one scenario, the analysis was impossible.

Further, we identify and present a list of factors that hampered the analysis of the scenarios. Some of these aspects are of relevance to future research directions. One relevant factor is the lack of abstractions to specify messages and messaging queues. Moreover, when we model queues through passive resources and locks, Palladio does not support the specification of self-adaptation rules based on the number of threads waiting to acquire a lock.