

dqualizer: Domain-Centric Runtime Quality Analysis of Business-Critical Application Systems [Extended Abstract]

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Context and Problem

Today’s application landscapes become larger and more complex as the number of users increases. This comes with the need for more flexible architecture styles such as (distributed) microservices [5]. Conclusively, the runtime quality of application systems – e.g., in terms of performance, reliability, and resilience – becomes more important as the impact of these attributes increases with use.

The runtime quality of application systems directly influences the business success of companies in a wide range of technical domains. Consequently, it is essential to continuously monitor, evaluate, and improve runtime quality through analysis measures. Over the last few years, corresponding analysis measures such as load [1] and resilience tests [2] or monitoring [3] have become widespread in practice, and mature commercial and open-source tools have been developed. When using these analysis measures, stakeholders usually have (different) issues to address. Developers, for example, are interested in the response time of specific (technical) methods to optimize the execution time. In contrast, domain experts are more interested in domain-related metrics, such as the number of products sold in a specific domain. However, modern and popular software architecture and development approaches do not consider runtime quality despite their criticality.

Importantly, the analysis measures are all located at the technical level and are not interpreted at the domain level. This technical data can be collected directly, whereas the business metrics must be derived from technical measures. Hence, this data needs to be translated between the technical and the business metric perspective, which poses a major challenge. Moreover, the quality attributes of the domain can differ from those of technical components. On the

one hand, direct metrics such as CPU load or memory consumption provide a profound insight into the overall health of a system. On the other hand, derived quality attributes, such as cost or power consumption, play a major role at the domain level and are used in business decision-making. One promising software architecture and development approach is Domain-Driven Design (DDD) [4], which divides a software system into domains and therefore enables to collaboratively develop a ubiquitous language for each domain, which then can be used for translation. However, DDD does not consider runtime quality.

Objective and Method

The research project dqualizer (<https://dqualizer.github.io/>) aims to close this gap between the domain-specificity of application systems and the (technical) measures and findings of quality assurance by means of a domain-centric approach. For this purpose, we will integrate means to model and monitor runtime quality metrics into DDD-based techniques that enable domain experts to describe domain-centric runtime quality concerns. Subsequently, dqualizer intends to offer tools to generate technical solutions to gather the relevant metrics with open-source tools (see <https://openapm.io>) and aggregate the analysis results on the domain level. From a domain perspective, meaningful load and resilience tests can be automatically generated and interpreted by dqualizer, and the links to technical monitoring can be established. The innovative concepts will be implemented in an open-source tool that should be usable with existing (OpenAPM) tools.

The joint research project of the Novatec Consulting GmbH and the University of Hamburg collaborates closely with the industry partners DATEV eG und VHV Solutions GmbH to evaluate the concept of

dqualizer in real case studies. The industry partners work in complex domains, i.e., tax accounting and insurance, that are well suited for applying dqualizer to get hands-on experience and quick feedback from industry-relevant domains and their technical environments. The development and use of dqualizer in the case studies further enable domain experts and management to be involved in the quality management of an enterprise application during the entire life cycle, starting from requirements engineering to operation and maintenance of the running software. This results in higher software quality regarding quality attributes.

Talk Outline

In this talk, we will elaborate on the challenges and problems that dqualizer intends to solve and report the experiences and insights from workshops conducted with the industry partners. Additionally, we discuss a first take on dqualizer's architecture and render out the intended timeline of the dqualizer journey.

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