Performance Engineering Practices
for Modern Industrial Applications at ABB Research

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ABSTRACT

ABB is developing a vast range of software services for process automation applications used in chemical production facilities, power plants, and container ships. High responsiveness and resource efficiency is important in this domain both for real-time embedded systems and distributed containerized systems, but performance engineering can be challenging due to system complexity and application domain heterogeneity. This talk provides experiences and lessons learned from several selected case studies on performance engineering. It illustrates testing performance of OPC UA pub/sub communication, clustered MQTT brokers for edge computing, software container online updates, and lightweight Kubernetes frameworks while highlighting the applied practices and tools. The talk reports on challenges in workload modeling, performance testing, and performance modeling.

KEYWORDS

kubernetes, benchmark, containers, container orchestration performance testing, OPC UA, MQTT, load testing, edge computing, resource-constrained devices

BIOGRAPHY

Dr.-Ing. Heiko Koziolek is Corporate Research Fellow for Software Architecture at ABB Research in Ladenburg, Germany. After obtaining a PhD in software engineering in 2008, he has been leading research projects on software architectures and technologies for industrial process control and consults ABB software development units for the design of large-scale software systems. His research is concerned with predicting software performance and analyzing software maintainability, specifically in applied research projects connected to product development. He was awarded Most Influential Paper awards of the Elsevier Journal of Systems and Software (2019) and the ACM/SPEC International Conference on Performance Engineering (2020). He is co-author of the book 'Modeling and Simulating Software Architecture' published by MIT Press in 2016. His professional activities include serving as Associate Editor at Elsevier's Journal of Systems and Software and program committee member of ICSA, ICPE, ECSA, and ICSE.