Master’s Thesis

QoS-centered Topology Extraction for Distributed Applications

Background
Modern distributed systems are dynamically deployed across multiple runtime environments. This is especially true for Microservice-based architectures and in the IoT domain. Due to this inherent complexity, orchestrators (e.g. container orchestration, such as Kubernetes) are being adopted, which explicitly hide the underlying distribution and network topology to simplify management, deployment and administration of applications.

Problem
For specialized applications, e.g. building on streaming middleware and real-time data, a look at the deployment topology in combination with QoS-aspects is required. This information can be gathered at runtime by monitoring and evaluating a cluster’s state. While the allocation of instances to hosts is maintained by orchestrators, quality aspects, such as throughput or an assessment of “critical paths” – in particular from an application perspective – are not integrated with the topology.

Goals
The goal of this thesis is to analyze / compare / implement (one or multiple) approach(es) to extract application-specific topology information, based on a combination of deployment topology, performance analysis (e.g. from monitoring) and other orchestrator metadata (e.g., Kubernetes or Docker) of applications. Variations of the topic, depending on personal interest, are possible and encouraged.

Required Skills:
• Familiarity with deployment of container technology and orchestration tools
• Good programming skills in a modern programming language, ability to work with RESTful APIs in that language

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Our Mission:
Our lectures cover fundamental methods and techniques in the areas of service computing, cloud computing, and enterprise computing. We like to engage students in hands-on building of distributed information systems and to take an interdisciplinary approach to evaluating such systems. Through a close mentoring of students, especially in our seminars, we aim to introduce students to our ongoing research and to excite them to do future studies and research with us.