

# Testing Performance of Microservices on Edge

## Abstract

In the computing era in which we live, several computing paradigms have emerged. Cloud computing enabled a wide number of applications providing overwhelming processing power and storage space. However, with cloud computing came issues of privacy and network communication overhead. In order to solve these issues, another computing approach emerged, focusing on processing data close to the source, at the edge of the network. However, adopting Edge computing is challenging. In order to design edge-based systems, it is necessary to understand how software will perform on specific edge computing configurations. The main challenge we are focusing on in this work is measuring performance of software, designed according to microservices pattern, on edge. In edge computing, performance parameters such as response time, reaction time, and utilization of hardware resources (CPU, memory), are important for making architectural decisions. The challenge is, how to measure these for specific hardware configurations, even for cases when all hardware parts are not available.

In order to solve this problem, we focus on using system simulators and virtual prototyping. System simulators are valuable tools for exploring performance of existing hardware platforms, and those platforms that are still in the design stage. However, system simulators have high performance requirements. Therefore, the idea is to execute system simulators on cloud, and establish a toolchain that integrates them with existing performance measuring pipeline tools, such as PPTAM.

The main benefits of this work will be the possibility to measure performance related parameters of software execution on specific hardware configurations, and establishment of opensource toolchain approach that enables specification of provisional hardware configuration on which microservices execute.

In order to achieve these goals, it is necessary to do the following action. It is first necessary to identify performance related properties that are specific to execution of microservice-based software on edge. Then, it is necessary to survey the available system simulators and choose an appropriate one considering the following factors: i) accuracy of the system simulator, ii) flexibility of the simulator for the integration, and iii) existing analysis tools for the simulator. Then, it will be necessary to integrate the system simulator with PPTAM, and if necessary, develop additional benchmarks and analysis components. Finally, it will be necessary to create a smooth pipeline that enables configuration of this toolchain for different hardware configurations with analysis considering various performance parameters, and deploy it online (e.g., using containers, Docker).

Keywords: Edge computing, performance measuring, microservices, system simulation, virtual prototyping.