Systematic Literature Review on Microservices: Challenges and Technologies

Keerthana Sanala Prakash[1] | Henrique Rocha[2] | Marco Túlio Valente[3] | Serge Demeyer[1]

[1]Department of Computer Science, University of Antwerp, Belgium

[2]Department of Computer Science, Loyola University Maryland, USA

[3]Deparment of Computer Science, UFMG, Brazil

Correspondence
Henrique Rocha. Email:
henrique.rocha@gmail.com

Summary

As microservice architecture is a new research area, the need for a systematic literature review is important to summarise the state of the art and identify the potential for future studies. Although various studies have been conducted which cover the microservice challenges, it is still strenuous to get a clear image of all the existing challenges one needs to understand while adopting microservices. In this paper, we conducted a systematic literature review to understand the challenges in adopting microservices and the technologies used in implementing microservices. In our systematic literature review, we collected 81 primary studies. We identified that the most common challenges in adopting microservices are migration (14 references), performance (11 references), scalability (10 references), and testing (10 references). For the technologies used in implementing microservices, container technologies (i.e., docker, kubernetes) are the most cited (14 references). Moreover, the second most cited are the programming languages and Other technologies used to develop microservices (13 references). The resulting study can serve as a foundation for researchers and practitioners to plan and implement microservices.

KEYWORDS:
microservices, systematic literature review, service oriented architecture, internet of things.

1 | INTRODUCTION

During the last ten years, cloud computing, and the relatively low cost of server renting services like amazon web services, azure, and google cloud have opened the opportunity to build businesses around cloud technologies. This model also brings new challenges to scale and maintain systems

The design, development, and operation of microservices are picking up more momentum in the industry. At the same time, academic work on the topic is at an early stage

The academia is joining microservices architectural patterns to other disciplines. For example, devOps and internet of things (IoT)

While many organizations like netflix

The main contribution of the paper includes all the recent challenges after the introduction of microservice and a list of technologies that have been used in leveraging the implementation of microservice. We also discuss proposed solutions we found in the literature to address the challenges.

The rest of the paper is structured as follows. In Section **??**, we describe background information on microservice and monolith; we also explain the importance to migrate from monolith to microservices. In Section **??**, we describe the method and protocol followed in our systematic literature review. In Section **??**, we answer the research questions and cover the challenges and technologies used in microservice. In Section **??**, we discuss possible solutions for challenges mentioned in the studied literature. In Section **??**, we cover the threats to the validity of our study. In Section **??**, we present the related work. Finally, in Section 2, we conclude the paper and outline future work ideas.

2 | CONCLUSION

In this paper, we reported the results of our systematic literature review in microservices. We collected and read a total of 81 references we deemed relevant to answer our research questions. Our work can be used as groundwork and complementary to the existing literature reviews to guide researchers to open issues and challenges in microservices and offer an overview of solutions to consider.

The first research question addresses the challenges in adopting microservices. Among the collected publications, we identified 18 different challenges. The most mentioned challenges were migration (14 references), performance (11 references), scalability (10 references), and testing (10 references). The least mentioned were power management (2 references) and load balancing (2 references).

The second question addresses the technologies used in implementing microservices. We distinguished a total of 44 reported technologies which we grouped into the following categories: container, programming languages, and Other technologies, communication, framework and platform as a service. The most mentioned technology categories were Container (14 references), programming languages (13 references) and Other technologies (13 references). When we look at the ungrouped technologies, the most cited are docker (12 references), kubernetes (9 references), and REST (8 references).

We also discussed the possible solutions for each of the challenges. The solutions may vary based upon the requirement and necessity of adoption of microservices. According to the gathered solution, a necessary aspect to remember is to analyze the entire system before migrating to microservices.

Future work includes (i) adding more grey literature and valuable resources; (ii) conducting a survey with the industrial peers; and (iii) providing some broader scope to the collected materials about the aspects and architecture of microservices.

References