Microservices

MicS, Special session along with
SERVICE COMPUTATION 2018, February 18 - 22, 2018 - Barcelona, Spain
The Tenth International Conferences on Advanced Service Computing

Arne Koschel, Andreas Hausotter, Malte Zuch

University of Applied Sciences & Arts Hannover
Faculty IV, Business and Computer Science,
Hannover, Germany
email: arne.koschel@hs-hannover.de, andreas.hausotter@hs-hannover.de, malte.zuch@hs-hannover.de

Abstract—**Our paper introduces to a special session on microservices (MicS), which is included in the Tenth International Conference on Advanced Service Computing – Service Computation 2018, held in Barcelona, Spain. It presents selected aspects of software systems using microservices for four topics in research applications and CS education alike, namely: The handling of large scale matrix calculations within e-mobility scenarios, usage within smart grid capable pmCHPs, teaching of microservices in a private cloud, and services applied for situation-aware adaptive event stream processing.**

Keywords–e-mobility; microservices; matrix calculations; adaptive event processing; micro CHP; private cloud; CS services education, adaptive event stream processing

I. Introduction

Microservices [6][7][8] are the most recent flavor of service-based software architectural styles and might be seen as an evolution of 'more traditional' service oriented architectures (SOAs) [9][10][11]. Driven by prominent early adopters such as Netflix, during the last decade microservices became a popular industrial software architectural style to build software systems, which are potentially highly flexible, highly scalable, fault- and change-tolerant.

A general overview of microservices is presented in [12], which also looks at several modern companies using microservices, like Uber, Netflix, Amazon, and Twitter. The transition from monolithic application to modern microservices is shown in [13]-[14]. This work particularly emphasizes the advantages of the scalability of microservices, in order to solve also large data problems.

Recently a survey of more than 100 IT companies has shown that only 20 % of companies are not considering microservices in their company decisions. For 80 % of the companies surveyed, microservices are already integrated or are currently in the integration process [15]. A similar survey confirms these findings, with 23.9 % of companies not yet in contact with microservices and the majority with 76.1 % are already in use of practicing or implementing microservices [16]. All these surveys clearly show microservices to be a worthwhile topic to be looked at not only in different applied software application areas but also within research and computer science education.

II. Microservices – Selected Topics

In the special session on Microservices (MicS), held as part of The Tenth International Conference on Advanced Service Computing (Service Computation 2018) in Barcelona, Spain [1], four papers are presented. They apply and discuss different aspects of microservices in different research areas as well as in computer science education.

In the first paper [2] Zuch, Hausotter, and Koschel discuss modern mobility scenarios, where microservices could be applied to large numbers of matrix calculations. Within modern mobility, topics such as smart-cities, Car2Car-Communication, vehicle sensor-data, e-mobility and charging point management systems might be considered. These topics often have in common that they are characterized by complex and extensive data situations. Vehicle position data, sensor data or vehicle communication data must be preprocessed, aggregated and analyzed. In many cases, the data is interdependent. For example, the vehicle position data of electric vehicles and surrounding charging points have a dependence on one another and characterize a competition situation between the vehicles. Such dependencies can provoke very complex and large data situations. In [2] a model is presented in order to be able to map such typical data situations with a strong dependency of the data among each other. Microservices applied to scale multiple matrix calculations can help to reduce complexity.

Next, Pump, Koschel, and Ahlers evaluate the usage of a (micro)services based software architecture in the applied research area of 'Smart Grid Capable portable micro combined heat and power units (pmCHP)' in their paper [3]. The authors argue, that to integrate a portable micro combined heat and power unit into a Smart Grid, an architecture of high quality is needed to ease further development under changing requirements, especially taking typically often somewhat changing research environments into account. Therefore the authors design and evaluate three different architectures using a scenario-based comparison. They conclude that a service-oriented architecture using microservices provides a higher quality solution than a layered or event-driven complex-event-processing approach.

The third paper [4] from Schöner, Koschel, and Heine presents a private cloud (eduDScloud) based approach to teach about microservices, SOA, cloud and big data related topics in computer science education. Cloud computing has become well established in private and public sector projects over the past few years, opening ever new opportunities for research and development, but also for education. One of these opportunities presents itself in the form of dynamically deployable, virtual lab environments, granting educational institutions increased flexibility with the allocation of their computing resources. These fully sandboxed labs provide students with their own internal network and full access to all machines within. This provides them the necessary flexibility to gather hands-on experience with building heterogeneous microservice architectures. The eduDScloud provides a private cloud infrastructure to which labs like the microservice lab outlined in this paper can be flexibly deployed in very short time.

In the last paper [5] Schaaf looks at more fundamental research, where microservices are utilized for 'A Service Based Architecture for Situation-Aware Adaptive Event Stream Processing'. In his work Schaaf shows the central aspects of a service based architecture for a distributed event stream processing system. He gives an emphasis on the microservices based system components and on related scalability considerations. His processing system architecture is designed based on a well defined situation-aware adaptive event stream processing model and a matching scenario definition language (SDL). His SDL allows for the definition of such processing scenarios in a processing system independent way.

References

[1] A. Koschel, J. Klink, and A. Hausotter, Eds., Proc. 10th International Conference on Advanced Service Computing (SERVICE COMPUTATION 2018), Barcelona, Spain. IARIA, Feb. 2018.

[2] M. Zuch, A. Hausotter, and A. Koschel, "Handling matrix calculations with microservices within scenarios of modern mobility," in Proc. 10th International Conference on Advanced Service Computing (SERVICE COMPUTATION 2018), Feb. 18–22, Barcelona, Spain. IARIA, 2018.

[3] R. Pump, A. Koschel, and V. Ahlers, "On Microservices in Smart Grid Capable pmCHP," in Proc. 10th International Conference on Advanced Service Computing (SERVICE COMPUTATION 2018), Feb. 18–22, Barcelona, Spain. IARIA, 2018.

[4] D. Schöner, A. Koschel, and F. Heine, "Teaching Microservices in the Private Cloud by Example of the eduDScloud," in Proc. 10th International Conference on Advanced Service Computing (SERVICE COMPUTATION 2018), Feb. 18–22, Barcelona, Spain. IARIA, 2018.

[5] M. Schaaf, "A Service Based Architecture for Situation-Aware Adaptive Event Stream Processing," in Proc. 10th International Conference on Advanced Service Computing (SERVICE COMPUTATION 2018), Feb. 18–22, Barcelona, Spain. IARIA, 2018.

[6] "Microservices – a definition of this new architectural term," 2014, URL: https://martinfowler.com/articles/microservices.html [accessed: 2018-03-23].

[7] S. Newman, Building Microservices, 1st ed. Sebastopol: O'Reilly & Associates, 2015.

[8] E. Wolff, Microservices: Grundlagen flexibler Softwarearchitekturen, 1st ed. Heidelberg: dpunkt.verlag, 2016.

[9] "OASIS SOA Reference Model TC," 2017, URL: https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=soa-rm [accessed: 2018-02-06].

[10] T. Erl, C. Gee, J. Kress, B. Maier, H. Normann, P. Raj, L. Shuster, B. Trops, C. Utschig-Utschig, P. Wik, and T. Winterberg, Next Generation SOA. NJ, USA: Prentice Hall, 2014.

[11] D. Krafzig, K. Banke, and D. Slama, Enterprise SOA: Service-Oriented Architecture Best Practices. USA: Prentice-Hall, 2004.

[12] R. RV, Ed., Spring Microservices. Packt Publishing, Birmingham, Jun. 2016, ISBN: 978-1786466686.

[13] S. Sharman, R. Rv, and G. D., Eds., Microservices: Building Scalable Software. Packt Publishing, Birmingham, Jan. 2017, ISBN: 978-1-78728-583-5.

[14] T. Hunter, Ed., Advanced Microservices: A Hands-on Approach to Microservice Infrastructure and Tooling. Apress, Jun. 2017, ISBN: 978-1484228869.

[15] "LeanIX Microservices Survey," 2017, URL: https://www.cio.de/a/microservices-machen-die-it-schneller-und-agiler,3329517 [accessed: 2017-12-06].

[16] "Microservices trends 2017: Strategies, tools and frameworks," 2017, URL: https://jaxenter.com/microservices-trends-2017-survey-133265.html [accessed: 2017-12-06].