PREFACE

Special section on
Advances in Complex Cloud and Service Oriented Computing

Cloud computing is considered today to be a key paradigm that provides ubiquitous, on-demand access to shared pools of configurable, massively scalable resources, services, and virtualized hardware. Emerging technologies and increased Internet access, which has become reliable and faster, make the provision of service and cloud computing evolve continuously. Over the past few years, we have witnessed the adoption of container platforms in clouds. Also, infrastructure-as-code solutions and software defined networking have gained significant popularity in cloud environments.

With continuation of progress, disruptive changes in services and cloud computing have accelerated and moved the technology into a new phase of innovation and development. Nowadays, many new applications take the form of micro-services. A serverless paradigm, in which clouds execute snippets of code without the need for provisioning the underlying infrastructure, has been promoted. With the advent of IoT, a large number of devices generating a huge amount of data is deployed. Such data is in turn stored and analyzed by advanced algorithms in a large scale of edge/fog devices and cloud computing infrastructures. Finally, almost every major cloud software provider has introduced artificial intelligence algorithms. Provision of all the above mentioned capabilities in service and cloud computing presents a new set of emerging challenges that are being identified and addressed by the research community.

This special section addresses these problems and presents four papers reporting the most recent research, development and solution techniques related to cloud and service oriented computing. The papers are extended versions of works presented at the 7th IEEE International Symposium on *Cloud and Service Computing (SC2)* and the 10th IEEE International Conference on *Service Oriented Computing and Applications (SOCA)*, held in Kanazawa, Japan, in 2017. The papers were selected after several rounds of a meticulous review process. A brief description of their content follows.

In the first paper, entitled *Cooperative adaptive driving for platooning autonomous self driving based on edge computing*, B.-J. Chang, R.-H. Hwang, Y.-L. Tsai, B.-H. Yu and Y.-H. Liang present an approach to cooperative adaptive driving. The work leverages the mobile edge and cloud techniques and proposes a distributed model for assisting the driving control. The presented solution adaptively determines platoon velocity according to traffic information, a safe distance for platoon synchronization or the platoon length, and at the same time avoids butterfly effects and shockwaves. The authors evaluate the proposed model and compare it with integrated full-range speed assistance, an intelligent driver model and human driving under different traffic load conditions. Their results show that the proposed approach outperforms the existing solutions in some important performance metrics, including the number of shockwaves, average vehicle velocity, average travel time and time to collision. The work extends the research from the IoV/V2X area and can be applied to advanced driver-assistance systems and self-driving vehicles, as well as further developed to be used in 5G networks.

The paper *Multilayered auto scaling performance evaluation: Can virtual machines and containers co-scale*? by V. Podolskiy, A. Jindal and M. Gerndt uses the notion of cooperative multilayered scaling and presents performance implications of applying a solution based on this approach. The authors provide a broad analysis of different aspects of auto scaling of virtual machines in cloud computing systems, and identify a set of auto scaling events on different virtualization layers that can be considered a single auto scaling event that spans through multiple layers. They also improve the approach to QoS-based multilayered auto scaling performance evaluation based on scaling intervals. This goal is achieved by introducing an auto scaling performance measurement tool, called ScaleX, which analyzes the impact of the container image size and pulling policy type on scaling performance.

J.-J. Chou, C.-S. Shih, W.-D. Wang, and K.-C. Huang in their paper *IoT sensing networks for gait velocity measurement* design a gait velocity measurement solution on the foundation of a location framework of the WuKong distributed IoT middleware. Within the proposed solution, the authors devise smart algorithms that accept multiple sensors inputs to minimize not only sensing errors caused by thermal noise and overlapped sensing regions, but also the data transition cost with a parameterized data reduction algorithm. The paper identifies the existing issues, such as thermal noise and overlapping sensing regions, and provides a systematic solution which fusions the temporal and spatial data of multiple sensors to improve the accuracy of tracking results in an indoor environment. The proposed solution is evaluated in real system settings with promising results in terms of the accuracy of tracking a user's walking path.

Finally, in the paper *Solving SAT in a distributed cloud: A portfolio approach* by Y. Ngoko, C. Cérin and D. Trystram a portfolio-based approach for solving the classical satisfiability problem (SAT) in a distributed computing environment is proposed. The approach is composed of two modules: a planning engine, which computes the optimal plan for resource sharing during algorithm execution, and an execution engine running this plan. The authors define algorithms for the generation of near-optimal resource sharing schedules, and perform an experimental evaluation of the proposed approach. Based on the obtained results, they claim that some algorithms become more competitive if the trade-off between their quality and the runtime required for their computation is determined.

As guest editors, we would like to take this opportunity to thank the authors for their input and effort. We believe that this collection of papers provides a significant contribution to the development of cloud and service oriented systems and will appeal to a broad audience as well as inspire future research in the field. We also would like to express our gratitude to all reviewers, who helped us ensure the high quality of this special section. We gratefully acknowledge their time and effort.

We also express special thanks to the journal Editor-in-Chief, Professor Józef Korbicz, for accepting this special section, as well as for his excellent co-operation and invaluable assistance.

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