

Preface

— Service-Oriented System Engineering: An Emerging Engineering Discipline

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In the December of 2011, more than 100 researchers from academics and industry from the world joined together for three sunny days in Irvine, California, a warm bay on the east coast of the Pacific Ocean. 39 research papers were presented. 5 world leading prominent researchers shared their research results and visions for future development in their keynote speeches, and 2 panel discussions were staged. This is the IEEE 2011 Symposium on Service-Oriented System Engineering (SOSE 2011), which is the 6th edition of the series symposiums sponsored by the IEEE Computer Society. These researchers are developing a new engineering discipline for the service-oriented computer systems. This journal special issue is one of the results of the symposium: a collection of selected best papers presented at the symposium. They have been extended and revised, and reviewed in the journal's standard of quality.

As a new engineering discipline, service-oriented system engineering aims at solving engineering problems in the development, operation and maintenance of service-oriented systems. It covers all aspects of service-oriented systems. With the rapid advance of service-oriented computing, engineering service-oriented system is becoming ever more important than before. In the past few years, we have seen a rapid growth of research interest in this area. The papers in this special issue represent the cutting edge of the current research on engineering service-oriented systems. They also indicate the direction of future development.

Correctness and reliability are always a key issue for all engineering disciplines. It is no exception for service engineering. This journal special issue contains three papers addressing this topic in different approaches: one takes a formal method approach aiming at ensuring correctness in service composition; the other takes a fault-tolerance approach aiming at improving system reliability even when unexpected events happens; and the third takes a testing approach to ensure the quality of the software. These papers are as follows.

In the paper entitled “*Using Byzantine Fault-Tolerance to Improve Dependability in Federated Cloud Computing*”, Garraghan, Townend and Xu introduced a Byzantine

fault-tolerance framework that enables the deployment of applications across multiple cloud administrations. An implementation of this framework has facilitated in-depth experiments comparing the dependability of Cloud applications hosted in a federated Cloud to that of a single Cloud.

In the paper entitled “*Applying structural testing to services using testing interfaces and metadata*”, Eler, Bertolino and Masiero proposed an approach to achieve high test coverage of services by providing test metadata. They illustrated the feasibility of the proposed approach via a case study of a real system. They also reported a successful experiment to compare the proposed solution with a functional approach.

Adeel Ali, Roop and Warren were concerned with the correctness of service composition in their paper, entitled “*Web Service Choreography: Unanimous Handling of Control and Data*”. They proposed a service composition framework that addresses both aspects of functional/behavioral constraints and data mediation by integrating existing techniques in formal methods, service oriented computing, and data mediation.

Modeling is indispensable to all engineering of complex and large scale systems. In the paper entitled “*Entity-Centric Operations Modeling for Business Process Management*”, Sanz and Nandi presented an in-depth multidisciplinary review of the state-of-the-art in the research on entity life cycle modeling. Their review focused on the modeling concepts and methodology in the context of service oriented computing. They pointed out that the entity-based approach for operation modeling offers a conceptual framework to integrate different types of enterprise operations.

Service-Oriented architecture enables software systems to be composed flexibly, even dynamically at runtime. However, how to realize the power of this facility is a challenging task for software engineers. Clark and Barn, in their paper “*Dynamic Reconfiguration of EDA using Reflection and Higher-Order Functions*”, addressed this issue through architectural design of service oriented systems. They employ a reflection mechanism and high-order functions to support dynamic reconfiguration of services in an event-driven architecture. Cardellini, et al., in the paper “*QoS Driven per-Request Load-Aware Service Selection in Service Oriented Architectures*”, employs a different approach, where a service broker is used to offer a fine customizable service selection in a load-aware per-request approach.

Tan and Su also addressed the problem of architectural design of service-oriented systems in their paper entitled “*Media Cloud: When Media Revolution Meets Rise of Cloud Computing*”. Media content has become the major traffic on the Internet and will keep on increasing rapidly. “We are facing a media revolution”, Tan and Su pointed out this after a comprehensive overview on the recent media cloud research. They then move further to propose a new architecture for the media cloud and suggested several future research topics.

Like many complex systems, evolution is inevitable for service-oriented systems. Dealing with service evolution is therefore one of the most challenging problems in service engineering. Pichler, Huemer and Wimmer’s paper, entitled “*Evolution of Business Documents based on UN/CEFACT’s Core Components*”, was concerned with the evolution of service-oriented systems. They focused on standardized business documentation because this is a prerequisite for successful information

exchange in electronic business transactions, and it has been widely recognized as a key application area of service-oriented computing. In this paper, they proposed a framework that provides a low-cost and light-weight approach for dealing with evolving business documents.

In summary, the special issue covers a variety of aspects of engineering service oriented systems, including system design, modeling, testing, composition, and evolution and quality assurance of service-oriented systems. So, enjoy reading.

We as the guest-editors would like to express our appreciation of the SOSE 2011 Program Committee members for their great support and contributions to the review of these papers. We would also like to thank all the authors for their contribution to the symposium and the journal special issue. Without their contributions, the publication of this special issue would not be possible. We are most grateful to Prof. Ruqian Lu, the journal's editor-in-chief, for his support to the special issue and invaluable advices and instructions as well as his patience in the process of the editing of this special issue. Thank you.

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