Guest Editorial: Introduction to the Special Issue on Modeling and Implementation of Service Enterprise Systems

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1 INTRODUCTION

The services industry is one of the most important and fast-growing fields in computing. Businesses are rapidly becoming aware of the ubiquitous presence and significant advantages of service-oriented computing and supply chains. However, the heterogeneity of online businesses and their applications makes interoperability, an essential requirement for business globalization, a huge challenge. Many businesses, such as Amazon.com, United Airlines, and Motorola, have implemented or transformed their online business applications into Web Services using a variety of service infrastructures provided by vendors including IBM, SAP, Microsoft, Oracle, and BEA. As a result, the Internet is shifting from a repository of data to a repository of services. Gartner predicts that the worldwide Software as a Service (SaaS) market will grow from $6.3 billion in 2006 to $19.3 billion by the end of 2011.

Services Computing is a rapidly emerging discipline that aims to enable efficient and effective interaction and collaboration among heterogeneous, distributed business services. Web Services promote abstraction, loose coupling, and interoperability among services. By allowing components to be decoupled using specified interfaces, service-oriented computing enables platform-independent integration. These new integration possibilities are valuable for constructing today’s interoperable, large-scale, complex software-intensive systems that help make businesses more agile. With Web Services as an effective enabling technology and Service-Oriented Architecture (SOA) as the central architectural model, Services Computing leverages computing, service standards, and information technology to model, create, operate, and manage critical business transactions as defined and managed flows of services. Web Services are increasingly implemented and deployed as an effective means to create and streamline processes and collaborations among governments, businesses, and individuals.

With such ubiquitous and powerful capabilities found in Services Computing, businesses are poised to move many of their enterprise-critical systems to SOA environments. However, many remain hesitant due to important open questions on security, performance, provenance, governance, reliability, sustainability, and stakeholder acceptance issues. Thus, the need for more research, education, and training on Services Computing is vital before business adoption and the full impacts of Services Computing can be achieved. The papers published in this special issue fill a critical research gap by investigating models and techniques for the design and implementation of service-oriented systems for the business enterprise.

2 MODELING AND IMPLEMENTATION IN SERVICES COMPUTING: SPECIAL ISSUE PAPERS

This special issue focuses on the modeling and implementation issues of enterprise service systems. Out of 25 submissions, five papers were eventually accepted after an initial screening and then two to three rounds of review and revisions. Together, these five articles advance our understanding of planning, designing, maintaining, monitoring, delivering, and reusing services in enterprise information systems. A brief overview of these papers is given below.

“The Impact of Service Cohesion on the Analyzability of Service-Oriented Software” by Mikhail Perepletchikov, Caspar Ryan, and Zahir Tari studies how Services Computing helps improve software maintainability as more agile businesses allow their processes and rules to change more frequently. In particular, it focuses on the impact of service cohesion on the analyzability subcharacteristic of maintainability. Their work extends existing notions of cohesion in the procedural and object-oriented modeling paradigms, thereby supporting the derivation of design-level software metrics for quantifying the degree of service cohesion. The work also theoretically validates the proposed metrics with an empirical evaluation using a controlled study to predict analyzability in the Software Development Life Cycle. The practical applicability of such metrics is to support the development of service-oriented systems that can be analyzed and maintained more easily.

In “An Autonomic Service Delivery Platform for Service-Oriented Network Environments,” Robert Callaway, Michael Devetsikiotis, Yannis Viniotis, and Adolfo Rodriguez
proposed a new autonomic service delivery platform in service-oriented network environments by enabling a self-optimizing infrastructure that balances the goals of maximizing the business value and the optimal utilization of IT resources. It is a novel idea to integrate several theoretical and practical techniques from networking, microeconomics, and service-oriented computing to create a fully-distributed service delivery platform. The principal component of the platform is a utility-based cooperative service routing protocol that disseminates congestion-based prices among intermediaries to enable the dynamic routing of service requests from consumers to providers. The authors discuss the underlying analytical framework for the service routing protocol as well as key methodologies which together provide a robust framework for the service delivery platform aligned with the next generation of middleware and telecommunications architectures. The paper provides numerical results that demonstrate the ability of the platform to provide optimal routing of service requests.

In “Template-Based Adaptation of Semantic Web Services with Model-Driven Engineering,” Athanasios Staikopoulos, Owen Cliffe, Razvan Popescu, Julian Padget, and Siobhàn Clarke advocate the importance of developing service applications that are inherently flexible and adaptive and are supported by appropriate infrastructures. In their article, the authors propose a model-driven approach for the dynamic adaptation of Web Services based on ontology-aware service templates. At a higher level of abstraction than concrete Web Service implementations, model-driven service engineering leads to more flexible and automated adaptations through template designs and transformations using ontological semantics to enhance the service matching capabilities required by the dynamic adaptation process. Their service templates are based on OWL-S descriptions and provide the necessary means to capture and parameterize specific behavior patterns of service models. The proposed approach is applied to illustrate how the proposed framework supports the adaptation of the authentication mechanism used by an interactive tourist recommendation system.

As illustrated in “An Integrated Workbench for Model-Based Engineering of Service Compositions,” Howard Foster, Sebastian Uchitel, Jeffrey N. Magee, and Jeffrey Kramer believe that the difficulties in building reusable service components remain an important challenge to service engineers. Engineering the behavior of these services means ensuring that the interactions and obligations are correct and consistent with the policies set out to guide partners in building the correct sequences of interactions to support the functions of one or more services. Hence, checking the suitability of service behavior is complex, particularly when dealing with a composition of services and concurrent interactions. To enable service engineers to design and implement suitable and safe service compositions, the authors present an approach that models service orchestration, choreography behavior, and service deployment through formal semantics. A method for checking these service models is provided in an integrated workbench for the verification and validation of service compositions.

In “From Software Architecture Analysis to Service Engineering: An Empirical Study of Methodology Development for Enterprise SOA Implementation,” Hong-Mei Chen, Rick Kazman, and Opal Perry present an integrated service-oriented enterprise system development framework (called the BITAM-SOA Framework), as well as an instantiated design process model that is a result from a three-year case study with a Fortune 500 company in the financial services industry. The BITAM-SOA framework and schematic advance both business-IT alignment and software architecture analysis techniques toward supporting the engineering of enterprise-wide service-oriented systems—that is, service engineering. The schematic advances the state-of-the-art and contributes to the theory and practice by offering an integrated framework and a methodological scaffold for cross-disciplinary research. The schematic explicitly identifies the multidimensional-technical and social/organizational complexity of enterprise SOA implementation and the continuous governance, communication, change assessment, and architectural realignment required for achieving the organizational agility promised by SOA.

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