Guest Editorial: Special Section on Transactional Web Services

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THE Internet, along with its related technologies, has created an interconnected world in which information flows easily and tasks are processed collaboratively. To make service-oriented applications more robust, Web services must be examined from a transactional perspective. By transactional, we mean first defining the actions that guide the execution of Web services when failures arise and then the states that permit claiming the success of this execution following the handling of these failures. A variety of transactional models are reported in the database community. Some of these models can be leveraged and enhanced in response to Web services characteristics while others are not suitable for Web services due to the dynamic nature of Web services, the long-running execution scenarios that Web services take part in, and the successful execution of Web services despite other peers' failure. Today's service-oriented applications require advanced transactional models that guarantee integrity and continuity of business processes despite the dynamic nature of the features of the environments hosting the execution of these applications. This special section sheds light on the latest advances in the fields of Web services and transactional models in order to better address advanced research on and experience with transactional Web services.

Four papers out of 19 submissions were selected for inclusion in this special section. Each submission was subject to a double-review process by at least three peer reviewers.

In the first paper, entitled "Event-Based Design and Runtime Verification of Composite Service Transactional Behavior," Gaaloul et al. propose an event-driven approach to validate the transactional behavior of Web services taking part in compositions. A composition life cycle consists of four phases, namely, design, execution, monitoring, and reengineering. The verification of this behavior throughout this life cycle is done either at design time to validate recovery mechanisms' consistency or after runtime to detect execution deviations and repair design errors, and, therefore, formally ensure the execution reliability of Web services. In addition, this verification is based on the Event Calculus formalism, which offers a sound definition for this reliability.

In the second paper, entitled "FACTS: A Framework for Fault-Tolerant Composition of Transactional Web Services," Liu et al. note that delivering reliable compositions over unreliable Web services is challenging. To address this challenge, Liu et al. identify a set of high-level exception handling strategies and a new taxonomy of transactional Web services to devise a fault-tolerant mechanism that combines exception handling and transaction techniques. In addition, Liu et al. devise two modules, known as specification and verification, to assist service designers in constructing fault handling logic conveniently and correctly. This logic is automatically injected into WS-BPEL.

In the third paper, entitled "Rule-Based Coordination of Distributed Web Service Transactions," von Riegen et al. study the distributed transactional activity control problem in the context of service choreographies. In such a context, many participants are allowed to work together to achieve a global, common goal, and the initiator of a process is not always the one who is able to commit or cancel a transaction. Von Riegen et al. introduce a framework that allows autonomous coordination of dynamic processes. This framework extends WSBusinessActivity to strengthen the role of the coordinator. Predicate rules are developed to let participants cancel or complete a process and help the coordinators decide on the completion processes and the confirmation or cancellation of the participants' works.

In the fourth paper, entitled "TQoS: Transactional and QoS-Aware Selection Algorithm for Automatic Web Service Composition," El Haddad et al. focus on the issues of selecting and composing Web services. A design-time selection algorithm is proposed in which transactional and QoS requirements are both integrated into the selection process. This algorithm is based on the notion of risk that indicates if execution outcomes can either be compensated for or not. Two risk levels of execution in a transactional system are considered: Risk 0, meaning that if the execution is successful, the obtained outcomes can be compensated for by the user, and Risk 1, meaning that the system does not guarantee successful execution, but if it achieves it, the outcomes cannot be compensated for by the user.

We hope this special section inspires researchers to develop new transactional models that would guarantee service-oriented applications integrity and continuity.

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1939-1374/10/$26.00 © 2010 IEEE Published by the IEEE Computer Society

Finally, we are grateful to the anonymous reviewers for their valuable comments and efforts and to the authors of all of the papers submitted to this special section. We are also deeply indebted to the editor-in-chief, Dr. Liang-Jie Zhang, for including this special section in the *IEEE Transactions on Services Computing*.

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Ling Liu is a full professor in the College of Computing at the Georgia Institute of Technology. Her research interests are in the junctions of databases and distributed computing. She has published more than 200 international journal and conference articles and is a recipient of several best paper awards, including the best paper award at ICDCS 2003, the best paper award at WWW 2004, and the 2005 Pat Goldberg Memorial Best Paper Award. She has chaired a number of conferences as a program committee chair, vice program committee chair, or general chair, including the IEEE International Conference on Data Engineering (ICDE 2004, ICDE 2006, ICDE 2007), the IEEE International Conference on Distributed Computing (ICDCS 2006), the IEEE International Conference on Web Services (ICWS 2004), the IEEE/ICST Collaborative Computing Conference (CollaborateCom 2005, 2006), and the ACM International Conference on Knowledge and Information Management (CIKM 2000). Dr. Liu served on the editorial board of the *IEEE Transactions on Knowledge and Data Engineering* and the *International Journal of Very Large Database Systems* (Springer) from 2004-2008 and currently serves on the editorial board of the *IEEE Transactions on Services Computing*, *Parallel and Distributed Databases* (Springer), the *International Journal of Peer-to-Peer Networking and Applications* (Springer), the *International Journal of Web Services Research*, and the *Wireless Network Journal* (*WINET*). Her research is primarily sponsored by the US National Science Foundation, the US Department of Energy, the US Defense Advanced Research Projects Agency, IBM, Intel, and HP.