

Introduction to the Proceedings of the EDOC 2006 Workshop Middleware for Web Services (MWS) 2006

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Welcome to the Proceedings of the EDOC 2006 workshop Middleware for Web Services (MWS) 2006! The workshop is a follow-up to the successful MWS 2005 workshop held at the EDOC 2005 conference and the subsequent special issue of the International Journal of Business Process Integration and Management (IJBPIIM, published by Inderscience Publishers). Similarly to these past venues, the MWS 2006 workshop is sponsored by the National Information and Communications Technology Australia (NICTA).

During the past several years, Web services technologies have become very prominent in both the research community and the industry. Web services are distributed computing application components implementing the service-oriented architecture (SOA). They rely on Extensible Markup Language (XML) interface description languages, such as the standardized Web Services Description Language (WSDL), and communication protocols, such as the standardized SOAP protocol (previously known as the Simple Object Access Protocol). In addition, Web services can use a number of other standardized and/or proprietary XML-based formats, such as the standardized Web Services Business Process Execution Language (WSBPEL) for describing business processes implemented as Web service compositions. Implementation-independence of Web services technologies allows different businesses to collaborate and achieve common business goals despite the fact that the collaborating Web services can be distributed over the Internet, run on different platforms, and implemented in different programming languages. Web services technologies are already embedded in various products and services of all major computing companies and used for diverse purposes. An important application area is e-business process integration in business-to-business (B2B) and/or enterprise application integration (EAI) scenarios. Additionally, Web service technologies became the basis for several

other recent distributed computing technologies, such as Grid services and Semantic Web services.

Reusable Web services technologies are implemented in middleware, so appropriate middleware is a prerequisite for the growing acceptance of these technologies. For example, implementation independence of Web services is achieved using middleware, such as application servers and/or SOAP engines (software that analyzes, processes, and generates SOAP messages). In addition, middleware solutions have been proposed to provide, monitor, and manage quality of service (QoS) aspects, such as response time, throughput, availability, reliability, security, and privacy. Quality of service is important for Web services for several reasons. For example, run-time management (monitoring and control) of QoS for a Web service helps to ensure correct operation, attain or surpass QoS levels expected by consumers, discover and fix (or, better, predict and prevent) problems, accommodate change, balance price/performance ratios, and maximize profits. QoS negotiation between consumer and provider Web services can help in providing QoS levels appropriate for particular consumers. Also, description and publication of QoS in addition to functionality can help in selection between provider Web services with the same (or similar) functionality. One of the major challenges that Web services middleware faces is to provide appropriate reusable software building blocks for QoS management. Consequently, middleware for Web services is a very important research and development topic for advanced enterprise distributed computing and e-business process integration and management.

The previous version of this workshop, MWS 2005, was held at the EDOC 2005 conference. It gathered industrial, academic, and government researchers and developers interested in Web services and/or middleware technologies. Through an interesting and diverse program, containing a keynote speech, presentations of selected peer-reviewed papers, and a panel discussion,

the MWS 2005 workshop contributed to the exchange of knowledge and ideas, dissemination of results about completed and on-going research projects, as well as identification and analysis of remaining open research issues and possible approaches towards their solution. The workshop proceedings were published by the IEEE Computer Society. MWS 2005 was followed by a special IJBPIM journal issue on middleware for web services, for which papers were invited both from MWS 2005 authors and through an open call for papers. After an additional rigorous double-blind review process, four best submissions were selected. Two of them were papers from the open call for papers, while two were significantly improved versions of MWS 2005 papers.

The goal of this year's workshop, MWS 2006, is to further contribute to the research and development in this exciting area, using the workshop model of MWS 2005. We have again composed an interesting and diverse program, containing a keynote speech, presentations of selected long and short (work-in-progress) peer-reviewed papers, a book review, and a discussion session. Research papers were selected after a thorough and competitive peer-review by workshop Program Committee members. In most cases, there were 4 reviewers per long paper and 3 reviewers per short paper. These proceedings contain the best 5 full papers and 3 short papers.

The first long paper is "Towards Explanation-Aware Selection in Internet-Scale Infrastructures: Generating Rationale for Web Services Ratings and Reputation" by Wanita Sherchan, Seng W. Loke, and Shonali Krishnaswamy. Wanita and Shonali are from Monash University, Australia, while Seng is from Latrobe University, Australia. The authors suggest a knowledge-based approach to generating rationale for reputation ratings, which can be important in section of Web services. They describe their knowledge base design and discuss operation and prototype implementation of the corresponding reasoning system.

The second long paper is "A Service Mediator Based Information System: Service-Oriented Federated Multiple Document Management" by Luiz Russo and Sam Chung, both from the University of Washington, Tacoma, the United States of America. The authors present their SoDOCM (Service-Oriented Document Management) system, a mediator-based federated information system of document management applications. The central concept in their solution is a novel four-level service schema architecture.

The third long paper is "A Data Centric Approach for Workflows" by Asif Akram, J. Kewley and R. Allan, who are all from the CCLRC e-Science Centre in the

United Kingdom. The authors propose a data-centric approach to instantiation, monitoring, and management of complex workflows. Their solution is based on modeling a workflow as a stateful Web Service with data model encapsulated as a WS-Resource.

The fourth long paper is "Average-Based Workload Allocation Strategy for QoS Constrained Jobs in a Web Service-Oriented Grid" by Yash Patel and John Darlington, both from the Imperial College, the United Kingdom. Their paper discusses workflow allocation techniques for Grid workflows. They propose modeling a Web service as a G/G/k queue and minimizing QoS guarantee violations by solving a mixed-integer non-linear program (MINLP).

The fifth long paper is "A Service-Oriented Architecture in a Multi-Agency Environment: A Case Study in Enterprise Dynamics" by Kangmin Zheng, Kenneth C. Hoffman, Thomas J. Pawlowski III, and Christopher D. Knouss. All authors are from the MITRE Corporation, the United States of America. This is a follow-up to their MWS 2005 paper "Enterprise Business, Computing, and Information Services in a Multi-Agency Environment: A Case Study in Enterprise Architect-Engineering". The authors discuss further improvements to their Integrated Enterprise Engineering Workbench (IEEW) middleware and the case study of monitoring and managing international trade in an environment of heightened security risk.

The first short paper is "A CoS-Enabled Request Scheduling Policy" by Yubin Yang, Yazhe Tang, Ming Zhao, and Lei Yao, all from Xi'an Jiaotong University, China. The authors present a class of service (CoS) enabled request scheduling policy for CoS deployment in their CoS-based QoS-enabled Framework (CQEF). Their prototype has been developed over the Globus platform for Grid computing.

The second short paper is "A Mediation Framework for Mobile Web Service Provisioning" by Satish Narayana Srirama, Matthias Jarke, and Wolfgang Prinz. All authors are from RWTH Aachen, Germany, while Matthias and Wolfgang are also affiliated with Fraunhofer FIT, Germany. The paper describes initial work on the Mobile Web Services Mediation Framework (MWSMF), extending their previous work on a basic mobile Web Service provider for smart phones. An interesting aspect of their work is that it combines Web service technologies with JXTA peer-to-peer (P2P) technologies.

The third short paper is "Triple Space Computing Middleware for Semantic Web Services" by Omair Shafiq, Reto Krummenacher, Francisco Martin-Recuerda, Ying Ding, and Dieter Fensel, all from the

Digital Enterprise Research Institute (DERI), Austria. The authors describe a general architecture and its components to be used for realization of the Triple Space Computing communication and coordination paradigm. They also discuss how this architecture can act as a middleware for Semantic Web services.

After the peer-reviewed papers, these proceedings also contain a review of the popular Sahai & Graupner book “Web Services in the Enterprise: Concepts, Standards, Solutions, and Management”. The book review was written by Yazhe Tang from Xi’an Jiaotong University, China and Hanan Lutfiyya from the University of Western Ontario, Canada.

The workshop will also contain the discussion session “Requirements and Challenges for Middleware Supporting Reliability of Web Service Composition”. It will be an open forum about middleware support for composed Web services, with particular focus on the resulting reliability. The challenges in achieving reliable composition of Web services are paramount. From assuring correct transactional properties of composite business processes to the role of standards and from the inherent reliability of supporting middleware (open source or not) to the semantic correctness of match making. In fact, the mere definition of the term reliability is an open issue. While some general issues related to reliability were debated at the MWS 2005 panel “Quality of Service (QoS) Middleware for Web Services: Achieved Results and Challenges for the Future”, many additional specific questions have to be explored. This forum discussion may address the following questions:

- What are the main reliability requirements in Web service composition? For instance in:
 - transactional properties,
 - matching semantics,
 - middleware reliability.
- Can middleware contribute to fulfilling these reliability requirements?
- Can we prioritize the main requirements?
- Can we identify the most challenging issues in middleware support for reliable Web service composition?
- Are there unsolvable reliability questions?
- Which middleware support does already exist?
- What is the role of standards in creating reliable service composition, and which are most promising?
 - WS Transaction
 - WS Composite Application Framework
 - WS Reliable Messaging
 - WS Management

- Can we define a roadmap to develop solutions for reliable Web services?

We hope the above, non-exhaustive, list of topics provides ample input for a stimulating discussion.

We sincerely thank the National Information and Communications Technology Australia (NICTA) for their sponsorship. Further, we are grateful to the members of the EDOC 2006 committees and, particularly, the workshop chair Antonio Vallecillo from the University of Malaga, Spain and the general chair Patrick C.K. Hung from the University of Ontario Institute of Technology, Canada for their help in organizing the workshop. Last, but not the least, we acknowledge the members of the MWS 2006 workshop Program Committee for their help in publicizing the workshop and reviewing submitted papers. The list of Program Committee members is given at the end of this introduction.

We hope that the papers, presentations, and discussions at MWS 2006 will inspire you to contribute further to the research and development in the exciting area of middleware for Web services and service-oriented computing in general.

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