Introduction to the Proceedings of the EDOC 2008 Workshop Middleware for Web Services (MWS) 2008

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Abstract

Middleware is software that provides common functionality in a distributed computing system. Use of middleware significantly simplifies development of distributed applications, including those using Web service technologies. For example, middleware can support implementation independence and quality of service (QoS) management.

The Middleware for Web Services (MWS) 2008 workshop is the fourth workshop in the series of international workshops on this topic, which are organized annually at the IEEE EDOC conferences. The MWS 2008 program contains 2 invited keynote presentations and 10 peer-reviewed papers (5 full and 5 short).

This introduction to the Proceedings of MWS 2008 starts with a brief explanation of the motivation for the workshop and its history. Then, it contains a short description of the keynotes and peer-reviewed papers. After concluding statements, MWS 2008 Program Committee members and external reviewers are listed.

1. Introduction and motivation

The World Wide Web Consortium (W3C) defines a Web service as a distributed computing component (encapsulating software, but possibly also hardware, functionality) that has a unique Uniform Resource Identifier (URI), can be described using the Extensible Markup Language (XML), and supports exchange of XML messages by means of Internet-based protocols. Web services are instantiations of the broader service-oriented architecture (SOA) paradigm, in which distributed applications are composed from relatively independent and loosely coupled components – services. In the last decade, Web service technologies became the dominant distributed computing framework. In addition to the widely used industrial standards such as SOAP and WSDL (Web Services Description Language), many other Web service technologies (often denoted collectively as WS-*) have appeared and achieved various degrees of acceptance in practice. Another stream of Web service technologies (not based on SOAP and WSDL) supports the REST (REpresentational State Transfer) architecture style and the resource-oriented architecture (ROA) paradigm. Furthermore, Web service technologies are being built upon in other recent distributed computing areas, such as Grid computing, Semantic Web, and Web 2.0.

Middleware is software that provides common functionality in a distributed computing system. Use of middleware significantly simplifies development of distributed applications and it is not surprising that middleware plays important role for Web services. 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 control quality of service (QoS) aspects,

such as response time, throughput, availability, reliability, security, and privacy. Consequently, middleware for Web services is an important research and development topic for (intra- and inter-) enterprise distributed computing and business process integration and management.

2. Workshop history

The Middleware for Web Services (MWS) 2008 workshop is the fourth workshop in the series of international workshops on this topic, which are organized annually at the IEEE (Institute of Electrical and Electronics Engineers) EDOC conferences. This series started in 2005 and continued in 2006 and 2007. In addition, the MWS 2005 workshop was followed by the July-September 2007 special issue of the International Journal of Business Process Integration and Management (IJBPIM). For this special journal issue, papers were invited both from MWS 2005 authors and through an open call for papers. After an additional rigorous double-blind review process, 4 best submissions were selected (2 from significantly improved versions of MWS 2005 papers, 2 from the open call for papers). Similarly to the past MWS workshops and the special journal issue, MWS 2008 is sponsored by NICTA (previously known as National ICT Australia).

The MWS series of workshops at the IEEE EDOC conferences is also coordinated with the related series of Middleware for Service Oriented Computing (MW4SOC) workshops at the ACM (Association for Computing Machinery) / IFIP (International Federation for Information Processing) / USENIX Middleware conferences in 2006, 2007, and 2008.

The previous MWS workshops were successful as they contributed to the field through useful exchange of knowledge and ideas, dissemination of results about completed and on-going research projects, improvement of understanding of wider research issues, as well as clearer identification and analysis of important open research issues and possible approaches towards their solution. They gathered industrial, academic, and government researchers and developers interested in Web services and/or middleware technologies, many of whom have not attended the previous EDOC conferences. Their programs were interesting and diverse. In addition to presentations of selected peer-reviewed papers describing both mature results and work in progress, the workshops contained keynote speeches and discussion sessions. The keynote speakers and discussion session panelists were praised for the insights they passed to the audience. The workshop proceedings were published by the IEEE Computer Society.

3. Proceedings contents

The goal of MWS 2008 is to further contribute to the research and development in the exciting area of middleware for Web services. We have again composed an interesting and diverse program, containing presentations of selected full (mature work) and short (work-in-progress) peer-reviewed papers and 2 invited keynote presentations (keynote abstracts and short speaker biographies are included into these Proceedings). Note that the main program of the EDOC 2008 conference also contains several keynotes, peer-reviewed research papers, industrial presentations, and a panel related to the topic of middleware for Web services. In this way, MWS 2008 and the main program of the EDOC 2008 conference complement and strengthen each other.

Research papers were selected for MWS 2008 after a thorough peer-review by workshop Program Committee members and external reviewers. Every paper was reviewed by 3 to 5 international experts whose identity was not revealed to the authors. The selection process was competitive. From 15 submissions, the best 5 full papers and 5 short papers were selected for publication in these workshop proceedings and presentation at the MWS 2008 workshop.

It is important to note that the paper authors come from 5 continents (only Africa and Antarctica are not represented). Similarly, the workshop Program Committee has members from 4 continents. In total, 18 countries (plus 1 territory with some international status – Hong Kong) are represented. Thus, the workshop has achieved not only international, but also world-wide nature.

3.1. Invited keynote presentations

The first MWS 2008 keynote is “Self-adaptive Web Service Compositions” by Luciano Baresi (Politecnico di Milano, Italy). This talk explains the need for a holistic and flexible solution for self-adaptive Web service compositions, as well as the role of middleware in achieving this goal. It overviews the past works (including the author’s infrastructure for reliable and self-adaptive Web Services Business Process Execution Language – WSBPEL processes) and identifies open issues for future research.

The second MWS 2008 keynote is “An Open Architecture for Scalable Database Clustering” by Rui Carlos Oliveira (University of Minho, Portugal). The author discusses the need for greater flexibility of data management systems so that their major functionalities can be realized as autonomous services. The work in

this area is relevant for the emerging Cloud storage systems. The talk focuses on presenting and illustrating on examples the general purpose database management system (DBMS) reflection architecture and interface GAPI, which was proposed by the GORDA project.

3.2. Full papers

The first full paper is "MobileSOA: A Service Oriented Web 2.0 Framework for Context-Aware, Lightweight and Flexible Mobile Applications" by Anuraj Ennai and Siddhartha Bose (both from Motorola India Research Labs, India). The authors first explore various aspects relevant for service-oriented systems involving mobile devices and identify several architectural requirements. Then, they present their MobileSOA framework that uniformly virtualizes local, remote and ambient services at a mobile device and enables lightweight access to these services from a Web 2.0 front-end. An enterprise back-end system controls the mobile device and uses context to provide "just-in-time" targeted applications, services, and data at the device. The major classes of components in MobileSOA are: clients, the MobileSOA device layer, virtualized services, and mobile device platform components. Next, the authors discuss advantages and limitations of their work, in respect to service discovery and binding, context awareness and reflection, security, and asynchronous push. The MobileSOA framework (except support for ambient services) has been implemented on Windows Mobile and Linux platforms. The authors also present an example application built on top of the MobileSOA framework – the Active Business Feeds (ABF).

The second full paper is "Distributed Control Patterns using Device Profile for Web Services" by J. Marco Mendes (the University of Porto, Portugal), Alexandre Rodrigues (New University of Lisbon, Portugal), Paulo Leitão (Polytechnic Institute of Bragança, Portugal), Armando W. Colombo (Schneider Electric, Germany) and Francisco Restivo (the University of Porto, Portugal). Their work builds upon Microsoft's Device Profile for Web Services (DPWS) specification for using Web services in resource-constrained devices. Thus, the paper first describes and critically analyzes the DPWS specification. Then, the authors present their own architecture that applies DPWS to communication of components in industrial automation systems. They focus on the DPWS-based Communications module responsible for communication to other components over a network. They also discuss lifecycle phases of interaction between services in their solution, as well as how the interaction protocol patterns map to Web service endpoints/ports. The authors have prototyped their solution for a simulation of a particular mechatronic device used in industrial automation systems.

The third full paper is "Integrated Metadata Support for Web Service Runtimes" by Florian Rosenberg, Philipp Leitner, Anton Michlmayr and Schahram Dustdar (all from Vienna University of Technology, Austria). The authors propose the VRESCo (Vienna Runtime Environment for Service-Oriented Computing) model for metadata in service systems. Here, metadata includes functionality descriptions, functionality categorization, pre-/post-conditions, as well as produced and consumed data. They start by providing a motivational example of building a composite service for cell phone number portability. Then, they describe their metadata model and how it can be applied to concrete service instances. Next, they illustrate their metadata model by applying it to the previously given motivating example. They also discuss how this metadata modeled has been implemented within the VRESCo project.

The fourth full paper is "Comparative Performance Evaluation of Web Services and JXTA for Embedded Environmental Monitoring Systems" by Jens Schmutzler, Andreas Wolff and Christian Wietfeld (all from Dortmund University of Technology, Germany). The authors wanted to determine which communication protocol stacks are favorable for middleware used in an environmental monitoring system with sensor networks. Therefore, they have implemented prototype middleware for this system with 3 different technologies: standard XML based SOAP messages, WAP (Wireless Application Protocol) Binary XML (WBXML) based SOAP messages, and JXTA peer-to-peer protocol messages. With these prototypes, they performed experiments to compare the 3 options, keeping in mind processing and energy constraints in embedded environments. The paper first gives an overview of the performance evaluation. Then, it describes the used environmental monitoring scenario, system architectures for the compared options, and test bed setup. The essential part of the paper is on the presentation and discussion of the experimental results for data traffic size, transmission delay, and error rate when XML, WBXML, and JXTA were used.

The fifth and final full paper is "GLUEMan: a WBEM-based Framework for Information Providers in Grid Services" by Sergio Andreozzi, Marco Canaparo and Michele Carpenè (all from INFN-CNAF, Italy). The authors' work builds upon the Open Grid Forum's (OGF) GLUE information model for describing advertisable capabilities of Grid services and resources. This paper presents the GLUEMan framework that simplifies adoption of GLUE in existing Grid middleware by leveraging the WBEM (Web-Based Enterprise Man-

agement) technologies standardized by the Distributed Management Task Force (DMTF). The authors first explain the background of their research, including GLUE and WBEM. Then, they present features of the GLUEMan framework, such as the requirements, high-level design, details of the proxy provider modules and clients, implementation choices, and integration into Grid middleware. The GLUEMan has been implemented on top of the Open Pegasus open-source, multi-platform, modular implementation of WBEM standards and also uses the SimpleWBEM (a.k.a. CIMPLE) library to simplify development of portable WBEM information providers.

3.3. Short papers

The first short paper is "An Easy Way to Access Grid Resources" by Roger Menday, B. Hagemeier (both from Forschungszentrum Jülich, Germany), C. Cacciari, G. Fiameni (both from CINECA, Italy), M. Melato, A. Curtoni (both from NICE, Italy) and S. van den Berghe (Fujitsu Laboratories of Europe, UK). This paper presents the A-WARE project that provides a single Web browser based access point to multiple distributed Grid resources in a way that reduces interaction complexity on the client side.

The second short paper is "Monitoring Cross-Site Processes Executed across Heterogeneous WS-BPEL Processors" by Yohsuke Isozaki, Yoshihiro Kanna (both from NEC, Japan), Koki Kato, Tsuyoshi Kanai (both from Fujitsu, Japan), Daisuke Miyamoto (Hitachi, Japan) and Shinji Kikuchi (NEC, Japan). This paper presents authors' results on developing and using a common audit data format for message-level monitoring of large-scale, heterogeneous, cross-domain business processes implemented with WSBPEL.

The third short paper is "An SCA-Based Middleware Platform for Mobile Devices" by Daniel Romero, Carlos Parra, Lionel Seinturier, Laurence Duchien (all from INRIA and the University of Lille 1, France) and Rubby Casallas (the University of Los Andes, Colombia). It discusses the authors' middleware platform that, through lightweight and adaptable bootstrapping, enables access from mobile devices to diverse resources and services in pervasive computing environments.

The fourth short paper is "A Lightweight Inter-node Operation for UDDI Cloud" by Roberto Podesta' (INRIA, France). It presents the author's work on improving scalability and efficiency of coordination of UDDI (Universal Description, Discovery, and Integration) registries by reducing the number of replicated entries.

The fifth and final short paper is "An Event-Based Near Real-Time Data Integration Architecture" by M. Asif Naeem, Gillian Dobbie and Gerald Webber (all from the University of Auckland, New Zealand). The authors present architecture of a middleware-based solution for event-driven, push-based, near real-time transfer and transformation (e.g., enrichment) of data from operational databases into data warehouses.

4. Concluding remarks

We sincerely thank NICTA for their sponsorship. Further, we are grateful to the members of the EDOC 2008 committees for their help in organizing the workshop. The help of the EDOC 2008 Workshop Chair Antonio Vallecillo (The University of Malaga, Spain) and the EDOC 2008 General Chair Marcus Spies (Ludwig-Maximilians University, Germany, and STI and the University of Innsbruck, Austria) was particularly significant. Last, but not the least, we acknowledge the members of the MWS 2008 workshop Program Committee for their help in publicizing the workshop and reviewing the submitted papers. The list of Program Committee members and additional external reviewers is given below.

We hope that the papers, presentations, and discussions at MWS 2008 will inspire further research and development in the important and exciting area of middleware for Web services and service-oriented computing in general.

5. Members of the Program Committee

- Alexander Keller, IBM Global Technology Services, USA
- Shonali Krishnaswamy, Monash U., Australia
- Franky Lam, Microsoft, USA
- Frank Leymann, U. of Stuttgart, Germany
- Ying CR Li, IBM Research, China
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- Yan (Jenny) Liu, NICTA, Australia
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- Piyush Maheshwari, Perot Systems, India
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- Akhil Sahai, VMware, USA
- Regis Saint-Paul, CREATE-NET, Italy
- Stefan Tai, KIT and U. of Karlsruhe, Germany
- Yazhe Tang, Xi'an Jiaotong U., China
- Vladimir Tosic, NICTA and U. of New South Wales, Australia; U. of Western Ontario, Canada
- Farouk Toumani, U. Blaise Pascal, France
- Aad van Moorsel, U. of Newcastle upon Tyne, UK
- Kunal Verma, Accenture Technology Labs, USA
- Chunyang Ye, HKUST, Hong Kong
- George Yee, National Research Council of Canada and Carleton U., Canada
- Jim Webber, ThoughtWorks, UK
- Ian Warren, U. of Auckland, New Zealand
- Raymond Wong, NICTA and U. of New South Wales and Green Pea Software, Australia
- Wenbing Zhao, Cleveland State U., USA
- Liming Zhu, NICTA, Australia

External reviewers

- Matthias Farwick, U. of Innsbruck, Austria
- Ayyappan Gandhirajan, Perot Systems, India
- Khalid Sherdil, U. of Western Ontario, Canada
- Basem Suleiman, NICTA and U. of New South Wales, Australia
- Branimir Wetzstein, U. of Stuttgart, Germany