



## Project IST 026850 SUPER

Semantics Utilized for Process management within and between Enterprises

### Deliverable 11.2

SBPM Community Building and Standardisation Activities

Leading Partner: LFUI

Contributing Partner: USTUTT, SAP, IBM

Security Classification: Public (PU)

October, 2008

Version 2.0

Project	SUPER	SUPER-Project-No	026850
	SBPM Community Building and Standardisation Activities	Work Package 11	
Document	Deliverable 11.2	Date	03.10.08

## Project Details

IST Project Number	026850
Acronym	SUPER
Project Title	Semantics Utilised for Process management within and between EnteRprises
Project URL	<a href="http://www.ip-super.org">http://www.ip-super.org</a>
EU Project Officer	Werner Janusch

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## Versioning and Contribution History

Version	Description	Comments
0.1	Initial draft; TOC	
0.2.	Added some workshop organisations and UPMS-HA submission	
0.3	Added more workshops reports and standardisation activities	
0.4	Added reports on some conferences	
1.0	Final Version	
1.1	Implmented reviewers' comments	
1.2	Updates according to reviewers' comments	
2.0	Final Updated Version	

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## Executive Summary

The SUPER project will only then unfold its full potential if the vision and the successful implementation of its results can be successfully disseminated, and standards implemented in relevant communities (preferably outside the Semantic Web and ontology research communities). It will be crucial to create a lasting Semantic Business Process Management community of its own which has members from all relevant adjacent communities in industry and research.

In this document we report on various dissemination and standardization activities that have been carried out so far in the context of the SUPER project. These activities aimed at creating the basis for a Semantic Business Process Management community. More specifically, this deliverable reports on two types of activities:

- Organization of conferences and workshops by SUPER participants. The goal of such events was to bring together people interested in SBPM, raise awareness of the topics and problems SUPER tackles, and disseminate SUPER results.
- Contributions to standards by SUPER participants. These contributions are aimed at building up agreement amongst people and organizations interested in SBPM, and influence standardization bodies such as OASIS, W3C, and OMG in the development of future standards in the area of SBPM.

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# 1 Introduction

The SUPER Project aims at combining BPM and Semantic Web Services capabilities in order to create a methodological and technological framework for mechanized BPM. This semantic-based framework is founded on Semantic Web Services technology that acquires, organises, shares and uses the knowledge embedded in business processes within existing IT systems and software, and within employees' heads.

The success of the SUPER project depends on the successful implementation of its research, dissemination of its results, as well as development of standards in relevant communities. The combination of Semantic Web Services and traditional BPM technology as well as its application within the telecommunication industry create the need for the development of a cross-field community to investigate and disseminate the benefits of combining semantics and BPM. It will be crucial to create a lasting Semantic Business Process Management community of its own which has members from all relevant adjacent communities in industry and research.

Work Package 11 (Community & Standardization) activities are aimed at creating a community composed of both academia and industry focused on research, development and commercial exploitation of semantic technologies for business process management. For the SUPER project to create the basis for such a community, two kinds of activities are essential: (1) organization of conferences and workshops that bring together people interested in SBPM, raise awareness of the topics and problems SUPER tackles, and disseminate SUPER results, and (2) contributions to standards to build up agreement amongst people and organizations interested in SBPM, and to influence the development of future standards in the area of SBPM.

The SUPER partners have been active in organizing various community-building events such as conferences and workshops. SUPER participants played a key role in the organization of the European Semantic Web Conference (ESWC), the European Semantic Technology Conference (ESTC), the International Conference on Advances in Semantic Processing (SEMAPRO), as well as in the organization of two conference tracks: Semantic Web and Information Systems and Semantic Web Technology in Business Information Systems. As far as the workshops are concerned, the SUPER participants co-organized more than ten workshops co-located with various conferences. Both conferences and workshops rose awareness of the topics and problems SUPER tackles, and many of them provided a suitable venue for the dissemination of concrete SUPER results. For example the initiation of the workshops Advances in Semantics for Web services (semantics4ws), Semantic Web Services Challenge (SWS Challenge), or Semantic Business Process and Product Lifecycle Management (SBPM), resulted in a series of successful workshop editions that are specifically targeted at building a community around SBPM.

Another key aspect in community building is participation in standardization activities. The SUPER participants have been actively involved in three core standardization organizations: Organization for the Advancement of Structured Information Standards (OASIS), the World Wide Web Consortium (W3C), and the Object Management Group (OMG). By chairing the Semantic Execution Environment

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(SEE) TC at OASIS, the Semantic Annotations for WSDL (SAWSDL) Working Group at W3C, and by contributing to the UPMS-HA Initial Submission and BPMN 2.0 at OMG, SUPER partners are actively involved in the development of future standards related to SBPM.

The rest of this deliverable is organized as follows. Section 2 reports of conferences and workshops organized by SUPER participants, and their impact on building communities around topics tackled in SUPER. Section 2.2.7 reports on the involvement of SUPER participants in standardization activities, as far as they are relevant for community building, and Section 4 summarizes this deliverable with an outlook for future plans for building communities around the technologies developed in the context of the SUPER project.

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## 2 Events Organisation

### 2.1 Conferences and Conference Tracks Organisation

#### 2.1.1 European Semantic Web Conference (ESWC)

The 4th European Semantic Web Conference (ESWC 2007) took place from 3-7th, June 2007 in the Tyrol region of Innsbruck, Austria. ESWC was hosted by the European Semantic Systems Initiative (ESSI), to which SUPER was a core participating project. The conference hosted a variety of workshops, tutorials, demonstrations and posters dedicated to the most current trends in Semantic Web technologies. ESWC 2007 presented the latest results in research and application of Semantic Web technologies, including knowledge mark-up languages, Semantic Web services, and ontology management.

The conference included two major events that were directly related to the SUPER project

- A tutorial on Semantic BPM (The Integration of Business Process Management and Semantic Web Services), organized by SUPER participants; the tutorial explained and demonstrated how the combination of Business Process Management (BPM) and Semantic Web Services (SWS) can eliminate the deficiencies that current BPM technology exhibits.
- A workshop on Semantic Business Process and Product Lifecycle Management (SBPM 2007) co-organized by SUPER participants; we report on this workshop in the workshops section below.

Besides the above events, SUPER results were presented during the main conference track through several papers, including:

- M. Dimitrov, A. Simov, M. Konstantinov and V. Momtchev: WSMO Studio - a Semantic Web Services Modelling Environment for WSMO (System Description)
- Tomas Vitvar, Maciej Zaremba, Matthew Moran: Dynamic Service Discovery through Meta-Interactions with Service Providers
- Martin Hepp, Jos de Bruijn: GenTax: A Generic Methodology for Deriving OWL and RDF-S Ontologies from Hierarchical Classifications, Thesauri, and Inconsistent Taxonomies

The 5th European Semantic Web Conference (ESWC 2008) took place from 1-5 June 2008 in Tenerife, Spain. ESWC2008 presented the latest results in research and applications of Semantic Web technologies. The SUPER project was present at this event through the 3rd international Workshop on Semantic Business Process Management and several papers that included:

- Carlos Pedrinaci, John Domingue and Ana Karla Alves de Medeiros. A Core Ontology for Business Process Analysis
- Matthias Born, Joerg Hofmann, Tomasz Kaczmarek, Marek Kowalkiewicz, Ivan Markovic, James Scicluna, Ingo Weber, Xuan Zhou: Semantic Annotation and Composition of Business Processes with Maestro for BPMN

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- Stefan Dietze, Alessio Gugliotta and John Domingue. Conceptual Situation Spaces for Semantic Situation-Driven Processes
- Tomas Vitvar, Jacek Kopecky, Jana Viskova and Dieter Fensel. WSMO-Lite Annotations for Web Services
- Dumitru Roman, Michael Kifer and Dieter Fensel. WSMO Choreography: From Abstract State Machines to Concurrent Transaction Logic

Further information can be found at: <http://www.eswc2007.org/> and <http://www.eswc2008.org/>.

### **2.1.2 European Semantic Technology Conference (ESTC)**

The 1st European Semantic Technology Conference held on May 31 - June 1<sup>st</sup> 2007 in Vienna, Austria, initiated a new conference series in Semantic technologies in Europe. ESTC is meant to be a European meeting ground for customers, developers and researchers to discuss the applicability and commercialization of Semantic technologies in corporate settings. With Semantic technology becoming increasingly mature and commercially deployed, the need for a European industrial event (to complement existing academic events) is evident. The first ESTC contained contributions of businesses and public organizations describing their practical experience (case studies) in using Semantic Technologies (the problem, the solution, initial expectations, the project, results, cost/benefit), vendor reports on semantically-enabled products and solutions, and analyst reports on the current market situation for Semantic Technologies.

The SUPER consortium gave the tutorial "Semantics Applied to Business Process Management" at ESTC 2007, introducing the SUPER project, approach, and results to the business community.

The 2nd European Semantic Technology Conference was held from 24th to 26th of September 2008 in Vienna, Austria. The SUPER consortium presented the progress of the project through the presentation "Application of Semantic Web technologies within Business Process Management"

The ESTC conference series have been co-organized by SUPER participants and given the success of the first two editions, its future editions are expected to play a key role in forming an industrial community around the technologies developed in the SUPER project.

Further information can be found at <http://www.estc2007.com/> and <http://www.estc2008.com/>.

### **2.1.3 International Conference on Advances in Semantic Processing (SEMAPRO)**

This inaugural International Conference on Advances in Semantic Processing, SEMAPRO 2007, was held on November 4-9, 2007 in Papeete, France. Its aim is to be a forum that deals with the complexity of understanding and processing information. The goal of the conference is to bring together researchers from the academia and practitioners from the industry in order to address fundamentals of semantic processing. The conference provided a forum where researchers were able to present recent research results and new research problems and directions related to semantic processing (e.g. storing, computing, representation, communications, etc.),

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The conference was co-chaired by one of the SUPER participants. The program of the conference included the tutorial "Towards Semantic Service-Oriented Systems on the Web" which presented results from the SUPER project. Also, results from the project were presented during the main conference track through the paper:

- D. Roman, J. Kopecky, I. Toma, D. Fensel, and B. Sapkota.: The Place of Policy in Semantically Enabled Service-oriented Architectures. SEMAPRO 2007.

Further information can be found at <http://www.iaia.org/conferences2007/SEMAPRO07.html>.

#### **2.1.4 Semantic Web and Information Systems**

Track "Semantic Web and Information Systems" was held at the 16th European Conference on Information Systems (ECIS 2008), June 09 - 11, 2008, Galway, Ireland.

In this conference track, the aim is to providing a venue for research that transfers the foundational research from the Semantic Web movement into the information systems domain, and extends the state of the art in ontology research by explicitly considering the economic dimension.

The conference track was co-chaired by one of the SUPER participants. Several papers presenting results from the SUPER project were published at the conference, including:

- Martin Hepp, Katharina Siorpaes, Daniel Bachlechner, Towards the Semantic Web in E-Tourism: Can Annotation Do the Trick?
- Martin Hepp: The True Complexity of Product Representation in the Semantic Web.

Further information can be found at [http://www.ecis2008.ie//index.php?option=com\\_content&task=view&id=29&Itemid=116](http://www.ecis2008.ie//index.php?option=com_content&task=view&id=29&Itemid=116).

#### **2.1.5 Semantic Web Technology in Business Information Systems**

The track "Semantic Web Technology in Business Information Systems" was held at the Multikonferenz Wirtschaftsinformatik 2008 (MKWI 2008), February 26-28, 2008, Munich, Germany. The main topic of the this track was the applicability of semantic Web technologies in core areas of business information systems, like ERP systems and their maintenance, logistics, etc. The aim was to disseminate of the state of the art in SW technology into the respective communities of business information systems. Various SUPER-related topics (e.g. Semantic Business Process Management, SOA and Semantic Web Services, Ontology Engineering, etc) were core topics in the call for contributions.

The conference track was co-chaired by one of the SUPER participants. Several papers presenting results from the SUPER project were published at the conference, including:

- D. Karastoyanova, T. van Lessen, F. Leymann, Z. Ma, J. Nitzsche, B. Wetzstein, S. Bhiri, M. Hauswirth, M. Zaremba: A Reference Architecture for Semantic Business Process Management Systems.

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- Ivan Markovic, Alessandro Costa Pereira, Nenad Stojanovic: A Framework for Querying in Business Process Modeling,

Further information can be found at [http://srvmatthes6.in.tum.de/semantic\\_web\\_technology\\_in\\_business\\_is.html](http://srvmatthes6.in.tum.de/semantic_web_technology_in_business_is.html).

## 2.2 Workshops Organisation

### 2.2.1 Modeling, Design, and Analysis for Service-oriented Architecture (mda4soa)

The *Modeling, Design, and Analysis for Service-oriented Architecture (mda4soa)* workshop series was initiated in 2006 with the aim of creating a community around methodologies for SOAs. In recent years, various forms of service-oriented architectures have appeared; amongst them, Web services, Grid services, Semantic Web Services, and e-Services are the most important. Although they share some of the principles of service-oriented architectures, they differ in many other aspects, which is an undesirable situation in the context of service-oriented architectures. Since standard protocols are a basic principle of SOA, this undesirable situation is partly due also to the fact that there are currently no mature methodologies and techniques to support analysis for service-oriented architectures. Moreover, all these forms of service-oriented architectures have developed different conceptual models, resulting in different methodologies for modelling and designing service-oriented architectures.

In this context, the *mda4soa* initiative aims to tackle the research problems (as well as practical experiences) around methods, concepts, models, languages and technology that enable computing in service-oriented environments.

This initiative has brought together researchers and industry practitioners (e.g. leading modelers, architects, system vendors, open-source projects, developers, and end-users) addressing many of these issues (including recent developments in tools and techniques, and real-world implementations of service-oriented distributed applications), and promoted and fostered a greater understanding of how service-oriented architectures can assist business to business and enterprise application integration, thus helping people develop and manage business processes more efficiently and effectively.

So far three editions of the *mda4soa* took place:

- *mda4soa'06*: this was the first edition of the workshop and was held on September 18, 2006, Chicago, USA, co-located with the 2006 IEEE International Conferences on Services Computing (SCC 2006)<sup>1</sup> and Web Services (ICWS 2006)<sup>2</sup>. This first edition managed to bring together more than 25 participants and attracted 20 submissions out of which 8 paper were selected for presentation and publication.
- *mda4soa'07*: this was the second edition of the workshop and was held on July 13, 2007, Salt Lake City, Utah, USA, co-located with the 2007 IEEE International Conferences on Services

<sup>1</sup> <http://conferences.computer.org/scc/2006/>

<sup>2</sup> <http://conferences.computer.org/icws/2006/>

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Computing (SCC 2007)<sup>3</sup> and Web Services (ICWS 2007)<sup>4</sup>. This edition managed to bring together more than 30 participants and attracted more than 25 submissions out of which 7 paper were selected for presentation and publication. The workshop program included three invited speaker as well as various panel discussions. This edition also served as meeting of the UPMS-HA OMG submission, which will be discussed later on in this deliverable.

- *mda4soa'08*: a very successful third edition of the workshop was held on September 17 2008, Munich, Germany, co-located with the 12th IEEE International EDOC Conference (EDOC 2008)<sup>5</sup>

The *mda4soa* workshops were co-organized by one of the SUPER participant. As far as the SUPER project is concerned, the *mda4soa* series of workshops managed to create a community dealing with MDA aspects of SOAs. Moreover, with the UPMS-HA OMG submission and its links to the *mda4soa* workshop, it is expected that this workshop will be used as a link between the SUPER project and The Object Management Group (OMG)<sup>6</sup>, in which SUPER technologies will be disseminated in the OMG in order to create interest for such technologies which can then be picked up by OMG for standardization. Also, the *mda4soa* 2007 featured a keynote presentation on "Semantic services" which included results from the SUPER project.

Based on the success of the first three editions of the *mda4soa* workshop, future editions are planned for the next years.

Further information can be found at:<http://events.deri.at/mda4soa2006/>, <http://events.deri.at/mda4soa2007/>, and <http://events.deri.at/mda4soa2008/>.

## 2.2.2 Mobile Services-oriented Architectures and Ontologies (MoSO)

The *Mobile Services-oriented Architectures and Ontologies (MoSO)* workshop series was initiated in 2006 with the aim of creating a community investigating the intersection of three major trends in today's computing: *mobile computing, service-oriented computing, and research on ontologies*. The MoSO series of workshops aims at investigating how mobile computing can benefit from service-orientation and ontologies and vice versa. This workshop series aim at tackling the research problems around methods, concepts, models, languages and technologies that enable new opportunities in the mobile space through adoption, usage, and integration of mobile services and ontologies.

So far three successful editions of *MoSO* took place:

- *MoSO 2006*: this was the first edition of the workshop and was held on May 9, 2006, Nara, Japan, co-located with the 7th International Conference on Mobile Data Management (MDM'06)<sup>7</sup>. This first edition managed to bring together more than 20 participants and attracted 18 submissions out of which 8 paper were selected for presentation and publication.

<sup>3</sup> <http://conferences.computer.org/scc/2007/>

<sup>4</sup> <http://conferences.computer.org/icws/2007/>

<sup>5</sup> <http://www.lrz-muenchen.de/~edoc2008/>

<sup>6</sup> <http://www.omg.org/>

<sup>7</sup> <http://www.mdm2006.kddilabs.jp/>

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- *MoSO 2007*: this was the second edition of the workshop and was held on May 11, 2007, Mannheim, Germany, co-located with the 8th International Conference on Mobile Data Management (MDM'07)<sup>8</sup>. This edition managed to bring together more than 25 participants and attracted 20 submissions out of which 7 paper were selected for presentation and publication.
- *RoSOC-M 2008*: the third successful edition in the workshop series was held on April 27, 2008 in Beijing, China, co-located with the 9th International Conference on Mobile Data Management (MDM'08)<sup>9</sup>

Given the success of the first two editions of the *MoSO* workshops, a journal special issue was recently organized. The *Special Issue on Mobile Services and Ontologies* was organized in the context of International Journal on Semantic Web and Information Systems<sup>10</sup>. It attracted over 20 submissions which are currently under review. Future editions of the *MoSO* workshop are planned for the next years.

The *MoSO* workshops were co-organized by one of the SUPER participant. As far as the SUPER project is concerned, the *MoSO* series of workshops are aimed at creating interest in the mobile computing community for the technologies developed in SUPER. Future editions of the *MoSO* workshops will be used as a core tool to apply and disseminate SUPER technologies in the area of mobile computing, showing the benefits of such technologies for mobile computing.

Further information can be found at <http://events.deri.at/moso2006/>, <http://events.deri.at/moso2007/>, and <http://events.deri.at/RoSOC-M08/>.

### 2.2.3 Advances in Semantics for Web services (semantics4ws)

The *Advances in Semantics for Web services (semantics4ws)* workshop series was initiated in 2006 with the aim of creating a community around recent advances in semantic technologies in the context of traditional Web services (SOAP, WSDL, UDDI), with specific applications in the area of business process management. The workshop aims at providing a forum in which to focus on selected core technical challenges for deployment of Semantic Web Services, and reach a better understanding of the relationships between commercial Web service standards, current SWS research efforts, and the ultimate requirements for full-scale deployment of these technologies. More specifically, this workshop aims at tackling the research problems (as well as recent practical experiences) around methods, concepts, models, languages and technology that enable semantics in the context of Web services, as well as discussing recent advances in semantics for Web services and business processes.

This initiative managed to bring together researchers and industry practitioners addressing many of these issues (including recent developments in tools and techniques, and real-world implementations of SWS applications), and promote and foster a greater understanding of how semantics can assist

<sup>8</sup> <http://mdm2007.uni-mannheim.de/>

<sup>9</sup> <http://idke.ruc.edu.cn/mdm2008/>

<sup>10</sup> <http://www.ijswis.org/>

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automation in Web services, thus helping people develop and manage services more efficiently and effectively.

So far two editions of the *semantics4ws* workshops took place:

- *semantics4ws'06*: this was the first edition of the workshop and was held on September 4, 2006, Vienna, Austria, co-located with the Fourth International Conference on Business Process Management (BPM 2006)<sup>11</sup>. This first edition managed to bring together more than 30 participants and attracted 32 submissions out of which 7 paper were selected for presentation and publication.
- *semantics4ws'07*: this was the second edition of the workshop and was held on September 24, 2007, Brisbane, Australia, co-located with the Fifth International Conference on Business Process Management (BPM 2007)<sup>12</sup>.
- *sSemantics4ws'08*: this was the third edition of the workshop and was held on September 1<sup>st</sup>, 2008 in Milan, Italy, in conjunction with the Sixth International Conference on Business Process Management (BPM 2008)<sup>13</sup>

The *semantics4ws* workshops were co-organized by one of the SUPER participant. As far as the SUPER project is concerned, the *semantics4ws* series of workshops are aimed at creating a community dealing with and discussing the most recent advances in semantic Web services, in which technologies developed in the SUPER project are expected to play a key role. Being held in conjunction the BPM conference series, this workshop managed to provide a good venue for dissemination of semantic business process management technologies. The SUPER project was present in all three events and various results from SUPER were disseminated, including the following papers:

- Ivan Markovic, Alessandro Costa Pereira: Towards a Formal Framework for Reuse in Business Process Modeling,
- Agata Filipowska, Monika Kaczmarek, Sebastian Stein: Semantically Annotated EPC within Semantic Business Process Management
- Matthias Born, Christian Brelage, Ivan Markovic, Daniel Pfeiffer, Ingo Weber: Auto-completion for Executable Business Process Models.
- Sebastian Stein, Christian Stamber, Marwane El Kharbili: ARIS for Semantic Business Process Management
- Barry Norton: Ontology-based Behavioural Reasoning for Business Processes.
- Joerg Nitzsche, Barry Norton: Ontology-based Data Mediation in BPEL (for Semantic Web Services)

<sup>11</sup> <http://bpm2006.tuwien.ac.at/>

<sup>12</sup> <http://bpm07.fit.qut.edu.au/>

<sup>13</sup> <http://emma.polimi.it/emma/showEvent.do?idEvent=22>

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Based on the success of the first three edition of the *semantics4ws* workshop, future editions are planned for the next years. It is expected that this workshop series to form a core venue for dissemination of recent results in the area of business process management.

Further information can be found at: <http://events.deri.at/semantics4ws2006/>, <http://events.deri.at/semantics4ws2007/> and <http://www.knoesis.org/semantics4ws2008/>.

#### 2.2.4 Service Composition (*sercomp*)

The *Service Composition (sercomp)* workshop series was initiated in 2005 with the organization of the *WWW Service Composition with Semantic Web Services (wscomps05)*<sup>14</sup>, and then picked up in 2006 and 2007 by participants in SUPER, with the aim of creating a community around the emerging specific topic of service composition. Composition of services in dynamic environments has received much interest for its potential to support Business-to-Business (B2B) or Enterprise Application Integration (EAI). So far two editions of the *sercomp* workshops took place:

- *sercomp*"06: this was the second edition of the workshop and was held on December 18, 2006, Hong Kong, co-located with the 2006 IEEE/WIC/ACM International Conference on Web Intelligence (WI 2006)<sup>15</sup>. This edition managed to bring together more than 20 participants and attracted 24 submissions out of which 11 paper were selected for presentation and publication.
- *sercomp*"07: this is the third edition of the workshop and is to be held November 5, 2007, Silicon Valley, USA, co-located with the 2007 IEEE/WIC/ACM International Conference on Web Intelligence (WI 2007)<sup>16</sup>, and the SWS-Challenge workshop<sup>17</sup>. This edition is currently under organisation.

The *sercomp* workshops were co-organized by one of the SUPER participant. As far as the SUPER project is concerned, the *sercomp* series of workshops is aimed at creating a community dealing with and discussing the most recent advances in service composition, in which service composition-related technologies developed in the SUPER project are expected to play a key role. Based on the success of the previous editions, future editions are planned for the next years.

Further information can be found at <http://events.deri.at/sercomp2006/> and <http://events.deri.at/sercomp2007/>.

#### 2.2.5 Semantic Web Services Challenge (SWS Challenge)

The goal of the SWS Challenge is to develop a common understanding of various technologies intended to facilitate the automation of mediation, choreography and discovery for Web Services using semantic annotations. The intent of this challenge is to explore the trade-offs among different existing approaches. The SWS Challenge aims at providing a forum for discussion based on a common

<sup>14</sup> <http://events.deri.at/wi2005/>

<sup>15</sup> <http://www.comp.hkbu.edu.hk/iwi06>

<sup>16</sup> <http://www.cs.sjsu.edu/wi07/wi/>

<sup>17</sup> <http://sws-challenge.org/>

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application. At the moment the workshop has two types of scenarios, i.e. Mediation and Discovery, each further divided into other sub-problems. Several workshop series took place so far:

- *Workshop Stanford, March 2006*: this workshop was the first workshop that was held at Stanford University from 8 to 10 March 2006. This workshop helped the participants in understanding, getting familiarized with the challenge problem. It also helped the participants in understanding and refining the evaluation criteria. Details about this workshop are available at [http://sws-challenge.org/wiki/index.php/Workshop\\_Stanford](http://sws-challenge.org/wiki/index.php/Workshop_Stanford)
- *Workshop Budva, June 2006*: this workshop was held in conjunction with 3<sup>rd</sup> European Semantic Web Conference (ESWC 2006), at Budva, Montenegro, from 15 to 16 June 2006. Participants from AIFB Karlsruhe, STI Innsbruck (former DERI Innsbruck), CEFRIEL, Politecnico di Milano, University of Dortmund, University of Jena, DERI Stanford, DERI Galway, Universidad Rey Juan Carlos. Four teams mainly participated and built the solution of the challenge problem. According to the chair of SWS Challenge, all of the four teams did amazing, and informative work, however, the most complete coverage of problems was achieved by the team of the Politecnico di Milano and CEFRIEL. They accomplished this coverage by teaming up approaches best suited for each part of the challenge. Further details about this workshop are available at [http://sws-challenge.org/wiki/index.php/Workshop\\_Budva](http://sws-challenge.org/wiki/index.php/Workshop_Budva)
- *Workshop Athens, November 2006*: this workshop was held in conjunction with 5<sup>th</sup> International Semantic Web Conference (ISWC 2006), Athens, GA USA, from 10 to 11 November 2006. This workshop was sponsored by LSDIS, STI Innsbruck and EU Knowledge Web NoE. The participants in this workshop were from Stanford University, STI Innsbruck, LSDIS Lab UGA, IBM Almaden Research Center, CEFRIEL, University of Jena, University of Postdam, University of Dortmund and DERI Galway. Almost all participants showed significant performance in solving the solution. Further details of this workshop are available at [http://sws-challenge.org/wiki/index.php/Workshop\\_Athens](http://sws-challenge.org/wiki/index.php/Workshop_Athens)
- *Workshop Innsbruck, June 2007*: this workshop was fully funded by EU Knowledge Web NoE and was held in conjunction with 4<sup>th</sup> European Semantic Web Conference (ESWC 2007), from 6 to 7 June 2007. Participants from Stanford University, STI Innsbruck, University of Jena, University of Dortmund, University of Potsdam, CEFRIEL, DERI Galway, IBM Almaden Research Center attended the workshop. There was significant progress shown by STI Innsbruck, DERI Galway and University of Jena, in this workshop. Further details of this workshop are available at [http://sws-challenge.org/wiki/index.php/Workshop\\_Innsbruck](http://sws-challenge.org/wiki/index.php/Workshop_Innsbruck)
- *Special Session Workshop, June 2007*: this workshop as special session titled as "Comparative Evaluation of Semantic Web Service Frameworks". This workshop was held in conjunction with 9th International Conference on Enterprise Information Systems (ICEIS2007) 12-16, June 2007, Funchal, Madeira, Portugal. Participants from Stanford University, STI Innsbruck, DERI Galway, CEFRIEL, LSDIS Lab UGA, IBM Almaden Research Center, University of Jena, University of Postdam and University of Dortmund attended the workshop.

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Further details about the workshop [http://sws-challenge.org/wiki/index.php/Special\\_Session\\_at\\_ICEIS2007](http://sws-challenge.org/wiki/index.php/Special_Session_at_ICEIS2007).

- *Workshop Stanford (2), November 2007*: this workshop will be merged with SerCom'07 workshop at the 2007 IEEE/WIC/ACM International Conference on Web Intelligence (WI 2007), Silicon Valley, USA, from 5 to 6 November 2007. More information about this workshop can be found at [http://sws-challenge.org/wiki/index.php/Workshop\\_Stanford\\_%28%29](http://sws-challenge.org/wiki/index.php/Workshop_Stanford_%28%29)

The workshop series are co-organized by STI International. SUPER participants are involved in co-organization of these events, and actively contribute to the workshops, e.g. through paper submissions and demo presentations:

- Maciej Zaremba, Maximilian Herold, Raluca Zaharia and Tomas Vitvar: Data and Process Mediation Support for B2B Integration
- Matthew Moran, Tomas Vitvar and Maciej Zaremba: Towards Constraint-Based Composition With Incomplete Service Descriptions

Further information can be found at: <http://sws-challenge.org>.

## 2.2.6 Semantic Business Process and Product Lifecycle Management (SBPM)

The workshop on Semantic Business Process and Product Lifecycle Management (SBPM) was held in conjunction with the 4th European Semantic Web Conference (ESWC 2007), June 3, 2007, Innsbruck, Austria. The aim of the workshop was to bring together experts from various communities, namely the Business Process Management community on one hand and the Semantic Web / Semantic Web Services community on the other. In particular, the goal of the workshop is to bundle experiences and prototypes from the successful application of Semantic Web technology to BPM and PLM in various industries, like automotive, engineering, chemical and pharmaceutical products, and services domains. The particular focus was on deriving reusable best-practices from such experiences, and to yield convincing showcases of semantic technology.

As a follow-up edition, the successful 3rd international Workshop on Semantic Business Process Management took place on June 2nd 2008 in conjunction with the 5th European Semantic Web Conference (ESWC 2008).

The SBPM workshop series cover two themes central to the SUPER project:

- **Semantic Business Process Management**: This theme addresses the more intelligent engineering, management, and execution of business processes through the use of Semantic Web technology. In particular, we expect and encourage contributions from the areas of business process engineering, management, and optimization, workflow, semantic web services, business rules, as well as respective standardization efforts.
- **Semantic Web Meets Product and Process Lifecycle Management**: This theme shows how the management of products-related data in single enterprises and value-chains can be improved by the more sophisticated formalisms, tools, and methodologies from the Semantic

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Web community. The aim is to make Semantic Web technology widely considered in the Product Lifecycle Management community, and to exploit lessons learned in the PLM community for advancement of Semantic Web research.

The SBPM workshop series have been co-chaired by SUPER participants, and served as a good venue for dissemination research results related to semantics in business process management. Several important contributions from the SUPER project have been published at the workshop, including:

- Martin Hepp, Knut Hinkelmann, Dimitris Karagiannis, Rüdiger Klein, Nenad Stojanovic (Eds.): Proceedings of the Workshop on Semantic Business Process and Product Lifecycle Management (SBPM 2007).
- Ana Karla Alves de Medeiros, Alessio Carenini, Irene Celino, Emanuele Della Valle, Federico Michele Facca, Michael Oppitz, Gernot Zeissler, and Stefan Zöller: Using Semantics to Aid Scenario-Based Analysis
- Marwane El Kharbili, Sebastian Stein, Ivan Markovic, and Elke Pulvermueller: Towards Policy-Powered Semantic Enterprise Compliance Management
- Ingo Weber, Joerg Hoffmann, and Jan Mendling: Semantic Business Process Validation
- Witold Abramowicz, Agata Filipowska Monika Kaczmarek, Carlos Pedrinaci, Monika Starzecka, and Adam Walczak: Organization Structure Description for the Needs of Semantic Business Process Management

Based on the success of the first editions of the SBPM workshop, future editions are planned for the next years. Together with the *semantics4ws* workshop series, it is expected the SBPM workshop series will form a core venue for dissemination of recent results in the area of business process management.

Further information can be found at: <http://sbpm2007.fzi.de/> and <http://sbpm2008.fzi.de/>.

### **2.2.7 Data Engineering Issues in E-Commerce and Services (DEECS)**

The 3<sup>rd</sup> International Workshop on Data Engineering Issues in E-Commerce and Services (DEECS 2007) was held in conjunction with the 8th ACM Conference on Electronic Commerce (EC'07), June 12, 2007, San Diego, CA, USA.

This workshop aimed at providing a venue for discussion and the exchange of ideas on data and knowledge engineering issues in the dynamic environment of e-business, enterprise computing, and business services and transformation.

The workshop was co-chaired by one of the SUPER participants who presented and discussed the SUPER approach for SBPM. The workshop also included the following publication:

- Martin Hepp, Mehmet Sayal, Sang-goo Lee, Juhnyoung Lee, and Junho Shim: Data Engineering Issues in E-Commerce and Services: DEECS 2007 Workshop Summary

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Further information can be found at: <http://www.cebt.re.kr:8082/DEECS2007/>.

### **2.2.8 Ontologizing Industrial Standards (OIS)**

The first International Workshop on Ontologizing Industrial Standards (OIS 2006) was held in conjunction with the 25th International Conferences on Conceptual Modeling (ER 2006), November 6-9, 2006, Tucson, Arizona, USA.

The goal of this workshop was to advance the state of the art in mechanized and semi-automated transformation of existing industrial standards into useful ontologies.

The workshop was co-chaired by one of the SUPER participants and includes the following publication related to results from SUPER:

- Jacek Kopecky. WSDL RDF Mapping: Developing Ontologies From Standardized XML Languages

Further information can be found at <http://www.deri.at/events/workshops/ois2006/>.

### **2.2.9 Applications and Business Aspects of the Semantic Web (SEBIZ)**

The first International Workshop on Applications and Business Aspects of the Semantic Web (SEBIZ 2006) was held in conjunction with the Fifth International Semantic Web Conference (ISWC 2006), November 6, 2006, Athens, Georgia, USA.

The aim of this workshop was at disseminating Semantic Web research into enterprise applications, and especially to discuss the availability of best practices, convincing showcases, and quantitative and qualitative metrics that help manage the various stages of building ontologies and ontology-based systems.

The workshop was chaired by of the SUPER participants who presented and discussed the SUPER approach for SBPM.

Further information can be found at <http://www.ag-nbi.de/conf/SEBIZ06/>.

### **2.2.10 Symposium AI Meets Business Rules and Process Management**

The AAAI 2008 Spring Symposium AI Meets Business Rules and Process Management was held on March 24-26, 2008, Stanford University, California, USA.

The symposium aimed to bringing together researchers and practitioners from the 'Business Rules', 'Semantic Technologies' and 'Business Process Management' communities to educate and inspire each other in order to avoid pitfalls and provide the basis for synergetic cooperation, with the aim of identifying and advancing the most promising points of cross-fertilization.

The workshop was chaired by one of the SUPER participants who brought into the context of the workshop the importance of semantics in business processes, with a specific focus on the SUPER project.

Further information can be found at <http://knut.hinkelmann.ch/aibr2008/>.

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### **2.2.11 Business Oriented Aspects concerning Semantics and Methodologies in Service-oriented Computing**

The 2nd International SeMSoC Workshop – Business Oriented Aspects concerning Semantics and Methodologies in Service-oriented Computing is to be held on September 17<sup>th</sup>, 2007 in conjunction with the 5th International Conference on Service Oriented Computing (ICSOC) in Vienna.

The aim of the workshop was to discuss business oriented methodological approaches as well as semantic approaches to business process management within a SOA.

The workshop was chaired by one of the SUPER participants who discussed in the context of the workshop the importance of semantics in business processes, with an emphasis on the SUPER project.

Further information can be found at <http://www.sysedv.cs.tu-berlin.de/SemSoC/>.

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### 3 Contributions to Standardisation Bodies

#### 3.1 UPMS-HA Initial Submission to OMG

The initial submission of the *UML Profile and Metamodel for Services–for Heterogeneous Architectures (UPMS-HA)* was submitted to OMG in response to the UML Profile and Metamodel for Services (UPMS) Request for Proposals (OMG Document soa/2006-09-09)<sup>18</sup>. The RFP solicited submissions for a UML Metamodel and Profile for Service (UPMS). Essentially, the UPMS RFP requested a services metamodel and profile for extending UML with capabilities applicable to modeling services using an SOA. The profile should define extensions for modeling and integrating services within and across business enterprises. UPMS should include facilities for formal specification of service contracts that may be developed directly using the profile, or abstracted from business processes. The purpose of this RFP was to address Service Modeling. Submissions were expected to demonstrate how service models relate to business process models on the one hand and existing Web Services standards (XSD, WSDL, BPEL, etc.) on the other in order to facilitate bridging the gap between business models and deployed services solutions.

As a response to this RFP, one of the SUPER participants – DERI / University of Innsbruck – joined forces with other several organizations (ESI, Softeam, MID GmbH, Rhysome, SINTEF, University of Augsburg, DFKI, NKUA – University of Athens, and OSLO Software) and submitted the *UML Profile and Metamodel for Services–for Heterogeneous Architectures (UPMS-HA)*. The intention of UMPS-HA was to analyze meta models for a number of architectural styles in order to identify a common core basis for these, so that it is possible to specify large and complex systems using a common modeling approach. It was assumed that later RFPs would address the more specific details for these architectural styles, i.e. through a UPM for EDA/CEP (Event Driven Architectures and Complex Event Processing), a UPM for Agents, a UPM for Semantic services, a UPM for P2P and Grid, etc.) but it was already possible to identify a number of common concepts for these through an analysis of existing approaches and experiences. The UPMS-HA submission analyzed a number of available results in these areas, with respect to extracting the common concepts into a core UPMS-HA model. The approach for this has been to ensure that UPMS core is a suitable basis for UPM for Web service Architectures, UPM for SCA/SDO (Service Component Architecture and Service Data Objects), now also Open CSA Open Composite Services Architecture), UPM for Semantic (web) services, UPM for Agents, UPM for Event modelling and EDA/CEP, UPM for P2P, UPM for Grid, and UPM for Components.

Some of the SUPER ideas can be found in the UPMS-HA submission, especially those related to semantic services. A new version of the UPMS-HA submission is currently under development and is expected to serve as input for the formation of an UPMS working group in OMG.

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<sup>18</sup> <http://www.omg.org/cgi-bin/doc?soa/2006-9-9>

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### 3.2 OASIS Semantic Execution Environment (SEE) TC

The aim of the OASIS SEE TC<sup>19</sup> is to provide guidelines, justifications and implementation directions for an execution environment for Semantic Web services. The SEE TC was started in November 2005 and aims to provide results in two years (i.e. by November 2007). The resulting infrastructure will incorporate the application of semantics to service-oriented systems and will provide intelligent mechanisms for consuming Semantic Web services. It has participants from STI Innsbruck, DERI Galway, DERI Korea, Open University UK, CEFRIEL, SAP AG, NIA, RDC and some individual participants.

The OASIS SEE TC aims to continue work initiated by the WSMX project and working group visible at <http://www.wsmx.org> and several other projects in Europe such as DIP (<http://dip.semanticweb.org>), ASG (<http://asg-platform.org>) and other projects in the area of Semantic Web Services which will start in the coming months.

The SEE TC will define methods for using semantic technologies to solve these coordination and automation issues. The TC also will define the functional components of such an SWS system and the semantics descriptions of these components' interfaces. The TC will also define a formal description of execution semantics of such a system. In addition, the TC will define a generic and open framework, using metadata, to allow for new components to be plugged into the system and made available to the execution engine dynamically. Further, after providing the basic methods described above, or in parallel if appropriate, the SEE TC will seek to develop specifications addressing specific problem sets covering the spectrum from a general purpose environment to a specific business-domain-focused applications addressing financial, telecommunication, military and e-Government applications of Semantic Web Services technologies.

The SEE TC's efforts will foster compatibility across specifications developed for Semantic Web Services, and where possible re-use existing standards and methods that already have been carried in areas of Semantic Web and Web Services. This TC will engage with industry, academic and research communities to facilitate understanding, awareness and possible collaborations regarding emerging semantic technologies and research applicable to semantically-aware Web Services. The SEE TC will provide a test-bed for the Web Services Modeling Ontology (WSMO), which is anticipated as a contribution for use by the TC on a non-exclusive basis, and will seek to demonstrate the viability of using WSMO concepts, relationships and definitions as a means to achieve successful dynamic interoperation of multiple ambient services, whether or not they share a common design or source.

Following a top-down, component based development approach, the TC will provide a whole framework capable of carrying out the dynamic discovery, mediation, selection, invocation and inter-operation of Web Services and any other functionality which will be revealed during the requirements analysis phase. While the focus of this group will remain on a high level semantic description of components interfaces, the TC will seek tight cooperation with any group working on semantics-enabled functional components that fulfill the requirements of such system.

<sup>19</sup> [http://www.oasis-open.org/committees/tc\\_home.php?wg\\_abbrev=semantic-ex](http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=semantic-ex)

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OASIS SEE TC will develop Technical Specifications as described below, and also may elect to issue Technical Reports and White Papers. At the moment SEE TC is working on following three documents:

- **Background and Related Work:** This document is intended to provide the audience of SEE TC documents with a minimum set of back ground information. About SOA concepts, current implementation of SOA based on Web Services, efforts on adding semantics to SOA, relationship of OASIS and W3C standardization activities and a list of references to relevant literature.
- **Semantic SOA Reference Model:** This document provides a reference model for Semantically Enabled Service Oriented Architecture (SESA) in UML. It further provides relationship between the Semantic SOA Reference Model and the SOA-RM specifications.
- **Semantic SOA Reference Architecture:** This document provides details about Semantic SOA RA in context, details the reference architecture, provides services view of the Semantic SOA (describes the functionality required by a SSOA) and process view (describes the behavior required of an SSOA), and further describes the how the various services that make up the reference architecture combine to provide this behavior

The OASIS SEE TC also organized tutorials "Adding Semantics to Service Oriented Architecture" at OASIS Symposium in 2005 and 2006. The first year's focus was to introduce the basic notions of Semantic Web and Semantic Web Services in general and WSMO, WSML and WSMX in particular. The second year's focus was on how interoperability is achieved in Semantic enables Service Oriented Architecture. As such, the tutorial described the main feature of WSMX from the Semantic enabled SOA perspective, emphasizing the main points of interoperability in this architecture.

### **3.3 W3C Semantic Annotations for WSDL (SAWSDL) Working Group**

Standardization of semantic Web services technologies in W3C is in early stages, reflecting the relative youth of the research field. In 2004, the W3C started receiving submissions for specifications for semantic descriptions of Web services (OWL-S, WSMO and others). In June 2005, the W3C held a Workshop on Frameworks for Semantics in Web Services, to organize a discussion on the proposed steps. The workshop identified that there was a lot of disagreement on what Semantic Web Services should do; yet there was consensus on the fact that semantics are necessary in Web Service descriptions, and that building on the existing Web Services Description Language WSDL, as proposed by WSDL-S, would be a good start.

In April 2006, a working group was formed to standardize Semantic Annotations for WSDL, which resulted in a Recommendation (W3C standard) called "Semantic Annotations for WSDL and XML Schema", short name SAWSDL, published in August 2007. It builds mainly on WSDL 2.0 (W3C Recommendation, June 2007), but also supports the still prevalent WSDL 1.1. On the semantic side, SAWSDL is independent of any ontology technology, assuming that semantic concepts can be identified by URIs.

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RDF and OWL from W3C are example technologies that can be used in SAWSDL. Along with the SAWSDL specification, the working group has produced a companion Usage Guide note ([www.w3.org/TR/sawSDL-guide/](http://www.w3.org/TR/sawSDL-guide/)), to provide more examples on how SAWSDL can be used.

The working group included representatives from several IP-SUPER consortium partners: University of Innsbruck, National University of Ireland - Galway, and the Open University. Apart from personnel contributions, SUPER deliverable D1.3: "Process Ontology Language and Operational Semantics for Semantic Business Processes" was used as part of the evidence that SAWSDL can be implemented and used by other specifications; this evidence was necessary for the specification to become a W3C Recommendation.

### 3.4 BPMN 2.0

Participants in SUPER, notably IBM and SAP, are also working on other relevant standards such as BPMN - the business process modeling notation. The BPMN standard is gaining increasing support from the industry. Many vendors of business process modeling tools already support this notation, for example ARIS, Visio stencils, Casewise, MagicDraw, Tibco, Borland, others plan to offer support in the future, for example IBM.

The adoption of BPMN by the various tools is rather non-uniform. Very often, only parts of the notations are supported and usually, no modeling guidelines are given, which would help users to produce process models captured in a consistent modeling style. A very strong limitation is the absence of a metamodel for BPMN. As a consequence, each tool uses its own format to persist BPMN diagrams and thus, the models are not exchangeable across different tools.

The OMG is addressing this issue. Version 1.1 of the standard, which is cleaning up many ambiguities and typing errors contained in Version 1, is currently being finalized at the OMG. Besides this, a request for proposals (RFP) for BPMN 2.0 has been issued, which calls for a standardized metamodel. Two other standards have been brought into the discussion to provide such a metamodel: XPDL by the Workflow Coalition and BPDM by the OMG itself. However, many players in this area are looking for a third, newly to be developed metamodel.

Such a metamodel can be a purely syntactic representation of the BPMN diagrams. However, the RFP also calls for solutions for ensuring the semantic integrity of BPMN diagrams during an exchange and it requests that the metamodel should precisely define the semantics of the graphical elements.

BPMN is highly relevant for SUPER as it will be the dominating standard for business process modeling in the future due to the large industry support. Furthermore, the BPMN specification already sketches a mapping to BPEL and thus positions BPMN as the process-centric entry point into business process management systems and service oriented architectures. Unfortunately, the mapping of BPMN to BPEL is incomplete and does not lead to consumable or efficiently executable BPEL.

The IBM team in SUPER is currently using a significant portion of its work shares in packages 2, 3, and 11 to address unresolved issues in BPMN. These include:

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- a formal semantics for BPMN that is intuitive and easy for the business level, but at the same time precise enough that it makes BPMN suitable for the specification of process-centric IT systems. The semantics should thus provide a shared space where business and IT can meet.
- a complete and correct mapping from BPMN to BPEL based on this semantics
- a generalization of the Process Structure Tree developed by Vanhatalo, Voelzer, Leymann [Vanhatalo et al., 2007] in WP 3 to capture a structured representation of BPMN diagrams as a prerequisite for the (static) analysis of BPMN diagrams for better understanding, error detection, refactoring, and code/mapping optimization.

So far, the team is working with Steve White, IBM's representative for the BPMN standard at the OMG to identify open issues and remaining ambiguities and gaps in the BPMN spec. First ideas towards a semantics have also been developed combining ideas of dead-path elimination known from BPEL with the token flow semantics sketched in BPMN. First, publishable results are expected at month 24.

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## 4 Conclusions

SUPER chose a combination of activities for establishing a lasting SBPM community that will be based on members from existing, adjacent communities, such as Web Services, Business Process Management, ERP research, Information Systems, etc. In this deliverable we reported on various events members of the SUPER Consortium organised and standardization activities, which aimed at creating research communities related to topics investigated and addressed within the scope of SUPER. In order to strengthen these preliminary results on communities building, future editions of various events reported in this deliverables are planned for the next years, and various standardization activities will take place as more results become available from the project (e.g. BPEL4SWS – a specification that already exists as a result of SUPER – could be submitted for standardization in future).

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## 5 References

Modeling, Design, and Analysis for Service-oriented Architecture Workshop (mda4soa'06); first edition. Workshop Website available at <http://events.deri.at/mda4soa2006/>.

Modeling, Design, and Analysis for Service-oriented Architecture Workshop (mda4soa'07); second edition. Workshop Website available at <http://events.deri.at/mda4soa2007/>.

Mobile Services and Ontologies (MoSO 2006) <http://events.deri.at/moso2006/>

Special Issue on Mobile Services and Ontologies. 2007. <http://www.ijswis.org/cfp/mobileservices.html>

International Workshop on Service Composition (sercomp'06) 2nd edition <http://events.deri.at/sercomp2006/>

International Workshop on Service Composition & SWS Challenge (SerComp & SWS Challenge '07) <http://events.deri.at/sercomp2007/>

UML Profile and Metamodel for Services-for Heterogeneous Architectures (UPMS-HA) <http://www.omg.org/cgi-bin/doc?ad/07-06-02>

Workshop on Semantic Business Process and Product Lifecycle Management (SBPM) <http://sbpm2007.fzi.de/>

3rd International Workshop on Data Engineering Issues in E-Commerce and Services (DEECS 2007) <http://www.cebt.re.kr:8082/DEECS2007/>

First International Workshop on Ontologizing Industrial Standards (OIS 2006) <http://www.deri.at/events/workshops/ois2006/>

The AAAI 2008 Spring Symposium AI Meets Business Rules and Process Management <http://knut.hinkelmann.ch/aibr2008/>

Track "Semantic Web and Information Systems" held at the 16th European Conference on Information Systems (ECIS 2008)

[http://www.ecis2008.ie//index.php?option=com\\_content&task=view&id=29&Itemid=116](http://www.ecis2008.ie//index.php?option=com_content&task=view&id=29&Itemid=116)

Track Semantic Web Technology in Business Information Systems [http://srvmatthes6.in.tum.de/semantic\\_web\\_technology\\_in\\_business\\_is.html](http://srvmatthes6.in.tum.de/semantic_web_technology_in_business_is.html)

[Vanhatalo et al., 2007] Jussi Vanhatalo, Hagen Völzer and Frank Leymann: Faster and More Focused Control-Flow Analysis for Business Process Models Through SESE Decomposition. Proceedings ICSSOC 2007 LNCS 4749, pp. 43-55, Springer, Sep 2007.