Multiagent and Grid Systems – An International Journal 6 (2010) 103–104
DOI 10.3233/MGS-2010-0143
IOS Press


Guest-Editorial

# Special Issue: Agents, Web Services and Ontologies: Integrated Methodologies

Matteo Baldoni[a,*], Cristina Baroglio[a] and Viviana Mascardi[b]
[a]*Dipartimento di Informatica, Università degli Studi di Torino, c.so Svizzera, 185 I-10149 Torino, Italy*
[b]*Dipartimento di Informatica e Scienze dell'Informazione, Università degli Studi di Genova, via Dodecaneso, 35, 16146 Genova, Italy*

In the last years there has been a growing interest towards computing problems which involve a large number of *heterogeneous* components that are physically *distributed* and that *interoperate*, and which share with multi-agent systems the properties of *openness*, *dynamicity*, and *flexibility*. Web services, mashups, SOA, sensor networks, middleware, distributed components are but a few examples. Among these, *web services* are one of the most mature fields. Since the W3C defined them as software systems, designed to support interoperable machine-to-machine interaction over a network, web services attracted the attention of scientists, working in research areas as diverse as Semantic Web, Web Services, Agents, Ontologies. The aim is both to define theoretical basis and languages and to design the infrastructures, which are necessary to allow the construction of composed web services and which show the mentioned characteristics of openness, flexibility, heterogeneity and dynamicity. A final solution is not yet at hand but it is clear that the challenge involves many facets (from formal theories to software engineering and practical applications), and that the way is the integration of results achieved by different disciplines.

So, on the one hand, there is a need of representing web services. This has been done, initially, by consortia like W3C and OASIS, which developed and maintain languages like WSDL and BPEL4WS, bearing from the WorkFlow research area. However, in order to allow web services to be shared and reused across application, enterprise, and community boundaries, such languages are not sufficient: descriptions must be machine-processable, i.e. they must be given a *well-defined meaning*. To this aim the use of *ontologies* has been proposed and is being investigated. WSMO provides a conceptual framework and a formal language for semantically describing all relevant aspects of web services in order to facilitate the automation of discovering, combining and invoking electronic services over the Web. Recently, also declarative languages are raising attention in the Semantic Web research field, where the focus started to shift from the *ontology layer* to the *logic layer*, with a consequent need of expressing rules and of applying various forms of *reasoning*, such as verifying at design time properties regarding the behavioral aspects of a composed system. On the agents side, the explicit reference to ontologies in messages exchanged between agents in order to achieve better semantic interoperability, as well as the

*Corresponding author. E-mail: baldoni@di.unito.it.

ISSN 1574-1702/10/$27.50 

presence of an *ontology agent* providing ontology discovery, query, and translation services to agents in a multi-agent system, are advocated by the IEEE FIPA.

Basic semantic annotations of web services, of the kind "inputs, outputs, preconditions, and effects", are not sufficient to perform the search of services that are to be used jointly to solve a task: it becomes useful, in this case, to introduce a notion of *goal*, which can be used to guide both the selection and the composition of services.

More generally, the limits of web services can be overcome by adopting an abstraction, the abstraction of *agent*, which includes the ability of dealing with goals and of performing various forms of reasoning. Agents also show autonomy and proactivity, which are characteristics that help when dealing with open environments, allowing for instance a greater *fault tolerance* and an easy approach to *exception handling*.

The papers collected in this special issue, most of which are revised and extended versions of papers presented at the MALLOW-AWESOME'007 workshop on "Agents, Web Services and Ontologies: Integrated Methodologies", cover most of the aspects outlined above. In "A platform for developing SOA/WS applications as open and heterogenous multi-agent systems", A. Ricci, E. Denti and M. Piunti exploit agent-oriented concepts for defining a suitable programming model for SOA/WS applications, thus making a step towards reducing the gap between the abstract design of service-oriented applications and their implementation. Their approach makes it possible to conceive SOA/WS applications as open and distributed workspaces, where dynamic sets of agents work together by creating, sharing and exploiting dynamic sets of artifacts.

"Comparing Goal-Oriented and Procedural Service Orchestration" by M. B. van Riemsdijk and M. Wirsing investigates how goal-oriented mechanisms for handling failures compare to more standard exception handling mechanisms. A goal-oriented orchestration language is an orchestration language in which goals are part of the language. The paper provides a formally defined translation of programs in the goal-oriented orchestration language into programs in the procedural orchestration language, and proves that the procedural orchestration has the same behavior as the goal-oriented one.

Moving from service orchestration to service choreography, in the paper "On the Integration of Declarative Choreographies and Commitment-based Agent Societies into the SCIFF Logic Programming Framework", F. Chesani, P. Mello, M. Montali, S. Storari and P. Torroni present an integrated framework capable to cover the entire cycle of specification and verification of choreographies, by mixing approaches coming from the service-oriented computing and multi-agent systems research domains. The underlying logic programming framework adopted for modeling and verifying interaction in open systems is SCIFF.

Finally, "Ontology support for Agent-based Simulation of Organizations" by V. Dignum discusses a framework for the rapid development of organizational simulations. The framework is based on a formal language that provides a provable representation of organizations, their environment, objectives and agents, in a way that enables the developer to analyze the performance of the organization in a changing environment. An ontology is used to describe organization structures, environment characteristics and agent capabilities. The framework provides semi-automatic means to generate simulations from the ontology instances.

**Acknowledgements**

We would like to thank all authors for their contributions and the reviewers for the excellent work done.