

Semantic Web Enabled Web Services

Dieter Fensel¹, Christoph Bussler², and Alexander Maedche³

¹ Vrije Universiteit Amsterdam (VU)

Faculty of Sciences, Division of Mathematics and Computer Science

De Boelelaan 1081a, 1081 HV Amsterdam, the Netherlands

Fax: +31-84-872 27 22, phone: +31-6-51850619

dieter@cs.vu.nl

² Oracle Corporation

500 Oracle Parkway, Redwood Shores, 94065, CA, U. S. A.

Phone: +1-650-607-5684

chris.bussler@oracle.com

³ Forschungszentrum Informatik FZI

Forschungszentrum Informatik, Haid-und-Neu-Str. 10-14, 76131 Karlsruhe, Germany

Fax: (+49) 721 9654 803, phone: (+49) 721 9654 802

maedche@fzi.de

Abstract. Web Services will transform the web from a collection of information into a distributed device of computation. In order to employ their full potential, appropriate description means for web services need to be developed. For this purpose we define a full-fledged *Web Service Modeling Framework* (WSMF) that provides the appropriate conceptual model for developing and describing web services and their composition. Its philosophy is based on the following principle: *maximal de-coupling* complemented by *scalable mediation service*.

The current web is mainly a collection of information but does not yet provide support in processing this information, i.e., in using the computer as a computational device. Recent efforts around UDDI, WSDL, and SOAP try to lift the web to a new level of service. Software programs can be accessed and executed via the web based on the idea of web services. A service can provide information, e.g. a weather forecast service, or it may have an effect in the real world, e.g. an online flight booking service. Web services can significantly increase the Web architecture's potential, by providing a way of automated program communication, discovery of services, etc. Therefore, they are in the centre of interests of various software developing companies. In a business environment this translates into the automatic cooperation between enterprises. An enterprise requiring a business interaction with another enterprise can automatically discover and select the appropriate optimal web services relying on selection policies. They can be invoked automatically and payment processes can be initiated. Any necessary mediation is applied based on data and process ontologies and the automatic translation of their concepts into each other. An example are supply chain relationships where a manufacturing enterprise of short-lived goods has to frequently seek suppliers as well as buyers dynamically. Instead of constantly searching for suppliers and

buyers by employees the web service infrastructure does it automatically within the defined constraints.

Still, there need to be done more work before the web service infrastructure can make this vision true. Current technology around UDDI, WSDL, and SOAP provide limited support in mechanizing service recognition, service configuration and combination (i.e., realizing complex workflows and business logics with web services), service comparison and automated negotiation. Therefore, there are proposals such as WSFL that develops a language for describing complex web services or DAML-S that employees semantic web technology for service description. The Web Service Modeling Framework (WSMF) follows this line of research. It is a full-fledged modeling framework for describing the various aspects related to web services. Fully enabled E-commerce based on workable web services requires a modeling framework that is centered around two complementary principles:

- Strong de-coupling of the various components that realize an E-commerce application.
- Strong mediation service enabling anybody to speak with everybody in a scalable manner.

These principles are rolled out in a number of specification elements and an architecture describing their relationships.

WSMF is the methodological framework developed within SWWS,¹ a recent European project aiming on Semantic Web enabled Web Services. SWWS accounts for three main challenges:

- Provide a comprehensive Web Service description framework, including the definition of a Web Service Modeling Framework WSMF (establishing a tight connection to industrial like XML, RDF, WSDL, WSFL and research efforts like, DAML+OIL, OWL, etc.
- Define a Web Service discovery framework that goes beyond simple registration means (like UDDI) and provides full-fledged ontology-based and metadata driven service discovery.
- Provide a scalable Web Service mediation framework that is fundamentally based on the P2P approach in order to provide direct connectivity between service requesters and service providers. This framework also includes means for configuration, composition and negotiation.

SWWS has a large industrial advisory board with more than 60 members and is the nucleus of an initiative for a large integrated project within framework VI of the research funding schema of the European Commission.

Semantic Web enabled Web Services are a key-enabler for intelligent web services. Intelligent web services have a revolutionary potential for many applications areas such as eWork, eCommerce, eGovernment, eLearning, etc. We will sketch this potential during the talk.

¹ Project partners are the Vrije Universiteit Amsterdam (coordinator), NL; FZI, Germany; Isoco, Spain; Shinka Technologies, Germany; Ontotext, Bulgaria; and Hewlett-Packard (HP), UK.