Chapter 3.5
Integrating Semantic Web Technology, Web Services, and Workflow Modeling:
Achieving System and Business Interoperability

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ABSTRACT

Much of the early focus in the area of Semantic Web has been on the development of representation languages for static conceptual information, while there has been less emphasis on how to make Semantic Web applications practically useful in the context of knowledge work. To achieve this, a better coupling is needed between ontology, service descriptions and workflow modeling, including both traditional production workflow and interactive workflow techniques This article reviews the basic technologies involved in this area to provide system and business interoperability, and outlines what can be achieved by merging them in the context of real world workflow descriptions.

INTRODUCTION

"The Semantic Web" (Berners-Lee, Hendler, & Lassila, 2001) is seen as the next generation of Web systems, providing better information retrieval, better services, and enhanced interoperability between different information systems. The Semantic Web initiative is currently overseen in the Semantic Web activity of the W3C and includes a number of core technologies. Some core technologies that will be relevant to this overview

are XML, RDF, RDF/S, OWL, and Web Services (SOAP, WSDL, UDDI). Also newer initiatives such as OWL-S and WSMO are relevant to our work and will be described in more detail in the article. While these technologies are promising, it can still be argued that alone, they are not sufficient to achieve interoperability in the business domain, allowing for a smooth integration between different information systems within and between organizations. For this to be accomplished, it is not enough to describe ontological metadata about the information and services available— one also needs to know the work context in which the different types of information and services are requested. Hence there is a need to integrate ontologies and service descriptions with models of workflows and business processes. Most of the work within these areas focus on automating routine tasks. While computerization automates routine procedures, knowledge-based cooperation remains a challenge, where we see a role for interactive process models.

The purpose of this article is as follows:

a. To provide an overview of the relevant technologies (ontology, service models, workflow models, including those being based on interactive models).
b. To show how these technologies fit together, both in theory (presented as "The interoperability pyramid") and in practice (illustrated by an example of how the technologies could be combined, focussing on how approaches for interactive modeling can be enriched by the newer work within Semantic Web and Web services).

The rest of this article is structured as follows: The next three sections survey ontologies, service models, and workflow models, respectively. Then an integrated approach to enterprise and IS development is presented, where interoperability among the various systems (and enterprises) would be a major focus. Finally, the last section provides some concluding remarks.

BASE TECHNOLOGIES AND ONTOLOGY

Here is a brief description of core technologies within the area, including XML, RDF, RDF Schema, and ontologies including an overview of OWL.

XML

XML will receive the least coverage in this review. It is the most general and widespread of the technologies we consider and is therefore likely to be familiar to the majority of readers. Basically, XML defines a set of syntax rules that can be used to create semantically rich markup languages for particular domains. Once a markup language is defined and the semantics of the tags known, the document content can be annotated. The XML language thus defined can include specification of formatting, semantics, document metadata (author, title, etc.), and so on. XML allows for the creation of *elements* which are XML containers consisting of a start tag, content, and an end tag.

Because of the flexibility of XML in defining domain specific, meaningful markups, it has been widely adapted as a standard for application independent data exchange. These properties combine to make XML the foundational technology for the Semantic Web, providing a common syntax for authoring Web content. XML provides means for syntactic interoperability, as well as ways to ensure the validity of a document, and most importantly the necessary syntax to define the meaning of elements in a domain specific application. On the other hand, providing the syntax for defining meaning is a necessary, but not sufficient condition for the specification of semantics that allows interoperability.

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