26 Semantics-driven XML Data Exchange within Web-serviced Business Applications*

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26.1 Introduction

Many contemporary e-business applications come into being as Web-serviced systems. The technologies standing beyond such solution provide means to design collaborative and integrative, inter- and intra-organizational business applications. It appeared that in the considered framework the efficient data exchange needs the employment of their semantics specification. Therefore, the Semantic Web technologies occurred to be highly applicable, especially ontologies, natural language processing methods and knowledge representation methods, languages and tools.

The proposed methods of semantics-based exchange of data [1, 5] use the knowledge concerning the intended meaning of the whole schema (or its elements), which is obtained via some “revealing semantics” analysis of the schema, in most cases assisted by a human. The obtained semantics is usually formally specified in the form of ontology and helps to generate the data matches. There exist also the methods in which the matches are discovered by means of some heuristics and machine learning techniques [10].

The presented approach is based on the fact that Web-serviced e-business applications use XML as a standard format for data exchange (www.w3.org/TR/2004/REC-xml11-20040204/). The data are often accompanied by their schemas written in XSD (XML Schema Definition, www.w3.org/TR/2004/REC-xmlschema-0-20041028/).

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Moreover, there exist some recommended XSDs for domain-oriented e-business applications, notably BMECat (www.bmecat.org), OpenTrans (www.opentrans.org) or xCBL (www.xcbl.org). For commonly accepted schemas of this kind, ontologies defining their semantics can be defined. It is convenient to embed such schema ontologies in a common foundational ontology, for it enables to obtain a set of correspondences between schema elements via some ontology-based reasoning process. The considered correspondences can be further used to generate semantics-preserving transformations of data. We propose a method to perform this task automatically using information provided by the considered schemas and the discovered set of correspondences.

In Section 2 a general structure of the process of schema- and ontology-based XML data exchange in the e-business scenario is discussed. Section 3 describes a method to generate executable schema mappings performing the transformations. In Section 4 the issues concerning ontology-based support for schema matching are presented. Section 5 contains some final remarks.

26.2 XML-structured Messages Exchange within the Web-serviced Business Applications

Many e-business applications take the form of a Web service system. There exist some specifications of such systems, for example the W3C Web Service Architecture (WSA, www.w3.org/TR/2004/NOTE-ws-arch-20040211/) in which the architectural model consisting of the four modules is proposed. One of them is the message model that contains the conceptualization of the inter-service communication. The messages can be structured in different ways but the widely used form is the XML schema. So, in this approach the automatic interoperation within the e-business service relies on the exchange of the XML data. They may be structured according to standardized e-business schemas, such as xCBL or the cataloguing schema BMECat accompanied by the business transaction schema OpenTrans. Such schemas may immediately serve as a message structure definition in the WSDL (Web Services Description Language, www.w3.org/TR/2005/WD-wsdl20-primer-20050510) description of a service. The analysis of existing schemas reveals that they are developed by various individual, national and public organizations, with the use of various languages, currencies, customs and national legal regulations. Thus the exchange of messages needs doing their (possibly automatic) transformations that preserve the semantics of transmitted data. On this purpose the correspondences and mappings between schemas and their elements should be discovered and formally defined.

Recall the WSDL description assume that the interfaces of some services contain the processing methods of two types of messages, where the message C1 is structured under a schema S1 and the other, C2 - according to the schema S2. Both schemas are semantically specified by means of the relevant ontologies, say O1 and O2. A message C1 (the output data of some component) specified by S1 and O1 can play