Chapter 5.8
Semantic Synchronization in B2B Transactions

Janina Fengel
Hochschule Darmstadt University of Applied Sciences, Germany

Heiko Paulheim
SAP Research CEC Darmstadt, Germany

Michael Rebstock
Hochschule Darmstadt University of Applied Sciences, Germany

EXECUTIVE SUMMARY

Despite the development of e-business standards, the integration of business processes and business information systems is still a non-trivial issue if business partners use different e-business standards for formatting and describing information to be processed. Since those standards can be understood as ontologies, ontological engineering technologies can be applied for processing, especially ontology matching for reconciling them. However, as e-business standards tend to be rather large-scale ontologies, scalability is a crucial requirement. To serve this demand, we present our ORBI Ontology Mediator. It is linked with our Malasco system for partition-based ontology matching with currently available matching systems, which so far do not scale well, if at all. In our case study we show how to provide dynamic semantic synchronization between business partners using different e-business standards without initial ramp-up effort, based on ontological mapping technology combined with interactive user participation.

BACKGROUND

In Germany, academic education is provided by the universities and the universities of applied sciences, with the latter having been entitled to start being active in research about 10 years ago and concentrating on the field of practice-oriented research. In Darmstadt at the University of Applied Sciences, one of the major research topics within the faculty of business administration and economics is the realization of electronic collaboration and the arising business integration requirements. Starting out in the late 1990s with small research projects with partners from both

academia and industry, over the years the basis of the e-business integration research group could be established. Presently this group is firmly installed and is working in various projects of different size concentrating on the issues of business integration and intelligent information integration in business information systems. The idea of linking project partners from a university background with partners from the industry has been continuously applied and thus enabled the development of solutions for real-world demands. Thereby the focus is on one of the fundamentals of a market-oriented economy, particularly the matching of demand and supply and the resulting exchange of goods and services. Electronic transaction support enables its execution. However, the issues around integrating the business partners need to be solved, so that they can synchronize their activities wisely. Nowadays, the challenges for enterprises stemming from the dynamics of a globalized market lead to the need of agile management. The fulfillment of this demand does not only require internal business integration, but in particular calls for flexible collaboration enablement in B2B based on meaningful information integration.

Against this background, the research identified for developing a suitable semantic solution led to the creation of the ORBI project. The acronym is created from the project title "Ontologies-based Reconciliation for Business Integration". The approach is based on the insight that semantic heterogeneity occurs in all kinds of business information systems. Basically, the problem of creating a shared understanding of information arises wherever information to be integrated and subsequently processed is named, formatted or annotated differently.

The project was set-up for developing a conceptual design and implementing a prototypical proof-of-concept for a semantic information system. The idea was that e-business standards can be understood as ontologies. Therefore, ontological engineering methods and tools could be applied for discovering and processing the standards' semantic content. In order to develop a flexible application for providing semantic support and synchronization between business partners, scientific knowledge had to be linked with practical experiences and demands. A special focus was put on small and medium-sized enterprises, since in this environment the exploitation of market power is not the sole answer to unification efforts. Accordingly, in this context the need for being able to deal with information formatted according to different demands is particularly strong. Under the leadership of the University of Applied Sciences Darmstadt the project consortium assembled included partners from the same university, partner universities, a Fraunhofer research institute, software and consulting companies as well as electronic marketplace providers and industrial partners from different industries. The application for funding the project by the German Federal Ministry of Education and Research was granted under number 1716X04 within the framework "Forschung an Fachhochschulen mit Unternehmen (FHprofUnd)". This program concentrates on supporting application-driven research collaboration and transfer-oriented cooperations between universities of applied sciences and small and medium-sized enterprises in Germany.

In the following we present our project. First, the research problem is described, followed by a case description presenting the technologies used and problems faced together with the design and implementation of our solution and its application to solve the demand at hand. We close with a discussion and outlook on the current activities.

SETTING THE STAGE

Already for many years the operation of electronic transactions could be supported electronically. The recent high acceptance and spread of web-based technology all over the world led to a quickly growing diffusion of electronic support