
Yousef Aklouf, Guy Pierra & Yamine Ait Ameur
National Engineering School for Mechanics & Aerotechnics (ENSMA), Poitiers, France
Habiba Drias, Research Laboratory in Artificial Intelligence, Algeria

ABSTRACT

This paper deals with the integration of PLIB ontologies in electronic commerce architectures, especially in B2B electronic commerce. Exchange of data, information, and knowledge is the key issue. To ensure reliability and feasibility of such exchange, two kinds of ontologies prove useful. One addresses products and services characterization, whereas the other addresses business processes. This paper aims to demonstrate the capability of integration of these two kinds of ontologies in a unique and global B2B-layered architecture. The orthogonality principle is applied. It allows the use of any best existing standard in both business layer and contents layer. In this paper, we use RosettaNet PIPs and ebXML in the business process layer, and we claim that PLIB ontologies are the best-in-class solution for the contents layer. These standards are used conjointly to promote interoperability and automation between partners involved in exchange. The originality of our approach is the possibility offered to the partners to use any defined business process with any defined content. A case study showing an application of such ontologies using RosettaNet PIP2A9 for business process and PLIB-based ontology for product characterization is presented. Implementation issues are also discussed.

Keywords: B2B e-commerce; business process management; dictionary; ontology; PLIB

INTRODUCTION

Electronic commerce in the business-to-business (B2B) field is not a new phenomenon. Initiatives to support electronic data exchange in business processes (BP) between different companies existed already in the 1960s. In order to exchange business transactions, sender and receiver have to agree on common standards—protocols for transmitting information and languages for describing contents. A number of standards arose for this purpose. The most famous is the UN initiative: Electronic Data Interchange for Administration, Commerce, and Transport (EDIFACT) (United Nations, 1999).

In general, the automation of business transactions has not lived up to the expectations of its propagandists. This can be explained by some serious shortcomings of existing approaches like EDIFACT. It is a rather complex and cumbersome standard, making the programming of business transactions expensive, error prone, and hard to maintain. Finally, the exchange of business data via EDIFACT is not integrated with other document exchange pro-
cesses; EDIFACT is an isolated standard. The use of the infrastructure of the Internet for business exchange should significantly improve this situation. Standard browsers can be used to perform business transactions, and these transactions are transparently integrated into other document exchange processes both in intranet and Internet environments. The first portals for electronic commerce using Internet facilities are harbinger.net, mysap.com, and VerticalNet.com. However, this currently is hampered by the fact that HTML does not provide a means for presenting rich semantics of data. XML, which is designed to close this gap in current Internet technology, will therefore change the situation drastically (Glushko, Tenenbaum & Meltzer, 1999). Then, B2B communication and business exchange can be modeled with the same means as the other data exchange processes. Transaction content specifications can be rendered easily by standard browsers. Maintenance will be cheap. Such approaches include WebEDI (Westarp, Weitzel, Buxmann & König, 1999) or XML/EDI (Peat & Webber, 1997).

XML will provide a standard serialized syntax for defining the structure of data. Nevertheless, it does not provide a standard model or concepts for describing business processes and products. Therefore, on top of the XML structure, two kinds of knowledge need to be modeled and shared across all the partners involved in B2B transactions: business process knowledge and product and service knowledge. Such shared conceptualizations are usually called ontologies. Thus, two kinds of standard ontologies have to be developed: ontology of products and services on the one hand, and ontologies of business processes on the other hand.

In addition to official standards, online marketplaces may generate de facto standards (proprietary standards). When these proprietary standards attract significant shares of the online transactions in a business field, they factually will create a standard ontology for this area. But all these resulting partial ontologies will be built upon different concepts and models creating new interoperability issues. This is the main reason why the use of the PLIB ontology model (ISO 13584-42, 2003) is proposed in this paper. When comparing electronic commerce in the B2C and B2B, one has to admit that B2C seems to be more mature. However, in B2C, few services are automated in the whole buying process. The use of ontology-based trading will significantly extend the degree to which data exchange is automated. Moreover, this usage also will create complete new business models in the participating market segments (McGuinness, 1999). Our work deals with B2B with the goal to increase its efficiency. To save time and money through B2B transactions, much more pieces of information need to be modeled formally to make them computer-interpretable. Shared ontologies play a crucial role for supporting such formal modeling.

In the first part of this paper, we argue that a conceptual model of B2B architecture is needed to be able to split the work and to design a long-term solution. In the second part, a layered architecture of B2B e-commerce and its various modules are presented. The concept of ontology used in the PLIB model and its integration in the proposed approach are outlined in the third part of this paper. Finally, the last part shows an application of the use of a PLIB ontology in the context of a RosettaNet business protocol named PIP2A9.

A CONCEPTUAL MODEL FOR B2B E-COMMERCE

B2B standardization and automation deals with interoperability of business contents and of message exchanges among business systems of different enterprises. The process of automation associated with both business contents and message exchange requires a number of decisions at various levels (e.g., which exchange protocol, what format for contents, etc.). Because of the level of complexity, it is unrealistic to have any single group or standard body addressing all the issues. Setting a formal collaboration between both vertical and horizontal standardization bodies and industry leaders in order to work together for driving B2B standard definitions and convergence is required. To set such a collaboration, there is a
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