Use Case 1in Computers and Electronics - Research

Dynamic B2B Integration

KW Partner: DERI Galway

1. Overview

Challenge
Facilitate effective integration of business partners using different widely used B2B protocols

Solution
Mediating transport, data and process differences between the partners using semantic web service execution environment

Why a Semantic solution
Semantics support the intelligent mediation needed between the heterogeneous partners and B2B protocols

Key Business Benefits
The solution makes B2B integration significantly faster and cheaper than currently. As more partners can be integrated , more competition can be introduced to the supply chain resulting e.g. in lower procurement costs.

Business Partners
Bell Labs Research Centre Ireland.

Keys components

Existing Software
WSMX (DERI)

Research and development
RosettaNet ontologysing and research issues arising from that.E.g. transport, data and process mediations.

Technology locks
No, based on open technologies (XML, WSML)

As organizations rely more on collaboration with partners to enhance their competitiveness, integration of information systems is important in cutting costs in information exchange and enabling quicker reactions to e.g. demand fluctuations. B2B integration is not however easy as companies have heterogeneous information systems that cannot be integrated easily. There are certain standards for B2B integration such as EDI X12 and RosettaNet that are meant to ease the integration task by providing guidelines how certain processes are integrated. RosettaNet is a newer standard, which is constantly growing in the significance. RosettaNet had over 3000 documented production implementations in 2004 with a big growth on a way.

However, the B2B integration even when using an XML-based standards, such as RosettaNet, can currently take six months. This is due to the flexibility of these B2B protocols regarding message content, message sequencing and message security details, which are often not formally defined. This means that just supporting a same message does not mean that companies become interoperable. A significant effort is required to agree and implement exactly how the standard is used. This leads to the fact that current B2B integration partnerships are still quite rigid and longstanding.

The scenario assumes that SWS technologies come to B2B integration stepwise instead of big bang. So first SWS environments are used with existing B2B protocols and the SWS based B2B integrations can only after e.g. popular e-business frameworks available use SWS technologies in their specifications. If all companies would start using formal domain ontologies, it would eliminate the need for these complex adapters. However, this seems to be still in distant future, as the existing B2B protocols are still not defined using formal languages. Our scenario is based on the idea that existing RosettaNet and EDI implementations are working and they will not be substituted easily. So instead of making scenario of partners using purely SWS in the communication, it is here assumed that the B2B interactions still use existing working methods. This working with older standards for B2B integration means that this solution can more easily be verified in real business environments, but still the use of SWS can bring flexibility and dynamics to the B2B integrations

2. Description of Business Use Case

In our use case depicted in figure 1, there is a buyer organization A, which manufacturers electronic devices. For particular device, this organization needs specific component, in our case a *display unit X*. This display unit can be delivered by three different suppliers (further referred to as partners), namely B, C and D. The organization intends to build the B2B integration with all these partners and make preliminary agreement on possible trades. As the partners are large companies, the organization cannot just dictate the way how the B2B integration should happen. Therefore, the organization has implemented separate B2B integration with each partner, namely RosettaNet using RosettaNet Implementation Framework (RNIF) over HTTP with partner B, EDI X12 using Value-Added Network operator over specific network communication with partner C and SAP Intermediate Documents (SAP IDOC) using Web Services standards with partner D.

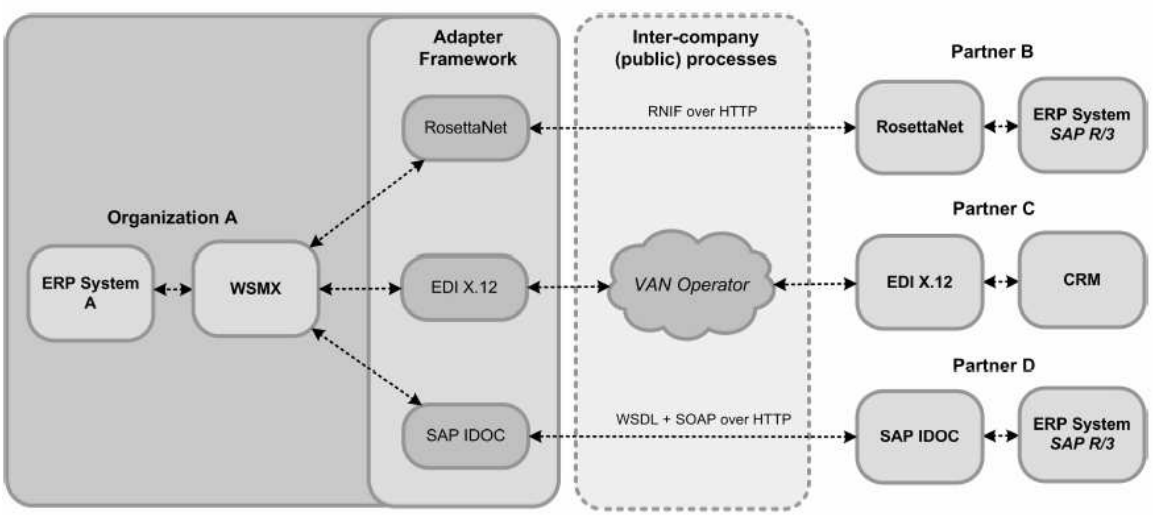

Figure 1 Use case scenario

3. Proposed SWS based Solution

The organization utilizes SWS environment, such as Web Service Modelling eXecution environment (WSMX), developed at DERI for the B2B integration with all its partners. The ERP system of the organization is integrated with SWS environment. Integration of the organization and each B2B protocol of each supplier should be built using a specific WSMX *adapter*. The role of each adapter is to adapt all protocols and languages used in specific communication to ontology language and SOAP protocol used by the WSMX technology (*technical-level interoperation*). WSMX further enables data mediation of different messages used in integration of different B2B protocols (*data-level interoperation*) and process mediation of different communication patterns (*process-level interoperation*). In order to enable successful interoperation of the organization and its partners, integration at all these three levels is needed. Following is the description of all these levels in the use case.

Technical-level interoperation is an ability of companies to exchange messages using specific communication protocols as well as languages. In our use case, following inconsistencies exist at technical level:

- Partner B uses RosettaNet Implementation Framework (RNIF 2.0) over HTTP(S) for secure transport. RNIF guides how the messages are sent and acknowledged and how digital signatures are used.
- With partner C the transportation uses a VAN operator, who takes care of messaging between the partners. Basically, the messages are dropped to a file system folder, where the VAN operator collects the messages and takes care of sending to the partner. As often is the case with EDI messages are not acknowledged but they are assumed to have gone through.

- With partner D, the transportation uses username/password secured Web Services over HTTP(S). If something goes wrong, the web services responses with an error code.

Data-level interoperation is an ability of companies to understand exchanged messages.
In our use case, following inconsistencies exist at data (semantic) level.

- Partner B uses the RosettaNet Partner Interface Process (PIP) messages according to the message guidelines provided by RosettaNet. So the *PIPs 3A1 Request for Quote* and *3A4 Request Purchase order* are used. Both consist of exchanging request and response messages.
- Partner C supports EDI X.12 messages and expects the *840 Request for Quotation* for queries and *850 Purchase Order* for orders. It responds price and availability queries by *879 Price Information* message and to purchase orders by *855 Purchase Order Acknowledgment* message. These differ from semantics from the RosettaNet messages.
- Partner D uses SAP IDocs for these. E.g. ORDERS05 IDoc for PO information exchange.

Process-level interoperation is an ability of companies to exchange message in the right timing and sequence order. In our use case, following inconsistencies exist at process level.

- Partner B complies again with RosettaNet choreographies in quoting and purchase order processing. That means the response message to queries arrives within 24 hours of sending of the requests. If the response message is not in time, the PIP will automatically report an error. Furthermore, for every PIP message sent, there is a signed acknowledgment receipt for delivery.
- Partner C with EDI has not such fixed response times between different messages is not dictated by EDI. However, to serve the organization needs they answer these messages within 24 hours of the request. The acknowledgment receipts are used in communications as often is the case with EDI.
- The implementation of partner D has no set timers but they also are committed to 24 hours in response. Partner D does not have any automatic time-out either. The response is sent directly to the organization A using web service interfaces that return a success code for successfully calling the service.

The whole integration process of organization A and partners B, C, and D happens in two phases: (1) integration set-up phase and (2) integration runtime phase. During the set-up phase, the integration is built based on requirements and design, and in runtime phase, a semantic web service execution process happens. The execution process for the scenario goes as (1) organization A sends its request from its ERP system (as WSML goal) to the WSMX requesting 10 pieces of display unit X devices to be purchased and delivered. In WSMX, (2) possible suppliers capable of fulfilling this request are discovered, (3) engagement with these suppliers is made to get price and conditions for a trade, (4) the best supplier is selected based on the price and conditions, (5) purchase order is submitted to this supplier and (6) result is sent back to the ERP system.

The main research challenges consider coping with heterogeneity in all the three levels with all the heterogeneous suppliers. Furthermore, the discovery of suppliers and the selection of the best service have also challenges for research.