eServices to integrate eBusiness with ERP Systems – The Case of HiServ's Business Port

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1 eBusiness and ERP Integration

With eBusiness being on the agenda of many companies (see (Ploenzke 2000)) the term dubbed by IBM has reached wide awareness in practice and research. eBusiness is defined in practice as "any Internet initiative – tactical or strategic – that transforms business relationships (...). [It] is really a new way to drive efficiencies, speed, innovation and new value creation in an organization" (Hartman *et al*. 2000, xvii) or from an institutional perspective as "an organization that connects critical business systems directly to key customers, employees, suppliers and distributors using the Web" (IBM 2000).

Due to its fast spread, ERP system suppliers have not yet managed to fully integrate outward reaching eBusiness activities like electronic markets or electronic procurement although they have started their own initiatives (e.g. mySAP.com of SAP). The Gartner Group forecasts that the market for these integration services will hit $100 billion by 2004, with a yearly growth rate of more than 50% (GartnerGroup, 2000). The integration of services via electronic media has just started and initiatives like Hewlett-Packard's E-Services are boasting it. So electronic Services (eServices) are seen as the next revolution (Plummer and Smith 2000).

However, integrating eServices into an existing organization proposes new challenges since process, data, protocol and interface standards for dynamic eService access are still under development or became available only recently. Since the knowledge and competencies to solve that problem is currently rare, the attractiveness of outsourcing these activities to third parties gains importance. It is strengthened due to the fact that one-to-one solutions between business partners should be avoided, if companies want to avoid lock-in situations previously established with relationship-specific interfaces and applications used for EDI or CAD systems.

This paper will focus on the integration of electronic services (eServices) into the application landscape of companies by presenting a conceptual model (see chapter 2) and providing a case study (see chapter 3) where an eService for such an integration is being established.

2 Business Networking Model for ERP and eBusiness Integration

To address the challenges described above, we have developed a conceptual model which helps to focus on relevant elements towards providing a solution. It focuses on standardization, and outsourcing or partnering required for Business Networking. Business Networking is defined as the design and management of IT-enabled relationships between

internal and external business partners. The model is based on the "Business Model of the Information Age" (Österle *et al*. 2000).

2.1 Elements of a Business Networking Model

The elements and guiding principles of the Business Networking Model are listed below:

- A *Business Bus* is a set of standards that supports the exchange of information, products and services among business partners. It is a logical space where (complex) services and products are flexibly and efficiently exchanged on previously agreed upon standards. Its purpose is to define a set of standards that enable "plug&play" connections. Examples are standards for catalogs (e.g. RosettaNet, cXML) or processes (e.g. CPFR).[1] The standardized infrastructure of the internet is extended to exchanging business information, services and knowledge on a semantic level. The concept builds upon the increasing availability of modular eServices and standards for processes, data, and interfaces.
- *Business Port***:** Applications and services, which denote a company's ability to interface with a large number of partners based on standards. First solutions for Business Ports are already on the market (e.g. SAP Business Connector) and are expected to develop with the diffusion of XML-related standards. These applications or external services build the layer that manages different syntax and semantics based on the standards defined by the Business Bus. It can be seen as customized layer to connect the internal with the external IT world with high requirements on security, performance and service levels.
- *EService:* Internet-based applications and services offered as individual products to solve a specific business need that seamlessly integrate with the (business or private) customer's processes. They derive their value from digital value creation and may include physical elements and/or other eServices (recursiveness). From an inside perspective of an eService provider this includes the selection of standards of the Business Port and the offering of the eService (Klueber *et al*. 1999).

One underlying design element is componentization which can be highlighted by specialized components for supply chain management (SCM), customer relationship management (CRM), electronic commerce (eC) and supplemented by knowledge management (KM) and data warehouse (DW) tools. Componentization can be also applied to eServices offered or

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[1] CXML stands for Commerce Extended Markup Language and CPFR for Collaboration, Planning, Forecasting and Replenishment (www.cpfr.org).

contracted (e.g. payment services or logistic services offered via the Internet). These can represent alternatives to inhouse applications and have subsitutional effects.

The implication for Business Networking is that it helps to stress the need for standardization in eBusiness (Buxmann 1996; Hartman *et al*. 2000); (Berners-Lee 1999), encompasses the integration of eServices and new application components as well as facilitates new intermediaries (Hagel and Armstrong 1997). These should be reflected in a future Business Networking oriented strategic application architecture. Figure 2.1-1 depicts an example of an intermediary who is contracting an eService that offers an electronic market to extend his offering to his customers. All Participants use the same set of standards and have to implement Business Ports in order to map their internal process and data standards.

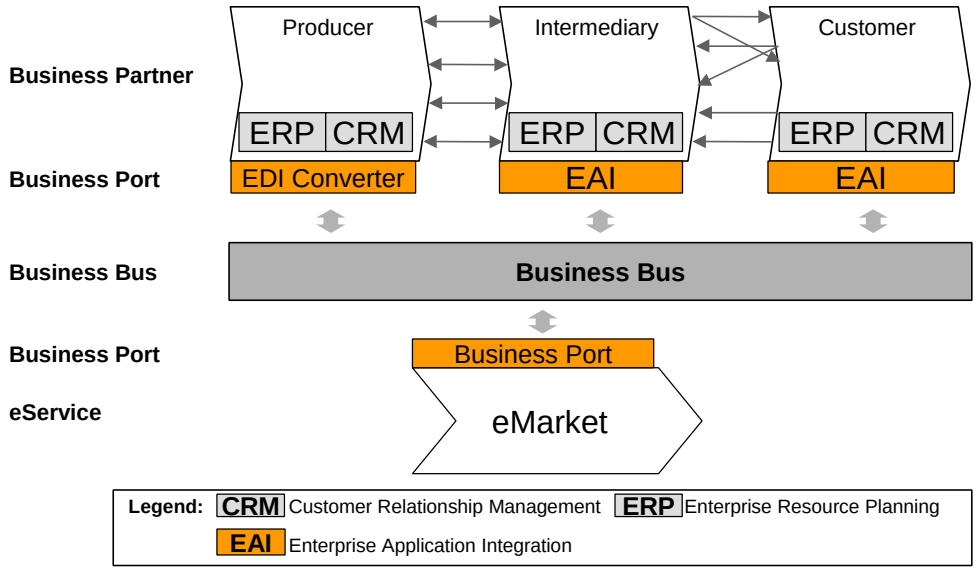


Figure 2.1-1: Elements of the Business Networking Model

2.2 Research background

This paper is based on research done in the Competence Center for inter-Business Networking initiated by the Institute for Information Management at the University of St. Gallen (www.ccibn.unisg.ch). The research is conducted with action research (Checkland and Holwell 1998) methods that help to understand which goals, business rules and logic the case companies pursue and which networks they form. The choice of companies are those who are involved with the Competence Center for Business Networking, which facilitates access to information and people as well as lowers the barriers of trust. Close collaboration with practice enables the researcher to study socio-technical phenomena in which “the researcher enters a real-world situation and aims both to improve it and to acquire

knowledge." (Checkland and Holwell 1998, 9). Preliminary results were obtained by starting with a problem definition from practice. It was followed by an understanding gained from desk research, which was then employed to the real life situations in semi-structured interviews and workshops - a cyclical process, which led to result documents such as working papers to document the process and the results.

The area of concern (Checkland and Holwell 1998) of this research is to better understand the rules, motivations and business logic that work in the environment of the cases. It provides the basis to present them in a better structured inter-personal, understandable, and sharable form. This applies when addressing internal business units, partners and customers as prerequisite for actions towards winning them to become an active part of the proposed business model. At this early stage an explorative attempt is has been made (Yin 1994) supported by action research methods.

3 Offering an eService to Outsource the ERP and eBusiness Integration

3.1 Outsourcing in eBusiness

Along with the strive for focusing on core competencies (Hamel and Prahalad 1994) and the lack of time to build internal competencies in eBusiness (Klueber 2000), it is neccessary to obtain the required competencies via Business Networking (Österle *et al*. 2000). The range of partnering arrangements extends from flexible ad-hoc outsourcing via virtual organizing (Venkatraman and Henderson 1998) towards more long-term insourcing via mergers and acquisitions (Alt *et al*. 2000). Furthermore there is a trend towards outsourcing of IT services and even business processes, which increasingly rely on partnership relations (Fröschel 1999, 459).

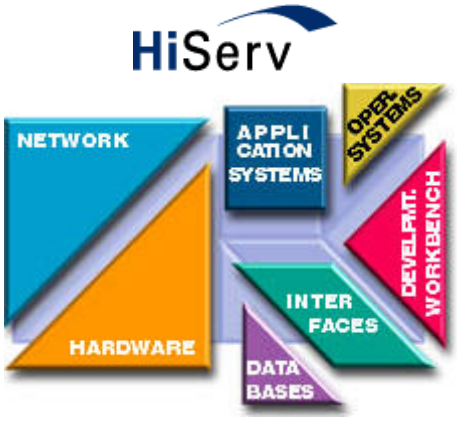
3.2 Case of HiServ's eService to integrate customers of Newtron's trading service

HiServ GmbH (www.hiserv.com) is a partner of the Competence Center inter-Business Networking. One of its competencies lies in providing solutions for integrating application systems between companies with middleware and enterprise application integration tools. It is partnering with Newtron to offer that competence as an eService for Newtron and its customers (see Figure 3.2-1). Newtron AG currently offers eMarkets for

- technical components (including mechanical and electronic engineering, electronics and plant building, measurement and control technology (www.newtroncomponet.com)),
- maintenance, replenishment and operations market (www.newtronMRO.com), and
- telecom and multimedia market (www.telbiz.com).

The supported business processes are request for bids (RFB), auctions and multi-supplier catalog sales. Newtron started its web presence 1999 based on the CompoNet catalog, which was extended to a marketplace. It offers buyers and sellers a platform providing information on products, producers, status as well as the exchange of product specifications and CAD files is included.

Product Catalog:
- 45.000 product categories
- 1.3 mio. page impressions per month
- more than 8.000 companies listed



Integration Know-how:
- ERP
- Middleware
- EAI

Figure 3.2-1: Overview of the participating partners

The HiServ and Newtron example shows that partners leverage their competencies through virtual organizing (Venkatraman and Henderson 1998). Newtron used its IT competencies combined with the content of Catalogic and Konradin to set-up a functioning market. This eService offering is now enhanced with the help of HiServ to offer ERP integration to Newtron's customers. This helps to increase the customer retention and to improve the offering in order to realize efficiency gains on the buyer side. Figure 3.2-2 shows the interaction of the business actors and their roles, the IS Architectures (standards of the Business Bus and required applications like HiWay) and eServices (e.g. multi-supplier catalog content by Catalogic).

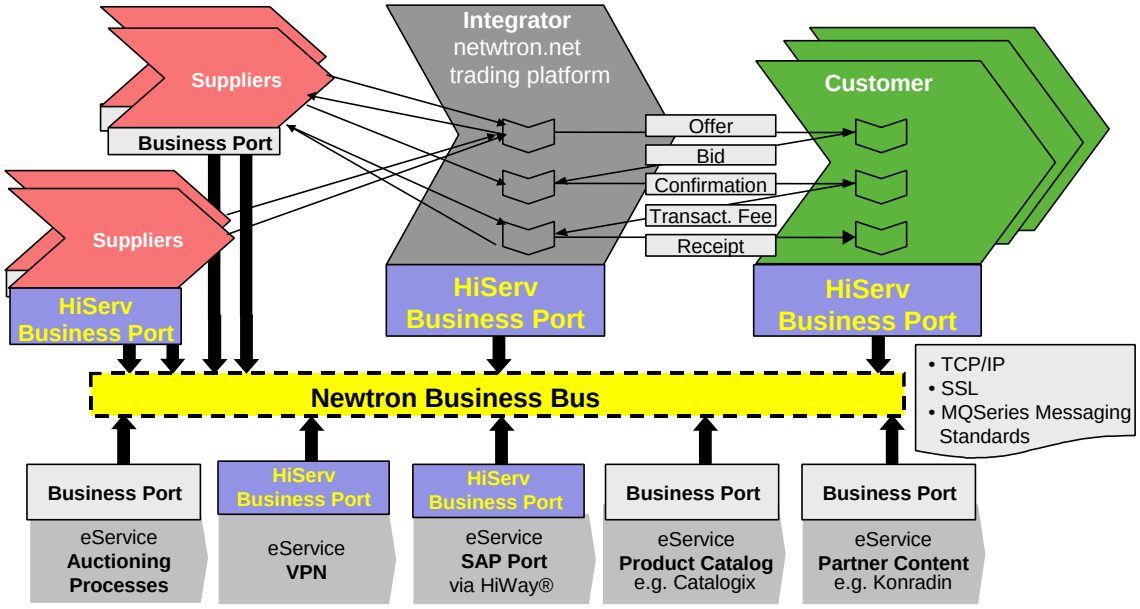


Figure 3.2-2: Business Networking Model of the Newtron and HiServ Partnership

HiServ is offering an eService that contains the definition and maintenance of the Business Port between Newtron and its customers in compliance with Newtron's Business Bus. Newtron's Business Bus defines the standards required to use the eServices of the eMarket offered by Newtron and its partners. The content of eServices offered is the outsourcing of the transportation, mapping of documents and information between trading partners as well as the running of the virtual private network (VPN) service.

3.3 Extension of Business Processes

Based on the Business Ports, Newtron will be able to offer its customers a more complete solution including a seamless electronic integration of the request for bidding process (RFB) or auctioning processes as well as contracting. This process support is not yet included into standard SAP R/3 software. The electronic integration will then include all transaction phases (Schmid and Lindemann 1998). The information and contracting phase will be implemented within the electronic commerce solutions of Newtron. The settlement phase will be implemented within the SAP R/3 system based on the data from the electronic commerce transactions made available by the eService offered by HiServ.

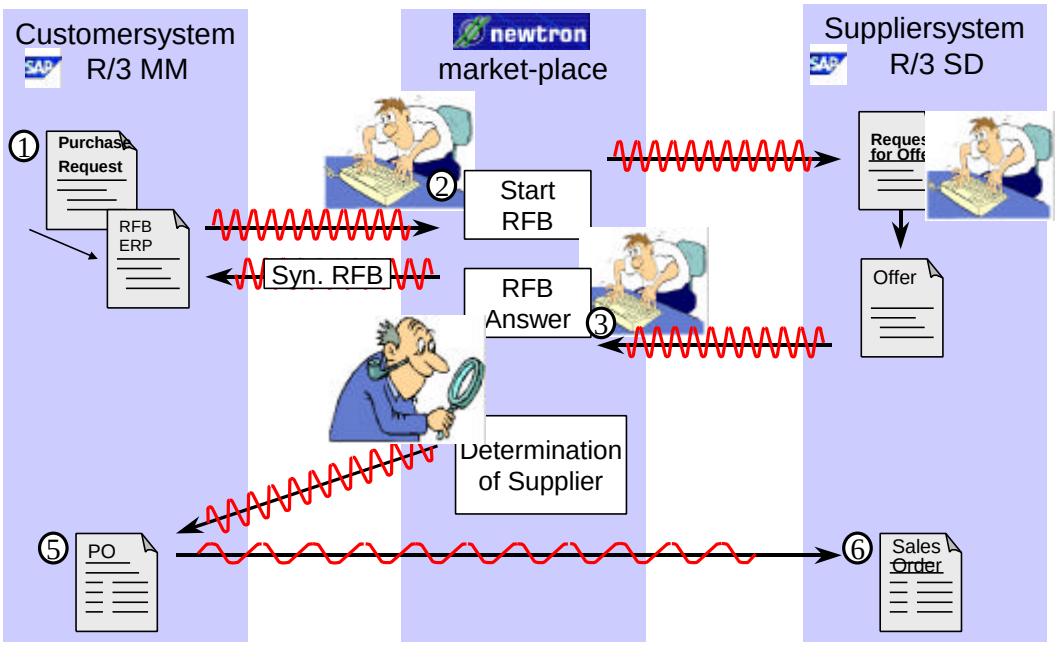


Figure 3.3-1: Process made possible by HiServ's Business Ports

The advantages are for the companies using the eService are the reduction of search costs and no need to build and allocate know-how and other resources for this task. Additionally the time saved can be used to concentrate on strategic procurement activities. The high quality of the electronic catalog enables a high market transparency and better information access than before.

To reap these benefits for Newtron's customers HiServ applies its own enterprise application integration tool called HiWay® in order to manage the many-to-many relationships efficiently and to achieve potentially increasing returns based on the network effect.

3.4 HiWay as a tool to offer an eService for Business Ports

HiServ's internal solution will be applied. It consists of two software components to build a Business Port: the A2A HiWay Navigator for the configuration and the A2A Backbone for the execution of interorganizational processes which includes the virtual private network. A2A HiWay Navigator is a graphical user interface-based tool HiServ developed to implement a seamless integration between multiple business systems and IT platforms. It manages and controls all interface requirements and allows transformation and translation of data in a truly vendor independent fashion. Figure 3.4-1 shows the linking of the SAP R/3 MM (Source) with the Newtron portal (destination) done via a graphical link. The next step is to define the connectors, which is performed via a choice of the possible connectors shown in the pop-up window. HiWay needs a transport and a filter adapter in order to be able to generate runtime coding for that connection.

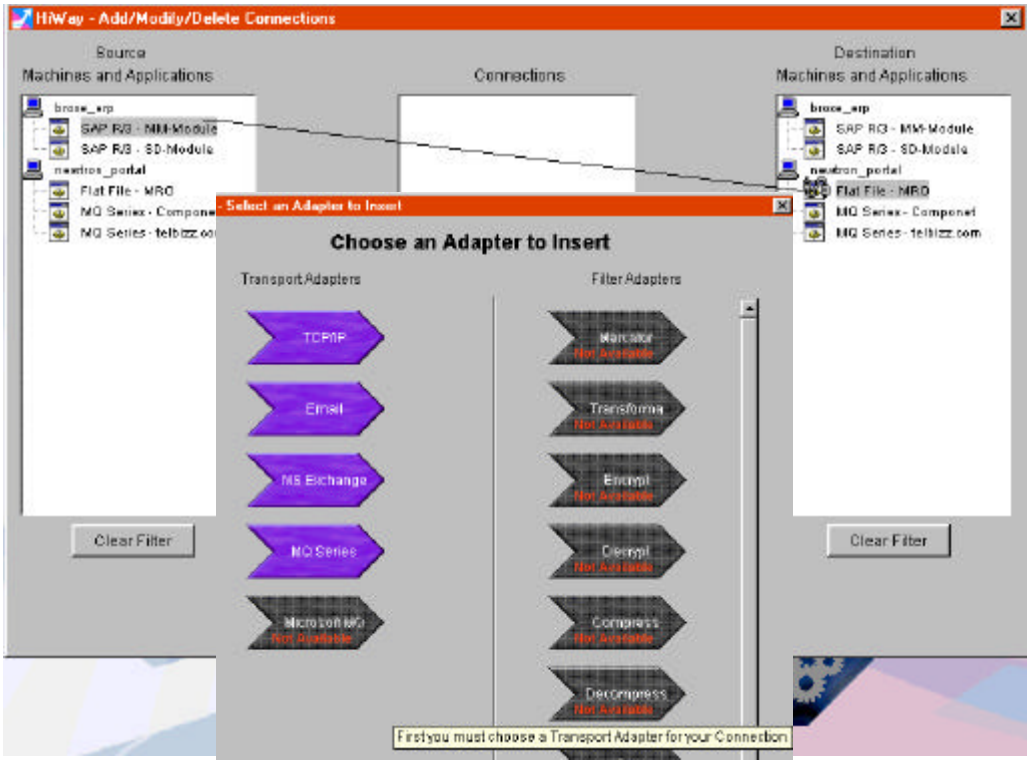


Figure 3.4-1: Screen Shot of the A2A HiWay Navigator

This step specifies the network protocols, security requirements and messaging middleware used in order to establish the link to the NewtronCompoNET market place. This Business Port is the prerequisite to make efficient use of the RFB processes and the content offered by Newtron without individual programming.

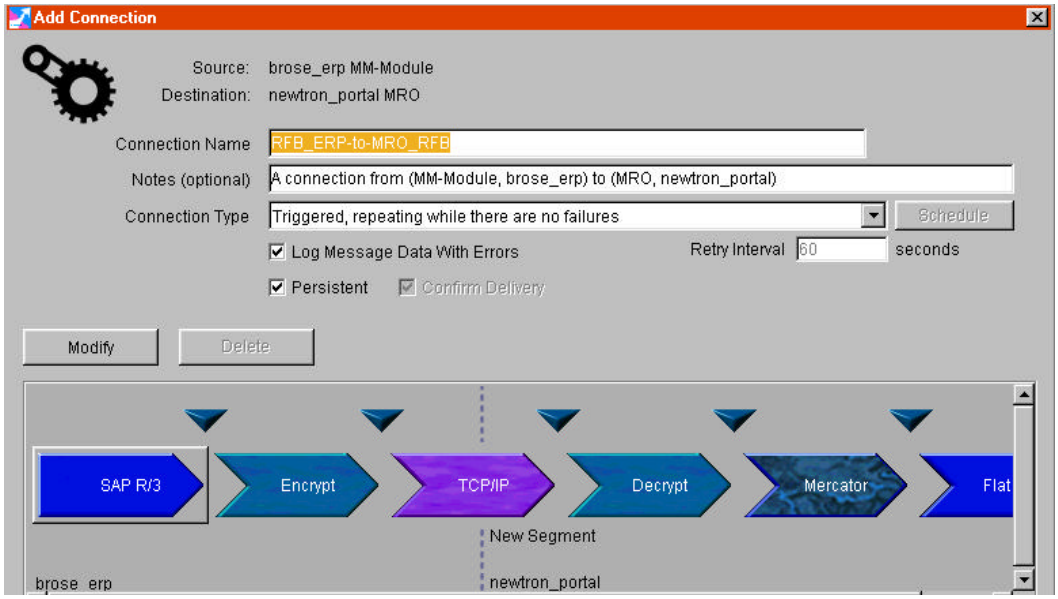


Figure 3.4-2: Business Port Elements to be implemented by HiWay

The next stage represented in Figure 3.4-2 is to generate code that implements the specified Business Port. The more implementations are done with HiServ the faster the future implementations will be as more and more data can be automatically mapped.

Due to limited support of synchronous information exchange and XML standards compliance like cXML, common business library (CBL) or RosettaNet[1] standards it might be required to use other tools that focus on this functionality. One important provider is WebMethods (www.webmethods.com) and the SAP Business Connector, which is also licensed form WebMethods. HiServ is considering to partner with WebMethods to achieve that integration. The intermediate state is depicted in Figure 3.4-3.

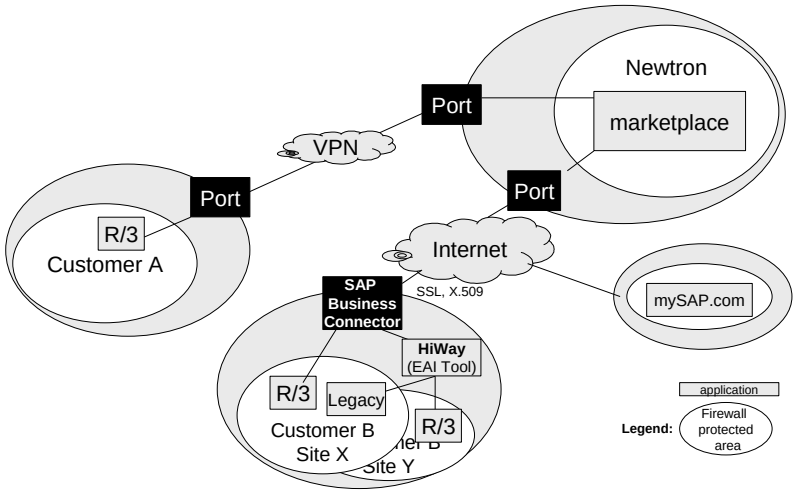


Figure 3.4-3: Technical view on intermediate solutions

For future releases of the HiWay the synchronous connection and enhanced XML capabilities will be offered either by HiServ or in cooperation with partners. One specific extension might be the one described below.

3.5 Enhancement potentials of the solution with tpaML

The Business Networking Model recommends that a set of standards is used in order to obtain the required flexibility for Business Networking. To facilitate the electronic contract definition and its implementation IBM has developed the Trading Partner Agreement Markup Language (tpaML)[2].

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[1] See www.ariba.com for cXML, http://www.commerceone.com/xml/cbl/index.html for CBL and www.rosettanet.org.

[2] It is an open standard available on the Internet and submitted for standardization with OASIS xml.org initiative. TpaML is complementary to the Electronic Business XML initiative (ebXML) of the UN/CEFACT and OASIS.

TpaML aims to facilitate collaboration by standardizing the interaction of trading partners ranging from the basic communication via data and document exchange to the business protocol layer. The XML-based tpa documents capture the relevant information to enable the communication of applications and processes. Since it covers a high level layer many standards below have to be agreed upon and defined. The language and its standards are based on the following assumptions (see Figure 3.5-1):

- Usually there is no common shared underlying middleware for inter-business processes. Setting up such a middleware would require a tight coupling of partners' software platforms with implications on security, naming and component registration.
- ACID principles (atomicy, consistency, isolation, durability (Gray and Reuter 1993)) and one sphere of control are not desirable since hold locks would lead to a loss of autonomy
- Current inter-business practices do not support rollback or compensation transactions, but rely on forward moving actions like explicit recourse actions (e.g. cancellation of a purchase). These can also be implemented in computer supported media.

TpaML relies on a conversation model of interaction that is based on a conversation history with mutually agreed upon permissible operations. Based on these the external interactions consist of requests, responses, modifications or cancellations. As in the inter-Business Networking method (Klueber *et al.* 2000, 272) the developers of tpaML stress the importance of control and monitoring as well as trust (Sachs *et al.* 2000, 3).

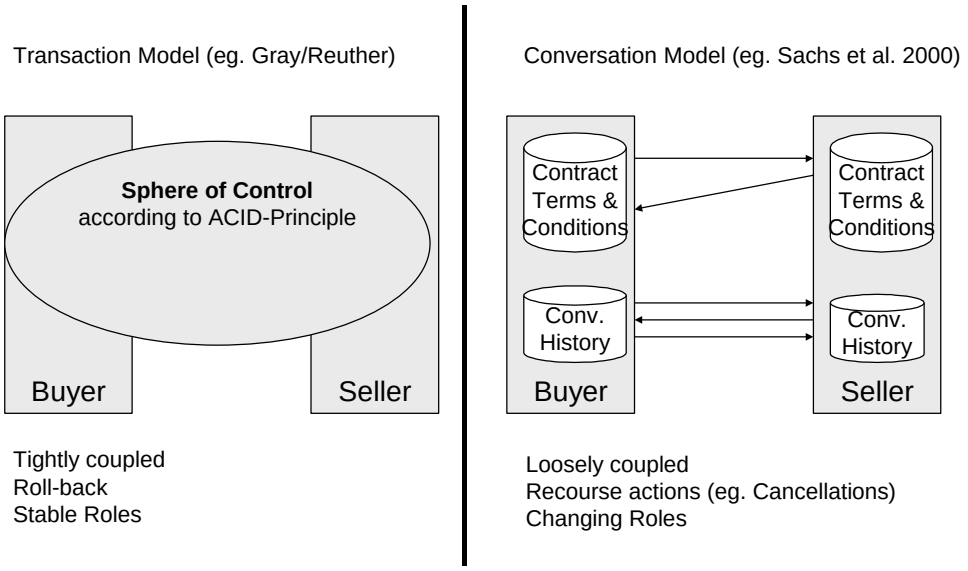

Figure 3.5-1 – Different perspectives on inter-business transactions

TPA expresses the IT terms and conditions which participating parties must agree upon. This also entails configuration information and the interaction rules that must be executable. To achieve this, tools for authoring and code-generation are required.

The standardization of the Business Bus could be supported by tpaML on several levels (see Figure 3.5-2). The hierarchy of categories defines a layer model of eService categories (c.f. Klueber 1999). It describes how different tasks are solved by tpaML standards or standards tpaML uses itself. The values result from the descripton of tpaML (Sachs *et al*. 2000) in the subcategories language, content, protocol. However not every layer is yet fully specified.

Content	Category	Criteria	Value
Pragmatics	Coordination Standards	Language	tpaML
		Content	Trading partner roles, Sequencing Rules
	Process Standards	Protocol	OBI, Rosettanet's Partner Interface Processes (PIP)
		Language	tpaML
		Content	Invoking actions at the partners' site
Semantics	Information Standards	Language	tpaML (contract), cXML (products) etc.
		Content	Bids, Availability, Contract information like conditions and service levels etc.
	Transaction Standards	Protocol	document interchange, message brokering
		Content	Workflow, Audit Logging, Non-repudiation (MD5, RSA, DSA), Authentication (X509.V3), message security , recovery procedures
Syntax	Data Standards	Content	Message formats (eg. BASE64), Exchanges, address parameters
	Basis Standards	Protocol	TCP/IP, SMTP (HTTP), SSL
		Content	Maximum allowed network delay

Figure 3.5-2 – TpaML Standardization Areas

TpaML reaches much above typical communication standards like TCP/IP or transaction standards. It aims to automate former not being conceived as "automatable" services. It moves towards covering semantic elements like the roles and the business processes applied. TpaML is a prototypical effort of a set of standards to achieve a higher level of standardization on the semantic level the Business Networking model focuses on.

These standards can to be implemented via eServices. Due to tpaML the computability rises to levels where computer supported task fulfillment was previously too complex in heterogeneous environments. However there is more research needed on the maturity and the applicability of tpaML. For example it has to proof, if it meets the time and functionality requirements (e.g. degree of details and adaptations for the bidding and auctioning processes) of the above described setting. Also, implementation questions like the integration into IBM's MQSeries as the first product that implements the standard are to be resolved, before this option can be explored any further.

Furthermore the authors of the tpaML themselves state limitations (Sachs *et al*. 2000). For example, there have only been two party scenarios implemented based on static negotiations. To date no hierarchical TPAs are possible (see p. 15) and monitoring and control procedures are not yet included. Furthermore it is not yet clear how trusted 3rd parties can be integrated and who can perform it.

If tpaML was able to be integrated as meta-language for describing the agreement process and enforcing this agreement, opportunities could be plentiful. One example would be to directly instantiate the monitoring process of agreed upon service levels, delivery times etc., which were part of the contract after the bidding process or auction. This could be done via importing that information into the SAP system or via an additional service offered by Newtron or HiServ respectively.

4 Conclusions and Outlook

The integration of services – of electronic or physical nature – presents a great challenge for eBusiness. The paper proposed a model to depict eServices and highlights preconditions for their integration like the use of standards (Business Bus), standardized interfaces, software components and services (Business Port) and their interplay to deliver a complete offering in eBusiness.

The general model was applied to a specific eService offering of HiServ and Newtron. HiServ is offering an eService to establish Business Ports to integrate ERP systems with the eBusiness solution of Newtron. This project will be used to evaluate the usability of the model as well as its refinement in a real life environment. We have provided an outlook on the potentials to extend this scenario by using tpaML on the semantic layer.

So far the Business Networking Model has helped to structure the tasks of the partnering project between HiServ and Newtron. The implementation of the project will show, if the identified architecture will materialize, customers are able to reap the benefits of the solution described above, and the cooperating parties will be able to achieve the critical mass.

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