

12 eServices for Integrating eMarkets

Norbert Kaltenmorgen, Roland Klüber, Florian Leser, Rainer Alt

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12.1 Business Networking and ERP Integration

Integration is a key element for Business Networking applications. First, many companies have introduced initiatives to restructure internal processes and integrate information systems by merging individual subprocesses into integrated information systems, such as desktop purchasing systems (cf. Chaps. 10 and 14.2). Second, the rapid evolution of new eMarkets, such as Covisint in the automotive sector or ChemConnect in the chemical industry, as well as external eServices providers, such as inet-logistics in logistics or Deutsche Merchant in factoring. As partners of the businesses are concerned, these new business models take over subprocesses or replace business processes with new high-quality IT-supported processes which ideally should represent a seamless extension of company processes. This means integrating the ERP systems of companies and the infrastructures of eMarkets and eServices.

As a result of the speed at which the Business Networking (or eBusiness) sector has developed, ERP system suppliers have not yet succeeded in fully integrating outwardly reaching eBusiness activities, such as electronic markets or eProcurement with internal processes, even if they have already launched their own initiatives and developed new infrastructures within an extremely short space of time (e.g. mySAP.com from SAP). Integration with these new partners via electronic media has only just begun and is being boosted by initiatives such as eServices and e-speak from Hewlett-Packard or tpaML from IBM. eServices are therefore seen as the next revolution [Plummer/Smith 2000]. The integration of eServices into an existing organization brings new challenges as process, data, protocol and interface standards for dynamic eService access are still at the development or introduction stage. This is partly because in eBusiness the vast majority of IT infrastructures are proprietary developments. The Gartner Group forecasts that the market for these integration services will hit USD 100 billion by 2004, with an annual growth rate of more than 50% [GartnerGroup 2000].

Since the knowledge and competencies required to solve this problem are currently rare, the attractiveness of outsourcing these activities to third parties is growing. This trend is being accentuated by a desire to avoid past experience where the relationship-specific interfaces and applications used for EDI or CAD systems led to technically limited and expensive one-to-one solutions between business partners. The case of Triaton shows how an eService business model of an outsourcing provider offering the integration of eMarkets into ERP systems is developed and technically realized.

12.2 eMarkets and eServices in Business Networking

12.2.1 Evolution and Market Potential

Electronic markets have become a vital part of Business Networking strategies in all industries. Well known examples are Covisint, a joint venture of General Motors, Ford, DaimlerChrysler, Nissan, Renault and others, or ChemConnect, a joint venture of Bayer, BASF, BP Amoco, Eastman Chemicals, Celanese, Dow, ICI, and others. Many analysts expect the volume of electronic transactions to expand from just under USD 400 billion (today) to almost USD 2,500 billion in the year 2004. Optimistic estimates from AMR even go as far as putting the value at USD 5,700 billion. Merrill Lynch und Forrester Research predict that the proportion of transactions handled by eMarkets will account for 10% – 20% of the total. [Blodget/McCabe 2000]. AMR, on the other hand, base their forecasts on over 50%, and consider a trade volume of almost USD 3,000 billion to be realistic. In addition, the number of eMarkets is expected to grow from the current level of around 600 (6/2000) to over 4,000 in the year 2004, with the number of users jumping from 400,000 at present to 12.2 million.

“It is questionable whether companies which do not participate in electronic markets will survive” is a popular argument put forward to persuade decision-makers to participate in eMarkets. Whether such assertions prove correct remains to be seen. What can be observed at the moment is the demise of certain electronic markets [cf. Hof 2000]. This trend towards consolidation will certainly increase until the critical mass (cf. Chap. 2.2.3) is reached. What is important is that businesses can derive benefits from participating in electronic markets.

12.2.2 Benefits of eMarkets

Compared to conventional procurement and sales channels, Internet-based eMarkets offer the advantage of lower transaction costs. Search costs (e.g. in catalogs or physical exhibitions) are reduced and it is easier to reach more customers. The catalogs for eMarkets combine the offerings of various suppliers in one sector (vertical integration) or across sectors (horizontal integration). The catalog for the Chemplorer marketplace, for instance, contains over 180,000 different products for the chemical industry.

Various mechanisms are available for coordination in eMarkets. In the first place auctions, exchanges and electronic requests for bids (RFB) help to achieve market transparency and higher market efficiency. The risk of not being able to find an alternative supplier in the event of procurement bottlenecks or having no buyers for remaining stocks is also reduced [cf. Kuper/Billington 2000, 33]. Companies

succeed in achieving significant procurement savings through price reductions when using eMarkets in procurement (cf. Chap. 10.8). For example, Bayer AG was able to cut the price for packaging materials by 15% compared to the previous level through an auction [cf. Hübner 2000]. Contract costs were also reduced by using standard contract templates [cf. Merz 1996, 12].

12.2.3 Benefits of Process Integration

Further increases in efficiency can be achieved if internal processes are integrated with the processes of the eMarkets and other suppliers. Where indirect goods (eProcurement) are concerned, it has been shown that 80% of procurement costs can be saved in this way.

eMarkets try to differentiate themselves from their competitors by offering additional services, thus surviving the consolidation phase and winning new customers. Such measures allow them to increase liquidity on the one hand and tap new sources of income on the other. Services, such as news and monitoring, are easily provided on the basis of the existing eMarket IT infrastructure and the associated know-how. This means that additional know-how relating to ERP systems and integration tools is necessary for integration with the processes of eMarket customers.

According to a survey carried out by Forrester Research, only 6% of eMarkets currently have backend integration. In 2002, 42% of eMarkets are planning to offer their customers this service. The high requirements in terms of ERP integration, eMarket infrastructure know-how, and the growing demand for solutions represent a market opportunity for specialized service providers. Many eMarkets have already concluded cooperation agreements with IT partners to avoid being exposed to the risks of inadequate IT. More complex outsourcing scenarios will evolve for handling logistics, financing and process integration.

12.2.4 Integration Requirements

The prerequisite for integration is a suitable model which shows how an integration solution can technically be realized. This model has been derived from the Business Networking model (cf. Chap. 2.3.4) and focuses on integration aspects between intermediaries, eMarkets and eServices. At the heart of integration is standardization (cf. [Hartman et al. 2000], [Berners-Lee 1999]) at all levels in the communication model (cf. Chap. 11.2.2): pragmatics (standardized processes), semantics (standardized content), and syntax (standardized data fields). Current standards in general focus on the syntax level (e.g. EDIFACT) and significant activities are underway to provide semantical standardization (e.g. EAN, eClass).

From an implementation point of view three elements are relevant in the business model:

- *Business Bus.* 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 the basis of previously agreed standards. Its purpose is to define a set of standards that enable 'plug&play' connections. Examples are standards for catalogs (e.g., BMEcat, eClass, cXML) or processes (e.g. CPFR, RosettaNet).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.* Information systems or services which enable a company to interface with a large number of partners. The first generation of business ports are already on the market (e.g. SAP Business Connector or systems for Enterprise Application Integration [cf. Linthicum 2000]) and are expected to develop with the diffusion of XML-related standards. These systems or external services form the layer that manages different syntax and semantics based on the standards defined by the business bus. It can be regarded as a customized layer to connect internal and external IT world, featuring high requirements on security, performance and service levels.
- *Standard Applications.* Increasingly standard software is becoming available for the individual Business Networking strategies. Standardized components (e.g. for CRM and EC) support the diffusion of processes and interfaces, i.e. the processes and interfaces being hardwired in the application. Another implication of standardized applications is that they can be outsourced to eServices more easily.

Figure 12-1 depicts an example of an intermediary who has networked systems with an eService and his partners via the business bus. All participants use the same set of standards and have to implement business ports in order to map their internal processes and data standards.

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

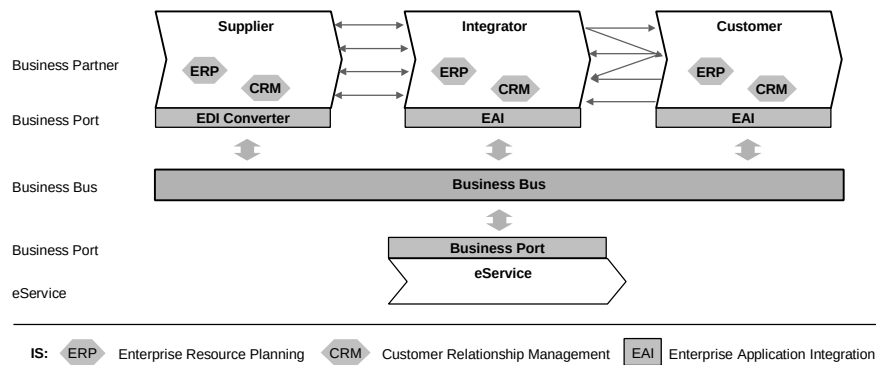


Figure 12-1: Integration Elements in Business Networking Model

12.3 eServices for Integration - Case of Triaton

In the following we will describe one of the first integration solutions which are offered as an eService. We believe that the Triaton – newtron case highlights an important solution for achieving critical backend-integration in Business Networking.

A cooperation agreement was concluded with newtron in order to offer solutions for the ERP integration to newtron eMarket customers. This cooperation gives Triaton access to new business fields by bringing together and utilizing many years of integration experience and eBusiness strategies. The partners involved and the basic eService idea are presented briefly below.

12.3.1 newtron and Triaton – eMarket and System Supplier

newtron AG is a typical company of the ‘New Economy’. Its core business areas include the development of eMarket software and the operation of eMarkets with own operating units (www.newtron.net). In autumn 2000, the company employed around 60 people at four sites. The eMarket software developed by newtron represents a trading platform to support business processes in sales and purchasing. The main task is to provide eMarket participants with the processes RFB and various forms of auction through the trading platform (see Figure 12-2). The platform is capable of flexible operation on various product supplier directories.

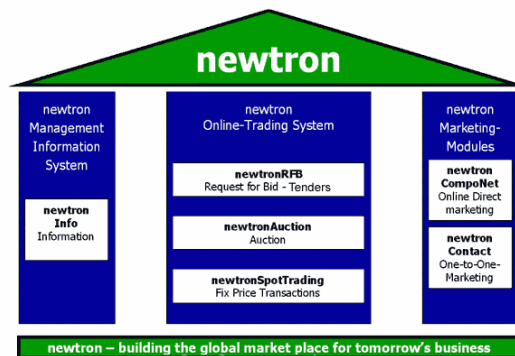


Figure 12-2: Processes Supported by newtron (Source: newtron AG)

Triaton GmbH (www.triaton.com) is a new system supplier of ThyssenKrupp Information Services Group which was founded in autumn 2000. The company was created through a merger between ThyssenKrupp Information Systems and HiServ, the former Aventis IT system supplier. The ThyssenKrupp Information Services Group employs a total of over 3,000 people, with a forecasted sales volume of almost DEM 1 billion for 2001. Triaton is positioned as a globally active, comprehensive system supplier. The areas on which it focuses include the automotive sector, agribusiness, chemicals, engineering, industrial trade, logistics, plant construction, the metal industry, pharmaceuticals, steel and other processing industries.

12.3.2 Considerations on eMarket Integration Potential

The competencies of Triaton include providing solutions for integrating application systems between companies with middleware and enterprise application integration systems. The idea of developing services and solutions for integrating eMarkets with the ERP systems of marketplace participants goes back to 1999. It was shaped by the following considerations and integration needs:

- eMarkets must offer their participants ERP integration by 2001 at the latest. Without the seamless integration of internal business processes (determination of requirements, ordering, etc.) with the processes of trading platforms (RFBs, auctions, etc.) it will not be possible to achieve the necessary growth rates for marketplace transactions.
- In view of the large number of existing vertical eMarkets, many businesses will have to confront the task of 'multi-eMarket integration'. Even if the anticipated eMarket consolidation goes ahead at a faster pace than generally ex-

pected, there are still going to be several hundred eMarkets in existence with significant business relevance in the year 2003.

- Although Internet and XML-based solutions will establish themselves, they will not do much to facilitate the task of integration initially. The vertical orientation of the eMarkets will tend to lead to a large number of different interfaces and protocols. In addition, competition between platform providers will encourage eMarket-specific solutions. Standards which even consider the role of eMarkets, for example, are not available at the present time. This is made more difficult of course by the different business models of the eMarkets themselves. The standardization of eMarket business processes would, however, be the prerequisite for interface standardization.
- Even if coordinated solutions were available from standard software vendors and eMarket operators, it would still take 1 to 2 years before these software versions were used by a reasonably large number of companies.

12.3.3 Triaton eService 'A2A e-Link for eMarkets'

Based on the considerations described above, Triaton developed the eService 'A2A e-Link for eMarkets'. This eService had to meet the following requirements:

- *Customers.* Concerning the target group, the eService was to focus on two groups: (1) eMarket operators who do not have their own integration infrastructure or who would like to outsource it to a partner for strategic reasons. This group also includes companies wishing to build up their own eMarkets exclusively for their own purposes. (2) Small and medium-sized enterprises as eMarket participants.
- *Flexibility.* Depending on the strategy of the eService customer, the eService must therefore allow flexible configuration, from a 'core business port' on the customer side and a suitably powerful business port on the e-Link side to the other distribution extreme: a powerful customer business port which only communicates with 'core business ports' of eMarkets.
- *Micro-expansions.* In principle, Although frameworks and tools are available, a classic software solution does not promise the desired success. What is lacking are the protocols implemented with these tools and 'micro-expansions' of the application systems (add-ons). Here, the emphasis is on a coordinated combination of education/knowledge services, consultancy and implementation services, operation and maintenance of customer and eMarket operator business ports including a fully integrated helpdesk, and the development of eMarket and ERP-specific adapters with the aid of middleware and EAI systems.

Finally, the eService must meet some additional criteria concerning timeframe, technological and economic constraints:

- It must be made rapidly available in an initial version for first customer projects
- It must be possible to implement it within one week (5 man-days per customer)
- The eService must have 'multi-protocol' capability
- Prices and services must be geared to target groups

Based on the above requirements, an initial development phase would be dedicated to supporting the ERP system SAP R/3 MM/SD² on the customer side plus an eMarket platform. Development of the basic services and the market launch itself will take place during this phase. In spring 2000 a cooperation was reached with newtron to support newtron's trading platform within three months.

12.3.4 Cooperation newtron and Triaton

The newtron platform is now used in various eMarkets and newtron currently runs three eMarkets: (1) technical components (including mechanical and electronic engineering, electronics and plant engineering, measurement and control technology (www.newtronComponNET.com), (2) Maintenance, Repair and Operations (www.newtronMRO.com), and (3) telecommunications and multimedia (www.telbiz.com). The platform is also used Europe-wide in the plastics industry in an eMarket for raw materials belonging to ClickPlastics AG (www.clickplastics.com).

The supported business processes are requests for bids (RFB), auctions and multi-vendor catalog sales. newtron started its web presence 1999, based on the CompoNET catalog, which was extended to an eMarket. It offers buyers and sellers a platform providing information on products, producers, status; the exchange of product specifications and CAD files is included.

² MM and SD are the names of SAP R/3 modules for Materials Management and Sales & Distribution.

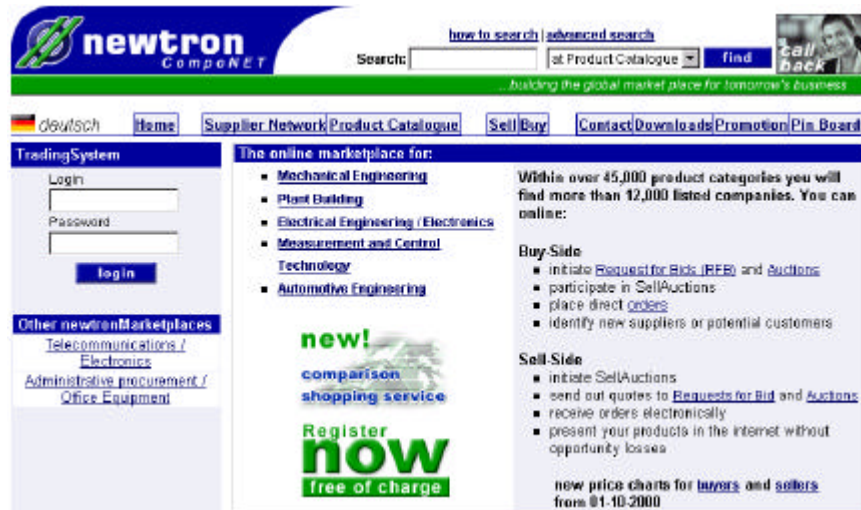


Figure 12-3: Example of a newtron eMarket CompoNET

In the cooperation newtron used its IT competencies combined with the content of other partners (Catalogic, Konradin, etc.) to set up a working eMarket. This eMarket offering has now been enhanced with the aid of Triaton to offer ERP integration to newtron's customers. This helps to increase customer retention and to improve the offering in order to realize efficiency gains on the buyer side. newtron is profiting from the early availability of this eService for its marketplace participants and, as a development partner arriving early on the scene, can influence how the eService is designed. In choosing newtron as a partner, Triaton was able to develop the eService within a short period of time and benefits from the dynamics and flexibility of being a start-up. The fair behavior of the partners towards each other and the recognition of the win-win situation laid the basis for the rapid transition from business idea to practical realization. The overview below shows how this cooperation works on the basis of the business networking model (see Figure 12-4).

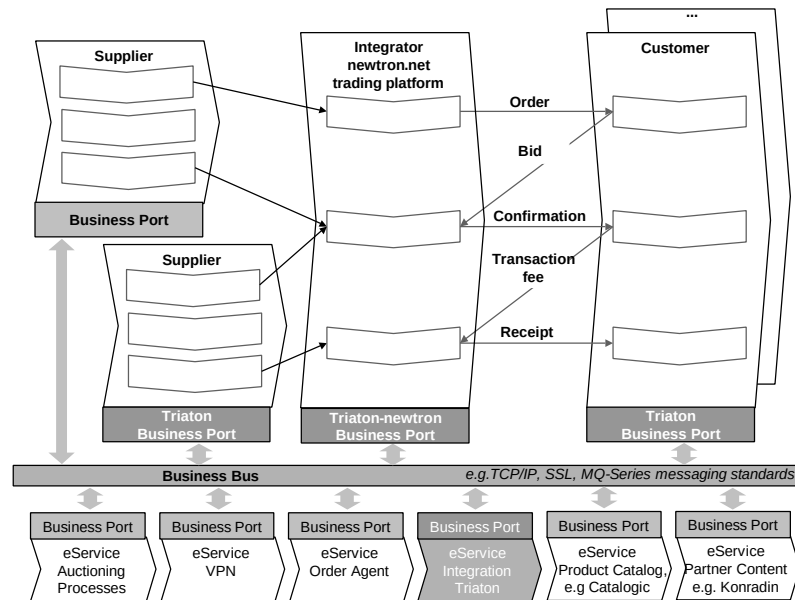


Figure 12-4: Business Networking Model of newtron and Triaton Partnership

12.3.5 Business Process Support and Benefits

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. Process support by an intermediary (eMarket) is not yet included in the standard SAP R/3 software. The electronic integration will then include all transaction phases (cf. Chap. 4.3.1). The information and contracting phase will be implemented within newtron's electronic commerce solutions. The settlement phase will be implemented within the SAP R/3 system, based on data from the electronic commerce transactions made available by Triaton's eService. Using several eMarkets in his ERP system gives the customer an overview of all business processes operating in the marketplaces in which he participates, whether in a buying or selling role.

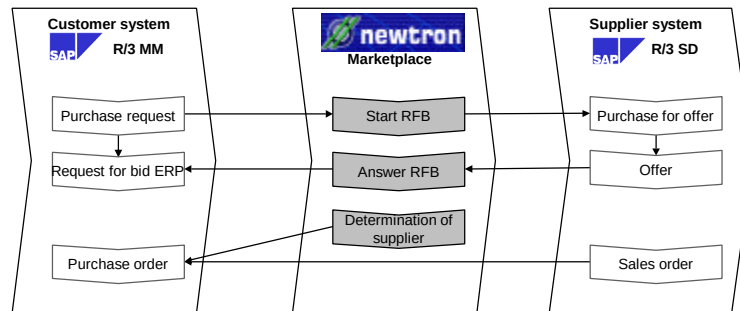


Figure 12-5: Process Flow via Individual Systems and Triaton Business Ports

Possible benefits for businesses using the eService 'A2A e-Link for eMarkets' include the following:

- Streamlined work processes and less duplication of data storage,
- Unread mailboxes and the misdirection of (mail-based) RFBs, invitations to auctions in the organization are avoided,
- eService enables quick and economic availability of eBusiness infrastructure,
- Increased acceptance and critical mass of connected eMarkets.

12.4 Implementation and Architecture of A2A e-Link for eMarkets

Figure 12-6 shows the architecture of the A2A e-Link for eMarkets. The process expansions required for the ERP system SAP R/3 SD/MM are grouped together in the applications components Sellers Port and Buyers Port. This is not a new applications package but minor extensions in the MM request for quotation/purchase order processing and the SD inquiry/incoming orders. The central component of the technical infrastructure is the e-Link Engine. This is responsible for communication between the ERP adapters on the customer side as well as the eMarket adapters. The important feature here is that the e-Link Engine is fully integrated with a service and helpdesk. Administrators can check the status of their own business processes, initiate and call up maintenance services at any time via the appropriate service portal. The flexibility with which components can be linked into this service and operating infrastructure on the customer side (e.g. SAP Business Connector) or marketplace side is decisive. A special prototype, known as the e-Link Configurator, has already been developed to manage the variety of configurations possible.

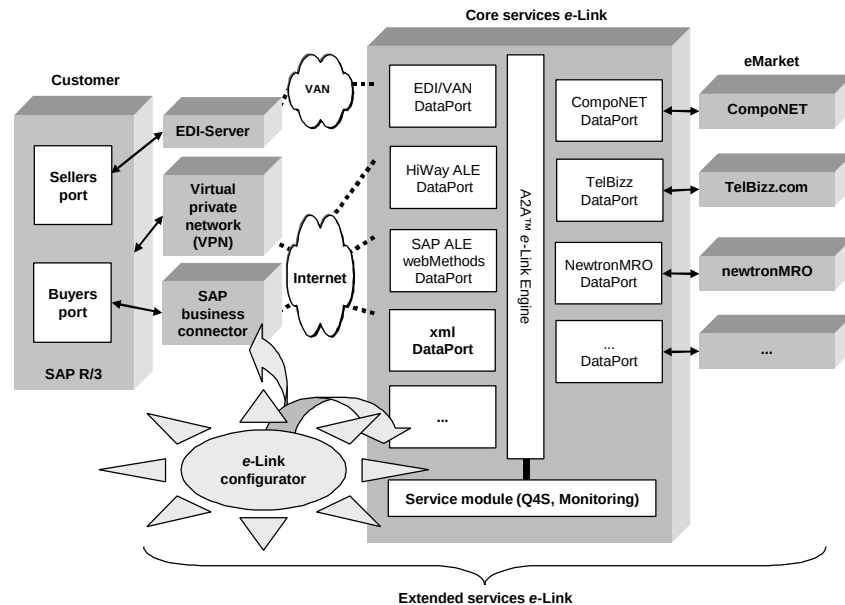


Figure 12-6: A2A e-Link System Architecture

The A2A e-Link Configurator is a graphical user interface-based tool which Triatton developed to implement seamless integration between multiple business systems and IT platforms. It manages and controls all interface requirements and allows the transformation and translation of data. Figure 12-7 shows the linking of the SAP R/3 MM (source) with the newtron eMarket (destination), as indicated by the line in the graphic.

The complete technical configuration can be generated with the Configurator, from selection of the application-specific dataports (ERP adapter, eMarket adapter), the communication middleware (messaging, etc.), the required data transformations and encoding through to distribution of the components to the servers involved.

The first step is to define the dataports. This is done by selecting one of the ports given in the pop-up window. The dataport contains the communication protocol with the appropriate application, eMarket or ERP system. The Configurator needs a transport and filter adapter in order to be able to generate runtime coding for that connection. While the transport adapter configures the physical data exchange between the servers, additional transformation and encoding rules required are included by means of the filter adapter.

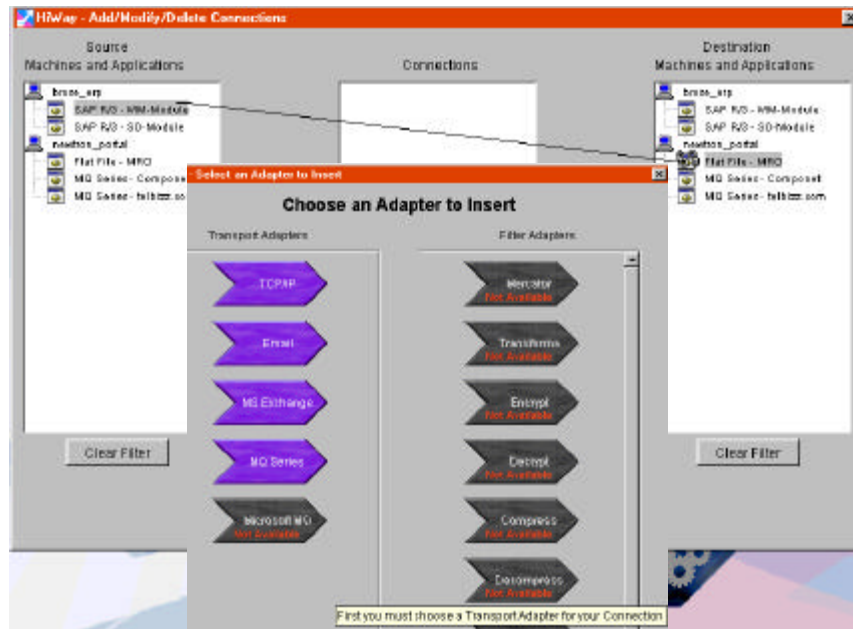


Figure 12-7: Screen Shot of the A2A e-Link Configurator

In this step the network protocols to be used, security requirements and messaging middleware are determined in order to set up the connection to the newtronComponentNET marketplace. The next stage represented in Figure 12-8 is to generate the code that implements the specified business port.

Further eMarket dataports and increasingly XML-based standards such as cXML, Common Business Library (CBL) or RosettaNet³ standards will be implemented in the forthcoming expansion phase. Synchronous links will also be used more frequently. A major supplier for this type of dataport is webMethods (www.webmethods.com) and the SAP Business Connector. A specific expansion might be as described below.

³ See www.ariba.com for cXML, <http://www.commerceone.com/xml/cbl/index.html> for Common Business Library (CBL) and www.rosettanet.org.



Figure 12-8: Business Port Elements to be Implemented by Configurator

12.5 Digression: Solution Enhancement Potentials with IBM 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 electronic contract definition and its implementation, IBM has developed the Trading Partner Agreement Markup Language (tpaML)⁴.

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 tpaML 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:

- 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 for security, naming and component registration.

⁴ This 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.

- ACID principles (Atomicity, Consistency, Isolation, Durability [Gray/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 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. 1999, 272] the developers of tpaML stress the importance of control and monitoring as well as trust [Sachs et al. 2000, 3].

Trading Partner Agreements (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 Table 12-1). The hierarchy of categories defines a layer model of eService categories. It describes how different tasks are solved by tpaML standards or standards which tpaML uses itself. The values result from the description of tpaML [Sachs et al. 2000] in the subcategories language, content, protocol. However, not every layer is fully specified as yet.

tpaML goes much further than typical communication standards like TCP/IP or transaction standards. It aims to automate services previously not considered to be 'automatable'. It is moving towards covering semantic elements like the roles and business processes applied. tpaML is a prototypical effort of a set of standards to achieve a higher level of standardization on the semantic level which forms the focus of the business networking model.

These standards can be implemented via eServices. Thanks to tpaML the computability rises to levels where computer-supported task fulfillment was previously too complex in heterogeneous environments. However, further research is needed on the maturity and applicability of tpaML. It remains to be proven, for example, whether it meets the time and functionality requirements (e.g. degree of detail and adaptations for the bidding and auctioning processes) of the setting described above. Implementation questions such as integration into IBM's MQSeries as the first product implementing the standard must also be resolved before this option can be explored any further.

Furthermore, the authors of the tpaML themselves state limitations [Sachs et al. 2000]. Thus far, for example, only two party scenarios have been implemented on the basis of static negotiations. At the moment, no hierarchical TPAs are possible

and monitoring and control procedures are yet to be included. In addition, it is not yet clear how trusted third parties can be integrated and who can perform this. If tpaML could be integrated as a meta language for describing the agreement process and enforcing this agreement, opportunities might be plentiful. One example would be to directly instantiate the monitoring process of agreed service levels, delivery times etc., which were part of the contract after the bidding process or auction. This could be done by importing that information into the SAP system or by means of an additional service offered by newtron or Triaton.

Content	Category	Criteria	Value
Prag-matics	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 (e.g. BASE64), exchanges, address parameters
	Basic Standards	Protocol	TCP/IP, SMTP (HTTP), SSL
		Content	Maximum allowed network delay

Table 12-1: tpaML Standardization Areas

12.6 Conclusions and Outlook

The integration of processes with new cooperation partners such as eMarkets and eServices presents a great challenge for eMarket operators, market participants and integration service providers. A model is required for the communication within and between participating partners. The requirements of this model are that it should highlight preconditions for the integration of eServices, such as the use of standards (business bus), standardized interfaces, software components and services (business port) and how these interact. These preconditions must be met if a complete offering in eBusiness is to be developed and delivered. The general model was applied to the case of a specific eService offering from Triaton, and the usability of the model investigated as well as its refinement in a real-life environment.

Triaton offers an eService to provide business ports for integrating ERP systems with the eBusiness solution of eMarkets. Long-term potentials lie in expanding the scenario described by using standards like tpaML on the semantic and pragmatic level. For businesses, these continuous changes in standards always mean one-off, high-risk investments in know-how and new interfaces. By working with outsourcing partners it is possible to utilize synergy potentials when dealing with integration problems.

