

B2B process integration using Service Oriented Architecture through Web Services

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Abstract—The electronic commerce of B2B for Small and Medium Enterprises is experiencing obstacles due to the nature of the processes involved. SMEs have different barriers to enter the B2B market due to lack of understanding, lack of finances and lack of IT experts that can create customized applications for standardized B2B ecommerce, such as ebXML. They have difficulties choosing the appropriate channel of communicating B2B messages, whether the public e-marketplace or own private Web Services. COTS software costs a lot, and this paper proposes a solution based on the ebXML framework and Web Services as a middleware that will do most of the job for these companies. It will offer private Web Services for the public e-marketplace usage as well. This Service Oriented Architecture can be further used by external partners in order to integrate their B2B processes in their own Enterprise Systems.

Keywords— e-commerce, e-marketplace, SOA, EAI, B2B, SMEs, middleware, web services, ebXML, frameworks

I. INTRODUCTION

THIS paper introduces the new B2B model tailored especially for Small and Medium Enterprises that intend to offer their services to other companies for the purpose of conducting Business online as well as offer a basis for Service Oriented Architecture (SOA). The SOA model through Web Services for Enterprise Application Integration will be presented throughout the paper.

E-commerce applications support and execute business processes for various business domains, such as an online retail store. In order to achieve business growth, e-commerce applications have been developed in a way that will change in a way to offer more functions and features through the simplicity of the graphical user interfaces (GUI). By interacting with these e-commerce applications or websites, users perform daily business actions [15].

Business-to-Consumer (B2C) e-commerce is difficult for new companies (Small and Medium Enterprises - SMEs), especially for those in Eastern and Central Europe, since the European market is shared between United Kingdom, France and Germany. A new Business-to-Business (B2B) approach can help manufactures and traders from Eastern Europe to penetrate in the European market by using new technologies and integration various business processes online [2].

Web Services or the SOA architecture are one type of a

solution for the struggle of SMEs to enter the B2B marketplace. The combination of Web Services with ebXML standards and the power of e-marketplaces can be an option for SMEs to participate in the biggest money making electronic market in the world.

II. SMEs AND THE E-BUSINESS

A recent article [17] published on the topic of dynamic companies and their characteristics, with accent on Romanian SMEs tends to emphasize the barriers and struggles SMEs have in order to survive, grow and develop themselves in the environment created by different institutions, people or policies and procedures. According to the authors, SMEs should make use of external environment resources and its internal capability for future growth. Their study shows that the entrepreneur is the key factor in rapid company growth [17]. This is related to a survey [20] conducted by South East European University regarding the acceptance of e-commerce by SMEs, which shows that every attempt to change some processes in SMEs, in this case entering e-commerce market, is driven by the entrepreneur (owner) and his will and not by real requirements or external environment which drives most of the businesses in the world today.

Another author, Jin [18] in his paper about examining e-business systems emphasizes the importance of using information technologies as the only way for businesses to exist in this rapidly changing and very competitive environment. “Developing E-business is an important factor to accelerate national economy increasing” [18]. It’s not just the national economy increasing by applying IT, but also the SMEs can benefit and increase their business by trying to participate in e-commerce.

SMEs can be a part of B2B e-commerce if they implement some of the B2B frameworks in their business operations. B2B frameworks offer the technical details and specifications needed to conduct business online based on standards that are known to the parties involved in B2B e-commerce.

Majority of B2B frameworks are document-centric frameworks based on XML. A paper conducted by Software Research and Development Center – Turkey [4], gives a comparison of some B2B frameworks, such as eCo Framework, RossetaNet, Microsoft’s BizTalk and Ariva cXML. Here the authors describe the architectural specification and business scenarios for each of the

frameworks. Common for all the frameworks is that they all define Business Processes and Transportation or Messaging as two main components for doing business online. The way of how Business Processes and Messaging is defined varies from framework to framework, but the essential is what type of document they produce.

The most important issue about these frameworks, according to the authors, is the level of implementation. Even though some of these frameworks have been implemented, majority of these frameworks offer specifications and guidelines on how to implement these standards [2].

ebXML is one of the widely spread frameworks that is used nowadays by SME's and is a good baseline to create COTS or Open Source software on top of its specifications [2].

The use of XML documents in e-business and e-commerce plays a very important role and is discussed by many authors as key element of dynamic and on-demand business transactions online. According to Jin [18], the messaging format should be standard and meaningful structure with semantics included that also should have a mechanism for parties to exchange ontology and have message interpreters. This is exactly what the whole logic behind ebXML framework is about: standard xml format with pre-defined structure that can be understood by different interpreters who can parse the message.

In order companies to do business online with other companies is not as simple as it sounds. Before everything, these companies need to understand the messages the other party is sending. Even before that, they need to find these companies electronically, implement custom software for B2B collaboration (B2B frameworks) and then finally agree on some trading [14].

Doing business online requires choosing the B2B channel for this purpose. Authors You, Choudhary, and Mukhopadhyay in their paper "Marketplaces or Web Services? Alternate Business Models for Electronic B2B Transactions" study the options for companies to choose B2B channels for their online business. According to them [22] the electronic B2B channels are categorized into two types: public marketplaces and private channels based on web services. The private ones are usually developed and owned in-house by companies that can be used only by them and their business partners. The public ones are the marketplaces that allow communication, publication of content as well as doing business online without any restrictions on the users participating in that e-marketplace.

Whether to choose one or another channel of e-business is a discussion that needs further analysis by the management and experts of this field. Both channels have their advantages and disadvantages.

On one hand, the strength of the private web service channel is the efficiency of customized transaction processes for only one supplier or buyer [22]. This is a limitation especially if SMEs tend to participate in this marketplace, they in a way need to have "invitation" by the company owning this channel.

Usually these are based on Web Services and the access is limited to business partners that usually transactions occur with. The other problem for SMEs except for the "invitation" is the implementation part and the need for IT staff to do so. Both cost and human resources are the main factor why SMEs lack behind other companies when we deal with B2B. For example, Volkswagen uses private channel only while its rivals such as GM and Ford built and joined Covisint, a public marketplace in the automotive industry [22].

On the other hand, the strength of public B2B channel is also evident. On the public e-marketplace the competition to offer better products and prices prevails. The good thing about e-marketplaces (the public ones) is that any company can participate and offer their products, while SMEs here have advantage because they don't have to use any specific software implementation, but instead they can use the existing system's services. An excellent examples of public e-marketplaces are the alibaba.com, amazon.com and similar. If these public e-marketplaces include the component of B2B framework standardization in their processes, they can become excellent choice for SMEs.

A decision which one is better is up to the companies, but assuming SMEs are discussed here, it is proposed a model (middleware) that uses Web Services (that can act as private channel) but on a public marketplace. This means that the model provided here offers the Web Service implementation that can be used by any SME for their private purpose of doing business online, and same time they are exposed on a public registry where any other external company can query it and do business. Simply, Web Services offered to SMEs are also a Service Oriented Architecture that can be used by any party involved in this collaboration.

III. SOA THROUGH WEB SERVICES

A. Web Services

According to W3C "A Web Service is a software application identified by a URI, whose interfaces and binding are capable of being defined, described and discovered by XML artifacts and supports direct interactions with other software applications using XML based messages via Internet-based protocols" [13].

The promises of Service Oriented Architecture (SOA) with accent on the use of Web Services are discussed in two articles of author Mahmood [16][19], where he raises the importance of integrating various business solutions that can be easily changeable (on demand), interoperable, scalable and localized at the same time. According to the author, SOA is a new approach that uses WS to "provide opportunities for better business applications development and integration with the added benefits of reduced costs, easier maintenance, greater flexibility and improved scalability" [16].

The "find-bind-execute" paradigm shown in Fig. 1 in the same paper [16] includes three main elements that can be used

in B2B framework integration as well:

- *Service registry* - is the list of services that can be consumed online, which in the case of B2B framework should be a list of Web Services that execute B2B methods.

- *Service consumers* – is the components that includes the users of these services, where in the case of B2B are the SMEs and interested companies. Any consumer can “invoke” the service depending on the privileges.

- *Service providers* - is the component that provides the services for usage, where in the case of B2B model proposed in this paper is the actual web based version of the middleware.

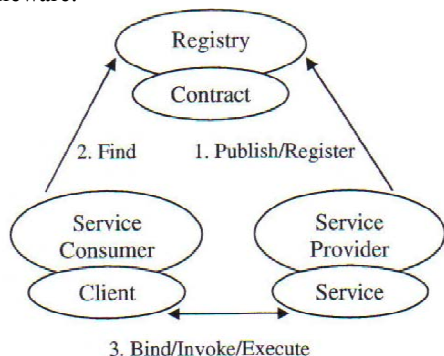


Fig. 1 Publish-Find-Bind-Execute paradigm

As discussed by Mahmood [16] the SOA is actually a list of software modules in the form of Web Services that can be consumed by various users (businesses). In the case of B2B model proposed in this paper, these Web Services should focus on the business requirements on how to do B2B e-commerce by including the common business processes for this type of activity.

The same author [19] addresses that “SOA is not just about technology - it is also an IT strategy to support business transformation and, as such, SOA has extensive organizational, procedural, and process implications”.

What are important about web services (WS) are the Simple Object Access Protocol (SOAP), Web Services Description Language (WSDL) and Universal Description, Discovery and Integration (UDDI). We are more interested in the protocol that consists of three parts: an envelope that defines a framework for describing what is in a message and how to process it, a set of encoding rules for expressing instances of application-defined data types, and a convention for representing remote procedure calls and responses. It is the messaging layer for Web services.

Web services or the SOAP technology is actually offered in ebXML messaging system. The ebXML Message Service is defined as a set of layered extensions to the Simple Object Access Protocol (SOAP) and SOAP Messages with Attachments (SwA) – which is itself an extension of SOAP [14]. The positive thing about SOAP is that it works using HTTP protocol, which is suitable for Internet use and can use port 80 for accessing, which is the only port not blocked by firewalls.

Web services are excellent standards that enable B2B e-business. However, there is a lack of framework to generate Web services. A paper published by Baghdadi [1] proposes a business model as framework to guide analysts in specifying and generating a set of consistent and useful Web services.

A paper published by Kim, Ock and Kim [8] states the same issue regarding the B2B framework implementation using Web Services. Authors state, “A lot of EDI-VAN companies are in need of transforming their business transaction systems into Web based e-Business frameworks because of high cost and closed structure of EDI systems”. Their research gives ideas and proposes that these companies adopt the new frameworks, such as ebXML and RosettaNet.

B. Web Services and ebXML

The proposed solution with the middleware application is to provide a Web Services architecture that will deal with data exchange and that will be based on SOAP technology. WS allow data communication through HTTP protocol and the result is an XML document that is exactly what the B2B frameworks have in common [2].

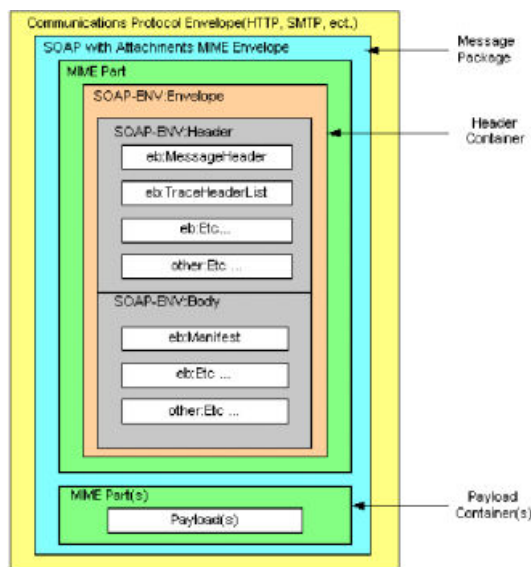


Fig.2 ebXML Message Structure (Source: ebXML Message Service Specification v0.99) (ebxml.org, 2001)

Considering Figure 2, the benefit of using WS, especially SOAP is that in the Header of SOAP message we can define ebXML Message Header, which is characteristic of ebXML documents. The same thing can be done with the Body of the SOAP message where elements of ebXML Message can be included.

The Header Container of SOAP is the interesting one, because of the ebXML SOAP Extensions part. “This is a set of SOAP element extensions, which are the elements bearing an “eb:” namespace prefix (e.g. eb:MessageHeader) to discern them from SOAP-specific or other elements” [14].

C. The Middleware

In order to be able to do business online, SMEs can use a simpler approach, by using a portal or “e-marketplace” that will do all the B2B transactions using standards, such as ebXML. The high-level architectural overview proposed on Figure 3, can be done by implementing the following parts:

1. *Hermes H2O ebXML Messaging Gateway* – is offered as an open source tool that can send and receive ebXML messages (ebMS) to defined destinations/companies and is compliant with ebXML standard that is widely used by companies that are involved in B2B e-commerce.

“Hermes is a Message Service Handler (MSH) or message gateway that provides a standardized, reliable, and secure infrastructure for enterprises to exchange business documents. It is in compliance with the OASIS ebXML Message Service (ebMS V2) standard.”

2. *Web Services Adapter*, or Web Services integrator is to be created with a purpose of translating/adapting different input/output documents to ebXML compliant documents. Other companies can query the register and use it to place orders simply by using these web services. These Web Services can be used by SMEs as private channel of communication if appropriate security is defined, such as Access Control List. Web Services Adapter is the core component of the middleware application, whose main job will be to offer *Services* to all the users of the system.

3. *HTTP Adapter* is to be used as endpoint that receives ebXML messages intended for SMEs that are users of this new system. Considering that multiple companies can use the same architecture and act as users, this endpoint is important to distinguish users by specifying the correct URL. This HTTP Adapter will use the Web Services methods already created in the part above. The different *End-point* hostnames will be generated for all users and any collaboration can be done between two parties in one-in-one notation.

4. *Web Portal* or the “e-marketplace” is proposed and it can be created to facilitate the GUI side for the users instead of using Web Services and XML documents. The web portal will use the Web Services and act as a B2B marketplace that will be public and accessible by any interested party (company).

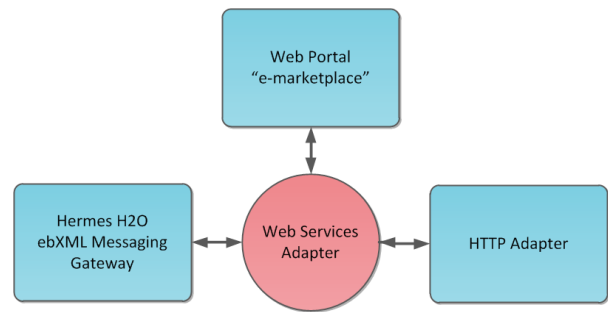


Fig.3 High-level architectural overview for B2B Integration Web Services Adaptor

To create and disseminate these messages is easy if we build a set of Web Services (Figure 4) that will deal with converting ebXML Messages (documents) from ebXML standard to another standard that is readable by small companies and that can be used for further integration of various applications, such as a B2B Web portal.

Considering Figure 4, the Middleware application, based on Web Services, will receive the regular ebXML document and convert it into a suitable format for small companies (Excel, PDF, e-Mail, Text file) and vice-versa. When companies will submit responses in their own format, the middleware application will convert them, using SOAP, to a standardized ebXML format that can be then registered to the ebXML repository that is hosted by the ebXML compliant Company.

```
<?xml version="1.0" encoding="UTF-8" ?>
- <purchase_order>
  <po_number>1</po_number>
  <part_number>123</part_number>
  <price_currency="USD">500.00</price>
</purchase_order>
```

Fig. 5 – Sample ebXML message: Purchase Order Details

These documents (as in Figure 5) are not understandable by end-users (SMEs), unless they are shown in an appropriate format, readable by them, such as Excel or PDF. The Web Services will try to adapt the ebXML document to a readable format. Same time, the responses to the companies using ebXML framework standard will be done by imputing data on a Excel or Web GUI by end-users (SMEs). Web Services Adaptor will facilitate the movement of data back-and-forth.

The importance of creating B2B using Web Services

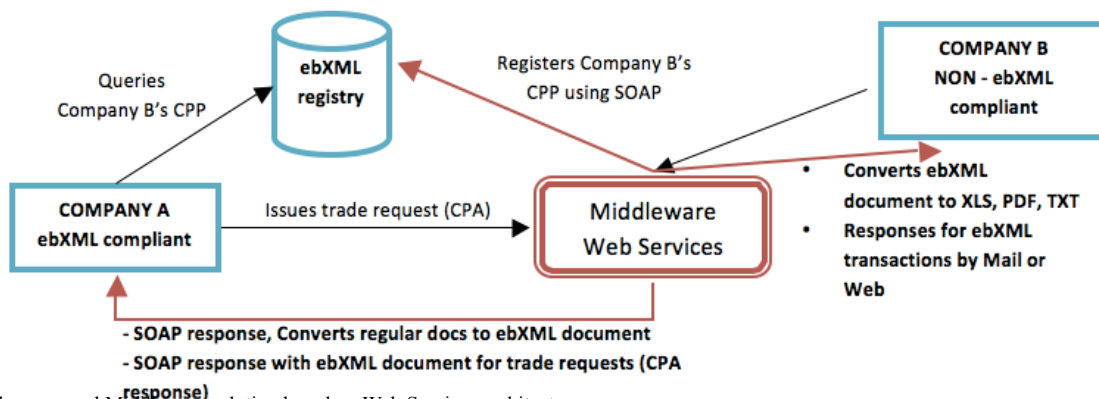


Fig.4 The proposed Middleware solution based on Web Services architecture

architecture is being discussed in many papers. The authors Chung, Huang and Tsai in their paper “eXFlow: A Web Services-Compliant System to Support B2B Process Integration” [3], propose a new way of integrating all B2B frameworks and processes into one workflow, eXFlow whose job is to extend the traditional workflow functionality and moves offer a total B2B process integration solution, by always taking into consideration the predefined B2B standards, thus providing all this solution using Web Services.

Another author, Baghdadi, in his paper “A Business Model for B2B Integration through Web Services” [1] proposes a business model with several interfaced abstraction levels as a framework to generate data-centric Web services. His proposal relies on Web Services as a standard model of B2B integration, by converting data to Web Services, converting business processes to Web Services, thus using any type of B2B framework would be easier due to the fact that most of the standardized B2B frameworks are XML based, where same thing stands for Web Services as well.

1) *What will Web Services Middleware do?*

The general idea behind WS Middleware is to integrate many services for B2B, based on the ebXML Framework as a standard of doing business online. WS can be used to adapt the various data from the outside companies in ebXML format to readable format for end-users (SMEs).

These Web Services are an excellent foundation to develop Service Oriented Architecture for B2B process integration. Assuming that companies that have Enterprise Application Integration (EAI) for all of their software packages and/or business process can benefit from using the SOA through Web Services in order to integrate their online business process. By doing this they can have a standardized communication medium through standardized messaging documents.

According to Lam [21], there are three major categories of application integration for enterprise level:

1. *Enterprise Application Integration (EAI)* that deals with integration of major applications and processes inside one organization.
2. *Web Integration (WI)* that is smaller part of EAI that uses Web Services to Integrate applications in one organization
3. *Business-to-Business (B2Bi)* that is specific integration category that deals with Business-to-Business processes and their linkage with other applications in one organization.

The middleware solution proposed here is a Business-to-Business integration (B2Bi) using Web Services or Web Integration (WI) as a platform to develop SOA for companies that wish to consume these “Services.”

The middleware will act as a Service provider for the purpose of future integration on enterprise level. Companies

can benefit from the SOA architecture and integrate their business processes for B2B just by consuming the Web Services exposed in the middleware layer.

Major Services that will be provided by the Middleware application/SOA solution are:

1. *Service to Generate CPPs* – WS-CPPProvider, accepts parameters that identify different companies (SMEs) that use the system and returns Profile to the Requester. Additionally it can convert Requesters CPP (Collaboration Protocol Profile) to Readable document for the SMEs.

2. *Service to Handle Messages (MSH)* – WS-MessageHandlerService, accepts parameters that identify different companies (SMEs) that use the system, accepts the message from sender or converts documents to ebXML Messages.

3. *Service to Process the Documents* – WS-ProcessDocs, accepts parameters that identify different companies (SMEs) that use the system and current document to be processed, returns compatible document for the end-user. This is an internal Service that will be run after the MSH has processed the message.

4. *Service to act as a Register* – WS-Register, accepts parameters in form of texts and queries the Database for CPA (Collaboration Protocol Agreement).

5. *HTTP End-Point* acts as another layer that serves as an URI for the outside companies that identifies end-users with custom address. This end-point helps different companies to be uniquely identified and accepts data as parameters submitted by HTTP Request and sends them to the Web Services Adaptor for further processing.

The simples messaging envelope will contain the details for the user, such as: Sender name, Service or Action, Senders CPA ID, Receivers CPA ID. If two companies that have shared their CPAs agree on trading, this partnership will be managed by the Web Service, and stored into the system in the form of XML schemas (ebXML).

D. *Use Case Scenario*

In order to explain the business transactions from a higher level of view, a use-case scenario (Fig. 6) by taking into consideration two companies: *Company A* that is a SME using this system and *Company B* that is a large Enterprise trying to do business with *Company A*, is explained in the following part.

Both parties involved in the process can act as Requester and/or Responder of services involved in the middleware application, depending on the transaction occurring at the given moment.

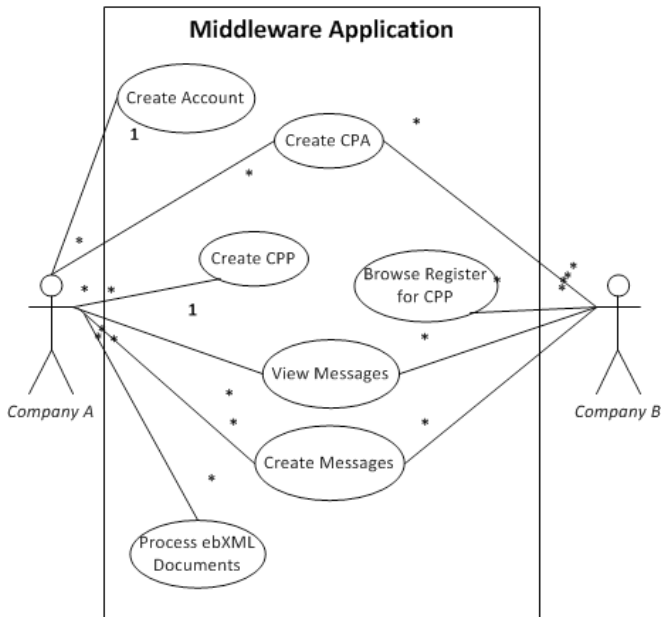


Fig.6 - High level use case diagram of Middleware Application based on Web Services

First step: Company A sets-up an account to the middleware application and fill-in the Profile of the Company (CPP is created base on the ebXML technical specification). From this moment Company A can be queried on the Register (*WS-Register*) and other companies can discover it.

Second step: any other company can access the Register (*WS-Register*) and lookup the Company (A). Since the middleware application uses S OA architecture approach, these web services can be accessed within Company B's own Electronic System or ERP. Company B chooses Company A to set up an agreement.

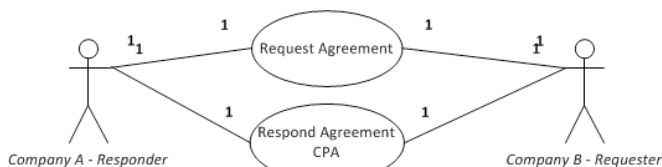


Fig.7 - Use case diagram of Collaboration Profile Agreement

Third step (Fig.7): Company A gets a message regarding the enquiry for new Agreement from Company B and it accepts the agreement using a Web-based GUI or using a third party application that consumes the Web Services created on the middleware application, where Company A has access. At this moment a new Company Profile Agreement (CPA) is generated. (CPA is created based on the ebXML technical specification).

Fourth step (Fig.7): Company B gets a message of the Agreement (CPA) with Company A. This message is standardized ebXML message that is sent to the Company B's endpoint, which can be any Enterprise Application (ERP or similar) that this company possesses. Now the business is ready to be started.

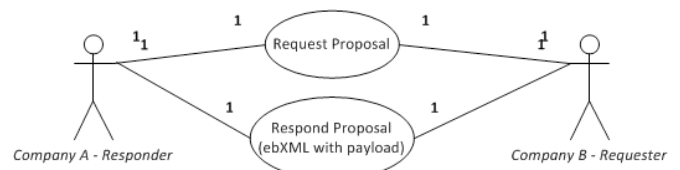


Fig.8 - Use case diagram of Proposal and Response negotiation

Fifth step (Fig.8): Company B can send an enquiry about products and quantity to Company A. This enquiry sometimes can be generated automatically if Company B has Supply Chain Management (SCM) software that orders products. The new message generated by their system is compliant to ebXML standard and it contains a payload with information on the products requested. This message is sent to Company A's end-point, which for the given case is the middleware application service that *Handles Messages (MSH) or WSMMessageHandlerService*.

Sixth step (Fig.8): Company A gets the new message with the payload for the products required, it processes this document using the Web GUI or the *Service to Process Documents, WS-ProcessDocs*, that translates the enquiry in the desirable format for Company A (pdf, xls).

Seventh step (Fig.8): Company A sends another message using Web GUI to Company B that contains a payload with details on quantities and prices.

Eighth step: Company B accepts the prices and places an order with another ebXML message with a payload that places the order.

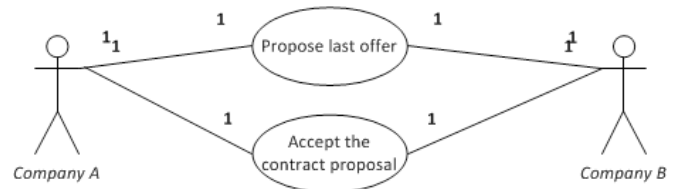


Fig.9 - Use case diagram of closing the contract after negotiation

Ninth step, Company A accepts the order using the Web GUI and processes it.

Tenth step, Company A issues the bill to Company A by sending the ebXML message to their end-point.

E. Security

The security of WS is being discussed in many articles. The authors Yunus and Mallal [23] give details on possible threats to Web Services. According to them, the major threat relies to the fact that these services are available for execution through HTTP protocol, thus no firewalls can block the access to this port.

Next concern is that SOAP messages can contain attachments as well (SwA) (Fig. 10), and if this is misused by attaching a virus or Trojan to the SOAP message the whole server architecture can be compromised. In Fig.10 (Courtesy of Yunus and Mallal, 2005) the second MIME boundary in-

cludes a base64-encoded attachment. The attachment is a virus.

```
-----=_MIME_boundary Content-Type: text/xml;
charset=UTF-8 Content-Transfer-Encoding: 8bit
Content-ID: SwAStart@crosschecknet.com Content-
Location: Echo.xml
<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope
xmlns:soap=http://schemas.xmlsoap.org/soap/envelope/
xmlns:xsi=http://www.w3.org/2001/XMLSchema-instance
xmlns:xsd=http://www.w3.org/2001/XMLSchema
xmlns:s0="http://qa.crosschecknet.com/ws">
  <soap:Body> <s0:Echo> <s0:Buf>hello world</s0:Buf>
</s0:Echo> </soap:Body> </soap:Envelope> -----
=_MIME_boundary Content-Type: text/plain Content-
Transfer-Encoding: base64 Content-ID: Eicar-
Virus.virus.txt@crosschecknet.com Content-Location:
Eicar-Virus.virus.txt
WDPVIVAlQEFQWzRcpYNTQoUF4pN0NDKtd9JEVJQ0FSLVNUQU5EQ
VJEL UFOVELWSVJVUy1URVNULUZJTEUJhJEgrSCoNcg0K -----
=_MIME_boundary-
```

Fig.10 – SOAP with Attachment of a Virus (Courtesy of Yunus and Mallal, 2005) [23]

Another concern is that of Denial of Service (DoS), where hackers can attack the hostname that is hosting these services, thus making the accessibility for businesses very difficult.

The solutions according to authors [23] can be of several types, such as: checking SOAP or XML messages checked for payload size, data types, and malicious content and installing Web Firewalls that can be easily configured for specific requirements by administrators.

Another option is that providers of these SOA with WS create Access Control List (ACL) to the services that may cause problems for realizing business transactions. The ACL [24] can limit access to some companies to query some of the services and leave the public services available to other companies.

Secure Socket Layer (SSL) with a 128 bit of encryption is installed on the same server allows is another security measure that enhances the security by encrypting the credentials and other sensitive data traveling from the user to the server and vice-versa. The SSL signed by a Certificate Authority is giving more weight to the security than custom signed Certificates.

Finally in case where majority of these security measures fail, there is the option to allow W3C XML Digital Signature or W3C XML Key Management System [13] to sign the SOAP messages using PKI (Public-Key Infrastructure), but this option is not preferred due to the fact that this limits the use of WS to certain group of users that have no private keys issued by Certificate Authority (CA) and/or credentials to do so.

IV. CONCLUSION

Small and Medium Enterprises do not have the sophistication of large enterprises but must be able to participate in B2B to be competitive in today's market. Since, B2B is achieved by using open standards such as ebXML, Small business can benefit in cost reduction in use of B2B offered for free in a form suitable for their needs. This can be

facilitated by e-marketplace that is driven by Web Services or SOA architecture.

In order this to become a reality a software implementation of this Middleware application as proposed in this paper is to be offered for free to the end-users (SMEs) and in the form that is understandable for them. This will not require any investment by SMEs to participate in B2B, neither technical expertise to be able to understand XML, all the adaption of data back-and-forth will be done by middleware application (Figure 4).

The Web Services can serve as middleware by applying the ebXML standards, where same time different Actors (users) can access different services based on their role in the system. These Web Services can be used also by another e-marketplace for listing business and establishing collaborations between them.

The proposal presented here tries to remove the barriers for entrance in the B2B e-commerce area for SMEs but at the same time to act as a translator of these business messages, and offering other enterprises' Service Oriented Architecture that can be used to integrate their own applications much easily.

The security of this Middleware is an issue to discuss, but as in every case where the Web Services are used, same security measures can be applied to the Middleware application as well.

REFERENCES

- [1] Baghdadi, Y. (2004). A Business Model for B2B Integration through Web Services. IEEE International Conference on E-Commerce Technology.
- [2] Besimi, A., Dika, Z., & Gerguri, S. (2010). B2B frameworks comparison and implementation challenges for small and medium enterprises (SME's). Information Technology Interfaces (ITI), 2010 32nd International Conference on , (pp. 417-422). Cavtat.
- [3] Chung, N. C.-N., Huang, W.-S., & Tsai, T.-M. (2004). eXFlow: A Web Services-Compliant System to Support B2B Process Integration. Hawaii International Conference on System Sciences, 37. Hawaii.
- [4] Dogac, A., & Cingil, I. A Survey and Comparison of Business to Business E-commerce Frameworks. Ankara, Turkey.
- [5] ebxml.org. (2001). The ebXML Message Service Specification v0.99. <http://www.ebxml.org/specdrafts/>. ebxml.org.
- [6] Huemer, C. (2002). ebXML: An Emerging B2B Framework. University of Vienna, Institute of Computer Science and Business Informatics. Vienna: University of Vienna.
- [7] Kadlec, P., & Mares, M. (2003). B2B eCommerce Opportunity for SMEs. Praha.
- [8] Kim, M., Ock, Y., & Kim, D. (2008). E-Transformation from EDI to Web-based B2B Frameworks. IEMS, vol.7, no.2, (pp. 150-159).
- [9] Kotinurmi, P. (2002). Comparing XML Based B2B Integration Frameworks. Towards the Semantic Web and Web Services. Helsinki: HIIT.
- [10] Mertz, D. (2001, June 01). developerWorks, XML, Technical library: Understanding ebXML . Retrieved December 28, 2008, from IBM: <http://www.ibm.com/developerworks/xml/library/x-ebxml/>
- [11] UN/CEFACT, OASIS. (2001). ebXML Technical Architecture Specification v1.0.4. UN/CEFACT & OASIS. ebXML.org.
- [12] UN/CEFACT, OASIS. (2001, May 11). Message Service Specification: ebXML Transport, Routing & Packaging. Retrieved 01 01, 2010, from <http://www.ebxml.org/specs/ebMS.doc>
- [13] W3C. (2002, October 28). W3C. Retrieved January 02, 2010, from Web Services Description Requirements: <http://www.w3.org/TR/ws-desc-reqs/>
- [14] Willaert, F. (2001). XML-based Frameworks and Standards for B2B E-commerce. Paper, Leuven.

- [15] Zou, Y., Qi, Z., & Xulin, Z. (2007). Improving the Usability of e-Commerce Applications Using Business Processes. *IEEE TRANSACTIONS ON SOFTWARE ENGINEERING* 33, 12.
- [16] Mahmood, Z. (2007). The Promise and Limitations of Service Oriented Architecture. *International Journal of Computers*, 1 (3) (pp. 74-78).
- [17] Bibu, N., Sala, D., Prediscan, M., & Nastase, M. (2011). Characteristics of dynamic companies from Romania. *International Journal of Mathematical Models and Methods in Applied Sciences*, 5 (2) (pp. 298-307)
- [18] Jin, X. (2008). Research on Intelligent Examination System for E-business Applications. *International Journal of Computers*, 2 (1) (pp. 58-65)
- [19] Mahmood, Z. (2007). Enterprise Application Integration based on Service Oriented Architecture. *International Journal of Computers*, 1 (3) (pp. 135-139).
- [20] Besimi, A ; Dika, Z. (2011). E-marketplaces: Way to go for Small and Medium Enterprises in Macedonia. *SEEU Review*, 6 (2).
- [21] Lam, W., and V. Venky Shankararaman (2007). Dissolving Organisational and Technological Silos: An Overview of Enterprise Integration Concepts. *Enterprise Architecture and Integration: Methods, Implementation and Technologies*, accessed April 01, 2011.
- [22] You B., Choudhary V., Mukhopadhyay T. (2011) Marketplaces or Web Services? Alternate Business Models for Electronic B2B Transactions. 44th Hawaii International Conference on System Sciences.
- [23] Yunus M. and Mallal R. (2005). An Empirical Study of Security Threats and Countermeasures in Web Services-Based Services Oriented Architectures. M. Kitsuregawa et al. (Eds.): *WISE 2005*, LNCS 3806, pp. 653 – 659, 2005.
- [24] Besimi, A., Shehu, V., Abazi-Bexheti, L., Dika, Z. (2009). Managing security in a new Learning Management System (LMS). *ITI 2009*, 31st International Conference on Information Technology Interfaces, (pp. 337 - 342). Cavtat, Croatia.