Web Services Middleware Application: A Solution for SMEs towards B2B Framework Implementation

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Abstract: - The electronic commerce for Small and Medium Enterprises on the part of Business-to-Business trade is experiencing difficulties due to the nature of the processes involved. SMEs fail to penetrate 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. 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.

Key-Words: - e-commerce, b2b, SMEs, middleware, web services, ebXML, frameworks

1 Introduction

This paper introduces the new B2B model tailored especially for Small and Medium Enterprises. The system architecture and software modules for the new B2B framework 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].

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].

2 SMEs barrier to enter B2B

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.

2.1 ebXML framework

“ebXML” stands for “electronic business XML”. The mission of ebXML is to offer an XML-based infrastructure that will be available for global use by electronic business processes and will be interoperable, secure and consistent manner by all participants.
ebXML can be seen as a standard framework for companies of all sizes, including SME’s (Small and Medium Enterprises). In order to support the needs of SME’s ebXML proposes that software companies will provide commercial software for B2B implementation to the SMEs. This is expressed in a typical ebXML scenario (Figure 1) between a large corporation (Company A) and a SME (Company B) [6].

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].

3 Proposed Middleware Application
In Figure 1 there is a change to the original image, by adding a “Middleware” application that will convert data (orders) to specific standards as requested by companies involved in online business. For the purpose of illustrating the Middleware solution everything will be proposed as a model working on top of ebXML.

The easiest way to create this “middleware” application is to use the Web Services (WS) architecture. WS allow data communication through HTTP protocol and results in XML documents which are exactly what the B2B frameworks have in common.

Instead of using third party applications or commercials APIs, a simple approach using Web HTTP Requests and Responses will be used for the new middleware application.

3.1 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].

What is 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
that “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.

3.2 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].

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) 1 to discern them from
SOAP-specific or other elements” [14].

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

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1 The
http://www.ebxml.org/namespaces/messag
eHeader” namespace must be used for the
ebXML SOAP Envelope extensions.
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. These web services can be used by other companies to query the register and use to place orders

3. HTTP Adapter is to be used as endpoint that receives ebXML messages indented 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

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.

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 (as well as Figure 1), 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.

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 an Excel or Web GUI by end-users (SMEs). Web Services Adaptor will facilitate the movement of data back-and-forth.

3.3 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).

Major Services that will be provided by Middleware application are:

1. Service to Generate CPAs – **WS-CPAPProvider**, accepts parameters that identify different companies (SMEs) that use the system and returns Profile to the Requester. Additionally it can convert Requesters CPA 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**, that will accept parameters in form of texts that can query the Database for CPA lookups.
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).

4 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.

Sales personnel can accept orders based on ebXML standards and still have no need to be concerned about technical details.
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 6).

The sample scenario used in the paper is extended by providing a proposal to remove the barriers for entrance in the B2B e-commerce area for SMEs. This proposal, also referred as „middleware“, is a good way to use the widespread Internet technology, Web Services, acting as a translator of these business messages, thus making SMEs gain competitive advantage without any bigger investment in commercial off-the-shelf (COTS) software.

References:


