UBL: The Next Step for Global E-Commerce

UBL Marketing Subcommittee

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Introduction

XML is often described as the *lingua franca* of e-commerce. The implication is that by standardizing on XML, enterprises will be able to trade with anyone, any time, without the need for the costly custom integration work that has been necessary in the past. But this vision of XML-based "plug-and-play" commerce is overly simplistic. Of course XML can be used to create electronic catalogs, purchase orders, invoices, shipping notices, and the other documents needed to conduct business. But XML by itself doesn't guarantee that these documents can be understood by any business other than the one that creates them.

XML is only the foundation on which additional standards can be defined to achieve the goal of true interoperability. The Universal Business Language (UBL) initiative is the next step in achieving this goal.

The task of creating a universal XML business language is a challenging one. Most large enterprises have already invested significant time and money in an e-business infrastructure and are reluctant to change the way they conduct electronic business. Furthermore, every company has different requirements for the information exchanged in a specific business process, such as procurement or supply-chain optimization. A standard business language must strike a difficult balance, adapting to the specific needs of a given company while remaining general enough to let different companies in different industries communicate with each other.

The UBL effort addresses this problem by building on the work of the ebXML initiative. ebXML is a joint project of UN/CEFACT, the world body responsible for international Electronic Data Interchange (EDI), and the Organization for the Advancement of Structured Information Standards (OASIS), a nonprofit consortium dedicated to the open development of XML languages. UBL is organized as an OASIS Technical Committee to guarantee a rigorous, open process for the standardization of the XML business language. The development of UBL within OASIS also helps ensure a fit with other essential ebXML specifications.

As an OASIS technical committee, UBL has access to a membership that reads like a *Who's Who* of technology and e-business vendors. Participants include leading XML and EDI experts, as well as a broad range of governmental and business organizations with a stake in e-business interoperability.

The Vision: Interoperable E-Commerce

UBL envisions a world where all companies, large and small, can interact seamlessly with their trading partners as if they were part of the same virtual enterprise. It achieves that goal by standardizing the form of information exchange.

The lack of a standard for business documents is not due to a shortage of specifications but rather to an overabundance. A multitude of XML business libraries are already in existence. And this has created a big interoperability problem for both users and system vendors.

A company that adopts one of these specifications is likely to find that many of the companies with which it would like to trade are inaccessible to it because they are using incompatible definitions and XML encodings for many of the same ordinary information elements – product and business descriptions, measurements, dates, locations, and so on. Since use of any e-commerce standard requires significant investment, this "Tower of Babel" greatly increases both the cost of integration and the cost of commercial software.

UBL proposes a single ubiquitous language for business communication that takes into account both the requirements common to all enterprises and the specific needs of companies in different regions and different vertical industries. Convergence on a single standard will significantly reduce the cost of integration. By lowering the bar to adoption of e-business technology, UBL promises to extend the efficiencies of automated ERP systems beyond the individual enterprise.

Documents, Components, and Context

The primary deliverable of UBL is a set of standard formats for common business documents such as invoices, purchases orders, and advance shipment notices. These formats are designed to be sufficient for the needs of many ordinary business transactions and, more importantly, to serve as the starting point for further customization. To enable this customization, the standard document formats will be made up of standard "business information entities," which are the common building blocks (addresses, prices, and so on) that make up the bulk of most business documents. Basing all UBL document schemas on the same core information entities maximizes the amount of information that can be shared and reused among companies and applications.

In a UBL-enabled world, companies publish profiles of their requirements for the business documents involved in specific interactions. These profiles specify the *business context* of each transaction, that is, specific parameters such as the industries and geographic regions of the trading partners. The context parameters are applied to the standard formats to create new formats specific to a given transactional setting. Since these context-specific formats are based on the standard components, interoperability is guaranteed while taking into account the requirements of each party to a particular transaction.

For example, a chemical manufacturer might require the specification of hazardous material information when receiving purchase orders from its customers, while an automotive manufacturer buying chemicals might require special satellite positioning (GPS) information in purchase orders to ensure that goods are delivered to exactly the right loading dock. By applying context-specific extensions to the base document formats, a standard format is created that includes fields for both GPS and HazMat information. The automotive and chemical manufacturers can then trade effectively without the need for long negotiations to settle on document formats that suit them both.

UBL: The Next Step

The last decade has seen the creation of a layered infrastructure that provides most of the pieces needed for the global adoption of electronic commerce.

- The first prerequisite, universal networking, has been met with the rapid spread of the Internet.

- The next layer is made up of various nuts-and-bolts standards such as XML and XML Schema that are the building blocks for creating higher level e-business standards.

- An additional layer, a standard for the reliable packaging and delivery of business messages across the Internet, was a product of the first phase of ebXML. This standard for XML messaging services was officially published in May 2001 and is now maintained by OASIS.

UBL is not an attempt to reinvent the steps that have come before. Instead, it focuses on the key issue that remains to be solved: the definition of an interoperable yet extensible set of standard formats for business communication.

Completely automated electronic commerce is still years away. UBL offers a staged approach to adoption that moves companies ever closer to universal interoperability while offering clear benefits at each stage.

Opening E-Commerce to Small Businesses

International agreement on a concrete XML syntax for business documents is the key to bringing the majority of the world's businesses into electronic commerce.

XML markup (the "tags") transforms documents into hierarchical sets of information objects with logical "handles" that can easily be manipulated by simple pattern matching and text processing tools like perl, Python, and emacs. And free lightweight parsers can apply rigorous structural and semantic validation to XML documents to ensure interoperability. These two characteristics of XML documents mean that when UBL arrives, any reasonably computer literate person with a PC and some free software tools will be able to interact with the UBL-compliant purchasing system of a Fortune 500 company. Custom programming with expensive data extraction and mapping software typical of EDI implementations will still be possible but no longer required. And taming the problem of context-driven data requirements – met in EDI with implementation guides – should greatly reduce the cost of adapting applications to the requirements of particular trading relationships.

International agreement on a single vocabulary for electronic business will create an environment where businesses of every size can automate their processes to exactly the degree that they can afford – from manually programmed text-hacking systems at the low end to off-the-shelf software in the midrange to completely automated and integrated purchasing systems at the high end. And it will allow all of these businesses to interoperate as if they were technologically at the same level.

The growth of the World Wide Web demonstrated the inherent power of a standardized tag set running over a ubiquitous transport layer. UBL plus ebXML messaging services will allow businesses of every kind access to electronic commerce just as HTML plus HTTP allowed

publishers of every kind access to the Internet. Like HTML, UBL will someday be seen as a transitional technology. And like HTML, its effect will be revolutionary.

EDI and the "XMLification" of EDI

Electronic Data Interchange standards have been effective in automating recurring business transactions between large companies, especially for the supply chains of a dominant enterprise. The promise of XML is to enable the automation of processes for which EDI would not make sense, either due to the relative size of the interacting parties, the frequency and regularity with which these interactions occur, or the dynamic nature of the interactions.

The first step in the transition of e-commerce to XML has been the creation of new business libraries that attempt to retain the semantics of EDI while exploiting the superior data modeling facilities of XML. XML-based business libraries are made up of schemas that describe specific XML document formats. By looking at the schema for an invoice, for example, the structure of a valid invoice document can be determined. This includes a description of the overall structure of the invoice (for example, the fact that an invoice contains information on the "buyer" and that "buyer" information includes an "address," etc.), as well as information about which elements of the schema are required, which are optional, which can occur more than once, what datatype they are, and so forth.

An existing business library that uses this approach is xCBL (XML Common Business Library), originally developed by Commerce One and more recently by Commerce One in cooperation with SAP. xCBL is broadly based on EDI data formats, but it uses modern object-oriented techniques that allow companies to make custom extensions without breaking interoperability with other users.

While they validate the UBL concept, however, neither xCBL nor any of the other current XML business dialects has established itself as a genuine international standard. The purpose of UBL is to achieve this standardization.

ebXML

One of the most important efforts to create a common framework for e-business integration is ebXML. ebXML recognizes that integration is a complex problem that requires standardization in a number of distinct areas:

ebXML Messaging Services

Standard protocols like TCP/IP and HTTP are too low-level to serve the needs of electronic business. ebXML messaging addresses this problem by extending the SOAP protocol to add features needed for the exchange of business documents: security, authentication, and non-repudiation.

ebXML Registry and Repository

ebXML also specifies a standard protocol for accessing central registries and repositories of business data. These data can include such things as trading partner profiles and business document formats.

ebXML Collaboration Partner Profile and Collaboration Partner Agreement

A CPP provides the information needed to do business with a specific trading partner, such as the business processes and document formats that it uses. When two parties trade for the first time, their CPPs are combined into a CPA that serves as the basis for their interaction.

ebXML Business Processes

ebXML aims to create a generic metamodel for business processes with which any business process can be modeled in a machine-readable way. Eventually, this will enable companies to deploy software that automatically adapts to the specific business processes of its trading partners.

ebXML Core Components

Finally, ebXML is compiling a set of common business document components for basic business information such as addresses, products, trading parties, and the like. A core component used in a particular business context is called a *business information entity* (BIE). BIEs can be assembled into business document forms (purchase orders, invoices, etc.), and these forms, when populated with data, become interoperable business documents.

The ebXML infrastructure specifications – Messaging services, Registry/Repository, and CPP/CPA – are now maintained by OASIS technical committees, while Core Component discovery and Business Process modeling continue under the aegis of UN/CEFACT.

The importance of ebXML is threefold. First, it draws on the lessons learned from pioneering vendors to fix some of the problems revealed by earlier efforts. Second, and more importantly, it standardizes essential infrastructure specifications in a way that should reduce dependencies between e-business software and particular platforms, thus spurring innovation in the integration space by letting enterprises put together best-of-breed solutions from different vendors, rather than having to bet everything on one specific vendor. And finally, it establishes the standard semantics for the basic components making up business data objects.

UBL assumes the existence of both the ebXML infrastructure specifications maintained by OASIS and the core component analysis and business process modeling that continue in UN/CEFACT. Since ebXML is "syntax neutral" and does not specify a particular XML encoding for business documents, UBL does not, strictly speaking, continue the ebXML work but rather complements it by providing the standard encoding of the ebXML business information entities, which in ebXML are pure data objects.

Because the designers of ebXML were careful to preserve support for manual methods in ebXML to facilitate incremental adoption, it should be possible to deploy UBL as a value-add to existing systems using no more of the ebXML infrastructure than ebXML messaging, which is simply the SOAP protocol plus extensions needed for secure business document interchange. But the fit with other pieces of the ebXML architecture shows how this lowest level of XML business functionality can be made to scale across the whole range of enterprise IT capabilities.

UBL Deliverables

UBL has currently established an initial phase of twelve to eighteen months, with three major deliverables planned.

Deliverable 1: Component Library

The first UBL deliverable is a set of reusable components that can be combined to create electronic business schemas. This will significantly ease the subsequent task of document design, since creating new document formats will mainly involve tying together predefined components rather than creating entirely new formats from scratch. A shared library is also essential to interoperability; without a common set of base components, each document format would risk redefining addresses, locations, and other basic information in similar but incompatible ways.

UBL has settled on an existing commercial XML business language, xCBL, as the starting point for its component design work. Three factors motivated this decision:

- xCBL covers a large set of document formats and takes a component-based approach to document design.

- xCBL has been tested in a large number of real-world deployments.

- xCBL is legally unencumbered. The four years of research, development, and harmonization invested in xCBL are freely available to the UBL effort.

The first step in creating the UBL library is the alignment of xCBL with the ebXML Core Components. This means going from a syntax-neutral abstract representation of information entities to concrete expressions of those entities using XML schemas.

The core library must also be checked against various XML business libraries that have been developed for specific vertical industries to make sure that the basic requirements common to all major verticals are accounted for. UBL library components will still have to be extended for use in a particular industry, but taking industry needs into account from the start will help to ensure that the core library is "universal" and sufficiently flexible to allow for context-specific extension.

Deliverable 2: Standard XML Documents

Based on the core library, specific XML document formats will be designed for various business processes. Creating these formats will mainly involve combining the appropriate base components. As with the core library itself, the specification of standard documents will take the form of concrete XML schema definitions.

Initial project planning has identified the following as the first UBL business schemas. These basic forms can be used for many generic applications and can serve as a standard basis for custom extension.

Core Library category

All the base-level and aggregate core components needed by the other categories

Trade/Procurement category

Purchase Order/Purchase Order Response/Purchase Order Change

Materials Management category

Despatch Advice (international) or Advance Ship Notice (U.S.)

Planning Schedule/Shipping Schedule

Goods Receipt

Trade/Payment category

Commercial Invoice

Remittance Advice

Transport/Logistics category

Consigment Status Request/Consignment Status Report

Transport Contract or Bill of Lading

Catalog category

Price Catalog/Product Catalog

Statistical Reports category

Accounting Report

Deliverable 3: Extension Methodology

Because the standard UBL documents will be designed for broad applicability, a methodology is needed to define how the documents can be extended based on specific trading partner characteristics.

A few early business library efforts (xCBL being the notable example) have used open extension methodologies that allow implementers to extend the business documents through object-oriented techniques like inheritance. This approach allows the creation of modified formats that interoperate with the standard formats while adding new information specific to the implementation.

Open extension methodologies have the advantage of simplicity, but they also have a number of drawbacks.

- The same extension can be performed by two implementers in similar but incompatible ways.

- Since these methodologies are general and relatively low-level, they do not take into account business-level considerations, and they require significant business and technical expertise on the part of the implementer.

- The generalized nature of these methodologies leaves broad scope for incorrect usage.

- It is not possible to establish after the fact exactly what steps were taken to produce an extended document format.

- Extension must be done manually, limiting the eventual automation of the contextualization process.

For these reasons, UBL has decided to adopt a more structured extension methodology driven by specific business factors such as the industry and region of the trading parties.

Context rules will be defined to specify exactly how standard documents should be extended based on parameters called *context drivers*. The context drivers specified by ebXML are the following (the ongoing UBL effort may result in some changes to this list):

Business process context	Official constraints context
Product classification context	Business process role context
Industry classification context	Supporting role context
Geopolitical context	System capabilities context

In ebXML document construction, context rules specify transformations to the base XML schema that are applied when triggered by particular context values. For example, adding a new data field or requiring a field that is optional in the base schema could be triggered by "procurement" as the value of the business process context or "automotive" as the value of the industry classification context.

This structured approach to extension directly addresses the drawbacks of open object-oriented extension methodologies.

- Two implementations of the same extension should be identical, since they are based on the same context rules.

- Predefining the context rules removes the need for XML expertise in arriving at the appropriate format.

- Schema extension is limited to the predefined rules, minimizing misuse.

- Extended documents can be keyed by context to indicate exactly how they were derived from standard documents.

- Eventually it will be possible to apply context rules automatically at run time to construct dynamic, ad hoc trading relationships without the need for human intervention.

The extension methodology provides a major business advantage as well. By expressing business process information as metadata, the UBL context mechanism enables a business to send documents that are tailored to a partner's business process without requiring it to reveal any proprietary details about its own processes.

UBL timeline

The long-term vision of UBL is universal, interoperable electronic commerce. But UBL approaches this ambitious goal incrementally by providing enterprises of every size with a clear path to adoption that does not require them to remake their business infrastructure overnight. UBL anticipates the following step-by-step approach to adoption:

Stage One: Basic Business Documents

A minimal core library and an associated set of schemas for the most common business documents will be released quickly to seed adoption of UBL. This library will offer a substantial advantage over existing business libraries simply by providing a standard base for ad hoc extension. Companies that adopt this standard library will be well placed to benefit from the subsequent UBL deliverables.

Stage Two: Forms for Common Contexts

Additional forms derived from the core library for use in specific contexts, especially vertical industry contexts, will be generated using the UBL extension methodology and added to the initial set of forms. Some larger companies will start using the context methodology to make their own extensions, but most will find what they need in the very large set of static schemas created by the application of standard context rules.

Stage Three: Design-Time Refinement

Using the context-based extension methodology, large corporations and vertical-industry consortia will design and publish specialized libraries of extended forms. Inexpensive standard tools will enable smaller companies to further refine these published formats to exactly fit their business requirements.

Stage Four: Run-Time Schema Generation

Maximum interoperability and automation of business processes will be achieved when context rules have been defined for all real-world business contexts and the appropriate format for any combination of context drivers can be reliably generated on demand. The achievement of true "plug-and-play" electronic commerce at this ultimate stage will also require the complete specification of business transactions in machine-processable terms – a project beyond the scope of UBL.

What you can do

- Learn more about UBL at http://www.oasis-open.org/committees/ubl

- Monitor the UBL technical work at http://lists.oasis-open.org/archives/ubl

- Comment on UBL work by subscribing to the UBL-comment list through the list manager at http://lists.oasis-open.org/ob/adm.pl

- Join the OASIS UBL TC by contacting the chair, jon.bosak@sun.com

- Promote UBL readiness in your company and industry association