

Open Standards in the Field of Boundaryless Information Flow

**Including Business Process and Web
Services**

A White Paper by:

Phil Holmes

Director Consortia Relations, The Open Group

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Open Standards in the Field of Boundaryless Information Flow

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Open Standards in the Field of Boundaryless Information Flow, Business Process, and Web Services

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Any comments relating to the material contained in this document may be submitted to:

The Open Group
44 Montgomery St. #960
San Francisco, CA 94104

or by Electronic Mail to:

ogpubs@opengroup.org

Table of Contents

- Executive Summary** **4**

- About this Document** **5**

- The Role of Open Standards** **6**

- Open Standards Activities** **7**
 - The right set of standards..... 7

- Business Processes** **8**
 - eBusiness standards..... 8
 - What is ebXML? 9
 - Related activities10

- Process Management Languages (PMLs)** **16**
 - What is the relationship between BPML and ebXML?16

- Web Services** **19**

- Location and Directory Services (WSDL, UDDI, etc.)** **20**
 - WSDL.....21
 - WSDL and ebXML22
 - UDDI.....22
 - Relationship between UDDI and other emerging standards.....23

- Data Interchange Services (XML, SOAP)** **25**
 - SOAP.....25

- Security Services** **26**

- Communications Infrastructure Interface (TCP/IP, SMTP, HTTP, SSL, etc.)** **26**

- Discussion** **27**

- About the Author** **29**

- About The Open Group** **29**



*Boundaryless Information Flow™
achieved through global interoperability
in a secure, reliable, and timely manner*

Executive Summary

The primary purpose of this document is to identify and track open standards activity. Relevant standards are grouped according to an architectural framework using a technical reference model related to The Open Group Architectural Framework. Key standards initiatives include ebXML, UDDI, WSDL, and SOAP. The relationship between these and other initiatives is explored. Future versions of this document will extend the scope to cover further standards related to or needed for Boundaryless Information Flow and to look at the adoption of standards by the industry. Contributions and comments are welcomed.

About this Document

The primary purpose of this document is to identify and track open standards activity related to Boundaryless Information Flow.

The starting point for this particular document is a desire to understand the relationship between various standards-based initiatives relating to Boundaryless Information Flow and the role of web services.

This paper is one of two discussion documents designed to coincide with The Open Group Conference entitled: *Boundaryless Information Flow: The Role of Web Services*, July 22-26, 2002 Boston, Massachusetts.

A document of this kind is a snapshot – a best shot at understanding what is going on. There are a lot of initiatives to be considered. It is not easy to establish the inter-relationships between them, nor to gauge which standards will be accepted and adopted by the industry; claims and counter-claims regarding the merits of different approaches abound.

The views expressed have been taken from recent articles and items on the web to show the flavor of the debate. They may be misguided or plain wrong.¹ We welcome feedback and discussion to improve the document for further versions. We will also extend the scope of the document as necessary to cover related fields of activity and to show the level of support and commitment for each standard in the market.

¹ The views expressed in this document are not necessarily the views of The Open Group or its membership. They are offered to reflect current issues and concerns expressed in the literature and on the web to encourage debate.

*Neither Boundaryless
Information Flow nor
web services can exist
without open standards*

The Role of Open Standards

Boundaryless Information Flow and web services are predicated on the adoption of a common set of open standards across the industry. It is clear from the discussion that neither can exist without open standards. Progress in both areas will be assisted by agreement on the right standards to implement, support from the industry, and certification programs to ensure conformity.

We need also to remember the overall benefits of open standards. Their adoption offers the best chance of achieving interoperability and integration. Wide adoption creates a level playing field in the market, offers more choice of product, and an environment where customers will buy product confident in the future of the product. Increased revenue provides the means for the industry to prosper and invest in new systems.

A key to the development of Boundaryless Information Flow and web services is the establishment and adoption of the right set of standards – both open and widely adopted. The emphasis here is the right set of standards.

The evolution and selection of the standards, and their eventual adoption, is in part a measure of the maturity of the subject. A brief examination of this paper confirms the number of standards initiatives with an element of competition and overlap. This is inevitable. However, it is also the cause of uncertainty as to which standards-based solutions vendors should implement and customers should seek to acquire.

In the web services arena, we see the influence of leading vendors who offer proprietary standards as the way forward. Early recognition of the need for products to interoperate led to announcement of joint commercial ventures and other forms of collaboration. Often collaboration is through the aegis of an industry consortium. The involvement of standards development organizations becomes necessary if standards are to be adopted on an international stage backed by government policy.

The authority of consortia and standards development organizations stems from their representation (vendor support and customer buy-in). This will influence the final outcome – the adoption and take-up of the open standard.

We should not forget the importance of certification and testing. In the context of Boundaryless Information Flow and web services, interoperability demands that different software applications implement the open standards in exactly the same way. Conformity to the one chosen set of standards becomes paramount, hence the need to provide for certification and testing.

All this adds up to a need for consortia and standards bodies to work together to identify and establish the right set of common standards, and to ensure that they are implemented in a uniform manner across the world.

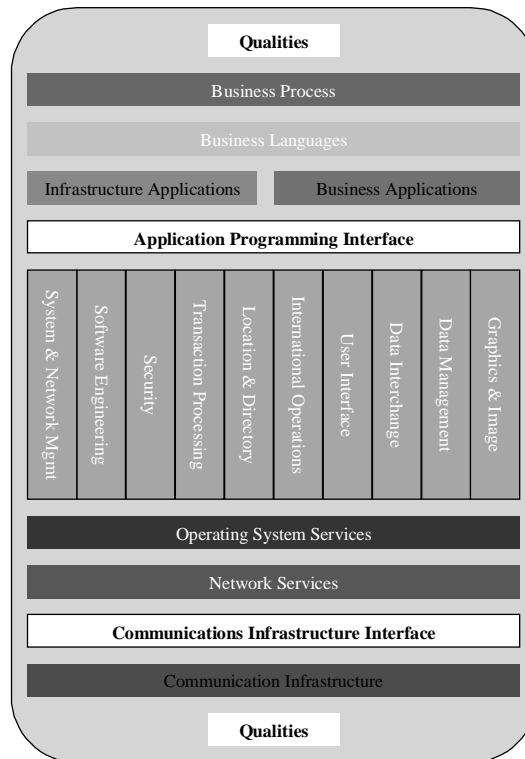
Open Standards in the Field of Boundaryless Information Flow

Only then can we achieve the goals of Boundaryless Information Flow and web services.

Open Standards Activities

The right set of standards

What is the right set of standards to bring about Boundaryless Information Flow and web services? To establish the requirements, indeed to identify and position the open standards, we need a frame of reference. The Open Group Architectural Framework (TOGAF) has been developed over many years (see www.opengroup.org/togaf). An augmented TOGAF Technical Reference Model (TRM) can be used as a frame of reference. The diagram shows a picture of the augmented TRM (on the left) with the key services related to Boundaryless Information Flow and web services on the right.



Business Process covers:

- ebXML, UBL, ACORD, HIPAA, etc.

Business Language covers:

- Xlang, WSFL, BPML, WfMc, UML, etc.

Location & Directory Services covers:

- UDDI
- WSDL

Data Interchange Services covers:

- XML
- SOAP

Communications Infrastructure covers:

- TCP/IP, SMTP, HTTP, SSL, etc.

Open Standards in the Field of Boundaryless Information Flow

Reference to the augmented TOGAF TRM helps position the various open standards initiatives. This paper discusses standards activity under each service heading:

- **Business Process:** Defines Common Business Transactions; e.g., sending a purchase order.
- **Business Language:** Defines Common Data-Interchange Formats; i.e., messages in the context of the business process transactions.
- **Location and Directory Services:** Defines a mechanism for listing your organization's capabilities and the business transactions that your organization can perform in a common Repository accessible to all other organizations. In short, an ability to describe your Company Profile.
Defines a mechanism to allow organizations to discover companies and look up their profile.
- **Data Interchange Services:** Defines a mechanism that allows two organizations to negotiate business terms before they commence transactions.
Defines a common transport mechanism for exchanging messages between organizations.
- **Communications Infrastructure Interface:** Defines the communications environment.

Besides the above services we can add Security, Management, and other services that are only partially covered in the current version of this document.

Business Processes

eBusiness standards

The larger organizations have been engaged in defining and implementing their systems around EDI (Electronic Data Interchange). EDI has allowed for not only the capture of common data interchange formats, but it has also tackled the challenge of capturing those formats; i.e., messages, by defining the business processes in which they are used. EDI, though, has proved to be expensive not only due to the high network infrastructure set-up/running costs but also the high costs of system integration. For the existing EDI implementations out there, there is usually a dominant business entity² that has tried to enforce proprietary integration approaches on all the other partners. As a result of this, several companies (especially smaller organizations) have gone about building their electronic businesses and collaboration with their trading partners in an *ad hoc* manner.

² The work of the Data Interchange Standards Association (DISA), amongst others, is relevant.

Open Standards in the Field of Boundaryless Information Flow

So, what do you think the solution would be to encourage all organizations to conduct electronic business over the Internet? A first step would be to define standards. But standards to define what? Listed below are some ideas:

- Define common business transactions; e.g., sending a purchase order
- Define common data interchange formats; i.e., messages in the context of the above transactions
- Define a mechanism for listing your organization's capabilities and the business transactions that your organization can perform in a common repository accessible to all other organizations; in short, an ability to describe your company profile
- Define a mechanism to allow organizations to discover companies and look up their profile
- Define a mechanism that allows two organizations to negotiate business terms before they commence transactions
- Define a common transport mechanism for exchanging messages between organizations
- Define the security and reliability framework

As we stand today, there is no particular standard for any of the points listed above. It is important to have a common standard or, more likely, a set of agreed standards in order to make global electronic commerce a reality. ebXML is one candidate.

What is ebXML?

ebXML is a global electronic business standard that is sponsored by UN/CEFACT (United Nations Center For Trade Facilitation And Electronic Business) and OASIS (Organization for the Advancement of Structural Information Standards). ebXML thus defines a framework for global electronic business that will allow businesses to find each other and conduct business based on well-defined XML messages within the context of standard business processes which are governed by standard or mutually-negotiated partner agreement.

ebXML provides a repository. This repository contains industry-defined Business Process Specification Schemas (BPSSs) – that is, scenarios that are commonly applicable to most business transactions. Companies can choose to extend these processes and add scenarios of their own. The repository also contains business profiles that are already registered to perform ebXML transactions with other trading partners. These profiles are known as Collaborative Protocol Profiles (CPPs) with the intention that other parties should be able to locate and access them via the registry. Once both parties have exchanged CPPs and created what is known as a

Open Standards in the Field of Boundaryless Information Flow

Collaborative Protocol Agreement (CPA) they can proceed to transact business.³

ebXML may be implemented in many ways. Implementations that support a subset of the ebXML specification may be fairly lightweight and based on open source technologies (e.g., servlet engine).

At run time, ebXML messages are exchanged following the ebXML MS specification. ebXML provides directory and messaging services as well as the registry services, and overlaps with WSDL and UDDI (see separate sections on directory and message services below).

ebXML, Biztalk, and RosettaNet are examples of frameworks for business processes. ebXML has attracted interest and support.

Related activities

Alongside these business frameworks, we can identify two types of activity:

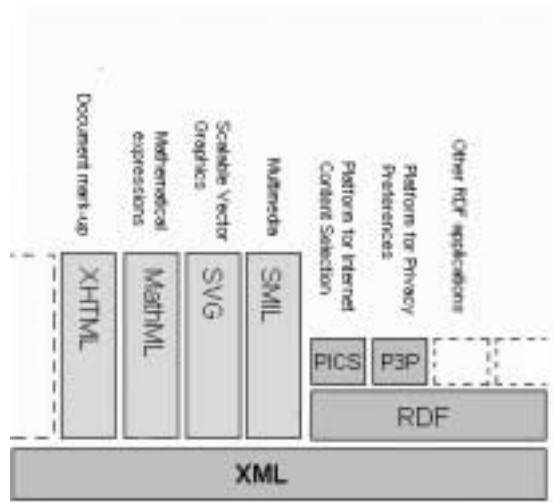
- First, initiatives to create libraries of business documents. An example would be UBL.
- Second, initiatives to develop XML schemas. Most Business Language consortia such as OAGIS, ACORD, and HR-XML have all announced that they will support ebXML.

XML schemas express shared vocabularies and allow machines to carry out rules made by people. They provide a means for defining the structure, content, and semantics of XML documents. The XML schema was approved as a W3C Recommendation on 2 May 2001.

XML itself is a low-level syntax for representing structured data. You can use this simple syntax to support a wide variety of applications. This idea is put across in a simplistic way in the diagram below, which shows how XML now underpins a number of web markup languages and applications.

³ Once an organization has determined the business processes it can support, it starts building an application to support the understood ebXML standards. This application defines the service interfaces that other organizations can invoke. It also describes the input and output messages that will be given to the service. Organizations with an Internal Legacy Application have to create an implementation wrapper around their Legacy Application, to help it understand ebXML messages. These interfaces are packaged in the Collaboration Protocol Profile (CPP).

Open Standards in the Field of Boundaryless Information Flow



SOAP and WSDL employ XML schemas. Outside and inside W3C, many groups are already defining new formats for information interchange. The number of XML applications is growing rapidly, and the growth appears likely to continue. There are many areas – for example, the healthcare industry, the Inland Revenue, government, and finance – where XML applications are used to store and process data. XML as a simple method for data representation and organization will mean that problems of data incompatibility and tedious manual re-keying will become more manageable.

Open Standards in the Field of Boundaryless Information Flow

The following tables summarize the key business process activities:

| Business Process (B2B) Frameworks | Organization/Remarks |
|---|--|
| ebXML (electronic business XML) Business Process Specification Schemas (BPSS) | UN/CEFACT and OASIS; see above. |
| BizTalk Framework | Biztalk.org/Microsoft A proprietary, single-vendor, single-platform solution. Ceased activity July 2002. |
| RNIF (RosettaNet Implementation Framework) | RosettaNet High Tech. Manufacture RosettaNet does not provide machine-readable business collaboration documents; its PIP definitions are somewhat rigid and cannot be discovered for a specific purpose. RosettaNet has publicly announced that they will migrate to ebXML and leave the RNIF behind. |

Open Standards in the Field of Boundaryless Information Flow

| Business Process Documents | Organization/Remarks |
|--|--|
| <p>UBL (Universal Business Language)</p> | <p>OASIS</p> <p>The purpose of the UBL Technical Committee is to quickly develop a synthesis of existing XML business libraries, to develop a coordinated set of XML grammatical components that will allow trading partners to unambiguously identify the business documents to be exchanged in a particular business context.</p> <p>The TC will align the vocabulary and structures of UBL with the vocabulary and structures of other already existing business libraries, and implement a mechanism for the generation of context-specific schemas for basic business documents and their components through the application of transformation rules to a common XML source library.</p> |
| <p>OAGIS (Open Applications Group Integration Specification)</p> | <p>Open Application Group, Inc.</p> <p>The principal notion in OAGIS is the BOD (Business Object Document), supporting a common horizontal message architecture. BODs are the business messages or business documents that are exchanged between software applications or components, between companies, across supply chains, and between supply chains. The BOD Message Architecture is independent of the communication mechanism: it can be used with simple transport protocols such as HTTP and SMTP, but it also can be used in more complex transport protocols such as SOAP, ebXML transport and routing, or any other Enterprise Application Integration system. Version 8.0 contains some 200 XML BODs, with over 300 XML schemas and over 400 example XML instances.</p> |

Open Standards in the Field of Boundaryless Information Flow

| Business Process Industry-Specific Schemas | Organization/Remarks |
|--|---|
| <p>Insurance Industry ACORD (Association for Cooperative Operations Research and Development)</p> | <p>Association for Cooperative Operations Research and Development (ACORD) ACORD is the focal point for standardizing insurance information and point-of-sale document requirements. ACORD licenses industry participants to incorporate ACORD Forms in their electronic products and web sites. The standards that are affected include Forms, AL3, and XML.</p> |
| <p>Human Resources HR-XML</p> | <p>HR-XML Consortium The HR-XML Consortium is an independent, non-profit organization dedicated to the development and promotion of standardized XML vocabularies for human resources (HR). Industry-standard XML vocabularies provide the means for one company to transact with many other companies without having to establish, engineer, and implement many separate interchange mechanisms.</p> |
| <p>Healthcare Department of Health and Human Services Forms relating to HIPAA</p> | <p>Centers for Medicare and Medicaid Services (CMS) formerly Health Care Financing Administration (HCFA) – Health Insurance Portability and Accountability Act Forms The Health Insurance Portability and Accountability Act of 1996 (HIPAA) mandated regulations that govern privacy, security, and electronic transactions standards for healthcare information. The US Department of Health and Human Services (HHS) has published final regulations related to electronic transactions and privacy. These regulations will require major changes in how healthcare organizations handle all facets of information management, including reimbursement, coding, security, and patient records.</p> |

Open Standards in the Field of Boundaryless Information Flow

| Business Process Industry-specific Schemas | Organization/Remarks |
|--|---|
| HL7 | Health Level Seven is one of several ANSI-accredited Standards Developing Organizations (SDOs) operating in the healthcare arena. Most SDOs produce standards (sometimes called specifications or protocols) for a particular healthcare domain such as pharmacy, medical devices, imaging, or insurance (claims processing) transactions. Health Level Seven's domain is clinical and administrative data. Their mission is: "To provide standards for the exchange, management, and integration of data that support clinical patient care and the management, delivery, and evaluation of healthcare services. Specifically, to create flexible, cost-effective approaches, standards, guidelines, methodologies, and related services for interoperability between healthcare information systems." |
| Finance Industry FpML (Financial products Markup Language) | FpML is the industry-standard protocol for complex financial products. It is based on XML (Extensible Markup Language), the standard meta-language for describing data shared between applications. All categories of privately negotiated derivatives will eventually be incorporated into the standard. Version 1.0 of FpML covers interest rate swaps and Forward Rate Agreements (FRAs). Version 2.0 extends the interest rate product coverage to the most common option products, including caps, floors, swaptions, and cancelable and extendible swaps. Version 3.0 covers different asset classes, it includes the interest rate work of Version 2.0, and covers additionally FX and Equity Derivatives. |
| IFX Business Message Specification | IFX Forum The Interactive Financial eXchange (IFX) Forum: where business and technology professionals gather to develop a robust XML framework for the electronic business-to-business exchange of data among financial service institutions around the world. The IFX Forum has published the IFX Business Message Specification, Version 1.3. |

Further examples can be found across different industries.

Process Management Languages (PMLs)

Apart from the business process frameworks described above, there is a collection of standards that define business process languages providing global models.⁴ Examples are BPML, XLANG, and WSFL.

These emerging standards are identified in the following table. The relationship between these languages or models is explained by their authors in the following section.

What is the relationship between BPML and ebXML?

BPML and ebXML are addressing complementary aspects of eBusiness process management. While ebXML provides a standard way to describe the Public Interface of eBusiness processes, BPML provides a standard way to describe their Private Implementation. BPML.org is proposing a binding between public processes and internal processes to bridge the different protocols. ebXML is more worried about “business process collaboration” rather than “describing the business process of an organization and integration with technical implementation” which is the concern of BPML.

BPML addresses the needs of enterprise IT infrastructure. It attempts to provide a process-based view to functionalities addressed by current enterprise IT infrastructure like legacy systems, ERP, EAI, and Workflow applications.

⁴ The Global Model provides a facility to model interactions between business partners. XLANG, a global model, is a mapping between inputs and outputs. WSFL collaborations enable mapping with bi-directional services, but they are still far from ebXML BPSS. Unlike in ebXML, BPSS business semantics such as non-repudiation, quality of service, legally binding, guaranteed delivery at the application level cannot be specified by a global model.

Open Standards in the Field of Boundaryless Information Flow

| Business Process Management Languages | Organization/Remarks |
|---|---|
| <p>BPML (Business Process Modeling Language) and BPQL (Business Process Query Language)</p> | <p>BPML.org (Business Process Management Initiative)</p> <p>BPML.org defines open specifications, such as the BPML and the BPQL, that will enable the standards-based management of eBusiness processes with forthcoming BPMSs (Business Process Management Systems), in much the same way that SQL enabled the standards-based management of business data with off-the-shelf DBMSs (Database Management Systems).</p> <p>The BPML is a meta-language for the modeling of business processes, just as XML is a meta-language for the modeling of business data. BPML provides an abstracted execution model for collaborative and transactional business processes based on the concept of a transactional finite-state machine.</p> <p>The BPQL defines a standard interface to forthcoming BPMSs. It allows system administrators to manage the BPMS and business analysts to query the instances of business processes it executes.</p> |
| <p>XLANG</p> | <p>Microsoft</p> <p>Automation of business processes based on web services requires a notation for the specification of message exchange behavior among participating web services. XLANG specifies such a notation. XLANG is expected to serve as the basis for automated protocol engines that can track the state of process instances and help enforce protocol correctness in message flows.</p> |

Open Standards in the Field of Boundaryless Information Flow

| Business Process Management Languages | Organization/Remarks |
|--|---|
| WSFL (Web Services Flow Language) | <p>IBM</p> <p>The Web Services Flow Language (WSFL) is an XML language for the description of web services compositions. WSFL considers two types of web services compositions: The first type (flow models) specifies the appropriate usage pattern of a collection of web services, in such a way that the resulting composition describes how to achieve a particular business goal; typically, the result is a description of a business process. The second type (global models) specifies the interaction pattern of a collection of web services; in this case, the result is a description of the overall partner interactions.</p> |
| BTL (Business Transaction Protocol) | <p>OASIS</p> <p>The Business Transactions Technical Committee will develop technology for business transactions on the Internet. Long-lasting business transactions spanning multiple enterprises pose a unique challenge to B2B systems. The interdependent workflows among multiple trading partners, which drive business transactions, need to be coordinated to ensure that the outcome of the transaction is reliable. The purpose of this committee is to develop an agreed set of requirements for a business transaction protocol; evaluate the BEA technology submission and other technologies made available to the committee and determine their suitability to the requirements identified by the committee; and produce a final specification for a business transaction protocol which works in conjunction with existing business messaging standards, particularly those being developed in the ebXML initiative.</p> |
| WfMC | <p>Workflow Management Coalition Workflow Reference Model, etc.</p> |
| UML 2.0 (Unified Modeling Language) | <p>OMG</p> <p>The OMG's Unified Modeling Language™ helps to specify, visualize, and document models of software systems, including their structure and design, in a way that meets all of these requirements.</p> |

Open Standards in the Field of Boundaryless Information Flow

The meta-model of each language varies from one specification to another. BPML, XLANG, and WSFL are all relying on the concept of web services. They also clearly define a data flow (as XML documents), a control flow (block structured or transition-based), a message flow (web services), and transaction flow. However, they do not spend much time on specifying how users may interact with a BPMS. The WfMC has mostly focused on that problem in the past. On the other hand, the WfMC specification does not support a real message flow and only a very limited data flow (process variables). The following table summarizes the differences between each data model.

| Specification | Control Flow | Data Flow | Message Flow | Transaction |
|---------------|------------------|------------------------------|------------------------------|-------------|
| BPML | Block structured | XML | Web Services | Yes |
| XLANG | Block structured | XML | Web Services | Yes |
| WSFL | Transitions | XML | Web Services | Yes |
| WfMC | Transitions | Process variables | Nested and chained processes | No |
| UML 2.0 | Transitions | Transitions and data buffers | Collaboration model | No |

Web Services

A web service is programmable application logic accessible using standard Internet protocols. Web services combine the best aspects of component-based development and the web. Like components, web services represent black-box functionality that can be reused without worrying about how the service is implemented. Web services provide well-defined interfaces, or contracts, that describe the services provided.

Unlike current component technologies, web services are not accessed using object model-specific protocols such as the Distributed Component Object Model (DCOM), Remote Method Invocation (RMI), or Internet Inter-ORB Protocol (IIOP). Instead, web services are accessed using ubiquitous web protocols and data formats such as Hypertext Transfer Protocol (HTTP), Extensible Markup Language (XML), and Simple Object Access Protocol (SOAP).

A web service contract describes the services provided solely in terms of the messages that the web service accepts and generates. No information about how the web service is implemented is necessary in the contract. Consumers of a web service do not need to know anything about the platform, object model, or programming language used to implement the service. They only need to understand how to send and receive messages as specified by the web services contract.

There are a few key specifications and technologies you are likely to encounter when building or consuming web services. These specifications and technologies address five requirements for service-based development:

- A standard way to represent data

Open Standards in the Field of Boundaryless Information Flow

- A common, extensible message format
- A common, extensible contract language
- A way to discover services located on a particular web site
- A way to discover service providers

The key initiatives are marked with an asterisk in the table below.

Location and Directory Services (WSDL, UDDI, etc.)

| Function | Web Service | Organization | Status | Description |
|--|---|--|--|--|
| Description | * WSDL (Web Services Description Language) | Developed jointly by Microsoft and IBM; submitted to W3C | See below. | |
| Standard way to document what messages the web service accepts and generates; that is, to document the web service contract. See more below. | | | | |
| Description/Discovery | *ebXML Registry Service Specifications | OASIS | OASIS/ebXML Registry Information Model Version 2.1, June 2002 OASIS/ebXML Registry Services Specification, Version 2.1, June 2002 | See ebXML under Business Process above and relation with WSDL and UDDI below |
| Description/Discovery? | WSCM (Web Services Component Model) | OASIS Web Services Component Model (WSCM) TC | | |
| Create an XML and web services-centric component model for interactive web applications. | | | | |
| Description | RDF | W3C | | |
| The RDF (Resource Description Framework) integrates a variety of applications from library catalogs and worldwide directories to syndication and aggregation of news, software, and content to personal collections of music, photos, and events using XML as an interchange syntax. The RDF specifications provide a lightweight ontology system to support the exchange of knowledge on the web. | | | | |
| Description | Network Accessible Services Specification Language (NASSL). | IBM | | |
| Supplanted by a new language jointly developed by Microsoft and IBM: the Web Services Description Language (WSDL). | | | | |
| Description | Service Description Language (SDL) | | | |
| Supplanted by a new language jointly developed by Microsoft and IBM: the Web Services Description Language (WSDL). | | | | |

Open Standards in the Field of Boundaryless Information Flow

| Function | Web Service | Organization | Status | Description |
|--|--|--------------|--|-------------|
| Description | SOAP Contract Language (SCL) | | | |
| Supplanted by a new language jointly developed by Microsoft and IBM: the Web Services Description Language (WSDL). | | | | |
| Discovery and Description | * UDDI (Universal Description, Discovery, and Integration) | UDDI.org | Formed in September 2000. In time, the UDDI project will be turned over to a standards organization. | |
| Specifies a mechanism for web service providers to advertise the existence of their web services and for web service consumers to locate web services of interest. See below. | | | | |
| Discovery | DISCO (Discovery of Web Services specification) | Microsoft | | |
| DISCO is a Microsoft® technology for publishing and discovering web services. DISCO (Discovery of Web Service) defines a discovery document format (based on XML) and a protocol for retrieving the discovery document, enabling developers to discover services at a known Uniform Resource Locator (URL). | | | | |
| Discovery | WS-Inspection | IBM | | |
| The WS-Inspection specification provides an XML format for assisting in the inspection of a site for available services and a set of rules for how inspection-related information should be made available for consumption. A WS-Inspection document provides a means for aggregating references to pre-existing service description documents which have been authored in any number of formats. These inspection documents are then made available at the point-of-offering for the service as well as through references that may be placed within a content medium such as HTML. | | | | |

WSDL

WSDL (Web Service Description Language) is an XML grammar. It provides a formal framework to describe services in terms of protocols, servers, ports, and operations which can be invoked. It also includes input/output document formats, and the exceptions which can be thrown by the service. WSDL is a joint proposal between Microsoft and IBM which is now being worked on, like SOAP, by the W3C as XMLP. WSDL is technology-independent. However, the specification provides a SOAP binding which is the most natural technology to use to implement web services. The fundamental semantics of WSDL are as follows:

- **Message:** A message is a potentially multi-part package of documents and context data that constitutes the unit of communication with a web service. Each part in a message is defined using some well-defined type system. The type system may be abstract and the wire format of the messages may not be defined by the type. Messages are in this sense abstract.
- **Operation:** An operation is a basic interaction pattern supported by a web service. These are either one-way messages or request-response message pairs, with optional fault messages. Operations are defined in terms of incoming or outgoing messages with respect to

Open Standards in the Field of Boundaryless Information Flow

the implementation of the service. Messages may be synchronous or asynchronous.

- **portType:** A port type is a named set of abstract operations, defined using abstract message types. For instance, in Java an operation would be a method, and a portType would be an interface.
- **Binding:** A binding defines message format and protocol details for operations and messages defined by a particular port type. There may be multiple bindings for a given port type. The binding for a message defines the wire form of a message, typically in the context of a specific message format standard such as SOAP.
- **Port:** A port is an externally visible target for a set of operations supported by a web service. A port minimally specifies a transport end point at which a binding is deployed.
- **Service:** A (web) service is a group of related ports.

WSDL and ebXML

WSDL is used to describe a web service. In ebXML, the CPP is used to describe the same web service. WSDL provides information about a service name, parameters for that service, and the endpoint to invoke it. The service is invoked using SOAP and XML. CPP not only produces this information, but also other important parameters, such as the role of an organization in the context of a particular service, error handling, and failure scenarios. In essence, the ebXML business process schema is a more rigorous definition of a web service than simply a WSDL document. It not only identifies business processes but also, for instance, the roles that an organization has to play and messages being exchanged. The ebXML Messaging Service utilizes SOAP and HTTP (it also allows for attachments). The ebXML Messaging Service will thus provide a standardized way to send messages to trading partners. It not only provides a secure and reliable transport infrastructure based on SOAP and HTTP, but also makes sure that the CPA governs any business transactions.

UDDI

The UDDI Project is an industry initiative that is working to enable businesses to quickly, easily, and dynamically find and transact with one another. UDDI enables a business to:

1. Describe its business and its services
2. Discover other businesses that offer desired services
3. Integrate with these other businesses

The UDDI Project is not “run” by any one company. UDDI is currently being guided by a group of industry leaders (not specifically identified on the UDDI.org web site) that are spearheading the early creation and design

Open Standards in the Field of Boundaryless Information Flow

efforts. UDDI is backed by IBM, Microsoft, and Ariba, but includes competitors like Ariba and Commerce One, and Microsoft and Sun Microsystems. It is also supported by major users such as Boeing and Ford. There remains the question as to who is going to run the centralized registry; several organizations are developing their own implementation.

Over 220 companies have agreed to become community members and to support the future development of the Universal Description, Discovery, and Integration (UDDI) standard. Technical input into Version 3 of the UDDI specification is finished and the Candidate Draft is in the review process at this time. UDDI.org is no longer accepting new members into the UDDI community.

UDDI.org has announced its intention to submit the completed specification to a standards body. The UDDI design team is determining the roadmap for UDDI. The web site is short on details as to the lead players, members of the design team, and the consensus review process.

Relationship between UDDI and other emerging standards

Most existing registries contain information about a particular business or group of businesses. The UDDI Business Registry is intended to serve as a global, all-inclusive listing of businesses and their services. The UDDI Business Registry does not contain detailed specifications about business services. It points to other sources that contain the service specifications. We anticipate that most businesses will continue to maintain detailed specifications in local registries and repositories, and that the UDDI Business Registry will point to the specifications in these local registries and repositories.

| | |
|----------------------|---|
| UDDI and SOAP | Access to and from the UDDI Business Registry is performed using the Simple Object Access Protocol (SOAP). However, a service registered in the UDDI Business Registry can expose any type of service interface. A service interface is the programmatic interface that is used to invoke the service. A web service interface can be implemented using an Internet protocol, such as SOAP, SOAP Messages with Attachments, ebXML Message Service, E-speak, XML-RPC, CORBA, Java RMI, and COM+. |
| UDDI and WSDL | There is no formal relationship between UDDI and WSDL (Web Services Description Language), although the technologies are complementary. WSDL can be used to specify a web service interface. The tModel entry for the service type could point to a WSDL abstract description, and the binding template for a specific service could point to a WSDL concrete description. |
| UDDI and WSCL | There is no formal relationship between UDDI and WSCL (Web Services Conversation Language), although the technologies are complementary. WSCL can be used to specify a web service interface and to describe service interactions. The tModel entry for the service type and the binding template entry for a specific service could point to WSCL descriptions. |

Open Standards in the Field of Boundaryless Information Flow

| | |
|--|---|
| <p>UDDI and LDAP</p> | <p>There is no formal relationship between UDDI and LDAP. The two technologies are designed to do different things. UDDI is a specific-purpose registry that is intended to manage descriptions of web service types, business organizations, and the web services the businesses offer. LDAP is an extensible, general-purpose directory that is most often used to manage users and resources. New LDAP object classes could be defined for the things UDDI registers, but there isn't a global, public, LDAP directory system.</p> <p>The UDDI specification does not dictate registry implementation details. The UDDI specification defines an XML-based data model and a set of SOAP APIs to access and manipulate that data model. The SOAP APIs define the behavior a UDDI registry must exhibit. A UDDI implementation could be built on an LDAP directory as long as it conforms to the specified behavior. Thus far, all UDDI implementations have been built on relational databases.</p> |
| <p>UDDI and ebXML</p> | <p>There is no formal relationship between UDDI and ebXML, although the technologies are complementary. UDDI is used to publish and discover web services; ebXML Registry Services; on the other hand, both publish and discover web services, and provide information about, for instance, business processes, business documents, and business profiles. Businesses that offer ebXML business services will want to register their businesses and their services in the UDDI Business Registry.</p> |
| <p>UDDI, E-Services Village, and eSpeak</p> | <p>There is no formal relationship between UDDI and the E-Services Village, although the technologies are complementary. Businesses that offer eSpeak business services will want to register their businesses and their services in the UDDI Business Registry. The UDDI business services, service types, and specification pointers could point to the E-Services Village for business and technical descriptions of the services.</p> |
| <p>UDDI and BizTalk.org</p> | <p>There is no formal relationship between UDDI and BizTalk.org, although the services are complementary. Businesses that register their schemas and style sheets in BizTalk.org will want to register these business formats as service types in the UDDI Business Registry. The UDDI tModel specification pointers could point to these schemas and style sheets in BizTalk.org.</p> |
| <p>UDDI and RosettaNet</p> | <p>RosettaNet defines a standard set of protocols and message formats for supply chain integration, called Partner Interface Processes (PIPs). The RosettaNet PIPs have been registered as service types in UDDI, and businesses can associate their services with these RosettaNet service types. Users can search the UDDI registry for businesses that support these PIPs. Other industry organizations can also register their service types in UDDI.</p> |

Data Interchange Services (XML, SOAP)

| Function | Web Service | Organization | Status | Description |
|---|--|--------------|--|--|
| XML Messaging | *XML (Extensible Markup Language) | W3C | | |
| XML Messaging | * SOAP (Simple Object Access Protocol) | W3C | SOAP 1.1 issued by W3C | |
| SOAP defines a lightweight protocol for information exchange. | | | | |
| ebXML Messaging | *ebXML Messaging Services (an extension of SOAP) | OASIS | Message Service Specification to Version 2.0; Revision C voting July 2002 as an OASIS standard | See discussion of exBML under Business Process (above) |
| XML Messaging | XML-RPC | W3C | | |

SOAP

SOAP defines a lightweight protocol for information exchange. Part of the SOAP specification defines a set of rules for how to use XML to represent data. Other parts of the SOAP specification define an extensible message format, conventions for representing remote procedure calls (RPCs) using the SOAP message format, and bindings to HTTP. (SOAP messages can be exchanged over other protocols, but the current specification defines bindings for HTTP only.) Microsoft .NET products will use SOAP as the primary message format for communicating with web services.

Note that the current SOAP specification does not define all the features developers might expect to find in a traditional distributed object protocol, such as object lifetime management, distributed transactions, or security. All of these features could be defined as extensions to SOAP, but they are not defined as part of the base specification.

SOAP is not a component model; it will not replace objects and components; i.e., EJB, JavaBeans. It is not a programming language.

Security Services

The following table identifies three initiatives concerned with web services and security.

| Function | Web Service | Organization | Status/Remarks |
|---|---|---|----------------|
| Security | WS-Security | IBM, MS, Verisign | |
| See Version 1.0 5/04/02 on the IBM web site. Bob Blakeley contributed, among others. | | | |
| Security | SAML (Security Assertion Markup Language) | OASIS XML-based Security Services TC (SSTC) | |
| The SAML 1.0 specification set is at Committee Specification maturity level and has undergone an editorial revision; as of 31 May 2002 the specifications were at Revision 01. They entered a balloting period in pursuit of OASIS Standard status on 1 June 2002. | | | |
| Security | XKMS (XML Key Management Specification) | W3C | |
| This document specifies protocols for distributing and registering public keys, suitable for use in conjunction with the proposed standard for XML Signature (XML-SIG) developed by the World Wide Web Consortium (W3C) and the Internet Engineering Task Force (IETF) and an anticipated companion standard for XML encryption. The XML Key Management Specification (XKMS) comprises two parts: the XML Key Information Service Specification (X-KISS) and the XML Key Registration Service Specification (X-KRSS). | | | |

Communications Infrastructure Interface (TCP/IP, SMTP, HTTP, SSL, etc.)

| Function | Web Service |
|-----------|-------------|
| Transport | HTTP |
| Transport | SMTP |
| Transport | FPT |
| Transport | BEEP |

Contrast the transport layer (HTTP, SMTP, FTP, BEEP) with existing transaction management standards XA and JTA.

Discussion

From the foregoing we can identify the consortia most closely identified with current developments in the field of business process and web services. W3C have responsibility for XML, SOAP, WSDL, and a number of other standards. Coordination of W3C efforts is handled through its Web Services Architecture Group and the Joint Coordinating Committee. OASIS has a number of Technical Committees working on different aspects of the subject. ebXML, UBL, and BTL figure in the tables above and we need to position the Directory Services Markup Language (DSML),⁵ Web Services Remote Portal TC (WSRP),⁶ and Web Services for Interactive Applications (WSIA).⁷ UDDI is a joint initiative of leading vendors whose intention is to submit the specification to a consortium or standards body.

ebXML should be singled out in the context of Boundaryless Information Flow as an example of a set of standards that address business collaboration. ebXML also provides a repository and its messaging service covers security and related aspects.

The requirements for Boundaryless Information Flow are set out in a separate document. This document also provides a discussion of the needs for security, management, quality of services, etc.⁸ Many of these requirements are beginning to be addressed and will be highlighted in future versions of this document.

A simple diagram which positions some of the key standards activity shows the way in which standards “build on” each other, overlap, or compete. Clearly the parties are working hard to reconcile the differences and to clarify how systems can and should implement the various standards.

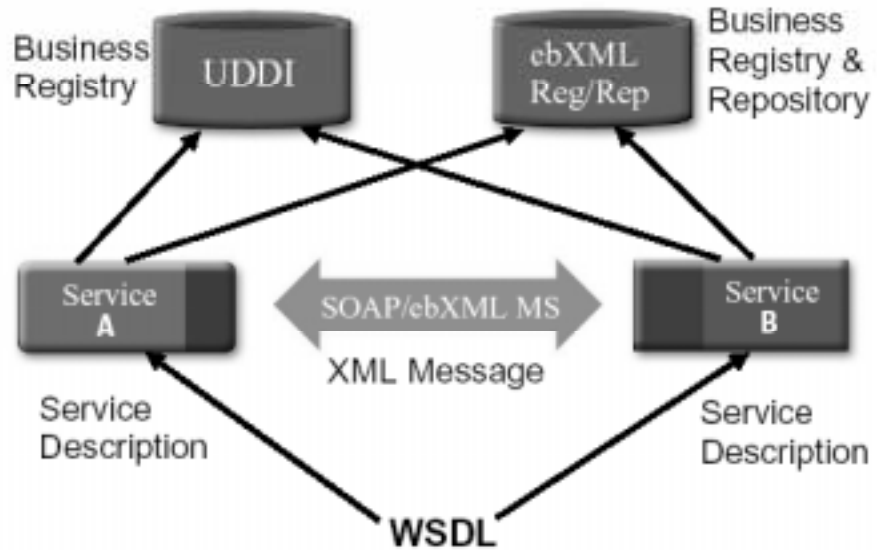
⁵ The Directory Services Markup Language (DSML) bridges the world of directory services with the world of XML. DSML 1.0 provided a means of representing directory information in XML. This Technical Committee is working on DSML 2.0 which will add support for querying and modifying directories.

⁶ The WSRP TC will develop an XML and web services standard that will allow for the “plug-and-play” of portals, other intermediary web applications that aggregate content, and applications from disparate sources. These Remote Portlet web services will be designed to enable businesses to provide content or applications in a form that does not require any manual content or application-specific adaptation by consuming applications. The TC will work with other OASIS web services TCs and will harmonize WSRP as far as practical with existing web application programming models, the work of the W3C, emerging web services standards, and the work of other appropriate business information bodies.

⁷ The purpose of the OASIS Web Services for Interactive Applications (WSIA) TC is to create an XML - and web services-centric framework for interactive web applications; harmonize WSIA as far as practical with existing web application programming models, with the work of the W3C, emerging web services standards, and with the work of other appropriate business information bodies; ensure that WSIA applications can be deployed on any tier on the network and remain target device and output markup-neutral; and promote WSIA to the status of an international standard for the conduct of XML and web services-based web application development, deployment, and management.

⁸ The list includes state management, service and user context, security, transaction, workflow, and accounting.

Core Web Services Standards



If we extend the picture to look at the totality of standards needed for Boundaryless Information Flow, there is a clear need to establish the right set of standards and for consortia and other parties to work hard on coordination of efforts.

Future versions of this document will take the analysis further.

About the Author



Dr. Phil Holmes has been a member of The Open Group staff for over ten years. His current role is Director, Consortia Relations working, amongst other things, on the creation and development of a knowledge database of open standards and consortia activities across the whole spectrum of IT. An ongoing assignment is to identify and understand the contributions of consortia in the field of web services. Web services is one facet of The Open Group's work towards Boundaryless Information Flow.

Over the years Phil has developed a number of white papers pulling together and analyzing developments in selected technology areas covering topics ranging from network computing and distributed networking to security-related subjects. He is currently examining developments in the field of digital rights management and business process transactions.

About The Open Group

The Open Group is a vendor-neutral and technology-neutral consortium, committed to a vision of **Boundaryless Information Flow** achieved through global interoperability in a secure, reliable, and timely manner.

The Open Group's mission is to drive the creation of **Boundaryless Information Flow** by:

- Working with customers to capture, understand, and address current and emerging requirements, establish policies, and share best practices
- Working with suppliers, consortia, and standards bodies to develop consensus and facilitate interoperability, to evolve and integrate specifications and open source technologies
- Offering a comprehensive set of services to enhance the operational efficiency of consortia
- Developing and operating the industry's premier certification service and encouraging procurement of certified products

The interoperability that characterizes **Boundaryless Information Flow** results in gaining operational efficiencies and competitive advantages. Through access to integrated information, across the extended enterprise and beyond, employees, trading partners, and customers are enabled and empowered.