



REVIEW OF ELECTRONIC WORKFLOW STANDARDS

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Please send responses to
Adrian Kent
Interoperability Policy Adviser
adrian.kent@e-envoy.gsi.gov.uk

Document Control

Abstract

This paper summarises the existing standards for computerised workflow and shows the coverage and relationships of the standards.

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1. Introduction

This short paper summarises the existing standards for computerised workflow and shows the coverage and relationships of the standards.

The paper is in 4 parts:

- Definitions of workflow;
- Table of existing standards;
- A diagram summarising the relevant standards;
- Summary and recommendation.

It has been modified as a result of discussion at the recent workflow working group meeting. The aim of the group is to recommend workflow standards for use by government.

Government has identified the need for workflow standards in the following areas:

- Business process description
 - This has 2 perspectives: internal and external. For Business to Business exchange the description needs to be able to allow the choreography and interoperability of processes
- Interoperability
 - Interoperability can work at a number of levels from simple task passing through to workflow management systems with complete interchange of process definition, workflow relevant data and a common look and feel
- Audit and Tracking
 - Audit data provides a historical record of the progress of a process instance from start to completion or termination.
 - Tracking data provides the ability to track and report on workflow events during workflow execution.

2. Definitions of workflow.

Workflow can be defined as “The computerised facilitation or automation of a business process, in whole or part”.

Workflow is concerned with the automation of procedures where documents, information or tasks are passed between participants according to a defined set of rules to achieve, or contribute to, an overall business goal.

Whilst workflow may be manually organised, in practice most workflow is normally organised within the context of an IT system to provide computerised support for the procedural automation.

Workflow is often associated with Business Process Management, which is concerned with the assessment, analysis, modelling, definition and subsequent operational implementation of the core business processes of an organisation (or other business entity).

Business Process

A set of one or more linked procedures or activities which collectively realise a business objective or policy goal, normally within the context of an organisational structure defining functional roles and relationships.

Although not all BPM activities result in workflow implementations, workflow technology is often an appropriate solution as it provides separation of the business procedure logic and its IT operational support, enabling subsequent changes to be incorporated into the procedural rules defining the business process.

A **Workflow Management System** is one which provides procedural automation of a business process by management of the sequence of work activities and the invocation of appropriate human and/or IT resources associated with the various activity steps.

An alternative definition of a **Workflow Management System** is:

A system that completely defines, manages and executes “workflows” through the execution of software whose order of execution is driven by a computer representation of the workflow logic.

An individual business process may have a life cycle ranging from minutes to days (or even months), depending upon its complexity and the duration of the various constituent activities. Such systems may be implemented in a variety of ways, use a wide variety of IT and communications infrastructure and operate in environments ranging from small local workgroups to inter-enterprise.

3. Table of current workflow standards

Specifications	Layers covered	Sponsor(s)	Notes
<p>Workflow management coalition (WfMC). The standard provides several interface definitions namely:</p> <p>Interface 1 - Process Definition Interchange XPDL</p> <p>Interface 2 - Workflow Client Application Programming Interface</p> <p>Interface 4 – Interoperability Wf-XML</p> <p>Interface 5 - Audit Data Specification CWAD</p> <p>http://www.wfmc.org/standards/docs/Std diagram.pdf</p>	<p>Business Process Description</p> <p>Interoperability</p> <p>Audit and tracking</p>	<p>WfMC</p>	<p>The Coalition’s mission is to promote and develop the use of workflow through the establishment of standards for software terminology, interoperability and connectivity between workflow products.</p> <p>Interface 1 This interface includes a common meta-model for describing the process definition (this specification) and also an XML schema for the interchange of process definitions. This provides standards for tools allowing portability between tools.</p> <p>Interface 2 defines the API specifications of the Workflow Management Coalition for building workflow-enabled applications.</p> <p>Interface 4 Wf-XML, can be used to implement the three models of interoperability defined in the Interoperability Abstract specification. Specifically, chained workflows, nested workflows and parallel-synchronized workflows are supported. Wf-XML supports these three types of interchanges both synchronously and asynchronously, and allows messages to be exchanged individually or in batch operations.</p> <p>Interface 5 This document does not define how the data is stored, but what information is to be gathered and made available for analysis. The information will be called Common Workflow Audit Data (CWAD).</p> <p>The WfMC cover all aspects of the workflow lifecycle and include</p>

			<p>resource assignment and interaction with organisation models (roles, responsibilities, and resource assignment rules, which can include automata as well as human resource). The model includes a simple, but extensible state notation. The standards do not (deliberately) embrace the use of other, external standards such as messaging, two-phase commit or security protocols.</p> <p>The standards were developed at two levels –</p> <ul style="list-style-type: none"> (i) abstract (functional) specifications of interfaces and operations (ii) concrete bindings of the interfaces to specific implementation technologies. The most recent binding specifications are XML / Web Services based <p>Current work is in hand to specify the handling of events and inter-process messages within XPDL and to map Wf-XML to SOAP and WSDL as well as HTTP.</p> <p>WfMC, in association with AIIM, has submitted a Memorandum of Understanding to ISO (TC171/SC2), which is expected to be approved in 2003. This is intended to be a precursor to submission of various WfMC standards for ratification.</p> <p>WfMC provides a register for workflow product vendors to self document standards conformance in product (see http://www.wfmc.org/standards/conformance.htm). This currently indicates approximately 25 products in conformance with WfMC standards. However, since the WfMC standards are freely available on the web, it is not easy to catalogue all take up world-wide. It is known that there are additional companies which have implemented these standards but which have not been formally documented in the above list.</p> <p>The WfMC has held preliminary discussions with a view to establishing some form of conformance testing capability. This would be likely to focus first on Wf-XML interoperability.</p>
BPML – Business Process Modeling Language. A meat-language for modelling of executable business processes. www.BPML.org	Business Process Description	BPML.org.	<p>Some overlap with the WfMC XPDL.</p> <p>BPML is focussed more on a process view derived from EAI plus messaging. It does not include the concept of a general resource assignment</p>

BPMN v0.9 The Business Process Modeling Notation (BPMN)		<p>model or support for roles and responsibilities. It is not directly focussed on execution time interoperability, although it does allow for predefined interactions in conjunction with a choreography standard such as WSCI(see below). Its process activity map is focussed on block structure and nesting. It is intended to support the definition of very low granularity process fragments and this may require specific consideration of scalability . Current work on BPML 1.0 has stopped; and BPMI is considering the relationship of BPML to BPEL4WS (see below).</p> <p>Version 1.0 published Aug 2002. BPMI.org has been established as a non-profit corporation within the state of California. The organization is headed by a five-member board of directors, along with an executive director. Specifications developed within BPMI.org are free for any organization to implement, extend, or modify</p> <p>BPMLv1.0 XML Specification, Business Process Management Initiative v1.0, 24 June 2002. The Business Process Modeling Language (BPML) specification provides an abstract model for expressing business processes and supporting entities. BPML defines a formal model for expressing abstract and executable processes that address all aspects of enterprise business processes, including activities of varying complexity, transactions and their compensation, data management, concurrency, exception handling and operational semantics. BPML also provides a grammar in the form of an XML Schema for enabling the persistence and interchange of definitions across heterogeneous systems and modeling tools.</p> <p>BPMN (http://bpmi-notation-wg.netfirms.com/files.htm). is an initiative to define a standardised modelling notation for processes (As such it is an alternative to UML). The first draft of BPMN was made available to the public on November 13, 2002.</p> <p>Its initial version was closely aligned to BPML functionality, an attempt has also been made to map it to BPEL4WS functionality. WfMC has submitted a proposed mapping of BPMN onto XPDL. This identifies how the BPMN modelling notation would be used to model (notationally) workflow processes which could subsequently be defined in XPDL. This is expected to be incorporated into a new draft version of BPMN later this</p>
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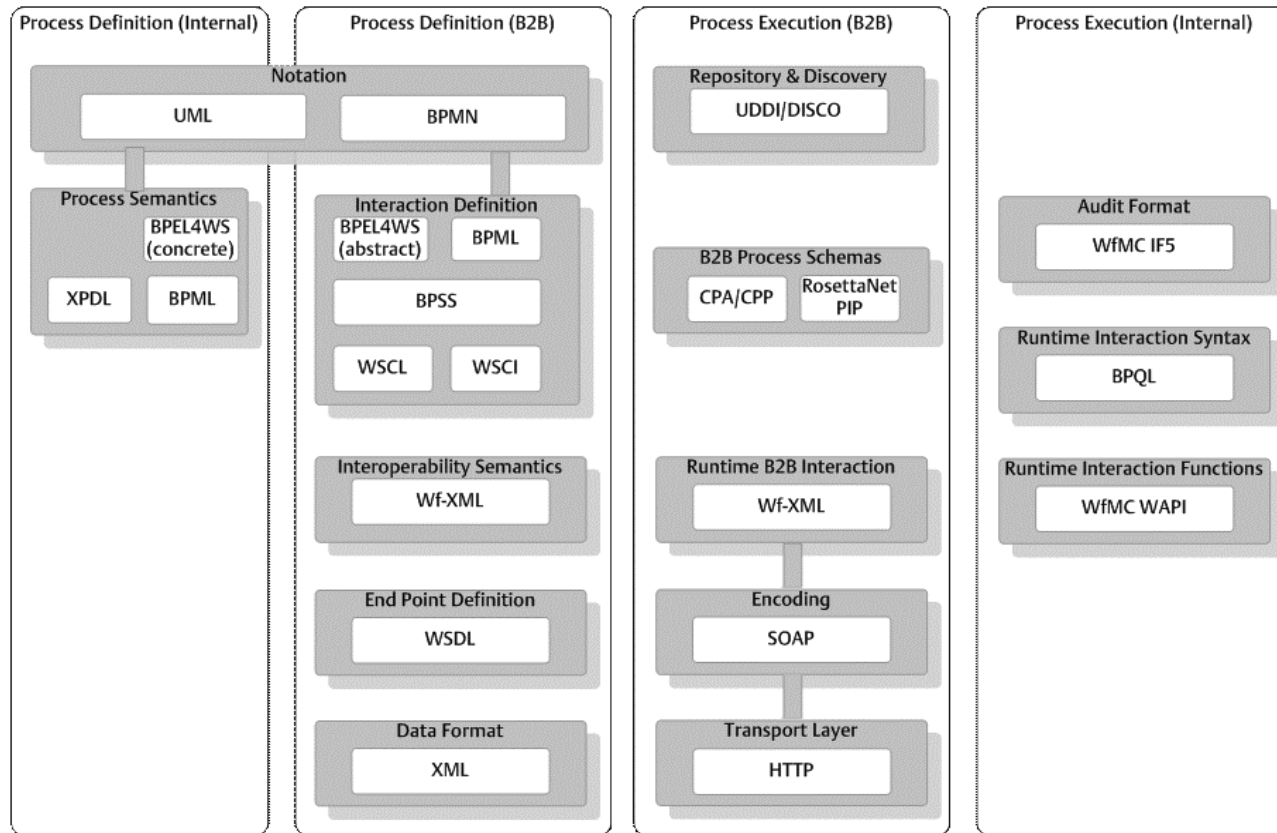
Business Process Query Language (BPQL)			<p>year.</p> <p>BPQL is a potential initiative to define a query language for interrogation of process information (c.f. SQL for interrogation of relational databases). This is not a reality yet.</p> <p>This has been discussed as a potential query interface layered on Wf-XML as the underlying control protocol, although formal work has not yet been started by the BPMI group.</p>
WSCI – Web Service Choreography Interface-language to describe the flow of messages exchanged by a Web service; it is intended to help developers design and create collaborative business processes based on the Web service model.	Interoperability	BEA, Sun , Oracle. - W3C have now taken this on.	<p>Specification for version 1.0 approved Aug 2002.</p> <p>WSCI v1.0 (August 2002) is an XML-based interface description language that describes the flow of messages exchanged by a Web Service participating in choreographed interactions with other services. It can be thought of as an interoperability layer for multiple process modelling languages.</p>
BPEL4WS, peer to peer interaction between WSDL services describing both the process and its partners.	Interoperability	IBM, Microsoft - Recently handed BPEL to OASIS for development.	<p>Initial implementation called BPWS4J released for developer education and testing. This relies on Web Services Technology and allows for some choreography between processes.</p> <p>BPEL4WS v1.0 (31 July 2002) provides a language for the formal specification of business processes and business interaction protocols. By doing so, it extends the Web services interaction model and enables it to support business transactions. BPEL4WS defines an interoperable integration model that should facilitate the expansion of automated process integration in both the intra-corporate and the business-to-business spaces.</p> <p>The purpose of the OASIS Web Services Business Process Execution Language TC is to continue work on the business process language published in the Business Process Execution Language for Web Services (BPEL4WS) specification.</p>

OASIS BTP	Interoperability	OASIS	<p>OASIS Business Transaction Protocol v1.0 (June 2002) – is designed to allow coordination of application work between multiple participants owned or controlled by autonomous organizations. BTP uses a two-phase outcome coordination protocol to ensure the overall application achieves a consistent result. BTP permits the consistent outcome to be defined <i>a priori</i> -- all the work is confirmed or none is -- (an atomic business transaction or atom) or for application intervention into the selection of the work to be confirmed (a cohesive business transaction or cohesion). BTP's ability to coordinate between services offered by autonomous organizations makes it ideally suited for use in a Web Services environment.</p>
ebXML BPSS	Business Process Description, Interoperability	OASIS	<p>Not much overlap with the WfMC XPD, this specification is more concerned with choreography of processes between businesses.</p> <p>Business process models describe interoperable business processes that allow business partners to collaborate. Business process models for e-business must be turned into software components that collaborate on behalf of the business partners.</p> <p>The goal of the ebXML Specification Schema is to provide the bridge between e- business process modeling and specification of e-business software components. The ebXML Specification Schema provides for the nominal set of specification elements necessary to specify collaboration between business partners, and to provide configuration parameters for the partners' runtime systems in order to execute that collaboration between a set of e-business software components.</p> <p>A specification created against the ebXML Business Process Specification Schema is referred to as an ebXML Business Process Specification. The <i>ebXML Business Process Specification Schema</i> is available in two stand-alone representations, a UML version, and an XML version.</p> <p>The UML version of the <i>ebXML Business Process Specification Schema</i> is merely a UML Class Diagram. It is not intended for the direct creation of ebXML Business Process Specifications. Rather, it is a self-contained statement of all the specification elements and relationships required to be able to create an ebXML compliant Business Process Specification. Any methodologies and/or metamodels used for the creation of ebXML compliant Business Process Specifications must at minimum support these</p>

			<p>elements and relationships. The XML version of the <i>ebXML Business Process Specification Schema</i> provides the specification for XML based instances of ebXML Business Process Specifications, and as a target for production rules from other representations. Both a DTD and a W3C Schema is provided. The UML and XML based versions of the <i>ebXML Business Process Specification Schema</i> are unambiguously mapped to each other.</p>
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4. Diagram summary of work flow standards.

One of the key problems is understanding how the various initiatives relate (or could relate) to each other and where overlap occurs.



The above standards diagram was produced by the WfMC as the proposed basis for joint working with BPMI..

This diagram is based on four levels of separation.

In the lifecycle dimension it separates *Process Definition* (1st & 2nd columns) and *Process Execution* aspects (3rd & 4th columns). The use of these terms is as defined within the Workflow Reference Model.

Process Definition - The process definition consists of a network of activities and their relationships, criteria to indicate the start and termination of the process, and information about the individual activities.

Process Execution - The time period during which the process is operational, with process instances being created and managed.

In the organisation dimension it separates *internal* and *external* (so called “B2B”) views of the process – either in definition or execution. These are represented in columns 1 and 4 (internal) and columns 2 & 3 (external).

In the *internal* space there is typically a tighter binding between functionality and product – not all aspects of internal process behaviour will need to be standardised or made visible at external boundaries (either at definition or in execution). The use of standards in this space is primarily focussed on the integration of different software tools – for example enabling a process definition tool to pass a process definition to an execution environment. Often software from a single vendor environment will be used within a particular organisation or department for both purposes.

In the *external* space the essential requirement is interoperability. At definition time this covers specification of the permitted business interactions between different process management systems (part of the *Choreography* space). At execution time the interoperability requirement is met through the use of a common protocol stack allowing the scoped process interactions.

Areas of potential standards overlap are principally in:

- (i.) the semantics of the process definition, and
- (ii.) interaction definition (choreography)

There has been some debate about the extent to which the scope of all potential runtime interactions can be pre-defined in a Choreography. One school of thought assumes that all potential process interactions can be so scoped (and hence standard WSDL/SOAP based messaging operations may be adequate for interoperability). The other school of thought believes that this approach will be impossible when dealing with large numbers of organisations and individuals, dynamically interacting through the web.

Hence a generic process interoperability protocol such as Wf-XML will be fundamental – in the same way that HTTP has become fundamental as a generic protocol for transporting hypertext. The use of a such a pre-defined set of inter-process operations also simplifies the context for specifying inter-process choreography, hence the inclusion of Wf-XML to provide interoperability semantics in the 2nd column of the above table.

5. Recommendation

There are a number of competing standards for workflow and a growing number for business process engineering. This paper has just concentrated on those concerning interoperability, business process description, and auditing and tracking.

The focus of the e-Government Interoperability Framework is on standards for interoperability. Wf-XML interoperability binding, an XML-based standard facilitating consistent data transfer between workflow engines appears to be the most appropriate. The Workflow Management Coalition, who produced this standard, have also produced those for business process description and, auditing and tracking. However the market use and support for these standards is unknown and more research needs to be done to find this out.

There also appears to be a divide between workflow standards implemented using Web services technology and those that do not. The current competition between OASIS and W3C web services standards adds a complication to any decision on workflow standards. (For background information see <http://consortiuminfo.org/bulletins/may03.php#featured>).

Further ebXML standards have a growing reputation and following; ebXML allows the definition of business processes and may expand to encompass the interoperability of these processes.

Workflow standards are required for business process description, interoperability, audit and tracking.

Currently the only standards that cover all these areas are those produced by the Workflow Management Coalition namely: XPDL, Wf-XML and CWAD. These standards are recommended for use in new workflow projects for government.