



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
Monica J. Martin
Sun Microsystems
monica.martin@sun.com

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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<u>4 October 2004</u>	<u>1.4</u>	<u>Draft</u>	<u>Monica J. Martin</u>	<u>Added other emerging specifications, and updates regarding WfMC work.</u>

Change History

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<u>4 October 2004</u>	<u>1.4</u>	<u>Draft</u>	<u>Monica J. Martin, Sun</u>	<u>Created additional detail with emerging specification information and updates on WfMC.</u>

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1. Introduction

In eGovernment, services are being delivered or planned for delivery via online applications. Agencies, organizations, departments, and government entities interact to support the definition, use and delivery of these online services. The need exists to define what minimal workflow or business process requirements are required. Initially, this white paper will outline the intra-entity requirements, standards, and other organizational workflow or business process criteria to deliver online services for eGovernment. Some basic assumptions include:

- No human intervention is anticipated.
- Business cases will guide definition.
- Legacy applications and investment must be supported..
- Online services may require skills and infrastructure (implicit assumption).¹
- Integration points may exist across multiple standards, environments, and organizations.
- Other non-technical or organizational constraints may apply that impact any development or use of existing standards or recommendations.

This short paper summarises the existing standards for computerised workflow and shows the coverage and relationships of the standards. Historically, workflow has been an enterprise capability. However, today the lines are increasingly unclear in the business process automation space. This paper will attempt to clarify these terms and their use in eGovernment. The paper is in 5 parts:

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

It has been modified as a result of discussion at the recent workflow working group meeting and includes inputs from eGovernment TC members. The aim of the group is to recommend workflow standards for use by government, particularly for delivery of eGovernment services.

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

- Business process description
 - This has 2 perspectives:
 - Externally visible or private
 - Within or across domains of control – For example, in a Business-to-Business exchange, the description needs should allow the monitoring of the visible behaviour of the parties in the choreography. In that case, the behaviour is know by both parties and crosses domains of control. It is important to note that a domain of control may be within an enterprise or across them given the infrastructure, business requirements, etc.
- 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.
- Interfaces NEED TO DISCUSS THIS FURTHER AS ONLINE SERVICES WILL INCLUDE HUMAN INPUT. **STILL OPEN**
 - Portal interfaces to automate the client input into the process in an automated fashion.

¹ Online here is synonymous with “e” in eGovernment.

2. Definitions of workflow.

The primary definitions related to workflow support of eGovernment services are:

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.²

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).

A workflow system may include the business process automation of work activities and the invocation of and interaction with appropriate human and/or system resources, and the activities involved. This is a clear differentiator for workflow where the human component adds a layer of complexity and requirements on the business processes.

Challenge 1: To effectively separate the business processes from the community that uses them and the user interfaces, presentation and portal capabilities that may make those processes available or visible to that community

Objective 1: To automate business processes to support eGovernment services.

Objective 2: Identify what if any interfaces are required or business requirements needed to support inclusion of human based, workflow actions that are part of the business process.

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 interfaces and implementations, workflow technology can support 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 business process rules defining the business process.³

Challenge 1: To separate business processes from the community that uses them (see Workflow).

Objective 1: To automate business processes to support eGovernment services.

Objective 2: To support interoperability across eGovernment entities within a domain of control.

Objective 3: To provide the capability to support eGovernment evidentiary requirements.

Objective 4: To recommend freely accessible, available solutions, based on standards to support eGovernment service delivery within and across government entities

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.⁴

² WfMC Reference Model, TC00-1003 Issue 1.1, 1998

³ Need source reference.

⁴ WfMC Reference Model, TC00-1003 Issue 1.1, 1998

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.⁵

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.

Challenge 1: To separate workflow from business processes it supports.

Objective 1: Automate activities that support eGovernment business processes that are important to the delivery of eGovernment services.

Objective 2: Separate business and application logics from the business process itself to allow reuse.

Objective 3: Allow reuse of business process definitions across government entities.

⁵ Need source reference.

3. Table of current workflow standards

Specifications	Layers covered	Sponsor(s)	Notes
<u>WS-BPEL [Business process execution language]</u>	<u>Process semantics and constraints, Interaction definition [1]</u>	<u>OASIS</u>	<p><u>Executable business processes model actual behavior of a participant in a business interaction. Business protocols, in contrast, use process descriptions that specify the mutually visible message exchange behavior of each of the parties involved in the protocol, without revealing their internal behavior (working draft [1]). WS-BPEL defines the partner links, services and a process from the view of a single role.</u></p> <p><u>Doesn't include human workflow.</u></p> <p><u>[1] Actual abstract process definition and scope for use are still under discussion in OASIS WS-BPEL TC.</u></p> <p><u>Working draft exists only.</u></p>
<u>WS-Choreography Choreography Description Language (CDL)</u>	<u>Interaction Definition, choreography semantics (choreography definition, and conditions/constraints)</u>	<u>W3C</u>	<p><u>WS-CDL is an XMLbased language that describes peer-to-peer collaborations of parties by defining, from a global viewpoint, their common and complementary observable behavior; where ordered message exchanges result in accomplishing a common business goal. Doesn't include human workflow and provides opaque capabilities to infer decision-making.</u></p> <p><u>Working draft exists only.</u></p>
<u>Business Process Definition [RFP under development and response]</u>	<u>Process Semantics (metamodel)</u>	<u>OMG</u>	<p><u>Planned to take a constrained set of UML v2.0 capabilities for business process modelling. This does not define a notation and build on UML v2.0, BPMN, and others. Projected to model flow, behavior, scope, variables, etc.</u></p> <p><u>Joint submission in work or pending with several key vendors.</u></p>
<p><u>ebXML BPSS [Business Process Specification Schema]</u></p> <p><u>4 October 200425 June 2004</u></p>	<p><u>Process Semantics Interaction Definition (Business process definition and conditions/constraints)</u></p> <p><u>Version 0.1</u></p>	<u>OASIS</u>	<p><u>The ebXML BPSS technical specification is part of the ebXML set of specifications and deals with both design-time and run-time aspects of "business-to-business processes" (or collaborations) between two or more business partners. The specification includes:</u></p> <ul style="list-style-type: none"> <u>• A business process specification schema which is used</u> <ul style="list-style-type: none"> <u>○ At design time to specify the terms of the collaboration</u> <u>○ At run-time to effectively but optionally validate the occurrences of these terms</u> <u>• The specification of a run-time protocol that is used to guarantee state alignment between the collaboration</u>

<u>Specifications</u>	<u>Layers covered</u>	<u>Sponsor(s)</u>	<u>Notes</u>
<p>Workflow management coalition (WfMC). The standard provides several interface definitions namely:</p> <p style="padding-left: 40px;">Interface 1 - Process Definition Interchange XPDL</p> <p style="padding-left: 40px;">Interface 2 - Workflow Client Application Programming Interface</p> <p style="padding-left: 40px;">Interface 4 – Interoperability Wf-XML</p> <p style="padding-left: 40px;">Interface 5 - Audit Data Specification</p> <p>CWAD</p> <p>http://www.wfmc.org/standards/docs/Stdstds_diagram.pdf</p>	<p>Business Process Description</p> <p>Interoperability</p> <p>Audit and tracking</p>	WfMC	<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. <u>This may allow interchange of different types of process definitions such as WS-BPEL. WfMC may have plans with WS-BPEL.</u></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 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> <p>(i) abstract (functional) specifications of interfaces and operations</p> <p>(ii) concrete bindings of the interfaces to specific implementation technologies. The most recent binding specifications are XML / Web Services based</p>
<p>4 October 2004 25 June 2004</p>	Version 0.1		<p>Current work is in hand to specify the handling of events and</p>

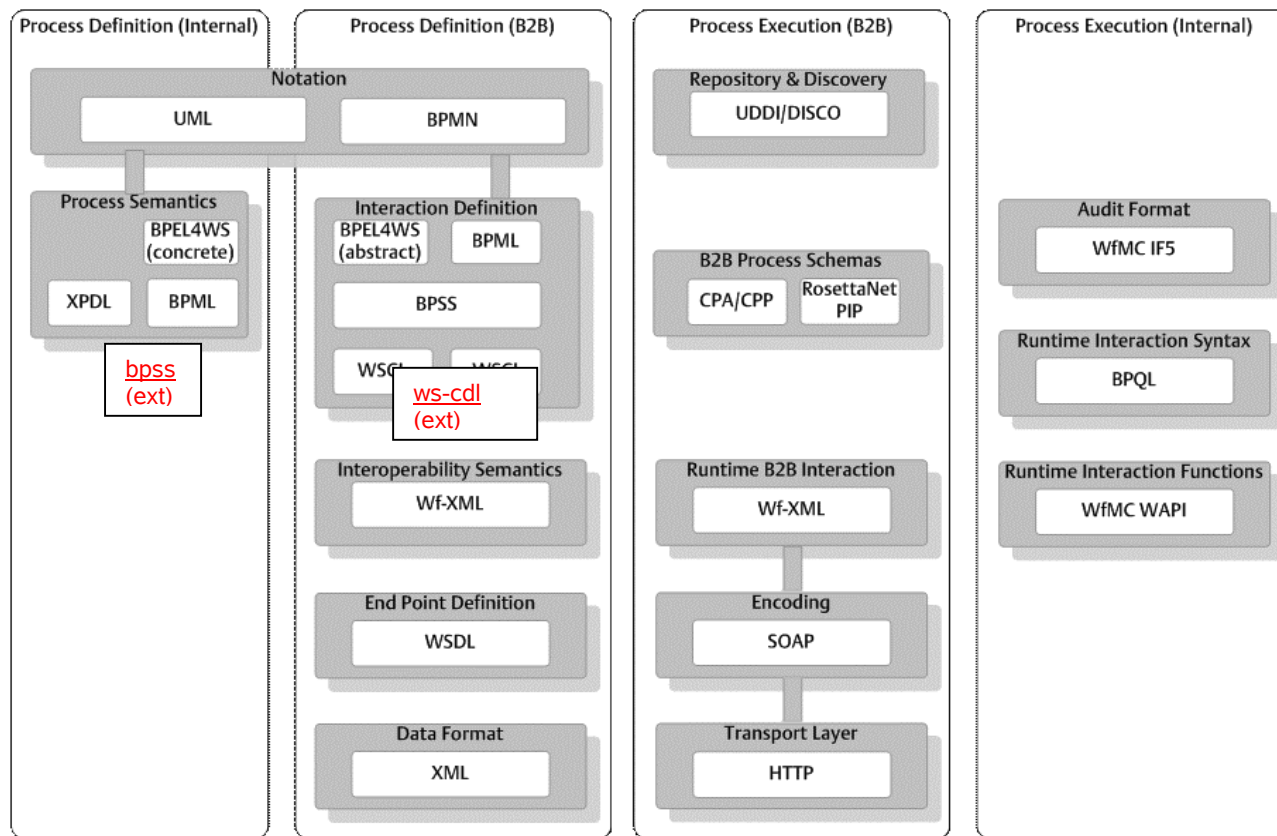
As a graph structured language, PDL understands workflow-relevant data (or data fields) that can be used in routing logic and expressions. Although primarily focused primarily on workflow, the language acknowledges the user interactions that may occur during a business process. Other capabilities noted include:

- Utilizes activities as the basic components of process definition and as a part of a process.
- It is the one of the few process specification that recognizes the participant or performer outside of a business activity, and provides some user administration capabilities.
- Recognizes the utility of a resource repository, and therefore could allow for our intended use of registry. XPDL also allows a participant to be defined as a team that infers delegation can occur within an organization unit by user definition (Need to investigate if this is a form of delegation or proxy).
- Allows mapping roles to a coordinator that could manage delegation.

Other specifications are under development may map to or integrate with, or secede XPDL, particularly WS-BPEL. WS-BPEL doesn't include the human workflow however. Recently, BPMI.org endorsed WS-BPEL and no future BPML version is planned.

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. Since this diagram was originally constructed in late 2003, more specification development has occurred (albeit immature). However, the focus of BPMI appears to be changing and could affect WfMC in light of their joint efforts at a minimum.-

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, when HTTP or other protocols are used (such as in mobile community):-

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

No change pending input from the team. Only input has been from UK eEnvoy.

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.