Workflow Management Coalition Reference Model Interface 4 Workflow Interoperability

The key to E-Commerce and to process scalability

Many businesses and IT communities have profited from the power of redesigned business processes that leverage workflow and document management technologies to automate and empower their workforce. Organisations are now faced with the opportunity of creating an extended enterprise network environment of users across multiple IT environments to manage business processes across a whole enterprise, as well as across multiple organisations.

To provide such a valuable service across heterogeneous systems requires standards. The Workflow Management Coalition has deployed some of the finest authorities in this specialist field to work on this topic, and the result is the W*f*MC Workflow Interoperability Definition. The W*f*MC first defined a Workflow Reference model with five Interfaces. Then teams were assigned to each. Interface 4 describes the method of passing a workflow activity from one workflow engine to another.

WfMC
Workflow Referance Model
Components and Interfaces

Process Definition Tools

Interface 1

Work Flow API and Interchange Formats

Work Flow Enactment Service

Administration & Monitoring Tools

Work Flow Engines

Interface 5

Interface 4

Other Work Flow Enactment Services

Work Flow Engine

Interface 3

External Applications Invoked by Workflow Instance
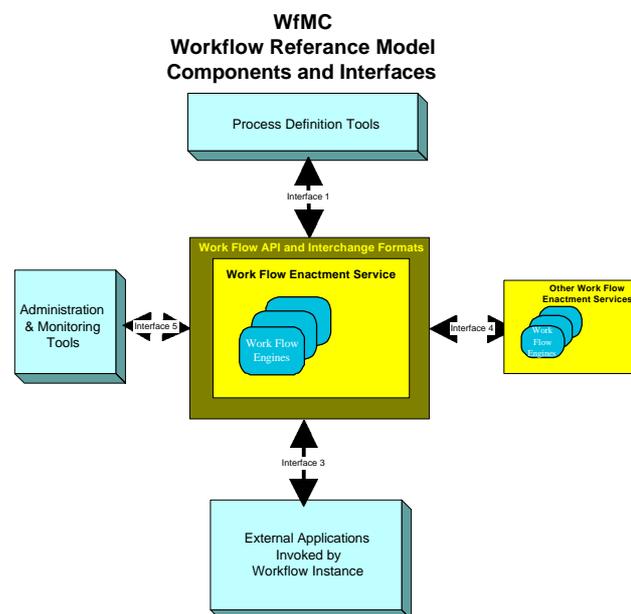
W*f*MC Interface 4 is a milestone publication depicting the importance of standards for mission-critical E-Commerce and E-Business applications. When

implemented together with document management standards, this definition enables organisations to co-ordinate work between distributed groups of employees, share work with business partners (suppliers and customers), and share in the control of the entire process.

Organisations will now be able to pass workflow items to external workflow systems owned and managed by commercial partners. This is the facility which organisations have been waiting for, in order to establish meaningful supply chains across networks. Thus a major car manufacturer can pass an incomplete workflow process to a supplier who will accept the message as an event which commences their part of the process. It is anticipated that chains involving many participants will be established. Members of the WfMC see that process-centric workflow engines will be the basis for the next generation for electronic commerce, and believe that it will replace many EDI activities.

E-commerce based on workflow engines, provides: -

- ➢ Inter-Organisation business process automation
- ➢ Low cost secure messaging facilities to enhance all aspects of commercial activity that can be automated.
- ➢ Business to business work process management
- ➢ Parallel processing of multi-participant commercial activities
- ➢ Basic services to facilitate outsourcing
- ➢ Support for the macro economic trend towards global manufacturing and trading

Business Rationale

The business rationale for Interface 4 is very persuasive:-

Vendor Independence	There are probably hundreds of workflow software authors and the present range of workflow products meet almost any need with varying efficiency, because of the different approaches that have been taken. Buyers of this technology are looking to get the best product for their particular needs on a departmental basis. WfMC I/F4 will enable customers to buy 'best of breed' products for each major application area, knowing these products will inter-operate.
Scalability	Conformance to WfMC I/F4 will enable one workflow engine to pass work to another.
	This has important implications for scalability. A system might be set up to achieve the current transaction rate; but then, after some time, the volume of transactions might increase beyond expectations. It will be a relatively simple task to install another workflow engine onto another machine to meet new demands.
	Alternatively, a workflow definition might include some very complex steps that involve heavy processing. It will now be possible to hand off those steps to another engine that will increase the overall efficiency substantially.
	As systems become larger and applications become complex, processing capacity restrictions can impact performance. Workflow interoperability enables a system designer to identify transaction intensive work and pass it off to a separate engine running on a networked CPU.
	Distributed processing, an established computing facility is now available for workflow engines
Speeds Implementation	Users can now build part of their overall system and place it into production, normally enjoying immediate cost and performance benefits.
	Later, other phases of the workflow project can be implemented.
Integration of Islands of	Workflow has been deployed as a departmental solution for many years. Companies now find that they have a

Workflow	corporate environment comprising different workflow applications with separate data storage.
	They are now able to link these systems to form a heterogeneous enterprise-wide workflow facility, destroying corporate data isolation.
Low cost change	It is possible that owing to changed circumstances, an organisation might find that their current workflow engine is not best suited to onward development.
	Now the users can use new technology for new developments whilst leaving the existing workflow engine to continue with its tasks.
	This is simpler and cheaper than replacing the existing legacy system.
E-Commerce	Electronic Commerce is the direct electronic exchange of goods and services using computers and telecommunication to send and receive transactions.
	Workflow Interoperability will enable organisations to automate much of their activity. This means that organisations will be able to expand transaction volumes substantially without having to increase costs.
	E-Commerce is already a very significant global activity and the signs are that the advances in workflow technology will provide the means for this activity to grow sharply.
Supply Chain Management	A supply chain encompasses every effort involved in producing and delivering a final product, from the supplier's supplier to the customer's customer. Four basic processes -- **Plan, Source, Make, Deliver** -- broadly define these efforts.
	Workflow Interoperability enables organisations to control an entire chain from start to finish with a series of workflow engines.
	Because of its wide scope, supply chain management must address complex interdependencies, in effect creating an "extended enterprise" that reaches far beyond the factory door.
	By providing common terminology, perspective and

measures, Interface 4 provides organisations with facilities to first describe and configure their internal business processes to reflect current business activities and product manufacturing resources. Then, organisations can establish standard process descriptions and metrics for use with external organisations inside and outside their industry segment; determine priority improvement efforts; and quantify the anticipated benefits of specific improvements.

Inter Enterprise Commerce

It is clear that workflow interoperability will equip organisations for business-to-business commerce.

Examples of this activity are described in other sections of this article

Outsourcing

Workflow Interoperability is going to assist organisations that wish to outsource activities. Suddenly geography is irrelevant.

Organisations can combine tasks from many divisions and locations into one 'processing factory.' They will centralise the accounts department into one location, processes will be automated and staff will deal with exceptions.

Thus, an organisation with real estate in London, Manhattan and Tokyo can have its general business operations run by a third party running a non-stop 'factory' facility at a low cost location such as Bangladesh.

Trading Function

The applications described so far in this article have all been examples of collaborative computing. One organisation passes off work to another for onward processing. However, I/F4 also creates the opportunity for automated trading.

Organisation A may have a number of articles to sell. The workflow engine A could be implemented so that it will send out messages to interested parties. Workflow engines B C and D would receive the message, and based on the rules implemented, could offer to buy the items at a certain price. Workflow engine A would accept the best offer and commit a transaction.

This is a very useful application in a closed environment,

where offers to buy and sell will not appear on the open market.

There is also the opportunity for Workflow engine A to place the offer on the web, but this involves one engine only.

Interoperability in Practice – AIIM demo

At the 1998 AIIM show in Anaheim Ca, in the "Standards at Work" pavilion, there was a major press event illustrating the power of W*f*MC I/F4 in a live interoperability demonstration. Sponsored by the Workflow Management Coalition (WfMC) and the Document Management Alliance (DMA), this event illustrated the business value of workflow and document management standards across an extended enterprise application as well as the synergy of the two standards.

The interoperability scenario demonstrated both the communications necessary internally between different company departments when placing an order for new PCs, and externally with suppliers and shipping companies during fulfilment. Reflecting the emergence of the Internet in commerce, this demonstration used only Internet communications.

The WfMC I/F4 standard allows applications from multiple vendors to be combined to handle tasks for a single business process that might span multiple departments or functional discipline in a seamless manner. The DMA standard allows systems from different vendors to interoperate thereby linking the "islands of information."   The two standards are synergistic because they solve similar problems facing organisations that deploy workflow and document management technologies throughout an enterprise. Illustrating this synergy, the demonstration showed a multi-process scenario managed by six different workflow vendors accessing three different vendor's document management repositories, integrated with DMA Middleware, into a single virtual information store.

Industry leaders involved in this demonstration include Action Technologies, Computron, DST Systems, FileNet, IBM, Staffware as well as the Workflow Solutions Group from the WfMC, and Eastman Software, FileNET, and Xerox from the DMA.

Description of the WfMC Interface 4 Definition

Interface 4 enables one conforming workflow engine to pass data to another that interprets the arrival as an event to commence a workflow activity. It is likely, but not inevitable, that the workflow engines can interpret a common process definition. Certainly there has to be a common view of key workflow process definitions, such as:- activity, application, organisation and role names, and navigation conditions.

Interface 4 - An Internet e-mail MIME Binding

Interface 4 defines the mechanisms that workflow product vendors are required to implement in order that one workflow engine may make requests of another workflow engine to effect the selection, instantiation, and enactment of known process definitions by that other engine. The requesting workflow engine should also be able to receive back status information and the results of the enactment of the process definition. As far as possible, this is to be done in a way that is "transparent to the user". This specification is based on MIME (Multipurpose Internet Mail Extension - RFC-2045 to RFC-2049). Interoperability information is placed into an electronic mail message to move data from one workflow engine to another, as described below.
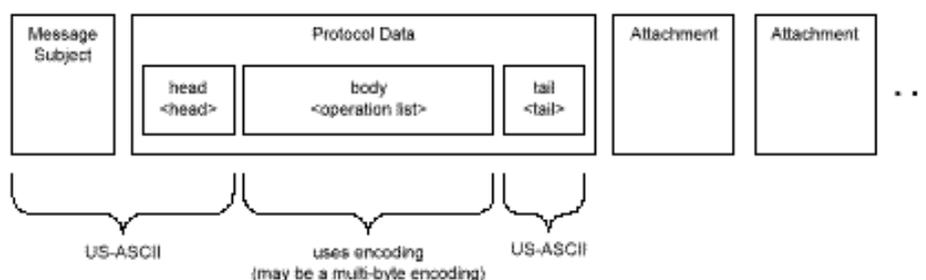
Message Subject An information field. If the content of this field is not in the defined format, then the receiving engine will ignore it.

Protocol Data The body of the message contains the operation requests or responses with appropriate fields encoded using concepts defined in the Common Gateway Interface and the URL encoding scheme. The Head carries message start information, while the tail contains checksum data to enable the receiving engine to detect message modification.

Attachments This facility can be used to pass files between workflow engines.

This latest version of I/F4 has been published at the W*f*MC web-site (www.wfmc.org). It includes mechanisms for recovery from lost, damaged, duplicated, and re-ordered messages, clarification and a more rigorous definition of message structures, data fields, and data types. It also includes an explanation of interoperability contracts which are the administrative agreements that must be set up in advance in order to enable secure and meaningful inter-operation among co-operating workflow systems

Conformance

The W*f*MC has identified the different models of interoperability. Examples include SIMPLE CHAINED PROCESSES where an activity is passed from one engine to another; and NESTED SUB-PROCESS where an activity is passed from one engine to another, and then, when completed, the activity is passed back to the original.

Simple Chains

The simple chain conformance profile allows one workflow engine to create a process instance on another according to a known process definition, causing the enactment of the process instance on the second engine.
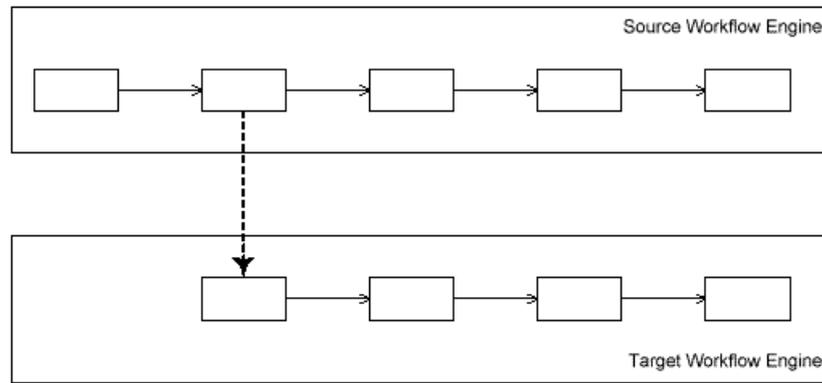
The simple chain conformance profile is typified by the ability of one workflow engine to:

- ➢ Create a process instance on another according to a known process definition;
- ➢ Instantiate a process instance created on another given the appropriate process identifier and permissions;
- ➢ Cause enactment of an identified, instantiated process instance on another workflow engine.

Nested Sub-Process
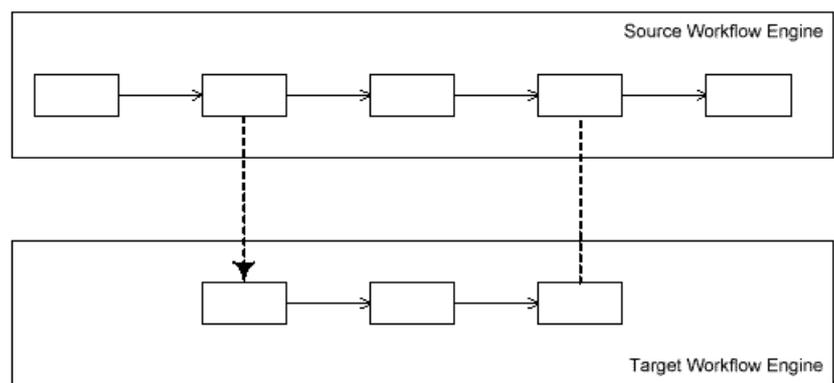
The Nested sub-process is characterised by the ability of

- ➢ One workflow engine to create a process instance on another engine according to a known process definition;

> ➢ One workflow engine to instantiate a process instance created on another engine given the appropriate process identifier and permissions;
> ➢ The source workflow engine to know when the sub-process has completed and optionally to take back resulting attribute values to be used in the ongoing enactment of the parent process instance.

More complex interoperability scenarios are under discussion within the WfMC. These will be published in due course. However the experience to be gain from actually operating these two scenarios commercially will help the future definition work.

WfMC I/F4 supports transactions across trading boundaries, which operate between workflow applications, enacted on different workflow engines. These co-operating workflow engines may be within the same organisation or they may be external. In any case the owner or operator of each participating workflow engine must agree to service conditions with the partners before the whole process chain can be used. In addition to conformance to the agreed process definition, participants must agree to the following.

> ➢ The conformance profile required to effect interoperability
> ➢ Enactment requirements.
> ➢ Access rights (readable/writable)
> ➢ Value constraints
> ➢ Audit data policy
> ➢ Change control policy
> ➢ Security policy and implementation
> > ➢ Authentication
> > ➢ Support for policy on non-repudiation
> > ➢ Handling security breaches
> ➢ Exception handling/recovery protocols & transactional behavior

This is not an exhaustive list. More details can be found on the WfMC web-site, but even that may not be complete. It is likely that each workflow activity chain will agree on a specific list prior to enactment. Industry Trade Associations and Regulatory Authorities have a major role to play because they can provide to provide industry specific 'best practice.'

WfMC interface 4 uses MIME that is of course an e-mail standard. Therefore the Interface supports messages actually coming by e-mail. The architecture of e-mail based interoperability is shown below

Workflow Engine A — workflow client — WfMC if4 binding — Mail Client — sendmail — mailbox
interoperability interface

Workflow Engine B — workflow client — WfMC if4 binding — Mail Client — sendmail — mailbox
interoperability interface
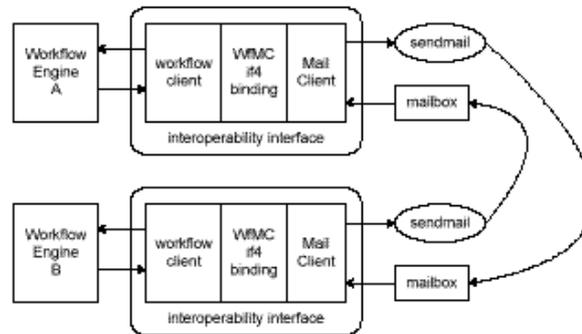
The Future

The Current version (1.1) of WfMC Interface 4 provides the first base of workflow interoperability. As Workflow Engines get deployed to support E-Commerce, new requirements will become evident, and the WfMC is committed to providing the definitions and specifications that are required.

Recovery Procedures

In a supply chain, there might be five organisations participating. A workflow activity instance might be sent from Point 2 to Point 3 and fail to start its work. The WfMC is working on how to recover that activity

Audit

In a similar way, it is necessary to monitor what is happening up and down the supply chain. The WfMC has set up a specialist team to determine management controls and audit information for automated supply chains.

Process interoperability modelling

The current WfMC I/F4 specification does not help users to model process interoperability. Process modelling is not really a part of I/F4. It is defined in WfMC I/F1, which defines the Workflow Process Definition Language. Having recently published a Definition for Process Definition Exchange, a WfMC

Group is turning their attention to process operating across heterogeneous workflow environments.