Object Management Group

First Needham Place
250 First Avenue, Suite 100
Needham, MA 02494

Telephone: +1-781-444-0404
Facsimile: +1-781-444-0320

Business Process Definition Metamodel

Request For Proposal

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Letters of Intent due: June 16, 2003
Submissions due: August 18, 2003

Objective of this RFP

This Request For Proposals solicits submissions that specify a business process definition metamodel, which is platform independent with respect to specific business process definition languages. This metamodel will define an abstract language for specification of executable business processes that execute within an enterprise (with or without human involvement); and may collaborate between otherwise-independent business processes executing in different business units or enterprises.

The specification developed in response to this RFP is expected to achieve the following:

- A common metamodel to unify the diverse business process definition graphical and textual notations that exist in the industry
- A metamodel that complements existing UML metamodels so that business processes specifications can be part of complete system specifications to assure consistency and completeness

- The ability to integrate process models for workflow management processes, automated business processes, and collaborations between business units.
- Support for the specification of choreography, describing the collaboration between participating business entities using lightweight collaboration mechanisms (e.g. Webservices); and the ability to reconcile the choreography with supporting internal business processes.
- The ability to exchange business process specifications between modeling tools, and between tools and execution environments using XMI.

Adoption of this specification will improve communication between modelers, including between business and software modelers, provide flexible selection of tools and execution environments, and promote the development of more specialized tools for the analysis and design of processes.

For more details, see Section 6 of this document.

Sections 1-5 are OMG boilerplate and are omitted from this draft.

6.0 Specific Requirements on Proposals

This section provides the information specific to this RFP.

6.1 Problem Statement

Workflow management systems were developed many years ago to use the computer to coordinate the activities of clerical personnel and eliminate the handling of paper. For the most part, the applications of these systems have been limited in scope to particular business functions. The development of on-line sales over the Internet created demand for faster response to customer requests, necessitating increased automation and development of systems that act on individual requests rather than periodic batches. The emergence of web services technology has further emphasized the need for automation and event-driven systems, along with a greater degree of integration of applications and human participation across the enterprise. The rapid pace of change in business and technology has increased the need for flexibility in business processes and continuous business process improvement. Business process automation is a key element in this integration, adaptation and streamlining of business operations.

6.1.1 A Standard for Business Process Definition

This RFP calls for a standard metamodel for business process definition, i.e., a specification of the modeling elements and their relationships used to define an automated business process and its relationships to other automated business processes, their participants and artifacts. Appendix B provides illustrative examples of business processes, and Appendix C provides examples of selection criteria for process resources such as human participants or supporting facilities.

A standard metamodel for business process definition will provide modelers with common modeling concepts, structure and semantics and the ability to exchange models between different modeling tools and execution environments. This will increase the communication between modelers, including between business and software modelers, provide flexible selection of tools and execution environments, and promote the development of more specialized tools for the analysis and design of processes. Basing a business process definition metamodel on UML will leverage the body of community knowledge already developed for UML. It will also enable the development of integrated system models that include robust process specifications.

Web services, engaging application-to-application interactions, have increased the importance and the requirements of standard business process definitions. These developments have increased the need to integrate and continuously improve business processes across the enterprise. In addition, web services require shared specifications for the exchange of data between participating business entities. The exposure of business processes to the Internet and potentially ad hoc business relationships makes careful crafting and analysis of business processes crucial.

6.1.2 Business Process Concepts

A business process consists of one or more related activities that together respond to a business requirement for action. A process defines the results to be achieved, the context of the activities, the relationships between the activities, and the interactions with other processes and resources. Activities are units of work that typically commit when completed, i.e., they are recoverable at the point of completion. At runtime, a business process definition may have multiple instantiations, each operating independently of the other (except as they may compete for the same resources), and each instantiation may have multiple activities that are concurrently active.

Business process definitions are expected to be executable in run-time environments either directly or through compilation. In general, instances of a process, its current state and the history of its actions will be visible at run time and expressed in terms of the business process definition so that users can determine the status of business activities and business specialists can monitor the activity and identify potential improvements to the business process definition.

A business process is executed by a computer or cooperating distributed computers within a business system domain—an integrated set of computers and applications that are managed by a single business unit and are recoverable to a consistent state. A business process activity may invoke another business process in the same or a different business system domain. A business process may receive events that alter the state of the process and the sequence of activities. A business process may produce events for input to other systems or processes. A business process may also invoke applications to perform computational functions, and it may post assignments to human work lists to request actions by humans. All these relationships must be modeled by a business process definition.

Business processes often involve the assignment of resources, such as human participants, facilities or materials. Resources to be assigned to a managed process are specified by selection criteria to be applied to a defined source of resources. This may be, for example, people in an organization, facilities on a campus or materials in an inventory. The specification of facilities to manage such resources is beyond the scope of this specification.

6.1.3 Collaboration between Business Processes

At the same time, collaboration may be required between otherwise independent business processes. Typically, different organizations may work in parallel to reduce the duration of a larger undertaking, but successful completion requires that they collaborate through exchange of information at various points in their processes in order to achieve compatible results. The specifications for the exchanges and relevant data of the participating business functions will be referred to as "choreography."

Business process collaborations may occur within an enterprise or between enterprises. When they occur between enterprises, it is more important that they be formalized and robust. The choreography must clearly define what each participant is expected to do as the collaboration progresses, and the consequences if they fail to meet expectations or the communication between them breaks down. Thus, choreography specifications will be particularly important for more complex business exchanges using web services technology.

Choreography is not executed like other business processes. It is accomplished through the independent actions of the participants. The specification of choreography in a business process definition model expresses requirements for the supporting business processes. Generally the modeler will only be concerned with the supporting business process of one participant, but a model could include specifications for business processes of multiple participants. In general, the choreography will describe the states and state transitions of participants as perceived by the other participants, and the messages exchanged as a result of state transitions. A perceived state transition may actually involve a number of actions and state transitions internal to the participant, performed by its internal, executable business processes.

For example, a choreography might specify the exchange of messages between two entities to perform the purchase of a product and arrange for payment and shipping. An internal executable business process might implement the order processing of the seller to cause the order to

be validated, payment terms to be accepted, the product to be produced, packaged and shipped, and the invoice to be generated. The negotiation of payment terms could involve another collaboration with a financial institution, and shipment might involve collaboration with a transportation carrier.

A collaboration will be implemented by activities within the executable processes of participants. For example, the choreography may define (1) a buyer sends an order, (2) the seller responds with a quote for price and delivery date or rejection if the order cannot be filled, and (3) the buyer responds with an acceptance or rejection of the quote. Within the seller, the order is received by an activity in the seller's internal process. The activity may then cause other activities and potentially sub-processes to take appropriate action on the order. When the seller's process has determined that the order is acceptable and assigned a price and delivery date, another activity will send a response message. The sending activity is then complete and may cause another activity to wait for the buyer's acceptance of the price and date.

A collaborative process may involve multiple participating entities described as having different roles. A participating entity may perform more than one role, but these will typically represent different business function responsibilities within the entity. So an entity might have the role of both seller and creditor. Generally, the assignment of entities to roles will occur when the collaboration is initiated, but with multiple participants, assignments to some roles might be deferred.

6.1.4 Business Process Patterns

Business processes can involve patterns of activity that are not easily modeled with current application process modeling techniques. The following paragraphs provide examples of some business process patterns to be considered in providing a robust solution. The examples in Appendix B may also provide insights on required process modeling capabilities.

6.1.4.1 Multiple inputs

A process may depend upon multiple inputs. Each input may require processing by different activities. Any of the alternative inputs might be received first, and initial processing of one input is not dependent on completion of processing of the other, i.e., the receiving activities could be concurrent. For example, an invoice may be received by an accounting activity and notice of receipt of a shipment may also be received by the

accounting activity for the same shipment. Either the invoice or the notice of receipt may be received first, and initial processing of either may occur without waiting for the other.

6.1.4.2 Multiple subsequent activities

When an activity completes, there may be more than one subsequent activity. It may be appropriate for all of these activities to be performed concurrently, or for their execution to be conditional so that less than all are executed. For example (see Figure 2, below) a review activity might result in asking for a modification of a document resulting in a notice and a return to the modification step. In the alternative, if the document passes the review, only the publish activity would be activated. Finally, if the document were rejected, then only the rejection notification activity would be performed.

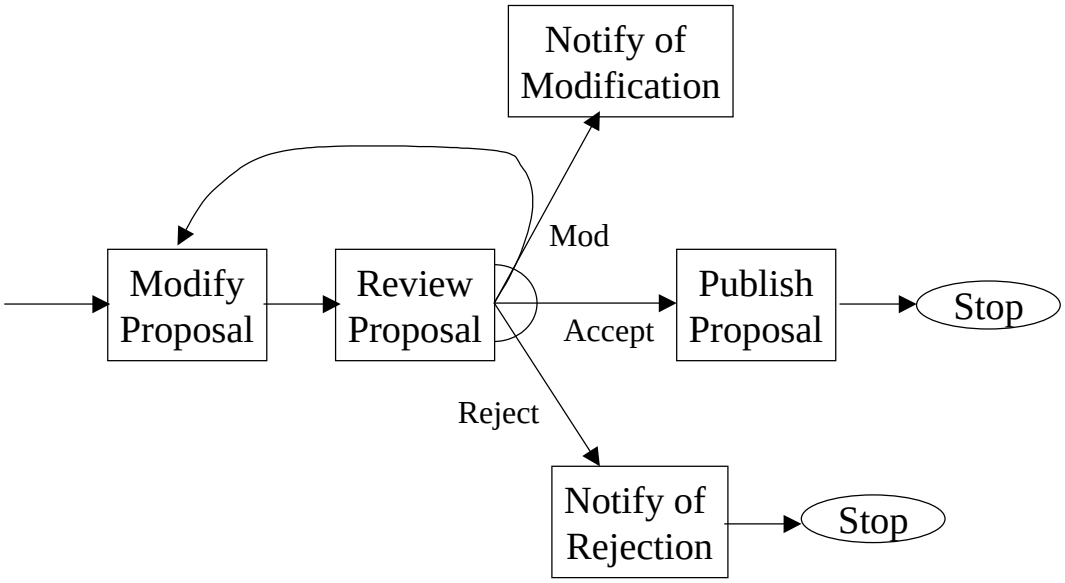

Figure 2, Document Review Process

More detail about this example can be found in bom/00-01-05.

6.1.4.3 Multiple resources for the same role

In the above example, the Modify Proposal activity may be performed more than once as a result of the review. It is possible that each modification could be assigned to a new resource. Thus another resource would be assigned to the same activity and role within a process instance. In this case, only one resource at a time would be assigned to the role.

It is also possible that an activity could be performed by a team, so that multiple resources could be concurrently assigned to the same role. This would give all such resources the same responsibility and authority, so that any of the resources could perform the work or report the result.

Further information is provided through examples in Appendix B.

6.2 Scope of Proposals Sought

This section describes the scope of proposals sought by this RFP. Specific requirements are set forth in Section 6.5, 6.6 and 6.7, below.

6.2.1 Business Process Definition metamodel

Proposals are expected to provide a metamodel that refers to, or incorporates subsets from, a selection of metamodels contained in the following specifications: “UML Profile for EDOC”, “Meta Object Facility” (MOF) and “Unified Modeling Language” (UML). The Object Constraint Language (OCL) is part of UML. Extensions to these metamodels must be consistent and not redundant.

This RFP is not requesting a notation since the goal is to provide a basis for unification of existing notations. A non-normative notation would be valuable for providing illustrations and examples. It would be desirable for existing UML tools to be able to express and operate on aspects of business process definitions that are compatible with existing UML models and notation.

The business process metamodel will be translatable to notations and process implementations. Existing tools provide a variety of textual notations and graphical representations. This RFP does not attempt to resolve these differences in notation, but is intended to provide a common underlying metamodel that represents the concepts, process semantics and relationships that are inherent in a process specification. This allows for continued development of notation and graphical techniques to support process definition activities. Furthermore, the

model is not to be designed for a specific execution platform or environment—the model is expected to be platform independent. Definitions should express the intent a modeler has for runtime behavior, rather than the means by which that behavior is realized. Implementers may continue to explore new performance and reliability enhancements to process implementations.

6.2.2 Runtime Implications of Process Definitions

Definitions of managed processes will include specifications that affect the manner in which the process is executed. The following paragraphs describe runtime aspects that should be addressed.

6.2.2.1 Creating process instances

Process instances are created from process definitions at execution time. Process definitions may define constraints on when a process instance can be created based on time and date, the content of a request, or the state of the system at the time of the request.

The process definition may specify requirements for initialization of the process such as initialization of variables and instantiation of associated objects.

6.2.2.2 Control of execution behavior

a) The process definition may specify the method and scope of propagation of process state change, such as whether pausing a process pauses the current activity being executed or allows it to finish.

b) Process definitions may specify execution constraints or characteristics such as maximum duration, predicted start time, the inability to pause or interrupt a process, or the ability to rollback execution to an earlier activity in the flow.

6.2.2.3 Control of Process Termination

a) Completion of a process may be determined by specified conditions.

b) Actions may be specified to be performed at the completion or abnormal termination of a process. In particular, specialized activities or processes may be initiated to compensate for the effects of completed activities in a failed process.

c) The effect of abnormally terminating a process on its active activities and invoked processes may be specified.

d) The effect of termination on process variables may be specified.

e) The result returned to a requester at process termination may be specified.

6.2.2.4 Event Publication

A process or activities within a process may issue events to enable external actions to be initiated or progress of the process to be monitored. A process definition may specify events to be posted to a publish and subscribe facility, including parameters that would be provided in the event publication.

6.2.2.5 Event Subscription

An activity within a process may be initiated or allowed to proceed by the receipt of an event. The process definition may specify parameters for the event subscription and criteria for acceptance of an event.

6.2.2.6 Audit Log Generation

Business processes typically generate logs of events and actions that occur in the execution of the process. This provides information for audit and for performance analysis. The process definition may include specifications for the generation of audit log records.

a) The process definition may specify which audit events are produced.

b) The process definition may specify the data to be included in a log record.

6.2.2.7 Resource Assignments

A process definition will specify the criteria by which resources are to be selected, but the process definition will not define how the resource assignment is actually accomplished. Selection criteria may include

a) A specific resource identifier (e.g., a person's name)

b) A conditional expression to be applied to attributes of a resource

c) Dependencies on resource assignments for other activities in the same process including dependencies on relationships between resources.

The process definition may specify policies regarding when a resource is assigned and when released. It may also specify the effect of removing a resource as where a replacement resource is assigned and the process is required restart from an earlier activity.

6.2.2.8 Access Control

A business process definition is not expected to provide specification of security access controls. However, a business process definition does define the criteria by which resources are selected as participants. These assignments should provide a basis for control of access to the process instance and its artifacts. For example, where an individual normally may not have access to certain business records, they may have access to specific instances of records as a result of their assignment in a particular process instance. Furthermore, the authority of a participant may change as the process progresses.

Business process access controls should complement not replace access control specifications applicable to other systems and applications.

6.2.2.9 Subject Matter

A business process typically will operate on objects representing the subject matter of the activity such as a purchase order or product specification. The business process may create such objects, it may be given references to such objects in parameters or return values, or it may retrieve such objects based on selection criteria that it receives or computes. The specification of these objects is outside the scope of the business process definition metamodel specification, per se, but specifications for such objects will typically be incorporated into a process definition by reference to support business process operations on the subject matter objects.

6.2.3 Asynchronous, concurrent process execution

Instances of processes are expected to execute independently of each other and to be capable of concurrent processing. A process that invokes another process may proceed with other concurrent activities while waiting for the invoked process to complete, and a process that is

completed is expected to commit to its completed state and be recoverable to that state.

6.2.4 Business Process Abstraction

The business process metamodel should enable the development of business process definitions starting with a simplified process abstraction and then extending this process definition with details to define a robust specification while preserving the ability to view the abstraction.

6.2.5 Choreography

Proposals should address the need to specify the choreography of collaborations between business processes (see 6.1.3). The model should facilitate validation of compliance of a business process or related business processes with the associated choreography.

While the primary driver of choreography specifications is the specification of inter-enterprise web services collaborations, the same concepts should be applicable to choreography of interactions between business processes within an enterprise.

6.2.6 Process State

The state of subject matter objects and process variables may be shared by the activities of a process. However, for a collaboration between processes, the state of the collaboration and subject matter must be maintained by each of the participants. In order to maintain consistency among the participants, relevant changes of state, along with other information affecting the flow of control, must be exchanged in the messages between participants.

Consequently, while each participant internally may use a different representation of the same subject matter, a choreography must specify the content, semantics and format of the messages to be exchanged as well as the state of the participants with respect to the collaboration. Details of the message format specifications are beyond the scope of this specification, but this specification should define the essential elements of message content and must provide for incorporation of message format specifications by reference. Note that messages may contain both data that is relevant to the state of the collaboration and data that is specific to the particular transaction and thus not specified for the choreography.

6.2.7 Initiation of Activities

The sequence of execution of activities may be defined in different ways. In some cases, the initiation of an activity will be expressed in terms of the completion of one or more preceding activities. In other cases, the initiation of an activity may be expressed in terms of the state of one or more variables. In still other cases, an activity may be initiated by the receipt of a message or request (e.g., an event or a message in a collaborative process). It should be possible to express all such forms of activity initiation.

6.2.8 Activity atomicity

Activity atomicity distinguishes business processes from other computational processes. Activities are units of work that are committed when they are completed so that the containing process is recoverable to that state. Activities are initiated based on committed state, so that an activity does not depend on the un-committed state of another activity. An activity may invoke applications or other processes. Invocation of an application may be synchronous, so that it is completed before the activity commits, or asynchronous so that the request for the application is committed when the activity commits.

6.2.9 Types of Performers

A process definition will involve specification of work to be done by different kinds of performers. For example, the activity may be performed by another business process, it may be performed by a computer application, it may be performed by a human, or it may be performed by a human using a computer application.

These different types of performers will require the specification of different forms of interface. Human performers typically will have work lists—some form of mechanism that identifies outstanding assignments. An application may have an API. A sub-process will have process parameters and return values.

6.2.10 Support for Simulation

Proposals may include support for simulation such as the specification of data that describes parameters or characteristics of the process execution. For example, process definitions might include expected activity duration, maximum activity duration, expected process duration, maximum process duration, expected branch activation probability, etc.

6.3 Relationship to Existing OMG Specifications

Proposals are expected to be consistent with, extend or, possibly, override the following specifications. In each case, the most recent version is applicable unless the most recent version was adopted less than three months before the final submission to this RFP.

- *OMG Workflow Management Facility* - Original Specification: bom/98-06-07 plus Errata bom/98-07-15. RTF 1.2 report: dtc/99-07-04 and IDL dtc/99-07-06. Convenience document, dtc/99-07-05. Proposals are expected to support implementations that are compatible with this existing specification for execution interfaces.

- *Unified Modeling Language (UML) Specification* (formal/01-09-67) - The business process definition metamodel should incorporate a subset of UML and extend it only as necessary. This would include *UML 1.4 with Action Semantics,* ptc/02-01-09. The specification should be limited to extensions that are needed in the domain of business modeling and avoid adding to generic UML modeling concepts.

- *Meta Object Facility Specification* (ptc/02/04/03) - It should be possible to store a process definition in a MOF repository, access it through MOF programming interfaces and exchange it with the repository using XMI.

- *XML Metadata Interchange (XMI) Specification version 1.1* (ptc/02-06-03) - It should be possible to exchange process definition specifications in XMI format.

- *Party Management Facility* (finance/98-12-09) - This specification involves the specification of roles with respect to parties to a contract or agreement. This may influence the approach to assignments of resources in a business process.

- *PDM Enablers* (formal/2000-11-11) especially PdmFoundation, PdmChangeManagement and PdmManufacturingImplementation. This specification involves specification of personnel resources associated with product specifications.

- *Organizational Structure Facility* (dtc/01-09-01) - Personnel resources should be assigned recognizing the concepts specified in the Organizational Structure Facility for such factors as the organizational relationships and job codes.

- *UML Profile for Event-based Architectures in Enterprise Application Integration* (EAI) (ad/02-03-07) - Enterprise Application Integration (EAI) involves the asynchronous exchange of data between

applications. Aspects of this may affect communications between business processes and between business processes and other applications.

- *UML Profile for Enterprise Distributed Object Computing* (EDOC) (ptc/02-02-05) - The UML Profile for EDOC includes a basic representation of process elements to support process composition as components, but it does not provide details such as activity types, enactment, specification of parameters, and resource selection criteria (Section 3.18 of ptc/02-02-05). The Business Process Definition Metamodel specification should complement and/or reuse the concepts contained in the EDOC specifications to provide a robust specification of processes

- *Software Process Engineering Metamodel* (ptc/02-05-04) – This specification defines a metamodel for specification of software development processes. Submitters should incorporate similar model elements where appropriate.

For more information see http://www.omg.org/schedule and http://www.omg.org/technology/documents/spec_catalog.htm.

6.4 Related Activities, Documents and Standards

These references are provided for reference to relevant industry specifications, but consistency with these specifications is only encouraged.

6.4.1 The Workflow Management Coalition (www.wfmc.org) has published the following specifications related to this RFP:

- Workflow Reference Model : WfMC-TC-1003, provides a general architecture for workflow management systems.

- Terminology & Glossary : WfMC-TC-1011, provides definitions for terms commonly used in discussions of workflow management.

- Workflow Process Definition Interchange : WfMC-TC-1016

- Resource Model : WfMC-TC-1020

- Process Definition Attributes List : WfMC-TC-1024

- XML Process Definition Language (XPDL): WfMC-TC-1-25.

6.4.2 The following are other non-OMG specifications that are relevant to this RFP:

- Business Process Execution Language for Web Services (BPEL4WS) is a leading proposed textual notation for specification of web services processes. http://dev2dev.bea.com/techtrack/BPEL4WS.jsp http://www-106.ibm.com/developerworks/library/ws-bpel/ http://msdn.microsoft.com/library/default.asp?url=/library/en-us/dnbiz2k2/html/bpel1-0.asp

- Business Process Modeling Language (BPML) is a proposed business process definition textual notation. http://www.bpmi.org/bpml.esp

- Web Services Definition Language (WSDL) defines specifications for the interfaces of web services that will participate in collaborative business processes. http://www.w3.org/TR/wsdl

- Web Services Conversation Language (WSCL) provides for specification of web services collaborations. http://www.w3.org/TR/wscl10/

- Web Services Choreography Interface (WSCI)complements WSDL with to provide for specification of the exchange of data through web services interfaces. http://dev2dev.bea.com/techtrack/wsci.jsp

- Business Process Specification Schema (BPSS) defines a framework for the specification of exchange of documents for web services. http://www.geocities.com/ebtwg_bp/2002/ebBPSS1.05.pdf.zip

6.4.3 The following OMG technology processes which are currently underway, address concerns related to this RFP (see more details at http://www.omg.org/techprocess/meetings/schedule/index.html). Submissions should address their relationship to these efforts:

- UML 2.0 Infrastructure and Superstructure

  Submitters should be aware that the design of the UML metamodel may change in UML 2.0, in particular the relation between State Machines and Activity Modeling.

- UML 2.0 Object Constraint Language (OCL)

  Submitters should be aware that a metamodel for OCL will be defined in UML 2.0 and that this may relate to conditional expressions for process definitions.

- Business Process Runtime Interfaces

The desired goal is for business process definitions to be compatible with this platform independent model of business process execution.

- MOF 2.0 Versioning

  The resulting specification should be compatible with MOF and submitters should be aware of the development of this new version.

- MOF 2.0 Query / View / Transformation

  To the extent the resulting specification relies on or supports alternative views of the metamodel, submitters should be aware of these general capabilities being defined for MOF models.

- Business Rules

  Work on modeling business rules is in the early stages. This work and the relationship of business rules to business processes should be considered in the development of this specification.

6.5 Mandatory Requirements

Background material to the following sections can be found in 6.1 and 6.2.

6.5.1 Required Metamodel

Responses to this RFP shall provide a metamodel forming an abstract language for the expression of business process definitions.

Proposals shall depict the solicited metamodel using UML.

6.5.2 Metamodel Compatibility

Proposals shall use the appropriate elements of existing metamodels including, UML, EDOC, MOF and OCL.

6.5.3 MOF Compliance

The resulting metamodel shall be MOF-compliant.

6.5.4 Procedural and rule-based flow of control

Proposals shall provide for specification of process flow based on control flow from completed activities to activities to be initiated as well as initiation of activities based on rules or pre-conditions.

6.5.5 Specification of Activity Performers

Proposals shall provide for the specification of selection criteria for performers and resources, including human performers, applications, passive resources and sub-processes.,

The basis for selection shall include

a) Specific resource identity

b) Resource attributes

c) Relationships with other assigned resources

d) Relationships to subject matter

e) Combinations of the above.

6.5.6 Asynchronous and Concurrent Execution

Proposals shall provide mechanisms for specifying concurrent execution of activities:

a) A process model shall be able to define when multiple, concurrent activities are initiated.

b) A process model shall be able to define when an activity or completion of a process depend on the completion of multiple, concurrent activities. This shall include initiation of an activity based on completion of *n* of *m* concurrent activities (where *n* <= *m*).

c) Business processes shall be able to invoke processes that execute asynchronously.

d) The model shall support specification of the publication of events and messages for asynchronous delivery.

e) The model shall support receipt of messages from a collaborator and subscription to events. Messages and events shall be received as asynchronous inputs to a receiving activity executing concurrently with other activities in the process.

6.5.7 Specification of initiation and termination

Proposals shall provide modeling constructs for specifying when and how activities and processes can be initiated and terminated:

a) Pre or post conditions

b) Actions for initialization and termination with consideration of actions required for abnormal termination, including the initiation of compensating processes.

c) Propagation of termination to active activities and sub-processes.

6.5.8 Choreography

Proposals shall provide for the specification of the signals and exchanges performed between processes to achieve collaboration as described in 6.2.5.

6.5.9 Audit Log Generation

Proposals shall include provisions in the metamodel to allow the specification of business logic related audit log records. This part of the metamodel shall provide for the specification of:

a) The content of the log record in relation to the process definition

b) The timing of the log record emission

6.5.10 Distributed Execution

Proposals shall ensure that the form of definition does not preclude distributed execution.

6.5.11 Process Definition import and export

Proposals shall support XMI export and import for exchange of process definitions.

6.5.12 Non-Normative Notation Mappings

As a proof of concept, proposals shall provide non-normative mappings to two recognized business process modeling languages, e.g.:

- BPEL4WS
- XPDL

(See section 6.4 for a non-exclusive list of references to relevant specifications)

6.5.13 Compatible Versions of Existing Specifications

The final, revised submission shall be based on the most recently adopted version of related specifications (e.g., UML and MOF) that is adopted three months prior to the final revised submission deadline for this RFP.

6.6 Optional Requirements

The following requirements would enhance the value of a specification but are not mandatory.

6.6.1 Additional Non-Normative Mappings

Proposals may provide additional mappings to recognized languages for business process definition, complementing the list of mandatory mappings requested in 6.5.12.

6.6.2 Additional Execution Constraints

Proposals may provide for the ability to model additional execution constraints, like maximum duration of a process or activity execution. For these additional constraints the behavior of constraint violation should be modeled and its affect on the process enactment described.

6.7 Issues to be discussed

These issues will be considered during submission evaluation. They should not be part of the proposed normative specification. (Place them in Part I of the submission.)

6.7.1 Relationship to existing UML metamodel

Proposals shall discuss the relationship of model elements used for business process modeling to the existing UML metamodel to demonstrate consistency with the UML metamodel.

6.7.2 Relationship to Related UML Profiles, Metamodels and Notations

Proposals shall discuss how business process definitions may be incorporated with or complement other UML profiles, metamodels and notations for specification of business systems, particularly the UML Profile for EDOC.

6.7.3 Mapping to Existing Business Process notations and UML Notation

Proposals shall discuss how the proposed metamodel may be mapped to existing process definition notations as a demonstration of completeness and compatibility.

6.7.4 Resource Model

Proposals shall describe assumptions regarding an associated resource model.

6.7.5 Relationships with related OMG specification activities.

Proposals shall discuss how the specifications relate to the specification development efforts currently under way as noted in Section 6.4.3.

6.7.6 Consistency checks

Proposals shall discuss how the specification supports consistency checks, particularly between choreography specifications and a business process that participates in the choreography.

6.7.7 Access Control

Proposals shall discuss how access authorization for process data, artifacts, activities in a process, and process enactment may be based on process roles of individuals associated with a specific process instance.

6.7.8 Web services and collaboration support

Proposals shall discuss how the specification supports the definition of business processes and choreography for web services and other collaborations including the relationships with messages, documents, interface specifications, participant roles, signatures and message exchanges.

6.8 Evaluation Criteria

Proposals will be evaluated against the mandatory and optional requirements, above, the explanations requested under issues to be discussed, and the extent to which they address the business needs as described in sections 6.1 and the scope as described in section 6.2.

Eavluation will be based on (but not limited to) the following list of criteria:

- Quality of expression provided by the metamodel
- Completeness of mandatory and optional mappings
- Ability to translate from one business process definition language to another one using the metamodel as an intermediate form.

6.9 Other information unique to this RFP

Not applicable.

6.10 RFP Timetable

The timetable for this RFP is given below. Note that the TF may, in certain circumstances, extend deadlines while the RFP is running, or may elect to have more than one revised submission step. The latest timetable can always be found in the Member Services section of OMG's Web page (URL http://www.omg.org/)

Approx Day	**Event or** *Activity*	**Actual Date**
	Preparation of RFP by TF	
	Approval of RFP by Architecture Board *Review by TC ("Three week rule")*	
0	*TC votes to issue RFP*	*January 31, 2003*
60	*LOI to submit to RFP due*	*June 16, 2003*
120	*Initial submissions due*	*August 18, 2003*
134	*Voter registration closes*	*August 25, 2003*
141	*Initial submission presentations*	*September 8, 2003*
	Preliminary evaluation by TF	*September, 2003*
240	*Revised submissions due*	*January, 2004*
261	*Revised submission presentations*	*January, 2004, meeting*

	Final evaluation and selection by TF *Recommendation to AB and TC*	*March, 2004, meeting*
	Approval by Architecture Board *Review by TC ("Three week rule")*	*March, 2004*
330	*TC votes to* recommend specifications	*March, 2004*
360	*BOD votes to adopt specifications*	*May, 2004*

Appendix A References and Glossary

A.1 References

The following documents are referenced in this document:

[BCQ] OMG Board of Directors Business Committee Questionnaire, *http://www.omg.org/cgi-bin/doc?bc/02-02-01*

[EDOC] UML Profile for EDOC Specification, *http://www.omg.org/techprocess/meetings/schedule/UML_Profile_for_EDOC_FTF.html*

[FORMS] Download of OMG templates and forms, *http://www.omg.org/technology/template_download.htm*

[Guide] The OMG Hitchhiker's Guide, Version 6.1, *http://www.omg.org/cgi-bin/doc?omg/2002-03-03*

[MDAa] OMG Architecture Board, "Model Driven Architecture - A Technical Perspective", *http://www.omg.org/mda/papers.htm*

[MDAb] "Developing in OMG's Model Driven Architecture (MDA)," *http://www.omg.org/cgi-bin/doc?omg/2001-12-01*

[MDAc] "MDA Guide" (to be published)

[MDAd] "MDA "The Architecture of Choice for a Changing World™"", *http://www.omg.org/mda*

[MOF] Meta Object Facility Specification, *http://www.omg.org/technology/documents/formal/mof.htm*

[OMA] "Object Management Architecture™", *http://www.omg.org/oma/*

[OTS] Transaction Service, *http://www.omg.org/technology/documents/formal/transaction_service.htm*

[P&P] Policies and Procedures of the OMG Technical Process, *http://www.omg.org/cgi-bin/doc?pp*

[RM-ODP] ISO / IEC 10746

[SEC] CORBA Security Service, http://www.omg.org/technology/documents/formal/security_service.htm

[TOS] Trading Object Service, http://www.omg.org/technology/documents/formal/trading_object_service.htm

[UML] Unified Modeling Language Specification, http://www.omg.org/technology/documents/formal/uml.htm

[UMLC] UML Profile for CORBA, http://www.omg.org/cgi-bin/doc?ptc/01-01-06

[UMLM] Chapter 6 of UML Profile for EDOC, http://www.omg.org/cgi-bin/doc?ptc/02-02-05

[XMI] XML Metadata Interchange Specification, http://www.omg.org/technology/documents/formal/xmi.htm

[XML / Value] XML Value Type Specification, http://www.omg.org/cgi-bin/doc?ptc/2001-04-04

These documents (and information about the OMG in general) can be obtained from the OMG's web site (http://www.omg.org/). Documents may also be obtained by contacting OMG at documents@omg.org. Questions related to the OMG's technology adoption process may be directed to omg-process@omg.org. General questions about this RFP may be sent to responses@omg.org.

A.2 Glossary

Architecture Board (AB) - The OMG plenary that is responsible for ensuring the technical merit and MDA-compliance of RFPs and their submissions.

Board of Directors (BoD) - The OMG body that is responsible for adopting technology.

Common Object Request Broker Architecture (CORBA) - An OMG distributed computing platform specification that is independent of implementation languages.

Common Warehouse Metamodel (CWM) - An OMG specification for data repository integration.

CORBA Component Model (CCM) - An OMG specification for an implementation language independent distributed component model.

Interface Definition Language (IDL) - An OMG and ISO standard language for specifying interfaces and associated data structures.

Letter of Intent (LOI) - A letter submitted to the OMG BoD's Business Committee signed by an officer of an organization signifying its intent to respond to the RFP and confirming the organization's willingness to comply with OMG's terms and conditions, and commercial availability requirements.

Mapping - Specification of a mechanism for transforming the elements of a model conforming to a particular metamodel into elements of another model that conforms to another (possibly the same) metamodel.

Metadata - Data that represents models. For example, a UML model; a CORBA object model expressed in IDL; and a relational database schema expressed using CWM.

Metamodel - A model of models.

Meta Object Facility (MOF) - An OMG standard, closely related to UML, that enables metadata management and language definition.

Model - A formal specification of the function, structure and / or behavior of an application or system.

Model Driven Architecture (MDA) - An approach to IT system specification that separates the specification of functionality from the specification of the implementation of that functionality on a specific technology platform.

Platform - A set of subsystems / technologies that provide a coherent set of functionality through interfaces and specified usage patterns that any subsystem that depends on the platform can use without concern for the details of how the functionality provided by the platform is implemented.

Platform Independent Model (PIM) - A model of a subsystem that contains no information specific to the platform, or the technology that is used to realize it.

Platform Specific Model (PSM) - A model of a subsystem that includes information about the specific technology that is used in the realization of it on a specific platform, and hence possibly contains elements that are specific to the platform.

Request for Information (RFI) - A general request to industry, academia, and any other interested parties to submit information about a particular technology area to one of the OMG's Technology Committee subgroups.

Request for Proposal (RFP) - A document requesting OMG members to submit proposals to the OMG's Technology Committee. Such proposals must be received by a certain deadline and are evaluated by the issuing task force.

Task Force (TF) - The OMG Technology Committee subgroup responsible for issuing a RFP and evaluating submission(s).

Technology Committee (TC) - The body responsible for recommending technologies for adoption to the BoD. There are two TCs in OMG – *Platform TC* (PTC), that focuses on IT and modeling infrastructure related standards; and *Domain TC* (DTC), that focus on domain specific standards.

Unified Modeling Language (UML) - An OMG standard language for specifying the structure and behavior of systems. The standard defines an abstract syntax and a graphical concrete syntax.

UML Profile - A standardized set of extensions and constraints that tailors UML to particular use.

XML Metadata Interchange (XMI) - An OMG standard that facilitates interchange of models via XML documents.

Appendix B Examples of Business Processes

This appendix provides examples of business processes to illustrate the capabilities of process definitions that a submission should be able to support. The list is by no means complete or exhaustive. All of the processes represented are based on real production processes. For the purposes of this RFP the essential or unique characteristics of each process is presented, rather than the full description.

B.1 Employee Expense Reimbursement (EER) Process

This process provides for reimbursement of expenses incurred by employees for the company. For example buying a technical book, office supplies or software. In a normal day there are several hundreds of instances of this process created. Below is a graphical representation of the EER process.

The main rules of the process are

- Amounts under $200 are automatically approved.
- Amounts equal to or over $200 require approval of the supervisor.
- The reimbursement goes to the employee's direct deposit bank account.
- In case of rejection, the employee must receive a rejection notice by email.
- If no action has happened in 7 days, then the employee must receive an approval in progress email.
- If the request is not finished within 38 days, then the request is cancelled and the employee receives an email cancellation notice and must re-submit the expense report.

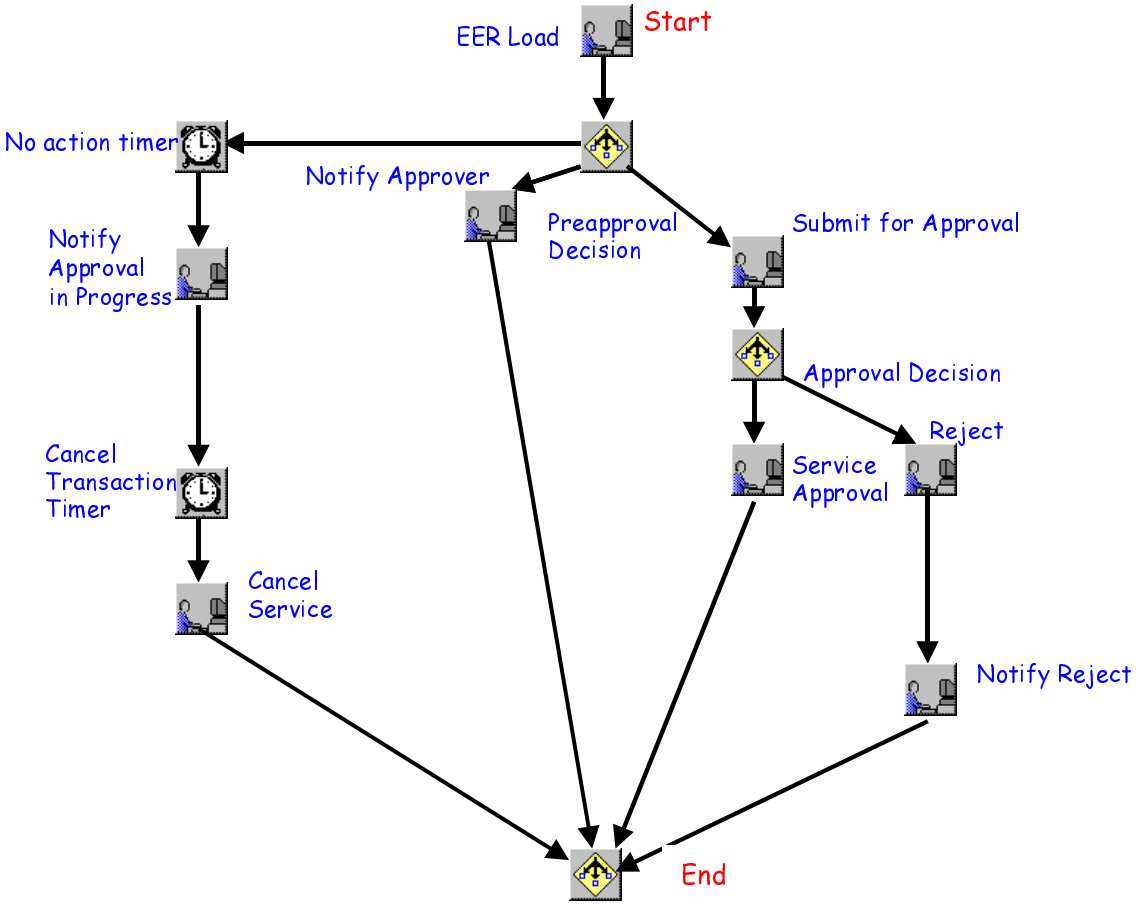

Figure 1, Employee Expense Reimbursement (EER) Process Graph

There are 3 types of nodes shown in the graphic: work nodes (person at computer icon), routing nodes (3 arrow icon), and timer node (clock icon). A work node represents a task performed by a human or application. A routing node indicates where the flow branches or combines. A timer node represents a waiting period or an absolute date. The process flow is indicated by arrows. There are many aspects of the process definition that do not appear in the graphical image. One important example of this is the rules that control the flow of the process at routing nodes. Another is the process data involved that is used by the workers, applications and rules.

There are two important characteristics in this example. The first is the time check path running in parallel to the basic approval path. Whichever path finishes first wins. This is the same as the test process in school; the test is done when the student has answered all the questions or when the test time is finished. The second is the branching with multiple outflows of which only some might be taken and multiple

inflows of which only some might be necessary to trigger the subsequent activity.

More detail about this process can be found in bom/00-01-06.

B.2 Airplane Design (AD) Process

This example centers on the design of an airplane. Design of an airplane means the selection of standard parts to assemble the interior of the airplane, not the aerodynamic aspects of the body and wings. There are two groups of people involved, the airplane designers and the standard part engineers. Each group has its own business processes.

The airplane designer works within the context of a process. In his work he discovers the need for a standard part within an activity in his process. That need is translated into a search process instance within the system of the standard part engineer group. A successful search returns an appropriate part specification to the plane design engineer activity.

An unsuccessful search results in a process for modification to a standard part being started in the standard part group system. Part of the modification process is to check the search conditions. The airplane designer might not have formulated the correct search because of the large number of parts and part categories. If no part is found with the reformulated search, then the process leads the standard parts group through a consideration of alternatives: whether to modify an existing part or to create a new standard part.

Whether a part is to be modified or a new part created, a process instance is started to develop a modified part. The process needs to take into account that not every standard part engineer can work on any standard part. To a certain extent this process definition is determined from a template at process instantiation time. The availability of a qualified engineer to create or modify the part is critical to the scheduling and enactment of the process instance. This schedule information is given back to the airplane designer for approval. If the new standard part cannot be designed in time then an alternate design is followed. In order to minimize lead time, concurrent processes may be initiated for alternative approaches.

One of the unique characteristics of this example is the messages or interactions that may occur between process instances. These exchanges might be described as a collaborative process. The collaboration is the basis for determining if one or more parallel processes is no longer justified based on the status or progress of other processes.

There are processes that define or complete the definition of other processes. There are complex resource qualification and assignment rules. The rules must take into account not only the skills and qualifications needed, but also the availability of the engineer in relation to the airplane schedule.

More detail about this example can be found in bom/98-02-14.

B.3 Trouble Ticket (TT) Process

The Trouble Ticket process covers quality assurance teams or customer support teams. A "bug" or "problem" is identified; it must be recorded; the record must be checked for accuracy; from a single instance of a problem, the underlying cause is identified; a resolution is identified, and the result must be communicated back to the original party with the problem identification.

This process contains a potential loop. If the resolution cannot be verified as successful, then the problem goes back to the resolution activity. Rework is quite common in processes, because the ability to verify if work was properly done might only be possible several activities later,

More detail about this example can be found in bom/98-02-09 and bom/98-07-13

Appendix C Resource Specification Examples

This appendix provides examples of resource selection criteria. A process definition will need to specify the resources it needs at various levels of abstraction. The specification of the resources can be viewed as a constraint expression.

The resource specification will (in the most general case) have two aspects. The first aspect of the specification consists of constraints associated with the instance enactment history such as a preference for the same person that worked on an earlier activity. The evaluation of these constraints will add to the second aspect of the resource expression. The second aspect consists of the characteristics of the resource needed. This part will be handed to a resource manager for identification of a resource.

The resources will usually be referenced as participants in roles. In this situation the term role is used in multiple ways. The first way is the role the resource plays via the assignment. Is the resource a performer or an artifact? A second way role is used is as an abstraction for a set of characteristics or capabilities. This might be a set of skills, an availability, a capability, an authority level, a location, etc.

A few example resource specifications of the kind that would appear in process definitions are included below. See bom/00-01-03 for more discussion and examples.

A person in organization position Z – a typical reference to a position in the organization structure, officer of the company, R&D manager, leader of project A

The manager of X, where X is initiator of process or some other participant – a typical reference into an organization structure that satisfies a relationship

Joe Smith – a direct reference

A mechanical engineer with skills in structural analysis and who is a registered Professional engineer in the state of Colorado – reference to a skill or capability set, often this information is not in the corporate organization structure

A master machinist and a 5 axis milling machine that can handle a part of 1m maximum dimension and 90 cm of stock (#12345A) and 5 diamond

tipped bits (#45-678) – a reference to a set of resources that come from several different resource models

The gear XXX CAD model to be changed and CAD models yyy, vvv and zzz as reference and context for the change – these references include roles that the information resources play during the process enactment