Semantic action

Service Oriented Architecture Information Model (SOA-IM)

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1.0 Introduction

Semantic integration is a key aspect of today's Service Oriented Architecture (SOA). Using the Federated Enterprise Reference Architecture [FERA], Semantion developed a set of Service Oriented Architecture (SOA) specifications needed to provide full SOA support from both a functional and an implementational point of view.

Semantion addresses SOA semantic integration providing two SOA specifications: SOA Information Model (SOA-IM) and SOA Collaboration Semantics (SOA-CS). SOA-IM can be stored in a standard registry like OASIS ebXML Registry and used to provide informational support for both context and content related to any business process. The SOA-IM is presented in a form of an XML document referred to as the Collaborative Process Information Document (CPID) that can be either created manually or generated from a business process definition using a modeling tool.

This document contains detailed definitions of SOA-IM entities and their associations. The CPID creation rules based on the OASIS ebXML Registry Information Model (RIM) [ebRIM] and OASIS ebXML Registry Services (RS) [ebRS] standard specifications are also presented.

2.0 SOA Information Model (IM)

SOA-IM enables information management of both context and content related to collaborative processes.

One-to-one and one-to-many relationships between SOA-IM entities are presented as they are and using Association entity as well. Many-to-many relationships are presented using the Association entity only. Association is explained in Section 2.1.7.

2.1 SOA Information Model Entities

This section covers all SOA-IM entities and their attributes.

2.1.1 Action

A consequence of an event taking place.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Action's name
description	String4000	Detailed description
event	String256	Event which this action relates to
referenceList	Set	A set of collaborative entity ids (references). The Set data type is a collection that does not contain duplicate elements.
type	String256	The type of the Action (Alert/Compensation/Information/Insertion/Link/Termination/Trigger Flow/End)

Associated with

- An Event where the Event is the target object and association type is "IsActionOf"

Parent: Event

2.1.2 ActiveInputs

This entity represents a list of active inputs that belong to a single collaborative entity (an activity or a decision).

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	ActiveInputs' name
description	String4000	Detailed description

Associated with

- An Activity where the Activity is the target object and association type is "AreActiveInputsOf " or
- A Decision where the Decision is the target object and association type is "AreActiveInputsOf "

Parent: Activity or Decision

2.1.3 Activity

A task or an operation performed by a federate or by a local SOA Federation agent.

Attribute	***Type***	***Description***
id	String256	Unique ID

name	String256	Activity's name
description	String4000	Detailed description
collaborativeProcessFlow	String256	CollaborativeProcessFlow's ID
stage	String256	Unique ID of the Stage entity associated with this Activity
resourceAssignmentType	String256	The resourceAssignmentType values can be: Agent, User, Service, Rule or Admin.
resourceAssignment	String256	An ID of the resource that will perform the activity or an ID of a rule or an administrator that will select a resource that will perform the activity. Either the rule or the administrator is used when more than one resource can perform the activity.
timeToComplete	String256	A period of time for which the activity must be completed. If the value for this attribute is not provided the time to complete is unlimited. The value for this attribute is specified using the XSD duration format (e.g., PT1H means one hour).

Associated with

- A CollaborativeProcessFlow where the CollaborativeProcessFlow is the target object and association type is "IsActivityIn".

Parent: CollaborativeProcessFlow

2.1.4 Agent

The Agent performs an activity or makes a decision or executes an event's action according to some predefined procedure or logic.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Agent's name
description	String4000	Detailed description
collaborativeEntity	String256	The ID of an activity or a decision or an event's action performed by the agent
activityStatus	String256	Agent activity status (Active/Inactive/Dormant)
locationType	String256	Agent location type (Fixed/Mobile)

processingType	String256	Agent processing type (Instant/Queue)
activityType	String256	Agent type (CART/Decision)
owner	String256	The ID of the owner (administrator) that registered the agent.
protocol	String256	The ID of the protocol (WSDL, CPPA, etc.) used to communicate with the agent.
modelReference	String256	The reference for the document that contains agent logic in the original agent modeling language format (UML, BPMN, text or other).
rule	String256	The ID of a Rule that the decision type agents will use in making a decision.
version	String16	Agent's version

Associated with

- An Activity where the Activity is the target object and association type is "IsAgentFor" or
- A Decision where the Decision is the target object and association type is "IsAgentFor" or
- An Action where the Action is the target object and association type is "IsAgentFor"

Parent: Activity or Decision or Action or Trigger

2.1.5 Application

The Application is a program running on a System or Device.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Application's name
description	String4000	Detailed description
type	String256	The type of the application.

Associated with

- An Activity or a Decision where the Activity or Decision is the target object and association type is "Support".
- A System or a Device where the System or Device is the target object and association type is "RunOn"

2.1.6 Argument

An argument used in a business rule.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Argument's name
description	String4000	Detailed description

Associated with

- A Rule(s) where the Rule is the target object and association type is "IsArgumentOf"

2.1.7 Association

Associates two SOA-IM entities. Association types can be dynamically defined. There is a pre-defined set of association types that includes all types used in this document.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Association's name
description	String4000	Detailed description
sourceObject	String256	Source object in the association
targetObject	String256	Target object in the association
type	String256	Association type (any type)

2.1.8 Audit

The Audit audits a communication between the SOA Federation components.

Attribute	***Type***	***Description***
source	String256	The information about a source component (Security Provider, Agent Interface Manager, Federation Registry, Flow Controller Manager, Gateway, etc.)
destination	String256	The information about a destination component (Security Provider, Agent Interface Manager, Federation Registry, Flow Controller Manager, Gateway, etc.)
messageType	String256	A type of the message that was exchanged
requestType	String256	A request type contained in the message
timestamp	String256	The time when the communication happened

2.1.9 Choice

A choice made by a decision.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Choice's name
description	String4000	Detailed description
alias	String256	The alias of the Choice. For example, if the alias is specified it will be used as a parameter name for a service which the Choice is associated with. Otherwise the name attribute will be used without spaces between the words included in the name.
collaborativeEntity	String256	Collaborative entity which this choice relates to. It could be a decision , an activity or a trigger.
choiceReference	String256	Unique ID of the reference
time	DateTime	Time when Choice is confirmed

Associated with

- A Decision where the Decision is the target object and association type is "IsChoiceOf"

May be associated with

- An Activity or a Trigger where the Activity or Trigger is the target object and association type is "IsInputOf"

Parent: Decision, Activity, Trigger

2.1.10 ChoiceReference

An XML document that contains choice value.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	ChoiceReference's name
description	String4000	Detailed description
choice	String256	Choice which ChoiceReference relates to.
documentId	String256	XML document that contains choice value
type	String256	Document type (any type)
value	String256	Document's reference

time	DateTime	Time when ChoiceReference is confirmed

Associated with

- A Choice where the Choice is the target object and association type "IsChoiceReferenceFor"

Parent: Choice

2.1.11 Cluster

The Cluster groups related events from one or more collaborative process flows which execution is co-related.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Cluster's name
description	String4000	Detailed description
correlation	String256	Logical expression that enables stage transformation of "Slave" events.
eventIdList	Set	A list of events' Ids
stageList	Bag	A list of events' stage values. The Bag data type is an unordered collection of elements that can contain duplicates.
typeList	Bag	Type of the events in the cluster (Lead/Slave)

Associated with

- A CollaborativeProcessFlow where the CollaborativeProcessFlow is the target object and association type is "IsClusterIn"

2.1.12 CollaborativeProcess

A collaborative process is a set of roles, collaborative process flows and other collaborative elements that represent collaborations between (autonomous) business entities. The collaborative process can have one or more collaborative process flows depending on types and number of collaborations involved in it.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	CollaborativeProcess's name
description	String4000	Detailed description

2.1.13 CollaborativeProcessFlow

A collaborative process flow is a set of correlated activities, events and decisions that represent a collaboration between roles belonging to (autonomous) business entities.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	CollaborativeProcessFlow's name
description	String4000	Detailed description
collaborativeProcess	String256	CollaborativeProcess which this CollaborativeProcessFlow relates to
stage	String256	The stage of the CollaborativeProcessFlow (Start/Progress/End)
timeToComplete	String256	A period of time for which the collaborative process flow must be completed. If the value for this attribute is not provided the time to complete is unlimited. The value for this attribute is specified using the XSD duration format (e.g., PT1H means one hour).

Associated with

- A CollaborativeProcess where the CollaborativeProcess is the target object and association type is "IsCollaborativeProcessFlowIn"

Parent: CollaborativeProcess

2.1.14 CPRole

CPRoles perform activities and decisions.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	CPRole's name
description	String4000	Detailed description

Associated with

- A User where the User is the source object and association type is "HasRole"
- An Agent where the Agent is the source object and association type is "HasRole"

- An Organization where the Organization is the source object and association type is "HasRole"
- A Service where the Service is the source object and association type is "HasRole"
- A CollaborativeProcess where the CollaborativeProcess is the source object and association type is "IncludeRole"
- An Activity or Decision where the Activity or Decision is the target object and association type is "Perform"

2.1.15 Criterion

The Criterion is an input for a Decision. The Decision makes a choice based on one or more criteria provided.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Criterion's name
description	String4000	Detailed description
type	String256	The type of the Criterion (Information/MessageRequest)

Associated with

- A Decision where the Decision is the target object and association type is "IsCriterionOf"

2.1.16 Decision

A specific activity in the collaborative process flow that makes choices.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Decision's name
description	String4000	Detailed description
choiceType	String256	The type of the decision's choices (Binary/Primary/Derivative)
collaborativeProcessFlow	String256	CollaborativeProcessFlow's ID
stage	String256	Unique ID of the Stage entity associated with this Decision
resourceAssignmentType	String256	The resourceAssignmentType values can be: Agent, User, Service, Rule or Admin.
resourceAssignment	String256	An ID of the resource that will make the decision or an ID of a rule or an administrator that will

		select a resource that will make the decision. Either the rule or the administrator is used when more than one resource can make the decision.
timeToComplete	String256	A period of time for which the decision must be completed. If the value for this attribute is not provided the time to complete is unlimited. The value for this attribute is specified using the XSD duration format (e.g., PT1H means one hour).

Associated with

- A CollaborativeProcessFlow where the CollaborativeProcessFlow is the target object and association type is "IsDecisionIn".

Parent: CollaborativeProcessFlow

2.1.17 Derivation

Specifies a derivation of an output from an input.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Derivation name
description	String4000	Derivation description
input	String256	An Input of a related Activity or Decision
output	String256	An Output of a related Activity or Decision
type	String256	Derivation type (Modeling/Execution). Modeling type belongs to Derivations and DerivationLists fully specified during the modeling phase. Execution type belongs to Derivations and DerivationLists specified during the modeling phase but their content is fully determined during the process execution only.
timestamp*	DateTime	Timestamp of an Output derivation during the process

		execution in a case of a derivation with Execution type.
operationType	String256	An optional property that specifies the type of an Activity operation that derived an Output from an Input. The default list of operation types include: Assemble, Attach, Create, Disassemble, Extract, Replace, Replicate, Select, Assimilate, Version.
collaborativeEntity	String256	A related collaborative entity (Activity or Decision).

*For all Outputs derived from Inputs during the execution of the process this property will have a value assigned by SOA-VM. For all others (Outputs that were not derived during the process execution) this property will not have an assigned value.

Associated with

- An Activity where the Activity is the target object and association type is "IsDerivationFor".
- A Decision where the Decision is the target object and association type is "IsDerivationFor".

2.1.18 DerivationList

Specifies a list of outputs derived from a list of inputs where input and output lists can be of any size.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	DerivationList name
description	String4000	DerivationList description
inputList	Set	A set of inputs of an Activity or Decision
inputListCardinality	Integer	The size (number of inputs) of the inputList.
outputList	Set	A set of outputs of an Activity or Decision.
outputListCardinality	Integer	The size (number of outputs) of the outputList.
type	String256	DerivationList type (Modeling/Execution). Modeling type belongs to DerivationLists fully specified during the modeling phase. Execution type belongs to DerivationLists specified during the modeling phase but their content is fully determined during the process execution only.

timestamp	DateTime	Timestamp of the output list derivation during the process execution in a case of a derivation list with the Execution type.
operationType	String256	An optional property that specifies the type of an Activity operation that derived an outputList from an inputList. The default list of operation types include: Assemble, Attach, Create, Disassemble, Extract, Replace, Replicate, Select, Assimilate, Version.
collaborativeEntity	String256	A related collaborative entity (Activity or Decision).

Associated with

- An Activity where the Activity is the target object and association type is "IsDerivationListFor".
- A Decision where the Decision is the target object and association type is "IsDerivationListFor".

2.1.19 DerivationMatrix

DerivationMatrix is used when specific number of inputs and outputs derived from them are not known during the modeling phase.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	DerivationMatrix name
description	String4000	DerivationMatrix description
source	String512	Derivation information source (XML document)
element	String256	The name of the XML element that is the source of the input, output, timestamp, and operationType properties.
inputList	String256	The name of the XML element that is the source of the input list.
input	String256	The name of the XML element that is the source of the input.
outputList	String256	The name of the XML element that is the source of the output list.
output	String256	The name of the XML element that is the source of the output.
listType	String256	The name of the XML attribute

		that specifies list type (Input/Output). This attribute is needed when both input and output list are specified in a derivation document.
operationType	String256	The name of the XML element's attribute that is the source of the operationType (Version, Transform, Assemble, Attach, Replicate, Create, Extract, Disassemble, Replace, Select).
timestamp	DateTime	Timestamp of an output list derivation during the process execution.
collaborativeEntity	String256	A related collaborative entity (Activity or Decision).

Associated with

- An Activity where the Activity is the target object and association type is "IsDerivationMatrixFor".
- A Decision where the Decision is the target object and association type is "IsDerivationMatrixFor".

2.1.20 Device

The Device is a mobile computing resource.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Device's name
description	String4000	Detailed description
type	String256	The type of the device

Associated with

- An Activity or Decision where the Activity or Decision is the source object and association type is "IsSupportedOnDevice".

2.1.21 EmailAddress

The EmailAddress defines attributes of an email address.

Attribute	***Type***	***Description***
userOrOrganization	String256	User or Organization this address relates to.
address	String256	Email address

type	String256	The type of the email address (Office/Home)

May be associated with
- A User where the User is the target object and association type is "IsEmailAddressOf"
- An Organization where the Organization is the target object and association type is "IsEmaillAddressOf"

Parent: User or Organization

2.1.22 Event

An event is a collaborative element that represents a progression point in time in the collaborative process flow of a specific interest to federates. They represent that something happens during the collaborative process flow.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Event's name
description	String4000	Detailed description
type	String256	Event's type (Start/Flow/End)
collaborativeProcessFlow	String256	CollaborativeProcessFlow's ID
stage	String256	Unique ID of the Stage entity associated with this Event
timeToComplete	String256	A period of time for which all event's actions must be completed. If the value for this attribute is not provided the time to complete is unlimited. The value for this attribute is specified using the XSD duration format (e.g., PT1H means one hour).

May be associated with
- A Cluster where the Cluster is the target object and association type is "IsClusteredBy"
- A CollaborativeProcessFlow where the CollaborativeProcessFlow is the target object and association type is "IsEventIn"

Parent: CollaborativeProcessFlow

2.1.23 InformationalReference

A reference to a document associated with an InputOutput.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	InformationalReference's name
description	String4000	Detailed description
documentId	String256	ID of a document that relates to the InformationalReference
type	String256	Type of the referenced document (any document type or ChoiceDoc)
value	String256	Document's reference
version	String16	Version of the document represented by this InformationalReference
time	DateTime	Time when InformationalReference is confirmed

Associated with

- A Criterion where the Criterion is the target object and association type is "IsReferenceFor"
- An InputOutput where the InputOutput is the target object and association type is "IsReferenceFor"
- A Metric where the Metric is the target object and association type is "IsReferenceFor"
- A Protocol where the Protocol is the target object and association type is "IsReferenceFor"
- A Message where the Message is the target object and association type is "IsReferenceFor"

2.1.24 InputOutput

The InputOutput is informational (XML document or message) element that is registered to carry required data for the activity to be performed.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	The name of the InputOutput.
description	String4000	Detailed description
alias	String256	The alias of the InputOutput. For example, if the alias is specified it will be used as a parameter name for a service which the InputOutput is associated with. Otherwise the name attribute will be used without spaces between the words included in the name.
type	String256	The type of InputOutput (Input/Output/Both)

time	DateTime	Time when InputOutput is confirmed

Associated with

- An Activity where the Activity is the target object and association type is "IsInputOf"
- An Activity where the Activity is the target object and association type is "IsOutputOf"
- A Decision where the Decision is the target object and association type is "IsOutputOf"
- A Decision where the Decision is the target object and association type is "IsCriterionOf"
- A Trigger where the Trigger is the target object and association type is "IsInputOf"
- A Metric where the Metric is the target object and association type is "IsSourceFor"

2.1.25 Matrix

The Matrix is assigned to each Activity's input and Decision's criterion and it controls the use of the input/criterion during the execution of the Activity/Decision.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Matrix's name
description	String4000	Detailed description
collaborativeEntity	String256	Activity or Decision or Trigger which this Matrix relates to
inputCriterion	String256	Input or criterion which this Matrix relates to
uponInputs	Set	A list of inputs related to the input of type Upon. The input of type Upon combined with uponInputs will trigger the execution of the related Activity.
cType	String256	Defines input coordination character (Latest/Configured)
iType	String256	Defines if single or more than one input/criterion instance is expected (Single/Multiple)
sType	String256	Defines the sequence of the input processing (All/Select)
tType	String256	Defines time character of the input (ASAP/AsAvailable/Upon)

Associated with

- An Activity for each its input where the Activity is the target object and association type is "IsMatrixOf"
- A Decision for each its criterion where the Decision is the target object and association type is "IsMatrixOf"
- A Trigger for each its input where the Trigger is the target object and association type is "IsMatrixOf"

Parent: Activity and Input, Trigger and Input or Decision and Criterion

2.1.26 Message

A message that contains an XML formatted content that could be a request, response or something else.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Message's name
description	String4000	Detailed description
documentId	String256	MessageContent ID
value	String256	MessageContent reference

Associated with

- An InputOutput where the InputOutput is the target object and association type is "IsMessageFor"
- A Criterion where the Criterion is the target object and association type is "IsMessageFor"
- An Action where the Action is the target object and association type is "IsMessageFor"

2.1.27 MessageContent

The MessageContent is the content of the Message.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	MessageContent's name
description	String4000	Detailed description

Associated with

- A Message where the Message is the target object and association type "IsMessageContentFor"

2.1.28 MessageRequest

The MessageRequest defines message requests used during the collaborations.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	MessageRequest's name
description	String4000	Detailed description
type	String256	The type of the MessageRequest (any type)

Associated with

- An InputOutput where the InputOutput is the target object and association type is "IsMessageRequestFor"
- Criterion where the Criterion is the target object and association type is "IsMessageRequestFor"

2.1.29 Metric

The Metric contains quantifiable value defining a specific performance variable and its state during the collaboration process.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Metric's name
description	String4000	Detailed description
argument	String256	The name of the argument representing the Metric
frequency	String256	Specifies how frequently is metric calculated (AtChange/AtSchedule)
source	String256	Metric's source (document, message, system, etc.)
element	String256	The name of the XML element that is the source of the metric
attribute	String256	The name of the XML element's attribute that is the source of the metric
type	String256	Metric's type (CycleTime/SumInst/QtyInst/QtyAgg/QtyMin/QtyMax)
value	String256	Metric's value
collaborativeProcess	String256	The ID of the CollaborativeProcess which this Metric relates to

Associated with

- Rule's Argument where the Argument is the target object and association type "IsMetricOf"
- CollaborativeProcess where the Collaboartive process is the target object and association type is "IsMetricIn"

Parent: CollaborativeProcess and Argument

2.1.30 ModelReference

A reference entity that represents a document containing an agent model or a service model (i.e., UML, BPMN, text, etc.).

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	ModelReference's name
description	String4000	Detailed description
collaborativeEntity	String256	Agent or Service which this ModelReference relates to.
documentId	String256	ID of a document that relates to the ModelReference
value	String256	Document's reference
version	String16	Version of the document represented by this InformationalReference

Associated with

- An Agent where the Agent is the target object and association type is "IsModelReferenceFor"
- A Service where the Service is the target object and association type is "IsModelReferenceFor"

2.1.31 Organization

Provides information on organizations.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Organization's name
description	String4000	Detailed description
parent	String256	Parent organization (if applicable)
primaryContact	String256	Unique ID of the person (User) who is the primary contact for the organization

May be associated with

- An Action (if the Action is Alert type only) where the Action is the target object and association type is "IsSubscriberTo"

2.1.32 PostalAddress

The PostalAddress defines attributes of a postal address.

Attribute	***Type***	***Description***
userOrOrganization	String256	User or Organization this address relates to.
streetNumber	String256	Street number
street	String256	Street name
city	String256	City name
stateOrProvince	String256	State or province name
postalCode	String256	Postal (ZIP) code
country	String256	Country name

May be associated with

- A User where the User is the target object and association type is "IsPostalAddressOf"
- An Organization where the Organization is the target object and association type is "IsPostalAddressOf"

Parent: User or Organization

2.1.33 ProcedureConfirmation

The ProcedureConfirmation is a run-time entity that specifies the current confirmation status of procedure type SOA-IM collaborative entities.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	ProcedureConfirmation's name
description	String4000	Detailed description
collaborativeEntity	String256	A unique ID of a collaborative entity (Action) which this ProcedureConfirmation relates to
value	String256	The value of the ProcedureConfirmation (Start/End)

Associated with

- An Action where the Action is the target object and association type "IsProcedureConfirmationOf"

Note: The above Association is a run-time Association that is created during the collaboration.

Parent: Action

2.1.34 Protocol

Provides information about a protocol (i.e., ebXML CPA, WSDL, etc.) used for a collaboration with a service or an agent or a user.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Organization's name
description	String4000	Detailed description
collaborativeEntity	String256	Service or Agent which this Protocol relates to.
type	String256	Protocol's type (i.e., CPA, WSDL, etc.)

May be associated with

- A Service where the Service is the target object and association type is "IsProtocolFor"
- An Agent where the Agent is the target object and association type is "IsProtocolFor"

2.1.35 Rule

The Rule represents a business rule that will be submitted to the rule engine.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Rule's name
description	String4000	Detailed description
conditionList	Set	A list of unique IDs of the RuleContents that represent the rules.
valueList	Bag	A list of values that will be used if applied Rule gives Boolean value true
valueType	Bag	The type of the values

Associated with

- A Decision where the Decision is the target object and association type is "IsRuleFor"
- A Decision where the Decision is the target object and association type is "IsAssignmentRuleFor"
- An Activity where the Activity is the target object and association type is "IsAssignmentRuleFor"

2.1.36 RuleContent

The RuleContent represents the content of the Rule.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Rule's name
description	String4000	Detailed description

Associated with

- A Rule where the Rule is the target object and association type "IsRuleContentFor"

2.1.37 Sequence

The Sequence defines an order in which activities, decisions and events are executed.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Sequence's name
description	String4000	Detailed description
entityIdList	Bag	A list of IDs of the collaborative entities which execution is controlled by the Sequence
predecessorList	Bag	A list of the collaborative entity's predecessor
successorList	Bag	The collaborative entity's successor list

Associated with

- An Event's Action, Activity or Decision where the Action, Activity or Decision is the target object and association type is "IsSequenceFor"
- A CollaborativeProcessFlow where the CollaborativeProcessFlow is the target object and association type is "IsSequenceIn"

Parent: CollaborativeProcessFlow, Event's Action, Activity or Decision

2.1.38 Service

The Service performs an activity or makes a decision or executes an event's action according to some predefined procedure or logic.

Attribute	***Type***	***Description***
id	String256	Unique ID

name	String256	Service's name
description	String4000	Detailed description
collaborativeEntity	String256	The ID of an activity or a decision or an event's action performed by the service
protocol	String256	The ID of the protocol used to communicate with the service (WSDL, CPPA, etc.).
modelReference	String256	The reference for the document that contains service logic in the original service modeling language format (UML, BPMN, text or other).
rule	String256	The ID of a Rule that the decision type services will use in making a decision.
version	String16	Service's version

Associated with

- An Activity where the Activity is the target object and association type is "IsServiceFor" or
- A Decision where the Decision is the target object and association type is "IsServiceFor"
- An Action where the Action is the target object and association type is "IsServiceFor"
- An Agent where the Agent is the target object and association type is "ProvideSupportFor"

Parent: Activity or Decision or Action

2.1.39 Stage

The Stage is a run-time entity that specifies the current stage of process type collaborative entities: collaborative process flow, activity, decision or event.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Stage's name
description	String4000	Detailed description
collaborativeEntity	String256	A unique ID of an Event, CollaboartiveProcessFlow, Activity or Decision which this Stage relates to
startTime	String256	Stage's start time
value	String256	The value of the Stage (Start/Confirmed/Escalated/End for events or Start/Progress/Escalated/End for collaborative process flows and activities/decisions)

endCause	String256	Specifies what caused an activity or a decision to get into the End stage, The possible values are: Regular when the activity or the decision are regularly ended or Compensation when multi-instance inputs or multi-versioned inputs require that the currently running activity instance or the currently running decision instance be stopped.

Associated with

- An Activity where the Activity is the target object and association type "IsStageOf" or
- A CollaborativeProcessFlow where the CollaborativeProcessFlow is the target object and association type "IsStageOf" or
- A Decision where the Decision is the target object and association type "IsStageOf" or
- An Event where the Event is the target object and association type "IsStageOf"

Note: All above Associations are run-time Associations that are created during the collaboration.

Parent: Activity or CollaborativeProcessFlow or Decision or Event

2.1.40 System

The System is a non-mobile computing resource.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	System's name
description	String4000	Detailed description
type	String256	The type of the system.

Associated with

- An Activity or Decision where the Activity or Decision is the source object and association type is "IsSupportedOnSystem".

2.1.41 TelephoneNumber

The TelephoneNumber defines telephone number attributes. Different types of numbers can be defined: office, home, mobile, beeper, and fax.

Attribute	***Type***	***Description***

userOrOrganization	String256	User or Organization this telephone number relates to.
type	String256	Telephone number type (Office/Home/Mobile/Beeper/Fax)
countryCode	String256	Country code
areaCode	String256	Area code
number	String256	Telephone number
extension	String256	Extension (if provided)

May be associated with

- A User where the User is the target object and association type is "IsTelephoneNumberOf"
- An Organization where the Organization is the target object and association type is "IsTelephoneNumberOf"

Parent: User or Organization

2.1.42 Trigger

The Trigger is a condition that creates an event.

Attribute	***Type***	***Description***
id	String256	Unique ID
name	String256	Trigger's name
description	String4000	Detailed description
type	String256	The type of the trigger (Information/Flow/Message/MessageRequest/Rule/ Administrator)
event	String256	Unique ID of the event that is created by this trigger

Associated with

- An Event where the Event is the target object and association type is "IsTriggerOf"

Parent: Event

2.1.43 User

The user defines a person who can be a federate or a person responsible for execution of an agent or a service.

Attribute	***Type***	***Description***
id	String256	Unique ID

name	String256	User's name
description	String4000	Detailed description
organization	String256	Organization that user works for.
firstName	String256	User's First name
middleName	String256	User's middle name
lastName	String256	User's last name

May be associated with

- An Action (if the Action is Alert type only) where the Action is the target object and association type is "IsSubscriberTo"
- An Agent where the Agent is the target object and association type is "IsResponsibleFor"
- A Service where the Service is the target object and association type is "IsResponsibleFor"
- An Organization where the Organization is the target object and association type is "IsEmployedBy"

Parent: Organization

2.2 More Details on Derivation, DerivationList, and DerivationMatrix

Inputs are consumed (used) by CollaborativeProcessFlow elements. The following elements of the CollaborativeProcessFlow consume inputs:

- Activity
- Decision
- Trigger
- Metric

An Activity consumes one or more inputs to produce one or more outputs. Some activities also consume inputs without producing outputs or produce outputs without consuming inputs. We use the term derivation to specify that one or more outputs are derived, by the Activity, from one or more inputs.

Inputs can also start a Trigger that triggers an Event. Since outputs are not derived from inputs by the Trigger we do not associate derivations with triggers.

A Decision is a specific activity in the CollaborativeProcessFlow that makes choices. Decisions are supplied with specific inputs called Criteria and possible outputs called Choices. While an Activity is expected to produce all

its declared outputs, a Decision is expected to produce a subset of the Choices.

Metrics have inputs as sources of values assigned to them. Metrics do not create any outputs.

According to these descriptions, only activities and decisions derive outputs from inputs.

There are two types of derivations of outputs from inputs:

- deterministic
- indeterministic

Deterministic derivations are derivations that can be determined in advance during the process modeling phase. Indeterministic derivations are derivations that can be determined during the process execution only.

Furthermore, there are two types of indeterministic derivations. One type where all possible indeterministic derivations are known and created during the modeling phase but which one will actually take place is known only during the process execution. For example, an activity that mixes four paints might operate under a rule that says that Paint A (input 1) and Paint B (input 2) are mixed in Paint X (output 1) if a car model is SUV, and Paint C (input 3) and Paint D (input 4) are mixed in Paint Y (output 1) if a car model is Sedan. The actual car model is not known before the production line process execution. Another type of indeterministic derivations is when derivations are not known during the modeling phase. For example, an activity replicates a document (input) into x number of copies (output) but the number of copies is not known until the activity is performed during the process execution.

A derivation of outputs from inputs is modeled by three concepts:

- Derivation
- DerivationList
- DerivationMatrix

Derivation is used to specify an output that is derived from an input while DerivationList specifies a list of outputs derived from a list of inputs where input and output lists can be of any size. Their sizes are specified by inputCardinality and outputCardinality properties. Sometimes specific numbers of inputs and outputs are not known during the modeling phase. In this case a DerivationMatrix is used.

There are two types of Derivations and DerivationLists:

- "modeling" type that belongs to Derivations and DerivationLists fully specified during the modeling phase

- "execution" type that belongs to Derivations and DerivationLists specified during the modeling phase but their content is fully determined during the process execution only.

The following derivations are possible:

- 1-1: an output is derived from an input
- 1-n: n outputs are derived from one input, where n>1
- n-1: one output is derived from n inputs, where n>1
- n-m: m outputs are derived from n inputs, where n>1 and m>1, and n>=m or n<=m

When all outputs of an Activity are derived from all its Inputs the modeling of derivations are not needed since all derivations are known from the associations between the Activity and its inputs and outputs. While the derivations can be redundant in this case it can still be useful to have them since they provide more compact form of derivation information between inputs and outputs.

In a case when there is an output but no input, the Derivation *input* property has value *null* while the *output* property has the value that is the identifier of the output. In a case when there is a list of outputs but no inputs, the DerivationList *inputList* is an empty list while the *outputList* contains output identifiers.

In a case when there is an input but no output, the *input* property has value that is the identifier of the input while the *output* property has the *null* value. In a case when there is a list of inputs but no outputs, the *inputList* of the DerivationList contains input identifiers while the output list is an empty list.

The table below contains some pros and cons of Derivation and DerivationList.

	Pros	**Cons**
Derivation	Derivation semantics are fully specified between inputs and outputs on an individual bases.	When we deal with large number of either inputs or outputs or both it could be a time consuming procedure to model separate derivations for each input-output combination.
	Derivation does not require any list (set) operations on the process execution level.	

DerivationList	Speeds up modeling of derivations that involve large number of either inputs or outputs or both.	Loose semantic details on an individual input-output combinations of derivation.
		Requires more processing resources to handle lists (sets) on the process execution level.

3.0 Collaborative Process Information Document

Collaborative Process Information Document (CPID) is an XML document that contains SOA-IM for a collaborative process. It can be written in an ontology language such as Tara Ontology Language [Tara], or OWL Web Ontology Language [OWL], or standard registry language such as the OASIS ebXML Registry [ebRIM,ebRS], and others.

This section documents CPID format and creation rules with OASIS ebXML Registry.

By using modeling tools, CPID can be generated from a business process definition. CPID contains a complete information model of a collaborative process. Submitting the content of this document to a standard registry will generate the collaborative process information model that provides support for the execution of collaborative processes of any type and complexity.

3.1 SOA-IM Hierarchy

This section presents a high level hierarchy of SOA-IM entities needed for a collaborative process information modeling. The following figure visualizes the hierarchy:

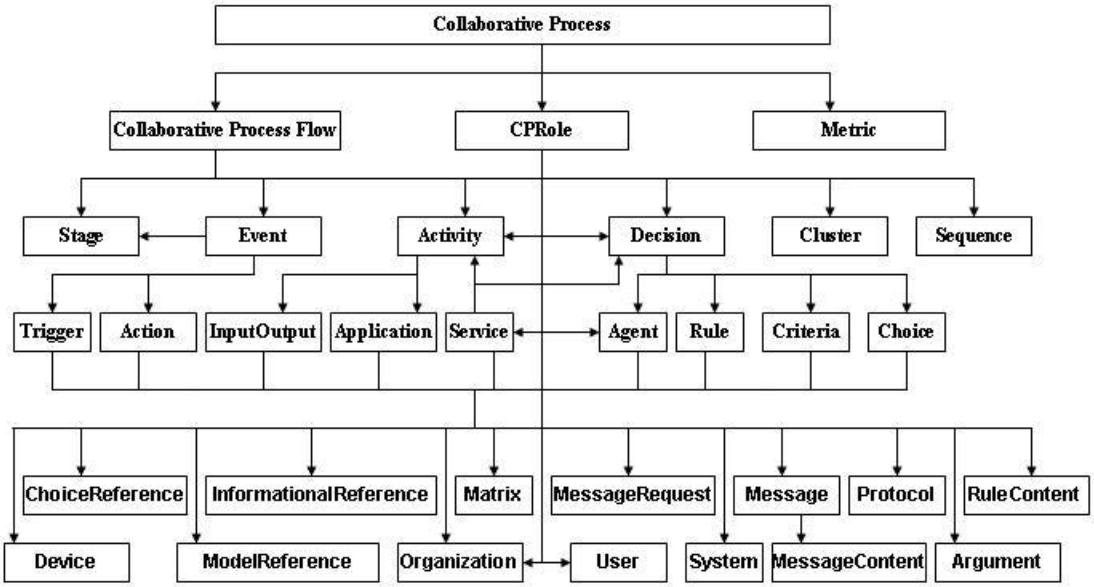

Figure 1: SOA Information Model (High Level)

Following paragraphs explain SOA-IM hierarchy presented in *Figure 1.*

CollaborativeProcess is a root entity that represents a business process. It includes *CollaborativeProcessFlows*, *CPRoles* and *Metrics*.

CollaborativeProcessFlow is a set of correlated *Activities*, *Events* and *Decisions* that represent collaboration between roles belonging to (autonomous) business entities. Each flow instance has the instance number and goes through *Stages*. *Sequences* are used if the specific order of executions is required. An *Activity* is a task or an operation performed by a federate (service, person) or by a local SOA Federation agent. Each Activity has one or more inputs and it produces one or more outputs. Since an output of one Activity can be an input for another Activity, both inputs and outputs are modeled using the *InputOutput* entity. A *Matrix* is assigned to each *Activity*'s input and it controls the use of inputs during the execution of the *Activity*.

A *Decision* is a specific activity in the *CollaborativeProcessFlow* that makes choices. *Decisions* are supplied with specific inputs called *Criteria* and possible outputs called *Choices*. An *Agent* is an entity that performs an activity or makes a decision according to some predefined procedure or logic that might also include business *Rules*. A business *Rule* is a logic encapsulated as an expression with sets of *Arguments* defining a domain of

interest for the rule. *Applications* run on *Systems* or *Devices* supporting *Activities* and *Decisions*.

An *Event* represents a node (progression point in time) in the *CollaborativeProcessFlow* of a specific interest to participants. It represents that something happens during the *CollaborativeProcessFlow*. *Events* can trigger alerts or insertion of the business logic from another *CollaborativeProcessFlow*. *Events* can be organized into *Clusters* or combine to form compound *Events*. They progress through *Stages* in the life cycle whereby each *Stage* change has a meaning to the participants. *Events* can take place in the federated context or in each of the systems that are federated. A *Trigger* is a condition that creates an *Event*. It could be an output of an *Activity*, result of the execution of a *Rule* or a *Metric* reaching a value, or just the fact that another *Event* has happened. *Triggers* link *Events* with other elements in the collaborative process orchestration. An *Action* is a consequence of an *Event* taking place. It can be an alert message, insertion of a flow, compensation within a flow, link to another flow or termination of a flow, or another trigger (flow trigger). One *Event* can have more *Actions*. Other collaborative process elements (Users, Organizations) can subscribe to or publish *Events*.

Each *CollaborativeProcessFlow* has a set of *CPRoles* that play in it. Each participant (User, Organization, Service, Agent) in the collaboration is assigned to a *CPRole*. *CPRoles* perform *Activities* and *Decisions*.

A Service performs an activity or makes a decision or executes an event's action according to some predefined procedure or logic.

A *Metric* is information that contains quantifiable value defining specific performance variables and their states during the collaboration.

SOA Collaboration Semantics includes documents and/or *Messages* and *MessageRequests* flows. The content of the documents is referenced by *InformationalReferences* and *ChoiceReferences* while the content of *Messages* is referenced by the *MessageContent*. A *ModelReference* is a reference entity that represents a document containing a Service model or an *Agent* model.

3.2 OASIS ebXML Registry Format for CPID

The execution format of the *Collaborative Process Information Document (CPID)* can be supported by *OASIS ebXML Registry Information Model (RIM)* [ebRIM] and *OASIS ebXML Registry Services (RS) Specifications* [ebRS].

First, all SOA-IM entities are "translated" into RIM meta-data and then RS Life Cycle Manager *SubmitObjects* request is used to submit and deploy SOA-IM in a Registry that implements OASIS ebXML Registry standard. CPID can be created either manually or using a modeling tool. For the modeling tool to generate a CPID from a collaborative process model, a translation from the collaborative process model to the CPID formatted in OASIS ebXML RIM and RS must be supported. The following sections explain how it can be done.

3.2.1 SOA-IM RIM Format

SOA-IM RIM format includes the following RIM meta-data entities:

- *Association*
- *ExtrinsicObject*
- *Service*
- *Slot*

Other RIM meta-data entities (i.e., *Classification, ClassificationNode, ClassificationScheme, ServiceBinding, etc.)* can be used as well but *Association, ExtrinsicObject, Service* and *Slot* are mandatory for SOA-IM. For example, *Classification, ClassificationNode* and *ClassificationScheme* can be used to implement classifications of any collaborative information from SOA-IM and/or another metadata and content stored in the registry. More information about all these meta-data entities is provided in [ebRIM]

Associations are used to define associations between objects in the information model. Association cardinality can be on-to-one, one-to-many and many-to-many.

ExtrinsicObjects provide metadata that describes submitted content whose type is not intrinsically known to the registry and therefore must be described by means of additional attributes (e.g., mime type). *ExtrinsicObjects* can also be used to add business entities of any type even if they do not represent the content.

Services provide metadata for Web Services.

Slots provide a dynamic way to add arbitrary attributes to registry objects. This enables extensibility within the Registry Information Model.

3.2.2 CPID Creation

CPID creation in this document is based on the following OASIS ebXML Registry Information Model (RIM) and ebXML Registry Services (RS) XML schemas:

- *rim-2.1.xsd*
- *rs-2.1.xsd*
- *query-2.1.xsd*

rim-2.1.xsd is OASIS ebXML RIM XML schema, *rs-2.1.xsd* is OASIS ebXML RS XML schema and *query-2.1.xsd* is OASIS ebXML RS query-related XML schema.

rim-2.1.xsd and *rs-2.1.xsd* define CPID format and registry XML-based requests needed to submit CPID and create all SOA-IM entities and associations in an ebXML Registry. *query-2.1.xsd* defines OASIS ebXML Registry query language required to query SOA-IM collaborative information from the registry.

SOA-IM entities are represented by *ExtrinsicObjects* and *Services*. Standard *ExtrinsicObject* and *Service* metadata attributes will be used along with *Slots* when SOA-IM entity specific attributes have to be added. This is the standard approach for creating SOA-IM entities in OASIS ebXML RIM.

For example, this is how collaborative process *Demo CP* would be presented in CPID:

```
<rim:ExtrinsicObject id = "cp-id" objectType = "CollaborativeProcess" >
  <rim:Name>
    <rim:LocalizedString value = "Demo CP"/>
  </rim:Name>
  <rim:Description>
    <rim:LocalizedString value = "Demo Collaborative Process"/>
  </rim:Description>
</rim:ExtrinsicObject>
```

As you can see in *Section 2.1.12 CollaborativeProcess,* all *CollaborativeProcess* attributes are supported by default *ExtrinsicObject* attributes. However, when SOA-IM entity requires extra attributes in addition to RIM default attributes, *Slots* must be specified. For example:

```
<rim:ExtrinsicObject id = "cpf-id" objectType = "CollaborativeProcessFlow">
  <rim:Name>
    <rim:LocalizedString value = "Demo CPF"/>
  </rim:Name>
  <rim:Description>
    <rim:LocalizedString value = "Demo Collaborative Process Flow"/>
  </rim:Description>
  <Slot name="collaborativeProcess" slotType="String">
```

```
      <rim:ValueList>
        <rim:Value>cp-id</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="stage" slotType="String">
      <rim:ValueList>
        <rim:Value></rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="timeToComplete" slotType="String">
      <rim:ValueList>
        <rim:Value>P1D</rim:Value>
      </rim:ValueList>
    </Slot>
  </rim:ExtrinsicObject>
```

Now when *CollaborativeProcess* and *CollaborativeProcessFlow* are created, we will create an *Association* between them:

```
<rim:Association id = "DemoCPDemoCPF-id"
      associationType = "IsCollaborativeProcessFlowIn"
      objectType = "Association"
      sourceObject = "cpf-id"
      targetObject = "cp-id">
    <rim:Name>
      <rim:LocalizedString value = "Demo CP - Demo CPF"/>
    </rim:Name>
    <rim:Description>
      <rim:LocalizedString value = "Associates Demo Collaborative Process Flow
                                    with Demo Collaborative Process "/>
    </rim:Description>
  </rim:Association>
```

Finally, the following is a simple CPID whose content demonstrates how some key SOA- IM entities and their associations should be specified:

```
<?xml version = "1.0" encoding = "UTF-8"?>
<rs:SubmitObjectsRequest
      xmlns = "urn:oasis:names:tc:ebxml-regrep:registry:xsd:2.1"
      xmlns:xsi = "http://www.w3.org/2001/XMLSchema-instance"
      xsi:schemaLocation = "urn:oasis:names:tc:ebxml-regrep:rim:xsd:2.1
                    http://www.oasis-
open.org/committees/regrep/documents/2.1/schema/rim.xsd
                    urn:oasis:names:tc:ebxml-regrep:registry:xsd:2.0
                    http://www.oasis-
open.org/committees/regrep/documents/2.1/schema/rs.xsd"
      xmlns:rim = "urn:oasis:names:tc:ebxml-regrep:rim:xsd:2.1"
```

```
        xmlns:rs = "urn:oasis:names:tc:ebxml-regrep:registry:xsd:2.1">

  <rim:LeafRegistryObjectList>
    <rim:ExtrinsicObject id = "cp-id" objectType = "CollaborativeProcess" >
      <rim:Name>
        <rim:LocalizedString value = "Demo CP"/>
      </rim:Name>
      <rim:Description>
        <rim:LocalizedString value = "Demo Collaborative Process"/>
      </rim:Description>
    </rim:ExtrinsicObject>

    <rim:ExtrinsicObject id = "cpf-id" objectType = "CollaborativeProcessFlow">
      <rim:Name>
        <rim:LocalizedString value = "Demo CPF"/>
      </rim:Name>
      <rim:Description>
        <rim:LocalizedString value = "Demo Collaborative Process Flow"/>
      </rim:Description>
      <Slot name="collaborativeProcess" slotType="String">
        <rim:ValueList>
          <rim:Value>cp-id</rim:Value>
        </rim:ValueList>
      </Slot>
      <Slot name="stage" slotType="String">
        <rim:ValueList>
          <rim:Value></rim:Value>
        </rim:ValueList>
      </Slot>
      <Slot name="timeToComplete" slotType="String">
        <rim:ValueList>
          <rim:Value>P1D</rim:Value>
        </rim:ValueList>
      </Slot>
    </rim:ExtrinsicObject>

    <rim:Association id = "DemoCPDemoCPF-id"
         associationType = "IsCollaborativeProcessFlowIn"
         objectType = "Association"
         sourceObject = "cpf-id"
         targetObject = "cp-id">
      <rim:Name>
         <rim:LocalizedString value = "Demo CP - Demo CPF"/>
      </rim:Name>
      <rim:Description>
         <rim:LocalizedString value = "Associates Demo Collaborative Process Flow
with Demo Collaborative Process "/>
      </rim:Description>
    </rim:Association>

    <rim:ExtrinsicObject id = "event-id" objectType = "Event">
      <rim:Name>
        <rim:LocalizedString value = "Demo Event"/>
```

```
    </rim:Name>
    <rim:Description>
      <rim:LocalizedString value = "Demo Collaborative Process Flow event"/>
    </rim:Description>
    <Slot name="type" slotType="String">
      <rim:ValueList>
        <rim:Value>Flow</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="collaborativeProcessFlow" slotType="String">
      <rim:ValueList>
        <rim:Value>cpf-id</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="stage" slotType="String">
      <rim:ValueList>
        <rim:Value></rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="timeToComplete" slotType="String">
      <rim:ValueList>
        <rim:Value>PT5M</rim:Value>
      </rim:ValueList>
    </Slot>
  </rim:ExtrinsicObject>

  <rim:Association id = "DemoEventDemoCPF-id"
       associationType = "IsEventOf"
       objectType = "Association"
       sourceObject = "event-id"
       targetObject = "cpf-id">
    <rim:Name>
       <rim:LocalizedString value = "Demo Event - Demo CPF"/>
    </rim:Name>
    <rim:Description>
       <rim:LocalizedString value = "Associates Demo Event with Demo
Collaborative Process Flow"/>
    </rim:Description>
  </rim:Association>

  <rim:ExtrinsicObject id = "agent-id" objectType = "Agent">
    <rim:Name>
      <rim:LocalizedString value = "Demo Agent"/>
    </rim:Name>
    <rim:Description>
      <rim:LocalizedString value = "DemoAgent."/>
    </rim:Description>
    <Slot name=" collaborativeEntity " slotType="String">
      <rim:ValueList>
        <rim:Value>activity-id</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="activityStatus" slotType="String">
```

```
      <rim:ValueList>
        <rim:Value>Active</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="locationType" slotType="String">
      <rim:ValueList>
        <rim:Value>Fixed</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="processingType" slotType="String">
      <rim:ValueList>
        <rim:Value>Instant</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="activityType" slotType="String">
      <rim:ValueList>
        <rim:Value>CART</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="owner" slotType="String">
      <rim:ValueList>
        <rim:Value>urn:uuid:3c760a70-91f8-11d9-b5e0-0050da30f668</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="protocol" slotType="String">
      <rim:ValueList>
        <rim:Value> urn:uuid:3c760a70-91f8-11d9-b5e0-3450f40f594</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="modelReference" slotType="String">
      <rim:ValueList>
        <rim:Value></rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="rule" slotType="String">
      <rim:ValueList>
        <rim:Value>rule-id</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="version" slotType="String">
      <rim:ValueList>
        <rim:Value>2.0.5</rim:Value>
      </rim:ValueList>
    </Slot>
  </rim:ExtrinsicObject>

  <rim:ExtrinsicObject id = "activity-id" objectType = "Activity">
    <rim:Name>
      <rim:LocalizedString value = "Demo Activity"/>
    </rim:Name>
    <rim:Description>
      <rim:LocalizedString value = "Demo activity"/>
    </rim:Description>
```

```
    <Slot name="collaborativeProcessFlow" slotType="String">
      <rim:ValueList>
        <rim:Value>cpf-id</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="stage" slotType="String">
      <rim:ValueList>
        <rim:Value></rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="resourceAssignmentType" slotType="String">
      <rim:ValueList>
        <rim:Value>Agent</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name=" resourceAssignment " slotType="String">
      <rim:ValueList>
        <rim:Value>agent-id</rim:Value>
      </rim:ValueList>
    </Slot>
     <Slot name="timeToComplete" slotType="String">
       <rim:ValueList>
         <rim:Value>PT5M</rim:Value>
       </rim:ValueList>
     </Slot>
  </rim:ExtrinsicObject>

  <rim:Association id = "DemoAgentDemoActivity-id"
       associationType = "IsAgentFor"
       objectType = "Association"
       sourceObject = "agent-id"
       targetObject = "activity-id">
    <rim:Name>
       <rim:LocalizedString value = "Demo Agent - Demo Activity"/>
    </rim:Name>
    <rim:Description>
       <rim:LocalizedString value = "Associates Demo Agent with Demo Activity"/>
    </rim:Description>
  </rim:Association>

  <rim:ExtrinsicObject id = "input-id" objectType = "InputOutput">
    <rim:Name>
      <rim:LocalizedString value = "Demo Input"/>
    </rim:Name>
    <rim:Description>
      <rim:LocalizedString value = "Demo Input of Demo Activity"/>
    </rim:Description>
    <Slot name="alias" slotType="String">
      <rim:ValueList>
        <rim:Value>demoInput</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="type" slotType="String">
```

```
      <rim:ValueList>
        <rim:Value>Input</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="time" slotType="String">
      <rim:ValueList>
        <rim:Value></rim:Value>
      </rim:ValueList>
    </Slot>
  </rim:ExtrinsicObject>

  <rim:ExtrinsicObject id = "input-reference-id" objectType =
"InformationalReference">
    <rim:Name>
      <rim:LocalizedString value = "Demo Input Informational Reference"/>
    </rim:Name>
    <rim:Description>
      <rim:LocalizedString value = "Demo Informational Reference for Demo
Input"/>
    </rim:Description>
    <Slot name="documentId" slotType="String">
      <rim:ValueList>
        <rim:Value></rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="type" slotType="String">
      <rim:ValueList>
        <rim:Value>OrderFromStore</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="value" slotType="String">
      <rim:ValueList>
        <rim:Value></rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="version" slotType="String">
      <rim:ValueList>
        <rim:Value></rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="time" slotType="String">
      <rim:ValueList>
        <rim:Value></rim:Value>
      </rim:ValueList>
    </Slot>

  </rim:ExtrinsicObject>

  <rim:Association id = "DemoInformationalReferenceDemoInput-id"
      associationType = "IsReferenceFor"
      objectType = "Association"
      sourceObject = "input-reference-id"
      targetObject = "input-id">
```

```
    <rim:Name>
       <rim:LocalizedString value = "Demo Informational Reference - Demo
Input"/>
    </rim:Name>
    <rim:Description>
       <rim:LocalizedString value = "Associates Demo Informational Reference -
Demo Input"/>
    </rim:Description>
  </rim:Association>

  <rim:Association id = "DemoInputDemoActivity-id"
      associationType = "IsInputOf"
      objectType = "Association"
      sourceObject = "input-id"
      targetObject = "activity-id">
    <rim:Name>
       <rim:LocalizedString value = "Demo Input - Demo Activity"/>
    </rim:Name>
    <rim:Description>
       <rim:LocalizedString value = "Associates Demo Input with Demo Activity"/>
    </rim:Description>
  </rim:Association>

  <rim:ExtrinsicObject id = "output-id" objectType = "InputOutput">
    <rim:Name>
      <rim:LocalizedString value = "Demo Output"/>
    </rim:Name>
    <rim:Description>
      <rim:LocalizedString value = "Demo Output of Demo Activity"/>
    </rim:Description>
    <Slot name="type" slotType="String">
      <rim:ValueList>
        <rim:Value>Output</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="time" slotType="String">
      <rim:ValueList>
        <rim:Value></rim:Value>
      </rim:ValueList>
    </Slot>
  </rim:ExtrinsicObject>

  <rim:ExtrinsicObject id = "output-reference-id" objectType =
"InformationalReference">
    <rim:Name>
      <rim:LocalizedString value = "Demo Output Informational Reference"/>
    </rim:Name>
    <rim:Description>
      <rim:LocalizedString value = "Demo Informational Reference for Demo
Output"/>
    </rim:Description>
    <Slot name="documentId" slotType="String">
      <rim:ValueList>
```

```
        <rim:Value></rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="type" slotType="String">
      <rim:ValueList>
        <rim:Value>OutputDoc</rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="value" slotType="String">
      <rim:ValueList>
        <rim:Value></rim:Value>
      </rim:ValueList>
    </Slot>
    <Slot name="version" slotType="String">
      <rim:ValueList>
        <rim:Value></rim:Value>
      </rim:ValueList>
    </Slot>
  </rim:ExtrinsicObject>

  <rim:Association id = "DemoInformationalReferenceDemoOutput-id"
       associationType = "IsReferenceFor"
       objectType = "Association"
       sourceObject = "output-reference-id"
       targetObject = "output-id">
    <rim:Name>
       <rim:LocalizedString value = "Demo Informational Reference - Demo
Output"/>
    </rim:Name>
    <rim:Description>
       <rim:LocalizedString value = "Associates Demo Informational Reference -
Demo Output"/>
    </rim:Description>
  </rim:Association>

  <rim:Association id = "DemoOutputDemoActivity-id"
       associationType = "IsOutputOf"
       objectType = "Association"
       sourceObject = "output-id"
       targetObject = "activity-id">
    <rim:Name>
       <rim:LocalizedString value = "Demo Output - Demo Activity"/>
    </rim:Name>
    <rim:Description>
       <rim:LocalizedString value = "Associates Demo Output with Demo Activity"/>
    </rim:Description>
  </rim:Association>

 </rim:LeafRegistryObjectList>
</rs:SubmitObjectsRequest>
```

CPID for any collaborative process can be created using the same principals and format explained and demonstrated in the previous examples. *Figure 1, SOA Information Model (High Level)* shows the hierarchical tree of SOA-IM entities used in CPID. For each SOA-IM entity, detailed attribute lists and associations with other entities are explained in *Section 2.1*.

4.0 References

[ebRIM] ebXML Registry Information Model Specification
http://www.oasis-open.org/specs

[ebRS] ebXML Registry Services Specification
http://www.oasis-open.org/specs

[FERA] Closing the Process/Technology Gap, FERA: Federated Enterprise Reference Architecture: A Framework for Loosely Coupled Business Process Integration
http://www.cpd-associates.com/index.cfm?content=subpage&file=include_RPPage.cfm&ID=72404138&DOC=177813046

[OWL] OWL Web Ontology language
http://www.w3.org/standards/techs/owl#w3c_all

[Tara] Tara Ontology Language
http://www.semantion.com/documentation/SBP/metamodeling/TaraOntologyLanguage_V1.3.pdf

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