# OSM Digital Product Architecture Public Interface Specifications

Version 9B, NOVEMBER 2000

TASK AND SESSION CONTENT © NIIIP, OSM
COMMUNITY AND COLLABORATION FRAMEWORKS, © OSM

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OSM specification submitted under OMG technology adoption processes are maintained under a number of independently chartered Revision Task Forces. Issues pertaining to **adopted** OMG specifications should be directed to issues@omg.org. All OSM specifications are subject to continuous review and improvement. As part of this process we encourage readers to report any ambiguities, inconsistencies, or inaccuracies they may find by notifying OSM through the following email address:

***support@osm.net***

## DOCUMENT STATUS

The specifications contained in this document have been submitted to the Object Management Group as part of technology adoption processes linked to the Electronic Commerce Domain Task Force. Prior to validation by OMG EC Negotiation Finalization Task Force members, ratification by the OMG Architecture Board, general vote by the OMG Domain Technical Committee and sanction by the OMG Board of Directors, these specifications shall form the general set of public interfaces to the OSM platform. Status of technology adoption processes and possible revision to modules naming will be published under the http://home.osm.net address.

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# Part 1
# Overview

## 1 Contents

This chapter contains the following topics.



## 2 About OSM

OSM SARL was established during early 1997 to support the coordination and subsequent exploitation of a series of collaborative research and development actions undertaken by thirteen partners companies[1]. Leading this development push, OSM initiated a series of technical development partnerships dealing with the management of distributed multi-enterprise collaboration. These activities involved requirement studies across several business domains, the establishment of a reference-architecture, and a series of prototype implementations and field trials. In May 1998, OSM commenced formal specification of the ***osm.enterprise*** product (extending the OMG Business Object Domain Specifications) and establishment of actions co-funded by the European ACTS program enabling delivery of pre-commercial reference implementation. In April 1999, the Object Management Group formally adopted the OSM Document, Community and Collaboration Framework APIs as part of the OMG set of Electronic Commerce Domain Specifications.

The specifications contained in this document constitute a consolidation of the most recent submissions by OSM to the OMG Negotiation Revision Task Force. As such a derivative of these specifications is pending OMG Architecture Board and Domain Technical Committee approval prior to establishment of OMG "available" status.

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[1] *INGENIA, AI Engineering, iHM, Center Internet European, TRIALOG, INESC, ACSSystemberatung Gmbh, Hamburg University, Fraunhofer Gesellschaft IML, Imperial College of Science Technology and Medicine, Object Management Group.*

# 3 Document Overview

The collective set of interfaces defined within these specifications aim to establish a framework on which arbitrary collaborative business processes can be executed. The specification supports the requirement for independence between different business domains in the validation actions of an initiating party (responsibility), and the validation of actions of the reciprocal parties (assurance). These features are considered as fundamental elements of peer-to-peer business process management.

## *Task and Session Framework*

This specification defines a model that represents the obvious objects and relationships in the end user view of a distributed system. End users are the people that directly interact with the system. These obvious things include:

- the existence of other users, roles, organizations, projects, etc.
- distributed program and information resources
- places where users and resources are found, and processes execute
- tasks that range from 'print a file' to 'build a software product (with other people)'

The Task and Session Model is a first step towards specifying these obvious things in a consistent and common manner. This small first step enables applications to significantly raise the level of collaboration and resource sharing within projects and enterprises, while also raising the level of abstraction for users of distributed systems.

Abstraction in present user models ranges from machine objects, such as files and programs, to human objects such as pages and links. The Task and Session Model extends these models with people, place, resource, and process objects that, when instantiated as cooperative components, become configurations of people in places, using resources in processes. Domain and common applications, such as desktops, browsers, and workflow, may use these configurations as the information representing the state and content of each user's distributed system.

Task and Session objects are scoped to represent the basic things in a user's distributed system environment. They are used with person, organization, and resource objects such as parties, workflows, tools, and domain entities, which are defined *separately* by other existing, planned, and future specifications. Objects used and adapted may be any CORBA objects which include non-CORBA resources wrapped with IDL.

## *Community Framework*

The CommunityFramework defines a specialization of the Task and Session Workspace called **Community**, a specialization of Community called **Agency**. Community is defined as a specialization of Workspace and an abstract interface called **Membership**. Agency is a specialization of a Community that introduces the abstract interface **LegalEntity**.

## *Collaboration Framework*

The CollaborationFramework defines a sharable Task named Encounter, formalizes the definition of a Processor, and introduces three types of Processes dealing with the application level requirements covering contractual engagement, voting and collaboration against which business processes supporting contract negotiation, fulfillment and settlement can be defined, simulated and executed.

Principal interfaces defined under this specification include:

- EngagementProcessor, a processor supporting the registration of Evidence and generation of Proof by a membership
- VoteProcessor, a processor supporting the registration of votes by a membership

- CollaborationProcessor, a processor supporting collaborative interaction between members of an Encounter.

These interface build upon the specifications established under the CommunityFramework, in particular the notion of Membership is reused as the basis for the definition of a shared Task associated to a common Processor. The CollaborationFramework continues the Model/Simulator pattern established under the CommunityFramework specifications as the mechanisms for separation of configuration and execution policy from the IDL computational interface.

# 4 Associated Documents

The CORBA documentation set includes the following books:

- *Object Management Architecture Guide* defines the OMG's technical objectives and terminology and describes the conceptual models upon which OMG standards are based. It defines the umbrella architecture for the OMG standards. It also provides information about the policies and procedures of OMG, such as how standards are proposed, evaluated, and accepted.
- *CORBA: Common Object Request Broker Architecture and* Specification contains the architecture and specifications for the Object Request Broker.
- *CORBAservices: Common Object Services Specification* contains specifications for OMG's Object Services.
- *CORBAfacilities: Common Facilities Architecture and* Specification describes an architecture for Common Facilities. Additionally, it includes specifications based on this architecture that have been adopted and published by the OMG.

The OMG collects information for each book in the documentation set by issuing Requests for Information, Requests for Proposals, and Requests for Comment and, with its membership, evaluating the responses. Specifications are adopted as standards only when representatives of the OMG membership accept them as such by vote. (The policies and procedures of the OMG are described in detail in the *Object Management Architecture Guide*.)

OMG formal documents are available from our web site in PostScript and PDF format. To obtain print-on-demand books in the documentation set or other OMG publications, contact the Object Management Group, Inc.

# Part 2
# Collaboration Criteria

## 1 Introduction

This chapter describes three collaboration models dealing with bilateral negotiation, multilateral negotiation and promissory commitment. Each model is presented with a general description of the model purpose and characteristics, followed by the specification of the structure and values of Criteria instances used to represent the model.

Criteria descriptions are defined through construction of instances based on valuetypes defined under Part 3 and 4 of this document. Composition of valuetypes is described using the Digital Product Modeling Language (DPML) XML schema. DPML is a non-normative supplement to this specification that allows a more complete representation of Criteria instances than possible under IDL. The DPML 2.0 DTD and mapping to CommunityFramework and CollaborationFramework valuetypes is presented under section 3.

*Criteria Descriptions*

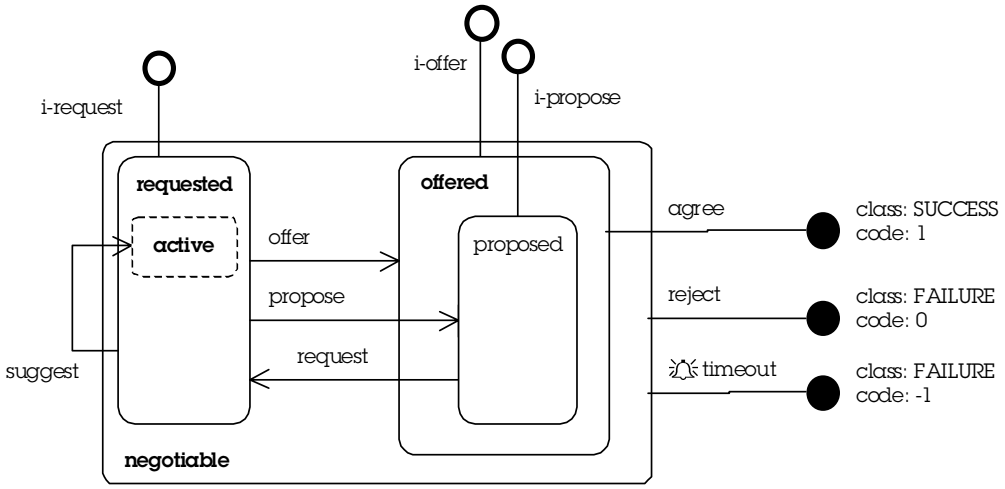
| Model label | Model Description |
|---|---|
| bilateral | A model of collaboration in which two parties can interact through offers, requests, suggestions and proposals, leading to an agreed or non-agreed conclusion. |
| multilateral | A model of collaboration in which an initiating party can establish a motion, a reciprocating party can second the motion, supporting actions enable motion amendment (through amendment motions), leading to a vote on the motion and possible establishment of an agreed result. |
| promissory | A model of collaboration in which an initiating party can establish a promise towards another party, where the reciprocating party can call the promise, thereby establishing an obligation on the promising party, leading to the launching of a fulfillment process (defined under a separate processor model). |

# 2 Collaborative Process Models

## 2.1 Bilateral Negotiation

This section describes a model of collaboration in which two parties can interact through offers, requests, suggestions and proposals, leading to an agreed or non-agreed conclusion. The model expressed here in DPML defines the structure and values of a CollaborationModel contained within a ProcessorCriteria that may be executed under a CollaborationProcessor. The mappings between DPML elements and criteria valuetype are presented under Part 2, Section 3. Definition of the control valuetypes and the supporting interfaces are presented under Part 3 "CollaborationFramework" and Part 4 "CommunityFramework".

*Schematic Representation*




*DPML Specification*

**<DPML>**

**<collaboration label="bilateral" note="Bilateral negotiable agreement process model.">**

This model defines a bilateral process through which two parties may attempt to establish an agreement through a pattern of interaction similar to the classic notions of peer-to-peer negotiation. The process enables the establishment of a negotiation subject, an initial offered, proposed, or requested state, and transitions supporting the escalation of the level of mutual agreement between an parties qualified by the implicit PARTICIPANT roles of INITIATOR and RESPONDENT. The model demonstrates the application of input and output declarations, a simple state hierarchy, initializations, transitional actions, terminations and usage directives.

```
<input tag="subject" required="TRUE"
       type="IDL:omg.org/Session/AbstractResource:2.0" />
```

The establishment of the subject of a negotiation is controlled by the addition of an input usage constraint on the CollaborationModel (refer InputDescriptor). This input descriptor declares a requirement for the association of a tagged usage link named "subject" when initializing the hosting process. Initialization of the process is achieved by invoking apply_arguments on the hosting CollaborationProcessor. The client passing a string identifying an initialization argument

(one of the values of "init.offer", "init.propose" or "init.request") and an ApplyArgument value containing the name of the input usage constraint (in this case "subject") together with an instance of AbstractResource that will constitute the initial subject of the collaboration.

```
<state label="negotiable" >
```

The **negotiable** state is a parent state to the two states **proposed** and **requested**. Transitions declared on the **negotiable** state enable the explicit rejection of a **subject** by a user through the **reject** termination. A second characteristic of the negotiable state is the association of a **timeout** transition that will close the negotiation after a predetermined period of inactivity.

```
<trigger label="reject" >
        <launch mode="PARTICIPANT" />
        <termination class="FAILURE" code="0" />
</trigger>
```

The reject trigger declares the possibility to any PARTICIPANT to terminate the collaboration under a FAILURE status. A **reject** transition may be invoked against any **open** (**proposed**, **requested** or **offered**) state.

```
<trigger label="timeout" >
        <clock timeout="3600000" />
        <termination class="FAILURE" code="-1" />
</trigger>
```

The timeout trigger declares a default termination condition, armed when the negotiation state becomes active. The value represents the period between arming and firing by a CollaborationProcessor implementation. DPML represents time periods in micro-seconds.

```
<state label="requested" >

        <trigger label="init.request" >
                <launch mode="INITIATOR" />
                <initialization/>
        </trigger>
```

The **requested** state exposes transitions that allow a respondent to transition to the **offered** or **proposed** states using the **offer** or **propose** transitions, or to continue in the **requested state** through application of the **suggest** transition.

```
        <trigger label="suggest" >
                <launch mode="RESPONDENT"/>
                <local reset="TRUE">
                   <input tag="subject" required="TRUE" implied="FALSE"
                        type="IDL:omg.org/Session/AbstractResource:2.0" />
                </local>
        </trigger>
```

The **suggest** transition is a local transition with **reset** semantics enabled. Semantically it is equivalent to the **request** transition except that it is initiated under the **requested** state. **Suggest** is used as an exploratory mechanism through which two members can continue to invoke suggestions towards each other relative to the subject, until such time that at least one party is

ready to migrate to a higher level of commitment as expressed under the **proposed** or **offered** states.

```
<trigger label="offer" >
        <launch mode="RESPONDENT"/>
        <transition target="offered">
                <input tag="subject"
                  required="TRUE" implied=”FALSE”
                  type="IDL:omg.org/Session/AbstractResource:2.0" />
        </transition>
</trigger>
```

An **offer** is a transition from the **requested** state to the **offered** state. Invoking **offer** is on one hand an expression of agreement by the offering party, but on the other hand, restricts the potential for further negotiation (as compared to propose).

```
<trigger label="propose" >
        <launch mode="RESPONDENT"/>
        <transition target="proposed">
                <input tag="subject"
                  required="TRUE" implied=”FALSE”
type="IDL:omg.org/Session/AbstractResource:2.0" />
        </transition>
</trigger>

</state>
```

**Propose** is a transition from the **requested** to **proposed** states that introduces the commitment by the proposing party in that the subject of the proposal may be agreed to by the correspondent. This is distinct to the **requested** state where, in comparison, no agreement is implied.

```
<state label="offered" >

        <trigger label="init.offer" >
                <launch mode="INITIATOR" />
                <initialization/>
        </trigger>
```

The **offered state** enables a respondent to **agree** or **reject** an agreement to the subject of the collaboration. Invoking **agree** leads to the firing of a successful terminal transition expressing agreement by both parties to the **subject** of the **Collaboration**.

```
        <trigger label="agree" >
                <launch mode="RESPONDENT" />
                <move source="subject" target="result" switch="TRUE"/>
                <termination class="SUCCESS" code="1">
                        <output tag="result"
type="IDL:omg.org/Session/AbstractResource:2.0" />
                 </termination>
        </trigger>
```

The **agree** Trigger is available to a respondent under the **offered** and **proposed** states. **Agree** signifies the agreement by the respondent to an **offer** or **proposal** raised by the issuing user. The **agree** transition establishes a collaboration process under an **agreed** termination, expressing the

agreement by both parties to the **subject** of a collaboration. Agree contains an output descriptor declaring the **result** tag, established under the move directive.

```
<state label="proposed" >

    <trigger label="init.propose" >
        <launch mode="INITIATOR" />
        <initialization/>
    </trigger>
```

The **proposed** state extends the semantics of the **offered** state by introducing the possibility of change to the subject of the collaboration. Through application of the **request** transition, a respondent may change the subject of the collaboration to a new value and establish the active state as **requested**.

```
    <trigger label="request" >
        <launch mode="RESPONDENT"/>
        <transition target="requested">
            <input tag="subject"
              required="TRUE" implied=”FALSE”
type="IDL:omg.org/Session/AbstractResource:2.0" />
        </transition>
    </trigger>
```

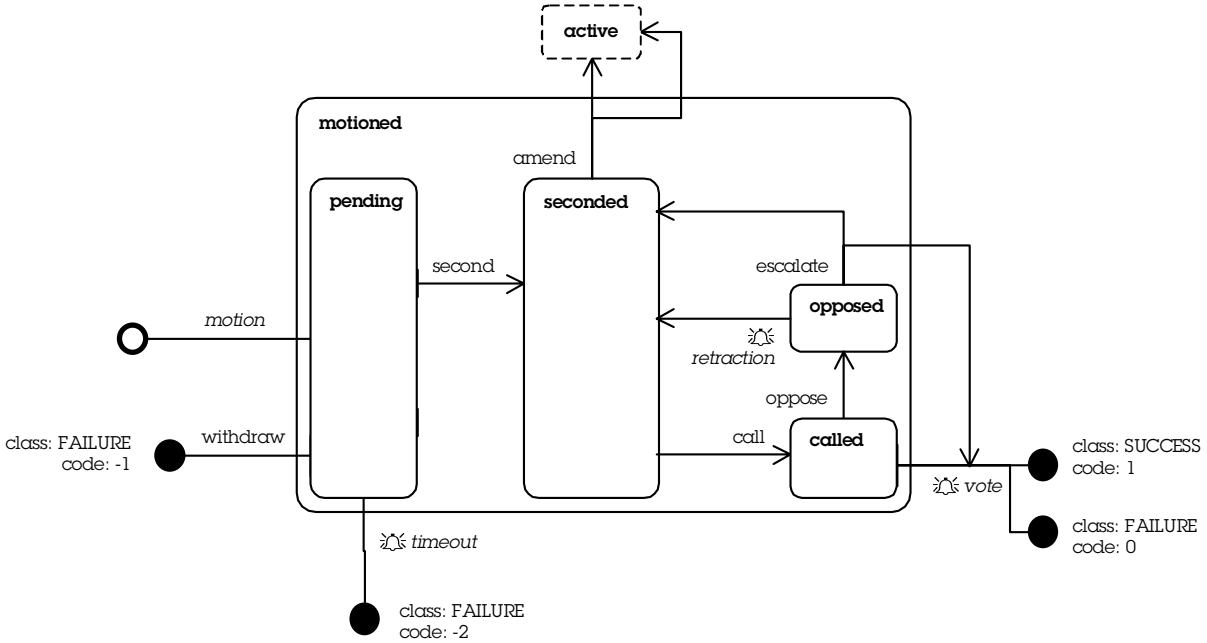
**Request** is a simple transition that can be applied under the **proposed** state. **Request** enables a respondent to change the subject of a negotiation and the context from the **proposed** to **requested** state. A **request** transition does not signify the commitment of the requesting party, however, it opens the possibility for the counterpart to respond with **propose** or **offer** against the **subject** under the **requested** state.

```
            </state>
        </state>
    </state>
</collaboration>
</DPML>
```

## 2.2 Multilateral Agreement

A Multilateral agreement model describes a collaboration criteria in which an initiating party can establish a motion, a reciprocating party can second that motion, and supporting actions that enable motion amendment (through amendment motions), leading to a vote on the motion and possible establishment of an agreed result. This model demonstrates the application of compound transitions dealing with voting and motion amendment. In the case of motion amendment, the compound transition is an example of a model recursion (multilateral declares amend which is a compound transition that references multilateral as the controlling model).

*Schematic Representation*




*DPML Specification*

```
<DPML>
<collaboration label="multilateral"
        note="Multilateral agreement through motion, amendment and voting">
```

A **motion**-based negotiation is a collaborative process model dealing with interactions between a group of two or more participants. It provides a framework within which a user can initiate a **motion** with an arbitrary **subject** under which agreement can be established through a consensus process.

```
        <input tag="subject"
                required="TRUE" implied="FALSE"
                type="IDL:omg.org/Session/AbstractResource:2.0" />
```

The subject input declaration requires that the Task associated to the hosting processor must be explicitly associated with a named usage tag (prior to processor start or during initalization). This resource represents the motion being raised.

**<state label="motioned" >**

The motioned state is the parent of two principal states, **pending** and **seconded** that through interaction between participants may lead to any of the terminal transitions of **agree**, **reject** or **withdraw**. Initialization of a multilateral **motion** is established through a **motion** trigger, establishing the invoking user as the INITIATOR. Under the **pending** state two actions are possible: (a) the **withdraw** transition may be launched either directly by the initiator, or though a **timeout** referral that will raise the withdraw termination or (b), a RECIPROCATING user (any user other than the user raising the motion) may **second** the motion leading to a transition to the seconded state. Once a **pending** motion is **seconded**, any user may invoke the **amend** or **call** triggers. Amend is executed as a full motion process whereas the call transition changes the active state to called. Under the called state the process may be opposed resulting in the potential withdrawal of the call or call escalation. The **escalate** trigger forces a 2/3 majority vote-to-vote, the successful outcome of which is mapped to a compound transition involving a formal vote. The failure of the vote-to-vote is mapped to a transition back to the seconded state. The **vote** trigger fires a voting compound transition that contains a ProcessorCriteria containing a VoteModel instance as the sub-processor definition The sub-processor, an instance of VoteProcessor exposes a **vote** operation under which participants may register **YES**, **NO** and **ABSTAIN**. The success or failure of a vote processor is mapped to an **agree** and **reject** termination that signal the success or failure of the multilateral process.

**<state label="pending" >**

The **pending** state signifies the agreement by one party to a motion, expressed as the **subject** of Collaboration and the expression of the interest of that party in the reaching of agreement to the associated subject. The issuing user may **withdraw** a motion at any time prior to **second** transition. A **timeout** terminal transition will fire after a predetermined interval if a motion is not seconded. A **second** transition establishes the motion as a valid motion to the Membership.

```
<trigger label="motion" >
        <launch mode="INITIATOR" />
        <initialization/>
</trigger>
```

Initialization using **motion** establishes the collaboration with the **pending** state and all parents as the **active-state** path. A motion is raised with the express interest of gaining the agreement (or rejection) of the membership to the subject of the motion. For a motion to be successful, the motion must be seconded and voted upon prior to the timeout of the withdraw action. At any time before a motion vote is initiated the principal raising the motion may actively withdraw the motion. A potential risk of raising a motion is that the subject of the motion, if seconded, may be amended at the discretion of the group.

```
<trigger label="second" >
        <launch mode="RESPONDENT" />
        <transition target="seconded" />
</trigger>
```

The **second** transition is a simple transition that may be invoked by a **respondent** in support of a **pending** motion. The second transition will result in the establishment of the **seconded** state and all **parent** states as the active-state path. Once a motion is seconded it may no longer be withdrawn and may be subject to amendment by the members of the collaboration.

```
<trigger label="withdraw" >
        <launch mode="INITIATOR" />
```

```
        <termination class="FAILURE" code="0" />
    </trigger>
```

The initiator of a motion may withdraw the motion at any time prior to the occurrence of a second action.

```
    <trigger label="timeout" >
        <clock timeout="120000" />
        <termination class="FAILURE" code="-1" />
    </trigger>
```

A **timeout** trigger will force termination of the process in the absence of a second to the motion.

```
    </state>

    <state label="seconded">
```

The **seconded** state establishes the process in a mode that disables the potential for motion withdrawn and raises the possibility for amendment of the motion or potential calling of a vote on the motion.

```
    <trigger label="amend" >
        <launch mode="PARTICIPANT"/>
        <move source="subject" target="subject.pending" />
        <external label="amending"
            public="-OSM//XML Model::MULTILATERAL//EN"
            system="http://home.osm.net/dpml/multilateral.xml">
        </external>
```

The **amend** Trigger contains a compound transition defined by a subsidiary collaboration process using the **motion** model (i.e. this model). To circumvent recursion restrictions within XML, the external element is used to indirectly reference the multilateral agreement model. Using the **apply_arguments** operation on CollaborationProcessor, the client passes in an identifier referencing the **Trigger** label (amend) together with a ApplyArgument value containing the "subject" usage label and an object representing the amendment. An amendment is executed as a sub-process under which the amended subject is raised as a new motion, subject to a second, and subsequent vote by the membership.

```
        <on class="SUCCESS">
            <remove source="subject.pending"/>
             <move source="result"
                    target="subject" switch="TRUE"/>
            <local reset="TRUE"/>
        </on>
```

On conclusion of the amendment process, a successful **result** of the underlying process will cause the completion of the transition by changing the **active-state** to **seconded** and the assertion of the sub-process result as the seconded subject.

```
        <on class="FAILURE">
            <remove source="subject" />
            <move source="subject.pending" target="subject"/>
            <local reset="TRUE"/>
        </on>
```

In the case of failure of the sub-process, the subject of the amendment sub-process is removed and the original subject is reinstated using the remove and move usage directives.

```
</trigger>

<trigger label="call" >
        <launch mode="PARTICIPANT" />
        <transition target="called" />
</trigger>
```

The **call** trigger may be invoked by any participant. It moves the process to a state that prevents further amendment.

```
</state>

<state label="called" >
```

The **called** state contains a vote clock, armed when the called state becomes active. The automatic launching of a vote can be disabled through the oppose trigger, forcing the Collaboration into an opposed state. If no participant opposes the call, a vote process will be automatically established.

```
<trigger label="vote" >
        <clock timeout="120000"/>
        <vote label="voting"
                policy="AFFERMATIVE" numerator="1" denominator="2">
                <input tag="subject" required="TRUE" implied="TRUE"
type="IDL:omg.org/Session/AbstractResource:2.0" />
        </vote>
```

The **vote** trigger is guarded by a timeout condition. It is armed when the containing state enters the active state path. The model declares a ProcessorCriteria value containing a vote model (refer VoteModel) and an input pre-condition that implicitly associates the current subject as the subject of the voting process.

```
        <on class="SUCCESS">
                <move source="subject" target="result" switch="TRUE" />
                <termination class="SUCCESS" code="1">
                        <output tag="result"
type="IDL:omg.org/Session/AbstractResource:2.0" />
                </termination>
        </on>
```

Post-conditions of the vote are expressed under the "on" statements (representing Map instances). On SUCCESS the subject usage link of the collaboration's task is moved to "result". The switch attribute signifies that the Collaboration implementation will switch the link containing the subject from consumed (input) to produced (output) as a post-condition to termination execution prior to process completion.

```
        <on class="FAILURE">
                <termination class="FAILURE" code="0" />
        </on>
```

On FAILURE of the vote, the process is terminated with its own failure status.

```
</trigger>

<trigger label="oppose" >
        <launch mode="RESPONDENT" />
        <transition target="opposed" />
</trigger>
```

The **oppose** Trigger enables declaration of opposition to the calling of a vote by transition to the opposed State.

```
</state>

<state label="opposed" >
```

The **opposed** state supports automatic retraction of a call under a timeout condition. Any member of the collaboration can intercept automatic timeout by invoking the escalate Trigger, forcing a vote-to-vote.

```
<trigger label="retraction" >
        <clock timeout="120000" />
        <transition target="seconded" />
</trigger>
```

The retraction trigger is armed when the opposed state enters the active state path. It declares a simple transition to the seconded state. Automatic retraction may be intercepted by the escalate trigger.

```
<trigger label="escalate" >
        <launch mode="RESPONDENT" />
```

The escalate trigger forces suspension of a retraction countdown by launching a vote-to-vote sub-processor.

```
<vote label="vote-to-vote"
        policy="AFFERMATIVE"
        numerator="2"
        denominator="3"/>
```

The vote-to-vote is a compound transition containing policy that defines vote rules to be applied, in this case an affirmative 2/3 majority is required for the vote processor to conclude with a successful result.

```
<on class="SUCCESS">
        <referral action="voting" />
</on>
```

On success of the vote-to-vote sub-processor, a referral action launches a normal vote process which will establish a finalization of the processor in a successful or failed state.

```
                    <on class="FAILURE">
                        <transition target="seconded" />
                    </on>
```

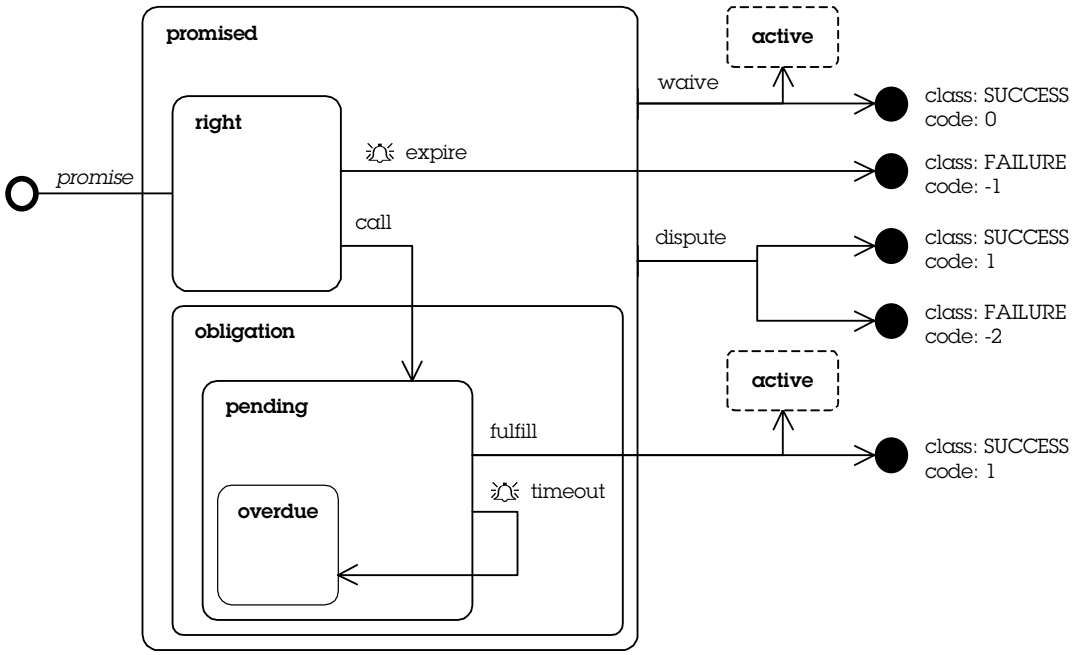
On failure of the vote-to-vote a simple transition to the seconded state is fired, enabling a resumption of subject amendment.

```
                    </trigger>
                </state>
            </state>
        </collaboration>
        </DPML>
```

## 2.3 Promissory Contract Fulfillment

The promissory contractual fulfillment model demonstrates the use of named roles as preconditions to trigger invocation. The model also includes reuse of the bilateral negotiation model as the means by which a commercial contract fulfillment process may be disputed and the means through which obligations of the contracting parties may be waived.

*Schematic Representation*




*DPML Specification*

```
<DPML>
<collaboration label="promissory" note="Promissory contract process model.">

    <role label="party" abstract="TRUE">
        <role.policy ceiling="1" quorum="1" assessment="STRICT"
            policy="CONNECTED" />
```

```
        <role label="supplier" abstract="FALSE"/>
        <role label="consumer" abstract="FALSE"/>
    </role>
```

The promissory contract fulfillment model contains a number of triggers that restrict the use of implicit role declarations such as INITIATOR and RESPONDENT. In this model the role guarding the call and fulfillment triggers are qualified by an explicit role declaration. One abstract role named "party" is defined as a container of two concrete roles named "supplier" and "consumer". Both supplier and consumer role policies are implied by the policy definition of the containing party role. In this example both are declared with a quorum and ceiling of one. This means that the maximum number of members associated with this role is one and the minimum number is one. The policy description also states that both users must be connected (refer Task and Session, User, Connected State) and that quorum assessment shall be strictly applied.

```
<input tag="contract"
        required="TRUE"
        type="IDL:omg.org/Session/AbstractResource:2.0" />
```

The promissory contract model is defined with a required Consumption association between the coordinating Task and the processor with a tag corresponding to "contract". This declaration establishes the requirements on a supplier to ensure that a tagged consumes link with the value "contract" is available prior to or during initialization of the hosting processor.

```
<state label="promised">
```

The **promissory** model defines a bilateral collaborative interaction. An initiator invoking a **promise** trigger establishes a **Collaboration** under the **right** state. Once initialized as a **right**, a respondent may call the promise by invoking a **call** transition. This corresponds to a **respondent** requesting fulfillment of the promise. An initiator of the promise (now in the role of respondent) fulfills a promise by applying the **fulfill** transition, itself a compound transition defined by a **bilateral** negotiation. Success of the negotiation leads to the **fulfilled** state whereas failure leads to the **rejected** state.

```
        <trigger label="waive" >
```

The **waive** trigger may be invoked by either consumer or provider. It is a compound transition referencing a bilateral or multilateral negotiation that if successful results in a transition to the terminal **waived** state. A failure of the negotiation will result in the continuation of the process under the active state establish prior to the initiation of the **waive** transition.

```
            <launch mode="PARTICIPANT" />
            <external label="waiving"
                public="-OSM//XML Model::BILATERAL//EN"
                system="http://home.osm.net/dpml/bilateral.xml">
            </external>
```

An implementation of Collaboration establishes a new sub-process using the declared criteria – in this case the DPML supplies criteria references a bilateral negotiation process using an external (ExternalCriteria) declaration.

```
            <on class="SUCCESS">
                <termination class="SUCCESS" code="0" />
            </on>
```

A successful result of a negotiation by the participants is mapped to a successful termination of the promissory contract.

```
<on class="FAILURE">
        <local reset="FALSE"/>
</on>
```

A failure result of a negotiation by the to participants in the attempt to waive the promise is mapped to a local transition to the last active state established prior to the initiation of the waive action.

```
</trigger>

<trigger label="dispute" >
        <launch mode="PARTICIPANT" />
        <copy source="contract" target="subject " />
        <external label="disputing"
                public="-OSM//XML Model::BILATERAL//EN"
                system="bilateral.xml">
        </external>
```

A **dispute** between a supplier and consumer can be established through applying the dispute trigger. A dispute may be initiated by either consumer or supplier. Prior to the initiation of the dispute sub-process, the contract association representing the promise is copied to a new link with the tag "subject", required as an input to a bilateral negotiation process. In this example a bilateral negotiation is defined as the dispute resolution mechanism.

```
        <on class="SUCCESS">
                <move source="result" target="contract" switch="TRUE"/>
                <local reset="TRUE"/>
        </on>
```

A successful conclusion of a dispute the "subject.pending" link is removed and the result of the negotiation process is established as the active subject. Process execution is returned to the last active state.

```
        <on class="FAILURE">
                <termination class="FAILURE" code="-2" />
        </on>
```

On failure of the dispute the process is terminated with a failed result.

```
</trigger>
```

A promise, made by a provider, towards a consumer under which the provider commits to the willingness to fulfill the promise at the request of the consumer.

```
<state label="right">

        <trigger label="promise" >
                <launch role="supplier" />
                <initialization/>
```

```
</trigger>
```

Initialization is achieved using the **promise** Trigger leading raised by a **supplier** facilitating the establishment of the promise offered under the subject of the process as a callable right of the **consumer**.

```
<trigger label="expire" >
        <clock timeout="12000000" />
        <termination class="FAILURE" code="-1" />
</trigger>
```

The **expire** trigger exposes a timeout value that will trigger the expiry of the consumer's right to invoke a **request** for fulfillment against a provider.

```
<trigger label="call" >
        <launch role="consumer" />
        <transition target="pending" />
</trigger>
```

The **call** trigger contains a transition to the pending state that is available to the consumer. Invoking the **call** transition establishes the promise as a **pending** obligation against the promise supplier.

```
</state>

<state label="obligation">
```

The **obligation** state establishes a collaborative context under which a promise constitutes an obligation of the provider to fulfill.

```
<state label="pending">
```

The **pending** state is a state under which a provider is obliged to fulfill on a promise through invocation of the **fulfill** transition.

```
<trigger label="fulfill" >
        <launch role="supplier" />

        <external label="fulfillment"
                public="-OSM//XML Model::BILATERAL//EN"
                system="http://home.osm.net/dpml/bilateral.xml">
        </external>
```

**Fulfill** is available to a provider under the obligation **pending** state. A **fulfill** transition is defined as a compound transition that uses a bilateral negotiation criteria. A subsidiary **Collaboration** is instantiated that, on resolution, defines the success or failure condition used to determine the conclusion of the fulfillment action.

```
        <on class="SUCCESS">
                <move source="result" target="deliverable" />
                <termination class="SUCCESS" code="1">
                        <output tag="deliverable"
type="IDL:omg.org/Session/AbstractResource:2.0" />
```

```
            </termination>
        </on>
```

On successful completion of the fulfillment sub-process, the result of the fulfillment is established under a link tagged as the fulfillment "deliverable. The implementation fires a success termination of the process, indicating satisfactory fulfillment of the promissory contract process.

```
        <on class="FAILURE">
            <local reset="TRUE"/>
        </on>
```

On failure of the fulfillment sub-process a local transition is enabled following which the supplier is able to re-attempt fulfillment or potentially enter into a dispute resolution process or request a waive of the promise.

```
        </trigger>

        <trigger label="timeout" >
            <clock timeout="240000000" />
            <transition target="overdue" />
        </trigger>
```

**Timeout** is a clock controlled simple transition that changes an existing **obligation pending** to **obligating pending** and **overdue**.

```
        <state label="overdue"/>
```

The **overdue** state is a sub-state of pending which is established by an implementation of Collaboration when a pending obligation timeout transition expires.

```
                </state>
            </state>
        </state>
    </collaboration>
</DPML>
```

## 3 DPML Schema Specification

Digital Product Modeling Language (DPML) DTD specification 2.0.
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This DTD defines the structural semantics of the data types used in the construction of digital products supporting distributed collaborative business process descriptions. This schema is a non-normative supplement supporting declaration of criteria composition related to the OMG EC Domain Specification - Community and Collaboration Frameworks. Descriptions of attributes and elements contained within this section are provided as a convenience. The formal specification of objects models and associated semantics are defined under the specification of valuetypes and interfaces within Part 3 "CommunityFramework" and Part 4 "CollaborationFramework" based on the mapping of element to types contained at the end of this section.

### *Criteria*

The criteria ENTITY is defined as the set of concrete criteria types that can be contained as the root element within a DPML document. The DPML root ELEMENT declaration defines the set of elements types that can be declared as a root element. The elements generic (GenericCriteria), community (CommunityCriteria), agency (AgencyCriteria), encounter (EncounterCriteria), external (ExternalCriteria) and processor (ProcessorCriteria) all map directly to criteria valuetypes. In the case of vote, engage and collaboration the elements map to an instance of ProcessorCriteria where the contained model is an instance of VoteModel, EngagementModel, and CollaborationModel respectively.

```
<!ENTITY % criteria
"(generic|community|agency|encounter|processor|external|vote|engagement|collaboration)">
<!ELEMENT DPML (%criteria;)>
```

### *Control*

The control ENTITY is a declaration that defines an identifying name and description attribute. These attribute declarations correspond to the state fields of the base type Control from the CommunityFramework.

IDL:osm.net/CommunityFramework::Control:2.0.

```
<!ENTITY % label "label ID #IMPLIED">
<!ENTITY % note "note CDATA #IMPLIED">
<!ENTITY % control "%label; %note;">
```

### *Input and Output*

The input and output elements define consumption and production statements that can be associated to process centric criteria. Both input and output are derived from the abstract UsageDescriptor exposed by a ProcessorModel usage state field. The value contained by the type field shall be consistent with the XMI Production Rules, specifically, types shall be declared in accordance with their IDL interface repository identifier. For example, a GenericResource would be identified by the string IDL:osm.net/CommunityFramework:GenericResource:2.0. The value of the tag field corresponds to the tag attributed to a usage link (refer Production and Consumption - Task and Session Specification). The implied attribute states that a usage link of the tag is required as distinct from optional. The implied attribute, if true, states that if the tagged link already exists on the controlling Task, that link is implied – whereas a false value states that the link must be explicitly set (possible resulting in the replacement of an existing link with the same tag value).

IDL:osm.net/CommunityFramework::InputDescriptor:2.0
IDL:osm.net/CommunityFramework::OutputDescriptor:2.0

```
<!ENTITY % tag "tag CDATA #REQUIRED">
<!ENTITY % required "required (TRUE|FALSE) 'TRUE'">
<!ENTITY % implied "implied (TRUE|FALSE) 'TRUE'">
<!ENTITY % type "type CDATA #REQUIRED">

<!ELEMENT input EMPTY >
<!ATTLIST input
        %tag; %required; %implied; %type;
>
```

```
<!ELEMENT output EMPTY >
<!ATTLIST output
        %tag; %type;
>
```

### *remove, copy, move and create*

The copy, move, create and remove directives are instructions that can be declared within the scope of a referral, a trigger, or an on post-condition statement. These directives declare actions to be taken by an implementation of CollaborationProcessor that effect tagged usage relationships on the coordinating Task or Encounter. Usage directives enable the declaration of operators that result in the manipulation of usage associations such as renaming or duplication of an association, inversion of an association from consumption to production, or retraction of an association.

IDL:osm.net/CollaborationFramework::Remove:2.0 // remove
IDL:osm.net/CollaborationFramework::Duplicate:2.0 // copy
IDL:osm.net/CollaborationFramework::Move:2.0 // move
IDL:osm.net/CollaborationFramework::Constructor:2.0 // create

```
<!ENTITY % source "source CDATA #REQUIRED">
<!ENTITY % target "target CDATA #REQUIRED">
<!ENTITY % switch "switch (TRUE|FALSE) 'FALSE'">
<!ENTITY % directive.attributes "%source; %target; %switch;">

<!ELEMENT copy EMPTY>
<!ATTLIST copy
        %directive.attributes;
>

<!ELEMENT move EMPTY>
<!ATTLIST move
        %directive.attributes;
>

<!ELEMENT create (target,%criteria;) >
<!ATTLIST create
        %target;
>

<!ELEMENT remove EMPTY >
<!ATTLIST remove
        %source;
>
<!ENTITY % directive.content "((create|copy|move|remove)*)" >
```

### *initialization*

An initialization ELEMENT is a type of transitional action. It qualifies the containing state as a candidate for establishment of the active-state when starting a processor. A processor may be initialized through the apply operation on the abstract Collaboration interface, or implicitly through starting a CollaborationProcessor.

IDL:osm.net/CollaborationFramework::Initialization:2.0

```
<!ELEMENT initialization (input*) >
<!ATTLIST transition
```

```
        %control;
>
```

### *transition*

A transition ELEMENT declares a target state facilitating modification of a CollaborationProcessor active state path. Modification of the active state path establishes a new collaborative context, enabling a new set of triggers, guard conditions and timeouts based on declared clocks. A transition element may also contain any number of input statements enabling declaration of required or optional arguments to be supplied under the Collaboration apply_arguments operation.

IDL:osm.net/CollaborationFramework::SimpleTransition:2.0

```
<!ELEMENT transition (input*) >
<!ATTLIST transition
        %control;
        target IDREF #IMPLIED
>
```

### *local*

The local ELEMENT defines a transition to the current active-state and exposes a clock timeout reset policy. If the reset policy is true, all timeout conditions established under the active state path shall be re-initialized. A local transition element may also contain any number of input statements enabling declaration of required or optional arguments to be supplied under the Collaboration apply_arguments operation.

IDL:osm.net/CollaborationFramework::LocalTransition:2.0

```
<!ELEMENT local (input*) >
<!ATTLIST local
        %control;
        reset (TRUE|FALSE) "FALSE"
>
```

### *termination*

A termination declares a processors termination within completion status. The ENTITY completion declares a completion class and code. It is used within a termination element to declare a SUCCESS or FAILURE result status and implementation specific result code. The termination element can contain any number of output declarations.

IDL:osm.net/CollaborationFramework::Completion:2.0
IDL:osm.net/CollaborationFramework::TerminalTransition:2.0

```
<!ENTITY % class "class (SUCCESS|FAILURE) 'SUCCESS'">
<!ENTITY % code "code CDATA #IMPLIED">
<!ENTITY % completion "%class; %code;">
<!ELEMENT termination (output*)  >
<!ATTLIST termination
        %control;
        %completion;
>
```

### *generic*

The generic ELEMENT is used to define the valuetype GenericCriteria, used as an argument to a ResourceFactory to construct resources containing arbitrary content contained within a CORBA any. Instances of GenericResource provide a convenience container for arbitrary resource association (such as the subject of a negotiation or XML document defining contractual terms).

IDL:osm.net/CommunityFramework::GenericCriteria:2.0

```
<!ELEMENT generic (nvp*) >
<!ATTLIST generic
        %control;
>
```

### *community*

The community ELEMENT describes an instance of CommunityCriteria. CommunityCriteria may be used as an argument to a ResourceFactory to construct a new instance of Community. Community is a type of Workspace (refer Task and Session) that supports the abstract Membership interface.

IDL:osm.net/CommunityFramework::CommunityCriteria:2.0

```
<!ELEMENT community (membership, (nvp*)) >
<!ATTLIST community
        %control;
>
```

### *agency*

The agency ELEMENT represents the AgencyCriteria valuetype that may be passed as an argument to a ResourceFactory resulting in creation of a new Agency instance. Agency is a type of Community with inheritance from LegalEntity. Agency represents a community against which supplementary implementation specific policy can be associated (such as an applicable legal domain).

IDL:osm.net/CommunityFramework::AgencyCriteria:2.0

```
<!ELEMENT agency (membership, (nvp*)) >
<!ATTLIST agency
        %control;
>
```

### *encounter*

The encounter ELEMENT defines an EncounterCriteria against which new instances of Encounter can be created using a ResourceFactory. Encounter is a type of Task that serves as a controller of Processor instances. Encounter, as a Membership, may be associated to may users. Through inheritance of Task exactly one User is associated as the owner of an Encounter.

IDL:osm.net/CollaborationFramework::EncounterCriteria:2.0

```
<!ELEMENT encounter (membership, nvp*) >
<!ATTLIST encounter
        %control;
>
```

### *external*

External describes the ExternalCriteria valuetype. ExternalCriteria contains a public and system identifier of a remote resource. The public and system identifiers contained within an external declaration are factory dependent. For example, a factory implementation with knowledge of DPML can use external criteria as a means through which criteria can be inferred. Other examples of external criteria application include embedding of interoperable naming URLs. An external element may include any number of input and output statements.

IDL:osm.net/CommunityFramework::ExternalCriteria:2.0

```
<!ELEMENT external ((input|output)*,nvp*)>
<!ATTLIST external
        %control;
        public CDATA #IMPLIED
        system CDATA #REQUIRED
>
```

### *processor*

The processor element contains input and output declarations and a named value pair sequence defining factory criteria. Input and output declarations define the resources that a processor implementation requires as input, and the resources that will be produced by the processor. Supplementary processor criteria is contained under the nvp (named value pair) sequence. An implementation is responsible for mapping of nvp values to a named value pair sequence as defined by the CosLifeCycle Criteria type specification.

IDL:osm.net/CollaborationFramework::ProcessorCriteria:2.0

```
<!ELEMENT processor ( (input|output)*, nvp*)>
<!ATTLIST processor
        %control;
>
```

### *vote*

The vote element defines ProcessorCriteria containing a VoteModel (referred to as vote criteria). Vote criteria, when passed to a ResourceFactory, results in the establishment of a new instance of VoteProcessor. Using a VoteProcessor, members of a coordinating Encounter can register votes in support of, in opposition to, or abstain relative to a subject. VoteProcessor raises a result status indicating the successful or failure status of a voting process.

IDL:osm.net/CollaborationFramework::ProcessorCriteria:2.0
IDL:osm.net/CollaborationFramework::VoteModel:2.0 // model

```
<!ENTITY % numerator "numerator CDATA #REQUIRED" >
<!ENTITY % denominator "denominator CDATA #REQUIRED" >
<!ENTITY % quorum "%numerator; %denominator;" >
<!ELEMENT vote ((input|output)*, nvp*)>
<!ATTLIST vote
        %control;
        %quorum;
        policy (AFFERMATIVE|NON_ABSTAINING) "AFFERMATIVE"
        single (TRUE|FALSE) "TRUE"
        lifetime CDATA #IMPLIED
>
```

### *engagement*

Engagement defines a ProcessorCriteria that contains an EngagementModel. When passed as an argument to a ResourceFactory, such a criteria will result in the creation of a new instance of EngagementProcessor. EngagementProcessor declares policy enabling the attribution of proofs and evidence in the establishment of binding agreements.

IDL:osm.net/CollaborationFramework::ProcessorCriteria:2.0

```
<!ELEMENT engagement ((input|output)*)>
<!ATTLIST engagement
        %control;
        policy CDATA #IMPLIED
>
```

### *collaboration*

The collaboration element defines ProcessorCriteria criteria containing a CollaborationModel (referred to as Collaboration Criteria). Collaboration criteria, when passed as an argument to a ResourceFactory results in the creation of a new instance of CollaborationProcessor. CollaborationProcessor is a type of Processor that contains a CollaborationModel as the definition of the rules of engagement between a set of members associated under a controlling Encounter.

IDL:osm.net/CollaborationFramework::ProcessorCriteria:2.0
IDL:osm.net/CollaborationFramework::CollaborationModel:2.0 // model

```
<!ELEMENT collaboration ((input|output)*, role?, state, nvp*) >
<!ATTLIST collaboration
        %control;
>
```

### *launch*

The launch element defines a Launch valuetype, itself a type of Guard that is contained by a Trigger. Guards establish preconditions to the activation of actions contained within triggers. In the case of Launch, the preconditions concern the implicit role of a user and optionally explicit association of a user under a particular role. Implicit preconditions declare three enumeration values – INITIATOR, the principal that invoked that last collaborative action, or in the case of no prior action, a member of the controlling Encounter; RESPONDENT, any principal other than the initiator; and PARTICIPANT, any principal associated to the controlling Encounter. These implicit roles are dynamically maintained by an implementation of CollaborationProcessor. Implicit roles can be further qualified by declaration of a role name that a principal must be associated to under the coordinating Encounter (such as "customer", "supplier", etc.).

IDL:osm.net/CollaborationFramework::Launch:2.0
IDL:osm.net/CollaborationFramework::TriggerMode:2.0

```
<!ENTITY % mode "mode (INITIATOR|RESPONDENT|PARTICIPANT) 'PARTICIPANT'">
<!ELEMENT launch EMPTY >
<!ATTLIST launch
        %mode;
        role IDREF #IMPLIED
>
```

### *clock*

A clock defines a Clock valuetype. Clock contains a timeout declaration. When the containing state enters the Active-state path the clock countdown is enabled. Clock resetting is possible through invocation of a local transition. Clock disabling is possible by changing the active state path such that the containing state is no longer active. On timeout of a clock, an implementation of CollaborationProcessor is responsible for invoking the action contained by the Trigger containing the clock declaration. A typical application of the clock operator is to automatically trip a state transition after a predetermined period of in-activity.

IDL:osm.net/CollaborationFramework::Clock:2.0

```
<!ELEMENT clock EMPTY >
<!ATTLIST clock
        timeout CDATA #IMPLIED
>
```

### *referral*

A referral references the ID of an action to apply. An implementation of Collaboration is responsible for management of the branching of the collaboration state to the identified action and in the case of an action defined as a compound transition, to execute on statements arising from sub-process conclusion.

IDL:osm.net/CollaborationFramework::Referral:2.0

```
<!ELEMENT referral %directive.content; >
<!ATTLIST referral
        action IDREF #REQUIRED
>
```

### *compound*

A compound transition is not directly represented in the DPML scheme as an element. Instead, it is represented in terms of an ENTITY content rule associating a processor criteria (or element expandable to a processor criteria) and result mapping. While simplifying DPML structure, the flattening of criteria and action results in the requirement for a compound action label to be equivalent to the model contained by a compound action.

IDL:osm.net/CollaborationFramework::CompoundTransition:2.0

```
<!ENTITY % compound "((external|process|collaboration|vote|engagement), (on+))">
```

### *trigger*

A trigger contains a guard, directive operators, an action, and a priority attribute. Triggers are referenced by their label under the Collaboration interface apply operation. An implementation of Collaboration takes trigger labels as execution instructions that enable clients to manipulate collaborative context. An implementation of apply is responsible for assessing guard preconditions, following which apply requests and associated usage directives are queued relative to Trigger priorities. On execution and implementation is responsible for executing usage directives before executing the action contained within the trigger.

IDL:osm.net/CollaborationFramework::Guard:2.0
IDL:osm.net/CollaborationFramework::Trigger:2.0

```
<!ENTITY % guard "(launch*, clock*)">
<!ENTITY % priority "priority CDATA #IMPLIED">
<!ENTITY % transitional "(initialization|transition|local|termination)">
<!ENTITY % action "(%transitional;|referral|%compound;)">

<!ELEMENT trigger (%guard;,%directive.content;,%action;)>
<!ATTLIST trigger
        %control;
        %priority;
>
```

*on*

A compound transition content declaration associates processor criteria that may be executed as a sub-process with a set of on statements. Each on statement declares an action to apply given a particular result of the process executed as a result of criteria expansion. On statements are defined by class and result code. An implementation of collaboration is responsible for matching sub-process result class and sub-codes and subsequent firing of the declared action.

IDL:osm.net/CollaborationFramework::Map:2.0

```
<!ELEMENT on (%directive.content;,%action;) >
<!ATTLIST on
        %class;
        %code;
>
```

*state*

A "state" is an element containing a set of sub-states and associated triggers. State elements are the basic building blocks for collaborative context. Each state element can contain sub-states and each state element can contain any number of Trigger declarations. A Collaboration implementation maintains the notion of active-state following initialization of the collaboration and tracks active-state relative to the last transition that has been invoked. The active state path is the set of states between the active state and the root-state of the CollaborationModel. All triggers declared within the active-state path are considered candidates relative to the apply operation. By modifying the active state (and by consequence the active-state path) the collaborative content and available trigger options available to the associated membership are modified relative to the constraints and directives declared under exposed triggers.

IDL:osm.net/CollaborationFramework::State:2.0

```
<!ELEMENT state ((trigger|state)*)>
<!ATTLIST state
        %control;
>
```

*membership*

Membership is a model of the policy and roles that establishes the notion of a group of users sharing the same set of rules. This element is used within the structural definition of criteria such as community, agency and encounter.

IDL:osm.net/CommunityFramework::MembershipModel:2.0

```
<!ELEMENT membership (membership.policy?, role) >
```

### *membership.policy*

The membership.policy ELEMENT declares privacy and exclusivity constraints on the membership. The membership.policy element is contained within the membership element. MembershipPolicy declares an exclusivity attribute that if true, ensures that all members of a membership are uniquely represented in terms of identifiable principals (i.e. no principal may be represented more than once). The privacy attribute qualifies the level of information that may be disclosed about the business roles attributed to a given member via operation of the Membership abstract interface.

IDL:osm.net/CommunityFramework::MembershipPolicy:2.0

```
<!ELEMENT membership.policy EMPTY>
<!ATTLIST membership.policy
        privacy (PUBLIC|RESTRICTED|PRIVATE) "PUBLIC"
        exclusivity (TRUE|FALSE) "TRUE"
>
```

### *role*

Role is a specification of the state of a business role that may be abstract or concrete depending on the value of the abstract attribute. A role element exposes a quorum and ceiling through the contained role.policy element. Business roles such as "supplier" or "customer" can be packaged under higher-level roles such as "signatory". Association of the status of "signatory" to both supplier and customer can be achieved by locating supplier and customer as sub-roles of a parent role named "signatory". Roles can then be used as conditional guards concerning access to triggers within the body of collaboration models.

IDL:osm.net/CommunityFramework::Role:2.0

```
<!ELEMENT role (role.policy?,role*) >
<!ATTLIST role
        %control;
        abstract (TRUE|FALSE) "FALSE"
>
```

### *role.policy*

Role policy is an element that defies the state of a RolePolicy valuetype. RolePolicy is used as a container of the policy attributed to a specific name business role that includes ceiling and quorum values, policy concerning quorum assessment and policy concerning the connection status of a user relative to quorum calculations.

IDL:osm.net/CommunityFramework::RolePolicy:2.0

```
<!ELEMENT role.policy EMPTY >
<!ATTLIST role.policy
        ceiling CDATA #IMPLIED
        quorum CDATA #IMPLIED
```

```
        assessment (STRICT|LAZY) "LAZY"
        policy (SIMPLE|CONNECTED) "SIMPLE"
>
```

*nvp*

Named value pairs are used as descriptive arguments to generic resource criteria. A sequence of nvp elements can be mapped to a CosLifeCycle::Criteria type as exposed by the Criteria type.

IDL:omg.org/CosLifeCycle::NameValuePair:1.0

While interpretation of nvp values is implementation dependant, the following rules shall apply to values expressing IDL types:

1. Basic IDL types are represented by a string containing the name of the type. The type is derived from the **CORBA TypeCode's TCKind** by deleting the leading "tk_". This rule follows the convention used in section 5.3.10.2 (CorbaTypeName) of the XMI 1.0 specification (formal/00-06-01).

   Example: the string representation of the type **long** is "long;" that of **unsigned long long** is "ulonglong."

2. Sequences of basic IDL types are represented by a string containing the type-specifier in IDL syntax without any spaces. That is, a sequence of **XXXs** is coded as "sequence<XXX>" where XXX is the name of the string found using rule 1.

   Example: A sequence of **longs** is represented by ""sequence<long>."

3. For other data types, the repository ID is used.

   Example: the **CollaborationProcessor** is represented by "IDL:osm.net/CollaborationFramework/CollaborationProcessor:2.0."

```
<!ELEMENT nvp (ANY) >
<!ATTLIST nvp
        name CDATA #REQUIRED
>
```

## 4 Element to IDL Type Mapping

| Element | IDL Type |
|---|---|
| input | IDL:osm.net/CommunityFramework::InputDescriptor:2.0 |
| output | IDL:osm.net/CommunityFramework::OutputDescriptor:2.0 |
| copy | IDL:osm.net/CollaborationFramework::Duplicate:2.0 |
| move | IDL:osm.net/CollaborationFramework::Move:2.0 |
| create | IDL:osm.net/CollaborationFramework::Constructor:2.0 |
| remove | IDL:osm.net/CollaborationFramework::Remove:2.0 |
| initialization | IDL:osm.net/CollaborationFramework::Initialization:2.0 |
| transition | IDL:osm.net/CollaborationFramework::SimpleTransition:2.0 |
| local | IDL:osm.net/CollaborationFramework::LocalTransition:2.0 |
| termination | IDL:osm.net/CollaborationFramework::TerminalTransition:2.0 |
| generic | IDL:osm.net/CommunityFramework::GenericCriteria:2.0 |
| community | IDL:osm.net/CommunityFramework::CommunityCriteria:2.0 |
| agency | IDL:osm.net/CommunityFramework::AgencyCriteria:2.0 |
| encounter | IDL:osm.net/CollaborationFramework::EncounterCriteria:2.0 |
| external | IDL:osm.net/CommunityFramework::ExternalCriteria:2.0 |
| processor | IDL:osm.net/CollaborationFramework::ProcessorCriteria:2.0<br>IDL:osm.net/CollaborationFramework::ProcessorModel:2.0 |
| vote | IDL:osm.net/CollaborationFramework::ProcessorCriteria:2.0<br>IDL:osm.net/CollaborationFramework::VoteModel:2.0 |
| engagement | IDL:osm.net/CollaborationFramework::ProcessorCriteria:2.0<br>IDL:osm.net/CollaborationFramework::EngagementModel:2.0 |
| collaboration | IDL:osm.net/CollaborationFramework::ProcessorCriteria:2.0<br>IDL:osm.net/CollaborationFramework::CollaborationModel:2.0 |
| launch | IDL:osm.net/CollaborationFramework::Launch:2.0 |
| clock | IDL:osm.net/CollaborationFramework::Clock:2.0 |
| referral | IDL:osm.net/CollaborationFramework::Referral:2.0 |
| compound | IDL:osm.net/CollaborationFramework::Compound:2.0 |
| trigger | IDL:osm.net/CollaborationFramework::Trigger:2.0 |
| on | IDL:osm.net/CollaborationFramework::Map:2.0 |
| state | IDL:osm.net/CollaborationFramework::State:2.0 |
| membership | IDL:osm.net/CommunityFramework::MembershipModel:2.0 |
| membership.policy | IDL:osm.net/CommunityFramework::MembershipPolicy:2.0 |
| role | IDL:osm.net/CommunityFramework::Role:2.0 |
| role.policy | IDL:osm.net/CommunityFramework::RolePolicy:2.0. |
| nvp | IDL:osm.net/CosLifeCycle::NameValuePair:1.0 |

## 5 Related DPML Documents

Additional information concerning DPML development and additional DPML documents are maintained under the following URL:

http://home.osm.net/dpml

The latest version of DPML can be located under the following URL:

http://home.osm.net/dpml/dpml.dtd

The DPML examples described under Part 2 of this specification are available at the following URL:

http://home.osm.net/dpml/bilateral.xml
http://home.osm.net/dpml/multilateral.xml
http://home.osm.net/dpml/promissory.xml

# Part 3
# CollaborationFramework

The CollaborationFramework defines a sharable Task named Encounter, formalizes the definition of a Processor, and introduces three types of Processors dealing with the application level requirements covering contractual engagement, voting and collaboration against which business processes supporting contract negotiation, fulfillment and settlement can be defined, simulated and executed.

Principal interfaces defined under this specification include:

- EngagementProcessor, a processor supporting the registration of Evidence and generation of Proof by a membership
- VoteProcessor, a processor supporting the registration of votes by a membership
- CollaborationProcessor, a processor supporting collaborative interaction between members of an Encounter.

These interfaces build upon the specifications established under the CommunityFramework, in particular the notion of Membership is reused as the basis for the definition of a shared Task associated to a common Processor. The CollaborationFramework continues the Model/Simulator pattern established under the CommunityFramework specifications as the mechanisms for separation of configuration and execution policy from the IDL computational interface.

*Core Interfaces - Summary Table*

| Interface | Description |
|---|---|
| Processor | Processor is a base type for interfaces dealing with contractual engagement voting and collaboration. Processor is associated to a Task and can expose a sub-processor hierarchy. |
| ProcessorModel | A valuetype derived supporting the abstract Model interface used to describe preconditions to Processor execution. |
| UsageDescriptor | An abstract valuetype inherited by valuetypes contained by a ProcessorModel that declares a usage (input, output) constraint. |
| InputDescriptor | Declaration of an input resource (consumed) that a processor requires on its associated task. |
| OutputDescriptor | Declaration of an output (produced) resource that a processor generates on its associated task. |

| Interface | Description |
|---|---|
| ProcessorCriteria | A type of Criteria used by a ResourceFactory to construct a new Processor instance based on the contained ProcessorModel. |
| Encounter | An Encounter is a type of Task that incorporates the abstract Membership interface. |
| EncounterModel | A valuetype extending the abstract CommunityFramework MembershipModel that contains the policy and role model of a membership. |
| EncounterCriteria | A type of Criteria used by a ResourceFactory to construct a new Encounter instance. |

*Application Interfaces - Summary Table*

| Interface | Description |
|---|---|
| Engagement | Abstract definition of engagement. |
| EngagementProcessor | A type of Processor supporting the association of Proof and Evidence by a set of collaborating users based on the abstract Engagement interface. |
| EngagementModel | A valuetype containing implementation dependant policy of an Engagement processor. |
| Vote | Abstract interface defining vote registration and vote aggregation operations. |
| VoteProcessor | A type of processor supporting the registration of votes by members of an associated Encounter based on the Vote abstract interface. |
| VoteModel | A valuetype containing the ceiling, count and multiple registration policy applicable to a VoteProcessor. |
| Collaboration | An abstract interface defining operations through which a client can interact with a collaborative state model. |
| CollaborationProcessor | A type of Processor supporting collaborative interaction relative to a CollaborationModel rule base using the abstract Collaboration interface. |
| CollaborationModel | A valuetype defining state, sub-states, transitions, compound actions and role related policies. |

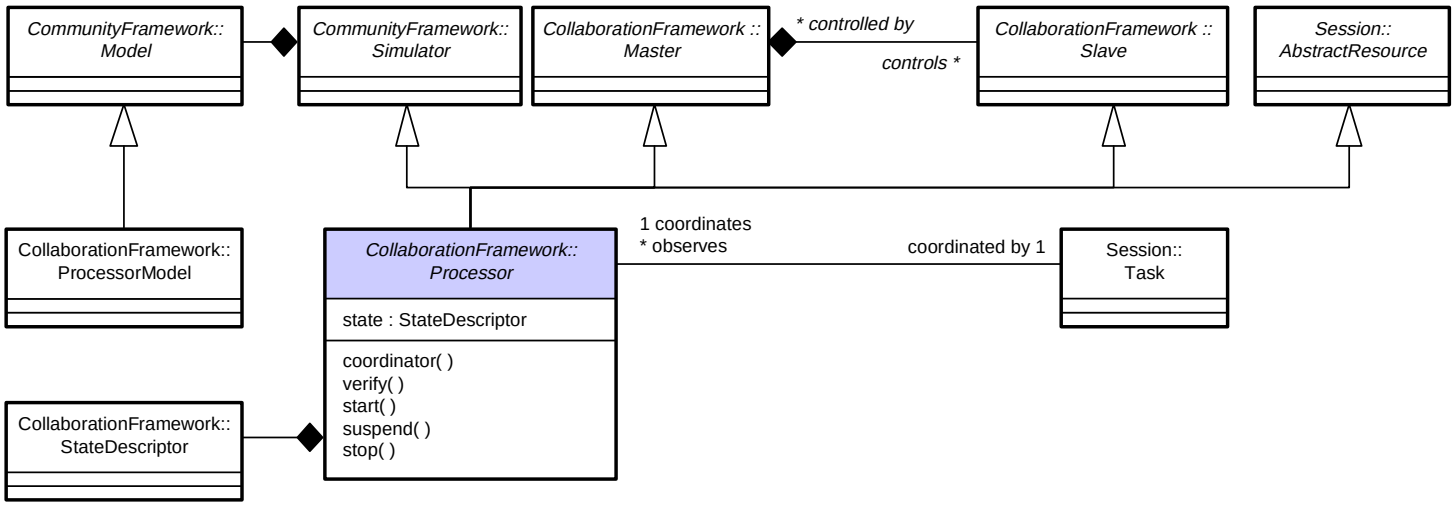
*CollaborationModel Related valuetypes - Summary Table*

| Interface | Description |
|---|---|
| State | A valuetype defining a state hierarchy against which Triggers and sub-States can be associated. |
| Trigger | A container of an invocation guard, preconditions and an action. |
| Action | Base valuetype for Transition, CompoundTransition and Referral. |
| Transition | A type of action that is a base type to all actions related to modification of a collaborative state context. A transition may declare changes to rules concerning inputs of a processor. |
| Transitional | Abstract valuetype contained by a Transition. This is the base type to Initialization, SimpleTransition, LocalTransition, and TerminalTransition. |

| Interface | Description |
|---|---|
| Initialization | A transitional valuetype used to declare a candidate initial state. |
| SimpleTransition | A type of Transitional supporting the modification of the active state of a collaboration. |
| LocalTransition | A type of Transitional supporting loop-back transition functionality. |
| TerminalTransition | A type of Transitional that defines a processor result value. |
| CompoundTransition | A type of Action that declares a transition that is executed as a sub-process associated with an independent processor model. A compound transition may have multiple possible result states. |
| Referral | A type of Action used to redirect a result to a locally defined action. |
| Map | A valuetype contained by a CompoundTransition. Used to associate compound transition sub-process results to explicit actions. |

## 1 Processor and related Interfaces

The Task and Session specification defines the notion of a processor as the source of execution relative to a Task. The CollaborationFramework establishes a formal definition of Processor as abstract base type for interfaces dealing with collaboration, engagement and voting. Section 1.1 presents the definition of the Processor interface that serves as a base type to CollaborationProcessor, VoteProcessor and EngagementProcessor. Section 1.2 defines the Master and Slave abstract interfaces and their relationship to the Control link through which one processor can be associated as a sub-processor to another. Section 1.3 presents StateDescriptor, a valuetype exposed by an instance of Processor that contains information about a processor execution state including declaration of problems arising during configuration and execution. Section 1.4 details the ProcessorModel valuetype used to declare configuration preconditions and the ProcessorCriteria valuetype used by a ResourceFactory in the creation of new processor instances. Section 1.5 defines a set of abstract and concrete link types used to describe the coordination relationship between a Task and a Processor.




*Processor object model.*

## 1.1 Processor

A processor is responsible for applying input arguments (associated consumed and produced resource selection) declared by a co-ordinating Task in the execution of a service. Operations exposed by Processor are largely defined by the implied semantics documented under the Task and Session Specification (formal/00-05-03). A processor is responsible for notification of state change towards its associated Task and handling start, suspend and stop requests in accordance with the Task Session state model. Processor inherits from AbstractResource (consistent with the Task and Session Specification of a processor).

As a Simulator, a Processor exposes a valuetype that supports the Model interface. A Processor specialisation is required to return an instance of ProcessorModel under the **model** operation from the inherited abstract Simulator interface. Through inheritance of both Slave and Master abstract interfaces, a Processor can expose subsidiary and parent processors associated through Coordination links to a single managing Task. As such, a Task can be view as the coordinator of the processor hierarchy.

### *IDL Specification*

```
interface Processor :
        Session::AbstractResource,
        CommunityFramework::Simulator,
        Master, Slave
        {

        readonly attribute StateDescriptor state;

        Session::Task coordinator(
        ) raises (
                Session::ResourceUnavailable
        );

        CommunityFramework::Problems verify( );

        void start (
        ) raises (
                Session::CannotStart,
                Session::AlreadyRunning
        );

        void suspend (
        ) raises (
                Session::CannotSuspend,
                Session::CurrentlySuspended
        );

        void stop (
        ) raises (
                Session::CannotStop,
                Session::NotRunning
        );
};
```

*Processor Attribute Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| state | StateDescriptor | readonly | Declaration of the state of a Processor – refer State Descriptor. |

*Processor Operation Table*

| Name | Returns | Description |
|---|---|---|
| coordinator | Task | The coordinator operation returns the Task acting as coordinator of the processor. If no task is associated to the processor, the operation raises the ResourceUnavailable exception. |
| verify | Problems | Operations returns a sequence of Problem instances concerning configuration of a processor relative to the constraints defined under the associated ProcessorModel. |
| start | void | Moves a processor into the running state. Semantically equivalent to the Task start operation (refer Task and Session, Task specification). If the start operation raises the CannotStart exception, a client can access supplementary information under the StateDescriptor instance returned from the processor state attribute. |
| suspend | void | Moves a processor into a suspended state. Semantically equivalent to the Task suspend operation (refer Task and Session, Task specification). |
| stop | void | Stops a processor. Semantically equivalent to the Task stop operation (refer Task and Session, Task specification). |

*Processor Structured Event Table*

| Event: | Description | | |
|---|---|---|---|
| state | Notification of the change of state of a **Processor**. | | |
| | *Supplementary properties:* | | |
| | value | StateDescriptor | Description of the current state and any associated problems. |

### *Processor creation and Task association*

The following sequence concerning Processor instantiation is strongly influenced by the Task and Session specification and factory operation pattern defined under the CommunityFramework module.

1. Client creates a new concrete instance of Processor by passing a **Criteria** valuetype as an argument to a ResourceFactory **create** operation.

2. Client creates a new Task, passing the created processor as an argument to the **create_task** operation on User (refer Task and Session specification of User and Task).
   - Task implementation binds to processor using a **Coordinates** link referencing itself under the **resource** state field.
   - Processor establishes internal reference to coordinating Task using the supplied link by creating and maintaining a **CoordinatedBy** link that references the coordinating Task..
3. Task establishes initial state from Processor using the **state** attribute.
4. Client is responsible for ensuring that any usage preconditions to processor execution are resolved using the **verify** operation.
5. Client invokes the **start** operation on Task that in turn invokes **start** on the controlled processor.

*Verification of processor configuration*

The Processor **verify** operation returns a sequence of **Problem** instances related to configuration of a processor relative to the constraints defined under the associated ProcessorModel. This operation is provided so that a client can validate proper and complete configuration of a processor prior to execution. For example, a ProcessorModel may declare input and output resource associations that must be established by a controlling task before invocation of the start operation. The **verify** operation enables verification of a Processor configuration and readiness to start.

```
Problems verify( );
```

## 1.2 Master, Slave and the Control link

The abstract interfaces Master and Slave are used in conjunction with an abstract valuetype named Management that defines the base type for the concrete links **Controls** and **ControlledBy**. **Controls** is a link held by an implementation of Master that references zero to many Slave instances. **ControlledBy** is a link held by a Slave implementation that references zero to one Master instances. The relationship from master to slave is one of strong aggregation – removal of the Master implies removal of all Slaves. Using the control relationship, it is possible for a Processor to expose a sub-process hierarchy that can be navigated by a client. Both Master and Slave define convenience operations concerning access to the respective sub-processors and parent processor. Master interface defines the **slaves** operation that returns an iterator and a sequence of Slave sub-processors. The maximum length of the Slaves sequence is controlled by the input argument **max_number**. The Slave interface defines the readonly attribute **master** that returns a reference to the controlling Master. In the event of a top-level processor, the master attribute will return a null object reference.

*IDL Specification*

```
abstract interface Master {
        SlaveIterator slaves (
                in long max_number,
                out Slaves slaves
        );
};

abstract interface Slave {
        readonly attribute CollaborationFramework::Master master;
};
```

```
abstract valuetype Management : Session::Link{ };

valuetype Controls : Management {
        public Slave resource;
};

valuetype ControlledBy : Management {
        public Master resource;
};
```

*Controls Link State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | Slave | public | A reference to an AbstractResource implementing the Slave interface. An implementation of Master may hold 0..* Controls link instances, representing the strong aggregation relationship from a Master to subsidiary Slaves. |

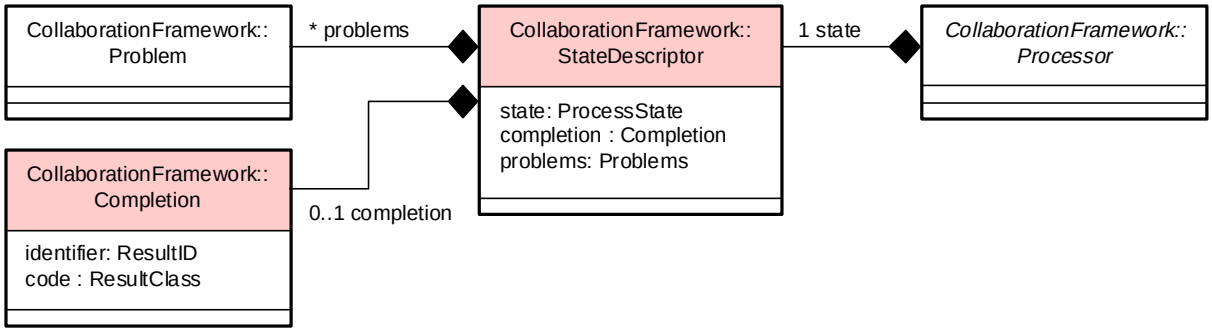
*ControlledBy Link State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | Master | public | A reference to an AbstractResource implementing the Master interface. An implementation of Master may hold 0..1 ControlledBy link instances representing the parent processor. |

## 1.3 StateDescriptor

Processor state is accessible through the **state** attribute. The **state** attribute returns an instance of **StateDescriptor**, a valuetype containing an enumeration value of the process state equivalent to the state model defined under Task and Session specification (refer Task and Session, Task Specification). StateDescriptor also contains a state field named **problems** that exposes any standing problems concerning processor configuration or execution.

**Completion** is a valuetype contained within StateDescriptor. When a processor completes (signalled by the establishment of the closed processor state), the completion field contains a Completion instance that qualifies the closed state as either a logical business level success or failure. For example, a processor supporting vote aggregation can declare a distinction between a successful and unsuccessful result towards a client. In this example, failure could arise as a result of an insufficient number of affirmative votes, or through failure of the group to establish quorum. In both cases, the failure is a business level failure and should not be confused with technical or transaction failure. An implementation dependant identifier may be attributed to a Completion instance to further classify a success or fail result. Prior to a processor reaching a closed state the completion field shall return a null value.




*StateDescriptor Object Model*

### *IDL Specification*

```
valuetype ResultID unsigned long ;
valuetype ResultClass boolean;

valuetype Completion
        {
        public ResultClass result;
        public ResultID code;
};

valuetype ProcessorState Session::task_state;

valuetype StateDescriptor
        {
        public ProcessorState state;
        public CollaborationFramework::Completion completion;
        public CommunityFramework::Problems problems;
};
```

*StateDescriptor State Table*

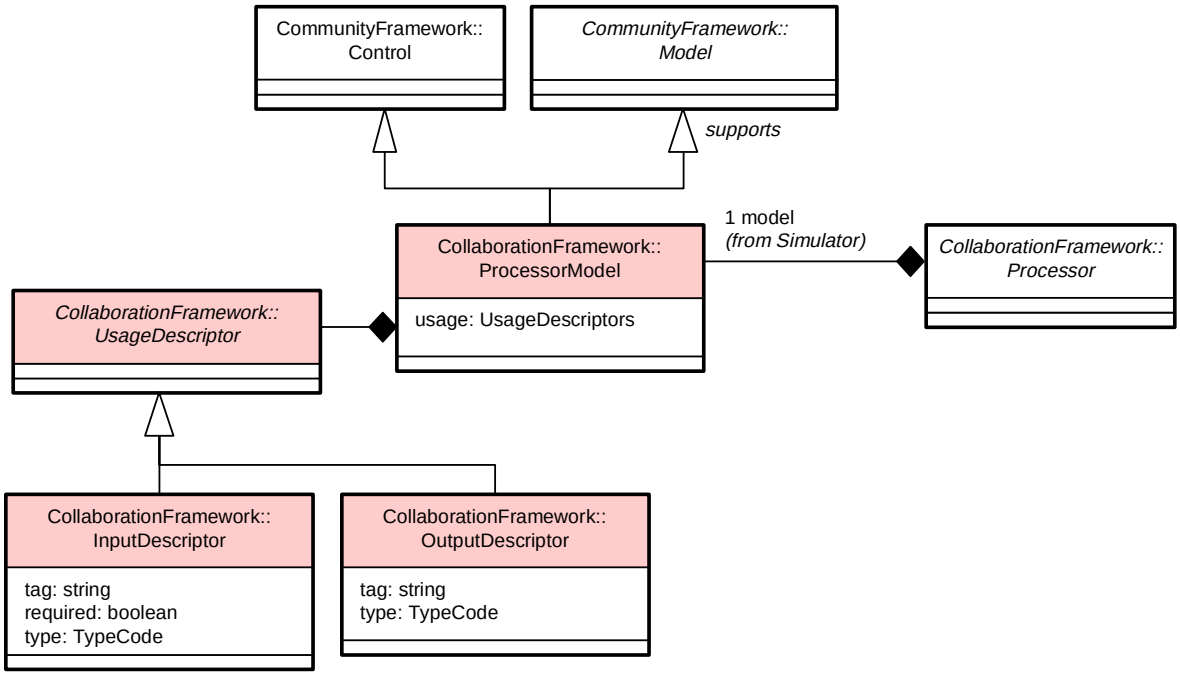
| Name | Type | Properties | Purpose |
|---|---|---|---|
| state | ProcessorState | public | An enumeration of process state values **open**, **not_running**, **notstarted**, **running**, **suspended**, **terminated**, **completed**, and **closed** (refer Task and Session, Task state description). |
| problems | Problems | public | A sequence of Problem instances (of possibly zero length) attributable to the current execution state of the processor. |
| completion | Completion | public | Declaration of a success or fail completion condition together with a numeric application defined result identifier. |

*Completion State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| code | ResultID | public | An implementation specific identifier of a completion state. |
| result | ResultClass | public | A boolean value indicating a business level notion of success or failure of the process. |

## 1.4 ProcessorModel and related constraint declarations

The **ProcessorModel** valuetype defines a set of usage (input and output) towards its controlling Task. These declarations are expressed as a set of **UsageDescriptor** instances (equivalent to the declaration of argument parameters). Collectively, the set of UsageDescriptor instances declare the naming convention to be applied to tagged Usage links held by the co-ordinating Task. Usage declarations are defined through the valuetypes InputDescriptor and OutputDescriptor. Both valuetypes contain the declaration of a **tag** name (corresponding to the usage tag string) and a **type** field containing a TypeCode value. The OutputDescriptor contains an additional **required** field that if true, states that the link must exist or be supplied. If false, the input declaration can be considered as an optional argument.




*ProcessorModel and UsageDescriptor*

Using the control structures it is possible for a processor model to define constraints such as "the processor must be associated to a controlling Task with a resource of type User associated as a consumed resource declared under the tag "customer" before this processor can be started. Such a requirement can be expressed by the creation of an InputDescriptor exposing the following:

- The text string "customer" under the **tag** field
- The boolean value true under the **required** field (indicating that a Usage link tagged as subject must be associated to the controlling Task before attempting to start a processor).
- A UsageSource instance under the **source** field that declarers a type precondition on the Usage link's resource field – in this example, the value would be the Session::User type code.

Collectively, these constraints represent the processor signature and facilitate plug-and-play interoperability between process descriptions defined in and executing under different technical and administrative domains.

A new instance of Processor may be created by passing an instance of ProcessorCriteria to a resource factory (refer CommunityFramework::ResourceFactory create operation).

*IDL Specification*

```
valuetype TypeCode CORBA::TypeCode;

abstract valuetype UsageDescriptor { };

valuetype InputDescriptor :
        UsageDescriptor
        {
        public string tag;
        public boolean required;
        public boolean implied;
        public TypeCode type;
};

valuetype OutputDescriptor :
        UsageDescriptor
        {
        public string tag;
        public TypeCode type;
};

valuetype ProcessorModel :
        CommunityFramework::Control
        supports CommunityFramework::Model
        {
        public UsageDescriptors usage;
};

valuetype ProcessorCriteria :
        CommunityFramework::Criteria
        {
        public ProcessorModel model;
};
```

*ProcessorModel State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| usage | UsageDescriptors | public | A sequence of valuetypes derived from UsageDescriptor, each defining usage links conditions relative to the associated Task. |

*InputDescriptor State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| tag | string | public | The name to be set as the tag value of Usage link that can be established on the controlling Task. |
| required | boolean | public | If true, the usage association must exist under the coordinating Task before attempting to start the processor. Default value is true. |
| implied | boolean | public | A qualifier used under a CollaborationModel. If true, the usage association may be implicitly inferred by an existing link with the same tag name, if false, the link must be explicitly passed as an ApplyArgument (refer Collaboration apply operation) establishing or replacing an existing tag link of the same name. Default value is true. |
| type | TypeCode | public | Declaration of the type of resource to be bound under a Consumes usage association on the controlling Task. |

*OutputDescriptor State Table*

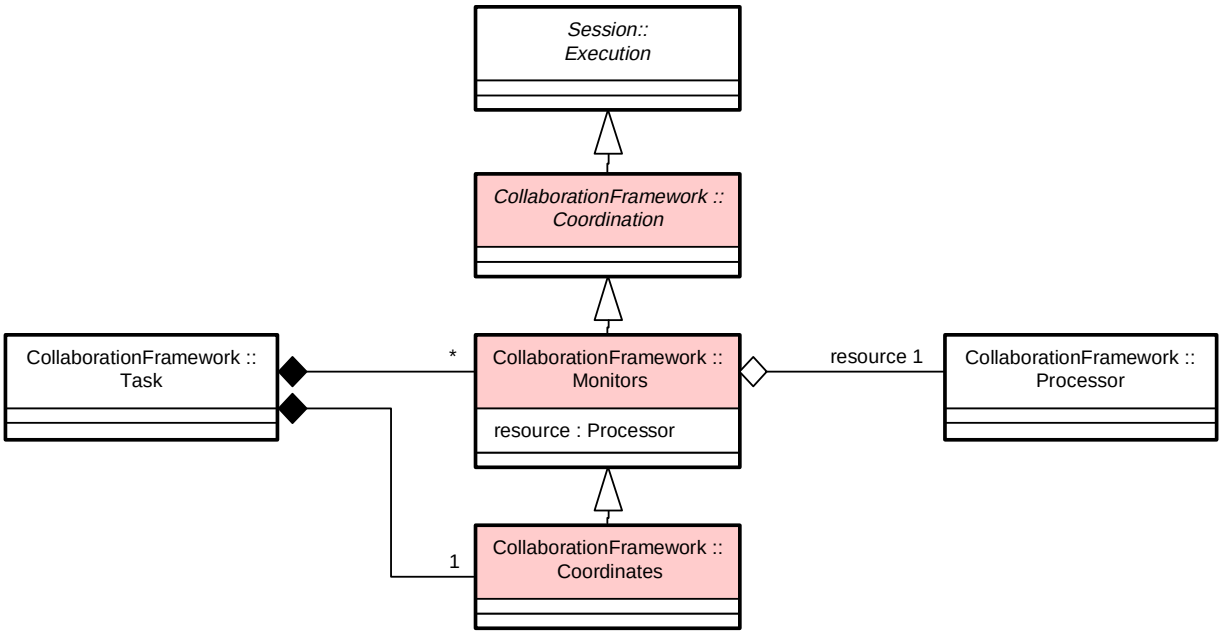
| Name | Type | Properties | Purpose |
|---|---|---|---|
| tag | string | public | OutputDescriptor declares an association that will be established by a Processor on normal completion. The tag value declares the value of the usage tag value that will be created. |
| type | TypeCode | public | Declaration of the type of resource that will be created by the processor on the controlling Task. |

*ProcessorCriteria State Table*

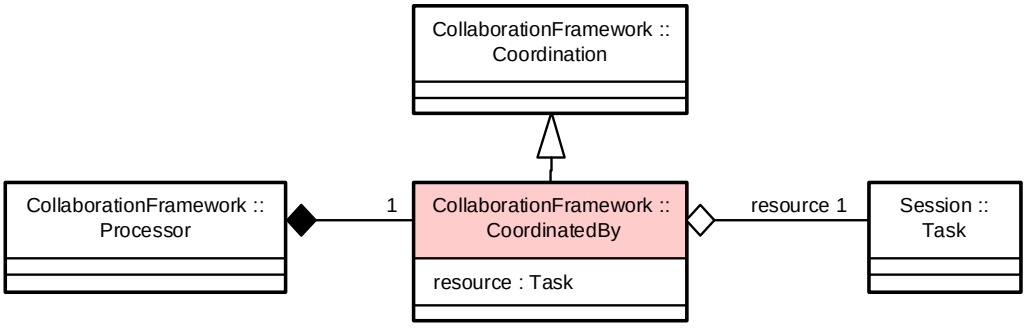
| Name | Type | Properties | Purpose |
|---|---|---|---|
| model | ProcessorModel | public | Declaration of processor consumption and production usage constraints. An implementation of ResourceFactory is responsible for assessing the type of Model contained within a ProcessorCriteria to determine the type of Process to create. For example, a ProcessorCriteria containing an instance of CollaborationModel will return a type of CollaborationProcessor. |

## 1.5 Coordination Link family

The Execution link defined under the Task and Session specification declares an abstract association between an AbstractResource, acting as a processor, and a Task. The abstract Execution relationship is used as the base for definition of an abstract **Coordination** relationship. Coordination serves as the base for the concrete links named **Monitors**, **Coordinates**, and **CoordinatedBy**.




*The abstract Coordination and concrete Monitors and Coordinates link.*




*Inverse CoordinatedBy link.*

### IDL Specification

```
abstract valuetype Coordination : Session::Execution{ };

valuetype Monitors : Coordination {
        public Processor resource;
};
```

```
valuetype Coordinates : Monitors {};

valuetype CoordinatedBy : Coordination {
        public Session::Task resource;
};
```

*Coordination link family Cardinality Table*

| Type holding the link | Link type | Type referenced by Link | Description |
|---|---|---|---|
| Task | Monitors | Processor | An instance of Task monitors 0..* Processors. |
| Task | Coordinates | Processor | Coordinates is a type of Monitor. An instance of Task coordinates 0..1 Processor instance. |
| Processor | CoordinatedBy | Task | A Processor is coordinated by 0..1 Task instances. |

*Monitors State Table*

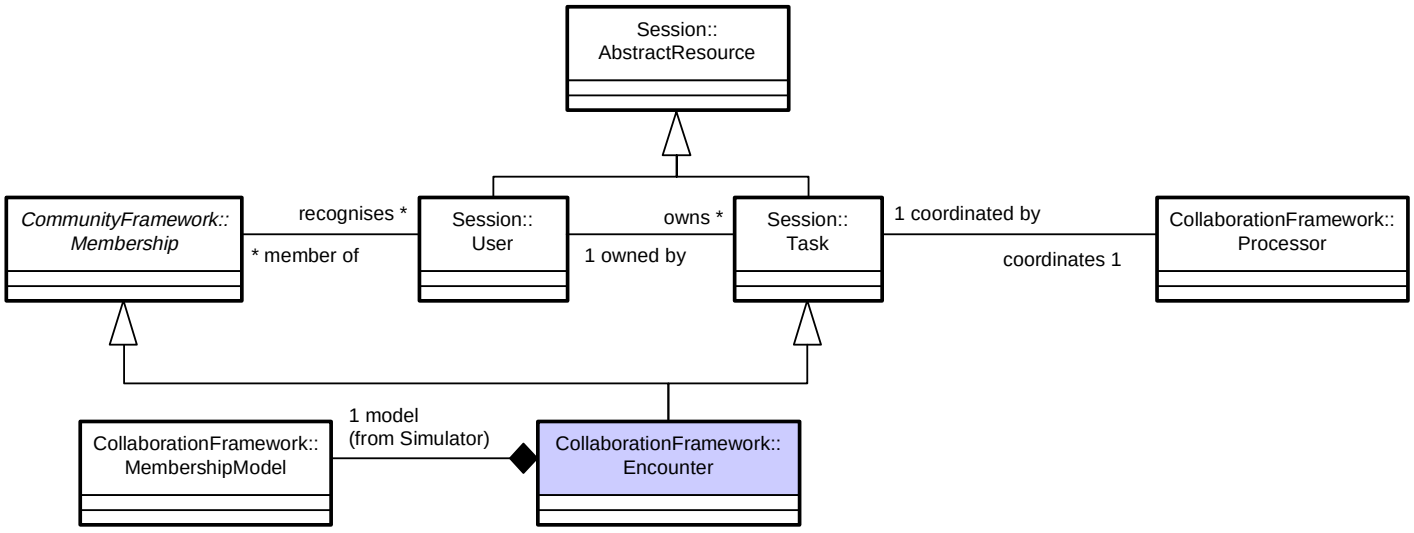
| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | Processor | public | A reference to a Processor that the Task holding this link monitors. |

*CoordinatedBy State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | Task | public | A reference to a Task that is coordinating the processor that is holding this link instance. The Task is maintaining either a Monitors or Coordinates link towards the Processor holding this link. |

## 2 Encounter

The Task and Session specification defines a Task as a type corresponding to a view of a processor. The specification of a Task is focussed extensively towards a single user. The CollaborationFramework extends this notion through the introduction of a Task type called **Encounter** that is owned and managed by a single User but associated by reference to other Users though Member links (refer CommunityFramework).




*Encounter object model.*

In effect an Encounter can be considered as a Task managed by its owner where the state of the Task is available to closed community of members. This model enables the association of multiple users within a collaborative execution context defined by an associated processor. An Encounter is defined as both a Task (refer Task and Session specification) and Membership (refer CommunityFramework). As a Task it supports full lifecycle semantics, can be referenced as a resource within a workspace or community, and exposes a relationship to an assigned processor. As a Membership, the Encounter aggregates a set of members, representing a set of collaborating Users. Encounter, through inheritance of Simulator is required to return a valuetype supporting the abstract Model interface. In the case of Encounter, the valuetype returned must be an instance of MembershipModel (a valuetype supporting the abstract Model interface). Implementations of Processor associated to an Encounter can interrogate an Encounter to establish the roles attributed to members of the Encounter. This information can be used by processor implementations to enforce preconditions on role related actions.

## 2.1 Encounter and EncounterCriteria

An Encounter is a type of Task that incorporates the abstract Membership interface. As a Membership an Encounter is associated to possibly many Users through Member links. As a Task an Encounter is associated to exactly one owner, possibly multiple consumed and produced resources, and a single processor. As such, Encounter can be considered as a shared view of a collaborative process context under the coordination of a single User. New instances of Encounter may be created using a ResourceFactory by passing an instance of EncounterCriteria as the criteria argument.

*IDL Specification*

```
interface Encounter :
        Session::Task,
        CommunityFramework::Membership
        {
};

valuetype EncounterCriteria :
        CommunityFramework::Criteria
        {
```

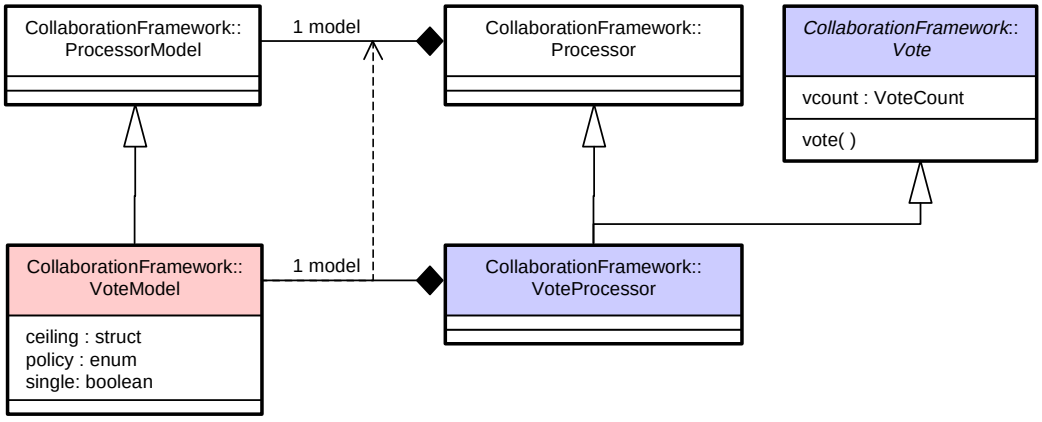
```
        public CommunityFramework::MembershipModel model;
};
```

*EncounterCriteria State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| model | MembershipModel | public | Declaration of the membership model instance to be associated to the created Encounter. |

## 3 VoteProcessor and VoteModel

VoteProcessor is a Processor extended to include the abstract Vote interface. The Vote interface declares an attribute **vcount** through which the last vote count can be accessed, and a single **vote** operation supporting the registration of a vote by a client. Vote registration is achieved though supply of one of the enumerated value YES, NO or ABSTAIN as defined by VoteDescriptor. The vote operation returns an implementation defined Proof to the client. The vcount attribute returns a VoteCount instance that holds a summation of yes, no and abstain votes registered at the time of the invocation.




*VoteProcessor and VoteModel*

### 3.1 Supporting structures

Four supporting structures are used in the definition of a voting process. **VoteCount** is a valuetype containing the summation of yes, no and abstain votes under a voting process at a particular time. **VoteDescriptor** is an enumeration of vote value, YES, NO and ABSTAIN. **VoteStatement**, a valuetype containing a VoteDescriptor, is passed as an input argument to a VoteProcessor's **vote** operation. The vote operation returns a **VoteReceipt** to a client following invocation of the vote operation. VoteReceipt contains a copy of the supplied vote together with a timestamp value corresponding to the date and time of the operation invocation.

*IDL Specification*

```
valuetype VoteCount {
        public Session::Timestamp timestamp;
        public long yes;
        public long no;
```

```
        public long abstain;
};

enum VoteDescriptor{
        NO,
        YES,
        ABSTAIN
};

abstract valuetype Proof {};
abstract valuetype Evidence {};

valuetype VoteStatement :
        Evidence
        {
        public VoteDescriptor vote;
};

valuetype VoteReceipt :
        Proof
        {
        public Session::Timestamp timestamp;
        public VoteStatement statement;
};
```

*VoteCount State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| timestamp | Session:: Timestamp | public | Timestamp of the last vote registration. |
| yes | long | public | The summation of YES votes registered under a process. |
| no | long | public | The summation of NO votes registered under a process. |
| abstain | long | public | The summation of ABSTAIN votes registered under a process. |

*VoteStatement State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| vote | VoteDescriptor | public | One of the enumerated values YES, NO or ABSTAIN. |

*VoteReceipt State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| timestamp | Session:: Timestamp | public | Date and time of registration of the VoteStatement by a VoteProcessor. |
| statement | VoteStatement | public | Copy of the VoteStatement instance passed into the vote operation. |

## 3.2 VoteProcessor

A VoteProcessor is a type of Processor supporting operations defined under the abstract Vote interface. Vote exposes an attribute named **vcount** that returns a **VoteCount** instance. The VoteCount instance must be updated following each valid vote invocation. The vote operation supports registration of a **VoteStatement** and returns a **VoteReceipt** to a client. New instances of VoteProcessor may be created using a ProcessorCriteria passed as an argument to a ResourceFactory where the contained ProcessorCriteria model is an instance of VoteModel.

*IDL Specification*

```
abstract interface Vote
        {
        readonly attribute VoteCount vcount;

        VoteReceipt vote(
                in VoteDescriptor value
        );
};

interface VoteProcessor:
        Vote,
        Processor
        {
};
```

*Vote Attribute Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| vcount | VoteCount | readonly | Summation of yes, no and abstain votes registered with the processor. |

*VoteProcessor Structured Event Table*

| Event: | Description | | |
|---|---|---|---|
| vote | Notification of modification of the vcount attribute value. | | |
| | *Supplementary properties:* | | |
| | value | VoteCount | Summation of yes, no and abstain vote, |

## 3.3 VoteModel

The **VoteModel** valuetype contains the policy to be applied by a VoteProcessor. VoteModel is accessed through VoteProcessor under the **model** operation on the inherited Simulator interface. VoteModel contains three fields described in the following table that define the rules applicable to the vote process execution.

*IDL Specification*

```
valuetype Duration {
        public TimeBase::TimeT value;
};
```

```
struct VoteCeiling{
        short numerator;
        short denominator;
};

enum VotePolicy{
        AFFIRMATIVE_MAJORITY,
        NON_ABSTAINING_MAJORITY
};

valuetype VoteModel :
        ProcessorModel
        {
        public VoteCeiling ceiling;
        public VotePolicy policy;
        public boolean single;
        public Duration lifetime;
};
```

*VotePolicy Enumeration Table*

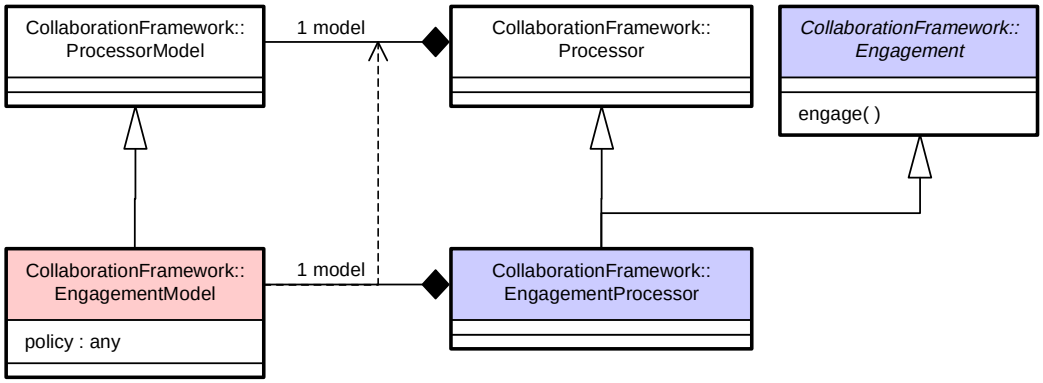
| Element | Description |
|---|---|
| AFFIRMATIVE_MAJORITY | indicating that the number of yes votes must be equal to or greater than (VoteCeiling * number of votes registered) |
| NON_ABSTAINING_MAJORITY | indicating that the number of yes votes must be equal or greater than (VoteCeiling * (number of votes registered less the total number of abstaining votes)) |

*VoteModel State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| ceiling | VoteCeiling | public | The ceiling exposes a fractional value indicating the proportion of YES votes required to conclude a vote process successfully. Values of ceiling such as ½ or ¾ are expressed by the VoteCeiling structure in the form of a numerator and denominator value. |
| policy | VotePolicy | public | Policy to apply to vote counting – refer *VotePolicy Enumeration Table* |
| single | boolean | public | If true, a vote may not be recast – i.e. one vote only. If false, a client may recast a vote. |
| lifetime | Duration | public | The maximum lifetime of the vote process commencing on transition of the process to a running state. A zero, negative or null value is equivalent to no constraint on process lifetime. |
| unilateral | boolean | public | If true, the process of voting shall be considered as binding on all members. If false, then the result of the vote process is considered as binding on members that have voted. |

# 4 EngagementProcessor and EngagementModel

EngagementProcessor is a type of Processor that defines an **engage** operation. The Engage operation, defined under the inherited abstract Engage interface, is used to facilitate the establishment of Proof of agreement between a set of collaborating clients. EngagementProcessor contains an EngagementModel, exposed through the inherited model operation from the abstract Model interface. EngagementModel contains a root Role used to qualify the number of engagements required for an engagement process to be considered as binding.




*EngagementProcessor and EngagementModel*

## 4.1 EngagementProcessor

An EngagementProcessor supports the registration of Evidence by a client and return of Proof of the act of engagement. Proof and Evidence are abstract valuetypes that may be specialized to support implementation specific engagement models. Engagement policy, also implementation specific is exposed as an instance of EngagementModel by the inherited model operation from the abstract Model interface under EngagementProcessor. New instances of EngagementProcessor may be created using a ProcessorCriteria passed as an argument to a ResourceFactory, where the contained model is an instance of EngagementModel.

*IDL Specification*

```
abstract interface Engagement
        {
        Proof engage(
                in CollaborationFramework::Evidence evidence
        ) raises (
                EngagementProblem
        );
};

interface EngagementProcessor :
        Engagement,
        Processor
        {
};
```

*EngagementProcessor Structured Event Table*

| Event: | Description | | |
|---|---|---|---|
| vote | Notification of modification of the vcount attribute value. | | |
| | *Supplementary properties:* | | |
| | value | VoteCount | Summation of yes, no and abstain vote, |

*Exceptions related to the engage operation*

| Exception | Reason |
|---|---|
| EngagementProblem | Raised following an attempt to invoke engage before the processor is running, or as a result of passing an invalid Evidence valuetype (where validity is implementation defied). |

## 4.2 EngagementModel

EngagementModel extends ProcessorModel through the addition of three values, a Role used to qualify the engagement context, a declaration of the maximum lifetime of an Engagement process, and a value indicating if the engagement has a unilateral implication on the members of an associated Encounter.

### *IDL Specification*

```
valuetype Duration {
        public TimeBase::TimeT value;
};

valuetype EngagementModel :
        ProcessorModel
        {
        public CommunityFramework::Role role;
        public Duration lifetime;
        public boolean unilateral;
};
```

*EngagementModel State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| role | Role | public | The value of quorum under this Role indicates the number of engagements required following which engagement is considered as binding. |
| unilateral | boolean | public | If true, the process of engagement shall be considered as binding on all members. If false, then the act of engagement is considered as binding on members that have actively engaged. Members that have not invoked the engage operation shall not be considered as bound to the engagement. |

| Name | Type | Properties | Purpose |
|---|---|---|---|
| lifetime | Duration | public | The maximum lifetime of the process commencing on transition of the process to a running state. A zero, negative or null value is equivalent to no constraint on process lifetime. |

# 5 CollaborationProcessor, CollaborationModel and supporting types

CollaborationProcessor is a type of Processor that contains a model supporting the declaration of states and state transitions. This state model defines a set of rules concerning the way in which a membership can interact towards achievement of a joint conclusion. Examples of collaboration models defined within this specification include bilateral negotiation, multilateral voting and promissory engagement. The specification approach of separation of structural IDL from a semantic model ensures that the framework can be applied to a range of collaborative processes through the creation of collaboration models that reflect the business rules within different enterprises and across different vertical domains.

We commence with the definition of a CollaborationProcessor under section 5.1, followed by specification of a number of supporting structures under section 5.2. Section 5.3 defines CollaborationModel under which the notions of an initialization and state are introduced, together with a description of the relationship to business roles. Section 5.4 though to 5.7 present the CollaborationModel control structures supporting state declaration under section 5.4, and the semantics of an abstract trigger, an initialization, and the relationship between a Trigger and an action under section 5.5. Section 5.6 details a set of supported action declarations, including simple transitions, recursive or local transitions and commands. Section 5.7 details the valuetypes used in the definition of a compound transition, a structure that can be used to cause the establishment of a sub-processor and declare the implication of that sub-processor towards the active processor.

The specifications under section 5 establish the framework for the definition of a broad range of collaboration models. Part 2 of this document details three instances of collaboration criteria (a ProcessorCriteria containing a CollaborationModel) covering formal negotiation, bilateral interaction leading to a unilateral agreement between a group, and contractual fulfillment.

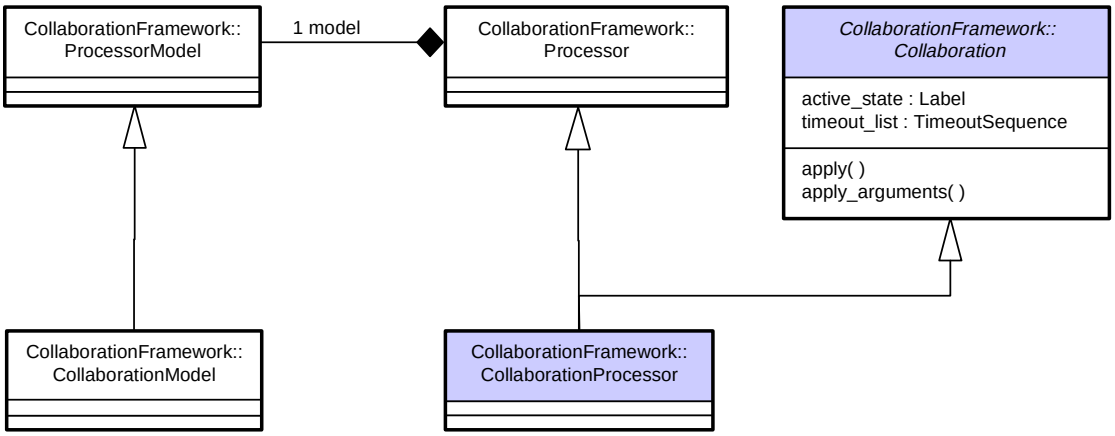
## 5.1 CollaborationProcessor

CollaborationProcessor is type of Processor that contains an instance of CollaborationModel (exposed under the model operation on the inherited Simulator interface). Operations defined under the inherited abstract Collaboration interface provide the ability for a client to modify the state of the processor relative to constraints established under the associated model. In the case of CollaborationProcessor, the model defines a nested state hierarchy, and associated transitions. A client can establish an initial collaborative state though invocation of the **apply** operation on the Collaboration interface, passing the identifier of a preferred initialization, following which members of an associated membership can invoke the **apply** and **apply_arguments** operations to achieve modification of the collaborative context through state-transitions. Following initialization, the collaboration is established in a running state exposed under the Collaboration **active_state** attribute. The active_state attribute is the identifier of a deepest state in a CollaborationModel state hierarchy referenced by a proceeding initialization or transition. Establishing an active state has an important implication on the membership associated to the collaboration. Every state from the deepest state referenced by the **active_state** attribute, up through all containing states, until the highest root-state are considered as active. Once a state is classified as active, any Trigger instances (transition holders) associated with that state are considered as candidates for subsequent reference under the apply operation.

Triggers contain actions such as transitions and are also associated to business roles that act as guards to the trigger. Triggers can be declared as timeout (automatically activated) or launch

trigger (explicit activation). Timeout based triggers are activated as a result of modification of the active state path and declared as active under the CollaborationProcessor **timeout_list** attribute.

New instances of a CollaborationProcessor may be created by passing a ProcessorCriteria instance to a ResourceFactory create operation, where the model contained by the ProcessorCriteria is an instance CollaborationModel.




*Collaboration and CollaborationProcessor*

*IDL Specification*

```
abstract interface Collaboration
        {

        readonly attribute Label active_state;
        readonly attribute TimeoutSequence timeout_list;

        void apply(
                in Label identifier
        ) raises (
                InvalidTrigger,
                ApplyFailure
        );

        void apply_arguments(
                in Label identifier,
                in ApplyArguments args
        ) raises (
                InvalidTrigger,
                ApplyFailure
        );
};

interface CollaborationProcessor :
        Collaboration,
        Processor
        {
};
```

*Collaboration Attribute Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| active_state | Label | readonly | Identifier of the state resulting from an initialization or subsequent transition. All states between the active state and the root top level state constitute the active state path. |
| timeout_list | TimeoutSequence | readonly | A sequence of Timeout valuetypes corresponding to current activated timeout conditions in place. |

*Collaboration Operation Table*

| Name | Returns | Description |
|---|---|---|
| apply | void | Used by a client to modify the state of a collaborative process by passing in a reference to a Trigger in the active state path. Typically used to invoke a transition resulting in the modification of the collaboration context. |
| apply_arguments | void | Equivalent to apply except that the operation takes a series of arguments corresponding to change request to be applied to the usage relationships associated to the Encounter coordinating the Collaboration. |

*Exceptions related to the operations named apply and apply_arguments.*

| Exception | Reason |
|---|---|
| InvalidTrigger | Raised following an attempt to invoke apply against a Collaboration with an Label that does not correspond to an identified Trigger within the CollaborationModel associated to the Collaboration instance. |
| ApplyFailure | Raised if a client attempts to invoke apply against the collaboration processor in contravention with the implied or explicit rules exposed by the CollaborationProcess state and associated CollaborationModel. |

*CollaborationProcessor Structured Event Table*

| Event: | Description | | |
|---|---|---|---|
| active | Notification of modification of the active_state attribute value. | | |
| | *Supplementary properties:* | | |
| | value | Label | Identifier of the state referenced as a target by an initialization or last transition established under the apply operation. |
| | timeout | TimeoutSequence | Timeout sequence established as a result of a change in active state. |

## 5.2 Supporting Structures

### *Structures supporting Apply*

The CollaborationProcessor interface defines two operations, named **apply** and **apply_arguments**. Both operations concern the modification of the state of a collaboration processor in accordance with the rules and constraints defined in the associated CollaborationModel instance. The **apply_arguments** operation takes a sequence of ApplyArgument valuetypes as operation arguments. This sequence of ApplyArgument instances declares to the processor a set of changes to be applied to the input and output relationships of the attached **Encounter**. For example, a collaboration processor supporting amendment of a standing motion needs to receive the declaration of the amended motion. This is equivalent to modification of the Usage links associated with a controlling Task (Encounter) while a processor is running. ApplyArgument is a valuetype that contains the declaration of a Usage link **tag** name and a **value** containing a reference to an AbstractResource to be associated to the Encounter coordinating the Collaboration under a new or existing usage link with the same tag name.

### *Structures supporting timeout declarations.*

A second supporting structure exposed by a CollaborationProcessor is a **TimeoutSequence**. A CollaborationModel associated to a CollaborationProcessor defines a hierarchy of states. Within this hierarchy there may be any number of actions that are configured to execute after a certain delay (refer Clock). The set of active timeout conditions is exposed through the CollaborationProcessor **timeout_list** attribute. A timeout condition is defined through the valuetype **Timeout**. Timeout contains an identifier of a Trigger within the CollaborationModel associated to the processor, together with a Timestamp value indicating the date and time under which the timeout will occur (causing an implementation to automatically invoke the Action contained by the Trigger referenced by the Timeout label).

### *IDL Specification*

```
valuetype ApplyArgument
        {
        public CollaborationFramework::Label label;
        public Session::AbstractResource value;
};

valuetype ApplyArguments sequence <ApplyArgument> ;

valuetype Timeout
{
        public Label identifier;
        public Session::Timestamp timestamp;
};

valuetype TimeoutSequence sequence <Timeout> ;
```

*Timeout State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| identifier | Label | public | Identifier of a Trigger within the CollaborationModel contained by the CollaborationProcessor that will be fired at the date and time indicated by the timestamp value. |

| Name | Type | Properties | Purpose |
|---|---|---|---|
| timestamp | Timestamp | public | The date and time that a timeout will be triggered. Timeout conditions may be modified by modification of an active state of a collaboration processor (refer active_state). |

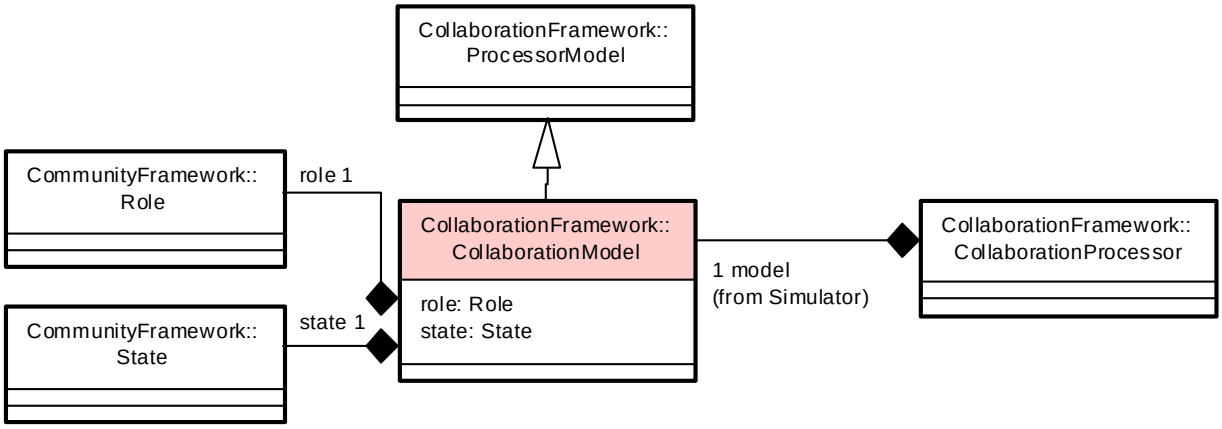
*ApplyArgument State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| tag | Label | public | An ApplyArgument is a valuetype that can be passed into an apply operation. The tag value must be equal to a tag value declared under the processors input usage list (declaration of InputDescriptor values exposed by ProcessorModel usage field). Following assessment of any preconditions associated with a referenced Trigger, an implementation of apply will create or replace an existing consumption link resource value on the associated Task with the value field of the ApplyArgument valuetype. |
| value | AbstractResource | public | The AbstractResource to associate under a tagged consumption link with the Task associated as coordinator to the Collaboration. |

## 5.3 CollaborationModel

CollaborationModel is the valuetype that defines the bulk of the semantics behind an instance of CollaborationProcessor. CollaborationModel extends ProcessorModel though addition of a role hierarchy, and, State hierarchy. The entire collaboration model is structurally centered on a state hierarchy, the root of which is defined by the State instance exposed under the **state** field. The root-state and sub-states contain the declaration of available triggers (transitions holders) that can be referenced by clients through **apply** operations on the Collaboration interface. The state field named role contains a Role valuetype that represents the root of a role hierarchy that can be referenced by **Trigger** instances (contained by State instances) as preconditions to activation. For example, a transition (exposed as Trigger) may reference a role as a guard, which in turn introduces a constraint on the invoking client to be associated with the Encounter membership under an equivalent role.

As a valuetype, a CollaborationModel can be passed between different domains and treated as a self-contained structure that can be readily re-used by trading partners. The structural information contained in the inherited ProcessorModel defines the logical wiring of a processor towards its coordinating task, while the extensions introduced under CollaborationModel define the semantics of collaborative interaction.




*CollaborationModel Object Model*

*IDL Specification*

```
valuetype CollaborationModel :
        ProcessorModel
        {
        public CommunityFramework::Role role;
        public CollaborationFramework::State state;
};
```

*CollaborationModel State Table*

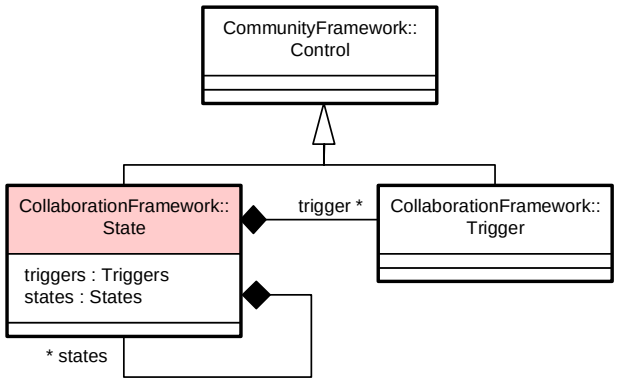
| Name | Type | Properties | Purpose |
|---|---|---|---|
| role | Role | public | A Role valuetype (refer CommunityFramework) that defines a hierarchy of business roles that may be referenced by other control structures within a CollaborationModel (refer Trigger) for the purpose of establishing membership and quorum preconditions towards an invoking client. This value may be null if all Trigger guard value are also null. |
| state | State | public | A non-null value defining the root state of the collaboration model. A State is itself a container of other states within which Triggers are contained. Triggers act as constraint guards relative to the Actions they contain. |

## 5.4 State declaration

The primary valuetype used in the construction of a CollaborationModel is the **State** valuetype. A State is a container of sub-states and Trigger valuetypes. An instance of State has an identifier label (from the inherited Control valuetype), that may be exposed by a CollaborationProcessor under the active_state attribute. A State is activated as a result of a transition action applied

through the apply operation or through implicit initialization using the start operation (from the abstract Processor interface inherited by Collaboration).

The Collaboration declares an **active_state** attribute and a corresponding structured event named **active**. The value of the event and attribute is an identifier of the state referenced in the last valid action (such as an initialization or simple transition). Once an active state has been established, the state containing an active state is considered as active, and as such, its parent, until the root-state is reached. This set of states is referred to as the active state path of the Collaboration processor. For every state in the active state path, all directly contained Triggers are considered as candidates with respect to the **apply** and **apply_arguments** operations on CollaborationProcessor. That is to say that a client may invoke any Trigger exposed by a state in the active state path, providing that preconditions to Trigger activation are satisfied.




*State object model.*

*IDL Specification*

```
valuetype State :
        CommunityFramework::Control
        {
        public CollaborationFramework::Triggers triggers;
        public CollaborationFramework::States states;
};
```

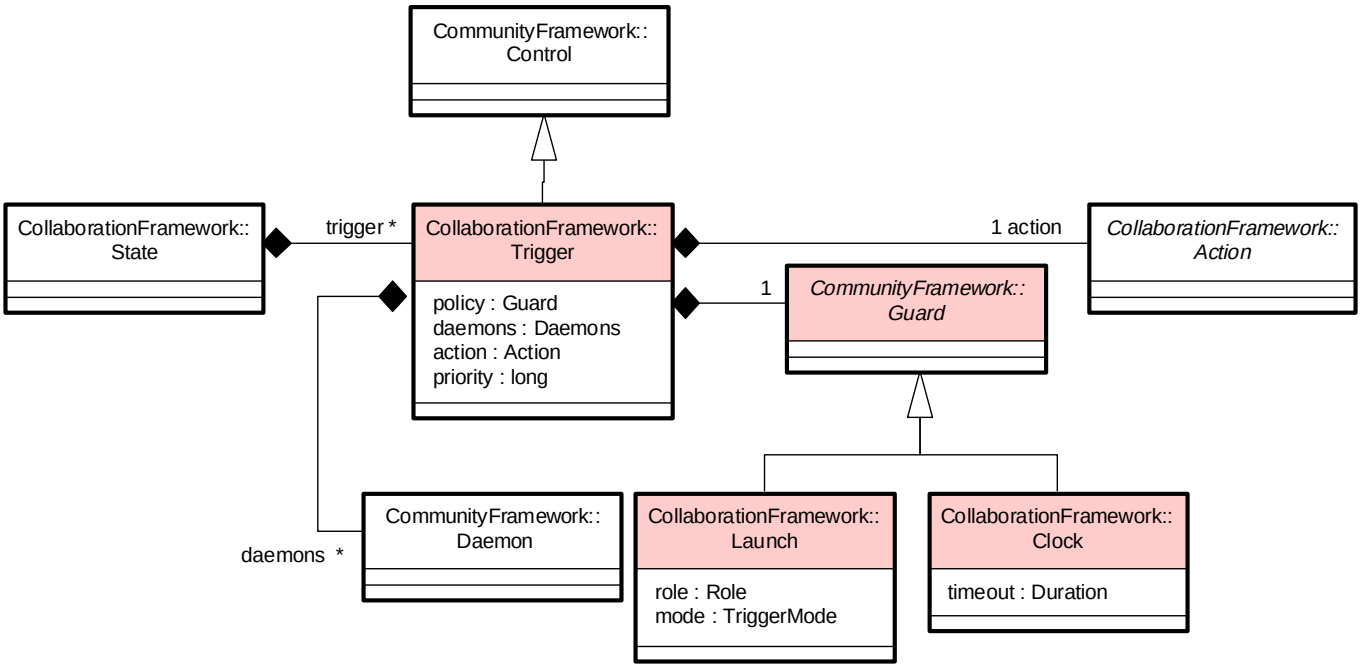
*State valuetype State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| triggers | Triggers | public | A sequence of Trigger instances that each define constraint conditions relative to a contained Action. |
| states | States | public | A sequence of sub-states forming a state hierarchy. |

## 5.5 Trigger and supporting valuetypes

A **Trigger** is a valuetype contained by a State that is used to define an activation constraint (referred to as a **guard**), declarations of implementation actions to fire before action execution (referred to as **directives**), the **action** that a collaboration implementation applies to the collaborative state, and an action **priority**. Trigger labels are candidate arguments to the Collaboration apply operation when the State containing the Trigger is within the active state

path. The value of guard is a valuetype that qualifies the functional role of the trigger. Two types of Guard are defined. A **Clock**, representing a timeout condition that is automatically armed by a Collaboration implementation whenever the containing trigger is a candidate (within the active state path). A second type of Guard is a **Launch** that contains a **mode** constraint (one of INITIATOR, RESPONDENT or PARTICIPANT) and a reference to a **role** that qualifies accessibility of the Trigger relative to Members of an associated Encounter. A Trigger containing a Clock is managed by a Collaboration implementation. A Trigger containing a Launch may be explicitly referenced by a client through the apply operations on the Collaboration interface providing the client meets any mode and role constraints associated with the Trigger.




*AbstractTrigger, Trigger and Initialization*

*IDL Specification*

```
valuetype Trigger :
        CommunityFramework::Control
        {
        public long priority;
        public CollaborationFramework::Guard guard; // constraint
        public CollaborationFramework::Directives directives; // preconditions
        public CollaborationFramework::Action action;
};

abstract valuetype Guard {};

valuetype Clock :
        Guard
        {
        public Duration timeout;
};

valuetype Launch :
```

```
        Guard
        {
        public TriggerMode mode;
        public CommunityFramework::Role role;
};

enum TriggerMode{
        INITIATOR,
        RESPONDENT,
        PARTICIPANT
};
```

*Trigger State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| action | Action | public | An Action valuetype that describes the action to take following client invocation of the apply operation. Argument to apply reference the label that corresponds to the Trigger label state filed inherited from Control. |
| guard | Guard | public | An instance of Clock or Launch that defines the Trigger activation policy. |

*Clock State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| timeout | Duration | public | Declaration of the delay between establishment of the containing trigger as a candidate (the moment the Trigger's containing state enters the active state path) and the automatic invocation of the action contained by the containing Trigger by a Collaboration implementation. |

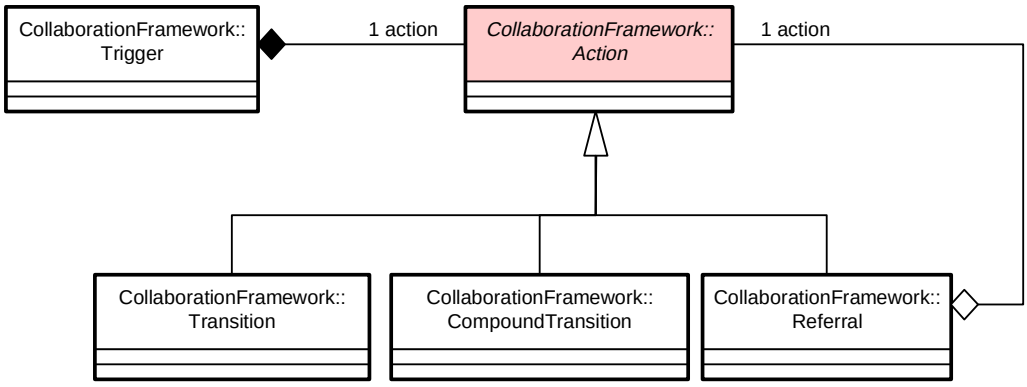
*Launch State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| mode | TriggerMode | public | A value corresponding to one of INITIATOR, RESPONDENT or PARTICIPANT. |
| priority | long | public | An implementation of apply is responsible for queuing apply requests relative to trigger priority and invocation order. Higher priority triggers will be fired ahead of lower priority triggers irrespective of apply invocation order. An implementation is responsible for retractions of apply requests following the disassociation of a containing state from the active state path. |

| Name | Type | Properties | Purpose |
|---|---|---|---|
| role | Role | public | If the role value is not null, a client invoking the containing trigger must be associated to the Encounter under a role with a label equal to the role identifier. |

## 5.6 Action

The Action valuetype is a base type for Transition, CompoundAction and Referral. Examples of transitions include initialization, simple transition, local transition and terminal transition. Transition can be considered as atomic in that there is no subsequent redirection involved. In comparison, CompoundTransition and Referral redirects execution towards another action.




*Action object model.*

*IDL Specification*

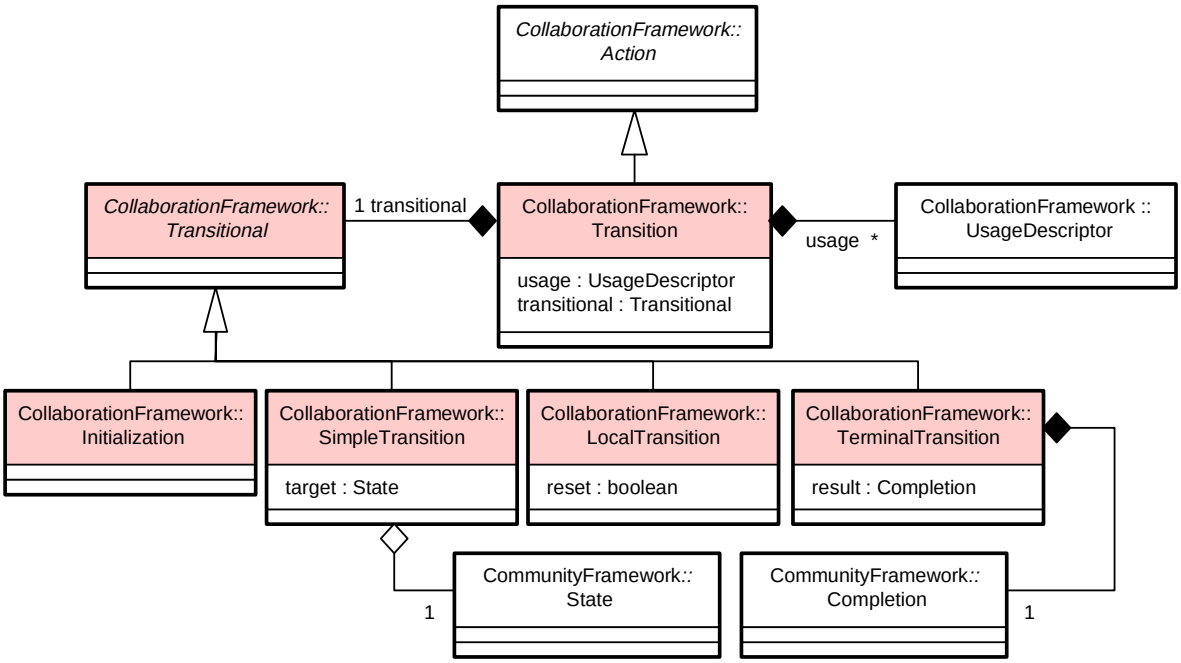
```
abstract valuetype Action
        {
};
```

## 5.7 Transition and related Control Structures

Transition contains a state field named **usage** that contains a **UsageDescriptor** value. The value allows the definition of input and/or output statements (refer UsageDescriptor) during a collaborative process execution as a consequence of changes in the collaborative state. A second state field named **transitional** contains a single valuetype derived from the abstract **Transitional** valuetype.

Four types of **Transitional** valuetypes are defined,

- **Initialization**, declares a possible initial active-state target
- **SimpleTransition**, declares a potential a state transition
- **LocalTransition**, declares a potential transition from the current state to the current state, during which side effects such as timeout resetting and Usage references may be modified.
- **TerminalTransition**, signals termination of the running state of the processor and declares a successful or failure result.




*Transition and the Transitional family of valuetypes.*

*IDL Specification*

```
abstract valuetype Transitional { };

valuetype Transition :
        Action
        {
        public CollaborationFramework::Transitional transitional;
        public UsageDescriptors usage;
};

valuetype Initialization :
        Transitional
        {
};

valuetype SimpleTransition :
        Transitional
        {
        public State target;
};

valuetype LocalTransition :
        Transitional
        {
        public boolean reset;
};

valuetype TerminalTransition :
        Transitional
```

```
        {
        public Completion result;
};
```

*Transition State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| usage | UsageDescriptors | public | Contains a sequence of UsageDescriptor instance (input and output declarations) that define required or operational arguments to the Collaboration apply operation when the state containing the usage declaration is active. |
| transitional | Transitional | public | Declaration of the transitional operator – one of Initialization, SimpleTransition, LocalTransition or TerminalTransition. |

*SimpleTransition State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| target | State | public | The state to be established as the active state of the CollaborationProcessor (refer CollaborationProcessor active_state attribute). |

*LocalTransition State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| reset | boolean | public | If true, any timeout conditions established through Triggers containing Clocks are reset. |

*TerminalTransition State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| result | Completion | public | Declaration of processor termination – the hosting processor will expose the Completion result instance, indicating the success or failure of the process (refer CollaborationProcessor state attribute). |

### *Initialization*

Initialization is a type of Transitional that declares the potential for establishment of the active_state as the State instance containing a Trigger that contains an Action that contains an Initialization. The containing State corresponds to the initalization target. The Trigger containing the Initialization may declare a priority value. The value of priority is considered in the event of implicit initialization arising from client invocation of the Processor start operation. When invoking

start, the Initialization with the highest priority and non-conflicting constraints set is inferred. Alternatively, a CollaborationProcessor may be explicitly initialized by referencing the Initialization's containing Action label under the apply operations.

### *SimpleTransition*

**SimpleTransition** is Transitional that enables a state transition from the current active state to a State declared under by the SimpleTransition **target** value. A successful invocation of **apply** or **apply_arguments** on CollaborationProcessor will result in the change of the CollaborationProcessor active state to the state referenced by the **target** value.

### *LocalTransition*

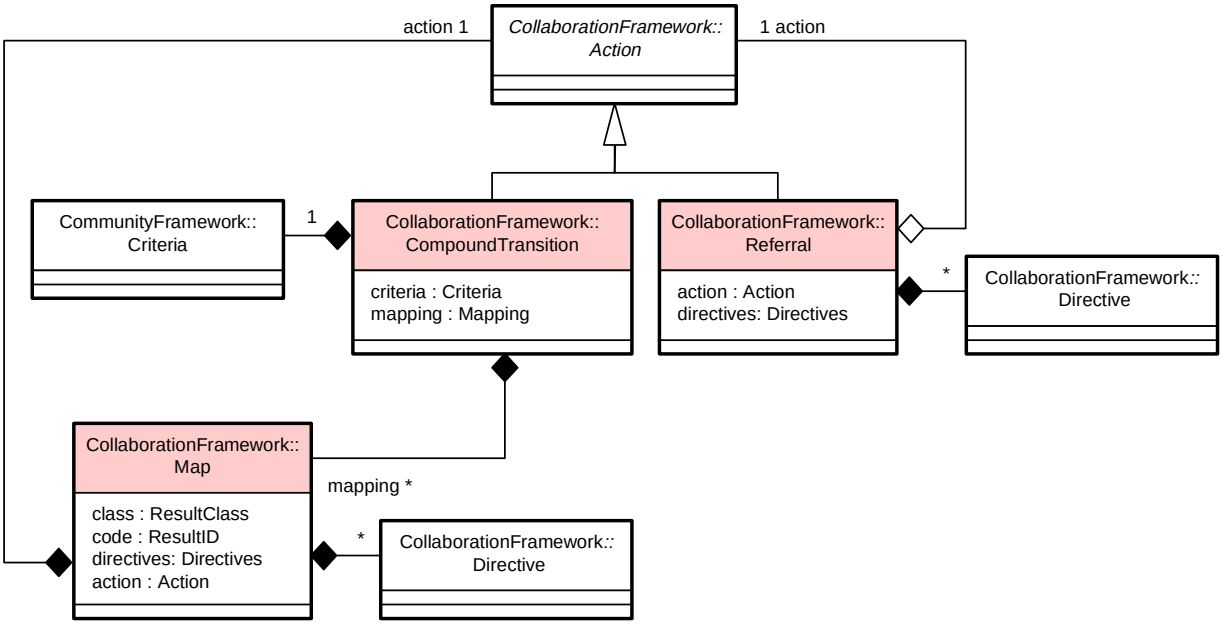
**LocalTransition** enables the possible modification of usage relationships (if the containing Trigger enables this), and the possibility to **reset** timeout constraints associated with the containing Trigger. LocalTransition can be considered as a transition from the current active state to the same state, where side effects concerning timeout and usage relationships can be declared.

### *Terminal Transition*

Starting a CollaborationProcessor is enabled through the start or initialize operation. These actions cause the establishment of an initial active state and active-state path. Actions such as SimpleTransition enable modification of the active-state-path leading to the potential exposure of a TerminalTransition action. Once a TerminalTransition action has been fired, the hosting processor enters a closed and completed state (refer ProcessState). A CollaborationProcessor implementation signals this change though modification of the **state** attribute on the inherited Processor interface (and corresponding structured event). This attribute returns a StateDescriptor which itself contains the Completion valuetype declared under the CollaborationModel TerminalTransition (indicating Success or Failure of the process).

## *5.8 Compound Action Semantics*

Two valuetypes define indirect action semantics. The first is a Referral, an action that references another Action instance. The second is CompoundTransition that introduces the notion of a transition where the target is defined by the result of the execution of another processor. An implementation of Collaboration on triggering a CompoundTransition, uses a factory Criteria instance defined under the **criteria** field to establish a new sub-processor to the current processor. The result of the sub-process execution is exposed by an instance of Completion (refer Completion valuetype). Completion contains a result identifier (refer ResultClass and ResultID). This identifier is used to establish the Action to apply based on a result to action **mapping**.




*CompoundTransition, Referral and Map.*

Examples of the application of a Compound transition are shown under Part 2 "Collaboration Criteria". The fulfillment transition of the promissory contract model is an example of a CompoundTransition that uses a bilateral negotiation sub-process between customer and supplier. The result of the negotiation sub-process raises a result state that is mapped by the fulfillment transition to one of two possible outcomes (fulfillment success or failure due to non-fulfillment). A similar use of compound transition is defined under the multilateral voting model in which an amendment is defined as a compound transition applying the same process model as the initial motion.

### *IDL Specification*

```
valuetype Referral :
        Action
        {
        public CollaborationFramework::Action action;  // reference
        public CollaborationFramework::Directives directives;
};

valuetype Map
        {
        public ResultClass class;
        public ResultID code;
        public CollaborationFramework::Directives directives;
        public CollaborationFramework::Action action;
};

valuetype Mapping sequence <Map> ;

valuetype CompoundTransition :
        Action
        {
```

```
        public CommunityFramework::Criteria criteria;
        public CollaborationFramework::Mapping mapping;
};
```

*Referral State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| action | Action | public | A reference to the action to invoke (refer Action) where the action is an existing Action instance within the containing model. |
| directives | Directives | public | A sequence of Directive valuetypes that declare modifications (rename, remove, copy and move) to the associated Task usage associations that will be invoked before the action is handled by the Collaboration implementation. |

*Map State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| class | ResultClass | public | One of the enumerated values of SUCCESS or FAILURE |
| code | ResultID | public | An optional Completion code that qualifies a success or failure class. |
| action | Action | public | The action to invoke (refer Action). |
| directives | Directives | public | A sequence of Directive valuetypes that declare modifications (rename, remove, copy and move) to the associated Task usage associations that will be invoked before the action is handled by the Collaboration implementation. |

*CompoundTransition State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| criteria | Criteria | public | An instance of Criteria that is to be used as the criteria for sub-process establishment under a ResourceFactory. |
| mapping | Mapping | public | A sequence of Map instances defining the actions to be applied in the event of an identified result status. An implementation is responsible for ensuring a complete mapping of all possible sub-process result states to actions within the parent processor prior to initialization (refer verify operation on Collaboration interface). |

## 5.9 Directive

Directive is a utility valuetype contained by Trigger and Referral. It is used to express an execution directive to an implementation of Collaboration concerning link associations on the coordinating Task. For example, a compound transition can contain a directive that declares that a link be modified before the transition is fired. Another link directive could be contained in a Map declaring that the result of the compound transition sub-process must be assigned as an input to the current process. Four concrete valuetypes support the abstract Directive interface - Duplicate, Move, Remove and Constructor.

### *Duplicate*

Instructs an implementation of Collaboration to create a new consumption link named **target** based on the state of a **source** link. If the value of **invert** is false, the type of link created is the same as the source link. If **invert** is true, then if the source link is a Consumption link, the created link will be a Production link and visa-versa. The resource associated to the new target link shall be the same as the resource declared under the source link.

### *Move*

The Move directive is a directive to a Collaboration implementation to change a source Consumption link name to the value of target. If the invert value of the Move instance is true, the move directive implies replacement of the link with its inverse type – i.e. if the source link is a type of Consumption link, then replace the link with a type of Production link. If the source link is a type of Production link then replace the link with a type of Consumption link.

### *Remove*

The Remove Directive directs a Collaboration implementation to remove a tagged Usage link (with a tag value corresponding to **source**) from the coordinating Task.

### *Constructor*

The Constructor directive directs a Collaboration implementation to create a new resource based on the supplied **criteria** and associate the resource under a new named Consumption link on the coordinating Task using the **target** value as the links tag value.

### *IDL Specification*

```
abstract interface Directive {};
valuetype Directives sequence <Directive>;

valuetype Duplicate
        supports Directive
        {
        public Label source;
        public Label target;
        public boolean invert;
};

valuetype Move
        supports Directive
        {
        public Label source;
        public Label target;
        public boolean invert;
};
```

```
valuetype Remove
        supports Directive
        {
        public Label source;
};

valuetype Constructor
        supports Directive
        {
        public Label target;
        public CommunityFramework::Criteria criteria;
};
```

*Duplicate State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| source | Label | public | The name (tag value) of an existing link held by the coordinating Task. |
| target | Label | public | The name (tag value) of a Usage Link to be created or replaced on the coordinating Task. |
| invert | boolean | public | If true, an implementation of Collaboration is required to create a new Usage link using the inverse type (i.e. if source is Consumption then target type is Production, is source is Production then target type is Consumption). The new usage link is added to the coordinating Task. |

*Move State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| source | Label | public | The name (tag value) of an existing link held by the coordinating Task. |
| target | Label | public | The name (tag value) of a Usage Link to be created or replaced on the coordinating Task. |
| invert | boolean | public | If true, an implementation of Collaboration is required to replace an existing Usage link with the inverse (i.e. Consumption is replaced by Production, Production is replaced by Consumption). |

*Remove State Table*

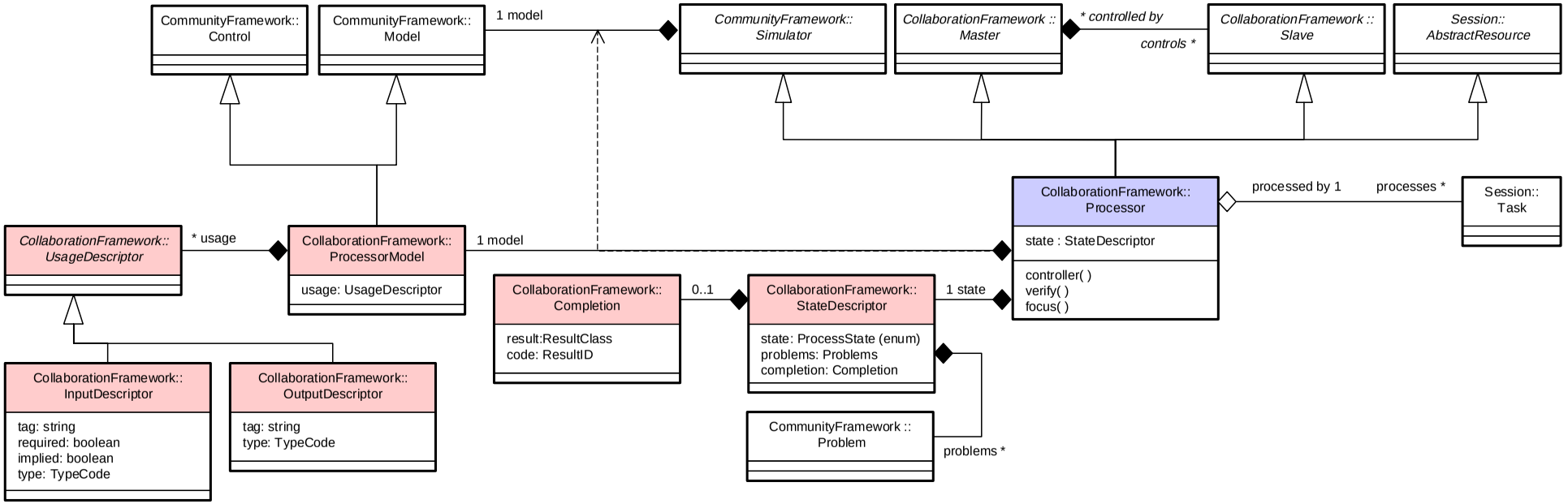
| Name | Type | Properties | Purpose |
|---|---|---|---|
| source | Label | public | The name of a Usage Link to be removed from the coordinating Task. |

*Constructor State Table*

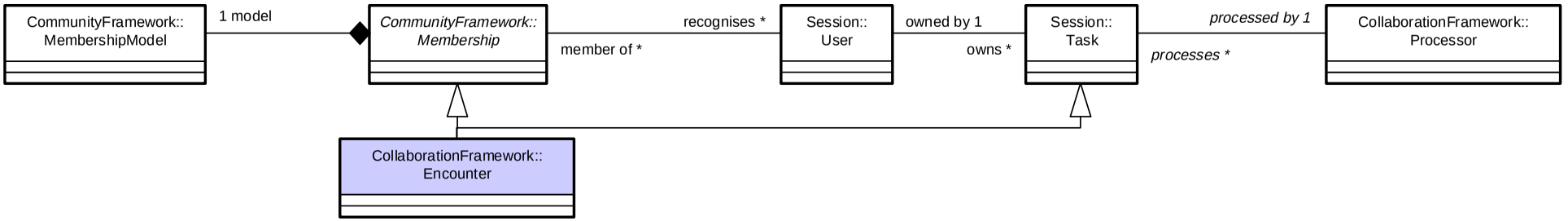
| Name | Type | Properties | Purpose |
|---|---|---|---|
| target | Label | public | The name of a Usage Link to be created and added to the coordinating Task (replacing any existing usage link of the same name), using the supplied criteria. |
| criteria | Criteria | public | An instance of Criteria describing the resource to be created. |

# 6 UML Overview

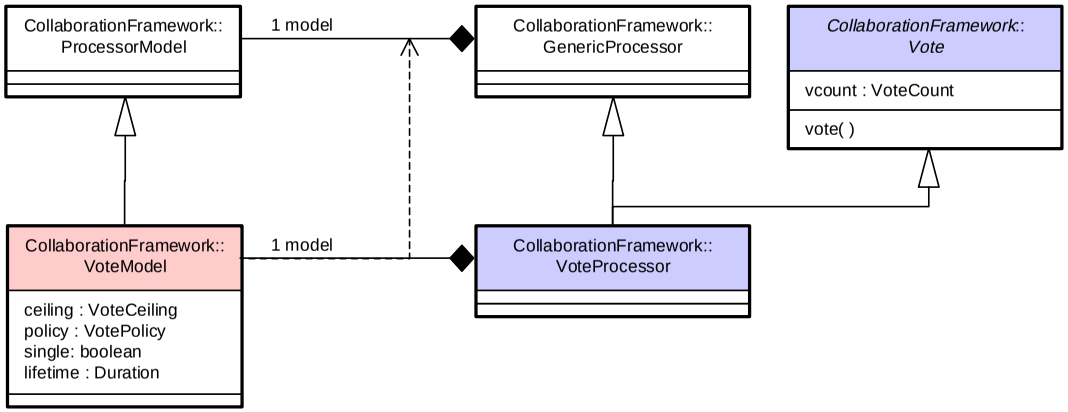
## *Processor and related valuetypes*



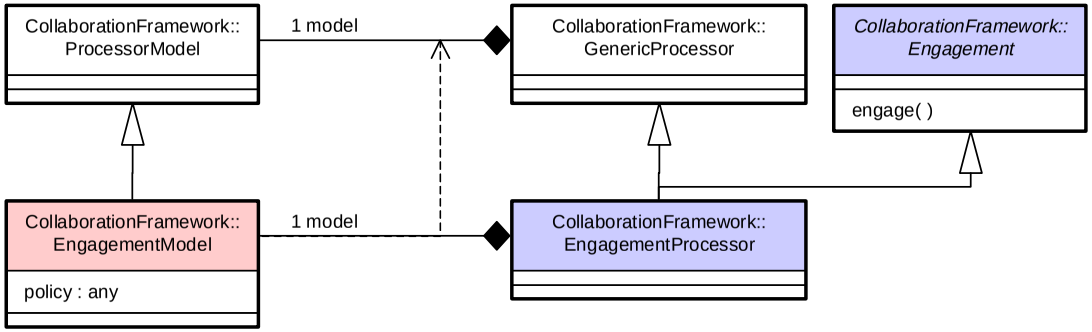
*Encounter*



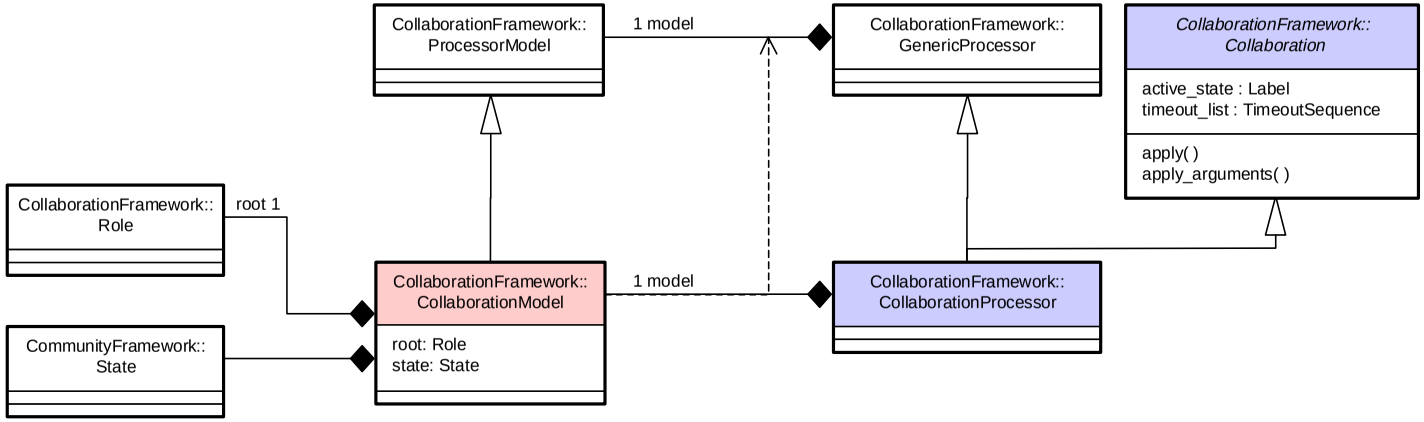

*Voting*



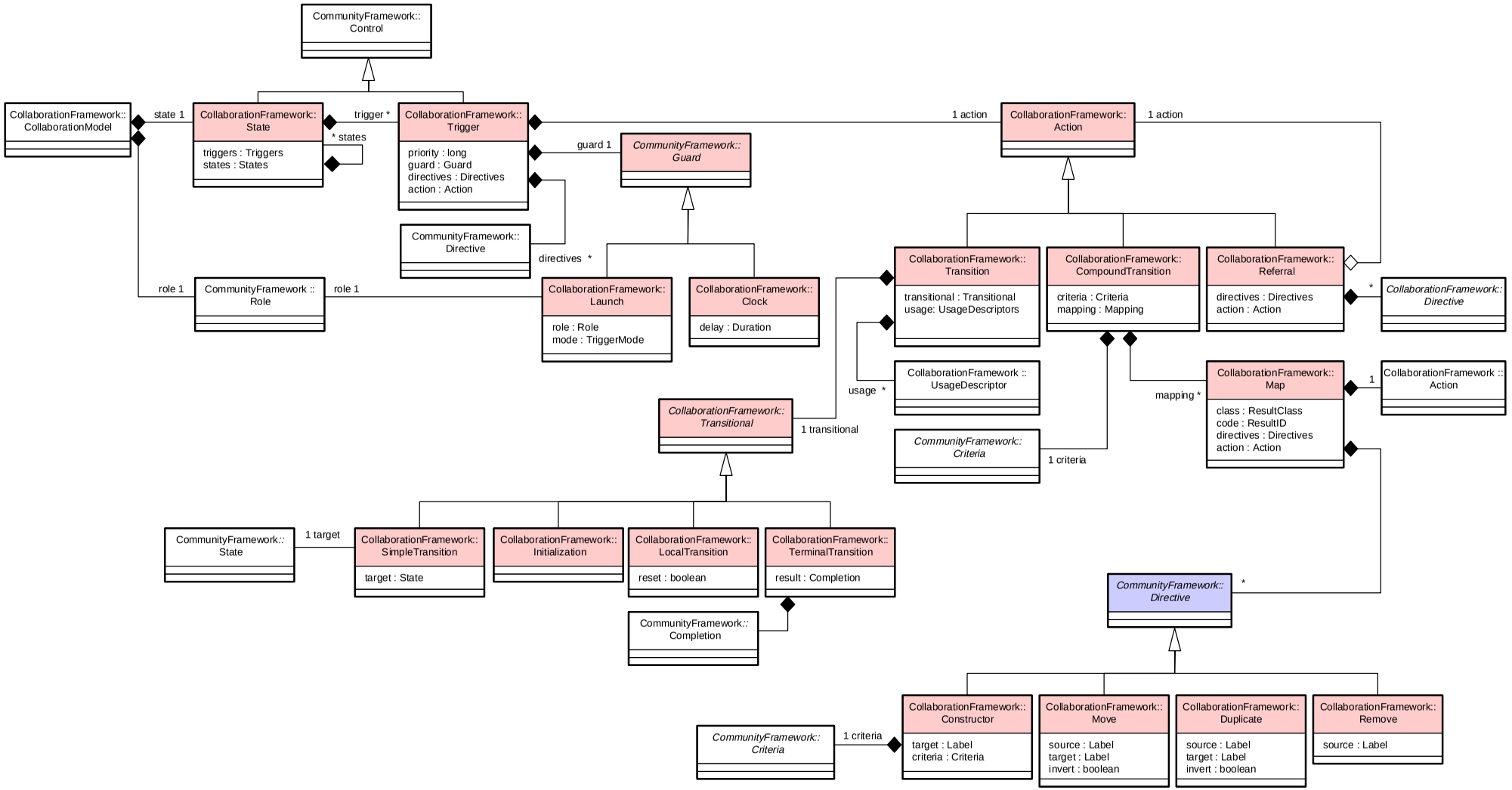
*Engagement*




*Collaboration and CollaborationModel*



## *Valuetypes supporting CollaborationModel*



## 7 CollaborationFramework Complete IDL

```
#ifndef _COLLABORATION_IDL_
#define _COLLABORATION_IDL_
#include <CommunityFramework.idl>
#pragma prefix "osm.net"

module CollaborationFramework{

        #pragma version CollaborationFramework 2.0

        //  forward declarations

        abstract valuetype Action;
        abstract valuetype Transitional;
        abstract valuetype Guard;
        abstract valuetype Proof;
        abstract valuetype Evidence;
        abstract valuetype UsageDescriptor;

        valuetype State;
        valuetype Initialization;
        valuetype Trigger;
        valuetype Transition;
        valuetype SimpleTransition;
        valuetype LocalTransition;
        valuetype TerminalTransition;
        valuetype CompoundTransition;
        valuetype Referral;

        abstract interface Slave;
        abstract interface Master;
        abstract interface Collaboration;
        abstract interface Engagement;
        abstract interface Vote;
        abstract interface Directive;

        interface Encounter;
        interface Processor;
        interface VoteProcessor;
        interface EngagementProcessor;
        interface CollaborationProcessor;

        // typedefs

        valuetype States sequence <State> ;
        valuetype Triggers sequence <Trigger> ;
        valuetype Initializations sequence <Initialization> ;
        valuetype UsageDescriptors sequence <UsageDescriptor> ;
        valuetype Slaves sequence <Slave> ;
        valuetype Directives sequence <Directive>;
        valuetype Label CommunityFramework::Label;
        valuetype ProcessorState Session::task_state;
        valuetype ResultID unsigned long ;
```

```
valuetype TypeCode CORBA::TypeCode;
valuetype ResultClass boolean;

// structures

valuetype Duration {
        public TimeBase::TimeT value;
};

struct VoteCeiling{
        short numerator;
        short denominator;
};

enum VotePolicy{
        AFFERMATIVE_MAJORITY,
        NON_ABSTAINING_MAJORITY
};

abstract valuetype Proof {};
abstract valuetype Evidence {};

enum VoteDescriptor{
        NO,
        YES,
        ABSTAIN
};

valuetype VoteStatement :
        Evidence
        {
        public VoteDescriptor vote;
};

valuetype VoteReceipt :
        Proof
        {
        public Session::Timestamp timestamp;
        public VoteStatement statement;
};

valuetype VoteCount :
        Proof
        {
        public Session::Timestamp timestamp;
        public long yes;
        public long no;
        public long abstain;
};

valuetype Timeout{
        public Label identifier;
        public Session::Timestamp timestamp;
};

valuetype TimeoutSequence sequence <Timeout> ;
```

```
enum TriggerMode{
        INITIATOR,
        RESPONDENT,
        PARTICIPANT
};

valuetype Completion
        {
        public ResultClass result;
        public ResultID code;
};

valuetype StateDescriptor
        {
        public ProcessorState state;
        public CollaborationFramework::Completion completion;
        public CommunityFramework::Problems problems;
};

// exceptions

exception InvalidTrigger{
        CommunityFramework::Problem problem;
        Label identifier;
};

exception ApplyFailure{
        CommunityFramework::Problem problem;
        Label identifier;
};

exception InitializationFailure{
        CommunityFramework::Problem problem;
        Label identifier;
};

exception EngagementProblem{
        CollaborationFramework::Evidence evidence;
        CommunityFramework::Problem problem;
};

interface SlaveIterator : CosCollection :: Iterator { };

// coordination link

abstract valuetype Coordination : Session::Execution{ };

valuetype Monitors : Coordination {
        public Processor resource;
};

valuetype Coordinates : Monitors {};

valuetype CoordinatedBy : Coordination {
        public Session::Task resource;
```

```
        };

        // management link

        abstract valuetype Management : Session::Link{ };

        valuetype Controls : Management {
                public Slave resource;
        };

        valuetype ControlledBy : Management {
                public Master resource;
        };

/**
Encounter
*/

        interface Encounter :
                Session::Task,
                CommunityFramework::Membership
                {
        };

        valuetype EncounterCriteria :
                CommunityFramework::Criteria
                {
                public CommunityFramework::MembershipModel model;
        };

/*
ProcessorModel
*/

        abstract valuetype UsageDescriptor { };

        valuetype InputDescriptor :
                UsageDescriptor
                {
                public string tag;
                public boolean required;
                public TypeCode type;
        };

        valuetype OutputDescriptor :
                UsageDescriptor
                {
                public string tag;
                public TypeCode type;
        };

        valuetype ProcessorModel :
                CommunityFramework::Control
                supports CommunityFramework::Model
                {
                public UsageDescriptors usage;
```

```
        };

    /**
    Master, Slave and Processor.
    */

        abstract interface Master {
            SlaveIterator slaves (
                in long max_number,
                out Slaves slaves
            );
        };

        abstract interface Slave {
            readonly attribute CollaborationFramework::Master master;
        };

        abstract interface Processor :
            Session::AbstractResource,
            CommunityFramework::Simulator,
            Master, Slave
            {

            readonly attribute StateDescriptor state;

            Session::Task coordinator(
            ) raises (
                Session::ResourceUnavailable
            );

            CommunityFramework::Problems verify( );

            void start (
            ) raises (
                Session::CannotStart,
                Session::AlreadyRunning
            );
            void suspend (
            ) raises (
                Session::CannotSuspend,
                Session::CurrentlySuspended
            );
            void stop (
            ) raises (
                Session::CannotStop,
                Session::NotRunning
            );
        };

        valuetype ProcessorCriteria :
            CommunityFramework::Criteria
            {
            public ProcessorModel model;
        };

    /**
```

```
Engagement
*/

        abstract interface Engagement
                {
                Proof engage(
                        in CollaborationFramework::Evidence evidence
                ) raises (
                        EngagementProblem
                );
        };

        interface EngagementProcessor :
                Engagement,
                Processor
                {
        };

        valuetype EngagementModel :
                ProcessorModel
                {
                public CommunityFramework::Role role;
                public Duration lifetime;
                public boolean unilateral;
        };

/**
Vote.
*/

        abstract interface Vote
                {
                readonly attribute VoteCount vcount;

                VoteReceipt vote(
                        in VoteDescriptor value
                );
        };

        interface VoteProcessor :
                Vote,
                Processor
                {
        };

        valuetype VoteModel :
                ProcessorModel
                {
                public VoteCeiling ceiling;
                public VotePolicy policy;
                public boolean single;
                public Duration lifetime;
        };

/**
Collaboration
```

```
*/

        // directive

        abstract interface Directive {};

        valuetype Duplicate
                supports Directive
                {
                public Label source;
                public Label target;
                public boolean invert;
        };

        valuetype Move
                supports Directive
                {
                public Label source;
                public Label target;
                public boolean invert;
        };

        valuetype Remove
                supports Directive
                {
                public Label source;
        };

        valuetype Constructor
                supports Directive
                {
                public Label target;
                public CommunityFramework::Criteria criteria;
        };

        // apply arguments

        valuetype ApplyArgument
                {
                public CollaborationFramework::Label label;
                public Session::AbstractResource value;
        };

        valuetype ApplyArguments sequence <ApplyArgument> ;

        // collaboration

        abstract interface Collaboration
                {

                readonly attribute Label active_state;
                readonly attribute TimeoutSequence timeout_list;

                void apply(
                        in Label identifier
                ) raises (
```

```
                InvalidTrigger,
                ApplyFailure
        );

        void apply_arguments(
                in Label identifier,
                in ApplyArguments args
        ) raises (
                InvalidTrigger,
                ApplyFailure
        );
};

interface CollaborationProcessor :
        Collaboration,
        Processor
        {
};

/**
Collaboration controls
*/

        valuetype State :
                CommunityFramework::Control
                {
                public CollaborationFramework::Triggers triggers;
                public CollaborationFramework::States states;
        };

        abstract valuetype Guard {};

        valuetype Clock :
                Guard
                {
                public Duration timeout;
        };

        valuetype Launch :
                Guard
                {
                public TriggerMode mode;
                public CommunityFramework::Role role;
        };

        valuetype Trigger :
                CommunityFramework::Control
                {
                public long priority;
                public CollaborationFramework::Guard guard;
                public CollaborationFramework::Directives directives; // precondition
                public CollaborationFramework::Action action;
        };

        abstract valuetype Action { };
```

```
abstract valuetype Transitional { };

valuetype Transition :
        Action
        {
        public CollaborationFramework::Transitional transitional;
        public UsageDescriptors usage;
};

valuetype Initialization :
        Transitional
        {
};

valuetype SimpleTransition :
        Transitional
        {
        public State target;
};

valuetype LocalTransition :
        Transitional
        {
        public boolean reset;
};

valuetype TerminalTransition :
        Transitional
        {
        public Completion result;
};

valuetype Referral :
        Action
        {
        public CollaborationFramework::Action action;
        public CollaborationFramework::Directives directives;
};

valuetype Map
        {
        public ResultClass class;
        public ResultID code;
        public CollaborationFramework::Directives directives;
        public CollaborationFramework::Action action;
};

valuetype Mapping sequence <Map> ;

valuetype CompoundTransition :
        Action
        {
        public CommunityFramework::Criteria criteria;
        public CollaborationFramework::Mapping mapping;
};
```

```
        valuetype CollaborationModel :
                ProcessorModel
                {
                public CommunityFramework::Role role;
                public CollaborationFramework::State state;
        };
};

#endif // _COLLABORATION_IDL_
```

# Part 4
# CommunityFramework

## 1 Overview

The CommunityFramework defines a specialization of the Task and Session Workspace called **Community** and a specialization of Community called **Agency**. Community is defined as a specialization of Workspace and an abstract interface called **Membership**. Agency is a specialization of a Community that introduces the abstract interface **LegalEntity**.

*Principal Interfaces - Summary Table*

| Interface | Description |
|---|---|
| Community | The Community type combines the definition of Workspace from the Task and Session framework. Community is derived from the abstract interfaces Membership and Simulator. |
| Agency | Agency extends Community through the addition of the abstract interface named LegalEntity. |
| GenericResource | A type of AbstractResource used to wrap another object. |

*Abstract Interfaces and supporting valuetypes - Summary Table*

| Interface | Description |
|---|---|
| Simulator | An abstract interface used to expose a valuetype supporting the Model valuetype. |
| Model | An abstract interface supported by valuetypes used for models that declares execution policy. |
| Control | A valuetype with identity, a label and human readable description. |
| Role | A valuetype derived from Control that defines a hierarchy of business roles and associated role policies. |
| RolePolicy | A valuetype defining policy of a business role. |

| Interface | Description |
|---|---|
| MembershipModel | An extension of Control supporting the abstract Membership interface that exposes Membership policy and a role hierarchy. |
| MembershipPolicy | A valuetype used to define the policy applicable to a Membership. Contained by MembershipModel. |
| Membership | Membership is an abstract interface that enables association, qualification and retraction of instances of the type User with a concrete type derived from Membership (such as Community and Agency). Users are associated to a Membership through a type of Link called Member. |
| Member | A valuetype used to describe the association of a User to a Membership (inverse of Recognizes). |
| Recognizes | A valuetype used to describe the association of a Membership to a User (inverse of Member) |

*Factory related interfaces and valuetypes - Summary Table*

| Interface | Description |
|---|---|
| ResourceFactory | An abstract interface defining factory operations based on supplied Criteria valuetypes. |
| Problem | A valuetype used to describe issues relating or contributing to an exception condition. |
| Criteria | Abstract interface supported by ExternalCriteria, CommunityCriteria, AgencyCriteria and GenericCriteria. |
| ExternalCriteria | A criteria valuetype used as a container of an XML public and system identifier of criteria related information resources. |
| CommunityCriteria | A valuetype used as an argument to a resource factory. It contains a MembershipModel that defines the business semantics of the community to be created. |
| AgencyCriteria | A valuetype used as an argument to a resource factory. It contains a MembershipModel that defines the business semantics of the agency to be created. |
| GenericCriteria | A valuetype used as a criteria argument to a resource factory. |

## 2 Model, Simulator and supporting valuetypes

The interfaces defined under the CommunityFramework separate the notion of service object managed by a particular domain, (typically reference objects derived from the Task and Session specification) from valuetype used to describe policy or state. An abstract interface named **Simulator** defines the **model** attribute that returns a valuetype supporting the abstract **Model** interface. From a computational point of view, a by-reference object such as Community or Agency is a manager and container of a related model valuetype.

### 2.1 Model

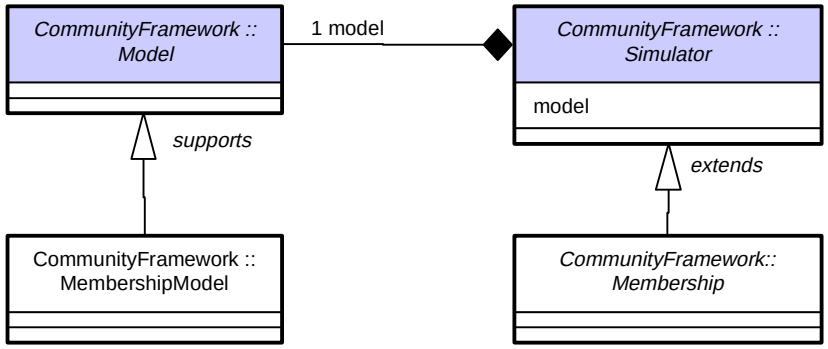
A Model is an abstract interface supported by valuetypes exposed by the Simulator model attribute. An example of a valuetype that supports Model is MembershipModel (additional types supporting the Model abstract interface are defined under the CollaborationFramework).

*IDL Specification*

```
abstract interface Model
        {
};
```

## 2.2 Simulator

A Simulator is an abstract interface that defines a single attribute through which a client can access a related Model. A model valuetype defines constraints and operational semantics. Implementations of concrete simulators (such as Community and Agency) are responsible for ensuring that the appropriate type of model is returned through to the client. For example, a Community implementation of the model operation will return an instance of MembershipModel.




*Model and Simulator*

*IDL Specification*

```
abstract interface Simulator
        {
        readonly attribute CommunityFramework::Model model;
};
```

*Simulator Attribute Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| model | Model | readonly | Access to a valuetype supporting the abstract Model interface. |

## 2.3 Control

Control is an identifiable valuetype used in definition of valuetypes defining complex models. Control contains a human readable label and descriptive note. Control is used as a utility state container by several valuetypes defined within the Community and Collaboration frameworks.

*IDL Specification*

```
valuetype Label CORBA::StringValue;
valuetype Note CORBA::StringValue;
```

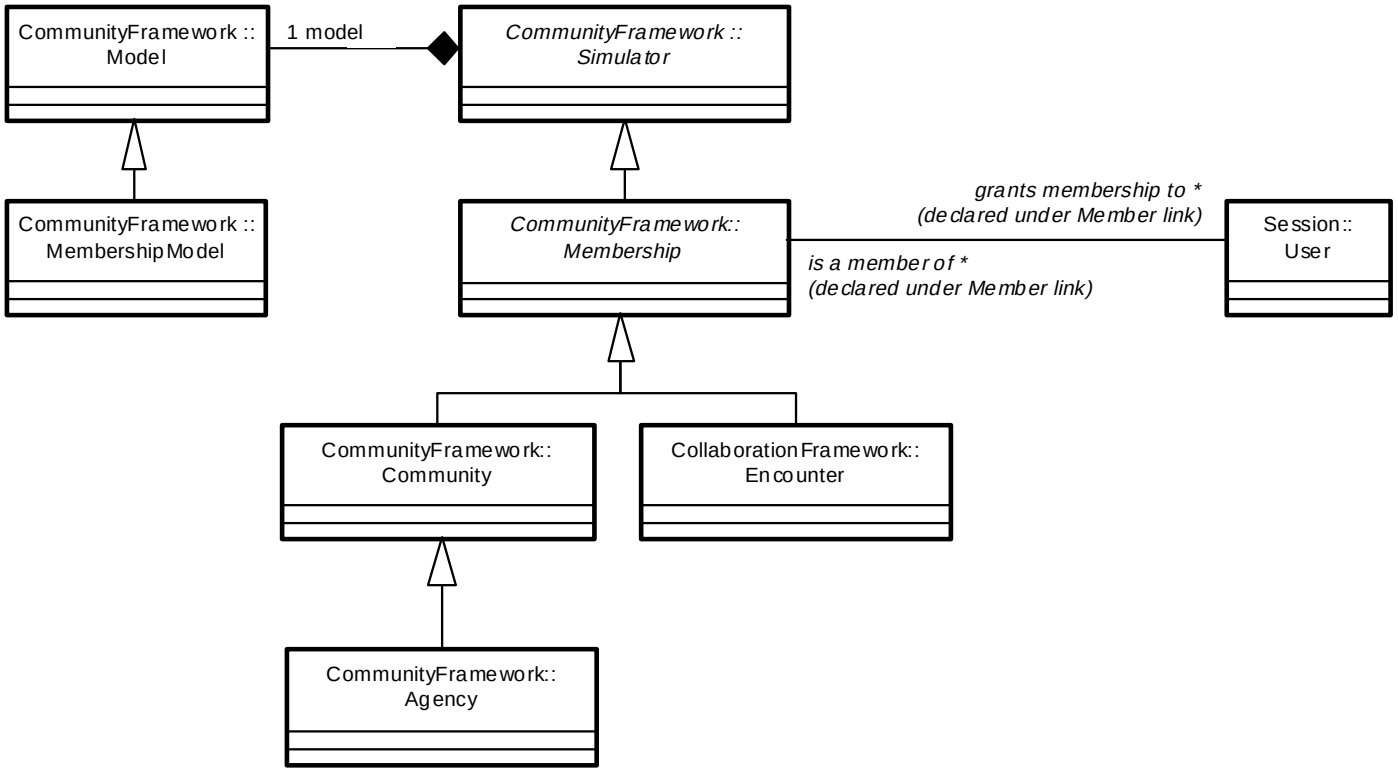
```
valuetype Control :
        {
        public CommunityFramework::Label  label;
        public CommunityFramework::Note  note;
};
```

*Control State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| label | Label | public | Name of the control. |
| note | Note | public | Descriptive text. |

## 3 Membership, MembershipPolicy and Member Link

The abstract Membership interface declares a set of operations supporting the association of Users (refer Task and Session specification) under a single policy domain. Operations provide support for the addition, modification and removal of a User association, access to the quorum status of a membership, and access to information about the set of associated Users. Membership to User association is through a link named Member (derived from the Task and Session Link).

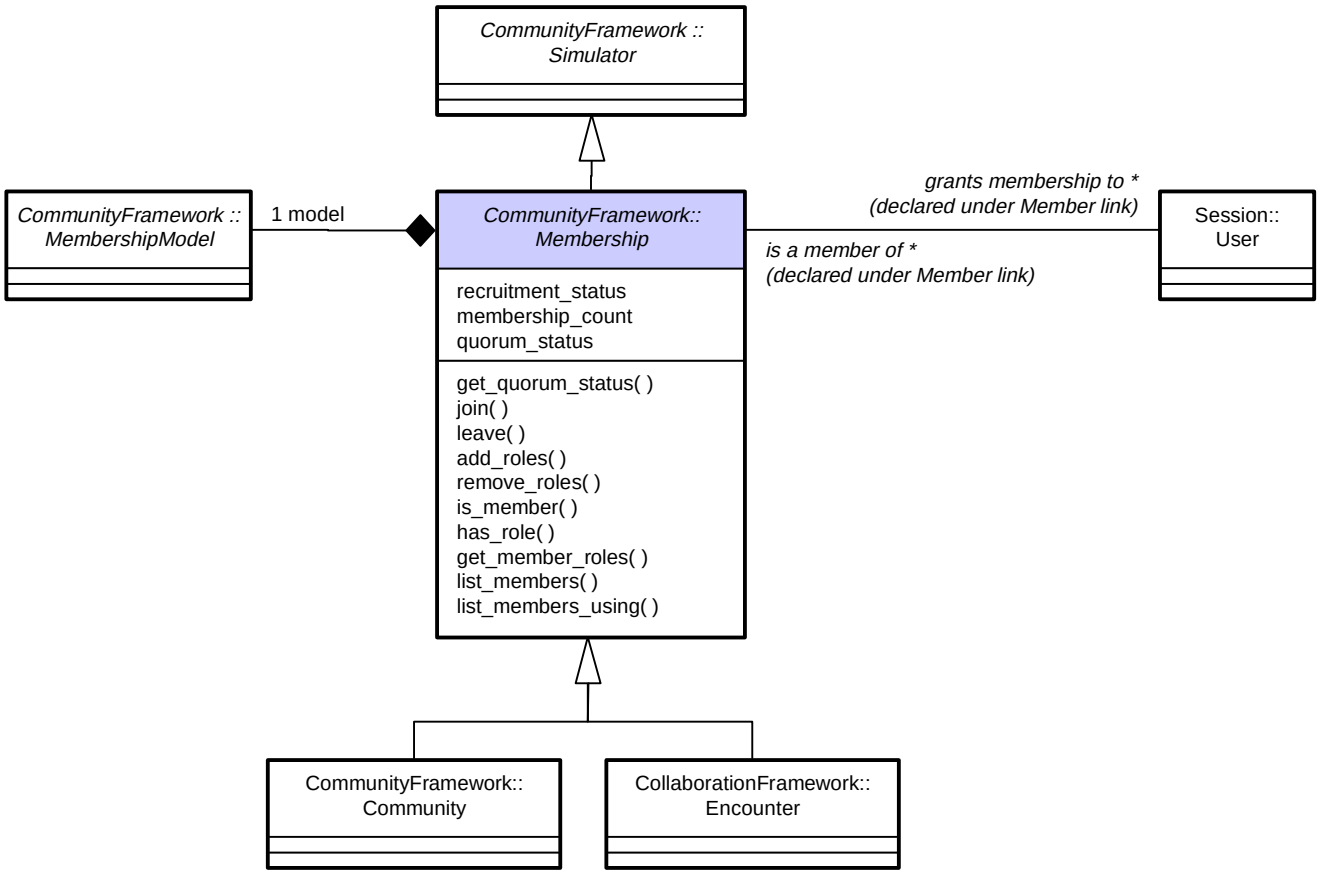



*Membership Object Model*

### 3.1 Membership

Membership is an abstract interface inherited by Community that defines operations supporting association and retraction of users under Member links, the qualification of members in terms of

business roles, and operations supporting access to information about associated Users. A MembershipModel qualifies membership behavior. The MembershipModel defines a hierarchy of business roles that qualify the association between a User and the Membership. In addition, MembershipModel declares policy concerning privacy of Member relationship information, User to role association, and exclusivity of the membership.




*Membership abstract interface Object Model*

*IDL Specification*

```
abstract interface Membership :
        Simulator
        {

        readonly attribute RecruitmentStatus recruitment_status;
        readonly attribute MembershipCount membership_count;
        readonly attribute boolean quorum_status;


        RoleStatus get_quorum_status(
                in Label identifier
        );

        Member join(
                in Session::User user,
```

```
        in Labels roles
) raises (
        AttemptedCeilingViolation,
        AttemptedExclusivityViolation,
        RecruitmentConflict,
        RoleAssociationConflict,
        MembershipRejected,
        UnknownRole
);

void leave(
        in CommunityFramework::Member member
) raises (
        RecruitmentConflict,
        UnknownMember
);

void add_roles(
        in CommunityFramework::Member member,
        in Labels roles
) raises (
        UnknownMember,
        RoleAssociationConflict,
        UnknownRole
);

void remove_roles(
        in CommunityFramework::Member member,
        in Labels roles
) raises (
        UnknownRole,
        UnknownMember,
        CannotRemoveRole
);

boolean is_member(
        in Session::User user
) raises (
        PrivacyConflict
);

boolean has_role(
        in Session::User user,
        in Label role
) raises (
        PrivacyConflict
);

Labels get_member_roles(
        in Session::User user
) raises (
        PrivacyConflict
);

Session::UserIterator list_members(
        in long max_number,
```

```
                out Session::Users list
        ) raises (
                PrivacyConflict
        );

        Session::UserIterator list_members_using(
                in Label role,
                in long max_number,
                out Session::Users list
        ) raises (
                PrivacyConflict
        );

};

exception PrivacyConflict
        {
        PrivacyPolicyValue reason;
};

exception AttemptedCeilingViolation{
        Membership source;
};

exception AttemptedExclusivityViolation{
        Membership source;
};

exception UnknownRole{
        Membership source;
};

exception UnknownMember{
        Membership source;
        Member link;
};

exception UnknownIdentifier{
        Membership source;
        Label identifier;
};

exception MembershipRejected{
        Membership source;
        string reason;
};

exception RoleAssociationConflict{
        Membership source;
        string reason;
        Label role;
};

exception CannotRemoveRole{
        Membership source;
```

```
        string reason;
        Label role;
};

exception RecruitmentConflict{
        Membership source;
        RecruitmentStatus reason;
};
```

### *Operations supporting association and retraction of Users*

The join operation allows a client to associate a User reference with a Membership under a set of declared business roles (refer MembershipPolicy). The join operation returns a Member instance to be maintained by the User instance.

```
Member join(
        in Session::User user,
        in Lables roles
) raises (
        AttemptedCeilingViolation,
        AttemptedExclusivityViolation,
        RecruitmentConflict,
        RoleAssociationConflict,
        MembershipRejected,
        UnknownRole
);
```

The leave operation disassociates a Member from a Membership.

```
void leave(
        in CommunityFramework::Member member
) raises (
        RecruitmentConflict,
        UnknownMember
);
```

*Exceptions related to the Join and leave operations*

| Exception | Reason |
|---|---|
| AttemptedCeilingViolation | An attempt is made to add a member association to a Membership where the number of Members is equal to or greater than the ceiling state field value exposed by the associated MemberPolicy instance. |
| AttemptedExclusivityViolation | If the associated MemberPolicy declares **exclusive** as true, then for any identifiable principal (CORBA Current Principal) there may be only one Member association for that principal. |
| RecruitmentConflict | May be raised at the discretion of an implementation when an attempt is made to join or leave a Membership when the recruitment status is CLOSED. |
| RoleAssociationConflict | Raised when an attempt is made to associate a Member to an abstract role. |

| Exception | Reason |
|---|---|
| MembershipRejected | Implementation specific decision to disallow a join request. |
| UnknownRole | Raised when an attempt is made to association a Member under an unknown role. |
| UnknownMember | May be raised at the discretion of an implementation following an attempt to disassociate a Member from a Membership. |

### *Operations supporting modification of business roles assigned to Members*

The **add_roles** operation enables the addition of business roles attributed to a Member.

```
void add_roles(
        in CommunityFramework::Member member,
        in Labels roles
) raises (
        UnknownMember,
        RoleAssociationConflict,
        UnknownRole
);
```

The **remove_roles** operation enables the retraction of business roles attributed to a Member.

```
void remove_roles(
        in CommunityFramework::Member member,
        in Labels roles
) raises (
        UnknownRole,
        UnknownMember,
        CannotRemoveRole
);
```

*Exceptions related to the role association*

| Exception | Reason |
|---|---|
| UnknownRole | Raised following an attempt to associate or disassociate a Member when the supplied role identifier is unknown (i.e. not defined within the associated MembershipPolicy). |
| UnknownMember | May be raised at the discretion of an implementation following an attempt to add or remove a role from/to a Member. |
| CannotRemoveRole | Raised if a role removal would result in no role association towards the Member. |

### *Attributes and Operations supporting access to recruitment and quorum state*

The following attribute returns the recruitment status of a Membership. The value returned is one of the enumeration values OPEN_MEMBERSHIP or CLOSED_MEMBERSHIP. Modification of the

recruitment status of a Membership is implementation specific. When a Membership is under a CLOSED_MEMBERSHIP, an implementation may raise the RecruitmentConflict exception.

```
enum RecruitmentStatus{
        OPEN_MEMBERSHIP,
        CLOSED_MEMBERSHIP
};

// from Membership

        readonly attribute RecruitmentStatus recruitment_status;
```

The following attribute supports access to the number of associated Member instances. The valuetype MembershipCount contains two values, the number of Member instances associated to the Membership (static field), and the number of Member instances referencing connected Users at the time of invocation (refer Task and Session, User, Connected State).

```
valuetype MembershipCount{
        public long static;
        public long active;
};

// from Membership

        readonly attribute MembershipCount membership_count;
```

The following attribute returns true if all roles defined within the associated MembershipPolicy have met quorum – that is to say that for each role, the number of member instances associated with that role, equal or exceed the quorum value defined under the RolePolicy associated with the given role (refer RolePolicy).

```
// from Membership

        readonly attribute boolean quorum_status;
```

Quorum status relating to individual roles is available through the **get_quorum_status** operation. The identifier argument corresponds to identify of a role exposed within a MembershipModel.

```
// from Membership

        RoleStatus get_quorum_status(
                in Label identifier
        );
```

Possible QurumStatus values correspond to QUORUM_VALID, indicating that all roles have reached quorum, QUORUM_PENDING, indicating that the a role has not reached quorum, and the special case of QUORUM_UNREACHABLE, indicating that the maximum number of members required for a particular role is less than the minimum required.

```
enum QuorumStatus {
        QUORUM_VALID,
        QUORUM_PENDING,
```

```
        QUORUM_UNREACHABLE
};

valuetype RoleStatus
        {
        public Label identifier;
        public MembershipCount count;
        public QuorumStatus status;
};
```

*Operations supporting access to information about members*

The **is_member** operation returns true if the supplied User is a member of the membership.

```
// from Membership

        boolean is_member(
                in Session::User user
        ) raises (
                PrivacyConflict
        );
```

The **has_role** operation returns true if the supplied User is associated to the Membership under a role corresponding to the supplied identifier.

```
// from Membership

        boolean has_role(
                in Session::User user,
                in Label role
        ) raises (
                PrivacyConflict
        );
```

The **get_member_roles** operation returns the sequence of all role identifiers associated with the supplied user.

```
// from Membership

        Labels get_member_roles(
                in Session::User user
        ) raises (
                PrivacyConflict
        );
```

The **list_members** operation returns an iterator of all User instances associated with the Membership. The **max_number** argument constrains the maximum number of User instances to include in the returned list sequence.

```
// from Membership

        Session::UserIterator list_members(
```

```
        in long max_number,
        out Session::Users list
    ) raises (
        PrivacyConflict
    );
```

The **list_members_using** operation returns an iterator of all User instances associated with the Membership under a supplied role. The **max_number** argument constrains the maximum number of Member instances to include in the returned list sequence.

```
// from Membership

    Session::UserIterator list_members_using (
        in Label role,
        in long max_number,
        out Session::Users list
    ) raises (
        PrivacyConflict
    );
```

*Exceptions related to information about members*

| Exception | Reason |
|---|---|
| PrivacyConflict | Raised in the case of a conflict between the invocation and the privacy policy defined under the Membership's MemberPolicy instance (refer MembershipPolicy, Privacy Constraints). |

## 3.2 MembershipModel

MembershipModel is a valuetype that extends the Model valuetype through addition of fields containing a MembershipPolicy and a Role representing the root business role of a role hierarchy.

### *IDL Specification*

```
valuetype MembershipModel :
    Control
    supports Model
    {
    public MembershipPolicy policy;
    public CommunityFramework::Role role;
};
```

*MembershipModel State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| policy | MembershipPolicy | public | Defines privacy and exclusivity policy of the containing Membership. |
| role | Role | public | The root Role instance establishing a business role hierarchy. |

## 3.3 MembershipPolicy

The MembershipPolicy valuetype is contained within the CommunityModel valuetype (and other valuetypes defined under the CollaborationFramework). MembershipPolicy defines privacy and exclusivity policy of the containing Membership.

### IDL Specification

```
enum PrivacyPolicyValue
        {
        PUBLIC_DISCLOSURE,
        RESTRICTED_DISCLOSURE,
        PRIVATE_DISCLOSURE
};

valuetype MembershipPolicy
        {
        public PrivacyPolicyValue privacy;
        public boolean exclusive;
};
```

*MembershipPolicy State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| privacy | PrivacyPolicyValue | public | Qualification of the extent of information to be made available to clients (refer Privacy Constraints). |
| exclusive | boolean | public | Restricts the number of Member instances associated to a Membership to 1 for a given principal identity (refer CORBA::Current). |

### Privacy Constraints

The **MembershipPolicy** privacy attribute exposes an enumeration of privacy qualifiers. Each qualifier defines a level of information access concerning members and the roles they have. Privacy constraints refer to structural information (the association of members to a membership) and member role attribution.

*PrivacyPolicyValue Enumeration Table*

| Value | Description |
|---|---|
| PUBLIC_DISCLOSURE | Operations may return structural and member role associations to non-members. |
| RESTRICTED_DISCLOSURE | Operations may return structural and member role associations to members that share a common root **Membership** (where a root membership is derived from navigation of collection relationships to higher-level membership instances). |
| PRIVATE_DISCLOSURE | Operations may return structural and member role associations to members of the same **Membership**. |

## 3.4 Member and Recognizes Link

**Member** is a type of Privilege link (refer Task and Session) that defines relationship between a **Membership** and a **User**. **Recognizes** is the inverse association of Member that associates a Membership with a Users. A Member instance when held by a Membership implementation references the participating User. The inverse relationship, held by an implementation of User, contains a reference to the target Membership.

### *IDL Specification*

```
valuetype Member : Session::Privilege {
        public Membership resource;
};

valuetype Recognizes : Session::Privilege {
        public Session::User resource;
        public Labels roles;
};
```

*Member State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | Membership | public | The reference to a Membership that the User, holding this link is a member of. |

*Recognizes State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | User | public | The reference to a User that is a recognized member of the Membership holding this link. |
| roles | Labels | public | A sequence of role identifies managed by the Membership implementation that the membership has granted to the Member. |

# 4 Roles and role related policy

A business role hierarchy is defined with the Role valuetype. The hierarchy declares a set role instances against which members can be implicitly or explicitly associated.

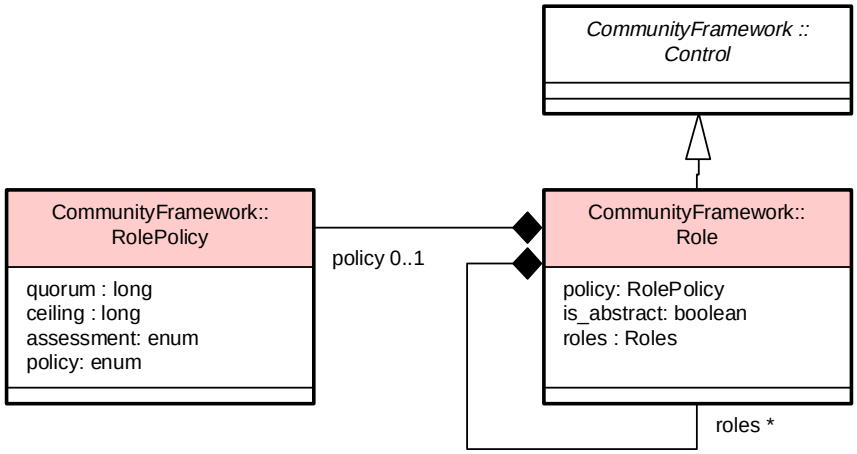
## 4.1 Role

Role is a valuetype that declares the notion of a "business role" of a User. The state fields **label** and **note** inherited from Control are used to associate a role name and role description. Role supplements this information with an additional three state fields, **policy**, **is_abstract** and **roles**. The **roles** field contains a sequence of role instances through which role hierarchies can be constructed. The policy field value is RolePolicy valuetype that qualifies the quorum, ceiling,

quorum assessment and quorum policy applicable to the containing role. A Role can be declared as an abstract role by setting the **is_abstract** state field value to true. Declaring the role as abstract disables direct association of a User to the Role under a Membership. Instead, members can associate lower-level roles, thereby implicitly associating themselves with the containing roles.

Examples of business role hierarchies include the logical association of "customer" and "supplier" as roles under a parent named "signatories". In this example, both "customer" and "supplier" would be modeled as Role instances with **is_abstract** set to false, and contained within a single Role named "signatories". By setting the "signatories" role **is_abstract** value to true, Members cannot directly associate to this role. Instead, Members associating to either "customer" or "supplier" are implicitly granted "signatory" association.

An implementation is responsible for ensuring the consistency of quorum and ceiling values across a role hierarchy.




*Role and role policy object model.*

## *IDL Specification*

```
valuetype Role :
        Control
        {
        public RolePolicy policy;
        public CommunityFramework::Roles roles;
        public boolean is_abstract;
};
```

*Role State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| policy | RolePolicy | public | Defines policy associated with an instance of RoleContainer or RoleElement. If null, no direct policy constraint is implied. |

| Name | Type | Properties | Purpose |
|---|---|---|---|
| roles | Roles | public | A sequence of Role instances that are considered as children relative to the containing role. Association of a Member to a child role implicitly associates the Member with all parent roles. |
| is_abstract | boolean | public | If true, Member instances may not be directly associated with the role under a Membership. Members may be associated implicitly through association to a non-abstract sibling. |

## 4.2 RolePolicy

RolePolicy is a valuetype that defines ceiling limits and quorum policy for a particular role. The value of the quorum filed defines the minimum number of Members that must be associated with the role that the policy is associated with before the role can be considered to have reached quorum. The ceiling field defines the maximum number of Members that may be associated under the role. The policy field exposes a RolePolicy value that details the mechanism to quorum calculations. In the case of a null value for policy or assessment, the value shall be inferred by the parent policy. In the case of no parent policy declaration, quorum policy shall be SIMPLE and assessment policy shall be LAZY (representing the least restrictive case). The absence of a ceiling value shall indicate no limit on the number of associated members. The absence of a quorum value shall imply a quorum of 0.

### *IDL Specification*

```
enum QuorumPolicy
        {
        SIMPLE, // default
        CONNECTED
};

enum QuorumAssessmentPolicy
        {
        STRICT,
        LAZY // default
};

valuetype RolePolicy
        {
        public long quorum;
        public long ceiling;
        public QuorumPolicy policy;
        public QuorumAssessmentPolicy assessment;
};
```

*RolePolicy State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| quorum | long | public | The minimum number of Members that must be associated with the role before the role can be considered to have achieved quorum. |
| ceiling | long | public | The maximum number of Member instances that may be associated to this role. |
| assessment | QuorumAssessmentPolicy | public | An enumeration used to determine the mechanism to be applied to quorum assessment. The enumeration describes STRICT and LAZY assessment policies. Under STRICT assessment, the establishment of a quorum is required before the membership is considered valid. Under LAZY assessment, the determination of quorum is based on the accumulative count of members during the lifetime of the membership. LAZY assessment introduces the possibility for the execution of optimistic processes that depend on valid quorums for finalization and commitment of results. |
| policy | QuorumPolicy | public | An emanation of SIMPLE or CONNECTED. When the value is SIMPLE, quorum calculation is based on number of Member instances. When the quorum policy is CONNECTED, the quorum calculation is based on the number of Member instances that reference a User that is in a connected state. |

# 5 Community, Agency, LegalEntity and related valuetypes

## 5.1 Community

A Community is a type combining a formal model of membership with the Task and Session Workspace. As a Workspace, a Community is a container of AbstractResource instances. As a Membership, a Community exposes a MembershipModel detailing the allowable business roles and group constraints applicable to associated Users. A new instance of Community may be created by passing an instance of CommunityCriteria to the create operation on ResourceFactory.

*IDL Specification*

```
interface Community :
        Session::Workspace,
```

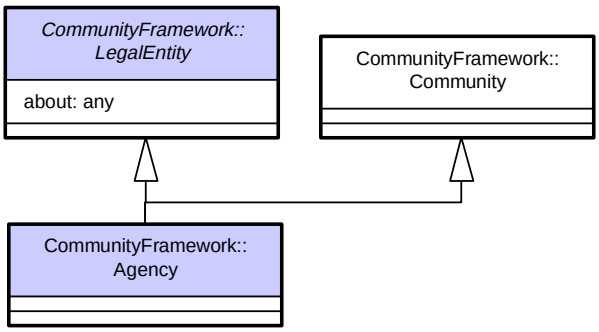
```
        Membership
        {
};

valuetype CommunityCriteria :
        Criteria
        {
        public MembershipModel model;
};
```

*CommunityCriteria State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| model | MembershipModel | public | The model to associate to the Community on creation. |

## 5.2 Agency and LegalEntity

**Agency** is a specialization of **Community** and **LegalEntity** that introduces the notion of organized community such as a company. As a **LegalEntity**, an **Agency** may be associated to a number of users representing roles relative to a resource derived from LegalEntity. **LegalEntity** is an abstract interface that defines access to implementation specific criteria such as security policy, public company information and so forth. A new instance of Agency may be created by passing an instance of AgencyCriteria to the create operation on ResourceFactory.




*LegalEntity Object Model*

*IDL Specification*

```
abstract interface LegalEntity {
        readonly attribute any about;
};

interface Agency : Community, LegalEntity { };

valuetype AgencyCriteria :
        CommunityCriteria
        {
};
```

*LegalEntity Attribute Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| about | any | readonly | A value that may be used in an implementation specific way to expose security and other credentials towards clients. |

# 6 General Utility Interfaces

## 6.1 GenericResource

GenericResource is a type of AbstractResource that exposes operations through which values (in the form of an any) can be attributed to the resource in an interoperable manner. Instances of GenericResource are created through a ResourceFactory using an instance of GenericCriteria as the criteria argument.

*IDL Specification*

```
exception LockedResource{
        Generic source;
};

abstract interface Generic
        {
        readonly attribute any value;
        attribute boolean locked;
        attribute boolean template;
        void set_value(
                in any value
        ) raises (
                LockedResource
        );
};

interface GenericResource :
        Session::AbstractResource,
        Generic
        {
};

valuetype GenericCriteria : Criteria { };
```

## 1.2 Criteria

Concrete instances of Criteria may be passed as arguments to the ResourceFactory **create** operation. Criteria is an abstract interface supported by valuetypes that define factory creation criteria for concrete resource types defined within Community and Collaboration frameworks. A Criteria specialisation is defined for each concrete resource type (refer ResourceFactory Required Criteria Support). ExternalCriteria is a special case of Criteria used to describe a reference to an external artefact (such as an XML document) that can be resolved in an implementation specific manner.

*IDL Specification*

```
valuetype Arguments CosLifeCycle::Criteria;

valuetype Criteria:
        Control
        {
        public Arguments values;
};

valuetype ExternalCriteria :
        Criteria
        {
        public CORBA::StringValue common;
        public CORBA::StringValue system;
};
```

*Criteria State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| values | Arguments | readonly | Implementation specific criteria used as supplementary information by a ResourceFactory implementation. |

*ExternalCriteria State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| common | StringValue | public | XML public identifier. |
| system | StringValue | public | XML system identifier. |

## 6.2 ResourceFactory

ResourceFactory is a general utility exposable by FactoryFinder interfaces on Session::Workspace and Session::User interfaces. ResourceFactory creates new instances of AbstractResource and derived types based on a supplied name and Criteria. The **supporting** operation exposes a sequence of default Criteria instances supported by the factory. The Criteria types that a resource factory is required to expose and support are detailed in the following table.

*ResourceFactory required Criteria Support*

| Module | Criteria type | Created Resource Type |
|---|---|---|
| CommunityFramework | CommunityCriteria | Community |
| | AgencyCriteria | Agency |
| | GenericCriteria | GenericResource |
| CollaborationFramework | ProcessorCriteria | Processor |
| | | EngagementProcessor |
| | | VoteProcessor |
| | | CollaborationProcessor |

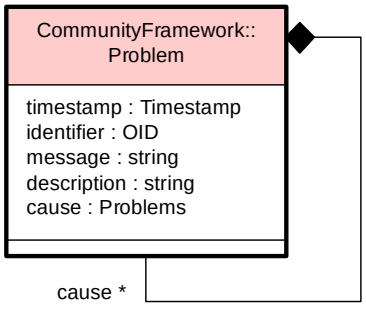
*IDL Specification*

```
exception ResourceFactoryProblem{
        ResourceFactory source;
        CommunityFramework::Problem problem;
};

abstract interface ResourceFactory
        {

        readonly attribute CriteriaSequence supporting;

        Session::AbstractResource create(
                in CORBA::StringValue name,
                in CommunityFramework::Criteria criteria
        ) raises (
                ResourceFactoryProblem
        );
};
```

## 6.3 Problem

Problem is a utility valuetype that is exposed under the ResourceFactoryProblem exception within the CommunityFramework module, and is used to describe configuration and runtime problems within the CollaborationFramework that are not readily exposed as formal exceptions. Examples of the application of Problem instances include the description of the cause of a failure arising during a factory creation operation. Other examples from the CollaborationFramework include description of non-fulfillment of a constraints and documentation of non-critical problem encountered during the execution of a collaborative process.

The Problem valuetype contains a timestamp, a problem identifier, message and description, and a possibly empty sequence of contributing Problem declarations.




*Problem valuetype object model.*

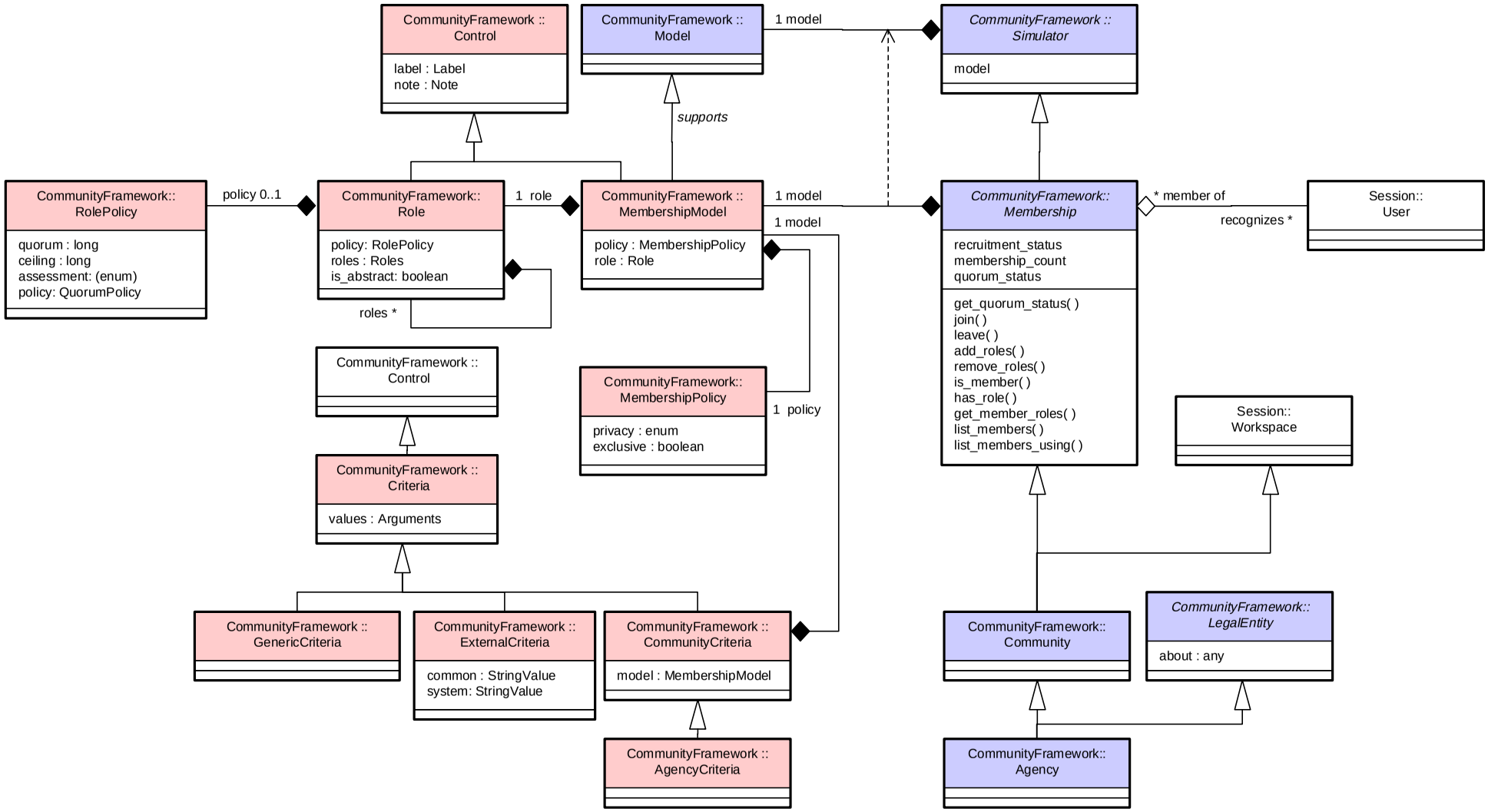
*IDL Specification*

```
valuetype Problem
        {
        public Session::Timestamp timestamp;
        public Label identifier;
        public CORBA::StringValue message;
        public CORBA::StringValue description;
        public Problems cause;
};
```

*Problem State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| timestamp | Timestamp | public | Date and time that the problem identification occurred. |
| identifier | Label | public | Identifier of a labeled control. |
| message | StringValue | public | Short human readable message describing the problem. |
| description | StringValue | public | Descriptive text detailing the problem, suitable for presentation under a human interface. |
| cause | Problems | public | A sequence of Problem instances representing the problem cause. |

## 7 UML Overview



*Principal interfaces only – does not include enumeration types, GenericResource or ResourceFactory.*

## 8 CommunityFramework Complete IDL

```
#ifndef _COMMUNITY_IDL_
#define _COMMUNITY_IDL_
#include <Session.idl>
#pragma prefix "osm.net"

module CommunityFramework{

	#pragma version CommunityFramework 2.0

	// forward declarations

	interface Agency;
	interface Community;

	abstract interface LegalEntity;
	abstract interface Model;
	abstract interface Simulator;
	abstract interface Membership;
	abstract interface Generic;
	abstract interface ResourceFactory;

	valuetype Criteria;
	valuetype Control;
	valuetype Role;
	valuetype MembershipPolicy;
	valuetype MembershipModel;
	valuetype Problem;

	// typedefs

	valuetype Roles sequence <Role>;
	valuetype Models sequence <Model>;
	valuetype CriteriaSequence sequence <Criteria>;
	valuetype Problems sequence <Problem>;
	valuetype Note CORBA::StringValue;
	valuetype Label CORBA::StringValue;
	valuetype Labels sequence <Label>;

	// links

	valuetype Member : Session::Privilege {
		public Membership resource;
	};

	valuetype Recognizes : Session::Privilege {
		public Session::User resource;
		public Labels roles;
	};

	// structures

	enum QuorumAssessmentPolicy
		{
		STRICT,
		LAZY // default
	};
```

```
enum PrivacyPolicyValue
        {
        PUBLIC_DISCLOSURE,
        RESTRICTED_DISCLOSURE,
        PRIVATE_DISCLOSURE
};

enum RecruitmentStatus{
        OPEN_MEMBERSHIP, // default
        CLOSED_MEMBERSHIP
};

valuetype MembershipCount{
        public long static;
        public long active;
};

enum QuorumPolicy
        {
        SIMPLE, // default
        CONNECTED
};

enum QuorumStatus {
        QUORUM_VALID,
        QUORUM_PENDING,
        QUORUM_UNREACHABLE
};

valuetype RoleStatus
        {
        public Label identifier;
        public MembershipCount count;
        public QuorumStatus status;
};

valuetype Problem
        {
        public Session::Timestamp timestamp;
        public Label identifier;
        public CORBA::StringValue message;
        public CORBA::StringValue description;
        public Problems cause;
};

// exceptions

exception PrivacyConflict
        {
        PrivacyPolicyValue reason;
};

exception AttemptedCeilingViolation{
        Membership source;
};

exception AttemptedExclusivityViolation{
        Membership source;
};
```

```
        exception UnknownRole{
                Membership source;
        };

        exception UnknownMember{
                Membership source;
                Member link;
        };

        exception UnknownIdentifier{
                Membership source;
                Label identifier;
        };

        exception MembershipRejected{
                Membership source;
                string reason;
        };

        exception RoleAssociationConflict{
                Membership source;
                string reason;
                Label role;
        };

        exception CannotRemoveRole{
                Membership source;
                string reason;
                Label role;
        };

        exception RecruitmentConflict{
                Membership source;
                RecruitmentStatus reason;
        };

        exception LockedResource{
                Generic source;
        };

        exception ResourceFactoryProblem{
                ResourceFactory source;
                CommunityFramework::Problem problem;
        };


// interfaces

        abstract interface Model
                {
        };

        abstract interface Simulator
                {
                readonly attribute CommunityFramework::Model model;
        };

        valuetype MembershipPolicy
                {
```

```
        public PrivacyPolicyValue privacy;
        public boolean exclusive;
};

valuetype RolePolicy
        {
        public long quorum;
        public long ceiling;
        public QuorumPolicy policy;
        public QuorumAssessmentPolicy assessment;
};

valuetype Control
        {
        public CommunityFramework::Label label;
        public CommunityFramework::Note note;
};

valuetype Role :
        Control
        {
        public RolePolicy policy;
        public CommunityFramework::Roles roles;
        public boolean is_abstract;
};

abstract interface Membership :
        Simulator
        {

        readonly attribute RecruitmentStatus recruitment_status;
        readonly attribute MembershipCount membership_count;
        readonly attribute boolean quorum_status;

        RoleStatus get_quorum_status(
                in Label identifier // role identifier
        );

        Member join(
                in Session::User user,
                in Labels roles
        ) raises (
                AttemptedCeilingViolation,
                AttemptedExclusivityViolation,
                RecruitmentConflict,
                RoleAssociationConflict,
                MembershipRejected,
                UnknownRole
        );

        void leave(
                in CommunityFramework::Member member
        ) raises (
                RecruitmentConflict,
                UnknownMember
        );

        void add_roles(
                in CommunityFramework::Member member,
                in Labels roles
```

```
        ) raises (
                UnknownMember,
                RoleAssociationConflict,
                UnknownRole
        );

        void remove_roles(
                in CommunityFramework::Member member,
                in Labels roles
        ) raises (
                UnknownRole,
                UnknownMember,
                CannotRemoveRole
        );

        boolean is_member(
                in Session::User user
        ) raises (
                PrivacyConflict
        );

        boolean has_role(
                in Session::User user,
                in Label role
        ) raises (
                PrivacyConflict
        );

        Labels get_member_roles(
                in Session::User user
        ) raises (
                PrivacyConflict
        );

        Session::UserIterator list_members(
                in long max_number,
                out Session::Users list
        ) raises (
                PrivacyConflict
        );

        Session::UserIterator list_members_using(
                in Label role,
                in long max_number,
                out Session::Users list
        ) raises (
                PrivacyConflict
        );

};

valuetype MembershipModel :
        Control supports Model
        {
        public MembershipPolicy policy;
        public CommunityFramework::Role role;
};

valuetype Criteria :
        Control
```

```
        {
        public CosLifeCycle::Criteria values;
};

valuetype ExternalCriteria :
        Criteria
        {
        public CORBA::StringValue common;
        public CORBA::StringValue system;
};

interface Community :
        Session::Workspace,
        Membership
        {
};

valuetype CommunityCriteria  :
        Criteria
        {
        public MembershipModel model;
};

abstract interface LegalEntity {
        readonly attribute any about;
};

interface Agency : Community, LegalEntity { };

valuetype AgencyCriteria :
        CommunityCriteria
        {
};

abstract interface Generic {

        readonly attribute any value;
        attribute boolean locked;
        attribute boolean template;

        void set_value(
                in any value
        ) raises (
                LockedResource
        );
};

interface GenericResource :
        Session::AbstractResource,
        Generic
        {
};

valuetype GenericCriteria : Criteria { };

abstract interface ResourceFactory
        {

        readonly attribute CriteriaSequence supporting;
```

```
                Session::AbstractResource create(
                        in CORBA::StringValue name,
                        in CommunityFramework::Criteria criteria
                ) raises (
                        ResourceFactoryProblem
                );
        };

};

#endif // _COMMUNITY_IDL_
```

# Part 5
# Task and Session

## 1 Overview

### 1.1 Design Rationale

#### *Rationale*

Large and distributed organizations, such as virtual enterprises, typically have system environments with:

- A variety of platforms, ORBs, and applications written in different languages
- Legacy applications
- Multiple Data Managers from different vendors and for different domains
- Multiple Workflow Management Systems, from different vendors
- People represented and replicated in many ways
- Distributed and heterogeneous resources in many places
- Multi-user distributed projects with parallelism to synchronize and manage
- Different user models for each application, system, and product implementation

Many of these interoperation and synchronization requirements are addressed by existing and planned CORBA specifications:

- Platform, ORB, and language interoperation is, of course, provided by CORBA
- Legacy applications can be wrapped in IDL to become CORBA objects
- Data Managers can be wrapped with CORBAservice or business object facility interfaces
- Workflow Managers will interoperate when their implementations exhibit behaviors which conform to a common specification

This specification builds on this foundation to:

- Define common objects for people, using (with some specialization) separately defined models, e.g., organization models
- Specify common place objects that contain distributed and heterogeneous resources

- Define objects that represent atomic units of work used by synchronization rules for managing parallel activity and resource sharing
- Define a common user model with people, places, resources, and processes

### *People and Place Objects*

User objects exist in all multi-user systems to identify people and determine access to resources. Information describing the system environment of a User, e.g., state, resources, places, and processes can be found from this object. Properties, such as preferences, may also be established by specialization.

Places are represented by Workspace objects. Workspace objects are populated and configured, by Users, with Resources which may be contained in more than one Workspace. Access to objects in a Workspace is independent of access to the Workspace, i.e., Resources determine access, not their Workspace containers. They may represent private or shared places for projects, departments, enterprises, and other environments.

Common representations of these objects enable interoperation within collaborative processes between different enterprise, workflow, and domain applications. When used with common process and resource objects, they establish a collaboration model that can be recognized by all objects and applications in a process.

### *Resource and Process Objects*

Process objects, represented as Tasks in this specification, describe User units of work that bind a User to selected data and process resources. Viewed in terms of model-view-controller, Tasks are the controller with commands and selections. A Task defines *what* instances to process and *how* to process (workflow, tool, or other executable). A Task may represent:

- a simple request such as "edit a file" where *what* is file x and *how* is editor y
- a more abstract request where *what* is collection j of files and *how* is workflow k (which may contain a hierarchy of workflows)

Tasks that describe simple requests are very similar to objects found in all systems - commands. Task extends and generalizes the notion of command objects to include abstract selections which facilitate dynamic binding of data and process resources.

Task objects represent information that is typically not presented at user interfaces.

Simple requests, e.g., "edit a file", create a Task but what is exposed at the user interface is likely to be the editor, not a presentation of the Task object. Similarly Tasks using workflows may, or may not, be presented as hooks to workflow viewer and worklist handler user interfaces.

Task objects represent the decomposition of work, within projects, organizations, and by people, to atomic units (individual work items) that are independent of, and isolated from, each other. Dependencies between Task objects can be handled, as in the real world, by waiting, polling, and requesting. Task objects may only be executed by their assigned (by resource utilization mechanisms), authenticated User, not by another User. If a process has a Task dependency it must either wait for this dependency to be met or define rules for satisfying the dependency through alternative paths. Task objects provide an abstraction of work consistent with how people and projects define and manage their work. This includes the reality that collaboration between people requires recognition of their independence and separateness in time and space.

A Task is associated with one, and only one, User. Tasks may, however, depend on other Tasks. Dependent and independent Tasks have general differences, as described below, but are represented in the same way.

Independent Tasks:

- are typically created by direct User requests such as "edit a file" or "print a document", as unplanned units of work
- can be created by other Users
- do not depend on other Tasks, however when workflows are used this may not be known until runtime

Dependent Tasks:

- are typically created by workflow and project management tools or scheduled by event handlers, as planned units of work
- contain rules for sequencing, synchronization, and event handling
- use concurrency mechanisms, configurations, and versions

Unplanned Tasks typically bind a tool, rather than a workflow process resource, to a specific data resource. Using the "edit a file" example the Task object created will bind the requester (User), to the edit tool selected (process resource), and to the file selected (data resource). It is also possible that the request to "edit a file" included the selection of an edit workflow, rather than an edit tool, and a collection of files, rather than a single file. This, however, is just another Task with more abstract selections – the process Resource is the selected workflow (which may itself invoke a sequence of tools and other workflows), and the data Resource is the selected collection of files (which will be selected by the User and/or workflow when the Task executes).

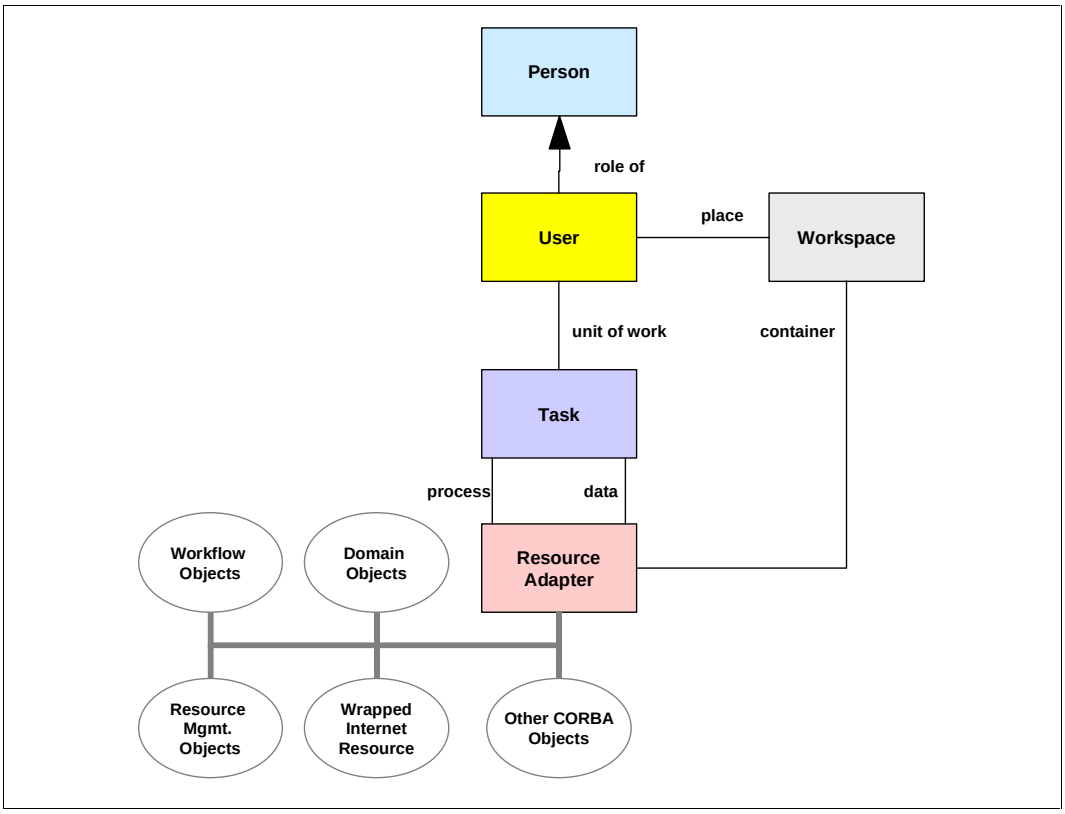



*Figure 1-2 Task and Session with Resource Objects*

Planned Tasks may contain dependencies on other Users, with other skills. They are usually controlled by workflows and operate on data resource contexts with types and versions used by process rules for selection of instances at runtime.

Tasks, planned and unplanned, are scalable atomic units of work that:

- capture user requests and assigned work
- can be executed by workflows or tools
- specify information instances to process and interpret
- can have abstract selections that dynamically bind process and data
- utilize resources selected by resource assignment mechanisms
- contain history for enabling recovery and analysis of cost and performance

- model units of work in terms of people and resources to enable collaboration

Resource is implemented with adapters that wrap distributed, loosely coupled, concrete resources. Adapted resources are CORBA components which include dynamically wrapped internet resources, workflows, resource managers, and domain objects.

Resources are collected in Workspaces and used to represent:

- process resources such as workflows and applications
- data resources which include files, pages, domain, and other CORBA objects.

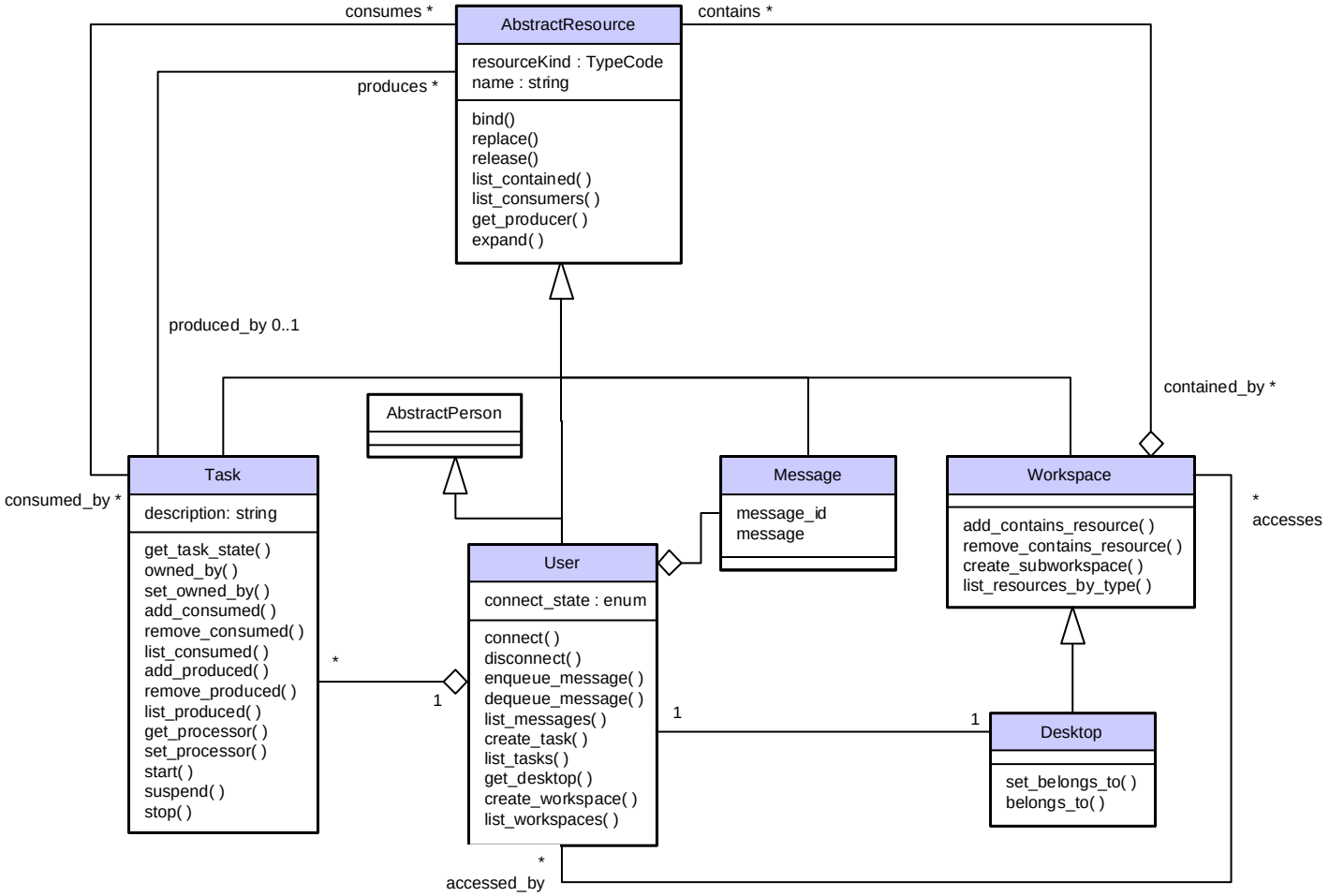
Resource implementations are responsible for maintaining the integrity and consistency of the User computing environment. This includes referential integrity between resources, change notification, and recovery mechanisms.

Resources are like "bookmarks" in browsers that provide:

- links to independent resource objects with managed loose coupling
- role based links to units of work (Tasks)
- resource sharing via CORBA security and concurrency mechanisms
- typed resources that use interoperation capabilities provided by CORBA

# 2 Specification

This specification defines cooperative components that form a framework representing the basic model for users of distributed systems.




## 2.1 IdentifiableDomainObject

**IdentifiableDomainObject** is an abstract base type for **BaseBusinessObject** through which object identity may be managed across independently managed domain. The attribute **domain** qualifies the name space associated with the object identity provided under the **IdentifiableObject** interface. The **AuthorityId** type is a **struct** containing the declaration of a naming authority (ISO, DNS, IDL, OTHER, DCE), and a string defining the naming entity. The **same_domain** operation is a convenience operation to compare two **IdentifiableDomainObject** object instances for domain equivalence.

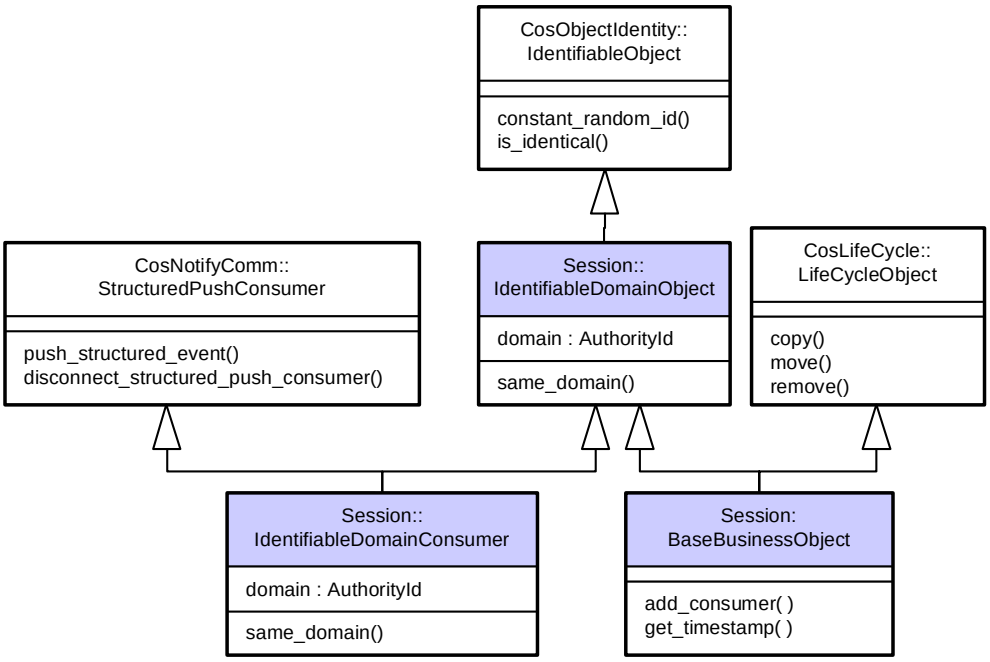
### *IDL Specification*

```
interface IdentifiableDomainObject :
        CosObjectIdentity::IdentifiableObject
        {
        readonly attribute NamingAuthority::AuthorityId domain;
        boolean same_domain(
                in IdentifiableDomainObject other_object
        );
```

**};**

## 2.2 BaseBusinessObject

**BaseBusinessObject** is the abstract base class for all principal Task and Session objects. It has identity, is transactional, has a lifecycle, and is a notification supplier.




The **CosNotification** service defines a **StructuredEvent** that provide a framework for the naming of an event and the association of specific properties to that event. All events specified within this facility conform to the **StructuredEvent** interface. This specification requires specific event types to provide the following properties as a part of the **filterable_data** of the structured event header. Under the **CosNotification** specification all events are associated with a unique domain name space. This specification establishes the domain namespace "**org.omg.session**" for structured events associated with **AbstractResource** and its sub-types.

### *Association of an Event Consumer*

**IdentifiableDomainConsumer** defines a **StructuredPushConsumer** callback object that can be passed to an implementation of **BaseBusienssObject** under the **add_consumer** operation. An implementation of this operation is required to establish the association of the consumer with an instance of **StructuredPushSupplier** before returning the supplier to the invoking client.

### *Accessing Creation, Modification and Last Event timestamps.*

The operations, **creation**, **modification**, and **access** return a **Timestamp** value. The **creation** operation returns the date and time of the creation. The **modification** operation returns the last modification date and time (where modification refers to a modification of the state of a concrete derived type). The **access** operation returns the date and time a derived type was accessed.

## 2.3 Data Types

These type definitions specify user, task, message, resource, and workspace sequences.

### *IDL Specification*

```
typedef sequence<Session::User>Users;
typedef sequence<Session::Workspace>Workspaces;
```

```
typedef sequence<Session::Task>Tasks;
typedef sequence<Session::AbstractResource>AbstractResources;
typedef sequence<Session::Message>Messages;
typedef sequence<Session::Link>Links;
```

## 2.4 Iterators

The interfaces defined below specify iterators used for the user, task, workspace, resource, and message sequences.

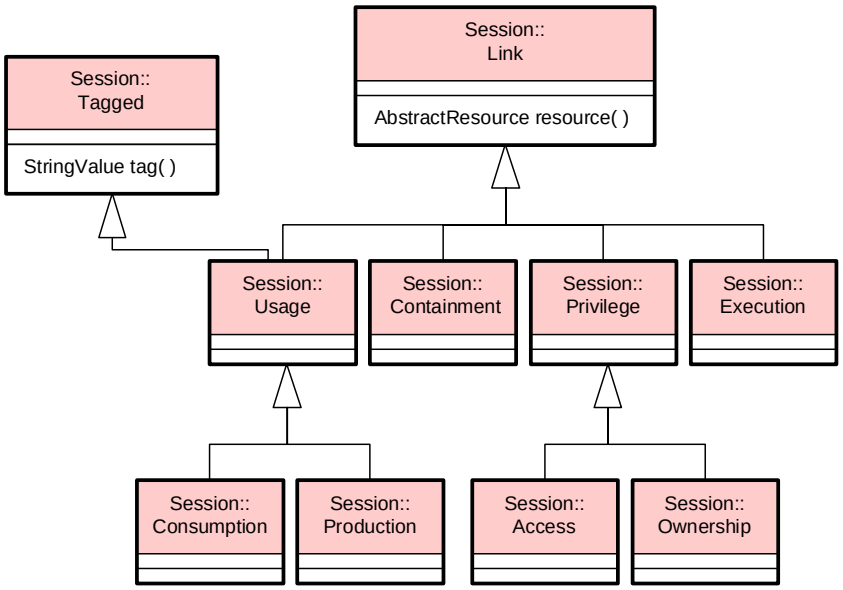
```
interface UserIterator : CosCollection :: Iterator { };
interface WorkspaceIterator : CosCollection :: Iterator { };
interface TaskIterator : CosCollection :: Iterator { };
interface AbstractResourceIterator : CosCollection :: Iterator { };
interface MessageIterator : CosCollection :: Iterator { };
interface LinkIterator : CosCollection :: Iterator { };
```

The core Task and Session interfaces are:

- **AbstractPerson**, defines information about people. In this model it is a placeholder for party and organization models.
- **User,** defines people as distributed computing users with messages and state as well as workspace, task, and resource associations.
- **Message**, defines basic interface for sending asynchronous messages to Users
- **Desktop**, links Users to Workspaces.
- **Workspace**, defines private and shared places for Resources and Tasks.
- **Task**, defines and manages of User units of work.
- **AbstractResource**, links resource objects to Task and Workspace objects.
- **Link**, defines a resource dependency.

## 2.5 Links

The **Link** type is ~~a struct~~ used within the Task and Session framework as an argument to operations that establish relationship dependencies between resources such as usage and containment. The **Link** type is used as an argument to the **bind**, **replace** and **release** operations of an **AbstractResource** and as a type exposed under the **expand** operation.




*Abstract Link definitions (link families)*

*IDL Specification*

```
abstract valuetype Link {
        AbstractResource resource( );
};

abstract interface Tagged {
        CORBA::StringValue tag( );
};

abstract valuetype Containment : Link{ };
abstract valuetype Privilege  : Link{ };
abstract valuetype Access : Privilege { };
abstract valuetype Ownership : Privilege { };
abstract valuetype Usage : Link supports Tagged { };
abstract valuetype Consumption : Usage{ };
abstract valuetype Production : Usage{ };
abstract valuetype Execution : Link{ };

valuetype Consumes : Consumption {
        public AbstractResource resource;
        public CORBA::StringValue tag;
};
valuetype ConsumedBy : Consumption {
        public Task task;
        public CORBA::StringValue tag;
};

valuetype Produces : Production  {
        public AbstractResource resource;
        public CORBA::StringValue tag;
};
valuetype ProducedBy : Production {
```

```
        public Task task;
        public CORBA::StringValue tag;
};

valuetype Collects : Containment {
        public AbstractResource resource;
};
valuetype CollectedBy : Containment {
        public Workspace resource;
};

valuetype ComposedOf : Collects { };
valuetype IsPartOf : CollectedBy { };

valuetype Accesses : Access {
        public Workspace resource;
};
valuetype AccessedBy  : Access {
        public User resource;
};

valuetype Administers : Accesses { };
valuetype AdministeredBy : AccessedBy { };

valuetype Owns : Ownership {
        public Task resource;
};

valuetype OwnedBy : Ownership {
        public User resource;
};
```

### *Link*

Link represents an abstract association of one resource towards another. Link contains a single operation named **resource** that returns a reference to an AbstractResource. Link serves as an abstract base to a series of other abstract relationship families – Containment, Privilege, Containment, Usage and Execution. Unless otherwise stated, a link represents a weak aggregation relationship.

```
abstract valuetype Link {
        AbstractResource resource( );
};
```

### *Containment*

Containment is an abstract Link that represents the set of concrete Link definitions dealing with a **Collects** of AbstractResource by a Workspace, ad the inverse notion of a AbstractResource being **CollectedBy** a Workspace. An instance of Workspace maintains a set of n **Collects** link instances, each holding a reference to exactly one collected AbstractResource. For every instance of Collects, there is an opposite **CollectedBy** Link instance maintained by an AbstractResource that references the collecting Workspace. A specialization of both Collects and CollectedBy is defined to represent a Workspace containing an AbstractResource, where an implementation wishes to express strong aggregation from the containing Workspace to the contained AbstractResource. This is defined under the **ComposedOf** and **IsPartOf** links where ComposedOf is a type of Collects and IsPartOf is a type of CollectedBy.

```
abstract valuetype Containment : Link{ };

valuetype Collects : Containment {
        public AbstractResource resource;
};
valuetype CollectedBy : Containment {
        public Workspace resource;
};

valuetype ComposedOf : Collects { };
valuetype IsPartOf : CollectedBy { };
```

*Collects State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | AbstractResource | public | A weak reference to a single AbstractResource contained by a Workspace managing this Link instance. In the case of the derived ComposedOf link, the relationship is one of strong aggregation. |

*CollectedBy State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | Workspace | public | A weak reference to a single Workspace that contains the AbstractResource managing by this link instance. In the case of the derived CollectedBy link, the Workspace is a Workspace that strongly aggregates the AbstractResource that holds the Link. |

## *Privilege*

**Privilege** is a type of abstract link, representing a family of abstract relationships dealing with **Access** and **Ownership**. Access is an abstract Link that serves as the abstract base type for **Accesses** and **AccessedBy**. Accesses is a Link held by a User that reference a Workspace – similar to a bookmark. AccessedBy is a Link held by a Workspace referencing a User that has attached a bookmark to it. The specialisation of Accesses and AccessedBy named **Administers** and **AdministeredBy** provide a qualification of the access relationship whereby external clients can establish the identity of an administrating user identity. **Ownership** is an abstract link used to reflect the bi-directional relationship between a User and a Task. Every Task is owned by exactly one user, reflected under the **OwnerBy** link. A User **Owns** between zero and may Tasks.

```
abstract valuetype Privilege  : Link{ };
abstract valuetype Access : Privilege { };
abstract valuetype Ownership : Privilege { };

valuetype Accesses : Access {
        public Workspace resource;
};
valuetype AccessedBy  : Access {
        public User resource;
};

valuetype Administers : Accesses { };
```

```
valuetype AdministeredBy : AccessedBy { };

valuetype Owns : Ownership {
        public Task resource;
};

valuetype OwnedBy : Ownership {
        public User resource;
};
```

*Accesses State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | Workspace | public | A weak reference to a single Workspace held by a User, representing a bookmark of a Workspace by a User. A specialization of Access named Administers qualifies the Workspace as a Workspace that the holding user has administrative responsibility for. |

*AccessedBy State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | User | public | A weak reference to a single User that is maintaining a bookmark reference to the Workspace holding this link, A specialization of AccessedBy named AdministeredBy qualifies the User as an administrator of the Workspace. |

*Owns State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | Task | public | A strong aggregation reference to a single Task held by a User, representing a user's unit of Work. |

*OwnedBy State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | User | public | A weak reference to a single User that is the owner of the Task holding this link. |

### *Usage*

Usage is abstract Link that captures the notions of the bi-directional relationships between a Task and the AbstractResource references that are associated through consumption and production relationships. Usage is an abstract base type for **Consumption** and **Production** that extends the notion of Link through the introduction of the tag operation. Any concrete valuetype supporting usage is required to expose a state field named **tag**. The tag value is equivalent to an argument name, facilitating the establishment of naming conventions on the resources consumed by and produced by a Task. Consumption is the abstract base for the Link valuetypes **Consumes** and **ConsumedBy**. Production is the abstract base for the Link valuetypes **Produces** and **ProducedBy**. Consumes is a Link held by a Task that references an AbstractResource it is consuming. The inverse of this association is the Link ConsumedBy, held by the consumed AbstractResource,

referencing the Task that is consuming it. Produces is a Link held by a Task that references an AbstractResource it is producing. The inverse of this association is the link ProducedBy, held by the produced AbstractResource, referencing the Task that is producing it.

```
abstract interface Tagged {
        CORBA::StringValue tag( );
};

abstract valuetype Usage : Link supports Tagged { };
abstract valuetype Consumption : Usage{ };
abstract valuetype Production : Usage{ };

valuetype Consumes : Consumption {
        public AbstractResource resource;
        public CORBA::StringValue tag;
};
valuetype ConsumedBy : Consumption {
        public Task task;
        public CORBA::StringValue tag;
};

valuetype Produces : Production  {
        public AbstractResource resource;
        public CORBA::StringValue tag;
};
valuetype ProducedBy : Production {
        public Task task;
        public CORBA::StringValue tag;
};
```

*Consumes State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | AbstractResource | public | A weak aggregation reference to a single AbstractResource consumed by the Task holding this link. |
| tag | StringValue | public | An application specific name attributed to the association. |

*ConsumedBy State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | Task | public | A weak reference to a single Task that is consuming the AbstractResource holding this link. |
| tag | StringValue | public | An application specific name attributed to the association. |

*Produces State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | AbstractResource | public | A weak aggregation reference to a single AbstractResource produced by the Task holding this link. |

| Name | Type | Properties | Purpose |
|---|---|---|---|
| tag | StringValue | public | An application specific name attributed to the association. |

*ProducedBy State Table*

| Name | Type | Properties | Purpose |
|---|---|---|---|
| resource | Task | public | A weak reference to a single Task that is producing the AbstractResource holding this link. |
| tag | StringValue | public | An application specific name attributed to the association. |

### *Execution*

The abstract link Execution is defined under the Session module. It represents the abstract family of relationships between a processor and Task. The definition of concrete associations between a Task and the processing source is implementation dependent.

```
abstract valuetype Execution : Link{ };
```

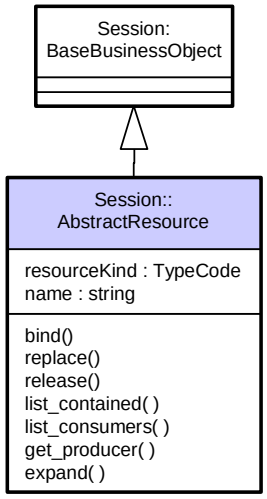
### *General Comments*

The Link type is a generalized utility that enables an AbstractResource, User, Task or Workspace to declare a dependency which is exposed directly under the expand operation on AbstractResource, and indirectly through related list operations.

The Link type is provided as a means through which the type and subject resource of a dependency may be declared by the resource raising the dependency to the target. Declaration of dependency between resources enables referential integrity between resources irrespective of technology or administrative domain boundaries. Declaration, modification and retraction of dependencies are achieved through invocation of the **bind**, **release** and **replace** operations on the AbstractResource type by a client resource.

## *2.6 AbstractResource*

An AbstractResource is a transactional and persistent CORBA objects contained in one or more Workspaces. They may be selected, consumed and produced by Tasks. AbstractResources are found and selected by tools and facilities that present lists of candidate resources. These lists may be filtered by things like security credentials, by type, and by implementation. CORBAservice Trading can be used to build resource candidate lists. Resources selected from the lists are then wrapped by the tool or facility as AbstractResources. Task and Workspace are dependent on the AbstractResources they use and contain. Implementations are required to notify Task and Workspace of changes and defer deletion requests until all linked Tasks signal their readiness to handle.




## *Structural Associations*

*LinkKind exposed by AbstractResource*

| LinkKind | Description | Cardinality | Reciprocal |
|---|---|---|---|
| consumed_by | The resource argument references the Task that this resource is consumed by. | * | consumes |
| processes | The resource argument references the Task that this resource is acting as a processor to. | * | processed_by |
| produced_by | The resource argument references the Task that this resource is produced by. | 0,1 | produces |
| contained_by | The resource argument references the Workspace that this resource is contained within. | * | contained |

## *Attributes*

| Name | Type | Purpose |
|---|---|---|
| name | string | Resource name. |
| resourceKind | CORBA::TypeCode | The most derived type that this resource represents. |

## *Structured Events*

*AbstractResource Filterable Data Properties*

| Name | Type | Description |
|---|---|---|
| timestamp | TimeBase::UtcT | Date and time of to which the event is issued. |
| source | AbstractResource | Abstract resource raising the event. |

*Life Cycle Structured Event Table*

| Event: | Description |
|---|---|
| move | Notification of the transfer (move) of a AbstractResource under which the |

| Event: | Description | | |
|---|---|---|---|
| | identity is changed. The source of the event supplies the old instance identity. | | |
| | *Supplementary properties:* | | |
| | new | AbstractResource | Reference containing the new object identity. |
| remove | Notification of the removal of an AbstractResource | | |

*Feature Event Table*

| Event: | Description | | |
|---|---|---|---|
| update | Notification of the change of a value of an attribute from value x to value y, where x represents the old value and y represents the new value. | | |
| | *Supplementary properties:* | | |
| | feature | string | Attribute name. |
| | old | any | Old value. |
| | new | any | New value. |
| bind | Notification of the addition of a link from a dependant resource to this resource. | | |
| | *Supplementary properties:* | | |
| | link | Link | The link defining the dependency. |
| replace | Notification of the replacement of a link under this resource. | | |
| | *Supplementary properties:* | | |
| | old | Link | The link being replaced. |
| | new | Link | The replacement Link. |
| release | Notification of the release of a dependency link from this resource. | | |
| | *Supplementary properties:* | | |
| | link | Link | The link being released. |

## *IDL Specification*

```
interface AbstractResource :
        BaseBusinessObject {
        attribute string name;
        readonly attribute TypeCode resourceKind;
        exception ResourceUnavailable{ };
        exception ProcessorConflict{ };
        exception SemanticConflict{ };
        void bind(
                in Link link
        ) raises (
                ResourceUnavailable,
                ProcessorConflict,
                SemanticConflict
        );
        void replace(
                in Link old,
                in Link new
        ) raises (
                ResourceUnavailable,
```

```
            ProcessorConflict,
            SemanticConflict
        );
        void release(
            in Link link
        );
        void list_contained (
            in long max_number,
            out Session::Workspaces workspaces,
            out WorkspaceIterator wsit
        );
        void list_consumers (
            in long max_number,
            out Tasks tasks,
            out TaskIterator taskit
        );
        Task get_producer(
        );

        short count(
            in CORBA::TypeCode type
        );

        LinkIterator expand (
            in CORBA::TypeCode type,
            in long max_number,
            out Links seq
        );
};
```

*Declaration of Dependencies*

The bind, replace and release operations enable a client to declare a dependency on an AbstractResource. When a Task, User or Workspace establishes a usage of containment dependency on an AbstractResource, it is required to invoke the bind operation. When dependencies are changed, such as the modification of the owner of a Task or the replacement of a resource within a workspaces, an implementation is required to invoke the replace operation. When a relationship is retracted, as a result of the completion of a task, an implementation is required to invoke the **release** operation on resources to which it has established a dependency.

```
        void bind(
            in Link link
        ) raises (
            ResourceUnavailable,
            ProcessorConflict,
            SemanticConflict
        );
        void replace(
            in Link old,
            in Link new
        ) raises (
            ResourceUnavailable,
            ProcessorConflict,
            SemanticConflict
        );
        void release(
            in Link link
        );
```

Exceptions raised under the bind and replace operations include **ResourceUnavailable**, **ProducerConflict** and **SemanticConflict**. The **ResourceUnavailable** and **ProducerConflict** exception may be raised by an implementation to indicate that the resource that is the target of a bind or replace operation is unable to fulfill the request. **ResourceUnavailable** may be raised as a result of a concurrency control conflict. The **ProducerConflict** exception may be raises in a situation where the producer resource is unable to support the association (for example, as a result of a processing capacity limit). A **SemanticConflict** exception may be raised if an attempt is made to violate the cardinality or type rules concerning the link kind referenced under the Link argument.

### *Workspaces*

This operation returns a list of Workspaces containing this resource.

```
void list_contained (
        in long max_number,
        out Session::Workspaces workspaces,
        out WorkspaceIterator wsit
);
```

### *Task Consumers*

This operation returns a list of Tasks using or consuming this resource.

```
void list_consumers (
        in long max_number,
        out Tasks tasks,
        out TaskIterator taskit
);
```

### *Task Producer*

This operation returns the Task that produced this resource.

```
Task get_producer( );
```

### *Get Resource Tree by Link Kind*

This operation asks an AbstractResource to return a set of resources linked to it by a specific relationship. Objects returned are, or are created as, AbstractResources. This operation may be used by desktop managers to present object relationship graphs.

```
LinkIterator expand (
        in CORBA::TypeCode type,
        in long max_number,
        out Links seq
);
```

*Expand Argument list.*

| Argument | Description |
|---|---|
| type | The CORBA::TypeCode referencing a type derived from Link, passed under the type argument qualifies the link selection constraint relative to its most derived type. Any link that is derived from the type identified by the **type** argument is a candidate to include in the returned set of links. |

| Argument | Description |
|---|---|
| max_number | The maximum number of elements to be included in the seq of exposed Link instances. |
| seq | A sequence of Link instances. |
| iterator | An iterator of Link instances. |

### *Count Operation*

This operation returns the number of Links held by an AbstractResource corresponding to a given TypeCode filter criteria. Filter criteria is based on the same filtering model as applied under the expand operation.

```
short count(
        in CORBA::TypeCode type
);
```

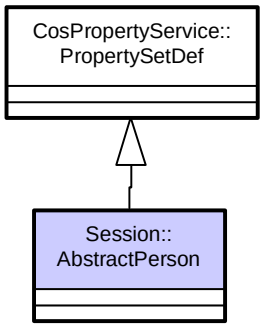
## 2.7 AbstractPerson

The **AbstractPerson** interface is a placeholder for organization and other models that define information about people. When **AbstractPerson** uses an organization model it obtains information about Users (role_of AbstractPerson) is including things like roles and membership within projects and organizations.

**AbstractPerson** inherits from the interface **CosPropertyService::PropertySetDef**, providing mechanisms through which implementations may attribute features to a person such as a name, address information, or history.

### *IDL Specification*

```
interface AbstractPerson :
        CosPropertyService::PropertySetDef {
};
```




### *Structured Events*

*AbstractPerson Structure Event Table*

| Event: | Description |
|---|---|
| property | Notification of the change in the value of a property |

| Event: | Description | | |
|---|---|---|---|
| | *Supplementary properties:* | | |
| | old | Property | The old value of the property, possibly null in the case of a new property addition. |
| | new | Property | The value of the property, possibly null in the case of property deletion. |

## 2.8 User

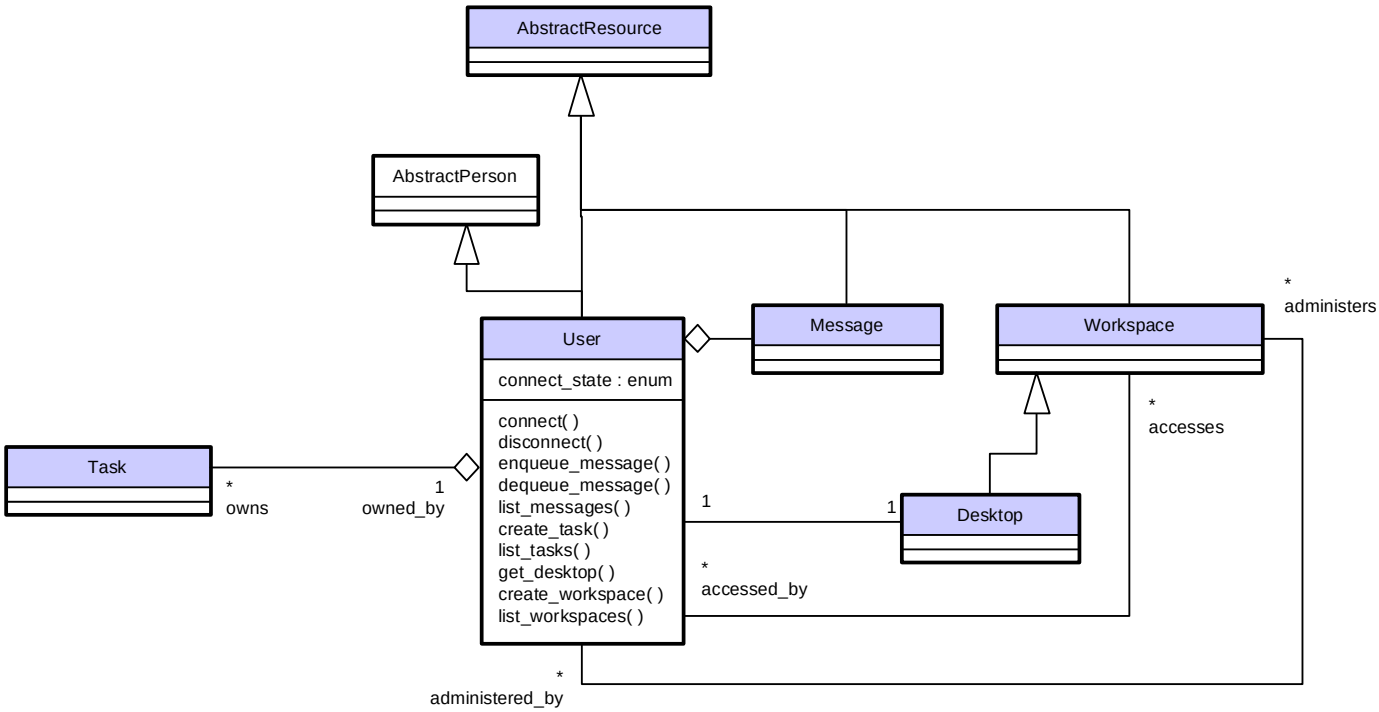
User is a role of a person in a distributed computing environment. Information about the person is inherited by User. In this specification Users have tasks and resources located in workspaces on a desktop, as well as a message queue and a connection state.

A specialization of User can add things like preferences.

### *IDL Specification*

```
enum connect_state {connected, disconnected};
exception AlreadyConnected {};
exception NotConnected {};

interface User  :
        AbstractResource,
        AbstractPerson,
        CosLifeCycle::FactoryFinder
        {
        readonly attribute connect_state connectstate;
        void connect()
                raises (AlreadyConnected);
        void disconnect()
                raises (NotConnected);
        void enqueue_message (
                in Message new_message);
        void dequeue_message (
                in Message message);
        void list_messages(
                in long max_number,
                out Messages messages,
                out MessageIterator messageit);
        Task create_task (
                in string name,
                in AbstractResource process,
                in AbstractResource data);
        void list_tasks (
                in long max_number,
                out Tasks tasks,
                out TaskIterator taskit
        );
        Desktop get_desktop ( );
        Workspace create_workspace (
                in string name,
                in Users accesslist
        );
        void list_workspaces (
                in long max_number,
                out Session::Workspaces workspaces,
```

```
        out WorkspaceIterator wsit
    );

};
```




## *Structural Features*

*LinkKind exposed by User*

| LinkKind | Description | Cardinality | Reciprocal |
|---|---|---|---|
| owns | The resource argument references a Task owned by this User. | * | owned_by |
| accesses | References a Workspace that this User is authorized to access | * | accessed_by |
| administers | References a Workspace that this User is authorized to administer, granting the user the right to modify access lists. | * | administered_by |

*Supplementary associations*

| Feature | Type | Description |
|---|---|---|
| desktop | Desktop | Link to resources and task in a distributed workspaces. |
| messages | MessageIterator | Receives asynchronous messages for this user. |

### *Attributes*

| Name | Type | Purpose |
|---|---|---|
| connectstate | connect_state | Declaration of the connected state of a physical user to the system, may be one of the enumerated values **connected** or **disconnected**. |

### *Structured Events*

*User Structure Event Table*

| Event: | Description | | |
|---|---|---|---|
| connected | Notification of the change of the connected state of a User. | | |
| | *Supplementary properties:* | | |
| | value | boolean | True indicated that the user is connected, false indicates that the user is disconnected. |

### *Connection State*

This represents the basic current state of a User connection (logically at, or not at, the desktop). Asynchronous processes and events are managed in the disconnected state within the limitations this state imposes. When the User reconnects informational messages and actions required, if any, are presented.

Information which people expect to be retained between connections is persistent. The currency of this information must be sufficient to provide consistency over synchronous and asynchronous (including abrupt system failure) terminations.

```
enum connect_state {
        connected,
        disconnected
};

readonly attribute connect_state connectstate;
```

*conect_state Enumeration Table*

| Value | Purpose |
|---|---|
| connected | The User is connected (logged in) to the system. |
| disconnected | The User is not connected to the system (logged off). |

### *Connect Operations*

Connect establishes the User session for clients, such as desktop managers to present Workspaces and the computing environment. Successful completion of this operation will result in the session state being changed to connected. Clients of disconnect interact with the User and the computing environment to close the session. When complete the session state is set to not connected.

```
void connect(
) raises (
        AlreadyConnected
);
```

```
void disconnect(
) raises (
        NotConnected
);
```

### *Message Queue*

These operations are used to enqueue, dequeue, and get a list of messages.

```
void enqueue_message (
        in Message new_message
);

void dequeue_message (
        in Message message
);

void list_messages(
        in long max_number,
        out Messages messages,
        out MessageIterator messageit
);
```

Message factory location is achieved through invocation of the **find_factories** operation (inherited from the CosLifeCycle::FactoryFinder interface), and passing the CosNaming::Name sequence of "Factory" and "MessageFactory" as the **factory_key** argument. Client applications may choose to create a message within or external to the domain of the User to whom a message is enqueued.

*Note: It is a recommendation of the Task and Session 1.1 RTF that the Message reviewed in the context of pass-by-value services.*

### *User Tasks and Tasklist*

These operations are used to create and list Tasks. Task creation includes the initial specification of "who", "what", and "how" for the Task. The User instance of this interface is "who", the "what" is the AbstractResource data to update or produce, and the "how" is the AbstractResource process (workflow, tool, etc.) used.

```
Task create_task (
        in string name,
        in AbstractResource process,
        in AbstractResource data
);

void list_tasks (
        in long max_number,
        out Tasks tasks,
        out TaskIterator taskit
);
```

### *Desktop Operations*

This operation returns the Desktop that links one User to many Workspaces. Workspaces may have many Users linked via Desktop.

```
Desktop get_desktop ( );
```

### *Workspace Operations*

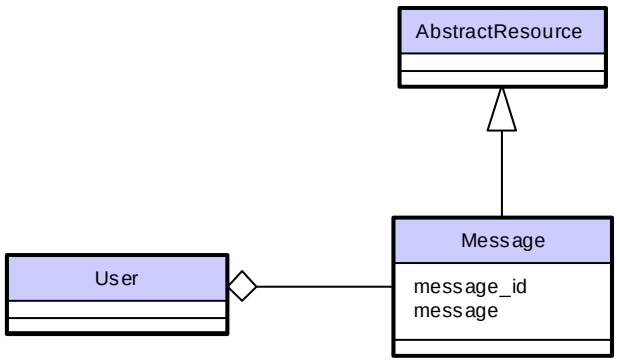
Users may create and find their Workspaces with these operations. As Workspace may be shared implementations must set access control lists to the Users sequence specified with the create operation.

```
Workspace create_workspace (
        in string name,
        in Users accesslist
);

void list_workspaces (
        out Workspaces workspaces,
        out WorkspaceIterator wsit
);
```

## 2.9 Message

This interface defines the basic structure for messages that are enqueued to Users and dequeued for presentation by a desktop manager or used, as needed, by other clients. It is expected that Message will be specialized by implementations and user message definition standards. Typical messages include asynchronous completion, notification of Workspace content changes, and communications from other people.

Message factory location is achieved through invocation of the **find_factories** operation (inherited from the CosLifeCycle::FactoryFinder interface), and passing the CosNaming::Name sequence of "Factory" and "MessageFactory" as the **factory_key** argument. Client applications may choose to create a message within or external to the domain of the User to whom a message is enqueued.




### *Attributes*

| Name | Type | Purpose |
|---|---|---|
| message_id | any | Message name. |
| message | any | Message description. |

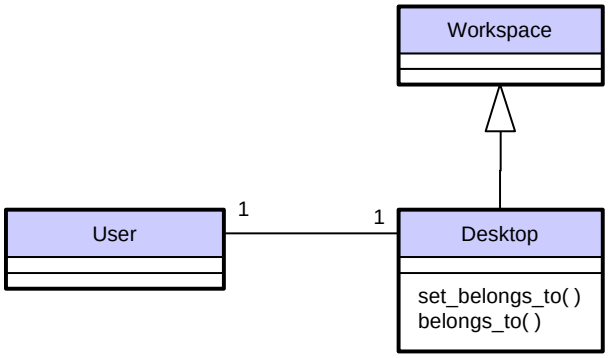
### *IDL Specification*

```
interface Message : AbstractResource {
        attribute any message_id;
```

```
        attribute any message;
};

interface MessageFactory {
        Message create(
                in any message_id,
                in any message
        );
};
```

## 2.10 Desktop

The Desktop interface links Users to many Workspaces and Workspaces to many Users. Each User has one Desktop and many Workspaces. Workspaces may be shared so they may have many Users.




### *Structural Features*

| Keyword | Type | Description |
|---|---|---|
| owner | User | Identify desktop owner. |

### *IDL Specification*

```
interface Desktop:Workspace {
        void set_belongs_to(
                in Session::User user
        );
        User belongs_to();
};
```

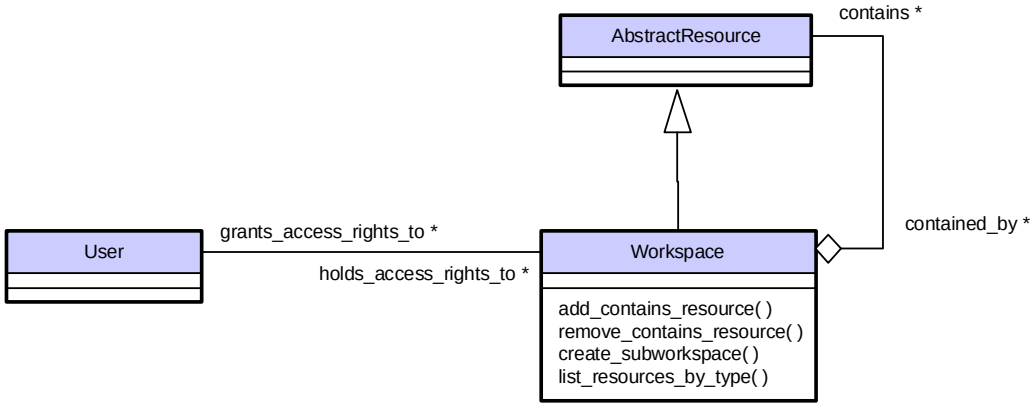
### *Ownership*

These operations set and return the User that is the owner of this Desktop.

```
        void set_belongs_to(
                in Session::User user
        );
        User belongs_to();
```

## 2.11 Workspace

Workspace defines private and shared places where resources, including Task and Session objects, may be contained. Workspaces may contain Workspaces. The support for sharing and synchronizing the use of objects available in Workspaces is provided by the objects and their managers. Each Workspace may contain any collection of private and shared objects that the objects and their managers provide access to, and control use of.




### *IDL Specification*

```
interface Workspace :
        AbstractResource,
        CosLifeCycle::FactoryFinder
        {
        void add_contains_resource(
                in AbstractResource resource
        );
        void remove_contains_resource(
                in AbstractResource resource
        );
        Workspace create_subworkspace (
                in string name,
                in Users accesslist
        );
        void list_resources_by_type(
                in TypeCode resourcetype,
                in long max_number,
                out AbstractResources resources,
                out AbstractResourceIterator resourceit
        );
};
```

### *Container Operations*

These operations will add and remove AbstractResources to/from a Workspace. They will also create a new Workspace contained in this Workspace.

An implementation of **add_contains_resource** must invoke the **bind** operation on the target resource with the link kind of **contains** and the issuing Task as the resource. An implementation of **remove_contains_resource** must invoke the **release** operation on the target resource with the link kind of **contains** and the issuing Task as the resource. An implementation of **create_subworkspace** must invoke the **bind** operation on newly created workspace using the **contains** link kind and the parent workspace as the resource argument.

```
void add_contains_resource(
        in AbstractResource resource
);
void remove_contains_resource(
        in AbstractResource resource
);

Workspace create_subworkspace (
        in string name,
        in Users accesslist
);
```

*List Resources*

The list resources operation will return a list of all Workspace resources by type. This facilitates organization of resource types by user interfaces and use by task creation, workflow, and other functions requiring specified types.

```
void list_resources_by_type(
        in TypeCode resourcetype,
        in long max_number,
        out AbstractResources resources,
        out AbstractResourceIterator resourceit
);
```

*Administration*

On creation of a new workspace (through either the **create_workspace** or **create_subworkspace** operations), the principal User creating the new instance is implicitly associated with the workspace as administrator. As administrator, the User holds rights enabling the modification of the access control list through bind, replace and release operations.

## 2.12 Task

A Task represents a unit of work defined by users. It represents the binding (which can be dynamic) between the data to be processed, the method for processing, and the User responsible. The duration of a Task can range from a short, single, non-repeatable process step to long process steps that can be repeated many times. A Task can be completed with the execution of a single tool, or the execution of a flow. Tasks may be suspended to the extent that the tool or flow used to execute them can be suspended. Tasks can serve as the repository of execution history information.

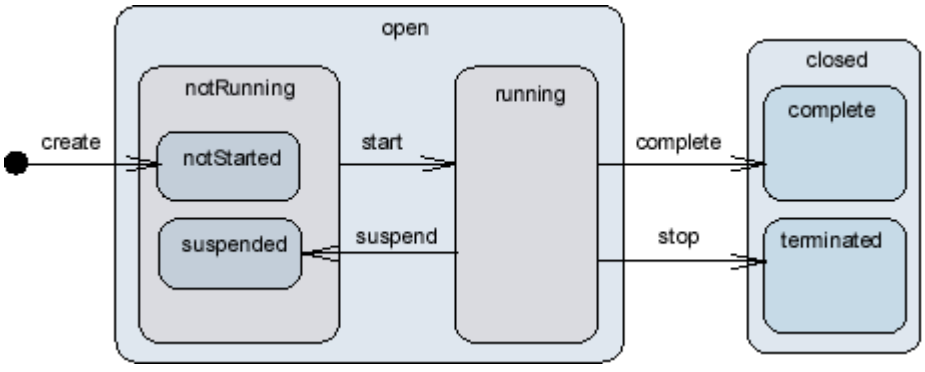
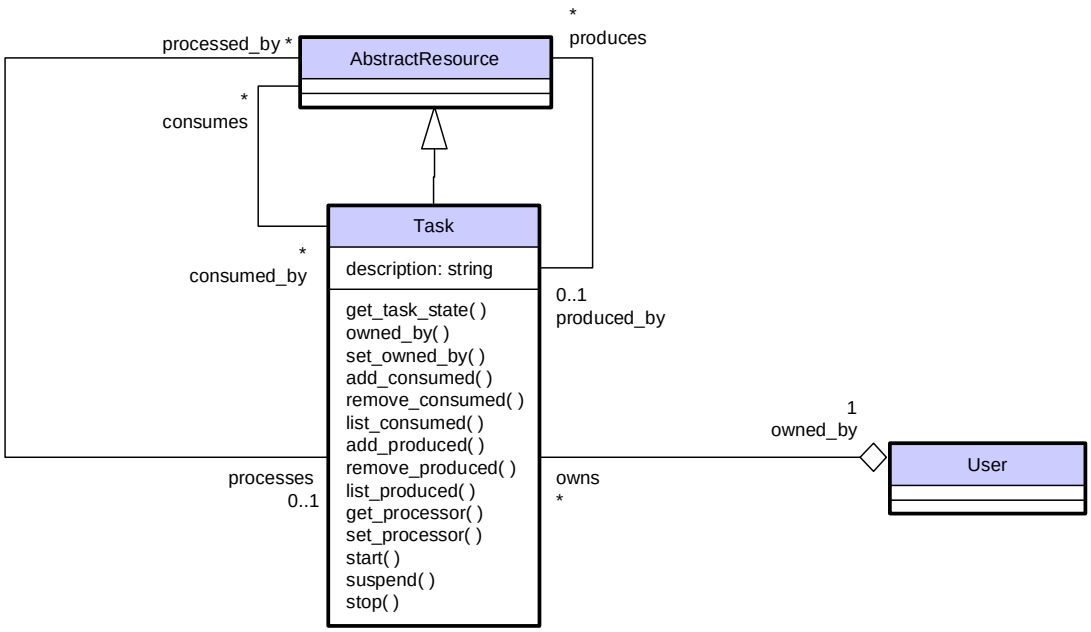



*Figure 2-2 Task State Diagram*

The task state is determined by the state of its execution and the state of the data content being processed. The task state and data state are related but independent. The data state contains information about the application or system object. The task state contains information about the task. For example, when a fault simulator completes execution it is not necessarily true that the fault simulation task has completed – the completeness depends on the value of the fault coverage. The value of the fault coverage is based on the data, what has been called the "data state". The execution of the fault simulator is independent of the results of the execution. Also the fault coverage may be changed, independent of the fault simulator, if the parameters of the design are changed.




*IDL Specification*

```
exception CannotStart {};
exception AlreadyRunning {};
exception CannotSuspend {};
exception CurrentlySuspended {};
exception CannotStop {};
exception NotRunning {};

enum task_state {
        open, not_running, notstarted, running,
        suspended, terminated, completed, closed
};

interface Task : AbstractResource {
        attribute string description;
        task_state get_task_state();
        User owned_by();
        void set_owned_by (
                in User new_task_owner
        );
        void add_consumed(
                in AbstractResource resource
        );
        void remove_consumed(
                in AbstractResource resource
        );
```

```
        void list_consumed (
                in long max_number,
                out AbstractResources resources,
                out AbstractResourceIterator resourceit
        );
        void add_produced(
                in AbstractResource resource);
        void remove_produced(
                in AbstractResource resource
        );
        void list_produced (
                in long max_number,
                out AbstractResources resources,
                out AbstractResourceIterator resourceit
        );
        void set_processor(
                in AbstractResource processor
        ) raises (
                ProcessorConflict
        );
        AbstractResource get_processor( );
        void start ( ) raises (CannotStart, AlreadyRunning);
        void suspend ( ) raises (CannotSuspend, CurrentlySuspended);
        void stop ( ) raises (CannotStop, NotRunning);
};
```

### *Attributes*

| Name | Type | Purpose |
|---|---|---|
| description | string | Task description. |

*Task Structured Event Table*

| Event: | Description | | |
|---|---|---|---|
| process_state | Notification of the change of state of a **Task**. | | |
| | *Supplementary properties:* | | |
| | value | task_state | Task state enumeration. |
| ownership | Notification of the change of ownership of a **Task**. | | |
| | *Supplementary properties:* | | |
| | owner | User | **User** assigned as owner of the **Task**. |

### *Task Description*

This attribute can describe the Task.

```
attribute string description;
```

### *Task State*

States are defined, as in Figure 2-2 on page 24, and the get_task_state operation returns the current Task state, as calculated by the implementation.

*task_state Enumeration Table*

| Value | Description |
|---|---|
| open | Task is not finished and active. |
| closed | Task is finished and inactive. |
| not_running | Task is active and quiescent, but ready to execute. |
| running | Task is active and executing. |
| notstarted | Task is active and ready to be initialized and started. |
| suspended | Task is active, has been started and suspended. |
| completed | Task is finished and completed normally. |
| terminated | Task finished and stopped before normal completion. |

```
enum task_state {
        open,
        not_running,
        notstarted,
        running,
        suspended,
        terminated,
        completed,
        closed
};

task_state get_task_state(
);
```

### *Task Owner*

These operations will return the User that owns the Task and reassign a Task to another User. Task reassignment is a process that requires an agreed protocol for one User to transfer a Task to another User. Authority to reassign belongs to the User or authorized agents and managers, such as workflow and project management systems.

```
User owned_by(
);
void set_owned_by (
        in User new_task_owner
);
```

### *Resource Usage*

These operations add, remove, and list execution and information resources consumed by the Task.

An implementation of **add_consumed** must invoke the **bind** operation on the target resource with the link kind of **consumes** and the issuing Task as the resource. An implementation of **remove_consumes** must invoke the **release** operation on the target resource with the link kind of **consumes** and the issuing Task as the resource.

```
void add_consumed(
        in AbstractResource resource
);
```

```
void remove_consumed(
        in AbstractResource resource
);

void list_consumed (
        in long max_number,
        out AbstractResources resources,
        out AbstractResourceIterator resourceit
};
```

*Resource Production*

These operations create modify and list associations to resources produced by the Task.

An implementation of **add_produced** must invoke the **bind** operation on the target resource with the link kind of **produces** and the issuing Task as the resource. An implementation of **remove_produces** must invoke the **release** operation on the target resource with the link kind of **produces** and the issuing Task as the resource.

```
void add_produced(
        in AbstractResource resource);

void remove_produced( in AbstractResource resource );

void list_produced (
        in long max_number,
        out AbstractResources resources,
        out AbstractResourceIterator resourceit
);
```

*Task Execution*

These operations start/resume, stop, or suspend Tasks. Successful completion of start Task will set its state to Running. Completion of stop Task will set the state to Terminated. Successful completion of suspend Task will result in a Suspended state.

```
void start (
) raises (
        CannotStart,
        AlreadyRunning
);

void suspend (
 ) raises (
        CannotSuspend,
        CurrentlySuspended
);

void stop (
) raises (
        CannotStop,
        NotRunning
);
```

A Task is associated to an AbstractResource that acts as the processor for the Task. The protocol of interaction between a Task and its processing resource is implementation dependent. An example of a processor resource is an application editor, simulation, or workflow engine. .

The following operations set the AbstractResource acting in this capability.

```
void set_processor(
        in AbstractResource processor
) raises (
        ProcessorConflict
);
AbstractResource get_processor( );
```

The **set_processor** operation may raise the **ProcessorConflict** exception if the **AbstractResource** passed under the processor argument is unable or unwilling to provide processing services to the task.

An implementation of **set_process** must ensure that appropriate bind and release operations are invoked on the processor resources in order to ensure referential integrity. When a task is initially created, the implementation is responsible for invocation of the bind operation on the abstract resource that is serving as the processor, using the **processed_by** link kind. Subsequent invocations of **set_processor** are responsible for the releasing and re-establishing **processed_by** links on the old and new process resource using the **release** and **bind** operation on the respective process resources.

## 3 Summary of Optional versus Mandatory Interfaces

Task and Session objects define a model of systems that people interact with. For this model to be complete and consistent all interfaces in this specification are mandatory.

## 4 Proposed Compliance Points

There is only one proposed compliance point, the IDL specification in this specification.

## 5 Complete IDL

```
// Task and Session V2.0 Session.idl
// Version 2.0

#ifndef _SESSION_
#define _SESSION_

#include <CosLifeCycle.idl>
#include <CosObjectIdentity.idl>
#include <CosCollection.idl>
#include <NamingAuthority.idl>
#include <CosNotifyComm.idl>
#include <CosPropertyService.idl>
#include <TimeBase.idl>
#include <orb.idl>
#pragma prefix "omg.org"

module Session {

        #pragma version Session 2.0

        interface AbstractResource;
        interface Task;
        interface Workspace;
        interface AbstractPerson;
```

```
interface User;
interface Message;
interface Desktop;
valuetype Link;

// sequence defintions

typedef sequence<Session::AbstractResource>AbstractResources;
typedef sequence<Session::Task>Tasks;
typedef sequence<Session::Message>Messages;
typedef sequence<Session::User>Users;
typedef sequence<Session::Workspace>Workspaces;
typedef sequence<Session::Link>Links;

// iterator defintions

interface AbstractResourceIterator : CosCollection :: Iterator { };
interface TaskIterator : CosCollection :: Iterator { };
interface MessageIterator : CosCollection :: Iterator { };
interface WorkspaceIterator : CosCollection :: Iterator { };
interface UserIterator : CosCollection :: Iterator { };
interface LinkIterator : CosCollection :: Iterator { };

// Link types

abstract valuetype Link {
        AbstractResource resource( );
};

abstract valuetype Containment : Link{ };
abstract valuetype Privilege  : Link{ };
abstract valuetype Access : Privilege { };
abstract valuetype Ownership : Privilege { };
abstract valuetype Execution : Link{ };

abstract interface Tagged {
        CORBA::StringValue tag( );
};

abstract valuetype Usage : Link supports Tagged { };
abstract valuetype Consumption : Usage{ };
abstract valuetype Production : Usage{ };

// concrete link associations

valuetype Consumes : Consumption {
        public AbstractResource resource;
        public CORBA::StringValue tag;
};

valuetype ConsumedBy : Consumption {
        public Task task;
        public CORBA::StringValue tag;
};

valuetype Produces : Production  {
        public AbstractResource resource;
        public CORBA::StringValue tag;
};
```

```
valuetype ProducedBy : Production {
        public Task task;
        public CORBA::StringValue tag;
};

valuetype Collects : Containment {
        public AbstractResource resource;
};

valuetype CollectedBy : Containment {
        public Workspace resource;
};

valuetype ComposedOf : Collects { };
valuetype IsPartOf : CollectedBy { };

valuetype Accesses : Access {
        public Workspace resource;
};

valuetype AccessedBy  : Access {
        public User resource;
};

valuetype Administers : Accesses { };
valuetype AdministeredBy : AccessedBy { };

valuetype Owns : Ownership {
        public Task resource;
};

valuetype OwnedBy : Ownership {
        public User resource;
};

// interfaces

interface IdentifiableDomainObject :
        CosObjectIdentity::IdentifiableObject
        {
        readonly attribute NamingAuthority::AuthorityId domain;
        boolean same_domain(
                in IdentifiableDomainObject other_object
        );
};

interface IdentifiableDomainConsumer :
        Session::IdentifiableDomainObject,
        CosNotifyComm::StructuredPushConsumer
        {
};

valuetype Timestamp TimeBase::UtcT ;

interface BaseBusinessObject :
        IdentifiableDomainObject,
        CosLifeCycle::LifeCycleObject
        {
        CosNotifyComm::StructuredPushSupplier add_consumer(
```

```
                in IdentifiableDomainConsumer consumer
        );

        Timestamp creation( );
        Timestamp modification( );
        Timestamp access( );
};

exception ResourceUnavailable{ };
exception ProcessorConflict{ };
exception SemanticConflict{ };

interface AbstractResource :
        BaseBusinessObject {

        attribute string name;
        readonly attribute TypeCode resourceKind;

        void bind(
                in Link link
        ) raises (
                ResourceUnavailable,
                ProcessorConflict,
                SemanticConflict
        );

        void replace(
                in Link old,
                in Link new
        ) raises (
                ResourceUnavailable,
                ProcessorConflict,
                SemanticConflict
        );

        void release(
                in Link link
        );

        void list_contained (
                in long max_number,
                out Session::Workspaces workspaces,
                out WorkspaceIterator wsit
        );

        void list_consumers (
                in long max_number,
                out Tasks tasks,
                out TaskIterator taskit
        );

        Task get_producer( );

        short count(
                in CORBA::TypeCode type
        );

        LinkIterator expand (
                in CORBA::TypeCode type,
                in long max_number,
```

```
                out Links seq,
                out LinkIterator iterator
        );

};

interface AbstractPerson :
        CosPropertyService::PropertySetDef
        {
};

enum connect_state {
        connected,
        disconnected
};

exception AlreadyConnected {};
exception NotConnected {};

interface User  :
        AbstractResource,
        AbstractPerson,
        CosLifeCycle::FactoryFinder
        {

        readonly attribute connect_state connectstate;

        void connect(
        ) raises (
                AlreadyConnected
        );

        void disconnect(
        ) raises (
                NotConnected
        );

        void enqueue_message (
                in Message new_message
        );

        void dequeue_message (
                in Message message
        );

        void list_messages(
                in long max_number,
                out Messages messages,
                out MessageIterator messageit
        );

        Task create_task (
                in string name,
                in AbstractResource process,
                in AbstractResource data
        );

        void list_tasks (
                in long max_number,
                out Tasks tasks,
```

```
                out TaskIterator taskit
        );

        Desktop get_desktop ( );

        Workspace create_workspace (
                in string name,
                in Users accesslist
        );

        void list_workspaces (
                in long max_number,
                out Session::Workspaces workspaces,
                out WorkspaceIterator wsit
        );
};

interface Message : AbstractResource {
        attribute any message_id;
        attribute any message;
};

interface MessageFactory{
        Message create(
                in any message_id,
                in any message
        );
};

interface Workspace :
        AbstractResource,
        CosLifeCycle::FactoryFinder
        {
        void add_contains_resource(
                in AbstractResource resource
        );

        void remove_contains_resource(
                in AbstractResource resource
        );

        Workspace create_subworkspace (
                in string name,
                in Users accesslist
        );

        void list_resources_by_type(
                in TypeCode resourcetype,
                in long max_number,
                out AbstractResources resources,
                out AbstractResourceIterator resourceit
        );
};

interface Desktop:Workspace {

        void set_belongs_to(
                in User user
        );
```

```
        User belongs_to();
};

exception CannotStart {};
exception AlreadyRunning {};
exception CannotSuspend {};
exception CurrentlySuspended {};
exception CannotStop {};
exception NotRunning {};

enum task_state {
   open, not_running, notstarted, running,
   suspended, terminated, completed, closed
};

interface Task :
        AbstractResource
        {

        attribute string description;


        task_state get_state( );

        User owned_by();
        void set_owned_by (
                in User new_task_owner
        );

        void add_consumed(
                in AbstractResource resource,
                in string tag
        );
        void remove_consumed(
                in AbstractResource resource
        );
        void list_consumed (
                in long max_number,
                out AbstractResources resources,
                out AbstractResourceIterator resourceit,
                out LinkIterator linkit
        );

        void add_produced(
                in AbstractResource resource,
                in string tag
        );
        void remove_produced(
                in AbstractResource resource
        );
        void list_produced (
                in long max_number,
                out AbstractResources resources,
                out AbstractResourceIterator resourceit,
                out LinkIterator linkit
        );

        void set_processor(
                in Session::AbstractResource processor
        ) raises (
```

```
                ProcessorConflict
            );
            AbstractResource get_processor( );

            void start (
            ) raises (
                CannotStart,
                AlreadyRunning
            );
            void suspend (
            ) raises (
                CannotSuspend,
                CurrentlySuspended
            );
            void stop (
            ) raises (
                CannotStop,
                NotRunning
            );
        };
};

#endif /* _SESSION_ */
```