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UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

UNITED NATIONS CENTRE FOR TRADE FACILITATION AND ELECTRONIC BUSINESS (UN/CEFACT)

UML Profile for UN/CEFACT’s Modeling Methodology (UMM)
Foundation Module
Version 2.0 Technical Specification
2011-04-01
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1 About this Document

1.1 Status of this Document
This document has completed the Open Development Process (ODP) of UN/CEFACT on 2011-04-01. It is a UN/CEFACT Technical Specification

1.2 Revision History

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1.3 Document Context
The UMM meta model is divided into a set of meta modules. This means that the UMM meta model is partitioned into functional levels, ranging from core, minimal functionality, to complete functionality. The following partition levels have been defined for meta modules:

![Module structure of the UMM meta model]

**Base:** Covers the fundamental principles that are shared across all the other modules.

**Foundation:** Includes the core concepts of the UMM. In addition, it defines all the concepts that are used as part of the minimal methodology to produce a UMM compliant business collaboration model. Furthermore, it provides fundamental principles which are shared across all other modules.
Specialization: Multiple specialization modules might define add-on concepts to the foundation. Each specialization module addresses a specialized type of analysis that extends the foundation module at a well-defined extension point for a specific topic. Specialization modules might become candidates for later inclusion into the foundation module.

Extension: Extension modules serve the same purpose as specialization modules. Whereas specialization modules are developed and maintained by UN/CEFACT, extension modules are adding features that are created and maintained by organization(s) which are external to UN/CEFACT.

This specification defines the foundation module of UMM 2.0.

1.4 Conventions

The keywords MUST, MUST NOT, REQUIRED, SHALL, SHALL NOT, SHOULD, SHOULD NOT, RECOMMENDED, MAY and OPTIONAL, when they appear in this document, are to be interpreted as described in [RFC2119] as quoted here:

- MUST: This word, or the terms "REQUIRED" or "SHALL", means that the definition is an absolute requirement of the specification.
- MUST NOT: This phrase, or the phrase "SHALL NOT", means that the definition is an absolute prohibition of the specification.
- SHOULD: This word, or the adjective "RECOMMENDED", means that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications MUST be understood and carefully weighed before choosing a different course.
- SHOULD NOT: This phrase, or the phrase "NOT RECOMMENDED", means that there may exist valid reasons in particular circumstances when the particular behavior is acceptable or even useful, but the full implications should be understood and the case carefully weighed before implementing any behavior described with this label.
- MAY: This word, or the adjective "OPTIONAL", means that an item is truly optional. One vendor may choose to include the item because a particular marketplace requires it or because the vendor feels that it enhances the product while another vendor may omit the same item. An implementation that does not include a particular option MUST be prepared to interoperate with another implementation which does include the option, though perhaps with reduced functionality. In the same vein an implementation that does include a particular option MUST be prepared to interoperate with another implementation which does not include the option (except, of course, for the feature the option provides).

2 Project Team

2.1 Disclaimer

The views and specification expressed in this document are those of the authors and are not necessarily those of their employers. The authors and their employers specifically disclaim responsibility for any problems arising from correct or incorrect implementation or use of this technical specification.

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The Editing Team of this UMM foundation module likes to thank former members of TMG’s Business Process Working Group (BPWG) who have spent enormous efforts in putting the UMM into a stage that we were able to build upon in order to create this foundation module.

3 Introduction

3.1 Audience

A reader of the document MUST have a deep understanding of UML 2.1.2. She or he MUST be able to understand meta models denoted as UML class diagrams. She or he SHOULD be familiar with the UML 2.1.2. meta model, at least she or he MUST be able to check back the UML 2.1.2. meta model. The reader SHOULD be familiar with OCL 2.0 in order to understand the OCL constraints of this UMM profile – those who are not familiar with OCL are provided with a plain text description of the constraint.

The information described in this manual is aimed at
• advanced business process modelers who check a UML model for UMM compliance (if not supported by a tool)
• advanced business process modelers who train other business process modelers and business process analysts
• software designers who want to produce UML tools providing support for this UMM foundation module
• software designers who want to produce tools to transform UMM compliant business collaboration models into specifications within an IT-layer (ebXML, Web Services, UN/EDIFACT, etc.).
• software designers who want to produce repositories to register UMM compliant business collaboration models

3.2 Related Documents

• UN/CEFACT
  o UPCC: UML Profile for Core Components
    http://unstandards.org:8080/display/public/UPCC+-+UML+Profile+for+Core+Components
  o Core Component Technical Specification

• International Organization for Standardization (ISO)
  o Open-edi Reference Model. ISO/IEC 14662

• Object Management Group (OMG)
  o Unified Modeling Language Specification (UML), Version2.1.2
    http://www.omg.org/docs/formal/07-02-05.pdf

3.3 UN/CEFACT’s Modeling Methodology (UMM): Overview

UN/CEFACT’s Modeling Methodology (UMM) is a UML modeling approach to design the business services that each partner must provide in order to collaborate. It provides the business justification for the services to be implemented in a service-oriented collaboration architecture. Thus, a primary vision of UN/CEFACT is to capture the business knowledge that enables the development of low cost software based on service-oriented architectures (SOA) helping the small and medium size companies (SMEs), and emerging economies to engage in e-Business practices. UMM focuses on developing a global choreography of inter-organizational business processes and their information exchanges. UMM models are notated in UML syntax and are platform independent models. The platform independent UMM models identify which services need to be realized in a service-oriented architecture, implementing the business collaboration. This approach provides insurance against technical obsolescence.

The UMM, as described in this document, is the formal description technique for describing any Open-edi scenario as defined in ISO/IEC 14662 “Open-edi reference model”. An Open-edi scenario is a formal means to specify a class of business transactions having the same business goal, such as, purchasing or inventory management. The primary scope of UMM is the Business Operations View (BOV) and not the Functional Service View (FSV) as defined in ISO/IEC IS 14662. The BOV is defined as “a perspective of business transactions limited to those aspects regarding the making of business decisions and commitments among organizations”, while the FSV is focused on implementation specific, technological aspects of Open-edi. The commitments of the BOV layer are reflected in the choreography of the inter-organizational business processes and their information exchanges. At the FSV layer, this choreography must be implemented by a set of composite services. Therefore it follows, that UMM, which targets the BOV layer, defines what the
business is about; and the technologies on the FSV layer define how to implement the business by a service-oriented architecture.

This version of the UMM consists of three views each covering a set of well defined artifacts:

- Business Requirements View (bRequirementsV)
- Business Choreography View (bChoreographyV)
- Business Information View (bInformationV)

**Business Requirements View (bRequirementsV):** The Business Requirements View is used to gather existing knowledge. It identifies the business processes in the domain and the business problems that are important to stakeholders. It is important at this stage that business processes are not constructed, but discovered. Stakeholders might describe intra-organizational as well as inter-organizational business processes. All of this takes place in the language of the business experts and stakeholders. The business requirements view results in a categorization of the business domain (manifested as a hierarchical structure of packages) and a set of relevant business processes (manifested as use cases). The result may be depicted in use case diagrams. In order to model the dynamics of each business process, one may use a Business Process Activity Model, or a Sequence Diagram, which would be placed beneath the Business Process Use Case. As a practical note, the Business Process Activity Model may depict a process or processes which involve one or more Business Partners. A Sequence Diagram will depict information exchanges between two or more Business Partners. The Business Partners are described within their own package (Business Partner View). A Business Process Activity Model may show state changes to Business Entities. Business Entities are “real-world” things having business significance and are shared among the business partners involved in the collaboration. The Business Entities and their lifecycles of state changes are modeled in the Business Entity View. Furthermore, the Business Entity View also contains one or more packages which represent the conceptual data structures of the Business Entities.

**Business Choreography View (bChoreographyV):** The Business Choreography View is used to define and document the global choreography between collaborating business partners in an inter-organizational business process. Within the Business Choreography View, the Business Transaction View contains and documents the requirements of Business Transaction Use Cases, and their participating Authorized Roles. The dynamics of a Business Transaction Use Case are described by a Business Transaction. A business transaction defines a simple choreography of exchanging business information between two authorized roles and an optional response. A business transaction identifies the business actions of each partner responsible for sending and receiving the business information. These actions correspond to the requirements of any solution that must be implemented on each business partner’s side in a service-oriented collaboration architecture. Within the Business Choreography View, the Business Collaboration View contains and documents the requirements of Business Collaboration Use Cases and their participating Authorized Roles. The dynamics of a Business Collaboration Use Case are described by a Business Collaboration Protocol. A Business Collaboration Protocol choreographs the flow among business transactions, and/or nested Business Collaboration Protocols. This flow depends on the states of business entities. When a Business Collaboration Use Case is identified, but different sets of parties may execute this collaboration, the different Realizations (executions) may be modeled within the Business Realization View, as a Business Realization Use Cases.
Business Information View (bInformationV): An execution of a business transaction usually results in the change of state of one or more business entities. Thus, the information exchanged in a transaction should be limited to the minimum information needed to change the state of a business entity. Nevertheless, UMM allows the definition of an information exchange in a document-centric approach – even if this is not recommended. A Business Information View contains Business Information Artifacts. UMM does not mandate a specific Business Information Modeling approach. However, UMM strongly recommends that Business Information is modeled in accordance to UN/CEFACT’s Core Components Technical Specification and Message Assembly Guidelines. In order to model Core Components by means of UML, UN/CEFACT provides the Profile for Core Components (UPCC).

3.4 Objectives

3.4.1 Goals of the Technical Specification

The goals of this specification are:

- To define the semantics of well-formed UMM business collaboration models, which describe a public choreography of an inter-organizational system. Local choreographies and private processes of a businesses partner are out of scope.
- To define the validation rules for UMM compliant business collaboration models.
- To clarify the basic concepts that a UMM-compliant business collaboration model is based on.
- To provide an unambiguous definition for UMM business collaboration models that allows an unambiguous mapping to artifacts for deployment in a service-oriented architecture. Note, that the mapping itself is not part of UMM.
- To define a UML profile for the UMM foundation module that allows UML tool vendors to customize their tools to be UMM compliant. Better UML 2.1.2. tool support will lead to a growing UMM user base.

3.4.2 Requirements

This specification is guided by the following key requirements derived from the above goals:

- The UMM foundation module defines only those modeling concepts that are considered as fundamental to deliver a UMM compliant model. Additional advanced modeling concepts shall be covered in specialization and extension modules.
- The UMM foundation module is directed towards the Business Operational View of Open-edi. This means it is independent of certain implementation technologies used in SOAs like Web Services and ebXML or other future technologies. However, the UMM compliant business collaboration models must be defined in a way that allows a mapping to an implementation technology of choice. Such a mapping is not part of the UMM foundation module. It is a candidate for a specialization/extension module.
- Today, the UML is the most commonly supported modeling language by modeling tools. In order to use the broad range of tools, a UMM business collaboration model must be a special kind of UML model. Thus, the UMM foundation module is based on the UML meta model. In fact, it provides a UML Profile consisting of stereotypes, tagged definitions and constraints.
- In order to support a broad adoption of the UMM-modeling approach, the formal descriptions of the UMM is supplemented by a set of examples that show UMM compliant artifacts.

3.4.3 Caveats and Assumptions

This specification makes the following assumptions:
• This UML profile is based on the UML meta-model version 2.1.2. This version is the current OMG version. Using another UML meta-model as a basis for the development of a UMM compliant business collaboration model may not deliver correct results.

• The basic concepts of the UMM and the way they relate to each other are described and explained by means of a meta model (to be found in the non-normative “conceptual description” sections of this document).

• Different specialization and extension modules might extend the foundation module in order to define additional semantics to the minimum semantics required to create a UMM compliant business collaboration models.

3.5 Structure of the UMM Foundation Module

Figure 2 Package overview of UMM Foundation Module meta model

Section 5 defines the UML profile of the foundation module of the UMM meta model (Section 1, Figure 1). The figure above (Figure 2), shows the package structure of the foundation module of the UMM meta model. The numbers referring to the subsections are included in figure 2. Those numbers refer to the subsections containing the stereotypes, tag definitions and constraints of the corresponding package. The first level packages of the foundation module conform to the three views of the current UMM version: Business Requirements View (5.1), Business Choreography View (5.2), and Business Information View (5.3).

The Business Requirements View (5.1) comprises the Business Domain View (5.1.1), the Business Partner View (5.1.2), and the Business Entity View (5.1.3). The second top-level package, the Business Choreography View (5.2) consists of the Business Transaction View (5.2.1), the Business Collaboration View (5.2.2), and the Collaboration Realization View (5.2.3). The third top-level package is the Business Information View (5.3). It does not contain any sub packages.

Each section describing a package is structured in the same way. The first subsection is informative. It describes the conceptual model of the artefact that is addressed by the package. The second subsection is normative and defines all the stereotypes and associated tag definitions that are defined in the package. The third subsection is normative and includes all the constraints in plain text that apply to the respective
package. The constraints are also expressed using the Object Constraint Language (OCL) in section 6. The two remaining informative subsections cover on the one hand side worksheets used to gather information from business people in order to create the UMM models and on the other hand side examples to depict instances of the artefact type addressed by the package.

4 Dependencies on other UMM Modules (normative)

4.1 Abbreviations of Stereotypes

<table>
<thead>
<tr>
<th>Stereotype Abbreviation</th>
<th>Full Stereotype Name</th>
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</thead>
<tbody>
<tr>
<td>bInformation</td>
<td>BusinessInformation</td>
</tr>
<tr>
<td>bLibrary</td>
<td>BusinessLibrary</td>
</tr>
<tr>
<td>InfEnvelope</td>
<td>InformationEnvelope</td>
</tr>
</tbody>
</table>

4.2 Dependency between Base Module and Foundation Module

The UMM foundation module 2.0 is built on top of the UMM base module 2.0. This means that all stereotypes and tag definitions defined in the UMM base module 2.0 are imported into the UMM foundation module 2.0. The figure below shows the stereotypes defined in the UMM base module also used in the foundation module. Note that the stereotypes of the base module are identified with notes in all figures of this specification. The formal definition of the stereotypes bInformation, InfEnvelope and bLibrary is given in the UMM base module 2.0 specification. In the foundation module, packages - that are containers of stereotypes realizing main UMM artefacts - are defined as specializations of the base stereotype bLibrary. This means that such packages and their contents are candidates for registration in a registry. In the UMM foundation module 2.0 we do not define any stereotype that directly inherits from bLibrary. As a consequence, only packages are candidates for registration.

The concepts of bInformation and InfEnvelope are used to define the business document information being exchanged between authorized roles in a UMM business transaction.
5.0 Foundation Module Management

5.0.1 Abbreviations of Stereotypes

<table>
<thead>
<tr>
<th>Stereotype Abbreviation</th>
<th>Full Stereotype Name</th>
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<tbody>
<tr>
<td>bCollModel</td>
<td>BusinessCollaborationModel</td>
</tr>
<tr>
<td>bRequirementsV</td>
<td>BusinessRequirementsView</td>
</tr>
<tr>
<td>bChoreographyV</td>
<td>BusinessChoreographyView</td>
</tr>
<tr>
<td>bInformationV</td>
<td>BusinessInformationView</td>
</tr>
<tr>
<td>bLibrary</td>
<td>BusinessLibrary</td>
</tr>
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</table>
5.0.2 Conceptual Description (informative)

A project that follows the UMM approach leads to a business collaboration model. A business collaboration model that is UMM compliant is stereotyped as \texttt{bCollModel}. As described above, the UMM is built by three views. The business requirements view stereotyped as \texttt{bRequirementsV} is optional and may occur multiple times in a business collaboration model. The business choreography view (stereotyped as \texttt{bChoreographyV}) and the business information view (stereotyped as \texttt{bInformationV}) are mandatory parts of a business collaboration model and may also occur multiple times.

Within the business requirements view the specific requirements of the business collaboration between two or more business partners are captured. The collected information from the business collaboration is then further elaborated within the business choreography view. The information exchanged during the process is modeled in the business information view. For further information on the specific sub-views of the UMM, please see the relevant sub-chapters of this specification.
5.0.3 Stereotypes and Tag Definitions (normative)

Figure 6 UMM Foundation Module Management - Abstract Syntax

<table>
<thead>
<tr>
<th>Stereotype</th>
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<tr>
<td><strong>Base Class</strong></td>
<td>Package</td>
</tr>
<tr>
<td><strong>Parent</strong></td>
<td>BusinessLibrary (from Base Module)</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>A business collaboration model is a model that is compliant to the UMM meta model. It MUST be compliant to the base and foundation module, and it MAY be compliant to one or more specialization and/or extension modules. Since a business collaboration model is of base class package, a UML model MAY contain one to many business collaboration models. Therefore, either the root element of a UML model is stereotyped as business collaboration model or any of the packages beneath the root element.</td>
</tr>
<tr>
<td><strong>Tag Definition</strong></td>
<td><strong>Justification</strong></td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
</tr>
<tr>
<td>Multiplicity</td>
<td>1</td>
</tr>
<tr>
<td>Description</td>
<td>Explains the reason from a business perspective why the given business case is considered for possible business collaborations.</td>
</tr>
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</table>
### Stereotype: bRequirementsV (BusinessRequirementsView)

<table>
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<tbody>
<tr>
<td>Parent</td>
<td>BusinessLibrary (from Base Module)</td>
</tr>
<tr>
<td>Description</td>
<td>The business requirements view is a container for all elements needed to identify and describe the requirements of collaborations between business partners. It captures the relevant packages which are used for discovering relevant business processes and their business partners executing/participating in them, as well as the lifecycle and state changes of business entities which are important within a business process.</td>
</tr>
<tr>
<td>Tag Definition</td>
<td>Inherited tagged values:</td>
</tr>
<tr>
<td></td>
<td>- businessTerm</td>
</tr>
<tr>
<td></td>
<td>- copyright</td>
</tr>
<tr>
<td></td>
<td>- owner</td>
</tr>
<tr>
<td></td>
<td>- reference</td>
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<td>- status</td>
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<tr>
<td></td>
<td>- uniqueldentifier</td>
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<tr>
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<td>- versionIdentifier</td>
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### Stereotype: bChoreographyV (BusinessChoreographyView)

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<td>BusinessLibrary (from Base Module)</td>
</tr>
<tr>
<td>Description</td>
<td>The business choreography view is a container for all elements needed to describe the choreography of business collaborations at various levels.</td>
</tr>
<tr>
<td>Tag Definition</td>
<td>Inherited tagged values:</td>
</tr>
<tr>
<td></td>
<td>- businessTerm</td>
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### Stereotype: bInformationV (BusinessInformationView)
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<td>Parent</td>
<td>BusinessLibrary (from Base Module)</td>
</tr>
<tr>
<td>Description</td>
<td>The business information view is a container for all elements representing the exchanged information in business collaborations.</td>
</tr>
</tbody>
</table>

**Tag Definition**

Inherited tagged values:
- businessTerm
- copyright
- owner
- reference
- status
- uniquedentifier
- versionIdentifier

5.0.4 Constraints (normative)

Constraints with respect to the BusinessCollaborationModel (bCollModel)

C.1. A BusinessCollaborationModel MUST contain one to many BusinessChoreographyViews
C.2. A BusinessCollaborationModel MUST contain one to many BusinessInformationViews
C.3. A BusinessCollaborationModel MAY contain zero to many BusinessRequirementsViews
C.4. A BusinessRequirementsView, a BusinessChoreographyView and a BusinessInformationView MUST be directly located under a BusinessCollaborationModel

5.1 Business Requirements View

5.1.0 Sub-Views in the Business Requirements View

5.1.0.1 Abbreviations and Stereotypes

<table>
<thead>
<tr>
<th>Stereotype Abbreviation</th>
<th>Full Stereotype Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>bRequirementsV</td>
<td>BusinessRequirementsView</td>
</tr>
<tr>
<td>bDomainV</td>
<td>BusinessDomainView</td>
</tr>
<tr>
<td>bPartnerV</td>
<td>BusinessPartnerView</td>
</tr>
<tr>
<td>bEntityV</td>
<td>BusinessEntityView</td>
</tr>
</tbody>
</table>

5.1.0.2 Conceptual Description (informative)

The **BusinessRequirementsView** is composed by three significant sub-views which are all of optional use. Firstly, the **BusinessDomainView** captures all of the business processes which may be of interest for the domain under consideration. In order to enable users to readily identify business processes, these business processes are classified into business categories. This classification is done by creating business areas and process areas. However, UN/CEFACT recommends using this classification, but it is not mandatory. Secondly, the **BusinessPartnerView** specifies a list of business partners and stakeholders that are involved in the business processes defined in the **BusinessDomainView**. Furthermore the relationships between each others are defined in this package. Finally, the **BusinessEntityView** defines the business entities that are involved in a business process. A business entity is a real-world thing having business significance that is shared among two or more business partner in a collaborative business process (e.g. order, account, etc.). It is important to depict the possible state changes of such business entities within the **BusinessEntityView** in order to get an understanding of how a collaborative business process affects such real-world things during the execution of a business process.
### 5.1.0.3 Stereotypes and Tag Definitions (normative)

#### Stereotype: `bDomainV (BusinessDomainView)`

<table>
<thead>
<tr>
<th><strong>Base Class</strong></th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent</strong></td>
<td>BusinessLibrary (from Base Module)</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The business domain view is used to discover business processes that are of relevance in a project. A business domain is a framework for identification and understanding of business processes as well as for categorizing them according to a classification schema. The business domain view is a container capturing the categorization scheme and categorized business processes.</td>
</tr>
<tr>
<td><strong>Tag Definition</strong></td>
<td>Inherited tagged values:</td>
</tr>
<tr>
<td></td>
<td>- owner</td>
</tr>
<tr>
<td></td>
<td>- copyright</td>
</tr>
<tr>
<td></td>
<td>- reference</td>
</tr>
<tr>
<td></td>
<td>- status</td>
</tr>
<tr>
<td></td>
<td>- businessTerm</td>
</tr>
<tr>
<td></td>
<td>- uniqueldentifier</td>
</tr>
<tr>
<td></td>
<td>- uniqueldentifier</td>
</tr>
</tbody>
</table>

#### Stereotype: `bPartnerV (BusinessPartnerView)`

<table>
<thead>
<tr>
<th><strong>Base Class</strong></th>
<th>Package</th>
</tr>
</thead>
</table>
The business partner view captures a list of business partners and stakeholders in the domain under consideration as well as the relationships between them.

Inherited tagged values:
- uniqueIdentifier
- owner
- copyright
- reference
- versionIdentifier
- status
- businessTerm

The business entity view is a container to describe the lifecycle of a business entity having business significance in the modelled domain including its' business entity states.

Inherited tagged values:
- uniqueIdentifier
- versionIdentifier
- owner
- copyright
- reference
- status
- businessTerm

5.1.0.4 Constraints (normative)

Constraints with respect to a BusinessRequirementsView:

- C.5. A BusinessRequirementsView MAY contain zero or one BusinessDomainView.
- C.6. A BusinessRequirementsView MAY contain zero or one BusinessPartnerView.
- C.7. A BusinessRequirementsView MAY contain zero to many BusinessEntityViews.
- C.8. A BusinessDomainView, a BusinessPartnerView, and a BusinessEntityView MUST be located directly under a BusinessRequirementsView.

5.1 Business Domain View

5.1.1 Abbreviations of Stereotypes

<table>
<thead>
<tr>
<th>Stereotype Abbreviation</th>
<th>Full Stereotype Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>bDomainV</td>
<td>BusinessDomainView</td>
</tr>
<tr>
<td>bCategory</td>
<td>BusinessCategory</td>
</tr>
<tr>
<td>bArea</td>
<td>BusinessArea</td>
</tr>
</tbody>
</table>
5.1.1.2 Conceptual Description (informative)

Figure 9 BusinessDomainView – Conceptual Overview
The business domain view is used to discover business processes use cases that are of relevance in a project. A business process use case is executed by at least one (but possibly more) business partners. A business partner might execute multiple business process use cases. Thus, the participates association between BusinessPartner and BusinessProcessUseCase is a (1..n) to (0..n) association. A stakeholder does not need to participate in a business process use case. A stakeholder might have interest in multiple business process use cases and a business process use case might be of interest to multiple stakeholders. The relationship between a BusinessProcessUseCase and a Stakeholder is described by the isOfInterestTo dependency in UMM. A business process can be decomposed into sub-processes using the «include» and «extends» association stereotypes.

To enable users to readily identify business process use cases, they should be classified into business categories. A business category is an abstract concept, which has two concrete specializations – business area and process area. A business area corresponds to a division of an organization and a process area corresponds to a set of common operations within the business area. A business area might be composed of other business areas. This means, a business area may form a hierarchy. Thus, a unary (0..1) to (0..n) composition is defined for a BusinessArea. The lowest level of a business area hierarchy includes process areas or business processes use cases. Therefore, we have a (0..1) to (0..n) composition between BusinessArea and ProcessArea. Furthermore, a BusinessArea may also include 0..n BusinessProcessUseCases if no further classification using process areas is required. Similar to a business area, a process area may form a hierarchy. This means, a unary (0..1) to (0..n) composition is defined for a ProcessArea. Similar to a business area, a ProcessArea may contain zero to many BusinessProcessUseCases. On the lowest level of a ProcessArea hierarchy, at least one BusinessProcessUseCase must be present.

The flow of a business process use case may be described by business processes. Thus, a BusinessProcessUseCase is realized by zero to many BusinessProcesses. A business process represents the dynamic behavior of a business process use case. A business process corresponds to a flow of actions performed by one participant or even by more participants. If two or more business partners collaborate, a business process is divided into partitions – one for each business partner. In case of an internal business process, which is executed by one partner only, a single partition for that partner is optional. Consequently, a BusinessProcess is composed of zero or more UML ActivityPartitions. An ActivityPartition is assigned to one BusinessPartner; a BusinessPartner is assigned to one ActivityPartition. However, a BusinessPartner may be assigned to multiple ActivityPartitions – each one in a different BusinessProcess. Hence, there is a 1 to (0..n) association between BusinessPartner and ActivityPartition.

A business process is described as a flow of business process actions. In the case where no activity partition is used, the business process actions are directly included in the Activity Diagram of the business process. In case of activity partitions, a business process action is assigned to the partition of the business partner executing the action. The need for a collaborative business process is identified whenever a transition connecting two business process actions crosses activity partitions. It follows, that either a BusinessProcess is composed of one or more BusinessProcessAction or an ActivityPartition (which is part of a business process) is composed of one or more BusinessProcessActions. A business process action might be refined by another business process. Thus a BusinessProcessAction is composed of zero or one BusinessProcess which in turn is a composite of zero or one BusinessProcessActions.

A business process may also denote important states of business entities that are manipulated during the execution of a business process. A business entity state is the output from one business action and input to
another business action. There is a transition from a business process action to a business entity state signaling an output as well as a transition from a business entity state to a business process action signaling an input. Some business entity states are meaningful to one business partner only. These are internal business entity states. Business entity states that must be communicated to a business partner are shared business entity states. A business process may include both internal and shared business entity states. Hence, a BusinessProcess is composed of zero to many InternalBusinessEntityStates and of zero to many SharedBusinessEntityStates. If a business process uses activity partitions, the two business process actions creating and consuming an internal business entity state are in the same activity partition. In contrast, the two business process actions creating and consuming a shared business entity state are in different activity partitions. A shared business entity state signals the need for a collaborative business process.
5.1.1.3 Stereotypes and Tag Definitions (normative)
**Stereotype**

<table>
<thead>
<tr>
<th>bCategory (BusinessCategory, abstract)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Class</strong></td>
</tr>
<tr>
<td><strong>Parent</strong></td>
</tr>
</tbody>
</table>

**Description**

A business category is an abstract concept. Business categories are used to classify the business processes in the Business Domain View. The prime purpose of classifying the business processes is to enable potential users to readily identify processes that have been defined in the business category under consideration.

Consequently a business category is used to group either other business categories or business processes that belong to the respective business category. The Business Domain View is structured by its specializations **BusinessArea** and **ProcessArea** (see below for these stereotype definitions).

**Tag Definition**

<table>
<thead>
<tr>
<th><strong>objective</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Multiplicity</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>scope</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Multiplicity</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>businessOpportunity</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Multiplicity</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

**Inherited tagged values:**

- uniqueldentifier
- versionIdentifier
- owner
- copyright
- reference
- status
- businessTerm

---

**Stereotype**

<table>
<thead>
<tr>
<th>bArea (BusinessArea)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Class</strong></td>
</tr>
<tr>
<td><strong>Parent</strong></td>
</tr>
</tbody>
</table>
A business area usually corresponds to a division of an enterprise. Business areas might be structured recursively. A business area is a category of decomposable business areas or process areas (on the lowest level of business area hierarchy). This means that a business area collates either other business areas, process areas or business process use case.

The UMM does not mandate a specific classification schema. A classification schema that might be used is the Porter Value Chain. Based on the Porter Value Chain, the UN/CEFACT Common Business Process Catalog recommends a list of eight flat (i.e. non-recursive) categories: Procurement/Sales, Design, Manufacture, Logistics, Recruitment/Training, Financial Services, Regulation, and Health Care. This list of business areas is considered as non exhaustive.

### Tag Definition

- **Inherited tagged values:**
  - uniqueIdentifier
  - versionIdentifier
  - objective
  - scope
  - businessOpportunity
  - owner
  - copyright
  - reference
  - status
  - businessTerm

### Stereotype | ProcessArea (ProcessArea)
---|---
**Base Class** | Package
**Parent** | BusinessCategory

A process area corresponds to a set of common operations within a business area. Process areas might be structured recursively. A process area is a category of common business process use cases. This means a process area collates either other process areas or business process use cases.

The UMM does not mandate a specific classification schema. The UN/CEFACT Common Business Process Catalog recommends a list of five flat (i.e. non-recursive) categories that correspond to the five successive phases of business collaborations as defined by the ISO Open-edi model: Planning, Identification, Negotiation, Actualization, Post-Actualization.

### Tag Definition

- **Inherited tagged values:**
  - uniqueIdentifier
  - versionIdentifier
  - objective
  - scope
  - businessOpportunity
  - owner
  - copyright
  - reference
  - status
  - businessTerm

### Stereotype | bProcessUC (BusinessProcessUseCase)
---|---
**Base Class** | UseCase
A business process use case is a set of related activities that together create value for a business partner. A business process use case might be performed by a single business partner type or by multiple business partner types crossing organizational boundaries. In the case where organizations collaborate in a business process, the business process should create value for all of its participants. A business process use case can be decomposed into sub-processes using the «include» and «extends» association stereotypes defined in UML.

<table>
<thead>
<tr>
<th>Tag Definition</th>
<th>definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
</tr>
<tr>
<td>Multiplicity</td>
<td>1</td>
</tr>
<tr>
<td>Description</td>
<td>Gives a definition of the business process use case. This definition must describe the customer value to be created by the business process use case. In the case of a business process use case executed by multiple parties, it describes the value to be created to all participants.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tag Definition</th>
<th>beginsWhen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
</tr>
<tr>
<td>Multiplicity</td>
<td>1</td>
</tr>
<tr>
<td>Description</td>
<td>Specifies a business event that triggers the initiation of the business process use case.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tag Definition</th>
<th>preCondition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
</tr>
<tr>
<td>Multiplicity</td>
<td>1</td>
</tr>
<tr>
<td>Description</td>
<td>Specifies a condition that has to be fulfilled in order to execute a business process use case. This condition SHOULD refer to states in the life cycle of a business entity. A pre-condition statement MAY use Boolean operators specifying a combination of multiple business entity states.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tag Definition</th>
<th>endsWhen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
</tr>
<tr>
<td>Multiplicity</td>
<td>1</td>
</tr>
<tr>
<td>Description</td>
<td>Specifies a business event that leads to the termination of the business process use case.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tag Definition</th>
<th>postCondition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>String</td>
</tr>
<tr>
<td>Multiplicity</td>
<td>1</td>
</tr>
<tr>
<td>Description</td>
<td>Specifies a condition that will be reached after executing the business process use case. Usually, this condition SHOULD refer to states in the life cycle of a business entity. A post-condition statement MAY use Boolean operators specifying a combination of multiple business entity states.</td>
</tr>
<tr>
<td>exceptions</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>String</td>
</tr>
<tr>
<td><strong>Multiplicity</strong></td>
<td>0..*</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Identifies situations leading to a deviation of the regular execution of the business process use case.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>actions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Multiplicity</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stereotype</th>
<th>participates (participates)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Class</strong></td>
<td>Association</td>
</tr>
<tr>
<td><strong>Parent</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Describes the association between a business partner and a business process use case. This stereotype defines that the business partner provides input to and/or output from the associated business process use case.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tag Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Multiplicity</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stereotype</th>
<th>isOfInterestTo (isOfInterestTo)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Class</strong></td>
<td>Dependency</td>
</tr>
<tr>
<td><strong>Parent</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Describes a dependency from a business process use case to a stakeholder. This stereotype defines that a business process use case depends on the interest of the connected stakeholder.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tag Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Multiplicity</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>
### Stereotype: bProcess (BusinessProcess)

<table>
<thead>
<tr>
<th>Base Class</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The business process describes the behavior of a business process use case between the involved business partners. It is a tool to identify requirements to collaborate between two or more business partners. A business process refines a business process use case by describing its dynamic behaviour.</td>
</tr>
<tr>
<td>Tag Definition</td>
<td>No tagged values.</td>
</tr>
</tbody>
</table>

### Stereotype: bProcessAction (BusinessProcessAction)

<table>
<thead>
<tr>
<th>Base Class</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>A business process action corresponds to a step in the execution of a business process. A business process action might be refined by another business process. In this case, a UML call behavior action MUST be used as base class for the business process action.</td>
</tr>
<tr>
<td>Tag Definition</td>
<td>No tagged values.</td>
</tr>
</tbody>
</table>

### Stereotype: bEInternalState (InternalBusinessEntityState)

<table>
<thead>
<tr>
<th>Base Class</th>
<th>ObjectNode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The internal business entity state represents a state of a business entity that is internal to the business process of a business partner.</td>
</tr>
<tr>
<td>Tag Definition</td>
<td>No tagged values.</td>
</tr>
</tbody>
</table>

### Stereotype: bESharedState (SharedBusinessEntityState)

<table>
<thead>
<tr>
<th>Base Class</th>
<th>ObjectNode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The shared business entity state represents a state of a business entity that is shared between the business processes between two involved business partners.</td>
</tr>
<tr>
<td>Tag Definition</td>
<td>No tagged values.</td>
</tr>
</tbody>
</table>
### Form for Business Domain View

#### General

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>

#### Business Library Information

<table>
<thead>
<tr>
<th>UniqueIdentifier</th>
<th>BusinessTerm</th>
<th>VersionIdentifier</th>
<th>Status</th>
<th>Owner</th>
<th>Copyright</th>
<th>Reference(s)</th>
</tr>
</thead>
</table>

#### Business Area(s)

<table>
<thead>
<tr>
<th>Business Area No 1</th>
<th>Business Area No 2</th>
<th>Business Area No 3</th>
<th>Business Area No 4</th>
<th>Business Area No 5</th>
<th>Business Area No 6</th>
<th>(add columns as needed)</th>
</tr>
</thead>
</table>

### 5.1.1.4 Worksheets

#### Form for Business Area

#### General

<table>
<thead>
<tr>
<th>Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td></td>
</tr>
</tbody>
</table>

**Details**

| Objective |
| Scope |
| Business Opportunity |
| Included in | (insert the parent Business Area or Business Domain View) |

**Business Library Information**

| UniqueIdentifier |
| BusinessTerm |
| VersionIdentifier |
| Status |
| Owner |
| Copyright |
| Reference(s) |

**Business Area(s)**

| (insert additional nested business areas if appropriate; otherwise fill process areas that apply) |
| Business Area No 1 |
| Business Area No 2 |
| Business Area No 3 |
| Business Area No 4 |
| Business Area No 5 | (add columns as needed) |

**Process Area(s)**

| (you only fill process areas if you do not have completed a business area above) |
| Process Area No 1 |
| Process Area No 2 |
| Process Area No 3 |
| Process Area No 4 |
## Form for Process Area

### General

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
</table>

### Details

<table>
<thead>
<tr>
<th>Objective</th>
<th>Scope</th>
<th>Business Opportunity</th>
</tr>
</thead>
</table>

| Included in | (insert the parent Business Area or Process Area) |

### Business Library Information

<table>
<thead>
<tr>
<th>UniqueIdentifier</th>
<th>BusinessTerm</th>
<th>VersionIdentifier</th>
<th>Status</th>
<th>Owner</th>
<th>Copyright</th>
<th>Reference(s)</th>
<th>Process Area(s)</th>
<th>(if present)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process Area No 1</th>
<th>Process Area No 2</th>
<th>Process Area No 3</th>
<th>Process Area No 4</th>
<th>Process Area No 5</th>
<th>(add columns as needed)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Form for Business Process

<table>
<thead>
<tr>
<th><strong>General</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Details</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Classified to Business Areas and Process Areas</td>
</tr>
<tr>
<td>Participants and their interests</td>
</tr>
<tr>
<td>Stakeholders and their interests</td>
</tr>
<tr>
<td>Reference(s)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Start/End Characteristics</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-condition</td>
</tr>
<tr>
<td>Post-condition</td>
</tr>
<tr>
<td>Begins When</td>
</tr>
<tr>
<td>Ends When</td>
</tr>
<tr>
<td>Actions</td>
</tr>
<tr>
<td>Exceptions</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Relationships</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Included Business Processes</td>
</tr>
<tr>
<td>Affected Business Entities and their states</td>
</tr>
</tbody>
</table>

### 5.1.1.5 Constraints (normative)

- **C.9.** A BusinessDomainView MUST include one to many BusinessAreas.
- **C.10.** A BusinessArea MUST include one to many BusinessAreas or one to many ProcessAreas or one to many BusinessProcessUseCases.
- **C.11.** A ProcessArea MUST contain one to many other ProcessAreas or one to many BusinessProcessUseCases.
C.12. A BusinessProcessUseCase MUST be associated with one to many BusinessPartners using the participates relationship.

C.13. A BusinessProcessUseCase MAY be associated with zero to many Stakeholders using the isOfInterestTo relationship.

C.14. A BusinessProcessUseCase SHOULD be refined by zero to many BusinessProcesses. These relationships MAY also be visualized by realize relationships from each of the owned BusinessProcesses to the owning BusinessProcessUseCase.


C.16. A BusinessProcessUseCase MAY be refined by zero to many UML Sequence Diagrams.


C.18. A BusinessProcess, which has no ActivityPartitions, MUST contain one or more BusinessProcessActions and MAY contain zero to many InternalBusinessEntityStates and zero to many SharedBusinessEntityStates.

C.19. An ActivityPartition being part of a BusinessProcess MUST contain one to many BusinessProcessActions and MAY contain zero to many InternalBusinessEntityStates.

C.20. A SharedBusinessEntityState MUST NOT be located in an ActivityPartition. (They must be contained within the BusinessProcess even if this BusinessProcess contains ActivityPartitions.)

5.1.1.6 Example (informative)
Figure 12 Business Domain View Example: Business Process of the internal Place Order Business Process Use Case (Activity Diagram)
5.1.2 Business Partner View

### 5.1.2.1 Abbreviations of Stereotypes

<table>
<thead>
<tr>
<th>Stereotype Abbreviation</th>
<th>Full Stereotype Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>bPartnerV</td>
<td>BusinessPartnerView</td>
</tr>
<tr>
<td>bPartner</td>
<td>BusinessPartner</td>
</tr>
<tr>
<td>Stakeholder</td>
<td>Stakeholder</td>
</tr>
</tbody>
</table>
5.1.2.2 Conceptual Description (informative)

A business partner is an organization type, an organizational unit type or a person type that participates in a business process. A BusinessPartnerView must contain at least two BusinessPartners. A stakeholder is a person or representative of an organization who has a stake – a vested interest – in a certain business category or in the outcome of a business process. By definition, a business partner always has a vested interest in the business processes which they are participating in. Therefore, a BusinessPartner is a special type of a Stakeholder. In UML, specific relationships between Actors MAY be defined. The business partner view does not restrict the definition of those relationships between business partners and/or stakeholders. For example, generalizations between business partners MAY be defined.

5.1.2.3 Stereotypes and Tag Definitions (normative)
Stereotype: Stakeholder (Stakeholder)

<table>
<thead>
<tr>
<th><strong>Base Class</strong></th>
<th>Actor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>A stakeholder is a person or representative of an organization who has a stake — a vested interest — in a certain business category or in the outcome of a business process. A stakeholder does not necessarily participate in the execution of a business process.</td>
</tr>
</tbody>
</table>

**Tag Definition**

<table>
<thead>
<tr>
<th>Tag</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>interest</td>
<td>Describes the vested interest of the stakeholder in the business category it is defined within.</td>
</tr>
</tbody>
</table>

Stereotype: bPartner (BusinessPartner)

<table>
<thead>
<tr>
<th><strong>Base Class</strong></th>
<th>Actor</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent</strong></td>
<td>Stakeholder</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>A business partner type is an organization type, an organizational unit type or a person type that participates in a business process. Business partner types typically provide input to and/or receive output from a business process. Due to the fact that a business partner type participates in a business process, they have, by default, a vested interest in the business process. Therefore, a business partner type is a special kind of stakeholder.</td>
</tr>
</tbody>
</table>

**Tag Definition**

<table>
<thead>
<tr>
<th>Tag</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inherited tagged values:</td>
<td>- interest</td>
</tr>
</tbody>
</table>

### 5.1.2.4 Constraints (normative)

C.21. A BusinessPartnerView MUST contain at least two to many BusinessPartners. If the BusinessPartnerView is hierarchically decomposed into sub packages these BusinessPartners MAY be contained in any of these sub packages.

C.22. A BusinessPartnerView MAY contain zero to many Stakeholders

### 5.1.2.5 Example (informative)

![Figure 16 Business Partner View Example](image-url)
5.1.3 Business Entity View

5.1.3.1 Abbreviations of Stereotypes

<table>
<thead>
<tr>
<th>Stereotype Abbreviation</th>
<th>Full Stereotype Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>bEntityV</td>
<td>BusinessEntityView</td>
</tr>
<tr>
<td>bEntity</td>
<td>BusinessEntity</td>
</tr>
<tr>
<td>bEState</td>
<td>BusinessEntityState</td>
</tr>
<tr>
<td>bDataV</td>
<td>BusinessDataView</td>
</tr>
</tbody>
</table>

5.1.3.2 Conceptual Description (informative)

A business entity is a real-world thing having business significance that is shared between two or more business partners in a collaborative business process (e.g. “order”, “account”, etc.). Within the business entity view at least one, but possibly more business entities are described. Thus, the BusinessEntityView is composed of one to many BusinessEntities. The lifecycle of a business entity MAY be described as a flow of business entity states. Depending on the importance of the business entity lifecycle, the lifecycle may or may not be included. A lifecycle is described using a UML State Diagram. Hence, a BusinessEntity is composed of zero to one UML State Diagram. The lifecycle represents the different business entity states a business entity can exist in. The lifecycle of a business entity consists of at least one business entity state. Therefore, the lifecycle of a business entity is composed of one or more BusinessEntityStates.

A business entity is a potential candidate for becoming a business document in later steps of the UMM. A business data view MAY be used to elaborate a first conceptual design of a business entity. Hence, a BusinessEntity is composed of zero to one BusinessDataViews. Within a business data view, a UML class...
diagram is used to describe the assembly of a business entity. Thus, a BusinessDataView contains one to many UML Class Diagrams.

### 5.1.3.3 Stereotypes and Tag Definitions (normative)

<table>
<thead>
<tr>
<th>Stereotype</th>
<th>bEntity (BusinessEntity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Class</td>
<td>Class</td>
</tr>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>A business entity is a real-world thing having business significance that is shared among two or more business partner types in a collaborative business process (e.g. order, account, etc.).</td>
</tr>
<tr>
<td>Tag Definition</td>
<td>No tagged values.</td>
</tr>
</tbody>
</table>
Stereotype | bEState (BusinessEntityState)
--- | ---
Base Class | State
Parent | N/A
Description | A business entity state represents a specific state a business entity can exist in during its lifecycle (an “order” can exist in the states “issued”, “rejected”, “confirmed”, etc.)
Tag Definition | No tagged values.

Stereotype | bDataV (BusinessDataView)
--- | ---
Base Class | Package
Parent | BusinessLibrary
Description | The business data view is a container for all elements needed to describe the conceptual assembly of a business entity
Tag Definition | Inherited tagged values:
- uniqueldentifier
- versionIdentifier
- owner
- copyright
- reference
- status
- businessTerm

5.1.3.4 Constraints (normative)

C.23. A BusinessEntityView MUST contain one to many BusinessEntities
C.24. A BusinessEntity SHOULD have one UML State Diagram that describes its lifecycle
C.26. A BusinessEntityView MAY contain zero to many BusinessDataView that describes its conceptual design
C.27. The parent of a BusinessDataView MUST be a BusinessEntityView
C.28. A BusinessDataView SHOULD use a UML Class Diagram to describe the conceptual design of a BusinessEntity
C.29. A BusinessDataView SHOULD contain one to many classes.

5.1.3.5 Worksheets

Form for Business Entity

General

Business Entity Name
Description

**Business Library Information**

UniqueIdentifier
BusinessTerm
VersionIdentifier
Status
Owner
Copyright
Reference(s)

**Lifecycle**

Pre-Condition
Post-Condition
Begins When
Ends When
Exceptions

**Lifecycle States (add more Business Entity States if needed)**

Business Entity State
Name
Description
Preceding State(s) including events and transition conditions
Valid Actions
Business Entity State
Name
Description
Preceding State(s) including events and transition conditions
Valid Actions
Business Entity State
Name
Description
Preceding State(s) including events and transition conditions
Valid Actions
Business Entity State
Name
Description
Preceding State(s) including events and transition conditions
Valid Actions
Business Entity State
Name
Description
Preceding State(s) including events and transition conditions
Valid Actions
5.1.3.6 Example (informative)

Figure 19 BusinessEntityView Example: BusinessEntities - CreditCheck, Registration, Quote and Order (Class Diagram)

Figure 20 BusinessEntityView Example: CreditCheck Lifecycle (State Diagram)
Figure 21 BusinessEntityView Example: Registration Lifecycle (State Diagram)

Figure 22 BusinessEntityView (BusinessRequirementsView) Example: Order BusinessEntityLifecycle (State Diagram)
Figure 23 BusinessEntityView (BusinessRequirementsView) Example: Quote BusinessEntityLifecycle (State Diagram)

5.2  Business Choreography View

5.2.1  Sub-Views in the Business Choreography View

5.2.1.1 Abbreviations and Stereotypes

<table>
<thead>
<tr>
<th>Stereotype Abbreviation</th>
<th>Full Stereotype Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>bChoreographyV</td>
<td>BusinessChoreographyView</td>
</tr>
<tr>
<td>bCollaborationV</td>
<td>BusinessCollaborationView</td>
</tr>
<tr>
<td>bTransactionV</td>
<td>BusinessTransactionView</td>
</tr>
<tr>
<td>bRealizationV</td>
<td>BusinessRealizationView</td>
</tr>
</tbody>
</table>
5.2.1.2 Conceptual Description (informative)

The BusinessChoreographyView is the second out of the 3 views of a UMM compliant business collaboration model. The business choreography view describes the view how the business analyst sees the process to be modeled. The requirements captured in the business requirements view serve as a basis for the definition of a choreography of information exchanges. The business choreography view is a container for three different artifacts that together describe the overall choreography of information exchanges. A BusinessTransactionView is a container for artifacts that define a choreography leading to synchronized states of business entities at both sides of the interaction. In fact, a business transaction view captures two different artifacts that define the business transaction. First, the business analyst defines concrete requirements specifying the business transaction on a more general level by using business transaction use cases. Second, he defines the flow of information exchanges in accordance to the requirements specified in this container. The business collaboration view is a container for artifacts describing the flow of a complex business collaboration between business partner types that may involve many steps. Similar to the business transaction view, the BusinessCollaborationView captures two different artifacts as well. Once the business analyst has specified the concrete requirements for a business collaboration by using business collaboration use cases, he is able to define the flow in accordance to the requirements defined in this container. Finally, the CollaborationRealizationView describes the realization of a business collaboration use case for a specific set of business partner types.

Figure 24 BusinessChoreographyView Conceptual Overview
### 5.2.1.3 Stereotypes and Tag Definitions (normative)

**Stereotype**  
`bChoreographyV (BusinessChoreographyView)`

<table>
<thead>
<tr>
<th><strong>Base Class</strong></th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent</strong></td>
<td>BusinessLibrary (from Base Module)</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The business choreography view is a container for all elements needed to describe the choreography of a business collaboration at various levels and the information exchanged in each step of the choreography.</td>
</tr>
</tbody>
</table>

**Tag Definition**

Inherited tagged values:
- uniqueldentifier
- versionIdentifier
- owner
- copyright
- reference
- status
- businessTerm

---

**Stereotype**  
`bCollaborationV (BusinessCollaborationView)`
| Base Class | Package |
| Parent | BusinessLibrary (from Base Module) |
| Description | The business collaboration view is a container for artifacts describing the flow of a complex business collaboration between business partner types that may involve many steps. |
| Tag Definition | Inherited tagged values: |
| | - uniqueldentifier |
| | - versionIdentifier |
| | - owner |
| | - copyright |
| | - reference |
| | - status |
| | - businessTerm |

| Stereotype | bTransactionV (BusinessTransactionView) |
| Base Class | Package |
| Parent | BusinessLibrary (from Base Module) |
| Description | The transaction requirements view is a container for artifacts that define a choreography leading to synchronized states of business entities at both sides of the business transaction. |
| Tag Definition | Inherited tagged values: |
| | - uniqueldentifier |
| | - versionIdentifier |
| | - owner |
| | - copyright |
| | - reference |
| | - status |
| | - businessTerm |

| Stereotype | bRealizationV (BusinessRealizationView) |
| Base Class | Package |
| Parent | BusinessLibrary (from Base Module) |
| Description | The business realization view is a container for all elements describing the realization of a business collaboration use case by business partner types. |
| Tag Definition | Inherited tagged values: |
| | - uniqueldentifier |
| | - versionIdentifier |
| | - owner |
| | - copyright |
| | - reference |
| | - status |
| | - businessTerm |
5.2.1.4 Constraints (normative)

Constraints with respect to a BusinessChoreographyView:

C.30. A BusinessChoreographyView MUST contain one to many BusinessCollaborationViews
C.33. A BusinessTransactionView, a BusinessCollaborationView, and a BusinessRealizationView MUST be directly located under a BusinessChoreographyView

5.2.2 Business Transaction View

5.2.2.1 Abbreviations of Stereotypes

<table>
<thead>
<tr>
<th>Stereotype Abbreviation</th>
<th>Full Stereotype Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>bTransactionView</td>
<td>BusinessTransactionView</td>
</tr>
<tr>
<td>AuthorizedRole</td>
<td>AuthorizedRole</td>
</tr>
<tr>
<td>bTransactionUC</td>
<td>BusinessTransactionUseCase</td>
</tr>
<tr>
<td>bTransaction</td>
<td>BusinessTransaction</td>
</tr>
<tr>
<td>bTPartition</td>
<td>BusinessTransactionPartition</td>
</tr>
<tr>
<td>bInformation</td>
<td>BusinessInformation</td>
</tr>
<tr>
<td>ReqInfPin</td>
<td>RequestingInformationPin</td>
</tr>
<tr>
<td>ResInfPin</td>
<td>RespondingInformationPin</td>
</tr>
<tr>
<td>InfPin</td>
<td>InformationPin</td>
</tr>
<tr>
<td>BusinessAction</td>
<td>BusinessAction</td>
</tr>
<tr>
<td>ReqAction</td>
<td>RequestingBusinessAction</td>
</tr>
<tr>
<td>ResAction</td>
<td>RespondingBusinessAction</td>
</tr>
<tr>
<td>bESharedState</td>
<td>SharedBusinessEntityState</td>
</tr>
</tbody>
</table>
5.2.2.2 Conceptual Description (informative)

Each `BusinessTransactionView` defines exactly one message exchange that leads to a synchronized business state between the two authorized roles executing it. The flow of messages is specified by the concept of a `BusinessTransaction`. The requirements of a `BusinessTransaction` are captured by a `BusinessTransactionUseCase`.

Each business transaction and its corresponding business transaction use case are defined in their own business transaction view package. Accordingly, the business transaction view is composed of exactly one `BusinessTransactionUseCase` and one `BusinessTransaction`.

Figure 26 Business Transaction View – Conceptual Overview
5.2.2.2.1 Business Transaction Use Case Diagram

Two authorized roles participate in a business transaction use case. These authorized roles must be defined in the same business transaction view package as the corresponding business transaction use case. Accordingly, a BusinessTransactionView is composed of exactly two AuthorizedRoles. This means, if a certain role (e.g. buyer, seller, etc.) participates in multiple business transactions, it requires a different authorized role for each business transaction use case. Each authorized role of the same role (i.e., with the same name) is in a different namespace of a corresponding business transaction view. Therefore, an authorized role participates in only one business transaction use case – it is the one in the same business transaction view. Accordingly, BusinessTransactionUseCase and AuthorizedRole are related by a 1 to 2 association. It is important to note, that the same authorized role is not associated twice to the same business transaction use case.

5.2.2.2 Business Transaction Diagram

A BusinessTransaction choreographs the synchronization of business states and the required information exchange between two authorized roles. The business transaction follows exactly the requirements defined in the corresponding business transaction use case. The business transaction that describes the business transaction use case is defined as a child beneath. Accordingly, each BusinessTransactionUseCase has exactly one BusinessTransaction beneath. A business transaction is a “composite” UML Activity. The graph of a business transaction is described by a flow of UML Actions.

A business transaction is an atomic step in a collaborative business process between two authorized roles, which involves sending business information from one authorized role to the other and an optional reply. The business transaction is built by two partitions - one for each authorized role. Hence, a BusinessTransaction is composed of exactly two BusinessTransactionPartitions. Each BusinessTransactionPartition relates to one AuthorizedRole. An AuthorizedRole is assigned to exactly one BusinessTransactionPartition. It follows, that the two partitions of a business transaction must be assigned to different authorized roles.

Within a business transaction each authorized role performs exactly one business action – the requesting authorized role performs a requesting business action and the responding authorized role performs a responding business action. Each business action – no matter whether requesting or responding business action – is assigned to a swimlane, and each swimlane comprises exactly one business action. It follows that a BusinessTransaction is composed of exactly one RequestingBusinessAction and exactly one RespondingBusinessAction. Both, RequestingBusinessAction and RespondingBusinessAction are specializations of the abstract type BusinessAction. A BusinessAction is assigned to one BusinessTransactionPartition, and a BusinessTransactionPartition comprises one BusinessAction. Since a partition is dedicated to exactly one authorized role, it follows that the business action is executed by this authorized role. Furthermore an authorized role executes just one business action, because only one business action sits within a partition.

The requesting business action outputs the requesting information through the requesting information pin that is input to the responding business action’s requesting information pin. Business information created by the responding business action and returned to the requesting business action is optional. If business information is returned by the responding business action zero to many responding information pins might be specified. Multiple responding information pins may be used to describe different business intentions (e.g., a positive and a negative response to a purchase order).
It follows, that a BusinessTransaction is composed of exactly two RequestingInformationPins and zero to many RespondingInformationPins. Both RequestingInformationPin and RespondingInformationPin are instances of the type BusinessInformation. A RequestingBusinessAction has exactly one RequestingInformationPin and zero to many RespondingInformationPins.

A RespondingBusinessAction has exactly one RequestingInformationPin and zero to many RespondingInformationPins.

RequestingInformationPin and RespondingInformationPin are stereotypes of the UML base class Pin. The type of the Pin is defined by the BusinessInformation that is a stereotype of the UML base class Class. According to UML, multiple Pins might be instances of the same Class. It follows that different requesting or responding information pins might be instances of the same business information. In other words, business information might be reused in different business transactions. Action pins that specify output information from a business action MUST be stereotyped and classified accordingly, whereas action pins that specify input information to a business action MAY not be stereotyped and classified.

If multiple responding information pins are defined, those must be in an XOR relationship with each other. In order to specify an XOR relationship between multiple incoming or outgoing responding information pins, each of them has to be enclosed by an UML ParameterSet (c.f. Figure 32). If only one responding information pin is defined within a business transaction, ParameterSets SHOULD not be used.

In order to determine the outcome of a business transaction (success or failure) the contents of the responding business document SHOULD be evaluated. OCL constraints SHOULD be used for assessing the document’s content. An OCL constraint may either check the responding business information’s type (e.g., positive or negative response to a quote) or directly investigate the document’s content (e.g., if products were quoted or not). If the responding business information is checked, the constraints MUST be applied as condition guards to the transitions leading into the respective final states (e.g., success or response) of the business transaction. If the business transaction does not include a response, OCL constraints MAY not be used.

A business transaction synchronizes the states between the two authorized roles executing it. Thus, the execution of a business transaction results in a certain business entity shared state (the concept of business entity shared states have already been introduced in section 5.1.1.2). In order to point out the state change, setting the resulting shared state of a business entity might be visualized on the diagram of a business transaction. A SharedBusinessEntityState MAY be included as a predecessor of a final state to indicate the resulting synchronized state. The example in Figure 33 illustrates this concept.
5.2.2.3 Stereotypes and Tag Definitions (normative)

Figure 27 Business Transaction View – Abstract Syntax

<table>
<thead>
<tr>
<th>Stereotype</th>
<th>bTransactionUC (BusinessTransactionUseCase)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Class</td>
<td>UseCase</td>
</tr>
<tr>
<td>Parent</td>
<td>bProcessUC</td>
</tr>
<tr>
<td>Description</td>
<td>A business transaction use case describes in detail the requirements on a collaboration between exactly two involved partners. A business transaction use case cannot be further refined and describes the requirements on a one-way or two-way information exchange. Business partners take part in a business transaction use case by playing an authorized role in it.</td>
</tr>
<tr>
<td>Tag Definition</td>
<td>Inherited tagged values:</td>
</tr>
<tr>
<td>Stereotype</td>
<td>AuthorizedRole (AuthorizedRole)</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Base Class</td>
<td>Actor</td>
</tr>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>An authorized role (e.g. a “buyer”) is a concept which is more generic than a business partner (e.g. a “wholesaler”) and allows the reuse of collaborations by mapping an AuthorizedRole to a business partner within a given scenario. Since business collaboration use case and business transaction use case are defined as occurring between authorized roles, they might be reused by different business partners (a “wholesaler” or a “broker”) in different scenarios of the same domain or even in different domains.</td>
</tr>
<tr>
<td>Tag Definition</td>
<td>No tagged values.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stereotype</th>
<th>bTransaction (BusinessTransaction)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Class</td>
<td>Activity</td>
</tr>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>A business transaction is the basic building block to define choreography between authorized roles. If an authorized role recognizes an event that changes the state of a business object, it initiates a business transaction to synchronize with the collaborating authorized role. It follows that a business transaction is an atomic unit that leads to a synchronized state in both information systems. We distinguish one-way and two-way business transaction: In the former case, the initiating authorized role reports an already effective and irreversible state change that the reacting authorized role has to accept. Examples are the notification of shipment or the update of a product in a catalog. It is a one-way business transaction, because business information (not including business signals for acknowledgments) flows only from the initiating to the reacting authorized role. In the other case, the initiating partner sets the business object(s) into an interim state and the final state is decided by the reacting authorized role. Examples include request for registration, search for products, etc. It is a two-way transaction, because business information flows from the initiator to the responder to set the interim state and backwards to set the final and irreversible state change. In a business context irreversible means that returning to an original state requires another – compensating – business transaction. E.g., once a purchase order is agreed upon in a business transaction a rollback is not allowed anymore, but requires the execution of a cancel order business transaction compensating the before sent purchase order. We distinguish 2 one-way business transactions and four two-way business transactions. The type of transaction is indicated in the tagged value of business transaction type. The other tagged values provide quality of service parameters. A business transaction follows always the same pattern: A business transaction is performed between two authorized roles that are assigned to exactly one swimlane each. Each authorized role performs exactly one activity. An object flow between the requesting and the responding business activity is mandatory. Up to two object flows in the reverse direction are optional. If two object flows are defined as...</td>
</tr>
</tbody>
</table>
response, those are in an XOR relationship with each other (e.g., a purchase order is accepted or declined). According to the business transaction semantics, the requesting business activity does not end after sending the business information - it is still alive. The responding business activity may output the response which is returned to the still living requesting business activity.

<table>
<thead>
<tr>
<th>Tag Definition</th>
<th>businessTransactionType</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Enumeration with name TransactionPatterns consisting of the following values:</td>
</tr>
<tr>
<td></td>
<td>• Commercial Transaction</td>
</tr>
<tr>
<td></td>
<td>• Request/Confirm</td>
</tr>
<tr>
<td></td>
<td>• Query/Response</td>
</tr>
<tr>
<td></td>
<td>• Request/Response</td>
</tr>
<tr>
<td></td>
<td>• Notification</td>
</tr>
<tr>
<td></td>
<td>• Information Distribution</td>
</tr>
<tr>
<td><strong>Multiplicity</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The business transaction type determines a corresponding business transaction pattern. A business transaction pattern provides a language and grammar for constructing business transactions. The business transaction type follows one of the following six property-value conventions:</td>
</tr>
<tr>
<td></td>
<td>(1) Commercial Transaction - used to model the “offer and acceptance” business transaction process that results in a residual obligation between both parties to fulfill the terms of the contract</td>
</tr>
<tr>
<td></td>
<td>(2) Query/Response – used to query for information that a responding partner already has e.g. against a fixed data set that resides in a database</td>
</tr>
<tr>
<td></td>
<td>(3) Request/Response - used for business contracts when an initiating partner requests information that a responding partner already has and when the request for business information requires a complex interdependent set of results</td>
</tr>
<tr>
<td></td>
<td>(4) Request/Confirm - used if an initiating partner asks for information that requires only confirmation with respect to previously established contracts or with respect to a responding partner’s business rules</td>
</tr>
<tr>
<td></td>
<td>(5) Information Distribution - used to model an informal information exchange business transaction that therefore has no non-repudiation requirements</td>
</tr>
<tr>
<td></td>
<td>(6) Notification - used to model a formal information exchange business transaction that therefore has non-repudiation requirements</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tag Definition</th>
<th>isSecureTransportRequired</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Boolean</td>
</tr>
<tr>
<td><strong>Multiplicity</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Both partners must agree to exchange business information using a secure transport channel. The following security controls ensure that business document content is protected against unauthorized disclosure or modification and that business services are protected against unauthorized access. This is a point-to-point security requirement. Note that this requirement does not protect business information once it is off the network and inside an enterprise. The following are requirements for secure transport channels.</td>
</tr>
</tbody>
</table>
Authenticate sender identity – Verify the identity of the sender (employee or organization) that is initiating the interaction (authenticate). For example, a driver’s license or passport document with a picture is used to verify an individual’s identity by comparing the individual against the picture.

Authenticate receiver identity – Verify the identity of the receiver (employee or organization) that is receiving the interaction.

Verify content integrity – Verify the integrity of the content exchanged during the interaction i.e. check that the content has not been altered by a 3rd party.

Maintain content confidentiality – Confidentiality ensures that only the intended, receiver can read the content of the interaction. Information exchanged during the interaction must be encrypted when sent and decrypted when received. For example, you seal envelopes so that only the recipient can read the content.

### Stereotype

#### bTPartition (BusinessTransactionPartition)

<table>
<thead>
<tr>
<th><strong>Stereotype</strong></th>
<th>bTPartition (BusinessTransactionPartition)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Class</strong></td>
<td>Partition</td>
</tr>
<tr>
<td><strong>Parent</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>A business transaction partition is used to define an area of responsibility. An authorized role is appointed to a business transaction swimlane to indicate that this authorized role takes on the responsibility for the business action that is allocated within that area.</td>
</tr>
<tr>
<td><strong>Tag Definition</strong></td>
<td>No Tagged Values</td>
</tr>
</tbody>
</table>

#### BusinessAction (BusinessAction, abstract)

<table>
<thead>
<tr>
<th><strong>Stereotype</strong></th>
<th>BusinessAction (BusinessAction, abstract)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Class</strong></td>
<td>Action</td>
</tr>
<tr>
<td><strong>Parent</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>A business action is executed by an authorized role during a business transaction. Business action is an abstract stereotype. This means a business action is either a requesting business action or a responding business action.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Tag Definition</strong></th>
<th>isAuthorizationRequired</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Boolean</td>
</tr>
<tr>
<td><strong>Multiplicity</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>If an authorized role needs authorization to request a business action or to respond to a business action then the sender must sign the business document exchanged and the receiver must validate this business control and approve the authorizer. A receiver must signal an authorization exception if the sender is not authorized to perform the business activity. A sender must send notification of failed authorization if a receiver is not authorized to perform the responding business activity.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Tag Definition</strong></th>
<th>isNonRepudiationRequired</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>Boolean</td>
</tr>
<tr>
<td>Multiplicity</td>
<td>1</td>
</tr>
<tr>
<td>------------------</td>
<td>------------------</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The <em>isNonRepudiationRequired</em> tag is used to indicate that an involved party must not be able to repudiate the execution of the business action that input/outputs business information.</td>
</tr>
</tbody>
</table>

### isNonRepudiationReceiptRequired

<table>
<thead>
<tr>
<th><strong>Type</strong></th>
<th>Boolean</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Multiplicity</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>The <em>isNonRepudiationOfReceiptRequired</em> tag requires the receiver of a business information to send a signed receipt. The <em>isNonRepudiationOfReceiptRequired</em> tag indicates that an involved party must not be able to repudiate the execution of sending the signed receipt.</td>
</tr>
</tbody>
</table>

### timeToAcknowledgeReceipt

<table>
<thead>
<tr>
<th><strong>Type</strong></th>
<th>String (which must conform to a value of the W3C duration data type)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Multiplicity</strong></td>
<td>1</td>
</tr>
</tbody>
</table>
| **Description** | Both partners may agree to mutually verify receipt of business information within a specific time duration. Acknowledgements of receipt may be sent for both the requesting business information and the responding business information. This means the sender of the business information may be the requesting authorized role as well as the responding authorized role – it depends on whether a requesting or a responding business information is acknowledged. Similarly, the affirmant may be the requesting authorized role as well as the responding authorized role – again depending of which business information is acknowledged. Inasmuch we use the terms sender and affirmant in the explanation of acknowledgement of receipt semantics.  

An affirmant must exit the transaction if they are not able to verify the proper receipt of a business information within the agree timeout period. A sender must retry a business transaction if necessary or must send notification of failed business control (possibly revoking a contractual offer) if an affirmant does not verify properly receipt of a business information within the agreed time period. The time to acknowledge receipt is the maximum duration from the time a business information is sent by a sender until the time a verification of receipt is “properly received” by the sender (of the business information). Accordingly, the time to acknowledge receipt is always specified by the sender’s business action. This verification of receipt is an audit-able business signal and is instrumental in contractual obligation transfer during a contract formation process (e.g. offer/accept). |

### timeToAcknowledgeProcessing

<table>
<thead>
<tr>
<th><strong>Type</strong></th>
<th>String (which must conform to a value of the W3C duration data type)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Multiplicity</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Similarly to the <em>timeToAcknowledgeReceipt</em>, the sender of a business information might be the requesting authorized role as well as the responding authorized role – depending whether a requesting or a responding business information is acknowledged. Also the affirmant may be one of the two authorized roles. Thus,</td>
</tr>
</tbody>
</table>
we use again the terms sender and affirmant in the explanation of the acknowledgment of processing semantics.

Both partners may agree to the need for an acknowledgment of processing to be returned by a responding partner after the requesting business information passes a set of business rules and is handed over to the application for processing. The time to acknowledge processing of a business information is the duration from the time a sender sends a business information until the time an acknowledgement of processing is “properly received” by the sender (of the business information). Accordingly, the time to acknowledge processing is always specified by the sender’s business action. An affirmant must exit the transaction if they are not able to acknowledge processing of business information within the maximum timeout period. A sender must retry a business transaction if necessary or must send notification of failed business control (possibly revoking a contractual offer) if an affirmant does not acknowledge processing of business information within the agreed time period.

<table>
<thead>
<tr>
<th>isIntelligibleCheckRequired</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Multiplicity</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stereotype</th>
<th>ReqAction (RequestingBusinessAction)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Class</strong></td>
<td>Action</td>
</tr>
<tr>
<td><strong>Parent</strong></td>
<td>BusinessAction</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>A requesting business action is a business action that is performed by an authorized role requesting business service from another authorized role.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tag Definition</th>
<th>timeToRespond</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
<td>String (which must conform to a value of the W3C duration data type)</td>
</tr>
<tr>
<td><strong>Multiplicity</strong></td>
<td>1</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>Both partners may agree in case of a two-way business transaction that the responding authorized role must return the responding information business information within a specific duration. A responding authorized role must exit the transaction if they are not able to return the responding business information within the agreed timeout period. A requesting authorized role must retry a business transaction if necessary or must</td>
</tr>
</tbody>
</table>
send notification of failed business control (possibly revoking a contractual offer) if a responding authorized role does not deliver the responding business information within the agreed time period. The time to perform is the maximum duration from the time a requesting business information is sent by a requesting authorized role until the time a responding business information is “properly received” by the requesting authorized role in return.

<table>
<thead>
<tr>
<th>retryCount</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Multiplicity</strong></td>
</tr>
<tr>
<td><strong>Description</strong></td>
</tr>
</tbody>
</table>

**Inherited tagged values:**
- isAuthorizationRequired
- isNonRepudiationRequired
- isNonRepudiationReceiptRequired
- timeToAcknowledgeReceipt
- timeToAcknowledgeProcessing
- isIntelligibleCheckRequired

**Default assignment of tagged values for the requesting business action:**

<table>
<thead>
<tr>
<th></th>
<th>Time to Acknowledge Receipt</th>
<th>Time to Acknowledge Processing</th>
<th>Time to Respond</th>
<th>Is Authorization Required</th>
<th>Is Non Repudiation of Receipt Required</th>
<th>Retry Count</th>
<th>Is Intelligible Check Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Transaction</td>
<td>2h</td>
<td>6h</td>
<td>24h</td>
<td>TRUE</td>
<td>TRUE</td>
<td>3</td>
<td>TRUE</td>
</tr>
<tr>
<td>Request/Confirm</td>
<td>NULL</td>
<td>NULL</td>
<td>24h</td>
<td>FALSE</td>
<td>FALSE</td>
<td>3</td>
<td>TRUE</td>
</tr>
<tr>
<td>Request/Response</td>
<td>NULL</td>
<td>NULL</td>
<td>4h</td>
<td>FALSE</td>
<td>FALSE</td>
<td>3</td>
<td>TRUE</td>
</tr>
<tr>
<td>Query/Response</td>
<td>NULL</td>
<td>NULL</td>
<td>4h</td>
<td>FALSE</td>
<td>FALSE</td>
<td>3</td>
<td>TRUE</td>
</tr>
<tr>
<td>Notification</td>
<td>24h</td>
<td>NULL</td>
<td>NULL</td>
<td>FALSE</td>
<td>TRUE</td>
<td>3</td>
<td>TRUE</td>
</tr>
<tr>
<td>Information Distribution</td>
<td>NULL</td>
<td>NULL</td>
<td>NULL</td>
<td>FALSE</td>
<td>FALSE</td>
<td>0</td>
<td>TRUE</td>
</tr>
</tbody>
</table>
### Stereotype ResAction (RespondingBusinessAction)

<table>
<thead>
<tr>
<th>Base Class</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>Business Action</td>
</tr>
<tr>
<td>Description</td>
<td>A responding business activity is a business action that is performed by an authorized role responding to another authorized role’s request for business service.</td>
</tr>
</tbody>
</table>

#### Inherited tagged values:
- isAuthorizationRequired
- isNonRepudiationRequired
- isNonRepudiationReceiptRequired
- timeToAcknowledgeReceipt
- timeToAcknowledgeProcessing
- isIntelligibleCheckRequired

#### Tag Definition

Default assignment of tagged values for the responding business action:

<table>
<thead>
<tr>
<th>Commercial Transaction</th>
<th>Time to Acknowledge Receipt</th>
<th>Time to Acknowledge Processing</th>
<th>Is Authorization Required</th>
<th>Is Non Repudiation Required</th>
<th>Is Non Repudiation of Receipt Required</th>
<th>Is Intelligible Check Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>2h</td>
<td>6hr</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
<tr>
<td>Request/Confirm</td>
<td>2h</td>
<td>NULL</td>
<td>TRUE</td>
<td>FALSE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
<tr>
<td>Request/Response</td>
<td>NULL</td>
<td>NULL</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
</tr>
<tr>
<td>Query/Response</td>
<td>NULL</td>
<td>NULL</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
</tr>
<tr>
<td>Notification</td>
<td>NULL</td>
<td>NULL</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>TRUE</td>
</tr>
<tr>
<td>Information Distribution</td>
<td>NULL</td>
<td>NULL</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>TRUE</td>
</tr>
</tbody>
</table>

### Stereotype InfPin (InformationPin, abstract)

<table>
<thead>
<tr>
<th>Base Class</th>
<th>Pin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>The abstract concept information pin represents the incoming/outgoing point for business information in a business action. Business information is sent from the requesting authorized role to the responding authorized role or the reverse way. The actual exchanged information is represented using the type</td>
</tr>
</tbody>
</table>
business information. Both concrete stereotypes requesting information pin and responding information pin inherit from the abstract stereotype information pin.

<table>
<thead>
<tr>
<th>Tag Definition</th>
<th>isConfidential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Boolean</td>
</tr>
<tr>
<td>Multiplicity</td>
<td>1</td>
</tr>
<tr>
<td>Description</td>
<td>If the flag is set, the exchanged information is encrypted so that unauthorized parties cannot view the information.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>isTamperProof</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Multiplicity</td>
</tr>
<tr>
<td>Description</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>isAuthenticated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Multiplicity</td>
</tr>
<tr>
<td>Description</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stereotype</th>
<th>ReqInfPin (RequestingInformationPin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Class</td>
<td>Pin</td>
</tr>
<tr>
<td>Parent</td>
<td>InformationPin</td>
</tr>
<tr>
<td>Description</td>
<td>The requesting information pin is a container for business information that is sent from the requesting authorized role to the responding authorized role to indicate a state change in one or more business entities. This business state change might be irreversible in the case of a one-way business transaction or an interim state of a two-way business transaction. It is important to note that the term requesting information pin does not mean that the exchanged business information refers to a request in a business sense. The term requesting information pin indicates that the execution of a transaction is requested from the requesting authorized role to the responding authorized role – no matter whether this is an information distribution, a notification, a request, or the offer in a commercial transaction.</td>
</tr>
<tr>
<td>Tag Definition</td>
<td>Inherited tagged values:</td>
</tr>
<tr>
<td></td>
<td>- isConfidential</td>
</tr>
<tr>
<td></td>
<td>- isAuthenticated</td>
</tr>
<tr>
<td></td>
<td>- isTamperProof</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stereotype</th>
<th>ResInfPin (RespondingInformationPin)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Class</td>
<td>Pin</td>
</tr>
<tr>
<td>Parent</td>
<td>InformationPin</td>
</tr>
</tbody>
</table>
Description

The responding information pin is a container of business information that is sent in case of a two-way business transaction from the responding authorized role to the requesting authorized role in order to set one or more business entities in a final state (which were in an interim state before).

Tag Definition

Inherited tagged values:
- isConfidential
- isAuthenticated
- isTamperProof

5.2.2.4 Constraints (normative)

C.34. A BusinessTransactionView MUST contain exactly one BusinessTransactionUseCase, exactly two AuthorizedRoles, and exactly two participates associations.

C.35. A BusinessTransactionUseCase MUST be associated with exactly two AuthorizedRoles via stereotyped binary participates associations.

C.36. A BusinessTransactionUseCase MUST NOT include further UseCases

C.37. A BusinessTransactionUseCase MUST be included in at least one BusinessCollaborationUseCase.

C.38. A BusinessTransactionUseCase MUST NOT be source or target of an extend association.

C.39. The two AuthorizedRoles within a BusinessTransactionView MUST NOT be named identically

C.40. Exactly one BusinessTransaction MUST be placed beneath each BusinessTransactionUseCase.

This relationship MAY also be visualized by a realize relationship from the BusinessTransaction to the BusinessTransactionUseCase.

C.41. A BusinessTransaction MUST have exactly two partitions. Each of them MUST be stereotyped as BusinessTransactionPartition.

C.42. One of the two BusinessTransactionPartitions MUST contain one RequestingBusinessAction and the other one MUST contain one RespondingBusinessAction.

C.43. A BusinessTransactionPartition MUST have a classifier, which MUST be one of the associated AuthorizedRoles of the corresponding BusinessTransactionUseCase.

C.44. The two BusinessTransactionPartitions MUST have different classifiers.

C.45. The BusinessTransactionPartition containing the RequestingBusinessAction MUST contain two or more FinalStates. Each of the FinalStates MAY have a SharedBusinessEntityState as predecessor. One of the FinalStates SHOULD reflect a ControlFailure – this FinalState SHOULD NOT have a predeccessing SharedBusinessEntityState.

C.46. A RequestingBusinessAction MUST embed exactly one RequestingInformationPin

C.47. A RespondingBusinessAction MUST embed exactly one RequestingInformationPin

C.48. If the tagged value businessTransactionType of the BusinessTransaction is either Request/Response, Query/Response, Request/Confirm, or CommercialTransaction, then the RequestingBusinessAction MUST embed one to many RespondingInformationPins and the RespondingBusinessAction MUST embed one to many RespondingInformationPins.

C.49. If the tagged value businessTransactionType of the BusinessTransaction is either Notification or InformationDistribution, then both, the RequestingBusinessAction and the RespondingBusinessAction, MUST NOT embed a RespondingInformationPin

C.50. A RequestingBusinessAction and a RespondingBusinessAction MUST embed same number of RespondingInformationPins.


C.53. If a BusinessTransactionPartition contains SharedBusinessEntityStates, each SharedBusinessEntityState MUST be the target of exactly one control flow relationship starting from the RequestingBusinessAction and MUST be the source of exactly one control flow relationship targeting a FinalState.

C.54. Each FinalState MUST be the target of one to many control flow relationships starting from the RequestingBusinessAction or from a SharedBusinessEntityState.

C.55. Each RequestingInformationPin and each RespondingInformationPin MUST have a classifier, this classifier MUST be an InformationEnvelope or a subtype defined in an extension/specialization module.

C.56. Two RequestingInformationPins which are connected using an object flow MUST have the same classifier.

C.57. Two RespondingInformationPins which are connected using an object flow MUST have the same classifier.

5.2.2.5 Worksheets

<table>
<thead>
<tr>
<th>Form for Business Transaction Use Case</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Description</td>
</tr>
<tr>
<td><strong>Business Library Information</strong></td>
</tr>
<tr>
<td>UniqueIdentifier</td>
</tr>
<tr>
<td>BusinessTerm</td>
</tr>
<tr>
<td>VersionIdentifier</td>
</tr>
<tr>
<td>Status</td>
</tr>
<tr>
<td>Owner</td>
</tr>
<tr>
<td>Copyright</td>
</tr>
<tr>
<td>Reference(s)</td>
</tr>
<tr>
<td><strong>Details</strong></td>
</tr>
<tr>
<td>Requesting Role</td>
</tr>
<tr>
<td>Responding Role</td>
</tr>
<tr>
<td>--------------------------------------</td>
</tr>
<tr>
<td>Requesting Activity</td>
</tr>
<tr>
<td>Responding Activity</td>
</tr>
<tr>
<td>Is Included In (Name of Business Collaboration)</td>
</tr>
<tr>
<td><strong>Start/End Characteristics</strong></td>
</tr>
<tr>
<td>Affected Business Entities</td>
</tr>
<tr>
<td>Pre-condition</td>
</tr>
<tr>
<td>Post-condition</td>
</tr>
<tr>
<td>Begins When</td>
</tr>
<tr>
<td>Ends When</td>
</tr>
<tr>
<td>Exceptions</td>
</tr>
</tbody>
</table>

**Form for Business Transaction**

**General**

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
</tr>
</tbody>
</table>

**Business Library Information**

<table>
<thead>
<tr>
<th>UniqueIdentifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>BusinessTerm</td>
</tr>
<tr>
<td>VersionIdentifier</td>
</tr>
<tr>
<td>Status</td>
</tr>
<tr>
<td>Owner</td>
</tr>
<tr>
<td>Copyright</td>
</tr>
<tr>
<td>Reference(s)</td>
</tr>
</tbody>
</table>

**Details**
### Select Business Transaction Pattern

- [ ] Information Distribution
- [ ] Notification
- [ ] RequestResponse
- [ ] RequestConfirm
- [x] QueryResponse
- [ ] Commercial Transaction

### Secure Transport

### Requestor's Side

<table>
<thead>
<tr>
<th>Requesting Role</th>
<th>Requesting Business Action Name</th>
<th>Time to Respond</th>
<th>Time to Acknowledge Receipt</th>
<th>Time to Acknowledge Processing</th>
<th>Authorization Required</th>
<th>Non Repudiation Required</th>
<th>Non Repudiation of Receipt Required</th>
<th>Intelligible Check Required</th>
<th>Number of Retries</th>
</tr>
</thead>
</table>

### Responder's Side

<table>
<thead>
<tr>
<th>Responding Role</th>
<th>Responding Business Action Name</th>
<th>Time to Acknowledge Receipt</th>
<th>Time to Acknowledge Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Authorization Required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Repudiation Required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Repudiation of Receipt Required</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intelligible Check Required</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Business Information Envelopes**

**Requesting Information Envelope**

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are Contents Confidential?</td>
</tr>
<tr>
<td>Is the Envelope Tamperproof?</td>
</tr>
<tr>
<td>Authentication Required?</td>
</tr>
</tbody>
</table>

**Responding Information Envelope (add more Responding Information Envelopes if different response documents are possible)**

<table>
<thead>
<tr>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resulting Business Entity State (including transition condition)</td>
</tr>
<tr>
<td>Are Contents Confidential?</td>
</tr>
<tr>
<td>Is the Envelope Tamperproof?</td>
</tr>
<tr>
<td>Authentication Required?</td>
</tr>
</tbody>
</table>
5.2.2.6 Example (informative)

Figure 28 Business Transaction Use Case Example: Register Customer (including the optional realize relationship to the business transaction placed beneath)

Figure 29 Business Transaction Example: Register Customer
Figure 30 Business Transaction Use Case Example: Request For Quote (the optional realize relationship is not shown)

Figure 31 Business Transaction Example: Request For Quote

Figure 32 Business Transaction Use Case Example: Place Order (the optional realize relationship is not shown)
5.2.3 Business Collaboration View

5.2.3.1 Abbreviations of Stereotypes

<table>
<thead>
<tr>
<th>Stereotype Abbreviation</th>
<th>Full Stereotype Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>bCollaborationV</td>
<td>BusinessCollaborationView</td>
</tr>
<tr>
<td>AuthorizedRole</td>
<td>AuthorizedRole</td>
</tr>
<tr>
<td>bCollaborationUC</td>
<td>BusinessCollaborationUseCase</td>
</tr>
<tr>
<td>bCPartition</td>
<td>BusinessCollaborationPartition</td>
</tr>
<tr>
<td>bTransactionCall</td>
<td>BusinessTransactionCall</td>
</tr>
<tr>
<td>bCollaborationCall</td>
<td>BusinessCollaborationCall</td>
</tr>
<tr>
<td>bNestedCollaboration</td>
<td>NestedBusinessCollaboration</td>
</tr>
</tbody>
</table>
5.2.3.2 Conceptual Description (informative)

A BusinessCollaborationView is used to define the business choreography of exactly one business collaboration. This business choreography is specified by the concept of a BusinessCollaborationProtocol. The requirements of a BusinessCollaborationProtocol are captured by a BusinessCollaborationUseCase.


5.2.3.2.1 Business Collaboration Use Case Diagram

At least two authorized roles participate in a business collaboration use case. These authorized roles must be defined in the same business collaboration view package as the corresponding business collaboration use case. Accordingly, a BusinessCollaborationView is composed of two or more AuthorizedRoles. This means, if a certain role (e.g. buyer, seller, etc.) participates in multiple business collaborations, it requires a different authorized role for each business collaboration use case. Each authorized role of the same role (i.e., with the same name) is in a different namespace of a corresponding business collaboration view. Therefore, an authorized role participates in only one business collaboration use case – it is the one in the same business collaboration view. Accordingly, BusinessCollaborationUseCase and AuthorizedRole are related by a 1 to (2..n) association. This association is defined as a participates association. It is important to note, that the same authorized role is not associated twice to the same business collaboration use case.
A business collaboration use case may include additional business collaboration use cases. A business collaboration use case may optionally have multiple parent business collaboration use cases. Hence, BusinessCollaborationUseCase has a unary (0..n) to (0..n) include-composition. A business collaboration use case may include multiple business transaction use cases. A business transaction use case must be included in at least one business collaboration use case. Consequently, an (1..n) to (0..n) aggregation between BusinessCollaborationUseCase and BusinessTransactionUseCase exists. It is important that a business collaboration use case includes at minimum one use case – no matter whether this is a business collaboration use case or a business transaction use case. A hierarchy of business collaboration use cases built by include-compositions must not include any cycles. A business transaction uses case cannot be further decomposed by an include-association.

A business collaboration use case may be extended by additional business collaboration use cases. A business collaboration use case may optionally extend multiple business collaboration use cases. Hence, BusinessCollaborationUseCase has a unary (0..n) to (0..n) extend-association.

5.2.3.2.2 Business Collaboration Protocol Diagram

A business choreography view is used to define the business choreography of exactly one business collaboration. The BusinessCollaborationProtocol follows exactly the requirements defined by the corresponding BusinessCollaborationUseCase. The business collaboration protocol that describes the business collaboration use case is defined as a child beneath. Accordingly, each BusinessCollaborationUseCase has exactly one BusinessCollaborationProtocol beneath. A business collaboration protocol is a “composite” UML Activity. The diagram of a business collaboration protocol is described by a flow of UML Actions.


The collaborative actions of a business collaboration protocol are business collaboration calls and/or business transaction calls. Hence, a BusinessCollaborationProtocol is composed of zero to many BusinessCollaborationCalls and of zero to many BusinessTransactionCalls. However, at least one business collaboration call or at least one Business Transaction Call must be present in a business collaboration protocol. Transitions defining the flow among the business collaboration activities and/or business transaction activities may be guarded by the states of business entities.

A business collaboration call is characterized by the fact that it is executed by calling a business collaboration protocol. This calling behavior is accomplished by classifying the behavior of the business collaboration call by the desired business collaboration protocol. Not every business collaboration protocol is a called by a business collaboration call. A business collaboration protocol may be called by multiple business collaboration calls. Thus, the behavioral classifying relationship between BusinessCollaborationAction and BusinessCollaborationProtocol is (0..n) to 1.
A Business Transaction Call is characterized by the fact that it is executed by calling a business transaction. This calling behavior is accomplished by classifying the behavior of the Business Transaction Call by the desired business transaction. Since the business transaction is a concept of the business transaction view it is described in more detail above. Each business transaction must be at least once used to refine a Business Transaction Call. A business transaction may be called by many Business Transaction Calls. Hence, the behavioral classifying relationship between BusinessTransactionCall and BusinessTransaction is (1..n) to 1.

In many scenarios, there is a requirement for a nested business collaboration within the scope of execution of a given Business Transaction Call. In other words, before a responding authorized role can send a response as required by the Business Transaction Call that calls a two-way business transaction, the responding authorized role has to first participate in a business collaboration with other business partners. UMM supports this scenario by introducing the concept of a NestedBusinessCollaboration. Like the business collaboration call, the NestedBusinessCollaboration is characterized by the fact that it is executed by calling another business collaboration protocol. This calling behavior is accomplished by classifying the behavior of the NestedBusinessCollaboration by the desired business collaboration protocol. Not every business collaboration protocol is called by a NestedBusinessCollaboration. A business collaboration protocol may be called by multiple NestedBusinessCollaborations. Thus, the behavioral classifying relationship between NestedBusinessCollaboration and BusinessCollaborationProtocol is (0..n) to 1. However, unlike the business collaboration call, the NestedBusinessCollaboration must reside within a business collaboration partition representing the responding authorized role of a given Business Transaction Call. Accordingly, not every business collaboration partition representing a Business Transaction Call responding role includes a NestedBusinessCollaboration. Thus, there is a 1 to (0..n) composition between a BusinessCollaborationPartiton and a NestedBusinessCollaboration.

In UMM 2.0, role mapping between business collaboration authorized roles and either called business transaction authorized roles or business collaboration protocol authorized roles is defined in the business collaboration protocol and no longer by the business collaboration use case. This role mapping is accomplished by information flows and specializations of information flows, i.e. InitiatingFlow and RespondingFlow, between either business collaboration partitions or nested collaborations and either business collaboration calls or Business Transaction Calls. Using the approach also enhances the business collaboration protocol by graphically illustrating the relationships between authorized roles and the choreography of actions within a business collaboration protocol. This mapping approach is defined by the following cases:

1. **From business collaboration partitions to business collaboration calls.** The UML 2.0 Information flow is used. The source of Information flow must be the business collaboration partition and the target must be the business collaboration call. This means that the authorized role in this business collaboration protocol is participating in the called business collaboration protocol. Therefore the calling business collaboration protocol must have at least the same number of business collaboration partitions as the number of business collaboration partitions in the called business collaboration protocol. There are two cases for defining a role mapping:

   - The authorized role name of the calling business collaboration protocol maps to an authorized role in the called business collaboration protocol which has exactly the same name. In this case, the information flow association explicitly defines the role mapping between these two roles.
• The authorized role name of the calling business collaboration protocol maps to an authorized role in the called business collaboration protocol which has a different name. In this case, the information flow association must be classified by the authorized role of the called business collaboration protocol.

2. From business collaboration partitions to Business Transaction Calls. In this case two specializations of the Information flow are used, InitiatingFlow and RespondingFlow. In all cases an authorized role of a business collaboration protocol initiates a Business Transaction Call, which calls a business transaction, which also has an initiating authorized role. To provide this role mapping the business collaboration partition classified by an authorized role is the source of the InitiatingFlow and the Business Transaction Call is the target. Likewise for two-way business transactions, a business collaboration partition is the source of the RespondingFlow and the Business Transaction Call is the target.

3. From Business Transaction Calls to business collaboration partitions. In this case two specializations of the Information Flow are used, InitiatingFlow and RespondingFlow. In all cases an authorized role of a business collaboration protocol responds to a Business Transaction Call which calls a business transaction which also has a responding authorized role. To provide this role mapping the Business Transaction Call is the source of an InitiatingFlow and a business collaboration partition is the target. Therefore the authorized role that classifies the business collaboration partition maps to the responding business transaction authorized role. Likewise, for two-way business transactions, a Business Transaction Call is the source of a RespondingFlow and a business collaboration partition is the target.

4. From Business Transaction Calls to nested business collaborations. In this case only one specialization of the Information Flow is used, InitiatingFlow. The source of the InitiatingFlow is a Business Transaction Call and the target is a nested business collaboration. This means that the responding authorized role of the business transaction initiates the business collaboration protocol called by the nested business collaboration and therefore maps to initiating authorized role of the called business collaboration protocol.

5. From nested business collaborations to Business Transaction Calls. In this case only one specialization of the Information Flow is used, RespondingFlow and only applies in the case of two-way business transactions. The RespondingFlow indicates that the called business collaboration has completed and the responding authorized role can now return the response envelope to the initiating authorized role. The NestedBusinessCollaboration is the source of the RespondingFlow and a Business Transaction Call is the target.
### 5.2.3.3 Stereotypes and Tag Definitions (normative)

#### Stereotype: `bCollaborationUC (BusinessCollaborationUseCase)`

<table>
<thead>
<tr>
<th><strong>Base Class</strong></th>
<th>UseCase</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent</strong></td>
<td>bProcessUC (Business Process Use Case)</td>
</tr>
<tr>
<td><strong>Description</strong></td>
<td>A business collaboration use case describes in detail the requirements on the collaboration between two or more involved partners. Business partner types take part in a business collaboration use case by playing an authorized role in it. A business collaboration use case can be broken down into further business collaboration use cases and business transaction use cases. A business collaboration use case may extend another business collaboration use case.</td>
</tr>
<tr>
<td><strong>Tag Definition</strong></td>
<td><strong>context</strong></td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>String</td>
</tr>
<tr>
<td>Stereotype</td>
<td>bCollaborationProtocol (BusinessCollaborationProtocol)</td>
</tr>
<tr>
<td>------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>Base Class</td>
<td>Activity</td>
</tr>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>A business collaboration protocol choreographs Business Transaction Calls and/or business collaboration calls. At least one action of either one must be present. A business collaboration protocol is a long running transaction that does not meet the atomic principle of transactions. It should be used in cases where transaction rollback is inappropriate.</td>
</tr>
<tr>
<td>Tag Definition</td>
<td>No Tagged Values.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stereotype</th>
<th>bCPartition (BusinessCollaborationPartition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Class</td>
<td>ActivityPartition</td>
</tr>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>A business collaboration partition is used to define an area of responsibility. The business collaboration partition is always classified by an authorized role defined as a participant in the corresponding business collaboration use case. A business collaboration partition may be empty. It is not empty in the special case of a nested collaboration. A nested collaboration must be placed within the business collaboration partition of the authorized role which is the responding authorized role in the triggering Business Transaction Call and which will initiate the nested collaboration.</td>
</tr>
</tbody>
</table>

Inherited tagged values:
- definition
- beginsWhen
- preCondition
- endsWhen
- postCondition
- exceptions
- actions

<table>
<thead>
<tr>
<th>Multiplicity</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td>Describes the context (e.g., geo-political, industry, product, official constraints,...) of the given business collaboration</td>
</tr>
</tbody>
</table>
### Stereotype `bTransactionAction` (BusinessTransactionCall)

<table>
<thead>
<tr>
<th>Base Class</th>
<th>CallBehaviorAction (Action with call behaviour action kind)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>A Business Transaction Call is an action within a business collaboration protocol. This action is refined by using the call behaviour to classify the behaviour of this Business Transaction Call by one and only one business transaction. The Business Transaction Call executes the called business transaction. The Business Transaction Call can be executed more than once at the same time if the “isConcurrent” property is true.</td>
</tr>
</tbody>
</table>

#### Tag Definition `timeToPerform`

<table>
<thead>
<tr>
<th>Type</th>
<th>String (which must conform to a value of the W3C duration data type)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiplicity</td>
<td>1</td>
</tr>
<tr>
<td>Description</td>
<td>A Business Transaction Call has to be executed within a specific duration. The initiating partner must send a failure notification to a responding partner on timeout. A responding partner simple terminates its activity. The time to perform is the maximum duration between the moment the requesting authorized role initiates the Business Transaction Call, i.e. sending the requesting business information envelope, and the moment the requesting authorized role receives a substantive response. The substantive response is the responding business information envelope if there is any. In case not, it is the acknowledgement of processing, if any. If not it is the acknowledgement of receipt, if any.</td>
</tr>
</tbody>
</table>

#### Tag Definition `isConcurrent`

<table>
<thead>
<tr>
<th>Type</th>
<th>Boolean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiplicity</td>
<td>1</td>
</tr>
<tr>
<td>Description</td>
<td>If the Business Transaction Call is concurrent then more than one Business Transaction Call of the same underlying business transaction can be open at one time in executing the same business collaboration with the same business partner type. If the Business Transaction Call is not concurrent then only one Business Transaction Call of the same underlying business transaction can be open at one time.</td>
</tr>
</tbody>
</table>

### Stereotype `bCollaborationAction` (BusinessCollaborationCall)

<table>
<thead>
<tr>
<th>Base Class</th>
<th>CallBehaviorAction (Action with call behaviour action kind)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>A business collaboration call is an action within a business collaboration protocol. This business collaboration call is refined by using the call behaviour to classify the behaviour of this business collaboration call by one and only one business collaboration protocol. The business choreography action executes the called business collaboration protocol exactly once. It follows, that business collaboration protocols might be recursively nested.</td>
</tr>
</tbody>
</table>

Tag Definition | No Tagged Values |
### Stereotype: NestedBCollaboration (NestedBusinessCollaboration)

<table>
<thead>
<tr>
<th>Base Class</th>
<th>Action with call behaviour action kind (CallBehaviorAction)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Description**

A nested business collaboration represents the case where the responding authorized role of a Business Transaction Call after receiving a requesting information envelope which is represented as an initFlow (InitiatingFlow) must carry out an additional business collaboration protocol with other business partners before responding to the initiating authorized role of a given Business Transaction Call indicated by a reFlow (RespondingFlow). This nested business collaboration is refined by using the call behaviour to classify the behaviour of this nested business collaboration by one and only one business collaboration protocol. The nested collaboration executes the called business collaboration protocol exactly once.

**Tag Definition**

No tagged values.

---

### Stereotype: initFlow (InitiatingFlow)

<table>
<thead>
<tr>
<th>Base Class</th>
<th>Information Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Description**

The initiating flow represents the following two cases:

- The initiating flow of information that triggers the execution of a Business Transaction Call. The source of the initiating flow is the business collaboration partition that is classified by the authorized role initiating the Business Transaction Call and the target is the Business Transaction Call. In this case the initiating flow provides the authorized role mapping between the initiating role of the Business Transaction Call and the initiating authorized role of the business transaction that is called by this Business Transaction Call.
- The initiating flow of information that triggers an execution on the responder’s side. The source of this initiating flow is the Business Transaction Call and the target is the business collaboration partition which is classified by the authorized role responding in the Business Transaction Call. In this case the initiating flow provides the authorized role mapping between the responding role of the Business Transaction Call and the responding authorized role of the business transaction that is called by this Business Transaction Call. In the special case that the initiating flow triggers a nested business collaboration, the target of the initiating flow is not the business collaboration partition, but the nested business collaboration residing within this business collaboration partition.

**Tag Definition**

No tagged values.

---

### Stereotype: reFlow (RespondingFlow)

<table>
<thead>
<tr>
<th>Base Class</th>
<th>Information Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**Description**

The responding flow in case of two-way transactions represents the following two cases:

- The responding flow of information that completes the execution of a Business Transaction Call. The source of the responding flow is the business collaboration partition that is classified by the
authorized role responding in the Business Transaction Call and the target is the Business Transaction Call. In the special case that the responding flow is started after a nested business collaboration has completed, the source of the responding flow is not the business collaboration partition, but the nested business collaboration residing within this business collaboration partition.

- The responding flow of information that completes the Business Transaction Call on the initiator’s side. The source of this initiating flow is the Business Transaction Call and the target is the business collaboration partition which is classified by the authorized role initiating the Business Transaction Call.

**Tag Definition**

No tagged values.

### 5.2.3.4 Constraints (normative)

- **C.58.** A BusinessCollaborationView MUST contain exactly one BusinessCollaborationUseCase.
- **C.59.** A BusinessCollaborationView MUST contain two to many AuthorizedRoles.
- **C.60.** A BusinessCollaborationUseCase MUST have two to many participates associations to AuthorizedRoles contained in the same BusinessCollaborationView.
- **C.61.** Each AuthorizedRole contained in the BusinessCollaborationView MUST have exactly one participates association to the BusinessCollaborationUseCase included in the same BusinessCollaborationView.
- **C.62.** A BusinessCollaborationUseCase MUST have one to many include relationships to another BusinessCollaborationUseCase or to a BusinessTransactionUseCase.
- **C.63.** Exactly one BusinessCollaborationProtocol MUST be placed beneath each BusinessCollaborationUseCase. This relationship MAY also be visualized by a realize relationship from the BusinessCollaborationProtocol to the BusinessCollaborationUseCase.
- **C.64.** A BusinessCollaborationProtocol MUST contain one to many BusinessTransactionCalls and/or BusinessCollaborationCall.
- **C.65.** Each BusinessTransactionCall MUST call exactly one BusinessTransaction.
- **C.66.** Each BusinessTransaction called by a BusinessTransactionCall MUST be placed beneath a BusinessTransactionUseCase which is included in the BusinessCollaborationUseCase that covers the corresponding BusinessCollaborationProtocol.
- **C.69.** The number of AuthorizedRoles in the BusinessCollaborationView MUST match the number of BusinessCollaborationPartitions in the BusinessCollaborationProtocol which is placed beneath the BusinessCollaborationUseCase of the same BusinessCollaborationView.
- **C.70.** Each AuthorizedRole in the BusinessCollaborationView MUST be assigned to a BusinessCollaborationPartition in the BusinessCollaborationProtocol which is placed beneath the BusinessCollaborationUseCase of the same BusinessCollaborationView.
- **C.71.** Each BusinessCollaborationPartition MUST be classified by exactly one AuthorizedRole included in the same BusinessCollaborationView as the BusinessCollaborationUseCase covering the BusinessCollaborationProtocol containing this BusinessCollaborationPartition.
- **C.72.** A BusinessCollaborationPartition MUST be either empty or contain one to many NestedBusinessCollaborations.
C.73. Each BusinessTransactionCall MUST be the target of exactly one InitialFlow which source
         MUST be a BusinessCollaborationPartition.

C.74. Each BusinessTransactionCall MUST be the source of exactly one InitialFlow which target
         MUST be either a BusinessCollaborationPartition or a NestedBusinessCollaboration.

C.75. The InitialFlow sourcing from a BusinessTransactionCall and the InitialFlow targeting a
         BusinessTransactionCall MUST NOT be targeting to / sourcing from the same
         BusinessCollaborationPartition, nor targeting to a NestedBusinessCollaboration within the same
         BusinessCollaborationPartition.

C.76. If a BusinessTransactionCall calls a two-way BusinessTransaction, this
         BusinessTransactionCall MUST be the source of exactly one RespondingFlow which target MUST be a
         BusinessCollaborationPartition.

C.77. If a BusinessTransactionCall calls a two-way BusinessTransaction, this
         BusinessTransactionCall MUST be the target of exactly one RespondingFlow which source MUST be
         either a BusinessCollaborationPartition or a NestedBusinessCollaboration.

C.78. The RespondingFlow sourcing from a BusinessTransactionCall and the RespondingFlow
         targeting a BusinessTransactionCall MUST NOT be targeting to / sourcing from the same
         BusinessCollaborationPartition, nor targeting to a NestedBusinessCollaboration within the same
         BusinessCollaborationPartition.

C.79. If a BusinessTransactionCall calls a one-way BusinessTransaction, this
         BusinessTransactionCall MUST NOT be the source of a RespondingFlow and MUST NOT be the target
         of a RespondingFlow.

C.80. The RespondingFlow targeting a BusinessTransactionCall must start from the
         BusinessCollaborationPartition / NestedBusinessCollaboration which is the target of the InitialFlow
         starting from the same BusinessTransactionCall.

C.81. The RespondingFlow starting from a BusinessTransactionCall must target the
         BusinessCollaborationPartition which is the source of the InitialFlow targeting to the same
         BusinessTransactionCall.

C.82. A NestedBusinessCollaboration MUST be the target of exactly one InitialFlow.

C.83. A NestedBusinessCollaboration MAY be the source of a RespondingFlow, but MUST NOT be
         the source of more than one RespondingFlow.

C.84. A BusinessCollaborationCall MUST be the target of two to many InformationFlows (UML
         standard: <<flow>>).

C.85. A BusinessCollaborationCall MUST not be the source of an InformationFlow.

C.86. A BusinessCollaborationCall MUST not be the source and MUST not be the target of an
         InitialFlow.

C.87. A BusinessCollaborationCall MUST not be the source and MUST not be the target of a
         RespondingFlow.

C.88. A BusinessTransactionCall MUST not be the source and MUST not be the target of an
         InformationFlow (<<flow>>) that is neither stereotyped as InitialFlow nor as RespondingFlow nor is
         of type <<flow>>.

C.89. A NestedBusinessCollaboration MUST not be the source and MUST not be the target of an
         InformationFlow that targets to / sources from a BusinessCollaborationCall.

C.90. The number of InformationFlows targeting a BusinessCollaborationCall MUST match the
         number of BusinessCollaborationPartitions contained in the BusinessCollaborationProtocol that is
         called by this BusinessCollaborationCall.
Either an AuthorizedRole classifying a BusinessCollaborationPartition that is the source of an InformationFlow (UML standard: <<flow>>) targeting a BusinessCollaborationCall MUST match an AuthorizedRole classifying a BusinessCollaborationPartition in the BusinessCollaborationProtocol that is called by this BusinessCollaborationCall or the InformationFlow must be classified by an AuthorizedRole classifying a BusinessCollaborationPartition in the BusinessCollaborationProtocol that is called by this BusinessCollaborationCall.

### 5.2.3.5 Worksheets

<table>
<thead>
<tr>
<th>Form for Business Collaboration Use Case</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
</tr>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Description</td>
</tr>
<tr>
<td><strong>Business Library Information</strong></td>
</tr>
<tr>
<td>UniqueIdentifier</td>
</tr>
<tr>
<td>BusinessTerm</td>
</tr>
<tr>
<td>VersionIdentifier</td>
</tr>
<tr>
<td>Status</td>
</tr>
<tr>
<td>Owner</td>
</tr>
<tr>
<td>Copyright</td>
</tr>
<tr>
<td>Reference(s)</td>
</tr>
<tr>
<td><strong>Participants</strong></td>
</tr>
<tr>
<td>Participating Role</td>
</tr>
<tr>
<td>Participating Role</td>
</tr>
<tr>
<td>[add more participating roles in case of a multiparty collaboration]</td>
</tr>
<tr>
<td>Is Included In (Name of parent Business Collaboration – if there is any)</td>
</tr>
<tr>
<td><strong>Start/End Characteristics</strong></td>
</tr>
<tr>
<td>Affected Business Entities</td>
</tr>
<tr>
<td>Pre-condition</td>
</tr>
<tr>
<td>Post-condition</td>
</tr>
<tr>
<td>Begins When</td>
</tr>
<tr>
<td>Ends When</td>
</tr>
<tr>
<td>Exceptions</td>
</tr>
</tbody>
</table>

**Included Business Transaction Use Cases (add more Business Transaction Use Cases if needed)**

| Business Transaction Use Case Name |  |
| Business Transaction Use Case Name |  |
| Business Transaction Use Case Name |  |
| Business Transaction Use Case Name |  |
| Business Transaction Use Case Name |  |

**Form for Business Collaboration Protocol**

**General**

| Name |  |
| Description |  |

**Participants (copy from Business Collaboration Use Case Worksheet)**

| Participating Role |  |
| Participating Role |  |
| [add more participating roles if elicited in the Business Collaboration Use Case Worksheet] |  |

**Included Business Transaction Calls / Business Collaboration Calls**

<p>| Business Transaction Call |  |
| Name |  |</p>
<table>
<thead>
<tr>
<th>Preceding Action(s) including transition condition</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Initiating Role</td>
<td>[select one participating role from above]</td>
</tr>
<tr>
<td>Reacting Role</td>
<td>[select one participating role from above]</td>
</tr>
</tbody>
</table>

**Business Transaction Call**

<table>
<thead>
<tr>
<th>Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Preceding Action(s) including transition condition</td>
<td></td>
</tr>
<tr>
<td>Initiating Role</td>
<td>[select one participating role from above]</td>
</tr>
<tr>
<td>Reacting Role</td>
<td>[select one participating role from above]</td>
</tr>
</tbody>
</table>

**Business Transaction Call [add more if needed]**

<table>
<thead>
<tr>
<th>Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Preceding Action(s) including transition condition</td>
<td></td>
</tr>
<tr>
<td>Initiating Role</td>
<td>[select one participating role from above]</td>
</tr>
<tr>
<td>Reacting Role</td>
<td>[select one participating role from above]</td>
</tr>
</tbody>
</table>

**Business Collaboration Call [delete if not required or add more if needed]**

<table>
<thead>
<tr>
<th>Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Preceding Action(s) including transition condition</td>
<td></td>
</tr>
<tr>
<td>Initiating Role</td>
<td>[select one participating role from above]</td>
</tr>
<tr>
<td>Reacting Role</td>
<td>[select one participating role from above]</td>
</tr>
</tbody>
</table>

**Role Mapping**

<table>
<thead>
<tr>
<th>Role Mapping</th>
<th>Role in this Business Collaboration</th>
<th>Role in the nested Business Collaboration</th>
</tr>
</thead>
</table>

**Role Mapping**

<table>
<thead>
<tr>
<th>Role Mapping</th>
<th>Role in this Business Collaboration</th>
<th>Role in the nested Business Collaboration</th>
</tr>
</thead>
</table>

[add more Role Mappings if required]
5.2.3.6 Normal Business Collaboration View Example (informative)

Figure 36 Business Collaboration Use Case Example: Register Customer (including the optional realize relationships)

Figure 37 Business Collaboration Protocol Example: Register Customer
5.2.3.7 Nested Business Collaboration View Example (informative)

In this example the Order from Quote example is modified to show an example of a Nested Collaboration. Before the Seller can either accept or reject the Buyer’s order, the seller must confirm the order with his/her business partners. If this confirmation is unsuccessful, it follows that the Seller will respond by sending a negative response message (e.g. OrderRejectEnvelope) to the Buyer.
Figure 40 Business Collaboration Use Case Example: Order From Quote (the optional realize relationships are not shown)

Figure 41 Business Collaboration Protocol Example: Order from Quote (with nested collaboration)
Figure 42 Business Collaboration Use Case Example: Confirm Order With Partners the optional realize relationships are not shown)
5.2.4 Business Realization View

5.2.4.1 Abbreviations and Stereotypes

<table>
<thead>
<tr>
<th>Stereotype Abbreviation</th>
<th>Full Stereotype Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>bChoreographyV</td>
<td>BusinessChoreographyView</td>
</tr>
<tr>
<td>bRealizationV</td>
<td>BusinessRealizationView</td>
</tr>
<tr>
<td>bRealizationUC</td>
<td>BusinessRealizationUseCase</td>
</tr>
<tr>
<td>bCollaborationUC</td>
<td>BusinessCollaborationUseCase</td>
</tr>
<tr>
<td>bPartner</td>
<td>BusinessPartner</td>
</tr>
<tr>
<td>bProcessUC</td>
<td>BusinessProcessUseCase</td>
</tr>
</tbody>
</table>
5.2.4.2 Conceptual Description (informative)

Business partners identified in the previous business requirements view must not directly be associated with business collaboration use cases and business transaction use cases. In order to specify that a specific set of business partners collaborate, we use the concept of a business realization use case. Each business realization use case is defined in its own business realization view. Accordingly, the BusinessRealizationView is composed of exactly one BusinessRealizationUseCase. A business realization use case realizes exactly one business collaboration use case. Each business collaboration use case may be realized by multiple business realization use cases. Not each business collaboration use case (e.g. one that is nested within another one) needs to have a corresponding business realization use case. As a consequence, the realizes-association between a BusinessCollaborationUseCase and BusinessRealizationUseCase is a 1 to (0..n).

Two or more authorized roles participate in a business realization use case. These authorized roles (e.g. seller, payee) must be defined in the same business realization view package as the corresponding business realization use case. Accordingly a BusinessRealizationView is composed of two or more AuthorizedRoles. Usually, the names of the authorized roles participating in the business collaboration use case (e.g. payer...
and payee) will be the names of the authorized roles in the business realization use case (e.g. payer and payee) realizing it. However, the authorized roles participating in the business collaboration use case and the business realization use case will be defined in different namespaces – each in the package of the corresponding view. In Figure 46 the authorized role Buyer on the lower left hand side participates in the business collaboration use case. It is defined in a different namespace than the Buyer participating in the business realization use case.

Similar to the business collaboration use case, the BusinessRealizationUseCase and AuthorizedRole are related by an 1 to (2..n) association. Furthermore, the number of actors participating in a business collaboration use case must be the same as the number of actors participating in the business realization use case realizing it.

In order to bind a business realization use case to the business partners executing it, business partners are mapped to the authorized roles participating in the business realization use case. It is required that each authorized role of a business realization use case (but not an authorized role in general) is target of exactly one mapsTo-association from a business partner. A business partner may play multiple authorized roles of a business realization use case. Consequently, there is a (0..1) to (0..n) mapsTo-association between BusinessPartner and AuthorizedRole.
### 5.2.4.3 Stereotypes and Tag Definitions (normative)

#### Figure 45 BusinessRealizationView - Abstract Syntax

<table>
<thead>
<tr>
<th>Stereotype</th>
<th>bRealizationUC (BusinessRealizationUseCase)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Base Class</strong></td>
<td>UseCase</td>
</tr>
<tr>
<td><strong>Parent</strong></td>
<td>N/A</td>
</tr>
</tbody>
</table>
A business realization use case realizes a business collaboration use case between a specific set of business partners. The requirements of the business realization use case are the ones defined in the tags of the corresponding business collaboration use case. Thus, the business realization use case does not include any tag definitions for capturing requirements.

### Stereotype: AuthorizedRole (AuthorizedRole)

<table>
<thead>
<tr>
<th>Description</th>
<th>No tagged values</th>
</tr>
</thead>
</table>

### Stereotype: mapsTo (mapsTo)

<table>
<thead>
<tr>
<th>Description</th>
<th>A mapsTo dependency represents (1) the fact, that a business partner plays a certain authorized role in a business realization use case and (2) the fact, that an authorized role of a source business collaboration use case takes on a certain authorized role in a target business transaction use case or business collaboration use case.</th>
</tr>
</thead>
</table>

### 5.2.4.4 Constraints (normative)

- **C.92.** A `BusinessRealizationView` MUST contain exactly one `BusinessRealization`, two to many `AuthorizedRoles`, and two to many `participates` associations.
- **C.93.** A `BusinessRealization` MUST be associated with two to many `AuthorizedRoles` via stereotyped binary `participates` associations.
- **C.94.** A `BusinessRealization` MUST be the source of exactly one realization dependency to a `BusinessCollaborationUseCase`.
- **C.95.** A `BusinessRealization` MUST NOT be the source or target of an `include` or `extends` association.
- **C.96.** All dependencies from/to an `AuthorizedRole` must be stereotyped as `mapsTo`.
- **C.97.** An `AuthorizedRole`, which participates in a `BusinessRealization`, must be the target of exactly one `mapsTo` dependency starting from a `BusinessPartner`. Furthermore the `AuthorizedRole`, which participates in the `BusinessRealization` must be the source of exactly one `mapsTo` dependency targeting an `AuthorizedRole` participating in a `BusinessCollaborationUseCase`.
- **C.98.** `AuthorizedRoles` in a `BusinessRealizationView` must have a unique name within the scope of the package, they are located in
C.99. The number of AuthorizedRoles participating in a BusinessCollaborationUseCase MUST match the number of AuthorizedRoles participating in the BusinessRealization realizing this BusinessCollaborationUseCase.

5.2.4.5 Example (informative)

Figure 46 BusinessRealizationView - Example: Realization of the OrderFromQuote Collaboration between Purchasing Organization and SellingOrganization
5.3 Business Information View

5.3.1 Abbreviations of Stereotypes

<table>
<thead>
<tr>
<th>Stereotype Abbreviation</th>
<th>Full Stereotype Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>bInformationV</td>
<td>BusinessInformationView</td>
</tr>
<tr>
<td>bInformation</td>
<td>BusinessInformation</td>
</tr>
<tr>
<td>InfEnvelope</td>
<td>Information Envelope</td>
</tr>
</tbody>
</table>

5.3.2 Conceptual Description (informative)

A BusinessInformationView is a container of artifacts that describe the information exchanged in a BusinessTransaction. As previously mentioned, RequestingInformationPin and RespondingInformationPin are classified by an InformationEnvelope which is a subclass of a BusinessInformation. A BusinessInformation serves as an abstract container for all of the information exchanged between the RequestingAction and the RespondingAction or vice versa, respectively. The stereotypes BusinessInformation and InformationEnvelope is part of the UMM base module and imported into the UMM foundation module.

The current UMM foundation module does not mandate a specific business information modeling approach. All methodologies and rules to build quality class diagrams can be used in order to model the exchanged information, as long as the root element of the data structure generalizes the InformationEnvelope class being part of the UMM base module.

However, UMM strongly suggests using UN/CEFACT’s Core Components and Core Components Message Assembly artifacts to model the business information. Because Core Components are syntax independent and stereotyped, the usage of the UML Profile for Core Components is suggested within the BusinessInformationView.
5.3.3 Stereotypes and Tag Definitions (normative)

Figure 48 BusinessInformationView - Abstract Syntax

<table>
<thead>
<tr>
<th>Stereotype</th>
<th>bInformation (BusinessInformation)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Class</td>
<td>Class</td>
</tr>
<tr>
<td>Parent</td>
<td>N/A</td>
</tr>
<tr>
<td>Description</td>
<td>A BusinessInformation realizes abstract business document information that is exchanged between authorized roles performing activities in a business transaction. Since a BusinessInformation is defined as abstract it cannot be used directly in order to set the type of exchanged information in a BusinessInformation. Instead the concept of an InformationEnvelope is used.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stereotype</th>
<th>InfEnvelope (InformationEnvelope)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Class</td>
<td>Class</td>
</tr>
<tr>
<td>Parent</td>
<td>BusinessInformation</td>
</tr>
<tr>
<td>Description</td>
<td>An InformationEnvelope is a subtype of a BusinessInformation and represents a concrete business message which is exchanged in a UMM business transaction. Any business document artifacts are connected to an InformationEnvelope using associations.</td>
</tr>
</tbody>
</table>

5.3.4 Constraints (normative)

C.100. A BusinessInformationView MUST contain one to many InformationEnvelopes or subtypes thereof defined in any other extension/specialization module. Furthermore, it MAY contain any other document modeling artifacts.
5.3.5 Example using UPCC (UML Profile for Core Components) (informative)

The following example shows how to model the information exchanged in a BusinessTransaction using the UML Profile for Core Components (UPCC). Figure 49 shows how UMM and UPCC are related to each other on the meta-level.

An information envelope has exactly one message assembly (MA) which serves as the root element of the business document. The root message assembly (MA) has an optional standard business document header (SBDH) which serves for identification purposes of technical sender and receiver, document type etc. A standard business document header is defined in the Standard Business Document Header specification of UN/CEFACT.

The root message assembly is connected to the information envelope using a standard UML aggregation. Message assemblies are used to assemble different aggregate business information entities (ABIE) to a specific business document. Association message assemblies (ASMA) are used to connect different message assemblies to each other and to connect aggregate business information entities to message assemblies. Additionally, association message assemblies are used to connect an optional standard business document header to the root message assembly. ABIEs, MAs, and ASMAs are part of the UML Profile for Core Components (UPCC) standard. A comprehensive description of the
different core component compliant UML modeling artifacts and their relationships is given in the UPCC standard.

Figure 50 shows an example for a QuoteEnvelope modeled using concepts of the UML Profile for Core Components Standard.

The information envelope QuoteEnvelope has exactly one root message assembly Quote. Attached to a Quote there are a standard business document header and multiple association message assemblies (ASMA), leading to aggregate business information entities (ABIE) and other message assemblies (MA).
I. Business Transaction Patterns

A UMM business transaction follows one of six business transaction patterns. The business transaction pattern defines the type of a legally binding interaction between two decision making applications as defined in Open-edi. In the following, the six business transaction patterns in UMM are described in detail:

i. Commercial transaction (two-way):

![Figure 51 Commercial Transaction Pattern](image)

Represents the typical “offer and acceptance” business interaction. A commercial transaction (Figure 51) results in a residual obligation between two parties to fulfill the terms of a contract. In other words both parties enter into a commitment to fulfill their part of the contract. An example would be the submission of an order and receipt of a purchase order response. The commercial transaction pattern constitutes that the responding party has to return an acknowledgement of receipt when receiving the requesting information envelope. The time frame within the acknowledgement of receipt has to be sent is specified by time to acknowledge receipt (of the requesting business action). If the document passes a set of business rules and is handed over to the business application the responder has to send an acknowledgement of processing. The corresponding timeframe is specified by the time to acknowledge processing (of the requesting business action). Furthermore, the responding party has to return the responding information envelope within the period defined by time to respond (of the requesting business action). The requesting party has to re-initiate the business transaction in case the time to acknowledge receipt, time to acknowledge processing or time to respond is exceeded. The number of attempts is defined by the retry count. When the responding party answers with the responding
information envelope the requestor has to issue an **acknowledgement of receipt** within the **time to acknowledge receipt** (specified in the **responding business action**). If the responding **information envelope** passes again the business rules (e.g. grammar validation, sequence validation...) the requestor has to transmit an **acknowledgement of processing** to the responder. The allowed period is set by the **time to acknowledge processing** of the **responding business action**. Both parties are required to authorize themselves (authorization is required by both business actions) and have to the sign their envelopes and business signals (as defined by **non repudiation required** and **non repudiation of receipt required** of both business actions).

**ii. Query/Response (two-way):**

1241

This pattern ([Figure 52](#)) describes the request of information that is available to the responder prior to the request. This might be a fixed data set inside a database or any kind of static information (e.g. a catalog). The requestor initiates the transaction by submitting the request within a requesting **information envelope** to the responder. The responder has to provide the information within the period specified by **time to respond**. The requestor has to re-initiate the transaction as defined by the **retry count** if the responder is not answering within the given **time to respond**. No business signals and no non-repudiation requirements are necessary in the **query/response** pattern.
iii. 

Request/Response (two-way):

A transaction follows the request/response pattern (Figure 53) if the requestor asks for information that requires some business processing on the responder’s side. This includes information that needs to be dynamically assembled and hence cannot be returned immediately (i.e. non-static information). An example would be the request for a product quote. The request/response pattern results in no residual obligation between the two parties to fulfill the terms of a contract. Concerning the request for quote example, this inquiry leads to no commitment of the requestor to buy the quoted product. Similarly the responder does not pledge himself to have the quoted product available in case of a further order. The request/response pattern specifies the exchange of a requesting and a responding information envelope.

Non-Repudiation requirements as well as requiring business signals are optional, but not recommended using the request/response pattern. If either business signals or nonrepudiation are required, they follow the same semantics as specified for the commercial transaction pattern.
iv. Request/Confirm (two-way):

This pattern (Figure 54) should be used if the requesting partner asks for information that requires only confirmation in respect to previously agreed business contracts. An example might be the request of status information. The requestor initiates the transaction by submitting the request document to confirm to the responder. Business signals or non-repudiation are not required by the responder. Anyway, the requestor re-initiates the transaction as defined by the *retry count* if the responder misses answering within the *time to respond*. Regarding the responding *information envelope*, the responder might require that the requestor sends an *acknowledgement of receipt* when he receives the confirmation response (within the timeframe specified by *time to acknowledge receipt*). Furthermore, the responder might require the requestor to authenticate himself and to guarantee the non-repudiation of the *acknowledgement of receipt*. 
Information distribution (one-way):

This pattern (Figure 55) represents an informal, unidirectional information transmission. An example would be information about price discounts to customers. Neither business signals nor non-repudiation or authorization requirements are allowed in the information distribution pattern. Since the receipt of the distributed information is not guaranteed no retry count must be claimed.
vi. Notification (one-way):

The notification pattern (Figure 56) represents a formal, unidirectional sending of information. This pattern is applied if the requesting side has to inform the responding side about an irreversible business state. An example is the notification of a product shipment. Since the notification transmittal is a formal action the requestor has to claim for an acknowledgement of receipt with the specified time to acknowledge receipt. Furthermore, the non-repudiation of a receipt is required. If the reacting party is not sending the business signal within the agreed time to acknowledge receipt the requesting party has to reinitiate the transaction as specified by the retry count.
vii. Default assignments of tagged values

Furthermore each business document has to be checked for readability by the receiver as defined by the value of *is intelligible check required* which is by default set to true for every document. Table 1 shows the requirements on the responding party within the different transaction patterns. These requirements are specified in the *requesting business action* (because the requestor demands the responder to fulfill these requirements). Similarly Table 2 shows the requirements posed by the responding party to the requesting party. We specify them using the *tagged values* of the *responding business action*, because the responder demands them to be fulfilled by the requestor.

**Default assignment of tagged values for a requesting business action**

The following table (Table 1) shows the default assignment of *tagged values* for a *requesting business action*. They denote the requirements on the responder in context of the six business transaction patterns.

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Commercial Transaction</th>
<th>Request/Confirm</th>
<th>Request/Response</th>
<th>Query/Response</th>
<th>Notification</th>
<th>Information Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time to Acknowledge Receipt</td>
<td>2h</td>
<td>NULL</td>
<td>NULL</td>
<td>24h</td>
<td>NULL</td>
<td>NULL</td>
</tr>
<tr>
<td>Time to Acknowledge Processing</td>
<td>6h</td>
<td>NULL</td>
<td>NULL</td>
<td>4h</td>
<td>NULL</td>
<td>NULL</td>
</tr>
<tr>
<td>Time to Respond</td>
<td>24h</td>
<td>24h</td>
<td>4h</td>
<td>4h</td>
<td>NULL</td>
<td>NULL</td>
</tr>
<tr>
<td>Is Authorization Required</td>
<td>TRUE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>Is Non Repudiation Required</td>
<td>TRUE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>Is Non Repudiation of Receipt Required</td>
<td>TRUE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>Retry Count</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Is Intelligible Check Required</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
</tbody>
</table>

Table 1 Default assignment of tagged values for a requesting business action

**Default assignment of tagged values for a responding business action**

The following table (Table 2) shows the default assignment of *tagged values* for a *responding business action*. They denote the requirements on the requestor in context of the six business transaction patterns.
<table>
<thead>
<tr>
<th></th>
<th>Time to Acknowledge Receipt</th>
<th>Time to Acknowledge Processing</th>
<th>Is Authorization Required</th>
<th>Is Non Repudiation Required</th>
<th>Is Non Repudiation of Receipt Required</th>
<th>Is Intelligible Check Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Transaction</td>
<td>2h</td>
<td>6hr</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
<tr>
<td>Request/Confirm</td>
<td>2h</td>
<td>NULL</td>
<td>TRUE</td>
<td>FALSE</td>
<td>TRUE</td>
<td>TRUE</td>
</tr>
<tr>
<td>Request/Response</td>
<td>NULL</td>
<td>NULL</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>TRUE</td>
</tr>
<tr>
<td>Query/Response</td>
<td>NULL</td>
<td>NULL</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>TRUE</td>
</tr>
<tr>
<td>Notification</td>
<td>NULL</td>
<td>NULL</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>TRUE</td>
</tr>
<tr>
<td>Information Distribution</td>
<td>NULL</td>
<td>NULL</td>
<td>FALSE</td>
<td>FALSE</td>
<td>FALSE</td>
<td>TRUE</td>
</tr>
</tbody>
</table>

Table 2 Default assignment of tagged values for a responding business action
II. OCL Constraints

--- Constraint 1
--- A BusinessCollaborationModel MUST contain one to many BusinessChoreographyViews.
context Package inv: self.isBCollModel()
implies self.nestedPackage->exists(a|a.isBChoreographyV())

--- Constraint 2
--- A BusinessCollaborationModel MUST contain one to many BusinessInformationViews.
context Package inv: self.isBCollModel()
implies self.nestedPackage->exists(a|a.isBInformationV())

--- Constraint 3
--- A BusinessCollaborationModel MAY contain zero to many BusinessRequirementsViews
context Package inv: self.isBCollModel()
implies self.nestedPackage->select(a|a.isBRequirementsV())->size>=0

--- Constraint 4
--- A BusinessRequirementsView, a BusinessChoreographyView and a BusinessInformationView MUST be directly located under a BusinessCollaborationModel
context Package inv: (self.isBChoreographyV() or self.isBInformationV() or self.isBRequirementsV())
implies self.hlpOwningPackage().isBCollModel()

--- Constraint 5
--- A BusinessRequirementsView MAY contain zero or one BusinessDomainViews.
context Package inv: self.isBRequirementsV()
implies self.nestedPackage->select(a|a.isBDomainV())->size <=1

--- Constraint 6
--- A BusinessChoreographyView MAY contain zero or one BusinessPartnerViews.
context Package inv: self.isBRequirementsV()
implies self.nestedPackage->select(a | a.isBPartnerV())->size <=1

--- Constraint 7
--- A BusinessRequirementsView MAY contain zero to many BusinessEntityViews.
context Package inv: self.isBRequirementsV()
implies self.nestedPackage->select( a | a.isBEntityV())->size >= 0

-- Constraint 8
-- A BusinessDomainView, a BusinessPartnerView, and a BusinessEntityView
-- MUST be located directly under a BusinessRequirementsView
context Package inv:
  self.isBDomainV() or self.isBPartnerV() or self.isBEntityV()
implies self.hlpOwningPackage().isBRequirementsV()

-- Constraint 9
-- A BusinessDomainView MUST include one to many BusinessAreas.
context Package inv: self.isBDomainV()
implies self.nestedPackage->exists( a | a.isBArea())

-- Constraint 10
-- A BusinessArea MUST include one to many BusinessAreas or one to many ProcessAreas or one to many BusinessProcessUseCases.
context Package inv: self.isBArea()
implies ( self.nestedPackage->exists( a | a.isBArea() )
  or a.isProcessArea() )
  or ( self.ownedElement -> exists( b | b.oclAsType(UseCase).isBProcessUseCase() ) )

-- Constraint 11
-- A ProcessArea MUST contain one to many other ProcessAreas or one to many BusinessProcessUseCases
context Package inv: self.isProcessArea()
implies (self.nestedPackage -> exists( a | a.isProcessArea()))
  or ( self.ownedElement -> exists( b | b.oclAsType(UseCase).isBProcessUseCase() ) )

-- Constraint 12
-- A BusinessProcessUseCase MUST be associated with one to many BusinessPartners using the participates relationship
context UseCase inv: self.isBProcessUseCase() and
  not(self.isBCollaborationUC())
  and not(self.isBTransactionUC())
implies self.owner.ownedElement->exists(a|
  a.isAsType(Actor).isBPartner())
  or a.isAsType(Actor).isBPartner())
  exists(t|t.isAsType(BusinessPartner))
  or a.isAsType(BusinessPartner))
  exists(t|t.isAsType(BusinessProcessUseCase))

-- Constraint 13
-- A BusinessProcessUseCase may be associated with zero to many Stakeholders using the isOfInterestedTo relationship
context UseCase inv: self.isBProcessUseCase()
implies if self.owner.ownedElement->
  exists(a|a.isAsType(Actor).isStakeholder())
1413 then selfoclAsType(UseCase).clientDependency->
1414 exists(p|p.oclAsType(Dependency).isOfInterestTo()
1415 and p.client->exists(t|t.oclAsType(Actor).isStakeholder() ))
1416 else true endif

1418 -- Constraint 14
1419 -- A BusinessProcessUseCase SHOULD be refined by zero to many
1420 BusinessProcesses. These relationships MAY also be visualized by
1421 realize relationships from each of the owned BusinessProcesses to
1422 the owning BusinessProcessUseCase
1423 context UseCase inv: self.isBProcessUseCase()
1424 implies self.ownedElement->select( process |
1425 process.oclAsType(Activity).isBProcess())->size()>=0

1427 -- Constraint 15
1428 -- A BusinessProcess MUST be modeled as a child of a
1429 BusinessProcessUseCase
1430 context Activity inv: self.isBProcess()
1431 implies self.owner.oclAsType(UseCase).isBProcessUseCase()

1433 Constraint 16 refers to a Diagram and is therefore not represented in
1434 OCL

1438 -- Constraint 17
1439 -- A BusinessProcess MAY contain zero to many ActivityPartitions
1440 context Activity inv: self.isBProcess()
1441 implies self.ownedElement->select( partitions |
1442 partitions.oclIsTypeOf(ActivityPartition))->size()>=0

1442 -- Constraint 18
1443 -- A BusinessProcess, which has no ActivityPartitions, MUST contain
1444 one or more BusinessProcessActions and
1445 -- MAY contain zero to many InternalBusinessEntityStates and zero to
1446 many SharedBusinessEntityStates.
1447 context Activity inv: self.isBProcess()
1448 implies if self.ownedElement->
1449 select(b|b.oclAsType(ActivityPartition).isActivityPartition())->
1450 size=0
1451 then self.ownedElement-
1452 exists(bp|bp.oclAsType(Action).isBProcessAction()) else true endif

1454 -- Constraint 19
1455 -- An ActivityPartition being part of a BusinessProcess MUST contain
1456 one to many BusinessProcessActions and
1457 -- MAY contain zero to many InternalBusinessEntityStates.
1458 context ActivityPartition inv: self.isActivityPartition() and
1459 self.owner.oclAsType(Activity).isBProcess()
1460 implies self.ownedElement->exists( act |
1461 act.oclAsType(Action).isBProcessAction())
-- Constraint 20
-- A SharedBusinessEntityState MUST NOT be located in an
-- ActivityPartition. (They must be contained within
-- the BusinessProcess even if this BusinessProcess contains
-- ActivityPartitions.)
context ObjectNode inv: self.oclAsType(ObjectNode).isBSharedState()
and self.owner.oclAsType(Activity).isBProcess()
implies
not(self.owner.oclAsType(ActivityPartition).isActivityPartition())

-- Constraint 21
-- A BusinessPartnerView MUST contain at least two to many
-- BusinessPartners. If the BusinessPartnerView is hierarchically
decomposed into subpackages these BusinessPartners MAY be contained
-- in any of these subpackages.

Missing on purpose

-- Constraint 22
-- A BusinessPartnerView MAY contain zero to many Stakeholders

Missing on purpose

-- Constraint 23
-- A BusinessEntityView must contain one to many BusinessEntities
context Package inv: self.isBEntityV()
implies self.ownedElement->
exists(a|a.oclAsType(Class).isBEntity())

-- Constraint 24 (Since the first part of the constraint refers to a
diagram, only the second part of the constraint is represented in
OCL)
Constraint 24 refers to a diagram and is therefore not represented in
OCL

-- Constraint 25 (Since the first part of the constraint refers to a
diagram, only the second part of the constraint is represented in
OCL)
-- A UML State Diagram describing the lifecycle of a BusinessEntity
MUST contain one to many BusinessEntityStates. The parent of a
BusinessEntityState MUST be a BusinessEntity
context Class inv: self.isBEntityState()
and self.owner.isBEntity()

-- Constraint 26
-- A BusinessEntity MAY contain zero to many BusinessDataViews that
describes its conceptual design
context Package inv: self.isBEntityV()
implies self.nestedPackage->select( package |
package.oclAsType(Package).isBDataV())->size>=0

-- Constraint 27
-- The parent of a BusinessDataView MUST be a BusinessEntityView
context Package inv: self.isBDataV()
implies self.owner.isBEntityV()

-- Constraint 29
-- A BusinessDataView SHOULD contain one to many classes.
context Package inv: self.isBDataV()
    implies self.ownedElement->select( elem | elem.oclIsTypeOf(Class))->size()>=1

-- Constraint 30
-- A BusinessChoreographyView MUST contain one to many BusinessCollaborationViews
context Package inv: self.isBChoreographyV()
    implies self.nestedPackage->exists(c|c.isBCollaborationV())

-- Constraint 31
-- A BusinessChoreographyView MUST contain one to many BusinessTransactionViews
context Package inv: self.isBChoreographyV()
    implies self.nestedPackage->exists(c|c.isBTransactionV())

-- Constraint 32
-- A BusinessChoreographyView MAY contain zero to many BusinessRealizationViews
context Package inv: self.isBChoreographyV()
    implies self.nestedPackage->select( package | package.oclAsType(Package).isBRealizationV())->size()>=0

-- Constraint 33
-- A BusinessTransactionView, a BusinessCollaborationView, and a BusinessRealizationView
-- MUST be directly located under a BusinessChoreographyView
context Package inv: self.isBTransactionV() or self.isBCollaborationV() or self.isBRealizationV()
    implies self.owner.isBChoreographyV()

-- Constraint 34
-- A BusinessTransactionView MUST contain exactly one BusinessTransactionUseCase, exactly two AuthorizedRoles,
-- and exactly two participates associations.
context Package inv: self.isBTransactionV()
    implies self.ownedElement->
        select(a|a.oclAsType(UseCase).isBTransactionUC())->size=1
    and self.ownedElement->
        select(b|b.oclAsType(Actor).isAuthorizedRole())->size=2
    and self.ownedElement->
        select(c|c.oclIsTypeOf(Association) and c.oclAsType(Association).isParticipates())->size=2
    and self.ownedElement->size=5

-- Constraint 35
-- A BusinessTransactionUseCase MUST be associated with exactly two AuthorizedRoles via stereotyped binary participate associations.
context UseCase inv: self.isBTransactionUC()
implies self.owner.ownedElement->
select(q|q.oclIsKindOf(Association))->
forall(a|a.oclAsType(Association).isParticipates() and a.oclAsType(Association).ownedEnd.type->
forall(t|t.oclAsType(Actor).isAuthorizedRole() or t.oclAsType(UseCase)=self))

-- Constraint 36
-- A BusinessTransactionUseCase MUST NOT include further UseCases
context UseCase inv: self.isBTransactionUC()
implies self.include->size=0

-- Constraint 37
-- A BusinessTransactionUseCase MUST be included in at least one BusinessCollaborationUseCase.
context UseCase inv: self.isBTransactionUC()
implies self.owner.owner.oclAsType(Package).nestedPackage->select(collV|collV.isBCollaborationV())->
exists(c|c.ownedElement->exists(k|k.oclAsType(UseCase).isBCollaborationUC() and k.oclAsType(UseCase).include.addition->
exists(s|s.oclAsType(UseCase)=self))

-- Constraint 38
-- A BusinessTransactionUseCase MUST NOT be source or target of an extend association.
context UseCase inv: self.isBTransactionUC()
implies self.extend->size=0 and UseCase.allInstances->
forall(u|u.oclAsType(UseCase).extend.extendedCase->
forall(t|t.oclAsType(UseCase).isNotBTransactionUC()))

-- Constraint 39
-- The two AuthorizedRoles within a BusinessTransactionView MUST NOT be named identically
context Actor inv: self.isAuthorizedRole() and self.owner.oclAsType(Package).isBTransactionV()
implies self.owner.ownedElement->
select(k|k.oclAsType(Actor).isAuthorizedRole())->
collect(p|p.oclAsType(Actor).name)->asSet->size()=2

-- Constraint 40
-- A BusinessTransactionUseCase MUST be described by exactly one BusinessTransaction defined as a child element of this BusinessTransactionUseCase.
context UseCase inv: self.isBTransactionUC()
implies self.ownedElement->select( act | act.oclAsType(Activity).isBTransaction()) -> size = 1
-- Constraint 41
-- A BusinessTransaction MUST have exactly two partitions.
-- Each of them MUST be stereotyped as BusinessTransactionPartition.
context Activity inv: self.isBTransaction()
implies self.ownedElement->select( part |
part.oclAsType(ActivityPartition).isBTransaction())->size=2

-- Constraint 42
-- One of the two BusinessTransactionPartitions MUST contain one
-- RequestingBusinessAction and
-- the other one MUST contain one RespondingBusinessAction.
context Activity inv:
let ReqAct : Action = self.ownedElement->
select( act | act.oclAsType(Action).isReqAction())->
asSequence->first().oclAsType(Action)
in let ResAct : Action = self.ownedElement->
select( act | act.oclAsType(Action).isResAction())->
asSequence->first().oclAsType(Action)
in let Part1 : ActivityPartition = self.ownedElement->
select( part | part.oclAsType(ActivityPartition).isBTPartition())
->asSequence->first().oclAsType(ActivityPartition)
in let Part2 : ActivityPartition = self.ownedElement->
select( part | part.oclAsType(ActivityPartition).isBTPartition())
->asSequence->last().oclAsType(ActivityPartition)
in self.isBTransaction()
implies self.ownedElement->
select( act | act.oclAsType(Action).isReqAction())->size=1
and self.ownedElement->
select( act | act.oclAsType(Action).isResAction())->size=1
and ReqAct.inPartition->size=1 and ResAct.inPartition->size=1
and ( ReqAct.inPartition->asSequence
->first().oclAsType(ActivityPartition)=Part1
and ResAct.inPartition->asSequence
->first().oclAsType(ActivityPartition)=Part2)
or (ResAct.inPartition->asSequence
->first().oclAsType(ActivityPartition)=Part1
and ReqAct.inPartition->asSequence
->first().oclAsType(ActivityPartition)=Part2 ) )

-- Constraint 43
-- A BusinessTransactionPartition MUST have a classifier, which MUST
-- be one of the associated
-- AuthorizedRoles of the corresponding BusinessTransactionUseCase.
context ActivityPartition inv:
let authRoles : Sequence(Element) =
self.owner.owner.owner.ownedElement->
select(roles | roles.oclAsType(Actor).isAuthorizedRole())
->asSequence in self.isBTPartition()
implies self.name=authRoles->first().oclAsType(Actor).name
or self.name=authRoles->last().oclAsType(Actor).name

-- Constraint 44
-- The two BusinessTransactionPartitions MUST have different
-- classifiers.

context Activity inv: self.isBTransaction()
  implies not(self.ownedElement->
    select( part | part.oclAsType(ActivityPartition).isBTPartition())
    ->asSequence->first().oclAsType(ActivityPartition).name =
    self.ownedElement->
    select( part | part.oclAsType(ActivityPartition).isBTPartition())
    ->asSequence->last().oclAsType(ActivityPartition).name)

-- Constraint 45
-- The BusinessTransactionPartition containing the
-- RequestingBusinessAction MUST contain two or more FinalStates.
-- Each of the FinalStates MAY have a SharedBusinessEntityState as
-- predecessor.
-- One of the FinalStates SHOULD reflect a ControlFailure - this
-- FinalState SHOULD NOT have a
-- preceeding SharedBusinessEntityState.
context ActivityPartition inv: self.isBTPartition() and
  self.containedNode->exists( action |
    action.oclAsType(Action).isReqAction())
implies self.containedNode->select( finNode |
  finNode.oclIsTypeOf(ActivityFinalNode))->size()>=2

-- Constraint 46
-- A RequestingBusinessAction MUST embed exactly one
-- RequestingInformationPin
context Action inv: self.isReqAction()
implies
  self.ownedElement->select( pin | pin.oclAsType(Pin).isReqInfPin())
  ->size=1

-- Constraint 47
-- A RespondingBusinessAction MUST embed exactly one
-- RequestingInformationPin
context Action inv: self.isResAction()
implies
  self.ownedElement->select( pin | pin.oclAsType(Pin).isReqInfPin())
  ->size=1

-- Constraint 48
-- If the tagged value businessTransactionType of the
-- BusinessTransaction is either Request/Response, Query/Response,
-- Request/Confirm, or CommercialTransaction, then the
-- RequestingBusinessAction must embed one to many
-- RespondingInformationPins and the RespondingBusinessAction must
-- embed one to many RespondingInformationPins.
context Action inv: self.isBTransaction() and
  self.hlpMustHaveResInfPin() implies
  self.ownedElement-> select( action |
    action.oclAsType(Action).isReqAction())
  ->forAll( actions | actions.ownedElement->
    exists( pin | pin.oclAsType(Pin).isResInfPin())


-- Constraint 49
-- If the tagged value businessTransactionType of the
-- BusinessTransaction is either Notification or
-- InformationDistribution, then both, the RequestingBusinessAction
-- and the RespondingBusinessAction, MUST NOT embed a
-- RespondingInformationPin
class Action inv: self.isBTransaction() and
  self.hlpMustNotHaveResInfPin()
implies
  not(self.ownedElement-> select( action |
    action.oclAsType(Action).isReqAction() 
  or action.oclAsType(Action).isResAction())->
forAll( actions | actions.ownedElement->
  exists( pin | pin.oclAsType(Pin).isResInfPin())))

-- Constraint 50
-- A RequestingBusinessAction and a RespondingBusinessAction MUST
-- embed same
-- number of RespondingInformationPins.
let ReqAct : Action = self.ownedElement->select( act |
  act.oclAsType(Action).isReqAction())->
asSequence->first().oclAsType(Action) in
let ResAct : Action = self.ownedElement->select( act |
  act.oclAsType(Action).isResAction())->
asSequence->first().oclAsType(Action) in
self.isBTransaction() implies
  ReqAct.ownedElement->select( resPin |
    resPin.oclAsType(Pin).isResInfPin())->size
  =
  ResAct.ownedElement->select(resPin |
    resPin.oclAsType(Pin).isResInfPin())->size

-- Constraint 51
-- The RequestingInformationPin of the RequestingBusinessAction MUST b
-- e connected
-- with the
-- RequestingInformationPin of the RespondingBusinessAction using an o
-- bject
-- flow relationship leading from the RequestingBusinessAction
-- to the RespondingBusinessAction.
Missing on purpose

-- Constraint 52
-- Each RespondingInformationPin of the RespondingBusinessAction MUST
-- be
-- connected with exactly one RespondingInformationPin of the
-- RequestingBusinessAction
-- using an object flow relationship leading from the
-- RespondingBusinessAction
-- to the RequestingBusinessAction
Missing on purpose
-- Constraint 53
-- If a BusinessTransactionPartition contains
-- SharedBusinessEntityStates, each SharedBusinessEntityState
-- MUST be the target of exactly one control flow relationship
-- starting from the RequestingBusinessAction and
-- MUST be the source of exactly one control flow relationship
targeting a FinalState.
context ActivityPartition inv: self.isBTPartition()
implies self.owner.ownedElement->
select( nodes | nodes.oclIsTypeOf(CentralBufferNode)
and nodes.oclAsType(CentralBufferNode).isBESharedState() ) ->
forAll( states | states.oclAsType(CentralBufferNode).incoming
->size()=1 and states.oclAsType(CentralBufferNode).incoming->
forAll( income | income.oclAsType(ObjectFlow).source.
oclAsType(Action).isReqAction() )
and states.oclAsType(CentralBufferNode).outgoing->
forAll( outgo | outgo.oclAsType(ObjectFlow).target.
oclIsTypeOf(ActivityFinalNode)
and states.oclAsType(CentralBufferNode).outgoing->size()=1 ) )

-- Constraint 54
-- Each FinalState MUST be the target of one to many control flow
relationships starting
-- from the RequestingBusinessAction or from a
SharedBusinessEntityState.
context ActivityFinalNode inv: self.oclIsTypeOf(ActivityFinalNode)
and self.owner.oclAsType(Activity).isBTransaction()
implies self.incoming->forAll( income |
income.oclAsType(ControlFlow).source.
oclAsType(Action).isReqAction() or
income.oclAsType(ObjectFlow).source.oclAsType(CentralBufferNode).is
BESharedState() )

-- Constraint 55
-- Each RequestingInformationPin and each RespondingInformationPin
MUST have a classifier, this classifier MUST be an
InformationEnvelope or a subtype defined in an
extension/specialization module.
Missing on purpose

-- Constraint 56
-- Two RequestingInformationPins which are connected using an
-- object flow MUST have the same classifier.
Missing on purpose

-- Constraint 57
-- Two RespondingInformationPins which are connected using an
-- object flow MUST have the same classifier.
Missing on purpose
-- Constraint 58
-- A BusinessCollaborationView MUST contain exactly one BusinessCollaborationUseCase.
context Package inv: self.isBCollaborationV()
implies self.ownedElement
->select(k|k.oclAsType(UseCase).isBCollaborationUC())->size=1

-- Constraint 59
-- A BusinessCollaborationView MUST contain two to many AuthorizedRoles.
context Package inv: self.isBCollaborationV()
implies self.ownedElement
->select(k|k.oclAsType(Actor).isAuthorizedRole())->size>=2

-- Constraint 60
-- A BusinessCollaborationUseCase MUST have two to many participates associations
to AuthorizedRoles contained in the same BusinessCollaborationView.
context UseCase inv: self.isBCollaborationUC()
implies self.owner.ownedElement
->select(c|c.oclIsTypeOf(Association)
and c.oclAsType(Association).isParticipates()
and c.oclAsType(Association).ownedEnd.type
->exists(t|t.oclAsType(Actor).isAuthorizedRole()))->size>=2

-- Constraint 61
-- Each AuthorizedRole contained in the BusinessCollaborationView MUST have exactly
-- one participates association to the BusinessCollaborationUseCase
-- included in the same BusinessCollaborationView.
context Actor inv: self.isAuthorizedRole() and
self.owner.oclAsType(Package).isBCollaborationV()
implies self.owner.ownedElement->
select(as|as.oclIsTypeOf(Association))-
select(ass| ass.oclAsType(Association).ownedEnd.type->
exists(end|end.oclAsType(Actor)=self)
and ass.oclAsType(Association).ownedEnd.type->
exists(oend|oend.oclAsType(UseCase).isBCollaborationUC())) ->size=1

-- Constraint 62
-- A BusinessCollaborationUseCase MUST have one to many include relationships to another BusinessCollaborationUseCase
-- or to a BusinessTransactionUseCase.
context UseCase inv: self.isBCollaborationUC()
implies self.include.addition->size>0
and self.include.addition->forall(Uc |Uc.oclAsType(UseCase).isBCollaborationUC() or Uc.oclAsType(UseCase).isBTransactionUC())

-- Constraint 63
context Activity inv: self.isBCollaborationProtocol() implies self.owner.oclAsType(UseCase).isBCollaborationUC()

-- Constraint 64
-- A BusinessCollaborationProtocol MUST contain one to many BusinessTransactionCalls and/or BusinessCollaborationCall.
context Activity inv: self.isBCollaborationProtocol()
implies self.ownedElement->exists( actions |
actions.oclAsType(CallBehaviorAction).isBTransactionAction() 
or actions.oclAsType(CallBehaviorAction).isBCollaborationAction())

context Activity inv: self.oclAsType(CallBehaviorAction).isBTransactionAction() implies self.oclAsType(CallBehaviorAction).behavior.oclAsType(Activity).isBTransaction()

-- Constraint 65
-- Each BusinessTransactionCall MUST call exactly one BusinessTransaction
context Action inv: self.oclAsType(CallBehaviorAction).isBTransactionAction() implies self.oclAsType(CallBehaviorAction).behavior.oclAsType(Activity).isBTransaction()

context Activity inv: self.oclAsType(Activity).isBTransaction() and CallBehaviorAction.allInstances->exists( node | node.oclAsType(CallBehaviorAction).behavior.oclAsType(Activity)=self) implies self.owner.oclAsType(UseCase).isBTransactionUC() and UseCase.allInstances->select( uc | uc.oclAsType(UseCase).isBCollaborationUC()->exists( anInclude | anInclude.oclAsType(UseCase).include.addition->exists( elem | elem.oclAsType(UseCase)=self.owner.oclAsType(UseCase)) and anInclude.oclAsType(UseCase).ownedElement->exists( protocol | protocol.oclAsType(Activity).isBCollaborationProtocol() )

context CallBehaviorAction inv: let protocol : Activity = self.behavior.oclAsType(Activity) in self.isBCollaborationAction() implies protocol.owner.oclAsType(UseCase).isBCollaborationUC() and self.owner.owner.oclAsType(UseCase).isBCollaborationUC() and self.owner.owner.oclAsType(UseCase).include.addition->
exists( inc |
incoclAsType(UseCase)=protocol.owneroclAsType(UseCase))

-- Constraint 68
-- A BusinessCollaborationProtocol MUST contain two to many
BusinessCollaborationPartitions.
context Activity inv: self.isBCollaborationProtocol()
implies self.ownedElement->select( partitions |
partitionsoclAsType(ActivityPartition).
isBCollaborationPartition())->size()>=2

-- Constraint 69
-- The number of AuthorizedRoles in the BusinessCollaborationView MUST
match the number of BusinessCollaborationPartitions
-- in the BusinessCollaborationProtocol which is placed beneath the
BusinessCollaborationUseCase of the same BusinessCollaborationView.
context Package inv:
let authRoles : Set(Element) = self.ownedElement->
select( role | roleoclAsType(Actor).isAuthorizedRole())
in let collUC : Set(Element) = self.ownedElement->
select( bCollUC | bCollUCoclAsType(UseCase).isBCollaborationUC())
in let protocol : Set(Element) = collUC.ownedElement
->select(prot|protoclAsType(Activity).isBCollaborationProtocol())
->asSet in let partitions : Set(Element) = protocol.ownedElement
->select(part|partoclAsType(ActivityPartition).
isBCollaborationPartition())
asSet in self.isBCollaborationV()
implies authRoles->size() = partitions->size()

-- Constraint 70
-- Each AuthorizedRole in the BusinessCollaborationView MUST be
assigned to a BusinessCollaborationPartition
-- in the BusinessCollaborationProtocol which is placed beneath the
BusinessCollaborationUseCase
-- of the same BusinessCollaborationView.
context Actor inv:
let bCollUC : Set(Element) = self.owner.ownedElement->
select ( uc | ucoclAsType(UseCase).isBCollaborationUC())
in let bCollProtocol : Set(Element) = bCollUC.ownedElement->
select ( protocol | protocoloclAsType(Activity).isBCollaborationProtocol())->asSet
in let bCollPartition : Set(Element) =
bCollProtocol.ownedElement -> select( partition |
partitionoclAsType(ActivityPartition).isBCollaborationPartition())
->asSet in self.isAuthorizedRole() and
self.owneroclAsType(Package).isBCollaborationV()
implies bCollPartitionoclAsType(ActivityPartition).represents->
select( part | partoclAsType(Actor)=selfoclAsType(Actor))
->size()='1

-- Constraint 71
-- Each BusinessCollaborationPartition MUST be classified by exactly
one AuthorizedRole included in the same
context ActivityPartition inv: self.isBCollaborationPartition() implies self.hlpOwningPackage().ownedElement->exists( actor | actor.oclAsType(Actor).isAuthorizedRole() and actor.oclAsType(Actor)=self.represents.oclAsType(Actor))

context ActivityPartition inv: self.isBCollaborationPartition() implies self.owner.ownedElement->select( action | action.oclAsType(Action).inPartition->exists(element | element.oclAsType(ActivityPartition)=self))->forall( elem | elem.oclAsType(Action).isBNestedCollaboration()) and (self.ownedElement->size()==0 or self.ownedElement->forall( elem | elem.oclAsType(Action).isBNestedCollaboration()) )

context CallBehaviorAction inv: self.oclAsType(CallBehaviorAction).isBTransactionAction() implies Dependency.allInstances->select( dependency | dependency.oclAsType(Dependency).supplier->exists( ends | ends.oclAsType(CallBehaviorAction)=self) and dependency.oclAsType(Dependency).isInitFlow() and dependency.oclAsType(Dependency).client->exists( end | end.oclAsType(ActivityPartition).isBCollaborationPartition()) )->size()==1

context CallBehaviorAction inv: self.oclAsType(CallBehaviorAction).isBTransactionAction() and self.owner.oclAsType(Activity).isBCollaborationProtocol() implies Dependency.allInstances->select( dependency | dependency.oclAsType(Dependency).client->exists( ends | ends.oclAsType(CallBehaviorAction)=self) and dependency.oclAsType(Dependency).isInitFlow() and dependency.oclAsType(Dependency).supplier->exists(end | end.oclAsType(ActivityPartition).isBCollaborationPartition() or end.oclAsType(Action).isBNestedCollaboration()))->size()==1

context CallBehaviorAction inv: self.oclAsType(CallBehaviorAction).isBTransactionAction() and self.owner.oclAsType(Activity).isBCollaborationProtocol() implies Dependency.allInstances->select( dependency | dependency.oclAsType(Dependency).client->exists( ends | ends.oclAsType(CallBehaviorAction)=self) and dependency.oclAsType(Dependency).isInitFlow() and dependency.oclAsType(Dependency).supplier->exists(end | end.oclAsType(ActivityPartition).isBCollaborationPartition() or end.oclAsType(Action).isBNestedCollaboration()))->size()==1

context CallBehaviorAction inv: self.oclAsType(CallBehaviorAction).isBTransactionAction() and self.owner.oclAsType(Activity).isBCollaborationProtocol() implies Dependency.allInstances->select( dependency | dependency.oclAsType(Dependency).client->exists( ends | ends.oclAsType(CallBehaviorAction)=self) and dependency.oclAsType(Dependency).isInitFlow() and dependency.oclAsType(Dependency).supplier->exists(end | end.oclAsType(ActivityPartition).isBCollaborationPartition() or end.oclAsType(Action).isBNestedCollaboration()))->size()==1
2032   -- within the same BusinessCollaborationPartition.
2033   context Dependency inv: self.isInitFlow()
2034     implies not(Dependency.allInstances->exists( dep |
2035       (dep.oclAsType(Dependency).supplier=self.client
2036       or ( dep.oclAsType(Dependency).supplier->forAll(end |
2037         end.oclAsType(Action).isBNestedCollaboration())
2038         and
2039         dep.oclAsType(Dependency).supplier.oclAsType(Action).inPartition
2040         ->includesAll(self.client.oclAsType(ActivityPartition)) ) )
2041     and dep.oclAsType(Dependency).client=self.supplier and
2042     dep.oclAsType(Dependency).isInitFlow() ))
2043
2044   -- Constraint 76
2045   -- If a BusinessTransactionCall calls a two-way BusinessTransaction,
2046   this BusinessTransactionCall MUST be the source of exactly one
2047   RespondingFlow which target MUST be a
2048   BusinessCollaborationPartition.
2049   context CallBehaviorAction inv: self.isBTransactionAction() and
2050     self.behavior.oclAsType(Activity).isTwoWayBTransaction()
2051     implies self.owner.ownedElement->
2052     select( dep | dep.oclAsType(Dependency).isReFlow() and
2053       dep.oclAsType(Dependency).client->
2054       exists( end | end.oclAsType(CallBehaviorAction)=self)
2055       and dep.oclAsType(Dependency).supplier->
2056       exists( end |
2057       end.oclAsType(ActivityPartition).isBCollaborationPartition()) )
2058     ->size()=1
2059
2060   -- Constraint 77
2061   -- If a BusinessTransactionCall calls a two-way BusinessTransaction,
2062   this BusinessTransactionCall MUST be the target of exactly one
2063   RespondingFlow which source MUST be either a
2064   BusinessCollaborationPartition or a NestedBusinessCollaboration.
2065   context CallBehaviorAction inv: self.isBTransactionAction() and
2066     self.behavior.oclAsType(Activity).isTwoWayBTransaction()
2067     implies self.owner.ownedElement->
2068     select( dep | dep.oclAsType(Dependency).isReFlow() and
2069       dep.oclAsType(Dependency).client->
2070       exists( end | end.oclAsType(CallBehaviorAction)=self)
2071       and dep.oclAsType(Dependency).supplier->
2072       exists( end |
2073       end.oclAsType(ActivityPartition).isBCollaborationPartition() or
2074       end.oclAsType(Action).isBNestedCollaboration() ) )
2075     ->size()=1
2076
2077   -- Constraint 78
2078   -- The RespondingFlow sourcing from a BusinessTransactionCall and the
2079   RespondingFlow targeting a BusinessTransactionCall
2080   -- MUST NOT be targeting to /sourcing from the same
2081   BusinessCollaborationPartition, nor targeting to a
2082   NestedBusinessCollaboration
2083   context Dependency inv: self.isReFlow()
2084     implies not(Dependency.allInstances->exists( dep |
2085       (dep.oclAsType(Dependency).supplier=self.client
2086       or ( dep.oclAsType(Dependency).supplier->forAll(end |
2087         end.oclAsType(Action).isBNestedCollaboration()))
2088         and
2089         dep.oclAsType(Dependency).supplier.oclAsType(Action).inPartition
2090         ->includesAll(self.client.oclAsType(ActivityPartition)) ) )
2091     and dep.oclAsType(Dependency).client=self.supplier and
2092     dep.oclAsType(Dependency).isReFlow() )}
or dep.oclAsType(Dependency).supplier.owner.
oclassType(ActivityPartition)=self.client.
oclassType(ActivityPartition) )
and ( dep.oclAsType(Dependency).client=self.supplier
or dep.oclAsType(Dependency).supplier.owner.
oclassType(ActivityPartition)=self.supplier.
oclassType(ActivityPartition) )
and dep.oclAsType(Dependency).isReFlow() ))

-- Constraint 79
-- If a BusinessTransactionCall calls a one-way BusinessTransaction,
this BusinessTransactionCall MUST NOT be the source of a
RespondingFlow and MUST NOT be the target of a RespondingFlow.
context CallBehaviorAction inv: self.isBTransactionAction() and
self.behavior.oclAsType(Activity).isOneWayBTransaction()
implies not(self.owner.ownedElement->
exists( dep | dep.oclAsType(Dependency).isReFlow() and ( dep.oclAsType(Dependency).client->
exists( end | end.oclAsType(CallBehaviorAction)=self or dep.oclAsType(Dependency).supplier->
exists( end | end.oclAsType(CallBehaviorAction)=self )))

-- Constraint 80
-- The RespondingFlow targeting a BusinessTransactionCall must start
from the
-- BusinessCollaborationPartition / NestedBusinessCollaboration which
is the target of the InitialFlow starting
-- from the same BusinessTransactionCall.
context Dependency inv: self.isReFlow()
and self.supplier->forAll( end |
end.oclAsType(CallBehaviorAction).isBTransactionAction())
implies Dependency.allInstances->
exists( flow | flow.oclAsType(Dependency).isInitFlow() and ( flow.oclAsType(Dependency).supplier.oclAsType(ActivityPartition)=
self.oclAsType(Dependency).client.oclAsType(ActivityPartition) or
flow.oclAsType(Dependency).supplier.oclAsType(ActivityPartition)=
self.oclAsType(Dependency).client.oclAsType(ActivityPartition) ) and
flow.oclAsType(Dependency).client.oclAsType(CallBehaviorAction)=
self.supplier.oclAsType(CallBehaviorAction) )

-- Constraint 81
-- The RespondingFlow starting from a BusinessTransactionCall must
target the BusinessCollaborationPartition which is
-- the source of the InitialFlow targeting to the same
BusinessTransactionCall.
context Dependency inv: self.isReFlow()
and self.oclAsType(Dependency).client->forAll( end |
end.oclAsType(CallBehaviorAction).isBTransactionAction())
implies Dependency.allInstances->exists( flow |
flow.oclAsType(Dependency).isInitFlow() and
flow.oclAsType(Dependency).client.oclAsType(ActivityPartition)=
self.oclAsType(Dependency).supplier.oclAsType(ActivityPartition)
and flow.oclAsType(Dependency).supplier.
oclassType(CallBehaviorAction)=

self.client.oclAsType(CallBehaviorAction) )

-- Constraint 82
-- A NestedBusinessCollaboration MUST be the target of exactly one InitialFlow.
context Action inv: self.isBNestedCollaboration()
implies Dependency.allInstances->
select( dep | dep.oclAsType(Dependency).supplier->
exists(end | end.oclAsType(Action)=self.oclAsType(Action)))
->size()=1

-- Constraint 83
-- A NestedBusinessCollaboration MAY be the source of a RespondingFlow,
-- but MUST NOT be the source of more than one RespondingFlow.
context Action inv: self.isBNestedCollaboration()
implies Dependency.allInstances->
select( dep | dep.oclAsType(Dependency).isReFlow()
and dep.oclAsType(Dependency).client->exists(end |
end.oclAsType(Action)=self.oclAsType(Action)))->size()<=1

-- Constraint 84
-- A BusinessCollaborationCall MUST be the target of two to many InformationFlows
context CallBehaviorAction inv: self.isBCollaborationAction()
implies Dependency.allInstances->select( dep |
dep.oclAsType(Dependency).supplier->
exists( end | end.oclAsType(CallBehaviorAction)=self))->size()>=2

-- Constraint 85
-- A BusinessCollaborationCall MUST not be the source of an InformationFlow.
context CallBehaviorAction inv: self.isBCollaborationAction()
implies not(Dependency.allInstances->exists( dep |
dep.oclAsType(Dependency).client->
exists( end | end.oclAsType(CallBehaviorAction)=self)))

-- Constraint 86
-- A BusinessCollaborationCall MUST not be the source and MUST not be the target of an InitialFlow.
context CallBehaviorAction inv: self.isBCollaborationAction()
implies not(Dependency.allInstances->exists( dep |
dep.oclAsType(Dependency).isInitFlow()
and (dep.oclAsType(Dependency).client->exists( end |
end.oclAsType(CallBehaviorAction).isBCollaborationAction())
or dep.oclAsType(Dependency).supplier->exists( end |
end.oclAsType(CallBehaviorAction).isBCollaborationAction()))))
-- Constraint 87
-- A BusinessCollaborationCall MUST not be the source and MUST not be
the target of a RespondingFlow.
context CallBehaviorAction inv: self.isBCollaborationAction()
implies not(Dependency.allInstances->exists( dep |
depoclAsType(Dependency).isReFlow() 
and (depoclAsType(Dependency).client->exists( end |
endoclAsType(CallBehaviorAction).isBCollaborationAction())
or depoclAsType(Dependency).supplier->exists( end |
endoclAsType(CallBehaviorAction).isBCollaborationAction()))))

-- Constraint 88
-- A BusinessTransactionCall MUST not be the source and MUST not be
the target of an InformationFlow that is neither
-- stereotyped as InitialFlow nor as RespondingFlow.
context CallBehaviorAction inv: self.isBTransactionAction()
implies not( Dependency.allInstances-> exists( dep |
depoclAsType(Dependency).client->
exists(end | endoclAsType(CallBehaviorAction)=self) 
and not(depoclAsType(Dependency).isInitFlow() 
or depoclAsType(Dependency).isReFlow()) ))
and not( Dependency.allInstances-> exists( dep |
depoclAsType(Dependency).supplier->
exists(end | endoclAsType(CallBehaviorAction)=self) 
and not(depoclAsType(Dependency).isInitFlow() 
or depoclAsType(Dependency).isReFlow()) ))

-- Constraint 89
-- A NestedBusinessCollaboration MUST not be the source and MUST not
be the target of an InformationFlow that
targets to / sources from a BusinessCollaborationCall.
context Action inv: selfoclAsType(Action).isBNestedCollaboration()
implies not( Dependency.allInstances->exists( dep |
depoclAsType(Dependency).supplier->exists(end |
endoclAsType(Action)=self) 
and depoclAsType(Dependency).client->exists(end |
endoclAsType(CallBehaviorAction).isBCollaborationAction())))
and not( Dependency.allInstances->exists( dep |
depoclAsType(Dependency).client->exists(end |
endoclAsType(Action)=self) 
and depoclAsType(Dependency).supplier->exists(end |
endoclAsType(CallBehaviorAction).isBCollaborationAction())))

-- Constraint 90
-- The number of InformationFlows targeting a
BusinessCollaborationCall MUST match the number of
BusinessCollaborationPartitions
-- contained in the BusinessCollaborationProtocol that is called by
this BusinessCollaborationCall.
context CallBehaviorAction inv: self.isBCollaborationAction()
implies self.owner.ownedElement->select( dep |
depoclAsType(Dependency).supplier->
exists( end | endoclAsType(CallBehaviorAction)=self )->size() =
self.behavioroclAsType(Activity).ownedElement->
context ActivityPartition inv: self.isBCollaborationPartition()
  and self.represents.oclAsType(Actor).isAuthorizedRole()
  and Dependency.allInstances->exists( dep |
    dep.oclAsType(Dependency).client->exists( end |
      end.oclAsType(ActivityPartition)=self)
    and dep.oclAsType(Dependency).supplier-> exists( end |
      end.oclAsType(CallBehaviorAction).isBCollaborationAction()))
  implies Dependency.allInstances->select( dep |
    dep.oclAsType(Dependency).client->
    exists( end | end.oclAsType(ActivityPartition)=self)
    and dep.oclAsType(Dependency).supplier-> exists( end |
      end.oclAsType(CallBehaviorAction).isBCollaborationAction())) ->
  forAll(dependency | dependency.oclAsType(Dependency).supplier->
    exists(end|end.oclAsType(CallBehaviorAction).behavior.
   oclAsType(Activity).ownedElement->
    exists( partition | partition.oclAsType(ActivityPartition).
    isBCollaborationPartition() and partition.oclAsType(ActivityPartition).represents.
    oclAsType(Actor)=self.represents.oclAsType(Actor))))

-- Constraint 92
-- A BusinessRealizationView MUST contain exactly one
-- BusinessRealizationUC, two to many AuthorizedRoles,
-- and two to many participates associations.
context Package inv: let ownEl : Set(Element) = self.ownedElement in
  self.isBRealizationV()
  implies ownEl -> select ( ass |
    ass.oclAsType(Association).isParticipates())->size>=2
  and ownEl -> select ( bRealUC |
    bRealUC.oclAsType(UseCase).isBRealizationUC()
    and not(bRealUC.oclAsType(UseCase).isBCollaborationUC()))
  ->size()=1 and ownEl
  -> select ( roles |roles.oclAsType(Actor).isAuthorizedRole())
  ->size()>=2

-- Constraint 93
-- A BusinessRealization MUST be associated with two to many
-- AuthorizedRoles via stereotyped binary participates associations.
context UseCase inv: self.isBRealizationUC() and
    not(self.isBCollaborationUC())
implies self.owner.ownedElement->
select(a| a.oclAsType(Association).isParticipates() and a.oclAsType(Association).ownedEnd.type
    ->exists(t|t.oclAsType(Actor).isAuthorizedRole()) and a.oclAsType(Association).ownedEnd.type
    ->exists(t|t.oclAsType(UseCase)=self ) )->size()>=2

-- Constraint 94
-- A BusinessRealization MUST be the source of exactly one realization
dependency to a BusinessCollaborationUseCase.
context UseCase inv: self.isBRealizationUC()
implies self.owner.ownedElement->exists( ass |
    ass.oclAsType(Realization).isRealizes() and ass.oclAsType(Realization).client->exists(uc |
    uc.oclAsType(UseCase)=self) and ass.oclAsType(Realization).supplier->exists(uc |
    uc.oclAsType(UseCase).isBCollaborationUC()))

context UseCase inv: self.isBRealizationUC()
implies self.include->size()=0 and UseCase.allInstances
    ->forAll(k|k.oclAsType(UseCase).include.addition
    ->forAll(s|not(s.oclAsType(UseCase)=self)))
and UseCase.allInstances
    ->forAll(u|u.oclAsType(UseCase).extend.extendedCase
    ->forAll(t|not(t.oclAsType(UseCase)=self))
and self.extend->size=0

-- Constraint 96
-- All dependencies from/to an AuthorizedRole must be stereotyped as mapsTo.
context Package inv: self.isBRealizationV()
implies self.ownedElement->select( dep |
    dep.oclAsType(Dependency).client->
    exists( k | k.oclAsType(Actor).isAuthorizedRole() ) and dep.oclAsType(Dependency).supplier->
    exists( k | k.oclAsType(Actor).isAuthorizedRole()) )
forAll(dep| dep.oclAsType(Dependency).isMapsTo())

-- Constraint 97
-- An AuthorizedRole, which participates in a BusinessRealization,
-- must be the target of exactly one mapsTo dependency
-- starting from a BusinessPartner. Furthermore the AuthorizedRole,
-- which participates in the BusinessRealization must
-- be the source of exactly one mapsTo dependency targeting an
-- AuthorizedRole participating in a BusinessCollaborationUseCase.
context Actor inv: self.isAuthorizedRole()
    and self.owner.ownedElement ->
exists( ass | ass.oclAsType(Association).isParticipates() and ass.oclAsType(Association).ownedEnd.type->exists( end | end.oclAsType(Actor)=self) and ass.oclAsType(Association).ownedEnd.type->exists( end | end.oclAsType(UseCase).isBRealizationUC() and not(end.oclAsType(UseCase).isBCollaborationUC())))) implies self.owner.ownedElement->select( dep | dep.oclAsType(Dependency).isMapsTo()) and dep.oclAsType(Dependency).client ->exists(t|t.oclAsType(Actor).isBPartner() and not(t.oclAsType(Actor).isAuthorizedRole()))-> select(dep | dep.oclAsType(Dependency).supplier-> exists(t|t.oclAsType(Actor)=self))-> size()=1 and self.oclAsType(Actor).hlpMapsToAuthRoleParticipates()

-- Constraint 98
-- AuthorizedRoles in a BusinessRealizationView must have a unique
name within the scope of the package, they are located in
context Package inv:
let authRoles : Set(Element) = self.ownedElement->select( roles | roles.oclAsType(Actor).isAuthorizedRole()) in self.isBRealizationV() implies authRoles->size() = authRoles->collect(p|p.oclAsType(Actor).name)->asSet->size()

-- Constraint 99
-- The number of AuthorizedRoles participating in a
BusinessCollaborationUseCase MUST match the number of
AuthorizedRoles participating in the BusinessRealization realizing
this BusinessCollaborationUseCase
context Package inv:
let ass : Set(Element) = self.ownedElement->select( ass | ass.oclAsType(Association).isParticipates()) in self.isBRealizationV() implies ass->select( ends |ends.oclAsType(Association).ownedEnd.type->exists( auth | auth.oclAsType(Actor).isAuthorizedRole()) and ends.oclAsType(Association).ownedEnd.type->exists( uc | uc.oclAsType(UseCase).isBRealizationUC())) -> size() = ass->select( ends |ends.oclAsType(Association).ownedEnd.type->exists( auth | auth.oclAsType(Actor).isAuthorizedRole()) and ends.oclAsType(Association).ownedEnd.type->exists( uc | uc.oclAsType(UseCase).isBCollaborationUC())) -> size()

-- Constraint 100
-- A BusinessInformationView MUST contain one to many
InformationEnvelopes or subtypes thereof defined in any other
extension/specialization module. Furthermore, it MAY contain any
other document modeling artifacts.
context Class inv: self.isBInformationV() implies self.ownedElement->exists( doc | doc.isInfEnvelope())

-- Convenience method:
-- Evaluates if a package is stereotyped as bCollMode
def:
  let: isBCollModel() : Boolean =
  self.oclAsType(Package).extension_bLibrary.
  oclIsKindOf(UMM2_Profile__bCollModel)

-- Convenience method:
-- Evaluates if a package is stereotyped as bCollaborationV
def:
  let: isBCollaborationV() : Boolean =
  self.oclAsType(Package).extension_bLibrary.
  oclIsKindOf(UMM2_Profile__bCollaborationV)

-- Convenience method:
-- Evaluates if a package is stereotyped as bRealizationV
def:
  let: isBRealizationV() : Boolean =
  self.oclAsType(Package).extension_bLibrary.
  oclIsKindOf(UMM2_Profile__bRealizationV)

-- Convenience method:
-- Evaluates if a package is stereotyped as bTransactionV
def:
  let: isBTransactionV() : Boolean =
  self.oclAsType(Package).extension_bLibrary.
  oclIsKindOf(UMM2_Profile__bTransactionV)

-- Convenience method:
-- Evaluates if a package is stereotyped as bChoreographyV
def:
  let: isBChoreographyV() : Boolean =
  self.oclAsType(Package).extension_bLibrary.
  oclIsKindOf(UMM2_Profile__bChoreographyV)

-- Convenience method:
-- Evaluates if a package is stereotyped as bInformationV
def:
  let: isBInformationV() : Boolean =
  self.oclAsType(Package).extension_bLibrary.
  oclIsKindOf(UMM2_Profile__bInformationV)

-- Convenience method:
-- Evaluates if a package is stereotyped as bRequirementsV
def:
  let: isBRequirementsV() : Boolean =
  self.oclAsType(Package).extension_bLibrary.
  oclIsKindOf(UMM2_Profile__bRequirementsV)

-- Convenience method:
-- Evaluates if a package is stereotyped as bDomainV
def:
  let: isBDomainV() : Boolean =
  self.oclAsType(Package).extension_bLibrary.
  oclIsKindOf(UMM2_Profile__bDomainV)

-- Convenience method:
-- Evaluates if a package is stereotyped as bPartnerV
def:
  let: isBPartnerV() : Boolean =
  self.oclAsType(Package).extension_bLibrary.
  oclIsKindOf(UMM2_Profile__bPartnerV)

-- Convenience method:
-- Evaluates if a package is stereotyped as bEntityV
def:
  let: isBEntityV() : Boolean =
  self.oclAsType(Package).extension_bLibrary.
  oclIsKindOf(UMM2_Profile__bEntityV)

-- Convenience method:
-- Evaluates if a package is stereotyped as bArea
def:
  let: isBArea() : Boolean =
  self.oclAsType(Package).extension_bLibrary.
  oclIsKindOf(UMM2_Profile__bArea)

-- Convenience method:
-- Evaluates if a use case is stereotyped as bProcessUC
def:
  let: isBProcessUseCase() : Boolean =
  self.oclAsType(UseCase).extension_bProcessUC.isDefined

-- Convenience method:
-- Evaluates if an activity is stereotyped as bProcess
def:
  let: isBProcess() : Boolean =
  self.oclAsType(Activity).extension_bProcess.isDefined

-- Convenience method:
-- Evaluates if an actor is stereotyped as bPartner
def:
let: isBPartner() : Boolean =
    self.oclAsType(Actor).extension_Stakeholder.oclIsKindOf(UMM2_Profile__bPartner)

-- Convenience method:
-- Evaluates if an association is stereotyped as participates
def:
    let: isParticipates() : Boolean =
        self.oclAsType(Association).extension_participates.isDefined

-- Convenience method:
-- Evaluates if an actor is stereotyped as stakeholder
def:
    let: isStakeholder() : Boolean =
        self.oclAsType(Actor).extension_Stakeholder.isDefined

-- Convenience method:
-- Evaluates if a dependency is stereotyped as isOfInterestTo
def:
    let: isOfInterestTo() : Boolean =
        self.oclAsType(Dependency).extension_isOfInterestTo.isDefined

-- Convenience method:
-- Evaluates if an actor is stereotyped as authorized role
def:
    let: isAuthorizedRole() : Boolean =
        self.oclAsType(Actor).extension_AuthorizedRole.isDefined

-- Convenience method:
-- Evaluates if an use case is stereotyped as BCollaborationUC
def:
    let: isBCollaborationUC() : Boolean =
        self.oclAsType(UseCase).extension_bProcessUC.oclIsKindOf(UMM2_Profile__bCollaborationUC)

-- Convenience method:
-- Evaluates if a class is stereotyped as bEntity
def:
    let: isBEntity() : Boolean =
        self.oclAsType(Class).extension_bEntity.isDefined

-- Convenience method:
-- Evaluates if a package is stereotyped as bDataV
def:
    let: isBDataV() : Boolean =
        self.oclAsType(Package).extension_bLibrary.oclIsKindOf(UMM2_Profile__bDataV)
-- Convenience method:
-- Evaluates if an use case is stereotyped as bTransactionUC
def:
let: isBTransactionUC() : Boolean =
self.oclAsType(UseCase).extension_bProcessUC.oclIsKindOf(UMM2_Profile__bTransactionUC)

-- Convenience method:
-- Evaluates if a modeling is an activity partition
def:
let: isActivityPartition() : Boolean =
self.oclIsTypeOf(ActivityPartition)

-- Convenience method:
-- Evaluates if an action is stereotyped as bProcessAction
def:
let: isBProcessAction() : Boolean =
self.oclAsType(Action).extension_bProcessAction.isDefined

-- Convenience method:
-- Evaluates if an use case is not stereotyped as bTransactionUC
def:
let: isNotBTransactionUC() : Boolean =
not(self.oclAsType(UseCase).isBTransactionUC())

-- Convenience method:
-- Evaluates if an activity is stereotyped as bCollaborationProtocol
def:
let: isBCollaborationProtocol() : Boolean =
self.oclAsType(Activity).extension_bCollaborationProtocol.isDefined

-- Convenience method:
-- Evaluates if a call behavior action is stereotyped as bTransactionAction
def:
let: isBTransactionAction() : Boolean =
self.oclAsType(CallBehaviorAction).extension_bTransactionAction.isDefined

-- Convenience method:
-- Evaluates if a call behavior action is stereotyped as bCollaborationAction
def:
let: isBCollaborationAction() : Boolean =
self.oclAsType(CallBehaviorAction).extension_bCollaborationAction.isDefined

-- Convenience method:
-- Evaluates if a class is stereotyped as InfEnvelope
def: let: isInfEnvelope() : Boolean = self.oclAsType(Class).extension_InfEnvelope.isDefined

-- Convenience method:
-- Evaluates if an object node is stereotyped as bESharedState
def: let: isBESharedState() : Boolean = self.oclAsType(ObjectNode).extension_bESharedState.isDefined

-- Convenience method:
-- Evaluates if a state is stereotyped as bEState
def: let: isBEState() : Boolean = self.oclAsType(State).extension_bEState.isDefined

-- Convenience method:
-- Evaluates if an activity is stereotyped as bTransaction
def: let: isBTransaction() : Boolean = self.oclAsType(Activity).extension_bTransaction.isDefined

-- Convenience method:
-- Evaluates if an activity partition is stereotyped as bTPartition
def: let: isBTPartition() : Boolean = self.oclAsType(ActivityPartition).extension_bTPartition.isDefined

-- Convenience method:
-- Evaluates if an action is stereotyped as ReqAction
def: let: isReqAction() : Boolean = self.oclAsType(Action).oclIsKindOf(UMM2_Profile__ReqAction)

-- Convenience method:
-- Evaluates if an action is stereotyped as ResAction

-- Convenience method:
-- Evaluates if an use case is stereotyped as bRealizationUC
def: let: isBRealizationUC() : Boolean = self.oclAsType(UseCase).extension_bRealizationUC.isDefined
-- Convenience method:
-- Evaluates if a dependency is stereotyped as realizes
def:
  let: isRealizes() : Boolean =
  self.oclAsType(Realization).extension_realizes.isDefined

-- Convenience method:
-- Evaluates if a dependency is stereotyped as mapsTo.
def:
  let: isMapsTo() : Boolean =
  self.oclAsType(Dependency).extension_mapsTo.isDefined

-- Convenience method for evaluating if there is a mapsTo dependency
from an authorized role
-- that leads to another authorized role participating in a business
-- collaboration use case
def:
  let: hlpMapsToAuthRoleParticipates() : Boolean =
  self.owner.ownedElement->
  select( dep | dep.oclAsType(Dependency).isMapsTo()
  and dep.oclAsType(Dependency).client->
  exists( t | t.oclAsType(Actor)=self)
  and dep.oclAsType(Dependency).supplier->
  exists(t | t.oclAsType(Actor).isAuthorizedRole()
  and t.oclAsType(Actor).hlpParticipatesBCollaborationUC() ))
  ->size()==1

-- Convenience method for evaluating if a certain authorized role
participates in a business
-- collaboration use case
def:
  let: hlpParticipatesBCollaborationUC() : Boolean =
  self.owner.ownedElement->
  select( ass | ass.oclAsType(Association).isParticipates()
  and ass.oclAsType(Association).ownedEnd.type->exists( end |
  end.oclAsType(Actor)=self)
  and ass.oclAsType(Association).ownedEnd.type->exists( end |
  end.oclAsType(UseCase).isBCollaborationUC()) )->size()==1

-- Convenience method:
-- Evaluates if an activity partition is stereotyped as
-- bCollaborationPartition
def:
  let: isBCollaborationPartition() : Boolean =
  self.oclAsType(ActivityPartition).
  extension_bCollaborationPartition.isDefined

-- Convenience method:
-- Evaluates if a business transaction MUST have an responding
-- information pin
-- (i.e., is a two-way transaction) according to its business
transaction pattern

def:
    let: hlpMustHaveResInfPin() : Boolean =
        self.oclAsType(Activity).extension_bTransaction.
businessTransactionType='RequestResponse'
or self.oclAsType(Activity).extension_bTransaction.
businessTransactionType='QueryResponse'
or self.oclAsType(Activity).extension_bTransaction.
businessTransactionType='RequestConfirm'
or self.oclAsType(Activity).extension_bTransaction.
businessTransactionType='CommercialTransaction'

-- Convenience method:
-- Evaluates if a business transaction MUST NOT have an responding
information pin
-- (i.e., is an one-way transaction) according to its business
transaction pattern

def:
    let: hlpMustNotHaveResInfPin() : Boolean =
        self.oclAsType(Activity).extension_bTransaction.
businessTransactionType='Notification'
or self.oclAsType(Activity).extension_bTransaction.
businessTransactionType='InformationDistribution'

-- Convenience method:
-- Evaluates if an action is stereotyped as bNestedCollaboration

def:
    let: isBNestedCollaboration() : Boolean =
        self.oclAsType(Action).extension_bNestedCollaboration.isDefined

-- Convenience method:
-- Evaluates if a dependency is stereotyped as InitFlow

def:
    let: isInitFlow() : Boolean =
        self.oclAsType(Dependency).extension_initFlow.isDefined

-- Convenience method:
-- Evaluates if a dependency is stereotyped as ReFlow

def:
    let: isReFlow() : Boolean =
        self.oclAsType(Dependency).extension_reFlow.isDefined