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8 Metamodel

8.1 Business Metamodel

This section specifies the abstract syntax and semantics of a Business Operations Map (BOM) model and model management packages. The abstract syntax of models is defined using stereotypes and tagged values. The semantics of models are specified using the truth semantics of well-formed-formula expressed with OCL expressions and with natural language.

8.1.1 Model Abstract Syntax

Figure 8-1 specifies the modelling elements, and their inter-relationships that are used to express the structure and behaviour of objects in a BOM model. Each element and interrelationship permitted in a BOM is defined in the metamodel specified in this section of the document.

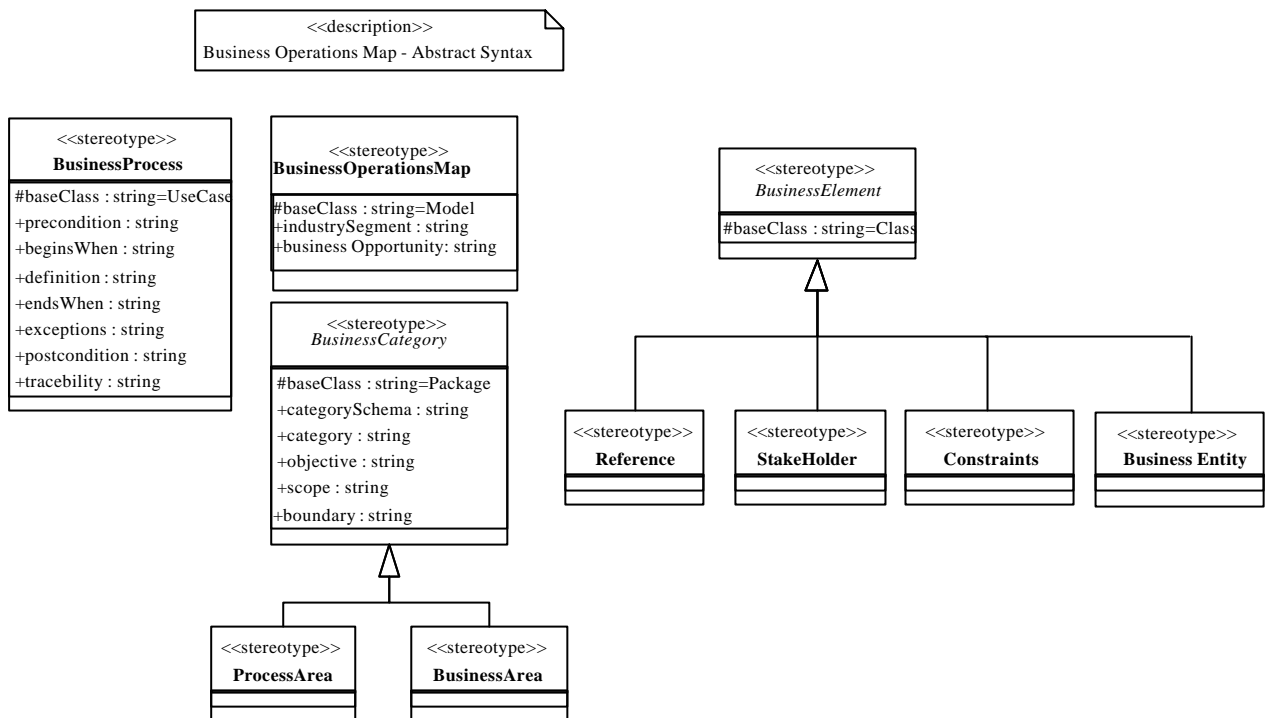


Figure 8-1 Business Operations Map - Abstract Syntax

BusinessEntity

Business Entity is an abstraction for any artifact that is important in the execution of a business collaboration.

*BusinessProcess*¹

A business process is a use case that is used to gather requirements about business processes. Inputs to the business process must be specified in the preconditions and outputs from the business process must be specified in the post-conditions.

Tagged Values:

precondition. Preconditions are constraints that must be satisfied starting the use case.

beginsWhen. Describe the initial event from the actor that starts a use case.

definition. A set of simple sentences that state the actions performed as part of the use case. This description includes references to

¹ Business Processes should consider the inclusion of measure, metric and meter parameters for a business process. Measures are quantifiable properties; a metric is an expression of some performance calculation and a meter is a comparison of the metric to a benchmark.

1		"include" use cases and "extend" use
2		cases.
3	<i>endsWhen.</i>	Describe the condition or event that
4		causes normal completion of the use case.
5	<i>exceptions.</i>	List all exception conditions that will cause
6		the use case to terminate before its normal
7		completion.
8	<i>postcondition.</i>	Post-conditions are constraints that must
9		be satisfied ending the use case.
10	<i>traceability.</i>	An explicit list of requirements, identified
11		by requirements category, that are either
12		partially or completely satisfied by this use
13		case. Requirements categories are 1)
14		Static and structural, 2) Dynamics, 3)
15		Exception conditions, 4) Non-functional, 5)
16		System Administration

17 *BusinessOperationsMap*

18 A Business Operations Map is a framework for understanding
19 business area sub-process interrelationships. This framework is
20 termed a Business Operations Map (BOM).

21 **Tagged Values:**

22 *industrySegment.* A specification of the scope of an
23 industry-specific business process activity
24 that encapsulates all of the business areas
25 to be considered for the BOM

26 *businessOpportunity.*a statement of the business
27 opportunity or the problem that is
28 addressed by the BOM

29 ~~*references.*~~

31 *BusinessArea*

32 A business area is a category of decomposable business
33 process areas. A business area collates process areas.

34 *BusinessCategory*

35 A business category is an abstraction category for reusing tag-
36 values. A business category collates sub-categories.

37 **Tagged Values:**

38 *categorySchema.* The name of the categorization
39 schema used to reference use cases.

1	<i>category.</i>	The category identifier used to reference a
2		business area or process area set of use
3		cases.
4	<i>objective.</i>	A brief description of the purpose of the
5		BOM, business area or process area
6	<i>scope.</i>	A description of what the business area or
7		process area applies to; what is affected or
8		influenced by the business area or process
9		area
10	<i>boundary.</i>	A more detailed description of scope in
11		terms of 1) stakeholders within/without, 2)
12		information passed into or out from, 3) key
13		business information objects used within,
14		or 4) external interfaces to another - BOM,
15		business area or process area
16	<i>ProcessArea</i>	
17		A process area is a category of business processes and
18		business transactions. A process area collates business
19		processes and business transactions.
20	<i>BusinessElement.</i>	
21		Business element is an abstraction category for reusing tag-
22		values
23	<i>Reference</i>	
24		If applicable, list documents that relate to the BOM or the
25		business opportunities or problems which are to be addressed
26		
27	<i>StakeHolder</i>	
28		Represented by a role played in relation to the BOM, business
29		area or process area
30	<i>Constraints</i>	
31		Note any design constraints, external constraints or other
32		dependencies
33		

8.1.2 Model Semantics

The semantics of each element of the BOM metamodel is defined in this section.

Figure 8-2 illustrates the interrelationships between the BOM modelling elements.

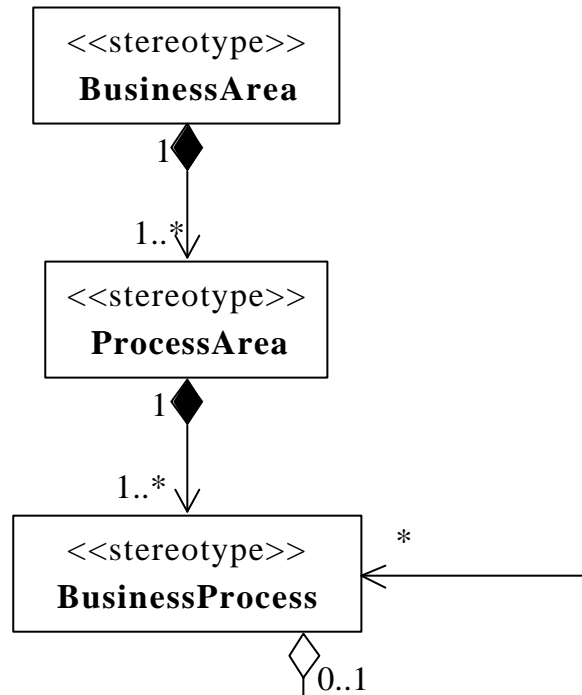
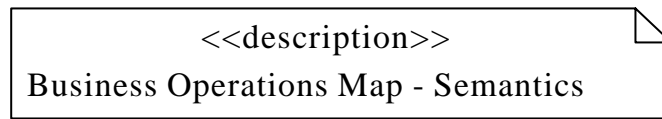


Figure 8-2 Business Operations Map - Semantics

A business process is a set of business tasks performed by individual business partners together with business interface tasks performed collaboratively among two or more business partners.

Business process can be decomposed into sub-processes using the «include» and «extend» association stereotypes defined in UML.

8.1.3 Model Management Abstract Syntax

The BOM model management organizes business processes (use cases) into a framework of business areas and process areas. These modelling elements are organized as logical, business area and sub-process categories arranged in a framework for understanding their interrelationships. The framework is termed a Business Operations Map (BOM).

Figure 8-3 shows the metamodel for managing the BOM model. The modelling elements used to manage and organize these three specifications are defined in this section.

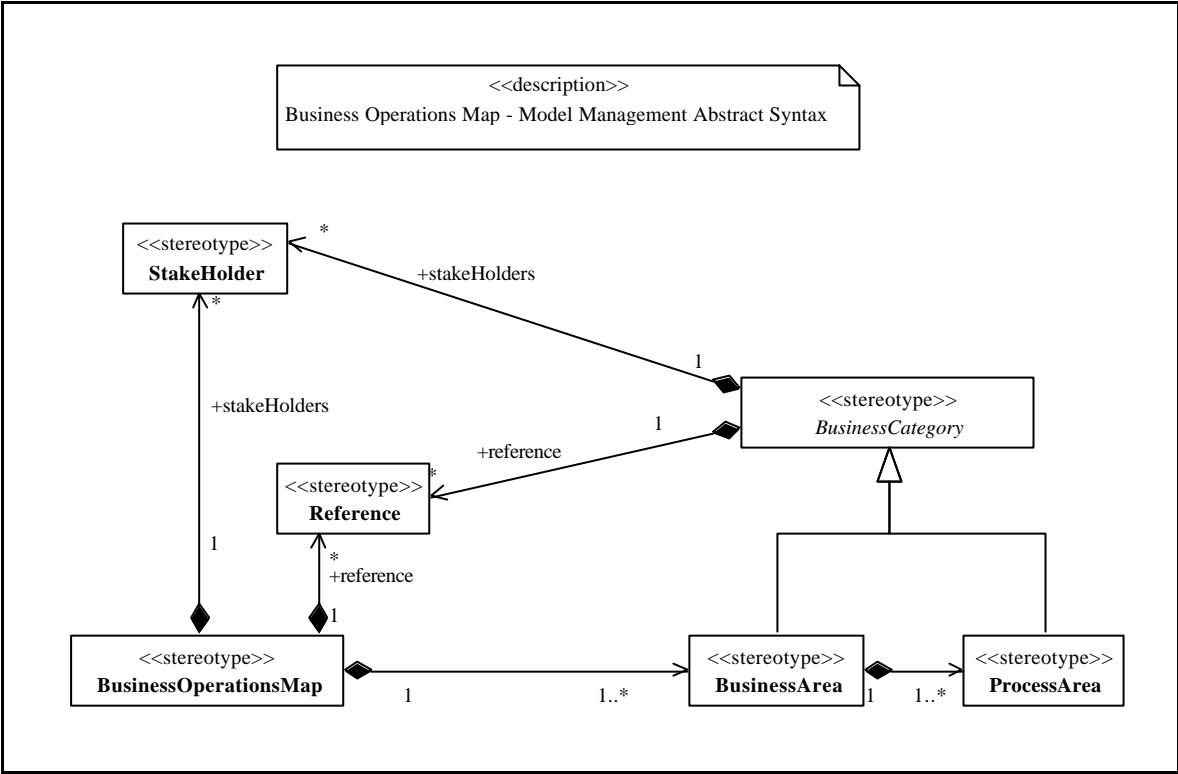


Figure 8-3 Business Operations Map - Model Management Abstract Syntax

The following stereotypes and tagged values are contained in the BOM management metamodel.

Business Category

Associations:

- reference. Reference source for the definition of the Business Areas and Process Areas.
- stakeHolders. Defines the set of stakeholders associated with the Business Areas and Process Areas.

Business Operations Map

Associations:

- reference. Reference source for the definition of the BOM.
- stakeHolders. Defines the set of stakeholders associated with the BOM.

1

2 **8.1.4 Model Management Semantics**

3

4 The semantics of each element of the BOM model management metamodel is
5 defined in this section. Figure 8-4 illustrates the interrelationships between the
6 BOM model management elements.

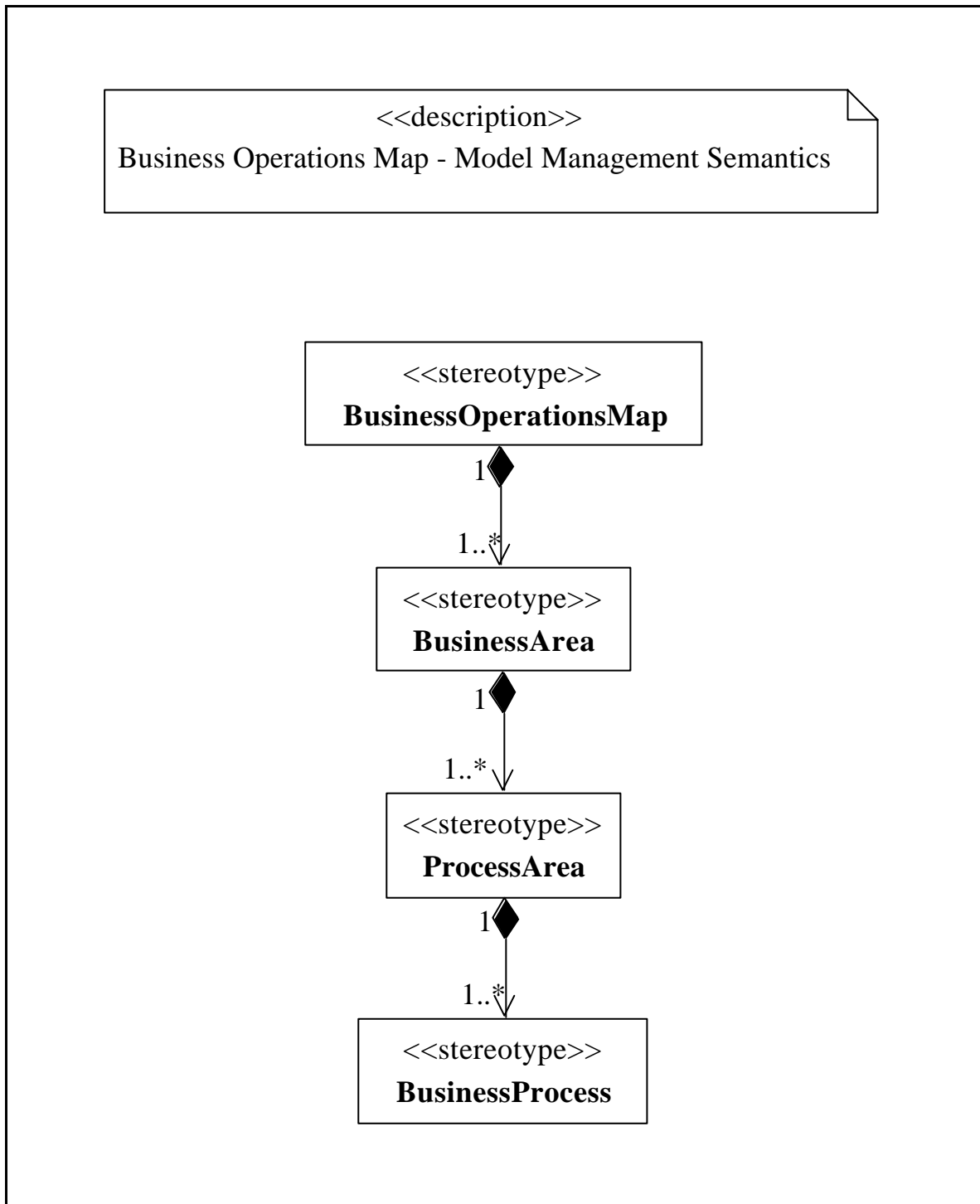


Figure 8-4 Business Operations Map - Model Management Semantics

A business operations map comprises business areas. The [Supply Chain Council](#) defines plan, source, make and deliver business areas in their Supply Chain Operations Reference (SCOR) model. The model describes business processes in the Discrete and Continuous Goods Supply Chain. The [Telecommunications Management Forum](#) defines fulfil, assure and bill business

1 areas in their Telecom Operations Map (TOM). The map describes business
2 processes in the services industry.

3 Business areas comprise process areas. A process area is a sequence of
4 business processes that implements a particular business model. Business
5 areas such as “Deliver stocked product” and “Deliver make-to-order products”
6 are two different business models that use many of the same business
7 processes.

8 **8.1.5 Well-formedness Rules**

9
10 The following well-formedness rules apply to the BOM metamodel.

- 11 • A BOM must contain at least one Business Area.
- 12 • A Business Area must contain at least one Process Area.
- 13 • A Process Area must contain at least one Business Process.

14 **8.2 Requirements Metamodel**

15
16 The Business Requirements View (BRV) of a process model specifies the use case
17 scenarios, input and output triggers, constraints and system boundaries for
18 business transactions (BTs), business collaboration protocols (BCPs) and their
19 interrelationships.

20 This section specifies the abstract syntax and semantics of the BRV of a BT and
21 BCP model and model management packages. The abstract syntax of models is
22 specified using stereotypes and tagged values. The semantics of models are
23 specified using the truth semantics of well-formed-formula expressed with OCL
24 expressions and with natural language.

25 26 **8.2.1 Model Abstract Syntax**

27
28
29 Figure 8-5 specifies the modelling elements and their interrelationships that are
30 used to express the structure and behaviour of objects in the BRV of a BT and
31 BCP model. Each element and interrelationship permitted in a BRV is defined in
32 the metamodel specified in this section of the document.

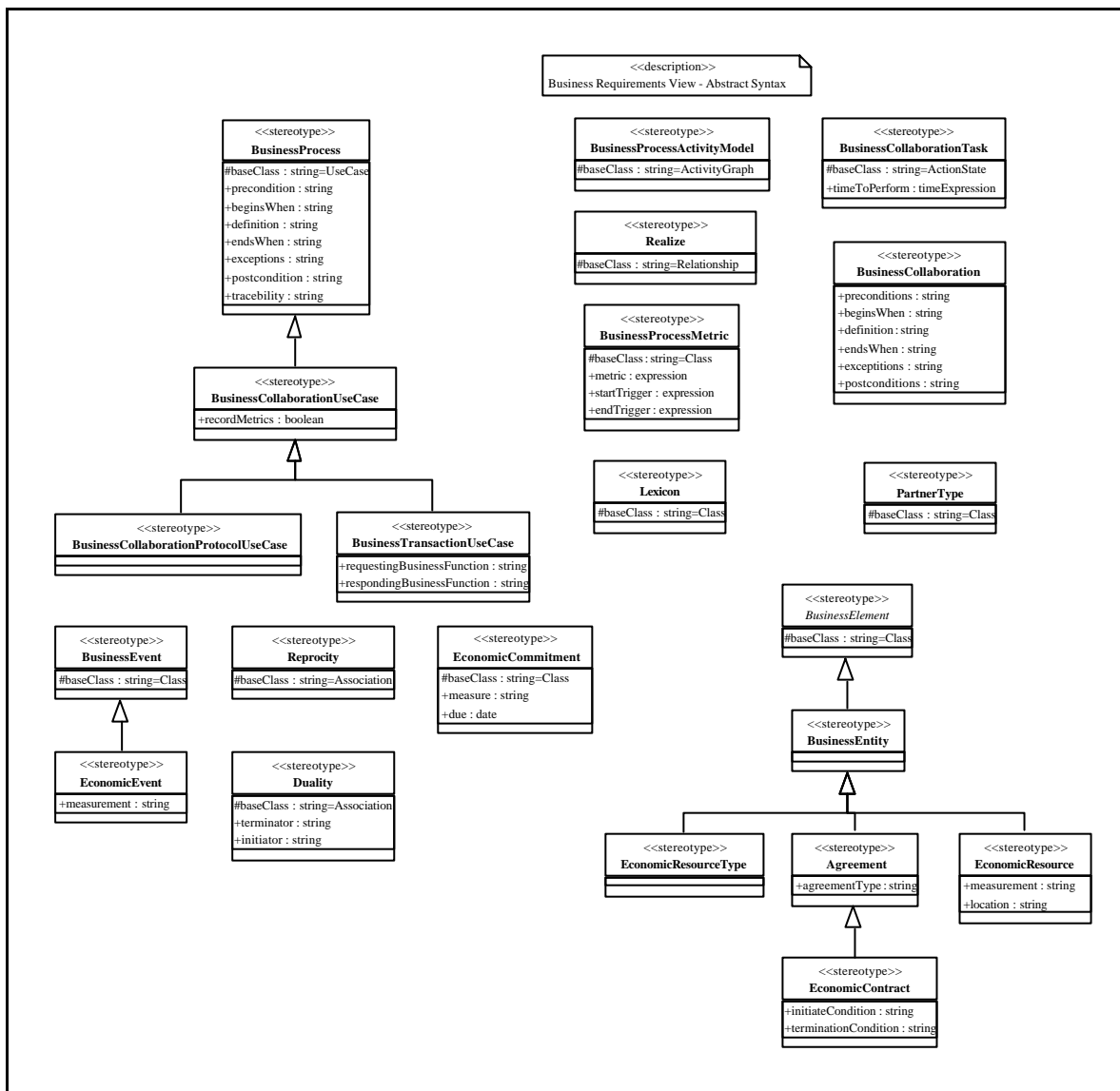


Figure 8-5 BRV - Abstract Syntax

BusinessCollaboration

A business collaboration model specifies the input and output relationships between business collaboration use cases and Agents. Agents provide input triggers to use cases and business collaboration use cases can provide input triggers and output triggers to and from other business collaboration use cases. A business collaboration model captures business information constraints imposed by a specific partner type collaboration. For example, sending a business document to a US Government agency requires a Standard Industry Classification (SIC) code to be included with the business information

BusinessCollaborationTask

A business collaboration task is a task that is performed by one business partner in collaboration with another business partner performing another business interface task. A business process is decomposed into business tasks and business interface tasks.

Tagged Values:

timeToPerform. A task is work that is performed with respect to time. There may be a specific time within which the task must be performed.

BusinessCollaborationProtocolUseCase

A business collaboration protocol use case is used to gather requirements for e-business collaboration protocol specifications.

BusinessCollaborationUseCase

A business collaboration use case is an abstraction for a business collaboration protocol use case and a business transaction use case. The abstraction permits the reuse of the business collaboration realization relationship.

A completed use case assumes that some one “thing” of “measurable value” be created either as a service performed or a product created. Four appropriate classes of measure that can be applied to use case performance are: quantity measure, quality measure, time of performance measure and resource usage or consumption measure. Each use case should have an identified set of appropriate measures. At a minimum, at least one quantity measure should be employed.

Tagged Values:

recordMetrics.

BusinessProcessActivityModel

A business process activity model specifies the behavioural aspects of a business process. The model specifies a flow of control between tasks.

BusinessProcessMetric

Business process metrics are operational or structural measurements that track how the process is performing over time. Operational metrics deal directly with dynamic properties of business while structural metrics deal with static properties.

E.g. Quantity measurements are a performance count or a measure of the amount of product produced by a single process case performance. Quality measurements are a determination of the value of the particular product in relation to some pre-determined quality norm. Time of performance are a

measure of elapsed time between inception based on pre-condition and completion based on post-conditions being in place.

Tagged Values:

Metric.	An OCL expression which defines the measurement.
startTrigger.	An OCL expression which defines the condition which initiates the measurement.
stopTrigger	An OCL expression which defines the condition which terminates the measurement.

BusinessTransactionUseCase

A business transaction use case is used to gather requirements for business transaction specifications.

Tagged Values:

<i>requestingBusinessFunction.</i>	The business function that is implemented by the requesting business partner which is performing a role with respect to the use case e.g. procurement.
<i>respondingBusinessFunction.</i>	The business function that is implemented by the responding business partner which is performing a role with respect to the use case e.g. fulfilment.

Lexicon

A lexicon is a repository of grammar components that are at its base, form a list or set of basic concepts or lexical entries (lexical affinity). It contains information about (a) the notation, (b) the semantics, (c) morphological properties, and (d) syntactic properties of its entries. The Lexicon must contain at least the idiosyncratic information about its entries. Any property of a concept or lexical entry that can be predicted by morphological or syntactic rule will be excluded from the Lexicon. Morphological rules or constructs may be identified by the Lexicon.

PartnerType

A partner type is an actor in a business collaboration use case. Partner types are manufacturer, distributor, retailer, end user, carrier and financier.

Agreement

An agreement is an arrangement between two partner types that specifies in advance the conditions under which they will trade (terms of shipment, terms of payment, collaboration protocols, etc.) An agreement does not imply specific economic commitments.

Tagged Values:

AgreementType. *AgreementTypes* classify and structure agreements. For example, an *AgreementType* might specify the kinds of terms and conditions that must be agreed upon for any instance of an agreement of the particular type. Examples of agreement types might include trading partner agreements and yearly economic contracts.

EconomicContract

A contract is subtype of agreement between partner types that some actual economic exchanges will occur in the future. Contracts can have recursive relationships with other contracts, for example, yearly contracts with monthly releases and weekly or daily shipping schedules. Contracts are containers for collections of commitments. For example, a purchase order is a contract wherein the line items are commitments.

Tagged Values:

initiateCondition. An economic contract term of effect is determined by the *initiateCondition*. This is an OCL constraint and may be defined by measurable elements such as a date, event or system metric.

terminationCondition. An economic contract is no longer in effect if the *terminationCondition* has been true after the qualification of the *initiateCondition*. This is an OCL constraint and may be defined by measurable elements such as a date, event or system metric.
Economic Commitment

An economic commitment is an obligation to perform an economic event (that is, transfer ownership of a specified quantity of a specified economic resource type) at some future point in time. Order line items are examples of commitments.

Tagged Values:

measure. The measurement of an economic resource of the specified type to be transferred.

due. The condition that determines when the transfer of ownership is promised to occur. This is an OCL constraint and may be defined by elements such as a date, event or system metrics.

Reciprocity

Reciprocity is a mandatory relationship between two or more commitments. Business contracts require reciprocal commitments, called “consideration”.

EconomicResourceType

An economic resource type is the abstract classification or definition of an economic resource. For example, in an ERP system, ItemMaster or ProductMaster would represent the Economic Resource Type that abstractly defines an Inventory item or product. Forms of payment are also defined by economic resource types, e.g. currency.

EconomicResource

An economic resource is a quantity of something of value that is under the control of an enterprise, which is transferred from one partner type to another in economic events. Examples are cash, inventory, labor service and machine service.

Tagged Values:

measurement. The number and unit of the economic resource. Unit may be a unit of measure for products, a unit of time for services, or a currency for cash.

location. The location where the economic resource currently resides or is available.

BusinessEvent

A business event is a significant change in the state of one or more entities within a business, e.g. the taking of an order or a price change.

EconomicEvent

An economic event is the transfer of control of an economic resource from one partner type to another partner type. Examples would include sale, cash-payment, shipment, and lease.

Tagged Values:

measurement. The number and unit of the economic resource. that is being transferred.

Duality

Duality is a relationship between Economic Events, where one is the legal or economic consideration of the other. Examples include a payment for a product or service. Duality relationships occur between two or more economic events.

8.2.2 Model Semantics

The semantics of each element of the BRV metamodel is defined in this section.

Figure 8-6 illustrates the interrelationships between the BRV modelling elements.

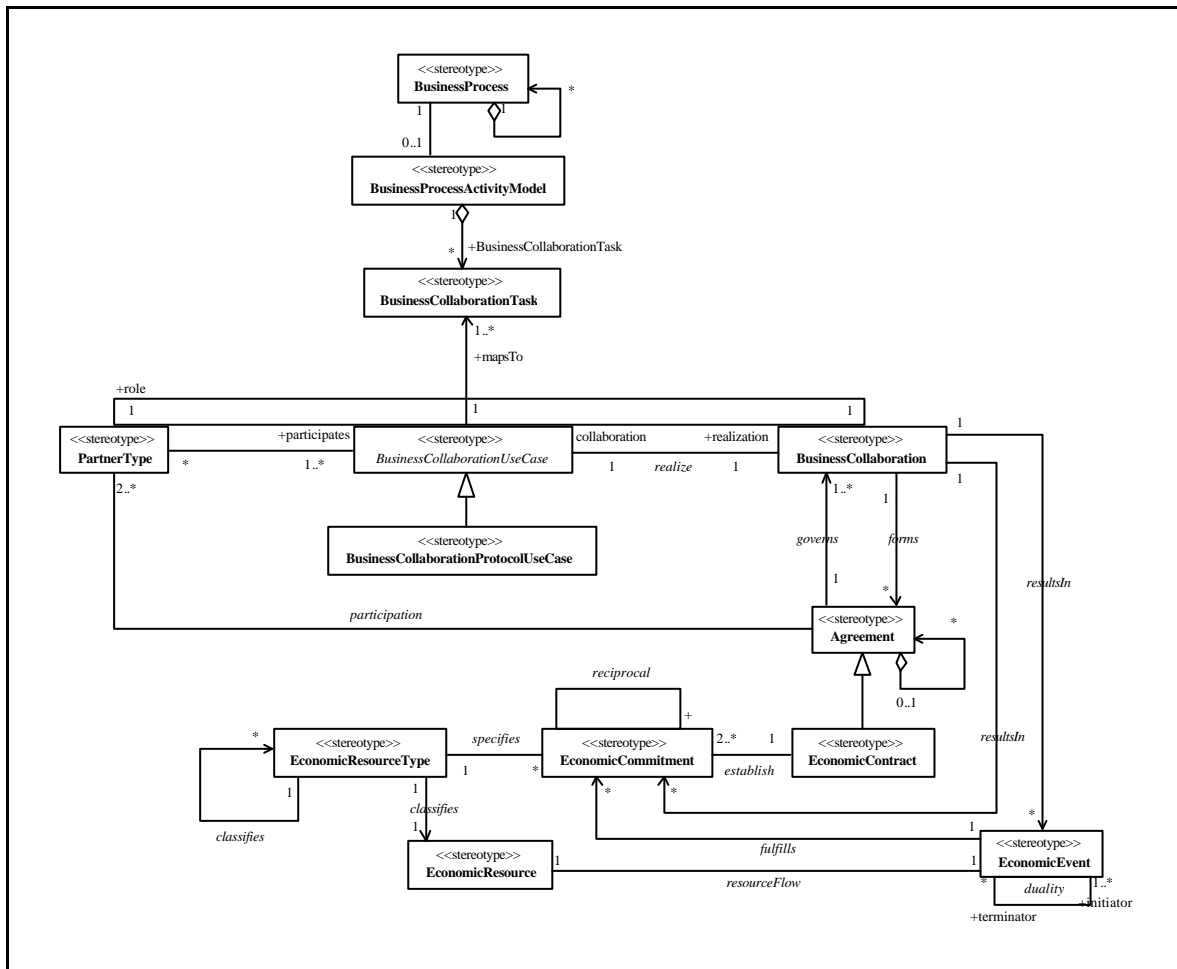


Figure 8-6 BRV - Semantics

A business process is a sequence of business tasks performed by one business partner alone and business interface tasks performed two or more business partners. A business process activity model should only contain activity states that are either business interface task specifications or that are interpreted as business tasks.

Each task can be further decomposed into activities. Business process can be decomposed into sub-processes using the «include» association stereotype defined in the UML.

A transition relationship specifies a change in state of a business process that is triggered by the completion of some part of the business process. A transition relates a source business process and a target business process. The direction of the transition is from the source to the target.

BusinessCollaborationTask

Associations:

mapsTo

A business collaboration use case maps to two business interface tasks specified in a Business Operations Map. One task is the originator of a business contract and the other is a responder to the business contract. The business collaboration use case can either be a business collaboration protocol specification or a business transaction specification.

A business transaction specifies an initiating business partner starting the contract formation process by communicating a business document request to a responding business partner. A responding partner accepts the conditions of the business contract in zero or more returning business signals (e.g. an acknowledgement of receipt) followed by an optional responding business document (e.g. an acknowledgement of acceptance)².

A business collaboration protocol choreographs business transactions when the contract formation process requires a number of requesting and responding business document exchanges. For example the creation of a purchase order request can be specified as a business collaboration protocol that choreographs both a purchase order and notification of acceptance business transactions. In these instances the responding business partner does not accept the entire purchase order offer in a response to the initial business transaction request. Instead the partner communicates line item acceptance of the purchase order using many notifications of acceptance over an agreed period. The contract is formed when the initiating business partner is able to reconcile all the notifications of acceptance with the original purchase order request.

A partner type performs a specific role in business collaboration. The partner roles are not employee or organization titles.

² Business Collaboration Protocol = (Request Signal*, Response?) +

A business requirements use case should capture both the requirements for forming business contracts and the requirements for auditing the formation of business contracts. A business transaction models the start and end of a business contract formation process. This is not always sufficient to capture the start and end of an auditable business formation process. For example, an offer and acceptance contract is formed once an originating partner receives the agreed “acceptance document”. The fact that the sending partner does not receive a verification of proper receipt for an acceptance business document is immaterial to the formation of the contract. It may be important, however, if the sending partner wishes to retain an audit trail of the process for a receiving party to verify proper receipt of the business document.

Economic contracts carry two or more reciprocal commitments, which are promises that future economic events will occur, specifying particular economic resource types. Business contracts require reciprocal commitments, called “considerations”. Subsequently, the promised economic events may fulfill the commitments, transferring ownership of actual economic resources of the committed types from one partner type to another. For example, a purchase order is an economic contract, typically committing one partner type to deliver a product or service of a specified type, and the other partner type to pay for it. The delivery of the product or service might be the first economic event (fulfilling one commitment) and obligating (by the duality relationship) the reciprocal partner type to pay the committed price.

Aggreement

Associations:

- governs.* One agreement may govern an collaboration or another agreement, recursively.
- participation.* At least two partner types must participate in an economic event, one to give the economic resources, the other to take them.

BusinessCollaboration

Associations:

- realize.* A relationship between a business collaboration Use Case and the realization of a Use Case A business collaboration is a realization of a business collaboration use case.
- base.* The base use case for the collaboration in the realization relationship.

BusinessCollaborationUseCase

Associations:

1	realize	A relationship between a business
2		collaboration Use Case and the realization of a
3		Use Case
4	collaboration.	The collaboration realization for the base use
5		case.
6		
7	<i>EconomicContract</i>	
8	Associations:	
9	establishes.	An economic contract establishes two or more
10		commitments.
11	<i>Economic Commitment</i>	
12	Associations:	
13	<i>reciprocal.</i>	A commitment always has reciprocity
14		relationships with one or more other
15		commitments.
16	<i>specifies.</i>	Commitments specify economic resource
17		types.
18	<i>EconomicEvent</i>	
19	Associations:	
20	<i>duality.</i>	Duality is a relationship between economic
21		events, where one is the legal or economic
22		consideration of the other. Examples
23		include a payment for a product or service.
24		If one economic event occurs, but its dual
25		or expected consideration has not
26		occurred, the giving partner type has an
27		imputed claim against the taking partner
28		type for the value of the economic
29		resources transferred.
30	<i>fulfills.</i>	Commitments may be fulfilled by economic
31		events. An economic event may fulfill a
32		prior commitment.
33	<i>resourceFlow.</i>	Economic resources flow from one partner
34		type to another via economic events.
35	<i>EconomicResourceType</i>	
36	Associations:	
37	classifies.	Economic resource types classify
38		economic resources. Economic Resource
39		Types may have recursive relationships,
40		so that for example broad classifications

like "product" could group smaller classifications like "product family", which in turn could have as members the specific "product masters" with SKU numbers.

8.2.3 Model Management Abstract Syntax

The BRV model can be a business collaboration protocol use case model or a business transaction use case model, as well as business collaborations.

Figure 8-7 shows the metamodel for managing the BRV model. The modelling elements used to manage and organize these modelling elements are defined in this section.

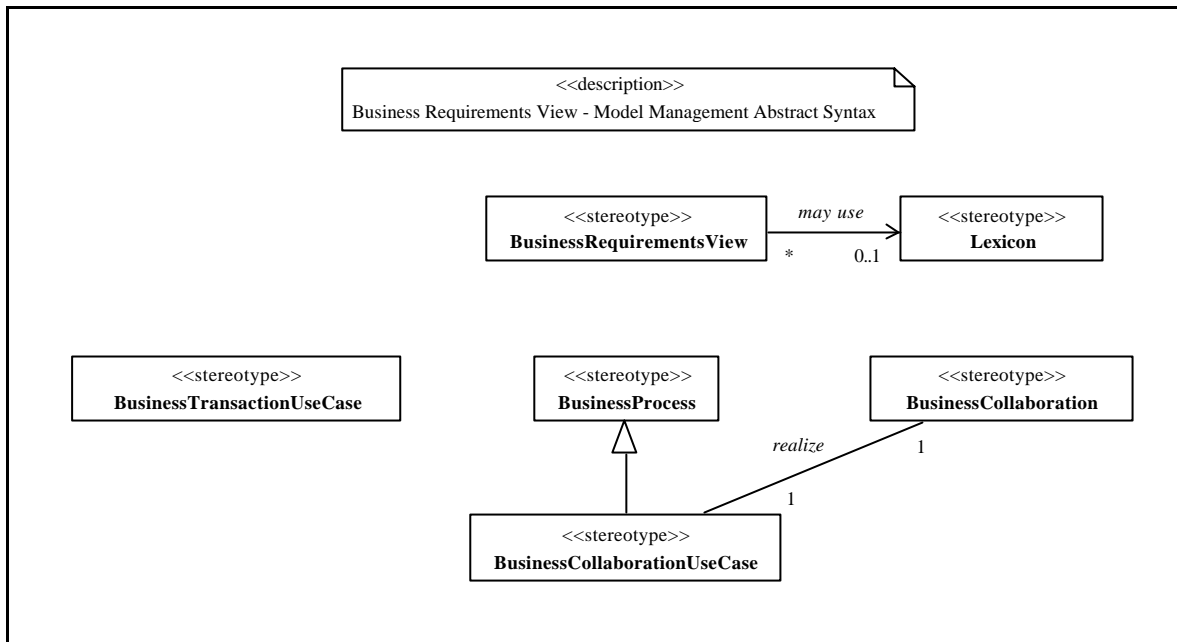


Figure 8-7 BRV - Model Management Abstract Syntax

The following stereotypes and tagged values are contained in the BRV model management metamodel.

BusinessRequirementsView

The Business Requirements View specifies the requirements for one or more business collaborations.

8.2.4 Model Management Semantics

The semantics of each element of the BRV model management metamodel is defined in this section.

Figure 8-8 illustrates the interrelationships between the BRV model management and model elements.

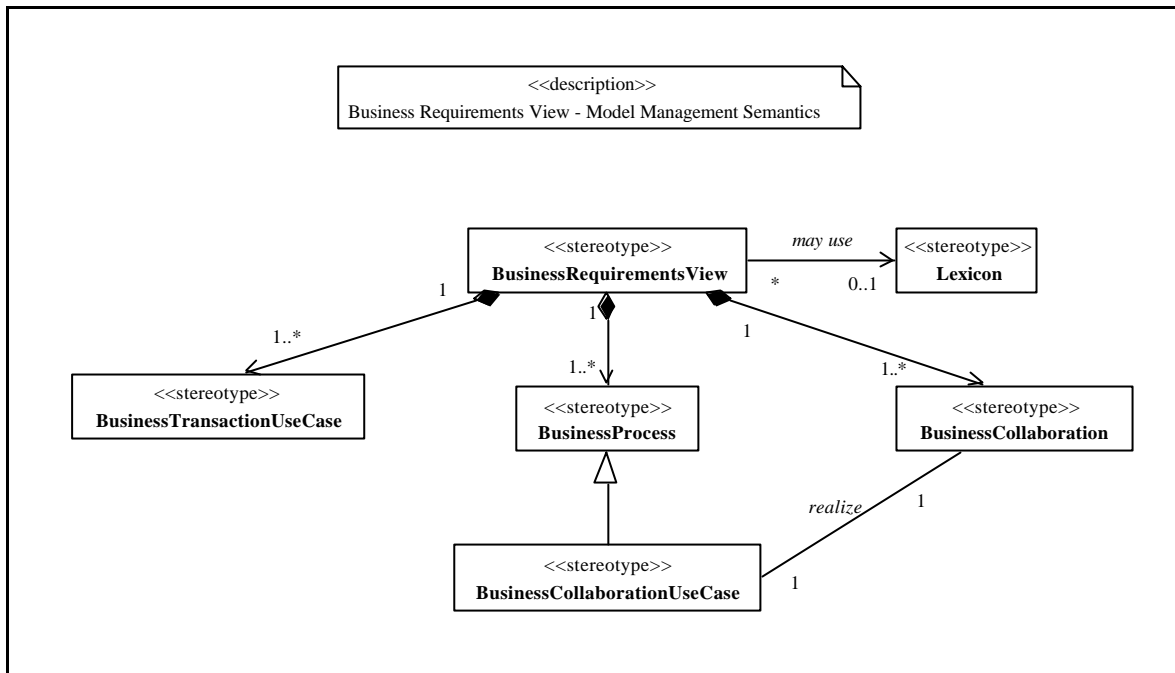


Figure 8-8 BRV - Model Management Semantics

A business requirements view is a model of the requirements of a single business collaboration Use Case and its realizations as business collaborations.

Well-formedness Rules

The following well-formedness rules apply to the business requirements view metamodel package.

- All associations between partner types and business use cases must specify the partner type as the source of the association and the source association end must have a name that is the role of the partner type with respect to the business transaction use case to which it interfaces.
 - A business transaction use case may not be the target of an «extend» association.
 - Business transaction use cases may not be the source of an «include» association.
 - Compliant models must have all use cases stereotyped as «BusinessCollaborationProtocolUseCase», to at least be either the source of an «include» association or the target of an «extend» association.
 - The name of the association between a partner type and a use case must be the name of input/output triggers of the use case.
 - All partner types in the model (classes stereotyped «PartnerType») must be defined as partner types e.g. manufacturer, distributor, retailer, carrier, financier and end user.
 - Economic contracts must have at least two partner types as participants.
 - Each economic contract must establish at least two commitments.
 - Each commitment must have a reciprocity relationship with at least one other commitment.

- If an economic event fulfills a prior commitment, the economic resource type of the economic resource transferred by the economic event must be compatible to the economic resource type promised in the commitment. “Compatible” means either the same type or a subtype of the type of the commitment.
- A business requirements view model contains one or more Business Transaction Use Cases.
- Each Business Transaction Use Case is realized by a Business Collaboration. A business requirements view model contains one or more Business Transaction
- The *collaboratesWith* association must be navigable from the client use case to the supplier use case only.
- Business process activity models must have one initial state and at least one end state.

8.3 Analysis Metamodel

The Business Transaction View (BTV) of a process model specifies the flow of business information³ between business roles as they perform business activities. The business process specification can be formal as in the formation of offer/acceptance business contracts as well as informal as in the announcement of new products.

This section specifies the abstract syntax and semantics of the BTV of a business transaction (BT) and business collaboration protocol (BCP) model and model management packages. The abstract syntax of models is specified using stereotypes and tagged values. The semantics of models are specified using the truth semantics of well-formed-formula expressed with OCL expressions and with natural language.

8.3.1 Model Abstract Syntax

The syntax of e-business collaboration models is comprised of stereotypes and tagged values. The semantics of e-business collaboration models are specified using the truth semantics of well-formed-formula (specified as OCL expressions) and with language.

Figure 8-9 specifies the modelling elements and their interrelationships that are used to express the structure and behaviour of objects in the BTV of a BT and BCP model. Each element and interrelationship permitted in a BTV is defined in the metamodel specified in this section of the document.

³ The use the term “business information” is intentional as the BRV of a business process must capture the semantics of business information exchanged and not the data format or storage format of the information that is specified in the BSV.

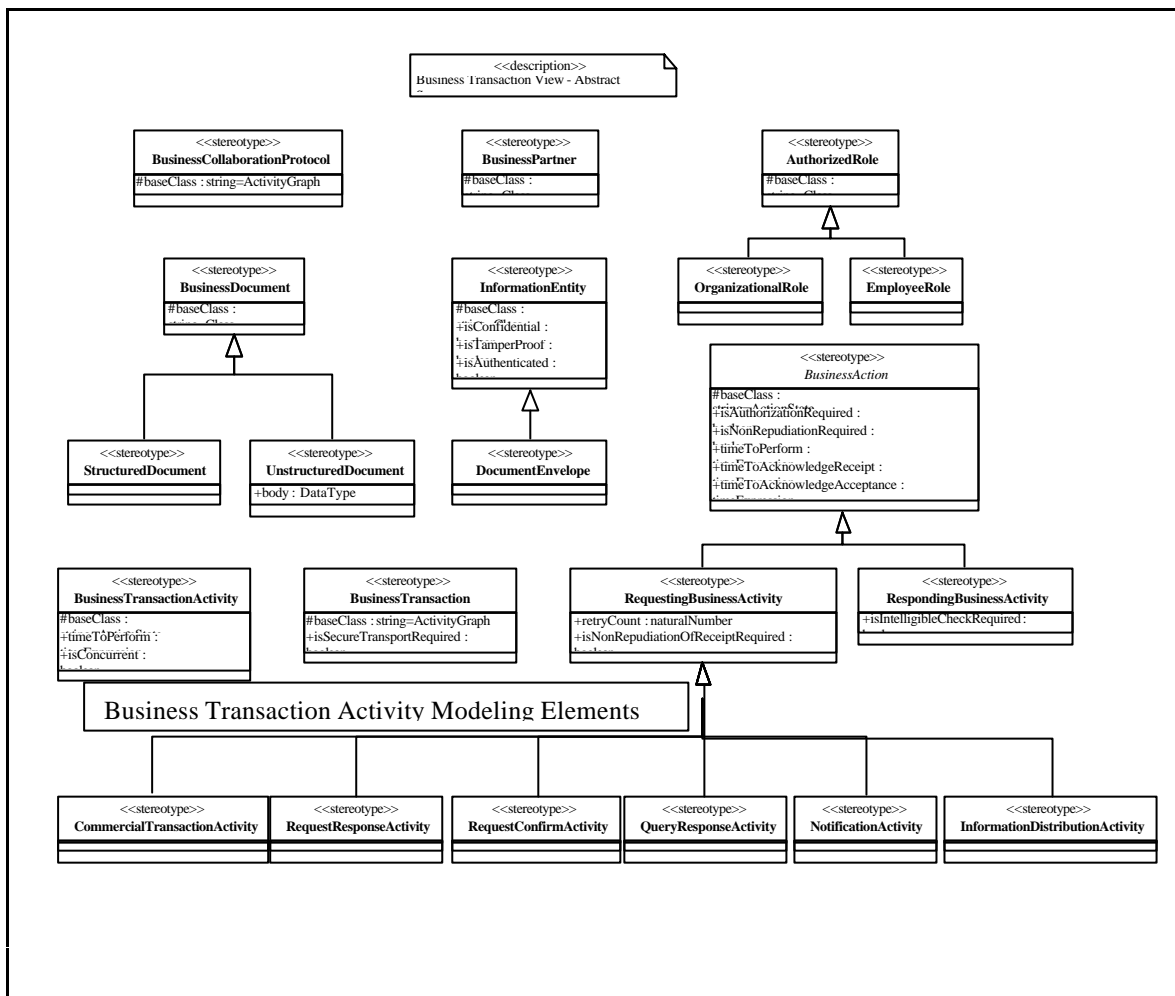


Figure 8-9 BTV - Abstract Syntax

*BusinessAction*⁴

The state of a business transaction is defined by reciprocal Business Actions executed by an authorized role. This is an abstract class that is not a stereotype.

Tagged Values:

IsAuthorizationRequired. If a partner role needs authorization to request a business action or to respond to a business action then the sending partner role must sign the business document exchanged and the receiving partner role must validate this business control and approve the

⁴ A business action is derived from the UML Action State model element. This enables multiple exit and entry transitions for the requesting and responding activity states. A business action is *not* derived from the UML Call State model element that typically models the behavior of an operation. An action state does not have an internal transition, exit action or a do activity. The entry action of a Call State is a single call action.

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authorizer. A responding partner must signal an authorization exception if the sending partner role is not authorized to perform the business activity. A sending partner must send notification of failed authorization if a responding partner is not authorized to perform the responding business activity.

isNonRepudiationRequired. If non-repudiation of origin and content is required then the business activity must store the business document in its original form for the duration mutually agreed to in a trading partner agreement. A responding partner must signal a business control exception if the sending partner role has not properly delivered their business document. A requesting partner must send notification of failed business control if a responding partner has not properly delivered their business document.

This property provides the following audit controls:
Verify sending role identity (authenticate) – Verify the identity of the sending role (employee or organization). 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.
Verify content integrity – Verify the integrity of the original content sent from a partner role i.e. check that the content has not been altered by a 3rd party while the content was exchanged between partners.

timeToPerform. Both partners agree to perform a business transaction within a specific duration. A responding partner must exit the transaction if they are not able to respond to a business document request within the agreed timeout period. A sending partner must retry a business transaction if necessary or must send notification of failed business control (possibly revoking a contractual offer) if a responding partner does not deliver their business document within the agreed time period. The time to perform is the duration from the time a business document request is sent by a requesting partner role

1 until the time a responding business
2 document is “properly received” by the
3 requesting partner role. Both partners
4 agree that the business signal document
5 or business action document specified as
6 the document to return within the time to
7 perform is the “Acceptance Document” in
8 an on-line offer/acceptance contract
9 formation process.

10 *TimeToAcknowledgeReceipt.* Both partners agree to
11 mutually verify receipt of a requesting
12 business document within specific time
13 duration. A responding partner must exit
14 the transaction if they are not able to verify
15 the proper receipt of a business document
16 request within the agree timeout period. A
17 sending partner must retry a business
18 transaction if necessary or must send
19 notification of failed business control
20 (possibly revoking a contractual offer) if a
21 responding partner does not verify
22 properly receipt of a business document
23 request within the agreed time period. The
24 time to acknowledge receipt is the duration
25 from the time a business document
26 request is sent by a requesting partner
27 until the time a verification of receipt is
28 “properly received” by the requesting
29 business partner. This verification of
30 receipt is an audit-able business signal
31 and is instrumental in contractual
32 obligation transfer during a contract
33 formation process (e.g. offer/accept).

34 *timeToAcknowledgeAcceptance.* Both partners agree to
35 the need for a business acceptance
36 document to be returned by a responding
37 partner after the requesting business
38 document passes a set of business rules.
39 The time to acknowledge business
40 acceptance of a requesting business
41 document is the duration from the time a
42 requesting partner sends a business
43 document until the time an
44 acknowledgement of acceptance is
45 “properly received” by the requesting
46 partner. A responding partner must exit the
47 transaction if they are not able to
48 acknowledge business acceptance of a
49 business document request within the
50 agreed timeout period. A sending partner
51 must retry a business transaction if

1 necessary or must send notification of
2 failed business control (possibly revoking a
3 contractual offer) if a responding partner
4 does not acknowledge acceptance of a
5 business document within the agreed time
6 period.

7 *RequestingBusinessActivity*

8 A requesting business activity is a business activity that is
9 performed by a partner role requesting business service from
10 another business partner role.

11 **Tagged Values:**

12 *isNonRepudiationOfReceiptRequired.* Both partners
13 agree to mutually verify receipt of a
14 requesting business document and that
15 the receipt must be non-reputable. A
16 receiving partner must send notification of
17 failed business control (possibly revoking a
18 contractual offer) if a responding partner
19 has not properly delivered their business
20 document.

21
22 Non-repudiation of receipt provides the
23 following audit controls.

24 **Verify responding role identity**
25 (authenticate) – Verify the identity of the
26 responding role (individual or organization)
27 that received the requesting business
28 document.

29 **Verify content integrity** – Verify the
30 integrity of the original content of the
31 business document request.

32 *retryCount.* Both partners agree to the number of
33 times to retry a transaction when a time-
34 out-exception condition is signaled. This
35 parameter only applies to time-out signals
36 and not business process controls or
37 document content exceptions.

38 *RespondingBusinessActivity*

39 A responding business activity is a business activity that is
40 performed by a partner role responding to another business
41 partner role's request for business service.

42 **Tagged Values:**

43 *isIntelligibleCheckRequired.* Both partners agree that a
44 responding partner role must check that a
45 requesting document is not garbled

1 (unreadable, unintelligible) before
2 verification of proper receipt is returned to
3 the requesting partner. Verification of
4 receipt must be returned when a document
5 is “accessible” but it is preferable to also
6 check for garbled transmissions at the
7 same time in a point-to-point synchronous
8 business network where partners interact
9 without going through an asynchronous
10 service provider.

11 *InformationEntity*

12 An information entity realizes structured business information
13 that is exchanged by partner roles performing activities in a
14 business transaction. Information entities include or reference
15 other information entities through associations.

16 A secure information entity is an information entity with security
17 controls. Security controls must be specified when information
18 must be secured within an enterprise until it is accessed by an
19 authorized partner role.

20 These parameters on this model element must be specified in a
21 manner that ensures document integrity by maintaining a “chain-
22 of-custody” from the sender to the intended recipient of the
23 business information.

24 **Tagged Values:**

25 *isConfidential.* The information entity is encrypted so that
26 unauthorized parties cannot view the
27 information.

28 *isTamperProof.* The information entity has an encrypted
29 message digest that can be used to check
30 if the message has been tampered with.
31 This requires a digital signature (sender's
32 digital certificate and encrypted message
33 digest) associated with the document
34 entity.

35 *isAuthenticated.* There is a digital certificate associated
36 with the document entity. This provides
37 proof of the signer's identity.

38 *StructuredDocument*

39 A structured document is an information entity container.

40 *UnstructuredDocument*

41 An unstructured document is any document that is not comprised
42 of document entities.

43 **Tagged Values:**

dataType. This property specifies the document type. It is recommended that a registered MIME type be used for this property (refer to <http://www.iana.org>) for registered MIME types. Partners can agree to use their own experimental MIME types.

OrganizationalRole

Only an organization performs a particular role in an e-business collaboration. An employee does not perform these activities.

AuthorizedRole

A partner role is a functional role, an employee role or an organizational role. Either an employee role or an organizational role can perform a functional role.

An organizational role must be performed by a conforming business service.

EmployeeRole

An employee for business/legal reasons can only perform an employee role. Usually the details of the employee must be captured and stored/transmitted to another partner for auditing/liability purposes when the two partner roles are not in the same organization.

BusinessTransaction

A business transaction is a set of business information and business signal exchanges between two business partners that must occur in an agreed format, sequence and time period. If any of the agreements are violated then the transaction is terminated and all business information and business signal exchanges must be discarded. Business transactions can be formal as in the formation of on-line offer/acceptance business contracts and informal as in the distribution of product announcements. Business transactions can be comprised of sub-transactions.

Tagged Values:

isSecureTransportRequired. 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

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network and inside an enterprise. The following are requirements for secure transport channels.

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

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

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

BusinessCollaborationProtocol

A business collaboration protocol choreographs one or more business transaction activities. A business collaboration protocol is not a transaction and should be used in cases where transaction rollback is inappropriate. For example, a buying partner may request a purchase order by a selling partner. The selling partner may partially accept the purchase order and thus complete the transaction but may only return shipping information on part of the order. The buying partner is sent any number of later notifications regarding the outstanding portions of the order until the order is completely reconciled.

BusinessPartner

The business partners that participate in business collaborations are enumerated for each business collaboration protocol. Partners provide the initiating and responding roles in the protocol.

BusinessTransactionActivity

A business transaction activity is a business collaboration protocol activity that executes a specified business transaction. The business transaction activity can be executed more than once if the *isConcurrent* property is *true*.

Tagged Values:

timeToPerform. Both partners agree to perform a business transaction activity within a specific duration. The initiating partner must send a failure notification to a responding partner on timeout. A responding partner simply terminates its activity. The time to perform is the duration from the time a business transaction activity initiates the first business transaction until there is a transition back to the initiating business transaction activity. Both partners agree that the business signal document or business action document specified as the document to return within the time to perform is the "Acceptance Document" in an on-line offer/acceptance contract formation process.

isConcurrent. If the business transaction activity is concurrent then more than one business transaction can be open at one time. If the business transaction activity is not concurrent then only one business transaction activity can be open at one time.

DocumentEnvelope

A document envelope is a container for structured and unstructured business documents.

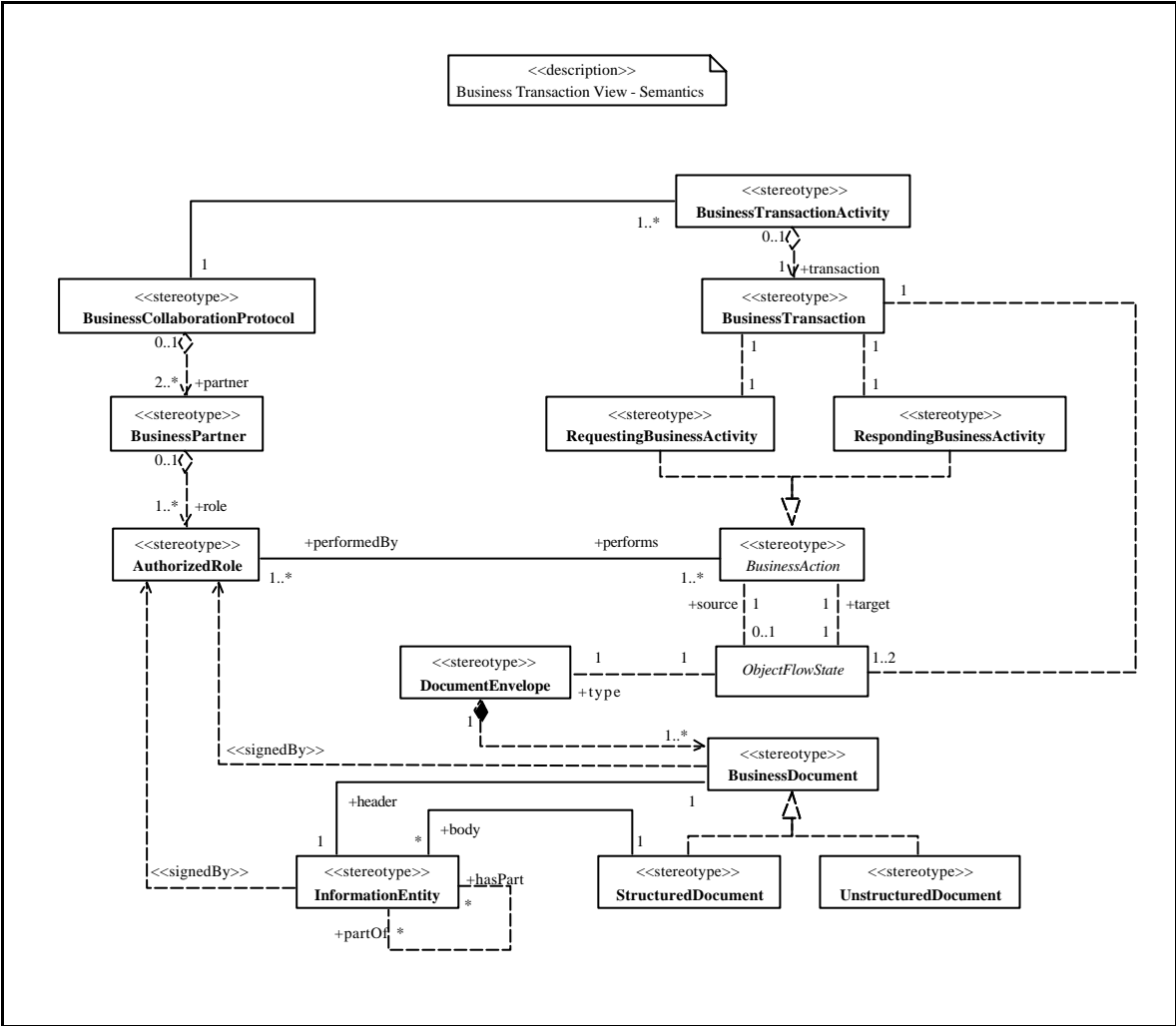
Business Transaction Activity Model Elements

Business Transaction Activity elements are specialized elements derived from a *RequestingBusinessActivity* element. Each element defines as a stereotype, the default value for each required tag in support of each Business Transaction pattern. The definitions and tag values for each pattern are found in chapter 9.

8.3.2 BTV Model Semantics

The semantics of each element of the BTV model metamodel is defined in this section.

1 Figure 8-10 illustrates the interrelationships between the BTV model elements.



2
3 **Figure 8-10 BTV - Semantics**

4
5 *AuthorizedRole*

6 **Associations:**

7 performs Associates the Business Actions performed by
8 this role.

9
10 Requesting Business Activity / Responded Business Activity
11 Requesting Business Activity or Responding Business Activity is
12 an business action performed by a authorized role participating
13 in a business transaction. There are two business activities in a
14 business transaction each of which is performed by one of two
15 partners engaged in a business endeavor. A business partner
16 that is initiating the business transaction performs a requesting

business activity. A business partner that is responding to a request to engage in a business transaction performs a responding business activity.

A business transaction specifies either a synchronous or asynchronous flow of control between two activities. The business transaction is a unit of work. All of the interactions in a business transaction must succeed or the transaction must be rolled back to a defined state before the transaction was initiated.

There are two business signals that can be asynchronously returned to the initiator of the business transaction: a business signal to verify proper receipt of a business document request and a business signal to non-substantively or substantively (contains business information) confirm the acceptance of a requesting business document for business processing.

If any of the time out parameters are exceeded, a time out exception must be thrown. If the *retryCount* property on the responding business activity is greater than zero then the business transaction must be re-initiated (or a notification of failed business control – possibly revoking a contractual offer – must be sent). All business signals and business documents returned after the transaction was initiated and up until the time out exception must be discarded. The recurrence property specifies the number of times a business transaction must be initiated. If the recurrent property value is 3 then the business transaction can be initiated a total of 4 times (the first initiation plus 3 retries). The time to perform property specifies the time to perform a single business transaction.

A responding partner simply terminates if a timeout is thrown. This prevents responding business transactions from hanging indefinitely.

A partner role that initiates an asynchronous business transaction does not need to receive any business signals. A partner role that initiates a synchronous business transaction must be able to receive business signals and must block until the flow of control is returned. This should not preclude the initiation and execution of multiple concurrent business transactions, however.

If any business exceptions (includes negative receipt and acceptance acknowledgements) are signaled then the business transaction must terminate. The business transaction must not be re-initiated even if the *retryCount* parameter is not zero. Business transactions must only be retried if a timeout exception is thrown.

There are two business signals that are used for on-line business contract formation and auditing:

Acknowledge receipt business signal. The UN/EDIFACT model Trading Partner Agreement (TPA) suggests that partners should agree on the point at which a message can be "said" to

1 be properly received and this point should be when a
2 receiving partner can "read" a message. They suggest this
3 should be the point after which a message passes a structure/
4 schema validity check. Note that this is not a necessary
5 condition for verifying proper receipt, only accessibility is. The
6 property *isIntelligibleCheckRequired* allows partners to agree
7 that a message should be "readable" before its receipt is
8 verified⁵.

9 Acknowledge acceptance business signal. The UN/EDIFACT model
10 TPA suggests that partners should agree on the point at
11 which a message can be "said" to be accepted for business
12 processing and this point should be after the contents of a
13 business document have passed a business rule validity
14 check. For example, if 100,000,000,000 copies of a single
15 book from Amazon are ordered, it can be assumed the order
16 will fail some business rule check. These business rules are
17 often found in trading contracts.

18 Associations:

19 *transaction.* This relationship relates a specific
20 business transaction activity to a business
21 transaction. The business transaction
22 activity executes the business transaction.
23 The business transaction, accordingly
24 becomes a subprocess of the higher level
25 Business Collaboration.
26

27 *BusinessAction*

28 performedBy Identifies the role(s) that performs the
29 associated business activity
30

31 *BusinessCollaborationProtocol*

32 Associations:

33 *partner.* The partners that collaborate are enumerated
34 so that they can be associated to specified
35 Business Collaboration.
36

37 *BusinessDocument*

38 Associations:

⁵ This is the convention specified for RosettaNet commercial transactions.

1	signedBy	Designates by derivation the AuthorizedRole that is required to digitally sign this Business Document.
2		
3		
4	header.	Document header that contains security, signature and dictionary reference information
5		

6 *StructuredDocument*

7 **Associations:**

8	body.	One or more Information Entities that are part of this docuement.
9		

10 *BusinessPartner*

11 **Associations:**

12	role.	The roles provided by each of the partners in the business collaboration protocol. A partner provides each initiating and responding role in a business transaction activity.
13		
14		
15		

16 *InformationEntity*

17 **Associations:**

18	hasPart	Designates the set of InformationEntities that an InformationEntity is comprised
19		
20	partOf	Designates the set of InformationEntities that an InformationEntity is contained in.
21		
22	signedBy	Designates by derivation the AuthorizedRole that is required to digitally sign this InformationEntity.
23		
24		

25

26

27 *ObjectFlowState (DocumentEnvelope)*

28	source	Defines the source (business activity) that the Object Flow State as typed by the DocumentEnvelope originated/transitioned from.
29		
30		
31		
32	target	Defines the target (business activity) that the Object Flow State as typed by the DocumentEnvelope is destined/transitioning to.
33		
34		
35	type	Specifies the DocumentEnvelope which defines the typing for this Object Flow State.
36		

37

38

39 ***BTV-to-BRV Mapping***

A BTV model is the Business Transaction View of a business process that meets the requirements of a business process as described in a BRV model. Figure 8-11 illustrates the elements of the BTV metamodel that map to elements of the BRV metamodel.

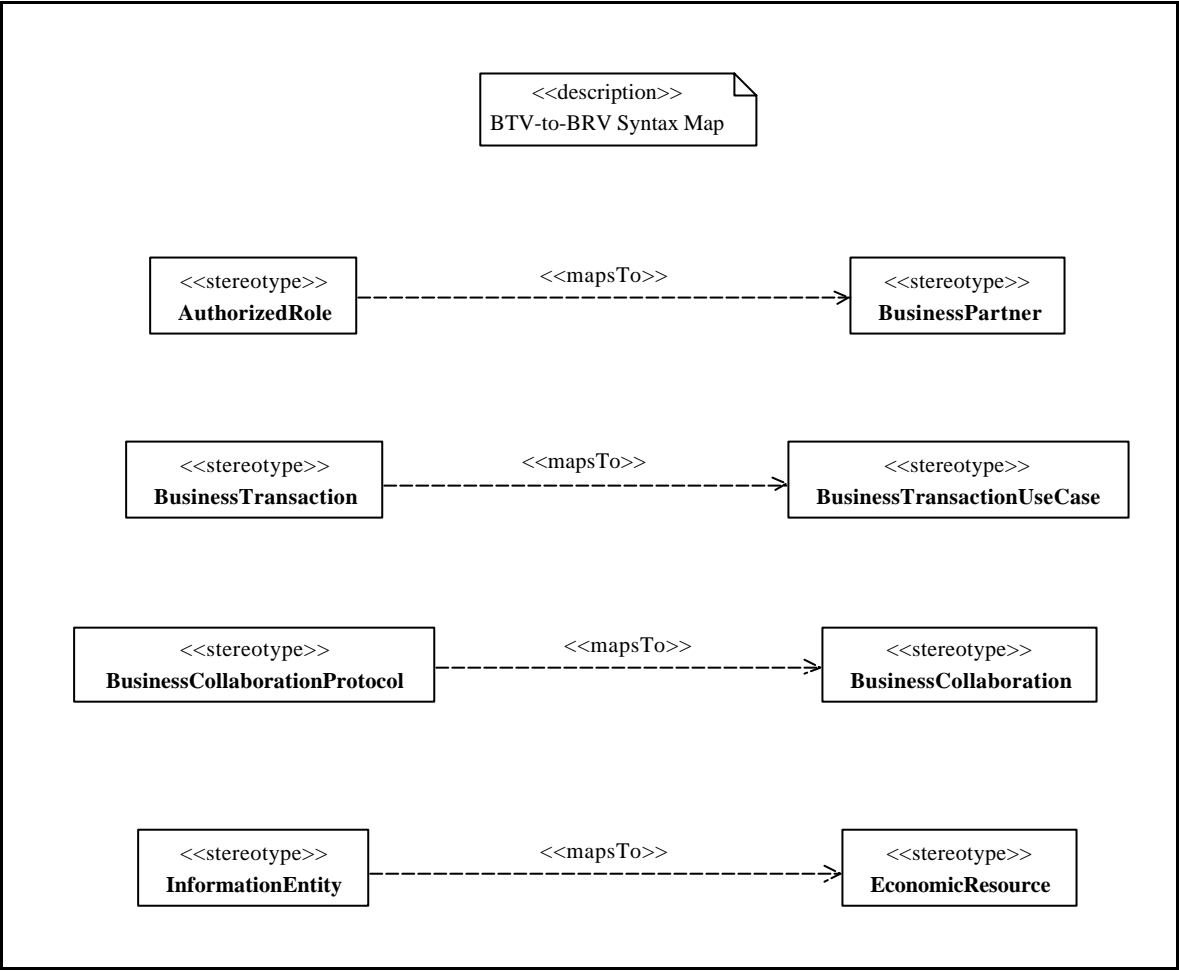


Figure 8-11 BTV-to-BRV Syntax Map

A functional role in the BTV is a refinement of a partner type performing a particular role as described in a business transaction Use Case. A business transaction is an activity graph that is a refinement of a business transaction Use Case. Partner roles are modeled in a business transaction activity graph and partner types and their roles are modeled in a Use Case model. The conditional constraints on business information that are described in BRV collaborations are described using business information entity constraints and business information constraints.

A business collaboration protocol activity graph is a refinement of a business collaboration protocol Use Case.

8.3.3 Model Management Abstract Syntax

Business process models specify business process participants interacting while executing a business process. A complete business process model must comprise the following modelling elements: business process information, business process participants, and business process flow. The modelling elements used to manage and organize these three modelling elements are described in this section.

Stereotypes and Tagged Values

Figure 8-12 shows the metamodel for managing business process models. The modelling elements used to manage and organize these three specifications are described in this section.

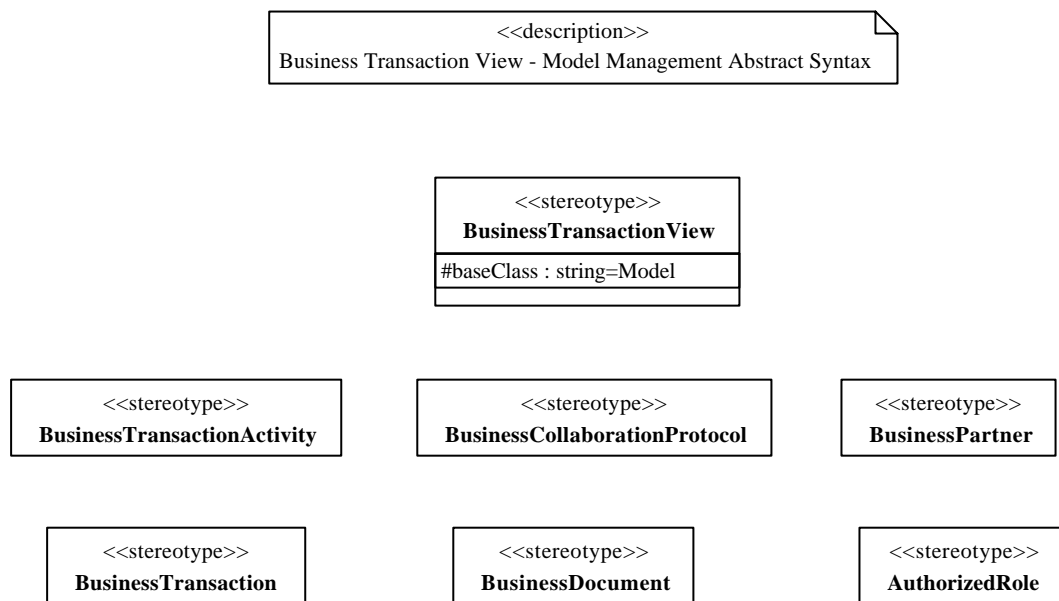


Figure 8-12 BTV - Model Management Abstract Syntax

The following stereotypes and tagged values are contained in the Business Transaction View management metamodel.

BusinessTransactionView

The business transaction view of an e-business collaboration model comprises diagrams and specifications that show the flow of business Information entities between roles as they perform business activities.

8.3.4 Model Management Semantics

The semantics of each element of the BTV model management metamodel is defined in this section.

Figure 8-13 illustrates the interrelationships between the BTV model management and model elements.

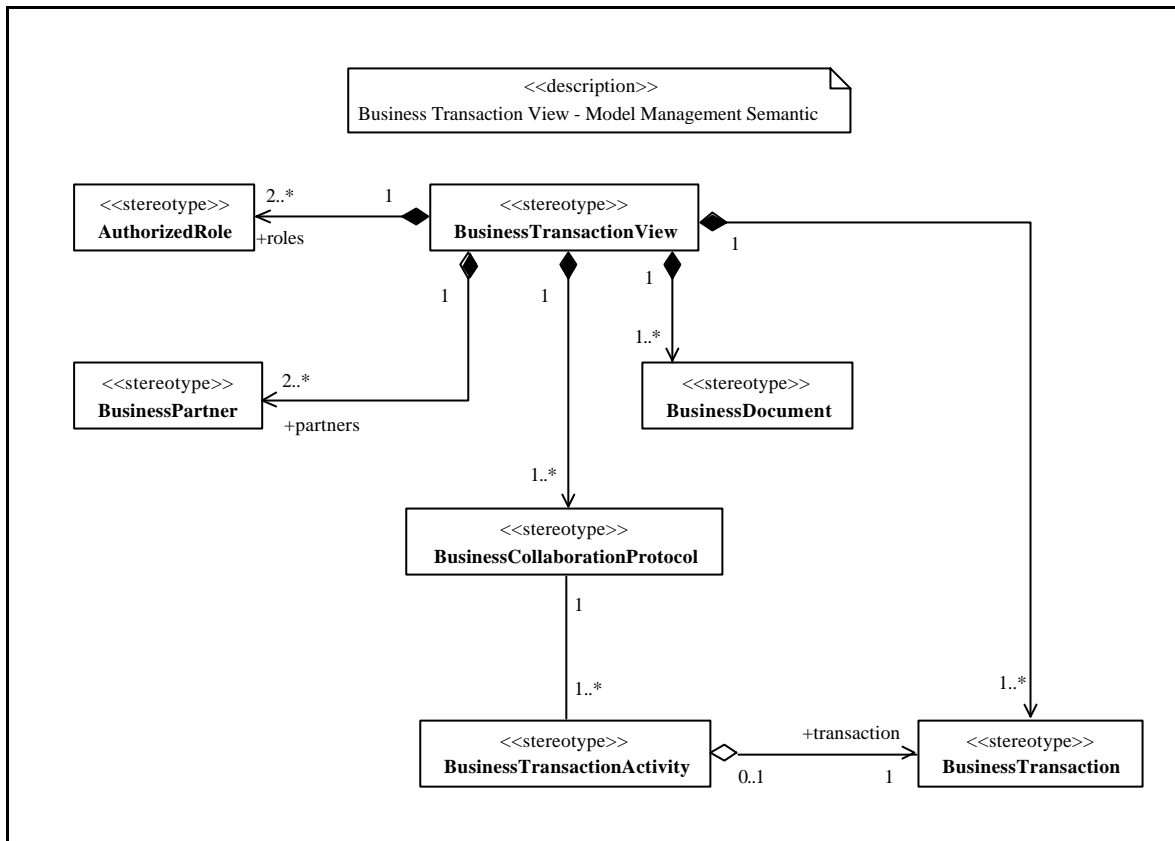


Figure 8-13 BTV - Model Management Semantic

The Business Transaction View contains all the objects and activity graphs in the BTV model. A BTV model can comprise zero or one business collaboration protocol specification and can comprise one or more business transaction specifications.

Well-formedness Rules

The following well-formedness rules apply to the Business Transaction View metamodel package.

BusinessTransactionView

A business transaction view must comprise one business transaction or business collaboration protocol state machine.

BusinessActivity

- If non-repudiation is required then the input or returned business document must be a tamper proofed entity.
- If authorization is required then the input business document and business signal must be an authenticated or a tamper proofed secure entity.
- The time to acknowledge receipt must be less than the time to acknowledge acceptance if both properties have values.

timeToAcknowledgeReceipt < timeToAcknowledgeAcceptance

- If the time to acknowledge acceptance is null then the time to perform an activity must either be equal to or greater than the time to acknowledge receipt.
- The time to perform a transaction cannot be null if either the time to acknowledge receipt or the time to acknowledge acceptance is not null.
- If non-repudiation of receipt is required then the time to acknowledge receipt cannot be null.
- The time to acknowledge receipt, time to acknowledge acceptance and time to perform cannot be zero.
- If non-repudiation is required at the requesting business activity, then there must be a responding business document.
- The time to acknowledge receipt, time to acknowledge acceptance and time to perform properties must be specified for both the requesting and responding business activities and they must be equal.

RequestingBusinessActivity

- There must be one input transition whose source state vertex is an initial pseudo state.
- There must be one output transition whose target state vertex is a final state specifying the state of the machine when the activity is successfully performed.
- There must be one output transition whose target state vertex is a final state specifying the state of the machine when the activity is not successfully performed.
- There must be one output transition to an object state that in turn has one output transition to a responding business activity.
- There must be zero or one input transition from an object state that in turn has one input transition from a responding business activity.

RespondingBusinessActivity

- There must be one input transition from an object state that in turn has one input transition from a requesting business activity.
- There must be zero or one output transition to an object state that in turn has an output transition to a requesting business activity.

Object Flow State

- The source and target of an object flow must not be the same business activity.
- The source and target of the requesting object flow must be opposite to the source and target of the responding object flow.

Information Entity

- The associations on an information entity must be aggregation relationships with other information entities to form a partonomy, a hierarchical decomposable arrangement of business document parts.

- The information entity associations only must be navigable from a containing entity to an element entity (has-part relationship).
- Constraints on an information entity association must be specified on the role of the part (supplier) with respect to the whole (client).
- The client and supplier of an entity association must not be the same entity.

Business Collaboration Protocol

- A business partner cannot provide both the initiating and responding roles of the same business transaction activity.

8.4 Design Metamodel

The Business Service View (BSV) Metamodel captures the syntax and semantics of business actions and their exchange between network components that provide business services. The BSV's metamodel specifies the elements of an execution process (Service Collaboration) that comprises business transaction exchange between network component business services as a result of the execution of business activities. The functional service model is a reification of the Business Transaction View model.

The first part of this section specifies the syntax and semantics of execution processes. The second part of this section specifies the organizational management elements of these execution process models.

8.4.1 Model Abstract Syntax

Stereotypes and Tagged Values

Figure 8-14 specifies the modelling elements and their interrelationships that are used to express the structure and behaviour of objects in the BSV of a Business Transaction and Business Collaboration Protocol model. Each element and interrelationship permitted in a BSV is defined in the metamodel specified in this section of the document.

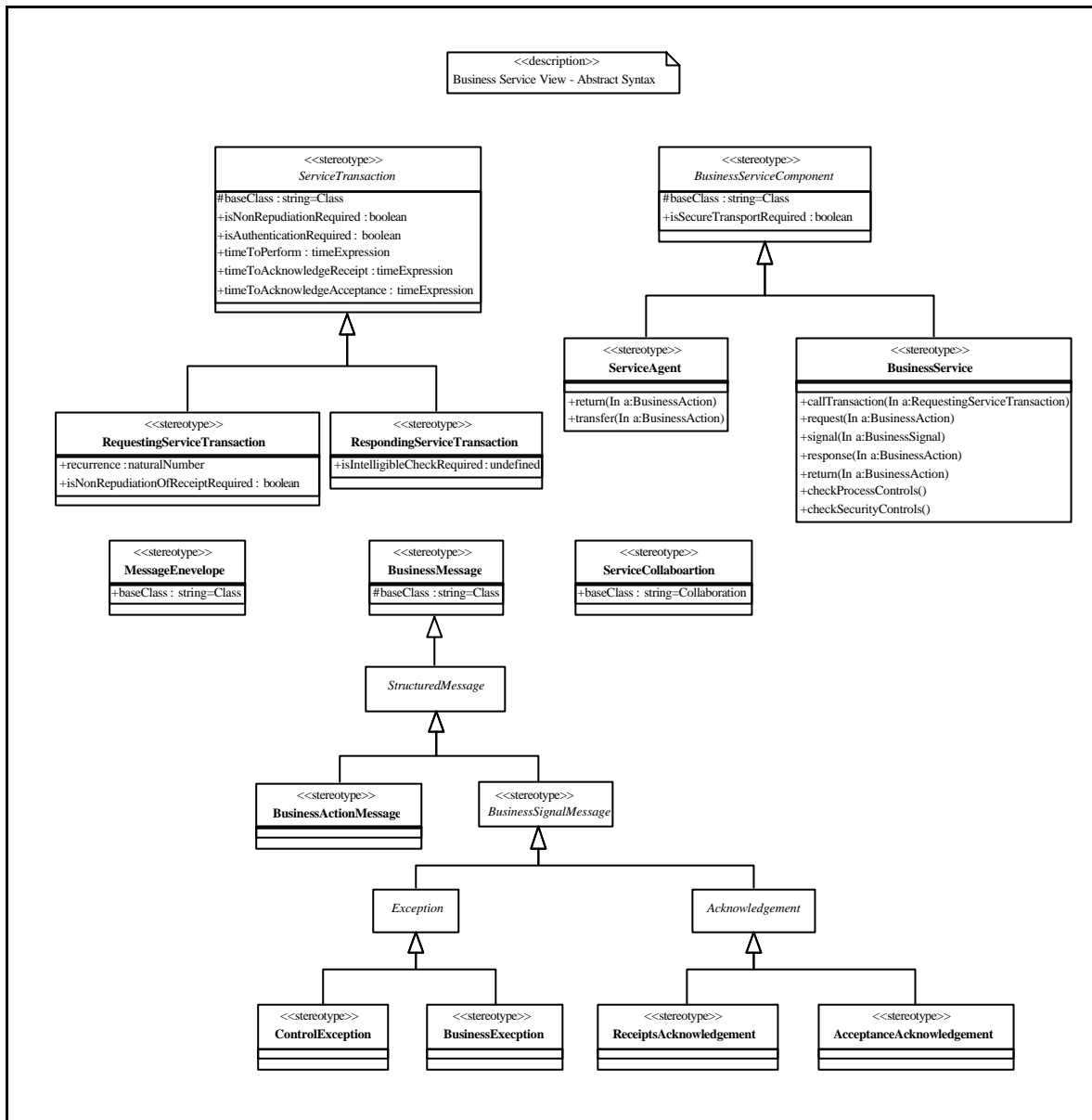


Figure 8-14 BSV Abstract Syntax

ServiceAgent

A ServiceAgent is a business communications component that must implement protocols up to the agent layer of the e-business application communications model.

Associations:

forService. An ServiceAgent acts on behalf of a service.

Operations:

1 *return(a:BusinessActionMessage)*. Return a business
2 action message to this ServiceAgent. This
3 ServiceAgent becomes the owner of the
4 business action. The argument may not be
5 null.

6 *transfer(a: BusinessActionMessage)*. Transfer a business
7 action message to this agent. This
8 ServiceAgent becomes the owner of the
9 business action. The argument may not be
10 null.

11 *BusinessService*

12 A business service is a network component that responds to
13 business transaction requests initiated by other services.

14 **Operations:**

15 *callTransaction(a: RequestingServiceTransaction)*.

16 *response(a:BusinessAction)*. Response to a timed
17 (synchronous) business action request.

18 *request(a:BusinessAction)*. Request to perform a
19 business action. This request can be timed
20 or asynchronous.

21 *signal(a:BusinessAction)*. Asynchronous signal returned
22 for security, auditing and execution control.

23 *return(a:BusinessAction)*. Return a business transaction
24 from an enterprise component after a
25 business action has been performed.

26 *checkProcessControls()*. Requests the Business Service
27 to validate the current state of the current
28 business transaction.

29 *checkSecurityControls()*.Requests the Business Service
30 to validate the security controls of the
31 current business transaction.

32 **Associations:**

33 *transactions*. The *ServiceTransactions* that support this
34 *BusinessService*.

35 *ServiceTransaction*

36 A *ServiceTransaction* is a mutually binding interaction between
37 an initiating service and a responding service.

38 **Tagged Values:**

39 *isNonRepudiationRequired*. If non-repudiation of origin
40 and content is required then the business
41 activity must store the business document

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in its original form for the duration mutually agreed to in a trading partner agreement. A responding partner must signal a business control exception if the sending partner role has not properly delivered their business document. A requesting partner must send notification of failed business control if a responding partner has not properly delivered their business document.

This property provides the following audit controls:
Verify sending role identity (authenticate)⁶ – Verify the identity of the sending role (employee or organization). 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.
Verify content integrity – Verify the integrity of the original content sent from a partner role i.e. check that the content has not been altered by a 3rd party while the content was exchanged between partners.

IsAuthenticationRequired If *isNonRepudiationRequired* is true, this tag is not applicable. Otherwise, the tag indicates whether the identity of the sending role is verified.

timeToPerform. Both partners agree to perform a business transaction within a specific duration. A responding partner must exit the transaction if they are not able to respond to a business document request within the agreed timeout period. A sending partner must retry a business transaction if necessary or must send notification of failed business control (possibly revoking a contractual offer) if a responding partner does not deliver their business document within the agreed time period. The time to perform is the duration from the time a business document request is sent by a requesting partner role until the time a responding business document is "properly received" by the requesting partner role. Both partners agree that the business signal document

⁶ The BCF specifies digital signatures for partner-to-partner non-repudiation of origin and content.

1 or business action document specified as
2 the document to return within the time to
3 perform is the "Acceptance Document" in
4 an on-line offer/acceptance contract
5 formation process.

6
7 *timeToAcknowledgeReceipt.* Both partners agree to
8 mutually verify receipt of a requesting
9 business document within specific time
10 duration. A responding partner must exit
11 the transaction if they are not able to verify
12 the proper receipt of a business document
13 request within the agreed timeout period. A
14 sending partner must retry a business
15 transaction if necessary or must send
16 notification of failed business control
17 (possibly revoking a contractual offer) if a
18 responding partner does not verify
19 properly receipt of a business document
20 request within the agreed time period. The
21 time to acknowledge receipt is the duration
22 from the time a business document
23 request is sent by a requesting partner
24 until the time a verification of receipt is
25 "properly received" by the requesting
26 business partner. This verification of
27 receipt is an audit-able business signal
28 and is instrumental in contractual
29 obligation transfer during a contract
30 formation process (e.g. offer/accept).

31 *timeToAcknowledgeAcceptance.* Both partners agree to
32 the need for a business acceptance
33 document to be returned by a responding
34 partner after the requesting business
35 document passes a set of business rules.
36 The time to acknowledge business
37 acceptance of a requesting business
38 document is the duration from the time a
39 requesting partner sends a business
40 document until the time an
41 acknowledgement of acceptance is
42 "properly received" by the requesting
43 partner. A responding partner must exit the
44 transaction if they are not able to
45 acknowledge business acceptance of a
46 business document request within the
47 agreed timeout period. A sending partner
48 must retry a business transaction if
49 necessary or must send notification of
50 failed business control (possibly revoking a

contractual offer) if a responding partner does not acknowledge acceptance of a business document within the agreed time period.

Associations:

requestingAction. The *BusinessActionMessage* that initiates this *ServiceTransaction*.

respondingAction. The *BusinessActionMessage* that is the response to *theRequestingAction*. Not all requesting actions require a response message. In this case a 'non-substantive' acknowledgement is sufficient.

receiptAcknowledgement. A *BusinessSignalMessage* that affirms receipt of a *BusinessActionMessage*.

exceptions. *BusinessSignalMessages* that report control or process exceptions.

acceptanceAcknowledgement. An acceptanceAcknowledgement is a *BusinessSignalMessage* that affirms the acceptance of a action request. This business signal is an acceptance from a legal viewpoint. Through this acceptance mechanism, responsibility for the transaction is transferred to the responding business service.

BusinessServiceComponent

A business service component is a logical computing component in a distributed network environment.

Tagged Values:

isSecuredTransportRequired. Both partners must agree to exchange business information using a secure transport channel. The security controls ensure that business document content is protected against unauthorized disclosure or modification and that business services are protected against unauthorized access. This value is derived from the *isSecuredTransportRequired* property of the *BusinessTransaction* in the BTV.

BusinessMessage

A *BusinessMessage* is a document or information that is exchange between business processes.

Associations:

<i>header.</i>	Message header that contains security, signature and dictionary reference information.
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MessageEnvelope

A *MessageEnvelope* is container used to route *BusinessActionMessages*.

Associations:

<i>header.</i>	Message header that contains security, signature and dictionary reference information.
<i>body.</i>	One or more business messages that are carried with this envelope.
<i>prototype.</i>	Identification of the message envelope prototype.

BusinessActionMessage

A *BusinessActionMessage* is a specialized *StructuredMessage* used to convey *BusinessDocuments* (from BTV) between two business processes via a network component.

BusinessSignalMessage

A *BusinessSignalMessage* is used to convey control and exception conditions between two business processes.

Associations:

<i>forAction.</i>	References the <i>BusinessActionMessage</i> that this <i>BusinessSignalMessage</i> correlates to. Signals are returned to an initiating service by a responding service.
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RequestingServiceTransaction

A *RequestingServiceTransaction* is the initial business transaction within a *CommercialTransaction*.

Tagged Values:

recurrence.	Specifies the number of attempts a <i>RequestingServiceTransaction</i> may be sent in response to a control exception. Control exceptions are those that were
-------------	---

1 generated as a result of a control failure
2 (e.g. TimeOut, Authentication, ect)

3 *isNonRepudiationOfReceiptRequired*. The
4 *isNonRepudiationOfReceiptRequired* is
5 derived from the
6 RequestingBusinessActivity(BTV) and
7 indicates that both partners agree to
8 mutually verify receipt of a requesting
9 business document and that the receipt
10 must be non-reputable.

11

12 *RespondingServiceTransaction*

13 A RespondingServiceTransaction is the responding business
14 transaction within a *BusinessTransaction* to a particular
15 *RequestingServiceTransaction*.

16 **Tagged Values:**

17 *isIntelligibleCheckRequired*. Both partners agree that a
18 responding partner role must check that a
19 requesting document is not garbled
20 (unreadable, unintelligible) before
21 verification of properly receipt is returned
22 to the requesting partner.

23 *ServiceCollaboration*

24 A ServiceCollaboration comprises a set of interactions (service
25 request) between business service components, which
26 comprises one business collaboration (from BTV).

27 **Associations:**

28 *components*. References the NetworkComponent that
29 participates in this collaboration.

30 *interactions*. References the BusinessTransactions that
31 are exchanged between the
32 BusinessServiceComponents.

33

34 Figure 8-15 specifies the modelling elements and their interrelationships
35 that are used to express the structure and behaviour of objects in the
36 Business Signal model. Each element and interrelationship permitted in
37 a Business Signal is defined in the metamodel specified in this section
38 of the document.

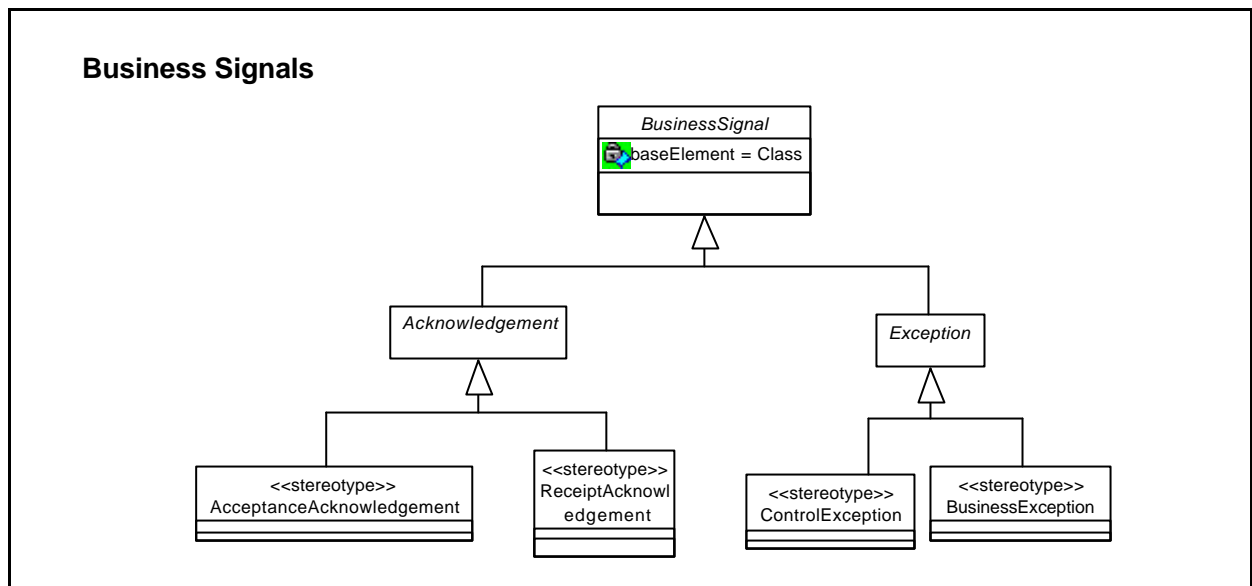


Figure 8-15 BSV Abstract Syntax (Business Signals)

Acknowledgement

An acknowledgement is an asynchronous business signal that acknowledges some aspect of a received business action message (request). The acknowledgement is sent to the service from which the business action message was received.

AcceptanceAcknowledgement

An acceptance acknowledgement business signal is returned to the initiating service if the business action message (request) content is valid with respect to the responding services business rules and the responding service is willing to perform further processing activities with this content. The initiating service must not assume that the responding service will act on a request that has not been accepted by the responding service. A trading partner agreement must agree that a receiving service has “legally” accepted a business action request (*BusinessActionMessage*) when the *BusinessActionMessage* has been “accepted” by the receiving service. At this point there is transference of legal responsibility for the fulfillment of this request by the receiving service. This signal is required if the correlating *ServiceTransaction* has the *timeToAcknowledgeAcceptance* attribute set to a duration greater than zero.

BusinessSignal

A business signal is an object that is transmitted asynchronously back to an activity that initiated the transfer of business process execution control.

ControlException

A *ControlException* signals an error condition in the management of a *ServiceTransaction* within a *ServiceCollaboration*. This signal is asynchronously returned to the initiating service that originated the request. This exception must terminate the *ServiceCollaboration*. These errors deal with the mechanisms of message exchange such as verification, validation, authentication and authorization and will occur up to message acceptance. Typically the rules and constraints applied to the message will have only dealt with structure, syntax and message element values.

BusinessException

A *BusinessException* signals an error condition in a business activity. This signal is asynchronously returned to the initiating service that originated the request. This exception must terminate the *ServiceCollaboration*. These errors deal with the mechanisms that process the *ServiceTransaction* and will occur after message verification and validation. Typically the rules and constraints applied to the message will deal the semantics of message elements and the validity of the request itself and the content is not valid with respect to a responding service's business rules. This type of exception is usually generated after an *AcceptanceAcknowledgement* has been returned.

ReceiptAcknowledgement

Acknowledges the receipt of a *BusinessActionMessage*. This business signal is returned by the responding service to acknowledge the receipt of a *BusinessActionMessage* if it is syntactically and structurally valid. A trading partner agreement must agree that a receiving service has "legally" received a business action request (*BusinessActionMessage*) when the *BusinessActionMessage* can be "read" by the receiving service. This signal is required if the correlating has the *timeToAcknowledgeReceipt* attribute set to a duration greater than zero.

8.4.2 Model Semantics

The semantics of each element of the BSV metamodel is defined in this section. Figure 8-16 illustrates the interrelationships between the BSV modelling elements.

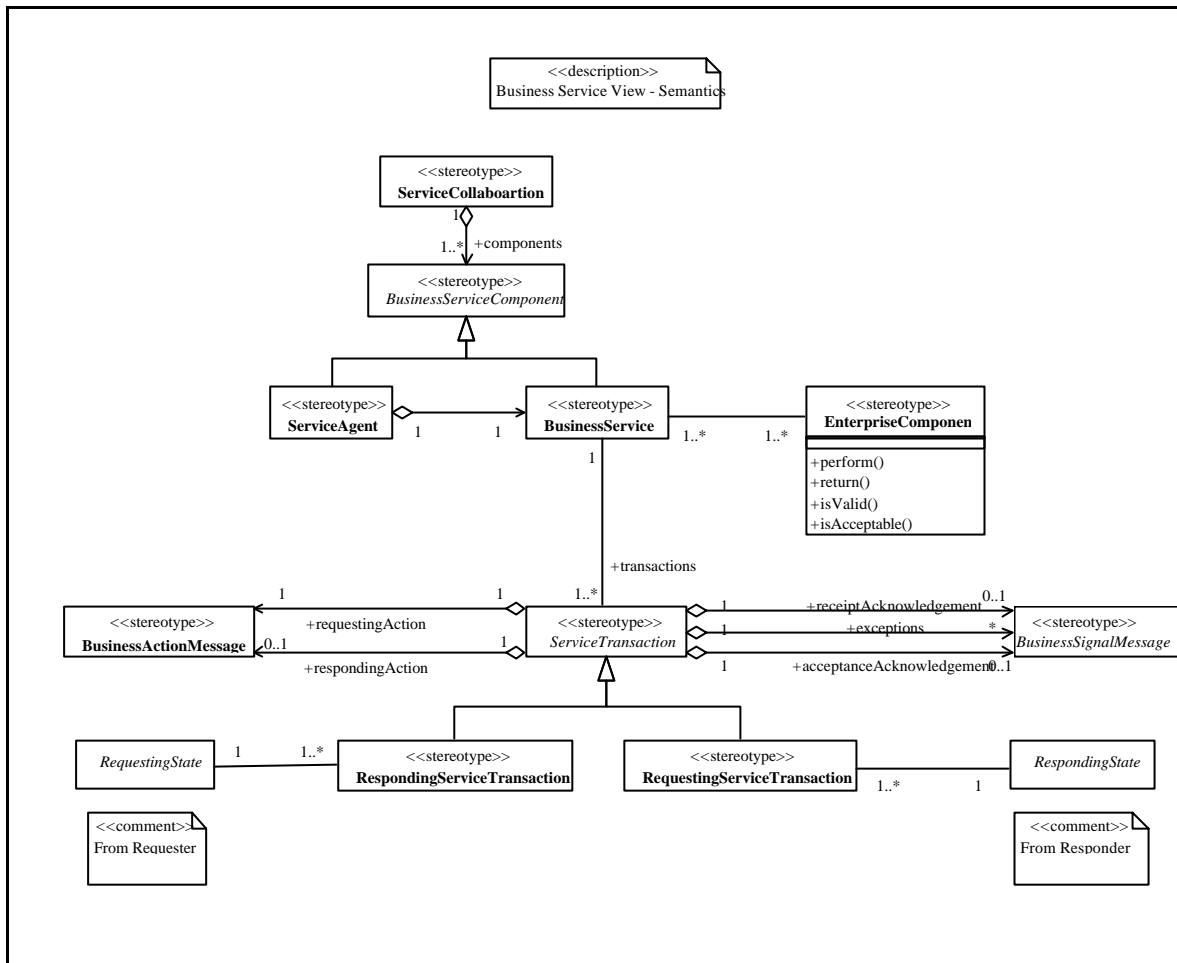


Figure 8-16 BSV Model Semantics

Agent

An agent acts on behalf of a service. An agent can be a user agent such as a web browser but may also be an agent acting on behalf of another service. An agent is a network component that must implement protocols up to the agent layer of the e-business network application, communications model. An agent has no network identity as a business service component. A user agent acts as an intermediary between a business service and an employee.

BusinessService

A business service is a network component that responds to business transaction requests initiated by other services. A business service implements protocols in all of the layers of the e-business network application, communication model. Business services monitor the execution of service collaborations. A service component has network identity as a business service.

ServiceTransaction

1 A *ServiceTransaction* is a mutually binding interaction between an
2 initiating service and a responding service. There may be zero or more
3 business signals exchanged during the interaction that can be used for
4 security, auditing and process control. A set of business transactions as
5 defined by a *BusinessTransaction (from BTV)* is a unit of work. Both
6 services in the *BusinessTransaction (CT)* must agree to the CT's
7 conclusion or both sides must roll back to a state before the initial
8 *RequestingServiceTransaction* was initiated.

9 A timed *ServiceTransaction* is a synchronous transaction that must
10 complete within the specified time. An asynchronous transaction is a
11 one-way exchange of a business action.

12 ***BusinessServiceComponent***

13
14 A network component is a logical computing component in a distributed
15 network environment. Network transport security is specified and
16 enabled by the network component.

17 ***BusinessMessage***

18
19 A *BusinessMessage* is an information document that is exchange
20 between business processes. The message header provides for
21 security, signature and dictionary reference information.

22 ***MessageEnvelope***

23
24 A *MessageEnvelope* is used to define routing information and privacy
25 properties for one or more *BusinessActionMessage* that is contained
26 within the message envelope. The *MessageEnvelope* is the highest
27 level of containment for information that is exchange between two
28 business processes.

29 ***BusinessActionMessage***

30
31 A *BusinessActionMessage* is a specialized *StructuredMessage* used to
32 convey *BusinessDocuments (from BTV)* between two business
33 processes via a network component.

34 ***BusinessSignalMessage***

35
36 A *BusinessSignalMessage* is a specialized *StructuredMessage* used to
37 convey control and exception conditions between two business
38 processes as it relates to a particular *BusinessActionMessage* request.
39 A *BusinessSignalMessage* is transmitted asynchronously back to an
40 business process that initiated the transfer of business process
41 execution control.

42 ***RequestingServiceTransaction***

43
44 A *RequestingServiceTransaction* is the initial business transaction within
45 a *CommercialTransaction*. When a *BusinessTransaction* fails, the
46 rollback is to the state of the system and business process as it was just
47 before the initiation of the transaction. If the recurrence property is set to
48 a positive value the request is tried again until the count is decremented

1 to zero. Retrys only occur on the receipt of a control exception which
2 may an indicator that the failure could have been technical in nature. If
3 the exception was a process exception then the recurrence counter is
4 not applicable, since the exception was generated due to the failure of a
5 business rule and must be redress by higher level processes.

6 If a *isNonRepudiationOfReceiptRequired* is true, this indicates that both
7 partners agree to mutually verify receipt of a requesting business
8 document and that the receipt must be non-reputable. A receiving
9 partner must send notification of failed business control (possibly
10 revoking a contractual offer) if a responding partner has not properly
11 delivered their business document.

12 Non-repudiation of receipt provides the following audit controls.

13 **Verify responding role identity** (authenticate)⁷ – Verify the identity of
14 the responding role (individual or organization) that received the
15 requesting business document.

16 **Verify content integrity** – Verify the integrity of the original content of
17 the business document request.
18

19 **RequestingState**

20 A Requesting State is the state of a Business Service Interface that
21 exectutes, manages and monitors a RequestingServiceTransaction.

22 **RespondingServiceTransaction**

23 A RespondingServiceTransaction is the responding business
24 transaction within a *BusinessTransaction* to a particular
25 *RequestingServiceTransaction*. Typically all *BusinessTransaction* are
26 defined in *RequestingServiceTransaction/*
27 *RespondingServiceTransaction* pairs. If the *isIntelligibleCheckRequired*
28 property is true then both partners agree that a responding partner role
29 must check that a requesting document is not garbled (unreadable,
30 unintelligible) before verification of properly receipt is returned to the
31 requesting partner. Verification of receipt must be returned when a
32 document is “accessible” but it is preferable to also check for garbled
33 transmissions at the same time in a point-to-point synchronous business
34 network where partners interact without going through an asynchronous
35 service provider.
36
37

38 **RespondingState**

39 A Responding State is the state of a Business Service Interface that
40 exectutes, manages and monitors a RespondingServiceTransaction.

41 **Service Collaboration**

42 A *ServiceCollaboration* specifies the interactions between network
43 components. It specifies the conditions and/or constraints by which
44 interactions are executed.
45
46

47 **Message Model Semantics**

⁷ The BCF specifies digital signature for partner-to-partner non-repudiation of origin and content.

Figure 8-17 specifies the semantics for the definition of business messages.

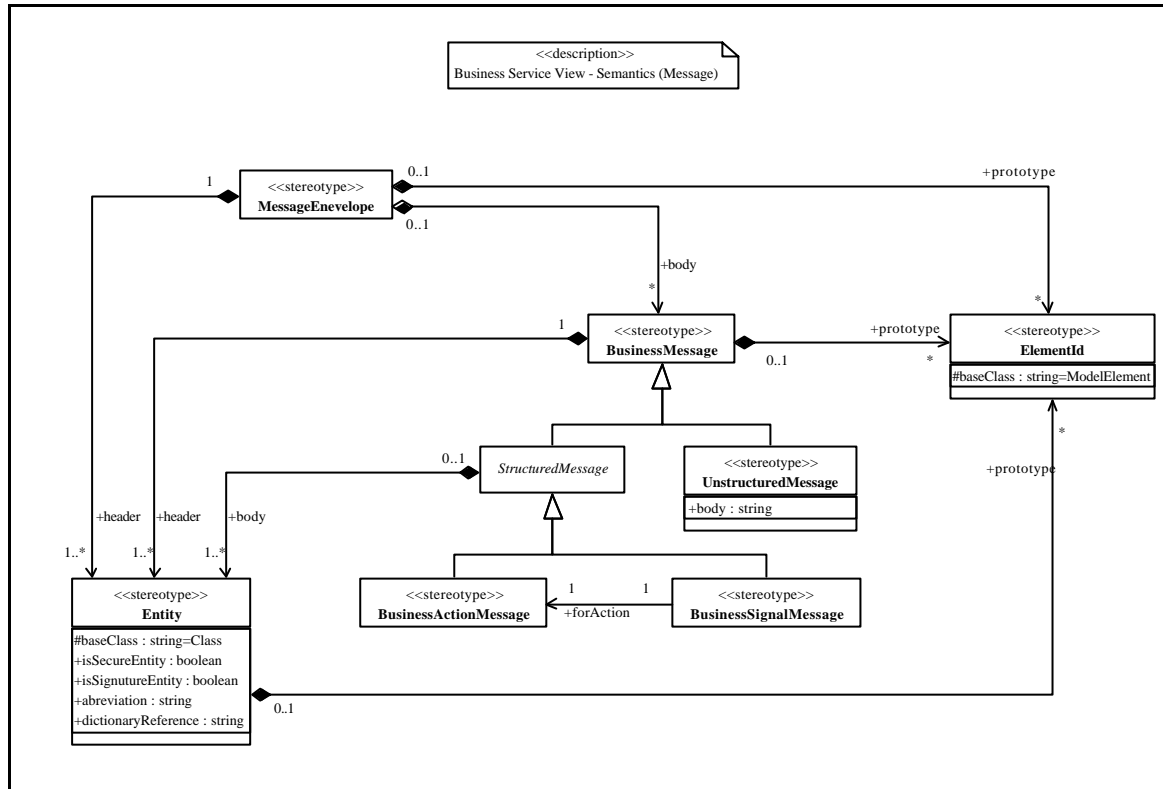


Figure 8-17 BSV Message Model Semantics

BusinessActionMessage

The *BusinessActionMessage* specifies the business activity that processes a business request and the header and body of the message. The *BusinessActionMessage* maps to the business document that was defined in the BTV and defines process routing and security constraints.

ElementId

The *ElementId* identifies the dictionary prototype template that defines the *MessageEnvelope*, *BusinessMessage* and the *Entities* used in the construction of the message.

InformationEntity

An *Entity* is the basic element for specifying information elements. Along with the name and type, it specifies privacy and security for the information.

MessageEnvelope

A *MessageEnvelope* is the highest level container for transporting business documents between business processes via network components.

BusinessActionMessage

A *BusinessActionMessage* is a specialization of a *StructuredMessage* used to invoke a business process in the receiving system.

BusinessSignalMessage

A *BusinessSignalMessage* is a specialization of a *StructuredMessage* used to convey control and process exceptions occurring in a business process in the receiving system to a business process in the initiating system.

UnstructuredMessage

A *UnstructuredMessage* is a specialization of a *BusinessMessage* used to transport arbitrary bit streams such as would be the case for images, video and audio.

StructuredMessage

A *StructuredMessage* is a specialization of a *BusinessMessage* used to transport structured information.

8.4.3 Model Management Abstract Syntax & Semantics

The following stereotypes and tagged values are contained in the Business Service View management metamodel. Figure 8-18 illustrates the interrelationships between the BSV model management and model elements.

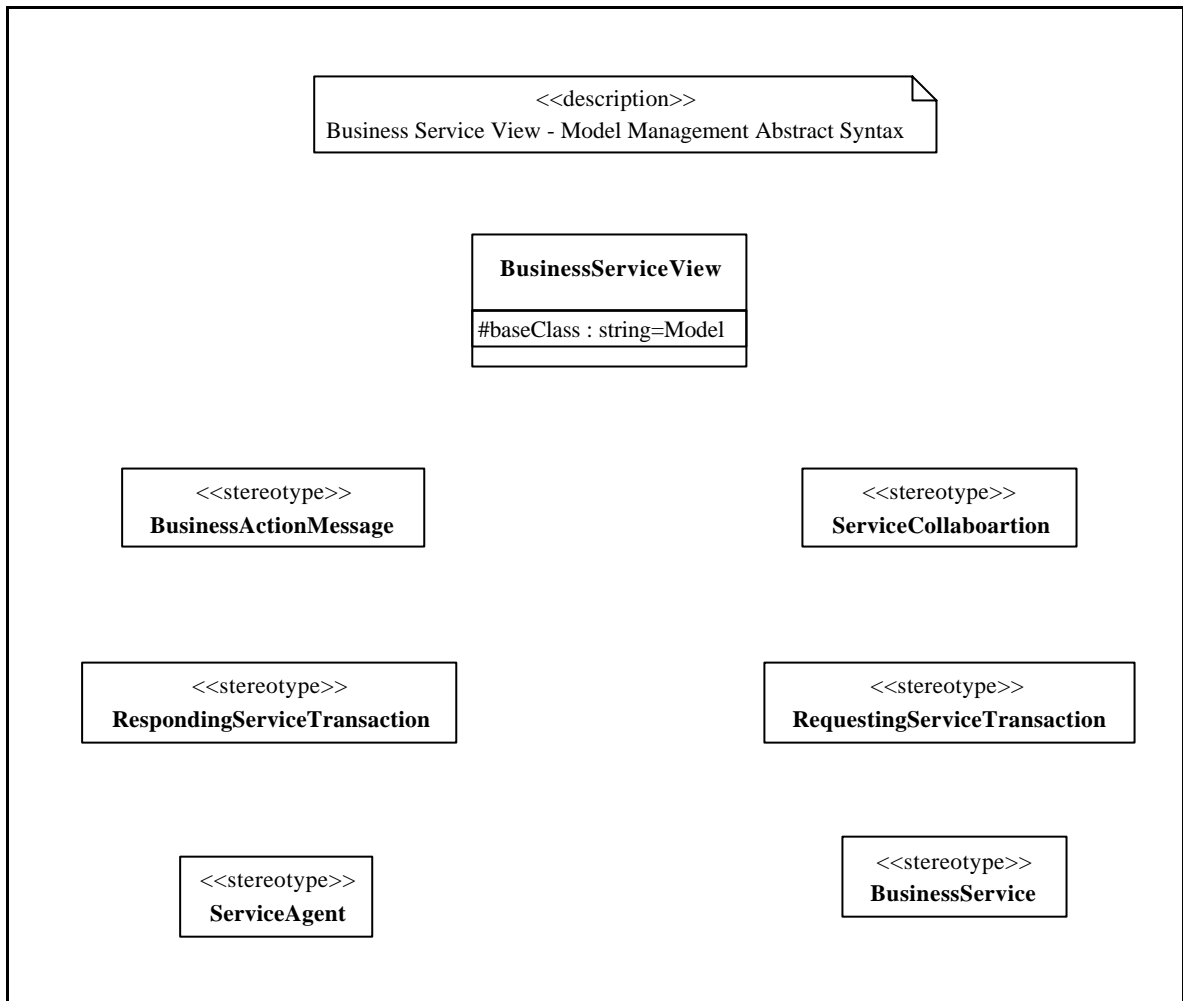


Figure 8-18 BSV - Model Management Abstract Syntax

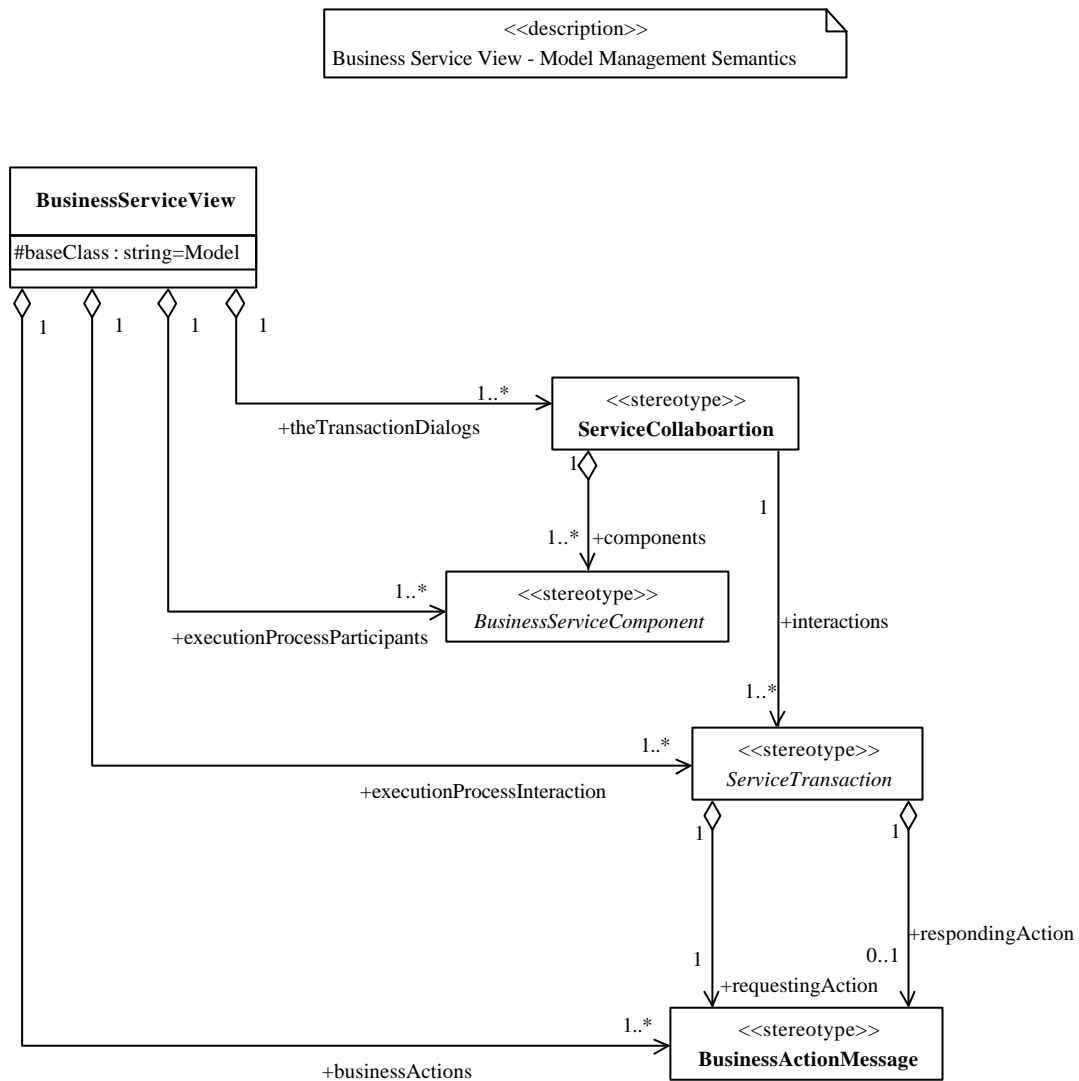


Figure 8-19 BSV - Model Management Semantics

Well-formedness Rules

The following well-formedness rules apply to the BSV metamodel package.

8.5 Business Information Structure Design Metamodel

The e-business collaboration modeling metamodel provides a language and grammar for constructing business collaboration models. Business information structure design patterns are applications of the metamodel to common business object representations. Representations capture common structure and semantics applicable to specific business object domains.

This document describes the following design patterns.

1. Reference design pattern. The design pattern for referencing business information descriptions to describe aggregate business information containers.
2. Query/Response business document design pattern. The design pattern for both querying business information and for specifying the structure of the response.
3. Disjunction design pattern. The design pattern for representing business information entities that contain one or more of a disjunctive entity.
4. Reification design pattern. The design pattern for representing common business information entities.
5. UML/XML DTD translation design pattern. The design pattern for translating UML business document models into XML DTD document schema.
6. Business document design pattern. The design pattern for exchanging messages that can be interpreted as “legal writings” with respect to commercial law.
7. Request/Response business document design pattern. The design pattern for requesting complex query results and for specifying the structure of the response.

8.5.1 Business Information Model Abstract Syntax

8.5.1.1 Stereotypes and Tagged Values

Figure 8-20 specifies the modeling elements and their interrelationships that are used to express the structure of business objects and documents in the BSV of a Business Transaction and Business Collaboration Protocol model. Each element and interrelationship permitted in a FSV Information Model is defined in the metamodel specified in this section of the document.

Information Model Abstract Syntax

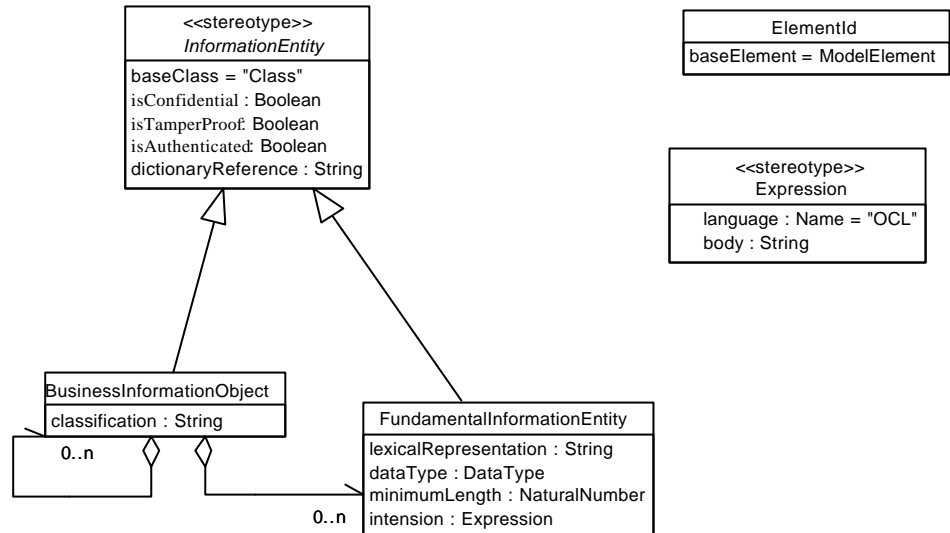


Figure 8-20 Business Information Model Abstract Syntax

BusinessInformationObject

A business Information Object represents a business concept or business process. A business information object captures information about a real world (business) concept, and relationships between that concept and other business concepts. An information entity can be either an individual piece of business information, or a natural “go-together” family of business information pieces. Business Information Objects provide for elements of relationship, identification, and state requirements. Business Information Objects have unique instance identities.

Tagged Values:

classification	Identifies the classification scheme used to define the business object.
----------------	--

InformationEntity

An InformationEntity is the basic element used for modeling hierarchical information structures.

Tagged Values:

1 isConfidential. The information entity is encrypted so that
2 unauthorized parties cannot view the
3 information.

4 isTamperProof. The information entity has an encrypted
5 message digest that can be used to check
6 if the message has been tampered with.
7 This requires a digital signature (sender's
8 digital certificate and encrypted message
9 digest) associated with the document
10 entity.

11 isAuthenticated. There is a digital certificate associated
12 with the document entity. This provides
13 proof of the signer's identity.

14 dictionaryReference Identifies the dictionary reference
15 where the InformationEntity is defined.

16 FundamentalInformationEntity

17 An FundamentalInformationEntity is an atomic element used for
18 modeling hierarchical information structures.

19 Tagged Values:

20 lexicalRepresentative. Defines the lexical representation
21 of the element.

22 dataType. Defines the data type.

23 minimumLength. Defines the minimal length that this
24 element.

25 intention. A OCL expression used to define the intended
26 use of this element.

27 ElementId

28 The ElementID is used to provide a unique identification for a
29 particular information element.

30 Tagged Values:

31 Expression

32 An Expression provides for the definition of context and business
33 rules..

34 Tagged Values:

35 language. Defines the formal language used to
36 define the expression.

37 body. Defines the business rules.

