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Systems Engineering & Formulation Division

Analysis Ontology

Integrated Model-Centric Engineering

National Aeronautics and Space Administration

Jet Propulsion Laboratory
California Institute of Technology
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The Analysis Ontology defines general concepts and properties for analyses (e.g., trade studies, driving requirements analysis, etc.). It provides a basis for specialization by domain experts.

2 Imported Ontologies

- http://imce.jpl.nasa.gov/foundation/mission/mission

3 Namespaces

Metrology http://imce.jpl.nasa.gov/www.omg.org/spec/SysML/20140311/Metrology#

Metrology-backbone http://imce.jpl.nasa.gov/backbone/imce.jpl.nasa.gov/www.omg.org/spec/SysML/20140311/Metrology#

Metrology-metamodel http://imce.jpl.nasa.gov/www.omg.org/spec/SysML/20140311/Metrology-metamodel#

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PrimitiveTypes http://imce.jpl.nasa.gov/www.omg.org/spec/PrimitiveTypes/20110701/PrimitiveTypes#

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xsd http://www.w3.org/2001/XMLSchema#

xsd-backbone http://imce.jpl.nasa.gov/backbone/www.w3.org/2001/XMLSchema#

4 Abstract Class Definitions

4.1 AnalyzedElement

Asserted Superclasses: analysis-backbone:Aspect

Inferred Superclasses: analysis-backbone:Thing

Asserted Subclasses: analysis-backbone:Entity, analysis-backbone:ReifiedObjectProperty, analysis-backbone:ReifiedStructuredDataProperty, analysis-backbone:StructuredDatatype, base-backbone:Entity, base-backbone:ReifiedObjectProperty, base-backbone:StructuredDatatype, mission-backbone:Entity, mission-backbone:ReifiedObjectProperty, mission-backbone:StructuredDatatype

Asserted Object Properties: **isAnalyzedBy** [0..*] Explanation

The class definition diagram for AnalyzedElement is shown in Figure 1.

4.2 CharacterizedElement

Asserted Superclasses: analysis-backbone:Aspect

Inferred Superclasses: analysis-backbone:Thing

Asserted Subclasses: analysis-backbone:Entity, analysis-backbone:ReifiedObjectProperty, analysis-backbone:ReifiedStructuredDataProperty, analysis-backbone:StructuredDatatype, base-backbone:Entity, base-backbone:ReifiedObjectProperty, base-backbone:StructuredDatatype, mission-backbone:Entity, mission-backbone:ReifiedObjectProperty, mission-backbone:StructuredDatatype

Asserted Object Properties: **isCharacterizedBy** [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

The class definition diagram for CharacterizedElement is shown in Figure 2.

4.3 MeasuredElement

A *MeasuredElement* is a model element that may be measured by one or more associated *Metric*s. Both *Objective*s and *Requirement*s
are *MeasuredElement*s.

Asserted Superclasses: analysis-backbone:Aspect

Inferred Superclasses: analysis-backbone:Thing

Asserted Subclasses: mission:Objective, mission:Requirement

Asserted Object Properties: **isMeasuredBy** [0..*] Criterion

The class definition diagram for MeasuredElement is shown in Figure 3.

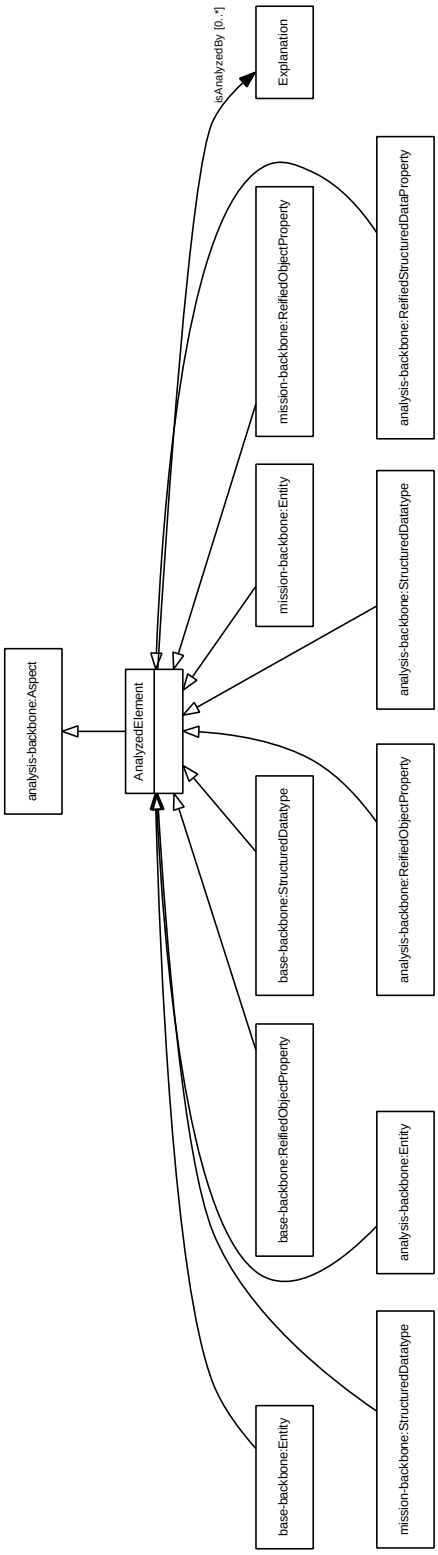

Figure 1: Class definition diagram for AnalyzedElement.

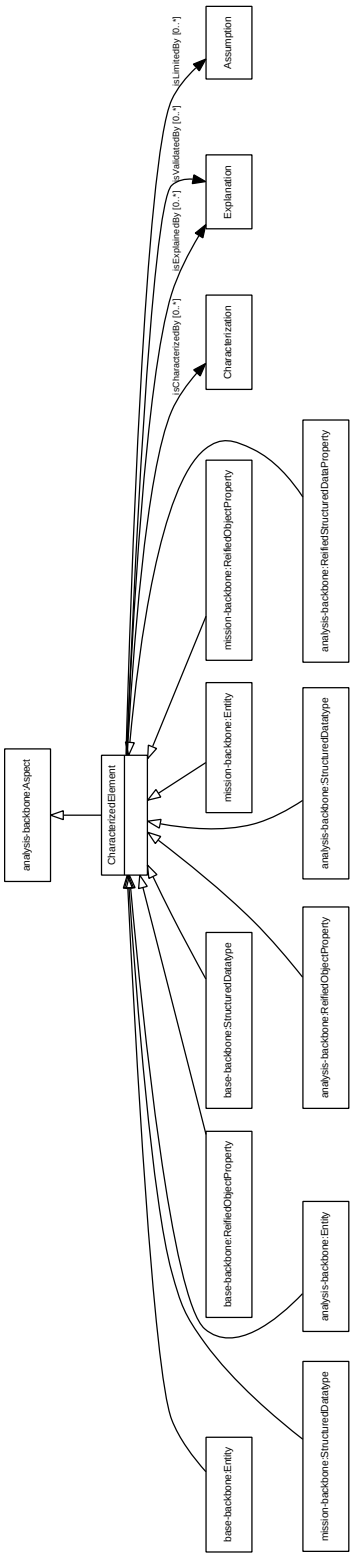

Figure 2: Class definition diagram for CharacterizedElement.

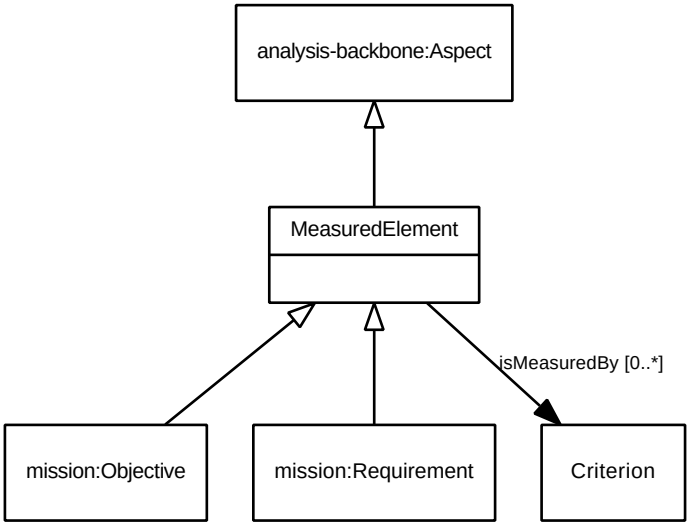

Figure 3: Class definition diagram for MeasuredElement.

5 Concrete Class Definitions

5.1 Analysis

Analysis is a deprecated synonym for *Explanation.*

Asserted Superclasses: Explanation

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Entity, analysis-backbone:Thing, AnalyzedElement, base-backbone:Aspect, base-backbone:Thing, base:AggregatedElement, base:IdentifiedElement, Characterization, CharacterizedElement

Asserted Subclasses: CostEstimate, DrivingRequirementsExplanation, KeyRequirementsExplanation, TradeStudy

Inferred Datatype Properties: **base:hasAlternateName** [0..*] xsd:string

base:hasCanonicalName [0..1] xsd:string

base:hasDescription [0..1] xsd:string

base:hasIdentifier [0..*] xsd:string

base:hasIndexEntry [0..*] xsd:string

base:hasShortName [0..1] xsd:string

base:hasSortKey [0..1] xsd:string

base:hasUuid [0..1] xsd:string

Inferred Object Properties: **analyzes** [0..*] AnalyzedElement

base:aggregates [0..*] base:AggregatedElement

base:isAggregatedIn [0..*] base:AggregatedElement

characterizes [0..*] CharacterizedElement

explains [0..*] CharacterizedElement

isAnalyzedBy [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

validates [0..*] CharacterizedElement

The class definition diagram for Analysis is shown in Figure 4. The class usage diagram for Analysis is too large to include.

5.2 Assumption

An *Assumption* is *Characterization* that is taken to be true for the purpose of analysis.

Asserted Superclasses: Characterization

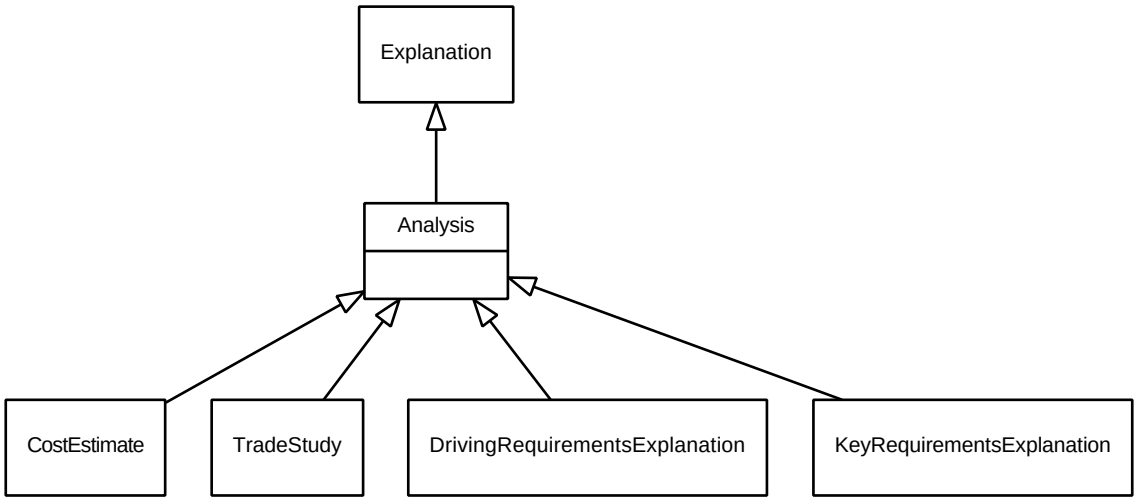

Figure 4: Class definition diagram for Analysis.

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Entity, analysis-backbone:Thing, AnalyzedElement, base-backbone:Aspect, base-backbone:Thing, base:IdentifiedElement, CharacterizedElement

Asserted Subclasses: Fact

Inferred Datatype Properties: **base:hasAlternateName** [0..*] xsd:string

base:hasCanonicalName [0..1] xsd:string

base:hasDescription [0..1] xsd:string

base:hasIdentifier [0..*] xsd:string

base:hasIndexEntry [0..*] xsd:string

base:hasShortName [0..1] xsd:string

base:hasSortKey [0..1] xsd:string

base:hasUuid [0..1] xsd:string

Asserted Object Properties: **limits** [0..*] CharacterizedElement

Inferred Object Properties: **characterizes** [0..*] CharacterizedElement

isAnalyzedBy [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

The class definition diagram for Assumption is shown in Figure 5. The class usage diagram for Assumption is too large to include.

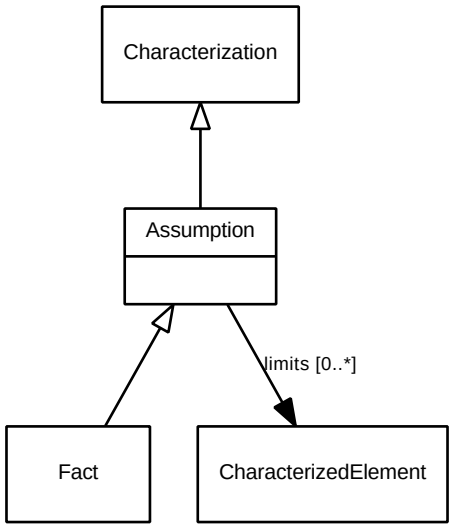

Figure 5: Class definition diagram for Assumption.

5.3 Characterization

A *Characterization* is an element that provides a parametric or other characterization of another model element. The canonical example of a *Characterization* is a set of name/value pairs, but other characterizations (e.g., classification) are possible.

Asserted Superclasses: analysis-backbone:Entity, base:IdentifiedElement

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Thing, AnalyzedElement, base-backbone:Aspect, base-backbone:Thing, CharacterizedElement

Asserted Subclasses: Assumption, Explanation, Quantity

Inferred Datatype Properties: **base:hasAlternateName** [0..*] xsd:string
base:hasCanonicalName [0..1] xsd:string
base:hasDescription [0..1] xsd:string
base:hasIdentifier [0..*] xsd:string
base:hasIndexEntry [0..*] xsd:string
base:hasShortName [0..1] xsd:string
base:hasSortKey [0..1] xsd:string
base:hasUuid [0..1] xsd:string

Asserted Object Properties: **characterizes** [0..*] CharacterizedElement

Inferred Object Properties: **isAnalyzedBy** [0..*] Explanation
isCharacterizedBy [0..*] Characterization
isExplainedBy [0..*] Explanation
isLimitedBy [0..*] Assumption
isValidatedBy [0..*] Explanation

The class definition diagram for Characterization is shown in Figure 6. The class usage diagram for Characterization is too large to include.

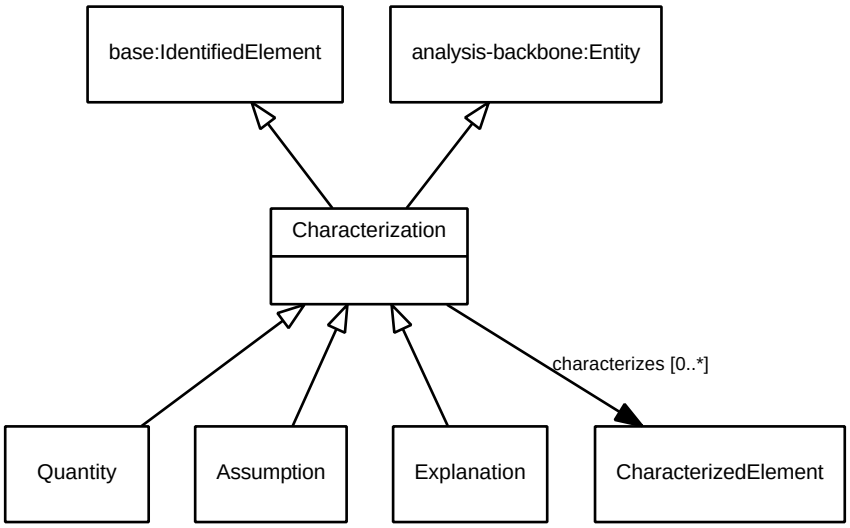

Figure 6: Class definition diagram for Characterization.

5.4 CostEstimate

A *CostEstimate* is a kind of *Explanation* that provides a cost estimate for the model elements it explains.

Asserted Superclasses: Analysis

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Entity, analysis-backbone:Thing, AnalyzedElement, base-backbone:Aspect, base-backbone:Thing, base:AggregatedElement, base:IdentifiedElement, Characterization, CharacterizedElement, Explanation

Inferred Datatype Properties: **base:hasAlternateName** [0..*] xsd:string

base:hasCanonicalName [0..1] xsd:string

base:hasDescription [0..1] xsd:string

base:hasIdentifier [0..*] xsd:string

base:hasIndexEntry [0..*] xsd:string

base:hasShortName [0..1] xsd:string

base:hasSortKey [0..1] xsd:string

base:hasUuid [0..1] xsd:string

Inferred Object Properties: **analyzes** [0..*] AnalyzedElement

base:aggregates [0..*] base:AggregatedElement

base:isAggregatedIn [0..*] base:AggregatedElement

characterizes [0..*] CharacterizedElement

explains [0..*] CharacterizedElement

isAnalyzedBy [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

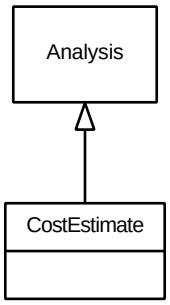

Figure 7: Class definition diagram for CostEstimate.

isLimitedBy [0..*] Assumption
isValidatedBy [0..*] Explanation
validates [0..*] CharacterizedElement

The class definition diagram for CostEstimate is shown in Figure 7. The class usage diagram for CostEstimate is too large to include.

5.5 Criterion

A *Criterion* establishes a region for some *Metric* that corresponds to success for some *MeasuredElement*.
A *Criterion* for the *Metric sample mass in kg* might be *at least 10 kg*.

Asserted Superclasses: analysis-backbone:Entity, base:IdentifiedElement

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Thing, AnalyzedElement, base-backbone:Aspect, base-backbone:Thing, CharacterizedElement

Inferred Datatype Properties: **base:hasAlternateName** [0..*] xsd:string
base:hasCanonicalName [0..1] xsd:string
base:hasDescription [0..1] xsd:string
base:hasIdentifier [0..*] xsd:string
base:hasIndexEntry [0..*] xsd:string
base:hasShortName [0..1] xsd:string
base:hasSortKey [0..1] xsd:string
base:hasUuid [0..1] xsd:string

Asserted Object Properties: **isCriterionFor** [0..1] Metric
measures [0..*] MeasuredElement

Inferred Object Properties: **isAnalyzedBy** [0..*] Explanation
isCharacterizedBy [0..*] Characterization
isExplainedBy [0..*] Explanation
isLimitedBy [0..*] Assumption
isValidatedBy [0..*] Explanation

The class definition diagram for Criterion is shown in Figure 8. The class usage diagram for Criterion is shown in Figure 9.

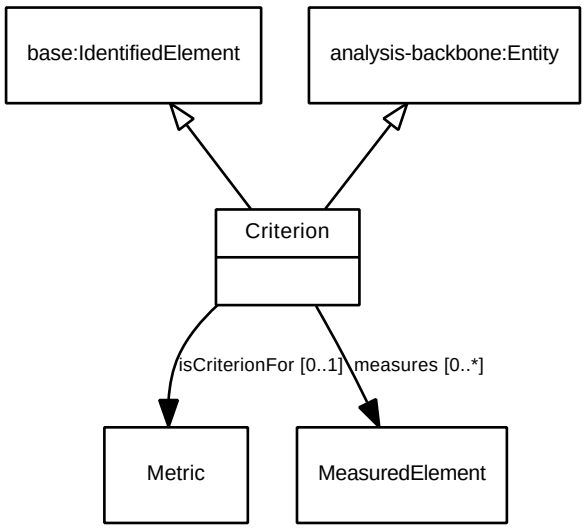

Figure 8: Class definition diagram for Criterion.

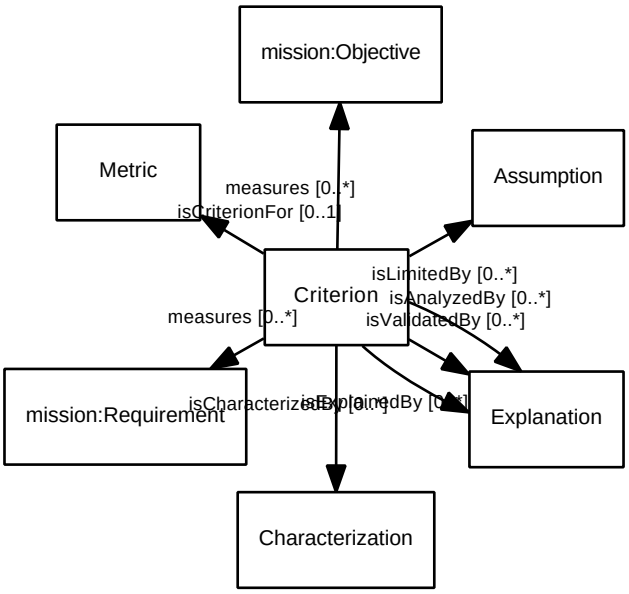

Figure 9: Class usage diagram for Criterion.

5.6 DrivingRequirementsAnalysis

DrivingRequirementsAnalysis is a deprecated synonym for *DrivingRequirementsExplanation.*

Asserted Superclasses: DrivingRequirementsExplanation

Inferred Superclasses: Analysis, analysis-backbone:Aspect, analysis-backbone:Entity, analysis-backbone:Thing, AnalyzedElement, base-backbone:Aspect, base-backbone:Thing, base:AggregatedElement, base:IdentifiedElement, Characterization, CharacterizedElement, Explanation

Inferred Datatype Properties: **base:hasAlternateName** [0..*] xsd:string

base:hasCanonicalName [0..1] xsd:string

base:hasDescription [0..1] xsd:string

base:hasIdentifier [0..*] xsd:string

base:hasIndexEntry [0..*] xsd:string

base:hasShortName [0..1] xsd:string

base:hasSortKey [0..1] xsd:string

base:hasUuid [0..1] xsd:string

Inferred Object Properties: **analyzes** [0..*] AnalyzedElement

base:aggregates [0..*] base:AggregatedElement

base:isAggregatedIn [0..*] base:AggregatedElement

characterizes [0..*] CharacterizedElement

explains [0..*] mission:Requirement

isAnalyzedBy [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

validates [0..*] CharacterizedElement

The class definition diagram for DrivingRequirementsAnalysis is shown in Figure 10. The class usage diagram for DrivingRequirementsAnalysis is too large to include.

5.7 DrivingRequirementsExplanation

A *DrivingRequirementsAnalysis* provides the rationale for designating a set of *Requirement*s as *driving*, and makes the designation via the *explains* property.

Asserted Superclasses: Analysis

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Entity, analysis-backbone:Thing, AnalyzedElement, base-backbone:Aspect, base-backbone:Thing, base:AggregatedElement, base:IdentifiedElement, Characterization, CharacterizedElement, Explanation

Asserted Subclasses: DrivingRequirementsAnalysis

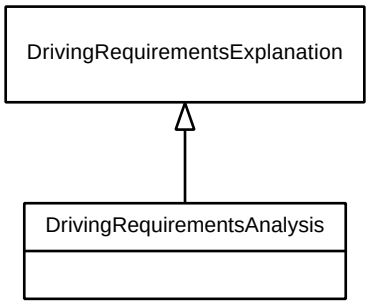

Figure 10: Class definition diagram for DrivingRequirementsAnalysis.

Inferred Datatype Properties: **base:hasAlternateName** [0..*] xsd:string

base:hasCanonicalName [0..1] xsd:string

base:hasDescription [0..1] xsd:string

base:hasIdentifier [0..*] xsd:string

base:hasIndexEntry [0..*] xsd:string

base:hasShortName [0..1] xsd:string

base:hasSortKey [0..1] xsd:string

base:hasUuid [0..1] xsd:string

Inferred Object Properties: **analyzes** [0..*] AnalyzedElement

base:aggregates [0..*] base:AggregatedElement

base:isAggregatedIn [0..*] base:AggregatedElement

characterizes [0..*] CharacterizedElement

explains [0..*] mission:Requirement

isAnalyzedBy [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

validates [0..*] CharacterizedElement

The class definition diagram for DrivingRequirementsExplanation is shown in Figure 11. The class usage diagram for DrivingRequirementsExplanation is too large to include.

5.8 Explanation

An *Explanation* is a product that captures or summarizes the results of an analysis activity and relates it to one or more other model elements. It may contain narrative prose directly or provide a reference to external products.

Driving requirements analyses, trade studies, and cost estimates are all examples of *Explanation*.

Asserted Superclasses: base:AggregatedElement, Characterization

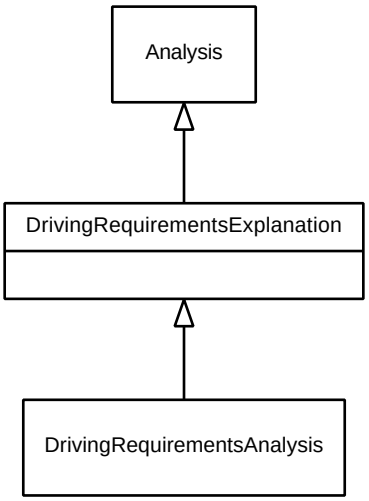

Figure 11: Class definition diagram for DrivingRequirementsExplanation.

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Entity, analysis-backbone:Thing, AnalyzedElement, base-backbone:Aspect, base-backbone:Thing, base:IdentifiedElement, CharacterizedElement

Asserted Subclasses: Analysis

Inferred Datatype Properties: **base:hasAlternateName** [0..*] xsd:string
base:hasCanonicalName [0..1] xsd:string
base:hasDescription [0..1] xsd:string
base:hasIdentifier [0..*] xsd:string
base:hasIndexEntry [0..*] xsd:string
base:hasShortName [0..1] xsd:string
base:hasSortKey [0..1] xsd:string
base:hasUuid [0..1] xsd:string

Asserted Object Properties: **analyzes** [0..*] AnalyzedElement
explains [0..*] CharacterizedElement
validates [0..*] CharacterizedElement

Inferred Object Properties: **base:aggregates** [0..*] base:AggregatedElement
base:isAggregatedIn [0..*] base:AggregatedElement
characterizes [0..*] CharacterizedElement
isAnalyzedBy [0..*] Explanation
isCharacterizedBy [0..*] Characterization
isExplainedBy [0..*] Explanation
isLimitedBy [0..*] Assumption
isValidatedBy [0..*] Explanation

The class definition diagram for Explanation is shown in Figure 12. The class usage diagram for Explanation is too large to include.

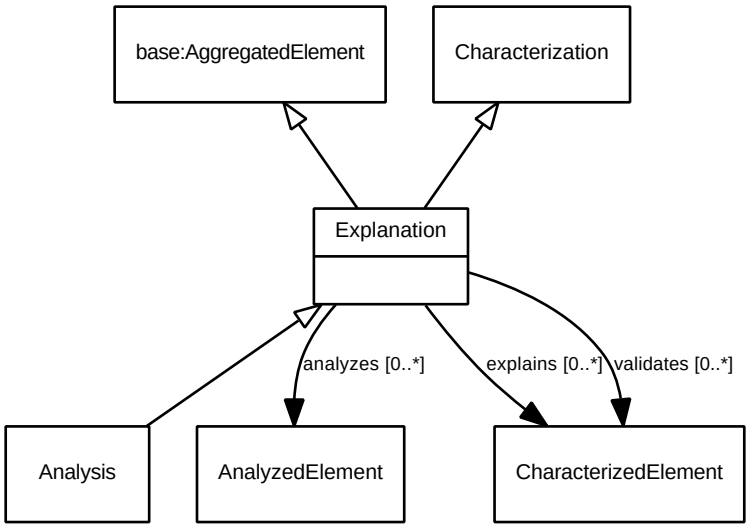

Figure 12: Class definition diagram for Explanation.

5.9 Fact

A *Fact* is an *Assumption* that is true.

Asserted Superclasses: Assumption

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Entity, analysis-backbone:Thing, AnalyzedElement, base-backbone:Aspect, base-backbone:Thing, base:IdentifiedElement, Characterization, CharacterizedElement

Inferred Datatype Properties: **base:hasAlternateName** [0..*] xsd:string

base:hasCanonicalName [0..1] xsd:string

base:hasDescription [0..1] xsd:string

base:hasIdentifier [0..*] xsd:string

base:hasIndexEntry [0..*] xsd:string

base:hasShortName [0..1] xsd:string

base:hasSortKey [0..1] xsd:string

base:hasUuid [0..1] xsd:string

Inferred Object Properties: **characterizes** [0..*] CharacterizedElement

isAnalyzedBy [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

limits [0..*] CharacterizedElement

The class definition diagram for Fact is shown in Figure 13. The class usage diagram for Fact is too large to include.

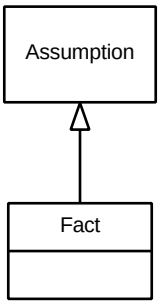

Figure 13: Class definition diagram for Fact.

5.10 KeyRequirementsAnalysis

KeyRequirementsAnalysis is a deprecated synonym for *KeyRequirementsExplanation*.

Asserted Superclasses: KeyRequirementsExplanation

Inferred Superclasses: Analysis, analysis-backbone:Aspect, analysis-backbone:Entity, analysis-backbone:Thing, AnalyzedElement, base-backbone:Aspect, base-backbone:Thing, base:AggregatedElement, base:IdentifiedElement, Characterization, CharacterizedElement, Explanation

Inferred Datatype Properties: **base:hasAlternateName** [0..*] xsd:string

base:hasCanonicalName [0..1] xsd:string

base:hasDescription [0..1] xsd:string

base:hasIdentifier [0..*] xsd:string

base:hasIndexEntry [0..*] xsd:string

base:hasShortName [0..1] xsd:string

base:hasSortKey [0..1] xsd:string

base:hasUuid [0..1] xsd:string

Inferred Object Properties: **analyzes** [0..*] AnalyzedElement

base:aggregates [0..*] base:AggregatedElement

base:isAggregatedIn [0..*] base:AggregatedElement

characterizes [0..*] CharacterizedElement

explains [0..*] mission:Requirement

isAnalyzedBy [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

validates [0..*] CharacterizedElement

The class definition diagram for KeyRequirementsAnalysis is shown in Figure 14. The class usage diagram for KeyRequirementsAnalysis is too large to include.

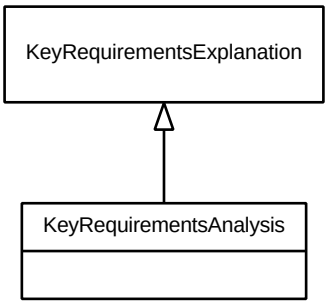

Figure 14: Class definition diagram for KeyRequirementsAnalysis.

5.11 KeyRequirementsExplanation

A *KeyRequirementsAnalysis* provides the rationale for designating a set of *Requirement*s as *key*, and makes the designation via the *explains* property.

Asserted Superclasses: Analysis

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Entity, analysis-backbone:Thing, AnalyzedElement, base-backbone:Aspect, base-backbone:Thing, base:AggregatedElement, base:IdentifiedElement, Characterization, CharacterizedElement, Explanation

Asserted Subclasses: KeyRequirementsAnalysis

Inferred Datatype Properties: **base:hasAlternateName** [0..*] xsd:string
base:hasCanonicalName [0..1] xsd:string
base:hasDescription [0..1] xsd:string
base:hasIdentifier [0..*] xsd:string
base:hasIndexEntry [0..*] xsd:string
base:hasShortName [0..1] xsd:string
base:hasSortKey [0..1] xsd:string
base:hasUuid [0..1] xsd:string

Inferred Object Properties: **analyzes** [0..*] AnalyzedElement
base:aggregates [0..*] base:AggregatedElement
base:isAggregatedIn [0..*] base:AggregatedElement
characterizes [0..*] CharacterizedElement
explains [0..*] mission:Requirement
isAnalyzedBy [0..*] Explanation
isCharacterizedBy [0..*] Characterization
isExplainedBy [0..*] Explanation
isLimitedBy [0..*] Assumption
isValidatedBy [0..*] Explanation
validates [0..*] CharacterizedElement

The class definition diagram for KeyRequirementsExplanation is shown in Figure 15. The class usage diagram for KeyRequirementsExplanation is too large to include.

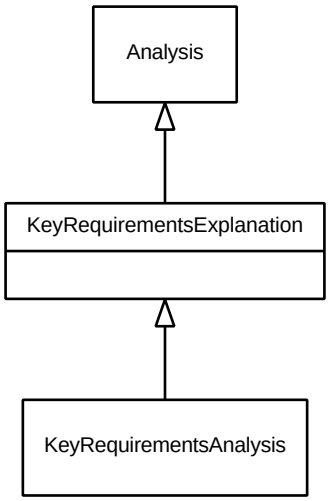

Figure 15: Class definition diagram for KeyRequirementsExplanation.

5.12 Metric

A *Metric* establishes a method for quantifying achievement or satisfaction of one or more *MeasuredElement*s. Note that the relationship is many to many: a given *Metric* may jointly quantify multiple *MeasuredElement*s. Likewise, a *MeasuredElement* may be quantified by multiple *Metric*s.

Appropriate *Metric*s for the *Objective image Martian north polar region* might include data volumes at specified wavelength and resolution.

Asserted Superclasses: analysis-backbone:Entity, base:IdentifiedElement

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Thing, AnalyzedElement, base-backbone:Aspect, base-backbone:Thing, CharacterizedElement

Inferred Datatype Properties: **base:hasAlternateName** [0..*] xsd:string
base:hasCanonicalName [0..1] xsd:string
base:hasDescription [0..1] xsd:string
base:hasIdentifier [0..*] xsd:string
base:hasIndexEntry [0..*] xsd:string
base:hasShortName [0..1] xsd:string
base:hasSortKey [0..1] xsd:string
base:hasUuid [0..1] xsd:string

Asserted Object Properties: **hasCriterion** [0..*] Criterion

Inferred Object Properties: **isAnalyzedBy** [0..*] Explanation
isCharacterizedBy [0..*] Characterization
isExplainedBy [0..*] Explanation
isLimitedBy [0..*] Assumption
isValidatedBy [0..*] Explanation

The class definition diagram for Metric is shown in Figure 16. The class usage diagram for Metric is shown in Figure 17.

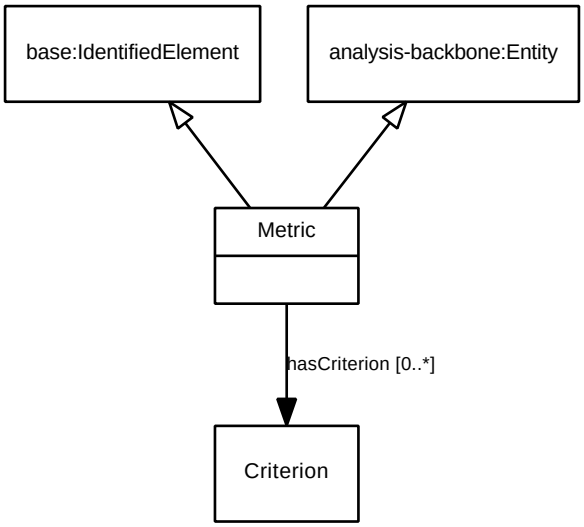

Figure 16: Class definition diagram for Metric.

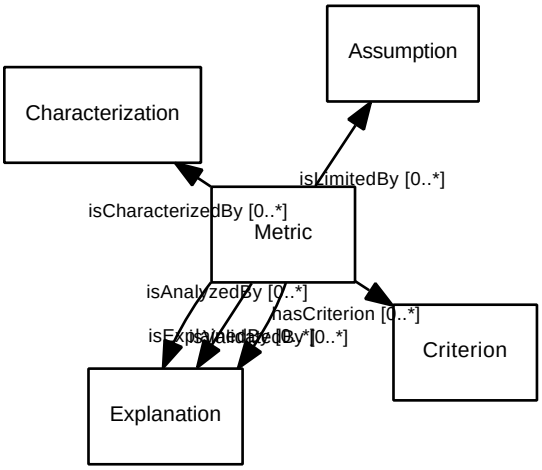

Figure 17: Class usage diagram for Metric.

5.13 Quantity

A *Quantity* attaches a value for some *Metric* to one or more *SpecifiedElement*s. That is, it evaluates some aspect of a design by assigning a definite value to a specific *Metric*.

Asserted Superclasses: Characterization

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Entity, analysis-backbone:Thing, AnalyzedElement, base-backbone:Aspect, base-backbone:Thing, base:IdentifiedElement, CharacterizedElement

Inferred Datatype Properties: **base:hasAlternateName** [0..*] xsd:string

base:hasCanonicalName [0..1] xsd:string

base:hasDescription [0..1] xsd:string

base:hasIdentifier [0..*] xsd:string

base:hasIndexEntry [0..*] xsd:string

base:hasShortName [0..1] xsd:string

base:hasSortKey [0..1] xsd:string

base:hasUuid [0..1] xsd:string

Asserted Object Properties: **hasMetric** [0..1] Metric

hasValue [0..1] QuantityValue

quantifies [0..*] mission:SpecifiedElement

Inferred Object Properties: **characterizes** [0..*] CharacterizedElement

isAnalyzedBy [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

The class definition diagram for Quantity is shown in Figure 18. The class usage diagram for Quantity is too large to include.

5.13.1 Comments

5.14 QuantityValue

A *QuantityValue* assigns a value to a *Quantity*.

Asserted Superclasses: analysis-backbone:Entity

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Thing, AnalyzedElement, CharacterizedElement

Inferred Object Properties: **isAnalyzedBy** [0..*] Explanation

isCharacterizedBy [0..*] Characterization

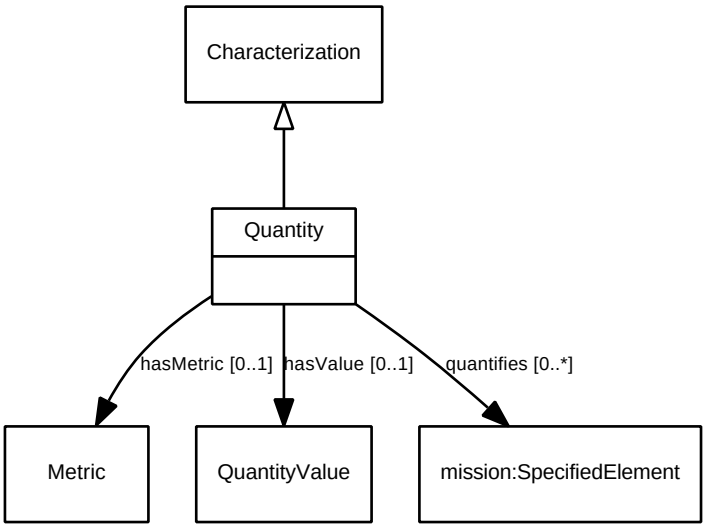

Figure 18: Class definition diagram for Quantity.

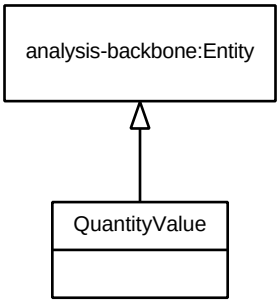

Figure 19: Class definition diagram for QuantityValue.

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

The class definition diagram for QuantityValue is shown in Figure 19. The class usage diagram for QuantityValue is shown in Figure 20.

5.15 TradeStudy

A *TradeStudy* explains some set of model elements and their properties through comparison with alternatives.

Asserted Superclasses: Analysis

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Entity, analysis-backbone:Thing, AnalyzedElement, base-backbone:Aspect, base-backbone:Thing, base:AggregatedElement, base:IdentifiedElement, Characterization, CharacterizedElement, Explanation

Inferred Datatype Properties: **base:hasAlternateName** [0..*] xsd:string

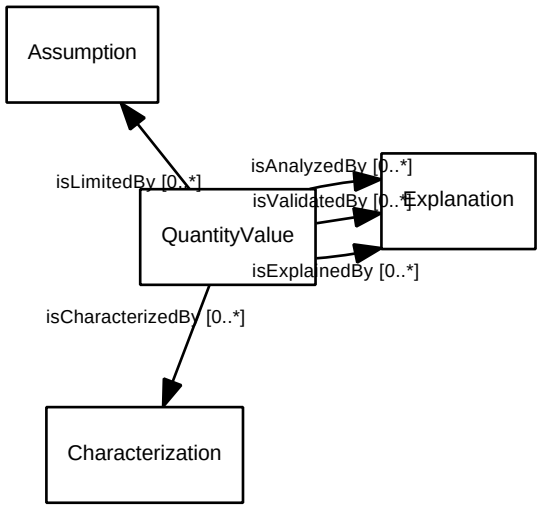

Figure 20: Class usage diagram for QuantityValue.

base:hasCanonicalName [0..1] xsd:string

base:hasDescription [0..1] xsd:string

base:hasIdentifier [0..*] xsd:string

base:hasIndexEntry [0..*] xsd:string

base:hasShortName [0..1] xsd:string

base:hasSortKey [0..1] xsd:string

base:hasUuid [0..1] xsd:string

Inferred Object Properties: analyzes [0..*] AnalyzedElement

base:aggregates [0..*] base:AggregatedElement

base:isAggregatedIn [0..*] base:AggregatedElement

characterizes [0..*] CharacterizedElement

explains [0..*] CharacterizedElement

isAnalyzedBy [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

validates [0..*] CharacterizedElement

The class definition diagram for TradeStudy is shown in Figure 21. The class usage diagram for TradeStudy is too large to include.

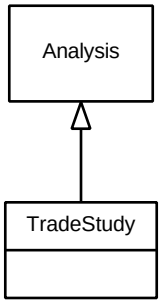

Figure 21: Class definition diagram for TradeStudy.

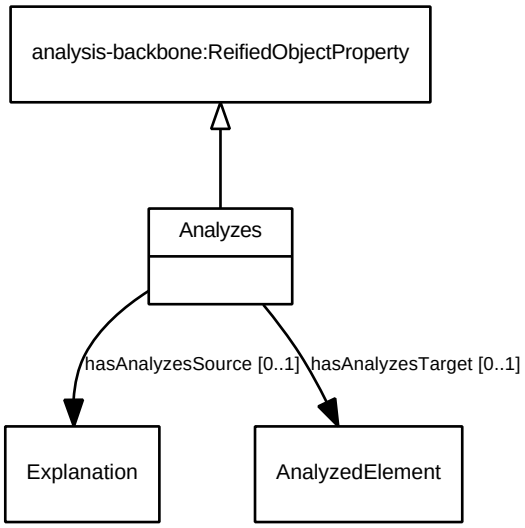

Figure 22: Class definition diagram for Analyzes.

6 Object Property Reification Class Definitions

6.1 Analyzes

Asserted Superclasses: analysis-backbone:ReifiedObjectProperty

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Thing, AnalyzedElement, CharacterizedElement

Asserted Object Properties: **hasAnalyzesSource** [0..1] Explanation

hasAnalyzesTarget [0..1] AnalyzedElement

Inferred Object Properties: **isAnalyzedBy** [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

Reified Object Properties: analyzes

The class definition diagram for Analyzes is shown in Figure 22. The class usage diagram for Analyzes is too large to include.

6.2 Characterizes

Asserted Superclasses: analysis-backbone:ReifiedObjectProperty

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Thing, AnalyzedElement, CharacterizedElement

Asserted Subclasses: Explains, Limits

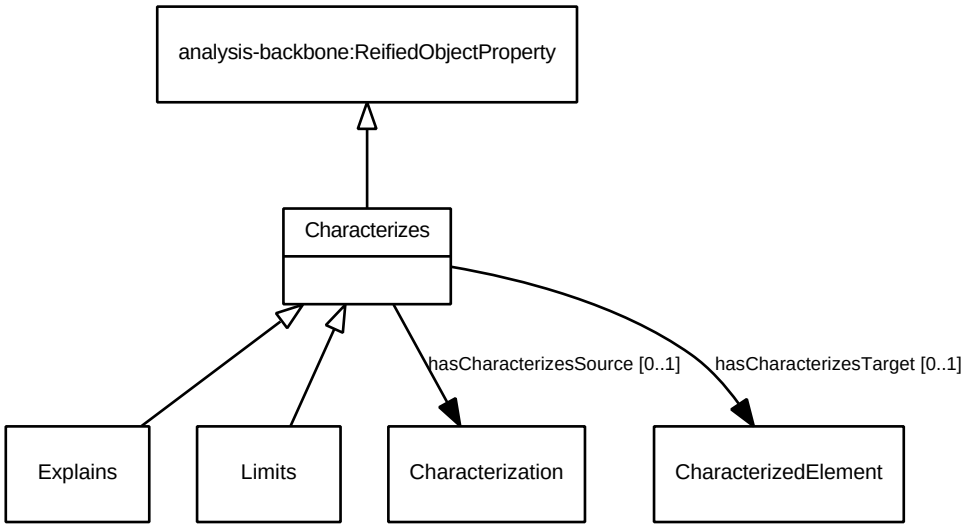

Figure 23: Class definition diagram for Characterizes.

Asserted Object Properties: **hasCharacterizesSource** [0..1] Characterization
hasCharacterizesTarget [0..1] CharacterizedElement

Inferred Object Properties: **isAnalyzedBy** [0..*] Explanation
isCharacterizedBy [0..*] Characterization
isExplainedBy [0..*] Explanation
isLimitedBy [0..*] Assumption
isValidatedBy [0..*] Explanation

Reified Object Properties: characterizes

The class definition diagram for Characterizes is shown in Figure 23. The class usage diagram for Characterizes is too large to include.

6.3 Explains

Asserted Superclasses: Characterizes

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:ReifiedObjectProperty, analysis-backbone:Thing, AnalyzedElement, CharacterizedElement

Asserted Subclasses: Validates

Asserted Object Properties: **hasExplainsSource** [0..1] Explanation
hasExplainsTarget [0..1] CharacterizedElement

Inferred Object Properties: **hasCharacterizesSource** [0..1] Characterization
hasCharacterizesTarget [0..1] CharacterizedElement
isAnalyzedBy [0..*] Explanation
isCharacterizedBy [0..*] Characterization

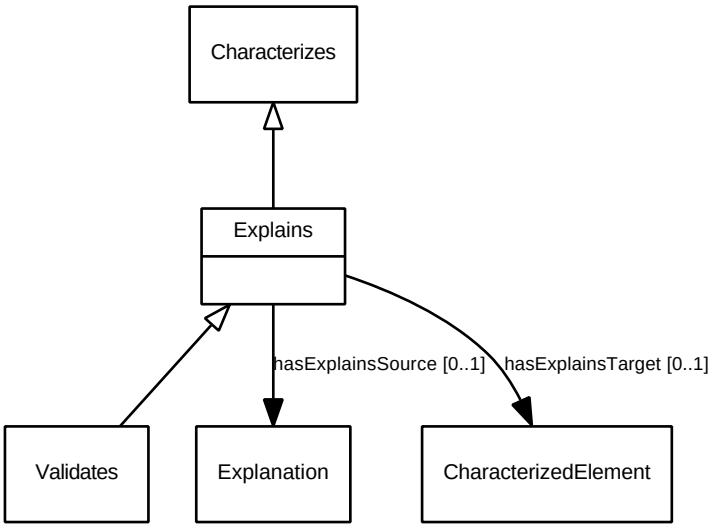

Figure 24: Class definition diagram for Explains.

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

Reified Object Properties: explains

The class definition diagram for Explains is shown in Figure 24. The class usage diagram for Explains is too large to include.

6.4 HasCriterion

Asserted Superclasses: analysis-backbone:ReifiedObjectProperty

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Thing, AnalyzedElement, CharacterizedElement

Asserted Object Properties: **hasHasCriterionSource** [0..1] Metric

hasHasCriterionTarget [0..1] Criterion

Inferred Object Properties: **isAnalyzedBy** [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

Reified Object Properties: hasCriterion

The class definition diagram for HasCriterion is shown in Figure 25. The class usage diagram for HasCriterion is shown in Figure 26.

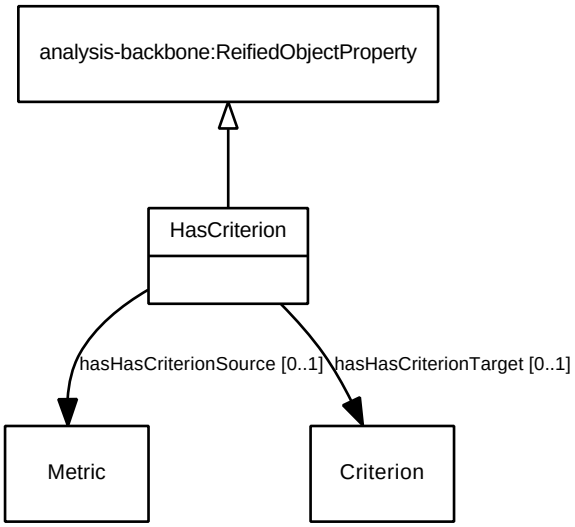

Figure 25: Class definition diagram for HasCriterion.

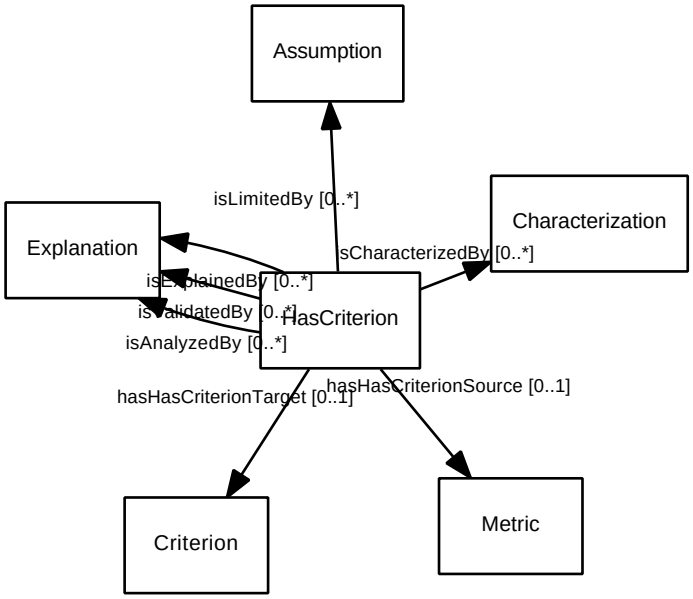

Figure 26: Class usage diagram for HasCriterion.

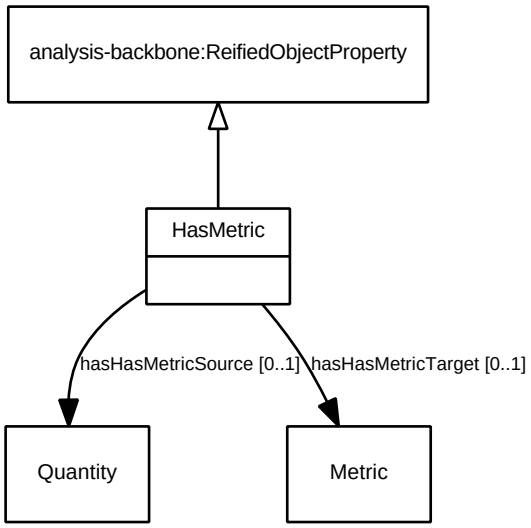

Figure 27: Class definition diagram for HasMetric.

6.5 HasMetric

Asserted Superclasses: analysis-backbone:ReifiedObjectProperty

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Thing, AnalyzedElement, CharacterizedElement

Asserted Object Properties: **hasHasMetricSource** [0..1] Quantity

hasHasMetricTarget [0..1] Metric

Inferred Object Properties: **isAnalyzedBy** [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

Reified Object Properties: hasMetric

The class definition diagram for HasMetric is shown in Figure 27. The class usage diagram for HasMetric is shown in Figure 28.

6.6 HasValue

Asserted Superclasses: analysis-backbone:ReifiedObjectProperty

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Thing, AnalyzedElement, CharacterizedElement

Asserted Object Properties: **hasHasValueSource** [0..1] Quantity

hasHasValueTarget [0..1] QuantityValue

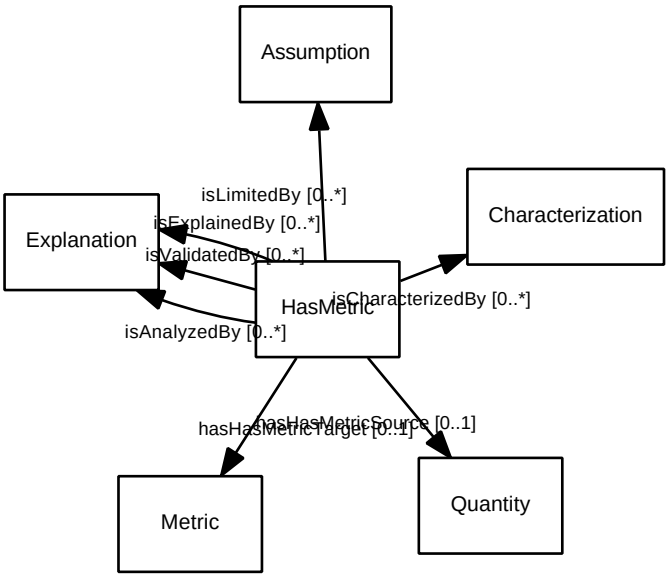

Figure 28: Class usage diagram for HasMetric.

Inferred Object Properties: **isAnalyzedBy** [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

Reified Object Properties: hasValue

The class definition diagram for HasValue is shown in Figure 29. The class usage diagram for HasValue is shown in Figure 30.

6.7 Limits

Asserted Superclasses: Characterizes

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:ReifiedObjectProperty, analysis-backbone:Thing, AnalyzedElement, CharacterizedElement

Asserted Object Properties: **hasLimitsSource** [0..1] Assumption

hasLimitsTarget [0..1] CharacterizedElement

Inferred Object Properties: **hasCharacterizesSource** [0..1] Characterization

hasCharacterizesTarget [0..1] CharacterizedElement

isAnalyzedBy [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

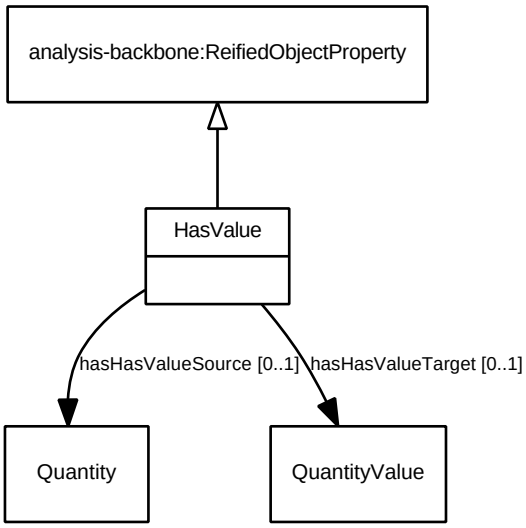

Figure 29: Class definition diagram for HasValue.

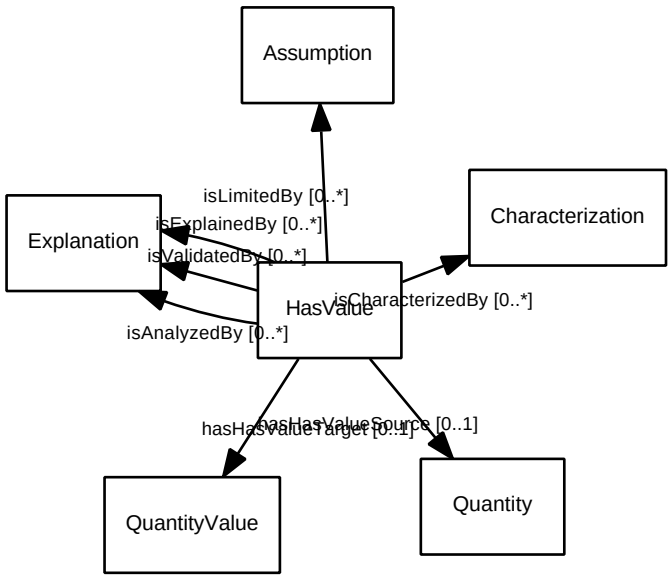

Figure 30: Class usage diagram for HasValue.

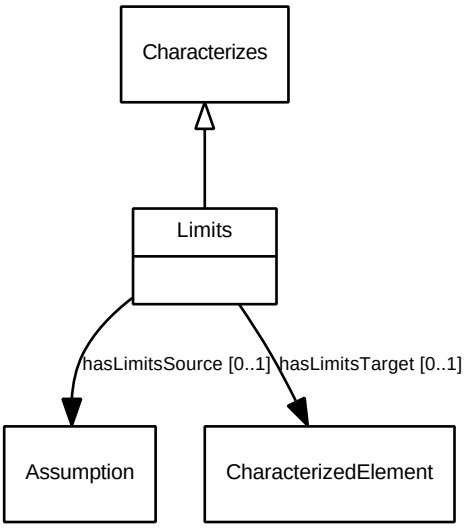

Figure 31: Class definition diagram for Limits.

isValidatedBy [0..*] Explanation

Reified Object Properties: limits

The class definition diagram for Limits is shown in Figure 31. The class usage diagram for Limits is too large to include.

6.8 Measures

Asserted Superclasses: analysis-backbone:ReifiedObjectProperty

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Thing, AnalyzedElement, CharacterizedElement

Asserted Object Properties: **hasMeasuresSource** [0..1] Criterion

hasMeasuresTarget [0..1] MeasuredElement

Inferred Object Properties: **isAnalyzedBy** [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

Reified Object Properties: measures

The class definition diagram for Measures is shown in Figure 32. The class usage diagram for Measures is shown in Figure 33.

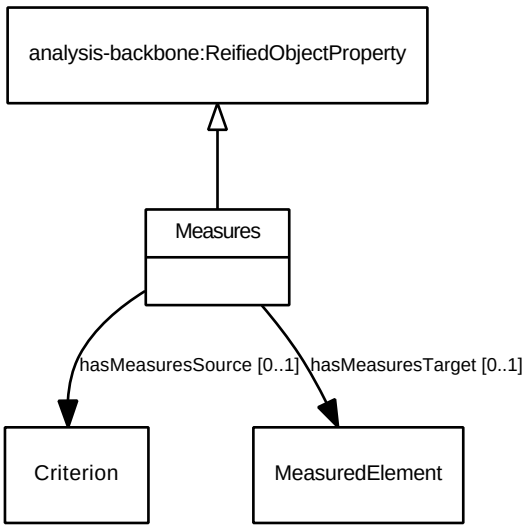

Figure 32: Class definition diagram for Measures.

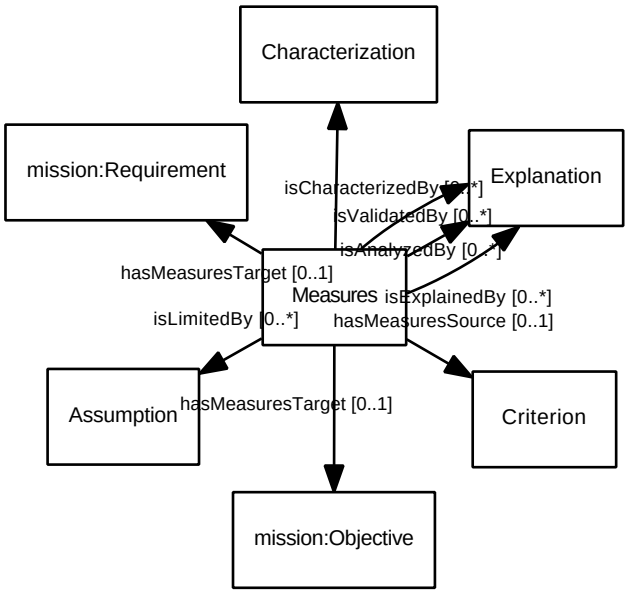

Figure 33: Class usage diagram for Measures.

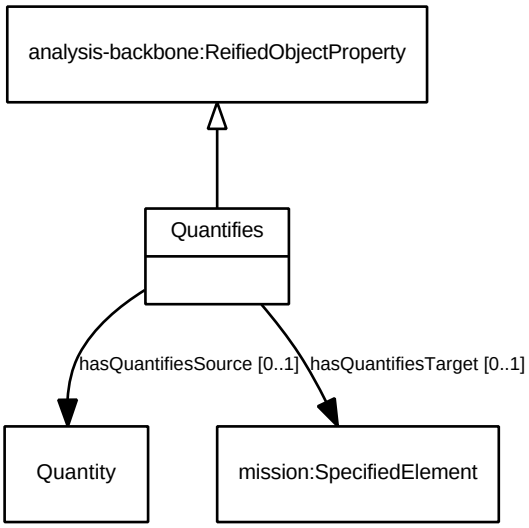

Figure 34: Class definition diagram for Quantifies.

6.9 Quantifies

Asserted Superclasses: analysis-backbone:ReifiedObjectProperty

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:Thing, AnalyzedElement, CharacterizedElement

Asserted Object Properties: **hasQuantifiesSource** [0..1] Quantity

hasQuantifiesTarget [0..1] mission:SpecifiedElement

Inferred Object Properties: **isAnalyzedBy** [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

Reified Object Properties: quantifies

The class definition diagram for Quantifies is shown in Figure 34. The class usage diagram for Quantifies is shown in Figure 35.

6.10 Validates

Asserted Superclasses: Explains

Inferred Superclasses: analysis-backbone:Aspect, analysis-backbone:ReifiedObjectProperty, analysis-backbone:Thing, AnalyzedElement, CharacterizedElement, Characterizes

Asserted Object Properties: **hasValidatesSource** [0..1] Explanation

hasValidatesTarget [0..1] CharacterizedElement

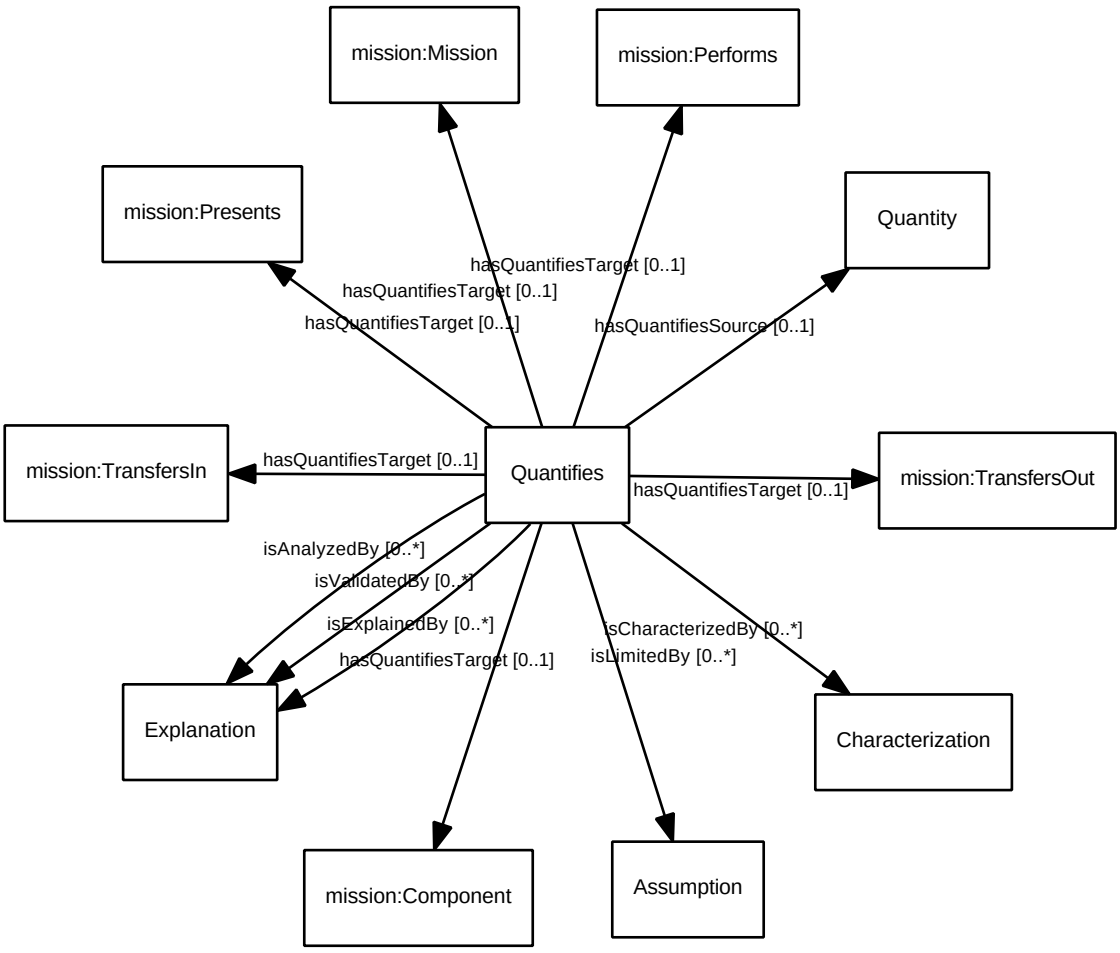

Figure 35: Class usage diagram for Quantifies.

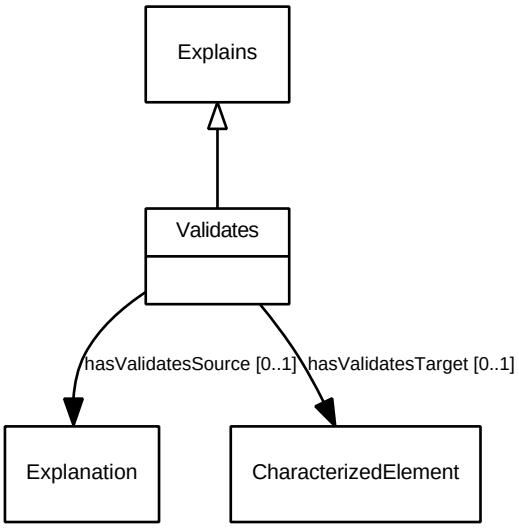

Figure 36: Class definition diagram for Validates.

Inferred Object Properties: **hasCharacterizesSource** [0..1] Characterization

hasCharacterizesTarget [0..1] CharacterizedElement

hasExplainsSource [0..1] Explanation

hasExplainsTarget [0..1] CharacterizedElement

isAnalyzedBy [0..*] Explanation

isCharacterizedBy [0..*] Characterization

isExplainedBy [0..*] Explanation

isLimitedBy [0..*] Assumption

isValidatedBy [0..*] Explanation

Reified Object Properties: validates

The class definition diagram for Validates is shown in Figure 36. The class usage diagram for Validates is too large to include.

7 Concrete Object Property Definitions

7.1 analyzes

An *Explanation a analyzes* some *IdentifiedElement e* if and only if *a* considers or otherwise takes account of *e*.

Asserted Superproperties: analysis-backbone:topReifiedObjectProperty

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Explanation

Range: [0..*] AnalyzedElement

Inverse: isAnalyzedBy

Derived: false

Reification Class: Analyzes

Reification Property Chain: hasAnalyzesSource $^{-1}$ ∘ hasAnalyzesTarget

The property usage diagram for analyzes is shown in Figure 37.

7.2 characterizes

A *Characterization c characterizes* a *CharacterizedElement e* if and only if *c* describes, delimits, or restricts *e*.

Asserted Superproperties: analysis-backbone:topReifiedObjectProperty

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Characterization

Range: [0..*] CharacterizedElement

Inverse: isCharacterizedBy

Derived: false

Reification Class: Characterizes

Reification Property Chain: hasCharacterizesSource $^{-1}$ ∘ hasCharacterizesTarget

The property usage diagram for characterizes is shown in Figure 38.

7.3 explains

An *Explanation a explains* some *SpecifiedElement e* if and only if *a* provides a rationale or justification for some design aspect of *e*.

Asserted Superproperties: characterizes

Inferred Superproperties: analysis-backbone:topObjectProperty,
analysis-backbone:topReifiedObjectProperty

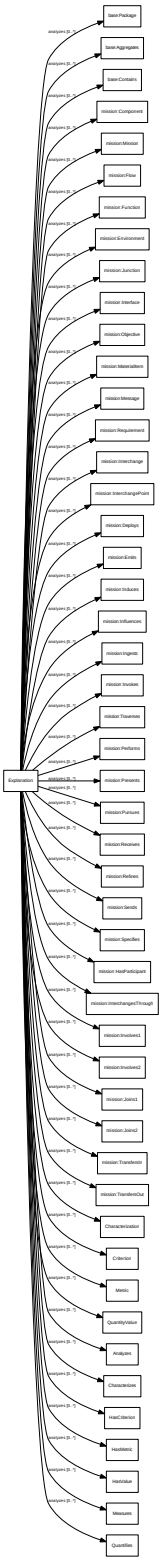

Figure 37: Property usage diagram for analyzes.

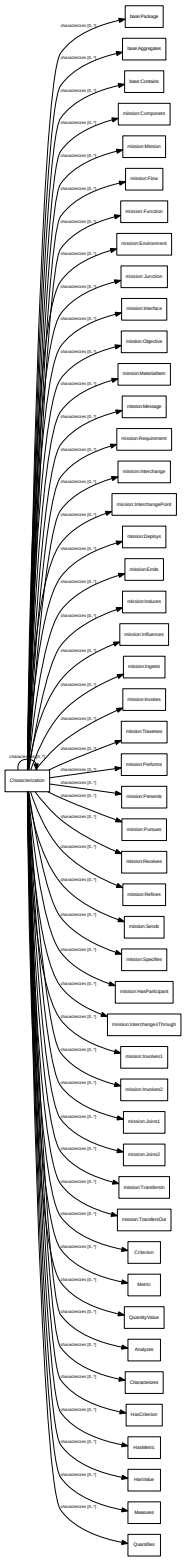

Figure 38: Property usage diagram for characterizes.

Domain: Explanation

Range: [0..*] CharacterizedElement

Inverse: isExplainedBy

Derived: false

Reification Class: Explains

Reification Property Chain: hasExplainsSource $^{-1}$ ∘ hasExplainsTarget

The property usage diagram for explains is shown in Figure 39.

7.4 hasCriterion

A *Metric m hasCriterion* some *Criterion c* if and only if *c* establishes a region of success for *m*.

Asserted Superproperties: analysis-backbone:topReifiedObjectProperty

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Metric

Range: [0..*] Criterion

Inverse: isCriterionFor

Derived: false

Reification Class: HasCriterion

Reification Property Chain: hasHasCriterionSource $^{-1}$ ∘ hasHasCriterionTarget

The property usage diagram for hasCriterion is shown in Figure 40.

7.5 hasMetric

An *Quantification q hasMetric* some *Metric m* if and only if *q* assigns a value to *m* for some aspect of a design.

Asserted Superproperties: analysis-backbone:topReifiedObjectProperty

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Quantity

Range: [0..1] Metric

Derived: false

Reification Class: HasMetric

Reification Property Chain: hasHasMetricSource $^{-1}$ ∘ hasHasMetricTarget

The property usage diagram for hasMetric is shown in Figure 41.

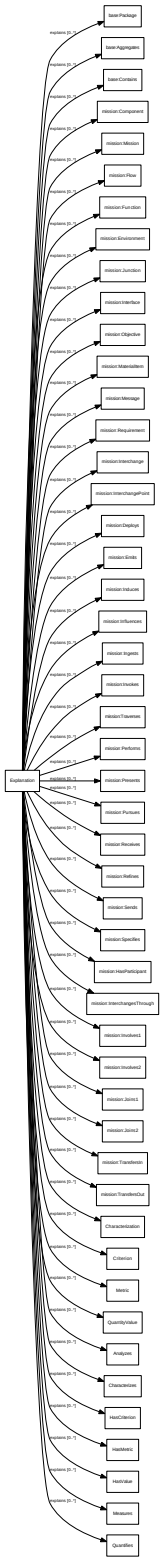

Figure 39: Property usage diagram for explains.

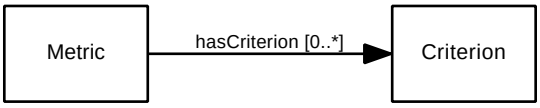

Figure 40: Property usage diagram for hasCriterion.

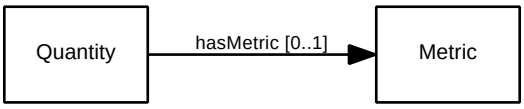

Figure 41: Property usage diagram for hasMetric.

7.6 hasValue

Asserted Superproperties: analysis-backbone:topReifiedObjectProperty

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Quantity

Range: [0..1] QuantityValue

Derived: false

Reification Class: HasValue

Reification Property Chain: hasHasValueSource $^{-1}$ ∘ hasHasValueTarget

The property usage diagram for hasValue is shown in Figure 42.

7.7 isAnalyzedBy

Asserted Superproperties: analysis-backbone:topReifiedObjectProperty

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: AnalyzedElement

Range: [0..*] Explanation

Inverse: analyzes

Derived: true

The property usage diagram for isAnalyzedBy is shown in Figure 43.

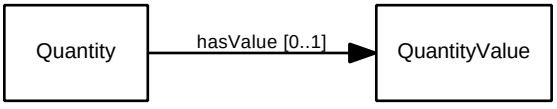

Figure 42: Property usage diagram for hasValue.

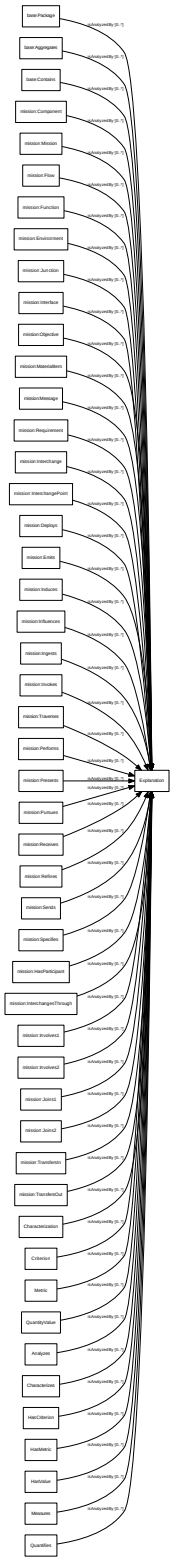

Figure 43: Property usage diagram for isAnalyzedBy.

7.8 isCharacterizedBy

See *characterizes*.

Asserted Superproperties: analysis-backbone:topReifiedObjectProperty

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: CharacterizedElement

Range: [0..*] Characterization

Inverse: characterizes

Derived: true

The property usage diagram for isCharacterizedBy is shown in Figure 44.

7.9 isCriterionFor

Asserted Superproperties: analysis-backbone:topReifiedObjectProperty

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Criterion

Range: [0..1] Metric

Inverse: hasCriterion

Derived: true

The property usage diagram for isCriterionFor is shown in Figure 45.

7.10 isExplainedBy

See *explains*.

Asserted Superproperties: isCharacterizedBy

Inferred Superproperties: analysis-backbone:topObjectProperty, analysis-backbone:topReifiedObjectProperty

Domain: CharacterizedElement

Range: [0..*] Explanation

Inverse: explains

Derived: true

The property usage diagram for isExplainedBy is shown in Figure 46.

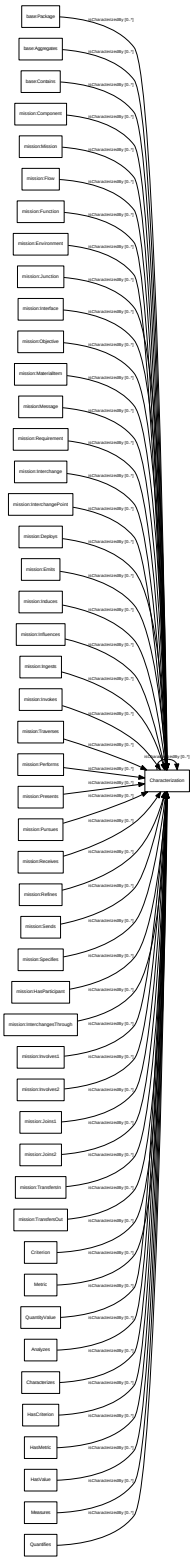

Figure 44: Property usage diagram for isCharacterizedBy.

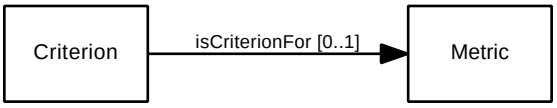

Figure 45: Property usage diagram for isCriterionFor.

7.11 isLimitedBy

See *limits*.

Asserted Superproperties: isCharacterizedBy

Inferred Superproperties: analysis-backbone:topObjectProperty, analysis-backbone:topReifiedObjectProperty

Domain: CharacterizedElement

Range: [0..*] Assumption

Inverse: limits

Derived: true

The property usage diagram for isLimitedBy is shown in Figure 47.

7.12 isMeasuredBy

Asserted Superproperties: analysis-backbone:topReifiedObjectProperty

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: MeasuredElement

Range: [0..*] Criterion

Inverse: measures

Derived: true

The property usage diagram for isMeasuredBy is shown in Figure 48.

7.13 isQuantifiedBy

Asserted Superproperties: analysis-backbone:topReifiedObjectProperty

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: mission:SpecifiedElement

Range: [0..*] Quantity

Inverse: quantifies

Derived: true

The property usage diagram for isQuantifiedBy is shown in Figure 49.

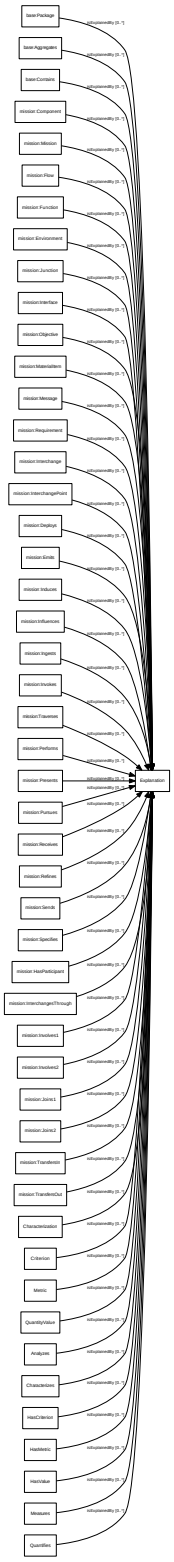

Figure 46: Property usage diagram for isExplainedBy.

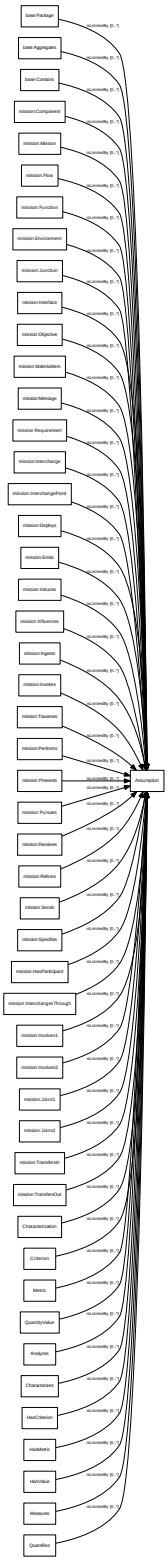

Figure 47: Property usage diagram for isLimitedBy.

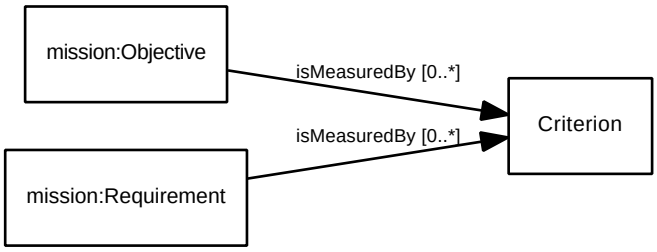

Figure 48: Property usage diagram for isMeasuredBy.

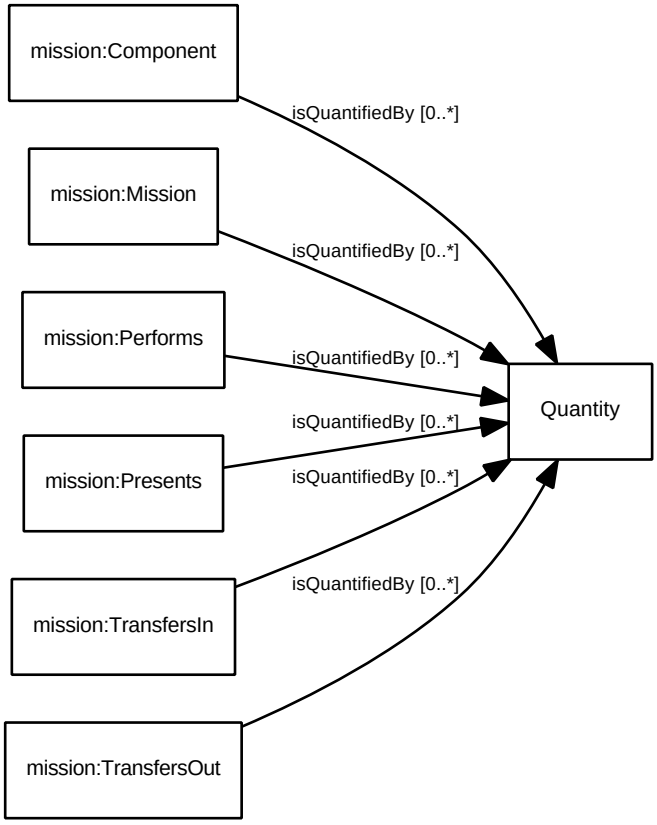

Figure 49: Property usage diagram for isQuantifiedBy.

7.14 isValidatedBy

See *validates*.

Asserted Superproperties: isExplainedBy

Inferred Superproperties: analysis-backbone:topObjectProperty, analysis-backbone:topReifiedObjectProperty, isCharacterizedBy

Domain: CharacterizedElement

Range: [0..*] Explanation

Inverse: validates

Derived: true

The property usage diagram for isValidatedBy is shown in Figure 50.

7.15 limits

Asserted Superproperties: characterizes

Inferred Superproperties: analysis-backbone:topObjectProperty, analysis-backbone:topReifiedObjectProperty

Domain: Assumption

Range: [0..*] CharacterizedElement

Inverse: isLimitedBy

Derived: false

Reification Class: Limits

Reification Property Chain: hasLimitsSource $^{-1}$ $\circ$ hasLimitsTarget

The property usage diagram for limits is shown in Figure 51.

7.15.1 Comments

7.16 measures

A *Criterion c measures* some *MeasuredElement e* if and only if *c* defines a region for some *Metric* that corresponds to success for *e*.

Asserted Superproperties: analysis-backbone:topReifiedObjectProperty

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Criterion

Range: [0..*] MeasuredElement

Inverse: isMeasuredBy

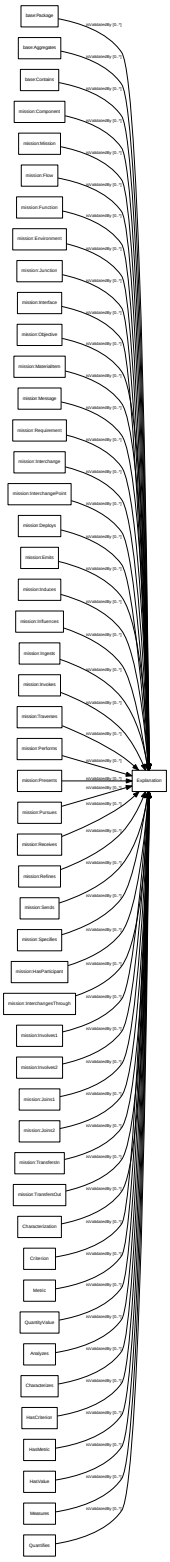

Figure 50: Property usage diagram for isValidatedBy.

Figure 51: Property usage diagram for limits.

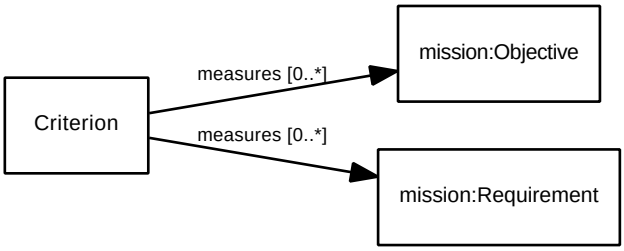

Figure 52: Property usage diagram for measures.

Derived: false

Reification Class: Measures

Reification Property Chain: hasMeasuresSource $^{-1}$ ∘ hasMeasuresTarget

The property usage diagram for measures is shown in Figure 52.

7.17 quantifies

A *Quantification q quantifies* some *SpecifiedElement e* if and only if *q* assigns a value to some *Metric* for *e*.

Asserted Superproperties: analysis-backbone:topReifiedObjectProperty

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Quantity

Range: [0..*] mission:SpecifiedElement

Inverse: isQuantifiedBy

Derived: false

Reification Class: Quantifies

Reification Property Chain: hasQuantifiesSource $^{-1}$ ∘ hasQuantifiesTarget

The property usage diagram for quantifies is shown in Figure 53.

7.18 validates

An *Explanation a validates* some *SpecifiedElement e* if and only if *a* provides a definitive, determinative explanation for some design aspect of *e*.

Asserted Superproperties: explains

Inferred Superproperties: analysis-backbone:topObjectProperty,
analysis-backbone:topReifiedObjectProperty, characterizes

Domain: Explanation

Range: [0..*] CharacterizedElement

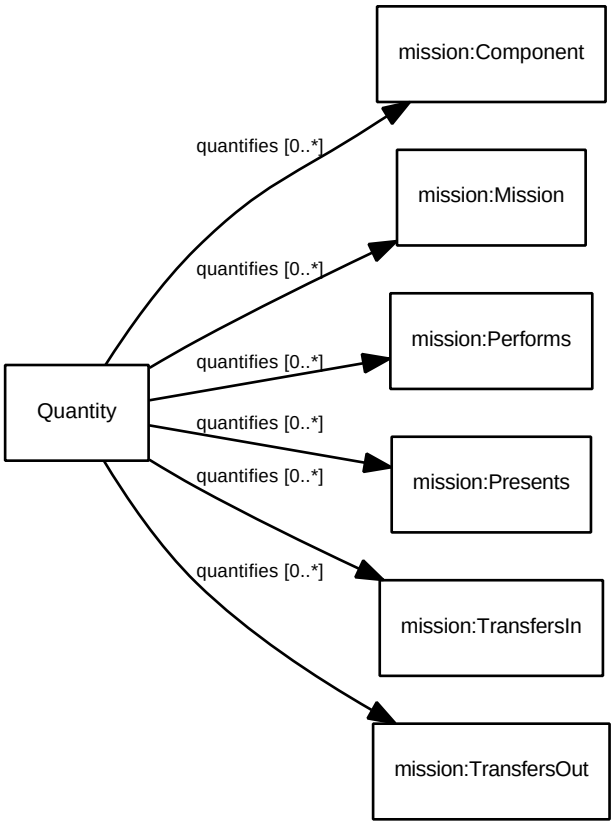

Figure 53: Property usage diagram for quantifies.

Inverse: isValidatedBy

Derived: false

Reification Class: Validates

Reification Property Chain: hasValidatesSource $^{-1}$ $\circ$ hasValidatesTarget

The property usage diagram for validates is shown in Figure 54.

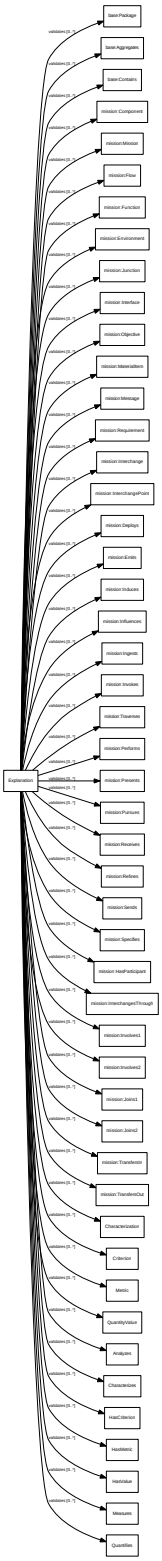

Figure 54: Property usage diagram for validates.

8 Object Property Reification Source/Target Object Property Definitions

8.1 hasAnalyzesSource

Asserted Superproperties: analysis-backbone:topReifiedObjectPropertySource

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Analyzes

Range: [0..1] Explanation

Derived: false

8.2 hasAnalyzesTarget

Asserted Superproperties: analysis-backbone:topReifiedObjectPropertyTarget

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Analyzes

Range: [0..1] AnalyzedElement

Derived: false

8.3 hasCharacterizesSource

Asserted Superproperties: analysis-backbone:topReifiedObjectPropertySource

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Characterizes

Range: [0..1] Characterization

Derived: false

8.4 hasCharacterizesTarget

Asserted Superproperties: analysis-backbone:topReifiedObjectPropertyTarget

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Characterizes

Range: [0..1] CharacterizedElement

Derived: false

8.5 hasExplainsSource

Asserted Superproperties: hasCharacterizesSource

Inferred Superproperties: analysis-backbone:topObjectProperty, analysis-backbone:topReifiedObjectPropertySource

Domain: Explains

Range: [0..1] Explanation

Derived: false

8.6 hasExplainsTarget

Asserted Superproperties: hasCharacterizesTarget

Inferred Superproperties: analysis-backbone:topObjectProperty, analysis-backbone:topReifiedObjectPropertyTarget

Domain: Explains

Range: [0..1] CharacterizedElement

Derived: false

8.7 hasHasCriterionSource

Asserted Superproperties: analysis-backbone:topReifiedObjectPropertySource

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: HasCriterion

Range: [0..1] Metric

Derived: false

8.8 hasHasCriterionTarget

Asserted Superproperties: analysis-backbone:topReifiedObjectPropertyTarget

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: HasCriterion

Range: [0..1] Criterion

Derived: false

8.9 hasHasMetricSource

Asserted Superproperties: analysis-backbone:topReifiedObjectPropertySource

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: HasMetric

Range: [0..1] Quantity

Derived: false

8.10 hasHasMetricTarget

Asserted Superproperties: analysis-backbone:topReifiedObjectPropertyTarget

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: HasMetric

Range: [0..1] Metric

Derived: false

8.11 hasHasValueSource

Asserted Superproperties: analysis-backbone:topReifiedObjectPropertySource

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: HasValue

Range: [0..1] Quantity

Derived: false

8.12 hasHasValueTarget

Asserted Superproperties: analysis-backbone:topReifiedObjectPropertyTarget

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: HasValue

Range: [0..1] QuantityValue

Derived: false

8.13 hasLimitsSource

Asserted Superproperties: hasCharacterizesSource

Inferred Superproperties: analysis-backbone:topObjectProperty, analysis-backbone:topReifiedObjectPropertySource

Domain: Limits

Range: [0..1] Assumption

Derived: false

8.14 hasLimitsTarget

Asserted Superproperties: hasCharacterizesTarget

Inferred Superproperties: analysis-backbone:topObjectProperty, analysis-backbone:topReifiedObjectPropertyTarget

Domain: Limits

Range: [0..1] CharacterizedElement

Derived: false

8.15 hasMeasuresSource

Asserted Superproperties: analysis-backbone:topReifiedObjectPropertySource

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Measures

Range: [0..1] Criterion

Derived: false

8.16 hasMeasuresTarget

Asserted Superproperties: analysis-backbone:topReifiedObjectPropertyTarget

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Measures

Range: [0..1] MeasuredElement

Derived: false

8.17 hasQuantifiesSource

Asserted Superproperties: analysis-backbone:topReifiedObjectPropertySource

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Quantifies

Range: [0..1] Quantity

Derived: false

8.18 hasQuantifiesTarget

Asserted Superproperties: analysis-backbone:topReifiedObjectPropertyTarget

Inferred Superproperties: analysis-backbone:topObjectProperty

Domain: Quantifies

Range: [0..1] mission:SpecifiedElement

Derived: false

8.19 hasValidatesSource

Asserted Superproperties: hasExplainsSource

Inferred Superproperties: analysis-backbone:topObjectProperty, analysis-backbone:topReifiedObjectPropertySource, hasCharacterizesSource

Domain: Validates

Range: [0..1] Explanation

Derived: false

8.20 hasValidatesTarget

Asserted Superproperties: hasExplainsTarget

Inferred Superproperties: analysis-backbone:topObjectProperty, analysis-backbone:topReifiedObjectPropertyTarget, hasCharacterizesTarget

Domain: Validates

Range: [0..1] CharacterizedElement

Derived: false

A UML/SysML Embedding

Table 1: Class UML/SysML Embedding

	Metrology-metamodel:DataType.ValueType.MasurementScale	SysML-metamodel:Component.Block	SysML-metamodel:DataType.ValueType	UML-metamodel:Component	UML-metamodel:Constraint	UML-metamodel:DataType
Analysis		•		•		
AnalyzedElement						
Assumption		•		•		
Characterization		•		•		
CharacterizedElement						
CostEstimate		•		•		
Criterion					•	
DrivingRequirementsAnalysis		•		•		
DrivingRequirementsExplanation		•		•		
Explanation		•		•		
Fact		•		•		
KeyRequirementsAnalysis		•		•		
KeyRequirementsExplanation		•		•		
MeasuredElement						
Metric	•		•			•
Quantity		•		•		
QuantityValue						
TradeStudy		•		•		

Table 2: Class OWL2-MOF2 Embedding

	owl2-mof2:BinaryAssociationEndType	owl2-mof2:BinaryDependencyEndType	owl2-mof2:ObjectPropertyDependentRangeType
Analysis	•	•	
AnalyzedElement			•
Assumption		•	
Characterization		•	
CharacterizedElement			•
CostEstimate	•	•	
Criterion		•	
DrivingRequirementsAnalysis	•	•	
DrivingRequirementsExplanation	•	•	
Explanation	•	•	
Fact		•	
KeyRequirementsAnalysis	•	•	
KeyRequirementsExplanation	•	•	
MeasuredElement			•
Metric		•	
Quantity		•	
QuantityValue		•	
TradeStudy	•	•	

Table 3: Object Property Reification Class OWL2-MOF2 Embedding

	owl2-mof2-backbone:ReifiedObjectProperty	owl2-mof2:BinaryDependency	owl2-mof2:BinaryDependencyEndType
Analyzes	•		•
Characterizes	•		•
Explains		•	•
HasCriterion	•		•
HasMetric	•		•
HasValue	•		•
Limits		•	•
Measures	•		•
Quantifies	•		•
Validates		•	•

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