

Annex A: Mappings from existing industrial notations for assurance cases

(informative)

This appendix supplies a Metamodel and Profile mapping of the two most popular Assurance Case Notations: namely GSN (Goal Structuring Notation) and CAE (Claims, Arguments, and Evidence).

The Profiles for GSN and CAE have green colored elements which define elements that are concrete (instantiable) and provide a layer on top of SACM to do GSN and CAE.

pages 51-57

A.1 Goal Structuring Notation (GSN)

~~Details of the of the mapping between GSN elements and SACM, and the available relevant tool support, are maintained at the following URL:~~

~~<http://www.goalstructuringnotation.info/gsn-metamodel>~~

A.2 Claims, Arguments, Evidence (CAE)

pages 58-62

~~Details of the mapping between CAE elements and SACM, and the available relevant tool support, are maintained at the following URL:~~

~~<https://www.adclard.com/asce/choosing-asce/standardisation.html>~~

A.1.1 GSNConcept (abstract)

GSNConcept is the most abstract metaclass for all GSN concepts including GSNRelationship and GSNElement.

Superclass

Argument::ArgumentConcept

Attributes

isUninstantiated : Boolean [0..1] = false {redefines isSACMAbstract} - SACM's term is Abstract for uninstantiated, one can define a concrete element in SACM

A.1.2 GSNAsset (abstract)

GSNElement is the most abstract metaclass for all GSN non-relationships.

Superclass

GSNConcept

A.1.3 GSNRelationship (abstract)

GSNRelationship is the most abstract metaclass for all GSN relationships.

Superclass

GSNAsset, Argument::AssertedRelationship

Attributes

isChallenge : Boolean [0..1] = false {redefines isCounter} - This is a counter argument called a Challenge in GSN

Semantics

Note that each of the relationships in SACM has targets and sources reversed in their metamodels and notations. All Relationships are binary in GSN.

A.1.4 GoalStrategy (abstract)

GoalStrategy is the abstract metaclass for GSNGoal and GSNStrategy.

Superclass

GSNElement

Attributes

isUndeveloped : Boolean [1] = false {redefines needsDevelopment} - GSN term is isUndeveloped, SACM term is needsDevelopment

A.1.5 GSNGoal

GSNGoal represents the Goal in GSN.

Superclass

GoalStrategy

A.1.6 GSNStrategy

GSNStrategy represents the Strategy in GSN.

Superclass

GoalStrategy

Attributes

value : ExpressionLangString [0..1] {redefines value} - Content of Strategy statement

Semantics

The name can be the content or one can have a name and then the value contains the content

A.1.7 GoalContext (abstract)

GoalContext is an abstract class for GSNJustification and GSNAssumption.

Superclass

Argument::Claim, GSNElement

Semantics

The name can be the content or one can have a name and then the value contains the content

A.1.8 GSNJustification

GSNJustification is a Justification in GSN.

Superclass

GoalContext

Attributes

assertionDeclaration : AssertedDeclarationKind [0..1] = axiomatic {redefines assertionDeclaration}

A.1.9 GSNAssumption

GSNAssumption is an Assumption in GSN.

Superclass

GoalContext

Attributes

assertionDeclaration : AssertedDeclarationKind [0..1] = assumed {redefines assertionDeclaration}

A.1.10 GSNSolution

GSNSolution is a Solution in GSN.

Superclass

GSNAsset, Artifact::Artifact

A.1.11 GSNContext

GSNContext is a Context in GSN.

Superclass

GSNAsset, Artifact::Artifact

A.1.12 GSNChoice

GSNChoice is the one element needed to support all of the GSN Extensions for Structural Abstract (options, multiple instantiation, and choice).

Superclass

GSNAsset, NonNormative::Join::Join

A.1.13 GSNInContextOf_Context

GSNInContextOf_Context is the GSN InContextOf relationship that is supported by AssertedContext relationship in SACM.

Superclass

GSNRelationship, Argument::AssertedContext

AssociationEnds

context : GSNContext [1] {redefines context} - the context part (source in SACM, target in GSN) of this relationship
goalStrategy : GoalStrategy [1] {redefines contextable} - the contextable part (target in SACM, source in GSN) of this relationship

A.1.14 GSNInContextOf_Inference

GSNInContextOf_Inference is the GSN InContextOf relationship that is supported by AssertedInference relationship in SACM.

Superclasses

GSNRelationship, Argument::AssertedInference

AssociationEnds

source : GoalContext [1] {redefines source} - the inferrer of this relationship
goalStrategy : GoalStrategy [1] {redefines target} - the inferred of this relationship

A.1.15 GSNSupportedBy_GoalStrategy

GSNSupportedBy_GoalStrategy is the GSN SupportedBy relationship that is supported by AssertedInference relationship in SACM.

Superclass

GSNRelationship, Argument::AssertedInference

AssociationEnds

source : GoalStrategy [1] {redefines source} - the supporting element of the relationship
target : GoalStrategy [1] {redefines target} - the supported element of the relationship

A.1.16 GSNSupportedBy_Solution

GSNSupportedBy_Solution is the GSN SupportedBy relationship that is supported by AssertedEvidence relationship in SACM.

Superclass

GSNRelationship, Argument::AssertedEvidence

AssociationEnds

solution : GSNSolution [1] {redefines evidence} - the supporting element of the relationship
goal : GSNGoal [1] {redefines target} - the supported element of the relationship

A.2 GSN Package

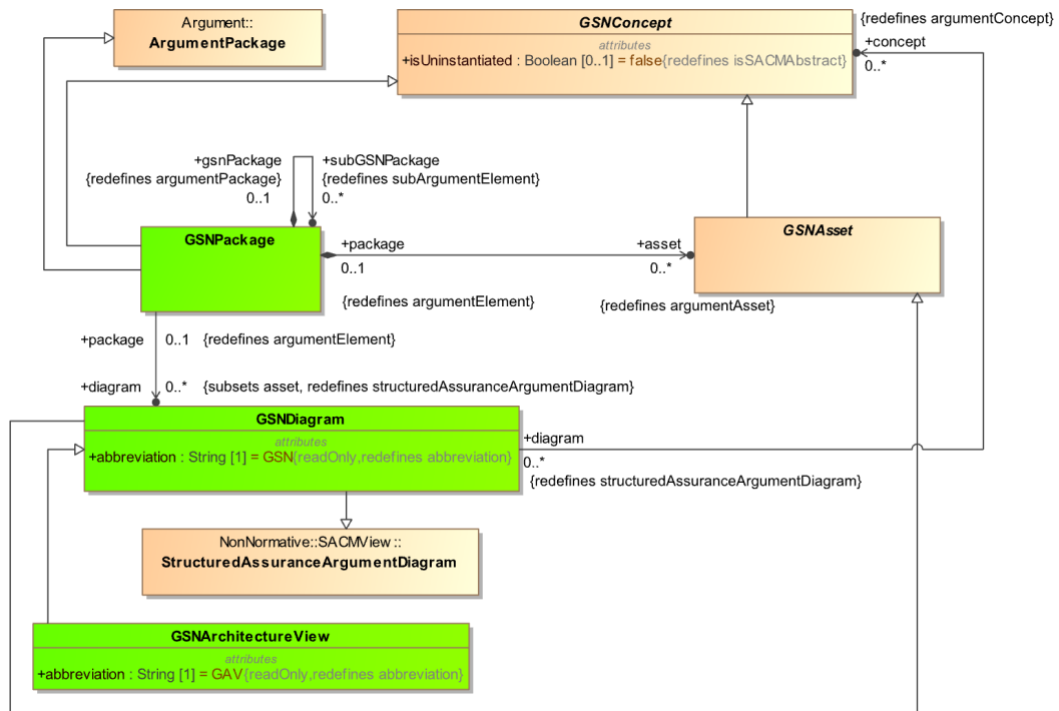


Figure A.2 – GSN Package Diagram

A.2.1 GSNPackage

GSNPackage is a Package that may contain any GSN Assets as well as BaseElements, and can contain another GSNPackage.

Superclass

GSNConcept, Argument::ArgumentPackage

AssociationEnds

asset : GSNAsset [0..*] {redefines argumentAsset} - GSNAsset contained in this package

diagram : GSNDiagram [0..*] {subsets asset, redefines structuredAssuranceArgumentDiagram} - GSNDiagrams contained in this package

subGSNPackage : GSNPackage [0..*] {redefines subArgumentElement}

A.2.2 GSNDiagram

GSNDiagram is a Diagram that can have any GSN concept as well as BaseElements.

Superclass

GSNAsset, NonNormative::SACMView::StructuredAssuranceArgumentDiagram

Attributes

abbreviation : String [1] = GSN {readOnly, refines abbreviation}

AssociationEnds

concept : GSNConcept [0..*] {redefines argumentConcept} - concepts that are shown on the GSNDiagram.

A.2.3 GSNArchitectureView

GSNArchitectureView is a GSN Diagram that has high level connections among GSN Modules.

Superclass

GSNDiagram

Attributes

abbreviation : String [1] = GAV {readOnly, refines abbreviation}

A.2.4 Away Elements

There are many elements that are prefaced by "Away" in GSN. "Away" is modeled in SACM as cited Elements in SACM. In SACM, an "Away" element is created in the model and they can cite either a local (in the same model) element using cited AssociationEnd or if it is not local, then citedIRI can be used to provide an IRI for a non-local reference.

A.2.5 Modular Packaging

There are many concepts that are in GSN to support modularization and contracts. These can be modeled in SACM with Packages, InterfacePackages, and BindingPackages.

A.3 GSN Profiles

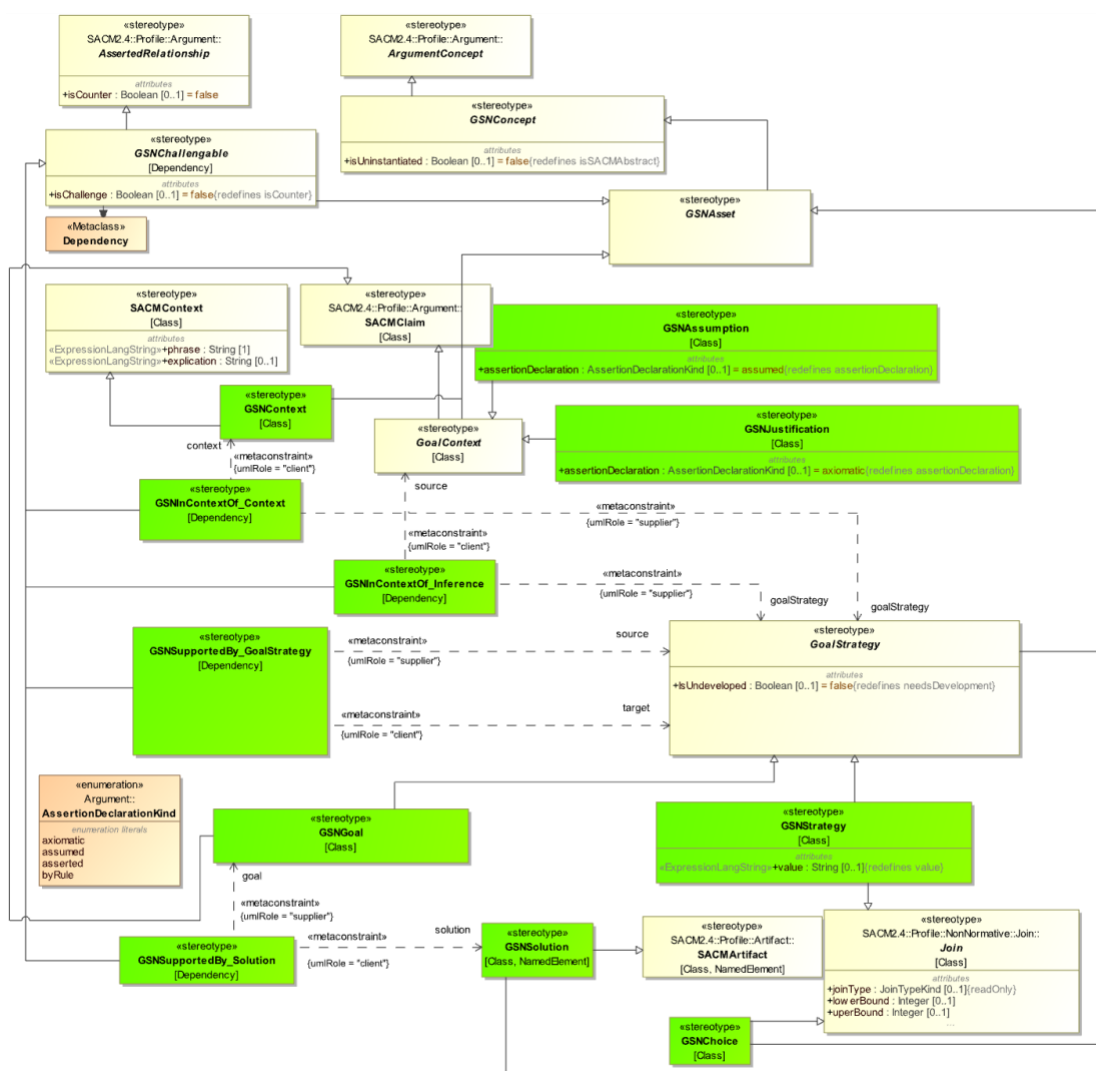


Figure A.3.1 – GSN Profile Diagram

Attributes

joinType : JoinTypeKind [1] = combine {readOnly,redefines joinType}

Constraints

DeriveReference

Reference is set to be the CAEClaims that are subclaims of this CAEArgument.

inv: reference = supports.claim.isSubClaimOf->select(a|a.oclKindOf(CAEClaim))

A.4.3 CAEEvidence

Evidence is an artefact that establishes facts that can be trusted and lead directly to a claim. In projects there can be many sources of information, but what makes this evidence is the support or rebuttal it gives to a claim.

Superclass

Artifact::Artifact, CAEAsset

A.4.4 CAEIsSubclaimOf

CAEIsSubclaimOf connects a source CAEClaim to either another CAEClaim (indicating that the source claim is a subclaim of the target) or to a CAEArgument (indicates that the source claim is a subclaim of the CAESupports target connected to the CAEArgument).

Superclass

Argument::AssertedInference, CAEAsset

AssociationEnds

subClaim : CAEClaim [1] {redefines source} - subclaim of this relationship

supportable : Supportable [1] {redefines target} - CAEClaim or CAEArgument target of this relationship

A.4.5 CAESupports

CAESupports connects CAEArgument source to a CAEClaim target indicating that the CAEArgument (and everything connected to it) support the CAEClaim.

Superclass

Argument::AssertedInference, CAEAsset

AssociationEnds

claim : CAEClaim [1] {redefines target} - target CAEClaim supported by the CAEArgument

argument : CAEArgument [1] {redefines source} - CAEArgument that supports the CAEClaim

supportable : Supportable [1] {redefines target} - target CAEClaim (or other CAEArgument) supported by the CAEArgument

argument : CAEArgument [1] {redefines source} - CAEArgument that supports the CAEClaim

A.4.6 CAEIsEvidenceFor

CAEIsEvidenceFor ties CAEEvidence to what it provides evidence for (CAEClaims or CAEArgument).

Superclass

Argument::AssertedEvidence, CAEAsset

AssociationEnds

supportable : Supportable [1] {redefines target} - target CAEClaim or CAEArgument for this relationship

evidence : CAEEvidence [1] {redefines evidence} - source evidence for this relationship

A.4.7 CAEAsset (abstract)

CAEAsset is an abstract class for all of the CAE elements.

Superclass

Argument::ArgumentAsset

