CAMSS - Solutions

Core Assessment Vocabulary

(CAV) v1.0.0

Specification

Directorate-General for Informatics

ISA²

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INTRODUCTION

1. INTRODUCTION

The Core Assessment Vocabulary represents, expresses, and defines what an “Assessment” of “Assets” is and how to perform the assessment based on “Criteria”. It is a domain-agnostic vocabulary, meaning that it can be used to assess any asset.

1.1. Context

The Common Assessment Method for Standards and Specifications (CAMSS) is a development of the ISA2 Programme Action “achieving a modern ICT standardisation policy[1]” aimed at “assessing and selecting standards and specifications for an eGovernment project, as a reference when building an architecture, and as an enabler for justifying the choice of standards and specifications in terms of interoperability needs and requirements. It is fully aligned with the European Standardisation Regulation 1025/2012”[2].

The Core Assessment Vocabulary represents, expresses, and defines what an “Assessment” of “Assets” is and how to perform the assessment based on “Criteria”. It is a domain-agnostic vocabulary, meaning that it can be used to assess any asset. Hence, the CAV is at the very core of the CAMSS Ontology. Or, in other words, the CAMSS Ontology reuses and extends the CAV.

1.2. Objective and Scope of the document

The objective of this document is to provide an interoperability oriented solution for the expression and exchange of CAMSS Assessments.

The scope of this document encompasses the following.

- Conceptual data models used for the CAMSS Vocabulary.
- Constraints and rules specific to the CAMSS domain.
- A reference implementation of the Ontology as an OWL Turtle syntax.

In addition, this vocabulary has been publicly analysed to create a stable version of the vocabulary.

The CAV has been reviewed by a group of experts contributing to the new release of the vocabulary.

[1] Achieving a modern standard ICT standardisation policy; CAMSS Action 2016.27: https://ec.europa.eu/isa2/actions/achieving-modern-ict-standardisation-policy_en.
[2] See CAMSS Joinup Community for additional details: https://joinup.ec.europa.eu/collection/common-assessment-method-standards-and-specifications-camss/about.

1.3. Methodological approach

The approach followed for the development of the CAV adheres to three fundamental principles.

1. Reuse and share when possible (i.e. do not reinvent the wheel).
2. Do not betray the knowledge and experience of the domain, nor the terminology and interpretation of the concepts (i.e. do not invent new terms when they already exist in the communities of practice or generic domains).
3. Isolate technical and business constraints and rules as much as possible (i.e. externalise them in separate artefacts, for example, graph and data shapes for the control and validation of the data). This has a great impact on the quality and cost of the implementation, as well as the maintenance of the ontology.
4. One way of facilitating the semantic interoperability consists of reusing existing generic ontologies and vocabularies. This way, the semantics of common concepts and properties are agreed upon without the need for re-discussion. When concepts or properties have not been identified nor defined for the purposes pursued, they must be proposed as either extensions, or from scratch.

The methodological approach followed for the development of the CAV reuses the following ontologies and vocabularies.

- Friend of a Friend (FOAF)
- Core Person Vocabulary (CPV), only Natural Persons
- The Organization Ontology
- Core Criterion and Core Evidence Vocabulary (CCCEV)

The rationale for defining this vocabulary goes as follows.

1. No generic ontologies or vocabularies have been found defining what an Assessment is that fulfils the purposes of CAMSS, partially or totally (e.g. some initiatives define methodologies for assessment, but not ontologies or vocabularies).
2. Existing concepts in other ontologies did not cover all the information requirements needed in CAV and had to be reused or specialised by new classes.
3. Concepts and properties existing in other ontologies have different semantics to those needed in CAV.
4. Concepts required in CAV have not been identified in any other existing ontologies and therefore needed to be defined.
5. Given this is “Core” vocabulary, a key goal is to make it as flexible as possible. This means that predicates are set with optional and multiple cardinality (0..n) unless there is a strong reason for further restriction.

1.4. Structure of this document

This document consists of the following sections.

- Section 2 describes the related solutions to the Core Assessment Vocabulary (CAV).
- Section 3 explains the CAV model and identifies the classes and properties defined for the vocabulary.
- Section 4 contains the Conformance Statement for this vocabulary.
- Section 5 describes specific accessibility and multilingualism aspects.
- Section 6 lists the different acronyms used in the whole document.
- Section 7 contains related references.

2

RELATED SOLUTIONS

2. RELATED SOLUTIONS

This section lists the different CAV related solutions. Note that some are still under development.

2.1. CAMSS Ontology

The Common Assessment Method for Standards and Specifications (CAMSS) is an action of the ISA2 Programme[1].

The CAMSS Ontology defines the CAMSS terminology and the axioms that define the CAMSS concepts and logic rules. The interpretation of the CAMSS concepts illustrates the idea of the method defined in CAMSS to assess standards and specifications.

2.2. EIRA Library of Interoperability Specifications (ELIS)

The ELIS is a family of interoperability specifications that define the interoperability aspects of the Architecture Building Blocks (ABBs) contained in EIRA©. ELIS aims to support architects for the modelling of solutions based on EIRA©. The current version of ELIS will need to be slightly revamped to accommodate the concepts defined in the CSSV and to support the requirement of all stakeholders, e.g. EIRA-based solution developer needs, NATO profiles, and others.

2.3. Core Standards and Specifications Vocabulary (CSSV)

The CSSV is the vocabulary used for the information exchange related to standards and specifications amongst software solutions, as well as being the key element for the development of the new release of the EIRA Library of Interoperability Specifications (ELIS). In order to improve the quality of this vocabulary, it was publicly reviewed through a public consultation[2] where some stakeholders contributed to the improvement of the CSSV.

2.4. Data Catalogue Vocabulary (DCAT)3

The Data Catalogue Vocabulary (DCAT) is used to describe public sector datasets in Europe. This vocabulary has been developed by the W3C. DCAT can be used to describe any type of asset (treated as a dataset, especially when considering that metadata is also data).

The figure below shows the DCAT conceptual data model with its classes and properties:

[1] Achieving a modern standard ICT standardisation policy; CAMSS Action 2016.27: https://ec.europa.eu/isa2/actions/achieving-modern-ict-standardisation-policy_en.
[2] CSSV Public Consultation: https://github.com/SEMICeu/CAMSS_CSSV
[3] DCAT: https://www.w3.org/TR/vocab-dcat-2/

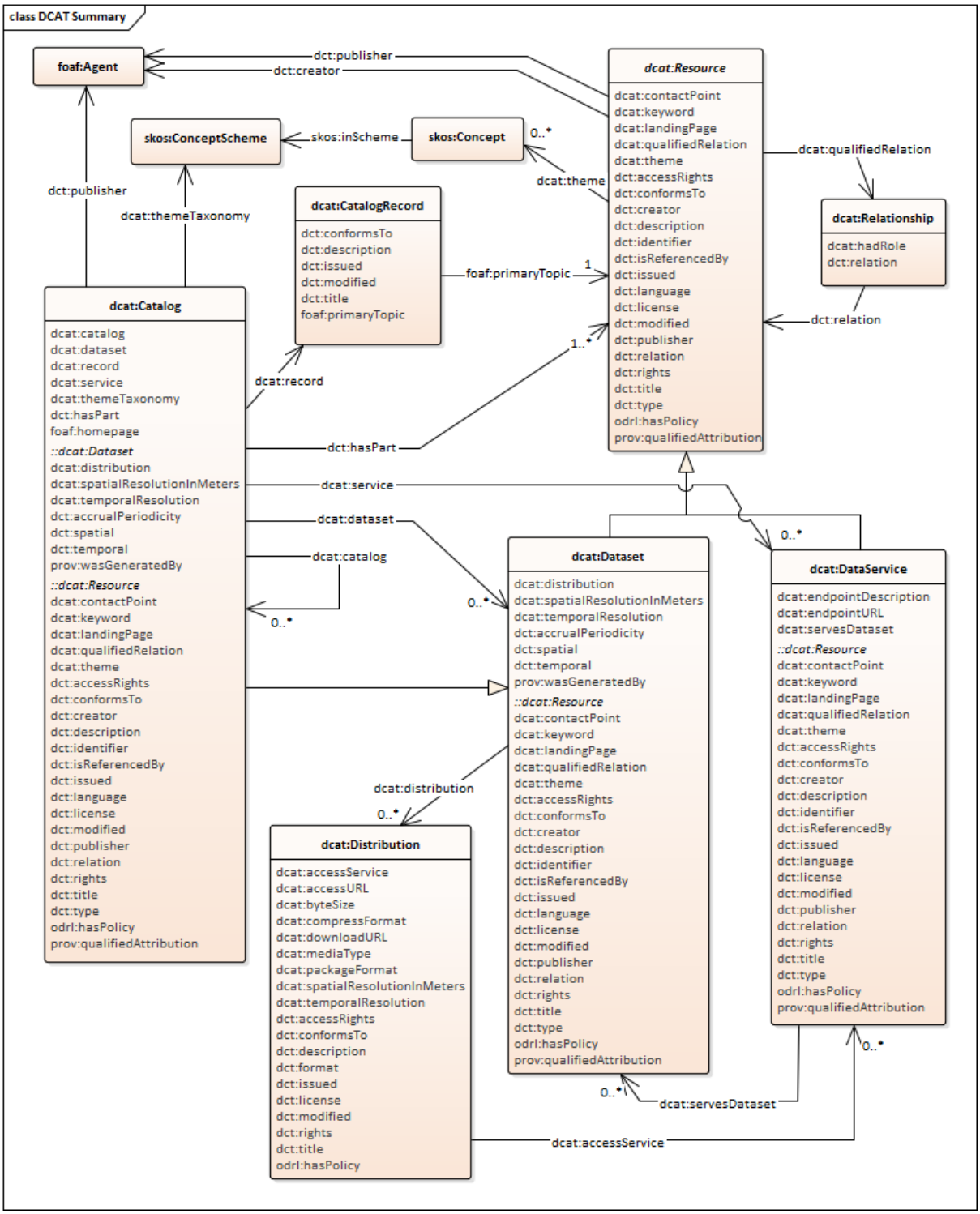

Figure 1: DCAT classes and properties

In the CAV model, the class Assessment can be considered the "root" class and is a "Resource" as defined in DCAT.

3

CORE ASSESSMENT VOCABULARY (CAV)

3. CORE ASSESSMENT VOCABULARY (CAV)

The Core Assessment Vocabulary represents and defines what an "Assessment" of an "Asset" is and how to perform the Assessment using scenario-based "Criteria". It is a domain-agnostic vocabulary, meaning that it can be used to assess any type of asset. For this reason, the CAV is at the core of the CAMSS Ontology. In other words, the CAMSS Ontology reuses 100% of the CAV.

The CAV is depicted in *Figure 2: The Core Assessment Vocabulary*. The figure shows the classes and properties used or defined in the vocabulary.

3.1. Data Model for the CAV

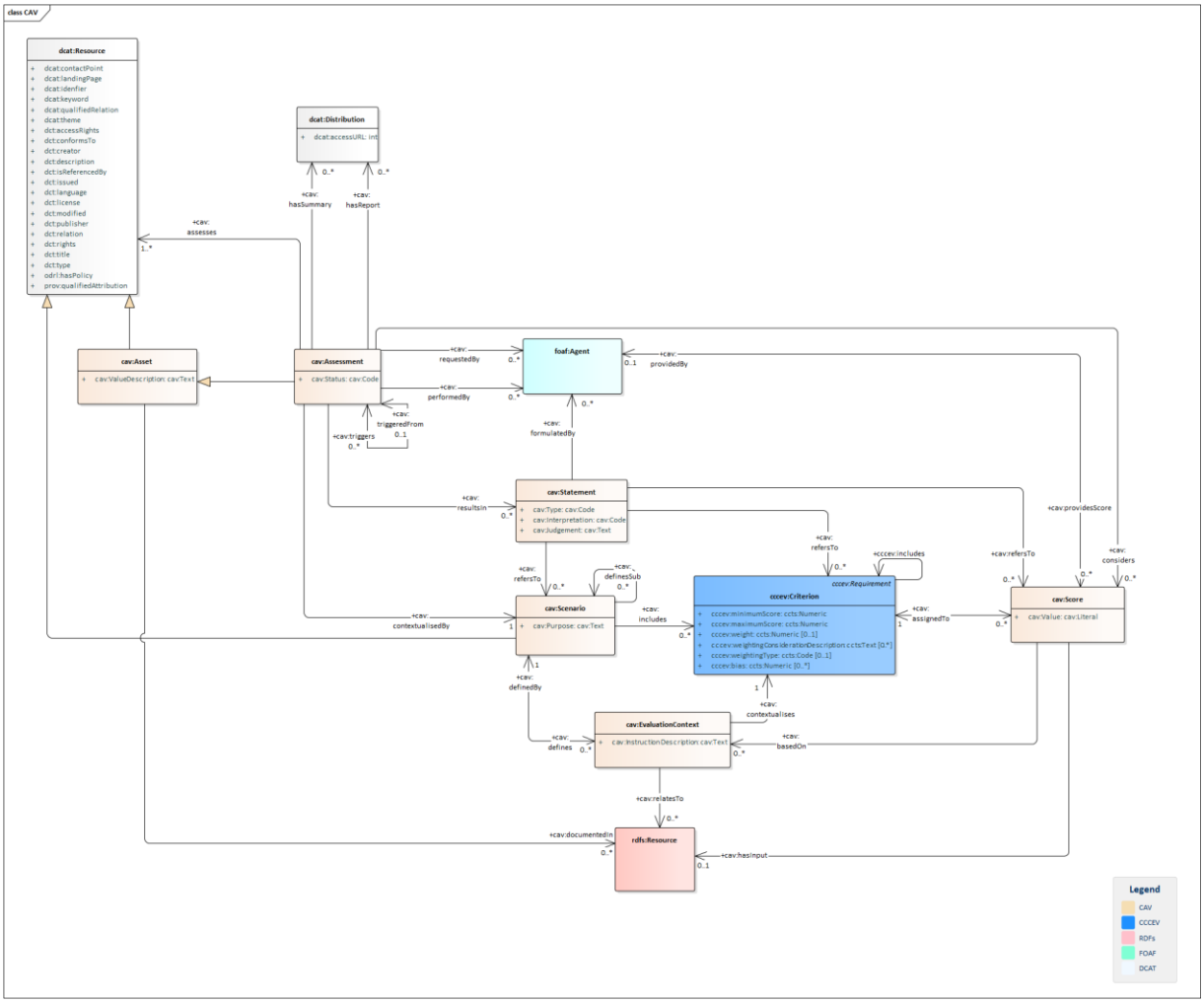

Figure 2: The Core Assessment Vocabulary

3.1.1. Interpretation

A CAV Assessment is a specialisation of an Asset, which is itself a specialisation of the *dcat:Resource*. As any asset, it can be identified and described, and holds individual distributions, publishers, etc. Additionally to these properties the CAV class Assessment needs

to specify who the requestors and evaluators of the Assessments are. These can be anything represented by a FOAF[1] Agent, such as a natural person or an organisation. Notice that the objects assessed are also Resources, meaning that the CAV may be used to assess anything that is considered a valuable resource. Example of such resources could be products, services, or, in the case of CAMSS, standards and specifications.

An Assessment results in **Statements** that capture the produced knowledge and provide value judgments. These can refer to the Assessment as a whole or to a specific section, even being as detailed as to refer to individual evaluated criteria.

A **Criterion** is typically derived from a Reference Framework, which can be understood as a series of "agreed and descriptive reference requirements" coming from one or more sources (e.g. legislation, specifications and standards, ICT policy-related works like the EIF within the EIS, etc.).

Throughout the Assessment each Criterion is assigned a **Score** (in principle by human users, but potentially also by systems) as the value output that is considered when formulating the resulting Statement(s). The **Score** can take into consideration any resource input (e.g. when the score is calculated based on different input parameters, algorithms, and formulae).

Any Assessment is performed in the context of a **Scenario**. The Scenario defines the purpose of the Assessment and the set of Criteria to be scored by one or more Agents. Scenarios can be defined with a flexible structure including nested sections (represented as sub-Scenarios) that serve to provide additional context, thematically group Criteria, and to be referred by the Assessment's resulting Statement(s). Criteria can themselves be simple or complex and originate from various reference sources. The overall context for the evaluation of the Criteria is provided by the Scenario, however in the certain case that Criteria require additional contextualisation or evaluation instructions, these can be exceptionally provided by means of **EvaluationContext** which is related to a resource.

Finally, an Assessment might trigger another related Assessment of different content with its own Scenario and Criteria. Note that it is also possible to model work in progress, expressed by having the Assessment defining optional links to Scores, Statements, reports, and summaries.

3.2. Class: cav:Asset

OWL Class	cav:Asset
Label	Asset
Definition	A resource, probably resulting from a work, with purpose and value. Additional information: This definition considers "resource" as a res "available for use" (see the definition of res in the IFLA FRBR/LRM specifications).
Subclass of	dcat:Dataset

[1] FOAF Vocabulary Specification http://xmlns.com/foaf/spec/

3.2.1. Property: cav:documentedIn

OWL Property	cav:documentedIn
OWL type	owl:ObjectProperty
Label	Documented in
Definition	A link to any information supporting the value of the asset and any other related relevant details. Additional information: A good choice to implement instances of resources supporting the value of the asset can be the use of the cccev:Evidence class from the Core Criterion and Core Evidence Vocabulary.
Domain	cav:Asset
Range	Rdfs:Resource
Cardinality	0..n

3.3. Class: cav:Assessment

OWL Class	cav:Assessment
Label	Assessment
Definition	The intellectual work to evaluate an asset against the criteria of a given scenario.
Subclass of	dcat:Dataset

3.3.1. Property: cav:hasStatus

OWL Property	cav:hasStatus
OWL type	owl:DataProperty
Label	hasStatus
Definition	The current situation of the assessment. Additional Information: A list with different status codes is to be provided by context/domain-specific application profiles to identify the statuses that make sense for that context or domain.
Domain	*cav:Assessment*
Property Type	skos:Concept

3.3.2. Property: cav:hasReport

OWL Property	cav:hasReport
OWL type	owl:ObjectProperty
Label	hasReport
Definition	A manifestation[1] of all the information related to and resulting from an assessment. Additional Information: The included information usually contains everything about the assessment, e.g. the purpose of the assessment, the criteria defined in the scenario, the responses and the scoring provided by the evaluator; The report may be manifested in one or multiple ways (distributed as different formats), e.g. as OWL triples, as an HTML, as a narrative text (pdf, doc, ods, etc.).
Domain	*cav:Assessment*
Range	*dcat:Distribution*
Cardinality	0..n

3.3.3. Property: cav:hasSummary

OWL Property	cav:hasSummary
OWL type	owl:ObjectProperty
Label	hasSummary
Definition	An abbreviated manifestation of the performed assessment.
Domain	*cav:Assessment*
Range	*dcat:Distribution*
Cardinality	0..n

3.3.4. Property: cav:assesses

OWL Property	cav:assesses

[1] The term “manifestation” is used herein as defined in the IFLA Library Reference Model (IFLA LRM): https://www.ifla.org/publications/node/11412

OWL type	owl:ObjectProperty
Label	assesses
Definition	The reference to the asset(s) that are the object of the assessment.
Domain	cav:Assessment
Range	dcat:Resource
Cardinality	1..n

3.3.5. Property: cav:performedBy

OWL Property	**cav:performedBy**
OWL type	owl:ObjectProperty
Label	performedBy
Definition	The agent(s) that carry out the assessment.
Domain	*cav:Assessment*
Range	*foaf:Agent*
Cardinality	0..n

3.3.6. Property: cav:requestedBy

OWL Property	**cav:requestedBy**
OWL type	owl:ObjectProperty
Label	requestedBy
Definition	The agent(s) requesting the assessment of an asset.
Domain	cav:Assessment
Range	foaf:Agent
Cardinality	0..n

3.3.7. Property: cav:contextualisedBy

OWL Property	cav:contextualisedBy
OWL typ	owl:ObjectProperty
Label	contextualisedBy
Definition	The assignment of the scenario for the current assessment providing its context, purpose, and criteria.
Domain	cav:Assessment
Range	cav:Scenario
Cardinality	1

3.3.8. Property: cav:resultsIn

OWL Property	cav:resultsIn
OWL type	owl:ObjectProperty
Label	resultsIn
Definition	The creation of the statement(s) resulting from the assessment. Additional Information: The cardinality allows for optional associations to express an Assessment that is typically a work in progress.
Domain	cav:Assessment
Range	cav:Statement
Cardinality	0..n

3.3.9. Property: cav:considers

OWL Property	cav:considers
OWL type	owl:ObjectProperty
Label	considers
Definition	The evaluation of a criterion score in the context of the current assessment as input to issue one or more statements.
Domain	*cav:Assessment*

Range	*cav:Score*
Cardinality	0..n

3.3.10. Property: cav:triggeredFrom

OWL Property	**cav:triggeredFrom**
OWL type	owl:ObjectProperty
Label	triggeredFrom
Definition	The event causing the current assessment as the result of another related assessment.
Domain	*cav:Assessment*
Range	*cav:Assessment*
Cardinality	0..1

3.3.11. Property: cav:triggers

OWL Property	**cav:triggers**
OWL type	owl:ObjectProperty
Label	triggers
Definition	The event causing further related assessment(s) due to the current one.
Domain	*cav:Assessment*
Range	*cav:Assessment*
Examples	0..n

3.4. Class: cav:Scenario

OWL Class	**cav:Scenario**
Label	Scenario

Definition	The context of the assessment establishing its purpose, the organisation of criteria being evaluated, and its reference Framework(s). Additional Information: A scenario can be used to include criteria sourced from various reference frameworks and organised in a flexible structure including nested parts (expressed as sub-scenarios each with a further specified context). A scenario with no included criteria is considered as high-level or informal.
Subclass of	dcat:Dataset

3.4.1. Property: cav:includes

OWL Property	**cav:includes**
OWL type	owl:ObjectProperty
Label	includes
Definition	The aggregation of criteria to one scenario or parts of it. Additional Information: This aggregation may be contextualised at different granularity levels, scenario, and parts of the scenario or specific criteria. The cardinality is 0..* to allow assessments that are very high-level, informal or subjective without criteria and scoring.
Domain	*cav:Scenario*
Range	*cccev:Criterion*
Cardinality	0..n

3.4.2. Property: cav:definesSub

OWL Property	**cav:definesSub**
OWL typ	owl:ObjectProperty
Label	definesSub
Definition	The definition of nested scenarios grouped based on different sub-purposes, commonalities or particularities of the sub-sets of criteria.

Domain	*cav:Scenario*
Range	*cav:Scenario*
Cardinality	0..n

3.4.3. Property: cav:defines

OWL Property	**cav:defines**
OWL type	owl:ObjectProperty
Label	defines
Definition	The link to the evaluation contexts for specific criteria provided by the given scenario.
Domain	*cav:Scenario*
Range	*cav:EvaluationContext*
Cardinality	0..n

3.4.4. Property: cav:Purpose

OWL Property	**cav:Purpose**
OWL type	owl:DataProperty
Label	Purpose
Definition	The reason for which the assessment is done.
Property Type	xsd:String

3.5. Class: cav:Statement

OWL Class	**cav:Statement**
Label	Statement
Definition	A value judgement, resulting from the assessment, pertinent to its entirety or to one or more of its specific parts.

3.5.1. Property: cav:Judgement

OWL Property	cav:Judgement
OWL type	owl:DataProperty
Label	Judgement
Definition	The text expressing the statement's resulting value judgement.
Property Type	xsd:String

3.5.2. Property: cav:Type

OWL Property	cav:Type
OWL type	owl:DataProperty
Label	Type
Definition	The categorisation of the statement. Additional Information: This code needs a context/domain-specific application profile codelist. An example of what this code can be used for is when there is need of signalling whether the statement is totally subjective, a judgement based on comparative actions performed upon several score inputs, a sentence picked-up from a database and as a result of an automated calculation, etc.
Property Type	skos:Concept

3.5.3. Property: cav:Interpretation

OWL Property	cav:Interpretation
OWL type	owl:DataProperty
Label	Interpretation
Definition	The favorability perception of the statement (e.g. positive, negative or neutral).
Property Type	skos:Concept

3.5.4. Property: cav:formulatedBy

OWL Property	cav:formulatedBy
OWL type	owl:ObjectProperty
Label	formulatedBy
Definition	The reference to the agent(s) responsible for issuing the current statement.
Domain	*cav:Statement*
Range	*foaf:Agent*
Cardinality	0..n

3.5.5. Property: cav:refersTo

OWL Property	cav:refersTo
OWL type	owl:ObjectProperty
Label	refersTo
Definition	The provision of a value judgement on one or more elements of the assessment.
Domain	*cav:Statement*
Range	*cav:Scenario*
Cardinality	0..n

3.5.6. Property: cav:refersTo

OWL Property	cav:refersTo
OWL type	owl:ObjectProperty
Label	refersTo
Definition	The provision of a value judgement on one or more elements of the assessment.
Domain	*cav:Statement*
Range	*cccev:Criterion*
Cardinality	0..n

3.5.7. Property: cav:refersTo

OWL Property	cav:refersTo
OWL type	owl:ObjectProperty
Label	refersTo
Definition	The provision of a value judgement on one or more elements of the assessment.
Domain	*cav:Statement*
Range	*cav:Score*
Cardinality	0..n

3.6. Class: cav:EvaluationContext

OWL Class	cav:EvaluationContext
Label	Evaluation Context
Definition	The context for a criterion providing guidance on its evaluation considering the given scenario. This is used exceptionally to extend the context offered by the scenario when it is not sufficient for the evaluation of a given criterion. A criterion's evaluation produces an objective output that will then be considered to form value judgments expressed as the assessment's statements.

3.6.1. Property: cav:InstructionDescription

OWL Property	cav:InstructionDescription
OWL type	owl:DataProperty
Label	Instruction Description
Definition	Guideline or description that needs to followed during the evaluation of one particular criterion.
Property Type	xsd:String

3.6.2. Property: cav:definedBy

OWL Property	cav:definedBy

OWL type	owl:ObjectProperty
Label	definedBy
Definition	The link to the scenario that provides the evaluation context for one or more criteria.
Domain	*cav:EvaluationContext*
Range	*cav:Scenario*
Cardinality	1

3.6.3. Property: cav:contextualises

OWL Property	**cav:contextualises**
OWL type	owl:ObjectProperty
Label	contextualises
Definition	The provision of context for the evaluation of the criterion.
Domain	*cav:EvaluationContext*
Range	*cccev:Criterion*
Cardinality	1

3.6.4. Property: cav:relatesTo

OWL Property	**cav:relatesTo**
OWL type	owl:ObjectProperty
Label	relates To
Definition	The context for a criterion related to a resource.
Domain	*cav:EvaluationContext*
Range	*rdfs:Resource*

3.7. Class: cav:Score

OWL Class	**cav:Score**

Label	Score
Definition	The value output assigned to the criterion as part of the assessment.

3.7.1. Property: cav:providedBy

OWL Property	**cav:providedBy**
OWL type	owl:ObjectProperty
Label	providedBy
Definition	The agent responsible to provide score.
Domain	*cav:Score*
Range	*foaf:Agent*
Cardinality	0..1

3.7.2. Property: cav:Value

OWL Property	**cav:Value**
OWL type	owl:DataProperty
Label	Value
Definition	The literal representing the final score assigned to one criterion. Additional Information This literal is normally a number, generally a decimal. Be aware that one criterion may have multiple scores assigned, especially when there is a need to identify who the agent is providing the score.
Property Type	rdfs:Literal

3.7.3. Property: cav:hasInput

OWL Property	**cav:hasInput**
OWL type	owl:ObjectProperty
Label	hasInput

Definition	The different resources provided to feed the context for the evaluation of a criterion. Additional Information: For example, the assessment of the quality of a criterion that is answered by a multiple respondents, as the cases of an exam question answered by multiple students or the case of multiple evaluators evaluating the same quality aspect, etc.
Domain	*cav:Score*
Range	*rdfs:Resource*
Cardinality	0..1

3.7.4. Property: cav:basedOn

OWL Property	**cav:basedOn**
OWL type	owl:ObjectProperty
Label	basedOn
Definition	The consideration of a specific evaluation context when assigning the score to a criterion.
Domain	*cav:Score*
Range	*cav:CriterionEvaluationContext*
Cardinality	0..n

3.7.5. Property: cav:assignedTo

OWL Property	**cav:assignedTo**
OWL type	owl:ObjectProperty
Label	assignedTo
Definition	The assignment of a value output to the criterion.
Domain	*cav:Score*
Range	*cccev:Criterion*
Cardinality	1

4

CONFORMANCE STATEMENT

4. CONFORMANCE STATEMENT

The performance of an Assessment using scenario-based “Criteria” is conformant with the CAV if:

- the Assessment uses the terms (classes and properties) in a consistent way with their semantics as declared in this specification;
- the Assessment does not use terms from other vocabularies instead of ones defined in this vocabulary that could reasonably be used.
    - A conforming data interchange:
        - may include terms from other vocabularies;
        - may use only a subset of CAV terms.

The CAV is technology-neutral and a publisher may use any of the terms defined in this document encoded in any technology although RDF and XML are preferred.

5

ACCESSIBILITY AND MULTILINGUAL ASPECTS

5. ACCESSIBILITY AND MULTILINGUAL ASPECTS

The CAV can operate in any language due to the following.

- In a multilingual context, with all properties that are datatype “Text”, the value may exist in multiple languages, the property may be instantiated multiple times and tagged with the language identifier for the value used for that property.
- The CAV specification encourages the use of PURIs as identifiers.

6

ACRONYMS

6. ACRONYMS

Term	Description
CAV	Core Assessment Vocabulary
CCCEV	Core Criterion and Core Evidence Vocabulary
CSSV	Core Standards and Specifications Vocabulary
DCAT	Data Catalogue Vocabulary
ELIS	EIRA Library of Interoperability Specifications

7

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7. REFERENCES

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8

ANNEXES

8. ANNEX I – FINDINGS AND CONCLUSIONS

The public consultation has produced some findings and relevant conclusions.

- **Finding**: a data model, vocabulary, or ontology tackling the domain of assessments using scenario-based “Criteria” was not found.
- The pilot of the CAV has produced some relevant conclusions:
    - The objective of the current pilot has always been to place the CAV into a context of reality and check whether it was complete or if it could be evolved. The dataset, formulae and documentation provided by Italy has shown that the CAV was quite complete but for a couple of attributes: score thresholds and the linking to external resources such as algorithms and formulae (see UML for these two aspects).
    - The application of the CAV to the eProcurement eEvaluation phase, which is what Italy is trying to do, requires taking the CAV and extending it with the ePO specialized classes of criterion. It also requires the use of a reification class (e.g. score “InputValue”) to relate all the data about evaluation decision. But this is what application profiles are expected to do in respect of eGovernment Core Vocabularies.
    - Modelling and implementing the algorithms and formulae that intervene in the calculation of the results and the issuing of a report goes beyond the objectives of the current pilot. The model, however, sets a good foundation for approaching the development of a ‘Reference Implementation’ of the complete ELECTRE Methods.

9. ANNEX II – CAV MODEL


cav.xmi


cav_tbox.ttl

An action supported by ISA²

ISA² is a EUR 131 million programme of the European Commission which develops digital solutions that enable interoperable cross-border and cross-sector public services, for the benefit of public administrations, businesses and citizens across the EU. ISA² supports a wide range of activities and solutions, among which is the Interoperability Maturity Assessment of a Public Service (IMAPS) action.
ISA² solutions can be used free of charge and are open source when related to IT.

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