EPOS-DCAT-AP: an extension of the DCAT Application Profile for Research Infrastructures in the solid-Earth domain

Version 1.0

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1 EXECUTIVE SUMMARY

This document contains the specification for EPOS-DCAT-AP, an extension of the DCAT application profile[1] for Research Infrastructures in the solid-Earth domain. It is developed in the framework of European Plate Observing System[2] (EPOS).

To Be Completed…

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[1] DCAT Application profile for data portals in Europe (DCAT-AP)
https://joinup.ec.europa.eu/solution/dcat-application-profile-data-portals-europe
[2] European Plate Observing System
https://www.epos-ip.org/

2 INTRODUCTION

2.1 Background

To Be Completed…

2.2 Objectives and related work

To Be Completed…

EPOS-DCAT-AP extension respects the minimum conformance requirements as defined in section 6 of the specification of DCAT-AP v1.1[3] and more specific rules as:

- Extensions must not widen but may only narrow down the usage notes as specified in DCAT-AP v1.1, so that all information provided according to the extension remains valid for DCAT-AP v1.1;

- Extensions may add classes that are not specified for DCAT-AP; however, an extension should not add classes that are similar to DCAT-AP classes;

- Extensions may add properties that are not specified for DCAT-AP; however, an extension should not add properties that are similar to DCAT-AP properties;

- Extensions may change the cardinalities for properties defined for DCAT-AP v1.1 respecting the following rules:
  - Mandatory properties in DCAT-AP v1.1 must be mandatory in the extension;
  - Recommended properties in DCAT-AP v1.1 may be declared optional or mandatory in the extension;
  - Optional properties in DCAT-AP v1.1 may be declared recommended or mandatory in the extension;
  - Recommended and optional properties in DCAT-AP v1.1 may be removed from the extension;

- Extensions must include all the mandatory controlled vocabularies as listed in section 5 of the specification of DCAT-AP v1.1;

- Extensions may add mandatory controlled vocabularies.

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[3] DCAT-AP version 1.1
https://joinup.ec.europa.eu/release/dcat-ap/11

2.3 Structure of this document

This document consists of the following sections:

- Section 1 provides an Executive summary
- Section 2 introduces this document;
- Section 3 provides the terminology used in the EPOS-DCAT-AP;
- Section 4 and 5 provide the EPOS-DCAT-AP specification;
- Section 6 provides examples of applications of EPOS-DCAT-AP.

3 An overview of the model

The following UML class diagram (Figure 1) shows all classes and properties included in the DCAT Application Profile with additional classes (in orange) and their relationships in order to fulfil the EPOS requirements.

Figure 1 – EPOS-DCAT Application Profile UML Class Diagram.

The Application Profile reuses terms from various existing specifications. Classes and properties specified in the next sections have been taken from the following namespaces:

- adms: http://www.w3.org/ns/adms#
- dcat: http://www.w3.org/ns/dcat#
- dct: http://purl.org/dc/terms/
- epos: https://www.epos-eu.org/epos-dcat-ap#
- foaf: http://xmlns.com/foaf/0.1/
- hydra: http://www.w3.org/ns/hydra/core#
- owl: http://www.w3.org/2002/07/owl#
- rdfs: http://www.w3.org/2000/01/rdf-schema#
- schema: http://schema.org/
- skos: http://www.w3.org/2004/02/skos/core#

- spdx: http://spdx.org/rdf/terms#
- xsd: http://www.w3.org/2001/XMLSchema#
- vcard: http://www.w3.org/2006/vcard/ns#

4 EPOS-DCAT-AP classes

The following section describes the properties used in EPOS-DCAT Application Profile. It contains the specification for DCAT-AP v1.1 (blue tables) and indicates the extensions for EPOS-DCAT-AP separately under the relevant classes (orange tables).

4.1 Mandatory Classes for DCAT-AP

Class name	Usage note	URI
Agent	An entity that is associated with Catalogues and/or Datasets. If the Agent is an organisation, the use of the Organization Ontology is recommended.	foaf:Agent
Catalogue	A catalogue or repository that hosts the Datasets being described.	dcat:Catalog
Dataset	A conceptual entity that represents the information published.	dcat:Dataset
Literal	A literal value such as a string or integer; Literals may be typed, e.g. as a date according to xsd:date. Literals that contain human-readable text have an optional language tag as defined by BCP 47.	rdfs:Literal
Resource	Anything described by RDF.	rdfs:Resource

4.2 Recommended Classes for DCAT-AP

Class name	Usage note	URI
Category	A subject of a Dataset.	skos:Concept
Category scheme	A concept collection (e.g. controlled vocabulary) in which the Category is defined.	skos:ConceptScheme
Distribution	A physical embodiment of the Dataset in a particular format.	dcat:Distribution
Licence document	A legal document giving official permission to do something with a resource.	dct:LicenseDocument

4.3 Optional Classes for DCAT-AP

Class name	Usage note	URI
Catalogue Record	A description of a Dataset's entry in the Catalogue.	dcat:CatalogRecord
Checksum	A value that allows the contents of a file to be authenticated. This class allows the results of a variety of checksum and cryptographic message digest algorithms to be represented.	spdx:Checksum
Document	A textual resource intended for human consumption that contains information, e.g. a web page about a Dataset.	foaf:Document
Frequency	A rate at which something recurs, e.g. the publication of a Dataset.	dct:Frequency
Identifier	An identifier in a particular context, consisting of the string that is the identifier; an optional identifier for the identifier scheme; an optional identifier for the version of the identifier scheme; an optional identifier for the agency that manages the identifier scheme	adms:Identifier
Kind	A description following the vCard specification, e.g. to provide telephone number and e-mail address for a contact point. Note that the class Kind is the parent class for the four explicit types of vCards (Individual, Organization, Location, Group).	vcard:Kind
Linguistic system	A system of signs, symbols, sounds, gestures, or rules used in communication, e.g. a language	dct:LinguisticSystem
Location	A spatial region or named place. It can be represented using a controlled vocabulary or with geographic coordinates. In the latter case, the use of the Core Location Vocabulary is recommended, following the approach described in the GeoDCAT-AP specification.	dct:Location
Media type or extent	A media type or extent, e.g. the format of a computer file	dct:MediaTypeOrExtent
Period of time	An interval of time that is named or defined by its start and end dates.	dct:PeriodOfTime
Publisher type	A type of organisation that acts as a publisher	skos:Concept
Rights statement	A statement about the intellectual property rights (IPR) held in or over a resource, a legal document giving official permission to do something with a resource, or a statement about access rights.	dct:RightsStatement
Standard	A standard or other specification to which a Dataset or Distribution conforms	dct:Standard
Status	An indication of the maturity of a Distribution or the type of change of a Catalogue Record.	skos:Concept
Provenance Statement	A statement of any changes in ownership and custody of a resource since its creation that are significant for its authenticity, integrity, and interpretation	dct:ProvenanceStatement

4.4 Additional classes for EPOS-DCAT-AP

Class name	Usage note	URI	Subclass Of
Annotation	A statement providing explanatory information about a resource or agent.	oa:Annotation	none
Equipment	Device	epos:Equipment	schema:Product and rdfs:Resource
Facility	This refers to facilities with resources and related services used by the scientific community to conduct top-level research in their respective fields, ranging from social sciences to astronomy, genomics to nanotechnologies. Examples include laboratories, special habitats, libraries, databases, biological archives, etc. A type of facility could be a research infrastructure a higher aggregated entity.	epos:Facility	rdfs:Resource
SoftwareApplication	This represents software packages, applications and programs.	schema:SoftwareApplication	schema:CreativeWork
SoftwareSourceCode	Computer programming source code. Example: Full (compile ready) solutions, code snippet samples, scripts, templates.	schema:SoftwareSourceCode	schema:CreativeWork
Publication	a text publication is a resource relating to a dataset, data product or other.	epos:Publication	schema:CreativeWork
WebService	Online interfaces (APIs) enabling a user or a machine to programmatically access the given resource.	epos:WebService	schema:Service and rdfs:Resource
Service	Describes an offer of an RI to the community. It could be free or ask for something in return (money, publication of the datasets, etc.).	schema:Service	schema:Intangible
Project	This refers to associated projects for an organization.	foaf:Project	none
Operation	A description of a web service operation.	hydra:Operation	hydra:Resource
IriTemplate	An IriTemplate consists of a template literal and a set of mappings.	hydra:IriTemplate	hydra:Resource
IriTemplateMapping	This maps a variable used in the template to a property and may optionally specify whether that variable is required or not. The syntax of the template literal is specified by its datatype and defaults to the [RFC6570] URI Template syntax, which can be explicitly indicated by hydra:Rfc6570Template.	hydra:IriTemplateMapping	hydra:Resource

4.5 Equivalent classes for EPOS-DCAT-AP

Class name	URI	mapping property	DCAT-AP class
ContactPoint	schema:ContactPoint	owl:equivalentClass	vcard:Kind
Organization	schema:Organization	owl:equivalentClass	foaf:Organization subclass of foaf:Agent
Person	schema:Person	owl:equivalentClass	foaf:Person subclass of foaf:Agent

5 EPOS-DCAT-AP Properties per Class

The following section describes the properties used in EPOS-DCAT Application Profile. The blue tables describe the properties per classes that already exist in DCAT-AP v1.1 with an additional column called 'Change Type'. *URI* column represents the property URI, *Range* column represents the range of the property, *Usage note* column represents the description of the property, *Cardinality* column represents property cardinality restrictions, *Change type* represents the type of change made in the extension. The orange tables describe the added classes to meet the requirements of the EPOS-DCAT-AP extension. They are structured like the blue tables, except for the Change Type column, as the properties will be 'added' for all rows.

5.1 Catalog

Properties for Catalog class

URI	Range	Usage note	Card.	Change type
dcat:dataset	dcat:Dataset	This property links the Catalogue with a Dataset that is part of the Catalogue.	1..n	none
dct:description	rdfs:Literal	This property contains a free-text account of the Catalogue. This property can be repeated for parallel language versions of the description.	1..n	none
dct:publisher	foaf:Agent	This property refers to an entity (organisation) responsible for making the Catalogue available.	1..1	**Extended range to schema:Organization**
dct:title	rdfs:Literal	This property contains a name given to the Catalogue. This property can be repeated for parallel language versions of the name.	1..n	none
foaf:homepage	foaf:Document	This property refers to a web page that acts as the main page for the Catalogue.	0..1	none
dct:language	dct:LinguisticSystem	This property refers to a language used in the textual metadata describing titles, descriptions, etc. of the Datasets in the Catalogue. This property can be repeated if the metadata is provided in multiple languages.	0..n	none
dct:license	dct:LicenseDocument	This property refers to the licence under which the Catalogue can be used or reused.	0..1	none
dct:issued	rdfs:Literal typed as xsd:date or xsd:dateTime	This property contains the date of formal issuance (e.g., publication) of the Catalogue.	0..1	none
dcat:themeTaxonomy	skos:ConceptScheme	This property refers to a knowledge organization system used to classify the Catalogue's Datasets.	0..n	none
dct:modified	rdfs:Literal typed as xsd:date or xsd:dateTime	This property contains the most recent date on which the Catalogue was modified.	0..1	none
dct:hasPart	dcat:Catalog	This property refers to a related Catalogue that is part of the described Catalogue	0..n	none
dct:isPartOf	dcat:Catalog	This property refers to a related Catalogue in which the described Catalogue is physically or logically included.	0..1	none
dcat:record	dcat:CatalogRecord	This property refers to a Catalogue Record that is part of the Catalogue	0..n	none
dct:rights	dct:RightsStatement	This property refers to a statement that specifies rights associated with the Catalogue.	0..1	none
dct:spatial	dct:Location	This property refers to a geographical area covered by the Catalogue.	0..n	none
epos:resource	rdfs:Resource	This property links the Catalogue with a Resource.	0..n	**added**

5.2   Catalog Record

Properties for Catalog Record class

URI	Range	Usage note	Card.	Change type
foaf:primaryTopic	dcat:Dataset	This property links the Catalogue Record to the Dataset described in the record.	1..1	none
dct:modified	rdfs:Literal typed as xsd:date or xsd:dateTime	This property contains the most recent date on which the Catalog Record was modified.	1..1	none
dct:conformsTo	rdfs:Resource	This property refers to an Application Profile that the Dataset's metadata conforms to.	0..1	none
adms:status	skos:Concept	This property refers to the type of the *latest* revision of a Dataset's entry in the Catalogue. It MUST take one of the values :created, :updated or :deleted depending on whether this *latest* revision is a result of a creation, update or deletion.	0..1	none
dct:issued	rdfs:Literal typed as xsd:date or xsd:dateTime	This property contains the date on which the description of the Dataset was included in the Catalogue.	0..1	none
dct:description	rdfs:Literal	This property contains a free-text account of the record. This property can be repeated for parallel language versions of the description.	0..n	none
dct:language	dct:LinguisticSystem	This property refers to a language used in the textual metadata describing titles, descriptions, etc. of the Dataset. This property can be repeated if the metadata is provided in multiple languages.	0..n	none
dct:source	dcat:CatalogRecord	This property refers to the original metadata that was used in creating metadata for the Dataset	0..1	none
dct:title	rdfs:Literal	This property contains a name given to the Catalogue Record. This property can be repeated for parallel language versions of the name.	0..n	none
dct:identifier	rdfs:Literal	This property contains the main identifier for the Catalog Record.	0..1	**added**

5.3   Dataset

Properties for Dataset class

URI	Range	Usage note	Card.	Change type
dct:description	rdfs:Literal	This property contains a free-text account of the Dataset. This property can be repeated for parallel language versions of the description.	1..n	none
dct:title	rdfs:Literal	This property contains a name given to the Dataset. This property can be repeated for parallel language versions of the name.	1..n	none
dcat:contactPoint	vcard:Kind	This property contains contact information that can be used for sending comments about the Dataset.	0..n	**Extended range to schema:ContactPoint**
dcat:distribution	dcat:Distribution	This property links the Dataset to an available Distribution.	0..n	none
dcat:keyword	rdfs:Literal	This property contains a keyword or tag describing the Dataset.	0..n	none
dct:publisher	foaf:Agent	This property refers to an entity (organisation) responsible for making the Dataset available.	0..1	**0..n**
dcat:theme, subproperty of dct:subject	skos:Concept	This property refers to a category of the Dataset. A Dataset may be associated with multiple themes.	0..n	none
dct:accessRights	dct:RightsStatement	This property refers to information that indicates whether the Dataset is open data, has access restrictions or is not public. A controlled vocabulary with three members (:public, :restricted, :non-public) will be created and maintained by the Publications Office of the EU.	0..1	none
dct:conformsTo	dct:Standard	This property refers to an implementing rule or other specification.	0..n	none
foaf:page	foaf:Document	This property refers to a page or document about this Dataset.	0..n	none
dct:accrualPeriodicity	dct:Frequency	This property refers to the frequency at which the Dataset is updated.	0..1	none

URI	Range	Usage note	Card.	Change type
dct:hasVersion	dcat:Dataset	This property refers to a related Dataset that is a version, edition, or adaptation of the described Dataset.	0..n	none
dct:identifier	rdfs:Literal	This property contains the main identifier for the Dataset, e.g. the URI or other unique identifier in the context of the Catalogue.	0..n	**1..1**
dct:isVersionOf	dcat:Dataset	This property refers to a related Dataset of which the described Dataset is a version, edition, or adaptation.	0..n	none
dcat:landingPage	foaf:Document	This property refers to a web page that provides access to the Dataset, its Distributions and/or additional information. It is intended to point to a landing page at the original data provider, not to a page on a site of a third party, such as an aggregator.	0..n	none
dct:language	dct:LinguisticSystem	This property refers to a language of the Dataset. This property can be repeated if there are multiple languages in the Dataset.	0..n	none
adms:identifier	adms:Identifier	This property refers to a secondary identifier of the Dataset, such as MAST/ADS, DataCite, DOI, EZID or W3ID.	0..n	none
dct:provenance	dct:ProvenanceStatement	This property contains a statement about the lineage of a Dataset.	0..n	none
dct:relation	rdfs:Resource	This property refers to a related resource.	0..n	none
dct:issued	rdfs:Literal typed as xsd:date or xsd:dateTime	This property contains the date of formal issuance (e.g., publication) of the Dataset.	0..1	none
adms:sample	dcat:Distribution	This property refers to a sample distribution of the dataset	0..n	none
dct:source	dcat:Dataset	This property refers to a related Dataset from which the described Dataset is derived.	0..n	none
dct:spatial	dct:Location	This property refers to a geographic region that is covered by the Dataset.	0..n	none
dct:temporal	dct:PeriodOfTime	This property refers to a temporal period that the Dataset covers.	0..n	none
dct:type	skos:Concept	This property refers to the type of the Dataset. A controlled vocabulary for the values has not been established.	0..1	none
dct:modified	rdfs:Literal typed as xsd:date or xsd:dateTime	This property contains the most recent date on which the Dataset was changed or modified.	0..1	none
owl:versionInfo	rdfs:Literal	This property contains a version number or other version designation of the Dataset.	0..1	none
adms:versionNotes	rdfs:Literal	This property contains a description of the differences between this version and a previous version of the Dataset. This property can be repeated for parallel language versions of the version notes.	0..n	none
dct:isPartOf	dcat:Dataset	This property refers to a related Dataset in which the described Dataset is physically or logically included.	0..n	**added**
dct:hasPart	dcat:Dataset	This property refers to a related Dataset that is part of the described Dataset.	0..n	**added**
epos:annotation	oa:Annotation	The information may include quality aspects such as accuracy, reliability, comparability, coherence, relevance, etc.	0..n	**added**
dct:created	rdfs:Literal typed as xsd:date or xsd:dateTime	This property contains the date on which the Dataset was created.	0..1	**added**

5.4 Distribution

Properties for Distribution class

URI	Range	Usage note	Card.	Change type
dct:identifier	rdfs:Literal	This property contains the main identifier for the Distribution.	1..1	**added**
dcat:accessURL	rdfs:Resource	This property contains a URL that gives access to a Distribution of the Dataset. The resource at the access URL may contain information about how to get the Dataset.	1..n	none
dct:description	rdfs:Literal	This property contains a free-text account of the Distribution. This property can be repeated for parallel language versions of the description.	0..n	none
dct:format	dct:MediaTypeOrExtent	This property refers to the file format of the Distribution.	0..1	none
dct:license	dct:LicenseDocument	This property refers to the licence under which the Distribution is made available.	0..1	none
dcat:byteSize	rdfs:Literal typed as xsd:decimal	This property contains the size of a Distribution in bytes.	0..1	none
spdx:checksum	spdx:Checksum	This property provides a mechanism that can be used to verify that the contents of a distribution have not changed	0..1	none
foaf:page	foaf:Document	This property refers to a page or document about this Distribution.	0..n	none
dcat:downloadURL	rdfs:Resource	This property contains a URL that is a direct link to a downloadable file in a given format.	0..n	none
dct:language	dct:LinguisticSystem	This property refers to a language used in the Distribution. This property can be repeated if the metadata is provided in multiple languages.	0..n	none
dct:conformsTo	dct:Standard	This property refers to an established schema to which the described Distribution conforms.	0..n	none
dcat:mediaType, subproperty of dct:format	dct:MediaTypeOrExtent	This property refers to the media type of the Distribution as defined in the official register of media types managed by IANA.	0..1	none
dct:issued	rdfs:Literal typed as xsd:date or xsd:dateTime	This property contains the date of formal issuance (e.g., publication) of the Distribution.	0..1	none
dct:rights	dct:RightsStatement	This property refers to a statement that specifies rights associated with the Distribution.	0..1	none
adms:status	skos:Concept	This property refers to the maturity of the Distribution	0..1	none
dct:title	rdfs:Literal	This property contains a name given to the Distribution. This property can be repeated for parallel language versions of the description.	0..n	none
dct:modified	rdfs:Literal typed as xsd:date or xsd:dateTime	This property contains the most recent date on which the Distribution was changed or modified.	0..1	none
dct:type	skos:Concept	This property refers to the type of the Distribution.	0..1	**added**
epos:annotation	oa:Annotation	The information may include quality aspects such as accuracy, reliability, comparability, coherence, relevance, etc.	0..n	**added**

5.5 Agent

Properties for Agent class

URI	Range	Usage note	Card.	Change type
foaf:name	rdfs:Literal	This property contains a name of the agent. This property can be repeated for different versions of the name (e.g. the name in different languages)	1..n	none
dct:type	skos:Concept	This property refers to a type of the agent that makes the Catalogue or Dataset available	0..1	none

5.6 Resource

Properties for Resource class

URI	Range	Usage note	Card.	Change type
dct:type	skos:Concept	This property refers to the type of the Resource.	0..1	added

5.7 Category Scheme

Properties for Category Scheme class

URI	Range	Usage note	Card.	Change type
dct:title	rdfs:Literal	This property contains a name of the category scheme. May be repeated for different versions of the name	1..n	none

5.8 Category

Properties for Category class

URI	Range	Usage note	Card.	Change type
skos:prefLabel	rdfs:Literal	This property contains a preferred label of the category. This property can be repeated for parallel language versions of the label.	1..n	none

5.9 Checksum

Properties for Checksum class

URI	Range	Usage note	Card.	Change type
spdx:algorithm	spdx:checksumAlgorithm_sha1	This property identifies the algorithm used to produce the subject Checksum. Currently, SHA-1 is the only supported algorithm. It is anticipated that other algorithms will be supported at a later time.	1..1	none
spdx:checksumValue	rdfs:Literal typed as xsd:hexBinary	This property provides a lower case hexadecimal encoded digest value produced using a specific algorithm.	1..1	none

5.10 Identifier

Properties for Identifier class

URI	Range	Usage note	Card.	Change type
skos:notation	rdfs:Literal typed with the URI of one of the members of the DataCite Resource Identifier Scheme[4]	This property contains a string that is an identifier in the context of the identifier scheme referenced by its datatype.	0..1	none

5.11 Licence Document

Properties for Licence Document class

URI	Range	Usage note	Card.	Change type
dct:type	skos:Concept	This property refers to a type of licence, e.g. indicating 'public domain' or 'royalties required'.	0..1	none

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[4] DataCite Resource Identifier Scheme. http://purl.org/spar/datacite/ResourceIdentifierScheme

5.12 Period of Time

Properties for Period of Time class

URI	Range	Usage note	Card.	Change type
schema:startDate	rdfs:Literal typed as xsd:date or xsd:dateTime	This property contains the start of the period	0..1	none
schema:endDate	rdfs:Literal typed as xsd:date or xsd:dateTime	This property contains the end of the period	0..1	none

Please note that while both properties are optional, one of the two must be present for each instance of the class dct:PeriodOfTime, if such an instance is present.
The start of the period should be understood as the start of the date, hour, minute etc. given (e.g. starting at midnight at the beginning of the day if the value is a date); the end of the period should be understood as the end of the date, hour, minute etc. given (e.g. ending at midnight at the end of the day if the value is a date).

5.13 Annotation

Properties for Annotation class

URI	Range	Usage note	Card.
dct:created	xsd:dateTime	Date when this annotation was created.	0..1
dct:creator	schema:Person or schema:Organization	This property refers to an entity (Person or Organization) responsible for making the annotation.	0..1

5.14 Equipment

Properties for Equipment class

URI	Range	Usage note	Card.
schema:description	rdfs:Literal	This property contains a free-text description of the Equipment.	1..1
schema:identifier	rdfs:Literal or schema:PropertyValue	This property contains the main identifier for the Equipment.	1..1
schema:name	rdfs:Literal	This property contains a name given to the Equipment.	1..1
dct:type	skos:Concept or rdfs:Literal typed with URI	This property refers to the type of the Equipment.	0..1
schema:manufacturer	schema:Organization	This property refers to an Organisation responsible for manufacturing the Equipment.	0..1
schema:serialNumber	rdfs:Literal	This property contains the serial number for the Equipment.	0..1
dct:isPartOf	epos:Equipment or epos:Facility	This property refers to an Equipment or a Facility in which the described Equipment is included.	0..n
dcat:contactPoint or schema:contactPoint	schema:ContactPoint	This property contains contact information that can be used for sending comments about the Equipment.	0..n
dct:spatial	dct:Location	This property refers to a geographical location of the Equipment.	0..1
epos:filter	rdfs:Literal	This property describes the filter that the instrument uses to produce data.	0..1
epos:dynamicRange	schema:QuantitativeValue	This property contains the full-scale measuring ability, in nT (unit and value).	0..1
epos:orientation	rdfs:Literal	This property describes how the instrument is oriented.	0..1
epos:resolution	rdfs:Literal	This property contains the resolution in nT.	0..1
epos:samplePeriod	schema:QuantitativeValue	This property contains the sample period in mS (unit and value)	0..1
epos:annotation	oa:Annotation	The information may include quality aspects such as accuracy, reliability, comparability, coherence, relevance, etc.	0..n
dct:temporal	dct:PeriodOfTime	This property refers to a temporal period that the Web Service covers.	0..n
dct:relation	rdfs:Resource	This property refers to a related resource (e.g., Dataset, WebService, Service, etc.).	0..n
dcat:theme	skos:Concept	This property refers to a category of the Equipment. An Equipment may be associated with multiple themes.	0..n

URI	Range	Usage note	Card.
foaf:page	rdfs:Literal typed with URI	This property refers to a page or document about the Equipment	0..n

5.15 Facility

Properties for Facility class

URI	Range	Usage note	Card.
dct:description	rdfs:Literal	This property contains a free-text description of the Facility.	1..1
dct:identifier	rdfs:Literal	This property contains the main identifier for the Facility.	1..1
dct:title	rdfs:Literal	This property contains a name given to the Facility.	1..1
dct:type	skos:Concept or rdfs:Literal typed with URI	This property refers to the type of the Facility.	0..1
dcat:theme	skos:Concept	This property refers to a category of the Facility. A Facility may be associated with multiple themes.	0..n
dct:isPartOf	epos:Facility	This property refers to a Facility in which the described Facility is included.	0..n
vcard:hasAddress	vcard:Address	This property contains the physical address of the Facility.	0..1
foaf:page	foaf:Document	This property refers to a page or document about this Facility.	0..n
dcat:contactPoint or schema:contactPoint	schema:Contact Point	This property contains contact information that can be used for sending comments about the Facility.	0..n
dct:relation	rdfs:Resource	This property refers to a related resource (e.g., Dataset, WebService, Service, etc).	0..n
epos:annotation	oa:Annotation	The information may include quality aspects such as accuracy, reliability, comparability, coherence, relevance, etc.	0..n
dct:spatial	dct:Location	This property refers to a geographical location of the Facility.	0..1

5.16 WebService

Properties for WebService class

URI	Range	Usage note	Card.
schema:identifier	rdfs:Literal or schema:Property Value	This property contains the main identifier for the Web Service.	1..n
schema:description	rdfs:Literal	This property contains a free-text description of the Web Service.	0..1
dcat:theme	skos:Concept	This property refers to a category of the Web Service. A Web Service may be associated with multiple themes.	0..n
schema:name	rdfs:Literal	This property contains a name given to the Web Service.	0..1
hydra:entrypoint	rdfs:Literal typed with URI	This property refers to the API definitions (e.g., WSDL, WADL)	0..1
dcat:contactPoint or schema:contactPoint	schema:Contact Point	This property contains contact information that can be used for sending comments about the Web Service.	0..n
schema:provider	schema:Organiz ation	This property refers to an Organisation responsible for making the Web Service available.	0..1
schema:datePublished	rdfs:Literal typed as xsd:date or xsd:dateTime	This property contains the date of publication of the Web Service.	0..1
schema:dateModified	rdfs:Literal typed as xsd:date or xsd:dateTime	This property contains the most recent date on which the Web Service was modified.	0..1
dct:spatial	dct:Location	This property refers to a geographical area covered by the Web Service.	0..n
hydra:supportedOperation	hydra:Operation	This property refers to a web service operation supported by the Web Service.	0..n
dct:conformsTo	hydra:APIDocum entation	This property refers to the API documentation.	0..n
schema:keywords	rdfs:Literal	This property contains the keywords used to describe the Web Service. Multiple entries in a keywords list are typically delimited by commas.	0..n
dct:license	dct:LicenseDocu ment	This property refers to the licence under which the Web Service can be used or reused.	0..1
dct:temporal	dct:PeriodOfTim e	This property refers to a temporal period that the Web Service covers.	0..n

5.17 Operation

Properties for Operation class

URI	Range	Usage note	Card.
hydra:method	rdfs:Literal	The HTTP method	0..1
hydra:property	hydra:IriTemplate	This property refers to the IriTemplate of the Web Service operation. This describes the endpoint and parameters mapping for the operation.	0..1
hydra:returns	rdfs:Literal	This property is used to specify the output format of the Operation. The possible values are listed here: https://www.iana.org/assignments/media-types/media-types.xhtml	0..n

5.18 IriTemplate

Properties for IriTemplate class

URI	Range	Usage note	Card.
hydra:template	rdfs:Literal	The syntax of the template literal is specified by the [RFC6570] URI Template syntax.	1..1
hydra:mapping	hydra:IriTemplateMapping	A variable-to-property mapping of the IRI template.	0..n

5.19 IriTemplateMapping

Properties for IriTemplateMapping class

URI	Range	Usage note	Card.
hydra:variable	rdfs:Literal	This property contains the name of the parameter as required by web service specifications.	1..1
rdf:label	rdfs:Literal	This property contains a short string used to describe the meaning of the parameter.	1..1
hydra:required	rdfs:Literal typed as xsd:boolean	This property contains true if the property is required, false otherwise.	1..1
rdfs:range	rdfs:Literal	This property contains the type of parameter (e.g., xsd:string, xsd:Boolean, xsd:date, xsd:dateTime).	1..1
schema:defaultValue	rdfs:Literal	This property contains the default value of the parameter.	0..1
schema:minValue	rdfs:Literal	This property contains the minimum value of the parameter.	0..1
schema:maxValue	rdfs:Literal	This property contains the maximum value of the parameter.	0..1
http:paramValue	rdfs:Literal	This property contains one of the possible values which should be used in the web service query. It could be repeated as many times as needed.	0..n
hydra:property	rdfs:Literal	This property contains the vocabulary term which indicates the semantic description of parameter.	0..1
schema:valuePattern	rdfs:Literal	This property contains the regular expression for testing values according to the parameter's specification.	0..1

5.20 ContactPoint

Properties for ContactPoint class

URI	Range	Usage note	Card.
schema:contactType	rdfs:Literal	This property contains information about the role of the Contact Point.	0..1
schema:name	rdfs:Literal	This property contains the name of the Contact Point.	0..1
schema:email	rdfs:Literal	This property contains the email address of the Contact Point.	0..n
schema:availableLanguage	rdfs:Literal	This property contains information about the language used by the Contact Point. Please use one of the language codes from the IETF BCP 47 standard.	0..n
schema:telephone	rdfs:Literal	This property contains telephone number of the Contact Point.	0..n

5.21 Person

Properties for Person class

URI	Range	Usage note	Card.
schema:identifier	rdfs:Literal or schema:PropertyValue	This property contains the main identifier for the Person (e.g., ORCID, ScopusID, etc.).	1..n
schema:familyName	rdfs:Literal	This property contains the last name of the Person.	0..1
schema:givenName	rdfs:Literal	This property contains the first name of the Person.	0..1
dcat:contactPoint or schema:contactPoint	schema:ContactPoint	This property refers to the Contact Point role defined for the Person.	0..n
schema:address	rdfs:Literal or schema:PostalAddress	This property contains the physical address of the Person.	0..1
schema:email	rdfs:Literal	This property contains the email address of the Person.	0..n
schema:qualifications	rdfs:Literal	This property contains the specific qualifications of the Person.	0..1
schema:telephone	rdfs:Literal	This property contains the telephone number of the Person.	0..n
schema:url	rdfs:Literal typed with URI	This property refers to the URL of the Person curriculum vitae.	0..1
schema:affiliation	schema:Organization	This property refers to the organization to which the person is affiliated.	0..n

5.22 Organization

Properties for Organization class

URI	Range	Usage note	Card.
schema:identifier	rdfs:Literal or schema:PropertyValue	This property contains the main identifier for the Organization (e.g., PIC, ISNI, etc.).	1..n
schema:legalName	rdfs:Literal	This property contains the official name of the Organization.	0..1
schema:leiCode	rdfs:Literal	This property contains the Organization identifier that uniquely identifies a legal entity as defined in ISO 17442.	0..1
schema:address	rdfs:Literal or schema:PostalAddress	This property contains the physical address of the Organization.	0..1
schema:logo	rdfs:Literal typed with URI	This property contains the URL of the Organization logo.	0..1
schema:url	rdfs:Literal typed with URI	This property contains the URL of the Organization website.	0..1
schema:email	rdfs:Literal	This property contains the email address of the Organization.	0..n
schema:telephone	rdfs:Literal	This property contains the telephone number of the Organization.	0..n
dcat:contactPoint or schema:contactPoint	schema:ContactPoint	This property refers to the Contact Point defined for the Organization.	0..n
schema:memberOf	schema:Organization	This property refers to an Organization to which this Organization belongs.	0..n
schema:owns	epos:Facility or epos:Equipment	This property refers to a Facility or Equipment of which it is the owner.	0..n
epos:associatedProject	foaf:Project	This property refers to a Project in which the Organization is involved.	0..n

5.23 SoftwareApplication

Properties for SoftwareApplication class

URI	Range	Usage note	Card.
schema:identifier	rdfs:Literal or schema:PropertyValue	This property contains the main identifier for the Software Application.	1..n
schema:name	rdfs:Literal	This property contains the name of the Software Application.	0..1
dcat:contactPoint or schema:contactPoint	schema:ContactPoint	This property refers to the Contact Point defined for the Software Application.	0..n
schema:description	rdfs:Literal	This property contains the description of the Software Application.	0..1
schema:downloadUrl	rdfs:Literal typed with URI	If the Software Application can be downloaded this property contains the URL to download it.	0..1

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URI	Range	Usage note	Card.
schema:license	rdfs:Literal typed with URI	This property contains the URL of the license document that applies to the Software Application.	0..1
schema:softwareVersion	rdfs:Literal	This property contains the version of the Software Application instance.	0..1
schema:mainEntityOfPage	rdfs:Literal typed with URI	This property refers to the web page URL which describes the Software Application.	0..1
schema:keywords	rdfs:Literal	This property contains the keywords used to describe the Software Application. Multiple entries in a keywords list are typically delimited by commas.	0..1
dcat:theme	skos:Concept	This property refers to a category of the Software Application. A Software may be associated with multiple themes.	0..n
schema:softwareRequirements	rdfs:Literal or URI	Component dependency requirements for application. This includes runtime environments and shared libraries that are not included in the application distribution package, but required to run the application.	0..1
schema:potentialAction	schema:ControlAction	This property describes the object upon which the action is carried out and the result produced in the action.	0..1
schema:installUrl	rdfs:Literal typed with URI	This property contains the URL at which the application may be installed.	0..1
dct:relation	hydra:Operation	This property refers to the WebService Operation linked to the application.	0..n

5.24 SoftwareSourceCode

Properties for SoftwareSourceCode class

URI	Range	Usage note	Card.
schema:identifier	rdfs:Literal or schema:PropertyValue	This property contains the main identifier for the Software Source Code.	1..n
schema:name	rdfs:Literal	This property contains the name of the Software Source Code.	0..1
dcat:contactPoint or schema:contactPoint	schema:ContactPoint	This property refers to the Contact Point defined for the Software Source Code.	0..n
schema:description	rdfs:Literal	This property contains the description of the Software Source Code.	0..1
schema:codeRepository	rdfs:Literal typed with URI	This property contains the link to the repository where the un-compiled, human readable code and related code is located (SVN, GitHub, CodePlex).	0..1
schema:license	rdfs:Literal typed with URI	This property contains the URL of the license document that applies to the Software Source Code.	0..1
schema:softwareVersion	rdfs:Literal	This property contains the version of the Software Source Code instance.	0..1
schema:programmingLanguage	rdfs:Literal	This property contains the computer programming language used to develop the Software Source Code.	0..n
schema:mainEntityOfPage	rdfs:Literal typed with URI	This property refers to the web page URL which describes the Software Source Code.	0..1
schema:keywords	rdfs:Literal	This property contains the keywords used to describe the Software Source Code. Multiple entries in a keywords list are typically delimited by commas.	0..1
dcat:theme	skos:Concept	This property refers to a category of the Software Source Code. A Software may be associated with multiple themes.	0..n
schema:runtimePlatform	rdfs:Literal	This property refers to the runtime platform or script interpreter dependencies (Example - Java v1, Python2.3, .Net Framework 3.0).	0..1
schema:targetProduct	schema:SoftwareApplication	This property refers the target Operating System / Product to which the code applies. If applies to several versions, just the product name can be used.	0..n

5.25 Publication

Properties for Publication class

URI	Range	Usage note	Card.
schema:identifier	rdfs:Literal or schema:PropertyValue	This property contains the main identifier for the Publication.	1..n
schema:name	rdfs:Literal	This property contains the name of the Publication.	1..1

URI	Range	Usage note	Card.
schema:datePublished	rdfs:Literal typed as xsd:date or xsd:dateTime	This property contains the date of first Publication.	0..1
schema:publisher	schema:Organization or schema:Person or foaf:Agent	This property refers to an organization or person or agent which is the publisher of the Publication.	0..1
dct:abstract	rdfs:Literal	This property contains the abstract of the Publication.	0..1
schema:author	schema:Person	This property refers to a Person which is the author of the Publication.	0..1
schema:contributor	schema:Person	This property refers to a Person which is a contributor of the Publication.	0..n
schema:license	rdfs:Literal typed with URI	This property contains the URL of the license document that applies to the Publication.	0..1
schema:keywords	rdfs:Literal	This property contains the keywords used to describe the Publication. Multiple entries in a keywords list are typically delimited by commas.	0..1
schema:issn	rdfs:Literal	This property contains the International Standard Serial Number (ISSN) that identifies the Publication.	0..1
schema:numberOfPages	rdfs:Literal typed as xsd:integer	This property contains the number of pages of the Publication.	0..1
schema:volumeNumber	rdfs:Literal	This property contains the volume identifier of the Publication.	0..1
dcat:theme	skos:Concept	This property refers to a category of the Publication. A Publication may be associated with multiple themes.	0..n

5.26 Service

Properties for Service class

URI	Range	Usage note	Card.
schema:identifier	rdfs:Literal or schema:PropertyValue	This property contains the main identifier for the Service.	1..n
schema:name	rdfs:Literal	This property contains the name of the Service.	0..1
dcat:contactPoint or schema:contactPoint	schema:ContactPoint	This property refers to the Contact Point defined for the Service.	0..n
schema:description	rdfs:Literal	This property contains the description of the Service.	0..1
schema:serviceType	rdfs:Literal	This property contains the type of service being offered.	0..1
schema:provider	schema:Organization of schema:Person	This property refers to an Organisation or Person responsible for making the Service available.	0..1
schema:keywords	rdfs:Literal	This property contains the keywords used to describe the Service. Multiple entries in a keywords list are typically delimited by commas.	0..1
dcat:theme	skos:Concept	This property refers to a category of the Service. A Service may be associated with multiple themes.	0..n
dct:temporal	dct:PeriodOfTime	This property refers to a temporal period that the Service covers.	0..n
dct:spatial	dct:Location	This property refers to a geographical area covered by the Service.	0..n
schema:url	rdfs:Literal typed with URI	This property refers to a page about the Service.	0..1

5.27 Project

Properties for Project class

URI	Range	Usage note	Card.
dct:identifier	rdfs:Literal	This property contains the main identifier for the Project.	1..1
dct:title	rdfs:Literal	This property contains the title of the Project.	1..1
dcat:contactPoint or schema:contactPoint	schema:ContactPoint	This property refers to the Contact Point defined for the Project.	0..n
dct:description	rdfs:Literal	This property contains the description of the Project.	0..1
foaf:homepage	foaf:Document	This property refers to a web page that acts as the main page for the Project.	0..1

6 Examples

To Be Completed…