

# ETSI GR CIM 048 V1.1.1 (2024-09)



GROUP REPORT

## Context Information Management (CIM); Handling of data catalogues and data services with NGSI-LD

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### Document Preview

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# Foreword

This Group Report (GR) has been produced by ETSI Industry Specification Group (ISG) cross-cutting Context Information Management (CIM).

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# Modal verbs terminology

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# Introduction

The DCAT Application Profile (DCAT-AP) is a specification based on World Wide Web Consortium's Data Catalog vocabulary (DCAT) for describing public sector and other open datasets in Europe. Its basic use case is to enable a cross-data portal search for datasets and make public sector data better searchable across borders and sectors. The present document proposes a mapping to enrich NGSI-LD datasets with metadata aligned with DCAT/DCAT-AP definitions.

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## 1 Scope

The present document aims at recommending an approach to encode dataset and data services metadata within an NGSI-LD format using Data Catalog Vocabulary (DCAT) and its Application Profile (DCAT-AP) representation.

---

## 2 References

### 2.1 Normative references

Normative references are not applicable in the present document.

### 2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long-term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

[i.1] [W3C® Recommendation 22 August 2024](#): "Data Catalog Vocabulary (DCAT) - Version 3".

[i.2] [SEMIC community](#): "DCAT-AP 3.0", 14 June 2024.

NOTE: See also <https://joinup.ec.europa.eu/collection/semic-support-centre/solution/dcat-application-profile-data-portals-europe/release/300>.

[i.3] [ETSI GS CIM 009 \(V1.8.1\)](#): "Context Information Management (CIM); NGSI-LD API".

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## 3 Definition of terms, symbols and abbreviations

### 3.1 Terms

Void.

### 3.2 Symbols

Void.

### 3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

API	Application Programming Interface
DCAT	Data CATalog vocabulary
DCAT-AP	DCAT - Application Profile
DOI	Digital Object Identifier
ELI	European Legislation Identifier
ETSI	European Telecommunications Standards Institute
EU	European Union

EZID	Identifiers made easy
HTTP	HyperText Transfer Protocol
IANA	Internet Assigned Numbers Authority
IRI	Internationalized Resource Identifier
ISG CIM	Industry Specification Group on cross-cutting Context Information Management
JSON	JavaScript Object Notation
LD	Linked Data
MAST	Mikulski Archive for Space Telescopes
NAL	Named Authority Lists
NGSI	Next Generation Service Interfaces
NGSI-LD	Next Generation Service Interface - Linked Data
ODRL	Open Digital Rights Language
OGC	Open Geospatial Consortium
PROV-O	The PROV Ontology
RDF	Resource Description Framework
TB	Technical Board
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
W3ID	W3C <sup>®</sup> Permanent Identifier
WFS	Web Feature Service
XML	eXtensible Markup Language

---

## 4 DCAT-AP model for describing datasets and data services

### 4.0 Introduction

The exponential number of published datasets creates an ever-increasing and more complex data environment for a user to navigate. Data on its own, without contextual information or links to other similar sources, often proves difficult to analyse or interpret.

In Europe, a developing open government data ecosystem is employing various technologies and platforms to foster both data publication and data usability. A common metadata standard, the DCAT-AP specification, serves as the universal language amidst this otherwise fragmented environment. This standard-based approach fosters the subsidiarity principle, empowering open data portal owners to select platforms and internal structures tailored to their needs. Nevertheless, these owners are required to furnish DCAT-AP compliant metadata exports for their stored datasets.

"Data Catalog Vocabulary (DCAT) is a Resource Description Framework (RDF) vocabulary designed to facilitate interoperability between data catalogs published on the Web" [i.1]. DCAT is meant for the description of datasets and data services using a standard model and vocabulary. DCAT provides RDF classes and properties to allow datasets and data services to be described and included in a catalogue. This can increase the discoverability of datasets and data services. It also enables having a decentralized approach to publishing and discovering data catalogues.

Furthermore, the DCAT vocabulary can be extended by adding classes and properties for metadata fields not covered in the DCAT specification. Each of these new specifications constitutes a DCAT profile, i.e. a named set of constraints based on DCAT. In fact, there are already a number of profiles that have been created to extend it for application in data catalogues in different domains.

"DCAT-AP is a DCAT profile for sharing information about catalogues containing datasets and data services descriptions in Europe" [i.2]. This Application Profile provides a minimal common basis within Europe to share datasets and data services cross-border and cross-domain.

In this respect, an important clarification that has to be done to correctly understand the scope of DCAT-AP is that data described in a catalogue can come in many formats, ranging from spreadsheets, through XML and RDF to various specialized formats. DCAT does not make any assumptions about these serialization formats of the datasets but it does distinguish between the abstract dataset and its different manifestations or distributions. Thus, it is important to differentiate between the dataset (i.e. the entities containing the context information, for example, temperature, humidity, etc.) and the dataset description (i.e. the entities containing the metadata that describes which entities compose the dataset, for example, Catalogue, Dataset, DataService, Distribution, etc.). DCAT-AP's scope is on the dataset description (i.e. the metadata associated to the actual data).

Thus, the main classes in DCAT-AP are thus the classes Catalogue, Dataset, Distribution and Data Service, which can be combined for the description of each catalogue as necessary, usually as a mixture of datasets and data services. In the most recent version of the DCAT-AP specification, dataset series are introduced to further organise the datasets within a catalogue. DCAT-AP provides a plethora of properties, vocabularies and guidelines to extensively express information about Open Data.

In this sense, it is important to highlight that within the DCAT-AP specification the term Entities is actually employed to define the classes that can be leveraged to describe a catalogue and the datasets and/or data services contained in it. However, the present document is referring to them using the term Classes in order to not conflict with the concept of Entity that is used in the ETSI ISG CIM NGSI-LD standard [i.3] when specifying the mapping between DCAT-AP Entities (also known as DCAT-AP Classes) and the respective NGSI-LD Entities.

## 4.1 Prefixes and namespace

For the purposes of the present document, the following prefixes apply:

adms	<a href="http://www.w3.org/ns/adms#">http://www.w3.org/ns/adms#</a>
dcat	<a href="http://www.w3.org/ns/dcat#">http://www.w3.org/ns/dcat#</a>
dcatap	<a href="http://data.europa.eu/r5r/">http://data.europa.eu/r5r/</a>
dct	<a href="http://purl.org/dc/terms/">http://purl.org/dc/terms/</a>
foaf	<a href="http://xmlns.com/foaf/0.1/">http://xmlns.com/foaf/0.1/</a>
locn	<a href="http://www.w3.org/ns/locn#">http://www.w3.org/ns/locn#</a>
odrl	<a href="http://www.w3.org/ns/odrl/2/">http://www.w3.org/ns/odrl/2/</a>
owl	<a href="http://www.w3.org/2002/07/owl#">http://www.w3.org/2002/07/owl#</a>
prov	<a href="http://www.w3.org/ns/prov#">http://www.w3.org/ns/prov#</a>
rdfs	<a href="http://www.w3.org/2000/01/rdf-schema#">http://www.w3.org/2000/01/rdf-schema#</a>
skos	<a href="http://www.w3.org/2004/02/skos/core#">http://www.w3.org/2004/02/skos/core#</a>
spdx	<a href="http://spdx.org/rdf/terms#">http://spdx.org/rdf/terms#</a>
vcard	<a href="http://www.w3.org/2006/vcard/ns#">http://www.w3.org/2006/vcard/ns#</a>

---

## 5 DCAT-AP concepts to NGSI-LD mapping

### 5.0 Foreword

This clause introduces the rules for describing DCAT-AP classes using NGSI-LD.

The objective is to be able to describe the metadata related to NGSI-LD datasets (i.e. context information available through an NGSI-LD Context Broker) using the conceptual classes defined in the DCAT-AP model.

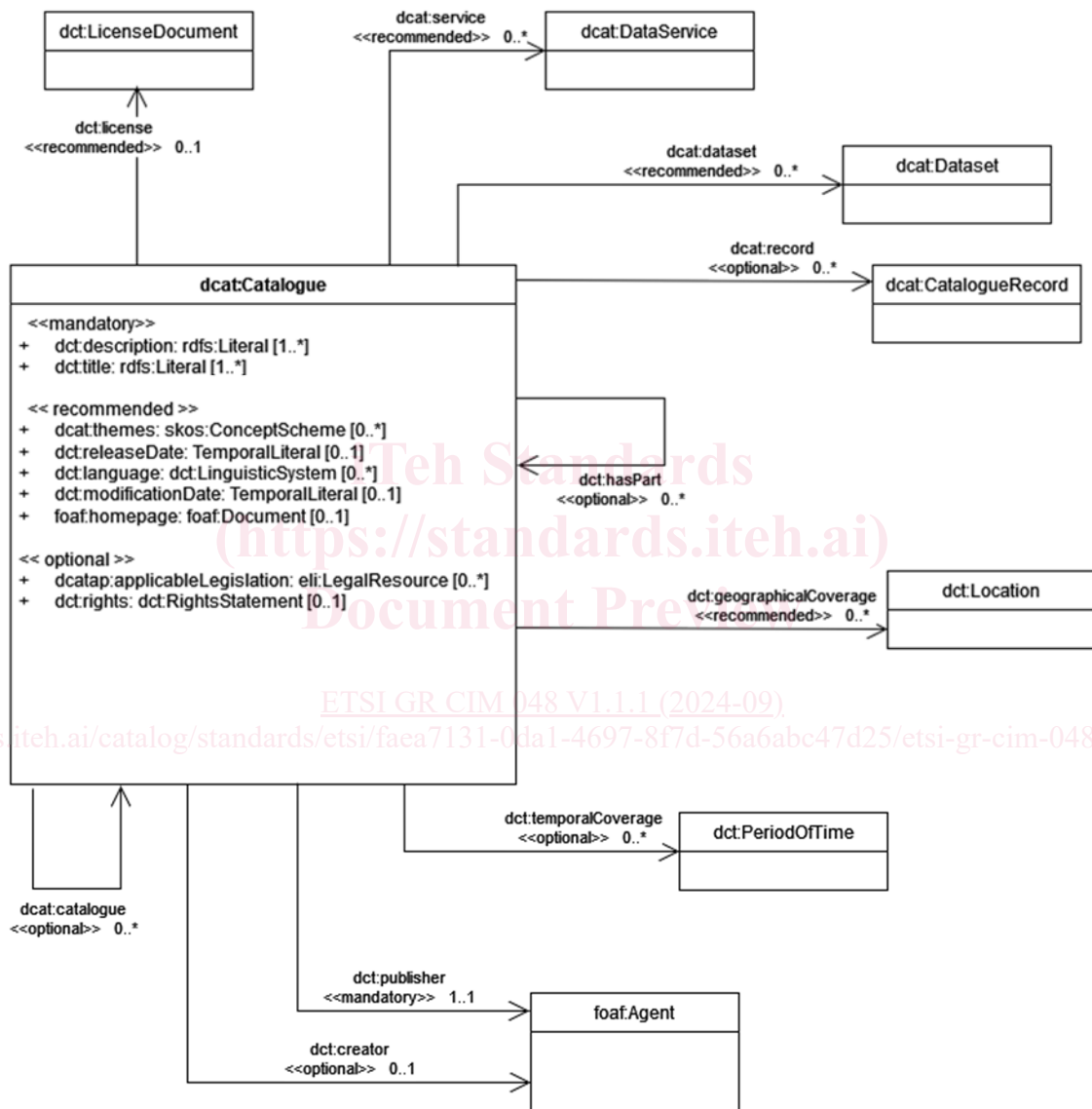
## 5.1 DCAT-AP main classes

### 5.1.0 Foreword

First the key classes from the DCAT-AP model are mapped into an NGSI-LD data model.

#### 5.1.1 Catalogue

Figure 1 shows the attributes and class hierarchy for the main DCAT-AP class, the Catalogue class.



**Figure 1: Attributes and class hierarchy for the Catalogue class**

This class is meant for describing a catalogue or repository that hosts the Datasets or Data Services being described. It has the following properties: `applicableLegislation`, `catalogue`, `creator`, `dataset`, `description`, `geographicalCoverage`, `hasPart`, `homepage`, `language`, `licence`, `modificationDate`, `publisher`, `record`, `releaseDate`, `rights`, `service`, `temporalCoverage`, `themes`, and `title`.

Table 1 summarizes these properties as on which type of NGSI-LD property they are mapped into, its description and usage recommendation, its cardinality and the range for each of them.

Table 1: Details on the Catalogue entities' properties

Property	NGSI-LD type	Description and Usage	Card	Range
<b>applicableLegislation</b>	Property	The legislation that mandates the creation or management of the Catalogue.	0..*	eli:LegalResource
<b>catalogue</b>	Relationship	A catalogue whose contents are of interest in the context of this catalogue.	0..*	dcat:Catalogue
<b>creator</b>	Relationship	An entity responsible for the creation of the catalogue.	0..1	foaf:Agent
<b>dataset</b>	Relationship	A Dataset that is part of the Catalogue. As empty Catalogues are usually indications of problems, this property should be combined with the property service to implement an empty Catalogue check.	0..*	dcat:Dataset
<b>description</b>	Property	A free-text account of the Catalogue. This property can be repeated for parallel language versions of the description.	1..*	rdfs:Literal
<b>geographicalCoverage</b>	Relationship	A geographical area covered by the Catalogue. It can be represented using a controlled vocabulary or with geographic coordinates. The EU Vocabularies Name Authority Lists have to be used for continents, countries and places that are in those lists; if a particular location is not in one of the mentioned Named Authority Lists, Geonames URIs have to be used.	0..*	dct:Location
<b>hasPart</b>	Relationship	A related Catalogue that is part of the described Catalogue.	0..*	dcat:Catalogue
<b>homepage</b>	Property	A web page that acts as the main page for the Catalogue.	0..1	foaf:Document
<b>language</b>	Property	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. EU Vocabularies Languages Named Authority List ( <a href="http://publications.europa.eu/resource/authority/language">http://publications.europa.eu/resource/authority/language</a> ).	0..*	dct:LinguisticSystem
<b>license</b>	Property	A licence under which the Catalogue can be used or reused.	0..1	dct:LicenseDocument
<b>modificationDate</b>	Property	The most recent date on which the Catalogue was modified.	0..1	rdfs:Literal
<b>publisher</b>	Relationship	An entity (organisation) responsible for making the Catalogue available.	1	foaf:Agent
<b>record</b>	Relationship	A Catalogue Record that is part of the Catalogue.	0..*	dcat:CatalogueRecord
<b>releaseDate</b>	Property	The date of formal issuance (e.g. publication) of the Catalogue.	0..1	rdfs:Literal
<b>rights</b>	Property	A statement that specifies rights associated with the Catalogue.	0..1	dct:RightsStatement
<b>service</b>	Relationship	A site or end-point (Data Service) that is listed in the Catalogue. As empty Catalogues are usually indications of problems, this property should be combined with the property dataset to implement an empty Catalogue check.	0..*	dcat:DataService
<b>temporalCoverage</b>	Property	A temporal period that the Catalogue covers.	0..*	dct:PeriodOfTime

Property	NGSI-LD type	Description and Usage	Card	Range
<b>themes</b>	Property	A knowledge organization system used to classify the Resources that are in the Catalogue. This property refers to a knowledge organization system used to classify the Catalogue's Datasets. It needs to have at least the value NAL:data-theme as this is the mandatory controlled vocabulary for dcat:theme. The values to be used for this property are the URIs of the concepts in the Dataset Theme Vocabulary ( <a href="http://publications.europa.eu/resource/authority/data-theme">http://publications.europa.eu/resource/authority/data-theme</a> ).	0..*	skos:ConceptScheme
<b>title</b>	Property	A name given to the Catalogue. This property can be repeated for parallel language versions of the name.	1..*	rdfs:Literal

Listing 1 shows an excerpt of the schema for the NGSI-LD mapping for the DCAT-AP Catalogue class. The complete JSON Schema can be found in Annex B.

Listing 1: Snippet of the JSON Schema for the NGSI-LD Catalogue entity

```

{
  "$schema": "https://json-schema.org/draft/2020-12/schema",
  "$schemaVersion": "1.0.1",
  "$id": "DCAT-AP_NGSI-LD_Mapping/Catalogue/schema.json",
  "title": "Catalogue DCAT-AP",
  "description": "Catalogue of datasets compliant with DCAT-AP specification version 3.0.0.",
  "type": "object",
  "properties": {
    "type": {
      "description": "Property. Model:'https://schema.org/Text'. It has to be Catalogue",
      "type": "string",
      "enum": ["Catalogue"]
    },
    "id": {
      "description": " Identifier format of any NGSI entity of type Catalogue.",
      "type": "string",
      "minLength": 1,
      "maxLength": 256,
      "pattern": "^[\\w\\-\\.\\{\\}\\$\\+\\*\\[\\]\\`~^@!,:\\\\\\\\]+ $"
    },
    "applicableLegislation": {
      "description": "Property. Model:'http://data.europa.eu/eli/ontology#LegalResource'. The legislation that mandates the creation or management of the Catalog",
      ...
    },
    "catalogue": {
      "description": "Relationship. Model:'http://www.w3.org/ns/dcat#Catalog'. This relationship refers to the catalogue(s) whose contents are of interest in the context of this catalogue",
      ...
    },
    "creator": {
      "description": "Relationship. Model:'http://xmlns.com/foaf/0.1/Agent'. The entities primarily responsible for producing the catalogue",
      ...
    },
    "dataset": {
      "description": "Relationship. Model:'http://www.w3.org/ns/dcat#dataset'. This relationship links the Catalogue with the Dataset(s) that is(are) part of the Catalogue",
      ...
    },
    "description": {
      "description": "Property. Model:'http://www.w3.org/2000/01/rdf-schema#Literal'. This property contains a free-text account of the Catalogue. This property can contain parallel language versions of the description.",
      ...
    },
    "geographicalCoverage": {
      "description": "Relationship. Model:'http://purl.org/dc/terms/Location'. This relationship refers to a geographical area covered by the Catalogue",
      ...
    }
  },
}

```

```

"hasPart": {
  "description": "Relationship. Model:'http://www.w3.org/ns/dcat#Catalog'. This relationship
refers to a related Catalogue that is part of the described Catalogue",
  ...
},
"homepage": {
  "description": "Property. Model:'http://xmlns.com/foaf/0.1/homepage'. This property refers
to a web page that acts as the main page for the Catalogue",
  ...
},
"language": {
  "description": "Property. Model:'http://purl.org/dc/terms/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 include multiple references if the metadata is
provided in multiple languages. DCAT-AP specification mandates the use of EU Vocabularies
Languages Named Authority List",
  ...
},
"license": {
  "description": "Relationship. Model:'http://purl.org/dc/terms/LicenseDocument'. This
relationship links to the licence under which the Catalogue can be used or reused",
  ...
},
"modificationDate": {
  "description": "Property. Model:'http://www.w3.org/2000/01/rdf-schema#Literal'. This
property contains the most recent date on which the Catalogue was modified",
  ...
},
"publisher": {
  "description": "Relationship. Model:'http://xmlns.com/foaf/0.1/#term_Agent'. This
relationship links to an entity (organisation) responsible for making the Catalogue available",
  ...
},
"record": {
  "description": "Relationship. Model:'http://www.w3.org/ns/dcat#CatalogRecord'. This
relationship refers to the Catalogue Record(s) that is(are) part of the Catalogue",
  ...
},
"releaseDate": {
  "description": "Property. Model:'http://www.w3.org/2000/01/rdf-schema#Literal'. This
property contains the date of formal issuance (e.g., publication) of the Catalogue",
  ...
},
"rights": {
  "description": "Property. Model:'http://purl.org/dc/terms/RightsStatement'. This property
refers to a statement that specifies rights associated with the Catalogue. DCAT-AP specification
mandates the use of Access Rights Named Authority List vocabulary",
  ...
},
"service": {
  "description": "Relationship. Model:'http://www.w3.org/ns/dcat#DataService'. This
relationship refers to the site(s) or end-point(s) (Data Service) that is(are) listed in the
Catalogue",
  ...
},
"temporalCoverage": {
  "description": "Property. Model:'http://purl.org/dc/terms/PeriodOfTime'. This property
refers to the temporal period that the Catalogue covers",
  ...
},
"themes": {
  "description": "Property. Model:'http://www.w3.org/2004/02/skos/core#ConceptScheme'. This
property refers to the knowledge organization system(s) used to classify the Catalogue's Datasets.
DCAT-AP specification mandates the use of Dataset Theme Vocabulary",
  ...
},
"title": {
  "description": "Property. Model:'http://www.w3.org/2000/01/rdf-schema#Literal'. This
property contains a name given to the Catalogue. This property can contain parallel language
versions of the title",
  ...
},
"@context": {
  "type": "array"
}
},
"required": [
  "id",

```

```

"type",
"description",
"publisher",
"title"
]
}

```

Some examples of the usage of the NGS-LD entity of type Catalogue can be found in Annex A.

## 5.1.2 Dataset

Figure 2 shows the attributes and class hierarchy for the DCAT-AP Dataset class.

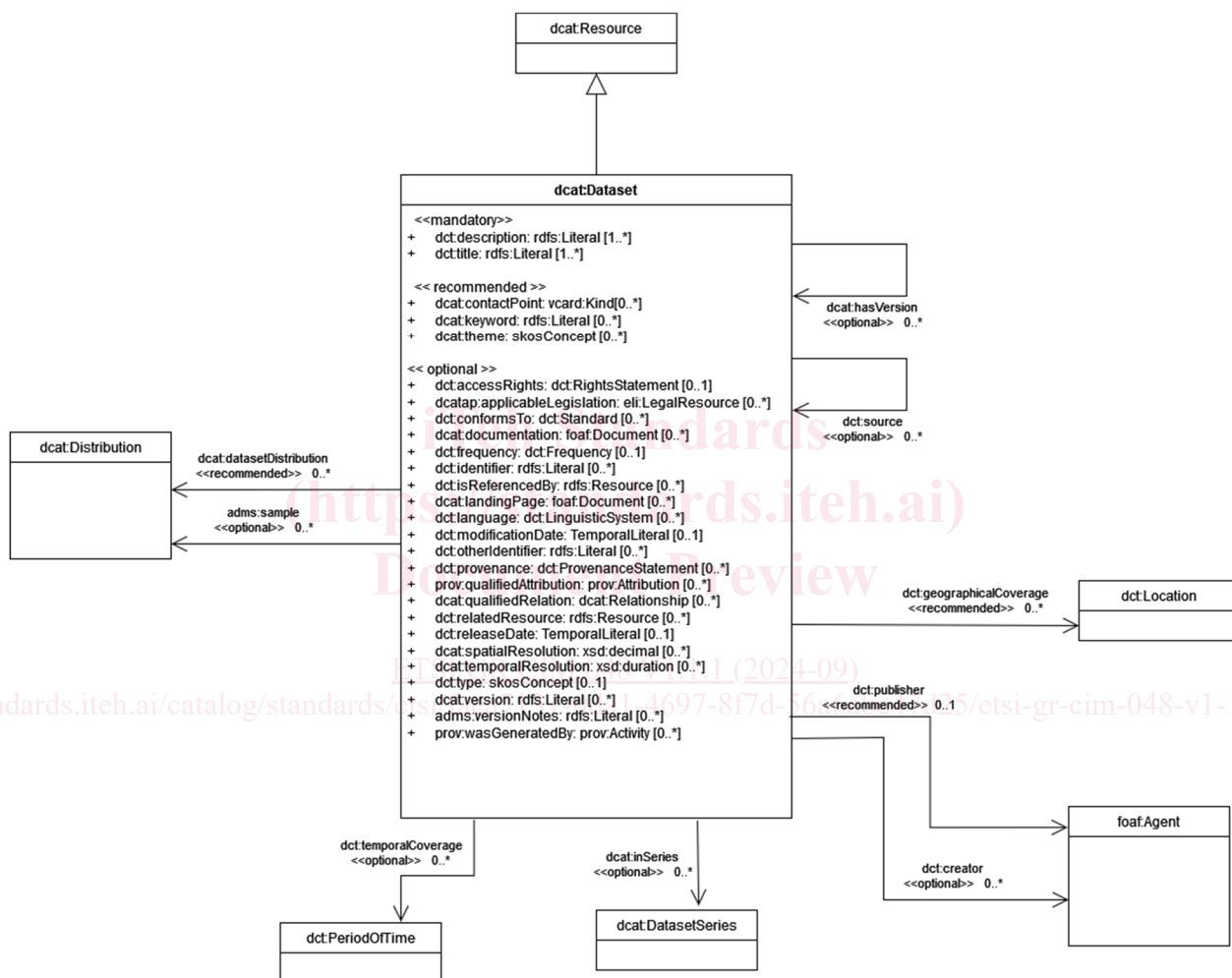


Figure 2: Attributes and class hierarchy for the Dataset class

This class is meant for describing a conceptual entity that represents the information published. It has the following properties: accessRights, applicableLegislation, conformsTo, contactPoint, creator, datasetDistribution, description, documentation, frequency, geographicalcoverage, hasVersion, identifier, inSeries, isReferencedBy, keyword, landingPage, language, modificationDate, otherIdentifier, provenance, publisher, qualifiedAttribution, qualifiedRelation, relatedResource, releaseDate, sample, source, spatialResolution, temporalCoverage, temporalResolution, theme, title, type, version, versionNotes, and wasGeneratedBy.

Table 2 summarizes these properties as on which type of NGS-LD property they are mapped into, its description and usage recommendation, its cardinality and the range for each of them.

Table 2: Details on the Dataset entities' properties

Property	NGSI-LD type	Description and Usage	Card.	Range
<b>accessRights</b>	Property	Information that indicates whether the Dataset is publicly accessible, has access restrictions or is not public.	0..1	dct:RightsStatement
<b>applicableLegislation</b>	Property	The legislation that mandates the creation or management of the Dataset.	0..*	eli:LegalResource
<b>conformsTo</b>	Property	An implementing rule or other specification.	0..*	dct:Standard
<b>contactPoint</b>	Relationship	Contact information that can be used for sending comments about the Dataset.	0..*	vcard:Kind
<b>creator</b>	Relationship	An entity responsible for producing the dataset.	0..*	foaf:Agent
<b>datasetDistribution</b>	Relationship	An available Distribution for the Dataset.	0..*	dcat:Distribution
<b>description</b>	Property	A free-text account of the Dataset. This property can be repeated for parallel language versions of the description.	1..*	rdfs:Literal
<b>documentation</b>	Property	A page or document about this Dataset.	0..*	foaf:Document
<b>frequency</b>	Property	The frequency at which the Dataset is updated. EU Vocabularies Frequency Named Authority List ( <a href="http://publications.europa.eu/resource/authority/frequency">http://publications.europa.eu/resource/authority/frequency</a> ).	0..1	dct:Frequency
<b>geographicalCoverage</b>	Relationship	A geographic region that is covered by the Dataset. It can be represented using a controlled vocabulary or with geographic coordinates. The EU Vocabularies Name Authority Lists have to be used for continents, countries and places that are in those lists; if a particular location is not in one of the mentioned Named Authority Lists, Geonames URIs have to be used.	0..*	dct:Location
<b>hasVersion</b>	Relationship	A related Dataset that is a version, edition, or adaptation of the described Dataset.	0..*	dcat:Dataset
<b>inSeries</b>	Relationship	A dataset series of which the dataset is part.	0..*	dcat:DatasetSeries
<b>isReferencedBy</b>	Relationship	A related resource, such as a publication, that references, cites, or otherwise points to the dataset.	0..*	rdfs:Resource
<b>keyword</b>	Property	A keyword or tag describing the Dataset.	0..*	rdfs:Literal
<b>landingPage</b>	Property	A web page that acts as the main page for the Catalogue. 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..*	foaf:Document
<b>language</b>	Property	A language of the Dataset. This property can be repeated if there are multiple languages in the Dataset. EU Vocabularies Languages Named Authority List ( <a href="http://publications.europa.eu/resource/authority/language">http://publications.europa.eu/resource/authority/language</a> ).	0..*	dct:LinguisticSystem
<b>modificationDate</b>	Property	The most recent date on which the Dataset was changed or modified.	0..1	rdfs:Literal
<b>otherIdentifier</b>	Property	A secondary identifier of the Dataset. Examples are DataCite, DOI, EZID or W3ID.	0..*	rdfs:Literal
<b>provenance</b>	Property	A statement about the lineage of a Dataset.	0..*	dct:ProvenanceStatement