



DCAT Application Profile for data portals in Europe Version 2.1.1



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Author	Bert Van Nuffelen
Reviewed by	Seth Van Hooland and Pavlina Fragkou
Approved by	Seth Van Hooland and Pavlina Fragkou
Abstract	This document is the result of the change release process described in the Change and Release Management Policy for DCAT-AP and was built starting from DCAT-AP version 2.0.0

Document History

Version	Date	Description	Action
0.1	24/06/2022	Addresses several issues listed in github	For review

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1. INTRODUCTION

1.1. Context

This document has been prepared in the context of Action 1.1 – Improving semantic interoperability in European eGovernment systems¹ of the European Commission's Interoperability Solutions for European Public Administrations (ISA) programme².

Studies conducted on behalf of the European Commission³ show that businesses and citizens still face difficulties in finding and re-using public sector information. In its communication on Open Data⁴ of 12 December 2011, the European Commission states that the availability of the information in a machine-readable format as well as a thin layer of commonly agreed metadata could facilitate data cross-reference and interoperability and therefore considerably enhance its value for reuse.

Much of the public sector information that would benefit from interoperability is published as datasets in data portals. Therefore, an agreement on a common format for data exchange would support the sharing, discovery and re-use of this data.

This document is the result of the major semantic change release process described in the Change and Release Management Policy for DCAT-AP⁵ and was built starting from DCAT-AP version 1.2.1⁶.

1.2. Scope of the revision

The objective of this work is to produce an updated release of the DCAT Application Profile based on numerous requests for change coming from real-world implementations of the specification listed on github since the previous release.

¹ European Commission. Interoperability Solutions for European Public Administrations (ISA). Improving semantic interoperability in European eGovernment systems. http://ec.europa.eu/isa/actions/01-trusted-information-exchange/1-1action_en.htm

² European Commission. Interoperability Solutions for European Public Administrations (ISA). http://ec.europa.eu/isa/index_en.htm

³ Review of recent studies on PSI reuse and related market developments, Graham Vickery. http://ec.europa.eu/information_society/policy/psi/docs/pdfs/report/final_version_study_psi.docx

⁴ European Commission. Communication on Open Data. http://ec.europa.eu/information_society/policy/psi/docs/pdfs/opendata2012/open_data_communication/en.pdf

⁵ European Commission. Joinup. Change and Release Management Policy for DCAT-AP <https://joinup.ec.europa.eu/document/change-and-release-management-policy-dcat-ap>

⁶ European Commission. Joinup. DCAT Application Profile for data portals in Europe. <https://joinup.ec.europa.eu/release/dcat-ap/121>

The Application Profile specified in this document is based on the specification of the **Data Catalog Vocabulary** (DCAT) developed under the responsibility of the Government Linked Data Working Group⁷ at W3C. DCAT is an RDF⁸ vocabulary designed to facilitate interoperability between data catalogues published on the Web. Additional classes and properties from other well-known vocabularies are re-used where necessary.

The work does not cover implementation issues like mechanisms for exchange of data and expected behaviour of systems implementing the Application Profile other than what is defined in the Conformance Statement in section 6.

The Application Profile is intended to facilitate data exchange and therefore the classes and properties defined in this document are only relevant for the data to be exchanged; there are no requirements for communicating systems to implement specific technical environments. The only requirement is that the systems can export and import data in RDF in conformance with this Application Profile.

1.3. The DCAT specification

The DCAT Application Profile defined in this document is based on the specification of the Data Catalog Vocabulary (DCAT) of 16 January 2014⁹, and the Data Catalog Vocabulary (DCAT) - Version 2, W3C Recommendation 04 February 2020¹⁰.

⁷ W3C. Government Linked Data (GLD) Working Group.
http://www.w3.org/2011/gld/wiki/Main_Page

⁸ W3C. Resource Description Framework (RDF). <http://www.w3.org/RDF/>

⁹ W3C. Data Catalog Vocabulary (DCAT). W3C Recommendation 16 January 2014.
<http://www.w3.org/TR/2014/REC-vocab-dcat-20140116/>

¹⁰ Data Catalog Vocabulary (DCAT) - Version 2. W3C Recommendation 04 February 2020 <https://www.w3.org/TR/vocab-dcat-2/>

2. TERMINOLOGY USED IN THE DCAT APPLICATION PROFILE

An **Application Profile** is a specification that re-uses terms from one or more base standards, adding more specificity by identifying mandatory, recommended and optional elements to be used for a particular application, as well as recommendations for controlled vocabularies to be used.

A **Dataset** is a collection of data, published or curated by a single source, and available for access or download in one or more formats.

A **Data Portal** is a Web-based system that contains a data catalogue with descriptions of datasets and provides services enabling discovery and re-use of the datasets.

In the following sections, classes and properties are grouped under headings 'mandatory', 'recommended' and 'optional'. These terms have the following meaning.

- **Mandatory property:** a receiver **MUST** be able to process the information for that property; a sender **MUST** provide the information for that property.
- **Recommended property:** a receiver **MUST** be able to process the information for that property; a sender **SHOULD** provide the information for that property if it is available.
- **Optional property:** a receiver **MUST** be able to process the information for that property; a sender **MAY** provide the information for that property but is not obliged to do so.
- **Deprecated property:** a receiver **SHOULD** be able to process information about **instances** of that property; a sender **SHOULD NOT** provide the information about instances of that property.

The meaning of the terms **MUST**, **MUST NOT**, **SHOULD** and **MAY** in this section and in the following sections are as defined in RFC 2119¹¹.

In the given context, the term "processing" means that receivers must accept incoming data and transparently provide these data to applications and services. It does neither imply nor prescribe what applications and services finally do with the data (parse, convert, store, make searchable, display to users, etc.).

The Application Profile reuses terms from various existing specifications. Classes and properties specified in the next sections have been taken from the following namespaces¹²:

- adms: <http://www.w3.org/ns/adms#>
- dcat: <http://www.w3.org/ns/dcat#>
- dcatap: <http://data.europa.eu/r5r/>
- dct: <http://purl.org/dc/terms/>

¹¹ IETF. RFC 2119. Key words for use in RFCs to Indicate Requirement Levels. <http://www.ietf.org/rfc/rfc2119.txt>

¹² For the dublicore vocabulary DCAT-AP is based on the version <https://www.dublincore.org/specifications/dublin-core/dcmi-terms/2012-06-14/>.

- foaf: <http://xmlns.com/foaf/0.1/>
- locn: <http://www.w3.org/ns/locn#>
- owl: <http://www.w3.org/2002/07/owl#>
- odrl: <http://www.w3.org/ns/odrl/2/>
- prov: <http://www.w3.org/ns/prov>
- 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#>
- vann: <http://purl.org/vocab/vann/>
- voaf: <http://purl.org/vocommons/voaf#>
- vcard: <http://www.w3.org/2006/vcard/ns#>
- time: <http://www.w3.org/2006/time#>

3. APPLICATION PROFILE OVERVIEW

DCAT-AP is a DCAT profile for sharing information about Catalogues containing Datasets and Data Services descriptions in Europe. The core classes of the Application Profile are thus the classes Catalogue, Dataset, Distribution and Data Service. DCAT-AP allows Catalogues of only Datasets, but also Catalogues of only Data Services, but usually it will be a mixture of both.

The properties of the core classes may enforce the existence of other classes. One such important class is the class Agent. However in contrast to the core classes, DCAT-AP leaves a lot of freedom to the implementors to shape them to their needs. Only minimal expectations are expressed by DCAT-AP.

Elaborated statements about the expectations are found in section 6 describing DCAT-AP conformance.

To improve the coherency between shared Dataset, Distribution and Data Service, DCAT-AP provides guidelines online¹³.

3.1. Application profile diagram

An overview of DCAT-AP is shown by the UML diagram below. The UML diagram illustrates the specification described in this document. For readability purposes the representation has been condensed as follows:

- no ranges for data properties are shown, because some of them are expressed as unions of XSD types
- The figure contain the key classes with some important supporting classes. Other object properties (relationships) are listed as properties on the UML class with there target range.
- The class `dcat:Resource` has been included to ease to see the connection with W3C DCAT. DCAT-AP treats it as an abstract notion.

The cardinalities and qualifications are included in the figure.

¹³<https://github.com/SEMICeu/DCAT-AP/blob/2.1.0-draft/releases/2.1.0/usageguide-dataset-distribution-dataservice.md>

3.2. Application profile classes

Class name	Usage note for the Application Profile	URI	Reference
Agent	Any entity carrying out actions with respect to the (Core) entities Catalogue, Datasets, Data Services and Distributions. If the Agent is an organisation, the use of the Organization Ontology ¹⁴ is recommended. See section 7 for a discussion on Agent roles.	foaf:Agent	http://xmlns.com/foaf/spec/#term-Agent ,http://www.w3.org/TR/vocab-org/
Catalogue	A catalogue or repository that hosts the Datasets or Data Services being described.	dcat:Catalog	http://www.w3.org/TR/2013/WD-vocab-dcat-20130312/#class-catalog
Dataset	A conceptual entity that represents the information published.	dcat:Dataset	http://www.w3.org/TR/2013/WD-vocab-dcat-20130312/#class-dataset

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Class name	Usage note for the Application Profile	URI	Reference
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 ¹⁵ .	rdfs:Literal	http://www.w3.org/TR/rdf-concepts/#section-Literals
Resource	Anything described by RDF.	rdfs:Resource	http://www.w3.org/TR/rdf-schema/#ch_resource
Category	A subject of a Dataset.	skos:Concept	http://www.w3.org/TR/2013/WD-vocab-dcat-20130312/#class-category-and-category-scheme
Category scheme	A concept collection (e.g. controlled vocabulary) in which the Category is defined.	skos:ConceptScheme	http://www.w3.org/TR/2013/WD-vocab-dcat-20130312/#class-category-and-category-scheme
Distribution	A physical embodiment of the Dataset in a particular format.	dcat:Distribution	http://www.w3.org/TR/2013/WD-vocab-dcat-20130312/#class-distribution
Licence document	A legal document giving official permission to do something with a resource.	dct:LicenseDocument	http://dublincore.org/documents/2012/06/14/dcmi-terms/?v=terms#LicenseDocument
Catalogue Record	A description of a Dataset's entry in the Catalogue.	dcat:CatalogRecord	http://www.w3.org/TR/2013/WD-vocab-dcat-20130312/#class-catalog-record
Data Service	A collection of operations that provides access to one or more datasets or data processing functions.	dcat:DataService	https://www.w3.org/TR/vocab-dcat-2/#Class:Data_Service
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	http://spdx.org/rdf/terms#Checksum
Document	A textual resource intended for human consumption that contains information, e.g. a web page about a Dataset.	foaf:Document	http://xmlns.com/foaf/spec/#term_Document
Frequency	A rate at which something recurs, e.g. the publication of a Dataset.	dct:Frequency	https://www.dublincore.org/specifications/dublin-core/dcmi-terms/2012-06-14/#terms-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	http://www.w3.org/TR/vocab-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).	vcad:Kind	http://www.w3.org/TR/2014/NOTE-vcad-rdf-20140522/#d4e181
Linguistic system	A system of signs, symbols, sounds, gestures, or rules used in communication, e.g. a language	dct:LinguisticSystem	https://www.dublincore.org/specifications/dublin-core/dcmi-terms/2012-06-14/#terms-LinguisticSystem

¹⁵ IETF. BCP 47. Tags for Identifying Languages. <http://www.rfc-editor.org/rfc/bcp/bcp47.txt>

Class name	Usage note for the Application Profile	URI	Reference
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 ¹⁶ is recommended, following the approach described in the GeoDCAT-AP specification.	dct:Location	https://www.dublincore.org/specifications/dublin-core/dcmi-terms/2012-06-14/#terms-Location
Media type	A media type, e.g. the format of a computer file	dct:MediaType	https://www.dublincore.org/specifications/dublin-core/dcmi-terms/2012-06-14/#terms-MediaType
Period of time	An interval of time that is named or defined by its start and end dates.	dct:PeriodOfTime	https://www.dublincore.org/specifications/dublin-core/dcmi-terms/2012-06-14/#terms-PeriodOfTime
Publisher type	A type of organisation that acts as a publisher	skos:Concept	http://www.w3.org/TR/vocab-adms/#dcterms-type
Relationship	An association class for attaching additional information to a relationship between DCAT Resources	dcat:Relationship	https://www.w3.org/TR/vocab-dcat-2/#Class:Relationship
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	https://www.dublincore.org/specifications/dublin-core/dcmi-terms/2012-06-14/#terms-RightsStatement
Role	A role is the function of a resource or agent with respect to another resource, in the context of resource attribution or resource relationships. Note it is a subclass of skos:Concept.	dcat:Role	https://www.w3.org/TR/vocab-dcat-2/#Class:Role
Standard	A standard or other specification to which a Dataset or Distribution conforms	dct:Standard	https://www.dublincore.org/specifications/dublin-core/dcmi-terms/2012-06-14/#terms-Standard
Status	An indication of the maturity of a Distribution or the type of change of a Catalogue Record.	skos:Concept	http://www.w3.org/TR/vocab-adms/#status
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	https://www.dublincore.org/specifications/dublin-core/dcmi-terms/2012-06-14/#terms-ProvenanceStatement

Historic note

In the past, classes were categorized to be mandatory, recommended and optional. This categorisation has been removed in favor of the above overview and guidelines to create a common expectations for DCAT-AP catalogues. It turned out that implementors ignored this categorisation as it was unclear what was intended with this.

4. DCAT APPLICATION PROFILE PROPERTIES PER CLASS

A quick reference table of properties per class is included in Annex I. The list of included properties contain a selection of the properties from the W3C DCAT 2.0 specification on which DCAT-AP expresses additional constraints or on which DCAT-

¹⁶ European Commission. Joinup. Core Location Vocabulary.
<https://joinup.ec.europa.eu/solution/core-location-vocabulary>

AP wants to emphasize their usage. Any property that is mentioned in DCAT applicable to a class but not explicitly is listed DCAT-AP is considered an optional field for DCAT-AP for that class. It means that for these properties DCAT-AP has no use cases that require additional usage considerations beyond 'use the property as DCAT specifies'.

4.1. Catalogue

4.1.1. Mandatory properties for Catalogue

Property	URI	Range	Usage note	Card.
description	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. For further information on multilingual issues, please refer to section 8.	1..n
publisher	dct:publisher	foaf:Agent	This property refers to an entity (organisation) responsible for making the Catalogue available.	1..1
Title	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

4.1.2. Recommended properties for Catalogue

Property	URI	Range	Usage note	Card.
dataset	dcat:dataset	dcat:Dataset	This property links the Catalogue with a Dataset that is part of the Catalogue. As empty Catalogues are usually indications of problems, this property should be combined with the next property <i>service</i> to implement an empty Catalogue check.	0..n
service	dcat:service	dcat:DataService	This property refers to 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 previous property <i>dataset</i> to implement an empty Catalogue check.	0..n
homepage	foaf:homepage	foaf:Document	This property refers to a web page that acts as the main page for the Catalogue.	0..1
language	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
licence	dct:license	dct:LicenseDocument	This property refers to the licence under which the Catalogue can be used or reused.	0..1
release date	dct:issued	rdfs:Literal typed as xsd:date, xsd:dateTime, xsd:gYear xsd:gYearMonth or	This property contains the date of formal issuance (e.g., publication) of the Catalogue.	0..1
spatial/ geographic	dct:spatial	dct:Location	This property refers to a geographical area covered by the Catalogue.	0..n
themes	dcat:themeTaxonomy	skos:ConceptScheme	This property refers to a knowledge organization system used to classify the Catalogue's Datasets.	0..n
update/ modification date	dct:modified	rdfs:Literal typed as xsd:date, xsd:dateTime, xsd:gYear xsd:gYearMonth or	This property contains the most recent date on which the Catalogue was modified.	0..1

4.1.3. Optional properties for Catalogue

Property	URI	Range	Usage note	Card.
has part	dct:hasPart	dcat:Catalog	This property refers to a related Catalogue that is part of the described Catalogue	0..n
is part of	dct:isPartOf	dcat:Catalog	This property refers to a related Catalogue in which the described Catalogue is physically or logically included.	0..1
record	dcat:record	dcat:CatalogRecord	This property refers to a Catalogue Record that is part of the Catalogue	0..n
Rights	dct:rights	dct:RightsStatement	This property refers to a statement that specifies rights associated with the Catalogue.	0..1
catalogue	dcat:catalog	dcat:Catalog	This property refers to a catalog whose contents are of interest in the context of this catalog	0..n
creator	dct:creator	foaf:Agent	This property refers to the entity responsible for producing the catalogue	0..n

4.2. Catalogue Record

4.2.1. Mandatory properties for Catalogue Record

Property	URI	Range	Usage note	Card.
primary topic	foaf:primaryTopic	dcat:Dataset dcat:DataService dcat:Catalog	This property links the Catalogue Record to the Dataset, Data service or Catalog described in the record.	1..1
update/ modification date	dct:modified	rdfs:Literal typed as xsd:date, xsd:dateTime, xsd:gYear xsd:gYearMonth	This property contains the most recent date on which the Catalogue entry was changed or modified.	1..1

4.2.2. Recommended properties for Catalogue Record

Property	URI	Range	Usage note	Card.
application profile	dct:conformsTo	dct:Standard	This property refers to an Application Profile that the Dataset's metadata conforms to	0..1
change type	adms:status	skos:Concept	The status of the catalogue record in the context of editorial flow of the dataset and data service descriptions	0..1
listing date	dct:issued	rdfs:Literal typed as xsd:date, xsd:dateTime, xsd:gYear xsd:gYearMonth	This property contains the date on which the description of the Dataset was included in the Catalogue.	0..1

4.2.3. Optional properties for Catalogue Record

Property	URI	Range	Usage note	Card.
description	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
language	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
source metadata	dct:source	dcat:CatalogRecord	This property refers to the original metadata that was used in creating metadata for the Dataset	0..1
Title	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

4.3. Data Service

4.3.1. Mandatory properties for Data Service

Property	URI	Range	Usage note	Card
endpoint URL	dcats:endpointURL	rdfs:Resource	The root location or primary endpoint of the service (an IRI).	1..n
Title	dct:title	rdfs:Literal	This property contains a name given to the Data Service. This property can be repeated for parallel language versions of the name.	1..n

4.3.2. Recommended properties for Data Service

Property	URI	Range	Usage note	Card
endpoint description	dcats:endpointDescription	rdfs:Resource	This property contains a description of the services available via the end-points, including their operations, parameters etc. The property gives specific details of the actual endpoint instances, while dct:conformsTo is used to indicate the general standard or specification that the endpoints implement.	0..n
serves dataset	dcats:servesDataset	dcats:Dataset	This property refers to a collection of data that this data service can distribute.	0..n

4.3.3. Optional properties for Data Service

Property	URI	Range	Usage note	Card
access rights	dct:accessRights	dct:RightsStatement	This property MAY include information regarding access or restrictions based on privacy, security, or other policies.	0..1
description	dct:description	rdfs:Literal	This property contains a free-text account of the Data Service. This property can be repeated for parallel language versions of the description.	0..n
licence	dct:license	dct:LicenseDocument	This property contains the licence under which the Data service is made available.	0..1

4.4. Dataset

4.4.1. Mandatory properties for Dataset

Property	URI	Range	Usage note	Card
description	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
Title	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

4.4.2. Recommended properties for Dataset

Property	URI	Range	Usage note	Card
contact point	dcats:contactPoint	vcard:Kind	This property contains contact information that can be used for sending comments about the Dataset.	0..n
dataset distribution	dcats:distribution	dcats:Distribution	This property links the Dataset to an available Distribution.	0..n

Property	URI	Range	Usage note	Card
keyword/ tag	dcat:keyword	rdfs:Literal	This property contains a keyword or tag describing the Dataset.	0..n
publisher	dct:publisher	foaf:Agent	This property refers to an entity (organisation) responsible for making the Dataset available.	0..1
spatial/ geographical coverage	dct:spatial	dct:Location	This property refers to a geographic region that is covered by the Dataset.	0..n
temporal coverage	dct:temporal	dct:PeriodOfTime	This property refers to a temporal period that the Dataset covers.	0..n
theme/ category	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

4.4.3. Optional properties for Dataset

Property	URI	Range	Usage note	Card.
access rights	dct:accessRights	dct:RightsStatement	This property refers to information that indicates whether the Dataset is open data, has access restrictions or is not public.	0..1
creator	dct:creator	foaf:Agent	This property refers to the entity responsible for producing the dataset	0..n
conforms to	dct:conformsTo	dct:Standard	This property refers to an implementing rule or other specification.	0..n
documentation	foaf:page	foaf:Document	This property refers to a page or document about this Dataset.	0..n
frequency	dct:accrualPeriodicity	dct:Frequency	This property refers to the frequency at which the Dataset is updated.	0..1
has version	dct:hasVersion	dcat:Dataset	This property refers to a related Dataset that is a version, edition, or adaptation of the described Dataset.	0..n
identifier	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
is referenced by	dct:isReferencedBy	rdfs:Resource	This property is about a related resource, such as a publication, that references, cites, or otherwise points to the dataset.	0..n
is version of	dct:isVersionOf	dcat:Dataset	This property refers to a related Dataset of which the described Dataset is a version, edition, or adaptation.	0..n
landing page	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
language	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

Property	URI	Range	Usage note	Card.
other identifier	adms:identifier	adms:Identifier	This property refers to a secondary identifier of the Dataset, such as MAST/ADS ¹⁷ , DataCite ¹⁸ , DOI ¹⁹ , EZID ²⁰ or W3ID ²¹ .	0..n
provenance	dct:provenance	dct:ProvenanceStatement	This property contains a statement about the lineage of a Dataset.	0..n
qualified attribution	prov:qualifiedAttribution	prov:Attribution	This property refers to a link to an Agent having some form of responsibility for the resource	0..n
qualified relation	dcat:qualifiedRelation	dcat:Relationship	This property provides a link to a description of a relationship with another resource	0..n
related resource	dct:relation	rdfs:Resource	This property refers to a related resource.	0..n
release date	dct:issued	rdfs:Literal typed as xsd:date, xsd:dateTime, xsd:gYear xsd:gYearMonth or	This property contains the date of formal issuance (e.g., publication) of the Dataset.	0..1
sample	adms:sample	dcat:Distribution	This property refers to a sample distribution of the dataset	0..n
source	dct:source	dcat:Dataset	This property refers to a related Dataset from which the described Dataset is derived.	0..n
spatial resolution	dcat:spatialResolutionInMeters	rdfs:Literal typed as xsd:decimal	This property refers to the minimum spatial separation resolvable in a dataset, measured in meters.	0..1
temporal resolution	dcat:temporalResolution	rdfs:Literal typed as xsd:duration	This property refers to the minimum time period resolvable in the dataset.	0..1
Type	dct:type	skos:Concept	This property refers to the type of the Dataset. A recommended controlled vocabulary data-type is foreseen.	0..n
update/ modification date	dct:modified	rdfs:Literal typed as xsd:date, xsd:dateTime, xsd:gYear xsd:gYearMonth or	This property contains the most recent date on which the Dataset was changed or modified.	0..1
version	owl:versionInfo	rdfs:Literal	This property contains a version number or other version designation of the Dataset.	0..1
version notes	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
was generated by	prov:wasGeneratedBy	prov:Activity	This property refers to an activity that generated, or provides the business context for, the creation of the dataset.	0..n

¹⁷ Mikulski Archive for Space Telescopes (MAST). Referencing Data Sets in Astronomical Literature. http://archive.stsci.edu/pub_dsn.html

¹⁸ DataCite. <http://www.datacite.org/>

¹⁹ DOI. Digital Object Identifier. <http://www.doi.org/>

²⁰ EZID. <http://n2t.net/ezid>

²¹ W3C Permanent Identifier Community Group. Permanent Identifiers for the Web. <https://w3id.org/>

4.5. Distribution

4.5.1. Mandatory properties for Distribution

Property	URI	Range	Usage note	Card
access URL	dcats: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

4.5.2. Recommended properties for Distribution

Property	URI	Range	Usage note	Card
availability	dcats:availability	skos:Concept	This property indicates how long it is planned to keep the Distribution of the Dataset available.	0..1
description	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
format	dct:format	dct:MediaTypeOrExtent	This property refers to the file format of the Distribution.	0..1
licence	dct:license	dct:LicenseDocument	This property refers to the licence under which the Distribution is made available.	0..1

4.5.3. Optional properties for Distribution

Property	URI	Range	Usage note	Card
access service	dcats:accessService	dcats:DataService	This property refers to a data service that gives access to the distribution of the dataset	0..n
byte size	dcats:byteSize	rdfs:Literal typed as xsd:decimal	This property contains the size of a Distribution in bytes.	0..1
Checksum	spdx:checksum	spdx:Checksum	This property provides a mechanism that can be used to verify that the contents of a distribution have not changed. The checksum is related to the downloadURL.	0..1
compression format	dcats:compressFormat	dct:MediaType	This property refers to the format of the file in which the data is contained in a compressed form, e.g. to reduce the size of the downloadable file. It SHOULD be expressed using a media type as defined in the official register of media types managed by IANA.	0..1
Documentation	foaf:page	foaf:Document	This property refers to a page or document about this Distribution.	0..n
download URL	dcats:downloadURL	rdfs:Resource	This property contains a URL that is a direct link to a downloadable file in a given format.	0..n
has policy	odrl:hasPolicy	odrl:Policy	This property refers to the policy expressing the rights associated with the distribution if using the ODRL vocabulary	0..1
Language	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
linked schemas	dct:conformsTo	dct:Standard	This property refers to an established schema to which the described Distribution conforms.	0..n
media type	dcats:mediaType, subproperty of dct:format	dct:MediaType	This property refers to the media type of the Distribution as defined in the official register of media types managed by IANA.	0..1
packaging format	dcats:packageFormat	dct:MediaType	This property refers to the format of the file in which one or more data files are grouped together, e.g. to enable a set of related files to be downloaded together. It SHOULD be expressed using a media type as defined in the official register of media types managed by IANA.	0..1

Property	URI	Range	Usage note	Card.
release date	dct:issued	<code>rdfs:Literal</code> typed as <code>xsd:date</code> , <code>xsd:dateTime</code> , <code>xsd:gYear</code> or <code>xsd:gYearMonth</code>	This property contains the date of formal issuance (e.g., publication) of the Distribution.	0..1
Rights	dct:rights	<code>dct:RightsStatement</code>	This property refers to a statement that specifies rights associated with the Distribution.	0..1
spatial resolution	dcat:spatialResolutionInMeters	<code>rdfs:Literal</code> typed as <code>xsd:decimal</code>	This property refers to the minimum spatial separation resolvable in a dataset distribution, measured in meters.	0..1
status	adms:status	<code>skos:Concept</code>	the status of the distribution in the context of maturity lifecycle. It MUST take one of the values Completed, Deprecated, Under Development, Withdrawn.	0..1
temporal resolution	dcat:temporalResolution	<code>xsd:duration</code>	This property refers to the minimum time period resolvable in the dataset distribution.	0..1
Title	dct:title	<code>rdfs:Literal</code>	This property contains a name given to the Distribution. This property can be repeated for parallel language versions of the description.	0..n
update/modification date	dct:modified	<code>rdfs:Literal</code> typed as <code>xsd:date</code> , <code>xsd:dateTime</code> , <code>xsd:gYear</code> or <code>xsd:gYearMonth</code>	This property contains the most recent date on which the Distribution was changed or modified.	0..1

4.6. Agent

4.6.1. Mandatory property for Agent

Property	URI	Range	Usage note	Card.
Name	foaf:name	<code>rdfs:Literal</code>	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

4.6.2. Recommended property for Agent

Property	URI	Range	Usage note	Card.
Type	dct:type	<code>skos:Concept</code>	This property refers to a type of the agent that makes the Catalogue or Dataset available	0..1

4.7. Category Scheme

4.7.1. Mandatory property for Category Scheme

Property	URI	Range	Usage note	Card.
Title	dct:title	<code>rdfs:Literal</code>	This property contains a name of the category scheme. May be repeated for different versions of the name	1..n

4.8. Category

4.8.1. Mandatory property for Category

Property	URI	Range	Usage note	Card.
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preferred label	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
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4.9. Checksum

4.9.1. Mandatory properties for Checksum

Property	URI	Range	Usage note	Card.
algorithm	spdx:algorithm	spdx:checksumAlgorithm_sha1	This property identifies the algorithm used to produce the subject Checksum.	1..1
checksum value	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

4.10. Identifier

4.10.1. Mandatory property for Identifier

Property	URI	Range	Usage note	Card.
notation	skos:notation	rdfs:Literal typed with the URI of one of the members of the DataCite Resource Identifier Scheme ²²	This property contains a string that is an identifier in the context of the identifier scheme referenced by its datatype.	1..1

4.11. Licence Document

4.11.1. Recommended property for Licence Document

Property	URI	Range	Usage note	Card.
licence type	dct:type	skos:Concept	This property refers to a type of licence, e.g. indicating 'public domain' or 'royalties required'.	0..n

4.12. Location

4.12.1. Recommended properties for Location

Property	URI	Range	Usage note	Card.
bounding box	dcat:bbox	rdfs:Literal	This property refers to the geographic bounding box of a resource.	0..1
centroid	dcat:centroid	rdfs:Literal	This property refers to the geographic center (centroid) of a resource.	0..1

Please note that the order of usage is as follows : use the most specific geospatial relationship by preference. E.g. if the spatial description is a bbox, use dcat :bbox, otherwise use locn:geometry

4.12.2. Optional properties for Location

Property	URI	Range	Usage note	Card.
geometry	locn:geometry	rdfs:Literal	This property associates any resource with the corresponding geometry	0..1

²² DataCite Resource Identifier Scheme.
<http://purl.org/spar/datacite/ResourceIdentifierScheme>

4.13. Period of Time

4.13.1. Recommended properties for Period of Time

Property	URI	Range	Usage note	Card.
start date	dcate:startDate	rdfs:Literal typed as xsd:date, xsd:dateTime, xsd:gYear or xsd:gYearMonth	This property contains the start of the period	0..1
end date	dcate:endDate	rdfs:Literal typed as xsd:date, xsd:dateTime, xsd:gYear or xsd:gYearMonth	This property contains the end of the period	0..1

Please note that while both properties are recommended, 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)

4.13.2. Optional properties for Period of Time

Property	URI	Range	Usage note	Card.
beginning	time:hasBeginning	time:Instant	This property contains the beginning of a period or interval.	0..1
end	time:hasEnd	time:Instant	This property contains the end of a period or interval	0..1

4.14. Relationship

4.14.1. Mandatory properties for Relationship

Property	URI	Range	Usage note	Card.
had role	dcate:hadRole	dcate:Role	This property refers to the function of an entity or agent with respect to another entity or resource.	1..n
relation	dct:relation	rdfs:Resource	This property refers to the resource related to the source resource.	1..n

5. CONTROLLED VOCABULARIES

5.1. Requirements for controlled vocabularies

The following is a list of requirements that were identified for the controlled vocabularies to be recommended in this Application Profile.

Controlled vocabularies SHOULD:

- Be published under an open licence.
- Be operated and/or maintained by an institution of the European Union, by a recognised standards organisation or another trusted organisation.
- Be properly documented.
- Have labels in multiple languages, ideally in all official languages of the European Union.
- Contain a relatively small number of terms (e.g. 10-25) that are general enough to enable a wide range of resources to be classified.
- Have terms that are identified by URIs with each URI resolving to documentation about the term.
- Have associated persistence and versioning policies.

These criteria do not intend to define a set of requirements for controlled vocabularies in general; they are only intended to be used for the selection of the controlled vocabularies that are proposed for this Application Profile.

5.2. Controlled vocabularies to be used

In the table below, a number of properties are listed with controlled vocabularies that MUST be used for the listed properties. The declaration of the following controlled vocabularies as mandatory ensures a minimum level of interoperability.

Property URI	Used Class for	Vocabulary name	Vocabulary URI	Usage note
dc:mediaType	Distribution	IANA Media Types ²³	http://www.iana.org/assignments/media-types/media-types.xhtml	
dc:theme	Dataset	Dataset Theme Vocabulary	http://publications.europa.eu/resource/authority/data-theme	The values to be used for this property are the URIs of the concepts in the vocabulary.
dc:themeTaxonomy	Catalogue	Dataset Theme Vocabulary	http://publications.europa.eu/resource/authority/data-theme	The value to be used for this property is the URI of the vocabulary itself, i.e. the concept scheme, not the URIs of the concepts in the vocabulary.
dct:accrualPeriodicity	Dataset	EU Vocabularies Frequency	http://publications.europa.eu/resource/authority/frequency	

²³ Internet Assigned Numbers Authority (IANA). Media Types
<http://www.iana.org/assignments/media-types/>

Property URI	Used for Class	Vocabulary name	Vocabulary URI	Usage note
		Named Authority List ²⁴		
dct:format	Distribution	EU Vocabularies File Type Named Authority List ²⁵	http://publications.europa.eu/resource/authority/file-type	
dct:language	Catalogue, Dataset, Catalogue Record, Distribution	EU Vocabularies Languages Named Authority List ²⁶	http://publications.europa.eu/resource/authority/language	
dct:publisher	Catalogue, Dataset	EU Vocabularies Corporate bodies Named Authority List ²⁷	http://publications.europa.eu/resource/authority/corporate-body	The Corporate bodies NAL must be used for European institutions and a small set of international organisations. In case of other types of organisations, national, regional or local vocabularies should be used.
dct:spatial	Catalogue, Dataset	EU Vocabularies Continents Named Authority List ²⁸ , EU Vocabularies Countries Named Authority List ²⁹ , EU Vocabularies Places Named Authority List ³⁰ , Geonames	http://publications.europa.eu/resource/authority/continent/ , http://publications.europa.eu/resource/authority/country , http://publications.europa.eu/resource/authority/place/ , http://sws.geonames.org/	The EU Vocabularies Name Authority Lists must 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 must be used.

²⁴ EUROPA. Publications Office of the EU. EU Vocabularies. Controlled Vocabularies. Authority tables. Frequency. <https://publications.europa.eu/en/web/eu-vocabularies/at-dataset/-/resource/dataset/frequency>

²⁵ EUROPA. Publications Office of the EU. EU Vocabularies. Controlled Vocabularies. Authority tables. File type. <https://publications.europa.eu/en/web/eu-vocabularies/at-dataset/-/resource/dataset/file-type>

²⁶ EUROPA. Publications Office of the EU. EU Vocabularies. Controlled Vocabularies. Authority tables. Language. <https://publications.europa.eu/en/web/eu-vocabularies/at-dataset/-/resource/dataset/language/>

²⁷ EUROPA. Publications Office of the EU. EU Vocabularies. Controlled Vocabularies. Authority tables. Corporate body. <https://publications.europa.eu/en/web/eu-vocabularies/at-dataset/-/resource/dataset/corporate-body/>

²⁸ EUROPA. Publications Office of the EU. EU Vocabularies. Controlled Vocabularies. Authority tables. Continent <https://publications.europa.eu/en/web/eu-vocabularies/at-dataset/-/resource/dataset/continent>

²⁹ EUROPA. Publications Office of the EU. EU Vocabularies. Controlled Vocabularies. Authority tables. Country. <https://publications.europa.eu/en/web/eu-vocabularies/at-dataset/-/resource/dataset/country>

³⁰ EUROPA. Publications Office of the EU. EU Vocabularies. Controlled Vocabularies. Authority tables. Place. <https://publications.europa.eu/en/web/eu-vocabularies/at-dataset/-/resource/dataset/place>

Property URI	Used Class for	Vocabulary name	Vocabulary URI	Usage note
adms:status	Distribution	ADMS status vocabulary	http://purl.org/adms/status/	The list of terms in the ADMS status vocabulary is included in the ADMS specification ³¹
dct:type	Agent	ADMS publisher type vocabulary	http://purl.org/adms/publisher-type/	The list of terms in the ADMS publisher type vocabulary is included in the ADMS specification
dct:type	Licence Document	ADMS licence type vocabulary	http://purl.org/adms/licence-type/	The list of terms in the ADMS licence type vocabulary is included in the ADMS specification
dcatap:availability	Distribution	Distribution availability vocabulary	http://publications.europa.eu/resource/authority/planned-availability	The list of terms for the availability levels of a dataset distribution in the DCAT-AP specification.
spdx:algorithm	Checksum	Checksum algorithm members	https://spdx.org/rdf/terms/#d4e1968	The members listed are considered a controlled vocabulary of supported checksum algorithms.
dct:accessRights	Dataset, Data Service	Access Rights Named Authority List	http://publications.europa.eu/resource/authority/access-right	Use one of the following values (:public, :restricted, :non-public).

In the table below, a number of properties are listed with controlled vocabularies that MAY be used for the listed properties. The declaration of the following controlled vocabularies as recommended stimulates interoperability.

Property URI	Used Class for	Vocabulary name	Vocabulary URI	Usage note
dct:type	Dataset	Dataset-type authority table	http://publications.europa.eu/resource/dataset/dataset-type	This list of terms provide types of datasets. Its main scope is to support dataset categorisation of the EU Open Data Portal.

5.3. Other controlled vocabularies

In addition to the proposed common vocabularies in section 5.2, which are mandatory to ensure minimal interoperability, implementers are encouraged to publish and to use further region or domain-specific vocabularies that are available online. While those may not be recognised by general implementations of the Application Profile, they may serve to increase interoperability across applications in the same region or

³¹ European Commission. Joinup. Asset Description Metadata Schema (ADMS). <https://joinup.ec.europa.eu/solution/asset-description-metadata-schema-adms>

domain. Examples are the full set of concepts in EuroVoc³², the CERIF standard vocabularies³³, the Dewey Decimal Classification³⁴ and numerous other schemes.

5.4. Licence vocabularies

Concerning licence vocabularies, implementers are encouraged to use widely recognised licences such as Creative Commons licences³⁵, and in particular the CC Zero Public Domain Dedication³⁶, the Open Data Commons Public Domain Dedication and License (PDDL)³⁷, the European Union Public Licence (EURL)³⁸ or an open government licence such as the UK Open Government Licence³⁹.

Further activities in this area are undertaken by the Open Data Institute⁴⁰ with the Open Data Rights Statement Vocabulary⁴¹ and by the Open Digital Rights Language (ODRL) Initiative⁴².

³² EuroVoc. <http://eurovoc.europa.eu/>.

³³ http://www.eurocris.org/Uploads/Web%20pages/CERIF-1.5/CERIF1.5_Semantics.xhtml

³⁴ OCLC. Dewey Summaries as Linked Data. <http://www.oclc.org/dewey/webservices.en.html> and <http://dewey.info/>

³⁵ Creative Commons. About The Licenses. <http://creativecommons.org/licenses/>

³⁶ Creative Commons. CC0 1.0 Universal (CC0 1.0) Public Domain Dedication. <http://creativecommons.org/publicdomain/zero/1.0/>

³⁷ Open Data Commons Public Domain Dedication and License (PDDL). <http://opendatacommons.org/licenses/pddl/>

³⁸ European Commission. Joinup. Open Source Software. European Union Public Licence (EURL). <https://joinup.ec.europa.eu/collection/eupl>

³⁹ The National Archives. Open Government Licence for public sector information. <http://www.nationalarchives.gov.uk/doc/open-government-licence/version/2/>

⁴⁰ Open Data Institute. <http://www.theodi.org/>

⁴¹ Open Data Institute. Open Data Rights Statement Vocabulary. <http://schema.theodi.org/odrs/>

⁴² Open Digital Rights Language (ODRL) Initiative. <http://www.w3.org/community/odrl/>

6. CONFORMANCE STATEMENT

6.1. Provider requirements

In order to conform to this Application Profile, an application that provides metadata **MUST**:

- Provide a description of the Catalogue, including at least the mandatory properties specified in section 4.1.1.
- Provide information for the mandatory properties specified in section 4.2.1, if descriptions of Catalogue Records are provided – please note that the provision of descriptions of Catalogue Records is optional.
- Provide descriptions of Datasets in the Catalogue, including at least the mandatory properties specified in section 4.4.1.
- Provide descriptions of Distributions, if any, of Datasets in the Catalogue, including at least the mandatory properties specified in section 4.5.1.
- Provide descriptions of Data Services, if any, of Datasets in the Catalogue, including at least the mandatory properties specified in section 4.3.1
- Provide descriptions of all organisations involved in the descriptions of Catalogue and Datasets, including at least the mandatory properties specified in section 4.6.1.
- Provide descriptions of all category schemes that contain the categories that are asserted in any of the descriptions of Datasets in the Catalogue, including at least the mandatory properties specified in section 4.7.1.
- Provide descriptions of all categories involved in the descriptions of Datasets in the Catalogue, including at least the mandatory properties specified in section 4.8.1.

For the properties listed in the table in section 5.1 , the associated controlled vocabularies **MUST** be used. Additional controlled vocabularies **MAY** be used.

In addition to the mandatory properties, any of the recommended and optional properties defined in section 4 **MAY** be provided.

Recommended and optional classes may have mandatory properties, but those only apply if and when an instance of such a class is present in a description.

6.2. Receiver requirements

In order to conform to this Application Profile, an application that receives metadata **MUST** be able to:

- Process information for all classes specified in section 3.
- Process information for all properties specified in section 4.
- Process information for all controlled vocabularies specified in section 5.2.

As stated in section 3, "processing" means that receivers must accept incoming data and transparently provide these data to applications and services. It does neither

imply nor prescribe what applications and services finally do with the data (parse, convert, store, make searchable, display to users, etc.).

7. AGENT ROLES

The DCAT Application Profile specified in this document has a single property to relate an Agent (typically, an organisation) to a Dataset. The only such 'agent role' that can be expressed in the current version of the profile is through the property `dct:publisher` (<http://purl.org/dc/terms/publisher>), defined as "An entity responsible for making the dataset available". A second property is available in the DCAT recommendation, `dcat:contactPoint` (http://www.w3.org/TR/vocab-dcat/#Property:dataset_contactPoint), defined as "Link a dataset to relevant contact information which is provided using VCard", but this is not an agent role as the value of this property is contact data, rather than a representation of the organisation as such.

In specific cases, for example in exchanging data among domain-specific portals, it may be useful to express other, more specific agent roles. In such cases, extensions to the base profile may be defined using additional properties with more specific meanings.

Two possible approaches have been discussed, particular in the context of the development of the domain-specific GeoDCAT Application Profile, an extension of the base DCAT Application Profile.

The first possible approach is based on the use of a predicate vocabulary that provides a set of properties that represent additional types of relationships between Datasets and Agents. For example, properties could be defined, such as `foo:owner`, `foo:curator` or `foo:responsibleParty`, in addition to the use of existing well-known properties, such as `dct:creator` and `dct:rightsHolder`. A possible source for such additional properties is the Roles Named Authority List⁴³ maintained by the Publications Office of the EU. Other domain-specific sources for additional properties are the INSPIRE Responsible Party roles⁴⁴, the Library of Congress' MARC relators⁴⁵ and DataCite's contributor types⁴⁶. To enable the use of such properties, they must be defined as RDF properties with URIs in a well-managed namespace.

⁴³ EUROPA. Publications Office of the EU. EU Vocabularies. Controlled Vocabularies. Authority tables. Roles. <https://publications.europa.eu/en/web/eu-vocabularies/at-dataset/-/resource/dataset/role>

⁴⁴ European Commission. INSPIRE Registry. Responsible Party Role. <http://inspire.ec.europa.eu/metadata-codelist/ResponsiblePartyRole/>

⁴⁵ Library of Congress. MARC Code List for Relators. <http://loc.gov/marc/relators/relaterm.html>

⁴⁶ DataCite Metadata Schema for the Publication and Citation of Research Data, version 3.1. In: https://schema.datacite.org/meta/kernel-3/doc/DataCite-MetadataKernel_v3.1.pdf, Appendix 1, table 5.

A second approach is based on the use of W3C's PROV ontology⁴⁷ which provides a powerful mechanism to express a set of classes, properties, and restrictions that can be used to represent and interchange provenance information generated in different systems and under different contexts. In the context of work on GeoDCAT-AP, a PROV-conformant solution for expressing agent roles was agreed⁴⁸. This solution uses `prov:qualifiedAttribution` in combination with a `dct:type` assertion pointing to the code list for Responsible Party Role in the INSPIRE registry. To enable the use of such types, they must be defined with URIs in a well-managed namespace.

Based on the experience gained with the use of domain-specific extensions for additional 'agent roles' in the exchange of information about Datasets and on the requests of implementors and stakeholders, the DCAT Application Profile release 2.0.0 is extended with additional roles as proposed by DCAT Version 2, W3C Working Draft 28 May 2019⁴⁹ that have proven to be useful across domains. Precisely, properties `dct:creator`, `prov:qualifiedAttribution` and `dcate:qualifiedRelation` have been added to `dcate:dataset` class to further facilitate relationships between datasets and agents.⁵⁰

It should be noted that, even if a more expressive approach is used in a particular implementation, the provision of information using `dct:publisher` for the Catalogue is still mandatory under the rules laid down in the Conformance Statement in section 6, while the provision of information using `dct:publisher` is strongly recommended for Dataset. The provision of such information using `dct:publisher` will ensure interoperability with implementations that use the basic approach of DCAT-AP.

⁴⁷ W3C. PROV-O: The PROV Ontology. W3C Recommendation 30 April 2013. <http://www.w3.org/TR/prov-o/>

⁴⁸ European Commission. Joinup. DCAT application profile for data portals in Europe. GeoDCAT-AP – How to express the different responsible party roles supported in ISO 19115 / INSPIRE. <https://joinup.ec.europa.eu/discussion/geodcat-ap-how-express-different-responsible-party-roles-supported-iso-19115-inspire>

⁴⁹ DCAT Version 2, W3C Working Draft 28 May 2019 <https://www.w3.org/TR/2019/WD-vocab-dcat-2-20190528/>

⁵⁰ <https://www.w3.org/TR/vocab-dcat-2/#qualified-attribution>

8. ACCESSIBILITY AND MULTILINGUAL ASPECTS

Accessibility in the context of this Application Profile is limited to information about the technical format of distributions of datasets. The properties `dcat:mediaType` and `dct:format` provide information that can be used to determine what software can be deployed to process the data. The accessibility of the data within the datasets needs to be taken care of by the software that processes the data and is outside of the scope of this Application Profile.

Multilingual aspects related to this Application Profile concern all properties whose contents are expressed as strings (i.e. `rdfs:Literal`) with human-readable text. Wherever such properties are used, the string values are of one of two types:

- The string is free text. Examples are descriptions and labels. Such text may be translated into several languages.
- The string is an appellation of a 'named entity'. Examples are names of organisations or persons. These names may have parallel versions in other languages but those versions don't need to be literal translations.

Wherever values of properties are expressed with either type of string, the property can be repeated with translations in the case of free text and with parallel versions in case of named entities. For free text, e.g. in the cases of titles, descriptions and keywords, the **language tag** is mandatory.

Language tags to be used with `rdfs:Literal` are defined by BCP47⁵¹, which allows the use of the "t" extension for text transformations defined in RFC6497⁵² with the field "t0"⁵³ indicating a machine translation.

A language tag will look like: "en-t-es-t0-abcd", which conveys the information that the string is in English, translated from Spanish by machine translation using a tool named "abcd".

For named entities, the language tag is optional and should only be provided if the parallel version of the name is strictly associated with a particular language. For example, the name 'European Union' has parallel versions in all official languages of the union, while a name like 'W3C' is not associated with a particular language and has no parallel versions.

For linking to different language versions of associated web pages (e.g. landing pages) or documentation, a content negotiation⁵⁴ mechanism may be used whereby different content is served based on the Accept-Languages indicated by the browser.

⁵¹ Internet Engineering Task Force (IETF). BCP47. Tags for Identifying Languages. <http://tools.ietf.org/html/bcp47>

⁵² Internet Engineering Task Force (IETF). BCP47 Extension T – Transformed Content. <http://tools.ietf.org/html/rfc6497>

⁵³ UNICODE Consortium. CLDR - Unicode Common Locale Data Repository. BCP47, transform_mt.xml. http://unicode.org/cldr/trac/browser/trunk/common/bcp47/transform_mt.xml

⁵⁴ Apache Web Server: content negotiation. <http://httpd.apache.org/docs/current/content-negotiation.html>

Using such a mechanism, the link to the page or document can resolve to different language versions of the page or document.

All the occurrences of the property `dct:language`, which can be repeated if the metadata is provided in multiple languages, **MUST** have a URI as their object, not a literal string from the ISO 639 code list.

How multilingual information is handled in systems, for example in indexing and user interfaces, is outside of the scope of this Application Profile.

9. ACKNOWLEDGEMENTS

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The members of the Working Group:

Name	Organisation
Øystein Åsnes	DIFI, Norway
Leda Bargiotti	PwC EU Services
Peter Biro	
Valérie Brasse	IS4RI, France
Georges Charlot	Centre d'Informatique pour la Région Bruxelloise (CIRB), Belgium
Pieter Colpaert	MultiMedia Lab, Ghent University, iMinds, Belgium
Marco Combetto	Informatica Trentina, Italy
Alex D.	Sciamlab, Italy
Michiel de Keyser	PwC EU Services
Makx Dekkers	AMI Consult, EU
Anastasia Dimou	University of Ghent
Benjamin Dittwald	Fraunhofer FOKUS, Germany
Martin Dürst	W3C
Simon Dutkowski	Fraunhofer FOKUS, Germany
Jan Dvorak	
Udo Einspanier	con terra, Germany
Enrico Francesconi	ITTIG-CNR, Italy
Emilio García	Ministerio de Hacienda y Administraciones Públicas, Spain
Stijn Goedertier	PricewaterhouseCoopers, Belgium
Christopher Gutteridge	University of Southampton, UK
Bart Hanssens	Fedict, Belgium
Pascal Heus	Integrated Data Management Services and Metadata Technology North America, USA
Norbert Hohn	Publications Office of the European Union, Luxembourg
Antonio Ibáñez Pascual	Junta de Castilla y León, Spain
Carlos Iglesias	Spain
Athanasios Karalopoulos	European Commission
Dominik Klauser	Bundeskansleramt, Austria
Stefanos Kotoglou	PwC EU Services
Javier Lacasta Miguel	University of Zaragoza
Deirdre Lee	Derilinx, Ireland
Nikolaos Loutas	PwC EU Services

Carlo Marchetti	SenatodellaRepubblica, Italy
Florian Marienfeld	Fraunhofer FOKUS, Germany
Andrea Maurino	University of Milano-Bicocca, Italy
Michael Ostling	MetaGIS, Sweden
Hans Overbeek	KOOP Kennis- en Exploitatiecentrum Officiële Overheidspublicaties, Netherlands
Theodoros Papadopoulos	Ministry of Administrative Reform and E-Governance, Greece
José Pastor Camarasa	Publications Office of the European Union, Luxembourg
Andrea Perego	Joint Research Centre (JRC)
VassiliosPeristeras	European Commission
Hannes Reuter	EUROSTAT, Luxembourg
Pascal Romain	Conseil général de la Gironde, France
Antonio Rotundo	Agenzia per l'Italia Digitale (AgID), Italy
Martin Seiler	Bundesamt für Kartographie und Geodäsie, Germany
Enric Staromiejski	Everis, Belgium
AngelosTzotsos	National Technical University of Athens, Greece
Jorgen Van Den Langenbergh	PwC EU Services
Willem Van Gemert	Publications Office of the European Union, Luxembourg
Bert Van Nuffelen	TenForce, Belgium
Brecht Wyns	PwC EU Services
Agnieszka Zajac	Publications Office of the European Union, Luxembourg
Suzanne Wigard	European Commission
Fidel Santiago	European Commission
Adina Dragan	DT4EU Consortium

Annex I. QUICK REFERENCE OF CLASSES AND PROPERTIES

Class	Class URI	Mandatory prop.	Recommended prop.	Optional properties
Agent	foaf:Agent	foaf:name	dct:type	
Category	skos:Concept	skos:prefLabel		
Category Scheme	skos:ConceptScheme	dct:title		
Catalogue	dcat:Catalog	dcat:dataset dct:description dct:publisher dct:title	foaf:homepage dct:language dct:license dct:issued dcat:themeTaxonomy dct:modified dct:spatial	dcat:catalog dct:creator dct:hasPart dct:isPartOf dcat:record dct:rights dcat:service
Catalogue Record	dcat:CatalogRecord	dct:modified foaf:primaryTopic	dct:conformsTo adms:status dct:issued	dct:description dct:language dct:source dct:title
Checksum	spdx:Checksum	spdx:algorithm spdx:checksumValue		
Data Service	Dcat:DataService	dcat:endpointURL dct:title	dcat:endpointDescription dcat:servesDataset	dct:accessRights dct:description dct:license
Dataset	dcat:Dataset	dct:description dct:title	dcat:contactPoint dcat:distribution dcat:keyword dct:publisher dct:spatial dct:temporal dcat:theme	adms:identifier adms:sample adms:versionNotes dcat:landingPage dcat:spatialResolutionInMeters dcat:temporalResolution dcat:qualifiedRelation dct:accessRights dct:accrualPeriodicity dct:conformsTo dct:creator dct:hasVersion dct:isReferencedBy dct:isVersionOf dct:identifier dct:issued dct:language dct:modified dct:provenance dct:relation dct:source dct:type foaf:page owl:versionInfo prov:qualifiedAttribution prov:wasGeneratedBy
Distribution	dcat:Distribution	dcat:accessURL	dcatap:availability dct:description dct:format dct:license	adms:status dcat:accessService dcat:byteSize dcat:compressFormat dcat:downloadURL dcat:mediaType dcat:packageFormat dcat:spatialResolutionInMeters dcat:temporalResolution dct:conformsTo dct:issued dct:language dct:modified dct:rights dct:title foaf:page odrl:hasPolicy spdx:checksum
Document	foaf:Document			
Frequency	dct:Frequency			
Identifier	adms:Identifier	skos:notation		

Kind	vcard:Kind			
Licence Document	dct:LicenseDocument		dct:type	
Licence Type	skos:Concept			
Linguistic System	dct:LinguisticSystem			
Literal	rdfs:Literal			
Location	dct:Location		dcat:bbox dcat:centeroid	locn:geometry
Media Type	dct:MediaType			
Period Of Time	dct:PeriodOfTime		dcat:startDate dcat:endDate	time:hasBeginning time:hasEnd
Publisher Type	skos:Concept			
Relationship	dcat:Relationship	dct:relation dcat:hadRole		
Resource	rdfs:Resource			
Rights Statement	dct:RightsStatement			
Role	dcat:Role			
Standard	dct:Standard			
Status	skos:Concept			

Annex II. CHANGE LOG

The table below summarises the changes applied to the current release of the DCAT-AP.

URI	Type	Action	Description	Issue	Release
foaf:primaryTopic	Mandatory property (Catalogue Record)	Update	Extended the range to cover the dcat:Resource subclasses dcat:Catalog, dcat:Dataset and dcat:DataService	DCAT-AP-92	2.0
dct:MediaTypeOrExtent	Optional Class	Deleted	A media type or extent, e.g. the format of a computer file	DCAT-AP-80	2.0
dct:MediaType	Optional Class	New	A media type, e.g. the format of a computer file	DCAT-AP-80	2.0
dct:language	property	Update	Align with w3C DCAT 2.0: add to usage of controlled vocabulary for all usages	DCAT-AP-88	
dcat:mediaType	Optional Property (Distribution)	Update	Updates Range: dct:MediaTypeOrExtent →dct:MediaType	DCAT-AP-80	2.0
loct:geometry	Optional property (Location)	New	Range: rdfs:Literal This property associates any resource with the corresponding geometry	DCAT-AP-85	2.0
dcat:bbox	Recommended property (Location)	New	Range: rdfs:Literal This property refers to the geographic bounding box of a resource.	DCAT-AP-85	2.0
dcat:centroid	Recommended property (Location)	New	Range: rdfs:Literal This property refers to the geographic center (centroid) of a resource	DCAT-AP-85	2.0
time:hasEnd	Optional property (Period Of Time)	New	Range: time:Instant This property contains the end of a period or interval.	DCAT-AP-84	2.0
time:hasBeginning	Optional property (Period Of Time)	New	Range: time:Instant This property contains the beginning of a period or interval.	DCAT-AP-84	2.0
dcat:endDate	Recommended property (Period Of Time)	New	Range: rdfs:Literal typed as xsd:date or xsd:dateTime This property contains the end of the period	DCAT-AP-83	2.0
dcat:startDate	Recommended property (Period Of Time)	New	Range: rdfs:Literal typed as xsd:date or xsd:dateTime This property contains the start of the period	DCAT-AP-83	2.0
schema:endDate	Optional property (Period Of Time)	Deleted	Range: rdfs:Literal typed as xsd:date or xsd:dateTime This property contains the end of the period/time	DCAT-AP-83	2.0
schema:startDate	Optional property (Period Of Time)	Deleted	Range: rdfs:Literal typed as xsd:date or xsd:dateTime This property contains the start of the period/time	DCAT-AP-83	2.0
dcat:Role	Optional class	New	A role is the function of a resource or agent with respect to another resource, in the context of resource attribution or resource relationships.	DCAT-AP-82	2.0
dct:relation	Mandatory property (Relationship)	New	Range: rdfs:Resource This property refers to the resource related to the source resource.	DCAT-AP-81	2.0
dcat:hadRole	Mandatory property (Relationship)	New	Range: dcat:Role This property refers to the function of an entity or agent with respect to another entity or resource.	DCAT-AP-81	2.0
dcat:Relationship	Optional class	New	An association class for attaching additional information to a relationship between DCAT Resources	DCAT-AP-81	2.0
odrl:hasPolicy	Optional property (Distribution)	New	Range: odrl:Policy	DCAT-AP-77	2.0

			This property refers to the policy expressing the rights associated with the distribution if using the ODRL vocabulary		
dcat:accessService	Optional property (Distribution)	New	Range: dcat :DataService This property refers to a data service that gives access to the distribution of the dataset	DCAT-AP-77	2.0
dcat:spatialResolutionInMeters	Optional property (Distribution)	New	Range: xs :decimal This property refers to the minimum spatial separation resolvable in a dataset distribution, measured in meters.	DCAT-AP-78	2.0
dcat:temporalResolution	Optional property (Distribution)	New	Range:xsd:duration This property refers to the minimum time period resolvable in the dataset distribution.	DCAT-AP-78	2.0
dcat:compressFormat	(Optional property (Distribution)	New	Range: dct:MediaType This property refers to the format of the file in which the data is contained in a compressed form, e.g. to reduce the size of the downloadable file.	DCAT-AP-79, DCAT-AP-95, DCAT-AP-79	2.0
dcat:packageFormat	Optional property (Distribution)	New	Range: dct:MediaType This property refers to the format of the file in which one or more data files are grouped together, e.g. to enable a set of related files to be downloaded together.	DCAT-AP-79, DCAT-AP-95, DCAT-AP-79	2.0
dct:isReferencedBy	Optional property (Dataset)	New	Range : rdfs :Resource This property is about a related resource, such as a publication, that references, cites, or otherwise points to the dataset.	DCAT-AP-75	2.0
dcat:qualifiedRelation	Optional property (Dataset)	New	Range dcat :Relationship This property provides a link to a description of a relationship with another resource	DCAT-AP-75	2.0
dct:creator	Optional property (Dataset)	New	Range:foaf:Agent This property refers to the entity primarily responsible for producing the dataset	DCAT-AP-75	2.0
prov:qualifiedAttribution	Optional property (Dataset)	New	Range: prov:Attribution This property refers to a link to an Agent having some form of responsibility for the resource	DCAT-AP-75	2.0
prov:wasGeneratedBy	Optional property (Dataset)	New	Range: prov:Activity This property refers to an activity that generated, or provides the business context for, the creation of the dataset.	DCAT-AP-75	2.0
dcat:spatialResolutionInMeters	Optional property (Dataset)	New	Range: xsd:decimal This property refers to the minimum spatial separation resolvable in a dataset, measured in meters.	DCAT-AP-76	2.0
dcat:temporalResolution	Optional property (Dataset)	New	Range: xsd :duration This property refers to the minimum time period resolvable in the dataset.	DCAT-AP-76	2.0
dcat:service	Optional property (Catalogue)	New	Range: dcat :DataService This property refers to a site or end-point that is listed in the catalog.	DCAT-AP-72	2.0
dcat:catalog	Optional property (Catalogue)	New	Range : dcat :Catalog This property refers to a catalog whose contents are of interest in the context of this catalog	DCAT-AP-72	2.0
dct:creator	Optional property (Catalogue)	New	Range foaf :Agent This property refers to the entity primarily responsible for producing the catalogue	DCAT-AP-72	2.0
dct:accessRights	Optional property (Data Service)	New	Range : dct:RightsStatement This property MAY include information regarding access or restrictions based on privacy, security, or other policies.	DCAT-AP-73	2.0
dct:description	Optional property (Data Service)	New	Range : rdfs:Literal This property contains a free-text account of the Data Service. This property can be repeated for parallel language versions of the description.	DCAT-AP-73	2.0
dct:license	Optional property (Data Service)	New	Range: dct:LicenseDocument This property contains the licence under which the service is made available.	DCAT-AP-73	2.0

dcats:dataset	Recommended property (Data Service)	New	Range : dcats:Dataset This property refers to a collection of data that this data service can distribute.	DCAT-AP-73	2.0
dcats:endpointDescription	Recommended property (Data Service)	New	Range : This property contains a description of the services available via the end-points, including their operations, parameters etc. The property gives specific details of the actual endpoint instances, while dct:conformsTo is used to indicate the general standard or specification that the endpoints implement.	DCAT-AP-73	2.0
dcats:endPointURL	Mandatory property (Data Service)	New	Range : rdfs:Resource The root location or primary endpoint of the service (an IRI).	DCAT-AP-73	2.0
dct:title	Mandatory property (Data Service)	New	Range : rdfs:Literal This property contains a name given to the Data Service. This property can be repeated for parallel language versions of the name.	DCAT-AP-73	2.0
dcats:DataService	Optional Class	New	Range : A collection of operations that provides access to one or more datasets or data processing functions.	DCAT-AP-73	2.0
dcats:availability	Recommended property (Distribution)	New	Range skos:Concept This property indicates how long it is planned to keep the Distribution of the Dataset available. It MUST take one of the values: temporary, experimental, available, stable.	DCAT-AP-40	2.0
adms:status (Catalog Record)	Controlled vocabulary	Removed	<i>Removed : The ADMS change type vocabulary http://purl.org/adms/change-type/ (:created, :updated, :deleted) does not exist and has been removed from the specification.</i>	DCAT-AP-45	2.0
dct:spatial	Recommended property (Catalog)	Updated	<i>Updates</i> Optional property → Recommended property	DCAT-AP-3	2.0
dct:spatial	Recommended property (Dataset)	Updated	<i>Updates</i> Optional property → Recommended property	DCAT-AP-9	2.0
dct:temporal	Recommended property (Dataset)	Updated	<i>Updates</i> Optional property → Recommended property	DCAT-AP-64	2.0
schema:startDate schema:endDate	UML schema	Updated	<i>Updates : Reversed the order of the properties startDate and endDate from dct:PeriodOfTime</i>	DCAT-AP-50	1.2.1
dcats:theme dcats:themeTaxonomy dct:accrualPeriodicity dct:format dct:language dct:publisher dct:spatial	Controlled Vocabularies	Updated	<i>Updates</i> http://publications.europa.eu/mdr/authority/data-theme/ → http://publications.europa.eu/resource/authority/data-theme , http://publications.europa.eu/mdr/authority/data-theme/ → http://publications.europa.eu/resource/dataset/data-theme , http://publications.europa.eu/mdr/authority/frequency/ → http://publications.europa.eu/resource/authority/frequency , http://publications.europa.eu/mdr/authority/file-type/ → http://publications.europa.eu/resource/authority/file-type , http://publications.europa.eu/mdr/authority/language/ → http://publications.europa.eu/resource/authority/language , http://publications.europa.eu/mdr/authority/corporate-body/ → http://publications.europa.eu/resource/authority/corporate-body , http://publications.europa.eu/mdr/authority/continent/ → http://publications.europa.eu/resource/authority/continent/ ,	DCAT-AP-54	1.2.1

			http://publications.europa.eu/mdr/authority/country/ → http://publications.europa.eu/resource/authority/country/ , http://publications.europa.eu/mdr/authority/place/ → http://publications.europa.eu/resource/authority/place/ .		
dct:type	Recommended property (Licence Document)	Updated	<i>Updates</i> Cardinality: 0..1 → 0..n This property can be repeated in the case that multiple licence types apply to a licence document.	DCAT AP-1	1.2
adms:versionNotes	Optional property (Dataset)	Updated	<i>Updates</i> Cardinality: 0..1 → 0..n This property can be repeated for parallel language versions of the version notes.	CO4	1.1
dcat:contactPoint	Recommended property (Dataset)	Updated	<i>Updates</i> URI: adms:contactPoint→dcat:contactPoint Range: VCard→vCard:Kind	MO8	1.1
dct:LicenseDocument	Recommended class	Updated	<i>Updates</i> Optional class → recommended class	OB4	1.1
dct:Location	Optional class	Updated	Added reference to GeoDCAT-AP for expression of co-ordinates	IM4	1.1
dct:source	Optional property (CatalogRecord)	New	Range: dcat:CatalogRecord This property links to the original metadata that was used in creating metadata for the Dataset	MO5	1.1
owl:versionInfo	Optional property (Dataset)	Updated	<i>Updates</i> URI: adms:version→owl:versionInfo	CO4	1.1
spdx:algorithm	Mandatory property (Checksum)	New	Range: spdx:checksumAlgorithm_sha1 Cardinality: 1..1 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.	PR1	1.1
spdx:Checksum	Optional class	New	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.	PR1	1.1
spdx:checksum	Optional property (Dataset)	New	Range: spdx:Checksum Cardinality: 0..1 This property provides a mechanism that can be used to verify that the contents of a Distribution have not changed	PR1	1.1
spdx:checksumValue	Mandatory property (Checksum)	New	Range: rdfs:Literal typed as xsd:hexBinary Cardinality: 1..1 This property provides a lower case hexadecimal encoded digest value produced using a specific algorithm.	PR1	1.1
vCard:Kind	Optional class	Updated	<i>Updates</i> Class name: VCard → Kind URI: VCard →vcard:Kind The class Kind is the parent class for the four explicit types of vCards (Individual, Organization, Location, Group).	MO4	1.1
dct:language	Optional property (Catalogue Record)	New	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.	PR28	1.1
dct:provenance	Optional property (Dataset)	New	Range: dct:ProvenanceStatement This property contains a statement about the lineage of a Dataset.	PR6 , PR13 , PR14 , MO5	1.1
dct:source	Optional property (Dataset)	New	Range: dcat:Dataset This property refers to a related Dataset from which the described Dataset is derived.	PR6 , PR13 , PR14 , MO5	1.1

dct:accessRights	Optional property (Dataset)	New	Range: dct:RightsStatement This property refers to information that indicates whether the Dataset is open data, has access restrictions or is not public.	PR2 , PR3	1.1
dct:hasVersion	Optional property (Dataset)	New	Range: dcat:Dataset This property refers to a related Dataset that is a version, edition, or adaptation of the described Dataset.	PR5 , PR16 , MO12	1.1
dct:isVersionOf	Optional property (Dataset)	New	Range: dcat:Dataset This property refers to a related Dataset of which the described Dataset is a version, edition, or adaptation.	PR5 , PR16 , MO12	1.1
dct:relation	Optional property (Dataset)	New	Range: rdfs:Resource This property refers to a related resource.	PR19 , MO12	1.1
foaf:page	Optional property (Dataset)	New	Range: foaf:Document This property refers to a page or document about this Dataset.	PR19 , PR26	1.1
dcat:mediaType	Controlled vocabulary	Updated	Modifications: MDR list → IANA types	PR22 , VO3	1.1
dct:spatial	Controlled vocabulary	Updated	Modifications: Added recommendation to use sws.geonames.org if the needed place is not listed in the MDR	VO9	1.1
dct:isPartOf	Optional property (Catalogue)	New	Range: dcat:Catalog This property refers to a related Catalogue in which the described Catalogue is physically or logically included.	nesting	1.1
adms:sample	Optional property (Dataset)	New	This property is related to sample(s) of the dataset	PR21	1.1
foaf:page	Optional Property (Distribution)	New	A page or document about this Distribution	M02	1.1
dct:hasPart	Optional property (Catalogue)	New	Range: dcat:Catalog This property refers to a related Catalogue that is part of the described Catalogue	nesting	1.1
dcat:themeTaxonomy	Controlled vocabulary	Updated	Modification Changed the recommendation to use new EU Data Theme vocabulary proposed by the Publications Office instead of EuroVoc. Added clarification that value is the URI of the concept scheme, not of the concepts	VO2	1.1
dcat:theme	Controlled vocabulary	Updated	Modifications: Changed the recommendation to use terms from the new EU Data Theme vocabulary proposed by the Publications Office instead of EuroVoc domains. URI: dct:theme → dcat:theme	VO2	1.1
dct:type	Optional Property (Dataset)	New	This property refers to a type of the Dataset		1.1
dct:conformsTo	Recommended Property (Catalogue Record)	New	This property refers to an Application Profile that the Dataset's metadata conforms to		1.1
dct:accrualPeriodicity	Controlled vocabulary	Updated	Modification Changed the recommendation to use terms from the Frequency Name Authority List maintained by the Publications Office instead of the Dublin Core Collection Description Frequency Vocabulary		1.1
dcat:landingPage	Optional property (Dataset)	Updated	Updates Cardinality: 0..1 → 0..n	Issuelink	1.1

Further textual changes (release 1.2):

- Updated the change management process in chapter 1 as now is based on Change and Release Management Policy for DCAT-AP.
- Updated Figure 1 - DCAT Application Profile UML Class Diagram

- Added column Release in the change log table
- Editorial fix in the quick reference in Annex I

Further textual changes (release 1.2.1):

- Updated Figure 1 - DCAT Application Profile UML Class Diagram
- Updated references 21-27 and 41 to point from Metadata Registry (MDR) to EU Vocabularies
- In section 5.2 Controlled vocabularies to be used, updated the entries in table column "Vocabulary name" (MDR-> EU Vocabularies)
- MDR has been replaced with EU Vocabularies within text.
- Updated Joinup references: 6, 13, 28, 35, 36, 46.

Further textual changes (release 2.0.0)

- Throughout the document, links are made clickable
- Apply various typo fixes indicated in the public review
- Page 15, Table 4.4.3, Optional properties for Distribution, the usage note for adms :status property has been updated to include « It MUST take one of the values Completed, Deprecated, Under Development, Withdrawn »
- Page 8, the following namespaces has been added :
 - vann : <http://purl.org/vocab/vann/>
 - dcatap: <http://data.europa.eu/r5r/>
 - voaf : <http://purl.org/vocommons/voaf/#>
 - odrl : <http://www.w3.org/ns/odrl/2/>
 - locn : <http://www.w3.org/ns/locn#>
- section 4. Added explanatory paragraph on the relationship with W3C DCAT 2.0
- Page 29, updated text to reflect agent roles and their relations to dataset using new added properties.
- Section 9, added list of contributors.

Bugfix release 2.0.1

- See <https://github.com/SEMICeu/DCAT-AP/labels/release%3A2.0.1-june2020>
- corrections to the prefix mappings
- insert the reference to the recommendation URL of DCAT

- fix the dcterms version to the version of 012-06-14, since a new release of dcterms has been done since nov 2019.
- corrections to the shacl templates
- small editorial changes
- version bumping from 2.0.0 to 2.0.1

Minor release 2.1.0

- The extended changelog can be found in github.

Bugfix release 2.1.1

- The extended changelog can be found in github.

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