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EUROPEAN STANDARD

Data Solutions (DATA);
Data catalogue implementation framework;
Guidelines for Data Catalogue Framework

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Reference
DEN/DATA-00304199

Keywords
DATA, data collection, data interoperability,
data sharing, semantic, terms, vocabulary

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Foreword

This European Standard (EN) has been produced by ETSI Technical Committee Data Solutions (DATA).

National transposition dates	
Date of adoption of this EN:	2 November 2026
Date of latest announcement of this EN (doa):	28 February 2027
Date of latest publication of new National Standard or endorsement of this EN (dop/e):	31 August 2027
Date of withdrawal of any conflicting National Standard (dow):	31 August 2027

Modal verbs terminology

In the present document "**shall**", "**shall not**", "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the ETSI Drafting Rules (Verbal forms for the expression of provisions).

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Introduction

The present document is developed in the context of the European Commission's Standardisation Request C(2025) 4135 [i.1] addressing article 33 of the Data Act (Regulation (EU) 2023/2854 [i.22]).

This standardization request foresees the joint development by ETSI and CEN/CENELEC of seven deliverables, ETSI is primarily responsible for deliverables 4 and 5, while the other deliverables have a primary responsibility of CEN/CENELEC.

The present document addresses the 4th deliverable (The Data Catalogue Implementation Framework), and it aims at making the data within European data spaces visible, findable, and therefore ready for supporting the trusted data transactions concept.

It ensures that data products, including data catalogues, datasets, and their distributions, are described in a consistent way.

Its relation to the other deliverables is sequential and interdependent:

- The Harmonised standards on Trusted Data Transactions (Deliverables 1-3) define how to share data securely and fairly. The present document ensures that data products are structured, described, and listed in a consistent way across all sectors. It is an essential precursor to enable the automated execution of transactions (the goal of Deliverables 1-3).
- Regarding the implementation framework for semantic assets (Deliverable 5): the present document standardizes the metadata for discovery (e.g. title, publisher, availability), the subsequent deliverable on semantic assets provides the meaning of the data itself. They are complementary: the catalogue framework allows one to find a data product, while the semantic assets framework ensures its content can be correctly interpreted. Both are critical for full data and semantic interoperability.
- Regarding Quality and Maturity (Deliverables 6 and 7), a standardized catalogue is a key indicator of mature internal data governance (Deliverable 6) and is a measurable feature for assessing the maturity of a data space itself (Deliverable 7). A participant's ability to register and manage assets in a shared catalogue reflects the quality of their data governance.

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1 Scope

The present document provides a framework for standardized catalogue metadata in data spaces, in support of the publication and discovery of data products and to assure findability of data products within and across data spaces.

The present document:

a) sets out the common catalogue metadata, the minimum set to be applied across all common European data spaces;

b) establishes rules on the setting out of catalogue metadata extensions, specific to a domain-specific data space or to a specific data spaces set.

2 References

2.1 Normative 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.

Referenced documents which are not found to be publicly available in the expected location might be found in the ETSI docbox.

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The following referenced documents are necessary for the application of the present document.

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[1] European Commission: "DCAT Application Profile for data portals in Europe".

[2] European Commission: "DCAT-AP reuse guidelines".

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.

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The following referenced documents may be useful in implementing an ETSI deliverable or add to the reader's understanding, but are not required for conformance to the present document.

[i.1] Commission Implementing Decision C(2025)4135 of 1.7.2025 on a standardisation request to the European standardisation organisations as regards a European Trusted Data Framework in support of Regulation (EU) 2023/2854 of the European Parliament and of the Council.

[i.2] SEMIC - Interoperable Europe.

[i.3] European Commission: "GeoDCAT Application Profile for data portals in Europe".

[i.4] mobilityDCAT-AP: "A mobility extension for the DCAT application profile for data portals in Europe".

[i.5] European Union: "StatDCAT Application Profile for data portals in Europe".

[i.6] HealthDCAT-AP Literacy.

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[i.7] European Data Portal.

[i.8] EPOS-DCAT-AP: "An extension of the DCAT Application Profile for Research Infrastructures in the solid-Earth domain".

[i.9] ETSI TS 103 757: "SmartM2M; Asynchronous Contact Tracing System; Fighting pandemic disease with Internet of Things (IoT)".

[i.10] LanguageDCAT-AP.

[i.11] W3C® Recommendation 22 August 2024: "Data Catalog Vocabulary (DCAT) - Version 3".

[i.12] ETSI TR 104 244: "Data Solutions (DATA); Implementation of Data Catalogues with NGSI-LD and DCAT-AP".

[i.13] W3C® Recommendation 16 July 2020: "JSON-LD 1.1".

[i.14] W3C® Recommendation 25 February 2014: "RDF 1.1 Turtle".

[i.15] W3C® Recommendation 20 July 2017: "Shapes Constraint Language (SHACL)".

[i.16] Commission Implementing Regulation (EU) 2023/138 of 21 December 2022 laying down a list of specific high-value datasets and the arrangements for their publication and re-use.

[i.17] W3C® Recommendation 15 February 2018: "ODRL Information Model 2.2".

[i.18] EN 18235-1: "Trusted Data Transactions - Part 1: Terminology, concepts and mechanisms", (produced by CEN).

[i.19] EN 18235-2: "Trusted Data Transactions - Part 2: Trustworthiness requirements", (produced by CEN).

[i.20] Language Data Space (LDS) procurement action CNECT/LUX/2022/OP/0026.

[i.21] The European Health Data Space Regulation (EHDS).

[i.22] Regulation (EU) 2023/2854 of the European Parliament and of the Council of 13 December 2023 on harmonised rules on fair access to and use of data and amending Regulation (EU) 2017/2394 and Directive (EU) 2020/1828 (Data Act).

[i.23] Commission Regulation (EC) No 1205/2008 of 3 December 2008 implementing Directive 2007/2/EC of the European Parliament and of the Council as regards metadata.

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3 Definition of terms, symbols, abbreviations and prefixes

3.1 Terms

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

catalogue metadata data model: data model describing the catalogue metadata used in a data space to increase the discoverability of data products within the data space and across other data spaces

data space rulebook: structured set of principles, processes, standards, protocols, rules and practices that guide and regulate the governance, management and operations within a data space to ensure effective and responsible leadership, control, and oversight

NOTE: See latest definition in EN 18235-2 [i.19].

The following terms are defined in EN 18235-1 [i.18]: **data**, **data catalogue**, **data user**, **data sharing/data exchange**, **data space participant**, **data product**, **data provider**, **data space**, **data transaction**, **metadata**, **trust**, **trusted data transaction**.

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3.2 Symbols

Void.

3.3 Abbreviations

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

ACT	Asynchronous Contact Tracing
AI	Artificial Intelligence
API	Advanced Programming Interface
BSSID	Basic Service Set Identifier
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CKAN	Comprehensive Knowledge Archive Network
CMEMS	Copernicus Marine Environment Monitoring Service
CNECT	Directorate-General for Communications Networks, Content and Technology
CoC	Code of Conduct
CSV	Comma-Separated Value
CSVW	Comma-Separated Value on the Web
CSW	Catalogue Service Web
CV	Controlled Vocabulary
DCAT	Data Catalogue vocabulary
DCAT-AP	Data Catalog vocabulary - Application Profile
DPV	Data Privacy Vocabulary
DQV	Data Quality Vocabulary
DSO	Distribution System Operator
ECDC	European Centre for Disease Prevention and Control
EHDS	European Health Data Space
EMS	Energy Management Systems
EPOS	European Plate Observing System
EPREL	European Product Registry for Energy Labelling
ESA	Energy Smart Appliances
EV	Electrical Vehicle
FAIR	Findable, Accessible, Interoperable, Reusable
GDPR	General Data Protection Regulation
GeoDCAT-AP	Geospatial DCAT-AP
GIS	Geographic Information System
HDAB	Health Data Access Bodies
HEMS	Home Energy Management Systems
HTML	HyperText Markup Language
HVAC	Heating, Ventilation, Air-Conditioning
HVD	High-Value Datasets
JSON	JavaScript Object Notation
LD	Linked Data
LDS	Language Data Space
LLM	Large Language Model
ML	Machine Learning
NAP	National Access Point
NAPCORE	National Access Point Coordination Organisation for Europe
NGO	Non-Governmental Organization
NGSI	Next Generation Service Interface
NGSI-LD	Next Generation Service Interface - Linked Data
OAI	Open Archives Initiative
ODRL	Open Digital Rights Language
PMH	Protocol for Metadata Harvesting
PROV	Provenance (Ontology)
RDF	Resource Description Framework
SAREF	Smart Applications REFference ontology
SHACL	Shapes Constraint Language
SKOS	Simple Knowledge Organization System

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SST	Sea Surface Temperature
TS	Technical Specification
UI	User Interface
URI	Uniform Resource Identifier
W3C	World Wide Web Consortium
XSLT	Extensible Stylesheet Language Transformations

3.4 Prefixes

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

This table is provided for information.

dcat:	http://www.w3.org/ns/dcat#
dcatap:	http://data.europa.eu/r5r/
dct:	http://purl.org/dc/terms/
s4ener:	https://saref.etsi.org/saref4ener/
epos:	https://www.epos-eu.org/epos-dcat-ap#
foaf:	http://xmlns.com/foaf/0.1/
rdf:	http://www.w3.org/1999/02/22-rdf-syntax-ns#
saref:	https://saref.etsi.org/core/
schema:	https://schema.org/
xsd:	http://www.w3.org/2001/XMLSchema#

4 Catalogue metadata data model

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4.1 Context

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Data spaces [2] are environments designed to enable trusted data sharing between participants.

A fundamental requirement for realizing trusted data transactions within a data space is that participants can publish and discover data products. To meet this requirement, a data space provides guidelines consisting of:

- a catalogue metadata data model for describing data products; and
- a catalogue infrastructure for fair discoverability.

Provision 4.1-1: These guidelines and any other data governance agreement shall be registered in a publicly available data space rulebook.

The term catalogue metadata refers to the machine-readable representation of a description of a data product.

Data products are often described in data catalogues by a combination of dataset, dataset series, data service and distribution concepts.

Data products are usually not bound to a single data space. Other data users participating in other data spaces can benefit from the provided data. Therefore, it is beneficial that data products can be discovered beyond the borders of a data space with a minimal publication effort. The present document sets a common basis for the metadata data model across data spaces.

To satisfy the requirements for a common metadata data model, the present document provides a reference metadata model. The present document shows how data spaces can make use of the reference metadata model to meet their needs.

The presented approach is not limited to data spaces. Any party involved in the development and implementation of data catalogues and metadata frameworks, aiming to make data assets discoverable, interoperable, and reusable, can find guidance in the presented approach.

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4.2 DCAT-AP as catalogue metadata data model

To ensure interoperability between data spaces, a common data model is needed. This data model provides the formal semantic underpinning of the metadata. Having a common data model does not exclude the presence, nor the use of alternative metadata representations. However, data spaces that opt for this choice are required to provide all necessary means to make their metadata interoperable with the data model.

General provisions for a metadata data model in a data space are given in provisions 4.2-1 to 4.2-5. Provisions 4.2-6 to 4.2-9 subsequently establish DCAT-AP as the reference data model.

Provision 4.2-1: A data space shall have a common catalogue metadata data model to describe a catalogue of data products.

The catalogue metadata data model contains at minimum the metadata required for the data space to function. This includes, but is not limited to, information on the data access methods supported by the data product and licence terms determining the legal usage conditions of the data product. Depending on the needs, the catalogue metadata data model should be able to capture provenance information, including aspects such as data collection methodology, data lineage or data quality.

Provision 4.2-2: The choice of a catalogue metadata data model for a data space is part of the data space governance and shall be included in the data space rulebook.

This catalogue metadata data model is primarily used for metadata describing data products listed in the data spaces' data catalogues, but it is also used in messages exchanged during the negotiation phase of a data transaction.

Provision 4.2-3: Every data catalogue in the data space shall support the catalogue metadata data model of the data space.

Provision 4.2-4: Metadata exchanged to establish or to execute a trusted data transaction in a data space shall conform to the metadata data model of the data space.

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The choice of a catalogue metadata data model for a data space is independent of the data format, access protocol, and access policy for metadata within the data space. It, however, shall be machine-readable and should be unambiguously transformable into RDF.

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Provision 4.2-5: The machine-readable data format, access protocol, and access policy for catalogue metadata within a data space are part of its data space governance and shall be included in the data space rulebook.

The Data Catalogue Application Profile (DCAT-AP) [1], developed and maintained by the SEMIC [i.2] community under the Interoperable Europe initiative, provides a mature, sustainable, and standardized framework for metadata description that enables different parties to interoperate at the semantic level. Its governance is organized as a public community guaranteeing access to the data model and enabling participation by any data space.

DCAT-AP [1] is a DCAT [i.11] profile. DCAT provides the universal terminology with minimal constraints. DCAT-AP augments DCAT with minimal metadata quality expectations, profiling and implementation guidelines for Europe.

DCAT-AP [1] is a data model for sharing information about catalogues containing dataset and data service descriptions in Europe. The core classes are the classes *catalogue*, *dataset*, *distribution* and *data service*. *Dataset series* enable further organizing datasets within a catalogue. Using these entities as building blocks, data products are usually a composition of the classes' dataset, distribution and data service. As data products will evolve over time, a modular approach for the description of data products facilitates the management of the information.

Provision 4.2-6: DCAT-AP [1] shall be used as the common data model.

A minimal model documenting the mandatory information for DCAT-AP can be found in [1].

Provision 4.2-7: The catalogue metadata data model shall be based on the terminology expressed in DCAT-AP for their metadata data model. Deviations or improvements shall be aligned with the DCAT-AP community. This common semantic basis guarantees interoperability across data spaces.

EXAMPLE: In DCAT-AP, a dataset is a conceptual entity, and a distribution is a downloadable expression of a dataset. Data spaces should not merge both notions into one entity in their metadata vocabulary.

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Provision 4.2-8: Data spaces shall align their catalogue metadata data model with DCAT-AP. The alignment can be either:

a) by using DCAT-AP; or

b) by using an extension of DCAT-AP; or

c) by mapping to DCAT-AP.

Dataspaces shall include the chosen approach(es) as part of the data space governance in the data space rulebook.

A data space is strictly aligned with DCAT-AP when all the metadata is exchanged according to DCAT-AP. Typically this is implemented by enforcing DCAT-AP based exchange of metadata by all the data catalogues present in the data space.

Further elaborations of the three alignment approaches are respectively provided in clauses 4.3.1, 4.3.2 and 4.3.3 of the present document.

Provision 4.2-9: The catalogue metadata data model shall be versioned to support the evolution of the data space and its alignment with new releases of DCAT-AP. The creation of the catalogue metadata data model should start from the most recent version of DCAT-AP. The catalogue metadata data model should include the version of DCAT-AP on which it is based. DCAT-AP guarantees the persistency of its versions.

Provision 4.2-10:

The data space rule book shall include:

- the catalogue metadata data model allowed according to the choice made in provision 4.2-8;
- the roles and responsibilities of the publishers of the catalogue metadata;
- the data catalogues for the metadata;
- the methodology and the KPI used to monitor the quality of the catalogue metadata.

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Data product publishers shall keep the metadata of the data products up to date and ensure their quality, to assure the well-functioning of the data space.

4.3 Guidelines for using DCAT-AP as catalogue metadata data model

4.3.1 Align the catalogue metadata data model with DCAT-AP

Clause 4.3 provides the guidance to data spaces to align their catalogue metadata data model with DCAT-AP.

The easiest and most straightforward approach is to use DCAT-AP directly.

Provision 4.3-1: Data spaces shall first explore whether this option satisfies their needs. DCAT-AP is a broad and flexible catalogue metadata data model addressing many needs already. Data space may, however, add additional guidance for their data product publishers to tailor the model for specific purposes.

4.3.2 Using DCAT-AP

The exploration can be done in various ways; here follows the description of a high-level constructive step-by-step process that incrementally creates a catalogue metadata data model for the data space strictly based on DCAT-AP.

The process starts with a data model consisting only of the DCAT-AP main classes and their mandatory attributes. This is the minimal information any DCAT-AP conformant data catalogue need to provide. (See DCAT-AP reuse guidelines [2], Step 1 (https://semiceu.github.io/DCAT-AP-reuse-guidelines/#step-1-familiarise-with-dcat-ap).)

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