



Requirements Analysis for a new Metadata Specification

A Report by subWG 4.4: NAP Metadata

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Author(s)	Petr Bureš, RSD; Peter Lubrich, BAST
Co-author(s)	Antonia Azzini / Marco Comerio / Mario Scrocca, Cefriel / Chrystomonos Mylonas, CERTH
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- To be revised by partners involved in the preparation of the document
- For review/ approval by the Core Alignment Team
- For approval by the NAPCORE Steering Committee

Abstract

The main objective of SWG 4.4 is to develop a “napDCAT-AP” specification, being an RDF-compatible representation of an agreed, Europe-wide metadata set for NAPs. The present report is a deliverable by Work Item “4.4.2.1 - Requirements analyses”, being a preparatory work for napDCAT-AP. The goal is to identify and to prioritise any requirements that need to be addressed by napDCAT-AP. The main outcome is a consolidated and structured table of requirements that will be considered by follow-up work of this SWG, namely the preparation and development of the napDCAT-AP data model and documentation.

Abbreviations

Abbreviation	Meaning
EC	European Commission
DCAT	Data Catalogue Vocabulary
DCAT-AP	DCAT Application profile for data portals in Europe
CMC	Coordinated Metadata Catalogue
NAP	National Access Point
NAPCORE	National Access Point Coordination Organisation for Europe
SWG	Sub-working Group

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1 Introduction

The present report is a deliverable by Work Item “4.4.2.1 - Requirements analyses”, being part of the NAPCORE sub working-group (SWG) “4.4 - NAP Metadata”.

The main objective of this SWG is to develop a “napDCAT-AP” specification, being an RDF-compatible representation of an agreed, Europe-wide metadata set for NAPs, based on the Coordinated Metadata Catalogue (CMC), and parallel DCAT-AP specifications. The CMC is an elaboration for NAP metadata harmonisation under the former EU EIP project¹. DCAT-AP is a well-established metadata specification in the domain of European Open Data portals, developed by a joint initiative of the EU organizations DG DIGIT, DG CONNECT and the EU Publications Office².

Before working on a first napDCAT-AP version, some preparations, i.e., analytical and conceptual works are needed first. Work Item 4.4.2.1 is one of such preparations. The goal here is to identify and to prioritise any requirements that need to be addressed by the upcoming napDCAT-AP specification. The Work Item was executed between November 2021 and May 2022. It was led by NAPCORE partner RSD (CZ), with contributing partners from BAST (DE) and Cefriel (IT).

The work is mainly based on a literature review, SWG 4.4 partners’ views and external experts’ inputs. For the literature review, we assumed that there are already many references that imply relevant requirements. These references might be previous research works, policy documents, or project documentation. Relevant references were collected from SWG members, and then structurally analysed via a template, containing a brief description of the reference, its purpose and its relevance for our work. For the SWG 4.4 partners’ views, we collected individual requirements by looking at different perspectives in the NAP context, again using a template. For the experts’ inputs, we consulted various experts working on the metadata topic, including authors from CMC, the DCAT-AP developers’ group, and selected NAP representatives.

The main outcome is a consolidated and structured table of requirements that will be considered by follow-up Work Items of this SWG, namely the preparation and development of the napDCAT-AP data model and documentation. The elicited list of requirements is also a “specification sheet” for our upcoming work, as it describes expected technical, organisational and functional features of napDCAT-AP.

¹ <https://www.its-platform.eu/achievement/monitoring-harmonisation-of-naps/>

² <https://joinup.ec.europa.eu/solution/dcat-application-profile-data-portals-europe/about>



2 Methodology

The goal of the document is to collect initial requirements for the definition of a metadata profile supporting the description of datasets published in European NAPs. In order to provide a rich picture, we have approached the analysis from 3 different viewpoints:

1. Literature review: Analysis of available literature, legislature, projects, and technical documentation, with a focus on metadata aspects,
2. SWG 4.4 partners' individual requirements, and
3. unstructured inputs from experts.

2.1 Literature review

For the literature review, we provided a master template and asked SWG 4.4 partners to review relevant literature, and summarise it using this template. Each reviewer was asked to upload the reviewed literature in a specific folder, and to describe his/her findings in the master template, containing:

- Intended audience (all project partners)
- Purpose of the document
- Methodology
- Literature review template itself

The key part of the review was a short commentary on its content and indication of **applicability for the metadata topic**. The structure of this template is shown in Figure 1.

Template

Ref short name of the reference group and number

Name of the document: title of filename (hyperlinked)

Folder: hyperlink to the SharePoint folder)

Date: upload date, WHO uploaded

Purpose: Short description of the document with context. Why it is useful to us, what exact parts and how we use it.

References

Add new document description HERE (on top of others)

Figure 1: Template for literature review

The requirements coming from the literature review were then processed in terms of relevant sources and contents. These are described later in Chapter 3.1.

2.2 Collection of SWG 4.4 partners' individual requirements

For the collection of requirements by individual SWG 4.4. partners, we initially defined a procedure to elicit requirements (presented at one of the SWG 4.4. meetings). The procedure was explained on an example including:

1. Unstructured question by a stakeholder (e.g., a NAP developer in an implementation phase)
2. Unstructured response to this question, i.e. resolution of the potential problem
3. Formulation of a requirement based on the unstructured "question" -> "answer" pairs.



Important for the requirements collection phase was to cover all stakeholders, therefore SWG 4.4 partners were asked to provide requirements, from their perspective:

- NAP developer: This perspective covers any issues when setting up a metadata catalogue in an individual NAP system. Such a database is usually built upon a certain data model (data fields, data types, data relationships etc.), for which our napDCAT-AP model should be a baseline, for interoperability reasons.
- NAP metadata provider: This perspective covers any needs of persons inserting metadata into a NAP, e.g., via a GUI. In many cases, the metadata provider is the same as the content data provider. This person might look for aspects of, e.g., clarity and efficiency when entering metadata.
- NAP metadata user: This perspective covers any needs of persons (or machines when using APIs) who read or seek metadata from a NAP. This actor might look for aspects of, e.g., expressiveness or usefulness when consuming metadata.
- Metadata standard experts: Lastly, as we build upon existing frameworks of other metadata specifications, we need to consider the experiences and expectations of experts from such other metadata specifications. This is particularly true for DCAT-AP, which explicitly provides guidelines and requirements for the extensions of DCAT-AP. The aspects considered here mainly focus on interoperability issues.

The initial template was further elaborated into a final requirements template, that contains additional fields used for classification and qualification of the requirement. The fields in the template are: (see also Figure 2):

- Identification
 - Identification: numeric or numeric with country information i.e., DE-01
 - Date and contact information
- Description of the requirement: a short and concise statement including “what” and “why”
- Category of the requirement:
 - Functional: requirements related to overall functionalities
 - Technical: requirements related to technical aspects such as access, distribution, vocabularies, etc.
 - Other: any additional category classification needed by a stakeholder
- Perspective of the requirement (see above):
 - NAP Developer
 - Metadata Expert
 - NAP metadata provider
 - NAP metadata user
 - Other: any additional perspective classification needed by a stakeholder
- Source of the requirement:
 - Interview: requirement based on experts' interview
 - Experience: requirement coming from the experience of the stakeholder when planning, implementing or maintaining a NAP
 - Project result: requirements collected as a result of a project focused on data sharing and reuse (literature review mostly)
 - Study: requirements collected from individual research papers or studies on data sharing and reuse
 - Other: any additional source classification needed by a stakeholder
- Notes: any interesting insight on why the requirement is important.

Requirement Number:	02
The requirement: (a short and clear statement)	xxx
Category: (Check with X)	Functional Technical Other: _____
The perspective: (Check with X)	NAP developer Metadata standard experts NAP metadata provider (=person who enters metadata) NAP metadata user (=person who reads/seeks metadata) Other: _____
The source: (Check with X)	Interview Own experience Outcome from project: _____ Outcome from study / paper: _____ Other: _____
Your name:	
Date:	
Notes:	

Figure 2: Template for individual requirements

The requirements coming from the SWG 4.4. partners were then processed in terms of perspectives and aspects considered. These are described later in Chapter 3.2.

2.3 Collection of inputs from experts

In this requirements collection input the active project members were asked to identify potential experts from the fields of open data / DCAT community and from projects identified in the literature review.

The experts should be interviewed by the partner to provide their insight / opinion regarding the metadata requirements during the partially structured interview or a collaborative workshop. There were no particular rules for the interview, the topics discussed should cover:

- Current state of the metadata in NAPs, potential improvements
- Practices regarding the metadata creation and governance that should be applied by NAPs
- Lessons to be learned from similar projects, how to involve the NAP community
- Any other aspect deemed important by the experts.

Chapter 3.3 summarizes the results of the interviews. Documents and responses collected during the interviews shall serve as the input for consolidated requirements in Chapter 4.

2.4 Consolidation

In the consolidation phase, the requirements were shortened and generalized. Similar requirements coming from different sources were merged. Also, an additional categorization of requirements was introduced to prioritise the activities of the SubWG 4.4:

- Mandatory requirements: Absolute must, as minimum
- Optional requirements: nice-to-have requirements but not necessary

The consolidation phase resulted in a “requirements consolidation table”, see Chapter 4.

3 Requirements analysis

3.1 Requirements from the literature review

Overall, 50 different resources were analysed from different project members and from different perspectives; 18 summaries were created with recommendations on usability. Resources were grouped into 6 categories:

- Open data literature (4 documents)
- Legislature: PSI (1 document), Open Data (1 document), INSPIRE Directive (4 documents) and data governance act, EU strategy
- DCAT-AP documentation, training webinars, and extensions documentation (several documents, examples and documentation, presentations)
- EU-EIP metadata documents (several documents including coordinated metadata catalogue, analyses, napDCAT-AP proposal etc.)
- Metadata standards and interoperability (several documents)
- Project results: SPRINT³ and LOD project

The individual literature review is provided in Annex 2, Chapter 2.

Useful resources for our metadata work are mainly related to different phases of the metadata specification, namely the planning, implementation and maintenance. In particular, we identified the following metadata relevant contents (the chapters in brackets indicate the analysed resource):

- data contents in the transport context together with implementation rules and requirements (Annex 2, Chapter 2.4)
- FAIR principles for data sharing (Annex 2, Chapter 2.2)
- requirements on development and sharing metadata (Annex 2, Chapter 2.5)
- contents of the catalogue and approaches to metadata (Annex 2, Chapter 2.6, 2.13, 2.15)
- information on how to build extensions (Annex 2, Chapter 2.7)
- metadata challenges and requirements (Annex 2, Chapter 2.10)
- overview of how to store and share metadata (Annex 2, Chapter 2.11)
- mappings between data concepts (Annex 2, Chapter 2.12)
- tools summary and existing ontologies comparison (Annex 2, Chapter 2.14)
- different requirements from national extensions (Annex 2, Chapter 2.16-17)

The information on requirements, coming from the identified, relevant resources, particularly from the SPRINT project which focused on the analysis of metadata profiles for the transportation domain, served as input to Chapter 4, i.e., the requirements consolidation.

3.2 Requirements from SWG 4.4. partners

Overall, 53 individual requirements were collected from 6 countries (BE, CY, CZ, DE, GR and IT), using templates as shown above in Table 2. Even if this is only a small sample of all European countries, the collected requirements still appear quite extensive, so the overall outcome presents a sufficient view

³ Semantics for Performant and scalable Interoperability of multimodal Transport (SPRINT) project
<http://sprint-transport.eu/>



of relevant requirements. Of course, other requirements might arise during the future napDCAT-AP elaborations, so our first collection might be extended later.

Any similarities between requirements were handled in the consolidation phase, see Chapter 4. An example response is shown next.

Requirement Number:	CZ 01
The requirement: (a short and clear statement)	The metadata catalogue shall contain information fields for schema (XSD, RGN, SHACL, ...) and samples, so the user has possibility to evaluate data before setting up consumption.
The perspective : (check with X)	NAP developer Metadata standard experts NAP metadata provider (=person who enters metadata) NAP metadata user (=person who reads/seeks metadata) <input checked="" type="checkbox"/> Other : data consumer / contents
The source: (check with X)	Interview <input checked="" type="checkbox"/> Own experience Outcome from project: _____ Outcome from study / paper: _____ Other: _____
Your name:	Petr Bureš
Date:	2022/04/05
Notes:	Based on current re-development of CZ NAP https://registr.dopravniinfo.cz/en/ , before setting up subscription to the data users could “peek” inside the data contents to know what to expect and prepare their systems.

Figure 3: Example for a requirement response

All individual responses are provided in Annex 2, Chapter 1.

The stakeholders classified the requirements into 6 types/categories:

- Content (new class): 18 requirements
- Existing vocabularies (new class): 6 requirements
- Functional: 14 requirements
- General (new class): 9 requirements
- Implementation (new class): 1 requirement
- Technical: 6 requirements

New requirement categories show that there is a need for more detailed classification and that formerly provided categories (functional, technical) were not sufficient. We focused on reclassification into relevant categories in the requirements consolidation phase.

With regards to the sources, stakeholders classified requirements accordingly:

- Own experience as NAP operator including implementation: 24 requirements
- Collected within specific projects:
 - SPRINT Project: 10 requirements
 - EU-EIP Project: 4 requirements
 - CMC development (within EU EIP project): 9 requirements
 - NAPCORE project (on-going activities): 1
- Experts' consultation: 12 requirements
- Studies: 1 requirement

Most of the requirements were based on the individual experience of stakeholders closely followed by requirements gathered within specific projects and interviews with experts. This finding is aligned with the categorisation of requirements according to the stakeholder perspective:

- Metadata experts (developers): 15 requirements
- NAP developer: 14 requirements
- NAP metadata provider: 13 requirements
- NAP metadata user: 15 requirements
- Other perspectives: 5 requirements

With regards to a NAP developer, we assume that various NAP functions are related to a metadata database, e.g., GUI interactions, administrative tasks for NAP operators, and metadata exchange with parties outside the NAP system (via APIs or harvesting). Thus, a NAP developer and the NAP operator might have special needs for the data model, which might be transferred into a requirement for napDCAT-AP. The collected inputs are mainly based on current NAP developments in BE, CZ and DE.

Further, interesting insights were provided by responders via individual notes associated with a requirement, where the rationale for the requirement is shortly summarized. This also allowed to shorten the text of the individual requirement.

3.3 Requirements from experts' input

The main experts' input came from an interview with the DCAT-AP developers' group. Before this interview, members of our SWG joined regular meetings of this group, to figure out current concepts and issues with DCAT-AP development, and to show presence in the DCAT-AP community.

Our envisioned napDCAT-AP specification is already recognised by the DCAT-AP group as a domain-specific profile, and listed in the DCAT-AP set of profiles (see the next figure). Thus, we expect that napDCAT-AP might be a complementary element to the landscape of DCAT-AP extensions, serving the needs of NAPs in particular, or of mobility data portals in general. However, we need to have a closer look at related extensions, such as TransportDCAT-AP, and tackle possible overlaps.



Figure 4: List of domain-specific profiles for DCAT-AP (@ DCAT-AP)

We intensified this exchange in a bilateral meeting between the DCAT-AP group and NAPCORE project partners. The meeting happened online on March 01, 2022. The goals of the meeting were to:

- get to know the vision of the new DCAT-AP extension under the NAPCORE project
- learn about general requirements for DCAT-AP extensions
- learn how NAPCORE can interact with the DCAT-AP or SEMIC community

The meeting was joined by the authors of this present report, on behalf of NAPCORE, and members from the Semantic Interoperability Community (SEMIC) team and from EC DG DIGIT, on behalf of DCAT-AP. Beforehand, the NAPCORE team provided a list of questions to the SEMIC team, about, e.g., guidelines and details for DCAT-AP extensions. The SEMIC team addressed all these questions, so we can reuse this feedback for our napDCAT-AP elaborations.

The meeting supported the requirements consolidation phase for napDCAT-AP (see chapter 4) and the work performed in the Work Item 4.4.2.2 for the definition of a roadmap towards napDCAT-AP. Overall, the meeting provided interesting and valuable insights into the DCAT-AP framework, and fostered a closer exchange with our napDCAT-AP development.

The minutes document from this meeting is provided as Annex 3.

Further experts' inputs were derived from the Coordinated Metadata Catalogue (CMC), being an antecessor of the metadata harmonisation activity in NAPCORE (see Chapter 1 and Figure 4).



Figure 5: Front page of the Coordinated Metadata Catalogue document by EU EIP

The elaboration of the CMC, as well as feedbacks of CMC users (mainly NAP developers), resulted in some comments and issues that might be addressed by napDCAT-AP. Such feedback includes the general wish to move from a proprietary CMC to a standardised DCAT-AP approach. Also, some questions and proposals were raised about individual metadata elements, as defined by the CMC.

Such inputs were summarized by BAST (DE), being one of the CMC authors, as an own document “EU EIP Coordinated Metadata Catalogue - A review”. This review is also used for the requirements consolidation (see chapter 4). The review document is provided as Annex 4.

4 Requirements consolidation

After the collection of requirements, as explained in Chapter 3, we consolidated all the elicited requirements re-organising the collected inputs (e.g., we handled overlaps and structured by topics), and producing a “requirements consolidation table”, which is presented below as Table 1.

This table is the main outcome of the requirements analysis, as presented in this report.

The consolidated table shows 40 requirements, divided by the following types:

- General: 8 requirements
- Existing Vocabularies: 5 requirements
- Content: 22 requirements
- Implementation: 5 requirements

Further, the 40 requirements were divided by the following levels of importance:

- Mandatory (the requirement should be addressed by napDCAT-AP from the start): 32 requirements
- Optional (the requirement might be addressed by napDCAT-AP, if found necessary during the project runtime, and if the project provides enough resources): 8 requirements

The following table compiles all requirements after the process shown above. Some key takeaways from this consolidation are explained later in Chapter 5 - Summary.

Table 1: Requirements consolidation table

ID	Type	Requirement	Perspective	Importance	Source	Contributor
Req-1	General	napDCAT-AP should address high-level requirements from literature on metadata including: expressiveness, richness, adequate data description, easy data access, context-sensitivity, modularity, detailed structure, strong typing and ruling, referential integrity and enable persistent identifiers.	NAP metadata user	Mandatory	Various literature ⁴ ; SPRINT project	DE, IT
Req-2	General	The napDCAT-AP specification should enable datasets to be discoverable, searchable and reusable , serve as a baseline for the development of a metadata database, allow a detailed description of the registry, its datasets and distributions and/or data services and allow aggregation and exchange of metadata.	NAP metadata user; NAP developer	Mandatory	Meeting with DCAT-AP experts; SPRINT project; EU EIP activity on NAP metadata; experience from DE NAP development	DE, IT
Req-3	General	napDCAT-AP-based metadata should be provided in both human-readable and machine-readable format.	NAP metadata user	Mandatory	SPRINT project	IT
Req-4	General	napDCAT-AP-based metadata should provide information in multiple languages .	NAP metadata user	Mandatory	SPRINT project	IT
Req-5	General	napDCAT-AP should adopt a standardised set of vocabularies to ensure semantic interoperability.	NAP metadata user	Mandatory	SPRINT project	IT
Req-6	General	napDCAT-AP should adopt a standard format/serialisation to ensure technological interoperability and automated access by means of software agents.	NAP metadata user; NAP developer	Mandatory	SPRINT project; EU EIP activity on NAP metadata; experience from DE NAP development	DE, IT
Req-7	General	The documentation of napDCAT-AP should be publicly available on the web without proprietary licenses. When possible, it should be annotated digitally, by means of a public repository. .	NAP developer	Mandatory	Own experience; Meeting with DCAT-AP experts;	DE, IT

⁴ Riley, J. (NISO). Understanding Metadata: What Is Metadata, and What Is It For?: A Primer. NISO Primer Series, 2017.

PwC EU Services. Cost of not having FAIR research data, 2018.

Jeffery, K. G., and A. Asserson. Data Intensive Science: Shades of Grey. No. 33, 2014

Mena-Garcés, E., E. García-Barriocanal, M. A. Sicilia, and S. Sánchez-Alonso. Moving from Dataset Metadata to Semantics in Ecological Research: A Case in Translating EML to OWL. No. 4, 2011.

Brauburger, N. Datenmarktplätze, Masterarbeit, TU Clausthal. 2021



ID	Type	Requirement	Perspective	Importance	Source	Contributor
Req-8	General	napDCAT-AP should support a maintenance cycle (issues/discussions/new releases). In particular, it should define governance processes and a revision methodology. It should allow for public commenting on its development and have an issues and releases planning tool. Issues and proposals should be discussed and resolved by the authors, and incorporated into follow-up releases of napDCAT-AP.	Metadata standard experts	Mandatory	Meeting with DCAT-AP experts; experience from DE NAP development; Good practice	CZ, DE, IT
Req-9	Existing Vocabularies	napDCAT-AP should consider the DCAT-AP vocabulary that is the European recommendation for data catalogues in Europe and is a well-known vocabulary guaranteeing interoperability also with data sources from other domains. In particular, it should reuse DCAT-AP classes and properties, where possible. Any additional classes and properties should be added in accordance with DCAT-AP extension rules.	Metadata standard experts	Mandatory	SPRINT project; Meeting with DCAT-AP experts	DE, IT
Req-10	Existing Vocabularies	napDCAT-AP should follow the ongoing evolution of DCAT-AP , i.e., consider developments and revisions of DCAT-AP.	Metadata standard experts	Optional	Meeting with DCAT-AP experts	DE
Req-11	Existing Vocabularies	napDCAT-AP should consider all metadata elements, as defined by the Coordinated Metadata Catalogue (CMC) to identify metadata that better fit the specific requirements of NAPs.	Metadata standard experts	Mandatory	SPRINT project; EU EIP activity on NAP metadata	DE, IT
Req-12	Existing Vocabularies	A metadata schema for NAPs should consider existing DCAT-AP extensions (es. geoDCAT-AP for geo-spatial data) and metadata specifications from the INSPIRE directive .	Metadata standard experts; NAP developer	Optional	Meeting with DCAT-AP experts; experience from CY NAP and BE NAP developments	IT, CY, BE
Req-13	Existing Vocabularies	When napDCAT-AP defines controlled vocabularies (or code lists), these should take into account already existing vocabularies in operational NAPs , to enable interoperability with existing solutions	NAP developer	Optional	Meeting with DCAT-AP experts; experience from DE NAP development	DE
Req-14	Content	napDCAT-AP should provide exhaustive metadata descriptions for the domain of mobility data , considering the emerging number and variety of mobility data sets.	NAP metadata user	Mandatory	EU EIP activity on NAP metadata and experience from other EU funded projects related to mobility data analysis	DE, GR

ID	Type	Requirement	Perspective	Importance	Source	Contributor
Req-15	Content	napDCAT-AP should propose essential metadata elements, which are relevant to any NAP (as a “minimum set of metadata for European NAPs”). Besides that, any further metadata elements should be allowed in individual NAP deployments.	NAP developer	Mandatory	Experience from DE NAP development	DE
Req-16	Content	napDCAT-AP should consider the canonical mappings between DCAT-AP and CMC to identify information that cannot be currently mapped in DCAT-AP.	Metadata standard experts NAP Developer	Mandatory	SPRINT project	IT
Req-17	Content	napDCAT-AP should support the description of metadata information : last date and time when the metadata set was created or last modified, the language in which the metadata is described, and the responsibility for creation and maintenance of the metadata.	NAP metadata provider/ user	Mandatory	CMC specification	IT
Req-18	Content	napDCAT-AP should support the description of the conditions of usage of the metadata itself.	NAP metadata provider/ user	Mandatory	Meeting with DCAT-AP experts	IT
Req-19	Content	napDCAT-AP should support the description of content information : name, a brief description, the type of resource (dataset or service), the dataset type category according to logical clustering or EC Delegated Regulations, the service type category listed in EU Delegated Regulation 2017/1926, the language, and the georeferencing method applied within the payload.	NAP metadata provider/ user	Mandatory	CMC specification, SPRINT project, and experience derived from ongoing activities of the NAPCORE project	IT, GR
Req-20	Content	napDCAT-AP should provide an indication of the Delegated Regulation (MMTIS, RTTI, SRTI, SSTP) covered by the dataset or service	NAP developer	Mandatory	experience from BE NAP development	BE
Req-21	Content	napDCAT-AP should support coordinated development of a controlled vocabulary to describe dataset/service content . Controlled vocabulary could be translated into local languages to allow for harmonization. It should be maintained and extendable, and be hosted by napDCAT-AP.	NAP metadata provider/ user	Mandatory	good practice	CZ
Req-22	Content	napDCAT-AP should support the description of temporal information : the period of time in which the publication of data does not expire.	NAP metadata provider/ user	Mandatory	CMC specification, SPRINT project	IT
Req-23	Content	napDCAT-AP should support the description of geographic information : the area covered by a dataset, the regions in which a dataset is valid and details on the transport network considered. (following existing and widely applicable functional classifications).	NAP metadata provider/ user	Mandatory	CMC specification, SPRINT project, transportDCAT-AP extension	IT, GR

ID	Type	Requirement	Perspective	Importance	Source	Contributor
Req-24	Content	napDCAT-AP should support the description of location referencing methods and CRS used in a dataset/service.	NAP metadata provider/user	Mandatory	good practice, experience from BE NAP development	CZ, BE
Req-25	Content	napDCAT-AP should support the description of transportation system information : describes the transportation modes and operators dealt with by the dataset.	NAP metadata provider/user	Mandatory	CMC specification, SPRINT project, transportDCAT-AP extension	IT
Req-26	Content	napDCAT-AP should support the description of information on responsibilities : who publishes and owns the datasets.	NAP metadata provider/user	Mandatory	CMC specification, SPRINT project	IT
Req-27	Content	napDCAT-AP should support the description of conditions for use : if there is a "License" or "Contract", and any other condition to use the data.	NAP metadata provider/user	Mandatory	CMC specification, SPRINT project	IT
Req-28	Content	napDCAT-AP should support the description of access information for data: encoding, syntax, grammar and data model.	NAP metadata provider/user	Mandatory	CMC specification, SPRINT project	IT
Req-29	Content	napDCAT-AP should support the description of data schema and data samples , so the user can evaluate data before setting up consumption.	NAP metadata provider/user	Mandatory	experience from CZ NAP development	CZ
Req-30	Content	napDCAT-AP should support the precise description of the data model adopted by a dataset , i.e., DATEX II version, publication type, extension, to allow better searching.	NAP metadata provider/user	Mandatory	experience from CZ NAP development	CZ
Req-31	Content	napDCAT-AP should support the description of quality information : the update rate, the quality criteria of the data set, the history and status of procedures to assess the compliance of the Delegated Regulations regarding the provisioning of data via a NAP.	NAP metadata provider/user	Mandatory	CMC specification	IT, GR
Req-32	Content	napDCAT-AP should specify the cardinalities and obligations for each metadata element (mandatory, recommended, optional). For such cardinalities, clear rules need to be established for NAP deployments (e.g. implications for database setups, GUI designs and API/harvesting mechanisms). Also, existing rules from DCAT-AP regarding such cardinalities need to be considered.	Metadata standard experts; NAP developer	Mandatory	Meeting with DCAT-AP experts; EU EIP activity on NAP metadata	DE, IT, GR
Req-33	Content	napDCAT-AP should define guidelines for identifiers .	Metadata standard experts	Optional	Meeting with DCAT-AP experts	IT

ID	Type	Requirement	Perspective	Importance	Source	Contributor
Req-34	Content	napDCAT-AP should define expected value ranges for each metadata element (e.g. by the usage of controlled vocabularies)	Metadata standard experts	Mandatory	Meeting with DCAT-AP experts	IT
Req-35	Content	napDCAT-AP should be able to track changes and different versions of metadata records on a NAP.	NAP metadata provider	Mandatory	SPRINT project	IT
Req-36	Implementation	napDCAT-AP should support the (automatic) validation of metadata adopting it.	Metadata standard experts	Optional	Meeting with DCAT-AP experts	IT
Req-37	Implementation	napDCAT-AP should provide usage rules in addition to the metadata definitions, including explanations of the semantics of each metadata element, advice how to relate these elements into NAP processes and other.	NAP developer	Mandatory	experience from DE NAP development	DE
Req-38	Implementation	napDCAT-AP should provide guidelines for cases with multiple resources for one dataset/service , i.e., provide guidelines and solutions to divide the metadata between the dataset and the resource.	NAP developer	Optional	experience from BE NAP development	BE
Req-39	Implementation	napDCAT-AP should provide guidelines on how to make NAP-specific metadata interoperable with other data portals (e.g., outside the mobility domain). This may include the handling of napDCAT-AP extensions when harvesting from other portals.	NAP developer	Optional	EU EIP activity on NAP metadata	DE
Req-40	Implementation	napDCAT should provide guidelines for a quality assurance process to check the quality of metadata collected on a NAP	NAP metadata user	Optional	SPRINT project	IT

5 Summary

The “Requirements Consolidation Table”, as presented in Chapter 4, presents a comprehensive catalogue of advice and assignments, to be considered by follow-up activities of NAPCORE SWG 4.4.

There are some up-front, **general requirements**, looking at, e.g., high-level requirements for a new metadata specification (see “Req-1” in the Table), including aspects of:

- Expressiveness,
- Richness,
- adequate description of the real data,
- easy access to the real data,
- context-sensitivity,
- modularity,
- detailed structure (=distinct metadata categories which are captured in form of specified metadata elements),
- strong typing and ruling,
- “referential integrity” (= a clear allocation of an identity to metadata elements in an unambiguous way), and
- enable persistent identifiers for data, datasets and metadata.

Further general advice looks at certain functionalities to be fulfilled by the napDCAT-AP specification (see “Req-2” in the Table):

- to make datasets, when offered on a NAP, discoverable, searchable and re-usable for national and international data consumers,
- to ensure a common understanding of the metadata content,
- to serve as a baseline for the development of a metadata database in an individual NAP,
- to allow for a detailed description of a NAP dataset registry, the datasets offered by such registry, and distributions or data services related to such data sets, and
- to allow for aggregation and exchange of metadata.

All of the above aspects, some of which we reflected by particular requirements, need to be kept in mind when developing and maintaining the envisioned napDCAT-AP model.

The remaining general requirements (see “Req-3” to “Req-8” in the Table) impose further technical and organisational prerequisites for napDCAT-AP.

There is also a series of requirements regarding **existing vocabularies** (see “Req-9” to “Req-13” in the Table), implying that we should build napDCAT-AP upon existing metadata definitions, where possible, instead of building a stand-alone approach. This would foster interoperability and acceptance with existing metadata domains and legacy systems.

The majority of the requirements is about **metadata contents** (see “Req-14” to “Req-35” in the Table). These correspond to information items which are seen as necessary to be covered by the napDCAT-AP model. Many of these requirements here can be translated into specific metadata elements, that might be modelled as classes or properties under the napDCAT-AP data model.

Finally, there are some requirements about **implementation** (see “Req-36” to “Req-40” in the Table), implicating approaches and methods to apply and host the envisioned napDCAT-AP specification in a real-life context.

We propose that all these requirements will be handled within NAPCORE SWG 4.4. as follows:

- **General requirements** are of interest for **any upcoming work item** of NAPCORE SWG 4.4.
- Requirements about **existing vocabularies and metadata contents** are of interest for the upcoming **Work Item 4.4.2.3 Conceptual model** and **Work Item 4.4.2.4 Draft specification**
- Requirements about **implementation** are of interest for any upcoming work under the **Task 4.4.3 “nap DCAT-AP back office”**

In summary, the consolidated table of requirements will be considered by follow-up Work Items of this SWG, during the preparation and development of the napDCAT-AP data model and documentation. This way, such requirements list is also a sort of a “specification sheet” for our upcoming work, as it describes expected technical, organisational, and functional features of napDCAT-AP.

The content of this report is integrated by the outcomes of the Work Item 4.4.2.2 “Approach towards napDCAT-AP specification” that, considering also the identified requirements, defines a roadmap based on guidelines and best practices for the definition, implementation and publication of napDCAT-AP as a DCAT-AP extension.

Annex 1: Individual requirements by SWG 4.4. partners

1.1. Germany

Rq. No.:	DE-00
The requirement:	The “NAPCORE Metadata Catalogue” should serve as a baseline for the development of a metadata database in a NAP.
Category	Functional
The perspective:	NAP developer
The source:	Own experience
Your name:	Peter Lubrich
Date:	2022/01/31
Notes:	Based on current re-development of DE NAP
Rq. No.:	DE-01
The requirement: (a short and clear statement)	<p>The harmonized metadata scheme should address some high-level requirements from literature on metadata:</p> <ul style="list-style-type: none"> • expressiveness • adequate description of the real data • easy access to the real data • context-sensitivity • modularity • detailed structure (=distinct metadata categories which are captured in form of specified metadata elements) • strong typing and ruling • “Referential integrity” (= a clear allocation of an identity to metadata elements in an unambiguous way) • enable persistent identifiers for data, datasets and metadata
Category	Technical
The perspective:	Metadata standard experts
The source:	<p>Outcome from study / paper:</p> <ul style="list-style-type: none"> • Riley, J. (NISO). Understanding Metadata: What Is Metadata, and What Is It For?: A Primer. NISO Primer Series, 2017. • PwC EU Services. Cost of not having FAIR research data, 2018. • Jeffery, K. G., and A. Asserson. Data Intensive Science: Shades of Grey. No. 33, 2014 • Mena-Garcés, E., E. García-Barriocanal, M. A. Sicilia, and S. Sánchez-Alonso. Moving from Dataset Metadata to Semantics in Ecological Research: A Case in Translating EML to OWL. No. 4, 2011. • Brauburger, N. Datenmarktplätze, Masterarbeit, TU Clausthal. 2021
Your name:	Peter Lubrich
Date:	2022/03/17

Notes:	
Rq. No.:	DE-02
The requirement: (a short and clear statement)	The harmonized metadata scheme should: <ul style="list-style-type: none"> • help to make data available and searchable for pan-European service providers, • ensure Metadata to be machine-readable, and • ensure a common understanding of the metadata content.
Category	Functional
The perspective:	Other: Author of EU EIP Coordinated Metadata Catalogue
The source:	Outcome from project: EU EIP
Your name:	Peter Lubrich
Date:	2022/03/17
Notes:	
Rq. No.:	DE-03
The requirement: (a short and clear statement)	The harmonization activity should provide exhaustive metadata descriptions for the domain of mobility data. This means we need to make mobility data sets more distinguishable and better findable, considering the emerging number and variety of mobility data sets.
Category	Functional
The perspective:	Other: Author of EU EIP Coordinated Metadata Catalogue
The source:	Outcome from project: EU EIP
Your name:	Peter Lubrich
Date:	2022/03/17
Notes:	
Rq. No.:	DE-04
The requirement: (a short and clear statement)	The harmonization activity should allow for mobility-related metadata descriptions, which still need to be interoperable with other data portals, outside the mobility domain. Mechanisms for interoperability need to be described. (For example, if you harvest your NAP metadata to an Open Data portal, a metadatum like "TRANSPORTATION MODES" may be transmitted, even if it will be likely ignored).
Category	Functional
The perspective:	Other: Author of EU EIP Coordinated Metadata Catalogue
The source:	Outcome from project: EU EIP
Your name:	Peter Lubrich
Date:	2022/03/17
Notes:	
Rq. No.:	DE-05
The requirement: (a short and clear statement)	When we describe harmonized metadata, we need to have a clear understanding of "mandatory", "recommended" and "optional"



	<p>metadata elements, and compare this understanding to DCAT-AP rules.</p> <p>For example, a “mandatory” element may mean the following:</p> <ul style="list-style-type: none"> • the NAP system can save such element within its database, • and/or such element can be entered by a manual metadata GUI in the NAP • and/or such element can be imported via an API/harvester to the NAP database • and/or such element can be exported via an API/harvester from the NAP database
Category	Functional
The perspective:	Other: Author of EU EIP Coordinated Metadata Catalogue
The source:	Outcome from project: EU EIP
Your name:	Peter Lubrich
Date:	2022/03/17
Notes:	
Rq. No.:	DE-06
The requirement: (a short and clear statement)	The “NAPCORE Metadata Catalogue” should serve as a baseline for the development of a metadata database in a NAP.
Category	Functional
The perspective:	NAP developer
The source:	Own experience
Your name:	Peter Lubrich
Date:	2022/01/31
Notes:	Based on current re-development of DE NAP
Rq. No.:	DE-07
The requirement: (a short and clear statement)	<p>The harmonization activity should only apply for essential Metadata elements, which are relevant to any NAP. We should follow the paradigm of the former Coordinated Metadata Catalogue to be a “minimum set of Metadata for NAPs”.</p> <p>Saying so, we should allow to add further, country-specific Metadata fields in individual NAP deployments.</p>
Category	Content
The perspective:	NAP developer
The source:	Own experience
Your name:	Peter Lubrich
Date:	2022/01/31
Notes:	Based on current re-development of DE NAP
Rq. No.:	DE-08
The requirement: (a short and clear statement)	The harmonized metadata scheme should be provided in an RDF-compatible format.

Category	Technical
The perspective:	NAP developer
The source:	Own experience
Your name:	Peter Lubrich
Date:	2022/01/31
Notes:	Based on current re-development of DE NAP
Rq. No.:	DE-09
The requirement: (a short and clear statement)	<p>Analogous to DCAT-AP, which serves certain functionalities, we need to define the functionalities of “napDCAT-AP”. Options are:</p> <ul style="list-style-type: none"> • Description of catalogues, datasets/distributions and data services • Aggregation and exchange of metadata • Expression of access rights and licences • Enabling faceted search through common data themes • Description of details of data to allow for automated processing
Category	Functional
The perspective:	Metadata standard experts
The source:	Other: Meeting with DCAT-AP experts on 1 st March 22
Your name:	Peter Lubrich
Date:	2022/03/17
Notes:	
Rq. No.:	DE-10
The requirement: (a short and clear statement)	“napDCAT-AP” should reuse DCAT-AP classes and properties, where possible. Further classes and properties should be added in accordance to DCAT-AP extension rules.
Category	Content / Existing Vocabularies
The perspective:	NAP developer
The source:	Own experience
Your name:	Peter Lubrich
Date:	2022/01/31
Notes:	Based on current re-development of DE NAP
Rq. No.:	DE-11
The requirement: (a short and clear statement)	<p>“napDCAT-AP” should provide usage rules in addition to the Metadata definitions, including:</p> <ul style="list-style-type: none"> • explanations of the semantics of each metadata element, • advice how to relate these elements into NAP processes • and other. <p>These rules should be laid down verbally and downloadable for users.</p>
Category	Functional
The perspective:	NAP developer

The source:	Own experience
Your name:	Peter Lubrich
Date:	2022/01/31
Notes:	Based on current re-development of DE NAP
Rq. No.:	DE-12
The requirement: (a short and clear statement)	“napDCAT-AP” should be governed and revisionable. Issues and proposals should be discussed and resolved by the authors, and maybe incorporated into follow-up versions of “napDCAT-AP”.
Category	Functional
The perspective:	NAP developer
The source:	Own experience
Your name:	Peter Lubrich
Date:	2022/01/31
Notes:	Based on current re-development of DE NAP
Rq. No.:	DE-13
The requirement: (a short and clear statement)	When “napDCAT-AP” defines controlled vocabularies, these should account for already existing vocabularies (or code lists) in operational NAPs. If the harmonized vs. national vocabularies are different, we should ensure interoperability of such multiple vocabularies. (use the “sub property” concept of RDF, and the mapping expressions used in SKOS)
Category	Technical / Existing Vocabularies
The perspective:	NAP developer
The source:	Own experience AND Other: Meeting with DCAT-AP experts on 1 st March 22
Your name:	Peter Lubrich
Date:	2022/03/17
Notes:	Based on current re-development of DE NAP
Rq. No.:	DE-14
The requirement: (a short and clear statement)	The production of “napDCAT-AP” should follow the official DCAT-AP extension rules: https://joinup.ec.europa.eu/release/dcat-ap-how-extend-dcat-ap
Category	Technical
The perspective:	Metadata standard experts
The source:	Other: Meeting with DCAT-AP experts on 1 st March 22
Your name:	Peter Lubrich
Date:	2022/03/17
Notes:	
Rq. No.:	DE-15
The requirement: (a short and clear statement)	The documentation of “napDCAT-AP” should be annotated digitally, maybe as a HTML site similar to: https://semiceu.github.io/GeoDCAT-AP/releases/
Category	Technical



The perspective:	Metadata standard experts
The source:	Other: Meeting with DCAT-AP experts on 1 st March 22
Your name:	Peter Lubrich
Date:	2022/03/17
Notes:	
Rq. No.:	DE-16
The requirement: (a short and clear statement)	“napDCAT-AP” should follow the ongoing evolution of DCAT-AP, i.e. consider developments and revisions of DCAT-AP.
Category	Functional
The perspective:	Metadata standard experts
The source:	Other: Meeting with DCAT-AP experts on 1 st March 22
Your name:	Peter Lubrich
Date:	2022/03/17
Notes:	

1.2. Belgium

Rq. No.:	BE-01
The requirement:	<p>Review an approach for cases with multiple resources for one dataset/service:</p> <p>A) multiple uploads of a dataset/service with (almost) identical metadata information</p> <p>B) division of metadata on the level of a dataset and metadata on the level of the resource, where a dataset can have multiple resources.</p> <p>In BE we chose option B, as this is inherent to the database approach used in the open source CKAN software. In the metadata we did not find any guidelines to divide the metadata between the dataset and the resource.</p>
Category	Functional
The perspective:	Metadata standard experts
The source:	Own experience
Your name:	Jasper Beernaerts
Date:	03/03/2022
Notes:	BE NAP operator
Rq. No.:	BE-02
The requirement:	Include a (mandatory, multiple choice) metadatafield indicating the type of NAP (MMTIS, RTTI, SRTI, SSTP) a dataset or service is registered for.
Category	Functional
The perspective:	NAP developer
The source:	Interview AND Own experience



Your name:	Jasper Beernaerts
Date:	03/03/2022
Notes:	BE Nap operator
Rq. No.:	BE-03
The requirement:	Definition of napDCAT-AP should be accompanied by mappings from other standards e.g. INSPIRE
Category	Technical
The perspective:	NAP developer AND Metadata standard experts
The source:	Own experience AND Outcome from project: Belgium project for mapping DCAT-AP & INSPIRE (in progress)
Your name:	Jasper Beernaerts
Date:	03/03/2022
Notes:	NAP Operator BE. Currently we are in progress of defining a mapping for DCAT-AP and INSPIRE data for our portal geo.be . In our opinion, development of napDCAT-AP could benefit from standardized mapping tables with for example INSPIRE to avoid that every country will do this independently (less efficient).
Rq. No.:	BE-04
The requirement:	Include more exhaustive values for metadatafield 'georeferencing'. Current options are too limited and leads to data owners indicating 'other' in too many cases.
Category	Functional
The perspective:	NAP developer AND NAP metadata provider (=person who enters metadata) AND NAP metadata user (=person who reads/seeks metadata)
The source:	Own experience AND Other: colleagues from the maps department generating
Your name:	Jasper Beernaerts
Date:	03/03/2022
Notes:	NAP Operator BE

1.3. Cyprus

Rq. No.:	CY-01
The requirement:	The need to convert/harmonize an INSPIRE metadata schema into a Cypriot profile of DCAT-AP. The requirement is to take into consideration the INSPIRE directives when creating the napDCAT-AP
Category	Technical
The perspective:	Metadata standard experts
The source:	Outcome from project: New Cyprus NAP (in progress)
Your name:	Rodolfo Da Silva (Cyprus)
Date:	8/3/2022
Notes:	Based on a major upgrade of CY NAP (in progress)



1.4. Czechia

Rq. No.:	CZ 01
The requirement:	The metadata catalogue shall contain information fields for schema (XSD, RGN, SHACL, ...) and samples, so the user has possibility to evaluate data before setting up consumption.
Category	Content
The perspective:	Other: data consumer / contents
The source:	Own experience
Your name:	Petr Bureš
Date:	2022/04/05
Notes:	Based on current re-development of CZ NAP https://registr.dopravniinfo.cz/en/ , before setting up subscription to the data users could “peek” inside the data contents to know what to expect and prepare their systems.
Rq. No.:	CZ 02
The requirement:	The metadata catalogue shall contain information fields for model of the used data source, i.e., version, publication, extension, to allow better searching.
Category	Content
The perspective:	NAP metadata user (=person who reads/seeks metadata)
The source:	Own experience
Your name:	Petr Bureš
Date:	2022/04/05
Notes:	Based on current re-development of CZ NAP https://registr.dopravniinfo.cz/en/ , to allow better searching possibility, data model information shall go beyond saying “just” DATEX II is used it shall further specify version and ideally or indicate if it was extended. Example: Model: DATEX II model version used: v3.3 Model specific publication SituationPublication Extended: true It could be put together like DATEX II v3.3/SituationPublication
Rq. No.:	CZ 03
The requirement:	Metadata catalogue shall allow for public commenting of its development, having issues and releases planning tool.
Category	Functional
The perspective:	NAP metadata user (=person who reads/seeks metadata)

The source:	Own experience
Your name:	Petr Bureš
Date:	2022/04/05
Notes:	Good practice, i.e. use github.com for development and keeping track of comments and issues and releases.
Rq. No.:	CZ 04
The requirement:	Metadata catalogue shall allow description of used location referencing methods (more) and used CRS.
Category	Content
The perspective:	NAP metadata user (=person who reads/seeks metadata) AND Other: data consumer
The source:	Own experience
Your name:	Petr Bureš
Date:	2022/04/05
Notes:	<p>Good practice, data could be described by many location referencing methods = we can use DATEX II as for basic set of methods, + it can be described in supplementary information (roadname, area) or general comment can be used for that as well. Also some of the providers might choose to provide also information in different CRS then ETRS89.</p> <p>Example: Reference methods:</p> <ul style="list-style-type: none"> - OpenLRpoint, OpenLRLinear, PointAlongLinear, WGSCoordinate, etc.
Rq. No.:	CZ 05
The requirement:	Metadata catalogue shall allow coordinated development of satellite ontologies used to describe data
Category	Technical / vocabularies
The perspective:	NAP metadata user (=person who reads/seeks metadata)
The source:	Own experience
Your name:	Petr Bureš
Date:	2022/04/05
Notes:	<p>Good practice, data are now described by 2 layer of hierarchical ontology, this ontology (vocabulary), shall maintained and extendable and shall be hosted by NAPCORE.</p> <p>The ontology shall serve as support structure for data description allowing translations to many languages.</p> <p>Relates to data categories specified by CMC and delegated regulations but is not limited by it.</p>

	Such vocabularies are then used in metadata description and instead of just being a literal it is an identifier.
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1.5. Italy

ID	Type	Requirement	Perspective	Source
Req-1	General	Rich metadata are needed to make data discoverable and re-usable	NAP metadata user (=person who reads/seeks metadata)	SPRINT project
Req-2	General	Metadata should be provided in both human-readable and machine-readable format	NAP metadata user (=person who reads/seeks metadata)	SPRINT project
Req-3	General	Metadata should provide information in multiple languages.	NAP metadata user (=person who reads/seeks metadata)	SPRINT project
Req-4	General	Metadata should adopt a standardised set of vocabularies to ensure semantic interoperability	NAP metadata user (=person who reads/seeks metadata)	SPRINT project
Req-5	General	Metadata should adopt a standard format/serialisation to ensure technological interoperability and automated access by means of software agents	NAP metadata user (=person who reads/seeks metadata)	SPRINT project
Req-6	General	Metadata should be collected defining a quality assurance process to check their quality	NAP metadata user (=person who reads/seeks metadata)	SPRINT project
Req-7	General	Changes and different versions of metadata should be handled	NAP metadata provider (=person who enters metadata)	SPRINT project
Req-8	General	Metadata schema specifications should be publicly available on the web without proprietary licenses	NAP Developer	Own experience
Req-9	General	Metadata schema specifications should support a maintenance cycle (issues/discussions/new releases)	Metadata standard experts	Meeting with DCAT-AP experts
Req-10	Existing Vocabularies	A metadata schema for NAPs should consider the DCAT-AP vocabulary that is the European recommendation for data catalogues in Europe and is a well-known vocabulary guaranteeing interoperability also with data sources from other domains	Metadata standard experts	SPRINT project

Req-11	Existing Vocabularies	A metadata schema for NAPs should consider the Coordinated Metadata Catalogue (CMC) to identify metadata that better fit the specific requirements of NAPs	Metadata standard experts	SPRINT project
Req-12	Existing Vocabularies	A metadata schema for NAPs should consider existing DCAT-AP extensions (es. geoDCAT-AP for geo-spatial data) and the INSPIRE directives	Metadata standard experts	Meeting with DCAT-AP experts
Req-13	Content	napDCAT-AP should consider the canonical mappings between DCAT-AP and CMC to identify information that can not be currently mapped in DCAT-AP	Metadata standard experts NAP Developer	SPRINT project
Req-14	Content	napDCAT-AP should support the description of metadata information: last date and time when the metadata set was created or last modified, the language in which the metadata is described, and the responsibility for creation and maintenance of the metadata.	NAP metadata provider/user	CMC specification
Req-15	Content	napDCAT-AP should support the description of the conditions of usage of the metadata itself	NAP metadata provider/user	Meeting with DCAT-AP experts
Req-16	Content	napDCAT-AP should support the description of content information: name, a brief description, the type of resource (dataset or service), the dataset type category according to logical clustering or EC Delegated Regulations, the service type category listed in EU Delegated Regulation 2017/1926, the language, and the georeferencing method applied within the payload.	NAP metadata provider/user	CMC specification, SPRINT project
Req-17	Content	napDCAT-AP should support the description of temporal information: the period of time in which the publication of data does not expire.	NAP metadata provider/user	CMC CMC specification, SPRINT project
Req-18	Content	napDCAT-AP should support the description of geographic information: the area covered by a dataset, the regions in which a dataset is valid and details on the transport network considered.	NAP metadata provider/user	CMC specification, SPRINT project, transportDCAT-AP extension
Req-19	Content	napDCAT-AP should support the description of transportation system information: describes the transportation modes and operators dealt with by the dataset.	NAP metadata provider/user	CMC specification, SPRINT project, transportDCAT-AP extension

Req-20	Content	napDCAT-AP should support the description of information on responsibilities: who publishes and owns the datasets.	NAP metadata provider/user	CMC specification, SPRINT project
Req-21	Content	napDCAT-AP should support the description of conditions for use: if there is a "License" or "Contract", and any other condition to use the data.	NAP metadata provider/user	CMC specification, SPRINT project
Req-22	Content	napDCAT-AP should support the description of access information for data: encoding, syntax, grammar and data model.	NAP metadata provider/user	CMC specification, SPRINT project
Req-23	Content	napDCAT-AP should support the description of quality information: the update rate, the quality criteria of the data set, the history and status of procedures to assess the compliance of the Delegated Regulations regarding the provisioning of data via a NAP.	NAP metadata provider/user	CMC specification
Req-24	Content	napDCAT-AP should specify the cardinalities and obligation for metadata (mandatory, recommended, optional).	Metadata standard experts	Meeting with DCAT-AP experts
Req-25	Content	napDCAT-AP should try to define recommendations for identifiers.	Metadata standard experts	Meeting with DCAT-AP experts
Req-26	Content	napDCAT-AP should define expected ranges for each metadata property (e.g. recommend the usage of controlled vocabularies for values)	Metadata standard experts	Meeting with DCAT-AP experts
Req-27	Implementation	napDCAT-AP may define SHACL shapes to facilitate the validation of metadata adopting it	Metadata standard experts	Meeting with DCAT-AP experts

1.6. Greece

Rq. No.:	GR-01
The requirement: (a short and clear statement)	The Coordinated Metadata Catalogue should include an element facilitating the association of a dataset with one or more (if strictly needed) Delegated Regulations supplementing the ITS Directive.
The perspective:	NAP metadata user (=person who reads/seeks metadata)
The source:	Own experience Outcome from project: NAPCORE (WG3 – Task 3.1/3.3)
Your name:	Chrysostomos Mylonas (Greece)
Date:	16/5/2022



Notes:	Based on experiences derived from the conduction of a survey targeting the monitoring of NAP data availability and data collection about utilized licenses per Delegated Regulation.
Rq. No.:	GR-02
The requirement: (a short and clear statement)	The network coverage element of the Coordinated Metadata Catalogue grouped under the network coverage category should consider existing and widely applicable functional classifications of urban and interurban roadways and other elements of a multimodal transport network (e.g., the one suggested by the FHWA).
The perspective:	NAP metadata user (=person who reads/seeks metadata)
The source:	Own experience
Your name:	Chrysostomos Mylonas (Greece)
Date:	16/5/2022
Notes:	Based on own experience (specifically in the conduction of a study targeting the assessment of climate change impacts on the national transportation network)
Rq. No.:	GR-03
The requirement: (a short and clear statement)	Distinguish “mandatory” and “nice to have” metadata elements and reflect this distinction on the “napDCAT-AP” extension.
The perspective:	NAP developer
The source:	Own experience
Your name:	Chrysostomos Mylonas (Greece)
Date:	16/5/2022
Notes:	Own experience while taking part in the development of the Greek NAP and the preparation of a document facilitating the adoption of the Coordinated Metadata Catalogue by data providers in Greece.
Rq. No.:	GR-04
The requirement: (a short and clear statement)	The Coordinated Metadata Catalogue should help NAP users and potential data consumers easily understand the content of mobility-related datasets included in NAPs and associated (or not) with the Delegated Regulation 1926/2017, given the heterogeneity of mobility services and relevant data thereof.
The perspective:	NAP metadata provider (=person who enters metadata) NAP metadata user (=person who reads/seeks metadata)
The source:	Own experience
Your name:	Chrysostomos Mylonas (Greece)
Date:	16/5/2022
Notes:	Own experience triggered by an exercise oriented to map MMTIS data categories.
Rq. No.:	GR-05
The requirement: (a short and clear statement)	For shared mobility-related datasets, the Coordinated Metadata Catalogue should provide information about the sharing model to which a shared-mobility service complies (e.g., station-based versus free-floating).

The perspective:	NAP metadata user (=person who reads/seeks metadata)
The source:	Own experience
Your name:	Chrysostomos Mylonas (Greece)
Date:	16/5/2022
Notes:	Based on own experience especially in tasks related to the analysis of shared mobility-related data.
Rq. No.:	GR-06
The requirement: (a short and clear statement)	The Coordinated Metadata Catalogue should be enriched with elements related to ITS data quality parameters (e.g., availability, timeliness, latency, error rate, location accuracy, event coverage, etc.)
The perspective:	NAP metadata provider (=person who enters metadata) NAP metadata user (=person who reads/seeks metadata)
The source:	Own experience
Your name:	Chrysostomos Mylonas (Greece)
Date:	16/5/2022
Notes:	Own experience triggered by the provision of support to the operation of the Greek NAP.

2. Annex 2: Input to consolidated requirements from literature

This appendix contains a summary of the reviewed literature, as explained in Chapter 2.1

2.1 Methodology:

Upload document to its respective folder and here put some description of it containing:

- Name of the document (link to that document / or folder)
- Who added / when added
- Purpose: why this document is important to us (1 sentence to 1 paragraph)

New documents should be put first. For common documents like policy there is probably no need for description. Updating this document is sole responsibility of the uploading party. The document does not reflect 1:1 contents of the reference folder

Template

Ref short name of the reference group and number

Name of the document: title of filename (hyperlinked)

Folder: hyperlink to the sharepoint folder)

Date: upload date, WHO uploaded

Purpose: Short description of the document with context. Why it is useful to us, what exact parts and how we use it.

2.2 TURNING FAIR INTO REALITY

Name of the document: TURNING FAIR INTO REALITY: Final Report and Action Plan from the European Commission Expert Group on FAIR Data

Folder: [Literature on Open Data](#); **Date:** 28/02/2022, RSD CR

Purpose: 2018, 76 pages. The federation of data infrastructure and application of standards will enable the discovery and interoperability of data. Data reuse. Defines steps how to implement FAIR principles to be findable, accessible, interoperable and reusable (page 19). Defines FAIR data in Open Data context. Defines 27 recommendations for implementation, mainly focused on stakeholders actions

Useful for us: FAIR guiding principles could be used in transport related data sharing [here](#), recommendations might be useful

2.3 Ref PSI

Name of the document: DIRECTIVE (EU) 2019/1024 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 20 June 2019 on open data and the re-use of public sector information

Folder: [PSI Directive](#); **Date:** 28/02/2022, RSD CR

Purpose: Directive establishes a set of minimum rules governing the re-use and the practical arrangements for facilitating the re-use of open data and stimulate innovation in products and services. Specify transport (mobility) as one of the high value data sets. Specify data and services to which it applies, sets grounds for delegated regulations. Sets licences and how the high value datasets shall be provided. Further specifies complementarity with ITS Directive!



Usability: inspiration only more relevant information in implementing coming decision

2.4 Ref INSPIRE

Name of the document: folder with INSPIRE Related documents

Folder: [INSPIRE](#); **Date:** 28/02/2022, RSD CR

Document: DIRECTIVE 2007/2/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 March 2007 establishing an Infrastructure for Spatial Information in the European Community (INSPIRE)

Purpose: INSPIRE Directive, metadata implementing regulation and technical guidelines. The Directive establishes rules for the Infrastructure for Spatial Information. Specifies that spatial data (or services) shall be shared by MS and defines which metadata shall be set up. Defines search criteria (article 11.2), sets up data theme names and themes => important for metadata and data organization. Directive not focused on transport.

Usability: inspiration only more relevant information in implementing decision

Document: 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

Purpose: Sets up rules for metadata! Defines metadata elements, definitions, multiplicity, domains and topics, metadata for services complex family of metadata is defined.

Usability: some metadata elements are useful in transport context, a lot of them similar: title, abstract, temporal and geographical reference, conditions of access and use, service description => all metadata to be compared with NAP needs and DCAT-AP

Document: INSPIRE Metadata Implementing Rules: Technical Guidelines based on EN ISO 19115 and EN ISO 19119

Purpose: revised version from 2013, 99 pages, to define how the requirements of the Implementing Rules for Metadata can be implemented using EN ISO 19115 and EN ISO 19119. Covers services, provides mapping to the standard 19115/19119 (xpath). Defines metadata, sets **requirements on metadata and conformity**, i.e., for metadata structure and encoding, textual value encoding, licences, data access, geographical bounding box, data quality, provides examples.

Usability: defines requirements for specific transport relevant metadata and defines conformance assessment services => inspiration for our metadata conformance.

Document: Technical Guidance for the implementation of INSPIRE dataset and service metadata based on ISO/TS 19139:2007

Purpose: Revised version from 2017, 157 pages, implementing rules describe metadata, harmonisation, measures and coordination. Describes how to Integrate metadata for Spatial Data Services, for interoperability, theme-specific metadata etc. Defines **Requirements on metadata and conformity**, i.e., for metadata structure and encoding, textual value encoding, licences, data access, geographical bounding box, data quality, provides examples.



Usability: defines requirements for specific transport relevant metadata and defines conformance assessment services => inspiration for our metadata conformance.

2.5 DCAT-AP release 2.0.0

Name of the document: Documentation of the DCAT-AP release 2.0.0 // **newer version available! 2.1.0**

Folder: [DCAT-AP release 2.0.0](#); **Date:** 28/02/2022, RSDCR

Official link: <https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semantic/solution/dcat-application-profile-data-portals-europe/release/200>

Purpose: DCAT-AP description in RDF format **also EAP file** and documentation in docx and PDF. Version 2.0.0 is obsolete (2019) version 2.1.0 is actual now (02/2022). Documentations sets up terminology and ontology / vocabulary references. Defines mandatory and optional classes to be used to describe a dataset. Sets up requirements for data compatibility. Defines how to address multi-linguality. DCAT AP available in [GITHUB](#).

Useful for us: as a general resource to base our extension on, documentation examples, github with issues etc.

2.6 Metadata harmonisation activities in EU EIP (ended in 2021)

Name of the document: Three deliverables:

- Coordinated Metadata Catalogue (CMC), Version 2019
- Metadata Guideline, Version 2018
- EU EIP NAP Annual Report 2020

Folder: [EU EIP](#); **Date:** 31/01/2022, BAST

Official link: <https://www.its-platform.eu/achievement/monitoring-harmonisation-of-naps/>

Purpose:

Document: [Coordinated Metadata Catalogue \(CMC\), Version 2019](#)

Purpose: blueprint for Metadata structures at each individual NAP in Europe. It defines a common, minimum Metadata set, in particular 32 Metadata elements, including their description, types and obligation levels.

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Document: [Metadata Guideline, Version 2018](#)

Purpose: for NAP deployers, discussing alternative Metadata approaches for individual NAP environments, taking into account higher-level considerations.

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Document: [EU EIP NAP Annual Report 2020](#)

Purpose: describes the deployment status of NAPs in Europe as well as harmonising work on NAPs; summarises findings and discussion of Metadata structures at NAPs in 2020, explaining harmonisation needs and harmonisation bottlenecks

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Useful for us:

Mostly relevant: the latest CMC version: each of the 32 metadata elements from the CMC needs to be represented by RDF classes/properties, either compliant to existing classes/properties in DCAT-AP, or as new classes/properties proposed by subWG4.4

Peter Lubrich has written a review of the CMC, discussing the benefits and some practical issues related to its use. See the document “4.4.1.1 CMC review_220131.docx” in the same Sharepoint folder.

2.7 DCAT and DCAT-AP training webinars 2021

Name of the document: Documentation of the DCAT and DCAT-AP training webinars 2021, provided by the EU Open Data Portal

Folder: [DCAT and DCAT-AP training webinars 2021](#); **Date:** 31/01/2022, BAST

Official link: <https://academy.europa.eu/courses/dcat-and-dcat-ap-training-advanced-user>

Purpose:

Webinar No 1: The learning objective is to understand what metadata is and how it relates to DCAT; Learn about the history and objectives of DCAT and DCAT-AP.

Webinar No 2: The learning objective is to understand the vocabularies used in DCAT and DCAT-AP and how they are used; Understand the way DCAT-AP defines mandatory, recommended and optional classes and properties; Understand the use of controlled vocabularies in DCAT-AP

Webinar No 3: The learning objective is to understand extensions of DCAT-AP and how they retain conformance.

Useful for us:

Webinar No 1: Basis knowledge - I expect everyone in subWG4.4 is aware of these basics!

Webinar No 2: This Important for us, as we apply the same building blocks in our DCAT-AP extension. Should be considered by Work Item 4.4.2.4 “Draft specification”

Webinar No 3: This Important for us as we build an own DCAT-AP extension. Should be considered by Work Item 4.4.2.2 “Approach towards DCAT-AP specification”.

2.8 EU Data Governance Act

Name of the document: REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL ON EUROPEAN DATA GOVERNANCE (Data Governance Act) (Proposed EC Regulation)

Folder: [Data Governance Act](#); **Date:** 31/01/2022, BAST

Official link: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52020PC0767&from=EN>

Purpose: The Regulation will facilitate data sharing across the EU and between sectors to create wealth for society, increase control and trust of both citizens and companies regarding their data, and offer an alternative European model to data handling practice of major tech platforms. In particular, to create new EU rules on neutrality to allow novel data intermediaries to function as trustworthy organisers of data sharing.

Useful for us: The term “Metadata” is only used in the regulation regarding data sharing services for DGPR-related data. As this is not in the scope of NAP (at least, yet), this regulation is not relevant!



2.9 EU European Data Strategy

Name of the document: A European strategy for data (EC Communication)

Folder: [European Data Strategy](#), **Date:** 31/01/2022, BAST

Official link: https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/european-data-strategy_en

Purpose: The Communication on a European strategy for data aims to create a single market for data that will boost Europe's global competitiveness and data laws. It is concretised via the Data Governance Act (see above).

Useful for us: The term "Metadata" is not mentioned, thus this is not relevant!

2.10 Cost of not having FAIR research data

Name of the document: Cost of not having FAIR research data (EC, 2018)

Folder: [Literature on Open Data](#); **Date:** 31/01/2022, BAST

Purpose: Estimating the cost of not having FAIR research data for the EU data market and EU data economy.

Useful for us: Reference to FAIR principles – a minimal set of guiding principles and practices, which enable both machines and humans to find, access, interoperate and re-use research data and metadata. Very generic elaboration:

- Metadata challenges ("lack of persistent identifiers for data, datasets and metadata", "unstructured or incomplete metadata.")
- Metadata requirements ("single point of access, where you could query for metadata which would instantly point to the layer where the data are located, thus reducing considerably time to access (meta)data.", "Quality and richness of the available metadata.", "Metadata following international recognised standards such as DataCite, DCAT-AP Dublin Core, DDI, or SDMX.", "Machine-readability of metadata")

2.11 Ref Riley and Baca

Name of the documents: Riley, J. (NISO). Understanding Metadata: What Is Metadata, and What Is It For?: A Primer. NISO Primer Series, 2017. and Baca, M., Pardo, P.E., Berg, S.U., Zozom, E., 2008. Introduction to Metadata. Getty Research Institute, 2008.

Folder: [Literature on Metadata standards and interoperability](#); **Date:** 19/01/2022, BAST

Purpose: some literature to get familiar with the topic of Metadata standards and interoperability. These two reports give you a good overview how to store and share metadata, based on the concepts of the Resource Description Framework (RDF), Linked Data and Semantic Web, as well as on domain-specific Metadata standards.

2.12 Ref SPRINT 1

Name of the document: Enabling Cross-Border Travel Offers Through National Access Point Federation via Metadata Harmonisation (paper and slides)

Folder: [SPRINT project](#); **Date:** 11/2021, Cefriel (IT)



Purpose: Paper and slides describing the work done within the Shift2Rail IP4 SPRINT project on a prototype harmonizing metadata from different NAPs (Belgium, Netherlands, and France) and enabling the defined cross-border scenario.

Useful for us: it investigates conceptual mappings between different NAP metadata schema, the CMC and DCAT-AP; it describes a working prototype to harmonise metadata from different NAPs using DCAT-AP.

2.13 Ref SPRINT 2

Name of the document: D2.3 Requirements for an IF architectural design F-REL

Folder: [SPRINT project](#); **Date:** 1/2022, Cefriel (IT)

Purpose: Deliverable of the Shift2Rail IP4 SPRINT project analysing different NAPs and the CMC to gather requirements for the IP4 Asset Manager, i.e., a catalogue of digital artifacts for transport service providers.

Useful for us: Analysis of the CMC, elicited requirements (e.g., competency questions for NAP metadata).

2.14 Ref DATEX-LOD-1

Name of the document: [Analysis and revision of the models used for road traffic and travel information in Europe](#)

Folder: [DATEX-LOD Project](#); **Date:** 11/01/2022, ŘSD ČR (CZ)

Purpose: Report of the CEF project LOD-RoadTran18, aimed at increased visibility of road traffic data across open data portals. This report focuses on review of existing models used for traffic description.

Useful for us is Annex C analysing different traffic ontologies including vocab.datex and summary of tools used for work with metadata and ontologies.

2.15 Ref DATEX-LOD-2

Name of the document: [Analysis of the implementation of the PSI and ITS Directives](#)

Folder: [DATEX-LOD Project](#); **Date:** 11/01/2022, ŘSD ČR (CZ)

Purpose: Report of the CEF project LOD-RoadTran18, aimed at increased visibility of road traffic data across open data portals. This report focuses on analysis of ITS and PSI directive implementation.

Useful for us is Annex D-F Analysing metadata approaches in ITS and Open Data contexts across the EU, Spain and Czechia. Used to point out traffic extensions to DCAT-AP and software for harvesting and converting metadata.

2.16 Ref DCAT-AP other extensions

Name of the documents: geoDCAT-AP, DCAT-AP_IT/DK/NO/SE, ISA and Aporta analysis of DCAT-AP extensions

Folder: [DCAT-AP\DCAT-AP other extensions](#); **Date:** 11/2021-01/2022, BAsT, Cefriel (IT)

Purpose: Specifications and analysis of different extensions of DCAT-AP (national profiles and domain specific profiles).



Useful for us: to define the napDCAT-AP roadmap it is useful to investigate what artefacts are delivered for each extension, and how the specifications of the extensions are structured. Moreover, the analysis for ISA reports guidelines for the definition of DCAT-AP extensions.

2.17 Ref DCAT-AP other extensions - transport DCAT AP

Name of the document: O1.2 TransportDCAT-AP and Controlled Vocs.pdf

Folder: [DCAT-AP\DCAT-AP other extensions\transportDCAT-AP](#); **Date:** 01/2022, Cefriel (IT)

Purpose: Document describing TransportDCAT-AP, a profile of the European standard for the representation of metadata in open data portals, created in the context of the CEF-OASIS project with a focus on the representation of metadata about open public transport data.

Useful for us: review of current metadata models and their features; extract requirements considering an extension addressing the same domain (pag. 7); provides an example of how to describe a DCAT-AP extension.

2.18 Ref Get Ready for Data Tool

Name of the document: Get ready for data! (paper long and compact version)

Folder: [Literature on Open Data](#); **Date:** 01/2022, BAST

Purpose: Paper and its compact version are describing the Get Ready for Data Tool. It is designed for city officials and early-child development practitioners who collect, share, and use data. The tool reports a set of questions to make considerations in planning a data-informed project or policy. The three main themes considered are: strategy, data collection and use, and ethics and engagement.

Useful for us: some of the question reported could help us in collecting requirements for the metadata profile.

3. Appendix 3 Input to consolidated requirements from expert interviews

3.1. Meeting Minutes – Discussion 01/03/2022 DCAT-AP and extensions

Project	Action 2016-07 Promoting semantic interoperability amongst the EU Member States	Meeting Date/Time	01/03/2022 09:00-10:30 AM (GMT+1)
Meeting Type	Discussion	Meeting Location	Microsoft Teams
Meeting Coordinator	Makx Dekkers	Issue Date	02/03/2022

Meeting Agenda
<ol style="list-style-type: none"> 1. Opening, welcome, agenda, objectives 2. Short presentations by participants 3. Vision of the new DCAT-AP extension in Napcore project 4. General requirements for DCAT-AP extensions 5. Discussion 6. Wrap up
Presentation and meeting details:

Attendee Name		Organisation/Country
Antonia Azzini	AA	Napcore
Bert Van Nuffelen	BVN	TenForce -- SEMIC team
Charline Alexandre	CA	PwC -- SEMIC team
Makx Dekkers	MD	Independent consultant -- SEMIC team
Marco Comerio	MC	Napcore
Marco Scrocca	MS	Napcore
Pavlina Fragkou	PF	European Commission
Petr Bures	PB	Napcore
Peter Lubrich	PL	Napcore

Summary of the meeting
Opening, welcome, agenda, objectives



- Peter Lubrich presented the objectives of today's discussion on the DCAT-AP extension in NAPCORE project, as well as the agenda of this meeting

Short presentations by participants

- Makx Dekkers reminded that he was the editor of DCAT-AP 1.0 and is currently looking at how DCAT-AP can help data spaces. He also remembered that he is a member of the working group at W3C that develops and maintains DCAT.
- Bert Van Nuffelen mentioned that he is the editor of DCAT-AP and is also supporting the Flemish Government in their metadata and their local DCAT-AP profiles.
- Antonia Azzini (IT) is working on the knowledge technology practice at Cefriel in Milan. She is working on the requirement definitions for the Napcore project.
- Marco Comerio (IT) is part of the research group Cefriel in Milan.
- Mario Scrocca (IT) added that he has been involved in the SPRINT project where he worked on asset management for an ecosystem of transport stakeholders.
- Petr Bures (CZ) is an independent expert in the Napcore project. His background is traffic information and creating a description of the data feed.
- Peter Lubrich (GE) is working for the Federal Highway Research Institute. He also operates the National Access Point and is the leader of the activity group in Napcore.

Vision of the new DCAT-AP extension in Napcore project

- Peter Lubrich presented the Napcore project which has a European dimension. He explained the NAP acronym standing for National Access Point. Technically, there are data portals for the mobility sector installed by the Member States of the EU. When looking at those portals, they look like open data portals with specific mobility data and metadata. There are data categories that are mobility related.
- PL explained that they are driven by the European Delegated Regulations, regulations about mobility data. Those regulations clarify that mobility data have to be on NAP. When looking at the details of those regulations, it is stated that appropriate metadata should be used. They also mention metadata catalogues, meaning that the European Commission is aware that metadata harmonization and alignment is needed.

Previous work

- “Coordinated Metadata Catalogue”:
 - Metadata minimum set for European NAPs
 - List of metadata elements
 - Proprietary approach
 - Published on EU EIP website
- <https://www.its-platform.eu/achievement/monitoring-harmonisation-of-naps/>



- PL presented what they did in the previous years when working with other NAPs about Coordinated Metadata Catalogue. They set up many specifications for metadata in European NAPs.
- PL explained the feedback they had on the Catalogue. It has been widely accepted, many people around the continent are aware of this and some use it. The EC likes it and recommends it for implementation. However, they faced some scepticism because of the proprietary approach, they did not use DCAT-AP. The compatibility is a big issue and there is a wish of making the catalogue compatible with DCAT-AP.
- PL added that now they have the idea to convert the catalogue into a proper DCAT-AP extension, called napDCAT-AP. They have the motivation of Linked Open Data.

SubWG 4.4: Facts & Figures

- Participants = 21
- Time plan = mid 2021 until end 2024
- Budget = 450.000 EUR
- Tasks = 4
- Milestones = 4

SubWG 4.4: Participants

AT	BE	BE-FL	BG	HR	CY	CZ	DK	EE	FI	HE	UITP
A	F			F	F	A	F		F		
FR	DE-BASt	DE-AB	GR	GR-EG	HU	IE	IT	LV	LT	ERTICO	ITxPT
F	L		A		F		A				
LU	NL	MT	PL	PT	RO	SK	SI	ES	SE	NPRA	FEDRO
	A	F	F	F	A		F		A	A	F

L = leading ; A = active ; F = following

- PL presented what they are doing these days. They are doing requirement analysis; conceptual modelling and they try to do some mapping of DCAT-AP elements.
- Petr Bures commented that countries developing their NAPs would like to use catalogue as the backbone of those portals.
- Bert van Nuffelen wondered if there was a European access point, a portal aggregating everything.
- Peter Lubrich clarified that this was the long-term goal. Once they have their metadata harmonized, they could establish a consolidation of the metadata and there will be already some demonstrators in their Napcore project.
- BVN also asked how many of the data is not public and is not open data.
- Peter Lubrich stated that in Germany it is more than a half of data.
- Petr Burse added that they did some research in the NAPs and more than half is hidden by APIs and you need to log in or sign some license terms.

General requirements for DCAT-AP extensions

- Makx Dekkers explained that SEMIC is building vocabularies and application profiles based on semantic web technologies. There is a focus on governance and the approach is based on co-creation with working groups involving people from Member States helping to build those standards with engagement. They are also toolchains for the implementation.

DCAT-AP Overview

- DCAT Application Profile for data portals in Europe, [v2.1.0](#)
- Based on W3C Recommendation [DCAT version 2](#)
- Interoperability among catalogues of datasets and data services
- Initial focus on open data from public administrations in Europe, but also looking at domain-specific requirements and non-open data
- Specific agreements among EU member states and other countries on cardinalities and obligations (mandatory, recommended, optional)
- Feeding the European Data Portal data.europa.eu, but also regional/national exchange of metadata

- MD presented DCAT-AP and the new version that was recently published (v2.1.0) based on W3C recommendation DCAT version 2.
- <https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semic/solution/dcat-application-profile-data-portals-europe/release/210>
- <https://www.w3.org/TR/2020/REC-vocab-dcat-2-20200204/>
- <https://data.europa.eu/en>

DCAT-AP Maintenance

- DCAT-AP working group with over 50 participants from 14 countries
- Open participation
- [GitHub](#) repository
- Regular Webinars – next one on identifiers, 10 March 2022
- Following documented [process and methodology](#)
- Publication according to documented [Change and Release Management Policy](#): bug-fixes every 6 months, yearly alternating minor and major releases (if necessary)
- Aligning as much as possible with W3C release schedule for DCAT

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- MD presented the DCAT-AP maintenance, the co-creation process as well as the GitHub repository. MD mentioned that W3C is currently working on a version 3 of DCAT which has functionalities on versioning and data series that they are trying to build in the new version of DCAT-AP as well.
- <https://github.com/SEMICEu/DCAT-AP>
- <https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semic/document/process-and-methodology-developing-semantic-agreements>
- <https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semic/solution/dcat-application-profile-data-portals-europe/document/change-and-release-management-policy-dcat-ap>

Main functionalities

- Description of catalogues, datasets/distributions and data services
- Aggregation and exchange of metadata
- Expression of access rights and licences
- Enabling faceted search through common data themes
- Description of details of data to allow for automated processing:
 - File format, packaging/compression, spatial/temporal resolution, checksum
 - Endpoint descriptions for data services, e.g. using OpenAPI, SPARQL, ISO 191xx, OGC GetCapabilities etc.
- MD presented the main functionalities of DCAT-AP.
- Petr Bures wondered if there is a harmonization with INSPIRE.
- MD clarified that there is a mapping from Inspire to GeoDCAT-AP but that does not map all of INSPIRE.



- BVN added that every Member States has its own INSPIRE rules. There is also mandatory information required. Most of INSPIRE data could be mapped to the DCAT space but there are some differences. ISO sometimes put information at the level of datasets while DCAT puts it at the distribution or data service level.

Questions from NAPCORE

Guidelines for DCAT-AP extension

On Joinup, there is a page dedicated to DCAT application profile implementation guidelines.

On this page, information is given on how to extend DCAT-AP.

<https://joinup.ec.europa.eu/release/dcat-ap-how-extend-dcat-ap>

- MD explained that there are guidelines which are pretty basic and explain how to extend DCAT-AP. It is allowed to add classes and properties but not something too similar to what is already there. The cardinalities for properties can also be changed.
- <https://joinup.ec.europa.eu/release/dcat-ap-how-extend-dcat-ap>
- MD clarified that it is needed to use the controlled vocabularies specified for DCAT-AP. Others may be used in addition.
- Peter Lubrich wondered if there is only one controlled vocabulary allowed per property.
- BVN clarifies that technically, there can be multiple. The problem is with the designers of portals for whom sub properties are handy.
- Peter asked about the portals that already exist. For example, the Belgian and the German portal have their own vocabularies talking about the same properties. He wonders if it is possible to do a mapping between 2 vocabularies.
- BVN clarified that for code lists, it is easy.

Best practices for DCAT-AP extension

We have never created guidelines with a set of best practices so far.

There are examples of good practices that can be found in existing DCAT-AP extensions:

- [Geo-DCAT-AP](#)



GeoDCAT-AP - Version 2.0.0
A geospatial extension for the DCAT application profile for data portals in Europe

SEMIC Editor's Draft 23 December 2020

This version:
<https://semiceu.github.io/GeoDCAT-AP/drafts/latest/>

Latest published version:
<https://semiceu.github.io/GeoDCAT-AP/releases/>

Latest editor's draft:
<https://semiceu.github.io/GeoDCAT-AP/drafts/latest/>

Latest Recommendation:
<https://semiceu.github.io/GeoDCAT-AP/releases/2.0.0/>

Editors:
Andrea Perego (External Consultant, European Commission, Joint Research Centre)
Bert van Nuffelen (TerForce)

- MD explained that GeoDCAT-AP is an example of good practices.
- <https://semiceu.github.io/GeoDCAT-AP/drafts/latest/>

Reuse of knowledge and support from DCAT group

- Become a member
- Follow the progresses on [GitHub](#)

Join us on the 10th of March for a DCAT-AP webinar dedicated to identifiers. More information and supporting files will be uploaded on the Joinup event page: <https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semantic/event/dcat-ap-webinar-10th-march-1000-cet>

For joining the meeting:

- Meeting link: <https://pwc-emeamc.webex.com/pwc-emeamc/j.php?MTID=mbab180a5cf65b39e93896adfcbaac5f>
- Password: DCAT-AP

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- MD mentioned that anybody working on this topic is welcome to be a member of the DCAT-AP working group.
- Peter Lubrich asked about how to become an official member.
- MD clarified that it is only important to subscribe.
- <https://github.com/SEMICEu/DCAT-AP>
- <https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semantic/event/dcat-ap-webinar-10th-march-1000-cet>

Tools for hosting and publications

Tools used to host and publish are dependant on what the community is used to.

You should rely as well on what the other projects working with DCAT-AP are doing.

On our side, we like to use [GitHub](#).

- MD presented the tools for hosting and publishing. At SEMIC, we like GitHub a lot.
- Peter Bures wondered if the vocabularies are also published on GitHub.
- BVN clarified that this is the case. Most of the vocabularies that are used by SEMIC are the ones of the Publication Office. They have a [website](#) where they publish the vocabularies as SKOS concept schemes.

Governance process of an extension

On Joinup, there is a page providing implementation guidelines:

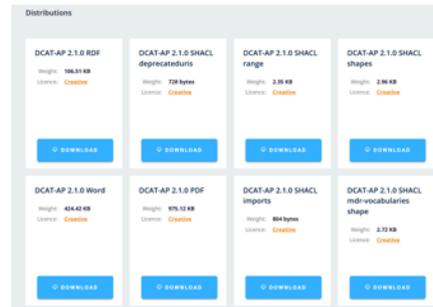
<https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semantic/solution/dcat-application-profile-implementation-guidelines/about>

- MD explained that the governance is the responsibility of NAPCORE. SEMIC has a public approach and a policy for releases. The only thing he recommends is to write their own rules down.
- <https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semantic/solution/dcat-application-profile-implementation-guidelines/about>



Deliverables to be produced

- Specifications of DCAT-AP
 - But depends on implementer expectations
- Examples of extensions:
 - Flanders: [DCAT-AP VL](#)
 - Norway: [DCAT-AP NO](#)
- Geo-DCAT-AP uses [GitHub](#)



- MD mentioned that the deliverables to be produced depends on what the implementers expect. For DCAT-AP, we have a pdf, word, RDF...
- <https://data.vlaanderen.be/doc/applicatieprofiel/DCAT-AP-VL/>
- <https://joinup.ec.europa.eu/collection/access-base-registries/solution/abr-bregdcatap-tools/norway-implementation-dcat-ap-no>
- <https://semiceu.github.io/GeoDCAT-AP/>
- Peter Lubrich wondered if the UML model is something SEMIC would like to publish.
- BVN clarifies that we always have a UML diagram because people would like to see a picture of what is happening. They are careful with it because there are a lot of debates on the meaning of the picture. It is important to well describe what is on the picture and what is not.
- Peter Lubrich explained that the German have already implemented a version of DCAT-AP and they marked what has been changed / extended.
- Petr Bures wondered what the main document for development is.
- BVN explained that examples, side information have to be added to a templating, this is not put in the enterprise architecture.

Discussion

- Makx Dekkers asked about the possibility to have a European portal for national access point data.
- Peter Lubrich clarified that this is the long-term goal. What they do in NAPCORE is that there will be a demonstrator where they take 3 NAPs as a beginning. Most likely, this will be portals that already have RDFs representations.
- Makx wonders if NAPCORE will look at the automated processing of data in the context of DCAT-AP.
- Petr Bures is not sure about that as NAPCORE is a harmonization project and they are in the working group for metadata with one of the goals being to have a portal which groups together several of the portals by way of metadata.

Wrap up

- Peter Lubrich thanked the participants for their contribution.



4. Appendix 4 EU EIP Coordinated Metadata Catalogue (CMC): A review

(Peter Lubrich, BAST, 22/01/31)

4.1. Background

Metadata describes the administration, organisation, and content of a dataset and of a data service. Metadata datasets are therefore crucial elements to make NAPs accessible and searchable. The EU EIP harmonisation task examined the usage of metadata in NAPs and worked towards harmonization.

The most visible Metadata representation are the dataset descriptions in NAP portals. Metadata are also a recurring element of Delegated Regulations of the ITS Directive. Metadata have been mentioned to date for Delegated Regulation (EU) 2015/962 for RTTI and for Delegated Regulation (EU) 2017/1926 for MMTIS. However, Metadata should also have the same relevance for all other Delegated Regulations.

EU EIP recognised there is a need to harmonise Metadata descriptions and structures for the following reasons:

- to help to make data available and searchable for pan-European service providers,
- to ensure Metadata to be machine-readable in a later stage, and
- to ensure a common understanding of the listed data content.

Consequently, EU EIP provided recommendations in terms of how to implement Metadata in existing and upcoming NAPs across Europe. The activities were based on:

- results from the former projects EIP and EIP+, in particular the “Coordinated Metadata Catalogue” (2015) as a proposal for a harmonised set of Metadata,
- evaluation of Metadata approaches in the MS so far, and
- identification of needs and requirements in order to further develop a recommended, harmonised Metadata approach across Europe.

4.2. EU EIP activities

EU EIP reviewed and evaluated the current practice and experiences of individual NAPs in terms of Metadata approaches.

This review indicated a quite heterogeneous Metadata landscape across all reviewed NAPs. In 2020, the CMC is a reference in about half of the analysed NAPs. It is noted that this Catalogue was updated in 2019, and we assume the latest version is only applied in a few instances, e.g. in Germany. However, in some other cases alternative Metadata approaches are chosen, or no information on the Metadata approach is given at all. Reasons for this heterogeneity have been discussed many times: individual system architectures, individual IT / Open Data frameworks, and individual NAPs “maturity levels”.

EU EIP has been working on the harmonisation issue for many years. A major product is the “Coordinated Metadata Catalogue” (CMC), as a blueprint for Metadata structures at each individual NAP in Europe; defining a common, minimum Metadata set; and considering all data and information domains of the EU Directive and the respective Delegated Regulations.

The CMC was updated in 2019, with additional coverage of multi-modal travel data and services, according to Delegated Regulation (EU) 2017/1926 for MMTIS.



4.3. CMC feedback from NAP operators and NAP deployers

We received some generic observations by NAP operators and NAP deployers on the CMC usage. One of them is about the level of obligation, i.e. the definition of obligatory and optional metadata elements, and the of the extent of CMC, i.e. the number of defined metadata elements. (Please remember that the CMC was considered a “minimum set of Metadata for NAPs”!)

The general question is what the general trend is in the European NAP community: should we simplify the NAP and its processes by only harmonizing the essential metadata, or try to be exhaustive by collecting also all the optional metadata?

There are in fact two trends:

1. to have exhaustive metadata -> to make transportation data sets more distinguishable and better findable, considering the emerging number and variety of transportation data sets.
2. To have limited metadata -> to be interoperable with other data portals, outside the transportation domain. (For example, if you harvest your NAP metadata to an Open Data portal, a metadatum like "TRANSPORTATION MODES" will be likely ignored).

For the NAPCORE work, we should discuss this, and find a way how we understand the “mandatory” and “optional” settings. We might explain that some few “essential” data MUST be provided by any NAP, and further propose a set of optional metadata, that CAN be provided by individual NAP deployments, depending on use cases, data providers and data users addressed by a NAP.

NAP operators and deployers also provided some concrete feedback and questions on individual metadata elements from the CMC. They are noted below, together with proposals how to resolve them in the NAPCORE follow-up work.

Metadata element “TRANSPORTATION MODE”:

- Comment: The CMC defines this as mandatory metadata, with multiple selection possible. In some NAPs, we might expect that some datasets cannot be related to concrete transportation modes. For example, in the German NAP, weather observations are offered, without relation to a transportation mode.
- Solution for NAPCORE: allowing a 0...n cardinality (instead of 1...n) for “TRANSPORTATION MODE”.

Metadata element “DATASET TYPE CATEGORY”:

- Comment: The CMC defines this as mandatory metadata, with only one selection possible. The question is that for instance a GTFS or NETEX group of files have themselves more than one those categories. They could belong at the same time to “Public transport operational information” and also to “Public transport: fare and purchase information”, as those files have information about Fares too.
- Solution for NAPCORE: allowing a 1...n cardinality (instead of 1) for “DATASET TYPE CATEGORY”.

Metadata element “NETWORK COVERAGE”:

- Comment: The options for this element cover all possibilities for infrastructure networks, but if we are talking about transport services (for instance bus), do we have to set the option that describes the infrastructure the bus lines are using?
- Solution for NAPCORE: We need to better explain the semantics of this element. Further, we might implement some logical relations between the entries for "NETWORK COVERAGE" and

"TRANSPORTATION MODES". For example: if a user enters "bus" for "TRANSPORTATION MODES", only the options "motorway", "arterial road network etc. will be selectable for "NETWORK COVERAGE".

Metadata element "VALID FROM" / "VALID TO":

- Comment: This element can be understood in two ways: (1) time interval when the data feed is delivered technically via the NAP; (2) the time reference of the delivered information (e.g. validity time of a public transport time table.)
- Solution for NAPCORE: We need to better explain the semantics of this element. We also might separate this element into two new elements: e.g. "START/END OF DATA FEED" + "START/END OF TIME REFERENCE OF DATA", or similar.

Metadata element "UPDATE FREQUENCY":

- Comment: This element can be understood in two ways: (1) The update intervals at the data provider side (i.e., transport service providers update their data when their data are changed, on occurrence or in constant time intervals). (2) The update intervals at the NAP data interface (the NAP connects to these transport service providers, take their data, and then shares those data in the NAP in a differing interval)
- Solution for NAPCORE: We need to better explain the semantics of this element. Proposal: "UPDATE FREQUENCY" is meant to tell a person who finds this dataset on the NAP, how often it is updated on NAP, so this person might install a regular data access to the NAP, to have an up-to-date picture anytime. So, we would use the semantic (2) from above. However, we could propose a new metadata element for the semantic (1), for example "UPDATE FREQUENCY OF ORIGINAL SOURCE" or something similar.

Metadata element "CONTRACT OR LICENCE":

- Comment: This element allows the following options:
 - No licence – No contract
 - Licence and Free of charge
 - Licence and Fee
 - Contract and Free of charge
 - Contract and Fee
 - Not relevant
 - The above list is not expressive enough to represent commonly used licences, e.g. "Creative Commons" etc. Further, the above list sometimes cannot be semantically mapped to such common licences.
- Solution for NAPCORE: Repair the above list of options for "CONTRACT OR LICENCE". Maybe use the following list:
 - royalty-free
 - Licence, free use/open data
 - Licence, restricted use, free of charge
 - Licence, restricted use, fee
 - Other contractual arrangement
 - Further, add a new metadata element for standard licenses, as "STANDARD LICENSE" or similar.

4.4. Handover to NAPCORE



As Metadata are more and more recognised as a key factor to ensure interoperability between different data catalogues, the Metadata perspective has to be widened beyond NAPs, also looking at Open Data Portals, Government Data platforms, commercial data platforms in the hands of e.g. IT big players. This way, any Metadata harmonization activities need to expand to wider data ecosystems.

Some stakeholders stated to advance with the CMC in the direction of Metadata interoperability. In particular, there was the idea to bring together the Catalogue with DCAT-AP, a well-established metadata specification in the domain of European Open Data portals, developed by a joint initiative of the EU organizations DG DIGIT, DG CONNECT and the EU Publications Office.

An envisioned product is a “napDCAT-AP” extension, i.e. an adaptation of the DCAT-AP data model to meet the specific demands of NAPs, e.g. by adding NAP-specific model elements. “napDCAT-AP” will eventually foster interoperability of NAP metadata with, e.g. open data portals, and eventually allow findability of NAP data sets outside the NAP portals.

“napDCAT-AP” is expected as a promising step towards efficient and harmonised Metadata usage across European NAPs. However, the current elaboration is still in a premature status. Many experts and references related to DCAT-AP have been consulted, and a first iteration to set up a stable specification of “napDCAT-AP” has been accomplished. However, a viability and acceptance of this concept will be only possible with wider stakeholder engagement and additional maintenance structures to handle this specification.

Ideas to do so were discussed and concretised within the NAPCORE project. A dedicated work package will deal with progressing of “napDCAT-AP”. Many experts and stakeholders from the previous EU EIP Metadata activities are part of this. Further, under this new activity, additional liaising is planned with other European Groups, such as the Semantic Interoperability Community (SEMIC), to ensure a wider perspective on Metadata beyond the NAP domain.

5. SPRINT project on Metadata Harmonisation [Summary “Cefriel project on Metadata Harmonisation”]

The focus of the NAP regulations is to promote the usage of a specific set of standards, based on Transmodel, across all Europe to improve transport data interoperability. The data published on a National Access Point are not easily discoverable and/or reusable if insufficient information is provided through metadata. Data publishers are encouraged to provide human-readable information in multiple languages. Metadata for both human data consumers and computer applications provide even greater benefit.

Even though the role of the NAP as a dataset catalogue is clear in the regulation, each member state is then free to implement it according to its design. Such principle led to the appearance of different metadata vocabularies, and the need for interoperability between different metadata sets offered by different NAPs.

An effort towards the harmonisation of metadata by NAPs is needed to support easy data exchange and to avoid errors in data exchange between catalogues. For example, if an international user accesses the NAPs of several EU Member States, there should be no difference in wording and meaning between the metadata provided, even in different languages. In this context, Semantic Web technologies can offer a valid solution to encode the semantic of metadata also in an interoperable machine-readable format.

The Shift2Rail IP4 SPRINT project (<http://sprint-transport.eu/>) designed and evaluated an automated solution, based on Semantic Web technologies, for the ingestion and harmonisation of metadata from different NAPs (Carenini et al., 2021). An RDF representation, adopting a standardised set of vocabularies for NAP metadata, can also enable software agents to access and explore data contained in different NAPs.

Besides the need of defining a conceptual mapping between different metadata schema, the implementation of a prototype adopting the described approach highlighted two important recommendations for the integration of multiple remote data providers, such as the NAPs: (i) to consider a quality assurance process for data and metadata, (ii) to handle changes and different versions of data and metadata.

In the project, the conceptual mappings between different NAP metadata schema (Belgium, Netherland, and France) and DCAT-AP were defined also leveraging the canonical Coordinated Metadata Catalogue to DCAT-AP mappings defined by EU EIP. The project highlights the following considerations: (i) DCAT-AP leverages a standardised vocabulary facilitating the encoding of specific semantics for each metadata property, moreover, the vocabulary is well-known also outside the mobility domain and can be easily used by users working with generic data catalogues, (ii) CMC defines a broader set of metadata that better fit the requirements for National Access Points, (iii) DCAT-AP should be extended to support domain-specific metadata, such as the ones related to transportation modes and network coverage and defined in CMC, that currently cannot be represented using DCAT-AP.

Alessio Carenini, Andrea Fiano, Mario Scrocca, Marco Comerio, and Irene Celino. Enabling Cross-Border Travel Offers Through National Access Point Federation via Metadata Harmonisation. Sem4Tra@SEMANTICS 2021, <http://ceur-ws.org/Vol-2939/paper6.pdf>



5.1. Coordinated Metadata Catalogue [Summary of information modelled by CMC extracted from SPRINT deliverables]

A specific effort of EU EIP WG NAP is the harmonization in the field of Metadata of European NAPs. A first agreement was found in the form of the “Coordinated Metadata Catalogue”. It allows the description and discovery of the most relevant features of NAP datasets. It is worth noting that the “Coordinated Metadata Catalogue” already contains a mapping with standard vocabularies as EU-EIP, DCAT-AP and INSPIRE.

According to Coordinated Metadata Catalogue, Metadata describes both datasets and services. A dataset contains the traffic or travel data, and specific services for multi-modal travel are listed by EU Regulation 2017/1926 lists. An example of a specific service is “location search” on a data set describing address identifiers.

A Publication is the combination of a dataset and how the data are published and made accessible. A Publisher is the one who publishes a dataset. A Contact Point is the one that registers the dataset at the NAP. A Data Owner is the one who owns or produces data.

A Metadata Set is the collection of different information represented as metadata elements:

- The metadata information on the last date and time when the metadata set was created or last modified, the language in which the metadata is described, and the responsibility for creation and maintenance of the metadata.
- The content information describes the dataset defining its name, a brief description, the type of resource (dataset or service), the dataset type category according to logical clustering or EC Delegated Regulations, the service type category listed in EU Delegated Regulation 2017/1926, the language, and the georeferencing method applied within the payload.
- The temporal information presents the period of time in which the publication of data does not expire.
- The geographic information describes the area covered by a dataset, the regions in which a dataset is valid and details on the transport network considered.
- The transportation system information describes the transportation modes dealt with by the dataset.
- The information on responsibilities defines who publishes and owns the datasets.
- The conditions for use specify if there is a “License” or “Contract”, and any other condition to use the data.
- The access information includes four layers: Encoding, Syntax, Grammar and Data Model.
- The quality information defines the update rate, the quality criteria of the data set, the history and status of procedures to assess the compliance of the Delegated Regulations regarding the provisioning of data via a NAP.

5.2. Competency Questions for NAP Metadata [Extracted from SPRINT D2.3]

Competency Questions (CQs) play an important role in the ontology development lifecycle, as they represent the ontology requirements. CQs consist of a set of questions stated in natural language that the data represented using the ontology structure must be able to answer. They play an important role in the ontology development life cycle, as they represent the ontology requirements. The same technique can be used to identify a minimum set of required metadata for NAPs. Below we provide some examples of competency questions that are specific to the metadata harmonised by NAP:

- Which are the publishers (transport data providers) of the datasets including information on different means of public transport?
- Which is the list of owners of the datasets containing information on the different means of public transport?
- Which are the datasets containing operational information such as vehicle details (i.e. A-1.1.d.viii and A-1.2.c.ii as codes according to EC Delegated Regulation)?
- Which are the datasets containing Special Fare Products (i.e. A-1.3.a.iii as the code according to EC Delegated Regulation)?
- Which are the names of the datasets published by the Consorcio Regional de Transportes de Madrid (CRTM)?
- What are the datasets related to the region of Madrid that also deal with buses?
- Which is the list of publishers of the datasets ordered by the publishers' websites?
- What is the metadata data and National body assessment status of a specific dataset?
- What are the starting time and the ending time from which a specific dataset is valid?
- What is the transportation mode covered by a given dataset?
- What is the license agreed on to use a given dataset?
- In which data format can a particular dataset be accessed?

5.3. Summary of requirements considered in the definition of the TransportDCAT-AP extension

TransportDCAT-AP is a profile of the DCAT-AP ontology focused on the public transport domain. This profile extends DCAT-AP to improve the representation of metadata in this domain.

The profile considers that the nature of the public transport data is geospatial, thus defining as mandatory the set of metadata related to this type of information. In addition, a specific set of admissible keywords is defined to standardise the range of metadata properties (i.e., the values that can be associated with property) and enable domain-related queries, e.g., considering specific transportation modes.

5.4. Additional requirements [Cefriel]

- Adoption of well-known and interoperable vocabularies to define metadata
- Enable the definition of conditions to access the assets
- Spatial and Temporal granularity of data