A common metadata model for representing public transport at the European level

TransportDCAT-AP and Controlled Vocs 1.2

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Summary

In this document we present TransportDCAT-AP, a profile of the European standard for the representation of metadata in open data portals, DCAT-AP[1], created in the context of the CEF-OASIS project[2] with a focus on the representation of metadata about open public transport data. Transport data is considered a key asset for the development of many types of applications, and hence we highlight the importance of providing good metadata for open data portals that are focused on the provision of public transport data, or general-purpose open data portals that cover public transport among their datasets. We estimate that the availability of such metadata will make it possible for agents to discover Open Transport Data throughout Europe. For that reason, we have worked on a common metadata model for the metadata representation of public transport data at a European level, taking into account its special characteristics.

In this document we present:

- A report on the current situation of open data portals in Spain and Belgium.

- A brief review of current metadata models and their features.

- TransportDCAT-AP: a new profile of DCAT-AP for the public transport domain.

- A best practices guideline for the implementation of TransportDCAT-AP.

- Some examples of TransportDCAT-AP with real metadata from relevant transport organizations in Spain and Belgium.

We are also doing an external validation of the metadata model provided by 10 relevant organizations from Spain and Belgium and an adaptation process followed by CRTM[3], where TransportDCAT-AP is added on top of their already existing ISO19139 metadata. On the Belgian case, we are validating 4 organizations and also adding TransportDCAT-AP over their transport data, which is provided as GTFS[4] and GTFS-RT[5] feeds. The involved organizations are: Localidata[6], EMT[7], CRTM[8], Red.es[9], Alcobendas council[10], Caceres council[11], De Lijn[12], SNCB[13], TEC[14] and STIB[15].

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1 https://joinup.ec.europa.eu/asset/dcat_application_profile
2 https://oasis.team/
3 http://www.crtm.es/
4 https://developers.google.com/transit/gtfs/reference/
5 https://developers.google.com/transit/gtfs-realtime/reference/
6 http://www.localidata.com/
7 http://opendata.emtmadrid.es/
8 http://datos.crtm.es/
9 http://www.red.es/redes/
10 http://datos.alcobendas.org/
11 http://opendata.caceres.es/
12 https://www.delijn.be/
13 http://www.belgianrail.be/
14 https://www.infotec.be/
15 https://www.stib-mivb.be/

Introduction

Metadata are data that describe other data, needed to be able to discover datasets within a certain domain. Simplifying, metadata describe the available information about or within a dataset(s). In the transport domain, metadata files may contain general information like the name of the distribution file or the company web page to whom data belongs. They may also contain more specific information about public transport, like the geographic area covered by a specific service.

Although there are open data portals in the domain of public transport, nowadays there are less than what we could wish for. For example, in Spain, there are organizations related to public transport, such as the Consorcio Regional de Transportes de Madrid[16] (CRTM), the Empresa Municipal de Transportes de Madrid[17,18] (EMT) or the Compañía de Transportes de Zaragoza[19,20] (CTZ), among others, that publish open transport data on their own portals. Besides, the open data portals of many cities and regions also include transport data. The national technical norm UNE 178301:2015 about open data and smart cities[21] proposes, in its annex, that public transport data has to be one of the priorities to be taken into account in the publication of open data of cities.

However, there is a clear lack of metadata in most of these open data portals, or such metadata has been created without applying the recommendations on interoperability that exist at the national and international levels.

There is a similar scenario in Belgium, companies such as De Lijn, SNCB, TEC or STIB expose their data as GTFS and GTFS-RT feeds with very limited metadata in the form of a textual description that does not follow any structured standard, therefore limiting discoverability and interoperability. Another issue regarding belgian companies is that most of them require signing a contract in order to access the datasets, which is not in accordance with the open data approach.

Current situation of public transport open data portals: Madrid and Belgium

In this section we describe the current status of public transport open data portals in the two cities/regions that are involved in our project.

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[16] http://datos.crtm.es/

[17] http://www.emtmadrid.es/

[18] http://opendata.emtmadrid.es/

[19] http://www.consorciozaragoza.es/

[20] http://www.consorciozaragoza.es/content/open-data

[21] http://www.aenor.es/aenor/normas/normas/fichanorma.asp?tipo=N&codigo=N0054318&PDF=Si#.WHNuG_ErJoB

Madrid - CRTM

In the case of Madrid, we have focused on the open data portal of the Consorcio Regional de Transportes de Madrid (CRTM), which is one of the partners of this project. The portal provides open data about all means of transport in the region of Madrid (metro, trains, trams and buses). Table 1 presents a summary about the most relevant information of this open data portal.

Number of Datasets	Transport	Metadata Files
4	Interurban Bus	1
4	EMT Bus	1
4	Madrid Bus	1
102	Metro	2
30	Tram	2
77	Train	2

Table 1: Summary of datasets and metadata files from CRTM open data portal

About metadata, as we can see in the table 1, nine differents files are currently representing this information in the portal. Each file provides the following data, based on ISO19139[22]:
- CreaDate: Date of the creation of the catalog
- idAbs: Catalog description
- Keywords: Set of important words
- idPurp: Naive catalog description
- idCredit: CRTM
- useLimit: License
- Data: Binary

It should be noted that after the analysis of the metadata, the current information provided is not enough for a portal that supplies all these data of the public transport domain. From CEF-OASIS, we perceived that a more robust and known metadata model following the European standard DCAT-AP was needed. This is why the process of adapting the metadata of CRTM to TransportDCAT-AP has been made (detailed in the last section of this document).

Datasets can be downloaded from the open data portal in different formats (GTFS, SHP, KML, SIG, and CSV). Data can be also obtained using an API. Data visualizations with graphics and tables is provided too in this portal.

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[22] https://www.iso.org/standard/32557.html

Belgium

For the Belgian scenario we have focused on four different transport companies (De Lijn, SNCB, TEC and STIB) and on the transport related datasets provided by the Open Data Portal of Ghent[23] which includes bicycle statistical information, parking data, train stations, traffic data, among others.

As mentioned above, the official web portals transportation companies require the signing of a contract to allow access to the datasets. Therefore, we rely on a third party company named iRail[24] which publishes the datasets as open data. Table 2 presents a general description of the different datasets provided by iRail and the Open Data Portal of Ghent.

Company	Number of Datasets	Transport	Metadata Files
De Lijn	1	Interurban Bus	0
SNCB	1	Train	0
TEC	1	Interurban Bus	0
STIB	1	Brussels Bus	0
Open Data Portal of Ghent	26	Miscellaneous	1

Table 2: Summary of Belgium datasets and metadata files.

Regarding metadata, as seen on table 2 the considered transportation companies do not provide any and the only information available about these datasets is the short description provided by the third party publisher iRail. As for the metadata file available for the Open Data Portal of Ghent, we found that is structured following the DCAP-AP standard and can be found here[25].

Following the same approach as for Madrid we decided to use the DCAP-AP standard to properly model and represent metadata of the belgian transportation companies datasets.

These datasets can be downloaded from the iRail data portal[26] and from the Open Data Portal of Ghent. They are available in GTFS, JSON, KML, among others.

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[23] https://data.stad.gent/

[24] https://hello.irail.be/

[25] https://datatank.stad.gent/4/api/dcat

[26] https://hello.irail.be/gtfs/

DCAT-AP, GeoDCAT-AP and Controlled Vocs

DCAT[27] is an RDF vocabulary designed to facilitate interoperability between data catalogs published on the Web. Using DCAT, publishers increase discoverability and applications easily consume metadata from multiple catalogs. Besides, it facilitates federated queries across sites.

DCAT Application Profile (DCAT-AP) is an extension of DCAT developed to include classes and properties that the initial vocabulary did not take into account. DCAT-AP is an ontology that contains mandatory, recommended and optional classes and properties, so as to make it easier to adapt to different domains. The European Data Portal implements the DCAT-AP as the common vocabulary to harmonize descriptions of over 258,000 datasets harvested from 67 data portals of 34 countries. The DCAT-AP team has identified two different scenarios, one for data reusers, who find it difficult sometimes to get an overview of which datasets exist and which public administrations are maintaining them, and another one for data providers, encouraging their reuse by making them searchable and accessible. So, it is easy to think that the development of a metadata model related to the public transport domain should follow the DCAT-AP standard. This approach has been followed before by other profiles, such as GeoDCAT-AP[28] o StatDCAT-AP[29], which are now standards in the European Data Portal for representing geospatial and statistical metadata.

GeoDCAT-AP provides an RDF syntax binding for the union of metadata elements defined in the core profile of ISO 19115:2003[30] and those defined in the framework of the INSPIRE Directive[31], which are focused on describing geospatial datasets, dataset series, and services. The idea of this extension is to provide a way of transforming from these standards, which are widely used, to DCAT-AP. The main goal is to offer owners of geospatial data the possibility of representing this information in RDF. Note that this extension does not make any changes, nor does it add anything new to the DCAT-AP standard model, only a transformation guideline.

The main goal of StatDCAT-AP is to enhance interoperability between the metadata of statistical datasets within the statistical domain and between statistical data and open data portal.

The controlled vocabulary are restricted lists of terms that are used for labeling, indexing or categorizing. They are controlled because only terms from a list may be used for a specific domain covered by the controlled vocabulary. DCAT-AP includes references to controlled vocabularies using the SKOS vocabulary[32], that is a common data model for sharing these

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[27] https://www.w3.org/TR/vocab-dcat/
[28] https://joinup.ec.europa.eu/node/154143/
[29] https://joinup.ec.europa.eu/asset/stat_dcat_application_profile
[30] https://www.iso.org/standard/26020.html
[31] http://inspire.ec.europa.eu/
[32] https://www.w3.org/TR/swbp-skos-core-spec

type of vocabularies. For example, the DCAT-AP web page recommends to use EuroVoc[33], but there are others about licenses[34] or file types[35].

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[33] http://eurovoc.europa.eu/
[34] http://publications.europa.eu/mdr/resource/authority/licence/html/licences-eng.html
[35] http://publications.europa.eu/mdr/resource/authority/file-type/html/filetypes-eng.html

TransportDCAT-AP: metadata for public transport

As discussed above, TranportDCAT-AP is a profile of the DCAT-AP ontology focused on the public transport domain. We have made few but important changes in the standard ontology to improve the representation of the metadata in this domain:

- The relation (dcat:Catalog, dct:spatial, dct:Location) changes from **optional** to **mandatory**.

- The relation (dcat:Dataset, dct:spatial, dct:Location) changes from **optional** to **mandatory**.

- The relation (dcat:Dataset, dct:keyWord, rdfs:Literal) changes from **optional** to **mandatory**.

- The range of the relation (dcat:Dataset, dct:keyWord, rdfs:Literal) changes from a free string to a list controlled keywords properties following the format:

    - dct:keyword A, where A is the type of transport. The available types of transport are an extension of the **route_type** property in GTFS[36]: Tram, Metro, Rail, Bus, Ferry, Cable car, Suspended cable car, Funicular or Other. This property can be repeated if the dataset involves multiple types of transport.

    - dct:keyword B, where B is the type of the dataset that A represents. The available types of datasets are followed GTFS[37] model and are: Calendar, Fare, Frequencies, Routes, Shapes, Stops, Transfers, Trips or Other. This property can be repeated if the dataset involves multiple sets.

    - dct:keyword C, where C is an INSPIRE feature for address, the AdminUnitName[38], where the level must be specified according to the official documentation of the framework (AdminUnitLevel3 (Province): Madrid, AdminUnitLevel4 (Municipality): Madrid).

We implement these changes since the nature of the public transport data is geospatial, so we consider that it has to be mandatory to provide this information in the generation of metadata for datasets in the catalogues of these open data portals. In addition, the modification of the keywords' property is implemented in order to facilitate querying and data visualization, for example, consulting all the datasets of a city or country associated to a specific type of public transport could be possible. Below we describe a best practice guideline and two examples of TransportDCAT-AP.

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[36] https://developers.google.com/transit/gtfs/reference/routes-file
[37] https://developers.google.com/transit/gtfs/reference/
[38] http://inspire.ec.europa.eu/id/document/tg/ad

Best practices guideline

In this section, we provide a guideline to generate metadata according to our TransportDCAT-AP proposal. This guideline is divided into several tables. Each table contains the properties of a class that can be either obligatory, recommended or optional. The properties in the table are described through their name, the type of property and an example.

dcat:Catalog - Mandatory class		
Property	**Type**	**Example**
dcat:dataset	Mandatory	dcat:dataset <#dataset-01>
dct:description	Mandatory	dct:description "Catálogo de transporte urbano del CRTM"
dct:publisher	Mandatory	dct:publisher <#agent-01>
dct:spatial	Mandatory	dct:spatial <http://sws.geonames.org/3117735/>
dct:title	Mandatory	dct:title "Autobuses urbanos de la EMT"
foaf:homepage	Recommended	foaf:homepage <http://datos.crtm.es/>
dct:language	Recommended	dct:language <http://id.loc.gov/vocabulary/iso639-1/es.html>
dct:license	Recommended	dct:license <http://www.crtm.es/licencia-de-uso>
dct:issued	Recommended	dct:issued "2011-12-05"^^xsd:date
dcat:themeTaxonomy	Recommended	dcat:themeTaxonomy <http//:datos.crtm.es/kos/vocabmetadata>
dct: modified	Recommended	dct:modified "2011-12-05"^^xsd:date
dct: hasPart	Optional	dct:hasPartOf <#catalog-02>
dct: isPartOf	Optional	dct:hasPartOf <#catalog-07>
dcat:record	Optional	dcat:record <#catalogRecord-01>
dct:rights	Optional	dct:rights "public"

dcat:Dataset - Mandatory class		
Property	**Type**	**Example**
dct:description	Mandatory	dct:description "Dataset de las paradas de autobuses interurbanos"
dct:title	Mandatory	dct:title "Paradas autobuses interurbanos del CRTM"
dct:spatial	Mandatory	dct:spatial <http://sws.geonames.org/3117735/>
dcat:keyWord	Mandatory	dcat:keyword "Bus"; dcat:keyword "Stops" dcat:keyword "AdminUnitLevel3 (Province): Madrid, Spain";
dcat:contactPoint	Recommended	dcat:contactPoint "<mailto: contacto@crtm.es>"
dcat:distribution	Recommended	dcat:distribution <#distribution-01>
dct:publisher	Recommended	dct:publisher <#agent-01>
dcat:theme	Recommended	dcat:theme <http//:datos.crtm.es/kos/vocabmetadata/interurbanbus>
dct:accessRights	Optional	dct:accessRights "public"
dct:conformsTo	Optional	dct:conformsTo "GTFS"
foaf:page	Optional	foaf:page <http://data.crtm.com/datasets/dataset01>
dct:accrualPeriodicity	Optional	dct:accrualPeriodicity <http://purl.org/cld/freq/monthly>
dct:hasVersion	Optional	dct:hasVersion <#dataset-0101>
dct:identifier	Optional	dct:identifier "M8Estaciones"
dct:isVersionOf	Optional	dct:isVersionOf <#dataset-0102>
dcat:landingPage	Optional	dcat:landingPage <https://services5.arcgis.com/UxADft6QPcvFyDU1/arcgis/rest/services/M8_Red/FeatureServer/0>
dct:language	Optional	dct:language <http://id.loc.gov/vocabulary/iso639-1/es.html>
adms:identifier	Optional	adms:identifier"InterUrbanBusesM8"
dct:provenance	Optional	dct:provenance "Este dataset pertenece al conjunto de todos los datos abiertos sobre autobuses interurbanos mostrados en datos.crtm.es"
dct:relation	Optional	dct:relation

		<http://data-crtm.opendata.arcgis.com/datasets?q=M8+red&sort_by=relevance>
dct:issued	Optional	dct:issued "2015-01-01"^^xsd:date
adms:sample	Optional	adms:sample <#distribution-01>
dct:source	Optional	dct:source <#dataset-05>
dct:temporal	Optional	dct:temporal <#periodOfTime-01>
dct:type	Optional	dct:type <http://inspire.ec.europa.eu/metadata-codelist/ResourceType/series>
dct:modified	Optional	dct:modified "2015-12-05"^^xsd:date
owl:versionInfo	Optional	owl:versionInfo "1.0"
adms:versionNotes	Optional	adms:versionNotes "final version for 2016"

foaf:Agent - Mandatory class		
Property	**Type**	**Example**
foaf:name	Mandatory	foaf:name "Consorcio Regional de Transporte de Madrid"
dct:type	Recommended	dct:type <http://eurovoc.europa.eu/3060>

dcat:Distribution - Recommended class		
Property	**Type**	**Example**
dcat:accessURL	Mandatory	dcat:accessURL <http://data-crtm.opendata.arcgis.com/datasets/19884a02ac044270b91fa478d80f7858_0.csv>
dct:description	Recommended	dct:description"Distribucion del dataset de las paradas autobuses urbanos de la comuidad de madrid en CSV"
dct:format	Recommended	dct:format "CSV"
dct:license	Recommended	dct:license <http://www.crtm.es/licencia-de-uso>
dcat:byteSize	Optional	dcat:byteSize 1.0
spdz:checksum	Optional	spdx:checksum <#checksum-01>
foaf:page	Optional	foaf:page <http://data-crtm.opendata.arcgis.com/datasets/19884a02ac044270

		b91fa478d80f7858_0>
dcat:downloadURL	Optional	dcat:downloadURL <http://crtm.maps.arcgis.com/home/item.html?id=885399f83408473 c8d815e40c5e702b7>
dct:language	Optional	dct:language <http://id.loc.gov/vocabulary/iso639-1/es.html>
dct:conformsTo	Optional	dct:conformsTo "CSV"
dcat:mediaType	Optional	dcat:mediaType "text/csv"
dct:issued	Optional	dct:issued "2015-12-05"^^xsd:date
dct:rights	Optional	dct:rights "public"
adms:status	Optional	adms:status "updated"
dct:title	Optional	dct:title "Paradas Autobuses Urbanos CRTM en CSV"
dct:modified	Optional	dct:modified "2015-12-05"^^xsd:date

dcat:CatalogRecord - Recommended class		
Property	**Type**	**Example**
foaf:primaryTopic	Mandatory	foaf:primaryTopic <#dataset-01>
dct:modified	Mandatory	dct:modified "2015-12-05"^^xsd:date
dct:conformsTo	Recommended	dct:conformsTo "TransportDCAT-AP"
adms:status	Recommended	adms:status "updated"
dct:issued	Recommended	dct:issued "2015-12-05"^^xsd:date
dct:description	Optional	dct:description"Incorporación del dataset de paradas de autobuses interurbanos del CRTM al catalogo de buses interurbanos"
dct:language	Optional	dct:language <http://id.loc.gov/vocabulary/iso639-1/es.html>
dct:source	Optional	dct:source <#catalogRecord-011>
dct:title	Optional	dct:title "Paradas autobuses interurbanos - Incorporación"

spdx:Checksum - Optional class		
Property	**Type**	**Example**
spdx:algorithm	Mandatory	spdx:algorithm <http://spdx.org/rdf/terms#checksumAlgorithm_sha256>

spdx:checksumValue	Mandatory	spdx:checksumValue "11542312"

dct:PeriodOfTime - Optional class		
Property	**Type**	**Example**
schema:startDate	Optional	schema:startDate "2011-05-12"^^xsd:date
schema:endDate	Optional	schema:startDate "2011-05-12"^^xsd:date

Examples

In this section we provide two examples of the usage of our TransportDCAT-AP model, the first one with metadata from the Consorcio Regional de Transportes de Madrid (CRTM) and the another with metadata from four belgian transport companies. If you want to have access to the files for a better visualization of the model or to reuse them in your organization, you can download the examples and the controlled vocabularies at: https://github.com/cef-oasis/DCAT-AP, http://crtm.linkeddata.es/metadata and http://crtm.linkeddata.es/kos.

Consorcio Regional de Transportes de Madrid (CRTM)

@base <http//datos.crtm.es/metadata>.
@prefix adms: <http://www.w3.org/ns/adms#>.
@prefix dcat: <http://www.w3.org/ns/dcat#>.
@prefix dct: <http://purl.org/dc/terms/>.
@prefix foaf: <http://xmlns.com/foaf/0.1/>.
@prefix owl: <http://www.w3.org/2002/07/owl#>.
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#>.
@prefix schema: <http://schema.org/>.
@prefix skos: <http://www.w3.org/2004/02/skos/core#>.
@prefix spdx: <http://spdx.org/rdf/terms#>.
@prefix xsd: <http://www.w3.org/2001/XMLSchema#>.
@prefix vcard: <http://www.w3.org/2006/vcard/ns#>.

<#catalog-01> a dcat:Catalog ;
        dcat:dataset <#dataset-01> ; #mandatory
        dct:description "Conjunto de datos de los autobueses interurbanos del CRTM" ;
#mandatory
        dct:publisher <#agent-01> ; #madantory
        dct:title "Autobuses Interurbanos del CRTM" ; #mandatory
        dct:spatial <http://sws.geonames.org/3117735/>; #mandatory
        foaf:homepage <http://datos.crtm.es> ; #recommended
        dct:language <http://id.loc.gov/vocabulary/iso639-1/es> ; #recommended

```
        dct:license <http://www.crtm.es/licencia-de-uso> ; #recommended
        dct:issued "2011-12-05"^^xsd:date ; #recommended
        dcat:themeTaxonomy <http//:datos.crtm.es/kos/vocabmetadata> ; #recommended
        dct:modified "2016-12-05"^^xsd:date ; #recommended
        dct:hasPartOf <#catalog-02> ; #optional
        dct:isPartOf <#catalog-03> ; #optional
        dcat:record <#catalogRecord-01> ; #optional
        dct:rights "public". #optional


<#dataset-01> a dcat:Dataset;
        dct:description "Localización de las paradas por las que pasan buses interurbanos
en la comunidad de madrid";          #mandatory
        dct:title "Paradas de buses Interurbanos" ;   #mandatory
        dct:spatial <http://sws.geonames.org/3117735/>; #mandatory
        dcat:keyword "Bus";
        dcat:keyword "Stops";
        dcat:keyword "AdminUnitLevel3 (Province): Madrid, Spain";          #mandatory
        dcat:contactPoint "<mailto: contacto@crtm.es>" ; #recommended
        dcat:distribution <#distribution-01> ; #recommended
        dcat:theme <http//:datos.crtm.es/kos/vocabmetadata/interurbanbus> ;
#recommended
        dcat:theme <http//:datos.crtm.es/kos/vocabmetadata/stops> ; #recommended
        dct:publisher <#agent-01> ;  #recommended
        dct:conformsTo "GTFS" ;      #optional
        foaf:page
<http://data-crtm.opendata.arcgis.com/datasets/19884a02ac044270b91fa478d80f7858_0> ;
        #optional
        dct:accrualPeriodicity <http://purl.org/cld/freq/monthly> ;  #optional
        dct:hasVersion <#dataset-0101> ;   #optional
        dct:identifier "M8Estaciones" ;        #optional
        dct:isVersionOf <#dataset-0102> ;   #optional
        dcat:landingPage
<https://services5.arcgis.com/UxADft6QPcvFyDU1/arcgis/rest/services/M8_Red/FeatureSer
ver/0>;  #optional
        dct:language <http://id.loc.gov/vocabulary/iso639-1/es> ;   #optional
        adms:identifier         "19884a02ac044270b91fa478d80f7858_0" ;          #optional
        dct:relation
<http://data-crtm.opendata.arcgis.com/datasets?q=M8+red&sort_by=relevance> ;  #optional
        dct:issued "2015-01-01"^^xsd:date ; #optional
        adms:sample  <#distribution-01> ;    #optional
        dct:source <#dataset-05> ;   #optional
        dct:temporal <#periodOfTime-01 ; #optional
        dct:modified "2015-12-05"^^xsd:date ;          #optional
        owl:versionInfo          "1.0" ; #optional
        adms:versionNotes "final version for 2016"; #optional
        dct:accessRights "public" ;     #optional
```

dct:type <http://inspire.ec.europa.eu/metadata-codelist/ResourceType/series> ;
#optional

dct:provenance "Este dataset pertenece al conjunto de todos los datos abiertos sobre autobuses interurbanos mostrados en datos.crtm.es". #optional

<#agent-01> a foaf:Organization ;
        foaf:name "Consorcio Regional de Transporte de Madrid" ; #mandatory
        dct:type <http://eurovoc.europa.eu/3060>. #recommended

<#distribution-01> a dcat:Distribution;
        dcat:accessURL
<http://data-crtm.opendata.arcgis.com/datasets/19884a02ac044270b91fa478d80f7858_0.csv> ; #mandatory
        dct:description   "Distribucion del dataset de las paradas autobuses urbanos de la comuidad de madrid en CSV" ; #recommended
        dct:format "CSV" ; #recommended
        dct:license <http://www.crtm.es/licencia-de-uso> ; #recommended
        dcat:byteSize 1.0 ; #optional
        spdx:checksum <#checksum-01> ; #optional
        foaf:page
<http://data-crtm.opendata.arcgis.com/datasets/19884a02ac044270b91fa478d80f7858_0> ;
#optional
        dcat:downloadURL
<http://crtm.maps.arcgis.com/home/item.html?id=885399f83408473c8d815e40c5e702b7> ;
#optional
        dct:language <http://id.loc.gov/vocabulary/iso639-1/es> ;   #optional
        dct:conformsTo "CSV" ; #optional
        dcat:mediaType "text/csv" ; #optional
        dct:issued "2015-12-05"^^xsd:date ; #optional
        dct:rights "public" ; #optional
        adms:status "updated" ; #optional
        dct:title "CSV Paradas de autobuses interurbanos CRTM" ; #optional
        dct:modified "2015-12-05"^^xsd:date. #optional

<#catalogRecord-01> a dcat:CatalogRecord;
        foaf:primaryTopic <#dataset-01>; #mandatory
        dct:modified "2015-12-05"^^xsd:date ; #mandatory
        dct:conformsTo "TransportDCAT-AP"; #recommended
        adms:status "updated"; #recommended
        dct:issued "2015-12-05"^^xsd:date ; #recommended
        dct:description   "Incorporación del dataset de paradas de autobuses interurbanos del CRTM al catalogo de buses interurbanos" ; #optional
        dct:language <http://id.loc.gov/vocabulary/iso639-1/es> ; #optional
        dct:source <#catalogRecord-011> ; #optional
        dct:title "Paradas autobuses interurbanos - Incorporación". #optional

```
<#checksum-01> a spdx:Checksum;
        spdx:algorithm <http://spdx.org/rdf/terms#checksumAlgorithm_sha256>; #mandatory
        spdx:checksumValue "11542312". #mandatory


 <#periodOfTime-01> a dct:PeriodOfTime;
        schema:startDate "2011-05-12"^^xsd:date; #optional
        schema:endDate "2015-05-12"^^xsd:date. #optional
```

Belgian Transport Companies (De Lijn, SNCB, TEC and STIB)

```
@base <https://gtfs.irail.be/metadata>.
@prefix adms: <http://www.w3.org/ns/adms#>.
@prefix dcat: <http://www.w3.org/ns/dcat#>.
@prefix dct: <http://purl.org/dc/terms/>.
@prefix foaf: <http://xmlns.com/foaf/0.1/>.
@prefix owl: <http://www.w3.org/2002/07/owl#>.
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#>.
@prefix schema: <http://schema.org/>.
@prefix skos: <http://www.w3.org/2004/02/skos/core#>.
@prefix spdx: <http://spdx.org/rdf/terms#>.
@prefix xsd: <http://www.w3.org/2001/XMLSchema#>.
@prefix vcard: <http://www.w3.org/2006/vcard/ns#>.

<#catalog-01> a dcat:Catalog ;
        dcat:dataset <#delijn>, <#stib-mivb>, <#snbc-nmbs>, <#tec> ;
        dct:description "Contains 4 data set comprising different transportation systems in
Belgium" ;
        dct:publisher <https://irail.be/#org> ;
        dct:title "iRail catalog for GTFS" ;
        dct:spatial <http://sws.geonames.org/2802361/>;
        foaf:homepage <https://hello.irail.be> ;
        dct:language <http://id.loc.gov/vocabulary/iso639-1/en> ;
        dct:license <http://creativecommons.org/publicdomain/zero/1.0/> ;
        dct:issued "2017-05-24"^^xsd:date ;
        dcat:themeTaxonomy <http://datos.crtm.es/kos/vocabmetadata> ;
        dct:modified "2017-05-24"^^xsd:date ;
        dcat:record <#catalogRecord-01> ;
        dct:rights "public".


<https://irail.be/#org> a foaf:Organization ;
        foaf:name "iRail - Promoting digital creativity concerning mobility in Belgium";
```

```
        foaf:page <https://hello.irail.be>.


<#delijn> a dcat:Dataset;
        dct:description "Flanders De Lijn bus information system";
        dct:title "De Lijn Bus System" ;
        dct:spatial <http://sws.geonames.org/3337388/>;
        dcat:keyword "Bus";
        dcat:keyword "Stops";
        dcat:contactPoint <http://www.delijn.be/en/contact/>;
        dcat:distribution <#delijn-distribution-01> ;
        dcat:theme <http://datos.crtm.es/kos/vocabmetadata/interurbanbus> ;
        dcat:theme <http//:datos.crtm.es/kos/vocabmetadata/stops> ;
        dct:publisher <https://irail.be/#org> ;
        dct:conformsTo <https://developers.google.com/transit/gtfs/reference> ;
        foaf:page <http://www.delijn.be> ;
        dct:accrualPeriodicity <http://purl.org/cld/freq/weekly> ;
        dct:hasVersion <#delijn01> ;
        dct:identifier "delijn" ;
        dcat:landingPage
<https://www.delijn.be/en/zakelijk-aanbod/reisinfodata/gebruik-onze-data.html>;
        dct:language <http://id.loc.gov/vocabulary/iso639-1/en> ;
        owl:versionInfo        "1.0" ;
        dct:accessRights "public" ;
        dct:type <http://inspire.ec.europa.eu/metadata-codelist/ResourceType/series> ;
        dct:provenance "This dataset belongs to the open data about Belgium transportation
system".


<#stib-mivb> a dcat:Dataset;
        dct:description "Brussels stib-mivb bus information system";
        dct:title "MIVB/STIB public transportation agency" ;
        dct:spatial <http://sws.geonames.org/2800866/>;
        dcat:keyword "Bus";
        dcat:keyword "Stops";
        dcat:contactPoint
<http://www.stib-mivb.be/article.html?_guid=803bdcc5-1b8e-3410-54a9-bf3b6e04a84c&l=en
>;
        dcat:distribution <#stib-mivb-distribution-01> ;
        dcat:theme <http://datos.crtm.es/kos/vocabmetadata/interurbanbus> ;
        dcat:theme <http//:datos.crtm.es/kos/vocabmetadata/stops> ;
        dct:publisher <https://irail.be/#org> ;
        dct:conformsTo <https://developers.google.com/transit/gtfs/reference> ;
        foaf:page <http://www.stib-mivb.be> ;
        dct:accrualPeriodicity <http://purl.org/cld/freq/weekly> ;
        dct:hasVersion <#stib-mivb01> ;
```

```
        dct:identifier "stib-mivb" ;
        dcat:landingPage <https://opendata.stib-mivb.be/store>;
        dct:language <http://id.loc.gov/vocabulary/iso639-1/en> ;
        owl:versionInfo        "1.0" ;
        dct:accessRights "public" ;
        dct:type <http://inspire.ec.europa.eu/metadata-codelist/ResourceType/series> ;
        dct:provenance "This dataset belongs to the open data about Belgium transportation
system".


<#sncb-nmbs> a dcat:Dataset;
        dct:description "Belgium sncb-nmbs train information system";
        dct:title "De Lijn Bus system" ;
        dct:spatial <http://sws.geonames.org/2802361/>;
        dcat:keyword "Train";
        dcat:keyword "Stops";
        dcat:contactPoint <http://www.belgianrail.be/en/customer-service/contact.aspx>;
        dcat:distribution <#stib-mivb-distribution-01> ;
        dcat:theme <http://datos.crtm.es/kos/vocabmetadata/train> ;
        dcat:theme <http//:datos.crtm.es/kos/vocabmetadata/stops> ;
        dct:publisher <https://irail.be/#org> ;
        dct:conformsTo <https://developers.google.com/transit/gtfs/reference> ;
        foaf:page <http://www.belgianrail.be> ;
        dct:accrualPeriodicity <http://purl.org/cld/freq/weekly> ;
        dct:hasVersion <#sncb-nmbs01> ;
        dct:identifier "sncb-nmbs" ;
        dcat:landingPage
<http://www.belgianrail.be/en/customer-service/information-services-and-travel-tools/public-d
ata.aspx>;
        dct:language <http://id.loc.gov/vocabulary/iso639-1/en> ;
        owl:versionInfo        "1.0" ;
        dct:accessRights "public" ;
        dct:type <http://inspire.ec.europa.eu/metadata-codelist/ResourceType/series> ;
        dct:provenance "This dataset belongs to the open data about Belgium transportation
system".


<#tec> a dcat:Dataset;
        dct:description "Walloonia bus information system";
        dct:title "De Lijn Bus system" ;
        dct:spatial <http://sws.geonames.org/3337387/>;
        dcat:keyword "Bus";
        dcat:keyword "Stops";
        dcat:contactPoint <https://www.infotec.be/en-us/contactus.aspx>;
        dcat:distribution <#tec-distribution-01> ;
        dcat:theme <http://datos.crtm.es/kos/vocabmetadata/interurbanbus> ;
```

dcat:theme <http//:datos.crtm.es/kos/vocabmetadata/stops> ;
dct:publisher <https://irail.be/#org> ;
dct:conformsTo <https://developers.google.com/transit/gtfs/reference> ;
foaf:page <https://www.infotec.be/> ;
dct:accrualPeriodicity <http://purl.org/cld/freq/weekly> ;
dct:hasVersion <#tec01> ;
dct:identifier "tec" ;
dcat:landingPage <hhttps://www.infotec.be/en-us/keepinformed.aspx>;
dct:language <http://id.loc.gov/vocabulary/iso639-1/en> ;
owl:versionInfo   "1.0" ;
dct:accessRights "public" ;
dct:type <http://inspire.ec.europa.eu/metadata-codelist/ResourceType/series> ;
dct:provenance "This dataset belongs to the open data about Belgium transportation
system".

<#delijn-distribution-01> a dcat:Distribution;
dcat:accessURL <https://hello.irail.be/gtfs/> ;
dct:description"Data set distribution for the De Lijn bus information system" ;
dct:format "CSV" ;
dcat:byteSize 37102494 ;
foaf:page <https://hello.irail.be/gtfs/> ;
dcat:downloadURL <http://gtfs.irail.be/de-lijn/de_lijn-gtfs.zip> ;
dct:language <http://id.loc.gov/vocabulary/iso639-1/en> ;
dct:conformsTo <https://developers.google.com/transit/gtfs/reference> ;
dcat:mediaType "text/csv" ;
dct:rights "public" ;
adms:status "updated" ;
dct:title "De Lijn Bus Information System".

<#stib-mivb-distribution-01> a dcat:Distribution;
dcat:accessURL <https://hello.irail.be/gtfs/> ;
dct:description"Data set distribution for the Brussels SITB-MIVB bus information
system" ;
dct:format "CSV" ;
dcat:byteSize 27661685 ;
foaf:page <https://hello.irail.be/gtfs/> ;
dcat:downloadURL <https://gtfs.irail.be/mivb/mivb-gtfs.zip> ;
dct:language <http://id.loc.gov/vocabulary/iso639-1/en> ;
dct:conformsTo <https://developers.google.com/transit/gtfs/reference> ;
dcat:mediaType "text/csv" ;
dct:rights "public" ;
adms:status "updated" ;
dct:title "Brussels SITB-MIVB Bus Information System".

```
<#snbc-nmbs-distribution-01> a dcat:Distribution;
        dcat:accessURL <https://hello.irail.be/gtfs/> ;
        dct:description"Data set distribution for the Belgium SNBC-NMBS train information
system" ;
        dct:format "CSV" ;
        dcat:byteSize 2122369  ;
        foaf:page <https://hello.irail.be/gtfs/> ;
        dcat:downloadURL <http://gtfs.irail.be/nmbs/nmbs-latest.zip> ;
        dct:language <http://id.loc.gov/vocabulary/iso639-1/en> ;
        dct:conformsTo <https://developers.google.com/transit/gtfs/reference> ;
        dcat:mediaType "text/csv" ;
        dct:rights "public" ;
        adms:status "updated" ;
        dct:title "Belgium SNBC-NMBS Train Information System".


<#tec-distribution-01> a dcat:Distribution;
        dcat:accessURL <https://hello.irail.be/gtfs/> ;
        dct:description"Data set distribution for the Wallonia TEC bus information system" ;
        dct:format "CSV" ;
        dcat:byteSize 36479515  ;
        foaf:page <https://hello.irail.be/gtfs/> ;
        dcat:downloadURL <https://gtfs.irail.be/tec/tec-gtfs.zip> ;
        dct:language <http://id.loc.gov/vocabulary/iso639-1/en> ;
        dct:conformsTo <https://developers.google.com/transit/gtfs/reference> ;
        dcat:mediaType "text/csv" ;
        dct:rights "public" ;
        adms:status "updated" ;
        dct:title "Wallonia TEC Bus Information System".


<#catalogRecord-01> a dcat:CatalogRecord;
        foaf:primaryTopic <#delijn>, <#stib-mivb>, <#snbc-nmbs>, <#tec>;
        dct:modified "2017-05-24"^^xsd:date ;
        dct:conformsTo "TransportDCAT-AP";
        adms:status    "updated";
        dct:issued "2017-05-24"^^xsd:date ;
        dct:description"Added iRail data sets to the catalog" ;
        dct:language <http://id.loc.gov/vocabulary/iso639-1/en> ;
        dct:title "Belgium Data sets - Inclusion".
```