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Technical Guide for the Interoperability of Data Catalogs

Based on the DCAT W3C standard, the Spanish Technical Interoperability Standard for the reuse of Information Resources and other best practices.

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The Government of Aragon, by means of official agreement of 17 July 2012, is committed to the effective opening of public data following the recommendations of the 2003/98/EC European Directive on Public Sector Information Reuse, as well as its transposition in Spain through Law 37/2007. To that end the Aragón Open Data project was born, providing a complete platform that supports the publication of open data.

Moreover, to date March 4, 2013 the Spanish Technical Interoperability Standard for the reuse of Information Resources (hereinafter the NTI Standard) was published in the National Official Bulletin (BOE). This NTI Standard aims to facilitate and ensure data sharing and re-use in Public Administrations. For that it provides guidance on how to ensure the persistence of information, the selection of appropriate formats, as well as the right terms and conditions for re-use.

The publication of this standard is an important milestone, because it describes in detail the metadata used to ensure *findability* and interoperability of those information resources produced or held by the public sector. However, for this being effectively possible, it is crucial to **avoid any ambiguity** in the interpretation and final application of the standard. This fact is essential to ensure that data processing will be not only technically feasible, but also semantically reliable.

A second project phase was focused on the evolution and improvement of Aragón Open Data, where an initial thorough study on the conformance of the platform with the NTI Standard was performed. The findings of the study indicate the measures that need to be adopted for a proper conversion to the regulatory Open Data standards in Spain.

This technical guide aims to ensure data reliability through a proper implementation of DCAT metadata accordingly to the NTI Standard and its additional update for minor corrections.

Through this technical guide the various elements needed to create complete metadata exchange files accordingly to NTI Standard are explained, as well as the best practices to be followed in the selection of formats, taxonomies and vocabularies without leaving room for ambiguity. The guide always adheres to the NTI and other existing standards, developing also new justified proposals for those use cases where still there is no clearly defined reference.

Document conventions

Semantic Web technologies are used for the description of the metadata in the NTI Standard, so it is convenient to get familiar with some general RDF concepts first.

In the examples shown throughout this guide the RDF/XML syntax is used to facilitate readability by those developers more used to work with XML instead of RDF. However, it should be noted that the semantic nature of RDF differs from the syntactic XML nature and therefore RDF should never be processed as XML beyond purely representational purposes.

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Some other conventions being applied throughout the document and the examples are:

Language identification

For the identification of textual content that is language dependent (regardless of whether it is available in one single language or multiple ones) the xml:lang attribute will be used accordingly to the XML 1.0 specification for language identification, along with the standard language tags as defined by RFC 5646 and the IANA registry, such as:

es: spanish.
an: aragonese.
en: english.
fr: french.

For example:

```
<eg:textualProperty xml:lang="en">Text example.</eg:textualProperty>
<eg:textualProperty xml:lang="es">Ejemplo de texto.</eg:textualProperty>
```

Data types

Literal: A literal is a textual string in UNICODE format that could be representing a sentence, a date, a number, etc.

A literal could simply contain a text string for which the usual writing rules that apply in the corresponding language are followed (capitalization, punctuation, etc.).

In other cases, the literal may represent a particular data type (indicated by the attribute rdf:datatype), so you should follow the specific format for that type. The NTI Standard uses the following XML Schema types:

Non negative integer: http://www.w3.org/2001/XMLSchema#nonNegativeInteger
Decimal: http://www.w3.org/2001/XMLSchema#decimal
Date: http://www.w3.org/2001/XMLSchema#date
Date and time: http://www.w3.org/2001/XMLSchema#dateTime
URI: http://www.w3.org/2001/XMLSchema#anyURI

For example:

```
<eg:decimalProperty rdf:datatype="http://www.w3.org/2001/XMLSchema#decimal">
    33.10
</eg:decimalProperty>

<eg:dateProperty rdf:datatype="http://www.w3.org/2001/XMLSchema#date">
    2014-5-25
</eg:dateProperty>
```

Vocabularies

The NTI Standard reuses several terms for descriptive metadata coming from various existing specifications, including:

W3C Time Ontology – Namespace: http://www.w3.org/2006/time#

An ontology of temporal concepts developed by the W3C, including items such as instants, intervals, durations and specific times. More information at http://www.w3.org/TR/owl-time/

Dublin Core Terms – Namespace: http://purl.org/dc/terms/

Complete set of terms produced by the Dublin Core metadata initiative, a reference in the development of widely applicable metadata and best practices for metadata management. Dublin Core terms include: classes, properties, vocabularies, common coding schemes and types. More information at http://purl.org/dc/terms/

Dublin Core Elements – Namespace: http://purl.org/dc/elements/1.1/

The original subset of core Dublin Core elements currently already incorporated into the full set of terms. This distinction remains here only to maximize compatibility with the NTI Standard, given that in the case of language metadata it still uses this previous elements version. More information at http://purl.org/dc/terms/

W3C Data Catalog Vocabulary – Namespace: http://www.w3.org/ns/dcat#

A vocabulary designed by the W3C to facilitate interoperability among data catalogs that have been published on the Web, improving its findability and facilitating not only reuse, but also a decentralized publication and the subsequent federation. More information at http://www.w3.org/TR/vocab-dcat/

Friend Of A Friend – Namespace: http://xmlns.com/foaf/0.1/

The FOAF language is a project to establish links between personal networks and information networks. With FOAF we can describe the characteristics of people and the social groups that are on the Web. More information at http://xmlns.com/foaf/spec/

XML Schema – Namespace: http://www.w3.org/2001/XMLSchema#

Several of the primitive types used by the XML Schema definition are used to facilitate interoperability of some metadata. More information at http://www.w3.org/TR/xmlschema11-2/#built-in-primitive-datatypes

RDF Schema – Namespace: http://www.w3.org/2000/01/rdf-schema#

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A wide scope vocabulary for assisting in RDF data modelling. More information at http://www.w3.org/TR/rdf-schema/

RDF Syntax – Namespace: http://www.w3.org/1999/02/22-rdf-syntax-ns#

Syntax used for the representation of RDF vocabularies in RDF/XML format. More information at http://www.w3.org/TR/rdf-syntax-grammar/

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CATALOG METADATA

NAME	
Description	**Short title or name given to the data Catalog.**
Type	**Literal** – Alphanumeric string in UNICODE format.
Property	**dct:title**
Character	**REQUIRED**
Comments	The title may be repeated multiple times to provide alternative representations in different languages.
Example:	

…
<dct:title xml:lang="en">**Aragón Open Data Catalog.**</dct:title>
<dct:title xml:lang="es">**Catálogo de datos de Aragón Open Data.**</dct:title>
…

DESCRIPTION	
Description	**Descriptive summary of the data Catalog.**
Type	**Literal** – Alphanumeric string in UNICODE format.
Property	**dct:description**
Character	**REQUIRED**
Comments	The description may be repeated several times to provide alternative representations in different languages.
Example:	

…
<dct:description xml:lang="en">**Government of Aragón Open Data Catalog, managed by the ICT Directorate, whose mission is…**</dct:description>
<dct:description xml:lang="es">**Catálogo de datos abiertos del Gobierno de Aragón, administrado por la Dirección General de Nuevas Tecnologías, cuya misión es que…**</dct:description>
…

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PUBLISHING BODY	
Description	**Body or agency publishing the Catalog.**
Type	**foaf:Agent** – A representation URI will be provided corresponding to the identifier of each body, agency or office.
Property	**dct:publisher**
Character	**REQUIRED**
Comments	Representation URIs must follow the URIs scheme defined by Aragón Open Data: **http://opendata.aragon.es/resource/public-sector/body/Body/BodyID** Being BodyID the identifier corresponding to the publishing body assigned by the Shared Organic Units and Offices Directory (DIR3) from the Ministry of Finance and Public Administration, which follows the format defined by the attributes guide. For the representation of Bodies the foaf:Organization class (foaf:Agent subclass) or the org:Organization class (equivalent to the previous one) could be used. Both of them are compatible with the current DIR3 semantization project.
Example:	
… <dct:publisher rdf:resource="**http://opendata.aragon.es/resource/public-sector/body/Body/A02002841**"/> …	

CATALOG SIZE	
Description	**Total number of datasets in the Catalog.**
Type	**dct:SizeOrDuration** – It is recommended to include an integer value as well as its equivalent textual representation.
Property	**dct:extent**
Character	**optional**
Comments	Total size of the Catalog (number of datasets) expressed by means of:

	Value – rdf:value: Literal non-negative integer – Total number of available datasets. **(optional) Label – rdfs:label: Literal** – Alphanumeric string in UNICODE format with the textual representation of the number of datasets. When a label is provided it may be repeated several times to provide alternative representations in multiple languages.

Example:

```
…
<dct:extent>
  <dct:SizeOrDuration>
    <rdfs:label xml:lang="en">Two hundred and thirty five.</rdfs:label>
    <rdfs:label xml:lang="es">Doscientos treinta y cinco.</rdfs:label>
    <rdf:value rdf:datatype="http://www.w3.org/2001/XMLSchema#nonNegativeInteger">235</rdf:value>
  </dct:SizeOrDuration>
</dct:extent>
…
```

IDENTIFIER	
Description	**Reference for Catalog identification.**
Type	**xsd:anyURI** – URI that identifies the current Catalog.
Property	**dct:identifier**
Character	**optional**
Comments	The same identifier could serve as resource identifier to represent the Catalog in the RDF model through the rdf:about attribute of the dcat:Catalog element.

Example:

```
<dcat:Catalog rdf:about="http://opendata.aragon.es/catalog">
  <dct:identifier rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI”>
     http://opendata.aragon.es/catalog
  </dct:identifier>
  …
</dcat>
```

DATE OF CREATION	
Description	**Date when the Catalog was originally published.**
Type	Date – **YYYY-MM-DD** DateTime – **YYYY-MM-DDTHH:MM:SS+TZ** Date/Time represented in ISO-8601 format.
Property	**dct:issued**
Character	**REQUIRED**
Comments	**YYYY** = **four digits** year (e.g. 2014) **MM** = **two digits** month (01=January, etc.) **DD** = **two digits** day (from 01 to 31) **hh** = **two digits** hour (from 00 to 23) (am/pm not allowed) **mm** = **two digits** minutes (from 00 to 59) **ss** = **two digits** seconds (from 00 to 59) **TZ** = Time zone designation. The Z value will be used to represent UTC. Any time difference with respect to UTC will be expressed in the form of +hh:mm or -hh:mm For example: 2014-06-22 2014-06-22T18:15:03+01:00 → (UTC+1)
Example:	

…
<dct:issued rdf:datatype="http://www.w3.org/2001/XMLSchema#date”>**2012-02-10**</dct:issued>
…

LAST UPDATE	
Description	**Date when the Catalog was last updated (a dataset was added, modified or deleted).**
Type	Date – **YYYY-MM-DD** DateTime – **YYYY-MM-DDTHH:MM:SS+TZ** Date/Time represented in ISO-8601 format.
Property	**dct:modified**

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Character	**REQUIRED**
Comments	**YYYY** = **four digits** year (e.g. 2014) **MM** = **two digits** month (01=January, etc.) **DD** = **two digits** day (from 01 to 31) **hh** = **two digits** hour (from 00 to 23) (am/pm not allowed) **mm** = **two digits** minutes (from 00 to 59) **ss** = **two digits** seconds (from 00 to 59) **TZ** = Time zone designation. The Z value will be used to represent UTC. Any time difference with respect to UTC will be expressed in the form of +hh:mm or -hh:mm For example: 2014-06-22 2014-06-22T18:15:03+01:00 → (UTC+1)
Example:	

…
<dct:modified rdf:datatype="http://www.w3.org/2001/XMLSchema#date">**2012-06-28**</dct:modified>
…

LANGUAGE(S)

Description	**Language(s) the information in the catalog is available in.**
Type	**Literal** – Standard tag values to identify languages as defined by the RFC 5646 and the IANA registry. For example: **es: spanish.** **an: aragones.** ga: galician. ca: catalonian. eu: basque. en: english. fr: french.
Property	**dc:language**
Character	**REQUIRED**

Comments	Do not confuse with the language in which the content of the datasets could be. Here we only indicate the language or languages in which the Catalog is described. One dc:language property will be used for each language of the catalog, repeating as many times as necessary to represent all available languages.
Example: … <dc:language>**en**</dc:language> <dc:language>**es**</dc:language> …	

GEOGRAPHICAL COVERAGE	
Description	**Geographical area covered by the Catalog.**
Type	**Resource** – URI that identifies the resource representing the geographical area covered.
Property	**dct:spatial**
Character	**optional**
Comments	A dct:spatial property will be used for each geographic location covered by the catalog for which any data is provided. For the different locations at Autonomy, Province, Municipality or County levels the class identifiers defined by the Aragopedia vocabulary will be used following these formats: Autonomy: **http://opendata.aragon.es/recurso/territorio/ComunidadAutonoma/Aragon** Provinces: **http://opendata.aragon.es/recurso/territorio/Provincia/Huesca** **http://opendata.aragon.es/recurso/territorio/Provincia/Zaragoza** **http://opendata.aragon.es/recurso/territorio/Provincia/Teruel** Municipalities (see complete list): **http://opendata.aragon.es/recurso/territorio/Municipio/NombreMunicipio** Counties (see complete list): **http://opendata.aragon.es/recurso/territorio/Comarca/NombreComarca** The taxonomies defined in this regard at the annex V of the NTI Standard will be used as follows in those cases where it may be

	necessary to represent a location outside the Aragón Autonomy: Autonomies: **http://datos.gob.es/recurso/sector-publico/territorio/Autonomia/NombreCA** Provinces: **http://datos.gob.es/recurso/sector-publico/territorio/Provincia/NombreProvincia**
Example: … <dct:spatial rdf:resource="**http://opendata.aragon.es/recurso/territorio/ComunidadAutonoma/Aragon**" /> …	

THEMES	
Description	**Taxonomy that represents the complete set of themes included in the Catalog.**
Type	**skos:ConceptScheme.** URI that represents the Knowledge Organization System in SKOS format that is being applied.
Property	**dcat:themeTaxonomy**
Character	**REQUIRED**
Comments	Will refer to the thematic taxonomy defined by the Spanish National Data Catalog, which is the same used by Aragón Open Data, whose representation in SKOS format is available at: **http://datos.gob.es/kos/sector-publico/sector/**
Example: … <dcat:themeTaxonomy rdf:resource="**http://datos.gob.es/kos/sector-publico/sector/**" /> …	

WEB PAGE	
Description	**Web address to access the data Catalog.**
Type	**Resource** – URI that references to the web page serving as the Catalog human interface.

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Property	**foaf:homepage**
Character	**REQUIRED**
Comments	Here we must provide the web address intended to be the home page for the general public, not any one oriented to the automatic Catalog processing.
Example:	… <foaf:homepage rdf:resource="**http://opendata.aragon.es/catalogo/catalogo**" /> …

TERMS OF USE	
Description	**Reference to the general terms of use.**
Type	**Resource** – URI that references a resource where the terms of use are described.
Property	**dct:license**
Character	**REQUIRED**
Comments	Link to a resource with the general terms of use for the Catalog. It is recommended that such resource also counts with its own self-contained metadata. Predefined ontologies such as the Creative Commons Rights Expression Language or the Open Data Rights Statement Vocabulary could be used.
Example:	… <dct:license rdf:resource="**http://opendata.aragon.es/terminos**" /> …

DATASETS	
Description	**Complete list of all datasets included in the Catalog.**
Type	**dcat:Dataset** – URI that references a resource where the Dataset in question is described.

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Property	**dcat:dataset**
Character	**REQUIRED**
Comments	A dcat:dataset property will be used for each of the datasets that are part of the Catalog. Details about the metadata to be used when describing each of the individual datasets are provided in the next section.
Example:	… <dcat:dataset rdf:resource="**http://opendata.aragon.es/catalogo/convocatorias-empleo-publico**" /> <dcat:dataset rdf:resource="**http://opendata.aragon.es/catalogo/presupuesto-y-ejecucion**" /> …

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COMPLETE CATALOG EXAMPLE

Required elements are indicated in bold and optional ones in italics:

```
<?xml version="1.0" encoding="UTF-8"?>

<rdf:RDF
  xmlns:dct="http://purl.org/dc/terms/"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:dcat="http://www.w3.org/ns/dcat#"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#">

<dcat:Catalog rdf:about="http://opendata.aragon.es/catalog">

  <!-- Catalog identifier -->
  <dct:identifier rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI”>
      http://opendata.aragon.es/catalog
  </dct:identifier>
  <!-- Title and description in English and Spanish -->
  <dct:title xml:lang="en">Aragón Open Data Catalog</dct:title>
  <dct:title xml:lang="es">Catálogo de datos de Aragón Open Data</dct:title>
  <dct:description xml:lang="en">Government of Aragón Open Data Catalog, managed by the ICT
          Directorate, whose mission is…</dct:description>
  <dct:description xml:lang="es">Catálogo de datos abiertos del Gobierno de Aragón,
          administrado por la DG de Nuevas Tecnologías, cuya misión es…</dct:description>
  <!-- Reference to the catalog publishing body: Innovation and Industry department -->
  <dct:publisher rdf:resource="http://opendata.aragon.es/resource/public-sector/body/Body/A02002841" />
  <!-- Total number of datasets in the catalog -->
  <dct:extent>
    <dct:SizeOrDuration>
      <rdfs:label xml:lang="en">Two hundred and thirty five</rdfs:label>
      <rdfs:label xml:lang="es">Doscientos treinta y cinco</rdfs:label>
      <rdf:value rdf:datatype="http://www.w3.org/2001/XMLSchema#nonNegativeInteger">235</rdf:value>
    </dct:SizeOrDuration>
  </dct:extent>
  <!-- Date of creation and last update for the catalog -->
  <dct:issued rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2012-02-10</dct:issued>
  <dct:modified rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2014-01-11</dct:modified>
  <!-- Languages used in the catalog -->
  <dc:language>en</dc:language>
  <dc:language>es</dc:language>
  <!-- Catalog geographical coverage -->
  <dct:spatial rdf:resource="http://opendata.aragon.es/recurso/territorio/ComunidadAutonoma/Aragon" />
  <!-- Reference to the theme taxonomy used in the catalog -->
  <dcat:themeTaxonomy rdf:resource="http://datos.gob.es/kos/sector-publico/sector/" />
  <!-- Reference to catalog home page -->
  <foaf:homepage rdf:resource="http://opendata.aragon.es/catalog/catalog" />
  <!-- Reference to the general terms of use for the catalog -->
  <dct:license rdf:resource="http://opendata.aragon.es/terms" />
  <!-- Complete list of references to each dataset in the catalog -->
  <dcat:dataset rdf:resource="http://opendata.aragon.es/catalog/convocatorias-empleo-publico" />
  <dcat:dataset rdf:resource="http://opendata.aragon.es/catalog/presupuesto-y-ejecucion" />
   …

</dcat:Catalog>
</rdf:RDF>
```

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DATASETS METADATA

NAME	
Description	**Name or title of the Dataset.**
Type	**Literal** – Alphanumeric string with UNICODE format.
Property	**dct:title**
Character	**REQUIRED**
Comments	The name may be repeated several times to provide alternative representations in different languages.
Example:	… <dct:title xml:lang="en">**Public examinations and employment.**</dct:title> <dct:title xml:lang="es">**Oposiciones y empleo público.**</dct:title> …

DESCRIPTION	
Description	**Detailed description of the Dataset.**
Type	**Literal** – Alphanumeric string in UNICODE format.
Property	**dct:description**
Character	**REQUIRED**
Comments	The description may be repeated several times to provide alternative representations in different languages.
Example:	… <dct:description xml:lang="en">**Calls for public examinations and employment published by the BOA since 2012/01/01.**</dct:description> <dct:description xml:lang="es">**Convocatorias de oposiciones y empleo público publicados en el BOA a partir de 01/01/2012.**</dct:description> …

THEME(S)	
Description	**Subject(s) or main topic(s) of the Dataset.**
Type	**skos:Concept** – Reference to a specific concept within the Knowledge Organization System in SKOS format that is being applied.
Property	**dcat:theme**
Character	**REQUIRED**
Comments	References will be provided to the different topics defined by the Public sector Taxonomy of the Spanish Data Catalog, whose identifiers are as follows: http://datos.gob.es/kos/sector-publico/sector/**theme** Being the theme (in Spanish) one of : *ciencia-tecnologia* *cultura-ocio* *demografia* *deporte* *economia* *educacion* *empleo* *energia* *hacienda* *industria* *legislacion-justicia* *medio-ambiente* *medio-rural* *salud* *sector-publico* *seguridad* *sociedad-bienestar* *transporte* *turismo* *urbanismo-infrastructura* *vivienda* A dcat:theme property will be used for each theme, repeating the property as many times as necessary to cover all applicable themes.
Example:	

```
…
<dcat:theme rdf:resource="http://datos.gob.es/kos/sector-publico/sector/empleo" />
<dcat:theme rdf:resource="http://datos.gob.es/kos/sector-publico/sector/sector-publico" />
…
```

TAG(S)	
Description	**Textual tag(s) that allow a free categorization of the Dataset in a complementary way to the one provided by the main themes.**

Type	**Literal** – Compact alphanumeric string.
Property	**dcat:keyword**
Character	**Optional**
Comments	Tags should be composed by on single word or a couple at most. A dcat:keyword property will be used for each tag, repeating the property as many times as needed to represent all tags and their different language representations.

Example:

```
…
<dcat:keyword xml:lang="en">public examinations</dcat:keyword>
<dcat:keyword xml:lang="en">announcement</dcat:keyword>
<dcat:keyword xml:lang="es">oposiciones</dcat:keyword>
<dcat:keyword xml:lang="es">convocatoria</dcat:keyword>
…
```

IDENTIFIER	
Description	**Reference for the identification of the Dataset.**
Type	**xsd:anyURI** – URI that identifies the Dataset.
Property	**dct:identifier**
Character	**optional**
Comments	The same identifier could serve as resource identifier to represent the Dataset in the RDF model through the rdf:about attribute of the dcat:Datalog element.

Example:

```
…
<dcat:Dataset rdf:about="http://opendata.aragon.es/catalogo/convocatorias-empleo-publico">
  <dct:identifier rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI”>
      http://opendata.aragon.es/catalogo/convocatorias-empleo-publico
  </dct:identifier>
  …
</dcat:Dataset>
…
```

DATE OF CREATION	
Description	**Original creation date of the Dataset.**
Type	Date – **YYYY-MM-DD** DateTime – **YYYY-MM-DDTHH:MM:SS+TZ** Date/Time represented in ISO-8601 format.
Property	**dct:issued**
Character	**optional**
Comments	**YYYY** = **four digits** year (e.g. 2014) **MM** = **two digits** month (01=January, etc.) **DD** = **two digits** day (from 01 to 31) **hh** = **two digits** hour (from 00 to 23) (am/pm not allowed) **mm** = **two digits** minutes (from 00 to 59) **ss** = **two digits** seconds (from 00 to 59) **TZ** = Time zone designation. The Z value will be used to represent UTC. Any time difference with respect to UTC will be expressed in the form of +hh:mm or -hh:mm For example: 2014-06-22 2014-06-22T18:15:03+01:00 → (UTC+1)
Example:	

…
<dct:issued rdf:datatype="http://www.w3.org/2001/XMLSchema#date">**2012-02-10**</dct:issued>
…

LAST UPDATE	
Description	**Date when the Dataset content (not the metadata) was last updated.**
Type	Date – **YYYY-MM-DD** DateTime – **YYYY-MM-DDTHH:MM:SS+TZ** Date/Time represented in ISO-8601 format.
Property	**dct:modified**
Character	**optional**

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Comments	**YYYY** = **four digits** year (e.g. 2014) **MM** = **two digits** month (01=January, etc.) **DD** = **two digits** day (from 01 to 31) **hh** = **two digits** hour (from 00 to 23) (am/pm not allowed) **mm** = **two digits** minutes (from 00 to 59) **ss** = **two digits** seconds (from 00 to 59) **TZ** = Time zone designation. The Z value will be used to represent UTC. Any time difference with respect to UTC will be expressed in the form of +hh:mm or -hh:mm For example: 2014-06-22 2014-06-22T18:15:03+01:00 → (UTC+1)
Example:	… <dct:modified rdf:datatype="http://www.w3.org/2001/XMLSchema#date">**2012-06-28**</dct:modified> …

UPDATE FREQUENCY	
Description	**Estimated period of time between two consecutive updates of the Dataset (when applicable).**
Type	**dct:Frequency** – It is recommended to use normalized periods of time in ISO-8601 format.
Property	**dct:accrualPeriodicity**
Character	**optional**
Comments	The estimated update period will be indicated. Periods of time must be expressed in the following units defined by the W3C Time Ontology: seconds: **http://www.w3.org/2006/time#seconds** minutes: **http://www.w3.org/2006/time#minutes** hours: **http://www.w3.org/2006/time#hours** days: **http://www.w3.org/2006/time#days** weeks: **http://www.w3.org/2006/time#weeks** months: **http://www.w3.org/2006/time#months** years: **http://www.w3.org/2006/time#years**

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	The periods to be used for NTI Standard compatibility are (lowest to highest update): triennial, biennial, annual, biannual, four-monthly, quarterly, bi-monthly, monthly, fortnightly, tri-monthly, weekly, bi-weekly, tri-weekly, daily, hourly and real-time. It is also recommended to add descriptive textual labels for any language included in the Catalog using the rdfs:label and indicating the corresponding language.

Example:

```
…
<dct:accrualPeriodicity>
  <dct:Frequency>
    <rdfs:label xml:lang="en">Weekly.</rdfs:label>
    <rdfs:label xml:lang="es">Semanal.</rdfs:label>
      <rdf:value>
        <time:DurationDescription>
          <time:weeks rdf:datatype="http://www.w3.org/2001/XMLSchema#decimal">1</time:weeks>
        </time:DurationDescription>
      </rdf:value>
  </dct:Frequency>
</dct:accrualPeriodicity>
…
```

LANGUAGE(S)	
Description	**Language(s) the information in the Dataset is available in.**
Type	Literal – Standard tag values to identify languages as defined by the RFC 5646 and the IANA registry. For example: **es: spanish.** **an: aragones.** ga: galician. ca: catalonian. eu: basque. en: english. fr: french.
Property	**dc:language**
Character	**optional**
Comments	One dc:language property will be used for each language of the Dataset, repeating the property as many times as necessary to represent all available languages.

Example:

…
<dc:language>**en**</dc:language>
<dc:language>**es**</dc:language>
…

PUBLISHING BODY	
Description	**Body or agency publishing the Dataset.**
Type	**foaf:Agent** – An URI will be provided corresponding to the unique identifier of each body, agency or office.
Property	**dct:publisher**
Character	**REQUIRED**
Comments	Representation URIs must follow the URIs scheme defined by Aragón Open Data: **http://opendata.aragon.es/resource/public-sector/body/Body/BodyID** Being BodyID the identifier corresponding to the publishing body assigned by the Shared Organic Units and Offices Directory (DIR3) from the Ministry of Finance and Public Administration, which follows the format defined by the attributes guide. For the representation of the different bodies, the foaf:Organization class (foaf:Agent subclass) or the org:Organization class (equivalent to the previous one) could be used. Both of them are compatible with the current DIR3 semantization project.

Example:

…
<dct:publisher rdf:resource="**http://opendata.aragon.es/recursos/sector-publico/Organismos/A02002834**"/>
…

TERMS OF USE	
Description	**Resource describing the terms of use or specific license applicable to the Dataset.**

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Type	**dct:LicenseDocument** – An URI reference to the resource that defines the terms of use will be provided.
Property	**dct:license**
Character	**optional**
Comments	All Creative Commons licenses have a machine-readable RDF equivalent representation whose identifier is made by adding **/rdf** to the original license URI, so for example: The Creative Commons CC-BY 4.0 license is being described at: **http://creativecommons.org/licenses/by/4.0/** And its equivalent machine-readable RDF representation is: **http://creativecommons.org/licenses/by/4.0/rdf** For a Creative Commons CC-BY-SA 4.0 license the description is at: **http://creativecommons.org/licenses/by-sa/4.0/** And the equivalent RDF is: **http://creativecommons.org/licenses/by-sa/4.0/rdf** In the case of Aragon Open Data, the standard license for the project is Creative Commons CC-BY 4.0. In those cases where the use of any other non CC license may be necessary, some of the existing vocabularies for representing the terms and conditions in machine readable format could be used, such as the Creative Commons Rights Expression Language itself, or the Open Data Rights Statement Vocabulary.
Example:	… <dct:license rdf:resource="**http://creativecommons.org/licenses/by/4.0/rdf**" /> …

GEOGRAPHICAL COVERAGE	
Description	**Geographical area covered by the Dataset.**

Type	**Resource** – URI that identifies the resource representing the geographical area being covered.
Property	**dct:spatial**
Character	**optional**
Comments	A dct:spatial property will be used for each geographic location covered by the Catalog for which any data is provided. For the different locations at Autonomy, Province, Municipality or County levels the class identifiers defined by the Aragopedia vocabulary will be used following these formats: Autonomy: **http://opendata.aragon.es/recurso/territorio/ComunidadAutonoma/Aragón** Provinces: **http://opendata.aragon.es/recurso/territorio/Provincia/Huesca** **http://opendata.aragon.es/recurso/territorio/Provincia/Zaragoza** **http://opendata.aragon.es/recurso/territorio/Provincia/Teruel** Municipalities (see complete list): **http://opendata.aragon.es/recurso/territorio/Municipio/NombreMunicipio** Counties (see complete list): **http://opendata.aragon.es/recurso/territorio/Comarca/NombreComarca** In those cases where it may be necessary to represent a location outside the Aragón Autonomy, the taxonomies defined in this regard at the annex V of the NTI standard will be used as follows: Autonomies: **http://datos.gob.es/recurso/sector-publico/territorio/Autonomia/NombreCA** Provinces: **http://datos.gob.es/recurso/sector-publico/territorio/Provincia/NombreProvincia**

Example:

```
…
<dct:spatial rdf:resource="http://opendata.aragon.es/recurso/territorio/ComunidadAutonoma/Aragón" />
…
```

TEMPORAL COVERAGE

Description	**Start date, end date and duration of the period of time covered by the Dataset.**

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Type	**dct:PeriodOfTime** – Time period that should be indicated by means of the intervals defined at the W3C Time Ontology.
Property	**dct:temporal**
Character	**optional**
Comments	Within a given interval the start and end moments will be defined as dates in the form of: **YYYY** = **four digits** year (e.g. 2014) **MM** = **two digits** month (01=January, etc.) **DD** = **two digits** day (from 01 to 31) **hh** = **two digits** hour (from 00 to 23) (am/pm not allowed) **mm** = **two digits** minutes (from 00 to 59) **ss** = **two digits** seconds (from 00 to 59) **TZ** = Time zone designation. The Z value will be used to represent UTC. Any time difference with respect to UTC will be expressed in the form of +hh:mm or -hh:mm For example: 2014-06-22 2014-06-22T18:15:03+01:00 → (UTC+1)

Example:

```
…
<dct:temporal>
  <time:Interval>
    <rdf:type rdf:resource="http://purl.org/dc/terms/PeriodOfTime" />
    <time:hasBeginning>
      <time:Instant>
        <time:inXSDDate rdf:datatype="http://www.w3.org/2001/XMLSchema#date">
            2013-06-01
        </time:inXSDDate>
      </time:Instant>
    </time:hasBeginning>
    <time:hasEnd>
      <time:Instant>
        <time:inXSDDate rdf:datatype="http://www.w3.org/2001/XMLSchema#date">
            2014-06-01
        </time:inXSDDate>
      </time:Instant>
    </time:hasEnd>
  </time:Interval>
</dct:temporal>
…
```

VALIDITY	
Description	**Validity of the Datasets before content update or expiration.**
Type	Date – **YYYY-MM-DD** DateTime – **YYYY-MM-DDTHH:MM:SS+TZ** Date/time represented in ISO-8601 format.
Property	**dct:valid**
Character	**optional**
Comments	**YYYY** = **four digits** year (e.g. 2014) **MM** = **two digits** month (01=January, etc.) **DD** = **two digits** day (from 01 to 31) **hh** = **two digits** hour (from 00 to 23) (am/pm not allowed) **mm** = **two digits** minutes (from 00 to 59) **ss** = **two digits** seconds (from 00 to 59) **TZ** = Time zone designation. The Z value will be used to represent UTC. Any time difference with respect to UTC will be expressed in the form of +hh:mm or -hh:mm For example: 2014-06-22 2014-06-22T18:15:03+01:00 → (UTC+1)
Example:	

…
<dct:valid rdf:datatype="http://www.w3.org/2001/XMLSchema#date">**2015-06-01**</dct:valid>
…

RELATED RESOURCE(S)	
Description	**Link(s) to Dataset related resource(s) (information or documentation about the data itself, audio-visual materials with additional explanations, etc.).**
Type	Resource – URI that identifies the related resource.
Property	**dct:references**
Character	**optional**

Comments	A dct:references property will be used for each additional resource, repeating the property as many times as necessary to cover all available resources associated with the dataset.
Example:	

```
…
<dct:references rdf:resource="http://aragon.es/Salud/Oposiciones/ListaAprobadosEnfermeria.pdf" />
…
```

REGULATIONS	
Description	**Legislation relating to the Dataset. This is a reference to a legal document.**
Type	Resource – URI that identifies a legal document.
Property	dct:conformsTo
Character	**optional**
Comments	One dct:conformsTo property will be used for each legal document, repeating as many times as necessary to represent all regulations associated with the dataset.
Example:	

```
…
<dct:conformsTo rdf:resource="http://boa.aragon.es/oposiciones/bases-convocatoria=271213" />
…
```

DISTRIBUTION(S)	
Description	**Reference to the different distributions with the actual data of the Dataset in any of its possible representations.**
Type	dcat:Distribution – URI that identifies the resource describing the dataset Distribution.
Property	dcat:distribution
Character	**REQUIRED**
Comments	A dcat:distribution property will be used for each Distribution of the Dataset. Details about the metadata to be used when describing each of the individual distributions are provided in the next section.

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Example:

…
<dcat:distribution rdf:about="**http://boa.aragon.es/oposiciones/convocatoria271213JSON**" />
…

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COMPLETE DATASET EXAMPLE

Required elements are indicated in bold and optional ones in italics:

```
<?xml version="1.0" encoding="UTF-8"?>

<rdf:RDF
  xmlns:dct="http://purl.org/dc/terms/"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:dcat="http://www.w3.org/ns/dcat#"
  xmlns:time="http://www.w3.org/2006/time#"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#">

<dcat:Dataset rdf:about="http://opendata.aragon.es/catalog/convocatorias-empleo-publico">

  <!-- Dataset identifier -->
  <dct:identifier rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI">
      http://opendata.aragon.es/catalog/convocatorias-empleo-publico
  </dct:identifier>
  <!-- Name and description in English and Spanish -->
  <dct:title xml:lang="en">Public examinations and employment.</dct:title>
  <dct:title xml:lang="es">Oposiciones y empleo público.</dct:title>
  <dct:description xml:lang="en">Calls for public examinations and employment published by the
        BOA since 2012/01/01.</dct:description>
  <dct:description xml:lang="es">Convocatorias de oposiciones y empleo público publicados en
        el BOA a partir de 01/01/2012.</dct:description>
  <!-- Themes addressed in the dataset -->
  <dcat:theme rdf:resource="http://datos.gob.es/kos/sector-publico/sector/empleo" />
  <dcat:theme rdf:resource="http://datos.gob.es/kos/sector-publico/sector/sector-publico" />
  <!-- Keywords associated to the dataset in English and Spanish -->
  <dcat:keyword xml:lang="en">public examinations</dcat:keyword>
  <dcat:keyword xml:lang="en">announcement</dcat:keyword>
  <dcat:keyword xml:lang="es">oposiciones</dcat:keyword>
  <dcat:keyword xml:lang="es">convocatoria</dcat:keyword>
  <!-- Date of creation and last update of the dataset and the underlying data -->
  <dct:issued rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2012-02-10</dct:issued>
  <dct:modified rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2012-06-28</dct:modified>
  <!-- Update frequency for the dataset -->
  <dct:accrualPeriodicity>
    <dct:Frequency>
      <rdfs:label xml:lang="en">Weekly.</rdfs:label>
      <rdfs:label xml:lang="es">Semanal.</rdfs:label>
      <rdf:value>
        <time:DurationDescription>
          <time:weeks rdf:datatype="http://www.w3.org/2001/XMLSchema#decimal">1</time:weeks>
        </time:DurationDescription>
      </rdf:value>
    </dct:Frequency>
  </dct:accrualPeriodicity>
 <!-- Languages used in the dataset -->
  <dc:language>es</dc:language>
  <dc:language>en</dc:language>
  <!-- Reference to the publishing body: Government of Aragón -->
 <dct:publisher rdf:resource="http://opendata.aragon.es/resource/public-sector/body/Body/A02002834"/>
  <dct:license rdf:resource="http://creativecommons.org/licenses/by/4.0/rdf" />
  <dct:spatial rdf:resource="http://opendata.aragon.es/recurso/territorio/ComunidadAutonoma/Aragon" />
  <!-- Temporal coverage of the dataset -->
  <dct:temporal>
    <time:Interval>
```

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```
      <rdf:type rdf:resource="http://purl.org/dc/terms/PeriodOfTime" />
      <time:hasBeginning>
        <time:Instant>
          <time:inXSDDate rdf:datatype="http://www.w3.org/2001/XMLSchema#date">
            2013-06-01
          </time:inXSDDate>
        </time:Instant>
      </time:hasBeginning>
      <time:hasEnd>
        <time:Instant>
          <time:inXSDDate rdf:datatype="http://www.w3.org/2001/XMLSchema#date">
            2014-06-01
          </time:inXSDDate>
        </time:Instant>
      </time:hasEnd>
    </time:Interval>
  </dct:temporal>
  <!-- Validity date for the dataset -->
  <dct:valid rdf:datatype="http://www.w3.org/2001/XMLSchema#date">2015-06-01</dct:valid>
  <!-- Additional documentation, regulations and information about the format being used -->
  <dct:references rdf:resource="http://aragon.es/Salud/Oposiciones/ListaAprobadosEnfermeria.pdf" />
  <dct:conformsTo rdf:resource="http://boa.aragon.es/oposiciones/bases-convocatoria=271213" />
  <dcat:distribution rdf:about="http://boa.aragon.es/oposiciones/convocatoria271213JSON" />

</dcat:Dataset>

</RDF>
```

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DISTRIBUTIONS METADATA

IDENTIFIER	
Description	**Reference to identify a given Distribution for a Dataset.**
Type	**xsd:anyURI** – URI that identifies the Distribution.
Property	**dct:identifier**
Character	**optional**
Comments	The same identifier could serve as the resource identifier that represents the Distribution in the RDF model.
Example:	

```
<dcat:Distribution rdf:about="http://boa.aragon.es/oposiciones/convocatoria271213JSON">
  <dct:identifier rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI”>
     http://boa.aragon.es/oposiciones/convocatoria271213JSON
  </dct:identifier>
  …
</dcat:Distribution>
```

NAME	
Description	**Name or title of the Distribution.**
Type	**Literal** – Alphanumeric string in UNICODE format.
Property	**dct:title**
Character	**Optional**
Comments	The name may be repeated multiple times to provide alternative representations in different languages.
Example:	

```
…
<dct:title xml:lang="en">Public examinations calls since 2012.</dct:title>
<dct:title xml:lang="es">Convocatoria de empleo público desde el año 2012.</dct:title>
…
```

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ACCESS URL	
Description	**URL giving access to the dataset Distribution dump or a query intermediary system.**
Type	**Literal** – URL address of the dataset Distribution or the service granting access to it.
Property	**dcat:accessURL**
Character	**REQUIRED**
Comments	This will be also used when a given Distribution could only be obtained through a Web page where the user needs to click some links, provide some information and check some boxes before accessing the data.
Example:	… <dcat:accessURL rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI”> **http://boa.aragon.es/oposiciones/convocatoria=271213&format=JSON** </dcat:accessURL> …

FORMAT	
Description	**Format in which a specific Distribution of the Dataset is represented.**
Type	**dct:MediaTypeOrExtent** – Resource indicating the MIME type of the data format. It is also recommended to include a textual description of the format using the rdfs:label property.
Property	**dct:format**
Character	**REQUIRED**
Comments	When specifying the format using MIME types the specific dct:MediaType class will be used. Just one single format must be specified for each Distribution.
Example:	… <dct:format>

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```
   <dct:MediaType>
      <rdf:value>application/json</rdf:value>
      <rdfs:label>JSON</rdfs:label>
   </dct:MediaType>
</dct:format>
…
```

SIZE	
Description	**Estimated size of the Distribution.**
Type	**Literal** – The size will be expressed in bytes.
Property	**dcat:byteSize**
Character	**optional**
Comments	
Example:	

```
…
<dcat:byteSize rdf:datatype="http://www.w3.org/2001/XMLSchema#decimal">1240</dcat:byteSize>
…
```

ADDITIONAL FORMAT INFORMATION	
Description	**Link (s) to document (s) associated to the Distribution, where you can get additional information about the format, the schema used for its representation or any other technical information about how to access and use the data.**
Type	**Resource** – URI with a reference to a resource associated with the format of the Distribution.
Property	**dct:relation**
Character	**optional**
Comments	A dct:relation property will be used for each resource, repeating as many times as needed to reference all the additional resources associated to the Distribution.
Example:	

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…
<dct:relation rdf:resource="**http://json.org**/" />
…

COMPLETE DISTRIBUTION EXAMPLE

Required elements are indicated in bold and optional ones in italics:

```
<?xml version="1.0" encoding="UTF-8"?>

<rdf:RDF
  xmlns:dct="http://purl.org/dc/terms/"
  xmlns:dcat="http://www.w3.org/ns/dcat#"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#">

<dcat:Distribution rdf:about="http://boa.aragon.es/oposiciones/convocatoria271213JSON">

   <!-- Distribution identifier -->
   <dct:identifier rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI”>
       http://boa.aragon.es/oposiciones/convocatoria271213JSON
   </dct:identifier>
   <!-- Distribution name -->
   <dct:title xml:lang="en">Public examinations calls since 2012</dct:title>
   <dct:title xml:lang="es">Convocatoria de empleo público desde el año 2012</dct:title>
   <!-- Distribution access URL -->
   <dcat:accessURL rdf:datatype="http://www.w3.org/2001/XMLSchema#anyURI”>
       http://boa.aragon.es/oposiciones/convocatoria=271213&format=JSON
   </dcat:accessURL>
   <!-- Distribution format -->
   <dct:format>
     <dct:MediaType>
        <rdf:value>application/json</rdf:value>
        <rdfs:label>JSON</rdfs:label>
     </dct:MediaType>
   </dct:format>
   <!-- File size -->
   <dcat:byteSize rdf:datatype="http://www.w3.org/2001/XMLSchema#decimal">1240</dcat:byteSize>
   <!-- Additional documentation about the format -->
   <dct:relation>
     <rdf:Description>
       <rdfs:label xml:lang="en">The JSON Data Interchange Standard.</rdfs:label>
       <rdfs:label xml:lang="es">El estándar de intercambio de datos JSON.</rdfs:label>
       <foaf:page rdf:resource="http://json.org" />
     </rdf:Description>
   </dct:relation>

</dcat:Distribution>

</RDF>
```

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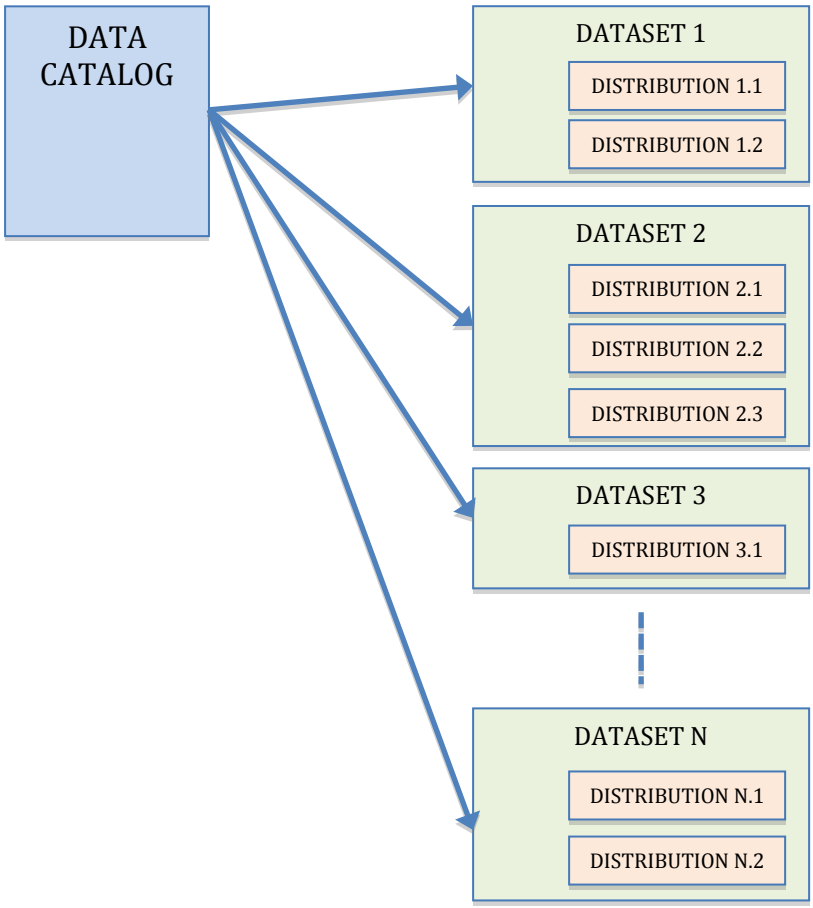
ANNEX I: METADATA COMPOSITON

When composing the various metadata elements (Catalog, Datasets and Distributions), the most common understanding is to differentiate between the Catalog metadata and the Datasets one, including in the latter the metadata corresponding to the respective Distributions.

The connection between the entities that represent the Catalog (dcat:Catalog) and the Datasets (dcat:Dataset) will be done through references between the representations of both entities (in different files) using the property rdf:resource; while entities representing the Distributions (dcat:Distribution) will be directly embedded in the datasets (within the same file) and seen in the following graph.



Therefore, the corresponding RDF documents would have the following form:

Catalog.rdf

The Catalog file will only include its metadata and a complete set of references to the corresponding files where Datasets are represented.

```
<?xml version="1.0" encoding="UTF-8"?>

<rdf:RDF
  xmlns:dct="http://purl.org/dc/terms/"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:dcat="http://www.w3.org/ns/dcat#"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#">

<dcat:Catalog rdf:about="http://opendata.aragon.es/catalog">
   <!-- Rest of the catalog metadata as indicated in the complete catalog example -->
    …
   <!-- List of references to each of the datasets included in the catalog -->
   <dcat:dataset rdf:resource="http://example.org/dataset1 " />
   <dcat:dataset rdf:resource="http://example.org/dataset2 " />
   <dcat:dataset rdf:resource="http://example.org/dataset3 " />
   …
   <dcat:dataset rdf:resource="http://example.org/datasetN " />
</dcat:Catalog>
</rdf:RDF>
```

Dataset1.rdf

The files for the rest of the datasets would also be created similarly (one per dataset), each one with the corresponding embedded distributions.

```
<?xml version="1.0" encoding="UTF-8"?>

<rdf:RDF
  xmlns:dct="http://purl.org/dc/terms/"
  xmlns:dc="http://purl.org/dc/elements/1.1/"
  xmlns:dcat="http://www.w3.org/ns/dcat#"
  xmlns:time="http://www.w3.org/2006/time#"
  xmlns:foaf="http://xmlns.com/foaf/0.1/"
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#">

<dcat:Dataset rdf:about="http://opendata.aragon.es/catalog/convocatorias-empleo-publico">
   <!-- Rest of the dataset metadata as indicated in the complete dataset example -->
    …
   <dcat:distribution>
     <!-- List with all distributions and their metadata directly embedded in the distribution -->
     <dcat:Distribution rdf:about="http://example.org/distribution1.1">
     <!-- Rest of the distribution metadata as indicated in the complete distribution example -->
     </dcat:Distribution>
     <dcat:Distribution rdf:about=" http://example.org/distribution1.2">
     <!-- Rest of the distribution metadata as indicated in the complete distribution example -->
     </dcat:Distribution>
   <dcat:distribution>
    …
</dcat:Dataset>
</RDF>
```

ANNEX II: EXTENSIONS TO THE NTI STANDARD

A best practice to be followed whenever possible is to provide the greatest amount and best quality of metadata. Therefore, there is no need to restrict ourselves providing only NTI Standard metadata (being that mandatory or optional), moreover we could also extend the metadata schema in use as deemed appropriate.

For that we need only to be following some simple rules:

1. When representing additional metadata, make use of **reference vocabularies** that are compatible with the RDF standard (the one used by the NTI).

    a. At section "3.1.3 - Description of Reusable Information" of the Aragón Open Data conformance report several of these reference vocabularies are listed, as well as different repositories that will be very useful when locating new vocabularies. These may be some particularly relevant ones:

        i. DCAT - Data Catalog Vocabulary.
        ii. DCAT-AP – DCAT European Application Profile.
        iii. ADMS – Asset Description Metadata Schema.
        iv. VoID – Vocabulary of Interlinked Datasets.
        v. Coming soon: Vocabulary for the description of dataset Quality and Granularity.

    For example, the following correspondences could be established among the extra metadata currently being used by Aragón Open Data:

Resource	metadata	property
Dataset	maintainer email	dcat:contactPoint
Dataset	landing page	dcat:landingPage
Dataset	version	owl:versionInfo
Distribution	description	dct:description
Distribution	license	dct:license
Distribution	format	dct:format

2. When there is no clear reference vocabulary for the metadata we need there are two alternative options:

    a. Create and document our own vocabulary (ideally also sharing it to facilitate further adoption by the global community).

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This option usually requires more initial efforts, but it also offers better results from the point of view of the metadata semantics.

b. To use generic extensions following the general RDF mechanism for describing resources (rdfs:label and rdf:value), and connecting such descriptions with the described resource by means of the wdrs:describedby property (being http://www.w3.org/2007/05/powder-s# the namespace corresponding to the wdrs prefix), as in the example below:

```
…
<wdrs:describedby>
  <rdf:Description>
    <rdfs:label>5 stars of Linked Data level</rdfs:label>
    <rdf:value>3</rdf:value>
  </rdf:Description>
</wdrs:describedby>
…
```

This option requires very few efforts, but in contrast it usually offers poor semantics given the *generality* of the solution. Such problem could be at least partially corrected through an adequate documentation that helps potential *re-users* to properly identify, understand and exploit these generic extensions.