

Presentation metadata

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OPEN DATA SUPPORT

Training Module 2.4

Designing and developing RDF vocabularies

Learning objectives

By the end of this training module you should have an understanding of:

- What the best practices are for creating an RDF vocabulary for modelling your data
- Where to find RDF vocabularies for reuse.
- How you can create your own RDF vocabulary.
- How to publish your RDF vocabulary.
- The process and methodology for developing semantic agreements developed by the ISA Programme of the European Commission.

Content

This module is about...

- The steps for modelling your data.
- How to reuse existing vocabularies to model your data.
- How to create new classes and properties in RDF.
- How and where to publish your RDF vocabulary so that it can be reused by others.

RDF Vocabulary

“A vocabulary is a data model comprising classes, properties and relationships which can be used for describing your data and metadata.”

- RDF Vocabularies are **sets of terms** used to describe things.
- A term is either a **class or a property**.
 - Object type properties (relationships)
 - Data type properties (attributes)

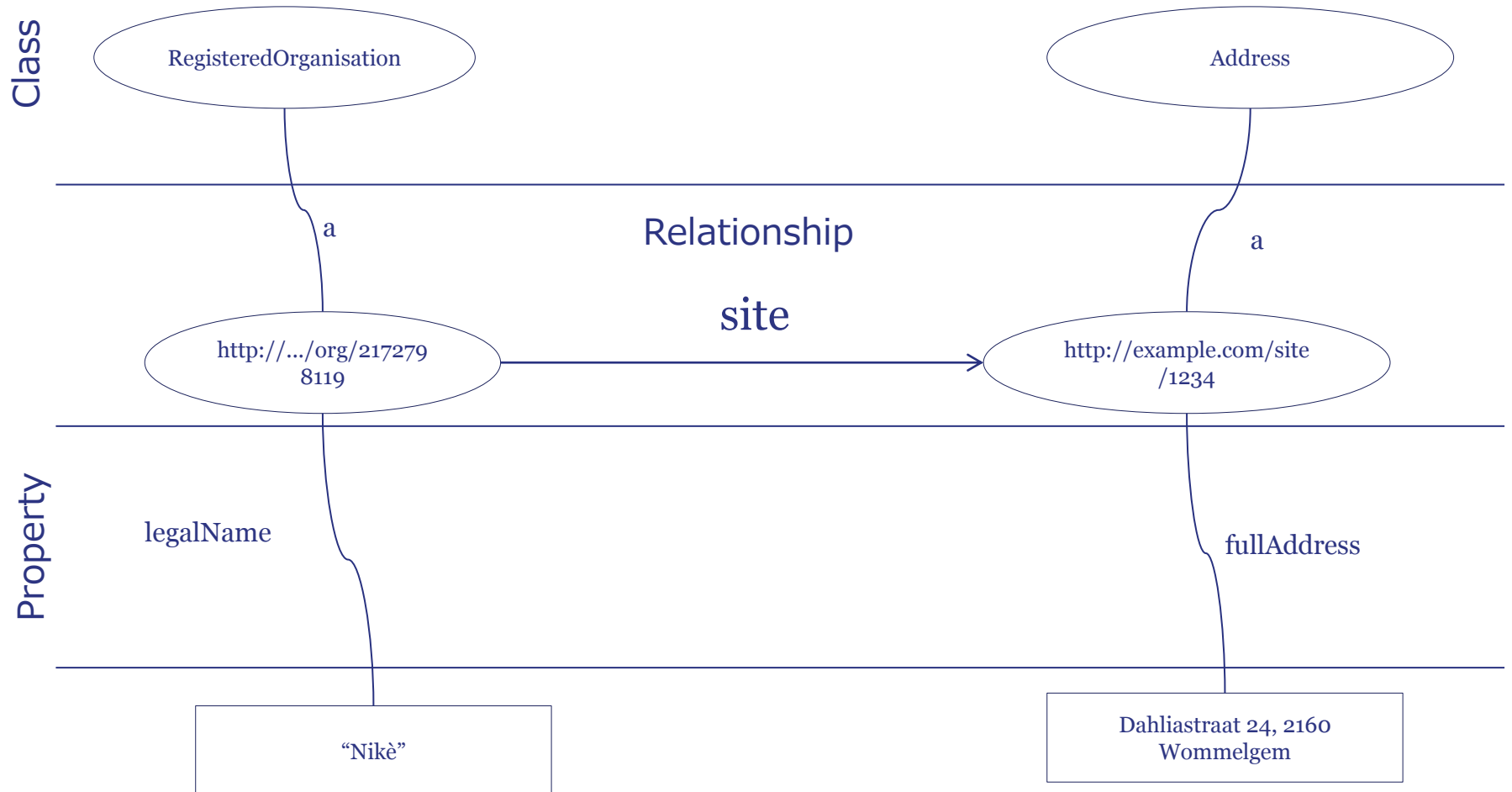
What are classes, relationships and properties?

Class. *A construct that represents things in the real and/or information world, e.g. a person, an organisation, a concepts such as “health” or “freedom”.*

Relationship. *A link between two classes; for the link between a document and the organisation that published it (i.e. organisation *publishes* document), or the link between a map and the geographic region it depicts (i.e. map *depicts* geographic region). In RDF relationships are encoded as object type properties.*

Property. *A characteristic of a class in a particular dimension such as the legal name of an organisation or the date and time that an observation was made.*

Examples of classes, relationships and properties



Model your data

How to reuse from other vocabularies, define your own terms and publish and promote your vocabularies to describe the data.

6 steps for modelling your data

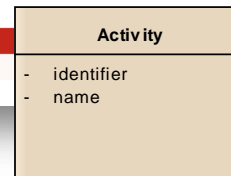
- 1** Start with a **robust Domain Model** developed following a structured process and methodology.
- 2** Research **existing terms** and their usage and **maximise reuse** of those terms.
- 3** Where new terms can be seen as specialisations of existing terms, create **sub class** and **sub properties**.
- 4** Where **new terms** are required, create them following **commonly agreed best practice**.
- 5** Publish within a **highly stable environment** designed to be **persistent**.
- 6** **Publicise the RDF schema** by registering it with relevant services.

See also:

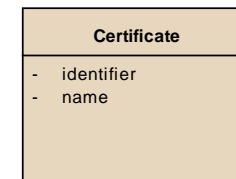
<https://joinup.ec.europa.eu/community/semic/document/cookbook-translating-data-models-rdf-schemas>

1 Start with a robust Domain Model

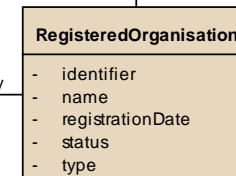
Ondernemingsgegevens	
Algemeen	
Ondernemingsnummer:	0443.368.489
Begindatum:	1 juli 1990
Maatschappelijke Naam:	Niké Benaming in het Nederlands, sinds 1 juli 1990
Adres van de maatschappelijke zetel	Jan-Baptist Guinardstraat 32 9000 Gent Sinds 7 oktober 1992
Telefoonnummer:	Geen gegevens opgenomen in KBO
Faxnummer:	Geen gegevens opgenomen in KBO
E-mailadres:	Geen gegevens opgenomen in KBO
Webadres:	Geen gegevens opgenomen in KBO
Type onderneming:	Rechtspersoon
Status:	Actief
Rechtsvorm:	Vereniging zonder winsttoegmerk Sinds 1 juli 1990
Aantal vestigingseenheden (VE):	0
Beroepsbekwaamheden en basiskennis bedrijfsbeheer	
Geen gegevens opgenomen in KBO	
Hoedanigheden	
Geen gegevens opgenomen in KBO	



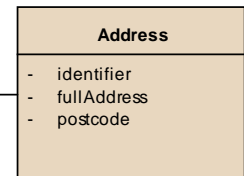
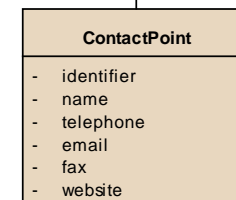
organisationActivity



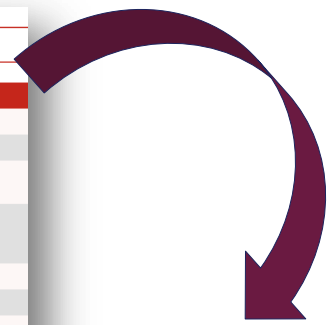
organisationCertificate




contactInformation



location



2 Reuse existing terms and vocabularies

- General purpose vocabularies: DCMI, RDFS  Dublin Core Metadata Initiative®
- To name things: rdfs:label, foaf:name, skos:prefLabel 
- To describe people: FOAF, vCard, Core Person Vocabulary 
- To describe projects: DOAP, ADMS.SW 
- To describe interoperability assets: ADMS 
- To describe registered organisations: Registered Organisation Vocabulary 
- To describe addresses: vCard, Core Location Vocabulary 
- To describe public services: Core Public Service Vocabulary 
- To describe datasets: DCAT, DCAT Application Profile, VoID 

Creating application profiles

- **Different domains** have **different requirements** for domain-specific semantics, e.g. classification concepts.
- Generic RDF vocabularies usually provides the **core base classes** needed to allow extensions to add specific sub-class structures or classification schemes as required.
- In such cases, reusers are encouraged to define **application profiles particular to an application domain** by specifying (if required) **sub-classes, sub-properties** and **controlled vocabularies**.
- For example,
 - [DCAT Application profile for data portals in Europe](#)
 - [Registered Organization vocabulary](#) as an application profile of the [Organization ontology](#).

See also:

joinup.ec.europa.eu/asset/dcat_application_profile/home

Advantages of reuse

- Reuse greatly **aids interoperability** of your data
 - Use of dcterms:created, for example, the value for which should be a data typed date such as 2013-02-21^{^xsd:date}, is immediately processable by many machines. If your schema encourages data publishers to use a different term and date format, such as ex:date "21 February 2013" – data published using your schema will require further processing to make it the same as everyone else's.
- Reuse **adds credibility** to your schema.
 - It shows it has been published with care and professionalism, again, this promotes its reuse.
- Reuse is **easier** and **cheaper**.
 - Reusing classes and properties from well defined and properly hosted vocabularies avoids your having to replicate that effort.

You can find reusable RDF vocabularies on...

The screenshot shows the Joinup Semantic Assets search page. The header includes the European Commission logo and the text "Share and reuse interoperability solutions for public administrations". The search bar contains the text "organisation RDF". The results section shows "1 to 20 of 102 results" and lists several items, including "Organisation Type List" and "Enterprise Competence Organisation Schema".

<http://joinup.ec.europa.eu/>



<http://lov.okfn.org/>

The screenshot shows the Linked Open Vocabularies (LOV) search page. The header includes the LOV logo and the text "Linked Open Vocabularies (LOV)". The search bar contains the text "organisation". The results section shows "147 results in 28 vocabularies" and lists several items, including "swrc:Organization (owl:Class)", "foaf:Organization (owl:Class)", "org:organization (owl:ObjectProperty)", and "org:Organization (owl:Class)".



3 *Creation of sub-classes and sub-properties*

- RDF schemas and vocabularies often include **terms that are very generic**.
- By creating **sub-class** and **sub-property** relationships, systems that understand the super property or super class may be able to interpret the data even if the more specific terms are unknown.
- **Do not create sub-classes and sub-properties simply to allow you to use your own term** for something that already exists.

Creation of sub-properties - example

The Registered Organization vocabulary defines three sub-properties of `org:classification`: `companyType`, `companyStatus` and `companyActivity`.

Company Type

Property	Domain	Range
<code>rov:companyType</code> <code>rdfs:subPropertyOf org:classification</code>	<code>org:Organization</code>	<code>skos:Concept</code>

This property records the type of company. Familiar types are SA, PLC, LLC, GmbH etc. At the time of publication, there is no agreed set of company types that crosses borders. The term 'SA' is used in Poland although they mean slightly different things. The UK's LLP and Greece's EPE provide further example of close, but not exact, matches.

That said, each jurisdiction will have a limited set of recognized company types and these should be expressed in a consistent manner in a SKOS Concept Scheme.

Company Status

Property	Domain	Range
<code>rov:companyStatus</code> <code>rdfs:subPropertyOf org:classification</code>	<code>org:Organization</code>	<code>skos:Concept</code>

Recording the status of a company presents the same issues as its type. The terms 'insolvent', 'bankrupt' and 'in receivership,' for example, are likely to mean slightly different things with different legal implications.

Taking advice from [XBRL Europe](#) as a starting point, however, the term 'Normal Activity' does appear to have cross-border usefulness and this should be used in preference to terms like 'trading' or 'operating.'

Best Practice for recording various other status levels is to use the relevant jurisdiction's terms and to encode these in a SKOS Concept Scheme.

Company Activity

Property	Domain	Range
<code>rov:companyActivity</code> <code>rdfs:subPropertyOf org:classification</code>	<code>org:Organization</code>	<code>skos:Concept</code>

Defining a sub-property in RDF

```
<rdf:Property rdf:about="rov:companyType">
```

```
  <rdfs:label xml:lang="en">company type</rdfs:label>
```

```
  <rdfs:comment xml:lang="en" rdf:parseType="Literal">
```

This property records the type of company. Familiar types are SA, PLC, LLC, GmbH etc. Each jurisdiction will have a limited set of recognised company types and these should be used in a consistent manner using a `skos:Concept` as described in the [Code](#) Class.

```
</rdfs:comment>
```

```
  <rdfs:isDefinedBy rdf:resource="http://www.w3.org/ns/regorg#" />
```

```
  <rdfs:range rdf:resource="skos:Concept" />
```

```
  <rdfs:subPropertyOf rdf:resource="org:classification" />
```

```
  <dcterms:Identifier>legal.companyType</dcterms:identifier>
```

```
</rdf:Property>
```


4 *Where new terms are required, create them following commonly agreed best practices*

- ✓ Classes begin with a capital letter and are always singular, e.g. skos:Concept.
- ✓ Properties begin with a lower case letter, e.g. rdfs:label.
- ✓ Object properties should be verbs, e.g. org:hasSite.
- ✓ Data type properties should be nouns, e.g. dcterms:description.
- ✓ Use camel case if a term has more than one word, e.g. foaf:isPrimaryTopicOf.

Defining a new class - Organisation

```
<rdf:RDF
```

```
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
```

```
  xmlns:org="http://example.org/organisation-schema">
```

```
<rdf:Class rdf:about="org:Organisation">
```

```
  <rdfs:label xml:lang="en">Organisation</rdfs:label>
```

```
  <rdfs:comment xml:lang="en">
```

```
    Legal entity that is registered in an official national or regional register.
```

```
  </rdfs:comment>
```

```
</rdf:Class>
```

Defining a new property - registrationNumber

```
<rdf:RDF
```

```
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:org="http://example.org/organisation-schema">
```

```
<rdf:Property rdf:about="org:registrationNumber">
```

```
  <rdfs:label xml:lang="en">registrationNumber</rdfs:label>
```

```
  <rdfs:comment xml:lang="en">
```

in the The number that a registered organisation receives upon registration
 official register.

```
  </rdfs:comment>
```

```
</rdf:Class>
```

Defining domain and range restrictions

```
<rdf:RDF
```

```
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:org="http://example.org/organisation-schema"
```

```
  xmlns:locn="http://www.w3.org/ns/locn#">
```

```
<rdf:Property rdf:about="org:isLocated">
```

```
  <rdfs:label xml:lang="en">isLocated</rdfs:label>
```

```
  <rdfs:comment xml:lang="en">
```

The official address of the registered organisation's headquarters.

```
</rdfs:comment>
```

```
  <rdfs:domain rdf:resource="org:Organisation"/>
```

```
  <rdfs:range rdf:resource="locn:Address">
```

```
</rdf:Class>
```

```
http://example.org/org/1234 org:isLocated http://dbpedia.org/page/Brussels
```

5 *Publish within a highly stable environment designed to be persistent*

- Choose a stable namespace for your RDF schema (e.g. W3C, Purl...)
- Use good practices on the publication of persistent Uniform Resource Identifiers (URI) sets, both in terms of format and of their design rules and management.
- Examples:
 - <http://www.w3.org/ns/adms>
 - <http://purl.org/dc/elements/1.1>

See also:

<https://joinup.ec.europa.eu/community/semic/document/cookbook-translating-data-models-rdf-schemas>

<http://www.slideshare.net/OpenDataSupport/design-and-manage-persitent-uris>

6 Publicise the RDF schema by registering it with relevant services

Once your RDF schema is published you will want people to know about it. To reach a wider audience register it Joinup and Linked Open Vocabularies.

More targeted.
Refine the search results via the faceted search filters.

The image shows two screenshots of web search interfaces. The left screenshot is from Joinup, showing an advanced search for 'organisation' with various filters on the left and search results on the right. The right screenshot is from Linked Open Vocabularies (LOV), showing search results for 'organisation' across 28 vocabularies.

1 More focused.

2 More targeted.

3 More relevant.

<http://lov.okfn.org>

<http://joinup.ec.europa.eu>

Conclusions

Analyse

Start with a robust Domain Model developed following a structured process and methodology.

Research existing terms and their usage and maximise reuse of those terms.

Model

Where new terms can be seen as specialisations of existing terms, create sub class and sub properties as appropriate.

Where new terms are required, create them following commonly agreed best practice in terms of naming conventions etc

Publish

Publish within a highly stable environment designed to be persistent.

Publicise the RDF schema by registering it with relevant services.

Group exercise



In groups of 2, create the RDF description of a vocabulary for representing a citizen.

<http://www.visualpharm.com>



According to you, what are the main barriers to the reuse of existing RDF vocabularies?

<http://www.visualpharm.com>

Take also the online test [here!](#)

Thank you!
...and now YOUR questions?

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Authors:

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References

Slides 9:

- Linked Data Cookbook. W3C.
http://www.w3.org/2011/gld/wiki/Linked_Data_Cookbook

Slide 10-23:

- ISA Programme. Cookbook for translating Data Models to RDF Schemas.
<https://joinup.ec.europa.eu/community/semic/document/cookbook-translating-data-models-rdf-schemas>

Slide 16, 18,-21:

- W3C. An organization ontology. <http://www.w3.org/TR/vocab-org/>

Slide 23:

- ADMS Brochure. ISA Programme.
<https://joinup.ec.europa.eu/elibrary/document/adms-brochure>

Related projects and initiatives



Joinup, <http://joinup.ec.europa.eu>



Linked Open Vocabularies (LOV), <http://lov.okfn.org/>



EC ISA, e-Government Core Vocabularies,
https://joinup.ec.europa.eu/community/core_vocabularies/home



W3C Schools – Learn RDF
<http://www.w3schools.com/rdf/default.asp>



EUCLID, <http://euclid-project.eu/>



XML Summer School <http://xmlsummerschool.com/>

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