RDF & SPARQL

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RDF

- Resource Description Framework
  - **Resource**: Everything that can have a unique identifier (URI), e.g. pages, places, people, dogs, products...
  - **Description**: Attributes, features, and relations of the resources
  - **Framework**: Model, languages and syntaxes for these descriptions
- Every piece of information expressed in RDF is represented as a triple:
  - **Subject**: A resource, which may be identified with a URI.
  - **Predicate**: A URI-identified reused specification of the relationship.
  - **Object**: A resource or literal to which the subject is related.
- A **graph** is a collection of triples

Advantages

+ Extensible vocabularies
+ Non-centralized vocabularies
+ Easy integration of information from different sources
+ Independence
+ Exchange
+ Scalability

Syntax - RDF/XML

```
<rdf:RDF

  xmlns:rov="http://www.w3.org/TR/vocab-regorg/ "
  xmlns:org="http://www.w3.org/TR/vocab-org/"
  xmlns:locn="http://www.w3.org/ns/locn#" >

<rov:RegisteredOrganization rdf:about="http://example.com/org/2172798119">
  <rov:legalName> "Niké"< /rov:legalName>
  <org:hasRegisteredSite rdf:resource="http://example.com/site/1234"/>
</rov:RegisteredOrganization>

<locn:Address rdf:about="http://example.com/site/1234"/>
  <locn:fullAddress>" Dahliastraat 24, 2160 Wommelgem"</locn:fullAddress>
</locn:Address>

</rdf:RDF>
```

Definition of prefixes

Description of data – triples

Syntax - Turtle

```
@prefix rov: <http://www.w3.org/TR/vocab-regorg/> .
@prefix org: <http://www.w3.org/TR/vocab-org/> .
@prefix locn: <http://www.w3.org/ns/locn#> .

< http://example.com/org/2172798119 >
 a <rov:RegisteredOrganization> ;
  rov:legalName "Niké ";
  org:hasRegisteredSite <http://example.com/site/1234> .

<http://example.com/site/1234>
  a <locn:Address> ;
  locn:fullAddress "Dahliastraat 24, 2160 Wommelgem" .
```

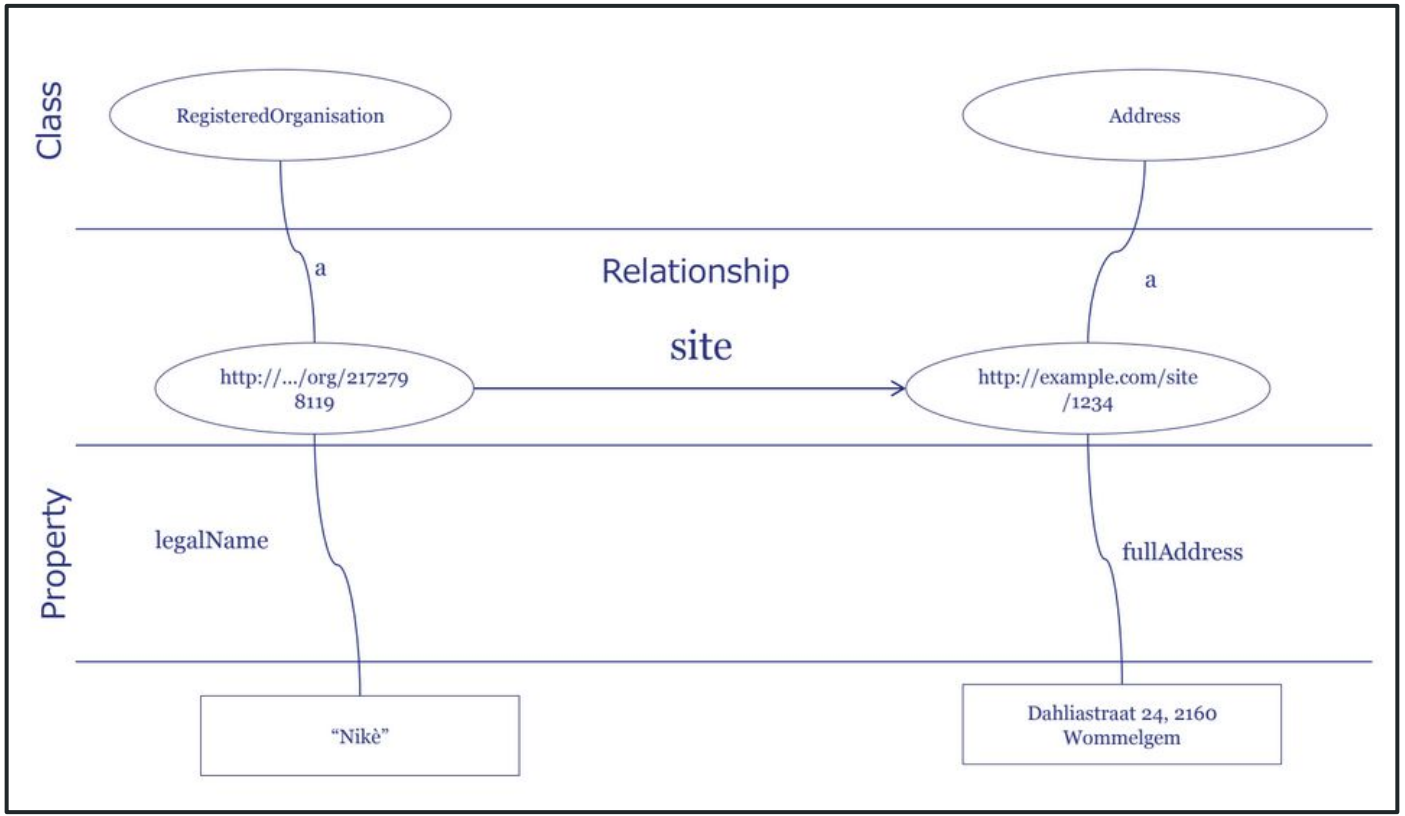
Definition of prefixes

Description of data – triples

Syntax - RDFa HTML

embedding RDF data in HTML

```
<html>
<head> ... </head>
<body>
...
<div resource="http://example.com/org/2172798119"
typeof= "http://www.w3.org/TR/vocab-regorg/RegisteredOrganization">
<p>
<span property=" http://www.w3.org/TR/vocab-regorg/legalName">Nike<span>
Address: <span property="http://www.w3.org/ns/locn#fullAddress"> Dahliastraat
24, 2160 Wommelgem </span>
</p></div>
 </body>
```


Class
RegisteredOrganisation
Address
a
Relationship
site
a
http://.../org/217279
8119
http://example.com/site
/1234
Property
legalName
fullAddress
"Nikè"
Dahliastraat 24, 2160
Wommelgem

How to represent data

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.
  - **Relationships**: Object type properties
  - **Attributes**: Data type properties

How to represent data

- **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.

Reusing RDF vocabularies

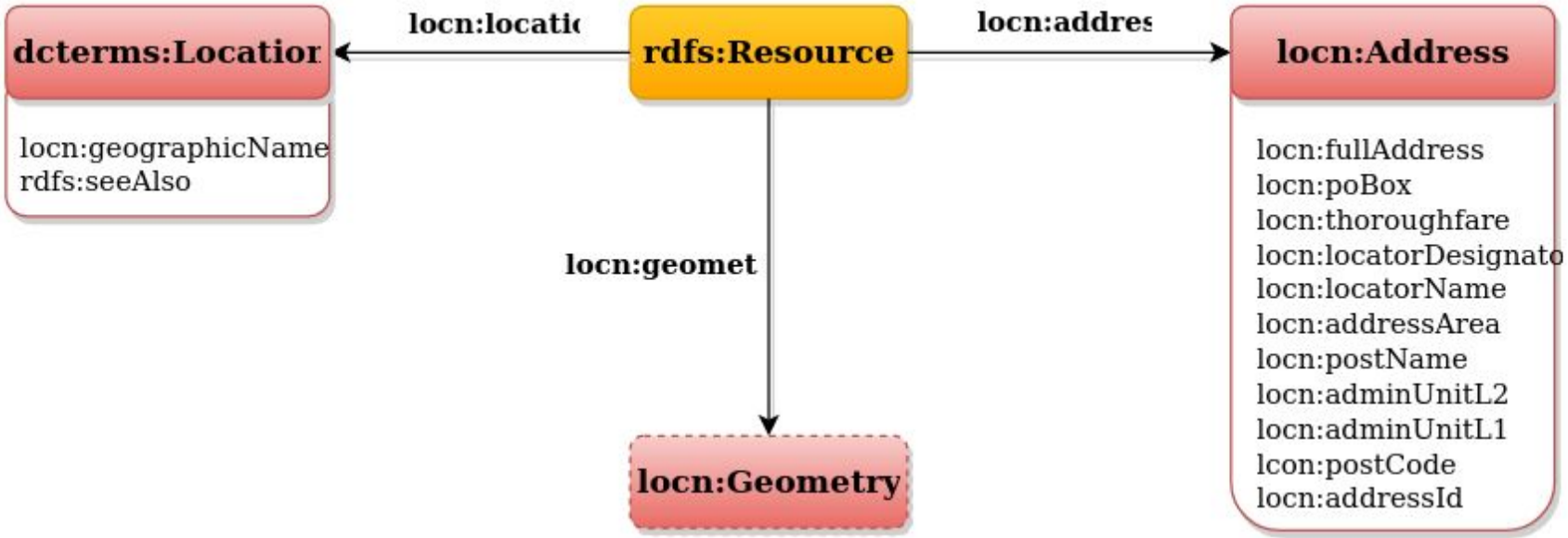
- Reuse greatly aids interoperability of your data.
- Reuse adds credibility to your schema.
- Reuse is easier and cheaper.

Existing vocabularies can be found in lov.linkeddata.es and joinup.ec.europa.eu

Some well known vocabularies:

- **Friend-of-a-Friend**: Vocabulary for describing people.
- **Core Person Vocabulary**: Vocabulary to describe the fundamental characteristics of a person.
- **DOAP**: Vocabulary for describing projects.

Vocabulary example



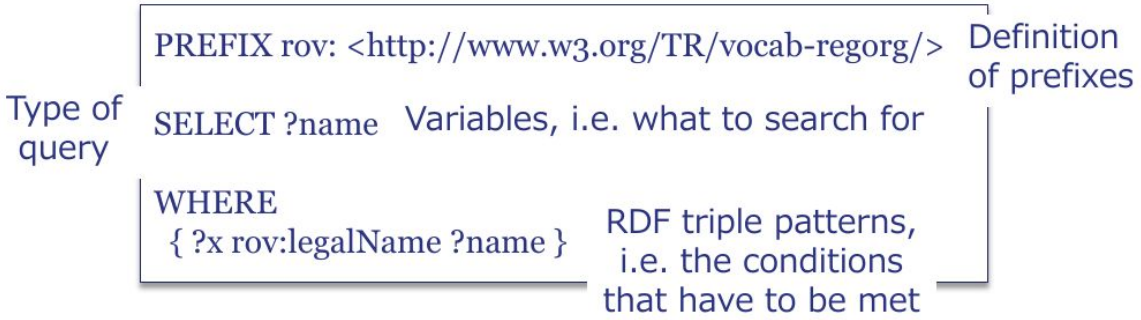
SPARQL

What is it?

SPARQL is the standard language to query graph data represented as RDF triples. It can be used to query and update RDF data.

- SPARQL Protocol and RDF Query Language
- One of the three core standards of the Semantic Web, along with RDF and OWL.
- Became a W3C standard January 2008.
- SPARQL 1.1 now in Working Draft status.

SPARQL Queries



- SELECT
  - Return a table of all X, Y, etc. satisfying the following conditions ...
- CONSTRUCT
  - Find all X, Y, etc. satisfying the following conditions ... and substitute them into the following template in order to generate (possibly new) RDF statements, creating a new graph.
- DESCRIBE
  - Find all statements in the dataset that provide information about the following resource(s) ... (identified by name or description)
- ASK
  - Are there any X, Y, etc. satisfying the following conditions ...

SPARQL Updates

Can be used for...

- Adding data (INSERT)
- Deleting data (DELETE)
- Loading RDF Graph (LOAD / LOAD .. INTO)
- Clearing an RDF Graph (CLEAR GRAPH)
- Creating RDF Graphs (CREATE GRAPH)
- Removing RDF Graphs (DROP GRAPH)
- Copying RDF Graphs (COPY GRAPH ... TO GRAPH)
- Moving RDF Graphs (MOVE GRAPH ... TO GRAPH)
- Adding RDF Graphs (ADD GRAPH TO GRAPH)

Conclusions

Can be used for...

- RDF ➜ Standard for Graphs
- RDF is a directed graph made up of triple statements.
- An RDF graph declaration is represented by:
- 1) a node for the subject,
- 2) an arc that goes from a subject to an object to the predicate and
- 3) a node for the object.
- Each of the three parts of the declaration can be identified by a URI

Conclusions

Can be used for...

- An RDF query language ➔ A semantic query language for databases
- Allows a query to consist of triple patterns, conjunctions, disjunctions, and optional patterns
- SPARQL allows users to write queries against what can loosely be called "key-value" data.
- For queries that read data from the database, the SPARQL language specifies four different query variations for different purposes.

References

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- Mar. (n.d.). *RDF*. Inicio Tesis hipertexto. Retrieved March 14, 2022, from http://www.hipertexto.info/documentos/rdf.htm

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Task assignment

- Erik B and David F have worked on the **design and content** of the presentation.

- Gabriel M and Pau D, reviewed this slides and added valuable information, **prepared the exposition** and found other **resources to explain** in class.

- Through the week, we had meetings via discord, to **discuss the work** & take **common decisions** on the project.