Semantic Web and Linked Data

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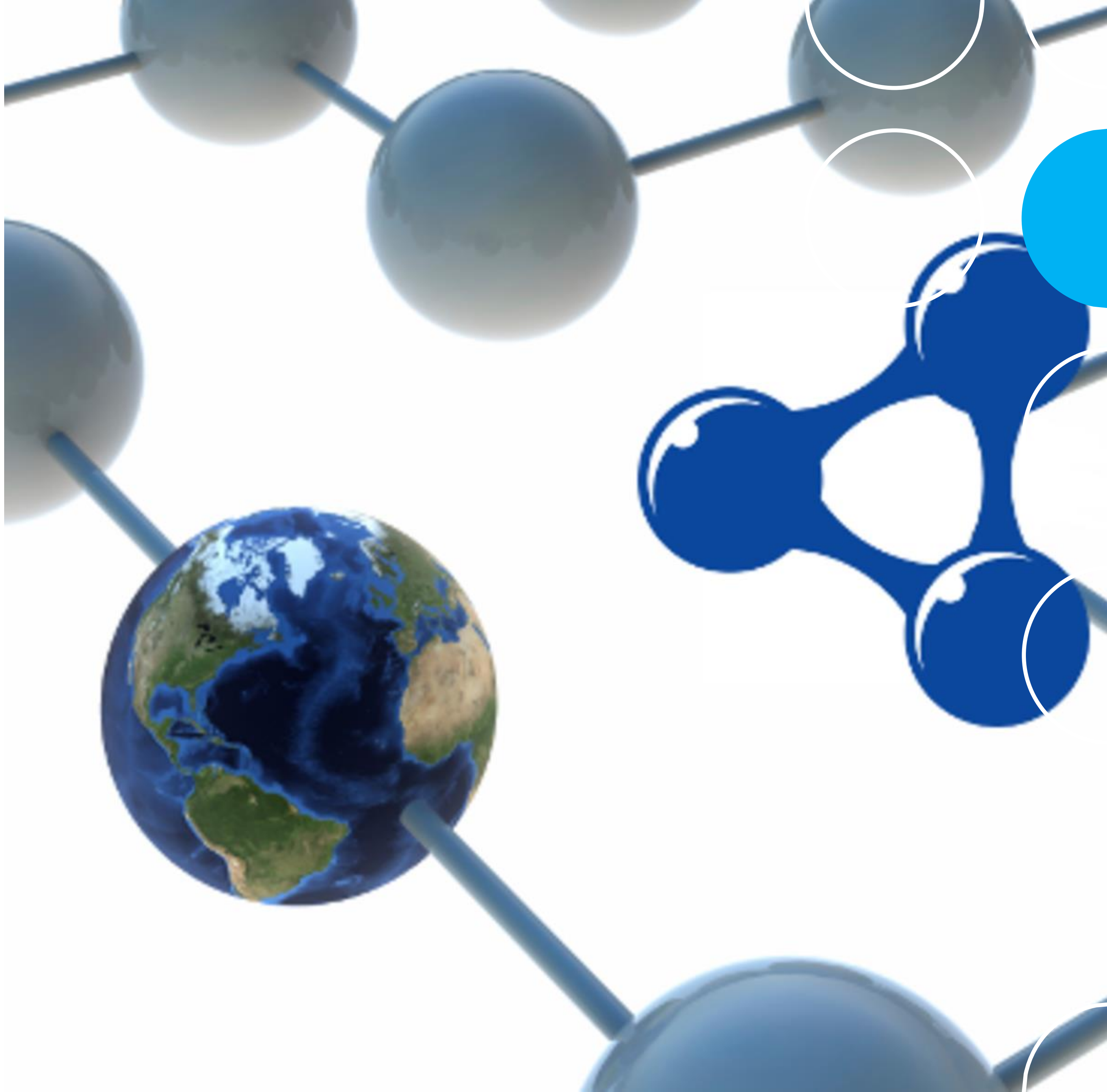


Class 3: Learning Objectives

- Practical work by Laws and selection.
- RDF vocabulary and serialization.
- Practical exercise 1:
    - Publishing data on the Semantic Web;
    - Learn to read and write RDF.

RDF Syntax

- The RDF data model provides an abstract, conceptual framework for defining and using metadata.
- A concrete syntax is also needed for the purposes of creating and exchanging this metadata.

RDF Vocabulary

- RDF defines a number of resources and properties;
- RDF vocabulary is defined in the namespace:
  - http://www.w3.org/1999/02/22-rdf-syntax-ns#

The vocabulary defined by the RDF specification is as follows:

- Classes:
  - `rdf:Property, rdf:Statement,rdf:XMLLiteral`
  - `rdf:Seq,rdf:Bag,rdf:Alt,rdf:List`

RDF Vocabulary

- Properties:
  - `rdf:type,rdf:subject,rdf:predicate,rdf:object,`
  - `rdf:first,rdf:rest,rdf:_n`
  - `rdf:value`

- Resources:
  - `rdf:nil`

RDF Vocabulary

Classes & Resources

- rdf:XMLLiteral - the class of XML literal values,
- rdf:Property - the class of properties,
- rdf:Statement - the class of RDF statements,
- rdf:Alt, rdf:Bag, rdf:Seq - containers of alternatives, unordered containers, and ordered containers (rdfs:Container is a super-class of the three),
- rdf:List - the class of RDF Lists,
- rdf:nil - an instance of rdf:List representing the empty list.

RDF Vocabulary

Properties

- rdf:type - an instance of rdf:Property used to state that a resource is an instance of a class,
- rdf:first - the first item in the subject RDF list,
- rdf:rest - the rest of the subject RDF list after rdf:first,
- rdf:value - idiomatic property used for structured values,
- rdf:subject - the subject of the RDF statement,
- rdf:predicate - the predicate of the RDF statement,
- rdf:object - the object of the RDF statement.

RDF Vocabulary

- Typing using rdf:type:

  ```
  <A, rdf:type, B>
  ```

  “A belongs to class B”

- All properties belong to class rdf:Property:

  ```
  <P, rdf:type, rdf:Property>
  ```

  “P is a property”

  ```
  <rdf:type, rdf:type, rdf:Property>
  ```

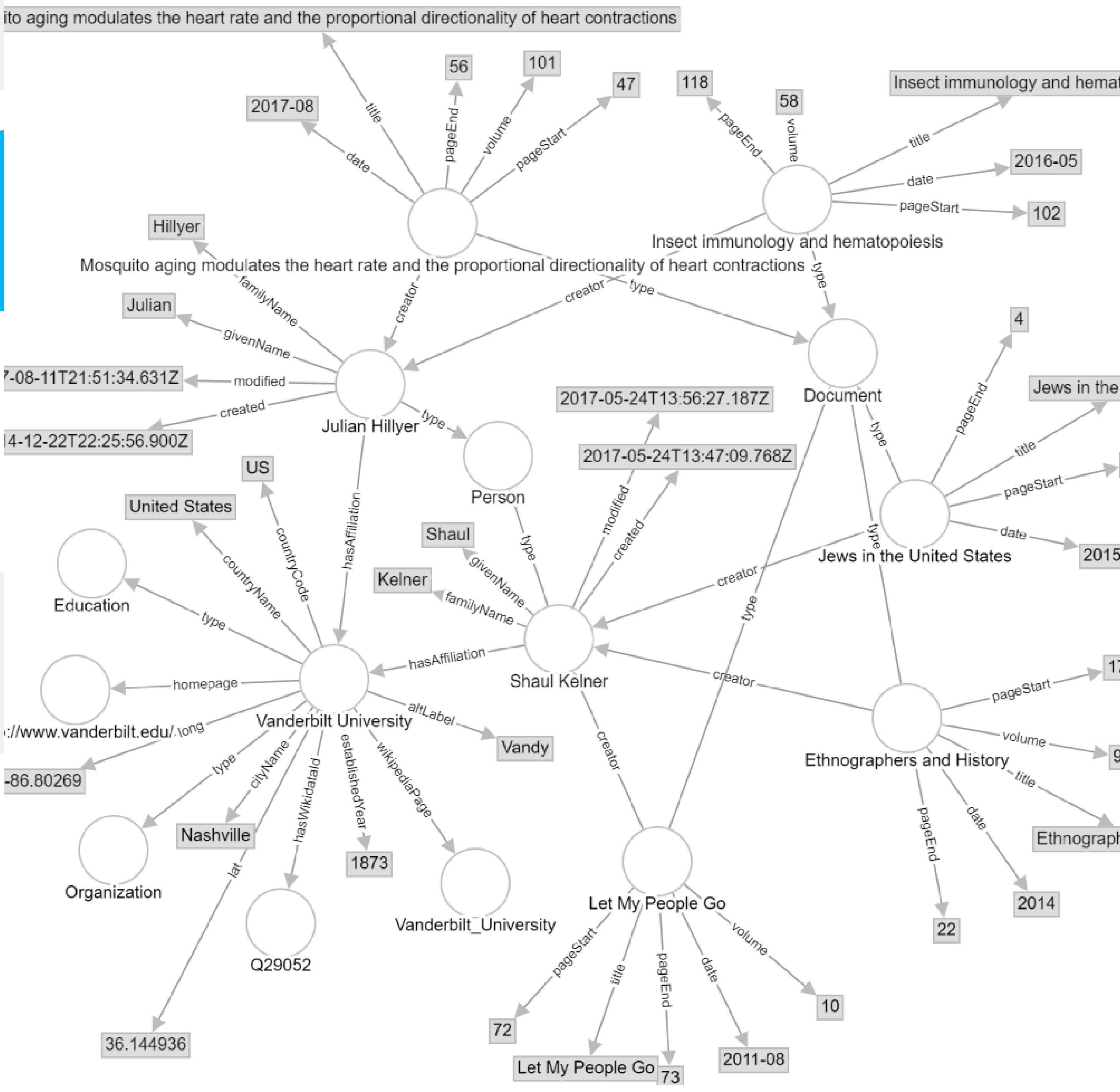
  “rdf:type is a property”

RDF Serializations and Triplestores

- Since RDF is an abstract model for expressing information about graphs, it can be expressed in a number of concrete ways.
- One way that is particularly easy for humans to understand is a graphical diagram.

RDF Serializations

- The triples in this table form a graph that can be represented by this diagram.



RDF Serializations

- However, it is generally not possible for machines to interpret graphs that are expressed as diagrams.
- Machines need an RDF *serialization*, a method of transmitting or storing the information about the triples in the graph as a file.

RDF graphs as files

- In WSLD, we will mostly use Turtle
- Others:
  - There is an XML-based syntax: RDF/XML
  - There is a JSON-based syntax: JSON-LD
  - There is an easy to parse, line-based triple syntax: N-Triples
  - There is a syntax to embed RDF in HTML and XML documents: RDFa

The Turtle RDF syntax

- Turtle stands for “**Terse RDF Triple Language”.**
- N-Triples is a subset of the RDF Turtle serialization, meaning that any file that is valid N-Triples is also valid Turtle serialization.
- However, Turtle allows compact URIs (CURIEs) and also allows shortcuts to prevent repeating parts of triples.

The Turtle RDF syntax

- For example, if several triples share the same subject, the predicates and objects can be listed, separated by semicolons.

The Turtle syntax

- Full IRIs:

```
 <http://www.example.com/test#this>
```

- A simple triple:

```
    <http://www.example.com/test#this>
             <http://relations.example.com/in>
                          <http://www.example.com/test#box> .
```

- Abbreviated IRIs (declare prefixes at the beginning of the file):

```
# This is a comment
@prefix ex: <http://www.example.com/test#> . # end dot!
@prefix rel: <http://relations.example.com/> .
ex:this rel:in ex:box . # Another comment
```

The Turtle RDF syntax

- The namespace prefixes that are used in the triples must be listed in a prolog at the start of the document.
- Notice that URIs aren’t required to be abbreviated.

The Turtle syntax

- Literals:

```
ex:this rel:date "2019-09-13"^^xsd:date . # normal literal
ex:this rel:name "this"@en . # language-tagged literal
ex:this rel:code "TX32" . # xsd:string can be omitted
ex:this rel:number 42 . # xsd:integer (no quotes)
ex:this rel:sizeInMeters 3.75 . # xsd:decimal (use a dot)
```

The Turtle syntax

- If two triples share both the same subject and predicate, the two objects can be separated by commas. For example:

```
ex:box rel:contains ex:this .
ex:box rel:contains ex:that .
# can be written
ex:box rel:contains ex:this, ex:that . # comma
```

The Turtle syntax

- Repeat object

```
ex:this rel:date "2019-09-13"^^xsd:date;
rel:name "this"@en; # new lines are optional
rel:code "TX32";
rel:nextTo ex:that, ex:thoot, ex:thus .
```

The Turtle syntax

- Turtle also allows a special abbreviation for the important predicate `rdf:type`. It can be replaced with `a` .
- Hence, the triple:

```
<http://dbpedia.org/resource/Bob_Marley> <http://www.w3.org/1999/02
/22-rdf-syntax-ns#type> <http://xmlns.com/foaf/0.1/Person> .
```

can be shortened in Turtle to:

```
dbr:Bob_Marley a foaf:Person
```

The Turtle syntax

- RDF text files in Turtle serialization are usually given the file extension .ttl
- Let us learn to read and write Turtle in an online editor. Go to: https://perfectkb.github.io/yate/

Further reading

- Semantic Web Stack
- RDF 1.1 Primer
- RDF 1.1 Concepts and Abstract
- https://www.w3.org/TR/turtle/