

RDF

1 Exercises from the lecture

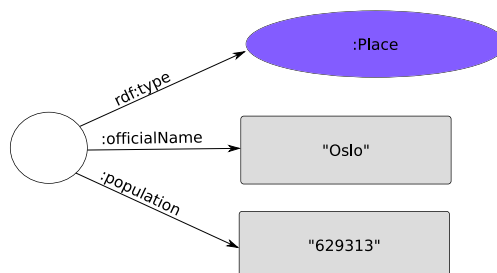
- a) What is RDF?
- b) What is a literal in RDF?
- c) What is a RDF graph?
- d) Why do we use URIs?
- e) Why do you think we need blank nodes?
- f) What is RDF/XML, Turtle and N-triples?
- g) Draw a graph with the following RDF graph:

```
[ ] a :Place ;  
    :officialName "Oslo" ;  
    :population 629313 .
```

- h) Why do you think we should reuse existing vocabularies when possible?

Solution

- a) The Resource Description Framework(RDF) is a standard model for data interchange on the Web
- b) The literal is used to represent data values in RDF.
- c) A set of RDF triples
- d) URIs are unique on the web and URIs are also addresses
- e) Represent unknown nodes or to create complex concepts
- f) Different serializations for RDF data.



- g)
- h) Not an easy task to design new namespaces. And interoperability.

2 Exercises from Foundations of Semantic Web Technologies

Read

- Foundations of Semantic Web Technologies: chapter 2.

The exercises

- Exercise 2.1
- Exercise 2.2

are relevant.

3 FOAF - Friend of a friend

The FOAF project is one of the most well-known projects using RDF and a project where RDF is the core technology. Quoting foaf-project.org¹ :

FOAF is about your place in the Web, and the Web's place in our world. FOAF is a simple technology that makes it easier to share and use information about people and their activities (eg. photos, calendars, weblogs), to transfer information between Web sites, and to automatically extend, merge and re-use it online.

See also the following webpages for more information.

- [FOAF project: home](http://foaf-project.org)²
- [Wikipedia: FOAF \(software\)](http://en.wikipedia.org/wiki/FOAF_(software))³

3.1 Exercise

Go to the [FOAF-a-Matic](http://www.ldodds.com/foaf/foaf-a-matic)⁴ and create your own FOAF file. If you are hesitant publishing information about yourself online, then make something up.

Solution

This solution shows Martin G. Skjæveland's FOAF file. We will go through the complete file now, code snippet by code snippet.

The RDF serialisation is RDF/XML. An RDF/XML file always starts with the element `<rdf:RDF>`. Inside the element the namespaces we will use are defined. The namespaces `rdf`, `rdfs`, `foaf` and `admin` are added by the FOAF-a-Matic. The first three are the standard namespaces for RDF, RDFS and FOAF. The `rel` and `geo` namespaces are manually added and will be used in later exercises.

```
1 <rdf:RDF
2   xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
3   xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
4   xmlns:foaf="http://xmlns.com/foaf/0.1/"
5   xmlns:admin="http://webns.net/mvcb/"
6   xmlns:rel="http://purl.org/vocab/relationship/"
7   xmlns:geo="http://www.w3.org/2003/01/geo/wgs84_pos#"
```

¹<http://www.foaf-project.org/about>

²<http://www.foaf-project.org/>

³[http://en.wikipedia.org/wiki/FOAF_\(software\)](http://en.wikipedia.org/wiki/FOAF_(software))

⁴<http://www.ldodds.com/foaf/foaf-a-matic>

```

8   xmlns="http://folk.uio.no/martige/foaf.rdf#"
9   xml:base="http://folk.uio.no/martige/foaf.rdf"
10  >

```

Next comes meta data about the file: who has made it, who is it about, what generated the file and where to send error reports.

```

11 <foaf:PersonalProfileDocument rdf:about="">
12   <foaf:maker rdf:resource="#me"/>
13   <foaf:primaryTopic rdf:resource="#me"/>
14   <admin:generatorAgent rdf:resource="http://www.ldodds.com/foaf/foaf-a-matic"/>
15   <admin:errorReportsTo rdf:resource="mailto:leigh@ldodds.com"/>
16 </foaf:PersonalProfileDocument>

```

Now information about Martin G. Skjæveland is listed. The statements and triples in this section are

Subject	Predicate	Object
me	rdf:type	foaf:Person
me	foaf:name	"Martin G. Skjæveland"
me	foaf:title	"Mr."
me	foaf:givenname	"Martin G."
me	foaf:family_name	"Skjæveland"
me	foaf:mbox_sha1sum	"5223e81829..."
me	foaf:homepage	http://folk.uio.no/martige
me	foaf:workplaceHomepage	http://www.uio.no/
me	foaf:schoolHomepage	http://www.uio.no/

Note the difference from when an object in a triple is a resource and when it is a literal. In the second to the fifth statement, foaf:name – foaf:mbox_sha1sum, the object is a literal, while in the first and the last three triples the object is a resource.

```

17 <foaf:Person rdf:about="#me">
18   <foaf:name>Martin G. Skjæveland</foaf:name>
19   <foaf:title>Mr.</foaf:title>
20   <foaf:givenname>Martin G.</foaf:givenname>
21   <foaf:family_name>Skjæveland</foaf:family_name>
22   <foaf:mbox_sha1sum>5223e81829088aa837295fab98f3c286b8f106a2</foaf:mbox_sha1sum>
23   <foaf:homepage rdf:resource="http://folk.uio.no/martige/">
24   <foaf:workplaceHomepage rdf:resource="http://www.uio.no/">
25   <foaf:schoolHomepage rdf:resource="http://www.uio.no/">

```

Martin G. Skjæveland knows Martin Giese. Martin Giese is identified *in this file* as martingi. Additionally, information about his name, email address and pointer to his FOAF file is given.

```

26   <foaf:knows>
27     <foaf:Person rdf:about="http://folk.uio.no/martingi/foaf.rdf#me">
28       <foaf:name>Martin Giese</foaf:name>
29       <foaf:mbox_sha1sum>9cc447f0f4877bc04e7d6703bf040d7337094e65</foaf:mbox_sha1sum>
30       <rdfs:seeAlso rdf:resource="http://folk.uio.no/martingi/foaf.rdf"/>
31     </foaf:Person>
32   </foaf:knows>
33 </foaf:Person>

```

What remains is to end the root tag of the document, <rdf:RDF . . .>, but since we still have more to add to the FOAF file in the coming exercises, we will wait with this. The file ends on line 70.

3.2 Exercise

Publish your foaf-file on your homepage if you have one. Alternatively, you can use Google Drive:

- Put the file in Google Drive
- Share it such that anyone with the link can view
- Use the ID from the link and build a link on this form:
<https://drive.google.com/uc?export=download&id=1pnc0ujaa-2LUZQLzTgK6hQ6yeI1wzvHv>

3.3 Exercise

In the FOAF file you have generated you are identified as me, e.g., the identifier for Martin G. Skjæveland could be:

`http://folk.uio.no/martige/foaf.rdf#me`

Explain why # me is used? What is the difference from

`http://folk.uio.no/martige/foaf.rdf`

and

`http://folk.uio.no/martige/foaf.rdf#me` ?

See [Best Practice Recipes for Publishing RDF Vocabularies⁵](#) and [Cool URIs for the Semantic Web⁶](#) for help.

Note that the URL to my FOAF file should not include the serialisation format, since what format the file is written should not be part of the identifier for the file. Instead I should have used *content negotiation* on the server decide what format and even file to return the user.

Solution

The URI

`http://folk.uio.no/martige/foaf.rdf`

is the identifier for the foaf.rdf file, while

`http://folk.uio.no/martige/foaf.rdf#me`

is the identifier for the person Martin G. Skjæveland.

3.4 Exercise

Open your FOAF file with an RDF browser, e.g., [FOAF-visualiser⁷](#) .

3.5 Exercise

Open your FOAF file in your favourite plain text editor. Add IfI as Organisation with the following values:

- `rdf:ID = ifi`

⁵<http://www.w3.org/TR/2008/NOTE-swbp-vocab-pub-20080828/>

⁶<https://www.w3.org/TR/cooluris/>

⁷<http://foaf-visualizer.gnu.org.ua/#form>

- name in both Norwegian and English
- homepage
- logo
- the coordinates where IfI is located, see <http://www.w3.org/2003/01/geo/>
- add at least yourself, Martin Giese and Martin G. Skjæveland as members of the organisation.

Use the [FOAF ontology](#)⁸ to find the correct resource names for adding this information. You can write RDF using the RDF serialisation you prefer, but you will need to publish it in RDF/XML as that currently is the only standardised RDF serialisation language. There are applications available online which convert between RDF serialisations, one is found behind the next link. Make sure that your FOAF file is written in valid RDF syntax. Use an RDF validator, e.g., [EasyRDF Validator and Converter](#)⁹ or W3C's [RDF validator](#)¹⁰ (accepts only RDF/XML), for this purpose. You can also use the library [Raptor RDF Syntax Library](#)¹¹ which ships with the package `raptor-utils` on a few Linux distributions.

Solution

The element name for organisation is `foaf:Organization`. Names and homepage are listed just like for a `foaf:Person`. To find how to specify logo, open the [FOAF ontology](#)¹² in a web browser and search for "logo". <http://www.w3.org/2003/01/geo/> gives good examples on how to add coordinates to a FOAF file. Use [iTouchMap.com](#)¹³ to find the coordinates.

```

34 <foaf:Organization rdf:ID="ifi">
35   <foaf:name xml:lang="en">Department of Informatics</foaf:name>
36   <foaf:name xml:lang="no">Institutt for informatikk</foaf:name>
37   <foaf:homepage rdf:resource="http://www.ifi.uio.no/">
38   <foaf:member rdf:resource="#me"/>
39   <foaf:member rdf:resource="http://folk.uio.no/martingi/foaf.rdf#me"/>
40   <foaf:logo rdf:resource="http://www.ifi.uio.no/gfx-bin/logo.jpg"/>
41   <foaf:based_near>
42     <geo:Point>
43       <geo:lat>59.943386</geo:lat>
44       <geo:long>10.717077</geo:long>
45     </geo:Point>
46   </foaf:based_near>
47 </foaf:Organization>

```

3.6 Exercise

Add more information about yourself or your surroundings, e.g., a picture of yourself, where you live—maybe using coordinates, places you have been to, your interests, your chat identities, and so on.

See the [FOAF ontology](#)¹⁴, e.g., these [relationships](#)¹⁵, for the vocabulary you can use in your

⁸<http://xmlns.com/foaf/spec/index.rdf>

⁹<http://www.easyrdf.org/converter>

¹⁰<http://www.w3.org/RDF/Validator/>

¹¹<http://librdf.org/raptor/>

¹²<http://xmlns.com/foaf/spec/index.rdf>

¹³<http://itouchmap.com/latlong.html>

¹⁴<http://xmlns.com/foaf/spec/index.rdf>

¹⁵<http://vocab.org/relationship/>

FOAF file.

Solution

First I have added a link to a picture of myself. Next I have added more information about my relationship to Martin Giese, who I work with (`rel:worksWith`), and added two more relationships. One to Tim Berners-Lee, who I know of (`rel:knowsOf`)¹⁶, and one to Robert Engels, who I have met (`rel:haveMet`).

The subject for all the "top-predicates" listed below, i.e., `foaf:depiction`, `rel:worksWith`, `foaf:knows`, `rel:knowsOf` and `rel:haveMet`, is me. To state this I have created a new subject element `<foaf:Person rdf:about="#me">` which is a sibling element to the `<foaf:Person rdf:ID="me">` on line 17. I could also have placed the information inside the `<foaf:Person rdf:ID="me">` element, but have chosen this way for the clarity of this exposition.

```
48 <foaf:Person rdf:about="#me">
49   <foaf:depiction rdf:resource="http://folk.uio.no/martige/180px-MartinGS.jpg"/>
50   <rel:worksWith>
51     <foaf:Person rdf:about="http://folk.uio.no/martingi/foaf.rdf#me"/>
52   </rel:worksWith>
53   <foaf:knows>
54     <foaf:Person rdf:about="http://www.w3.org/People/Berners-Lee/card#i">
55       <foaf:name>Tim Berners-Lee</foaf:name>
56     </foaf:Person>
57   </foaf:knows>
58   <rel:knowsOf>
59     <foaf:Person rdf:about="http://www.w3.org/People/Berners-Lee/card#i"/>
60   </rel:knowsOf>
61   <foaf:knows>
62     <foaf:Person rdf:about="http://www.esis.no/data/robert.engels/foaf.rdf#me">
63       <foaf:name>Robert Engels</foaf:name>
64     </foaf:Person>
65   </foaf:knows>
66   <rel:haveMet>
67     <foaf:Person rdf:about="http://www.esis.no/data/robert.engels/foaf.rdf#me"/>
68   </rel:haveMet>
69 </foaf:Person>
```

Now, finally, we add the closing tag for the root tag `<rdf:RDF ...>`.

```
70 </rdf:RDF>
```

3.6.1 Listing in Turtle

Here follows a generated listing of the FOAF file in Turtle serialization.

```
@prefix :      <http://folk.uio.no/martige/foaf.rdf#> .
@prefix rdfs:  <http://www.w3.org/2000/01/rdf-schema#> .
@prefix geo:   <http://www.w3.org/2003/01/geo/wgs84_pos#> .
@prefix foaf:  <http://xmlns.com/foaf/0.1/> .
@prefix admin: <http://webns.net/mvcb/> .
@prefix rdf:   <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rel:   <http://purl.org/vocab/relationship/> .
```

¹⁶Note that the `foaf:knows` relationship is very weak, e.g., `foaf:knows` is more general than `rel:knowsOf`.

```

:me a foaf:Person ;
rel:hasMet <http://www.esis.no/data/robert.engels/foaf.rdf#me> ;
rel:knowsOf <http://www.w3.org/People/Berners-Lee/card#i> ;
rel:worksWith <http://folk.uio.no/martingi/foaf.rdf#me> ;
foaf:depiction <http://folk.uio.no/martige/180px-MartinGS.jpg> ;
foaf:family_name "Skjæveland" ;
foaf:givenname "Martin G." ;
foaf:homepage <http://folk.uio.no/martige/> ;
foaf:knows <http://www.w3.org/People/Berners-Lee/card#i> ,
          <http://folk.uio.no/martingi/foaf.rdf#me> ,
          <http://www.esis.no/data/robert.engels/foaf.rdf#me> ;
foaf:mbox_sha1sum "5223e81829088aa837295fab98f3c286b8f106a2" ;
foaf:name "Martin G. Skjæveland" ;
foaf:schoolHomepage <http://www.uio.no/> ;
foaf:title "Mr." ;
foaf:workplaceHomepage
    <http://www.uio.no/> .

<http://www.w3.org/People/Berners-Lee/card#i>
a foaf:Person ;
foaf:name "Tim Berners-Lee" .

<http://folk.uio.no/martige/foaf.rdf>
a foaf:PersonalProfileDocument ;
admin:errorReportsTo
    <mailto:leigh@ldodds.com> ;
admin:generatorAgent
    <http://www.ldodds.com/foaf/foaf-a-matic> ;
foaf:maker :me ;
foaf:primaryTopic :me .

<http://folk.uio.no/martingi/foaf.rdf#me>
a foaf:Person ;
rdfs:seeAlso <http://folk.uio.no/martingi/foaf.rdf> ;
foaf:mbox_sha1sum "9cc447f0f4877bc04e7d6703bf040d7337094e65" ;
foaf:name "Martin Giese" .

<http://www.esis.no/data/robert.engels/foaf.rdf#me>
a foaf:Person ;
foaf:name "Robert Engels" .

:ifi a foaf:Organization ;
foaf:based_near
    [ a geo:Point ;
      geo:lat "59.943386" ;
      geo:long "10.717077"
    ] ;
foaf:homepage <http://www.ifi.uio.no/> ;
foaf:logo <http://www.ifi.uio.no/gfx-bin/logo.jpg> ;
foaf:member :me , <http://folk.uio.no/martingi/foaf.rdf#me> ;
foaf:name "Department of Informatics"@en , "Institutt for informatikk"@no .

```

3.7 Exercise

Open your FOAF file in Protégé and see how things look when Protégé interprets the RDF file as OWL. Try to find all the information you have written in your FOAF file. Pay attention

to where you find which information, e.g., which information is located under the classes, properties and individuals tabs, respectively.