NSWI144 – Linked Data – Lecture 2 – 25th October 2011

RDF, RDFS, OWL

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RDF

- RDF = Resource Description Framework
  - W3C Recommendation
    - http://www.w3.org/TR/rdf-primer/
  - Triples

    ```
    Subject Predicate Object .
    ```
  - Graph model
    - Directed labeled multigraph
      - Vertices for subjects and objects
      - Labeled edges for particular triples

RDF

- Example

```
<http://www.my.com/index.html>
<http://purl.org/dc/elements/1.1/creator>
<http://www.my.org/staff/85740> .
```

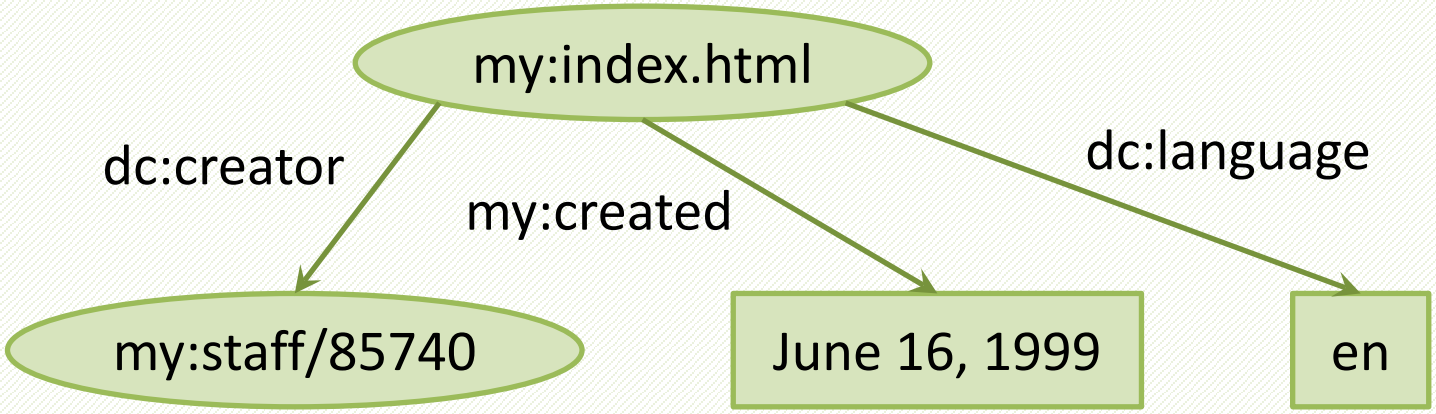
RDF

- Resources
  - URI references as identifiers for things
  - Qualified names
    - rdf: http://www.w3.org/1999/02/22-rdf-syntax-ns#
    - rdfs: http://www.w3.org/2000/01/rdf-schema#
    - dc: http://purl.org/dc/elements/1.1/
- Literals
  - Plain and typed literal values
  - Used only as objects

RDF

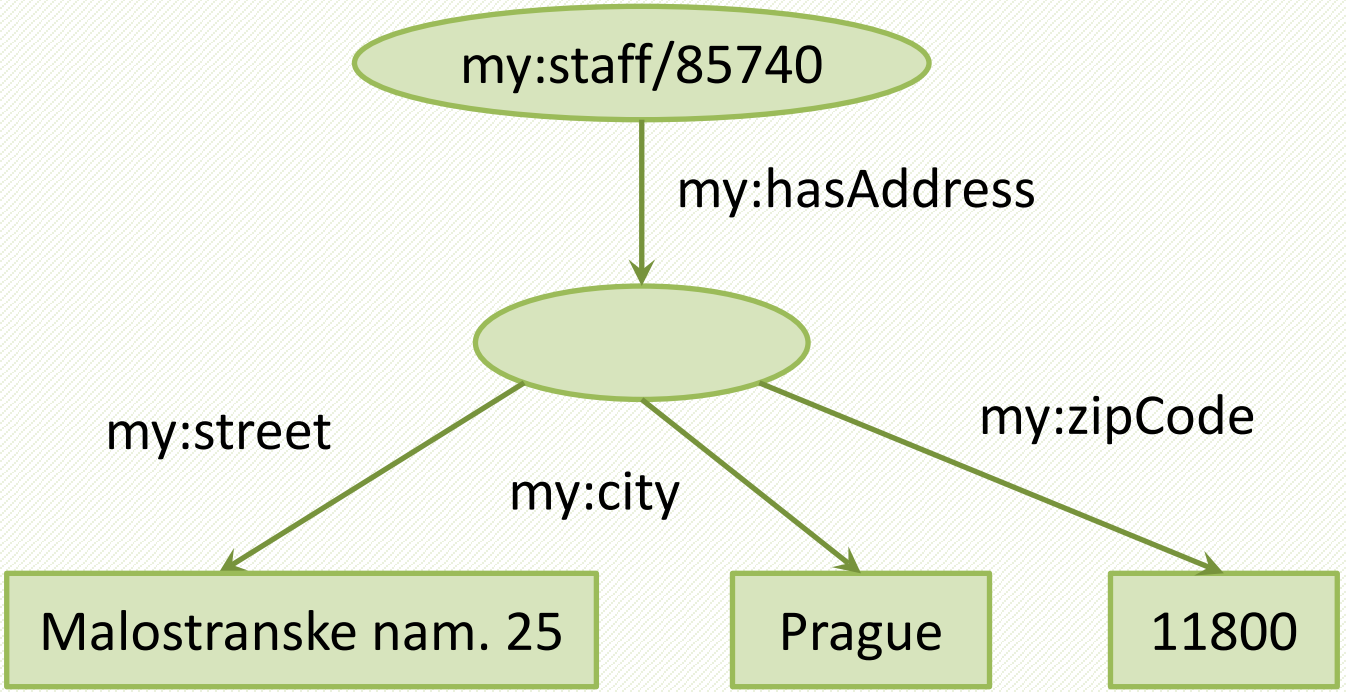
- Example

```
my:index.html dc:creator exstaff:85740 .
my:index.html my:created "June 16, 1999" .
my:index.html dc:language "en" .
```



RDF

- Blank nodes



RDF

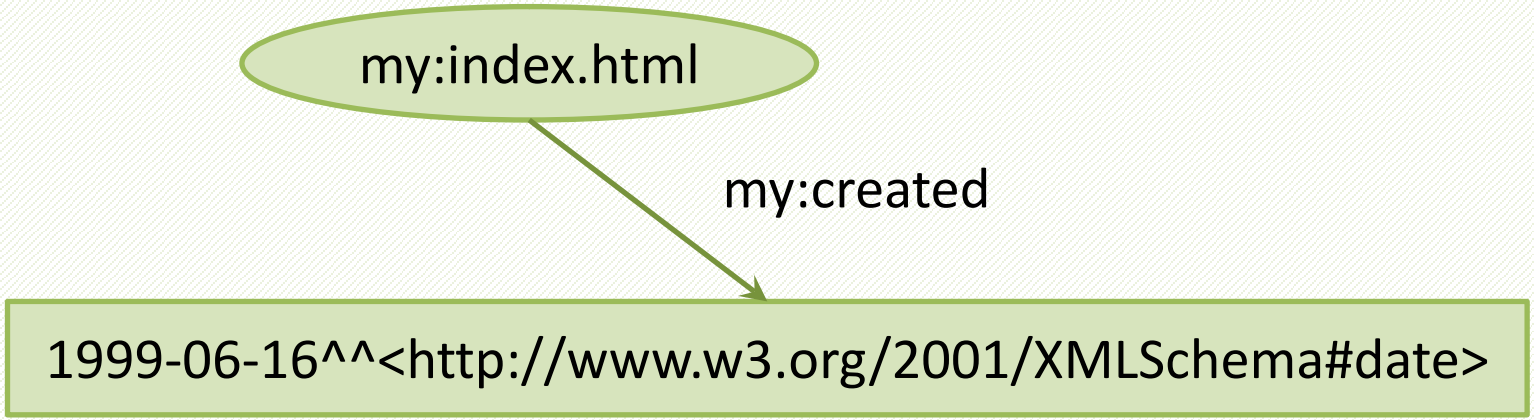
- Blank nodes

```
exstaff:85740 my:hasAddress _:a1 .
 _:a1 my:street "Malostranske nam. 25" .
 _:a1 my:city "Prague" .
 _:a1 my:zipCode "11800" .
```

RDF

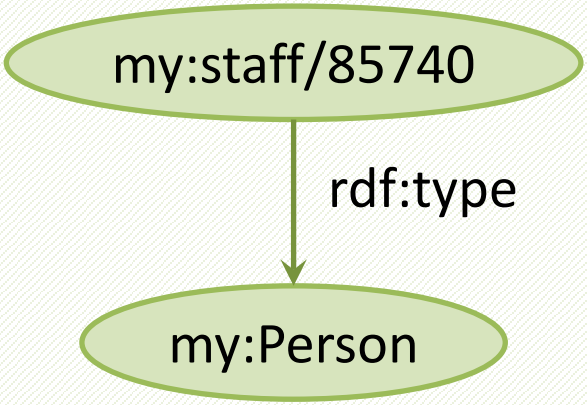
- Typed literals

```
my:index.html
my:created
"1999-06-16"^^xsd:date .
```



RDF

- Concepts
  - Assigning individuals their type
  - rdf:type



Assignment 1

- Create an RDF graph for a simple student information system…
  - Describe a few particular students, subjects, teachers, their relations and attributes
  - Use the following constructs:
    - Resources
    - Plain and typed literals
    - Blank nodes

Assignment 2

- Serialize the RDF graph from Assignment 1 using the Triples notation…

RDF/XML

- RDF/XML
  - W3C recommendation
    - http://www.w3.org/TR/rdf-syntax-grammar/
- Output pattern

```
<?xml version="1.0"?>
<rdf:RDF
   xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
   …>
   …
</rdf:RDF>
```

RDF/XML

- Basic syntax

```
<rdf:RDF …>
   <rdf:Description rdf:about="SubjectResource">
      <PredicateResource>ObjectLiteral</PredicateResource>
      <PredicateResource rdf:resource="ObjectResource"/>
      …
   </rdf:Description>
   …
</rdf:RDF>
```

RDF/XML

- Blank nodes

```
<rdf:RDF …>
   <rdf:Description rdf:about="SubjectResource">
      <PredicateResource rdf:nodeID="BlankNode"/>
   </rdf:Description>
   <rdf:Description rdf:nodeID="BlankNode">
      …
   </rdf:Description>
   …
</rdf:RDF>
```

RDF/XML

- Typed literals

```
<rdf:Description rdf:about="SubjectResource">
   <PredicateResource rdf:datatype="LiteralType">
      ObjectLiteral
   </PredicateResource>
</rdf:Description>
```

- Alternative way

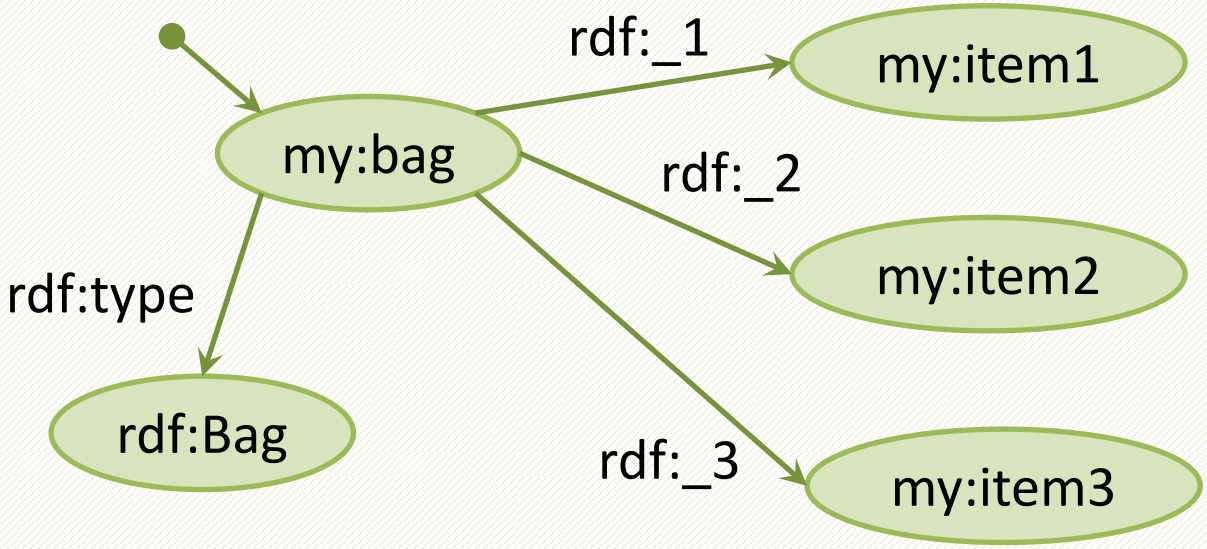
```
<!DOCTYPE rdf:RDF [<!ENTITY my "TypePrefix">]>
…
<… rdf:datatype="&my;TypeName">…</…>
```

Assignment 3

- Serialize the RDF graph from Assignment 1 using the RDF/XML notation…

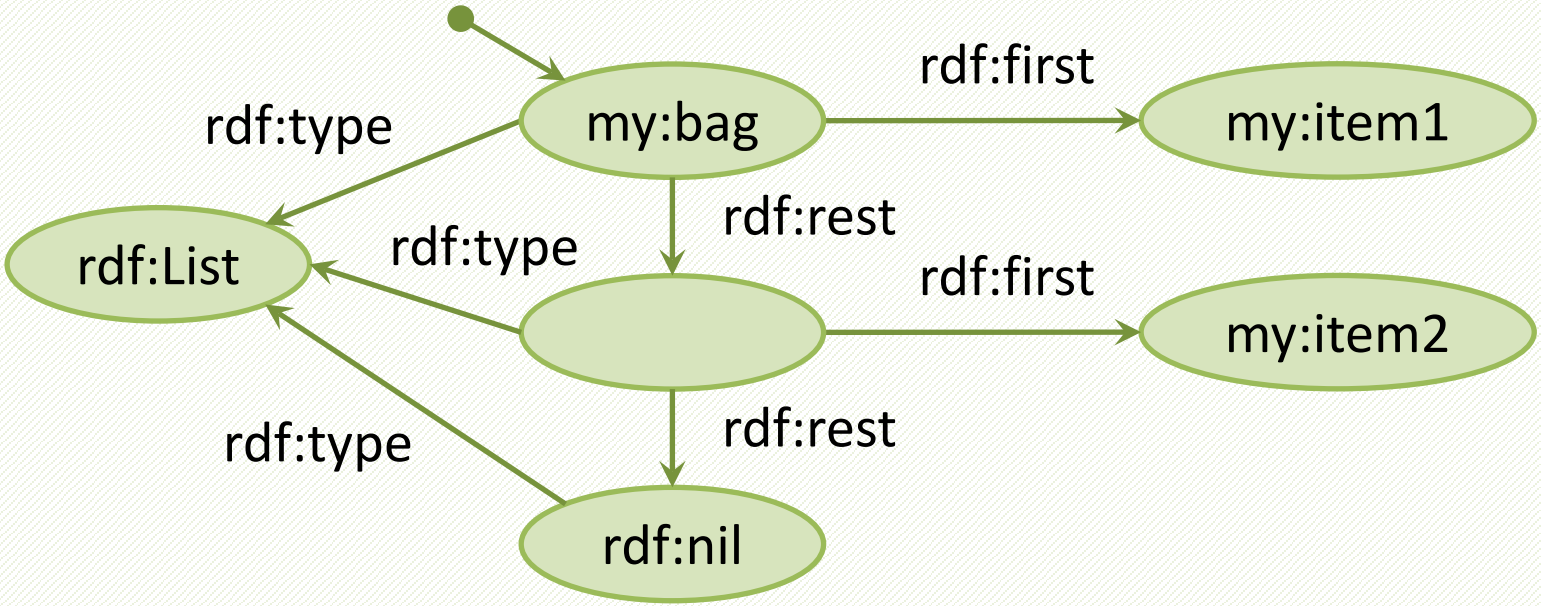
RDF

- Containers
  - rdf:Bag, rdf:Seq, rdf:Alt
  - Represent groups of resources or literals



RDF

- Collections
  - rdf:List
  - Allow to close intended group members



RDF

- Reification
  - Statements about statements

```
my:s          my:p            my:o              .

_:triple1     rdf:type        rdf:Statement     .
_:triple1     rdf:subject     my:s              .
_:triple1     rdf:predicate   my:p              .
_:triple1     ref:object      my:o              .
```

Turtle Notation

- Terse RDF Triple Language
  - Subset of Notation 3
  - http://www.w3.org/TeamSubmission/turtle/
- Example

```
@prefix my: <http://www.my.org/> .
my:s1 my:p1 my:o1 ,
              my:o2 ;
        my:p2 [ my:p3 my:o3 ] .
```

Assignment 4

- Serialize the RDF graph from Assignment 1 using the Turtle notation…

RDFS

- RDFS = RDF Schema
  - W3C
    - http://www.w3.org/TR/rdf-schema/
  - Vocabulary for RDF
    - rdfs:Resource, rdfs:Class, rdfs:subClassOf
    - rdfs:Property, rdfs:subPropertyOf
    - rdfs:range, rdfs:domain
    - rdfs:comment, rdfs:label, rdfs:seeAlso

Assignment 5

- Extend the RDF graph from Assignment 1 by an appropriate RDFS schema…
  - Use all introduced constructs.

OWL

- OWL = Web Ontology Language
  - W3C
    - http://www.w3.org/TR/owl2-overview/
  - Ontologies
    - Data and schemata
  - More complex constructs
    - owl:equivalentClass, owl:equivalentProperty, …
    - owl:sameAs, owl:differentFrom, …
    - owl:minCardinality, owl:maxCardinality, …

Conclusion

- RDF
  - rdf:type
  - rdf:Bag, rdf:Seq, rdf:Alt, rdf:_1, …
  - rdf:List, rdf:first, rdf:rest, rdf:nil
  - rdf:Statement, rdf:subject, rdf:predicate, rdf:object

Conclusion

- RDFS
  - rdfs:Resource, rdfs:Class, rdfs:subClassOf
  - rdfs:Property, rdfs:subPropertyOf
  - rdfs:range, rdfs:domain
  - rdfs:comment, rdfs:label, rdfs:seeAlso