the Resource Description Framework Schema (RDFS) is a W3C recommendation used to describe types and properties of resources

it provides a type system similar to those used in object-oriented programming languages
  – a class hierarchy
  – resources as instances of one or more classes

RDFS facilities are themselves provided in form of an RDF vocabulary defined in a namespace which is bound to an URI
  – http://www.w3.org/2000/01/rdf-schema#

vocabulary descriptions written in RDFS always represent valid RDF graphs
RDFS (II)

- a class in RDFS corresponds to the generic concept of a type or category and can represent almost any category of thing, such as web pages, people, document types, databases or abstract concepts

- describing classes:
  - resources: rdfs:Class, rdf:Resource
  - attributes rdf:type, rdfs:subClassOf

- describing properties:
  - class: rdf:Property
  - properties: rdfs:domain, rdfs:range, rdfs:subPropertyOf
Describing Classes

• "full" description
  - <rdf:Description rdf:ID="class_name">
    <rdf:type rdf:resource="http://www.w3.org/2000/01/rdf-schema#Class"/>
  </rdf:Description>

• "abbreviated" description
  - <rdfs:Class rdf:ID="class_name"/>

• specialisation of classes
  - <rdfs:Class rdf:ID="class_name">
    <rdfs:subClassOf rdf:resource="super_class"/>
  </rdfs:Class>
Describing Attributes

- properties are described as instances of the class `rdf:Property`
- `rdfs:range` – values of a property are instances of a designated class
- `rdfs:domain` – properties apply to a designated class
- `rdfs:subPropertyOf` – properties can be specialised
- properties may have more than one `rdf:range`, `rdf:domain` and `rdf:subPropertyOf` properties

```xml
  <rdf:Property rdf:ID="property_name">
    <rdfs:domain rdf:resource="#designated_class"/>
    <rdfs:range rdf:resource="#designated_class"/>
    <rdfs:subPropertyOf rdf:resource="#super_property"/>
  </rdf:Property>
```
RDFS – Example (IIa)

- RDF Schema document:
  
  ```xml
  <?xml version="1.0"?>
  <!DOCTYPE rdf:RDF [<!ENTITY xsd "http://www.w3.org/2001/XMLSchema#">]>
  <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
    xml:base="http://example.org/schemas/vehicles">
    <rdfs:Class rdf:ID="MotorVehicle"/>
    <rdfs:Class rdf:ID="PassengerVehicle">
      <rdfs:subClassOf rdf:resource="#MotorVehicle"/>
    </rdfs:Class>
  </rdf:RDF>
  ```
RDFS – Example (IIb)

```xml
<rdfs:Class rdf:ID="Truck">
    <rdfs:subClassOf rdf:resource="#MotorVehicle"/>
</rdfs:Class>

<rdfs:Class rdf:ID="Van">
    <rdfs:subClassOf rdf:resource="#MotorVehicle"/>
</rdfs:Class>

<rdfs:Class rdf:ID="MiniVan">
    <rdfs:subClassOf rdf:resource="#Van"/>
    <rdfs:subClassOf rdf:resource="#PassengerVehicle"/>
</rdfs:Class>

<rdfs:Class rdf:ID="Person"/>
<rdfs:Datatype rdf:about="&xsd;integer"/>
```
RDFS – Example (IIc)

```xml
<rdf:Property rdf:ID="registeredTo">
  <rdfs:domain rdf:resource="#MotorVehicle"/>
  <rdfs:range rdf:resource="#Person"/>
</rdf:Property>

<rdf:Property rdf:ID="rearSeatLegRoom">
  <rdfs:domain rdf:resource="#PassengerVehicle"/>
  <rdfs:range rdf:resource="&xsd;integer"/>
</rdf:Property>

<rdf:Property rdf:ID="driver">
  <rdfs:domain rdf:resource="#MotorVehicle"/>
</rdf:Property>
```
RDFS – Example (IIId)

```xml
<rdf:Property rdf:ID="primaryDriver">
  <rdfs:subPropertyOf rdf:resource="#driver"/>
</rdf:Property>
```

```xml
</rdf:RDF>
```
RDFS – Example (III)

- corresponding RDF instance document

```xml
<?xml version="1.0"?>
<!DOCTYPE rdf:RDF [<!ENTITY xsd "http://www.w3.org/2001/XMLSchema#">]>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:ex="http://example.org/schemas/vehicles#"
    xml:base="http://example.org/things">
    <ex:PassengerVehicle rdf:ID="johnSmithsCar">
        <ex:registeredTo rdf:resource="http://www.example.org/staffid/85740"/>
        <ex:rearSeatLegRoom rdf:datatype="&xsd;integer">127</ex:rearSeatLegRoom>
        <ex:primaryDriver rdf:resource="http://www.example.org/staffid/85740"/>
    </ex:PassengerVehicle>
</rdf:RDF>
```
Built-In Properties

- RDFS supplies a number of built-in properties
  - `rdfs:comment` - to provide a human-readable description of a resource
  - `rdfs:label` - to provide a more human-readable version of a resource’s name
  - `rdfs:seeAlso` - to indicate a resource that might provide additional information about the subject resource
  - `rdfs:isDefinedBy` - to indicate a resource that defines the subject resource (subproperty of `rdfs:seeAlso`)
Dublin Core

• minimal set of descriptive elements that facilitate the description and the automated indexing of document-like networked objects
• originally developed by the Dublin Core Metadata Initiative (DCMI) in March 1995 at a workshop on metadata management in Dublin, Ohio
• i.e. used for the OASIS Open Document Format for Office Applications (OpenDocument) and for RSS 1.0
• imports the namespaces dc \(^{(http://purl.org/dc/elements/1.1/)}\) and dcterms \(^{(http://purl.org/dc/terms/)}\)
  – the latter defines additional vocabulary
• of course Dublin Core properties can be declared within an RDFS document
# Dublin Core – Elements (I)

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>title</td>
<td>a name given to the resource</td>
</tr>
<tr>
<td>creator</td>
<td>an entity primarily responsible for making the content of the resource</td>
</tr>
<tr>
<td>subject</td>
<td>the topic of the content of the resource</td>
</tr>
<tr>
<td>description</td>
<td>an account of the content of the resource</td>
</tr>
<tr>
<td>publisher</td>
<td>an entity responsible for making the resource available</td>
</tr>
</tbody>
</table>
# Dublin Core – Elements (II)

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>contributor</td>
<td>an entity responsible for making contributions to the content of the resource</td>
</tr>
<tr>
<td>date</td>
<td>a date associated with an event in the life cycle of the resource</td>
</tr>
<tr>
<td>type</td>
<td>the nature or genre of the content of the resource</td>
</tr>
<tr>
<td>format</td>
<td>the physical or digital manifestation of the resource</td>
</tr>
<tr>
<td>identifier</td>
<td>an unambiguous reference to the resource within a given context</td>
</tr>
</tbody>
</table>
## Dublin Core – Elements (III)

<table>
<thead>
<tr>
<th>Property</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>source</td>
<td>a reference to a resource from which the present resource is derived</td>
</tr>
<tr>
<td>language</td>
<td>a language of the intellectual content of the resource</td>
</tr>
<tr>
<td>relation</td>
<td>a reference to a related resource</td>
</tr>
<tr>
<td>coverage</td>
<td>the extent or scope of the content of the resource</td>
</tr>
<tr>
<td>rights</td>
<td>information about rights held in and over the resource</td>
</tr>
</tbody>
</table>
Dublin Core - Example

- <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
          xmlns:dc="http://purl.org/dc/elements/1.1/">
  <rdf:Description rdf:about="http://www.dlib.org">
    <dc:description>The D-Lib program supports the community of people with research interests in digital libraries and publishing.</dc:description>
    <dc:publisher>Corporation For National Research Initiatives</dc:publisher>
    <dc:date>1995-01-07</dc:date>
    <dc:subject>Research, statistical methods</dc:subject>
    <dc:type>World Wide Web Home Page</dc:type>
    <dc:format>text/html</dc:format>
    <dc:language>en</dc:language>
  </rdf:Description>
</rdf:RDF>
Resources

• Dublin Core Metadata Initiative (DCMI)
  – http://dublincore.org/

• expressing Dublin Core in HTML/XHTML meta and link elements

• expressing qualified Dublin Core in RDF / XML

• expressing Dublin Core using SelfHTML

• RDF test cases
  – http://www.w3.org/TR/rdf-testcases/