ISIT315: Week 2

Describing Web Resources: RDF

Useful link – RDF 1.1 Primer

https://www.w3.org/TR/2014/NOTE-rdf11-primer-20140225/

RDF

- Resource Description Framework
  - A framework for representing information about **resources** in the Web
  - Intended for situations in which information needs to be processed by applications (machine)
- RDF graphs
  - Are sets of subject-predicate-object triples, where elements may be IRIs, blank nodes or datatyped literals.

Comparing data models

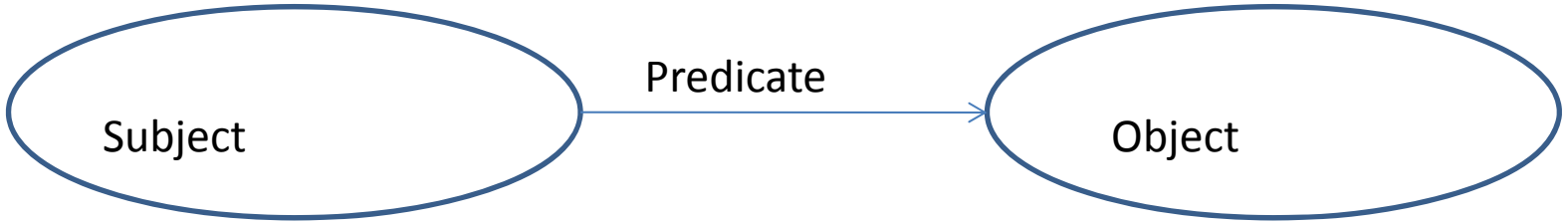
Model	Example format	Data	Metadata	Identifier	Query syntax	Semantics (Meaning)
Relational	MySQL, Oracle	Table Cell Values	Table Column definitions	Primary key (Data Column) value	SQL	n/a
Hierarchical	XML	Tag/Attribute Values	XSD/DTD	Unique Attribute Key Value	Xpath	n/a
Graph	RDF/XML, Turtle	RDF	RDFS/OWL	URI	SPARQL	Yes, using RDFS and OWL

Reading homework

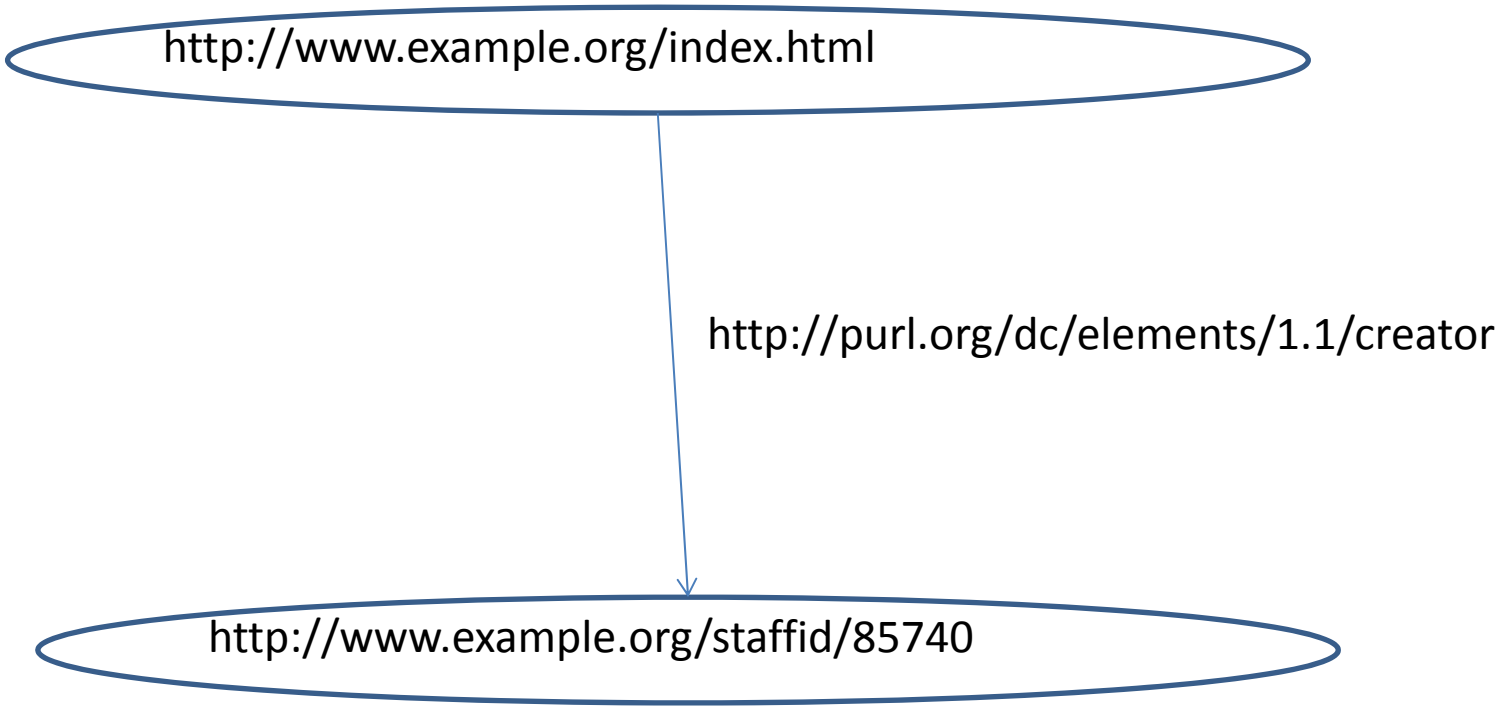
- Why use RDF?
  - Refer to RDF 1.1 Primer

RDF: Graph-based Model

- A graph of nodes and arcs representing the resources and their properties and values
- A graph is a collection of triples
  - Subject, predicate, object
  - Represented as node-arc-node
  - Predicate denotes a relationship
  - Direction of arc is significant
    - Always point to the object


Subject
Predicate
Object

A simple RDF statement



Triples

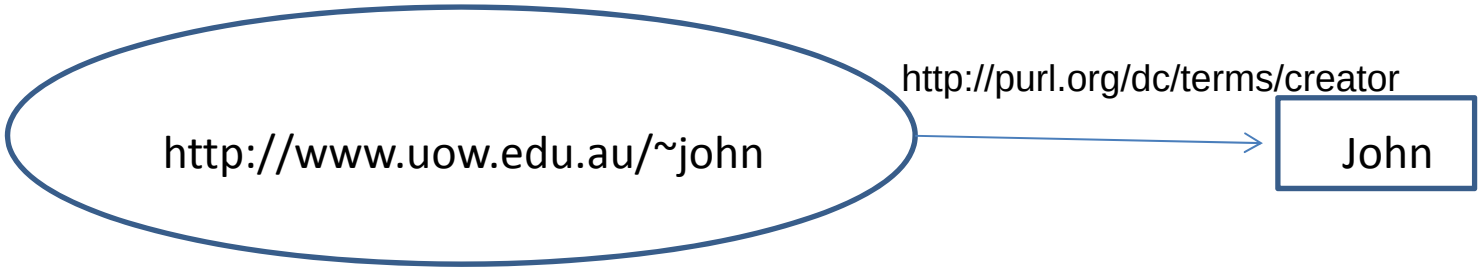
- RDF triple has the following structure:

  <subject> <predicate> <object>

Example 1

- John is the creator of the web page http://www.uow.edu.au/~john
  - Subject (resource)
    - http://www.uow.edu.au/~john
  - Predicate (property)
    - http://purl.org/dc/terms/creator
  - Object (Literal)
    - John
- URIrefs are shown as *ellipses*
- Literals are shown as *boxes*

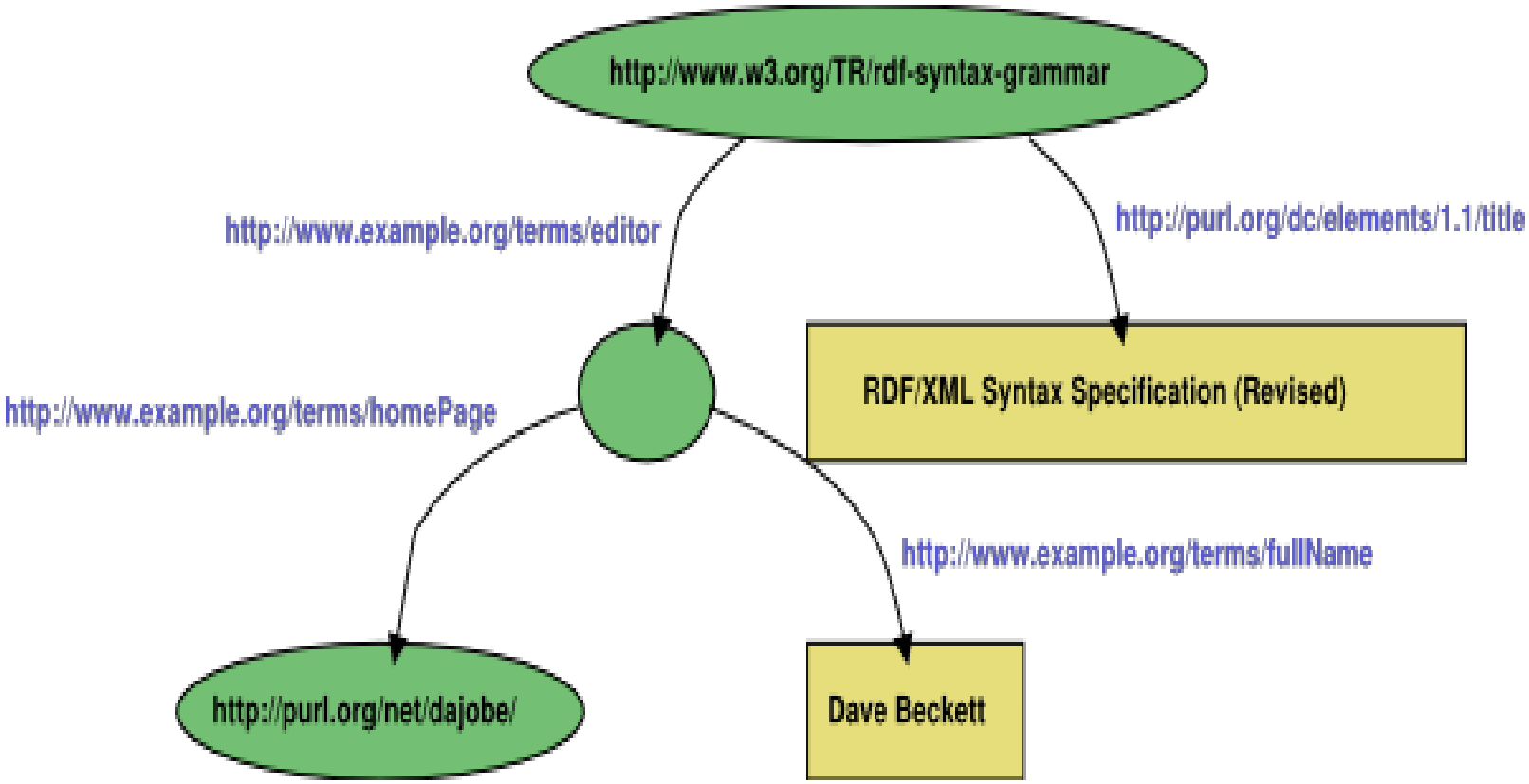
Example 1



Example 2

- See Fig 1
- https://www.w3.org/TR/2014/NOTE-rdf11-primer-20140225/

Example 3 (with blank node)



Triple: Summary

- An *RDF triple* contains three components:
- the *subject*
  - which is an RDF URI reference or a blank node
- the *predicate (also called property)*
  - which is an RDF URI reference
- the *object*
  - which is an RDF URI reference, a literal or a blank node
- Written in the order **subject, predicate, object**.

Exercise

Subject	Predicate	Object
Shakespeare	wrote	King Lear
Shakespeare	livedIn	Stratford
Stratford	isIn	England
England	partOf	UK

Exercise: Draw the above triples as informal RDF graph.

Three kinds of nodes in RDF graph

- IRI (Internationalized Resource Identifier)
- Literals
- Blank nodes

IRI: International Resource Identifier

- Can appear in all three positions of a triple
- Are global identifiers and reusable
  - So other people can re-use the IRI to identify the same thing
- IRI is a generalisation of URI
- URL is a form of IRI

Literals

- Basic values that are not IRIs
- Only appear in object position of a triple
- Literals have datatypes that define range of possible value: strings, numbers, dates
- Can be associated with a datatype
  - RDF re-uses many of the XML Schema built-in datatypes
- See https://www.w3.org/TR/2014/REC-rdf11-concepts-20140225/#section-Datatypes

Blank nodes

- Denote resources without explicitly naming them with IRIs
- Can appear in the subject or object position of a triple
- Blank nodes do not identify specific resources

Multiple graphs

- Multiple graphs in an RDF document constitute an RDF dataset
- See Example 2 in previous slide

RDF Vocabularies

- To support the definition of vocabularies RDF provides the RDF Schema language
- This language allows one to define semantic characteristics of RDF data

The main modeling constructs provided by RDF Schema are summarized in the table below:

Table 1: RDF Schema Constructs

Construct	Syntactic form	Description
Class (a class)	**C** rdf:type rdfs:Class	**C** (a resource) is an RDF class
Property (a class)	**P** rdf:type rdf:Property	**P** (a resource) is an RDF property
type (a property)	**I** rdf:type **C**	**I** (a resource) is an instance of **C** (a class)
subClassOf (a property)	**C1** rdfs:subClassOf **C2**	**C1** (a class) is a subclass of **C2** (a class)
subPropertyOf (a property)	**P1** rdfs:subPropertyOf **P2**	**P1** (a property) is a sub-property of **P2** (a property)
domain (a property)	**P** rdfs:domain **C**	domain of **P** (a property) is **C** (a class)
range (a property)	**P** rdfs:range **C**	range of **P** (a property) is **C** (a class)

Example of RDF vocabularies used world wide

- Friend of a friend (FOAF)
  - to describe social network
- Dublin Core
  - maintains a metadata element set for describing a wide range of resources
- schema.org
  - a vocabulary developed by a group of major search providers.
- SKOS
  - is a vocabulary for publishing classification schemes such as terminologies and thesauri on the Web

Serialization formats

- Turtle family of RDF languages
  - N-Triples, Turtle
- RDF/XML (XML syntax for RDF).

Turtle family of RDF languages

- N-Triples
  - A line-based, plain text format for encoding an RDF graph.
- See Example 6: N-Triples
- https://www.w3.org/TR/2014/NOTE-rdf11-primer-20140225/

Turtle

- An extension of N-Triples
- Turtle introduces a number of syntactic shortcuts, such as support for namespace prefixes, lists and shorthands for datatyped literals.
- Turtle provides a trade-off between ease of writing, ease of parsing and readability

See Example 7

- https://www.w3.org/TR/2014/NOTE-rdf11-primer-20140225/

RDF/XML

- RDF document represented by XML statement with the tag `rdf:RDF`
- The content of the element is a number of descriptions which use `rdf:Description` tags
  - Every description is a statement about a resource
    - An `about` attribute, referencing an existing resource
    - An `ID` attribute, creating a new resource
    - Without a name, creating an anonymous resource

Example

- *Ora Lassila is the creator of the resource* *http://www.w3.org/Home/Lassila*

```
<rdf:RDF>
  <rdf:Description
  about="http://www.w3.org/Home/Lassila">
     <s:Creator>Ora Lassila</s:Creator>
  </rdf:Description>
</rdf:RDF>
```

Complete XML

```
<?xml version="1.0"?>
<rdf:RDF
  xmlns:rdf=http://www.w3.org/1999/02/22-
  rdf-syntax-ns#
  xmlns:s="http://description.org/schema/">
  <rdf:Description
  about="http://www.w3.org/Home/Lassila">
     <s:Creator>Ora Lassila</s:Creator>
  </rdf:Description>
</rdf:RDF>
```

Description element

- The `Description` element names, in an `about` attribute, the resource to which each of the statements apply.
- If the resource does not yet exist (i.e., does not yet have a resource identifier) then a `Description` element can supply the identifier for the resource using an `ID` attribute.

Declaring the use of RDF

- It is necessary to declare that RDF is being used so that applications can recognise this is an RDF/XML document.

Example

```
<?xml version="1.0"?>
<!DOCTYPE rdf:RDF PUBLIC "-//DUBLIN CORE//DCMES DTD
   2002/07/31//EN“
   "http://dublincore.org/documents/2002/07/31/dcmes-
   xml/dcmes-xml-dtd.dtd">
<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.ilrt.bristol.ac.uk/people/cmdjb/">
       <dc:title>Dave Beckett's Home Page</dc:title>
       <dc:creator>Dave Beckett</dc:creator>
       <dc:publisher>ILRT, University of
       Bristol</dc:publisher>
       <dc:date>2002-07-31</dc:date>
   </rdf:Description>
</rdf:RDF>
```

Useful links

- RDF 1.1 Concepts and Abstract Syntax https://www.w3.org/TR/2014/REC-rdf11-concepts-20140225/
- Dublin Core Metadata Terms http://dublincore.org/documents/dcmi-terms/
- FOAF http://xmlns.com/foaf/spec/