Linked Data for Digital Humanities

- HUMN3001 and HUMN6003 -

Ontologies

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Plan

- What's an ontology?
- Examples of existing ontologies
- RDFS, OWL
- Ontology design

Sorry, Parmenides, not you!

So the Semantic Web is all about meaning...

How do we exchange meaning through RDF?

- *Ontologies*.

What's an ontology?

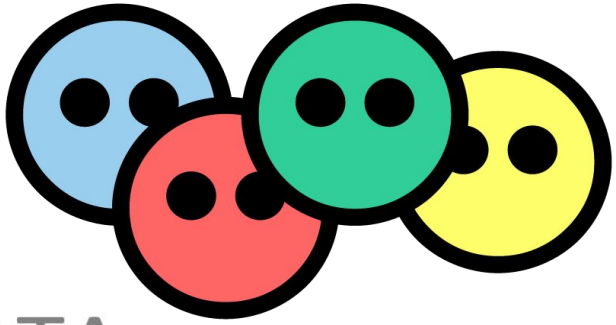
- An ontology is a description of concepts and their relationships.
- It enables us to build semantic models with RDF (more specific models than RDF itself).
- It's about adding meaning to your data so that it can be “understood” and reused by others.

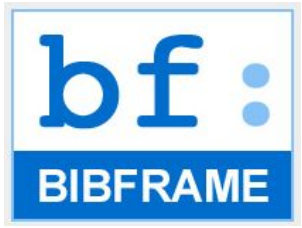
Appropriate ontologies

- Ontologies don't remove complexity, but they do enable us to scale it (relatively) gracefully.
- More than one “correct” ontology can be applicable to a resource – it depends what you're doing with it.
- Where available, use an applicable existing ontology (or extend it).
- Write the ontologies you need – you can extend them later. Better it be limited and right...
- It is probably unwise to expect an ontology for all Things...

Ontologies encountered...

- Friend-of-a-Friend (FOAF)
- Dublin Core
- DBpedia
- MODS RDF
- MADS RDF
- BIBFRAME
- eeboo
- Linkedjazz
- JazzCats

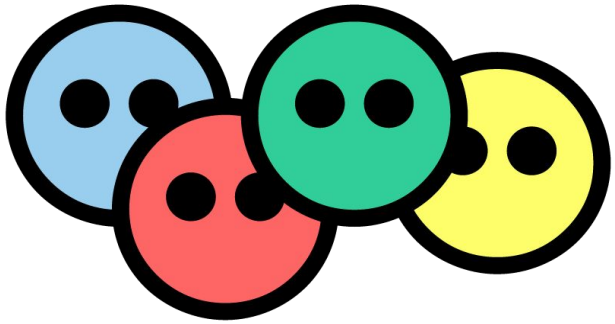




...and more!

Useful Ontologies

- **RDF Schema** http://www.w3.org/TR/rdf-schema/
- **XSD** https://en.wikipedia.org/wiki/XML_Schema_(W3C)
- **Dublin Core** http://dublincore.org/
- **SKOS** http://www.w3.org/2004/02/skos/
- **FOAF** http://xmlns.com/foaf/spec/



Some in Cultural Heritage

- **CIDOC-CRM**
  - http://www.cidoccrm.org/official_release_cidoc.html
- **FRBRoo**
  - http://www.cidoc-crm.org/frbr_drafts.html
- **PerioDO**
  - http://perio.do/specs/
- **Europeana Data Model**
  - http://pro.europeana.eu/page/edm-documentation

Bibliographical metadata

- **MODS/RDF**
  - http://www.loc.gov/standards/mods/modsrdf/
- **MADS/RDF**
  - http://www.loc.gov/standards/mads/rdf/v1.html
- **Bibframe**
  - http://www.loc.gov/bibframe/docs/
- **BiBO**
  - http://bibotools.googlecode.com/svn/bibo-ontology/trunk/doc/classes/
- **Schema.org**
  - http://schema.org/

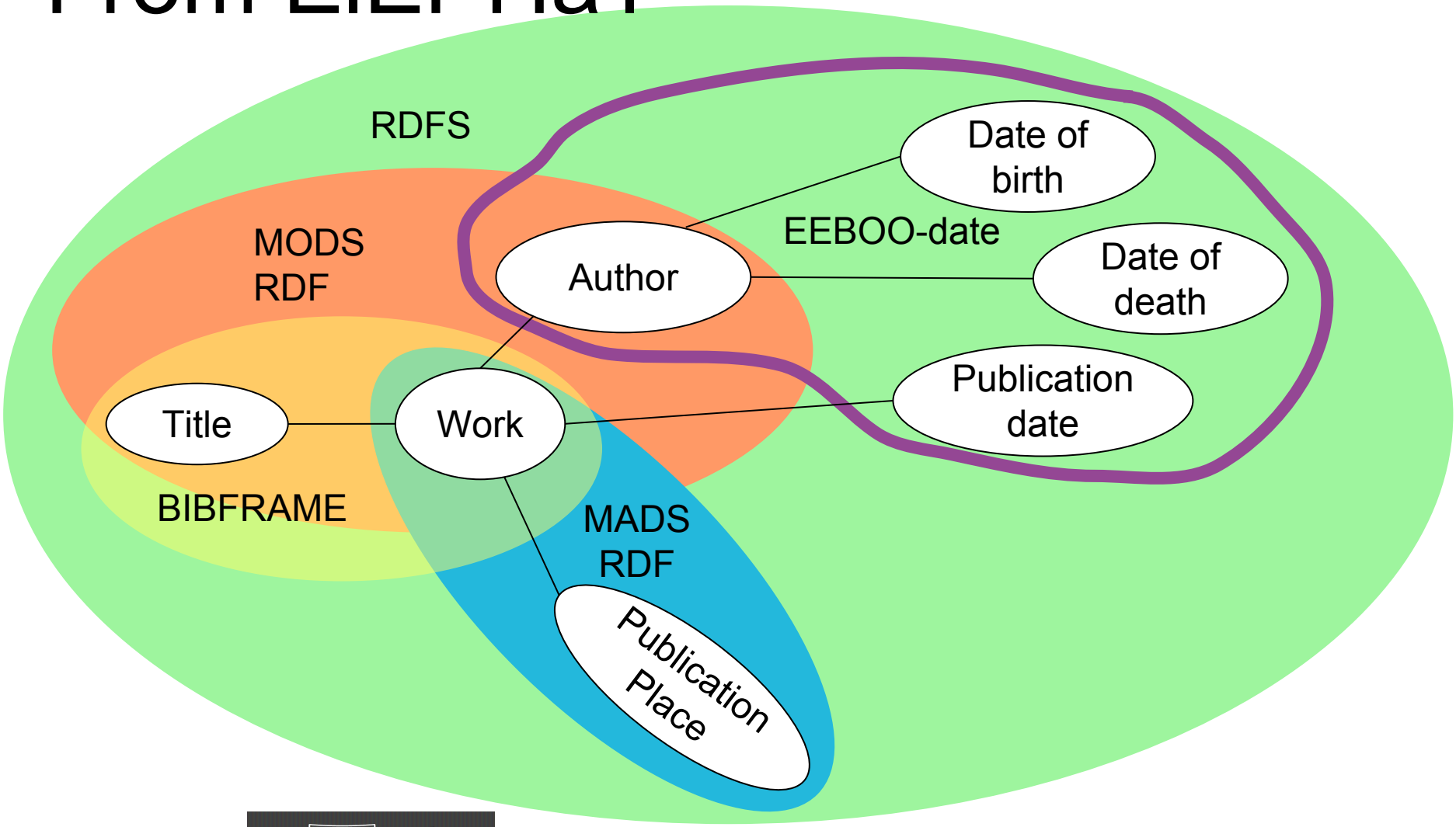
Other examples (1)

- **Music Ontology**
  - http://musicontology.com/
- **Timeline Ontology**
  - http://motools.sourceforge.net/timeline/timeline.html
- **Event Ontology**
  - http://motools.sourceforge.net/event/event.html
- **Media ontology**
  - http://www.w3.org/TR/mediaont-10/
- **Prov**
  - http://www.w3.org/TR/prov-o/

Other examples (2)

- **RO**
  - http://www.researchobject.org/specifications/
- **Open Annotation**
  - http://www.openannotation.org/spec/core/
- **Owl Time**
  - http://www.w3.org/TR/owl-time/
- **Segment ontology**
  - http://www.linkedmusic.org/ontologies/segment/

From ElEPHãT



Ontologies in ElEPHãT

- Each of these conceptual areas is a specialisation
  - which might be the subject of scholarly study
  - or computational analysis
  - or crowdsourcing, etc.

- There will be overlap
  - one person's metadata is another person's data
  - we can build upon others specialisation and knowledge.

- We do not expect complexity to vanish
  - but where it has been studied it should be scaled, shared, and linked.

How do we express our ontologies?

- Why, in RDF of course!

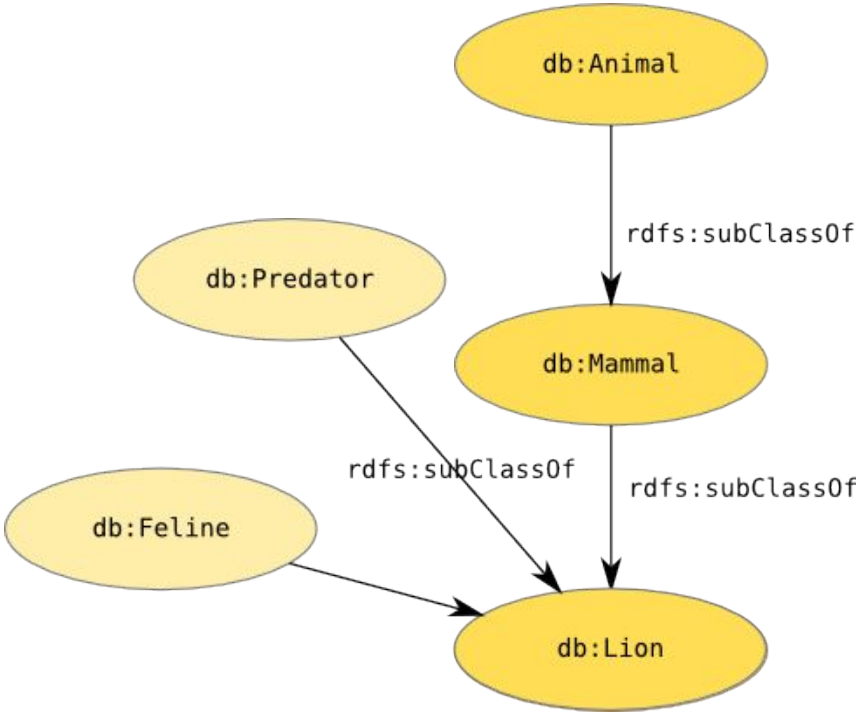
RDFS and OWL (intro)

- RDFS: RDF Schema
  - The basics required to structure
    - an ontology and
    - exchange vocabularies
  - Classes and properties, super- and sub-classes, range and domain.

- OWL: Web Ontology Language
  - More sophisticated structures
  - Constraints for existence and cardinality, transitive, inverse, symmetrical properties, …

Structuring RDF

- Little value if there's no structure at all.
- RDF Schema
  - Define Classes of resources
  - Define Properties
  - SubClasses
    - the isA relationship
- Represented in RDF itself



db: → http://live.dbpedia.org/resource/
rdfs: → http://www.w3.org/2000/01/rdf-schema#

RDF Schema (detail)

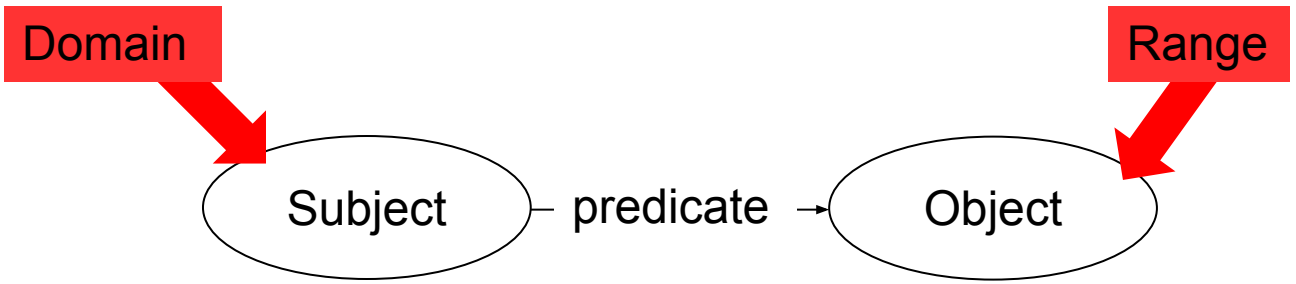
rdf:type	property to state that a resource is an instance of a Class
rdfs:Class	resources that are RDF classes (rdfs:Class is an instance of rdfs:Class)
rdf:Property	class of RDF properties (rdf:Property is an instance of rdfs:Class)
rdfs:subClassOf	isA relationship between classes
rdfs:subPropertyOf	isA relationship between properties
rdfs:label	a human-readable version of a resource's name
rdfs:seeAlso	a resource which might provide more information about the subject
...	

rdf: → http://www.w3.org/1999/02/22-rdf-syntax-ns#
rdfs: → http://www.w3.org/2000/01/rdf-schema#

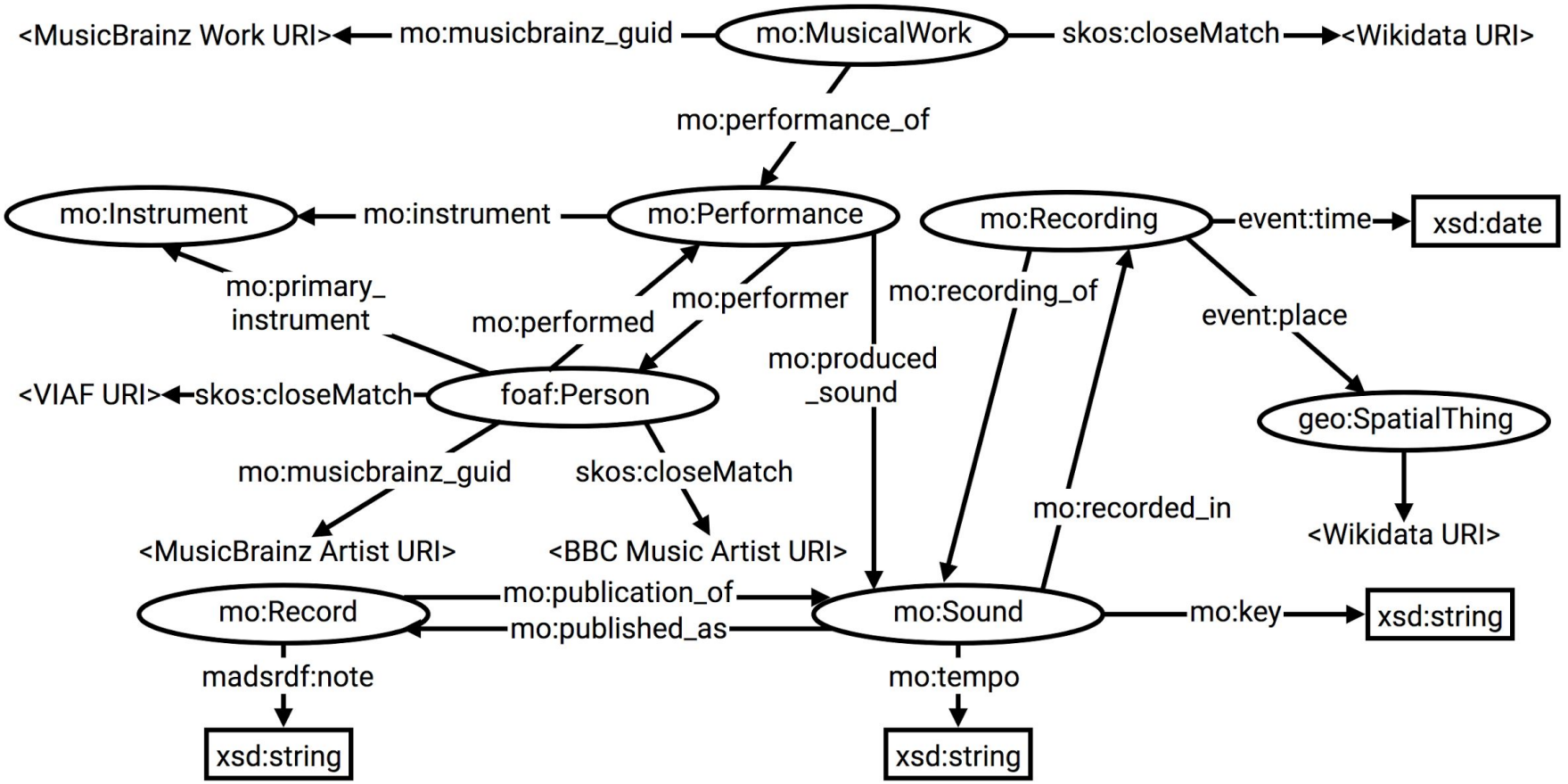
Domain + Range

- A Property can define a Domain and Range
  - Domain is the Class of the subject.
  - Range is the Class of the object.

Properties run from the Domain, to the Range.



Example of the JazzCats ontological structure



Music Ontology **SKOS** **Event ontology** **Geo ontology** **MADS/RDF** **XSD**

The rest are specifics URIs for resources and data entities, or strings, or integers.

How do we know what they mean?

Specifications and Documentations

- Yes, this does mean you have to spend (a really long!) time reading these documentations with your human eye balls and human brain.

- This is your responsibility as a human user to find out and use the right Class or property. The technology won't stop you from doing something stupid.

e.g. Music Ontology: http://motools.sourceforge.net/doc/musicontology.html

This is awesome, but I haven't found an ontology that matches my data and research aims perfectly. What can I do?

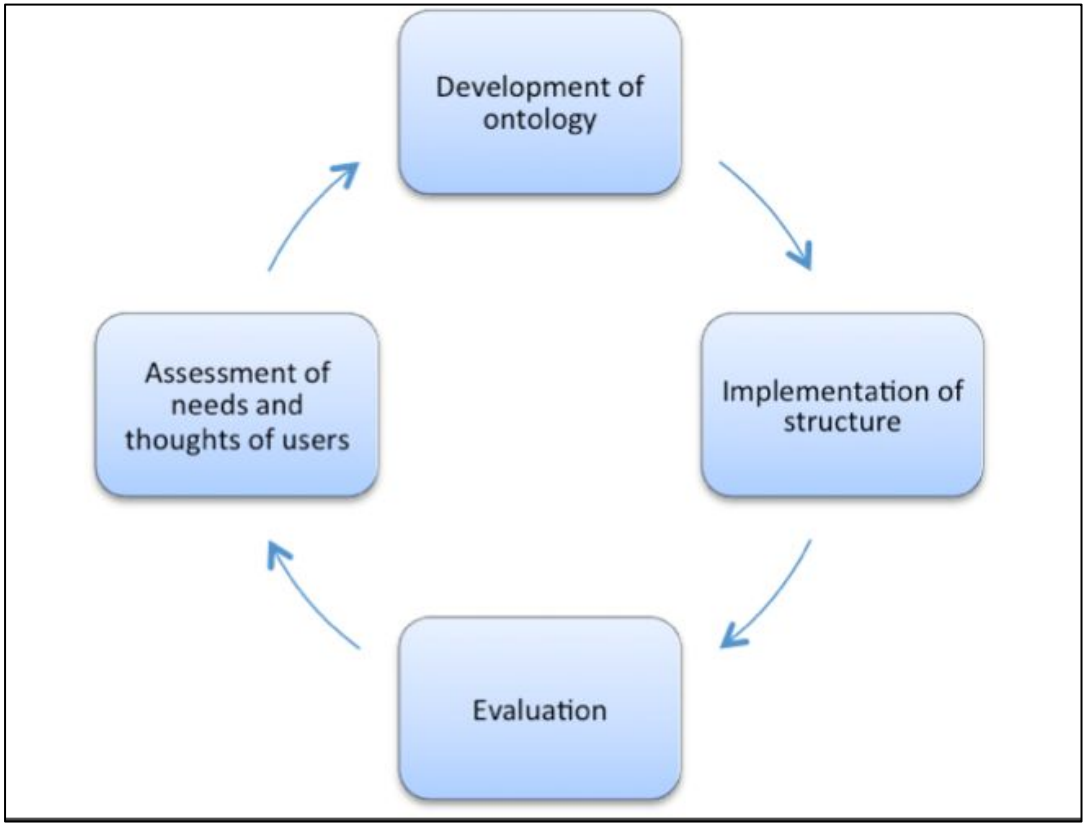
- Well, you can design your own ontology!

You just need to...

- Get *a* model right...

http://recyclenation.com/resources/2015/5/crumpledpaper.jpg

Ontology design (1)



Ontology design (2): 6 steps

1. Specification
   - reasons and aims of the ontology are assessed and determined

2. Conceptualisation
   - structure, classes and properties are planned out

3. Formalisation
   - ideas are realised in a model, and the hierarchy of concepts is defined

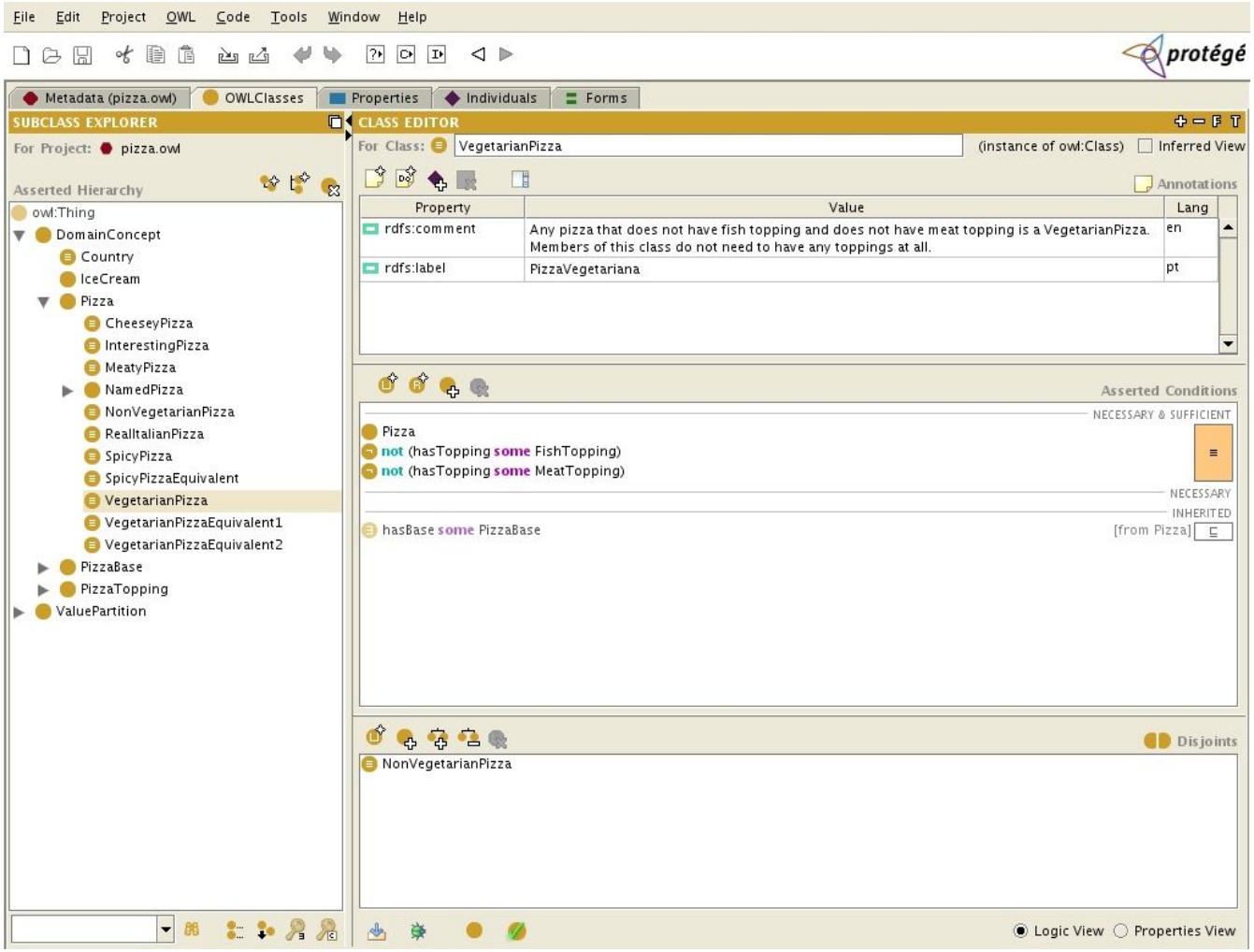
4. Implementation
   - requires the selecting of
     - the language (e.g. RDFS, OWL),
     - the editor software (e.g. Protégé),
     - if applicable, and the reasoner (e.g. FaCT++)

5. Evaluation
   - the ontology is tested against SPARQL queries or through an online validator

6. **Documentation**
   - information regarding the design decisions and the rationale are outlined for the benefit of other users.

Ontology design (3)

Ontology design (4)



Protégé

1. Free Ontology editor developed at Stanford
   a. http://protege.stanford.edu/
2. Has OWL support
3. Describing full use beyond today's session
   a. http://protegewiki.stanford.edu/wiki/Protege4GettingStarted
      i. for info on installing and running
   b. http://owl.cs.manchester.ac.uk/tutorials/protegeowltutorial/
      i. Tutorials

To Do Well on this Project:

- 50% on your ontology work.
- 50% on the RDF you produce next week using the ontology.

You need to:

- Design an ontology that is *not wrong.*
  - There are many possible correct models. There is no one right answer.
  - There can be mistakes! A page is part of a book, not a type of book.

- Document your ontology.

- Add or include parts from an existing ontology/ontologies.

What you call a specific Class or property is not that important. The documentation must makes the meaning clear, whether you call something a “work”, a “book”, or “12345”.