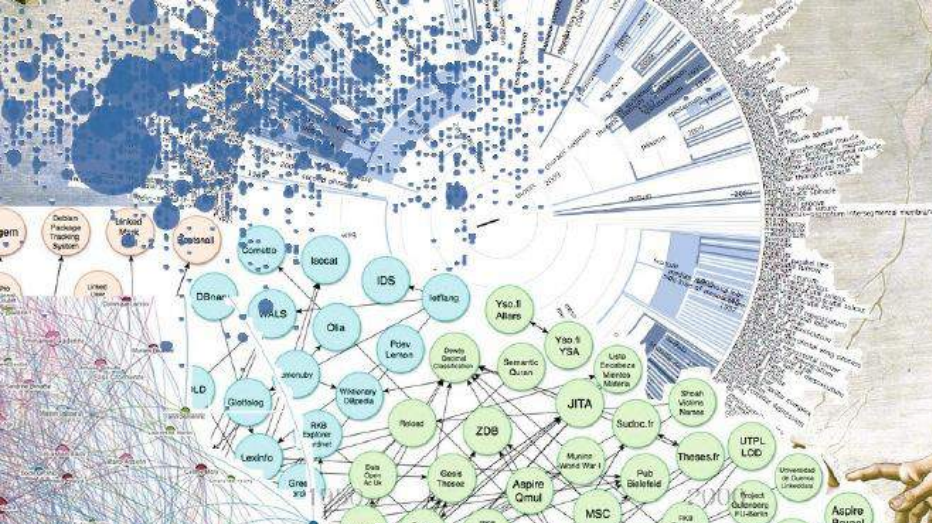




Linked Data Engineering

Lecture 3: Linked Data Vocabularies and Ontologies

3.2 Linked Data Vocabularies



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FIZ Karlsruhe

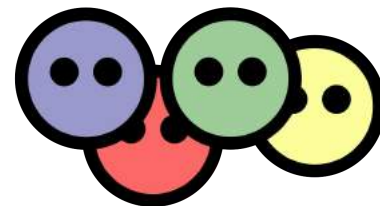
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Example

- Defining personal data for a user/person
 - e.g. given name, last name, address data, web page, email address, etc.
- There are several possibilities:
 1. **Define a new vocabulary** according to your needs
 2. **Use existing vocabularies** and (possibly) adapt your application accordingly
 3. Use existing vocabularies and **extend vocabularies** according to your needs

Example of Linked Data Vocabularies



<http://www.foaf-project.org/>

- **FOAF - Friend of a Friend**

- describes persons, their activities and their relations to other people and objects

```
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .

<#me>
  a foaf:Person ;
  foaf:name "Harald Sack" ;
  foaf:mbox <mailto:harald.sack@hpi.de> ;
  foaf:homepage <https://hpi.de/meinel/lehrstuhl/team-fotos/senior-researcher/sack.html> ;
  foaf:depiction <https://hpi.de/fileadmin/_migrated/pics/harald_min.jpg> ;
  foaf:interest <http://linkeddata.org> ;
  foaf:knows [
    a foaf:Person ;
    foaf:name "Magnus Knuth"
  ] .
```


HPI
Hasso
Plattner
Institut



Linked Data Engineering , Prof. Dr. Harald Sack, FIZ Karlsruhe - Leibniz Institute for Information Infrastructure & Karlsruhe Institute of Technology

The Open World of Linked Data

- `foaf:publications` `rdf:type` `rdf:Property` ;
 `rdf:domain` `foaf:Person` ;
 `rdf:range` `foaf:Document` .

`dbpedia:Hasso_Plattner_Institute` `rdf:type` `dbo:Organisation` ;
 `foaf:publications` `<https://hpi.de/technical-reports/>` .

`foaf:Person` $\neq$ `dbo:Organisation`

- According to RDF(S) semantics (`foaf:publications` `rdf:domain` `foaf:Person` .) it can be deduced that

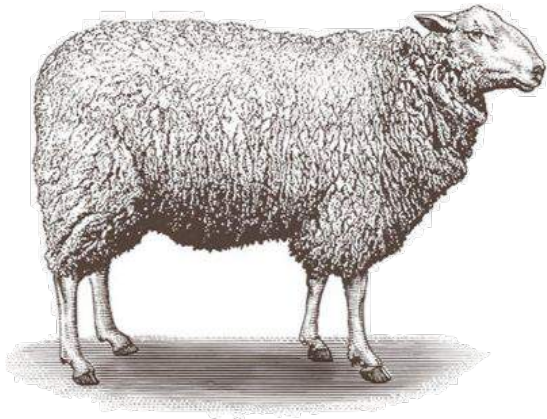
`dbpedia:Hasso_Plattner_Institute` `rdf:type` `foaf:Person` .

The Open World Assumption - OWA

- Question: Can Sheep fly?
- Answer under OWA assumption:

A sheep is an animal with 4 legs.

No idea, but probably yes
(according to our knowledge base)

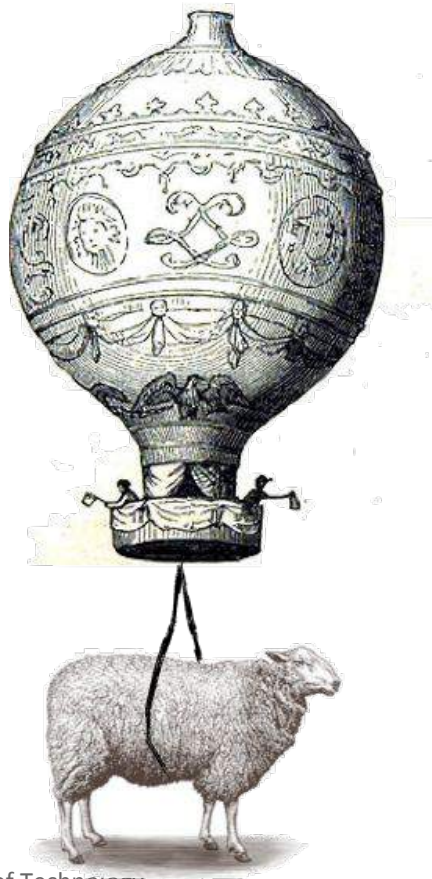


- In the OWA, unless we have a statement (or we can infer) “*sheep can/cannot fly*” we return “***don’t know***”
- In the real world, we are used to deal with incomplete information

The Open World Assumption - OWA

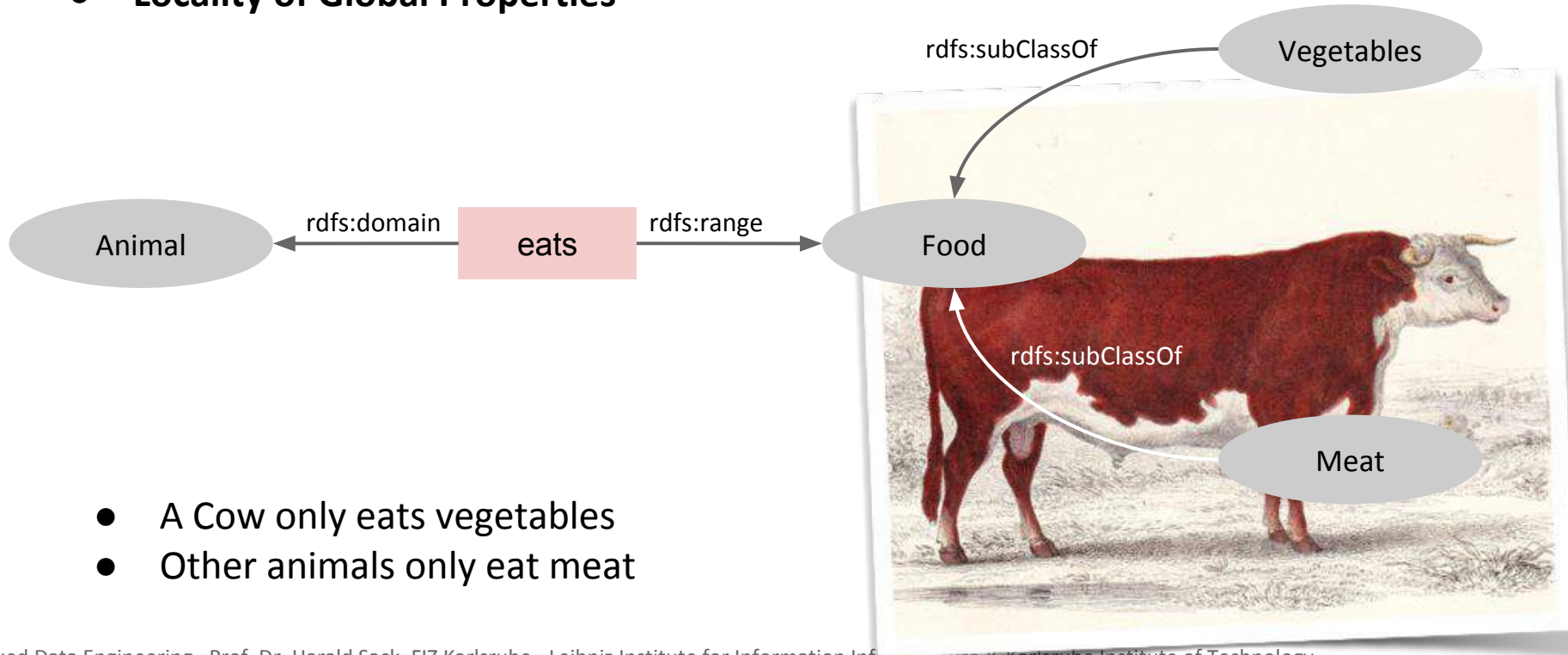
- In the Semantic Web / Linked Data we expect people to extend our own models
(but we don't worry in advance how)
- The OWA assumes incomplete information by default
- Therefore, we can intentionally underspecify our models and allow others to reuse and extend

A sheep is an animal with 4 legs that
(if lifted) can fly



Where RDF(S) is not sufficient...

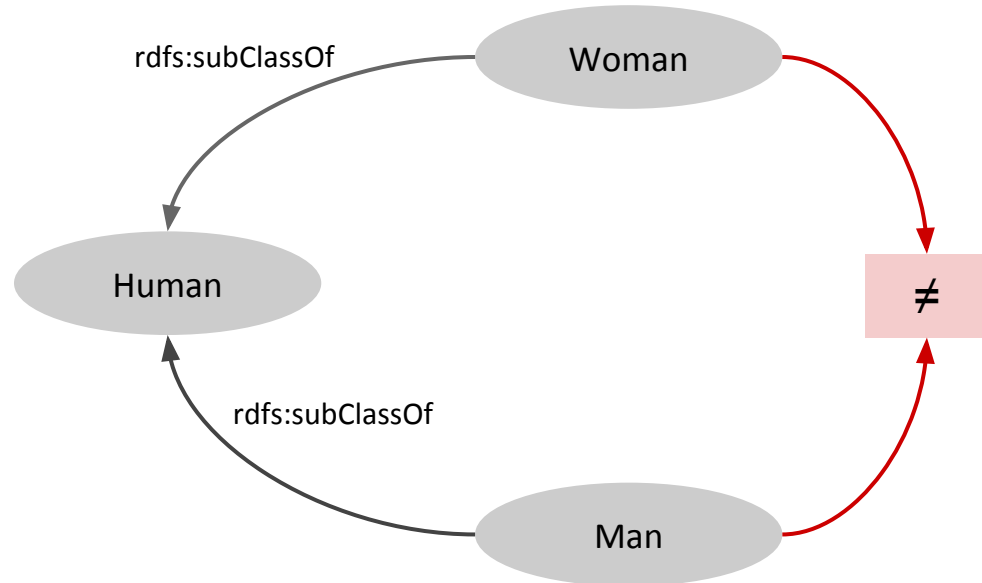
- **Locality of Global Properties**



- A Cow only eats vegetables
- Other animals only eat meat

Where RDF(S) is not sufficient...

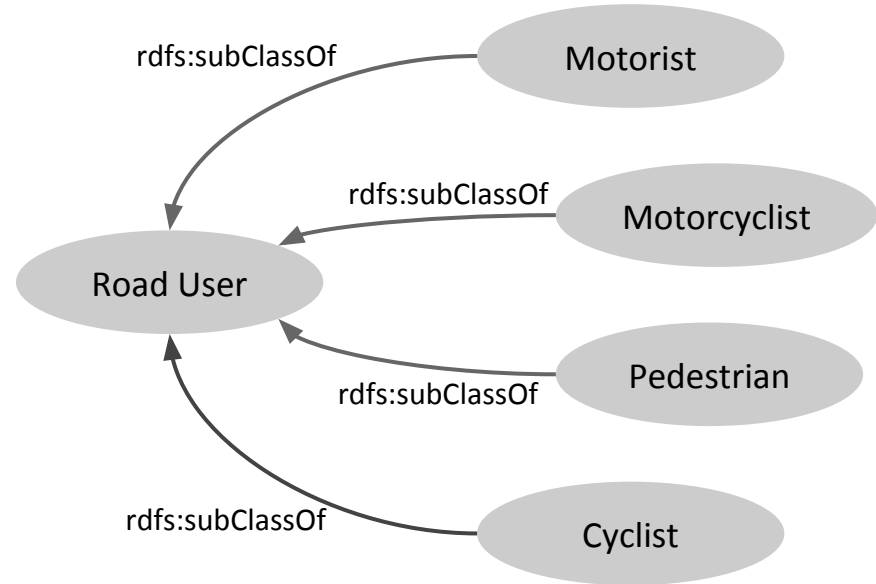
- Disjunctive Classes



- RDFS Subclass relation cannot express disjunctive class (subclass) membership

Where RDF(S) is not sufficient...

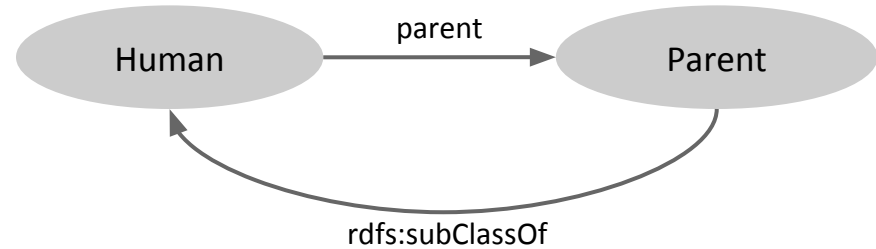
- Class Combinations



- Combination of classes define a new class
- New class contains only members from given class combinations

Where RDF(S) is not sufficient...

- **Cardinality Constraints**



- Every human (usually) has two parents

Where RDF(S) is not sufficient...

Special Property Constraints

- Transitivity (e.g. „is greater than“)
- Uniqueness (e.g. „is mother of“)
- Inversiveness (e.g. „is parent of“ and „is child of“)

General Problem of RDF(S)

- RDF(S) does not have the possibility of **negation**
 - `hpi:harald rdf:type hpi:Vegetarian .`
 - `hpi:harald rdf:type hpi:NonVegetarian .`
 - ...does not automatically generate a contradiction



Next: 03 - First Steps in OWL

Lecture 3: Linked Data Vocabularies and Ontologies - OpenHPI - Course Linked Data Engineering