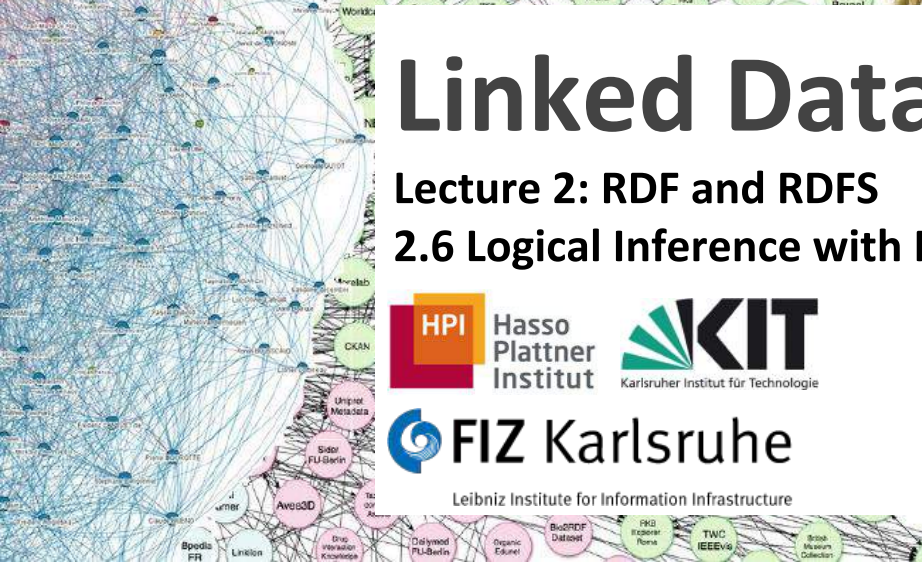




Lecture 2: RDF and RDFS

2.6 Logical Inference with RDFS

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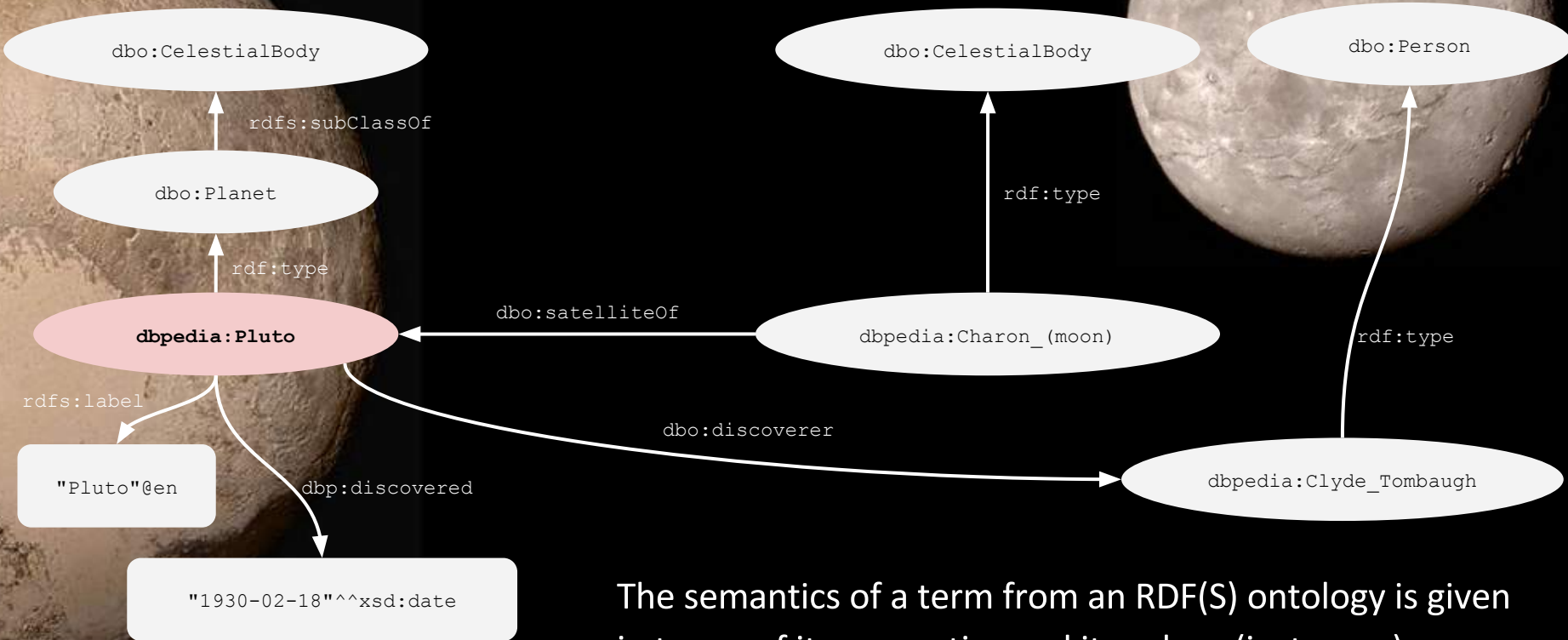


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Autumn 2016

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How much knowledge (semantics) is there?



The semantics of a term from an RDF(S) ontology is given in terms of its properties and its values (instances)

RDF(S) Semantics

- In difference to other data definition languages RDF(S) is based on a **formal semantics**
- Formal semantics enables RDF(S) to draw **valid** and **sound logical inferences**
- Examples:
 - dbpedia:Pluto `rdf:type` dbo:Planet
 - dbo:Planet `rdfs:subClassOf` dbo:CelestialBody
 - dbo:artificialSatelliteOf `rdfs:subPropertyOf` dbo:satelliteOf

dbpedia:Pluto $\in$ dbo:Planet
dbo:Planet $\subseteq$ dbo:CelestialBody
dbo:artificialSatelliteOf $\subseteq$ dbo:satelliteOf

Model-theoretic Semantics

Which Conclusions can we deduce with RDF(S)?



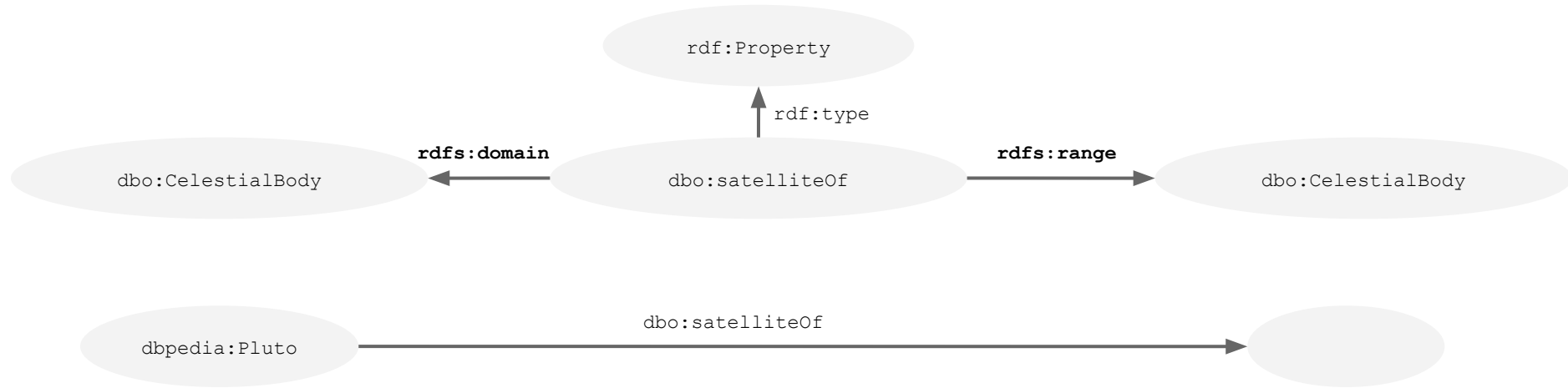
Which Conclusions can we deduce with RDF(S)?



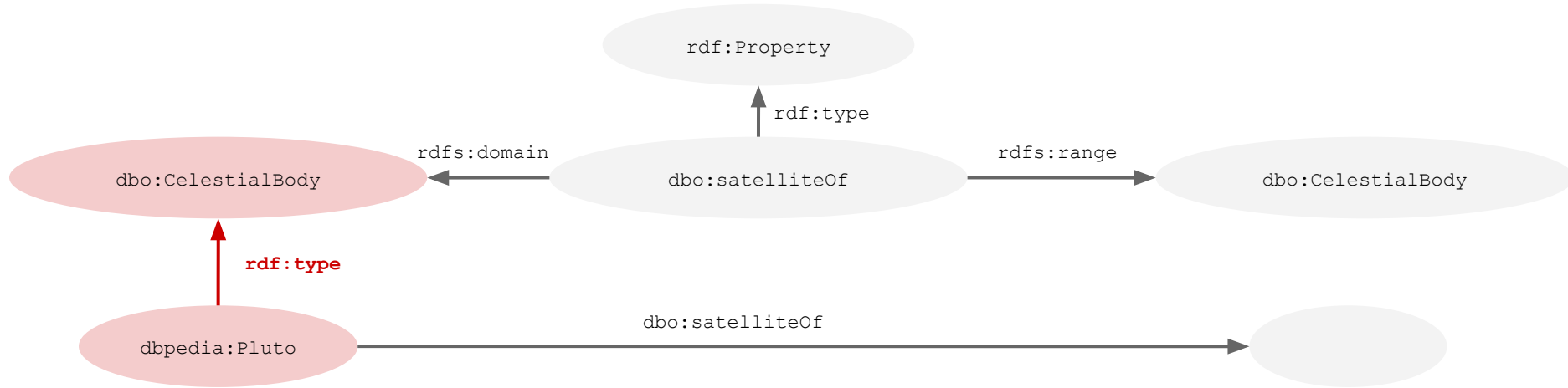
- Deduction of **new facts** from a **class hierarchy**.

$$\forall i, c_1, c_2: T(i, \text{rdf:type}, c_1) \wedge T(c_1, \text{rdfs:subClassOf}, c_2) \rightarrow T(i, \text{rdf:type}, c_2)$$

Which Conclusions can we deduce with RDF(S)?



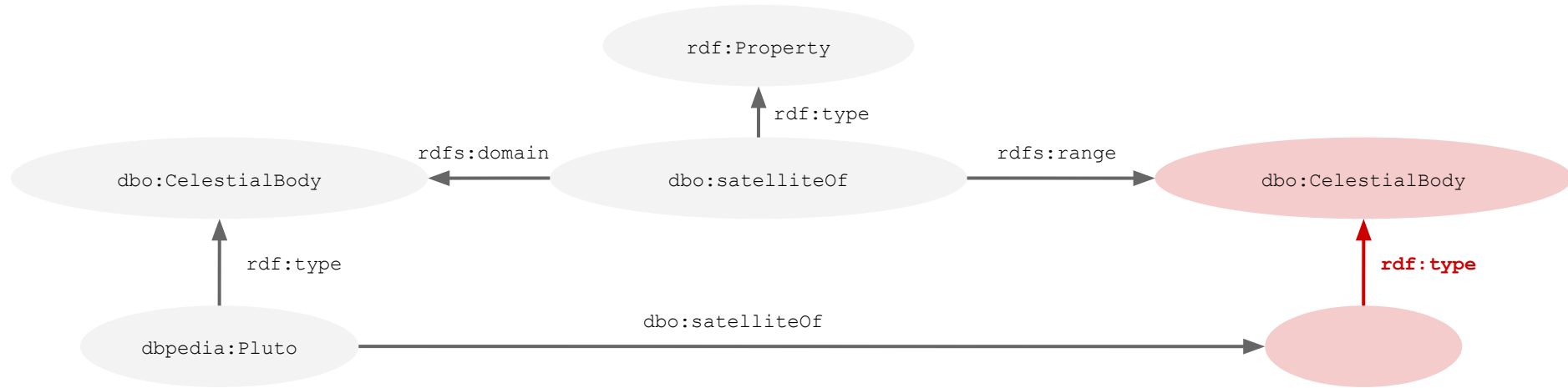
Which Conclusions can we deduce with RDF(S)?



- Deduction of entity **class membership** from the **domain** of one of its properties

$$\begin{aligned} \forall i_1, i_2, c_1, c_2, p: \quad & T(i_1, p, i_2) \wedge \\ & T(p, \text{rdfs:domain}, c_1) \wedge T(p, \text{rdfs:range}, c_2) \\ \rightarrow & T(i_1, \text{rdf:type}, c_1) \wedge T(i_2, \text{rdf:type}, c_2) \end{aligned}$$

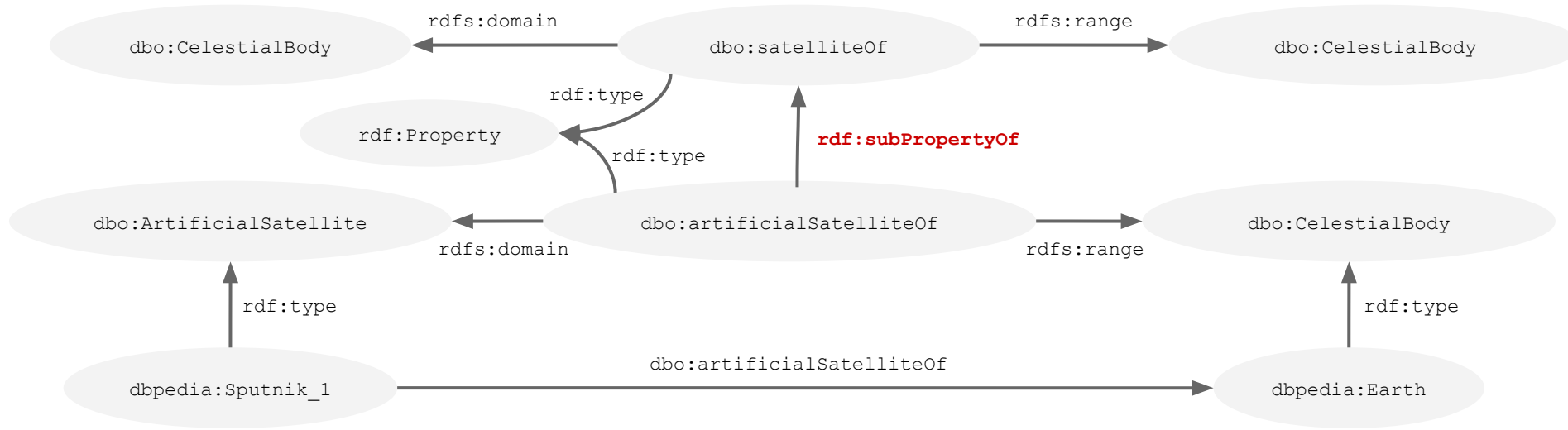
Which Conclusions can we deduce with RDF(S)?



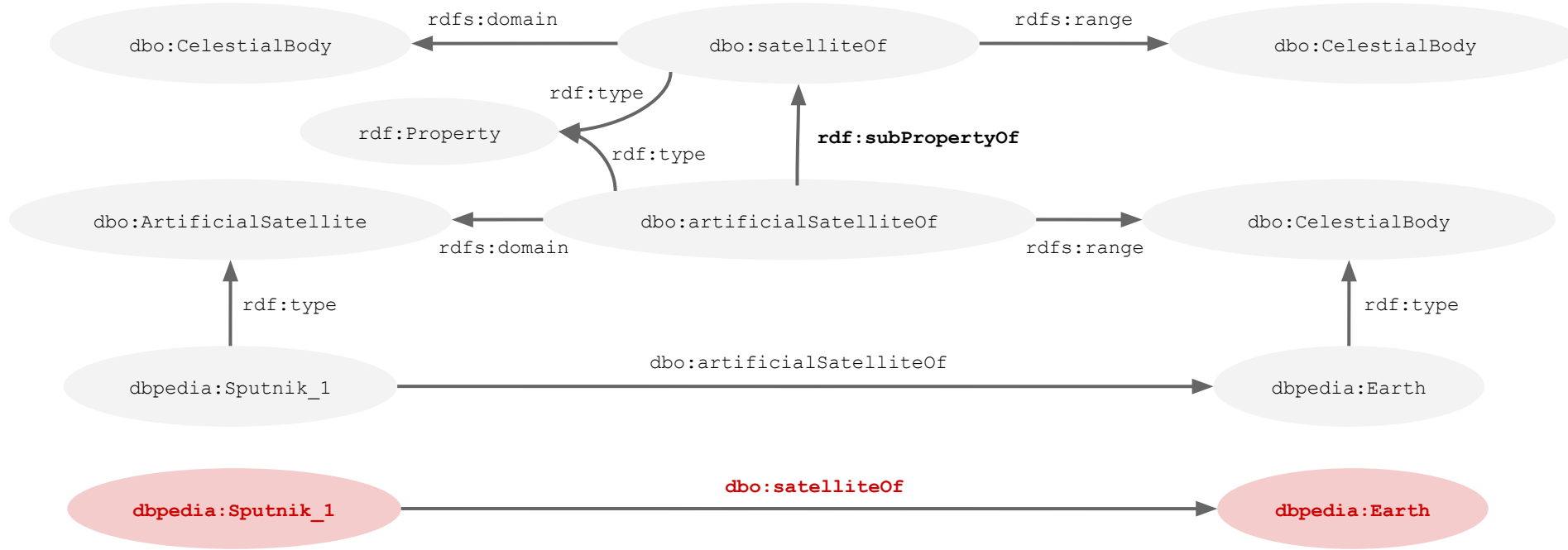
- Deduction of entity **class membership** from the **domain** of one of its properties

$$\begin{aligned} \forall i_1, i_2, c_1, c_2, p: \quad & T(i_1, p, i_2) \wedge \\ & T(p, \text{rdfs:domain}, c_1) \wedge T(p, \text{rdfs:range}, c_2) \\ & \rightarrow T(i_1, \text{rdf:type}, c_1) \wedge T(i_2, \text{rdf:type}, c_2) \end{aligned}$$

Which Conclusions can we deduce with RDF(S)?



Which Conclusions can we deduce with RDF(S)?

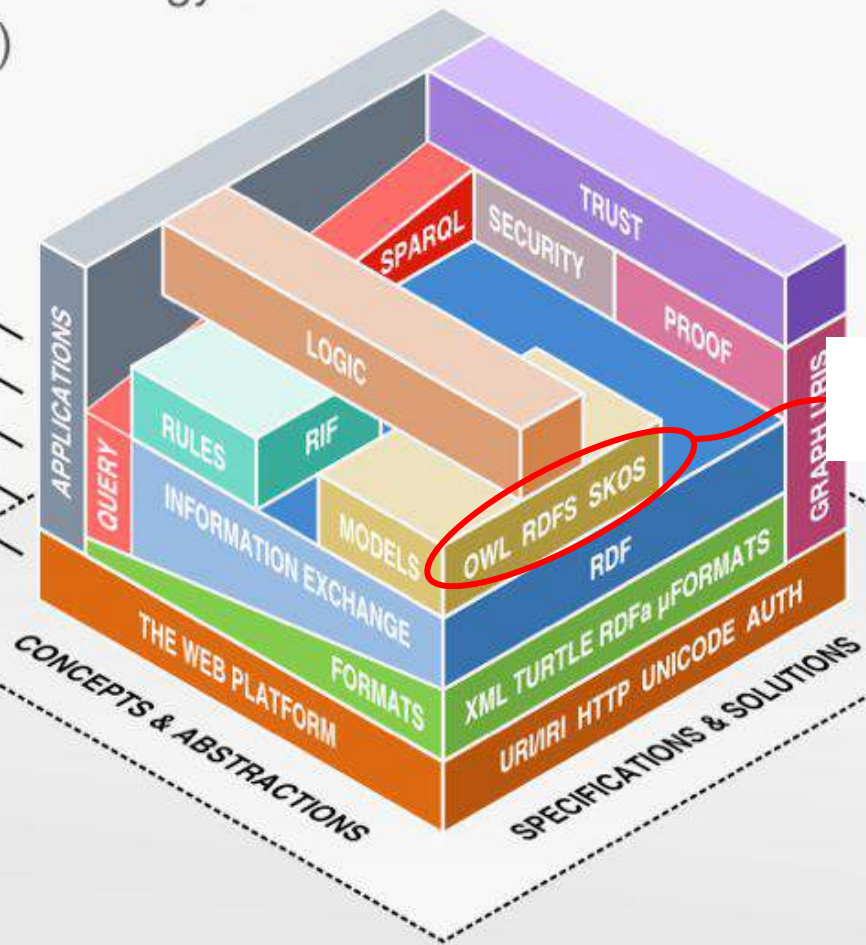
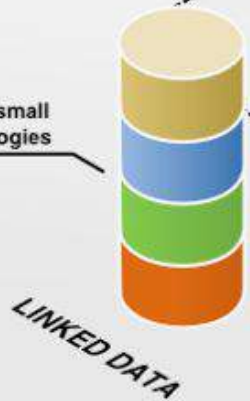


- Deduction of **new facts** from **subproperty** relationships

$$\forall i_1, i_2, p_1, p_2: T(i_1, p_1, i_2) \wedge T(p_1, \text{rdfs:subPropertyOf}, p_2) \rightarrow T(i_1, p_2, i_2)$$

The Semantic Web Technology Stack (not a piece of cake...)

- Most apps use only a subset of the stack
- Querying allows fine-grained data access
- Standardized information exchange is key
- Formats are necessary, but not too important
- The Semantic Web is based on the Web
- Linked Data uses a small selection of technologies



RDF Schema



Next: 07 - RDFa - RDF and the Web

OpenHPI - Linked Data Engineering - Lecture 2: RDF and RDFS