



Lecture 3: Linked Data Vocabularies and Ontologies

3.6 RDF(S) and OWL Knowledge Bases



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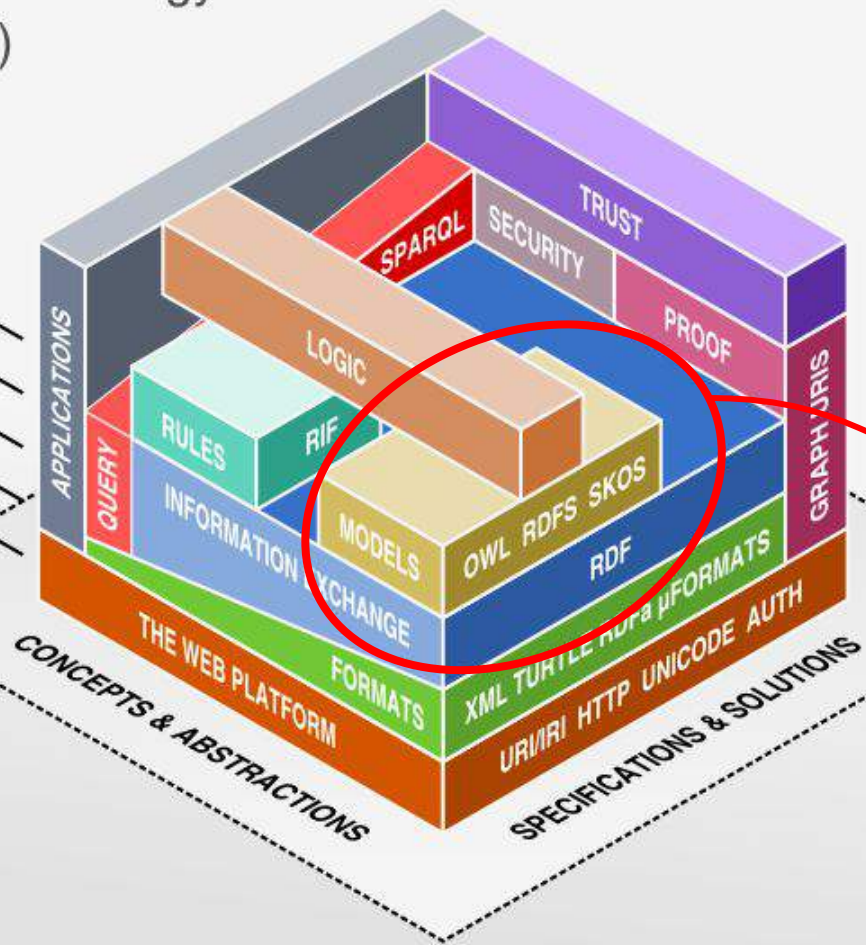
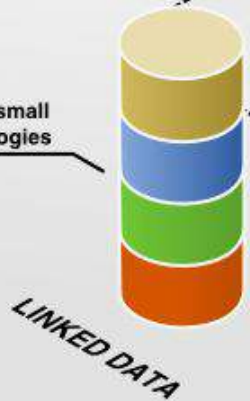
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Autumn 2016

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

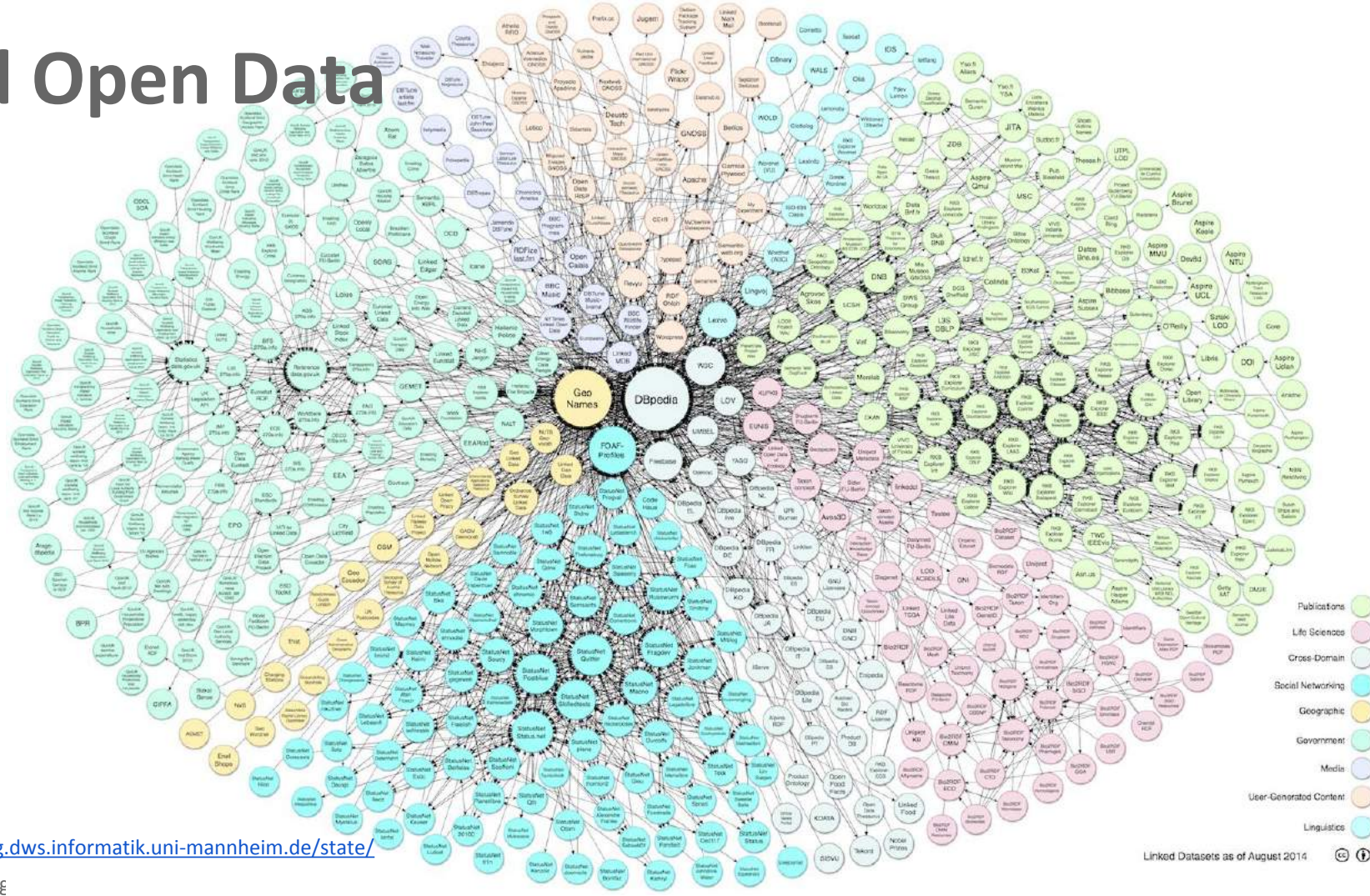
- Most apps use only a subset of the stack
- Querying allows fine-grained data access
- Standardized information exchange is key
- Formats are necessary, but not too important
- The Semantic Web is based on the Web

Linked Data uses a small selection of technologies



Knowledge Representations

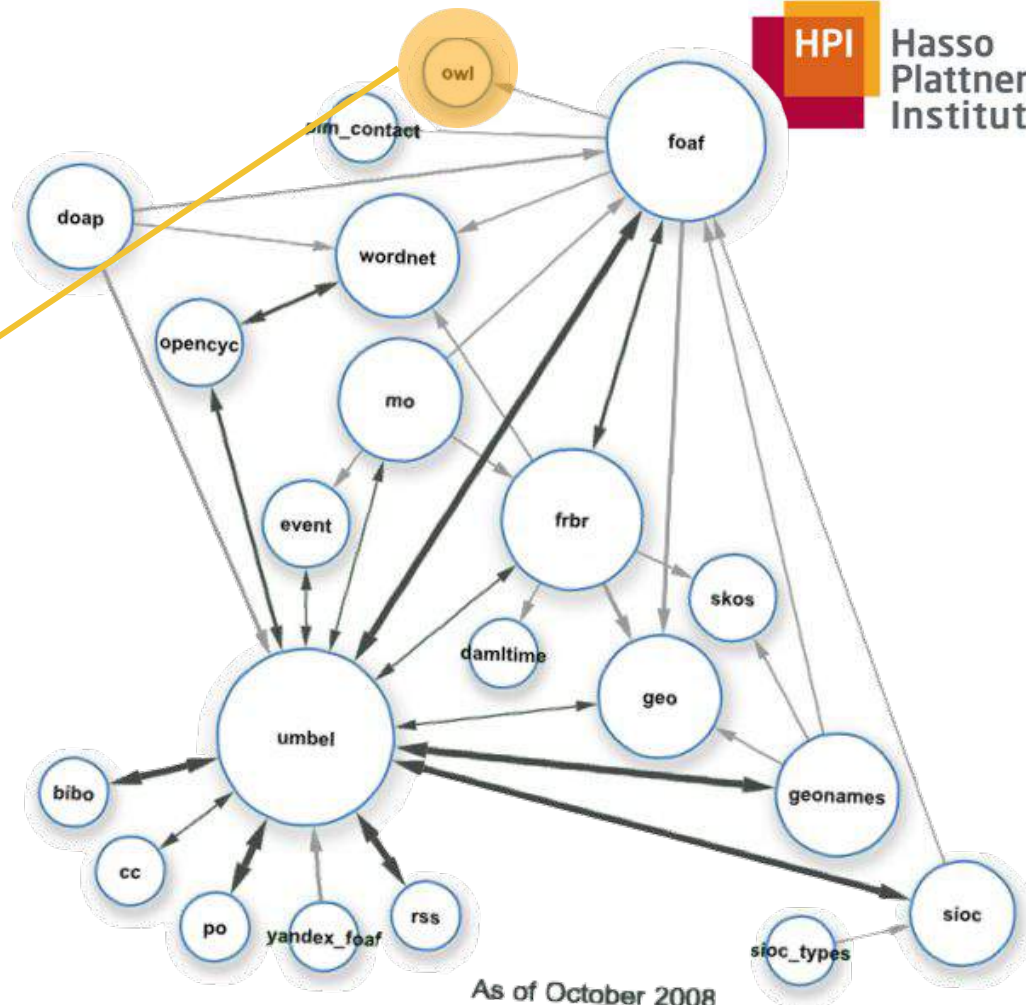
Linked Open Data



<http://linkeddatacatalog.dws.informatik.uni-mannheim.de/state/>

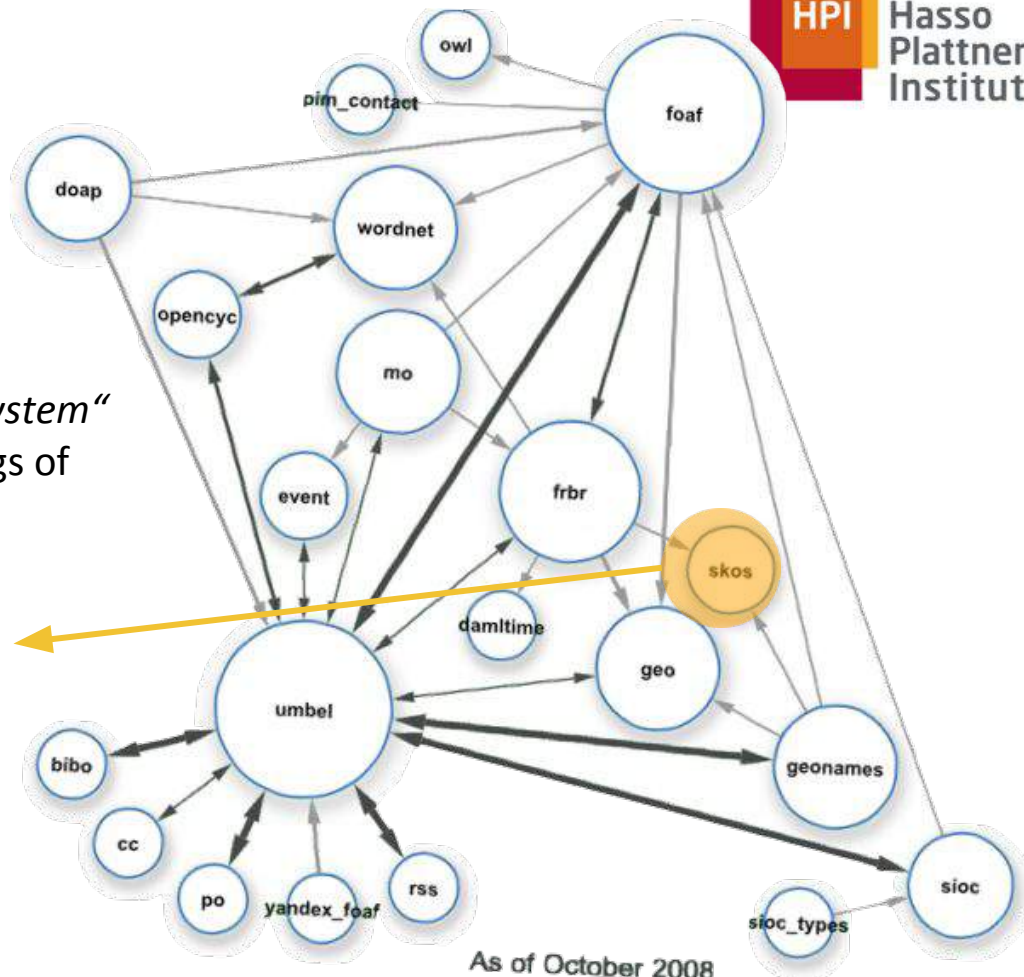
Linked Data Ontologies

- Ontologies hold the Linked Data Cloud together
- **OWL**
`owl:sameAs` connects identical individuals
`owl:equivalentClass` connects equivalent classes



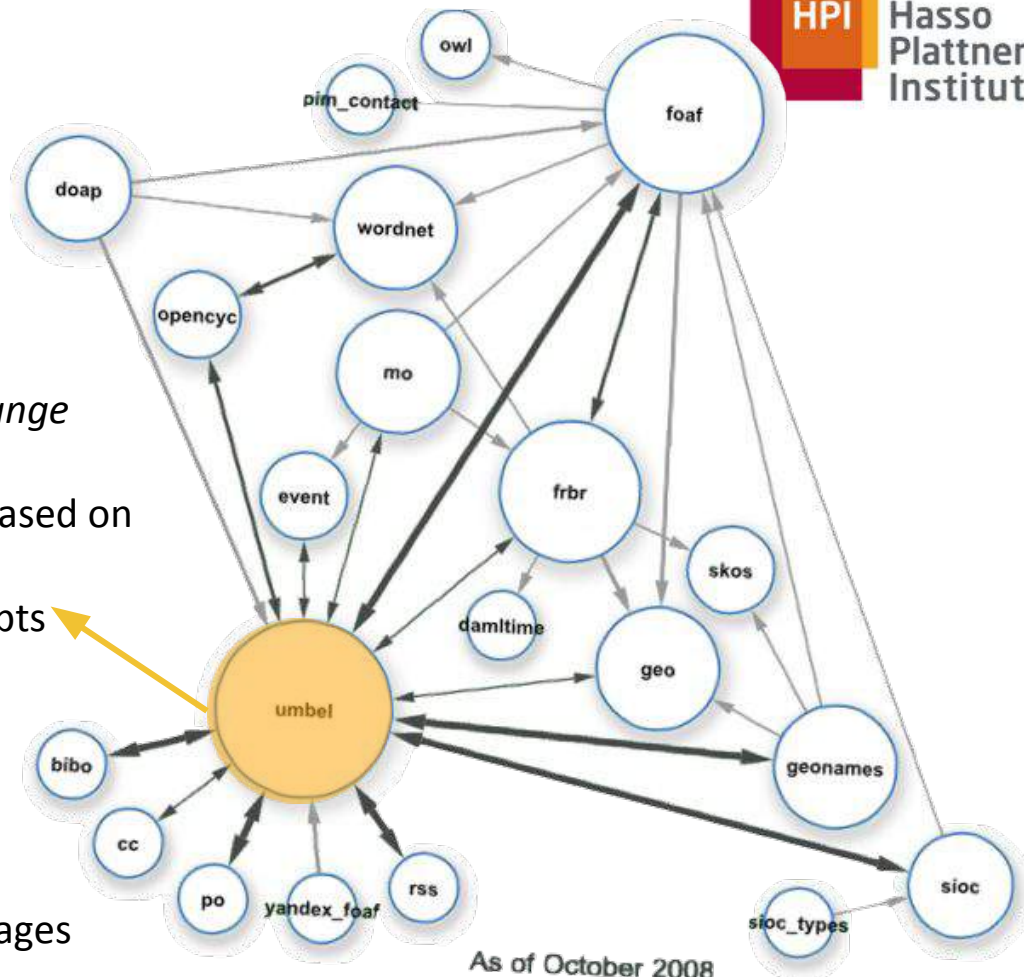
Linked Data Ontologies

- Ontologies hold the Linked Data Cloud together
- **SKOS**
 - „Simple Knowledge Organization System“
 - applied for definitions and mappings of vocabularies and ontologies
 - `skos:Concept`
 - `skos:narrower`
 - `skos:broader`
 - `skos:related`
 - `skos:exactMatch`,
`skos:narrowMatch`,
`skos:broadMatch`,
`skos:relatedMatch`



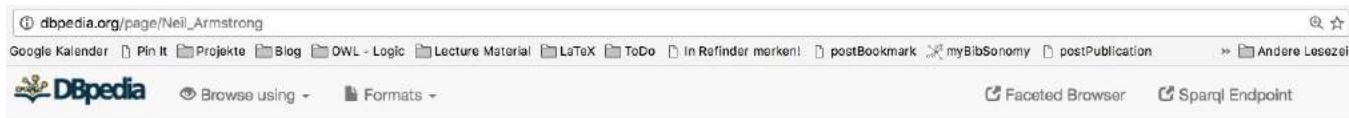
Linked Data Ontologies

- Ontologies hold the Linked Data Cloud together
- **UMBEL**
 - „Upper Mapping and Binding Exchange Layer“
 - Subset of OpenCyc as RDF Triples based on SKOS and OWL
 - Upper Ontology with 28.000 concepts (skos:Concept)
 - 46.000 Mappings into DBpedia, geonames, e.a.
(`owl:equivalentClass`,
`rdfs:subClassOf`)
 - Links to more than 2m Wikipedia pages



Example: DBpedia

http://dbpedia.org/page/Neil_Armstrong



About: Neil Armstrong

An Entity of Type : [NASA](#), from Named Graph : <http://dbpedia.org>, within Data Space : [dbpedia.org](#)

Neil Alden Armstrong (August 5, 1930 – August 25, 2012) was an American astronaut and the first person to walk on the Moon. He was also an aerospace engineer, naval aviator, test pilot, and university professor. Before becoming an astronaut, Armstrong was an officer in the U.S. Navy and served in the Korean War.

Property	Value
dbpedia:Astronaut/timeInSpace	0.5 12372.0
dbpedia:abstract	- Neil Alden Armstrong (* 5. August 1930 bei Wapakoneta, Ohio; † 25. August 2012 in Cincinnati, Ohio) war ein US-amerikanischer Testpilot und Astronaut. Er war Kommandant von Apollo 11, die mit Buzz Aldrin und Michael Collins zum Mond flog. Am 21. Juli 1969 betrat er als erster Mensch den Mond. (de) - Neil Alden Armstrong (August 5, 1930 – August 25, 2012) was an American astronaut and the first person to walk on the Moon. He was also an aerospace engineer, naval aviator, test pilot, and university professor. Before becoming an astronaut, Armstrong was an officer in the U.S. Navy and served in the Korean War. After the war, he earned his bachelor's degree at Purdue University and served as a test pilot at the National Advisory Committee for Aeronautics (NACA) High-Speed Flight Station, where he logged over 900 flights. He later completed graduate studies at the University of Southern California. A participant in the U.S. Air Force's Man in Space Soonest and X-20 Dyna-Soar human spaceflight programs, Armstrong joined the NASA Astronaut Corps in 1962. He made his first space flight as command pilot of Gemini 8 in March 1966, becoming NASA's first civilian astronaut to fly in space. He performed the first docking of two spacecraft, with pilot David Scott. This mission was aborted after Armstrong used some of his re-entry control fuel to stop a dangerous spin caused by a stuck thruster, in the first in-flight space emergency. Armstrong's second and last spaceflight was as commander of Apollo 11, the first manned Moon landing mission in July 1969. Armstrong and Lunar Module pilot Buzz Aldrin descended to the lunar surface and spent two and a half hours outside the spacecraft, while Michael Collins remained in lunar orbit in the Command/Service Module. Along with Collins and Aldrin, Armstrong was awarded the Presidential Medal of Freedom by President Richard Nixon. President Jimmy Carter presented Armstrong the Congressional Space Medal of Honor in 1978. Armstrong and his former roommate received the Congressional Gold Medal in 2009. Armstrong died in Cincinnati, Ohio, on August 25, 2012, at the age of 81.

How to Create your own Ontologies?

- There exists many commercial and free applications for editing OWL ontologies
 - **protégé** (free, open source)
 - available as
 - desktop application and
 - web application
 - <http://protege.stanford.edu/>
 - TopBraid Composer (commercial)
 - fluent editor 2014 (commercial, requires Microsoft Windows)
 - W3C Wiki – Ontology editors page
http://www.w3.org/wiki/Ontology_editors

protégé Demo

- **protégé** <http://protege.stanford.edu/>
 - a. web application
 - b. desktop application
- Demo with examples from the lecture slides



Next: 07 - How to Create your own Ontology

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