



ICCL Summer School Dresden 2013

Semantic Web – Ontology Languages and Their Use

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Data management involves a variety of tasks involved with the full data lifecycle






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Gartner: Big Data Will Generate 6 Million U.S. Jobs by 2015



[Susan Hall](#) | [CHARTING YOUR IT CAREER](#)  | 23 OCT, 2012

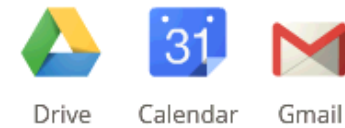
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Gartner predicts that 4.4 million IT **jobs will be created to support Big Data** by 2015, with 1.9 million of them to be in the United States.

In addition, every Big Data-related role in the United States will create employment for three people outside of IT, pushing the total to 6 million U.S. jobs, Peter Sondergaard, senior vice president at Gartner and global head of research, told those attending the Gartner Symposium/ITxpo. He said:

But there is a challenge. There is **not enough talent** in the industry. Our public and private education systems are failing us. Therefore, only one-third of the IT jobs will be filled. Data experts will be a scarce, valuable commodity," he said. "IT leaders will need immediate focus on how their organization develops and attracts the skills required. These jobs will be needed to grow your business. These jobs are the future of the new information economy.

Though I don't follow Sondergaard's math, we know there's a **shortage of analytics talent for Big Data and for engineering talent as well.**



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Big Data is characterized not only by the enormous volume or the velocity of its generation but also by the heterogeneity, diversity and complexity of the data.

Suzi Iacono, source: <http://community.topcoder.com/coeci/nitr/>

- **volume**: the sheer size of the data
- **velocity**: new data is added at breathtaking speed
- **variety**: different formats and different perspectives

Sometimes mentioned:

- **value**: how useful is the data?
- **veracity**: how good/reliable is the data?

however, these can also be subsumed under “variety”.

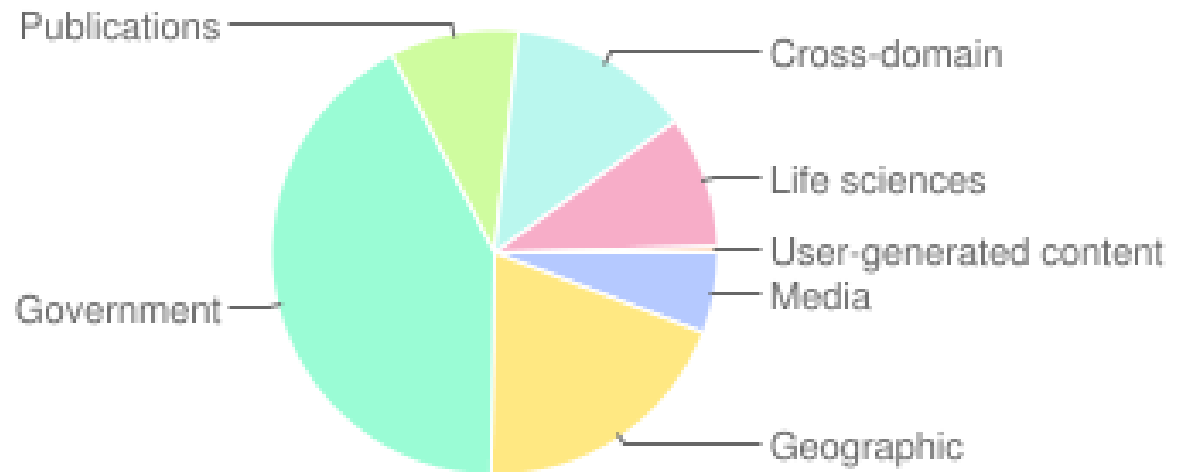
Number of Datasets

2011-09-19	295
2010-09-22	203
2009-07-14	95
2008-09-18	45
2007-10-08	25
2007-05-01	12

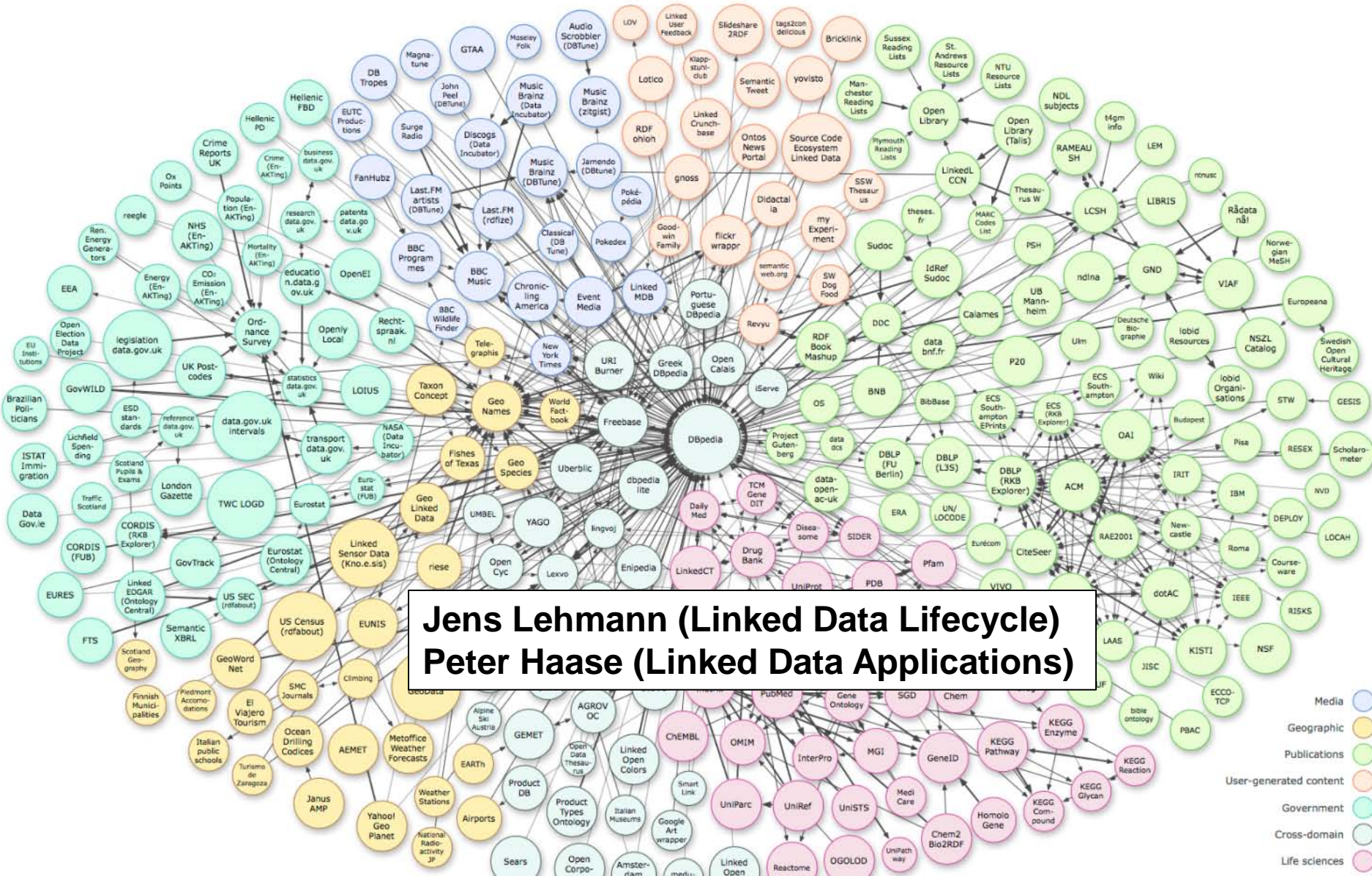
Number of triples (Sept 2011)

31,634,213,770

with 503,998,829 out-links



From <http://www4.wiwiss.fu-berlin.de/lodcloud/state/>



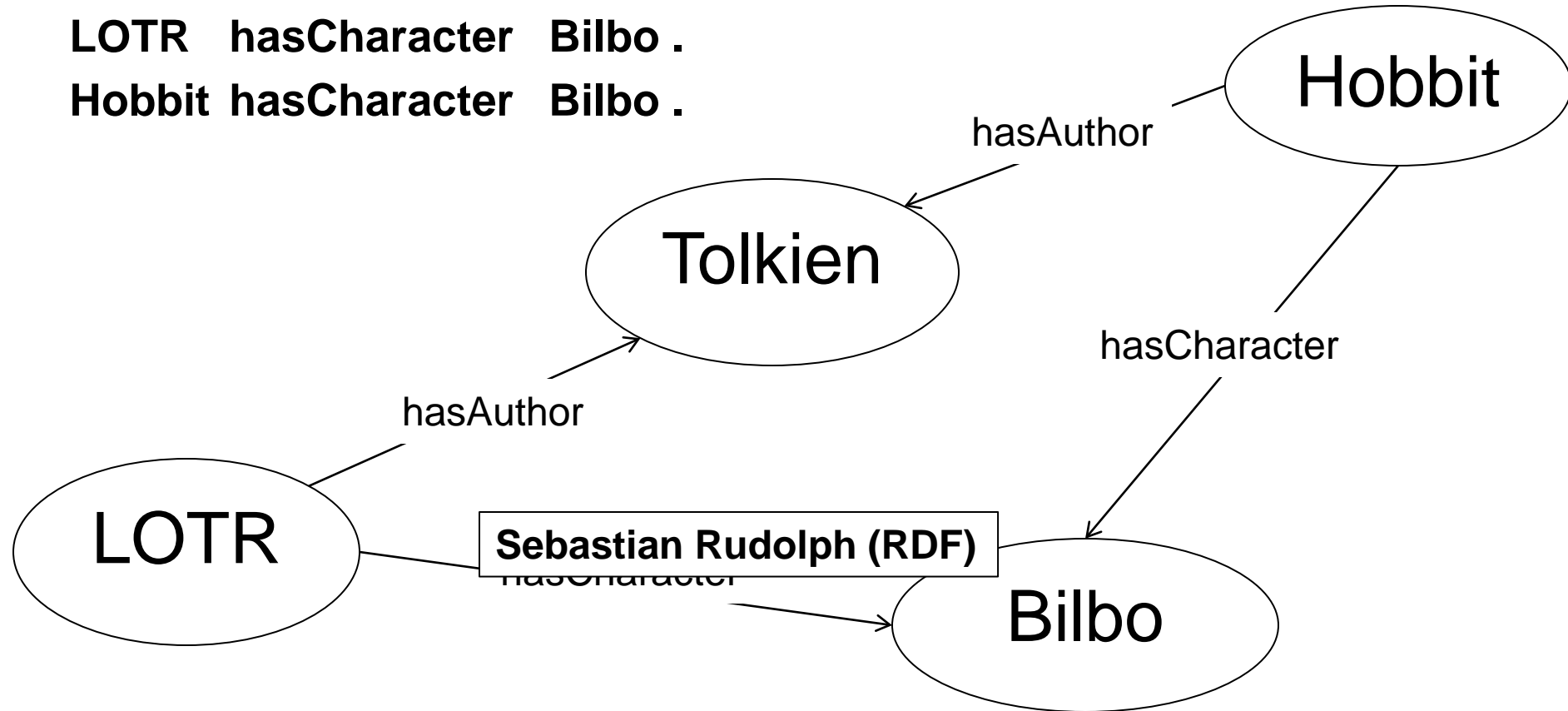
Information as RDF triples / graph

LOTR hasAuthor Tolkien .

Hobbit hasAuthor Tolkien .

LOTR hasCharacter Bilbo .

Hobbit hasCharacter Bilbo .



dbpedia-owl:thumbnail	<ul style="list-style-type: none">▪ http://upload.wikimedia.org/wikipedia/commons/thumb/6/62/Jrrt_lotr_cover_design.jpg/200px-Jrrt_lotr_cover_design.jpg
dbpedia-owl:wikiPageExternalLink	<ul style="list-style-type: none">▪ http://lotr.wikia.com▪ http://www.glyphweb.com/arda/▪ http://www.tolkienlibrary.com/▪ http://www.tolkien.co.uk/▪ http://www.houghtonmifflinbooks.com/features/lordoftheringstrilogy/
dbpprop:author	<ul style="list-style-type: none">▪ dbpedia:J._R._R._Tolkien
dbpprop:books	<ul style="list-style-type: none">▪ dbpedia:The_Two_Towers▪ dbpedia:The_Return_of_the_King▪ dbpedia:The_Fellowship_of_the_Ring▪ "Volumes:"
dbpprop:country	<ul style="list-style-type: none">▪ England
dbpprop:expiry	<ul style="list-style-type: none">▪ 20 (xsd:integer)
dbpprop:genre	<ul style="list-style-type: none">▪ dbpedia:Adventure_novel▪ dbpedia:High_fantasy
dbpprop:hasPhotoCollection	<ul style="list-style-type: none">▪ http://www4.wiwiss.fu-berlin.de/flickwrappr/photos/The_Lord_of_the_Rings
dbpprop:imageCaption	<ul style="list-style-type: none">▪ Tolkien's own cover designs for the three volumes
dbpprop:language	<ul style="list-style-type: none">▪ English
dbpprop:mediaType	<ul style="list-style-type: none">▪ Print
dbpprop:name	<ul style="list-style-type: none">▪ The Lord of the Rings
dbpprop:pages	<ul style="list-style-type: none">▪ 1216 (xsd:integer)
dbpprop:precededBy	<ul style="list-style-type: none">▪ dbpedia:The_Hobbit
dbpprop:pubDate	<ul style="list-style-type: none">▪ 21 (xsd:integer)
dbpprop:publisher	<ul style="list-style-type: none">▪ dbpedia:Allen_&_Unwin
dbpprop:small	<ul style="list-style-type: none">▪ yes
dbpprop:wikiPageUsesTemplate	<ul style="list-style-type: none">▪ dbpedia:Template:Infobox_book_series▪ dbpedia:Template:Pp-vandalism
dcterms:subject	<ul style="list-style-type: none">▪ category:Monomyths▪ category:High_fantasy_novels▪ category:Middle-earth_books▪ category:British_fantasy_novels▪ category:Fantasy_books_by_series▪ category:1950s_fantasy_novels▪ category:Sequel_novels▪ category:The_Lord_of_the_Rings▪ category:English_novels

Geoindexed Linked Data – courtesy of Krzysztof Janowicz

http://stko.geog.ucsb.edu/location_linked_data

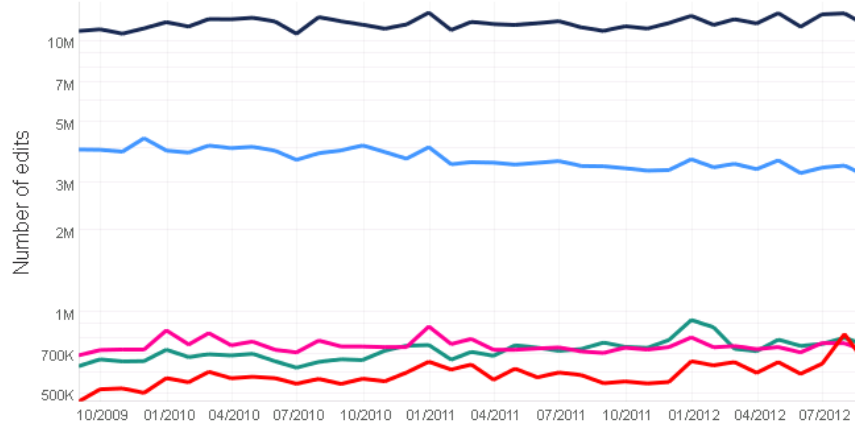


Krzysztof Janowicz (geospatial semantics)

11.39 Million

Sep 11 — Sep 12 4.64%
 Aug 12 — Sep 12 -9.85%

Wikipedia Edits per Month

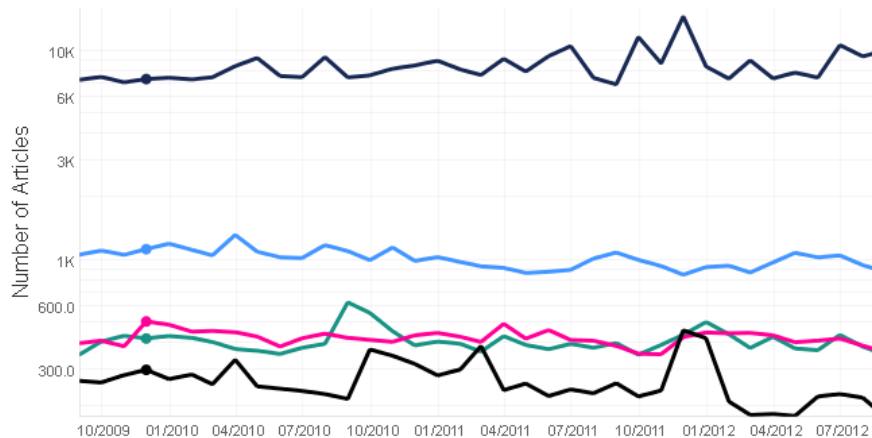


- Weather sensors
- Tweets
- Satellite images
- ...

10,028.00

Sep 11 — Sep 12 45.19%
 Aug 12 — Sep 12 6.68%

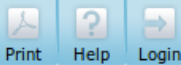
New Wikipedia Articles per Day



Dec 2009:

Total: 7.3K
English: 1.1K
French: 422.0
German: 509.0
Polish: 299.0

Copernicus lunar crater located on earth – courtesy of Krzysztof Janowicz http://stko.geog.ucsb.edu/location_linked_data (missing reference coordinate system)



Copernicus (lunar crater)

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Copernicus is a [lunar impact crater](#) named after the astronomer [Nicolaus Copernicus](#), located in eastern [Oceanus Procellarum](#). It is estimated to be about 800 million years old, and typifies craters that formed during the [Copernican period](#) in that it has a prominent [ray system](#).

Contents

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- [Names](#)
- [Satellite craters](#)
- [See also](#)
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Characteristics

Copernicus is visible using [binoculars](#), and is located slightly northwest of the center of the Moon's Earth-facing hemisphere. South of the crater is the [Mare Insularum](#), and to the south-south west is the crater [Reinhold](#). North of Copernicus are the [Montes Carpatus](#), which lie at the south edge of [Mare Imbrium](#). West of Copernicus is a group of dispersed lunar hills. Due to its relative youth, the crater has remained in a relatively pristine shape since it formed.

The circular rim has a discernible hexagonal form, with a [terraced](#) inner wall and a 30 km wide, sloping [rampart](#) that descends nearly a kilometer to the surrounding [mare](#). There are three distinct terraces visible, and arc-shaped [landslides](#) due to slumping of the inner wall as the crater debris subsided.

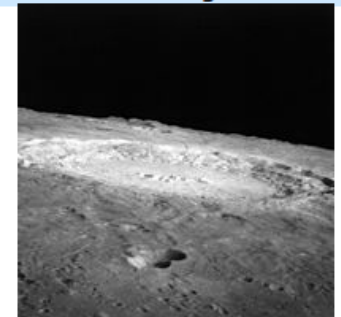
Most likely due to its recent formation, the crater floor has not been flooded

Location of Copernicus.

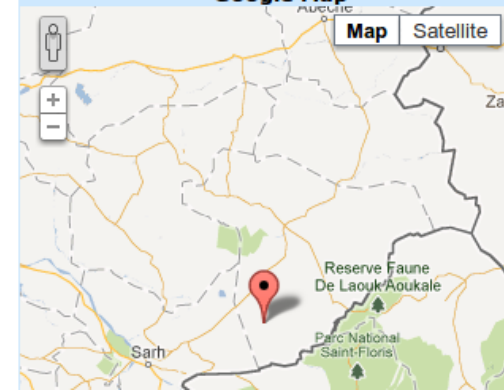


Location of Copernicus.

Image

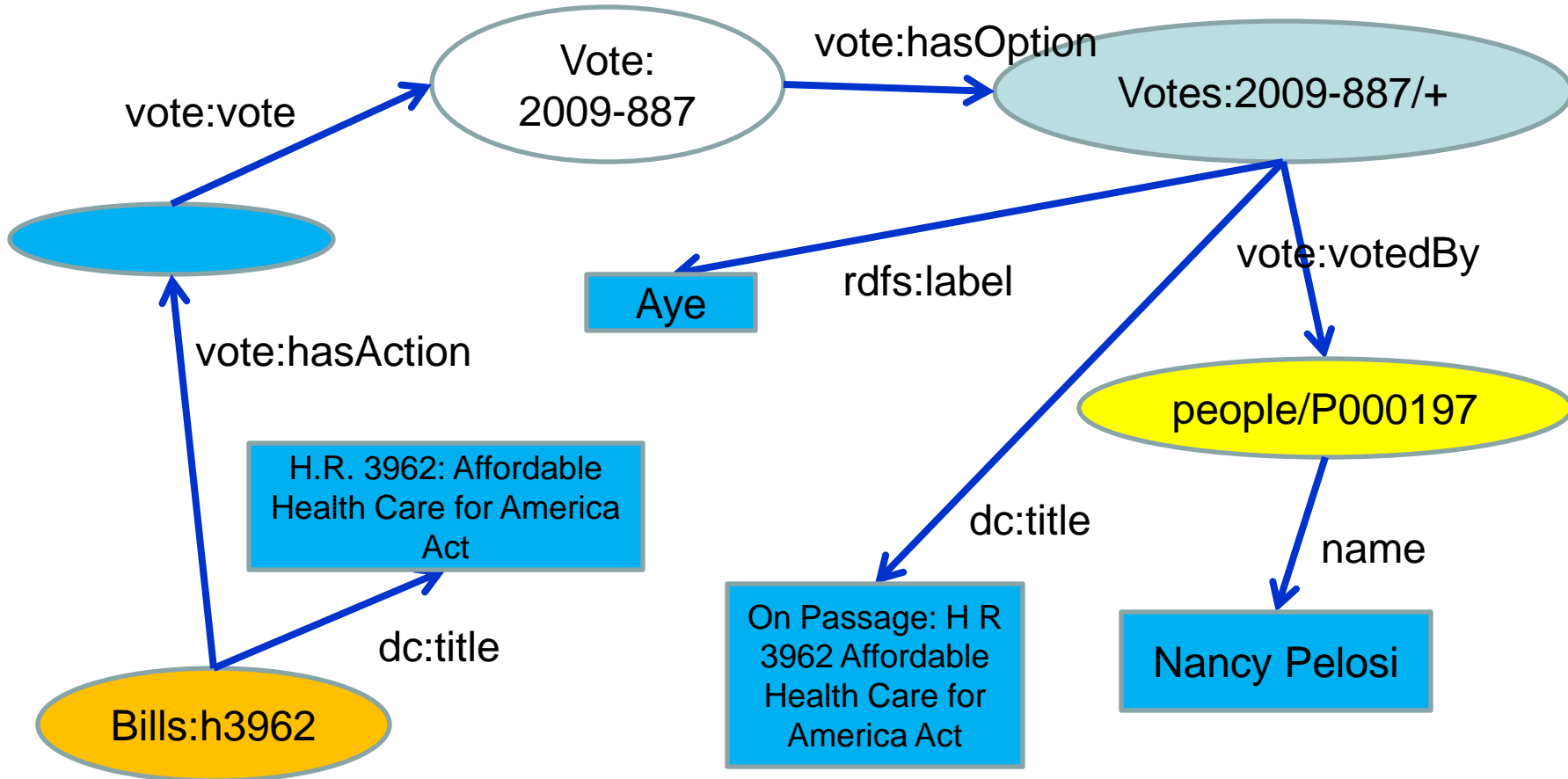


Google Map



Linked Data: Variety and Value (GovTrack)

“Nancy Pelosi voted in favor of the Health Care Bill.”



Linked Data: Variety and Veracity

Geoindexed Linked Data – courtesy of Krzysztof Janowicz

http://stko.geog.ucsb.edu/location_linked_data



Courtesy of Krzysztof Janowicz

http://stko.geog.ucsb.edu/location_linked_data



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SPARQL Query

Results for your query (6) - [Edit query](#)

View as [Exhibit](#) Download SPARQL Results in: [JSON](#) | [XML](#)

place	populationCount
dbpedia:Keta	18077
http://sws.geonames.org/2304548/	29748
w-flickr:Aneho	47579
http://sws.geonames.org/6295630/	6814400000
dbpedia:Lomé	749700
http://sws.geonames.org/2393947/	9847

Linked Data: Variety and Veracity

Courtesy of Krzysztof Janowicz

http://stko.geog.ucsb.edu/location_linked_data



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Welt RDF Rank

RDF Search and Explore

Source: <http://sws.geonames.org/6295630/>

Subject (100 of 8935127)

Predicate

Object

All

Download in: [JSON](#) | [RDF](#) | [N3/Turtle](#) | [N-Triples](#)

Statements in which the resource exists as a subject.

Named Gr

Coordinates:  1°0'N 4°0'E

Predicate	Object
rdf:type	http://schema.org/Place , geo-ont:Feature ,
rdfs:seeAlso	dbpedia:Earth , http://sws.geonames.org/6295630/
rdfs:isDefinedBy	http://sws.geonames.org/6295630/about.r
rdfs:label	Earth@en, Globe@en, World@en
skos:altLabel	Earth@en, Globe@en, World@en
dc:type	geo-ont:L , geo-ont:L.AREA
dc-term:type	geo-ont:L , geo-ont:L.AREA
geo-pos:long	0
geo-pos:lat	0

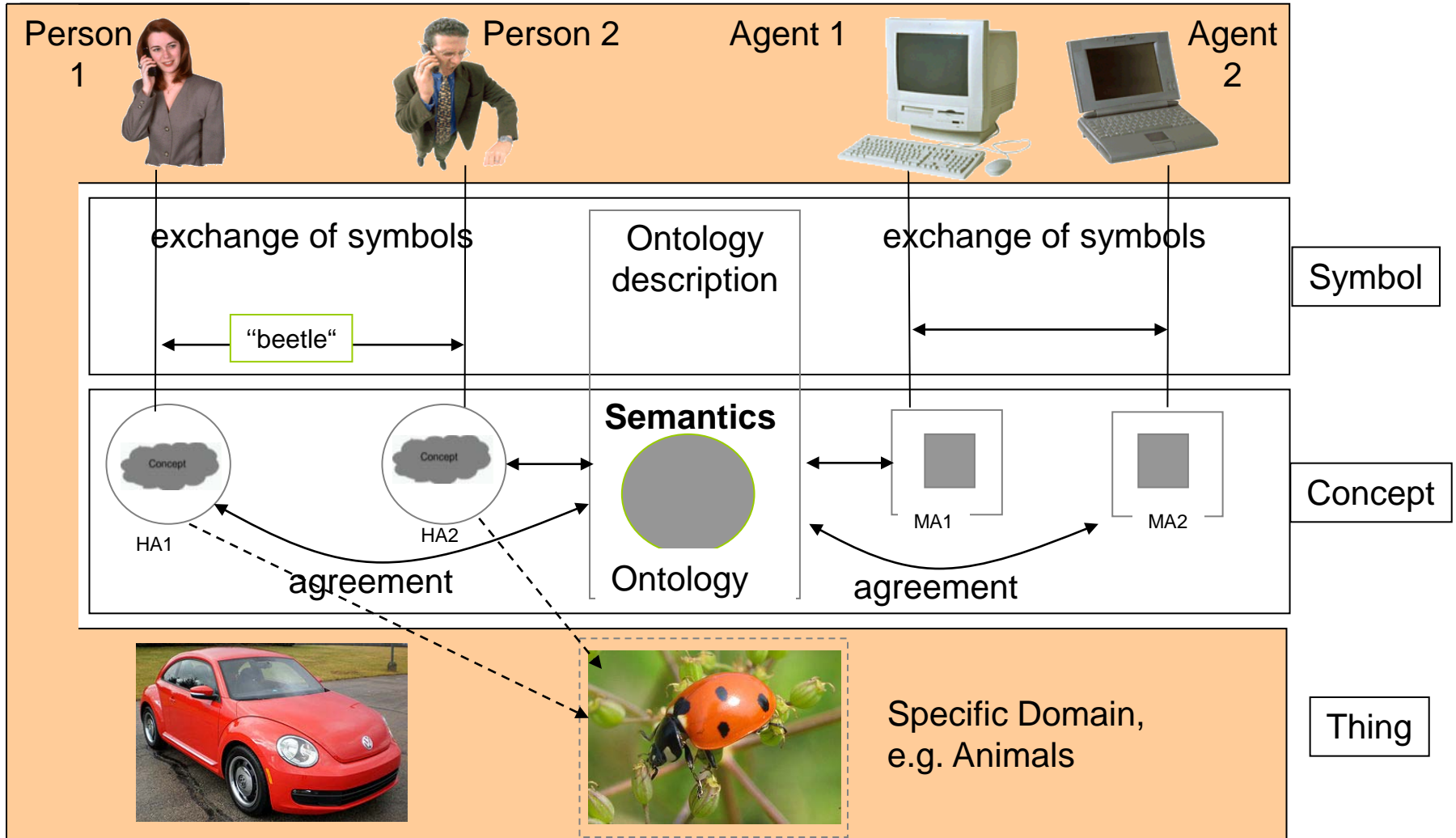


Map of the Gulf of Guinea, showing the chain of islands formed by the Cameroon line of volcanoes.

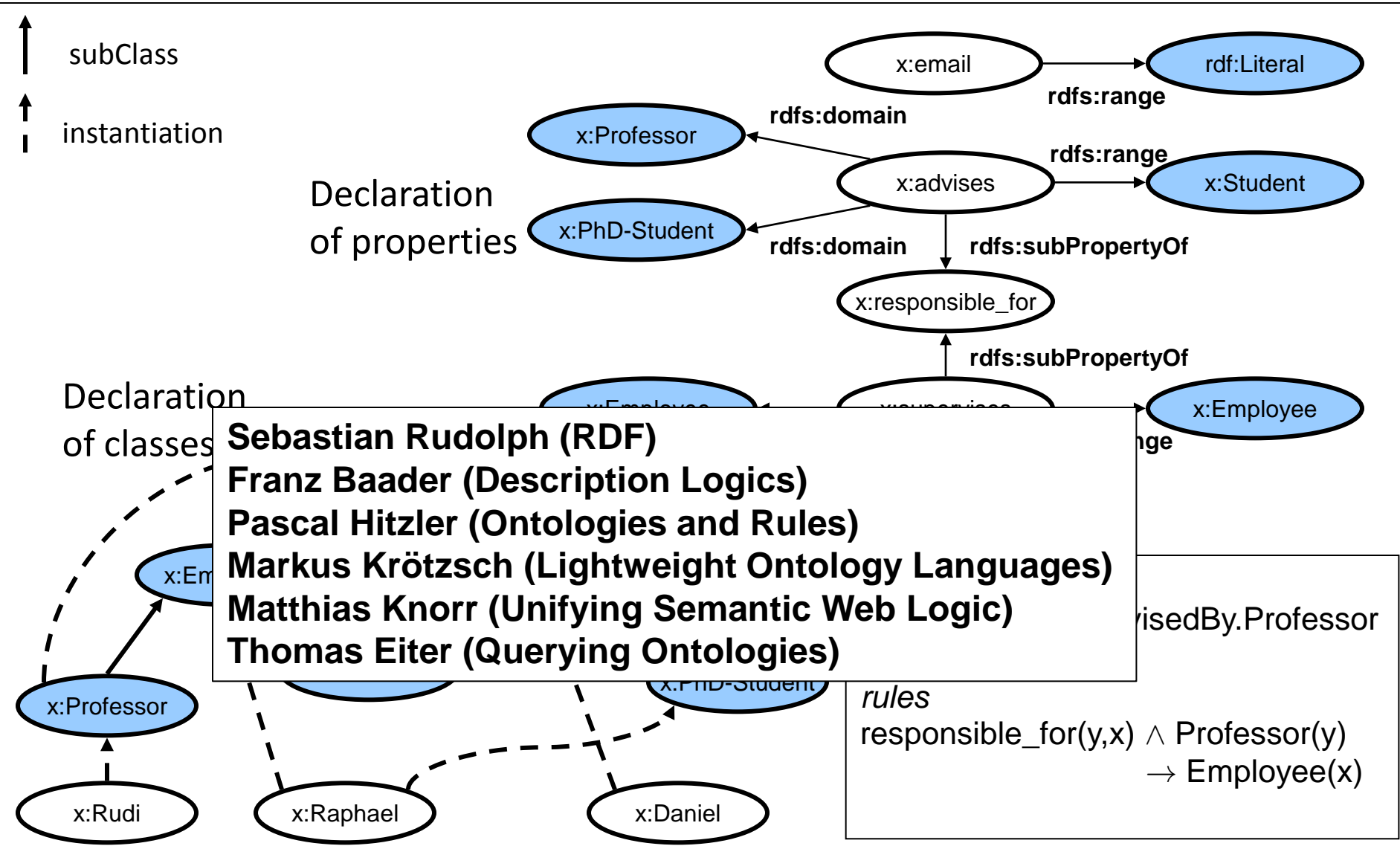
Variety can be handled with existing methods if volume and velocity are small.

Big Data research is primarily about methods for handling variety if volume and velocity are so high that existing methods fail.

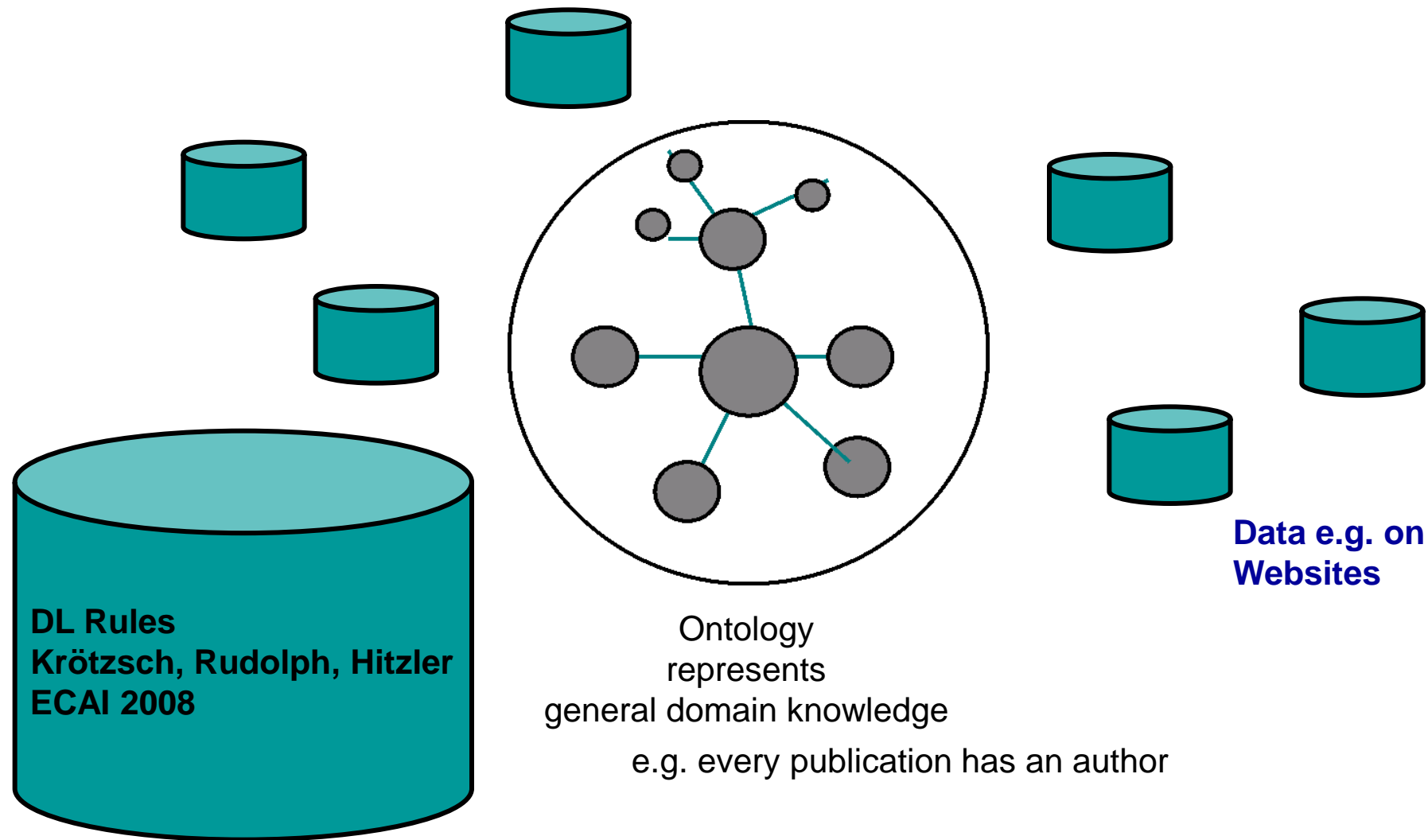
Basic Idea of the Semantic Web

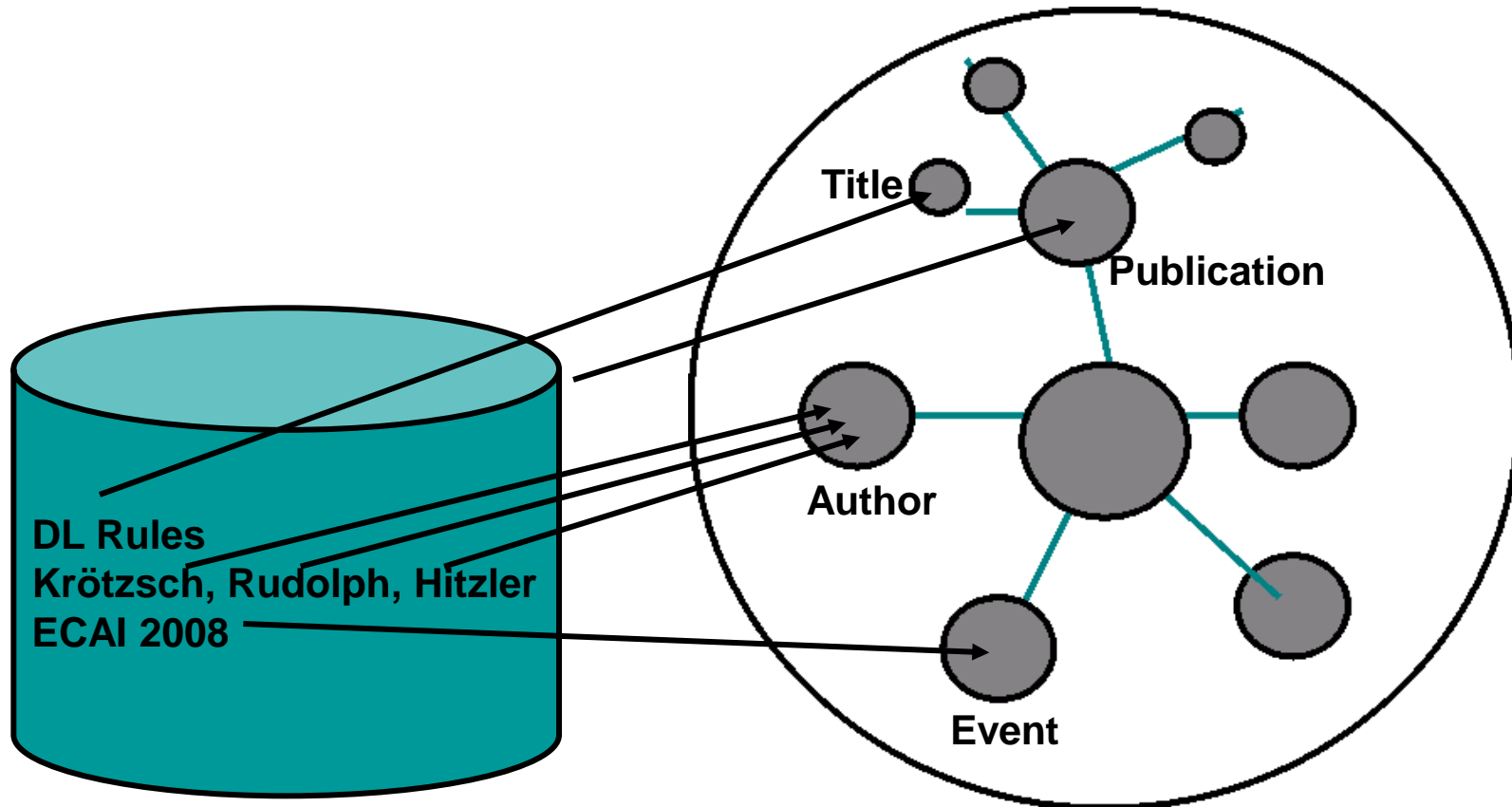


Ontology Example



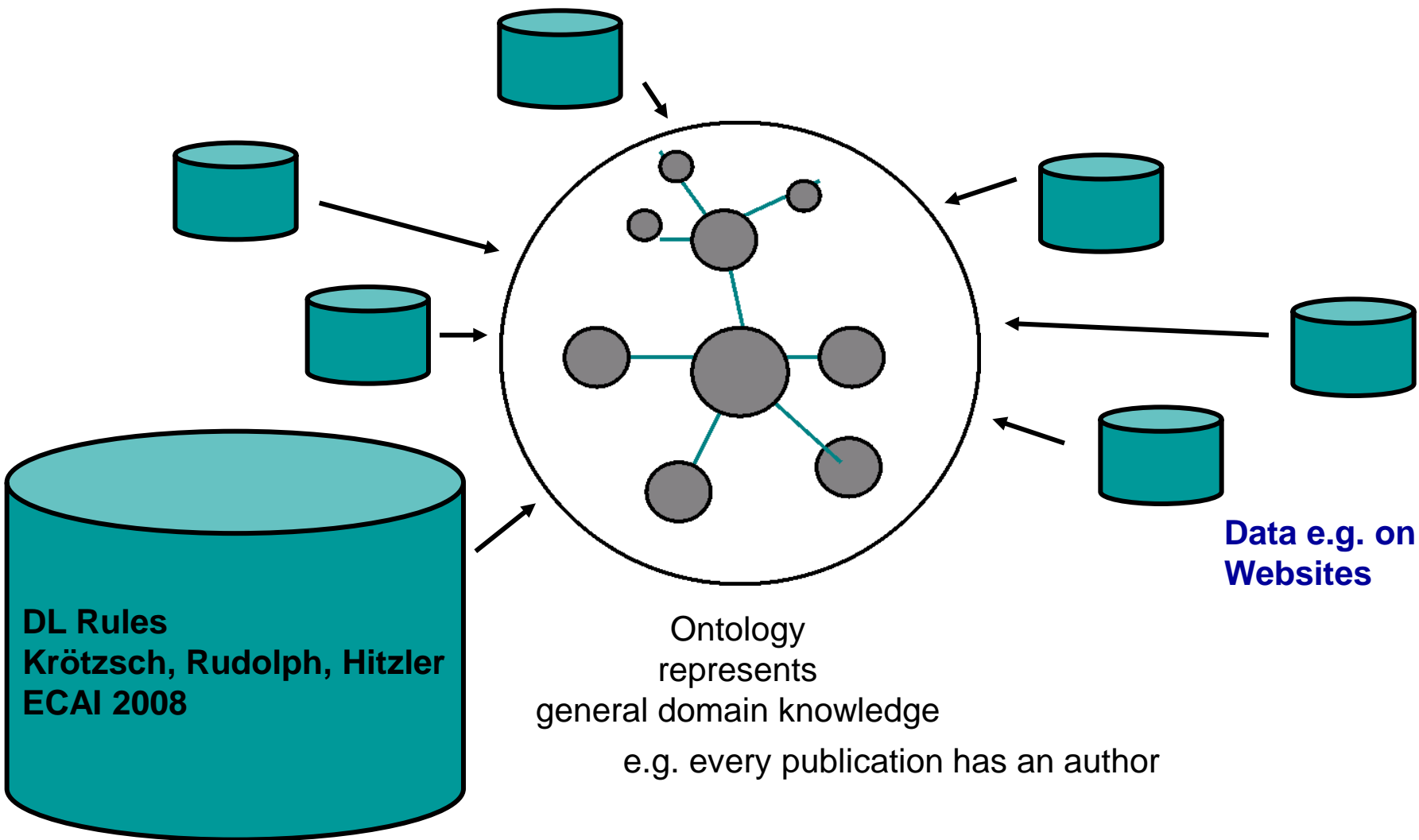
Basic Idea of the Semantic Web



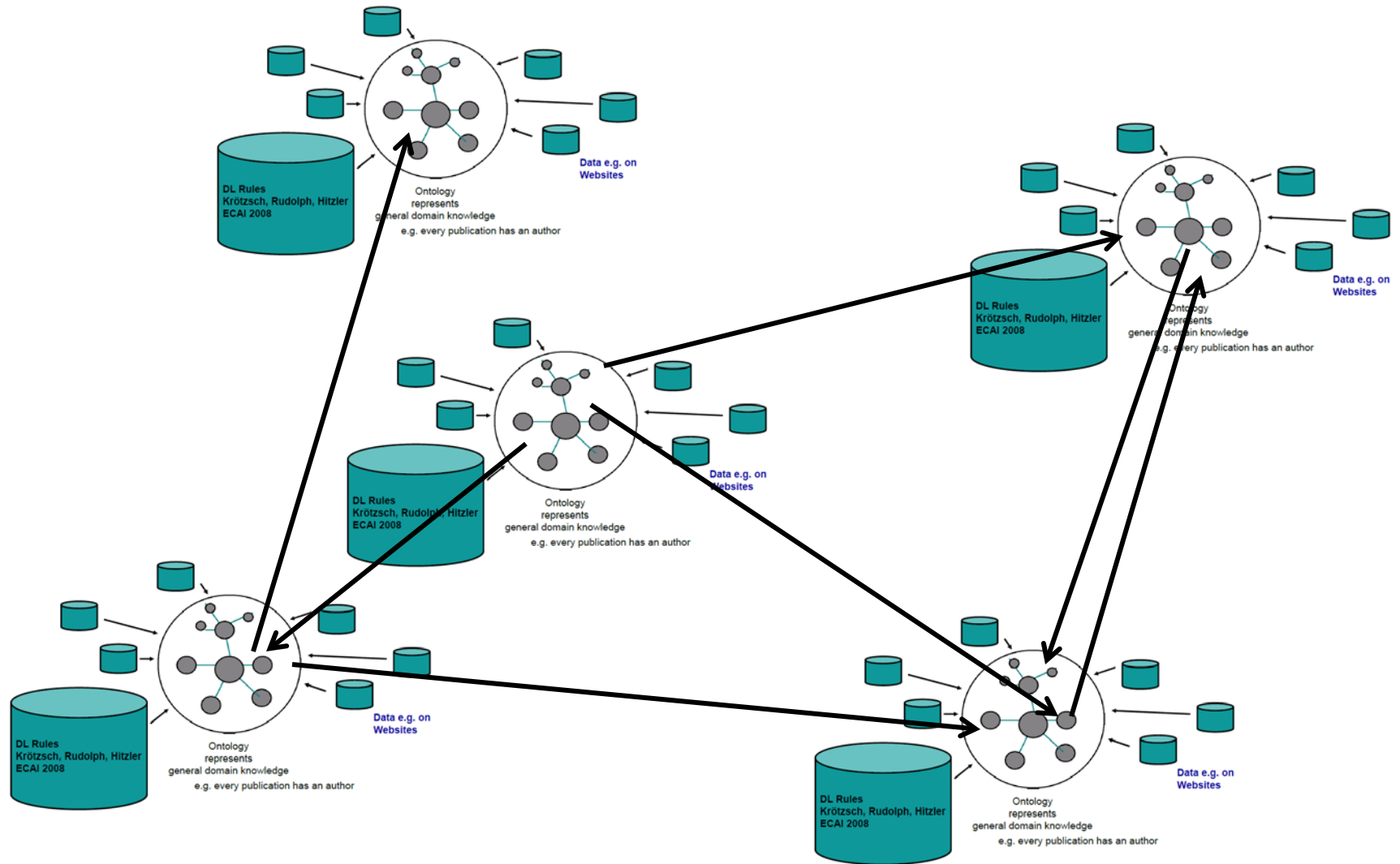


e.g. every publication has an author

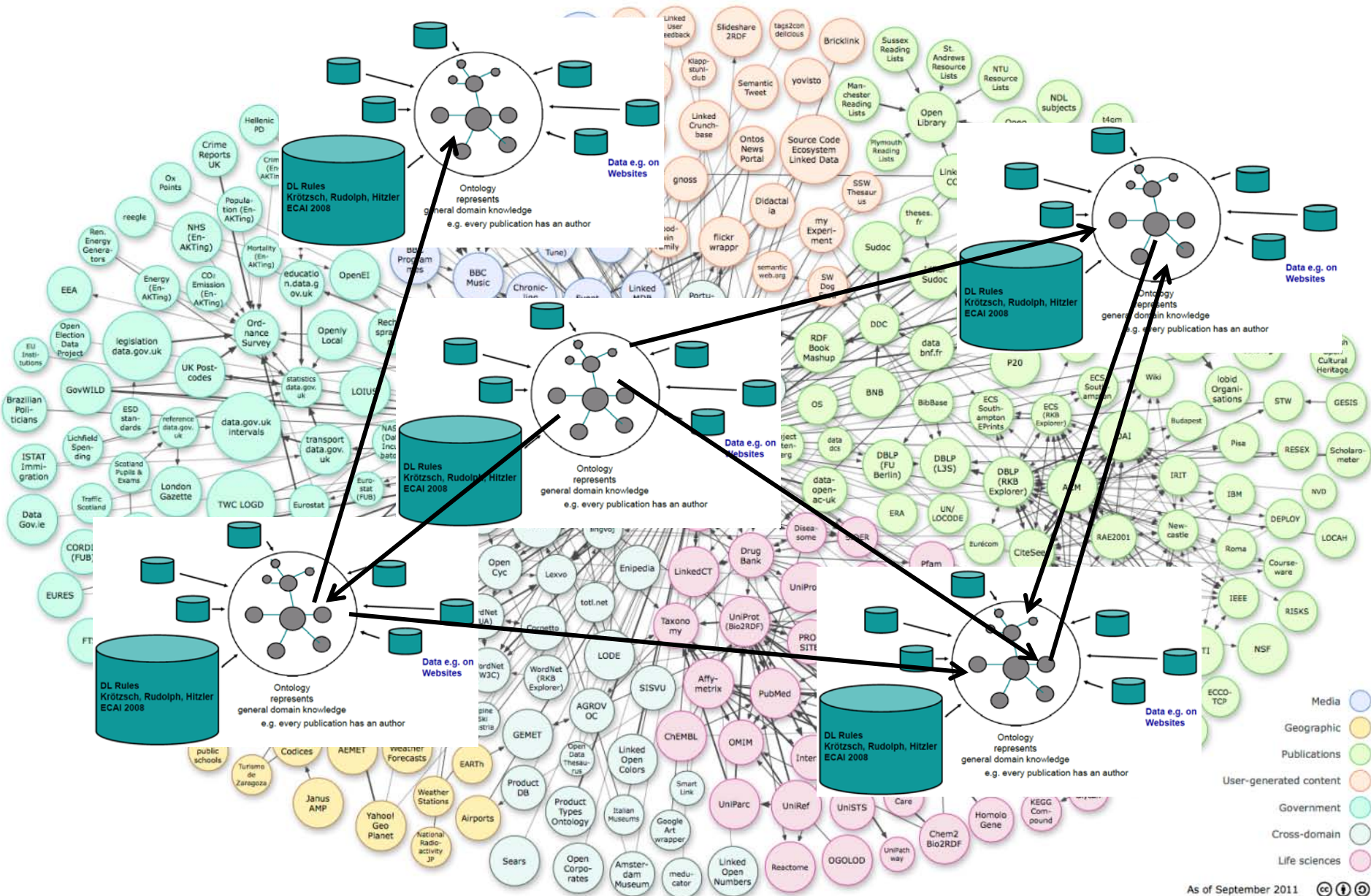
Basic Idea of the Semantic Web



Basic Idea of the Semantic Web



Basic Idea of the Semantic Web



Uwe Aßmann (Model Checking Applications)

Peter Haase (Linked Data Applications at fluidOps)

Krzysztof Janowicz (Geoscience Applications)

	Sunday August 18	Monday August 19	Tuesday August 20	Wednesday August 21	Thursday August 22	Friday August 23	Saturday August 24
9.20 - 9.30		Registration	org. issues	org. issues	org. issues	org. issues	
9.30 - 10.30		Opening	Baader	Hitzler	Kröttsch	Kröttsch	EXCURSION
11.00 - 12.00		Rudolph	Rudolph	Kröttsch	Hitzler	Lehmann	EXCURSION
13.30 - 14.30		Baader	Baader	Rudolph	EXCURSION	Lehmann	EXCURSION
15.00 - 16.00		Rudolph	Rudolph	Hitzler	EXCURSION	Haase	EXCURSION
16.30 - 17.30	Registration	Baader	Hitzler	Kröttsch	EXCURSION	Haase	EXCURSION
Evening	Guided Tour						

	Sunday August 25	Monday August 26	Tuesday August 27	Wednesday August 28	Thursday August 29	Friday August 30	Saturday August 31
9.20 - 9.30		org. issues	org. issues	org. issues	org. issues	org. issues	
9.30 - 10.30		Lehmann	Aßmann	Janowicz	Eiter	Eiter	
11.00 - 12.00		Knorr	Aßmann	Janowicz	Janowicz	Eiter	
13.30 - 14.30		Lehmann	Workshop	EXCURSION	Eiter	Farewell	
15.00 - 16.00		Knorr	Workshop	EXCURSION	Janowicz		
16.30 - 17.30		Workshop		EXCURSION	Workshop		
Evening			Dinner	EXCURSION			

- **Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, *Foundations of Semantic Web Technologies*. Chapman and Hall/CRC Press, 2009.**
- **Pascal Hitzler, Frank van Harmelen, *A reasonable Semantic Web*. Semantic Web 1(1-2), 39-44, 2010.**
- **Prateek Jain, Pascal Hitzler, Peter Z. Yeh, Kunal Verma, Amit P. Sheth, *Linked Data is Merely More Data*. In: Dan Brickley, Vinay K. Chaudhri, Harry Halpin, Deborah McGuinness: *Linked Data Meets Artificial Intelligence*. Technical Report SS-10-07, AAAI Press, Menlo Park, California, 2010, pp. 82-86. ISBN 978-1-57735-461-1. Proceedings of LinkedAI at the AAAI Spring Symposium, March 2010.**
- **Pascal Hitzler, Krzysztof Janowicz, *Linked Data, Big Data, and the 4th Paradigm*. Semantic Web 4 (3), 2013, 233-235.**