



WEBS OF DATA

Brian Sletten
Bosatsu Consulting, Inc.

@bsletten

INTERNATIONAL
SOFTWARE DEVELOPMENT
CONFERENCE

gotocon.com

Speaker's Qualification

- 19 years of experience
- Specialize in benefits and applicability of next-generation technologies
- Author "Resource-Oriented Architecture Patterns" Morgan & Claypool 2012
- Author "Building Data Webs: Creating Resource-Driven Architectures with REST, RDF and SPARQL" Addison-Wesley 2013
- One of [Top 100 Semantic Web People](#)

Agenda

- Introduction
- RDF
- Linked Data

Introduction

05-26



05-26



Birthday

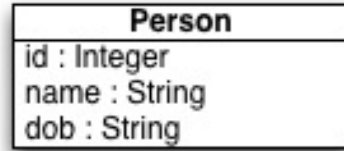
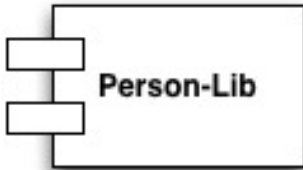
05-26

ID	Name	DOB
1234	"Brian Sletten"	"05-26"

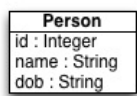
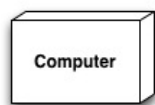
Person
id : Integer
name : String
dob : String



ID	Name	DOB
1234	"Brian Sletten"	"05-26"







ID	Name	DOB
1234	"Brian Sletten"	"05-26"



getPersonName(Id) : String



getPersonBirthday(Id) : String



getPerson(Id) : XML

http://server/person/id/1234



```
<person>  
  <name>Brian Sletten</name>  
  <dob>05-26</dob>  
</person>
```

http://server/person/id/1234



```
{  
  "type" : "person",  
  "name" : "Brian Sletten",  
  "dob" : "05-26"  
}
```

<http://server/person/id/1234>

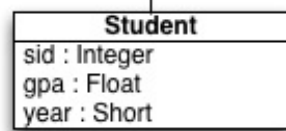
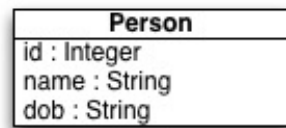


```
<person>
  <link rel="school" href="http://server/school/id/248"/>
  <name>Brian Sletten</name>
  <dob>05-26</dob>
</person>
```

http://server/school/id/248



```
<school>
  <link rel="admissions" href="http://server/admissions"/>
  <name>College of William and Mary</name>
  <established>1693</established>
</school>
```



Person
id : Integer
name : String
dob : String

Student
sid : Integer
gpa : Float
year : Short



ID	Name	DOB
1234	"Brian Sletten"	"05-26"

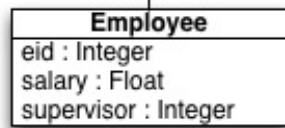
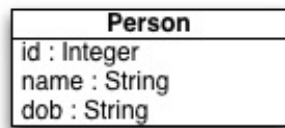
SID	PID	GPA	Year
3999	1234	3.0	4



<http://server/student/id/3999>



```
<student id="3999">
  <link rel="school" href="http://server/school/id/248"/>
  <name>Brian Sletten</name>
  <dob>05-26</dob>
  <gpa>3.0</gpa>
  <year>senior</year>
</student>
```



Person
id : Integer
name : String
dob : String

Employee
eid : Integer
salary : Float
supervisor : Integer

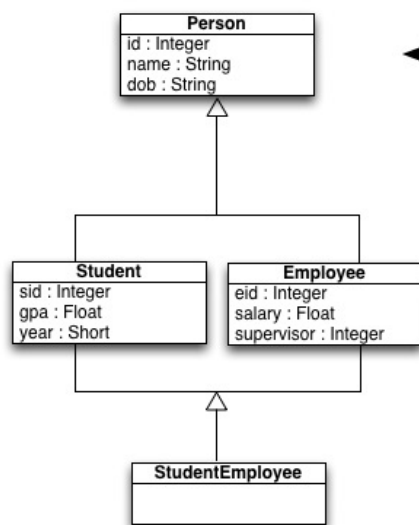


ID	Name	DOB
1234	"Brian Sletten"	"05-26"



EID	PID	SID	Salary
8827	1234	5555	10,000
5555	2356	1111	50,000





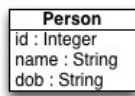
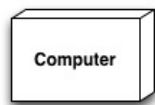
ID	Name	DOB
1234	"Brian Sletten"	"05-26"

EID	PID	SID	Salary
8827	1234	5555	10,000
5555	2356	1111	50,000

SID	PID	GPA	Year
3999	1234	3.0	4

Multi-Source Data

- Social networking
- External work history
- Different departments



ID	Name	DOB
1234	"Brian Sletten"	"05-26"

RDF


```
<person id="1234">  
  <link rel="school" href="http://server/school/id/248"/>  
  <name>Brian Sletten</name>  
  <dob>05-26</dob>  
</person>
```

1234	is a	person
------	------	--------

1234	has name	"Brian Sletten"
------	----------	-----------------

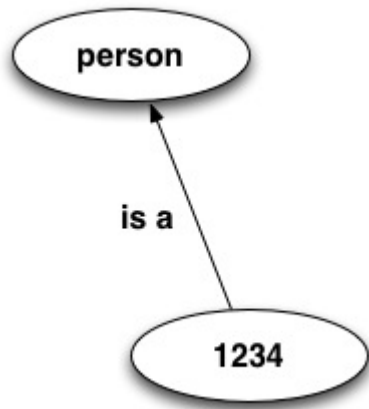
1234	has dob	"05-26"
------	---------	---------

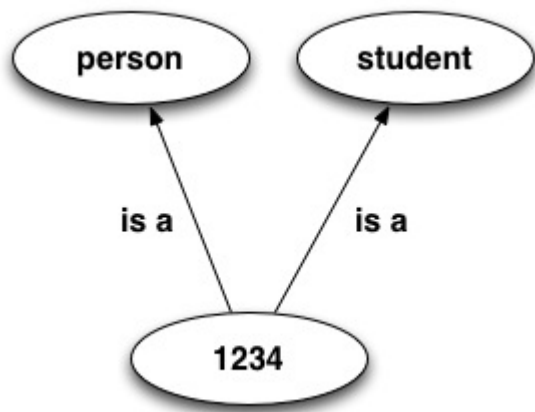
1234	is linked to	248
------	--------------	-----

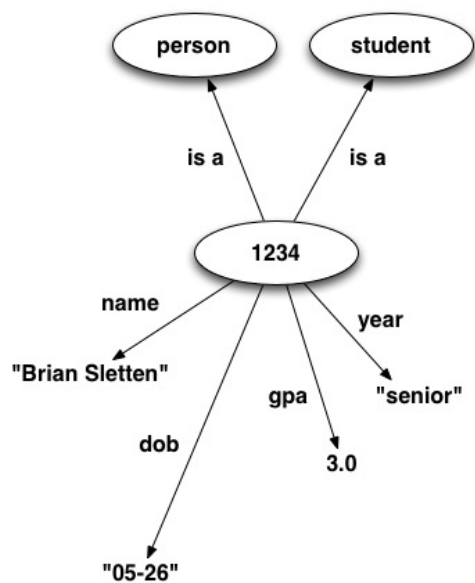
```
<student id="3999">
  <link rel="school" href="http://server/school/id/248"/>
  <name>Brian Sletten</name>
  <dob>05-26</dob>
  <gpa>3.0</gpa>
  <year>senior</year>
</student>
```

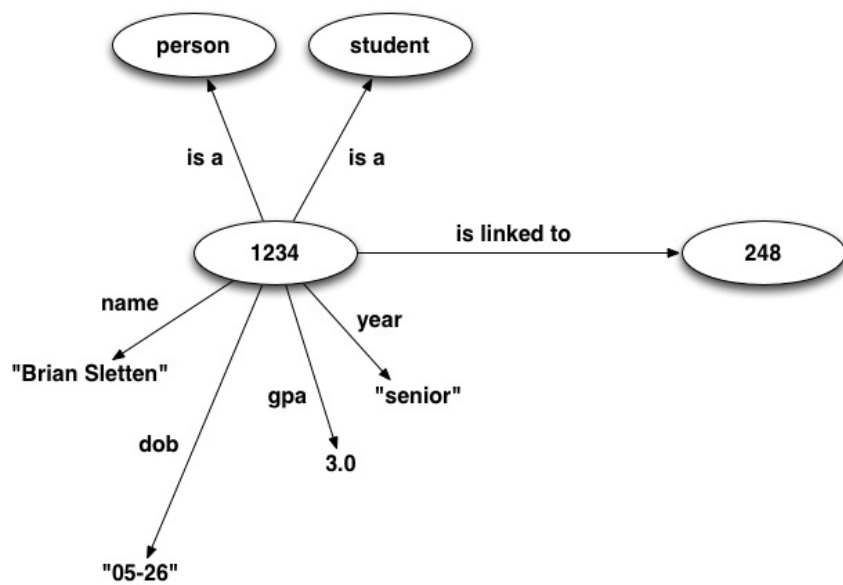
1234	is a	person
1234	has name	"Brian Sletten"
1234	has dob	"05-26"
1234	is linked to	248
1234	is a	student
1234	has gpa	3.0
1234	has year	senior

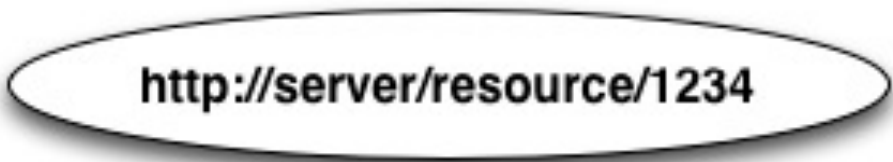
1234











<http://server/resource/1234>

The image shows a diagram with a vertical line on the left and a horizontal line at the bottom, forming an L-shape. In the upper right area of this frame, there is a horizontal oval containing the text 'http://server/resource/1234'.

<http://server/resource/5555>

<http://server2/resource/5555>

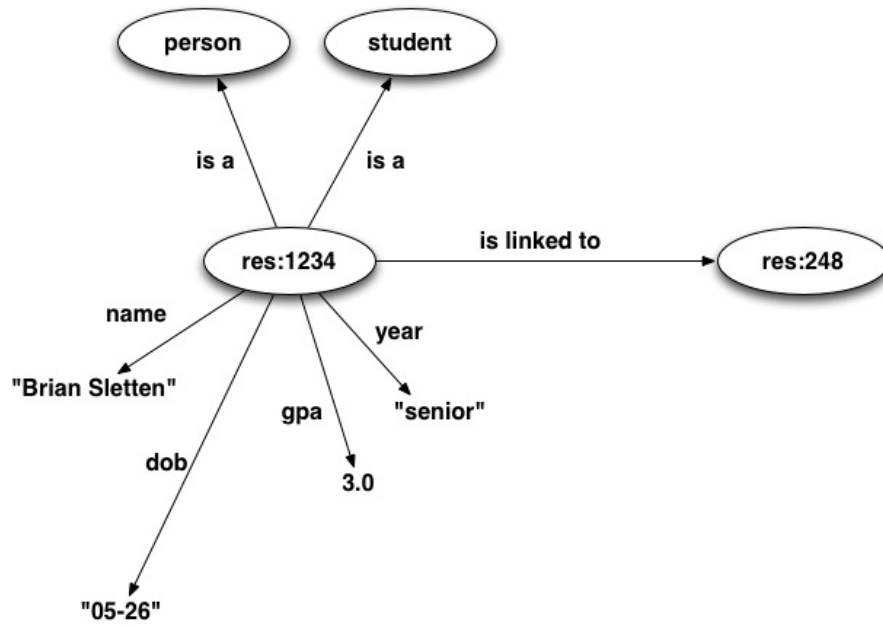
<http://server/resource/1234>

<http://otherserver/resource/1234>

res **→** **http://server/resource/**

res:1234

res **→** **http://server/resource/**



`http://xmlns.com/foaf/0.1/name`

Property: foaf:name

name - A name for some thing.

Status: testing

Domain: having this property implies being a [Thing](#)

The [name](#) of something is a simple textual string.

XML language tagging may be used to indicate the language of the name. For example:

```
<foaf:name xml:lang="en">Dan Brickley</foaf:name>
```

FOAF provides some other naming constructs. While foaf:name does not explicitly represent name substructure (family vs given etc.) it does provide a basic level of interoperability. See the [issue tracker](#) for status of work on this issue.

The [name](#) property, like all RDF properties with a range of `rdfs:Literal`, may be used with `XMLLiteral` datatyped values (multiple [names](#) are acceptable whether they are in the same language or not). `XMLLiteral` usage is not yet widely adopted. Feedback on this aspect of the FOAF design is particularly welcomed.

[\[#\]](#) [\[wiki\]](#) [\[back to top\]](#)

`http://xmlns.com/foaf/0.1/birthday`

Property: foaf:birthday

birthday - The birthday of this Agent, represented in mm-dd string form, eg. '12-31'.

Status: unstable

Domain: having this property implies being a [Agent](#)

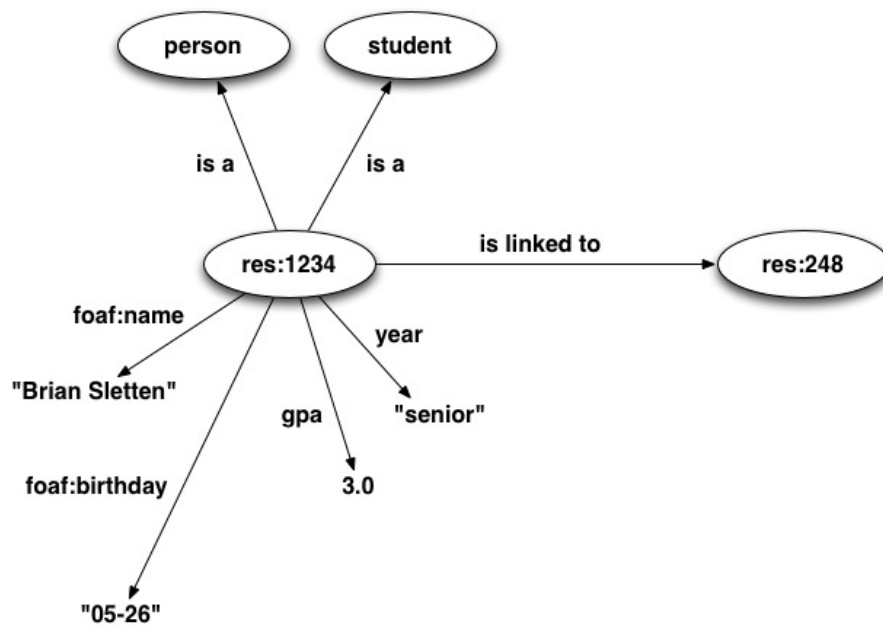
Functional Property

The [birthday](#) property is a relationship between a [Agent](#) and a string representing the month and day in which they were born (Gregorian calendar). See [BirthdayIssue](#) for details of related properties that can be used to describe such things in more flexible ways.

See also [age](#).

[\[#\]](#) [\[wiki\]](#) [\[back to top\]](#)

res $\longrightarrow$ <http://server/resource/>
foaf $\longrightarrow$ <http://xmlns.com/foaf/0.1/>



`http://xmlns.com/foaf/0.1/Person`

Class: foaf:Person

Person - A person.

Status: [stable](#)

Properties include: [myersBriggs](#) [familyName](#) [publications](#) [lastName](#) [family_name](#) [firstName](#) [currentProject](#) [surname](#) [knows](#) [workInfoHomepage](#) [pastProject](#) [geekcode](#) [schoolHomepage](#) [workplaceHomepage](#) [img](#) [plan](#)

Used with: [knows](#)

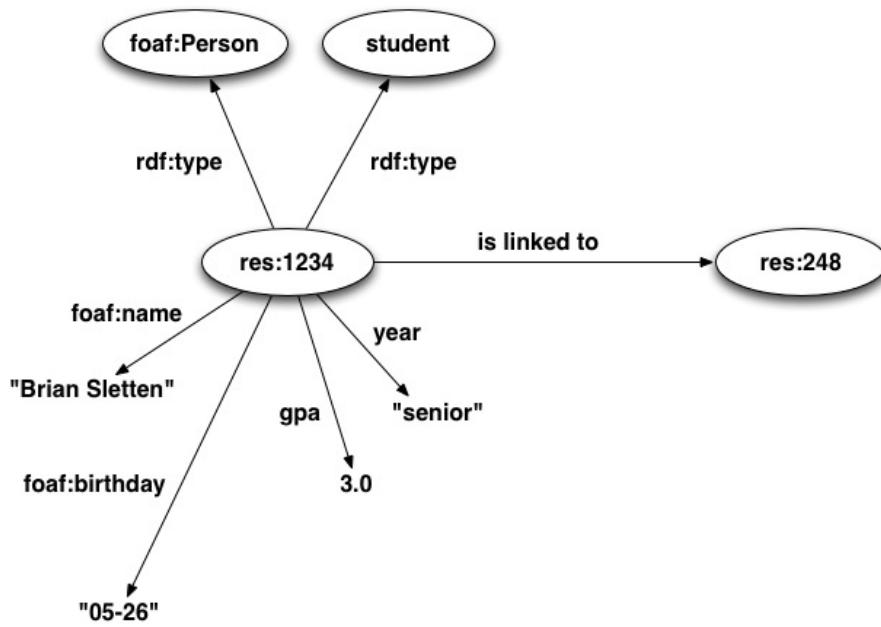
Subclass Of [Agent](#) [Spatial Thing](#) [Person](#)

Disjoint With: [Organization](#) [Project](#)

The [Person](#) class represents people. Something is a [Person](#) if it is a person. We don't nitpic about whether they're alive, dead, real, or imaginary. The [Person](#) class is a sub-class of the [Agent](#) class, since all people are considered 'agents' in FOAF.

[\[#\]](#) [\[wiki\]](#) [\[back to top\]](#)

res → <http://server/resource/>
foaf → <http://xmlns.com/foaf/0.1/>
rdf → <http://www.w3.org/1999/02/22-rdf-syntax-ns#>



<http://bosatsu.net/talks/facts.rdf>

```
<?xml version="1.0" encoding="utf-8"?>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:foaf="http://xmlns.com/foaf/0.1/">
  <rdf:Description rdf:about="http://server/resource/1234">
    <rdf:type rdf:resource="http://xmlns.com/foaf/0.1/Person"/>
    <foaf:name>Brian Sletten</foaf:name>
    <foaf:birthday>05-26</foaf:birthday>
  </rdf:Description>
</rdf:RDF>
```

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

```
<http://server/resource/1234>  
  a foaf:Person ;  
  foaf:birthday "05-26" ;  
  foaf:name "Brian Sletten" .
```

```
SELECT ?s ?p ?o
FROM <http://bosatsu.net/talks/facts.rdf>
WHERE { ?s ?p ?o }
```

s	p	o
http://server/resource/1234	http://xmlns.com/foaf/0.1/birthday	05-26
http://server/resource/1234	http://xmlns.com/foaf/0.1/name	Brian Sletten
http://server/resource/1234	http://www.w3.org/1999/02/22-...	http://xmlns.com/foaf/0.1/Person

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
```

```
SELECT ?name ?dob
```

```
FROM <http://bosatsu.net/talks/facts.rdf>
```

```
WHERE {
```

```
  ?s foaf:name ?name ;
```

```
    foaf:birthday ?dob .
```

```
}
```

name	dob
Brian Sletten	05-26

```
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
```

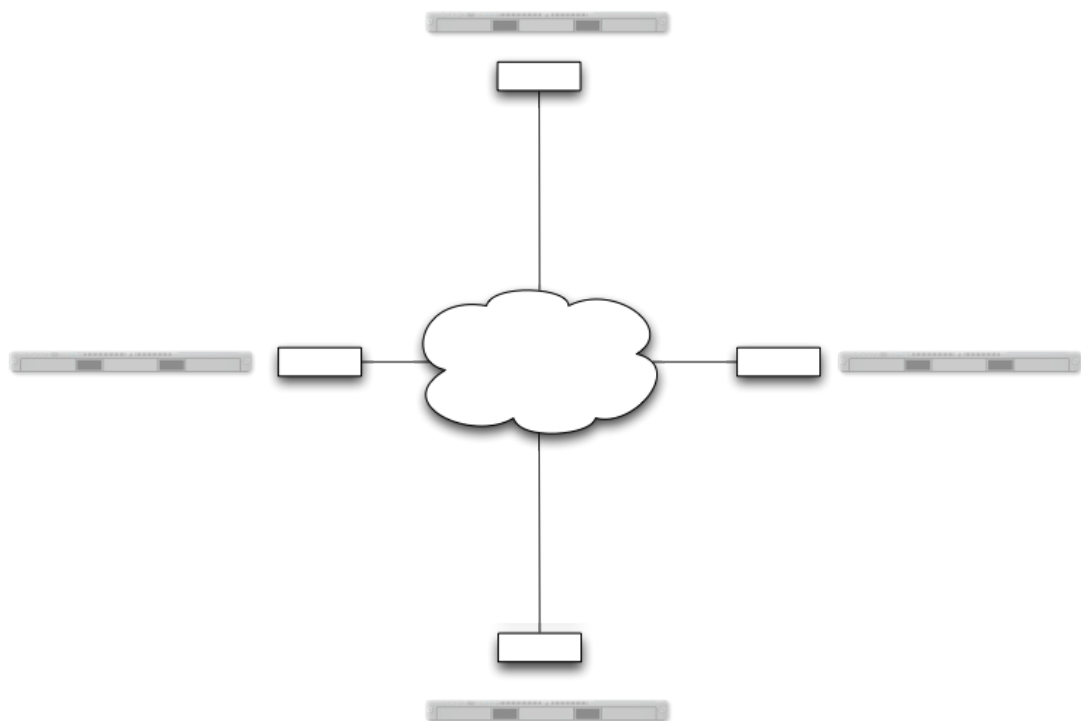
```
SELECT ?name ?dob
FROM <http://bosatsu.net/talks/facts.rdf>
FROM <http://bosatsu.net/talks/facts1.rdf>
WHERE {
    ?s foaf:name ?name ;
        foaf:birthday ?dob .
}
```

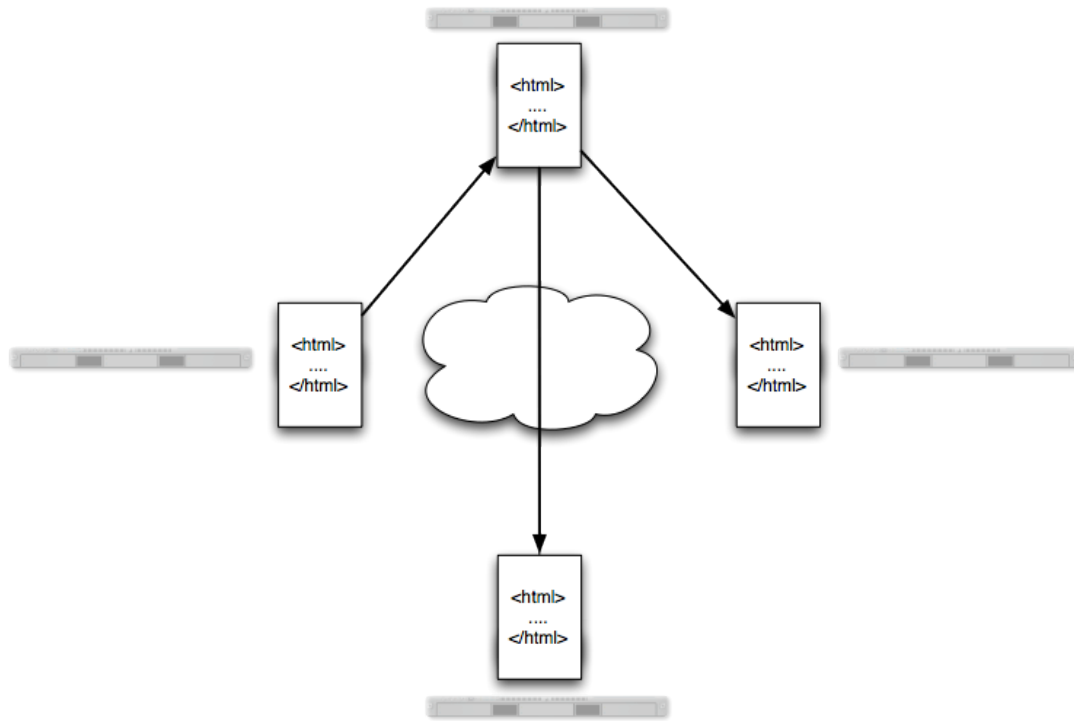
name	dob
Brian Sletten	05-26
Ryan Slobojan	07-02

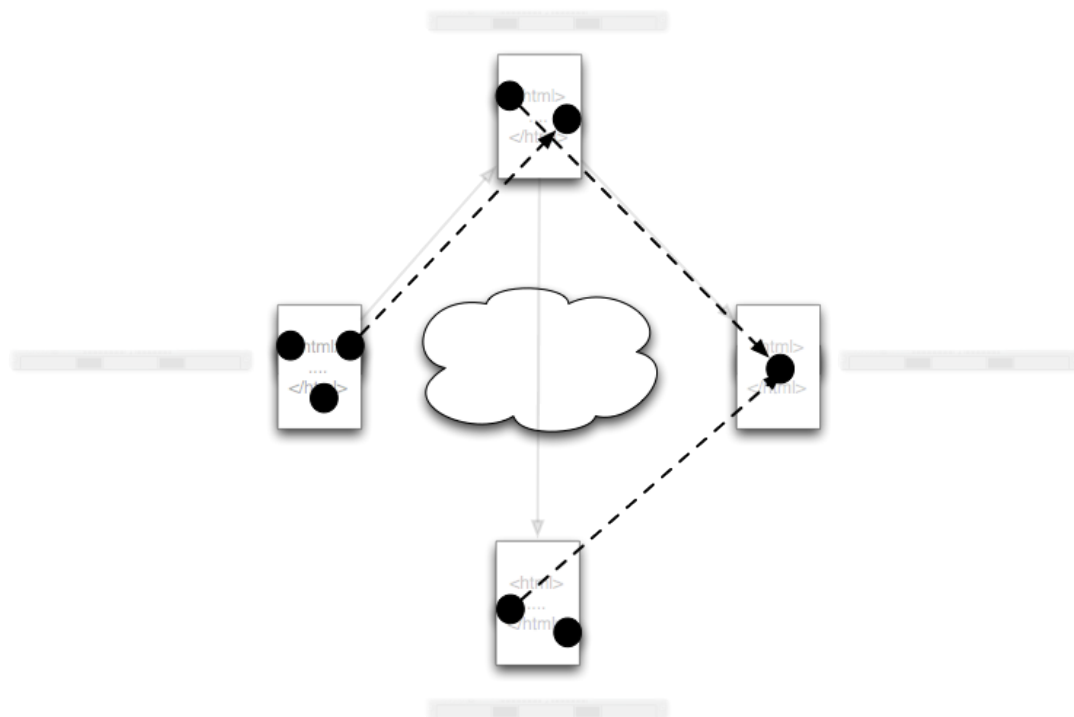
RDF Sources

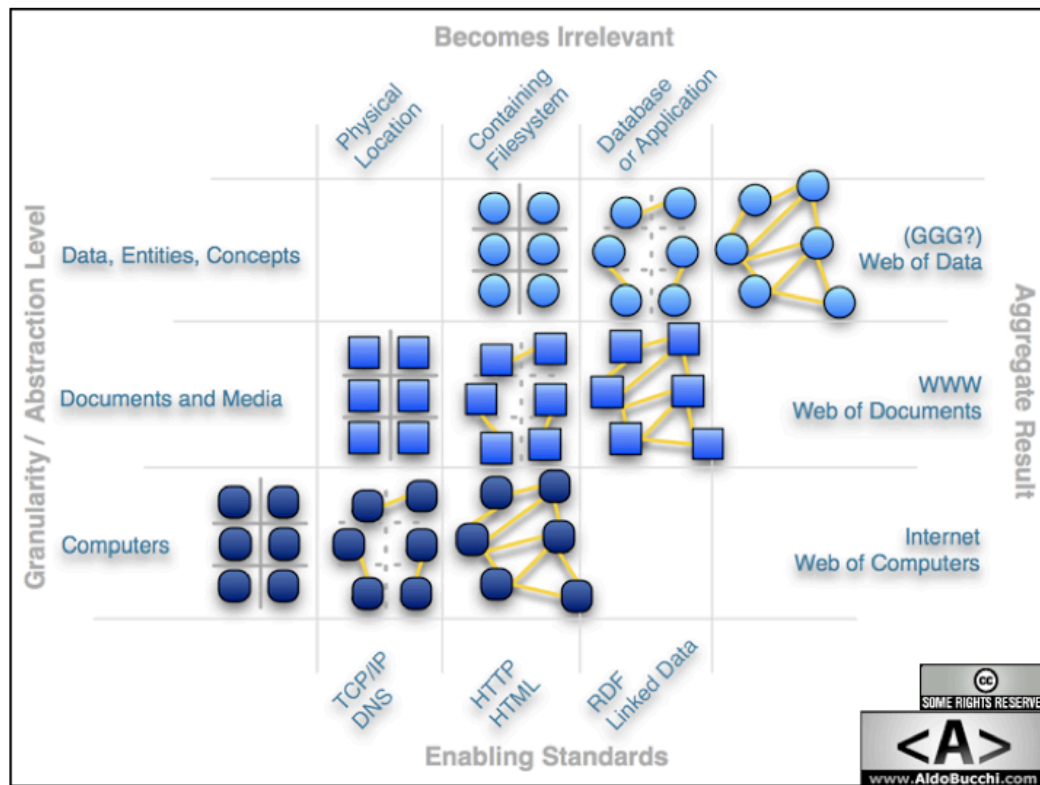
- Native
- Conneg of REST APIs
- SPARQL Endpoints
- R2RML
- RDFa Parsed
- GRDDL





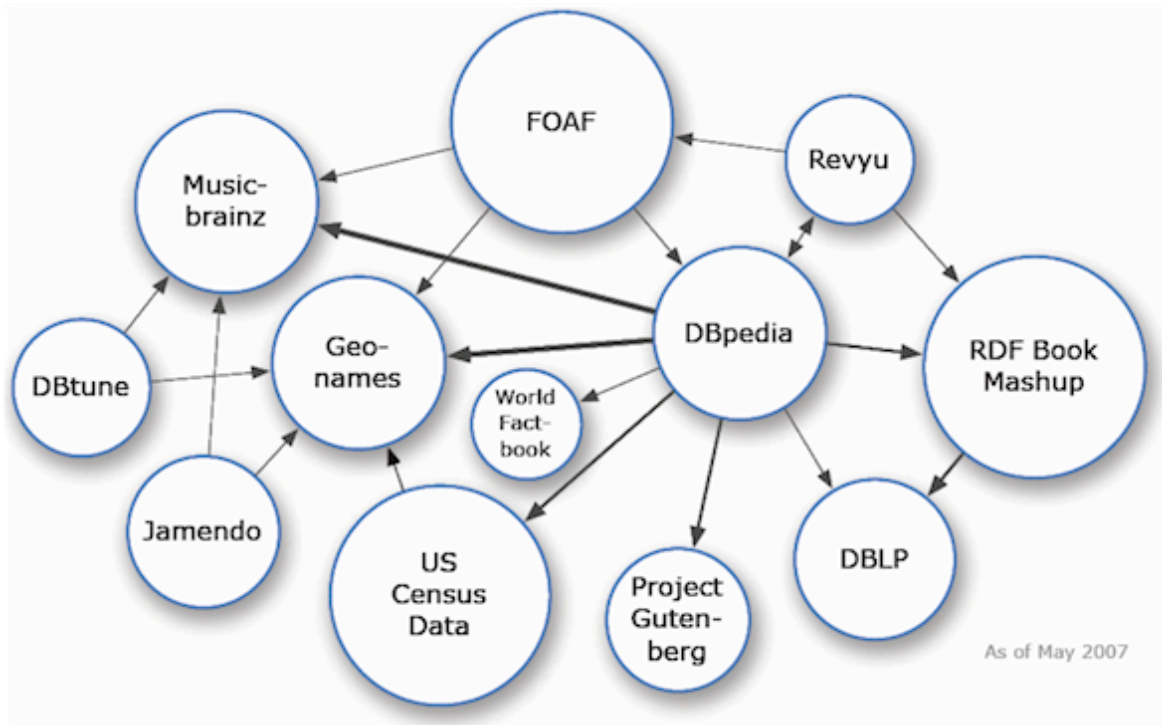






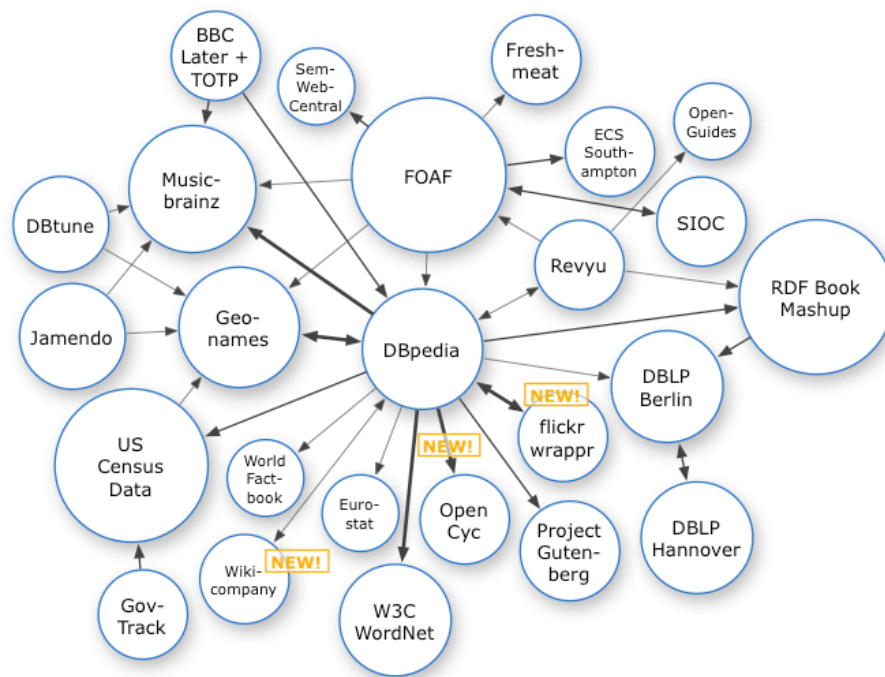
Linked Data

05/01/2007

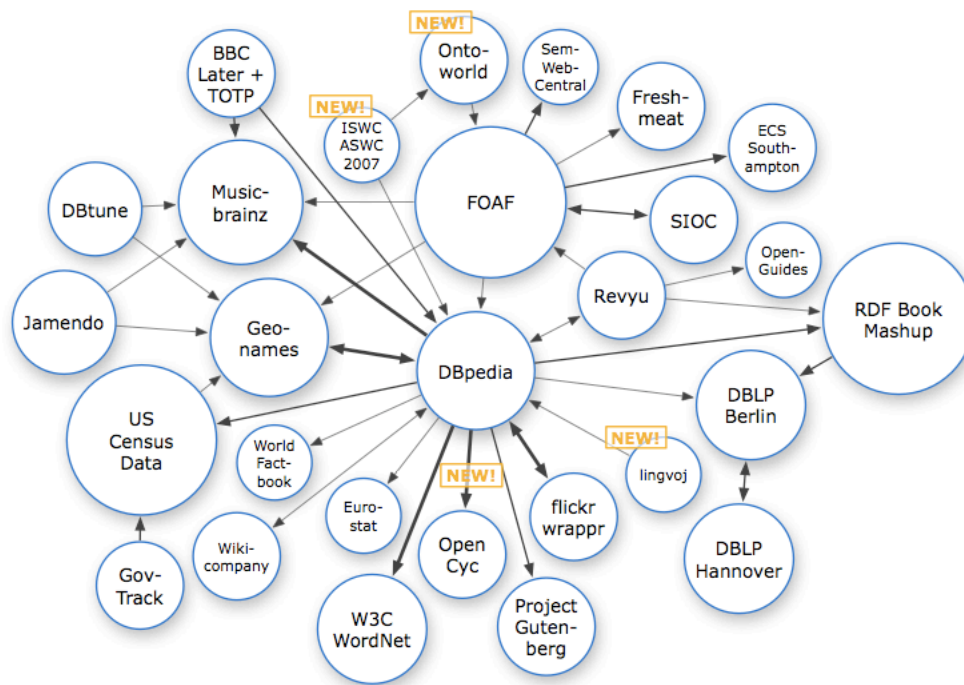


10/08/2007

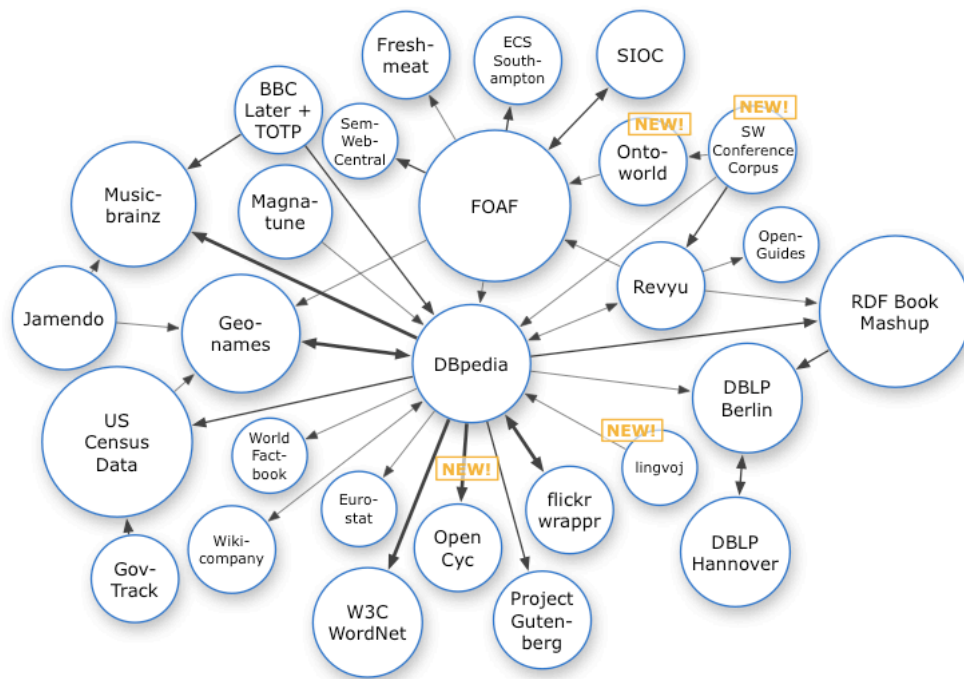
The diagram illustrates a network of interconnected web services and datasets, centered around DBpedia. The nodes are represented by circles, and the connections are shown by arrows. The central node is DBpedia, which is connected to many other nodes. Other prominent nodes include FOAF, Musicbrainz, Geo-names, and US Census Data. The network also includes various other services like BBC Later + TOTP, Sem-Web-Central, Freshmeat, ECS South-ampton, Revyu, Jamendo, DBtune, World Fact-book, Euro-stat, Open Cyc, Project Gutenberg, W3C WordNet, Wiki-company, Gov-Track, and flickr wrapper. Some nodes are marked with a 'NEW!' label, indicating recent additions or updates. The diagram demonstrates the concept of Linked Data and the Semantic Web, where data is interconnected and can be queried across different sources.



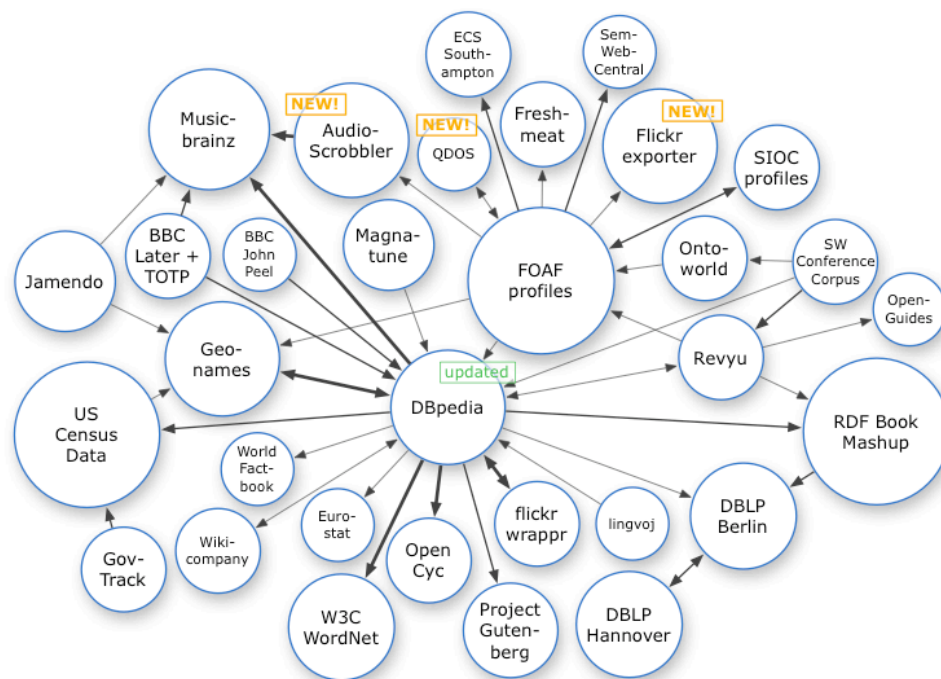
11/07/2007



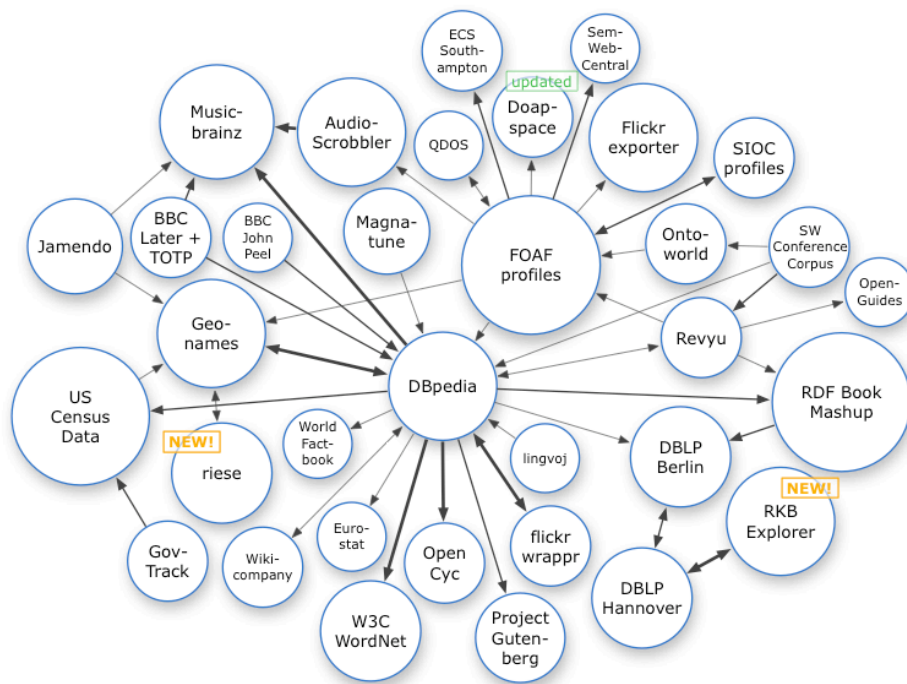
11/10/2007



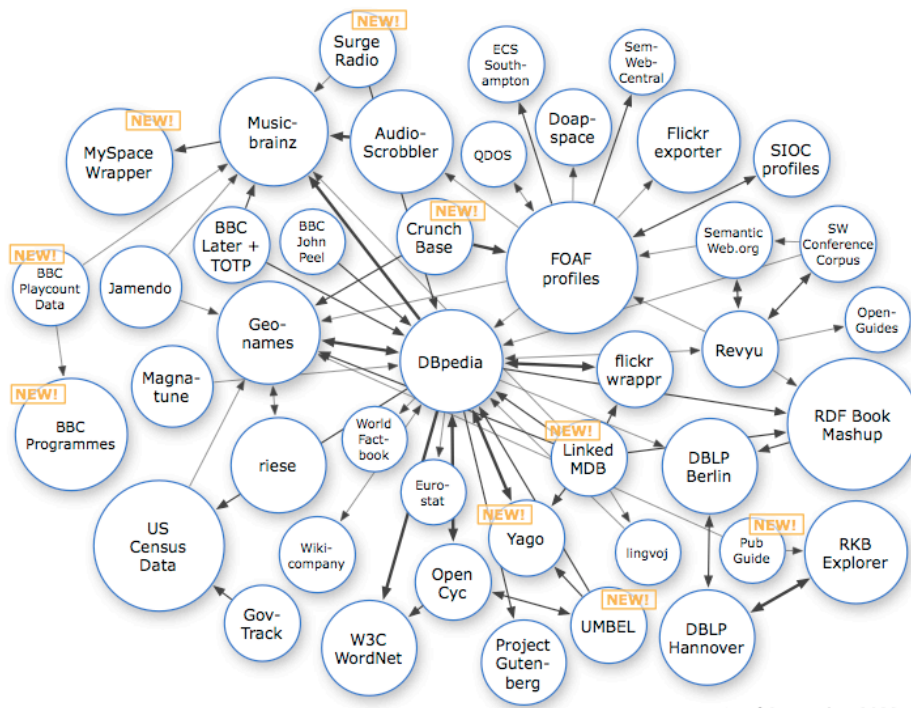
02/28/2008



03/31/2008



09/18/2008



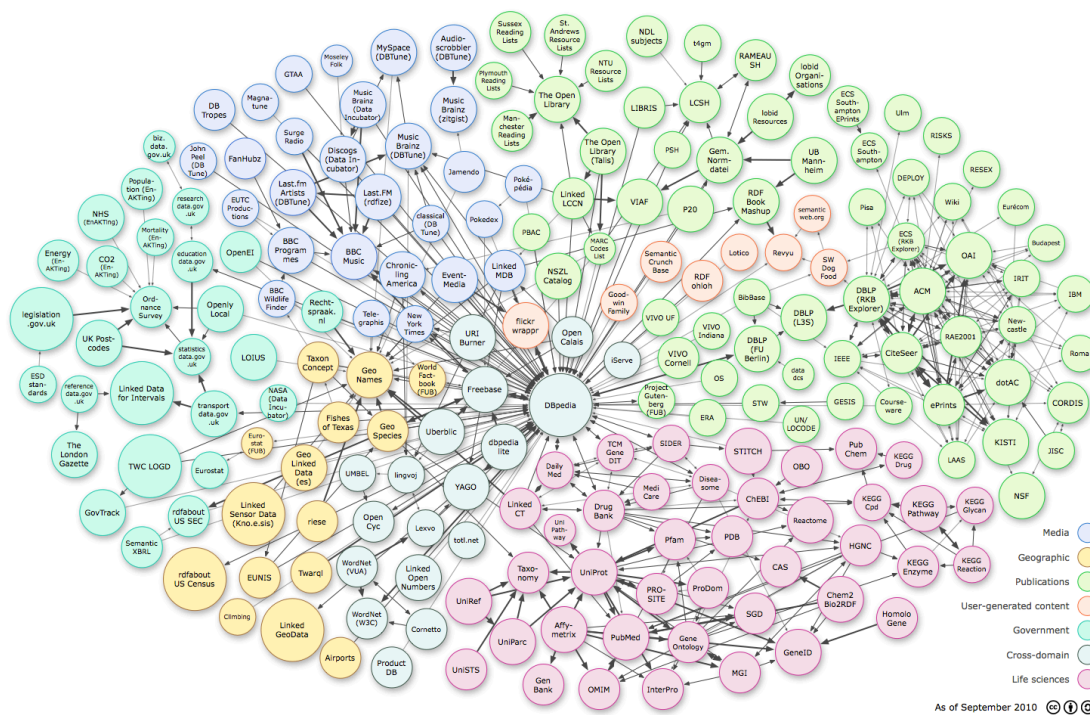
03/05/2009



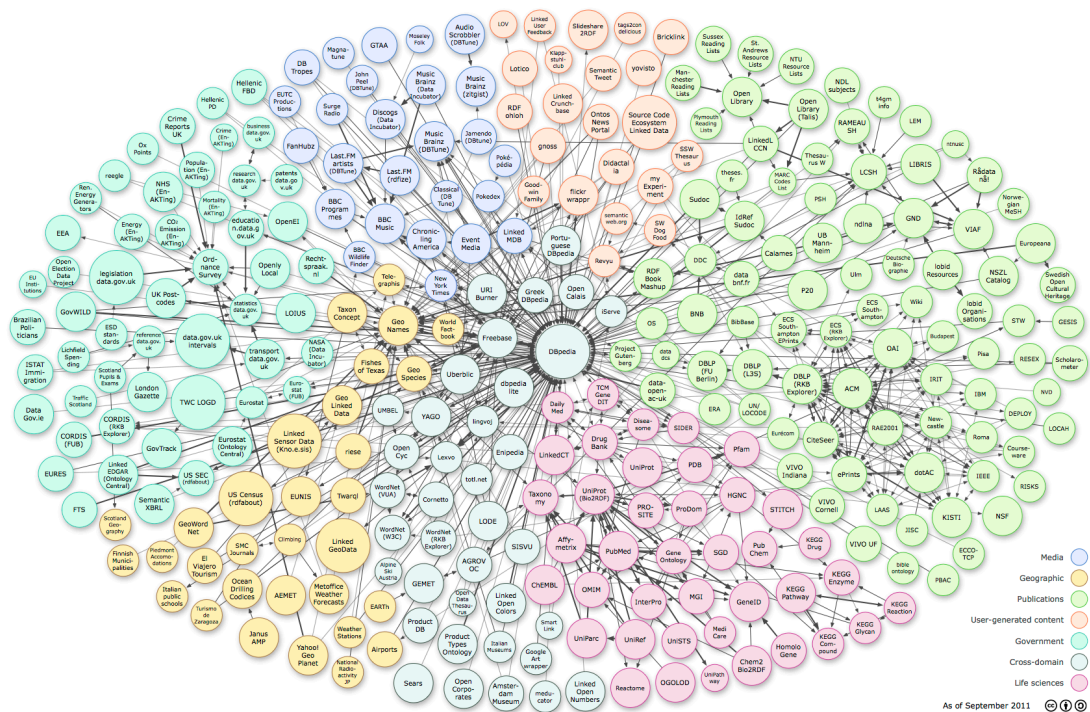
03/27/2009



09/22/2010



09/19/2011



Where Linked Data Fits In

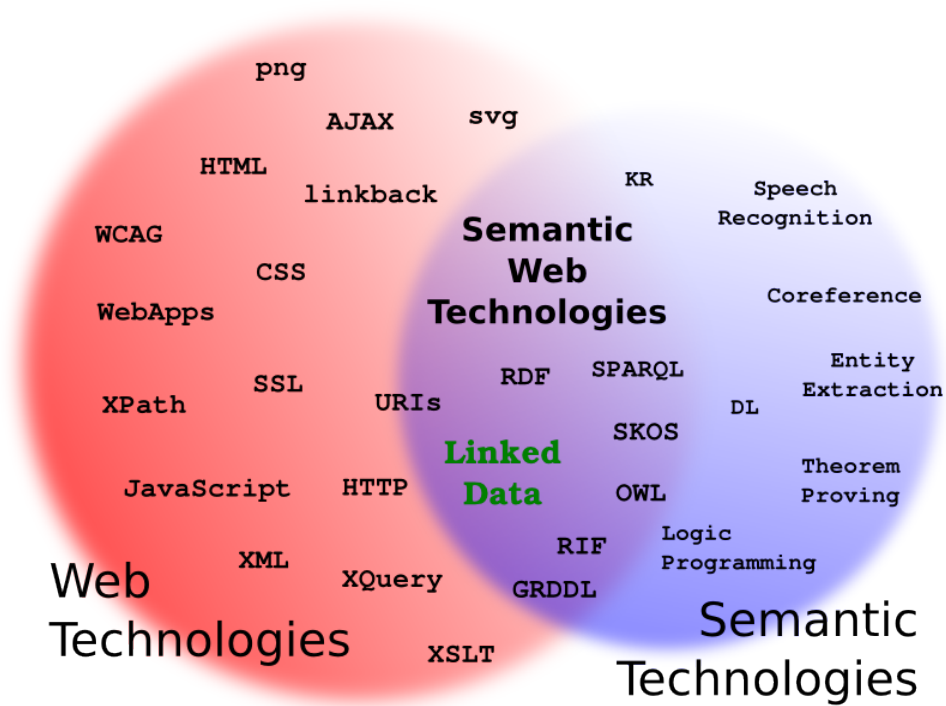
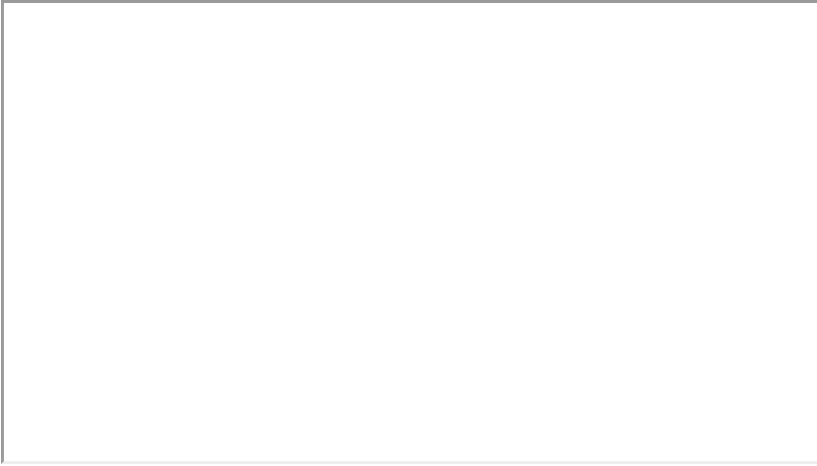
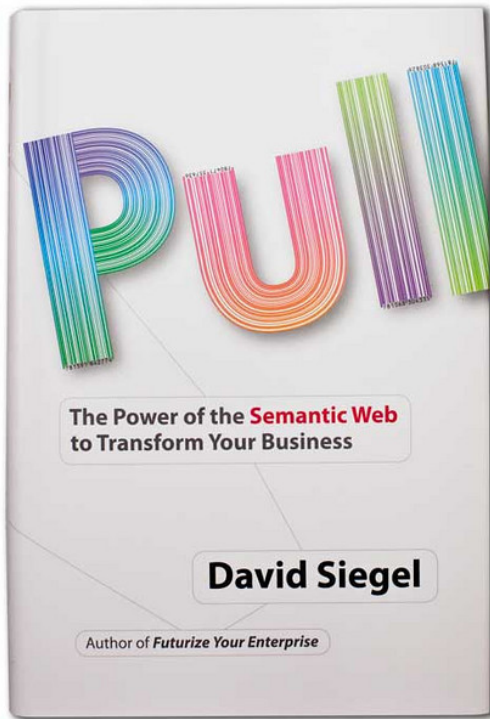


Image courtesy of

Kingsley Idehen (@kidehen)



Embedded example to http://www4.wiwiss.fu-berlin.de/flickrwrappr/photos/Los_Angeles



Querying and Updating with SPARQL 1.1

Learning

SPARQL



O'REILLY®

Bob DuCharme

SECOND EDITION

Semantic Web for the Working Ontologist

Dean Allemang
James Hendler

MK
MORGAN KAUFMANN

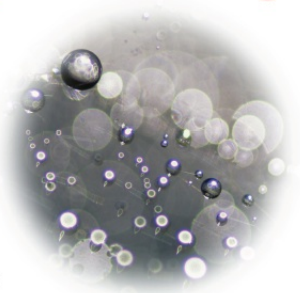
Effective Modeling
in RDFS and OWL

 **WILEY**

TIMELY. PRACTICAL. RELIABLE.

Semantic Web Programming

John Hebel
Matthew Fisher
Ryan Blace
Andrew Perez-Lopez



ISBN 1118-0478

Build Flexible Applications with Graph Data

Programming the

Semantic Web



O'REILLY®

*Toby Segaran,
Colin Evans & Jamie Taylor*

Questions?



Source: Eric Norris

[CC BY 2.0](#)

Contact



brian@bosatsu.net

[@bsletten](#)
