

Introduction to Semantic Web Technologies & Linked Data

Oktie Hassanzadeh
University of Toronto



Outline

2

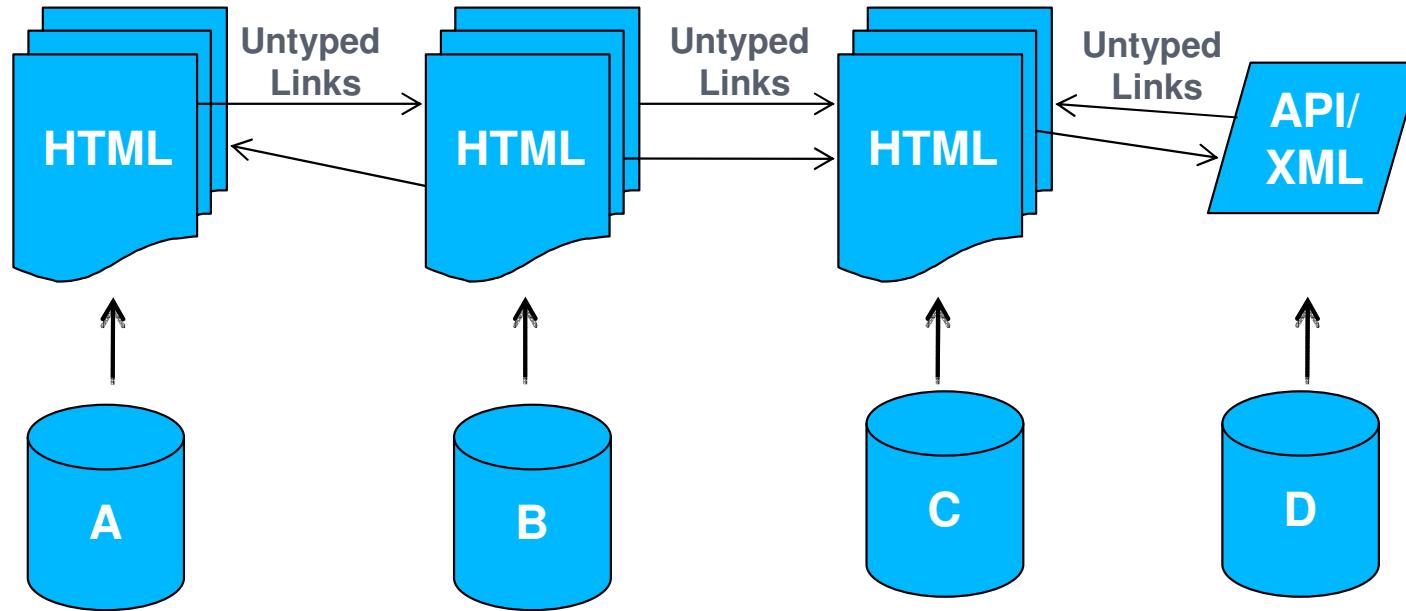
- Introduction
- Semantic Web Technologies
 - Resource Description Framework (RDF)
 - Querying RDF data (SPARQL)
- Linked Data
 - Linked Data Principles
 - Linking Open Data Community Project
 - Example Data Sources
 - Example Applications

Introduction

Web of Documents vs. Web of Data

Web of Documents

4



Primary objects: **documents**

Links between **documents** (or parts of them)

Degree of structure in data: fairly **low**

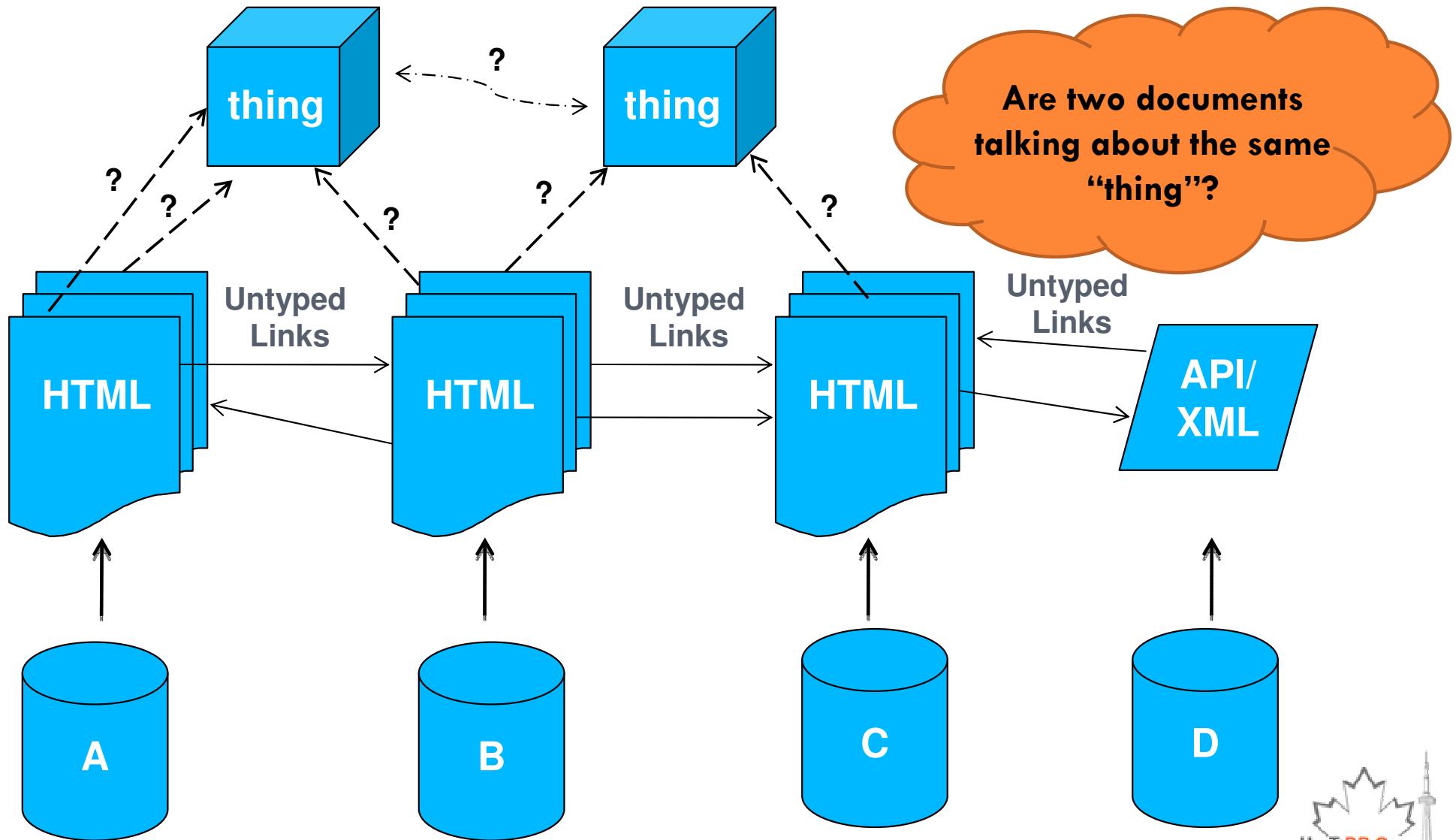
Implicit semantics of contents

Designed for: **human consumption**



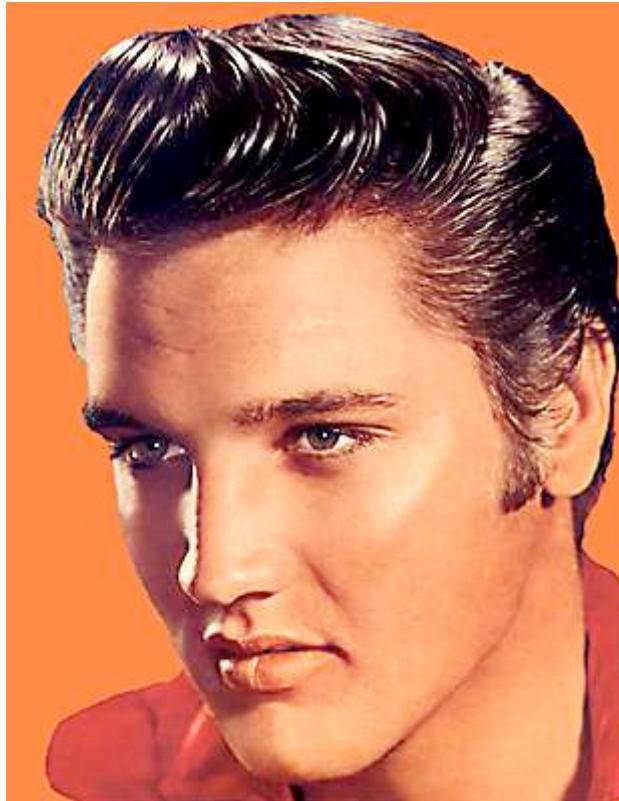
Web of Documents: Problem

5



Example Query

6



Elvis Presley
1935 - 1977

Will there ever be someone like him again?



Example Query

7



Another Elvis

[Elvis Presley: The Early Years](#)

Elvis spent more weeks at the top of the charts than any **other** artist.

www.fiftiesweb.com/elvis.htm



Example Query

8



Another singer called Elvis, young

[Personal relationships of Elvis Presley – Wikipedia](#)

...when Elvis was a **young** teen.... **another** girl whom the **singer**'s mother hoped Presley would The writer **called** **Elvis** "a hillbilly cat"

en.wikipedia.org/.../Personal_relationships_of_Elvis_Presley



Example Query

9



Dear Mr. Page, you don't understand me. I just...

[Elvis Presley - Official page for Elvis Presley](#)

Welcome to the Official Elvis Presley Web Site, home of the undisputed King of Rock 'n' Roll and his beloved Graceland ...

www.elvis.com/



Example Query

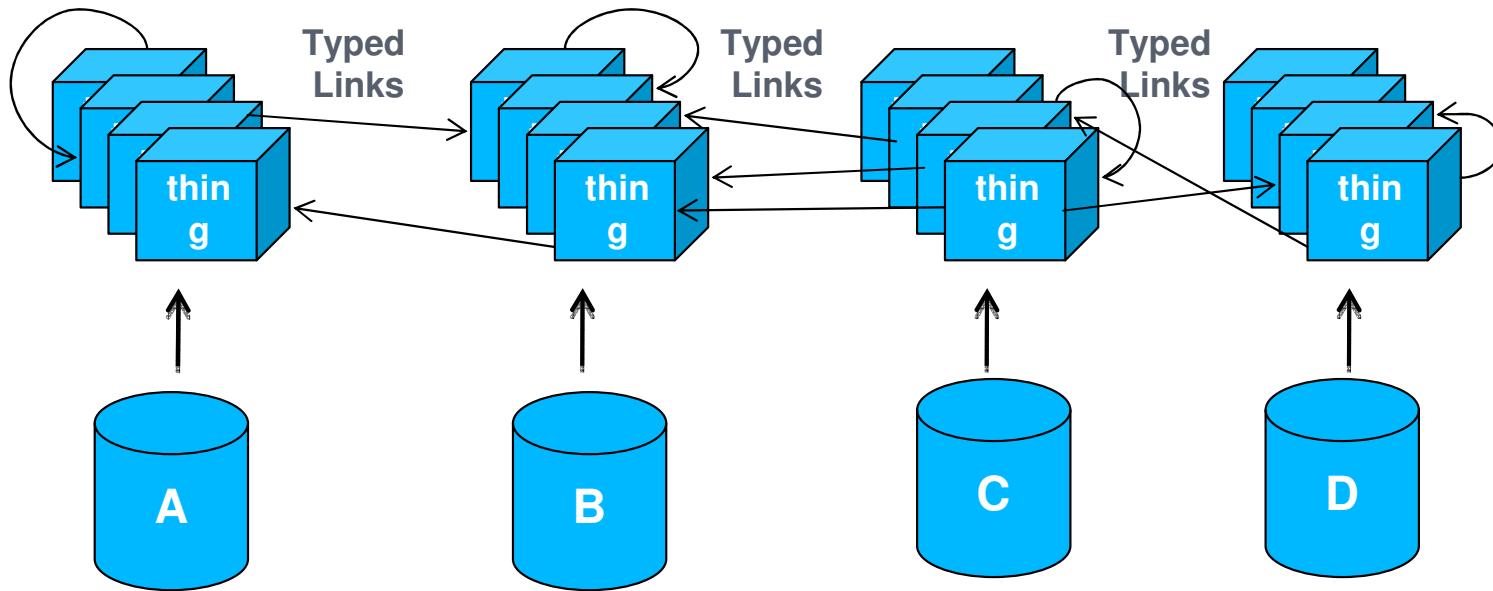
10

- How about this query:
 - How many romantic comedy Hollywood movies are directed by a person who is born in a city that has average temperature above 15 degrees!?
 - You need to:
 - Find reliable sources containing facts about movies (genre & director), birthplaces of famous artists/directors, average temperature of cities across the world, etc.
 - The result: several lists of thousands of facts
 - Integrate all the data, join the facts that come from heterogeneous sources

Even if possible, it may take days to answer just a single query!

Solution: Web of Data

11



Primary objects: “**things**” (or description of things)

Links between “**things**”

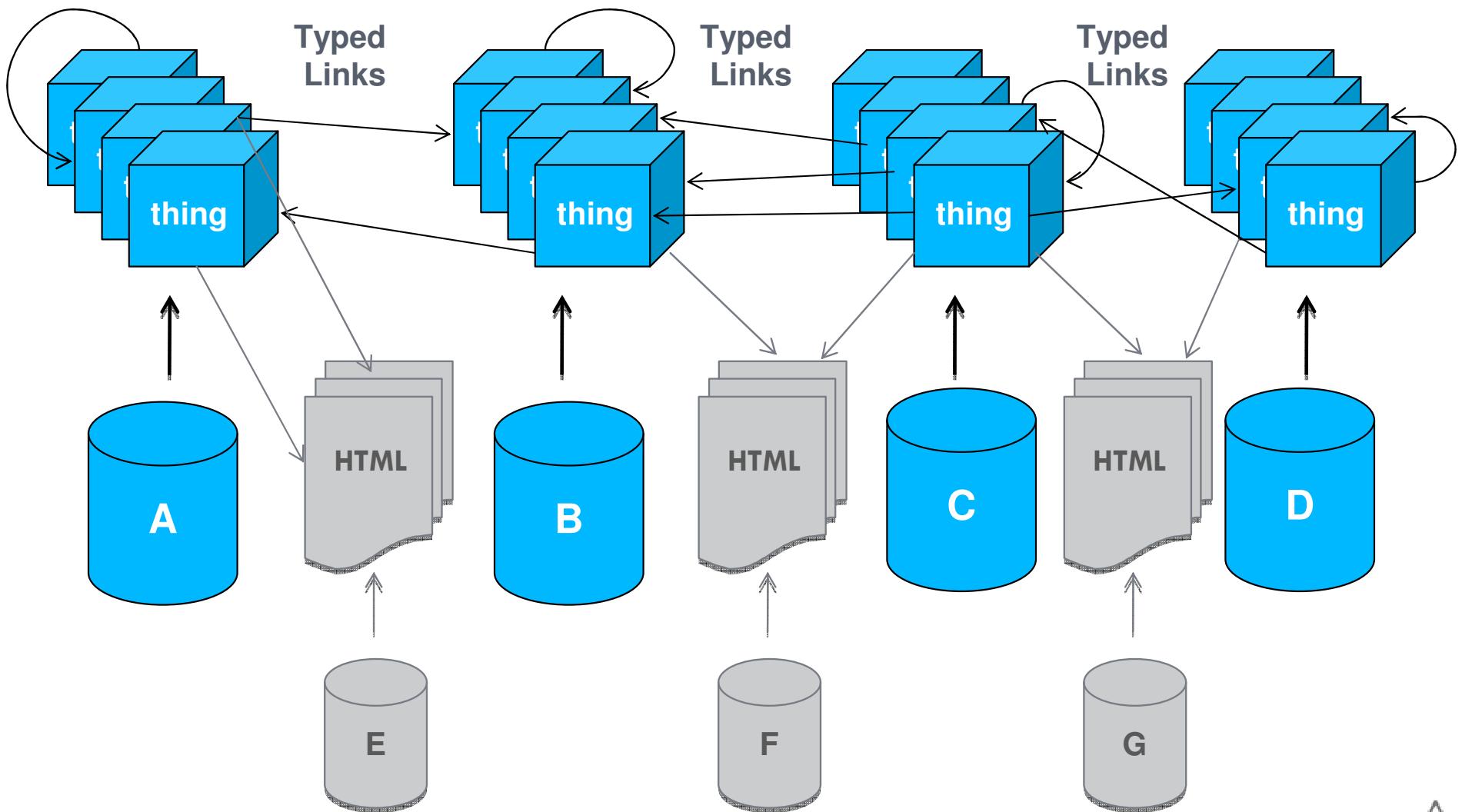
Degree of Structure: **High** (based on RDF data model)

Explicit semantics of contents **and** links

Designed for: Both **machines and humans**

Web of Data

12



Introduction to Semantic Web Technologies

Resource Description Framework (RDF)

Semantic Web Technologies

14

- A set of technologies and frameworks that enable the Web of Data:
 - Resource Description Framework (RDF)
 - A variety of data interchange formats (e.g. RDF/XML, N3, Turtle, N-Triples)
 - Notations such as RDF Schema (RDFS) and the Web Ontology Language (OWL)
 - All are intended to provide a formal description of concepts, terms, and relationships within a given knowledge domain

Source: http://en.wikipedia.org/wiki/Semantic_Web



Resource Description Framework (RDF)

15

- Data model for describing “things” and their interrelations
- Consists of statements about “things” (Web resources) in the form of subject-predicate-object expressions, also known as *triples*

subject → predicate → object

Renee Miller → *Teaches* → *CSC443*

Renee Miller → *Lives in* → *Toronto*

Resource Description Framework (RDF)

16

- Data model for describing “things” and their interrelations
- Consists of statements about “things” (Web resources) in the form of subject-predicate-object expressions, also known as *triples*

subject → **predicate** → **object**

<uri> → <uri> → <uri> or “literal”

<<http://cs.toronto.edu/~miller>> → <http://xmlns.com/foaf/spec/#term_based_near> → <<http://dbpedia.org/resource/Toronto>>

or

<<http://cs.toronto.edu/~miller>> → <http://xmlns.com/foaf/spec/#term_based_near> → “Toronto”

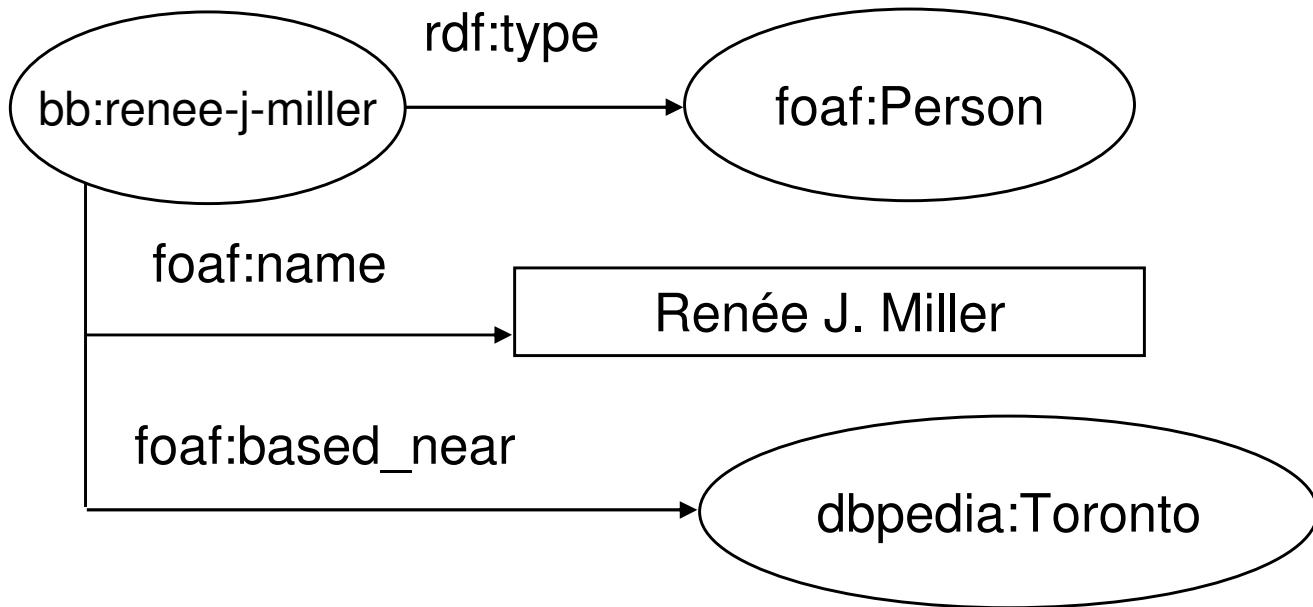
Uniform Resource Identifier (URI): a string of characters used to identify a name or a resource on the Internet.

http://en.wikipedia.org/wiki/Uniform_Resource_Identifier



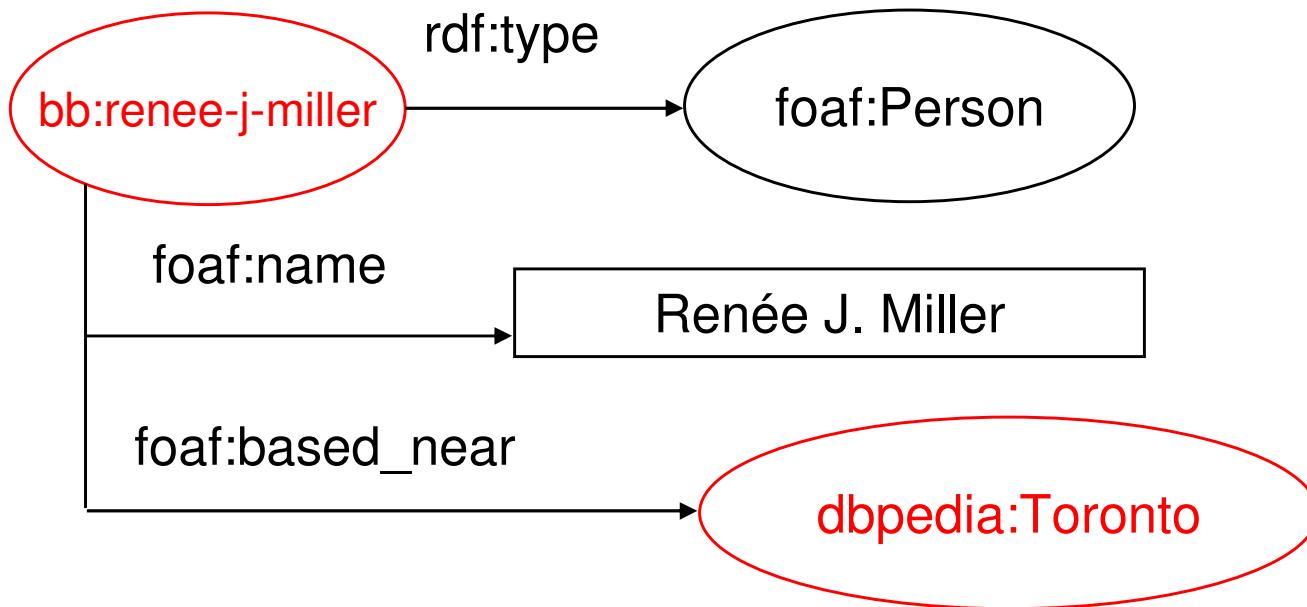
A simple RDF example

17



Data Items Identified with (HTTP) URIs

18

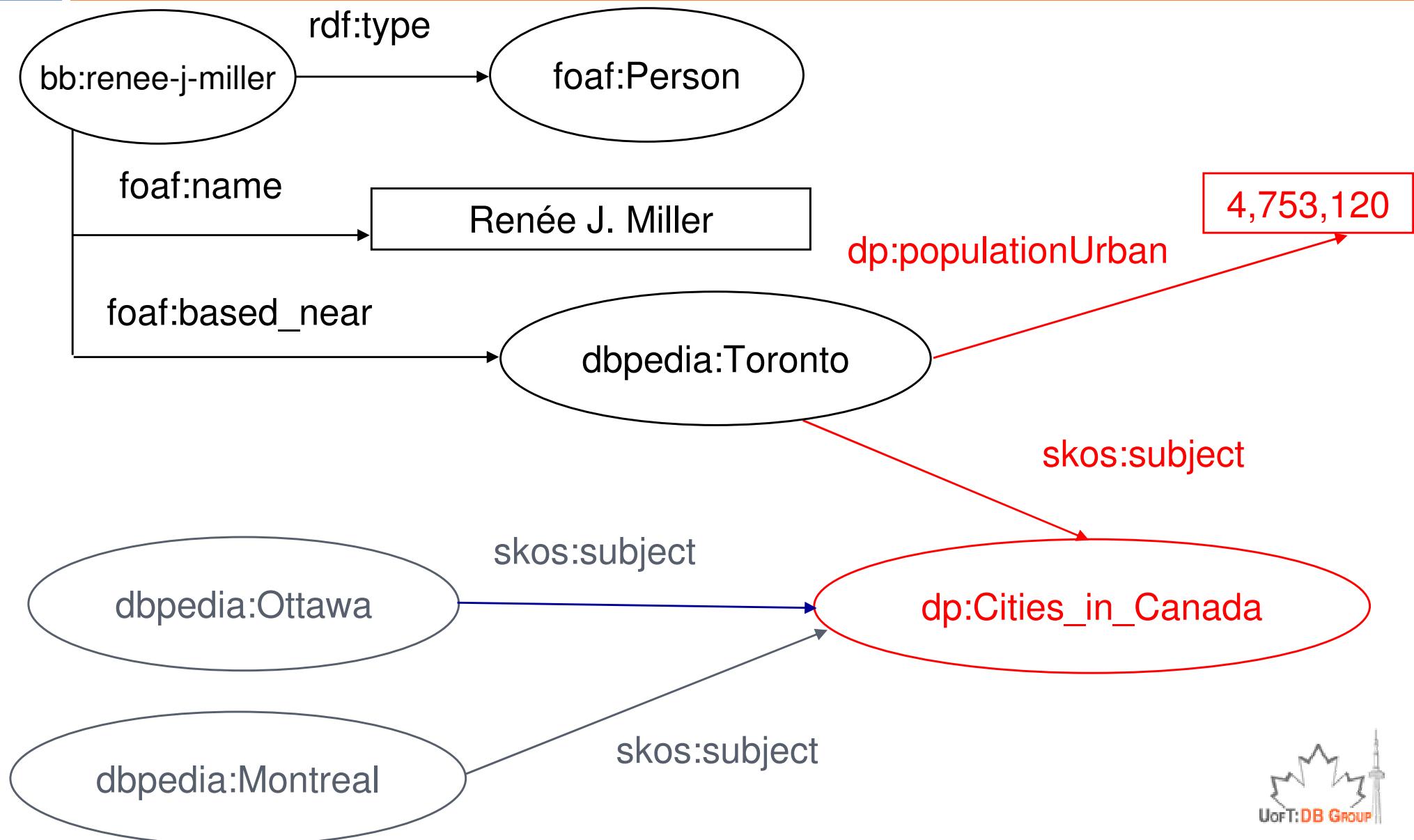


bb:reneee-j-miller = <http://data.bibbase.org/author/renee-j-miller/>
dbpedia:Toronto = <http://dbpedia.org/resource/Toronto>



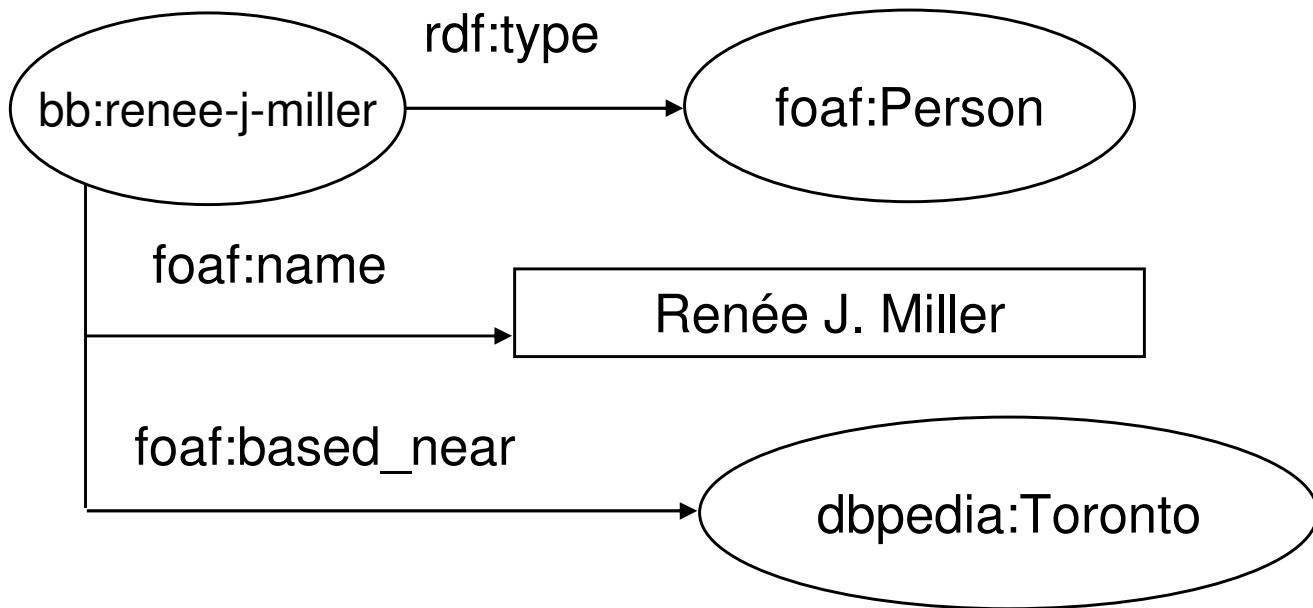
Dereferencing URIs over the Web

19



A Simple RDF Example (in RDF/XML)

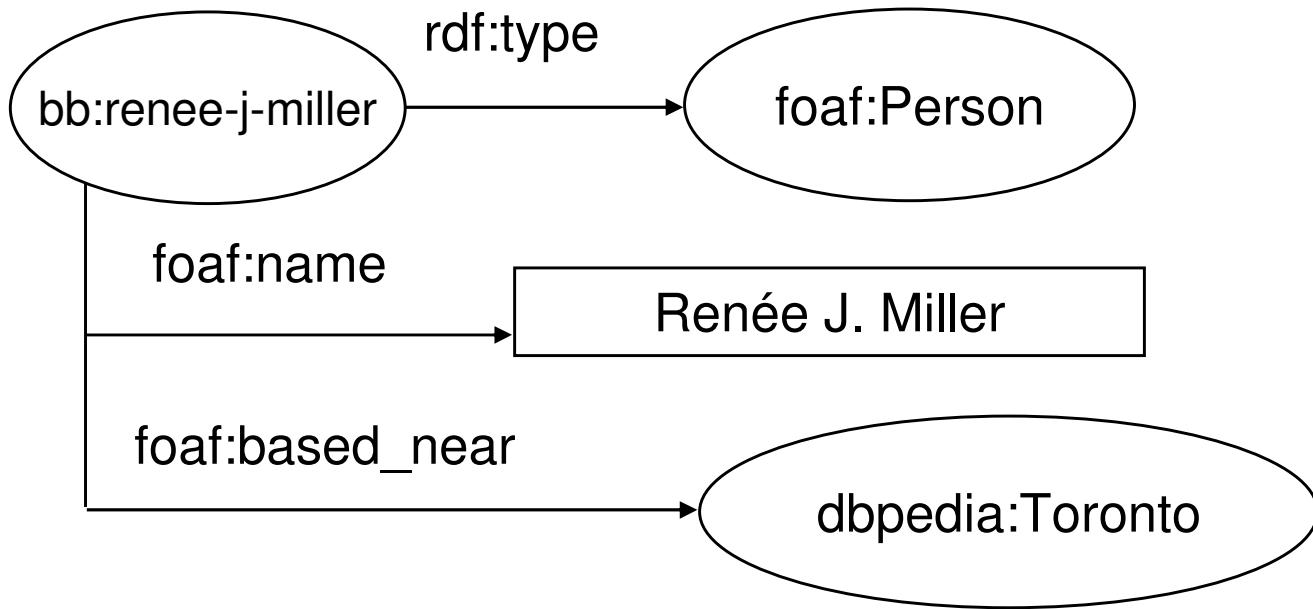
20



```
<?xml version="1.0"?>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
           xmlns:foaf="http://xmlns.com/foaf/spec/#"
           xmlns:bb="http://data.bibbase.org/ontology/">
  <rdf:Description rdf:about="http://.../author/renee-j-miller/">
    <rdf:type rdf:resource="http://xmlns.com/foaf/spec/#term_Person"/>
    <foaf:name xml:lang="en">Renée J. Miller</foaf:name>
    <foaf:based_near rdf:resource="http://dbpedia.org/resource/Toronto"/>
  </rdf:Description>
</rdf:RDF>
```

A Simple RDF Example (in Turtle)

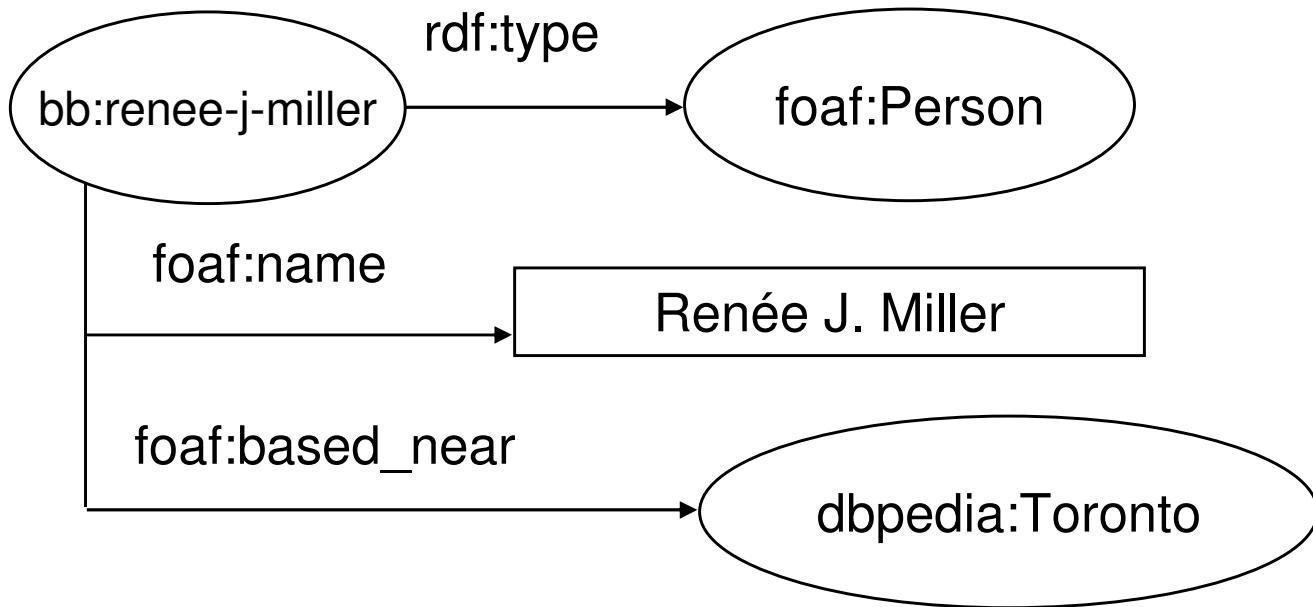
21



```
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .  
@prefix foaf: <http://xmlns.com/foaf/spec/#> .  
@prefix bb: <http://data.bibbase.org/ontology/> .  
  
<http://data.bibbase.org/author/renee-j-miller/>  
    rdf:type foaf:person .  
    foaf:name "Renée J. Miller"@en ;  
    foaf:based_near <http://dbpedia.org/resource/Toronto>
```

A Simple RDF Example (in RDFa)

22



```
...
<p about="http://.../author/renee-j-miller">The author
<span property="foaf:name" lang="en">Renée J. Miller</span>
lives in the city
<span rel="foaf:based_near" resource="http://.../Toronto">Toronto</span>
</p> .
...
```

Introduction to Semantic Web Technologies

Storing & Querying RDF

Storing RDF Data

24

- Simplest way: store and publish RDF files
 - It's like saving data into file system, instead of using a DBMS, although it's still *data* so it can be retrieved and processed by crawlers (machines)
- RDF store (aka Triplestore)
 - Database systems designed for the storage and retrieval of RDF data
 - Some popular RDF stores include Sesame, Jena, Redland, OpenLink Virtuoso
 - A more complete list at <http://en.wikipedia.org/wiki/Triplestore>
- RDF view over relational data (aka RDB2RDF)
 - A very common approach
 - Topic of our next class

Querying RDF graphs

25

- RDF data can be retrieved and processed by machines, but is that enough?
- Using Jena (A Semantic Web Framework for Java):

```
StmtIterator iter=model.listStatements(subject,null,null);
while(iter.hasNext()) {
    st = iter.next();
    p = st.getProperty(); o = st.getObject();
    do_something(p,o); }
```

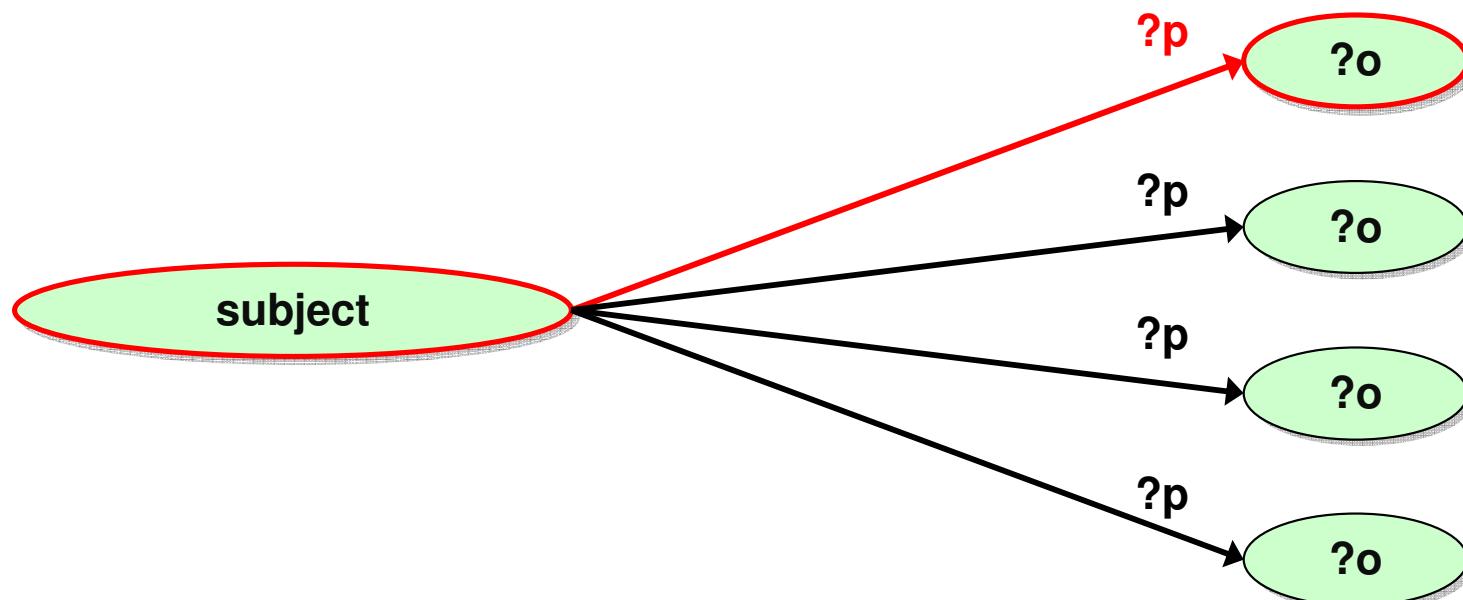
- In practice, more complex queries into the RDF data are necessary
 -



Analyze the Jena example

26

```
StmtIterator iter=model.listStatements(subject,null,null);  
while(iter.hasNext()) {  
    st = iter.next();  
    p = st.getProperty(); o = st.getObject();  
    do_something(p,o);
```



General: graph patterns

27

- The fundamental idea: use graph patterns
 - The pattern contains unbound symbols
 - By binding the symbols, subgraphs of the RDF graph are selected
 - If there is such a selection, the query returns bound resources

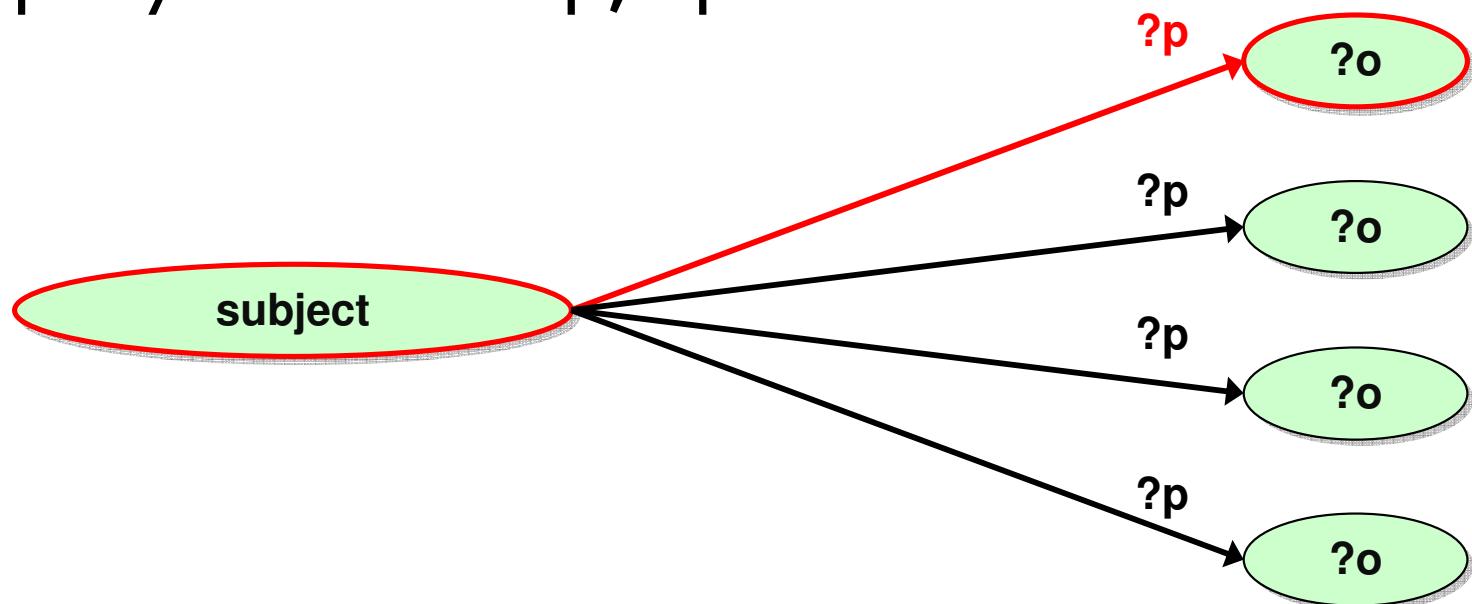


Our example in SPARQL

28

```
SELECT ?p ?o  
WHERE {subject ?p ?o}
```

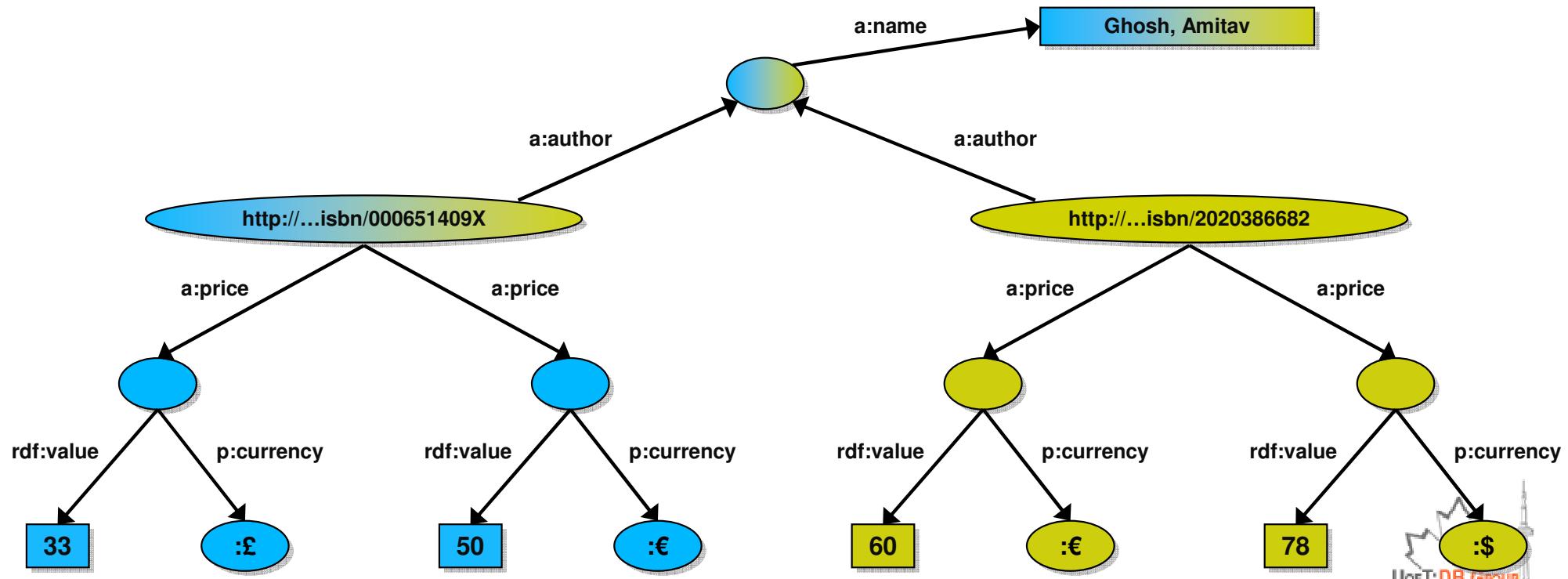
- The triples in WHERE define the graph pattern, with ?p and ?o are “unbound” symbols
- The query returns all p,o pairs



Simple SPARQL example

29

```
SELECT ?isbn ?price ?currency # note: not ?x!
WHERE { ?isbn a:price ?x .
        ?x rdf:value ?price .
        ?x p:currency ?currency. }
```

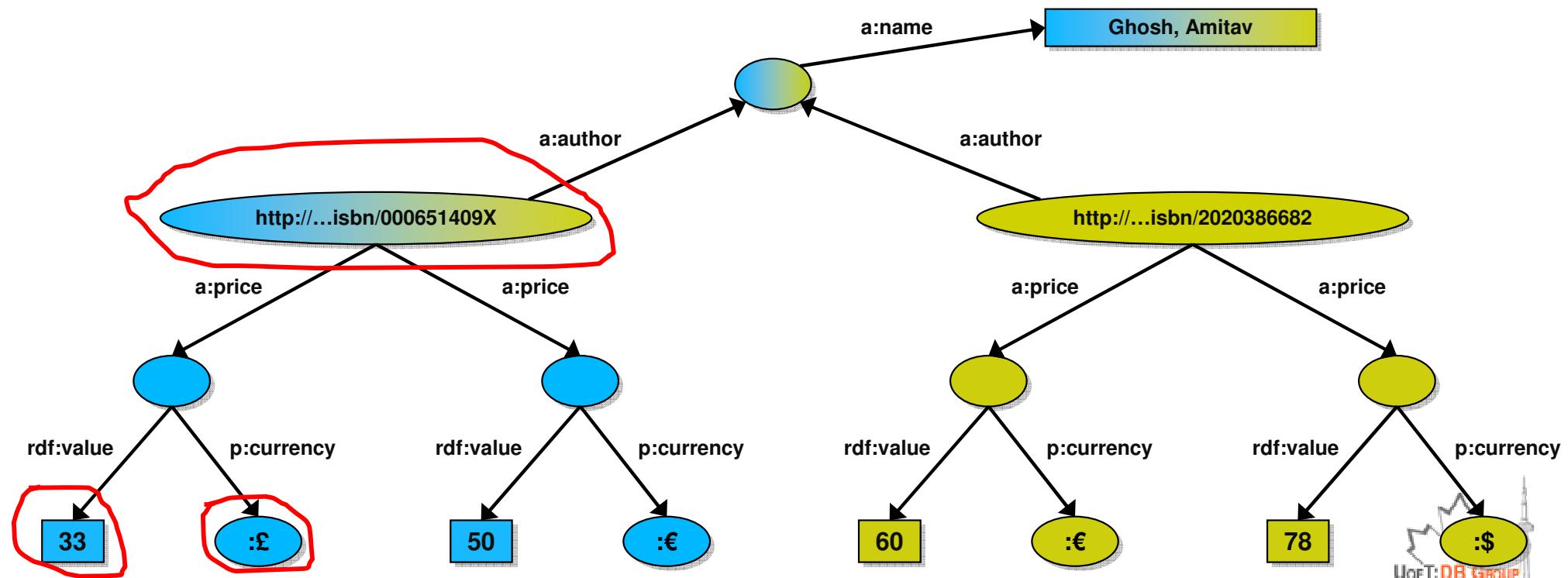


Simple SPARQL example

30

```
SELECT ?isbn ?price ?currency # note: not ?x!
WHERE { ?isbn a:price ?x .
        ?x rdf:value ?price .
        ?x p:currency ?currency. }
```

Returns: [<...409X>,33,:£]

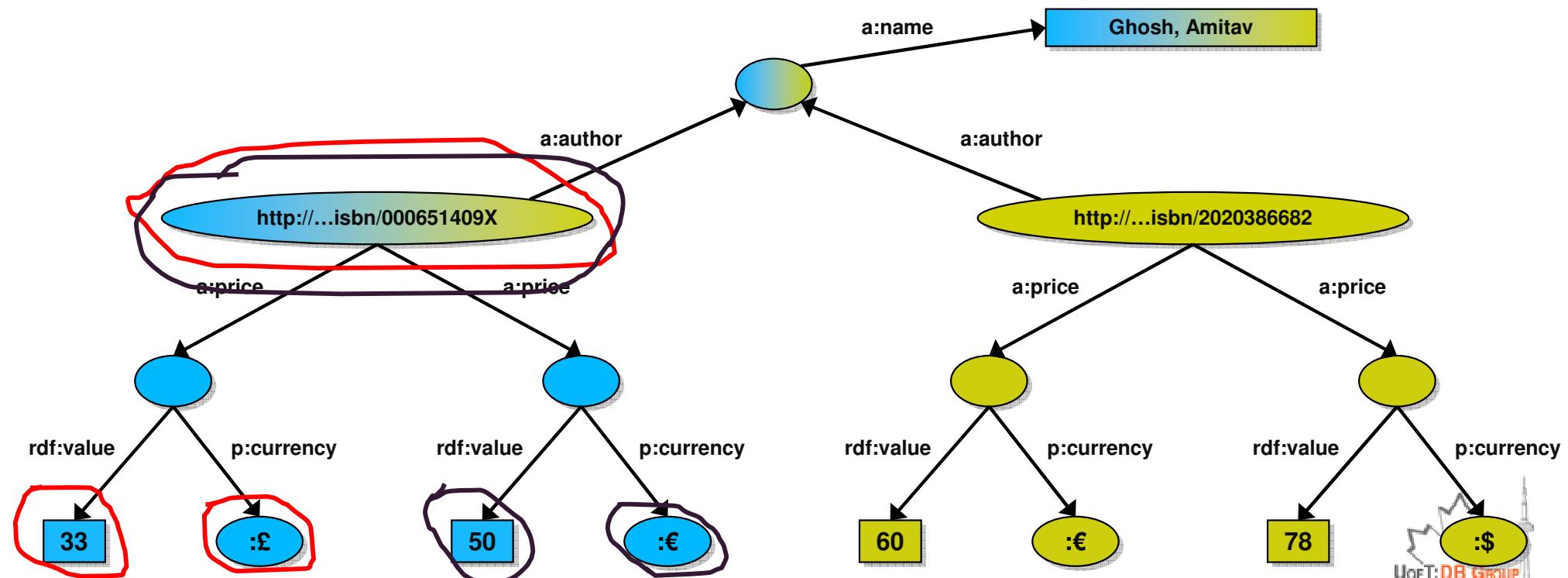


Simple SPARQL example

31

```
SELECT ?isbn ?price ?currency # note: not ?x!
WHERE { ?isbn a:price ?x .
        ?x rdf:value ?price .
        ?x p:currency ?currency. }
```

Returns: [<...409X>,33,:£], [<...409X>,50,:€]

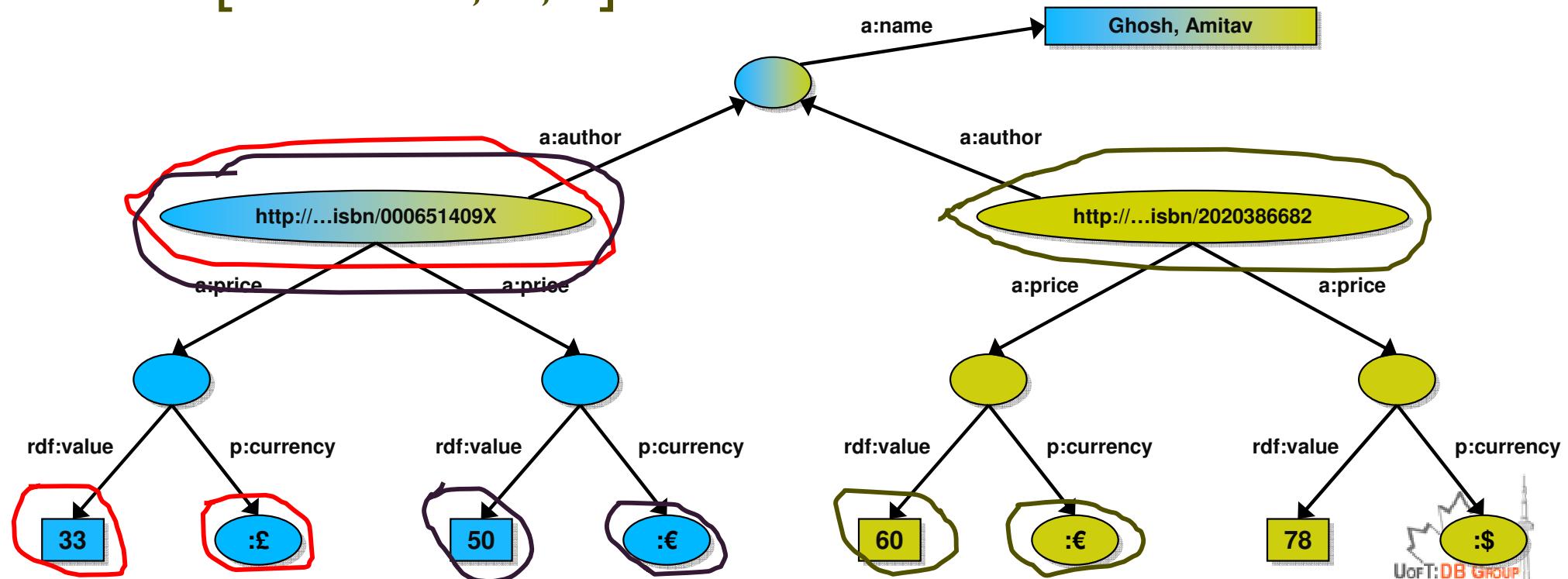


Simple SPARQL example

32

```
SELECT ?isbn ?price ?currency # note: not ?x!
WHERE { ?isbn a:price ?x .
        ?x rdf:value ?price .
        ?x p:currency ?currency. }
```

Returns: [<...409X>,33,:£], [<...409X>,50,:€],
[<...6682>,60,:€]



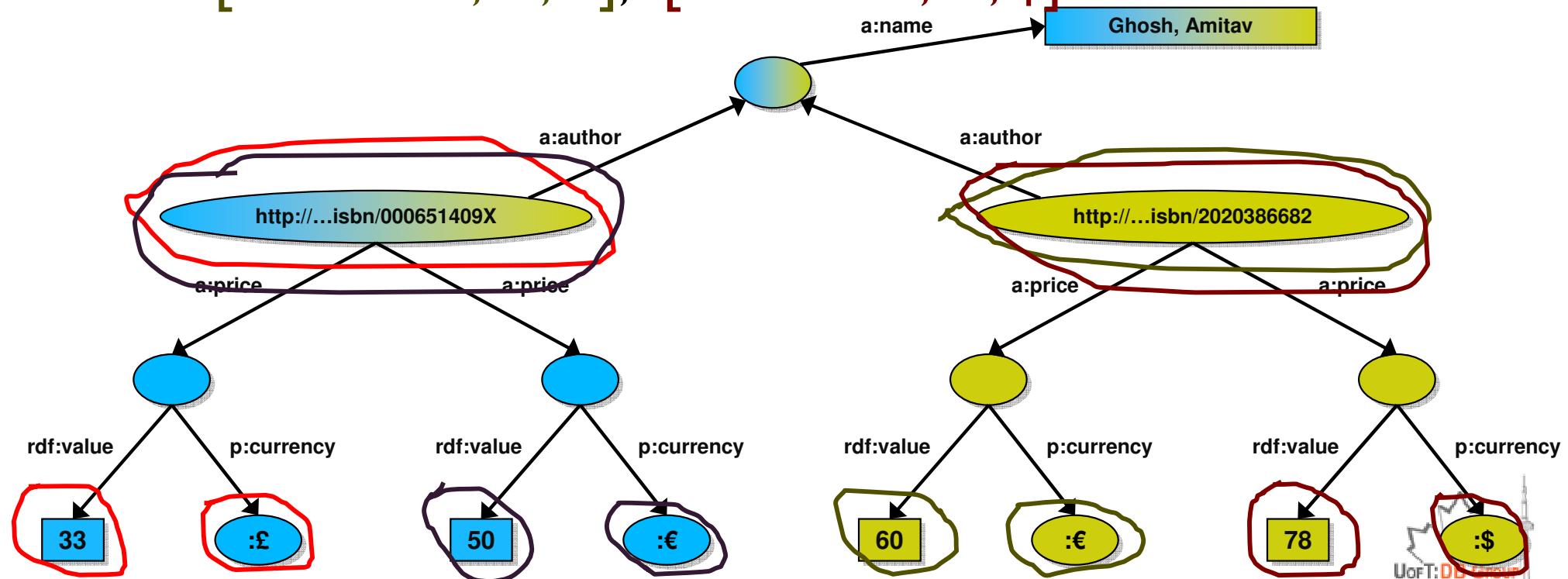
Based on presentation by Ivan Herman, available at <http://www.w3.org/2010/Talks/0622-SemTech-IH/>

Simple SPARQL example

33

```
SELECT ?isbn ?price ?currency # note: not ?x!
WHERE { ?isbn a:price ?x .
        ?x rdf:value ?price .
        ?x p:currency ?currency. }
```

Returns: [[<...409X>](#),[33](#),:[£](#)], [[<...409X>](#),[50](#),:[€](#)],
[[<...6682>](#),[60](#),:[€](#)], [[<...6682>](#),[78](#),:[\\$](#)]

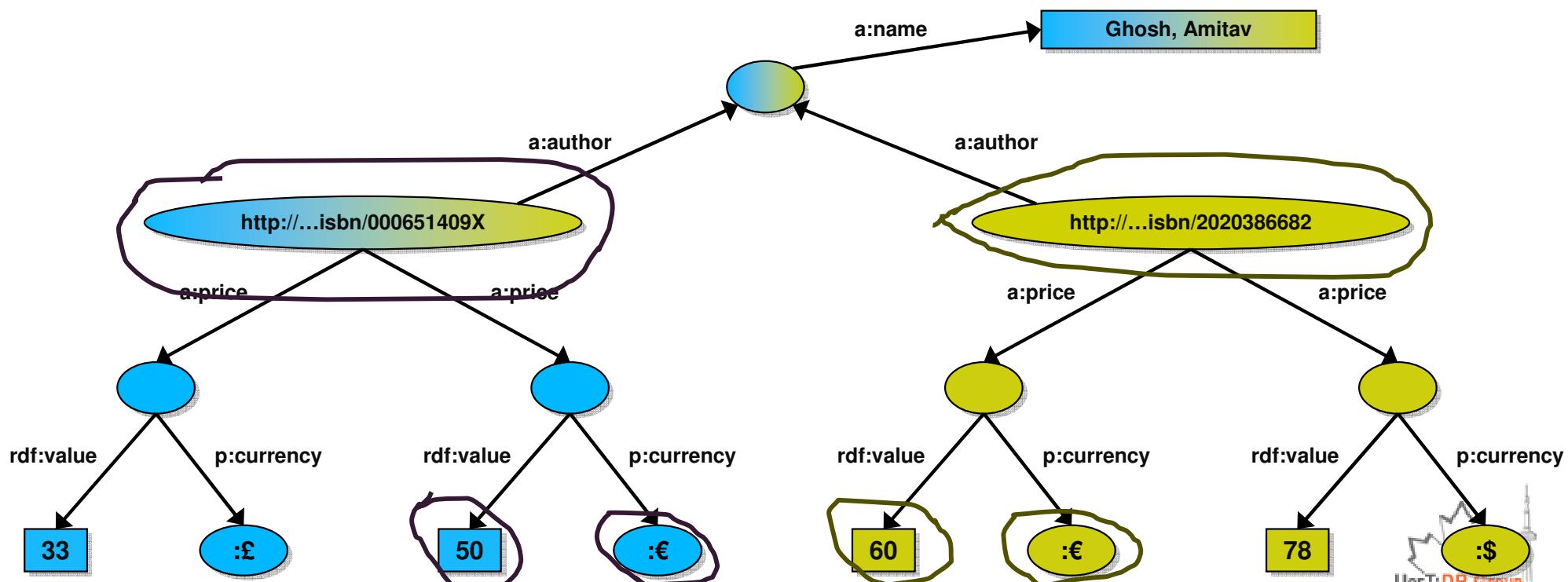


Pattern constraints

34

```
SELECT ?isbn ?price ?currency # note: not ?x!
WHERE { ?isbn a:price ?x .
        ?x rdf:value ?price .
        ?x p:currency ?currency .
        FILTER(?currency == :€) }
```

Returns: [<...409X>,50,:€], [<...6682>,60,:€]



Many other SPARQL features

35

- Limit the number of returned results; remove duplicates, sort them, ...
- Optional branches: if some part of the pattern does not match, ignore it
- Specify several data sources (via URI-s) within the query (essentially, a merge on-the-fly!)
- Construct a graph using a separate pattern on the query results
- In SPARQL 1.1: updating data, not only query

A good reference: SPARQL By Example

<http://www.cambridgesemantics.com/2008/09/sparql-by-example/>



SPARQL usage in practice

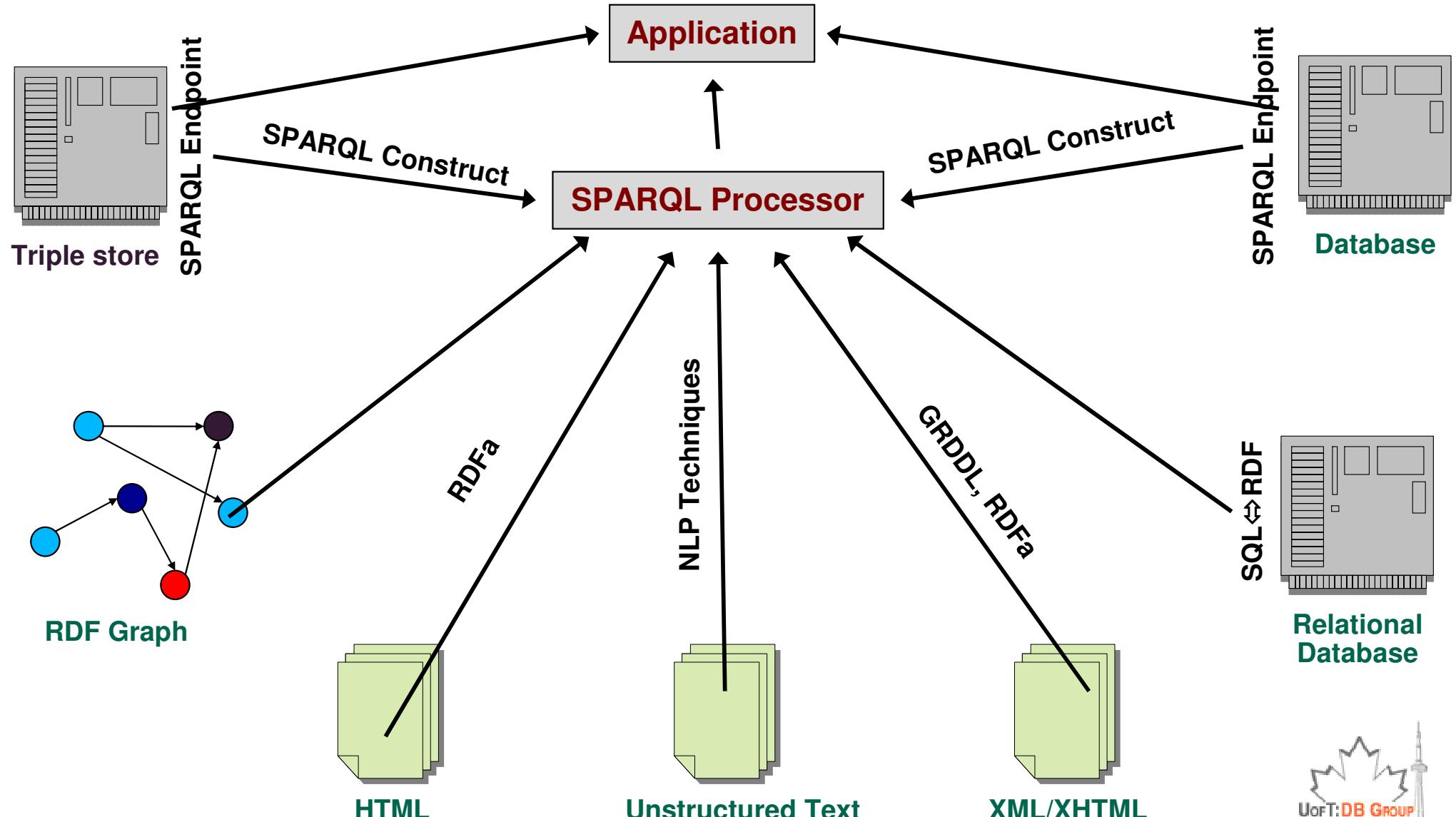
36

- SPARQL is usually used over the network
 - ▣ Separate documents define the protocol and the result format
 - SPARQL Protocol for RDF with HTTP and SOAP bindings
 - SPARQL results in XML or JSON formats
- Big datasets often offer “SPARQL endpoints” using this protocol
 - ▣ Typical example: SPARQL endpoint to DBpedia



SPARQL as a unifying point

37



Other Semantic Web Technologies

38

- Web Ontology Language (OWL)
 - A family of knowledge representation languages for authoring ontologies for the Web
- RDF Schema (RDFS)
 - RDF Vocabulary Description Language
 - <http://www.w3.org/TR/rdf-schema/>
 - How to use RDF to describe RDF vocabularies
- Other RDF Vocabularies
 - Simple Knowledge Organization System (SKOS)
 - Designed for representation of thesauri, classification schemes, taxonomies, subject-heading systems, or any other type of structured controlled vocabulary
 - FOAF (Friend of a friend)
 - A machine-readable ontology describing persons, their activities and their relations to other people and objects.

Linked Data

Linked Data Principles
Linking Open Data Community Project

Linked Data

40

- *Linked Data* is a way of publishing data on the (Semantic) Web that:
 - Encourages reuse
 - Reduces redundancy
 - Maximises its (real and potential) inter-connectedness
 - Enables network effects to add value to data



Principles of Linked Data

41

1. *Use URIs as names for things*
2. *Use HTTP URIs so that people can look up those names*
3. *When someone looks up a URI, provide useful (RDF) information*
4. *Include RDF statements that link to other URIs so that they can discover related things*

Tim Berners-Lee 2007

<http://www.w3.org/DesignIssues/LinkedData.html>



Linking Open Data Community Project

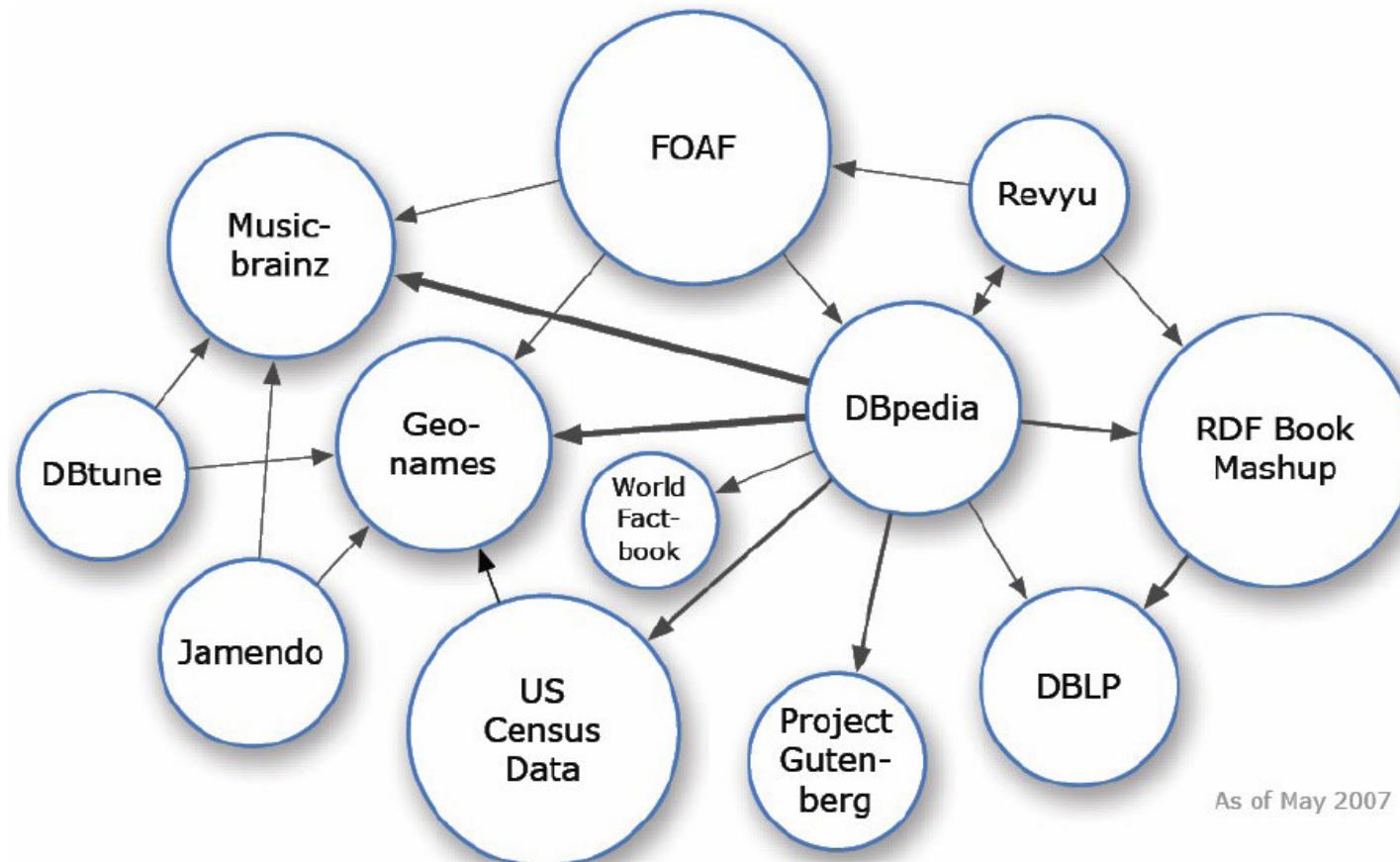
42



- A W3C SWEO community effort to
 - Publish existing open license datasets as Linked Data on the Web
 - Interlink things between different data sources
 - Develop clients that consume Linked Data from the Web

Linked Open Data Cloud of Data Sets

43

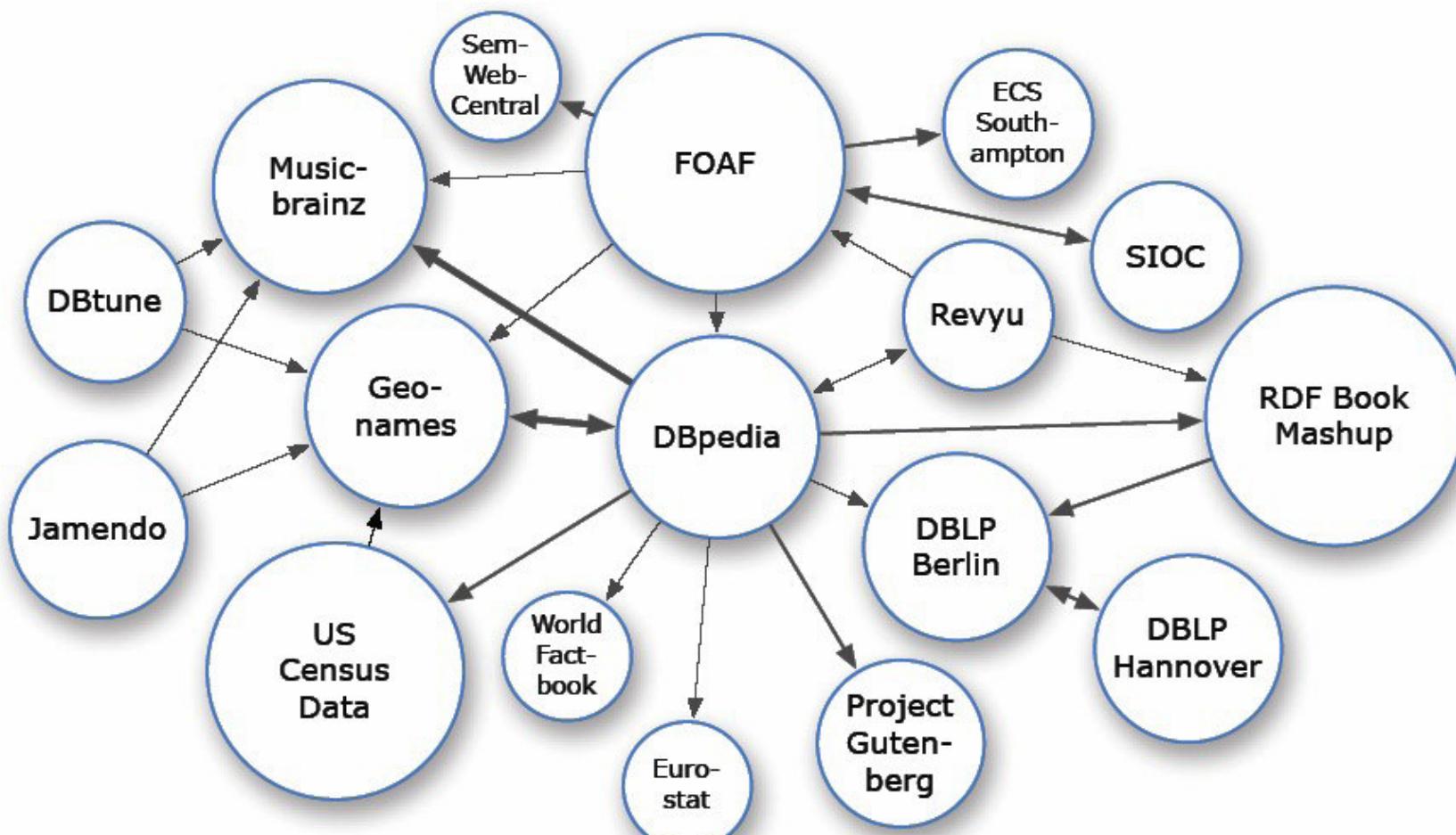


- Over 500 million RDF triples
- Around 120,000 RDF links between data sources

"Linking Open Data cloud diagram, by Richard Cyganiak and Anja Jentzsch. <http://lod-cloud.net/>"

LOD Cloud – July 2007

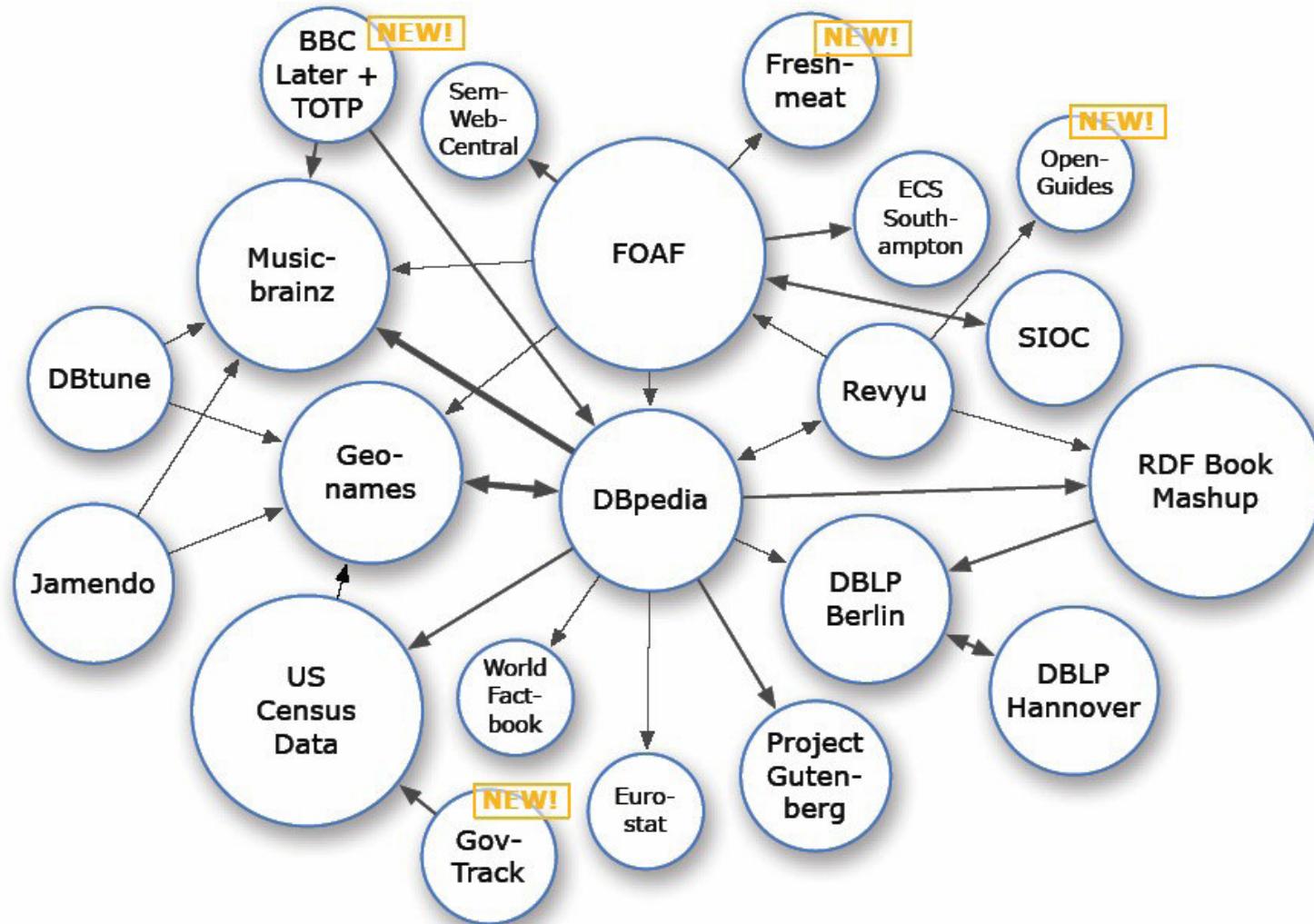
44



"Linking Open Data cloud diagram, by Richard Cyganiak and Anja Jentzsch. <http://lod-cloud.net/>"

LOD Cloud – August 2007

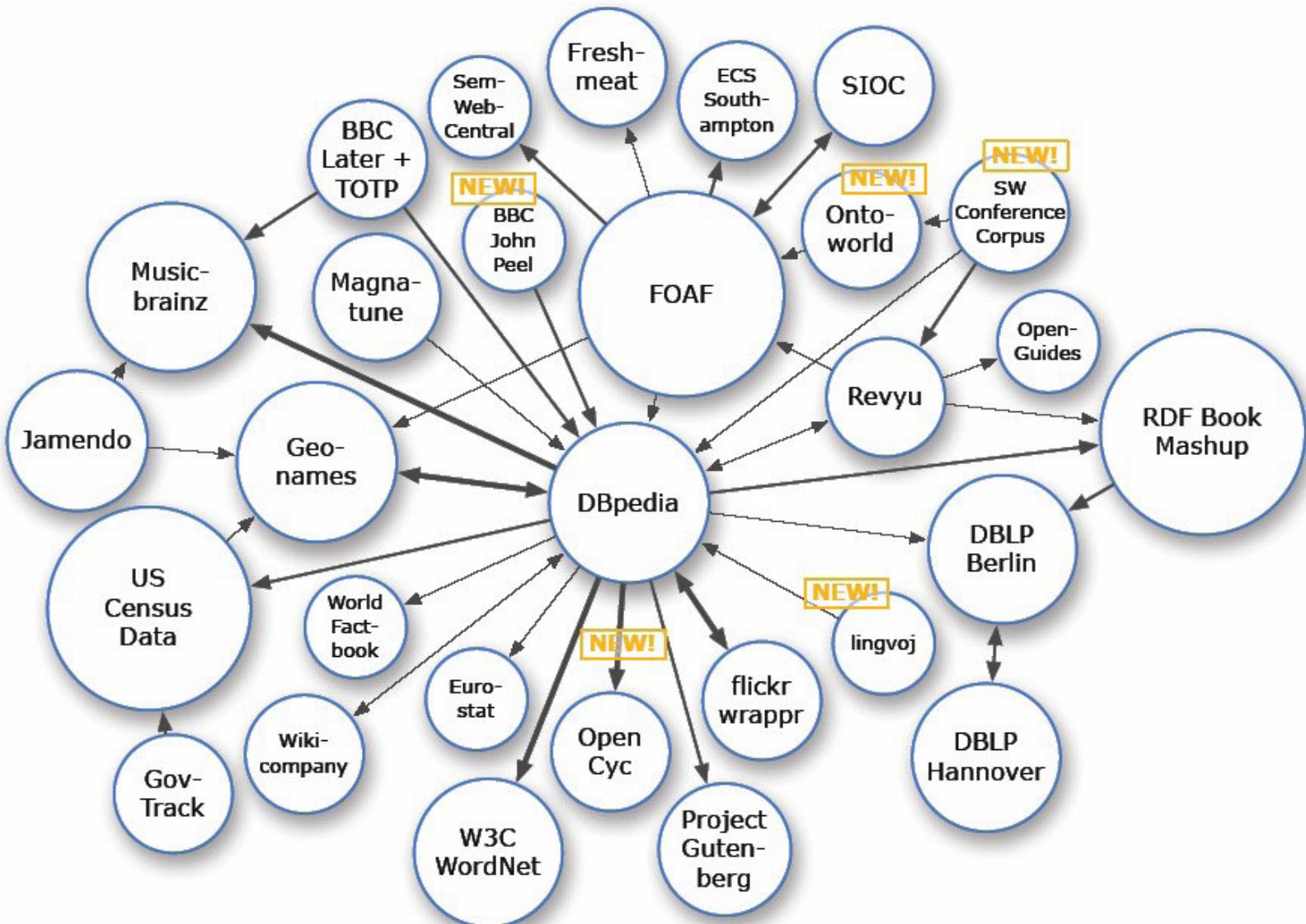
45



"Linking Open Data cloud diagram, by Richard Cyganiak and Anja Jentzsch. <http://lod-cloud.net/>"

LOD Cloud – November 2007

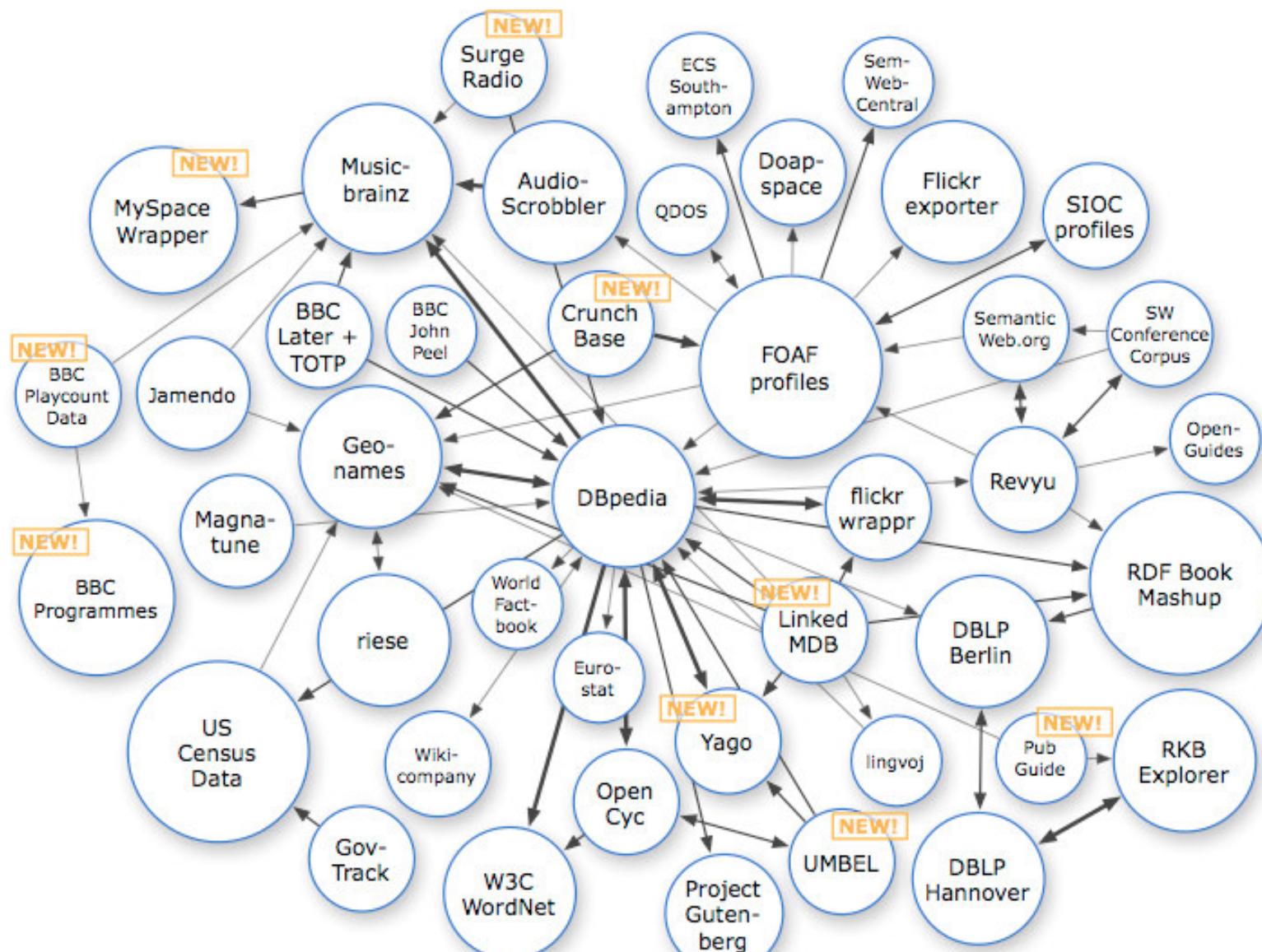
46



"Linking Open Data cloud diagram, by Richard Cyganiak and Anja Jentzsch. <http://lod-cloud.net/>"

LOD Cloud September 2008

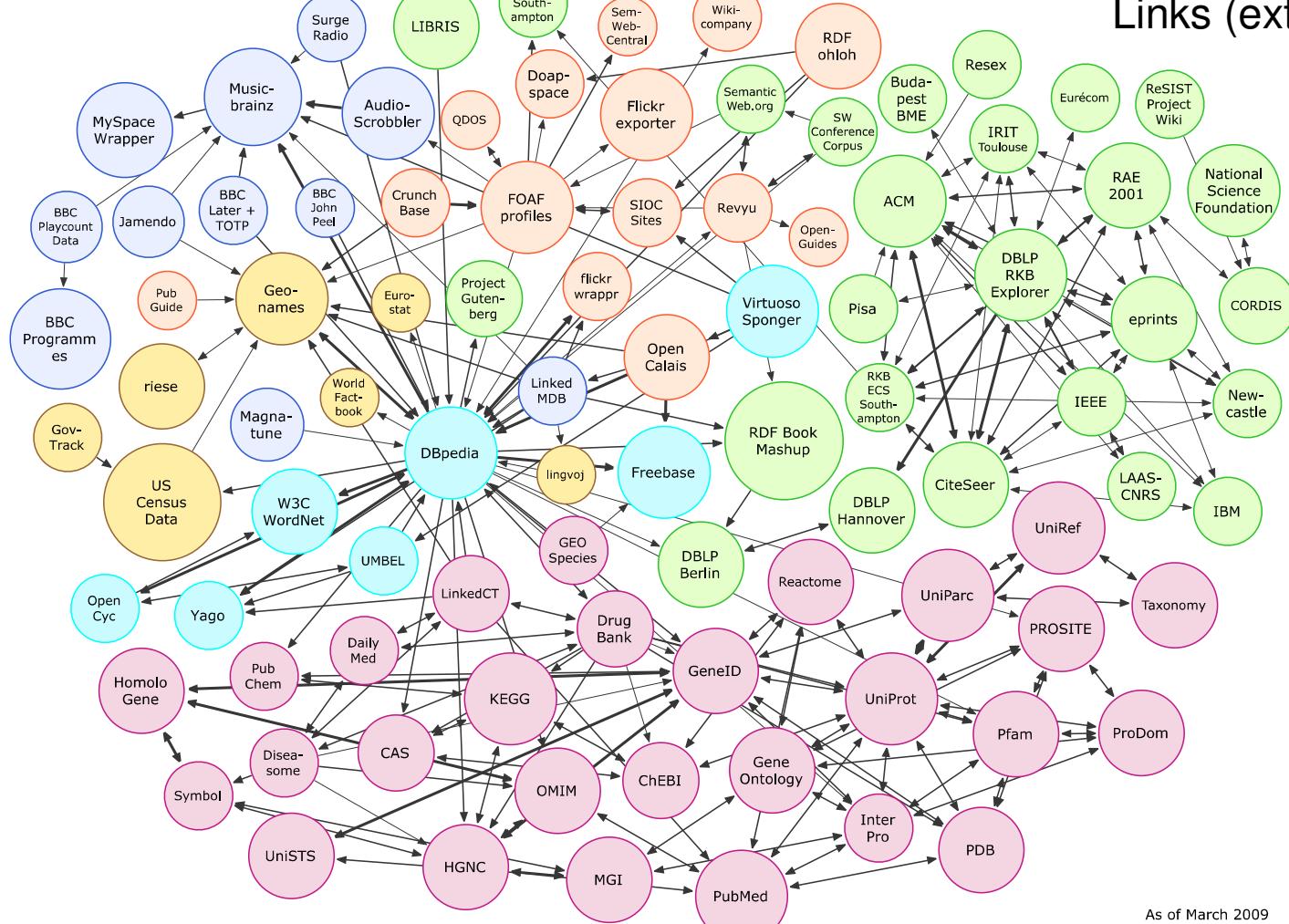
47



LOD Cloud – March 2009

48

Overall Statistics
Triples #: 7.7 billion
Links (external) #: 142 million



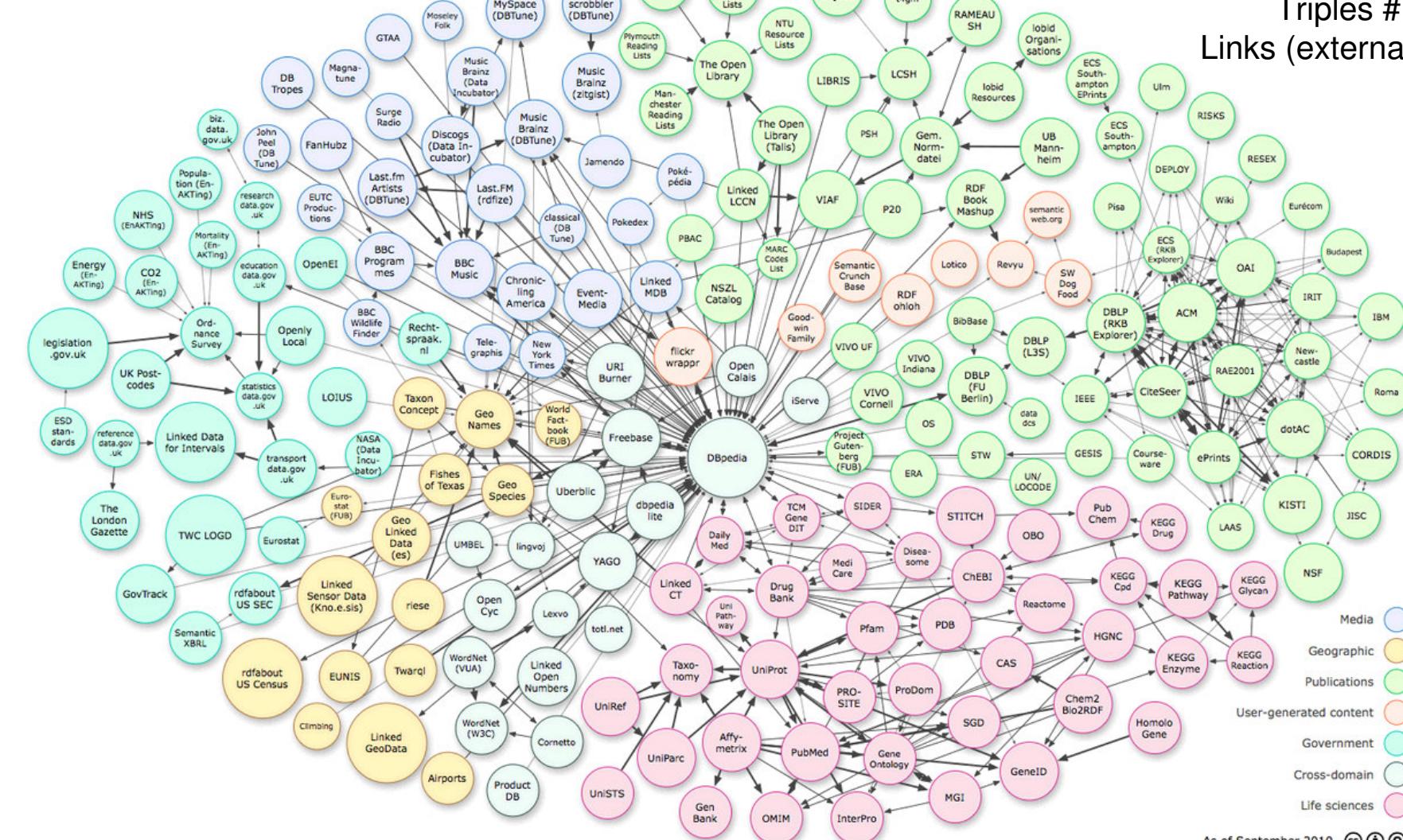
As of March 2009



LOD Cloud – September 2010

49

Overall Statistics
 Triples #: ~25 billion
 Links (external) #: ~440 million



"Linking Open Data cloud diagram, by Richard Cyganiak and Anja Jentzsch. <http://lod-cloud.net/>"

Properties of Web of Linked Data

50

- Anyone can publish data on the Web of Linked Data
- Entities are connected by links
 - ▣ Creating a global data graph that spans data sources and enables the discovery of new data sources.
- Data is self-describing
 - ▣ If an application encounters data represented using an unfamiliar vocabulary, the application can resolve the URLs that identify vocabulary terms in order to find their RDFS or OWL definition.
- The Web of Data is open
 - ▣ Meaning that applications can discover new data sources at run-time by following links.



Linked Data

Example Linked Data Sources

Example Applications

DBpedia

52

- Linked data source created by:
 - Extracting structured information from Wikipedia
 - Using “infobox” of the articles
 - Establishing links to other external sources

The screenshot shows a Microsoft Internet Explorer window displaying the English Wikipedia article for "Calgary". The title "Calgary" is at the top, followed by a short summary and the text: "This article is about the Canadian city. For other uses, see [Calgary \(disambiguation\)](#)". Below this, there is a detailed paragraph about the city's location and population. To the right of the main text, there is a sidebar with a "Calgary" infobox containing the city's name, status as a city, and a photo of the Calgary skyline. At the bottom right, there is a logo for "UoT: DB Group" featuring a stylized maple leaf and a line graph.

W Calgary - Wikipedia, th... en.wikipedia.org/wiki/Calgary Log in / create account

Article Discussion Read Edit View history Search

Coordinates: 51°02'42"N 114°03'26"W

Calgary

From Wikipedia, the free encyclopedia

This article is about the Canadian city. For other uses, see [Calgary \(disambiguation\)](#).

Calgary (/kælɡəri/) is the largest city in the [Province of Alberta, Canada](#). It is located in the south of the province, in an area of foothills and [prairie](#), approximately 80 km (50 mi) east of the front ranges of the [Canadian Rockies](#). The city is located in the Grassland region of Alberta.

In 2006, the City of Calgary had a population of 988,193 making it the [third-largest](#) municipality in the country and largest in [Alberta](#).^[2] The entire metropolitan area had a 2006 population of 1,079,310, making it the [fifth-largest census metropolitan area](#) (CMA) in Canada.^[3] In 2009, Calgary's metropolitan population was estimated at 1,230,248, raising its rank to fourth-largest CMA in Canada.^[4]

Located 294 km (183 mi) due south of [Edmonton](#), statisticians define the narrow populated area between these cities as the "[Calgary–Edmonton Corridor](#)".^[5] Calgary is the largest [Canadian metropolitan area](#) between [Toronto](#) and [Vancouver](#).

Calgary is a destination for [winter sports](#) and [ecotourism](#) with a number of major mountain resorts near the city and metropolitan area. Economic activity in Calgary is mostly centred on the [petroleum industry](#). [Agriculture](#), [tourism](#) and high-tech industries also contribute to the city's economic growth. In 1988, Calgary became the

Calgary — City — City of Calgary

Calgary skyline

UoT: DB Group

From Info Boxes to Linked Data

53

Calgary	
 Downtown Calgary.	
Government	
- Mayor	Dave Bronconnier (Past mayors)
- Governing body	Calgary City Council
- Manager	Owen A. Tobert
Area ^[1]	
- City	726.50 km ² (280.5 sq mi)
- Metro	5,107.43 km ² (1,972 sq mi)
Elevation	1,048 m (3,438.3 ft)
Population (2006) ^[1]	
- City	988,193
- Density	1,360.2/km ² (3,522.9/sq mi)
- Metro	1,079,310
- Population rank	3rd
- Metro rank	5th



<http://en.wikipedia.org/wiki/Calgary>

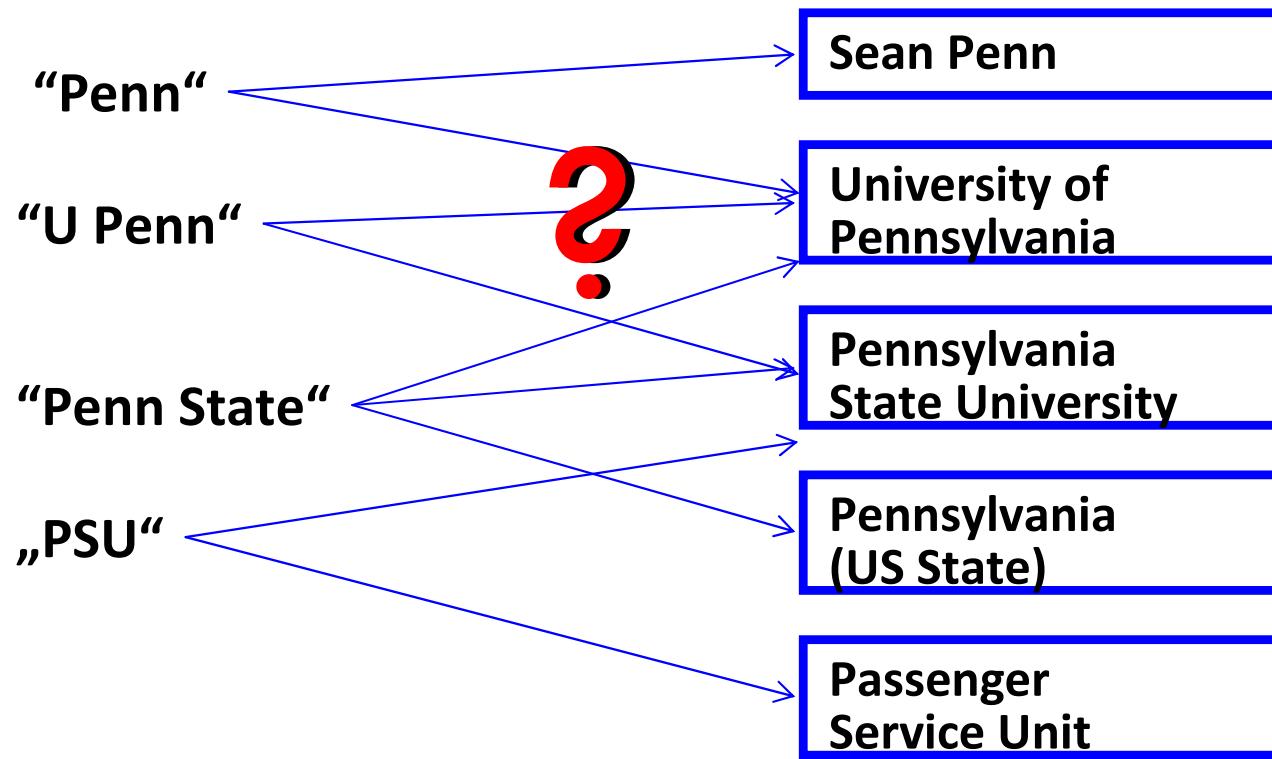
```
<http://dbpedia.org/resource/Calgary>
  dbpedia:native_name "Calgary" ;
  dbpedia:elevation "1048" ;
  dbpedia:population_city "988193" ;
  dbpedia:population_metro "1079310" ;
  mayor_name
    dbpedia:Dave_Bronconnier ;
  governing_body
    dbpedia:Calgary_City_Council ;
  ...
```

Based on presentation by Anja Jentzsch, available at http://www.swib09.de/vortraege/20091124_jentzsch.pdf

Information Extraction

54

- Why only info boxes?
- Extraction from text could be very challenging
 - One of many problems: Entity Disambiguation



DBpedia Data

55

D SPARQL Explorer for h... +

← → C dbpedia.org/snorql/?query=PREFIX+dbpedia-owl%3A+<http%3A%2F%2Fdbpedia.org%2Fontology%2I☆ 🍀 ↻

SPARQL Explorer for http://dbpedia.org/sparql

SPARQL:

```
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX foaf: <http://xmlns.com/foaf/0.1/>
PREFIX dc: <http://purl.org/dc/elements/1.1/>
PREFIX : <http://dbpedia.org/resource/>
PREFIX dbpedia2: <http://dbpedia.org/property/>
PREFIX dbpedia: <http://dbpedia.org/>
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>

PREFIX dbpedia-owl: <http://dbpedia.org/ontology/>
SELECT ?name ?birthDate ?occupation WHERE {
    ?person dbpedia-owl:birthPlace <http://dbpedia.org/resource/Toronto> .
    ?person dbpedia-owl:birthDate ?birthDate .
    ?person foaf:name ?name .
    ?person dbpedia-owl:occupation ?occupation .
    FILTER (?birthDate < "1900-01-01"^^xsd:date) .
}
```

Results: Browse ▾ Go! Reset

SPARQL results:

name	birthDate	occupation
"Allan Dwan"@en	"1885-04-03"^^xsd:date	:Screenwriter ↗
"Allan Dwan"@en	"1885-04-03"^^xsd:date	:Film_director ↗
"Conn Smythe"@en	"1895-02-01"^^xsd:date	:Conn_Smythe_Sports_team_owner ↗
"Conn Smythe"@en	"1895-02-01"^^xsd:date	:Conn_Smythe_Racehorse_owner%2Fbreeder ↗
"William Henry Withrow"@en	"1839-08-06"^^xsd:date	:Journalist ↗
"William Henry Withrow"@en	"1839-08-06"^^xsd:date	:Author ↗
"William Henry Withrow"@en	"1839-08-06"^^xsd:date	:William_Henry_Withrow_Methodist_minister%2C_journalist%2C_author ↗

Example App: DBpedia Mobile

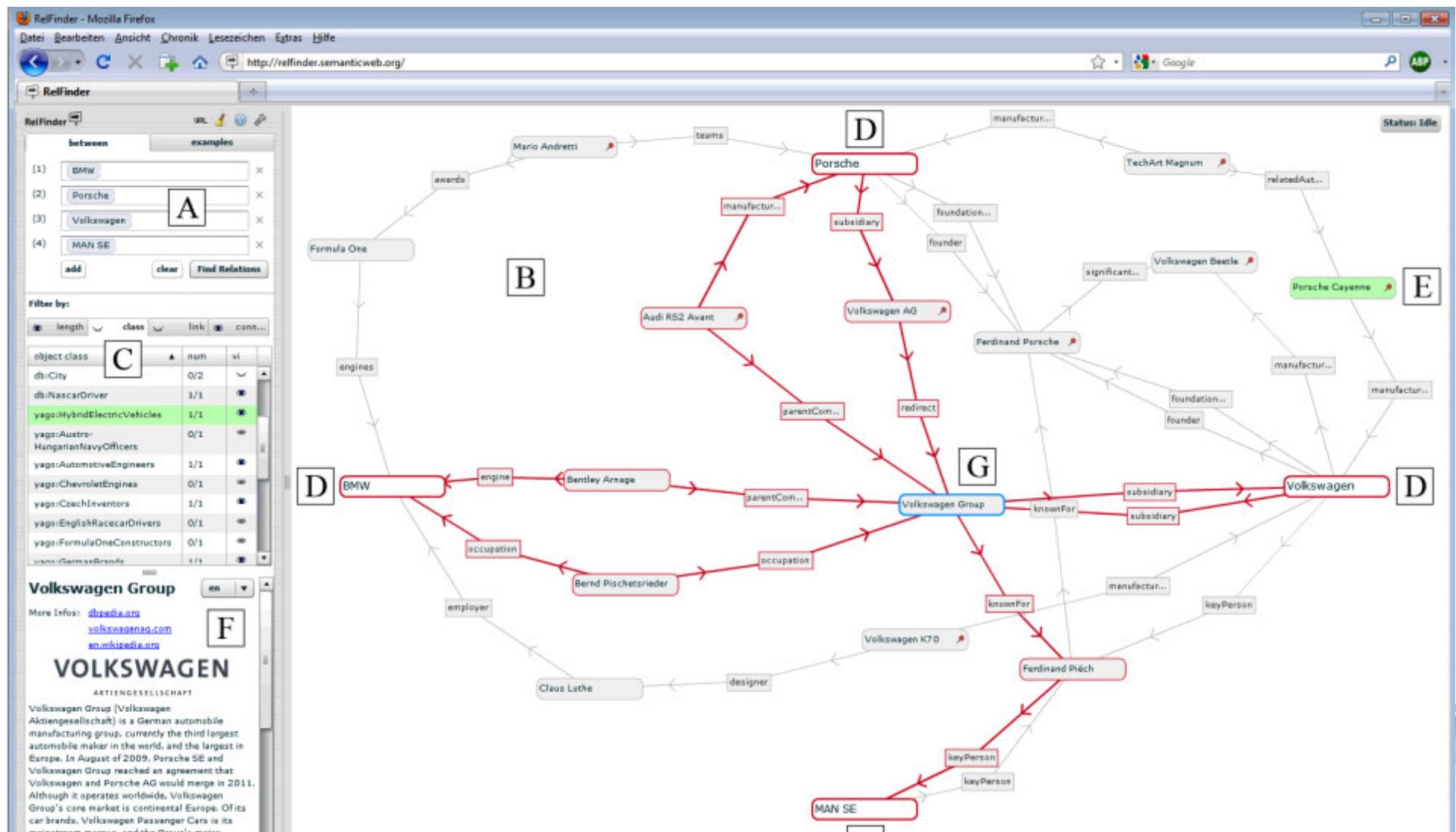
56



DBpedia RelFinder <http://relnetwork.dbpedia.org/>

57

□ Interactive online relationship discovery



Freebase

58

- Free (open, CC-licensed) web repository of over 12 million things (objects) of almost any type (movies, books, celebrities, locations, companies and more.)
 - Centralized, community-driven approach to publishing Linked Data
 - Each object has a globally unique identifier (GUID)
 - Data can be retrieved in RDF or JSON
 - Nice APIs, a query language (MQL), and a set of tools to simplify editing, publishing or retrieving the data

Freebase Interface

59

University of Toronto f... x

www.freebase.com/view/en/university_of_toronto

Freebase Find topics... Data Schema Apps Docs Sign In or Sign Up

University of Toronto

Scroll to:

- Education
- Employer
- Location
- Organization
- Architectural structure owner
- Tourist attraction
- Ranked item
- More...

 The University of Toronto (U of T, UToronto, or simply Toronto) is a public research university in Toronto, Ontario, Canada, situated on the grounds that surround Queen's Park. It was founded by royal charter in 1827 as King's College, the first institution of higher learning in Upper Canada. Originally controlled by the Church of England, the university assumed the present name in 1850 upon becoming a secular institution. As a collegiate univers... [More](#)

[W Read article at Wikipedia](#)

Time zone(s): North American Eastern Time Zone

School type: Public university

Contained by: Toronto, Ontario, Canada

Education

Students/Graduates:

Student	Start Date	End Date	Degree	Major/Field Of Study
David Weinberger	1973	1978	Doctorate	Philosophy
Norman J. Wildberger				
John Tuzo Wilson				
Robert Birgeneau				
Dwayne Benjamin				
Lawrence Morley				
Frederick Banting				
Duncan D. Derry				

These people have edited this topic:



[Edit this topic](#)

Last edited Feb 10, 2011 See all topic history »

Related Topics

 [University of California, Berkeley](#)

 [University of Washington](#)

 [Rutgers University](#)

 [University of Virginia](#)

University of Toronto elsewhere on the web

 [Official Website](#)

 [Wikipedia](#)

Freebase Data

60

University of Toronto f... www.firebaseio.com/ex... Freebase - Inspect - /e... +
www.firebaseio.com/inspect/en/university_of_toronto

Freebase Find topics... Data Schema Apps Docs Sign In or Sign Up

Inspect /en/university_of_toronto

University of Toronto Topic

Created by /user/metaweb on 2006-10-22T09:28:59.005Z
id: /en/university_of_toronto mid: /m/07wjk guid: #9202a8c04000641f800000000003ee11 permission: /boot/all_permission

[View Topic](#) [Build Query](#)

Names & Aliases (13)

source	property	target	creator	timestamp
-	/type/object/name	Университет Торонто /type/text /lang/ru	/user/wikipedia_intl/attr/2	2010-09-22T02:33:42.00003Z
-	/type/object/name	Uniwersytet Toronto /type/text /lang/pl	/user/mwcl_wikipedia_en	2007-09-28T04:20:29.0021Z
-	/type/object/name	Universidade de Toronto /type/text /lang/pt	/user/mwcl_wikipedia_en	2007-09-26T23:21:54.0024Z
-	/type/object/name	Toronton yliopisto /type/text /lang/fi	/user/mwcl_wikipedia_en	2007-09-26T00:49:35.0012Z
-	/type/object/name	多倫多大學 /type/text /lang/zh	/user/mwcl_wikipedia_en	2007-09-25T23:59:26.0047Z
-	/type/object/name	Universitato de Toronto /type/text /lang/eo	/user/mwcl_wikipedia_en	2007-09-25T23:24:57.00009Z
-	/type/object/name	Universitas Toronto /type/text /lang/id	/user/mwcl_wikipedia_en	2007-09-25T02:05:04.0014Z
-	/type/object/name	Universidad de Toronto /type/text /lang/es	/user/mwcl_wikipedia_en	2006-10-22T09:28:59.0067Z
-	/type/object/name	トロント大学 /type/text /lang/ja	/user/mwcl_wikipedia_en	2006-10-22T09:28:59.0066Z
-	/type/object/name	Università di Toronto /type/text /lang/it	/user/mwcl_wikipedia_en	2006-10-22T09:28:59.0065Z
-	/type/object/name	University of Toronto /type/text /lang/de	/user/mwcl_wikipedia_en	2006-10-22T09:28:59.0064Z
-	/type/object/name	University of Toronto /type/text /lang/en	/user/mwcl_wikipedia_en	2006-10-22T09:28:59.0063Z
-	/type/object/name	Université de Toronto /type/text /lang/fr	/user/mwcl_wikipedia_en	2006-10-22T09:28:59.0062Z

Keys (44)

source	property	namespace	value	creator	timestamp
-	/type/object/key	wikipedia/es_id	345420	/user/wikipedia_intl/attr/4	2010-09-29T04:49:22.00007Z

Names & Aliases

Filter this data

By Domain:

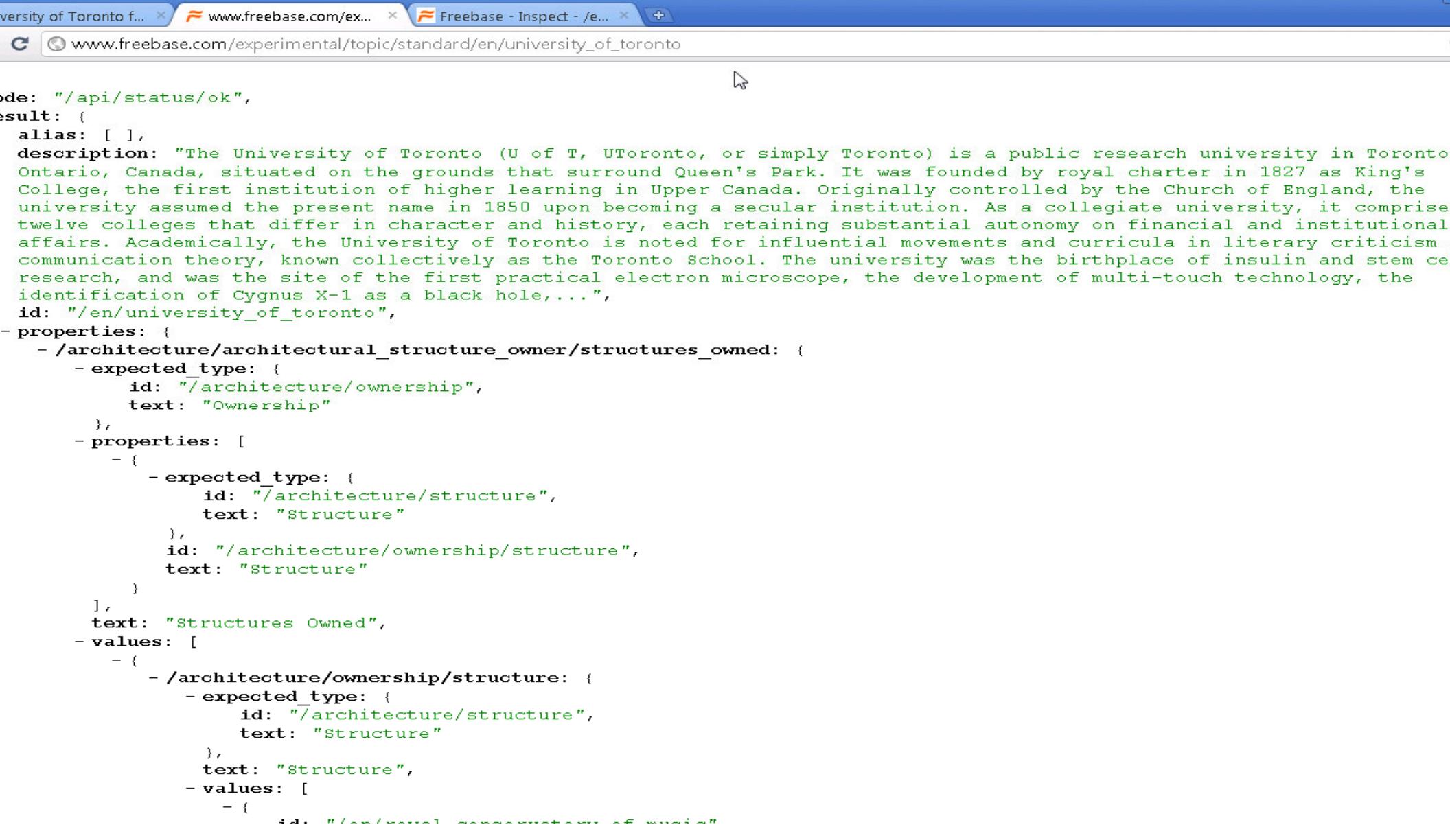
- /education 1.4k
- /business 200+
- /type 30+
- /base/upgrade <10
- /location <10
- /common <10
- /organization <10
- /time <10
- /base/bibkn <10
- /base/ontologies <10
- choose...

By Time:

- today
- yesterday
- this week

Freebase Data

61



The screenshot shows a web browser window with three tabs open. The active tab is titled "www.firebaseio.com/ex...". The URL in the address bar is "www.firebaseio.com/experimental/topic/standard/en/university_of_toronto". The page content displays a JSON-like structure representing data about the University of Toronto. The data includes fields like "ode", "result", "alias", "description", "id", "properties", and "values". The "description" field contains a detailed paragraph about the university's history and achievements. The "properties" and "values" sections show relationships to architectural structures and ownership types.

```
ode: "/api/status/ok",
result: {
  alias: [ ],
  description: "The University of Toronto (U of T, UToronto, or simply Toronto) is a public research university in Toronto, Ontario, Canada, situated on the grounds that surround Queen's Park. It was founded by royal charter in 1827 as King's College, the first institution of higher learning in Upper Canada. Originally controlled by the Church of England, the university assumed the present name in 1850 upon becoming a secular institution. As a collegiate university, it comprises twelve colleges that differ in character and history, each retaining substantial autonomy on financial and institutional affairs. Academically, the University of Toronto is noted for influential movements and curricula in literary criticism, communication theory, known collectively as the Toronto School. The university was the birthplace of insulin and stem cell research, and was the site of the first practical electron microscope, the development of multi-touch technology, the identification of Cygnus X-1 as a black hole,...",
  id: "/en/university_of_toronto",
  properties: {
    - /architecture/architectural_structure_owner/structures_owned: {
      - expected_type: {
        id: "/architecture/ownership",
        text: "Ownership"
      },
      - properties: [
        {
          - expected_type: {
            id: "/architecture/structure",
            text: "Structure"
          },
          id: "/architecture/ownership/structure",
          text: "Structure"
        }
      ],
      text: "Structures Owned",
      - values: [
        {
          - /architecture/ownership/structure: {
            - expected_type: {
              id: "/architecture/structure",
              text: "Structure"
            },
            text: "Structure",
            - values: [
              {
                - /architecture/structure: {
                  id: "/architecture/structure",
                  text: "Structure"
                }
              }
            ]
          }
        }
      ]
    }
  }
}
```

Freebase Applications

62

www.firebaseio.com/view.firebaseio/metaweb_application

Freebase Application

table started by danm for the [Freebase Commons](#)
'Freebase Application' is a type used to describe applications developed using MQL and the Freebase API. [More](#)

[Edit Description](#)

393 Freebase Application topics [Filter this Collection](#)

[Add More Topics](#) [Save as...](#)

Sort by Date Added ↓

Showing 1 - 60 next

Image	Name	Developed By (User)	Description
	Image Search	daepark	A simple gallery of images based on a search term. It will display: <ul style="list-style-type: none">- images related to topics matching the search term- images with the search term in the name- images with the search term in the caption
	Akuma Movie Game	vtalwar	This addictive movie guessing game lets you expose clues one at a time in an effort to figure out the movie title. If you've mastered the movies in English, try the international ones!
	Cinespin	ketananjaria	CineSpin is a graphical browser for films, actors and directors. Try CineSpin now. Note: CineSpin requires Flash 9. Make sure at least version 9.0.28.0 is installed. http://www.macromedia.com/software/flash/about/
	MJT Type Browser	nix robert	This is a very high-speed and geeky domain and type browser for Freebase written in MJT.



Popular Freebase Apps

63

- [Google Refine](#) - a power tool for data cleaning and discovery.
- [Powerset](#) - a semantic search engine that searched Freebase for answers to natural-language questions (purchased by Microsoft and used in their [Bing](#) search engine)
- [Freebase genealogy](#) - family-tree viewer
- [FMDb](#) - a Freebase [IMDB](#)
- [Freebase sets](#) - a clone of [Google sets](#) using Freebase data
- [Parallax data viewer](#) - an alternative UI
- [Freebase Schema Explorer](#) - a visualiser for Freebase's [ontologies](#)
- [2D Visualiser](#) - a Java app browser
- [Thinkbase](#) - a visual graph-based exploration tool

Source: Wikipedia - [http://en.wikipedia.org/wiki/Freebase_\(database\)](http://en.wikipedia.org/wiki/Freebase_(database))



LinkedMDB

64

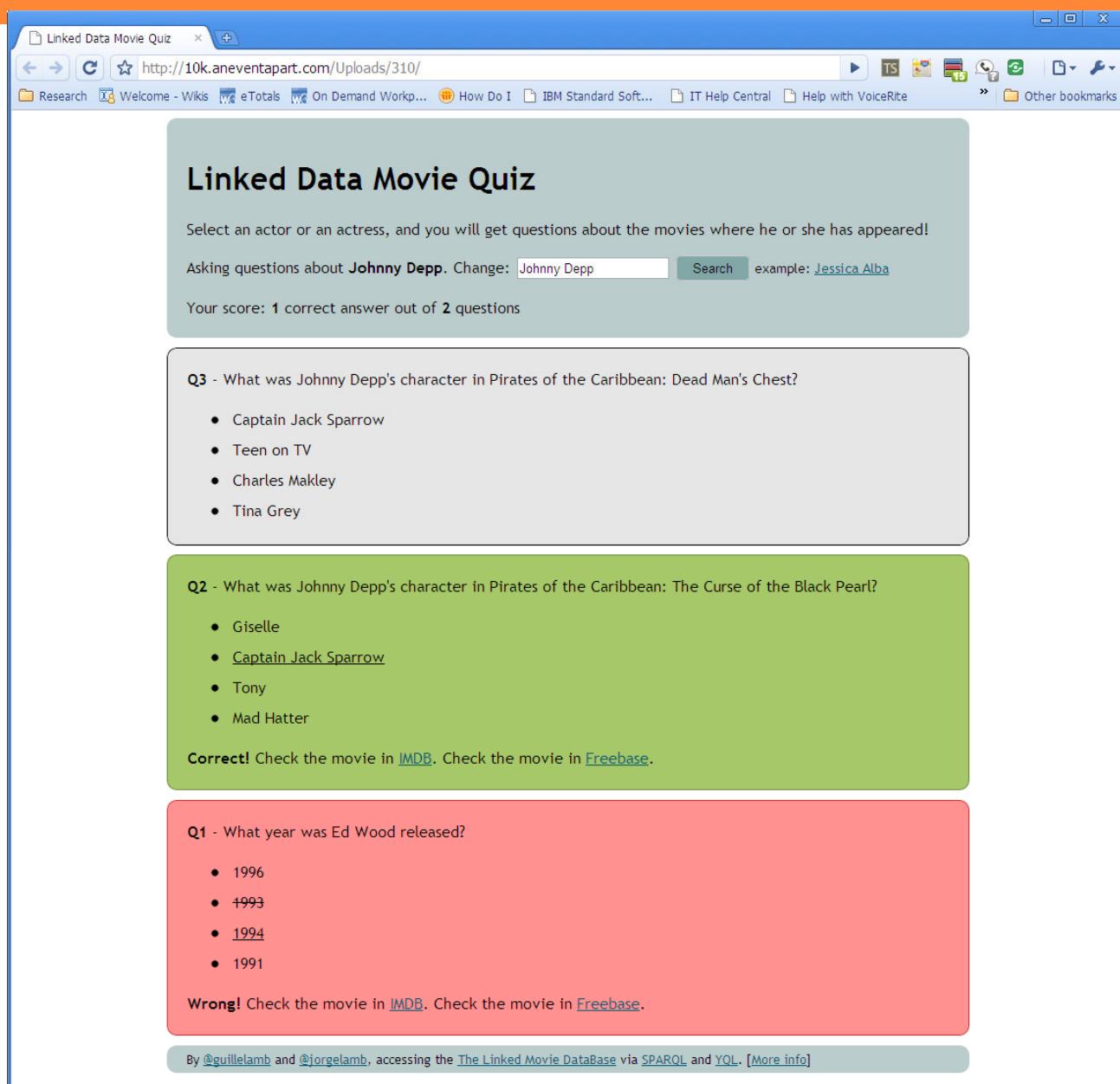


- The first Linked Data source dedicated to movies and movie-related information
 - Published by D2R Server (Linked Data interface to relational data)
 - Provides links to other linked data sources and movie web sites
 - Meta-data about *how the links are discovered* are published in the form of Linked Data
- Contains ~6 million triples and ~0.5 million external links
- Won the first prize at *Triplification Challenge*
 - I-Semantics Conference, October 2008

Application Built on top of LinkedMDB

65

- Automatically-generated quiz about your favorite actor or actress
 - Web application built in less than 10 KB
 - Uses LinkedMDB's data via SPARQL
 - Try it out:
[http://10k.aneventapart.com/
Uploads/310/](http://10k.aneventapart.com/Uploads/310/)



The screenshot shows a web browser window titled "Linked Data Movie Quiz" with the URL <http://10k.aneventapart.com/Uploads/310/>. The page content is as follows:

Linked Data Movie Quiz

Select an actor or an actress, and you will get questions about the movies where he or she has appeared!

Asking questions about **Johnny Depp**. Change: Search example: [Jessica Alba](#)

Your score: 1 correct answer out of 2 questions

Q3 - What was Johnny Depp's character in Pirates of the Caribbean: Dead Man's Chest?

- Captain Jack Sparrow
- Teen on TV
- Charles Makley
- Tina Grey

Q2 - What was Johnny Depp's character in Pirates of the Caribbean: The Curse of the Black Pearl?

- Giselle
- [Captain Jack Sparrow](#)
- Tony
- Mad Hatter

Correct! Check the movie in [IMDB](#). Check the movie in [Freebase](#).

Q1 - What year was Ed Wood released?

- 1996
- 1993
- 1994
- 1991

Wrong! Check the movie in [IMDB](#). Check the movie in [Freebase](#).

By [@guillelamb](#) and [@jorgelamb](#), accessing the [The Linked Movie DataBase](#) via [SPARQL](#) and [YQL](#). [\[More info\]](#)

Linked Clinical Trials

66

- Part of the Linking Open Drug Data Project under W3C's Health Care and Life Sciences (HCLS) task force
 - Won the first prize at Triplification Challenge
 - I-Semantics Conference, October 2009
- LinkedCT data – <http://linkedct.org>
 - Published by D2R Server
 - from ClinicalTrials.gov data
 - Online registry of clinical trials conducted in the United States and around the world
 - Published in XML
 - Links to several external sources about drugs, diseases, locations, etc.
- Actively working with domain experts (W3C's HCLS members) on increasing the quality of the data and the links based on real use cases
 - See: *Enabling Tailored Therapeutics with Linked Data* By A. Jentzsch et al. at LDOW2010

BibBase

67

□ Goals

- Makes it easy for scientists and research groups to maintain publications pages
 - Users maintain a BibTeX file; BibBase does the rest
 - Publishes a good-looking custom HTML page
 - Publishes the data in RDF, with a SPARQL endpoint
 - Links entries to the open linked data cloud on-the-fly
- With incentive, scientists are helping us build a high-quality bibliographic database (think DBLP but automated)
- Invaluable data set for benchmarking duplicate detection and semantic link discovery systems

BibBase

68

```
miller.bib
1 @article{Riz+10,
2   author = {Flavio Rizzolo and Alejandro A. Vaisman and R. J. Miller and M. Consens},
3   title = {Exploring XML web collections with DescribeX},
4   journal = {TWEB},
5   volume = {4},
6   number = {3},
7   year = {2010},
8 }
9
10
11 @article{GAMH10,
12   author = {B. Glavic and G. Alonso and R. J. Miller and L. M. Haas},
13   title = {{TRAMP: Understanding the Behavior of Schema Mappings through Provenance}},
14   year = 2010,
15   journal = {PVLDB},
16   volume = {3},
17   number = {1},
18   note = {To appear.}
19 }
20
21 @article{HHM10,
22   title = {{Just-in-time Data Integration in Action}},
23   author = {M. Hentschel and L. Haas and R. J. Miller},
24   year = 2010,
25   journal = {PVLDB},
26   volume = {3},
27   number = {2},
28   note = {System Demonstration. To appear.}
29 }
30
31 @article{Bot+10,
32   author = {I. Botan and R. Derakhshan and N. Dindar and L. Haas and R. J. Miller and N. Tatbul},
33   title = {{SECRET: A Model for Analysis of the Execution Semantics of Stream Processing Systems}},
34   year = 2010,
35   journal = {PVLDB},
36   volume = {3},
37   number = {1},
38   note = {To appear.}
39 }
```

BibBase

69

Renée J. Miller

(from <http://www.cs.toronto.edu/~miller>)

[Home](#) | [Projects](#) | [Professional Service](#) | [Publications](#) | [Students & Teaching](#) | [Awards & Funding](#)

 [RSS Feed](#) group by: generated by BIBBASE_β

2010 (6)

Composing local-as-view mappings: closure and applications. Arocena, P. C.; Fuxman, A.; and Miller, R. J. 2010. In *Database Theory - ICDT 2010, 13th International Conference, Lausanne, Switzerland, March 23-25, 2010, Proceedings*, 209-218.



Just-in-time Data Integration in Action. Hentschel, M.; Haas, L.; and Miller, R. J. 2010. *PVLDB*, 3(2):. System Demonstration. To appear.



TRAMP: Understanding the Behavior of Schema Mappings through Provenance. Glavic, B.; Alonso, G.; Miller, R. J.; and Haas, L. M. 2010. *PVLDB*, 3(1):. To appear.



Exploring XML web collections with DescribeX. Rizzolo, F.; Vaisman, A. A.; Miller, R. J.; and Consens, M. 2010. *TWEB*, 4(3):.



Stream schema: providing and exploiting static metadata for data stream processing. Fischer, P. M.; Esmaili, K. S.; and Miller, R. J. 2010. In *EDBT 2010, 13th International Conference on Extending Database Technology, Lausanne, Switzerland, March 22-26, 2010, Proceedings*, 207-218.



SECRET: A Model for Analysis of the Execution Semantics of Stream Processing Systems. Botan, I.; Derakhshan, R.; Dindar, N.; Haas, L.; Miller, R. J.; and Tatbul, N. 2010. *PVLDB*, 3(1):. To appear.



BibBase

70

The screenshot shows a web browser window with a blue title bar. The title bar displays "BibBase³: Renée J. Miller" and the URL "data.bibbase.org/author/renee-j-miller/". The browser interface includes standard buttons for back, forward, and search, along with a star icon for bookmarks and a magnifying glass icon for search.

The main content area of the browser shows the BibBase author profile for Renée J. Miller. The page title is "Author: Renée J. Miller [RDF, Bibtex, BibBase] has 90 publications". Below the title, there is a section titled "See also:" which lists several URLs related to the author's work. At the bottom of this section is a link "« Hide Links.". The page then displays four research publications, each with a title, authors, and a small icon consisting of a globe, a book, and a network node.

See also:

- <http://citeseer.rkbexplorer.com/id/resource-CSP211869-a9c22fb8973f6f825e4328661612fd51>
- <http://citeseer.rkbexplorer.com/id/resource-CSP211842-3f7182dc97f8d9c56eb223184e624155>
- <http://citeseer.rkbexplorer.com/id/resource-CSP211869-552bb01e86fb8336814a144729bf3164e>
- <http://acm.rkbexplorer.com/id/person-719062-c7212333dd5618caf609899dbccc31ff>
- <http://data.semanticweb.org/person/renee-j-miller>
- http://dblp.l3s.de/d2r/resource/authors/Renee_J._Miller
- http://www.informatik.uni-trier.de/~ley/db/indices/a-tree/m/Miller:Ren=eacute=e_J=.html

[« Hide Links.](#)

Composing local-as-view mappings: closure and applications Patricia C. Arocena, Ariel Fuxman, Renée J. Miller. Database Theory - ICDT 2010, 13th International Conference, Lausanne, Switzerland, March 23-25, 2010, Proceedings 209-218 2010

TRAMP: Understanding the Behavior of Schema Mappings through Provenance B. Glavic, G. Alonso, Renée J. Miller, Laura M. Haas. PVLDB 2010

Just-in-time Data Integration in Action Martin Hentschel, Laura M. Haas, Renée J. Miller. PVLDB 2010

Publishing Bibliographic Data on the Semantic Web using BibBase Reynold S. Xin, Oktie Hassanzadeh, Christian Fritz, Yang Yang, Jiang Du, Minghua Zhao, Renée J. Miller. Proceedings of the 9th International Semantic Web Conference (ISWC-10), Poster & Demo Track 2010

Stream schema: providing and exploiting static metadata for data stream processing Peter M. Fischer, Kyumars Sheykh Esmaili, Renée J. Miller. EDBT 2010, 13th International Conference on Extending Database Technology, Lausanne, Switzerland, March 22-26, 2010, Proceedings 207-218 2010

B GROUP

Revyu.com: Review Anything

71

Revyu.com
Review anything

[Home](#) | [Browse Things](#) | [Search Things](#) | [Browse People](#)
[Login/Register](#) | [New Review](#)

The Prestige

Links
Homepage: <http://theprestige.movies.go.com/>
See Also: <http://imdb.com/title/tt0482571/>

Tags
[christian-bale](#) [christopher-nolan](#) [drama](#) [entertainment](#) [film](#) [hugh-jackman](#) [illusion](#) [magic](#) [michael-caine](#) [movie](#) [murder](#) [period](#) [scarlett-johansson](#) [science-fiction](#) [whodunnit](#)

Reviews (1)

 by [martin](#) on 23 Jan 2007
This is a drama about intense rivalry between stage magicians in the late 19th Century. The evocation of the period, although first rate, is not the main attraction, however. The Prestige has an incredibly clever plot including the most ingenious murder I've ever come across. It also has a deeply moving and sad love story hidden in it, which gradually emerges over the course of the film.
The film requires a strong suspension of disbelief on some key points: there is a science-fiction premise which is introduced using the real historical character of Nikola Tesla (I'd rather they had used a fictional scientist). There are a couple more implausibilities required to hold it together (something odd that goes on that none of the characters pick up on and a dead-end that by a huge coincidence turns out not to be a dead-end: I can't be more specific without spoiling the plot).
However, rather than feeling cheated by these aspects of the film, I'm hugely impressed. The writers have taken an implausible (okay, impossible) premise but created an intricate, involving and visual story that would be impossible without that premise. Scenes join up with each other in many subtle ways, echoing the same writers' earlier film Memento. Even when you've seen the twist coming, the final scene which lays it all out is has a lot of impact and I suspect the final shot will haunt my dreams.
I expected the film to be about nice costumes or impressive magical trickery, but it is actually about deep emotions felt by the main characters as they deal with the situations life has dealt them, and it rather than serving up those emotions on a plate, it requires you to think and piece together what you've seen. That's got to be a good thing, in fact the best of what film a be.

What do you think of The Prestige? [Write Your Own Review...](#)

The Prestige

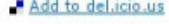


directed by [Christopher Nolan](#)

[RDF Metadata About The Prestige](#)



[Write a Review of The Prestige](#)



[Add to del.icio.us](#)

Revyu.com: [Contact](#) | [Credits](#) | [Privacy Policy](#) | [Disclaimer](#)



New York Times Data data.nytimes.com

72

The New York Times Linked Open Data BETA

data.nytimes.com

For the last 150 years, The New York Times has maintained one of the most authoritative news vocabularies ever developed. In 2009, we began to publish this vocabulary as linked open data.

The Data

As of 13 January 2010, The New York Times has published approximately ,10,000 subject headings as linked open data under a [CC BY license](#). We provide both [RDF](#) documents and a human-friendly [HTML](#) versions. The table below gives a breakdown of the various tag types and mapping strategies on data.nytimes.com.

Type	Manually Mapped Tags	Automatically Mapped Tags	Total
People	4,978	0	4,978
Organizations	1,489	1,592	3,081
Locations	1,910	0	1,910
Descriptors	498	0	498
			10,467

Browse individual data records:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

SKOS Files

Download all of the data records as [SKOS](#) Files.

- People
- Organizations
- Locations
- [Public Descriptions](#)

Example App: NYT Articles on University Alumni

73

Who Went Where

Hirek ▾ Social ▾ Private ▾ Mailing lists ▾ SW ▾ Python ▾ RDFa it! ▾ Bookmarklets ▾ bit.ly To Mendeley TinyURL To Faviki Dokuwiki MID

Who Went Where +

The New York Times Linked Open Data BETA View Application Source

Alumni In The News Harvard University

Enter a school name below and see our coverage of that school's alumni.

Harvard University

Henry Kissinger
Born: May 27, 1923

Henry Kissinger Is Released From Hospital in South Korea - March 15, 2010
Got Your Back - July 19, 2009
SPORTS OF THE TIMES; Kissinger's Soccer Diplomacy - March 31, 2009
THE TV WATCH; A Question Reprised, but the Words Come None Too Easily for Palin - September 26, 2009
OP-ED COLUMNIST; Park Avenue Diplomacy - September 24, 2008
Palin Will Meet With Kissinger and Foreign Leaders - September 22, 2008
Using Star Power to Repair Nigeria's Image - July 10, 2008
OP-ED CONTRIBUTOR; Listening to Compromise - July 08, 2008
EDITORIAL OBSERVER; Thinking the Unthinkable: A World Without Nuclear Weapons - June 30, 2003
ON THE WHITE HOUSE; One Trip, Dual Purposes - April 27, 2008

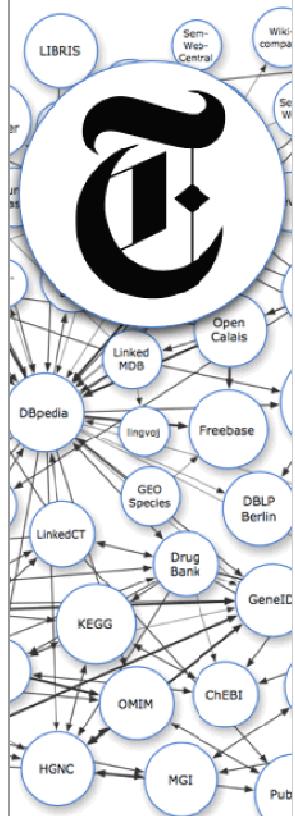
Jacques Chirac
Born: November 29, 1932

Chirac Faces New Inquiry On Charges Of Corruption - December 19, 2009
Ex-Leader Of France Faces Trial - October 31, 2009
French Power Elite Face a Fall From Grace - October 28, 2009
French President Raises Eyebrows With Remark on a Contentious Political Trial - September 25, 2009
INSIDE EUROPE; Order to Pay Back Farm Subsidies Comes at a Bad Time for France - August 11, 2009
WORLD BRIEFING | EUROPE; France: Chirac Creates Foundation - June 10, 2008
Putin Maintains Presidential Air in Paris Trip - May 31, 2008
A Statesman Without Borders - February 03, 2008
Chirac Under investigation for Misuse of Funds as Paris Mayor - November 22, 2007
Correction: For the Record - November 05, 2007

Kennedy, John Fitzgerald
Born: May 29, 1917

ESSAY; The Making of the President, Then and Now - March 21, 2010
Last in Time, Letters Capture American Grief For a President - March 09, 2010

Done

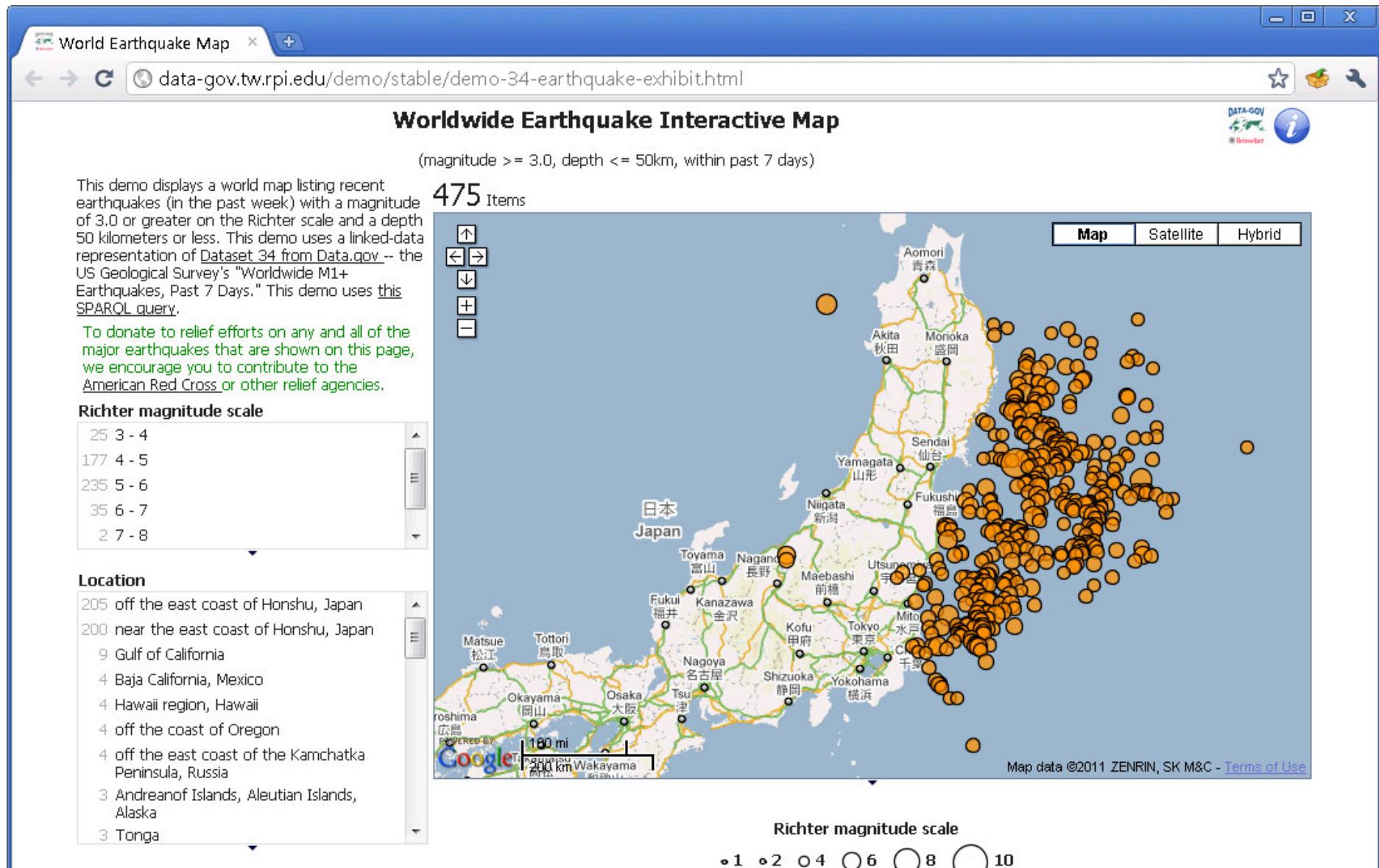


P ★★★★☆ SP



Dynamic Worldwide Earthquake Map Using Linked Data from Data.gov

74



Other Linked Data Applications

75

- Browsing
 - E.g., Marbles and DBpedia Mobile
- Searching
 - Falcons
- Mashups and more
 - Revyu, BBC Music, Pipe
 - Enterprise analytics

Browsing Linked Data

76

- Linked Data Browsers
 - Tabulator Browser (MIT, USA)
 - Marbles (FU Berlin, DE)
 - OpenLink RDF Browser (OpenLink, UK)
 - Zitgist RDF Browser (Zitgist, USA)
 - Humboldt (HP Labs, UK)
 - Disco Hyperdata Browser (FU Berlin, DE)
 - Fenfire (DERI, Ireland)
- Try the LOD Browser Switch
 - <http://browse.semanticweb.org/>



Marbles

77

<http://www.w3.org/People/Berners-Lee/card#i> Open

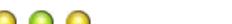


Tim Berners-Lee

<http://www.w3.org/1999/02/22-rdf-syntax-ns#type>

- Person 
- <http://www.w3.org/2000/10/swap/pim/contact#Male> 

label

- Tim Berners-Lee 

sameAs

- Tim Berners-Lee (also at www4.wiwiss.fu-berlin.de) 

image



Weblinks

<http://www.w3.org/People/Berners-Lee/> 

name

- Tim Berners-Lee 
- Timothy Berners-Lee 
- Tim Berners Lee 

Given name

- Timothy 

family_name

- Berners-Lee 

sha1sum of a personal mailbox URI name

- 965c47c5a70db7407210cef6e4e6f5374a525c5c 

workplace_homepage

- <http://www.w3.org/> 

nickname

- TimBL 

nickname

- TimBL 

- timbl 

personal_mailbox

- <mailto:timbl@w3.org> 



[sig.ma - Semantic Infor...](#) [+>](#)

[sig.ma/search?q=oktie+hassanzadeh](#)

SIG.MA

SEMANTIC INFORMATION MASHUP

Help About Forum

Version: 1.1.32

oktie hassanzadeh Add More Info Start New Order Options Use it

Oktie Hassanzadeh

 picture: [9]

given name: Oktie [4,7,19,20]

family name: Hassanzadeh [4,7,19,20]

is creator of: [Accuracy of Approximate String Joins Using Grams.](#) [3,10]
[Benchmarking declarative approximate selection predicates.](#) [3]
[A Hybrid Approach for Refreshing Web Page Repositories.](#) [3]
[A declarative framework for semantic link discovery over relational data.](#) [3,4,8,19,20]
[Publishing Bibliographic Data on the Semantic Web using BibBase](#) [7] show 57 more values ↗

affiliation: [University of Toronto](#) [4,7,19,20]

author name: ohassanzadeh [2]
variation: oktiehassanzadeh [2]

author first name: Oktie [2]

author name: Oktie Hassanzadeh [1,2]
creator: oktie [11,17,18]

country name: Canada [9]

is contributor of: [A Declarative Framework for Semantic Link Discovery over Relational Data](#) [4,19,20]
[Publishing Bibliographic Data on the Semantic Web using BibBase](#) [7]

date: 2009-06-30T01:11:52+02:00 [11,17,18]
Tue Jun 30 01:11:52 CEST 2009 [17,18]

encoded: O. [Hassanzadeh](#) University of Toronto, February 2007. [11]
O. [Hassanzadeh](#) und F. [Chiang](#) und H. C. [Lee](#) und R. J. [Miller](#) Proceedings of the 35th International Conference on Very Large Data Bases VLDB 2009, August 2009. [17]

Sources (18) Approved (0) Rejected (2)

- 1 [Untitled document](#) 54 facts | 2011-01-17
<http://data.bibbase.org/author/oktie-hassanzadeh/>
- 2 [Untitled document](#) 50 facts | 2010-08-11
[http://data.bibbase.org/author/oktie-hassanzadeh/](http://data.bibbase.org/author/oktie-hassanzadeh/?f...)
- 3 [Oktie Hassanzadeh](#) 10 facts | 2009-09-04
http://dblp.l3s.de/d2r/resource/authors/Oktie_Hassa...
- 4 [Oktie Hassanzadeh](#) 15 facts | 2010-06-09
<http://data.semanticweb.org/person/oktie-hassanzade...>
- 5 [Untitled document](#) 2 facts | 2010-03-18
<http://www.bibsonomy.org/burst/tag/fuzzy%20data>
- 6 [Oktie Hassanzadeh - Comp...](#) 6 facts | 2011-03-04
<http://www.mendeley.com/profiles/oktie-hassanzadeh/>
- 7 [ISWC 2010 Ontology](#) 18 facts | 2010-11-18
[http://data.semanticweb.org/conference/iswc/2010/](http://data.semanticweb.org/conference/iswc/2010/co...)
- 8 [A declarative framework ...](#) 5 facts | 2009-09-04
<http://dblp.l3s.de/d2r/resource/publications/conf/w...>
- 9 [Oktie Hassanzadeh @ Univ...](#) 10 facts | 2010-08-16
<http://www.cs.toronto.edu/~oktie/>
- 10 [Accuracy of Approximate ...](#) 5 facts | 2009-09-03
<http://dblp.l3s.de/d2r/resource/publications/conf/i...>
- 11 [Untitled document](#) 10 facts | 2010-03-18
<http://www.bibsonomy.org/pubrss/tag/fuzzy%20data>
- 12 [Untitled document](#) 2 facts | 2010-03-18
<http://www.bibsonomy.org/swrc/tag/fuzzy%20data>
- 13 [Untitled document](#) 2 facts | 2011-01-17
<http://www.bibsonomy.org/uri/bibtex/2c83ba2ca861943...>
- 14 [Untitled document](#) 2 facts | 2011-01-17
<http://www.bibsonomy.org/uri/bibtex/2d4418d2a36655c...>
- 17 [Untitled document](#) 26 facts | 2010-03-18
<http://www.bibsonomy.org/burst/tag/fuzzy%20clusteri...>
- 18 [Untitled document](#) 26 facts | 2010-03-16
<http://www.bibsonomy.org/burst/tag/health%20care>

<- 1 2 -> reject all ↑ approve all ↑

<http://example.loc/document.rdf> add source url +



Object Search Concept Search

Beijing

Search Objects

Supports Boolean operators, quotes, and wildcard characters.

All

Artifact

Capital City	City	Document	Group
Institution	Landmark	Location	Noun Synset
Organization	Person	Publication	Subject

Objects 1 - 10 of 8634 for your search Beijing (1.223 seconds)

[Beijing](#)

Types: Capital, City

Labels: 北京" || Pekin" || Пекин" || 北京市" || Pequim || Pechino || Beijing" || Pékin" || Peking" || Pekin"

<http://dbpedia.org/resource/Beijing> - Described in 184 documents

[Beijing](#)

Types: Subject,

Labels: Beijing

<http://ontoworld.org/wiki/Special:URIResolver/Beijing> - Described in 11 documents

[Beijing Guoan](#)

Types: Club

Labels: Beijing Hyundai || 北京国安" || 北京国安足球俱乐部" || Beijing Guoan

http://dbpedia.org/resource/Beijing_Guoan - Described in 30 documents

[Beijing](#)

The declaration of this URI may be unauthorized.

Types: Capital City

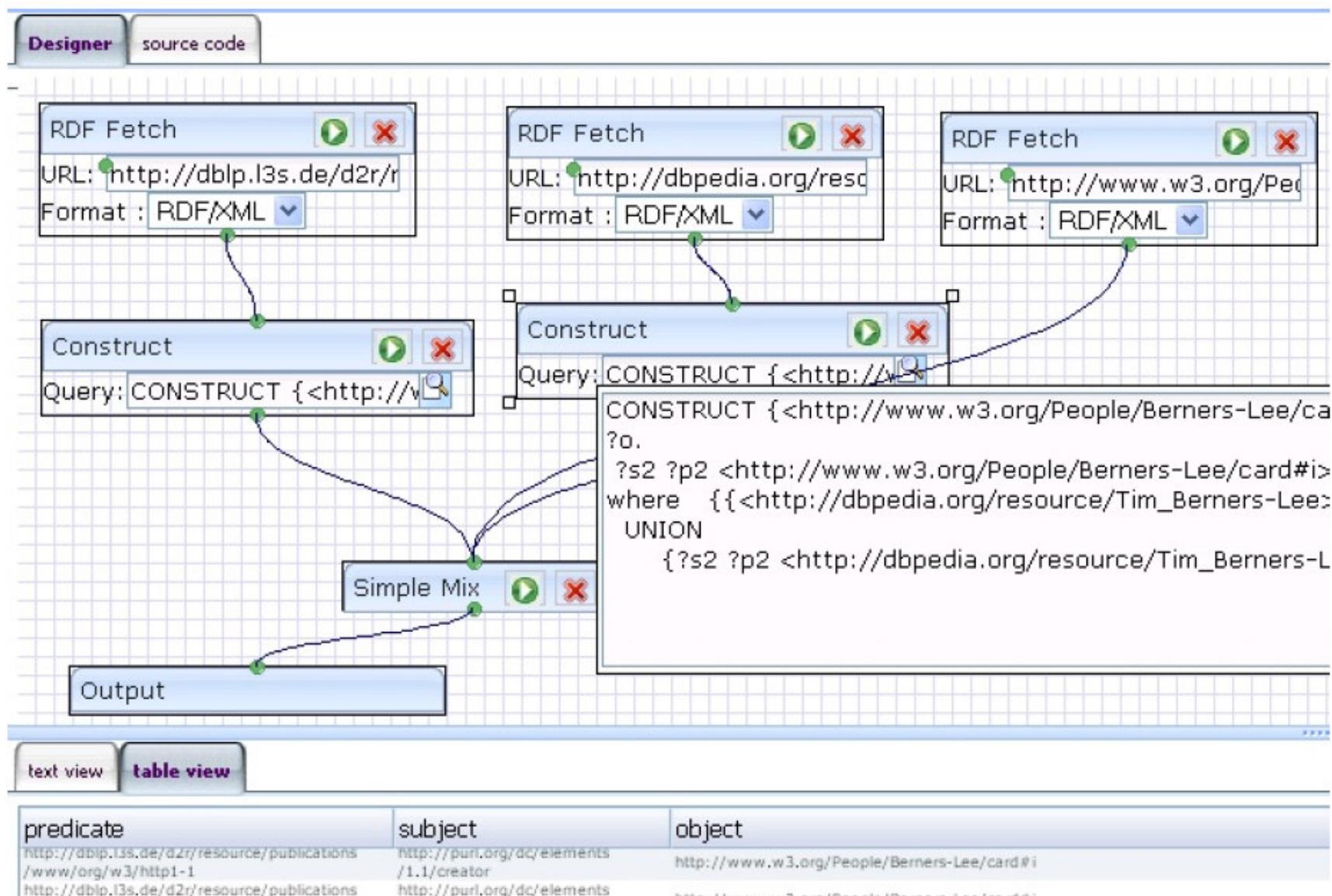
Labels: Beijing

<http://lonely.org/russia#Beijing> - Described in 5 documents



DERI Semantic Web Mashup

80



Yahoo!, Google & Facebook

81

- Yahoo! and Google have started to crawl Linked Data in its RDFa serialization as well as Microformats.
- Yahoo!
 - Provides access to crawled data through the **Yahoo BOSS API**
 - **Uses the data within Yahoo Search Monkey to make search results more useful and visually appealing.**
- Google
 - **Uses crawled RDF data for its Social Graph API**
 - **Plans to / uses crawled data to enhance search results snippets for reviews and people.**
- Facebook
 - The Open Graph Protocol is based on RDFa: <http://ogp.me/>
 - Application: Facebook's "Like" Buttons, and much more



Linked Open Data in IBM's Watson?

82



- Watson: IBM's supercomputer that defeated two of Jeopardy's greatest players
 - Check out <http://www.ibmwatson.com>
- Linked Data used to enhance Natural Language Question Answering
 - Finding/Verifying object types of the possible answers

Note: Watson was not connected to the Internet during the game, so the (linked) data has been used offline.

Source: Chris Welty's talk at ISWC2010 &

IBM China Research Lab's DeepQA home page http://www.research.ibm.com/deepqa/china_research_lab.shtml

Also see Welty's talk at ISWC 2007: http://videolectures.net/iswc07_welty_hiwr/

Verifying Answer Types in Watson

83

The category: U.S. cities.

The question: "This U.S. city's largest airport is named for a famous World War II hero, its second largest for a famous World War II battle."

Watson's answer: **What is Toronto???**

A screenshot of the Yahoo! News Canada homepage. The header features the 'YAHOO! NEWS CANADA' logo and a search bar. Below the header is a navigation menu with categories: HOME, CANADA, LOCAL, WORLD, BUSINESS, ENTERTAINMENT, SPORTS, and HEALTH. Underneath the main menu are links for VIDEO, PHOTOS, WEATHER, TRAVEL, SITEMAP, DAILY BREW, THE LIGHTER SIDE BLOG, and 2010 YEAR IN REVIEW. The main article headline reads: 'IBM's supercomputer Watson thinks Toronto is a U.S. city on Jeopardy!'.

IBM's supercomputer Watson thinks Toronto is a U.S. city on Jeopardy!

By Jordan Chittley | Daily Brew – Wed, 16 Feb, 2011 11:47 AM EST

[f Share](#) 348

[retweet](#) 16

[Email](#)

[Print](#)

The supercomputer known as Watson managed to destroy Jeopardy! superstars during the second round of play, but had no clue that Toronto was not a U.S. city.

Flesh-and-blood contestant Brad Rutter entered the second day of the three-day competition tied with Watson while fellow air-breathing contestant Ken Jennings was only a few thousand dollars behind giving some hope to



Linked Data Application Highlights

84

- See “Semantic Web Success Stories” from a recent tutorial at ISWC 2010 conference
 - ▣ <http://people.csail.mit.edu/pcm/SemWebTutorial.html>
- Linked Data published by New York Times, Best Buy, U.S. and U.K. governments
- Linked Open Data used in IBM’s Watson (DeepQA project)
- Yahoo! and Google user RDFa, Freebase data powers Bing
- Healthcare and life sciences applications
 - ▣ See W3C’s HCLS group activities
<http://www.w3.org/2001/sw/hcls/>

References

85



<http://linkeddata.org>

- New Book - *Linked Data: Evolving the Web into a Global Data Space*. By Tom Heath & Christian Bizer
Available online at <http://linkeddatabook.com/editions/1.0/>
- Linking Open Data Project Wiki
<http://esw.w3.org/topic/SweoIG/TaskForces/CommunityProjects/LinkingOpenData>
- Tutorial on How to Publish Linked Data on the Web
<http://www4.wiwiss.fu-berlin.de/bizer/pub/LinkedDataTutorial/>