A brief introduction to the Semantic Web

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About me

- Software developer
- Grew up in Haifa and Massachusetts (U.S.), live in New York City
- Wikipedia enthusiast since 2005
- Semantic MediaWiki enthusiast since 2006
- MediaWiki developer and consultant since 2007

My MediaWiki consulting company:

(wikiworks.com)

Via WikiWorks, also run the Semantic MediaWiki-based wiki farm Referata, at referata.com.

What is the Semantic Web?

Semantic = Meaning

(the opposite of syntax/"syntactic", which is the actual words used)

Web =

"Semantic Web" means different things to different people. Semantic information on the web can be expressed in three different ways:

1. Inferred
2. Free-form tagging
3. Structured data

These go in order from the **consumer** of data doing most of the work, to the **producer** of data doing most of the work.

1. Inferred information

From a website:

"Benny's Shoes is open from 9 AM to 5 PM Monday to Friday, and 10 AM to 7 PM on Sundays. Our phone number is 123-4567."

Hm… that looks like hours, and a phone number, for a store.

2. Free-form tagging

"Benny's Shoes is open from <time itemprop="openingHours" datetime="Mo-Fr 9:00-17:00">9 AM to 5 PM Monday to Friday</time>, and <time itemprop="openingHours" datetime="Su 10:00-19:00">10 AM to 7 PM on Sundays</time>. Our phone number is 123-4567.

This is in the "schema.org" *microformat*.

Microformats are additional tags and attributes in HTM that let you encode meaning.

schema.org is especially important, because it is supported by the Google, Yahoo! and Bing search engines since June 2011.

Similar to microformats is **RDFa**, which is considered more semantic, and preferred by academics.

3. Structured data

From a database of stores:

Name	Product	Telephone	Sunday opening hours	...
...				
Benny's Shoes	Shoes	123-4567	10 AM	...
...				

For types 2 and 3, the data can be exported as triples.

(For some people, "Semantic Web" = triples.)

Semantic triple:

Subject Relationship Object

Example:

Benny's shoes Telephone 123-4567

RDF and OWL

RDF = Resource Description Framework
- a framework for storing semantic triples

RDF/XML – a file format for storing RDF data

OWL = Web Ontology Language
- a superset of RDF – used to store both data and information about data structure

1. Inferred information

Advantages:

Untagged information is everywhere! 99.99% of all information is untagged.

Disadvantages:

Much potential for error.

2. Free-form tagging

Advantages:

Lets everyone publish any type of semantic data themselves.

Disadvantages:

Complicated to do.

3. Structured data

Advantages:

Easy to input data; easy to extract and publish data in a variety of formats.

Disadvantages:

Requires creating a separate system.

For *querying* semantic data, the same basic three options exist:

1) Unstructured language queries
2) Free-form data queries
3) Structured queries

1. Unstructured language queries

(Typed in a search engine:)

“Shoe stores open late on Wednesdays”

2. Free-form data queries

```
SELECT ?storeName
WHERE {
  ?x storesDB:name ?storeName ;
      storesDB:storeType storesDB:shoeStore ;
      storesDB:closingHoursWednesday > 7 .
}
```

This is a SPARQL query.

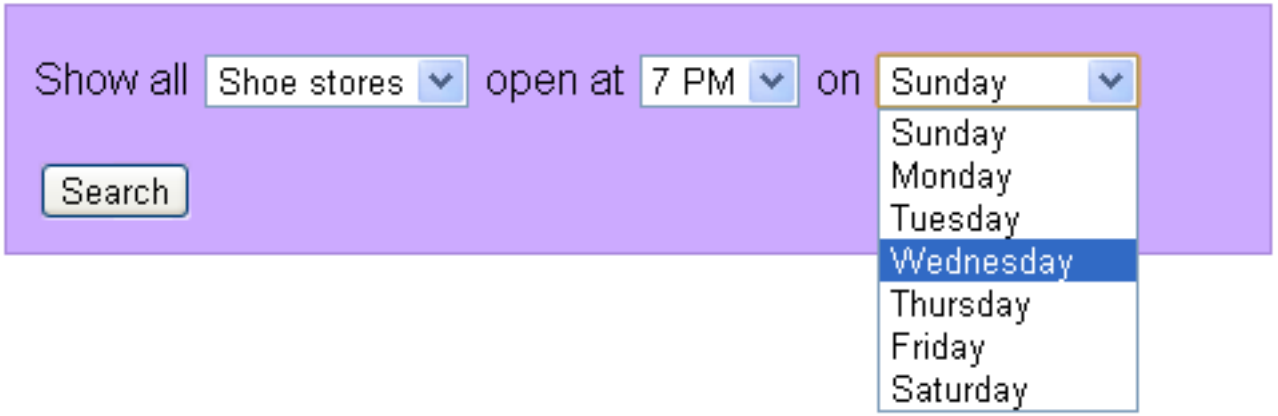
SPARQL

SPARQL = SPARQL (formerly Simple) Protocol and RDF Query Language

- standard language for querying and modifying RDF data

3. Structured queries

In a web/mobile/etc. application:



Wikipedia already contains a lot of data!

Can we query that data?

Bogart in 1946

Born	Humphrey DeForest Bogart December 25, 1899 New York City, U.S.
Died	January 14, 1957 (aged 57) Los Angeles, California, U.S.
Cause of death	Esophageal cancer
Resting place	Forest Lawn Memorial Park, Glendale, California
Occupation	Actor
Years active	1921–1956
Height	5'8"
Spouse	Helen Menken (1926–1927, divorced) Mary Philips (1928–1937, divorced) Mayo Methot (1938–1945, divorced) Lauren Bacall (1945–1957, his death)

Yes and no.

Wikipedia cannot be queried directly.

The "DBpedia" site (dbpedia.org) contains information from 3.5 million of the pages in Wikipedia, from English and other languages, in a format that can be queried (RDF).

From their website: "DBpedia is the Semantic Web mirror of Wikipedia."

In addition, there are ongoing discussions about adding this capability directly into Wikipedia. This may happen in the next few years.

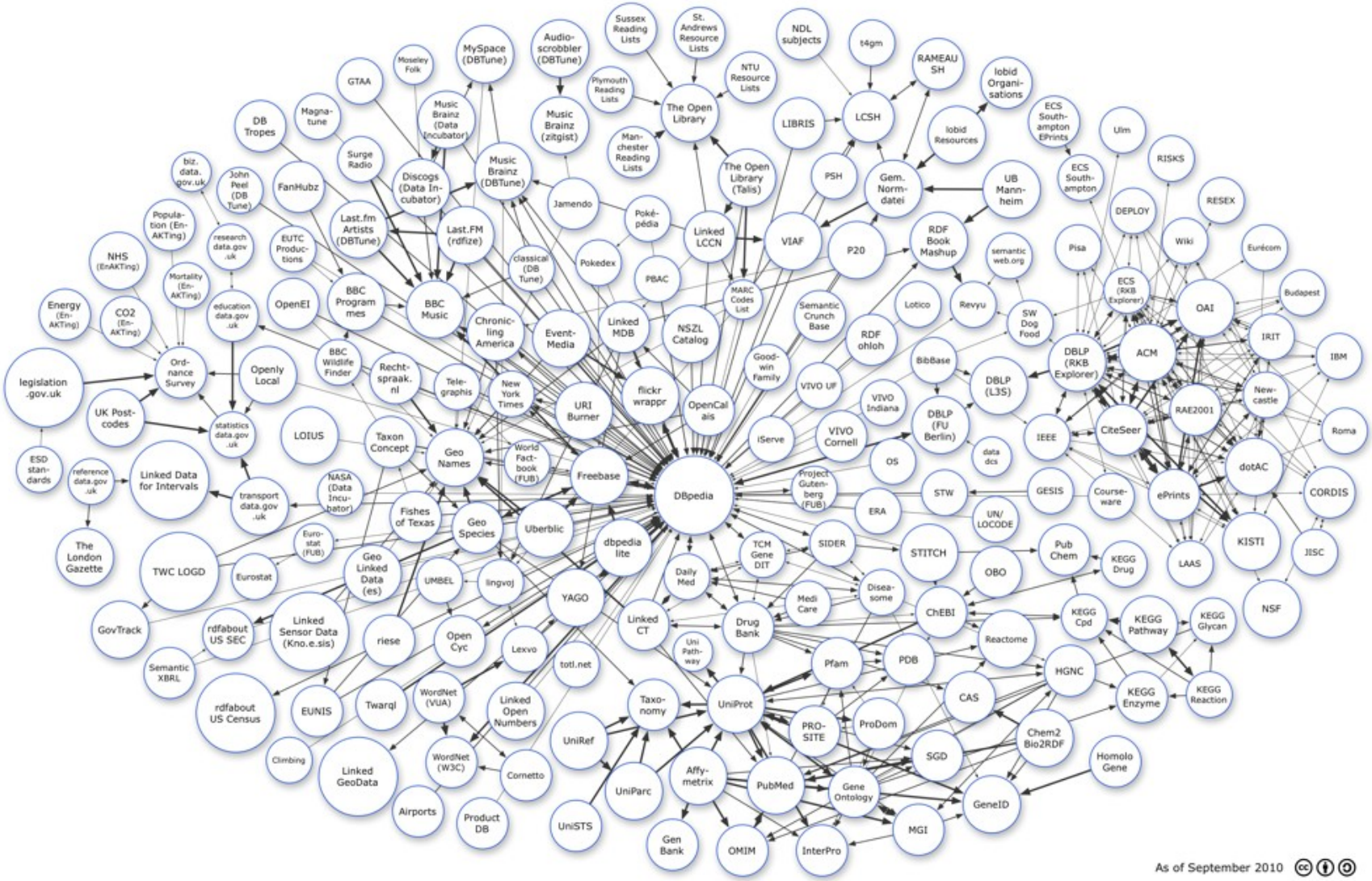
Wikipedia actually has two big roles in the Semantic Web:

1) A huge source of data
2) A set of "canonical" URLs, to define many real-world entities

"In my set of data, 'Yugoslavia' is the entity defined by http://en.wikipedia.org/wiki/Kingdom_of_Yugoslavia"

(RDF lets you express such a thing directly.)

The growing "Linked Open Data" cloud image:



DDpedia is the big circle in the middle – everyone uses its URLs!