Tetherless World Constellation

Semantic Web: “10 year update”

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Original Outline (July 2000)

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Scientific American Article notes

[Joint starting place:]

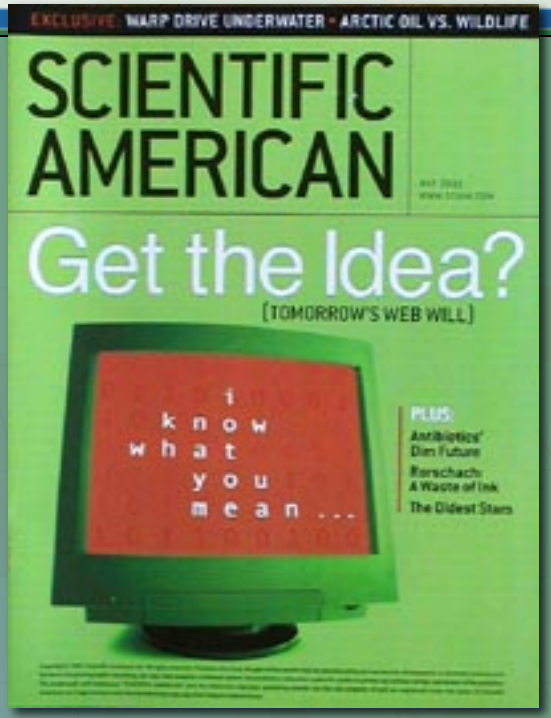
I. Semantic Web Vision (TBL)

II. What are the enablers? (in sequence)
Screen Scraping (Ora and TBL)
Data on Web (Ora and TBL)
Zip code link between Data Bases (TBL)
Ontology Independence (JAH)

Effect of Scale (TBL)

"Then, a miracle occurs"

III. What can you do with it? (not necessarily in sequence)
Self-describing documents (JAH)
Logic to encode… (TBL)
Services and Advertising (Ora)
Devices (Ora)
Digital Signatures, Authentication, and Trust (TBL)



(May 21, 2001)

ellation

The Next Generation Web

Web 3.0 Conference & Expo is focused on bringing together the key proponents and components delivering the promise of next generation *web applications, technologies* and *business utilization*.

Web 3.0

Semantic Web

Linked Data

Web 3.0 showcases in case-study format, the explosive, game-changing promise and disruptive opportunities as they develop in order to help the entire community realize the promise of Web 3.0.

Semantic Web takes that hyper-data and enriches it with meaning through semantic web standards, technologies and strategies, and ultimately leads to the next generation Web.

Linked Data brings traditional hyperlinks and today's "web of documents" into the era of an interconnected, standards-based "web of linked data".

Applications, Technologies and Business Utilization

Sem Web 2010

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Facebook's Graph API: The Future Of Semantic Web?

Posted by Dilip Krishnan on Apr 24, 2010

Community SOA Topics REST Tags Social Networking , Semantic Web , Facebook

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"There are two important themes behind everything we're delivering today." says Bret Taylor, head of Facebook's platform products in the facebook developer blog, about the recent announcements at the f8 conference in San Francisco. Facebook introduced Open Graph protocol, and the Graph API as the next evolution in the Facebook platform.

> First, the Web is moving to a model based on the connections between people and all the things they care about. Second, this connections-based Web is well on its way to being built and providing value to both users and developers — the underlying graph of connections just needs to be mapped in a way that makes it easy to use and interoperable.

Facebook introduced three new components of Facebook Platform two of which the Open Graph protocol, and the Graph API. The API provides access to Facebook objects like people, photos, events etc. and the connections between them like friends, tags, shared content etc. via a uniform and consistent URI to access the representation. Every object can be accessed using the the URL https://graph.facebook.com/ID, where ID stands for the unique ID for the object in the social graph. Every connection (CONNECTION_TYPE) that the facebook object supports can be examined using the URL https://graph.facebook.com/ID/CONNECTION_TYPE.

April 2010

Facebook's Open Graph Protocol

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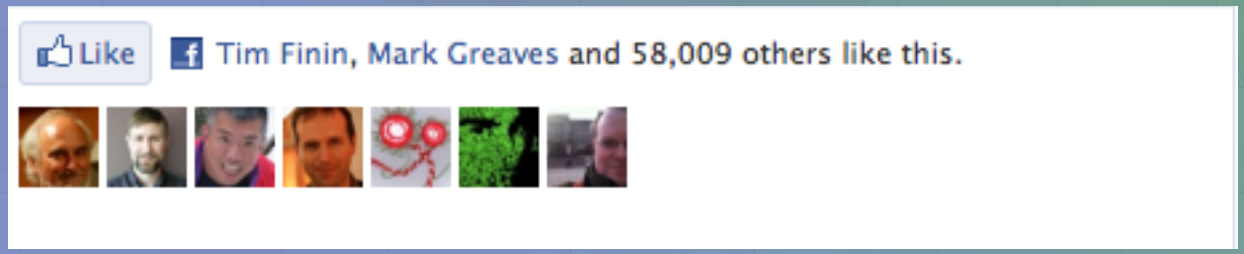
- Your Documents (XML, HTML, XHTML) contain RDFA with some FB specific vocabulary (+ links!!)
  - og:title - The title of your object as it should appear within the graph, e.g., "The Rock".
  - og:type - The type of your object, e.g., "movie". Depending on the type you specify, other properties may also be required.
  - og:image - An image URL which should represent your object within the graph.
  - og:url - The canonical URL of your object that will be used as its permanent ID in the graph
  - og:description - A one to two sentence description of your object.
  - og:site_name - If your object is part of a larger web site, the name which should be displayed for the overall site. e.g., "IMDb".



OGP use growing quickly

Facebook incentivizing use of RDFa like buttons

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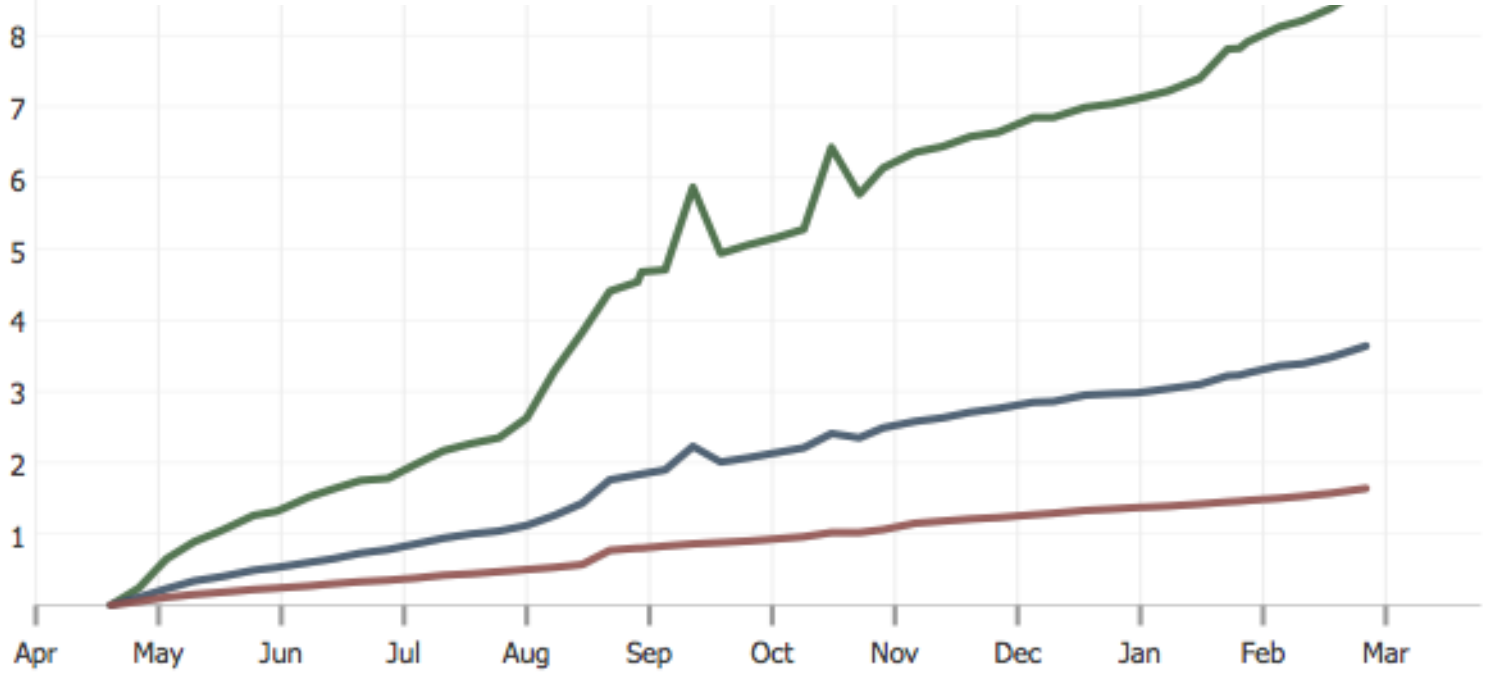
15,178 sites of top 1,000,000 as of 3/3/11



FB reports ~ 10-15% of > 3,000,000 likes per day!

Why are they pushing developers to use the RDFa version?

Because we need the links!

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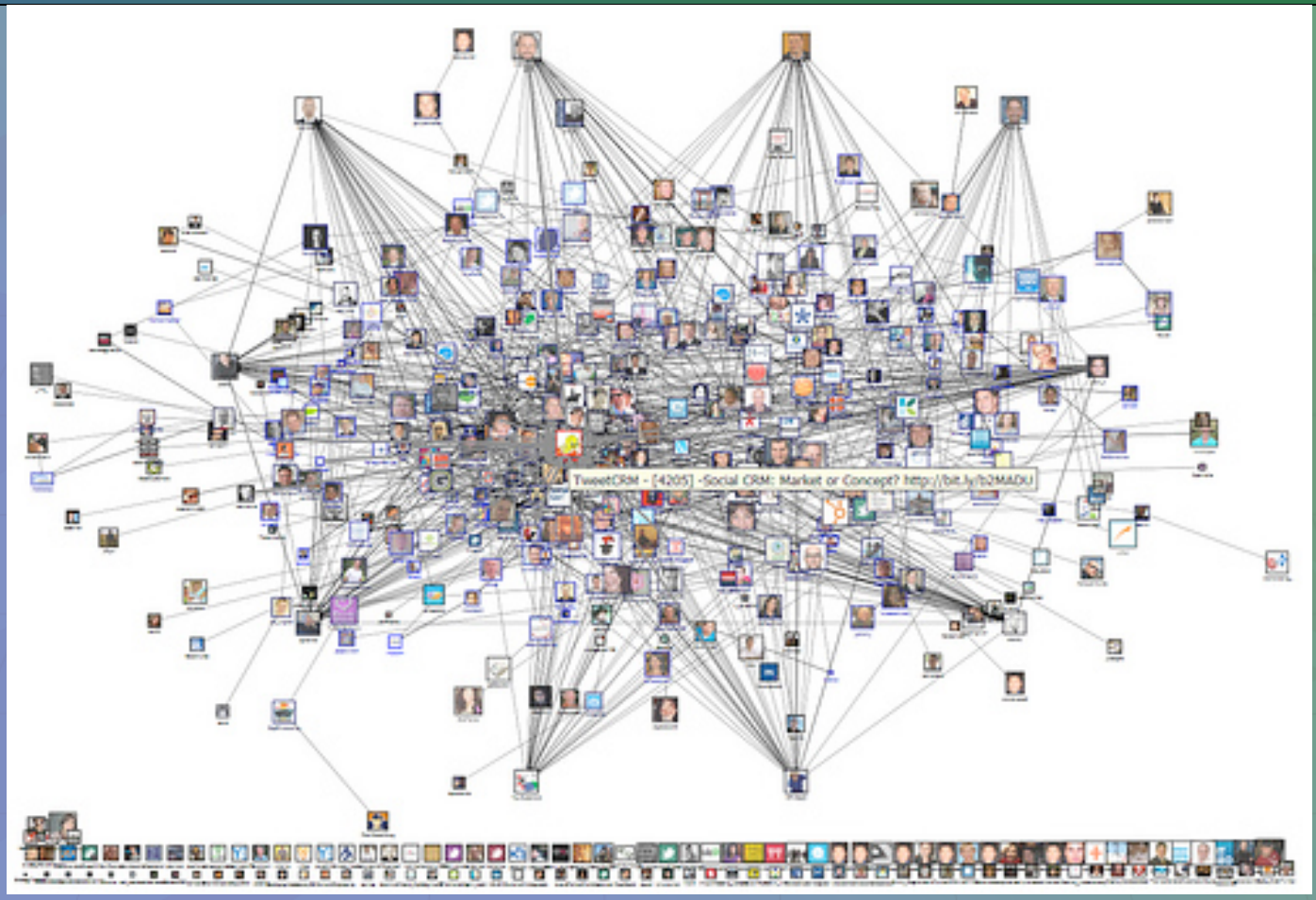

The network of likes is where their money is made!

(predicted >$5B of advertising in next two years)

Creates a platform for SW-powered apps

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SocialWire

facebook **Powered Recommendation Engine for E-Commerce**

PERSONALIZE

Instantly personalizes on-site shopping experience via socially engaging product recommendations.

ENGAGE

Shoppers get birthday reminders, discover gift ideas, recommend, ask and compare products with their friends.

RETARGET

Retargets shoppers and their friends on Facebook via personalized, product level advertising.

Truly Plug and Play

Step 1 - Update Header

```
<head>
...
  <meta property="og:title"
  <meta property="sw:price"
...
</head>
```

Step 2 - Paste Javascript

Step 3 - Drop Plugins

Compatible with Facebook Open Graph

Integrating **SocialWire** is as simple as adding a Facebook Like Button to your pages.

Semantic Web 2010

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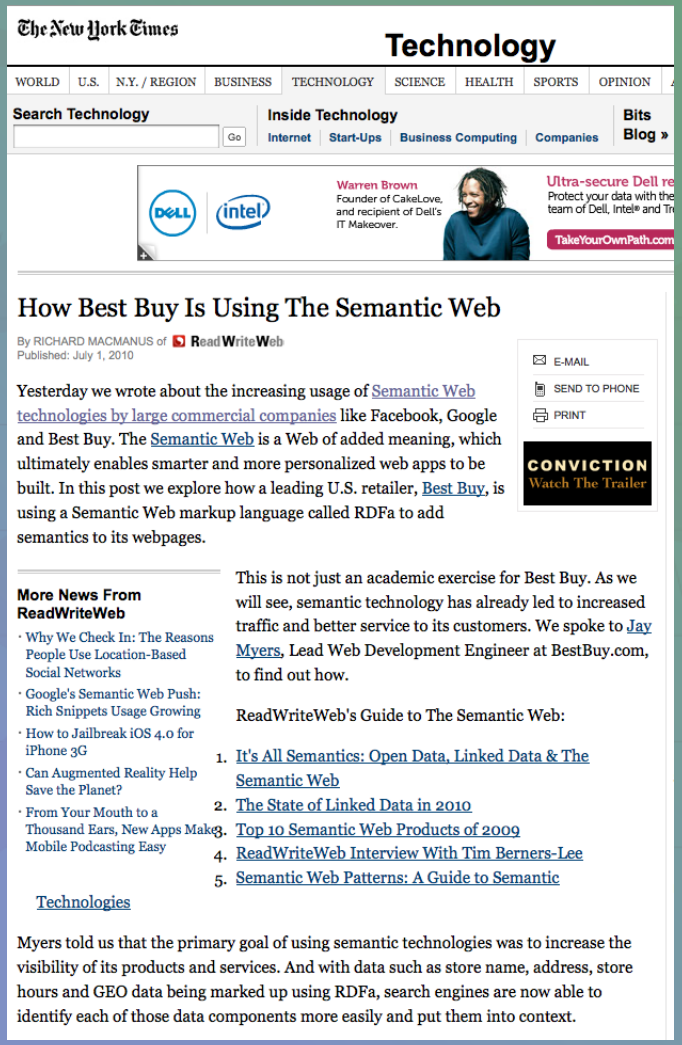

The New York Times — Technology

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DELL intel
Warren Brown
Founder of CakeLove, and recipient of Dell's IT Makeover.
Ultra-secure Dell re
Protect your data with the team of Dell, Intel® and Tr
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How Best Buy Is Using The Semantic Web

By RICHARD MACMANUS of ReadWriteWeb
Published: July 1, 2010

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CONVICTION
Watch The Trailer

Yesterday we wrote about the increasing usage of Semantic Web technologies by large commercial companies like Facebook, Google and Best Buy. The Semantic Web is a Web of added meaning, which ultimately enables smarter and more personalized web apps to be built. In this post we explore how a leading U.S. retailer, Best Buy, is using a Semantic Web markup language called RDFa to add semantics to its webpages.

More News From ReadWriteWeb

- Why We Check In: The Reasons People Use Location-Based Social Networks
- Google's Semantic Web Push: Rich Snippets Usage Growing
- How to Jailbreak iOS 4.0 for iPhone 3G
- Can Augmented Reality Help Save the Planet?
- From Your Mouth to a Thousand Ears, New Apps Make Mobile Podcasting Easy

This is not just an academic exercise for Best Buy. As we will see, semantic technology has already led to increased traffic and better service to its customers. We spoke to Jay Myers, Lead Web Development Engineer at BestBuy.com, to find out how.

ReadWriteWeb's Guide to The Semantic Web:

1. It's All Semantics: Open Data, Linked Data & The Semantic Web
2. The State of Linked Data in 2010
3. Top 10 Semantic Web Products of 2009
4. ReadWriteWeb Interview With Tim Berners-Lee
5. Semantic Web Patterns: A Guide to Semantic Technologies

Myers told us that the primary goal of using semantic technologies was to increase the visibility of its products and services. And with data such as store name, address, store hours and GEO data being marked up using RDFa, search engines are now able to identify each of those data components more easily and put them into context.

July 2010

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InternetNews.com >> Search

Google Snaps Up Metaweb in Semantic Web Play

Acquisition of firm offering a free, open source database of real-world information figures to inform smarter search as Google builds out semantic technology.

July 19, 2010
By Kenneth Corbin: *More stories by this author:*

Google's shopping spree doesn't show any signs of letting up, as the Web behemoth continues to open its wallet to acquire firms with niche technologies that can augment its developing business lines.

The latest target is Metaweb, a firm specializing in semantic Web technology that Google has acquired to improve its search engine. Specifically, Google thinks that Metaweb's database of real-world items can help it produce ordered and accurate results in response to specific, complex search queries. DevX has the details.

In the latest in a string of acquisitions, Google has unveiled plans to purchase Metaweb, a firm that maintains a vast open source database of information about objects in the real world.

Through the acquisition, Google (NASDAQ: GOOG) aims to provide a smarter search engine that will be able to retrieve more specific answers to complex queries.

Read the full story at DevX:
Google Snags Semantic Web Firm Metaweb

TAGS: Google, semantic Web, acquisition, search engine, Metaweb

0 Comments (click to add your comment)

July 2010

Semantic Web 2010

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Semantic SEO for Google with GoodRelations and RDFa

Breaking News: Google has just announced that they now support the GoodRelations vocabulary developed by Prof. Hepp for Google Rich Snippets.

If you add a few extra lines to the HTML code of your Web site, **you will feed Google and hundreds of evolving mobile and recommender applications** in one turn.

On this page, we provide **slightly modified markup** that is **superior to the original Google pattern** for marking up your pages. Our recipe, developed by the inventor of GoodRelations for you personally, is understood by ALL RDFa-aware search engines, shopping comparison sites, and mobile services, while the Google recipe is perfect for Google only.

Principle and Effect

If you add a little bit of additional mark-up to your page, Google will use that information to substantially enhance the rendering of your page directly in the search results list.

There is preliminary evidence that search results with respective extensions get **a 30 % higher click-through rate (CTR)**.

The flickering nature of search results in the new Google Instant technology will very likely further increase the gains of more appealing rendering in the results list. So don't put this off. **Act today!**

Without GoodRelations in RDFa

Hepp Research Personal SCSI Controller Card
The Hepp Research Personal SCSI is a 16-bit add-on card that allows attaching up to seven SCSI devices to...
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The Hepp Research Personal SCSI is a 16-bit add-on card that allows attaching up to seven SCSI devices to your computer. Designed in 1991 by Martin Hepp, the maker of the GoodRelations vocabulary for e-commerce.
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Nov 4, 2010

Sem Web 2010

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Semantic Web | Semantic Web SUMMIT | Semantic Web 100

Semantic Enterprise: What Are The Gorillas Doing? (Oracle, IBM, HP, Cisco, Microsoft and SAP)

By Bernard Lunn on Aug 03, 2010 07:00 AM

In Crossing The Chasm terminology, "gorillas" are the dominant vendors. Simple message for start-ups - don't mess with them!

In this post, we want to understand what the gorillas are doing to apply semantic web technology to the enterprise. The gorillas in this market are: Oracle, IBM, HP, Cisco, Microsoft and SAP.

Oracle: Embrace & Extend

Oracle is active in the semantic web. This matters to them. They cannot afford another database management system based on RDF to replace Oracle and MySQL. Oracle look at RDF as just another thing to store - like objects. The saw off the threat from object management systems and they aim to see off any threat from RDF triples.

(Enterprise Sem Web)

ORACLE DATABASE SEMANTIC TECHNOLOGIES

SEMANTIC DATABASE FEATURES

NEW IN ORACLE SPATIAL 11.2

- Triple-level security with Virtual Private Database and Label Security support
- Semantic indexing for documents based on popular natural language tools
- Change management to version triples within an RDF graph
- Parallel and incremental inference, and owl:sameAs optimization
- Support for the NIH SNOMED comprehensive clinical ontology
- W3C SKOS inference support
- More OWL constructs: union, intersection, oneOf, OWL 2 property chains, disjoint

As part of Oracle Spatial 11g, an option for Oracle Database 11g Enterprise Edition, Oracle delivers an advanced semantic data management capability not found in any other commercial or open source triple store. With native support for RDF/RDFS/OWL/SKOS standards, this semantic data store enables application developers to benefit from an open, scalable, secure, integrated, efficient platform for RDF and OWL-based applications. These semantic database features enable storing, loading, and DML access to RDF/OWL data and ontologies, inference using RDFS, OWL and SKOS semantics and user-defined rules, querying of RDF/OWL data and ontologies using SPARQL-like graph patterns embedded in SQL, and ontology-assisted querying of enterprise (relational) data

- What is different now?
  - Semantic Search
  - Advertising drives Web markets
  - "Buzz" around data on the Web
    - Esp open govt data
- Maturation of RDF technologies
  - SPARQL endpoints
  - RDFa !!!
  - Lightweight Knowledge
    - A little semantics goes a long way

The Evolving Web (Technology View)

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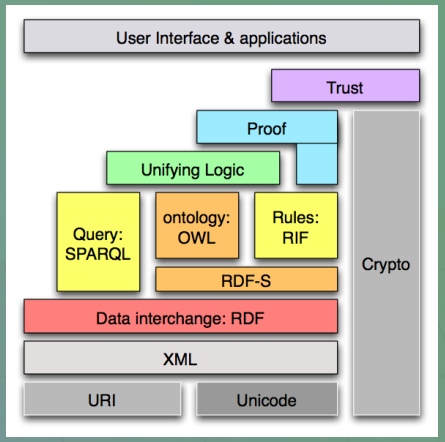
- Web is powered by the links between documents
  - Google worked because of the link space
- Web 2.0 is powered by "social context"
  - The network effect is in the social network
    - At scale tagging runs into usual vocabulary issues
- Web 3.0 adds data relations and vocabulary links
  - Controlled vocabularies express data relationships
    - Semantic Web standards



Maturation of the "bottom" of the Semantic Web

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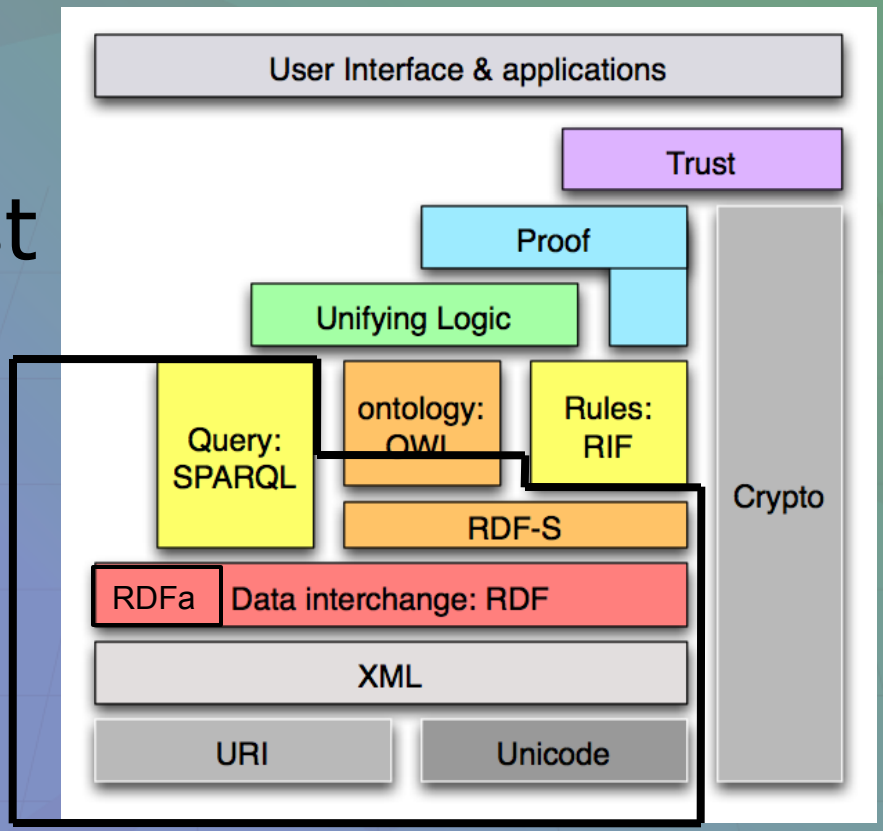
- What is seeing the most use??



On the Web -- links are critical!

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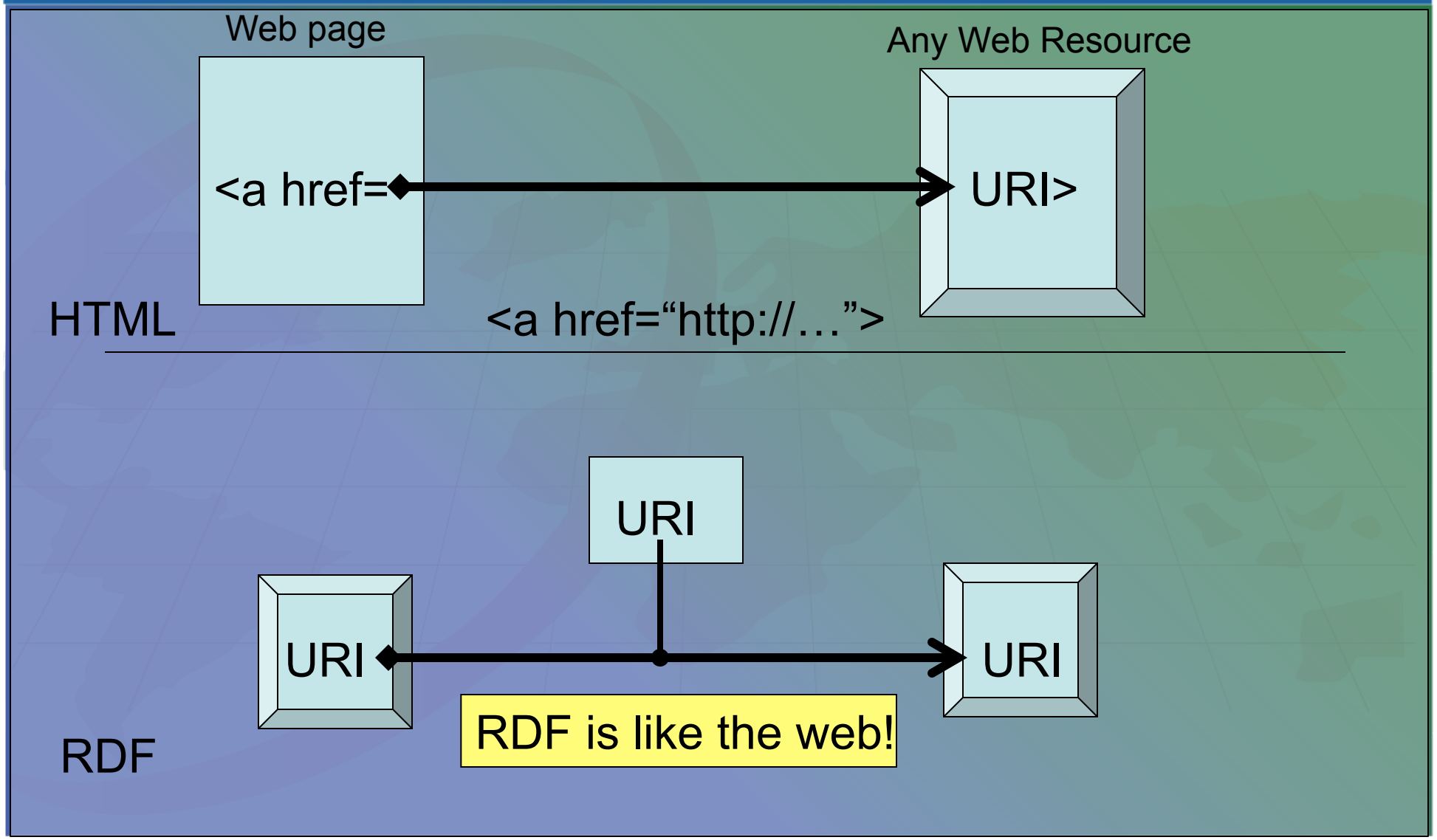

```
DOC1
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           <mind:title jobs:Professor>
            <jobs:placeOfWork  http://www.cs.rpi.edu>
      </mind:Person>
```

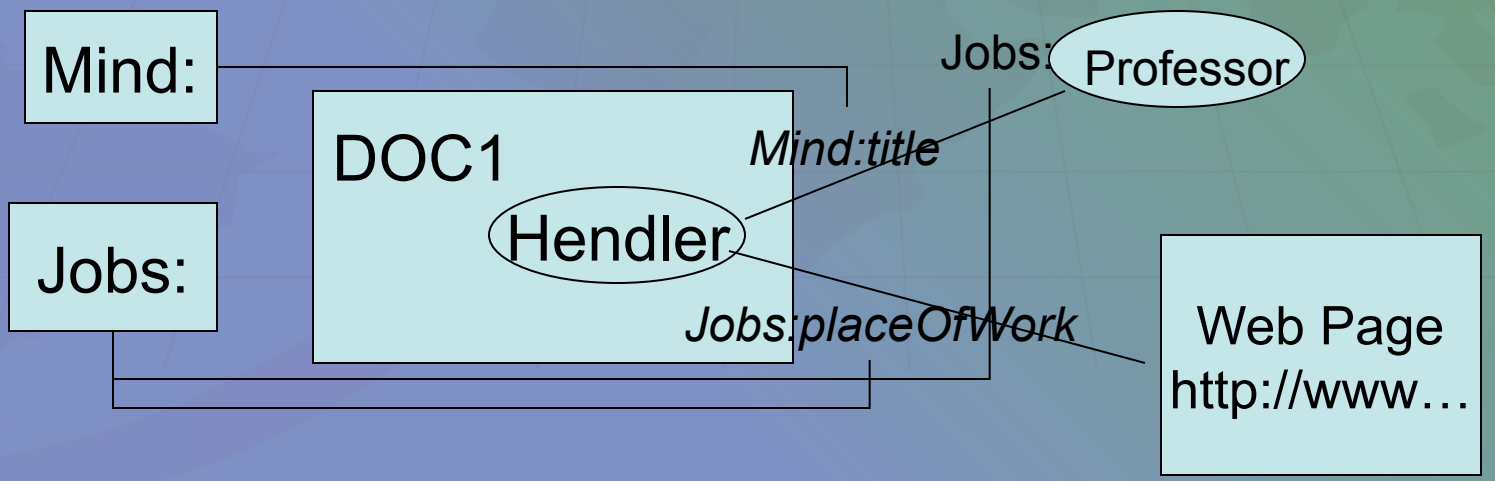

Directly linking datasets

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indice "James Hendler"

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3. http://dbpedia.org/resource/Aumen

Show 86 more

90. http://www4.wiwiss.fu-berlin.de/factbook/resource/Macau

rdf+xml · n3 · json · text

indice "http://dbpedia.org/ontology/SoccerPlayer"

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3. http://dbpedia.org/resource/Soccer

Show 123 more

127. http://www.w3.org/2006/03/wn/wn20/instances/synset-football_player-noun-1

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- DERI
- Fondazione Bruno Kessler
- OpenLink software

Sindice.com

Linked Data is entering many sectors

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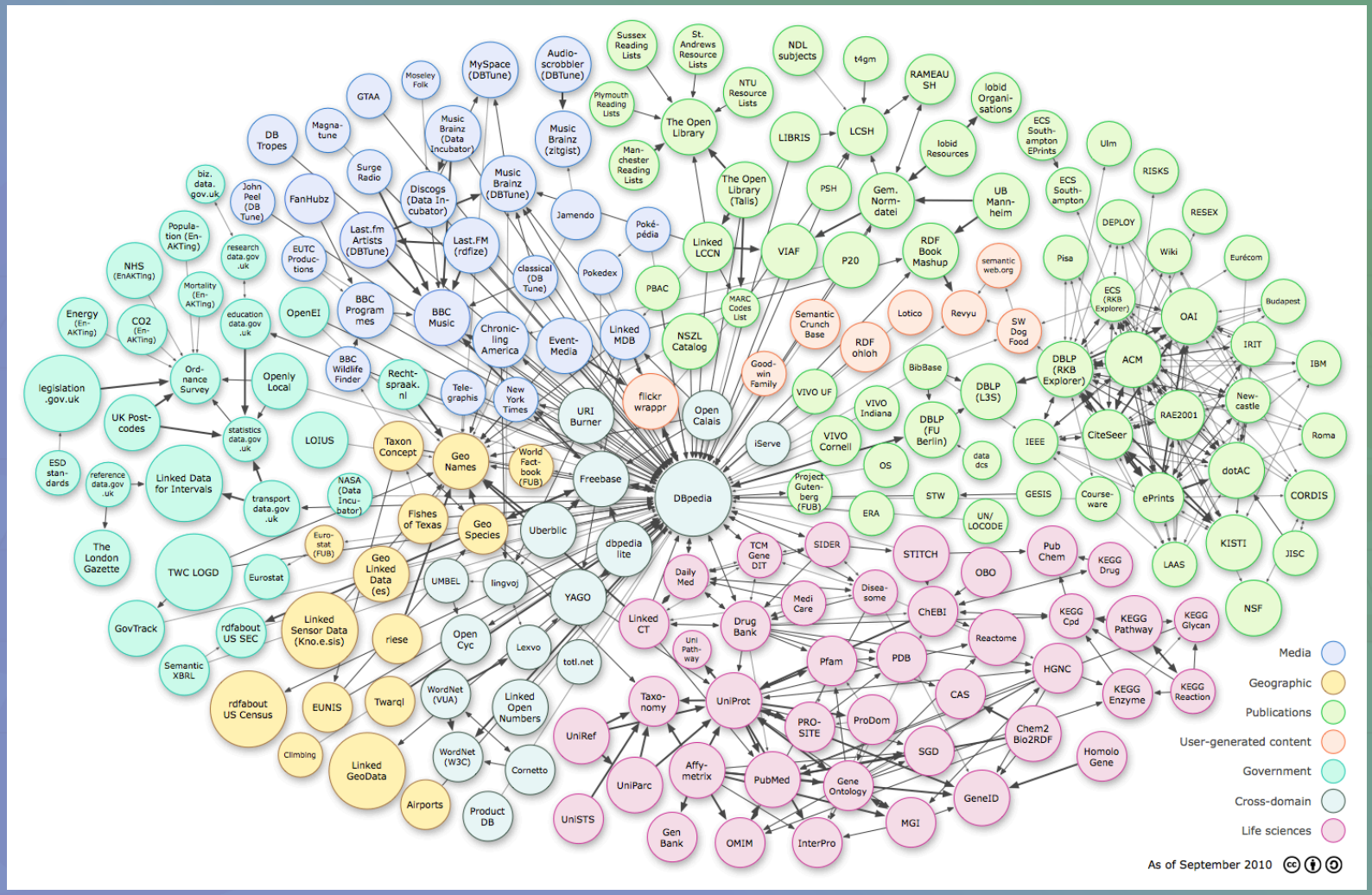

Linkeddata.org 25 billion links

What about ontologies?

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- *Consider, eg,* US National Center for Biotechnology Information, "Oncology Metathesaurus"
  - 50,000+ classes, ~8 people supporting full time, monthly updates, mandated for use by NIH-funded cancer researchers
    - OWL DL rigorously followed
    - Provably consistent
- Compare to OGP

- NCBI Oncology Ontology
  - "High use" in medical community (~1200 users)
  - Very "trusted" information (provenance from NCBI)
  - Primarily terminological (relationships between cancer-related concepts), not data-oriented
- Compare to OGP
  - Hundreds of millions of users
    - Generating >1M triples/day

The argument for NCBI seems compelling

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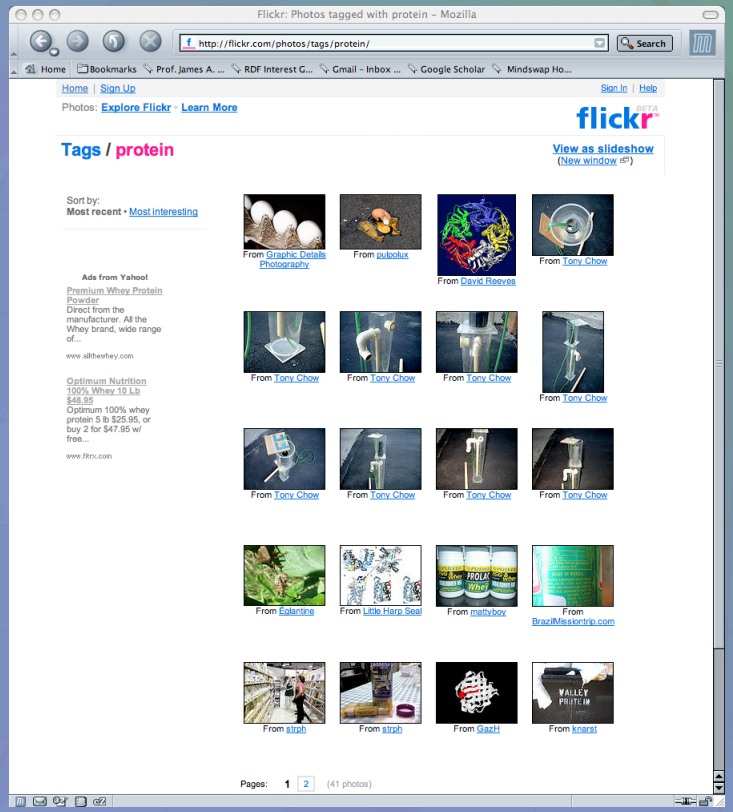
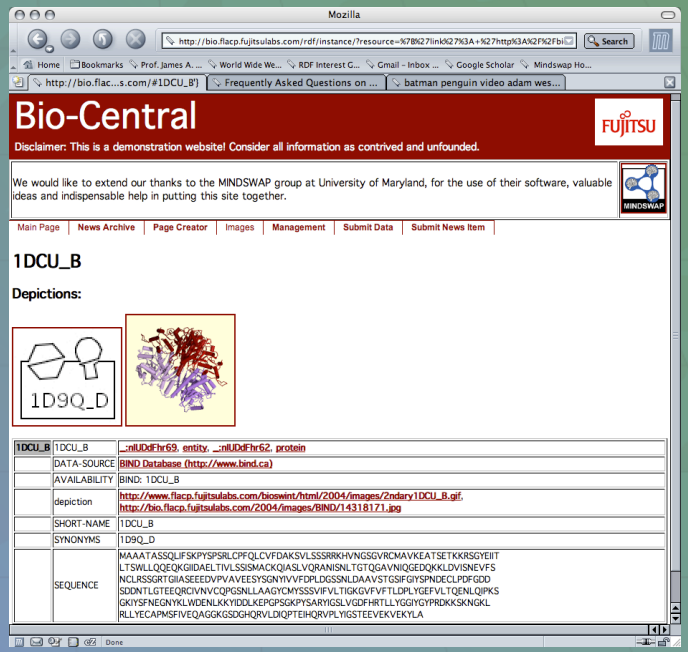


- When "folksonomy" isn't enough…



Which one do you want your *doctor* to use?

But the cost is VERY high

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- Formal modeling finds its use cases in verticals and enterprises
  - Where the vocabulary can be controlled
  - Where finding things in the data is important
- **But the modeling is very expensive and the return on investment must be very high!**
  - Which is part of why the "expert systems revolution" wasn't one
  - Became part of the technology tool kit, a useful niche in the programming pantheon, but didn't change the world

Analogy: the pre-web hypertext world

The alternative

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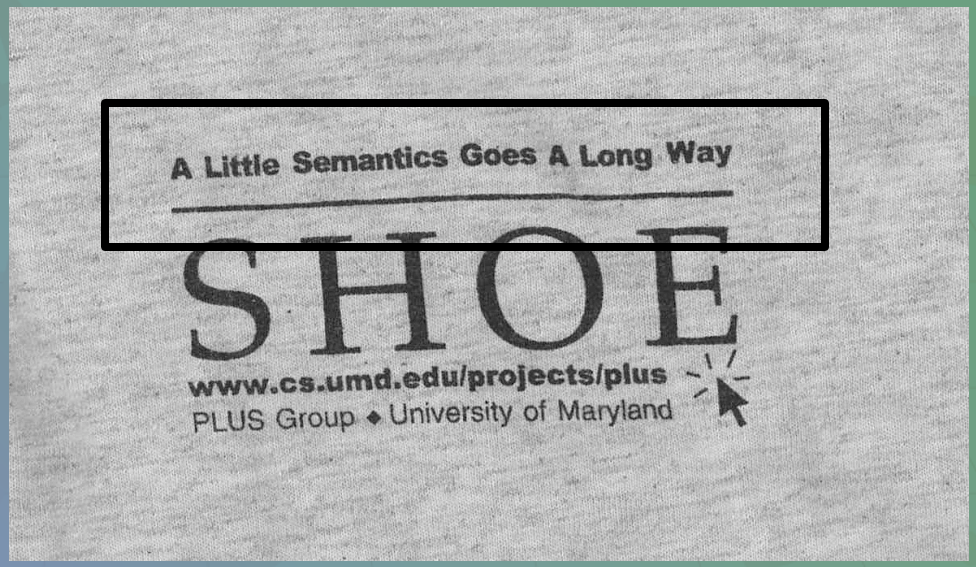
- Linked Data approach is based on RDF, a language designed for the (Semantic) Web
  - Built with Web architecture in mind
    - Exploits Web infrastructure, respects W3C TAG recommendations
      - Internationalization, accessibility, extensibility
  - Fits the ***Web culture***
    - Open and extensible, supports communities of interest
      - *If you don't like my ontology, extend it, change it, or build your own*
    - Fits the Web application development paradigm
      - Scales like "databases"
  - With some new ways of linking to formal models
    - **Heavy use of a small amount of RDFS and a tiny bit of OWL**
    - Generally used "like it sounds" not like the formal model
      - Example "owl:sameAs" debate

"linked data" often used to describe this low semantics Semantic Web

Analogy: the World Wide Web

- "Linked Data" approach finds its use cases in Web Applications (at Web scales)
  - **A lot of data, a little semantics**
  - **Finding anything in the mess can be a win!**



http://www.cs.rpi.edu/~hendler/LittleSemanticsWeb.html

Example: Government Data on the Web

Government Data Sharing

Tetherless World Constellation

January 1, 2009

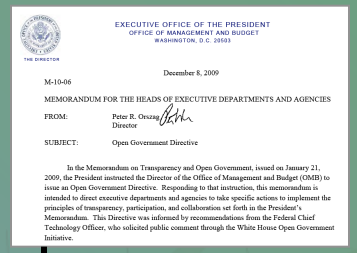
"Openness will strengthen our democracy and promote efficiency and effectiveness in Government."

--- President Obama

May 21, 2009

data.gov online

57 Data Sets



EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF MANAGEMENT AND BUDGET
WASHINGTON, D.C. 20503

December 8, 2009

M-10-06

MEMORANDUM FOR THE HEADS OF EXECUTIVE DEPARTMENTS AND AGENCIES

FROM: Peter R. Orszag
Director

SUBJECT: Open Government Directive

In the Memorandum on Transparency and Open Government, issued on January 21, 2009, the President instructed the Director of the Office of Management and Budget (OMB) to issue an Open Government Directive. Responding to that instruction, this memorandum is intended to direct executive departments and agencies to take specific actions to implement the principles of transparency, participation, and collaboration set forth in the President's Memorandum. This Directive was informed by recommendations from the Federal Chief Technology Officer, who solicited public comment through the White House Open Government Initiative.

December 8, 2009

"Open Government Directive" released

~2000 Data Sets

May 21, 2010

data.gov relaunch with semantic web featured

>305,000 Data Sets

2009

2010 …

June30,2009

Putting Govt Data online-Data.gov.uk beta

January 19, 2010

data.gov.uk online

~6000 Data Set

Data.gov community: International

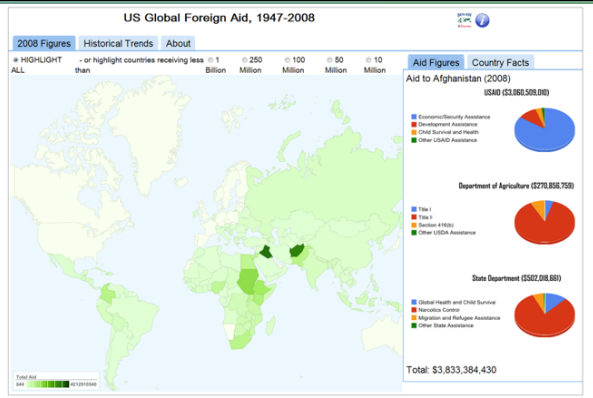
Tetherless World Constellation

Examples:	
US	305,000
Japan	30,184
Denmark	17,086
UK	6,000
Korea	833
Australia	700
World Health Org	400
Ireland	263
Catalonia	246

Creating/Using Data "app" technologies

Tetherless World Constellation

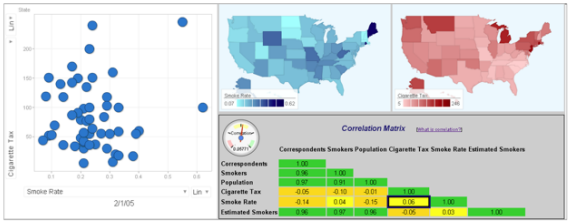
(a) White House visitor search



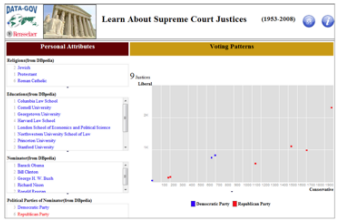
(b) US-UK Foreign Aid Comparison

(c) Agency Budget and NYTimes

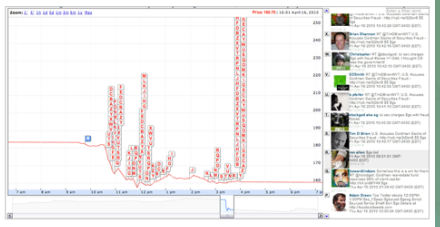
(d) Wildland fire and DBpedia

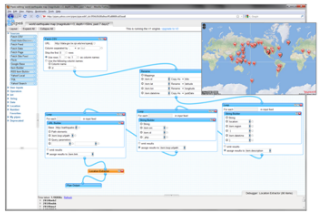


(e) [Health] Tobacco Prevalence and Correlated Factors



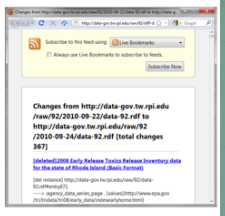
(f) [Policy] About Supreme Court Justices


(g) [Financial] Stock price and Twitter events


(h) [Yahoo! Pipes] World Earthquake Map

(i) [IBM ManyEyes] White House visitor network

(j) [RDFa] semantic search



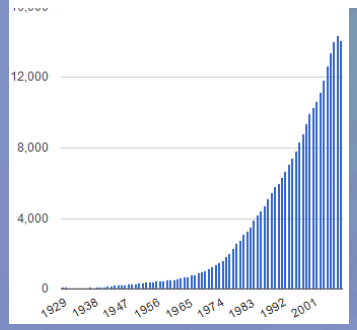
(k) [RSS] data.gov updates

See more than 50 of these at http://logd.tw.rpi.edu

Linking GDP of the US and China

Tetherless World Constellation

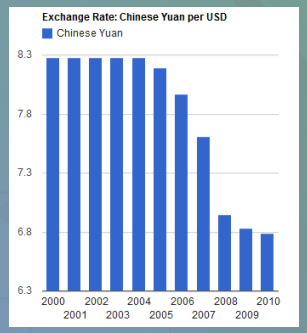
GDP of the US (Billion Dollar)



Federal Reserve Statistical Release

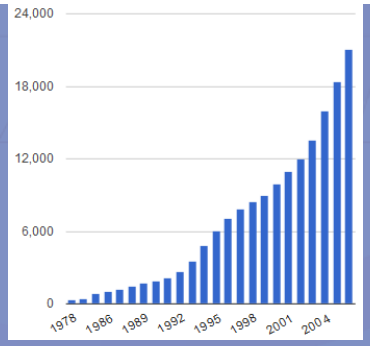
H.10

Foreign Exchange Rates (Weekly)



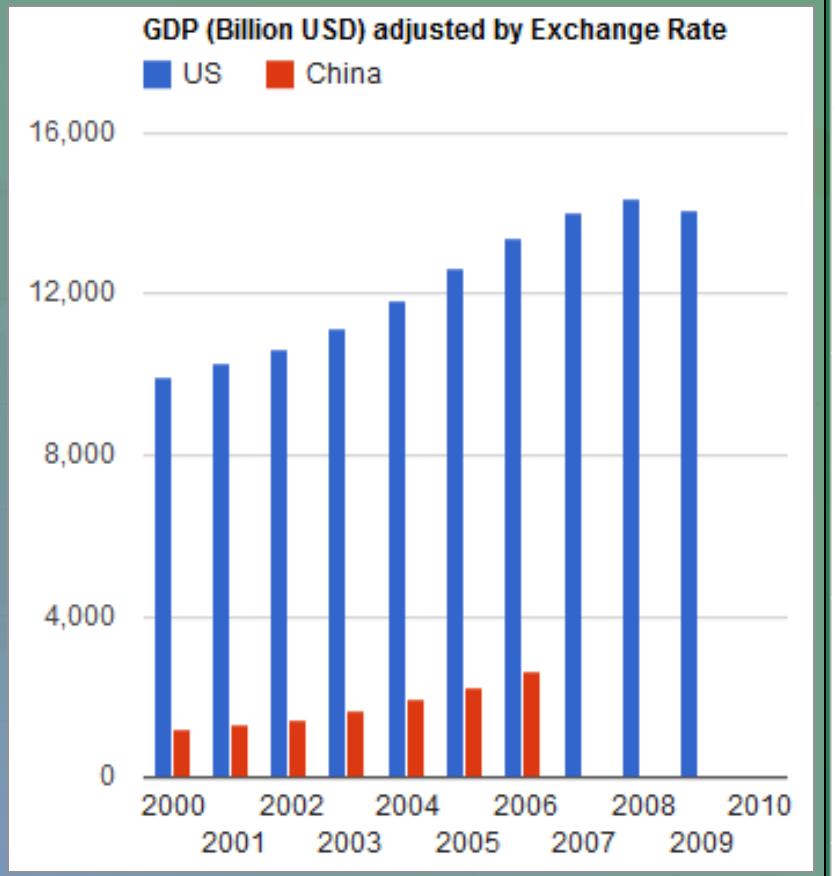
中华人民共和国国家统计局
National Bureau of Statistics of China

GDP of China (Billion Chinese Yuan)



TWC LOGD

Rensselaer



[Temporal Mashup] bea.gov + federalreserve.gov +stats.gov.cn

Linking GDP of the US and China

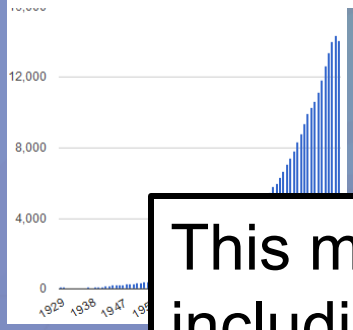
Tetherless World Constellation

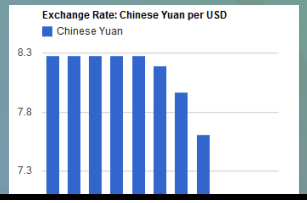
Federal Reserve Statistical Release

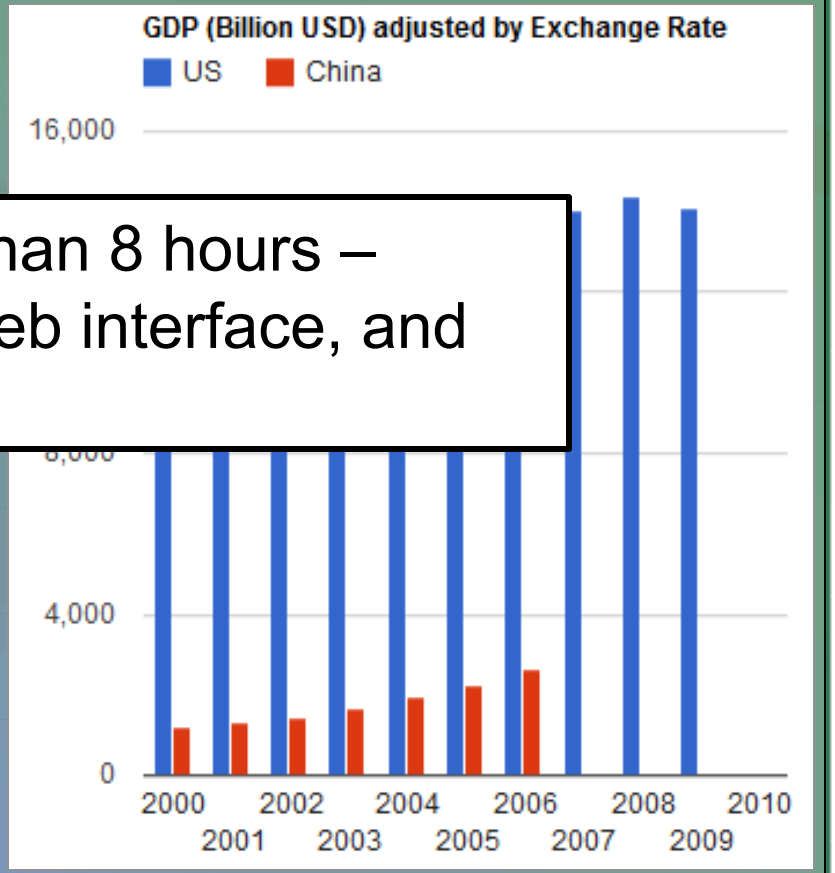
H.10

Foreign Exchange Rates (Weekly)

GDP of the US (Billion Dollar)



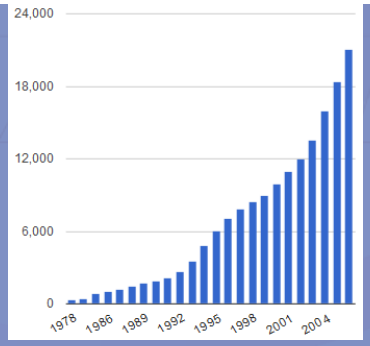




This mashup was built in less than 8 hours – including conversion of data, web interface, and visualization!

中华人民共和国国家统计局
National Bureau of Statistics of China

GDP of China (Billion Chinese Yuan)



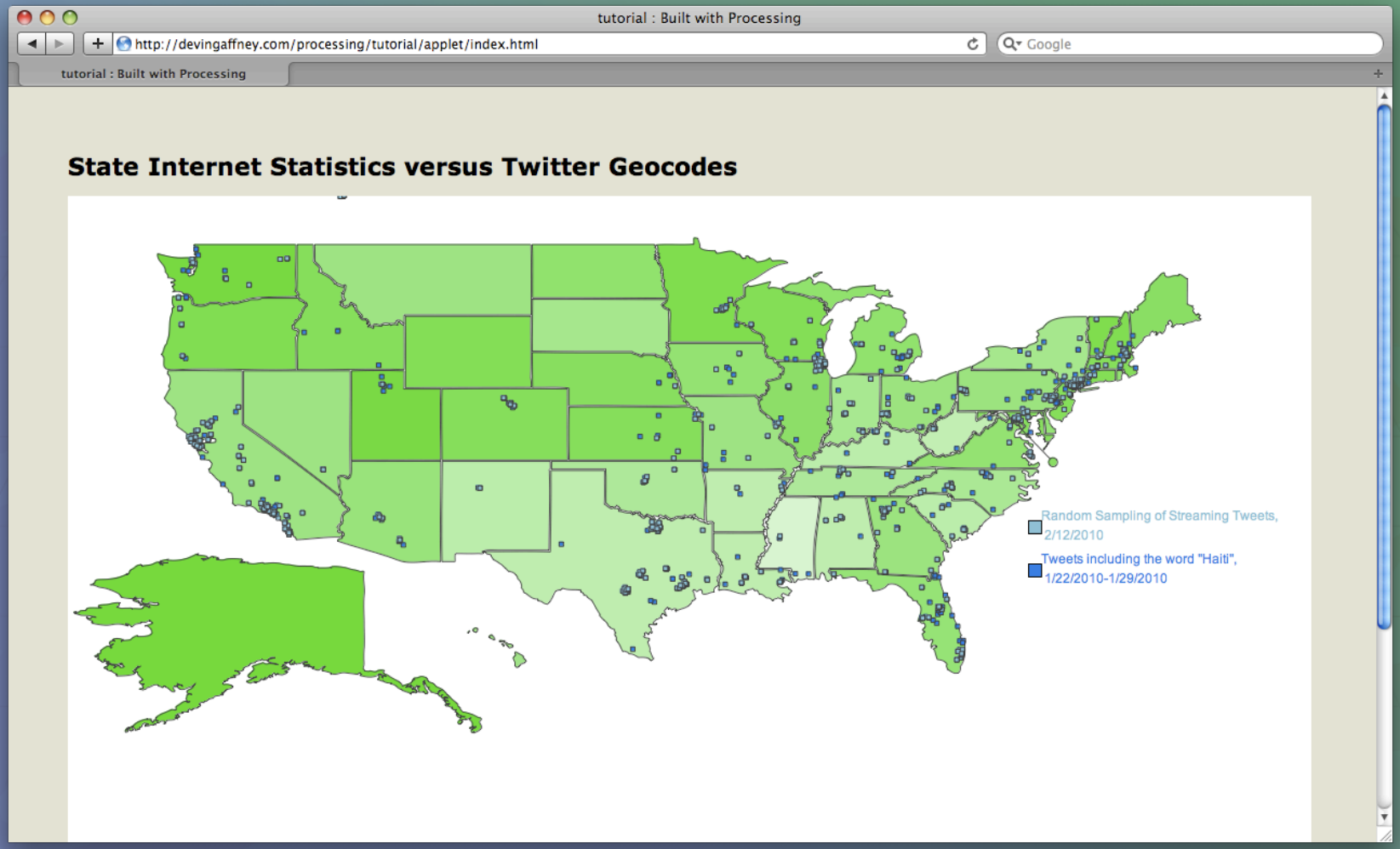
TWC LOGD

Rensselaer

[Temporal Mashup] bea.gov + federalreserve.gov +stats.gov.cn

Govt data linked to Social Media Metadata

Tetherless World Constellation

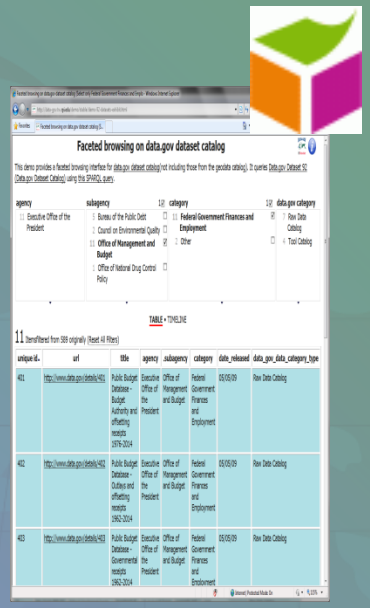


There is a lot of workflow information in the mix

Tetherless World Constellation

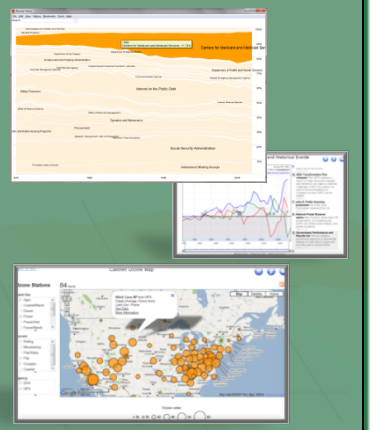
Convert

derive



Access

derive



Enhance

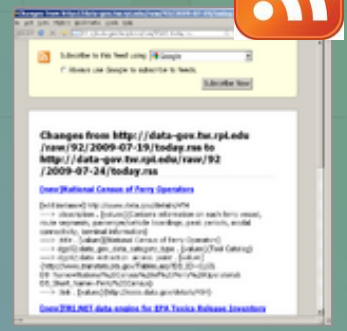
create

revision

Version

SemDiff

derive



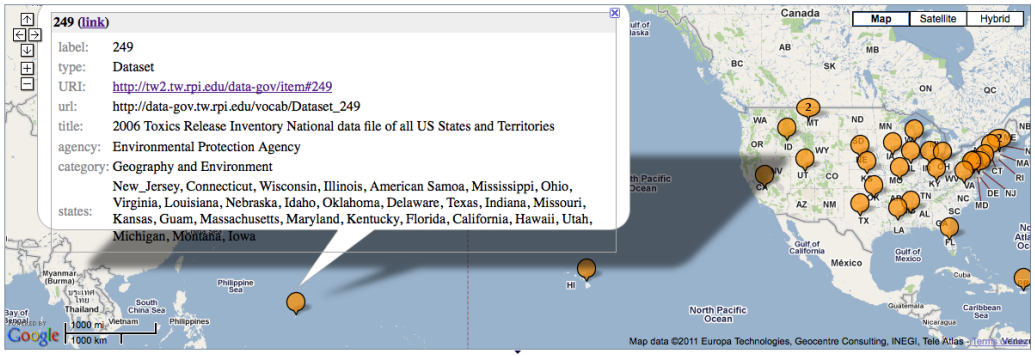
Data Search

Tetherless World Constellation

State-related Dataset Faceted Search

Datasets	States	1 ☑	Agency	Category
1 249	17 Alabama	☐	2 Environmental Protection Agency	2 Geography and Environment
1 307	12 Alaska	☐		
	2 **American Samoa**	☑		
	6 Arizona	☐		
	10 Arkansas	☐		
	9 California	☐		

2 Dataset filtered from 21 originally (Reset All Filters)



2 Dataset filtered from 21 originally (Reset All Filters)

Dataset ID ▲	URL	Title	Agency	Category	State-related Predicates
249	http://data-gov.tw.rpi.edu/vocab/Dataset_249	2006 Toxics Release Inventory National data file of all US States and Territories	Environmental Protection Agency	Geography and Environment	• /191/stack_air_emissions_release_pounds • /191/mailing_state • /191/facility_state • /191/total_transferred_off_site_for_further_waste_management • /191/other_on_site_waste_management • /191/total_stack_air_emissions
307	http://data-gov.tw.rpi.edu/vocab/Dataset_307	2007 Toxics Release Inventory National data file of all US States and Territories	Environmental Protection Agency	Geography and Environment	• /191/mailing_state • /191/stack_air_emissions_release_pounds • /191/facility_state • /191/total_stack_air_emissions

How can we search for data?

Metadata is crucial

Tetherless World Constellation

keyword: alaska

Run Query

search results (note: This demo only lists the first 200 search results)

agency

1	Department of Labor
4	Department of the Interior
8	DOC/NOAA/NESDIS/NGDC > National Geophysical Data Center, NESDIS, NOAA, U.S. Department of Commerce
25	Environmental Protection Agency
3	n/a
1	National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS), Office of Coast Survey (OCS)
19	NOAA National Oceanographic Data Center
1	U.S. Geological Survey
5	U.S. Geological Survey, Central Energy Resources Team
1	U.S. Geological Survey, Central Energy Resources Team, Data Management Project
118	US National Oceanographic Data Center

category

31	biota
1	boundaries
19	climatologyMeteorologyAtmosphere
2	elevation
32	Geography and Environment
31	geoscientificInformation
1	Health and Nutrition
1	Labor Force, Employment, and Earnings
5	Law Enforcement, Courts, and Prisons
9	n/a
2	Natural Resources

catalog

156	geodata catalog
40	Raw Data Catalog
4	Tool Catalog

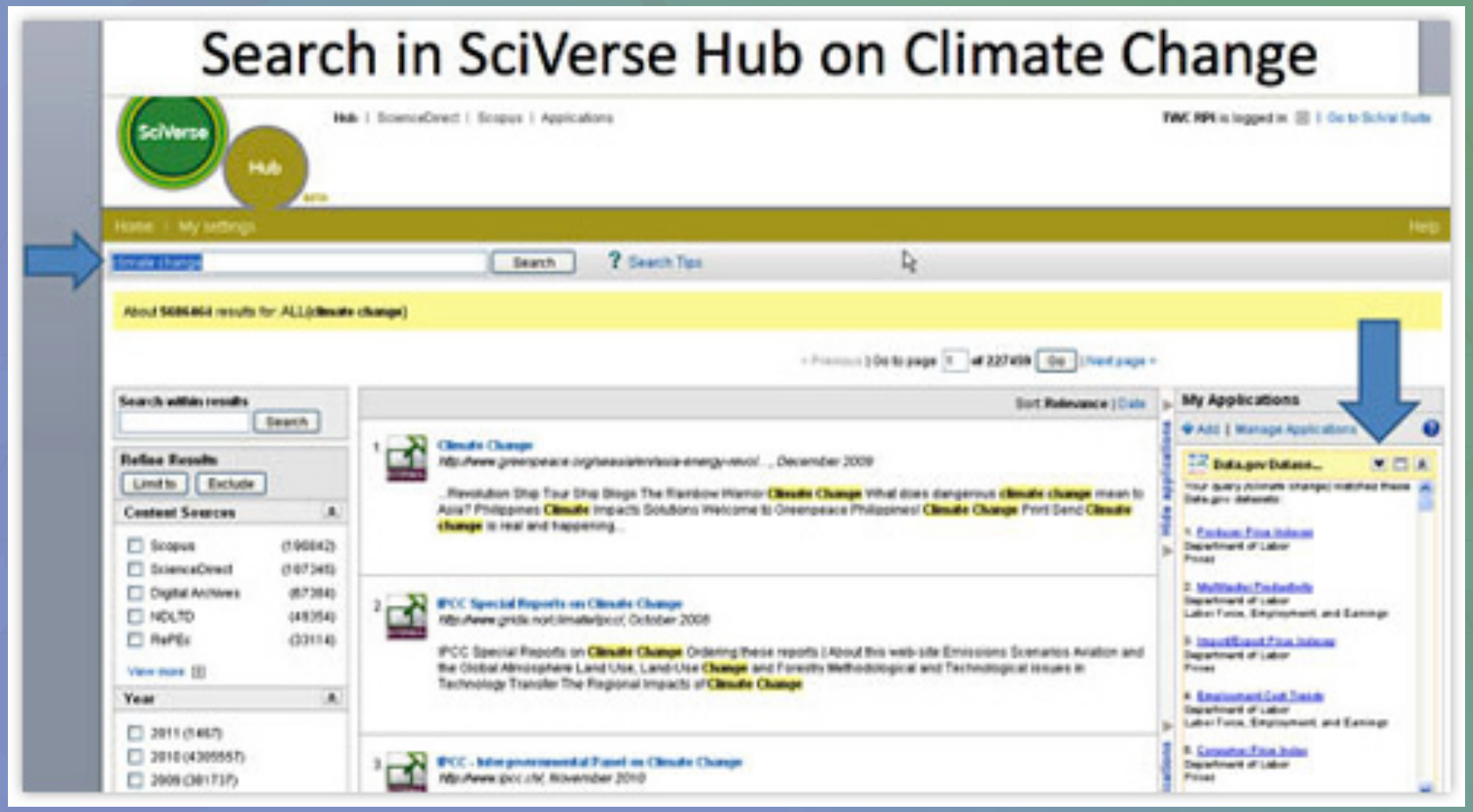
200 Items

dataset	agency	category	catalog	geographic coverage
Western Information Office	Department of Labor	Labor Force, Employment, and Earnings	Raw Data Catalog	http://logd.tw.rpi.edu/source/data-gov/dataset/92/value-of/geographic_coverage/States_Metro_Areas
U. S. Department of Energy (DOE) Categorical Exclusion (CX) Determinations Under the National Environmental Policy Act (NEPA)	Department of Energy	Geography and Environment	Tool Catalog	http://logd.tw.rpi.edu/source/data-gov/dataset/92/value-of/geographic_coverage/U_S_and_U_S_Territories
Total tonnage of commodites carried on commercial waterways by traffic type	Department of Defense	Transportation	Raw Data Catalog	http://logd.tw.rpi.edu/source/data-gov/dataset/92/value-of/geographic_coverage/United_States
Temperature and salinity profile	NOAA National Oceanographic	oceans	Geodata Catalog	lower corner:47.66,-158.7 upper corner: 61.07,-122.26
Accession No.: 0001332)				

What kinds of metadata are: simple to create, powerful enough for search and internationalizable (esp. beyond English)

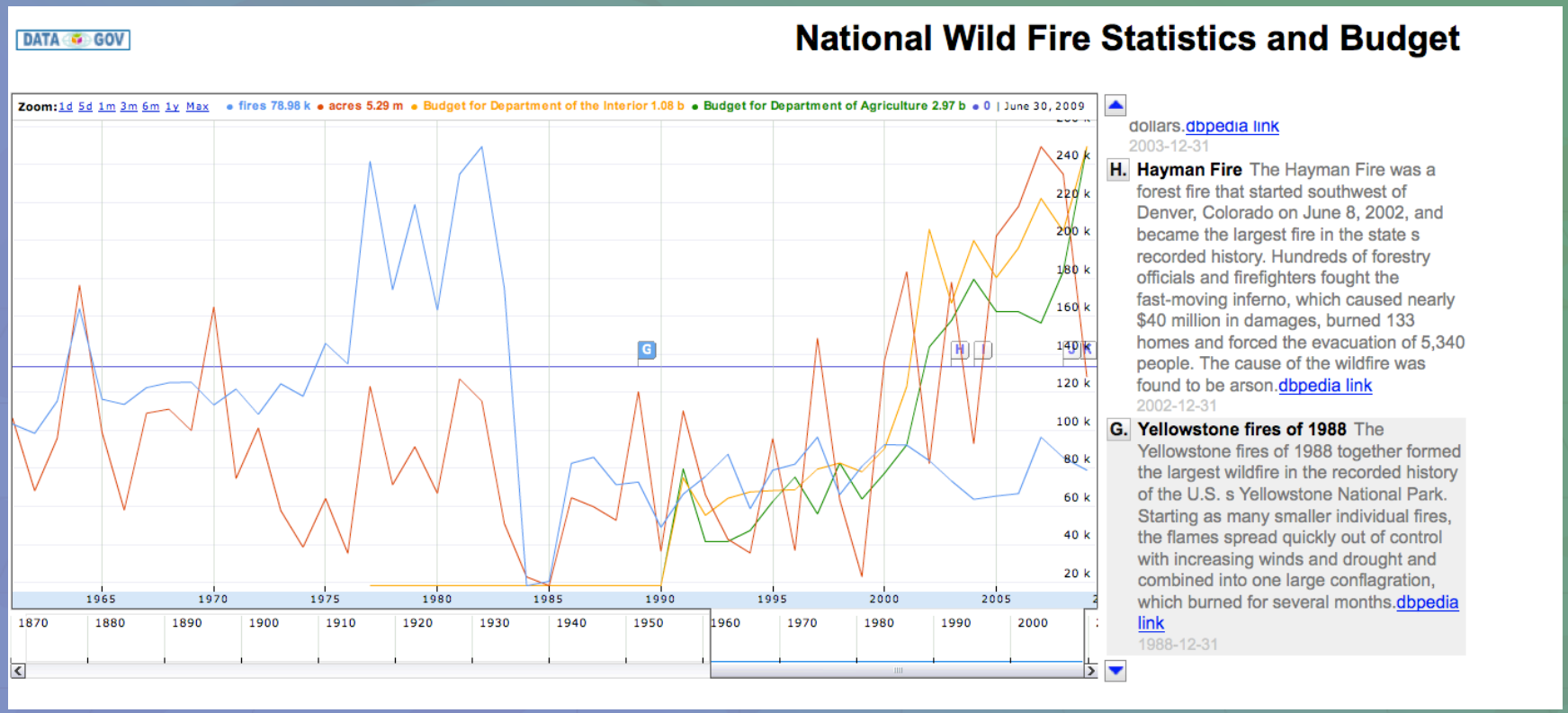
Example, integrating data and info search

Tetherless World Constellation



Visualization can help identify data errors

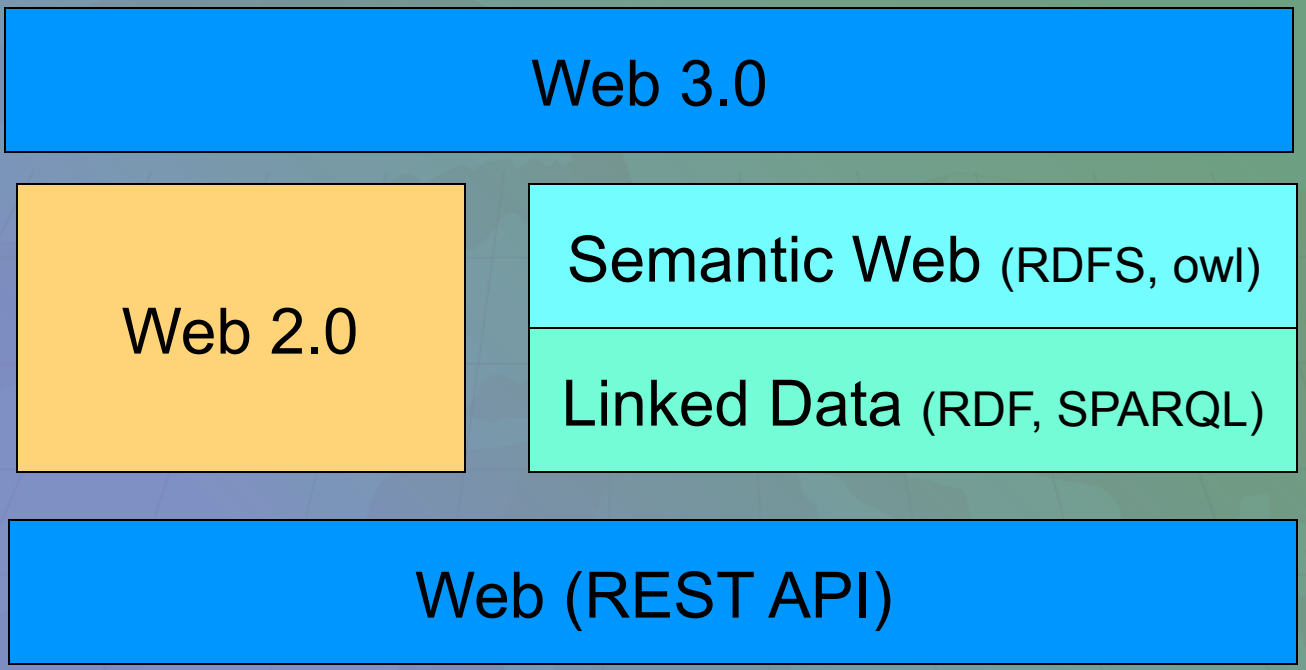
Tetherless World Constellation



Correlates fires, acres burned, and agency budgets

"Web 3.0"

Tetherless World Constellation



Web 3.0 extends current Web applications using Semantic Web, esp semantic and real-time search, technologies and graph-based, open data.

Semantic Search

Tetherless World Constellation

WEB TECHNOLOGIES

Web 3.0: The Dawn of Semantic Search

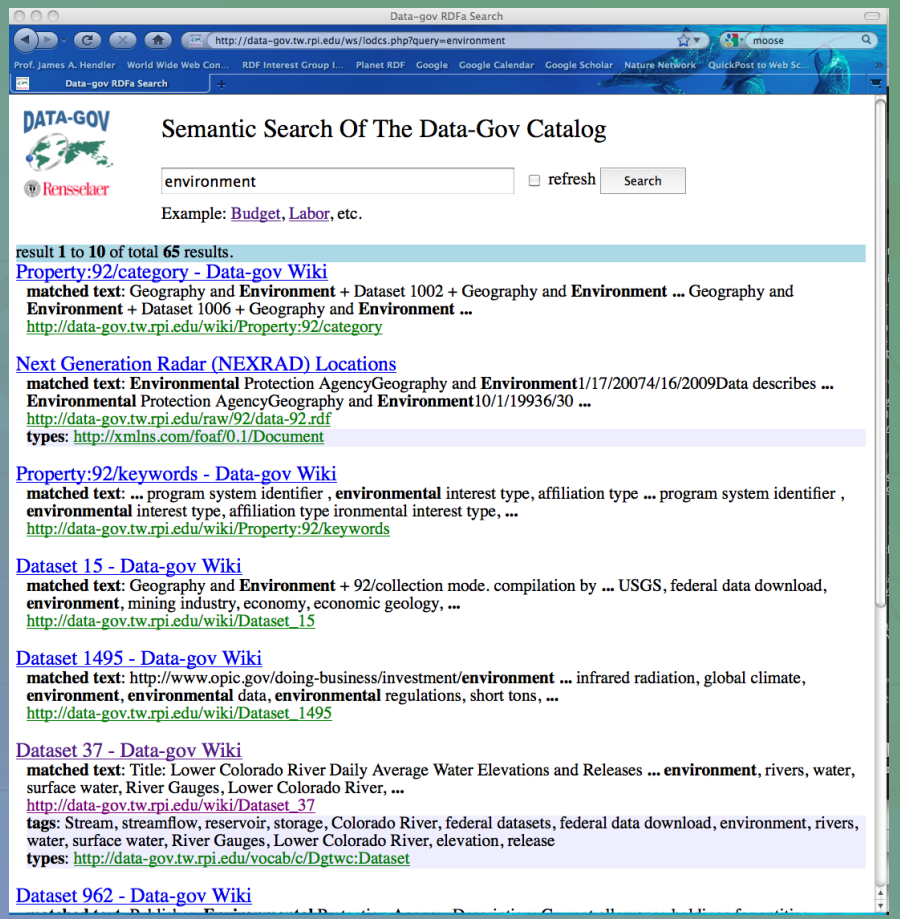
James Hendler, *Rensselaer Polytechnic Institute*

Emerging Web 3.0 applications use semantic technologies to augment the underlying Web system's functionalities.

IEEE Computer, Jan 2010; IEEE Computing Now, Feb 2010 (free)

Semantic Search

Tetherless World Constellation



Semantic Search Powered by RDFa

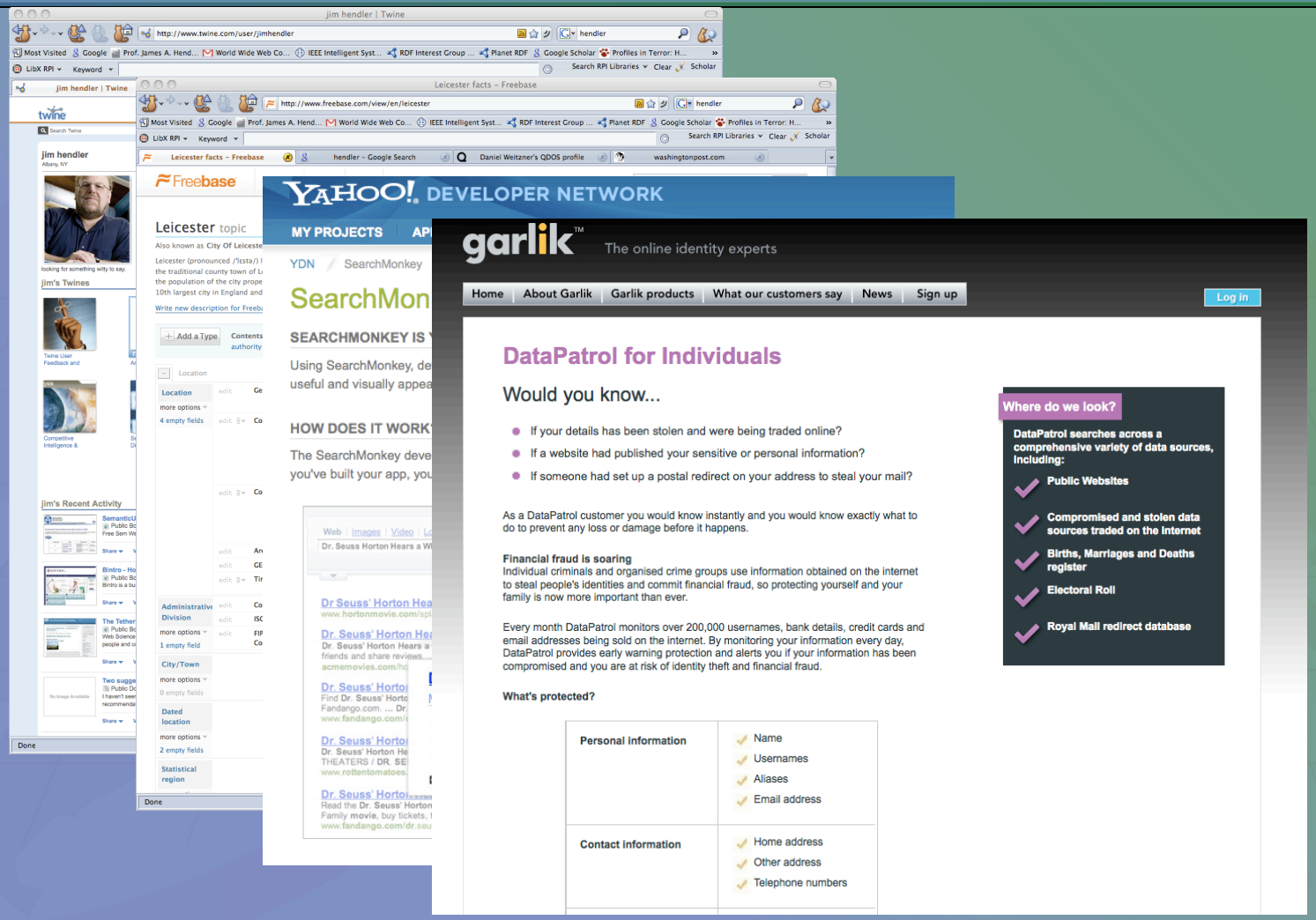
Trialx.com

Tetherless World Constellation

Save lives

Lots More

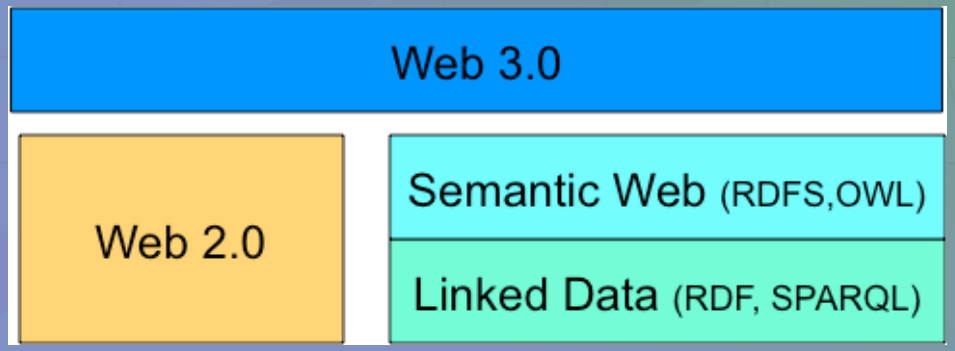
Tetherless World Constellation



Web 3.0 Applications

Web 3.0 excitement (hype?)

- Significant and growing commercial interest…
  - Web: Google, Amazon, Travelocity…
  - Web 2.0: Facebook, Wikipedia, YouTube, Twitter…
  - Web 3.0: ??



Summary

Tetherless World Constellation

- The Semantic Web is real
  - People asking "how," not why
- So far the commercial driver has been "weak semantics"
  - Very Simple "ontologies"
  - Lots of linking
  - Metadata agreements, not ontology alignments
- Web 3.0 adds semantics as a value add to regular Web functionality
  - Data mashup
  - Semantic search
  - Semantic match
- Investor excitement: The big one is still out there