

Some Steps from the Web to a Semantic Web

Presented on

World Wide Web:

Technology, Standards and Internationalization 2010 Conference

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New Delhi, May 7th 2010

based on a slide set by Ivan Herman,
Semantic Web Activity Lead, W3C

Questions to answer

What is and why would we want a Web of data?

Why do we need standards for this?

Can we use established WWW technology to do it?

What else would it take to build it?

Is it real?

**Let's e.g. organize a trip to
Budapest using the Web!**

Let's find a proper flight ...

... a big, reputable airline, or ...

Book flights - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.klm.com/travel/nl_nl/apps/ebt/ebt_home.htm

Stel hier uw vraag (in me ?)

KLM Royal Dutch Airlines **nwa**

Book flights You are not logged in

1 Vlucht zoeken 2 Datum kiezen 3 Tijd kiezen 4 Uw gegevens 5 Bekijken & betalen

Contact KLM Service Center

E-mail een vriend(in) Print deze pagina

Kies uw heen- en terugvlucht.

Vertrek: Amsterdam (Schiphol) naar Boedapest (Ferihegy Airport)

☒ Alleen vluchten gebaseerd op Alleen de beste verbindingen (10 van 13)

☐ Alleen rechtstreekse vluchten tonen (5 van 13)

☐ Laagste tarieven (9 van 13)

☐ Alle vluchten (13)

Kies	Prijs	Vertrek	Aankomst	Vlucht
Rechtstreekse vluchten				
☒		10:00 Vr 15 Aug 08 Amsterdam (Schiphol) Totale reistijd: 2 uren 0 minuten Uitgevoerd door MALEV Hungarian Airlines Vliegtuigtype :Boeing 737	12:00 Vr 15 Aug 08 Boedapest (Ferihegy Airport)	KL3201
☐		12:20 Vr 15 Aug 08 Amsterdam (Schiphol) Totale reistijd: 2 uren 0 minuten Uitgevoerd door MALEV Hungarian Airlines Vliegtuigtype :Boeing 737	14:20 Vr 15 Aug 08 Boedapest (Ferihegy Airport)	KL3203

Kies tarief

Take Off

RETOUR tarieven per persoon incl. belasting en toeslagen (excl. reserveringskosten)

Take Off (25% FB Miles)

300

☒ Geselecteerd

Take Off

341

Selecteer

Take Off (Flexibel)

383
455
537

... the airline of the target country, or ...

Review - Mozilla Firefox

File Edit View History Bookmarks Tools Help

https://booking.malev.com/BookingSite/Review/Review.aspx

BOOK YOUR TRIP
FLIGHTS, SCHEDULES
PREPARE FOR FLIGHT
FLYING WITH MALEV
DUNA CLUB
CUSTOMER CARE
CORPORATE INFO

MALEV Hungarian Airlines
ONE MORE REASON TO TRAVEL

English

1 Search 2 Select 3 Review 4 Traveller data 5 Purchase 6 Confirmation

SELECT DELIVERY METHOD

Please select ticket delivery method below!

Delivery method	Service fee	Address
☒  E-ticket View service fee breakdown	EUR 10	with e-invoice
☐  Airport	EUR 30	KLM ticket office, departure hall 2.
☐  Office	EUR 30	KLM ticket office, departure hall 2.
☐  Courier		Courier or mail delivery is available only within the country of departure! You will be asked to provide a delivery address on the next page. Please note that in case of courier delivery we will be unable to deliver your ticket(s) to a PO box.
☐  Mail	EUR 30	

BOOKING GUIDE
Book Cheap!
Card payment
About ticket pickup
If you are not among the travellers
Online Client Service


Check III

FLIGHT SUMMARY

Outbound flight		Return flight	
From:	Amsterdam, Schiphol (AMS), Netherlands	From:	Budapest, Ferihegy 2A (BUD), Hungary
	Budapest, Ferihegy 2A (BUD).	To:	Amsterdam, Schiphol (AMS),

... or a low cost one

Online booking | Select Flights - Mozilla Firefox

http://wizzair.com/skylights/cgi-bin/skylights.cgi?step=1

W!ZZ wizzair.com

new destination from London Luton:
Timisoara (from 17 December)

online booking | useful information | destinations | travel services | partners

important changes regarding checked-in baggages - Please click here for more details...

flights | agency login | my account | search bookings | log in

Book a Flight

Round Trip | One Way

From: Eindhoven

To: Budapest-Terminal 1

Depart: 14 Aug

Return: 03 Sep

Passengers: 1 Adult Over 14 years, 0 Child 2 to 14 years

search | **select** | contact | passengers | purchase | confirmation

The flights available for the date(s) that you have selected are shown below. Review and select that you wish to purchase by ticking the dot next to the fare price or use the form to the left ha search for new flights. All times are local.

Fares shown below are for one way flights and per adult, child and infant. The total price includes the taxes and the charges. Payments made with debit and credit cards are subject to a payment Click here to find out the exact amount. The fee depends on the type of card that you wish to u payment.

going out ✈

Eindhoven » Budapest-Terminal 1

date	fareclass	flight	departs	arrives		price excluding tax	taxes and charges
Fri 15 Aug 08	Web	W6 228	13:25	15:20	☐	Adult 94.99 EUR	26.00 EUR
Sun 17 Aug 08	Web	W6 228	13:25	15:20	☐	Adult 73.99 EUR	26.00 EUR

Next Week >

**You have to find a hotel,
so you look for...**

... or a really luxurious one, or ...

Search Results - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.hilton.com/en/hi/hotels/search/newresults.jhtml?searchType=city&stat

Hilton
Travel should take you places®

Sign in Username or HHonors #: Password or PIN: Register Forgot password? ☐ Remember Me View Text Only Customer Support 1-800-HILTONS

Specials & Packages Reservations Meetings Social Gatherings Hilton HHonors Things to Do eBrochures My Favorites

Search Results

Change Your Search

Location

City: Budapest

Search Within: 40 mi km

State/Province: State / Province

Country: Hungary

Brand

☒ Hilton Hotels
☐ All Hilton Family Hotels

Search Results Print Help

The following locations matched your request.
Rates displayed may be non-refundable.
Please review rate rules and restrictions prior to booking your stay.

Sort by: Brand Show: All Hotels Go View Hotels on a Map >

Hilton Hotels

Hilton Budapest WestEnd Compare Hotel

Vaci ut 1-3
Budapest, Hungary, 1062
36-1-288-5500

Available

... this one could work

Bestwestern.com, the World's Largest Hotel Chain - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://book.bestwestern.com/bestwestern/selectHotel.do?ata=00158210

Customer Service Rewards Program Gift Card Groups & Meetings

Best Western

Welcome to bestwestern.com®

My Profile

Email or Member#:

Password:

SIGN-IN

Forgot Password
Create Password
Enroll Now

HOME FIND A HOTEL CHECK RESERVATIONS TRIP PLANNER PROMOTIONS & PROGRAMS PACKAGES

RESERVATIONS HOTEL LOCATIONS BEST WESTERN PREMIER HOTELS NEW HOTELS QUESTIONS & ANSWERS

→ **Hotel Search Results** ← Select Occupancy Select Room Review & Reserve Confirmation

Find a Hotel - Select Hotel Page: 1

Modify Your Search:

City:

Select State or Province:

Select Country:

Check-In:

Check-Out:

Features & Amenities:

☐ High Speed Internet

☐ Complimentary Breakfast

5 Hotels Found within of the **Budapest** Area

Show: By:

Display Currency In:

 [Show Hotels on a Map](#)

Best Western Hotel Hungaria



[Photo Gallery](#)

Stay at this 4-star Budapest hotel offering guests deluxe accommodations near some of Budapest's popular attractions and business locations. Visitors... [More >](#)

 [Pet Policy](#)

Rákóczi Ut 90,
Budapest, H-1074, Hungary
Distance from City Center: 0.86m / 1.38km

Hotel not available on selected dates.

[Check Alternate Dates](#)

**Of course,
you could decide
to trust a specialized site...**

... like this one, or...

Create your package from Amsterdam to Budapest (and vicinity) - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.expedia.com/pub/agent.dll?qscr=cmsh&subm=1&CMBTX_0_rgnm=Bud

Welcome - Already a member? My Itineraries | My Account | Customer Support

Search Expedia

Home Flights Hotels Cars **Vacation Packages** Cruises Activities DEALS & OFFERS Maps Business Travel Rewards

Start search over

Change your search

Departing: 8/18/2008

Returning: 9/3/2008

Star Rating: Show all

Lodging Type: Show All

Name contains:

Go

Change Travelers

2 Adults
1 Room

Change travelers

Create your package from Amsterdam to Budapest (and vicinity)

Maps: Area map view Hotel map view

Hotel amenities: Narrow your search

Show hotels in this area:

Budapest (and vicinity) (all areas) Go

Not what you're looking for? Choose a different destination

View packages: 1 - 25 26 - 50 51 - 75 76 - 97 Previous | Next

Sort by: ☒ Expedia Picks ☐ Price ☐ Hotel Name ☐ City ☐ Star Rating ☐ Traveler Opinion

Avg/person: \$2889

Total: Price details \$5778

Get ThankYou® Points

Corinthia Grand Hotel Royal

Impressive landmark building with imposing Neo-classical façade and soaring glass atrium, set on Pest's busy Erzsébet Avenue, and housing shops, a spa, ... More lodging info

Hotel promotion - Stay 3 Nights and Save 20% on Your Stay!

★★★★★ Budapest, PEST

Executive Double-Executive lounge usage Check in: 8/18/08

Includes: Free Wireless Internet, Spa Check out: 9/03/08

Credit, Breakfast Buffet

Traveler Opinion 4.7 out of 5 15+ reviews

Amsterdam (AMS) to Budapest (BUD) Depart: 8/18/08 6:00 PM - 8:00 PM Malev Hungarian Airlines

... or this one

Budapest Hotels: Read Budapest Hotel Reviews and Compare Prices - TripAdvisor - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://www.tripadvisor.com/Hotels-g274887-Budapest-Hotels.html

My TripAdvisor
Register Now!

22,582,888 Travelers from 190 Countries Planned Trips Here This Week!

Home Destinations Fun & Games Just For Members

Home → Europe → Hungary → Budapest

Budapest Hotels

ADD TO MY MAP WRITE A REVIEW EMA

Hotels (272) B&Bs / Inns (24) Specialty Lodging (83)

Find Hotels Travelers Trust

Check-in: Any date
mm/dd/yyyy

Check-out: Any date
mm/dd/yyyy

☒ My dates are flexible

Price: Any Price U.S. Dollars Hotel class: Any Class Adults: 2

Recommended For: All

Best deals: Budapest hotels

- [Budapest: Book en bespaar tot 75%.](#)
Booking.com Geen reserveringskosten!
- [Great Budapest Hotels](#)
www.Venere.com/Budapest_Hotels See maps & pics, read book online. Relax and enjoy your stay!
- [Budapest easyHotel Deals](#)
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- [Cheap Hotels Budapest](#)
www.otel.com/BudapestHotels Fantastic rates on Budapest Huge Savings, Instant Confirmation!

[View all deals for Budapest](#)

Recommended Hotels (1-20 of 272)

Sort by: Popularity [next >>](#)

Free Budapest Guide

Get the best picks for where to eat and play.

[Download pdf](#)

you want to learn about Budapest

Budapest Travel Guide | Budapest Tourism - RealTravel - Mozilla Firefox

File Edit View History Bookmarks Tools Help

http://realtravel.com/budapest-hungary-travel-guide-d13081-1.html

travel tom

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Search

You are here: Destinations > Europe > Hungary > Budapest > Travel Guide

BUDAPEST TRAVEL GUIDE AND TOURISM

Introduction | **Guides** | Trips | Photos | Flights | Hotels | Restaurants | Attractions | Deals



photo by Taisteal

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[Destinations near Budapest >](#)

Budapest Travel Guide

This capital city - made up of two parts, Buda and Pest - sits on one of the most beautiful areas of the Danube River and it shows. Often dubbed the "Paris of Eastern Europe", it is a combination of Old World grandeur and a thriving cultural scene. Budapest has a vibrancy and vitality that never slows and the numerous sights can occupy travelers for weeks. With so much history and culture to explore, no traveler leaves unsatisfied.

Price Compare Tool

Search multiple sites for the best rate in Budapest

COMPARE FLIGHTS

COMPARE HOTELS

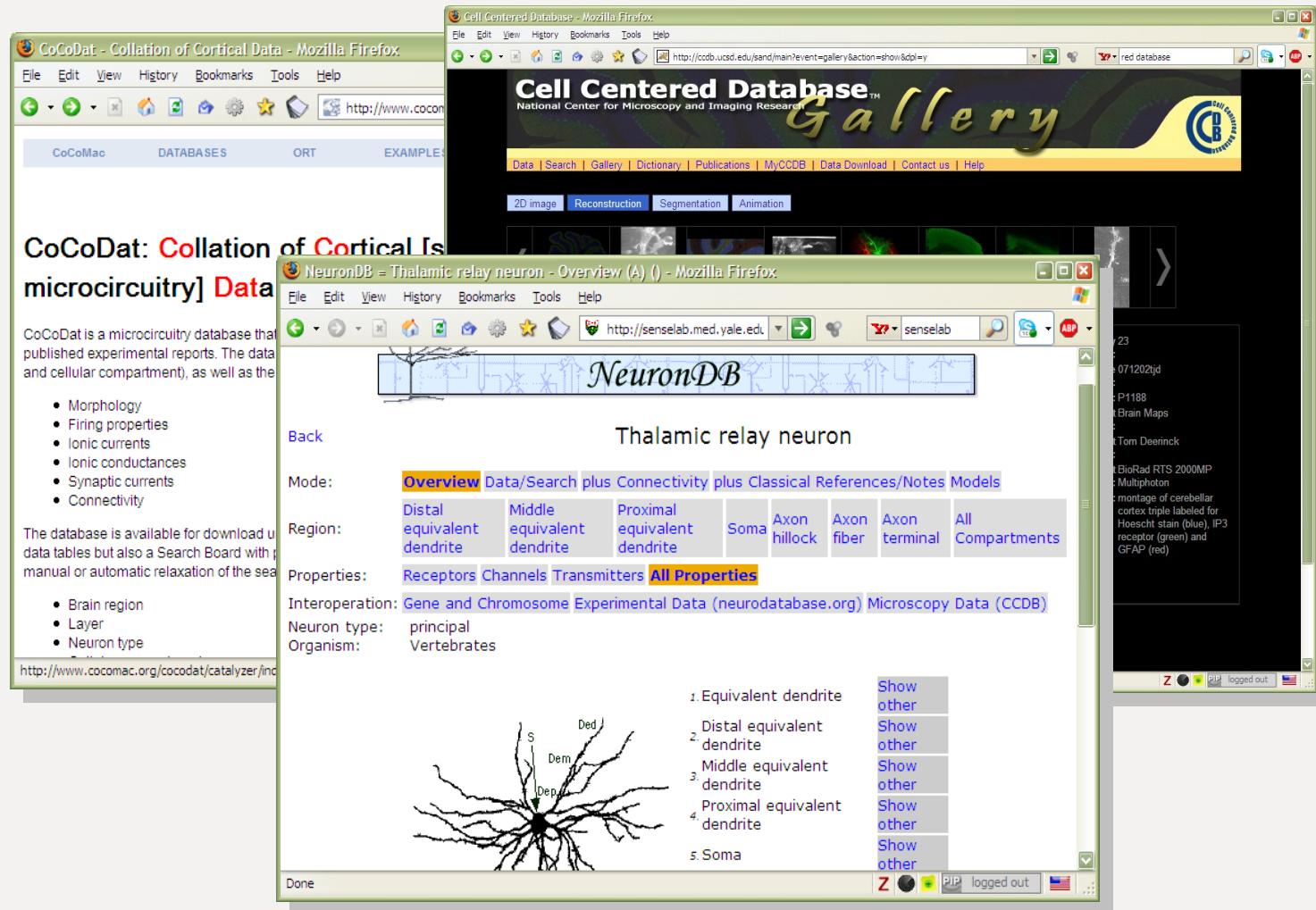
Travel Guide Information From Our Partners

What happened here?

- You had to consult a large number of sites, all different in style, purpose, possibly language...
- You had to mentally ***integrate*** all this information to achieve your goals
- We all know that, sometimes, this is a long and tedious process!

- All those pages are only tips of respective icebergs:
 - the real *data* is hidden somewhere in databases, XML files, spread sheets, SQL ...
 - you have only access to what the Web page designers allow you to see
- Specialized sites (Expedia, TripAdvisor) do a bit more:
 - they gather and combine data from other sources (usually with the approval of the data owners)
 - but they still control how you see those sources
- Sometimes you want more: you may want access to the original data and combine it yourself without remembering all intermediate results yourself!

Same problem in research ...



- Companies may have to hire a person to answer questions based on those (public!) databases!

What would we like to have?

- We would like to have applications that can combine all the data in the different Web sites (or underlying databases) in a useful way.
- This would require that the applications can access the data
- This would require that the data can be linked like Web pages today

Or put in another way:

- We would like to *extend* the current Web with a “Web of data”:
 - allow for applications to exploit the data directly

**But wait! Isn't this
what mash-up sites are
already doing?**

Example: Managing trips (tripit.com)

FLIGHT

Klaus Birkenbihl

Lufthansa 506

depart Frankfurt am Main (FRA) 22:35, arrive Sao Paulo (GRU) 05:15

seats 45H

Sunday, September 28, 2008

Sao Paulo, Brazil [\(Edit\)](#)

Avg: Sunny / Hi 25°C / Lo 17°C

[Add Plans](#)

DIRECTIONS

Directions

From: Rod. Hélio Smidt, sao paulo

To: RUA QUINTANA, 934, Sao Paulo, Brazil

[VIEW DETAILS](#)

HOTEL

Trypp Berrini (check-in)

TRYP BERRINI

Primary Guest: Klaus Birkenbihl

RUA QUINTANA, 934

Sao Paulo, SP, Brazil

Check in 28/9/2008, Check out 30/9/2008

Conf. # 603775

MAPS

Map of TRYP BERRINI - RUA QUINTANA, 934, Sao Paulo, Brazil

RUA QUINTANA, 934, Sao Paulo, Brazil

[VIEW DETAILS](#)

Monday, September 29, 2008

São Paulo, Brazil [\(Edit\)](#)

Avg: Sunny / Hi 26°C / Lo 17°C

[Add Plans](#)

MEETING

Meeting with .br Office

W3C Brazil Office

Av. das Nações Unidas, 11541, 7º andar, Sao Paulo

29/9/2008

DIRECTIONS

Directions

RUA QUINTANA, 934, Sao Paulo, Brazil

0,5 km (ca. 1 Minute.)

1. Ost auf R. Quintana Richtung Praça João Duran Alonso 62 m
2. Bei Praça João Duran Alonso links 65 m

PageRank Alexa Compete 74.53.50.201

How does it work

- Klaus forwards to Tripit the documents (mails, URIs) with the data related to a trip. e.g.
 - Flight bookings
 - Hotel reservations
 - Meetings
- Any time he has new documents he may add them
- Tripit tries to extract the data from these documents
- Based on the data it associates the documents to a trip
- It adds information from other sites about weather, directions, travel guides ...
- It checks its own database for travel activities of friends
- It connects with social networking sites
- It compiles a structured itinerary

This is great ... but

- Sometimes Tripit sends Klaus a message “Problem with your Triplt submission” and does nothing though the data was delivered
- Sometimes some data from in document are not identified
- Sometimes Klaus reads: “Please help us to improve! Let us know how good we captured your flight.”
- This gives a hint on what Tripit does: in case it does not know how to find the data it guesses
- Because there is no standardized way to access the data Tripit has to use proprietary interfaces and follow the changes – for all the many sources . *Greetings from Sisyphos to the programmers!*

- So in some ways, mash-ups show the huge power of what a Web of data provides
- But mash-up sites are forced to do very ad-hoc jobs
 - various data sources expose their data via Web Services
 - each with a different API, a different logic, different structure
 - these sites are forced to reinvent the wheel many times because they don't use a standard way of doing things



Put it another way (again)...

- We would like to *extend* to the current Web with a **standardized “Web of data”**

Questions to answer

What is and why would we want a Web of data?

Why do we need standards for this?

Can we use established WWW technology to do it?

URIs and Links

What else would it take to build it?

Machine readable description of Data (Metadata, Ontologies, Classification ...)

Is it real?

yes

The following slides are not shown in this presentation (for the sake of time) but they detail the answers to the last 3 questions.

Slides at:

<http://www.w3.org/2010/Talks/0507NewDelhi-KB-IH/>

But what does this mean?

- What makes the current (document) Web work?
 - people create different documents
 - they give a globally unique address to it (i.e. a URI) and make it accessible to others on the Web

Then some magic happens...

- Others discover the site and they link to it
 - So Search engines can find it and index it
- The more they link to it, the more important and well known the page becomes
 - remember, this is one criterion, search engines use to rank pages.
- This is the “Network effect”: some pages become important, and others begin to rely on it (even if the author did not expect it...)

Can this be used for a Web of Data?

- Lessons learned: we should be able to:
 - “publish” the data to make it known on the Web
 - standard ways should be used instead of ad-hoc approaches
 - the analogous approach to documents: *give URI-s to the data*
 - make it possible to “link” to that URI from *other* sources of data (not only Web pages) using standard approaches
 - i.e., applications should not be forced to make targeted developments to access the data (as we saw with mash-ups)
 - generic, standard approaches should suffice
 - and let the network effect work its way...

But it is a little bit more complicated 🤖

- On the traditional Web, humans are implicitly taken into account
- A Web link has a “context” that a person may use
e.g. if you read on a Web page
please [mail to Klaus Birkenbihl](#) ...
you can guess that the link labelled “mail to Klaus Birkenbihl” leads you to his e-mail address.
- It all only works in a meaningful way if you, the human, can make correct and meaningful assumptions about the link.

Machines cannot interpret labels ...

- Something is missing in our model for the web of data!
- extra information (“label”) must be added to a link e.g. saying “this links to a Klaus Birkenbihl thing”.
- this information should be machine readable
- this label is a characterization (or “classification”) of *both* the link *and* its target
- in some cases, the classification should allow for some limited “reasoning”

Let us put together what we need for a Web of Data

- URI-s to publish data, not only full documents
- data can to link to other data
- the data and the links (the “terms”) should be characterized/classified to convey some extra meaning
- standards for all these to maintain interoperability

So What *is* the Semantic Web?

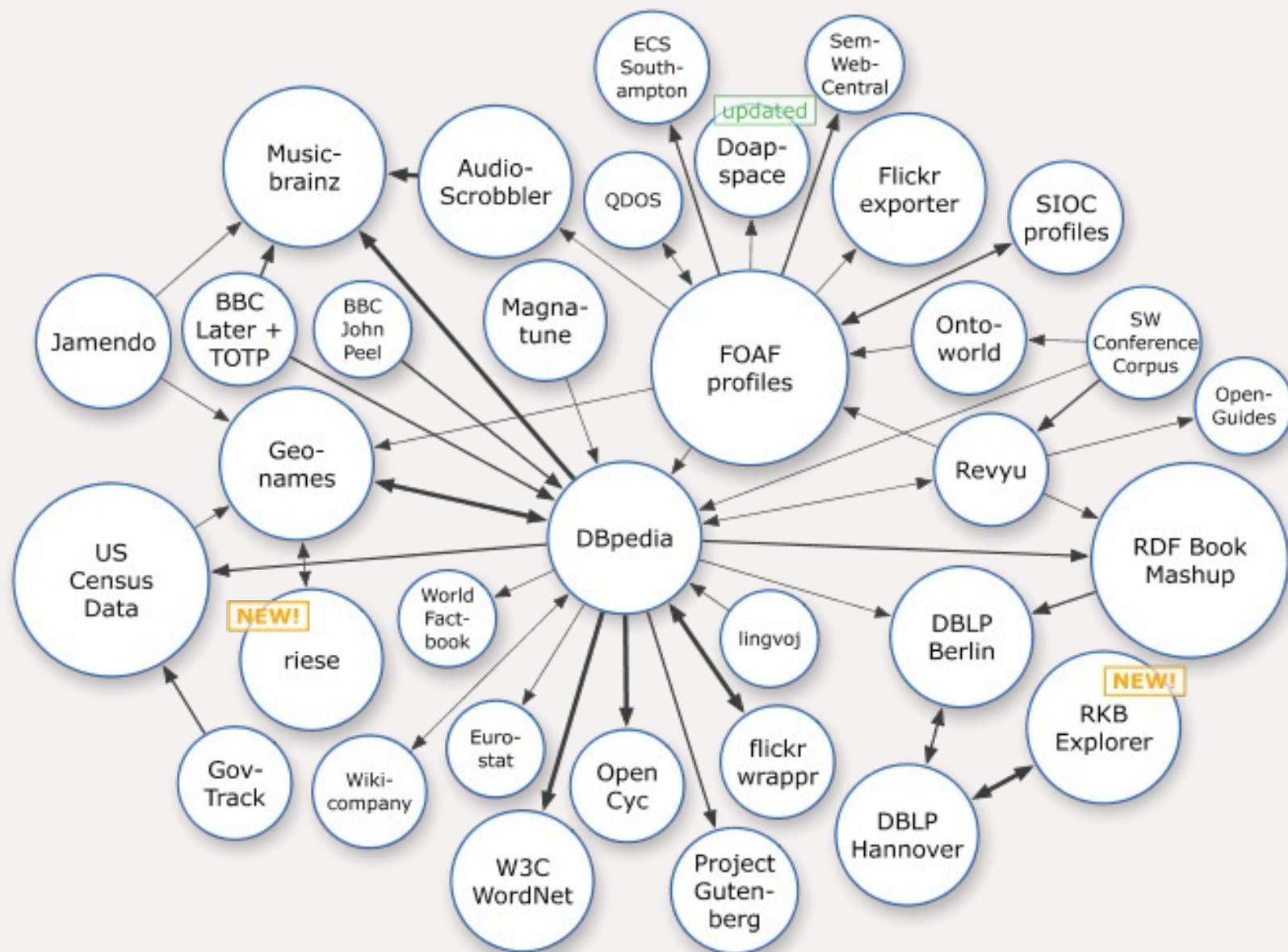
**It is a collection of standard technologies
to realize a Web of Data**

It is that simple...

but of course, the devil is in the details

- a common model has to be provided for machines to understand the “labels” and draw some conclusions from that info
- the “classification” of the terms can become very complex for specific knowledge areas: this is where ontologies, thesauri, vocabularies, etc, enter the game...
- W3C has developed a set of standards for this
 - RDF – the Resource Description Framework
 - OWL – the Web Ontology Language (based on RDF)
 - SPARQL – a Query language for the Semantic Web
 - and a few more that make it easier to use

The Linked Open Data “cloud”, March 2008



All this sounds nice, but isn't that just a dream?

The “corporate” landscape is moving

- Major companies offer (or will offer) Semantic Web tools or systems using Semantic Web: Adobe, Oracle, IBM, HP, Software AG, GE, Northrop Gruman, Altova, Microsoft, Dow Jones, Google, Yahoo, Facebook, ...
- Others are using it (or consider using it) as part of their own operations: Novartis, Pfizer, Telefónica, ...
- Some of the names of active participants in W3C SW related groups: ILOG, HP, Agfa, SRI International, Fair Isaac Corp., Oracle, Boeing, IBM, Chevron, Siemens, Nokia, Pfizer, Sun, Eli Lilly, ...

Lots of Tools (not an exhaustive list!)

- Categories:

- Triple Stores
- Inference engines
- Converters
- Search engines
- Middleware
- CMS
- Semantic Web browsers
- Development environments
- Semantic Wikis
- ...

- Some names:

- Jena, AllegroGraph, Mulgara, Sesame, flickurl, ...
- TopBraid Suite, Virtuoso environment, Falcon, Drupal 7, Redland, Pellet, ...
- Disco, Oracle 11g, RacerPro, IODT, Ontobroker, OWLIM, Tallis Platform, ...
- RDF Gateway, RDFLib, Open Anzo, DartGrid, Zitgist, Ontotext, Protégé, ...
- Thetus publisher, SemanticWorks, SWI-Prolog, RDFStore...
- ...

In the end ...

- There is a huge potential for useful applications once we have a web of data
- Mash-ups give good examples for applications based on linking data
- When (re)designing a web site some thoughts on publishing data along with the documents might pay in the future.





- Slides are available at:
<http://www.w3.org/2008/Talks/1002RioDeJaneiro-KB-IH/>
in OpenDocument Presentation Format and PDF.