

Using the Semantic Web

 **ISWC 2008**

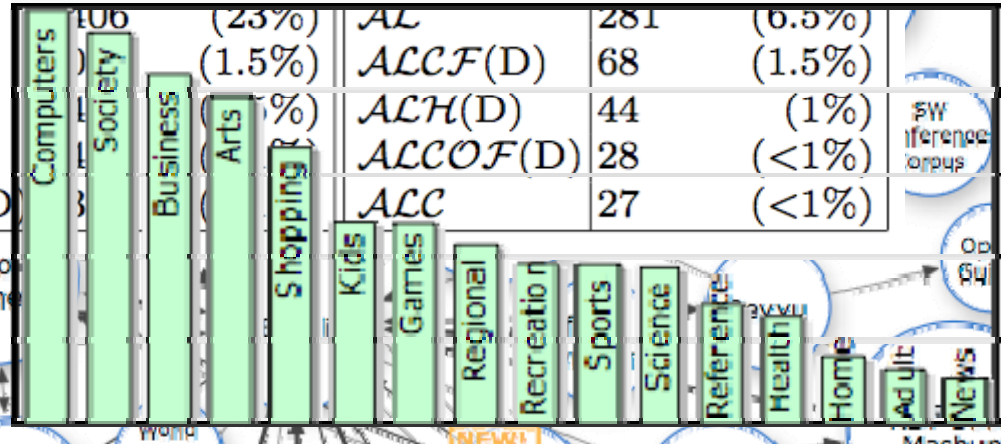
Mathieu d'Aquin

What is there to use on the Semantic Web?



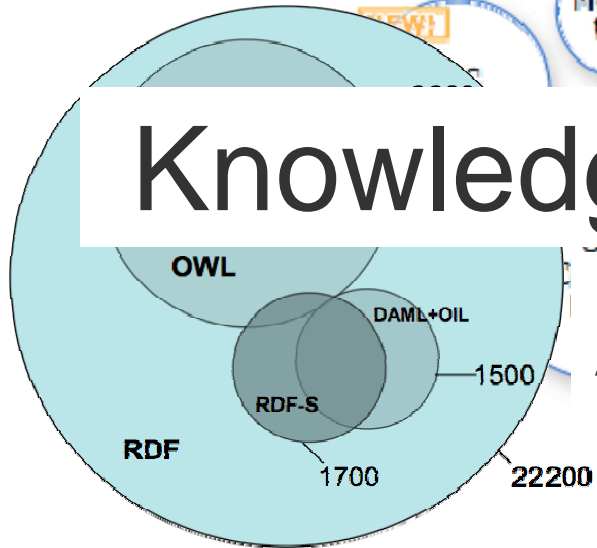
Total		OWL		OWL Full	
DL	Nb Documents	DL	Nb Documents	DL	Nb Documents
AC(D)	21275 (84%)	AC(D)	3644 (59%)	AC(D)	3365 (78%)
AC	2455 (10%)	AC	100 (2%)	AC	281 (6.5%)
ACH(D)	293 (1%)	ACCF(D)	3 (1.5%)	ACCF(D)	68 (1.5%)
ACCF(D)	105 (<1%)	ACC	1 (1%)	ACH(D)	44 (1%)
ACH	102 (<1%)	ACH(D)	3 (<1%)	ACCOF(D)	28 (<1%)
ACC	1 (<1%)	ACCOF(D)	3 (<1%)	ACC	27 (<1%)

- Technologies
- Systems
- Services



- Infrastructures

Knowledge, information, data...



A lot of that

Total number of domain relations	161
Total number of sub-class relations	76
Total number of instance relations	984
average P-density (number of properties per class)	32
average H-density (number of super-classes per class)	106
	1 114
	(
	(

Now that it is there, how to make use of this Semantic Web?



- Novel, smart, useful, **Semantic Web** based applications
 - that exploit the information available instead of creating their own
 - that combine sources of information dynamically, to create novelty



A developer perspective

A Programmable Semantic Web



The screenshot shows the homepage of Programmable Web. At the top, there is a navigation bar with links for 'Sign up/Sign In', 'Add a Link', 'Subscribe', 'Tag Cloud', a 'Google Custom Search' box, 'Advertise on PW', 'Contact Us', 'Press', 'About', and 'FAQ'. Below this is the site's logo, 'programmableweb', and the main heading, 'Mashups, APIs and the Web as Platform'. A secondary navigation bar includes 'Home', 'News', 'Mashups', 'APIs', 'Verticals', 'How-To', 'Contests', and 'Members'. A third bar contains 'Dashboard', 'Register', and 'Tour'. On the left, a 'Find' sidebar lists 'API Directory', 'Mashup Directory', 'Most Popular', and 'Mashup Matrix'. The main content area is dated 'October 17, 2008' and features three columns: 'New Mashups' with links to 'Energy: Country Comparisons of Fuel Production', 'MyGlobalLounge', 'GPABook.com', 'Local Area Info from Zillow Widget', and 'mediarosa'; 'Mashup of the Day' featuring 'Energy: Country Comparisons of Fuel Production' with two pie charts; and 'New APIs' with links to 'Google Email Settings', 'Wikia', 'Xavier Finance Exchange Rates', 'IIG Alerts', and 'New York Times Movie Reviews'.

<http://www.programmableweb.com/>

A Programmable Semantic Web



The screenshot shows the homepage of www.programmablesemanticweb.com/. The site features a navigation bar with links for Sign up/Sign In, Add a Link, Subscribe, Tag Cloud, Google Custom Search, Advertise on PW, Contact Us, Press, About, and FAQ. The main header includes the site logo and the title "Semantic Mashups, Semantic APIs and the Semantic Web as Platform". Below the header is a secondary navigation bar with links for Home, News, Mashups, APIs, Verticals, How-To, Contests, and Members. A third navigation bar contains Dashboard, Register, and Tour. The main content area is dated October 17, 2008, and is divided into three columns: "New Mashups", "Mashup of the Day", and "New APIs".

Find

- API Directory
- Mashup Directory
- Most Popular Mashup Matrix

October 17, 2008

New Mashups »

- ▶ Revyu.com: review anything
- ▶ Southampton RDF-based Pub Finder
- ▶ Wahoo

Mashup of the Day »

Revyu.com: review anything

New APIs »

- ▶ Watson
- ▶ Semantic Proxy
- ▶ TextWise Semantic Hacker
- ▶ Sindice SIOC API
- ▶ Hakia

<http://www.programmablesemanticweb.com/>

Agenda (in mixed order)



- What exists to support application developers in making use of the Semantic Web
 - Web APIs delivering semantic information
- What can be done with the Semantic Web
 - Examples of applications of these APIs
- What more can we do with the Semantic Web
 - ... something to discuss...

Covered



- APIs that produce semantic information and their applications
 - **TextWise Semantic Hacker**
 - **Open Calais/Semantic Proxy**
 - Triplify (server side)
- APIs that deliver existing semantic information and their applications
 - PingTheSemanticWeb.org
 - Semantic Web Client Library
 - **Sindice**
 - **Watson**

Not Covered



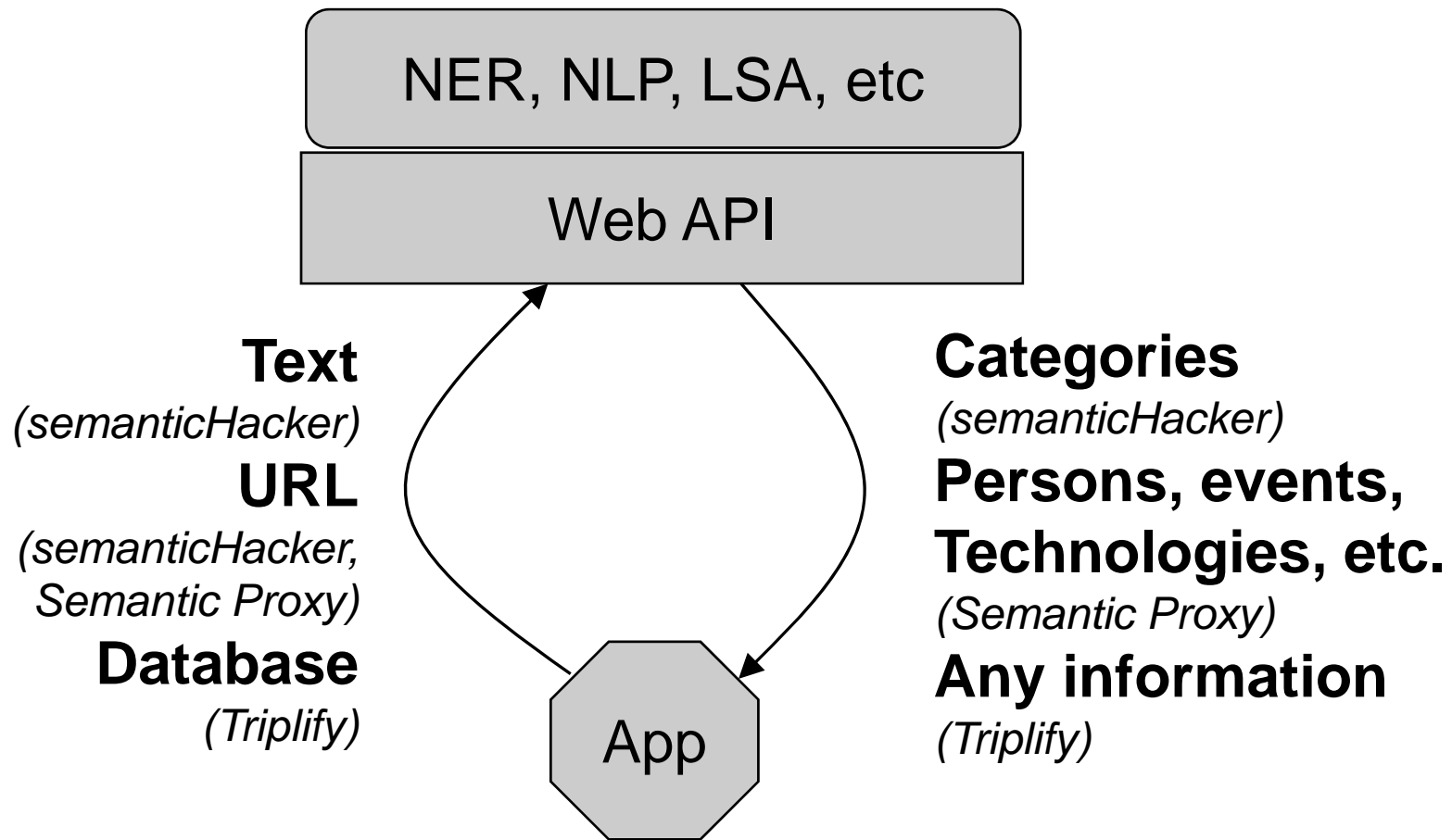
- Semantic Search APIs
 - E.g., Hakia
- Semantic information storing and querying
 - E.g., the Talis Platform
- Semantic information presentation and browsing
 - E.g., SearchMonkey

To Make Things Simple...



- All the API we will be looking at are based on the REST principles, meaning that:
 - They are accessed through HTTP
 - Use simple URLs
 - And return XML, JSON or RDF

APIs that Produce Semantic Information



TextWise Semantic Hacker



A screenshot of the Semantic Hacker website. The header includes the logo 'semantichacker' and navigation links for 'about', 'contact', 'blog', and 'textwise'. A secondary navigation bar contains 'HOME', 'THE CHALLENGE', 'API', 'TECHNOLOGY', 'FORUM', and 'INCREASE QUERY LIMIT'. The main content area features a lightbulb icon and the headline 'Turn on the power of semantics' with the subtext 'The World's First API for Semantic Discovery'. Below this, there are two columns of text: 'Semantic Discovery' and 'What Semantic Signatures® Do'. The latter includes an 'Input Text' field with a sample paragraph about capturing sunsets and a 'Submit' button. A character count '(Available Characters Remaining: 103 of 2000)' is visible below the input field.

Provides the *Semantic Signature* API.

Providing a text or the URL of a web document, returns an ordered list of categories (called dimensions) to classify the text.

<http://www.semantichacker.com/>

TextWise Semantic Hacker

Example



<http://api.semantichacker.com/sh/api?token=xxxxxxx&uri=http://kmi.open.ac.uk/events/iswc08-semantic-web-intro/&showLabels=true>

```
<response xmlns="http://www.semantichacker.com/api">
  <signature>
    <dimension label="Reference/.../.../Ontologies" weight="0.74655414" />
    <dimension label="Reference/.../.../Semantic_Web" weight="0.4789231" />
    <dimension label="Reference/.../.../Metadata/RDF" weight="0.25988686" />
    <dimension label="Computers/Artificial_Intelligence/Agents" weight="0.16180865" />
    <dimension label="Reference/Knowledge_Management/Knowledge_Representation/Topic_Maps" i
    <dimension label="Computers/Software/Databases/Object-Oriented/Conferences" index="10213" v
    <dimension label="Science/Social_Sciences/Linguistics/Computational_Linguistics/Research_Grou
    <dimension label="Science/Institutions/Europe/United_Kingdom/e-Science" index="5362" weight="
    <dimension label="Reference/Knowledge_Management/Business_and_Companies" index="19643
    <dimension label="Computers/Computer_Science/Conferences" index="11014" weight="0.0811044
    <dimension label="Computers/Software/Enterprise_Information_Integration" index="10425" weight:
    <dimension label="Computers/Computer_Science/Database_Theory/Conferences" index="11013"
    <dimension label="Reference/Knowledge_Management/Events/Past" index="19647" weight="0.07
```

TextWise Semantic Hacker Application Example



SemanticJournal ^{BETA}

This application does the following:

- It uses Semantic Hacker API to parse your entry and get the main themes within the text (top 3 results).
- It uses Google search API to get relevant results of the main themes in your entry (top 3 results).
- It uses RSSLib4J to read RSS feeds to match stories that are related to the main semantic theme.
- A detailed account of this application can be found at josesandoval.com.

Title:

The Art of War.

Entry:

The Art of War is one of the oldest books on military strategy in the world. It is the first and one of the most successful works on strategy and has had a huge influence on Eastern and Western military thinking, business tactics, and beyond. Sun Tzu was the first to recognize the importance of positioning in strategy and that position is affected both by objective conditions in the physical environment and the subjective opinions of competitive actors in that environment.

Clear Semantic Search Save Entry

Semantic Search Results

Arts Literature World Literature Sun Tzu The Art of War

[The Art of War by Sun Tzu. Search, Read, Study, Discuss.](#)

Whoever published **Sun Tzu's The Art of War** must have contemplated that the ... " **The Art of War**" is, in my opinion, comparable to other works of **literature**, ...

[Open Directory - Arts: Literature: World Literature: Chinese: Sun Tzu](#)

Sonshi - Presents a translation of "**Art of War**", as well as articles, FAQ, news, and a message board. **Sun Tzu Art of War** in Information Warfare - Collection ...

[Google Directory - Arts > Literature > World Literature > Chinese ...](#)

Sun Tzu Art of War in Information Warfare - <http://www.ndu.edu/inss/siws/cont.html> Collection of essays on **Sun Tzu's Art of War** and national security. ...

Arts Literature World Literature Sun Tzu

[Open Directory - Arts: Literature: World Literature: Chinese: Sun Tzu](#)

Sonshi - Presents a translation of "**Art of War**", as well as articles, FAQ, news, and a message board. **Sun Tzu Art of War** in Information Warfare - Collection ...

[Open Directory - Arts: Literature: World Literature: Chinese](#)

Sun Tzu (23) ... China the Beautiful - Extensive database of Chinese **literature** as well as other aspects of Chinese **arts** and culture. ...

[Google Directory - Arts > Literature > World Literature > Chinese ...](#)

Sun Tzu Art of War in Information Warfare - <http://www.ndu.edu/inss/siws/cont.html> Collection of essays on **Sun Tzu's Art of War** and national security. ...

Games Video Games Action Army Men Games

[Open Directory - Games: Video Games: Action: A: Army Men Games](#)

Games: Video Games: Developers and Publishers: 3: 3DO (1). "Army Men Games" search on: AltaVista - A9 - AOL - Ask - Clusty - Gigablast - Google - Lycos ...

[Google Directory - Games > Video Games > Action > A > Army Men Games](#)

Directory Help Search only in **Army Men Games** Search the Web ... Related Category : **Games > Video Games > Developers and Publishers > 3 > 3DO (26)** ...

[Google Directory - Games > Video Games > Action > A > Army Men ...](#)

"**Army Men** RTS has hit on something - it's serious, it's primal, it's wacky and it's fun, all at once. You get all the fun of RTS fundamentals combined with ...

<http://www.sandoval.ca:8080/SemanticWebJournal/SemanticWebJournal.html>

Introduction to the Semantic Web Tutorial

Open Calais/Semantic Proxy



The screenshot shows the Semantic Proxy web interface. At the top, there is a navigation bar with links for "Contact Us", "Forums", and "Are you a content". Below this is the "SEMANTIC PROXY" logo. The main heading is "SemanticProxy Demo". A search bar contains the URL "http://kmi.open.ac.uk/events/iswc08-semantic-web-intro/index.html" and a "Go" button. Below the search bar, a list of extracted entities is displayed under the heading "Person". Each entry includes the name, instance information, and a relevance percentage, along with an information icon.

Person		
name: John Domingue	Instance Info	i
relevance: 56.5%		
name: Fabio Ciravegna	Instance Info	i
relevance: 17.6%		
name: Natasha Noy Semantic Interoperability	Instance Info	i
relevance: 14.7%		
name: Aldo Gangemi	Instance Info	i
relevance: 51.6%		
name: David Martin Semantic	Instance Info	i
relevance: 56.7%		
name: Jerome Euzenat	Instance Info	i
relevance: 14.7%		
name: Sean Bechhofer	Instance Info	i
relevance: 24.1%		
name: Interoperability - Jerome Euzenat	Instance Info	i
relevance: 13.9%		
name: Jim Handler	Instance Info	i
relevance: ...		

Semantic Proxy translates the content of a Web document to a representation in RDF, HTML or Microformats.

It can recognize and type in the text people, organizations, cities, technologies, publications, companies, countries, medical conditions, ...

<http://semanticproxy.com/>

Open Calais/Semantic Proxy Example



<http://service.semanticproxy.com/processurl/xxxopencalaiskeyxxx/rdf/http://kmi.open.ac.uk/people/mathieu/>

Person: Fouad Zablith, Milton Keynes, Carlo Alloca, Marta Sabou, Enrico Motta

Organization: UHP University of Nancy, Open University, Knowledge Media Institute, PC

City: Nancy

Technology: fuzzy logic, artificial intelligence, API, Semantic Web technologies, knowledge management, Knowledge Management, XML, RDF

Country: France, United Kingdom

Company: Google

Facility: Walton Hall

Published Medium: Journal of Logic and Computation

Industry Term: online ontologies, Web Applications, cancer treatment, Web services, online knowledge, semantic web applications, Web gateway, Web technologies

Medical Condition: cancer

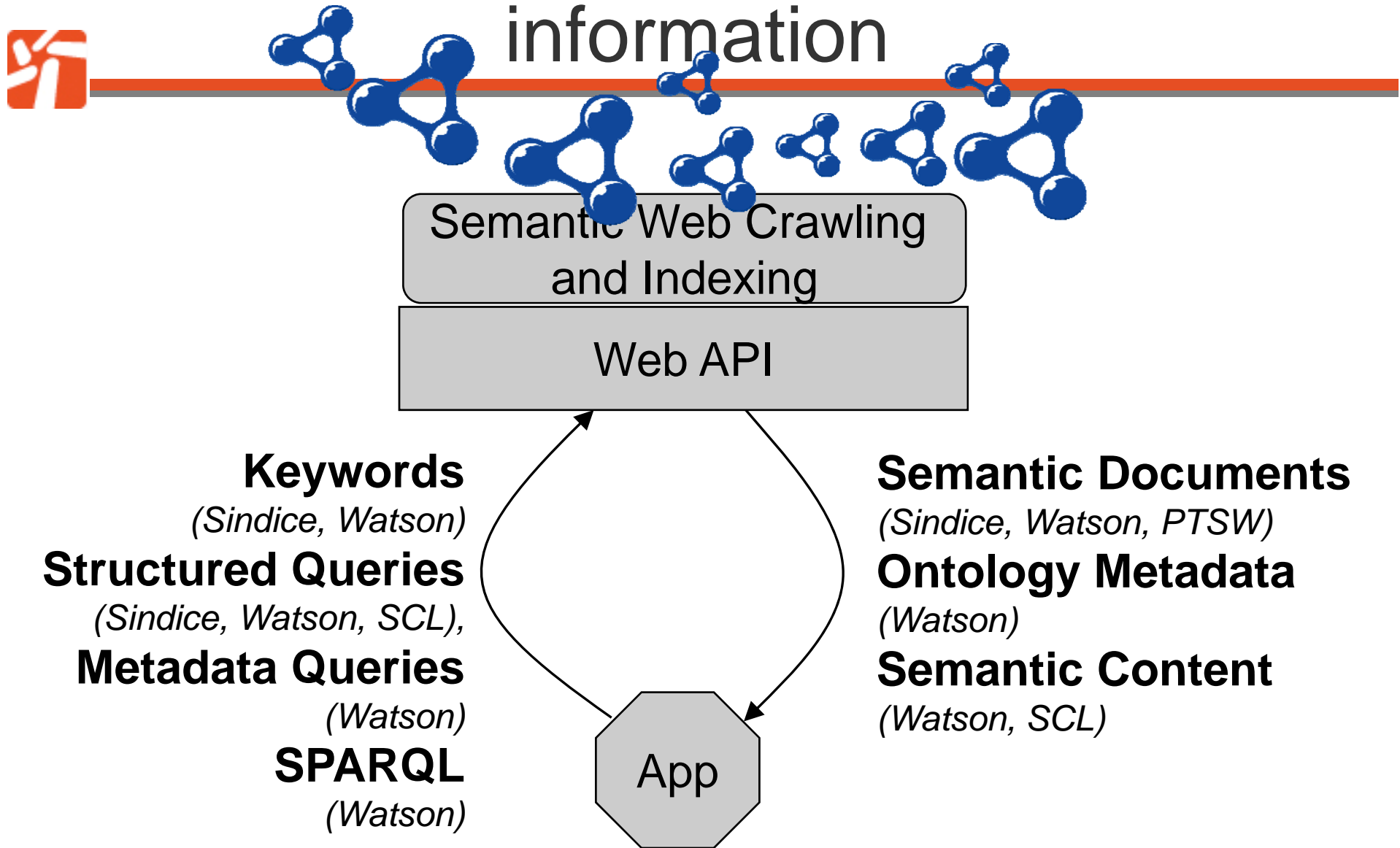
+ Annotations within the text!

Open Calais/Semantic Proxy Application Examples



<http://opencalais.com/gallery>

APIs that deliver semantic information



Sindice



The screenshot shows the Sindice website interface. At the top left is the Sindice logo with the tagline "THE SEMANTIC WEB INDEX". A navigation menu includes links for Home, About, Search, Submit, Forum, and Dev. Below the logo, a blue banner reads "Sindice - Data Web Services" and provides information about finding reusable information across 100 million web pages. A search box is prominently displayed with tabs for "Term", "Property", and "Advanced". The search box contains the text "Search the Semantic Web" and a search button. Below the search box, it says "Type one or more keywords" and "SEARCH". Examples of search terms are provided: "tim berners lee (by uri), michele, deri". It also states "Searching on about 37.72 million documents." Below the search box, there are two columns. The left column is titled "Latest News" and lists several events: "Meet us at:" followed by "ESTC 2008" (2nd Annual European Semantic Technology Conference), "XTech" (May 6-9, Dublin, Ireland), "SemTech" (May 18-22, San Jose, California), "Linked Data Planet" (June 17-18, New York City), and "ESTC 2008" (24-26 September 2008). The right column is titled "SINDICE BLOG" and lists several blog entries: "Sindice Beta 1 index" (JUN 20, 2008), "An Exciting Hard Hat area" (MAY 30, 2008), "Sindice in use" (FEB 20, 2008), "Sindice @ 20+ Millions and Openings" (NOV 22, 2007), and "Sindice Search in your Web Browser" (NOV 07 2007). Each entry includes a brief description and a "More" link.

Originally, an **entity lookup service**. Find a document that mention a URI or a keyword.

Extended with more structured query.

Sindice

Example 1



```
curl -H "Accept: application/rdf+xml"  
'http://api.sindice.com/v2/search?q=Mathieu+dAquin&qt  
=term&page=1'
```

...

```
<Result rdf:about="#result1">  
  <dc:title>Mathieu d&#8217;Aquin, Mathieu d'Aquin, Mathieu D'Aquin</dc:title>  
  <link rdf:resource="http://data.semanticweb.org/person/mathieu-daquin"/>  
  <dc:created>2008-10-17T00:00:00+01:00</dc:created>  
  <fields:format>RDF</fields:format>  
  <content>78 triples in 15925 bytes</content>  
  <rank>1</rank>  
</Result>  
<Result rdf:about="#result2">  
  <dc:title>Nodalities &#187; Blog Archive &#187; Mathieu d&#8217;Aquin Talks with  
  <link rdf:resource="http://blogs.talis.com/nodalities/2008/01/mathieu_daquin_tal  
  <dc:created>2008-07-22T00:00:00+01:00</dc:created>  
  <fields:format>LICENSE</fields:format>  
  <fields:format>MICROFORMAT</fields:format>  
  <content>2 triples in 412 bytes</content>
```

Sindice Structured Query



- Sindice can also be queried with structured query, e.g.
 - *<foaf:name> Mathieu d'Aquin*
 - *Mathieu d'Aquin class:Person*
- Return the documents containing entities that match the query (but not the entity itself)

Sindice

Application Example



A screenshot of the Sindice search application. The interface is split into two main sections. On the left, there's a sidebar with a 'View' menu and a search input field containing 'sparql'. Below this, there are sections for 'New URI ?:' with a text input field and a link to find relevant URIs. On the right, the main search results area shows a list of results for the query 'sparql'. Each result includes a date, the number of triples, the size in bytes, and a URL. The results are: 1) 2007-10-22 - 298 triples - 11609 b, URL: http://dbpedia.org/resource/SPARQL; 2) 2007-12-04 - 52 triples - 5217 b, URL: http://ontoworld.org/index.php?file=Special:ExportRDF/SPARQL&xmlmime=rd; 3) 2007-12-06 - 13 triples - 1796 b, URL: http://ontoworld.org/wiki/Special:ExportRDF/Help_talk:SPARQL_endpoint; 4) 2007-12-28 - 13 triples - 1786 b, URL: http://ontoworld.org/wiki/Special:ExportRDF/SPARQL_endpoint; 5) http://ontoworld.org/index.php?file=Special:ExportRDF/Talk:SPARQL_endpoint&xmlmime=rc.

- **MOAT:**
Meaning of a Tag.
- Can attach URIs found with Sindice to tags

Watson



The image shows four overlapping browser windows from the Watson Semantic Web Interface:

- Top Left:** The main search page. It features a search bar with the text "researcher" and a "Search Watson" button. Below the search bar, it says "Found 144 semantic documents - Search Options". A list of search results is visible, including URLs like http://www.csd.abdn.ac.uk/~cmckenzi/playpen/rdf/akt_ontology_LITE.owl.
- Top Center:** A window titled "Look up for an ontological entity - Watson Web Interface". It shows a graph of an ontology with a central yellow node labeled "Working-Person" and several surrounding nodes connected by lines.
- Bottom Center:** A window titled "Details for http://www.csd.abdn.ac.uk/~cmckenzi/playpen Person (view as list)". It displays a list of properties and values for the class "Person", such as "label: Working Person" and "isDefinedBy: http://www.csd.abdn.ac.uk/~cmckenzi/playpen/rdf/akt_ontology_LITE.owl".
- Right:** A window titled "Query Ontology and semantic data with SPARQL". It shows a SPARQL query:

```
SELECT ?s ?o
WHERE
{ ?s rdfs:label ?o }
```

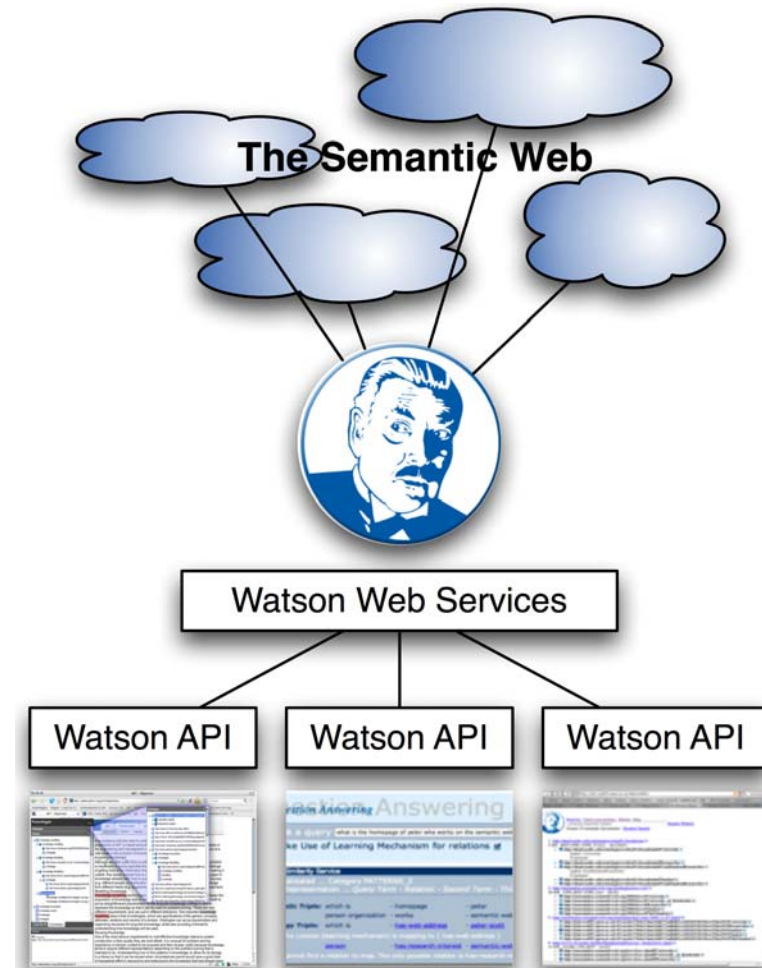
 Below the query is a table with metadata for the ontology, including "Size of the file: 67 KB", "Number of statements: 985", and "Representation languages: RDF, OWL".

A gateway to the Semantic Web: Supporting users and applications in *finding, exploring and exploiting* semantic content from the Web.

Watson APIs



- SOAP and REST APIs that provide the infrastructure to:
 - Find SW documents and retrieve metadata about them
 - Find entities (classes, properties, individuals) and explore their semantic description
 - Apply SPARQL queries to Semantic Web documents

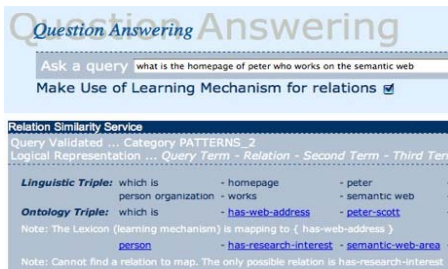
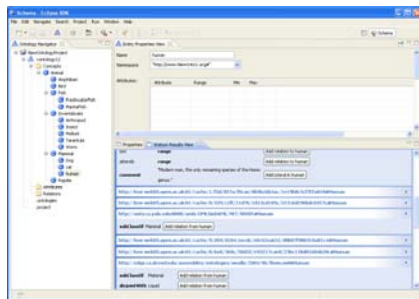


Watson Applications



Ontology Reuse:
The **Watson Plugin**

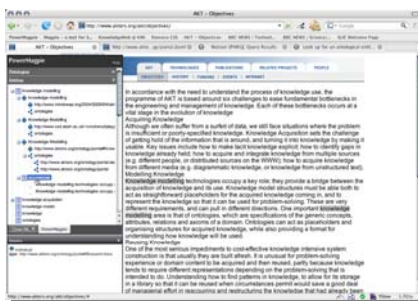
Semantic Relation
Discovery:
Scarlet



Question
Answering:
PowerAqua



URI Auto-
Completion:
MOAW



Semantic
Browsing:
PowerMagpie

And also:
Word sense disambiguation
Folksonomy Enrichment
Synonym Discovery...

Watson

A Demonstrator: Wahoo



WAHOO - Semantic Search with Yahoo! and Watson

file:///Users/mda99/Desktop/wahoo/index.html

Google

post?v=4;url...ument.title) Douglas W. J... card index http://www.....uk/~phale/ REST-Priciples MOAW diana Apple (129) Amazon

wahoo [What is it? - Watson - Yahoo!](#)

researcher student

Found 4100000 web documents

[CQ Press: The CQ Researcher - Students](#)
The CQ Researcher Winner of the ABA Silver Gavel Award and the Sigma Delta Chi Award of Excellence in Journalism Subscribers, click here to enter
<http://www.cqpress.com/student/student-researcher.html>

[Student Researcher Program](#)
... unique educational experience, the student researcher might also receive thesis ... The student and the ASMI researcher then discuss the time of participation and ...
<http://www.asmi.org/asmiweb/education/stuResearch.htm>

[HUDHRE.info - Resources by Audience](#)
Are you a researcher or a student looking for facts and statistics on homelessness? ... View all Researcher/Student resources for topic "Accessing Mainstream Services ..."
<http://www.hudhre.info/index.cfm?do=viewResourcesByRole&RoleId=7>

[CQ Press: PDF: CQ Researcher Students Under Stress v.17-25, Research, Report, Reports](#)
The average homework load for first- through third-graders has doubled over the past two decades, even though research shows homework doesn't benefit such young ...
<http://www.cqpress.com/product/Researcher-Students-Under-Stress-v17.html>

[The AGS Foundation for Health in Aging - Research - Student Researcher Fund](#)
The FHA Student Researcher Fund is supported by ticket sales for the annual ... can also support the Student Researcher Fund through the FHA's secure online ...
<http://www.healthinaging.org/research/studentresearcher.php>

[NCSU Student Researcher](#)
The NCSU Student Researcher, sponsored by the Center for Communication in ... Submissions to the Student Researcher are nominated by at least two faculty members. ...
<http://www.chass.ncsu.edu/ccstm/journal/>

[Distinguished Student Researchers - The School for Field Studies](#)

researcher

Generalize the Query

- person with occupation
- profession
- researcher
- marketing position
- seeker
- staff
- working person
- r d position
- affiliated person
- person
- sep 00030
- academic staff
- professor

Specialize the Query

- scientist
- investigator
- visiting researcher
- senior research fellow in academia
- researcher in academia
- research fellow in academia
- computer science researcher
- ph dstudent
- professor
- grad student researcher

student

Generalize the Query

- individual
- resident

Find on the Semantic Web terms to specialize or generalize a query to a search engine (Yahoo).

Watson

A Demonstrator: Wahoo



- Find ontologies containing the keyword “researcher”
<http://watson.kmi.open.ac.uk/API/semanticcontent/keywords?q=researcher>
- ... **exactly** “researcher” in the **label** or **id** of a **class**
<http://watson.kmi.open.ac.uk/API/semanticcontent/keywords?q=researcher&scope=LN+Label&ent=Class&match=Exact>
- Find entities corresponding to “researcher” in ontology
<http://watson.kmi.open.ac.uk/API/entity/keyword?q=researcher&uri=http://calo.sri.com/core-plus-office&scope=LN+Label&ent=Class&match=Exact>
- Find subclasses and superclasses of an entity
<http://watson.kmi.open.ac.uk/API/entity/subclasses?ent=http://calo.sri.com/core-plus-office#Researcher&uri=http://calo.sri.com/core-plus-office>
- The rest is interface stuff and call to Yahoo!

Discussion



What more could we do?

Put things together



[What is it? - Watson - Yahoo!](#)

researcher student

[Search](#)

Found **41000000** web documents

[CQ Press: The CQ Researcher - Students](#)

The CQ Researcher Winner of the ABA Silver Gavel Award and the Sigma Delta Chi Award of Excellence in Journalism Subscribers, click here to enter
<http://www.cqpress.com/student/student-researcher.html>

[Student Researcher Program](#)

... unique educational experience, the student researcher might also receive thesis ... The student and the ASMI researcher then discuss the time of participation and ...
<http://www.asmi.org/asmiweb/education/stuResearch.htm>

[HUDHRE.info -- Resources by Audience](#)

Are you a researcher or a student looking for facts and statistics on homelessness? ... View all Researcher/Student resources for topic 'Accessing Mainstream Services ...
<http://www.hudhre.info/index.cfm?do=viewResourcesByRole&RoleId=7>

[CQ Press: PDF: CQ Researcher Students Under Stress v.17-25, Research, Report, Reports](#)

The average homework load for first- through third-graders has doubled over the past two decades, even though research shows homework doesn't benefit such young ...
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[The AGS Foundation for Health in Aging - Research - Student Researcher Fund](#)

The FHA Student Researcher Fund is supported by ticket sales for the annual ... can also support the Student Researcher Fund through the FHA's secure online ...
<http://www.healthinaging.org/research/studentresearcher.php>

[NCSU Student Researcher](#)

The NCSU Student Researcher, sponsored by the Center for Communication in ... Submissions to the Student Researcher are nominated by at least two faculty members. ...
<http://www.chass.ncsu.edu/ccstm/journal/>

[Distinguished Student Researchers - The School for Field Studies](#)

- Organization
- Research Center
- [Health Foundation](#)
- Education
- [University](#)
- Education
- Higher Education
- [PhD](#)

- Organizations:** [CQ Press](#), [ASMI](#), [AGS](#), [NCSU](#)
Awards: [Silver Gavel](#), [Sigma Delta Chi](#), [FHA](#)
Technology: [Statistics](#)

[researcher](#)

Generalize the Query

- person with occupation
- profession
- researcher
- marketing position
- seeker
- staff
- working person
- r d position
- affiliated person
- person
- sep 00030
- academic staff
- professor

Specialize the Query

- scientist
- investigator

Discussion



What more could we do?

Your ideas!?