Semantic Web for the Working Ontologist

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TS-5555

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Java

Sun microsystems

Data Challenges in a Distributed World

- In the good old days:
  - We had a customer master file and a product master file
  - They represented a "Single Version of the Truth“
  - Even in large corporations, there was a relatively small number of IT systems and they were all centralized
- Today:
  - Many systems: corporate, departmental, personal, internal, external
  - Many databases, often hundreds and thousands:
    - reflecting some aspects of the total picture
    - referring to items that are conceptually the same, but not technically (in terms of their identity as understood by computers) the same
  - No "Single Version of the Truth“
- How do we function in a multi-faceted, distributed world?
  - In particular, how do we develop and deploy systems that can cope and thrive in this reality?


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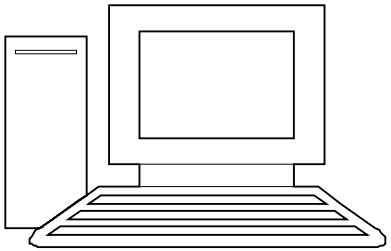
What is RDF? How to distribute data . . .

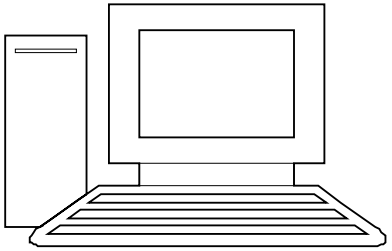
ID	Title	Author	Medium	Year
1	As You Like It	Shakespeare	Play	1599
2	Hamlet	Shakespeare	Play	1604
3	Othello	Shakespeare	Play	1603
4	Sonnet 78	Shakespeare	Poem	1609
5	Astrophil and Stella	Sir Phillip Sidney	Poem	1590
6	Edward II	Christopher Marlowe	Play	1592
7	Hero and Leander	Christopher Marlowe	Poem	1593
8	Greensleeves	Henry VIII Rex	Song	1525

By Rows?

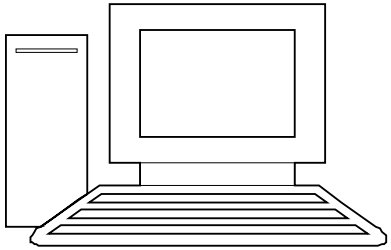


1	As You Like It	Shakespeare	Play	1599

Needs common schema - which column is which?

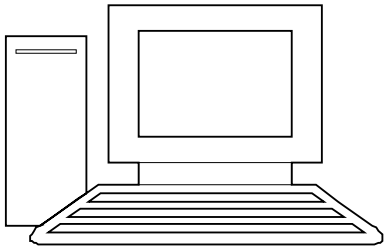


4	Sonnet 78	Shakespeare	Poem	1609
6	Edward II	Christopher Marlowe	Play	1592



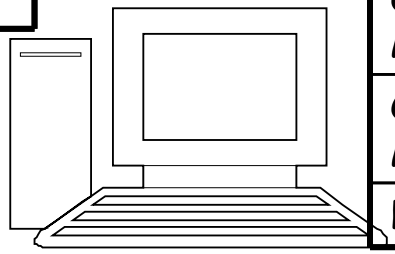
7	Hero and Leander	Christopher Marlowe	Poem	1593
3	Othello	Shakespeare	Play	1603

By columns?

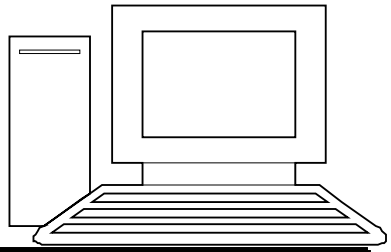


Year	Medium
1599	Play
1604	Play
1603	Play
1609	Poem
1590	Poem
1592	Play
1593	Poem
1525	Song

Needs to reference entities – which thing are we talking about?

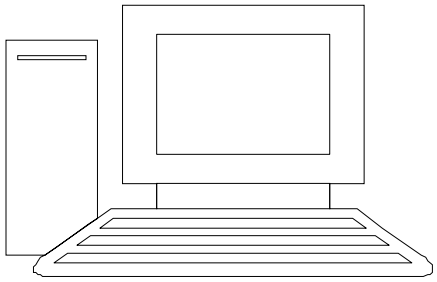


Author
Shakespeare
Shakespeare
Shakespeare
Shakespeare
Sir Phillip Sidney
Christopher Marlowe
Christopher Marlowe
Henry VIII Rex



Title
As You Like It
Hamlet
Othello
Sonnet 78
Astrophil and Stella
Edward II
Hero and Leander
Greensleeves

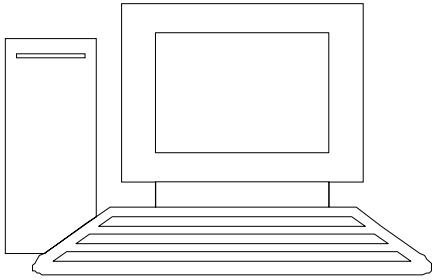
By cells?



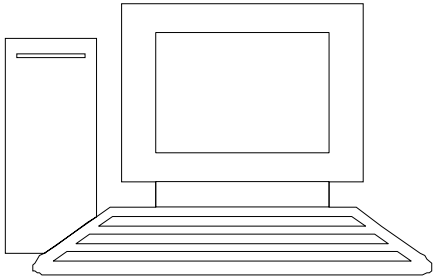
	Medium
7	Poem

	Title
2	Hamlet

Needs to reference both schema and entities



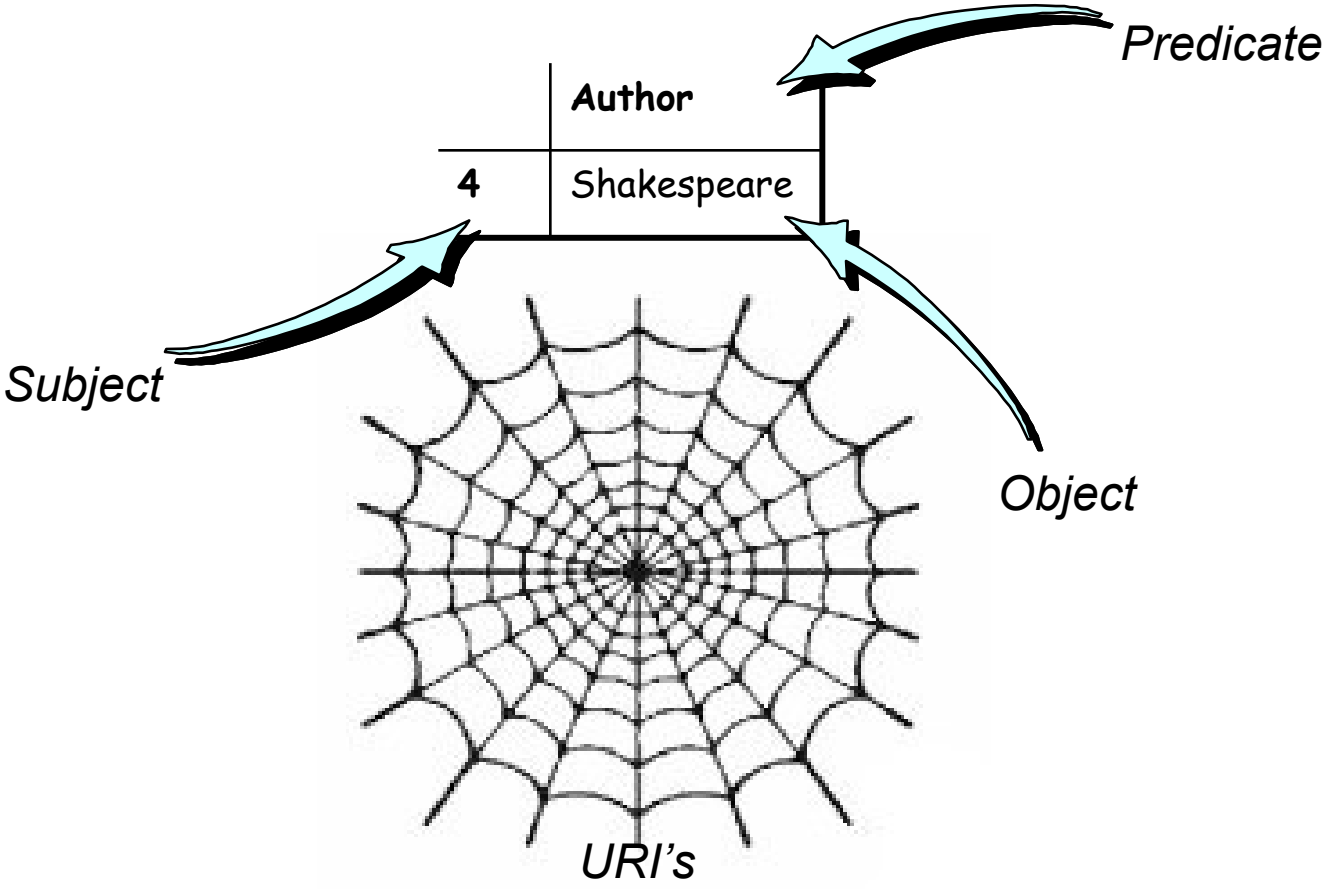
	Author
4	Shakespeare



	Year
2	1604

	Medium
6	Play

A web of Data!

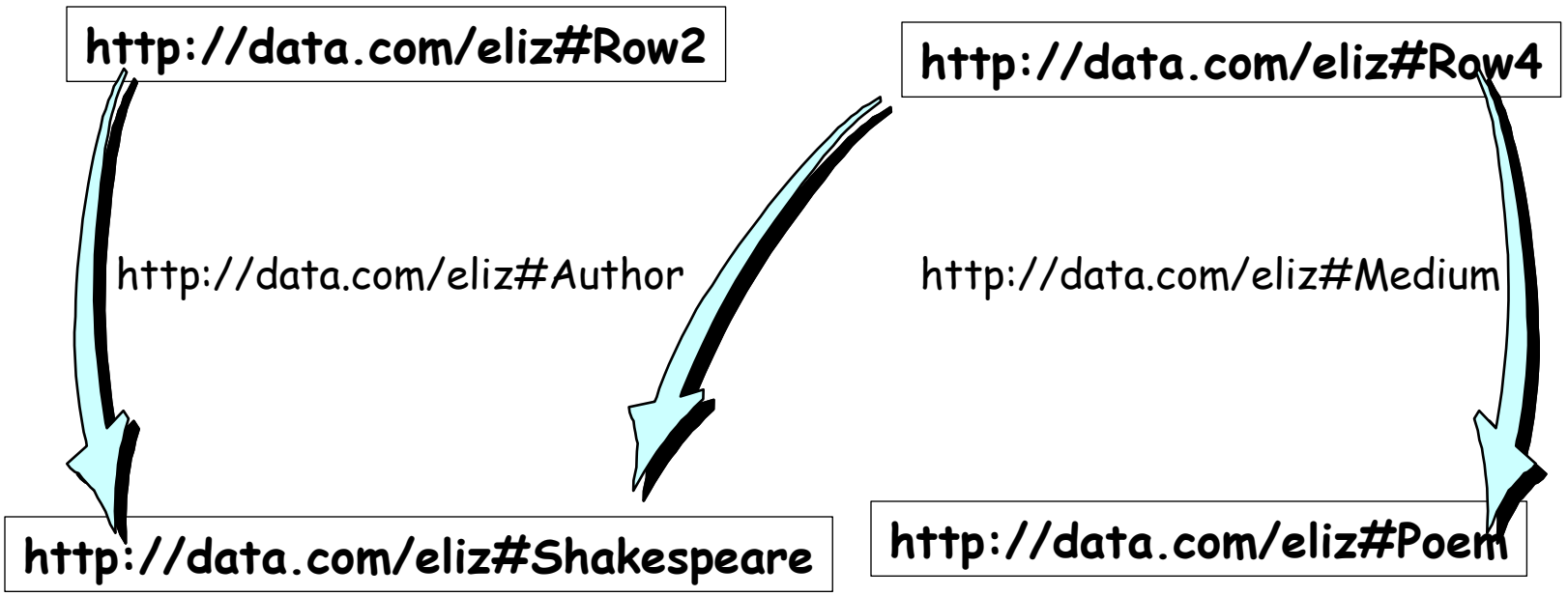


A web of Data!

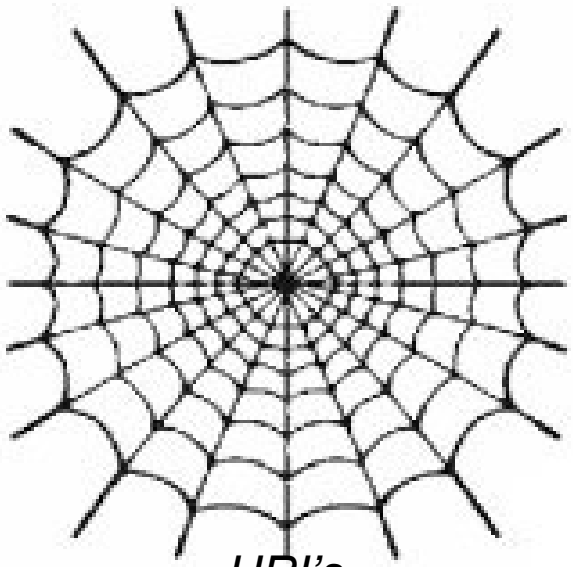
	Author
4	Shakespeare

	Author
2	Shakespeare

	Medium
4	Poem



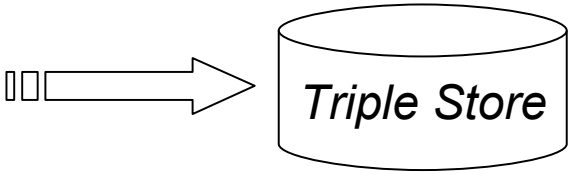
RDF Triple Store – a database for the Semantic Web



URI's

Row2	Author	Shakespeare
Row4	Author	Shakespeare
Row4	Medium	Poem

- *Store,*
- *Index, and*
- *Federate these triples*

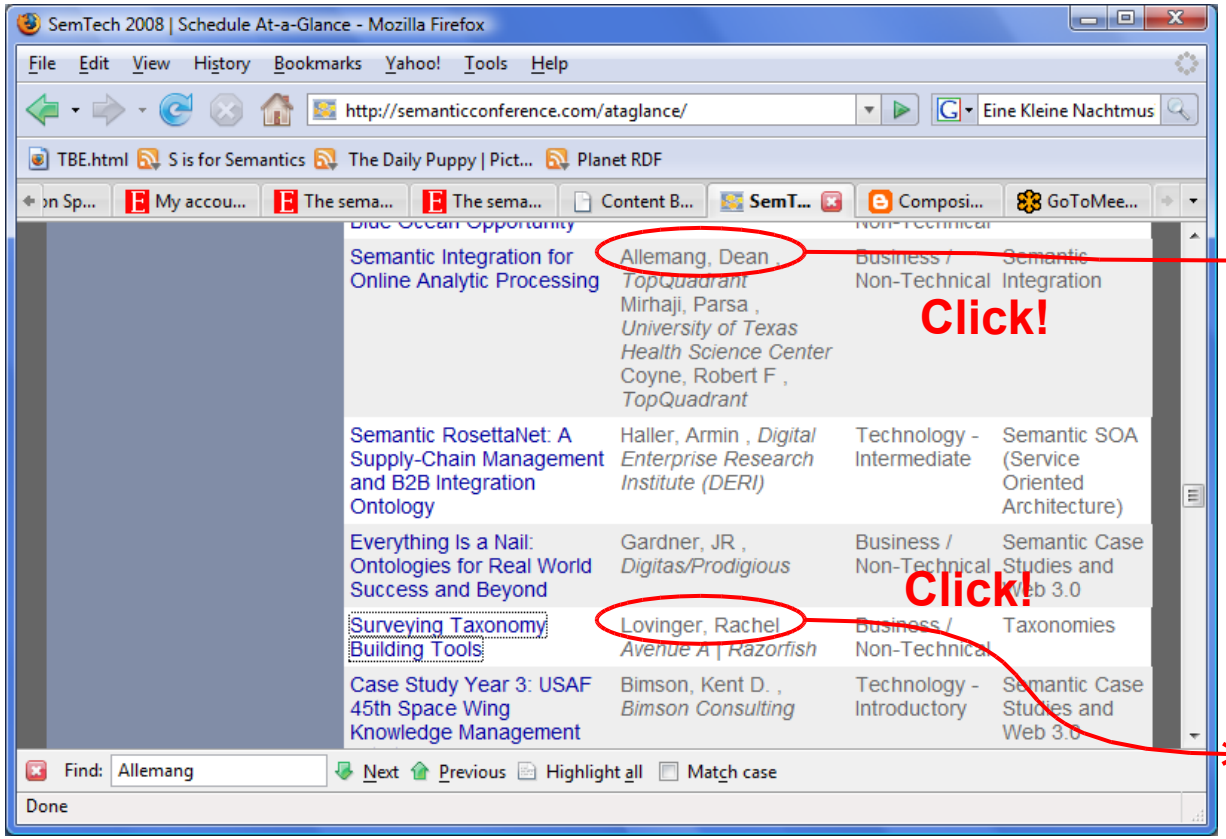


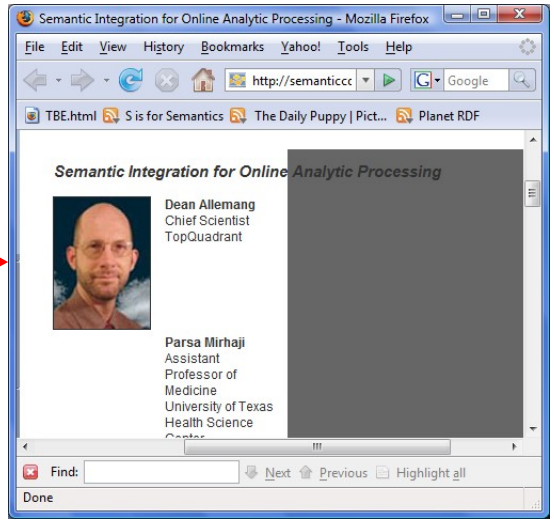
Semantic, Schemantic!

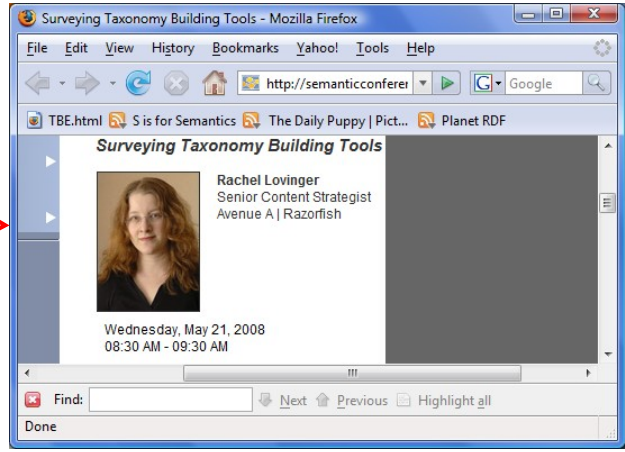
- In what sense is this “Semantic”?
- It doesn’t understand Natural Language
- It can’t figure out meanings of terms unless I tell it!
- It doesn’t automatically reconcile misunderstandings!

- Semantic as reference – “What does this term refer to?”

Web 3.0?

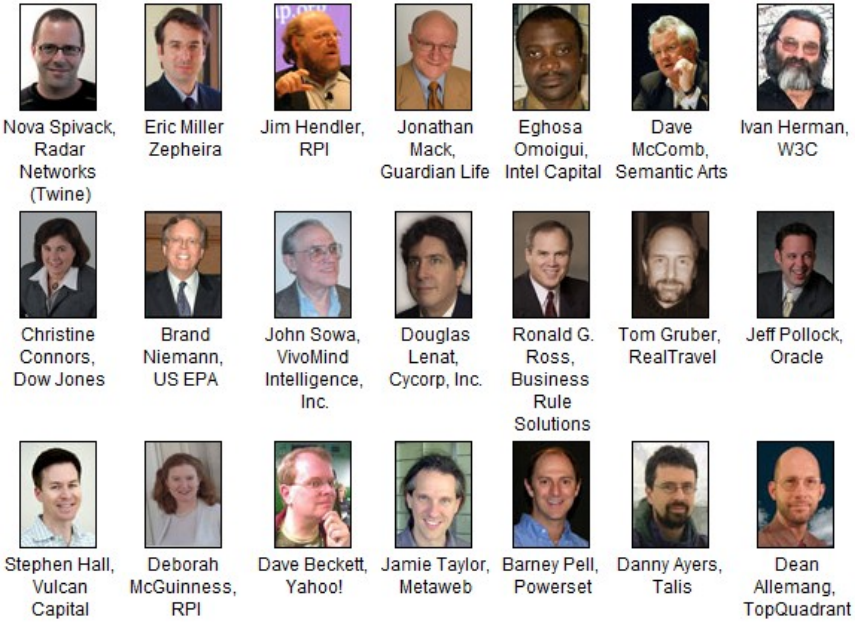






We already had data on the web. Now we have a Web of Data

```
SELECT ?photo ?name
WHERE {?s a :Session .
       ?s :speaker ?p .
       ?p :label ?name .
       ?p :image ?photo .}
```



We already had data on the web. Now we have a Web of Data

Distributed data requirement #1: universal names

- "My notion of the word 'shoe' is different from yours"

blacksmith:shoe

macys:shoe

Distributed data requirement #2: Assertions about items

- "Nellie wear horseshoes"
- "Kelly wears Macy's shoes"

wears

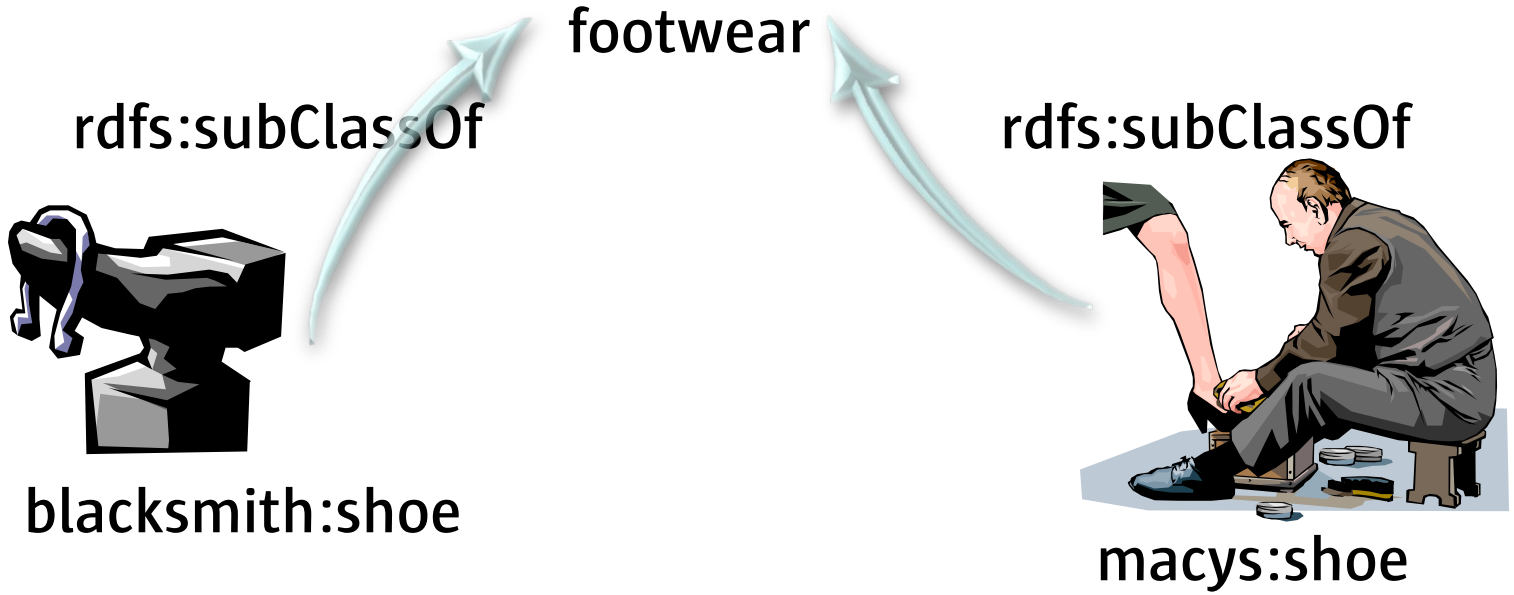
wears

blacksmith:shoe

macys:shoe

Distributed data requirement #3: Mapping items

Blacksmith's shoes do have something in common with Macy's shoes; they are all footwear!



A ***Semantic Model*** is a coherent set of statements like these

What is an Ontology?

Lots of wrong definitions

^

An Ontology is a reusable component of a distributed semantic model

Requirements of a Reusable data model?

- Extensible

Name	address	lat	long	Bike
Slausen	5585 Randolph St., Los Angeles 90032	-171.3	38.4	3
Union		-171.4	38.2	0
Vine		-170.9	37.9	12
McArthur		-170.4	38.1	3
Anaheim	1290 N. Long Beach Bl., Long Beach 90813	-171.3	38.2	12
Chinatown		-171.1	38.5	0
Beverly		-171.3	38.1	6

- Queryable Schema

```
SELECT ?property ?class
   WHERE ?property rdfs:domain ?class .
```

-> (Name, address, lat, long), Station

Requirements of a Reusable data model?

- Referenceable

  (on the web!)

- Mappable

  “My word “latitude” means the same as your word “lat”.

  my:latitude owl:equivalentProperty your:lat .

How small can be “(re-)usable”?

- Dublin Core – 15 properties

dc:title	dc:contributor	dc:source
dc:creator	dc:date	dc:language
dc:subject	dc:type	dc:relation
dc:description	dc:format	dc:coverage
dc:publisher	dc:identifier	dc:rights

- Do I have to use these?
  - No, I just have to decide which of my words correspond . . .

```
my:author owl:equivalentProperty dc:creator .
my:tile owl:equivalentProperty dc:title .
```

Mine is really small, but it gets the job done . . .

- TopBraid Geography Ontology has one class and three properties:

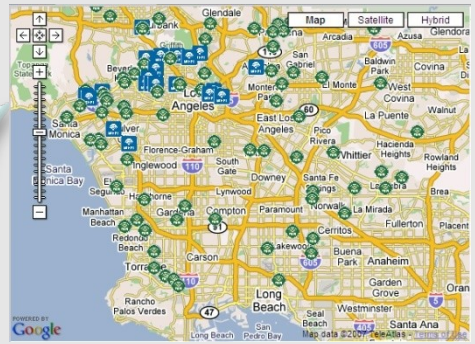
map:DisplayLocation (class)

geo:lat (domain DisplayLocation)
geo:long (domain DisplayLocation)

map:hasIcon (domain DisplayLocation)

Role of Ontologies in Model-based deployment

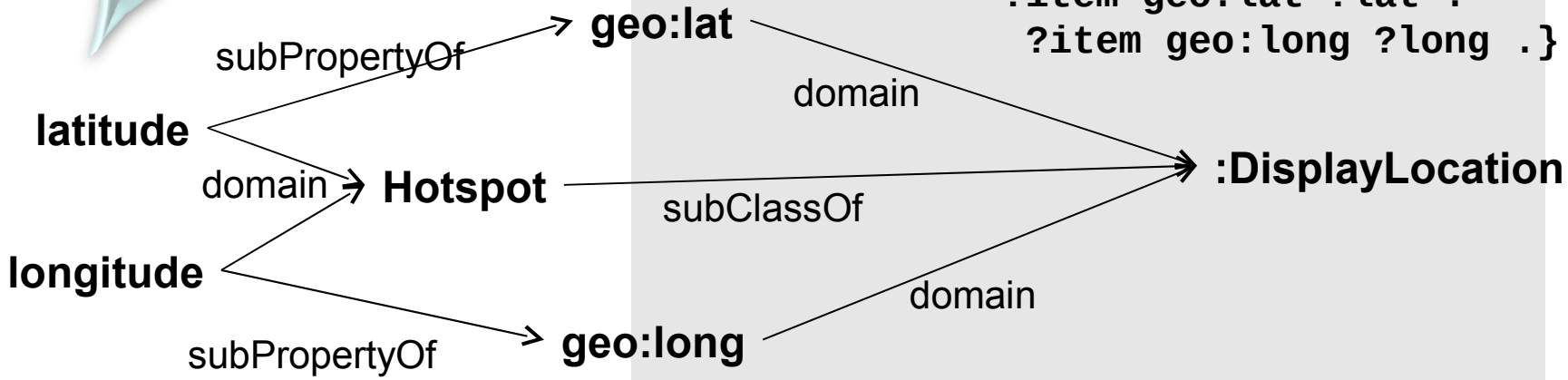
Name	latitude	longitude
Slausen	-171.3	38.4
Union	-171.4	38.2
Vine	-170.9	37.9
McArthur	-170.4	38.1
Anaheim	-171.3	38.2
Chinatown	-171.1	38.5
Beverly	-171.3	38.1



POWERED BY Google

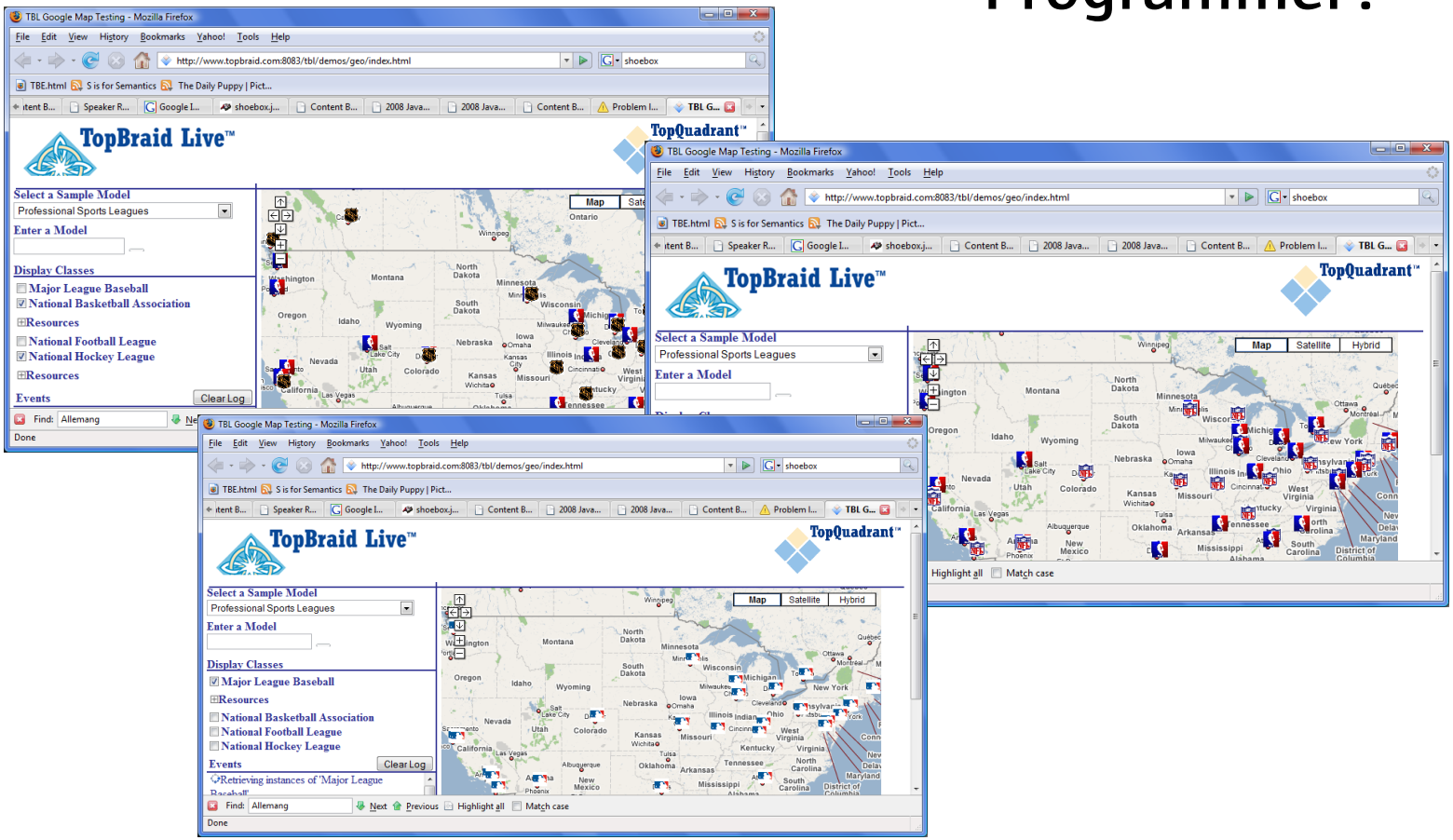
YAHOO! MAPS

```
SELECT ?lat ?long
WHERE {?item a :DisplayLocation .
       ?item geo:lat ?lat .
       ?item geo:long ?long .}
```



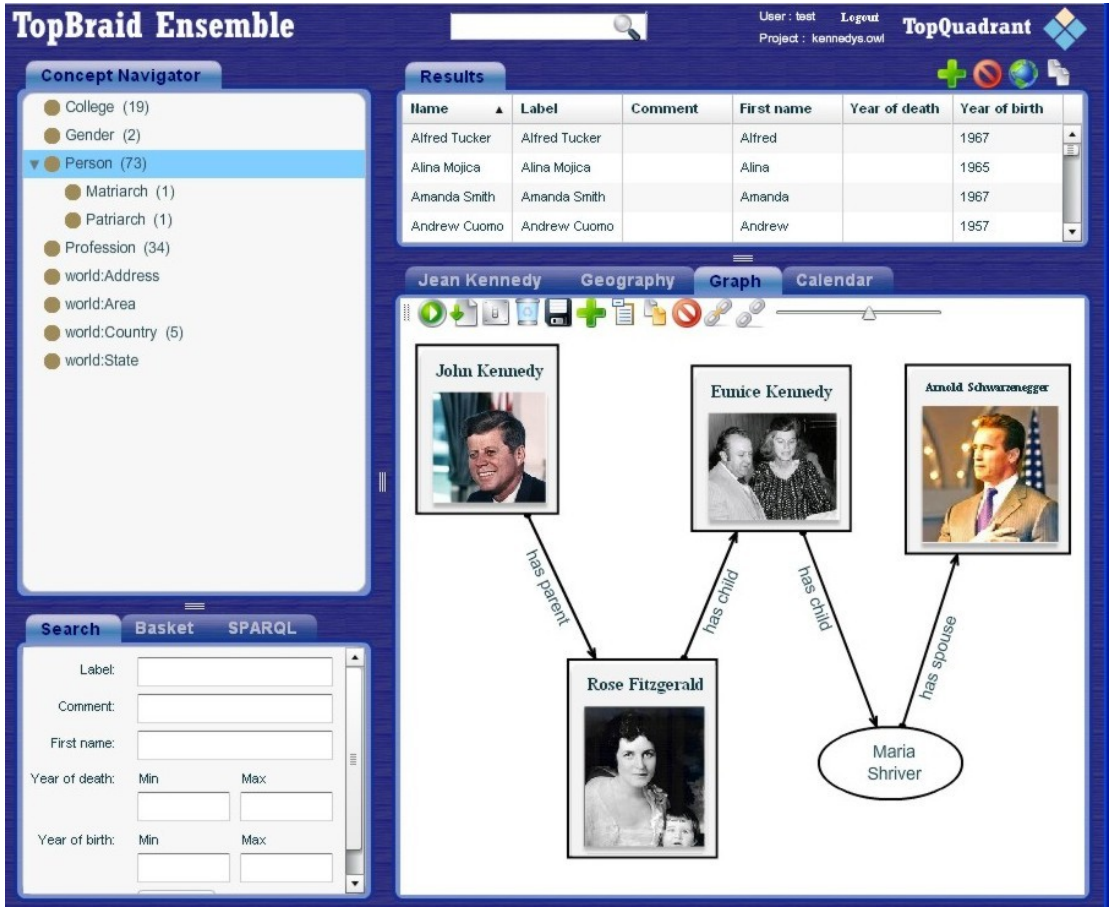
Who is responsible for mash-ups?

- Programmer?



Information Exploration

requires queryable schema!



Major brick-and-mortar retailer

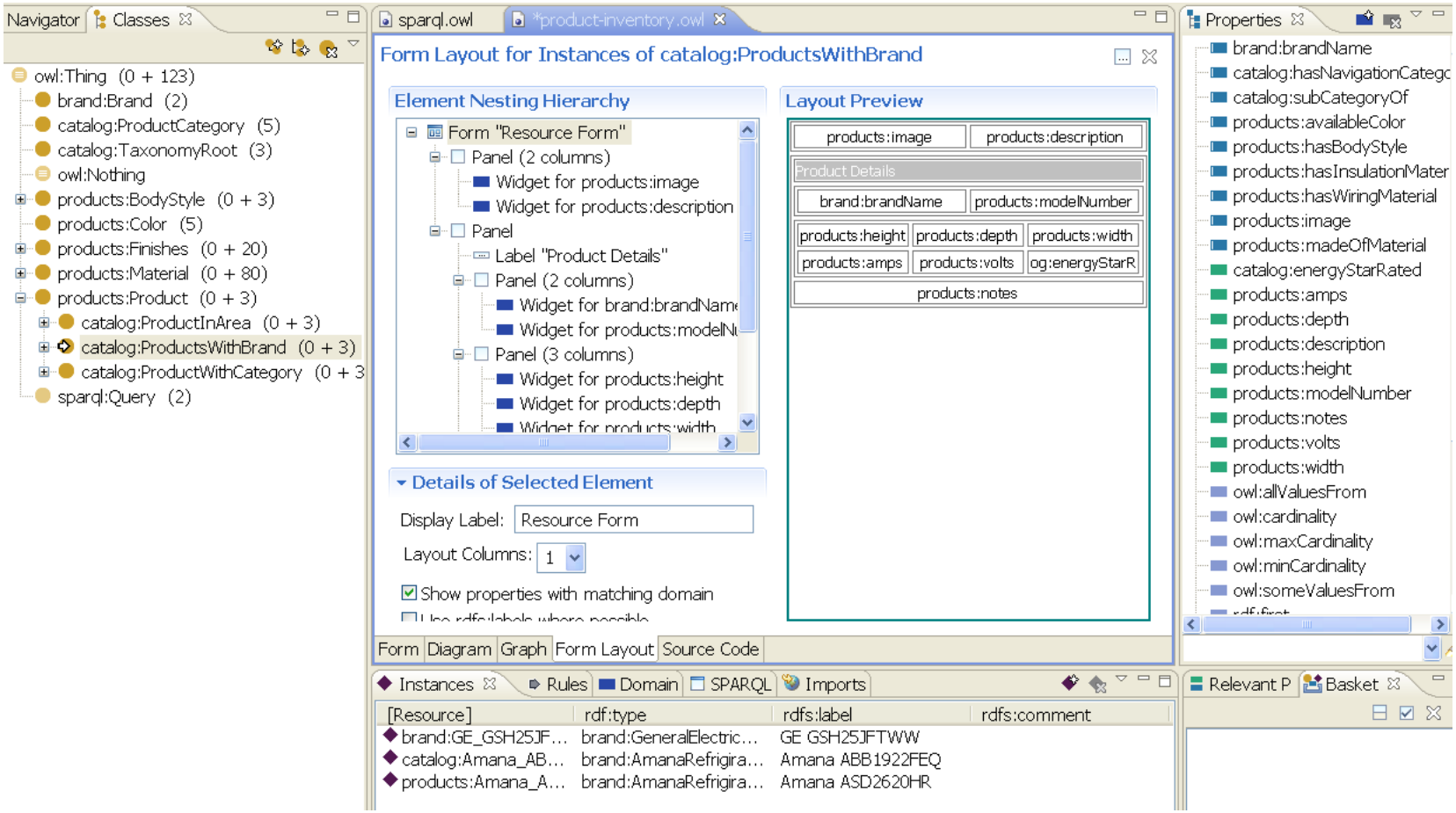
- Why are people shopping online?
- What do we have that online shops don't?
  - Famous service
  - Parts
  - Follow-through
- What keeps people from taking advantage of follow-thru?

- They can't find their
  - Receipts
  - Service contracts
  - Model number
  - . . .

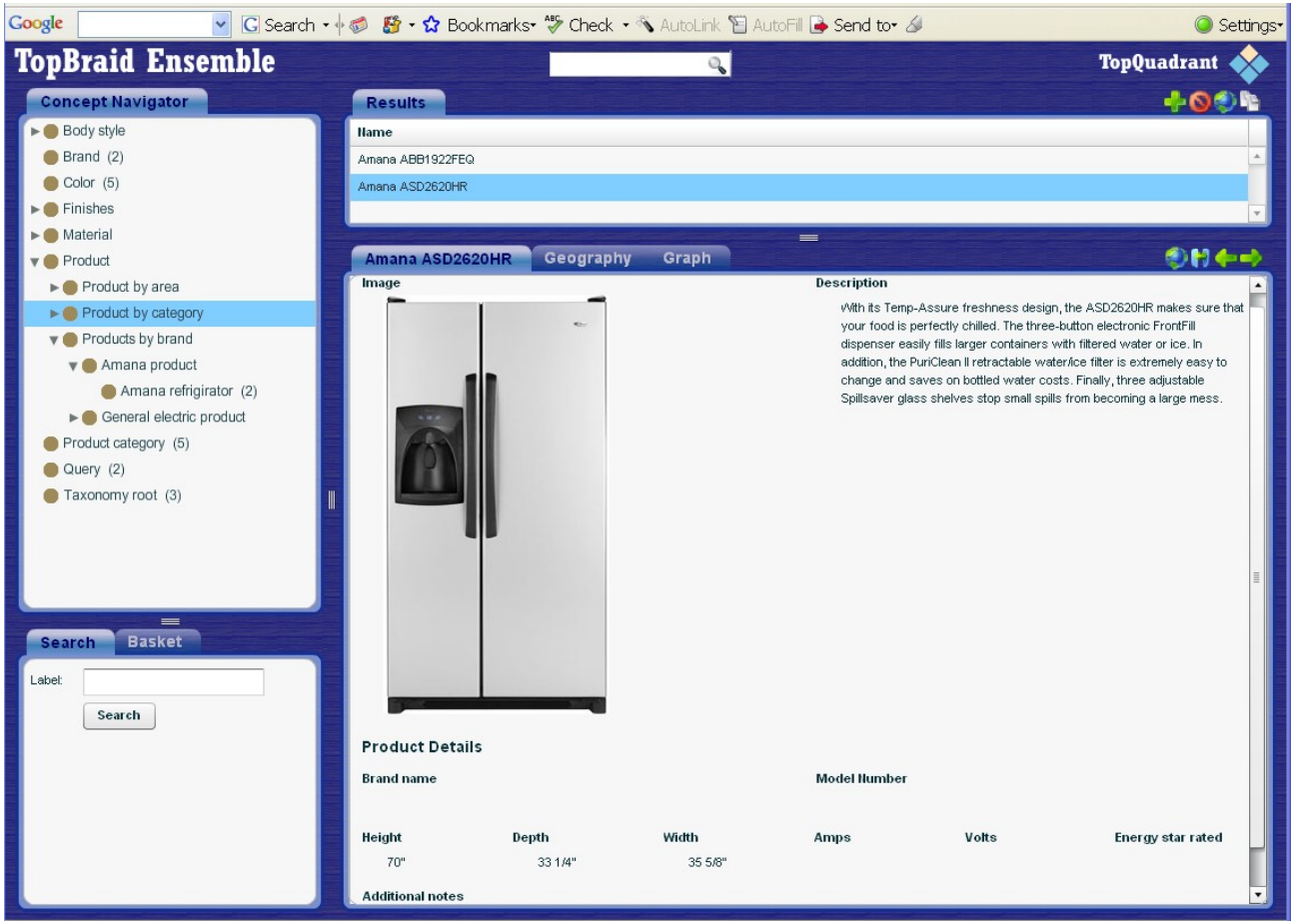
Solution

- Requirements:
  - A web portal for consumers to maintain information about their homes and belongings
  - Many different product lines and products need to be supported, all have different type of information
  - Flexibility for future extensions and ease of maintenance
  - Quick deployment – 10 weeks project to launch

Need user forms to conform to data schema – FOREVER!!



Render forms on web



Solution features

- Hundreds of product lines supported
- Forms correspond to schema (queryable schema!)
- Schema can be updated (new products – new product features)
- Form continue to conform to schemas as system develops

- Deployed quickly (< 10 weeks) !

The Ontology Connection

- Queryable schema allows forms to be built/maintained automatically (e.g., from a query like this):

```
SELECT  ?class ?prop ?type
WHERE {?prop rdfs:domain ?class .
       ?prop rdfs:range ?type .}
```

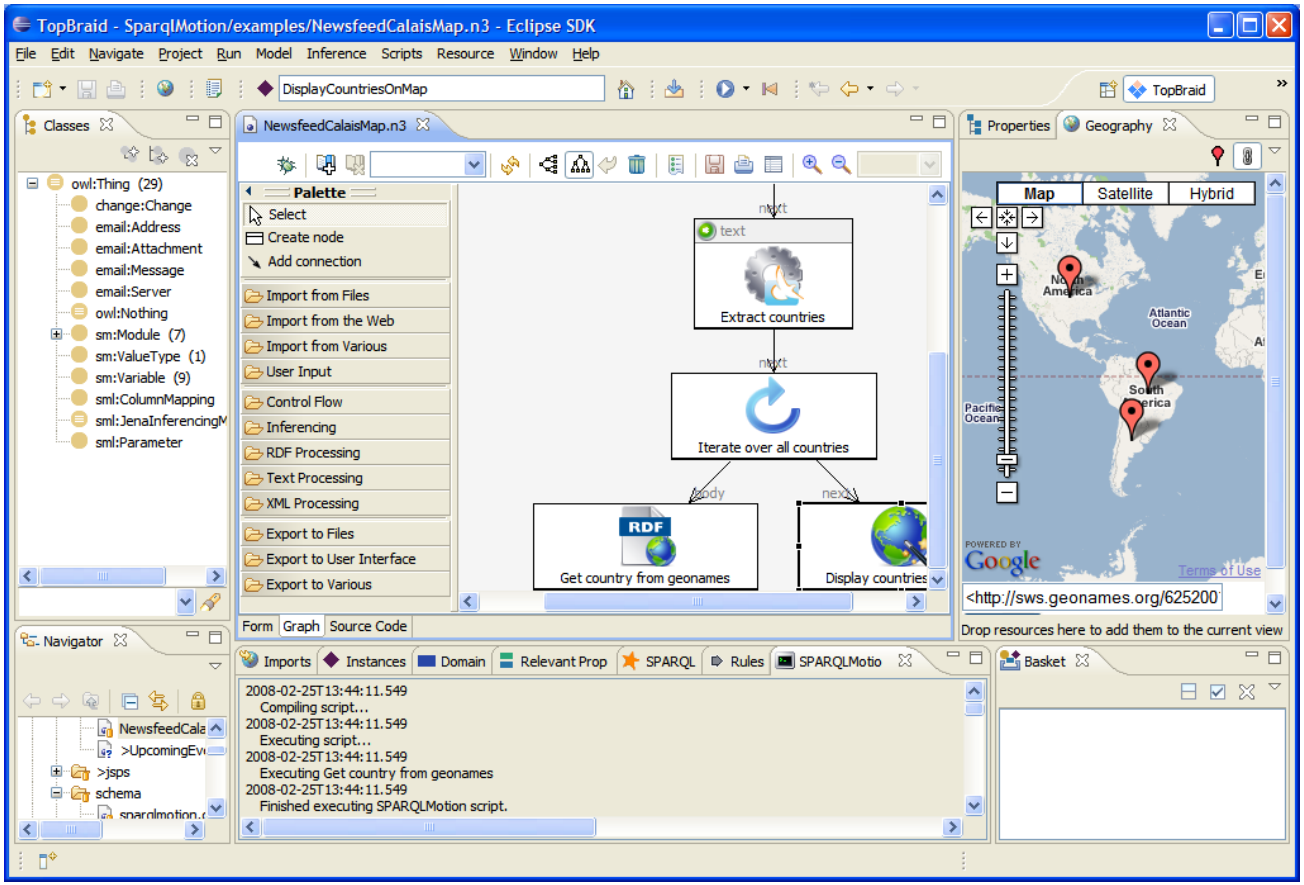
- Relations between product lines are represented and used

```
:Refrigerator rdfs:subClassOf :KitchenAppliance
```

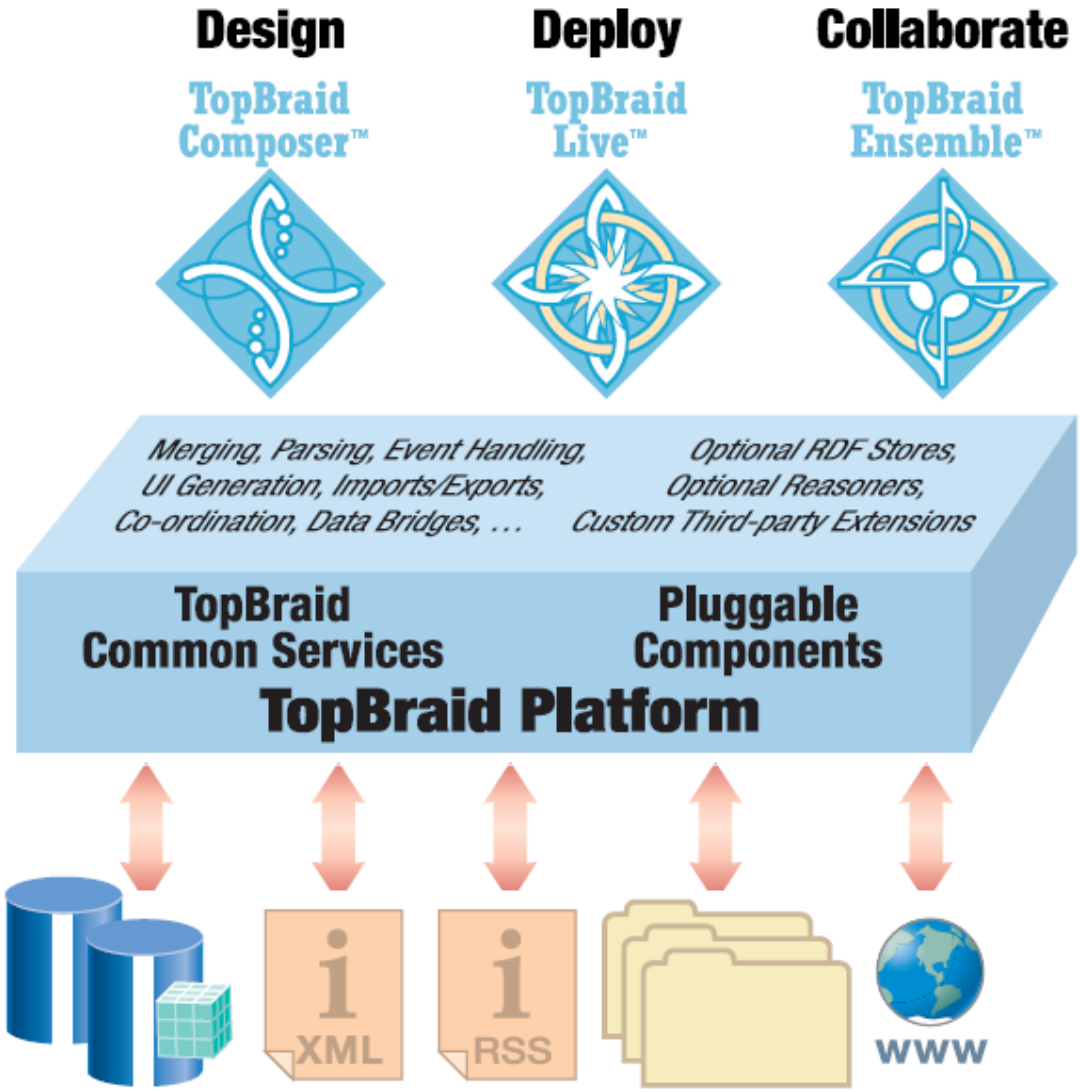
The Java Connection

- Jena – open source system for parsing, storing, querying RDF
- Jena – de-facto API (regardless of store)
- Sesame – open source scalable triple store
- Eclipse – open platform for model development and deployment
- TopBraid Composer™ - IDE for semantic applications
- TopBraid Live™ - deployment platform for semantic applications

Bringing it together – Java™ Technology, Eclipse and the Semantic Web



Semantic Solution Architecture



Evaluation

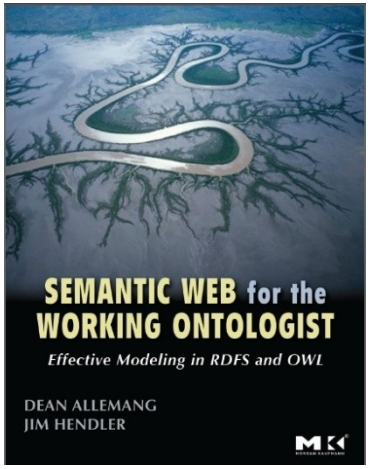
- Why Java Technology?
  - Eclipse platform – plugins
  - Platform independence
  - Community support: Java Tools for RDF, OWL, Rules, etc.
- Why Semantic Web?
  - Distribute data
  - Survive in an uncertain world!

Semantic Information Integration with TopBraid Suite™

TopQuadrant, Inc.

For More Information

- http://www.topquadrant.com/
- Semantic Web for the Working Ontologist, Allemang & Hendler



THANK YOU

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