

Semantic Web HCI: Discussing Research Implications

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Goals

For this session

- Start a conversation
 - User interaction enhanced by semantic technologies
 - Semantic Web designs informed by HCI methods
- Capture discussion for upcoming SWUI activities
 - www.webscience.org/swuiwiki

For the HCI / Semantic Web conversation

- Start fostering a community
- Share knowledge and ideas
- Identify who else should be involved



A “Semantic” Web ?

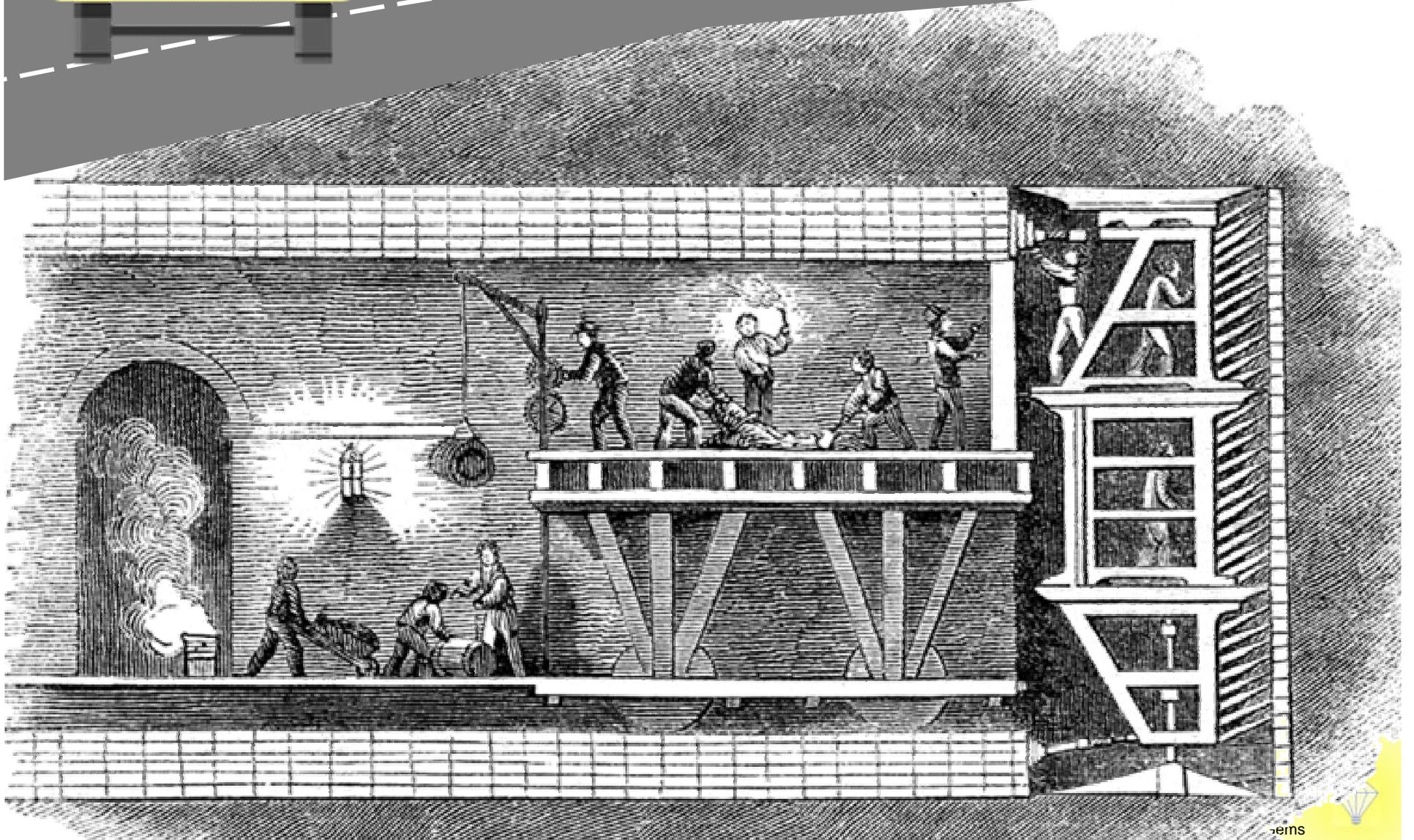
Semantic: Of or relating to meaning, especially meaning in language.

The American Heritage® Dictionary of the English Language, Fourth Edition

“ The Semantic Web is an extension of the current web in which information is given well-defined meaning, better enabling computers and people to work in cooperation. ”

“The Semantic Web,” *Scientific American*, Berners-Lee, Hendler, Lassila, 2001





AND... not OR... Relating to HCI

- Dynamic interaction, web-based apps, intelligent interfaces
- Mashups, sharing, tagging, and interweaving information
- Search: exploratory, natural language, faceted, etc.
- Large-scale information visualization (with heterogeneous data)
- Privacy, trust, social relationship-building
- Adaptivity, context-aware computing, location-awareness
- Personalization, user profiles
- Agents and avatars (e.g. instructing, giving permission)
- Machine learning and information complexity



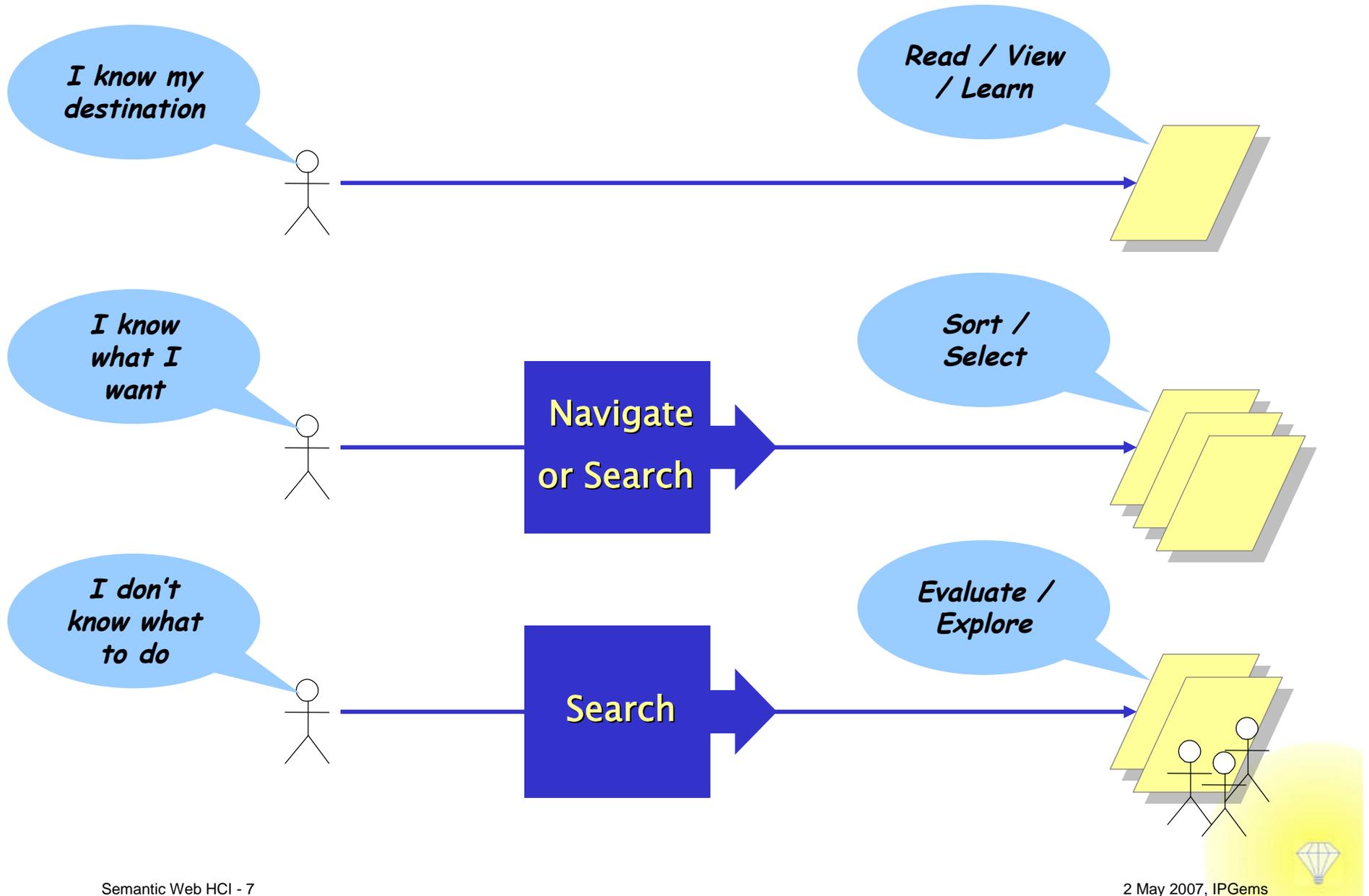
Why ?

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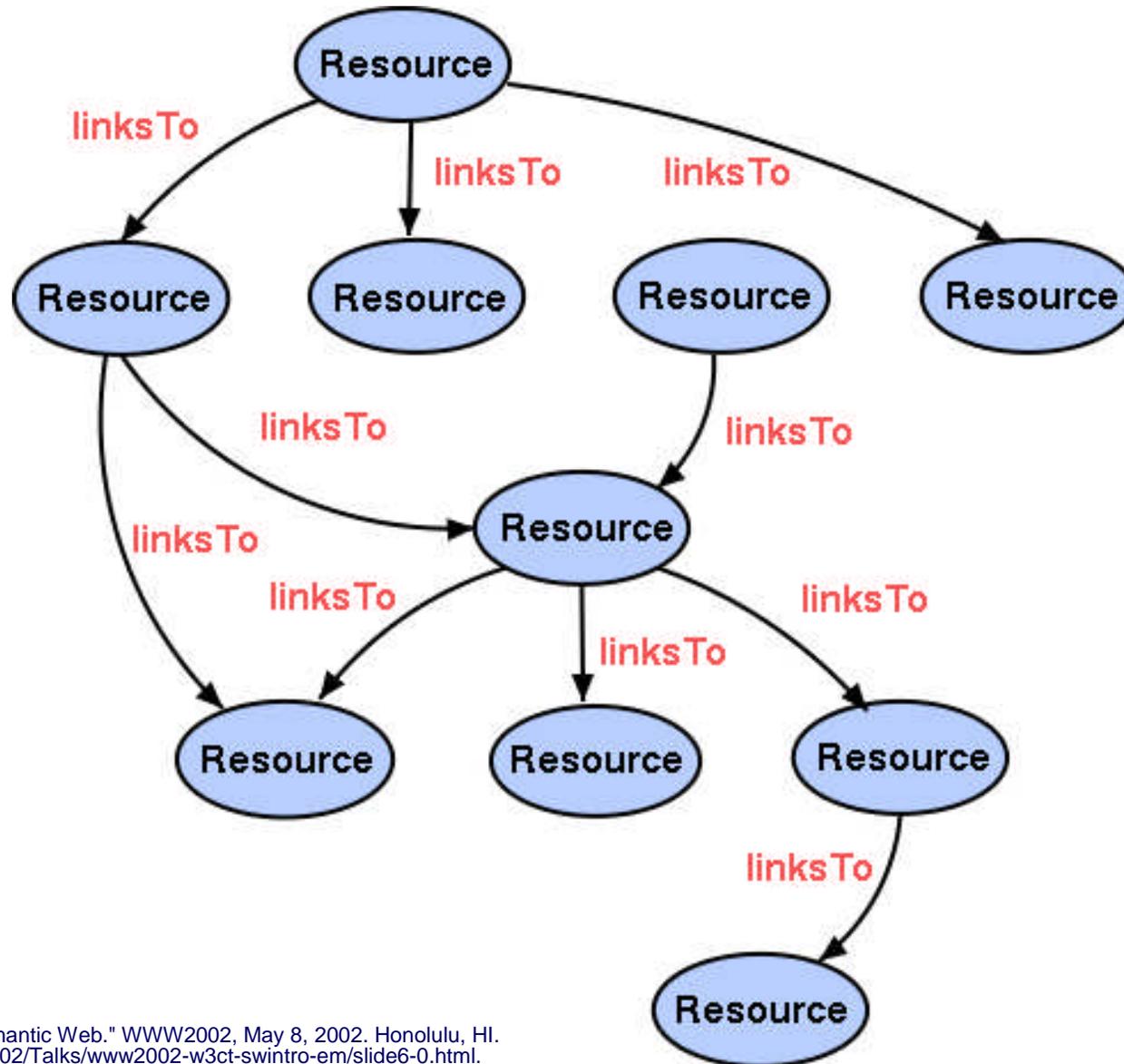
A brief overview



Now . . .



The Know-ability of the Web: Human



Miller, "W3C Track - The Semantic Web." WWW2002, May 8, 2002. Honolulu, HI. Slide 6. <http://www.w3.org/2002/Talks/www2002-w3ct-swintro-em/slide6-0.html>.



What do I need for HTML ?

<html>

<body>

<p>

... your stuff ...

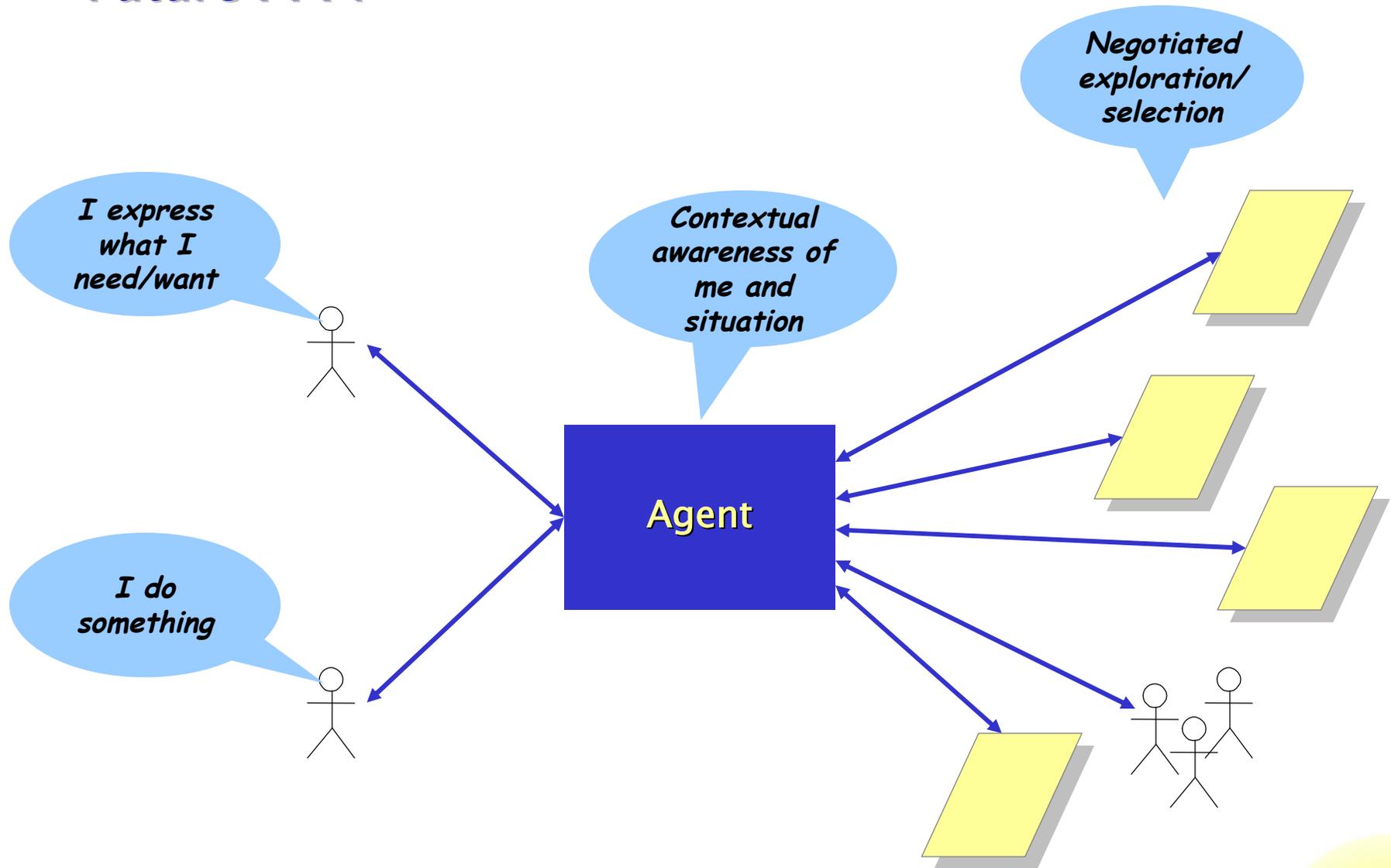
</p>

</body>

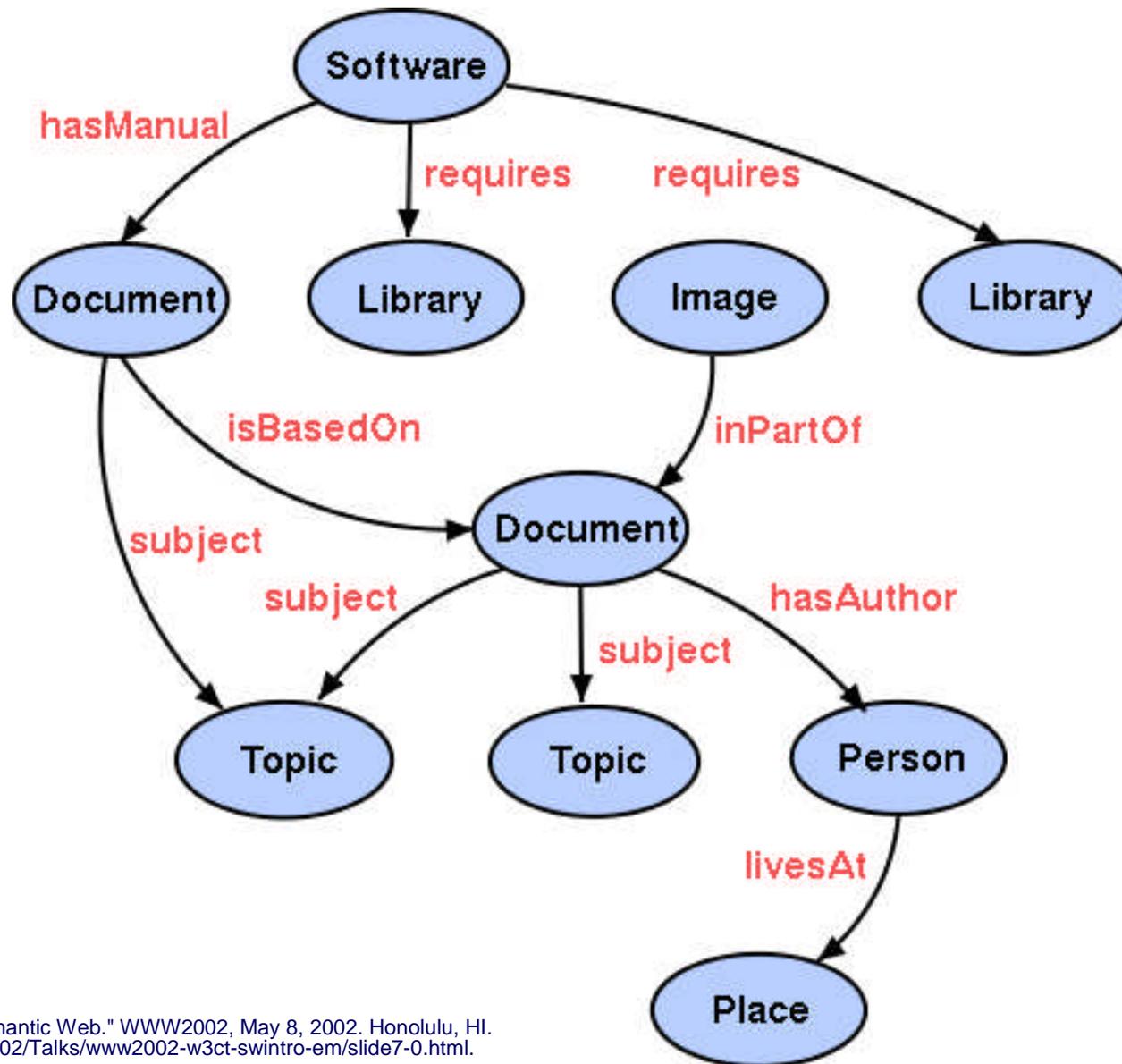
</html>



Future . . . ?



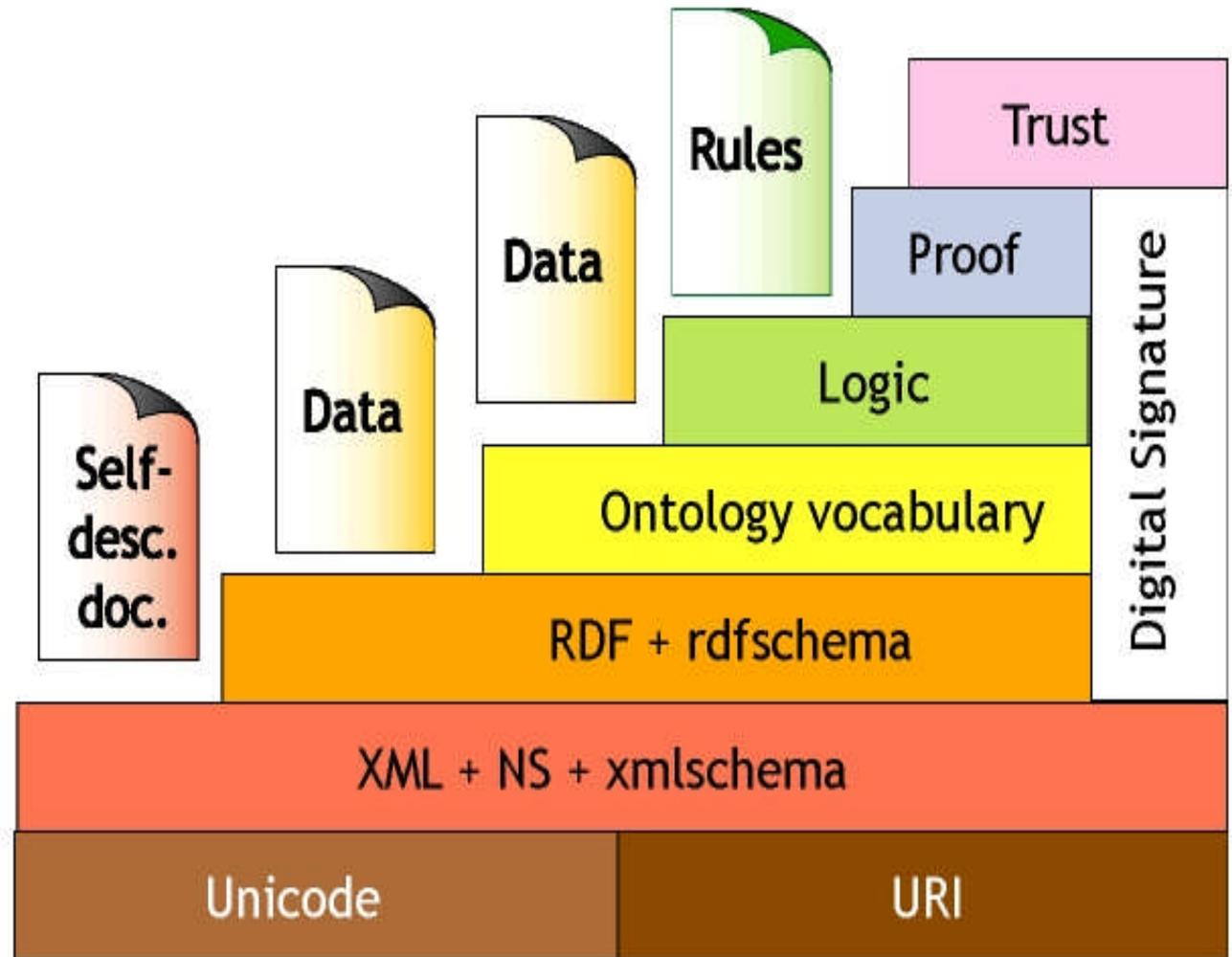
Know-ability for Semantic Web: Human + Machine



Miller, "W3C Track - The Semantic Web." WWW2002, May 8, 2002. Honolulu, HI. Slide 7. <http://www.w3.org/2002/Talks/www2002-w3ct-swintro-em/slide7-0.html>.



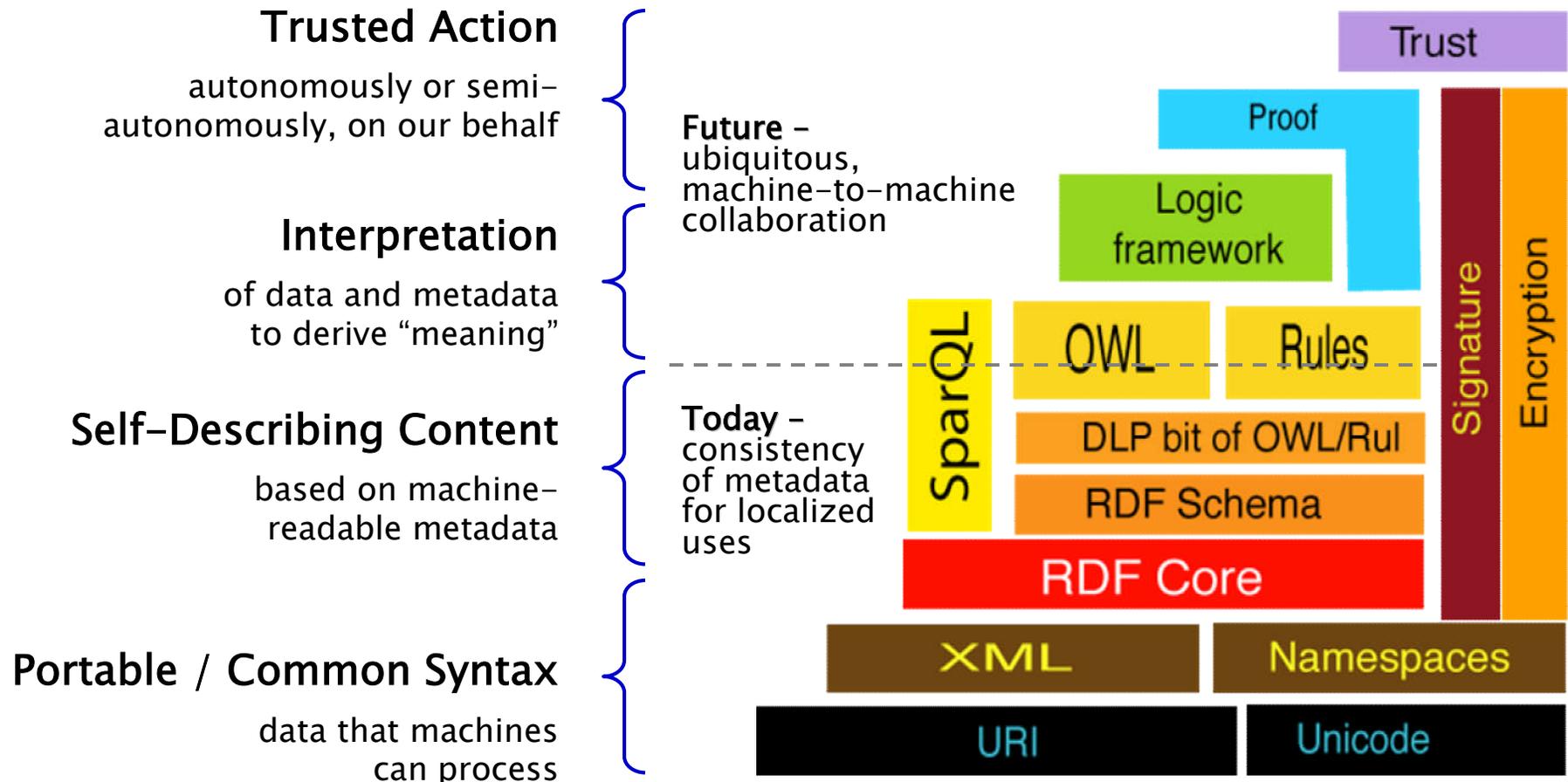
Layer Cake (c. 2000)



Berners-Lee, "Semantic Web on XML: Architecture" (slide 10). XML2000, 12/6/2000.
<http://www.w3.org/2000/Talks/1206-xml2k-tb/slide10-0.html>



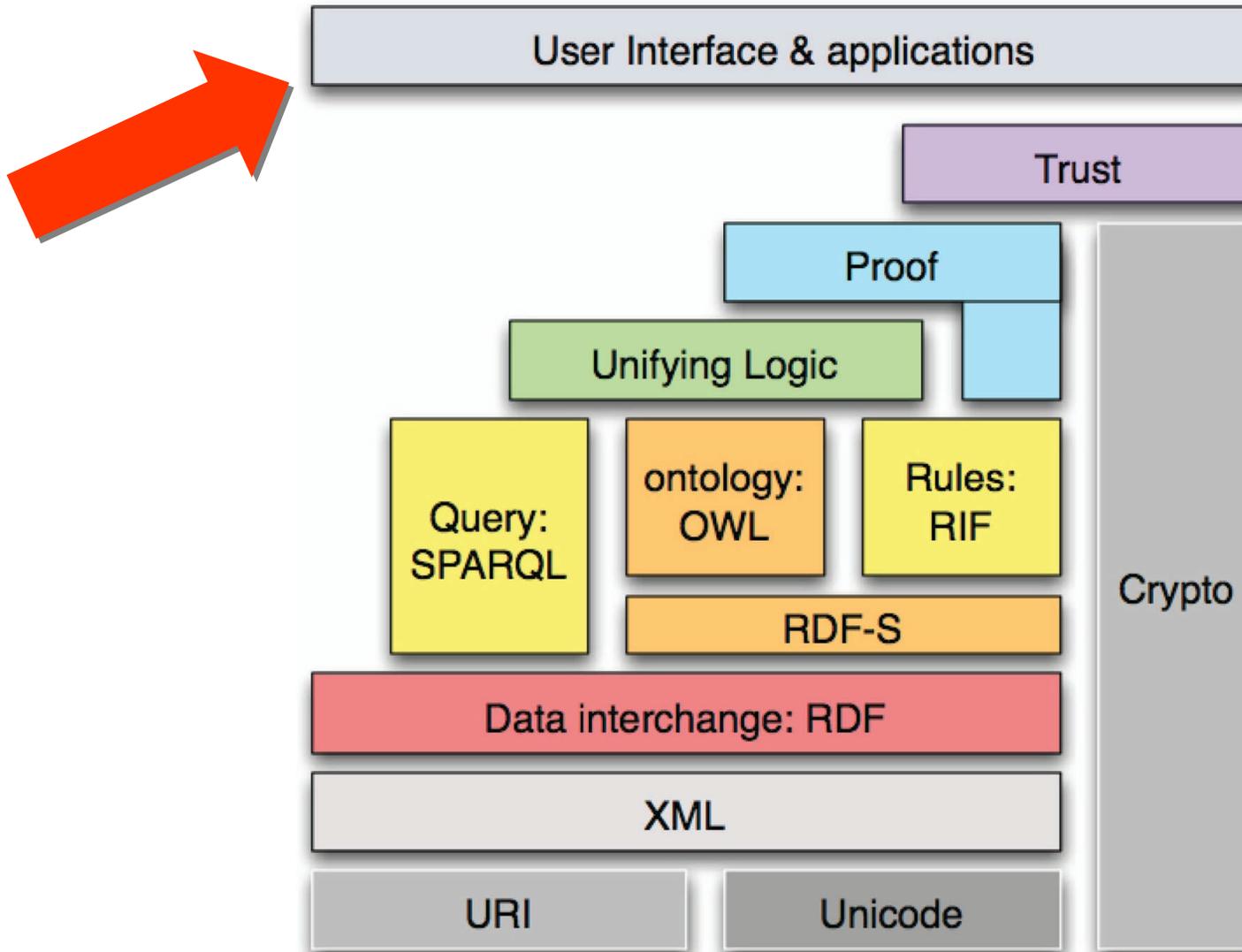
Layer Cake (c. 2005)



Berners-Lee, "Putting the Web back in Semantic Web" (12). W3C. ISWC, Galway 2005.



The “New” Layer Cake, September 2006



Berners-Lee et al, September 2006. Fig. 3.2 The Semantic Web Stack c.2006. Page 22.
In "A Framework for Web Science." *Foundations and Trends in Web Science*.
Vol. 1, No 1 (2006). <http://www.nowpublishers.com/product.aspx?product=WEB&doi=1800000001>



Users and Tasks

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What are we seeing so far ?



Categories of Users in the Literature

End Users

Ordinary people seeking information or trying to accomplish something in the course of their everyday life or work.

Knowledge of subject: ★★★ (Low to high)

Knowledge of ontologies: ★ (Low or none)

Knowledge of semantic web: ★ (Low or none)

Content Curators

Subject-matter experts, who as part of their jobs are responsible for providing or updating information used by others.

Knowledge of subject: ★★★★★ (High)

Knowledge of ontologies: ★★★ (Moderate)

Knowledge of semantic web: ★★ (Low)

Ontologists

Specialists in content categorization who participate in development and maintenance of ontologies and interactive systems.

Knowledge of subject: ★★★★★ (High)

Knowledge of ontologies: ★★★★★ (High)

Knowledge of semantic web: ★★★ (Moderate)

Sem. Web Developers

Technology specialists and members of a development team who are creating semantic web applications.

Knowledge of subject: ★★★ (Low to high)

Knowledge of ontologies: ★★★★★ (High)

Knowledge of semantic web: ★★★★★ (High)



Information Seeking Tasks

Examples include:

News seekers	Read news of interest to me from various on-line newspapers (filtered by time, geographical area, subject, and other attributes)
Entertainment seekers	Find a restaurant near the movie theater that will still be open after the movie
Music fans	Find new music similar to other music I like

Information Synthesis Tasks

Examples include:

Medical researchers	Draw conclusions about appropriate medical treatment based on synthesis of information on specific drugs and diseases from a wide range of published sources
Terrorism experts	Identify connections between suspected terrorist groups, based on pieces of information, some of it unreliable, from very disparate sources
Biologists	Predict the effect of introducing a new beetle into the ecosystem



Categories of Tasks in the Literature

End Users

Action Tasks

Examples include:

Patients	Schedule an appointment with a medical specialist covered by insurance in a certain geographic area with high approval ratings and who has available appointments
Emergency responders	Coordinate the efforts of multiple emergency response teams during an incident
Car buyers	Buy a used car from someone who is selling the type of car I want within 30 miles of my home

Information Sharing Tasks

Examples include:

Amateur photographers	Share pictures with friends and family
Friends with shared interests	Share bookmarks within my personal network
Consumers	Write a review of a restaurant, movie, etc.



Categories of Tasks in the Literature

Content Curators

Content Update Tasks

Examples include:

Biologists

Adding new findings about bird migrations to existing repositories

Photo editor

Annotating photos to make them searchable

Policy expert

Writing or editing policy and procedures to be added to a policy repository

Content Distribution Tasks

Examples include:

National Library of Medicine (NLM)

Providing all known medical ontologies for others to download and use

Museum/historic site curators

Providing information and interactive learning opportunities to visitors via a pervasive computing system and PDAs



Categories of Tasks in the Literature

Ontologists

Ontology Update Tasks

Examples include:

Biologists

Adding a new insect to an existing hierarchy

Policy expert

Adding new terms for tagging content within the public policy repository; re-organizing existing terms

“Owner” of an ontology

Cleaning up ontologies

Ontology Creation & Mapping Tasks

Examples include:

Member of project team
creating a semantic
application

Finding and selecting an existing ontology to use in a new semantic web application

Intelligence analyst

Reviewing the results of terms automatically extracted from text; populating an ontology through automated pattern recognition and information extraction

Health informatics
specialist

Cross-referencing terms between different medical ontologies



User Interaction Discussion Topics

Ontology Creation and Editing

Information Seeking

Information Synthesis

Content Update and Sharing

Formative Work



Ontology Creation and Editing

Beyond XML: Semantic definitions

- class hierarchies (taxonomies)
- defining formal vocabularies through logical restrictions

- Protégé demonstration

Formal vocabularies and logical inferencing

- infer class membership
- consistency checking (data integrity)



Ontology Creation and Editing

Understanding ontology structure and scale

- Pizza domain – **100+** concepts
- Protégé/OWL Viz

- Fungal Web domain – **10,000+** concepts
- Protégé/OWL Viz & Jambalaya

Hierarchical concept visualization

- SWOOP/Crop Circles



Ontology Creation and Editing

Logical concept definitions

- Benefit of automated machine processing?
- Who incurs cost of creating formal definitions?
- Implications of collaborative editing?
- Some answers with consistency checking and distributed editing?

Visualization of concept definitions

- “is-a” represented OK in visualizations (sans scaling)
- What about other relationship types?
- Are visualizations the answer?
- If not what other representations could be helpful?



Information Seeking

Facets

- mSpace – faceted browsing from many data sources

Metadata-rich navigation/search

- • MultimediaN E-Culture demonstrator

Natural language search

- Ginseng – underlying data relationships
- Complex questions use ontology relationships



Information Seeking

- Scalability? Wayfinding?
- HCI implications of the “open world scenario”?
- Cognitive issues for users switching facet relationship order?
Losing “containership” concepts?
- Importance of naming, labeling and parallelism?
- How to expose or signpost data provenance? Can transparency be unobtrusive and yet convenient?
- As possibilities and relationships expand, how does a user’s interaction with an application help filter the myriad possibilities and hone in on what is relevant?
- The role of context, preferences, agents in searches?



Information Synthesis

Subjects and structure

- AnimalDiversity.org – domain structure, adopting visualization techniques (TreePlus)
- IRS TaxMap – what other useful domains? Research, security?

Location and activity focus

- mSpace Mobile – multiple sources, in local context
- Controlling views (frame + context)

Integrating diverse approaches

- Design patterns ontology



Information Synthesis

- How to manage “views” of highly interconnected data, where the structure may not be known in advance?
- What do you do once you’ve found and synthesized?
- Role of visualization, and what kind of controls to go from “finding” to “using” data?
- Improving ease of use? Integrating seeking with action?
- Creating consistency – integrating information from multiple sites and formats?
- User control of relating new/added concepts?



Content Update and Sharing

FOAF (Friend of a Friend)

- Standard way of describing people
- Unique id (through e-mail or encoded e-mail address)
- Using forms to fill in data
- Standardized - many applications can read and use

PhotoStuff

- Metadata-based information
- Ontologies define (flexible) structures for standard information capture and use
- Semi-structured tagging



Content Update and Sharing

Metadata enabled knowledge capture

- More than personalized tagging - structured tagging?
- Will users understand metadata semantics?
- What is the balance between user control and consistency?
...formal vs. informal annotation?

Lowering costs of knowledge capture

- Use what is known already (time & date, location etc.)
...ambient data capture?
...but this assumes standards?
- Are the costs of formality worth the benefits?



Formative Work

- **Novel uses**

- e.g. SADle

- **Revisiting methods**

- Adapting usability/user-centered design methods for dynamic, data-driven applications?

- **Plenty of future research directions**

- Keeping the user experience seamless when it is constructed from multiple underlying sources of data and agents?
- Instructing and responding to agents?
- Alerting users when ambiguous or contradictory situations are encountered?
- Provenance and “correct-ability”?
- Trust?
- Privacy? Informed consent, and broader data transparency issues?
- Adaptivity?



SWUI Information on the Web

- swui.semanticweb.org
 - Prior workshop papers, also link to W3C mailing list

- www.webscience.org/swuiwiki
 - Includes notes on the CHI 2007 discussion

- www.ipgems.com/content/swui.html
 - Links to a range of examples and background information focused on user interaction

