e-Learning and Semantic Web

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Agenda

- What is Semantic Web?
- Components of Semantic Web
- Ontology
- E-Learning @ Semantic Web
- Advantages
- Semantic Applications

Size of the web

- The Indexed Web contains **at least 45.33 billion pages** (Thursday, 07 February, 2008).

- numbers of pages indexed by Google, Windows Live Search (Msn Search), Yahoo Search and Ask
- Actual Size of the Web is higher than this!

Types of Search Engines

- Keyword or Robot based

  Google (www.google.com)

  Alta Vista (www.altavista.com)

  Fast (www.alltheweb.com)

  Wisenut (www.wisenut.com)

- Directory Based

  Yahoo (www.yahoo.com)

  About (about.com)

  Looksmart (www.looksmart.com)

Types of Search Engines (cont..)

- Meta Index Based

  Dogpile (www.dogpile.com)

  Metacrawler (www.metacrawler.com/index.html)

  Surfwax (www.surfwax.com)

  Hotbot (www.hotbot.com)

e-Learning Resources

- Text
- Graphics
- Audio
- Video
- Reusable Objects (SCO Model)

Scenario: I want to design a new course, but from already existing materials from the web

What is lacking?

Content Vs Context

- Human Readable Vs Machine Readable

Semantic Web (Tim Berners-Lee)

- Semantic Web technologies help separate meanings from data, document content, or application code, using technologies based on open standards

- If a computer understands the *semantics* of a document, it doesn't just interpret the series of characters that make up that document: it understands the document's *meaning*.

Semantic Web

- You can think of the Semantic Web as an efficient way to represent data on the World Wide Web, or as a database that is globally linked, in a manner understandable by machines, to the content of documents on the Web

Components of Semantic Web
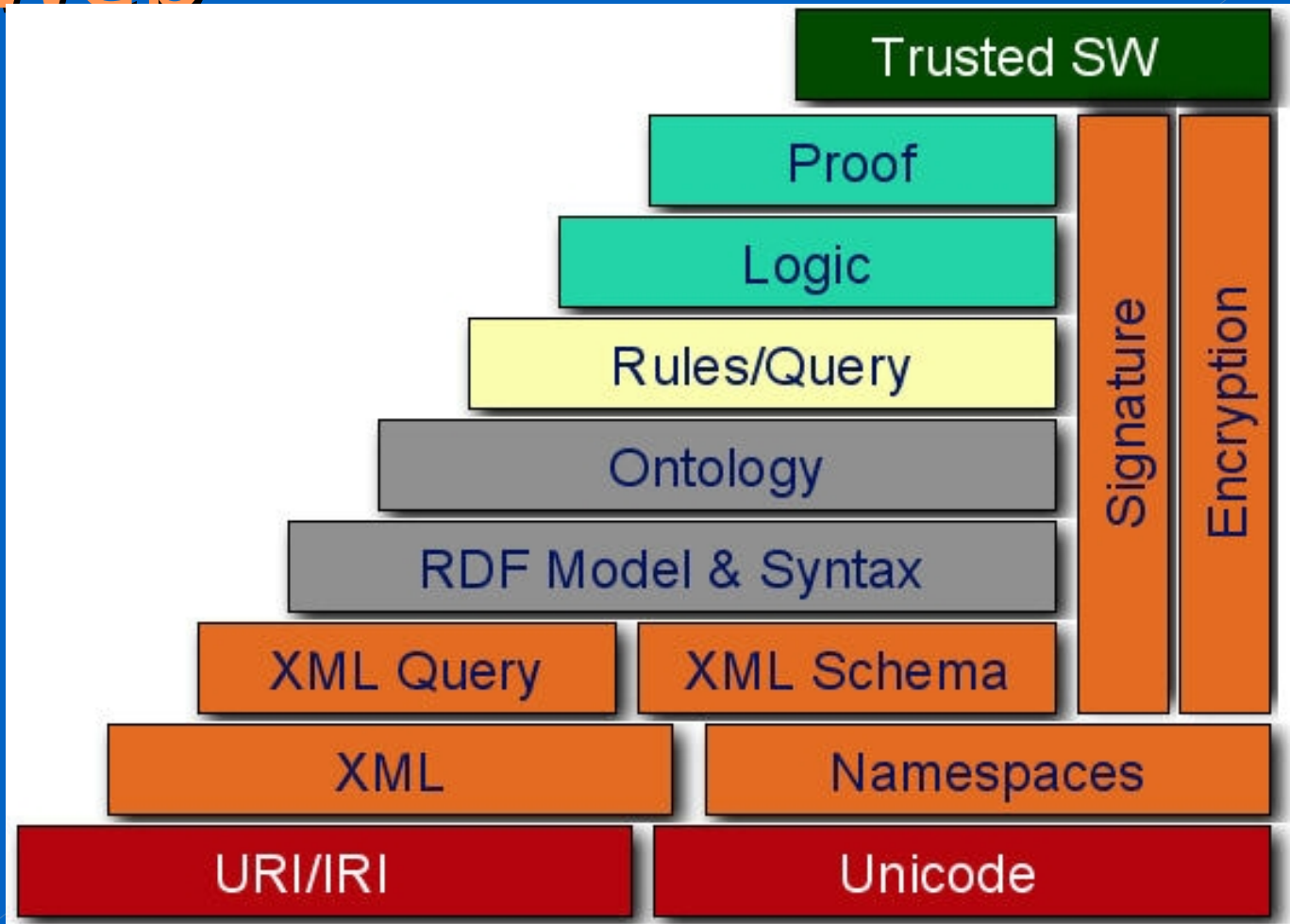
How to give meaning?

- Semantic technologies represent meaning using *ontologies* and provide reasoning through the relationships, rules, logic, and conditions represented in those ontologies

an **ontology** is a data model that represents a set of concepts within a domain and the relationships between those concepts. It is used to reason about the objects within that domain

Ontology

Upper Ontology

Thing

Vehicle

Upper ontologies bridge independent domains into a unified, structured theory. Within a domain, *instance knowledge* includes real-world *things* that differentiate themselves through their sum, class-specific attributes.

Landcraft   Sea Vessel   Aircraft

Lower Ontology

Airplane   Helicopter

Drone   Airliner   Fighter

Global Hawk   Predator   Boeing 747   Boeing 777   F/A-18C   F/A-22

Instance Knowledge

Benefits of Using Semantic Web as a technology for e-learing

- Delivery
- Responsiveness
- Access
- Symmetry
- Modality
- Authority
- Personalization
- Adaptivity

Delivery of Content

- E-Learning: Pull – Student determines agenda

- Semantic Web: Knowledge items (learning materials) are distributed on the web, but they are linked to commonly agreed ontologie(s). This enables construction of a user-specific course, by semantic querying for topics of interest.

Responsiveness

W E-Learning: Reactionary – Responds to problem at hand

▪ Semantic Web: Software agents on the Semantic Web may use commonly agreed service language, which enables co-ordination between agents and proactive delivery of learning materials in the context of actual problems. The vision is that each user has his own personalized agent that communicates with other agents.

Access

- E-Learning: Non-linear – Allows direct access to knowledge in whatever sequence makes sense to the situation at hand

- Semantic Web: User can describe situation at hand (goal of learning, previous knowledge,...) and perform semantic querying for the suitable learning material. The user profile is also accounted for. Access to knowledge can be expanded by semantically defined navigation.

Symmetry

- **E-Learning:** Symmetric – Learning occurs as an integrated activity

- Semantic Web: The Semantic Web (semantic intranet) offers the potential to become an integration platform for all business processes in an organization, including learning activities.

Modality

/ **E-Learning:** Continuous – Learning runs in parallel and never stops

▪ **Semantic Web:** Active delivery of information (based on personalized agents) creates a dynamic learning environment.

Authority

- **E-Learning:** Distributed – Content comes from the interaction of the participants and the educators

- **Semantic Web:** The Semantic Web will be as decentralized as possible. This enables an effective co-operative content management

Personalization

- **E-Learning:** Personalized – Content is determined by the individual user's needs and aims to satisfy the needs of every user

- **Semantic Web:** A user (using personalized agent) searches for learning material customized for her/his needs. The ontology is the link between user needs and characteristics of the learning material

Adaptivity

- **E-Learning:** Dynamic – Content changes constantly through user input, experiences, new practices, business rules and heuristics

- **Semantic Web:** The Semantic Web enables the use of knowledge provided in various forms, by semantical annotation of content. Distributed nature of the Semantic Web enables continuous improvement of learning materials.

Semantic Apps

- SPOCK : people search http://www.spock.com/
- Freebase : Open, Shared database of the worlds knowledge http://www.freebase.com/
- Powerset : Natural Language Search http://www.powerset.com/
- Twine: Learns about you and creates a semantic graph http://www.twine.com/
- Hakia : Natural Language Search

References

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Conclusion

- Making content machine-understandable is the primary thing we have to achieve.

- E-learning can extract all the potentials of semantic web

References

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Thank You
for your attention!