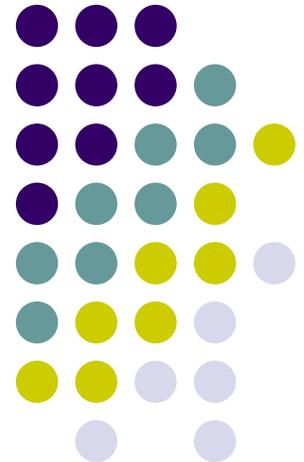


Living in a Transparent Future: Search in a Wired World

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Introduction

- Current state of search
- Goals for the web: The semantic web
- The essence of the semantic web
- Technologies for a wired future
- Three likely scenarios of a wired future
- Conclusions



Current Work in Search

- Material on the web is largely designed for human consumption
- Information is contained:
 - On web pages
 - In databases
- Two major clients for search engines:
 - Individual web-searcher
 - Corporations

Current Work in Search: Individual web-searcher



- Wants a genie which answers questions
- Examples:
 - *When was Harry S Truman born?*
 - *Find me a 1999-2004 Ford Lightning for \$20,000*
 - *We're looking for a family resort in the Caribbean with baby sitting, other activities for a family with a one and a three year old. Any Suggestions?* [Liddy, 2002]

Current Work in Search: Individual web-searcher



- Progress requires:
 - Natural language processing techniques
 - Artificial intelligence techniques for extracting information from documents
 - Ontology
 - Inference
 - Semantic web

Current Work in Search: Corporate web-searcher



- Wants to locate documents which contain particular information
- Documents come in a variety of formats (jpg, pdf, ppt, xls, etc.)
- Example
 - 2000 Powerpoint presentation which introduced our Java-enabled car
- In a large corporation, there are likely 100s of documents which would match such a query
- Similar to the attempt of locating documents on desktop; except it is scaled to the company level

Current Work in Search: Corporate web-searcher



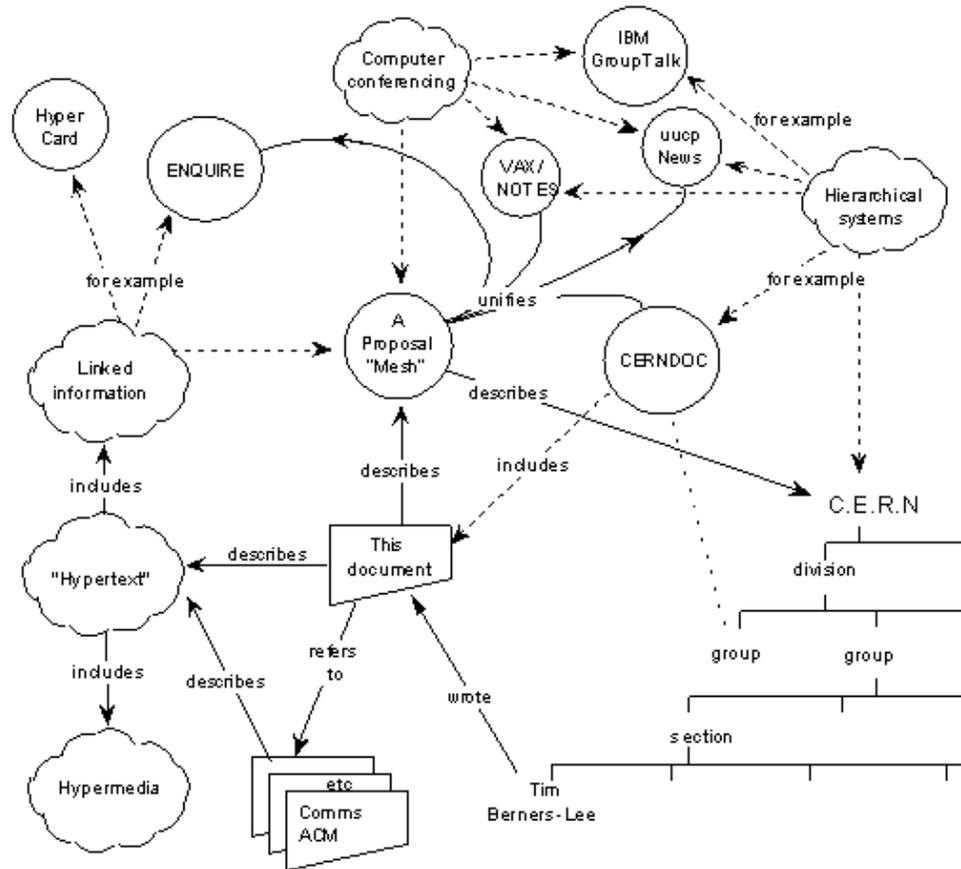
- Progress requires:
 - Locating distinguishing aspects of documents
 - Quick summary of documents
 - Artificial intelligence techniques
 - Semantic web

Old Goals and New Developments for the World-Wide Web



- The semantic web is a major current development for the web
- The semantic web is designed to provide: *“data integration across application and organization boundaries.”* [TBL, 2003]
- This goal is even older than the web

Old Goals and New Developments for the World-Wide Web



From TBL's 1989 proposal for the "web."



The Semantic Web

- Suppose we want to uniquely identify a person
 - Harry S Truman
 - Harry S. Truman
 - The 33rd president of the USA
- They all refer to the same person
- Traditionally: SSN
- Nowadays: Credit card numbers



The Semantic Web

- The semantic web would use a unique URI
- `<ID="http://www.whitehouse.gov/history/presidents/ht33.html">`
`<name>Harry S Truman</name>`
`</ID>`
- There is more than one URI about Truman
 - Ensure that everyone uses the same URI
 - Use a small set of URIs
 - Use inference to determine that they are about the same person



The Semantic Web

- Predicates are used to express attributes of objects and relationships between objects
- Example:
 - Harry loves Bess
- We know the meaning of “loves”
- Does a computer?
- It doesn't matter
- For the purpose of the semantic web, we are interested in uniquely identifying predicates



The Semantic Web

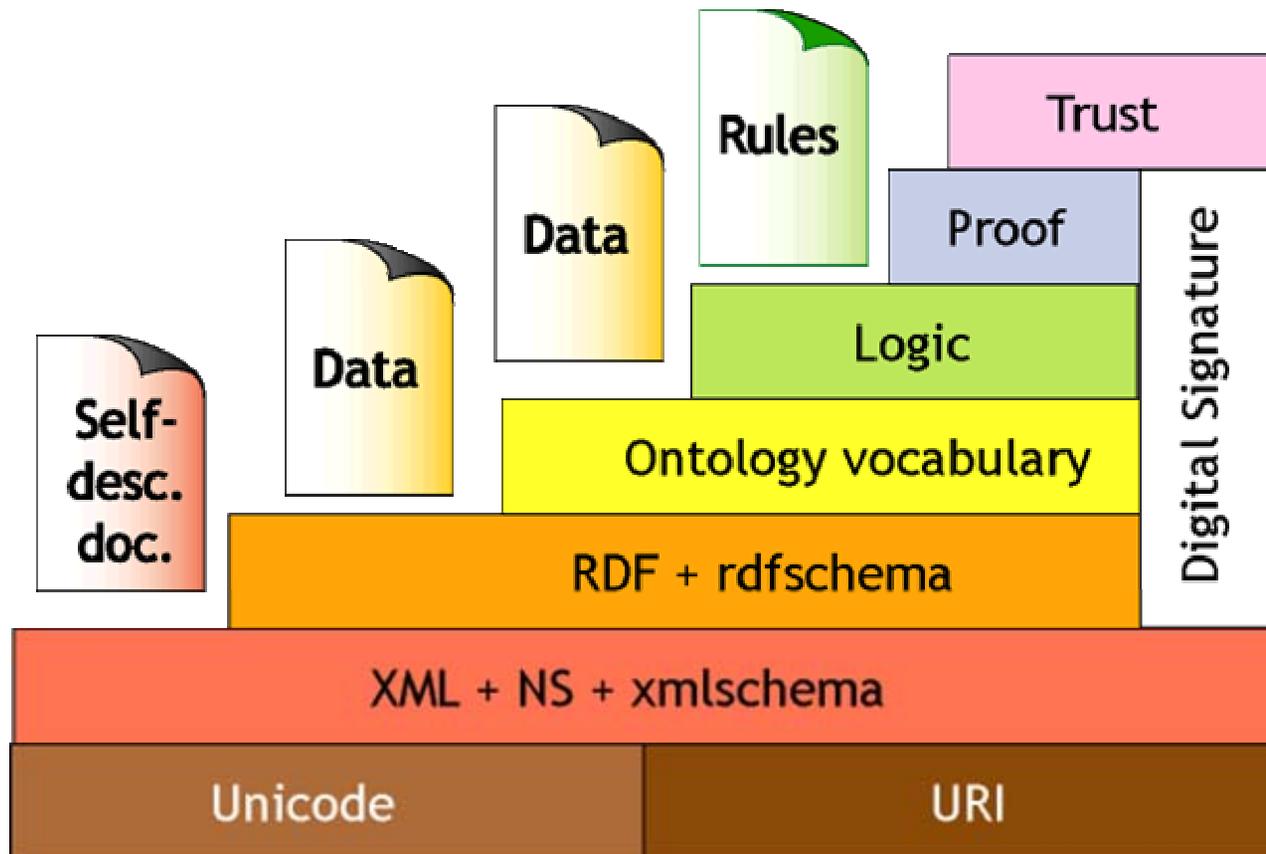
- RDF (Resource Description Framework) gives “meaning” to predicates
- `<rdf:RDF xmlns=“urn:predicates:”>`
 `<rdf:loves>`
 `<rdf:person ID=“...”>Harry</rdf:person>`
 `<rdf:person ID=“...”>Bess</rdf:person>`
 `</rdf:loves>`
 `</rdf:RDF>`



The Semantic Web

- Does the following refer to the same state of affairs?
- `<rdf:RDF xmlns="urn2:predicates:">`
 - `<rdf:liebt>`
 - `<rdf:Person ID="...">Harry</rdf:person>`
 - `<rdf:Person ID="...">Bess</rdf:person>`
 - `</rdf:liebt>`
 - `</rdf:RDF>`
- A computer can tell, if we add an inference engine

The Semantic Web



Eric Miller. Semantic Web Architectural Dependencies.
<http://www.w3.org/Talks/2001/07/30-swws/slide21-0.html>



Towards a Wired Future

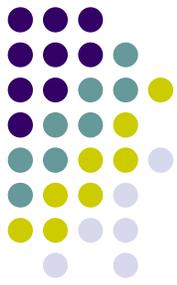
- The semantic web will facilitate progress towards the genie and for corporate search
- In this talk, we want to focus on an area that is currently in its infancy: the wired world
- In a wired world, devices are connected to the internet
- Many devices will be connected in a wireless fashion



Towards a Wired Future

- In principle, we can connect just about any device to the internet
- Examples:
 - Through X-10: anything for which we would traditionally use a switch, e.g. lights and coffee machines
 - Refrigerators (Samsung)
 - Soda machines (soda.cs.rose-hulman.edu)

Living in a Connected World



- How will life be different in a world in which “everything” is connected to the internet?
- Let’s assume a happy world in which information is used responsibly

Scenario 1: A connected car



Janice J. Heiss. The Network is the car.
http://java.sun.com/features/1999/06/concept_car.html,



Scenario 1: A connected car

- Goal: Color coded maps show traffic delays on the cars navigation system
- Interested? Buy an Acura RL or a Cadillac CTS
- Requirements:
 - Car sends its location to a computer
 - Car receives information
 - Car has electronic maps
- Desirable:
 - Navigation system plots alternate route



Scenario 1: A connected car

- Goal 2: Finding a parking space - in Boston
- Impossible!
- MIT's Media Lab is thinking about *smart curbs*:
 - Parking spaces are wired
 - Report their availability
- Make them interact with E-Z Pass
- Can be used instead of parking meters

Scenario 1: A connected car



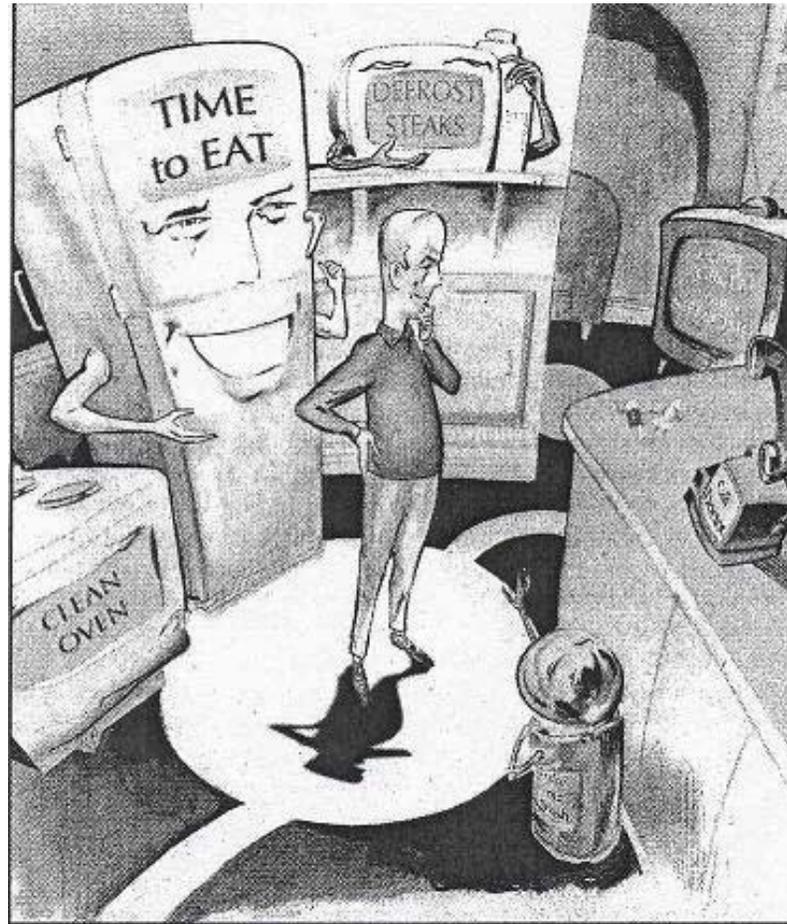
- Augment your car's navigation system to direct you towards an available parking space
- It will likely be taken by the time you arrive
- Use AI to predict availability of parking spaces in an area
- Have your car's computer talk to your PDA when it becomes obvious that you will be late for a meeting
- Have your PDA talk to your colleagues to move up the meeting for which you will be late
- Receive a note on your PDA that you are fired, because you missed yet another important client meeting



Scenario 1: A connected car

- Requirements:
 - A GPS system
 - Common communication protocols for car, curb, toll systems, PDA, colleagues' schedules
- Semantic web ensures compatibility of data
- Java can ensure compatibility of systems
- AI and search for various tasks
- Does not have to be perfect

Scenario 2: A connected house



Jill Glomstad. Everyday Technologies. Advance for Speech-Language Pathologists & Audiologists, p. 24

Scenario 2: A connected house



- Alzheimer's Association, together with Intel sponsors research into connected houses
- Goal: To assist people with Alzheimer's
- In particular: Reminding people of tasks such as cleaning the refrigerator or taking medicine
- Benefits:
 - Increased independence
 - Reduced health care cost

Scenario 2: A connected house



- Most of the devices shown in the drawing are in the future
- Samsung's connected refrigerator is a refrigerator with a laptop attached to it
- It cannot report status of items in it or whether it needs to be cleaned

Scenario 2: A connected house



- Houses wired with X-10 and connected to the web are a reality
- The web-based soda machine has sensors detecting whether the door is open or whether the vending flap is open
- We count how many sodas were sold

Scenario 3: A java-enabled person



Wired Magazine, February 2000

Scenario 3: A java-enabled person



In Search of a Juicy Burger

[see Example 3 from paper]

Scenario 3: A java-enabled person



- Pace makers and defibrillators are implanted in people
- They collect data
- Data is analyzed on the device
- Data is downloaded to a separate device
- Data is sent to a server and analyzed by medical personnel

Scenario 3: A java-enabled person



- Microsoft's Cambridge research center developed a prototype of a personal image and data recall system
- McDonald's operates a restaurant in Long Island which enables people to pay for their meals with the E-Z Pass system
- Insurance companies (Progressive) offers discounts for drivers agreeing to install a black box
- Life insurance policies have lower rates for non-smokers



Conclusions

- Claim: The connected world may be here sooner than we think
- This is in contrast to the genie which will likely take more time



Conclusions

- More and more devices will be wired to the internet
- Much of the information necessary to make a connected world is already stored in electronic format:
 - Credit card transactions
 - PayPal transactions
 - Electronic toll systems



Conclusions

- Most of those systems can already uniquely identify users across systems
- This is simply because in order to get an account, you have to divulge information such as credit card numbers and bank account numbers
- The connected world relies on highly structured information
- This information is meant to be processed by programs
- It is not meant for human consumption



Conclusions

- Ramifications of a connected future are hard to fathom
- Search goes on behind the scenes
- Search is not user initiated
- Search is initiated by the devices we use
- The internet “knows” us
- Individual systems may not know a lot about us, just enough to conduct necessary transactions



Conclusions

- Information, be it good or bad will be available quickly
- Adds a lot of conveniences to our lives
- One small misstep may have a big effect on people's lives



Future Work

- Develop acceptable norms for information use
- Build security into the systems we are about to build, so as to enforce information use policies