

# Knowledge Representation in Semantic Web

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## Outline

- Traditional knowledge representation
- Current world wide web
- Semantic web architecture
- Ontology
- Protégé-2000 as Ontology Editor (Demo)
- Ontology representation language: RDF
- Protégé-2000 as RDF(S) Editor (Demo)
- Extensions of RDF(S)

# Knowledge Representation

- A quick review
  - Domain: a subject area
  - Knowledge: An understanding of a subject area
  - KR: Methods to encode knowledge so that some reasoning systems can use it

## KR (cont.)

- Knowledge Representation
  - Must be In a form that humans can understand
  - Must cause the system using that knowledge to act as if it knows it

## **KR (cont.)**

- Knowledge Representation language
  - Translate natural language to the representation
  - Unambiguously represent the knowledge
  - The result of the translation must be usable for reasoning
  - FOL, semantic network, etc.

## **World wide web**

- A huge knowledge source
  - 3 billion pages on the web by 2002
- HTML pages
  - Medium of human knowledge
  - Human readable, but not machine
  - Tags for layout, not for semantic

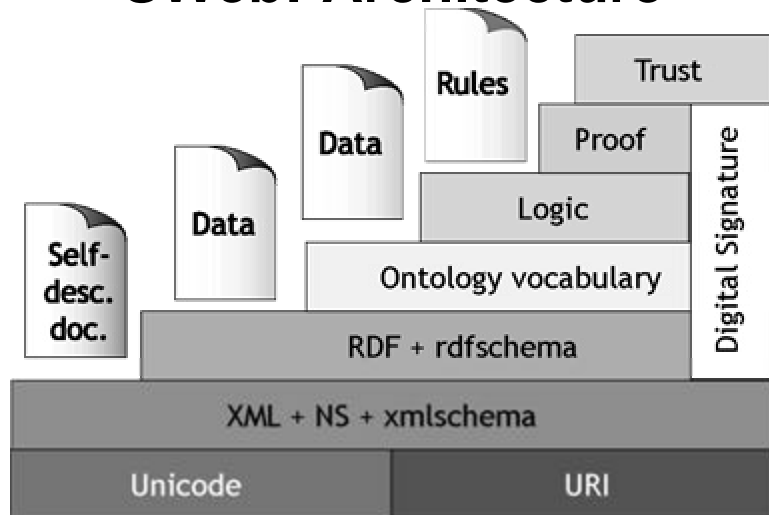
## **World wide web (cont.)**

- How to find information
  - Software agents from AI field
  - Information retrieval: general purpose search engine (google)
  - Information extraction: Specific domain oriented services (airline tickets, books ...)

## **Semantic Web**

- An extension of the current web
- Understandable by machines
  - Add semantics (metadata) into web
- Processable by machines
  - Automation
  - Information integration
  - Reasoning

# SWeb: Architecture



Semantic Web Architecture (Berners-Lee, 99; Swartz-Hendler, 2001)

## SWeb: URI

- Uniform Resource Identifiers
- anything that has a URI can be said to be "on the Web"
- Existing example
  - URL (Uniform Resource Locator)
  - `http://... ftp://...`

## SWeb: XML

- eXtensible Markup Language
- Create your own tags for your information
- Not perfect for representing knowledge
- Infrastructure for knowledge base

## SWeb: RDF

- Resource Description Framework
- General-purpose language for representing information in the Web
- make statements that are **machine-processable**
- <subject> <predicate> <object> triple filled by URIs

## **SWeb: RDF Schema**

- RDF's vocabulary description language
- Define the vocabulary (grammar) of RDF
- describe the relationships between resources
  - Type of classes
  - type of properties

## **SWeb: Ontology**

- A vocabulary that describes the meaning and relationships of terms
- A set of Inference rules that derive new data from existing data

## **SWeb: Logic**

- Not developed yet
- Should be a logical language for making inference

## **SWeb: Proof**

- Not developed yet
- The logic systems can prove things with logical rules



## **SWeb: Trust**

- Anyone can say anything about anything
- So who should my system trust?
- Digital signature
  - A little bits of code based on mathematics and cryptography
  - Identify the author of the RDF statements