


A 10-minute Introduction to Ontologies and the Semantic Web

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What is the Semantic Web

- **An extension of the current Web…**
  - … where information and services are given well-defined and explicitly represented meaning, …
  - … so that it can be shared and used by humans and machines, ...
  - ... better enabling them to work in cooperation
- **How?**
  - Promoting information exchange by tagging web content with machine processable descriptions of its meaning.
  - And technologies and infrastructure to do this

The Semantic Web Vision

- **The Web was made possible through established standards**
  - **TCP/IP** for transporting bits down a wire
  - **HTTP & HTML** for transporting and rendering hyperlinked text

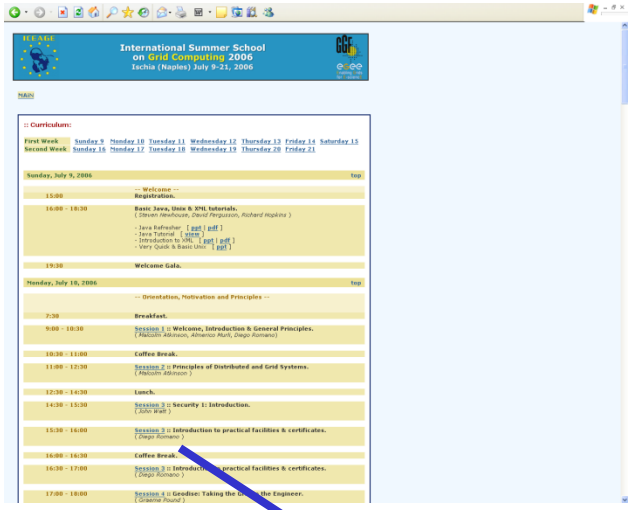
- **Applications able to exploit this common infrastructure**
  - Result is the WWW as we know it

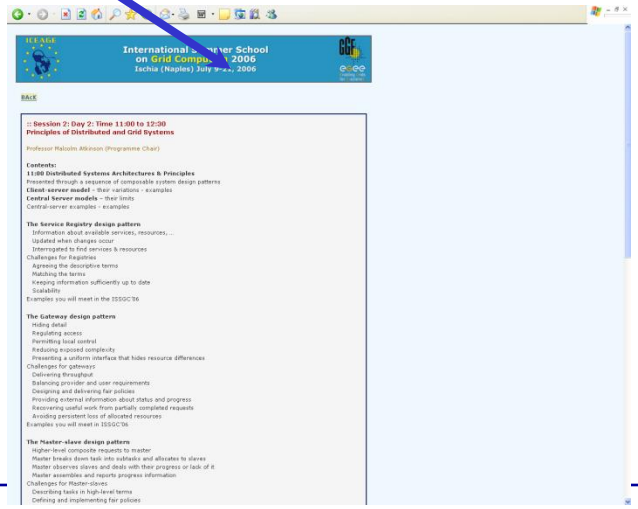
- **Generations**
  - 1st generation web mostly handwritten HTML pages
  - 2nd generation (current) web often machine generated/active
    - Both intended for direct human processing/interaction
  - In the next generation web, resources should be more accessible to automated processes
    - To be achieved via semantic markup
    - Metadata annotations that describe content/function

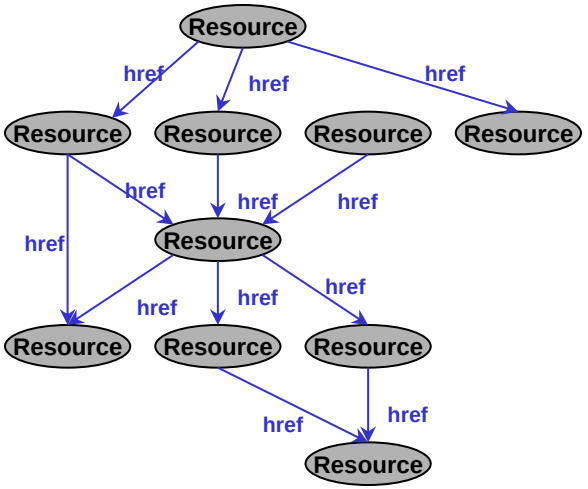
The Syntactic Web

The Semantic Web

Where we are Today: the *Syntactic* Web



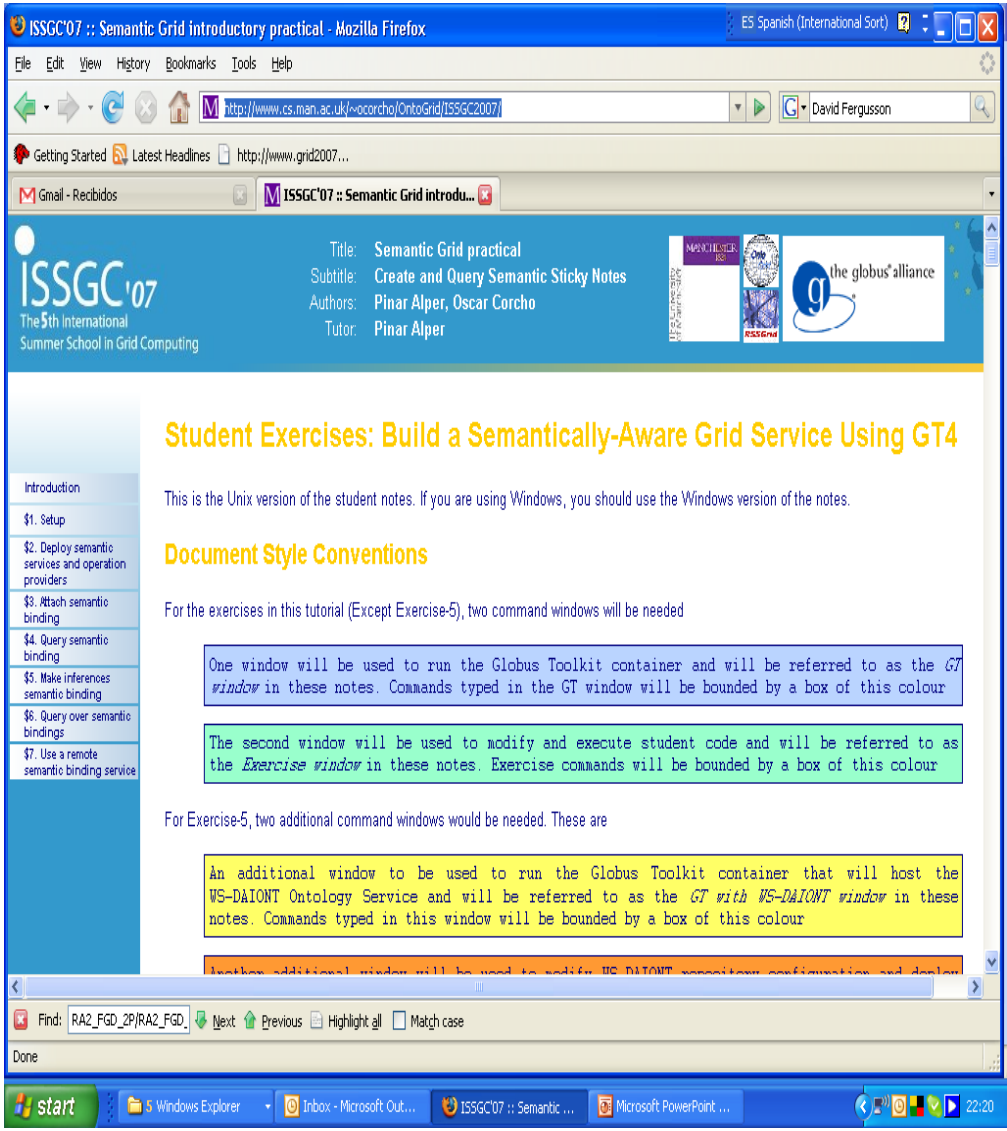




- **A place where computers do the presentation (easy) and people do the linking and interpreting (hard).**
- **Why not get computers to do more of the hard work?**

What's the Problem?

- **Typical web page markup consists of:**
  - Rendering information (e.g., font size and colour)
  - Hyper-links to related content
- **Semantic content is accessible to humans but not (easily) to computers…**



Information we can see…

International Summer School on Grid Computing (ISSGC2007)
Semantic Grid practical
Pinar Alper, Oscar Corcho

Project logos… (sponsors/related projects/…?)
OntoGrid, RSSGRID, Globus

Student Exercises
Structured in seven chapters
Setup chapter

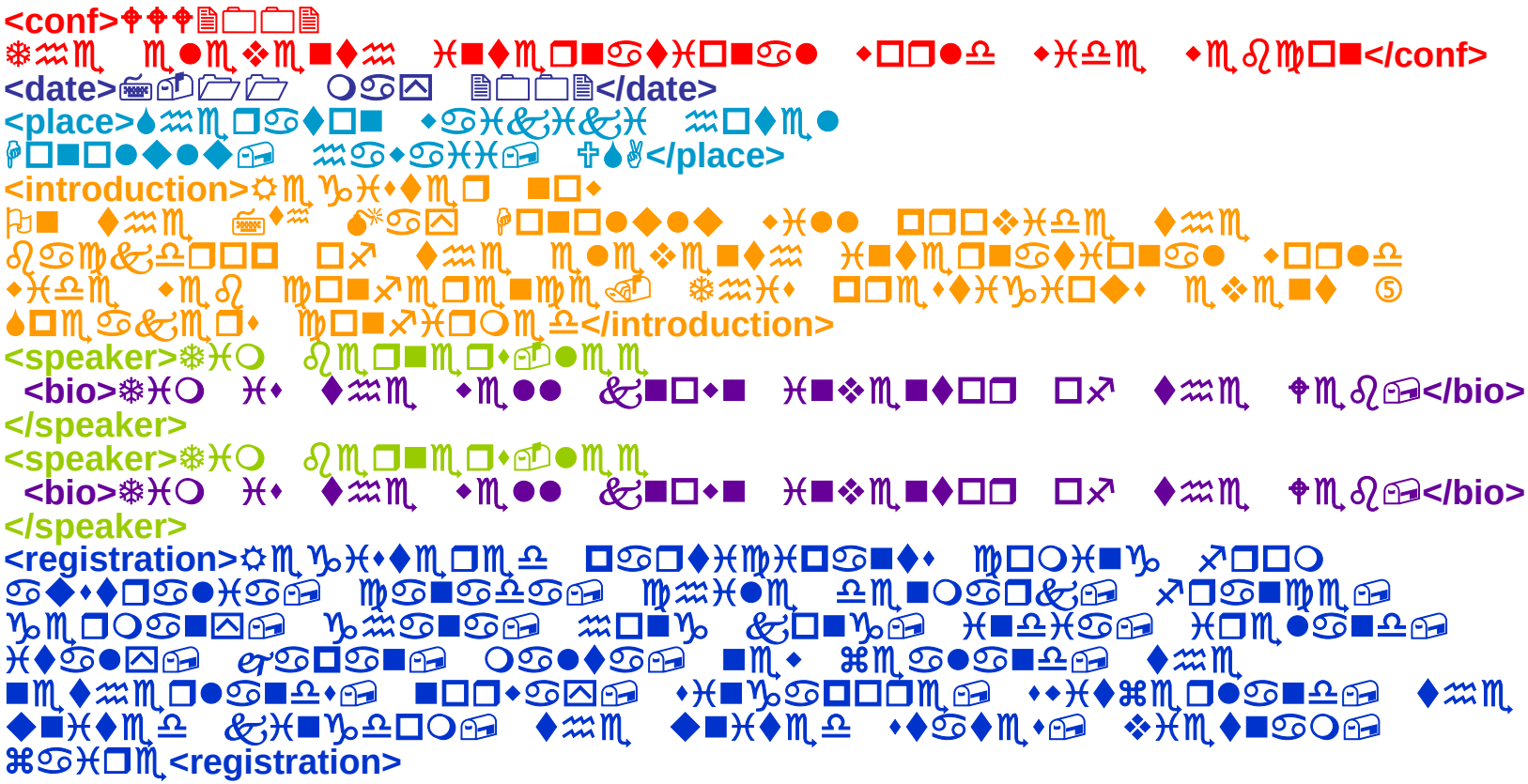
Instructions for each chapter
Code inside
Description of code
Material to change
Additional material

…

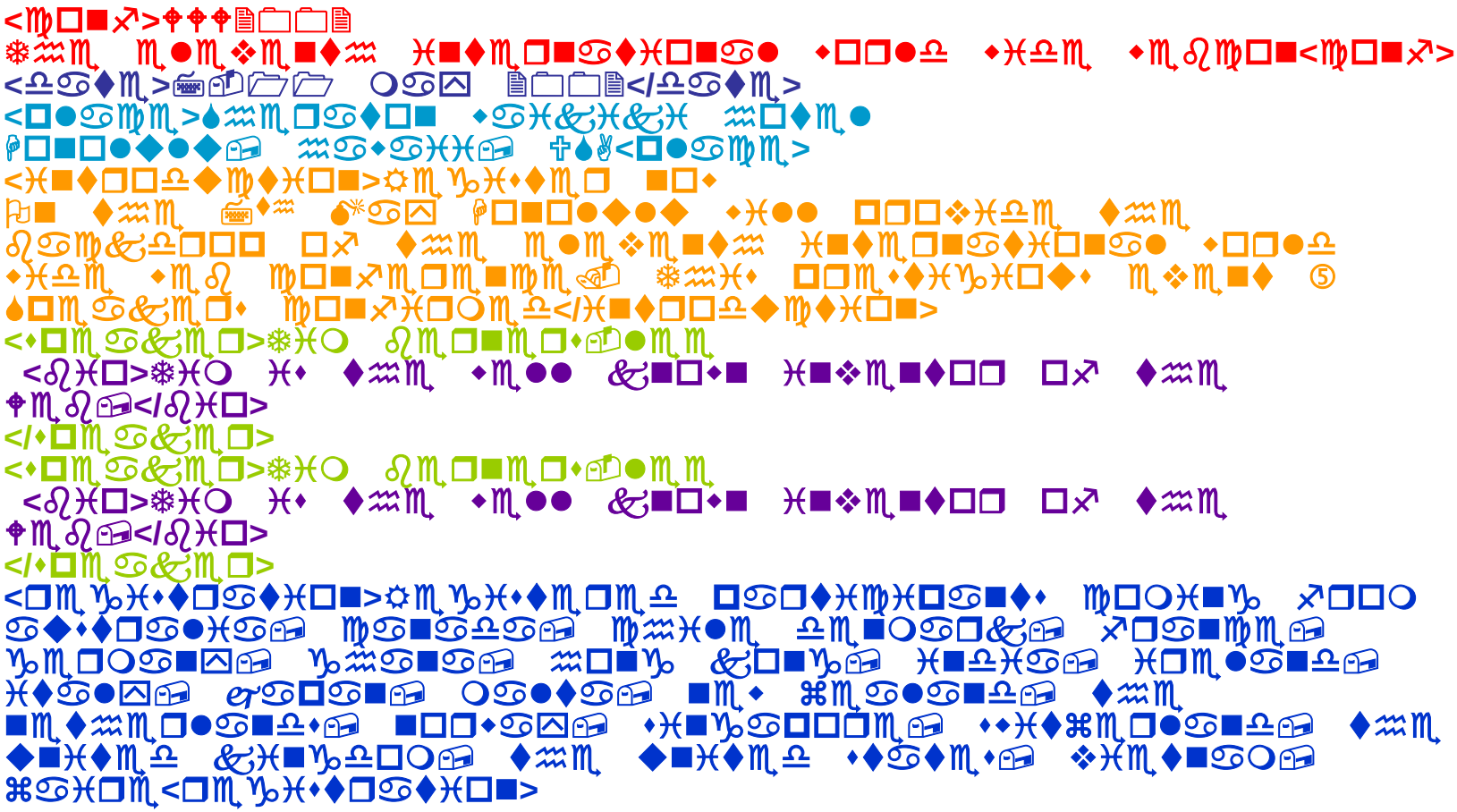
Information a machine can see…

Solution: XML markup with “meaningful” tags?

But What About…?



Still the Machine only sees…



Need to Add "Semantics"

- **External agreement on meaning of annotations**
  - E.g., *Dublin Core* for annotation of library/bibliographic information
    - Agree on the meaning of a set of annotation tags
  - Problems with this approach
    - Inflexible
    - Limited number of things can be expressed

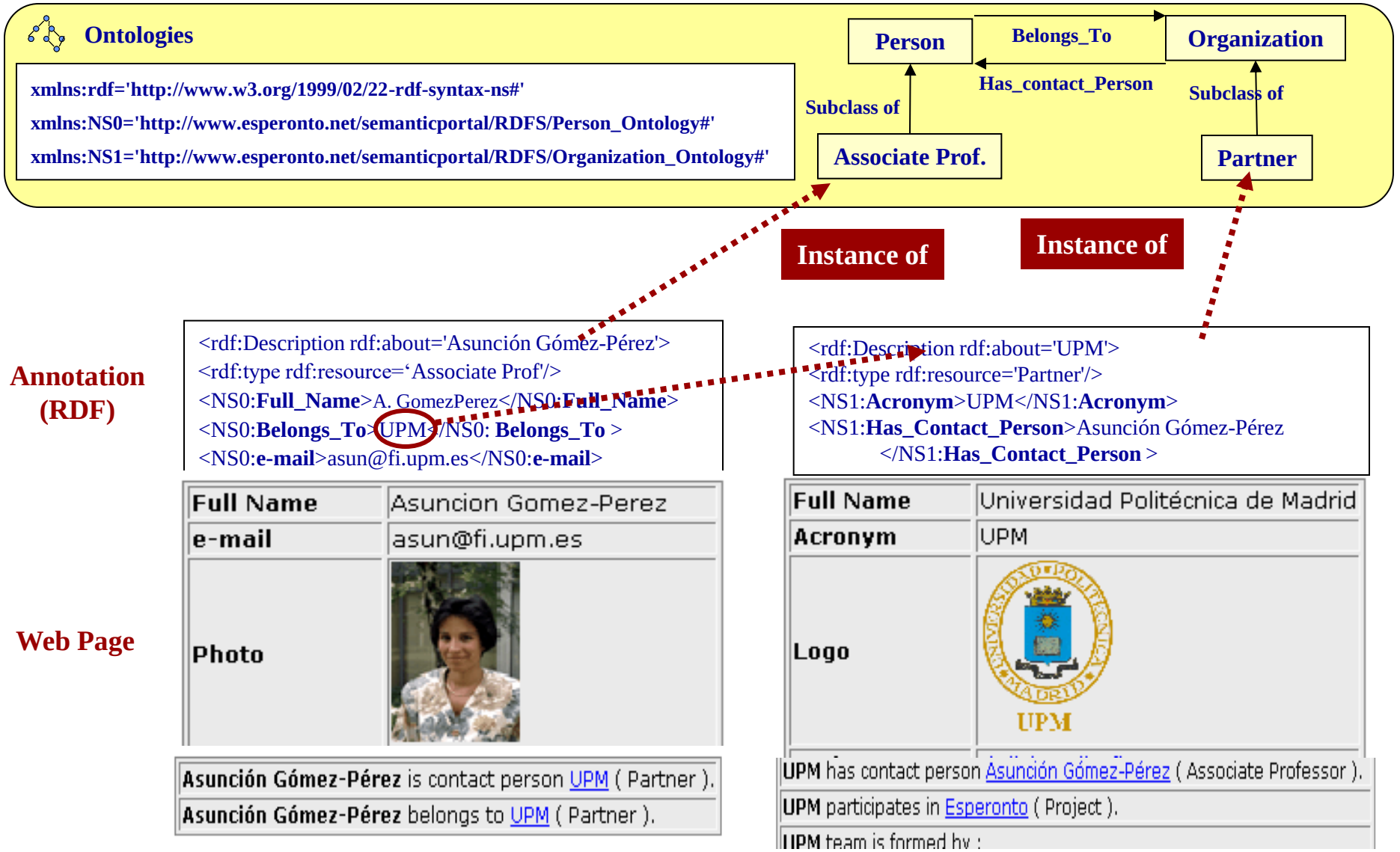
- **Use Ontologies to specify meaning of annotations**
  - Ontologies provide a vocabulary of terms
  - New terms can be formed by combining existing ones
    - "Conceptual Lego"
  - Meaning (semantics) of such terms is formally specified
  - Can also specify relationships between terms in multiple ontologies

Ontology in Computer Science

- **An ontology is an engineering artifact:**
  - It is constituted by a specific vocabulary used to describe a certain reality, plus
  - a set of explicit assumptions regarding the intended meaning of the vocabulary.
    - Almost always including concepts and their classification
    - Almost always including properties between concepts
    - ~~Similar to an object oriented model~~

- **Thus, an ontology describes a formal specification of a certain domain:**
  - Shared understanding of a domain of interest
  - Formal and machine manipulable model of a domain of interest

Ontologies and Metadata



Course objectives and structure

- **Provide the theoretical and practical basis over the scientific, methodological and technological foundations of the Semantic Web**
  - To be used in the construction of applications that integrate, combine and derive information
  - Distributed and heterogeneous information

- **Structured**
  - Unit 1. Semantic Web introduction
  - Unit 2. Ontology development
    - RDF and RDF Schema
    - OWL
    - Ontology building methodologies
  - Unit 3. Semanic Web
    - Annotation
    - Semantic similarity
    - Semantic search

Course outline

Content	Duration (hours)	Lecturer	Day
Introduction to the Semantic Web	3	Asunción Gómez-Pérez	19/5/2008
RDF and RDF Schema	4	Oscar Corcho Raúl García-Castro	8/5/2008
OWL	5	Oscar Corcho Mcarmen Suárez	13-14/5/2008
Ontology development methodologies	6	Asunción Gómez-Pérez Mcarmen Suárez	21-22/5/2008
Annotation	3	Oscar Corcho	10/6/2008
Semantic similarity	1,5	Asunción Gómez-Pérez	11/6/2008
Semantic search	1,5	Oscar Corcho	11/6/2008