Understanding is based on Consensus

The Book of Genesis tells of a great tower built by men not only from fear of a second Flood but above all "to make a name for themselves." Gods' punishment was the Babylonian confusion of tongues, with men unable to understand each other, the result being that the tower was never finished.

Dieter Fensel (with significant ezzes of Peter Fankhauser)

The Message in a Nutshell

- The computer was invented as a device for computation.
- Then the PC was detected as a means for games, text processing and power point presentations.
- Meanwhile the “computer” becomes a portal to cyberspace:

==> The “computer” is in fact an entry point to a world-wide network of information exchange and business transactions.

==> Technology that supports access to unstructured, heterogeneous and distributed information and knowledge sources will become as essential as programming languages were in the 60’s and 70’s.

==> In the mid of 2001, we already know the name of this technology.
It is called ...

Ontology

1 What are Ontologies?

- What are ontologies:
  - Ontologies are *formal* & *consensual* specifications of conceptualizations ...
  - providing a *shared and common* understanding of a domain that can be communicated across people and application systems.

==> Ontology glue together *two essential aspects* that help to bring the web to its full potential:

  - Ontologies define a *formal* semantics for information allowing information processing by a computer.
  - Ontologies define a *real-world semantics* allowing to link machine processable content with meaning for humans based on *consensual* terminologies.

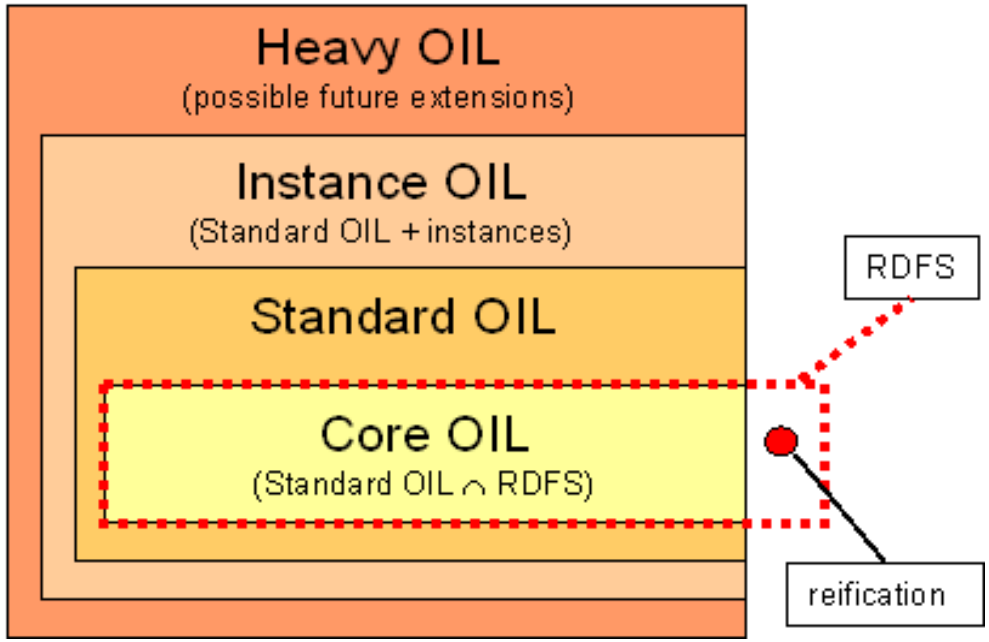
2 Ontologies define a formal semantics

- XML provides a serialized syntax for tree structures.
- RDF defines a data model on top of XML:

  (object, property, value)
- RDF schema (RDFS) defines basic ontology primitives in RDF:
  - classes with is-a and instance-of relationships
  - properties with is-a relationships and domain and range restrictions
- OIL extends RDFS to provide a full-fledged web-based ontology language (www.ontoknowledge.org/oil).

Ontologies define a formal semantics: The onion model of OIL

- There will never be one language meeting all man purposes.
- OIL has a principled architecture that reflects this need.



- One of its dialects called **DAML+OIL** reflects a broad European and (US) American consensus on modeling primitives for the semantic web.

3 Ontologies define a real-world semantics

Proving machine-understandable semantics of data is a great step.

- Instead of uninformed information retrieval we can provide automated support in information extraction and information processing.
- We start to use the computer again as a device for computation and not just as a means to render web pages.[1]

However the real challenge is in linking these results with actual needs and semantics for the human user.

==> Here is where ontologies employ their full potential.

1. The current web-based use of a computer is like using a phone for decorating a living room.

Ontologies define a real-world semantics: The Essence

- Originally, an Ontology should reflect the “truth” of a certain aspect of reality.

==> It was the holy task of a philosopher to find this truth.

- Now Ontologies are used as means to exchange meaning between different agents.

==> They can only provide this if they reflect an inter-subjectual consensus.

==> Per definition they can only be the result of a social process.

==> This gives ontologies a dual status for the exchange of meaning.

Ontologies define a real-world semantics: Evolving Ontologies

- Ontologies as *pre-requisite* for consensus: Agents can only exchange meaning when they have already agreed on a joined body of meaning reflecting a consensual point of view on the world.
- Ontologies as a *result* of consensus: Ontologies as consensual models of meaning can only arise as result of a process where agents agree on a certain world model and its interpretation.

==> In consequence, ontologies are as much a pre-requisite of consensus and information sharing as they are its results.

Ontologies define a real-world semantics: Evolving Ontologies

- In consequence, ontologies cannot be understood as a static model.
- An ontology is as much required for the exchange of meaning as the exchange of meaning may influence and modify an ontology.
- In consequence, *evolving* ontologies rather describe a process than a static model.

==> Having protocols for the process of evolving ontologies is the real challange!

Ontologies define a real-world semantics: The Process

Process modes for achieving consensus:

- Centralized process models have standardization bodies as central clearing unit: slow, not scalable, and mongrelized results (see XML schema).[1]

- Decentralized process models for consensus achievement based on the natural consensus of working networks: reflects true, proven useful, and broadly used consensus.

==> can we learn from P2P where communications is maintained via dynamic networks lacking central authority?

==> Ask yourself: How to people achieve to understand each other?[2]

1. The fly.
2. The origin of natural language. The people you talk or the national dictionary and grammar committee?

4 Conclusions

- Ontologies help to establish *consensual terminologies* that make sense to both sites:
  - computers are able to process information based on their machine-processable semantics
  - humans are able to make sense of this information based on their connection to real-world semantics.

==> Building up such ontologies that are pre-requisite and result of joined understanding of large user groups is far from being trivial.

==> A model or “protocol” for driving the network that maintains the process of *evolving ontologies* is the real challenge for making the **semantic** web reality.