Networked Ontologies

Steffen Staab
Information Systems & Semantic Web
Universität Koblenz-Landau
Koblenz, Germany

With acknowledgements to
S. Schenk, M. Aquin, E. Motta and the NeOn project team
http://www.neon-project.org/
"Microsoft Acquires Powerset": Why a Semantic Web Will Be Smarter, Faster & All-Around Better

Microsoft's acquisition of Powerset signals building of a future when the entire world likely have access to virtual "software agents" who will "roam" across the Web, making our work more productive and effective.

The future of the Web is Semantic
Ontologies form the backbone of a whole new way to understand information.

The New York Times Embraces the Semantic Web: "Opportunities are Quite Vast," R&D Chief Says

The BBC Music Beta project is an ongoing semantically linked and annotated web whose songs are played on BBC radio, collections of data are enhanced and in metadata, letting users explore content they may have not known existed.

Yahoo makes semantic search shift

Berners-Lee briefs Brown on opening up government data
Prime minister meets worldwide web inventor at Number 10 to discuss progress of plan to make public sector data more accessible.

Written by Bryan Glick
Computing, 15 Sep 2009
What is the status of the “semantic Web”?
One Type of Ontology Network

Requirement: Version, provenance and consistency management
Another Type of Ontology Network

Requirement: Joint Development
Yet Another Type of Ontology Network

Requirement: Ontology Design Pattern Management
Agenda

Applications

Networks

Ontologies

Data
**Networked Ontologies in FAO**

- FAO has numerous information systems about the world’s Fisheries:
  - Heterogeneous data:
    - statistics, documents, GIS, thesaurus...
  - Multilingual:
    - Arabic, Chinese, English, French, Spanish and Russian
  - Much of the data are ‘structured’, but not necessarily interoperable.

- Better exploited using ontologies, by bringing together related information

- FAO’s previous work (2003) to build a Fisheries ontology had drawbacks:
  - too big
  - un-manageable for maintenance
  - inefficient to be used by systems

- NeOn vision:
  - resources remain independent and they are networked by mapping them:
    - smaller ontologies
    - mapping them
    - effective maintenance of ontologies and mappings
Networked Ontologies: An Example

Fisheries ontology

Fisheries networked ontologies

- territories
- water areas
- species
- commodities
- gear types
- vessel types
- AgroVoc

- fish lives in a sea
- fish is fished with a gear
- gear is on vessel
- commodities from fish
- synonyms, translations
- territorial water
Fisheries Ontologies for the Fish Stock Depletion Assessment System (FSDAS)

- FSDAS requirements:
  - Using NeOn Toolkit runtime functionality

- Fishery ontologies lifecycle requirements:
  - Using NeOn Toolkit design time functionality
Networked Applications: Talk to Each Other

- Fire Department: Coordinate and keep up to date, Report and update about incident.
- Emergency Hotline: Creates incident event with audio.
- Emergency Control Center: Coordinate and keep up to date, Report and update about incident.
- Police Department: Coordinate and keep up to date.
- Forward Liaison Officer: Requests to report about a situation.
- Citizen: Calls to report about an incident, Event description with photo attached.
- Emergency Response Coordination:
NeOn Toolkit

29 Plugins available for the current download
The NeOn Toolkit ontology development environment

- Core ontology editor with
  - Support ontology engineering and management
  - Support for complete ontology lifecycle
  - Support for different languages (OWL, F-Logic)
  - Support for networked ontologies (modules, mappings)

- Built on the Eclipse platform

- Extensible architecture
  - Via Eclipse plugin mechanism

- Community support
  - http://neon-toolkit.org
Requirement: Version, provenance and consistency management
Example from FAO Case Study: Water Area – RADON to the rescue

From Peter Haase
Provenance Tracing

OWL Axiom Annotation (transitive(hasPart)
  MetaKnowledge Annotation (annot1
    Agent Annotation (OntoEngSmith)))

OWL Axiom Annotation (Property Assertion (ID_20_331 hasPart ID_30_558)
  MetaKnowledge Annotation (annot2
    Agent Annotation (KnowEngJones)))

OWL Axiom Annotation (Property Assertion (ID_30_558 hasPart ID_40_724)
  MetaKnowledge Annotation (annot2
    Agent Annotation (KnowEngJones)))

... Also applicable to time, location, fuzzy, ....
Requirement: Joint Development
Joint Development of AGROVOC@FAO

Problems:

- Communication between world-wide users and development team
- Communication within the development team
Discussion Support for Collaborative Ontology Engineering

- Allow an efficient, collaborative decision process
  - Structuring and understanding the problem
  - Systematic exploration of possible solutions

- Documentation of the ontology design rationale
  - Attach discussions to changes in the ontology
  - Resuming of discussions, e.g. if requirements have changed
Enhanced discussion support for Semantic MediaWiki
- Guiding the user through the discussion workflow
- Different argument types, voting and decision procedures
Plugin for NeOn Toolkit

Integration of Cicero into an ontology editor (NeOn toolkit)
  - Creating and searching discussions from within the toolkit
  - Annotating discussions to ontology elements
Requirement: Ontology Design Pattern Management

From Ansgar Scherp
OWL is not enough for building a good ontology, and we cannot ask all web users either to learn logic, or to study ontology design.

Reusable solutions are described as Ontology Design Patterns, which help reducing arbitrariness without asking for sophisticated skills ...

... provided that tools are built for any user.

An ontology design pattern is a successful reusable solution to a recurrent modeling problem

From Aldo Gangemi
Pattern-based ontology design is the activity of searching, selecting, and composing different patterns

Based on a catalogue of design patterns:
- http://www.ontologydesignpatterns.org

From Aldo Gangemi
Support for Extreme Ontology Design

From Valentina Presutti
Fish Stock Depletion Assessment System (FSDAS)

- **FSDAS requirements:**
  - Using NeOn Toolkit runtime functionality

- **Fishery ontologies lifecycle requirements:**
  - Using NeOn Toolkit design time functionality

*NeOn Toolkit – GUI = Runtime Backend*
Integrating Multiple Web2.0 Apps: Semaploreer

Koblenz

Koblenz (also Coblenz in pro-L...)

Wikipedia

Koblenz castle

Koblenz Hauptbahnhof

Koblenz, Switzerland

Search

Koblenz castle

Locations

Koblenz

Tags

Koblenz

Koblenz castle

Koblenz Hauptbahnhof

castle in Spain

castle in the air

Map Media

Locations

Persons

Tags

Time

Koblenz

Koblenz castle

castle in Spain

castle in the air

Ready
Networked Repositories

Networked Graphs + Federator

Views, Distributed Joins, & „Function Tables“ built into SPARQL

birthplace

PlaceOfBirth birthplace

RDFS Rules fulltext

WordNet + Swoogle + GeoNames

NeOn
IST-2005-027595
NeOn-project.org

http://isweb.uni-koblenz.de/Research/systeme/NetworkedGraphs

Steffen Staab
ISWeb
Conclusion

- Networked Ontologies, Data and Applications
  - Develop
  - Operate

- NeOn Toolkit
  - Versatile
  - 29 Plugins currently available
  - Development environment
  - Runtime environment
  - Functionality constantly extended

- Interesting New Challenges: Networked Ontologies of and for
  - Ontology Reuse
  - Ontology Publishing
  - Ontology Trust
  - ....
Thank You!

Steffen Staab
Scratching the tip of the iceberg


