



Networked Ontologies

Steffen Staab

Information Systems & Semantic Web

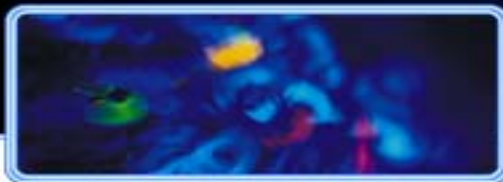
Universität Koblenz-Landau

Koblenz, Germany

With acknowledgements to

S. Schenk, M. Aquin, E. Motta and the NeOn project team

<http://www.neon-project.org/>



The Semantic Web Explosion

July 07, 2008

"Microsoft Acquires Powerset": Why a Semantic Web Will Be Smarter, Faster & All-Around Better



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

BBC's Semantic Music Project

Written by Sarah Perez / January 21, 2009 11:59 PM / 6 Comments



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 music fans explore content they may have not known existed.

IBM

Home | Products | Services & industry solutions | Support & downloads | My IBM

developerWorks > Web development | Open source | XML >

The future of the Web is Semantic

Ontologies form the backbone of a whole new way to understand the Web

Level: Introductory

In this article:

- Technologies that make up the Semantic Web

THURSDAY, JUNE 05, 2008

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



The Semantic Web been the longtime vision of Tim Berners-Lee, the British physicist who invented the World Wide Web. It is far from being implemented but is starting to

Michael Zimbalist, head of R&D at The New York Times Company, told me that the opportunities are "quite vast."

BBC NEWS

News Front Page

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BBC NEWS CHANNEL

LIVE

Last Updated: Friday, 14 March 2008, 15:01 GMT

[E-mail this to a friend](#) [Printable version](#)

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



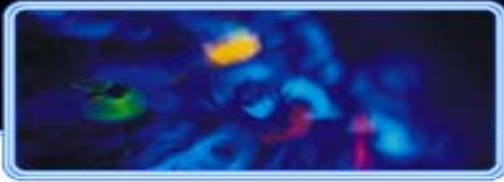
Berners-Lee is opening up government data



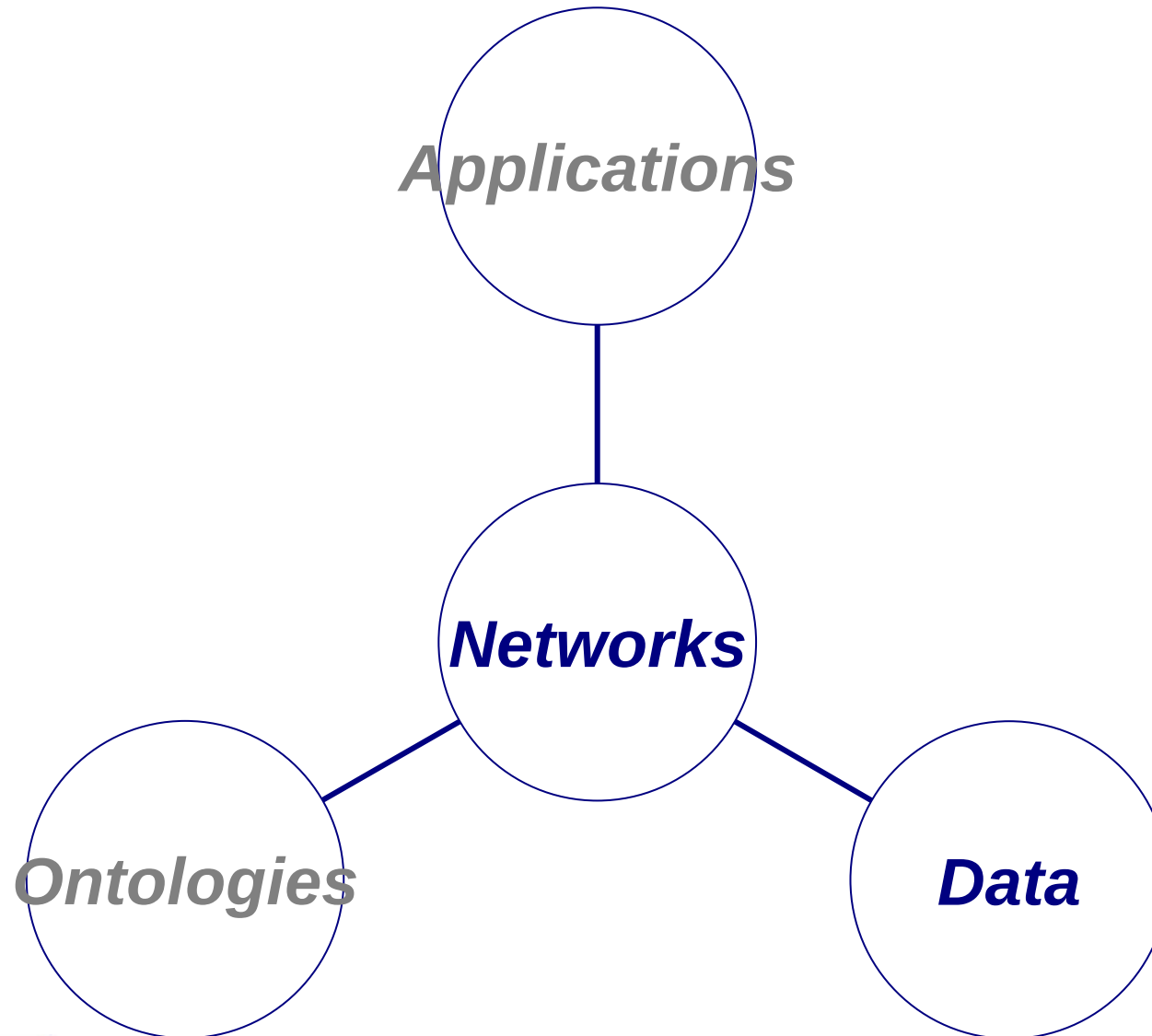
IST-2005-027595
NeOn-project.org

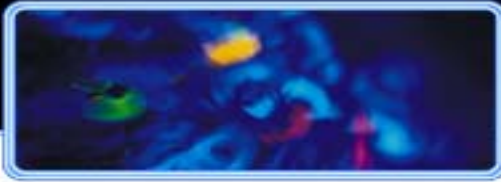
Slide 2

Steffen Staab
ISWeb

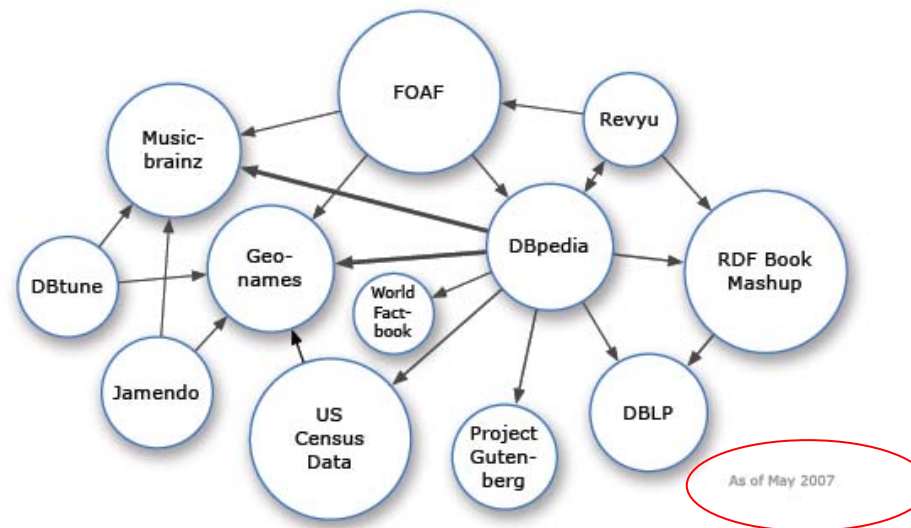


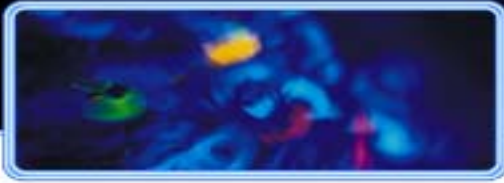
Agenda



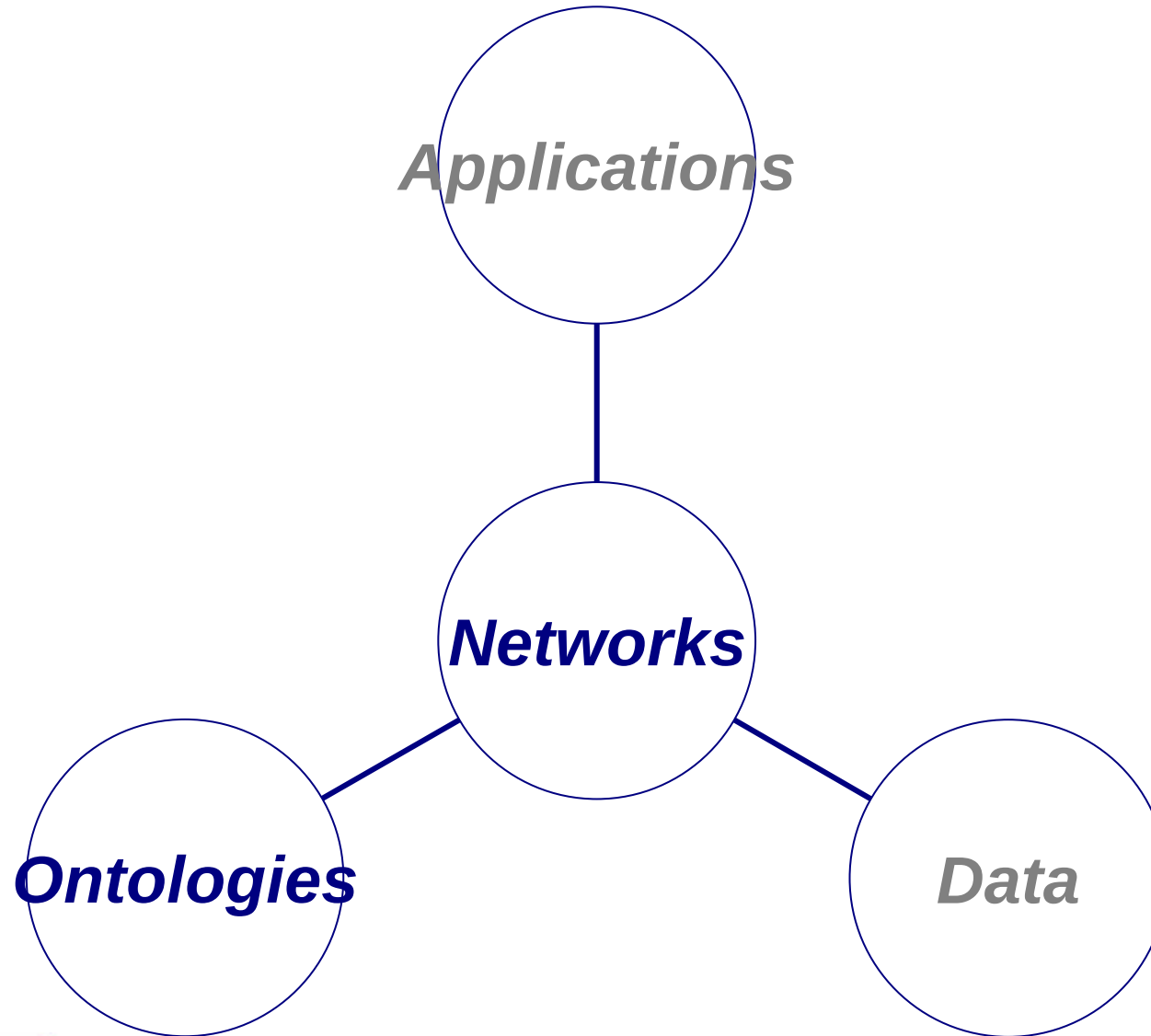


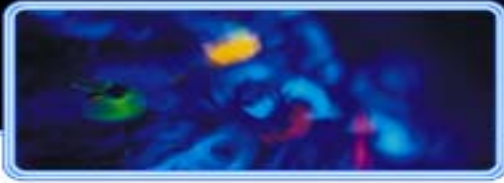
What is the status of the „semantic Web“?



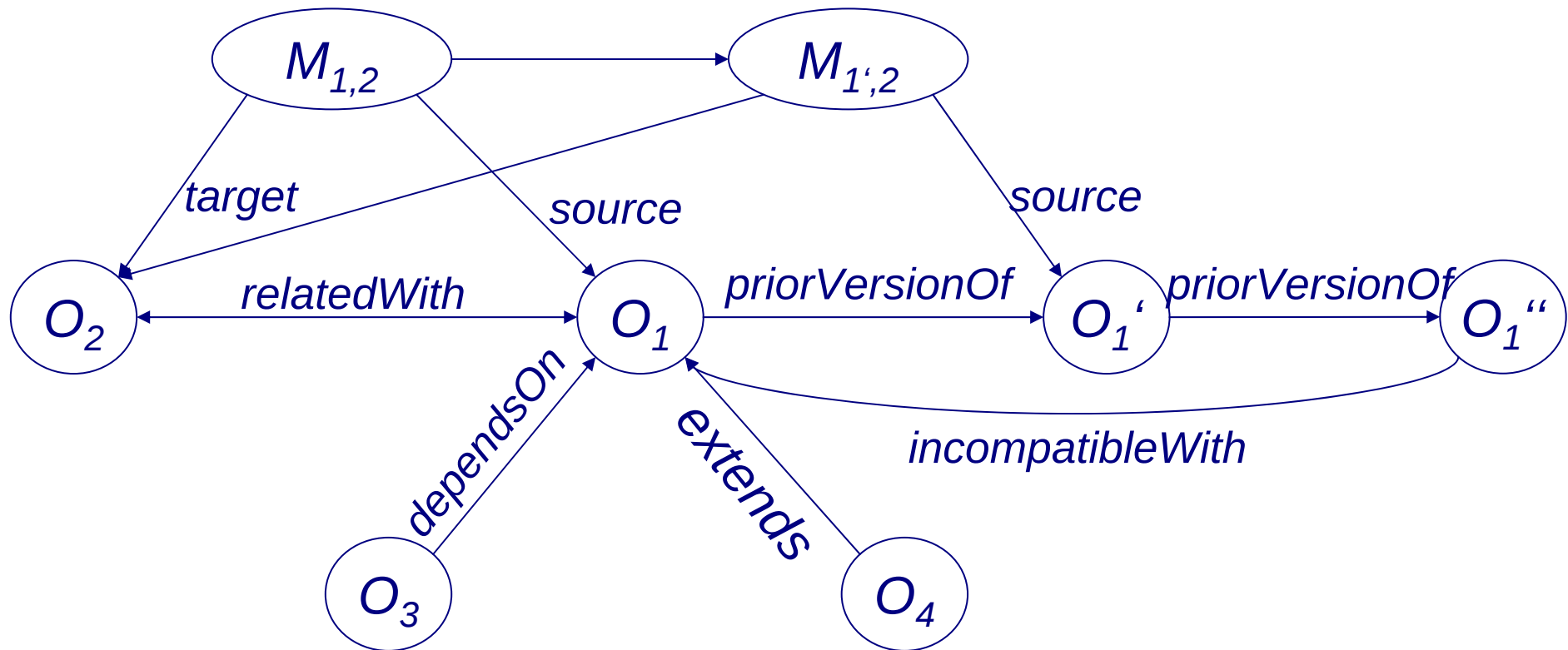


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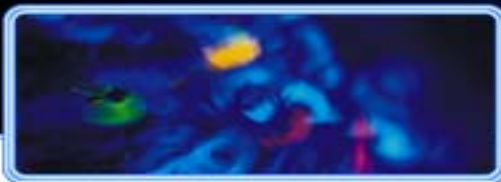




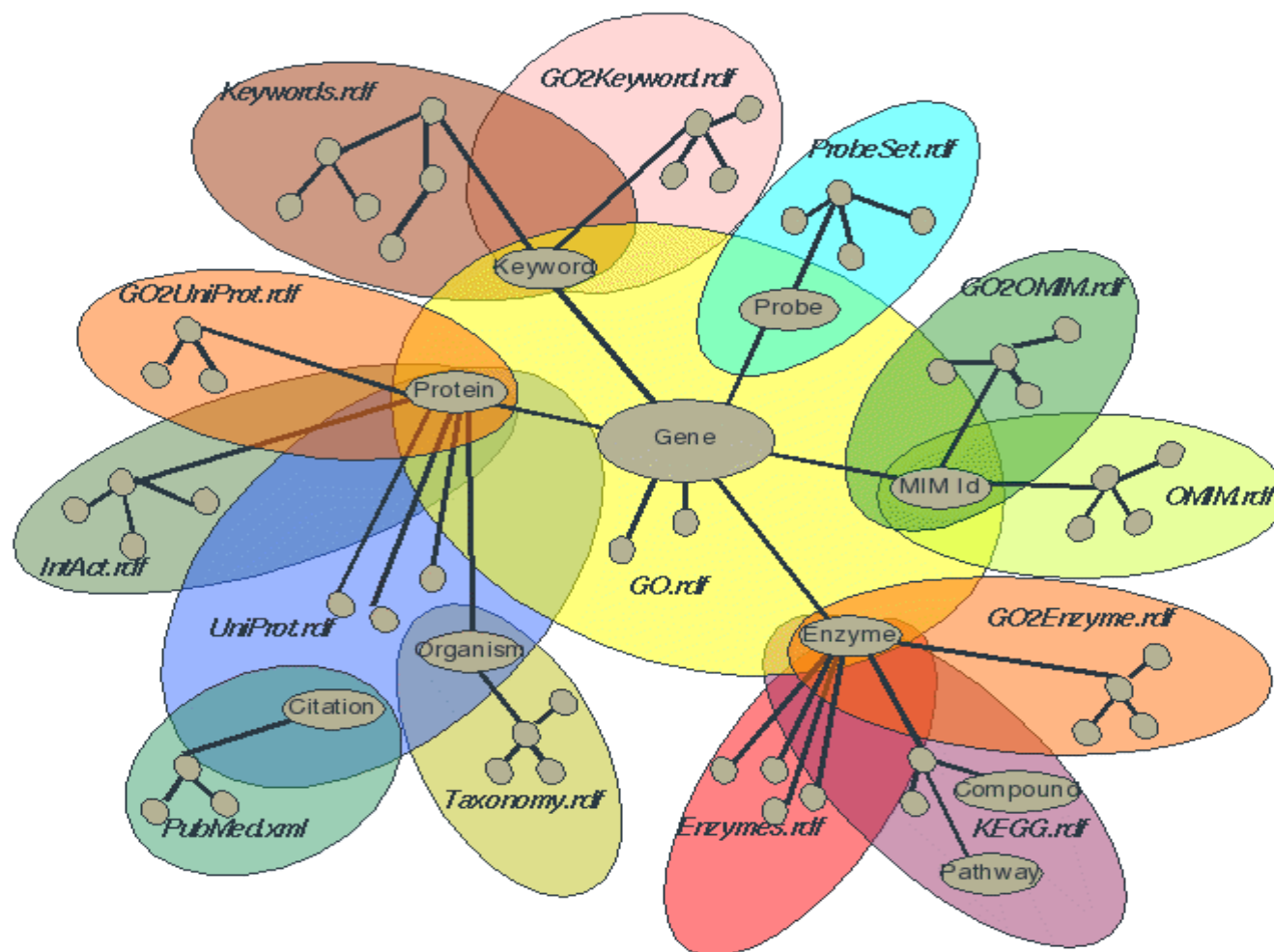
One Type of Ontology Network



Requirement: Version, provenance and consistency management

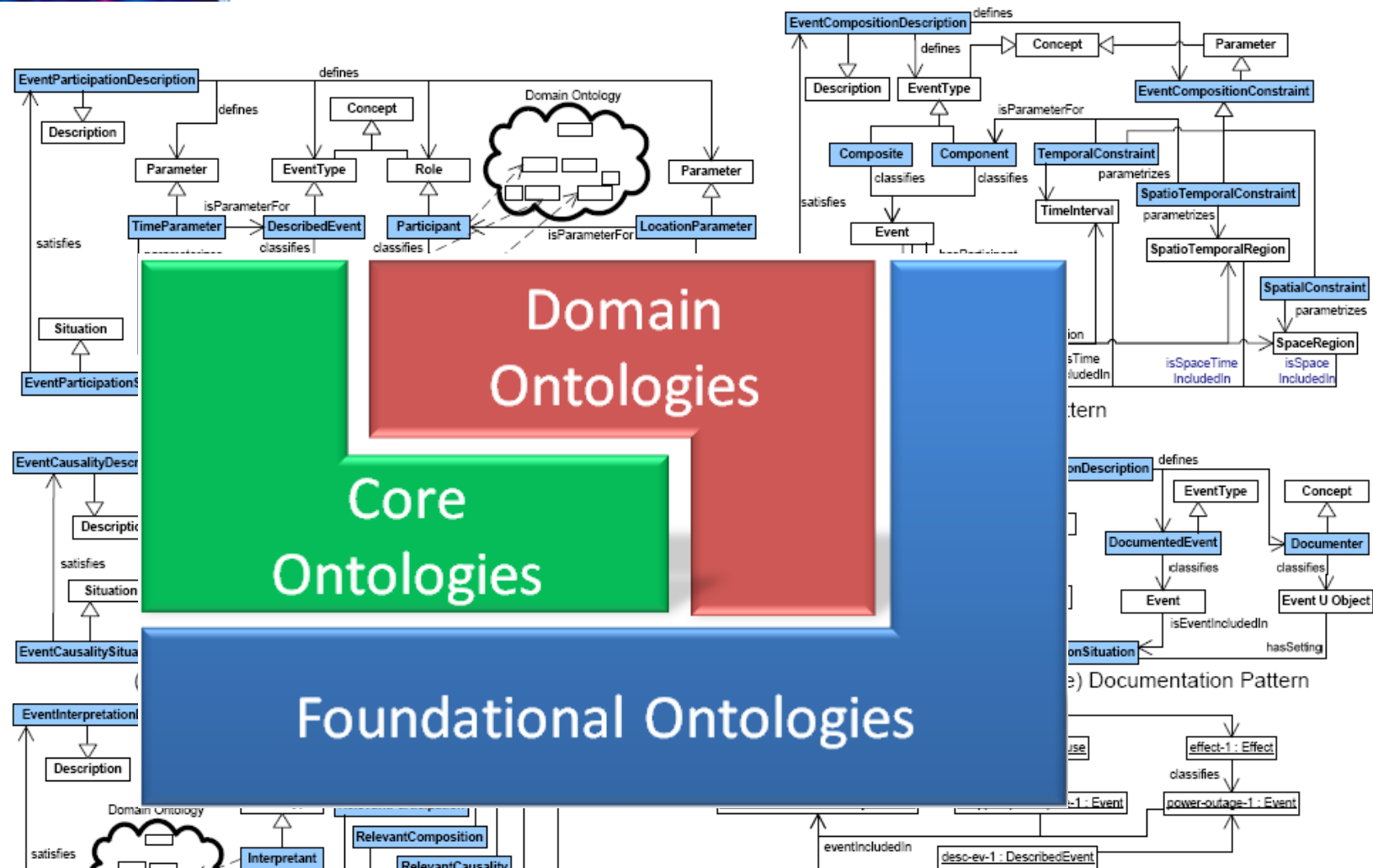


Another Type of Ontology Network

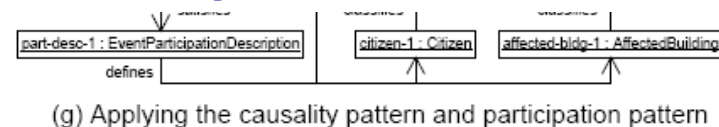
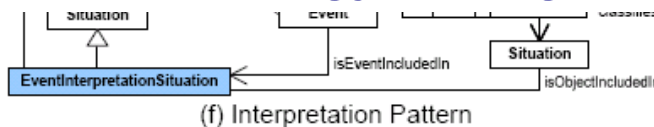


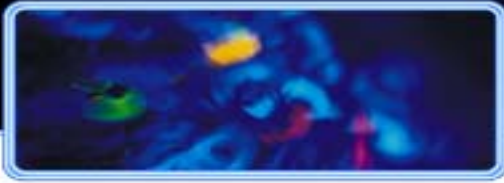
Requirement: Joint Development

Yet Another Type of Ontology Network

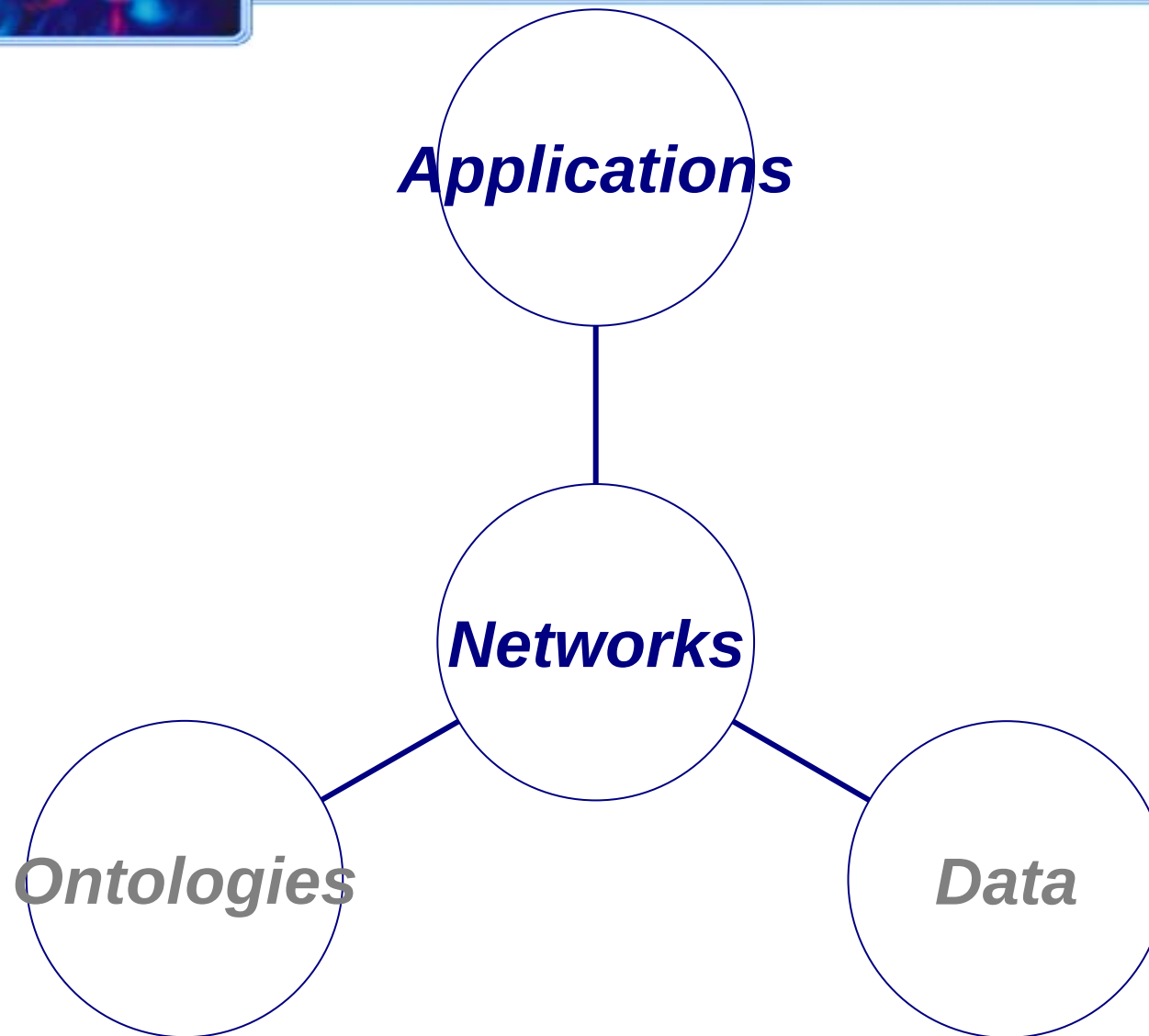


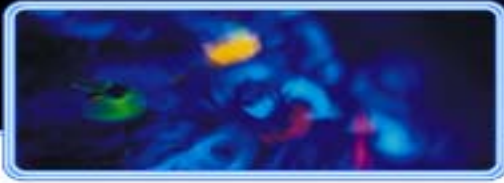
Requirement: Ontology Design Pattern Management





Agenda

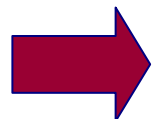




Networked Ontologies in FAO

Ã 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.

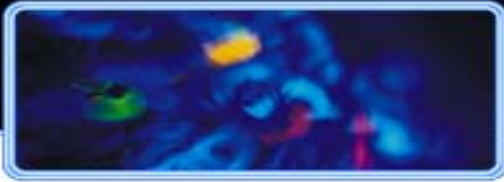
 Better exploited using ontologies, by bringing together related information

Ã FAO's previous work (2003) to build a Fisheries ontology had drawbacks:

- too big
- un-manageable for maintenance
- inefficient to be used by systems

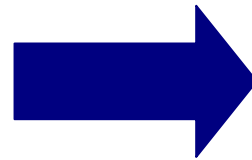
Ã NeOn vision:

- resources remain independent and they are networked by mapping them:
 - smaller ontologies
 - mapping them
 - effective maintenance of ontologies and mappings

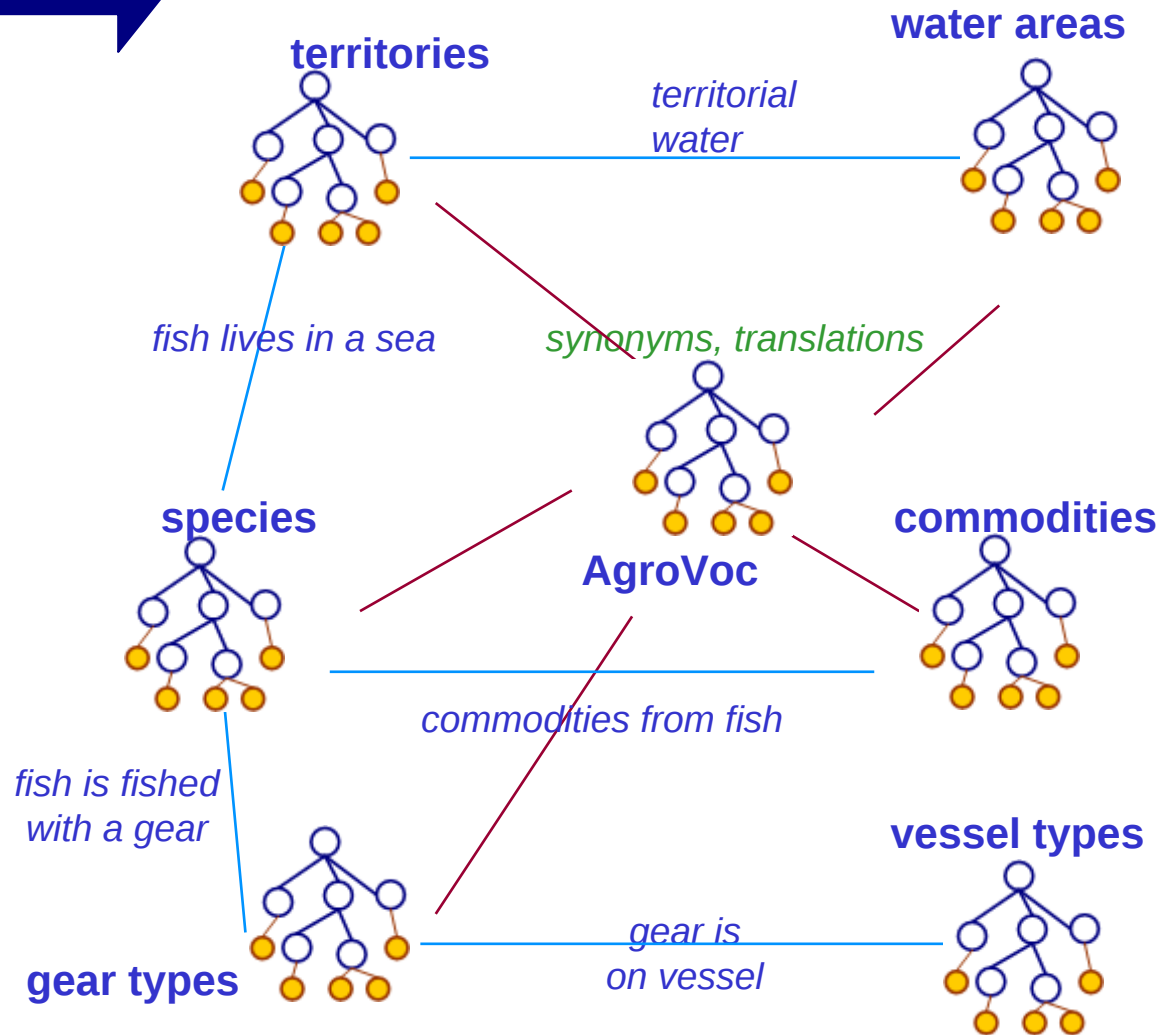
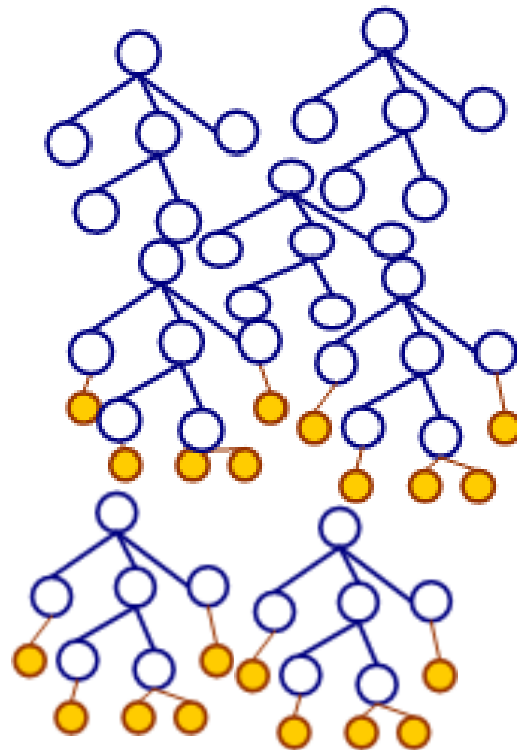


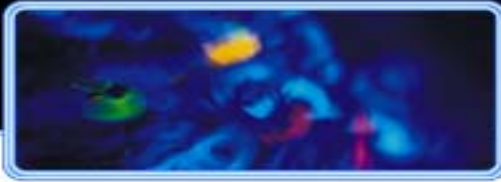
Fisheries ontology

Networked Ontologies: An Example



Fisheries networked ontologies





Fisheries Ontologies for the Fish Stock Depletion Assessment System (FSDAS)

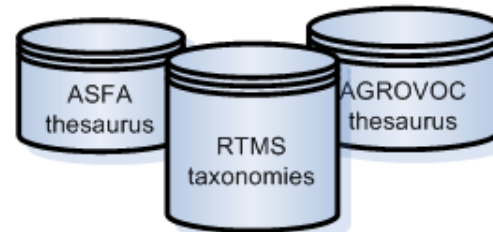
~ FSDAS requirements:

- Using NeOn Toolkit runtime functionality

~ Fishery ontologies lifecycle requirements:

- Using NeOn Toolkit design time functionality

Thesauri, classification schemes, glossaries



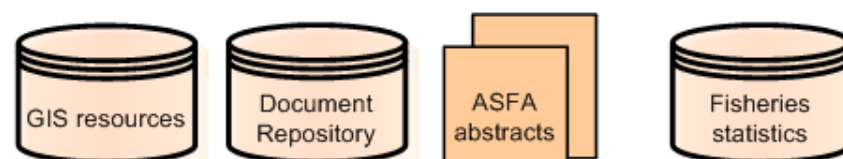
Populate, map, transform

Fisheries ontologies



Connect to

Knowledge bases (metadata, documents, statistics...)

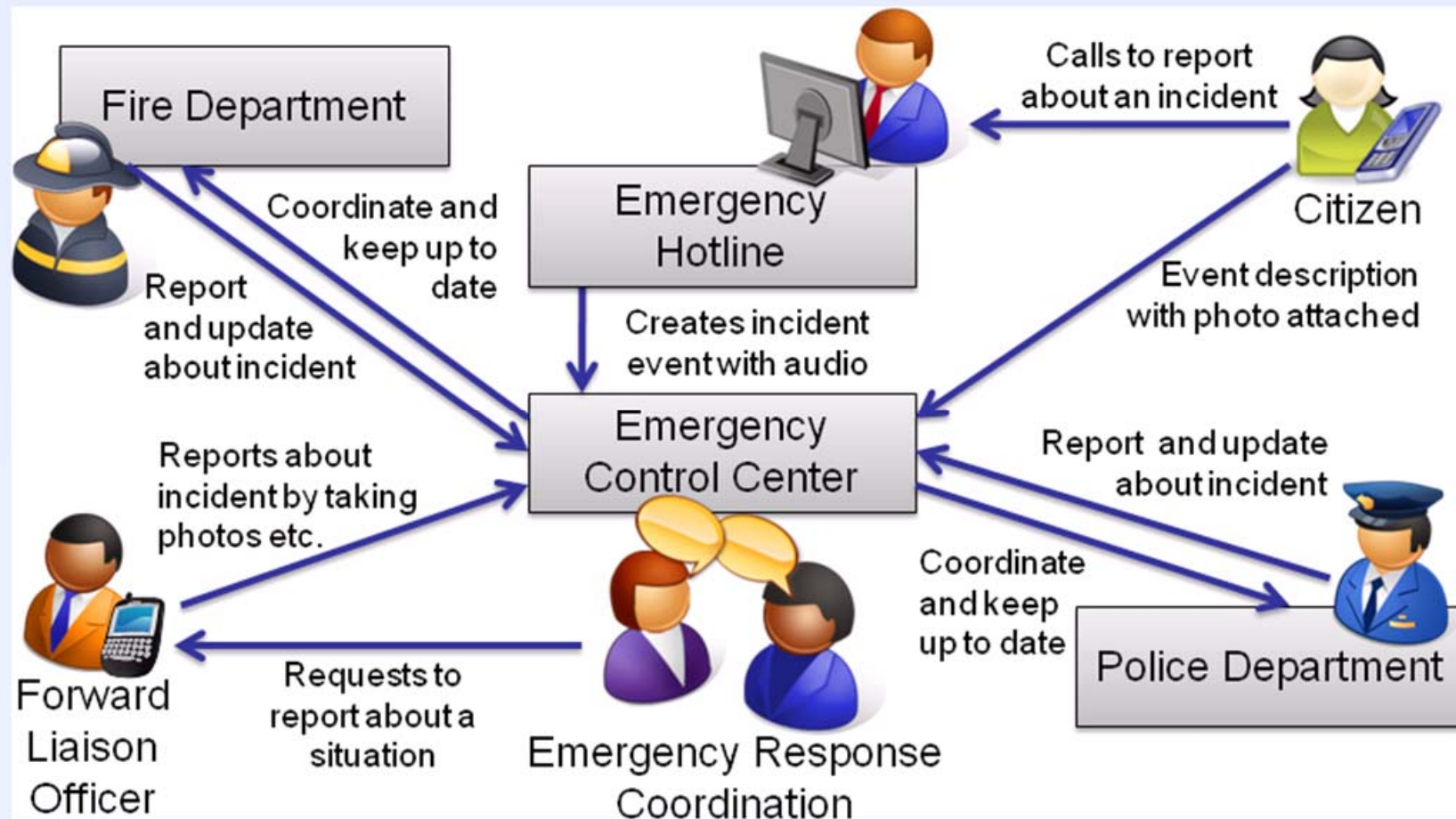


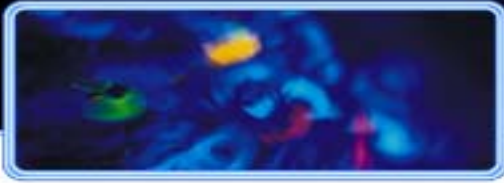
Fish Stock Depletion Assessment System

Use

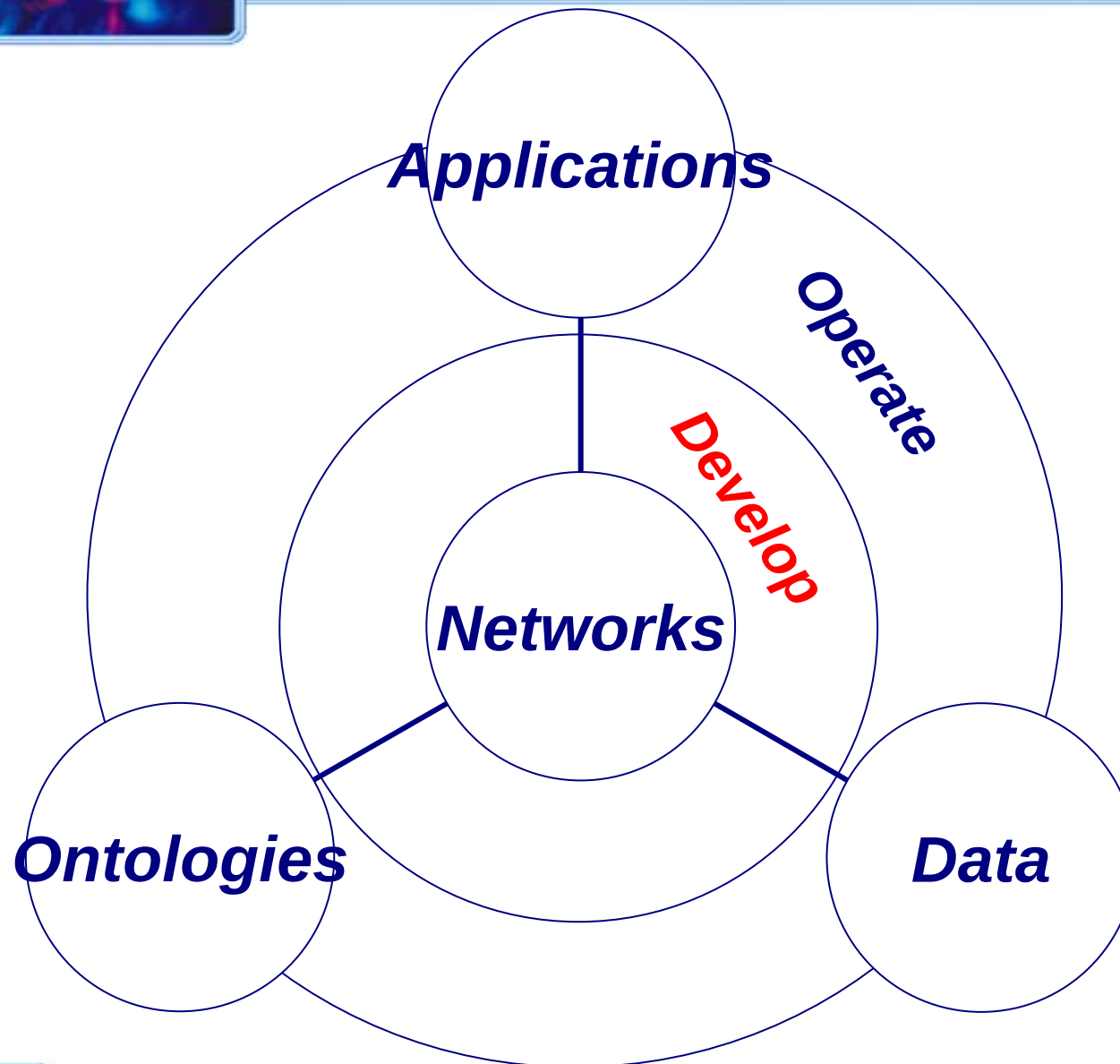
Use

Networked Applications: Talk to Each Other

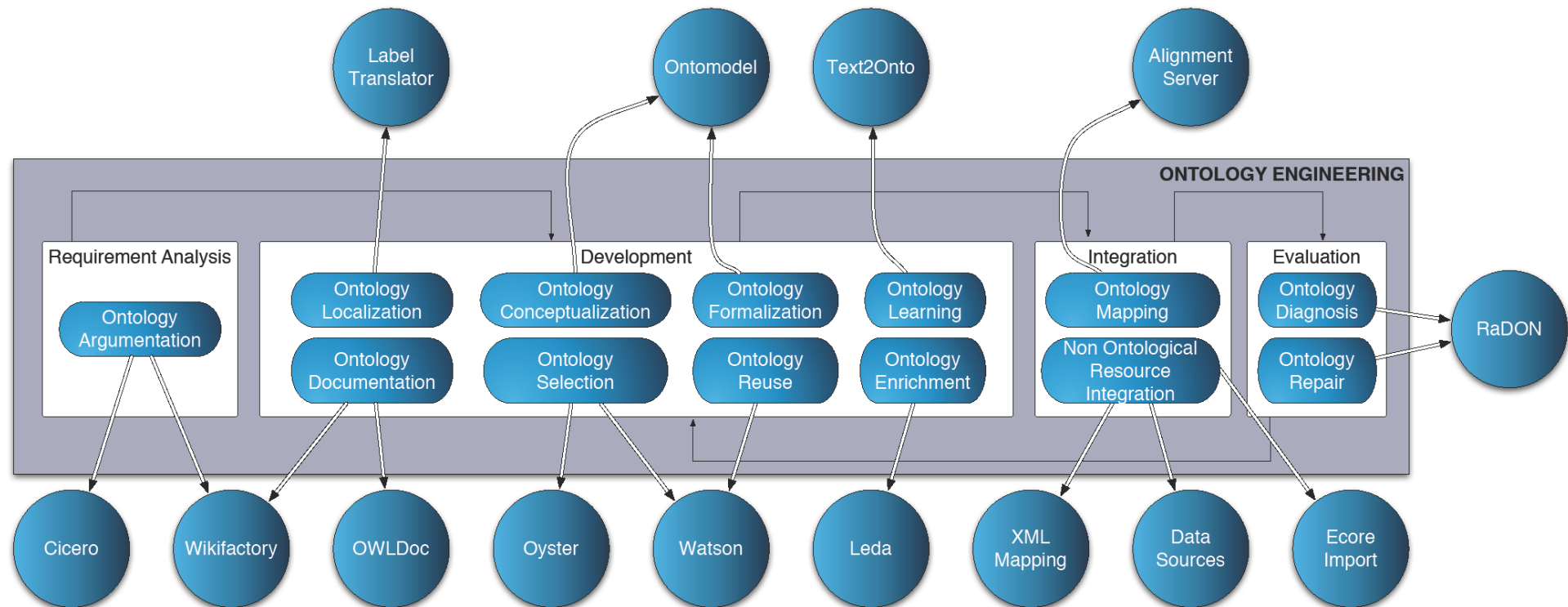




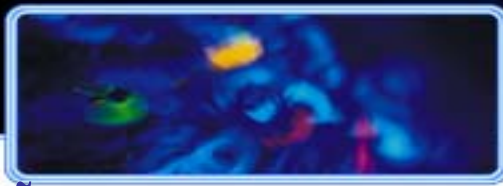
Agenda



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)

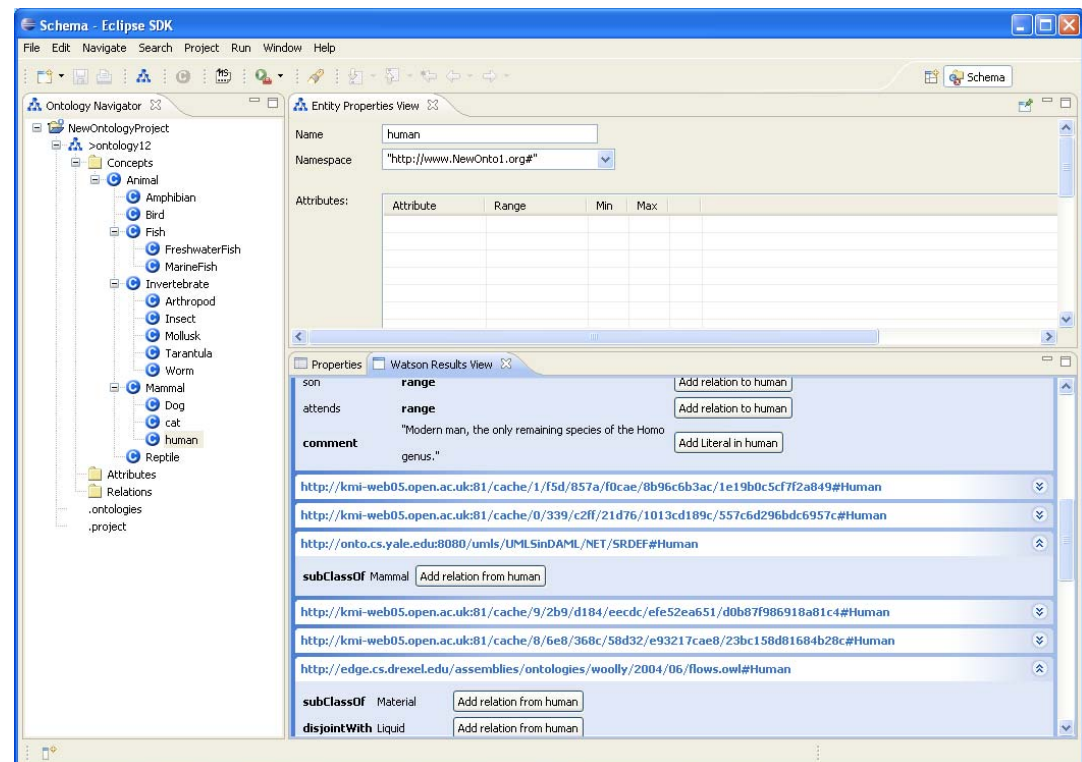
~ Built on the Eclipse platform

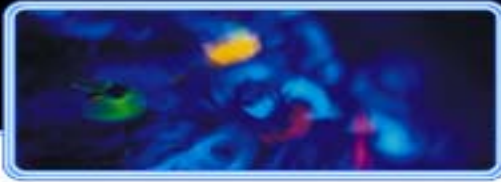
~ Extensible architecture

- Via Eclipse plugin mechanism

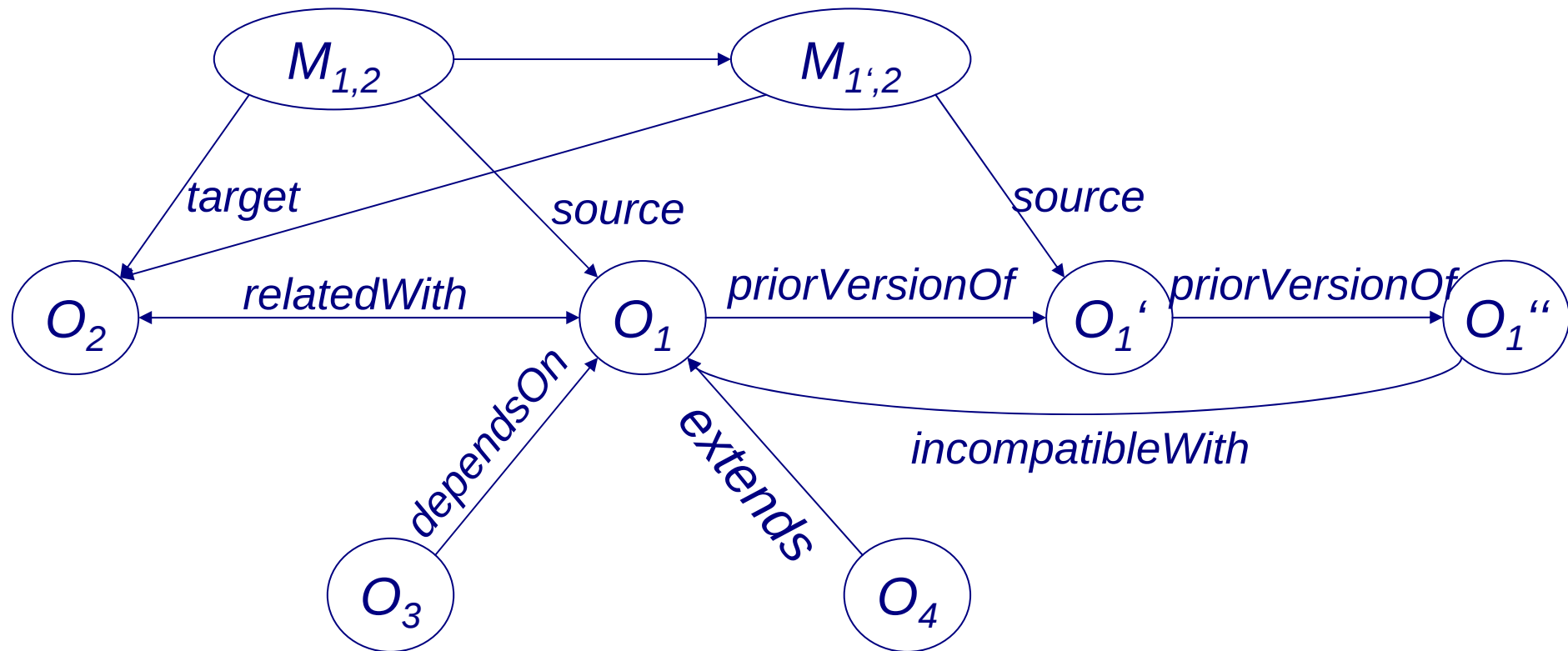
~ Community support

- <http://neon-toolkit.org>

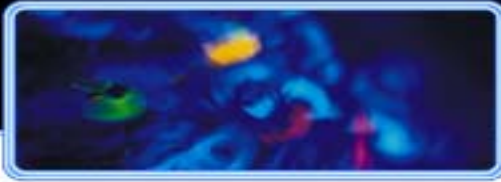




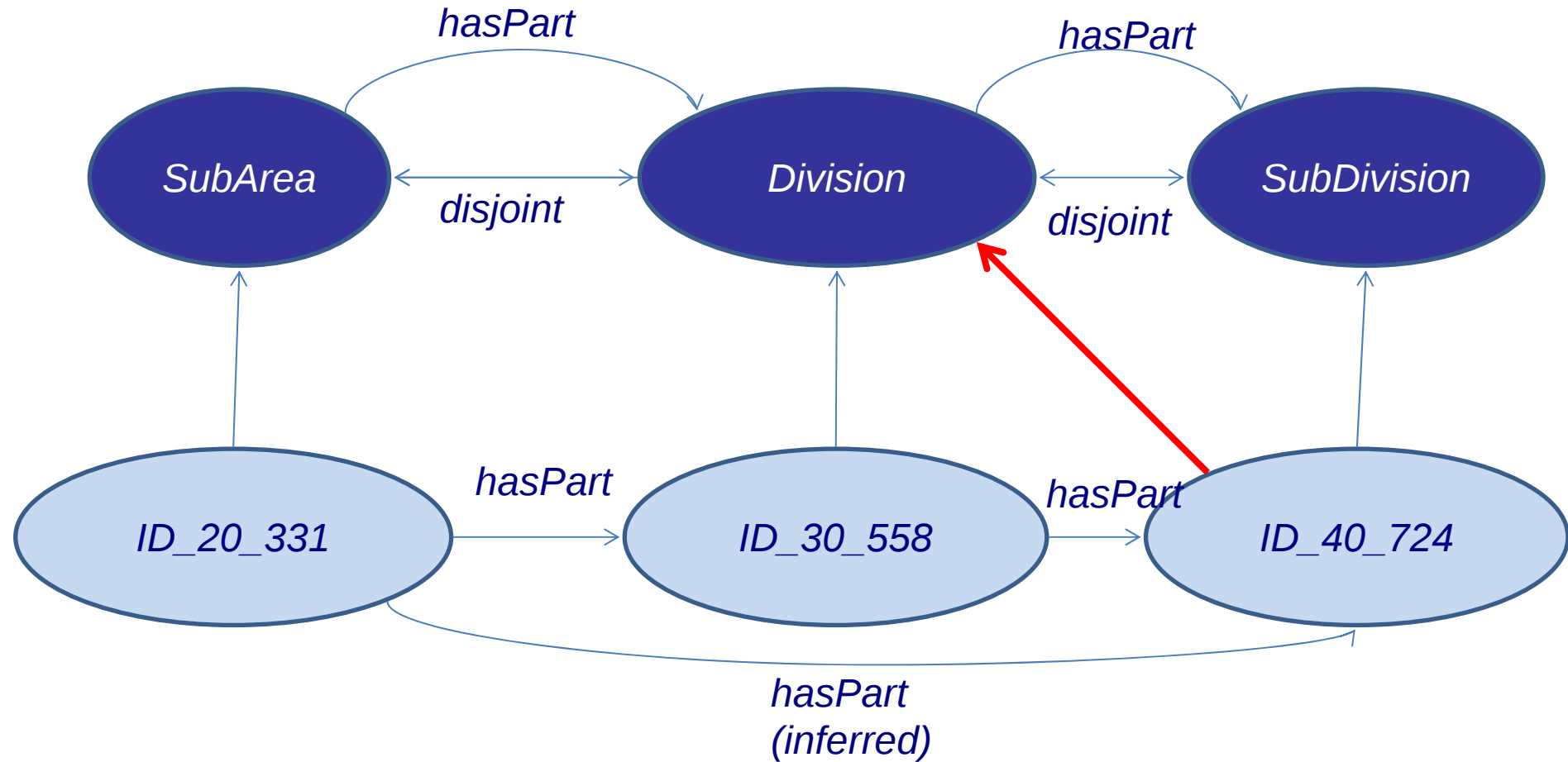
Requirement: Version, provenance and consistency management



Requirement: Version, provenance and consistency management

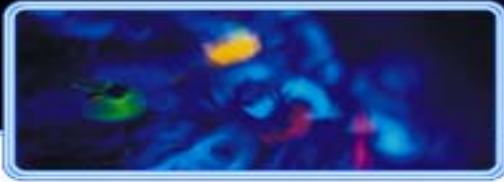


Example from FAO Case Study: Water Area – RADON to the rescue



Transitive(hasPart)

From Peter Haase



Provenance Tracing

```
OWLXiomAnnotation(                                {OntoEngSmith,KnowEngJones}
  transitive(hasPart)
  MetaKnowledgeAnnotation(annot1
    AgentAnnotation(OntoEngSmith)))

OWLXiomAnnotation(
  PropertyAssertion(ID'20'331 hasPart ID'30'558)
  MetaKnowledgeAnnotation(annot2
    AgentAnnotation(KnowEngJones)))

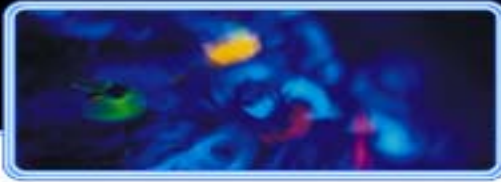
OWLXiomAnnotation(
  PropertyAssertion(ID'30'558 hasPart ID'40'724)
  MetaKnowledgeAnnotation(annot2
    AgentAnnotation(KnowEngJones)))
```

Diagram illustrating provenance tracing with red arrows and circles:

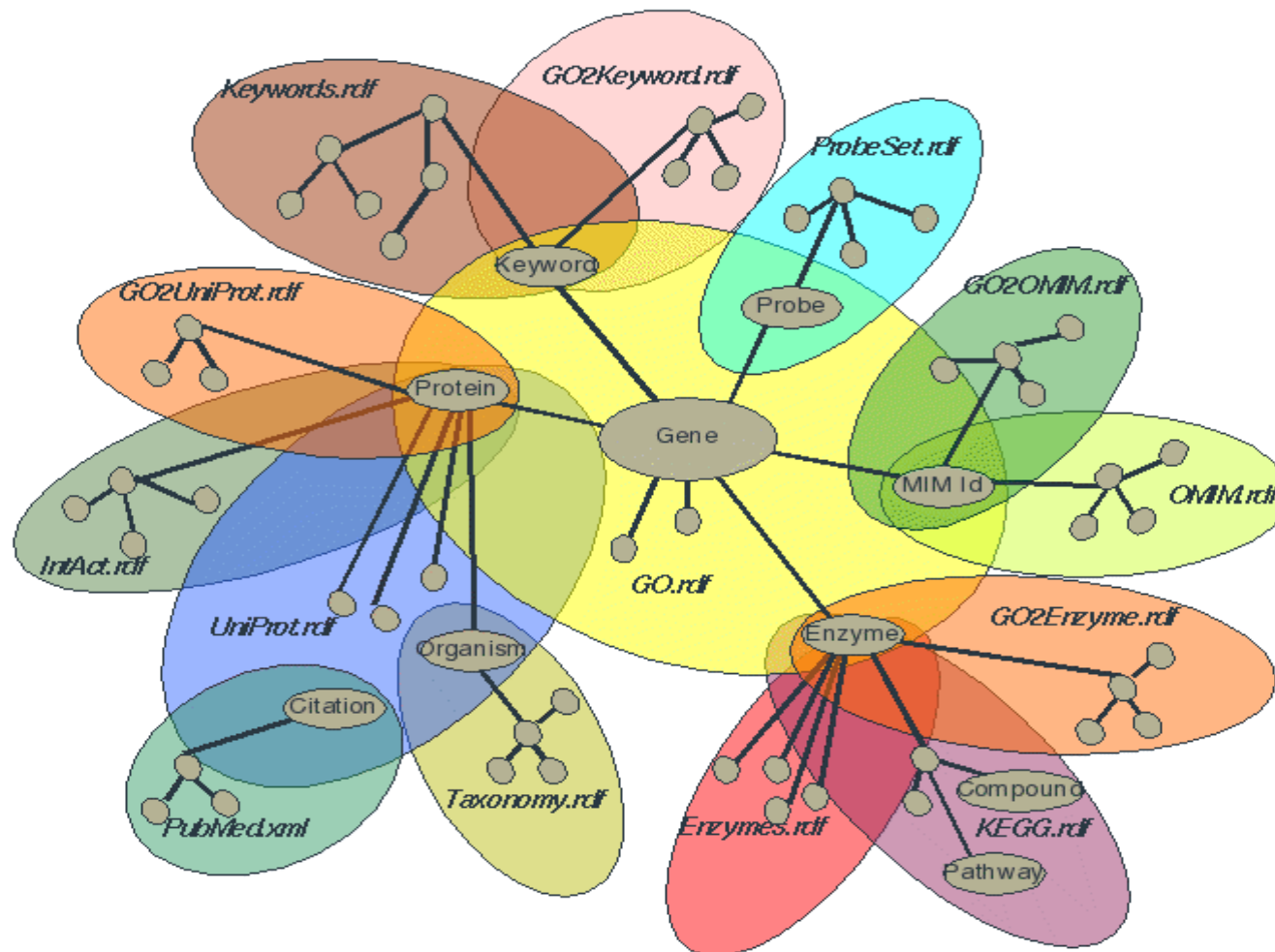
- Red circles highlight `OntoEngSmith` and `KnowEngJones` in the first two annotations.
- Red arrows point from these circles to the set `{OntoEngSmith, KnowEngJones}` at the top right.
- A third red arrow points from the `KnowEngJones` circle in the third annotation to the same set.

...

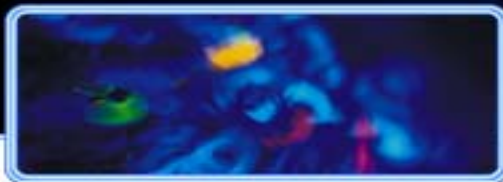
Also applicable to time, location, fuzzy,....



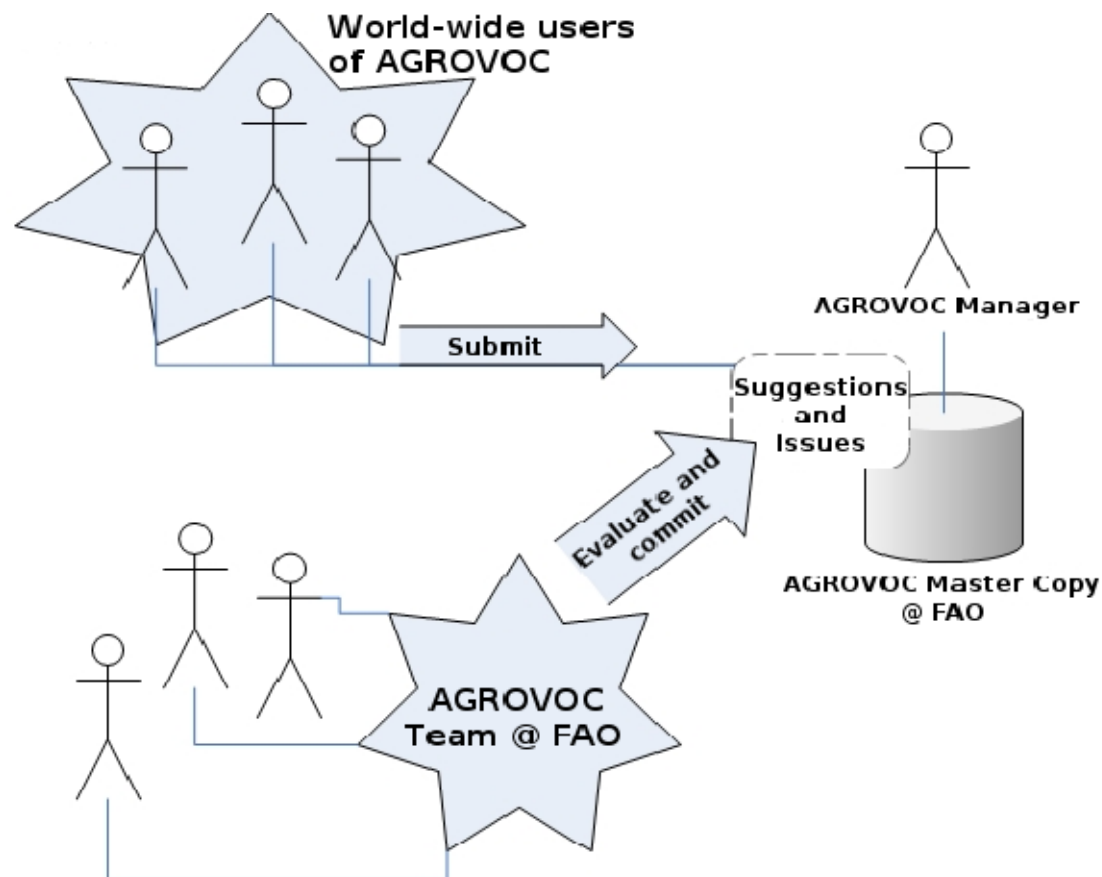
Requirement: Joint Development



Requirement: Joint Development

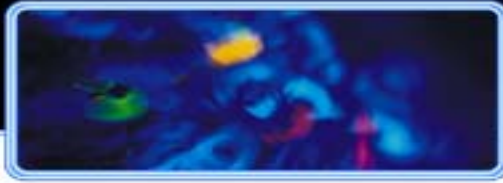


Joint Development of AGROVOC@FAO

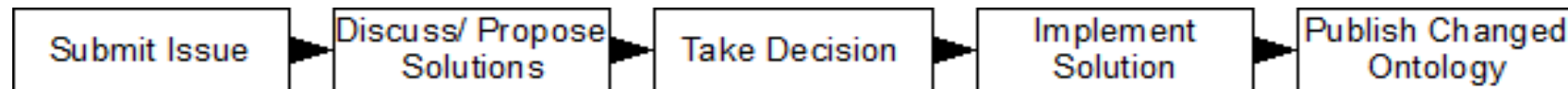


Problems:

- Ã Communication between world-wide users and development team
- Ã 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

Cicero

The screenshot displays the Cicero web interface. On the left is a navigation sidebar with the 'NeOn' logo and links for 'Main Page', 'About the argumentation tool', 'Project Overview', 'Help', 'Create Project', and 'developer shortcuts'. The main content area is divided into two panels. The left panel, titled 'Issue / suggestion', shows a discussion about the domain and range of 'biological_entity' and lists 'All Solution Proposals' (none listed). The right panel, titled 'Overview', shows 'Issue Overview' details (Created by: Klaasd, Created at: 2008-05-07 20:46:07, Issue state: running, Decision Mode: preferential, Selection Mode: single selection) and 'Reactions on this Issue' (0 Solution Proposals, 0 Arguments). A red arrow points from the 'View Discussion' link at the bottom of the Overview panel to the text 'Start Discussion'.

Issue / suggestion

< Prj:AGROVOC

The domain and range is the same for the three object properties: `biological\_entity`. However, there is a local restriction on their usage. It seems to me that domain and range should be personalized for each object properties as the classes you restrict on are disjoint. In other words, you do not want to allow for example the assignment of a value of `includesOrder` for a certain `family`.
This is now possible as the `includesOrder` property has domain `biological\_entity`.

All Solution Proposals:

- no solution proposals listed

Summarized Solution Proposals

Overview

Issue Overview

Created by:	Klaasd
Created at:	2008-05-07 20:46:07
Issue state:	running (until 2008-06-06 20:46:07)
Decision Mode:	preferential
Selection Mode:	single selection

Reactions on this Issue

There are

- 0 Solution Proposals
- 0 Arguments

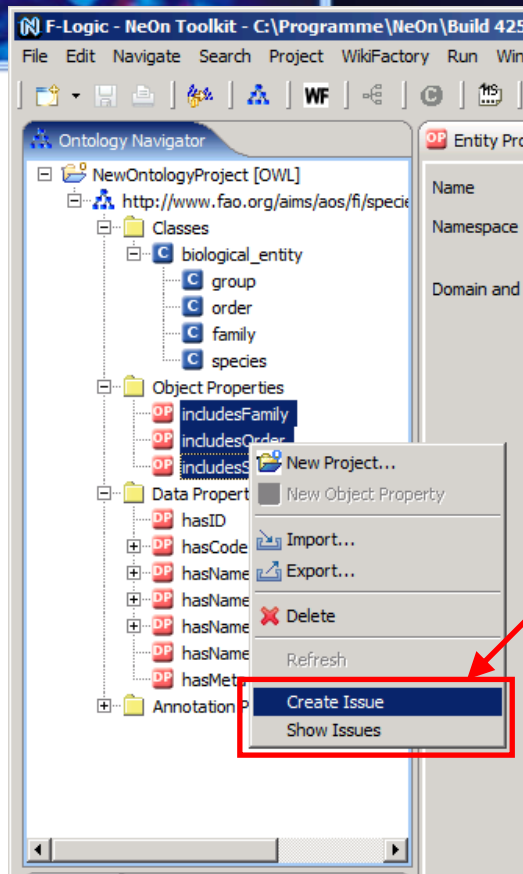
[View Discussion](#)

Start Discussion

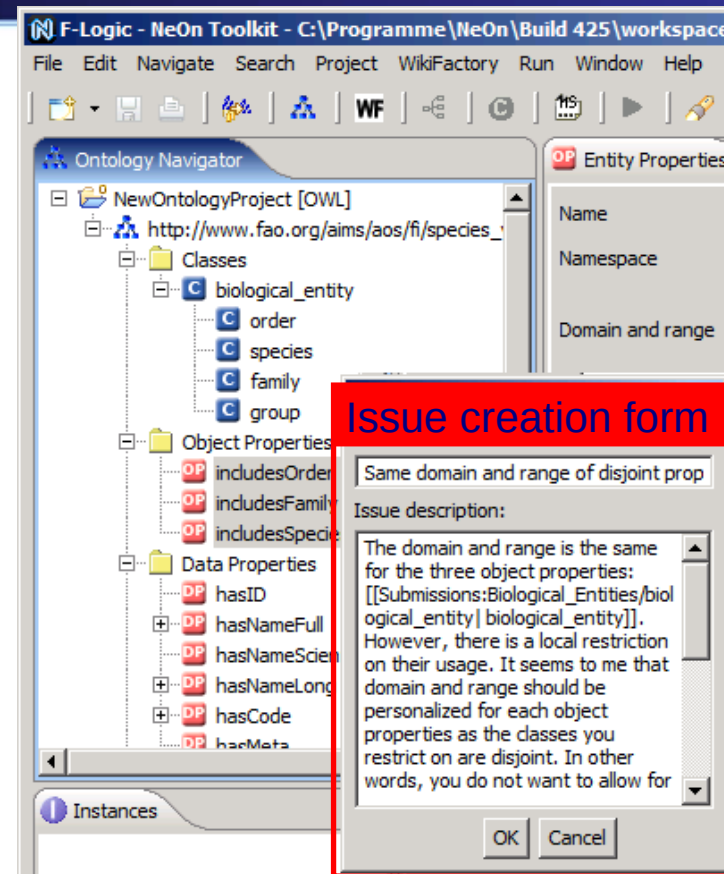
Enhanced discussion support for Semantic MediaWiki

- Guiding the user through the discussion workflow
- Different argument types, voting and decision procedures

Plugin for NeOn Toolkit



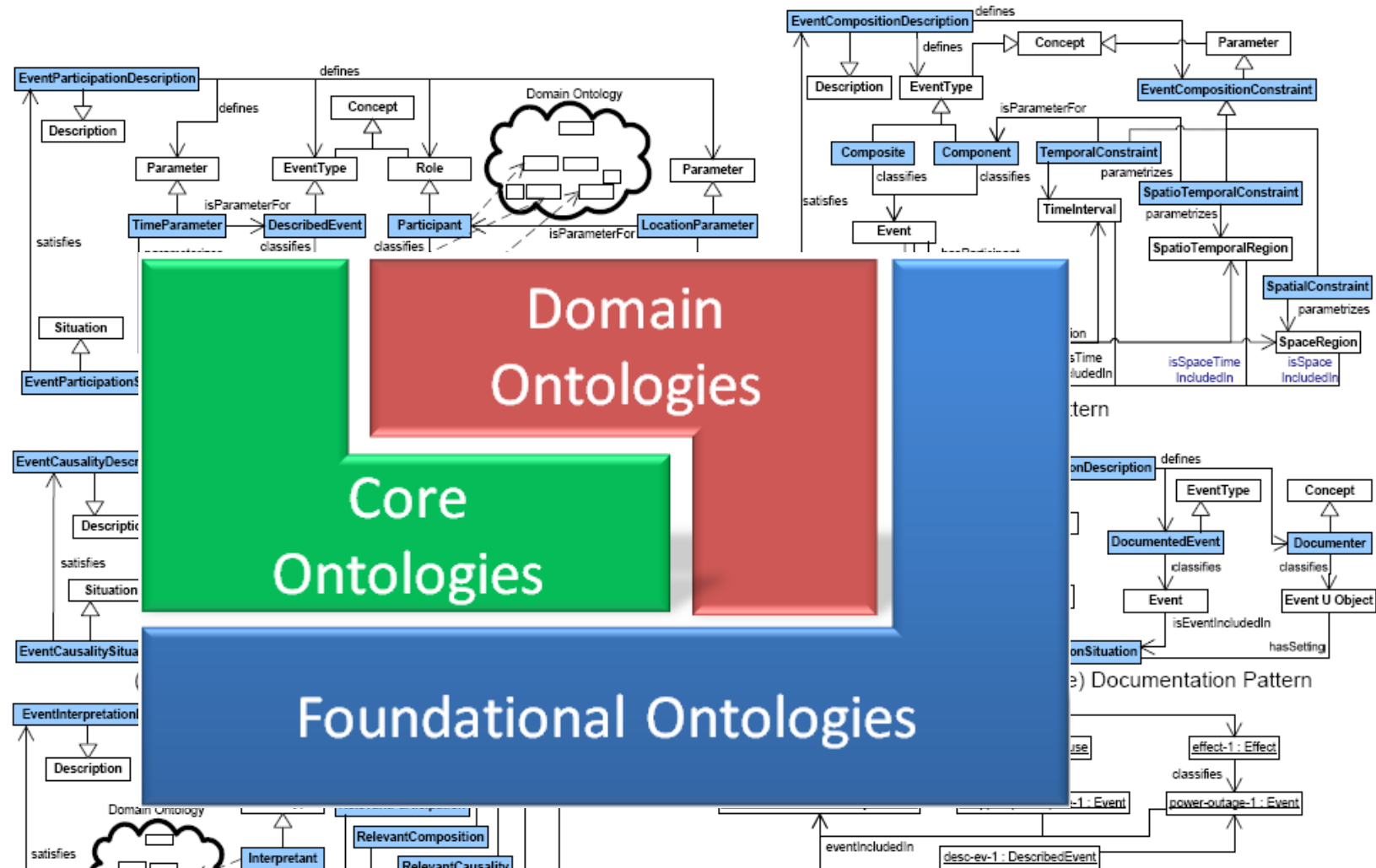
Context menu
for creating /
showing issues



~ Integration of Cicero into an ontology editor (NeOn toolkit)

- Creating and searching discussions from within the toolkit
- Annotating discussions to ontology elements

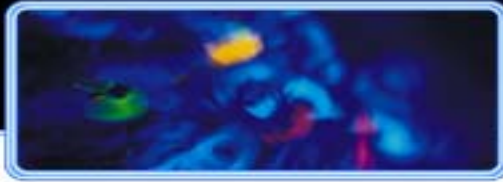
Requirement: Ontology Design Pattern Management



Requirement: Ontology Design Pattern Management

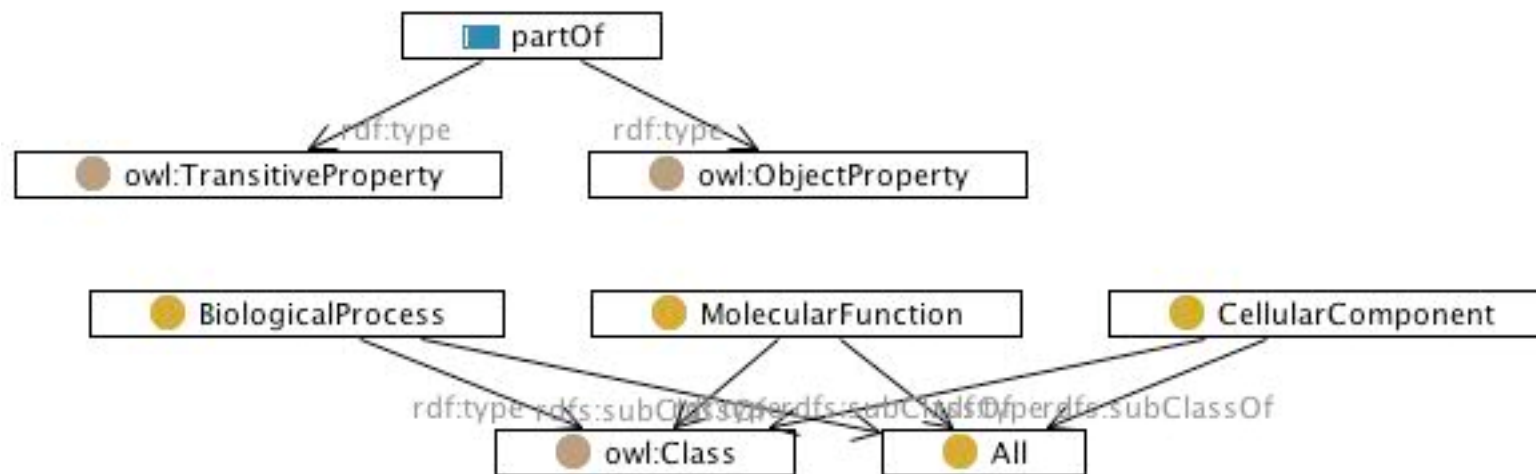


From Ansgar Scherp



Design Patterns

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

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

Ã Based on a catalogue of design patterns:

– <http://www.ontologydesignpatterns.org>

The screenshot shows a web browser window with the address bar displaying <http://ontologydesignpatterns.org/index.php/Submissions:Main>. The page title is "Submissions:Main". The main content area explains the purpose of the submissions area, which is to collect Ontology Design Pattern proposals. It mentions that proposals are assigned to members of the ODP Quality Committee for review. Positive reviews can be accompanied by guidelines for fixing problems. Once issues are addressed, the Proposed Content OP can be published in the Official Catalogue. Below this, it states that new proposals of CPs are very welcome and provides a link to "post a new proposal".

On the left side, there is a navigation menu with the following items:

- Main page
- Modeling Issues
- Proposed Content OPs
- Reviews
- Catalogue
- Feedback
- Domains
- Training

Below the navigation menu, there is a "users" section with the following items:

- Request an ODP account
- Post a modeling issue
- Propose a Content OP
- Post your Feedback
- Add a Domain
- List of Categories
- List of Properties

At the bottom left, there is a "quality committee" section.

In the main content area, there are two lightbulb icons with text:

- Before posting your proposed Content OP check the [list of domains](#).
- If your domain is not in the list create a page for it.

Below these, there is a section titled "Proposed Content OPs" with a table:

Name	Intent	Domains
Classification	To represent the relations between concepts (roles, task, parameters) and entities (person, events, values), which concepts can be assigned to. To formalize the	General

From Aldo Gangemi

Steffen Staab
ISWeb

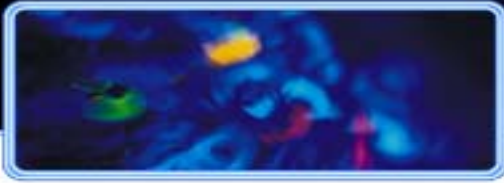
Support for Extreme Ontology Design

The screenshot displays the eXtreme Design - NeOn Toolkit interface. The main window shows an ontology visualization with nodes: Object (yellow), Action (blue), Task (red), and Role (blue). Relationships include: Object hasParticipant Action, Action isExecutedIn Task, Task hasTask Role, and Task isTaskOf Role. A legend identifies node types: Inherit Node (yellow), Import Node (light blue), Mandatory Node (blue), and Root Node (red).

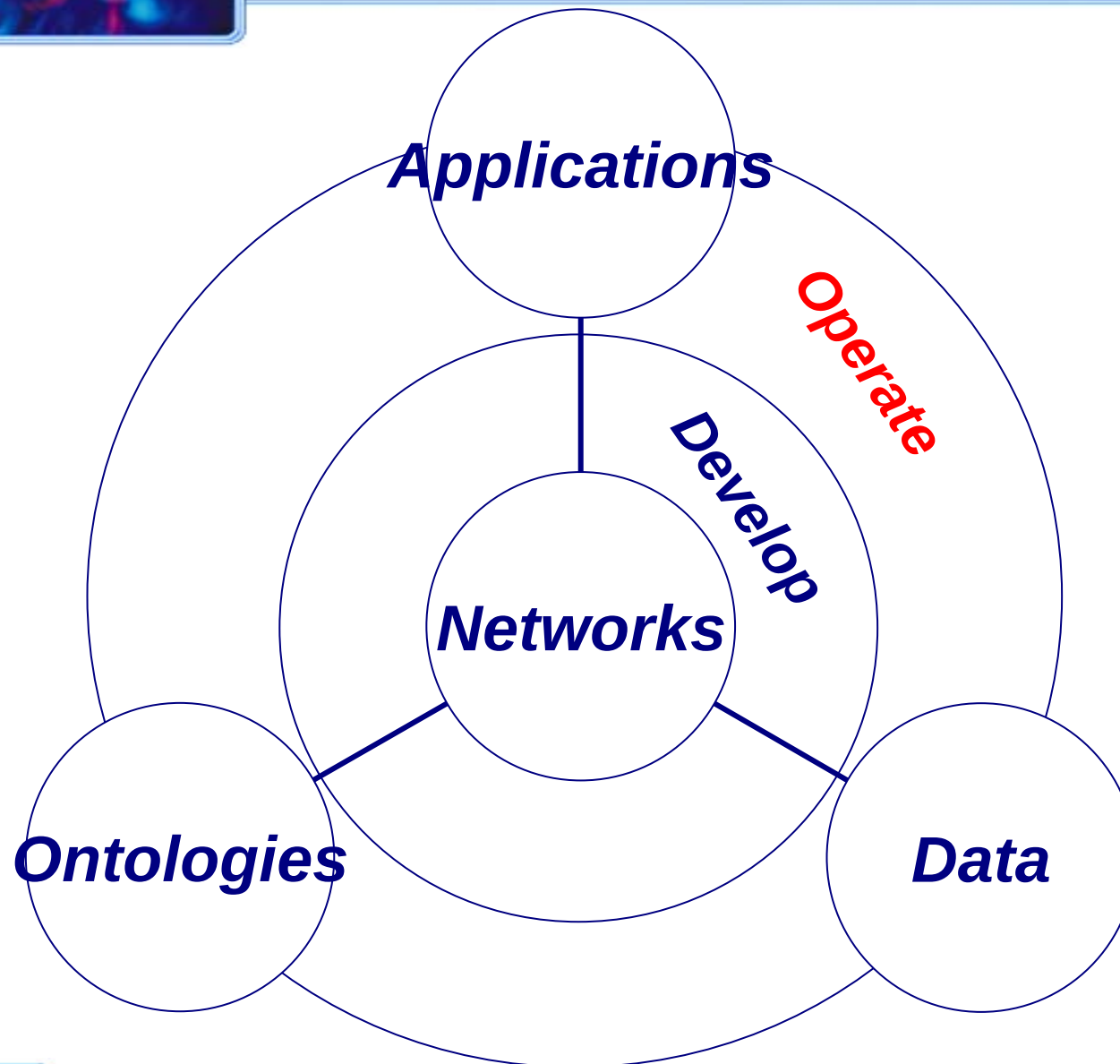
A "Specialize" dialog is open on the right, titled "Select the entity you want to specialize and click 'Add'". It contains a list of entities: Action, Object, Role, Task, executesTask, hasParticipant, hasTask, isExecutedIn, isParticipantIn, and isTaskOf. The "Show prefixes" checkbox is unchecked. Buttons for "Add", "Edit", and "Remove" are on the right. At the bottom of the dialog are "Back", "Next", "Cancel", and "Finish" buttons.

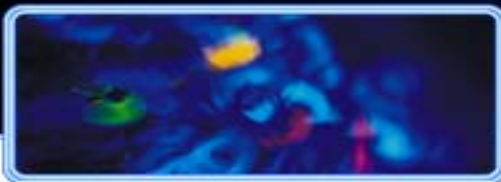
The left sidebar shows the "ODP Library Browser" with a list of ontology files. The bottom panel shows "Ontology Metadata" and "Ontology Navigator" tabs.

From Valentina Presutti



Agenda





Fish Stock Depletion Assessment System (FSDAS)

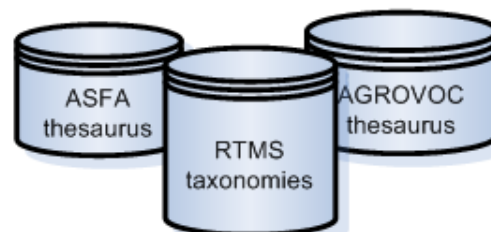
~ FSDAS requirements:

- Using NeOn Toolkit runtime functionality

~ Fishery ontologies lifecycle requirements:

- Using NeOn Toolkit design time functionality

Thesauri, classification schemes, glossaries



Populate, map, transform

Fisheries ontologies



Connect to

Knowledge bases (metadata, documents, statistics...)

NeOn Toolkit – GUI = Runtime Backend

GIS resources

Repository

abstracts

statistics

Fish Stock
Depletion
Assessment
System

Use

Use

Integrating Multiple Web2.0 Apps: Semaplorer

Sema Plorer

Context: Koblenz

Search

koblenz castle

Locations

- Koblenz
- Koblenz, Switzerland
- Koblenz Hauptbahnhof

Tags

- koblenz
- castle

Wordnet

- Balmoral Castle
- air castle
- castle
- castle in Spain
- castle in the air

Map Media

Locations Persons Tags Time

Wikipedia

Koblenz

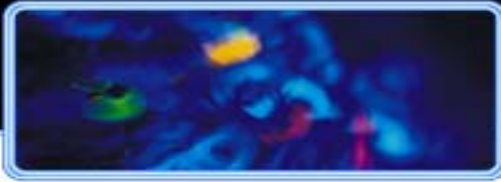
Koblenz (also Coblenz in pre-1...

Sights

- Festung Ehrenbreitstein

Ready.

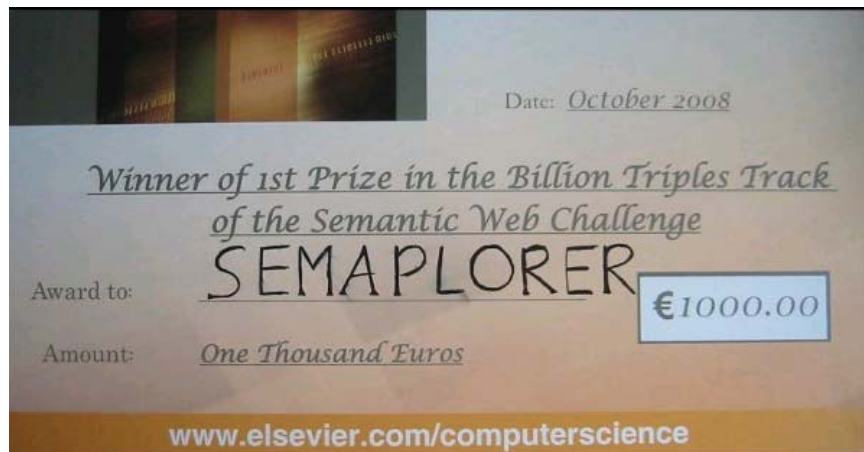
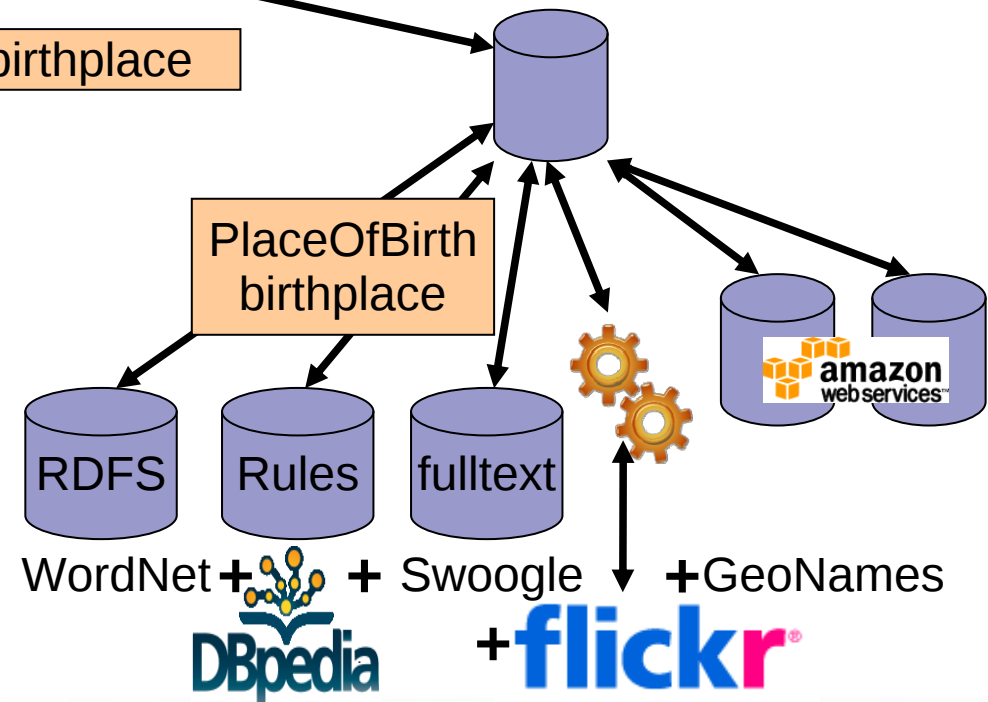
Networked Repositories



*Networked
Graphs +
Federator*

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

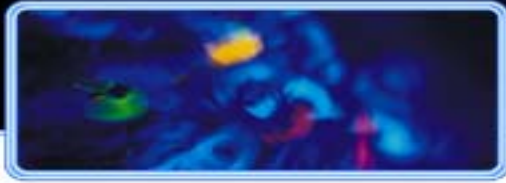
birthplace



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

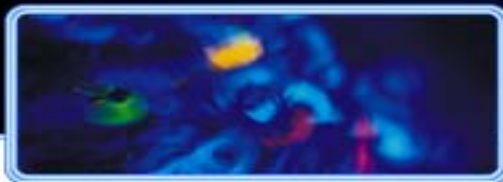
~ NeOn Toolkit

- 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
-

Basic Information



Thank You!

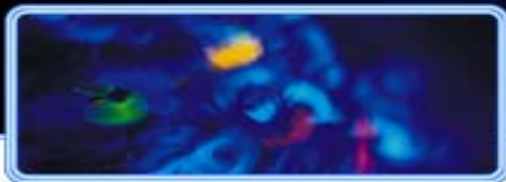
Steffen Staab



IST-2005-027595
NeOn-project.org

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Steffen Staab
ISWeb



Scratching the tip of the iceberg

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