

# AGROVOC and the OWL Web Ontology Language: the Agriculture Ontology Service - Concept Server OWL model

NKOS workshop  
Alicante, 2006

# Outline

- Background
- Needs and purposes
- Our approach
- Performance tests
- Current status and Next steps
- Open issues
- Conclusion

# Background (1/2)

- AGROVOC
  - Used worldwide
  - Multilingual
  - Term-based
  - Limited semantics
  - Maintained as a relational database
  - Distributed in several formats (RDBMS, TagText, ISO2709, ...)

# Background (2/2)

- Draft versions available in TBX, SKOS, OWL
- Access to full thesaurus through Web Services

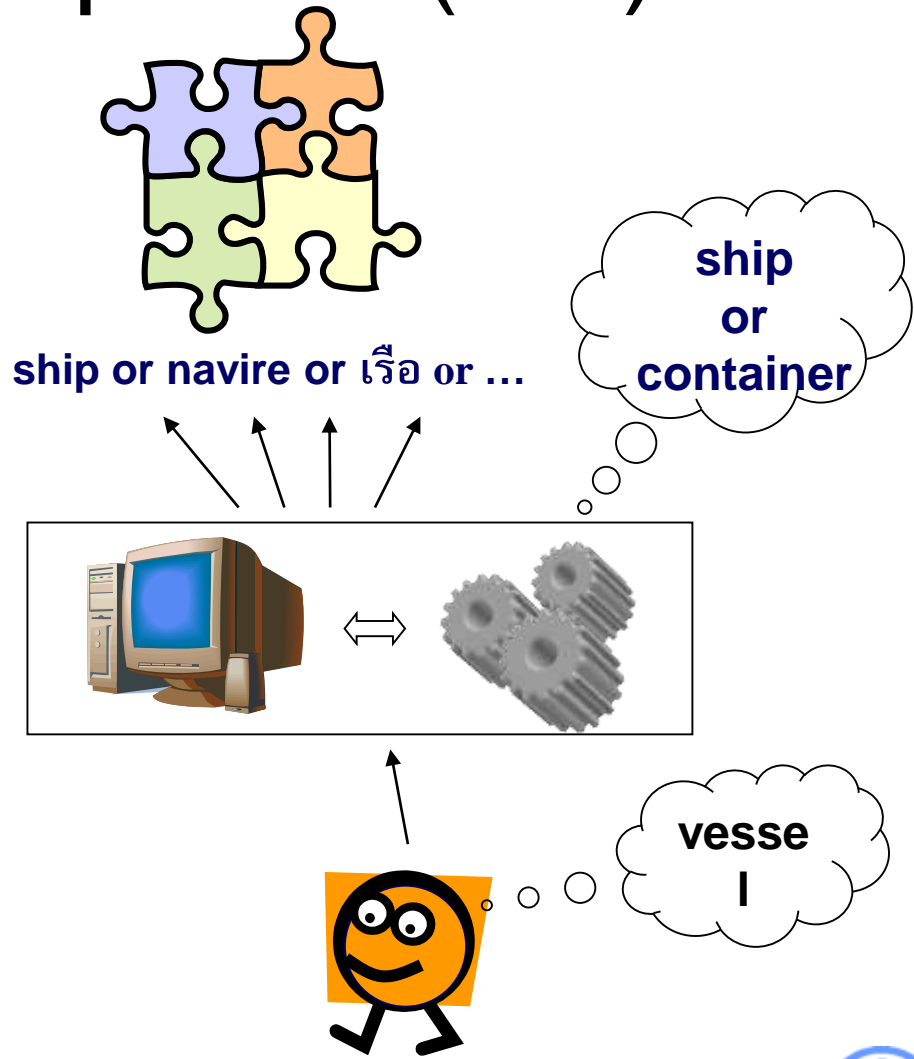
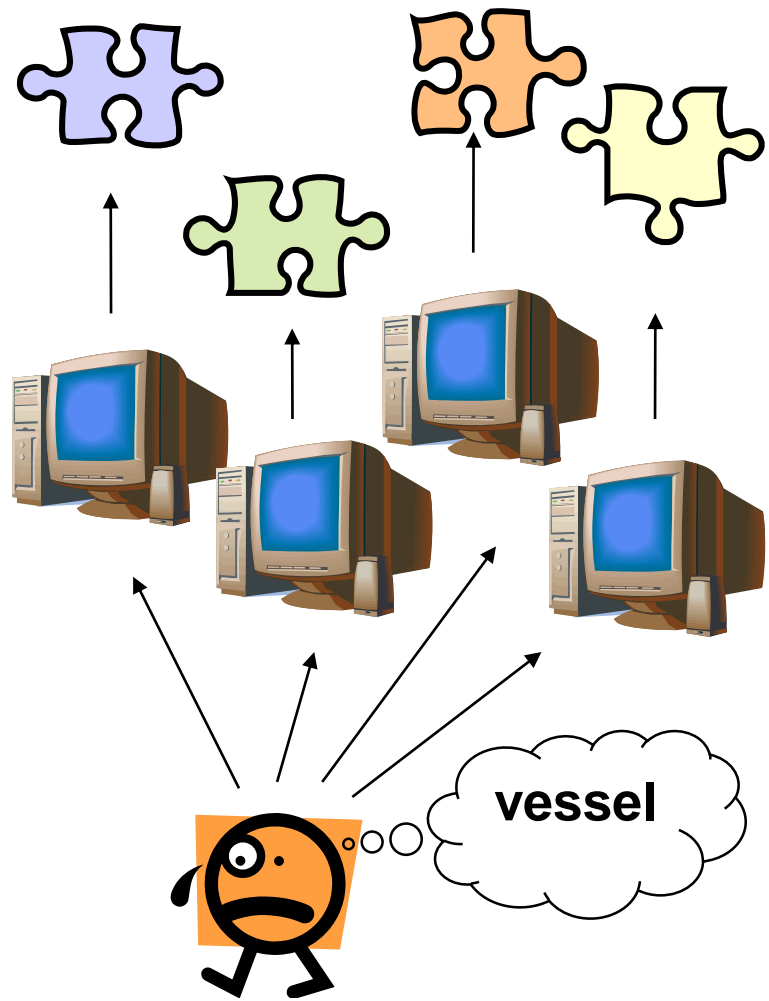


The screenshot shows the 'AGROVOC Web Services' page on the Agricultural Information Management Standards website. The page features a navigation menu on the left with categories like 'AGROVOC Thesaurus', 'Knowledge Organization Systems', and 'AOS/CS'. The main content area is titled 'AGROVOC Web Services' and includes a description of the services, a list of available services, and a table with columns for 'Name of Web Service' and 'Description'.

Name of Web Service	Description
<a href="#">getTermcodeByTerm</a>	Returns the termcode of an existing AGROVOC term
<a href="#">getTermByLanguage</a>	Returns an AGROVOC term specified by its termcode and language
<a href="#">getAllLabelsByTermcode</a>	Returns all labels of a term matching the specified termcode
<a href="#">searchByTerm</a>	Returns all AGROVOC terms containing the specified search string
<a href="#">getConceptByTerm</a>	Returns the concept, i.e. labels, broader terms, narrower terms, related terms matching a termcode
<a href="#">getDefinitions</a>	Returns a terms definitions, history or scope notes

- Agricultural Ontology Service (AOS)

# Needs and purposes (1/3)



# Needs and purposes (2/3): better serving web applications

- Semantic navigation of knowledge
- Semantic navigation of resources (bibliographical metadata, etc.)
- Intelligent query expansion
- Terminology brokering
- Improved natural language processing
  - Language recognition
  - Improved parsing (combinatorial)
  - Extended concept resolution
- Inferencing / Reasoning
- Machine learning
- Clustering and ranking

# Needs and purposes (3/3):

- Having a complete structure
  - From which to export any other traditional or different representation in any format
    - Word list, thesaurus, sub-domain ontologies, ...
    - TBX, SKOS, OWL, ...
- Having more
  - More than a thesaurus
  - SKOS: impossible to state information on terms
  - TBX: XML based

# Our approach (1/12)

## Natural resources (5091)

### Nonrenewable resources (24056)

- Land resources (4179)

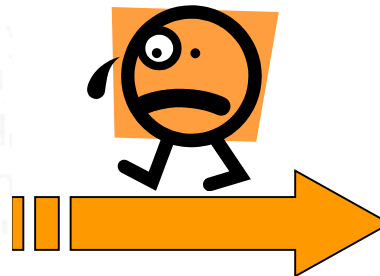
- Abandoned land (6)

- Arable land (18948)

- Common lands (1782)

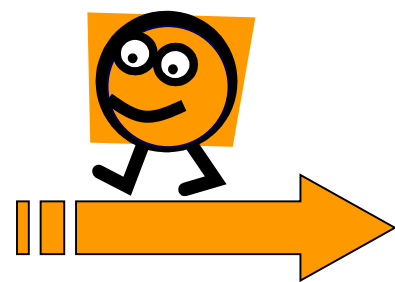
- Farmland (2808)

- Cultivated land (16212)



**Better defined structure**

**Better defined structure**



Natural resources (5091) **AGROVOC**  
Nonrenewable resources (24056)  
Land resources (4179)  
• Abandoned land (6)  
• Arable land (18948)  
• Common lands (1782)  
• Farmland (2808)

**RDBMS**

**XML formats (e.g. TBX)**  
**RDFS formats (e.g. SKOS)**

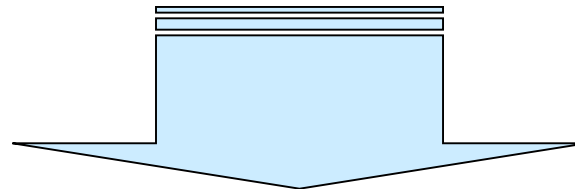




# Our approach (2/12)

- Concept-based
- More semantics
- “Language-independent”
- Easy integration with other KOS
- Easy sharing within the Web

**Better defined  
structure:  
the CS**



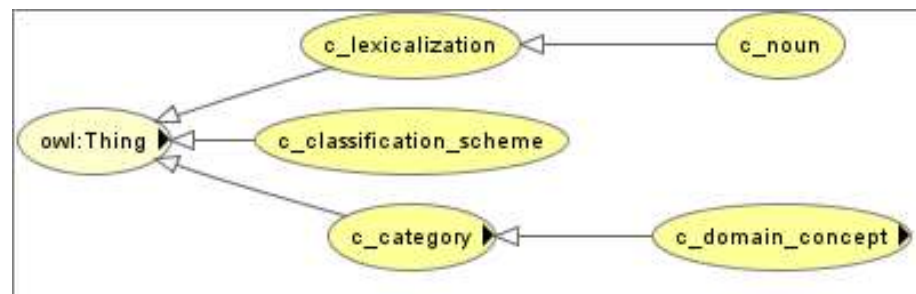
**ontology + OWL**

# Our approach: The OWL model (3/12)

- Why OWL?
  - Built on top of RDF, increased interest, future support
  - W3C recommendation
  - Represented as triples
  - Interoperable and web-enabled (linking multiple ontologies)
  - Reuse of existing tools, no proprietary RDBMS
  - Reasoning is possible: to arrive at conclusions beyond what is asserted + consistency checks
  - Revision was needed → better semantic and refinement
- Problems
  - Backward compatibility with legacy systems
  - Many desirable kinds of information must be represented tortuously or cannot be represented at all

# Our approach: The OWL model (4/12)

- Concept / Term / term variants



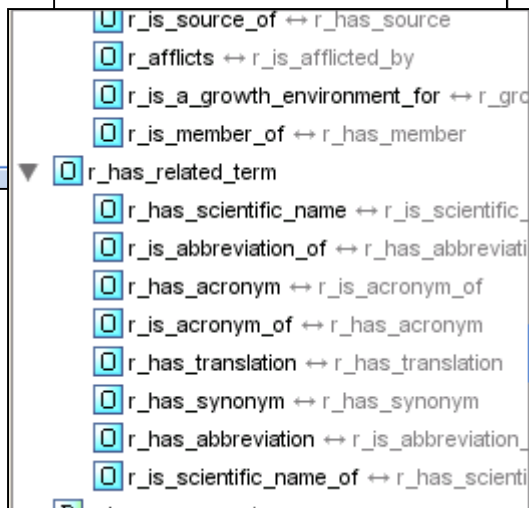
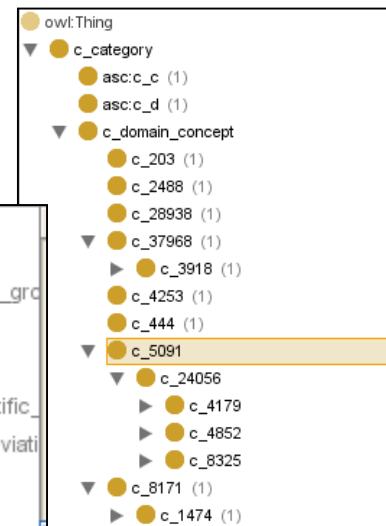
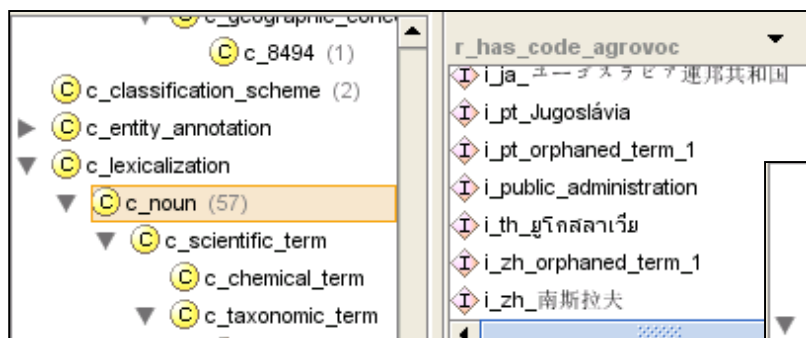
- Language issue
  - ‘has\_lexicalization’/ ‘lexicalized\_with’ functional
- AOS/CS base URI:  
<http://www.fao.org/aos/agrovoc>

# Our approach: The OWL model (5/12)

- Concepts are classes AND instances
  - Classes → to support hierarchy and inheritance
  - Instances → to keep OWL DL
- Terms are instances of a specific class

# Our approach: The OWL model (6/12)

- URI and class name: “c\_”, “r\_”, “i\_”
  - [http://www.fao.org/aos/agrovoc#c\\_28938](http://www.fao.org/aos/agrovoc#c_28938)
  - [http://www.fao.org/aos/agrovoc#i\\_en\\_public\\_administration](http://www.fao.org/aos/agrovoc#i_en_public_administration)
  - [http://www.fao.org/aos/agrovoc#r\\_90](http://www.fao.org/aos/agrovoc#r_90)



Disambiguation:

*i\_en\_plane* vs *i\_de\_plane*

*en\_sole\_1* vs *en\_sole\_2*

# Our approach: The OWL model (7/12)

- Concept-to-concept relationships
  - **to be refined**

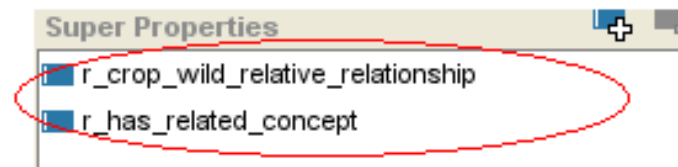
The screenshot displays an OWL editor interface. On the left, a tree view shows a hierarchy of relationships under 'r\_has\_related\_concept', with 'r\_has\_part ↔ r\_is\_part\_of' selected. The main area is divided into several panels:

- Super Properties:** A list containing 'r\_has\_related\_concept'.
- Inverse:** A list containing 'r\_is\_part\_of'.
- Properties:** A panel with checkboxes for 'Functional', 'InverseFunctional', 'Symmetric', and 'Transitive'. The 'Transitive' checkbox is checked.
- Domain:** A panel with a dropdown menu showing 'c\_domain\_concept'.
- Range:** A panel with a dropdown menu showing 'c\_domain\_concept'.

# Our approach: The OWL model (8/12)

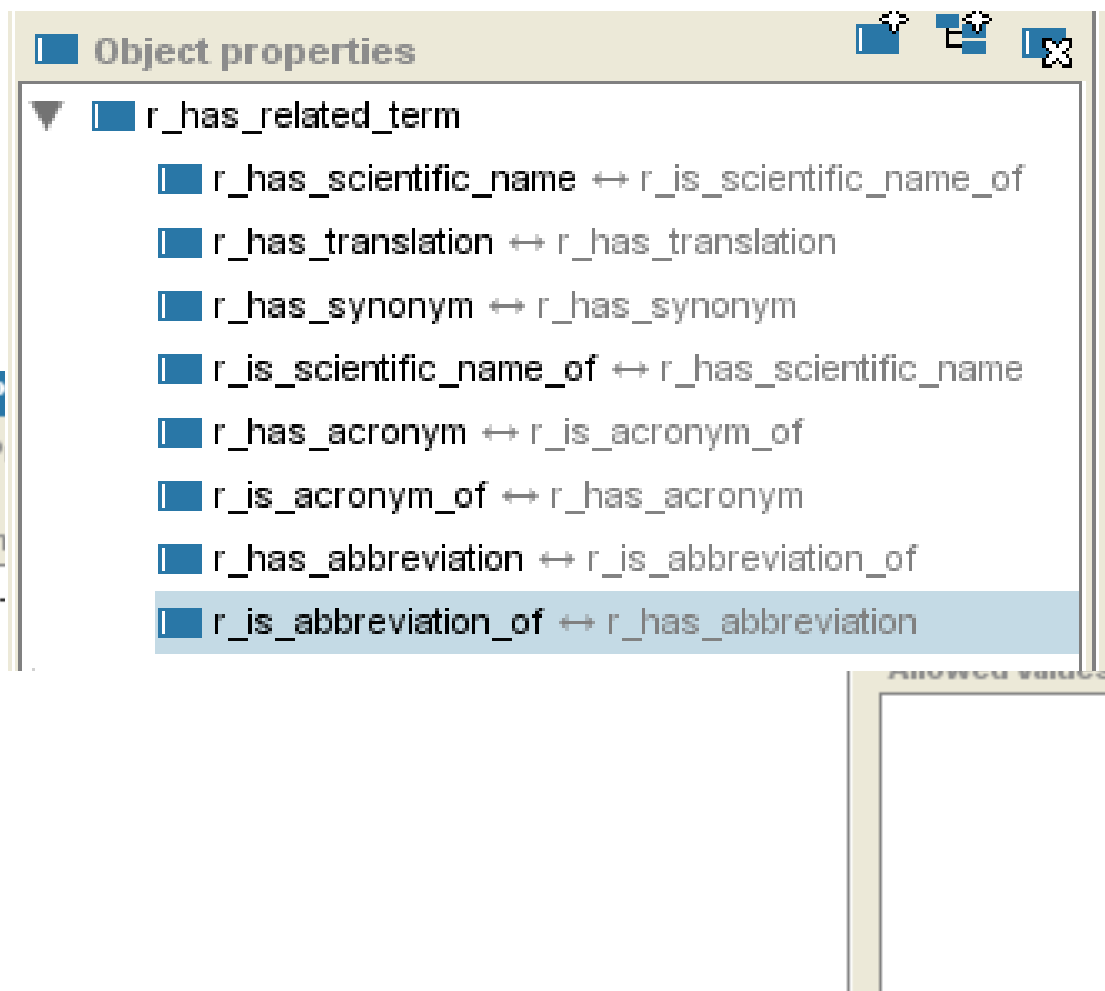
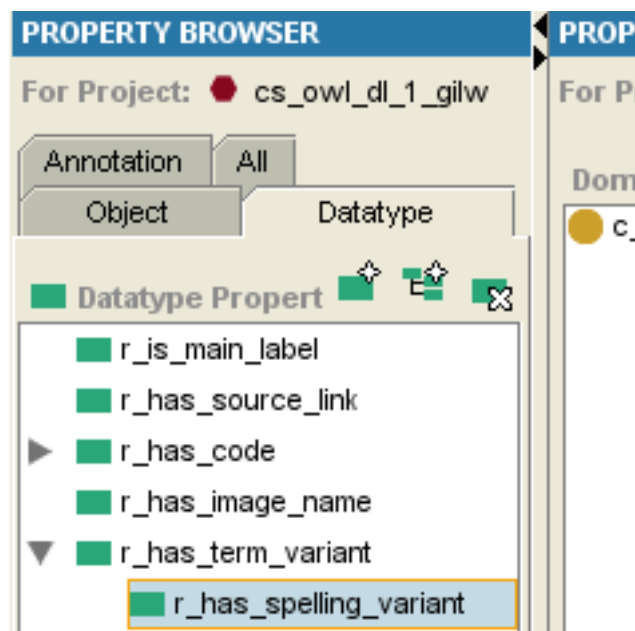
- Domain-specific relationships

- ▼  r\_domain\_specific\_relationship
  - ▼  r\_crop\_wild\_relative\_relationship
    - r\_has\_variety ↔ r\_is\_variety\_of
- ▼  r\_has\_related\_concept
  - ▶  r\_has\_part ↔ r\_is\_part\_of
  - r\_has\_variety ↔ r\_is\_variety\_of
  - r\_is\_variety\_of ↔ r\_has\_variety
  - ▶  r\_is\_part\_of ↔ r\_has\_part



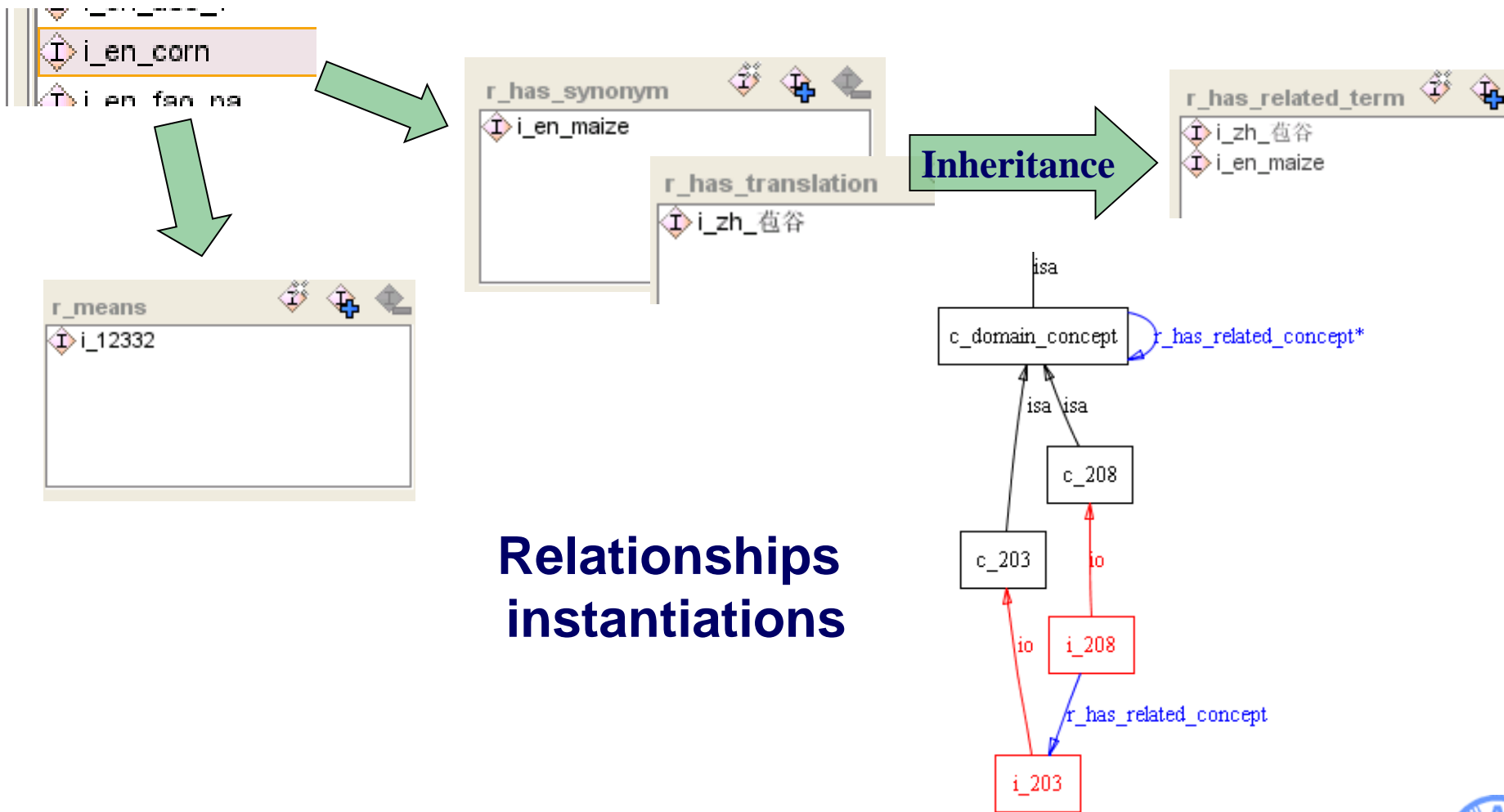
# Our approach: The OWL model (9/12)

## Term-to-Term and Term-to-Variants Relationships





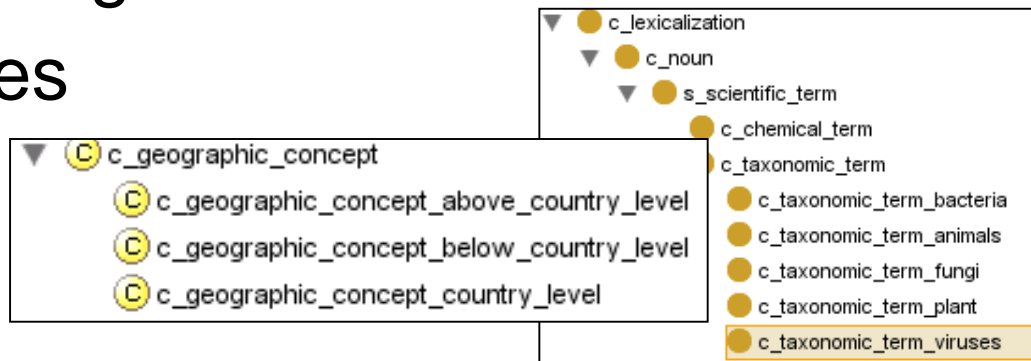
# Our approach: The OWL model (10/12)



**Relationships  
instantiations**

# Our approach: The OWL model (11/12)

- Other elements
  - Status for concepts and terms  
(suggested, approved, reviewed, deprecated)
  - *r\_has\_date\_created*
  - *r\_has\_date\_last\_updated*
  - Scope notes / images / definitions
  - Sub-vocabularies



# Our approach: The OWL model (12/12)

- Classification schemes and categories

The screenshot displays two panels from an OWL model browser. The left panel, titled 'CLASS BROWSER', shows a class hierarchy for the project 'cs\_owl\_dl\_1\_gilw'. The hierarchy starts with 'owl:Thing' and includes 'c\_category', 'asc:c\_c (1)', 'asc:c\_d (1)', 'c\_domain\_concept', 'c\_classification\_scheme (2)', 'c\_entity\_annotation', 'c\_lexicalization', and 'c\_maintainer'. The 'c\_classification\_scheme (2)' class is selected. The right panel, titled 'INSTANCE BROWSER', shows the 'Asserted Instances' for the selected class 'c\_classification\_scheme'. The instances listed are 'i\_asc' and 'i\_fao\_pa'.

# Backward compatibility

- Backward compatibility with a traditional thesaurus
  - Main descriptor (*r\_is\_main\_label*)
  - Term codes references
  - UF+
  - Scope notes
  - etc.

# Performance tests

- Sesame / Jena
- PostgreSQL / MySQL / Native db
- With Sesame:
  - Loading 9 MB ontology
    - Processed 273644 statements in 463 seconds
  - Querying
    - 21858 results found in 13030 ms

# Current status

- What exists concretely of the model:
  - Description of the model
  - Relationship definition (in collab. with CNR)
  - Test project
  - Full AGROVOC conversion procedure
  - Performance tests
  - AOS/CS Workbench construction

# Next steps

- AGROVOC refinement and conversion
- Build the AOS/CS Workbench
- Extensive tests
  - scalability at storage and operational level
  - performance at the maintenance and data retrieval level
  - integration of and linkage to datasets
- Create a network of ontology experts
  - Workshops/Trainings
- NeOn results

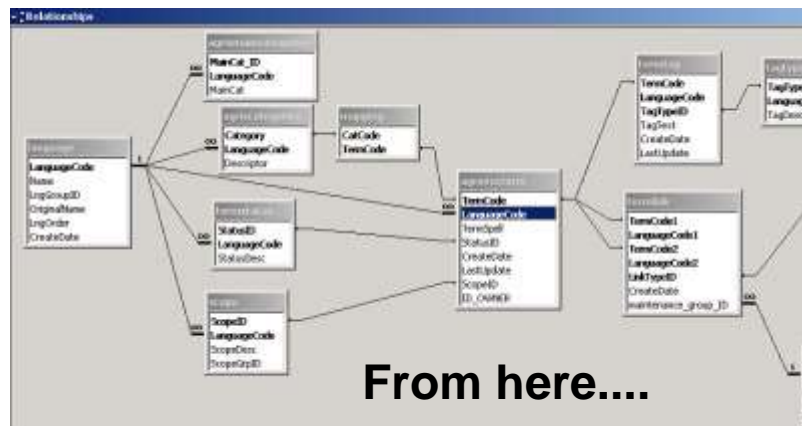
# Open issues

- Assign attributes to relationships
- Distinguish concepts instances from individuals
- Validity of relationships (or context)
- Ontology lifecycle, versioning
- Ontology mapping and merging
- No more words but URIs in IS
- Better exploitation of the potentiality at the application level: powerful IR
- Ontology Web services (OWS)



# Conclusion

- AOS is still a success story and is gaining terrain in private sector
- More ontologies in FAO
- NeOn toolkit



From here....

The screenshot shows a software interface for managing ontologies. On the left, a tree view displays a hierarchy of classes under 'Ashes', including 'Fly ash', 'Fresh products', 'Processed products', 'Canned products', 'Fermented products', 'Cultured milk', 'Alcoholic beverages', 'Fermented foods', 'Silage', 'Dried products', 'Frozen products', 'Bottled products', 'Processed foods', 'Deserts', 'Intermediate moisture foods', 'Reconstituted foods', 'Reconstituted milk', 'Semipreserved foods', and 'Processed animal products'. On the right, a table lists 'Related Terms' with columns for Property, Value, and Ling.

Property	Value	Ling
D rdfs:label	آش	ar
D rdfs:label	Cinza	pt
D rdfs:label	Ashe	en
D rdfs:label	Asches	en
D rdfs:label	popely	cs
D rdfs:label	Dendre	fr

To here....



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Questions?

Thank you