

# Introduction to the Semantic Web Tutorial

 ISWC 2008

## Ontological Engineering

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- Introduction**
- Scenarios in Ontology Building
- Methodological Guidelines for Ontology Specification
- Quick Search of Existing Knowledge Resources
- Guidelines for Ontology development project Planning
- Methodological Guidelines for Non Ontological Resource Reuse and Reengineering
- Methodological Guideliness for Ontology Reuse
- Creating the final Ontology Model

# I want to build my ontology



- Which are the key process and activities in ontology development?
- Which activities do I need in my development?
- When should I carry out each activity?
- Where is the relationship of one activity with the others?
- How do I collect the requirements of my ontology?
- Where can I find ontologies with the goal of reusing them?
- How can I reuse exiting knowledge resources?
- ...

# Limitations of current methodologies



- Methontology, On-To-Knowledge are for building ontologies from scratch
- They lack guidelines for:
  - building ontologies by reusing and reengineering existing knowledge aware resources
  - for contextualizing an existing ontology and plugging it in with existing ontologies that might be in continuous evolution
  - Building ontologies in a collaborative way
  - software developers that need to include ontologies into their IT developments

# New Ontology Development Paradigm



Whose emphasis is on

- ❑ the *reuse and reengineering of knowledge aware resources*
- ❑ the *collaborative and argumentative ontology development*
- ❑ the *building of ontology networks*, as opposed to custom-building new ontologies from scratch.



Dynamic

Contextualized

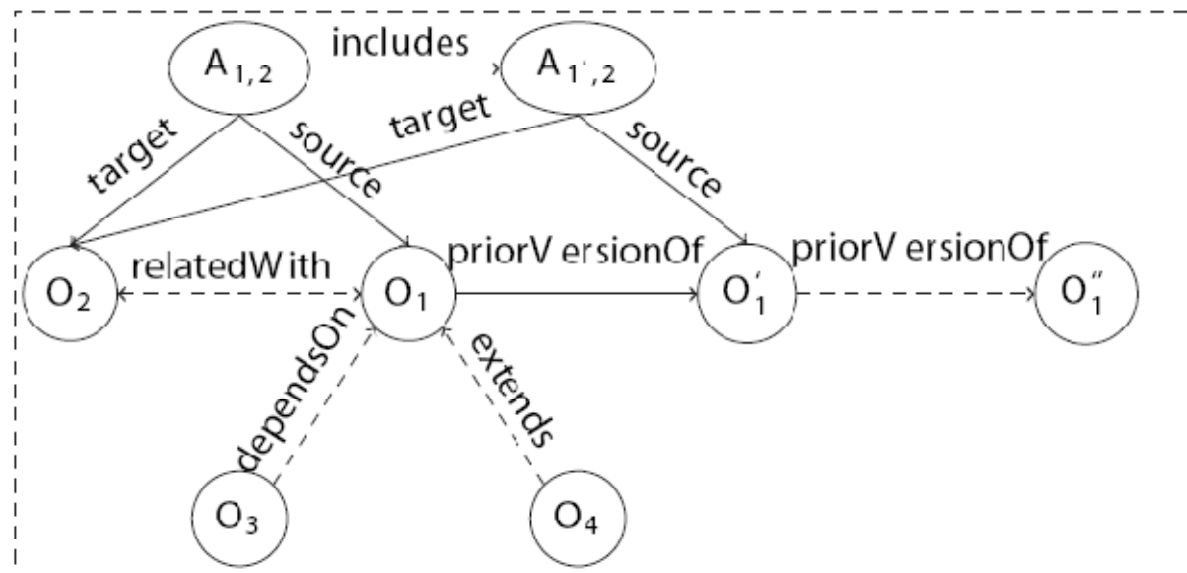
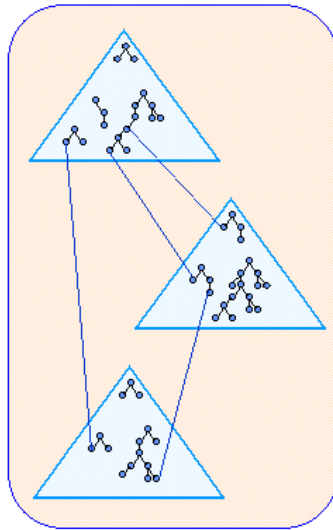
Collaboration

NeOn

# Ontology Networks



The Semantic Web of the future will be characterized by using a very large number of **ontologies embedded in ontology networks** built by distributed teams in a collaborative way.



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# Too many activities...

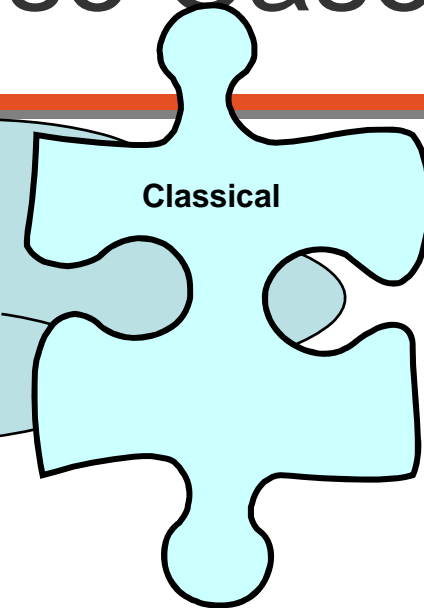




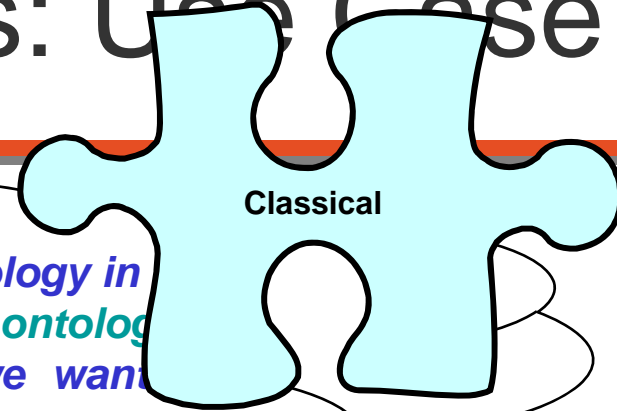
# Building Ontologies: Use Case



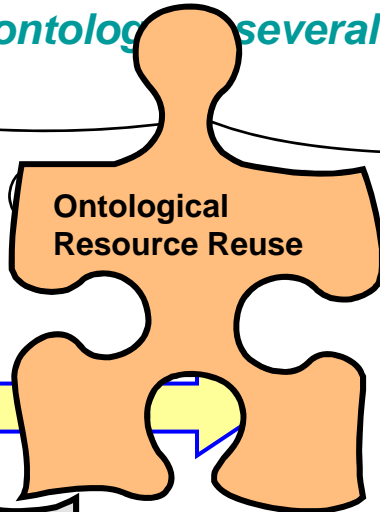
*In our team, we want to build an OWL ontology in the pharmaceutical domain, but we want to use several pharmaceutical standards in XML and classification schemes in our own format.*

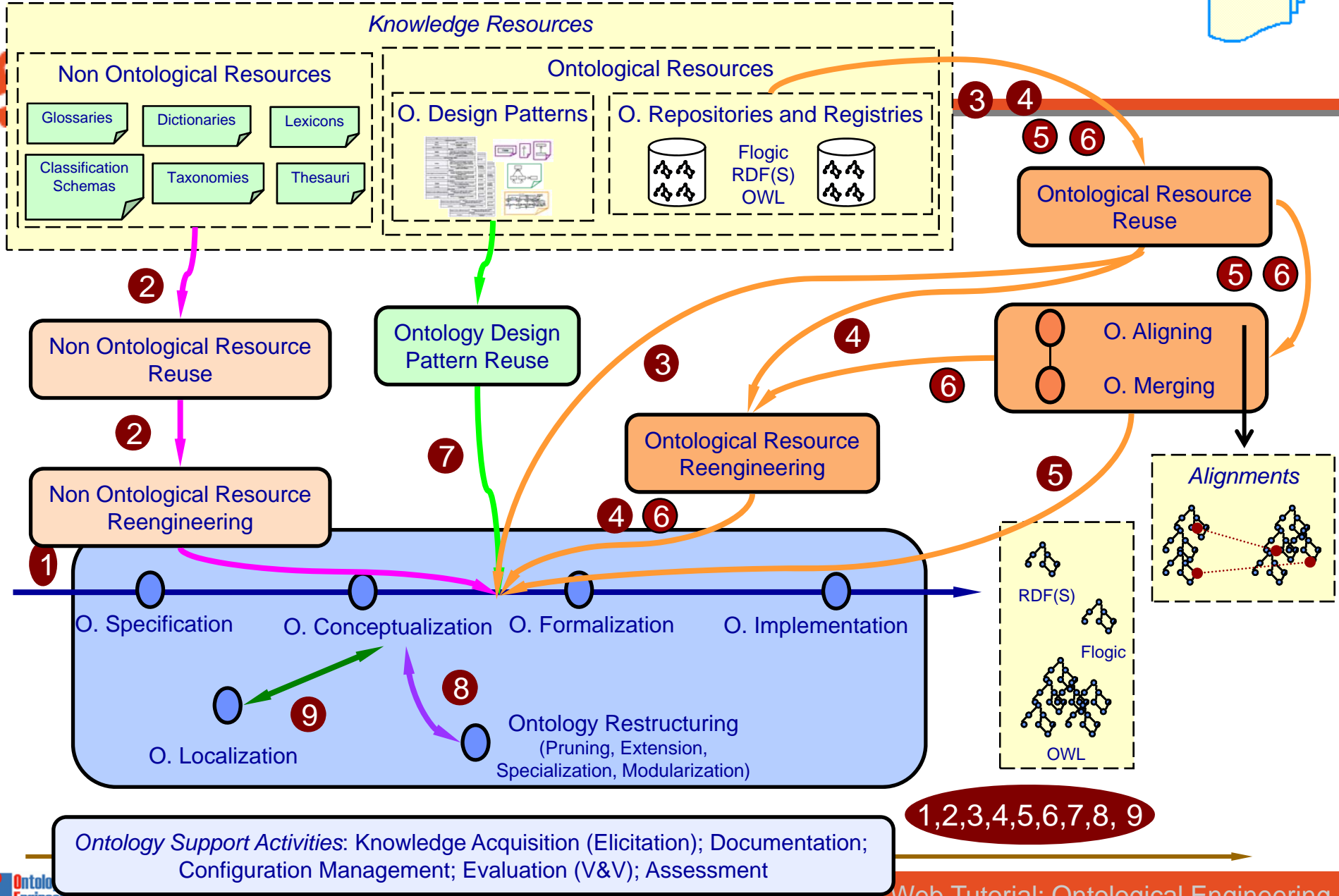


# Building Ontologies: Use Case



*In our team, we want to build an OWL ontology in fishery domain. We want to base on our ontology about species and commodities, and we want have the ontology several natural languages.*





# Scenarios



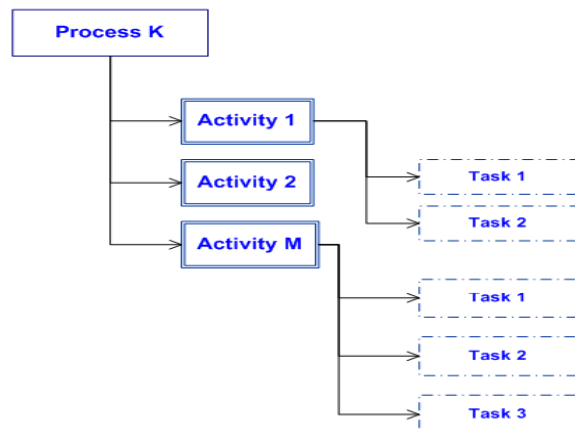
1. Building ontology networks **from scratch without reusing** existing resources.
2. Building ontology networks by **reusing and reengineering non ontological resources**.
3. Building ontology networks by **reusing ontologies** or ontology modules.
4. Building ontology networks by **reusing and reengineering** ontologies or ontology modules.
5. Building ontology networks by **reusing and merging** ontology or ontology modules.
6. Building ontology networks by **reusing, merging and reengineering** ontologies or ontology modules.
7. Building ontology networks by **reusing** ontology design patterns.
8. Building ontology networks by **restructuring** ontologies or ontology modules.
9. Building ontology networks by **localizing** ontologies or ontology modules.

# NeOn Methodology



Process and activities covered:

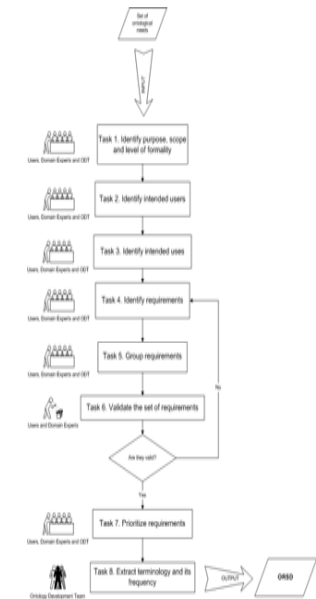
- Ontology Specification
- Scheduling
- Non Ontological Resource Reuse
- Non Ontological Resource Reengineering
- Reuse General Ontologies
- Reuse Domain Ontologies
- Reuse Ontology Statements
- Reuse Ontology Design Patterns



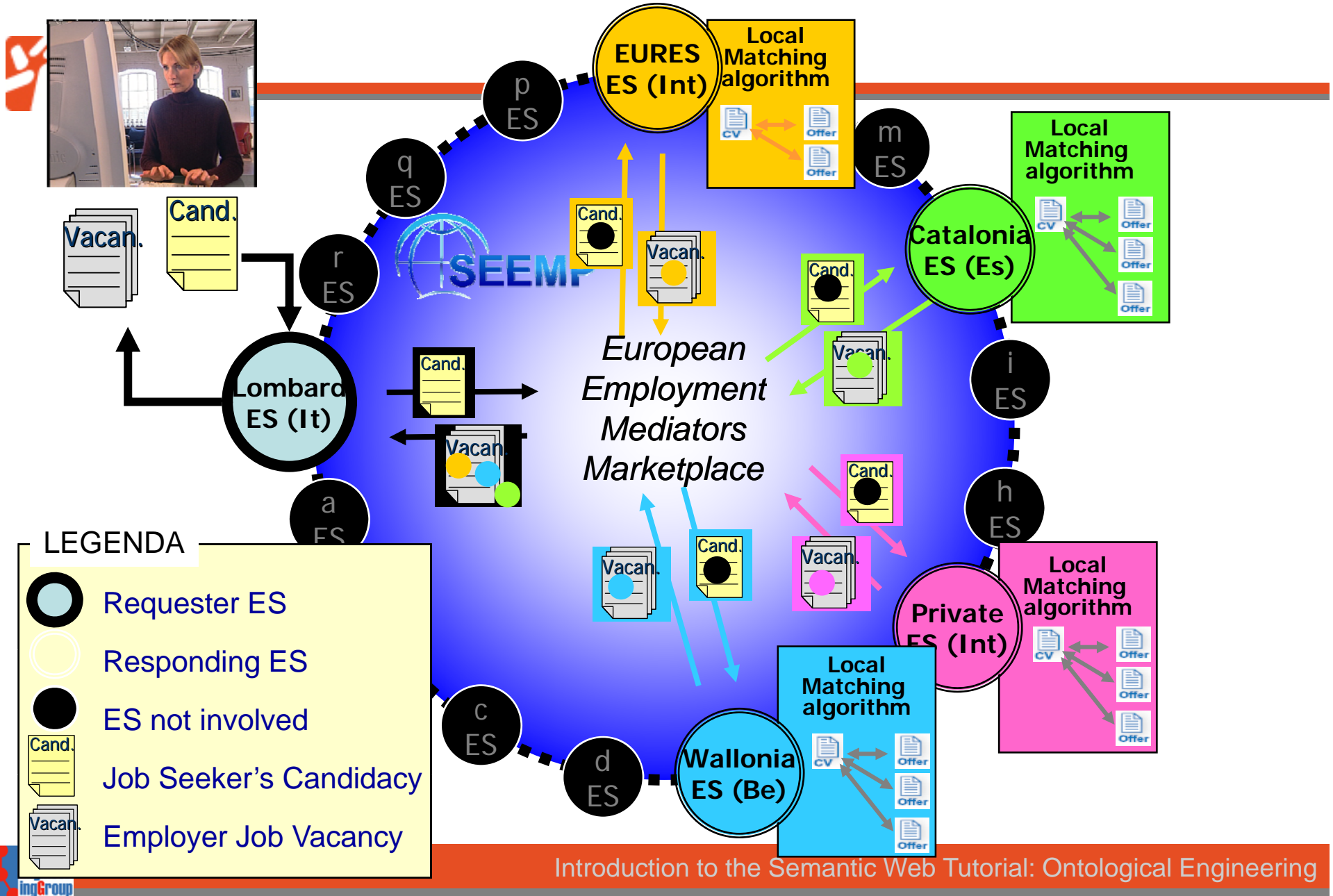
All processes and activities are described with:

- A filling card
- A workflow
- Examples

Process or Activity Name	
Definition	
<input type="text"/>	
Goal	
<input type="text"/>	
Input	Output
<input type="text"/>	<input type="text"/>
Who	
<input type="text"/>	
When	
<input type="text"/>	



# Helping Job Seekers on their way



# Index



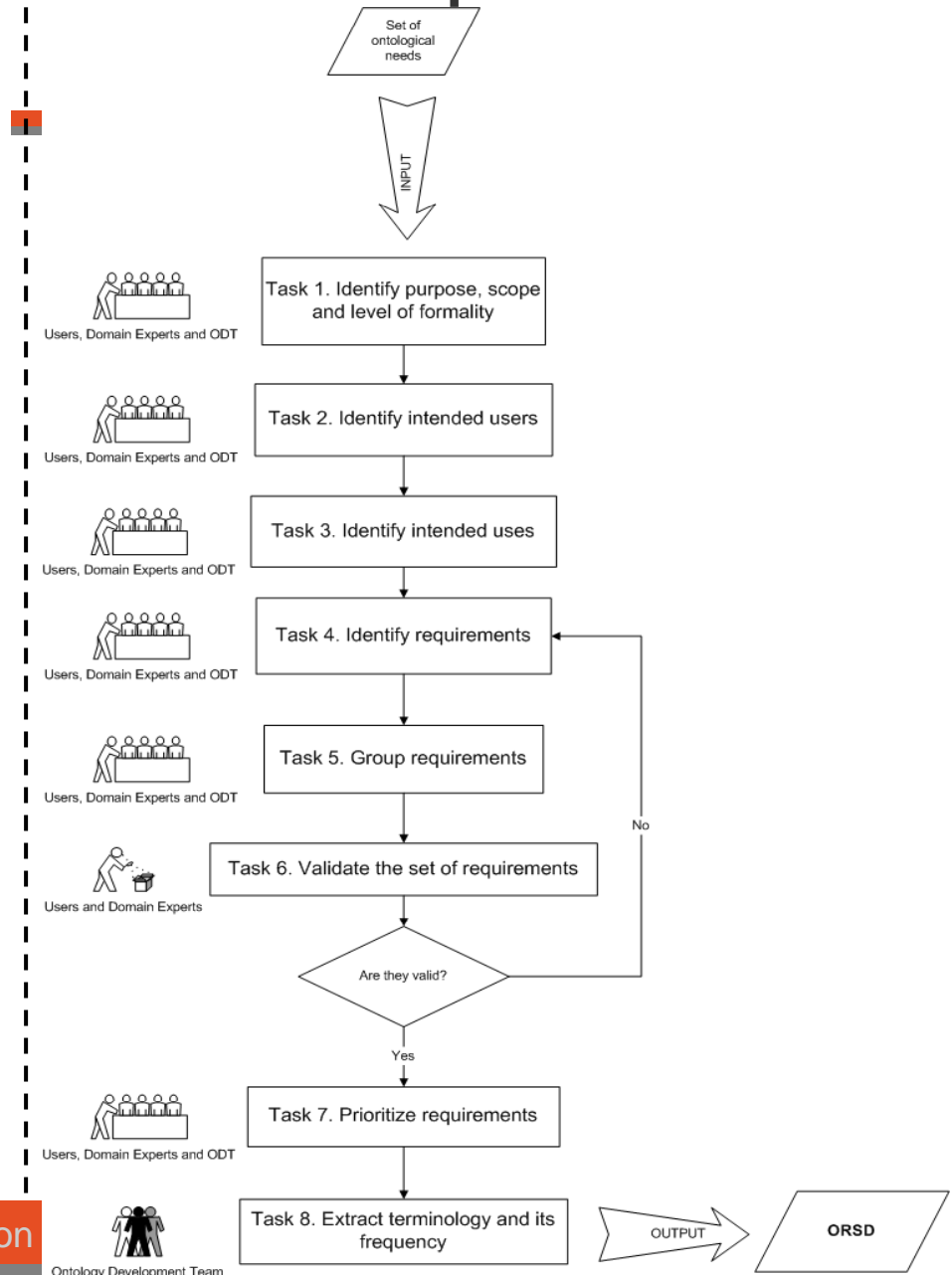
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# Ontology Requirements Specification

Ontology Specification	
<i>Definition</i>	
Ontology Specification refers to the activity of collecting the requirements that the ontology should fulfill, e.g. reasons to build the ontology, target group, intended uses, possibly reached through a consensus process.	
<i>Goal</i>	
The specification activity states why the ontology is being built, what its intended uses are, who the end-users are, and what the requirements the ontology should fulfill are.	
<i>Input</i>	<i>Output</i>
A set of ontological needs.	Ontology Requirements Specification Document (ORSD).
<i>Who</i>	
Software developers and ontology practitioners, who form the ontology development team (ODT), in collaboration with users and domain experts.	
<i>When</i>	
This activity must be carried out in parallel with the knowledge acquisition activity.	



NeOn Deliverable D5.4.1  
(2008)





# Ontology Requirement Specification Document. Template



<b>1</b>	<b>Purpose</b>
	“Software developers and ontology practitioners should include in this slot the purpose of the ontology”
<b>2</b>	<b>Scope</b>
	“Software developers and ontology practitioners should include in this slot the scope of the ontology”
<b>3</b>	<b>Level of Formality</b>
	“Software developers and ontology practitioners should include in this slot the level of formality of the ontology”
<b>4</b>	<b>Intended Users</b>
	“Software developers and ontology practitioners should include in this slot the intended users of the ontology”
<b>5</b>	<b>Intended Uses</b>
	“Software developers and ontology practitioners should include in this slot the intended uses of the ontology”
<b>6</b>	<b>Groups of Competency Questions</b>
	“Software developers and ontology practitioners should include in this slot the groups of competency questions and their answers, including priorities for each group”
<b>7</b>	<b>Pre-Glossary of Terms</b>
	<i>Terms</i>
	“Software developers and ontology practitioners should include in this slot the list of terms included in the CQs and their frequencies”
	<i>Objects</i>
	“Software developers and ontology practitioners should include in this slot a list of objects and their frequencies”

# SEEMP Ontology Requirement Specification Document

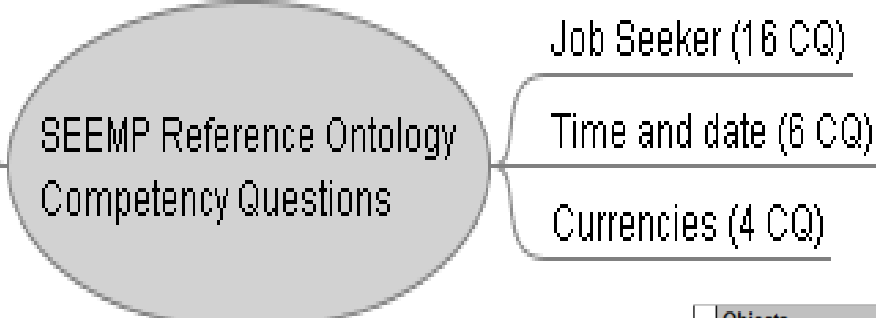
Job Offer (10 CQ)

1

2

3

4



SEEMP Reference Ontology Competency Questions

Job Seeker (16 CQ)

Time and date (6 CQ)

Currencies (4 CQ)

**Questions**

CQ1. What is the Job Seeker Name?  
 CQ2. What is the Job Seeker nationality?  
 CQ3. When is the Job Seeker birthdate?  
 CQ4. What is the Job Seeker contact information?  
 CQ5. What is the Job Seeker current job?  
 CQ6. What is the Job Seeker desired job?  
 CQ7. What are the Job Seeker desired working conditions?  
 CQ8. What kind of contract does the Job Seeker want?  
 CQ9. How much salary does the Job Seeker want to earn?  
 CQ10. What is the Job Seeker education level?  
 CQ11. What is the Job Seeker work experience?  
 CQ12. What is the Job Seeker knowledge?  
 CQ13. What is the Job Seeker expertise?  
 CQ14. What are the Job Seeker skills?  
 CQ15. What publications does the Job Seeker have?  
 CQ16. What hobbies does the Job Seeker have?  
 CQ17. What is the employer information?  
 CQ18. What kind of job does the employer offer?  
 CQ19. What kind of contract does the employer offer?  
 CQ20. How much salary does the employer offer?  
 CQ21. What is the work condition of the job offer?  
 CQ22. What is the required education level for the job offer?  
 CQ23. What is the required work experience for the job offer?  
 CQ24. What is the required knowledge for the job offer?

7 Pre-Glossary of Terms

	Terms	Frequency
User 4	a. Job Seeker	27
User 5	b. CV	2
User 5	c. Personal Information	3
User 5	d. Name	5
5 Intend	e. Gender	1
Use 1.	f. Birth date	1
Use 2.	g. Address	2
Use 3.	h. Nationality	1
Use 4.	i. Contact (phone, fax, mail)	4
Use 5.	j. Objective	3
	k. Job Category	6
	l. Job Offer	27
	m. Employer Information	1
	n. Vacancy	1
	o. Activity Sector	1
	p. Location	3
	q. Work Condition	3
	r. Contract Type	3
	s. Salary	3
	t. Education	3
	u. Work Experience	3

CQ17. What is the employer information?

**Objects**

Objects in the universe of discourse, which are instances of:

- Job Category
  - O1. Computer System Designer
  - O2. Computer System Analyst
  - O3. Programmer
  - O4. Computer Engineer
  - O5. Computer Assistant
  - O6. Computer Equipment Operator
  - O7. Industrial Robot Controller
  - O8. Telecommunication Equipment Operator
  - O9. Medical Equipment Operator
  - O10. Electronic Equipment Operator
  - O11. Image Equipment Operator
- Nationality
  - O12. Austrian
  - O13. Belgian
  - O14. Danish
  - O15. Estonian
  - O16. Finnish
  - O17. French
  - O18. German
  - O19. Greek
  - O20. Italian
- Activity Sector
  - O21. Telecommunication
  - O22. Justice and Judicial
  - O23. Public Security and law
  - O24. Manufacture of machine tools
  - O25. Research and Development
  - O26. Hardware Consultancy
  - O27. Software Consultancy and Supply
  - O28. Data processing
- Education
  - O29. Life Science
  - O30. Mathematics
  - O31. Computer Science
  - O32. Computer Use
  - O33. Statistics
  - O34. Physics
  - O35. Network Administration
- Languages
  - O36. Swedish
  - O37. Spanish
  - O38. Slovenian
  - O39. Portuguese
  - O40. English
  - O41. French
  - O42. German
- Currency
  - O43. Euro
  - O44. Krone
  - O45. Great British Pound
  - O46. Zlote
  - O47. US Dollar
  - O48. Franc
- Location
  - O49. Austria
  - O50. Belgium
  - O51. Danmark
  - O52. Estonia
  - O53. Finland
  - O54. France
  - O55. Germany
  - O55. Greece

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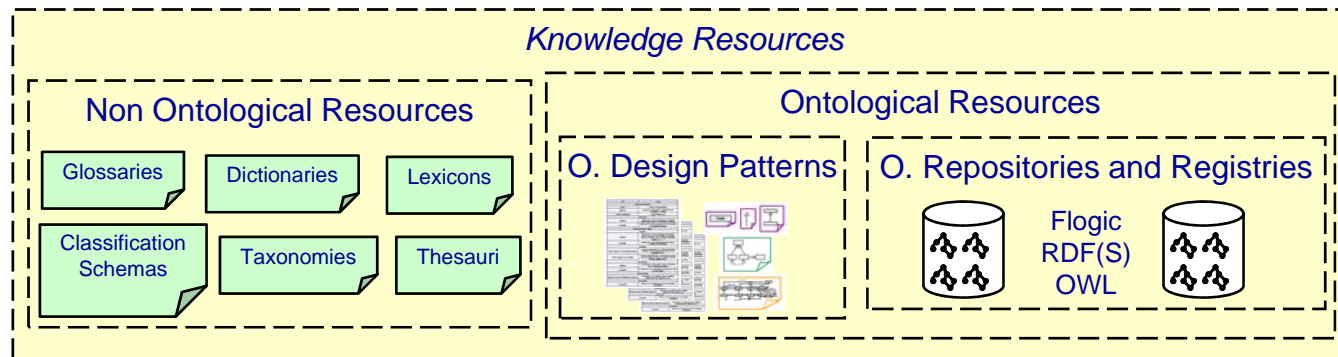


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- Quick Search and Selection of Existing Knowledge Resources**
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# Searching Resources



- Use the terminology from the ORSD
- Find resources covering the terminology



## Objects

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- Job Category
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  - O11. Image Equipment Operator
- Nationality
  - O12. Austrian
  - O13. Belgian
  - O14. Danish
  - O15. Estonian
  - O16. Finnish
  - O17. French
  - O18. German
  - O19. Greek
  - O20. Italian

- Where:
  - Internet
  - Standardization bodies (ISO,...)
  - Intranet of the organization
  - Ontology Registries



# Searching non ontological resources



- *We select the most appropriate standards and taxonomies for:*
  - **Occupation Classification**  
ISCO-88 (COM), SOC, ISCO-88, ONET, Eures Taxonomy.
  - **Classification of Economic Activities**  
ISIC Rev. 3.1, NACE Rev. 1.1, NAICS
  - **Apprenticeship classifications**  
ISCED 97, FOET
  - **Currency Classification**  
ISO 4217
  - **Geography Classification**  
ISO 3166, Eures Taxonomy

## Language Classification

ISO 6392, CEF

## Driving License Classification

European Legislation

## Skill Classification

Eures Taxonomy

## Contract Types Classification

LE FOREM, Eures and BLL Classification

## Work Condition Classification

LE FOREM, Eures and BLL Classification

**Is the terminology included in  
the Ontology Requirements Specification Document  
covered by the resources?**

# Selection of Ontologies



- Search ontologies
- Compare ontologies in the same domain using a set of criteria
- Assess if the ontologies cover the set of competency questions
- Select the best ontology based on
  - Coverage of the domain
  - Expressivity of the Implementation language

# Searching Ontologies in Watson



## Ontology Requirement Specification Document

Objects	
Objects in the ... of discourse, which are instances of:	
Job Category	• Education
01. Computer System Designer	028. Life Science
02. Computer System Analyst	030. Mathematics
03. Programmer	031. Computer Science
04. Computer Engineer	032. Computer Use
05. Computer Assistant	033. Statistics
06. Computer Equipment Operator	034. Physics
07. Industrial Robot Controller	035. Network Administration
08. Telecommunication Equipment Operator	• Languages
09. Medical Equipment Operator	036. Swedish
10. Electronic Equipment Operator	037. Spanish
11. Image Equipment Operator	038. Slovenian
• Nationality	039. Portuguese
012. Austrian	040. English
013. Belgian	041. French
014. Danish	042. German
015. Estonian	• Currency
016. Finnish	043. Euro
017. French	044. Krone
018. German	045. Great British Pound
019. Greek	046. Zlot
020. Italian	047. US Dollar
• Activity Sector	048. Franc
021. Telecommunication	• Location
022. Justice and Judicial	049. Austria
023. Public Security and law	050. Belgium
024. Manufacture of machine tools	051. Denmark
025. Research and Development	052. Estonia
026. Hardware Consultancy	053. Finland
027. Software Consultancy and Supply	054. France
028. Data processing	055. Germany
	056. Greece

Watson Semantic Web Search

http://kmi-web05.open.ac.uk/WatsonWJ/

Search: "smoking"

Found 19 semantic documents - [Restrict Search](#)

1- <http://daml.umbc.edu/ontologies/cobra/0.4/academia>

5 KB - RDF, OWL (OWL FULL) - ALCH(D)

- <http://daml.umbc.edu/ontologies/cobra/0.4/academia#University>
- Label: University
- Comment:
- <http://daml.umbc.edu/ontologies/cobra/0.4/academia#Researcher>
- <http://daml.umbc.edu/ontologies/cobra/0.4/academia#GradStudentResearcher>
- Label: GradStudentResearcher
- Comment:
- <http://daml.umbc.edu/ontologies/cobra/0.4/academia#Student>
- <http://daml.umbc.edu/ontologies/cobra/0.4/academia#GradStudentResearcher>

2- <http://annotation.semanticweb.org/ontologies/iswc.owl>

30 KB - OWL, RDF (OWL Lite) - AL(D)

- <http://annotation.semanticweb.org/2004/iswc#University>
- [http://annotation.semanticweb.org/2004/iswc#University\\_of\\_Karlsruhe](http://annotation.semanticweb.org/2004/iswc#University_of_Karlsruhe)
- <http://annotation.semanticweb.org/2004/iswc#Researcher>
- <http://annotation.semanticweb.org/2004/iswc#Student>
- <http://annotation.semanticweb.org/2004/iswc#PhDStudent>

3- <http://ontobroker.semanticweb.org/ontologies/ka2-orto-2000-11-07.daml>

- <http://kmi-web05.open.ac.uk:81/cache/7/64e/14aa/3dd17/adbdb1ce20/2653b336ce35ba101#University>
- <http://kmi-web05.open.ac.uk:81/cache/7/64e/14aa/3dd17/adbdb1ce20/2653b336ce35ba101#Researcher>
- <http://kmi-web05.open.ac.uk:81/cache/7/64e/14aa/3dd17/adbdb1ce20/2653b336ce35ba101#student>
- <http://kmi-web05.open.ac.uk:81/cache/7/64e/14aa/3dd17/adbdb1ce20/2653b336ce35ba101#Student>
- <http://kmi-web05.open.ac.uk:81/cache/7/64e/14aa/3dd17/adbdb1ce20/2653b336ce35ba101#PhDStudent>

4- [http://www.ifi.unizh.ch/ddis/fileadmin/pdf/service\\_broker/iswc.daml](http://www.ifi.unizh.ch/ddis/fileadmin/pdf/service_broker/iswc.daml)

32 KB - DAML+OIL, RDF - AL(D)

- <http://annotation.semanticweb.org/iswc/iswc.daml#University>
- [http://annotation.semanticweb.org/iswc/iswc.daml#University\\_of\\_Karlsruhe](http://annotation.semanticweb.org/iswc/iswc.daml#University_of_Karlsruhe)
- <http://annotation.semanticweb.org/iswc/iswc.daml#Researcher>

# The Time Ontology Selection



Checking which temporal properties are needed for answering the CQ

- When the job seeker completed his/her first degree?
- Is the job seeker older than 30 years?
- How much time did the job seeker spend completing his/her first degree?
- How long is the duration of the contract?
- Which job offers were posted in last 24 hours?
- .....

	Cyc's Upper Ontology	Unrestricted Time Ontology	Simple Time Ontology	Reusable Time Ontology	Kestrel Time Ontology	SRI's Time Ontology	SUMO Time Ontology	DAML Time Ontology	AKT Time Ontology
Time Points	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Time Interval	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Absolute and Relative Time			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Relations between time intervals					<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Convex and non convex intervals				<input checked="" type="checkbox"/>				<input checked="" type="checkbox"/>	
Distinction between open and closed intervals				<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Explicit modeling of proper intervals								<input checked="" type="checkbox"/>	
Concatenation of intervals								<input checked="" type="checkbox"/>	
Different temporal granularities	<input checked="" type="checkbox"/>					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Provides axioms		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	



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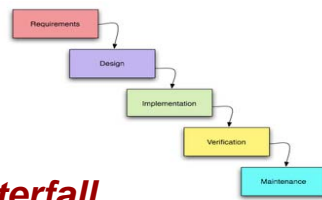


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- An **ontology life cycle model** is the framework (waterfall, evolving prototyping, spiral, etc.), selected by each using organization, on which to map the activities identified in the ontology development process.

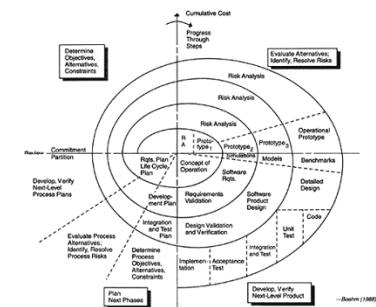
**Waterfall**



Incremental Model



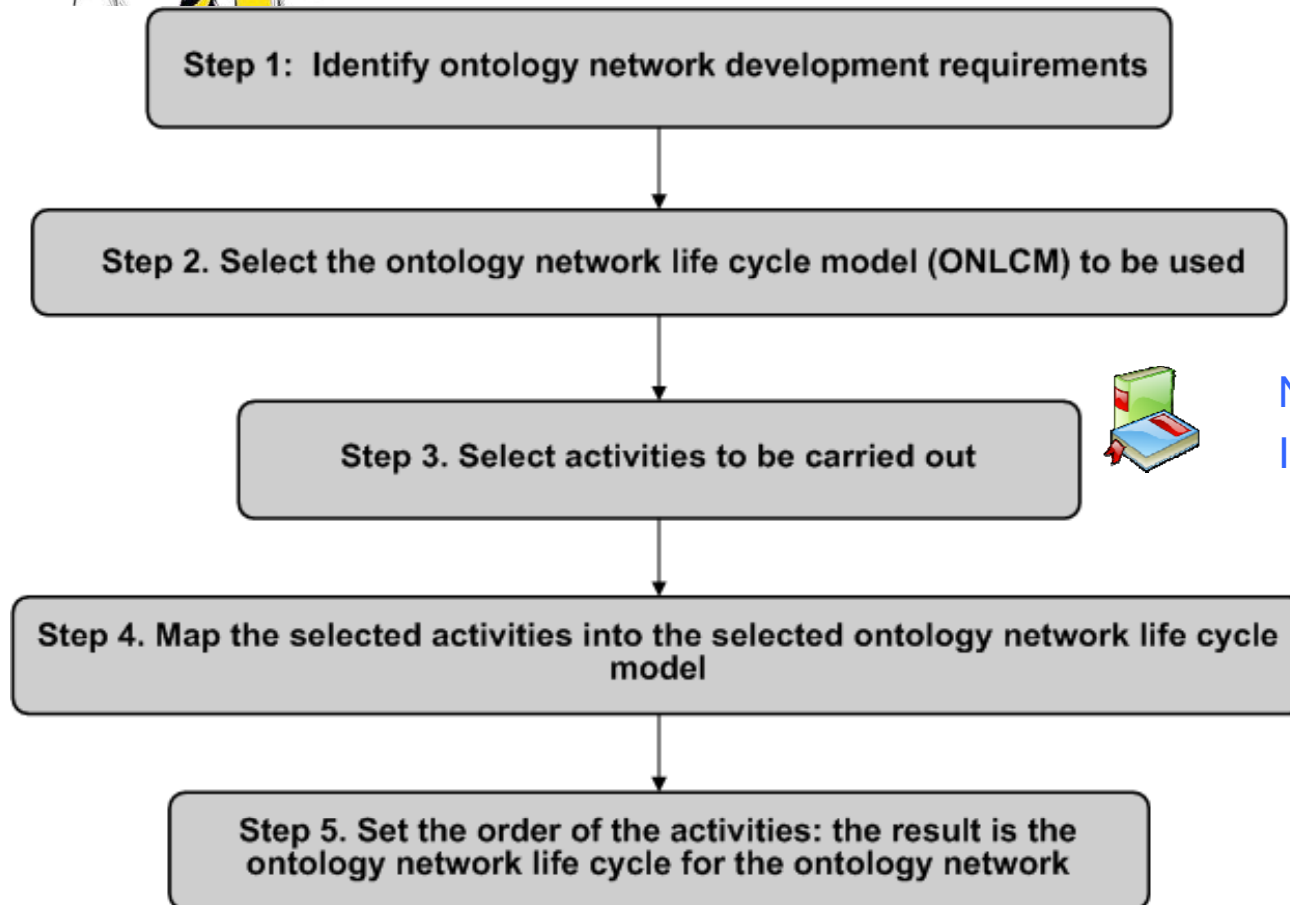
Iterative Model



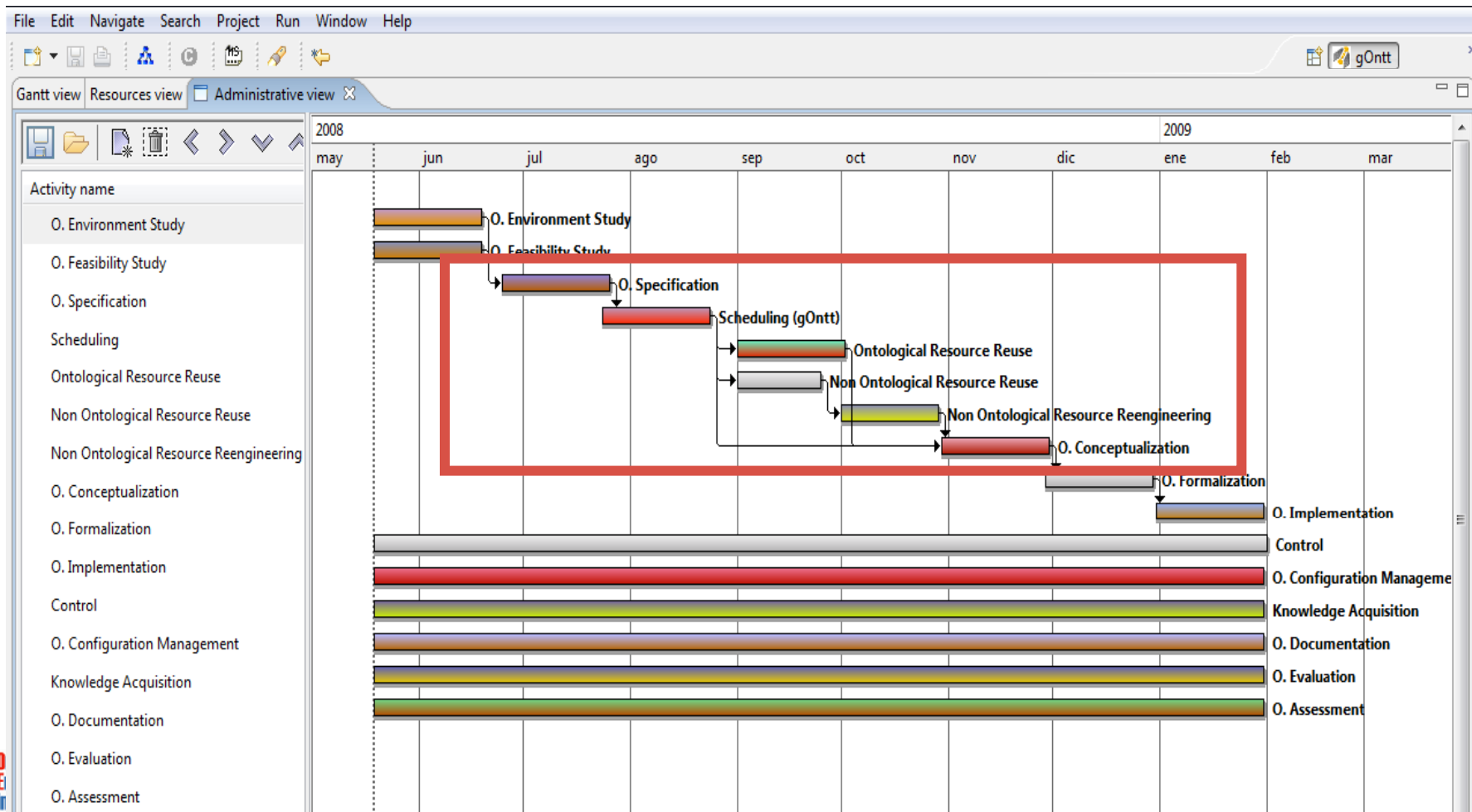
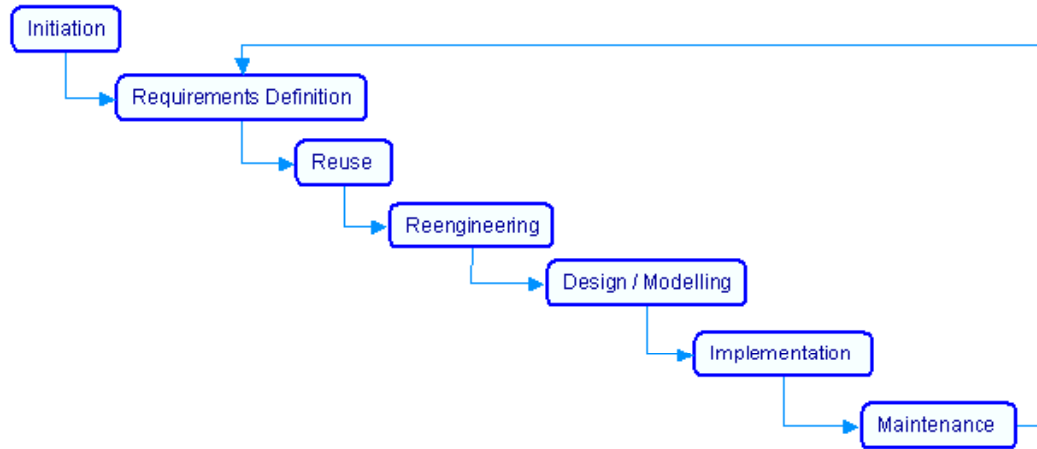
- The **ontology life cycle** is the specific sequence of activities that the ontology practitioners carry out for developing an ontology.
- There is **no a unique life cycle model** valid for all the ontology development projects



How software developers and ontology practitioners select the *ontology life cycle model* and the *particular ontology life cycle* for developing his/her ontology?



NeOn Deliverable D5.3.1 (2007)  
I-SEMANTICS 2008

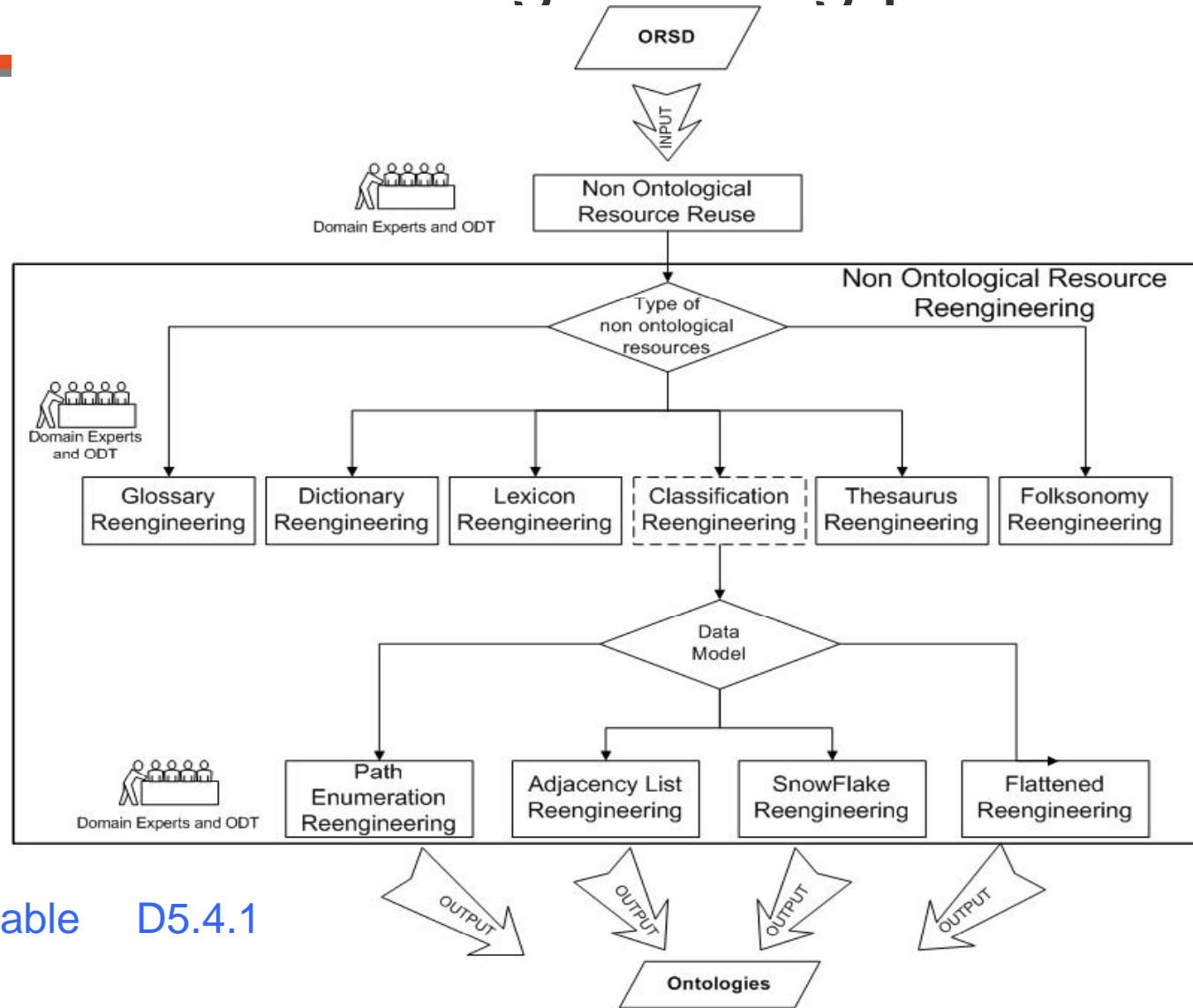
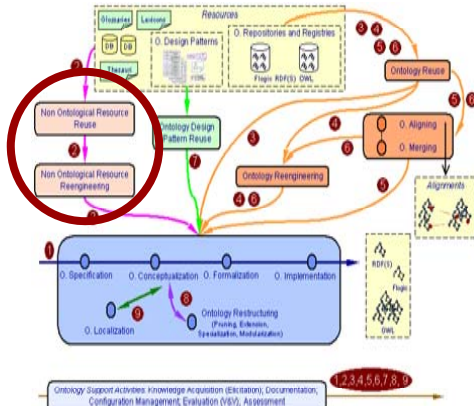


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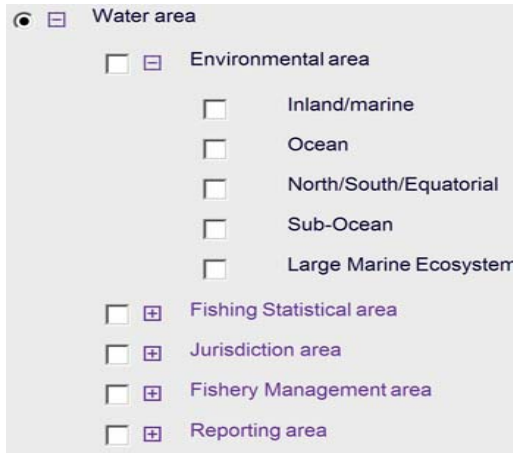
# The resource type and its data model influence the reengineering process



NeOn Deliverable D5.4.1 (2008)

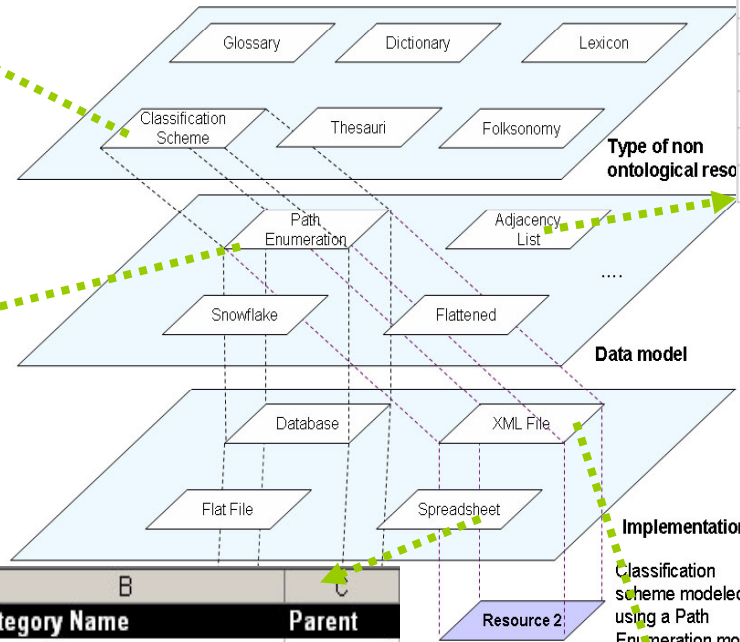
# Types of non ontological resources

Id	Category Name	Parent
20000	Water area	1
21000	Environmental area	20000
22000	Fishing Statistical area	20000
24020	Jurisdiction area	20000
21001	Inland/marine	21000
21002	Ocean	21000
21003	North/South/Equatorial	21000
21004	Sub Ocean	21000
21005	Large Marine ecosystem	21000



Id	Category Name
20000	Water area
20000.21000	Environmental area
20000.22000	Fishing Statistical area
20000.24020	Jurisdiction area
21000.21001	Inland/marine
21000.21002	Ocean
21000.21003	North/South/Equatorial
21000.21004	Sub Ocean
21000.21005	Large Marine ecosystem

	A	B	C
1	Id	Category Name	Parent
2	20000	Water area	1
3	21000	Environmental area	20000
4	22000	Fishing Statistical area	20000
5	24020	Jurisdiction area	20000
6	21001	Inland/marine	21000
7	21002	Ocean	21000
8	21003	North/South/Equatorial	21000
9	21004	Sub Ocean	21000
10	21005	Large Marine ecosystem	21000



```

<Classification>
  <Category>
    <NodeId>20000</NodeId>
    <WaterCategory>Water Area</WaterCategory>
    <parentNodeId>1</parentNodeId>
  </Category>
  <Category>
    <NodeId>21000</NodeId>
  
```

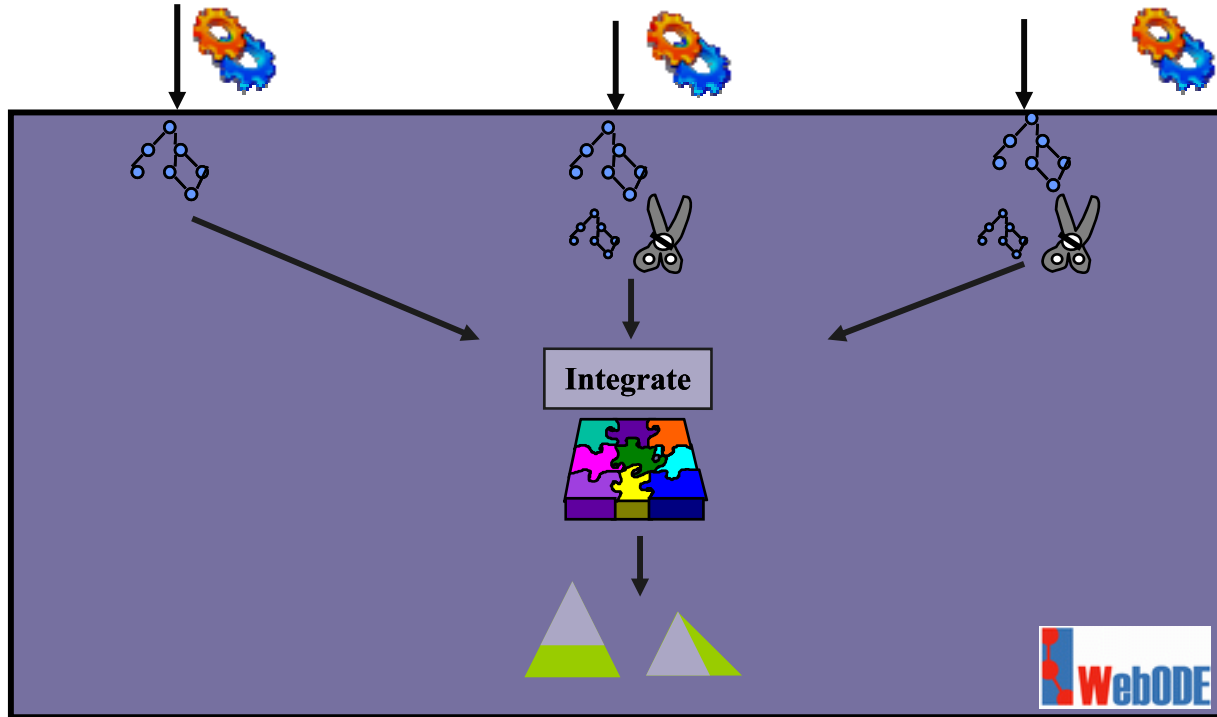
# Reengineering resources




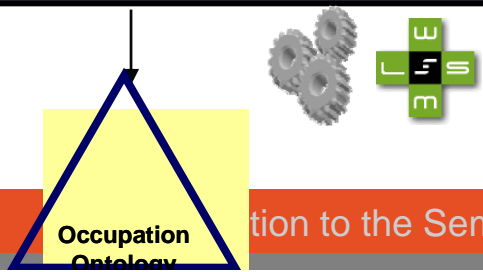
**EURES Taxonomy**  
(proprietary)  
Oracle DB

**ONET**  
HTML

**ISCO-88 (COM)**  
MS Access



-  Extend
-  Specialize
-  Prune
-  Ad hoc wrapper
-  WSML exporter





# Knowledge Resource Reengineering



```

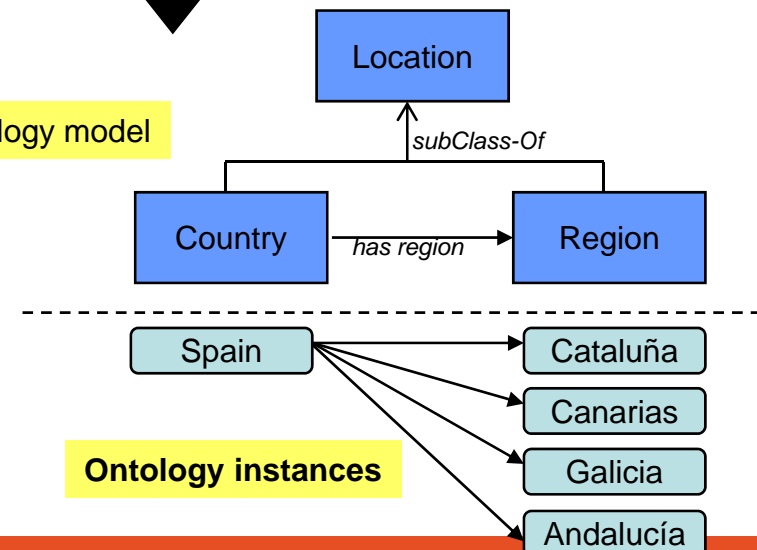
...
ISO 3166-1 (XML)
...
<ISO_3166-1_Entry>
  <ISO_3166-1_Country_name>SPAIN</ISO_3166-1_Country_name>
  <ISO_3166-1_Alpha-2_Code_element>ES</ISO_3166-1_Alpha-
2_Code_element>
</ISO_3166-1_Entry>
...
  
```

Excerpt of the Geography Ontology

Regions Table (Eures Oracle DB)

N	ISO31661 Code	Region
100	ES	Cataluña
101	ES	Canarias
102	ES	Galicia
103	ES	Andalucia
104	ES	Navarra
105	ES	Asturias
106	ES	Baleares
107	ES	Murcia
108	ES	Aragon

Ontology model



```

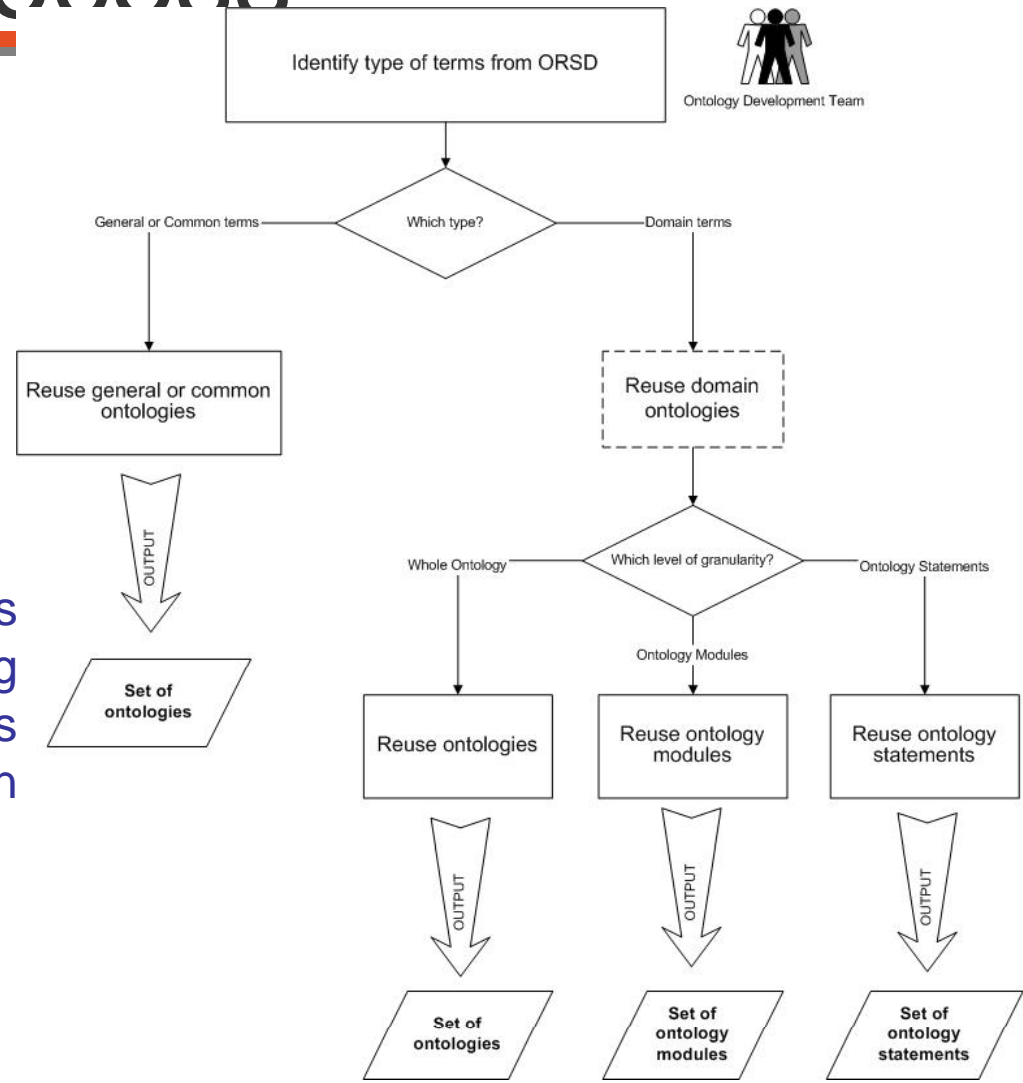
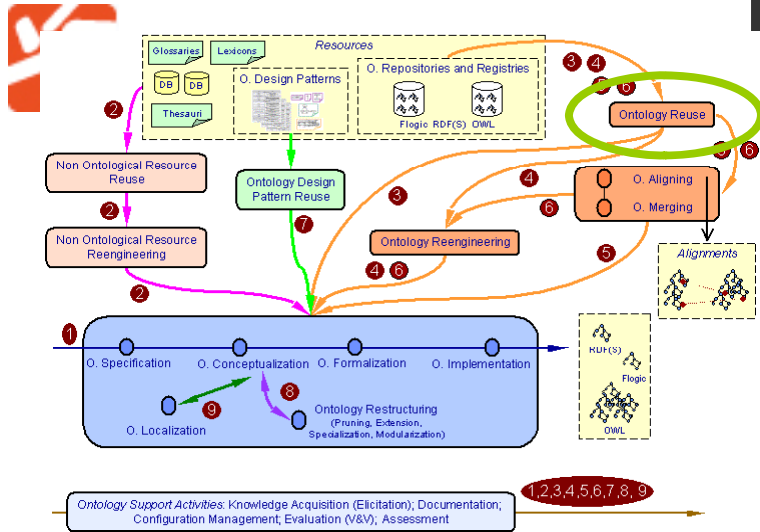
<rdf.Description rdf:about="webode://mccarthy.dia.fi.upm.es/Geography_Ontology#Country_SPAIN">
  <rdf.type rdf:resource="webode://mccarthy.dia.fi.upm.es/Geography_Ontology#Country"/>
  <GeoOnt.Code rdf:datatype="http://www.w3.org/2001/XMLSchema#string">ES</GeoOnt.Code>
  <GeoOnt.Name rdf:datatype="http://www.w3.org/2001/XMLSchema#string">SPAIN</GeoOnt.Name>
  <GeoOnt.is_located_in_Continent rdf:resource="webode://mccarthy.dia.fi.upm.es/Geography_Ontology#EU_Europe"/>
  <GeoOnt.has_region_Region rdf:resource="webode://mccarthy.dia.fi.upm.es/Geography_Ontology#Catalunya"/>
  <GeoOnt.has_region_Region rdf:resource="webode://mccarthy.dia.fi.upm.es/Geography_Ontology#Canarias"/>
  <GeoOnt.has_region_Region rdf:resource="webode://mccarthy.dia.fi.upm.es/Geography_Ontology#Galicia"/>
  <GeoOnt.has_region_Region rdf:resource="webode://mccarthy.dia.fi.upm.es/Geography_Ontology#Andalucia"/>
</rdf.Description>
  
```

# Index



- Introduction
- Scenarios in Ontology Building
- Methodological Guidelines for Ontology Specification
- Quick Search of Existing Knowledge Resources
- Guidelines for Ontology development project Planning
- Methodological Guidelines for Non Ontological Resource Reuse and Reengineering
- Methodological Guidelines for Ontology Reuse**
- Creating the final Ontology Model

# NeOn Ontological Resource Reuse Process



- Ontological Resource Reuse** is defined as the process of using available ontological resources (ontologies, modules, statements) in the solution of different problems.



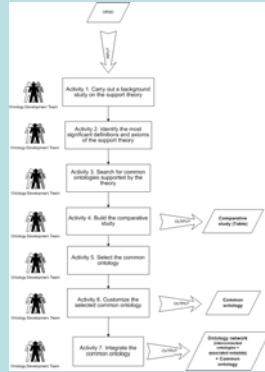
NeOn Deliverable D5.4.1 (2008)

# Detailed descriptions in D5.4.1



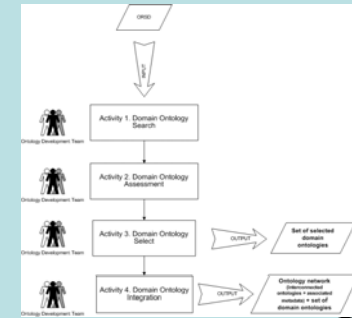
## Reuse Common Ontologies

General or Common Ontology Reuse	
<b>Definition</b>	General or Common Ontology Reuse refers to the process of using general or common ontologies in the solution of different problems.
<b>Goal</b>	The goal of this process is to find and select general or common ontologies to be integrated in the ontology network being developed.
<b>Input</b>	Conceptual models (CMs) produced in the OSRD phase, ontology methods for the development and the development language of each ontology. Additionally, there may be a set of related components across the team or other identifiable ontologies to be reused.
<b>Output</b>	A general or common ontology integrated in the ontology network being developed.
<b>Who</b>	Software developers and ontology practitioners involved in the ontology development. The role of an ontology practitioner formalized or formal ontologies/practices may be required.
<b>When</b>	The general or common ontology reuse process should be carried out after the ontology specification activity.



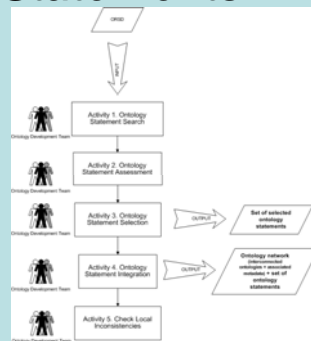
## Reuse Domain Ontologies

Domain Ontology Reuse	
<b>Definition</b>	Domain Ontology Reuse refers to the process of using domain ontologies in the solution of different problems.
<b>Goal</b>	The goal of this process is to find and select one or several domain ontologies related with the domain of the ontology being developed in order to be used in such ontology in development.
<b>Input</b>	The OSRD.
<b>Output</b>	Ontology network extended with the reused domain ontology.
<b>Who</b>	Software developers and ontology practitioners.
<b>When</b>	The domain ontology reuse process should be carried out after the ontology specification activity.



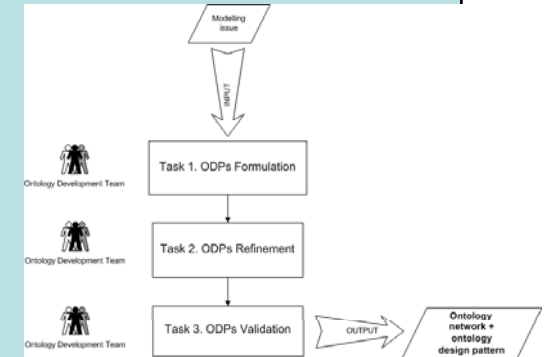
## Reuse Ontology Statements

Ontology Statements Reuse	
<b>Definition</b>	Ontology Statement Reuse refers to the process of using ontology statements (from domain ontologies) in the solution of different problems.
<b>Goal</b>	The goal of this process is to make use of ontology statements from an ontology that was not originally designed for the task at hand.
<b>Input</b>	The OSRD and available ontology statements in the same or similar domain that the ontology network being developed.
<b>Output</b>	Ontology network extended with reused ontology statements.
<b>Who</b>	Software developers and ontology practitioners.
<b>When</b>	Ontology statement reuse can be performed in various stages of the ontology life cycle. Most naturally reuse is performed at the stage of building the ontology, and it can be repeated in a variety of situations, whether the ontology is built from scratch or extended from an initial ontology. Reuse can also appear at later stages of the life cycle when the ontology is updated and/or extended to cover new knowledge.



## Reuse ODPs by naive users

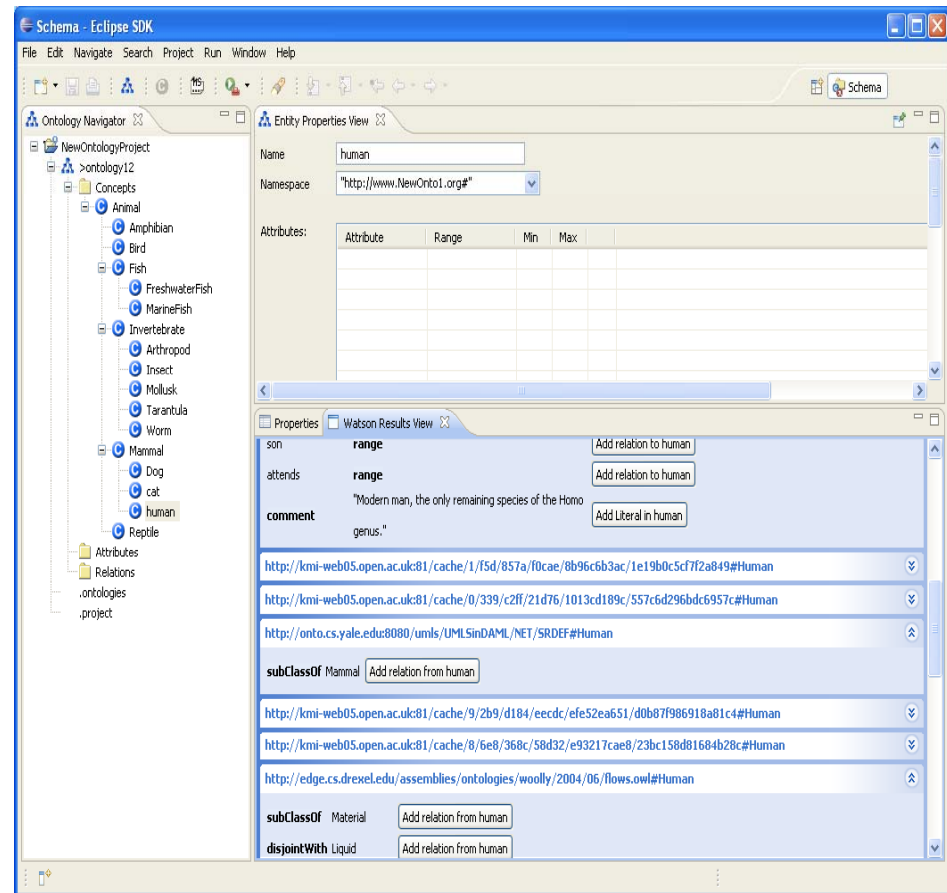
Ontology Design Patterns (ODPs) Reuse by Naive Users	
<b>Definition</b>	Ontology Design Patterns (ODPs) Reuse is defined as the set of of using ontology design patterns in the solution of different modeling problems during the development of new ontologies around the activity of ontology design. Its design knowledge.
<b>Goal</b>	The goal is to allow the reuse of ODPs during the ontology development in order to make better use of the ontology design modeling knowledge to the user.
<b>Input</b>	Modeling problem during the ontology development.
<b>Output</b>	Ontology design pattern (reused into the ontology network being developed).
<b>Who</b>	Software developers and ontology practitioners that have rich experience in the ontology development task and sufficient knowledge of ontology languages (OWL, RDFS, etc.). Ontology Design Patterns (ODPs), UML diagrams, etc.
<b>When</b>	During the development of the Ontology Construction Activity, the Ontology Formulation Activity, or the Ontology Implementation Activity.



Watson plug-in



- While building an ontology with the Neon toolkit
- Find descriptions of existing entities in Web ontologies
- Integrate these descriptions into the edited ontology
- Thus allowing knowledge reuse at the scale of the Semantic Web
- In one simple, integrated, and interactive tool



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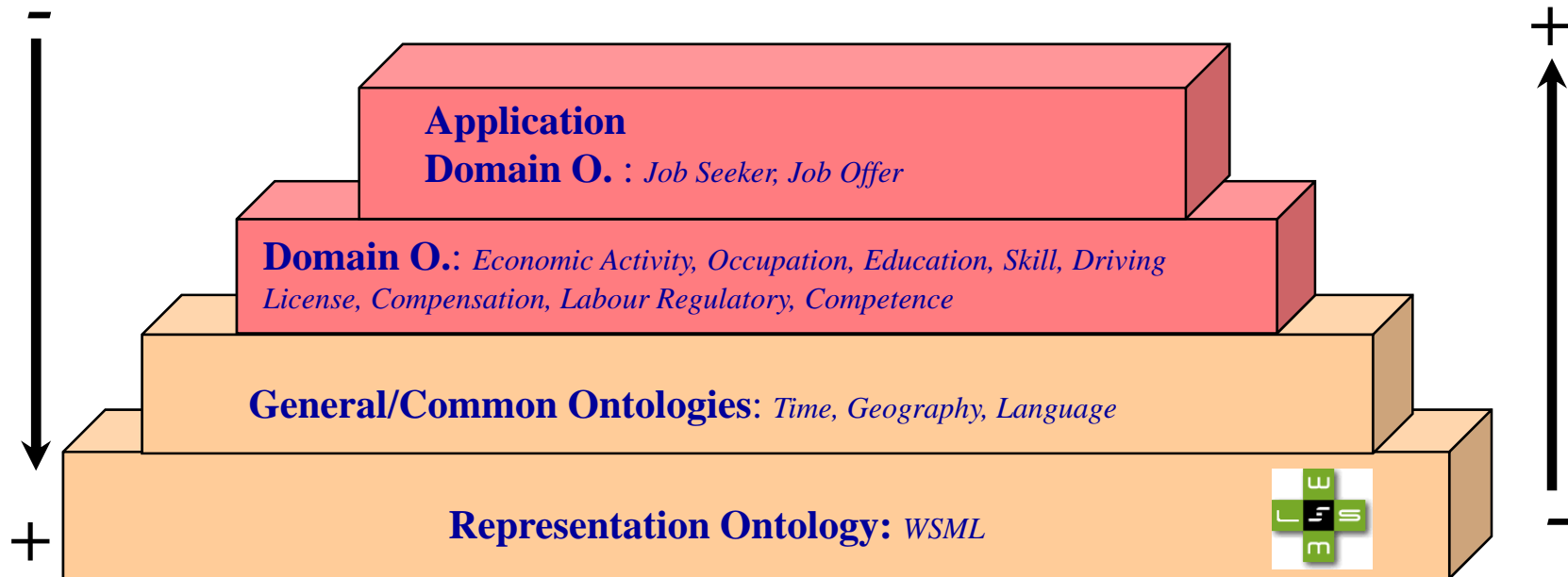
# Conceptualization:

## Modular approach for ontology construction

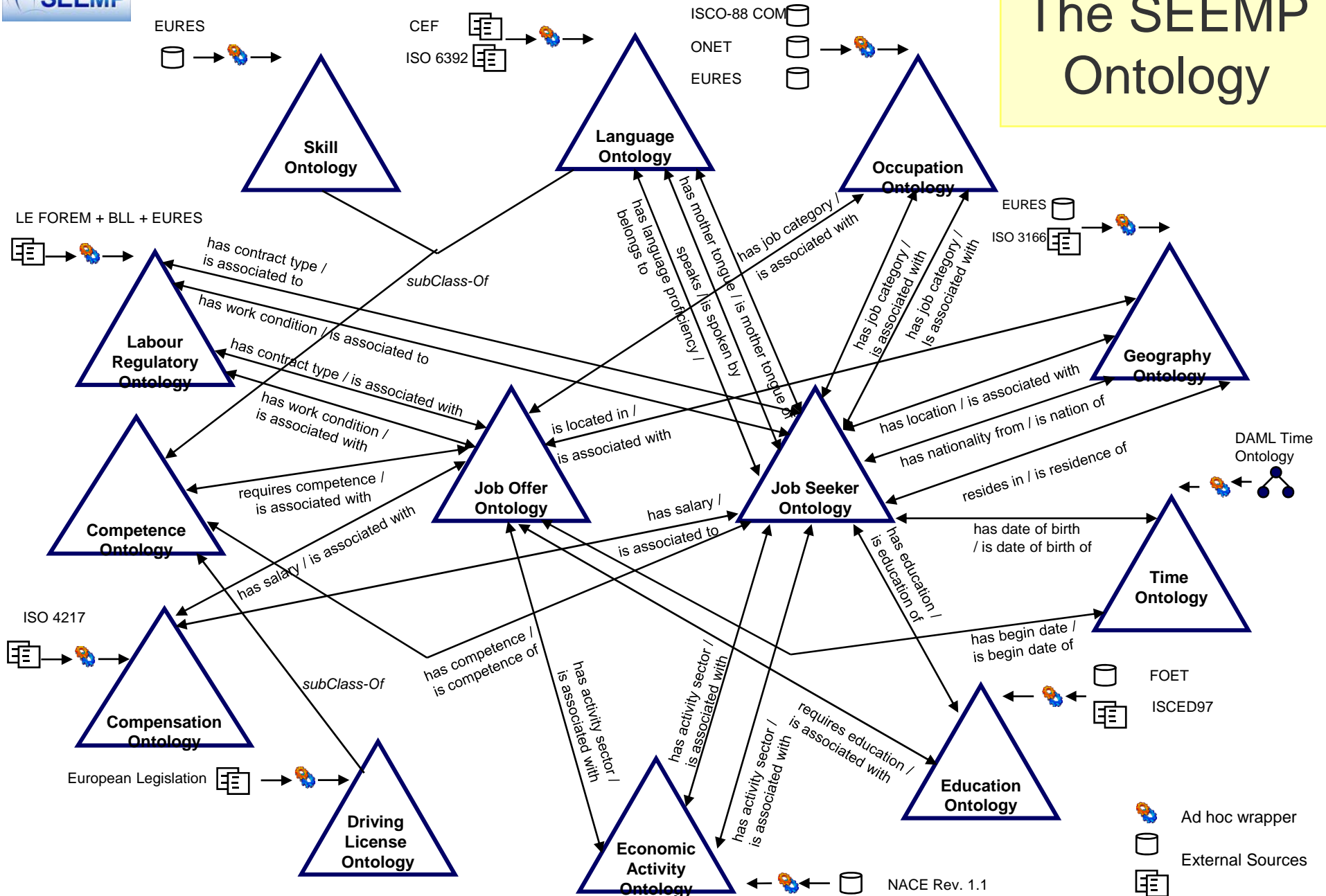


Reusability

Usability

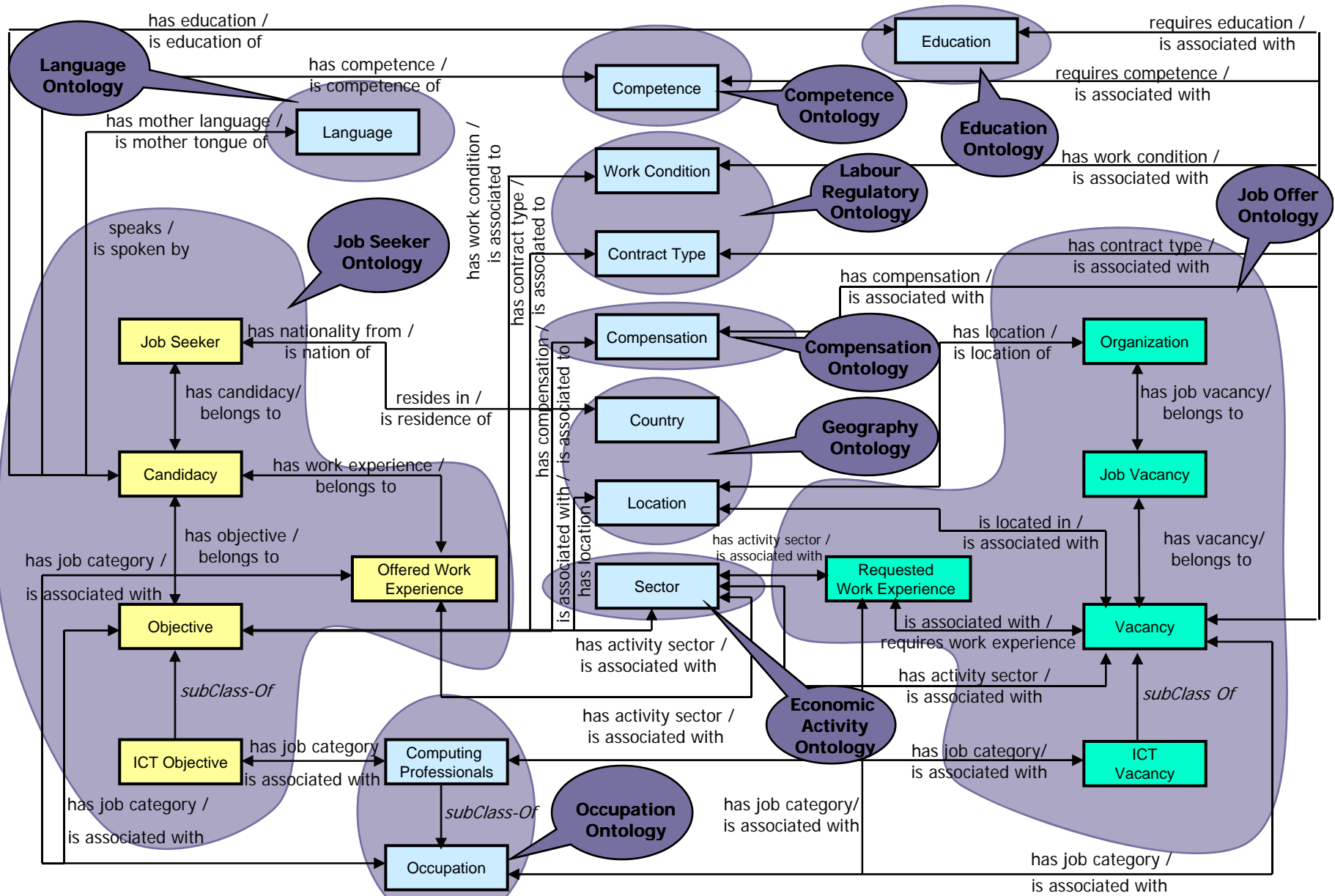


# The SEEMP Ontology





# Details of the ontology

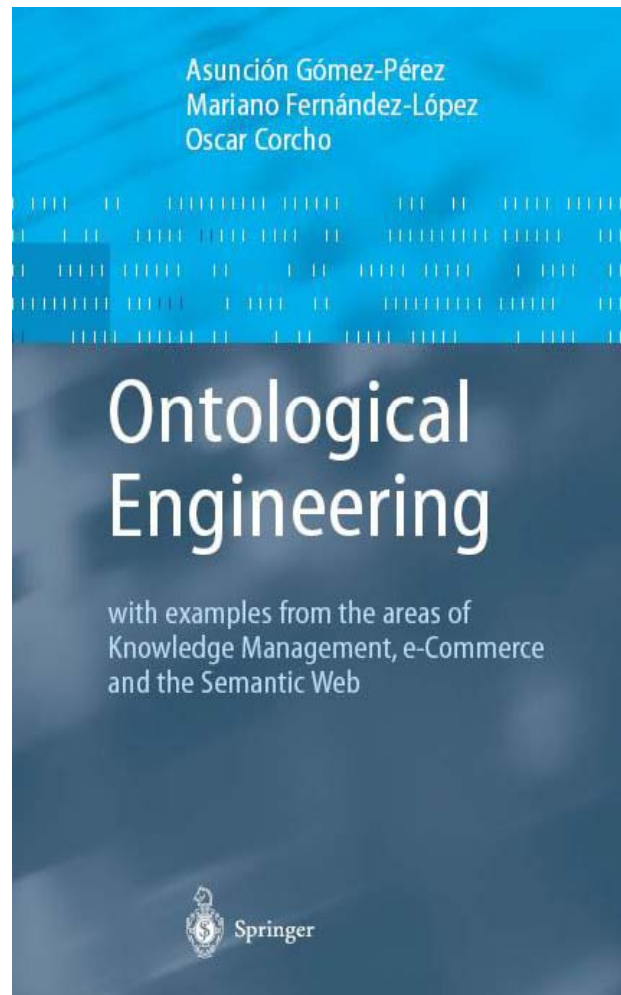


# Conclusions

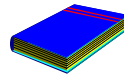


- The NeOn methodology leads the way to a new paradigm for ontology development
- Guidelines are focused on engineering for software developers
- Reuse and reengineering of knowledge aware resources
  - decreases the time spent in ontology development
  - eases sharing
  - improves quality and consensus because agreement was previously reached by domain experts
- There are more enabling technologies that support this new paradigm

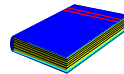
# Main References



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



D5.3.1. NeOn Development Process and Ontology Life Cycle



D5.4.1. NeOn Methodology for Building Contextualized Ontology Networks

# Introduction to the Semantic Web Tutorial

 ISWC 2008

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