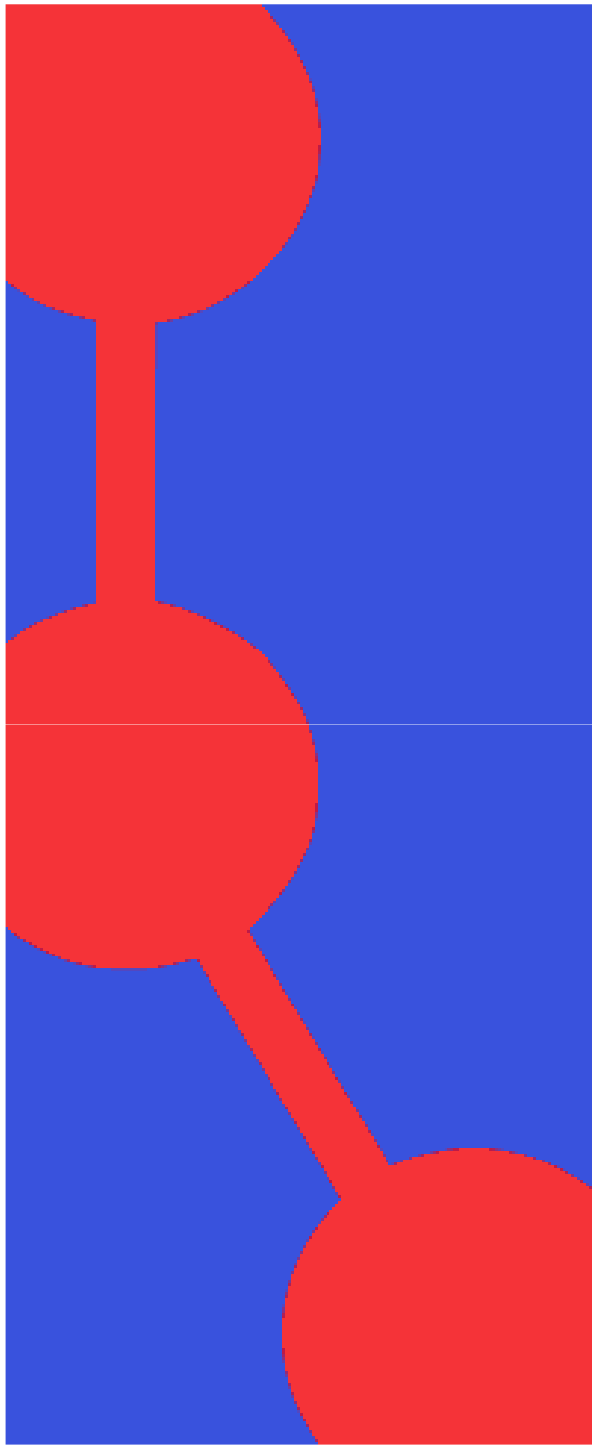

SEEMP
Single European Employment Market-Place

Boris Villazón-Terrazas, Asunción Gómez-Pérez

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Ontology Engineering Group. Laboratorio de Inteligencia Artificial
Departamento de Inteligencia Artificial
Facultad de Informática
Universidad Politécnica de Madrid

Date: 19/11/2009

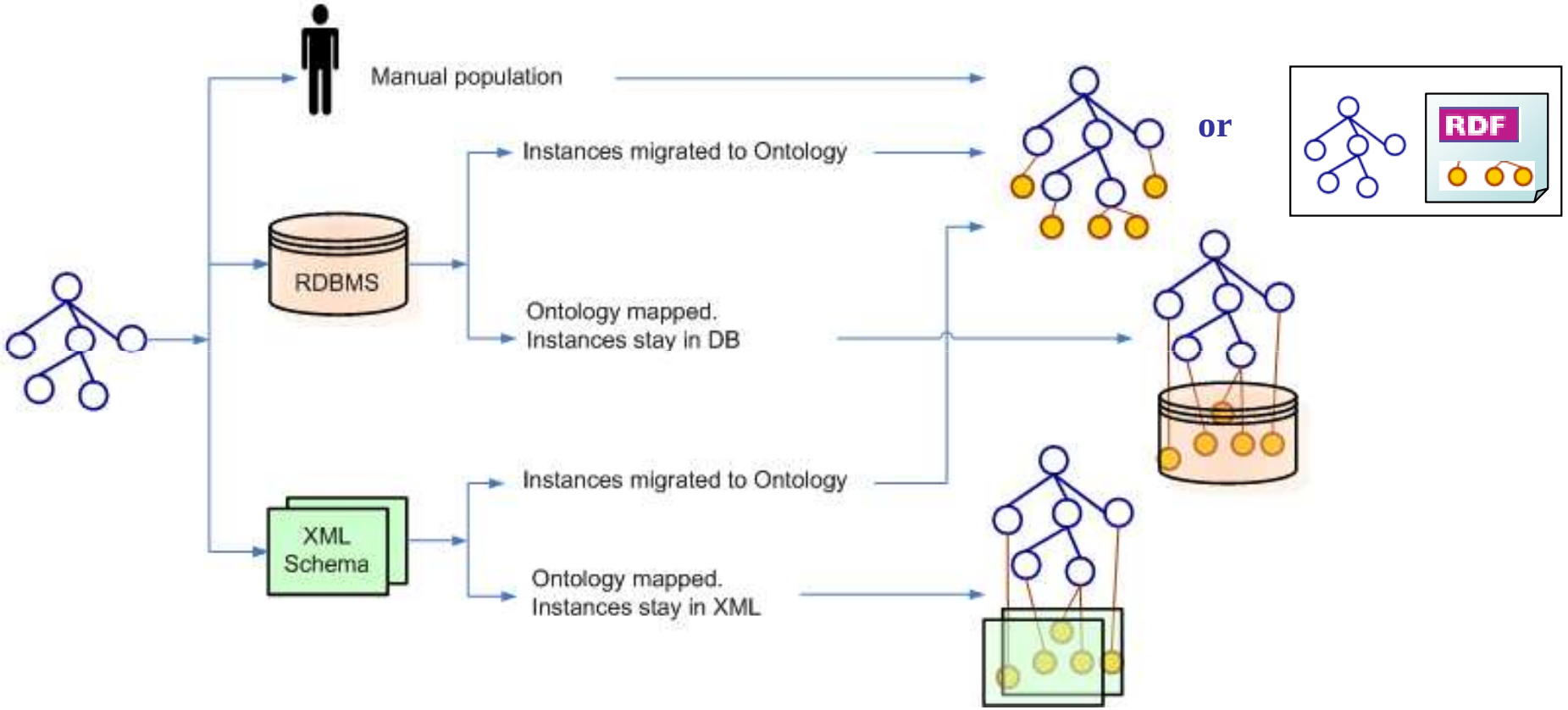
Looking for an European Employment

Helping Job Seekers on their way

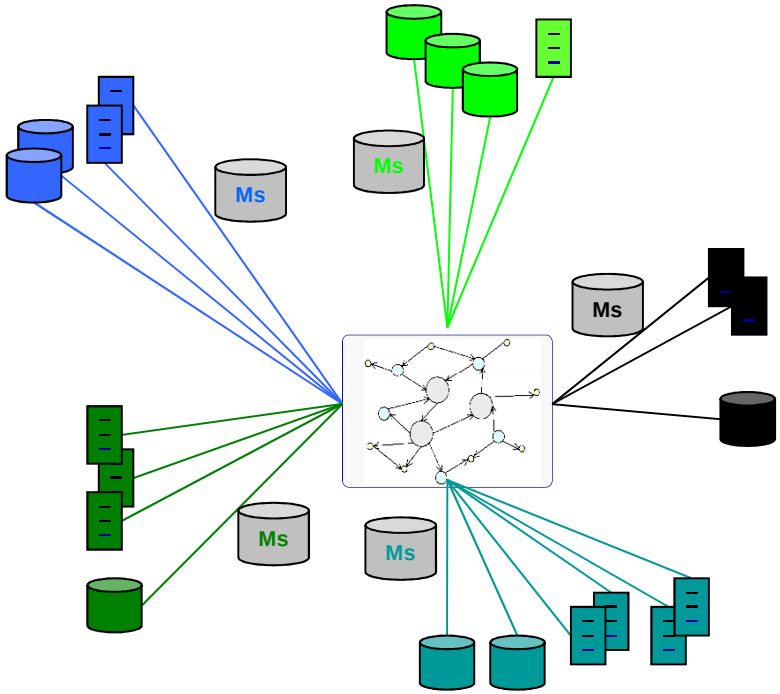
Key aspects of Ontological Engineering

- Ontologies
  - Single versus network of ontologies?
  - Are ontologies built from scratch or reusing knowledge-aware resources?
  - Are mappings used for solving conceptual mistmaches?
- Instances
  - Where are the data/instances?
    - Instances are in the ontology
    - Instances are in RDF files independently of the ontology
    - Data are kept in the original sources
  - Are instances distributed or centralized?
  - Have instances a very high rate of changes?
  - Heterogeneous provenance of instances
  - Degrees of data quality
  - Permissions

Where are the instances?

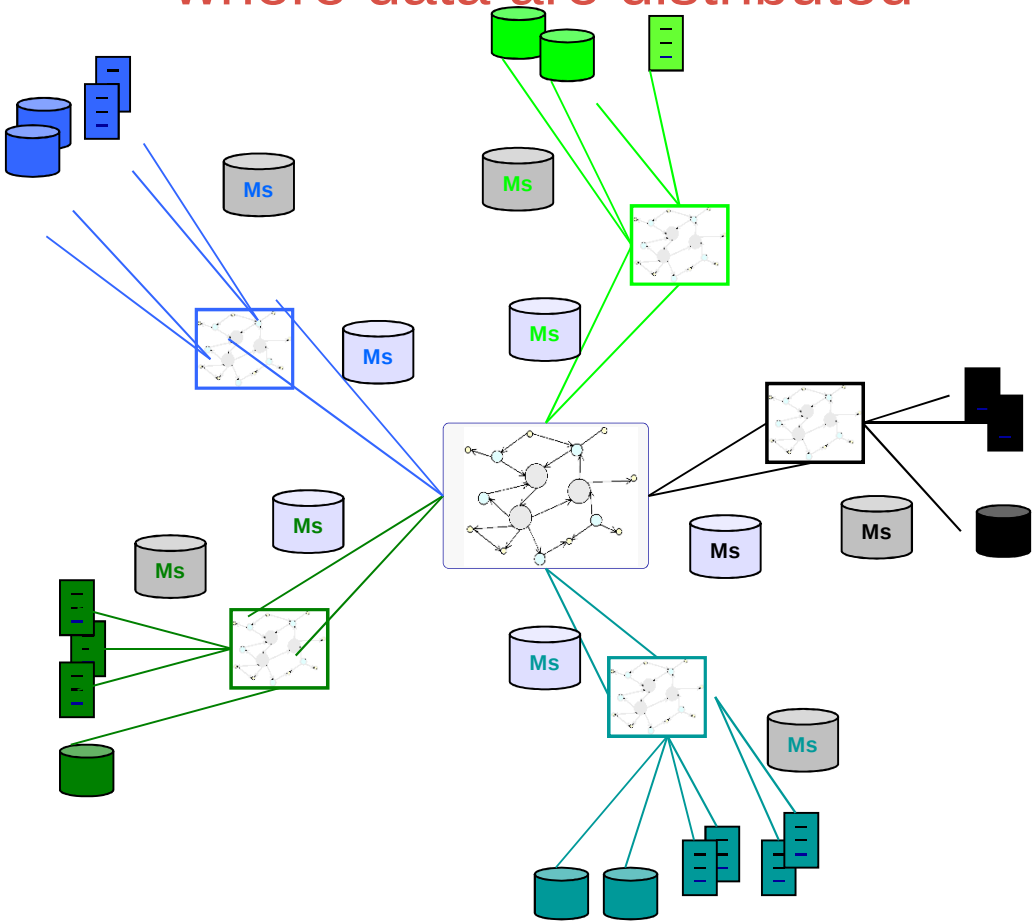


Centralized network of ontologies where data are distributed

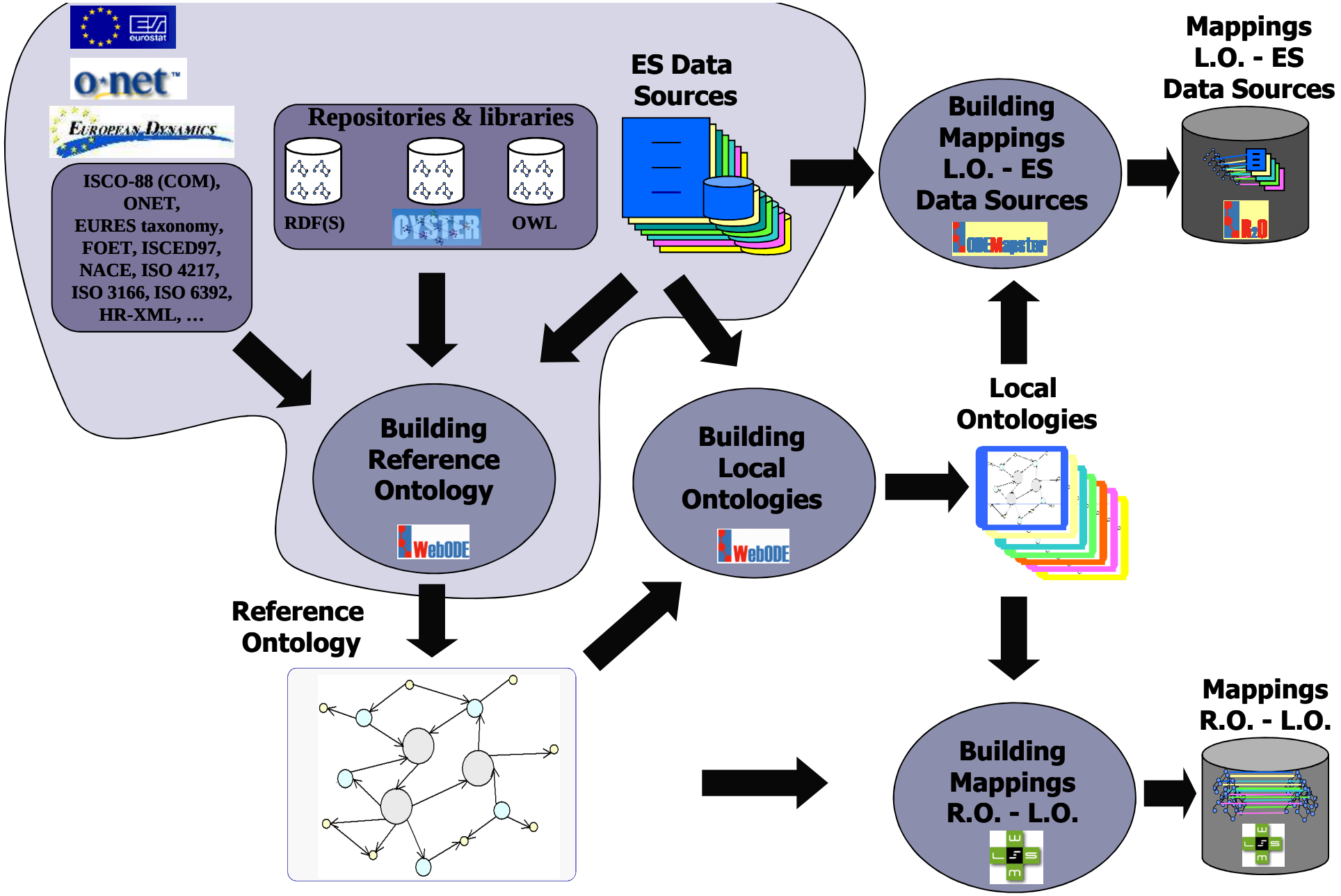


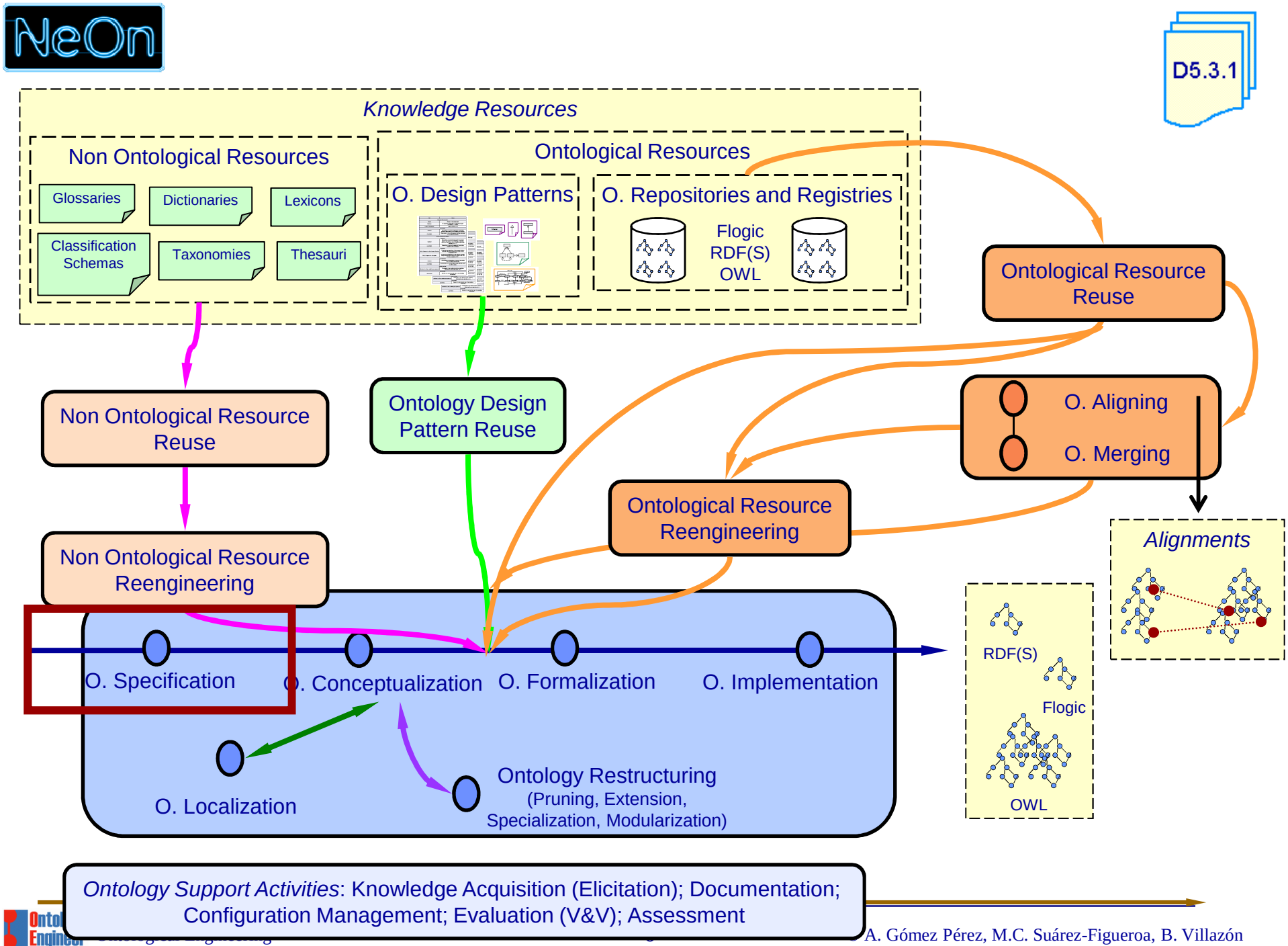
1. Build a reference ontology
2. Build mappings between the reference ontology and the data sources

Federated network of ontologies where data are distributed



1. Build a reference ontology for the domain
2. Build local ontologies
3. Build mappings between the core and local ontologies
4. Build mappings between the local ontologies and the data sources


ISCO-88 (COM), ONET, EURES taxonomy, FOET, ISCED97, NACE, ISO 4217, ISO 3166, ISO 6392, HR-XML, …
Repositories & libraries
RDF(S)
OWL
ES Data Sources
Building Mappings L.O. - ES Data Sources
Mappings L.O. - ES Data Sources
Building Reference Ontology
Building Local Ontologies
Local Ontologies
Reference Ontology
Building Mappings R.O. - L.O.
Mappings R.O. - L.O.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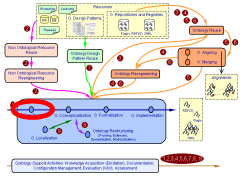
Ontology Specification. SEEMP Ontology Requirement Specification Document

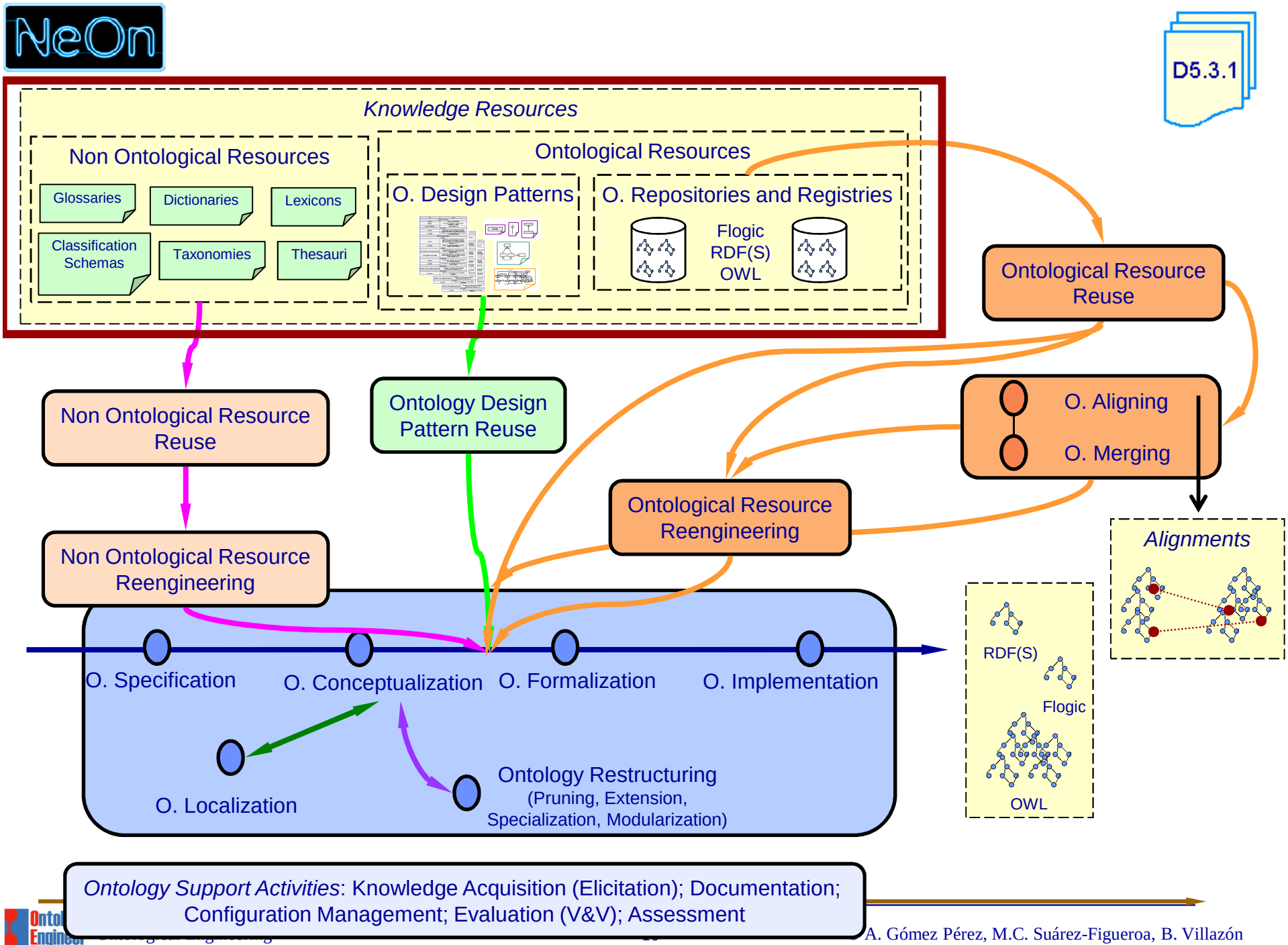


	SEEMP Reference Ontology Requirements Specification
1	**Purpose**
	The purpose of building the Reference Ontology is to provide a consensual knowledge model of the employment domain that could be used by public e-Employment services (PES).
2	**Scope**
	The ontology has to focus just on the ICT (Information and Communication Technology) domain. The level of granularity is directly related to the competency questions and terms identified.
3	**Level of Formality**
	The ontology has to be implemented in WSML language
4	**Intended Users**
	User 1. Candidate who is unemployed and searching for a job or searching another occupation for immediate or future purposes
	User 2
	User 3
	User 4
	User 5
5	**Intend**
	Use 1.
	Use 2.
	Use 3.
	Use 4.
	Use 5.

7	Pre-Glossary of Terms		
	Terms		**Frequency**
	a.	Job Seeker	27
	b.	CV	2
	c.	Personal Information	3
	d.	Name	5
	e.	Gender	1
	f.	Birth date	1
	g.	Address	2
	h.	Nationality	1
	i.	Contact (phone, fax, mail)	4
	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

6	Groups of Competency Questions	
	CQG1. Job Seeker (16 CQ)	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? Job Seeker 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?
	CQG2. Job Offer (10 CQ)	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 economic activity of the employer? Job Offer CQ23. What is the work condition of the job offer? CQ24. What is the required education level for the job offer? CQ25.What is the required work experience for the job offer? CQ26.What is the required knowledge for the job offer?
	CQG3	

	Objects	
	Objects in the universe of discourse, which are instances of:	
4	• 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	• 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
5	• 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	• 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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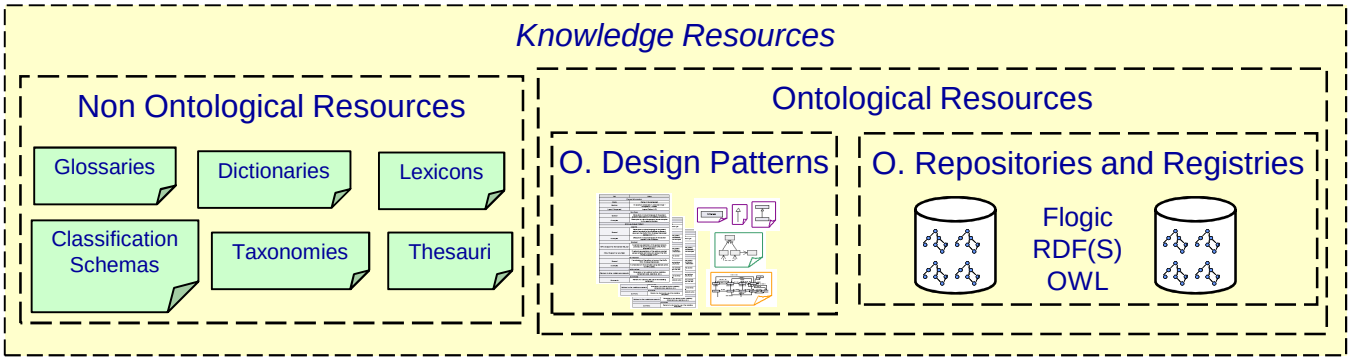
Searching Resources

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



Objects

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

- Job Category
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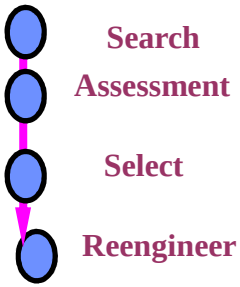
  - O5. Computer Assistant
  - O6. Computer Equipment Operator
  - O7. Industrial Robot Controller
  - O8. Telecommunication Equipment Operator
  - O9. Medical Equipment Operator
  - O10. Electronic Equipment Operator
  - O11. Image Equipment Operator
- Nationality
  - O12. Austrian
  - O13. Belgian
  - O14. Danish
  - O15. Estonian
  - O16. Finnish
  - O17. French
  - O18. German
  - O19. Greek
  - O20. Italian

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

Swoogle semantic web search 2006

watson exploring the semantic web

Search and Assess Standards and Taxonomies

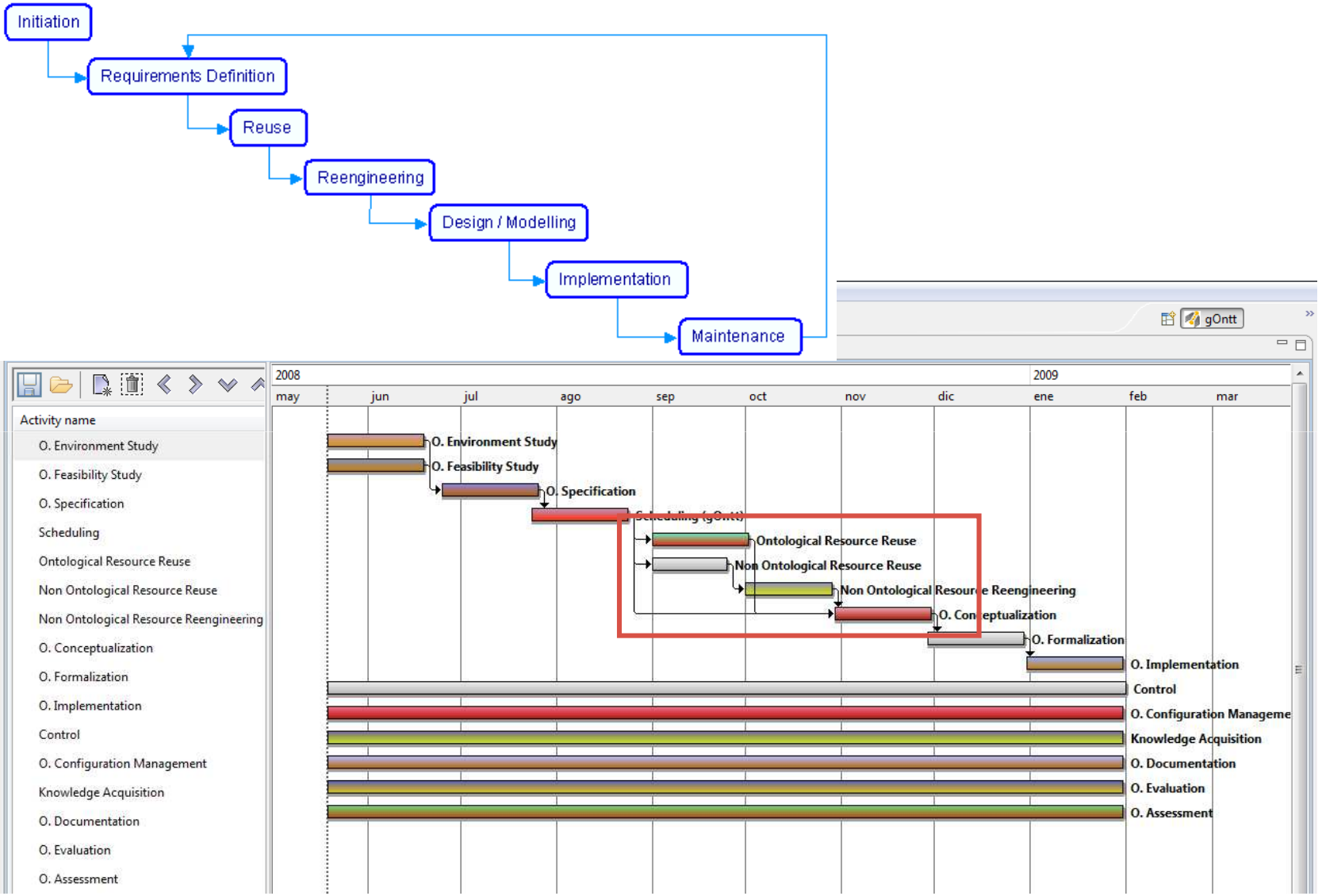


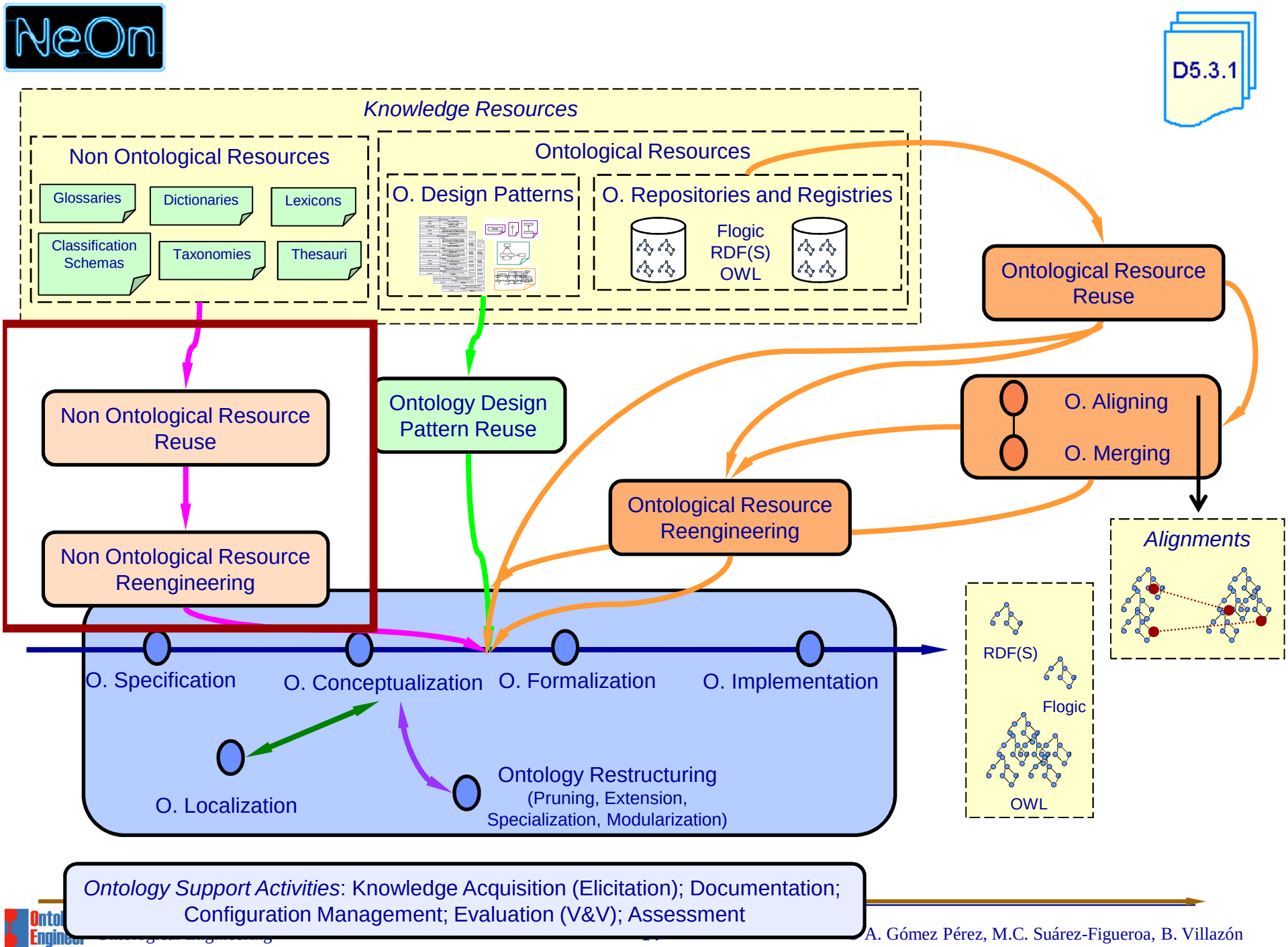
- *We select the most appropriate standards and taxonomies for:*
  - Occupation Classification
    ISCO-88 (COM), SOC, ISCO-88, ONET, Eures Taxonomy.
  - Classification of Economic Activities
    ISIC Rev. 3.1, NACE Rev. 1.1, NAICS
  - Apprenticeship classifications
    ISCED 97, FOET
  - Currency Classification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

Assessment activity: Matching terminology from Competency Questions against the Standards

Reuse and Reengineering + Waterfall

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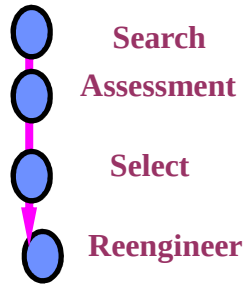
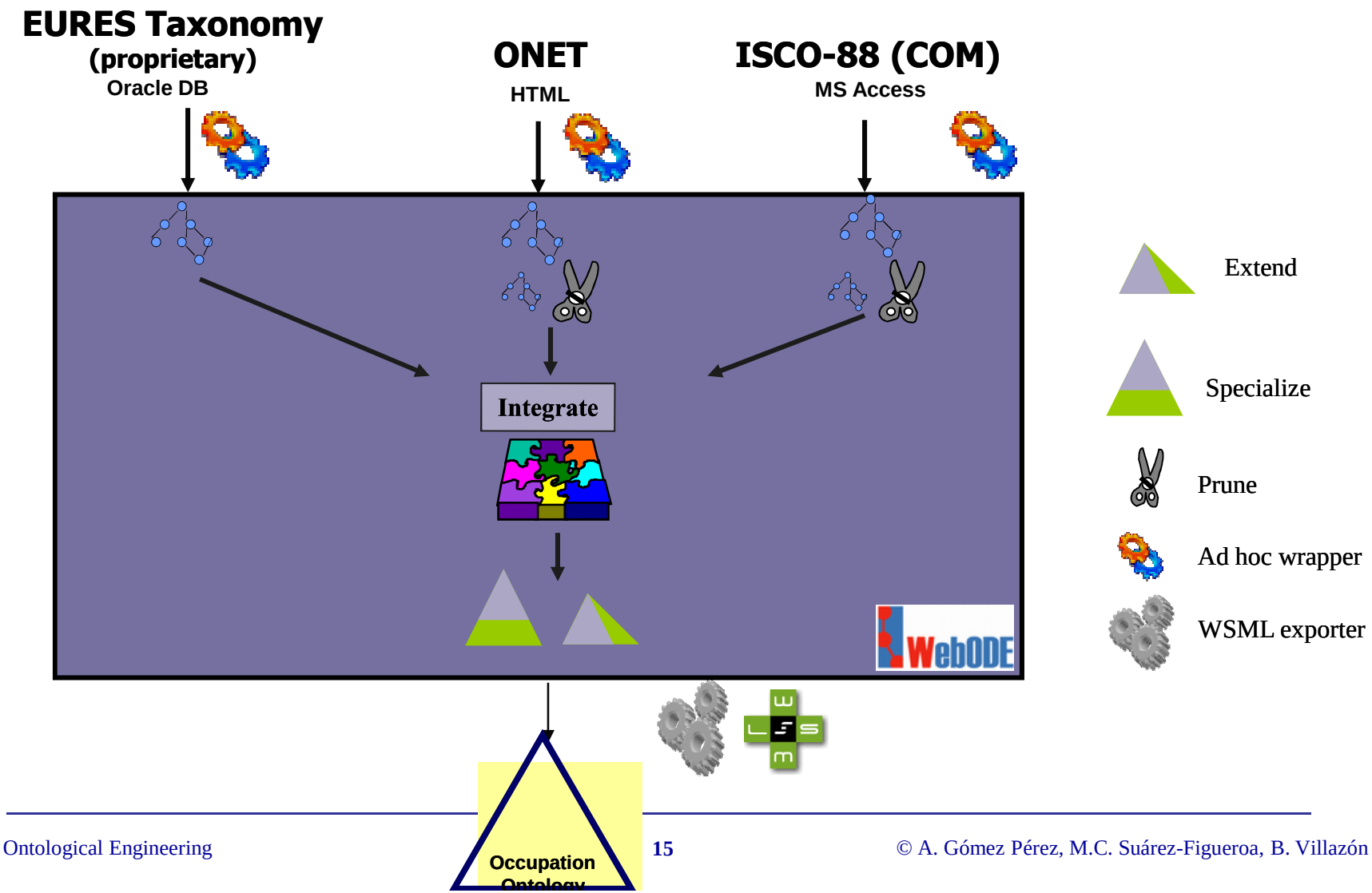
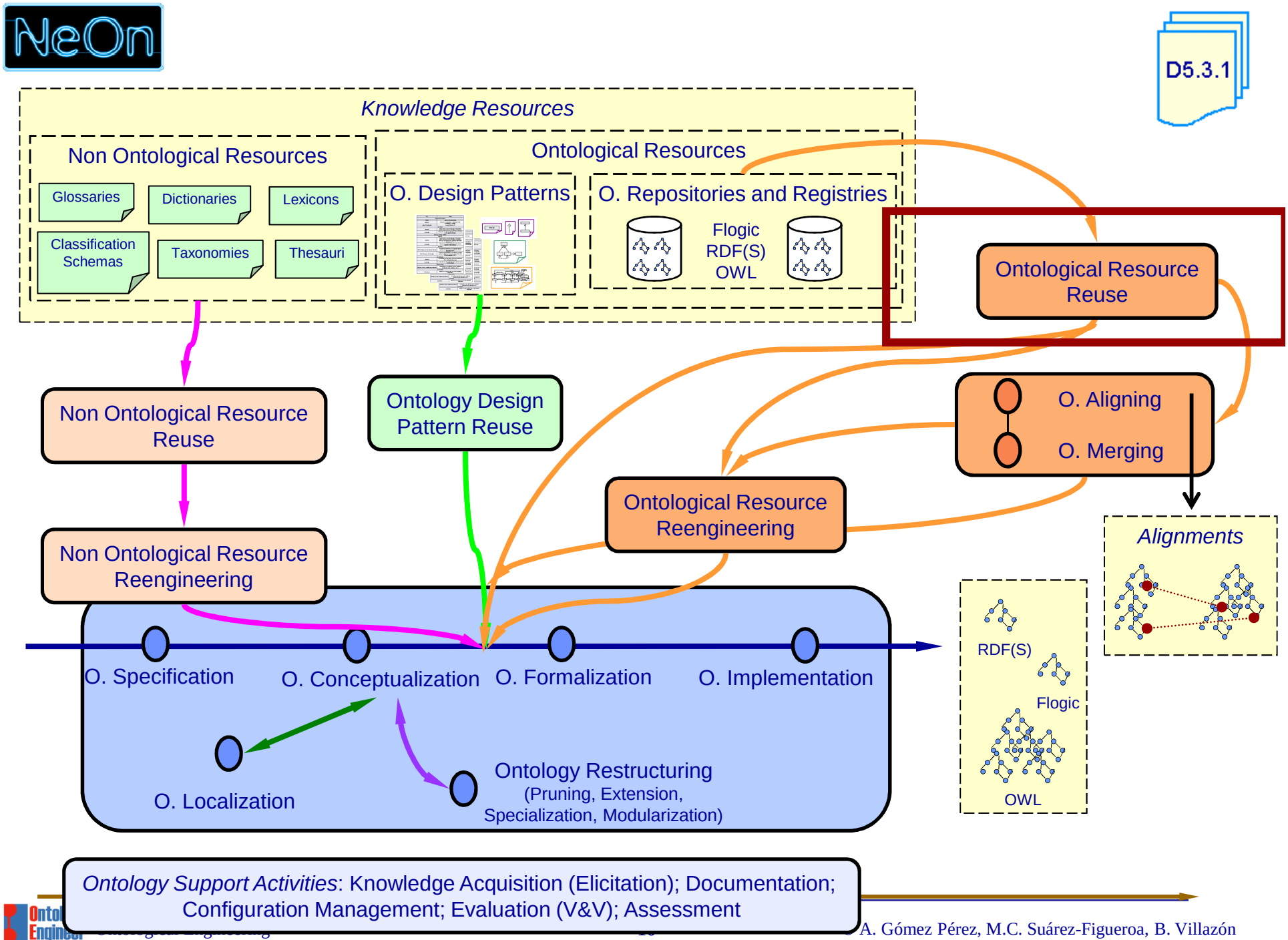
Reengineering resources



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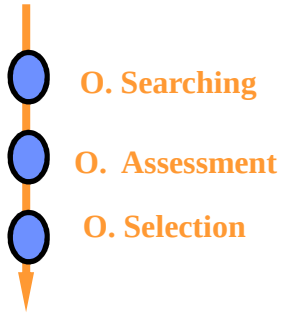
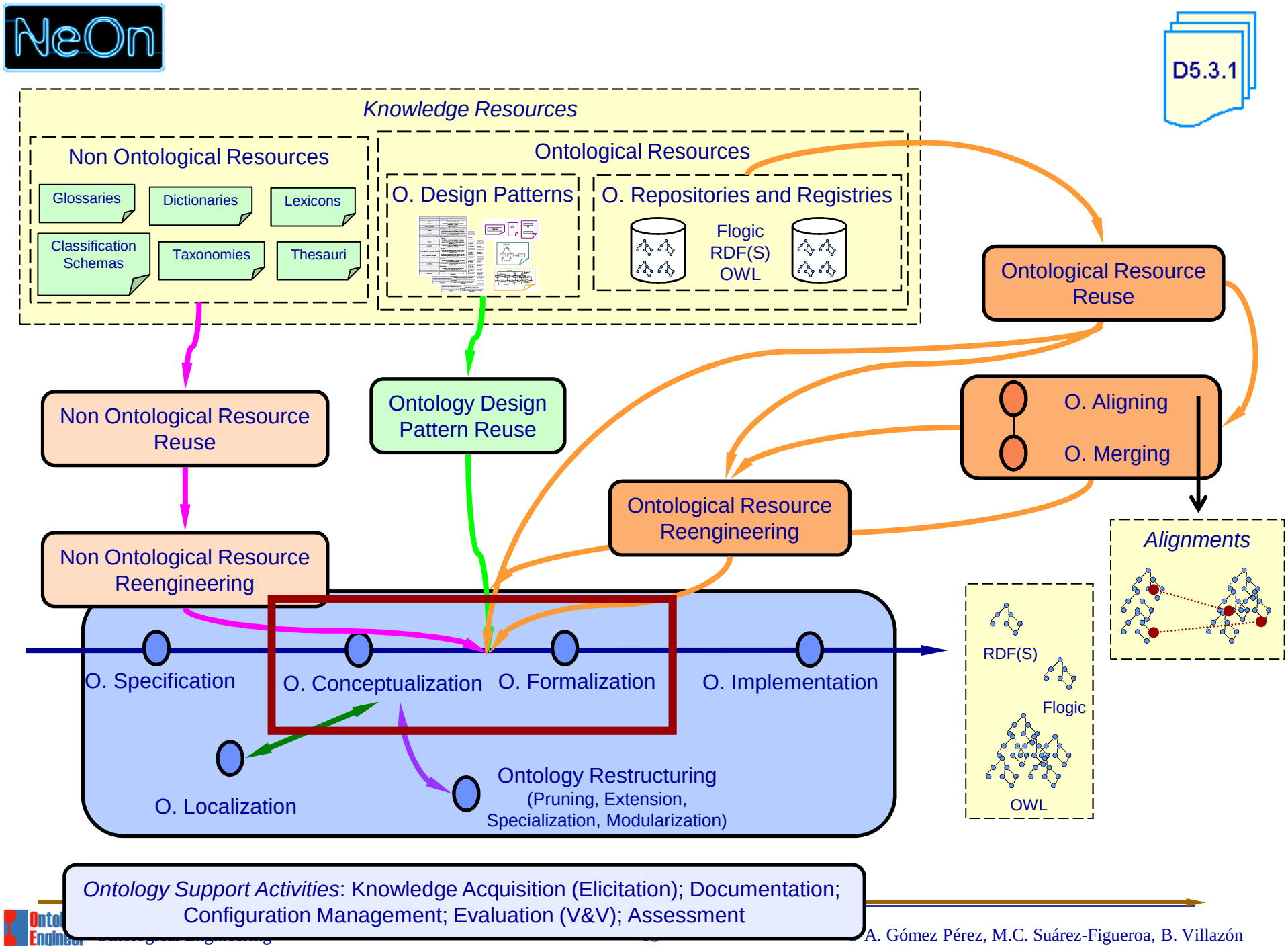
The Time Ontology Selection



	Cyc's Upper Ontology	Unrestricted Time Ontology	Simple Time Ontology	Reusable Time Ontology	Kestrel Time Ontology	SRI's Time Ontolog	SUMO Time Ontology	DAML Time Ontology	AKT Time Ontology
Time Points	☑				☑	☑	☑	☑	☑
Time Interval			☑	☑				☑	☑
Absolute and Relative Time					☑		☑	☑	
Relations between time intervals				☑				☑	
Convex and non convex intervals				☑			☑	☑	
Distinction between open and close intervals								☑	
Explicit modeling of proper intervals								☑	
Concatenation of intervals	☑					☑	☑	☑	☑
Different temporal granularities		☑	☑	☑			☑	☑	
Provides axioms									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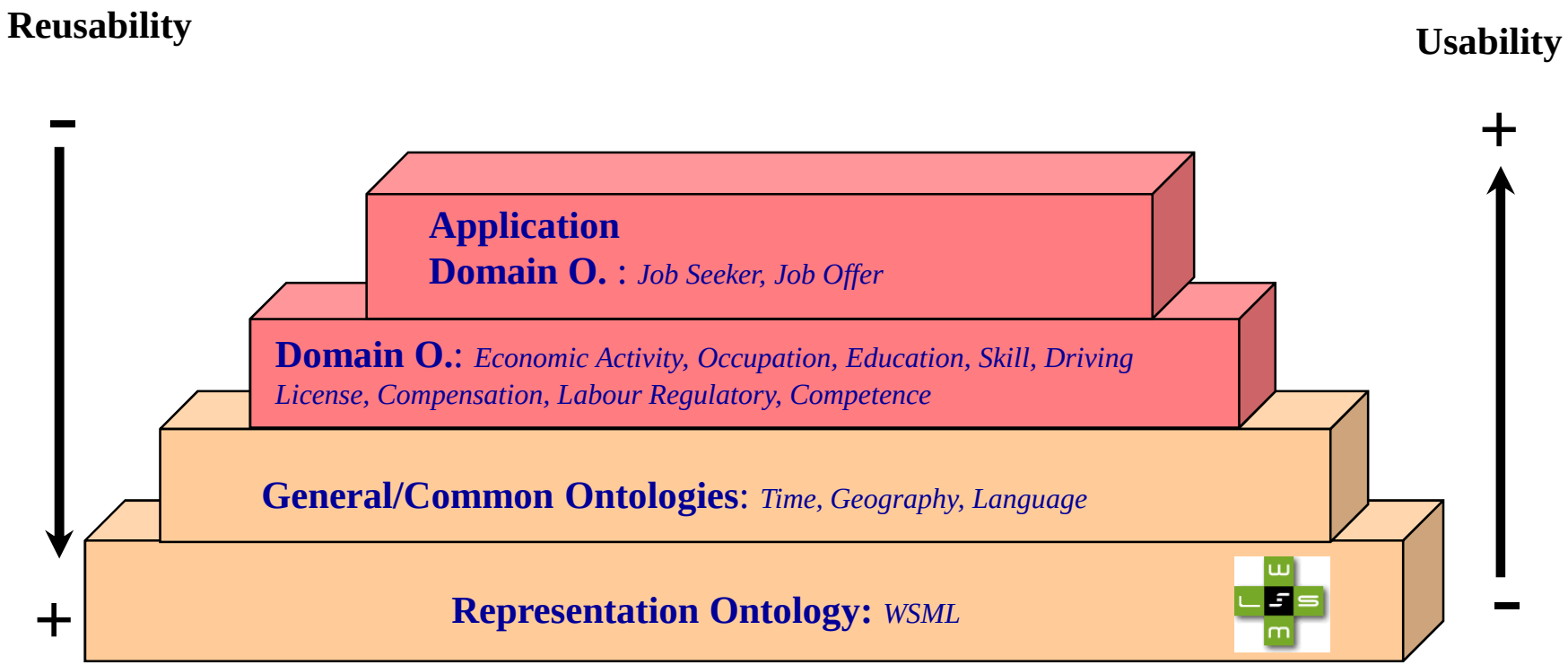
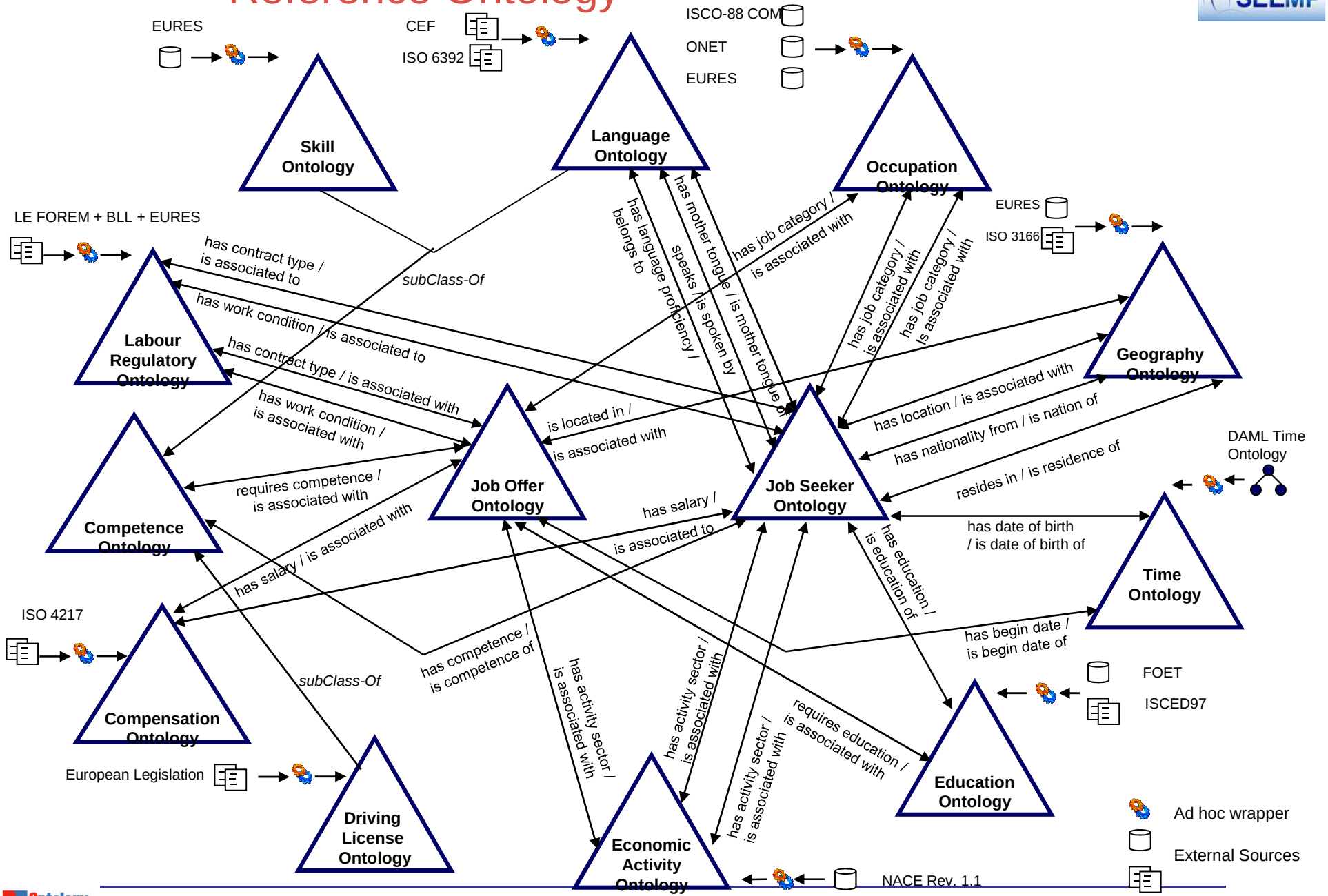
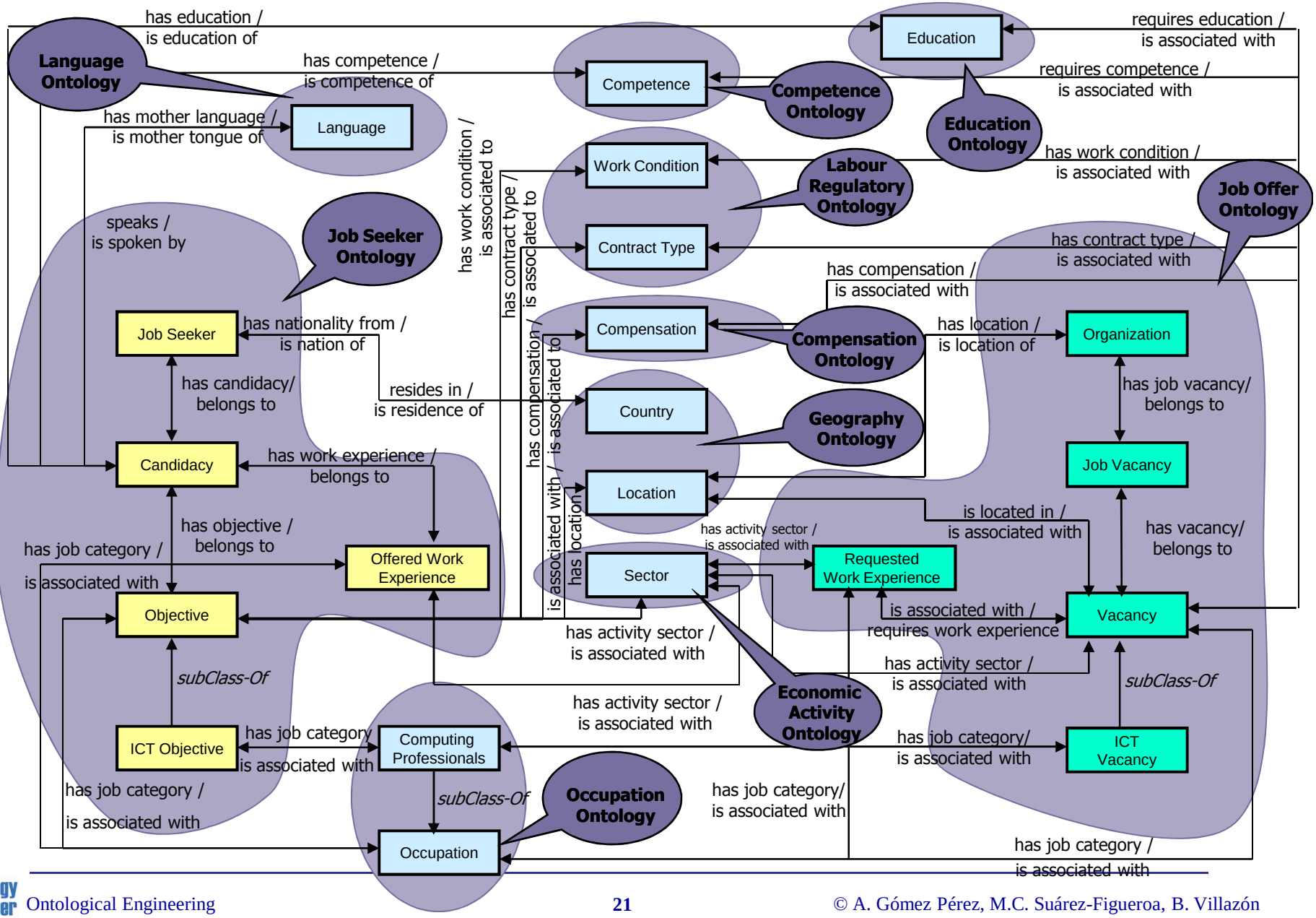
Conceptualization:
Modular approach for ontology construction

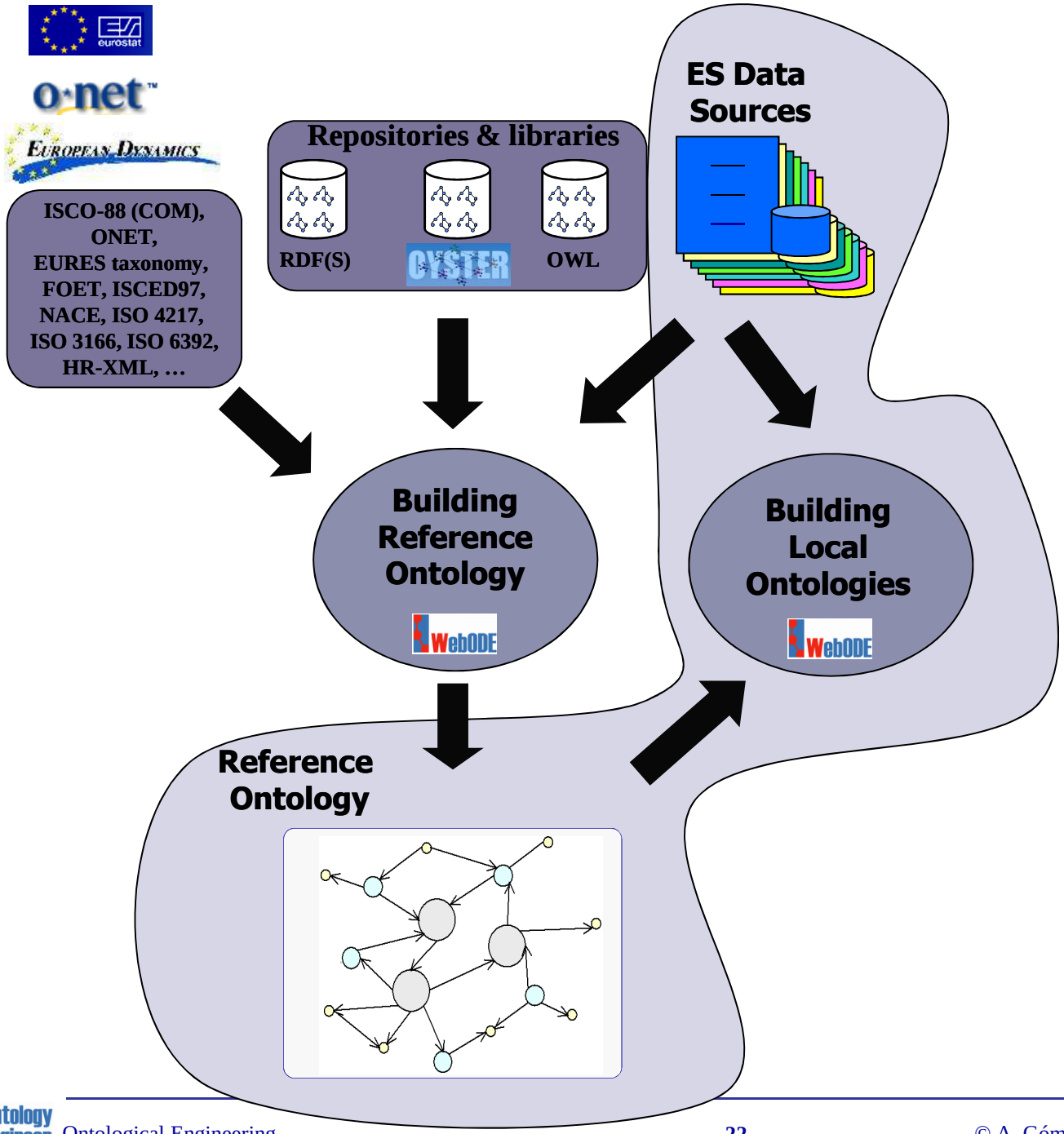


Reference Ontology



Details of the ontology

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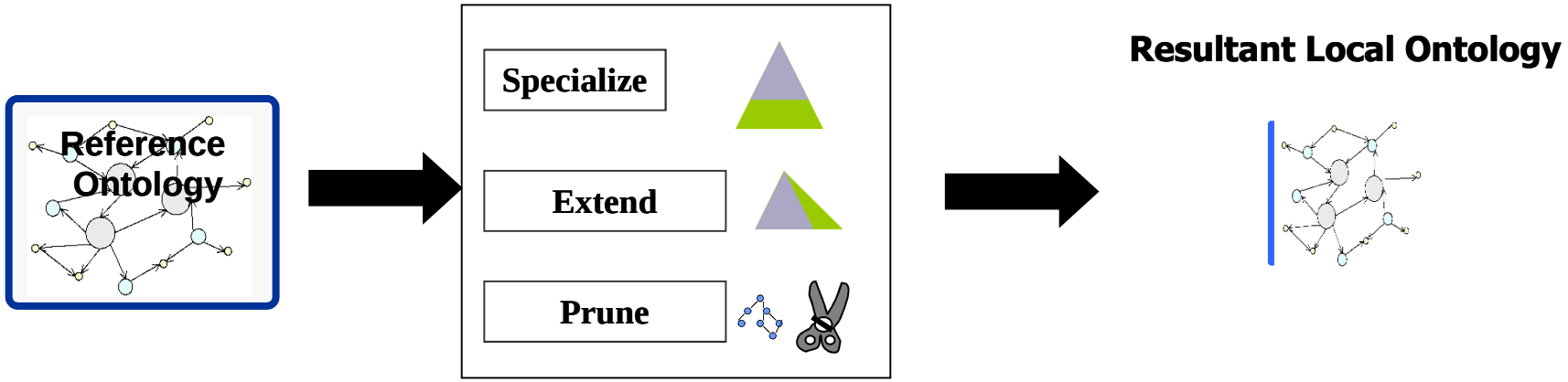
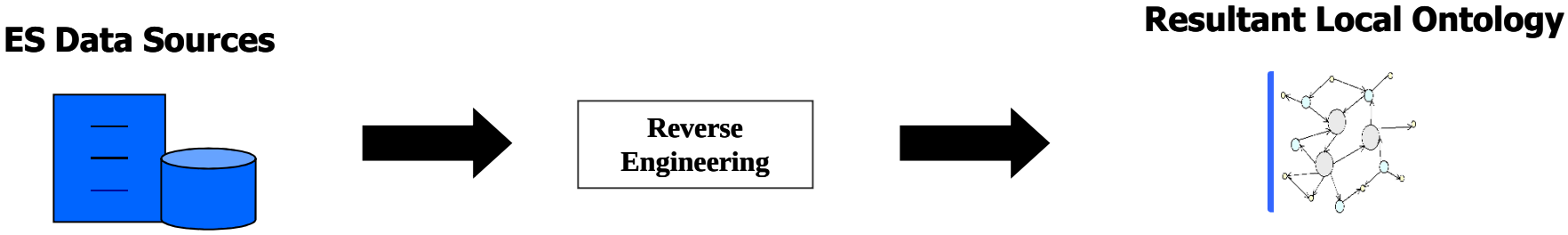
Building Reference Ontology
WebODE
Building Local Ontologies
WebODE
Reference Ontology

Local Ontologies Building Process

- Option 1: *Building Local Ontologies from the Reference Ontology.*



- Option 2: *Building Local Ontologies as a reverse engineering process from ES Data Sources.*



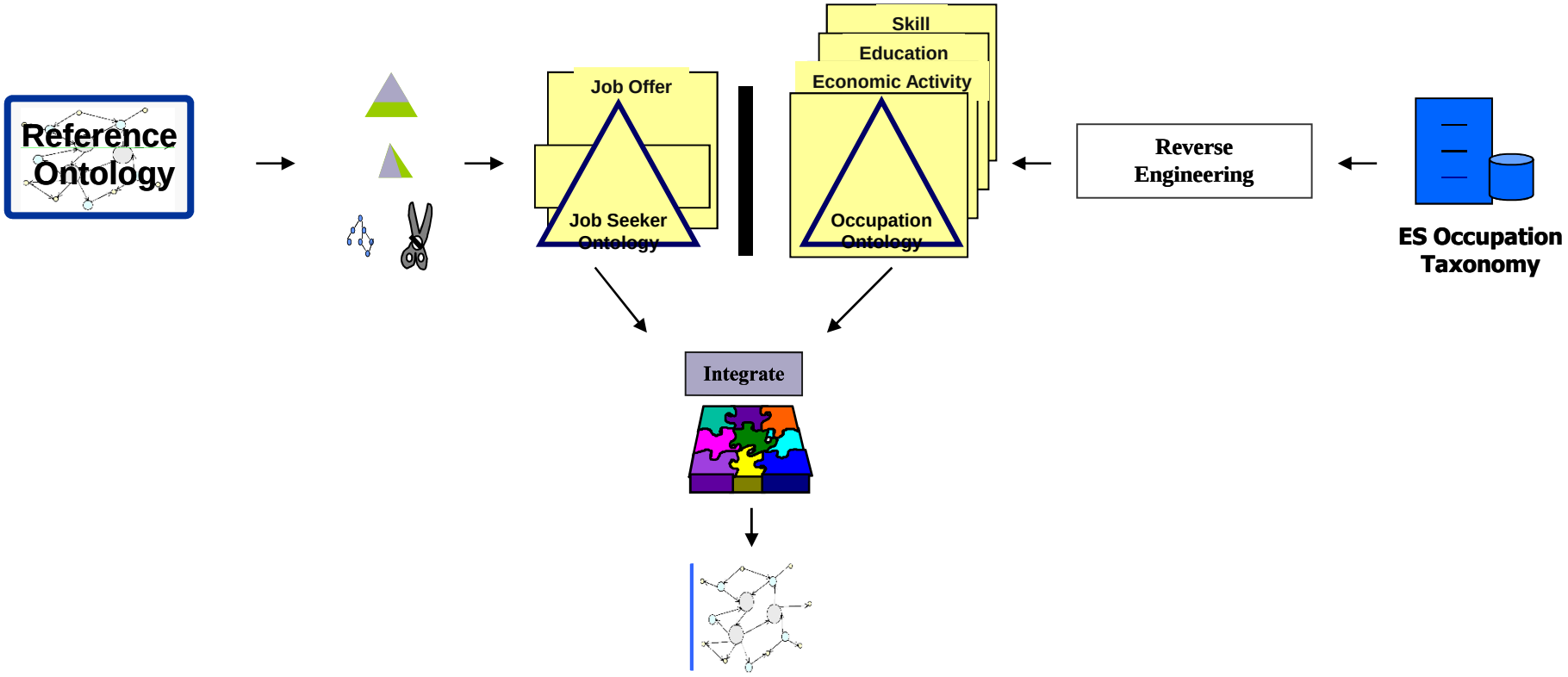
Which option is the most appropriate for the use

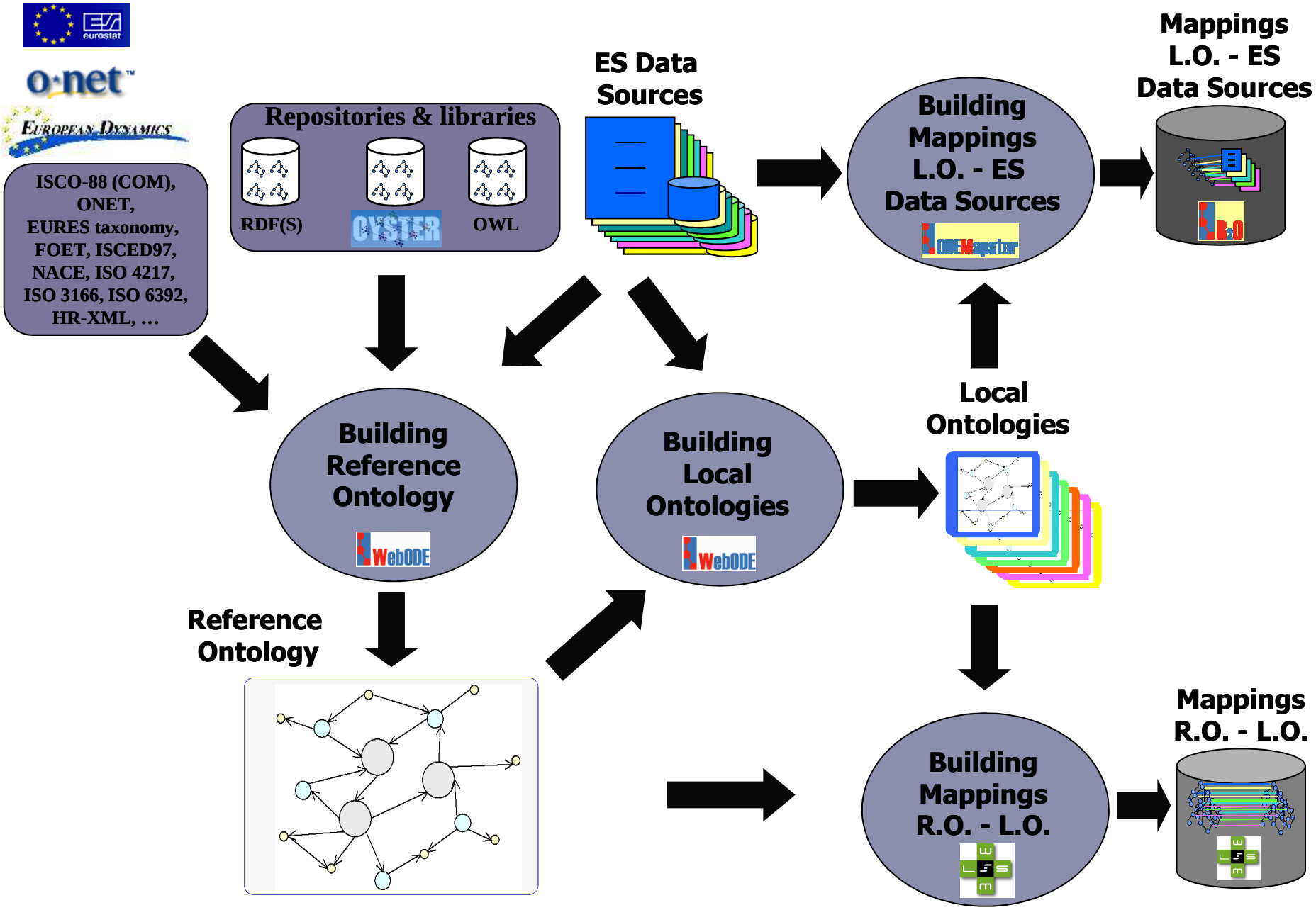
	Option 1: Building Local Ontologies from the Reference Ontology.	Option 2: Building Local Ontologies as a reverse engineering process from ES Data Sources.
Mappings between Local Ontologies and Reference Ontology	Mappings are not complex. They use the same terms.	Complex mappings due to terminology heterogeneity.
Mappings between Local Ontologies and ES schema sources	Complex mappings due to terminology and structural heterogeneity.	Mappings are not complex. They use the same terms.
Building process	Structured/guided by the architecture of the Reference Ontology and scoped with applications needs.	Requires more sophistication of knowledge engineering and good acquaintance of all the data and their structures of the application.
Changes in the Reference Ontology	Imply changes in · the mappings between local and reference ontologies. · the mappings between the local ontologies and the ES schema sources. · the Local Ontology.	Imply changes in · the mappings between Local Ontologies and the Reference Ontology.
Changes in the ES schema sources	Imply changes in · its Local Ontology (probably the part that is not a mirror of the Reference Ontology). · the mappings between Local Ontologies and ES schema sources. · in the mappings between Local Ontology and the Reference Ontology.	Imply changes in · the Local Ontologies. · in mappings between ES sources and Local Ontologies. · mappings between local and the Reference Ontology.

Approach followed by SEEMP for building Local Ontologies

A hybrid approach

- Option 1 for Job Seeker and Job Offer Ontologies
- Option 2 for Occupation, Education, etc.

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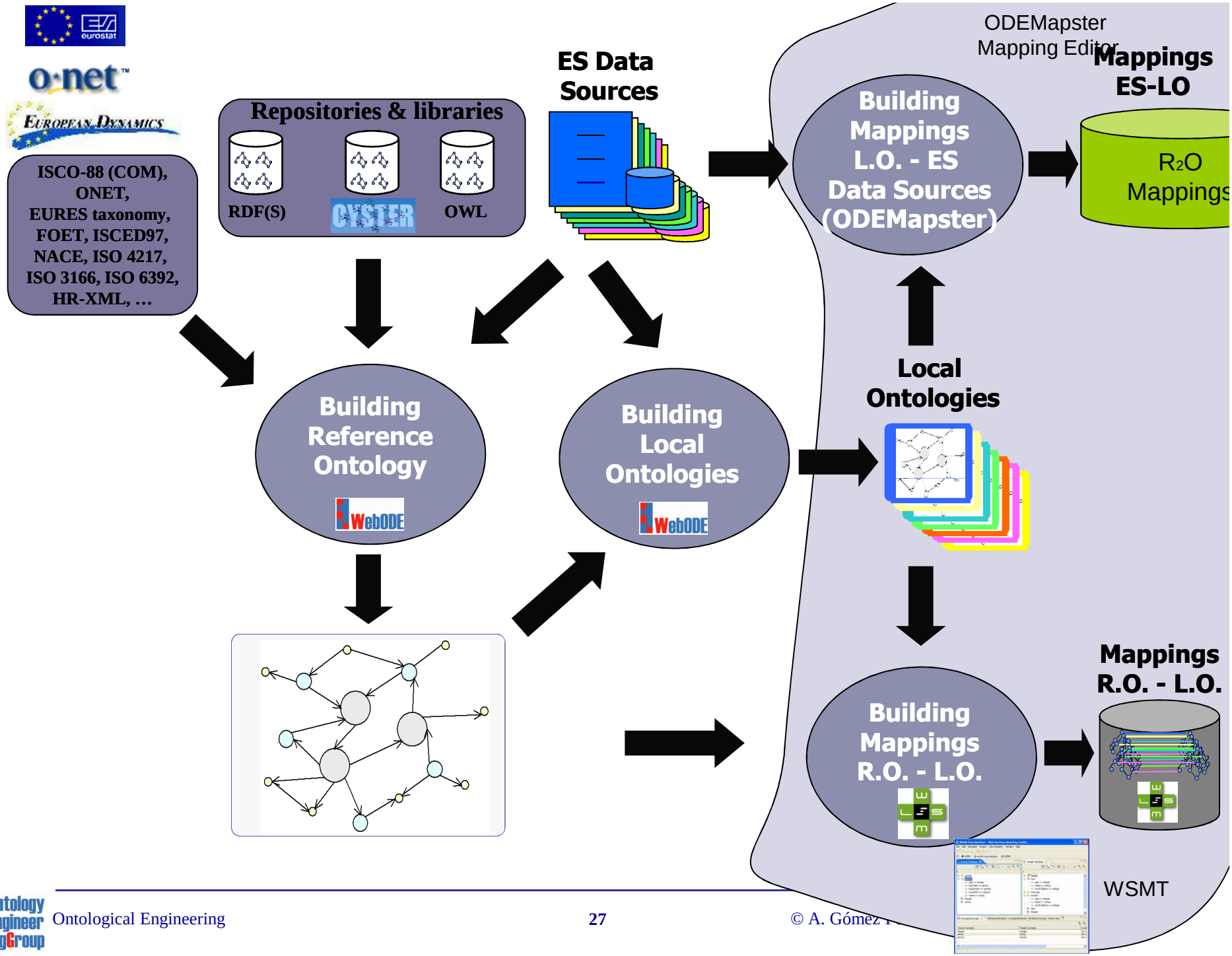
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R2O Mappings
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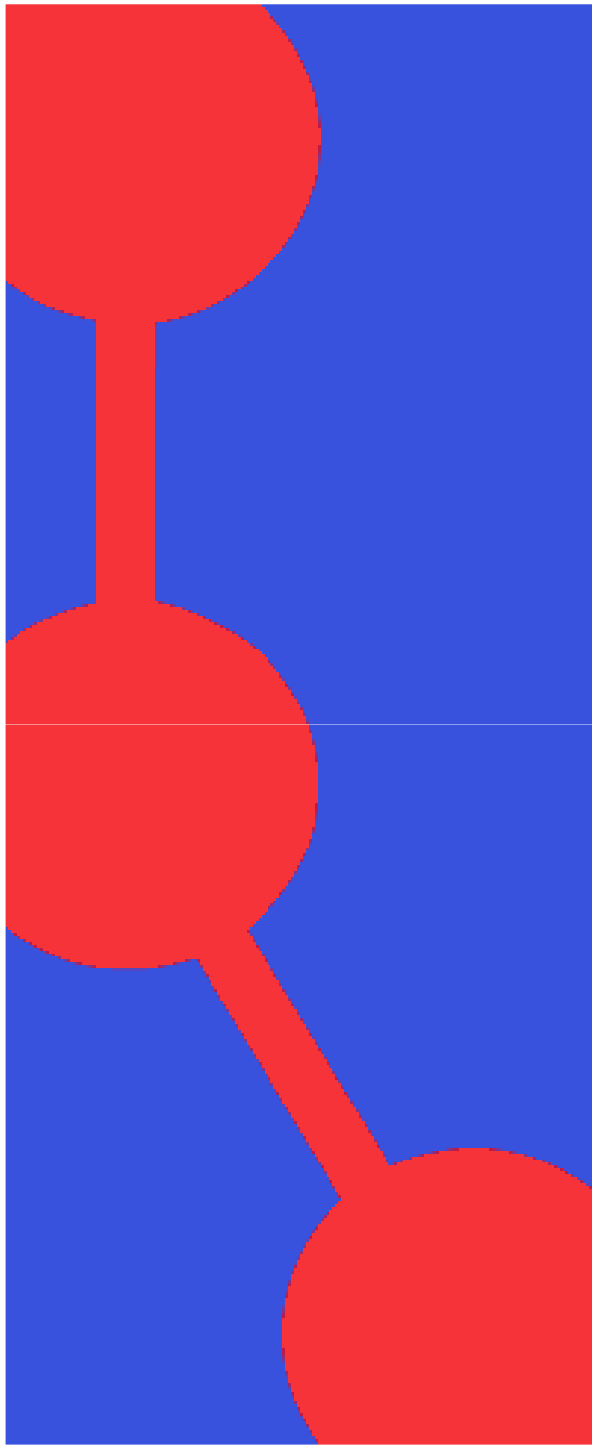
Mappings R.O. - L.O.
WSMT



SEEMP
Single European Employment Market-Place

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