



# NeOn Methodology for Building Ontology Networks

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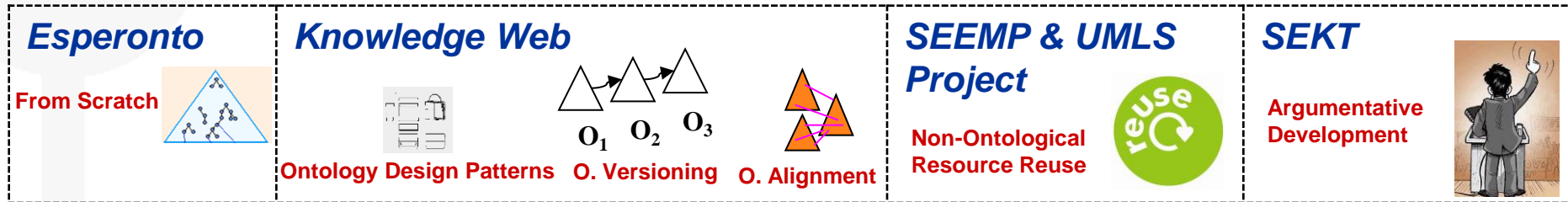
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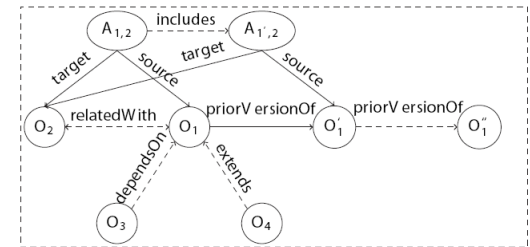
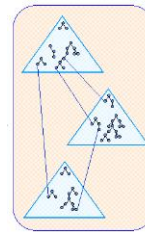
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# New Trend in Ontology Development

The development of ontologies in different international and national projects have revealed that **there are different alternative ways to build ontologies**.



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.



Thus, it is not premature to affirm that a **new trend in ontology development is starting**, whose emphasis is on the **reuse and possible subsequent reengineering of knowledge-aware resources**, the **collaborative and argumentative ontology development**, and the **building of ontology networks**.

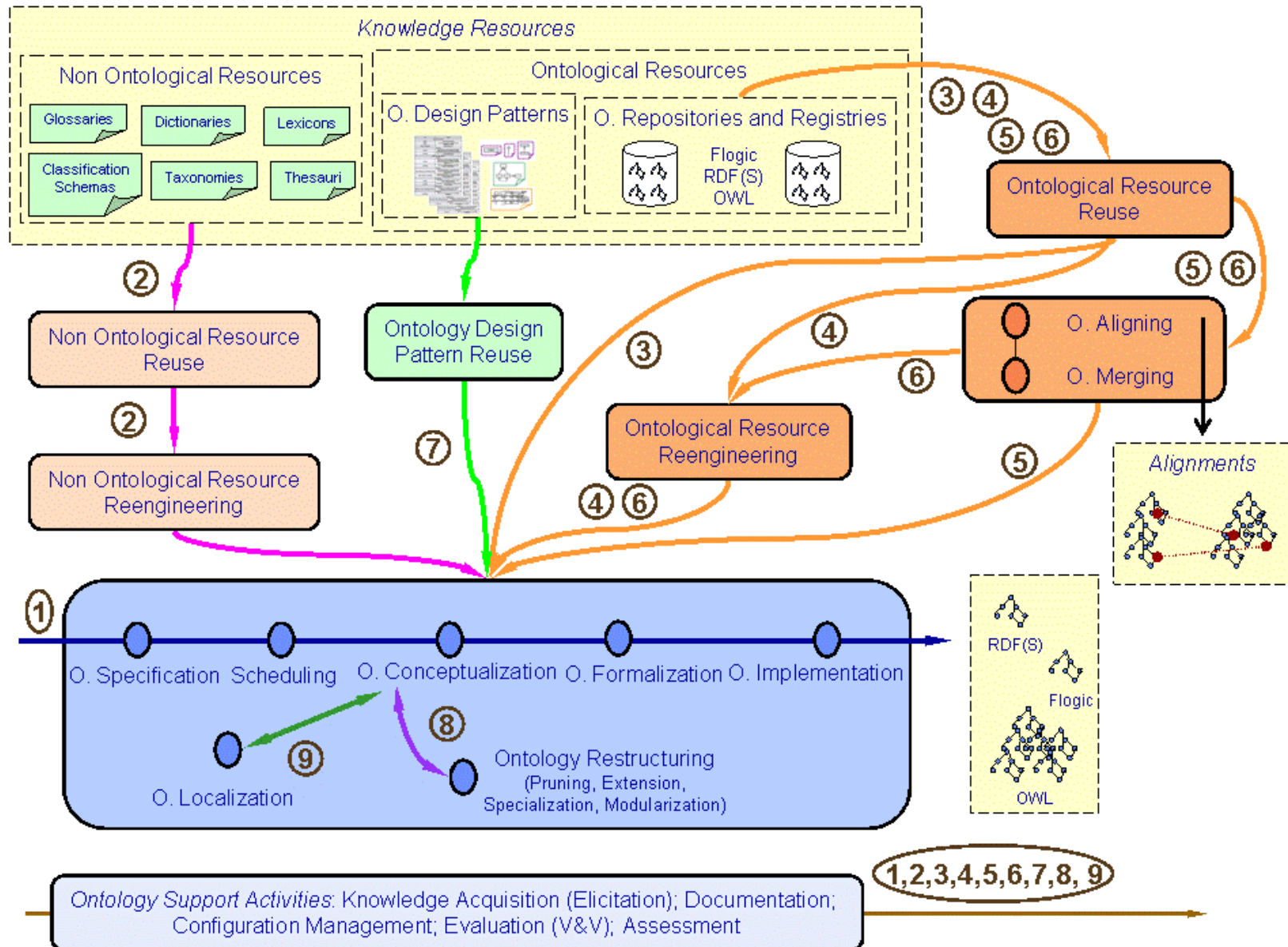
# Our Aim: The NeOn Methodology Framework

To create the ***NeOn Methodology for Building Ontology Networks*** to support both the collaborative aspects of ontology development and the reuse and dynamic evolution of networked ontologies.

We have identified a set of ***nine scenarios for building ontologies and ontology networks***

- ☐ emphasizing the reuse of existing knowledge resources (ontological and non-ontological),
- ☐ generalizing from previous experiences,
- ☐ covering the drawbacks of the existing methodologies, and
- ☐ taking into account the new trends based on collaboration, context and dynamism.

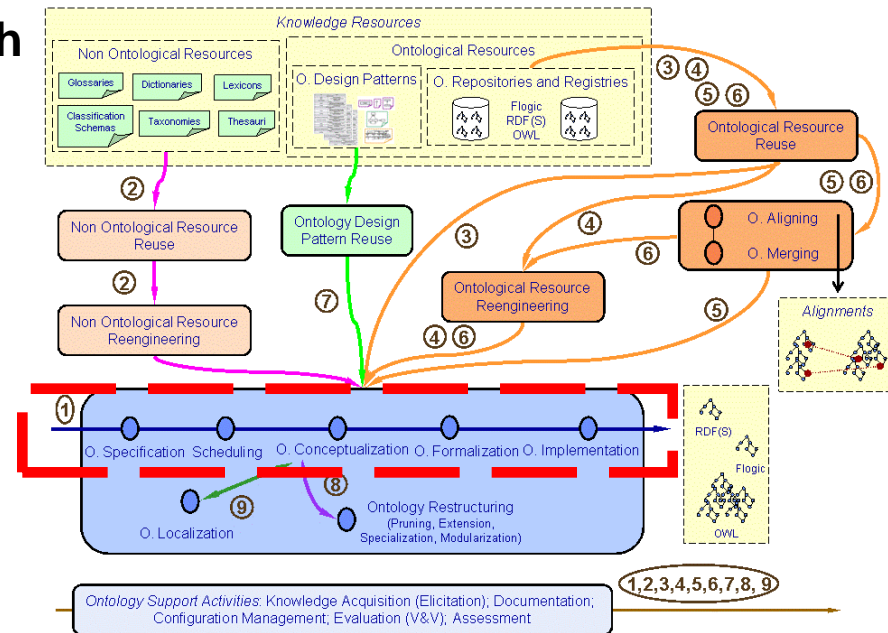
# 9 Scenarios for Building Ontology Networks



# Scenario 1: From Specification to Implementation

## Develop the ontology network from scratch

- ❑ **Ontology requirements specification activity**, whose objective of this activity is to output the ontology requirements specification document (ORSD).
- ❑ A *quick search* for knowledge-aware resources using the terms appearing in the ORSD as input. The search results allow knowing which types of resources are available for a possible reuse during the ontology network development.
- ❑ **Scheduling activity** using the ORSD and the results of the quick search.
- ❑ After this activity, the ontology developers should carry out the **ontology conceptualization**, the **ontology formalization**, and the **ontology implementation activities** following METHONTOLOGY or On-To-Knowledge.



# Reusing existing non-ontological resources (NOR) for speeding up the ontology building process

- to search non-ontological resources,
- to assess the set of candidate non-ontological resources, and
- to select the most appropriate non-ontological resources.

The diagram illustrates the Ontology Engineering Process, showing the flow from Knowledge Resources to Ontology Implementation and Restructuring, with feedback loops for Reuse and Reengineering.

**Knowledge Resources** are categorized into:

- Non Ontological Resources:** Glossaries, Dictionaries, Lexicons, Classification Schemas, Taxonomies, Thesauri.
- Ontological Resources:**
  - O. Design Patterns: Represented by a diagram of a design pattern.
  - O. Repositories and Registries: Represented by icons of storage containers.

The process flow is as follows:

- O. Specification** (1): Initial step.
- Scheduling** (2): Planning the process.
- O. Conceptualization** (3): Defining the ontology's concepts.
- O. Formalization** (4): Defining the ontology's structure.
- O. Implementation** (5): Implementing the ontology.
- Ontology Restructuring (Pruning, Extension, Specialization, Modularization)** (6): Modifying the ontology.
- O. Localization** (7): Adapting the ontology to a specific context.
- Alignments** (8): Comparing the ontology with other ontologies.

**Feedback and Reuse Mechanisms:**

- Non Ontological Resource Reuse** (2): Reusing non-ontological resources.
- Non Ontological Resource Reengineering** (2): Reengineering non-ontological resources.
- Ontology Design Pattern Reuse** (7): Reusing design patterns.
- Ontological Resource Reengineering** (4, 6): Reengineering ontological resources.
- Ontological Resource Reuse** (3, 4, 5, 6): Reusing ontological resources.
- O. Aligning** (5): Aligning the ontology with other ontologies.
- O. Merging** (5): Merging the ontology with other ontologies.

**Ontology Support Activities:** Knowledge Acquisition (Elicitation); Documentation; Configuration Management; Evaluation (V&V); Assessment.

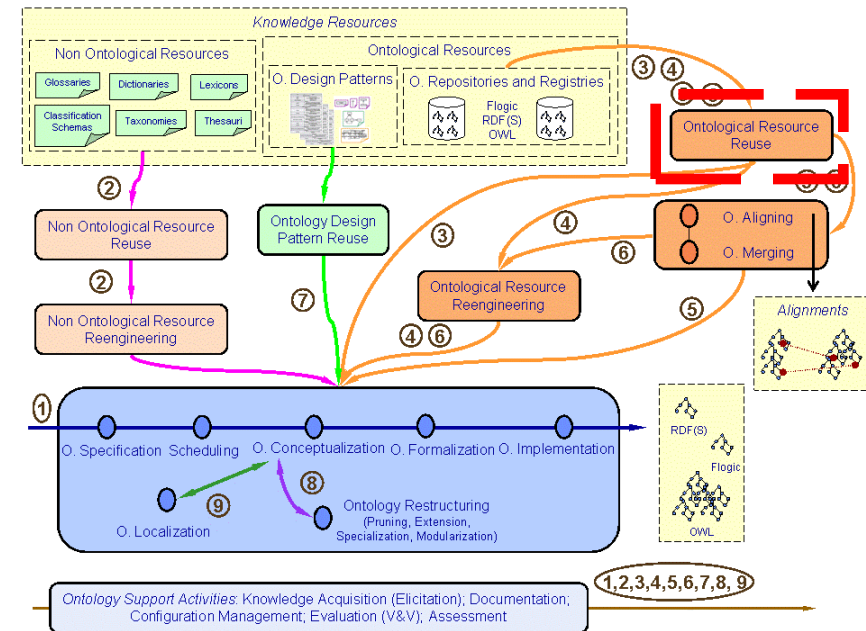


# Scenario 3: Reusing Ontological Resources

Use existing ontological resources for building ontology networks

Different **ways of reusing ontological resources**:

- ontologies can be reused as a *whole*;
- only one part or *module* can be reused; and
- *ontology statements* can be reused.



For **integrating the ontological resources to be reused**, ontology developers can decide:

- ❑ to reuse them such as they are in the ontology network being developed following the activities of Scenario 1
- ❑ to perform a re-engineering process following Scenario 4
- ❑ to merge several ontological resources to obtain a new ontological resource following Scenarios 5 or 6.

# Scenario 4: Reusing and Re-engineering Ontological Resources

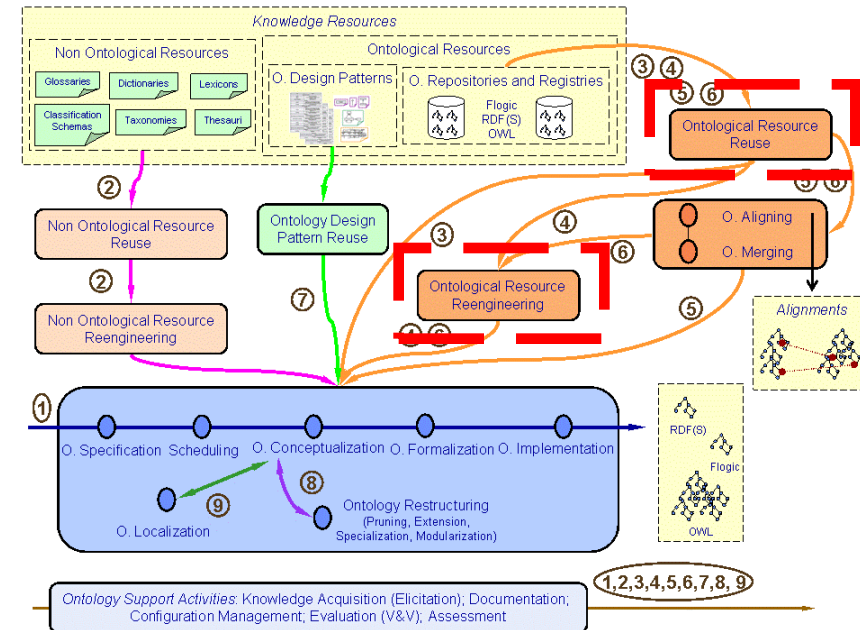
Reuse existing ontological resources and re-engineer them before their integration in the ontology network.

The **ontological resource re-engineering process** is composed of the following activities:

- *ontological resource reverse engineering*
- *ontological resource restructuring*
- *ontological resource forward engineering*.

These activities might be carried out at four different levels, depending on the needs of each particular case:

- ❑ at the specification level,
- ❑ at the conceptualization level,
- ❑ at the formalization level, and
- ❑ at the implementation level.



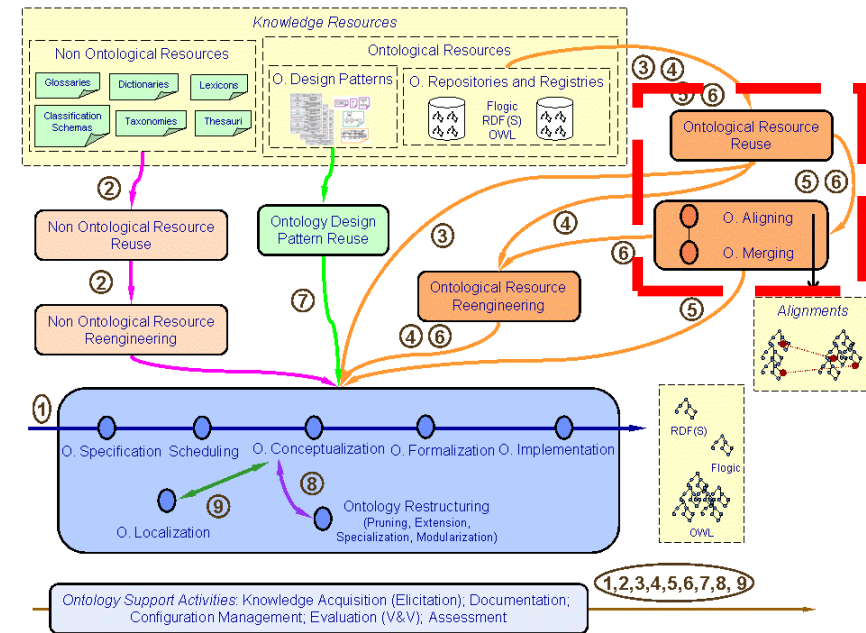


# Scenario 5: Reusing and Merging Ontological Resources

Reuse and merge existing ontological resources in the development of the ontology network.

First, ontology developers should carry out the **ontology aligning activity** and obtain a set of alignments among the selected ontological resources.

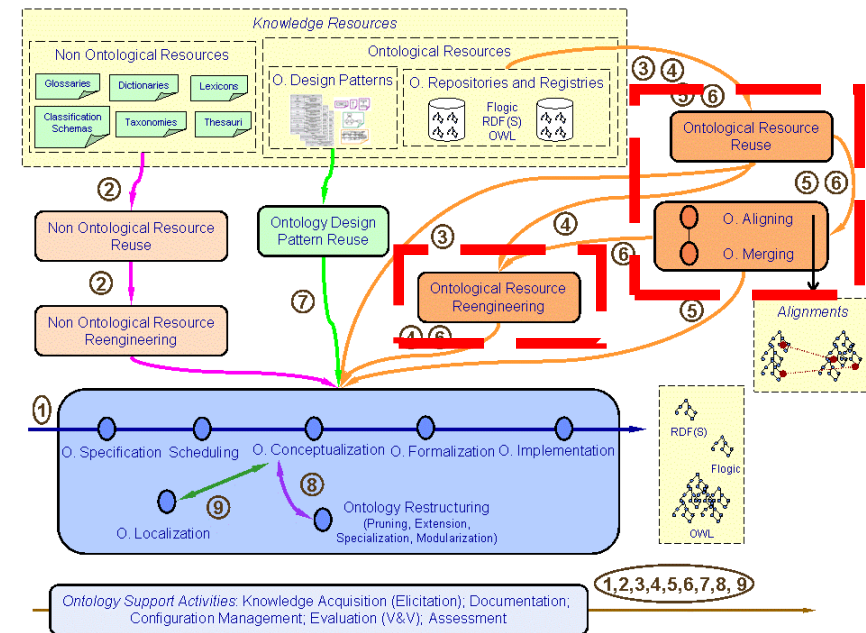
Once the ontology alignments have been established, ontology developers can **merge** the ontological resources using such alignments to obtain a new ontological resource.



# Scenario 6: Reusing, merging and re-engineering ontological resources

Ontology developers reuse, merge, and re-engineer existing ontological resources in the ontology network building.

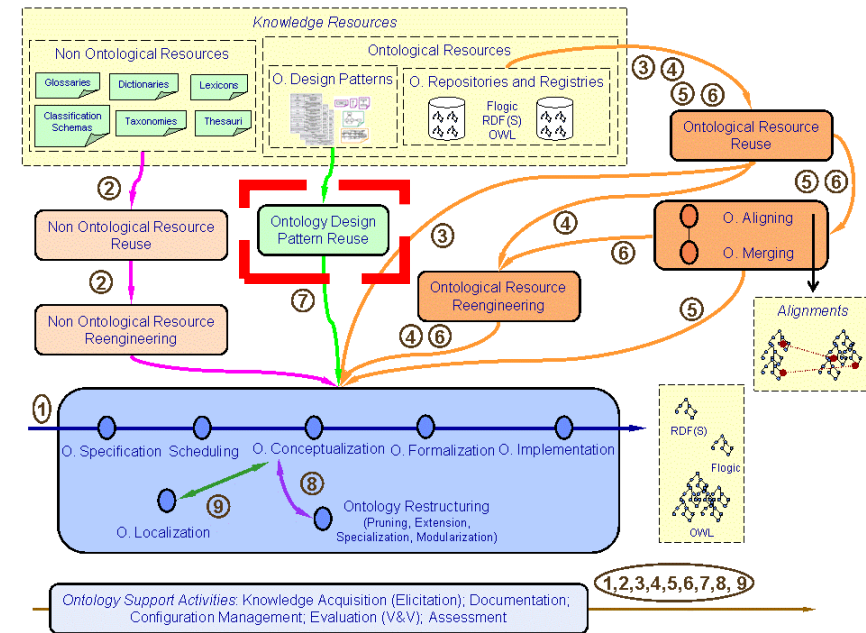
This scenario has the same sequence of activities as Scenario 5; however, here ontology developers can decide not to use the set of merged ontological resource such as it is, but to *re-engineer* it.



# Scenario 7: Reusing ontology design patterns

Access ODPs repositories to **reuse ODPs** for different purposes:

- to reduce modeling difficulties,
- to speed up the modeling process, or
- to check the adequacy of modeling decisions



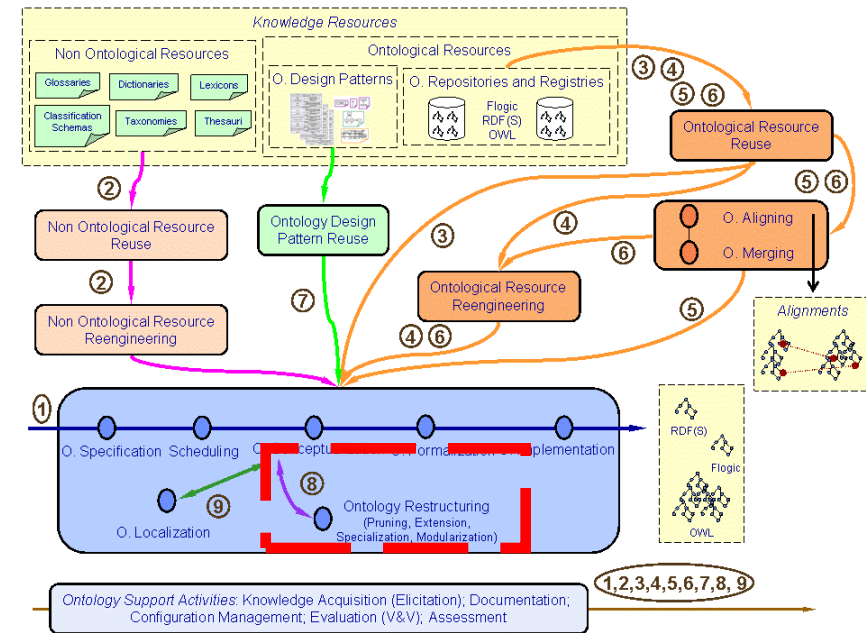
<http://ontologydesignpatterns.org>

## Scenario 8: Restructuring ontological resources

**Restructure ontological resources to be integrated in the ontology network being built.**

The **ontology restructuring activity** can be performed in the following ways:

- ❑ modularizing the ontology in different ontology modules;
- ❑ pruning the branches of the taxonomy not considered necessary;
- ❑ extending the ontology including (in width) new concepts and relations; and
- ❑ specializing those branches that require more granularity and including more specialized domain concepts and relations.

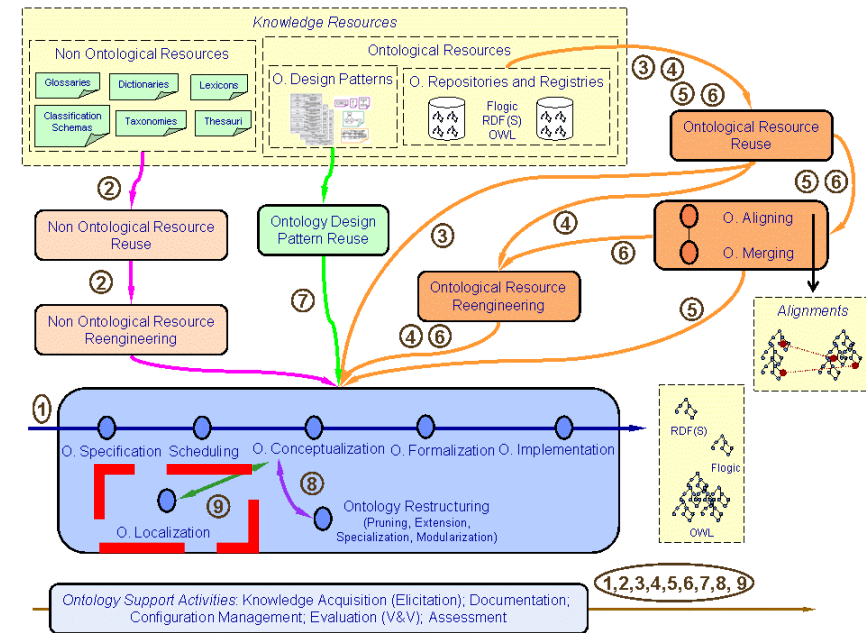


## Scenario 9: Localizing ontological resources

Ontology developers adapt an existing ontology to one or various languages and culture communities, obtaining as a result a multilingual ontology.

Once the ontology has been conceptualized, its **adaptation to a particular natural language** different from the language used in the conceptualization can be required.

Such an adaptation requires the **translation** of all ontology labels into one or several natural languages, being these languages other than the original language of the conceptualization.



# 9 Scenarios for Building Ontology Networks

In the framework of the NeOn Methodology there are *prescriptive methodological guidelines for carrying out processes and activities* involved in

- Scenario 1 (ontology requirements specification and scheduling),
- Scenario 2,
- Scenario 3,
- Scenario 7,
- Scenario 8 (ontology modularization), and
- Scenario 9; and also
- for ontology evaluation and ontology evolution.