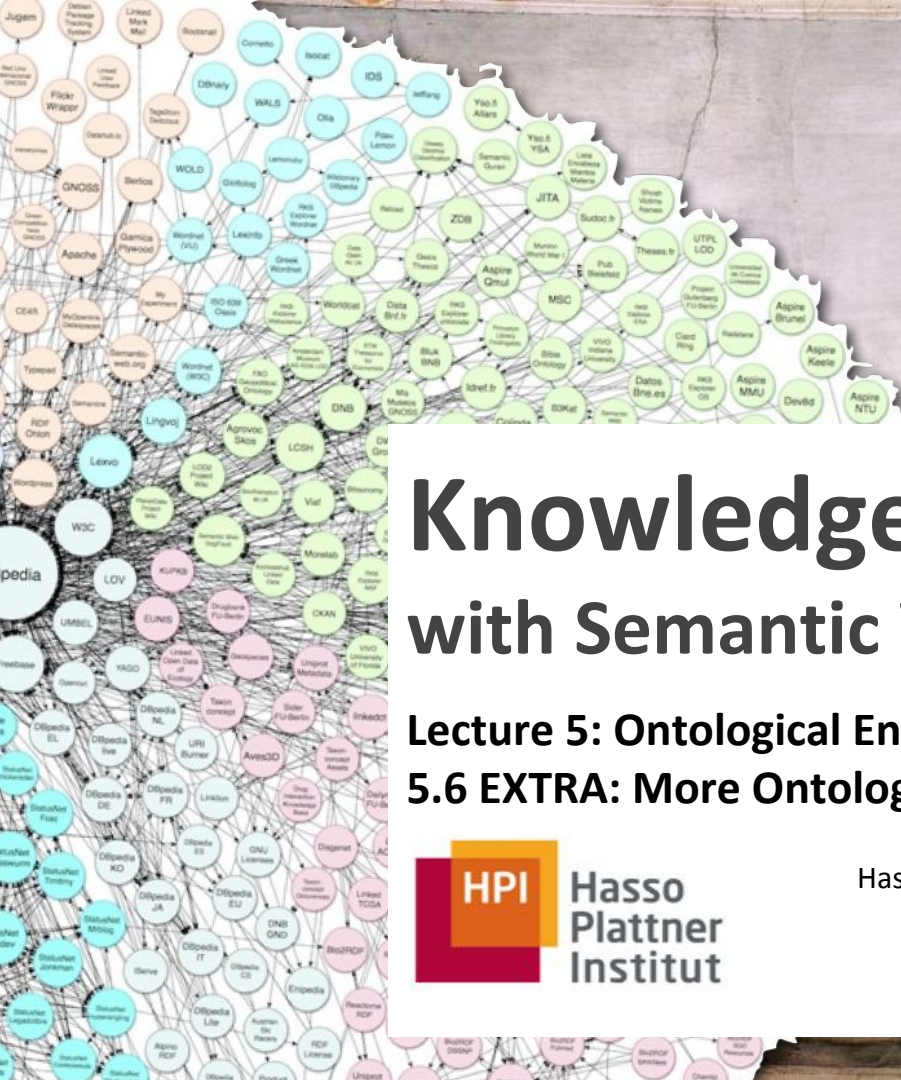




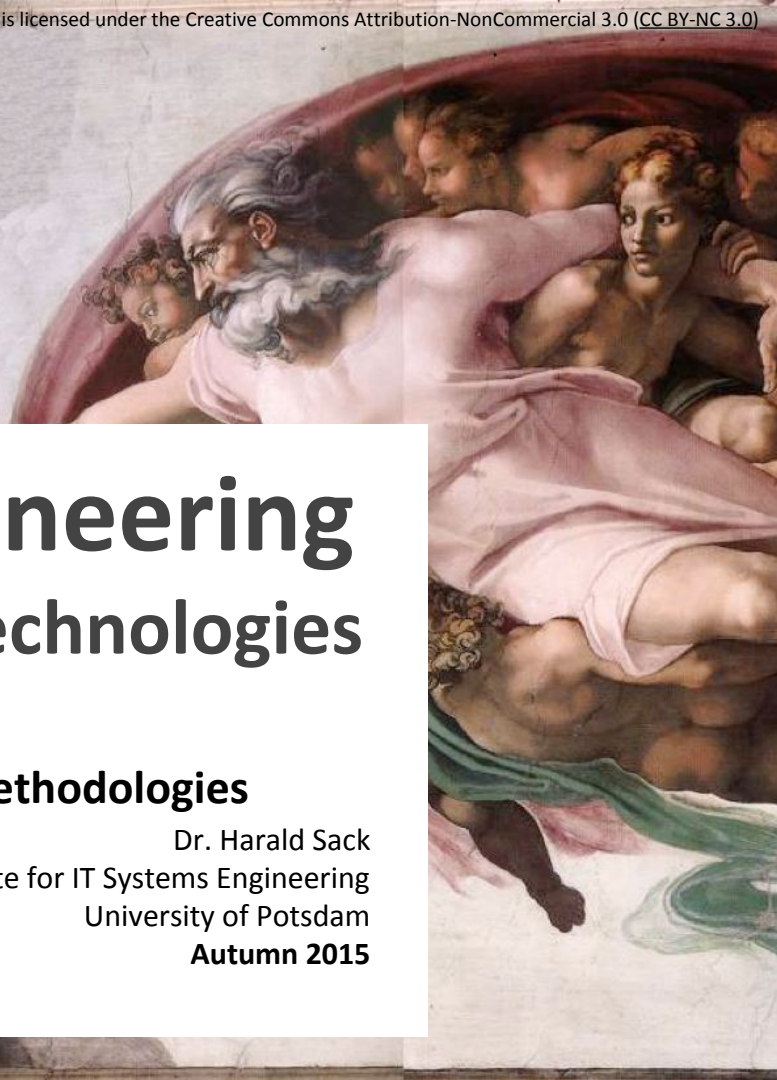
Knowledge Engineering with Semantic Web Technologies

Lecture 5: Ontological Engineering

5.6 EXTRA: More Ontology Design Methodologies



Dr. Harald Sack
Hasso Plattner Institute for IT Systems Engineering
University of Potsdam
Autumn 2015



The Ontology Development Process

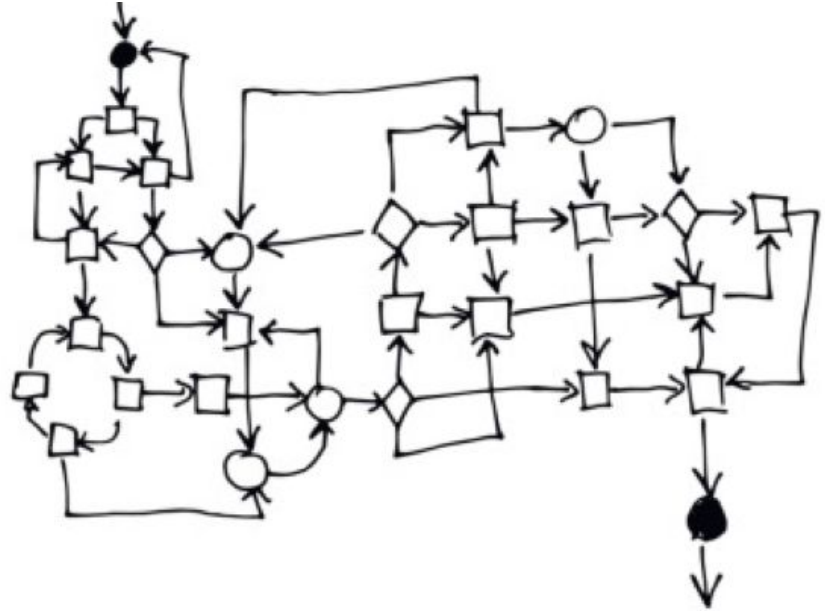
Ontology design methodologies already studied:

- Ontology 101

new ontology design methodologies:

- UPON
- Ontology Design Patterns

SOMETHING



**Great
Ontology**



Unified Process for Ontology Building

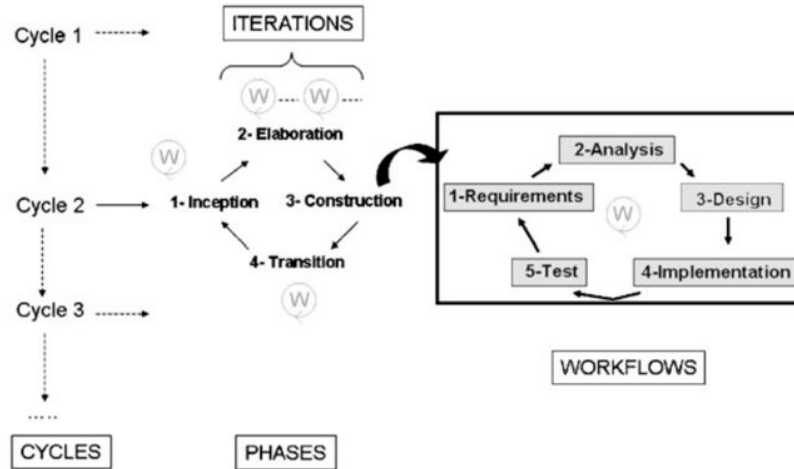
De Nicola, Missikoff, Navigli (2005)

- Based on **Unified Process** (UP) methodology in software development and **Unified Modelling Language** (UML)
- Use-Case driven, i.e. more suitable for **application ontologies** than for domain ontologies
- **Goals:**
 - **Reduction of time and cost** in the development of large scale ontologies
 - **Quality improvement** of the developed ontology via progressive validation of intermediate results
 - Methodology for **efficient collaboration** of Knowledge Engineers and Domain Experts with clear separation of roles
 - Intermediate results can already be evaluated by the user

Unified Process for Ontology Building

De Nicola, Missikoff, Navigli (2005)

- Development is divided into **Cycles**, which are subdivided into 4 **Phases** of **Iterations** (*Inception, Elaboration, Construction, Transition*). Each iteration results in a new prototyp

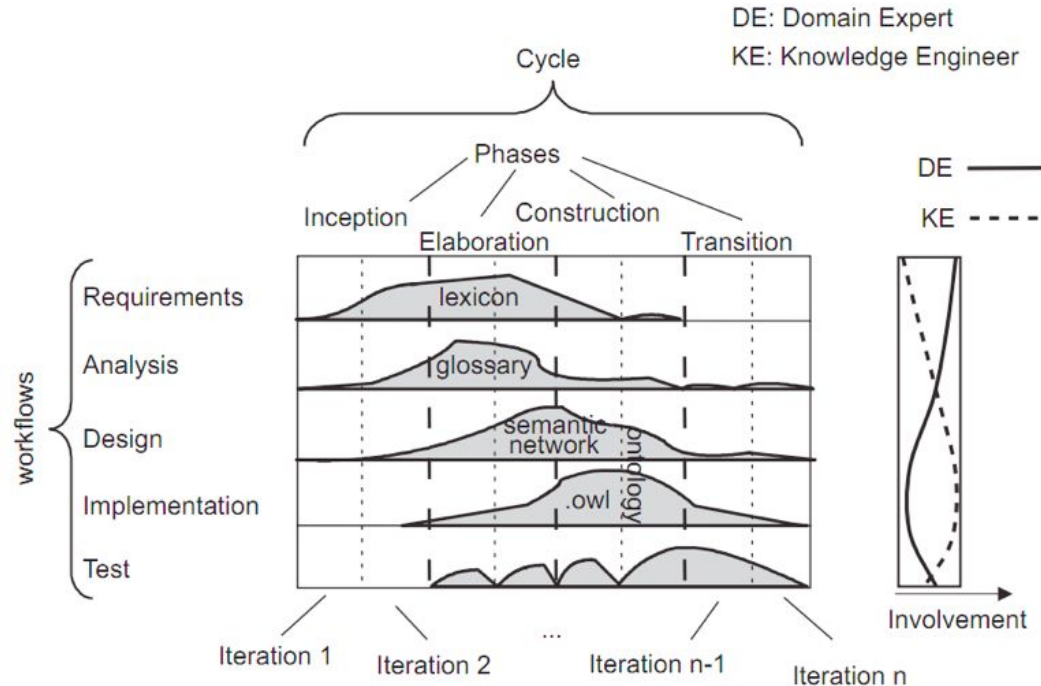


- Each iteration consists of 5 workflows (*Requirements, Analysis, Design, Implementation, Test*)

Unified Process for Ontology Building

De Nicola, Missikoff, Navigli (2005)

- **Workflows** and **Phases** are almost orthogonal, i.e. involvement of single workflows in different phases of ontology development does vary



Unified Process for Ontology Building

De Nicola, Missikoff, Navigli (2005)

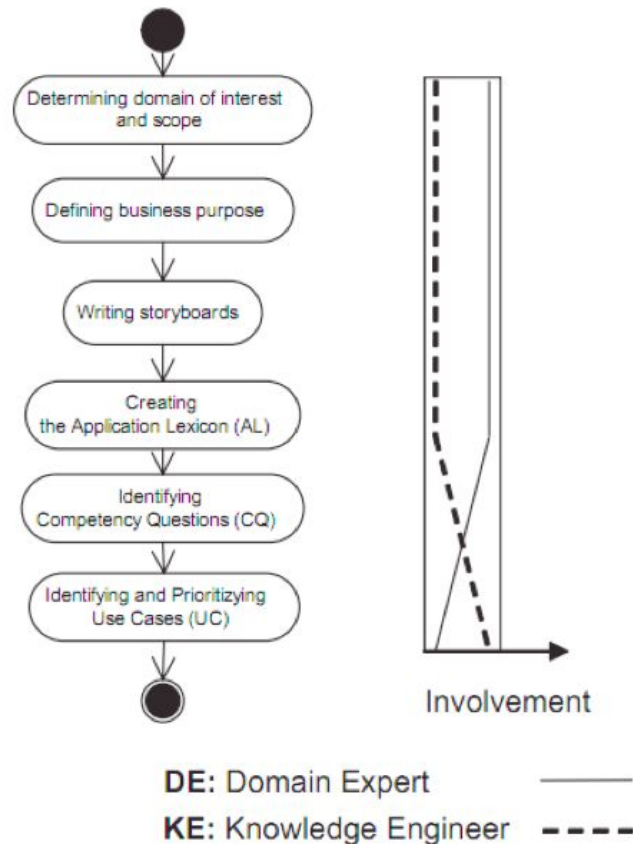
(1) Requirements Workflow

Input:

- interviews with domain experts, application specific documents

Output:

- **application lexicon**
- competency questions
- use cases



Unified Process for Ontology Building

De Nicola, Missikoff, Navigli (2005)

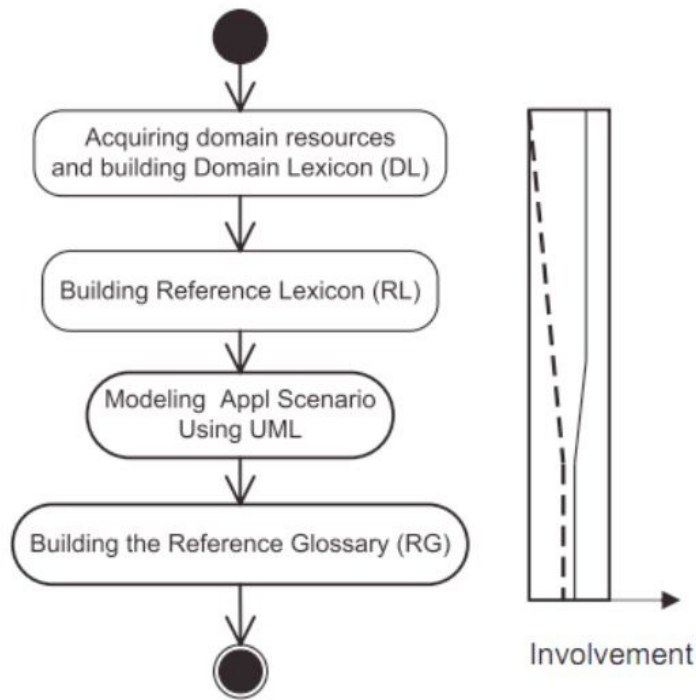
(2) Analysis Workflow

Input:

- existing external resources (*from documents to standards, to existing ontologies*)
- application lexicon

Output:

- domain lexicon
- reference lexicon
- UML class diagrams
- UML activity diagrams
- **reference glossary**



Unified Process for Ontology Building

De Nicola, Missikoff, Navigli (2005)

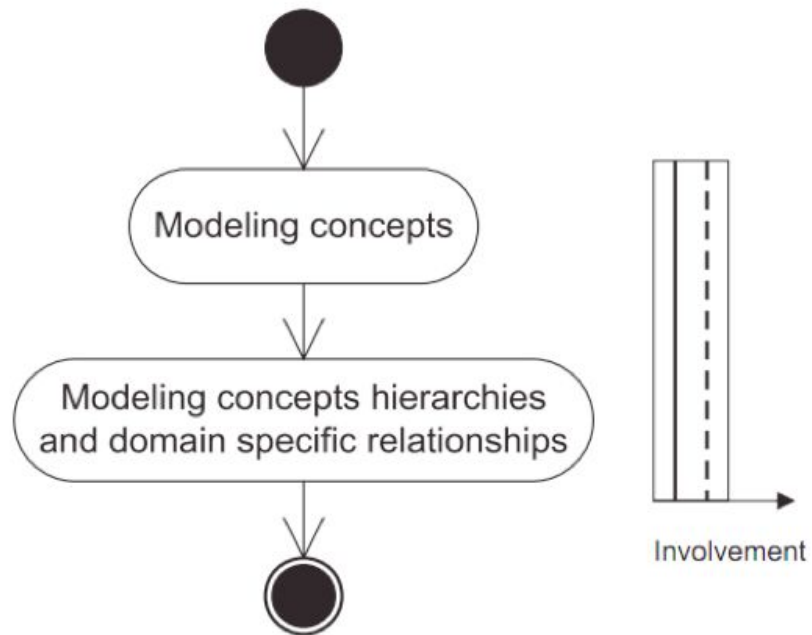
(3) Design Workflow

Input:

- reference glossary
- UML diagrams

Output:

- semantic network / ontology



DE: Domain Expert

KE: Knowledge Engineer



Unified Process for Ontology Building

De Nicola, Missikoff, Navigli (2005)

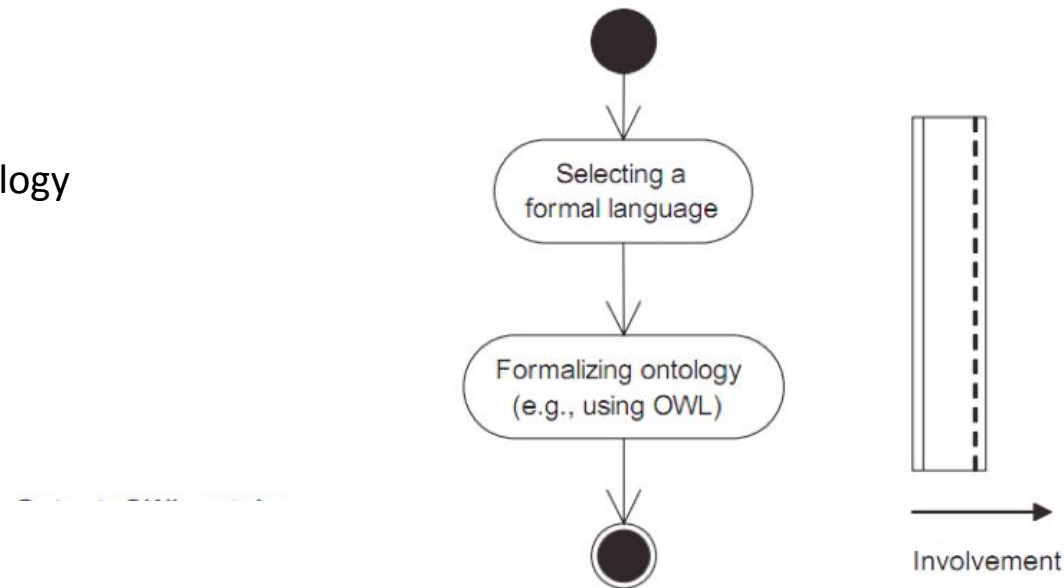
(4) Implementation Workflow

Input:

- semantic network / ontology

Output:

- OWL ontology



DE: Domain Expert ———

KE: Knowledge Engineer - - - -

Unified Process for Ontology Building

De Nicola, Missikoff, Navigli (2005)

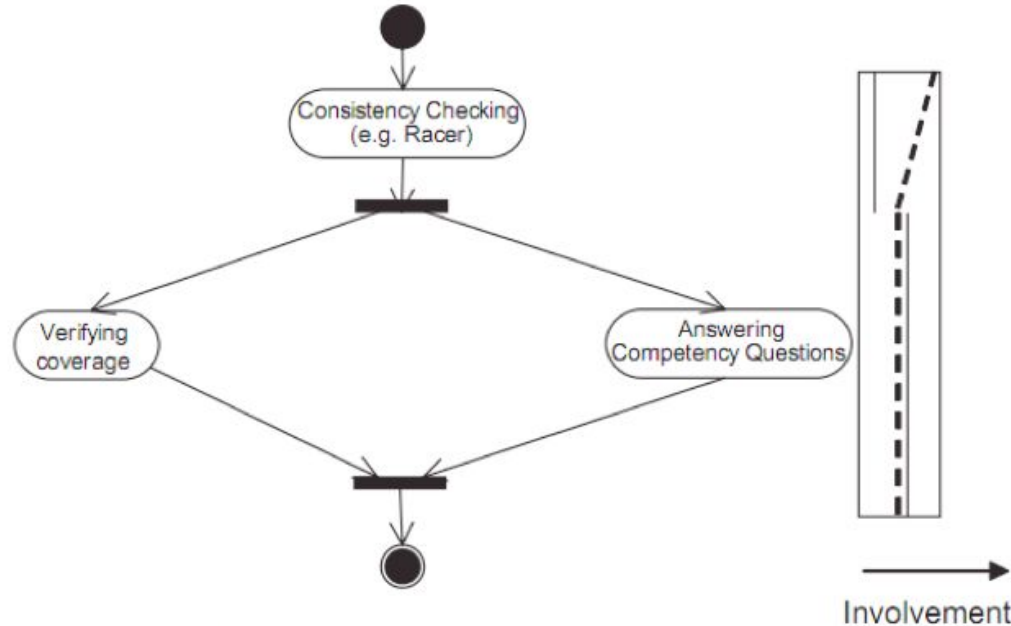
(5) Test Workflow

Input:

- OWL ontology

Output:

- tested OWL ontology



DE: Domain Expert

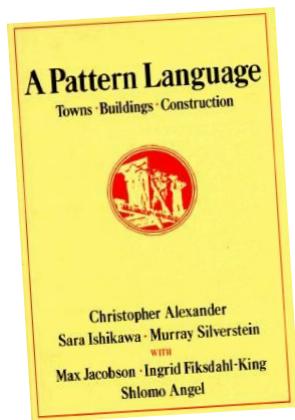
KE: Knowledge Engineer

—

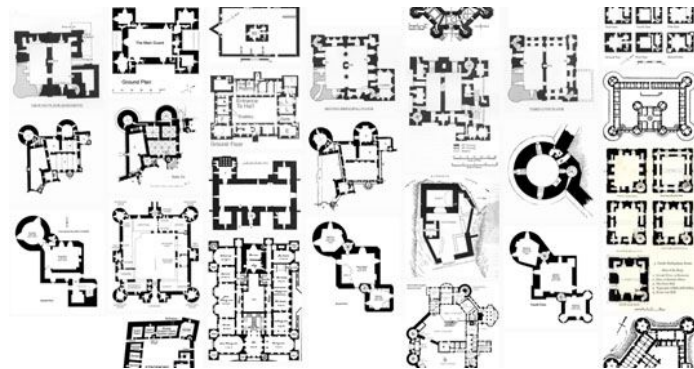
Ontology Design Patterns

Gangemi (2005)

- Adapting a design idea originally from architecture
 - recurring modeling problems
 - providing a set of adaptable standard solutions
 - *a “pattern” is a solution to a problem in a given context (Christopher Alexander)*



The elements of this language are entities called patterns. Each pattern describes a problem that occurs over and over again in our environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice. — *Christopher Alexander*

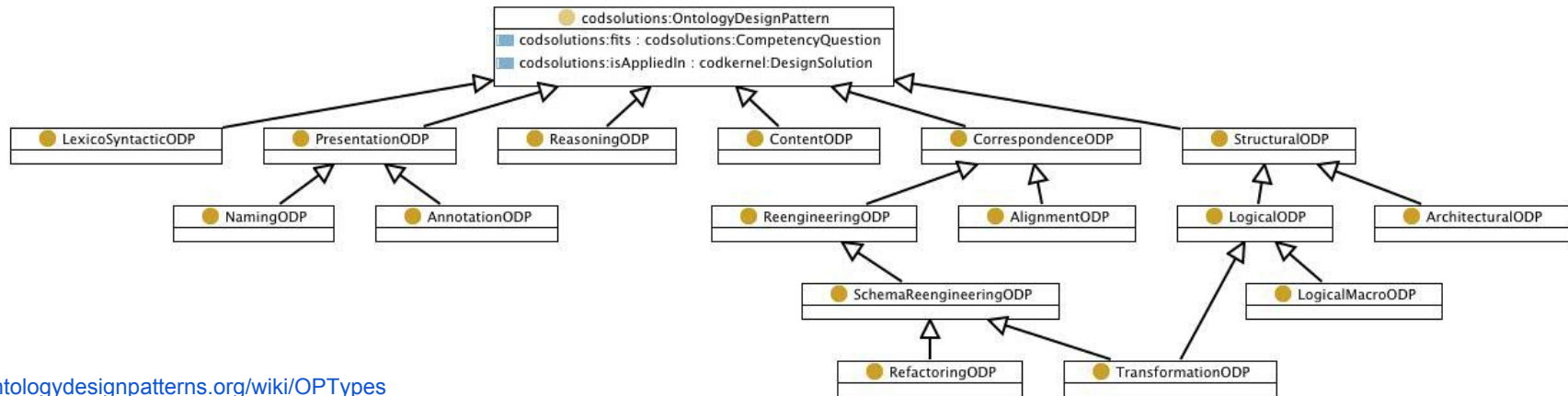


- **Ontology Design Patterns** provide
 - small reusable (abstract) ontology templates with explicit documentation
 - searchable repository ordered by competence questions
- We distinguish:
 - **Content Patterns**
 - Domain dependent, language independent
 - **Logical Patterns**
 - Domain independent, related to representation language
 - **Presentation Patterns**
 - Ontology from user perspective, as e.g. naming conventions
 - **Transformation Patterns**
 - how to transform an ontology in another representation language

Ontology Design Patterns

Logical vs. Content ODPs

- **Logical ODPs** solve design problems independently of a particular conceptualization or domain
- **Content ODPs** are patterns for solving design problems for the domain classes and properties that populate an ontology; they address content problems
- Content ODPs are instantiations of Logical ODPs (or of compositions of Logical ODPs)



- **Modeling problems** solved by Content ODPs have two components:
domain and **requirements**.
 - the same domain can have many requirements
 - the same requirement can be found in different domains
- A typical way of capturing requirements is by means of **competency questions**
- Content ODPs are collected and described in **catalogues** and comply to a common **presentation template**

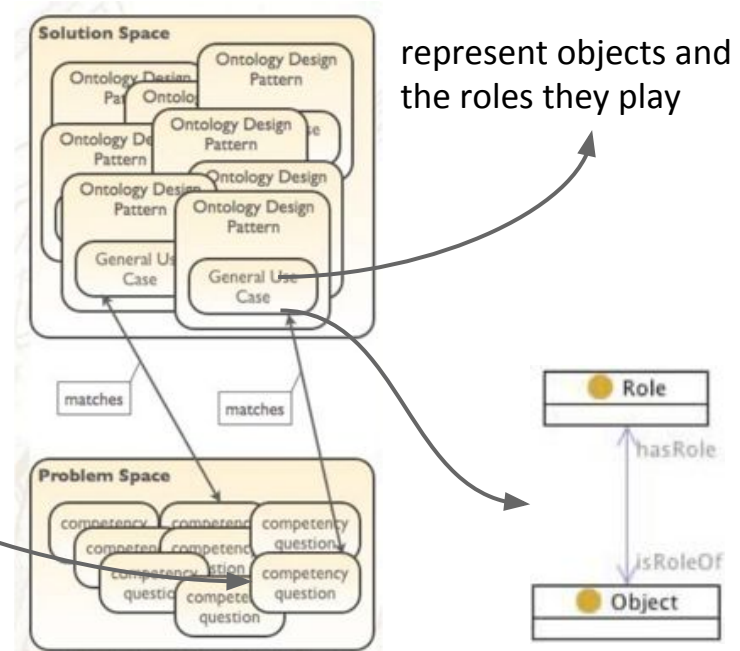
Ontology Design Patterns

A Simple Example

- **Example:** taking over a temporary role
- e.g.: *Basil Rathbone played Sherlock Holmes in the 1939 movie „The Hound of the Baskervilles“*
- Analyze the sentence, detect the **modeling issues**, and match to the Content ODPs



a person plays a character



Ontology Design Patterns . org (ODP)

<http://ontologydesignpatterns.org/>

OntologyDesignPatterns.org is a Semantic Web portal dedicated to ontology design patterns (ODPs).

The portal was started under the [NeOn project](#), which still partly supports its development.



What's new

- The 6th Workshop on Ontology and Semantic Web Patterns ([WOP2015](#)) will be held at [ISWC2015](#) (October 11 or 15) in Bethlehem, Pennsylvania, US.
- The 5th Workshop on Ontology and Semantic Web Patterns ([WOP2014](#)) will be held at ISWC2014 (October 19 or 20) in Riva del Garda - Trentino, Italy.
- The 4th Workshop on Ontology and Semantic Web Patterns ([WOP2013](#)) will be held at ISWC2013 (October 21 or 22) in Sydney, Australia.
- Two open position at STLab in research related to knowledge patterns: one is for a [junior researcher](#) and one is for a [post-doc](#). Have a look at the short description in the news.

Navigation

**List of Patterns**

You can find lists here, detailing all available ontology design patterns.

**Pattern types**

Ontology patterns are of several types. Here are details about pattern types and their taxonomy.

**Domains**

Ontology patterns can cover, or be related to, a particular domain. Here is a list.

**Modeling Issues**

See all loaded modeling issues. Modeling issues are linked to ontology patterns that solve a defined problem.

**Training Area**

Learn about ODPs!

**Events**

See a list of events related to ontology design patterns.

Contribute

**Submit Pattern**

Start here if you want to submit an ontology pattern.

**Post Modeling Issue**

If you have an unsolved modeling problem you wish to share with the community, post it here!

**Submit an Exemplary Ontology**

Start here if you want to submit an exemplary ontology.

**Post Review About a Pattern**

Review a submission to contribute to the certification process.

**Post Your Feedback**

If you have issues about the web site, can't find information you need, or simply wish to propose enhancements, you can give feedback here about the ODP portal.

**Request Account**

To make changes to the ODP wiki portal, you need to be logged in...

News

**Latest ODP News!**

[WOP2015 accepted for ISWC in October](#)
5 May 2015 07:07:57 - by EvaBlomqvist

[4th edition of WOP at ISWC 2013](#)
30 April 2013 13:13:07 - by ValentinaPresutti

[Two open position at STLab CNR Italy \(one junior researcher and one post-doc\)](#)
30 April 2013 13:13:04 - by ValentinaPresutti

[3rd Workshop on Ontology Patterns accepted for ISWC2012](#)
29 May 2012 09:09:06 - by EvaBlomqvist

[Pattern Camp - Paris](#)
22 November 2011 08:08:23 - by EvaBlomqvist

[ODP Seminar in Lim&Bio Lab - Paris 13 University - 16th June 2011](#)
27 October 2011 23:23:04 - by RimDJEDIDI

[2nd Workshop on Ontology Patterns \(WOP\) accepted at ISWC](#)

navigation

- Main page
- List patterns
- Pattern types
- Modeling Issues
- Domains
- Training
- Events

contribute

- Submit a pattern
- Submit an exemplary ontology
- Post a modeling issue
- Review a pattern
- Feedback about the portal
- Request an ODP account

help

- About ODP
- What is a pattern?
- What is an exemplary ontology?
- How to post a pattern
- Training

catalogues

- Content ODPs
- Reengineering ODPs
- Alignment ODPs
- Logical ODPs
- Architectural ODPs
- Lexico Syntactic ODPs
- Exemplary Ontologies

quality committee

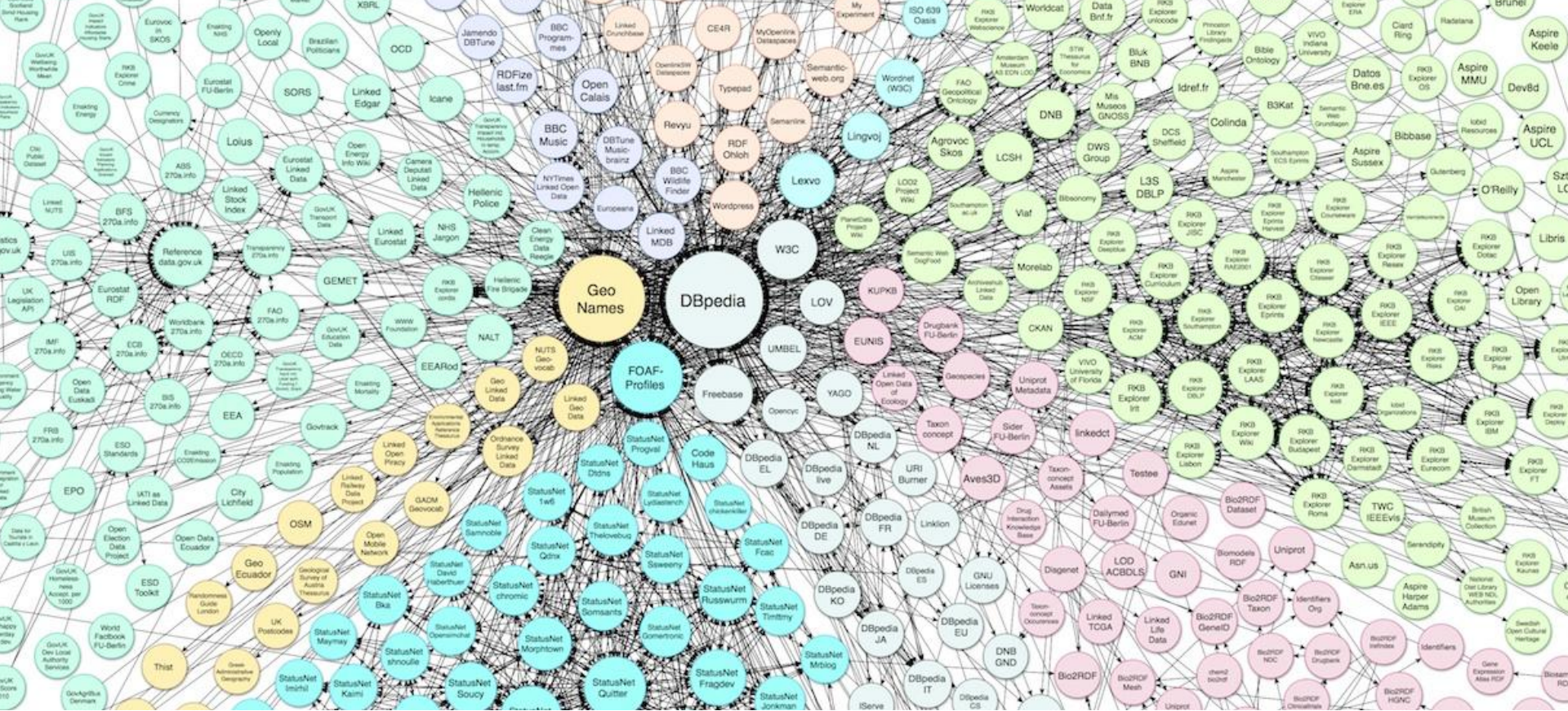
- Post a Review



07: EXTRA - More Ontology Evaluation

OpenHPI - Course Knowledge Engineering with Semantic Web Technologies

Lecture 5: Ontological Engineering



06: Linked Data Engineering

OpenHPI - Course Knowledge Engineering with Semantic Web Technologies

Lecture 5: Ontological Engineering