ABAP Software Ontologies
Virtual Community Day 2009

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Agenda

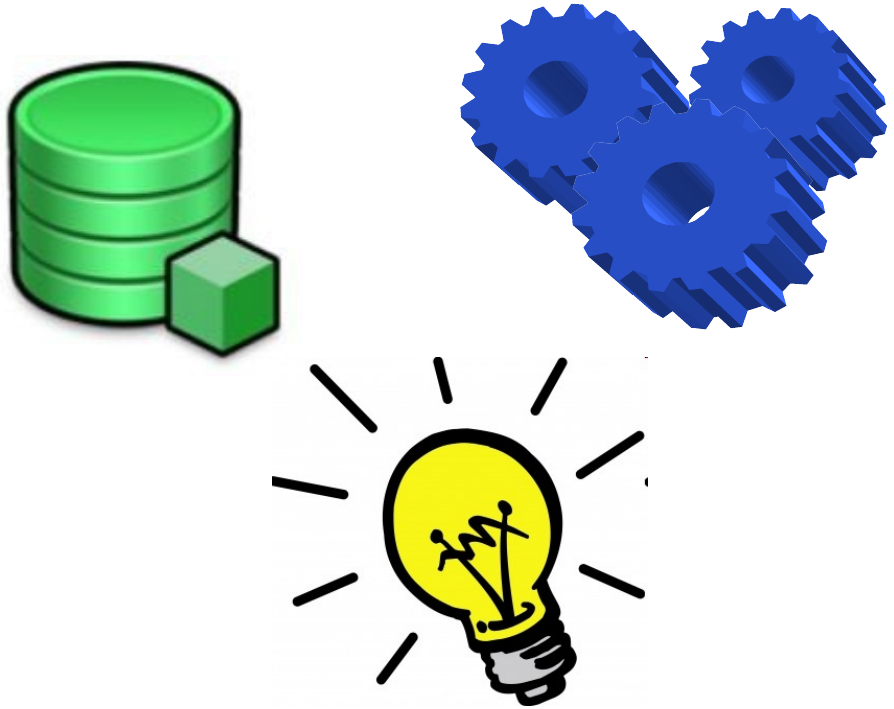
- Introduction
- Knowledge as Sets of Facts
- Ontologies and Reasoning
- An Ontology for SAP Architecture

Use of Semantic Web Technology in Enterprise Architecture

AOK systems

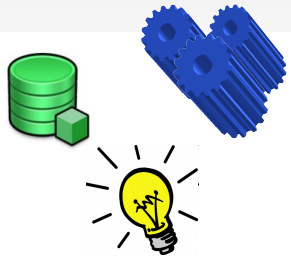
Elements of IT Systems are

- **DATA**
- **FUNCTIONS**
- **KNOWLEDGE**



Use of Semantic Web Technology in Enterprise Architecture

AOK systems



And what about SAP?

- SAP Business Suite is an integrated system containing **DATA** & **FUNCTIONS**
- It‘s the task of Business Process Experts to make IT „intelligent“ by doing customizing, process orchestration and implementing business rules
- In other words: he adds the aspect of business **KNOWLEDGE** to ERP

Semantic Web Technologies add Aspects of Knowledge Management to ERP & Netweaver

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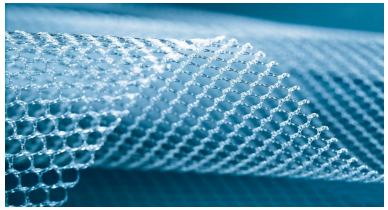
How can Semantic Web Technologies help?



- Tagging, i.e. linking different data sources
- adding metadata to business objects for advanced process automation
- enabling collaboration
- visualization
- exploration & reasoning
- building repositories

Use of Semantic Web Technology in SAP Enterprise Architecture

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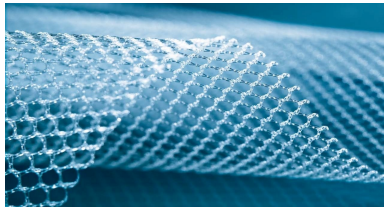


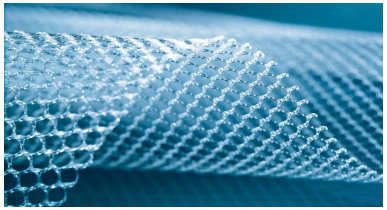
In this lecture we learn how to

- visualize and explore the architecture of ABAP applications
- build repositories of systems & applications
- explore repositories by using methods of artificial intelligence

We support an enterprise architect

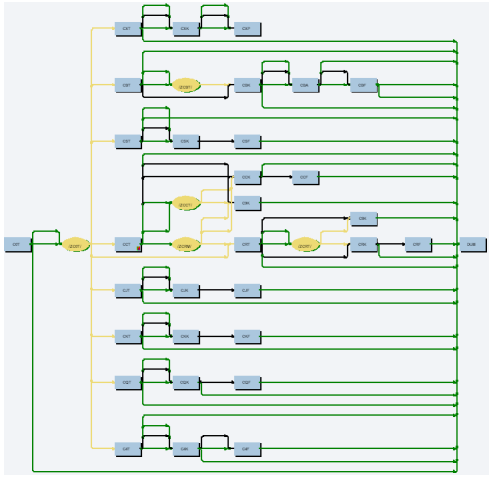
- doing architecting & change management,
- checking violations of architectural guidelines and
- putting his knowledge into a repository.

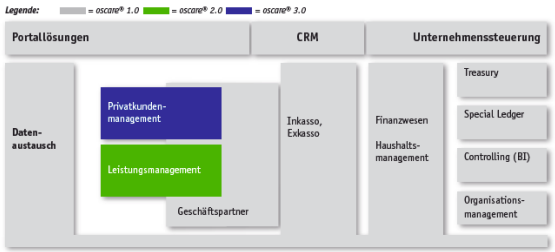
Status Quo

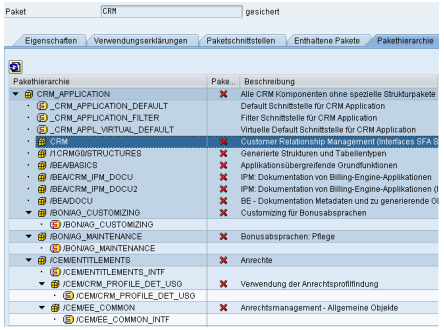


Current situation: information about systems, applications, software logistics are spread on different places:

- applications: SE80 (application hierarchy), excel sheets, bic pictures
- packages & dependencies: within SE80, on UML diagrams, PPT slides…
- software components: SLD, ST03, STMS…







Use Cases

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Online demo

- We have a set of applications developed on different sytems
- Some of these applications are cross section applications that are transported to other development systems
- We are looking for
  - an application, a certain package belongs to
  - packages developed on a certain system
  - packages which use a certain package indirectly
  - packages which are shipped in more than one software component
  - packages that do not use a certain package indirectly

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Modeling Knowledge using RDF

RDF consists of sentences coded as triples: subject – predicate - object

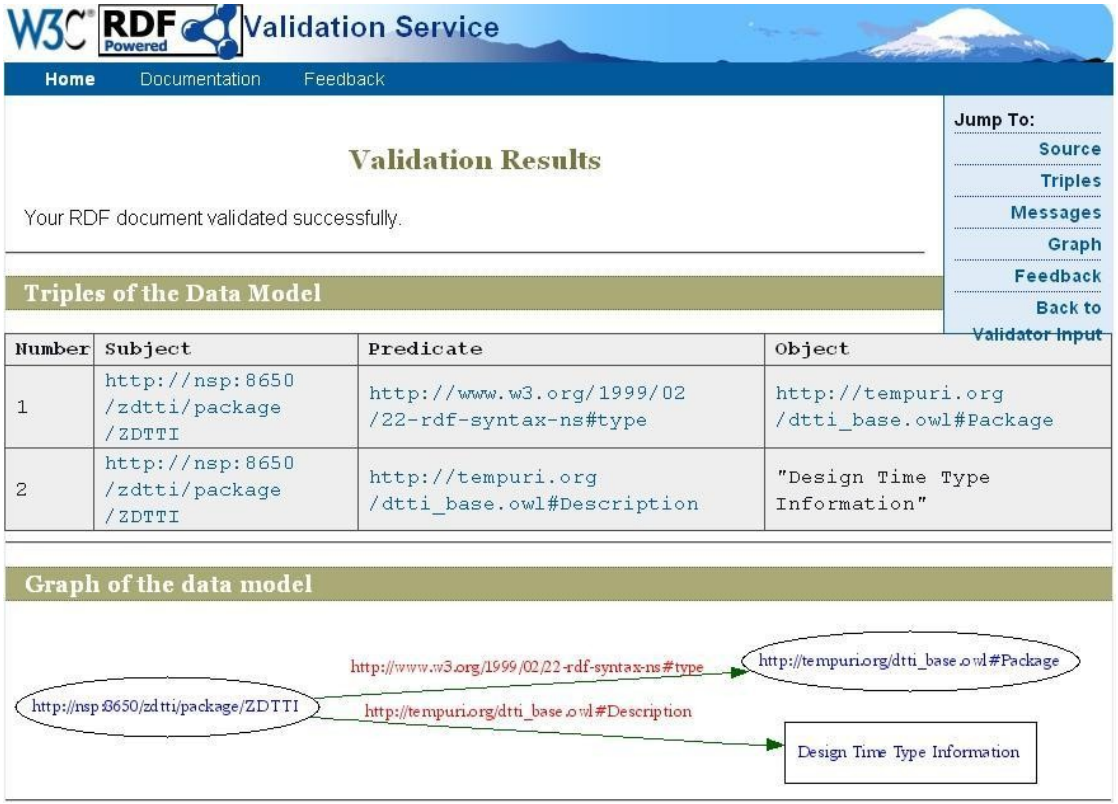
- *The ABAP development object* `ZDTTI` *is a Package with description 'design time type information'*
  coded in RDF:

```
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:dtti_base="http://tempuri.org/dtti_base.owl#">
  <rdf:Description
    rdf:about="http://nsp:8650/zdtti/package/ZDTTI">
  <rdf:type
    rdf:resource="http://tempuri.org/dtti_base.owl#Package"/>
  <dtti_base:Description>
    Design Type Type Information</dtti_base:Description>
  </rdf:Description>
</rdf:RDF>
```

Demo

RDF Validation Service: *http://www.w3.org/RDF/Validator/*

- *validate RDF*
- *explore triples*
- *explore RDF graph*



RDF Basics

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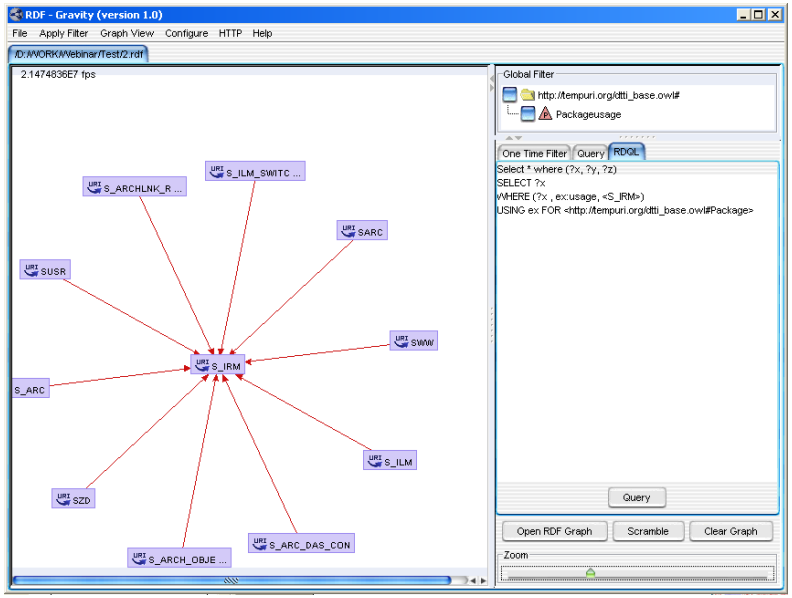
XML serialization of RDF data enables us to use the whole XML Middleware:

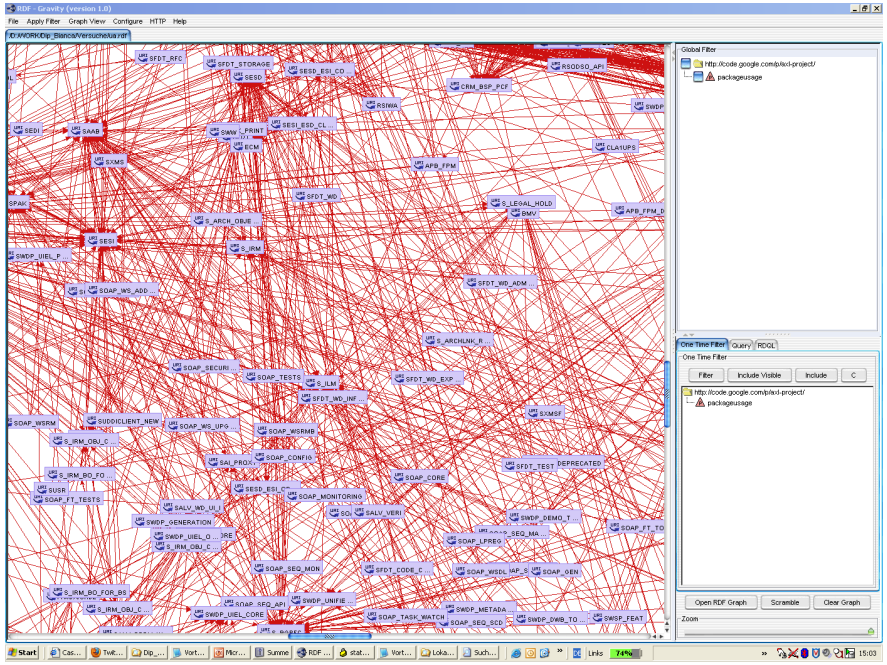
- generation and parsing of RDF using XSLT and Simple Transformations
- integration of RDF data in XML / XHTML documents:
  - add metadata to XML documents for process automation
  - tag your data for intelligent search
- save huge RDF datasets in XML databases
- expose Metadata by using REST Web Services:
  - you can see RSS 1.0 feed as a very simple REST Web Service.
  - the service provides metadata of as RDF triples.

Demo

Visualization :

- visualization of package dependencies within AS ABAP
- queries using RDQL and SPARQL





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Ontologies

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Ontologies are concept models

- They allow us define classes (f.i. packages, systems), relations between classes (f.i. a packages uses another package) and individuals of a class.
- We can use methods of logics to define classes & queries:
  „Computer, please give me all packages to use more then 10 other packages and that are used by more than 100 packages indirectly.“

Here we use OWL-DL to define Ontologies:

- OWL is a W3C standard based on RDF syntax
- OWL allows to import RDF facts and to classify them
- OWL-DL allows reasoning in conception models

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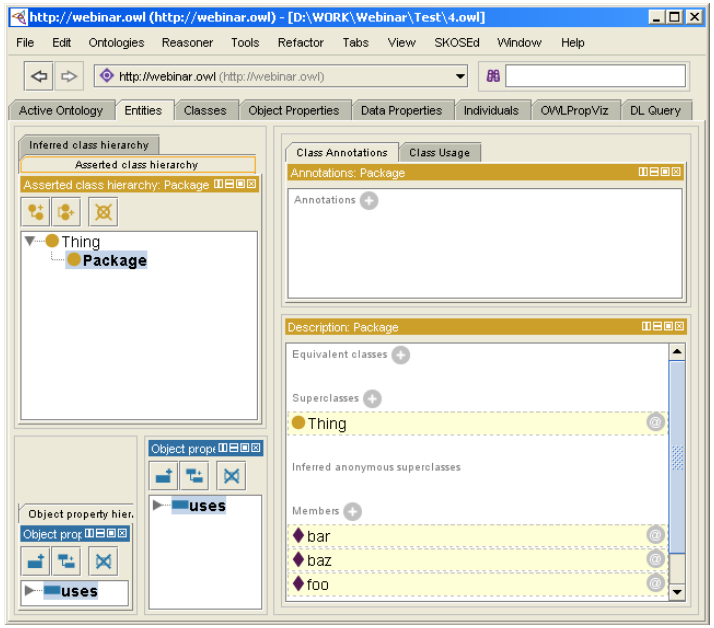
Creation of Ontologies

protégé

- Use an ontology editor and a reasoner, f.i.
  - *Protegé 4:* *http://protege.stanford.edu/*
  - Pellet: *http://clarkparsia.com/pellet*

Demo

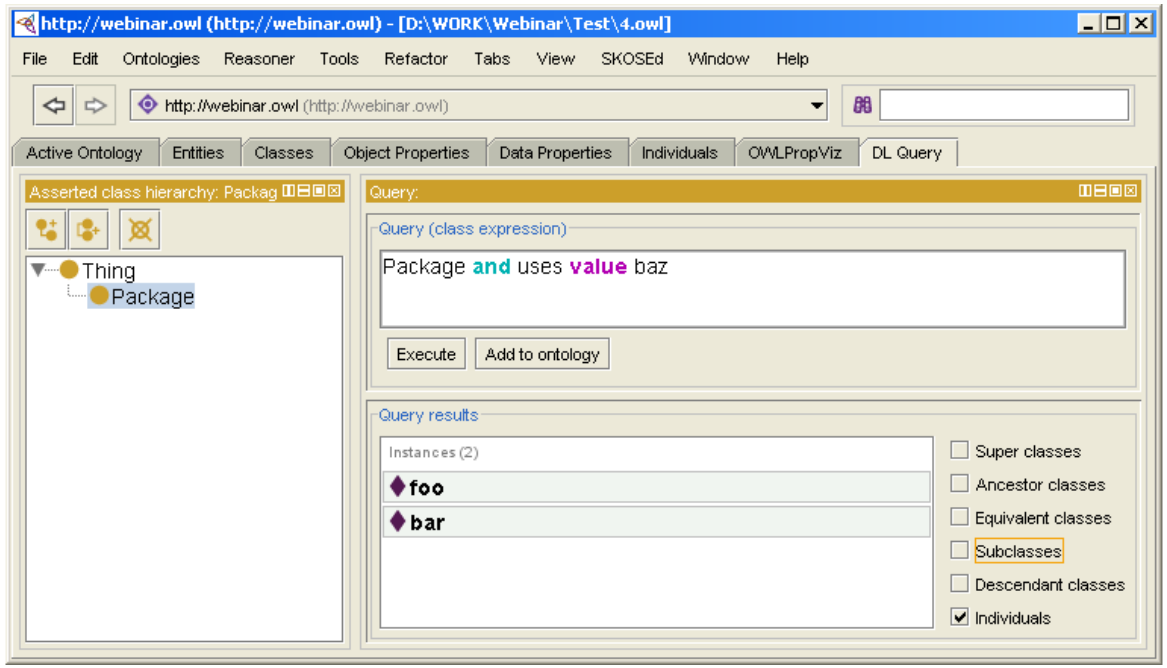
- Creation of a simple ontology
- We model packages and use accesses



Reasoning in OWL

Logical expressions

- We learn how to define classes with logical expressions
- We can use that mechanism for ad hoc queries



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How to Design Software Ontologies

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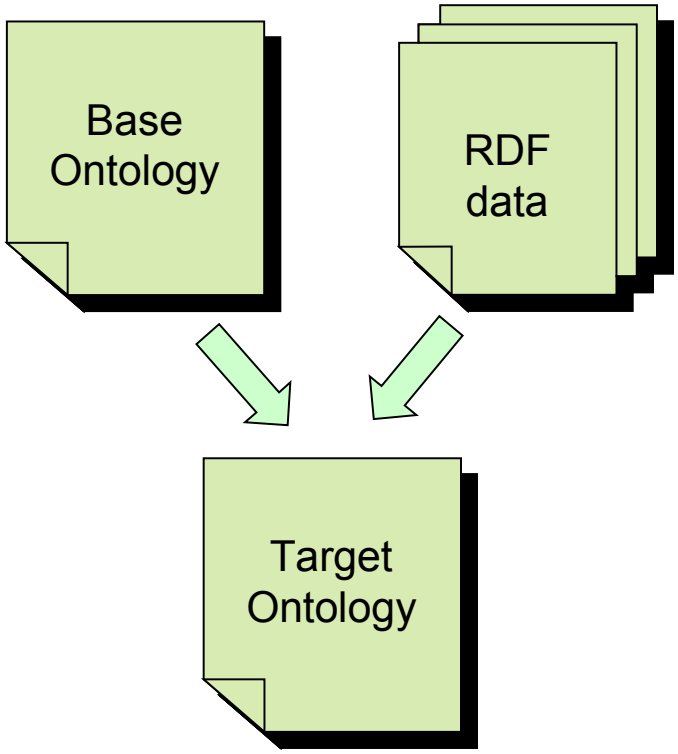
I suggest a hierarchical approach:

- Define an ontology of your main entities & properties: systems, software components, packages, dependencies…
- Import RDF data that is valid according to this base ontology. This data should be extracted from SAP systems automatically.
- Import all data to a target ontology:
  - use it to define your own concepts
  - model your system landscape
  - import additional data
  - do reasoning



DTTI Open Source Project

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Design Time Type Information:

- DTTI stands for „Design Time Type Information“ and is an Open Source Project under Apache License.
- It contains a base ontology together with a set of REST Webservices based on ICF that expose RDF data about ABAP development objects.
- It can easily extended for other entities:
  - enhancements
  - switches
  - SAP frameworks like Business Data Toolset
  - development objects like transformations

Summary

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Benefits of Ontologies

- Ontologies are approach to model system landscapes and architectures.
- They are based on open standards and supported by free tools.
- They can easily be extended and adapted to your specific needs.

We can use them for

- formal definition of architectural guidelines
- automated reasoning, f.i.
  - violations of architecture: are dependencies between packages properly so that we can install software components in linear order?
  - indirect depedencies
  - Are there dependencies betwenn packages which are forbidden due to an architectural guideline?

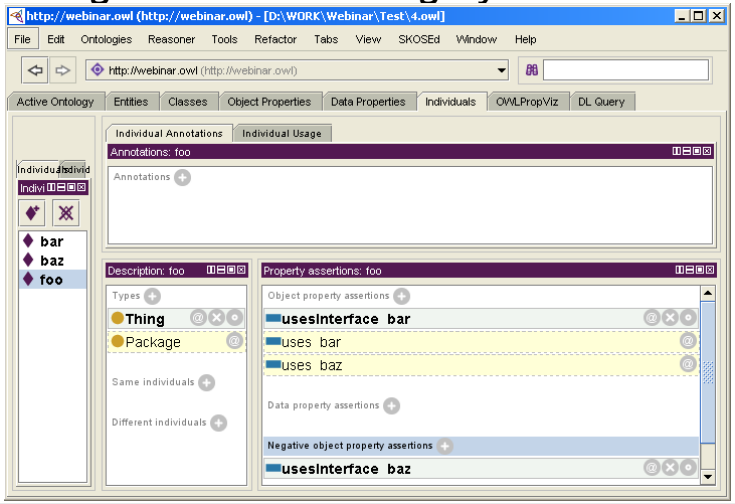
Thank you for your Attention!

Questions? Criticisms ? Comments?

Reasoning in OWL

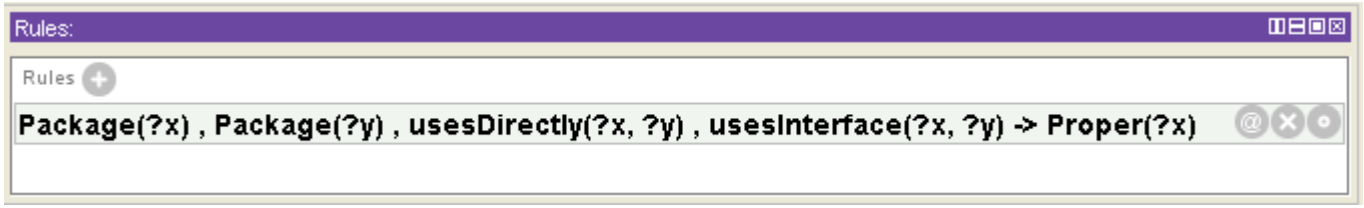
Open World Assumption

- If a set of facts doesn‘t contain a certain information it doesn‘t mean that it is false. As a consequence negations and „for all“ operators won‘t work.
- In database context we have complete knowledge – and so possibly in some parts of an ontology. In this case we should work with
  - integrity constraints: *http://clarkparsia.com/weblog/2009/02/11/integrity-constraints-for-owl/*
  - negative properties



Rules & DL safe queries

- Use rules to simplify an ontology by using an decidable subset of SWRL (*http://www.w3.org/Submission/SWRL/*). There is support in Protegé:



- Rules are supported by Pellet reasoner: *http://clarkparsia.com/weblog/2007/08/12/understanding-swrl-part-1/* and *http://clarkparsia.com/weblog/2007/08/27/understanding-swrl-part-2-dl-safety/*

- You can use SPARQL-DL to query data: *http://clarkparsia.com/weblog/2007/10/26/towards-sparql-dl-evaluation-in-pellet/*

Modularization

- You can modularize ontologies using `owl:import` command or using a tool like Protegé: