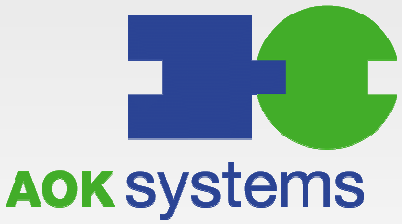


Enterprise Software Ontologies

SAP Inside Track Bonn 2010

Bianca Borsan, Tobias Trapp

Agenda

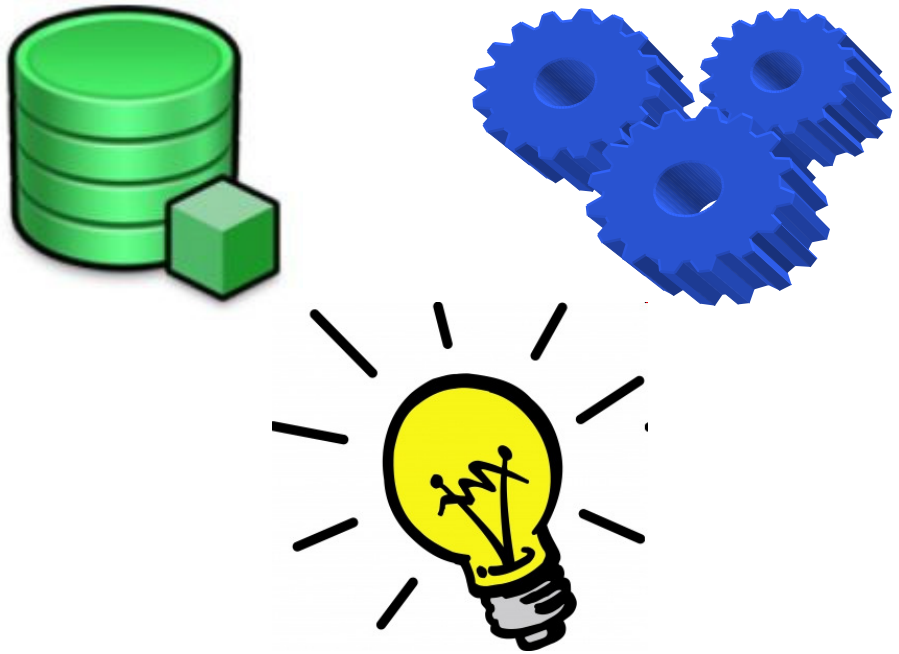
AOK systems

- Introduction
- Where Are The Apps?
- Ontologies for Software Architecture
- Appendix: Standards

AOK systems

Elements of IT Systems are

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

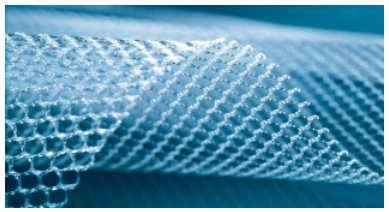


AOK systems

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 Technologies add Aspects of Knowledge Management to ERP & NetWeaver



How can Semantic 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
- specification of domain models
- designing and checking business rules

Interesting article about the „Semantic Enterprise“:
http://www.mkbergman.com/859/seven-pillars-of-the-open-semantic-enterprise/

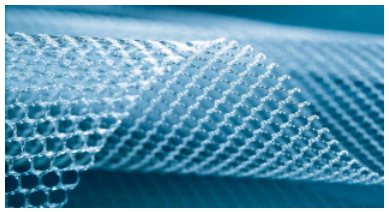
Agenda

AOK systems

- Introduction
- Where Are The Apps?
- Ontologies for Software Architecture
- Appendix: Standards

And is it really useful?

AOK systems



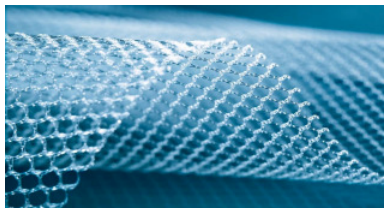
Semantic Technologies are used today:

- RSS 1.0 is based on RDF – it‘s the technological basis of newsfeeds of weblogs

- Metadata of documents are coded using Adobe‘s XMP format – if you watch photos on flickr you will find geopositions (where was the picture taken), at what time…
  http://www.adobe.com/products/xmp/

- Used in expert systems: ontologies are formal representations of a set of concepts within a domain and the relationships between those concepts. We can use methods from AI to reason about the properties of that domain.

Ontologies used for Specification & Design of Insurance Products



Insurance Products have Complex Properties

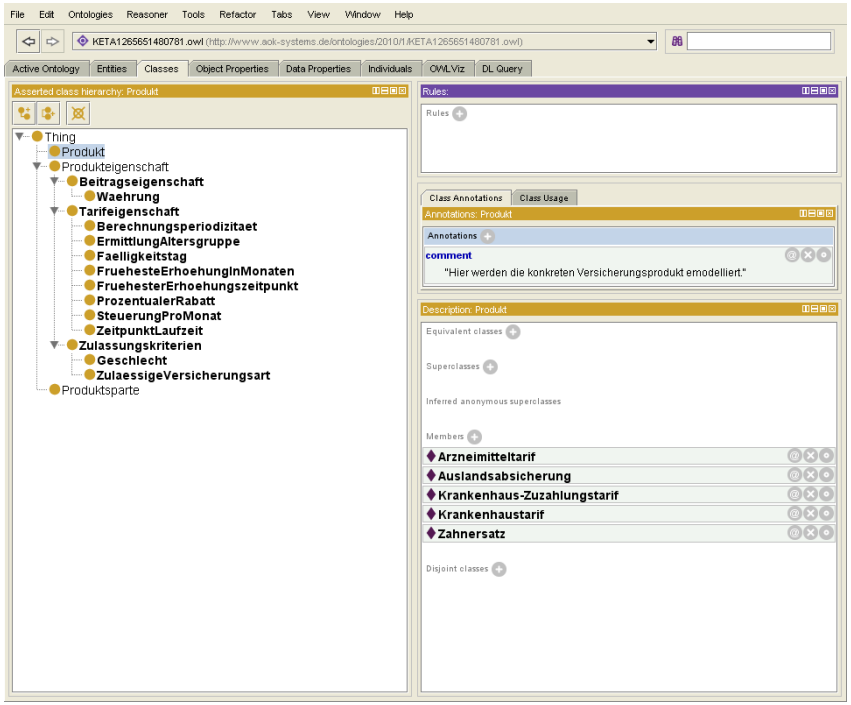
- Conditions that have to be met to sign a contract.
- Coverages of a damage event.

Using Ontologies you can

- create domain models you need for specification of software systems
- build repositories of insurance products of your company

An Ontology contains

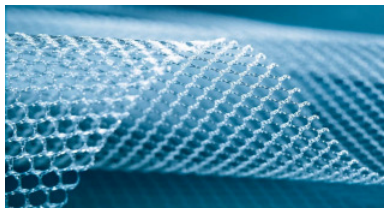
- Concepts of your domain model
- The „universe“ of all possible insurance products that meet certain requirements
- Instances: the set of products you offer your customers



Applications of Methods from AI

AOK systems

Ontologies are used to build to build expert systems that support the whole lifecycle of an insurance product



- Is a modelled insurance product valid according to the business rules of your company?
- Is there an insurance coverage in case of an damage event*?*
- Automated suggestions in upselling: should we offer a product to a customer?

You find an example at
http://www.faktorlogik.de/doku.php?id=flogik:demosystem:demosystem

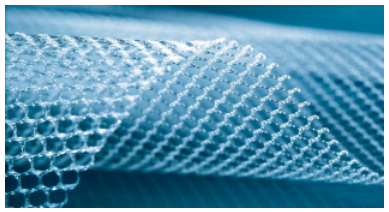
Methods of Reasoning

- Classifications based on logical conditions including counting quantifiers (OWL)
- Rules (SWRL)
- Integrity Constraints (Open World vs. Closed World)

Drawbacks

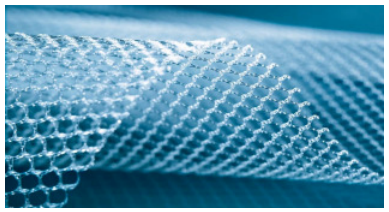
AOK systems

Ontologies are no Silver Bullet



- They are tools for expert users
- They require a deep understanding of the domain model
- So far I don‘t know any solution to express complex formulas
  (although I can refer to existing formulas of an business rule framework)

And What about SAP Business Suite?



These Tools are not used by within SAP ERP & Industry Solutions:

- FS-PM has it‘s own tools & infrastructure to model & implement insurance products as business objects
- FS-CM uses frameworks like BRF to „guide“ business processes
- FS-CD uses complex customizing for their calculations

Applications in Knowledge Managment

I‘m using Ontologies for my private historical Research Projects:

- In my „Stolperstein“ project I collect names of victims of national-socialism in Mainz.
- I extracted data of thousands of exilants from a database and converted them into an ontology - the result was a database independent format for semistructured data based on open standards.

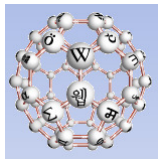
IMHO every research project that gets public money should publish their results in standardized XML based formats made for knowledge management.

And How do we Build Semantic Apps?

AOK systems

There are a lot of commercial and open source tools in Java:

- Ontology editors like Protégé and Swoop
- Reasoners like Pellet
- APIs like Jena
- RDF stores and databases
- Semantic Wikis



A list of tools especially for ontologies: *http://www.mkbergman.com/862/the-sweet-compendium-of-ontology-building-tools/*

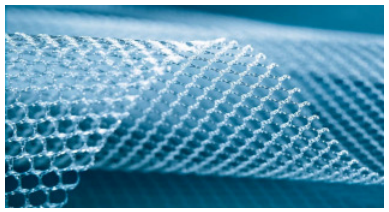
Agenda

AOK systems

- Introduction
- Where Are The Apps?
- Ontologies for Software Architecture
- Appendix: Standards

Use of Semantic Technologies in SAP Enterprise Architecture

AOK systems



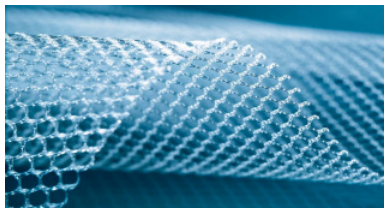
You can use Semantic Technologies to

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

It is a tool for an application & enterprise architect

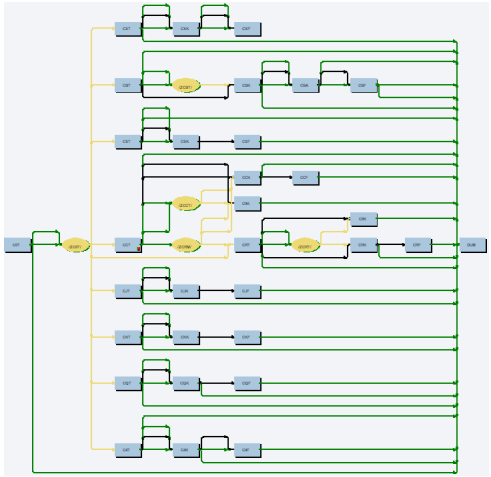
- architecting & doing change management,
- checking violations of architectural guidelines and
- putting his knowledge into a repository.

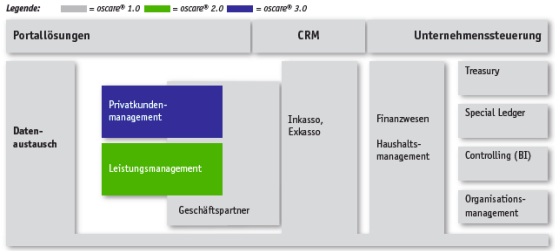
Status Quo

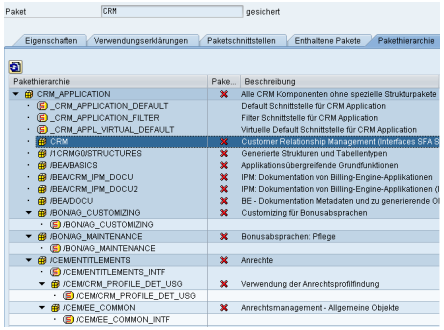


Current situation: information about systems, applications, software logistics are spread on different places:

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

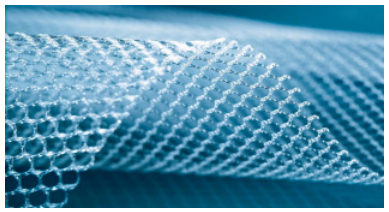




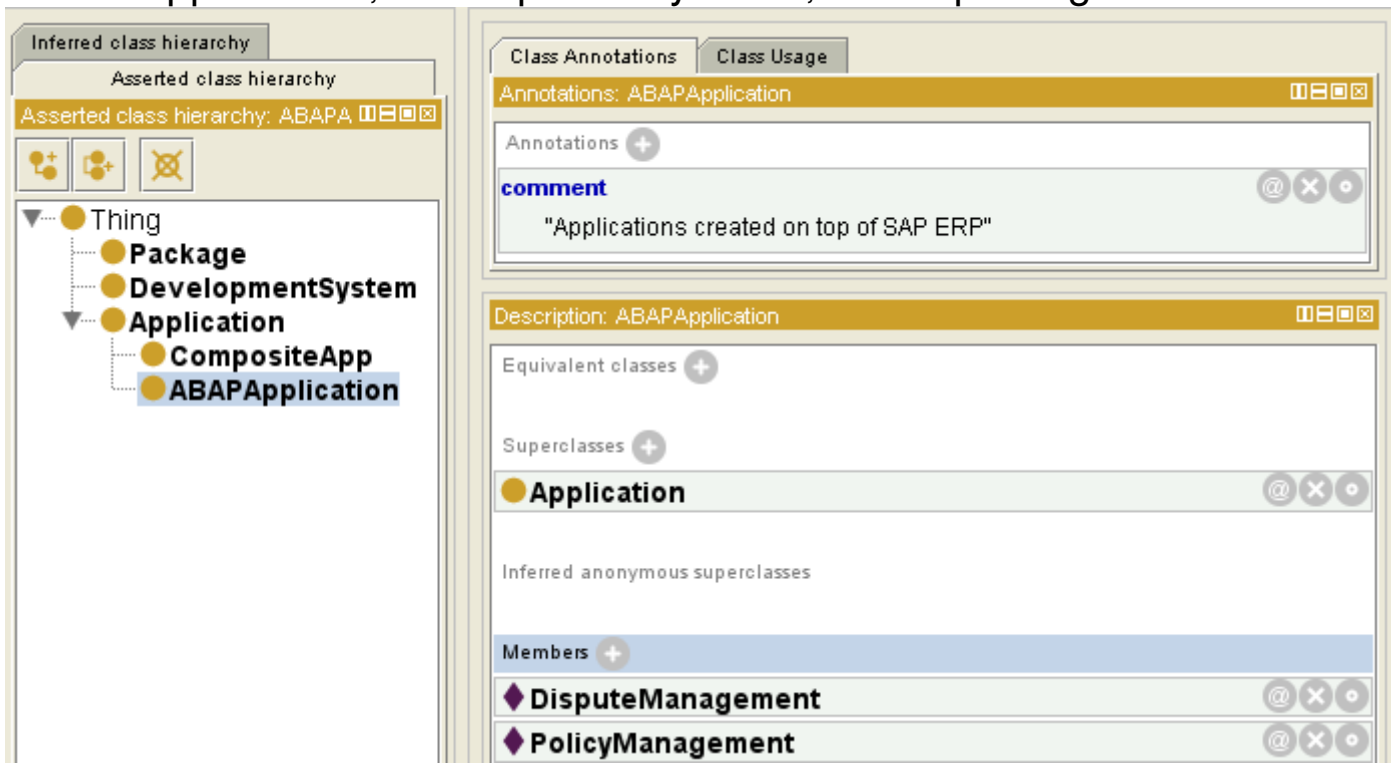


Use Case: Repository of Applications

Maintain all Custom Applications of your IT landscape



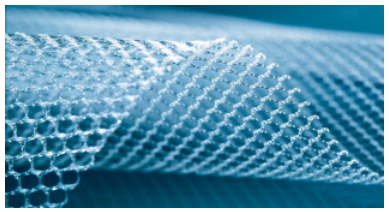
- Define applications, development systems, ABAP packages…



Use Case: Dependencies Between Packages

AOK systems

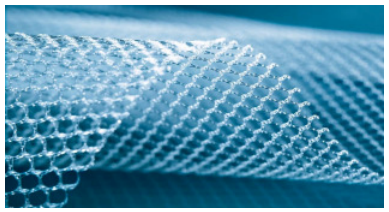
Applications are Developed in ABAP Packages



- When your are working with package hierarchies you and packages interfaces you have an explicit dependencies. Those can be defined when architecting or evaluated afterwards by scanning the DDIC & ABAP code.
- Using those methods you can analyse dynamic dependencies: publish & subscribe & BAdI interfaces for example.
- Just expose those data as (REST) web services giving back RDF data.
- Dependencies can be analysed using DL queries. Transitivity of dependencies is supported in OWL.

Use Case: Are SCs installable?

Melting Software Components in an Redesign Project



CUSTBAPL

CUSTAPL

CUSTABA

CUSTAPPL

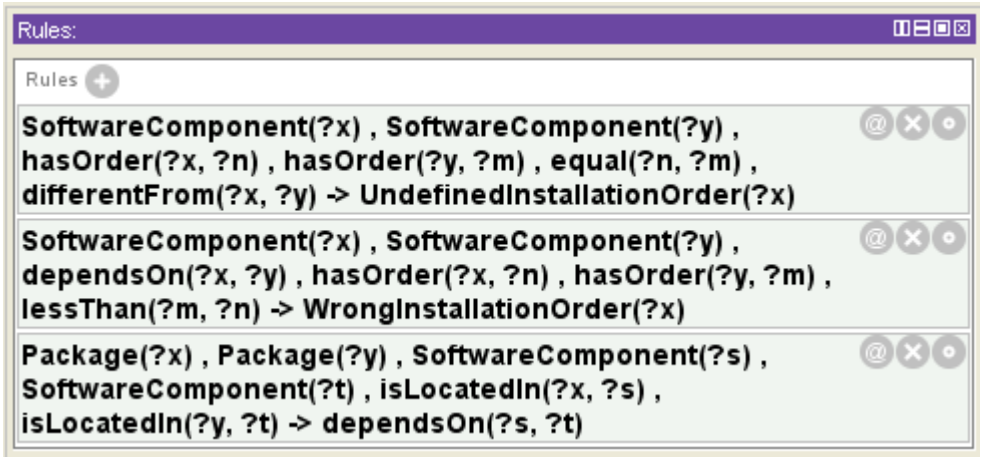
CUSTTAPZ

BBPCRM

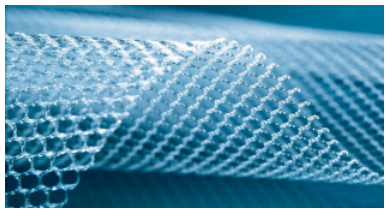
SAP_ABA

SAP_BASIS

- Derive SC dependencies from package dependencies
- Check installation orders of SCs



Further Information



- The appendix of this talk contains information about used standards & use cases.
- I wrote a series og blogs about this topic:
  - *http://www.sdn.sap.com/irj/scn/weblogs?blog=/pub/wlg/13978*
  - *http://www.sdn.sap.com/irj/scn/weblogs?blog=/pub/wlg/14015*
  - *http://www.sdn.sap.com/irj/scn/weblogs?blog=/pub/wlg/14091*
  - *http://www.sdn.sap.com/irj/scn/weblogs?blog=/pub/wlg/14273*
- My XML book covers semantic technologies

AOK systems

Thank you for your Attention!

Questions? Criticisms ? Comments?

Agenda

- Introduction
- Where Are The Apps?
- Ontologies for Software Architecture
- Appendix: Standards

AOK systems

Semantic Web

- Vision of a web of data, a global database
- is structured information representation, that provide explicit semantic
- describes information and supports inferencing of new information
- its key enabler: the ontologies

Semantic Web Architecture

AOK systems

What kind of data models manages Semantic Web?

- Text documents and data (e.g: Google‘s Index, Ebay‘s data base)
- XML documents with same vocabulary (e.g: Google API Web Service)
- RDF taxonomies with different vocabulary
- OWL ontologies and automatical conclusions

Resource Description Framework - RDF

AOK systems

RDF

- Data Interchange and Data Integration (export data base in sets of statements)
- a RDF-Triple Pattern consists of statements like:

  T (subject - ressources addressed about URIs
  predicate - properties of ressources
  object - ressources or literals)

- Directed RDF-Graphs

RDF Query Language: SPARQL

AOK systems

SPARQL

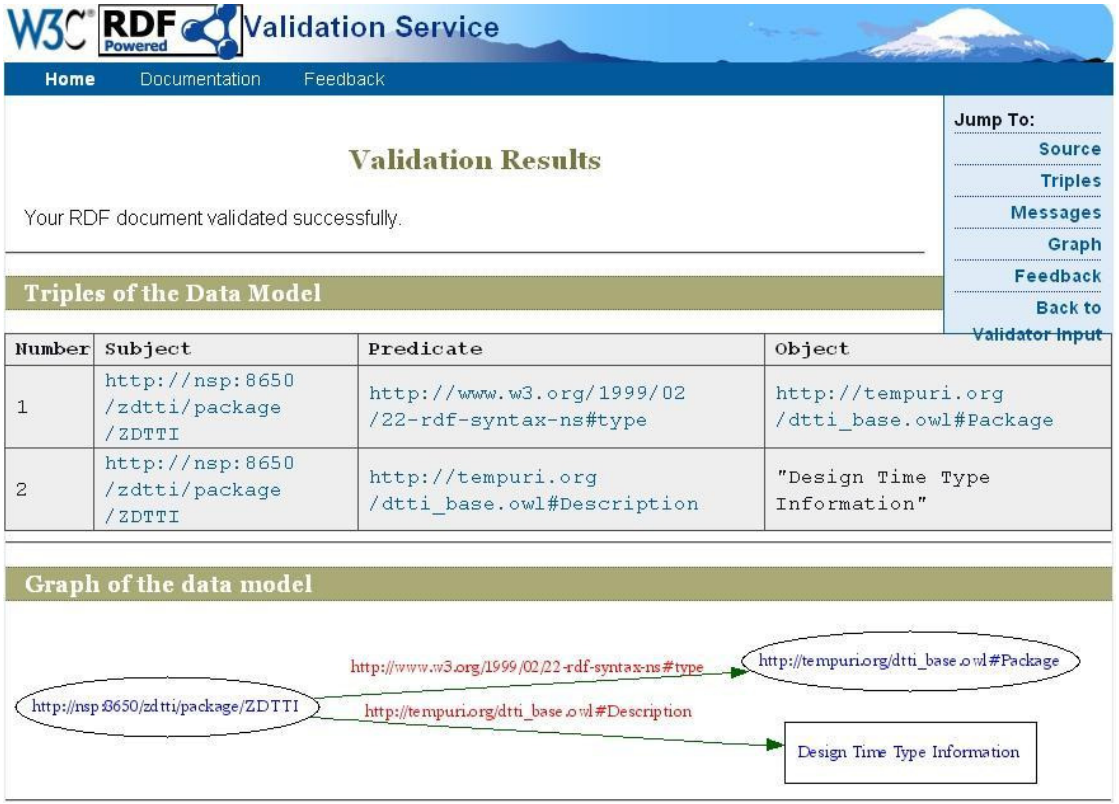
- extracts knowledge basis from RDF/RDFs
- allows transformations von RDF- data from one vocabulary to another
- explores RDF-Graphs using Select-statements and gives back as result a table:

  e.g. SELECT ?article ?author ?published

RDF Validator

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

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



RDF/XML Serialization

RDF / XML

- RDF content is generated using XSLT and Transformations
- RDF data is integrated in XML / XHTML documents
- XML serialization allow us to use the whole XML Middleware

RDF Use Cases

AOK systems

RDF

- RDF APIs (Jena)
- RDF Stores / Triple-Stores (Virtuoso)
- Basis for RSS 1.0, XMP (Adobe), SVG
- do not allow us to define classes
- are not able to describe relationships between them, only instances of a class

RDF Vocabulary Description Language

AOK systems

RDF(S)

- RDF-Schema specifies a data model for the RDF-statements
- abstract datatype (class)
- extends RDF with additional semantic features
- allows class definition, class hierarchies and restrictions

RDF(S) – Semantic

AOK systems

RDF(S)

- class disjunction problem
- restrictions of cardinality
- special properties:
  - transitivity
  - inverse
  - distinct / unique
- needs explicit semantic!

Use Cases of Semantic Web

AOK systems

- it enables new applications and functionalities
- has the ability to infer additional facts from provided facts
- will accomplish the vision of shareable data on the web

Ontologies – Enablers of Semantic Web

AOK systems

Ontologies

- are concept models that describe a domain
- enable the description of explicit semantic
- differentiate between terminological components (Tbox) and assertional components (Abox)
- the combination of Tbox vocabulary and Abox facts represent a knowledge base (KB)

Ontology Content

AOK systems

Semantic building blocks:

- class, property, and individual constructs
- relationships between these contructs
- restrictions of properties for certain classes

Ontology Web Language OWL

AOK systems

OWL expressions can be formed from:

- class names (URIrefs)
- enumerations
- property-restrictions
- boolean combination of class expressions

Description Logic OWL DL

AOK systems

OWL DL

- provides a Description Language (DL) that is based on RDF syntax and supports reasoning applications
- contains the whole OWL Full vocabulary with few restrictions that ensure that reasoning is computational and decidable in conception models
- supports complex classes, like enumerated classes, disjoint classes, and Boolean class expressions

Semantic Web Rule Language

AOK systems

SWRL

- support conjunctive queries (only instances) like:

e.g: „Which books were published by Springer and who wrote them?“
Book(x) ^ publisheBy(x,Springer) ^ Author(x,y) antecedent -> consequent

- is not decidable – but there are decidable („DL safe“) subsets

Rules Interchange Format

AOK systems

RIF-RDF / RIF-OWL

- Interoperable semantic with Semantic Web knowledge base
- W3C RIF Working Group

http://www.w3.org/2005/rules/wiki/RIF_Working_Group