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Emerging Web Services Technologies WiSe 2009/2010

Tools for Semantic Web Services

Agenda

- Short introduction of Semantic Web Services
  - Ontologies
  - Lifecycle of Semantic Web Services
  - Service descriptions

- Tools für Semantic Web Services
  - Web Service Modelling Toolkit
  - OWL-S IDE

Motivation Semantic Webservices

Sight Service

Car Reservation

Restaurant Finder

Find service

Service offer?

Requires manual interaction

My desire:

Go on trip to a sight nearby by car

Have dinner at a restaurant

Introduction to Semantic Web Services

1. How can a service be described so that it can be found by a requester?
2. How to translate the requester`s desires so that their meaning can be understood by a machine?

- Enhance web services with semantics
  - Establish a common understanding for concepts
  - Based an ontologies
- Semantic description is machine-interpretable

→ Provide support for automated

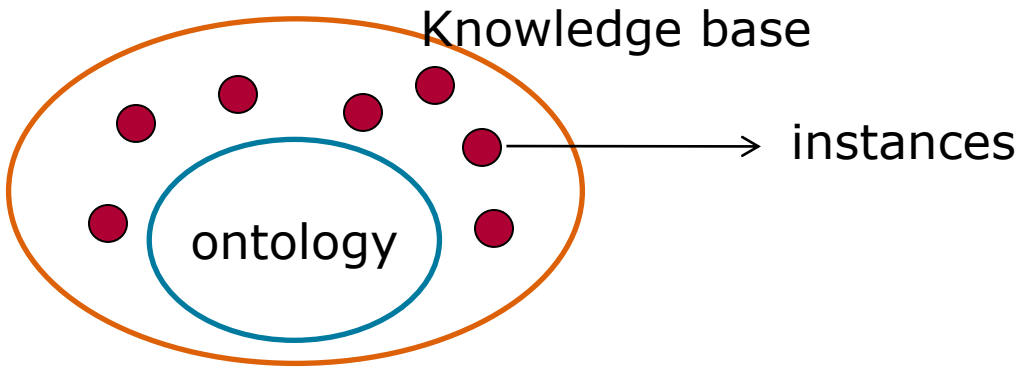
- Publication, Discovery, Selection, Composition, Mediation, Execution, Monitoring, Compensation, Replacement

Ontologies

Definition:

„An ontology is a formal explicit specification of a shared conceptualisation of a domain of interest.“ [Gruber, 1993]

- Conceptual model is described in a formal language
  - e.g. OWL or WSML
- Ontology + individual instances = Knowledge base
  - Can be reasoned on



Elements of an Ontology

Concept
conceptual entity of the domain

Property
attribute describing a concept

Relation
relationship between concepts or properties

Axiom
coherency description between Concepts / Properties / Relations via logical expressions

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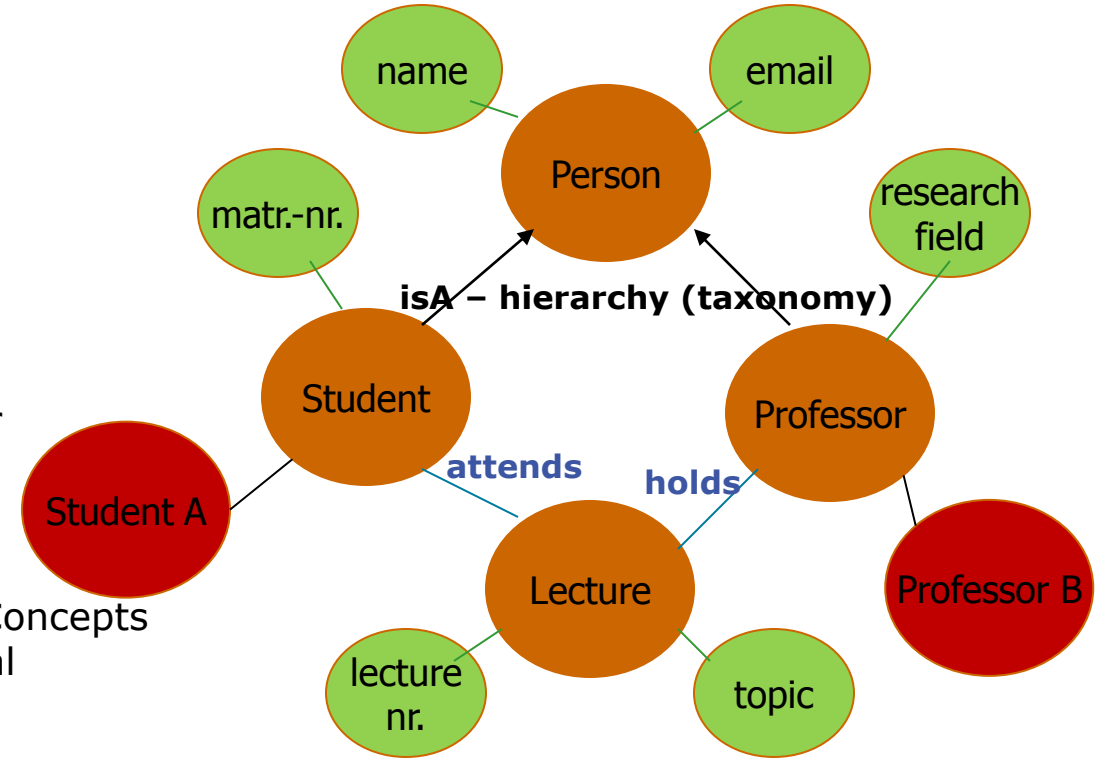
Instances
A concrete subject of a concept



holds(Professor, Lecture) =>
Lecture.topic = Professor.researchField

Ontology syntax example

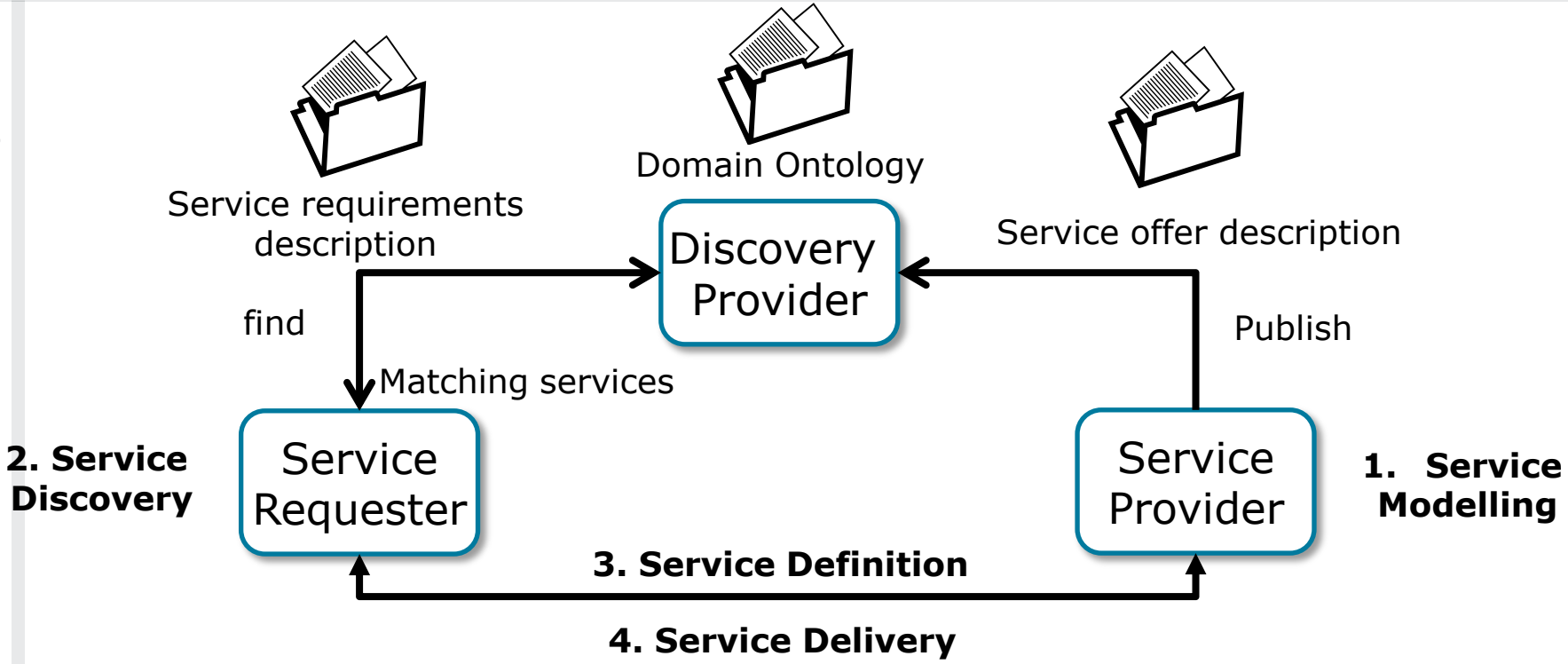
WSML

```
wsmlVariant _"http://www.wsmo.org/wsml/wsml-syntax/wsml-f.
namespace { _"http://example.org/"
 }

ontology Person

concept Person
     name ofType _string
     email ofType _string

concept Student subConceptOf Person
     matrnr ofType _string
     attends ofType Lecture

concept Lecture
     topic ofType _string

concept Professor subConceptOf Person
     researchField ofType _string
     holdsLecture ofType Lecture
```

OWL

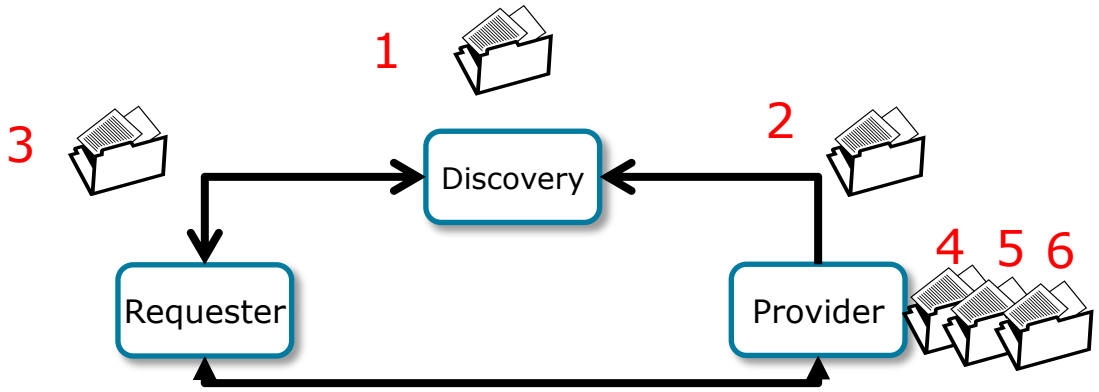
```
<owl:Class rdf:ID="Person">
    <owl:subClassOf rdf:resource="&owl;#Thing"/>
</owl:Class>
<owl:Property rdf:ID="email">
    <rdfs:range rdf:resource="&xsd;#string"/>
    <rdfs:domain rdf:resource="#Person"/>
</owl:Property>
<owl:Property rdf:ID="name">
    <rdfs:range rdf:resource="#string"/>
    <rdfs:domain rdf:resource="#Person"/>
</owl:Property>
-----------------------------------------
<owl:Class rdf:ID="Student">
    <owl:subClassOf rdf:resource="#Person"/>
</owl:Class>
<owl:Property rdf:ID="matrno">
    <rdfs:range rdf:resource="&xsd;#string"/>
    <rdfs:domain rdf:resource="#Student"/>
</owl:Property>
<owl:Property rdf:ID="attends">
    <rdfs:range rdf:resource="#Lecture"/>
    <rdfs:domain rdf:resource="#Person"/>
</owl:Property>
-----------------------------------------
<owl:Class rdf:ID="Lecture">
    <owl:subClassOf rdf:resource="&owl;#Thing"/>
</owl:Class>
<owl:Property rdf:ID="topic">
    <rdfs:range rdf:resource="&xsd;#string"/>
    <rdfs:domain rdf:resource="#Lecture"/>
</owl:Property>
```

Lifecycle of Semantic Webservices

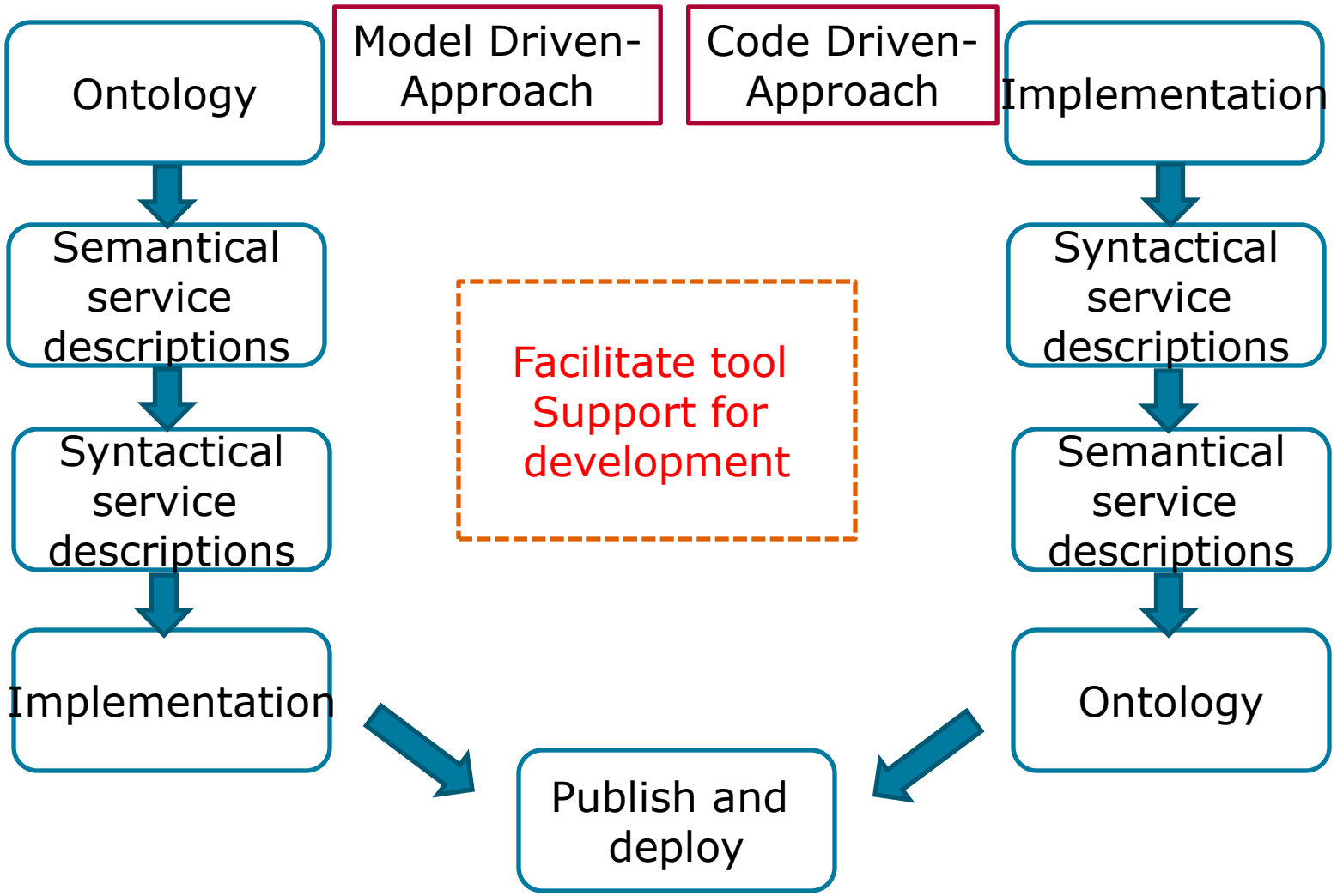


Abstract Service Descriptions

1. Domain Ontology	Common vocabulary to operate on
2. Service offer description	Benefit of the service
3. Service requirements description	Goal to achieve
4. Choreography description	Specify communication
5. Orchestration description	Invoking other services
6. Grounding description	Mapping to a concrete webservice



Development approaches



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Semantic Webservices specifications

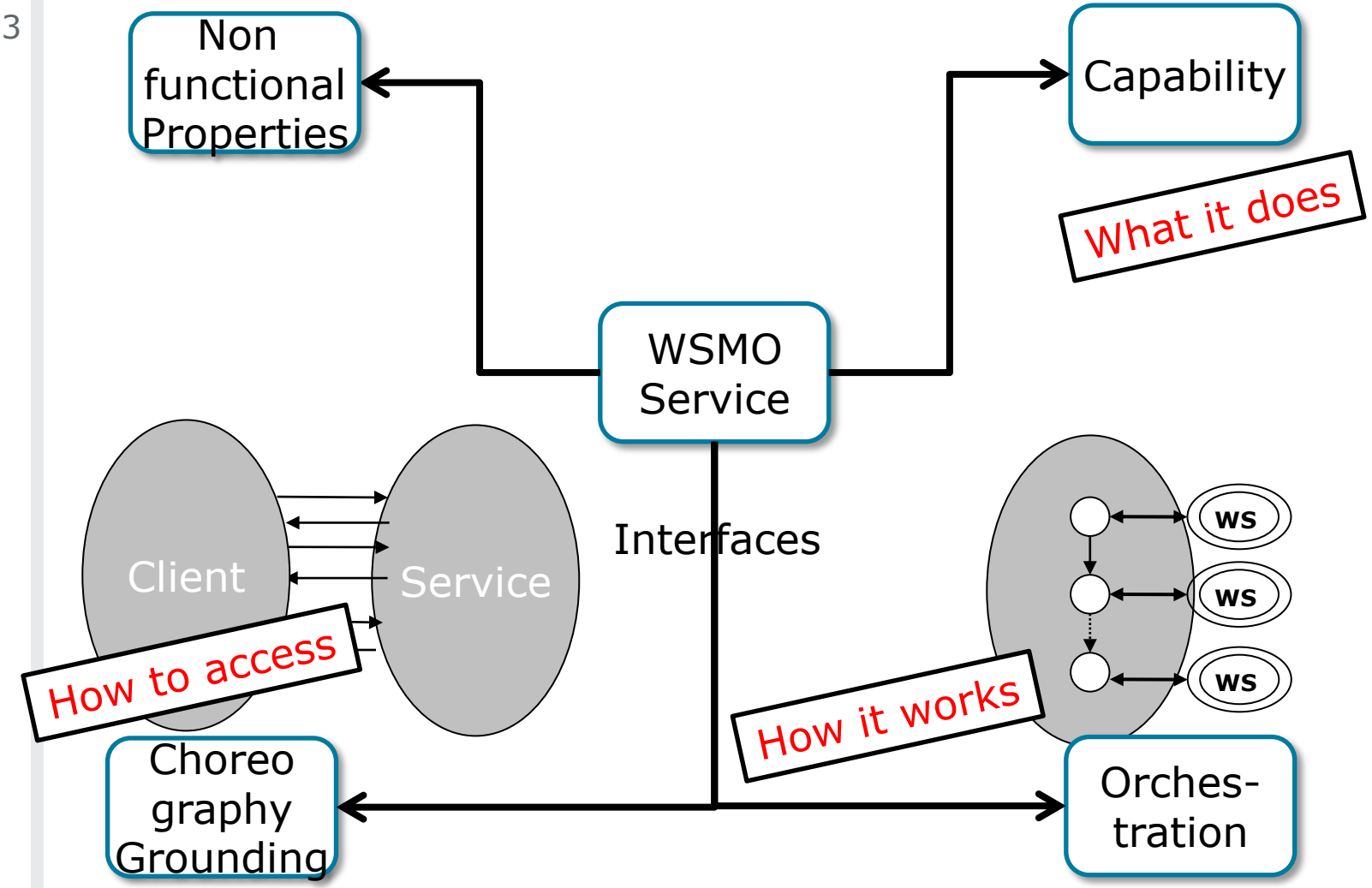
Web Service Modeling Ontology (WSMO)

- Language: Web Service Modeling Language (WSML)
- **WSMT** (http://sourceforge.net/projects/wsmt/)
- WSMO Studio (http://www.wsmo.org)

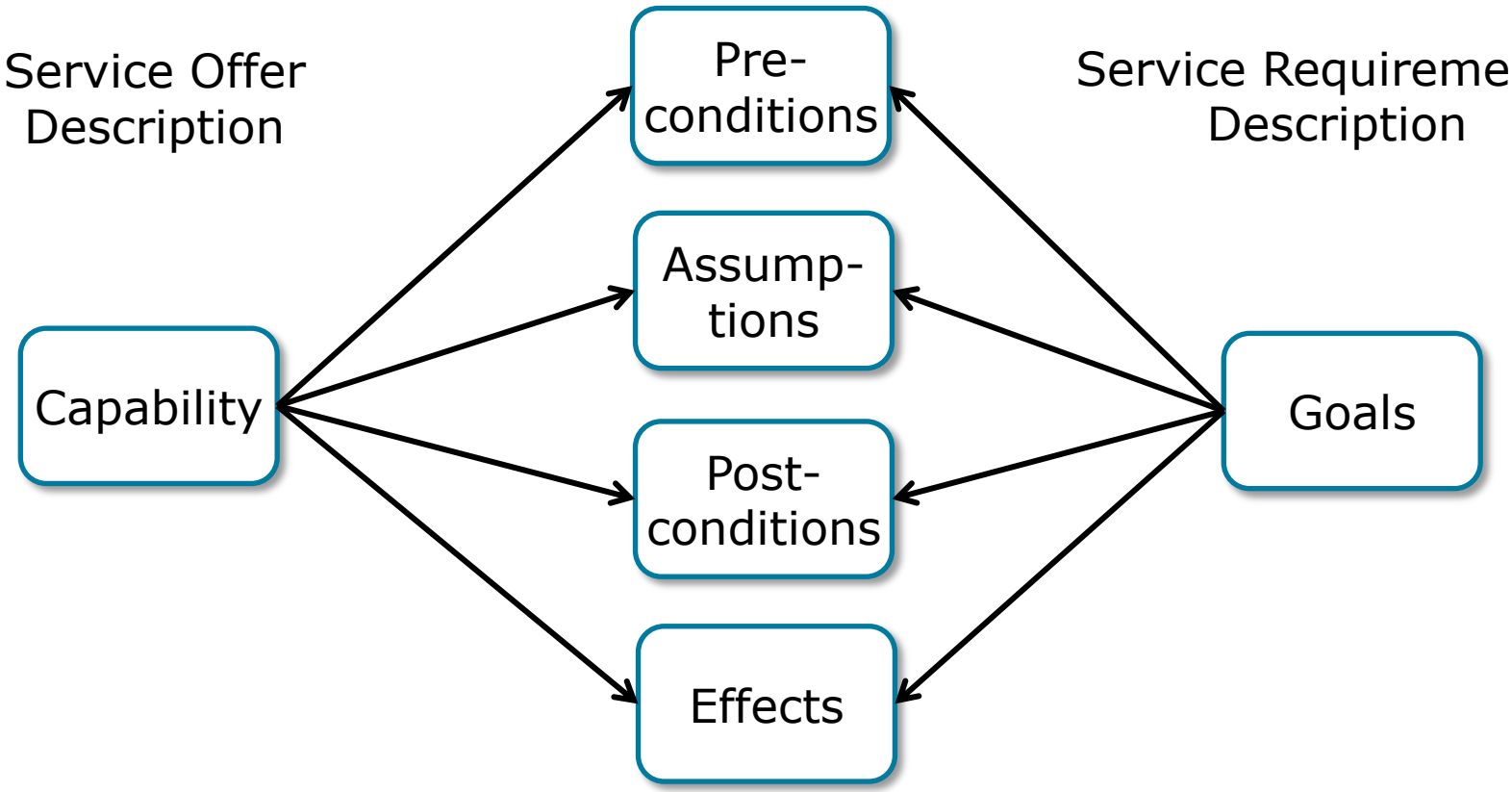
Web Ontology Language for Web Services (OWL-S)

- Language:OWL
- **OWL-S IDE** (http://projects.semwebcentral.org/projects/owl-s-ide/)
- Protégé (http://protege.stanford.edu/)

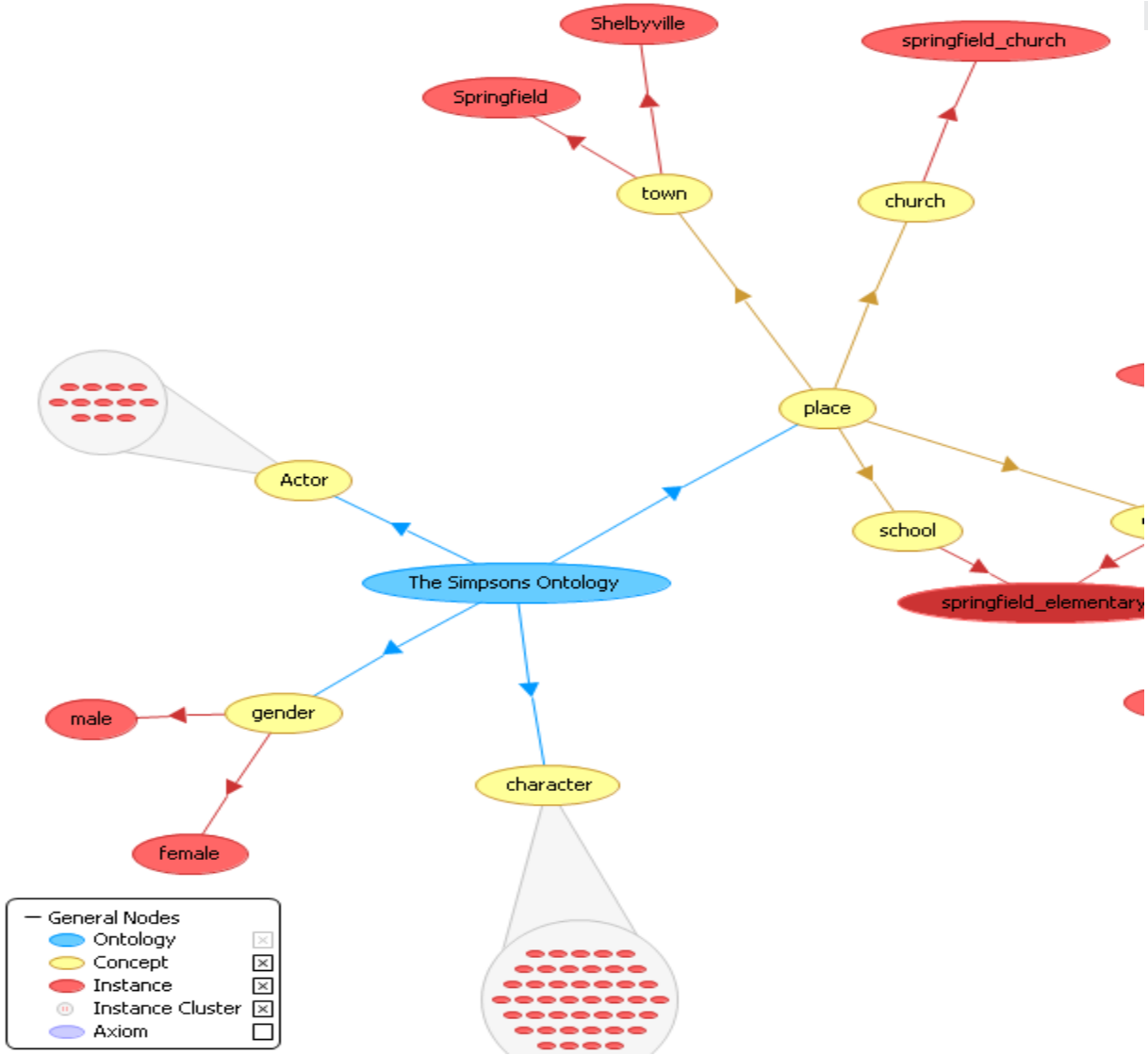
Service Descriptions in WSMO



WSMO Service Discovery

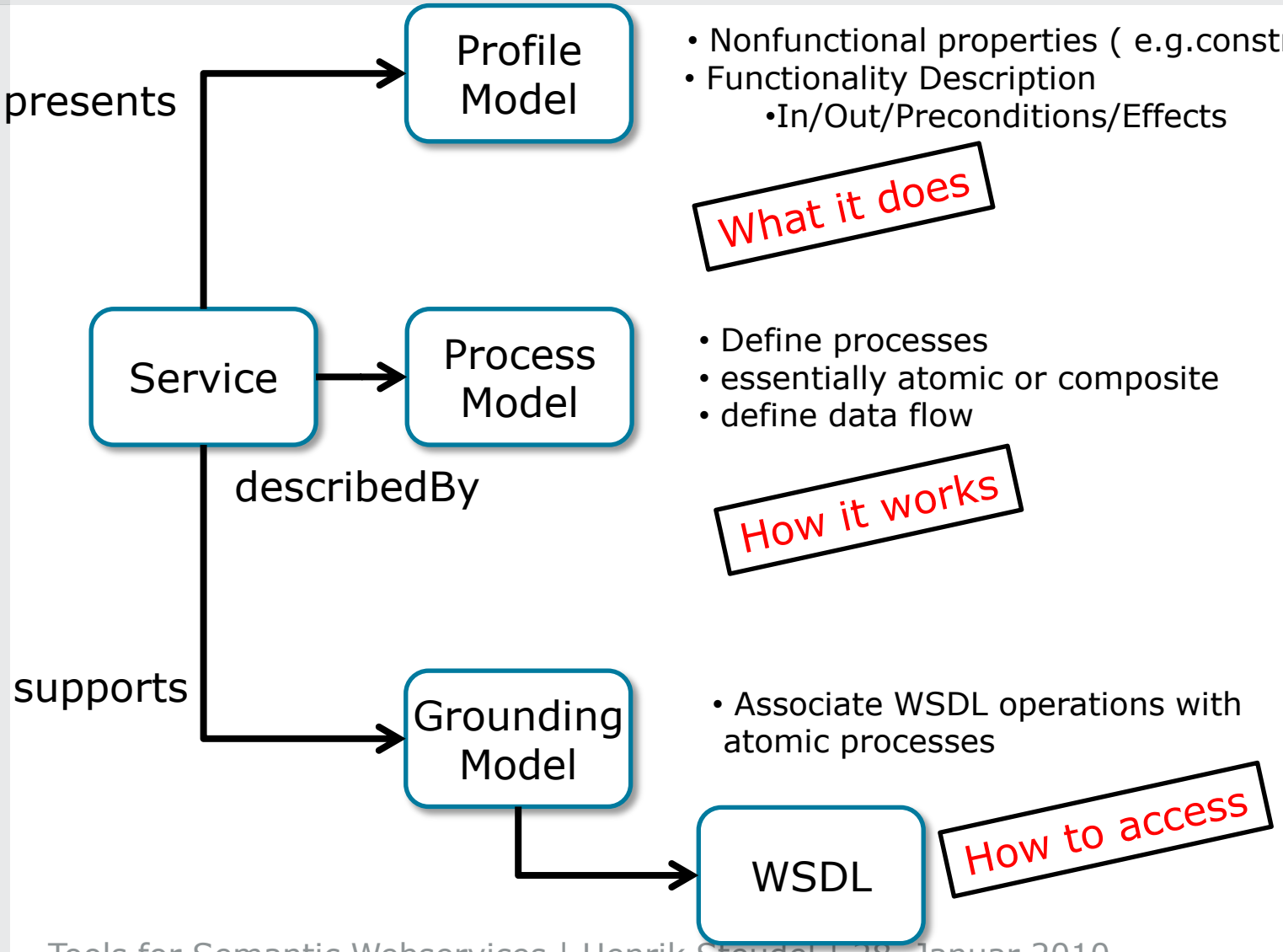


Example: Simpsons Ontology



WSMO/WSMT Demo

Service Descriptions in OWL-S



BravoAir-Szenario for OWL-S

Select Flight

Departure
Arrival
Date/Time

Login

UserName
Password

BravoAir Service

Confirm Flight

ETicket

http://www.daml.ri.cmu.edu/bravoair/

OWL-S IDE Demo

Summary

WSMT:

- Editing ontologies
- Reasoning on knowledgebase
- Discovery of a WSMO service

OWL-S IDE:

- Editors for description artefacts in OWL-S
  - Profile Model
  - Process Model
  - Grounding Model

Impressions

- OWL-S IDE last update: V1.1. from *27.07.2005*
- WSMT appear to be more integrated and comprehensive tools and actively developed

Overall Impression:

WSMO seems to be a good choice for developing semantic web services (when it comes to tooling)

References

[1] Semantic Web Services Tutorial, Michael Stollberg and Armin Haller, 3rd International Conference on Web Services (ICWS 2005) Orlando, Florida, 2005 July 11 (http://www.wsmo.org/TR/d17/resources/200507-ICWS/SWStutorial-iswc05.ppt)

[2] Ontology Development, Michael Tschugnall (http://www.sti-innsbruck.at/fileadmin/documents/sws_ss09/tutorial/2-ontology_development.pdf)

[3] OWL-S: Semantic Markup for Web Services (http://www.daml.org/services/owl-s/1.0/owl-s.pdf)

[4] OWL-S: Semantic Markup for Web Services, 22.11.2004 (http://www.w3.org/Submission/OWL-S/)

[5] WSMO, Web Service Modeling Ontology (http://www.wsmo.org)

[6] WSMT, Web Service Modeling Toolkit (http://sourceforge.net/projects/wsmt/)

Choreography and Grounding Editor