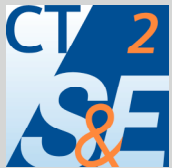


Web Services Annotation and Reasoning

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Software &
Engineering
Architecture

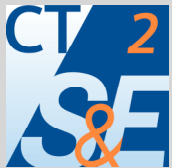
Motivation _ Current Problems

- **Software Applications**

- work with and
- depend on

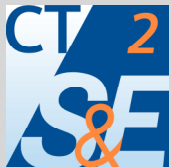
a concrete _SYNTACTIC_ representation of the information

- **To acquire information from different sources and domains is a difficult task**
- **Web service standard specifications do not support dynamic composition**
- **Until now, “semantic” description approaches do not cover full business life-cycle**



Motivation _ Expectations

- **Service provider requirements:**
 - Clear and easy way to describe services
 - Advanced possibilities to define and distinguish requirements, properties, characteristics, guaranties, ...
 - Flexibility – applicability of own terminology and its structure
 - Means to describe dynamic qualities due to business process modeling
 - Advanced features for providing variability in semantic descriptions
 - Consistent information
- **Service requestor requirements:**
 - Replace simple keyword search by a “semantic” one
 - Facile way to describe requirements, post- and pre-conditions
 - Possibility to formally express desired scenarios, business processes, workflows
 - Mechanisms for translating automatically visual specifications (UML, MSC) into formal ones
 - Formal specifications should be very intuitive, flexible, and close to natural language expressions



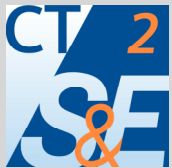
Current Work _ Framework Conception

- **Goal:**

Elaboration of a framework to support comprehensive semantic descriptions of Web services and their lifecycle

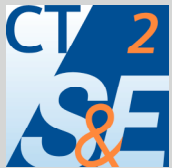
- **Main features:**

- flexible way to semantically annotate Web services based on the diversity of ready solutions, models, patterns specified for concrete domains, situations and user groups;
- integrating the connector concept for the service behavior description;
- uses the conception of “Logic-on-Demand”, which provides a variety of formal semantic specifications based on different logical formalisms with different levels of expressivity and decidability;
- provides an intuitive interface to work with logical reasoners;
- the conception is based on a *Service Description Reference Model*;
- user-friendly way to provide hybrid solutions for different user groups and their needs.



Current Work _ The Connector Conception

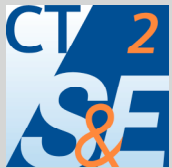
- **Peter Graubmann:** *Describing interactions between MSC Components: the MSC Connectors*, **Computer Networks 42, 2003.**
- **Maria Victoria Cengarle, Peter Graubmann, Stefan Wagner:** *From Feature Models to Variation Representation in MSCs*, **J. Bosch Editor, Second Groningen Workshop on Software Variability Management, Technical Report IWI Preprint 2004/7/01, Rijksuniversiteit Groningen, 2004.**



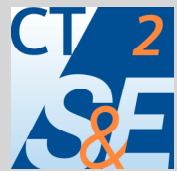
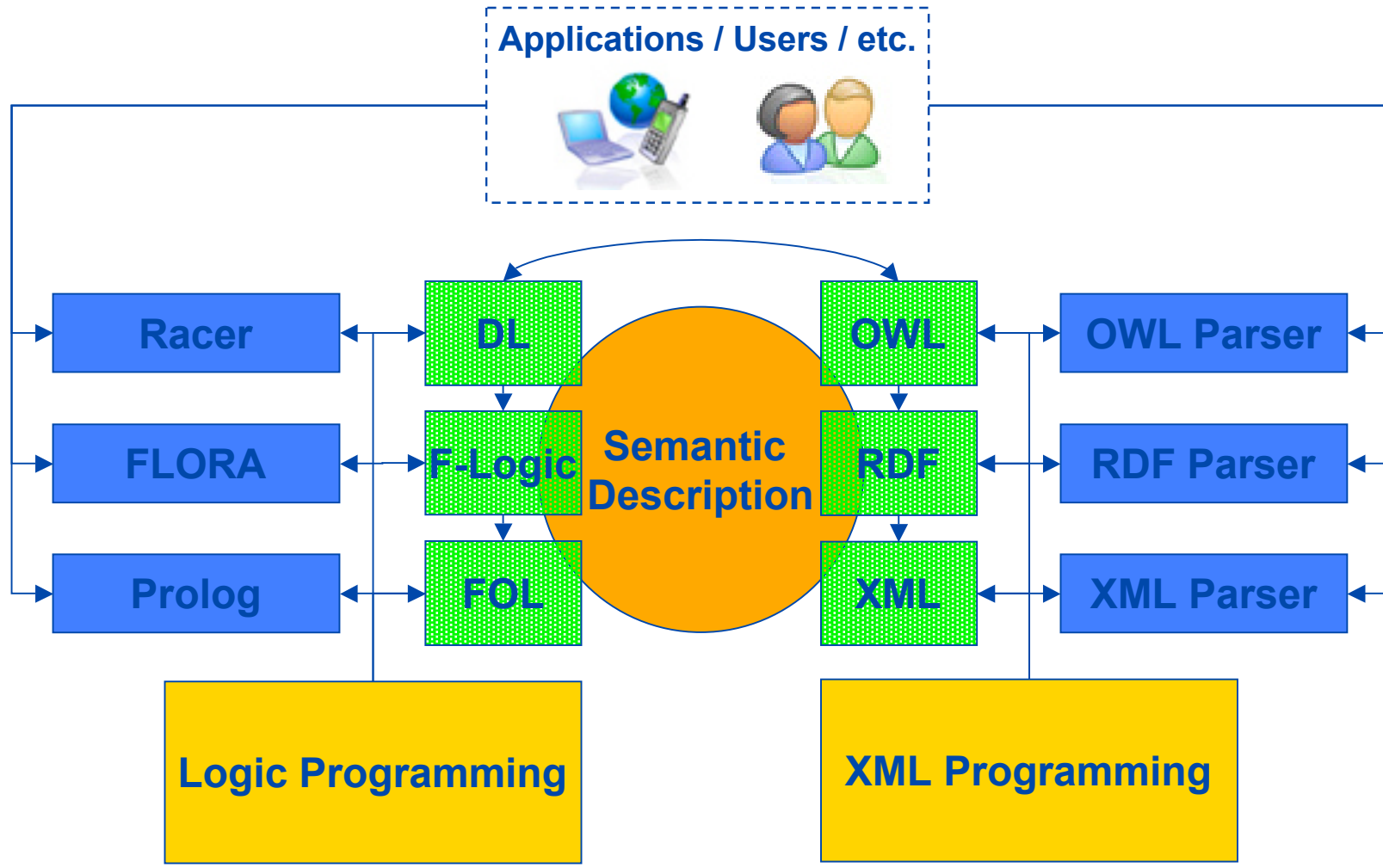
Current Work _ “Logic-on-Demand” Conception

“Logic-on-Demand” – hybrid solutions for expressing semantic knowledge in WS on different levels of user roles and requirements:

- Terminological representation and reasoning (Description Logics)
- Rule-based representation and reasoning (extensions of DL, FLORA, FOL)
- Temporal representation and reasoning (Modal Logics)
- Uncertain knowledge and probability representation and reasoning (Fuzzy Logics)

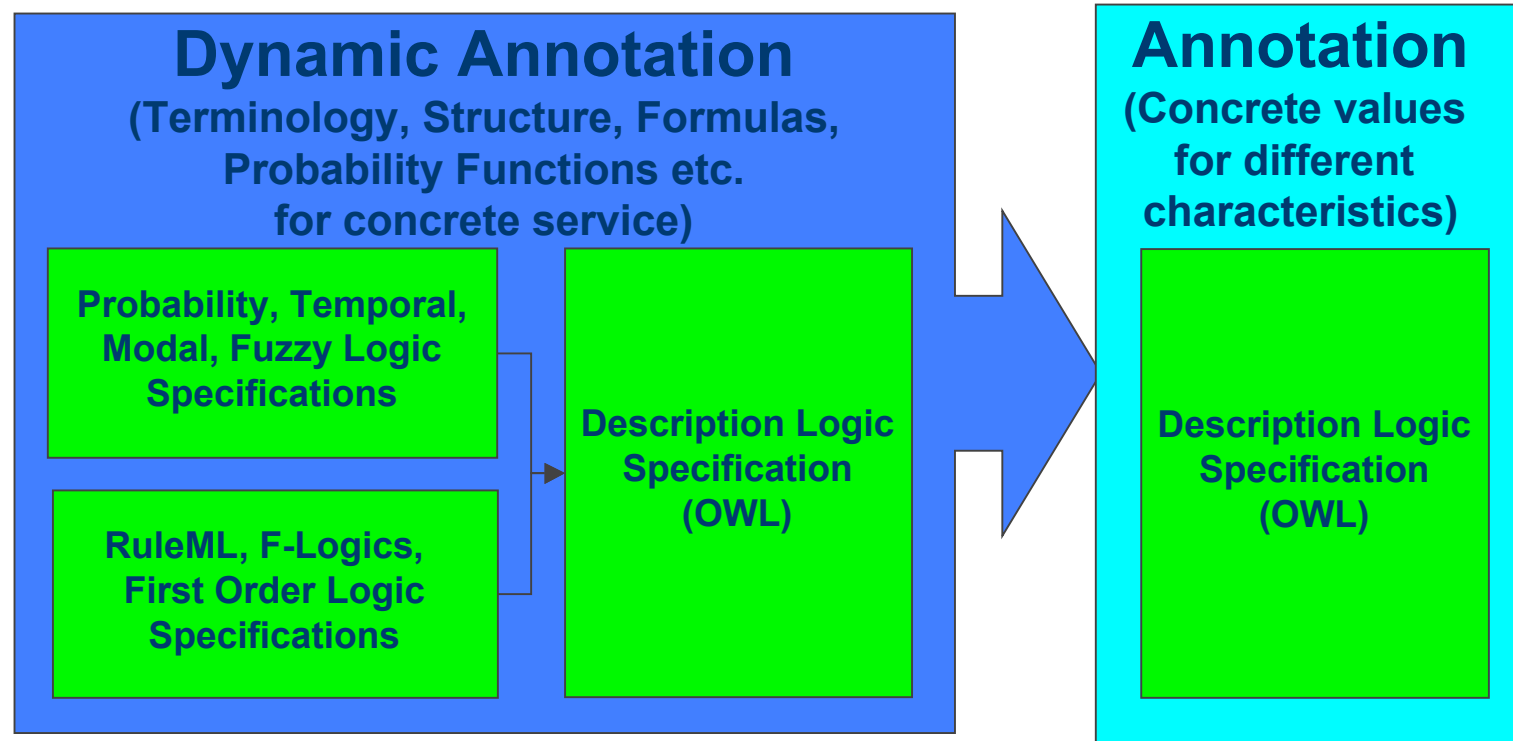


Idea _ How “Logic-on-Demand” Should Work

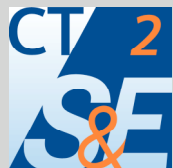
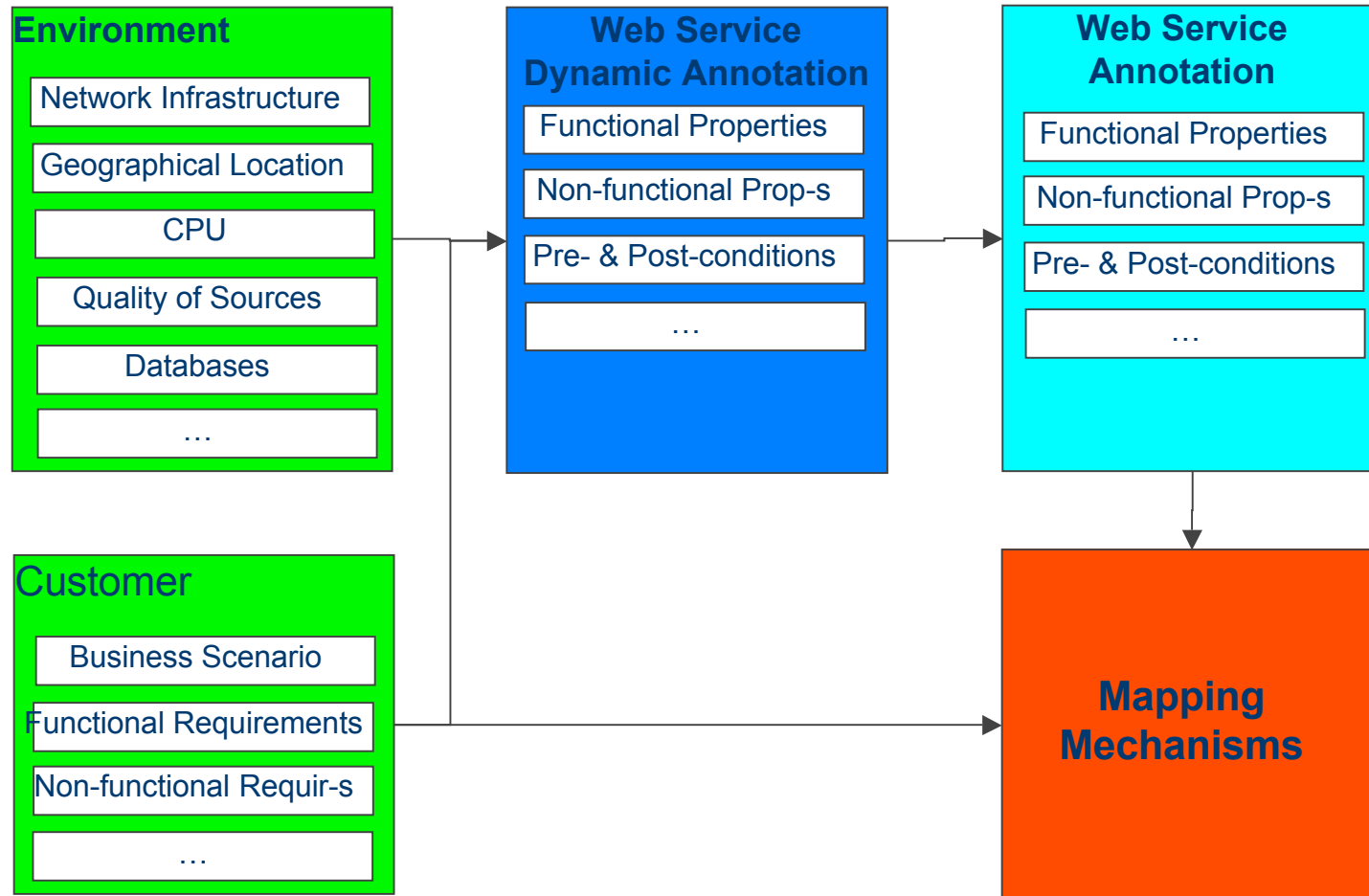


Software & Engineering Architecture

Idea _ Dynamic Annotation



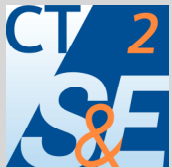
Idea _ Cooperation



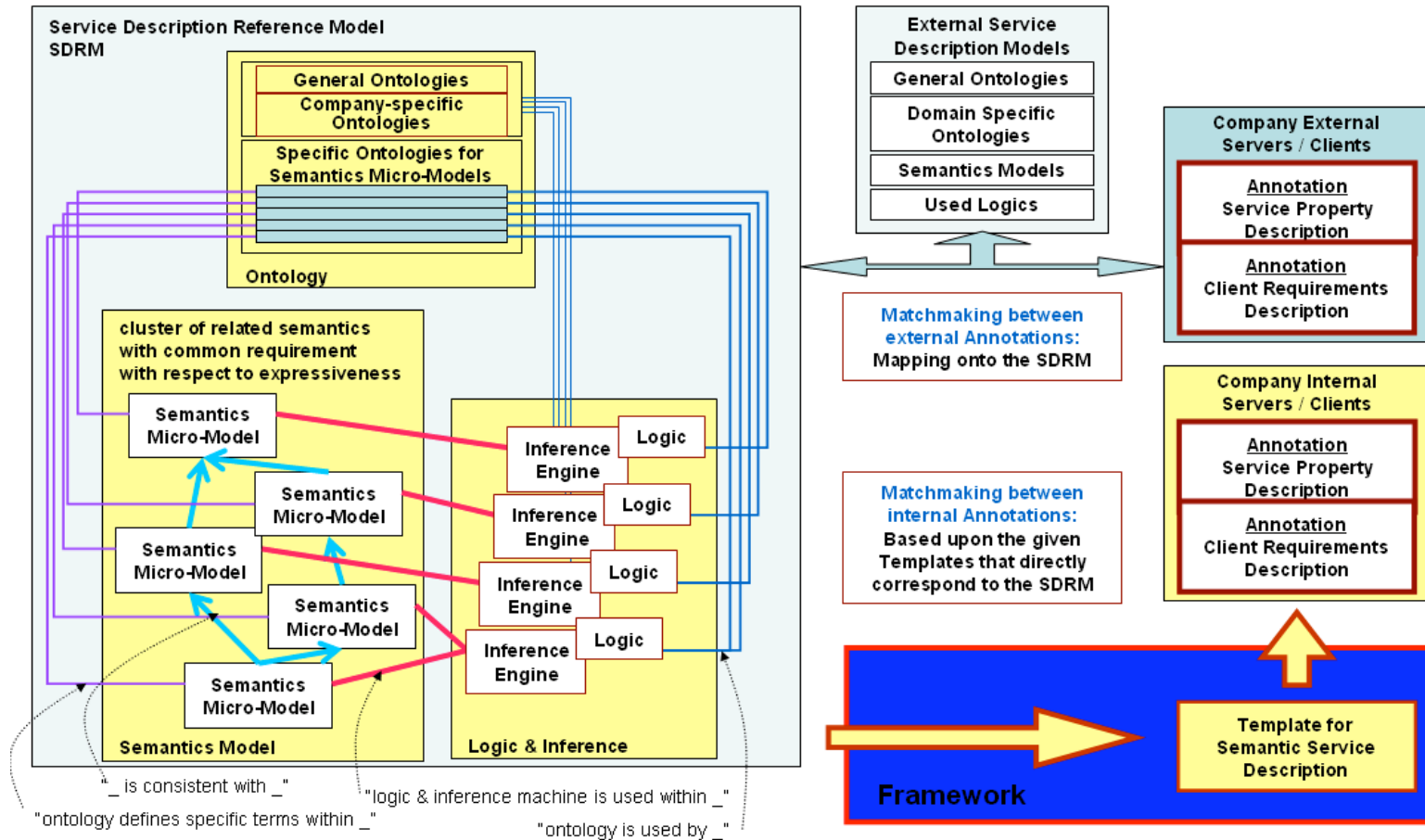
Software & Engineering Architecture

Idea _ The Key Points

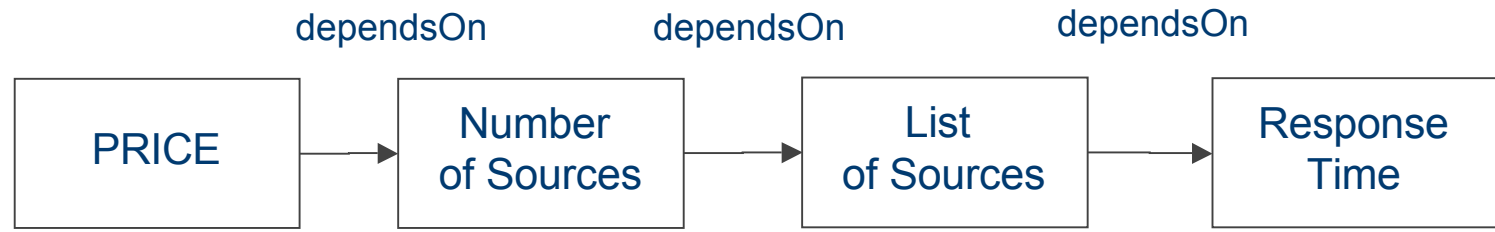
- To introduce relevant formal language specifications for describing semantic information of Web services and software components
- To support semantic description for the complete life-cycle
- To introduce understandable and processable semantics: Ontologies, Ontology Languages, Ontology merging and alignment, Ontology Reasoning
- To provide the proper way for automation of composition, mediation, compensation, execution of software components and Web services
- To introduce variability and probability features into the semantic description process (diversity of user groups, business scenarios, environment)
- To distinguish different levels of semantic formalisms and define relevant formal logical specifications for them



Big Picture _ Service Description Reference Model



Use Case _ Dynamic Annotation



Dynamic Annotation
 Rule-based Level
 (F-Logic, FOL, RuleML)

Probability Level
 (Modal, Temporal, Fuzzy Logics)

Dynamic Annotation

Requirement

Response Time < 5 ms

Response Time = $RT_{S1} + RT_{S2} + \dots + RT_{Sn}$

Annotation

$NoS * 0,4 \text{ €}$

Dynamic Annotation

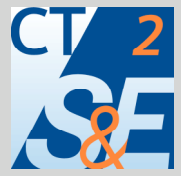
Number of Sources = 25

Dynamic Annotation

Price = 10 €

Fidelity = 65%

Response Time = 4 ms



Perspectives _ What to Do

- **Elaboration on the concepts**
- **Validation on a concrete project**
 - Definition of SMMs ...
- **Research in presentation of temporal, probabilistic and uncertain knowledge in Web services**

