

# DAIMLERCHRYSLER

## **Service Oriented Architecture (SOA)**

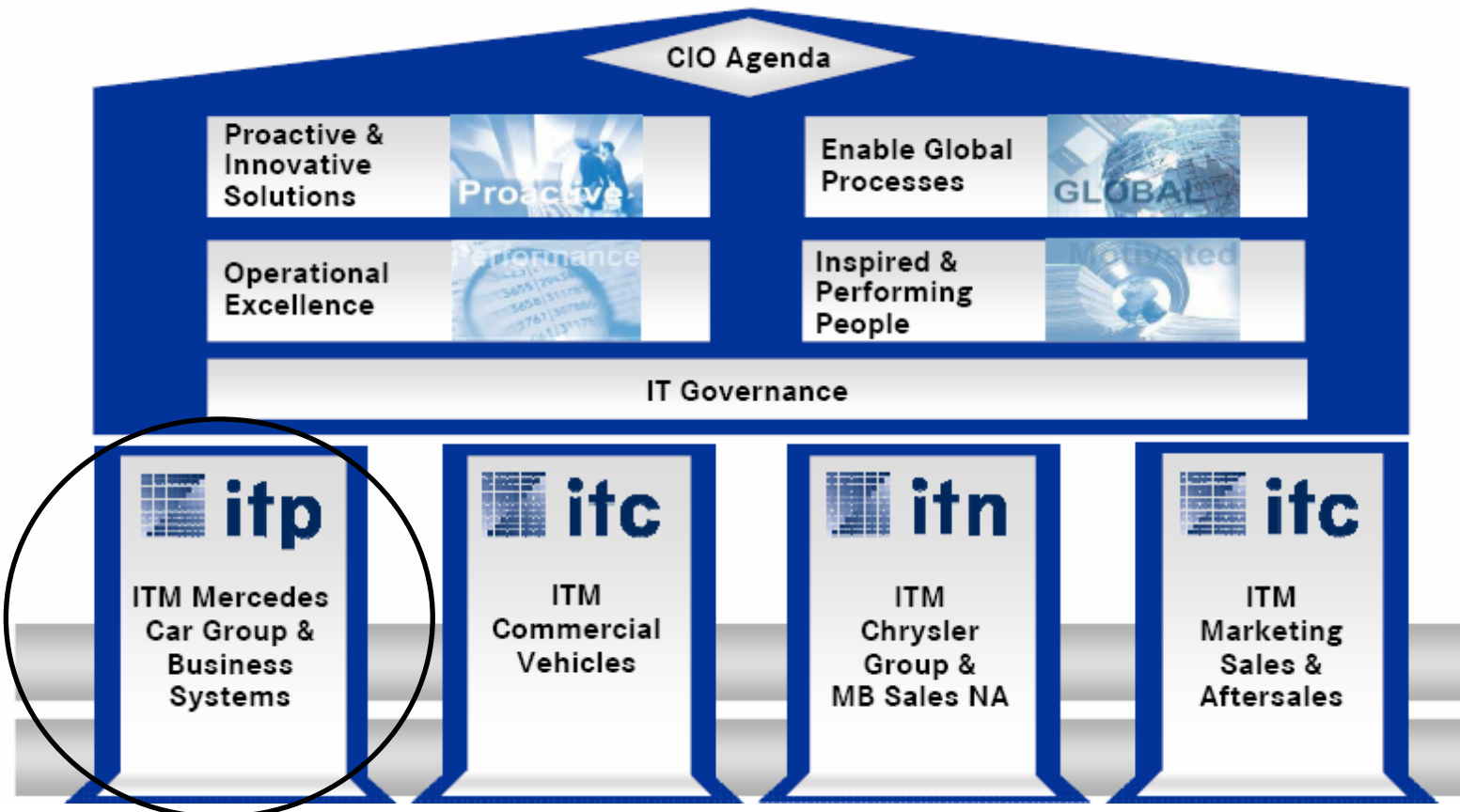
Michael Herrmann

Applying Semantics within SOA

# Agenda

- Common understanding
  - Definitions (selection) & Background
  - Big Picture
  - Services within SOA
  - Enterprise Service Bus (ESB)
- EMEO
  - Scenario I
  - Scenario II
  - WSDL-S
  - Symbolic + Inference
- Summary

## “Introducing” my working area



## Definition

„SOA is a technology neutral concept of Software architecture that represents one or more *business functions* as a *service*.

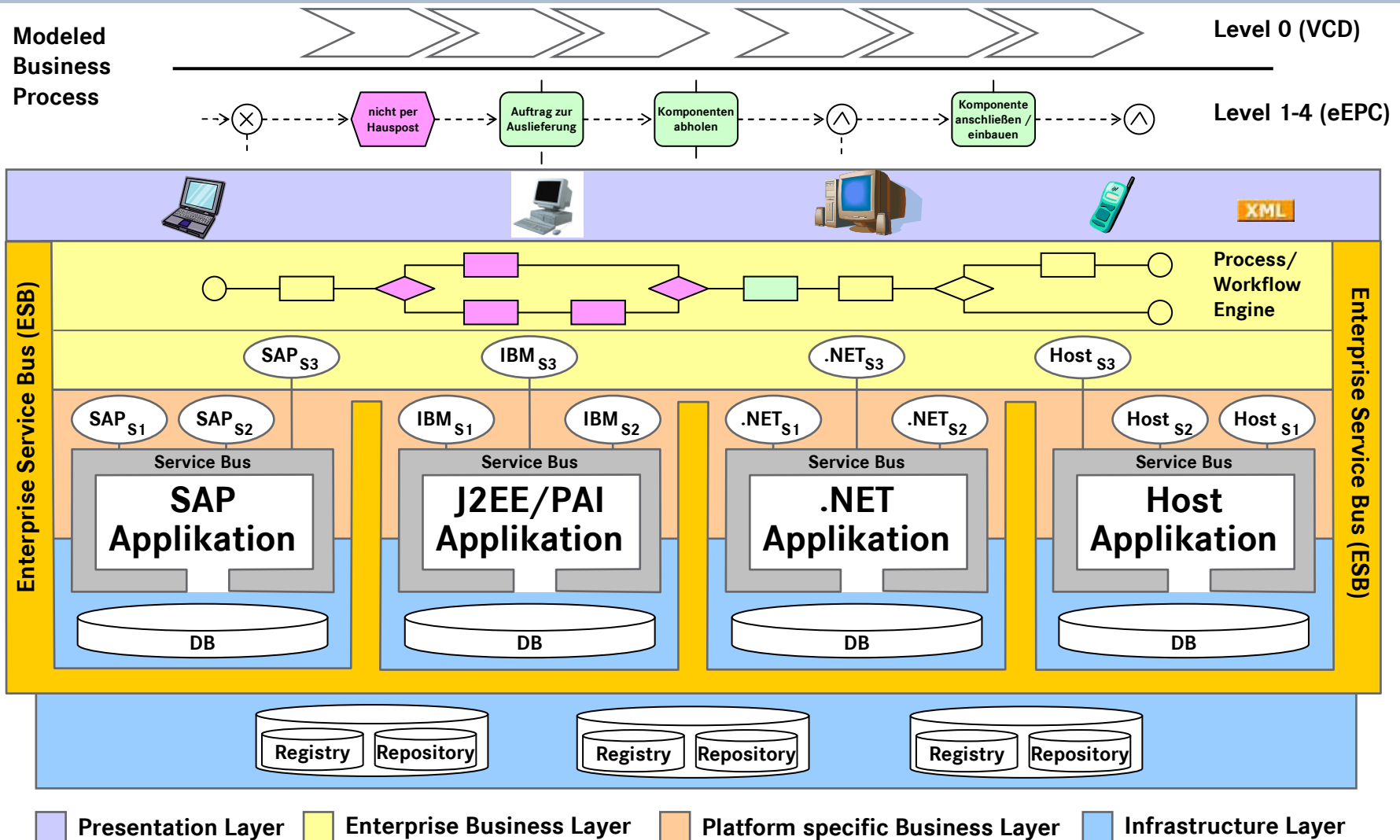
The *interface* description of a service is *platform independent*.

The implementations of the services are *reusable*, *encapsulated* and *loosely coupled*.

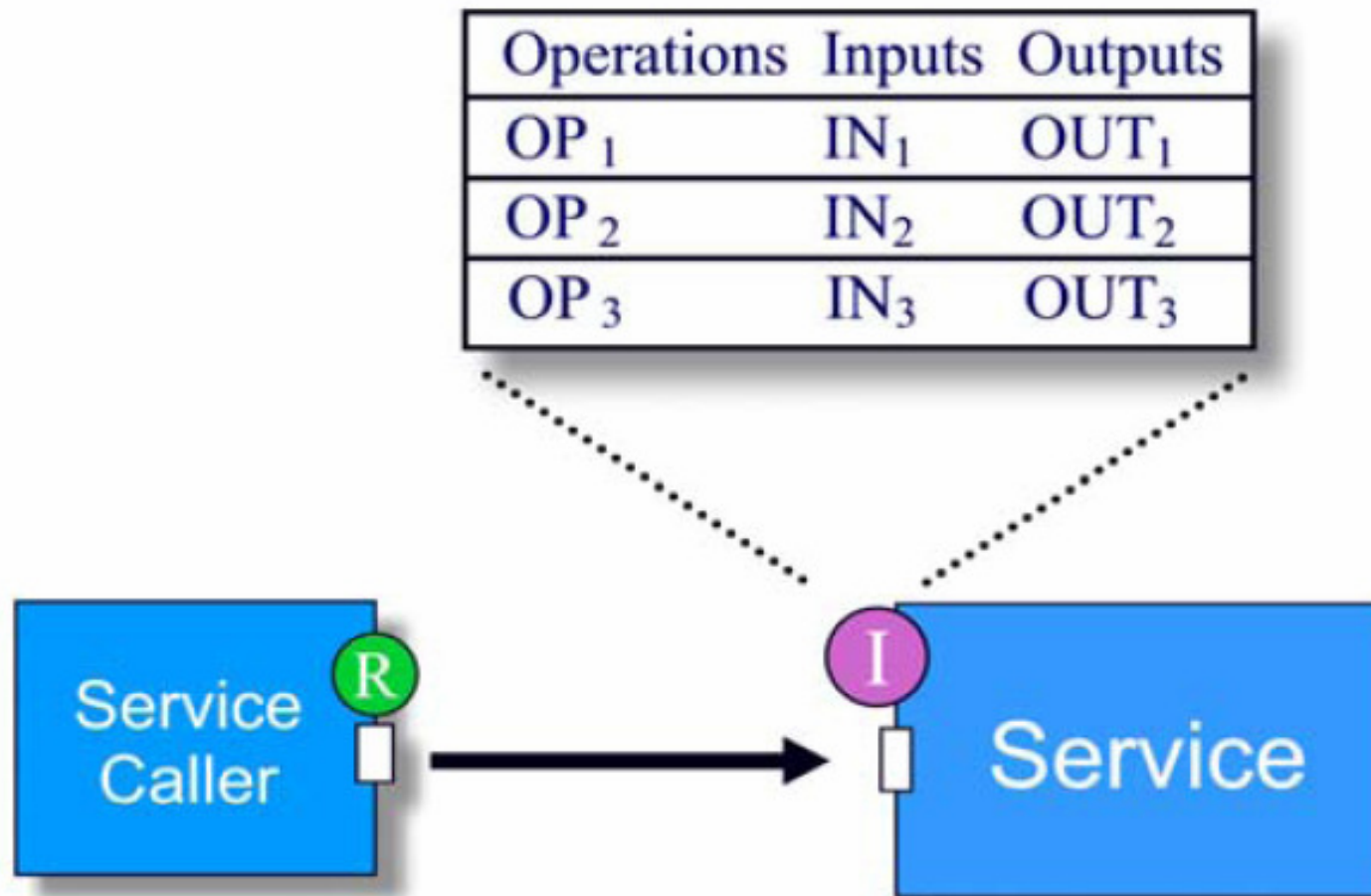
The service *interactions* are realized by a *standardized/uniformed* infrastructure.”

[DaimlerChrysler EMEA]

# SOA Big Picture



## Services inside SOA



## Service within SOA

### ■ A Service

- is a unit of third party composition
- has no (externally) observable state (encapsulates its state)
- is described platform independent (Interface)
- is potentially already deployed (deploy once, reuse several times)
- is Black Box reuse

### ■ Business Service is a Service

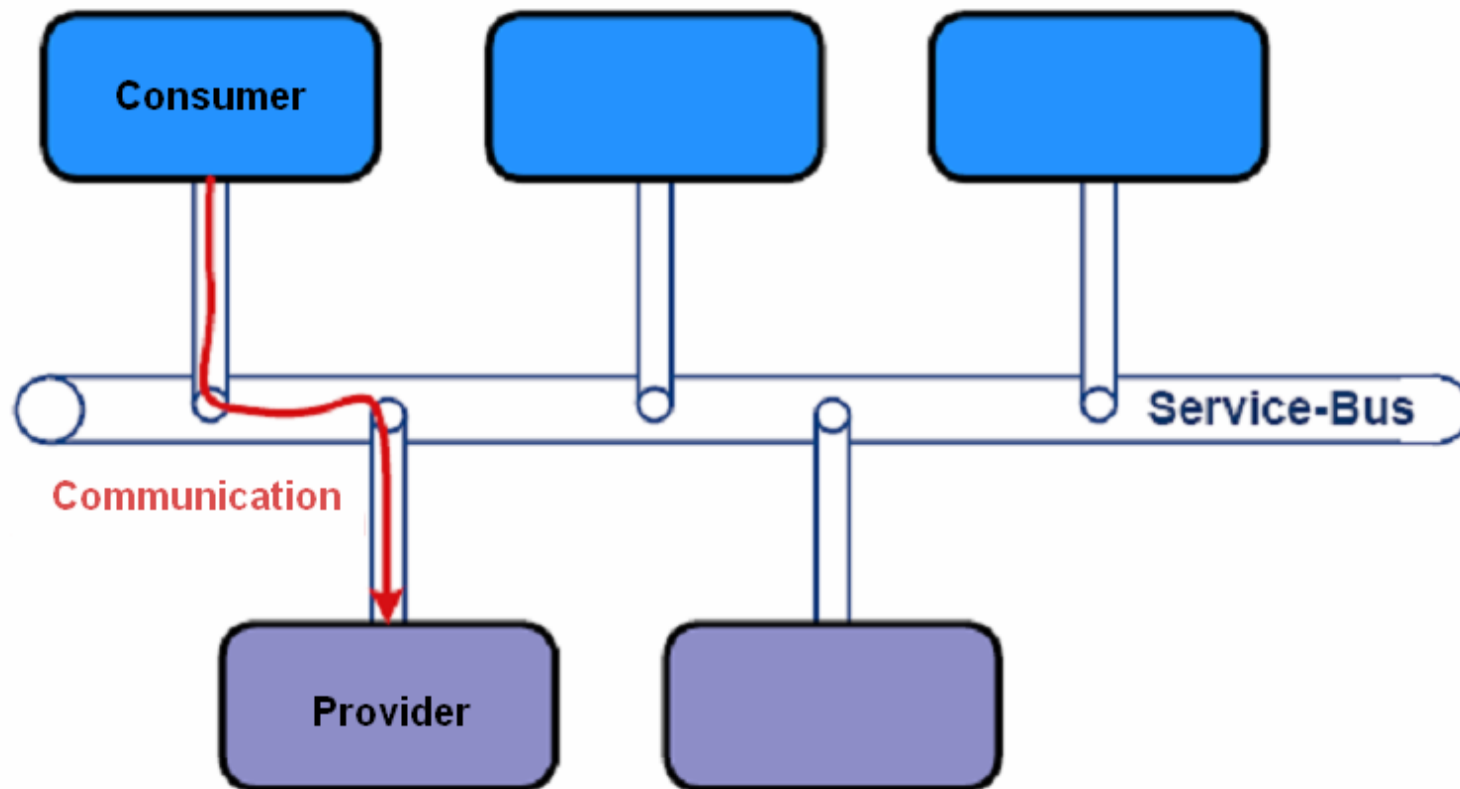
- representing one ore more Business functions

## Enterprise Service Bus (ESB)

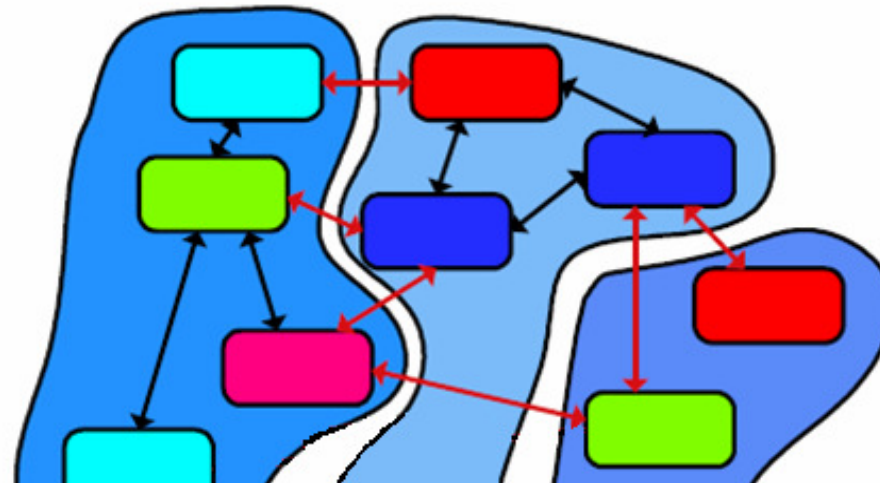
- Transport and content-based routing  
(Brokerage: Publish-Subscribe)
- Multi-protocol communication
- Validation and transformation (messages)
- Supports
  - Event-handling
  - Security (Partial Security on the message layer)
  - Monitoring
  - Adapter-connectivity
  - Dynamic addressing and service binding (Registry)
- Mediation



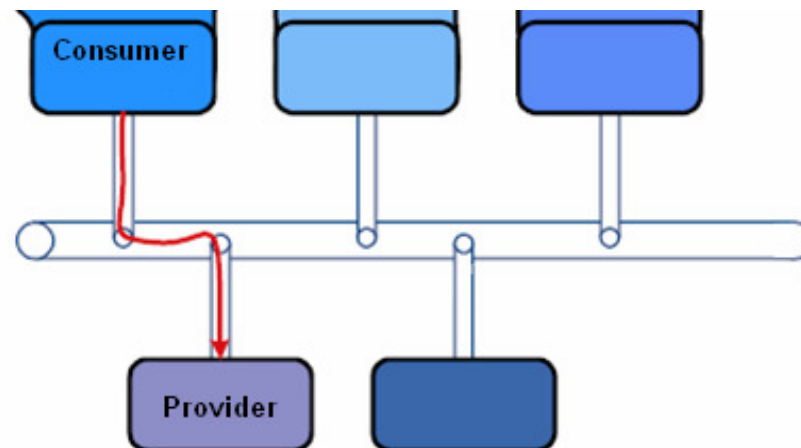
## SOA & ESB



## SOA & ESB & Semantics?!



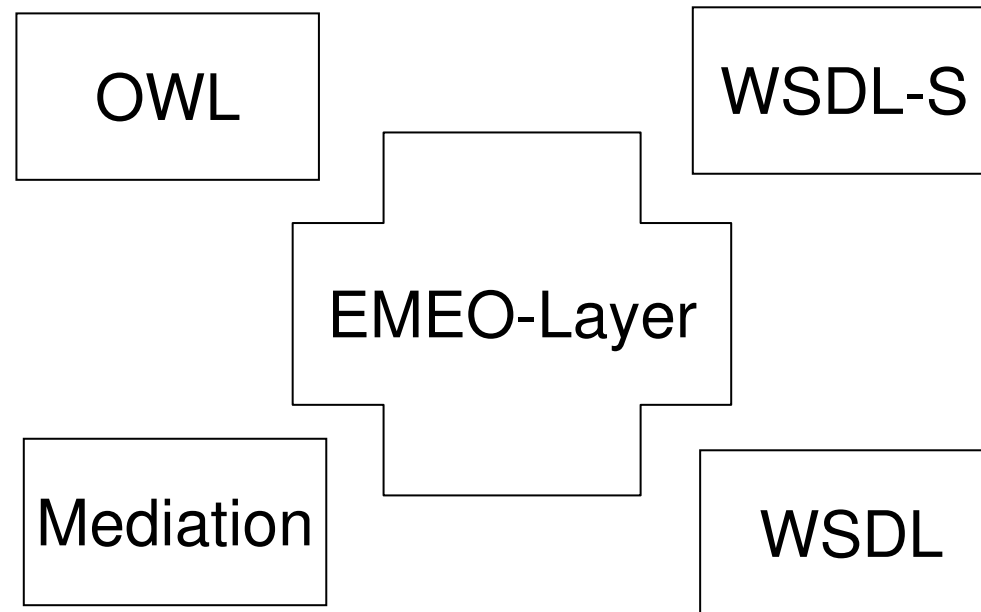
...reuse is depended upon the strengths of semantics...



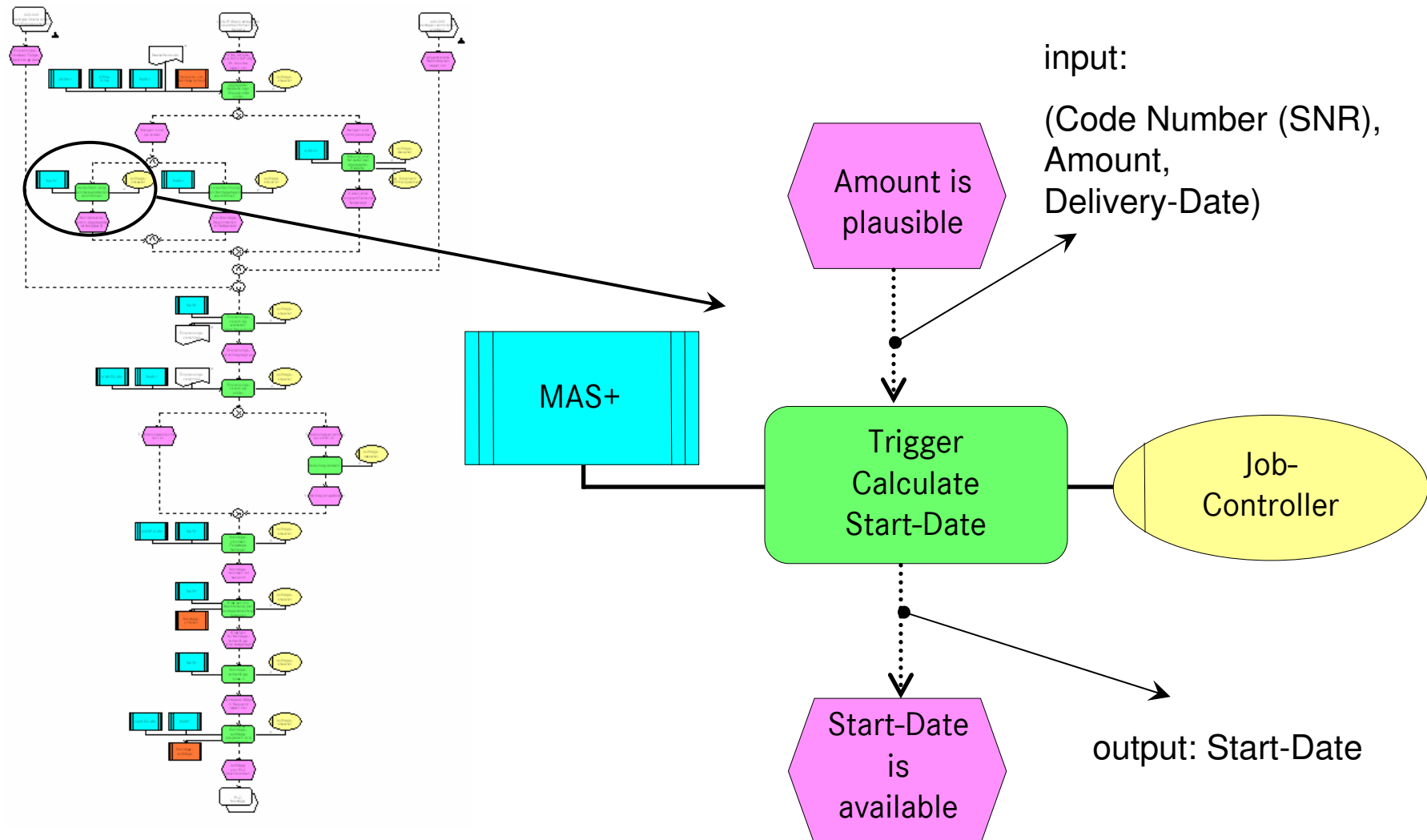
## Semantics with SOA (Approaches)

- SAWSDL (Semantic Annotations for Web Services Description Language Working Group)
- WSDL-S (Web Service Semantics)
- OWL-S (OWL-based Web Service Ontology)
- WSMO (Web Service Modeling Ontology)
- AI Planning
- Semantic Discovery Service (SDS)
- ...

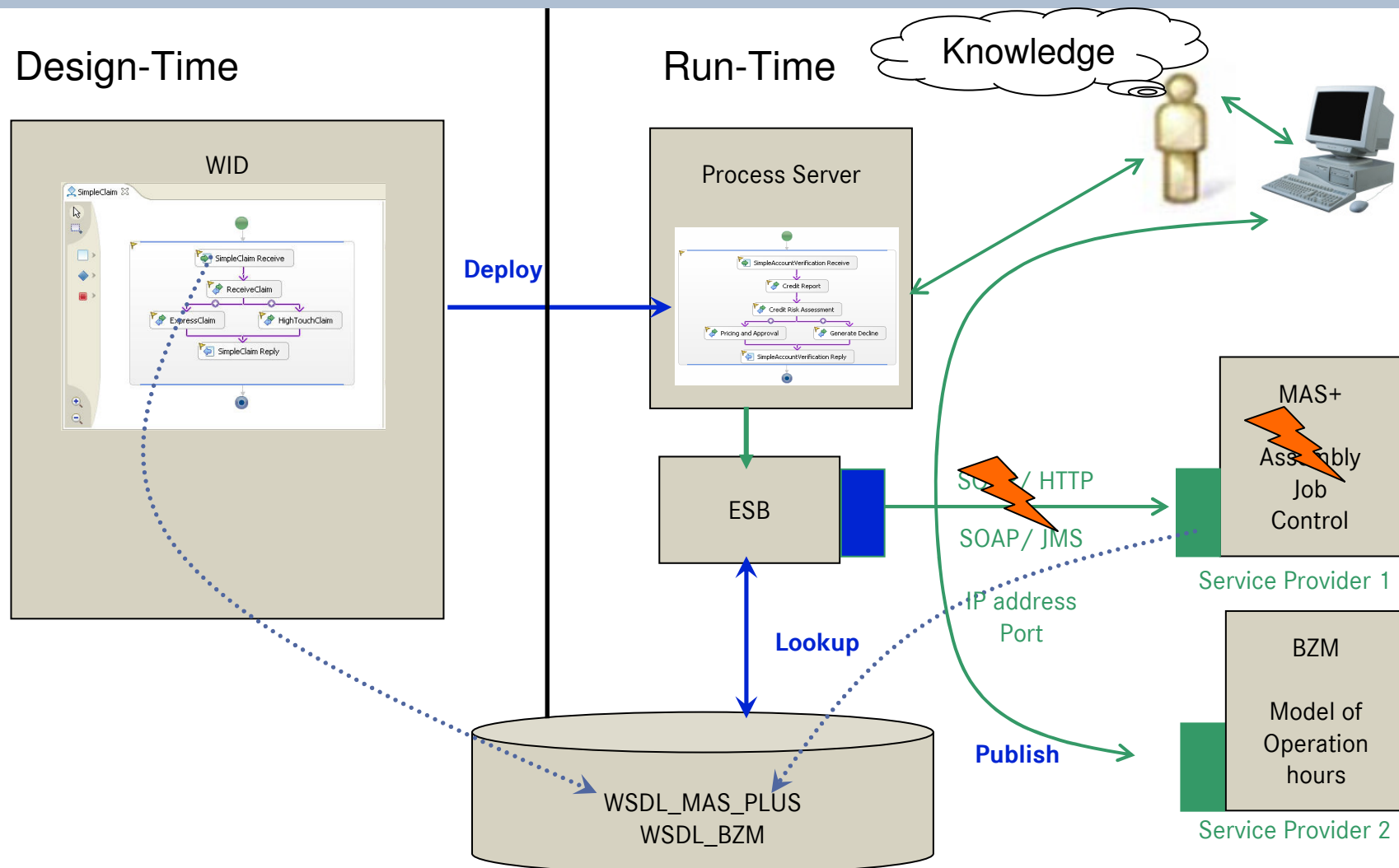
## EMEO supports loose coupling



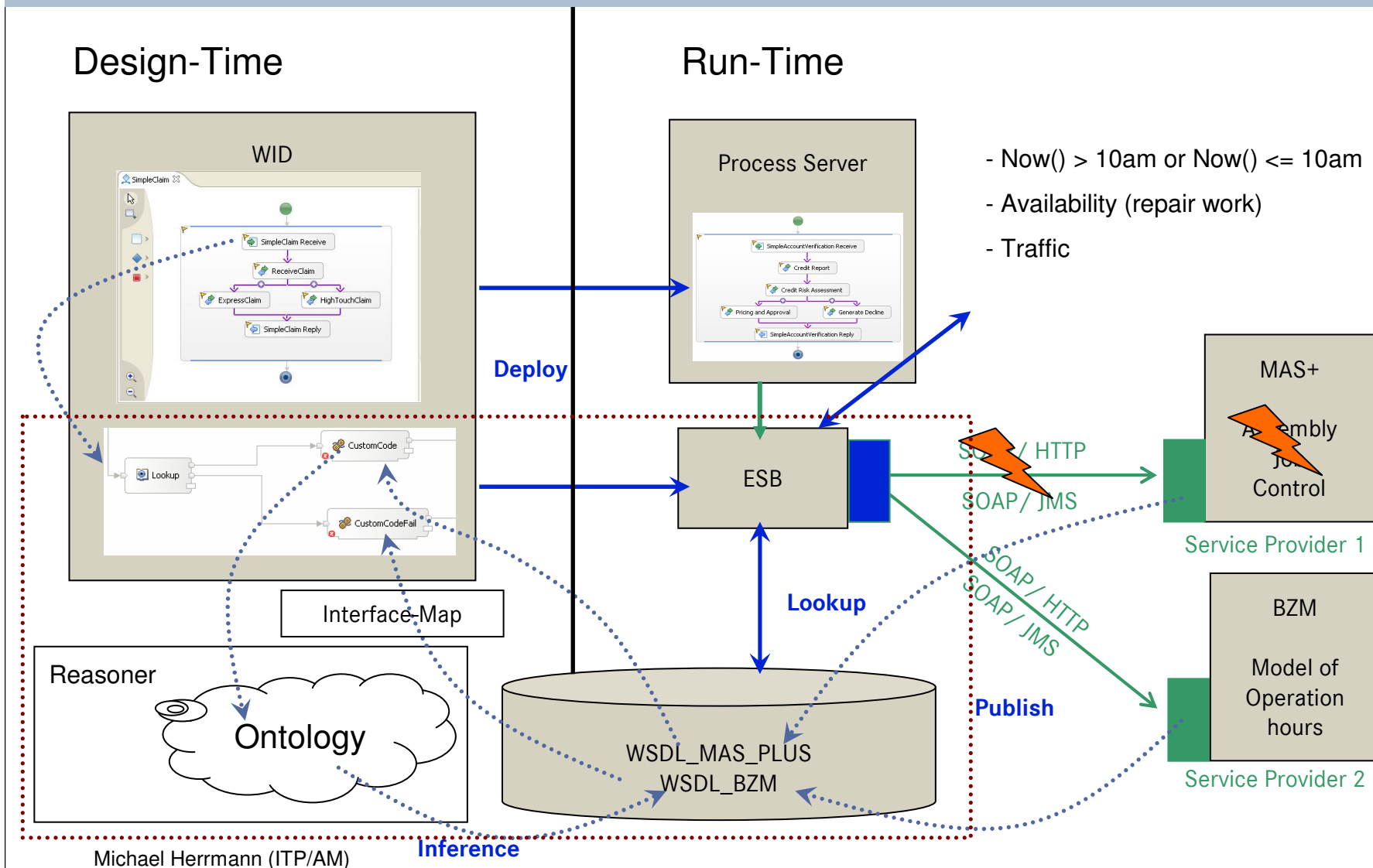
## Lab based study „440-020“ (IOPE)



# Scenario I



## Scenario II (including EMEO)



# WSDL within EMEO

```
<definitions>
  <types> ... </types>

  <message>
    <part>...</part>
  </message>

  <portType>
    <operation>
      <input>...</input>
      <output>...</output>
      <fault>...</fault>
      <documentation>...</documentation>
    </operation>
  </portType>

  <binding>
    <operation>
      <input>...</input>
      <output>...</output>
      <fault>...</fault>
    </operation>
  </binding>

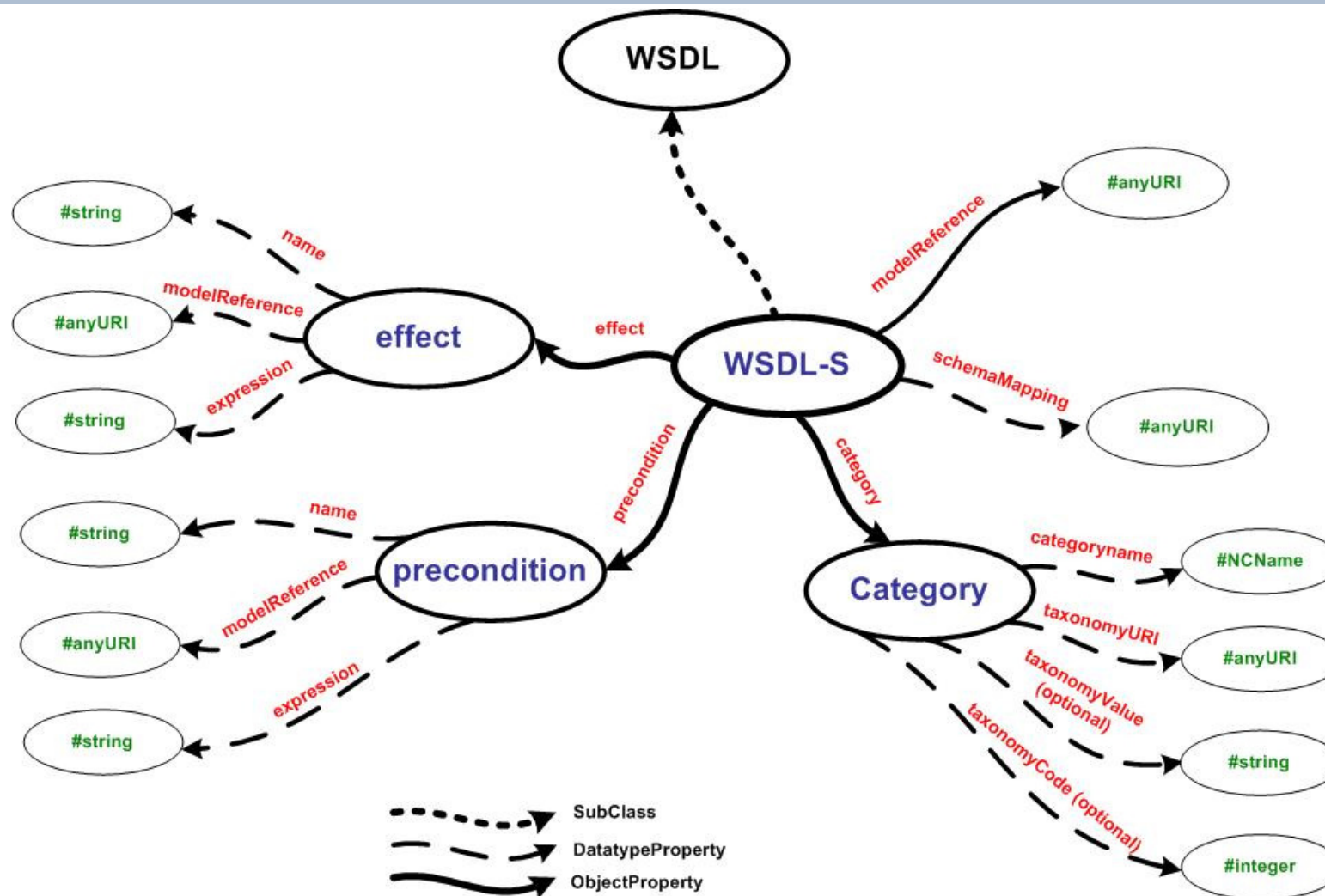
  <service>
    <port>...</port>
  </service>
</definitions>
```

**abstract description**

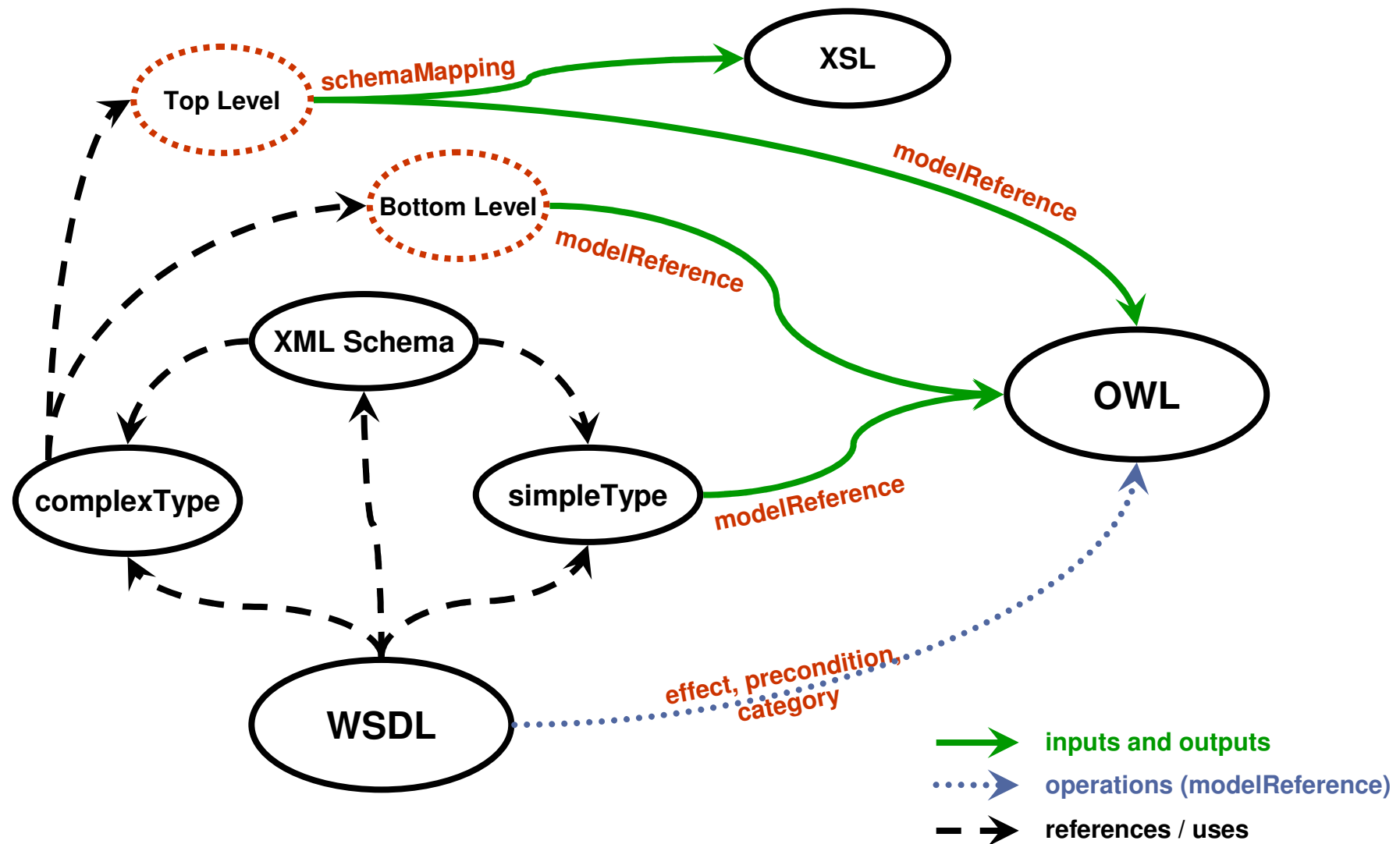
**concrete description**



# WSDL-S within EMEO



# Connecting WSDL to OWL over WSDL-S



# Connecting WSDL to OWL over WSDL-S (exemplary)

XML Schema / WSDL

WSDL-S

OWL

```

<xsd:complexType name="...Response">
  <xsd:sequence>
    <xsd:... name="SNR" />
    <xsd:... name="amount" />
    <xsd:... name="date_of_delivery"/>
    <xsd:... name="plausible" />
  </xsd:sequence>
</xsd:complexType>

```

WSDL

```

<operation name="CheckPlausi">
  <soap:operation soapAction="..." />
  ...
</operation>

```

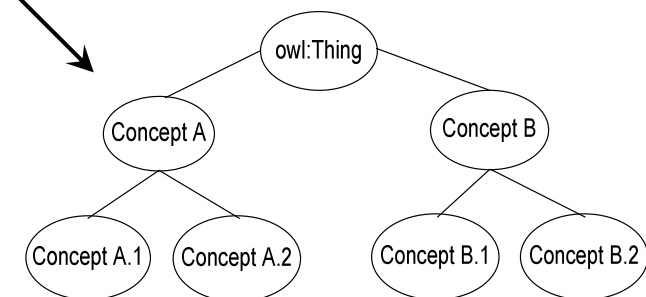
&lt;modelReference&gt;

&lt;schemaMapping&gt;

&lt;Category&gt;

&lt;precondition&gt;

&lt;effect&gt;



# WSDL-S @ DaimlerChrysler (Lab Approach)

...

```
xmlns:wssem="http://www.ibm.com/xmlns/Webservices/WS semantics"
xmlns:dcx="http://www.dcx.com/xmlns/XMLSchema/DCX"
xmlns:AutomotiveDCX="http://www.dcx.com/xmlns/XMLSchema/DCX/AutomotiveDCX"
```

```
<xs:element name="SNR" type="xs:string"
  wssem:modelReference="AutomotiveDCX:SNR"/>
```

...

```
<complexType name="CheckPlausiResponse">
  <sequence>
    <element name="SNR" nillable="false" type="dcx:SNR" />
  </sequence>
  <element name="amount" nillable="false" type="xsd:integer"
    wssem:modelReference="AutomotiveDCX:Amount"/>
  </sequence>
```

OWL Ontology

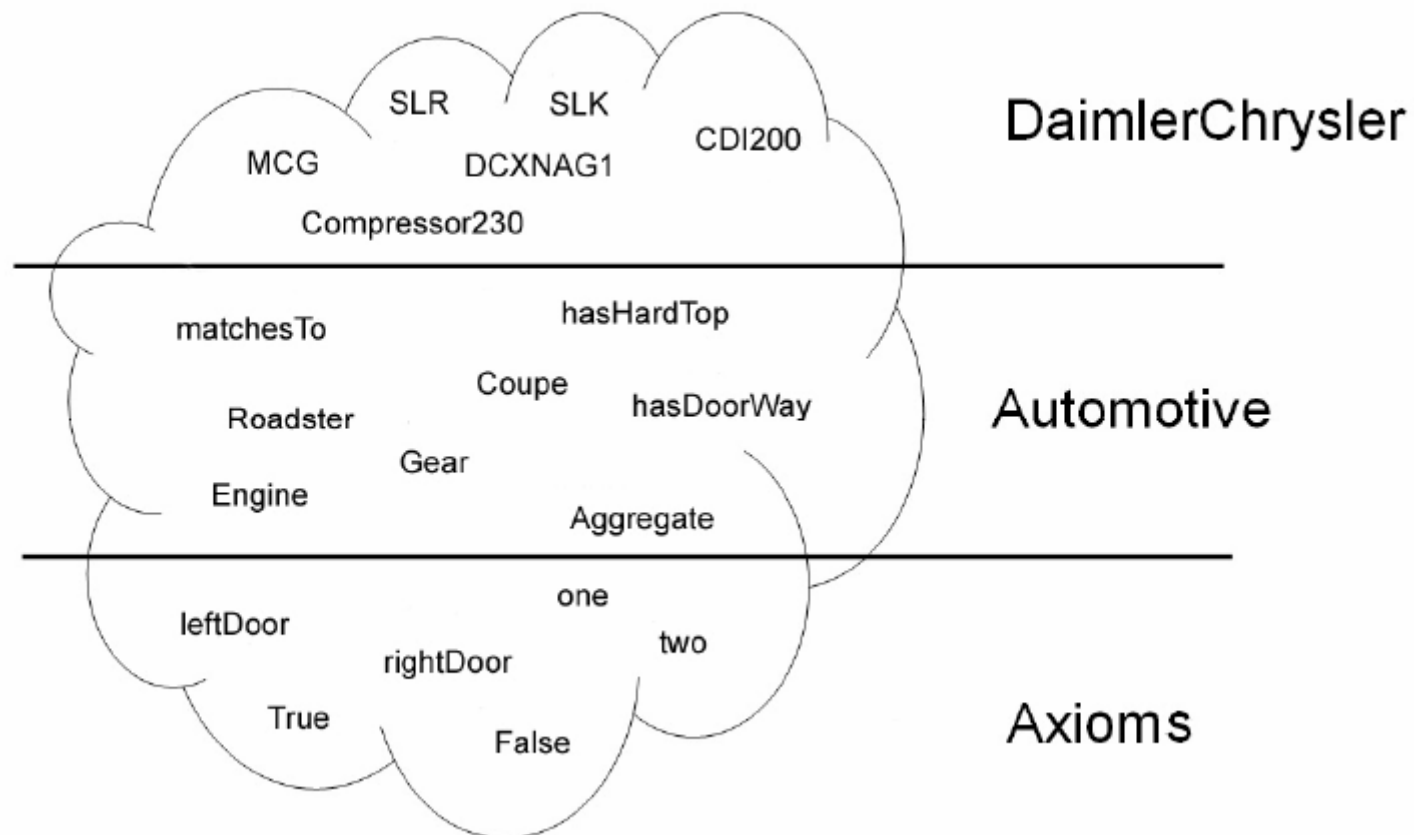
```
<owl:Class rdf:ID="Amount">
  <owl:equivalentClass>
    <owl:Class>
      <owl:intersectionOf rdf:parseType="Collection">
        ...
      </owl:intersectionOf>
    </owl:Class>
  </owl:equivalentClass>
  <rdfs:subClassOf rdf:resource="#Cars"/>
</owl:Class>
```

```
<owl:Class rdf:ID="SNR">
  <owl:equivalentClass>
    <owl:Class>
      ...
    </owl:Class>
  </owl:equivalentClass>
</owl:Class>
```

Schema

OWL Ontology

## Splitting our Domain into Areas



## Symbol stuff (extract)

$$DoorWayValueParitition \equiv one \cup two \cup three \cup four \cup five \quad (5.9)$$

$$one \subseteq \neg two \cap \neg three \cap \neg four \cap \neg five \quad (5.10)$$

$$two \subseteq \neg three \cap \neg four \cap \neg five \quad (5.11)$$

$$three \subseteq \neg four \cap \neg five \quad (5.12)$$

$$four \subseteq \neg five \quad (5.13)$$

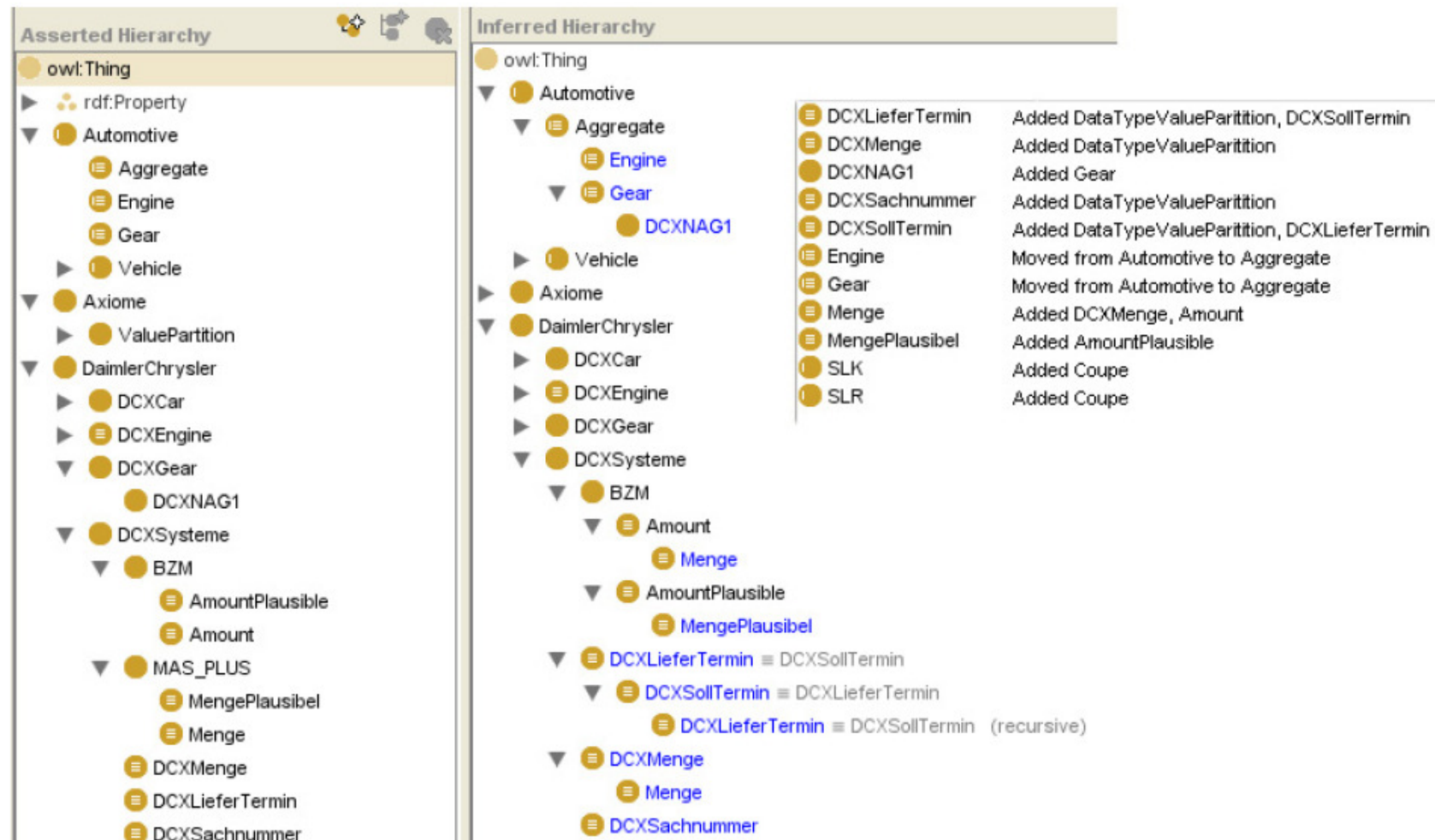
$$DCXCar \equiv \exists hasSeat (one \cup two \cup three \cup four \cup five) \quad (5.41)$$

$$DCXEngine \equiv \exists makesTo.DCXCar \quad (5.42)$$

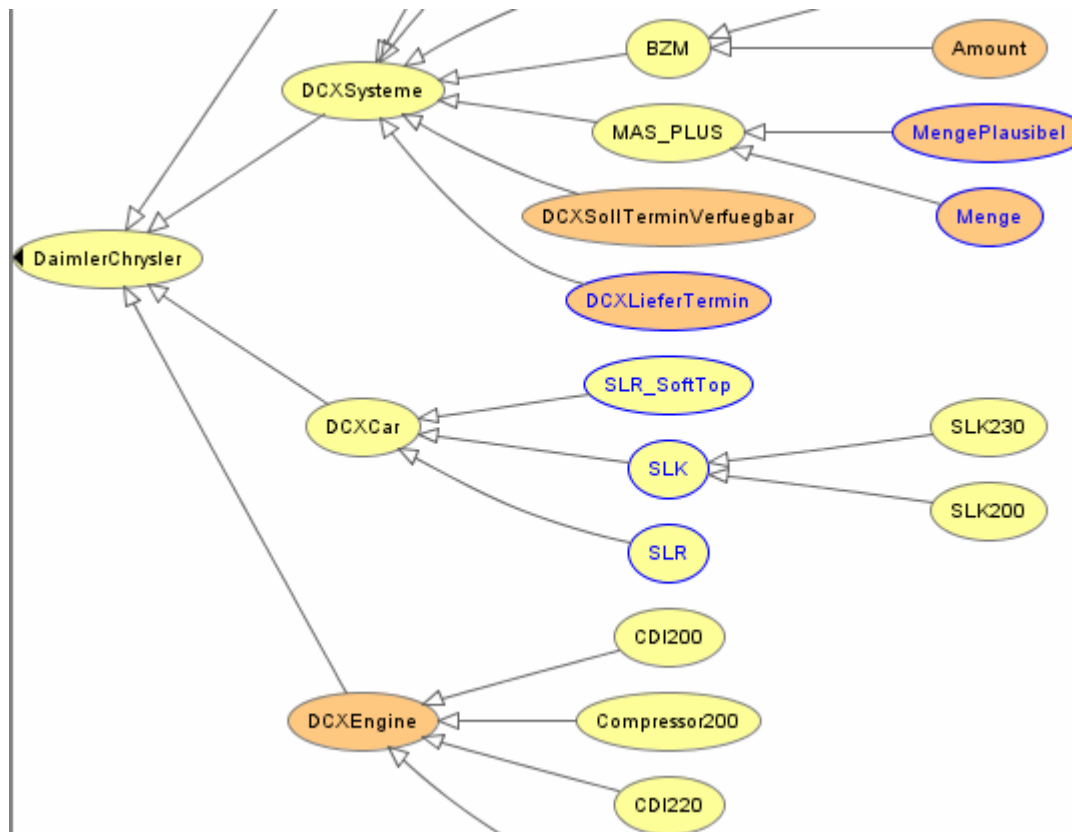
$$DCXEngine \equiv \forall isAssambledIn.DCXCar \quad (5.43)$$

$$\dots \quad (5.44)$$

# Inference (Protégé + RACER)



# Protégé (OWL Viz)





## Summary

- SOA is not JABOWS (“Just A Bunch of Web Services”)
- The Enterprise Service Bus (ESB) is not magic
- Semantics become more important in future
- Results are based on Lab

## Contact

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