



软件工程

国家重点实验室(武汉大学)

STATE KEY LAB OF SOFTWARE ENGINEERING (WUHAN UNIVERSITY)

MFI-7: Metamodel for Service Registration

Zaiwen Feng, Keqing He, Chong Wang, Jian Wang
Peng Liang, Jianxiao Liu, Yangfan He
SKLSE, Wuhan University, P.R. China

2010.05.25

Outline

- Motivation of this Work
- Definition of Service
- Scope of MFI-7
- Metamodel for Service Registration
- Service Registration Example
- MFI-7 v.s. UDDI
- Summary

Outline

- Motivation of this Work
- Definition of Service
- Scope of MFI-7
- Metamodel for Service Registration
- Service Registration Example
- MFI-7 v.s. UDDI
- Summary

Motivation of this Work

- Heterogeneity in service

- Different languages

WSMO, OWL-S, WADL, WSDL, SAWSDL, SA-rest...

- Different services registry mechanisms

UDDI, ebXML Registry...

Solution: Providing a metamodel as the common registration mechanism for different kinds of services.

Outline

- Motivation of this Work
- Definition of Service
- Scope of MFI-7
- Metamodel for Service Registration
- Service Registration Example
- MFI-7 v.s. UDDI
- Summary

Definitions of Service

- Service (systems architecture): the provision of a discrete function within a systems environment
 - In the context of Enterprise architecture, Service-orientation, and Service-oriented architecture, the term service refers to **a set of related software functionality, together with the policies that should control their usage.**
- Web service: a software system to support interaction over a network
 - OASIS : **a mechanism to enable access to one or more capabilities**, where the access is provided using a prescribed interface and is exercised consistent with constraints and policies as specified by the service description.”
 - Web services are frequently just **Internet Application Programming Interfaces (API)** that can be accessed over a network, such as the Internet, and executed on a remote system hosting the requested services

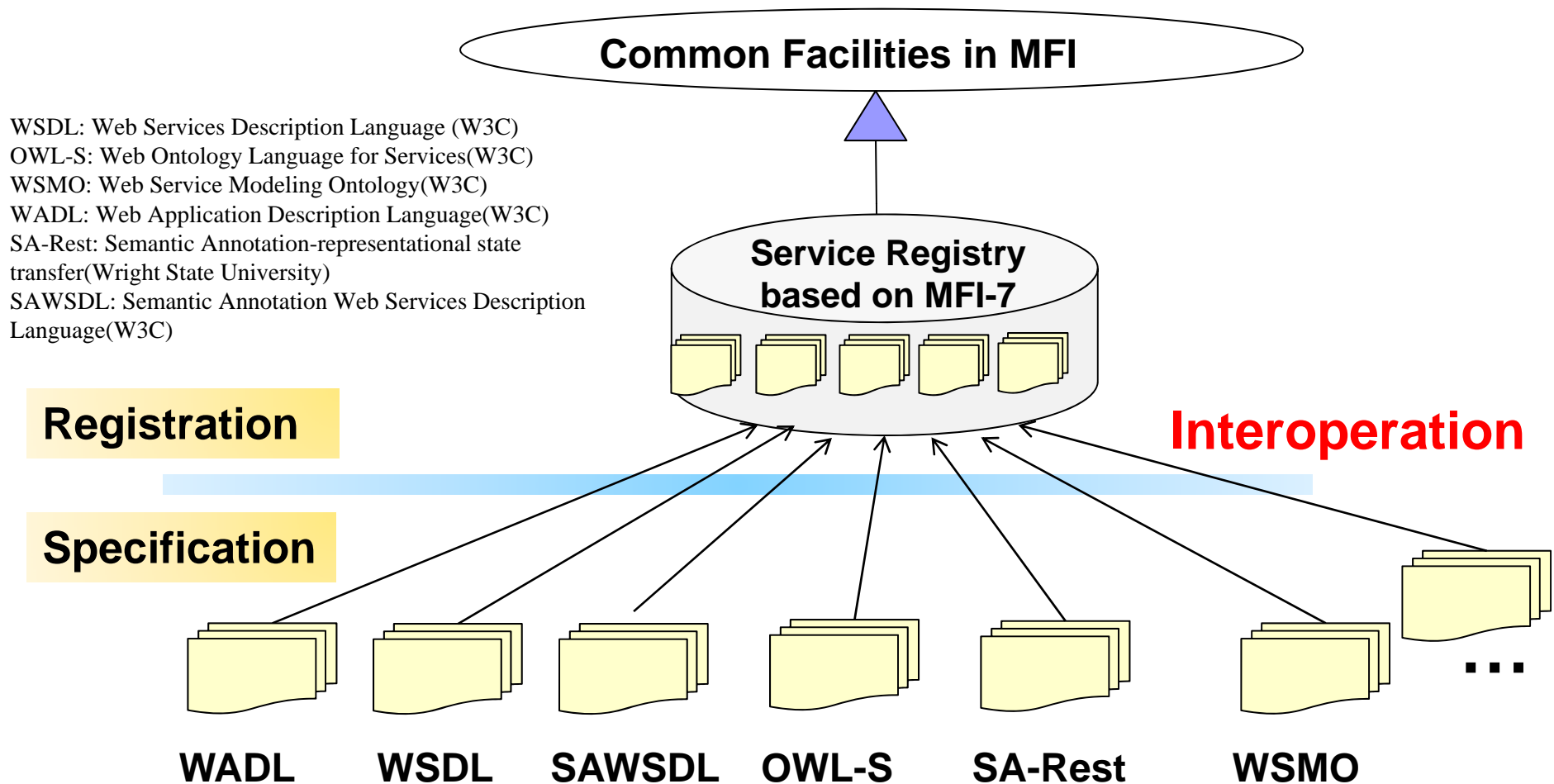
Service Definition in MFI-7

- Service is defined as a modular **functionality** entity with **provision of value** that can be invoked by accessing its **interface**.
- Currently, we focus on
 - SOAP Web service
- In the future, we will also focus on
 - Restful Web service
 - Web API

Outline

- Motivation of this Work
- Definition of Service
- **Scope of MFI-7**
- Metamodel for Service Registration
- Service Registration Example
- MFI-7 v.s. UDDI
- Summary

Scope of MFI-7(1/2)



Scope of MFI-7(2/2)

- It is intended to
 - specify a metamodel for registering services that can enable users to discover appropriate services.
 - define the functional and nonfunctional description of services.
 - promote semantic interoperation between various services.
- It does not specify
 - language specific details
 - details of service composition

Outline

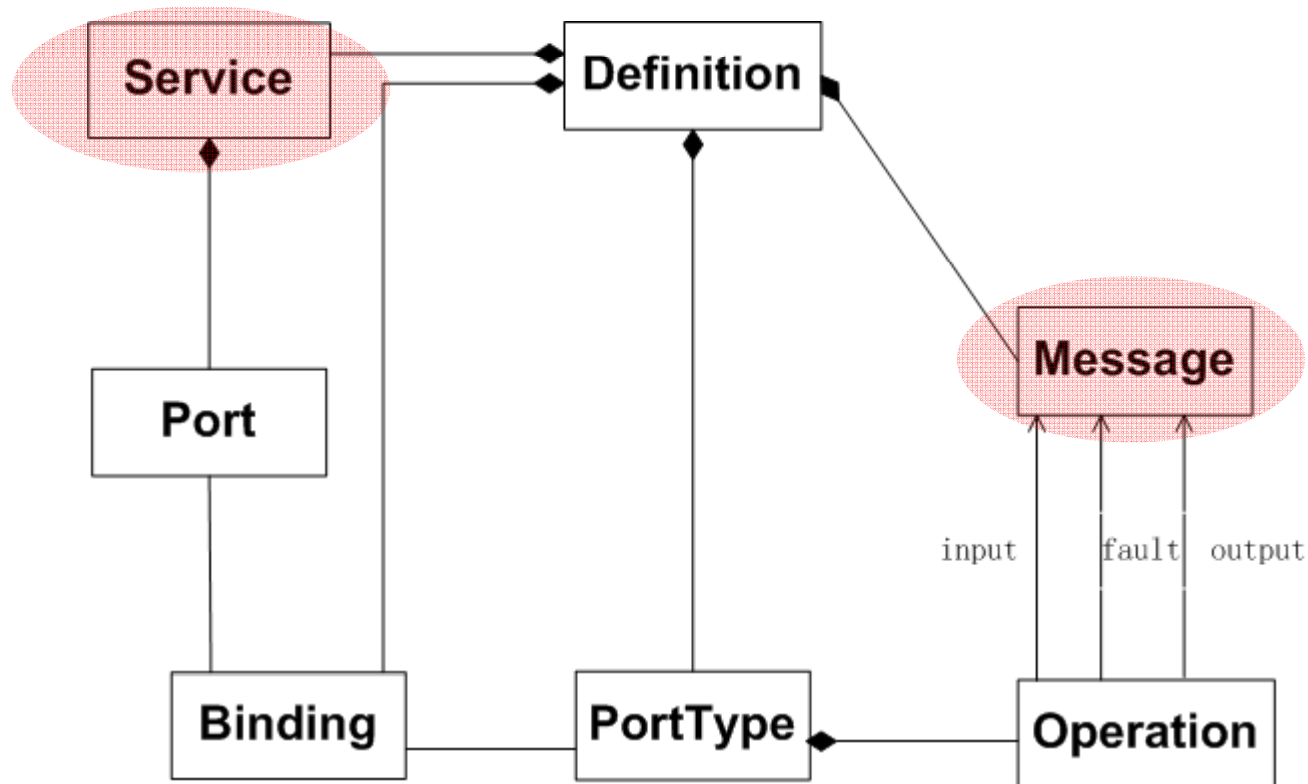
- Motivation of this Work
- Definition of Service
- Scope of MFI-7
- **Metamodel for Service Registration**
- Service Registration Example
- MFI-7 v.s. UDDI
- Summary

How MFI-7 is constructed

■ Harmonization of Service models for registration

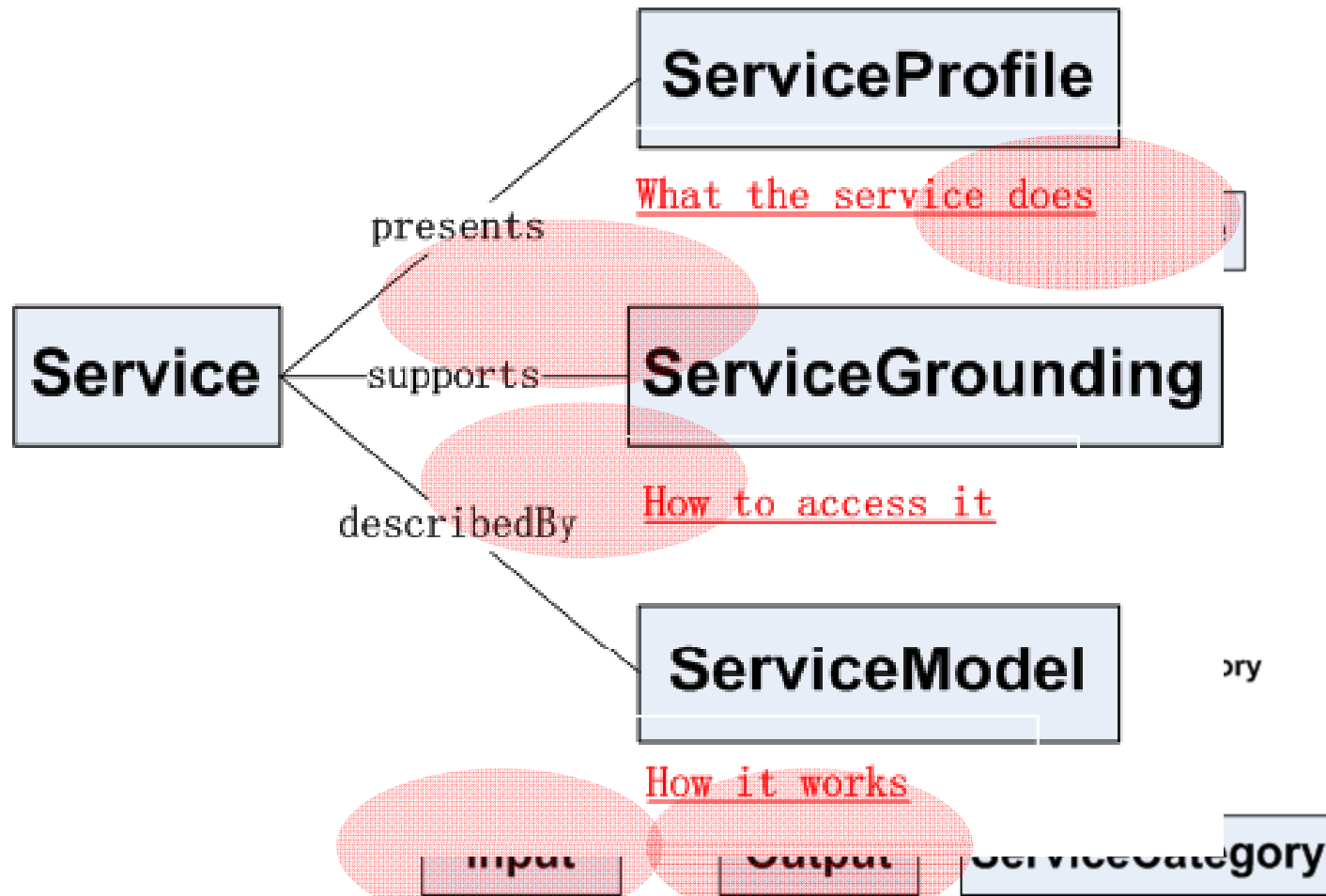
- WSDL (Web Services Description Language, *W3C, 2007*)
- OWL-S (Web Ontology Language for Services, *W3C, 2007*)
- WSMO (Web Service Modeling Ontology, *W3C, 2005*)
- SAWSDL (Semantic Annotation for WSDL, *W3C, 2007*)
- WADL (Web Application Description Language, *W3C, 2009*)
- SA-Rest: Semantic Annotation-representational state transfer (*Wright State University, 2007*)
- ...

Service concepts in WSDL



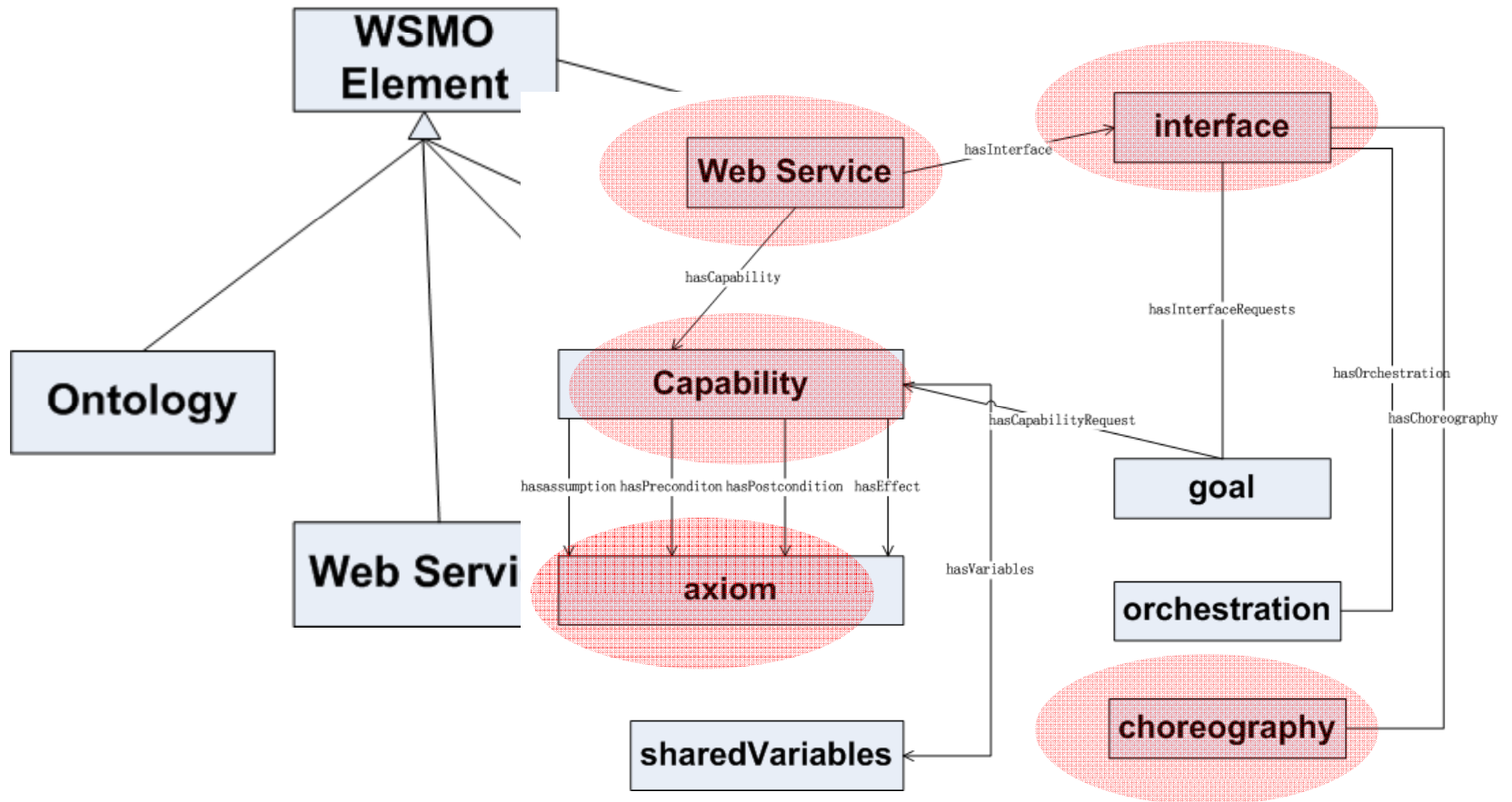
From: W3C Recommendation, Web Services Description Language (WSDL) Version 2.0 Part 1: Core Language, 2007

Service concepts in OWL-S



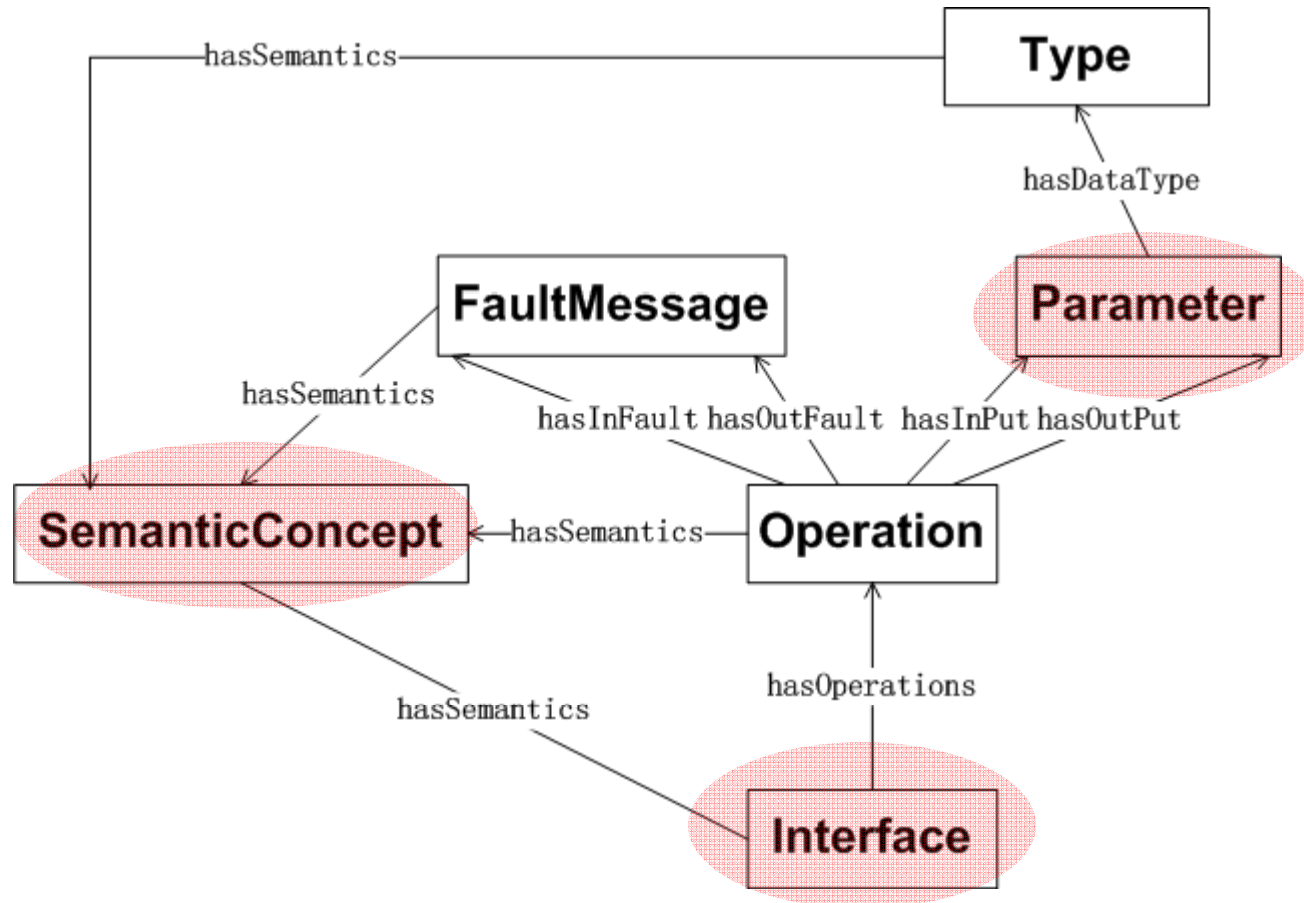
From: W3C, OWL-S: Semantic Markup for Web Services,
<http://www.daml.org/services/owl-s/1.2/overview/>, accessed on 2010-05-12

Service concepts in WSMO



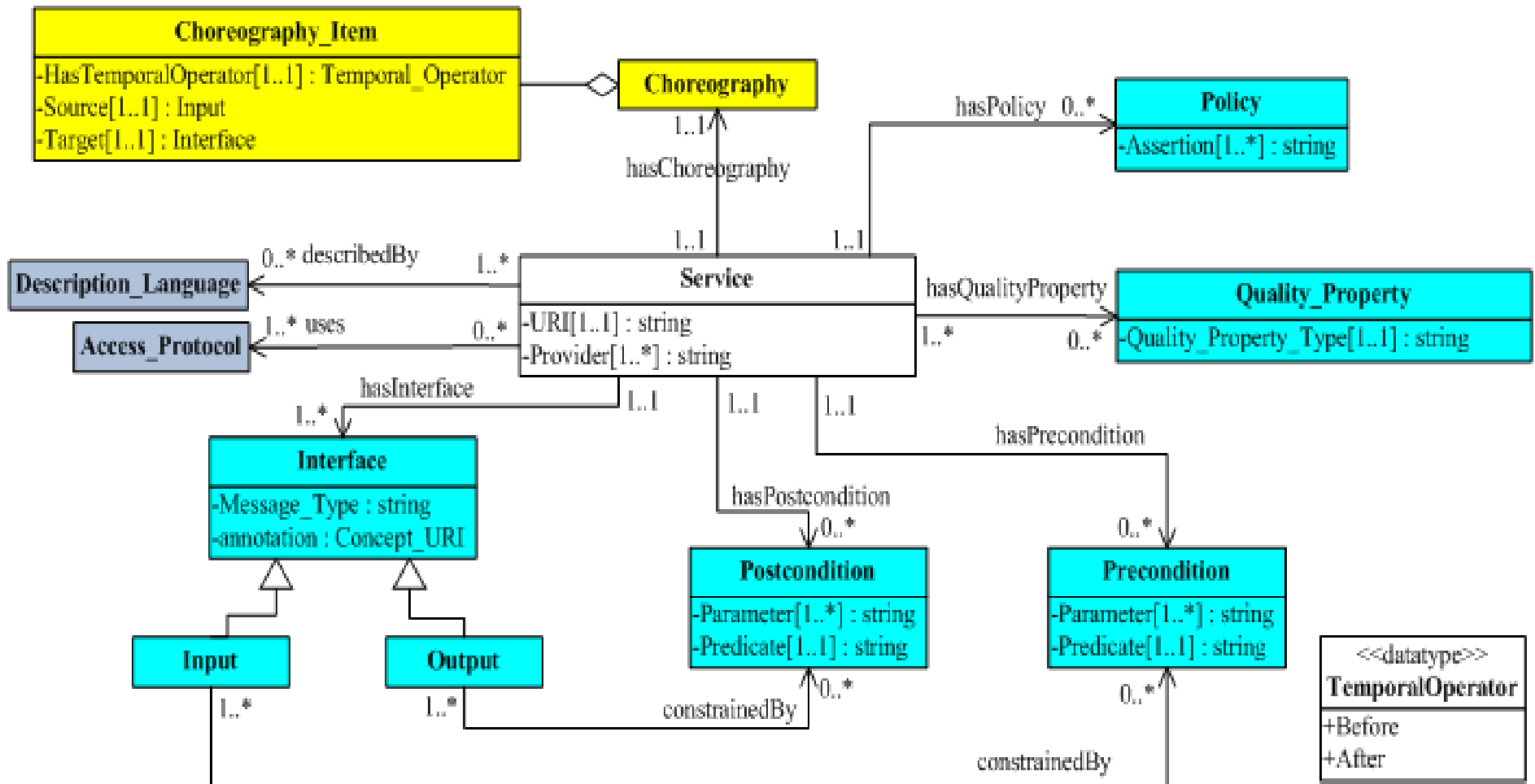
From: W3C, Web Service Modeling Ontology, <http://www.wsmo.org/TR/d2/v2.0/>, accessed on 2010-05-10

Service concepts in SAWSDL



From: W3C, Semantic Annotations for WSDL and XML Schema, <http://www.w3.org/TR/sawSDL/>, accessed on 2010-05-10

Metamodel for Service Registration



Basic Information



Capability_Related



Interaction_Related

Comparison between MFI-7 and Other Specifications

MFI-7	WSMO	OWL-S	WSDL	SAWSDL
Service	Web services	Service	Service	Web service
Description_Language	WSML	OWL-S	WSDL	WSDL
Access_Protocol	—	—	transport	transport
Input	precondition	Input	input	input
Output	postcondition	Output	output	output
Quality_Property	—	ServiceParameter	—	—
Precondition	assumption	Condition	—	—
Postcondition	effect	Result	—	—
Policy	—	—	—	—
Choreography	choreography	—	—	—

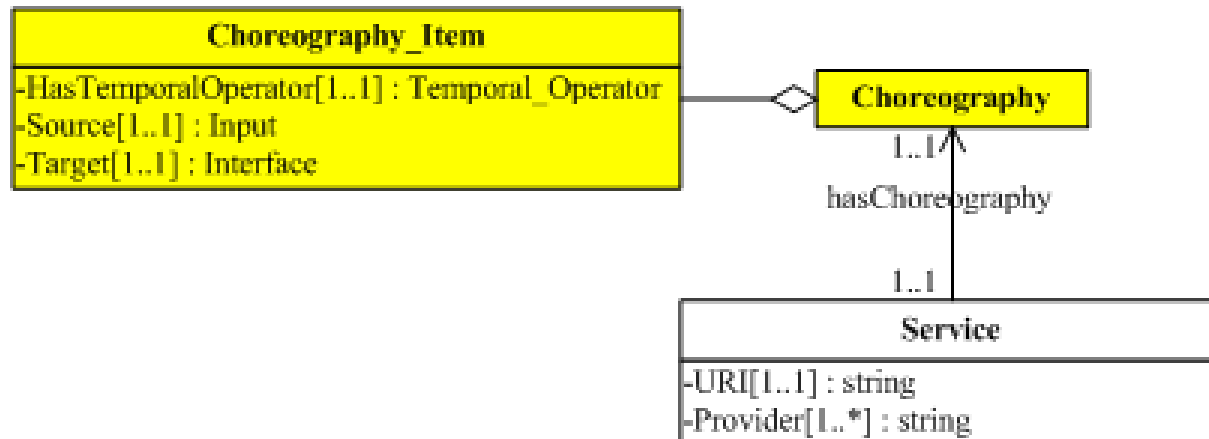
Choreography&Choreography_Item

■ Choreography

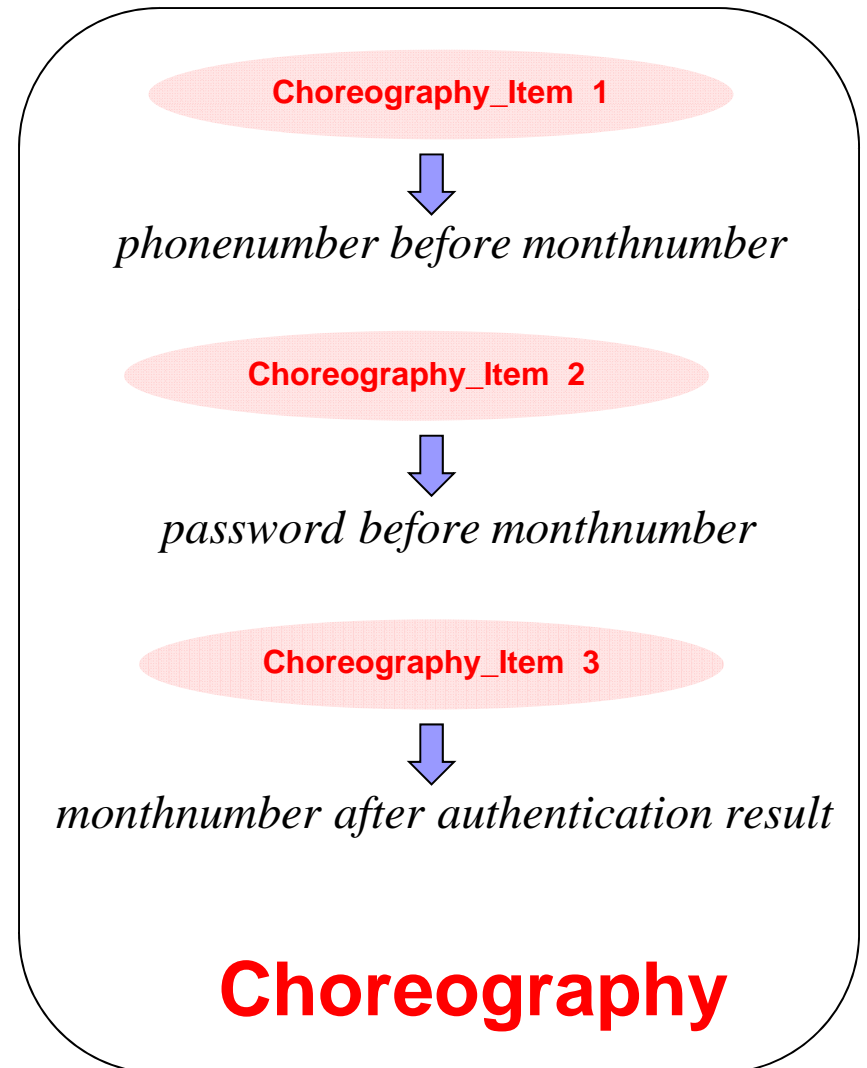
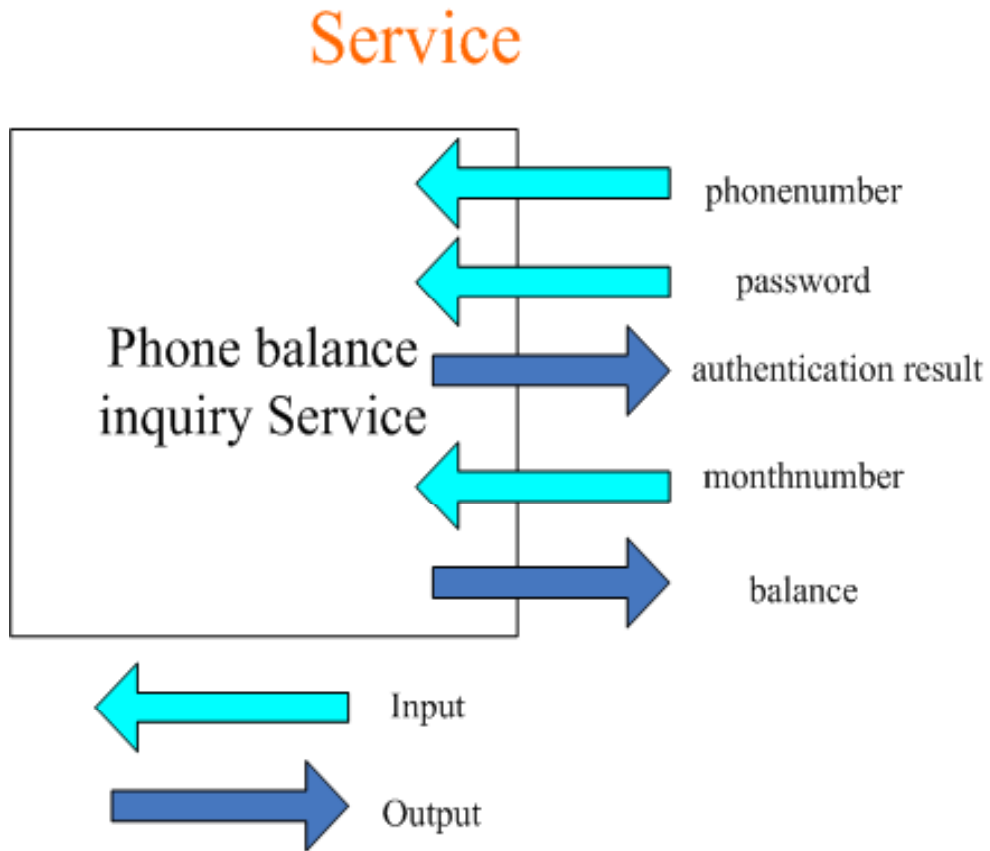
- provides the necessary information to enable communication with the service from the client point of view
- consists of Choreography_Items

■ Choreography_Item

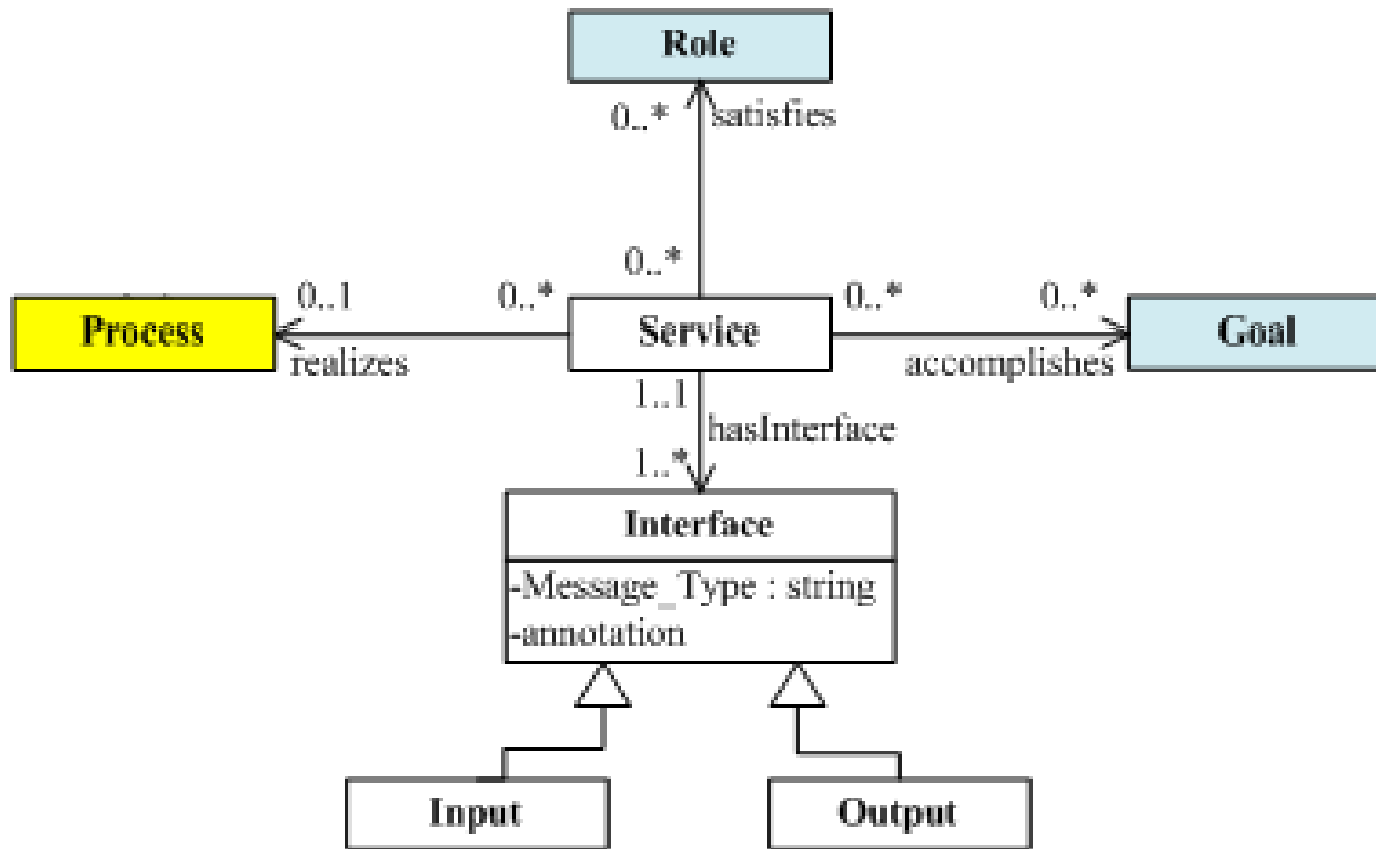
- the interaction unit specifying the execution order of input and output



Choreography example



Relationships with Other Parts in MFI



 Metaclass from MFI-5

 Metaclass from MFI-8

annotation attributes are annotated by `Ontology_Atomic_Construct` from MFI-3

Outline

- Motivation of this Work
- Definition of Service
- Scope of MFI-7
- Metamodel for Service Registration
- **Service Registration Example**
- MFI-7 v.s. UDDI
- Summary

Registration example(1/3)

- Case study: CongoService
- Description
 - a book selling service from www.congo.com.
- Reference
 - <http://www.daml.org/services/owl-s/1.0/examples.html>

Registration example (2/3)

```

<service:presentedBy rdf:resource="http://www.daml.org/services/owl-s/1.2/CongoService.owl#ExpressCongoBuyService"/>
<profile:has_process rdf:resource="http://www.daml.org/services/owl-s/1.2/CongoProcess.owl#ExpressCongoBuy"/>
<profile:serviceName>Congo_BookBuying_Agent</profile:serviceName>
- <profile:textDescription>
  This agentified service provides the opportunity to browse a book selling site and buy books there
</profile:textDescription>
- <profile:contactInformation>
  - <actor:Actor rdf:ID="CongoBuy_contacts">
    <actor:name>ExpressCongoBuy</actor:name>
    <actor:title> Service Representative </actor:title>
    <actor:phone>412 268 8780 </actor:phone>
    <actor:fax>412 268 5569 </actor:fax>
    <actor:email>Bravo@Bravoair.com</actor:email>
  - <actor:physicalAddress>
    somewhere 2, OnWeb, Montana 52321, USA
    </actor:physicalAddress>
  - <actor:webURL>
    http://www.daml.org/services/owl-s/1.2/ExpressCongoBuy.html
    </actor:webURL>
  </actor:Actor>
</profile:contactInformation>

```

```

transport="http://schemas.xmlsoap.org/soap/http"
<binding name="SpecifyPaymentMethod_SoapBinding" type="tns:SpecifyPaymentMethod_PortType">
  <soap:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
  <operation name="SpecifyPaymentMethod_operation">
    <soap:operation soapAction="tns:SpecifyPaymentMethod"/>
    <input>
      <soap:body
        parts="creditCardNumber creditCardType creditCardExpirationDate"
        use="encoded"
        namespace="http://www.daml.org/services/owl-s/1.0/Congo-Service.daml"/>
    </input>
  </operation>
</binding>

```

MFI-7		
Service	URI	http://www.daml.org/services/owl-s/1.2/CongoService.owl#ExpressCongoBuyService
	Provider	ExpressCongoBuy
	Name	Congo_BookBuying_Agent
Description_Language		OWL-S
Access_Protocol		http

Registration example (3/3)

```

<profile:hasInput rdf:resource="http://www.daml.org/services/owl-s/1.2/CongoProcess.owl#ExpressCongoBuyBookISBN"/>
<profile:hasInput rdf:resource="http://www.daml.org/services/owl-s/1.2/CongoProcess.owl#ExpressCongoBuySignInInfo"/>
<profile:hasInput rdf:resource="http://www.daml.org/services/owl-s/1.2/CongoProcess.owl#ExpressCongoBuyCreditCardNumber"/>
<profile:hasInput rdf:resource="http://www.daml.org/services/owl-s/1.2/CongoProcess.owl#ExpressCongoBuyCreditCardType"/>
<profile:hasInput rdf:resource="http://www.daml.org/services/owl-s/1.2/CongoProcess.owl#ExpressCongoBuyCreditCardExpirationDate"/>
<profile:hasPrecondition rdf:resource="http://www.daml.org/services/owl-s/1.2/CongoProcess.owl#ExpressCongoBuyAcctExists"/>
<profile:hasPrecondition rdf:resource="http://www.daml.org/services/owl-s/1.2/CongoProcess.owl#ExpressCongoBuyCreditExists"/>
<profile:hasResult rdf:resource="http://www.daml.org/services/owl-s/1.2/CongoProcess.owl#ExpressCongoBuyPositiveResult"/>
<profile:hasResult rdf:resource="http://www.daml.org/services/owl-s/1.2/CongoProcess.owl#ExpressCongoBuyNegativeResult"/>
<profile:hasOutput rdf:resource="http://www.daml.org/services/owl-s/1.2/CongoProcess.owl#ExpressCongoBuyOutput"/>
  
```

MFI-7	
Input	ExpressCongoBuyBookISBN
	ExpressCongoBuySignInInfo
	ExpressCongoBuyCreditCardNumber
	ExpressCongoBuyCreditCardType
	ExpressCongoBuyCreditCardExpirationDate
Output	ExpressCongoBuyOutput
Precondition	ExpressCongoBuyAcctExists
	ExpressCongoBuyCreditExists
Postcondition	ExpressCongoBuyPositiveResult
	ExpressCongoBuyNegativeResult

-
- Motivation of this Work
 - Definition of Service
 - Scope of MFI-7
 - Metamodel for Service Registration
 - Service Registration Example
 - **MFI-7 v.s. UDDI**
 - Summary

MFI-7 v.s. UDDI

■ UDDI

- lacks description of service semantics
- mainly considers SOAP Web services

■ MFI-7

- Provides a mechanism to register service semantics based on MFI-3&-5&-8
- Considers other kinds of services
 - ▣ different protocols, such as SOAP, HTTP,...

-
- Motivation of this Work
 - Definition of Service
 - Scope of MFI-7
 - Metamodel for Service Registration
 - Service Registration Example
 - MFI-7 v.s. UDDI
 - **Summary**

Summary and Future Work

■ Summary

- MFI-7 provides a means to register interaction information and capability of services

■ Future work

- The services supported in MFI-7 will be more than SOAP Web services
- Submit CD version in 2010
- Coordinate with other specifications
- Support interoperation between services in cloud computing

Thank you!

Q&A

