



软件工程
国家重点实验室(武汉大学)
STATE KEY LAB OF SOFTWARE ENGINEERING (WUHAN UNIVERSITY)

MFI-5: Metamodel for Process model registration (for discussion)

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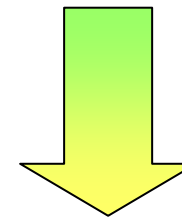
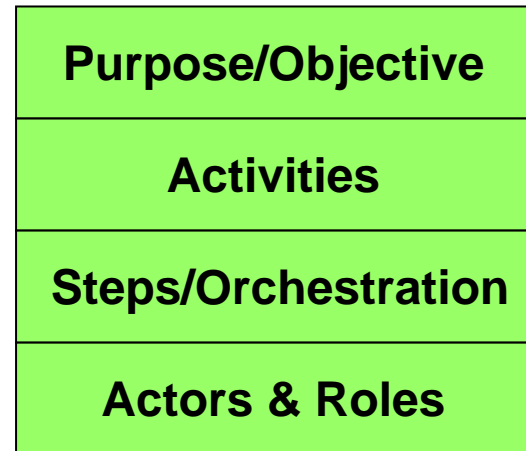
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- Background
- MFI & MFI-5
- Introduction of MFI-5
- Future work

Content

- Background
 - What is Process
 - Why we need MFI-5
- MFI & MFI-5
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- Future work

How to define a Process

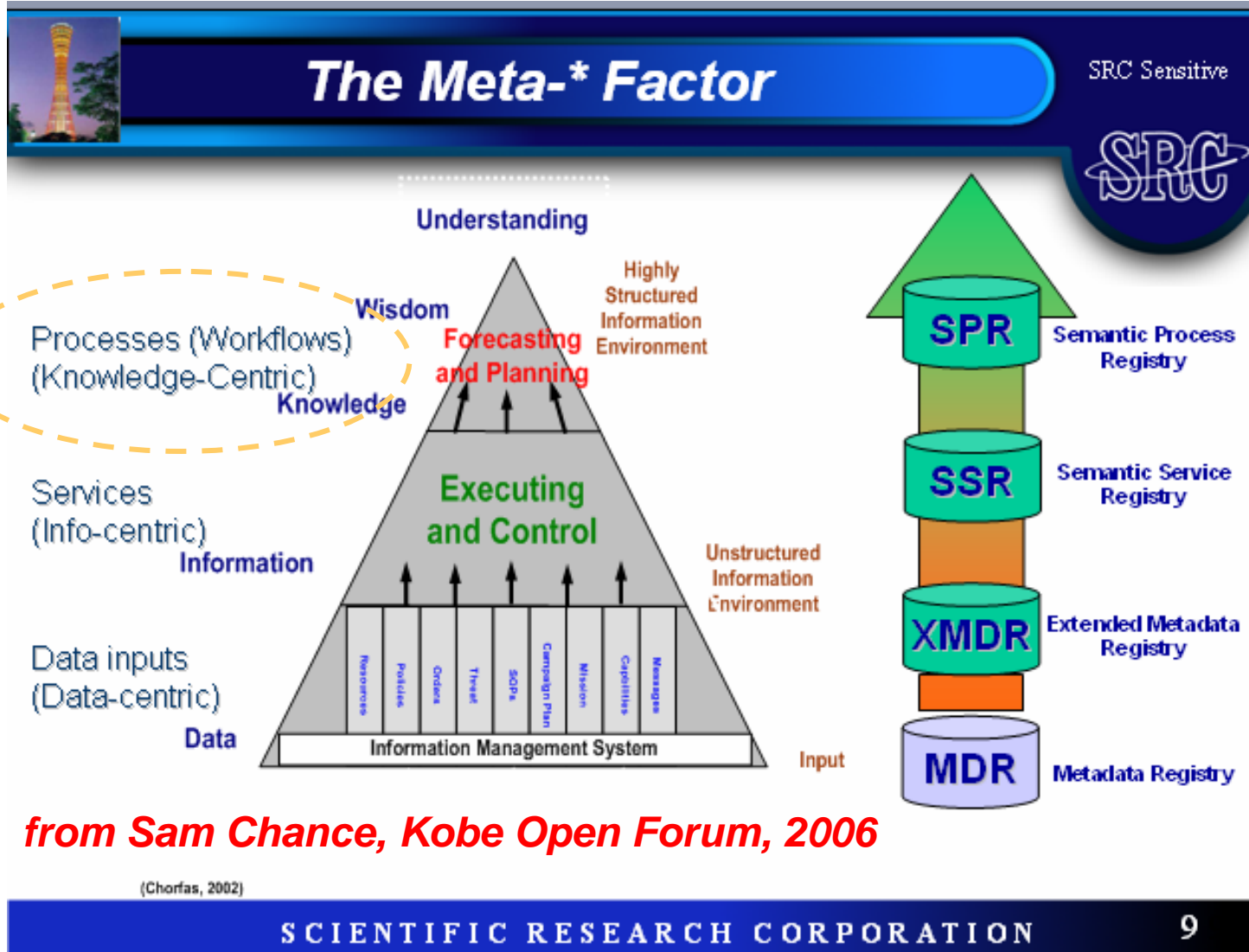


How to make them work together in a harmonious and effective way?

Process & Process model

- Process is defined as
 - a set of **work items**, scheduled according to **constraints**, which all participate in fulfilling a common **purpose**. [Breton and Bézivin, 2001]
 - transformation of **input** to **output**. [ISO/IEC 12207]
 - one or more **activities** that occurs over a period of **time** in which **objects** participate. [ISO 18629]
- Process model can be regarded as the product of process modeling, which is expressed in a certain description language.

The trends... (1/2)

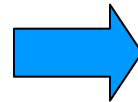


The trends...(2/2)

Trend 1:

static models

→ dynamic models



- Process models can be deemed as a special kind of models with **behavioral features**, including

- Web Services
- Business process
- Workflow
-

Trend 2:

complex interchange and communication between entities are increasing continuously.

- **Business cooperation and web service composition** are more and more popular in current practice **within/across enterprises**.

Related work (1/2)

- PSL (Process Specification Language, ISO 18629)
 - a language enabling interoperability of process information among industrial applications.
- IDEF-3 (Integrated DEFinition Methods -3)
 - captures process details.
- BPMN (Business Process Modeling Notation)
 - defines modeling notation for modeling business process.
- BPEL4WS (Business Process Execution Language for Web Service)
 - provides a means of specifying the interaction of cooperating services.
- OWL-S (Web Ontology Language for Services)
 - defines an ontology to describe the interface a service provides to the “outside world”.
 - only for Web Services
-

Related work (2/2)

- WSMO (Web Service Modeling Ontology)
 - Extension of WSMF (Web Service Modeling Framework)
 - Comprising four key elements
 - Ontology, Goal, Web services, Mediator
- SWSO (Semantic Web Service Ontology)
 - An ontology which is expressed in two forms: ROWS and FLOWS
 - ROWS (Rules Ontology for Web Services)
 - FLOWS (First-order Logic Ontology for Web Services)
 - Service Descriptor
 - Process Model, including 6 ontology modules:
 - ✓ FLOWS-Core, Control Constraints, Ordering Constraints, Occurrence Constraints, State Constraints and Exception Constraints
 - Grounding

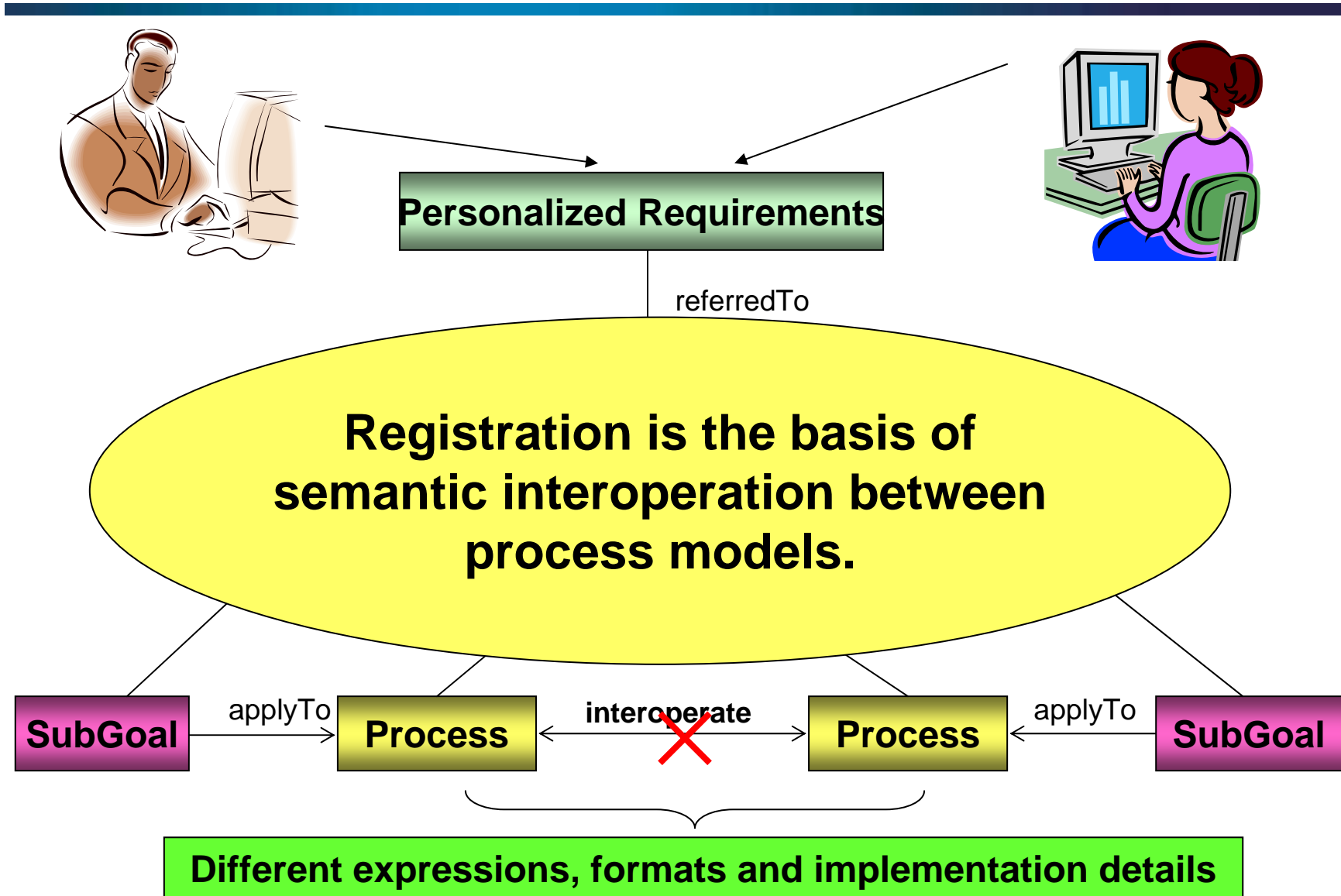
Why we need MFI-5 (1/2)

- Existent process/process models specifications
 - Relevant to process descriptions and expressions
 - Special for the specific domains
 - Weak for adding or registering semantic annotation
 - Insufficient to register and manage various kinds of process models
- Not all the existing process models are enriched with semantics.
 - Business process and workflow are lacking in semantics
 - Semantic web services have rich semantics

Why we need MFI-5 (2/2)

- Current MFI family focuses on the static resources on the web
 - MFI Core provides a very generic framework for various models
 - MFI Ontology Registration aims to the structure and semantics of ontology
- A new part is needed to meet the registration and management requirements of dynamic knowledge
 - process model registration
 - process model integration with semantics

A Scenario



Our proposal

- Based on the vision of
 - Process integration within/across enterprises semantically
 - Requirements Engineering
 - SKLSE proposes a Unified Requirements Metamodeling Framework **RGPS (Role-Goal-Process-Service)**
 - In RGPS, requirements refinement will be processed from Role layer to **Process layer**.
 - Process models are the main products of requirements modeling.

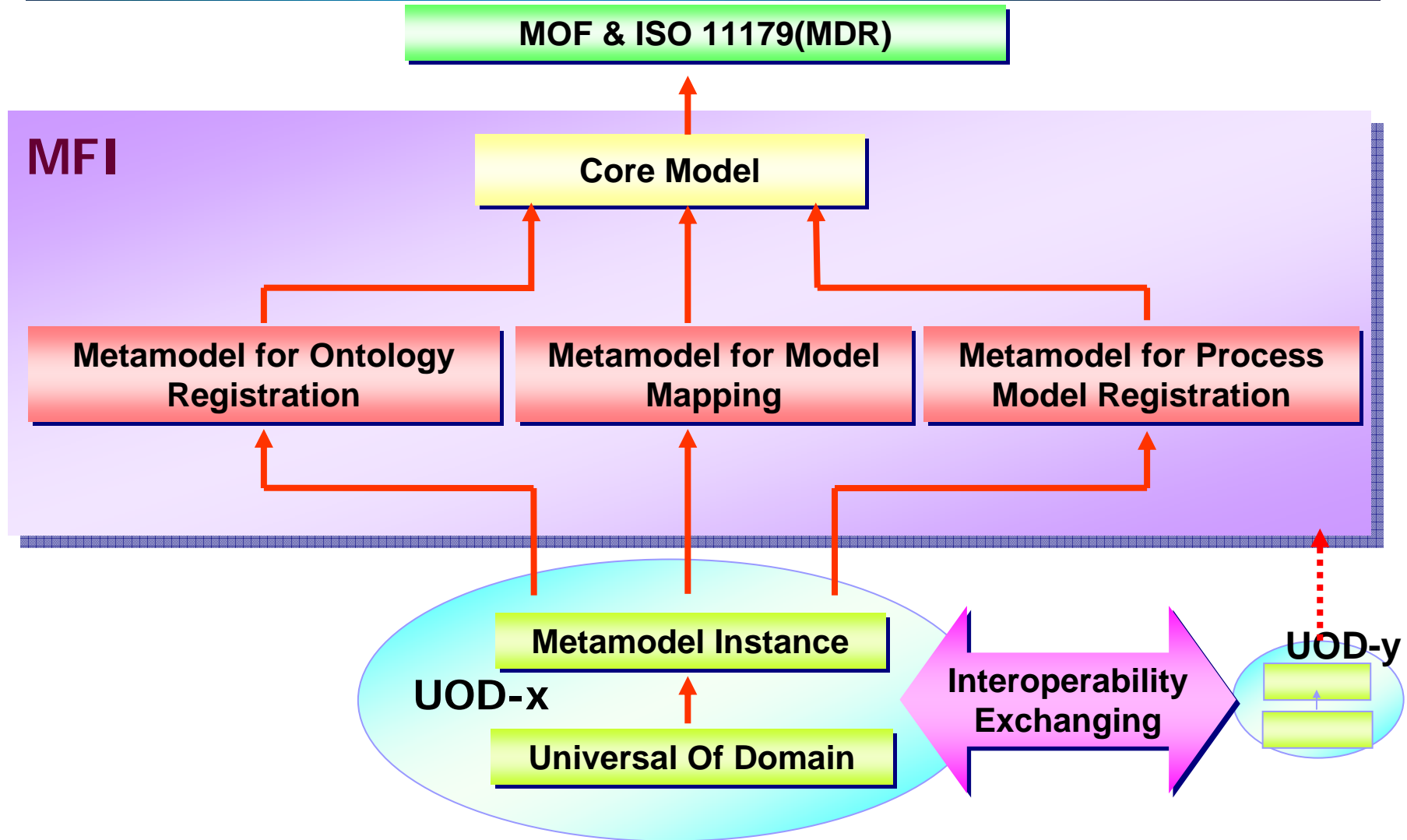
MFI-5 is needed as a common, scalable and extensible facility to promote semantic interoperation between heterogeneous process models on the semantic web.

Content

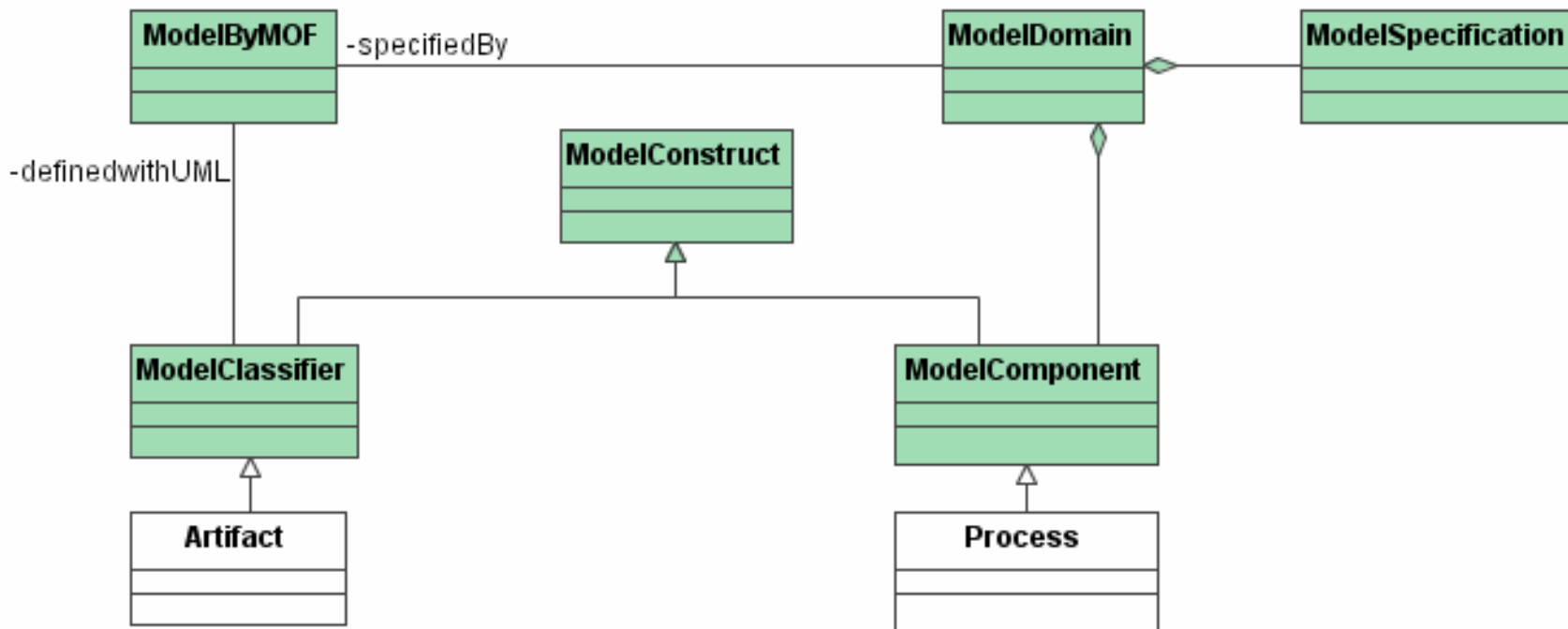
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ISO/IEC 19763

(Metamodel Framework for Interoperability)

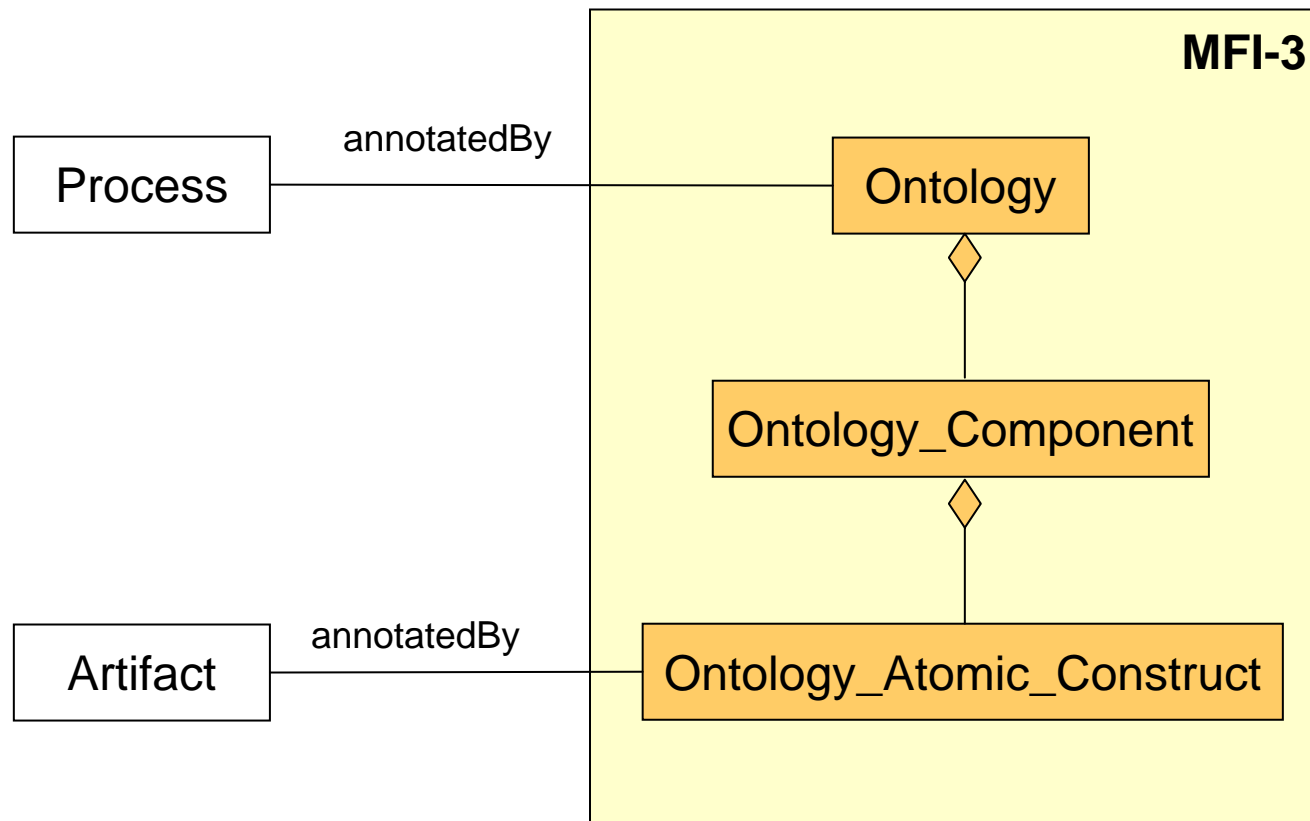


MFI Core & MFI-5



from MFI Core

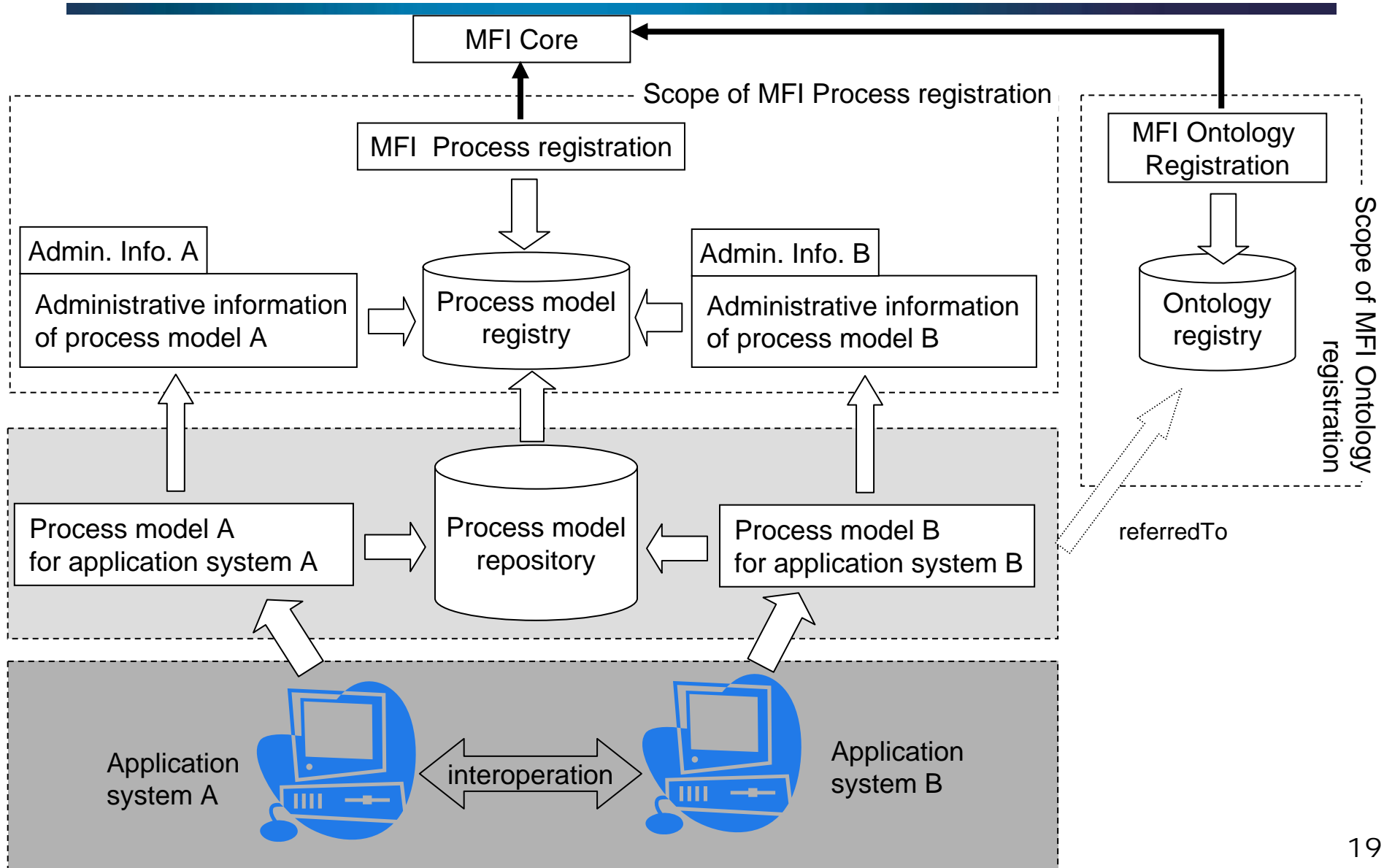
MFI-3 & MFI-5



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 - Scope of MFI-5
 - Models in MFI-5
 - Example
- Future work

Scope of MFI-5 (1/3)



Scope of MFI-5 (2/3)

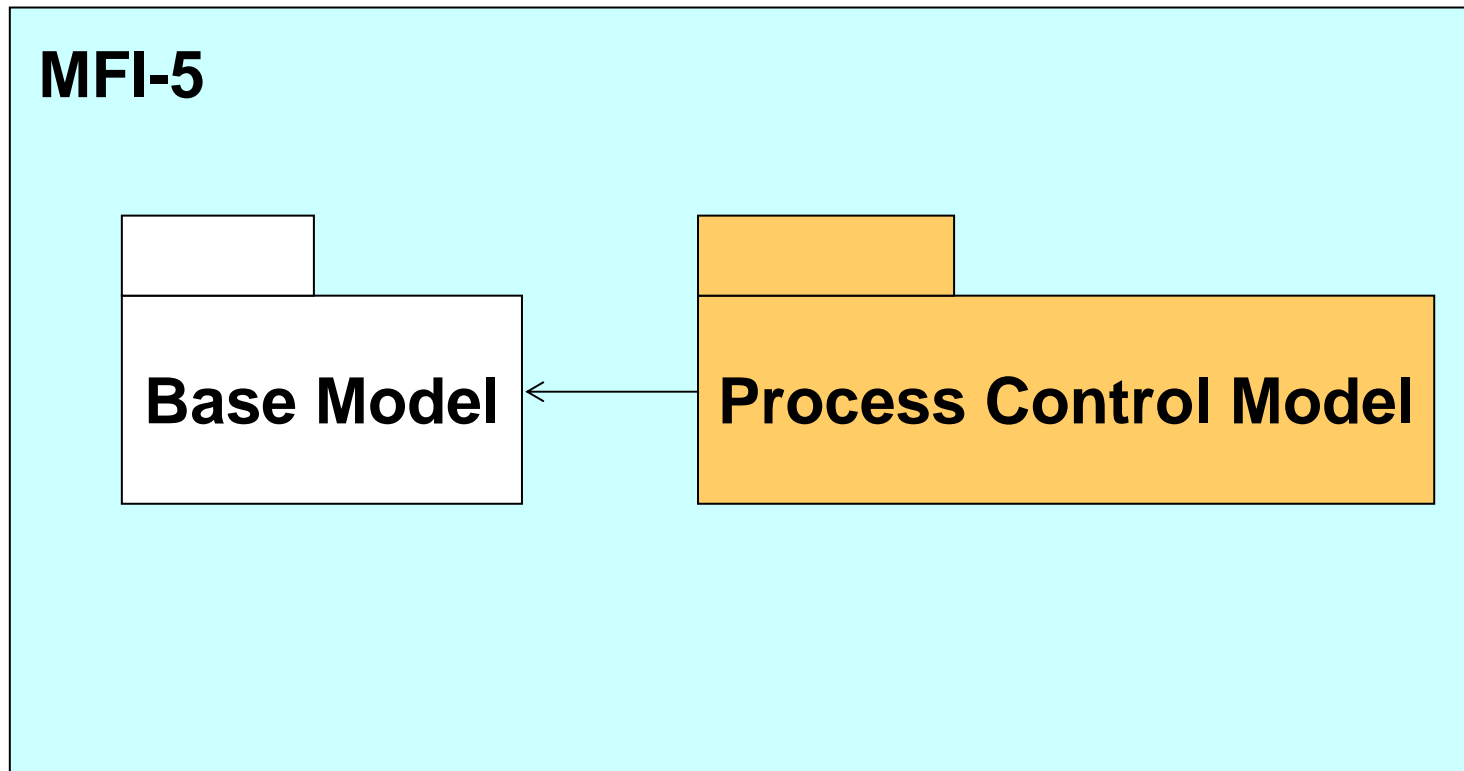
- Objective
 1. Provide a metamodel to register process models, including business process model and web service.
 2. Focus on the relationship between process model described with different process description languages, especially the composite process consists of subprocesses expressed in different languages.
 3. Promote semantic interoperation between various process models on the semantic web.

Scope of MFI-5 (3/3)

- What to do
 - Structural information of process model
 - Which subprocesses are contained in a process model
 - Which artifacts participate in fulfilling the common purpose
 - Semantic constraints of process model
 - Semantic relation/contradiction between artifacts
 - Order
 - ✓ Mandatory sequence
 - ✓ Precondition and postcondition
 - ✓ User-defined constraints
 -

- What not to do
 - Language specific details
 - Implementation level details

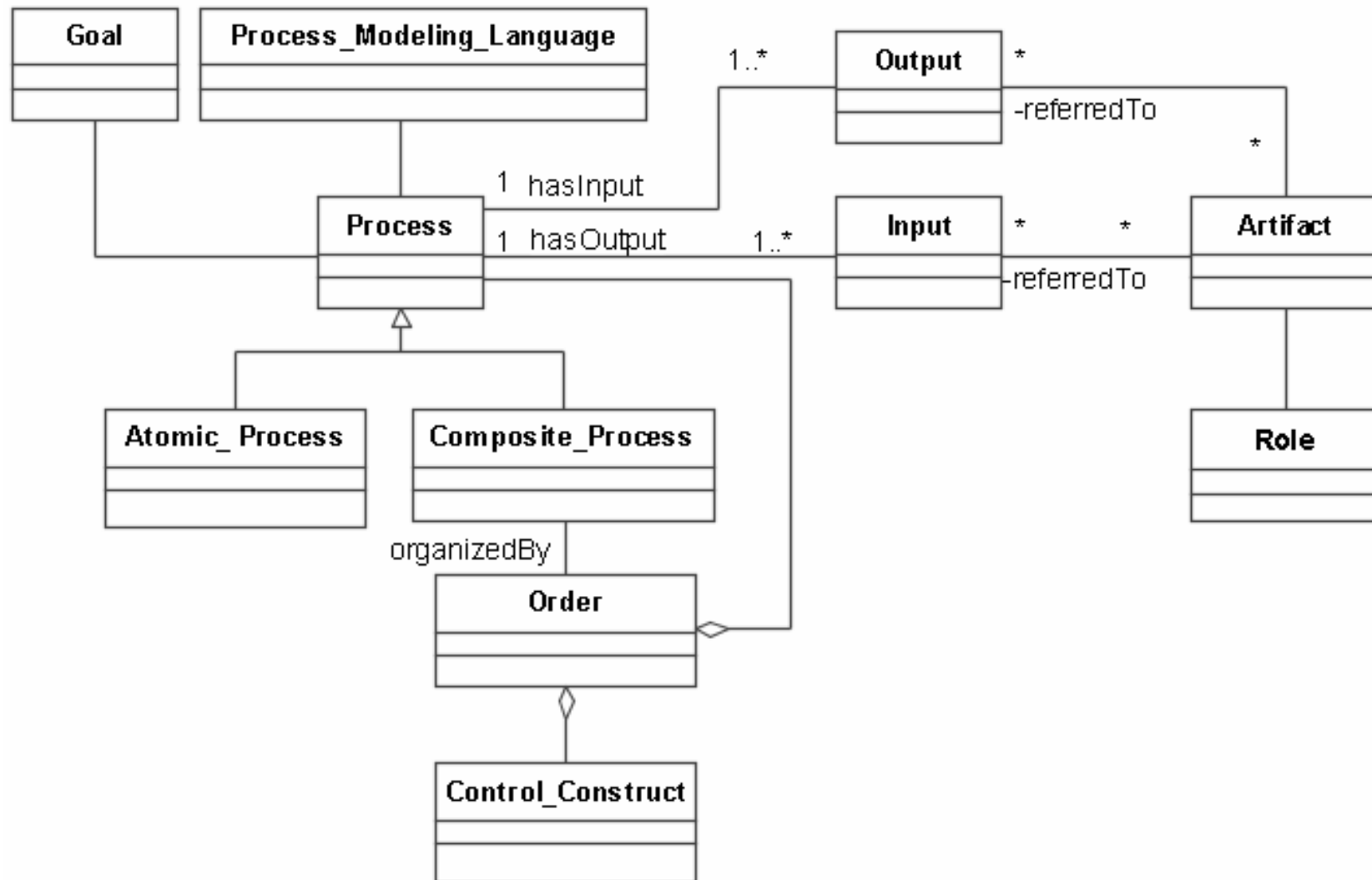
Overview of MFI-5



Base Model (1/2)

- Base Model is proposed to register structure information of various process models
 - Goal: the purpose that should be achieved by fulfilling the process model
 - Role: the actor who interact with the process
 - Resource: the things that participate in the process
 - Order: specifies the sequence of a composite process

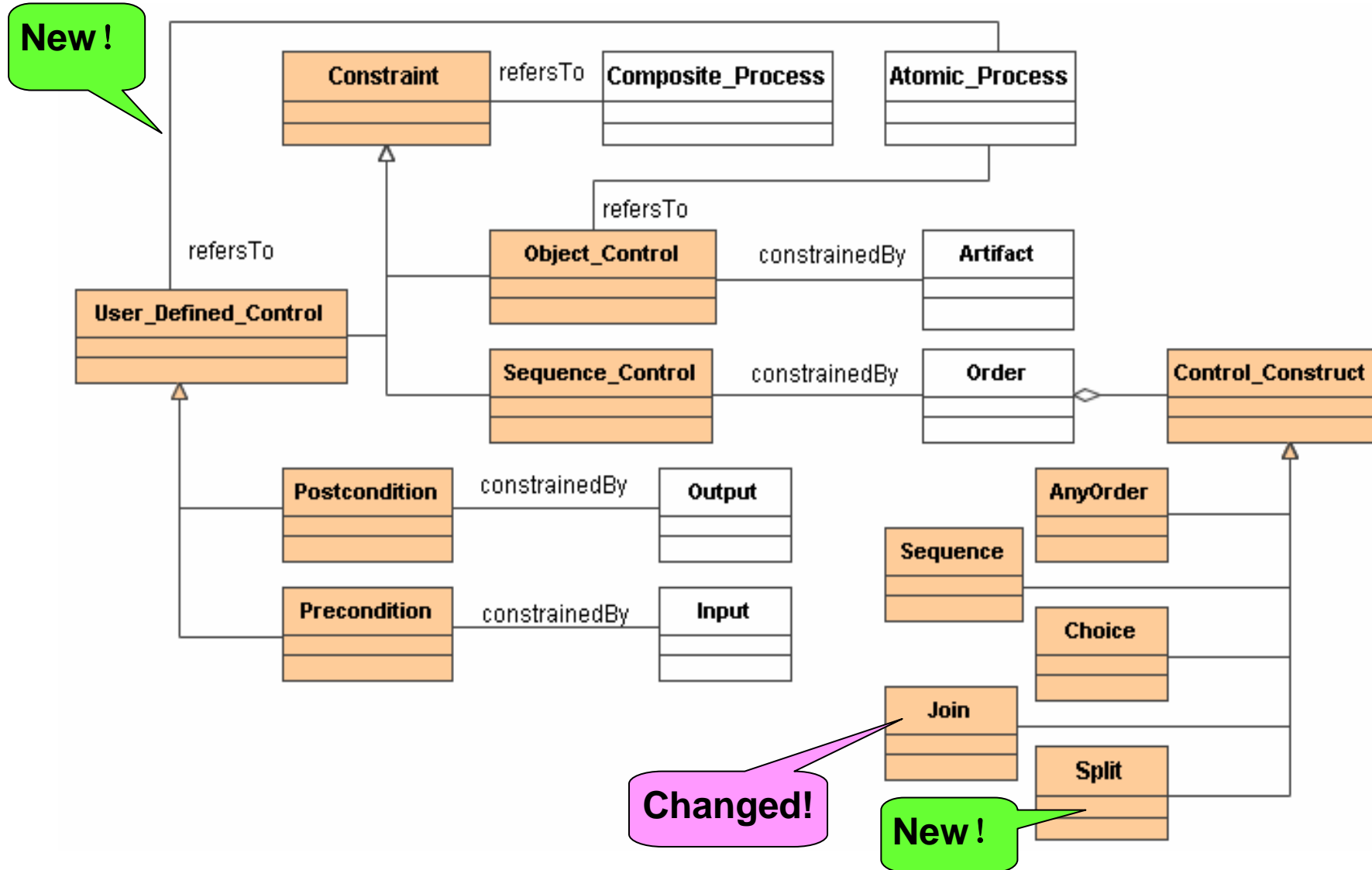
Base Model (2/2)



Process Control Model (1/2)

- Process Control Model is defined to record three kinds of control constraints in process models
 - Sequence control
 - Specify the sequence followed by the subprocesses
 - Object control
 - Restrict the semantic relations between artifacts and avoid possible semantic inconsistency
 - Support semantic interoperation between process models based on ontology
 - User-defined control
 - Trigger condition
 -

Process Control Model (2/2)





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An example: service registration based on MFI-5

from W3C,

<http://www.daml.org/services/owl-s/1.0/examples.html>

Fragment documents of BravoAir (1/2)

```
-->
- <process:CompositeProcess rdf:ID="BravoAir_Process">
  <rdfs:label>This is the top level process for BravoAir</rdfs:label>
- <process:composedOf>
  - <process:Sequence>
    - <process:components rdf:parseType="Collection">
      <process:AtomicProcess rdf:about="#GetDesiredFlightDetails" />
      <process:AtomicProcess rdf:about="#SelectAvailableFlight" />
      <process:CompositeProcess rdf:about="#BookFlight" />
    </process:components>
  </process:Sequence>
</process:composedOf>
</process:CompositeProcess>

- <process:CompositeProcess rdf:ID="BookFlight">
- <process:composedOf>
  - <process:Sequence>
    - <process:components rdf:parseType="Collection">
      <process:AtomicProcess rdf:about="#Login" />
      <process:AtomicProcess rdf:about="#ConfirmReservation" />
    </process:components>
  </process:Sequence>
</process:composedOf>
</process:CompositeProcess>
```

Fragment documents of BravoAir (2/2)

```
- <process:AtomicProcess rdf:ID="ConfirmReservation">
  <process:hasInput rdf:resource="#ReservationID_In" />
  <process:hasInput rdf:resource="#Confirm_In" />
  <process:hasOutput rdf:resource="#PreferredFlightItinerary_Out" />
  <process:hasOutput rdf:resource="#AcctName_Out" />
  <process:hasOutput rdf:resource="#ReservationID_Out" />
  <process:hasEffect rdf:resource="#HaveSeat" />
</process:AtomicProcess>
- <process:Input rdf:ID="ReservationID_In">
  <process:parameterType rdf:resource="http://www.daml.org/services/owl-s/1.0/Concepts.owl#ReservationNumber" />
</process:Input>
- <process:Input rdf:ID="Confirm_In">
  <process:parameterType rdf:resource="http://www.daml.org/services/owl-s/1.0/Concepts.owl#Confirmation" />
</process:Input>
- <process:UnconditionalOutput rdf:ID="PreferredFlightItinerary_Out">
  <process:parameterType rdf:resource="http://www.daml.org/services/owl-s/1.0/Concepts.owl#FlightItinerary" />
</process:UnconditionalOutput>
- <process:UnconditionalOutput rdf:ID="AcctName_Out">
  <process:parameterType rdf:resource="http://www.daml.org/services/owl-s/1.0/Concepts.owl#AcctName" />
</process:UnconditionalOutput>
- <process:UnconditionalOutput rdf:ID="ReservationID_Out">
  <process:parameterType rdf:resource="http://www.daml.org/services/owl-s/1.0/Concepts.owl#ReservationNumber" />
</process:UnconditionalOutput>
- <process:UnconditionalEffect rdf:ID="HaveSeat">
  <process:ceEffect rdf:resource="http://www.daml.org/services/owl-s/1.0/Concepts.owl#HaveFlightSeat" />
</process:UnconditionalEffect>
</rdf:RDF>
```

Exemplary Registration Information of BravoAirReservation

BravoAirReservation_ProcessModel	
attribute of Process	<i>Composite Process</i>
name	<i>BravoAir_ProcessModel</i>
URI	<i>URI_BravoAir_ProcessModel</i>
administration_Record	#
hasGoal	<i>Online flight booking</i>
modelType	<i>OWL-s</i>
hasInput	<i>Input:Depature Airport</i>
	<i>Input:Arrival Airport</i>
	<i>Input:RoundTrip</i>

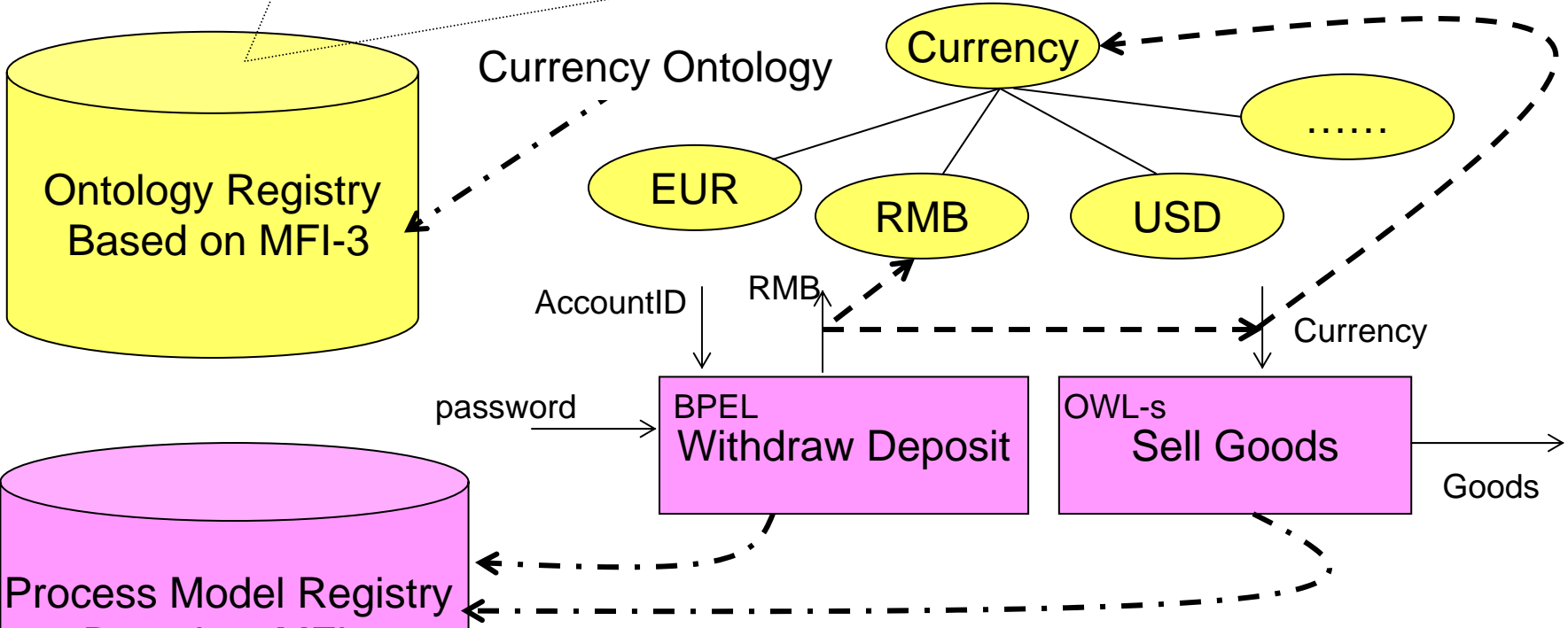
hasOutput	<i>Output:FlightsFound</i>
	<i>Output:Preferred FlightID</i>

consistsOf	<i>AtomicProcess: GetDesiredFlightDetails</i>
	<i>AtomicProcess: SelectAvailableFlight</i>
	<i>CompositeProcess: BookFlight</i>
organizedBy	<i>Sequence</i>

ConfirmReservation	
attribute of Process	<i>Atomic Process</i>
name	<i>ConfirmReservation</i>
URI	<i>URI_ConfirmReservation</i>
administration_Record	#
hasGoal	<i>Reservation confirmation</i>
modelType	<i>OWL-s</i>
hasInput	<i>Input: ReservationID_In</i>
	<i>Input: Confirm_In</i>
hasOutput	<i>Output:PreferredFlightItinerary_Out</i>
	<i>Output:AcctName_Out</i>
	<i>Output:ReservationID_Out</i>

Artifact	
name	<i>Airport</i>
referredTo	<i>Input:Depature Airport</i>
role	<i>Participant from BravoAir Provider</i>
URI	<i>http://www.w3.org/2001/XMLSchema#anyURI ">http://www.daml.org/services/owl-s/1.1/Concepts.owl#Airport</i>

Currency Ontology	administered_Item	<i>Admini_Record01</i>	Object01	administered_Item	<i>Admin_Record02</i>	Object03	administered_Item	<i>Admin_Record04</i>
	URI	#		namespace	#		namespace	#
	modelType	<i>OWL</i>	nonLogicalSymbol	<i>"Currency"</i>	logicalSymbol		<i>subClassOf</i>	
	consistsOf	<i>Object01</i>	administered_Item	<i>Admin_Record03</i>	from		<i>Object02</i>	
	<i>Object02</i>	namespace	#	to	<i>Object01</i>			
	nonLogicalSymbol	<i>"RMB"</i>					



Artifact	
name	<i>RMB</i>
referredTo	<i>Output:TakeOutRMB</i>
constraintsType	<i>Object_Control</i>

Artifact	
name	<i>Currency</i>
referredTo	<i>Input:PutInCash</i>
constraintsType	<i>Object_Control</i>

Future work

- Prepare new version according to the comments and suggestions in Seoul meeting
- Register as the candidate of CD in Sydney meeting, 2008



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Thank You!

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