



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

Metamodel and Toolkit for On Demand Model Selection

Wang Jian, He Keqing,
He Yangfan, Wang Chong,
State Key Lab of Software Engineering,
Wuhan University, P.R. China
2008-09-05

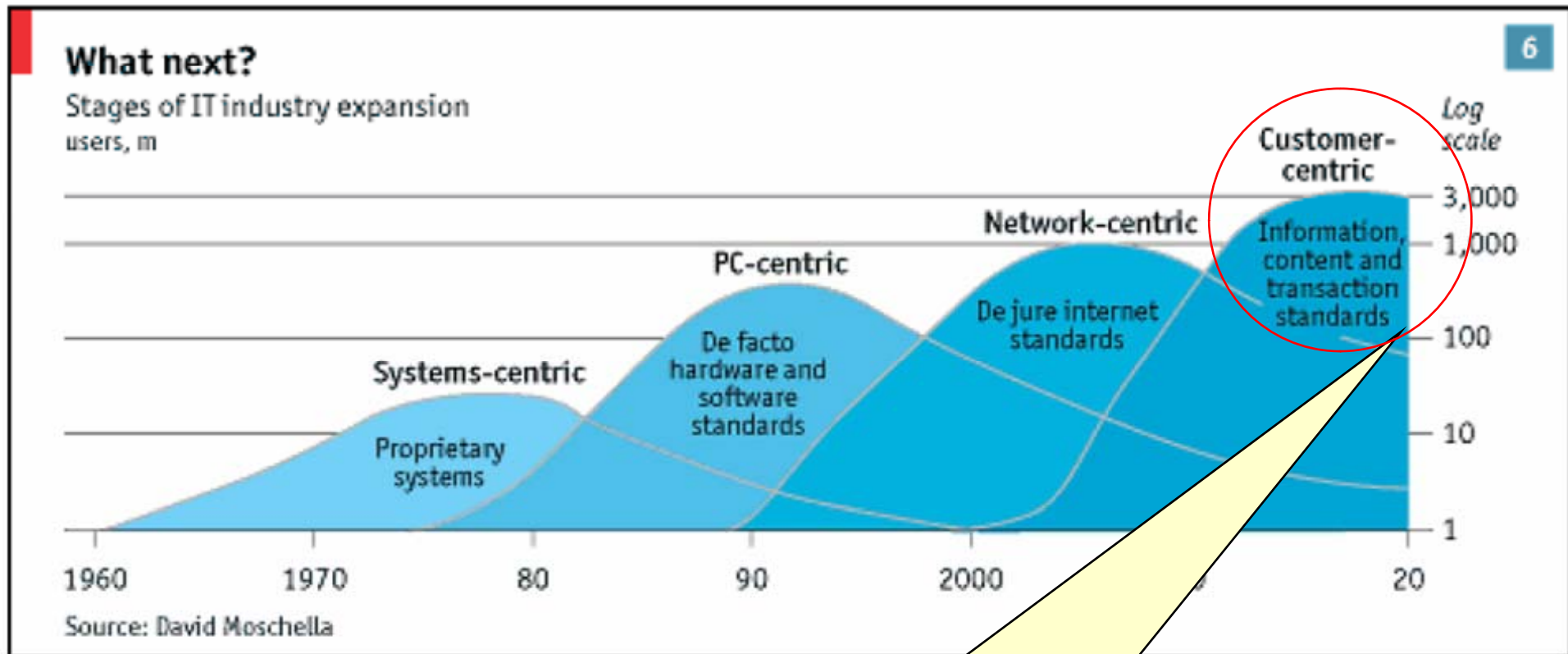
Outline

- Motivation
 - Related Work
 - Scope and Content
 - Research Foundation
 - Research Schedule
-
- Using ODMS for Process Model Selection
(Dr. Wang Chong)

Outline

- Motivation
- Related Work
- Scope and Content
- Research Foundation
- Research Schedule

IT Evolution



From: *The fortune of the commons*. In *Coming of Age: A Survey of the IT Industry*.
The Economist, May 8th 2003

Objectives:

- Provide on-demand services for end-users
- Provide on-demand business production for system engineers

What does Customer-centric mean for IT industry?

■ Requirements

- Shorter time-to-market
- Lower cost
- Higher quality of experience (QoE)

■ Supporting Technologies

- Software as a Service (SaaS)
- Mass Customization (MC)
- **On Demand Model Selection (ODMS)**

Mass Customization

– A new paradigm in manufacturing and service industry

■ A Paradigm Shift:

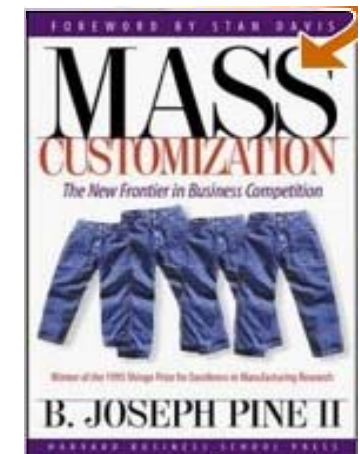
- Mass Production -> Mass Customization (Mass Production + Customization Production)
- a new paradigm based on creating variety and customization through flexibility and quick responsiveness

■ Key Points:

- **Customization and personalization** of products and services for individual customers at a low price and in a short time
- MC has a **dynamic system feedback loop** that generates the demand for a multitude of products and services at an ever increasing frequency.

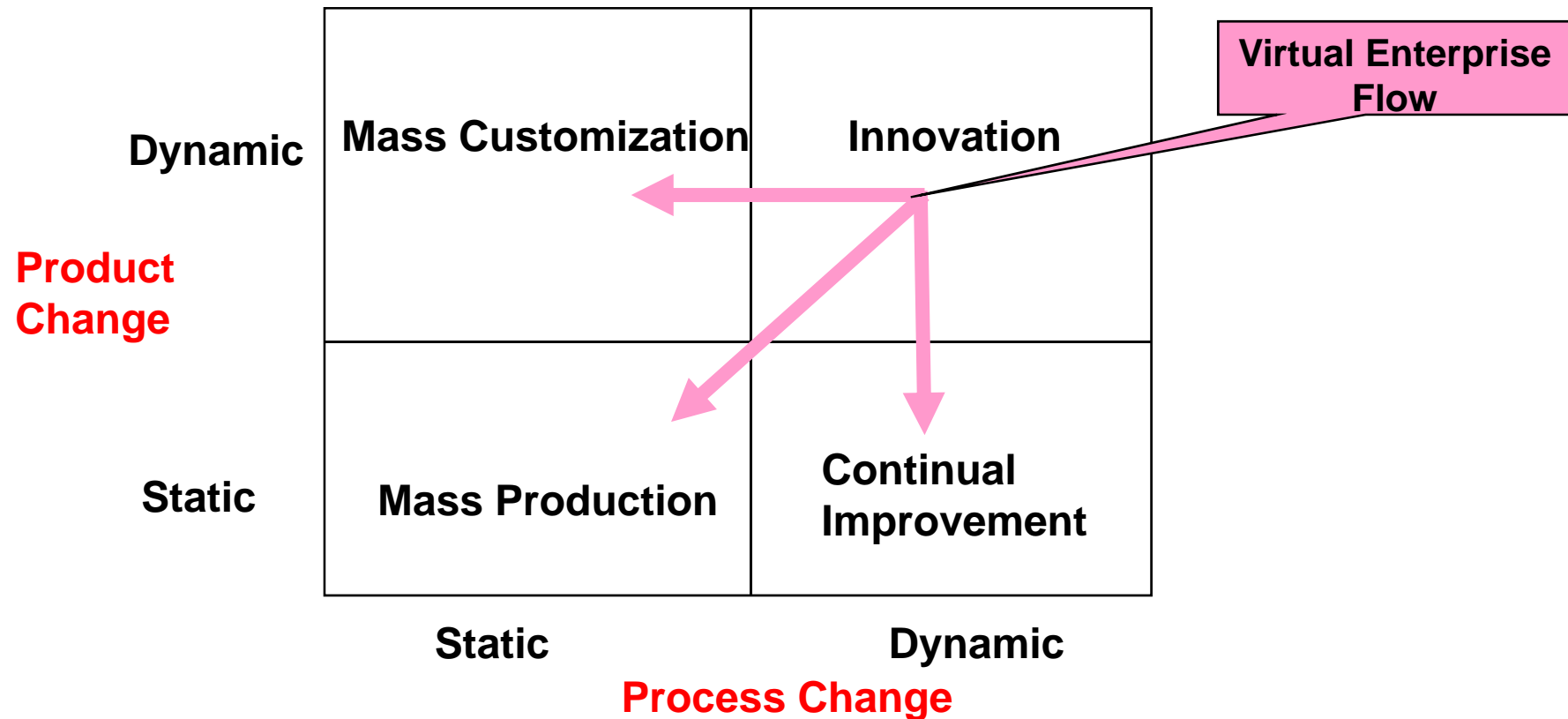


B. Joseph Pine II



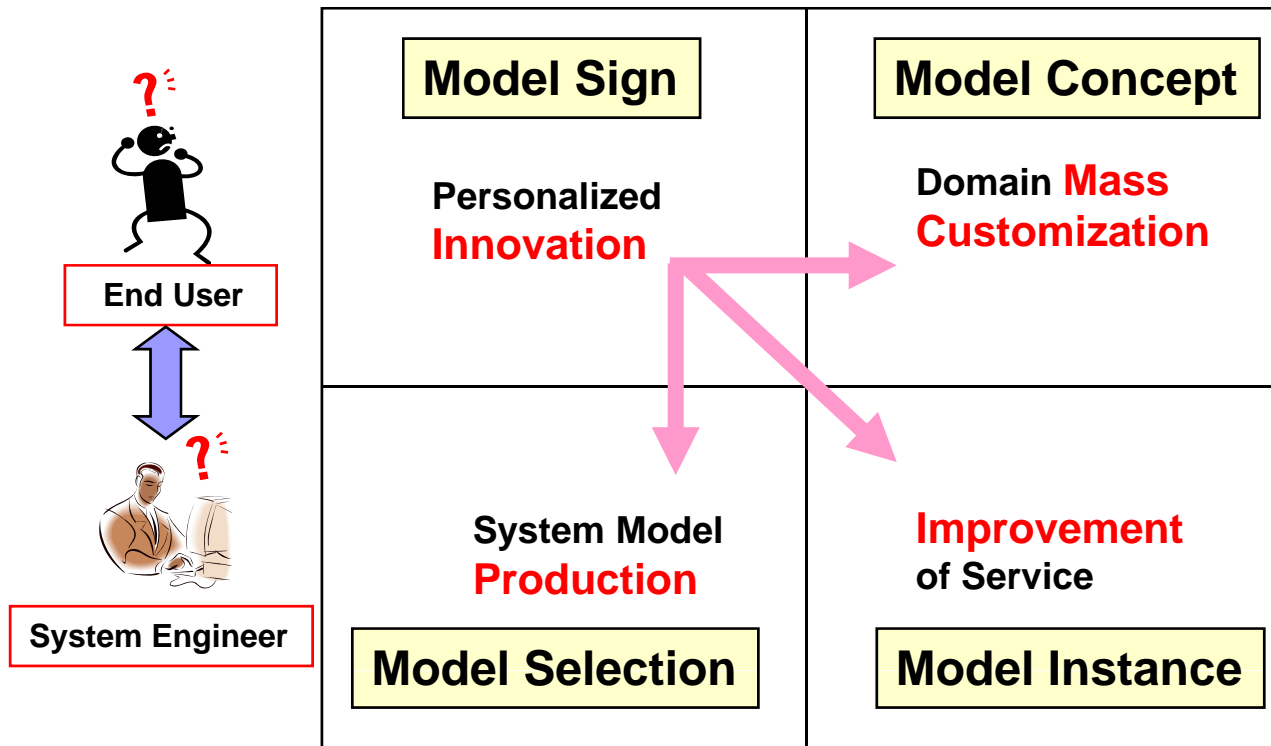
B. Joseph Pine II, *Mass Customization: The New Frontier in Business Competition*. 1993, USA

Change Matrix in MC



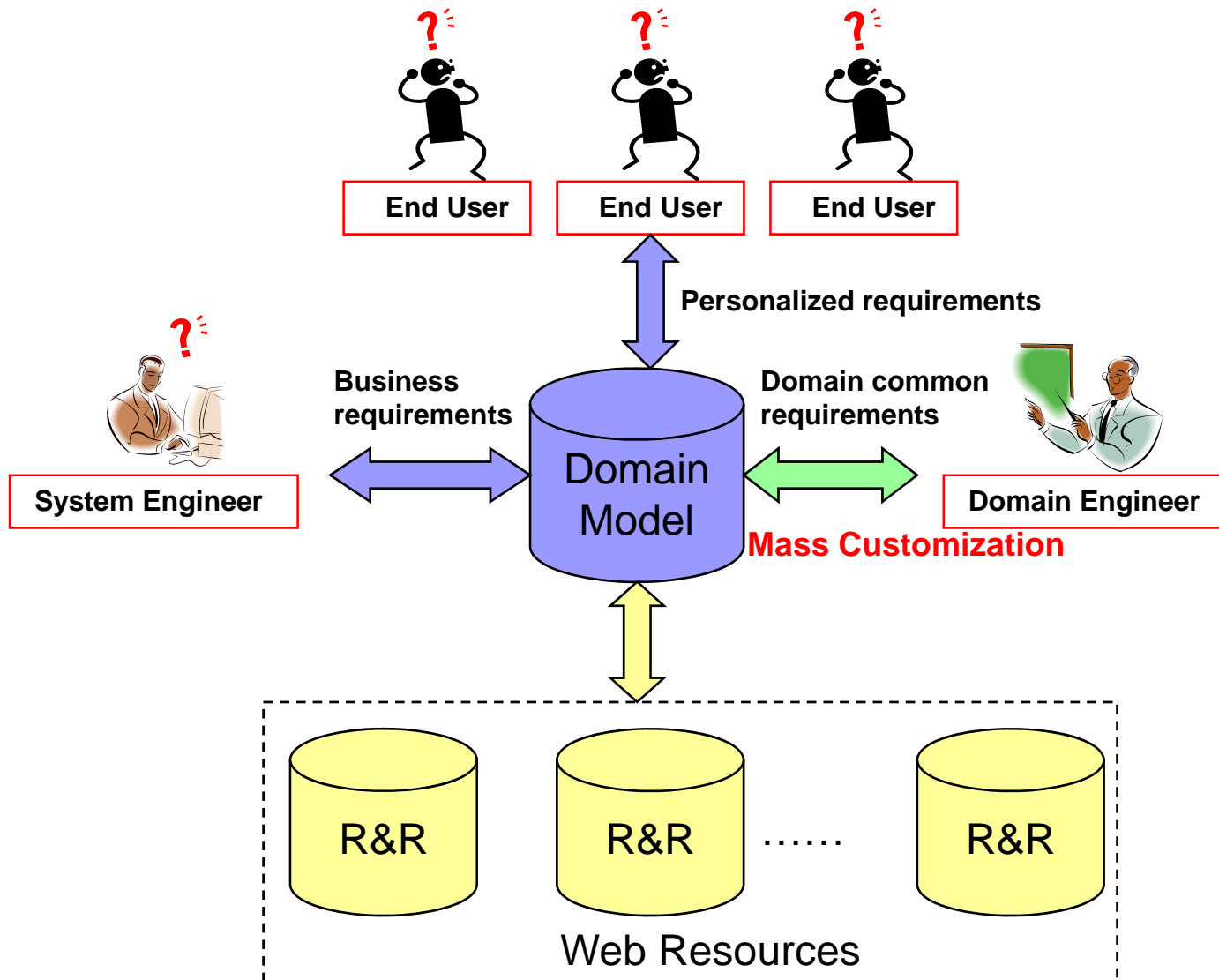
B. Joseph Pine II, *Mass Customization: The New Frontier in Business Competition*. 1993, USA

From Change Matrix to MFI-SCIS

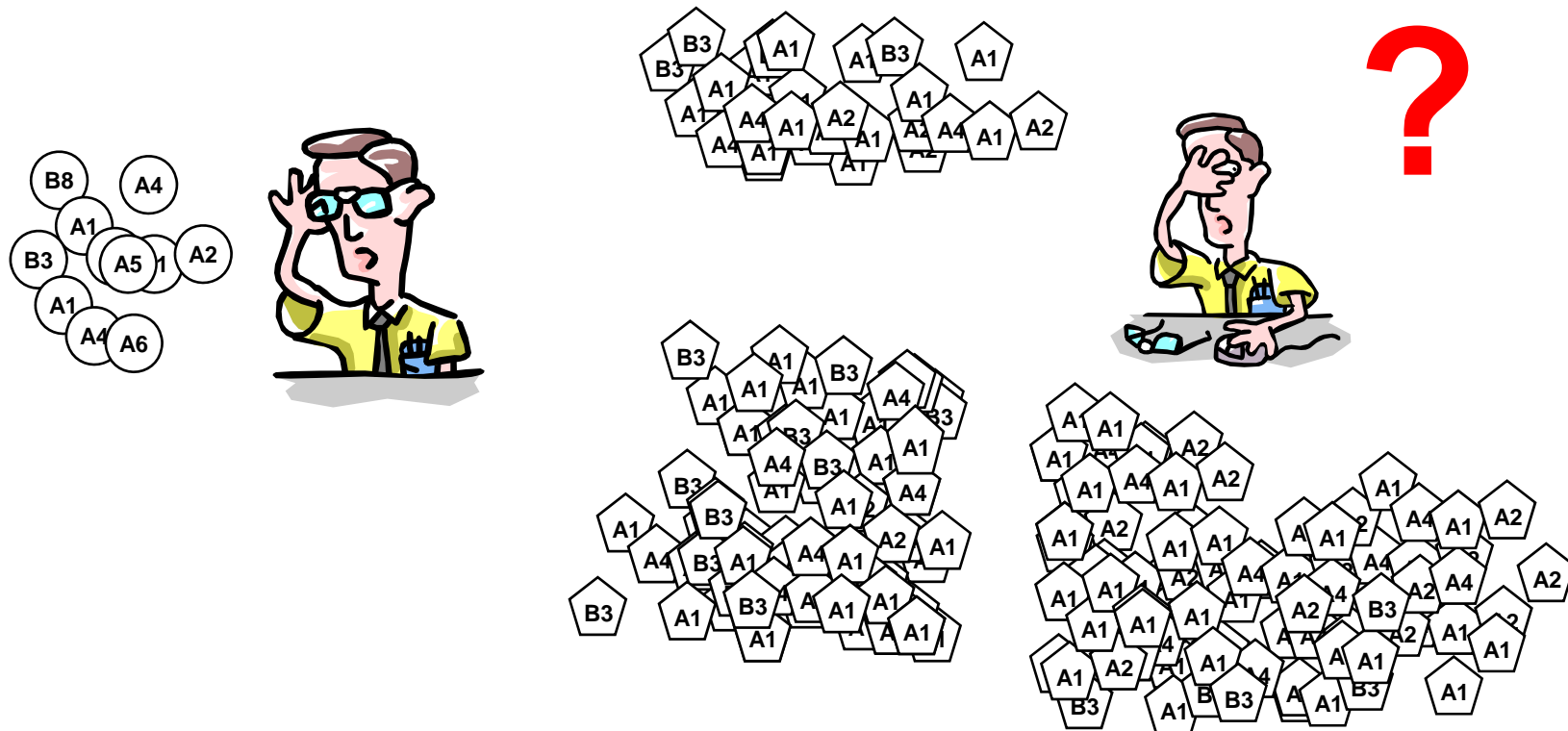


SCIS : Model Sign - Model Concept - Model Instance - Model Selection , MFI-2

Model Selection based on Domain Model



Difficulty of Model Selection



Why **On Demand Model Selection** will be useful?

- Personalized and diverse requirements
- Abundant and heterogeneous model resources

Outline

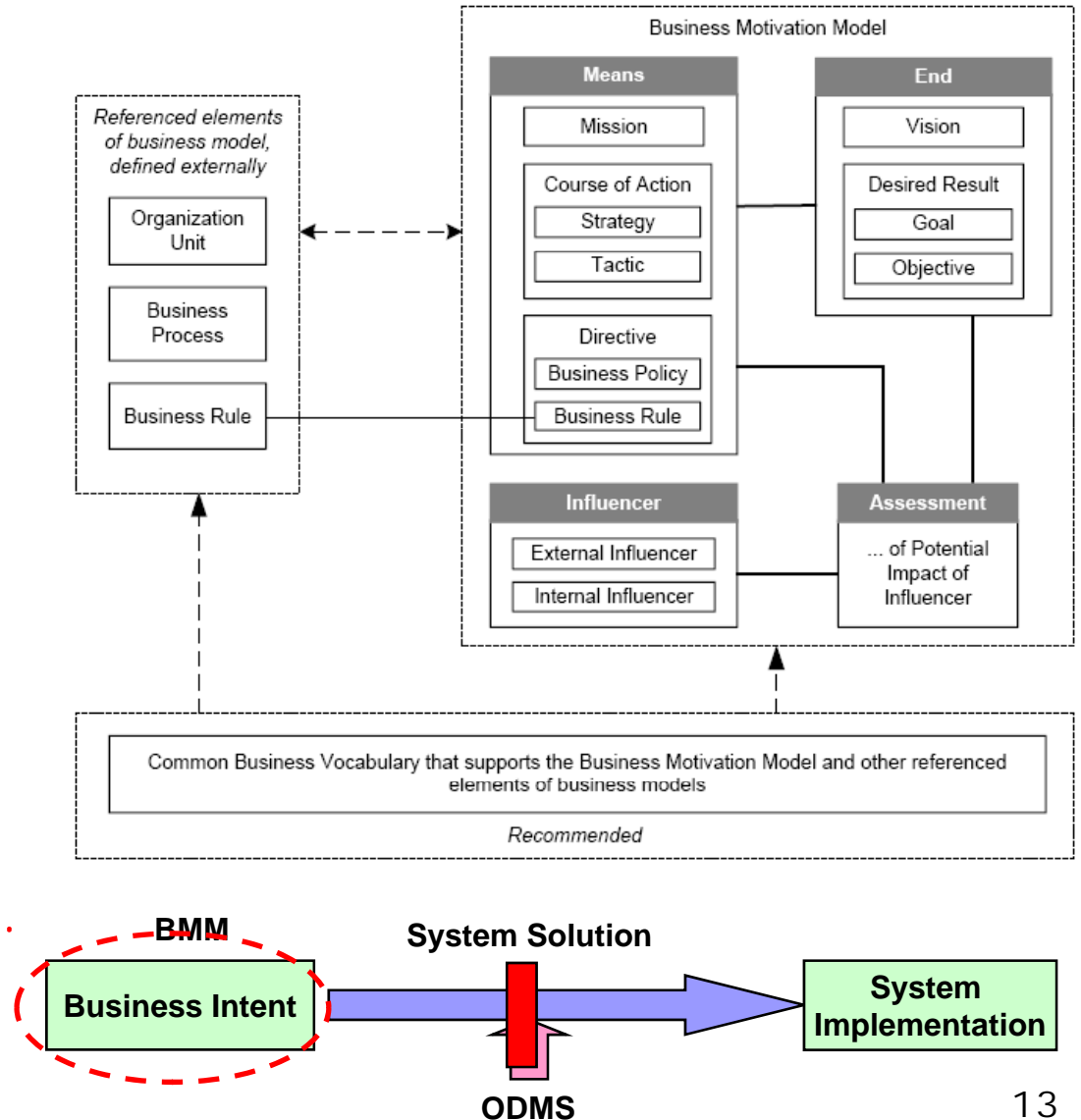
- Motivation
- Related Work
- Scope and Content
- Research Foundation
- Research Schedule

OMG Business Modeling Specification

- **Business Motivation Model (BMM) V1.1**
 - provides a scheme or structure for developing, communicating, and managing business plans in an organized manner.
- Business Process Definition Metamodel (BPDM) V1.0
- Business Process Maturity Model (BPMM) V1.0
- Business Process Modeling Notation (BPMN) V1.1
- Production Rule Representation (PRR) V1.0
- Semantics of Business Vocabulary and Business Rules (SBVR) V1.0
- Workflow Management Facility V1.2

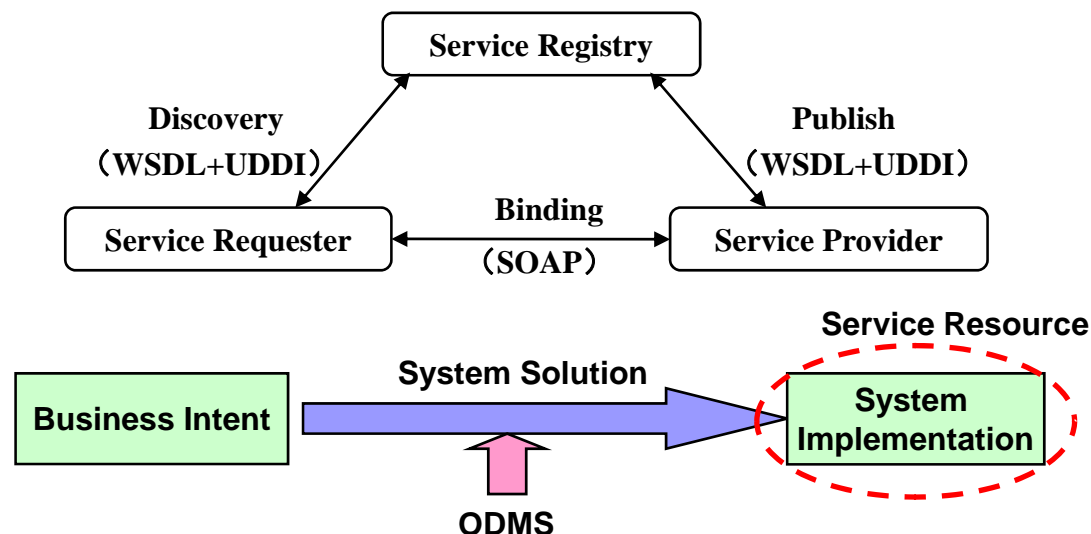
BMM (Business Motivation Model)

- BMM is developed from a business perspective
 - To develop a business model for the elements of the business plans before system design is begun.
- Relationship with ODMS
 - BMM provides the abstract elements which embody business intent.
 - **BMM doesn't provide direct connection with system implementation. While ODMS serves as a bridge between business intent and system implementation.**

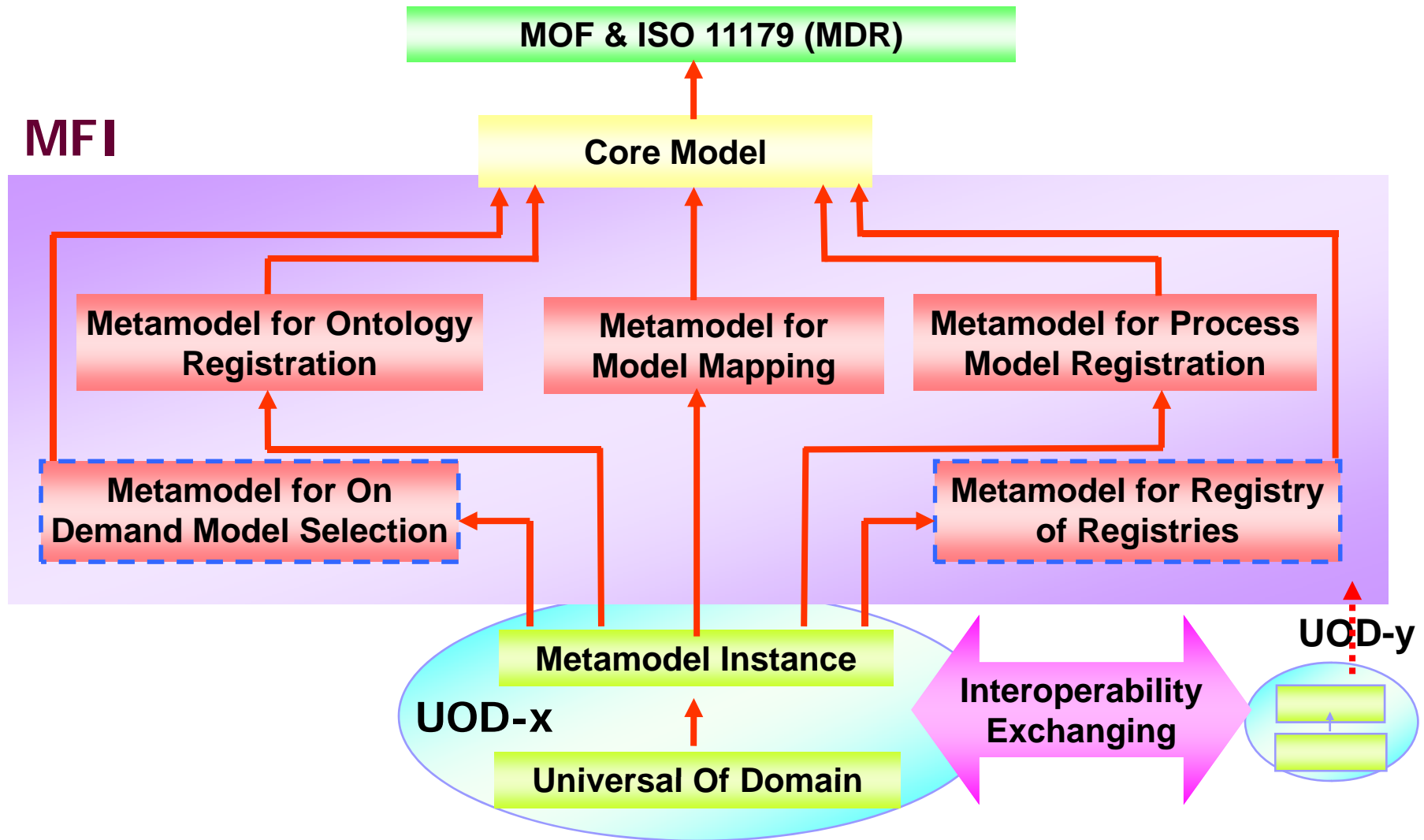


SOA Techniques

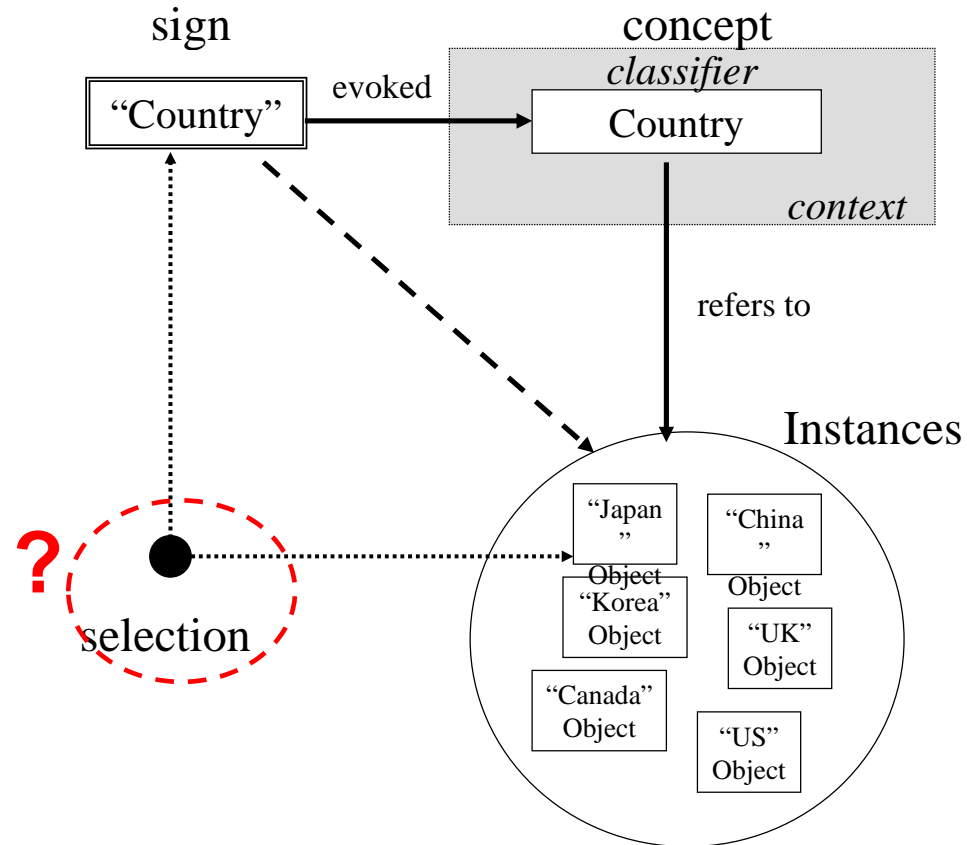
- UDDI (Universal Description, Discovery, and Integration)
 - Promote interoperation between services
 - **Mainly employed by technical people**
- Intel DSD (Dynamic Service Discovery)
 - Provides a dynamic service discovery mechanism based on UDDI
 - **Can be applied only when customers know exactly the parameters for expected service.**
- Relationship with ODMS
 - **As an implementation basis for ODMS**



ISO/IEC 19763 (Metamodel Framework for Interoperability)

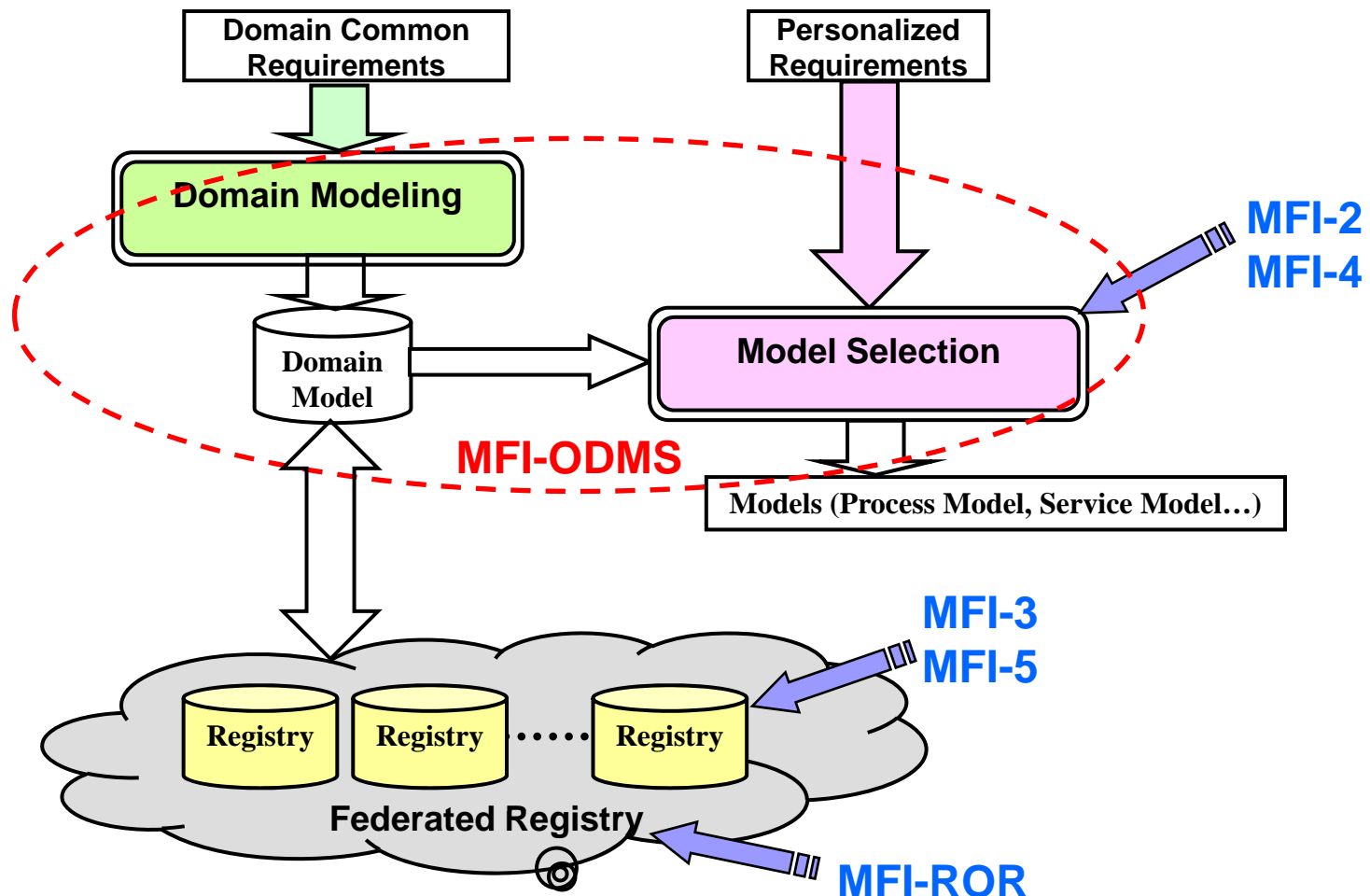


Model Selection Basis: MFI-2

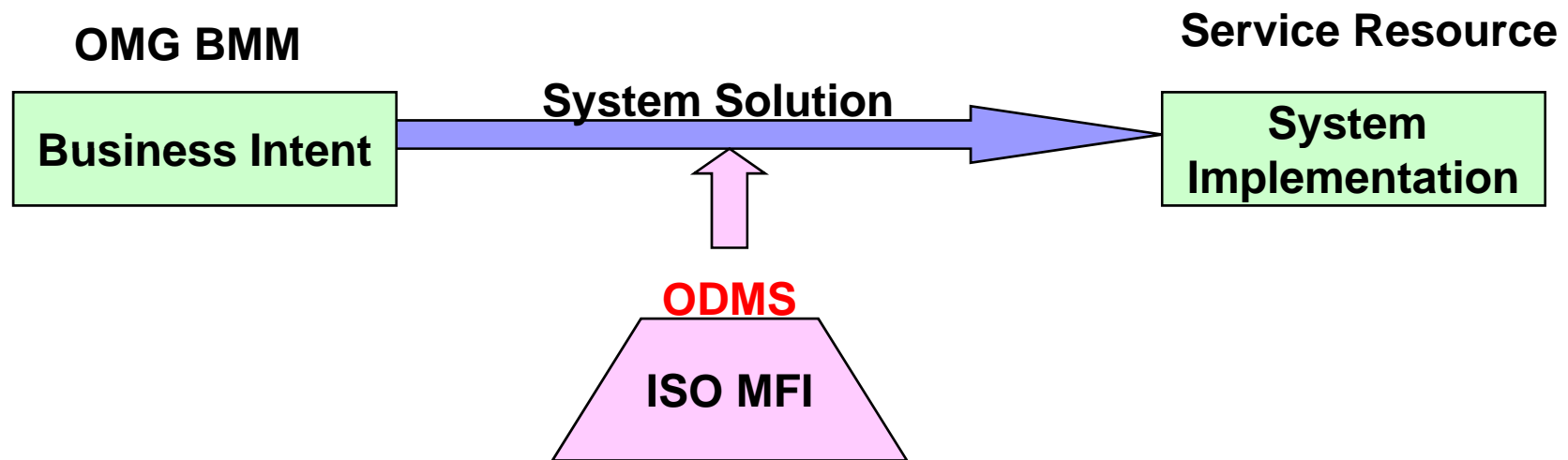


From: Masaharu Obayashi, *ISO/IEC SC32 19763(MFI) Part2, 2006*

Relationship with MFI standards



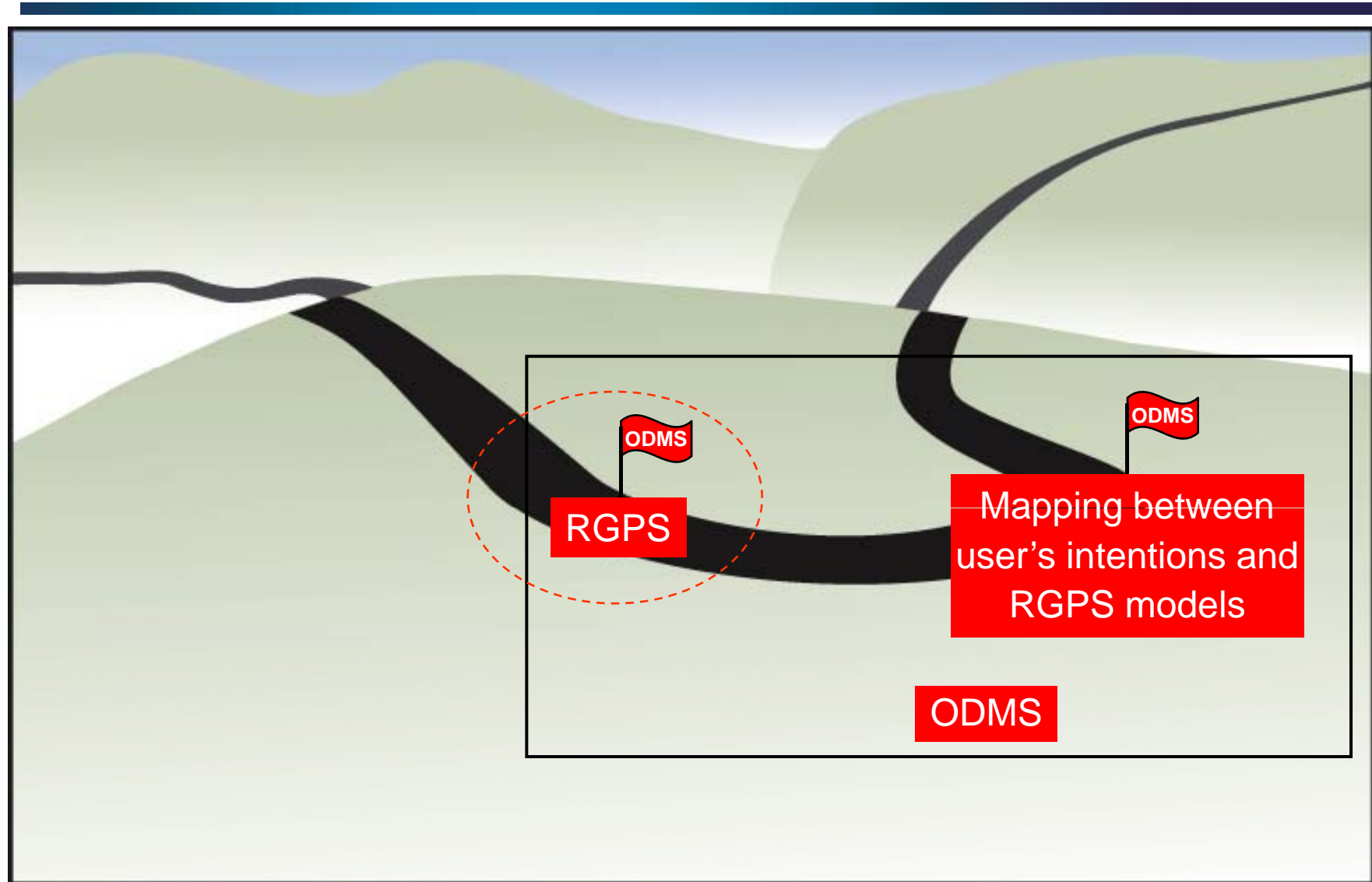
Summary of Related Work



Outline

- Motivation
- Related Work
- Scope and Content
- Research Foundation
- Research Schedule

Roadmap of ODMS



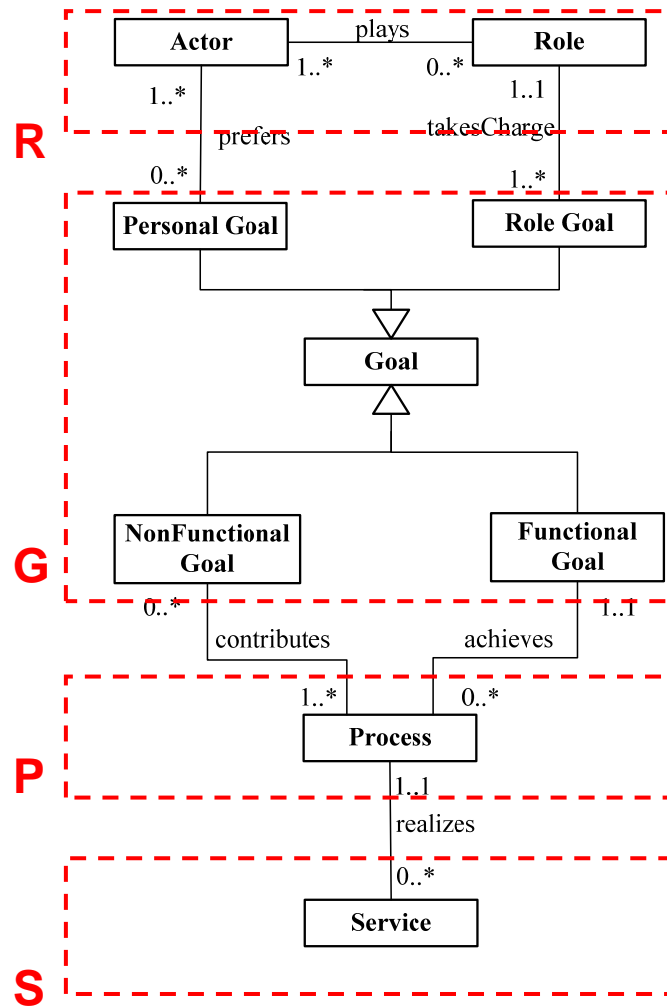
Scope

- Specify the metamodels for an RGPS registry of domain models and/or services that enable users to select appropriate combinations of models and/or services to meet users' goals.
- Specify an infrastructure to support operational harmonization and interoperability within and between industries.

A Closer Look at RGPS

- Based on the characteristics of customers' intention and implementation form
 - Customers' intention is proposed from the perspective of the **roles** they play.
 - Customers' **goals** are aptly variable and diverse.
 - Business **processes** to fulfill the goals are usually complex.
 - **Services** are the representative form of software system.
- With RGPS, we can model customers' intention from different aspects.
 - Customers' intent can be expressed from different level and different granularity
 - RGPS: From disorder to order --→ To help users select appropriate models

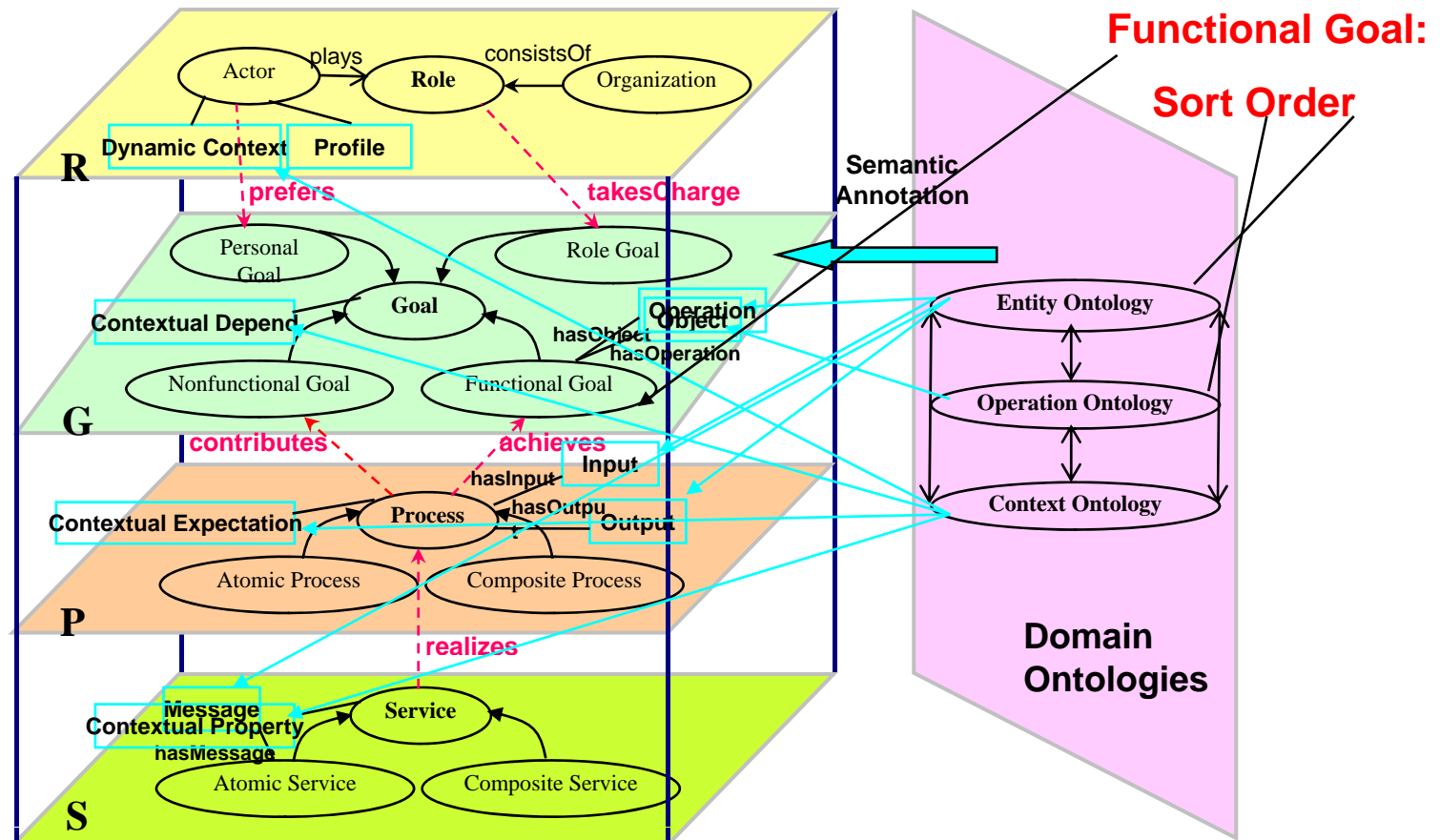
Relationships in RGPS



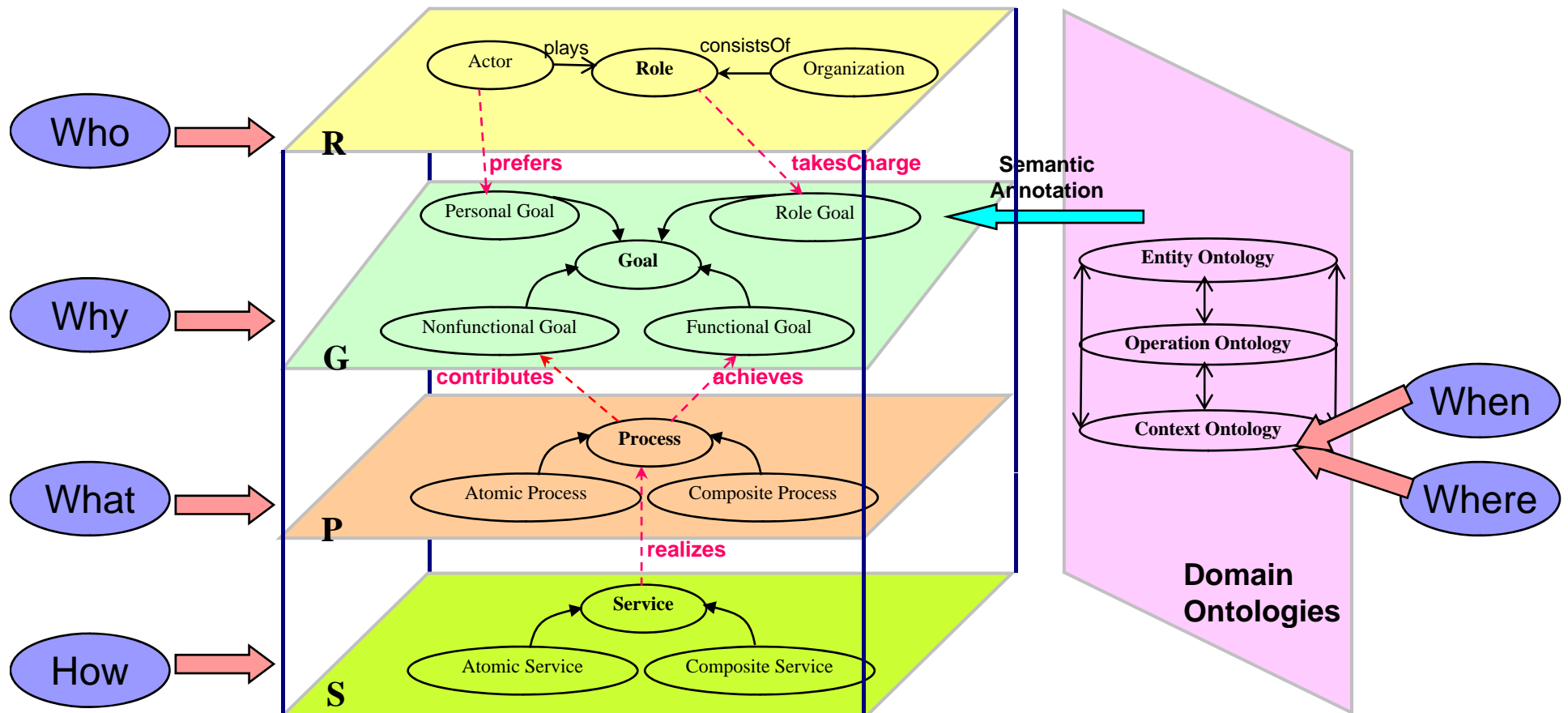
- **Relationships between Role and Goal**
 - *Roles* take charge of corresponding *role goals*
 - An *actor* prefers his *personal goal*
- **Relationships between Goal and Process**
 - *Processes* achieve *functional goals*
 - *Processes* contribute to the fulfillment of *nonfunctional goals*
- **Relationships between Process and Service**
 - A *service* realizes a *process*

Applying RGPS for Domain Modeling

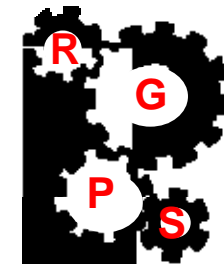
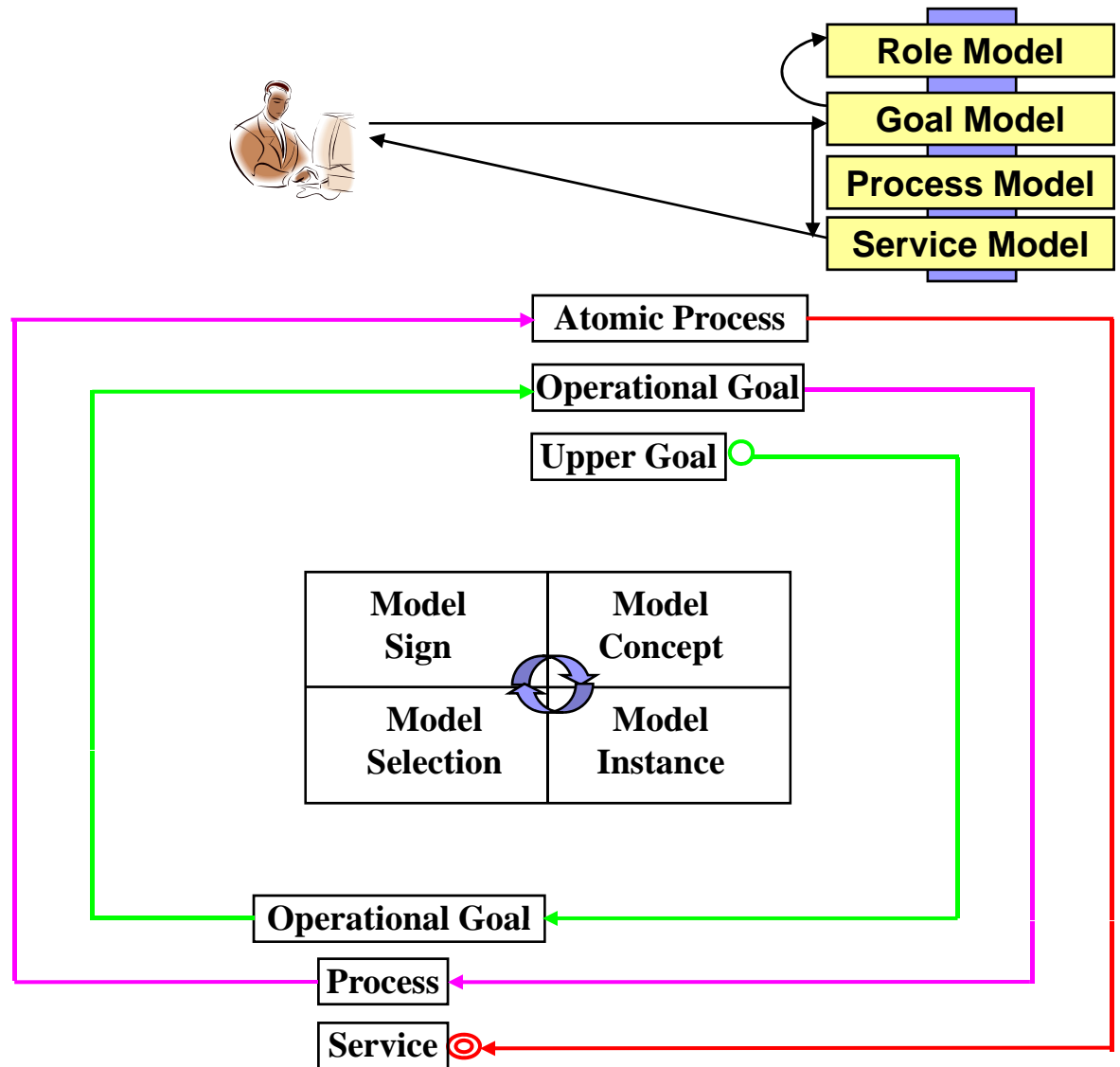
Domain model: the basis for MC



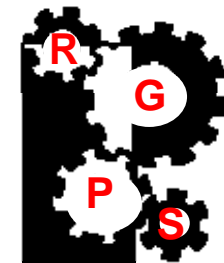
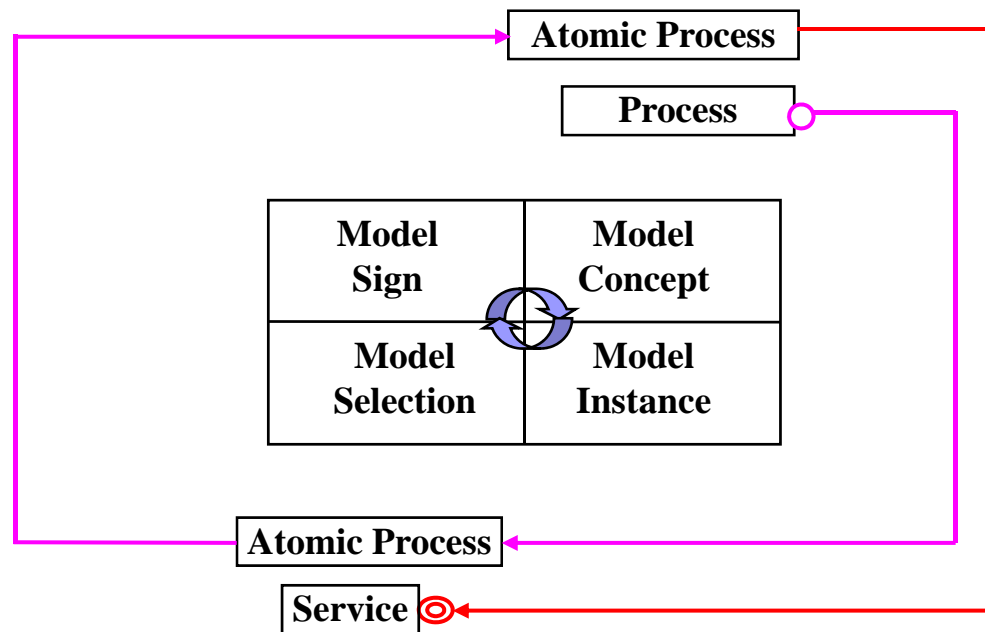
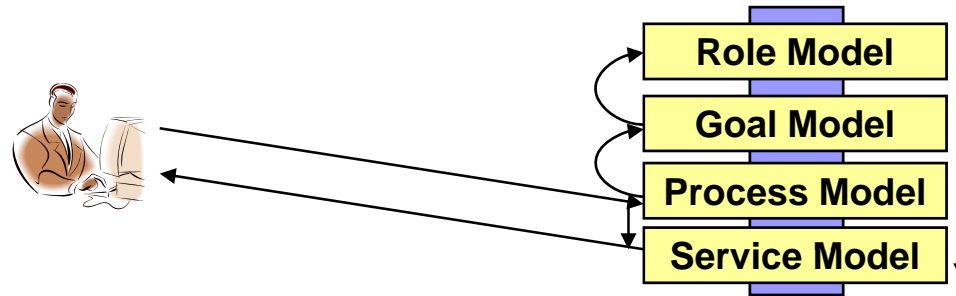
From the Perspective of W5H



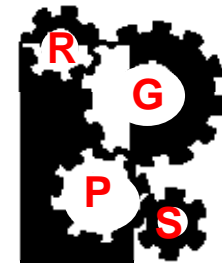
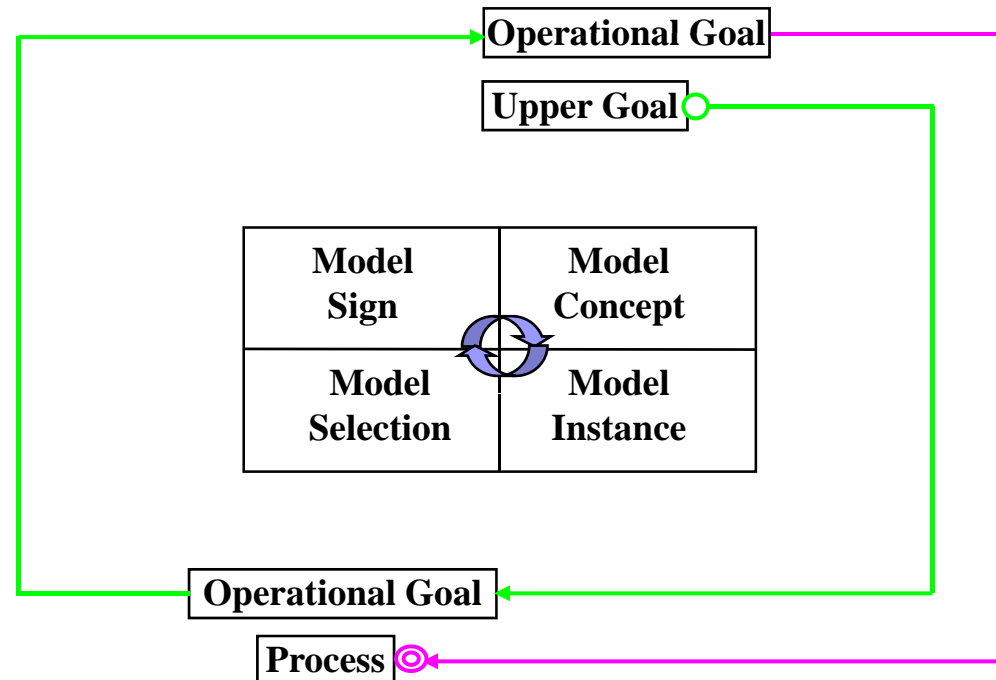
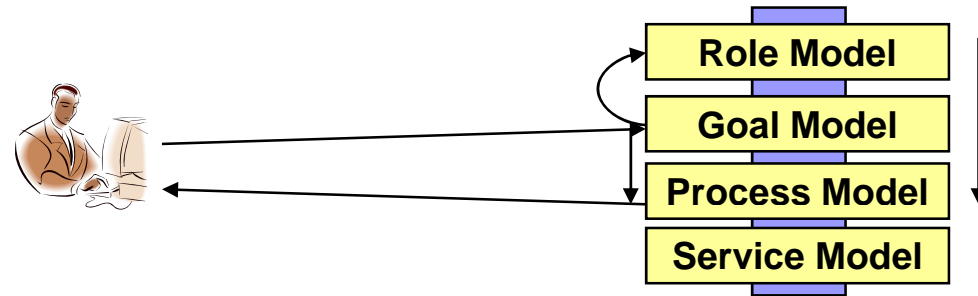
RGPS based Model Selection Process (Case 1)



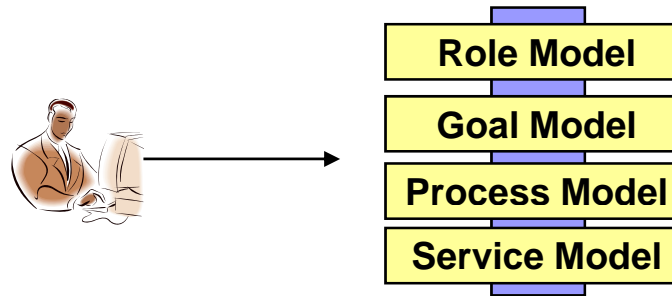
RGPS based Model Selection Process (Case 2)



RGPS based Model Selection Process (Case 3)

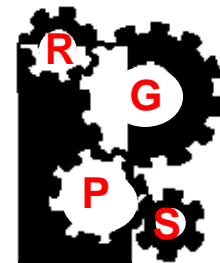


RGPS based Model Selection Process (Other Cases)



Depend on user's request and target!

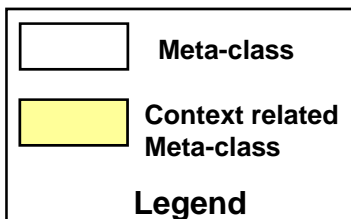
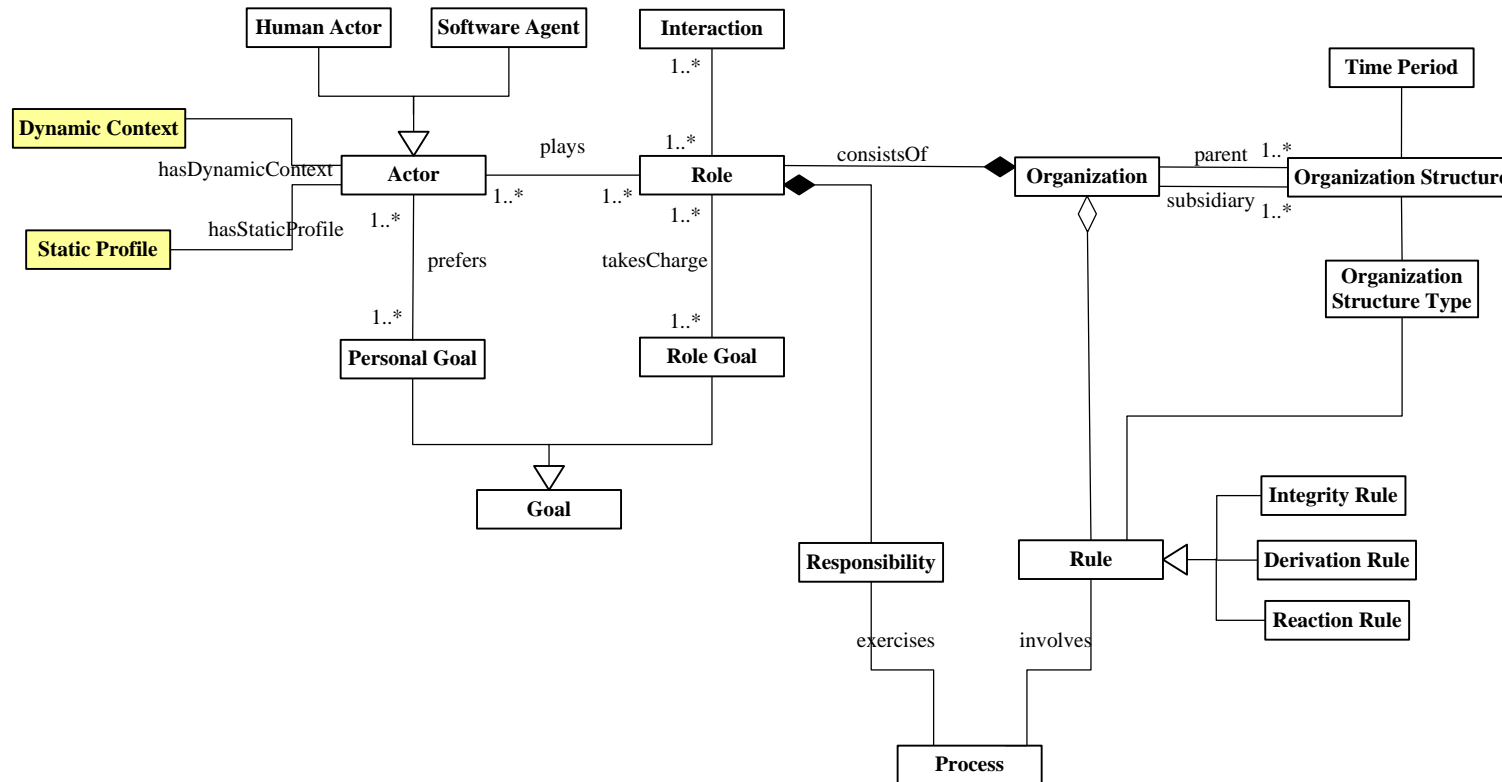
Model Sign	Model Concept
Model Selection	Model Instance



Outline

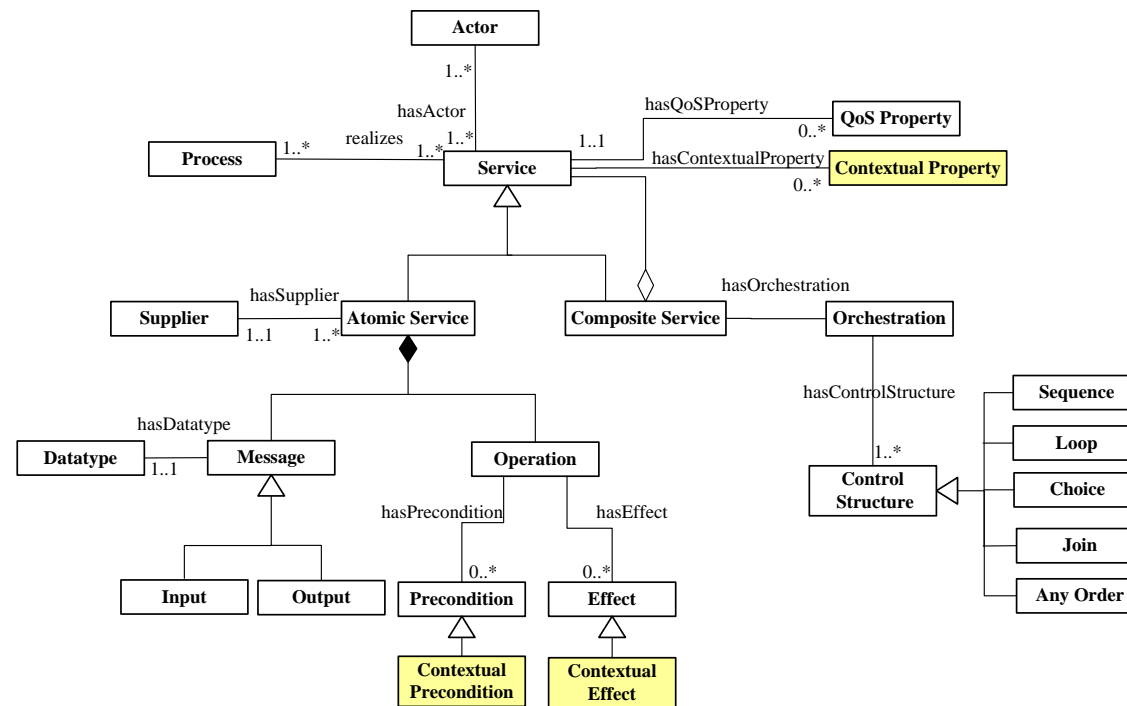
- Motivation
- Related Work
- Scope and Content
- Research Foundation
- Research Schedule

Current RGPS Metamodels

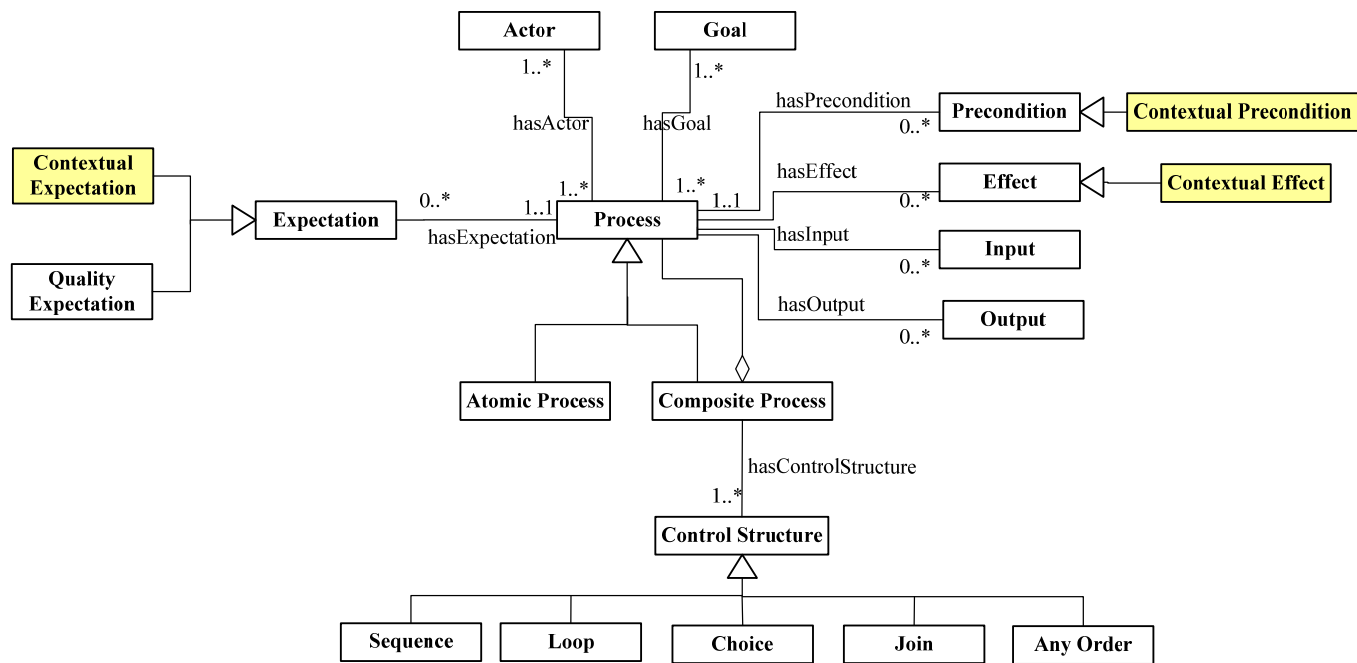


The Role Metamodel

The Service Metamodel



The Process Metamodel



RGPS-based Domain Modeling Toolkit – Goal Modeling

The screenshot displays the RGPS Editor interface. On the left is a toolbar with various modeling tools like Select, Marquee, Node, Actor Node, Functional Node (FG), NonFunctional Node (NFG), Operational Node (OG), and Connection types such as Alternative, Dependent, Equivalent, Exclude, Mandatory, Optional, OR, and HasGoal. The main workspace shows a hierarchical goal model diagram. The actor 'Traveler Info Operator' is connected to the goal 'ProvideJourney'. This goal is supported by 'GenerateTrip_Preference' and 'PrepareTrip_Plan'. 'PrepareTrip_Plan' is supported by 'PerformBooking', 'MakePayments', and 'ArrangeTrip'. 'PerformBooking' is supported by 'DisplayTravel_PlanbyVideo' and 'DisplayTrip_PlanbyAudio'. 'ArrangeTrip' is supported by 'DisplayTravel_PlanbyVideo' and 'DisplayTrip_PlanbyAudio'.

On the right side, the OWL code for the selected goal is shown:

```

<OperationalGoal rdf:about="http://www.sklse.com/Ontology/Model/GenerateTrip_Preference">
  <hasObject rdf:resource="http://www.sklse.com/Ontology/Model/Trip_Preference" />
  <hasOperation rdf:resource="http://www.sklse.com/Ontology/Model/Generate" />
  <comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string">No Comments</comment>
  <name rdf:datatype="http://www.w3.org/2001/XMLSchema#string">GenerateTrip_Preference</name>
  <isOperational rdf:datatype="http://www.w3.org/2001/XMLSchema#boolean">true</isOperational>
</OperationalGoal>
<Object rdf:about="http://www.sklse.com/Ontology/Model/Trip" />
<Operation rdf:about="http://www.sklse.com/Ontology/Model/Support" />
<FunctionalGoal rdf:about="http://www.sklse.com/Ontology/Model/SupportTrip">
  <hasObject rdf:resource="http://www.sklse.com/Ontology/Model/Trip" />
  <hasOperation rdf:resource="http://www.sklse.com/Ontology/Model/Support" />
  <comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string">No Comments</comment>
  <name rdf:datatype="http://www.w3.org/2001/XMLSchema#string">SupportTrip</name>
  <isOperational rdf:datatype="http://www.w3.org/2001/XMLSchema#boolean">false</isOperational>
  <mandatory rdf:resource="http://www.sklse.com/Ontology/Model/TrackTraveler" />
  <mandatory rdf:resource="http://www.sklse.com/Ontology/Model/AssessPlan_Change" />
  <optional rdf:resource="http://www.sklse.com/Ontology/Model/GuideTraveler" />
</FunctionalGoal>
<Operation rdf:about="http://www.sklse.com/Ontology/Model/Evaluate" />
<OperationalGoal rdf:about="http://www.sklse.com/Ontology/Model/EvaluateTrip">
  <hasObject rdf:resource="http://www.sklse.com/Ontology/Model/Trip" />
  <hasOperation rdf:resource="http://www.sklse.com/Ontology/Model/Evaluate" />
  <comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string">No Comments</comment>
  <name rdf:datatype="http://www.w3.org/2001/XMLSchema#string">EvaluateTrip</name>
  <isOperational rdf:datatype="http://www.w3.org/2001/XMLSchema#boolean">true</isOperational>
</OperationalGoal>
<Object rdf:about="http://www.sklse.com/Ontology/Model/Booking" />
<Operation rdf:about="http://www.sklse.com/Ontology/Model/Perform" />

```

At the bottom, the Properties window shows the following details for the selected goal:

Property	Value
Is Operational	false
Manner	
Node Comments	No Comments
Node Name	TrackTraveler
Object	Traveler
Operation	Track
Type	Role Goal

OWL

RGPS-based Domain Modeling Toolkit – Process Modeling

The screenshot shows the RGPS-based Domain Modeling Toolkit interface. On the left is a toolbar with various modeling tools like Start, Actor, AtomicProcess, CompositeP..., Choice, Join, Split, AnyOrder, Convergence, LoopCondition, End, Sequence, Loop, and HasProcess. The main workspace contains a process diagram with nodes like Atomic0, Atomic8, CP01, Atomic5, Atomic6, Atomic7, Atomic1, and Atomic2. A red dashed arrow points from the diagram to the XML code on the right. At the bottom, there is a Properties panel with a table:

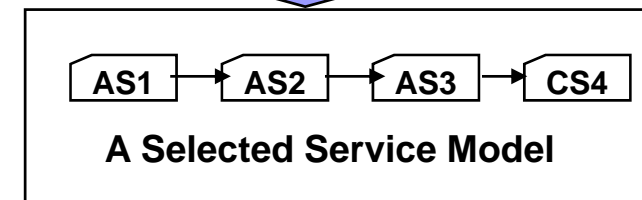
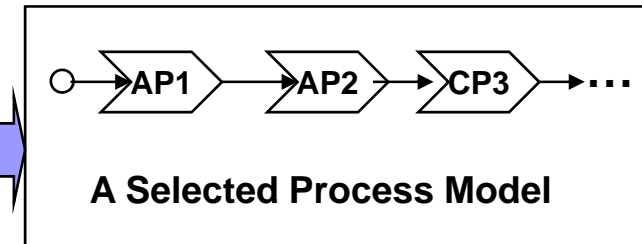
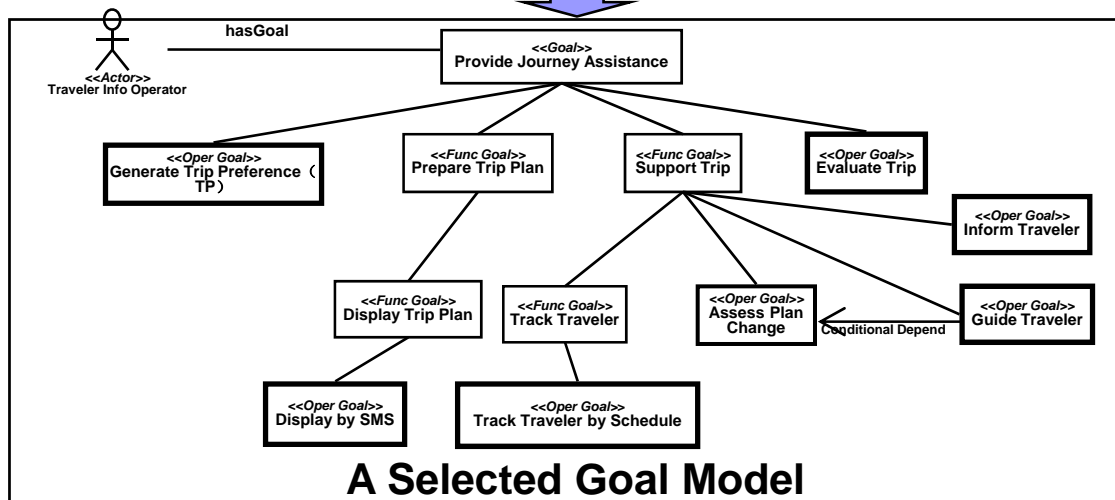
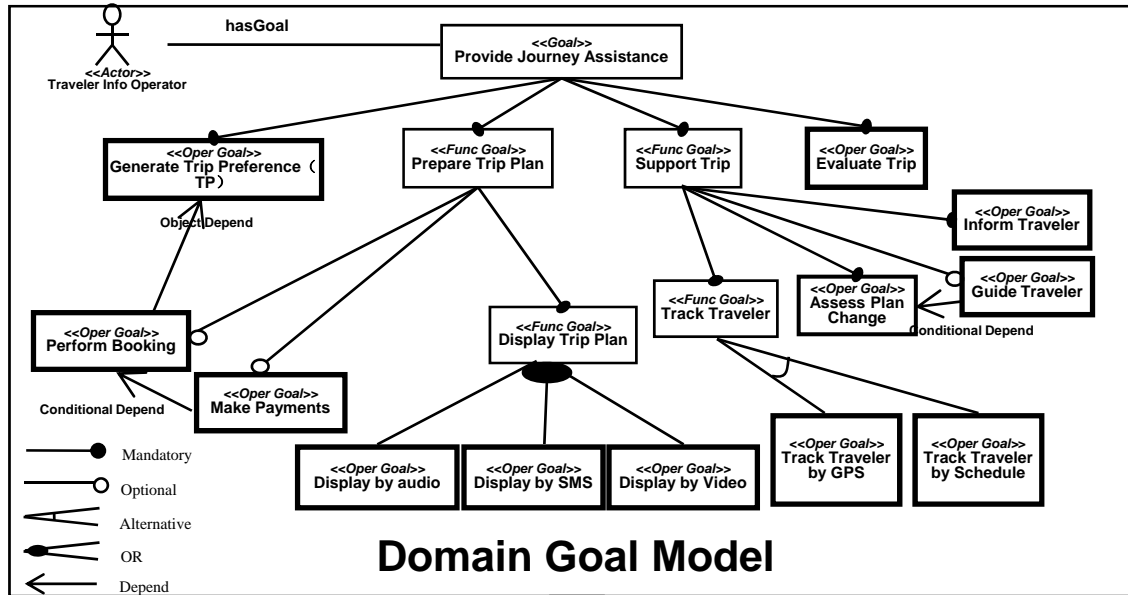
Property	Value
Effect	null
Expectation	null
Goal	ArrangeTrip
Input	[Atomic0_Departure_Spot:Departure
Node Comments	No Comments
Node Name	Atomic0
Output	null
PreCondition	[Accessorial_Class(Atomic0_Depart

```

<process:CompositeProcess rdf:ID="CP01">
  <process:comment rdf:datatype="http://www.w3.org/2001/XMLSchema#string">No
- <process:composedof>
- <process:Sequence>
- <process:components>
- <process:ControlConstructList>
- <process:first>
- <process:Repeat-Until>
- <process:untilProcess>
- <process:Sequence>
- <process:components>
- <process:ControlConstructList>
- <process:first>
- <process:Perform rdf:ID="PerformAtomic1">
  <process:process rdf:resource="Atomic1" />
</process:Perform>
</process:first>
- <process:rest>
- <process:ControlConstructList>
  >
  erform rdf:ID="PerformAtomic2">
;process rdf:resource="Atomic2" />
perform>
it>
  >
  <process:rest rdf:resource="nil" />
  </process:rest>
</process:ControlConstructList>
</process:rest>
</process:ControlConstructList>
</process:components>
</process:Sequence>
  </process:untilProcess>
- <process:untilCondition>
- <expr:SWRL-Condition>
  
```

Achieved Goal

An Example



Outline

- Motivation
- Related Works
- Scope and Content
- Research Foundation
- Research Schedule

Research Schedule

- 2008.11 Circulate 1st WD in WG2 as MFI-7
- 2009.6 Submit 1st WD to ISO SC32 and request project initiation

To Be Discussed

- 1. How about the version setting?
 - 1st edition: RGPS metamodel
 - 2nd edition: mapping mechanism between user's intention and RGPS models
- 2. What is the scope of ODMS?
 - What should be included?
 - What should not be included?
- 3. What about the contents?
 - Just provide a rough Sketch or provide the details of metaclasses in the metamodel
 - Besides the Metamodel, will the model selection process be consisted in ODMS? Should we list all the possible cases during the model selection process?

Thank you!