Towards Effects-Based Service Description And Integration In Pervasive Environments

ikerlan

Aitor Urbieta
Ekain Azketa
Inma Gomez
Jorge Parra

MONDRAGON UNIBERTSITATEA

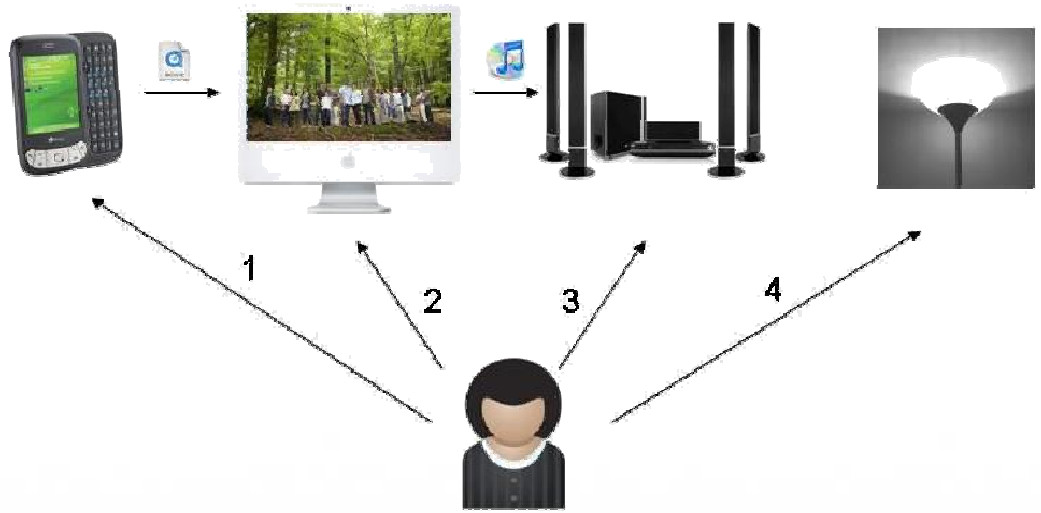
Nestor Arana

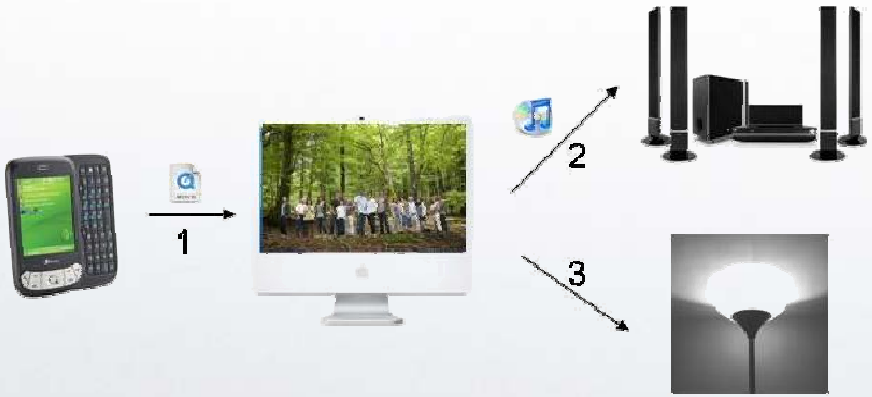
Outline

Outline

Current vs. Future Scenarios

Symphony





Jazz

Current vs. Future Scenarios

We are surrounded by many devices (PC, PDA, embedded devices, etc.)
We have the necessary infrastructure to achieve Weiser's vision

↓ but …

The reality is that we are a long way from the vision

↓ why?

The majority of the devices are isolated
The features they offer are described in a very simple manner
Functionalities offered by services cannot be adequately consumed
Services are not integrated with the environment (context-awaress)
Necessary full integration between services and context

Semantic service representation languages

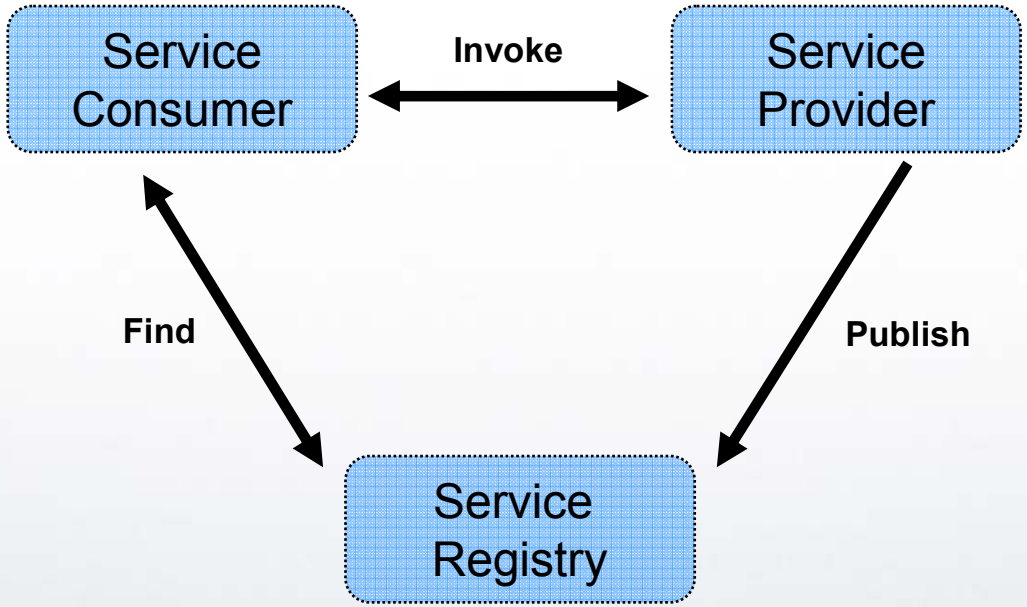
Effect- and condition-based approach

Ontology based context models

Outline

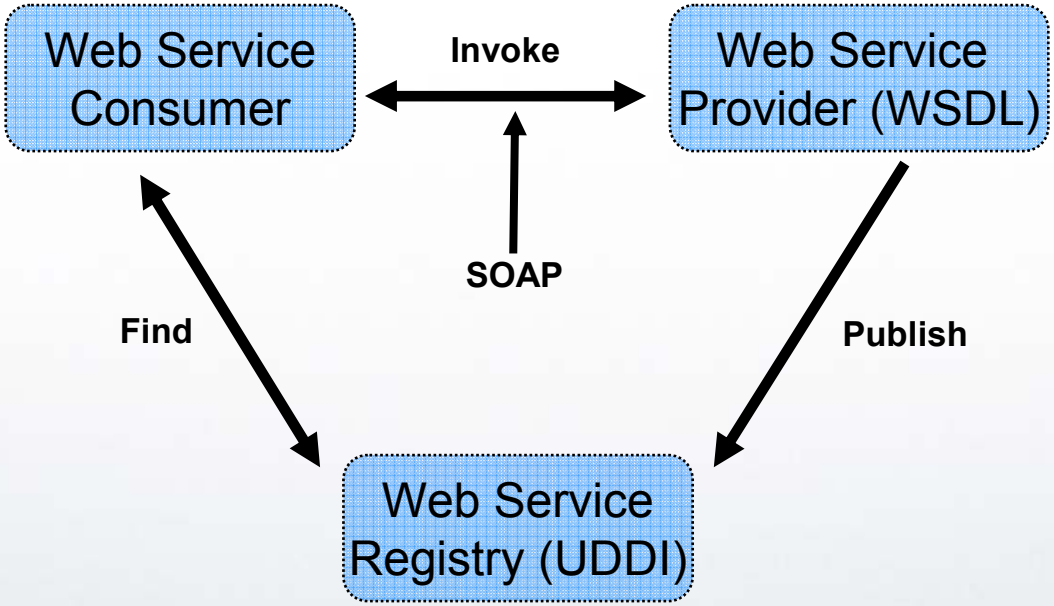
Service Oriented Architectures (SOA)

Service Oriented Architectures (SOA) paradigm meets perfectly the requirements of an pervasive computing environment due to the provided network services and applications are abstracted and loosely-coupled services that can be integrated in bigger systems



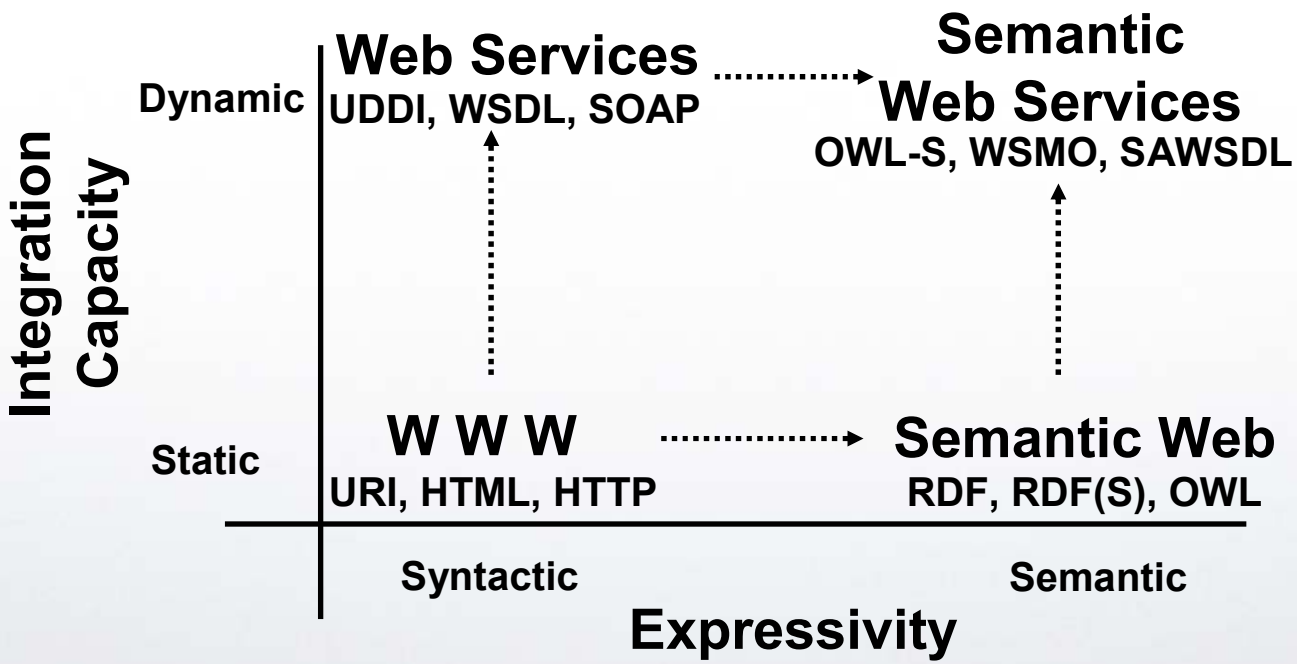
Web Services

A Web Service is an interface that describes a collection of operations that are accessible over the network by using XML standard messages. A Web Service carries out a specific task or group of tasks. This standard XML, namely WSDL, provides required details to interact with services



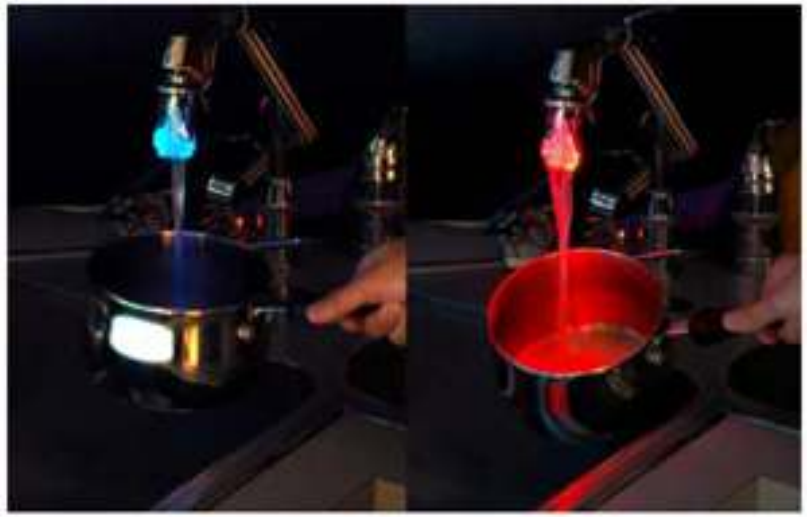
Semantic Web Services

Integrating ontologies in the service domain to Web Services leads to Semantic Web Services (SWS). These allow describing both functional and non-functional service attributes in a more expressive way than today's, enabling less human intervention (enabling automation)



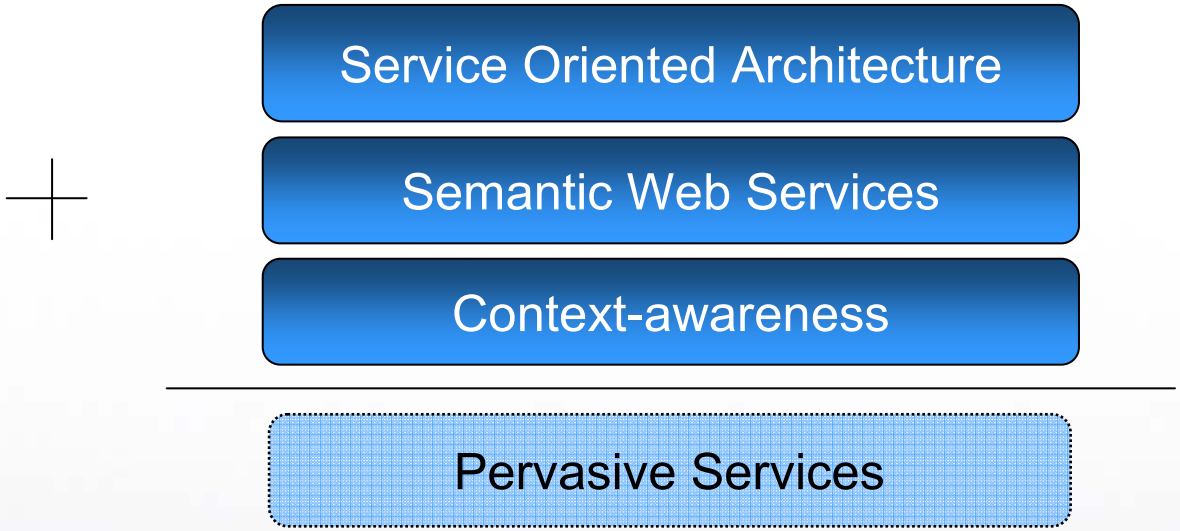
Context-awareness

Context: group of characteristics and ambient states that determines application behavior



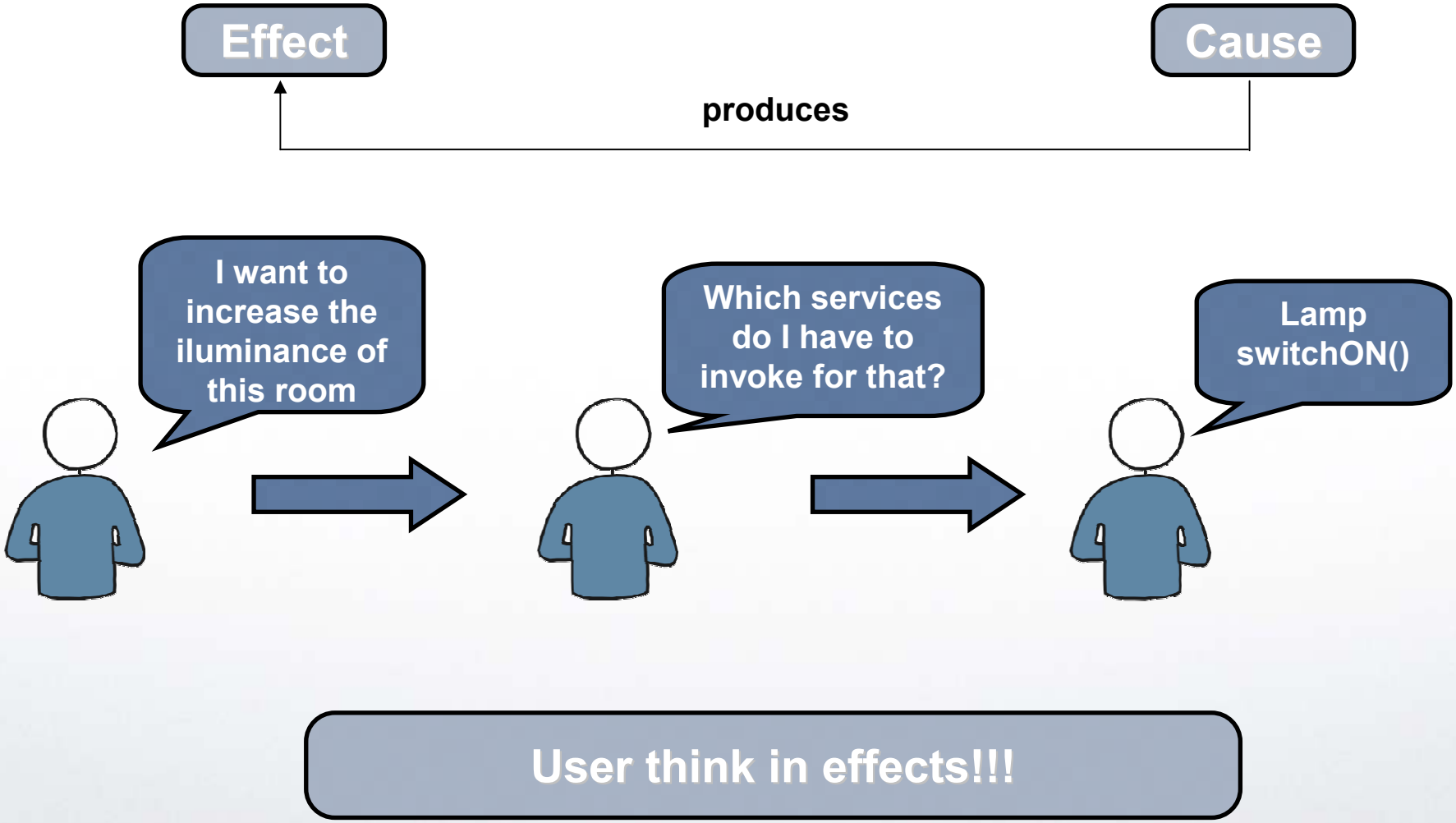
Context-awareness: Coined by Schilit and Theimer in 1994 to describe applications that adapt as a function of: the location of users and objects in the environment as well as their changes over time.

Our Vision


Service Oriented Architecture
Semantic Web Services
Context-awareness
Pervasive Services

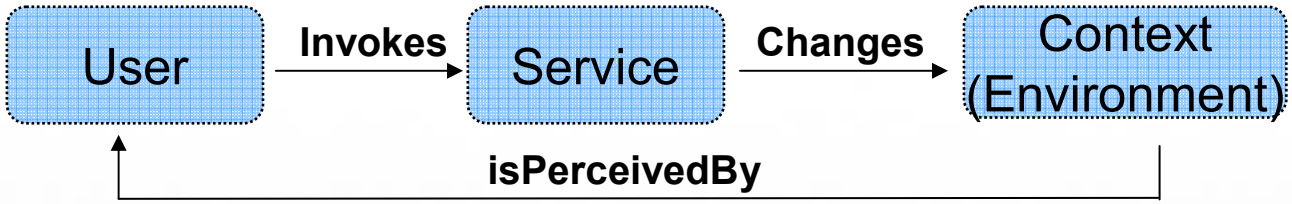
Outline

Cause-Effect paradigm



User Interaction

Relation between: User-Service-Context



User think in effects, but…. is the same for services and context

What is done currently to represent effects in this relation?

Service Modelling

In order to consume services it is essential to know their descriptions. Service description types can be divided in two aspects (IOPEs):

Signature-based description

Information transformation
Inputs and Outputs
"how to invoke it"

Syntactic (UPnP, WS, etc.)

Semantic (SWS)

Specification-based description

World state change
Effects and Preconditions
"environmental changes"

User Oriented and Context-Aware

Service Discovery and Integration

Related Work

Services

OWL-S
WSMO
SWSO
WSDL-S
SAWSDL
AmIGO-S

All these languages support effects and precondicions but **they neither detail how to do it nor do they provide an ontological model for their representation**

Context modelling ontologies

SOUPA-CoBrA
CONON
CoDaMos
CoOL
GAIA
Task-Computing

- No support for effects and preconditions
- Support but not used, only IOs
- Used, but very simple manner

No ontological model for services and context integration

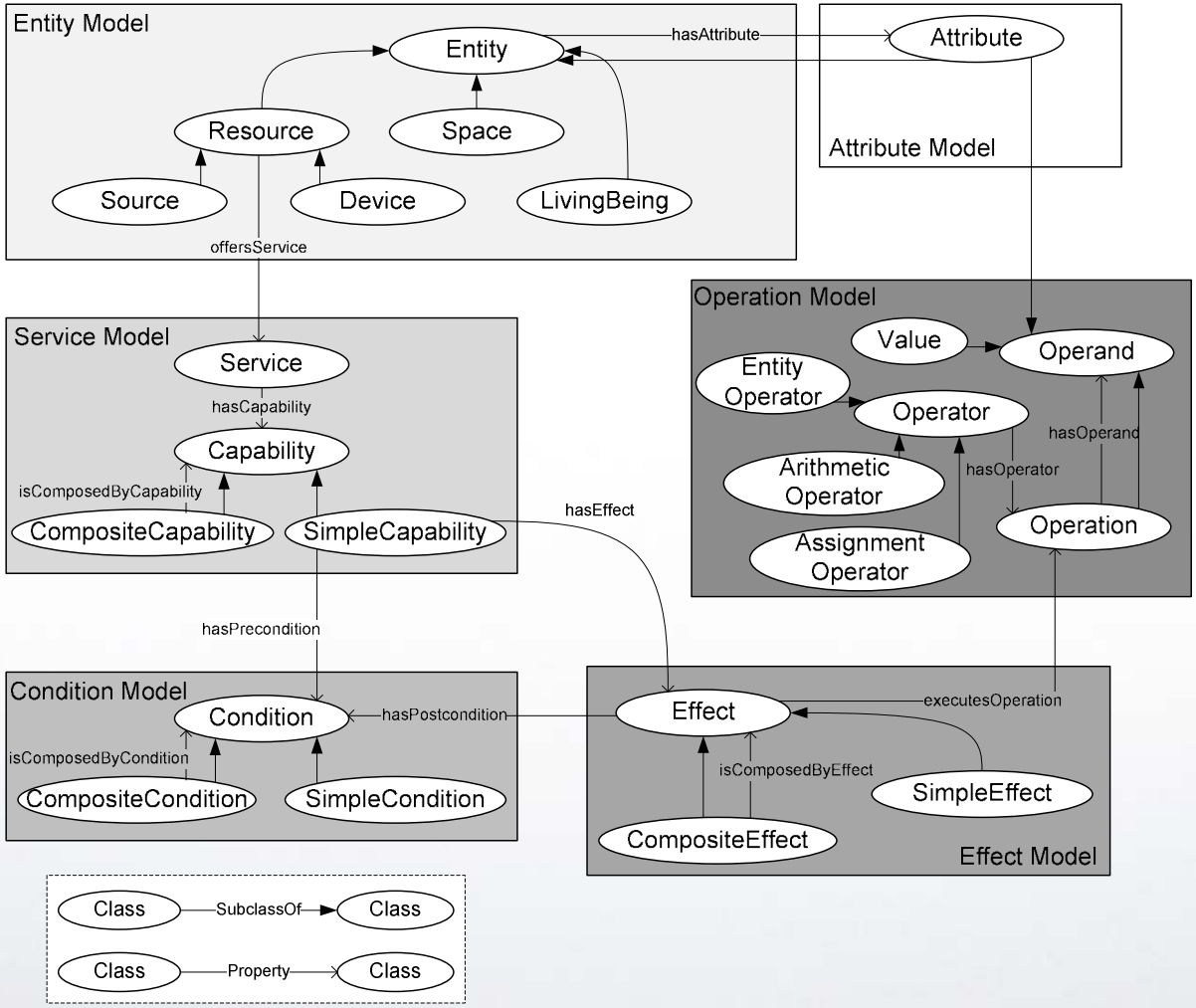
Semantic service representation languages

Effect- and condition-based approach

Ontology based context models

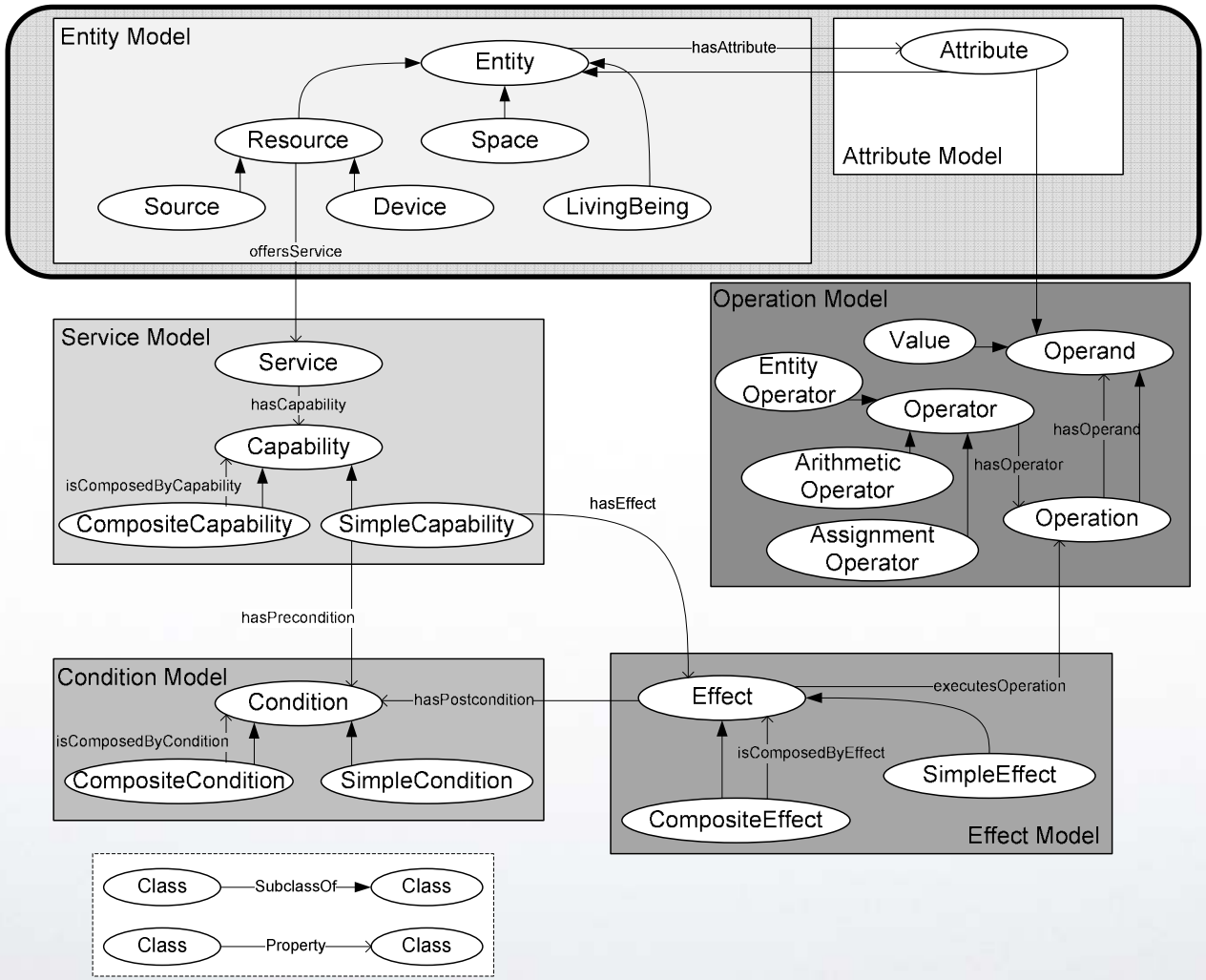
Outline

Proposed Model



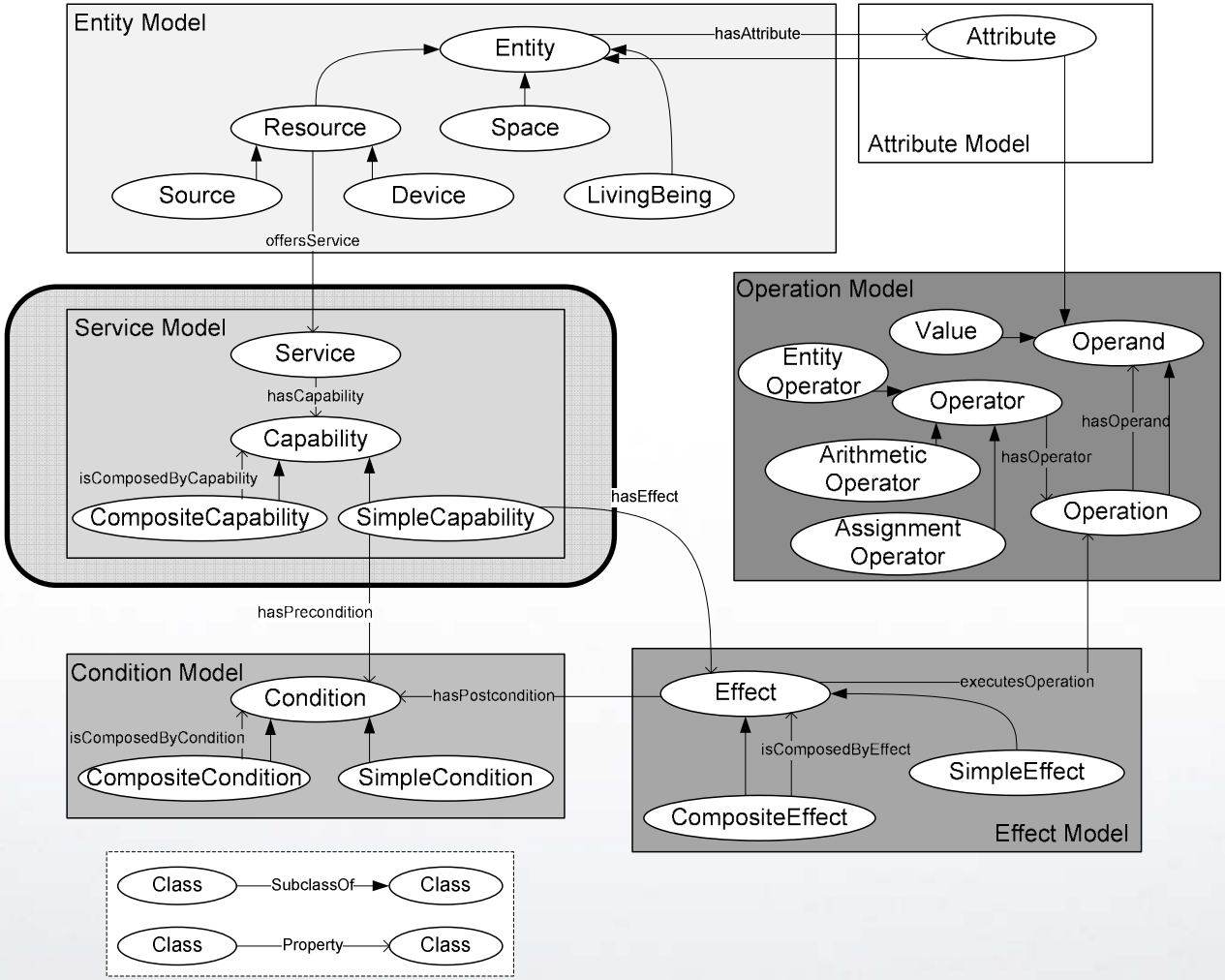
Ontological Model for Service Representation

Entity and Attribute Model



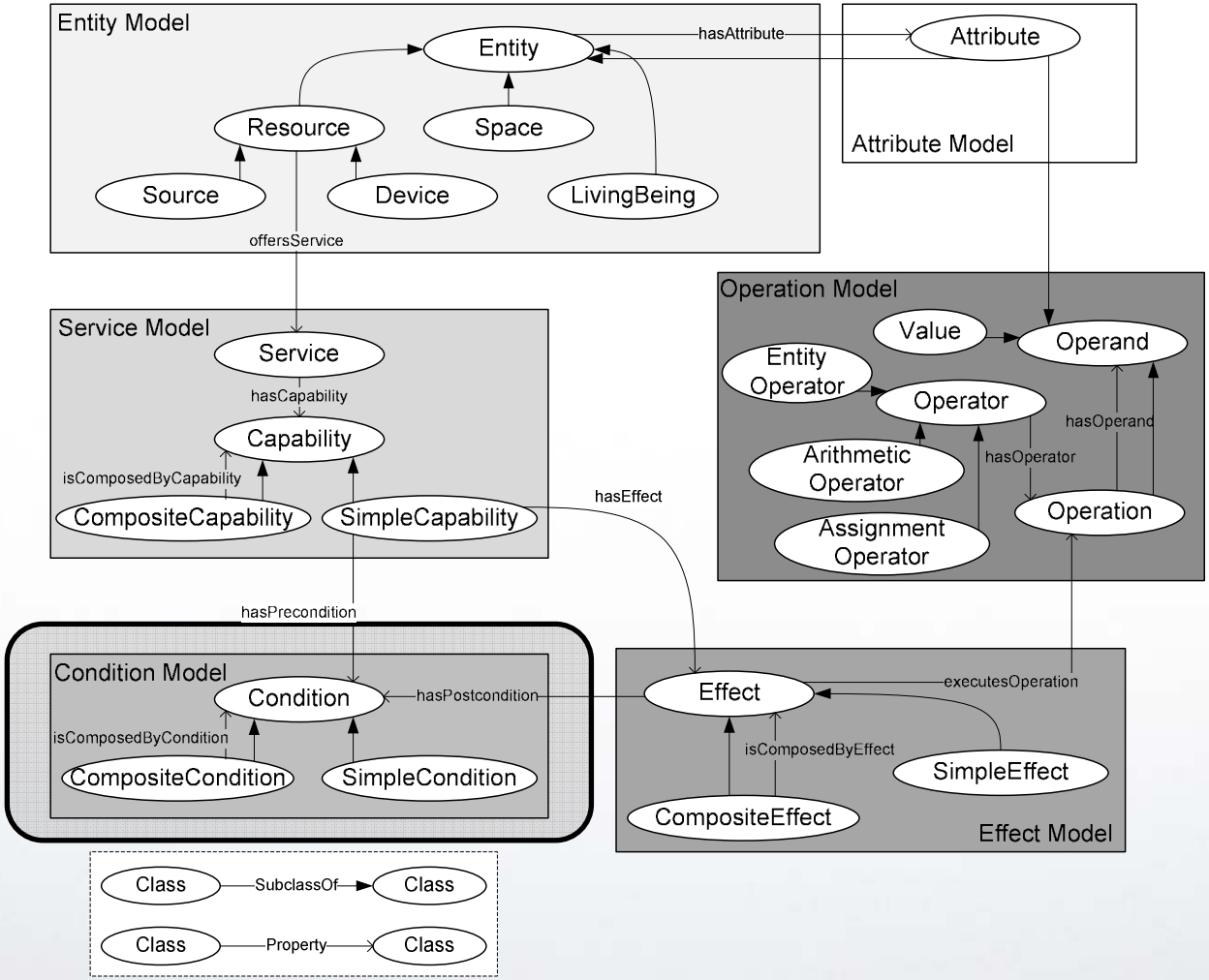
Ontological Model for Service Representation

Service Model



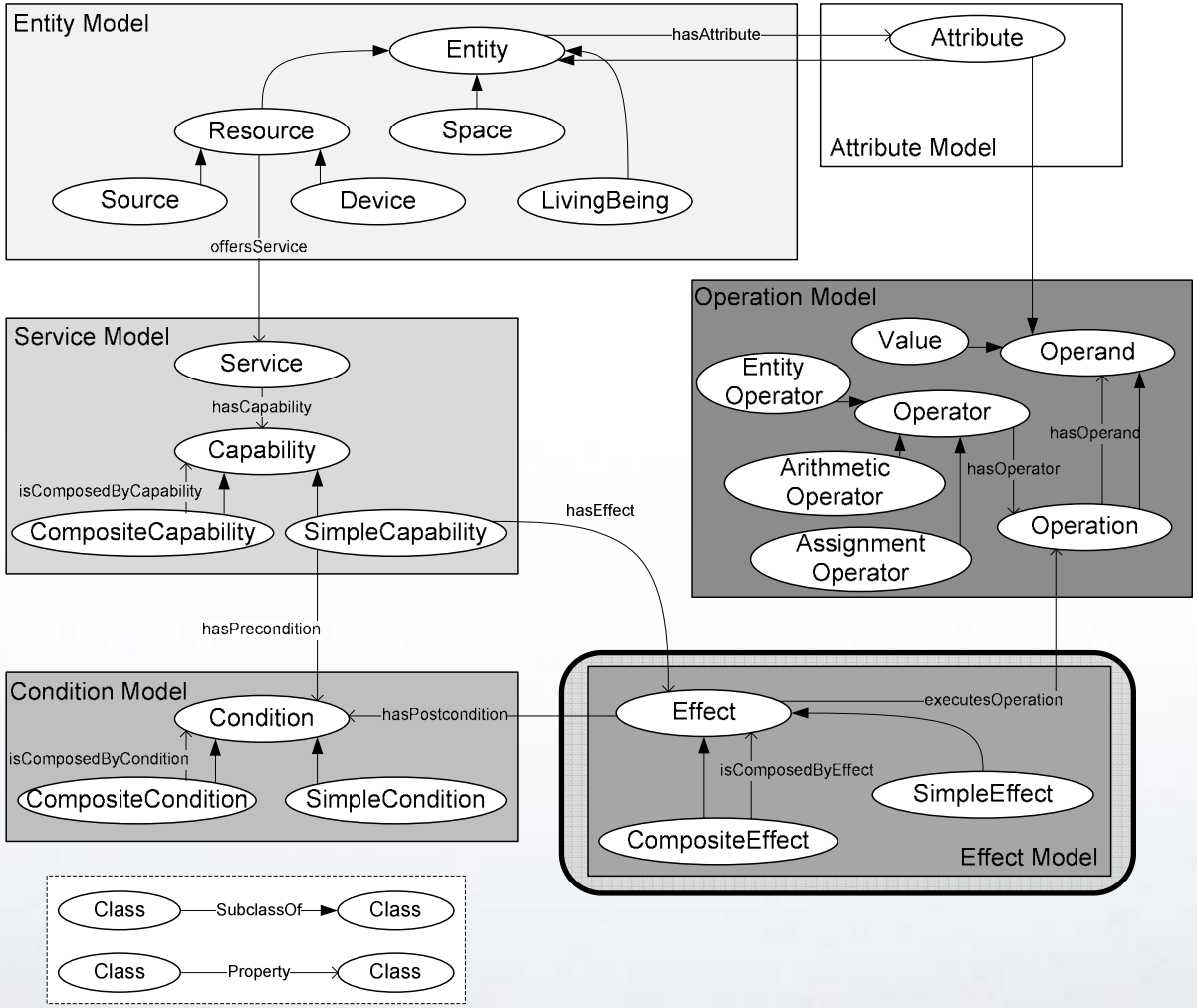
Ontological Model for Service Representation

Condition Model



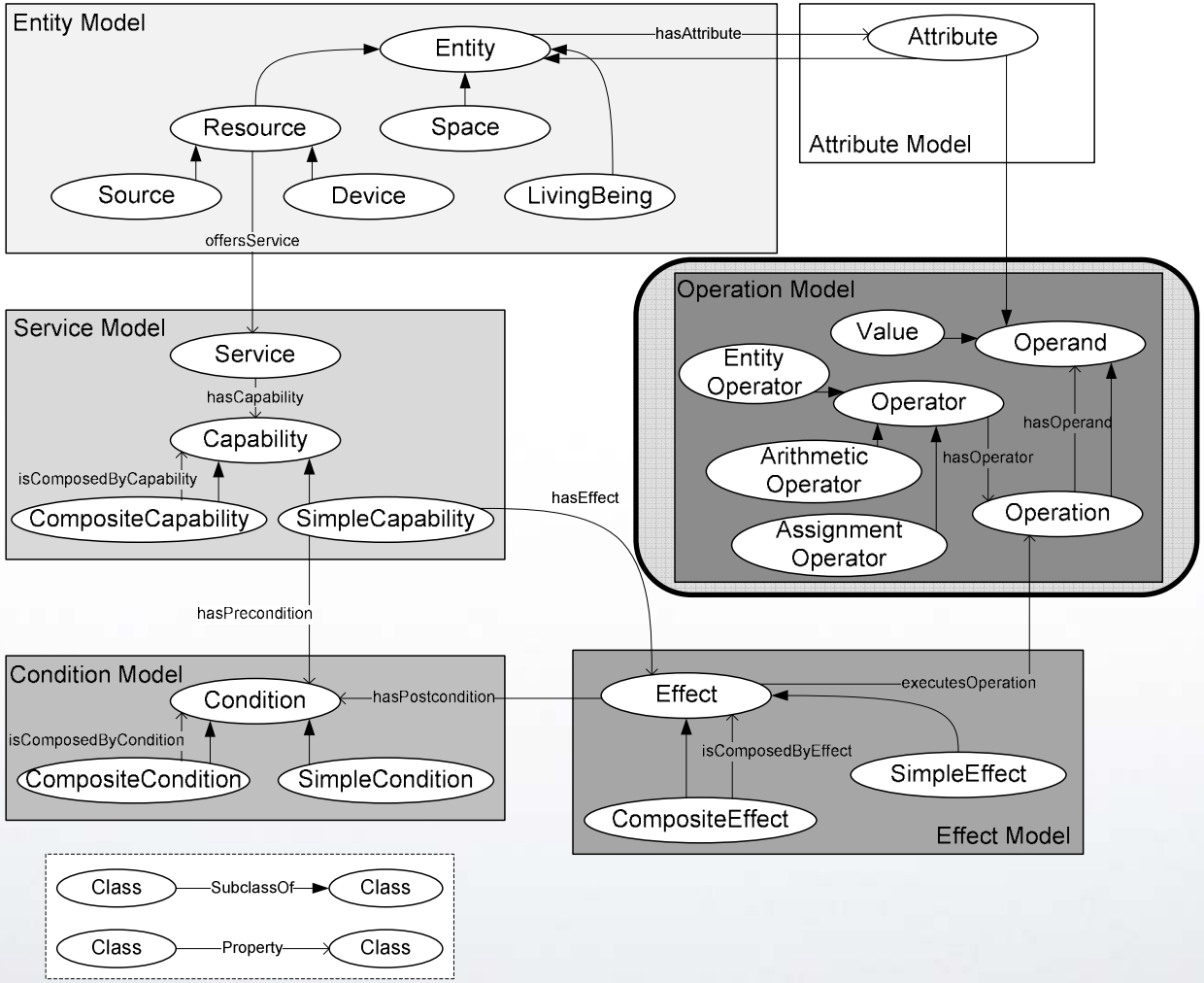
Ontological Model for Service Representation

Effect Model



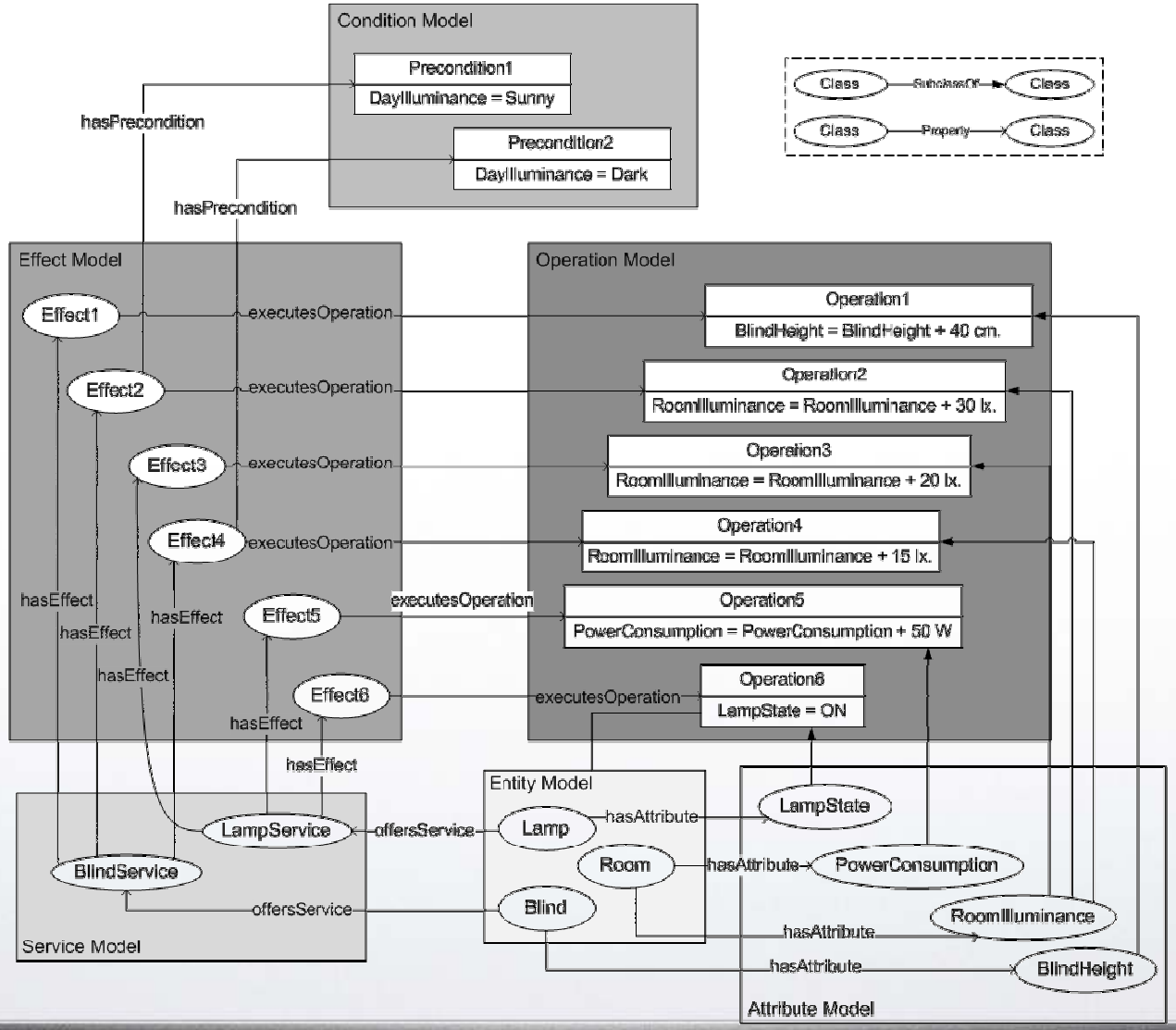
Ontological Model for Service Representation

Operation Model



Ontological Model for Service Representation

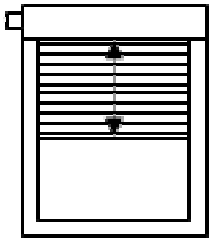
Scenario representation



Ontological Model for Service Representation

Outline

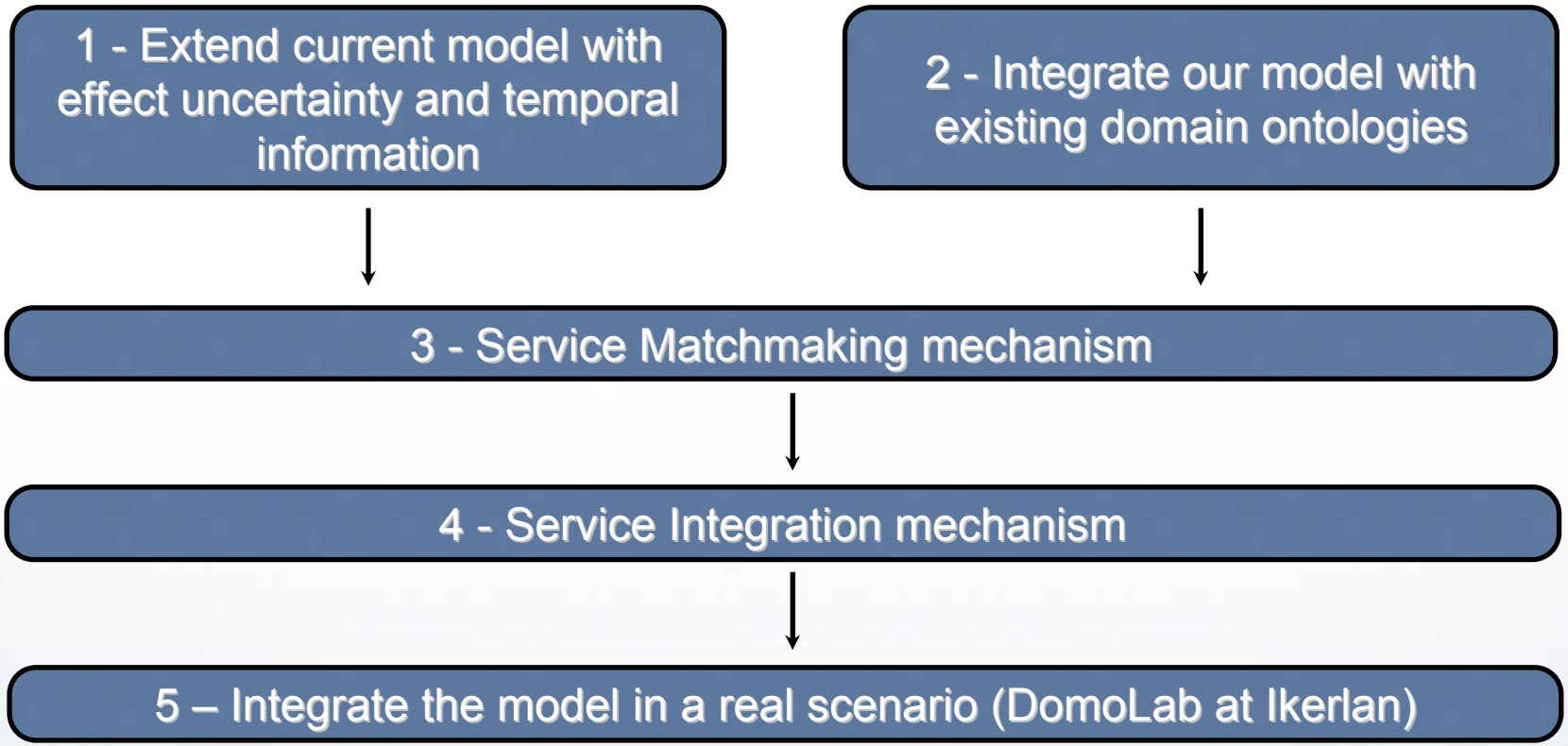
Service Discovery

	 **Blind**	 **Lamp**	**Knowledge of what services can do**	**Reasoning about service effects**
Signature-based syntactic service descriptions (WSDL)	Describe how to invoke the Blind Service	Describe how to invoke the Lamp Service	user	user
Signature-based semantic service descriptions (OWL-S)	Describe how to invoke the Blind Service with annotated semantic concepts	Describe how to invoke the Lamp Service with annotated semantic concepts	machine	user
Specification-based semantic service descriptions	Describe contextual changes: Raise the blind Increases illuminance	Describe contextual changes: Increases electric consumption Increases illuminance Changes lamp state	machine	machine

Example

Outline

Future


1 - Extend current model with effect uncertainty and temporal information
2 - Integrate our model with existing domain ontologies
3 - Service Matchmaking mechanism
4 - Service Integration mechanism
5 – Integrate the model in a real scenario (DomoLab at Ikerlan)

Outline

Questions, comments and suggestions

Aitor Urbieta: aurbieta@ikerlan.es