

# GIS UML-based Business Object Modelling: Renewable Energy

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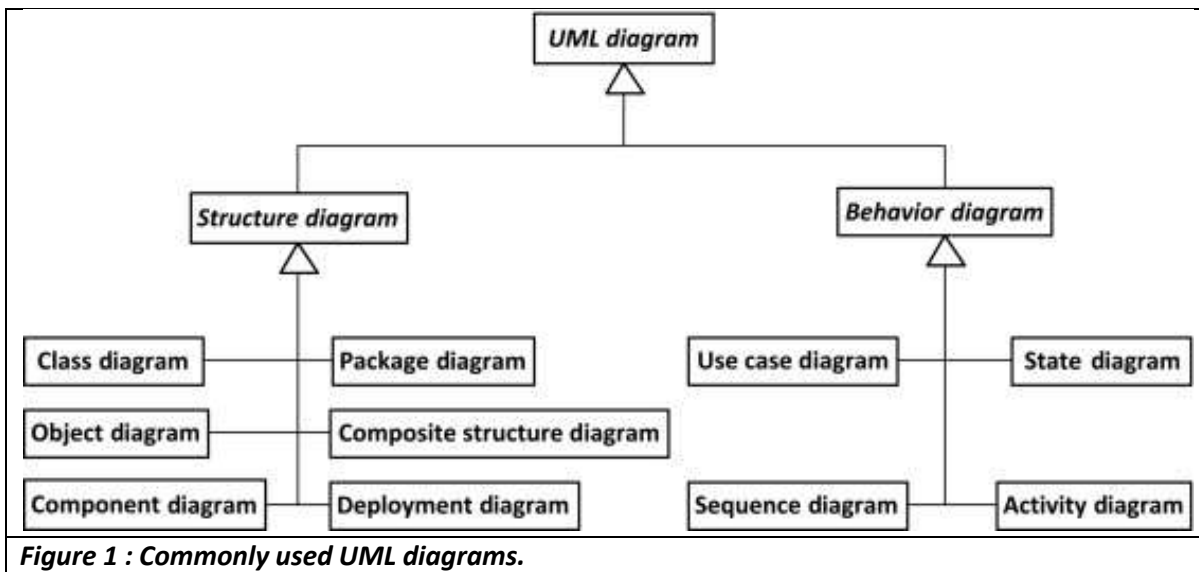
**Abstract**—The main objective of this research is the Unified Modeling Language (UML) approach to renewable energy modeling. The motivation of this study is to try to make this research a nucleus for studies in renewable energy modeling due to the lack of studies and research looking at the integration of unified modeling and its application to renewable energy and its sources. The main objectives are Analyze and Design, implementing an Object-Based Business System Modeling on renewable business energy. The Methodology depends on GIS System Analysis, there are three phases: Phase (1): Analysis and Phase (2): Design, Phase (3): Implementation. The results are the business object interfaces (BOIs) and Business object interfaces. The package Met level provides necessary UML extensions, the package Building Blocks provides general building blocks for constructing business object interface models, and the base layer serves as a foundation for the higher layers.

**Keywords**— BOI Model (Business Object Interface), BAPI Model (business application programming interface), BOP Model (business object programming Model), BORM - Business Object Relation Modeling, Business Object Notation (BON), object-oriented design.

## 1. INTRODUCTION

### 1.1 The Unified Modelling Language (UML)

UML is a visual, object-oriented, and multi-purpose modelling language. While primarily designed for renewable software systems, it can also be used for renewable energy business process modelling (Solar, wind and biomass energy).



### 1.2 Business Object Architecture

The renewable energy business object is used in two distinct ways, expressing the different areas of application, namely renewable energy business engineering and renewable energy software engineering: modeling renewable energy business objects and renewable energy systems business objects.

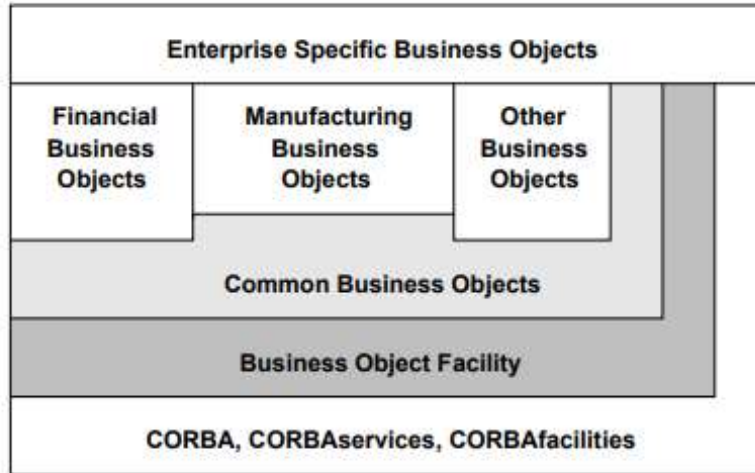


Figure 2 : Architecture for Business Objects

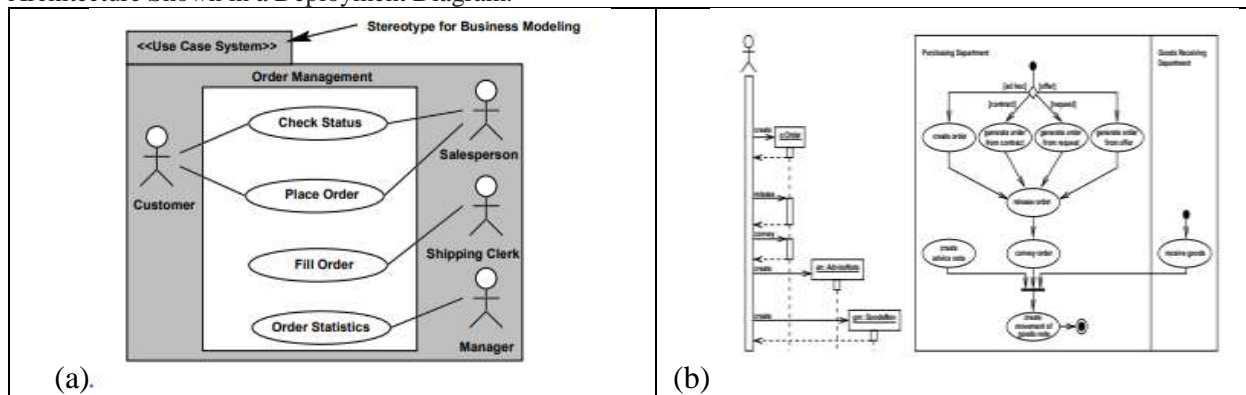
Also Multi-scale and multi-modal GIS-T data model [1], UML-based requirement modeling of Web online synchronous collaborative public participatory GIS [2], UML Based Integrated Resources Management Model for Arid Zone[3].

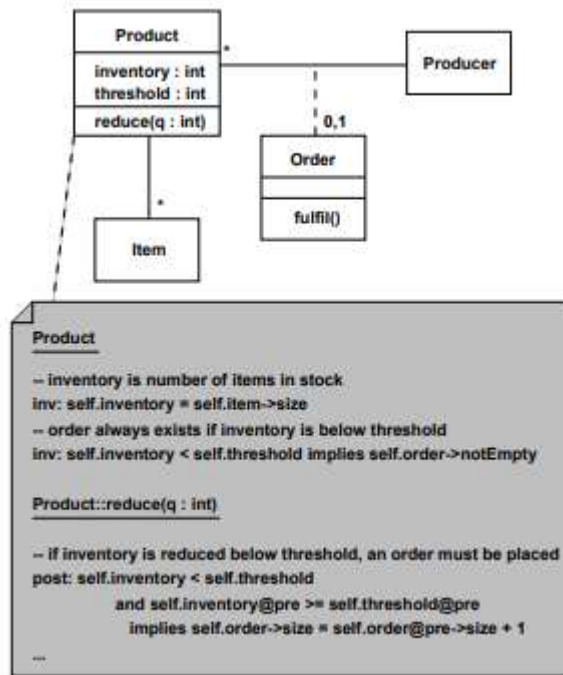
### 1.3 Geospatial Technology

Geospatial Technology Contains Geographic Information Technology and Remote Sensing, also there many researches as: [4], [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23], [24], [25], [26], [27], [28], [29], [30], [31].

## 2. METHODOLOGY

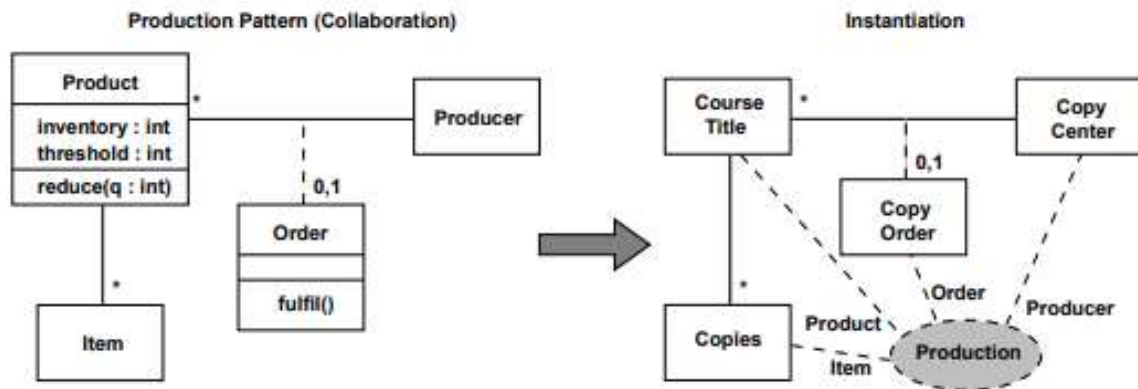
The requirements of the renewable energy business object as Communication, Modeling Goals, Business Processes and Workflows, Partitioning and Refinement, Modeling Business Rules, Patterns, and Reuse, Roles and Actors, and Component Technology. (a) Modeling Business Processes and System Functionality with Use Cases. (b) Mapping of Activity Diagrams to Sequence Diagrams. (c) Expressing Business Rules in Object Constraint Language (OCL). (D) UML’s Support for Patterns. (E ) Dynamic, Multiple Classification. (F) Role Pattern with Delegation. (G) External and Internal View of Business Object Components. (H) Component Architecture Shown in a Deployment Diagram.



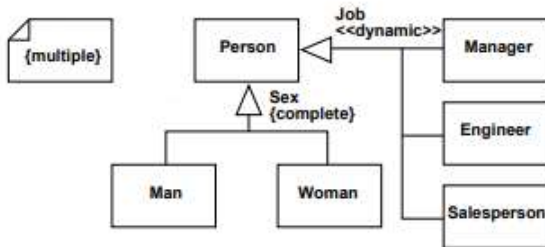


(C)

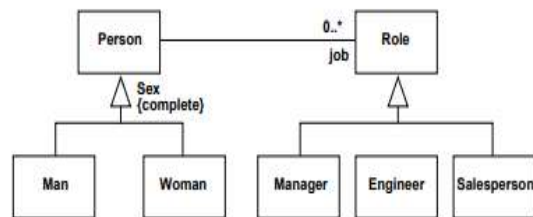
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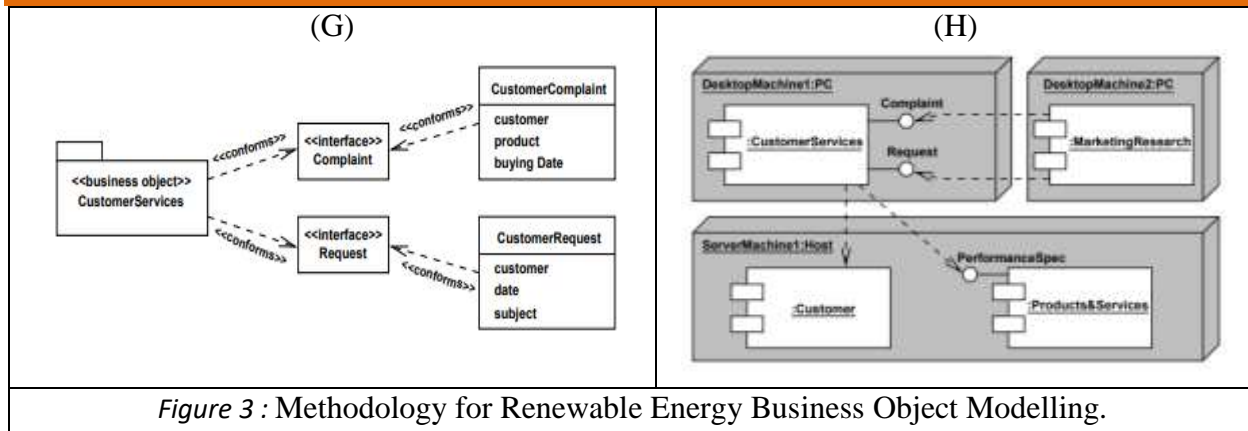


Figure 3 : Methodology for Renewable Energy Business Object Modelling.

### 3. RESULTS AND DISCUSSION

To analyze, Design and implementation business object interfaces (BOIs) for renewable energy must be specified interfaces of the distributed objects and distributed object models to XML models. Business object interfaces can be provided for conceptual elements on renewable energy (Solar, Wind and Biomass energy). The package renewable MetaLevel provides necessary UML extensions.(Show fig.5), The package renewable energy MetaLevel provides necessary UML extensions for building a renewable energy business object interface model refining the elements of renewable energy conceptual model.(Fig.5).

The package renewable energy building blocks provide general building blocks for constructing renewable energy business object interface models. The building blocks represent renewable energy business object interfaces refining conceptual model elements for renewable energy and enabling the flexible construction or description of specific renewable energy business object interface models. The reference renewable energy model only provides renewable energy business object interface building blocks for particular base classes and the processes of the renewable energy conceptual model.(Fig.6). The base layer serves for renewable energy as a foundation for the higher layers. In the current version of the renewable energy reference model, the base layer of the renewable energy BOI model only provides necessary base classes.(Fig.7). The process layer provides renewable energy business object interfaces for all processes defined within the conceptual model(Fig.8).

The **package GetAvailabilityProcess** specifies the process of retrieving the availability of renewable energy services and provides all business object interfaces and scenarios for the get availability process. (Fig.9)

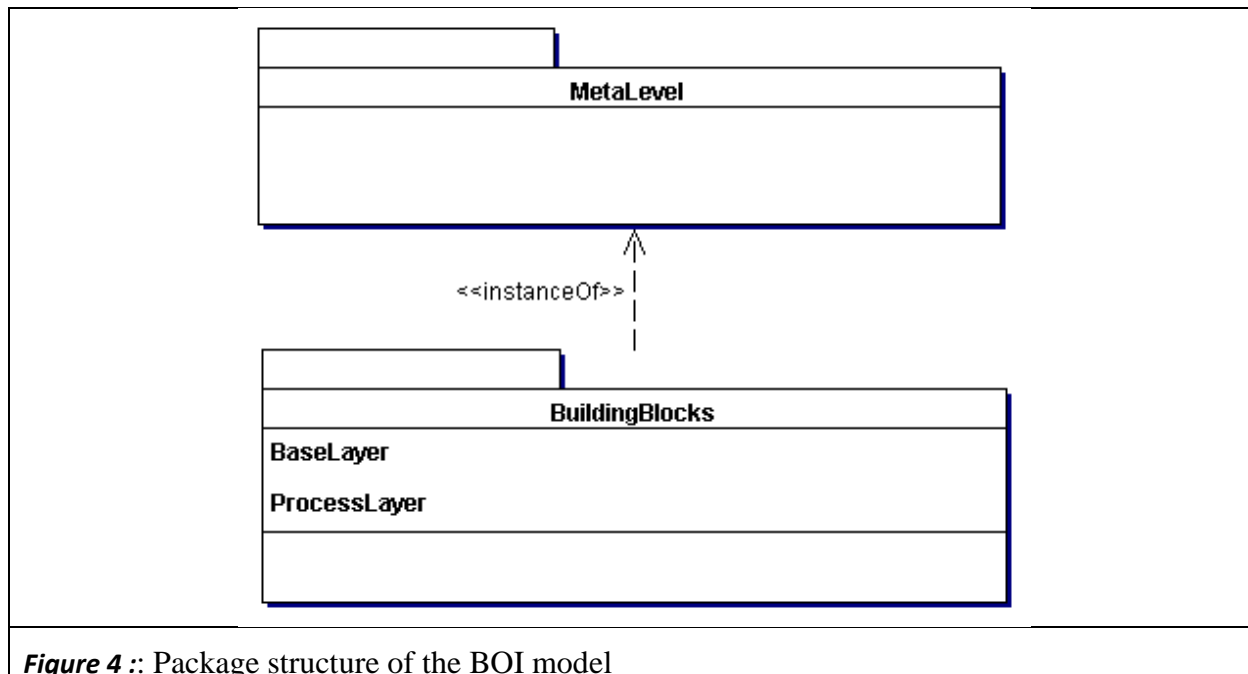


Figure 4 :: Package structure of the BOI model

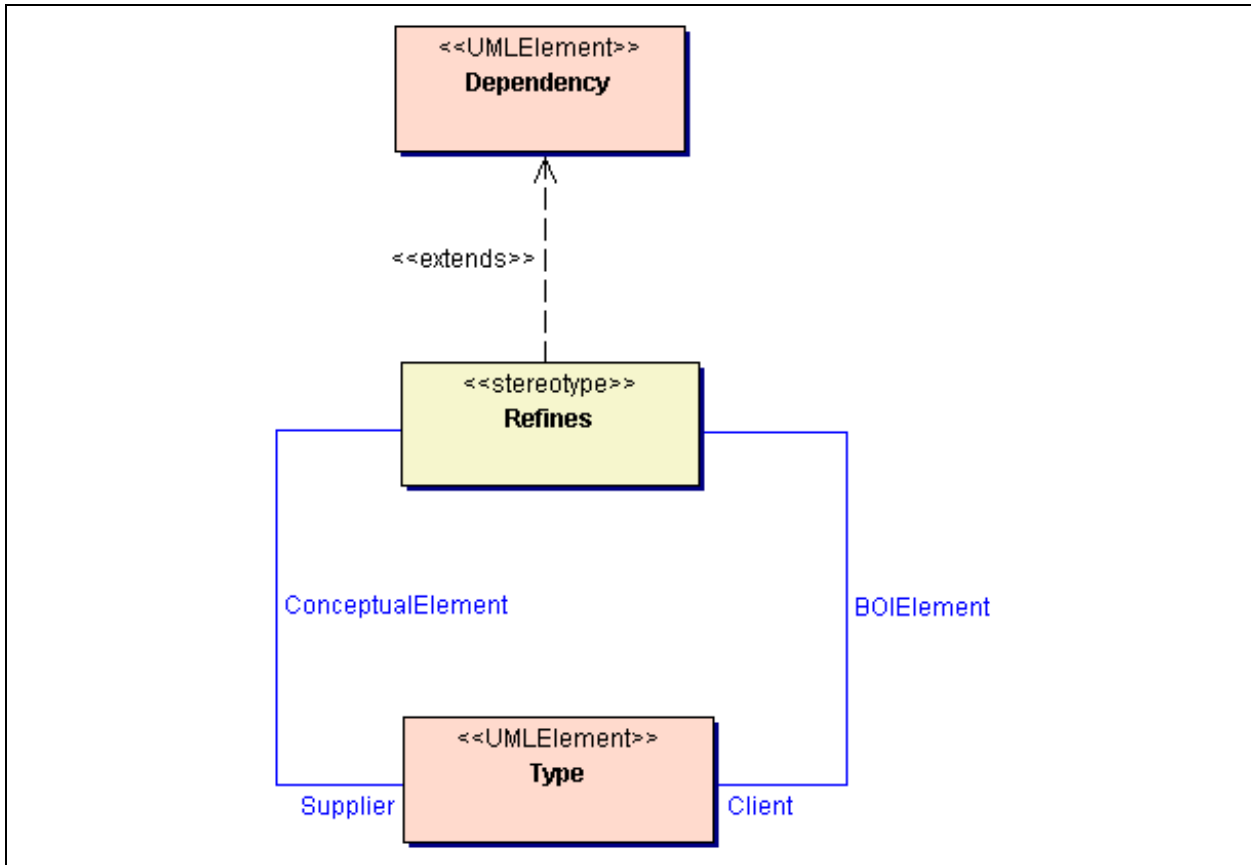


Figure 5 : Virtual metamodel

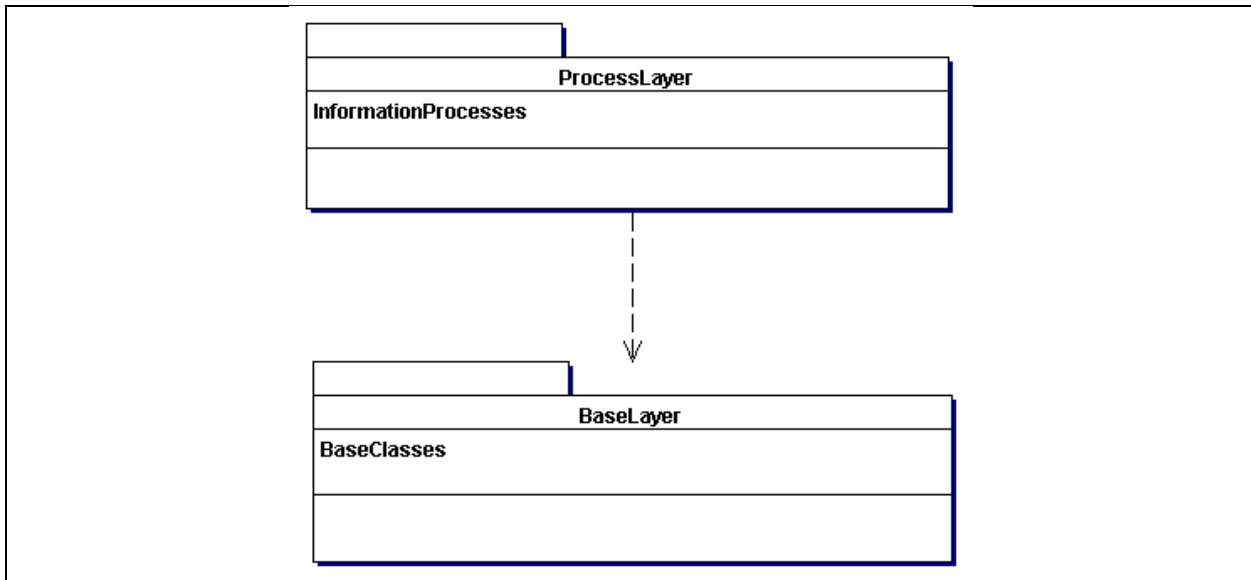


Figure 6 : Layers of building blocks

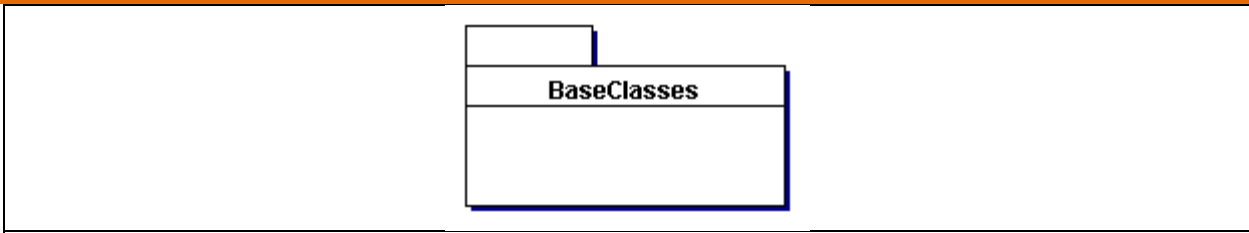


Figure 7 : Package structure of the base layer

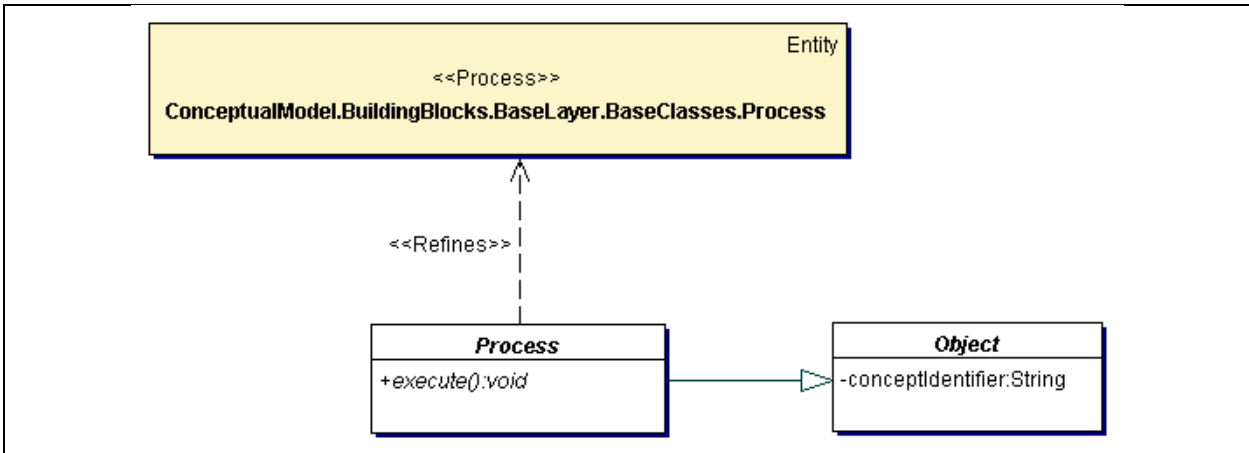


Figure 8 : Base classes

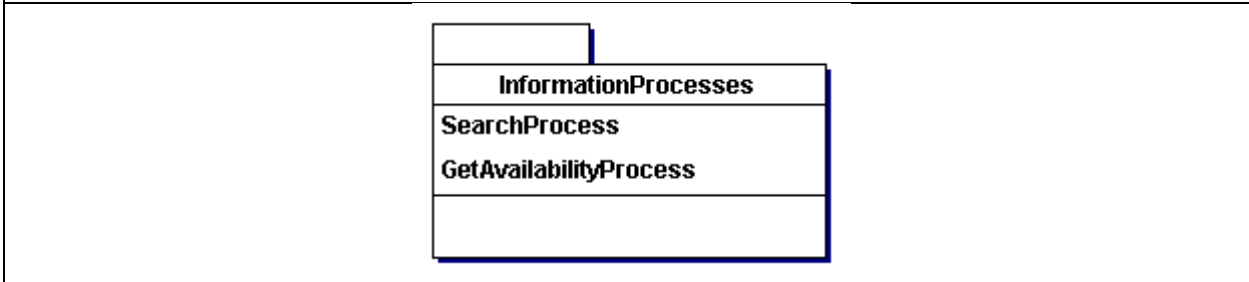


Figure 9: Package structure of the process layer

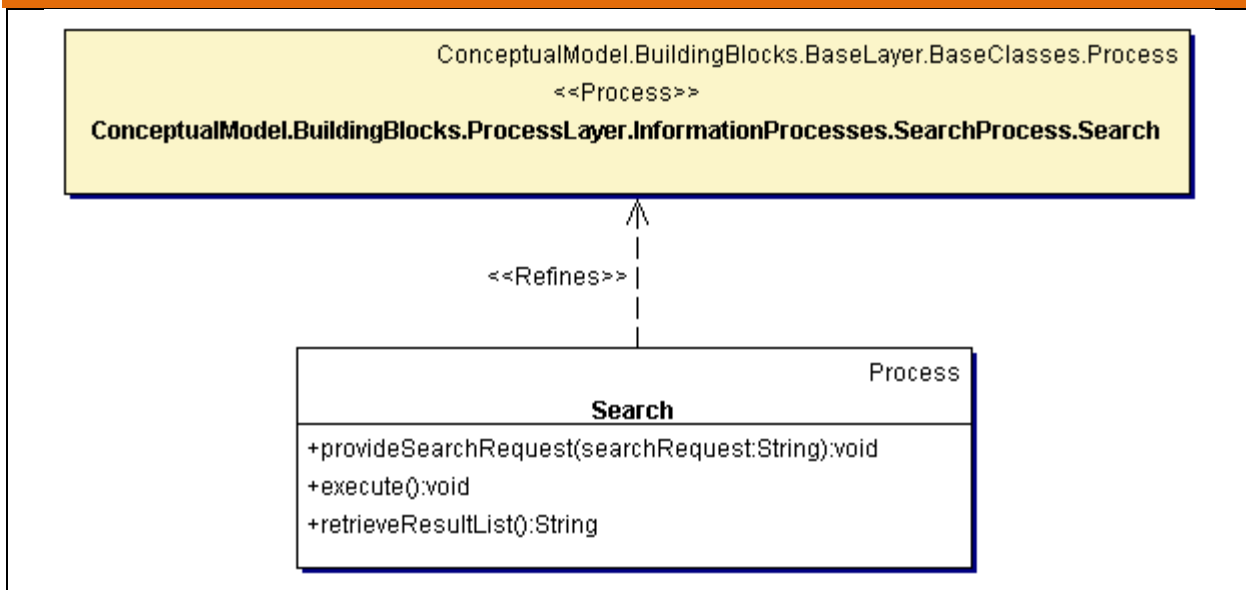


Figure 10: The search process

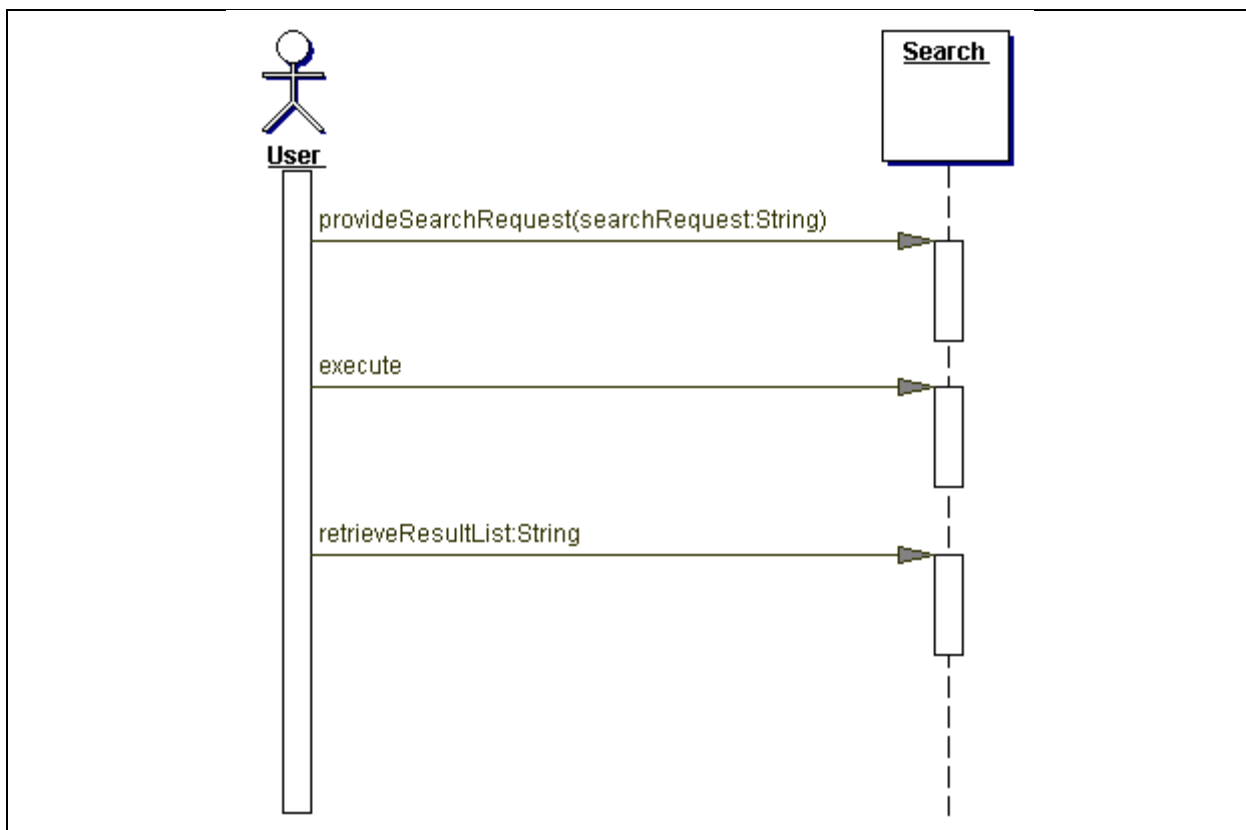


Figure 11: Search scenario

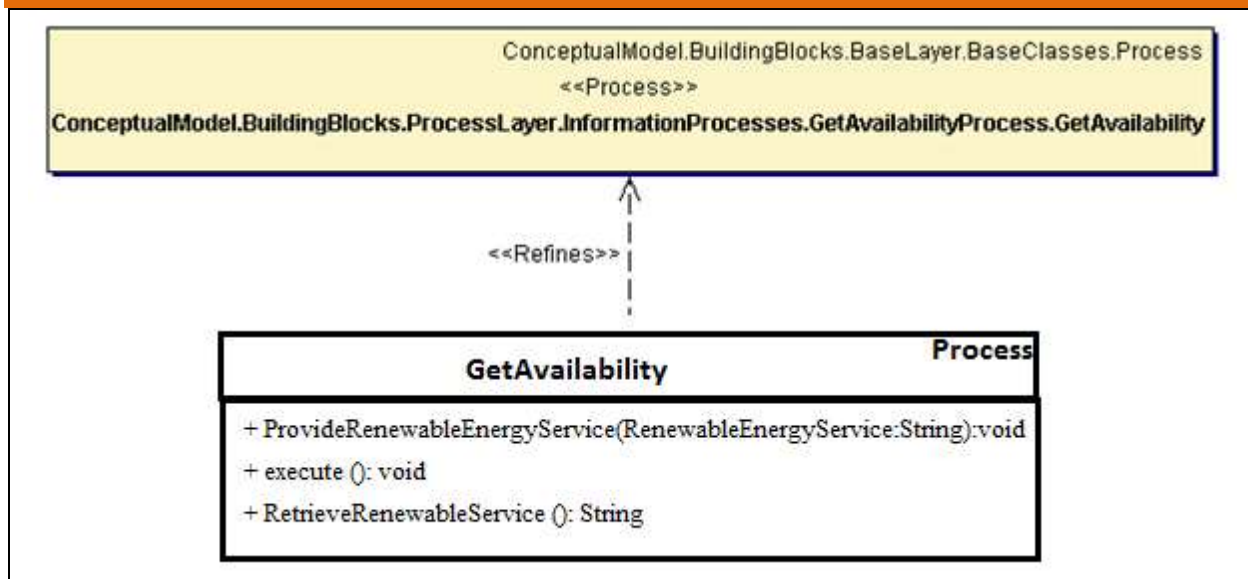


Figure 12 : Get availability process

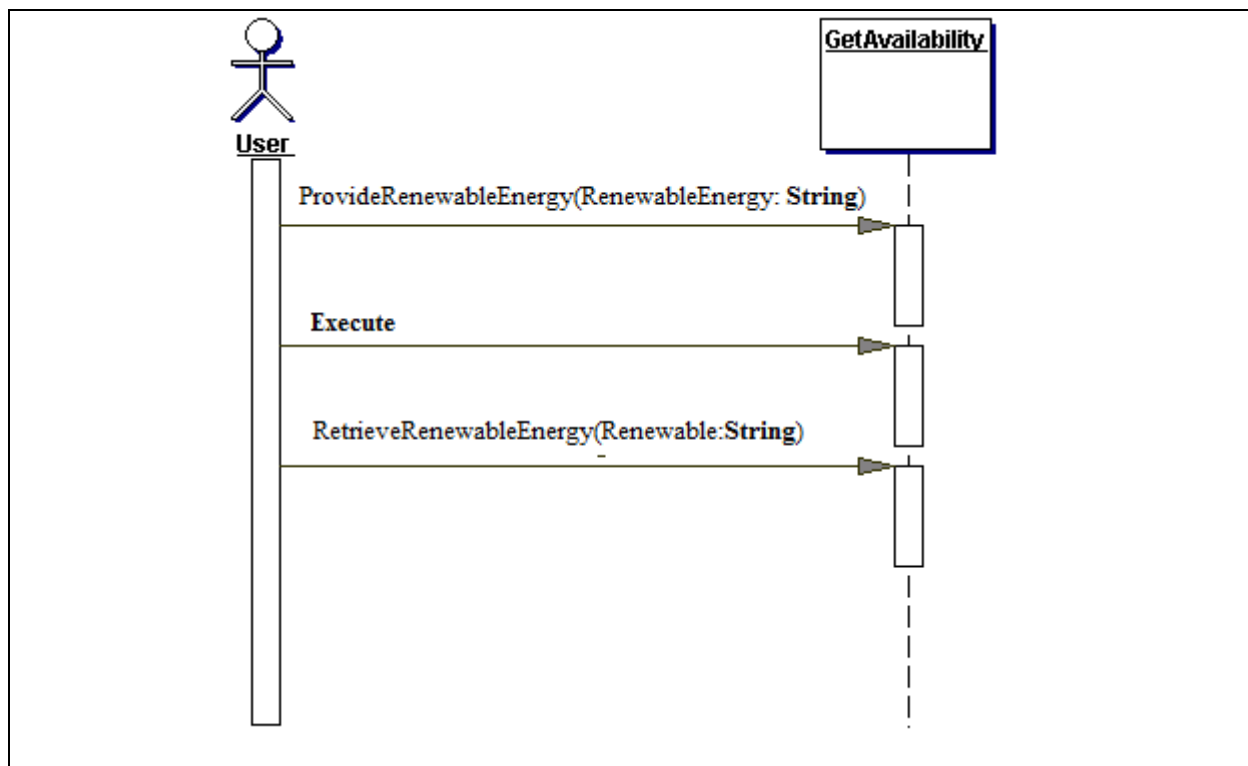


Figure 13 : Get availability scenario

#### 4. Conclusion

The business object interfaces (BOIs) and Business object interfaces. The package Metalevel provides necessary UML extensions, the package Building Blocks provides general building blocks for constructing business object interface models, and the base layer serves as a foundation for the higher layers.

#### 5. Acknowledgment



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