

Chapter 2 Modeling with UML

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1 Introduction

UML is not a method; its authors felt that it was not appropriate to define a method due to the diversity of specific cases. They preferred to limit themselves to defining a graphical language that allows the various aspects of an information system to be represented and communicated. The graphics are, of course, associated with texts that explain their content.

UML 2.0 thus includes thirteen types of diagrams representing as many distinct views to represent particular concepts of the information system. They are divided into two main groups:

2 UML diagrams

2.1 Structural diagrams or static diagrams (UML Structure)

- Class diagram
- object diagram
- Component diagram
- Deployment diagram
- Package diagram
- Composite structure diagram
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2.2 Behavior diagrams or dynamic diagrams (UML Behavior)

- Use case diagram
- activity diagram

- state machine diagram
- Interaction diagram
- Sequence diagram
- Communication diagram
- Interaction overview diagram
- Timing diagram

These diagrams, which vary in usefulness depending on the case, are not necessarily all produced during modeling. The most useful diagrams for project management are activity, use case, class, object, sequence, and state-transition diagrams. Component, deployment, and communication diagrams are especially useful for project management, who use them to formalize the implementation constraints and the technical solution.

Noticed :

Project Owner (MOA) :

- The MOA is a legal entity (company, management, etc..) , an entity of the organization. It is never a person.
 - Project manager (MOE) :
- The MOE is a legal entity (company, management, etc.) which guarantees the proper technical implementation of the solutions.
 - The MOA is the client of the MOE to whom he places an order for a product necessary for his activity.
 - The MOE supplies this product; either he produces it himself or places an order with one or more suppliers (“companies”) who develop the product under his direction.
 - The relationship between the MOA and the MOE is defined by a contract which specifies their mutual commitments.

3 UML diagrams most used during modeling

3.1 Use case diagram

The use case diagram represents the structure of the major functionalities required by the system’s users. It is the first diagram in the UML model, the one that ensures the relationship between the user and the objects implemented by the system.

3.2 Class diagram

The class diagram is generally considered the most important object-oriented development. It represents the conceptual architecture of the system: It describes the classes that the system uses, as well as their relationships, whether these represent conceptual nesting (inheritance) or organic relationships (aggregation).

3.3 Object diagram

The object diagram is used to clarify a class diagram by illustrating it with examples. It is used, for example, to check the suitability of a class diagram for different possible cases.

3.4 State- transition diagram

The state diagram represents the evolution (i.e. life cycle) of objects belonging to the same class. Life cycle modeling is essential for representing and shaping the dynamics of the system.

3.5 Activity diagram

The activity diagram is nothing other than the transcription in UML of the representation of the process as it was developed during the work that prepared the modeling: it shows the sequence of activities that contribute to the process.

3.6 Sequence and communication diagram

The sequence diagram represents the chronological succession of operations carried out by an actor. It indicates the objects that the actor will manipulate and the operations that move from one object to another. The same operations can be represented by a communication diagram whose nodes are objects and the arcs (numbered according to the chronology) the exchanges between objects. In fact, sequence diagram and communication diagram are two different, but logically equivalent views (one can be constructed from the other) of the same chronology. They are interaction diagrams.

4 How to present a UML model ?

The presentation of a UML model consists of several documents written in everyday language and a formalized document: It should not be limited to the formalized document alone, because it is practically incomprehensible if presented alone. In some cases, a UML expert will be able to reconstruct the initial intentions by reading the model, but not always; and UML experts are rare. Here is the list of documents that seem necessary:

Strategic presentation :

- It describes why the company wanted to equip itself with the tool in question, the goals it seeks to achieve, the planned implementation schedule, etc.;

Presentation of the work processes through which the strategy is intended to be achieved:

- To enable the reader to see how the application will work in practice, it should be illustrated by a sketch of the screens that will be displayed in front of field users;

Explanation of the choices that guided the formal modeling:

- It is a matter of synthesizing, before the eyes of the reader, the discussions which presided over these choices; Formal model: • This is the thickest and most difficult document to read. It is best to present it on the company's intranet. Indeed, the diagrams can then be equipped with hyperlinks allowing the opening of more detailed diagrams or comments.

First, we must present the use case diagram, which shows the sequence of use cases within the process, a sequence that is immediately understandable; then the activity diagram, which shows the content of each use case; then the sequence diagram, which shows the chronological sequence of operations within each use case. Finally, the class diagram, which is the most conceptually precise, but also the most difficult to read, because it presents each of the classes and their relationships (aggregation, inheritance, association, etc.).

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