

Software engineering Tutorial Series N°03

Tutorial N°03: Class & Object Diagram

Exercise 1:

- 1- Every writer has written at least one work
- 2- People can be associated with universities as students as well as professors.
- 3- A rectangle has two vertices that are points. We construct a rectangle from the coordinates of two points. It is possible to calculate its surface area and perimeter, or to translate it.
- 4- Cinemas are composed of several rooms. The films are screened in theaters. The corresponding screenings take place at a specific time each.
- 5- Every day, the postman distributes registered mail in a geographical area assigned to him. The inhabitants are also associated with a geographical area. Registered mail is of two kinds: letters or parcels. As several postmen can intervene in the same area, we want, for each registered letter, the postman who delivered it, in addition to the recipient.

- 1- Develop the corresponding class diagram.

Exercise 2:

An academy wishes to manage the courses given in several colleges. For this, the following information is available:

Each college has a website and is structured into departments, each of which brings together specific teachers. Among these teachers, one of them is in charge of the department. A teacher is defined by his or her surname, first name, phone, email, date of taking up the position and his or her index. Each teacher teaches only one subject. Students take several subjects and receive a grade for each of them. For each student, we want to manage his or her surname, first name, phone, email, as well as his or her year of entry to college. A subject may be taught by several teachers but always takes place in the same classroom (each with a set number of seats). We want to be able to calculate the average by subject as well as by department. We also want to calculate the general average of a student and be able to display the subjects in which he has not been graded. Finally, it must be possible to print the data sheet (first name, phone, email) of a teacher or a student.

- 1- Develop the corresponding class diagram.

Exercise 3:

A hotel is made up of at least two rooms. Each room has a bathroom: shower or bath. A hotel accommodates people. It can employ staff and is imperatively managed by a director. Only the first and last names of

employees, managers and occupants are known. Some people are children and others are adults (making children work is prohibited). A hotel has the following characteristics: an address, a number of rooms and a category. A room is characterized by the number and number of beds it contains, its price and its number. We want to be able to know who occupies which room on what date. For each day of the year, we want to be able to calculate the rent of each room according to its price and occupancy (the rent is zero if the room is unoccupied). The sum of these rents is used to calculate the hotel's turnover between two dates.

- 1- Give a class diagram to model the hotel problem.

Exercise 4:

A bank has several branches spread out. It has only one head office. Each agency has many clients, each of whom may have several accounts. There are three types of accounts: the current account (youth), the current account (adult) and the account (savings). Interest rates and services are of course different depending on the type of account. In addition, each branch has a maximum of 5 employees, of which only 1 is the director. In addition, the bank has administrative employees working at the head office and a general manager.

- 1- Model this system with a class diagram. Don't forget to indicate the multiplicities and roles of the necessary associations.

Exercise 5:

The teacher in charge of the Software Engineering (SE) course wants to develop an application to manage her students' tutorial (TD) and practical (TP) grades.

Each student is identified by a registration number and characterized by a surname, a first name, and a date of birth. Every student belongs to a specific group. The TD grade for each student is calculated from the grades of the TD test, report, participation, and attendance. The TP grade is calculated from the grades of the TP test, mini-project, participation, and attendance.

During the semester, each student carries out a mini-project with a report, individually or in a pair or a group of three students at most. Each mini-project and report is identified by a number and characterized by a submission date. This date makes it possible to reject late submissions, in which case the score is set to zero. The grades for mini-projects and reports are shared by all members of the same sub-group, while the remaining grades are individual.

The application must be able to calculate the final TD and TP grade for each student, as well as the average TD and TP grade for each group. Finally, it should also display the list of students' TD and TP grades by group.

- 1- Describe the structure of this system using a class diagram.
- 2- Implement the different classes of the result model in JAVA.