

### Supervised Work 3: Class & Object Diagrams

#### Part 1: Class diagram

**Exercise 1:** Consider the following statements:

- A directory contains several files.
- A room contains walls.
- Modems and keyboards are input/output devices.
- A stock transaction is a purchase or sale.
- A bank account can be owned by a natural or legal person.

**Question:** Create the corresponding classes diagrams by choosing the appropriate relationship type.

#### **Exercise 2:**

A hotel is made up of at least two rooms. Each room has a bathroom which can be a shower or a bathtub. The hotel accommodates people. It may employ staff and is managed by one of its employees. The hotel has the following characteristics: an address, the number of rooms, the category. A room is characterized by the number and type of beds, price and the room count. We can calculate the income and the fee based on the occupants.

**Question:** Elaborate the corresponding class diagram.

#### **Exercise 3:**

We would like to manage flight reservations made through an agency. According to interviews carried out with members of the agency, we know that:

1. Airlines offer different flights.
2. A flight is open for reservation and closed by order of the company.
3. A customer can book one or more flights, for different passengers.
4. A reservation concerns a single flight, and a single passenger.
5. A reservation can be canceled or confirmed.
6. A flight has a departure airport and an arrival airport.
7. A flight has a departure day and time and an arrival day and time.
8. A flight may include layovers at airports.
9. A layover has one arrival time and one departure time.
10. Each airport serves one or more cities.

**Question:** From the above description, develop the corresponding classes diagram (Add any attributes or operation you find relevant).

**Exercise 4 (optional):** An academy wishes to manage courses taught in several colleges. For this purpose, we have the following information:

- Each college has a website.
- Each college is structured into departments, which each bring together specific teachers. Among these teachers, one of them is responsible for the department.
- A teacher is defined by his/her last name, first name, telephone number, email, start date of his position and his index.
- Each teacher only teaches one subject.
- Students take several subjects and receive a mark for each of them.
- For each student, we want to manage their last name, first name, telephone number, email, as well as their year of college enrollment.
- A subject can be taught by several teachers but always takes place in the same classroom (each having a determined number of places).
- We want to be able to calculate the average by subject as well as by department
- We also want to compute a student's general average and be able to display the subjects in which they were not graded.
- Finally, we should be able to print the information sheet (surname, first name, telephone number, email) of a teacher or student.

**Elaborate the corresponding classes diagram. To simplify the exercise, we will limit the diagram to a single year of study.**

## Part 2: Object Diagram

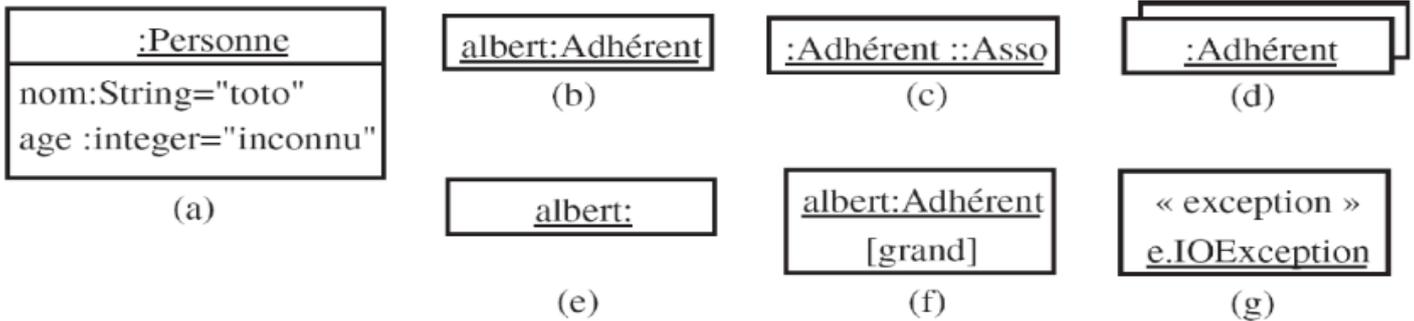
### Exercise:

A **robot** moves in an environment composed of **zones**, **walls** and **doors**. Propose the **object diagram** describing the following situation:

The **Mars robot** is moving. It is linked to a **currentWorld instance** of the **World class** describing the possible worlds in which the robot can evolve. The robot **can manipulate objects** found **in the World** in which it operates.

At the specific moment of interest, the Mars robot is moving and **currentWorld is linked to zones z1 and z2**. **Zone z2 is made up of two walls (m1 and m2) and a door**. The **width of the door is one meter**.

### Some illustrations of the representation of objects in UML (the different situations):



- The **names of the objects** are underlined and **identifiers** can be added in front of the name of its class.
- The values (a) or state (f) of an object can be specified.
- Instances can be **anonymous** (a,c,d), **named** (b,f), **orphan** (e), **multiple** (d) or **stereotyped** (g).