MTAT.03.083 – Systems Modelling

Homework 1 (HW1) - Domain Modelling (8 points)

Due on 15.10.2018 at 23:59
complete the homework in groups of 2 students.

Create a domain model for the system described below. Create a report including the domain model and all the assumptions that you make explaining why you made them. The reason can be that you asked the customer (in this exercise the lecturer). This will make your solution clearer in case of under-specifications. Note that the text may contain irrelevant information. The exercise requires you to select the information that is really relevant for building the domain model.

Submission format: pdf

Grading criteria:

- Classes correctly identified
- Relations correctly identified
- Multiplicities correct
- Attributes correctly identified
- Correct use of other elements of a class model
- Simplicity of the overall model

Hospital Information System

A hospital plans to develop an Information System to manage its oncological patients. This system will keep track of all the visits, therapies and surgeries of each oncological patient. The system should maintain the personal data of the patients (name, surname, ID-code, date of birth) and the insurance code for all the patients who are registered at the national medical insurance, or a private insurance code for all the patients who are not covered by the national medical insurance. In the latter case, the name of the insurance company should also be specified. Each patient is univocally identified by her ID-code. The insurance code for patients who are registered at the national medical insurance is obtained as the concatenation of surname and ID-code. The hospital system maintains a list of oncologists characterized by name, surname, professional-ID, type of oncologist (Medical oncologist, Radiation oncologist, Surgical oncologist, Gynecologic oncologist, Pediatric oncologist, Hematologist-oncologist) and level of career (Medical Student, Physician Assistant, Fellow, Specialist).

A person who wants to become a patient of the hospital has to book a so called first visit that should specify the doctor who prescribed it. The visit may be prescribed only by an oncologist of the hospital. A visit can be prescribed by specialists and fellows only.

During the check-in for the first visit, a new patient folder is opened by a receptionist, and the personal data of the patient are specified in the folder (name, surname, ID-code, date of birth) and the insurance code for all the patients who are registered at the national medical insurance, or the private insurance

code and agency if the patient is not covered by the national medical insurance. At the same time, but after the opening of the patient folder, a specialist oncologist is assigned to the patient, who will follow her case. The receptionist also specifies the date of the first visit in the patient folder. The first visit is always assigned to the reference specialist of the patient.

During the first visit, the doctor has to copy and add to the patient folder all the tests the patient did outside the hospital and that she brought with her at the visit. Secondly, the doctor has to write the patient anamnesis, which will be attached to her folder. Finally, after the evaluation of all the info collected during the first visit the doctor has to take a decision: (i) she asks for more clinical tests and/or (ii) she chooses a therapeutic treatment and/or (iii) she books a surgery.

(i)   The doctor has to book imaging and/or blood tests. The system should keep a calendar for the availability of imaging tests at the hospital (X-Ray, PET, TC, MRI). Also, once the results of the imaging tests are ready, they are uploaded into the patient folder and the doctors can view and print both the written report of the tests and the images. Doctors can also book blood tests for their patients. Similarly to the imaging tests, the system should keep another calendar for the availability of blood tests at the hospital laboratory. Also, once the results of the blood tests are ready, they are uploaded into the patient folder and the doctors can view and print the reports. For each type of imaging tests there are 20 time slots available per day. A test has a duration of 30 minutes and the tests are scheduled at the hour or 30 minutes past the hour between 9:00 and 19:00. Blood collections require 10 minutes and can be done between 9:00 and 11:00 every day (with time slots at 9:00, 9:10, 9:20 etc.).

(ii)   The doctor has to decide the therapeutic treatment (a.k.a. a therapy) to prescribe according to the patient's condition. A therapy specifies the medicine or the medicines that should be taken. A medicine is characterized by a name, a pharmaceutical company, and it is univocally identified by a code. The system keeps a catalogue of all the medicines used in the hospital. Each medicine in a therapy should be taken following a specific posology. The posology for taking a certain medicine is different for different therapies and the same medicine cannot be taken in the same therapy with different posologies. The therapy can be taken at home or in the hospital (e.g., chemotherapy infusions). The hospital offers two types of hospital therapies: day hospital therapy and therapy with overnight hospitalization. The former is for therapies which last for one day, the latter is for therapies which last more than one day and therefore the patient needs to stay at the hospital at least for one night. Each therapy (at home or in the hospital) should keep track of the day or the days when the patient is taking a certain medicine. In addition, the hospital has, for each day of the therapy calendar, a limited number of free places for both types of hospital therapies. In particular, in one day, the hospital can host twenty patients in total, but at most ten patients for therapy with overnight hospitalization. During the visit, the doctor has to book the schedule for a day hospital therapy, or for an overnight hospitalization. Booking the schedule means booking all the dates in which the patient will have to undertake the therapy from the first therapy-session to the last.

(iii)   It is possible that the patient needs a surgery. In this case, the doctor books a surgery specifying a date and an available surgeon suitable for the surgery needed by the patient. The hospital system contains a list of surgeons characterized by name, surname, professional-ID, type of surgeon (General, Pediatric, Cardiothoracic, Neurosurgery, Oral and Maxillofacial, Urology). One week before the surgery, the surgeon defines the team that carries out the operation (Medical Students, Physician Assistants, Fellows, or Specialists). A doctor can participate only in one operation per day and cannot do visits in that day.

Lastly, the doctor writes a report about the first visit and she books the follow-up visit (with an available oncologist). During the follow-up visit, the doctor evaluate the conditions of the patient and the info collected in the patient folder and after the evaluation follows the same procedure as in the first visit: (i) she asks for more clinical tests and/or (ii) she chooses a therapeutic treatment and/or (iii) she books a surgery. Lastly, the doctor writes a report about the follow-up visit and she books the next follow-up visit.

A doctor can do ten visits per day. A visit has a duration of 30 minutes and the visits are scheduled at the hour or 30 minutes past the hour between 9:00 and 14:00. Each visit (first visit and follow-ups) should specify the visit date, the specialist who is following the patient, the doctor who did the visit (which must be necessarily a specialist or a fellow), possible clinical tests prescribed, possible therapies and/or surgery prescribed. When a patient folder is deleted the clinical tests, surgeries and therapies are also deleted.