Engenharia de Domínio

Mestrado em Engenharia Informática

PL 2

UML modeling with Papyrus

Exercise 1: College System Problem

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Approaching a problem using UML

In this class a problem will be introduced and it will be addressed through the use of UML artifacts. In short, the approach to follow is:

- Obtain a basic software using Unified Modeling Language, a General-Purpose modeling Language, and writing the code in a programming language (Java). *This approach is not the focus of this course*

Later some parts of this problem will be worked out considering a metamodel that will be instantiated and generative programming will be used.

College system: vision (introduction)

A college with more than 5.000 students offer bachelor's and master's degree programs. The college catalog lists every degree program, identifies required and elective courses that are part of the plan of study of each program offered in a department of the college. The departements' directors are responsible for most administrative tasks.

The list of teaching minutes of each course includes the number of minutes for each class type grouped by a certain number of weekly occurences. A course can have many editions, but all of them with the same list of teaching minutes.

Each class section is composed of a maximum of 25 students. The class section schedule for each course considers its list of teaching minutes and includes start and end times, the week days, the rooms, the class type (Lectures, Lab and Tutorial) and the teacher identification. Some classes can have students working in group for some course work.

Schedule of class section: an example

The list of teaching minutes of EDOM comprises two occurrences of 50 minutes for its lecture classes, one occurrence of 110 minutes for its lab classes and 50 minutes for its tutorial classes (one occurrence) in all its editions.

The schedule of a class section M1B, as defined for a given course edition, includes lessons in two days of week (see the image). Notice that a room can be used at the same time for different class sections when assigned to the same course and teacher.

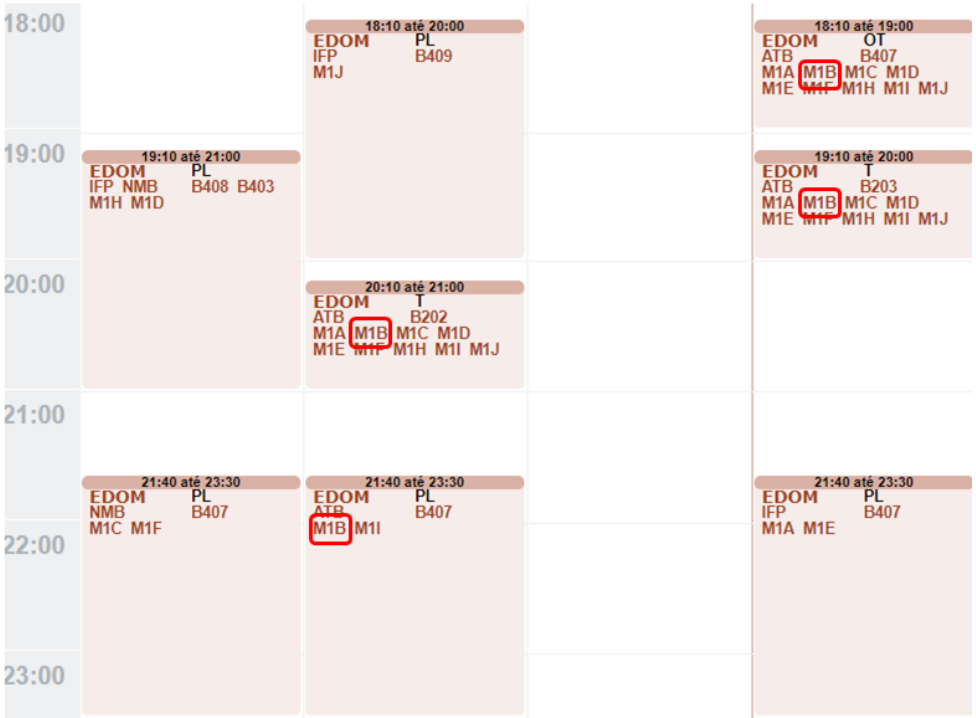

Figure 1: Shedule of class sections for a course edition.

College system: vision (product details)

A system is to be developed to facilitate many tasks and centralize data that has been dispersed in many services, also avoiding many common errors as using the same room for class sections of different courses or teachers at the same time.

In fact, the registration of the schedule of a class section for a given course in the system is a requirement to be available soon, for all the types of classes and minutes as indicated in its list of teaching minutes. Rooms availability should be reinforced. At this moment, the system should show the other class sections for other courses of the same year/semester that are compatible with the one being defined.

College system: quality attributes

Initially a text-based user interface is to be developed.The MVC architectural pattern will be used to guarantee modifiability of the interface.

Some tactics for modifiability, such as *increase cohesion* and *reduce coupling* are to be considered.

College system: a mind map

A mind map can be defined as visual, non-linear representations of ideas and their relationships [2].

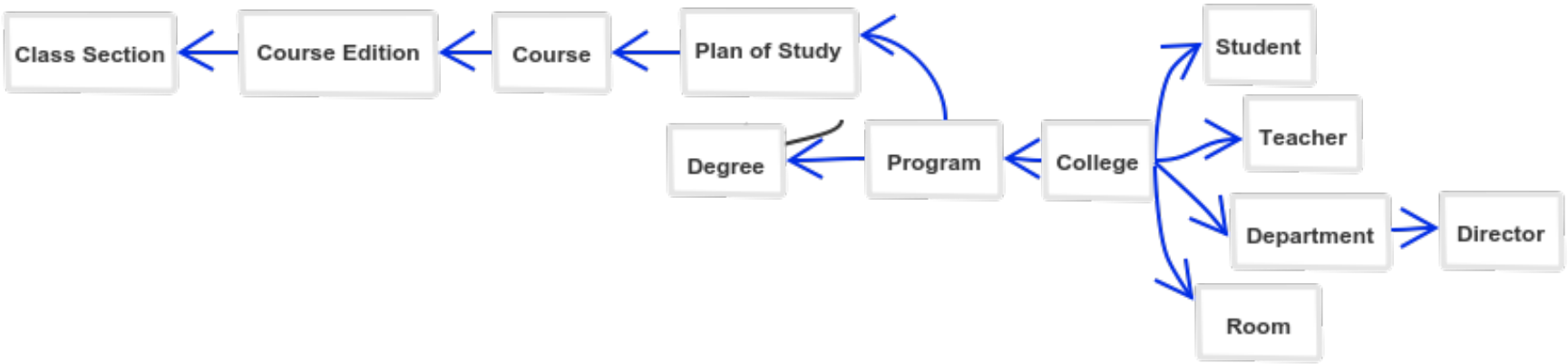

Figure 2: An initial incomplete mind map.

College system: use case diagram

Figure 3: The use case diagram - initial iteration.

College system: to do (two weeks)

- a mind map in Papyrus (which diagram to use?)
- a domain model diagram (class diagram) in Papyrus considering the whole vision of the system
- a use case diagram with the 'Register Schedule for Class Section' use case in Papyrus
- fully dressed use case descriptions. Only one use case is to be considered initially: 'Register Schedule for Class Section'
- an activity diagram in Papyrus that shows the steps of the 'Register Schedule for Class Section' use case
- for the use-case realization, a sequence diagram in Papyrus will be used and its messages and other parts will help to delineate, also, in Papyrus the design class diagram
- basic skeleton of a Java application considering the 'Register Schedule for Class Section' use case without database access or graphical interface

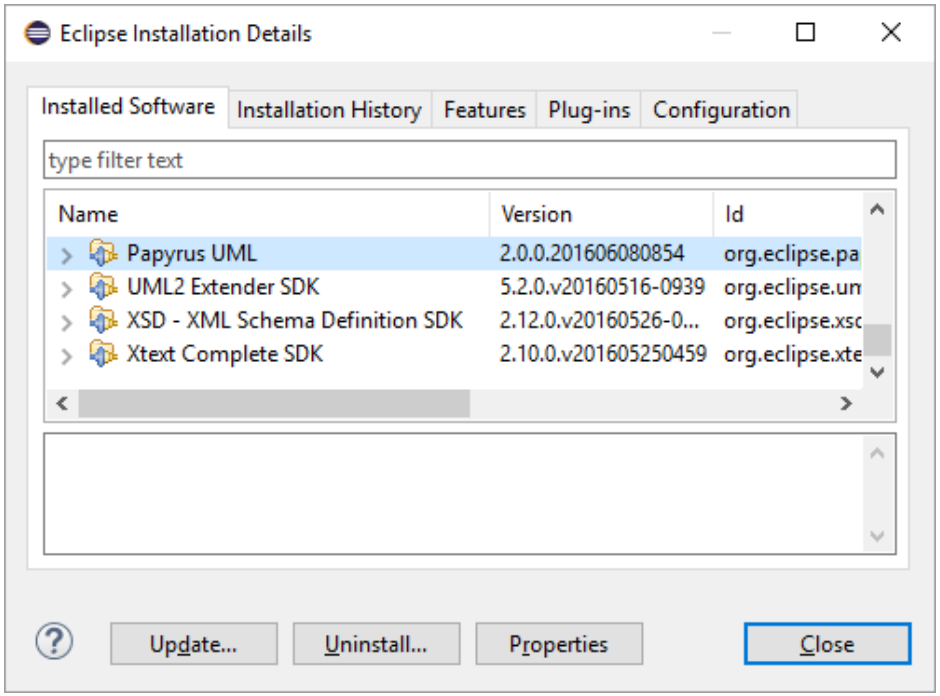

Figure 4: Verifying intallation details

Papyrus UML is an open-source graphical editing tool that provides support to UML 2, SysML and other standards.

Check if it is installed. It is a modelling plugin and it should have been installed before. If not, use the Eclipse Update manager (Help –> Install New Software....) for this purpose.

Papyrus project and models

A Papyrus project can have many models and many diagrams can be added to a model.

The notion of *submodel* is useful in large projects when a model has a great number of elements that can reside in different physical resources. Each submodel can group a number of elements. Later they can be reintegrated in only one model.

Papyrus: creating a project

Start a new Papyrus Project. Select UML as the language to be used.

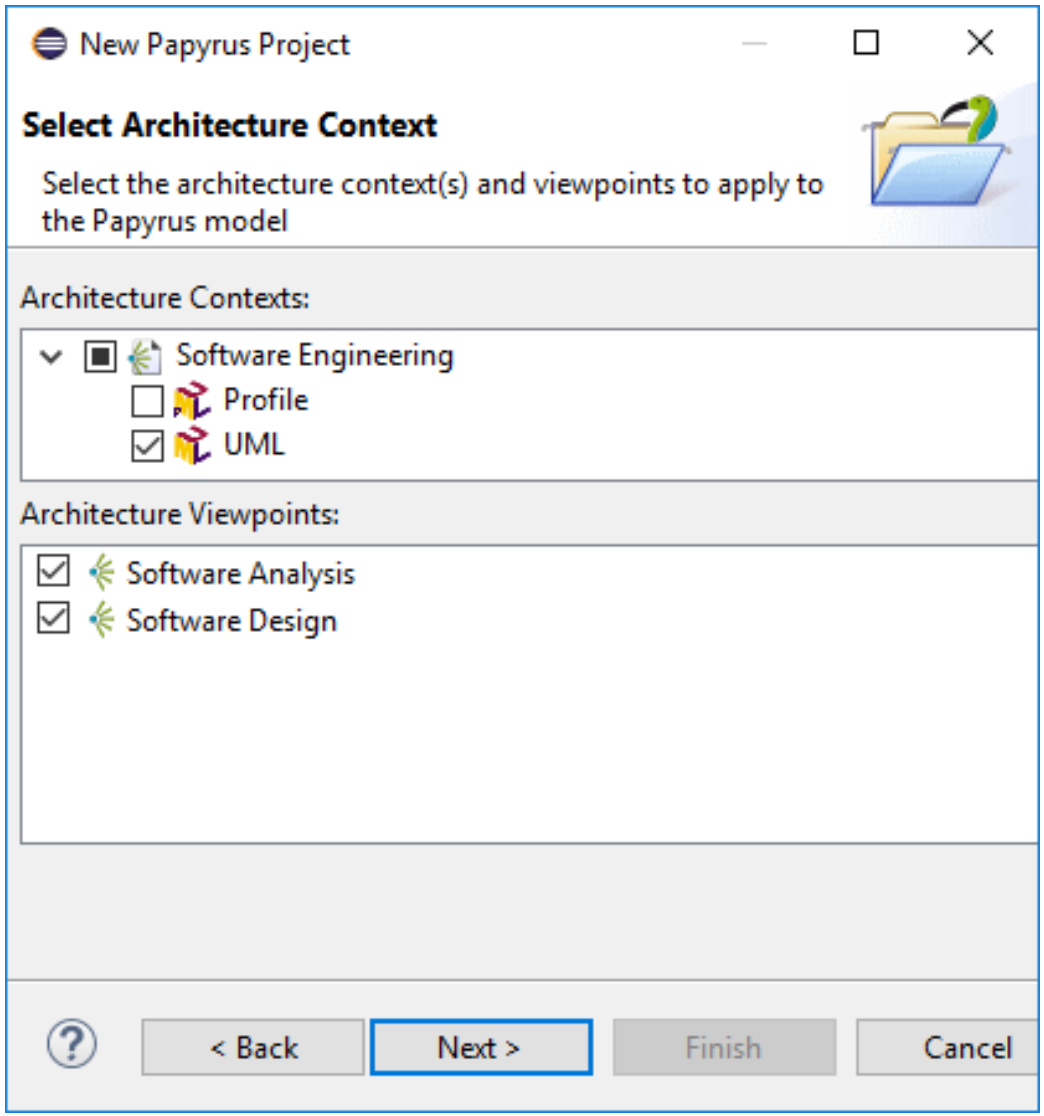

Figure 5: Creating a project

Papyrus: project and model

A project must have a name and one or more models. Just one model is to be created.

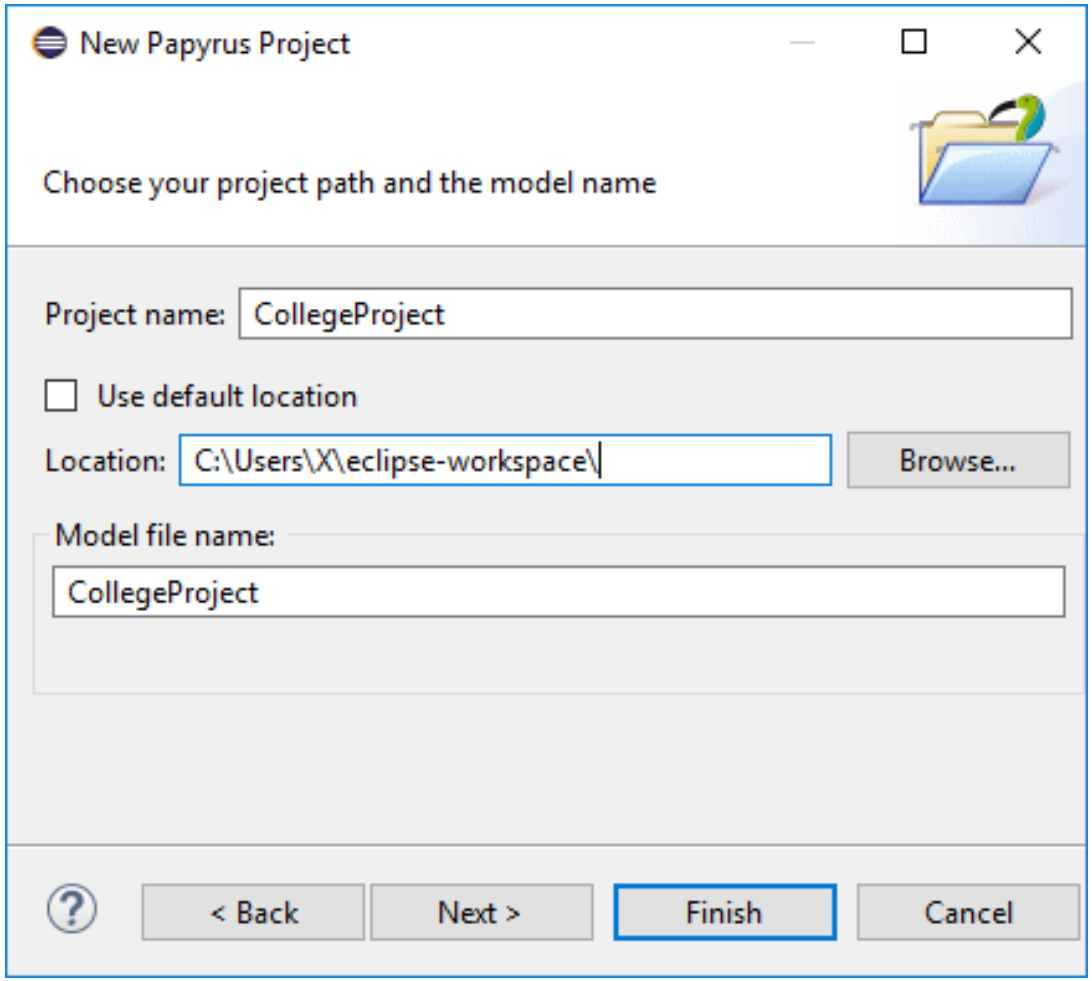

Figure 6: Indicating names for project and model

Papyrus: diagrams

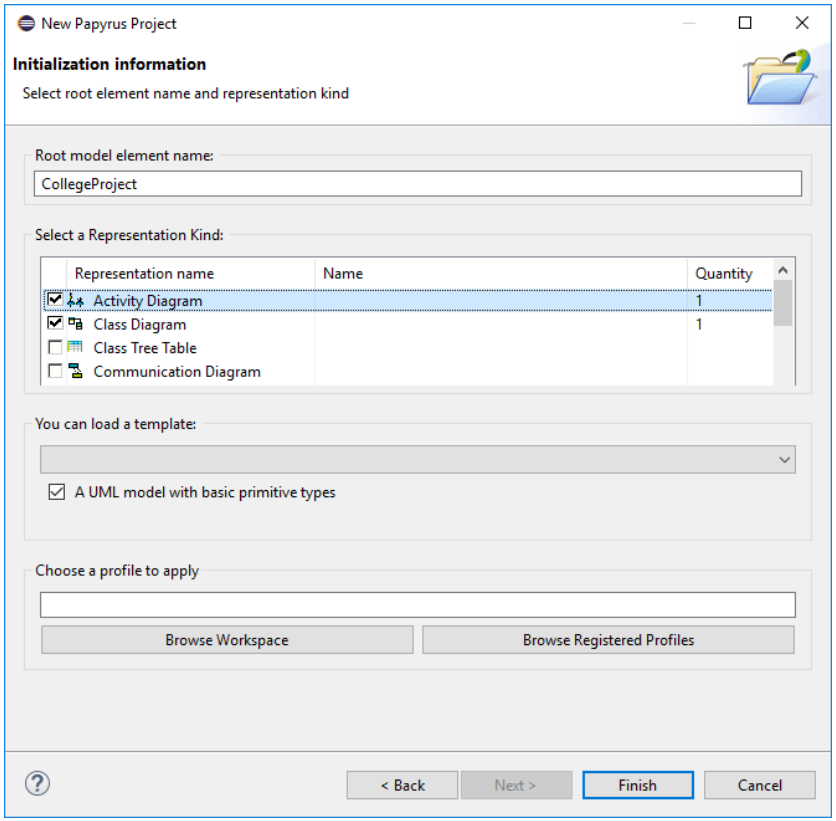

Figure 7: Final step

Select the diagrams to be initially created (use case diagram, activity diagram, class diagram and sequence diagram).

Note: A domain model diagram is also to be created.

Solution

Two **different** solutions (two different folders) must be presented in a folder "Exercise 1".

It is mandatory to use different UML diagrams to represent the mind map of each solution. Also, one sequence diagram is to be based on the use case description, and the other should follow the activity diagram.

Explanations and justifications must be provided as comments in the issue. An initial comment is required to clarify who is working in the solution of the exercise and the ideas that will be explored by each student.

Only solutions that include all artefacts can be graded above 2.

Further Reading

Lanusse Agnes and CEA LIST
Papyrus Tutorial: How to use Sequence Diagrams in Papyrus MDT.
2010,
https://www.eclipse.org/papyrus/resources/PapyrusTutorial_OnSequenceDiagrams_v0

Ernest N. Biktimirov and Linda B. Nilson
Show them the money: Using mind mapping in the introductory finance course.
2006,
Journal of Financial Education (2006): 72-86