



Exam

UML For Embedded Systems - UMLEmb

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Authorized documents: lectures' slides, notes you've taken during lectures, lab sessions results.

Each question is graded. 1 additional point is given as a general appreciation, including written skills and readability.

Also, do not spend more than 20 minutes on question **1** since the modeling exercise is long to perform. At last, consider **making assumptions** on the system so as to reduce the modeling work.

1 Understanding of the Course (4 points, ~20 minutes)

You probably have noticed an important characteristic of UML is that it relies on an object-oriented modeling language.

- (a) What are the main interests in using an object oriented language for modeling systems? (2 points)
- (b) Could you cite elements of UML which are really object-oriented ? Others that do not fit well with the object oriented paradigm? Explain! (2 points)

2 Modeling exercise (15 points, ~100 minutes)

The goal of this exercise is to model a smartphone software application in charge of managing photos. The time being limited, you may omit modeling details of your choice, but if you do so, clearly mention which ones you have decided to omit, and why. At last, do not forget to comment your diagrams, grading takes into account as much diagrams as

related comments. The application that you have to model is described with the following simplified specification.

A photo application is an application aimed at handling all photos stored in a smart-phone. Those photos may have been taken with the integrated camera, may have been received by MMS or email, or may have been downloaded from Internet. Photos may also be sent back by MMS, email, or stored in a cloud system for which a user id and a password are necessary. Each month, the user is charged a price corresponding to the amount of photos stored in the cloud.

The application makes it possible to search for photos stored locally or in the cloud, and according to three criteria: face, location or date. Each time a new photo is received by the application, a background process computes whether it contains known faces or not. The time it takes to compute the faces on a picture depends on the number of faces registered in the system, and the number of faces the picture contains. For each picture, a user may also manually indicate a name for each face a picture contains.

For a fast browsing of photos, thumbnails are computed as a background process. Computing a thumbnail takes between 5 and 10 ms. Also, when displaying photos, the next photo in the list is pre-loaded so as to display it more quickly when the user scrolls to it. Loading a full-size photo takes 50 ms. Displaying it shall not take more than 30 ms.

2.1 Analysis (~60 minutes)

- (a) Make the use case diagram of this application. (3 points)
- (b) Make two scenarios, one for the nominal case, and one for a non-regular case. (2 points)
- (c) Propose a collection of classes and objects (or SysML blocks) for this system. (1 point)
- (d) Refine the two previously performed scenarios. (3 points)

2.2 Design (~40 minutes)

- (a) Propose a design. It may either be based on a UML class diagram and a composite structure diagram (i.e., UML design), or on a SysML internal block diagram (i.e., a SysML design). (3 points)
- (b) Make the state diagram of the most important class (or block) of your system. (3 points)