Exam

UML for Embedded Systems – UMLEmb

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

For each question, the grading is provided. 1 additional point is given as a general appreciation, including written skills and readability.

Also, do not spend more than 20 minutes on question I since the modeling exercise is long to perform. At last, consider making assumptions on the system to leverage the modeling work.

I. Understanding the course   (4 points)   ~20mn

1) What is the abstraction, in UML, that lies between classes and objects? Why is this abstraction necessary? Provide an example of your choice to illustrate this. (2 points)

2) What is encapsulation? Which software engineering property does it target? (2 point)

II. Modeling exercise   (15 points) ~100mn

The goal of this exercise is to model the **software system** of a *smartphone* in charge of downloading and launching applications. The time being short to perform that modeling, 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 and related comments.

The smartphone has two network interfaces (WIFI, 3G) to communicate: the WIFI connection is selected by default, except if it is not available, and in that case, the 3G connection is used, if available.

A software-based application enables the user to browse a list of applications that can be downloaded - if not yet downloaded -, that are currently being downloaded, and applications that can be started or removed. From the application browser, the user can select, using a touch-screen, an application, and then, make an action on that application by selecting one of the three buttons of the smartphone dedicated to applications: download, start, remove. When an application is started, downloads of application can continue, but applications can not be browsed anymore. Also, an application takes between 10 and 20 seconds to be downloaded. When the download of an application terminates, the application is automatically installed: that installation takes between 5 and 7 seconds. Also, at most two applications can be downloaded at the same time.

Of course, when no network is available, applications to download cannot be browsed anymore, and ongoing downloads are paused.

1) Analysis   ~60mn

a) Make the use case diagram of this smartphone. (2 points)

b) Make two scenarios, one for the nominal case, and one for a non-regular case. (2 points)

c) Using the technique of "words in the text", propose a collection of classes and objects for this system. (2 points)

d) Refine the two previously performed scenarios. (2 points)

2) Design   ~40mn

a) From your analysis diagrams, propose a class diagram containing class relations such as associations, aggregations and so on, and also multiplicity. (2 points)

b) Perform the composite structure diagram of this system. Your diagram should model communication channels between system entities. (2 points)

c) Make the state diagram of the most important / complex class of your system. (2 points)