FEUP FACULDADE DE ENGENHARIA
UNIVERSIDADE DO PORTO

MESTRADO INTEGRADO EM ENGENHARIA INFORMÁTICA

Arquitectura de Sistemas de Software

2nd May 2013 • Personal notes allowed • Duration: 60+15 minutes

Please carefully read the description of the software system below and answer the questions **always justifying them succinctly and clearly**, mentioning the bibliography or references that fundament them. When required, you should make explicit all the assumptions you did to answer the questions.

Raspberry PI Online Environment (aka **PILE**) is a web platform that allows "very young engineers", around 10-14 years old, to be able to easily develop programs for Raspberry PI devices, either remotely or locally in the physical lab of PIs at FEUP.
The platform provides access to the available connected resources, such as real PIs, PI emulators, and external devices (e.g. lamps, motors, sensors, robots, etc.). The platform is structured in the following subsystems, below described in detail: web app, dev tools, cluster services, pi adapters, emulators, device drivers, back office.

Considering the design patterns you studied (mainly GoF), suggest a **partial class diagram** for each issue below (specific for the issue) and **justify** which patterns (if any) you think are appropriate to solve it.

a. From a global perspective, which key architectural styles (2-3) do you see as helpful to design the overall system, and why. Please explain by identifying some examples of components and connectors of PILE that may instantiate those styles.

b. PILE is a system that must support the notion of students, educators, groups, classes, schools, and all relations between them. Shortly, it must support the idea of groups of persons (social circles), which may contain or be part of other groups, in a nested way. Persons may be part of different groups.

c. Persons relate to other persons through relationships of different types in PILE. Different kinds of relationships should be configurable at runtime (teacher-of, classmate-of, responsible-of, etc.) and may have different properties and behaviour (dates, reasons, etc.). However, there are some commonalities between them all (name, start date, end date, status).

d. Persons do activities in projects, which all are usually listed as an activity stream, that can be subscribed by others, to keep in touch with the activity of a certain group or person. Persons may therefore follow projects, to be notified when things of the project change, or some activity is done.

e. To simplify the administration of the system, administrative staff is monitoring the system and may delegate specific actions to helpers, so that these later may perform some actions, based on specific rules, and with or without moderation, a priori, or a posteriori.

f. Focus now in one of the subsystems of PILE and identify two features that are fixed (frozen spots, ie. not changeable) and two others that might need easy adaptation (hot spots) across different instantiations and usages of the system. For those hot spots try to define how they could be implemented referring know design patterns.

Note: each question has a value of 15% and the global evaluation values 10%.

The End.

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