Pearl Test 111 – Requirements Engineering, Thu 27 Oct 2016, 8:45–9:45

Program: Technical Computer Science, University of Twente
Module: Pearls of Computer Science (201300070)
Module Coordinator: Maurice van Keulen
Instructor: Klaas Sikkel

- ***During this test you may consult one A4 sheet (both sides) with notes.***
  Simple calculators are generally allowed for pearl tests, but you won't need one here.
  Any other materials are not allowed.
- ***Grade = #points/10.***

Questions 1–3 relate to the course materials.

1 (a) What is the "iron triangle" in project management? (10 pt)
(b) How can the "iron triangle" principle help you to manage the module project next week?

2 "The improved software for their web store should allow company RedHot to increase online sales by 15 %" (10 pt)

Is this a goal-level requirement, a business-level requirement, a system-level requirement or a design-level requirement? Why do you think so?

3 Give five different requirements discovery techniques (10 pt)
(just names, you don't need to explain them).

Questions 4–6 relate to the case study on page 2.

4 For a mission statement, write the paragraphs *Motivation* and *Goal of the system*. (Skip *Type of system*, *Exclusions* and *Approach*.) (20 pt)

5 The "onion-model" has stakeholder roles in multiple layers around the software system, including (but not limited to): (25 pt)
The System: Normal Operator, Maintenance Operator, Operational Support; *The Containing System*: Purchaser, Functional Beneficiary, Interfacing System Owner; *The Wider Environment*: Developer, Sponsor, Champion, Politician, Functional Beneficiary, Negative Stakeholder, Regulator, The Public.

(a) Which stakeholders are mentioned in the text? To which roles do they fit?

(b) The text did not mention any negative stakeholder. Who could be a negative stakeholder? Why do you think so?

6 Give all user stories for a customer of Ruhrstrom in Neustadt. (25 pt)
Give appropriate acceptance criteria for <u>one</u> of these user stories.

Energy Demand Management

Germany has made substantial investments in renewable energy (i.e. wind and solar energy). When a substantial share of electricity production depends on these sources, this gives the complication that the production capacity varies with the weather conditions. One of the major technological challenges for the next decade is how to efficiently store and retrieve energy that is produced at peak hours.
Another way of dealing with peak levels in energy production and consumption is to induce citizens to use less electricity when supply is low / demand is high, and to shift electricity consumption to periods when supply is high / demand is low. This is called *Energy demand management.*
The basic idea is very simple. The price of electricity varies across the day. For each time slot of 30 minutes, the price (€/kWh) will be made available 24 hours in advance. Citizens can reduce their energy bill by shifting some of their electricity consumption to time slots with a lower price.
For example for owners of an electrical car, energy demand management should be very attractive. With a simple interface you can indicate when you plan to use the car again (e.g. tomorrow 8:00), then the car will charge when electricity is cheapest.

A large pilot project for energy demand management is being set up in the town Neustadt an der Ruhr. The pilot is conducted with support of the state government of North Rhine–Westphalia as well as the Federal Ministry for Economy and Energy. Also involved is the local electricity supplier Ruhrstrom, which has to disseminate the prices per timeslot and collect all the data how much electricity was used by whom in which time slot. Neustadt is a suitable location for the pilot because all homes now have smart electricity meters that have the ability to provide Ruhrstrom with the required data. The pilot will last 12 months and will be evaluated by the state and federal governments, so as to provide input for determining future energy strategies.

The IT company BuildIT will make the new administration software that is needed for energy demand management. They will also be available for the duration of the pilot to assist Ruhrstrom and fix any bugs at short notice, might that be required.
The system obviously should capture all data: electricity consumption of each household for each 30-minute time slot. Also, it should provide a web interface (for humans) and an API (for devices) giving the electricity prices for the next 24 hours. There should also be an app for smartphones.
In order to stimulate energy-aware behaviour, the city authorities insisted that Ruhstrom makes past data available to its citizens. On the website (and in the app) you can see numeric and graphic overviews of your electricity consumption the last 24 hours/week/month/3 months/year.
In order to get these data, you have to log in to Ruhrstrom's customer service site. There are two different ways to authenticate yourself when logging in: either with user ID and password, or with customer number and postal code and house number. Having logged in, you can see and download the various overviews; you can also modify your account details.

The smart electricity meters are owned by Ruhrstrom, yet they are *not* part of the administrative system. But they do provide input ("As a smart meter I want to transmit the electricity consumption for a given customer and time slot").
The system will also have a financial subsystem, keeping a balance for each customer, sending out debit payments (i.e. bank transfers ordered by the receiver, not the sender of the money) in regular intervals, maintaining debtor administration, etc. But to keep things short and simple we disregard that here.