

Projet Informatique 2017 - Project Description

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Abstract

This document represents the project description for the student project. It is a mock of a document that should be provided by a client to express what to expect of the outcome of a software project.

1 Introduction

The goal of this project is to create a dashboard application for an automated office environment. Our colleagues at the Universidade Nova de Lisboa ¹ is in the process of creating an automated laboratory for their research purposes. Their *SmartLAB* represents a modern Internet-of-Things (IoT) application where different kinds of sensors provide information about the current system state and actuators (such as “smart” power plugs can actively change behaviour. Your project is to create an application that mainly acts as an analysis tool for the data extracted from that system.

2 Instructions

Your first task is to extract user stories, use cases and use case diagrams from this document.

The following document was compiled after repeated discussions with our client. Please study it carefully and make sure none of the requirements are missed.

Make sure that you fully understand what the client wants and ask your contact (Stefan) in case of ambiguous or missing information. Potentially it will not be possible to implement all requirements for the version 1.0 of the software (Deadline: end of the semester) In this case it is necessary to prioritise some use cases to make sure the most important (“must”) functionality is available first, while “nice-to-have” features are implemented in later versions. If you are unsure about the importance of a requirement: ask your contact!

Note: While this document is a baseline for the tool, there is a possibility that the client requests additional features at a later stage. This means that you should incorporate an agile methodology while working on the project.

¹<http://www.fct.unl.pt/>

3 Accompanying documents

Our client provided the following information to

- `WSO2-whitepaper.pdf` A description of the data server concept
- `CaseStudy-Cyberlab.pdf` A concept document provided by the client
- `renderings/*` 3D renderings of the office
- `photos/*` photos of the real office

4 Project description

4.1 SmartLAB

The SmartLAB is a research project at the Universidade Nova de Lisboa. Although the physical setup of this “smart office” is likely to be extended in the future, there is already a schema prepared. Please consider the accompanying documents for details about the physical setup. They have been provided by the researchers in Lisbon directly. Especially the "CaseStudy-Cyberlab" document should provide you with an introduction of the project’s goal.

Here is some more data that we gathered after discussions:

There are ten workstations in the SmartLAB, each equipped with a “smart” power hub (six sockets each, which can be individually turned on/off and measured). There are also six “smart” light bulbs which are spread around the room and can be used (turn on/off, dim, change colour). Four workstations have a dedicated light bulb each, two more bulbs are “shared” between the other workstations. The laboratory is also equipped with sensors for light intensity and temperature. These sensors have a battery and their battery level can be checked. The sockets provide information about power, current and status (enabled/disabled). The plan is to extend the system with more sensors and actuators that detect presence and position (*iBeacon*), air condition controls, etc.

All sensors and actuators are connected to a central data server (*WSO2*, see accompanying whitepaper) that provides live controls and value readings, and an interface for historical data too. The communication will happen via this WSO2 REST server.

To begin with, our client requires our help in creating a dashboard application to facilitate the usage of the system and to provide an appealing GUI to the WSO2 server.

The application will be used directly for the existing SmartLAB, but should be extensible in case more such labs are installed.

Figure 1 shows a *very* simplified diagram of how the devices are connected.

4.2 Requirements

The aim of the software is to display live data (e.g. “which light bulbs are on at the moment”, “what is the current temperature”), and historical data (e.g. “how much electricity was consumed over the last 24 hours”).

This means users can check directly how much electricity their workstation is using and if their lightbulbs are on. As our managers are responsible for the resource consumption they should be able to see the consumption over a time period (hour/day/week) for the office managed by them. Live data should be “near real-time”. This means that some

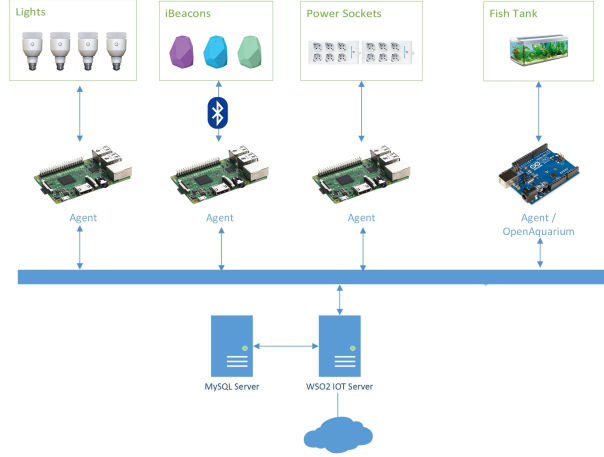


Figure 1: SmartLab physical connection concept

minor delays are acceptable, but the display should be updated frequently so the data is current.

The displays should be customisable for the users and it should be possible to hide certain data, if the user feels like it is not useful to him/her at the moment.

As with most applications of this kind, there is a data protection policy in place. This means that only registered users can actually see information. Further, it is important that users can only see the data of their own workstations, not others. They should have access to shared resources though (e.g. temperature of the room). A user should be able to check when his/her workstation was active (consuming power, having light turned on), but not when their colleagues were active and how much power they needed.

Management personnel however should be able to discover if a workstation uses particularly much/little resources. (e.g. an employee uses 100% more electricity than others). This should be visible in the manager's dashboard. A manager should see which user(s) is (are) assigned to which work station and vice versa.

Similarly, a manager should be warned if a resource usage changes suddenly (e.g. a severe drop in electricity usage for a workstation).

Our system administrators need to have special privileges. Rather than just look at the data analysis, they also need to be able to cut the power to a certain power socket, power hub, light source or entire work station. System administrators are also responsible for the system state. This means any devices that are powered by battery should be monitored. SysAdmins should be warned if there are low-battery devices. SysAdmins should be able to see all installed devices and filter them by state, position, etc. so they can easily navigate in the system.

At the moment there is only one SmartLAB installed, but if this pilot project is successful, many more offices will be equipped with this technology. A manager who is responsible for several offices should be able to see summaries for each in the dashboard. Then a "drill down" to see details about one particular screen is of interest.

The user interface should remain clear, especially for SysAdmins. In the future, they will have to deal with hundreds, perhaps thousands of devices. A clear navigation will be essential in the long run.

The data server will spend most of its capacity collecting information from the individual sensors in the system. This means that the dashboard server should have a light footprint on the data server and avoid unnecessary data requests (e.g. repeated retrieval

of the same data).

In the future the fish tank, the coffee machine, the air condition will be connected to the system, but their installation is not finished yet. The system should be capable of extending to such information too.