Technical Report - Project specifications

Blossom

Course:	IES - Introdução à Engenharia de Software
Date:	Aveiro, 01/12/2020
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Project abstract:	Web application with tracking capabilities in relation to soil moisture and PH, with subsequent advice on current status and ability to generate triggers at certain thresholds.

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1 Introduction

Blossom is a full stack web app project, fully developed by students from concept, to technical architecture, all the way to the final implementation, using enterprise frameworks and following agile methods of production .

Furthermore we'll work as teams do in actual work environments following structured roles (Team manager, Product owner, Architect, DevOps master) for each developer, each with their own specific responsibilities over different important aspects of the project as a whole. Although everyone shall still work as a core developer instead of focusing solely on their assigned role.

2 Product concept

Vision statement

Blossom seeks to provide a helpful environment for gardeners and farmers to monitor their soil status and guide them towards better crop opportunities as well as help them achieve better richer yields, or simply provide a more informative experience.
First, the users setup monitoring devices for pH and/or humidity on their chosen parcel of land and connect to our platform, this will provide them with, not only, the information relayed by said monitors but also provide tips regarding the monitors information, that way the user can be certain of when and how to tend to his crops, and if you're looking to start growing, what plants would better adapt to the soil at hand. Essentially telling the user when to water his crops and what type of plants is more fit to that specific soil.

Personas

Maria is a 25 year old wonderkid fresh out of college working her way up in a paper company in Scranton Pennsylvania, she just moved into her new house and has been having a little trouble growing her dream garden. Lately she has been wondering if the plants she's been growing are simply a bad fit for the type of soil she has and if maybe she should be trying to grow something else.

Joaquim is a 56 year old family man with 4 children and a lovely wife, he had been a farmer ever since he started working the fields with his dad at the tender age of 13 back in his hometown of Sagres in Portugal, lately due to climate change he has been having a hard time predicting the weather and how to adapt his crops, unfortunately this has had a real impact on his crop yield and he feels like he needs something to help adjust his plants to take the most out of the now unpredictable soil.

Vasco is a young entrepreneur with 34 years living in Lisbon, Portugal. He has been investing in new startups that show value, and at the moment he is looking to find one more to add to his arsenal. This is possible due to a stable life both personally and financially. He is the father of Antero, a 5-year-old boy very perceptive for his age, and married to Manuela, his best friend in life. He likes to go for walks by the sea on the weekend and does sports regularly, namely running and swimming.

Mónica is a 43 year old woman living in Portalegre, Portugal. She is married to Antonio, her partner for 21 years, having together 2 beautiful children. Despite spending a lot of time busy with activities related to her occupation, professor of physics and chemistry, she still likes to take some time out of her day to pay a visit to her garden and take care of her plants. Due to the lack of time, it often goes a few days without going to the garden to check on the plants. This often leaves her with great anxiety because it wouldn't be the first time that plants end up dying due to lack of care.

Main scenarios

Scenario 1:

Vasco noticed value in 'Blossom' and decided to acquire it. In order to make the app as profitable as possible, Vasco uses the management interface provided that allows it to check registrations of new affiliated farmers with the app, how satisfied they are and the state of their crops.

Scenario 2:

Joaquim needs a system that allows him to automate the irrigation process. To do so, he uses 'Blossom' which sends him frequent notifications regarding the need or not to water the soil of his plantations. Finally, Joaquim uses a lot of the log feature that allows him to check the last watering for each type of crop, letting him be constantly aware of the crop's state.

Scenario 3:

In an attempt to make a small crop at home, Maria attempted to plant some random plant she found on the market, not satisfied with the results she had from her previous garden, decided to try 'Blossom' so that she could monitor the soil and get advice on the type of plants to cultivate.

Scenario 4:

Monica is a person very concerned about the health of her plants as they keep dying on her. Therefore, the use of the app made perfect sense, as 'Blossom' allows constant monitoring of the soil's humidity thus checking whether it is necessary to water the plants . so they can better absorb soil's nutrients and grow healthier.

3 Architecture notebook

Key requirements and constraints

We're proposing a very simple architecture, to cater to long term performance without jamming or networking issues.

The system will have a central server containing our service API, which shall be connected to the frontend web platforms where our consumers interact, the data monitors(hardware components monitoring pH levels and soil moistness) which give us our relevant information and our database containing all the non-perishable information collected until the moment.

The monitors need a 5 day setup period to accurately convey the data, afterwards all readings shall be accurate.

The user accesses the app through a responsive web interface.

The key requirements are:

- Data access is fully intermediated by the presentation layer and the service API
- The construction of html pages is server-side
- All service components will be placed on the same machine, with the possibility of operating in different processes
- The user interface will be web, using thymeleaf
- Data sensing will communicate with api services, without communication with the client-side

Architectural view

Data Sensing

In the scope of this project we'll generate semi-random data similar to what we'd find from actual real life soil monitoring. The part of our project responsible for the Data generation will

be held in a separate docker container, this will prove beneficial in case we want to change our data source to real data as the project evolves.

Backend

Web App

The web app will use Thimeleaf, a server-side frontend templating tool for XML/XHTML/HTML5, which can be used in both web and non-web environments.

Business Layer and Service API

For the app's main api services we will be using Java / Spring in order to build and implement the main components.

Data Access

Data Access will be managed using Java Persistence API.

Long-Term Storage

Regarding long-term storage in order to keep our non-perishable data, we intend to implement a MySQL database with the following tables.

- Plant:
    - Plant_id
    - Cientific_name
    - English_name
    - Portuguese
    - Ph_max
    - Ph_min
    - Humid_min
    - Humid_max

- User:
    - User_id
    - Name
    - Email
    - Entry_date
    - Password

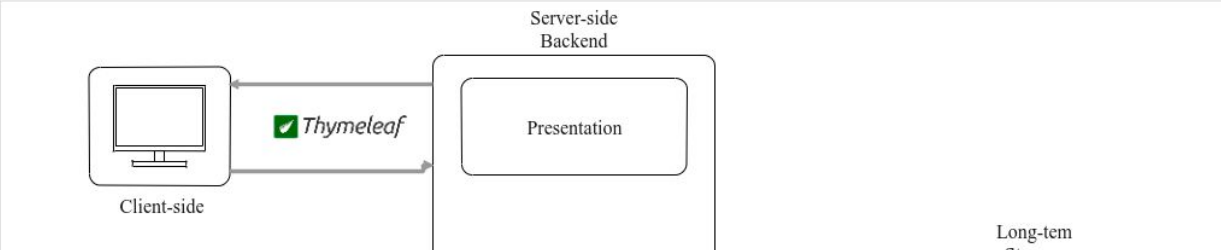
    - Phone_number
    - Last_joined
    - Is_active

- Monitor
    - User_id
    - Monitor_id
    - Parcel_id

- Parcel(of land)
    - User_id
    - Parcel_id
    - Ph
    - Humidity

- Plant_parcel
    - Plant_id
    - User_id
    - Parcel_id

Module interactions



As shown in the diagram above, this is basic structure of how the main system components will interact

Data sensing - Backend

The data sensing will communicate with the backend through a special program that will receive the data from the monitor, process, and store in the database

Client - Server

The client will communicate through the browser with the server, which will return a html page with the requested data.

Backend - Long-Term Storage

Both the parties responsible for user interaction, the API services, and the program responsible for data sensing coordination will interact with the database, reading, writing and updating it.

4 Information perspective

The main domain of the application is initially basic and involves the creation of simple components to deal with the main functionalities of the application. These are

- Component to deal with user data and its relationship with other users
- Component responsible for obtaining the monitoring data
- Component responsible for analyzing whether certain plants are suitable for planting and creating a list of viable options
- Component responsible for analyzing the irrigation of a plantation and whether it is adequate, in addition to suggesting a certain irrigation scheme

5 References and resources

http://www.mdpi.com/1424-8220/18/4/1285

https://whatis.techtarget.com/definition/perishable-data