

Technical Report - Project specifications

aLIVE

Course: IES - Introdução à Engenharia de Software

Date: Aveiro, 19th January 2021

Students: 89059: João Carvalho
92952: Rui Fernandes
93102: Francisca Barros
93150: Pedro Bastos
93169: Margarida Martins

Project abstract: aLIVE is a web-based application that allows patients to inform their assigned doctor about their own medical information (i.e, heart rate, blood pressure, blood glicemia, oxygen level, body temperature).
The connection between patients (even in elderly care homes) and doctors will be simplified - the patients themselves, or the caregivers, can update their profile information (such as medical conditions, weight and height) by inputting the specific values onto the platform.
Each patient can have multiple sensors tracking their health data and his doctor is notified when some value is dangerous.

Table of contents:

[1 Introduction](#)

[2 Product concept](#)

[Vision statement](#)

[Personas](#)

[Main scenarios](#)

[3 Architecture notebook](#)

[Key requirements and constrains](#)

[Architectural view](#)

[Module interactions](#)

[4 Information perspective](#)

[5 References and resources](#)

1 Introduction

In this document, the client's requirements for the development of the aLIVE application will be analysed. This will be done within the scope of the IES course.

aLIVE is a web-application that aims to simplify the connection between patients and doctors. This is done by the exchange of personal health-related information, tracked by the patient's sensors, with the associated doctor.

The concept of the application will be explored - the analysis of Use Cases, creation of Personas and Main Scenarios as well as the development of User Stories is outlined in the following chapters. Finally, the chosen architecture will also be overviewed.

2 Product concept

Vision statement

Our system is meant to be used as a means of communication between a patient and their assigned doctor or caretaker depending on the context of use, as it will support usage by hospitals and nursing homes. Besides simple communication the system allows for both the patients and the medicine responsables to access updating details about the patient's health and how those values evolve with time. These health details need to be measured by the patient with sensors to determine: heart rate, blood pressure, blood glicemia, oxygen level and body temperature. The assigned professional can then compare it to past records and see the evolution of his health status.

The impact we intend our product to have in the big picture is to reduce the amount of medical appointments that are simple checkups on health state allowing for this to be done in parallel to other more important appointments, leading to more efficient hospital work as well as less waiting time for patients. In addition to that in the context of nursing homes it allows the caretakers to efficiently keep tabs on all of the residents health status, even if some of them are at their own home. Finally in situations such as the current Covid-19 pandemic in which movement needs to be limited, hospitals are full, and nursing home residents are at higher risk, our product could ease hospital workload, lessen outings from home, and ensure some extra safety for elderly residents at nursing homes.

Personas



Joaquim is a 45 year old general medicine practitioner that has worked in the Hospital of Viseu for his whole career. He is married and has 2 sons, often going with them on camping trips and outdoor activities.

He is patient, caring and understanding with his patients, following their health status for years and developing good relationships with them, keeping them at ease.

Even with his good memory, Joaquim needs to check up on the evolution of the patient's health state with each visit. This process can be very cumbersome, as he needs to check either paper records or the Hospital's own system that

awkwardly displays information and is of slow access.

He likes to store some data on his personal laptop and has tried organizing it in graphics but it proved to be too much work and learning.

MOTIVATION: Joaquim would like to view his patient's health state evolution in a more organized fashion as well as do it more easily.



Sofia is a 50 year old nursing home manager, she works in Aveiro nursing home and started there as a caretaker. She really enjoys her work caring for the elderly, she's loving and close with them.

Being a manager for the home she needs to constantly be up to date with the residents' health state, for that the nursing home only has paper records that the caretakers update from time to time. This process can become bothering and slow if she has to see the evolution of a certain resident's health, as she needs to go back and search for the older records.

Although she loves her job she finds it hard to be in touch with all the residents, as she can't go through all the records

every day and personally see the residents at the same time.

She has tried storing the data digitally on her tablet for easier access, allowing for some interaction with the residents as she takes down their blood pressure or sugar level, however she still needs to write it for the paper records.

MOTIVATION: Have easy access to the health values of all her residents in one place and have it update easily.



Julio is a 72 year old retired and married man, he used to work as a civil engineer and ended with 40 years of career. He has 2 sons and a daughter, and a total of 6 grandchildren, he's generally a very happy man and loves his life.

He has some health complications however, since he has had diabetes for two decades and recently some hypertension problems. This leads him to often visit the doctor for checkups on his health where he measures various components of his health and evaluates him.

Often his children do the measurements at home for him since he needs to make sure he's not going over any limits, however they don't always know how to interpret the data directly from the machines. Julio downplays it and says it should be fine and they seemed similar to the ones at the doctor as to not be a hassle.

MOTIVATION: Julio wishes for a way to keep his health in check with professional evaluation without always having to be in the doctor.

Main scenarios

- Joaquim checks his patients health status - Joaquim opens the application, logs in, and sees his assigned patients health status (colored + warnings).
- Joaquim checks Julio's health markers - Joaquim opens the application, logs in, searches for Julio and clicks on his profile, being able to check his latest recordings and changing his medication, if needed.
- Sofia manages her nursing home patients - Sofia opens the application, logs in, clicks on the dashboard and checks the patient's health status (colored + warnings)
- Julio checks his own health data - Julio opens the application, logs in, and is able to see his own health measurements and whether or not they're in check (colour colored + warnings)
- Sofia has an overview of her patients - Sofia opens the application, logs in, opens the "Patients Stats" tab and can see multiple charts with various statistics regarding her patients.

3 Architecture notebook

Key requirements and constraints

- The users should be able to access the Web-App from remote PCs or Mobile Devices with internet connection.
- The professionals need to register on the platform, in order to access it. This includes providing personal information, such as an email address, password, full name, birth date and gender. This information will be stored in the database.
- The patients need to register on the platform, in order to access it. This includes providing personal information, such as an email address, password, full name, birth date, gender and, optionally, additional information related to health problems. It is also mandatory to input his assigned doctor. This information will be stored on the database.
- The Web-App should be continuously available.
- A Professional should have access to his patients' information organized in various charts.
- When a sensor registers a dangerous value, the doctor should receive a notification about this update within 1 minute.
- The Web-App should be protected with authentication and authorization, meaning that each professional only has access to his assigned patients, as well as each patient can only see and update his own information.
- The professional should be able to see the last time each of his patients were checked.

Architectural view

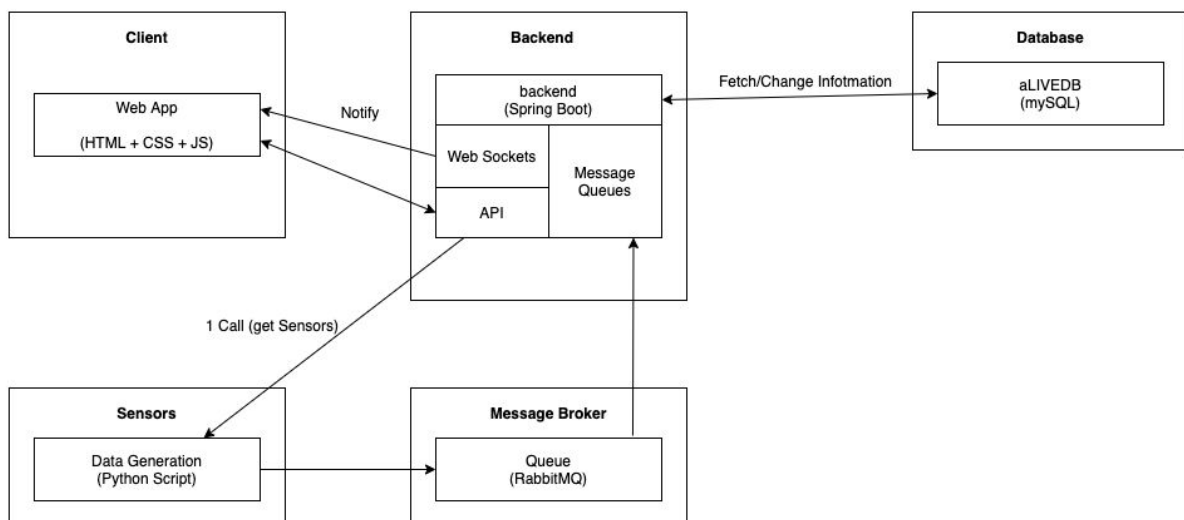
The architecture of the project is mainly composed of four parts: the sensor layer, the backend layer, the client side layer and the database layer.

The sensing layer will generate all the necessary information about the patient and send it through message queues using RabbitMQ to the backend, which after receiving the messages, processes them and saves them to the database.

The database will be developed in mySQL, in order to be able to store the necessary information.

The client side, developed in HTML + CSS + JavaScript, will communicate through the API to obtain the necessary information.

The backend will be developed using Spring Boot with Spring Security, being able to communicate with the client side through Web sockets.



Module interactions

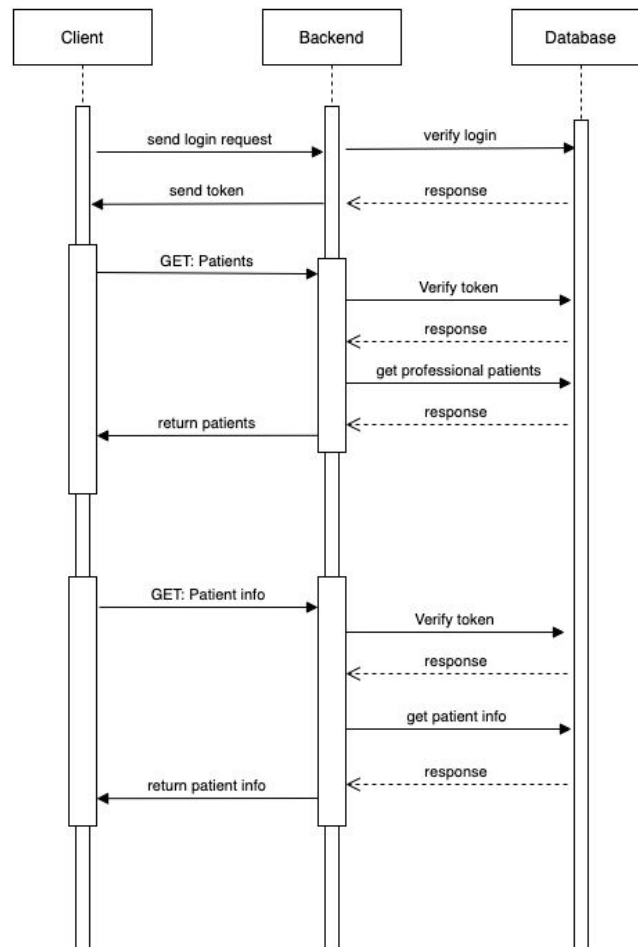
A typical interaction between the different modules consists of accessing the Web App , providing the user login. The client side calls the API and the backend checks whether the login is valid or not using the information stored in the database.

The Web App then checks the user's type (whether it's a patient or a health-care professional), and displays the appropriate dashboard to the given user.

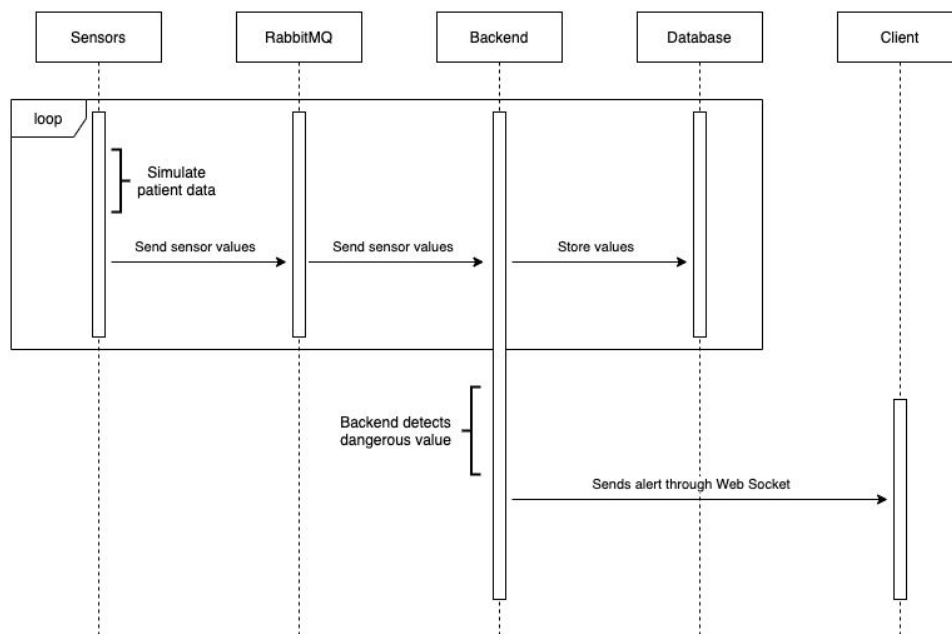
The user is now able to see his health data (if it's a patient), or it's assigned patients data (if it's a health-care professional).

The sensors' module generates data for each patient, which then sends it to the backend module through the RabbitMQ message queue. The backend then checks if there is any dangerous value and, if needed, notify the professional.

Example of a professional basic interaction, i.e., login, patient's dashboard and see patient info:



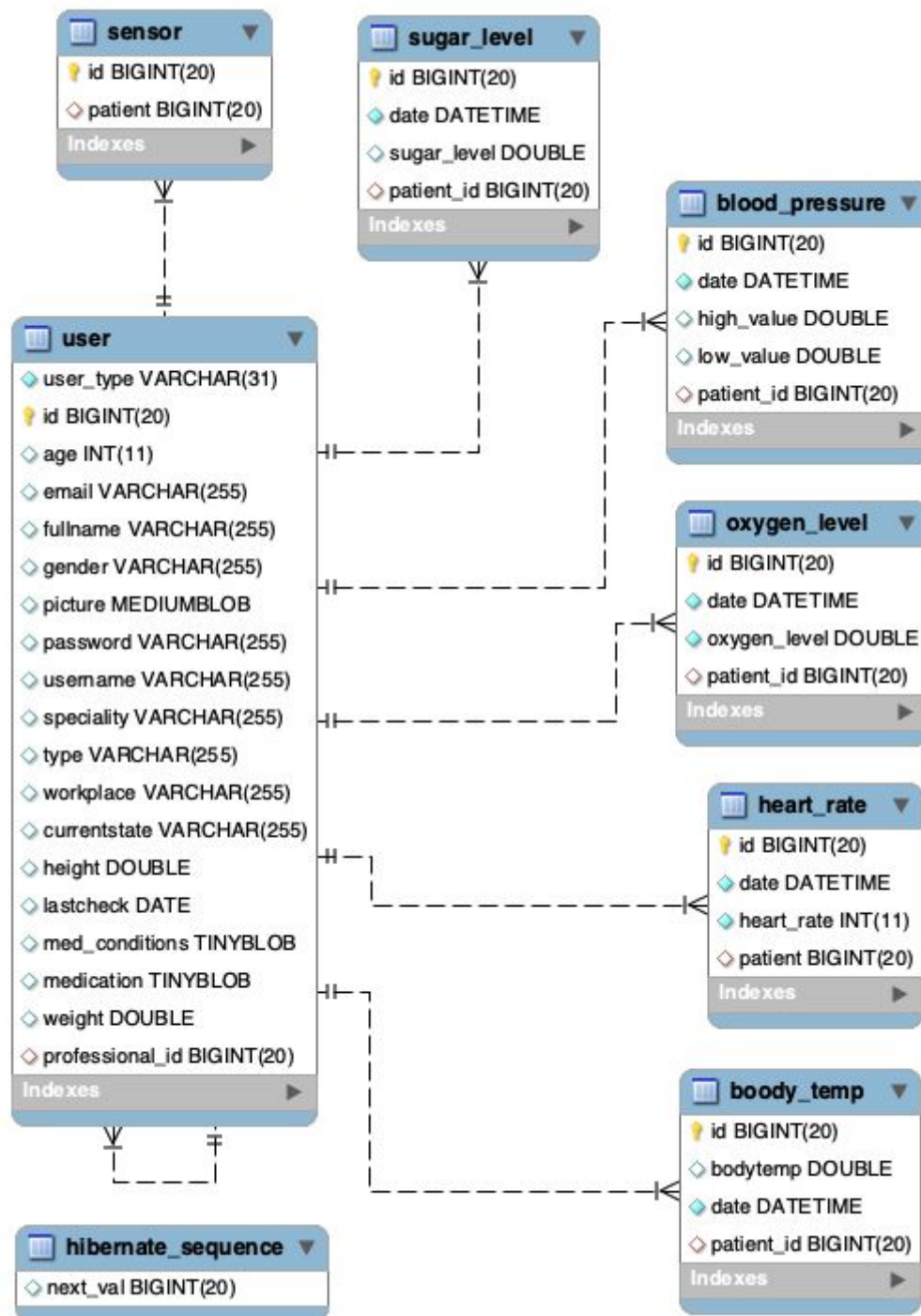
Example of Data generation and dangerous value alert triggered:



4 Information perspective

The following diagram represents the domain of aLIVE's application database, it was obtained with mySQL Workbench.

This is used to store information related to aLIVE users, as well as the data necessary to ensure the complete functionality of the application.



5 References and resources

<https://stackoverflow.com/questions/56649582/substitute-environment-variables-in-nginx-config-from-docker-compose>

<https://www.katacoda.com/courses/docker/create-nginx-static-web-server>

<https://www.baeldung.com/websockets-spring>

<https://github.com/sockjs/sockjs-client>

<https://javascript.info/websocket>

<https://spring.io/projects/spring-security>