



Future House System – Stage 2 “Halfway”

# OPTIMIZERS SOFTWARE ENGINEERING

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# 1. Introduction



## 1.1. Purpose

This document describes the beta design of the Future House System and the work that has been done so far. It includes details of the progress and the functionalities that been achieved during the first few weeks of the semester. A comparison with achievement to date and the original planned iteration, as well as our adapted plan. In addition, it includes high level overview of technologies, components and database design. Also, it explains how the system has been tested for technical correctness and assessed against expectations.

This document is intended to be read by:

1. Esteem and their appointed representatives: for the client to gain an insight and understanding of what exactly the end product will be capable of.
2. Optimizers Software Engineering: to act as a guide for us during the remaining of the development process.
3. Our line manager: Professor M. Hamdan.

## 1.2. Scope

The scope of stage 2 report is not as wide as stage 1 report. This document only covers information regarding the development of the Future House System from after the stage 1 deadline up to stage 2 deadline. However, this document will be further extended and incremented for stage 3, when the full application is ready.



## 2. Progress



## 2.1. Overall Work Done

- Database: building tables for all the different entities that we will need is completely done.
- Backend server: most of the functionalities needed on the backend server has been done.
- iOS App: main authentication functionalities, plus retrieving and adding homes.
- Android App: main authentication functionalities, plus retrieving and adding homes.
- Frontend Web APP: main component wrapper, plus overall look and design.

## 2.2. Functionalities

### 2.2.1. Backend server

- Registering users
- Logging in users
- Logging out users
- Updating users' profile
- Change email
- Forgot password/Change password

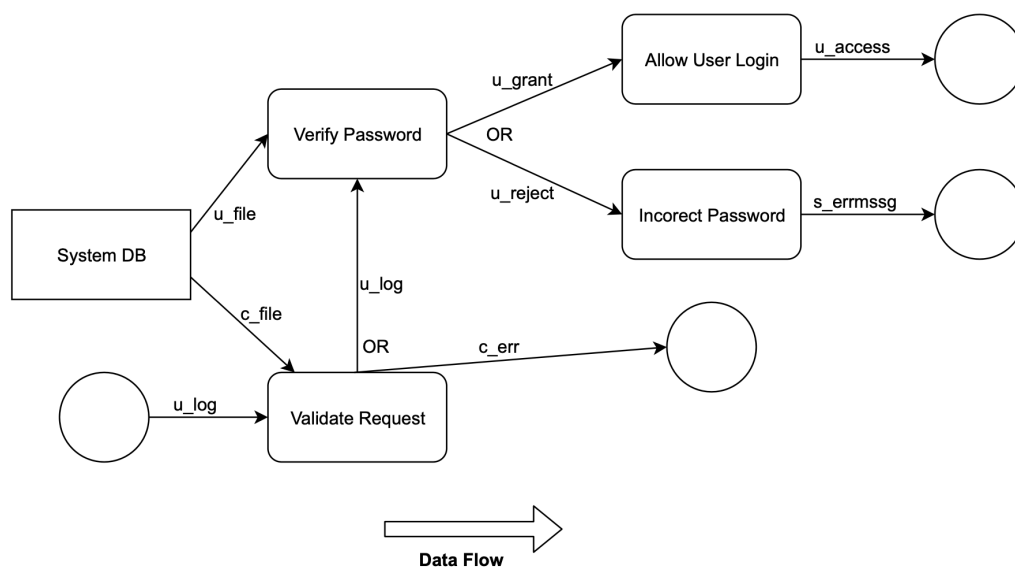


Fig. 1 – Login Data flow diagram

- Adding houses
- Retrieving houses
- Updating houses
- Deleting houses

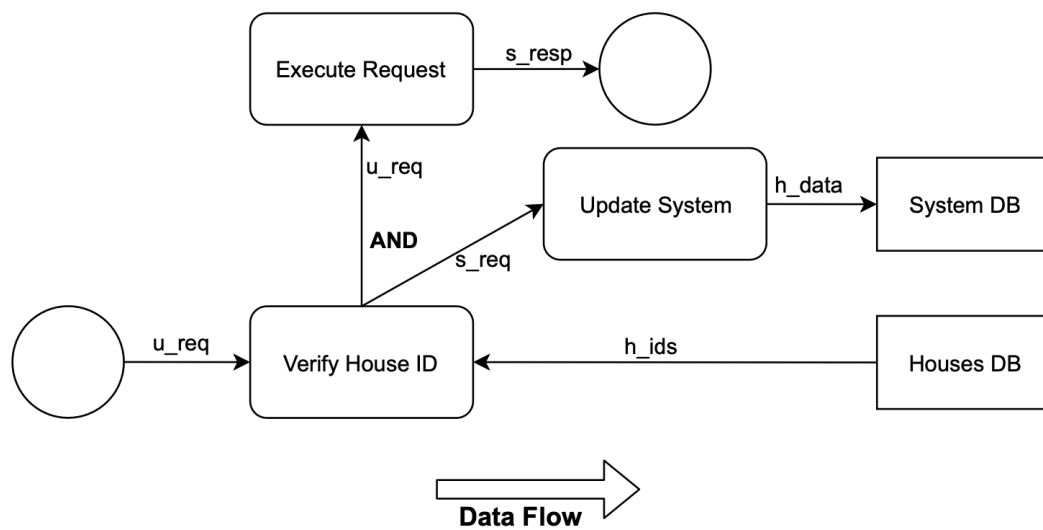


Fig. 2 – Add Home Data flow diagram

- Adding rooms
- Retrieving rooms
- Updating rooms
- Deleting rooms
- Adding IoT devices
- Retrieving IoT devices
- Updating IoT devices
- Deleting IoT devices



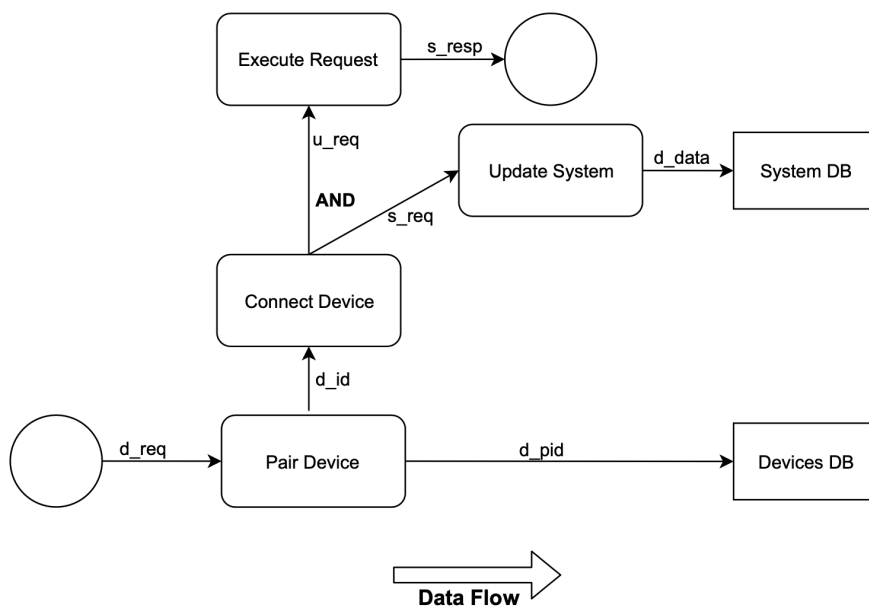


Fig. 2 – Add Home Data flow diagram

- Creating reports
- Retrieving reports
- Updating reports
- Deleting reports
- Sending feedback
- Asking a question
- Reporting a bug

### 2.2.2. iOS App

- Registering users
- Logging in users
- Logging out users
- Adding houses
- Retrieving houses





### 2.2.3. Android App

- Registering users
- Logging in users
- Logging out users
  
- Adding houses
- Retrieving houses



## 3. Database design



### 3.1. User model:

- ID
- Name
- Age
- Email
- Username
- Password (hashed)
- Profile picture: OneToOne relation with profile picture model.
- Code: code sent to the user's email when the user forgets the password.
- Code trials: a counter for the number of times the user tried to enter the code sent to his email (for security, after 5 trials a new code will be generated and sent).

### 3.2. Profile picture model:

- ID
- Uri: storage location of the photo file

### 3.3. House model:

- ID
- Manager: Foreign Key from User model
- Dweller: Foreign Key from User model
- Display name
- Timestamp
- Location
- CMU ID (Central Monitoring Unit ID)
- Cover photo: one to one relation with cover photo model.

### 3.4. Room model:

- ID
- House: Foreign Key from House model
- Display name
- Cover photo: One to One relation with cover photo model
- Timestamp



### 3.5. IoT Device Model:

- ID
- House: Foreign Key to House model
- Cover photo: One to One relation with cover photo model
- Display name
- Battery level
- State (on/off)
- Average Consumption
- Timestamp

### 3.6. Cover Photo Model:

- ID
- Uri: storage location of the photo file

### 3.7. Report Model

- ID
- House: Foreign Key from House model
- Room: Foreign key from Room model
- Energy generated
- Energy consumed
- Energy wasted
- Energy saved
- Timestamp

A report is auto generated for every house and every room every 24 hrs.

### 3.8. Feedback Model

- User: Foreign Key from User model
- Text
- Timestamp

### 3.9. Problem Model

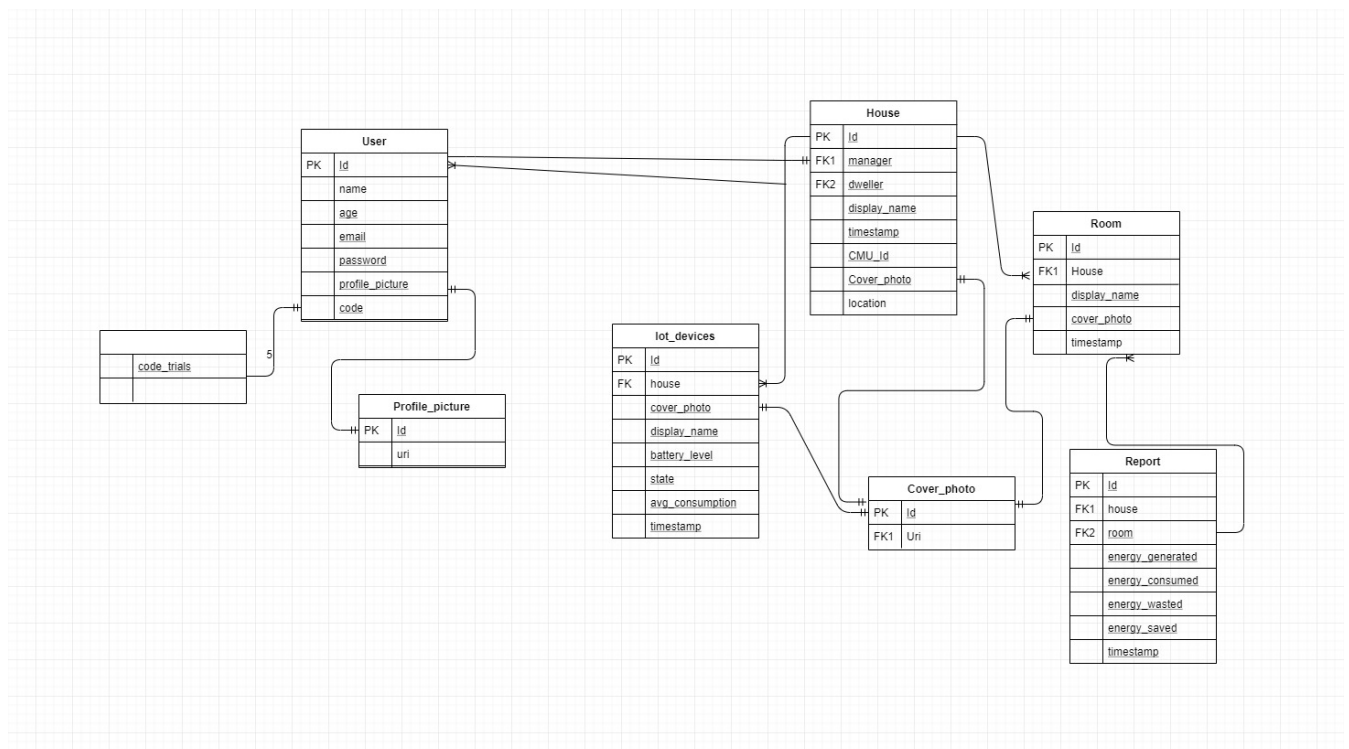
- User: Foreign Key from User model
- Text
- Timestamp



## 3.10. Question Model

- User: Foreign Key from User model
- Text
- Timestamp

## 3.11. ER Diagram



## 4. Product



## 4.1. Product scope

Due to the Smart Home Systems' wide scope as a concept, it can prove to be challenging to identify a concrete scope for this project. Since this is a software engineering project, and due to the time constraint available to us, our product will shed the light on the software that manages the system and will be using a simulation of the average smart home energy usage through researching datasets online.

This means that the hardware implementation for the Future House System is out of our scope, and we will be focusing on providing a service that uses the energy data collected from solar powered houses and providing insights to the user about his usage and recommendations that can possibly improve the energy efficiency in the user's house.

## 4.2. Technologies

### 4.2.1. Database



### 4.2.2. Backend Server





### 4.2.3. Web App Frontend



#### 4.2.4. iOS App



**Redux**



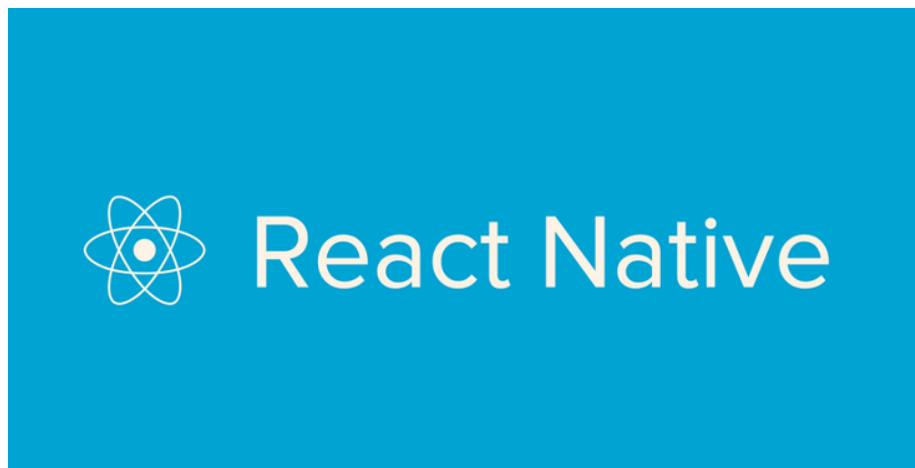
**React Native**



#### 4.2.5. Android App



**Redux**



## 5. Plan



## 5.1. Plan Update

Below is our initial plan for stage 2 showing the tasks which has been completely done, and the tasks which are partially done.

Task Name	Duration	Start	Finish	Progress	Team Members
<i>Sprint 1 Start</i>					
Familiarizing the Team with React	18 days	Sun 22/12/19	Tue 14/01/20	Complete	ALL
Developing Testing Infrastructure	18 days	Sun 22/12/19	Tue 14/01/20	Partial	ME
Database Models and Backend Server	18 days	Sun 22/12/19	Tue 14/01/20	Complete	OB
<i>Sprint 2 Start</i>					
<i>Semester 2 Initial Meeting</i>	1 day	Tue 14/01/20	Tue 14/01/20	Complete	ALL
Front End planning	1 day	Tue 14/01/20	Tue 14/01/20	Complete	ALL
Web App Basic Functionality	5 days	Tue 14/01/20	Mon 20/01/20	Complete	ALL
Mobile App Basic Functionality	5 days	Tue 14/01/20	Mon 20/01/20	Complete	ALL
Authentication	1 day	Wed 15/01/20	Wed 15/01/20	Complete	ALL
House Registration	1 day	Thu 16/01/20	Thu 16/01/20	Complete	ALL
Energy Data Simulation	1 day	Fri 17/01/20	Fri 17/01/20	Partial	ALL

Task Name	Duration	Start	Finish	Progress
<i>Sprint 3 Start</i>				
<i>Functionality Review</i>	1 day	Tue 21/01/20	Tue 21/01/20	Complete
Functionality Testing	2 days	Wed 22/01/20	Thu 23/01/20	Complete
IOT Devices Screen	2 days	Thu 23/01/20	Fri 24/01/20	Partial
House Rooms Screen	2 days	Fri 24/01/20	Mon 27/01/20	Partial
<i>Sprint 4 Start</i>				
<i>Functionality Review II</i>	1 day	Tue 28/01/20	Tue 28/01/20	Complete
Testing II	1 day	Wed 29/01/20	Wed 29/01/20	Complete
Bug Fixing	3 days	Wed 29/01/20	Fri 31/01/20	Partial
Report Prep	2 days	Fri 31/01/20	Mon 03/02/20	Complete
Demo Rehearsal	1 day	Mon 03/02/20	Mon 03/02/20	Complete
<i>Sprint 5 Start</i>				
<i>Stage 2 Final Review</i>	3 days	Tue 04/02/20	Thu 06/02/20	Complete
Submission Stage 2	1 day	Thu 06/02/20	Thu 06/02/20	



## 5.2. Adapted Plan

Since the F29PD has revealed the new group debates, a slot has been added to accommodate for this new task, and this will happen between sprints 7 and 8. Otherwise, the group is on progress to completion according to schedule. Thus, the plan will not change much. There are also buffers that were initially put in Sprint 6 for “completion of missing features” which will now be used to cover for any extra tweaks which we could not fit during the current sprints.

Task Name	Duration	Start	Finish
<i>Sprint 6 Start</i>			
<i>Progress Review Meeting</i>	1 day	Tue 11/02/20	Tue 11/02/20
Completing Partial Task Backlog	5 days	Tue 11/02/20	Mon 17/02/20
Recommendations Screen	2 days	Wed 12/02/20	Thu 13/02/20
Sharing to Social Media	2 days	Thu 13/02/20	Fri 14/02/20
<i>Sprint 7 Start</i>			
<i>Functionality Review III</i>	1 day	Tue 18/02/20	Tue 18/02/20
Debate Preparation	4 days	Wed 19/02/20	Mon 24/02/20
Testing III	1 day	Wed 19/02/20	Wed 19/02/20
Energy Charts	2 days	Thu 20/02/20	Fri 21/02/20
Graphs Screen	2 days	Fri 21/02/20	Mon 24/02/20
<i>Sprint 8 Start</i>			
<i>Functionality Review IV</i>	1 day	Tue 25/02/20	Tue 25/02/20
Debates Practice	1 day	Wed 26/02/20	Wed 26/02/20
Push Notifications	2 days	Thu 27/02/20	Fri 28/02/20
Usability Testing Prep	3 days	Fri 28/02/20	Tue 03/03/20



## 6. Testing & Challenges



## 6.1. Product testing

For the final project, a completely automated pipeline test will be created using gitlab runners, which is their CI tool. However, at the current moment, this is in progress, so manual testing has been conducted instead.

For backend the code was validated in a simple test to make sure it compiled, and then running a defined set of workloads.

First, the main landing page is tested, then the admin panel, then more specific tests involve adding data and making sure the database is populated.

For the frontend, any new functionality is tested as it is implemented, going through and making sure that all the buttons work. There are also bigger component tests to identify any major issues with the user flow.

For identifying whether it meets client standards, we have the demo with the line manager, in addition to usability testing which we will perform once the core prototype is ready to be shown to outside users. This testing is done in accordance with the usability guidelines we had set out in the prior report.

## 6.2. Challenges

Each section of the software development came with its own set of challenges. First of all, there was the amount of extra information required to learn about the new technologies we were using. Luckily, due to starting in winter break in addition to clear documentation and resources online, the hurdle was overcome successfully.

However, there were still some areas of confusion when it came to the code execution, most notably, the setup. Many of the group members could not get their local copies of the backend working initially, so extra time had to be spent making sure everyone could successfully run the backend to test certain functionality.

As the project progressed, it had become quickly apparent that there would be a lot of integration work required. This involves editing the other pages to fit a consistent design standard and making sure that different teams had a similar design library, and if not, adjusting based on the best design. We had to spend time trying out different designs and deciding on which design to stick with moving forward. This proved to be more challenging than initially expected due to the design's differences and our desire to modularize the front-end, which requires extra work to be done.

