**Requirements Document**

**Table of Contents**

1. Introduction
   1. 1.1.  Purpose
   2. 1.2.  Scope
2. General description
   1. 2.1.  Product perspective
   2. 2.2.  Product functions
   3. 2.3.  General constraints
3. Requirements
   1. 3.1.  User requirements
   2. 3.2. System requirements
4. Appendices
   1. 4.1.  Use case diagrams and textual use cases
   2. 4.2.  Data flow diagrams

**1. Introduction**

**1.1. Purpose**

This document describes the user requirements for the Future House System as requested by “Esteem”, a client whose aim is to raise environmental awareness and incentivize positive actions for the home dwellers as well as home managers. The System is intended to be used by members of the general population who will own the ‘future-proofed, zero-carbon, solar-powered’ house that will be presented by Esteem as part of World Expo 2020 in Dubai. The system will track and record energy generation and energy consumption inside the house, provide control over Internet enabled devices and make behavioral suggestions for the home dwellers and managers. The document is created for the benefit of “Esteem”, and the developers, Group Name developers.

It is therefore intended that the readers are:

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. Group Name: to act as a guide for us during the development process.

**1.2. Scope**

There is one software product – Future House System.

The System will consist of a native mobile application, web-based application, as well as a tablet-like screen installed inside the house, interacting with a backend server to provide the user with energy data information and control over IoT devices in the house. The backend server will be receiving the relevant information about the energy data of the house from a Central Monitoring Unit (CMU), which is pre-installed in the solar-powered house. The database will hold all the energy data, as well as the user information data.

The main functionality of the system is to record energy generation and consumption inside the smart house, and display these data in a user-friendly format through the mobile app as well as the web app. Also, the user will be able to control and manage IoT devices through the app. Furthermore, the user will be receiving daily feedback on the energy generation and consumption inside the house, and suggestions to improve the energy efficiency of the house.

.

1. General Description
   1. Product perspective

The development of this product is being sponsored by Esteem. It will provide a unique service for the owners and dwellers of Esteem’s solar powered houses. It will allow the users to view the energy consumption and as well as energy generation data, and will help them interact with IoT devices, lighting and A.C. in their home.

As this product will be providing a relatively unique service from most current smart home systems it has great potential for long­ term development and the capability to adapt to ever changing needs of the market.

* 1. Product functions

The system has 4 main functionalities:

* Record energy generation
* Record energy consumption
* Provide feedback to the user based on the usage patterns
* Provide control over IoT devices
  1. General constraints

The general constraints that would be encountered by the smart home system can be classified into the below categories:

* **User based constraints**: Users may find it very hard to keep pace with the smart home device configuration as they will be updated every time there is a change in preference or when new habits and routines are formed.

Users may also be burdened with the additional expense that will incur when an IoT device has to be replaced or when the server has to be updated as the income capacity of these users may not always be predictable.

* **Technological constraints:** There is always a chance of risk of malfunctioning of the IoT devices, or sensors or the central unit in smart home systems, along with the potential damage to the power storage which would all lead to hindrance in the working of the smart home system.

The risk of traffic overload in IoT devices in the network is also prevalent as extensive number of IoT devices are involved in the system.

* **Security based constraints:** There is a possibility of the loss of control of a thermostat or a smoke detector that will have consequences on the user safety. In case of fire, the emergency number has to be dialed which won’t happen in case of a power down of the system.
* **Energy Constraints**: Majority of devices are operated with battery power and the availability of battery power is based on the frequency of the storage data and computations. Therefore, energy is limited for smart home devices. Energy limitations provide vulnerability to resource depletion attacks
* **Physical Access**: If an intruder is successful to obtain the physical access of a device in a smart home in some way, then he/she will be able to take out all the encryption keys and other sensitive information. Therefore, they become easy targets of tampering attacks.

1. Requirements

|  |  |
| --- | --- |
| **M** | Must have |
| **S** | Should have |
| **C** | Could have |
| **W** | Won’t have this time |

* 1. User Requirements

|  |  |  |  |
| --- | --- | --- | --- |
| **Registration** | | |  |
| F-UR1 | | **Register as home manager**  Users shall be able to register as home managers and register their home. | **M** |
| F-UR2 | | **Register as home dweller**  Users shall be able to register as home dwellers. | **M** |
| F-UR3 | | **Login**  Users shall be able to sign in using their email and password. | **M** |
| F-UR4 | | **Logout**  Users shall be able to logout of their account | **M** |
|  |

|  |  |  |
| --- | --- | --- |
| **Home Dweller Specific Functionalities** | |  |
| F-UR5 | **Control IoT Devices**  The user shall be able to switch on/off IoT devices | **M** |
| F-UR6 | **IoT devices feedback**  The user shall be able to get a comprehensive feedback on the various IoT devices in the home, such as battery level and energy consumption. | **S** |
| F-UR7 | **Recommendations**  The user shall get recommendations based on his usage to improve energy efficiency | **S** |
| F-UR8 | **Sharing Statistics**  Home dwellers shall be able to share statistics to social media. | **C** |
| **Home Manager Specific Functionalities** | |  |
| F-UR9 | **Detailed Data usage**  Home managers shall be able to get a more detailed information on energy usage | **M** |
| F-UR10 | **Register multiple homes**  Home managers shall be able to register more than one home to their account. | **S** |
| F-UR11 | **Compare data usage**  Home managers shall be able to compare data usage of the different homes registered to their account. | **C** |

|  |  |  |
| --- | --- | --- |
| **Account** | |  |
| F-UR12 | **Change login credentials**  The user shall be able to change his email and password | **M** |
| F-UR13 | **Delete account**  The user shall be able to delete his account and all the data associated to that account. | **M** |

* 1. System Requirements

|  |  |  |  |
| --- | --- | --- | --- |
| **Backend Software** | | |  |
| NF-SR1 | | **Server OS**  The backend server will be hosted on a Linux server. | **S** |
| NF-SR2 | | **Environment**  The backend server will be running Python 3.6 | **S** |
| NF-SR3 | | **Database**  The backend database will be running PostgreSQL. | **S** |
| NF-SR4 | | **MVC Architecture**  The system shall use a Model-View-Controller framework. | **S** |
|  |

|  |  |  |
| --- | --- | --- |
| **Frontend Software** | |  |
| NF-SR5 | **Support multiple mobile platforms**  The Mobile App shall support Android and iOS | **M** |
| NF-SR6 | **Browser Support**  The Web App shall be able to run across all widely supported web browsers. | **M** |
| NF-SR7 | **Desktop App support**  There shall be Windows, MacOS and Linux desktop apps for the system. | **W** |
|  |
| **Security** | |  |
|  |  |  |
| NF-SR8 | **Hashing passwords**  The system shall hash passwords, such that no raw passwords are stored on the database. | **M** |
| NF-SR9 | **Auth Token**  The system shall issue an Authentication token related to a particular user when a user successfully logs in and invalidate that token when the user logs out. | **M** |
| NF-SR10 | **Password criteria**  The system shall require passwords to be at least 6 characters long | **S** |

|  |  |  |
| --- | --- | --- |
| **Performance** | |  |
| NF-SR11 | **Uptime**  The system shall have an uptime of 99% | **S** |
|  |  |  |
| NF-SR12 | **Transaction capacity**  The system shall be able to handle a minimum of 1000 IOPS. | **S** |
| NF-SR13 | **Responsiveness**  The backend server shall have a latency of less than 300ms. | **S** |
| NF-SR14 | **Multiple backend servers**  The system shall have multiple backend servers around the world to provide the most optimum latency for every user based on his location. | **W** |
|  |  |  |

1. **Appendices**
   1. **Use case diagram**

**A close up of a map

Description automatically generated**

**4.2 Data Flow Diagrams**

**A. Report**

**A close up of a map

Description automatically generated**

**B. Manager Report**

**A close up of a map

Description automatically generated**

**C. Voice Request**

**A close up of a map

Description automatically generated**

**D. Normal Request**

**A close up of a map

Description automatically generated**

**E. Motion Detect**

**A close up of a map

Description automatically generated**

**Risk Analysis Document**

|  |  |  |  |
| --- | --- | --- | --- |
| **L – Likelihood** | | **C – Consequence** | |
| **A** | Almost Certain | **A** | Severe |
| **B** | Likely | **B** | Major |
| **C** | Possible | **C** | Moderate |
| **D** | Unlikely | **D** | Minor |
| **E** | Rare | **E** | Trivial |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Risk** | **Risk type** | **L** | **C** | **Indicators** | **Strategy type** | **Strategy** |
| **Student dropout** | Project:  People | E | B | The student may indicate that he/she would dropout | Mitigate | Reorganize team so that there is more overlap of work and therefore we understand more each other’s work |
| **Student illness** | Project:  People | D | C | Usually illness happens suddenly | Mitigate | The ill student can have less work while ill, and then can catch up later by putting in extra work. |
| **Technology discontinued** | Business:  Technology | D | D | Software company announcement | Mitigate | Use open source frameworks, so our work won’t be affected even if the technology is discontinued. |
| **Natural Disaster** | Project:  People | E | A | Could happen without an indicator | --- | In case of a catastrophic natural disaster that would lead to the termination of the project, nothing could be done. |
| **Inability to meet deadlines** | People:  Estimation | C | B | Having several other deadlines in a short time period | Management | Re-evaluate current plan ASAP |
| **Poor communication** | Project:  People | D | B | Poor relationships amongst team members | Monitor | Monitor and resolve any conflicts among team members. |
| **Specifications change** | Product:  Requirements | E | B | An announcement from the project Co-Ordinator | Management | Although very unlikely to have changes in the specifications mid-project, but we would re-evaluate our plan in case that happened. |
| **Management change** | Business:  Organization | E | E | An announcement that we would have a new manager | Mitigate | Having a new line manager won’t affect our plan of work. |
| **Buggy software** | Project:  People | C | A | Discovering bugs while testing | Management | Have more people to focus on the buggy part till the issue is resolved. |
| **Server crash** | Business:  Technology | E | A | An announcement from the service provider | Mitigate | We will be deploying our backend server on AWS, which have an uptime of over 99%. |