

Requirements Document

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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.

2. General Description

2.1 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.

2.2 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

2.3 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.

3.Requirements

M	Must have
S	Should have
C	Could have
W	Won't have this time

3.1 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

3.2 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
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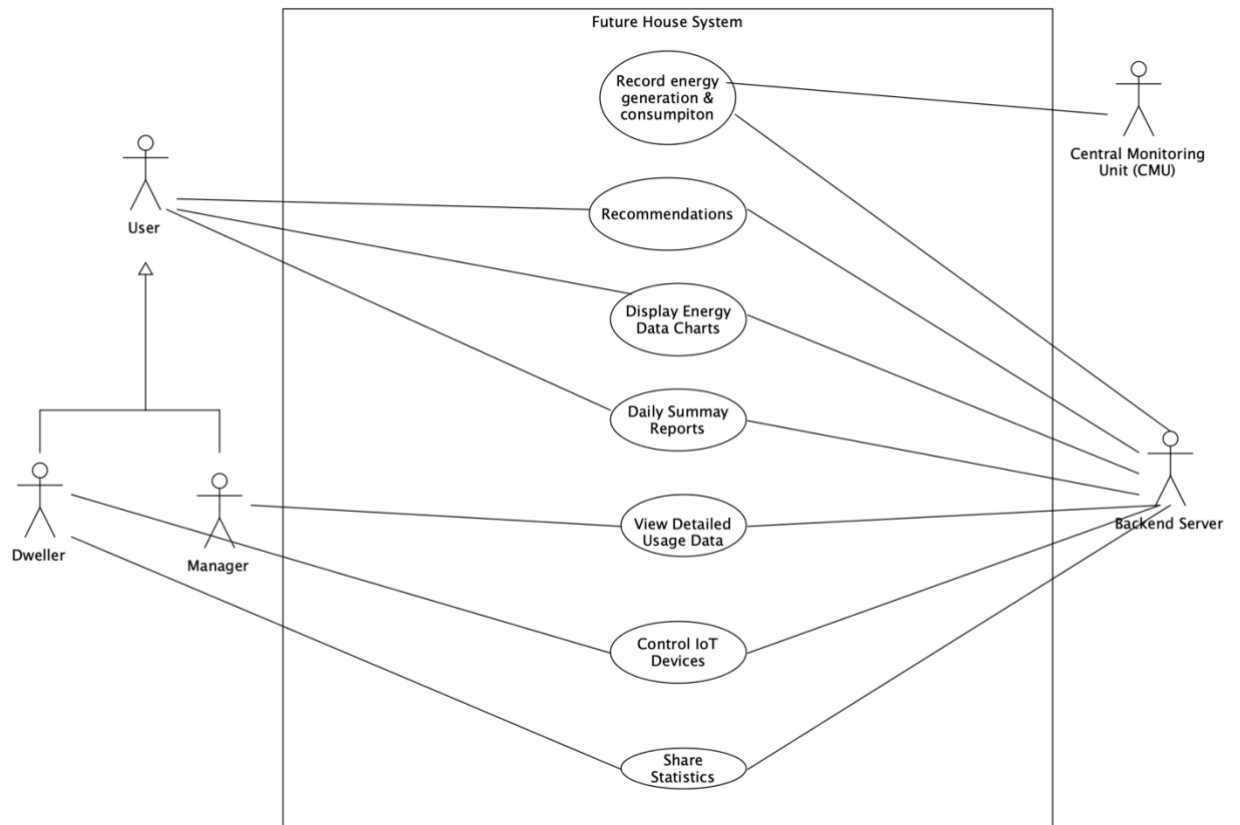
NF-SR9	Auth Token The system shall issue an Authentication token related to a particular user when a user successfully logs in and invalidate that token when the user logs out.	M
NF-SR10	Password criteria The system shall require passwords to be at least 6 characters long	S

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

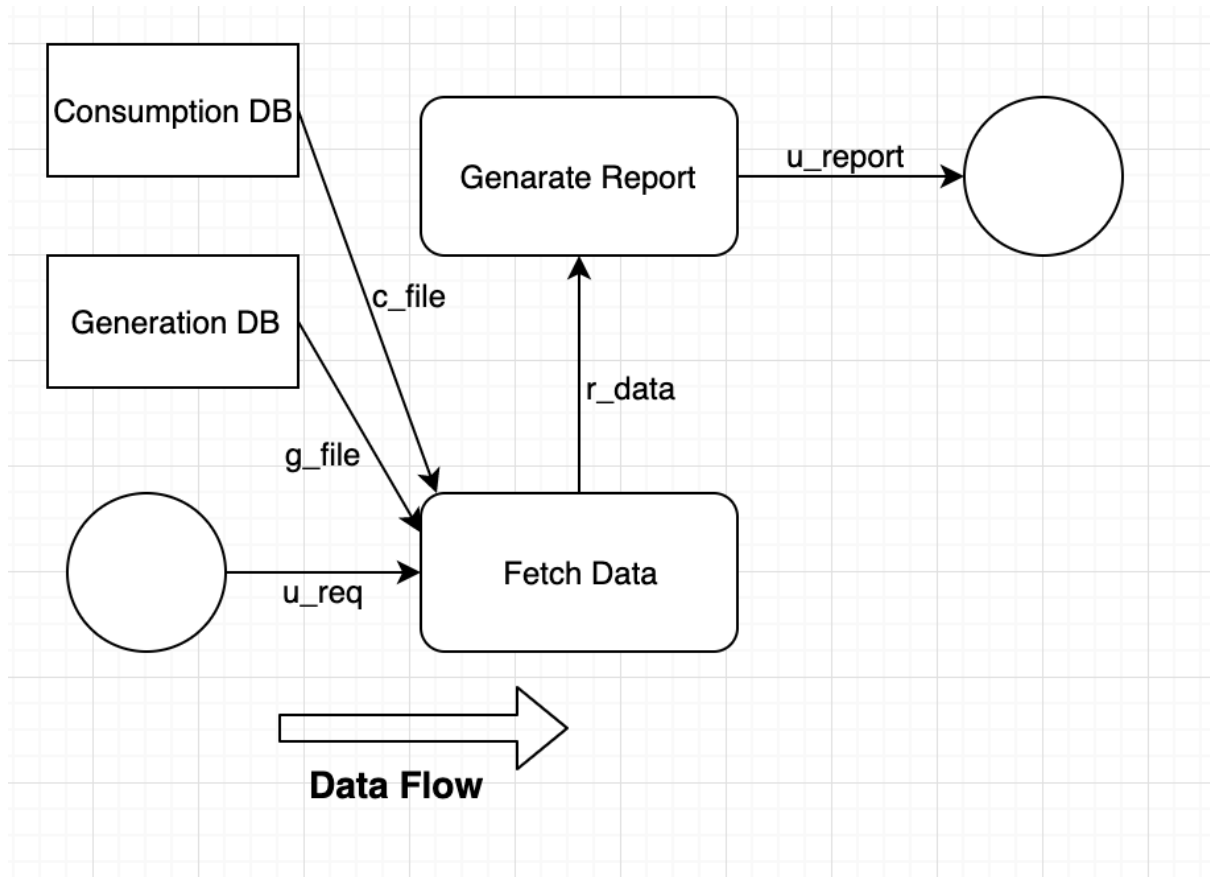
4. Appendices

4.1 Use case diagram

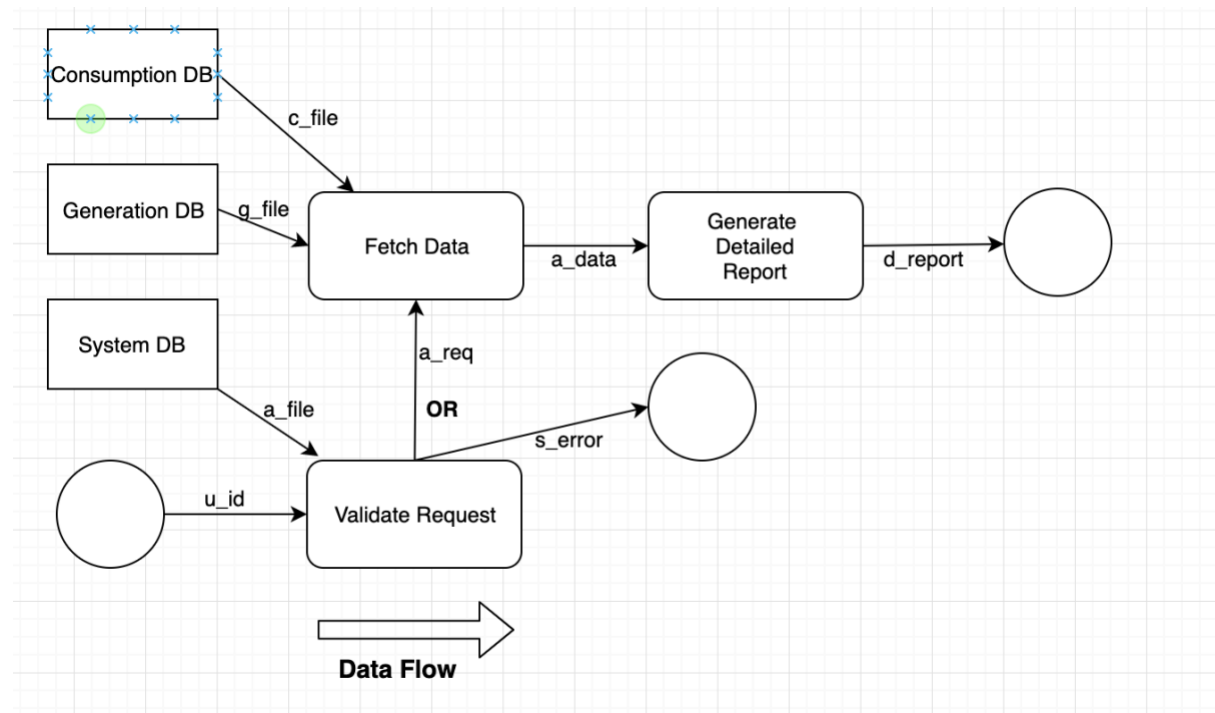


4.2 Data Flow Diagrams

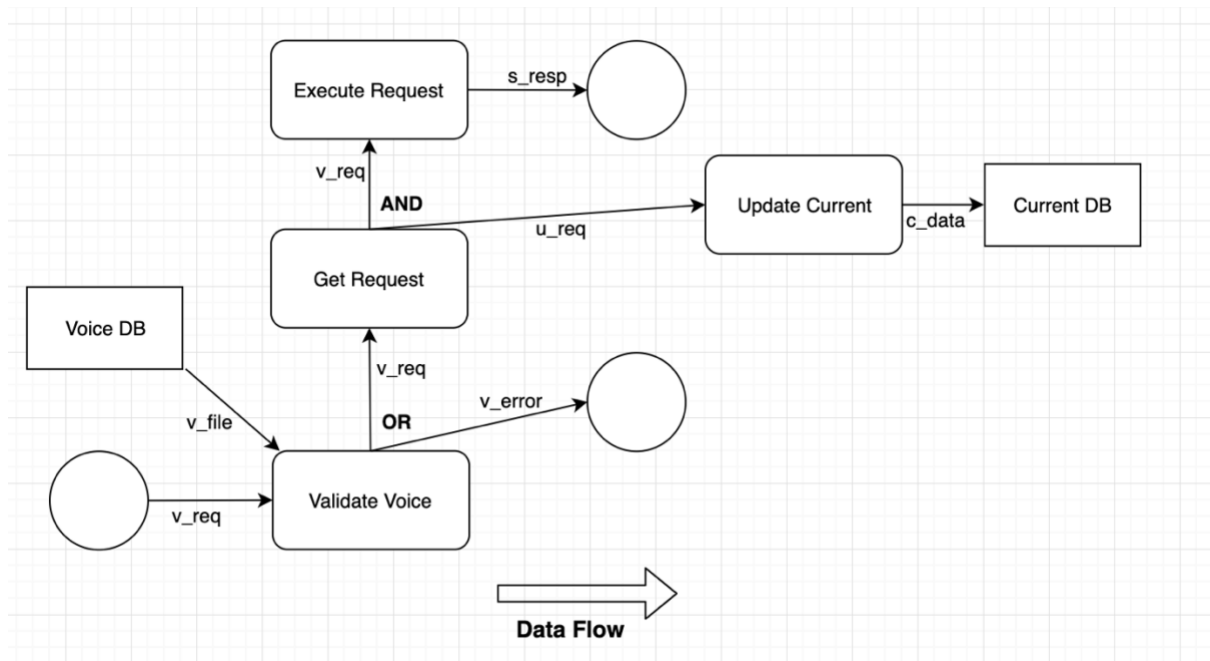
A. Report



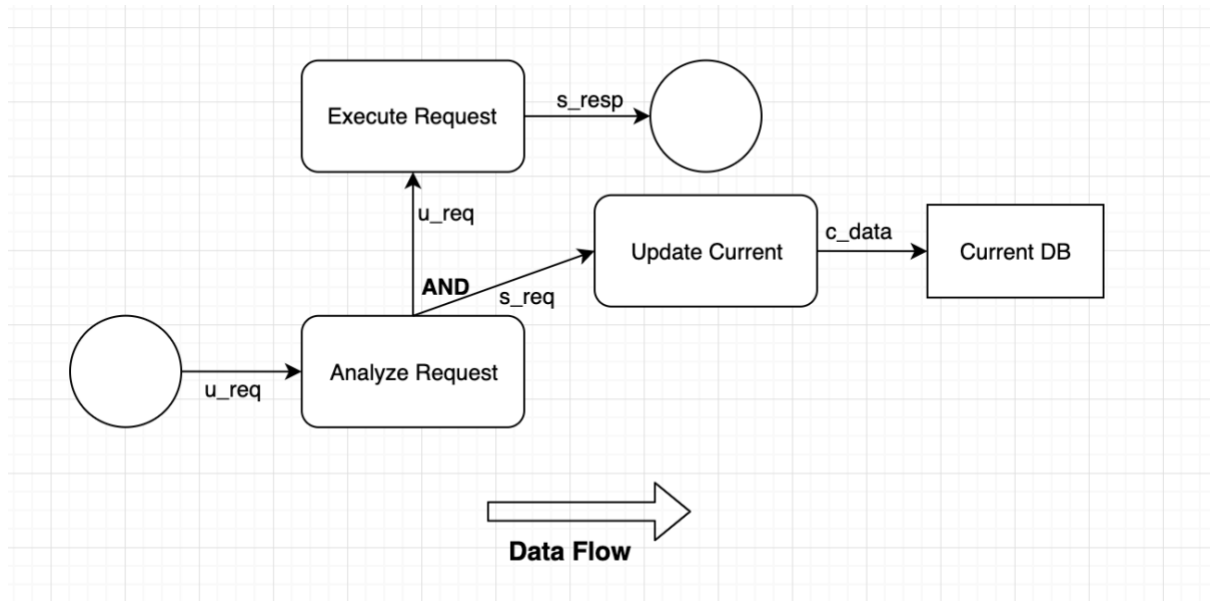
B. Manager Report



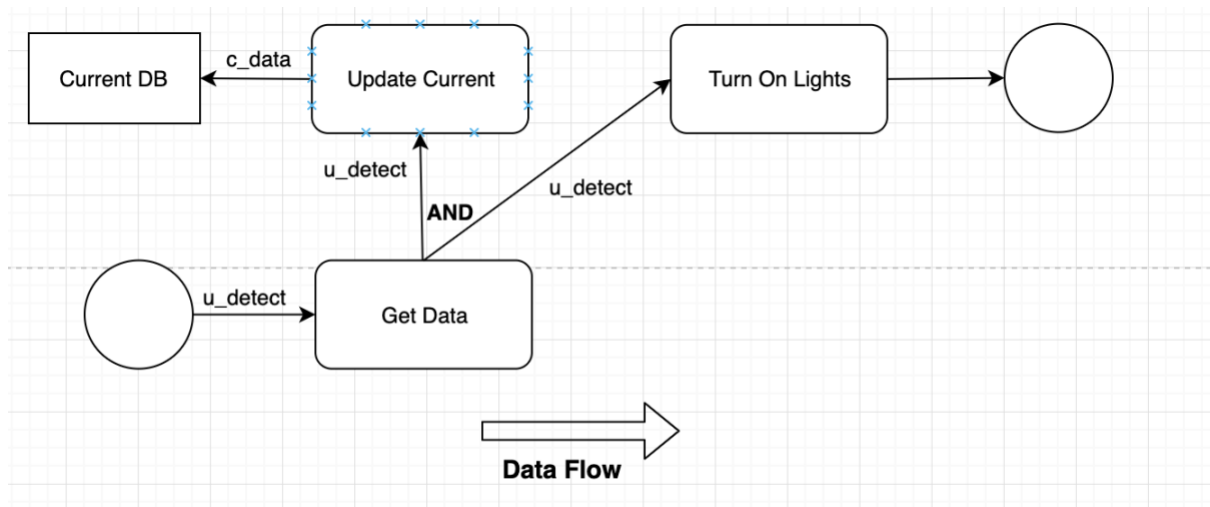
C. Voice Request



D. Normal Request



E. Motion Detect



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%.
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