



**Discovering Knowledge**

# **CQI REPORT**

**CLASS: BSE – 6 C**

## **Project Title**

**Smart Home Energy Management System**

## **Group Members**

<b>Student Name</b>	<b>Enrollment#</b>
Ahmed Younas	02-131222-115
Azhar Rasool	02-131222-118
Sarim Zia	02-131222-065
Hunain Nasir	02-131222-041

## Table of Contents

1. Project Definition .....	3
Problem: .....	3
2. Vision Statement .....	3
3. Vision Scope Document .....	3
1. Business Requirements .....	3
2. Scope and Limitations.....	4
3. Business Context .....	4
4. SRS Document (Software Requirements Specification) .....	5
A. Introduction .....	5
B. Document Conventions .....	5
C. References .....	5
D. Overall Description.....	5
E. Specific Requirements.....	6
5. UML Diagrams .....	6
A. Use Case Diagram.....	6
B. Class Diagram.....	7
C. Sequence Diagram.....	7
D. Activity Diagram .....	8
6. Low-Fidelity Prototypes .....	8
• Prototype 1 .....	8
• Prototype 2 .....	8
7. High-Fidelity Prototypes .....	9
• Prototype 1 .....	9
• Prototype 2 .....	10
8. References .....	10

## 1. Project Definition

**Problem:** Homeowners lack centralized control over energy-consuming devices, leading to high electricity bills and inefficient usage.

**Solution:** Develop a mobile app that enables real-time monitoring, control, and automation of smart home appliances to reduce energy consumption and costs.

## 2. Vision Statement

To empower homeowners with intelligent control and insights into their energy consumption through a unified mobile application, enhancing convenience, efficiency, and sustainability in their living environment.

## 3. Vision Scope Document

### 1. Business Requirements

- **1.1 Background:** Energy consumption in homes is rising due to multiple smart appliances being used inefficiently.
- **1.2 Business Opportunity:** The system will save energy costs, reduce environmental impact, and improve user convenience.
- **1.3 Business Objectives:**
  - Reduce energy consumption by 20%
  - Enable automation for routine energy usage
  - Increase user engagement with smart devices
- **1.4 Success Metrics:**
  - 5,000 active users in 6 months
  - 95% app uptime
  - 20% drop in average energy use
- **1.5 Vision Statement:**
  - To empower homeowners with intelligent control and insights into their energy consumption through a unified mobile application, enhancing convenience, efficiency, and sustainability in their living environment.

- *1.6 Business Risks:*
  - Integration issues with diverse IoT devices
  - Security vulnerabilities
- *1.7 Assumptions/Dependencies:*
  - Users have Wi-Fi-connected smart devices
  - Third-party APIs for smart devices

## 2. Scope and Limitations

- *2.1 Major Features:*
  - Dashboard of energy usage
  - Device control and scheduling
  - Automation rules (if/then logic)
- *2.2 Scope of Initial Release:*
  - Lights, air conditioners, heaters
  - Manual control and automation
- *2.3 Scope of Future Releases:*
  - Solar panel monitoring
  - Energy billing analysis
- *2.4 Limitations:*
  - No third-party security system integration
  - No support for offline devices

## 3. Business Context

- *3.1 Stakeholders:*
  - Homeowners
  - Developers
  - Utility providers

- **3.2 Priorities:**
  - User-friendliness > Features
  - Security > Performance
- **3.3 Deployment:**
  - Android/iOS app
  - Cloud backend

## 4. SRS Document (Software Requirements Specification)

### A. Introduction

- **Purpose:** Provide functional specs for a smart home energy management app.
- **Scope:** Control and monitor home appliances and automate routines.
- **Overview:** Modular app with dashboard, control panel, and automation engine.

### B. Document Conventions

- FR = Functional Requirement
- NFR = Non-Functional Requirement

### C. References

- IEEE SRS Guidelines
- Google Smart Home API

### D. Overall Description

- **Product Perspective:** Standalone app integrated with IoT platforms
- **Product Functions:** Monitor, control, automate smart devices
- **User Classes:** Admin (homeowner), Guest
- **Operating Environment:** Android, iOS, Web (optional)
- **Constraints:** Real-time updates, mobile-first design
- **Assumptions:** Smart devices are compatible with API

## E. Specific Requirements

### *Functional Requirements (FR)*

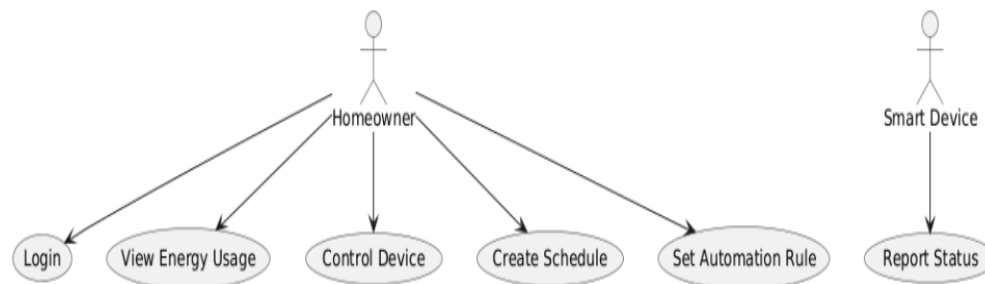
- FR1: User login and authentication
- FR2: View real-time device status
- FR3: Switch devices on/off
- FR4: Create and edit schedules
- FR5: View energy usage reports
- FR6: Configure automation (e.g., “Turn off heater if temp > 26°C”)

### *Non-Functional Requirements (NFR)*

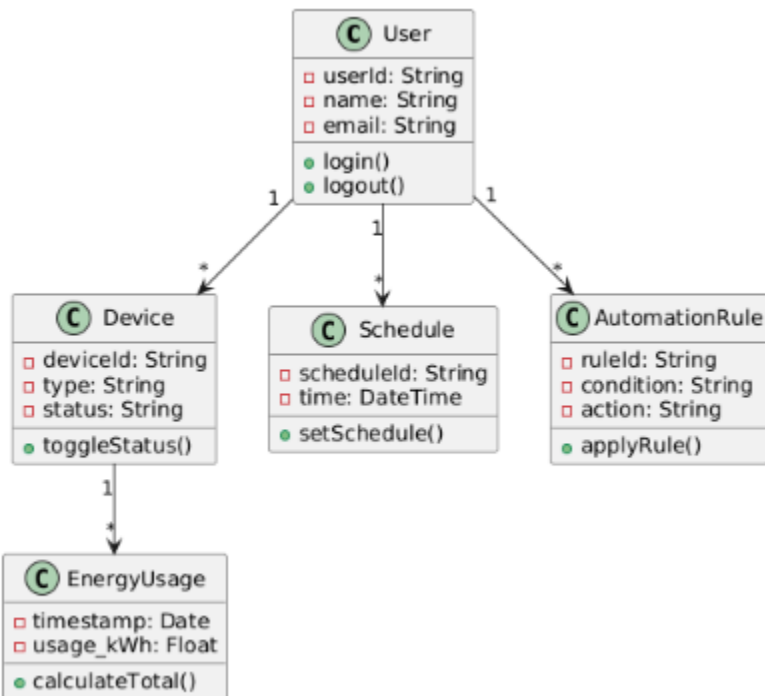
- NFR1: System shall respond to commands within 2 seconds
- NFR2: Data encryption (AES 256) for all communications
- NFR3: 99% uptime per month
- NFR4: App should work on Android 10+ and iOS 13+
- NFR5: Scalability for 10,000 users

## 5. UML Diagrams

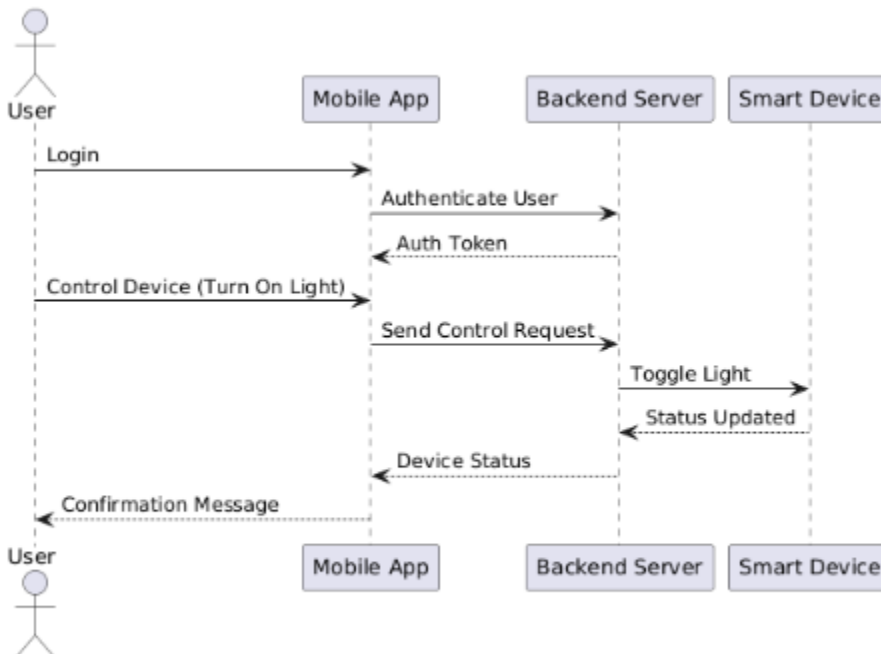
### A. Use Case Diagram



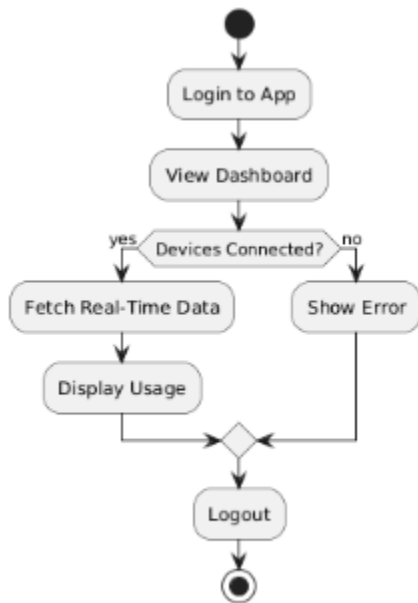
## B. Class Diagram



## C. Sequence Diagram

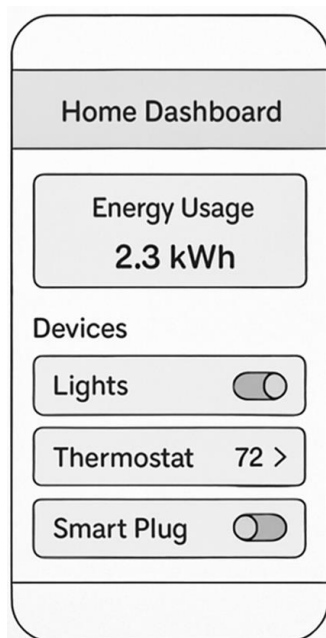


## D. Activity Diagram



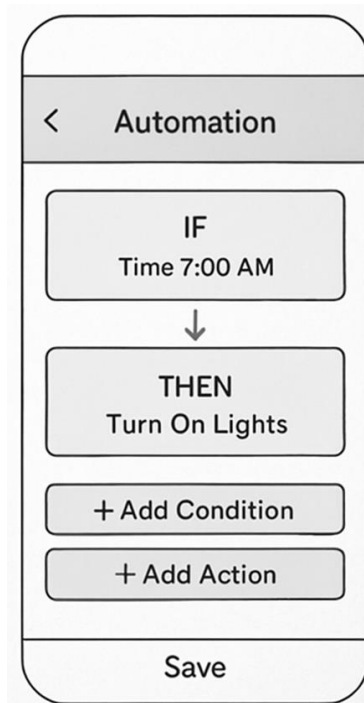
## 6. Low-Fidelity Prototypes

- **Prototype 1:** Home Dashboard



- **Prototype 2:** Automation Screen



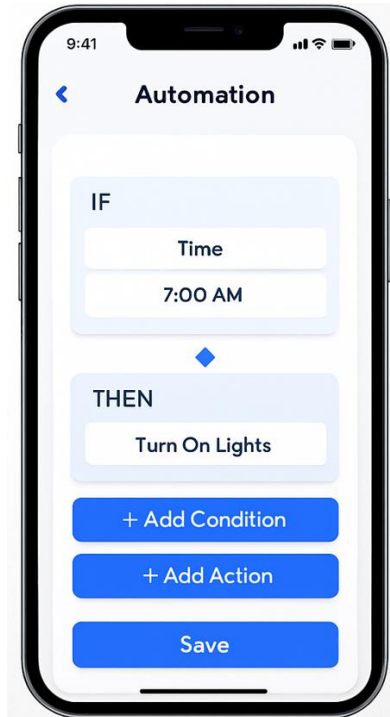


## 7. High-Fidelity Prototypes

- **Prototype 1:** Interactive energy usage dashboard with charts and toggles



- **Prototype 2:** Automation rule builder with a drag-and-drop interface



## 8. References

- [1] I. Sommerville, *Software Engineering*, 10th ed., Pearson Education, 2016.
- [2] R. S. Pressman and B. R. Maxim, *Software Engineering: A Practitioner's Approach*, 8th ed., McGraw-Hill Education, 2014.
- [3] IEEE, *IEEE Recommended Practice for Software Requirements Specifications (IEEE Std 830-1998)*, 1998. [Online]. Available: <https://ieeexplore.ieee.org/document/720574> [Accessed: Aug. 7, 2025].
- [4] S. W. Ambler, *The Elements of UML 2.0 Style*, Cambridge University Press, 2005.
- [5] J. Tidwell, *Designing Interfaces: Patterns for Effective Interaction Design*, 2nd ed., O'Reilly Media, 2010.
- [6] Figma, *Prototyping in Figma*. [Online]. Available: <https://www.figma.com/prototyping> [Accessed: Aug. 7, 2025].
- [7] Nielsen Norman Group, *Low-fidelity vs. High-fidelity Prototyping*. [Online]. Available: <https://www.nngroup.com/articles/low-vs-high-fidelity-prototypes/> [Accessed: Aug. 7, 2025].