

Project Title: Smart House Energy Management System

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Vision Statement

For modern homeowners **who** seek seamless, energy-efficient, and secure control over their living spaces, **our product** is a smart home management system **that** intelligently automates and monitors lighting, appliances, energy consumption, and security in real time. **Unlike** traditional home automation tools, **our product** offers a centralized, user-friendly dashboard with AI-powered insights, remote access, and personalized automation based on user behavior.

Problem Statement

In modern homes, energy usage is often inefficient due to a lack of real-time monitoring and control. Users are unaware of how much energy each device consumes and often forget to turn off appliances, leading to high electricity bills and energy waste.

Functional Requirements

These describe **what the system should do** the core features and functions.

1. User Authentication and Authorization

- a. Users must be able to register, log in, and manage their accounts securely.
- b. Role-based access (e.g., admin, user, guest).

2. Device Management

- a. Users can add, remove, and manage smart devices (e.g., lights, thermostat, fans, appliances, security cameras).
- b. Devices should show real-time status (on/off, temperature, etc.).

3. Real-Time Monitoring

- a. Display live data from devices such as room temperature, energy usage, security camera feeds, etc.

4. Remote Control

- a. Users can control devices remotely via mobile/web app (turn off lights, lock doors, adjust thermostat).

5. Notifications and Alerts

- a. System should send push/email/SMS notifications for specific events.

6. Energy Usage Reporting

- a. Show detailed reports on daily/weekly/monthly energy consumption per device and overall.

7. Voice Assistant Integration

- a. Support integration with Google Assistant, Alexa, or Siri for voice-based control.
- 8. User Profiles and Preferences**
 - a. Save personalized settings for lighting, temperature, and routines per user.
- 9. Scheduling**
 - Allow users to set schedules for devices (e.g., lights on at 6 PM, off at 10 PM).

Non-Functional Requirements

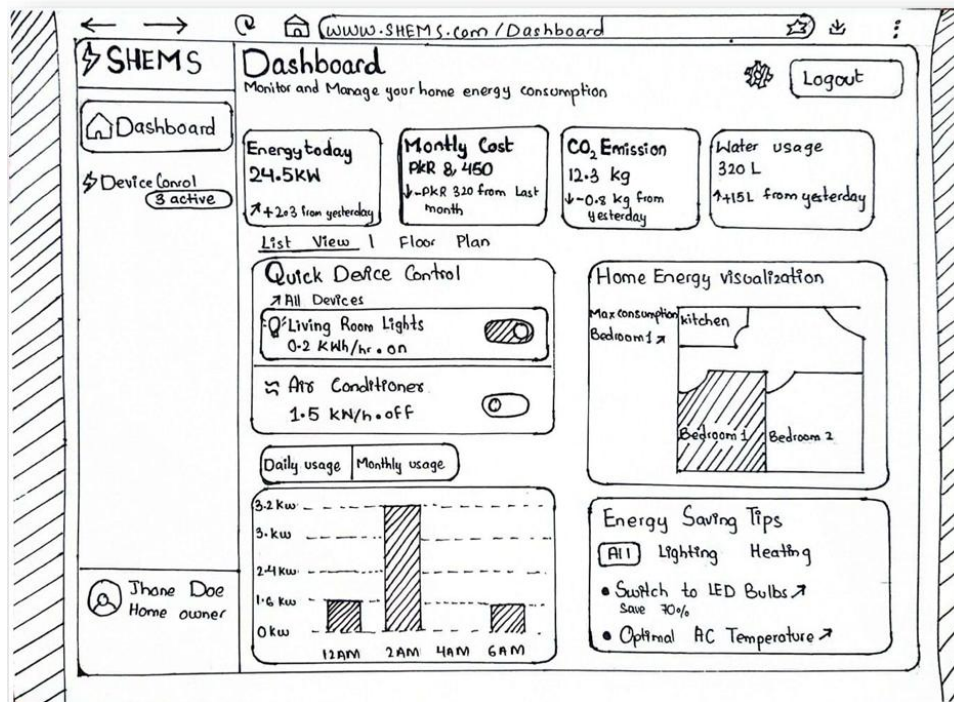
These define **how the system performs** quality attributes like security, performance, usability, etc.

- 1. Usability**
 - a. Interface should be intuitive, easy to navigate, and accessible on both desktop and mobile.
- 2. Reliability**
 - a. System must perform consistently without crashes or downtime, especially for safety-critical devices.
- 3. Performance**
 - a. Commands and status updates should execute with minimal latency (< 2 seconds).
 - b. System should support at least 100 concurrent users and 500 connected devices.
- 4. Security**
 - a. All data transmissions must be encrypted (TLS).
 - b. Role-based access control and secure storage of user credentials (e.g., hashed passwords).
- 5. Scalability**
 - a. The system should scale to support more users, devices, and data over time without performance issues.
- 6. Compatibility**
 - a. Support a wide range of smart devices from different manufacturers using standard protocols.
- 7. Maintainability**
 - a. The system should be modular and well-documented for easy maintenance and updates.
- 8. Availability**
 - a. System should have 99.9% uptime, especially for remote access and monitoring features.

Low-Fidelity Prototypes

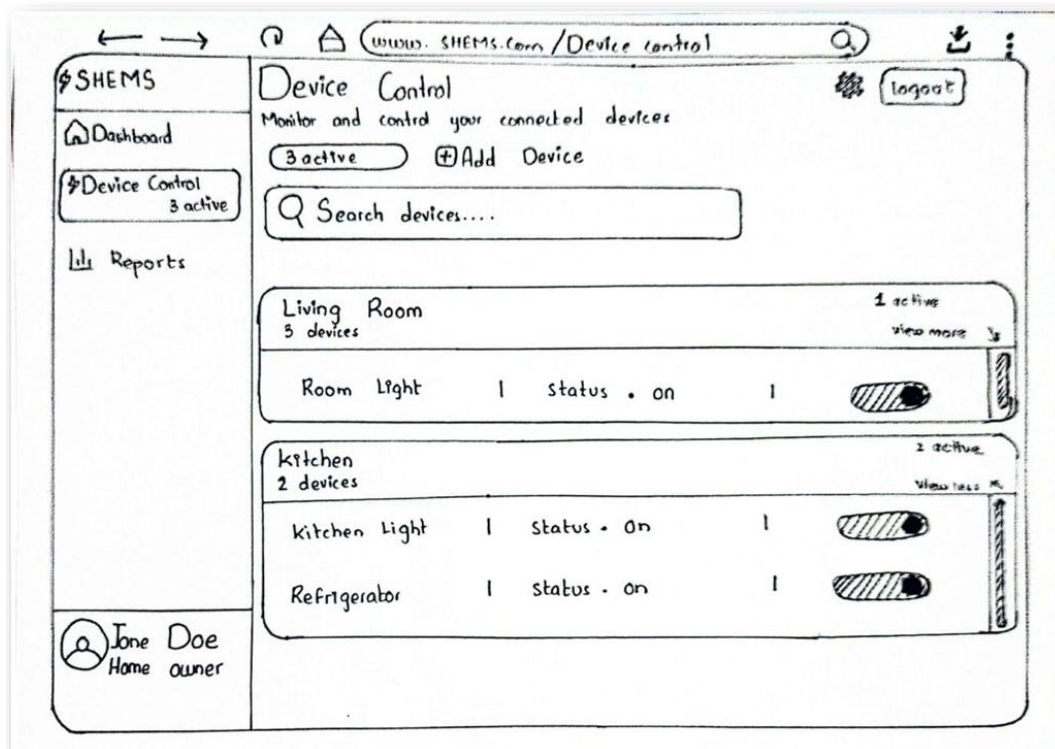
1. Dashboard:

Sketch of Dashboard with energy usage, cost card, device control, visual graphs, and energy tips. This helps you keep track of things without having to go deeper into the application.



2. Device Control Page:

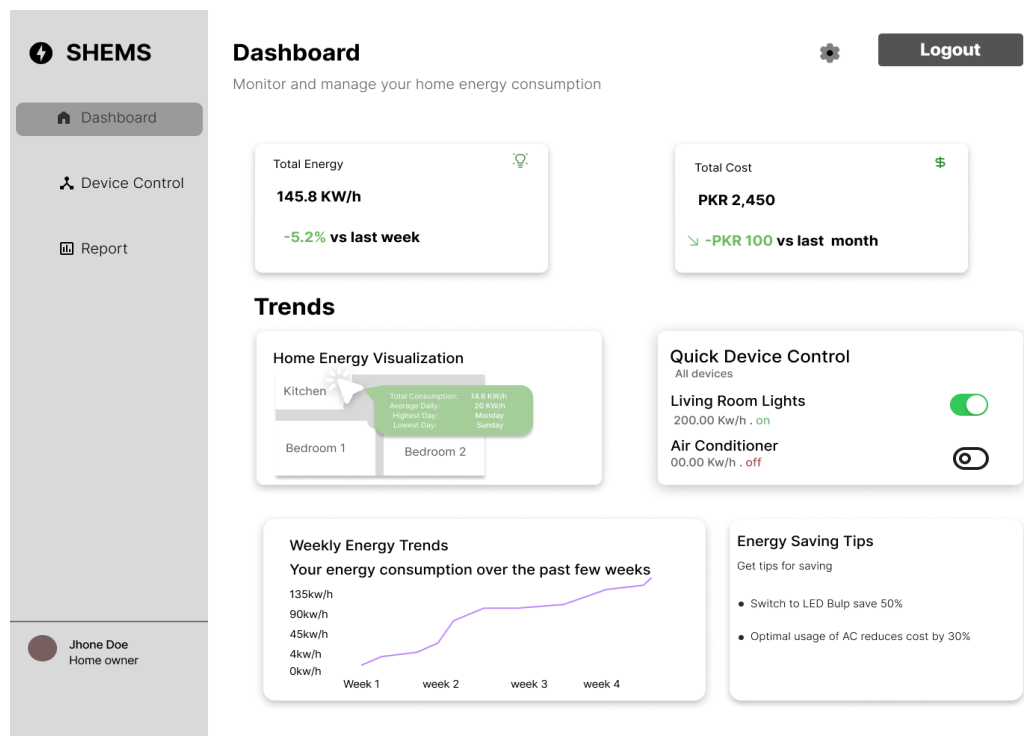
Search, control devices according to your energy needs so every device and technology in your house is on your fingertip.



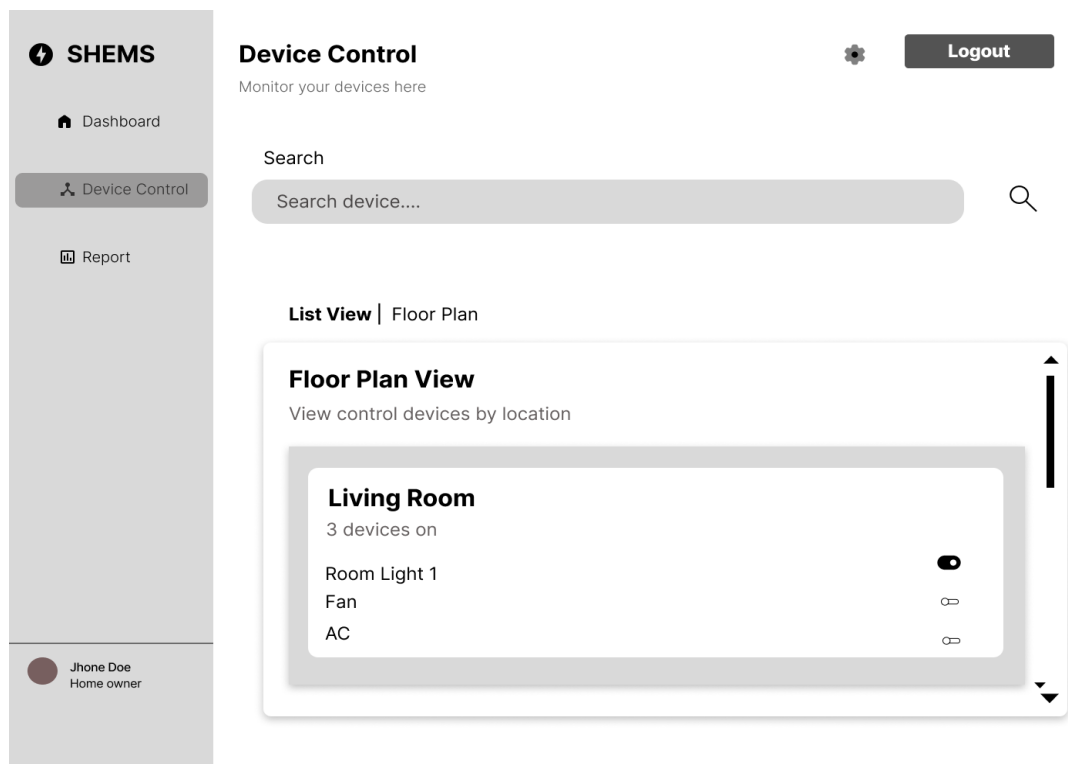
High-Fidelity Prototype

Used **Figma** to design an interactive and visually appealing mockup. This design shows all the screen that the user needs to interact with.

— Dashboard:

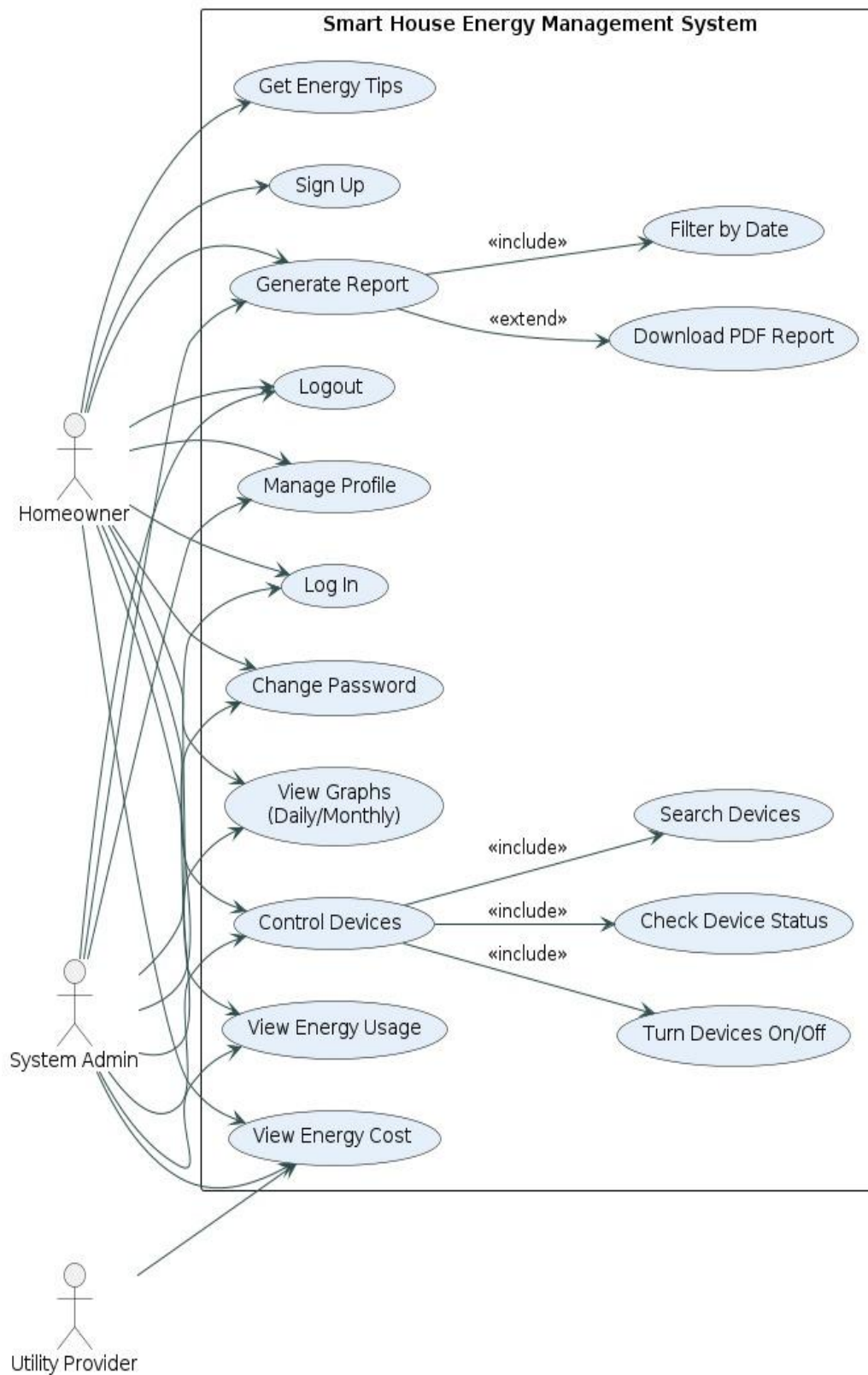


— Device Control Page:

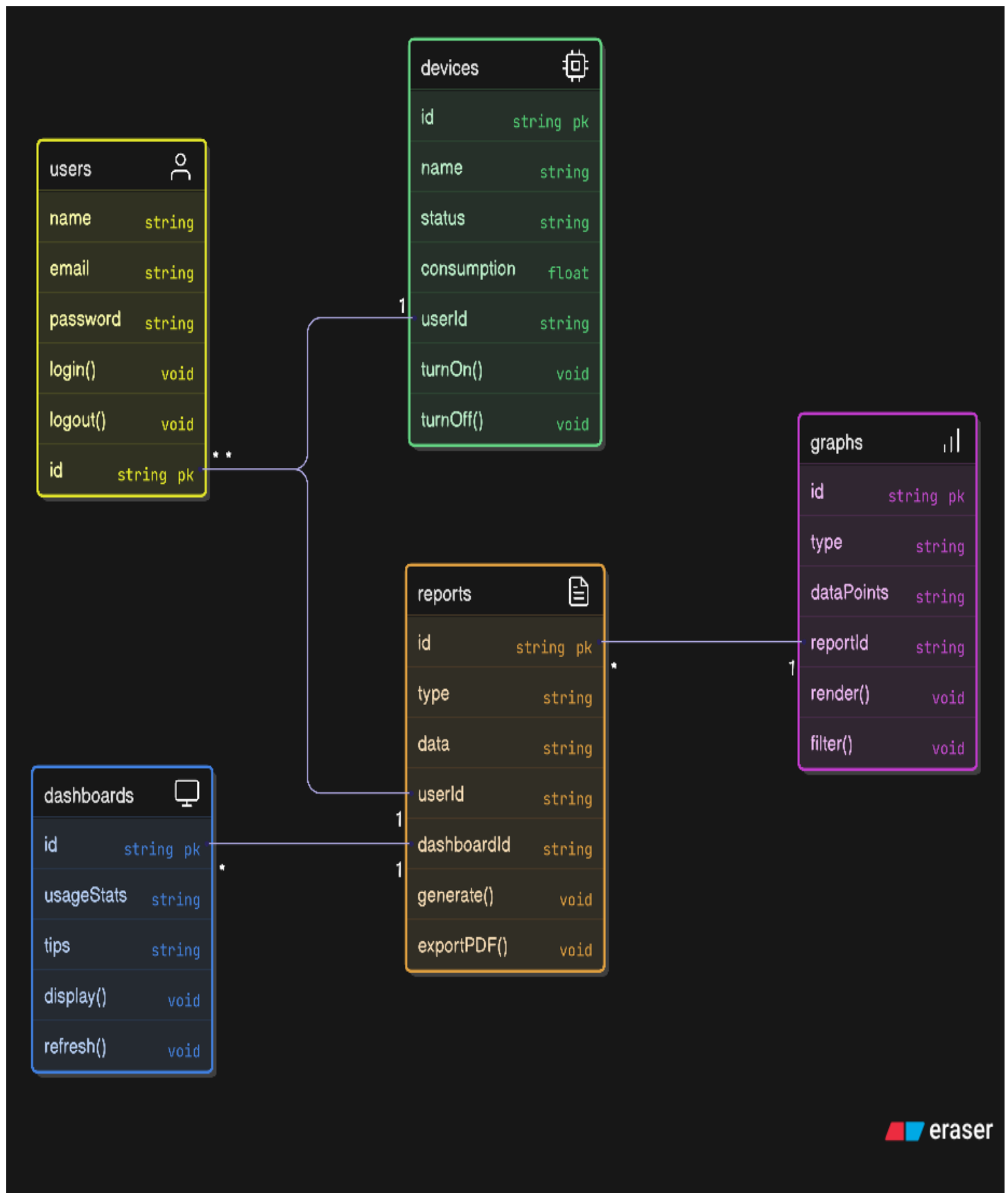


UML Diagrams:

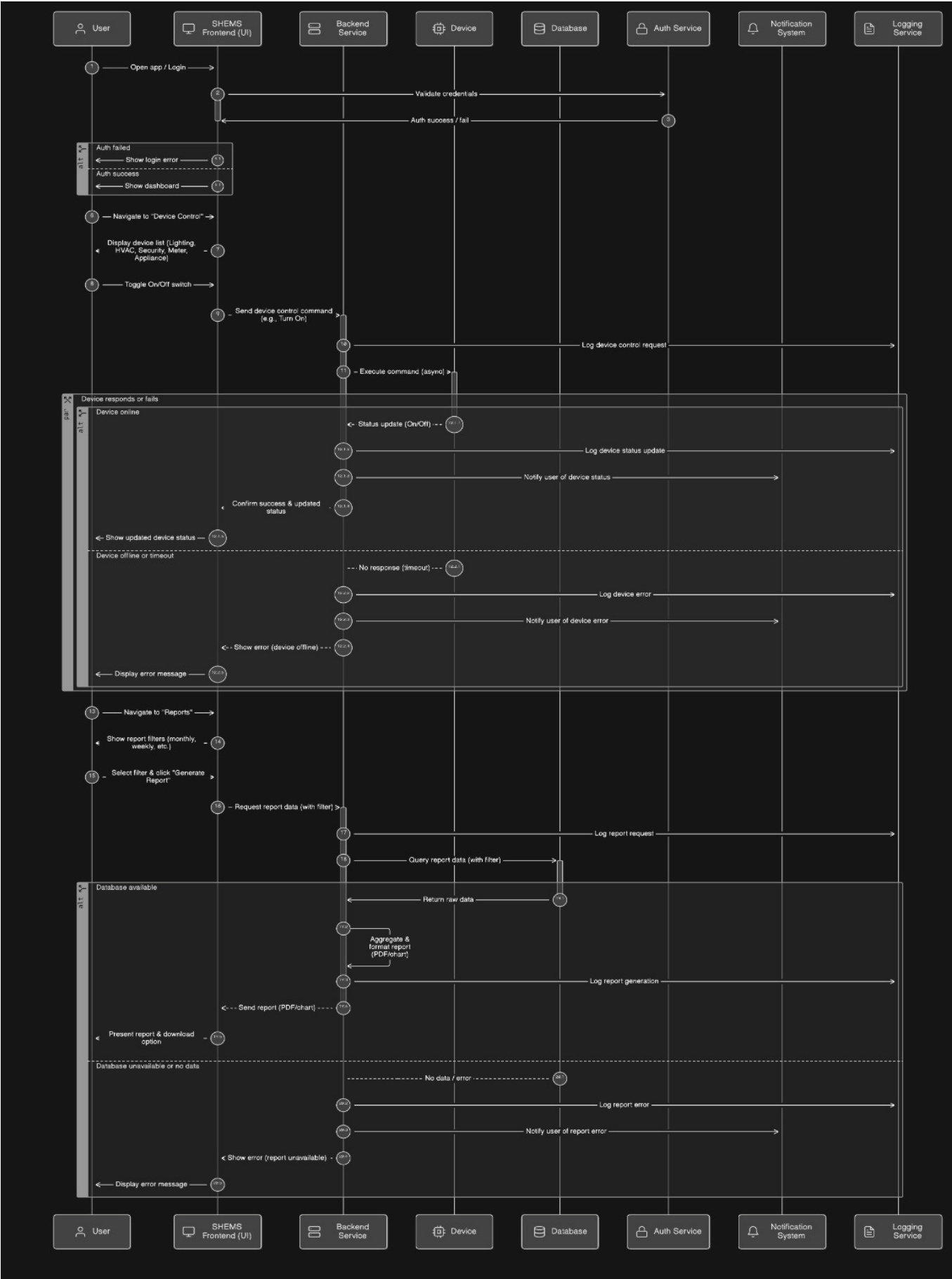
Use Case Diagram:



Class Diagram:



Sequence Diagram:



Context Diagram

