Technical Architecture for [CompanyX]

1. Introduction

This document presents the technical architecture and user experience design for [CompanyX], an innovative application aimed at visualizing and facilitating energy transactions through an IoT device. The system is designed with a modular feature set for smooth functionality and flexibility. Each section offers a detailed overview, including architectural diagrams and UX examples, to provide a clear and scalable framework for implementation.

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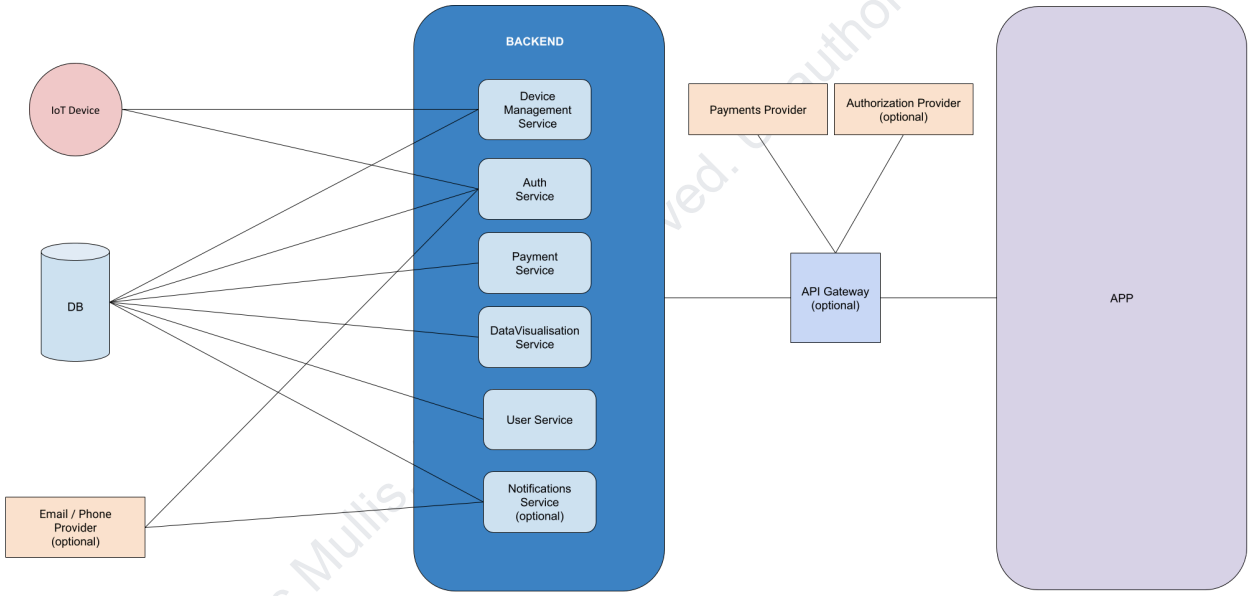
2. Global Overview

2.1. Architecture Diagram

This section provides a high-level overview of the system's architecture, highlighting the interaction between services to deliver the desired functionality.Optional providers or systems have been considered but could not be part of the initial implementation and may be included in future development.



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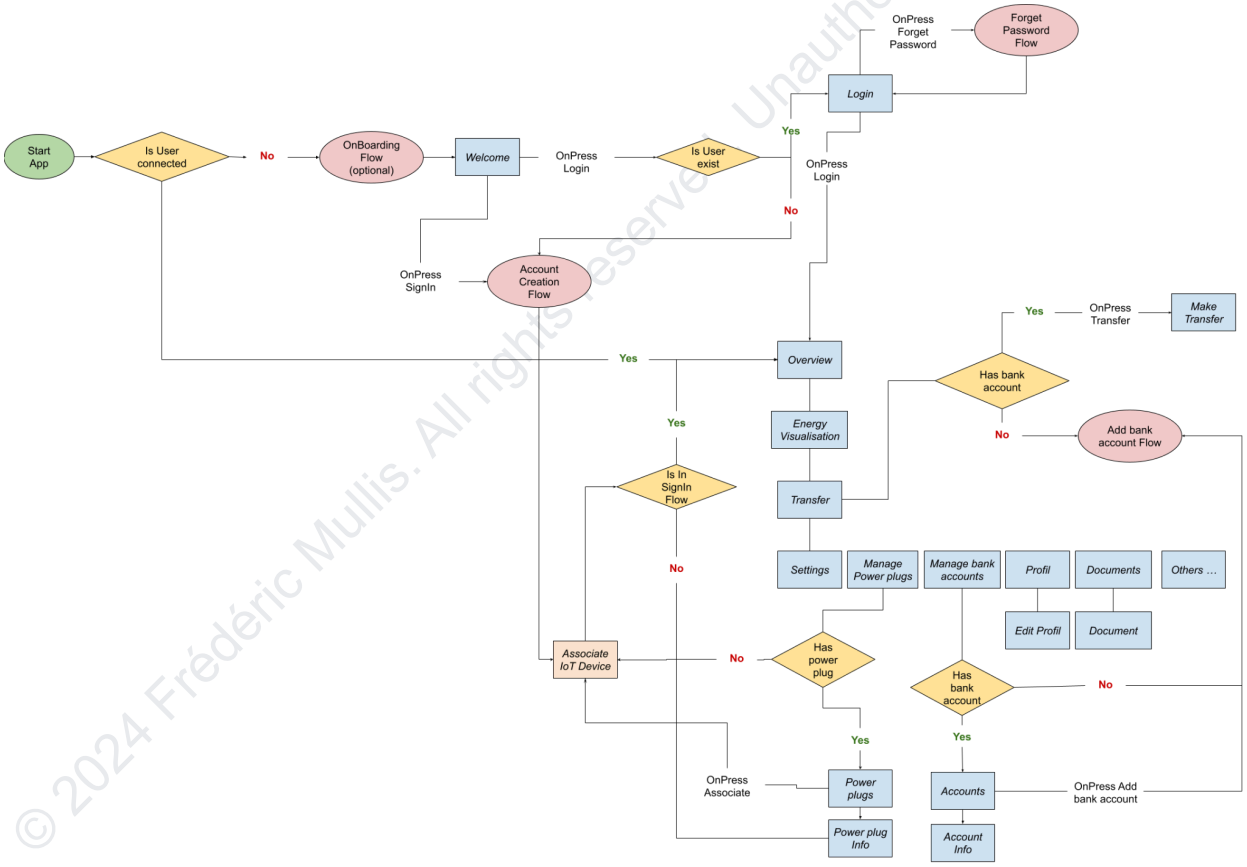
2.2. Flowchart

A high-level flowchart illustrates the relationships between the mobile features and the navigation experience.

2.2.1. Notes

A potential consideration arises when users have multiple power plugs and bank accounts. While the number of bank accounts does not affect the UX, the presence of multiple power plugs does. The flow and UX must be carefully designed to accommodate this scenario effectively.



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3. Authentication

3.1. Overview

Authentication ensures secure and reliable access to the platform. It covers account creation, secure login, password recovery, and logout processes.

3.1.1. Sub-Features

1. **Account Creation**: Enables users to sign up using their own credentials or with a auth provider (optional) and associate the account to a Iot Device
2. **Login:** Provides secure access with credentials or with auth provider (optional).
3. **Password Recovery:** Facilitates resetting a forgotten password via email or phone verification.
4. **Logout:** Allows users to log out from the system to ensure security.

3.1.2. Notes

1. There are several credential options available for the user to authenticate, including email address and, for added security, phone number.
2. There are several methods for implementing secure authentication, including JWT, OAuth, OpenID Connect, SAML, and others. Among these, OAuth stands out as particularly advantageous, especially when integrating with third-party services like Stripe Connect, as it simplifies the authentication process and enhances security.
3. In future development, Multi-Factor Authentication (MFA) can also be integrated into the workflow to further enhance connection security.

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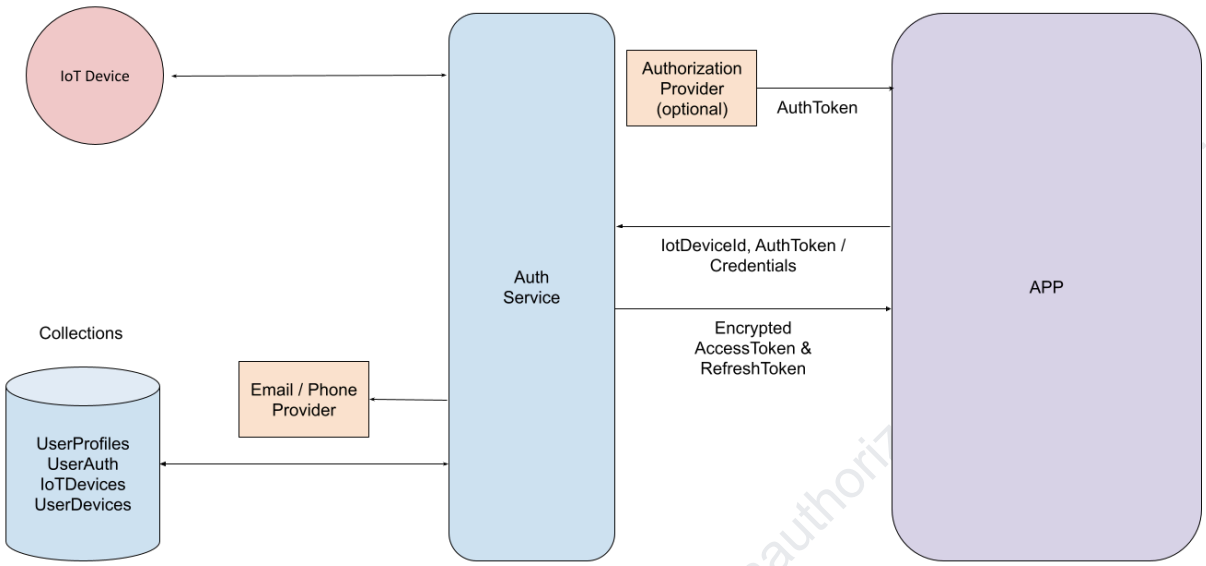
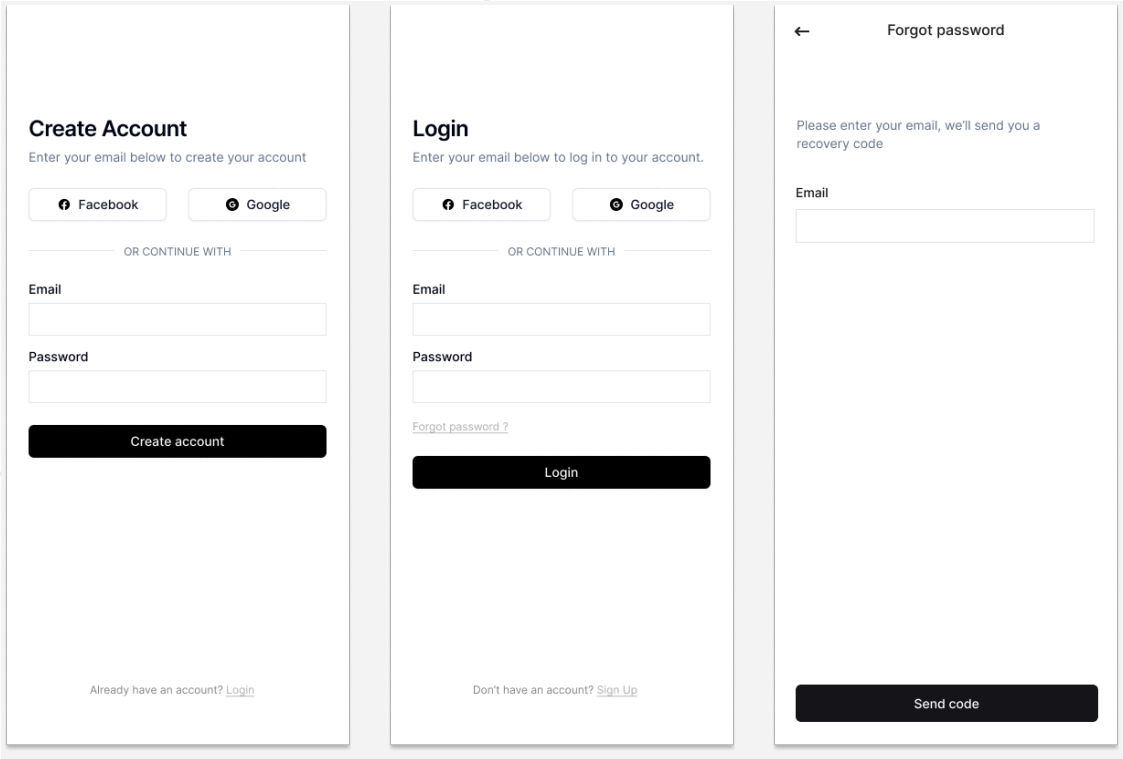
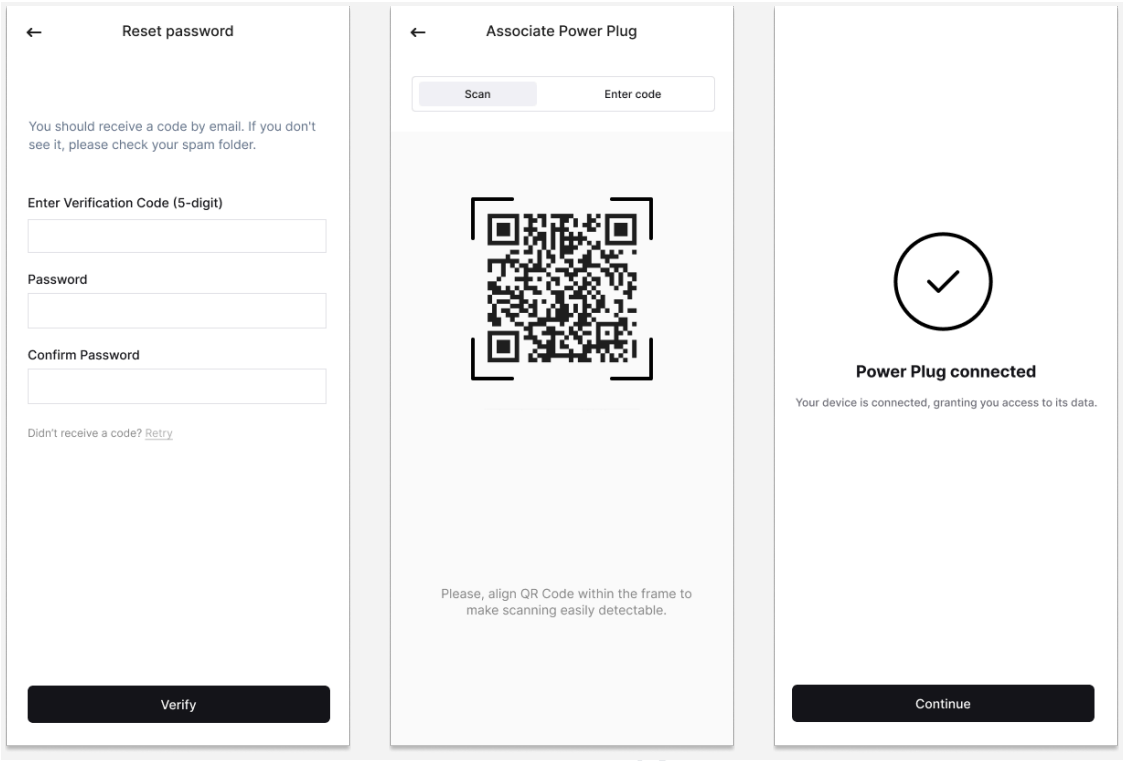
3.2. Architecture Diagram



3.3. UX Example





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4. Energy Data Visualization

4.1. Overview

This feature provides users with insights into their energy consumption through visual tools.

4.1.1. Sub-Features

1. **Consumption Balance:** Displays monthly energy usage vs. sales to help users decide how much energy to sell or retain.
2. **View Consumption:** Provides detailed graphs for hourly, daily, monthly, and yearly periods.

4.1.2. Notes

1. **Data visualization:** a critical feature that rapidly consumes significant database space. To effectively manage real-time data and ensure scalability, strategies such as optimizing data storage, enhancing resource utilization, and boosting overall system performance (e.g., data partitioning, indexing, and compression) are essential.
2. **Data retrieval**: several solutions can be considered depending on the use case: **polling**, **Server-Sent Events (SSE)**, **WebSockets**, **Azure SignalR Service**... Each method presents different trade-offs in complexity, real-time performance, and resource consumption, enabling the selection of the most suitable option based on specific application requirements.

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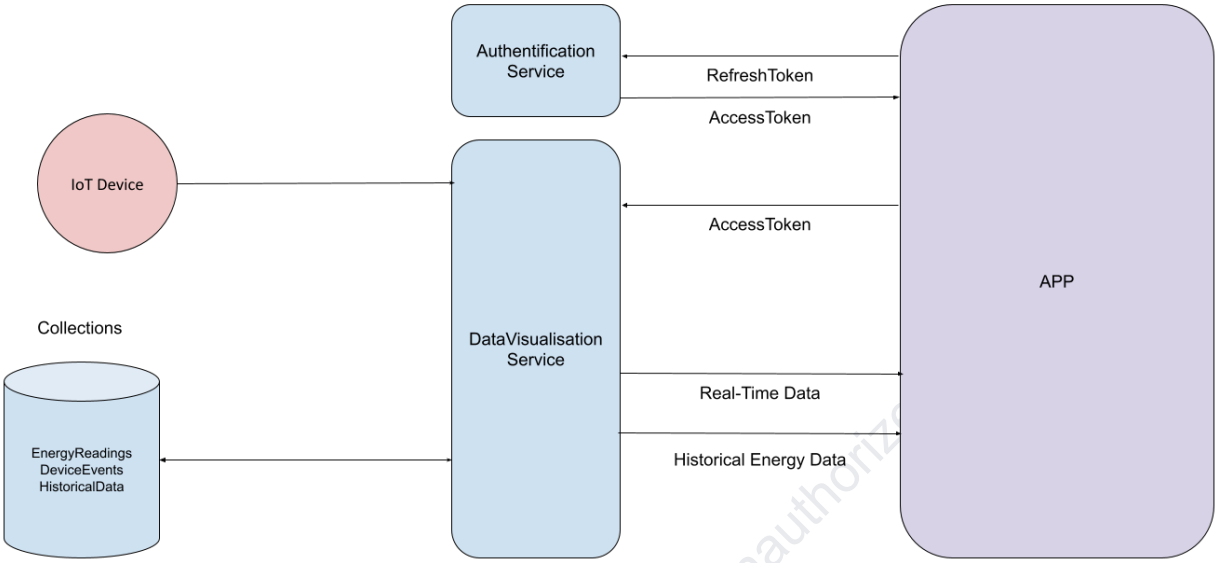
4.2. Architecture Diagram



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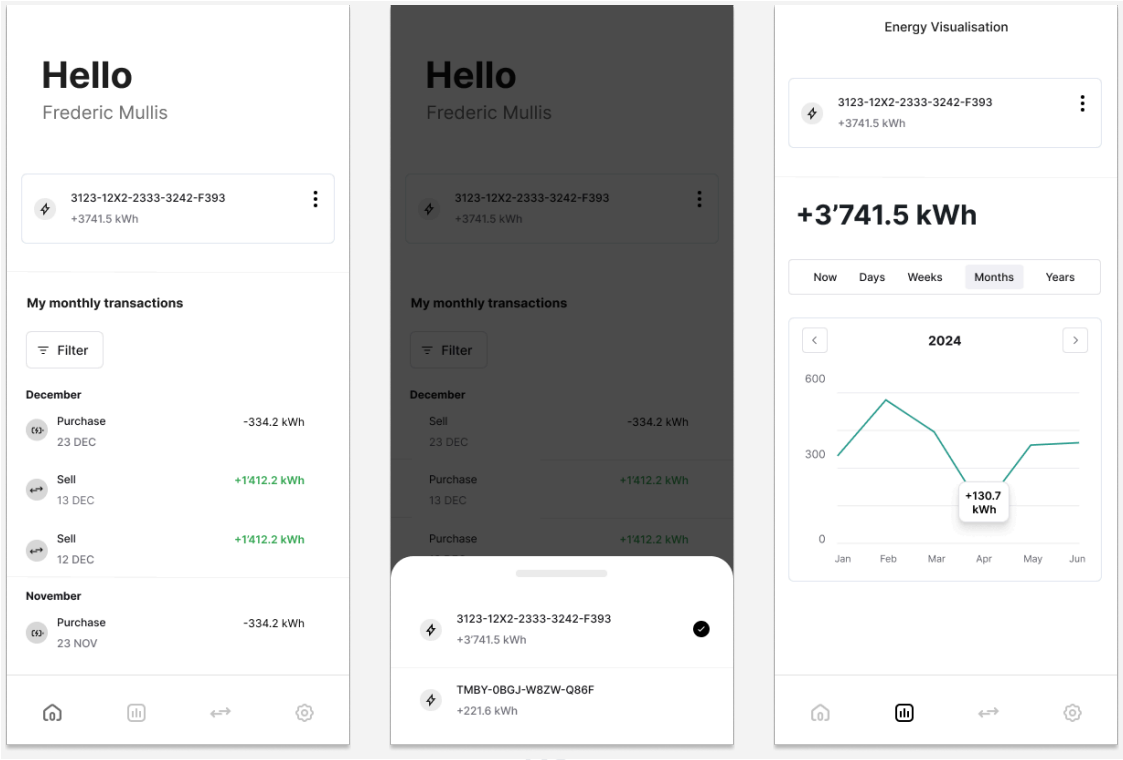
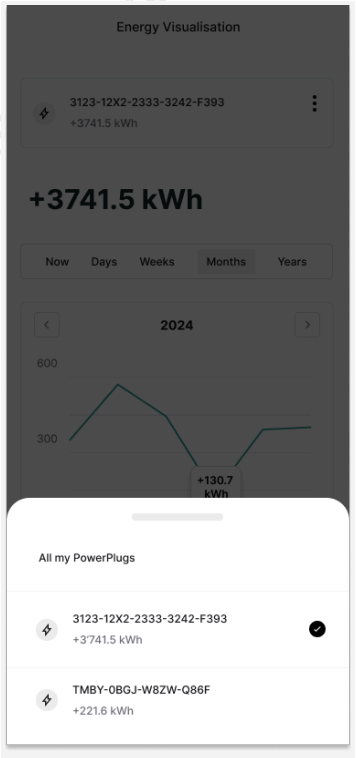
4.3. UX Example





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5. Transfer Process (Payout)

5.1. Overview

Facilitates secure financial transactions for users to manage payouts efficiently.

5.1.1. Sub-Features

1. **Add Bank Account:** Enables entering and validating bank account details.
2. **Transfer Funds:** Allows fund transfers to linked bank account.
3. **View Payment History:** Provides access to transaction history and details.

5.1.2. Notes

The design approach was inspired by a flow similar to **Stripe Connect**, where the frontend collects payment information and initiates the account linking process, while the backend manages sensitive operations like payouts and transaction handling. Stripe Connect is one of the most widely used mobile solutions, adopted by apps like Uber and Airbnb, though other external providers also offer similar services.

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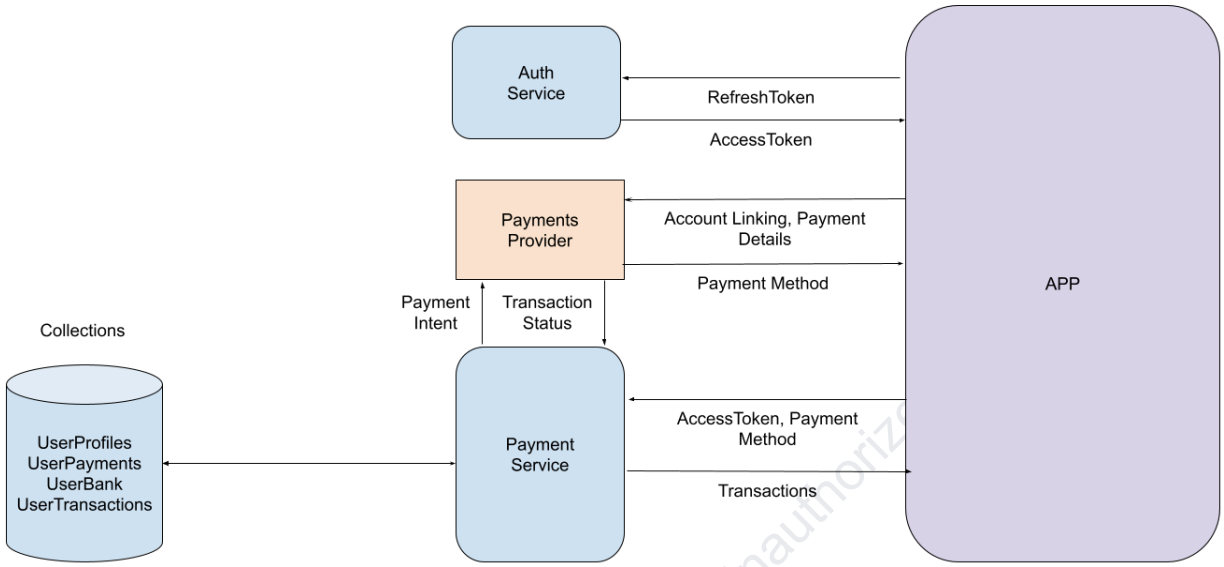
5.2. Architecture Diagram



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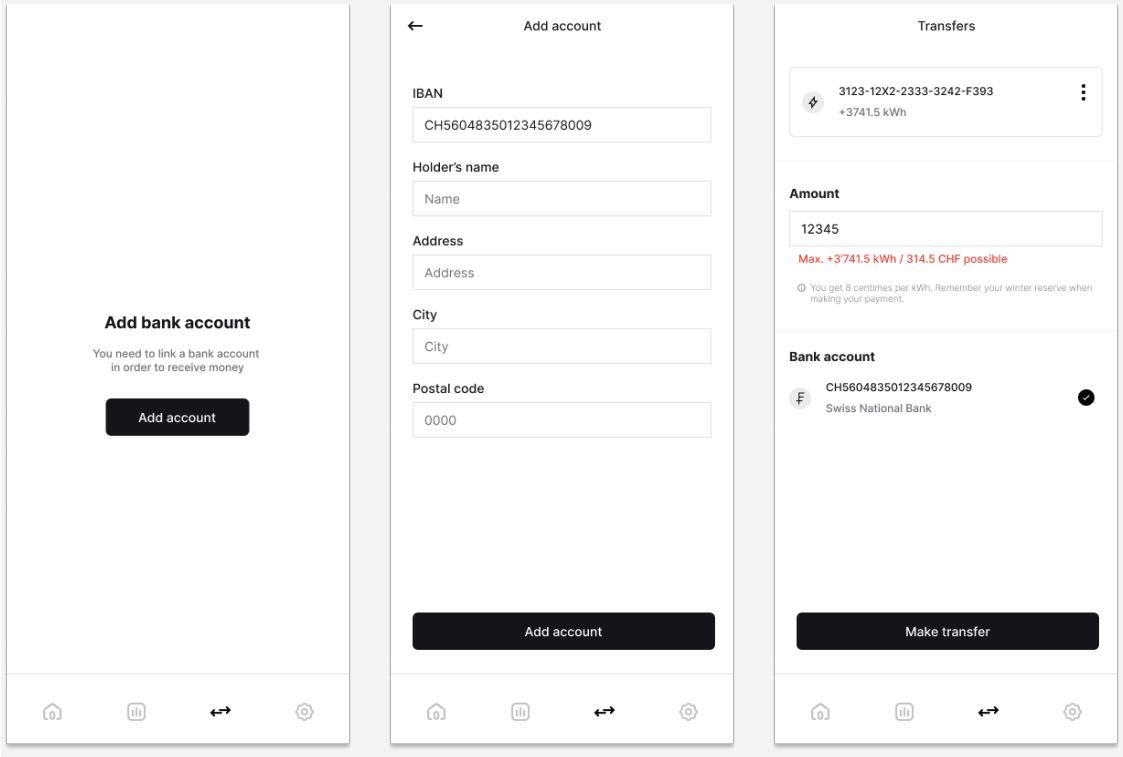
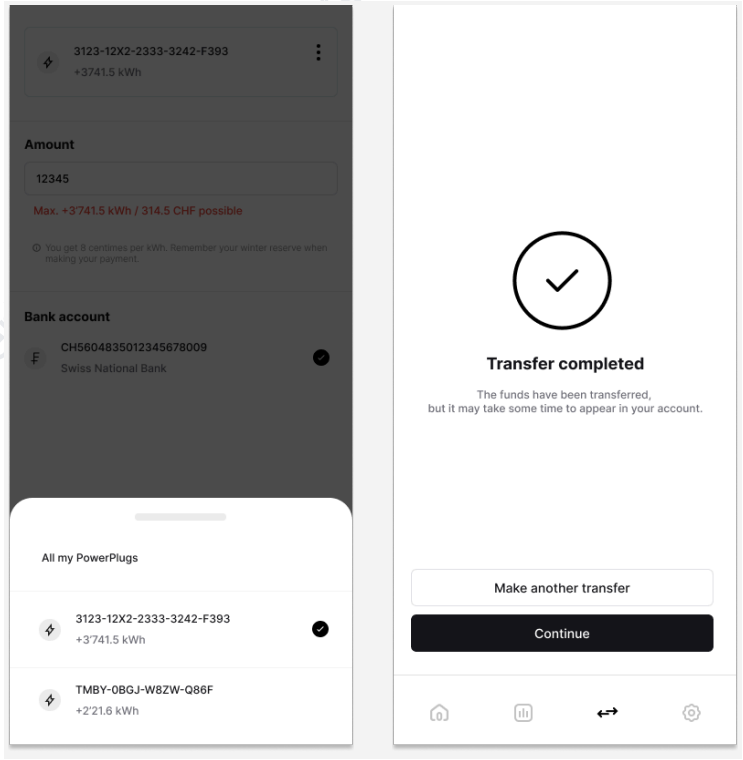
5.3. UX Example





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6. Profile Management

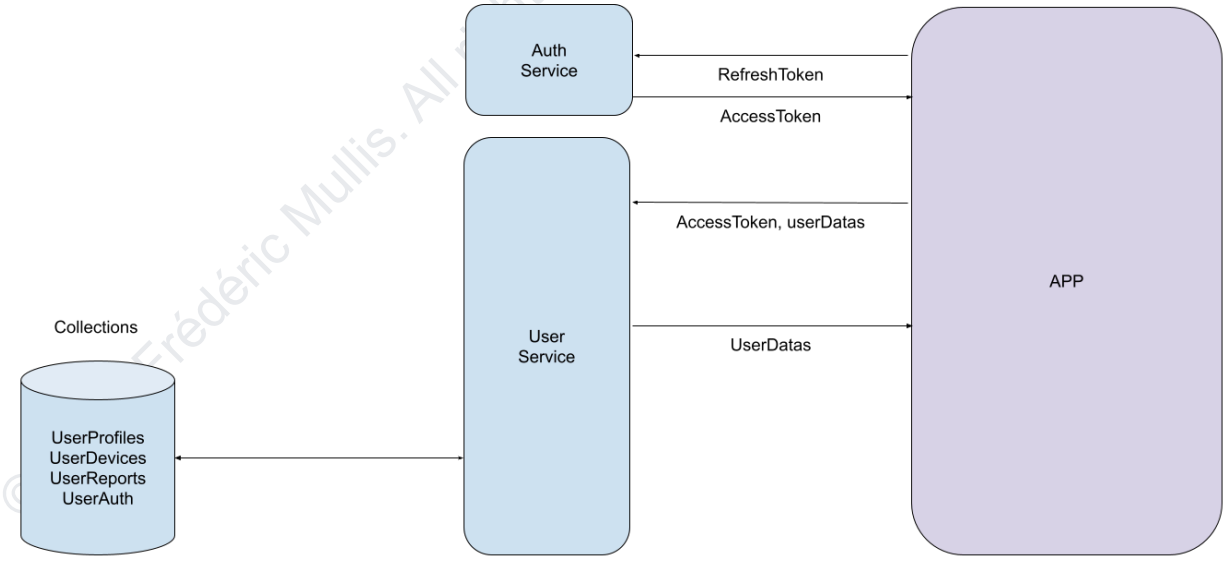
6.1. Overview

Profile management allows users to maintain and update their personal information while providing an option to delete their profile and associated data.

6.1.1. Sub-Features

1. **Edit Profile:** Users can update their personal details and contact information.
2. **Update password:** Users can update their personal details and contact information.
3. **Delete Profile:** Provides the ability to permanently delete the account and all associated data (General Data Protection Regulation)**.**

6.2. Architecture Diagram



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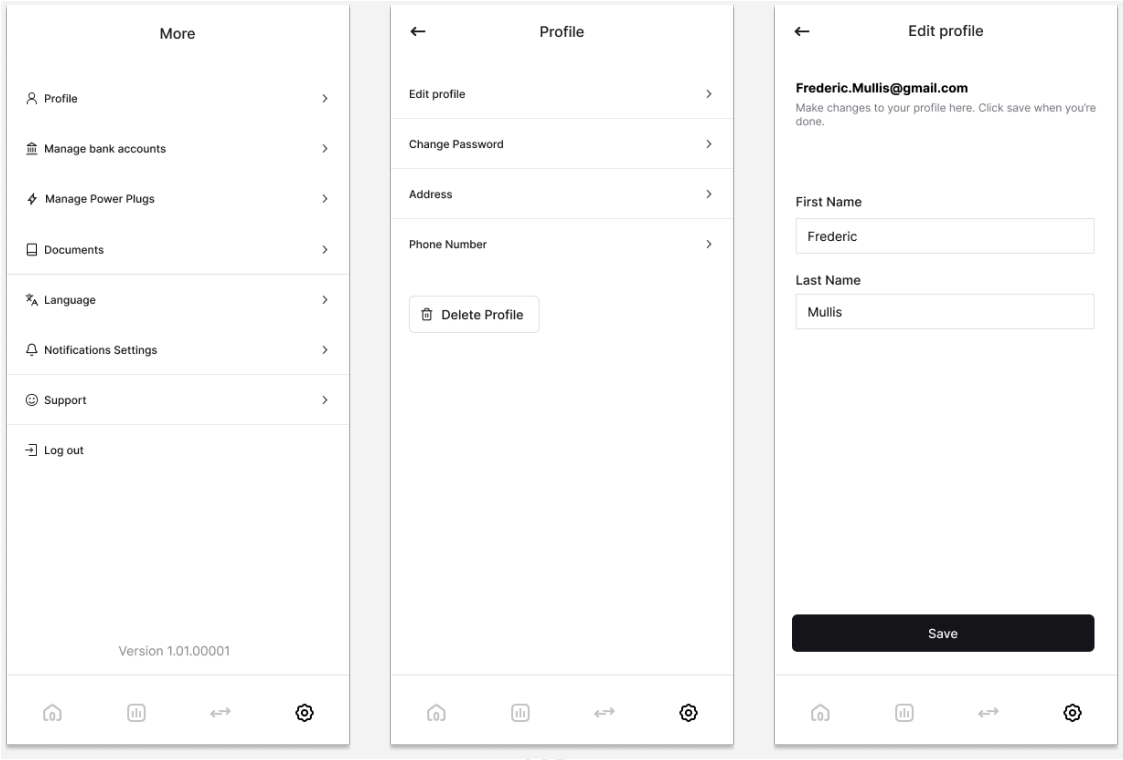
6.3. UX Example



7. IoT Device Management (PowerPlug)

7.1. Overview

This feature enables users to manage their IoT-enabled PowerPlug devices for energy monitoring and control.

7.1.1. Sub-Features

1. **Consult Device Informations**
2. **Associate Device:** Associates an IoT device with the user account via QR code or unique code.
3. **Dissociate Device:** Removes an IoT device device from the account.

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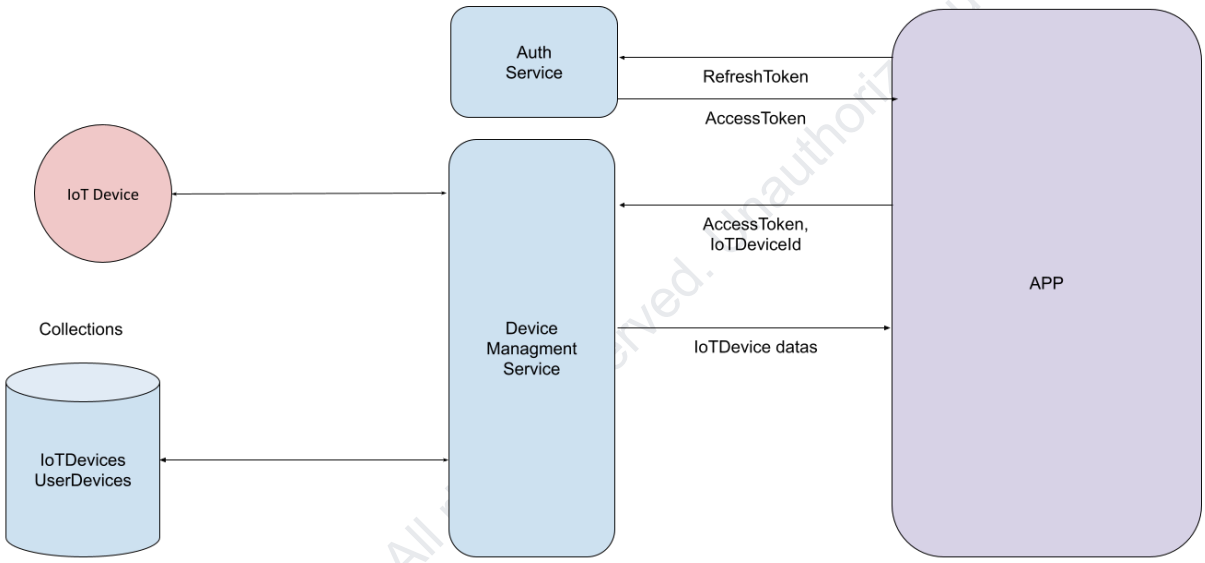
7.1.2. Notes

As mentioned in the first section, users can have multiple devices (at home, in a second house, etc.). While not directly related to this feature, it's crucial to provide a simple UX that allows users to easily switch between devices, while also ensuring they cannot access data features if no devices are associated with their account.

7.2. Architecture Diagram



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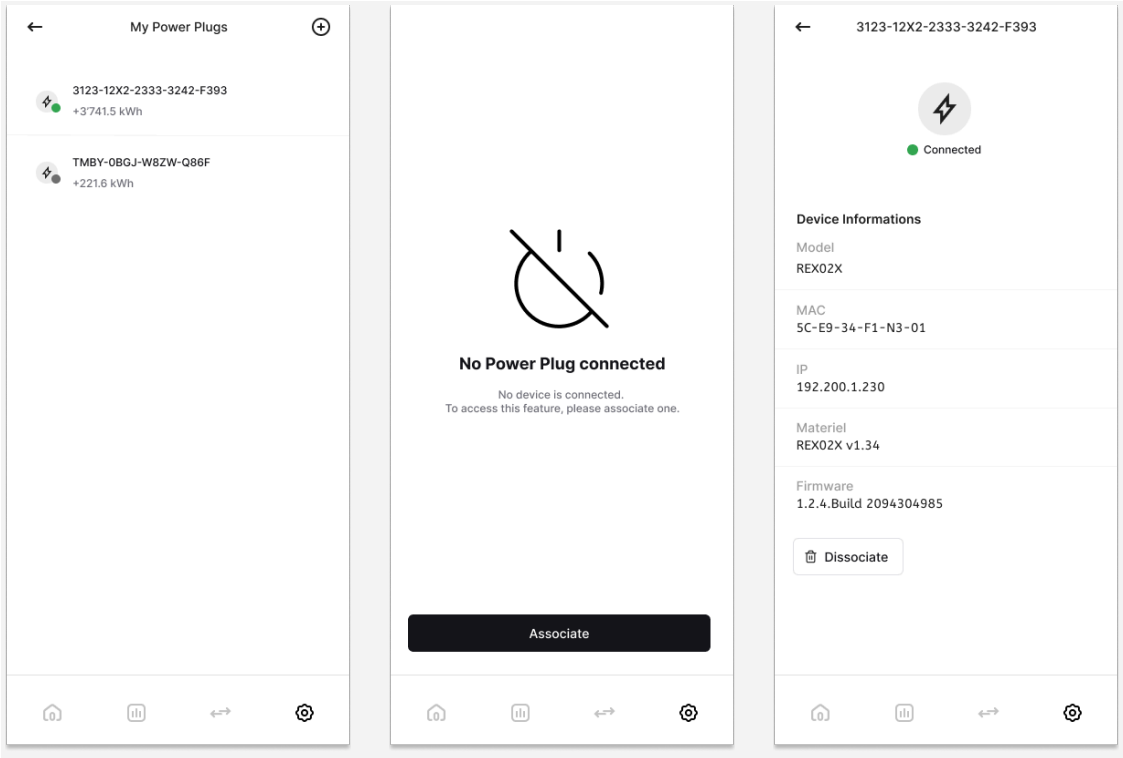
7.3. UX Example



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8. Additional Feature: Users [CompanyX] subscription

8.1. Overview

This is an additional feature that requires detailed analysis and customization, there are several ways to monetize the app (e.g., subscription, advertising). Below are some suggestions for the most effective options.:

8.1.1. Subscription Plans

Users pay a fixed recurring fee (e.g., monthly or annually) to access the platform's features or premium services.

- **Pros:**
    - Predictable revenue stream.
    - Encourages long-term user retention.
    - Simplifies budgeting for the business.
- **Cons:**
    - Users might hesitate to commit without experiencing clear benefits.
    - Requires additional features for tier differentiation (e.g., free vs. premium).

8.1.2. Transaction-Based Fees

Revenue is generated through a percentage fee on every energy transaction made on the platform.

- **Pros:**
    - Scales directly with platform activity.
    - Attracts users with no upfront subscription cost.
- **Cons:**
    - Revenue is variable and harder to predict.

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    - May discourage high-volume users due to cumulative costs.

9. Additional feature: Notifications & Communication

9.1. Overview

While notifications are an additional feature requiring detailed analysis and customization, here are some suggestions and possibilities:

- **Price Alerts:** Notify users when electricity prices change, allowing them to make timely buying or selling decisions.
- **Transaction Confirmation:** Send a notification after a successful purchase, sale, or transfer of electricity.
- **Balance Update:** Alert users when their electricity balance reaches a set threshold or after each transaction.

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10. Conclusion

[CompanyX] has the potential to be a valuable tool in the Swiss energy market by enabling efficient energy transaction visualization and management through its innovative IoT-based approach. While challenges such as real-time data processing and payout mechanisms exist, the document outlines the necessary considerations and strategies for tackling these complexities. With thoughtful implementation, [CompanyX] can offer practical solutions that support the evolving needs of energy users and providers.

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