

MICHIGAN STATE

UNIVERSITY

Project Plan Presentation

Remote Energy Distribution Payment Platform

The Capstone Experience

Team Caxy Interactive

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*From Students...
...to Professionals*

Functional Specifications

- Mediate issues of grid electricity in Cameroon and other African nations.
- Only 55% of the Cameroon population has access to the electrical grid, with only 17% in rural areas.
- Our project is an off-grid energy exchange marketplace to allow for the access of reliable, off-grid electricity.
- Phase 1 - Device Design and Prototype (Complete)
- Phase 2 - Payment System Design and Prototype

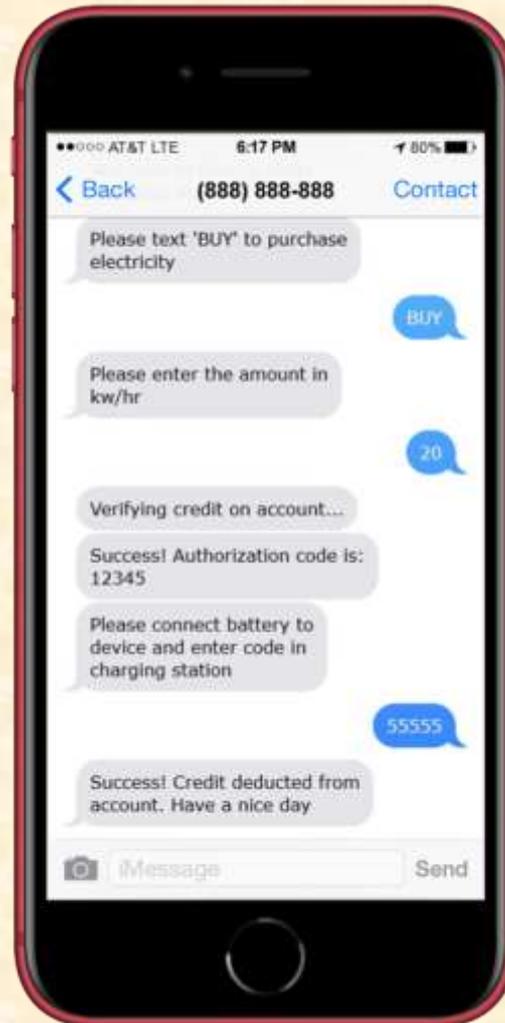


Design Specifications

- The design of our project can be divided into 2 broad categories:
- The SMS Chat
 - This will serve as the interface by which the user can request a code to input into the Arduino charging station to access the required amount of energy.
- The Web application
 - Users can access their accounts on the web application to add and view funds available
 - Administrators can view various analytics and statistics. They can also manage other users.



Screen Mockup: Messaging



Screen Mockup: Check Balance

The screenshot shows a web application interface for 'Caxy Interactive'. The top navigation bar includes the company name and 'Account' and 'Log Out' links. A dark blue sidebar on the left contains menu items for 'User' (Check Balance, Add Funds), 'Admin' (Analytics, Manage Users), and 'Account' (Log Out). The main content area displays the 'Current Balance' as 348.39 CHF, with a '+ funds' link below it. Below the balance is a 'History' section with a 'sort by' dropdown and a table of recent charges.

Date	Charge Station	Amount (CFA)	kWh
9/25/21	Magenta	500	10
9/24/21	Aqua	1250	25
9/23/21	Magenta	376	7.52
9/22/21	Beige	115	2.3

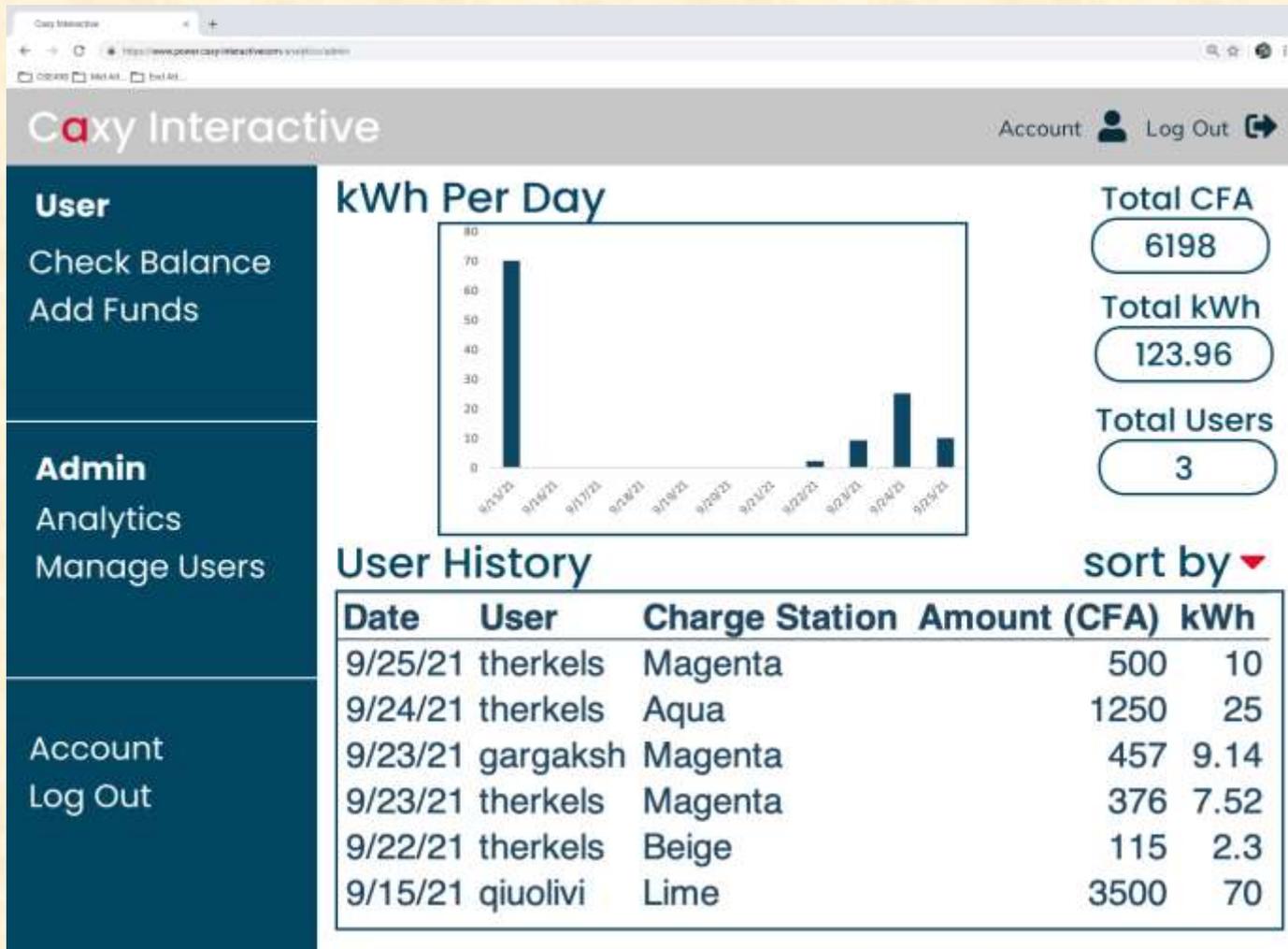


Screen Mockup: Add Funds

The screenshot displays a web application interface for Caxy Interactive. The top navigation bar includes the logo and links for 'Account' and 'Log Out'. A dark blue sidebar on the left contains three sections: 'User' with 'Check Balance' and 'Add Funds' (highlighted), 'Admin' with 'Analytics' and 'Manage Users', and 'Account' with 'Log Out'. The main content area shows the 'Current Balance: 348.39 CHF' in a rounded box. Below this is a payment form with the following fields: 'Amount' (text input), 'Card Number' (text input with a card icon), 'MM/YY' (calendar icon) and 'CVC' (lock icon) (two text inputs), and 'Confirm Email' (text input with an envelope icon). A red 'Pay' button is positioned at the bottom right of the form.



Screen Mockup: Analytics



Screen Mockup: Manage Users

The screenshot shows a web browser window with the URL <https://www.powerspyx.com/caxy-interactive/manage-users/index>. The page header includes the 'Caxy Interactive' logo and a user account menu with 'Account' and 'Log Out' options. The sidebar on the left is divided into three sections: 'User' (with links for 'Check Balance' and 'Add Funds'), 'Admin' (with links for 'Analytics' and 'Manage Users'), and 'Account' (with a link for 'Log Out'). The main content area is titled 'Manage Users' and contains a search bar labeled 'Search for user:', a 'sort by' dropdown menu, and a table of users.

User	Balance	View	Remove
therkels	348.39		
gargaksh	765.00		
qiuolivi	412.00		
Lyuuife	0.00		
mearscon	0.00		
stroste3	1000.00		

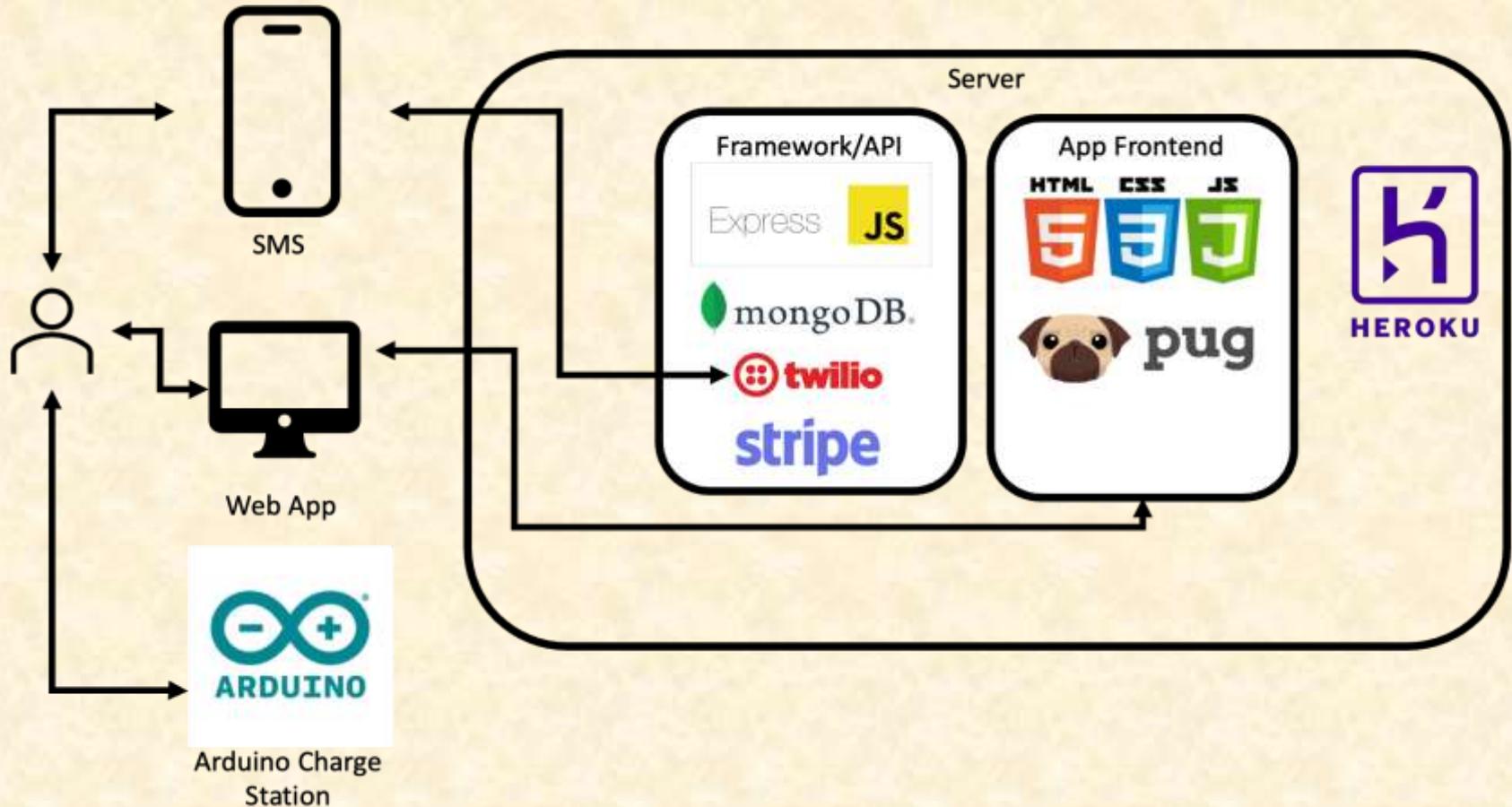


Technical Specifications

- Database
 - MongoDB for storing user transactions
- Backend
 - Express/NodeJS using MVC pattern
- Frontend
 - Pug html preprocessor for building dynamic HTML
 - HTML, CSS, and JS for supporting web application interface
- API Usage
 - Twilio communicates with user and server to process transactions via SMS
 - Stripe for payment updates and account balances
- Server
 - Heroku for cloud support
- Hardware - Arduino
 - Supports user 0–9-digit keypad
 - Process user codes for releasing energy



System Architecture



System Components

- Hardware Platforms
 - Arduino Charge Station
- Software Platforms / Technologies
 - Twilio
 - Node.js / Express
 - Heroku
 - MongoDB/Mongoose
 - Stripe
 - Pug



Risks

- Arduino Hardware Integrations
 - Wi-Fi connectivity, ability to receive HTTP POST/GET, hardware limitations
 - Design for simple data input and consider multiple processes/techniques
- Ambiguous User Accounts
 - There are uncertainty on the level of user data required
 - Build in flexibility, generalize a payment structure
- Payment Technology
 - SMS interactions will require users to withdrawal funds to afford energy
 - Design a "plug-and-play" server that can allow for different payment methods
- Data Encryption
 - Ensuring any sensitive data is either encrypted or protected
 - Data transfers between users, the Arduino, and server should be minimal and essential. Data stored should be labeled (ex. Is it PII?)



Questions?

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