Project Plan Presentation
Remote Energy Distribution Payment Platform

The Capstone Experience
Team Caxy Interactive

Jakob Therkelsen
Connor Mears
Akshaan Garg
Jesse Stroster
Olivia Qiu
Avery Lyu

Department of Computer Science and Engineering
Michigan State University
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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

Text messages:
- Please text "BUY" to purchase electricity
- Please enter the amount in kw/hr
- Verifying credit on account...
- Success! Authorization code is: 12345
- Please connect battery to device and enter code in charging station
- Success! Credit deducted from account. Have a nice day

Contact:
(888) 888-888
Screen Mockup: Check Balance

Current Balance

348.39 CHF

History

<table>
<thead>
<tr>
<th>Date</th>
<th>Charge Station</th>
<th>Amount (CFA)</th>
<th>kWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/25/21</td>
<td>Magenta</td>
<td>500</td>
<td>10</td>
</tr>
<tr>
<td>9/24/21</td>
<td>Aqua</td>
<td>1250</td>
<td>25</td>
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<tr>
<td>9/23/21</td>
<td>Magenta</td>
<td>376</td>
<td>7.52</td>
</tr>
<tr>
<td>9/22/21</td>
<td>Beige</td>
<td>115</td>
<td>2.3</td>
</tr>
</tbody>
</table>
Screen Mockup: Add Funds
Screen Mockup: Analytics
Screen Mockup: Manage Users

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Caxy Interactive

User
Check Balance
Add Funds

Admin
Analytics
Manage Users

Account
Log Out

Manage Users

Search for user:

<table>
<thead>
<tr>
<th>User</th>
<th>Balance</th>
<th>View</th>
<th>Remove</th>
</tr>
</thead>
<tbody>
<tr>
<td>therkels</td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

sort by ▼
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

[Diagram showing system architecture with components such as SMS, Web App, Arduino Charge Station, Server with Express, MongoDB, Twilio, Stripe, and pug, and related technologies like HTML, CSS, JS, and Heroku.]
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?