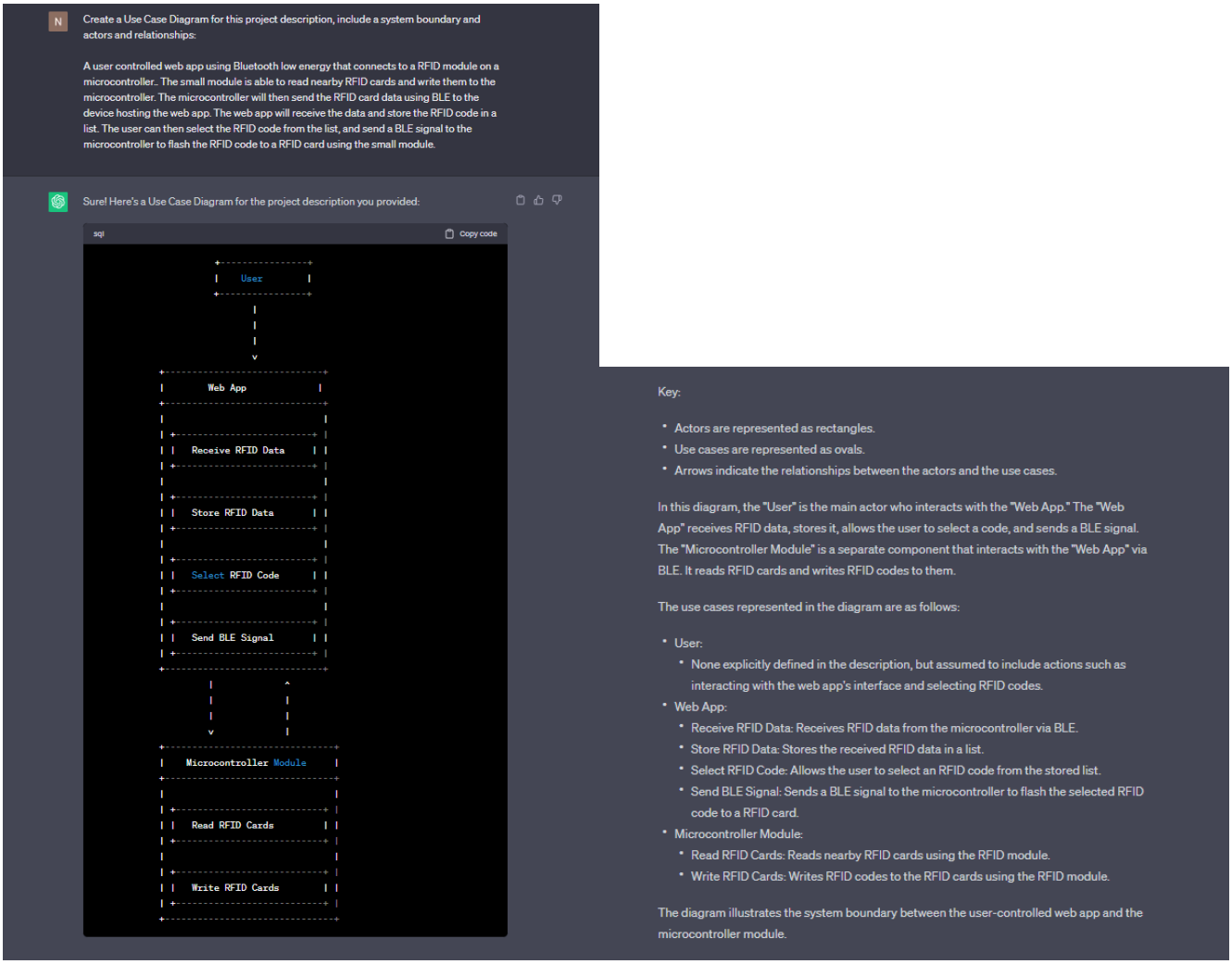
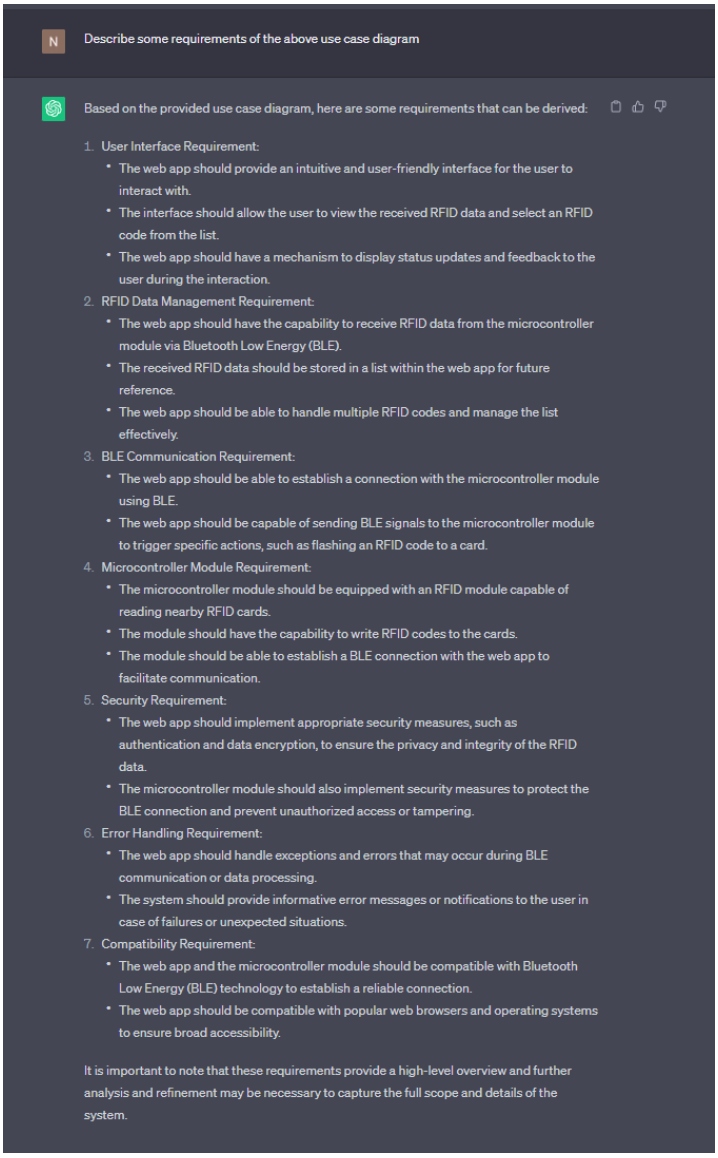
Groups, Ideas, System Boundary, & Use Case Diagram
Project: RFID Cloner Project

Members:
Dan George
Jack Lukomski
Nathan Strandberg
Jaime Malone

Brief Description: An embedded device with RFID that clones RFID cards and sends the card ID/passcode to a web application over Bluetooth Low Energy (BLE). The web application UI presents the ID/passcode to the user.

ChatGPT Use Case Diagram and Descriptions:





Discussion:

Overall, ChatGPT's generated use case diagram gave a decent diagram for the scope of our project. That being said, there are some problems in the microcontroller module. There is no use case for saving/storing the RFID data. Also, ChatGPT did not describe the relationships between each use case with includes/extends labels, as well as describe the actors and pre-conditions.

System:

- Bluetooth Low Energy
- Small Module (RFID Reader)
- ESP32 (Microcontroller)
- Web App
- Web App UI

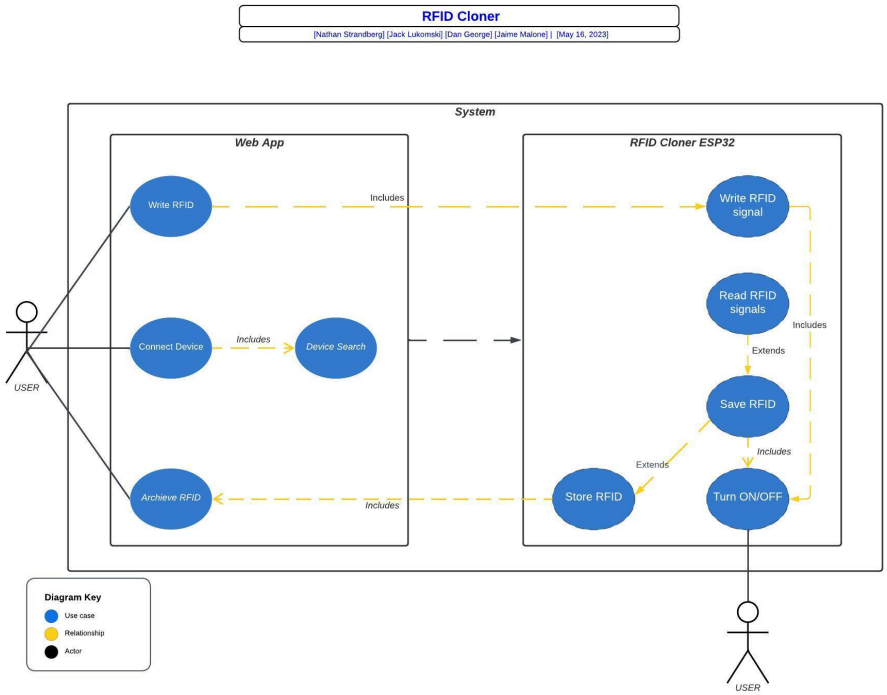
System Context:

- RFID Cards
- User
- Peripherals for Web App

Irrelevant Environment:

- External Interfaces:
    - Environmental noise
    - Other devices
    - Physical obstacles that affect BLE
- Network Infrastructure:
    - Routers, Switches, Internet connectivity
- Legal and Regulatory Requirements:
    - Data Privacy
    - Radio Frequency Usage

Use Case Diagram:



Use case Diagram Descriptions

Web Page

Use Case: Connect Device
Actors: User (initiator)
Description:

1. User presses the button to connect to the RFID device.
2. The button opens up a list of available devices.
3. The user selects a device which causes the web app to send a pairing signal to the cloner device.
4. The devices are paired.

Pre-Condition: Device Search

Use Case: Write RFID
Actors: User (Initiator)
Description:

1. User selects a badge from the web page to write to a blank card.
2. User hits the button and the website communicates with the RFID cloner, commanding it to write to a blank card.

Pre-Condition: User must have a badge number to write to the card.

Use Case: Archive RFID
Actors: User (initiator)
Description:

1. RFID cloner sends a signal to a website through bluetooth.
2. Website saves badge numbers for later use.

Pre-Condition: Cloner must have RFID badge numbers to send to the web app.

Use Case: Device Search
Actors: User (Initiator)
Description:

1. The web page uses Bluetooth Low Energy to search for nearby devices.
2. After obtaining all nearby devices, a list of devices would be displayed to the web app UI.
3. This list would be used during Connect Device.

Pre-Condition: Turn ON/OFF

RFID Cloner ESP32

Use Case: Write RFID Signal
Actors: User (Initiator)
Description:

1.) The microcontroller receives a command via bluetooth with the RFID data.
2.) The microcontroller writes the RFID signal to the RFID tag.

Pre-condition: The device must be turned on via the **Turn on/off** use case and the user must request an RFID signal to be flashed via the **Write RFID** use case.

Use Case: Read RFID Signal
Actors: User (Initiator)
Description:

1.) The microcontroller is turned on.
2.) The microcontroller reads the RFID signal present.

Pre-condition: The device must be turned on via the **Turn on/off** use case.

Use Case: Store RFID
Actors: User (Initiator)
Description:

1.) The microcontroller has received a command to send the stored RFID data.
2.) The RFID data gets sent to the web application via bluetooth.

Pre-condition: The RFID data must have been stored to the microcontroller via the **Save RFID** use case and the user must have requested data be sent via the **Archive RFID** use case.

Use Case: Save RFID
Actors: User (Initiator)
Description:

1.) The RFID device has detected a valid RFID signal.
2.) The RFID data gets sent to the microcontroller via SPI.
3.) The RFID data gets saved in flash memory on the microcontroller.

Pre-condition: The RFID must have found an RFID signal via the **Read RFID signals** use case. The device must have also been turned on via the **Turn on/off** use case.

Use Case: Turn ON/OFF
Actors: User (initiator)
Description:

1.) The device is toggled either on or off with a switch

Pre-condition: Needs Power