Smart Coffee Capsules Dispenser

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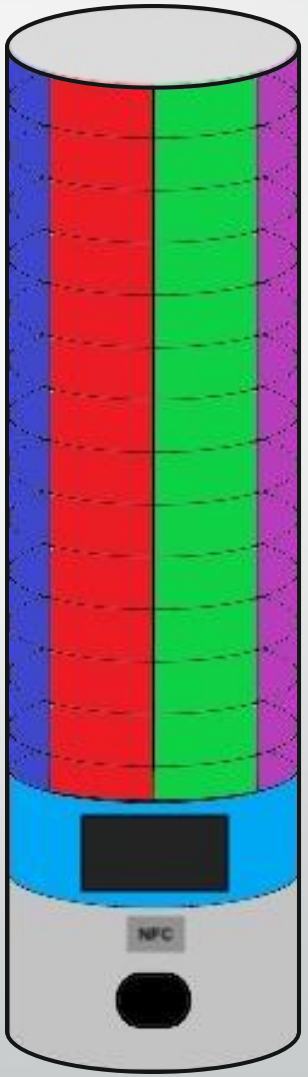
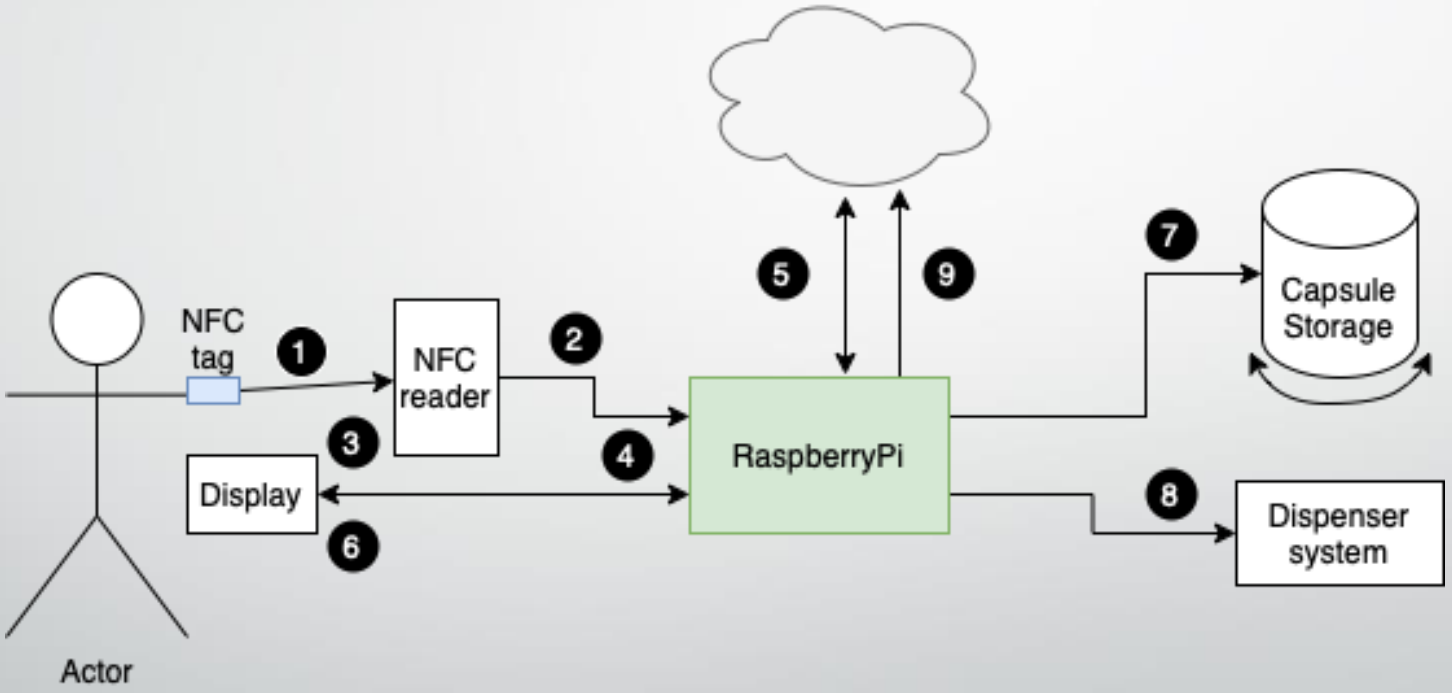
SYSTEM DESIGN

- The system was partitioned in subsystems:
  - Storage
  - Dispenser
  - Authentication
  - User Interface



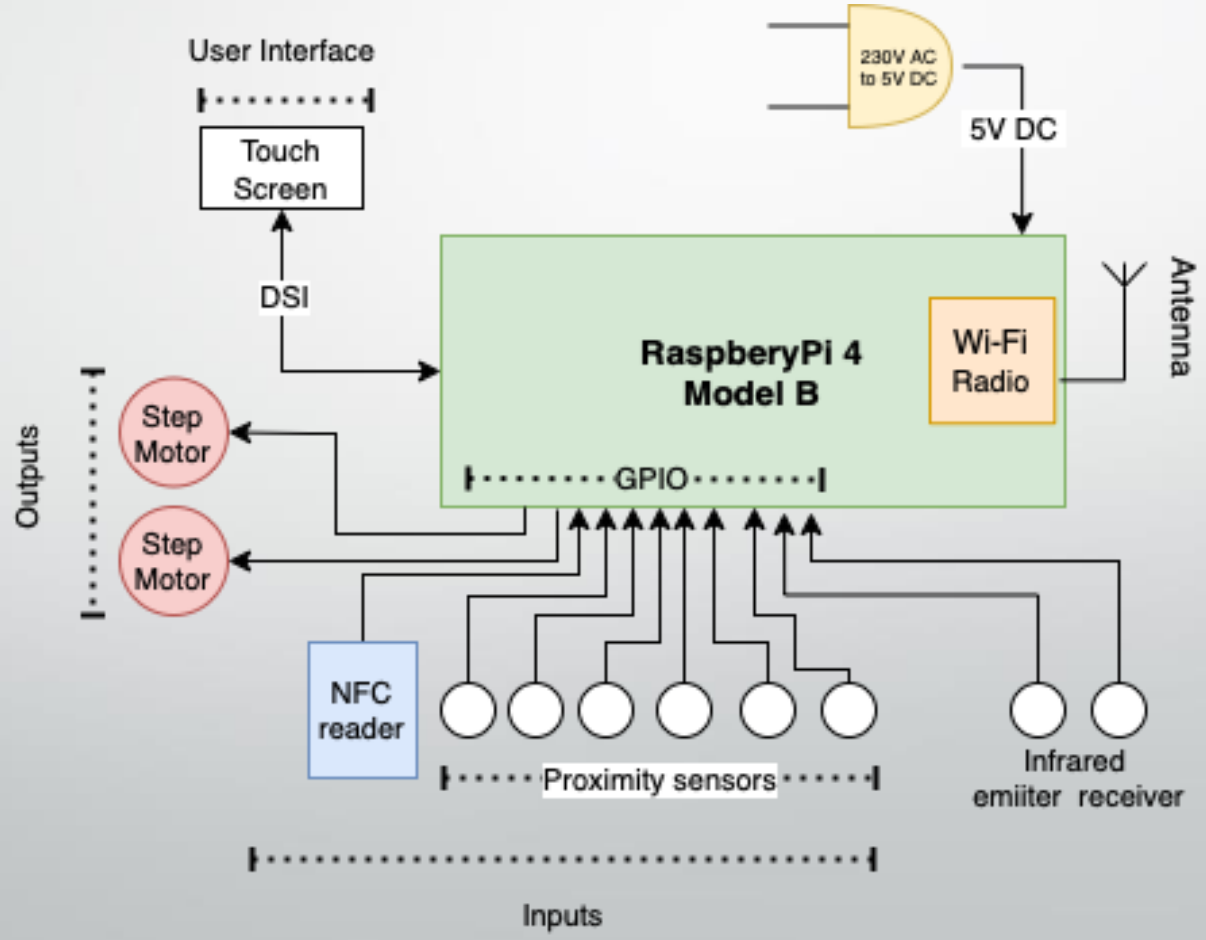
CONCEPTUAL MODEL



TECHNOLOGIES

- Raspberrypi 4 Model B
- RFID
- WiFi
- Apache
- MySQL
- SMTP
- MQTT (Mosquitto)
- GitHub

ARCHITECTURE



ELETRONIC COMPONENTS

SENSORS

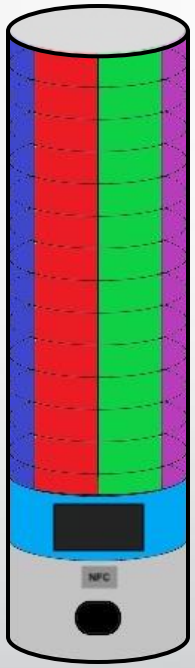
- 1 Touch Screen
- RFID Reader
- 2 Infrared sensors

ATUATORS

- 2 Servo motors

EARS REQUIREMENTS

MAIN SYSTEM



EXPECTED OPERATION

- The system shall be able to give coffee capsules.
- The system shall have multiple sections to storage different capsules.
- The system shall have a login screen.
- The system shall have a low capsule status.
- The system shall have an authentication status.

AUTHENTICATION SUBSYSTEM

EXPECTED OPERATION

- While there's no one authenticated the subsystem shall wait until the NFC reader detects a card.
- When an NFC card is read the subsystem shall identify the user.
- When the inserted password matches the user's password the subsystem shall authenticate the user.
- While a user is authenticated the subsystem shall have a logout function.

PROBLEM MITIGATION

- If the NFC card is not recognized the subsystem shall display the error on the screen.
- When the inserted password doesn’t match the subsystem shall display an error notification on the screen.

CAPSULE DISPENSER SUBSYSTEM

EXPECTED OPERATION

- The subsystem shall have a function to dispense all the coffee capsules in each section.
- While a user is authenticated when the user requests the selected coffee capsules the subsystem shall give the user all the coffee capsules selected.
- While a user is authenticated when a coffee capsule is delivered the system shall update the number of capsules acquired by that user.
- When the “admin” asks for the dispense of all the coffee capsules in one section the subsystem shall dispense all the coffee capsules in the selected section.

PROBLEM MITIGATION

- When a flavor is chosen if the coffee capsule doesn't arrive to the user the subsystem shall call the “operator”.
- If the capsule storage doesn’t rotate then the subsystem shall notify the “operator”.

STORAGE SYSTEM

EXPECTED OPERATION

- The subsystem shall detect the presence of capsules.
- The subsystem shall be able to calculate the number of capsules available in each section.
- While at low capsule status the subsystem shall publish to an MQTT server how many capsules are left in each section.
- When refilled the subsystem shall notify the operator of such act and report the number of capsules via email.

PROBLEM MITIGATION

- When refilled If the proximity sensor can’t detect capsules then the storage subsystem shall notify the “operator”

USER INTERFACE

EXPECTED OPERATION

- The subsystem shall be able to get a password typed by the user
- The subsystem shall have a capsule selection screen.
- While there’s no one authenticated the subsystem shall display a login screen.
- When an NFC card is read the subsystem shall display a virtual keyboard on the screen.

PROBLEM MITIGATION

- When an error is displayed the subsystem shall return to the login screen.
- While a user is authenticated if any of the flavors have no capsules left then the subsystem shall display that capsule variety in a black form.
- While a user is authenticated when a user selects a coffee capsule represented in black the subsystem shall notify the user about the presence of that variety in the other machines.
- If no password is inserted then the subsystem shall show a notification on the screen.