

Smart Power Monitoring System & Management



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Problem Statement

The project will provide a smart IoT wall outlet that can identify the loads connected to it using machine learning and can be controlled and monitored remotely via a web application to enable and guide end users to lower excessive power consumption.

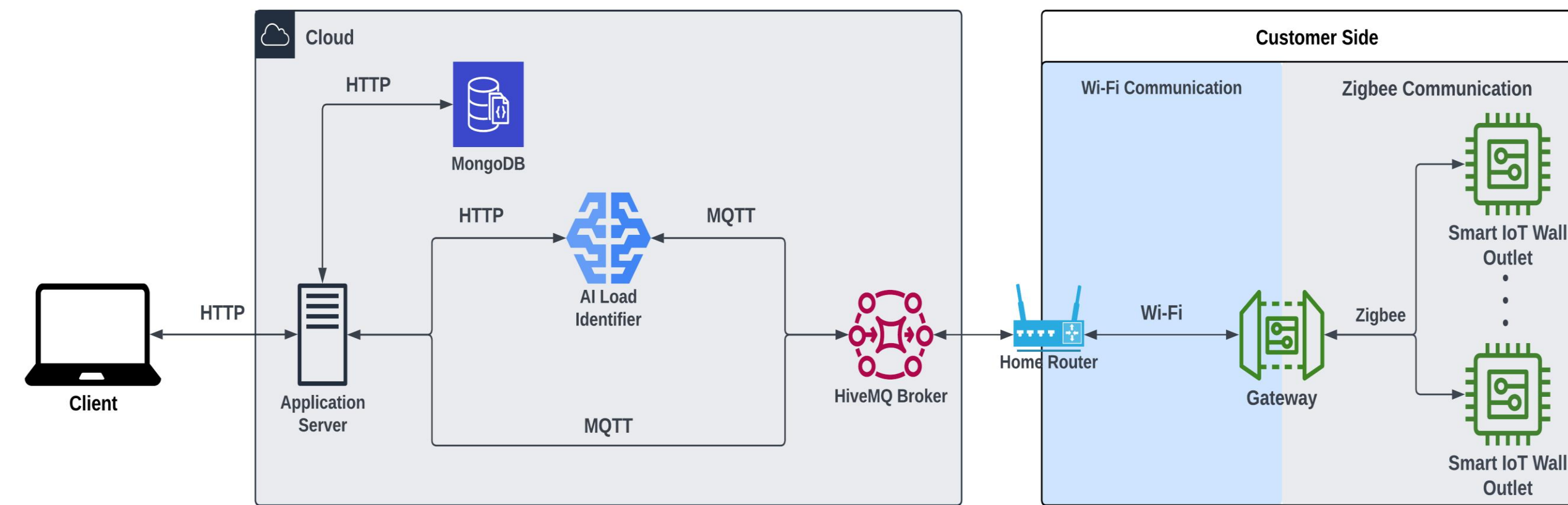
Constrains

- Low Power Communication (less than 2 W)
- Internet Connectivity (99.9% Available)
- Budget (6000 SAR)
- Implementation Period (15 Weeks)

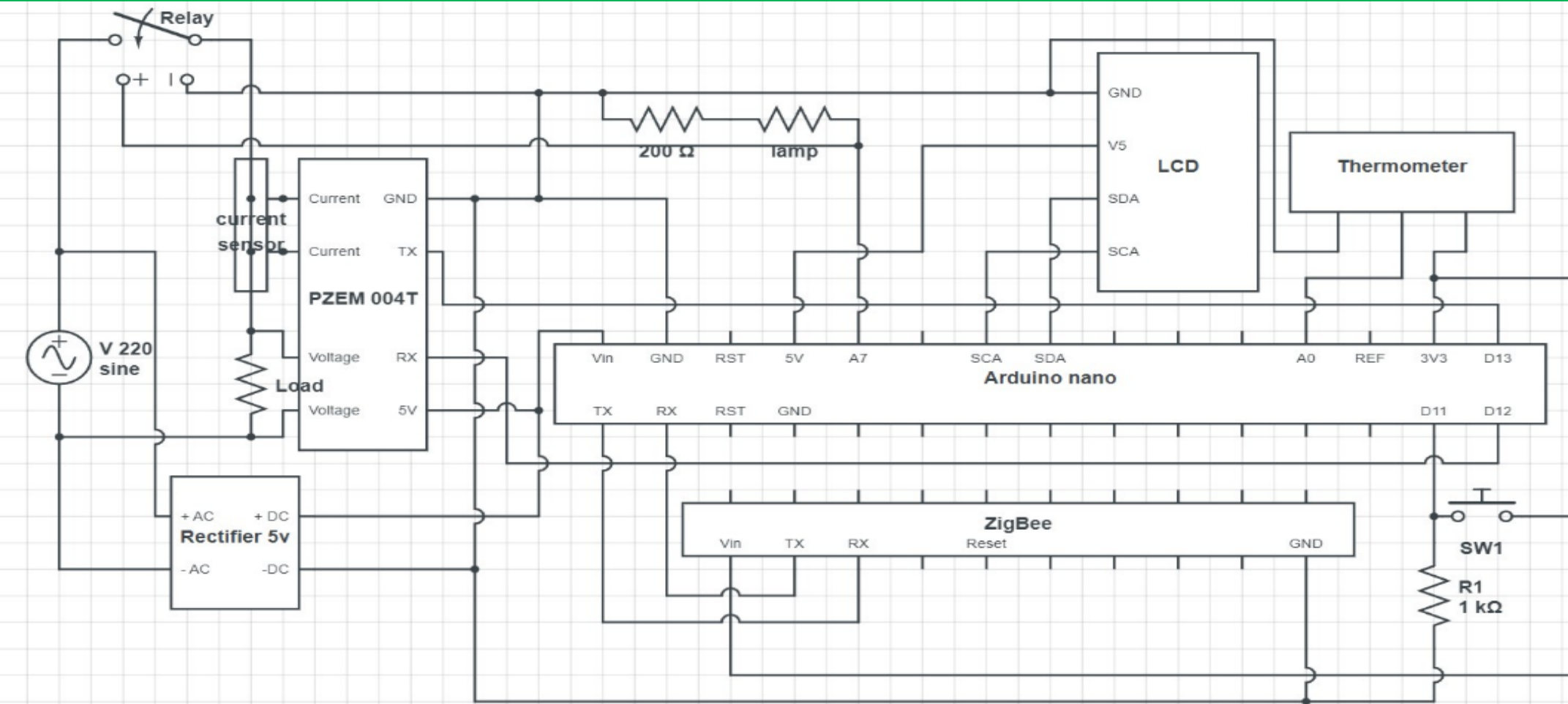
Target Specifications

- Control wall plugs and switches remotely in less than 10 second (Control).
- Display power consumption in terms of money and kWh (Visualization) with 95% accuracy.
- Send notifications for fire hazards in less than 10 second (Safety & control).
- promptly notify the client of any unusual power consumption patterns in less than 10 second (Safety).
- At most 5 minutes to install the product (compatibility).
- Accuracy of appliances classification at least 75%

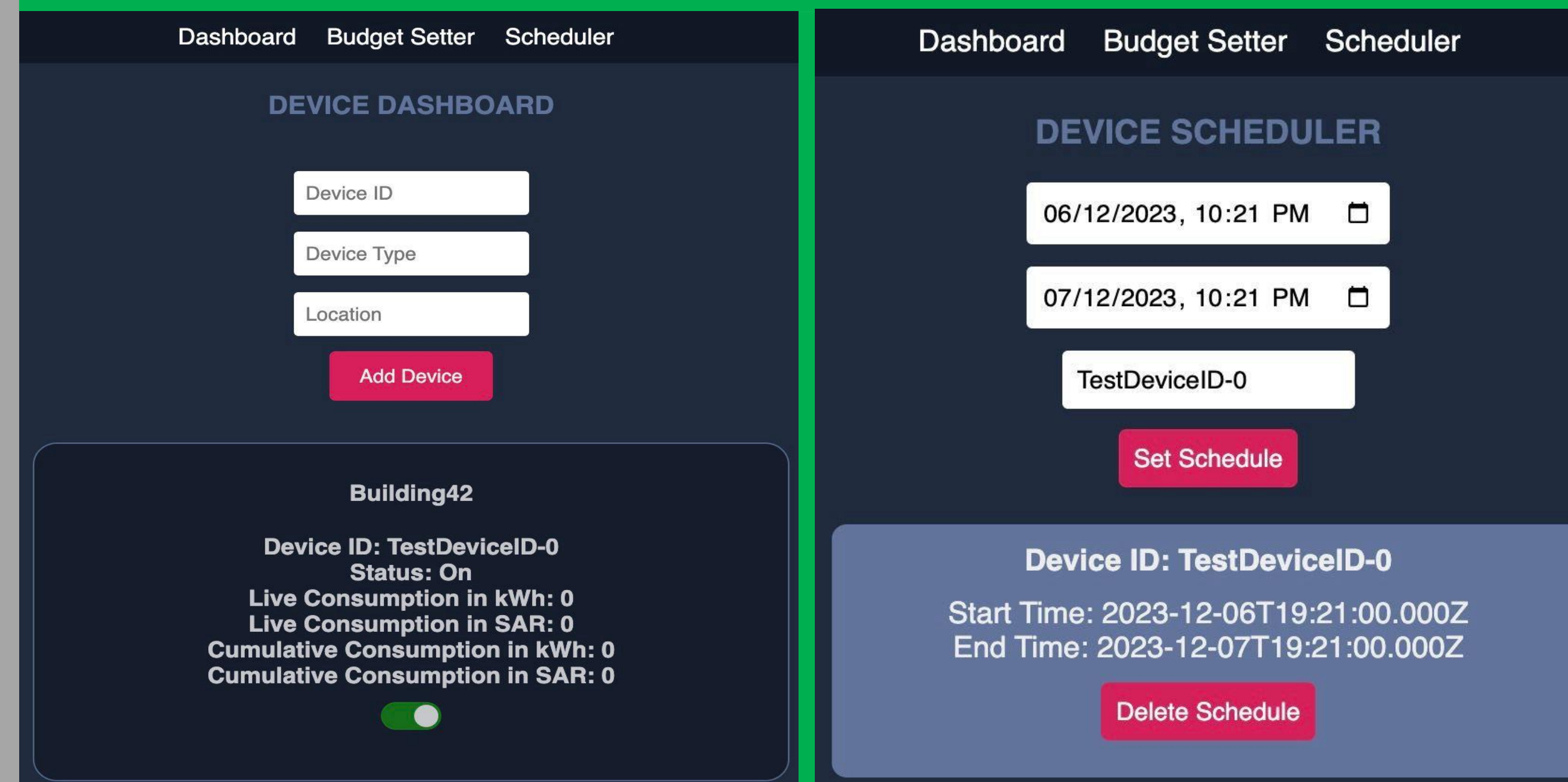
Design Concept



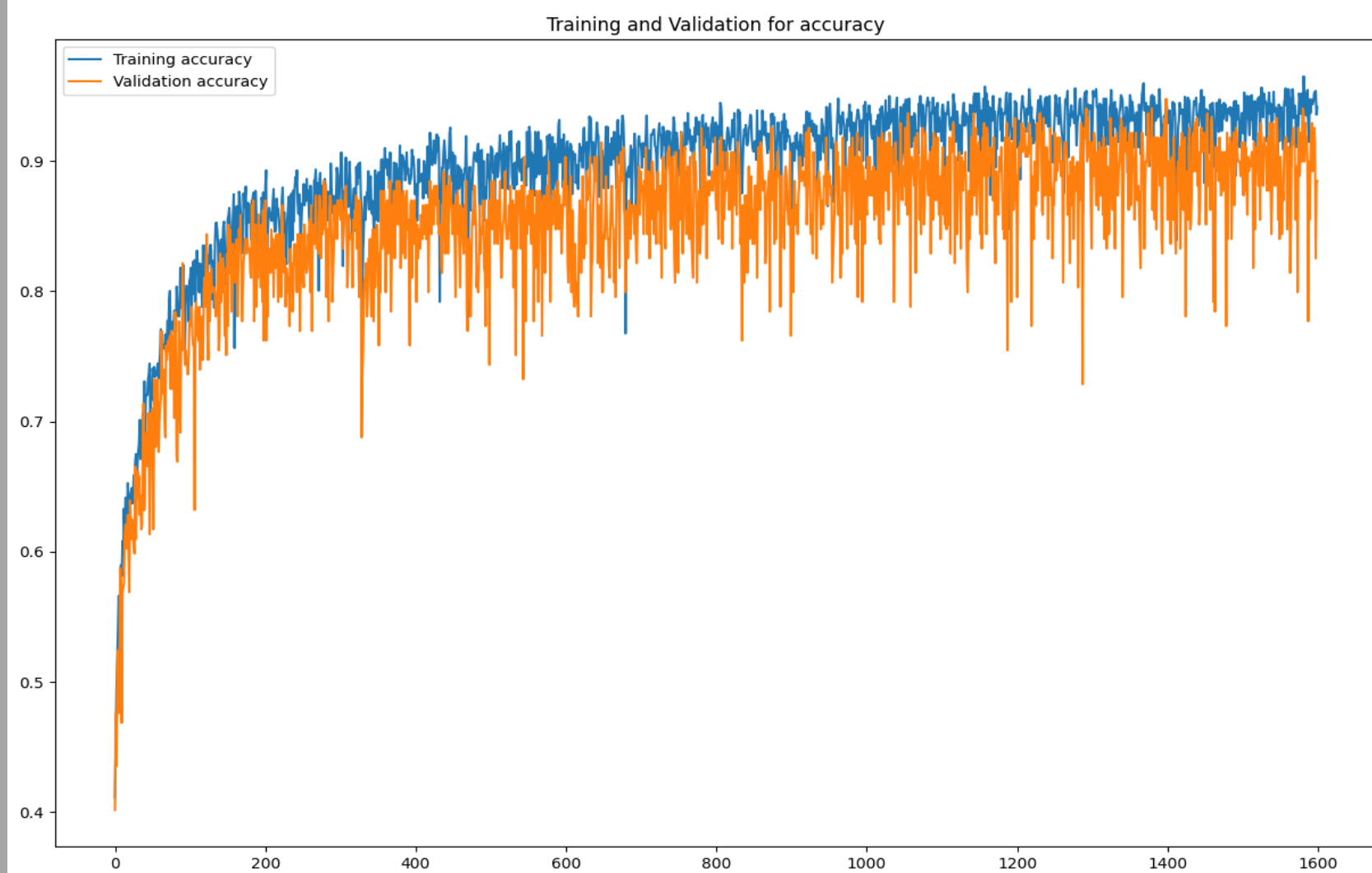
Circuit Design



User Interface



Testing and Validation



Current: 4.83A
Power: 1015.90W
Energy: 0.267kWh
Frequency: 60.0Hz
PF: 0.94

Temperature is: 16.53 degrees C
Custom Address:1
Voltage: 230.10V
Current: 0.04A
Power: 1.00W
Energy: 0.002kWh
Frequency: 59.8Hz
PF: 0.10

Results & Conclusion

- Since voltage is constant, the main measurement is the current and the test show 0.02 difference which is 99.58% accurate.
- These information can be sent throw Zigbee to the AI model to classify loads. Furthermore, the information will be sent to the cloud to do all the features implemented.
- This project can be enhanced by using smart electrical panels. However, the system will be more complex and harder to implement.