Preserve Home Pro (House Health Monitoring)

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Abstract

The Preserve Home Pro is a proposed system that monitors house health. It proposes a collection of sensors and a head unit to measure, record, and display important data. The system aims to provide homeowners with valuable information to help maintain and protect the value of their homes. It will be designed as a semi-permanent system that will last up to thirty years and will communicate information through a closed network without requiring the Internet.

Specifications

- **Head Unit:** provides historical and current data for each sensor.
- **Communication:** wirelessly transmits data via Zigbee protocol.
- **Power:** uses mains of the house then switches to a UPS during outages.
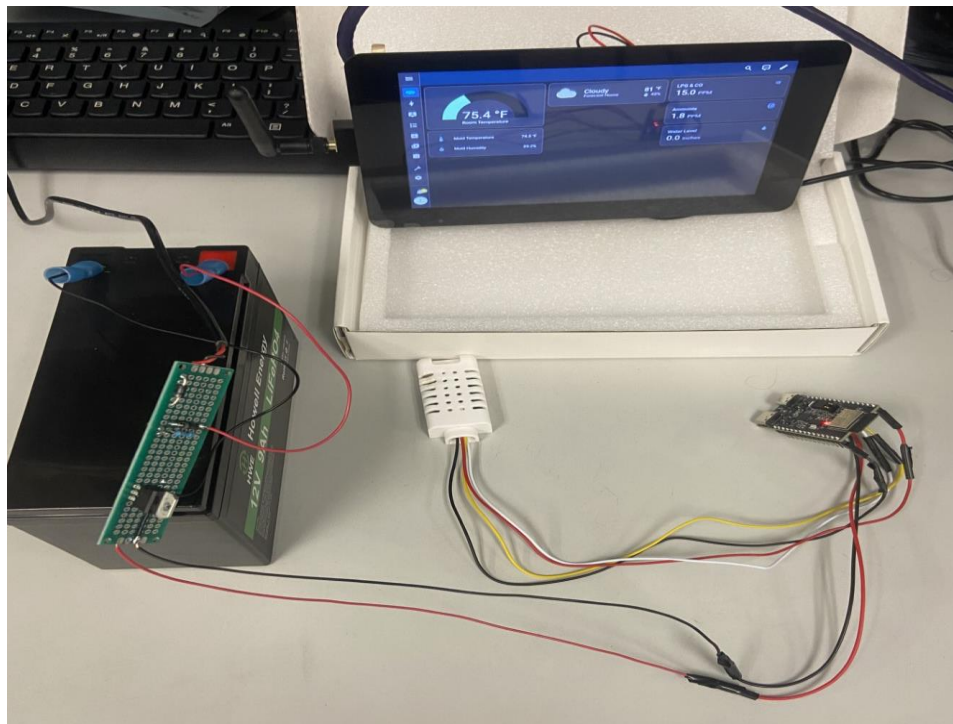- **Sensors:** four sensor modules to detect problems in the house.

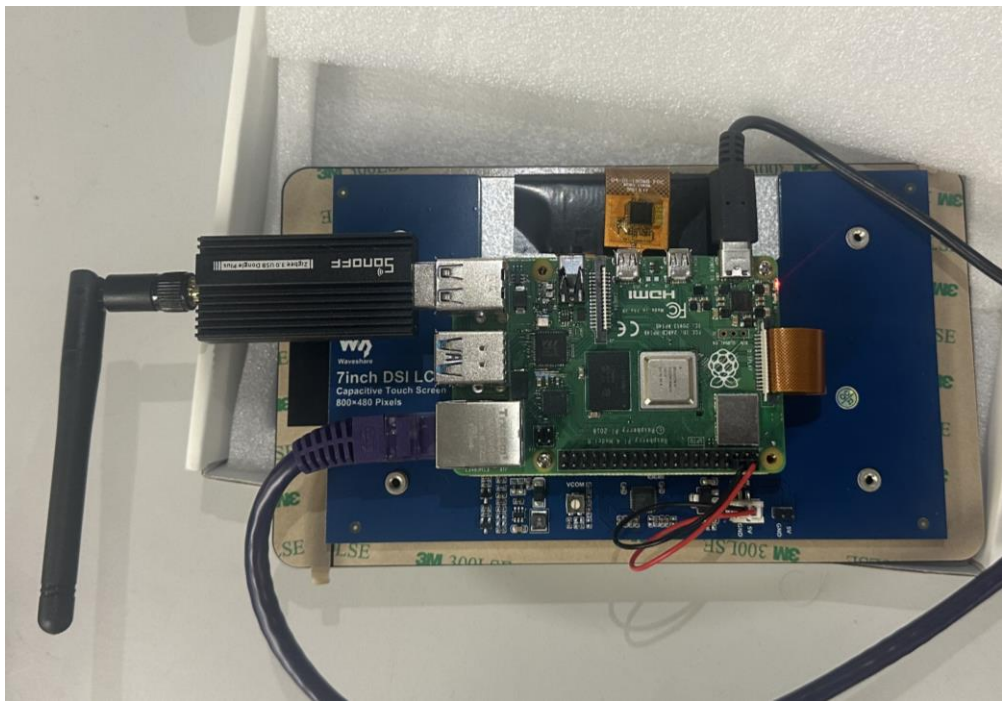Figure 1: UPS with Attached Sensor

Figure 2: Raspberry Pi & Zigbee Dongle

Acknowledgements

The team would like to give thanks to Jesse Roberts for his support throughout the entire Capstone Project. Finally, the team would like to thank one of the external stakeholders, Wes Harris from State Farm, for providing insights to advance the project. Lastly, to Dr. Bhattacharya for his help on the power module.
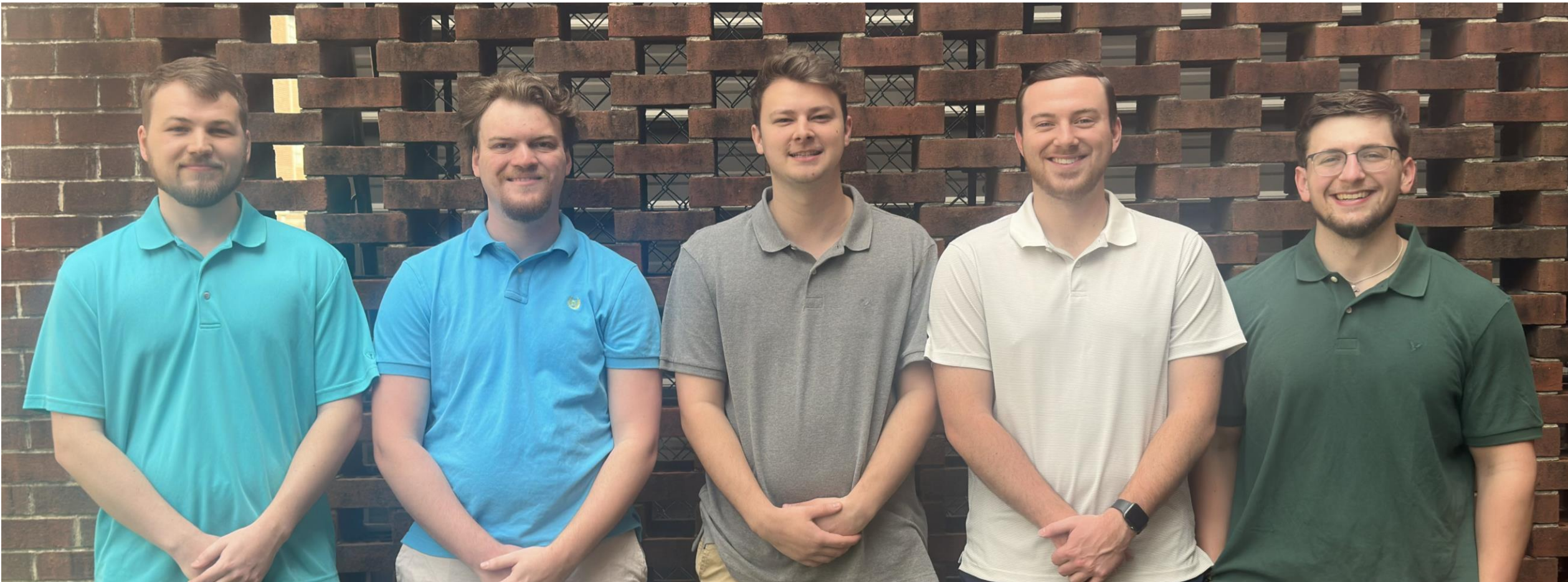
Design

- **User Interface:** Home assistant acts as a controller hub that allows different sensor entities to be integrated in one service.
- **ESP32-H2:** microcontrollers that allow wireless data communication through Zigbee protocol.
- **Raspberry PI 4B:** microcontroller used for head unit system that receives, displays and logs sensor data.
- **Power:** primarily uses the house's main service but with an outage a UPS will be switched on for a secondary service.
- **Sensors:**
  - **Gas-** detects propane, carbon monoxide, ammonia.
  - **Water-** detects the depth of water if present.
  - **Fire-** detects if a fire has started in the house.
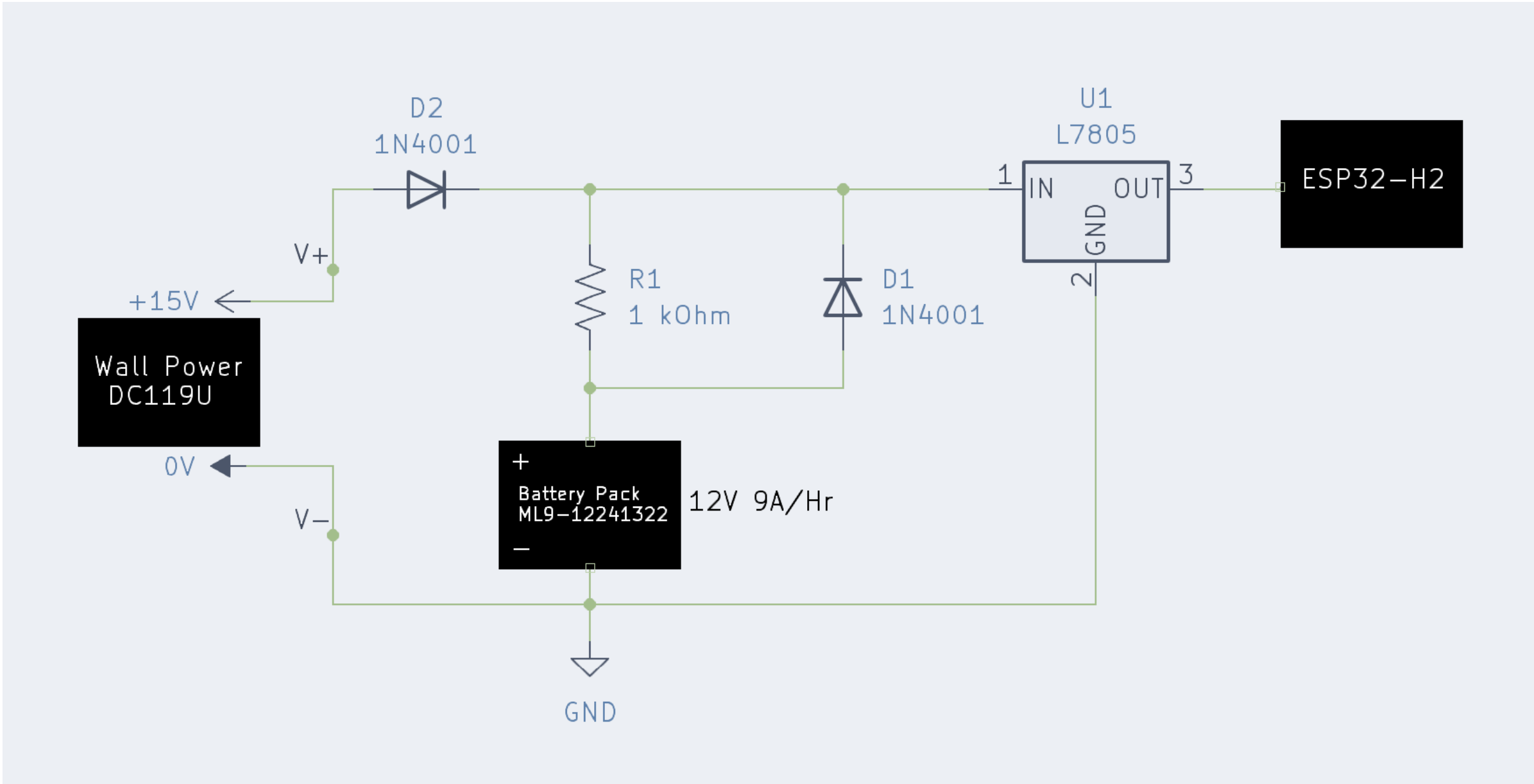 - **Mold-** detects conditions of the house that mold grows in.
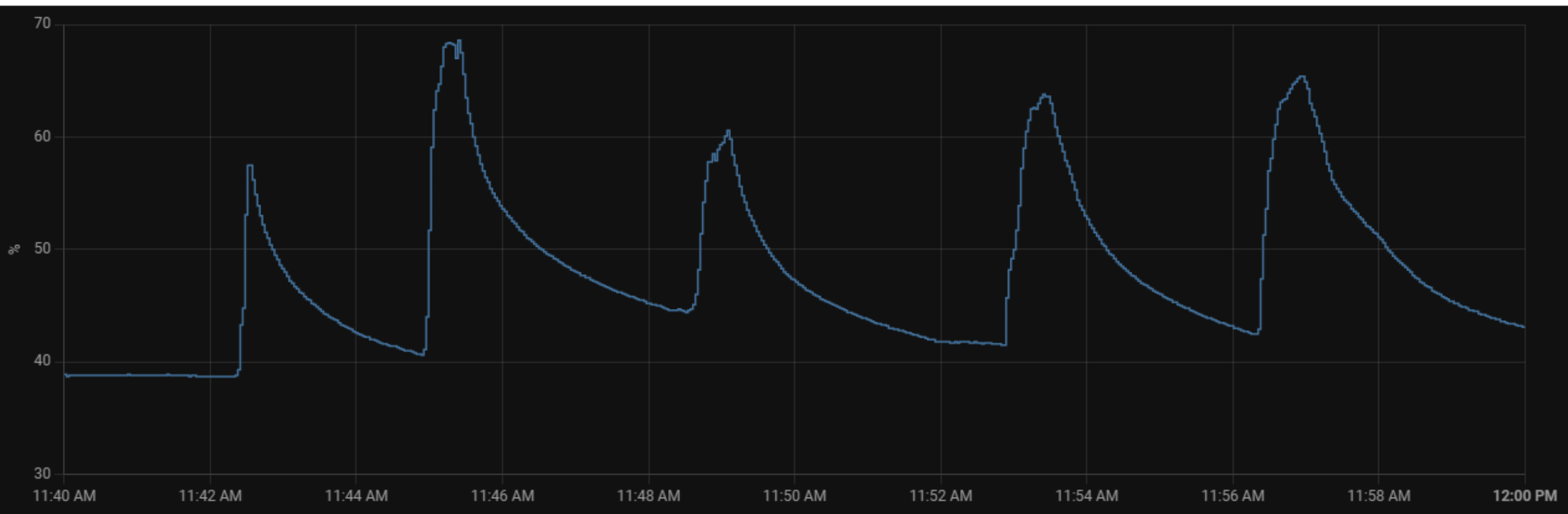

Figure 3: UPS Schematic

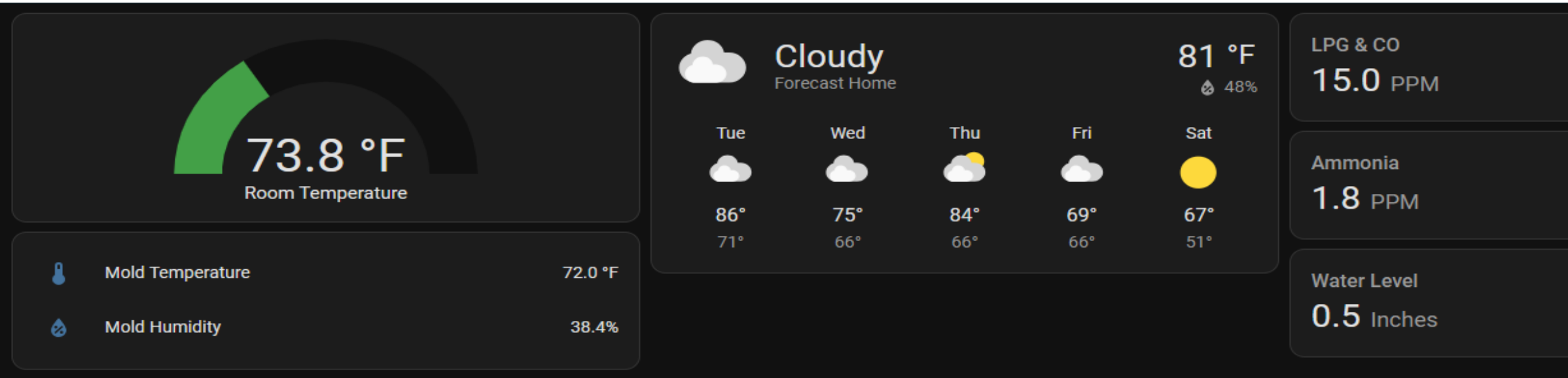## Experimentation & Results

Figure 4: Humidity Test Results

Figure 5: UI with Active Sensor Readings

Budget

Module	Cost
Head Unit Module	$123.40
Communication Module	$100.30
Power Module	$96.24
Flood Module	$9.99
Fire Module	$15.99
Mold Module	$13.41
Gas Module	$45.71

Total Cost $405.04

Future Work

- Implementation into an actual household would be the ultimate goal of this project.
- Better accuracy for more reliable data measurements and history documentation.
- More sensors for other applications.