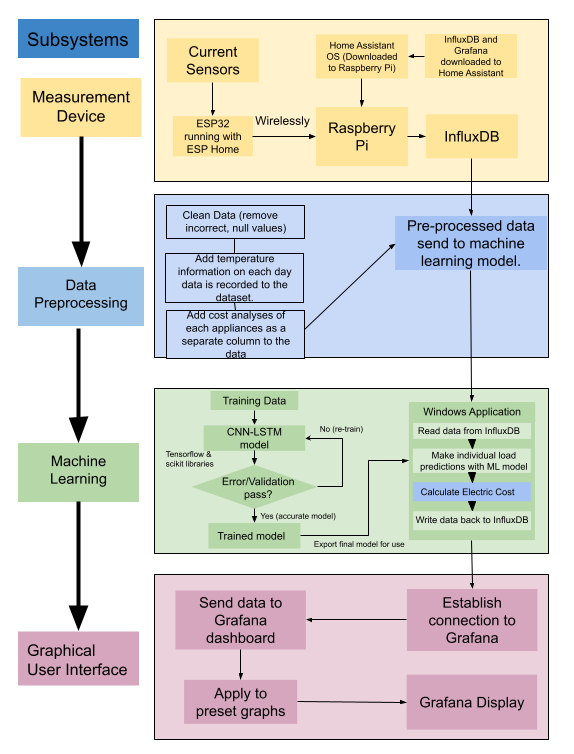
# **Residential Power Disaggregation - User Guide**

**Sponsored by ABB**

Andrew Bailey, Ralph Cullom, Manny Harris, Labib Kasim



**Main Components**

**Hardware Overview**

-RaspberryPi

-Windows PC

-ESP32

-CT Boards

**Home Assistant**

-ESPHome

-InfluxDB

-Grafana

**Machine Learning Application**

-sched.exe

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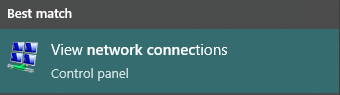
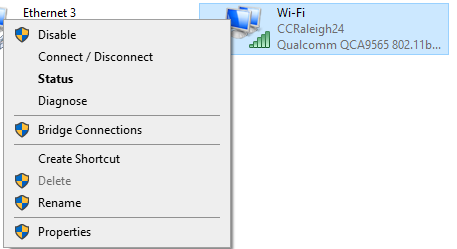
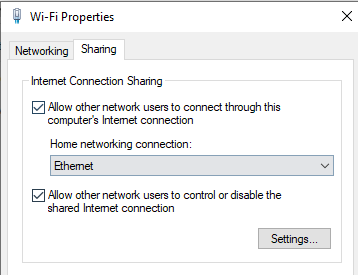
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# Initial Setup

## Hardware

#### Raspberry PI

1. The Raspberry Pi 3 must be powered by a micro USB connection for a power supply
2. A network connection is required and can be supplied through an ethernet cable
   1. For a normal home network, connect an ethernet cable between a router and the raspberry pi. The ESP32 must be on the same network through WiFi for data collection
   2. For use on eduroam without the ESP32, a connection can be provided by sharing a laptop’s network through ethernet
      1. Find and open network connections
      2. Right click on the wifi connection when you are on eduroam and choose properties
      3. Allow other connections and choose ethernet as the method then apply these settings
   3. ESPHome cannot be used on eduroam with homeassistant. To use them together on campus, an external network is needed. By using a WiFi hotspot on a phone a router can be implemented as a wireless bridge
      1. Configure the router as a wireless bridge and connected to the hotspot network created
         1. The router GUI can be opened by plugging an ethernet cable into a LAN port and connecting it to a laptop
         2. Then visit 192.168.0.1 and log in with username and password, both “admin”
      2. The router will create a new network called “Encore2” that the ESPHome can be connected to over WiFi as well as a computer through ethernet connected to a LAN port

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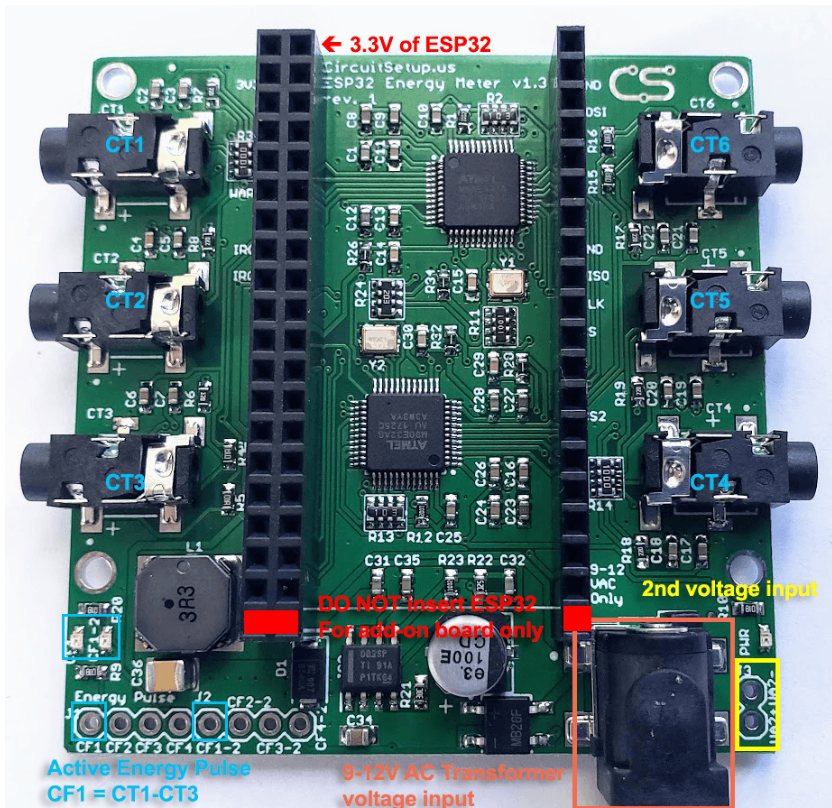
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#### ESP32 and CT Boards

1. The ESP32 can be connected to the CT boards using the header sockets on the top.



1. The CT boards will receive power from the power supply which will power the ESP23 as well
2. The CTs themselves are plugged into the 3.5mm jacks on the sides of the CT board.
   1. Calibration for the CTs can be found as comments in the code

For more information on the CT board layout see this [github](https://github.com/CircuitSetup/Expandable-6-Channel-ESP32-Energy-Meter?tab=readme-ov-file)

## Software

#### Home Assistant

1. The home assistant operating system is already set up on the SD cards in both the Raspberry Pi 3 and 4
   1. For information on how to reinstall the OS, install add-ons, or configure ESPhome in home assistant see [1.2 software/home assistant](https://drive.google.com/drive/folders/1oYOy80KtXfHzAh6u6MhipjaLcvPs788Z?usp=drive_link)

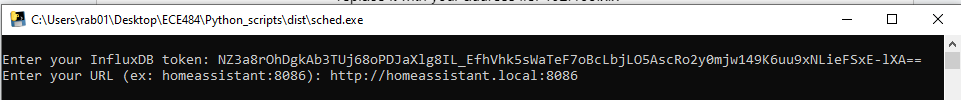
# General Use

#### Home Assistant

1. After the Raspberry Pi is connected to the internet and powered on (see initial setup) you can access the GUI from a computer on the same network
2. Access the home assistant interface by visiting the following link in a web browser <http://homeassistant.local:8123>
   1. If necessary, you can instead use http://(IP Address):8123, where you replace it with your address i.e. 192.168.x.x
3. Log in using these credentials
   1. Username: seniordesign50
   2. Password: seniordesign50
4. On the left-hand side of the home assistant GUI, click on the Grafana tab
5. Once in the Grafana GUI, click on the energy dashboard
6. The dashboard will display the total power usage, predicted values, and cost calculations
7. The time frame for viewing can be changed in the top right corner

#### Windows Application

1. After home assistant is up and running, you can run the Windows application sched.exe from the same computer on the network
2. The application will open up a command prompt window and ask you for credentials
   1. The influx DB token is like a special password that allows you to access a certain bucket. For the raspberry pi 3, the influx DB token is: NZ3a8rOhDgkAb3TUj68oPDJaXlg8IL\_EfhVhk5sWaTeF7oBcLbjLO5AscRo2y0mjw149K6uu9xNLieFSxE-lXA==
   2. The URL is where you can access the influxDB database. With Home Assistant it is on port 8086. The url is: <http://homeassistant.local:8086>



1. The program will make initial predictions for the past 20 minutes and then continue to make new predictions every following 20 minute