Open Source Home Automation

An Introduction to Home Assistant

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What is Home Automation?

- Using computers to control our physical world.

- Controlling lighting, HVAC, appliances, etc using remote systems and automations.

- Automating repetitive tasks around the home. We are humans, we shouldn't behave like computers.

My Home Automation Journey

- Bought our house in 2012, it has eave lighting. Makes the house look pretty at night. Decided I wanted them to turn on and off at certain times.

- Has 2 different banks of lights, with different switches on opposite sides of the house. :/

- First I used WeMo Wifi switches for this and they "worked" but were kind of a pain to use.

The Z-Wave Era

- After being unhappy with the WeMo Wifi switches, I decided to go deeper into the Home Automation world. Started looking at industry standards.

- There are a handful of home automation standards: ZigBee and Z-Wave are the two big ones and use mesh wireless. X10 is an older protocol using power line communication, Insteon is a newer powerline and wireless mesh protocol.

- I decided on Z-Wave mostly because it used the less-crowded 900mhz band with longer range. ZigBee is in the 2.4ghz band, same as wifi. Downside is Z-Wave devices are usually more expensive.

- Eventually I ended up with both.

SmartThings

- All protocols require a hub. The hub acts as a central coordinator of messages and a source for automations.

- Both ZigBee and Z-Wave are mesh protocols, meaning that *some* devices also act as re-transmitters so that messages can reach remote areas.

- Initially I decided on SmartThings, mostly because a friend of mine was already using it and had good things to say about it.

- Installed the first Z-Wave switches 2015. Worked great!

SmartThings

- Installed more Z-Wave switches. Front porch, garage lights, pantry.

- Added Z-Wave sensors on all the doors including the garage doors.

- Added Kwikset Z-Wave locks to the mix as well.

Leaving SmartThings

- So what went wrong? Samsung bought SmartThings and proceeded to basically destroy it.

- I started adding more things that were outside the SmartThings ecosystem:

  - Rachio sprinkler system, ecobee thermostats, MyQ garage door openers, Sensibo mini-split controller all had their own apps independent of SmartThings.

  - Need a unified way to control **everything**.

Home Assistant

- Home Assistant (also called hass.io) is an open-source home automation system predominantly written in Python.

- With the right hardware it can directly control ZigBee and Z-Wave devices as well as all my other things via various APIs.

- The depth of supported things in Home Assistant is pretty stunning, but that comes with a cost: it's not as simple as SmartThings and requires some at least basic programming understanding.

- Has a web interface, mobile apps, etc.

Home Assistant

- Can be installed on a Raspberry Pi using pre-built images to shorten startup time, or on any Linux system.

- Mine is running on a Raspberry Pi 3 sitting behind the entertainment center.

- I added a GoControl ZigBee/Z-Wave USB hub to control the ZigBee and Z-Wave decides.

Integrations

- Home Assistant is built around "integrations". Think of them as like plugins that add functionality to the Home Assistant Framework.

- There are literally hundreds of integrations for anything you can imagine.

- Out of the box, Home Assistant discovered some devices on my network (Plex and Sonos.) Others were manually added.
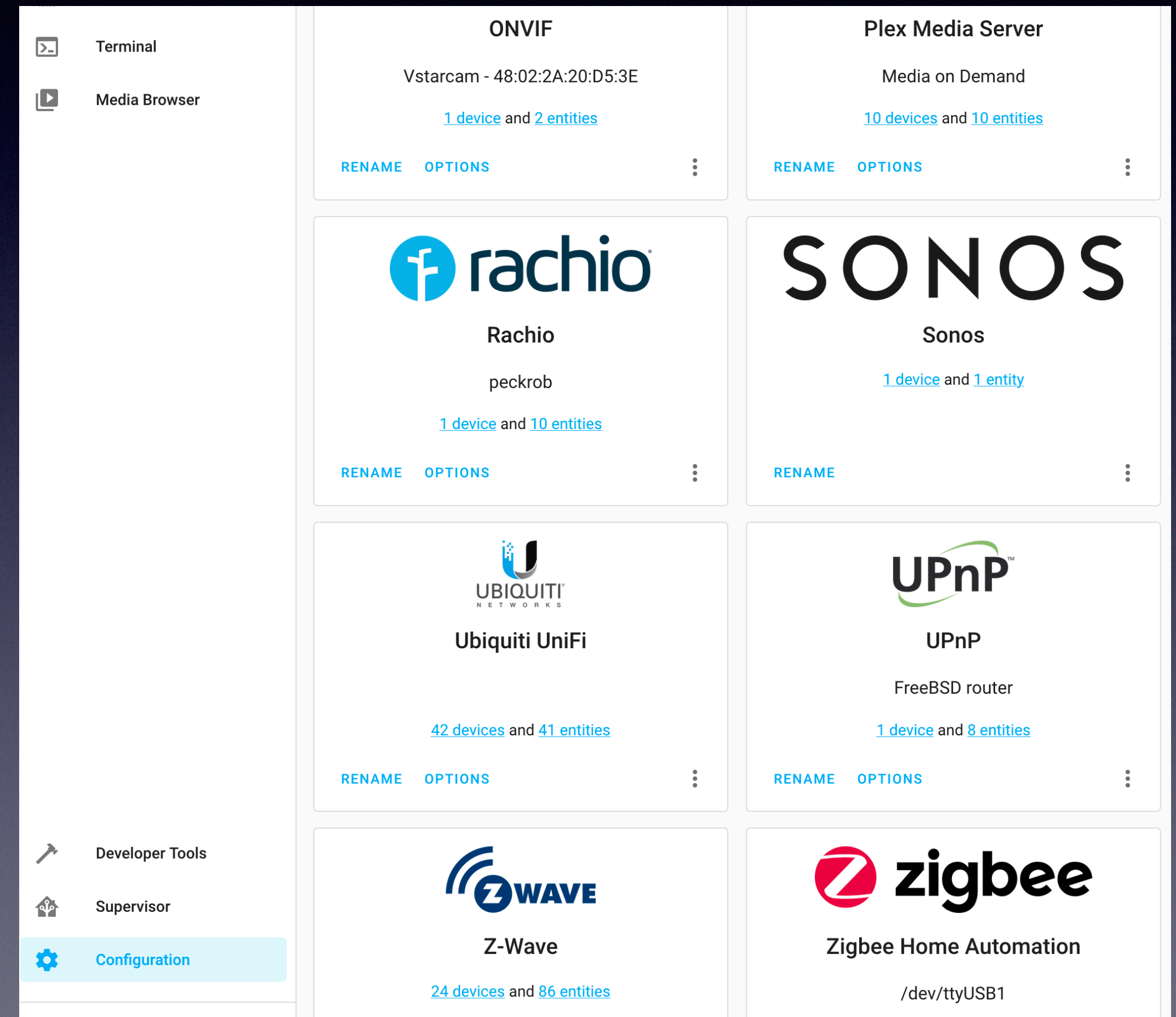
Converting to Home Assistant

- Started by migrating my cloud integrations first: ecobee, Rachio, Sensibo, MyQ.

- Then, migrated each ZigBee and Z-Wave device by individually unpairing it from SmartThings and pairing it to Home Assistant.

- Took about 5 hours total to migrate all of my mesh things, working out to one about every 11 minutes.

- Had to get creative in some areas because of the distance between the controllers and the nodes (remember this is a mesh network.)

Writing Automations

- Automations in Home Assistant can be configured in, broadly, two ways:

  - The GUI is perfectly fine for 99% of automations, even fairly complex ones.

  - But sometimes you have to jump down a level and directly edit YAML files.

Some Example Automations

- In the garage, turn on the overhead lights when any of the 3 doors open, then turn them off 5 minutes after the *last* door closes.

- Turn the front porch light on if the front door opens.

- Turn the eave and landscape lights on 30 minutes before sunset. Turn the eave lights off at 9pm and the landscape lights off at 11pm.

- If it's going to be a nice day (high temp between 68 and 80) turn the HVACs off at 7am and send me a push notification to open the windows. At 7pm send me another notification to close the windows, and turn the HVACs back on at 7:15pm.

Presence Detection

- Presence detection (are people home) can be done using the mobile app.

- Draw a geofence around the property. Home Assistant periodically checks to see if we're home, and if not, makes sure the doors are locked and turns the security system on.
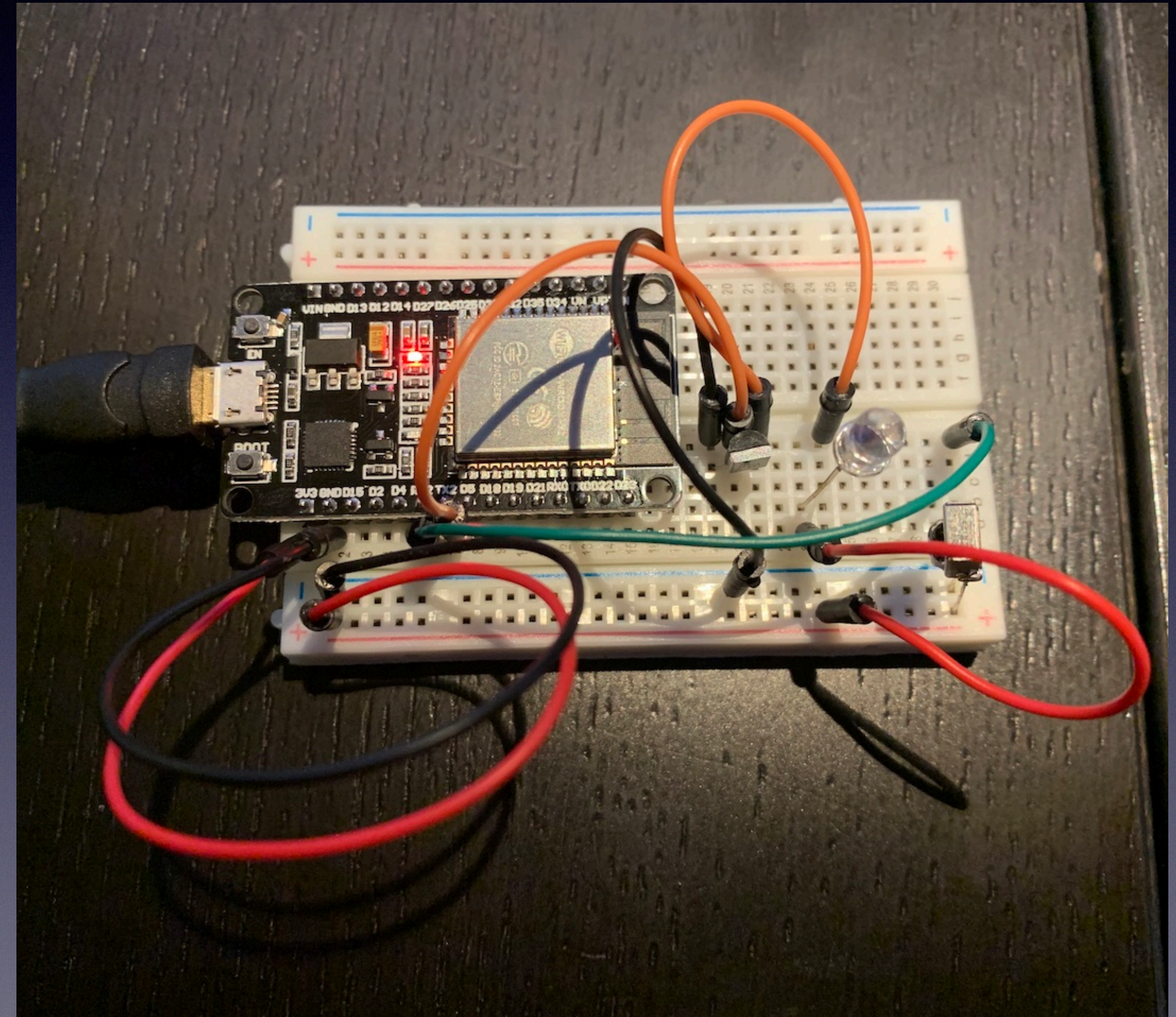
Demonstration

The Rabbit Hole is Deep

- Once you start doing things with Home Assistant, you realize how deep you can go.

- Things like MQTT bridges and custom things using ESP32 become possible.

- To the right is an ESP32 controller for my office heater that uses Home Assistant to turn it on and off remotely.

Upcoming Projects

- Car presence detection and parking sensor (using ultrasonic sensors to check the position of cars in the garage and display the results on a stoplight)

- A device that physically reminds me to put the trash and recycling cans out on the right days. Thinking some kind of light up box with ESP32 and buttons you push to turn the light off.

- Mailbox sensor so I know when the mail came.

Parts List

- You can get started for less than $60

  - Raspberry Pi 4

  - Raspberry Pi Power Supply

  - A case (I like the Flirc cases)

  - An 8gb SD card

- Optional: GoControl CECOMINOD016164 (ZigBee/Z-Wave radios)

Resources

- https://www.home-assistant.io/

- https://esphome.io/

- https://www.robpeck.com/2020/03/migrating-from-smartthings-to-home-assistant/

- https://www.robpeck.com/2020/05/securing-home-assistant-alexa-integration/

- https://www.robpeck.com/2020/10/remotely-controlling-a-delonghi-oil-radiator-using-home-assistant-esphome-and-esp32/