

# Building a Better Thermostat

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<https://github.com/mtreinish/building-a-better-thermostat>

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# Room Layout



# AC Units



## Thermostat

- ▶ Closed Loop control device
- ▶ 1 input temperature sensor
- ▶ 1 output for controlling heating and/or cooling system

## Controlling the AC

- ▶ Can't take apart the AC (I don't own it)
- ▶ No identifying information for the AC
- ▶ Control via power (use a relay to turn on and off)

- ▶ Use Z-Wave outlet to control
- ▶

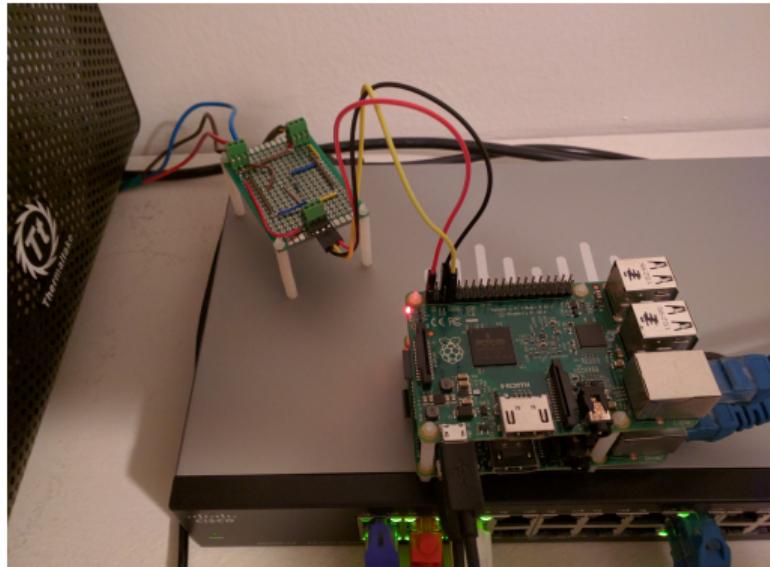


## Sensing the Living Room Temperature

- ▶ Wireless sensor
- ▶ Leverage Z-Wave network
- ▶

# Bedroom Temperature Sensing

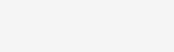
- ▶ Track both bedroom and “data” closet temperatures
- ▶ Leverage spare raspberry pi sitting in “data” closet
- ▶ Went with dallas 1 wire temperature sensors



## Home Assistant

- ▶ Open Source Home Automation Platform
- ▶ Written in Python 3
- ▶ Has support for over 600 different components
- ▶ Runs locally (with all data locally)

# Setting up thermostat in Home Assistant

 eQ-3 Bluetooth Smart Thermostats Climate	 Ecobee Thermostat Climate	 Generic Thermostat Climate	 Heatmiser Thermostat Climate
 HomeMatic Thermostats Climate	 Honeywell Thermostat Climate	 MySensors HVAC Climate	 Nest Thermostat Climate
 Netatmo Thermostat Climate	 OpenEnergyMonitor WIFI Thermostat Climate	 Proliphix Thermostat Climate	 Radio Thermostat (3M Filtrate) Thermostat Climate
 Vera Thermostat Climate	 Wink Thermostat Climate	 Z-Wave Climate Climate	

- ▶ Use the generic thermostat component

**Sun** moon **more info** 0 0 100 0

Aeotec ZW100 MultiGen, Multigen, 6-Alarm Level  
Aeotec ZW100 MultiGen, Multigen, 6-Alarm Type  
Aeotec ZW100 MultiGen, Multigen, 6-Battery Level  
Aeotec ZW100 MultiGen, Multigen, 6-Sensor Level

### Living Room

- Aeotec ZW096 Smart Switch 6 Current 0.0 A
- Aeotec ZW096 Smart Switch 6 Energy 289.87 kWh
- Aeotec ZW096 Smart Switch 6 Power 0.0 W
- Aeotec ZW096 Smart Switch 6 Previous Reading 289.87 kWh
- Aeotec ZW096 Smart Switch 6 Voltage 122.63 V
- Aeotec ZW100 MultiSensor 6 Burglar 0
- Aeotec ZW096 Smart Switch 6 Switch
- Aeotec ZW100 MultiSensor 6 Luminance 0.0 lux
- Aeotec ZW100 MultiSensor 6 Relative Humidity 21.0 %
- Aeotec ZW100 MultiSensor 6 SourceNodeID 0
- Aeotec ZW100 MultiSensor 6 Temperature 21.2 °C
- Aeotec ZW100 MultiSensor 6 Ultraviolet 0.0
- Living Room **Idle 25 °C** Currently: 21.2 °C

### Bedroom

- Bedroom Temperature Sensor 19.937 °C
- Aeotec ZW096 Smart Switch 6 Current 0.0 A
- Aeotec ZW096 Smart Switch 6 Energy 147.44 kWh
- Aeotec ZW096 Smart Switch 6 Power 0.0 W
- Aeotec ZW096 Smart Switch 6 Previous Reading 147.44 kWh
- Aeotec ZW096 Smart Switch 6 Voltage 122.63 V
- Aeotec ZW100 MultiSensor 6 Burglar 0
- Aeotec ZW096 Smart Switch 6 Switch
- Bedroom

### Data Closet

- Data Closet Temperature Sensor 20.75 °C
- UPS Battery 100.0 %
- UPS Battery Voltage 27.2 V
- UPS Input Voltage 123.0 V

**Living Room** 16 minutes ago **Idle 25 °C** Currently: 21.2 °C

Target Temperature

25 °C

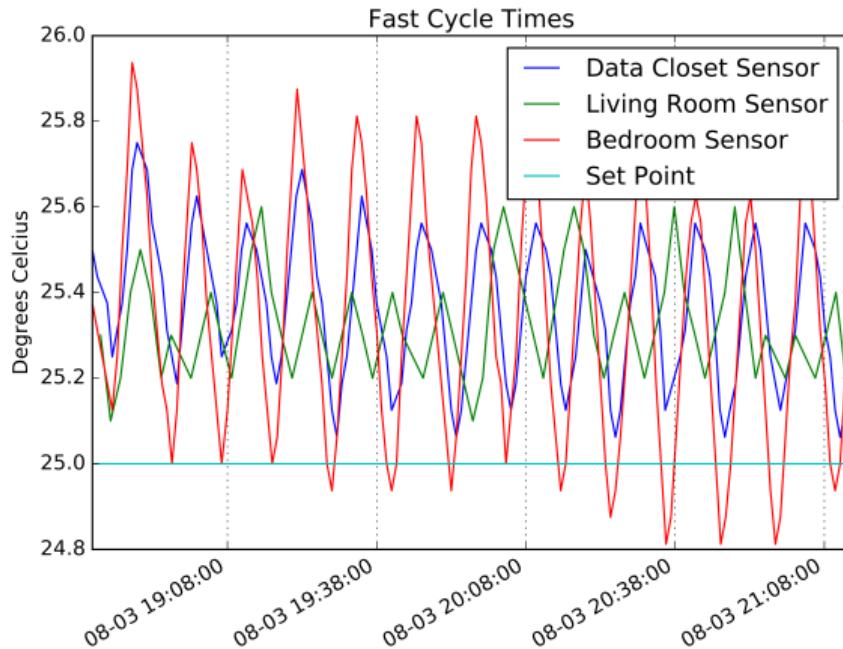
### Automation

- Set Bedroom AC to 25 C when arriving home
- Set Living Room AC to 25 C when arriving home
- Set Living Room AC to 26 C when leave starbucks on 44
- Set Living Room AC to 26 C when leave starbucks on 44
- Set Living Room AC to 26 C when leaving starbucks rou...
- Set Living Room AC to 28 C when leave home
- Set Living Room AC to 28 C when leave home
- Set Living Room AC to 30 C when asleep

## DallasMQTT

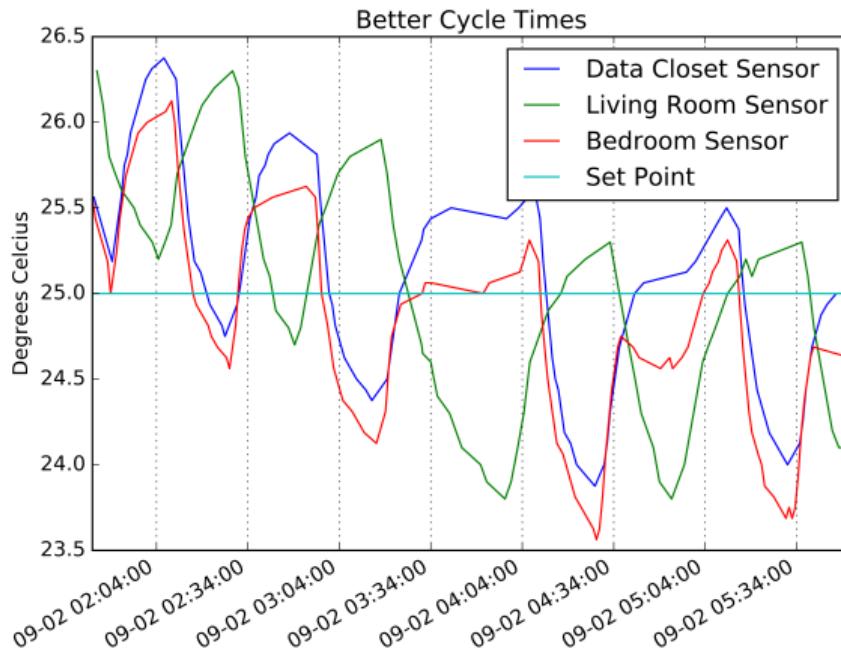
- ▶ Framework for polling sensors and pushing results on MQTT
- ▶ Handles an arbitrary number of sensors
- ▶ Currently only supports Dallas 1 wire temperature sensors from w1\_therm linux driver
- ▶ Written in python

# Short Cycle Time



- ▶ Bedroom on for 8 min. and off for 4 min.
- ▶ Living Room on for 4 min. off for 2 min.

## Corrected Cycle Time



- ▶ Bedroom on for 20 min. and off for 21 min.
- ▶ Living Room on for 17 min. off for 29 min.

## Starting to Automate

```
alias: Set Living Room AC to 30 C when asleep trigger: platform: time after:  
'12:30:00' condition: - condition: time before: '09:30:00' action: service:  
thermostat.set_temperature entity_id: thermostat.living_room data: temperature: 28
```

## Location Tracking

- ▶ Start writing rules based on my location
- ▶ Set temperature higher when I'm not home
- ▶ Pre-cool

# Owntracks

- ▶ Open Source iOS and Android app for reporting location over MQTT
- ▶ Enables you to use either a private MQTT broker or public service
- ▶ Home assistant component to use the data



## Location Based Automation Rules

```
alias: Set Living Room AC to 26 C when leaving starbucks route 9
trigger: platform:state entity_id: device_tracker.myphone from: 'Starbucks Route 9'
action: - delay: minutes: 5 - service: climate.set_temperature entity_id: climate.living_room data: temperature: 26
```

## Future Work

- ▶ More Sensors
- ▶ More automation
- ▶ Fix power usage collection

## Where to get more information

- ▶ Blog Post <http://blog.kortar.org/?p=319>
- ▶ <https://home-assistant.io/>
- ▶ <https://github.com/mtreinish/dallasMQTT>
- ▶ <http://owntracks.org/>

Questions?