# Building a personal home automation setup

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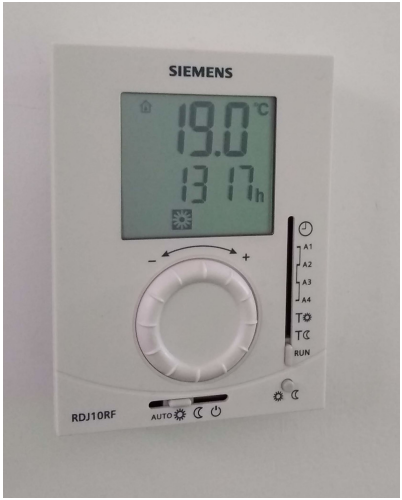
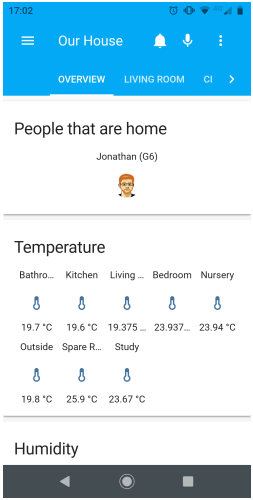
# Initial Motivation / Requirements

- 7 day heating control
- No external dependencies
- Other home occupiers to consider
- No desire to do serious home alterations



# Home Assistant

- Excellent Python home automation software
- https://www.home-assistant.io/
- Self contained Raspberry Pi install available (Hass.io)
- I run it in a systemd container under Debian




https://www.earth.li/~noodles/blog/2018/06/home-assistant.html

# MQTT

- Lightweight message broker
- Decouples sensors from control
- Settled on Mosquitto
- https://mosquitto.org/
- Available in OpenWRT, runs on the network gateway
- Proper SSL cert from Let's Encrypt


https://www.earth.li/~noodles/blog/2018/05/mqtt-broker.html

# Raspberry Pi temperature sensor

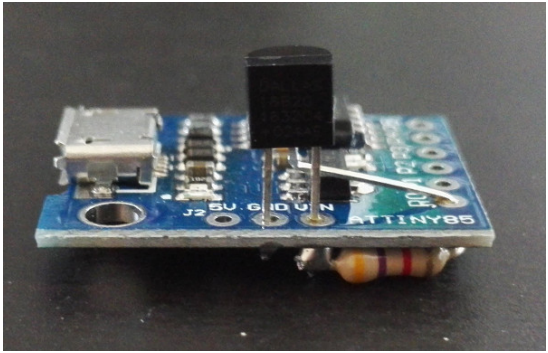
```
import paho.mqtt.publish as publish
import time

bme280_dir = '/sys/bus/i2c/devices/0-0076/iio:device0/'

while True:
    with open(bme280_dir + 'in_temp_input', 'r') as f:
        try:
            temp = int(f.read()) / 1000
            publish.single('location/study/temperature',
                           str(temp), hostname='mqtt.host',
                           port = 8883, tls={})
        except:
            pass

    time.sleep(60)
```

Simple MQTT temperature monitor

https://www.earth.li/~noodles/blog/2018/05/rpi-mqtt-temp.html

# Temper USB clone

- Existing PC in living room
- Looked for off-the-shelf USB device
- Found TEMPer USB
- Realised I had the parts to build my own
- Shaved another yak




https://www.earth.li/~noodles/blog/2018/07/badly-cloning-temper.html

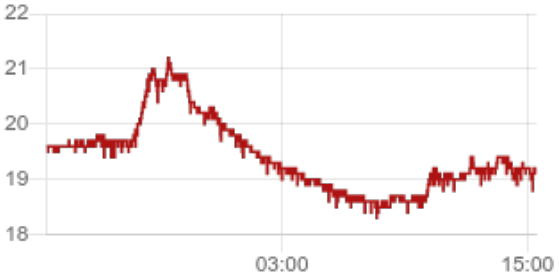
# Xiaomi Bluetooth LE sensor

- Low power standalone sensor
- Ideal for the bathroom
- Broadcasts over Bluetooth
- Excuse to learn some Go


https://www.earth.li/~noodles/blog/2019/05/cherry-lips.html

https://www.banggood.com/Xiaomi-Mijia-Bluetooth-Thermometer-Hygrometer-with-LCD-Screen-Magnetic-Suction-Wall-Stickers-p-1232396.html

# What can sensors tell you?

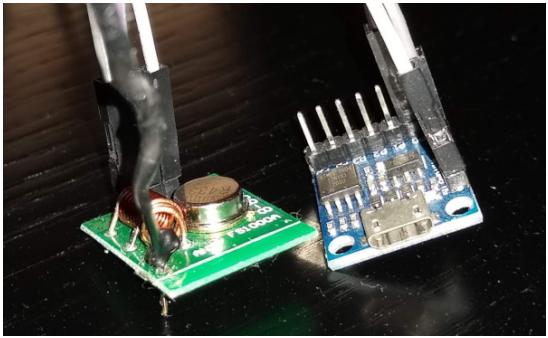
# Presence awareness

- Want to control heating based on house occupation
- GPS tracking too invasive
- Phone wifi presence useful proxy
- Home Assistant can scrape OpenWRT LuCI interface
- But: used this as a reason to learn Netlink/ARP notification interface

https://www.earth.li/~noodles/blog/2018/09/netlink-arp-presence.html

# 433MHz transmitter

- Avoids need to work directly with mains
- Heating already using this to communicate
- Allows for other bits too
- Commercial options available (e.g. Broadlink RM Pro)
- Of course I built my own



https://www.earth.li/~noodles/blog/2018/09/433mhz-atmel.html

https://rossharper.net/2015/11/decoding-a-siemens-rcr10433-thermostat-signal-to-control-a-boiler-from-a-raspberry-pi/

# Lights

- Off-the-shelf devices (careful with mains)
- Unfortunately all need firmware hacks
- Sonoff Tasmota is very flexible
- Ended up writing own ESP8266 MQTT firmware

https://www.earth.li/~noodles/blog/2018/05/sonoff-mqtt.html

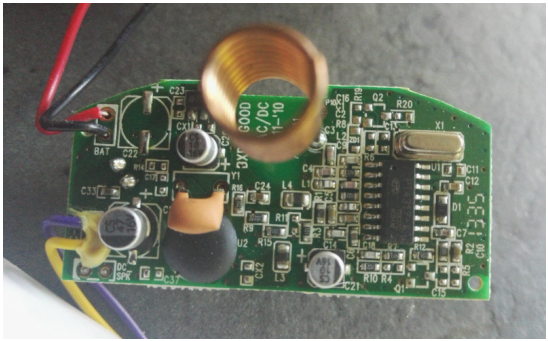
# Amazon Alexa

- Deliberated over this given privacy concerns
- Home Assistant provides logging + access control
- Useful control method, especially for visitors


https://www.earth.li/~noodles/blog/2018/06/alexa-assistant.html

# Doorbell

- Couldn't hear the doorbell throughout the house
- Another 433MHz device
- Ended up hacking an ESP8266 transmitter into the doorbell receiver
- Notification via Alexa (and original receiver)



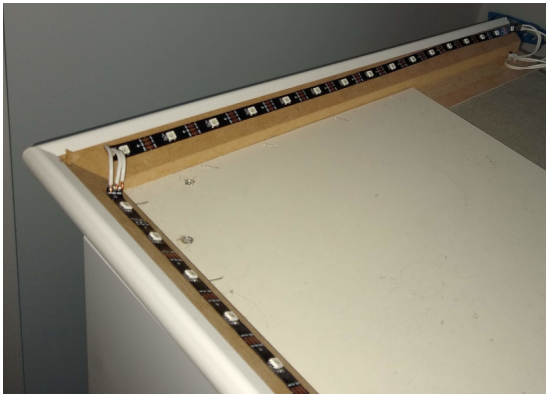
https://www.earth.li/~noodles/blog/2018/10/mqtt-doorbell.html

# Cinema

- Ties several things together
  - Lights
  - Heating control
  - Power on AV equipment
  - Media player status
- Activated as a 'scene'
- Unexpected outcome

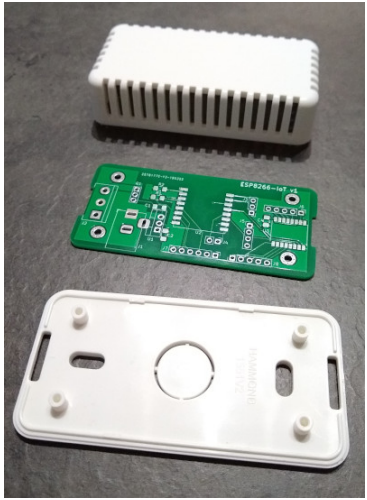
# More lights

- "It would be useful if..."
- Oh. Right. Er. *5 minutes pass*. Like that?
- Dimmable WS2812 LED strips, ESP8266 controller



# IoT PCB

- Project presentation could be improved
- Needed a better way to case my projects
- Kept seeing $2 PCB offers from JLCPCB
- Designed an ESP8266 PCB using KiCad to fit a suitable case




https://www.earth.li/~noodles/blog/2019/04/my-first-pcb.html

# What next?

- Zigbee (Philips Hue, IKEA TRÅDFRI, wireless buttons)
- External temperature/humidity monitor
- Energy meter monitoring
- Automated blinds?
- Burglar alarm integration (e.g. konnected)

# Thank you

# Credits / References

- My Home Automation blogging
- equiva Bluetooth radiator valve
- Domotitz
- openHAB
- David S. Pumpkins ©2016 Saturday Night Live