Building a smart humidifier with Tasmota, MQTT, and a Pico2

Or, "Townsville is too dry apparently"

Mushroom Production

I grow mushrooms.

No. Not "those" mushrooms

Mushroom Production

These mushrooms



LC to grain



LC to grain



Grain to bucket



Bucket to tent



You get one questionable screenshot



Humidifier

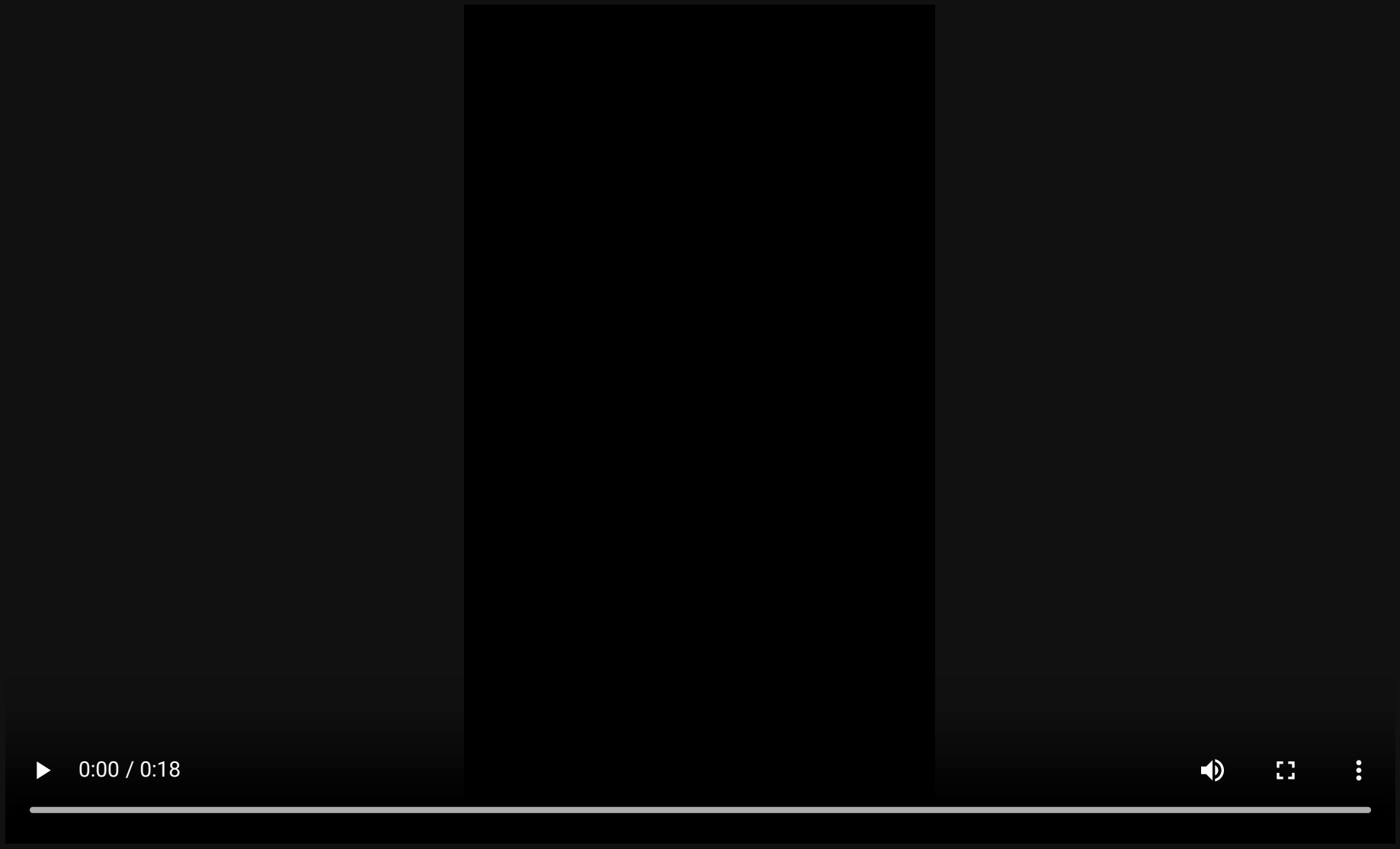
Two key parameters:

- Humidity: ~90%
- CO2: <800 ppm

Humidifier



Humidifier



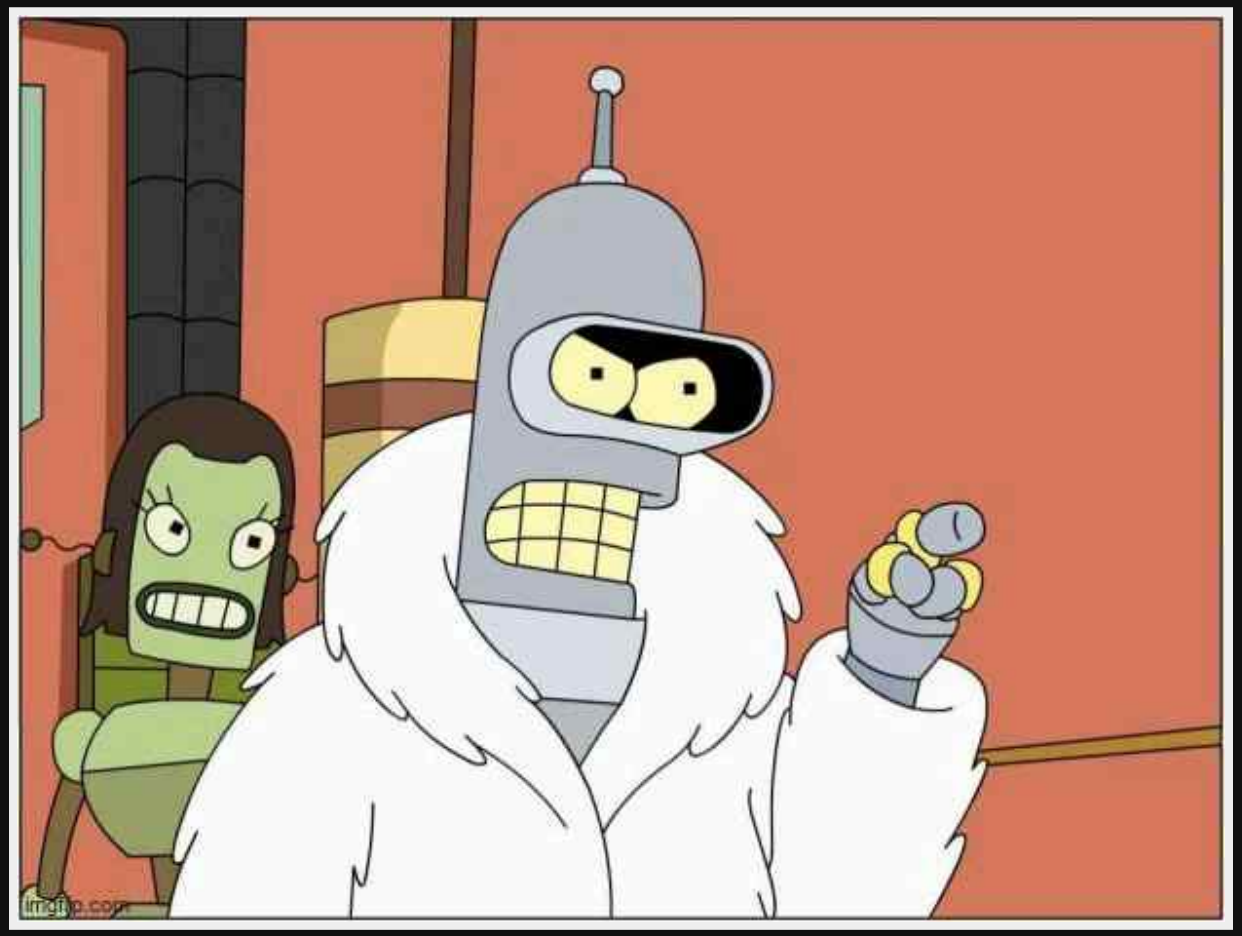
Humidifier



2am Failure



"I'll make my own controller"



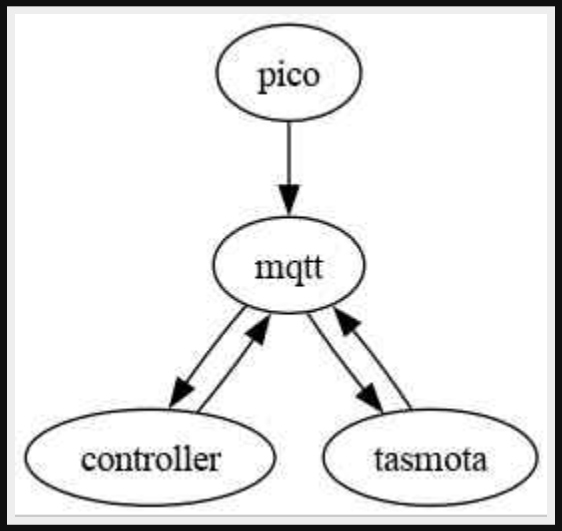
Constraints

- "Low" price
- Reusable components
- No power electronics
- Harsh environment; humidity, spores
- Minimise downtime

Components

- Tasmota plug
- Pico2W + SHT31
- Pi4

Plan



mqtt

- Topics
- Messages
- LWT
- QoS
- Persistence


▼ 192.168.0.43
▶ homeassistant (1240 topics, 1288 messages)
▼ tasmota
▼ discovery
▶ 78421CF28308 (2 topics, 2 messages)
▶ 78421CF27CA2 (2 topics, 2 messages)
▶ tele (1 topic, 1 message)
▶ device (2 topics, 2 messages)
▼ growcruft
▼ sensor
▼ hygrometer
status = online
log = 0 11
data = {"temp": 25.14, "rh": 88.53}
▶ $SYS (53 topics, 155 messages)

```
danny@gemini ✓ ~ $ mosquitto_sub -h \
    ${PI4} \
    -t 'growcruft/sensor/hygrometer/status' \
    -C 1
online
danny@gemini ✓ ~ $ mosquitto_sub -h ${PI4} \
    -t 'growcruft/#' \
    -C 1 \
    -v
growcruft/sensor/hygrometer/status online
```

/etc/mosquitto/conf.d/listeners.conf

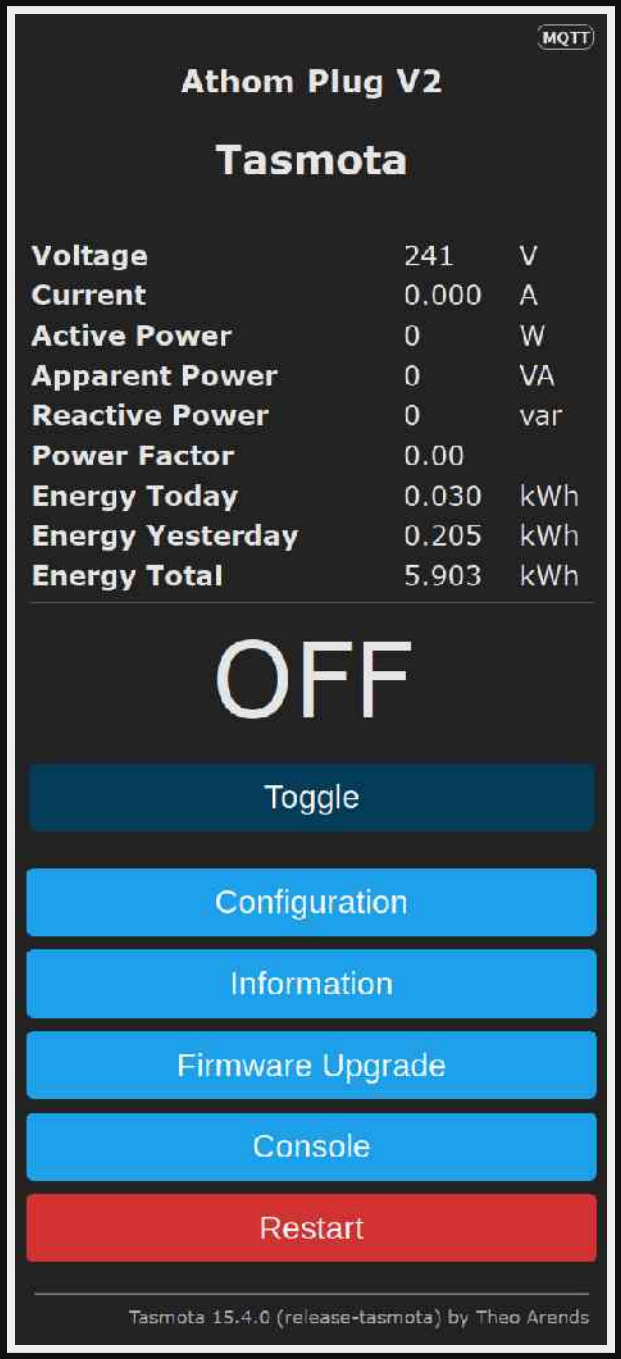
```
allow_anonymous true
listener 1883 0.0.0.0
```

```
apt install mosquitto-dev mosquitto-clients
vim /etc/mosquitto/conf.d/listeners.conf
systemctl enable --now mosquitto.service
```

Tasmota

"Open source firmware for ESP devices"


Model: PDOSV2-AU16A
Input: AC 100-240V, Max Load: 16A
ROHS
Made in China


MQTT
Athom Plug V2
Tasmota
Voltage 241 V
Current 0.000 A
Active Power 0 W
Apparent Power 0 VA
Reactive Power 0 var
Power Factor 0.00
Energy Today 0.030 kWh
Energy Yesterday 0.205 kWh
Energy Total 5.903 kWh
OFF
Toggle
Configuration
Information
Firmware Upgrade
Console
Restart
Tasmota 15.4.0 (release-tasmota) by Theo Arends

```
danny@gemini ✓ ~ $ curl "http://192.168.0.66/cm?cmnd=EnergyTotal0
{
  "EnergyTotal": {
    "Total": 5.905,
    "Yesterday": 0.205,
    "Today": 0.032
  }
}
```

```
danny@gemini ✓ ~ $ mosquitto_sub -h ${PI4} \
    -t 'device/tasmota/F28308/tele/tasmota_F28308/SENSOR'
{"Time":"2026-05-25T04:33:55","ENERGY":{"TotalStartTime":"2026-04
```

Fail "safe"

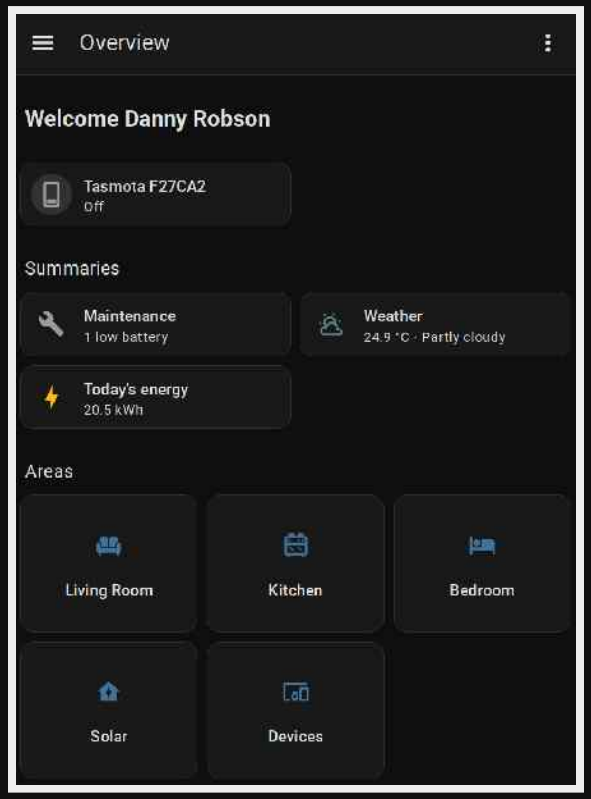
Set a maximum "on" duration.

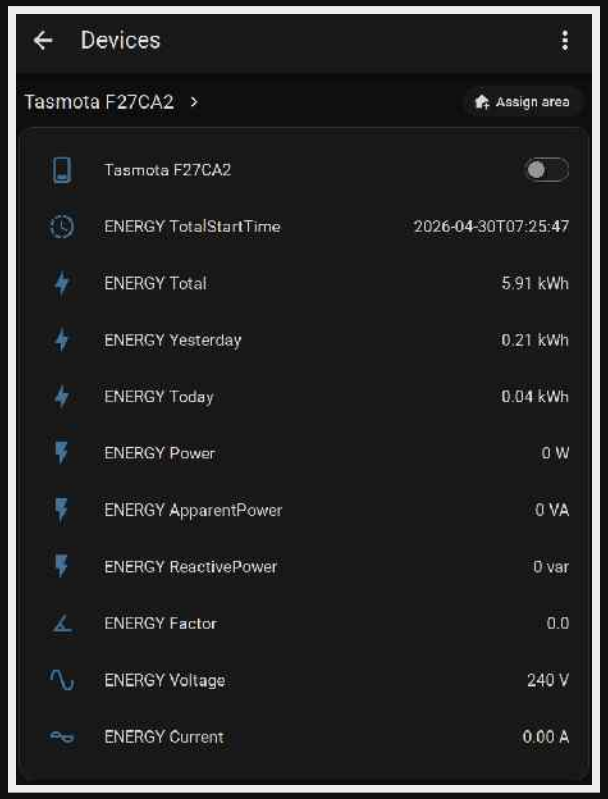
```
curl "http://192.168.0.66/cm?cmnd=PulseTime1 135"
```

Home Assistant

home-assistant.yaml

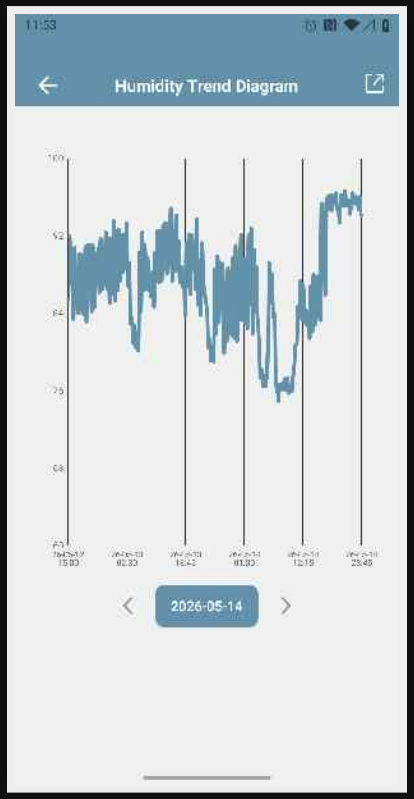
```
services:
  homeassistant:
    container_name: homeassistant
    image: ghcr.io/home-assistant/home-assistant:stable
    volumes:
      - /opt/stacks/homeassistant/config:/config
      - /etc/localtime:/etc/localtime:ro
      - /run/dbus:/run/dbus:ro
    restart: unless-stopped
    network_mode: host
    environment:
      TZ: Australia/Brisbane
networks: {}
```


Overview
Welcome Danny Robson
Tasmota F27CA2
Off
Summaries
Maintenance
1 low battery
Weather
24.9 °C · Partly cloudy
Today's energy
20.5 kWh
Areas
Living Room
Kitchen
Bedroom
Solar
Devices


Devices
Tasmota F27CA2
Assign area
Tasmota F27CA2
ENERGY TotalStartTime
2026-04-30T07:25:47
ENERGY Total
5.91 kWh
ENERGY Yesterday
0.21 kWh
ENERGY Today
0.04 kWh
ENERGY Power
0 W
ENERGY ApparentPower
0 VA
ENERGY ReactivePower
0 var
ENERGY Factor
0.0
ENERGY Voltage
240 V
ENERGY Current
0.00 A

Automation

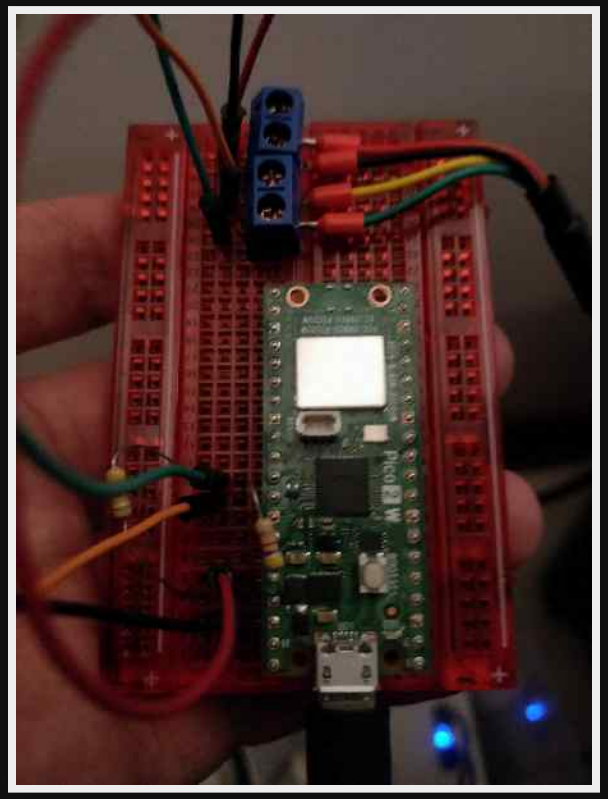
```yaml
alias: Humidifier Activation
description: "Turn on the mushroom humidifier periodically"
triggers:
  - trigger: time_pattern
    minutes: /10
conditions: []
actions:
  - action: switch.turn_on
    metadata: {}
    target:
      entity_id: switch.tasmota_f27ca2
    data: {}
  - delay:
      hours: 0
      minutes: 0
```


11:53
Humidity Trend Diagram
2026-05-14

Sensor

- Pico2W
- SHT31





MQTT

- report to "growcruft/sensor/hygrometer"
  - "log"
  - "status"
  - "data"

watchdog

Bugs happen. Reboot and rety.

```
watchdog_enable (60 * 1000, true);
while (1) {
    watchdog_update ();
    /* work */
}
```

```
auto const len = snprintf (buffer, sizeof (buffer), "{\"temp\": %
if (len < 0) {
    watchdog_hw->scratch[0] = 2;
    watchdog_hw->scratch[1] = len;
    die ("snprintf: %i\n", len);
}
```

```
if (watchdog_caused_reboot ()) {
    char buffer[64] {};
    auto const len = snprintf (
        buffer, sizeof (buffer),
        "%" PRIu32 " %" PRIu32,
        watchdog_hw->scratch[0],
        watchdog_hw->scratch[1]
    );
    auto const err = mqtt_publish (&s_server.mqtt,
        "growcruft/sensor/hygrometer/log",
        buffer, len, 1, 1, pub_request_cb, nullptr);
    if (err != ERR_OK)
        die ("mqtt_publish log: %i", err);
}
```

i2c

```
u08 CMD[] = { 0x24, 0x00 };
i2c_write_blocking (i2c1, SHT31_I2C_ADDR, CMD, sizeof (CMD), fals

sleep_ms (100);

u08 buffer[(2 + 1) * 2] {};
i2c_read_blocking (i2c1, SHT31_I2C_ADDR, buffer, sizeof (buffer),
return measurement_t::from_bytes (buffer);
```

decode

```
u16 const raw_temp = (buffer[0] << 8u) | buffer[1];
u16 const raw_rh   = (buffer[3] << 8u) | buffer[4];

return measurement_t {
    -45 + 175 * f32 (raw_temp) / 65535,
    100 * f32 (raw_rh) / 65535,
};
```

MQTT

- write 'online' to status, set LWT
- write 'log' if necessary
- every 10s
  - probe sensor
  - write JSON to 'data'

Monitoring

```
danny@gemini ✓ ~ $ mosquitto_sub -h ${PI4} -t 'growcruft/#' -v
growcruft/sensor/hygrometer/status online
growcruft/sensor/hygrometer/log 0 0
growcruft/sensor/hygrometer/data {"temp": 26.23, "rh": 88.74}
growcruft/sensor/hygrometer/data {"temp": 26.23, "rh": 88.53}
growcruft/sensor/hygrometer/data {"temp": 26.21, "rh": 88.26}
```

Controller

```
auto const payload = json::parse (msg->get_payload_str ());
f32 const rh = payload["rh"].get<f32> ();
if (rh > TARGET_LO or dt < MIN_INTERVAL)
    continue;

last_fired = now;
client.publish (ON_MESSAGE);
```

Deploy

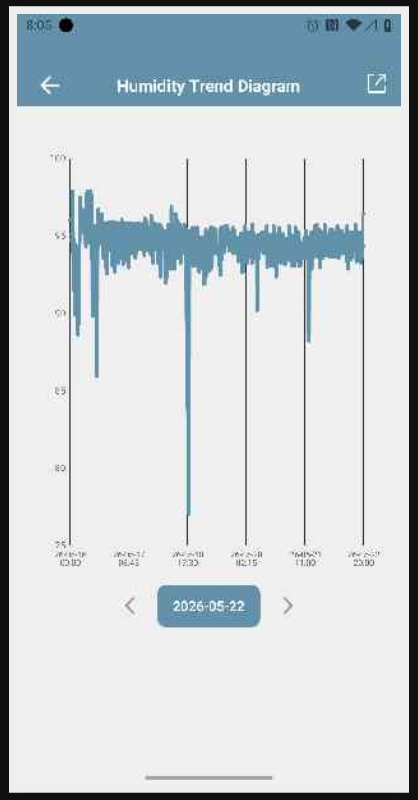
controller.service

```
[Unit]
Description=Growcruft Humidifier Controller
After=network.target mosquitto.service
Requires=mosquitto.service

[Service]
ExecStart=/opt/growcruft/controller
Restart=always
RestartSec=5

[Install]
WantedBy=multi-user.target
```

Results



Future

- Fewer magic values
- Better (read "some") error recovery
- CO2 sensor for exhaust fan automation

Questions

- https://tasmota.github.io/docs/
- https://www.home-assistant.io/
- **Somewhere** on https://git.nerdcruft.net/
- mailto:danny@nerdcruft.net