

DIY Home Automation, Internet of Things, Smart Homes and Devices.

TCF 2018

Overview

- Introduction, Warning, etc
- Demo
- Features
 - Hardware
 - PI
 - ESP
 - Arduino
 - Sensors

Overview

- Features (cont'd)
 - Software
 - Arduino
 - Sonoff-Tasmota
 - OTA upgrades
 - Web interface
 - MQTT client
 - MQTT
 - Node-Red
 - Javascript
 - JSON (XML, HTML, CSV, Text)
 - Flow
 - UI

Overview

- Features (cont'd)
 - Linux
 - Jessie
 - OpenWRT
 - Screen (with bash)
 - Dnsmasq (?, DHCP Server, DNS Server)
 - Syslog
 - Web Server (? with PHP)
 - Cron
 - Programming languages (various)

Overview

- Where to get the hardware
 - Adafruit
 - Sparkfun
- Where to get the software
 - Github/Gitlab/Bitbucket
 - SourceForge
- AI
- Other HA software
- Proprietary HA software

My Introduction

- Neil Cherry (ncherry@linuxha.com)
- Home Automation has been my hobby/passion/obsession since 1978
- Author: *Linux Smart Homes For Dummies* 2006, various magazine articles (see appendix)
- Background: computers, networking, electronics, embedded systems & programming (various languages)
- Worked on multiple open source projects
- Employed as a Tester for Network Services and now DevOps

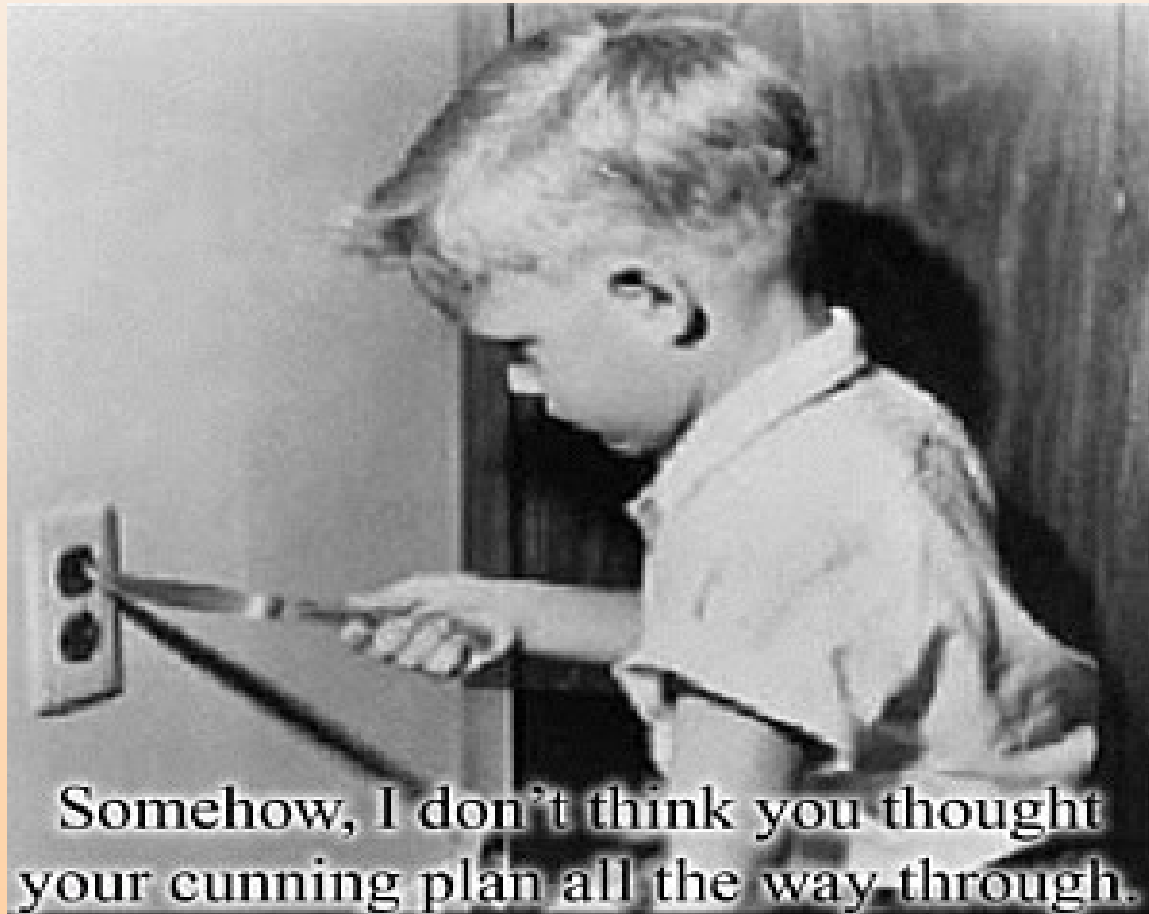
Who is this presentation for?

- Makers
- DIY
- Hackers
- Those who are interested in hardware and software

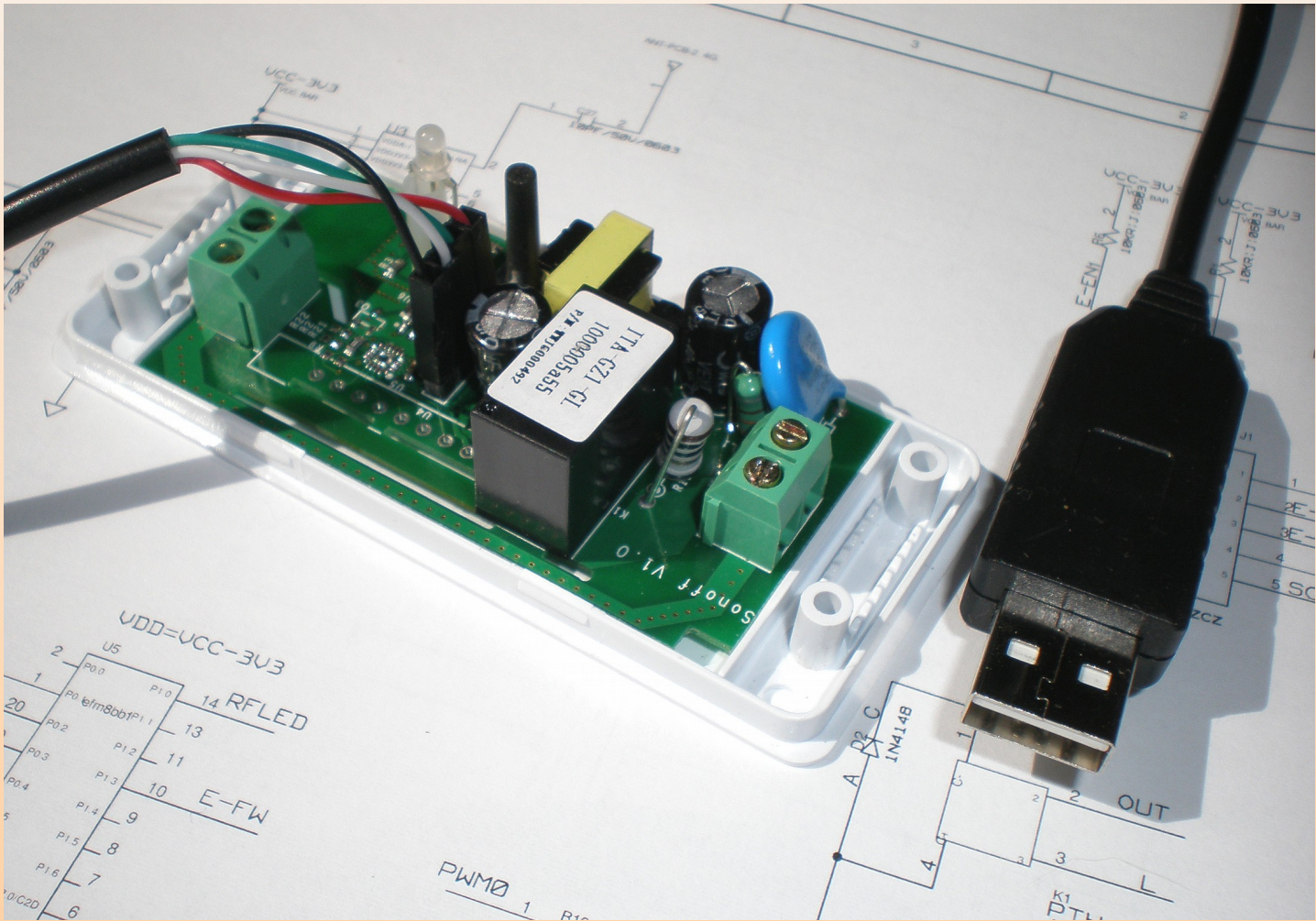


- The Institute For Exploratory Research
The InfoAge Science History Learning
Center and Museum,
at historic Camp Evans
2201 Marconi Road, Wall, NJ 07719
- Just off RT 18, Exit 7a (Brighton Ave exit)
- Monday 7PM

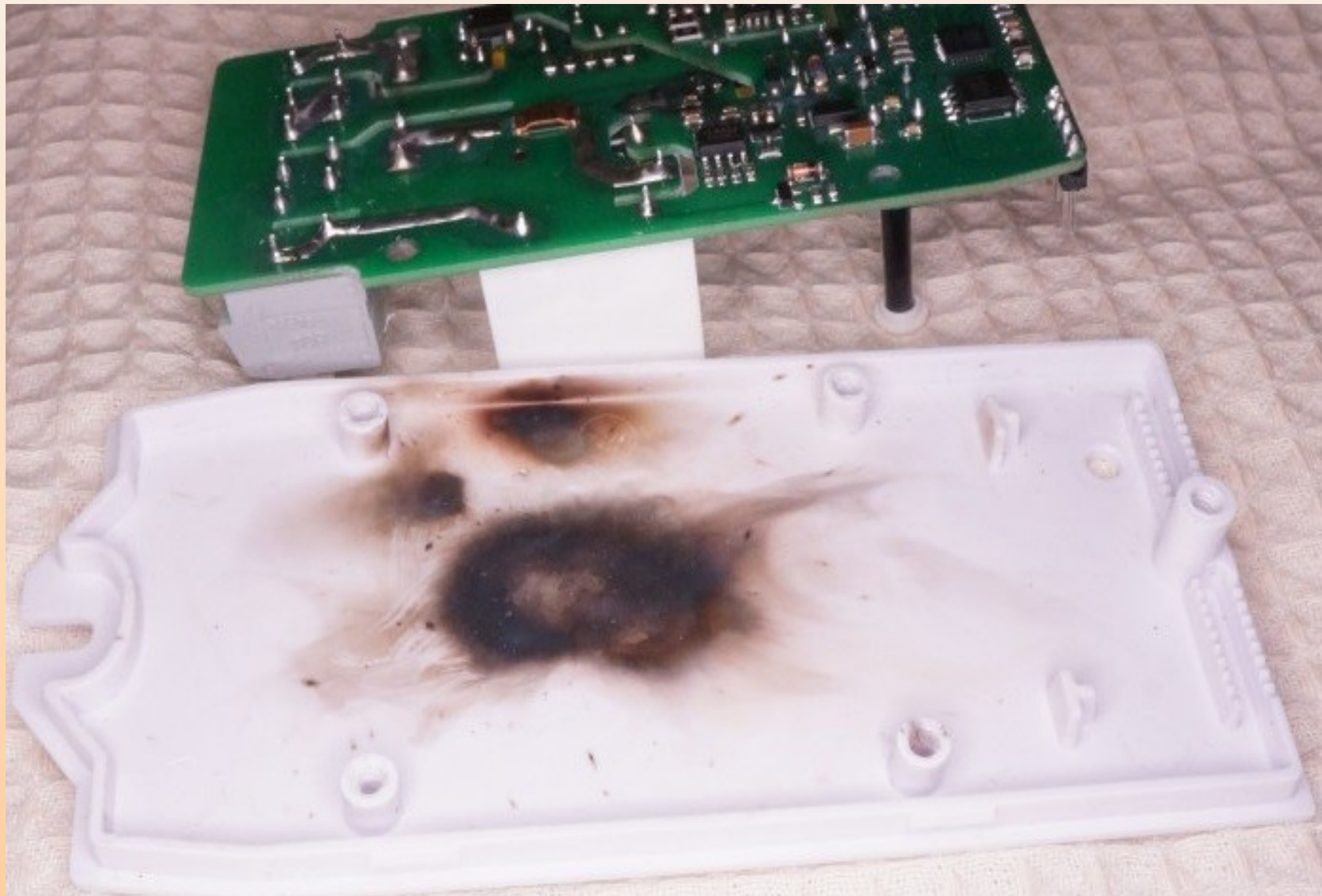
Safety & Disclaimer



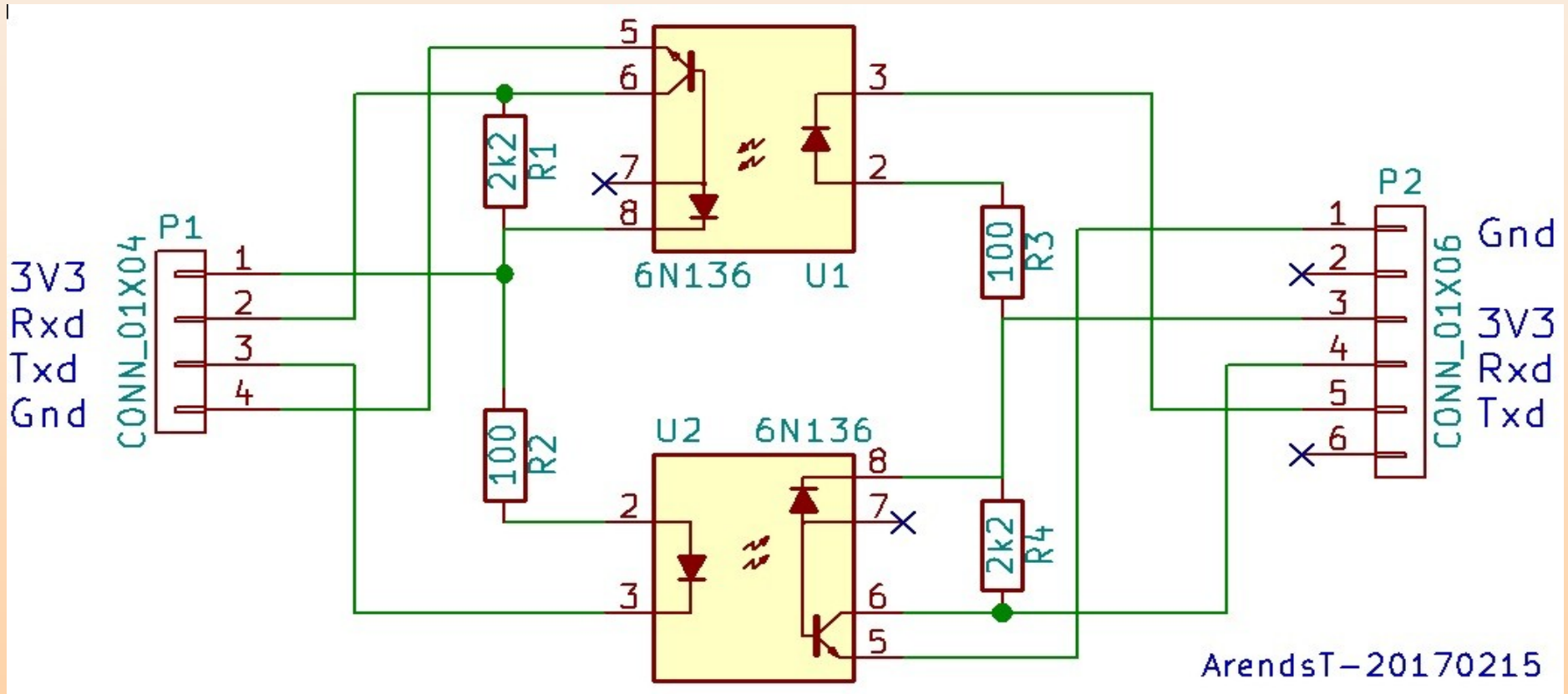
Somehow, I don't think you thought your cunning plan all the way through.

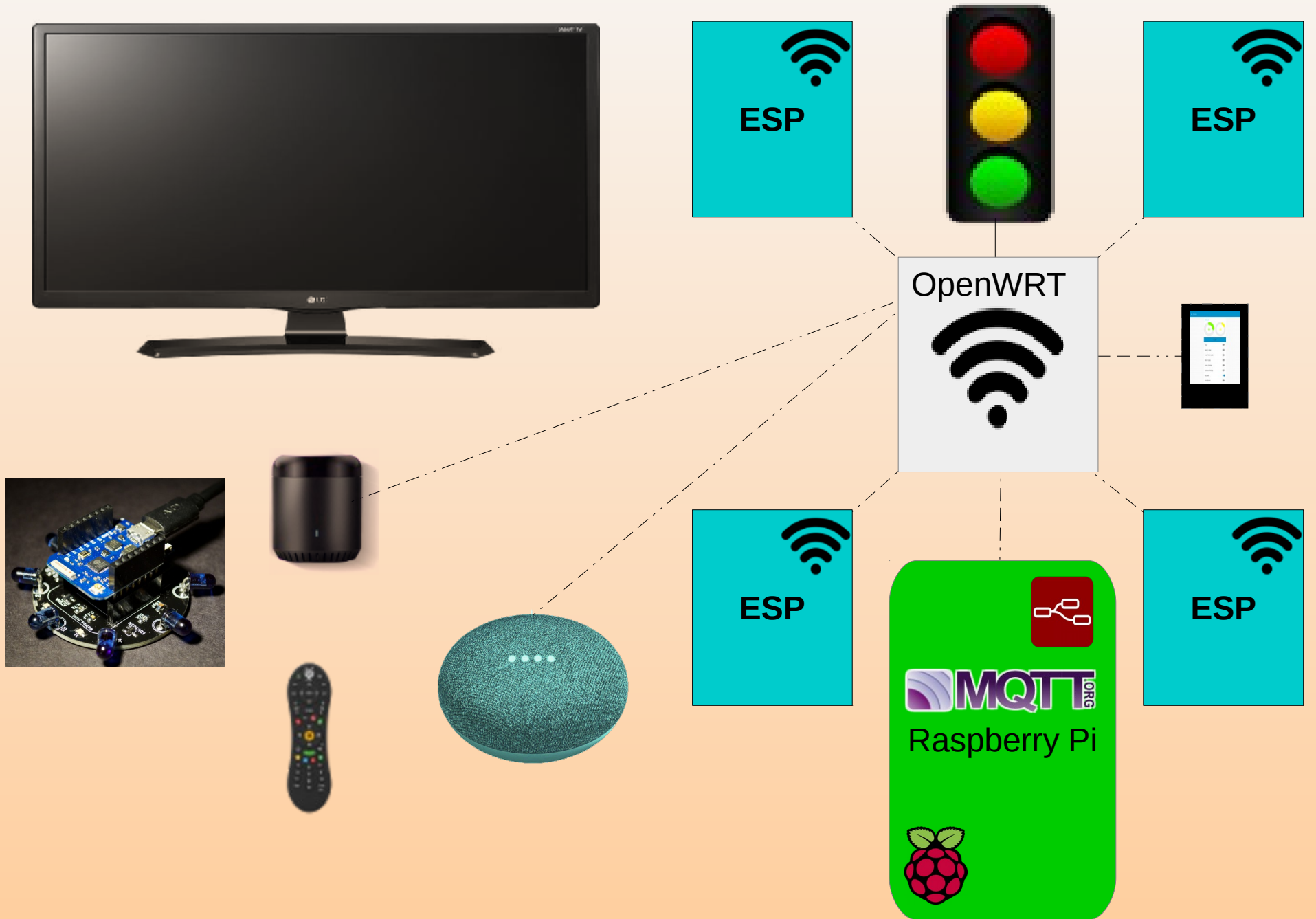


Smoke Test: Passed



Opt-isolated Serial

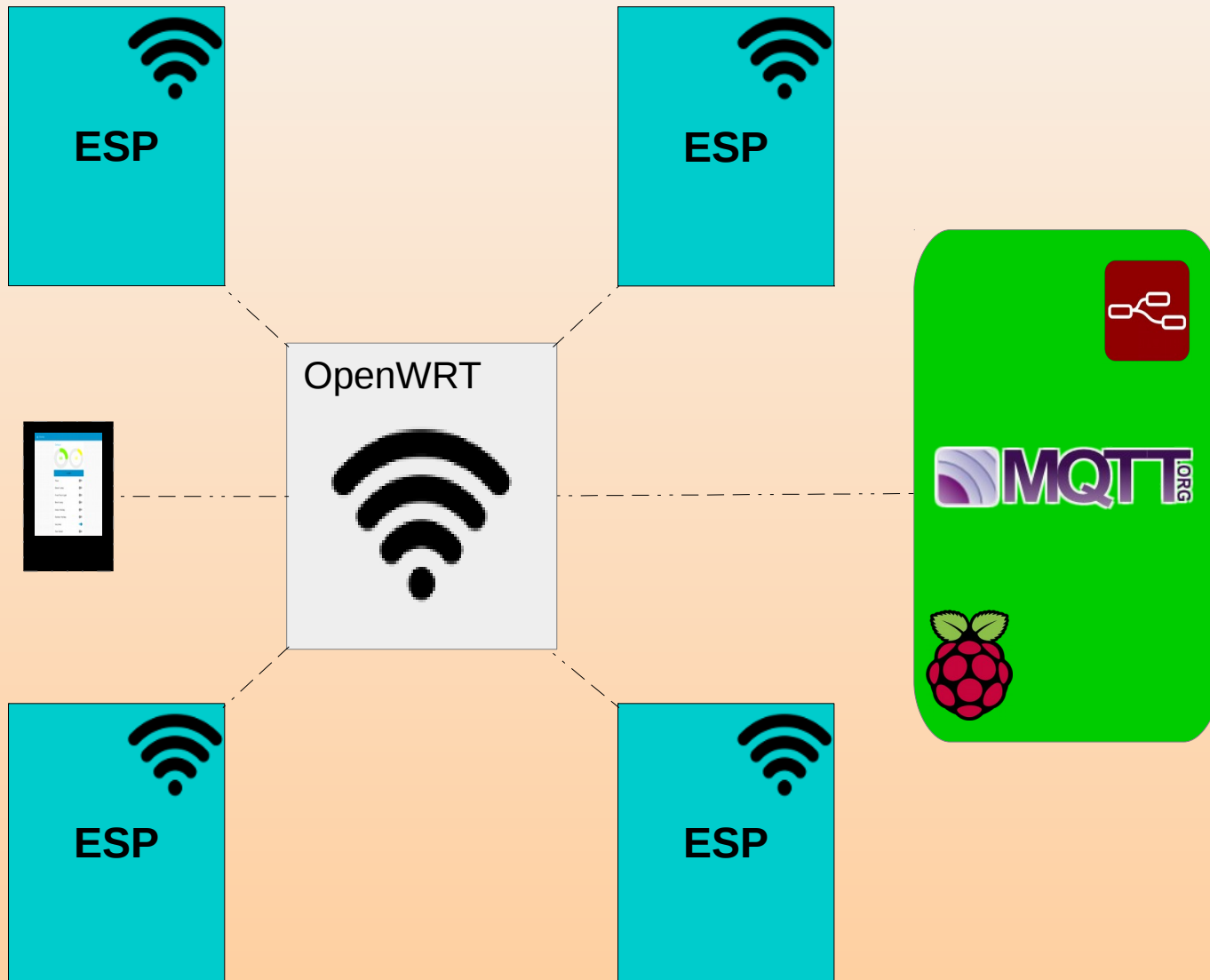




Demo



Demo



Parts list

- Sonoff Basic
 - Light bulb
- Sonoff 4CH
 - Light bulbs
- Sonoff S20 Sockets
 - Light bulb
- Client (Smart phone, laptop or tablet)

Parts list

- Raspberry Pi
 - SD card (to boot off of)
 - SD card reader (to add Raspbian to the SD)
 - SSD (120M)
 - Powered USB hub (for SSD)
- WiFi AP (running OpenWRT)

Node-RED Dashboard - Chromium (on mozart)

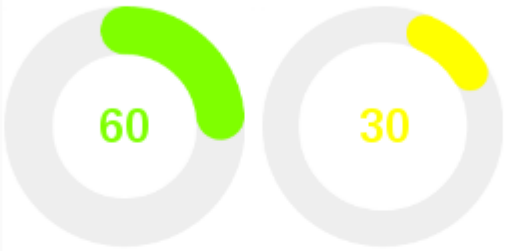
Node-RED Dashboard x Neil

mozart.uucp:1880/ui/#/0

Apps Daily Bil Herd helping m Other bookmarks

Home

Default



60 30

- SLEEP -

- Timer
- Diane's Lamp
- Front Porch Light
- Bench Lamp
- Indoor Hoilday
- Outdoor Holiday
- Leg Lamp
- Test Outlet

Demo

- Wireless router
- Raspberry Pi
 - Node-Red
 - MQTT
- ESP8266
 - Sonoff Basic node
 - IR Therm node
 - IR Transceiver node
 - WiFi wall switch

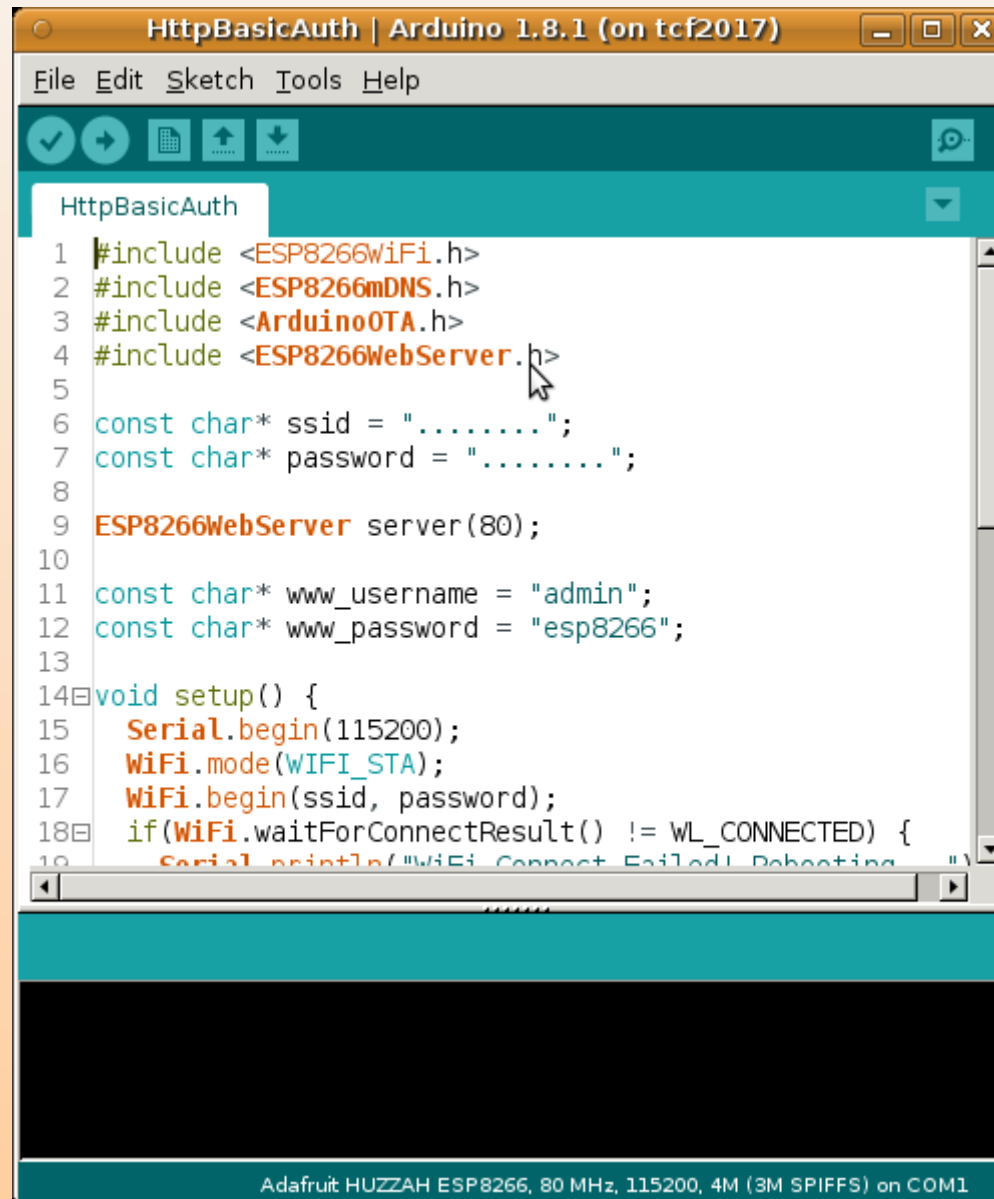
Demo (Show and Tell)

- Introduce the hardware
- Node-Red Web GUI
 - Show the flow
- Show the components and how they talk to each other (diagram)

Software

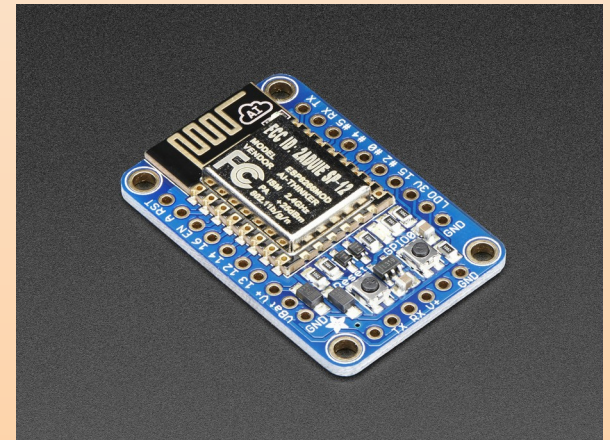
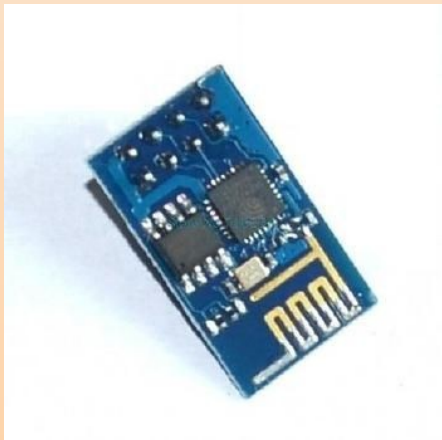
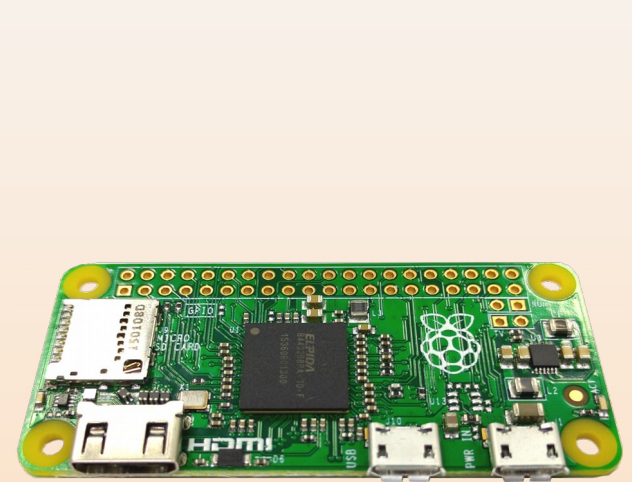
- Linux
 - Jessie
 - OpenWRT
- Screen (with bash)
- MQTT
- Node-Red (and node.js)
- Web Server (? with PHP)
- Dnsmasq (?, DHCP Server, DNS Server)

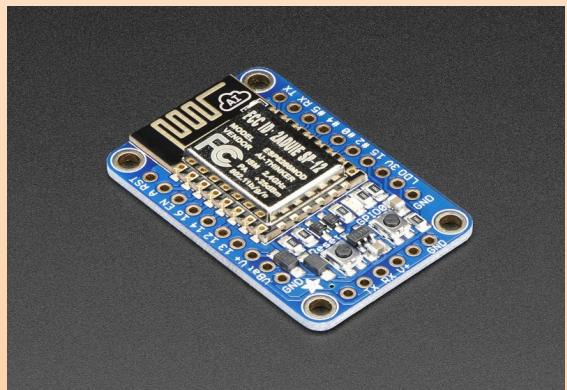
Arduino IDE



The screenshot shows the Arduino IDE interface with a sketch named "HttpBasicAuth" open. The sketch is written in C++ and includes several libraries: ESP8266WiFi, ESP8266DNS, ArduinoOTA, and ESP8266WebServer. It defines constants for SSID and password, creates an ESP8266WebServer instance on port 80, and sets up a basic web server with a username of "admin" and password of "esp8266". The setup function initializes the serial port, sets the WiFi mode to STA, and begins the WiFi connection. A comment at the end of the setup function indicates that the code will reboot if the connection fails.

```
HttpBasicAuth | Arduino 1.8.1 (on tcf2017)
File Edit Sketch Tools Help
HttpBasicAuth
1 #include <ESP8266WiFi.h>
2 #include <ESP8266DNS.h>
3 #include <ArduinoOTA.h>
4 #include <ESP8266WebServer.h>
5
6 const char* ssid = ".....";
7 const char* password = ".....";
8
9 ESP8266WebServer server(80);
10
11 const char* www_username = "admin";
12 const char* www_password = "esp8266";
13
14 void setup() {
15     Serial.begin(115200);
16     WiFi.mode(WIFI_STA);
17     WiFi.begin(ssid, password);
18     if(WiFi.waitForConnectResult() != WL_CONNECTED) {
19         Serial.println("WiFi Connect Failed! Rebooting...");
20     }
21 }
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Features

- Small, cheap and fast
- OTA
- WiFi
- Flashed based 32 bit processor
- Arduino IDE & Libraries
- MQTT to allow use with other apps
- Node-Red (JavaScript)

ESP Nodes

- 8x8 Thermal node
- Terminal Server (ESP-01)
- Power Node (INA219/INA3221)
- Spill Sink Node (water level)
- LED Lights node
- RF Node
- Fountain node
- FEMA Node (Weather Radio)
- Weather Station Node

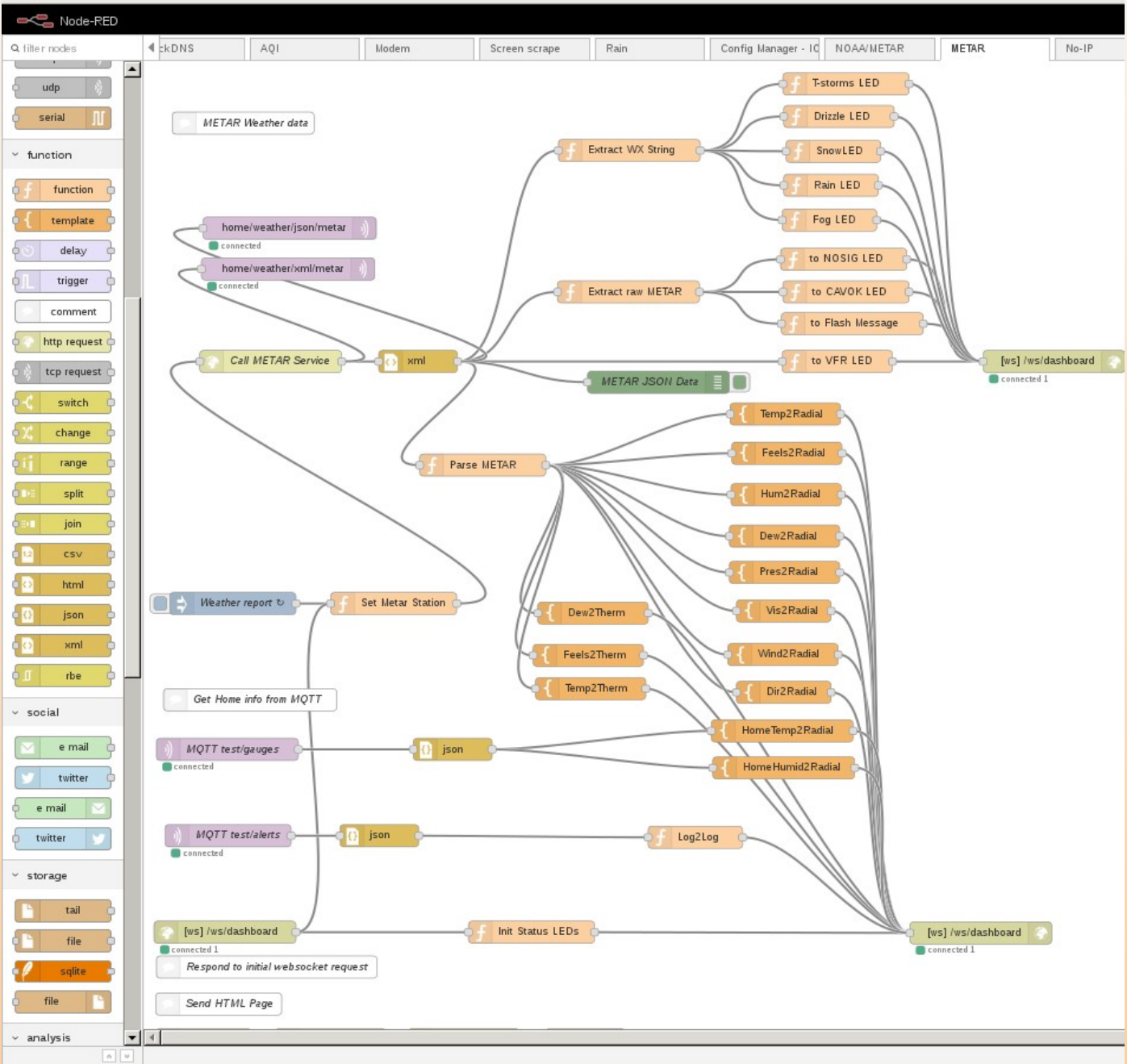
Hardware

- Raspberry Pi 3 (SD and SSD drive)
 - Serial console (3v3 USB serial)
- WiFi AP (this one only does A/B/G)
- Ethernet switch (optional)
- Sonoff Basic (with lamp)
- Sonoff 4CH (with 4 lamps)
- ESP8266 (with sensor)

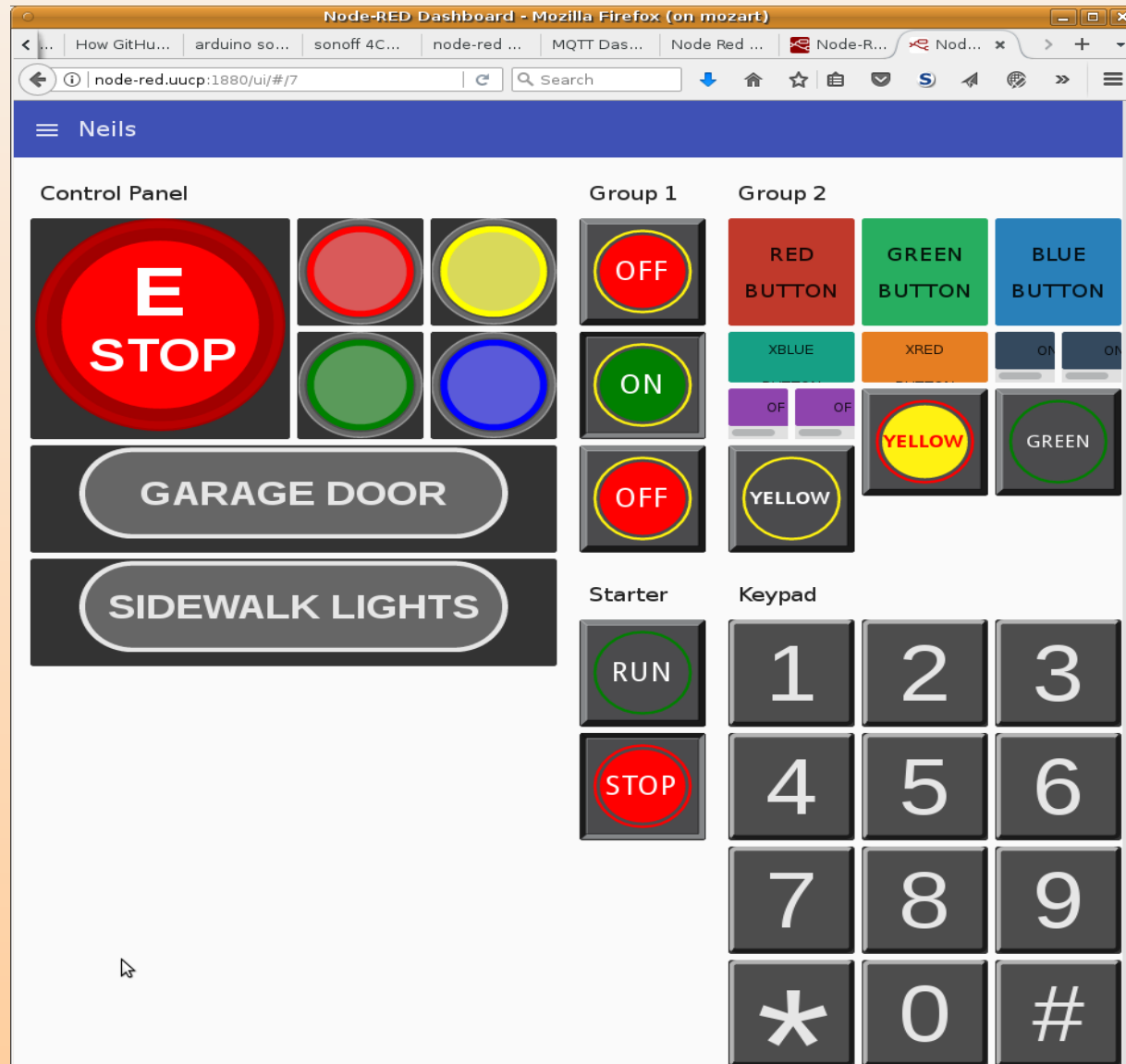
Button usage

- 1 short press: Toggles the relay
- 2 short presses: Toggles the relay.
- 3 short presses: Start Wifi smartconfig with Android ESP8266 SmartConfig app.
- 4 short presses: Start Wifi manager and a web server on IP address 192.168.4.1
- 5 short presses: Start Wifi Protected Setup (WPS).
- 6 short presses: Will restart the module
- 7 short presses: Start OTA download of firmware.
- Pressing the button for over four seconds: Reset settings to defaults as defined in user_config.h and restarts the device

Node-Red

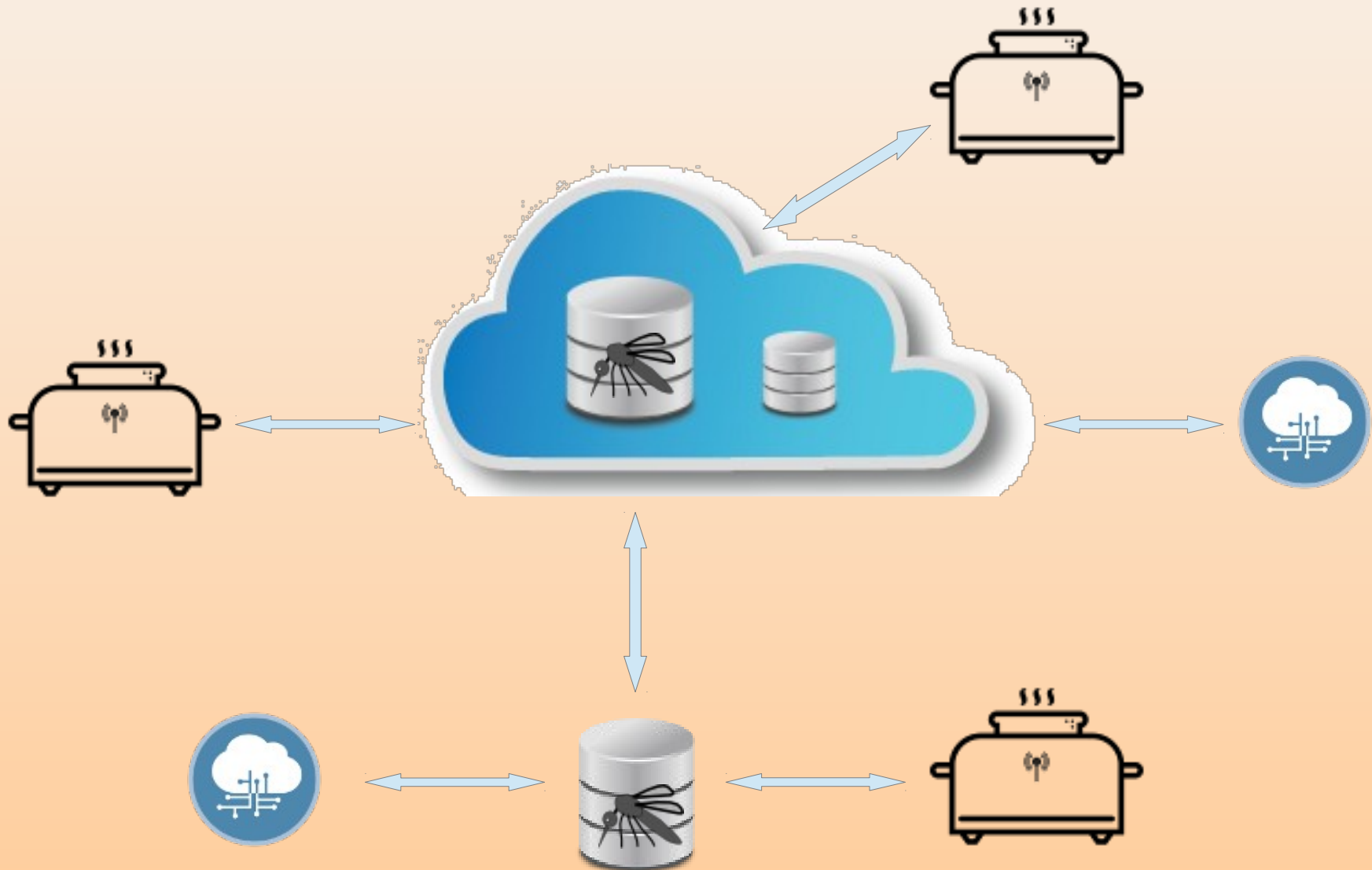


Node-Red Dashboard



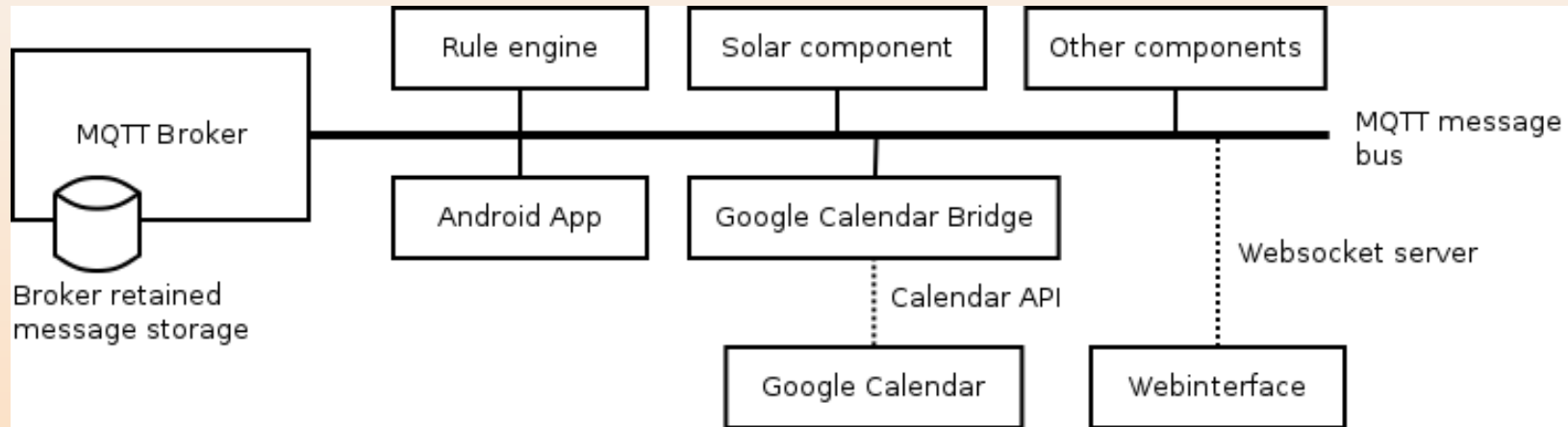
MQTT w/ Int. of Toasters

(Message Queue Telemetry Transport)



MQTT

Message Queue Telemetry Transport)



- MQTT is the middle-man (broker) in data exchange (M2M)
- Publishers
- Subscribers
- Both Publishers and Subscribers

Discussion

Software

- Linux
 - Jessie
 - OpenWRT
- Screen (with bash)
- MQTT
- Node-Red (and node.js)
- Dnsmasq (DHCP Server, DNS Server)

Software (cont'd)

- rsyslog
- Sonoff-Tasmota
 - Arduino IDE
 - ESP8266 (under Board Manager)
 - Pubsubclient library (MQTT)
 - ArduinoJSON library
 - Over The Air library
 - other extra libraries as needed (OneWire, etc)

AI / ML

- Alexa
- Google Home
- Siri
- Cortana
- DIY (roll your own, Alexia and/or Home clients)
- Splunk (ML? Data Visualization)

A word on Wireless

- Wireless is great but it has limitations
 - Some AP support no more than 16 devices
 - Everyone is using wireless
 - It can be jammed or flooded
- Don't use WiFi for security
- Don't use WiFi for bandwidth pigs
 - Some early baby monitors used all of 2.4Ghz

Home Automation Integration

- openHAB
- Home Assistant
- Domoticz
- HomeBridge
- HomeSeer
- SmartThings

Home Automation Integration

- Secure Setup
- IP-Symcon
- SonWEB
- Misterhouse
- Pytomatic
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Home Automation Integration

- openHAB
- Home Assistant
- Domoticz
- HomeBridge
- HomeSeer
- SmartThings
- Secure Setup
- IP-Symcon
- SonWEB
- OctoPrint

Resource Page

- <https://github.com/arendst/Sonoff-Tasmota>
- <https://github.com/arendst/Sonoff-Tasmota/wiki>
- <https://www.raspberrypi.org/documentation/installation/installing-images/>
 - I'm using Raspbian-lite
- <https://nodered.org/>
- https://flows.nodered.org/?num_pages=1
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End of Presentation

Appendix

- Presenter: Neil Cherry
 - ncherry@linuxha.com
 - <http://linuxha.com> (lots of HA links)
 - <http://ushomeautomation.com> (where I keep notes and stuff)
 - This presentation can be found @:
<http://ushomeautomation.com/Presentations/>
- Adafruit : <http://adafruit.com>

- IoT redux... this time, it's personal
 - Jim Hunter - "With great data comes great responsibility."
 - techcrunch.com/2016/12/28/iot-redux-this-time-its-personal
- <http://iotpodcast.com>
- <https://github.com/arendst/Sonoff-Tasmota>
- <https://github.com/arendst/Sonoff-Tasmota/wiki>

- <http://sensetecnic.com>
- <https://fred.sensetecnic.com/>
- http://esp8266.github.io/Arduino/versions/2.0.0/doc/ota_updates/ota_updates.html
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