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

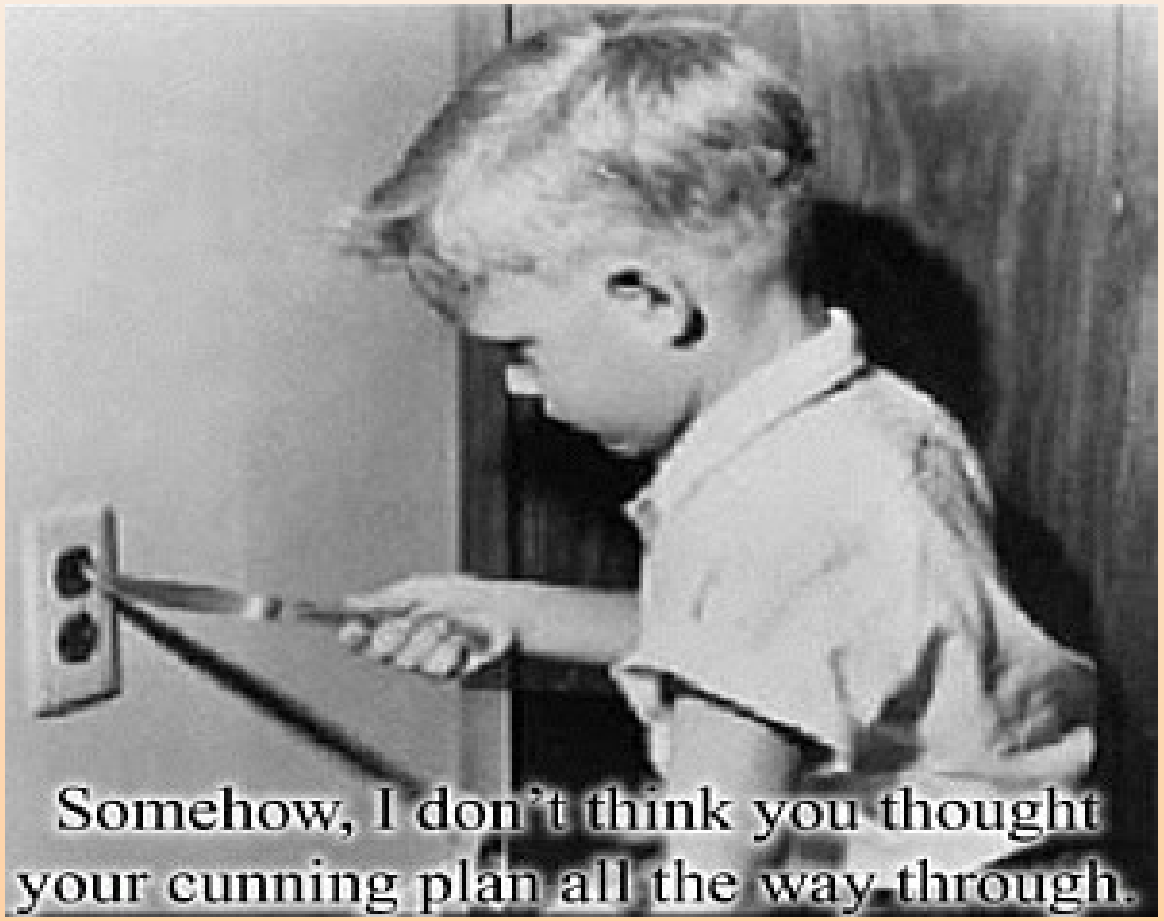
- The Institute For Exploratory Research

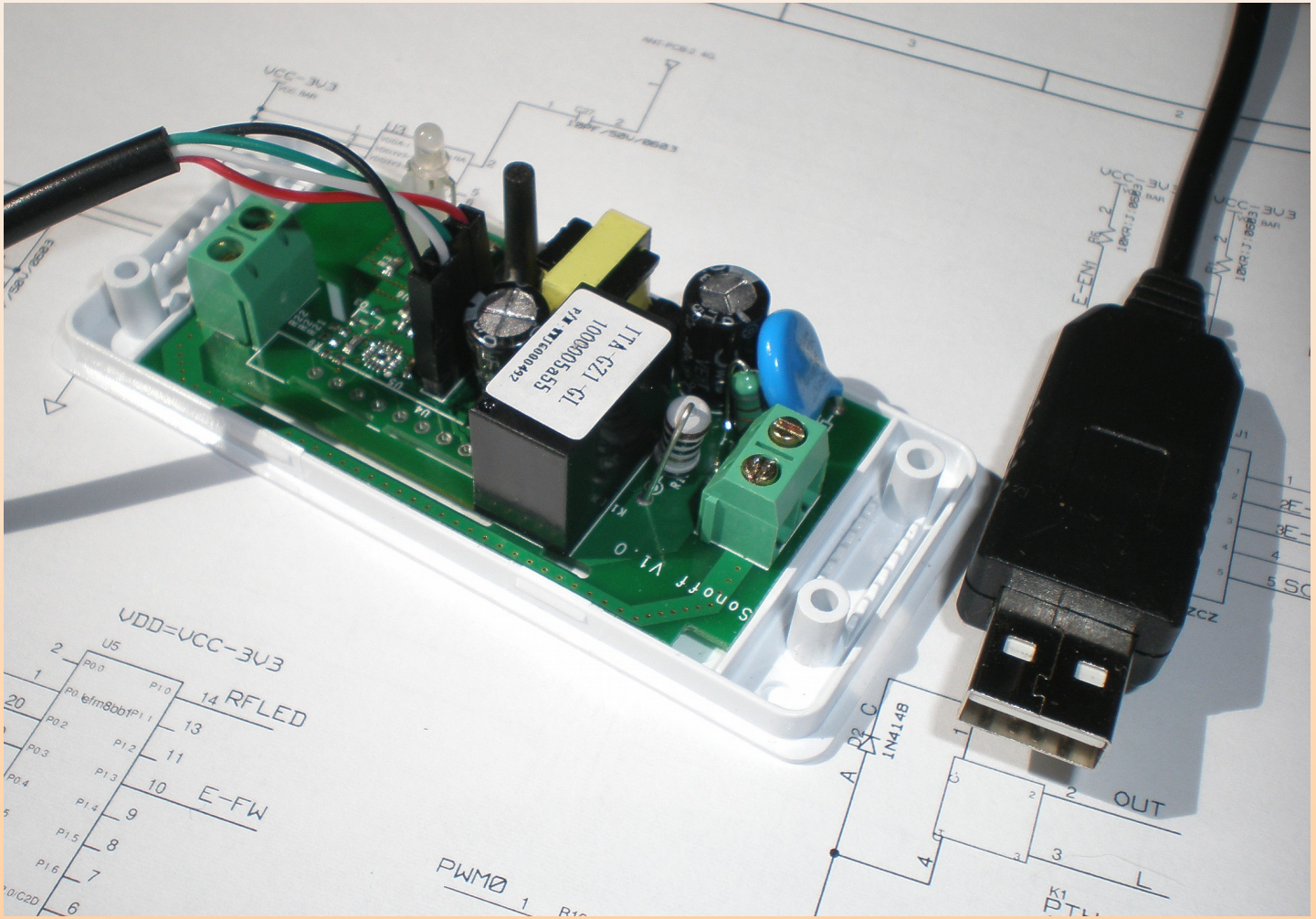
  The InfoAge Science History Learning Center and Museum,

  at historic Camp Evans

  2201 Marconi Road, Wall, NJ 07719
- Just off RT 18, Exit 7a (Brighton Ave exit)
- Monday 7PM

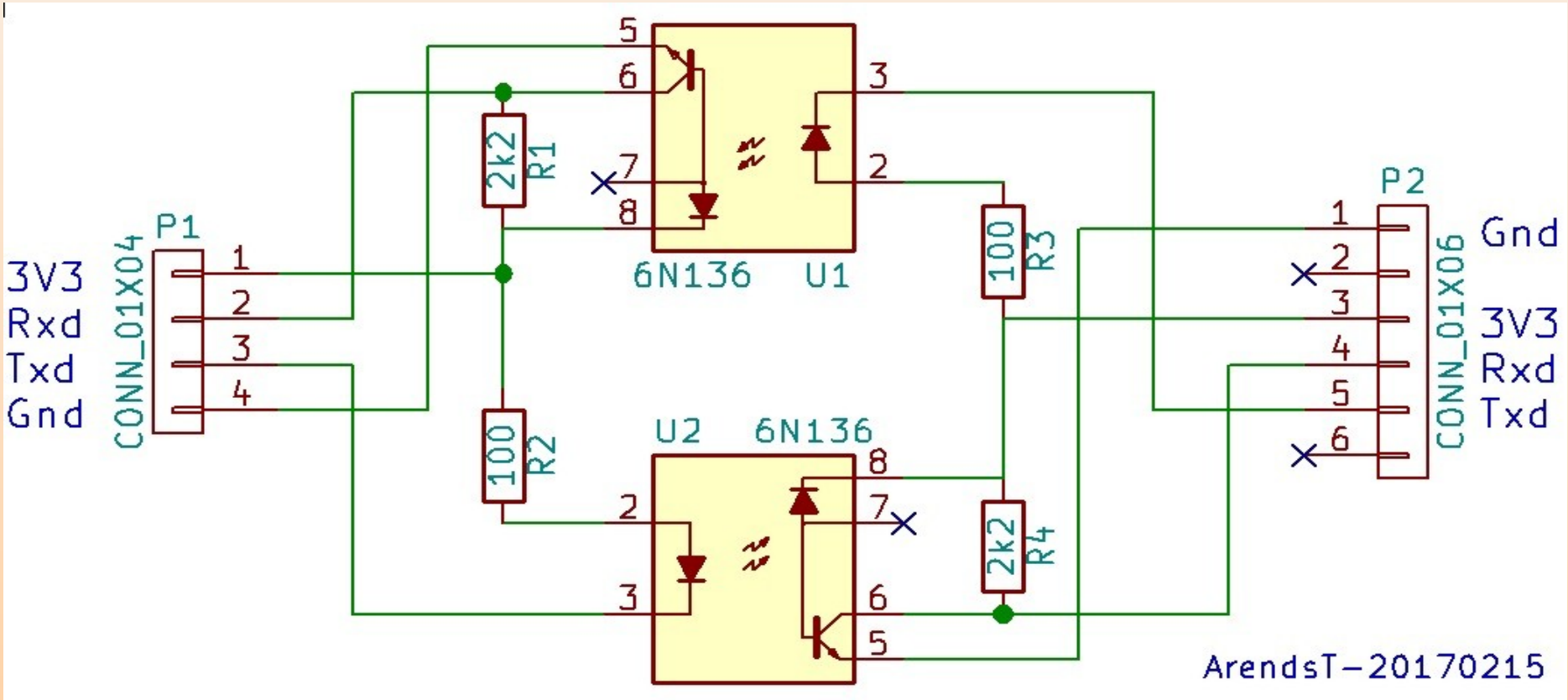
Safety & Disclaimer



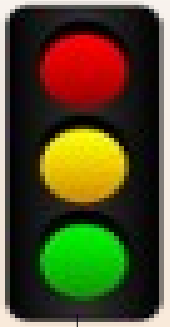

VDD=VCC-3V3
U5
RFLED
E-FW
PWM0
IN4148
OUT
SonOff V1.0

Smoke Test: Passed

Opt-isolated Serial

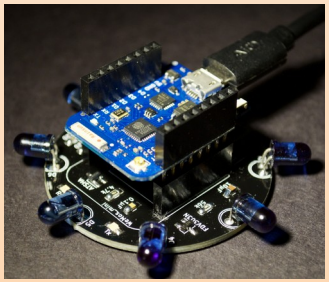


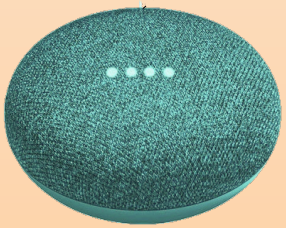
ESP



ESP

OpenWRT





ESP

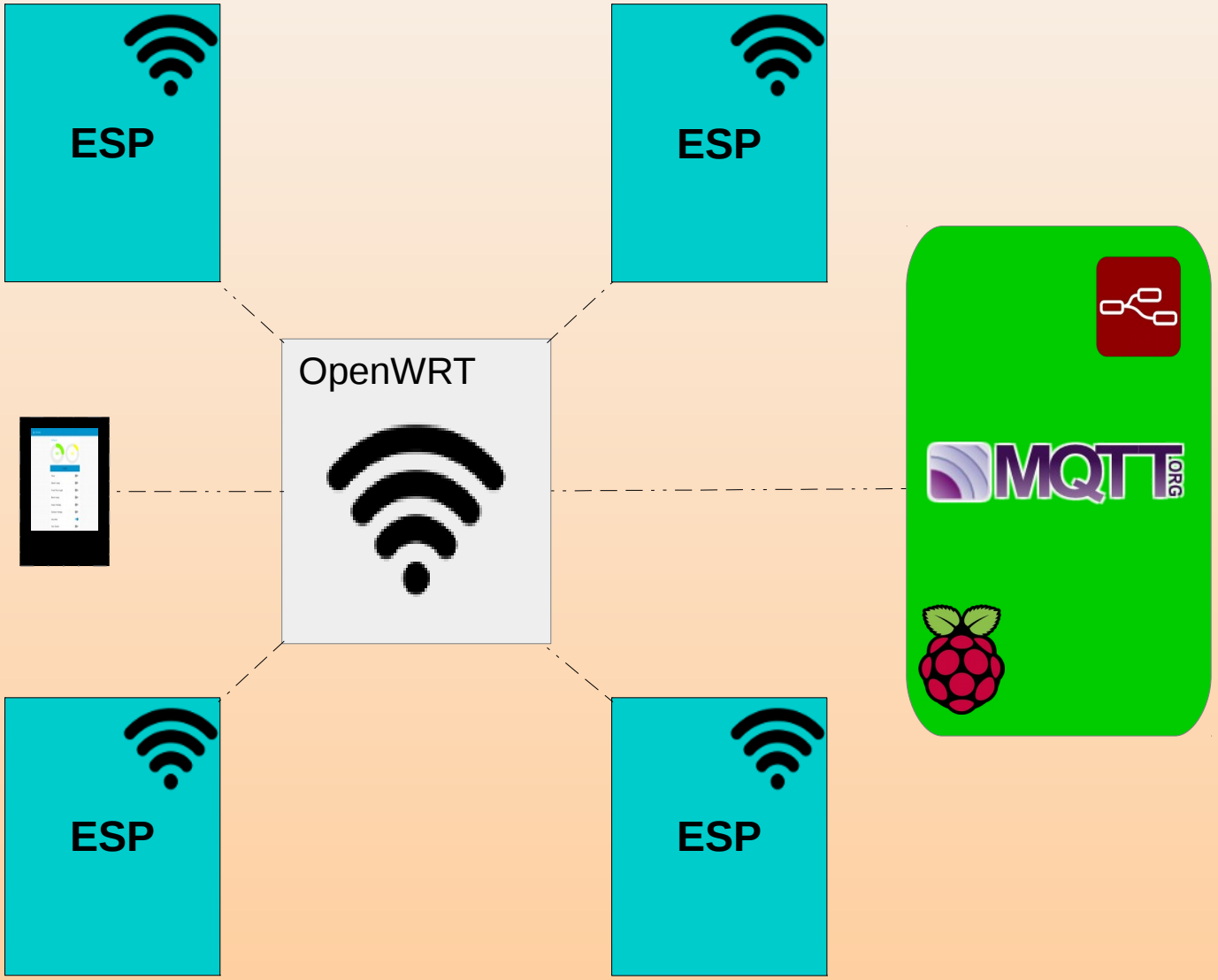
ESP

MQTT

Raspberry Pi

Demo

Demo

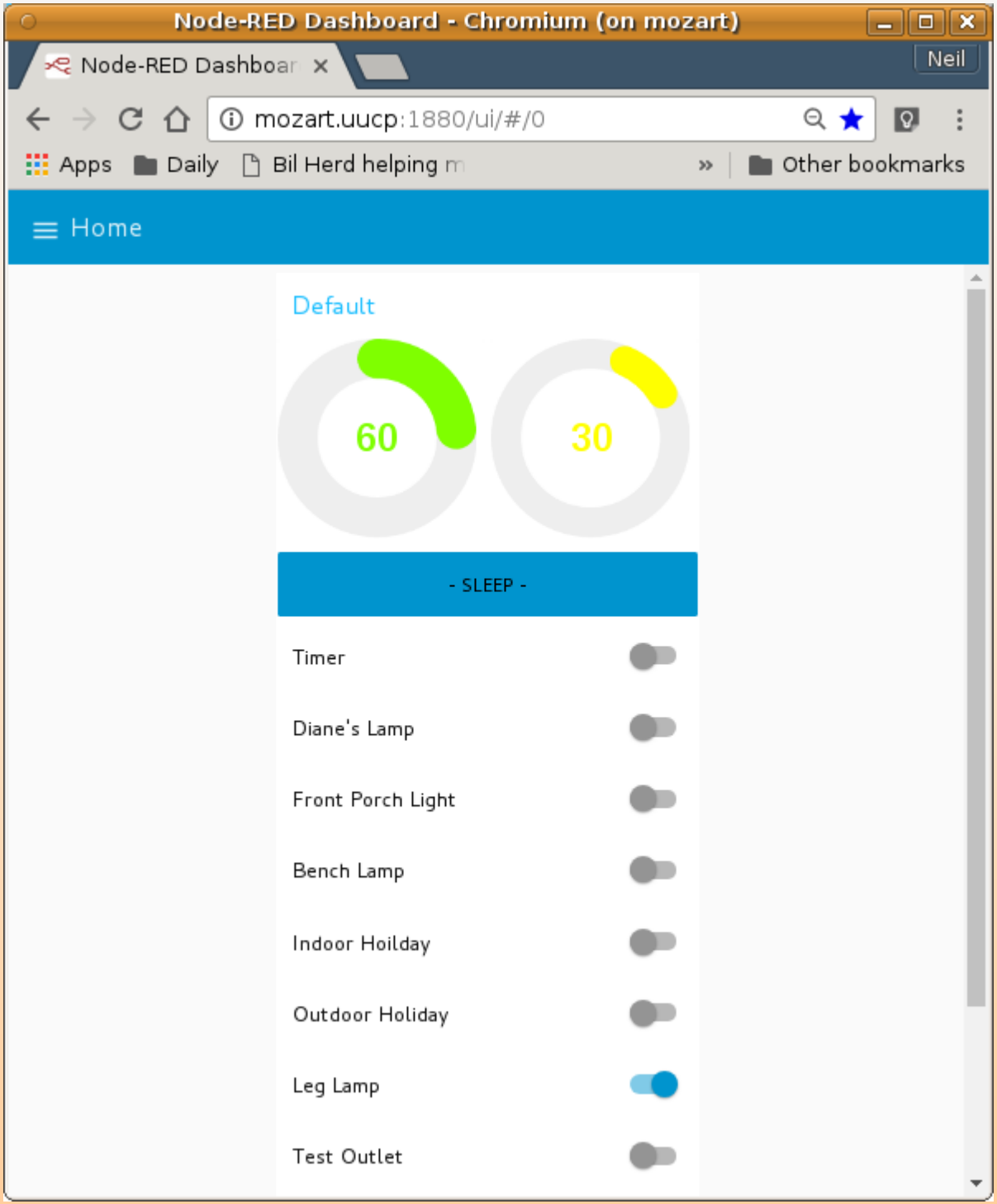


Parts list

- 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 Dashboar
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

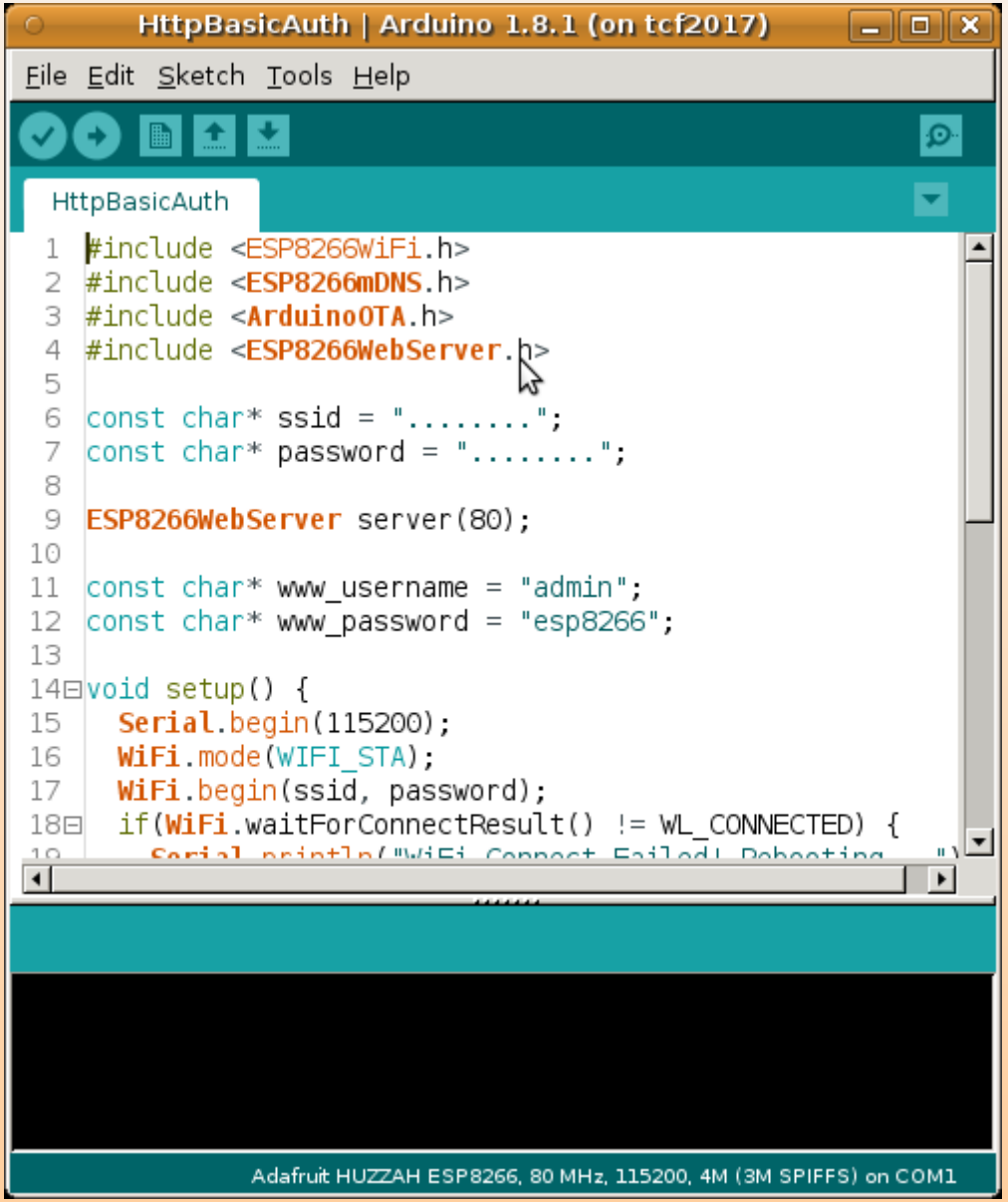
Demo (Show and Tell)

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

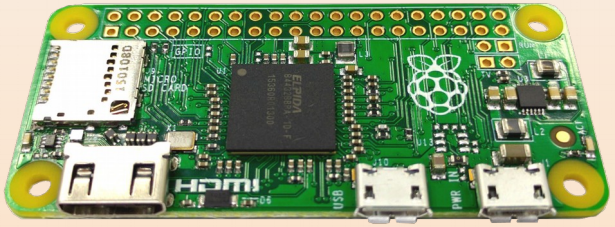
Software

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

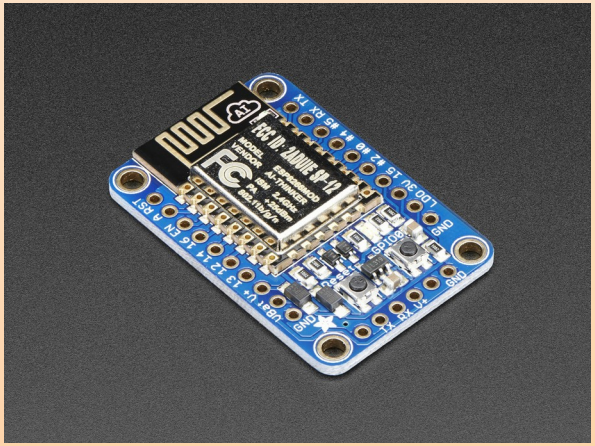
Arduino IDE

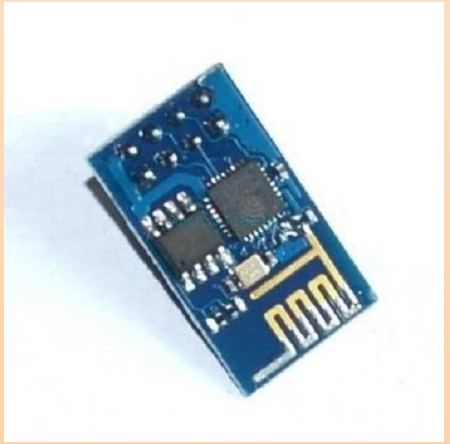

HttpBasicAuth | Arduino 1.8.1 (on tcf2017)
File Edit Sketch Tools Help
HttpBasicAuth
#include <ESP8266WiFi.h>
#include <ESP8266mDNS.h>
#include <ArduinoOTA.h>
#include <ESP8266WebServer.h>
const char* ssid = ".....";
const char* password = ".....";
ESP8266WebServer server(80);
const char* www_username = "admin";
const char* www_password = "esp8266";
void setup() {
Serial.begin(115200);
WiFi.mode(WIFI_STA);
WiFi.begin(ssid, password);
if(WiFi.waitForConnectResult() != WL_CONNECTED) {
Adafruit HUZZAH ESP8266, 80 MHz, 115200, 4M (3M SPIFFS) on COM1

UNO

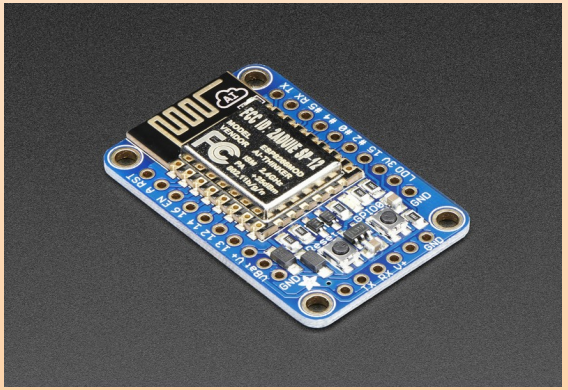


Sonoff





Sonoff



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

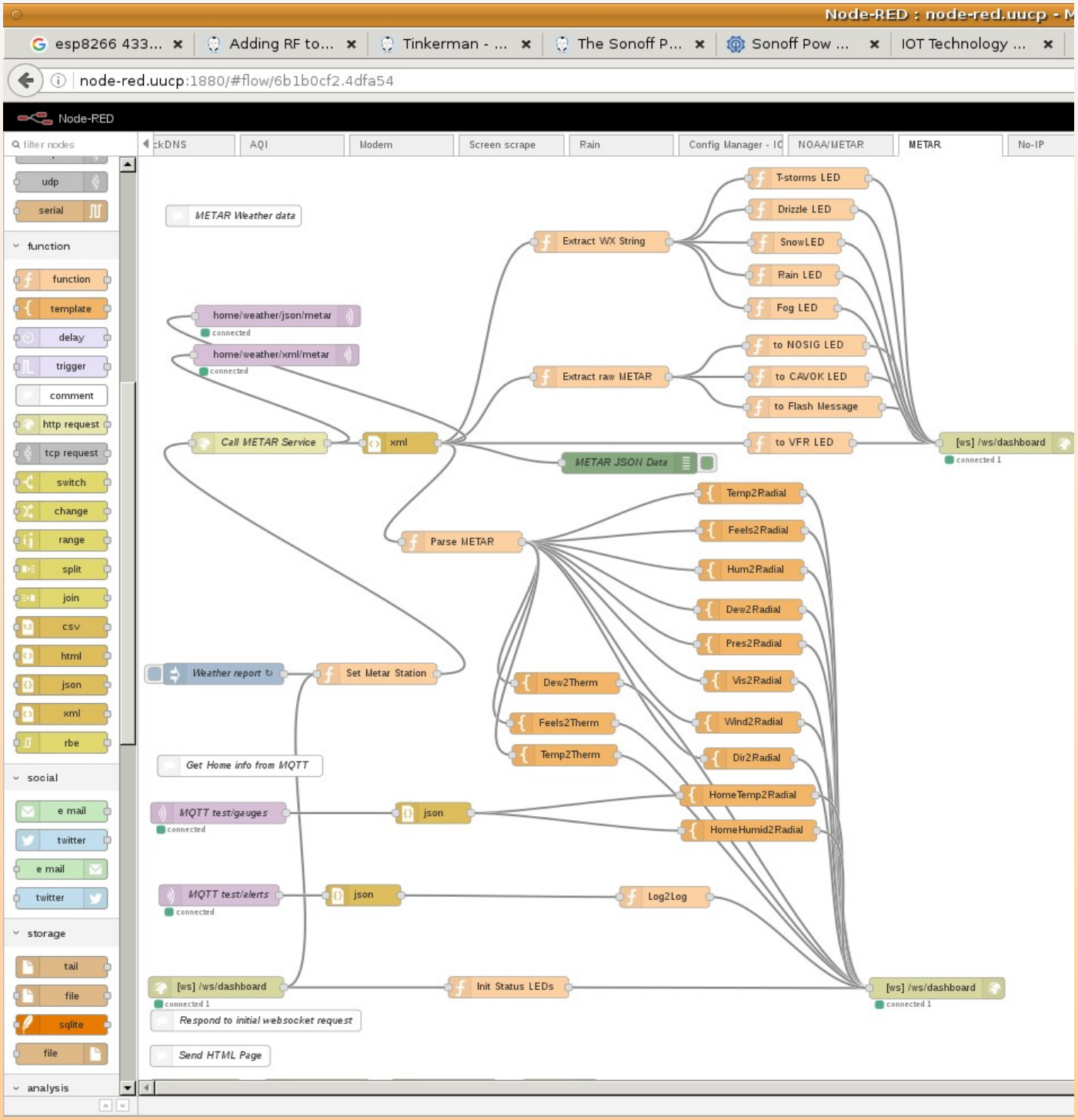
Hardware

- 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)

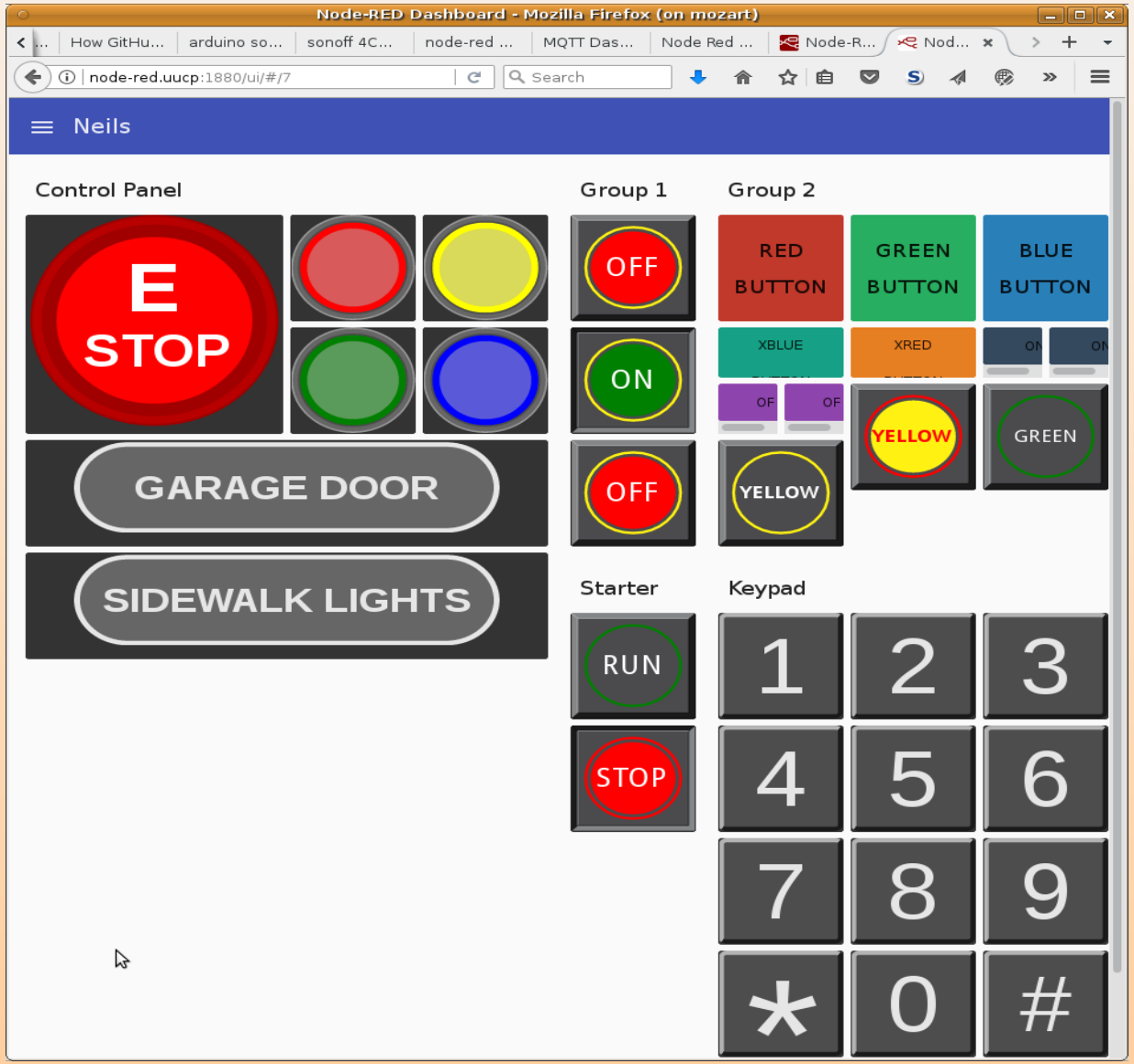
Button usage

- 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

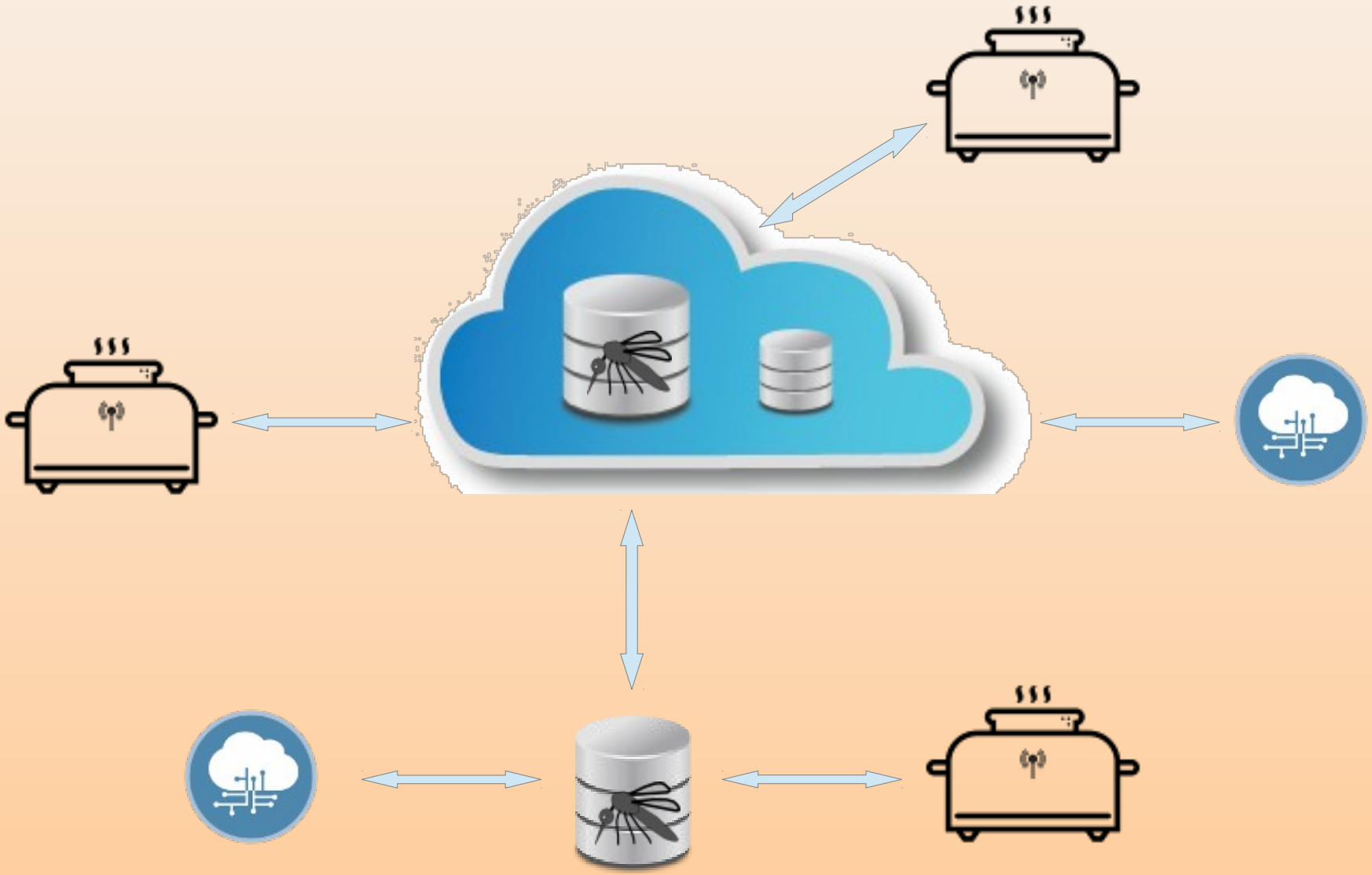
Node-Red


Node-RED : node-red.uucp - M
esp8266 433...
Adding RF to...
Tinkerman - ...
The Sonoff P...
Sonoff Pow ...
IOT Technology ...
node-red.uucp:1880/#flow/6b1b0cf2.4dfa54
Node-RED
filter nodes
udp
serial
function
function
template
delay
trigger
comment
http request
tcp request
switch
change
range
split
join
csv
html
json
xml
rbe
social
e mail
twitter
e mail
twitter
storage
tail
file
sqlite
file
analysis
ckDNS
AQI
Modem
Screen scrape
Rain
Config Manager - IC
NOAA/METAR
METAR
No-IP
METAR Weather data
Extract WX String
T-storms LED
Drizzle LED
SnowLED
Rain LED
Fog LED
home/weather/json/metar
connected
home/weather/xml/metar
connected
Extract raw METAR
to NOSIG LED
to CAVOK LED
to Flash Message
Call METAR Service
xml
to VFR LED
[ws] /ws/dashboard
connected 1
METAR JSON Data
Parse METAR
Temp2Radial
Feels2Radial
Hum2Radial
Dew2Radial
Pres2Radial
Vis2Radial
Wind2Radial
Dir2Radial
HomeTemp2Radial
HomeHumid2Radial
Weather report
Set Metar Station
Dew2Therm
Feels2Therm
Temp2Therm
Get Home info from MQTT
MQTT test/gauges
connected
json
MQTT test/alerts
connected
json
Log2Log
[ws] /ws/dashboard
connected 1
Init Status LEDs
[ws] /ws/dashboard
connected 1
Respond to initial websocket request
Send HTML Page

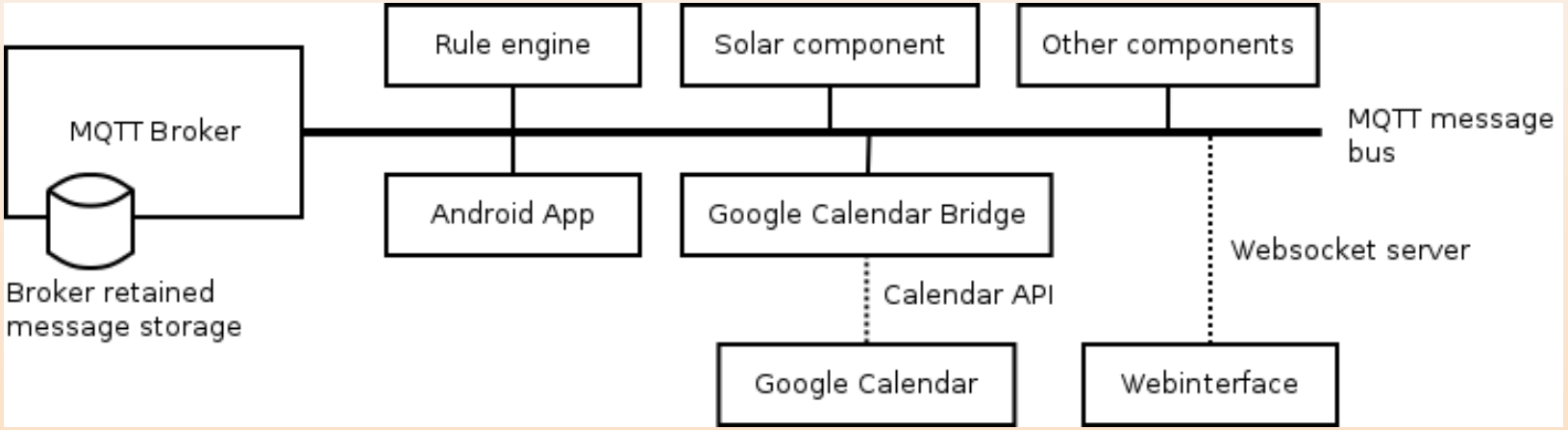
Node-Red Dashboard



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
- Pytomation
-

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
-

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
- http://esp8266.github.io/Arduino/versions/2.0.0/doc/ota_updates/ota_updates.html
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