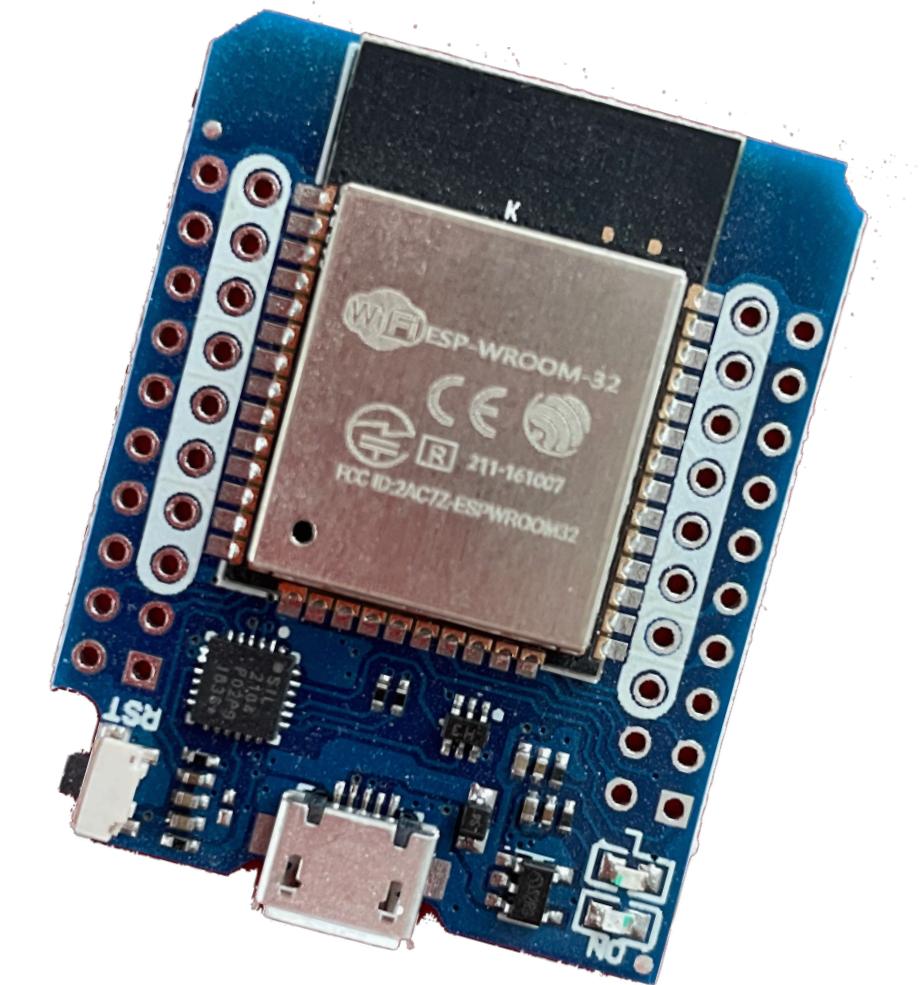


Open Source Firmware for EV chargers

using the ESP32 chip



Motivation

liberate and add features

- liberate from the cloud (the original was either dumb or cloud)
- add more features like
 - PV excess charging
 - load management
 - mesh networking

Project start in April 2021

Idea to use the **software from TinkerForge** on the EN+ hardware

warp-charger.com



tinkerforge.com



WARP

IMPRESSIONEN

ALLE AUßenansicht WEBINTERFACE INNENANSICHT



Vorderseite



Statusübersicht



Reverse engineering Autoaid / EN-Plus AC011K-AE-25 Wallbox mit ESP32

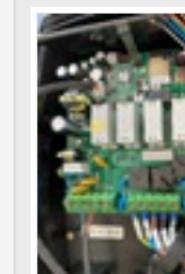
[Forenliste](#) | [Threadliste](#) | [Neuer Beitrag](#) | [Suchen](#) | [Anmelden](#) | [Benutzerliste](#) | [Bildergalerie](#) | [Hilfe](#) | [Login](#)

Reverse engineering Autoaid / EN-Plus AC011K-AE-25 Wallbox mit ESP32

von Birger S. ([birger_s](#))

10.04.2021 12:43

Angehängte Dateien:



[Autoaid_en_11kw_charger.jpg](#)

1,4 MB

Hallo,

mit Hilfe der Bilder (mehr Detailfotos hier:

<https://mail.netgaroo.com/img/AC011K-AE-25/>) kann mir hoffentlich einer von euch weiterhelfen und mir sagen was man da sieht und was die vermutliche Funktion ist. Siehe Liste unten.

Letztlich suche ich Mitstreiter um eine open source firmware für die AC011K-AE-25 zu entwickeln.

Ich habe zwei Wallboxen.

Zum einen den TinkerForge WARP Charger (<https://www.warp-charger.com/>). Der ist komplett open source - Hardware und Software - alles super. Zum anderen den Chinakracher AC011K-AE-25 von EN+ der in Deutschland von Autoaid (<https://www.autoaid.de/wallbox/>) verkauft wird.

Ich hätte gerne eine open source firmware für die Box von EN+ / Autoaid. Am besten einen Fork der WARP Charger Software (<https://github.com/Tinkerforge/warp-charger/> und <https://github.com/Tinkerforge/evse-bricklet>).

Ich hoffe das sich daraus sowas wie OpenWRT bzw. Tasmota für Wallboxen entwickelt.

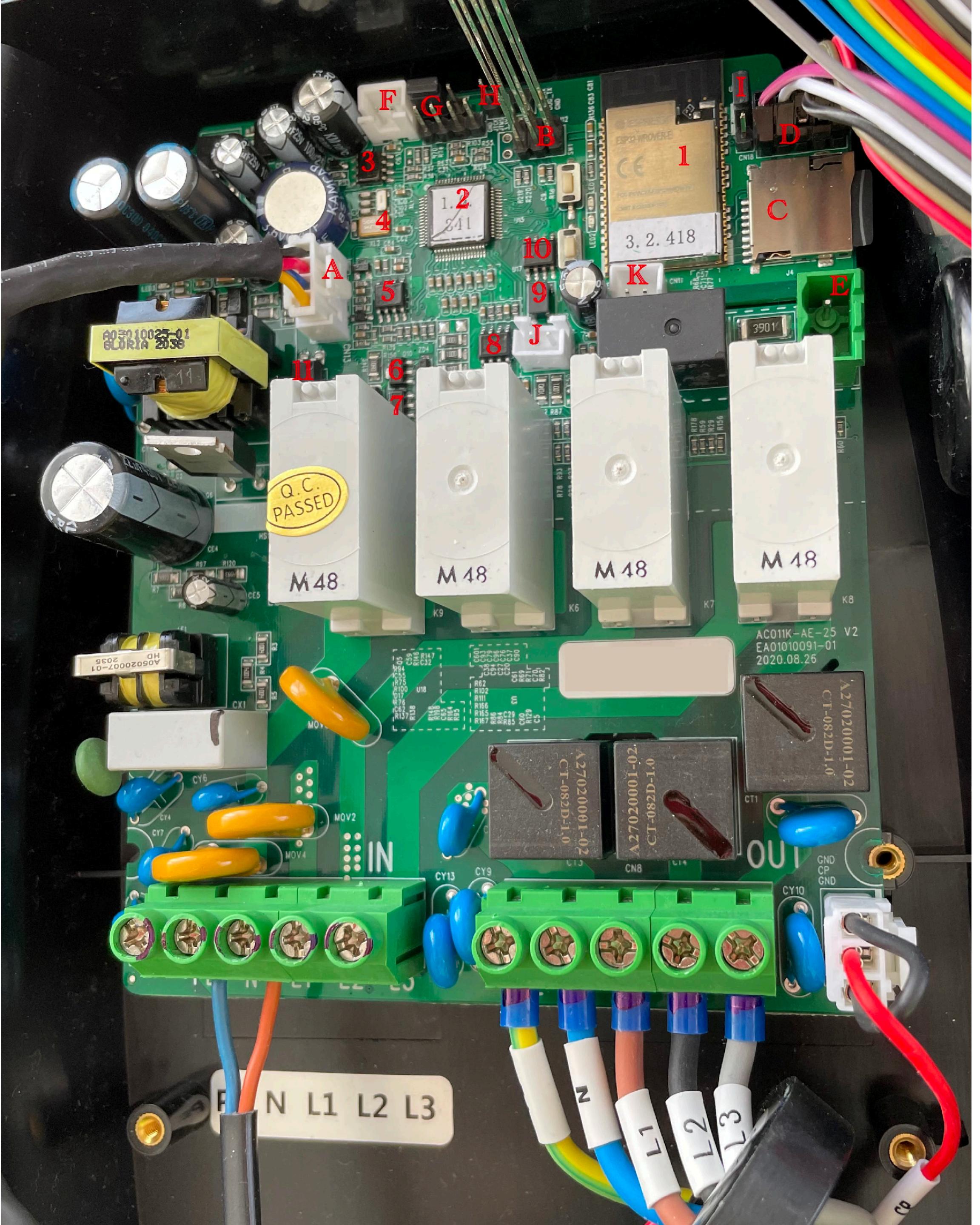
Project start in April 2021

Idea to use the **software from TinkerForge** on the **EN+ hardware**

during 2021

Idea to use the open source
software from TinkerForge
on the EN+ hardware

leads to
some reverse engineering



during 2021

Idea to use the open source software from TinkerForge on the EN+ hardware

**leads to
some reverse engineering**

2019 12:21:46

ERON_RESET),boot:0x17 (SPI_FAST_FLASH_BOOT)
, SPIWP:0xee
q_drv:0x00,d_drv:0x00,cs0_drv:0x00,hd_drv:0x00,wp_drv:0x00
ock div:2
018,len:4
01c,len:976
room 4
000,len:10124
400,len:5828
06a8
0,038 **** TINKERFORGE WARP CHARGER FOR AC011K V1.2.99-62bda6bb ****
0,039 314K RAM SYSTEM 262132 HEAP BYTES FREE
0,049 READY.
0,096 Mounted data partition. 53248 of 655360 bytes (8.1 %) used
0,228 WARP Charger for AC011K config version: 1.0.0
0,243 Set timezone to Europe/Berlin
0,384 Starting scan to select unoccupied channel for soft AP.
0,397 Set up PrivComm: 115200, SERIAL_8N1, RX 26, TX 27
0,398 000: FA 03 00 00 AC 01 05 00 11 0B 01 00 00 CA D3
0,409 Tx cmd_AC seq:01 len:15 crc:D3CA
0,409 000: FA 03 00 00 AC 02 05 00 11 09 01 00 01 4A BE
0,420 Tx cmd_AC seq:02 len:15 crc:BE4A
0,420 000: FA 03 00 00 AC 03 05 00 11 0A 01 00 00 4A F6
0,430 Tx cmd_AC seq:03 len:15 crc:F64A
0,441 000: FA 03 00 00 AC 04 05 00 11 0C 01 00 00 0B 98
0,441 Tx cmd_AC seq:04 len:15 crc:980B
0,452 000: FA 03 00 00 AA 05 08 00 18 3E 04 00 00 00 00 00 54 F0
0,462 Tx cmd_AA seq:05 len:18 crc:F054
0,462 000: FA 03 00 00 AC 06 08 00 11 0D 04 00 B8 0B 00 00 C5 B7
0,473 Tx cmd_AC seq:06 len:18 crc:B7C5
0,473 000: FA 03 00 00 AA 07 08 00 18 3F 04 00 1E 00 00 00 49 A0
0,483 Tx cmd_AA seq:07 len:18 crc:A049
0,494 000: FA 03 00 00 AA 08 12 00 18 25 0E 00 05 00 00 00 05 00 00 00
020: 00 03 00 00 00 02 EC 31
0,504 Tx cmd_AA seq:08 len:28 crc:31EC
0,505 000: FA 03 00 00 AA 09 07 00 18 12 01 00 03 7B 89 19 60
0,515 Tx cmd_AA seq:09 len:17 crc:6019
0,526 000: FA 03 00 00 AA 0A 07 00 18 12 01 00 03 3B 9C 19 60
0,526 Tx cmd_AA seq:0A len:17 crc:6019
0,536 000: FA 03 00 00 AA 0B 05 00 18 12 01 00 03 FA 50
0,547 Tx cmd_AA seq:0B len:15 crc:50FA
0,547 000: FA 03 00 00 AA 0B 06 00 18 08 02 00 78 00 EB 20
0,557 Tx cmd_AA seq:0B, len:6, crc:20EB
0,558 000: FA 03 00 00 AA 0C 0A 00 18 02 06 00 78 00 EB 20 60 00 4C 04
0,568 Tx cmd_AA seq:0C, len:10, crc:044C
0,579 000: FA 03 00 00 AA 0D 05 00 18 09 01 00 00 3C 9F
0,579 Tx cmd_AA seq:0D len:15 crc:9F3C
0,589 000: FA 03 00 00 AA 0E 04 00 18 2A 00 00 17 76
0,600 Tx cmd_AA seq:0E len:14 crc:7617
0,606 EVSE error, could not restore persistent storage config
0,608 No RS485 Bricklet found. Disabling energy meter support.
0,631 No NFC Bricklet found. Disabling NFC support.

vfs_api.cpp:102] open(): /spiffs/charge-records/charge-record-1.bin does not exist, no permits for
vfs_api.cpp:102] open(): /spiffs/charge-records/charge-record-1.bin does not exist, no permits for
vfs_api.cpp:102] open(): /spiffs/charge-records/charge-record-1.bin does not exist, no permits for
vfs_api.cpp:102] open(): /spiffs/charge-records/charge-record-1.bin does not exist, no permits for
vfs_api.cpp:102] open(): /spiffs/charge-records/charge-record-1.bin does not exist, no permits for
vfs_api.cpp:102] open(): /spiffs/charge-records/charge-record-1.bin does not exist, no permits for
0,718 mDNS responder started
1,020 000: FA 03 00 00 0A 05 04 00 14 3E 00 00 E4 9A
1,021 EN+ GD EVSE found. Enabling EVSE support.
1,032 Rx cmd_0A seq:05 len:4 crc:9AE4 - I don't know what 3E means.
1,044 Wifi connecting to adrion.netgaroo.com

```

1,047          000: FA 03 00 00 0A 07 04 00 14 3F 00 00 96 9A
1,047 Rx cmd_0A seq:07 len:4 crc:9A96 - I don't know what 3F means.
1,060          000: FA 03 00 00 0A 08 12 00 14 25 0E 00 05 00 00 05 00 00 00
          020: 00 03 00 00 00 02 85 10
1,071 Rx cmd_0A seq:08 len:18 crc:1085 - I don't know what 25 means.
1,084          000: FA 03 00 00 0A 09 05 00 14 12 01 00 00 D3 8E
1,084 Rx cmd_0A seq:09 len:5 crc:8ED3 - ctrl_cmd set ack done, type:0
1,096          000: FA 03 00 00 0A 0A 05 00 14 12 01 00 00 93 9B
1,107 Rx cmd_0A seq:0A len:5 crc:9B93 - ctrl_cmd set ack done, type:0
1,108 This is AC011K- (AC011K-), a WARP Charger for AC011K
1,119          000: FA 03 00 00 0A 0B 05 00 14 12 01 00 00 52 57
1,129 Rx cmd_0A seq:0B len:5 crc:5752 - ctrl_cmd set ack done, type:0
1,131          000: FA 03 00 00 0A 0B 06 00 14 08 02 00 78 00 ED 6E
1,142 Rx cmd_0A seq:0B len:6 crc:6EED - Heartbeat Timeout:120s
1,154          000: FA 03 00 00 0A 0C 04 00 14 02 00 00 BD 96
1,154 Rx cmd_0A seq:0C len:4 crc:96BD - Set Time done
1,166 Selecting channel 1 for softAP
1,168 Had to configure soft AP IP address 1 times.
1,168 Wifi soft AP started
1,179 SSID: AC011K-
1,182 MAC address: 1C:9D:C2:57:43:F9
1,182 IP address: 10.0.0.1
1,193          000: FA 03 00 00 0A 0D 05 00 14 09 01 00 00 D4 99
1,194 Rx cmd_0A seq:0D len:5 crc:99D4 - ctrl_cmd set start power mode done
1,206          000: FA 03 00 00 0A 0E 04 00 14 2A 00 00 1E 5E
1,216 Rx cmd_0A seq:0E len:4 crc:5E1E - cmdAACtrlcantestsetAck test cancom...111 done
3,304          000: FA 03 00 00 02 04 7D 00 53 4E 31 30 30 35 32 31 30 39 32 35
          020: 34 32 31 36 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
          040: 25 11 00 41 43 30 31 31 4B 2D 41 45 2D 32 35 00 00 00 00 00 00 00 00 00
          060: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
          080: 00 00 00 00 00 00 00 00 00 00 00 00 31 2E 31 2E 32 31 32 00 00
          100: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00 00 00
          120: 00 5A 00 78 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
3,356 Rx cmd_02 seq:04 len:125 crc:782A - Serial number and version.
3,357 EVSE serial: SN10052109254216 hw: AC011K-AE-25 fw: 1.1.212
3,367 EN+ GD EVSE initialized.
3,368          000: FA 03 00 00 A2 04 01 00 00 93 98
3,378 Tx cmd_A2 seq:04, crc:9893
6,306 Wifi connected to adrion.netgaroo.com
6,324 Wifi MAC address: 1C:9D:C2:57:43:F8
6,325 Wifi got IP address: 192.168.188.179. Connected to BSSID 10:9A:DD:8B:01:4B
7,304          000: FA 03 00 00 02 05 7D 00 53 4E 31 30 30 35 32 31 30 39 32 35
          020: 34 32 31 36 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
          040: 25 11 00 41 43 30 31 31 4B 2D 41 45 2D 32 35 00 00 00 00 00 00 00 00 00
          060: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
          080: 00 00 00 00 00 00 00 00 00 00 00 31 2E 31 2E 32 31 32 00 00
          100: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00 00 00
          120: 00 5A 00 78 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
7,356 Rx cmd_02 seq:05 len:125 crc:E42B - Serial number and version.
7,357 EVSE serial: SN10052109254216 hw: AC011K-AE-25 fw: 1.1.212
7,367          000: FA 03 00 00 A2 05 01 00 00 92 64
7,377 Tx cmd_A2 seq:05, crc:6492
11,304         000: FA 03 00 00 02 06 7D 00 53 4E 31 30 30 35 32 31 30 39 32 35
          020: 34 32 31 36 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
          040: 25 11 00 41 43 30 31 31 4B 2D 41 45 2D 32 35 00 00 00 00 00 00 00 00 00
          060: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
          080: 00 00 00 00 00 00 00 00 00 00 00 31 2E 31 2E 32 31 32 00 00
          100: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 01 00 00 00 00 00
          120: 00 5A 00 78 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
11,356 Rx cmd_02 seq:06 len:125 crc:002B - Serial number and version.
11,356 EVSE serial: SN10052109254216 hw: AC011K-AE-25 fw: 1.1.212
11,367          000: FA 03 00 00 A2 06 01 00 00 92 20
11,377 Tx cmd_A2 seq:06, crc:2092
30,613 Got no managed current update for more than 30 seconds. Setting managed current to 0
2022-07-01 14:25:39,741 NTP synchronized at 33,194!

```

a side project
late 2021,
early 2022

Idea to use the open source
software from TinkerForge
on the **EN+ hardware**

leads to
some **CAD and metal bending**



BETA release Feb 2022

software from TinkerForge on the AC011K (EN+ hardware)

The screenshot shows a GitHub repository page for [bs-github / esp32-firmware](#). The repository is public and forked from [Tinkerforge/esp32-firmware](#). The main navigation bar includes links for Code, Pull requests, Actions, Projects, Wiki, Security, Insights, and Settings. Below the navigation, there are tabs for Releases and Tags, with the Releases tab currently selected. A button for Draft a new release and a search bar for finding releases are also present.

A specific release is highlighted, dated 27 Feb 2022, created by bs-github, and titled "first BETA warp firmware for EN+ chargers". The release is marked as a Pre-release. The description states "First BETA!" and "See [Wiki](#) for features, limitations and instructions." The assets section lists three files: "warp8enplus_firmware_1_2_99_621b9375_merged.bin" (1.6 MB, 27 Feb 2022), "Source code (zip)" (27 Feb 2022), and "Source code (tar.gz)" (27 Feb 2022). A smiley face icon is at the bottom of the release card.

27 Feb 2022
bs-github
warp8enplus...
2fc7e37
Compare ▾

first BETA warp firmware for EN+ chargers Pre-release

First BETA!

See [Wiki](#) for features, limitations and instructions.

▼Assets 3

warp8enplus_firmware_1_2_99_621b9375_merged.bin	1.6 MB	27 Feb 2022
Source code (zip)		27 Feb 2022
Source code (tar.gz)		27 Feb 2022

SUSE Hack Week 21

more hacking to get version 2 running

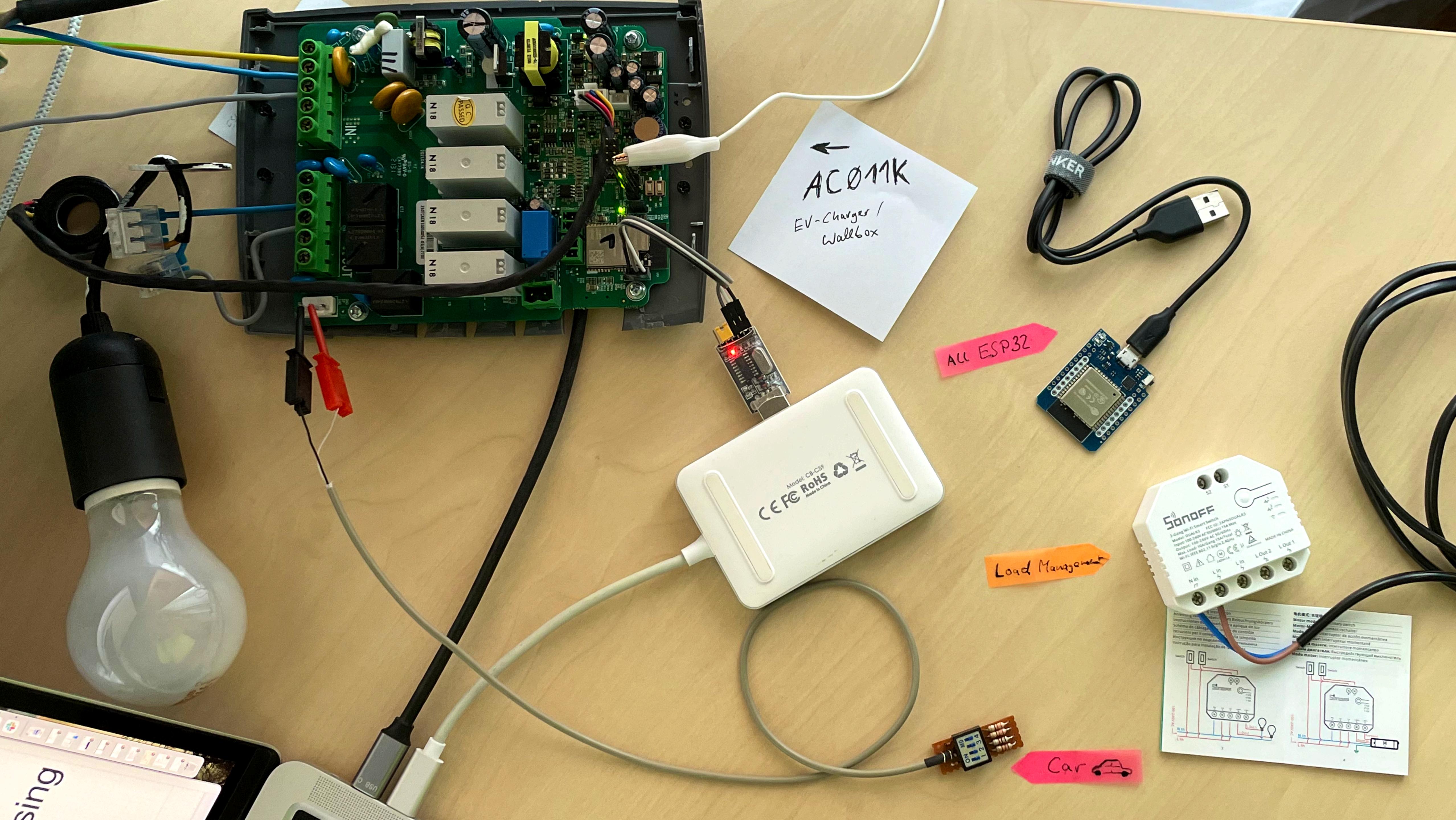


mid 2022 port TinkerForge WARP2 Charger

version 2
software from TinkerForge
needs to be ported to the
EN+ hardware

as well as to the
Sonoff DUAL R3

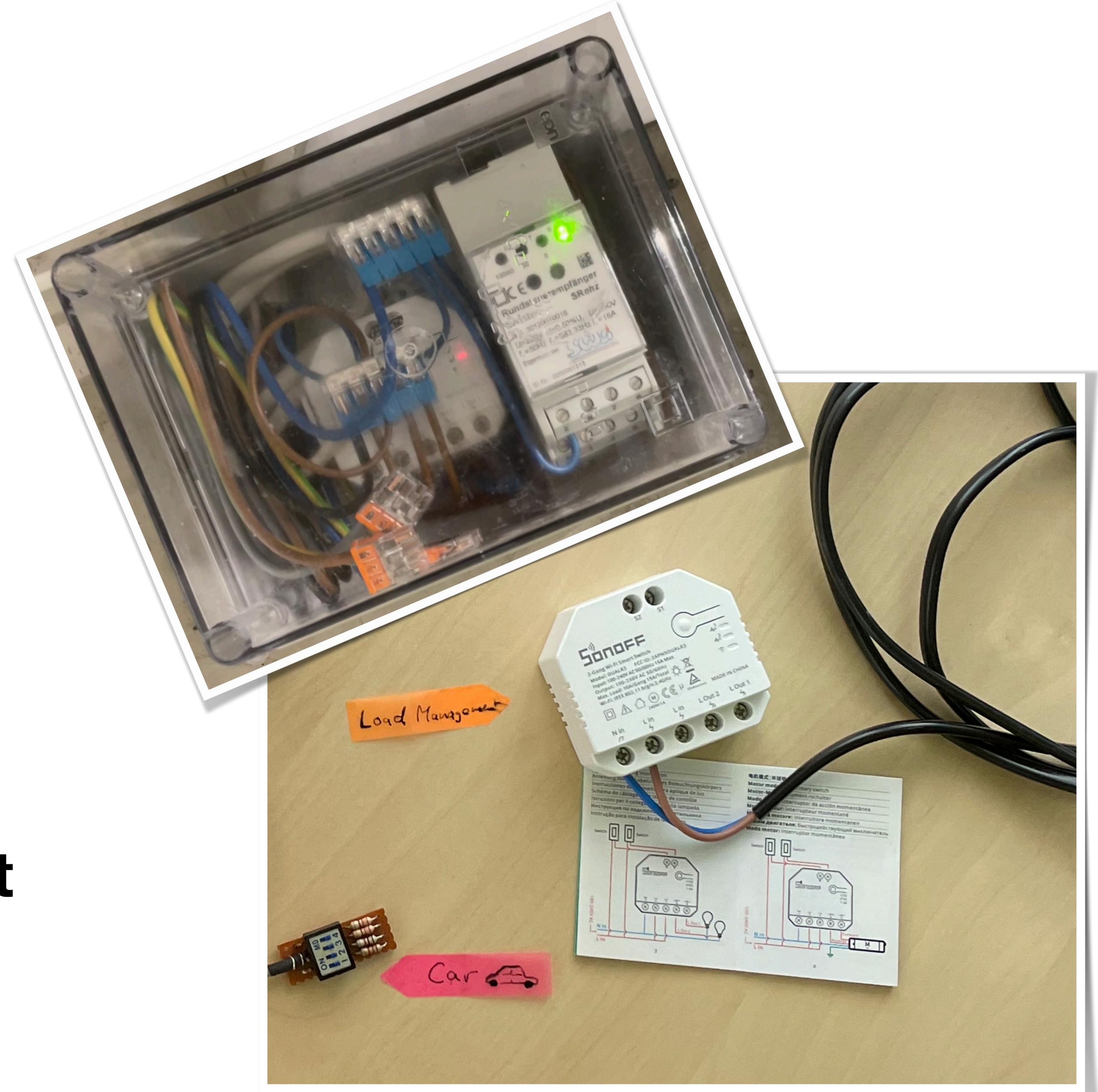




Why the Sonoff?

Sonoff DUAL R3 is
based on the ESP32 as well

energy provider requires that
they can switch off the load



Repeat success!

**Remember the
WRT54G?**

**That's where the OpenWrt
project came from**

**I'd like to have something similar
for EV charging**

many wallboxes are using the ESP32

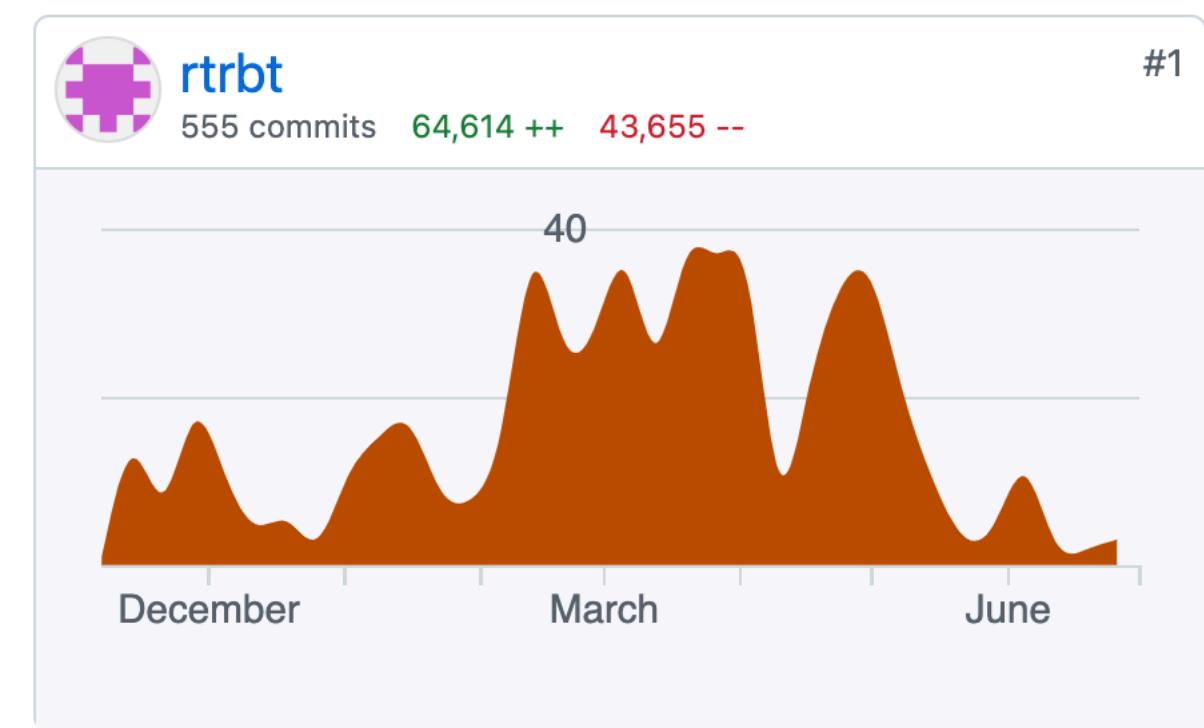
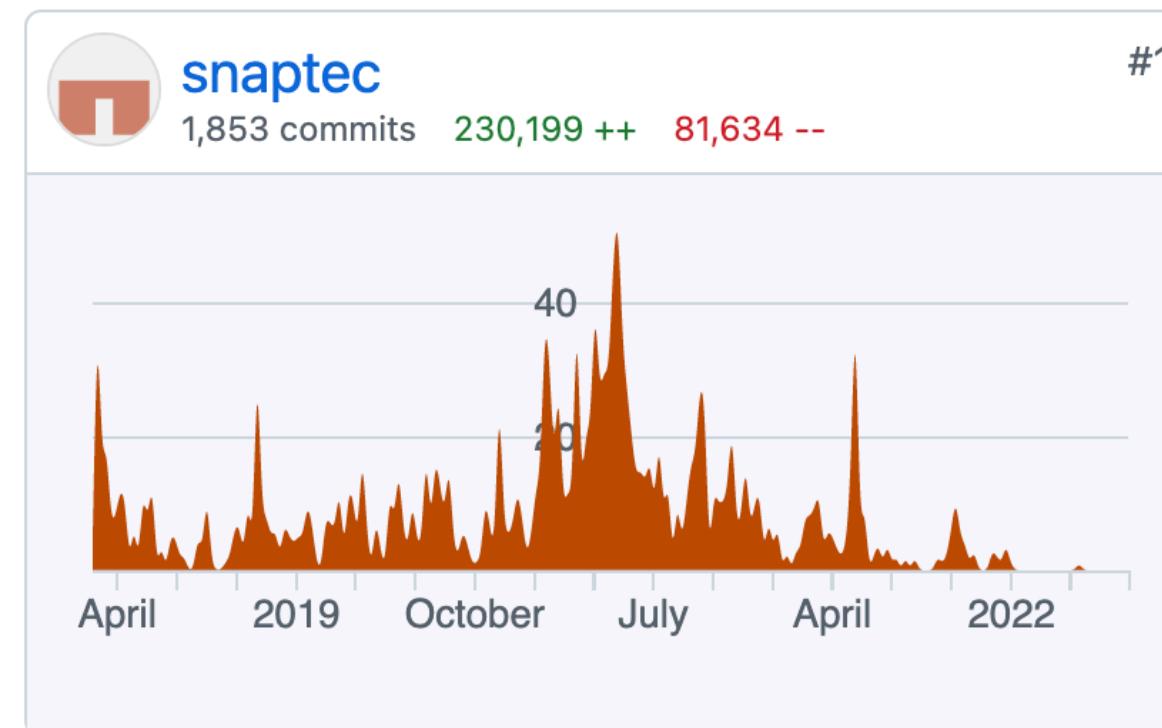


OpenWB vs. TinkerForge and EN+

Why not OpenWB?

sorry to say, but

software too bloated (x10)
hardware too expensive (x4)



openWB series2 standard

1.199,00 €

WALLBOX
Plug & Play mit 11 kW

autoaid

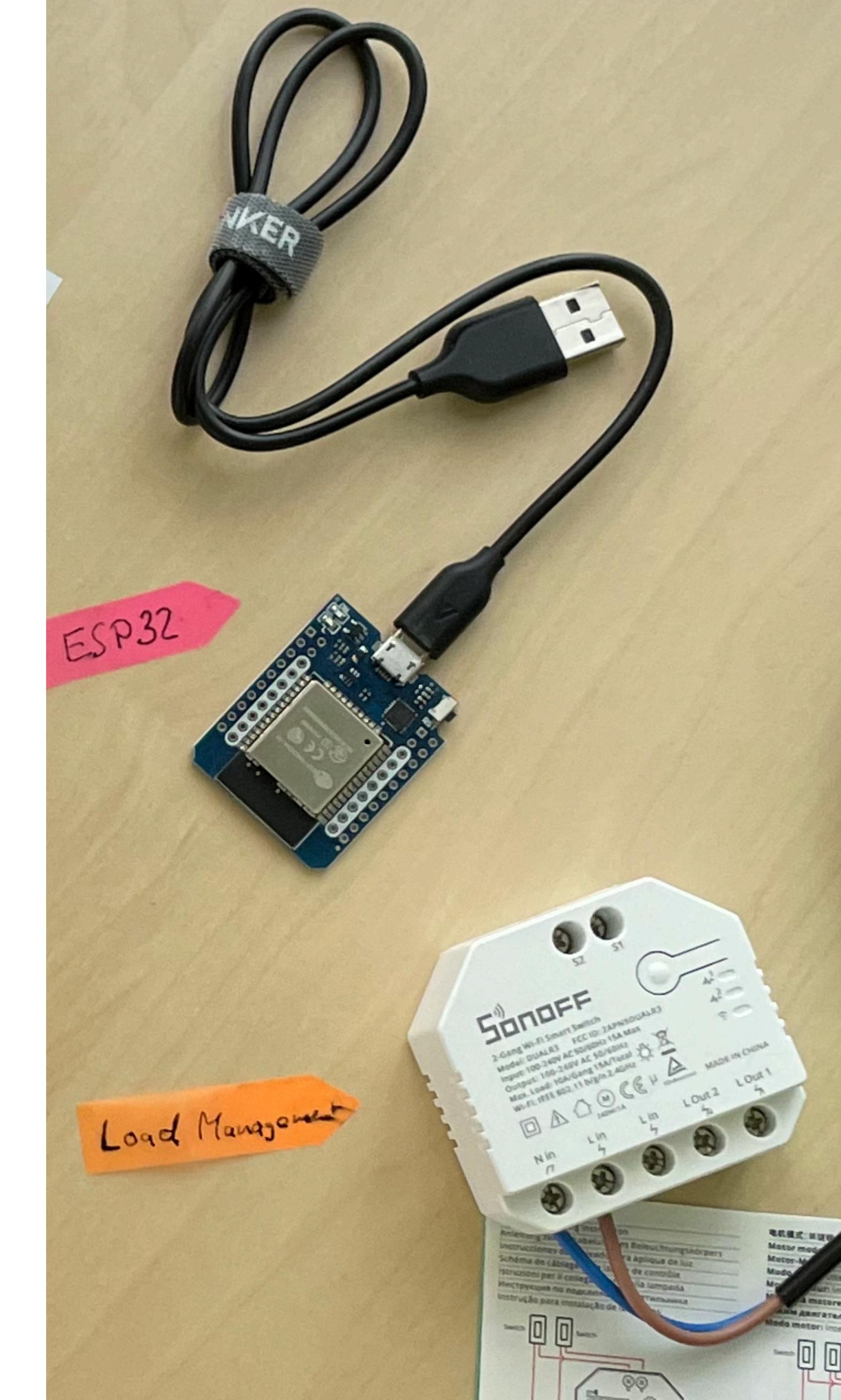
11 kW Ladeleistung
DC Fehlerstromschutz
Typ 2 Ladekabel integriert
(4 Meter, optional 7 Meter)

449,00 € **349,00 €**

To collaborate you only need the **ESP32**

to get **mesh networking** going would be
really great,
because the **ESP32** can only have max 10
WIFI clients, but unlimited mesh is possible

and I'd really like to have someone help me
clean up my very bad and messy C++ code



To collaborate you
only need the
ESP32

<https://github.com/bst-github/esp32-firmware/wiki>



Reactions

<https://github.com/bst-github/esp32-firmware/wiki>

