



# MESHCOM MCAPP INSTALLATION

# SCREEN SHOTS – RESPONSIVE UI WITH DARK MODE

Two screenshots of a web-based monitoring interface for a network of LoRaWAN nodes. The interface includes tabs for 'Messages', 'Positions', 'Internet', and 'MeshCom'. Each tab displays a list of nodes with their status, location, and recent messages.

**Messages Tab:**

- Internet:** Shows 20 nodes under 'No Filter (658)'. One message from 'IWIQAQF-11' is highlighted: "Il nuovo Nodo iwiqaqf-11 è aperto a tutto il traffico mesh.. Vede Piemonte, parte della Lombardia e Liguria." Another message from 'IWIQAQF-11' says "Happy Easter from Stuttgart SW-Germany".
- MeshCom:** Shows 69 nodes under 'No Filter (658)'. One message from 'DL2JA-1' is highlighted: "Il nuovo Nodo iwiqaqf-11 è aperto a tutto il traffico mesh.. Vede Piemonte, parte della Lombardia e Liguria."

**Positions Tab:**

- Internet:** Shows 20 nodes under 'No Filter (658)'. One message from 'IWIQAQF-11' is highlighted: "Il nuovo Nodo iwiqaqf-11 è aperto a tutto il traffico mesh.. Vede Piemonte, parte della Lombardia e Liguria."
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**Internet Tab:**

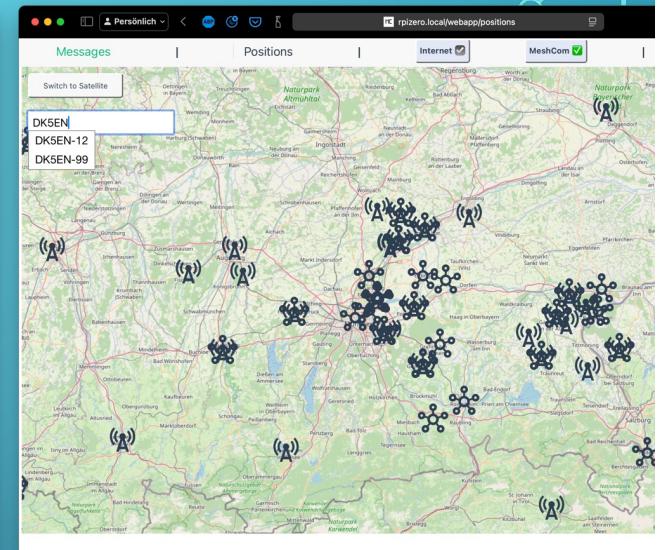
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**MeshCom Tab:**

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**Settings Tab:**

- Internet:** Shows 20 nodes under 'No Filter (658)'. One message from 'IWIQAQF-11' is highlighted: "Il nuovo Nodo iwiqaqf-11 è aperto a tutto il traffico mesh.. Vede Piemonte, parte della Lombardia e Liguria."
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- Settings:** Shows 69 nodes under 'No Filter (658)'. One message from 'DL2JA-1' is highlighted: "Il nuovo Nodo iwiqaqf-11 è aperto a tutto il traffico mesh.. Vede Piemonte, parte della Lombardia e Liguria."



| rpizero.local/webapp/settings |                   |                  |                   |             |
|-------------------------------|-------------------|------------------|-------------------|-------------|
| Messages                      | Positions         | Internet         | MeshCom           | Settings    |
| X 15 (1) X                    | X 20 (116) ✓      | X 222 (19) ✓     | X 888 (3) X       |             |
| X 999 (10) X                  | X 7007 (2) ✓      | X 8092 (1) X     | X 22281 (27) ✓    |             |
| X 28275 (1) X                 | X 26277 (11) ✓    | X 26298 (59) ✓   | X 28362 (1) ✓     |             |
| X 26379 (1) X                 | X 26386 (1) X     | X + (426) ✓      | X DK5EN-99 (20) ✓ |             |
| X OE5HWY-12 (24) ✓            | X OE9ROE-92 (2) ✓ | X DL2JA-11 (3) ✓ | X DL2JA-3 (2) ✓   |             |
| X DO1MH-12 (1) ✓              | X TEST (2) ✓      | X Time (10) ✓    |                   |             |
| Callsign                      | DK5EN             | SID              | 99                | Scrollbar   |
| WebSocket IP                  | rpizero.local     | WebSocket Port   | 2981              | LoRa IP     |
| LoRa Port                     | not used          | Country          | EU8               | TX Power    |
| Latitude                      | 48.123            | Longitude        | 12.073            | Altitude    |
| APRS Name                     | not used          | APRS Group       | /                 | APRS Symbol |

| Messages           | Positions         | Internet         | MeshCom           | Settings    |
|--------------------|-------------------|------------------|-------------------|-------------|
| X 15 (1) X         | X 20 (115) ✓      | X 222 (19) ✓     | X 888 (3) X       |             |
| X 999 (10) X       | X 7007 (2) ✓      | X 8092 (1) X     | X 22251 (27) ✓    |             |
| X 26275 (1) X      | X 26277 (1) ✓     | X 26298 (59) ✓   | X 26362 (1) ✓     |             |
| X 26379 (1) X      | X 26386 (1) X     | X *(426) ✓       | X DK5EN-99 (20) ✓ |             |
| X OE5HWN-12 (24) ✓ | X OE5ROE-92 (2) ✓ | X DL2JA-11 (3) ✓ | X DL2JA-3 (2) ✓   |             |
| X DO1MH-12 (1) ✓   | X TEST (2) ✓      | X Time (10) ✓    |                   |             |
| Callsign           | DK5EN             | SID              | 99                | Scrollback  |
| WebSocket IP       | rpizero.local     | WebSocket Port   | 2981              | LoRa IP     |
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# VORWORT

- Die Kommunikation zwischen Webbrower am PC und Server Komponente am Raspi Zero kann nur TLS-verschlüsselt erfolgen, weil die modernen Browser dies erzwingen. Dies ist kein unnötiger Luxus, sondern notwendig
- Offizielle Zertifikate werden von Let's Crypt nur für offizielle Domains ausgestellt. Wenn man mit mDNS „.local“ (auf MacOS oder Windows mit iTunes installiert) oder Fritz!Box .fritz.box arbeitet, dann gibt es keine SSL-Zertifikate, die gegen ein getrustete Root-Zertifikat laufen, die im Browser und Betriebssystem vorinstalliert sind
- Jedoch ist die für den geübten Admin kein Problem, denn Caddy bringt eine PKI mit Zertifikatsrotation mit sich. x.509 Zertifikate sind trotzdem komplex
- Daher müssen das self-signed Root Zertifikat der Caddy PKI importieren
- Da bei SSL-Zertifikaten immer der Hostname übereinstimmen muss, ist es nicht möglich mit IP-Adressen zwischen Webbrower und Raspi im lokalen Netz zu arbeiten. Es muss alles zwingend über DNS-Namen laufen, die auch dem cn= Eintrag im Zertifikat entsprechen müssen
- Die Serverkomponente ist ein Python Script, das die Messages per UDP mit dem MeshCom Node austauscht und alles über einen websocket weiterleitet. Der WebSocket wird TLS verschlüsselt durch Caddy, unseren Reverse Proxy
- Der lighttpd Webserver wird ebenso durch Caddy TLS verschlüsselt. Die Webseite selbst ist statisch, es wird kein PHP benötigt
- Wer seinen MeshCom Knoten nur über IP-Adresse erreicht, kann dies im `c2-mc-ws.py` Skript entsprechend anpassen.
- Zum Abschluss nicht vergessen auf dem MeshCom Knoten `--extudp on` zu konfigurieren und einzuschalten

Happy Meshing in MeshCom de DK5EN

# NEW INSTALL PROCEDURE

- Flash SD card, insert, boot up, wait for FS expansion (takes 2 minutes)
- Login via ssh and your user, execute statements one after another

```
▪ curl -fsSL https://raw.githubusercontent.com/DK5EN/McAdvChat/main/install_caddy.sh | bash  
▪ curl -fsSL https://raw.githubusercontent.com/DK5EN/McAdvChat/main/mc-install.sh | sudo bash  
▪ curl -fsSL https://raw.githubusercontent.com/DK5EN/McAdvChat/main/install_mcproxy.sh | bash  
▪ Sudo vi /etc/mcwebapp/config.json  
▪ curl -fsSL https://raw.githubusercontent.com/DK5EN/McAdvChat/main/install_mcproxy.sh | bash
```

- Got to web browser, import root certificate <https://mcapp.local/root.crt>
- Go to web browser, <https://mcapp.local/webapp>
- Go to settings on webpage, enter the address of your Raspi "mcapp.local" and your callsign and SID
- Click connect MC
- Enjoy

# UPDATING TO THE LATEST VERSION

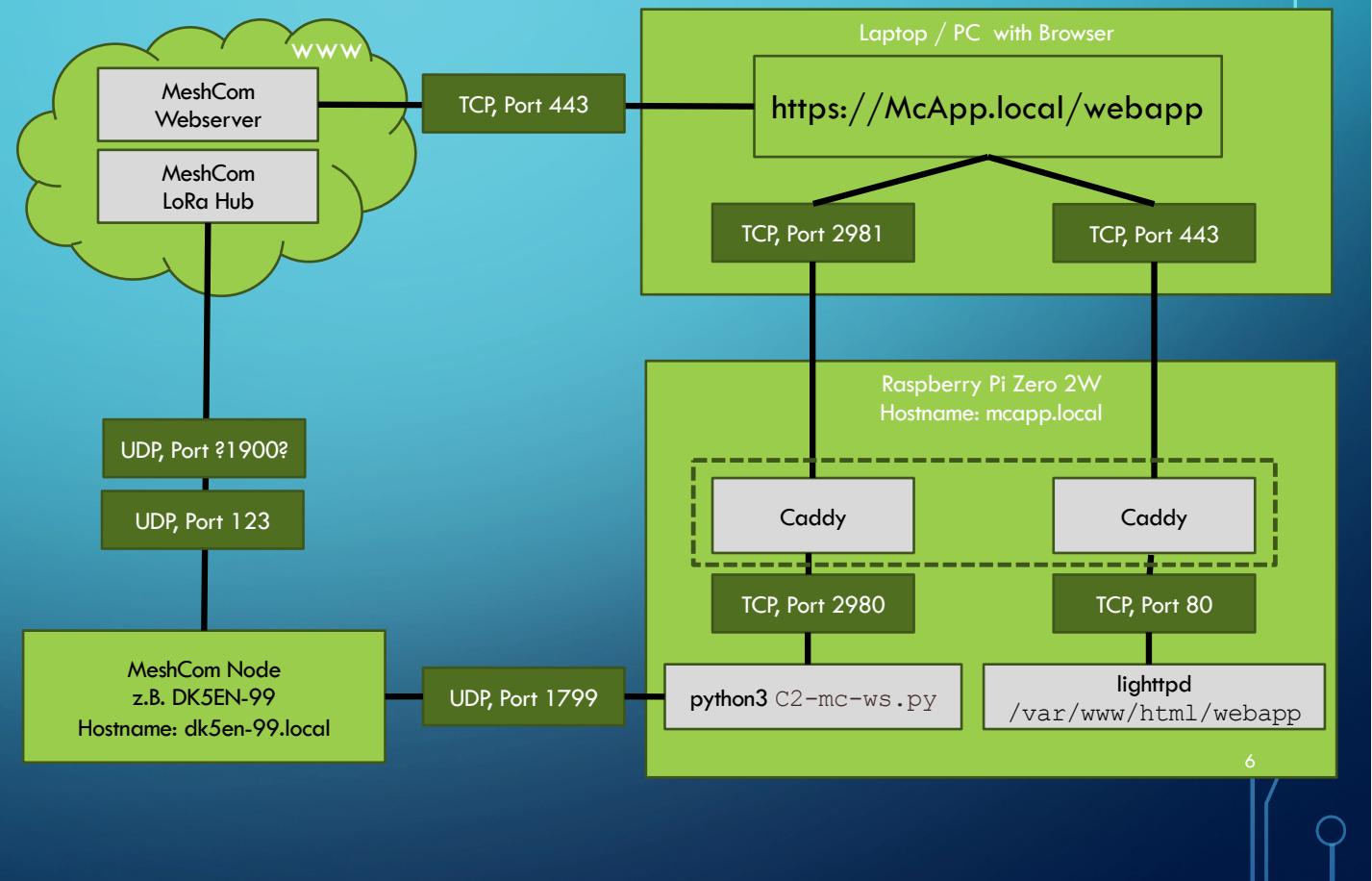
- At a later time, update everything, just use the script

```
martin@McApp:~ $ curl -fsSL https://raw.githubusercontent.com/DK5EN/McAdvChat/main/mc-install.sh | sudo bash

[INFO] Skript läuft unter Benutzer: martin
[INFO] Lokale WebApp-Version: v0.1.0
[INFO] Lokale Python-Skript-Version: v0.2.0
[INFO] Lokale Shell-Skript-Version: v0.2.0
[INFO] Install-Skript-Version: v0.1.0
[INFO] Remote WebApp-Version: v0.1.0
[INFO] Remote Python-Skript-Version: v0.2.0
[INFO] Remote Shell-Skript-Version: v0.2.0
[INFO] Reloade Webserver ...
[INFO] Prüfe WebApp unter https://rpiZero.local/webapp/version.txt
[INFO] WebApp erfolgreich aktualisiert auf Version v0.1.0
[INFO] Installations-Skript erfolgreich abgeschlossen.
```

# HIGH LEVEL ARCHITECTURE

- High level overview of how everything is tied together



## SD CARD & RPI ZERO

- Insert your at least 32GB SD Card into your card reader
- Please only use SD Cards with 100MBit/s like SanDisk
- Have your Raspberry Pi Zero 2W at Hand

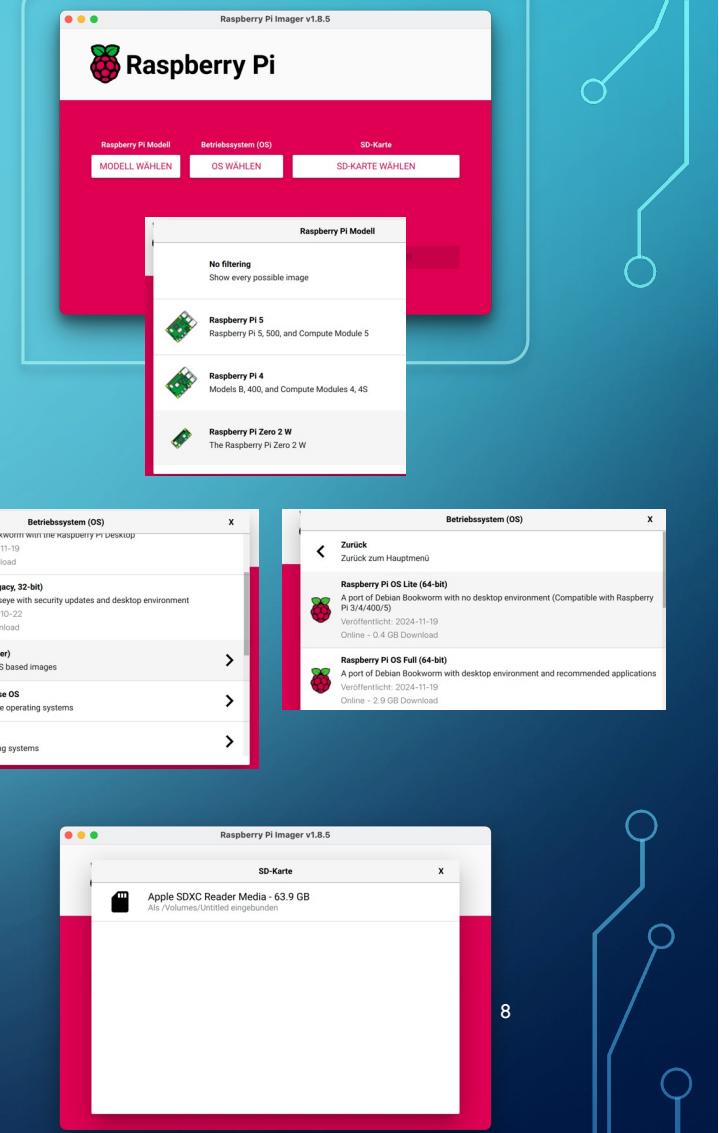


# CUSTOM OS INSTALLATION

We want to install a headless, 64Bit Debian Bookwork

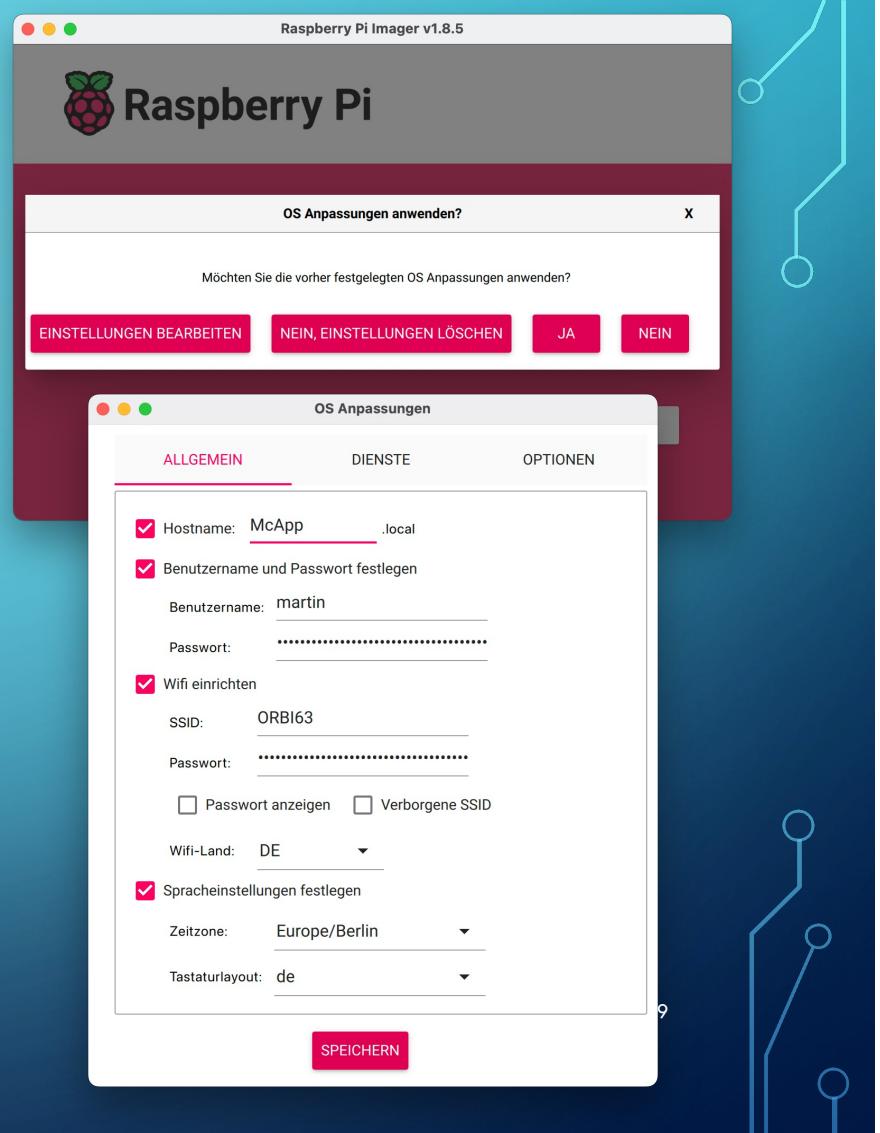
- I do recommend Raspberry PI Imager, which can be found here  
<https://www.raspberrypi.org/downloads/>
- Select your Model: Raspberry Pi Zero 2 W
- For OS, select “other“ – „Raspberry Pi OS Lite (64-bit), with no desktop, approx. 0,4GB
- Select your SD Card

.. And click next



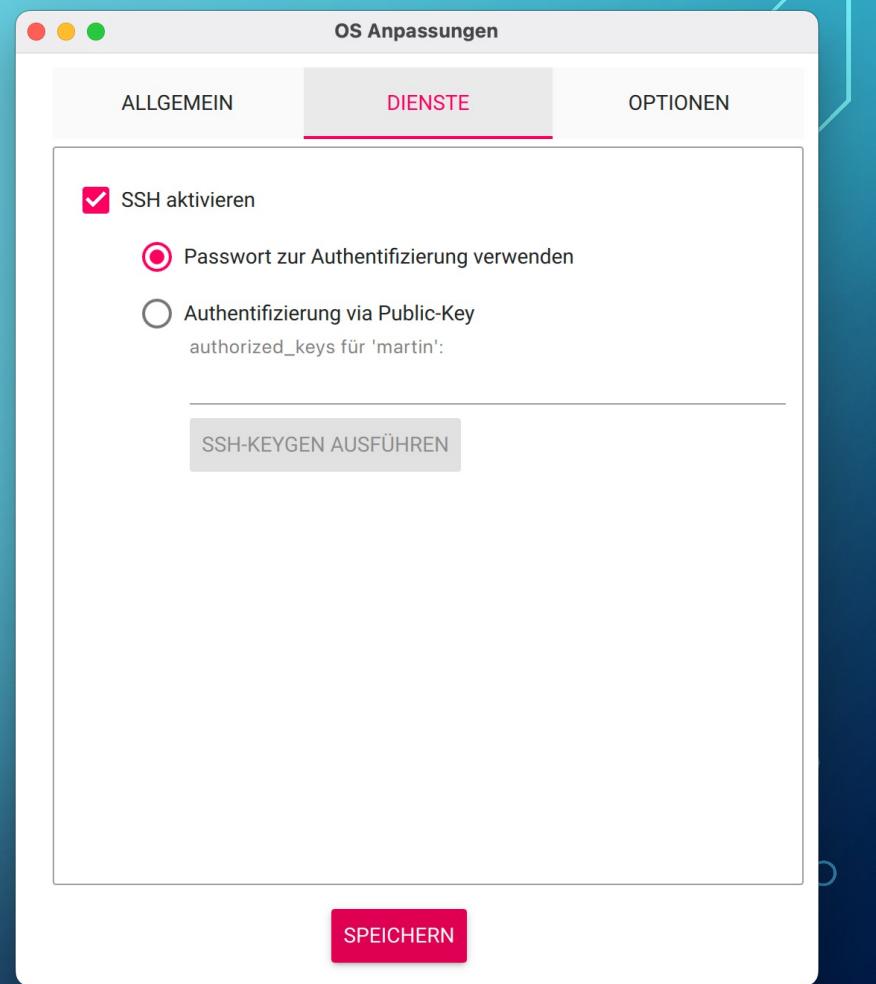
## IMPORTANT CUSTOMIZATIONS

- Choose your hostname: McApp in our example
- Choose what ever username, you want. I do not recommend to setup a standard „pi“ user, as this is a security risk
- Choose your login password, which should later be changed to a pre-shared ssh key
- Make sure you have your WiFi Settings correct, because otherwise you will not be able to access your headless system



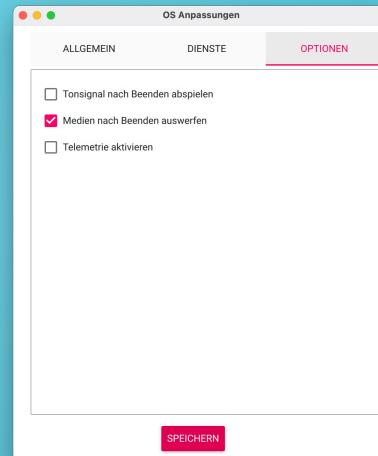
## ACTIVATE SSH

- Make sure that ssh is activated.
- For the initial setup, we start with password Authentication.
- If you are experienced, you can also set a pre-shared key.



## OPTIONS

- Nothing to change here, everything standard.
- Now click save
- Then click yes to apply custom settings
- Now agree to erase everything on the SD card.



## FLASHING THE SD CARD

- Now wait for the flashing to be finished
- On MacOS you get asked about your Admin password, as this is a low level write, that needs more privileges
- After a short while you should see the success message
- Close Raspberry Pi Imager, eject your SD card

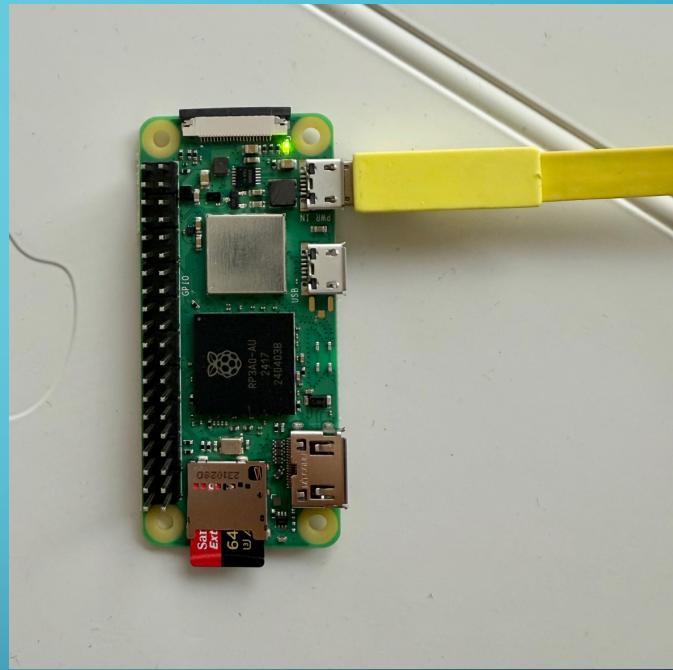


## FIRST TIME BOOT UP

- Insert your SD card into Raspberry Pi 2 Zero
- Attach 5V via Mini USB Jack
- The greenlight starts flashing

Raspberry Pi is booting up and expanding the filesystem. Depending on your SD card, this takes at least 2 Minutes. Grab yourself a coffee and wait

- If you have mDNS, then you can try to ping your Raspberry Pi
- Otherwise check your WiFi Router for the IP of the new device

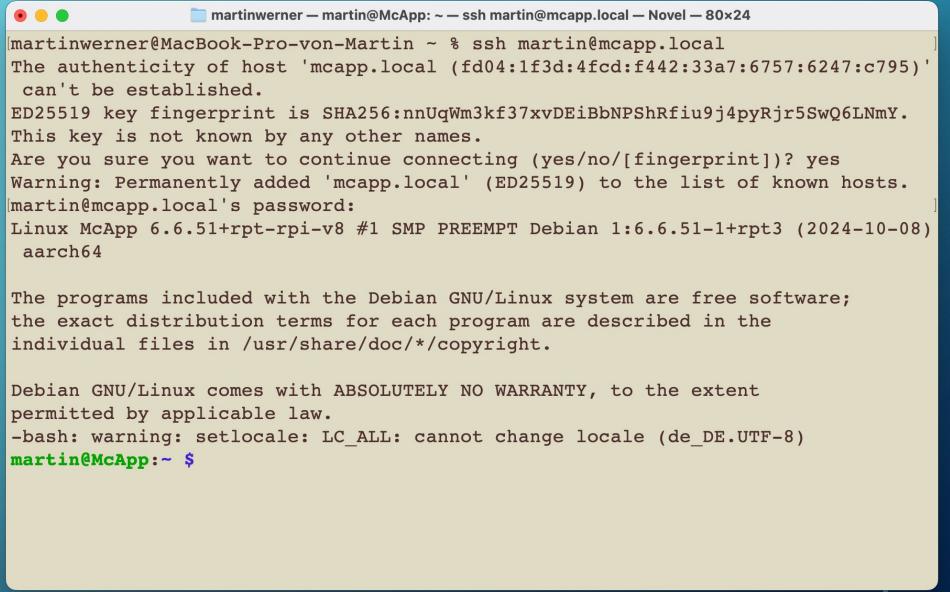


```
martinwerner@MacBook-Pro-von-Martin .ssh % ping mcapp.local
ping: cannot resolve mcapp.local: Unknown host
martinwerner@MacBook-Pro-von-Martin .ssh % ping mcapp.local
PING mcapp.local (192.168.68.70): 56 data bytes
64 bytes from 192.168.68.70: icmp_seq=0 ttl=64 time=121.193 ms
64 bytes from 192.168.68.70: icmp_seq=1 ttl=64 time=11.150 ms
64 bytes from 192.168.68.70: icmp_seq=2 ttl=64 time=8.156 ms
64 bytes from 192.168.68.70: icmp_seq=3 ttl=64 time=3.976 ms
64 bytes from 192.168.68.70: icmp_seq=4 ttl=64 time=8.038 ms
64 bytes from 192.168.68.70: icmp_seq=5 ttl=64 time=15.590 ms
```

# TIME TO ACCESS YOUR RASPI

Use putty on Windows or term on MacOS

- Make sure to use the correct username for your Pi Zero
- Accept the new ssh fingerprint
- Enter your password
- You should now have ssh access to your Raspi



```
martinwerner@MacBook-Pro-von-Martin ~ % ssh martin@mcapp.local
The authenticity of host 'mcapp.local (fd04:1f3d:4fc:f442:33a7:6757:6247:c795)' can't be established.
ED25519 key fingerprint is SHA256:nnUqWm3kf37xvDEiBbNPShRfiu9j4pyRjr5SwQ6LNmY.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'mcapp.local' (ED25519) to the list of known hosts.
martin@mcapp.local's password:
Linux McApp 6.6.51+rpt-rpi-v8 #1 SMP PREEMPT Debian 1:6.6.51-1+rpt3 (2024-10-08) aarch64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/*copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
-bash: warning: setlocale: LC_ALL: cannot change locale (de_DE.UTF-8)
martin@McApp:~ $
```

# CHECK THE WEB SERVER DOWNLOAD SSL CERTIFICATE

- First we access our lighttpd via http – the unencrypted version.

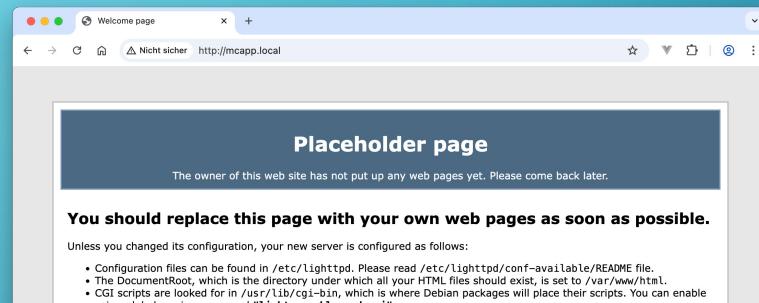
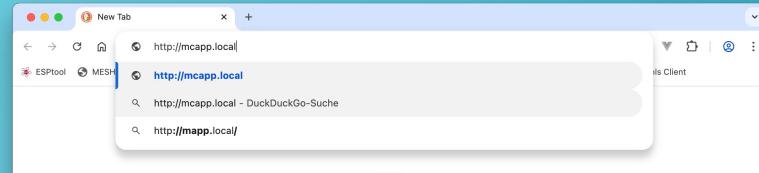
<http://mcapp.local>

- You should see the placeholder page

- Now we download the self-signed root certificate

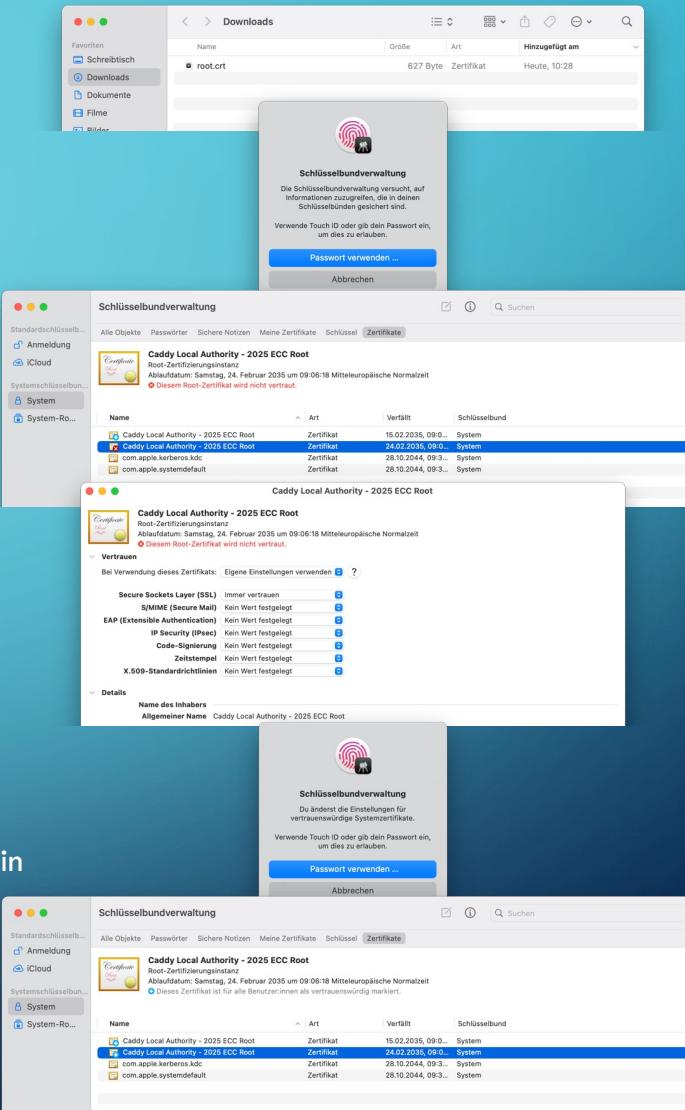
<http://mcapp.local/root.crt>

- Make sure to accept the blocked download



# INSTALL THE SSL CERTIFICATE

- Locate your root.crt in your download folder
  - Double click root.crt
  - Enter your Admin password
  - Now locate the newly installed certificate
  - Trust the certificate for TLS encryption
- 
- Same is true for the iPhone. After import, you have to accept it in General – Profiles AND then you need to trust it, which is hidden in the settings menu

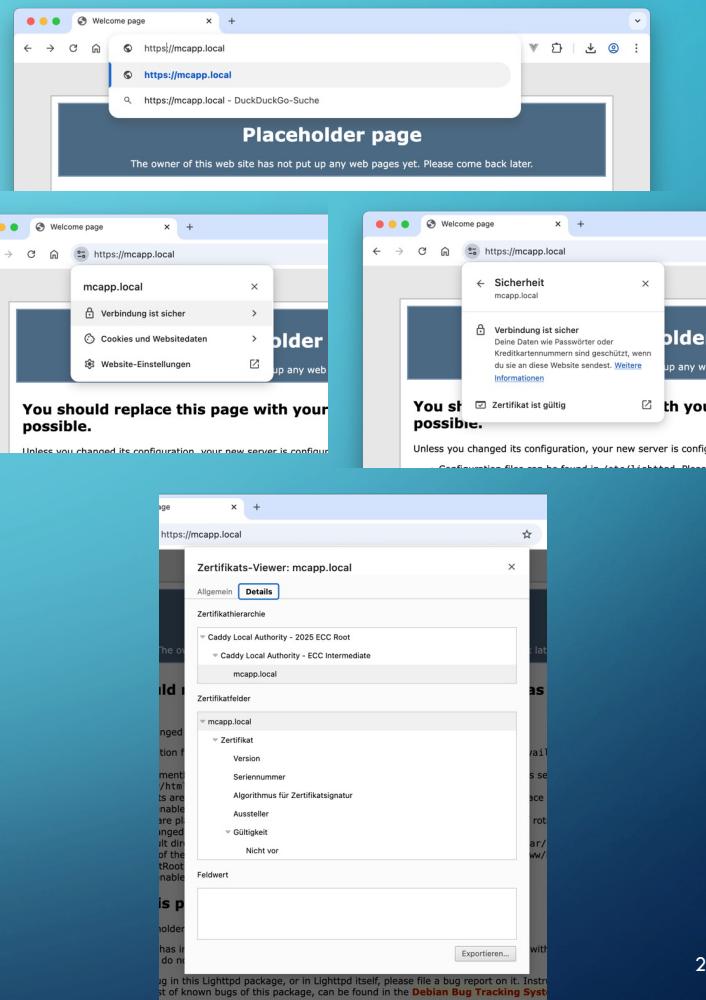


# TESTING SSL ACCESS

- Go to your web browser, now we access https

<https://mcapp.local>

- If everything worked out, as expected, you should see a fully trusted root chain.



# OPEN WEBBROWSER

- Click option command J for Debug Output
- Go to url: <https://mcapp.local/webapp/>
- Click on Settings
- Enter your Callsign
- Your SID
- 20 for scroll back buffer
- mcapp.local for your UDP Proxy server
- 2981 for the secure socket of the UDP Proxy that runs in python
- Click Connect MeshCom

Callsign DK5EN SID 99  
Scrollbar 20 WebSocket IP mcapp.local  
WebSocket Port 2981 LoRa IP not used  
LoRa Port not used Country EU8  
TX Power 10 Latitude 48.123  
Longitude 12.073 Altitude 468  
APRS Name not used APRS Group /  
APRS Symbol # Max V 3.500  
LoRa Group 1 9 LoRa Group 2 20  
LoRa Group 3 232 LoRa Group 4 262  
LoRa Group 5 222 LoRa Group 6 0  
BLE PIN 000000 Node UTC -2

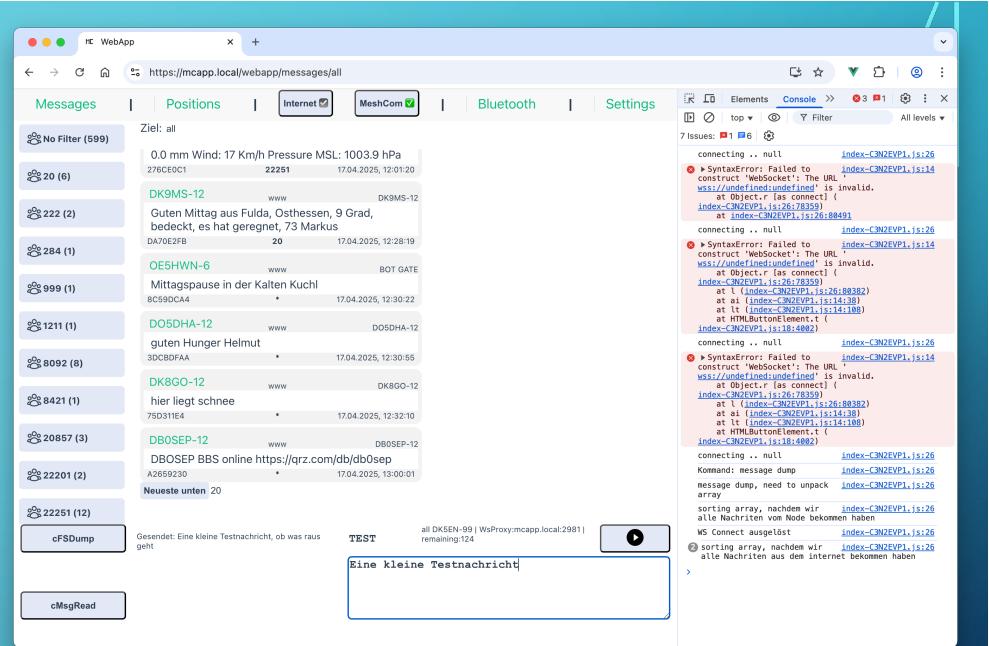
```
connecting .. null  
SyntaxError: Failed to construct 'WebSocket': The URL ws://mcapp.local:2981/underlinedisdefined is invalid.  
at Object.<anonymous> (index-CN2EVPl.1:126:88491)  
connecting .. null  
SyntaxError: Failed to construct 'WebSocket': The URL ws://mcapp.local:2981/underlinedisdefined is invalid.  
at 1 (index-CN2EVPl.1:126:8832)  
at t (index-CN2EVPl.1:126:8833)  
at tt (index-CN2EVPl.1:126:8834)  
at t (index-CN2EVPl.1:126:8835)  
at tt (index-CN2EVPl.1:126:8836)  
at t (index-CN2EVPl.1:126:8837)  
at tt (index-CN2EVPl.1:126:8838)  
at t (index-CN2EVPl.1:126:8839)  
at tt (index-CN2EVPl.1:126:8840)  
at t (index-CN2EVPl.1:126:8841)  
connecting .. null  
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Callsign DK5EN SID 99  
Scrollbar 20 WebSocket IP mcapp.local  
WebSocket Port 2981 LoRa IP not used  
LoRa Port not used Country EU8  
TX Power 10 Latitude 48.123  
Longitude 12.073 Altitude 468  
APRS Name not used APRS Group /  
APRS Symbol # Max V 3.500  
LoRa Group 1 9 LoRa Group 2 20  
LoRa Group 3 232 LoRa Group 4 262  
LoRa Group 5 222 LoRa Group 6 0  
BLE PIN 000000 Node UTC -2

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at tt (index-CN2EVPl.1:126:8840)  
at t (index-CN2EVPl.1:126:8841)  
connecting .. null  
Kommend: message dump  
message dump, need to unpack  
array  
sorting array, nachdem wir  
alle Nachrichten von Node bekommen haben
```

# TIME TO TEST EVERYTHING

- Go to <https://meshcom.oevsv.at/#>
  - Click on Test
  - Now enter a test Message
  - Check on MeshCom Test page



| meshcom.oevsv.at/# |                        |          |           |           |           |   |   |   |  |                   |
|--------------------|------------------------|----------|-----------|-----------|-----------|---|---|---|--|-------------------|
|                    |                        |          |           |           |           |   |   |   |  |                   |
| 34                 | 244-07-11/<br>12:22:45 | A2659224 | DB0SEP-12 | DB0SEP-12 | DK9MS-12  | 4 | 0 | 0 | Ping received, BBS online  | EU8 SF11CR46BW250 |
| 35                 | 2025-04-17<br>12:24:55 | DA70E2F6 | DK9MS-12  | DK9MS-12  | DB0SEP-12 | 4 | 0 | 0 | db0sep h   | EU SF11CR46BW250  |
| 36                 | 2025-04-17<br>12:24:58 | A2659226 | DB0SEP-12 | DB0SEP-12 | DK9MS-12  | 4 | 0 | 0 | Commands-> db0sep br,bs,mh,r,l,e,s,u,h,p,t<br>https://www.qrz.com/db/db0sep - done.. | EU8 SF11CR46BW250 |
| 37                 | 2025-04-17<br>12:26:37 | DA70E2F9 | DK9MS-12  | DK9MS-12  | DB0SEP-12 | 4 | 0 | 0 | db0sep p   | EU SF11CR46BW250  |
| 38                 | 2025-04-17<br>12:26:42 | A2659228 | DB0SEP-12 | DB0SEP-12 | DK9MS-12  | 4 | 0 | 0 | Ping received, BBS online  | EU8 SF11CR46BW250 |
| 39                 | 2025-04-17<br>12:56:05 | DA70E2FE | DK9MS-12  | DK9MS-12  | DB0SEP-12 | 4 | 0 | 0 | db0sep r 1   | EU SF11CR46BW250  |
| 40                 | 2025-04-17<br>12:56:08 | A265922D | DB0SEP-12 | DB0SEP-12 | DK9MS-12  | 4 | 0 | 0 | mal sehen ob das bei dir auch ankommt. 73 de Helmut - done..                         | EU8 SF11CR46BW250 |
| 41                 | 2025-04-17<br>12:56:44 | DA70E300 | DK9MS-12  | DK9MS-12  | DB0SEP-12 | 4 | 0 | 0 | db0sep e 1   | EU SF11CR46BW250  |
| 42                 | 2025-04-17<br>12:56:50 | A265922F | DB0SEP-12 | DB0SEP-12 | DK9MS-12  | 4 | 0 | 0 | Delete ok - done..   | EU8 SF11CR46BW250 |
| 43                 | 2025-04-17<br>13:00:01 | 10076000 | DB0SEP-12 | DB0SEP-12 | DK9MS-12  | 4 | 0 | 0 | DB0SEP BBS - done..  | EU8 SF11CR46BW250 |
| 44                 | 2025-04-17<br>13:00:39 | EA0EB280 | DK5EN-99  | DK5EN-99  | TEST      | 4 | 0 | 0 | Eine kleine Testnachricht, ob was raus geht  | EU8 SF11CR46BW250 |

## ANNOYANCES WITH LOCALES AND A SYSTEM UPDATE

```
martin@McApp:~ $ sudo raspi-config
```

- 5 Localization -> L1 locale -> select de\_AT.UTF-8 -> OK -> C.UTF-8 -> OK
- Finish

```
martin@McApp:~ $ sudo apt-get update
```

```
martin@McApp:~ $ sudo apt-get dist-upgrade
```

```
martin@McApp:~ $ sudo reboot
```