

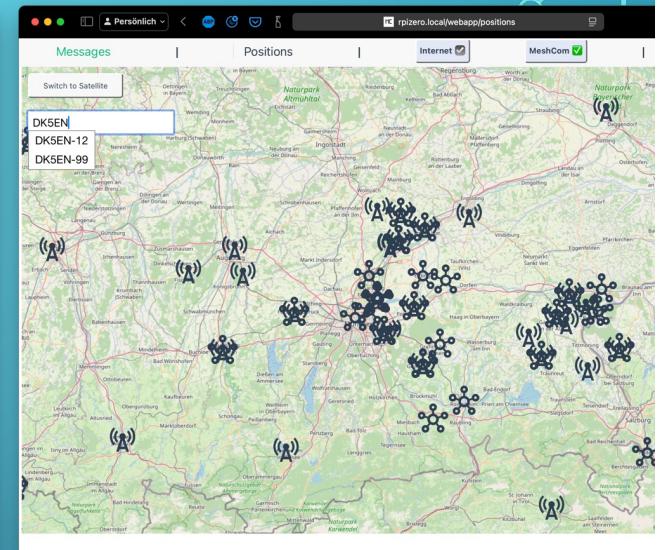


MESHCOM MCAPP INSTALLATION

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', 'MeshCom', and 'Settings'. Each node entry shows its ID, location, last seen, and battery level.

Node	ID	Location	Last Seen	Battery (%)
20 (113)	4B4C3287	Ziel: all	20.04.2025, 09:27:25	6935811
222 (18)	IWIQAF-11	udp		4B4C3287
Il nuovo Nodo iwiqaf-11 è aperto a tutto il traffico mesh.. Vede Piemonte, parte della Lombardia e Liguria.			20.04.2025, 09:27:25	20 (113)
22251 (27)	92F550FC	*	20.04.2025, 09:37:04	E9F1137F
DL9CL-10	A5E58041	Happy Easter from Stuttgart SW-Germany	20.04.2025, 09:42:24	DKSEN-99 (20)
DKSEN-99 (20)	DKSEN-12	node		AE0EB0F9
OE5HWN-12 (24)	EFF80245	buona pasqua IWIQAF-11	20.04.2025, 09:46:00	OESHWN-12 (24)
OE9ROE-92 (2)	DKG-12	node		EAE3D10
DG7RJ-11 (3)	EFF85246	Happy Easter to Skofja Loka, the city related to Freising 😊	20.04.2025, 09:46:31	OERHOE-92 (2)
DG7RJ-11 (3)	DG7RJ-12	node		DL2JA-11 (3)
DL2JA-3 (2)	DL2JA-3 (2)	node		DL9CL-10
DL2JA-3 (2)	mheard do9do-10	udp		DL2JA-3 (2)
DL2JA-3 (2)	A5E58044	999	20.04.2025, 09:49:05	mheard do9do-10
DO1MH-12 (1)	Neueste unten	140		A5E58044
cFSdump	all	all DKSEN-99 WsProxy:rpizero.local:2981 remaining:149		
cFSdump	Schreib etwas ..	Schreib etwas ..		
to the 🍀		to the 🍀		



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
LoRa Port	not used	Country	EU8	TX Power
Latitude	48.123	Longitude	12.073	Altitude
APRS Name	not used	APRS Group	/	APRS Symbol

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

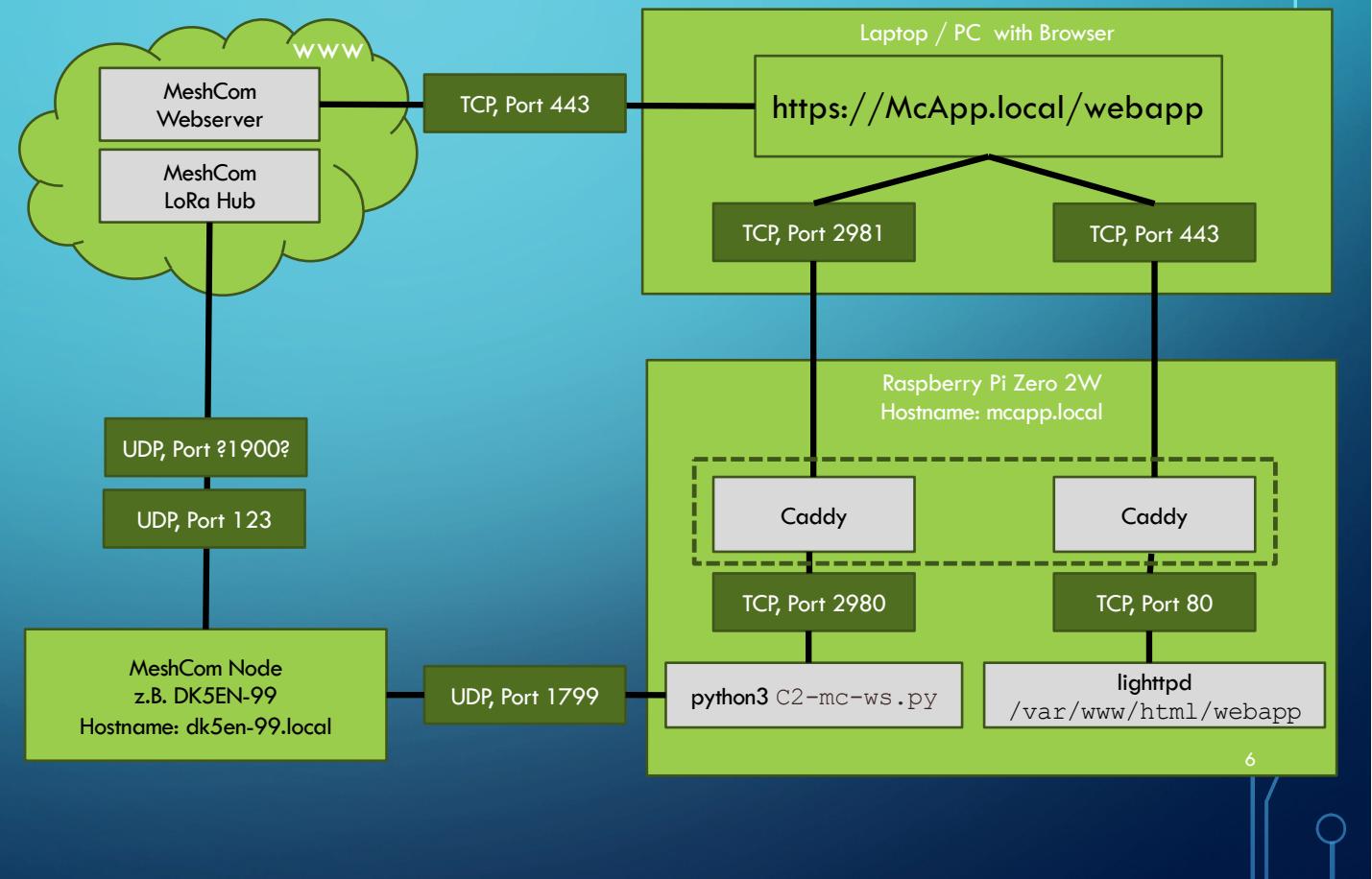
- At a later time, update everything, just use the script

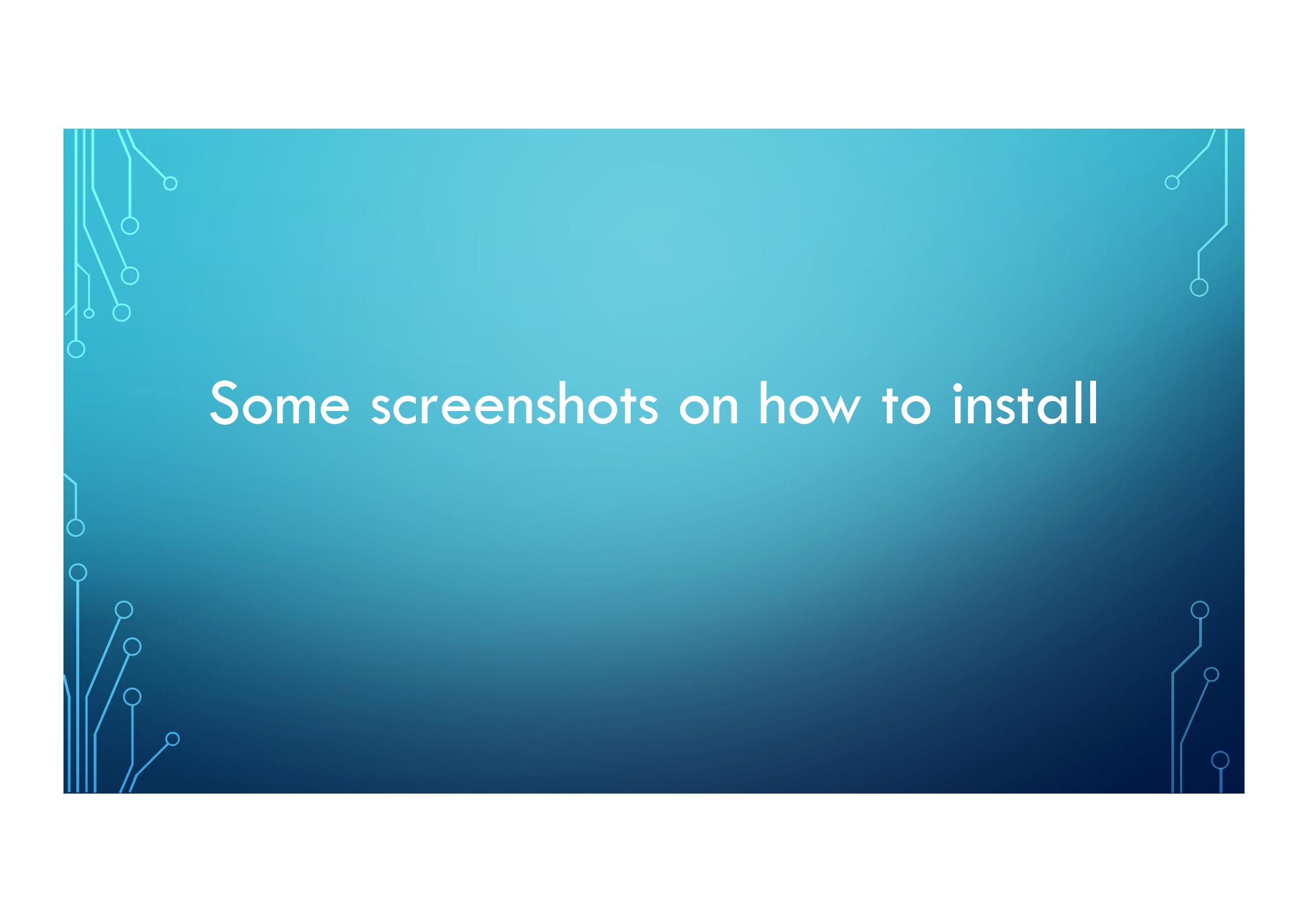
```
martin@McApp:~ $ curl -fsSL https://raw.githubusercontent.com/DK5EN/McAdvChat/main/mc-install.sh | sudo bash

[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





Some screenshots on how to install

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

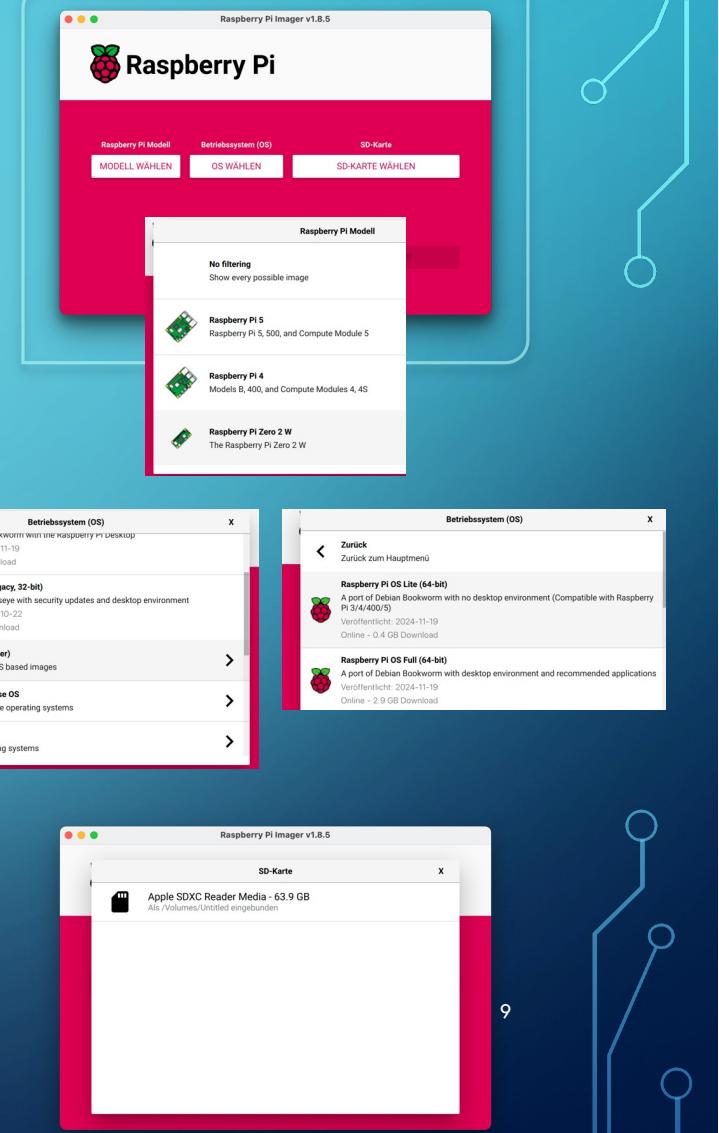


CUSTOM OS INSTALLATION

We want to install a headless, 64Bit Debian Bookwork

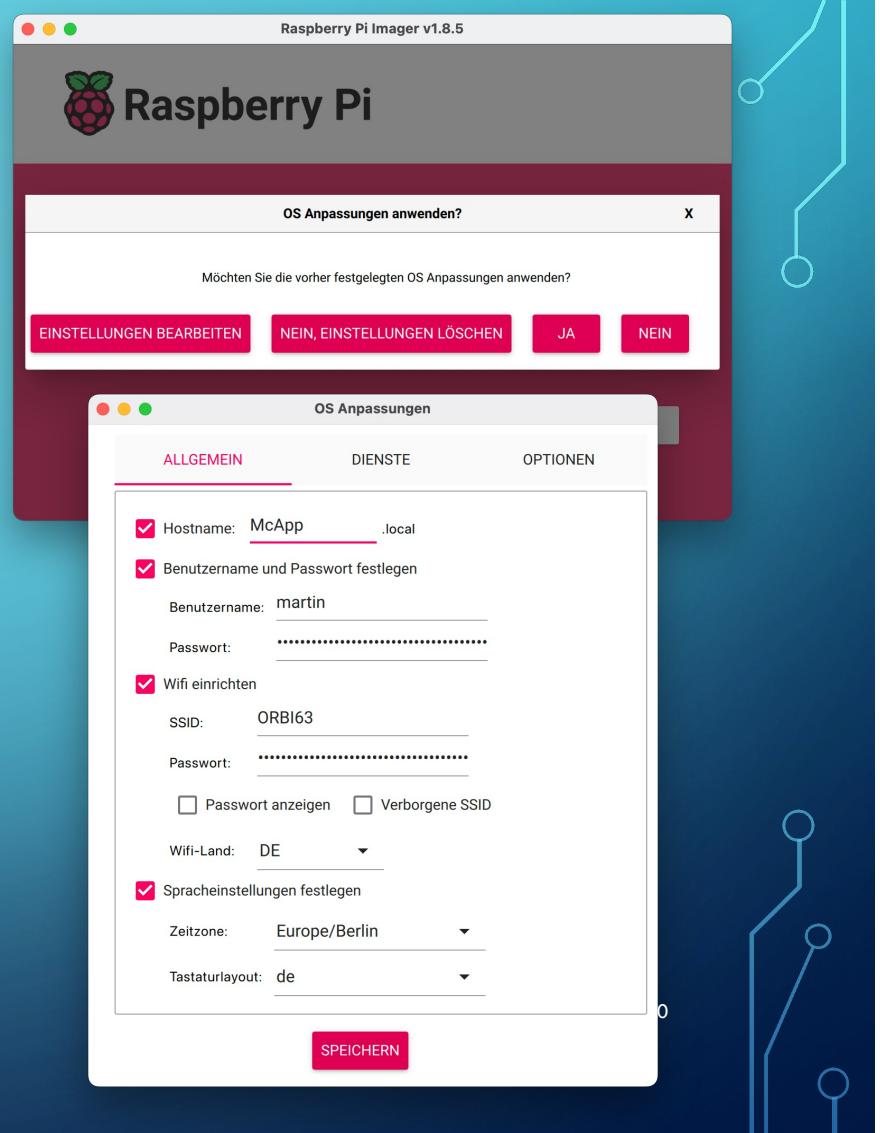
- I do recommend Raspberry PI Imager, which can be found here
<https://www.raspberrypi.org/downloads/>
- Select your Model: Raspberry Pi Zero 2 W
- For OS, select “other“ – „Raspberry Pi OS Lite (64-bit), with no desktop, approx. 0,4GB
- Select your SD Card

.. And click next



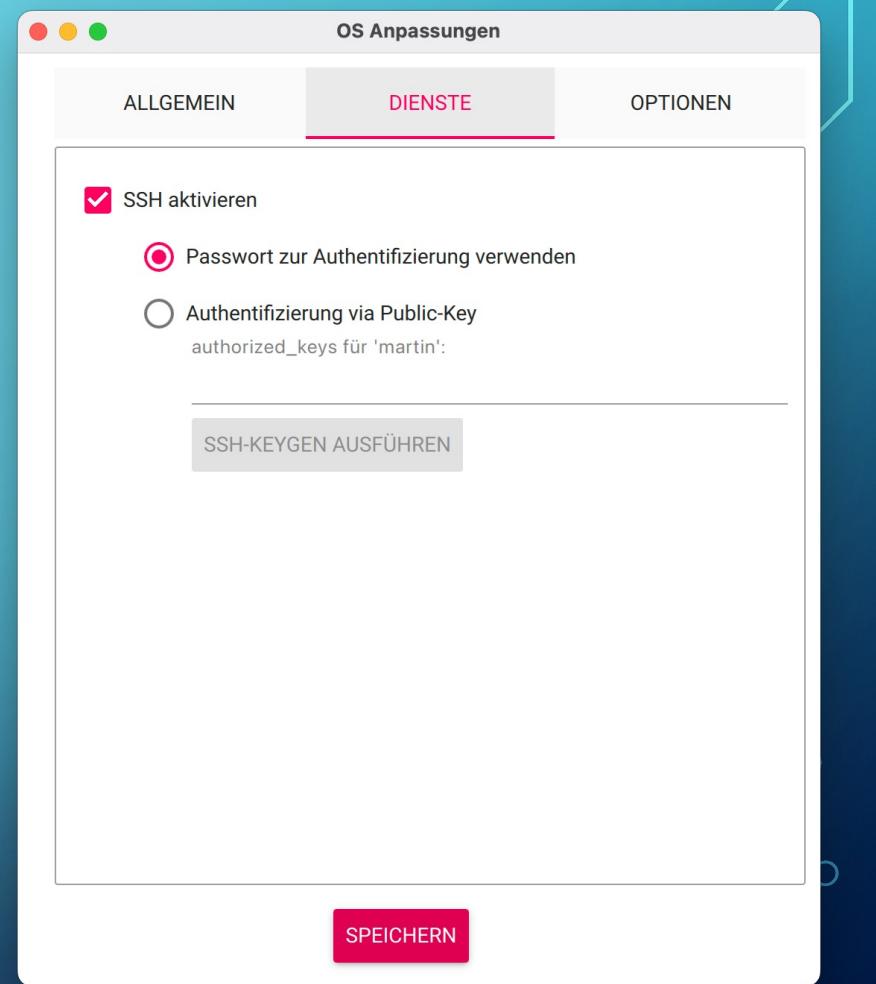
IMPORTANT CUSTOMIZATIONS

- 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



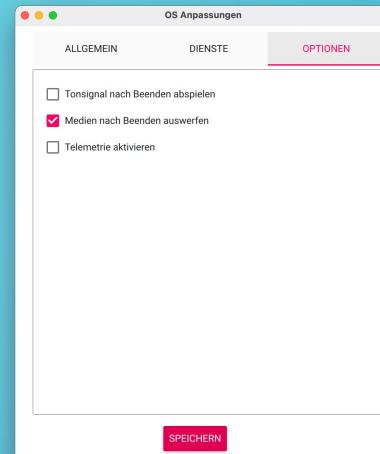
ACTIVATE SSH

- 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

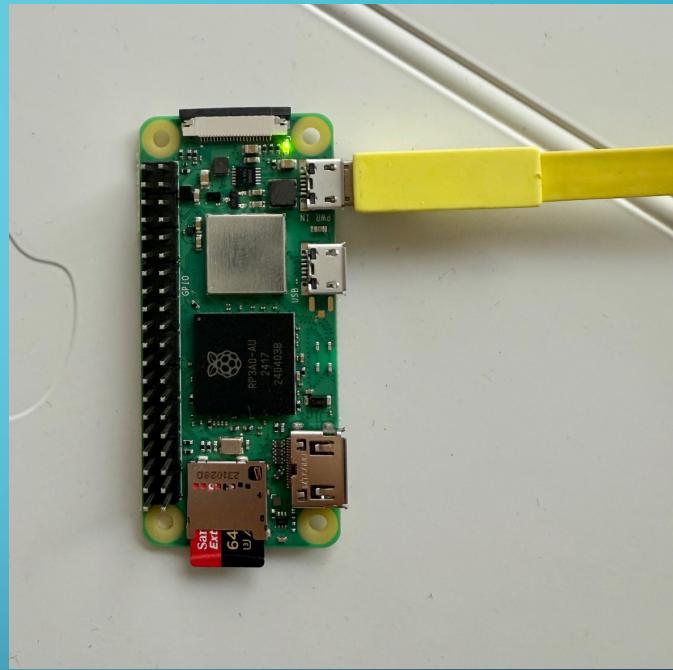


FIRST TIME BOOT UP

- 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

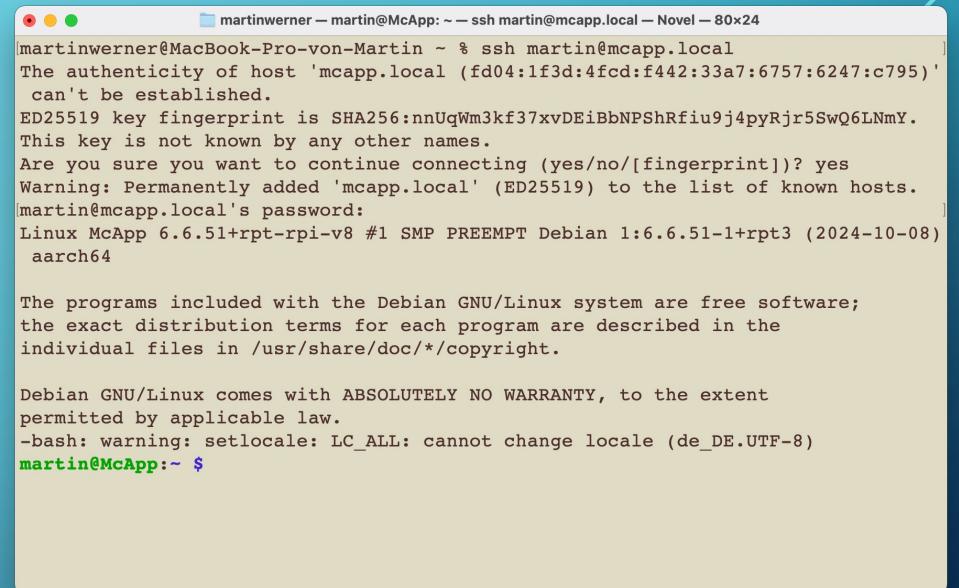


```
martinwerner@MacBook-Pro-von-Martin .ssh % ping mcapp.local
ping: cannot resolve mcapp.local: Unknown host
martinwerner@MacBook-Pro-von-Martin .ssh % ping mcapp.local
PING mcapp.local (192.168.68.70): 56 data bytes
64 bytes from 192.168.68.70: icmp_seq=0 ttl=64 time=121.193 ms
64 bytes from 192.168.68.70: 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

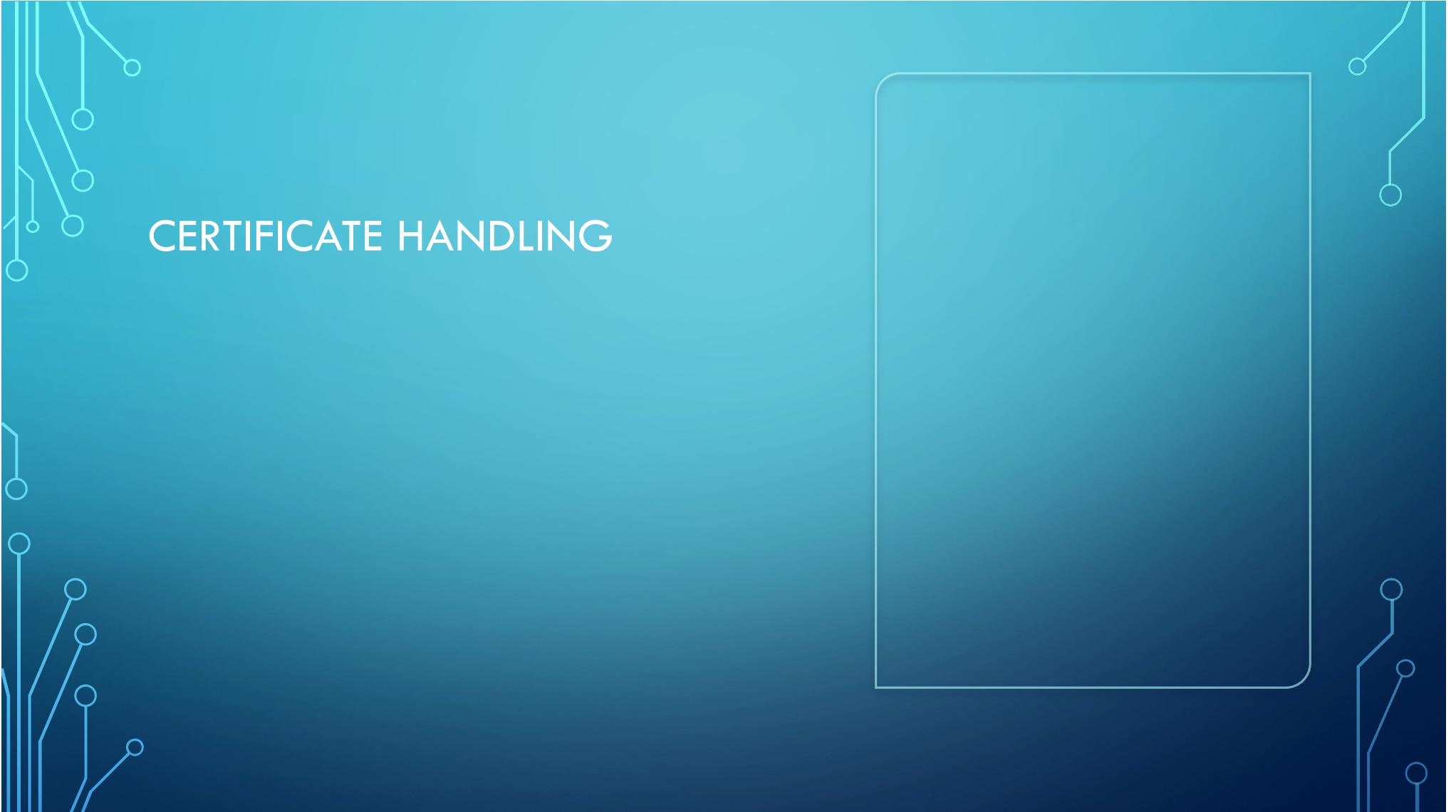
Use putty on Windows or term on MacOS

- 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
-
- Now run the 4 commands shown on Page 4- “New install procedure”



The screenshot shows a terminal window titled "martinwerner — martin@McApp: ~ — ssh martin@mcapp.local — Novel — 80x24". The session is connecting to "martinwerner@MacBook-Pro-von-Martin ~ % ssh martin@mcapp.local". It displays the SSH key fingerprint: "ED25519 key fingerprint is SHA256:nnUqWm3kf37xvDEiBbNPShRfiu9j4pyRjr5SwQ6LNmY.". A warning message asks if the user wants to continue connecting, with the response "yes". It also shows the password prompt "martin@mcapp.local's password:" and the system information "Linux McApp 6.6.51+rpt-rpi-v8 #1 SMP PREEMPT Debian 1:6.6.51-1+rpt3 (2024-10-08) aarch64". The message "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." is displayed. Finally, it shows the Debian warranty notice "Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent permitted by applicable law." and a bash warning about locale settings.

CERTIFICATE HANDLING



CHECK THE WEB SERVER DOWNLOAD SSL CERTIFICATE

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

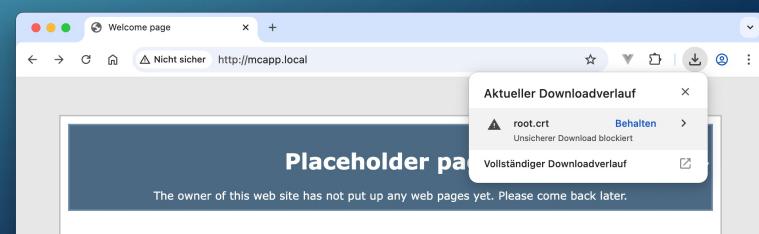
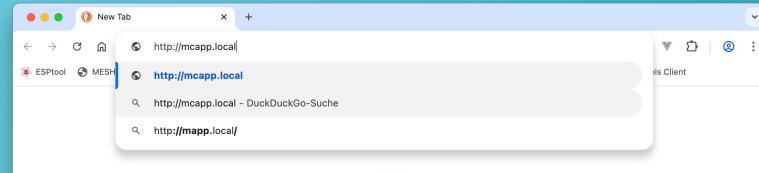
<http://mcapp.local>

- You should see the placeholder page

- Now we download the self-signed root certificate

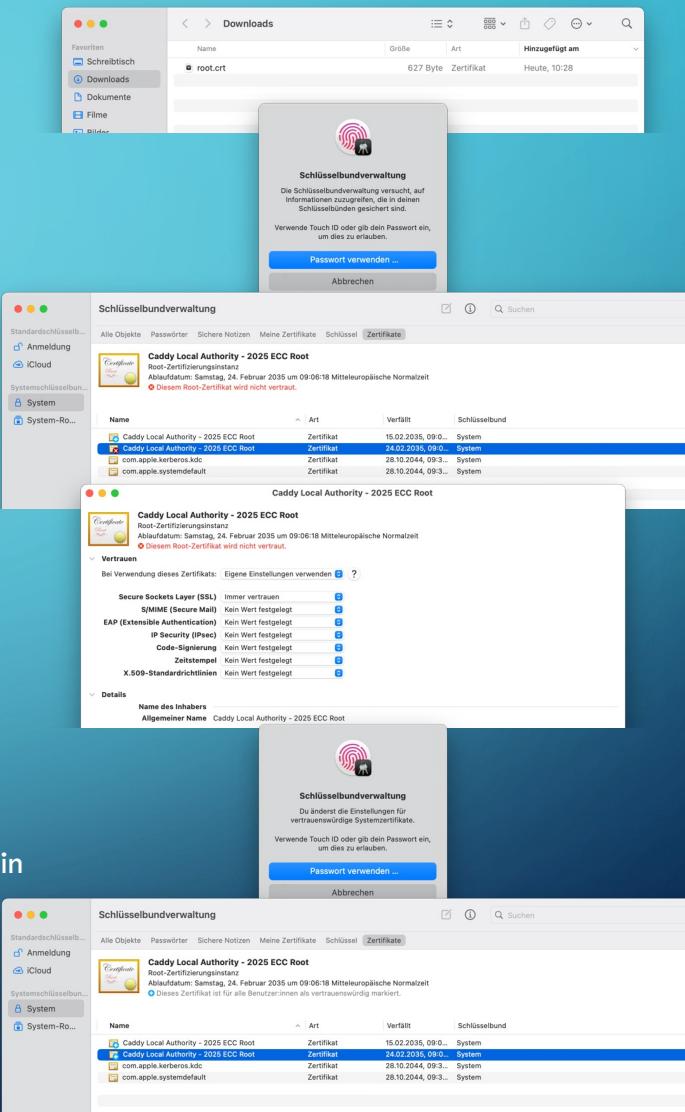
<http://mcapp.local/root.crt>

- 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

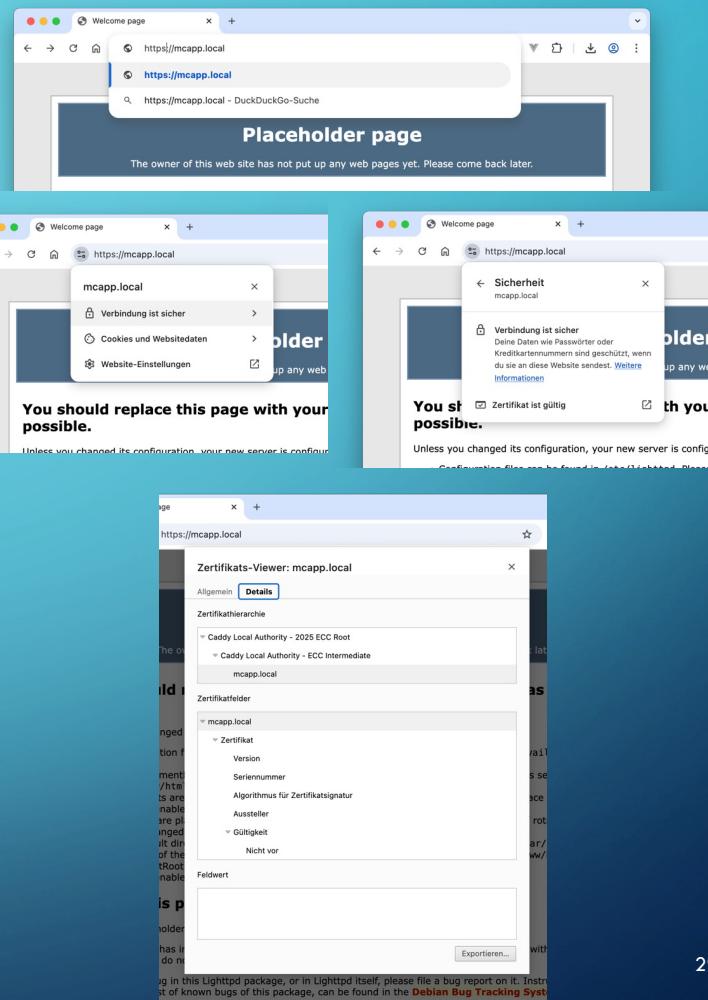


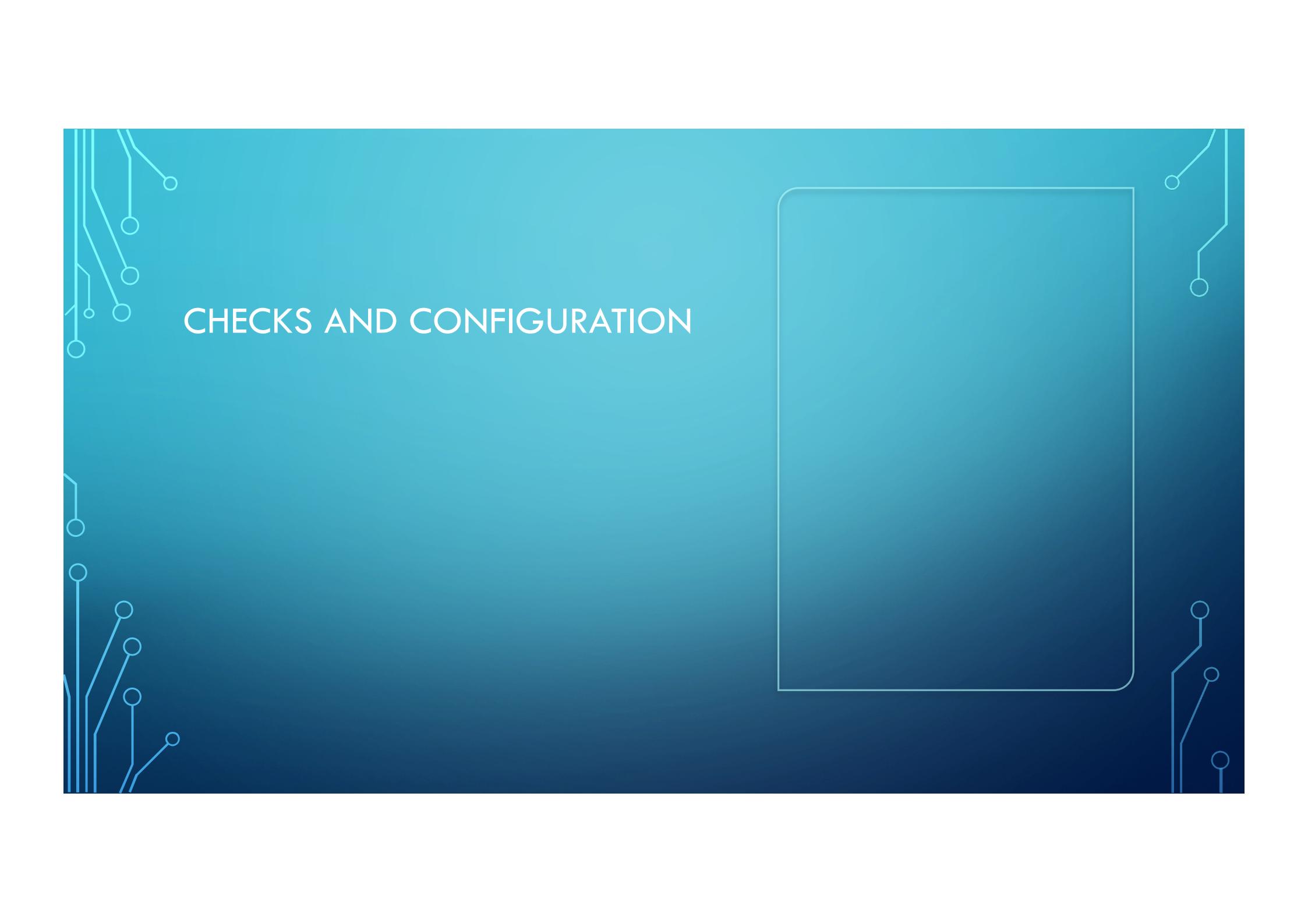
TESTING SSL ACCESS

- 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.





CHECKS AND CONFIGURATION

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 Object.<anonymous> (index-CN2EVPl.1:126:78339)  
at t (index-CN2EVPl.1:126:8832)  
at tt (index-CN2EVPl.1:126:8833)  
at tt (index-CN2EVPl.1:126:108)  
at t (index-CN2EVPl.1:126:108)  
at t (index-CN2EVPl.1:126:108)  
connecting .. null  
SyntaxError: Failed to construct 'WebSocket': The URL ws://mcapp.local:2981/underlinedisdefined is invalid.  
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at tt (index-CN2EVPl.1:126:108)  
at t (index-CN2EVPl.1:126:108)  
at t (index-CN2EVPl.1:126:108)
```

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  
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SyntaxError: Failed to construct 'WebSocket': The URL ws://mcapp.local:2981/underlinedisdefined is invalid.  
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at tt (index-CN2EVPl.1:126:8833)  
at tt (index-CN2EVPl.1:126:108)  
at t (index-CN2EVPl.1:126:108)  
at t (index-CN2EVPl.1:126:108)  
Kommand: message dump  
message dump, need to unpack  
array  
sorting array, nachdem wir alle Nachrichten haben  
Index-CN2EVPl.1:126
```

TIME TO TEST EVERYTHING

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

Messages | Positions | Internet | MeshCom | Bluetooth | Settings

Ziel: all

Node	Message	Details
20 (6)	0.0 mm Wind: 17 Km/h Pressure MSL: 1003.9 hPa	276CE0C1 22291 17.04.2025, 12:01:20
DK9MS-12	Guten Mittag aus Fulda, Osthessen, 9 Grad, bedeckt, es hat geregnet, 73 Markus	www DK9MS-12 DA70E2F8 20 17.04.2025, 12:28:19
OE5HWN-6	Mittagspause in der Kalten Kucht	www BOT GATE 8C590CA4 * 17.04.2025, 12:30:22
D05DHA-12	guten Hunger Helmut	www D05DHA-12 3DCB0FAA * 17.04.2025, 12:30:55
DK8GO-12	hier liegt schnee	www DK8GO-12 75D311E4 * 17.04.2025, 12:32:10
DB0SEP-12	DBOSEP BBS online https://qrz.com/db/db0sep	www DB0SEP-12 A2659230 * 17.04.2025, 13:00:01
Neueste unten: 20		

cFDump

cMsgRead

Eine kleine Testnachricht

connecting .. null

construct 'WebSocket': The URL 'ws://undefined' is invalid.

at Object.r [as connect] (index-C3N2EVPl.js:26:78359) at index-C3N2EVPl.js:12:26:78359) at index-C3N2EVPl.js:12:26:88491

connecting .. null

construct 'WebSocket': The URL 'ws://undefined' is invalid.

at Object.r [as connect] (index-C3N2EVPl.js:26:8832) at index-C3N2EVPl.js:12:26:8832) at index-C3N2EVPl.js:12:14:38) at index-C3N2EVPl.js:12:14:38) at HTMLButtonElement.t (index-C3N2EVPl.js:12:18:4882)

connecting .. null

construct 'WebSocket': The URL 'ws://undefined' is invalid.

at Object.r [as connect] (index-C3N2EVPl.js:26:8832) at index-C3N2EVPl.js:12:26:8832) at index-C3N2EVPl.js:12:14:38) at index-C3N2EVPl.js:12:14:38) at HTMLButtonElement.t (index-C3N2EVPl.js:12:18:4882)

connecting .. null

construct 'WebSocket': The URL 'ws://undefined' is invalid.

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connecting .. null

Kommand: message dump

message dump, need to unpack

array

sorting array, nachdem wir alle Nachrichten vom Node bekommen haben

WE Connect ausgelöst

sorting array, nachdem wir alle Nachrichten aus dem internet bekommen haben

meshcom.oevsv.at/#									
34	12:22:45	A2659224	DB0SEP-12	DB0SEP-12	DK9MS-12	4	0	0	Ping received, BBS online
35	2025-04-17	DA70E2F6	DK9MS-12	DK9MS-12	DB0SEP-12	4	0	0	db0sep h
36	2025-04-17	A2659226	DB0SEP-12	DB0SEP-12	DK9MS-12	4	0	0	Commands-> dbosep br,bs,mh,r,l,e,s,u,h,p,t https://www.qrz.com/db/db0sep - done..
37	2025-04-17	DA70E2F9	DK9MS-12	DK9MS-12	DB0SEP-12	4	0	0	db0sep p
38	2025-04-17	A2659228	DB0SEP-12	DB0SEP-12	DK9MS-12	4	0	0	Ping received, BBS online
39	2025-04-17	DA70E2FE	DK9MS-12	DK9MS-12	DB0SEP-12	4	0	0	db0sep r 1
40	2025-04-17	A265922D	DB0SEP-12	DB0SEP-12	DK9MS-12	4	0	0	mal sehen ob das bei dir auch ankommt. 73 de Helmut - done..
41	2025-04-17	DA70E300	DK9MS-12	DK9MS-12	DB0SEP-12	4	0	0	db0sep e 1
42	2025-04-17	A265922F	DB0SEP-12	DB0SEP-12	DK9MS-12	4	0	0	Delete ok - done..
43	2025-04-17	DA70E301	DK9MS-12	DK9MS-12	DB0SEP-12	4	0	0	DB0SEP BBS - done..
44	13:00:01	EA0EB280	DK5EN-99	DK5EN-99	TEST	4	0	0	Eine kleine Testnachricht, ob was raus geht

Starttime:2025-04-15 20:50:37

ID:338658

MAC:ff9f9fb

UPDATE LOCALES AND KEEP 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
```