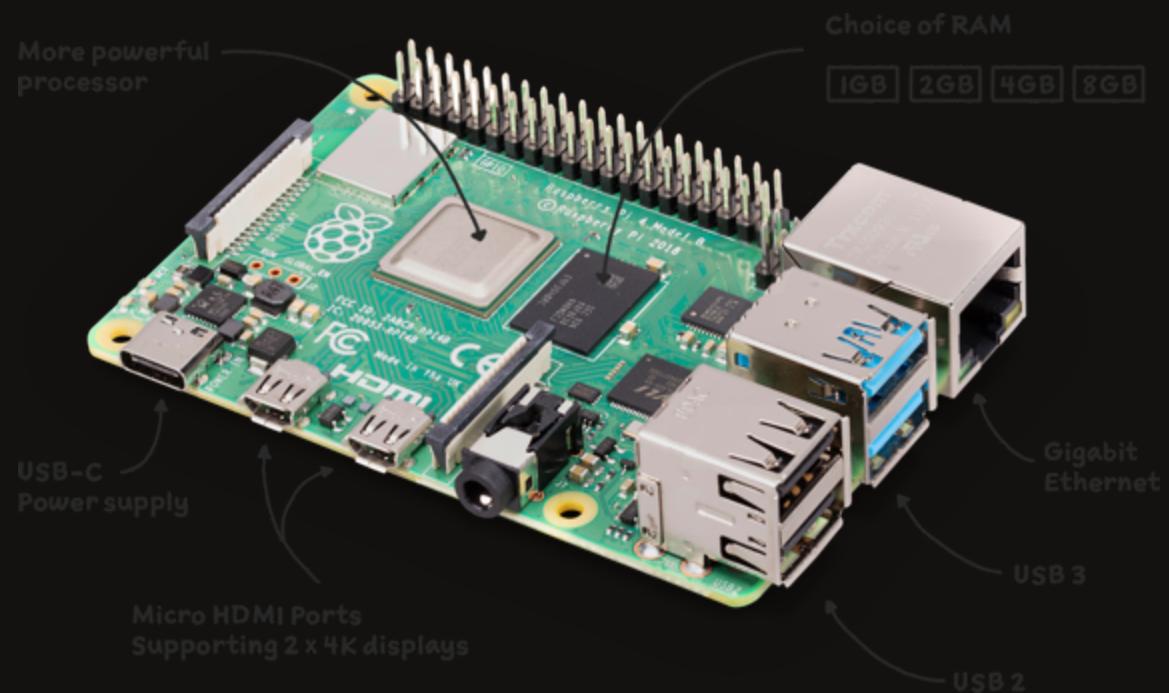


# RASPBERRY PI COMPUTE MODULE INSTALLATION KOMPLETT AUTOMATISIEREN

---

# RASPBERRY PI

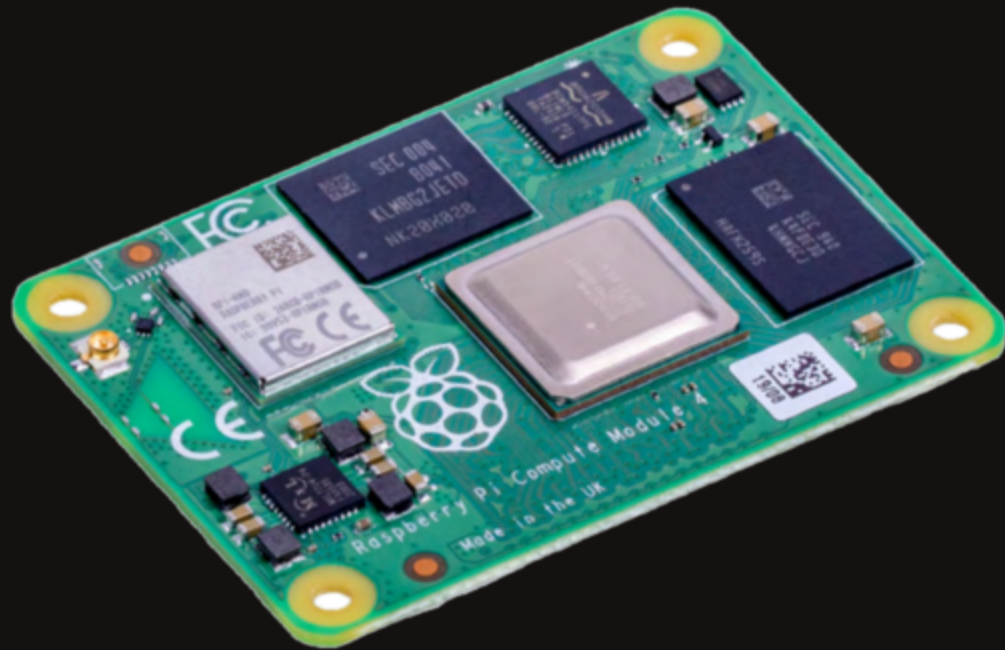
---



<https://www.raspberrypi.com/products/raspberry-pi-4-model-b/>

# RASPBERRY PI CM4

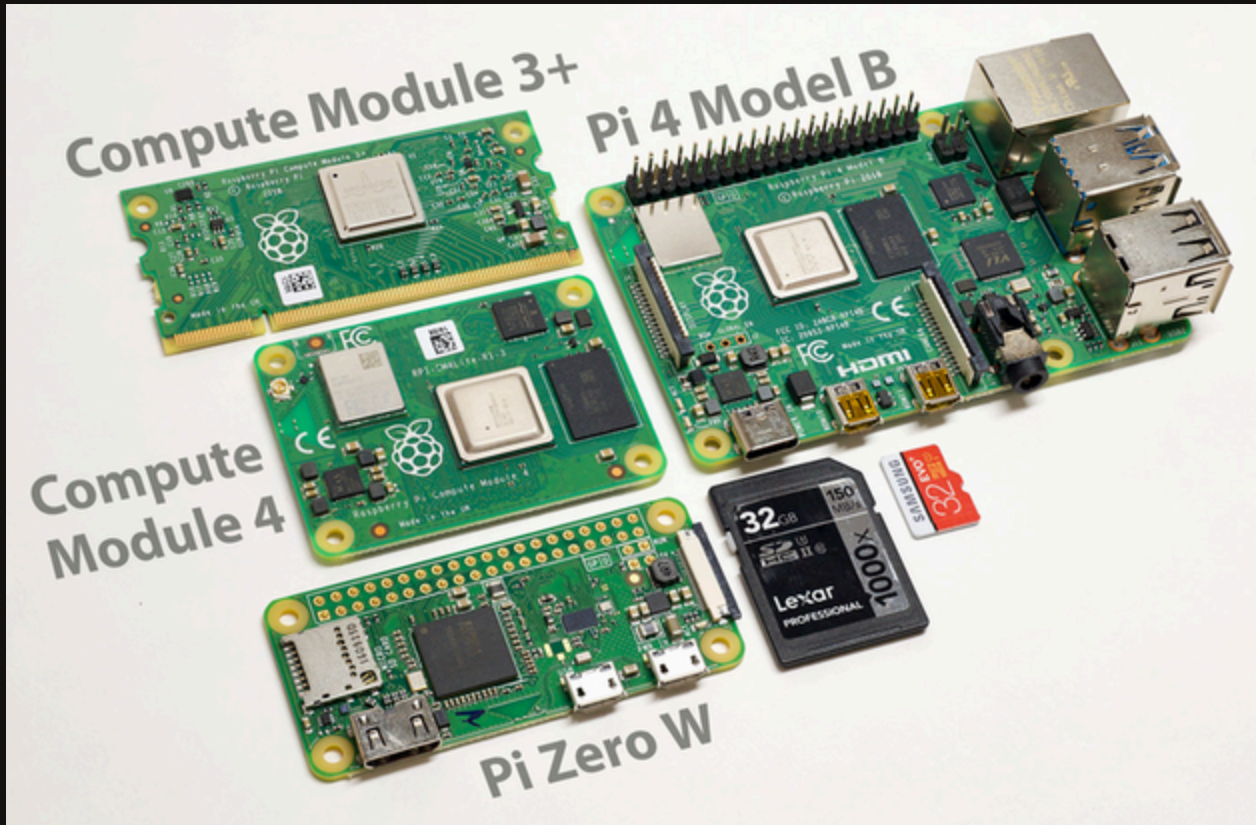
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<https://www.raspberrypi.com/products/compute-module-4/?variant=raspberry-pi-cm4001000>

# UNTERSCHIEDE (OPTISCH)

---



<https://www.jeffgeerling.com/blog/2020/raspberry-pi-compute-module-4-review>

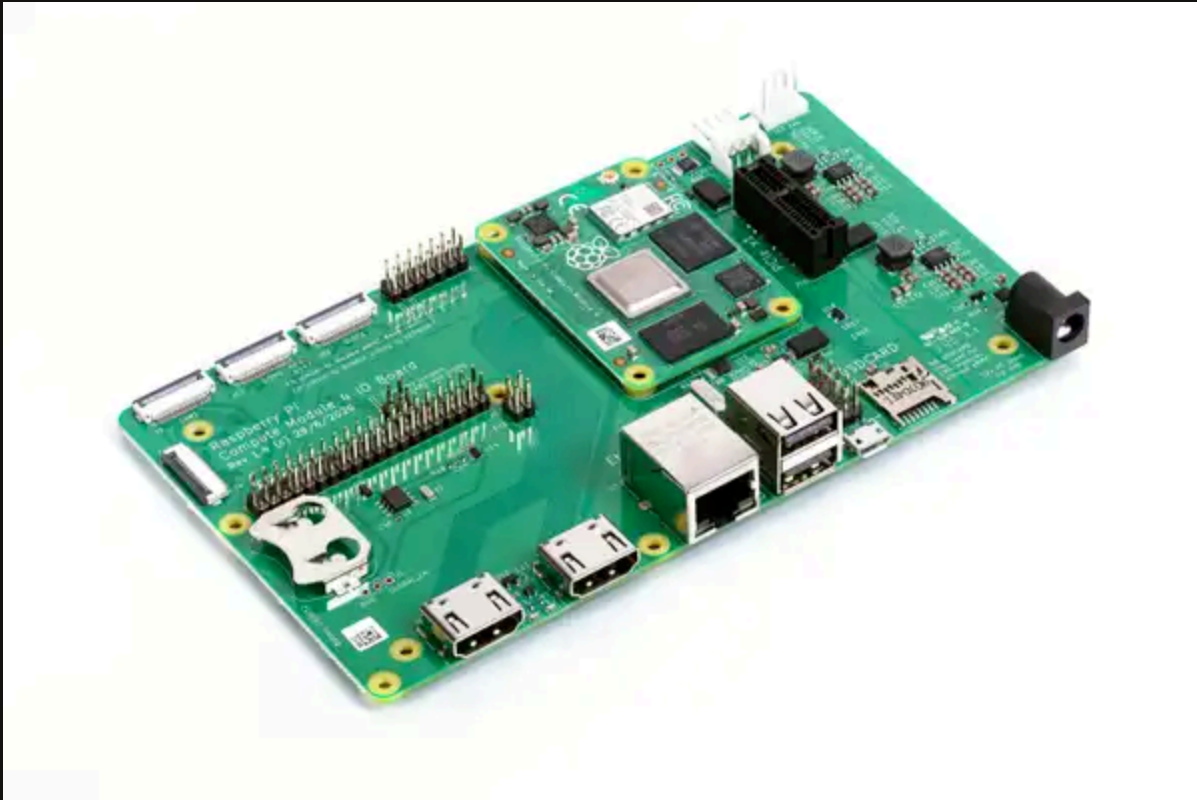
# UNTERSCHIEDE

---

- Preis
  - CM4 ist teuer
  - Zusätzlich noch ein Carrier Board notwendig
- WiFi/Bluetooth ist optional
  - Zusätzliche Antenne nötig
- Bis zu 32GB eMMC Storage
- Kein USB 3.0
- PCI Express (Gen2 x1)

# CARRIER BOARDS

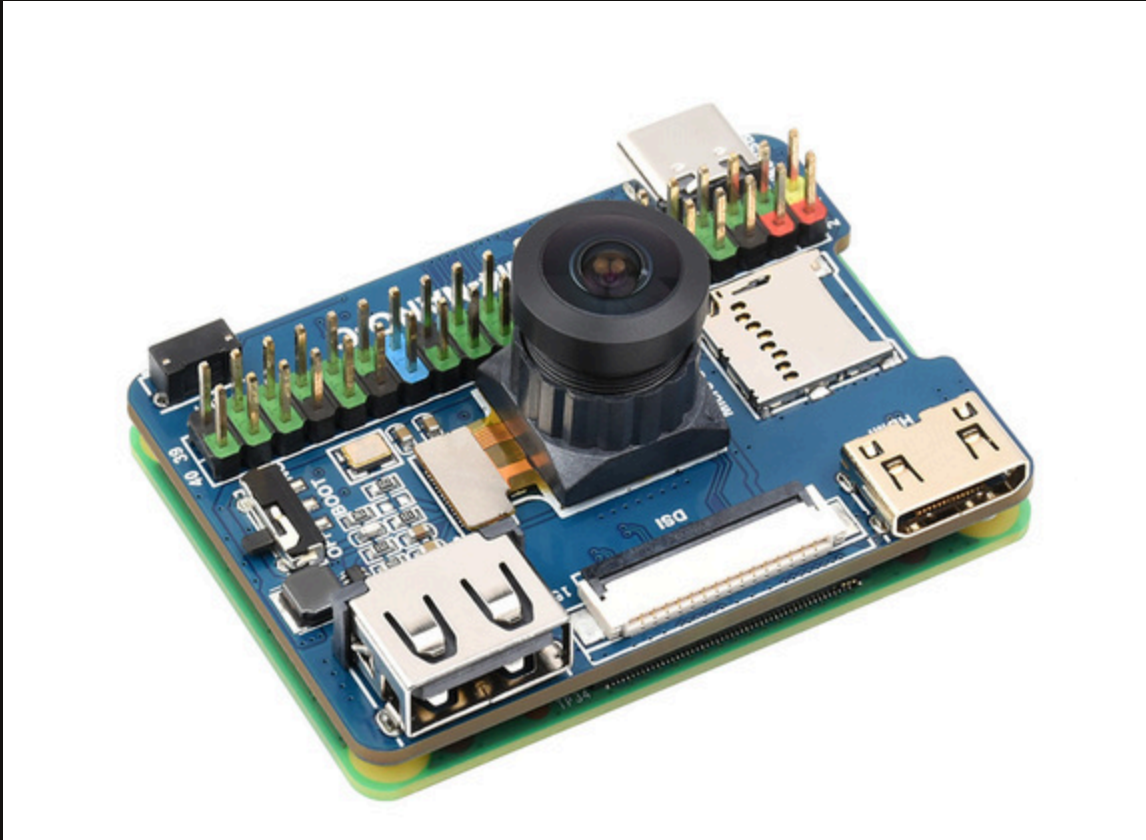
---



<https://www.raspberrypi.com/products/compute-module-4-io-board/>

# CARRIER BOARDS

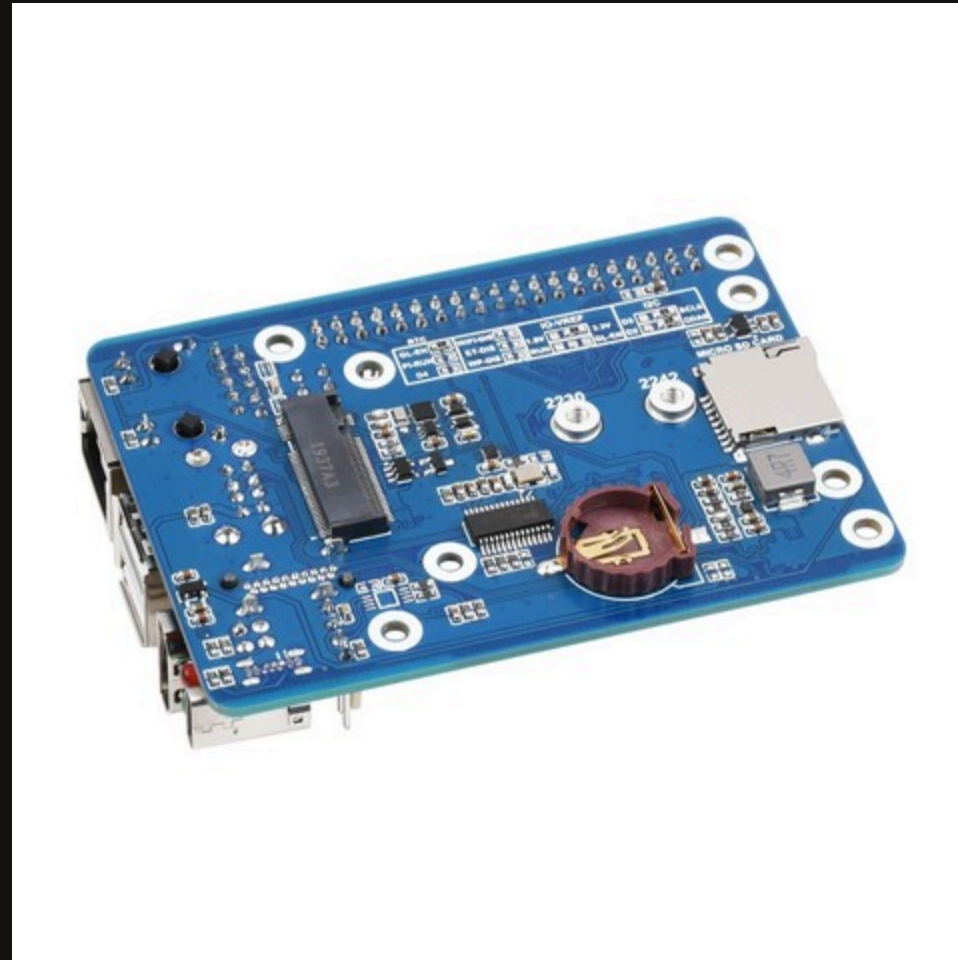
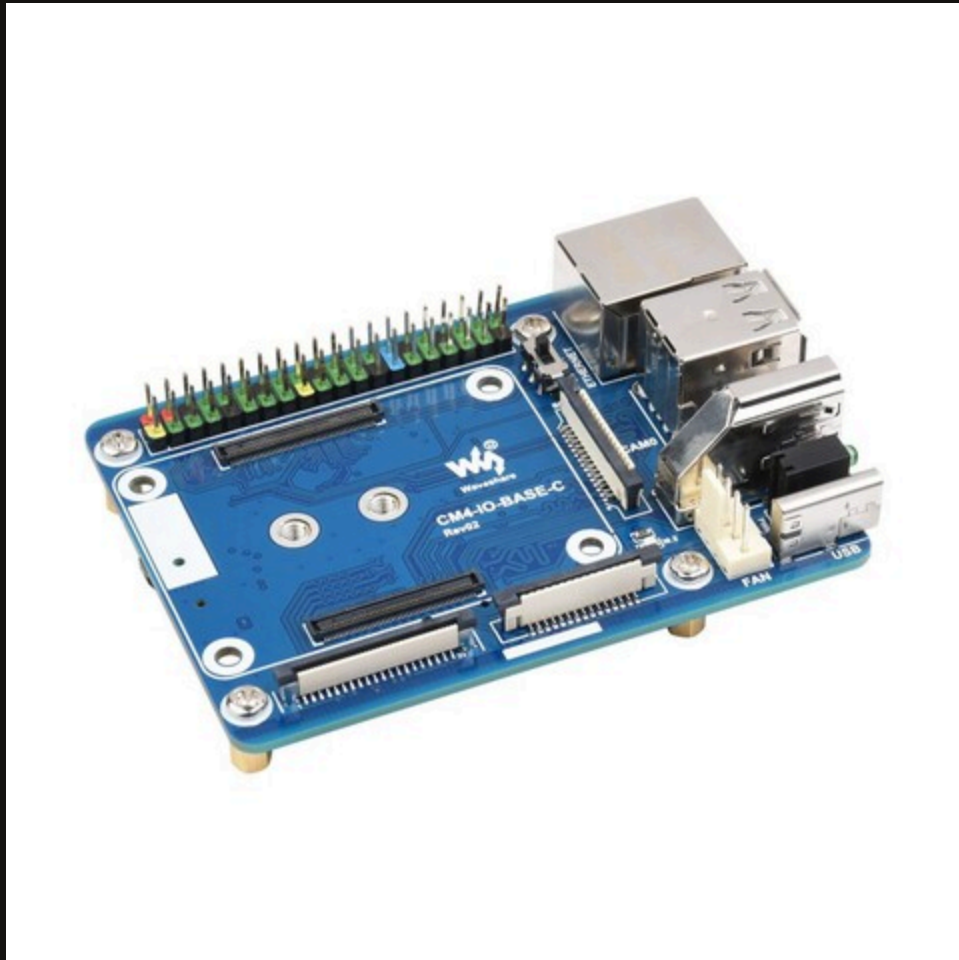
---



<https://www.waveshare.com/product/raspberry-pi/boards-kits/compute-module-4-cat/cm4-nano-c.htm>

# CARRIER BOARDS

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<https://www.waveshare.com/product/raspberry-pi/boards-kits/compute-module-4-cat/cm4-io-base-c.htm>



# CARRIER BOARDS

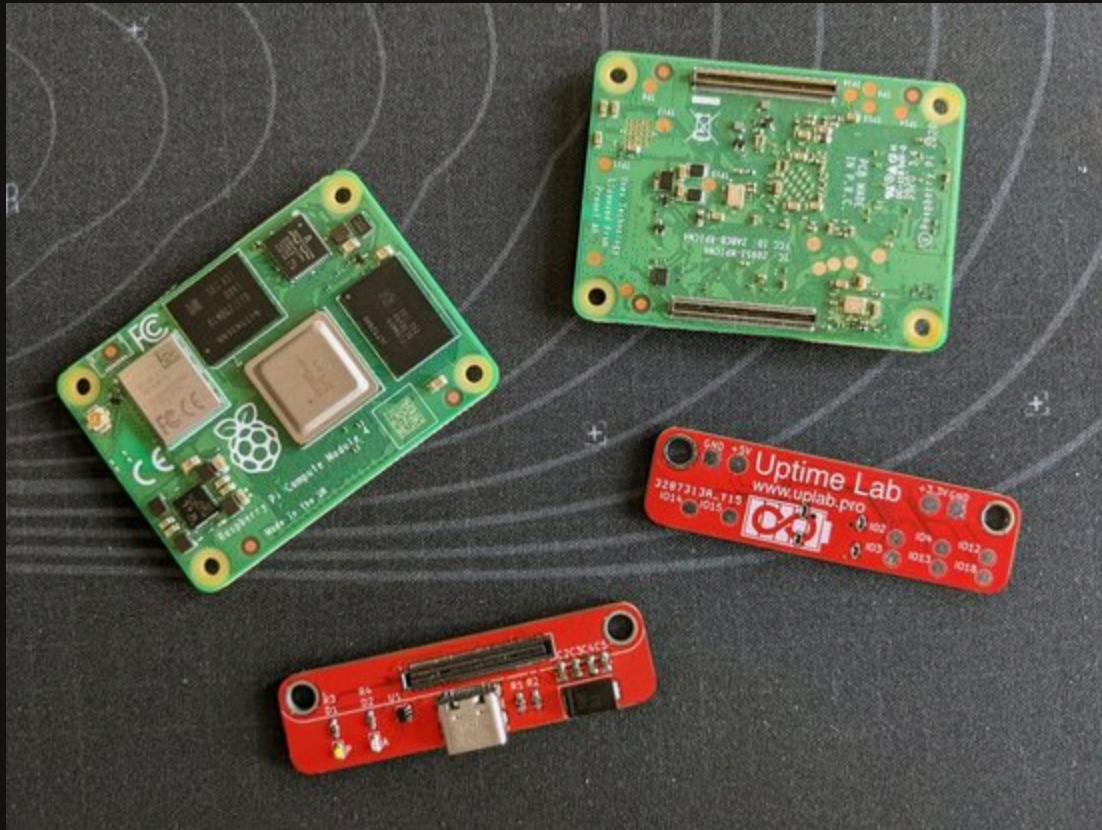
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<https://www.waveshare.com/product/raspberry-pi/boards-kits/compute-module-4-cat/cm4-duino.htm>

# CARRIER BOARDS

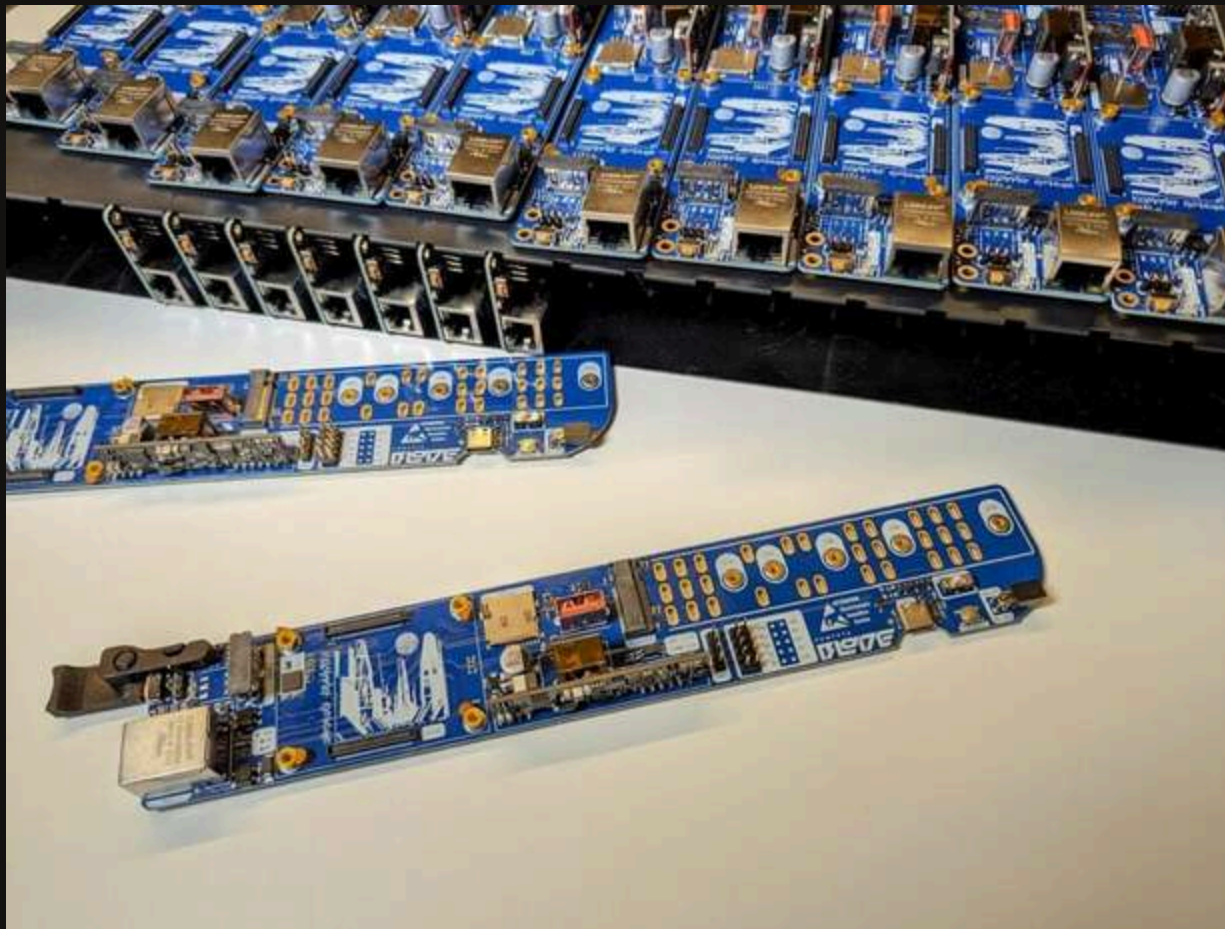
---



<https://uplab.pro/2021/10/mincab/>

# CARRIER BOARDS

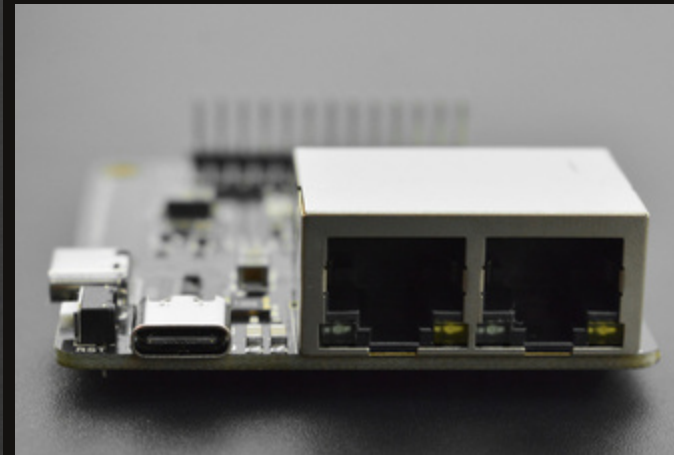
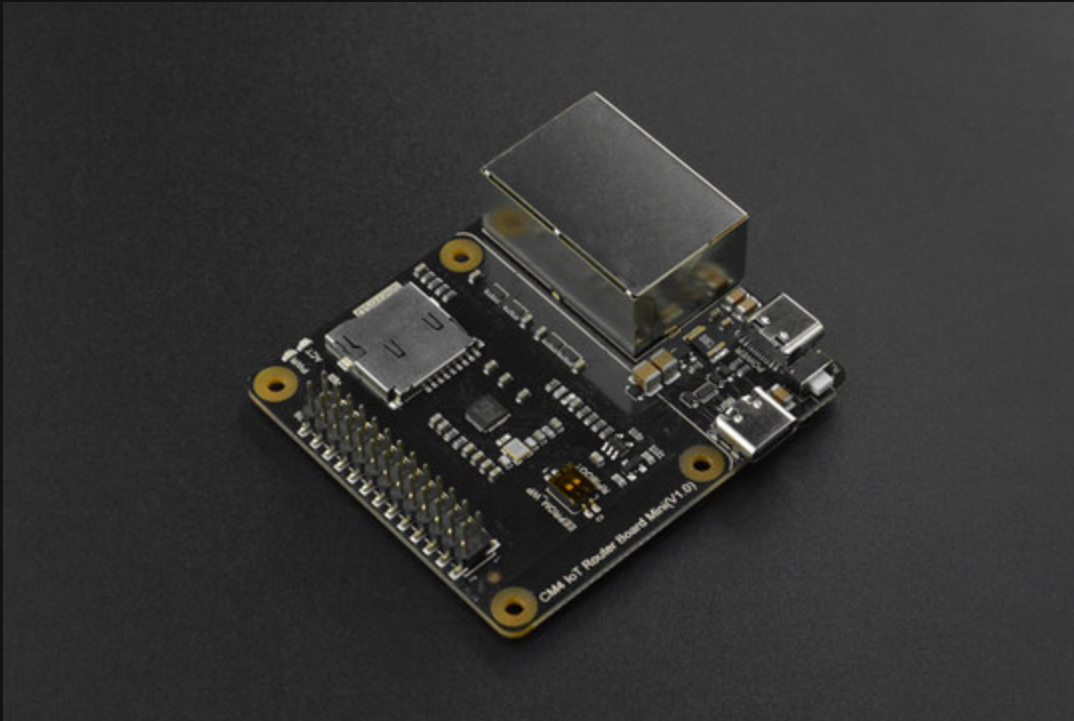
---



<https://uplab.pro/2022/03/compute-blade-changelog/>

# CARRIER BOARDS

---



<https://www.dfrobot.com/product-2242.html>

# CARRIER BOARDS

---



[https://52pi.com/collections/raspberry\\_pi-cm4/products/deskpi-super6c-raspberry\\_pi-cm4-cluster-mini-itx-board-kit-6-rpi-cm4-supported](https://52pi.com/collections/raspberry_pi-cm4/products/deskpi-super6c-raspberry_pi-cm4-cluster-mini-itx-board-kit-6-rpi-cm4-supported)

# CARRIER BOARDS

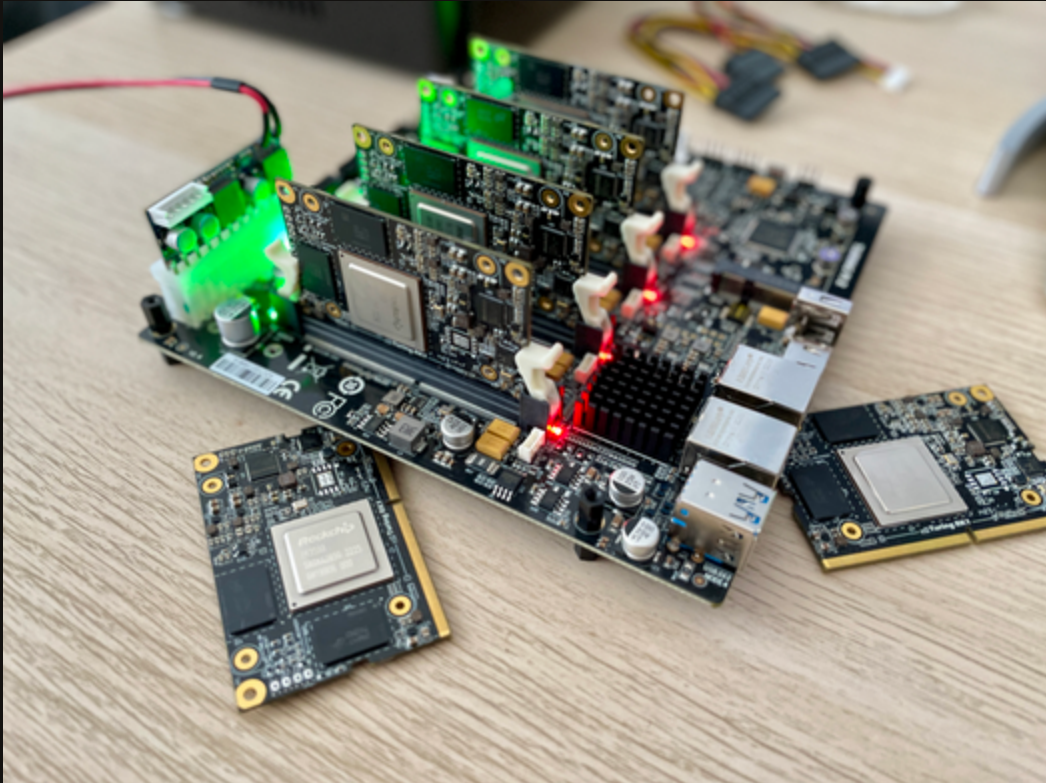
---



<https://www.seeedstudio.com/ReTerminal-with-CM4-p-4904.html>

# CARRIER BOARDS

---



<https://docs.turingpi.com/docs/turing-pi2-intro>

# CARRIER BOARDS

---



<https://docs.pikvm.org/v4/>



# FLASHEN EINES CM4

---

## 1. SD-Karte

- rpi-imager
- balena-etcher
- [...]

# FLASHEN EINES CM4

---

## 2. eMMC

- Per USB
  - Dedizierter USB-Port
  - Jumper
  - Schalter
  - Knopf
- Mit usbboot das eMMC als Mass-Storage erreichbar machen
  - rpi-imager
  - bala-etcher
  - [...]

# FLASHEN EINES CM4

---

## 3. NVMe

- Per Proxy
  - SD-Karte
  - eMMC

# MAN KANN CM4S WIEDER KAUFEN

rpilocator (powered by [DPHacks.com](#))

Vendors ▾

Regions ▾

Devices ▾

About/  
FAQ

Twitter Alerts

Feed Alerts

Buy Me a Coffee

Filter...

Follow us on [Twitter](#) or [Mastodon](#) or [Buy me a Coffee](#).

Check out our [recommended products](#)

Auto-refresh listings  Alert Sound

Country: DE

Devices: CM4

SKU	Description	Link	Update Status	Vendor	In Stock	Last Stock	Price
CM4001000	RPi CM4 - 1GB RAM, No MMC, No Wifi			Welectron (DE)	Yes	20-Apr-24	(EUR) <a href="#">31.90</a>
CM4001000	RPi CM4 - 1GB RAM, No MMC, No Wifi			pi3g (DE)	No	28-Mar-23	(EUR) <a href="#">33.99</a>
CM4001008	RPi CM4 - 1GB RAM, 8GB MMC, No Wifi			Welectron (DE)	Yes	20-Apr-24	(EUR) <a href="#">35.90</a>
CM4001008	RPi CM4 - 1GB RAM, 8GB MMC, No Wifi			BerryBase (DE)	Yes	20-Apr-24	(EUR) <a href="#">36.20</a>
CM4002000	RPi CM4 - 2GB RAM, No MMC, No Wifi			Welectron (DE)	Yes	20-Apr-24	(EUR) <a href="#">37.90</a>
CM4001008	RPi CM4 - 1GB RAM, 8GB MMC, No Wifi			Reichelt (DE)	Yes	20-Apr-24	(EUR) <a href="#">37.99</a>
CM4001000	RPi CM4 - 1GB RAM, No MMC, No Wifi			BerryBase (DE)	No	22-Feb-24	(EUR) <a href="#">38.06</a>
CM4001008	RPi CM4 - 1GB RAM, 8GB MMC, No Wifi			pi3g (DE)	Yes	20-Apr-24	(EUR) <a href="#">39.59</a>

# THEORETISCHE ANWENDUNGSZWECKE

---

- CI-Pipelines (arm)
- IoT
- Industrie 4.2
- Monitoring
- [...]

# SKALIEREN

---

- 20 CM4s

# FLASHEN VON 20 CM4S

---

- USB-Hub? 🏠
- Tasten drücken?
- Jumper setzen?
- Schalter umlegen
- Installation prüfen?

# NETBOOT!

---

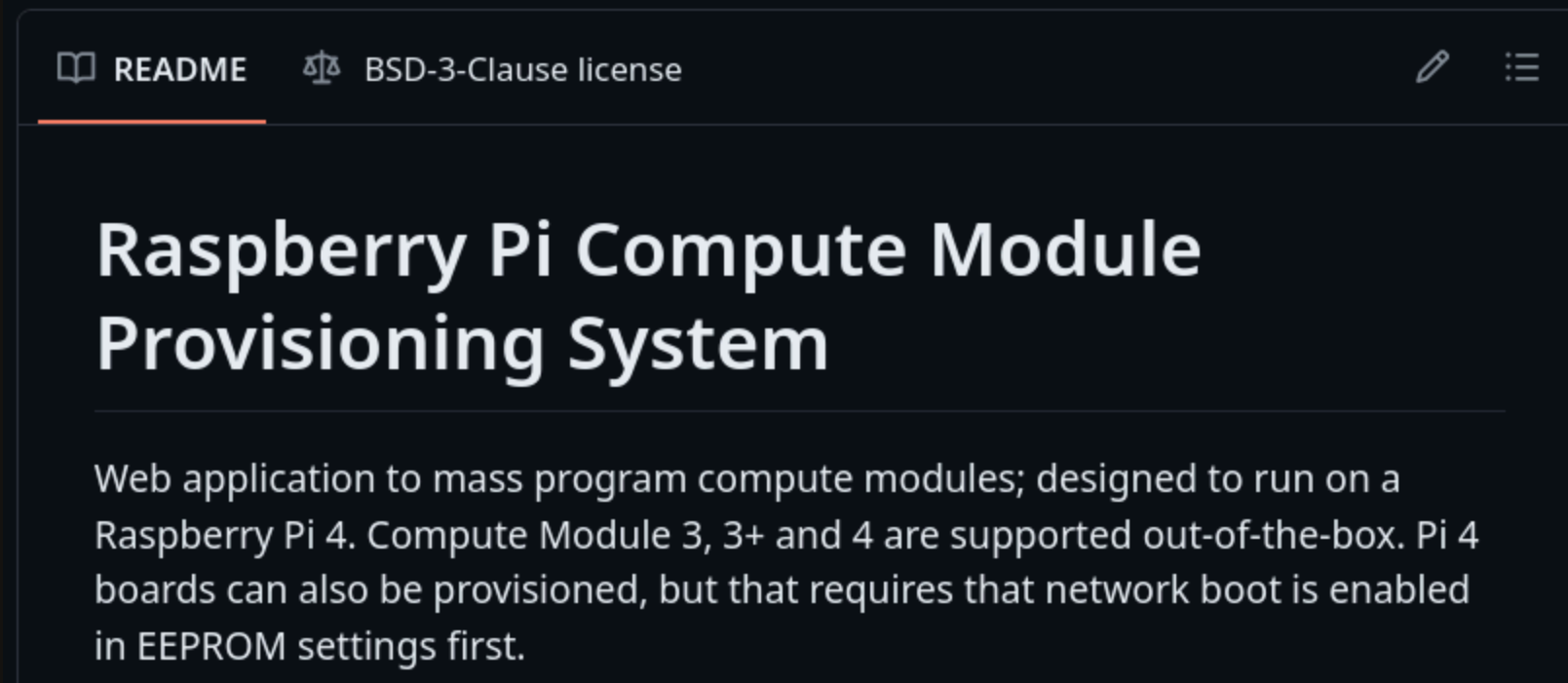
```
BOOT_ORDER=0xf25641
```

- 0x1 => SD Card
- 0x4 => USB-MSD
- 0x6 => NVMe
- 0x5 => BCM-USB-MSD
- 0x2 => NETWORK



# RASPBERRY PI COMPUTE MODULE PROVISIONING SYSTEM

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The screenshot shows a GitHub repository page for the 'Raspberry Pi Compute Module Provisioning System'. The page header includes a 'README' link and the license 'BSD-3-Clause license'. The main heading is 'Raspberry Pi Compute Module Provisioning System'. Below the heading, there is a paragraph of text describing the system as a web application for mass provisioning compute modules on a Raspberry Pi 4.

README BSD-3-Clause license

## Raspberry Pi Compute Module Provisioning System

Web application to mass program compute modules; designed to run on a Raspberry Pi 4. Compute Module 3, 3+ and 4 are supported out-of-the-box. Pi 4 boards can also be provisioned, but that requires that network boot is enabled in EEPROM settings first.

<https://github.com/raspberrypi/cmprovision>

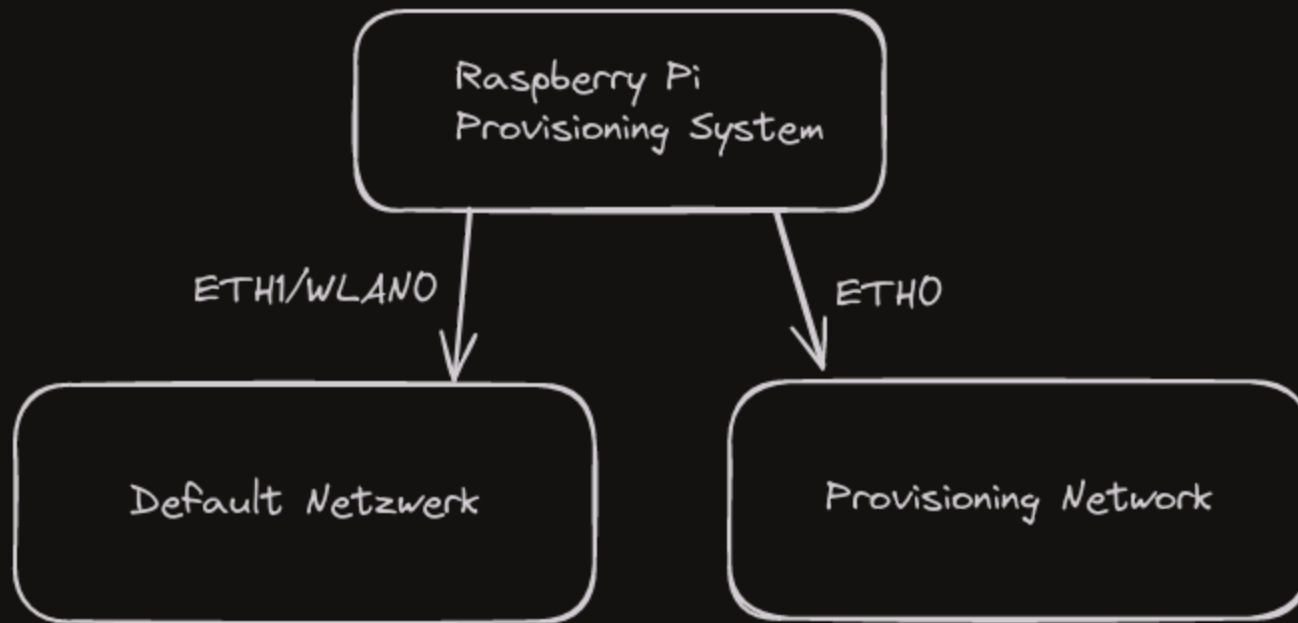
# RASPBERRY PI COMPUTE MODULE PROVISIONING SYSTEM

---

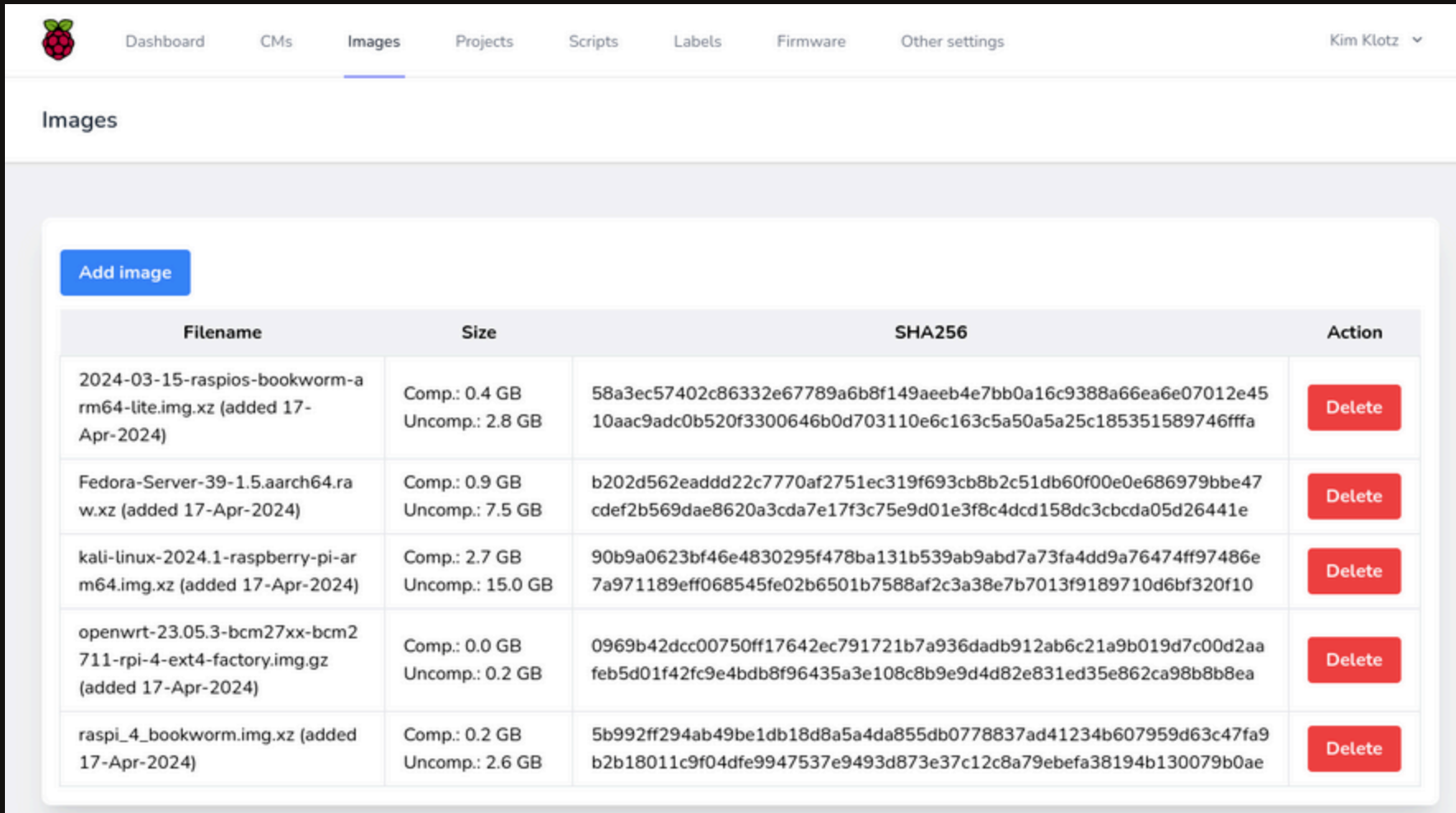
- DHCP
- TFTP
- Scriptexecutor
- PHP/Blade/Shell

# RASPBERRY PI COMPUTE MODULE PROVISIONING SYSTEM

---



# FEATURES: IMAGES



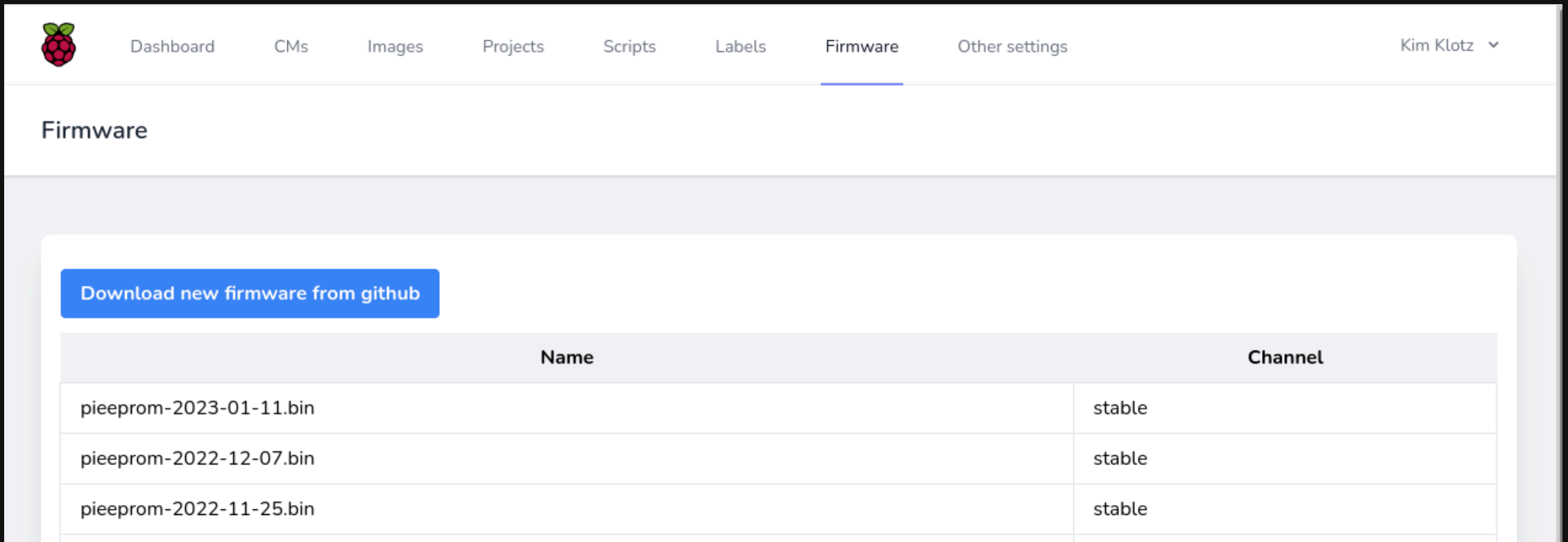
Dashboard CMs **Images** Projects Scripts Labels Firmware Other settings Kim Klotz

## Images

Add image

Filename	Size	SHA256	Action
2024-03-15-raspios-bookworm-arm64-lite.img.xz (added 17-Apr-2024)	Comp.: 0.4 GB Uncomp.: 2.8 GB	58a3ec57402c86332e67789a6b8f149aeeb4e7bb0a16c9388a66ea6e07012e4510aac9adc0b520f3300646b0d703110e6c163c5a50a5a25c185351589746fffa	Delete
Fedora-Server-39-1.5.aarch64.raw.xz (added 17-Apr-2024)	Comp.: 0.9 GB Uncomp.: 7.5 GB	b202d562eadd22c7770af2751ec319f693cb8b2c51db60f00e0e686979bbe47cdef2b569dae8620a3cda7e17f3c75e9d01e3f8c4dcd158dc3cbcda05d26441e	Delete
kali-linux-2024.1-raspberry-pi-arm64.img.xz (added 17-Apr-2024)	Comp.: 2.7 GB Uncomp.: 15.0 GB	90b9a0623bf46e4830295f478ba131b539ab9abd7a73fa4dd9a76474ff97486e7a971189eff068545fe02b6501b7588af2c3a38e7b7013f9189710d6bf320f10	Delete
openwrt-23.05.3-bcm27xx-bcm2711-rpi-4-ext4-factory.img.gz (added 17-Apr-2024)	Comp.: 0.0 GB Uncomp.: 0.2 GB	0969b42dcc00750ff17642ec791721b7a936dad912ab6c21a9b019d7c00d2aafeb5d01f42fc9e4bdb8f96435a3e108c8b9e9d4d82e831ed35e862ca98b8b8ea	Delete
raspi_4_bookworm.img.xz (added 17-Apr-2024)	Comp.: 0.2 GB Uncomp.: 2.6 GB	5b992ff294ab49be1db18d8a5a4da855db0778837ad41234b607959d63c47fa9b2b18011c9f04dfe9947537e9493d873e37c12c8a79ebefa38194b130079b0ae	Delete

# FEATURES: FIRMWARE



The screenshot shows the Raspberry Pi OS Firmware management interface. At the top, there is a navigation bar with the Raspberry Pi logo and menu items: Dashboard, CMs, Images, Projects, Scripts, Labels, Firmware (highlighted), and Other settings. The user's name, Kim Klotz, is displayed in the top right corner. Below the navigation bar, the page title "Firmware" is shown. A blue button labeled "Download new firmware from github" is positioned above a table. The table has two columns: "Name" and "Channel". It lists three firmware versions, all from the "stable" channel.

Name	Channel
pieeprom-2023-01-11.bin	stable
pieeprom-2022-12-07.bin	stable
pieeprom-2022-11-25.bin	stable

# FEATURES: SCRIPTS

**Add script**

Name	Type	Priority	Action
Add dtoverlay=dwc2 to config.txt			Edit Delete
Format eMMC as pSLC (one time)			Edit Delete
Resize ext4 partition			Edit Delete
add ssh key to pi user			Edit Delete
create userconf.txt			Edit Delete
overclock			Edit Delete
raspbian enable ssh			Edit Delete

**Script name:**

**Script type:**

**Priority:**

Script with lowest number is started first

Run in background

**Script:**

```
#!/bin/sh
set -e

mkdir -p /mnt/boot
mount -t vfat $PART1 /mnt/boot
echo "over_voltage=6" >> /mnt/boot/config.txt
echo "arm_freq=2147" >> /mnt/boot/config.txt
echo "gpu_freq=750" >> /mnt/boot/config.txt
umount /mnt/boot
```

Available environment variables:  
\$SERVER \$STORAGE \$PART1 \$PART2

Cancel Save

# FEATURES: SCRIPTS

---

```
#!/bin/sh
set -e

mkdir -p /mnt/boot
mount -t vfat $PART1 /mnt/boot
echo "over_voltage=6" >> /mnt/boot/config.txt
echo "arm_freq=2147" >> /mnt/boot/config.txt
echo "gpu_freq=750" >> /mnt/boot/config.txt
umount /mnt/boot
```

# FEATURES: LABELS

---



# FEATURES: PROJECTS

**Add project**

Project name	Action
fedora	<span>Set active</span> <span>Delete</span>
raspios	<span>Set active</span> <span>Delete</span>
raspios (overclocked) (active project)	<span>Set active</span> <span>Delete</span>

**Project name:**

**Image to write:**

Verify that image was written correctly

**Destination storage device:**

**EEPROM firmware update to apply:**

**When to print label:**

**Extra scripts to apply:**

- Add dtoverlay=dwc2 to config.txt
- Format eMMC as pSLC (one time settable only)
- Resize ext4 partition
- add ssh key to pi user
- create userconf.txt
- overclock
- raspbian enable ssh

**Other options:**

- Set as active project

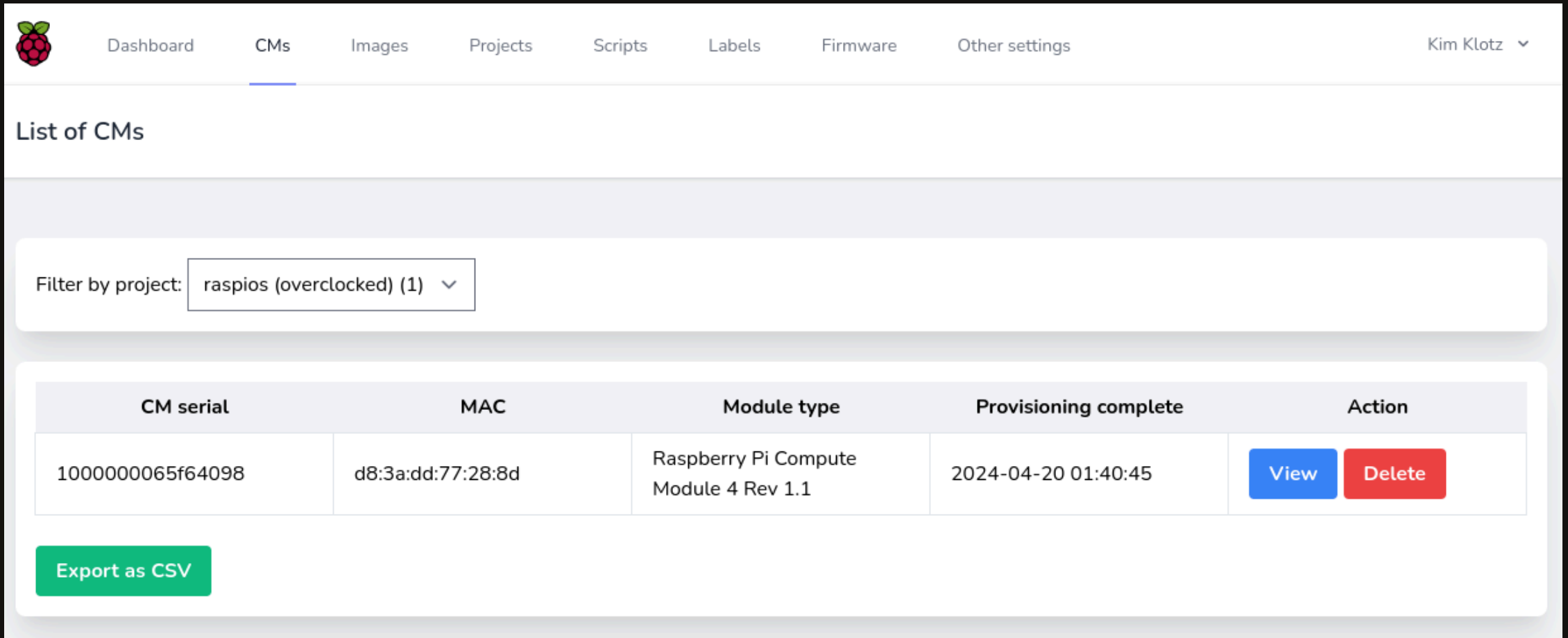
Cancel Save

# FEATURES: LOGS

Last 100 provisioning log entries

Board	CM serial	
000 (0)	1000000065f64098	01:40:45 Provisioning completed.
000 (0)	1000000065f64098	01:39:09 Provisioning started. Starting to write image.
000 (0)	1000000065f64098	23:41:41 Error during postinstall. Return code 1. Script output:  === Running post-installation script 'Resize ext4 partition' === #!/bin/sh set -e  parted -s \$STORAGE "resizepart 2 -1" "quit" Warning: Shrinking a partition can cause data loss, are you sure you want to continue?

# FEATURES: ÜBERBLICK



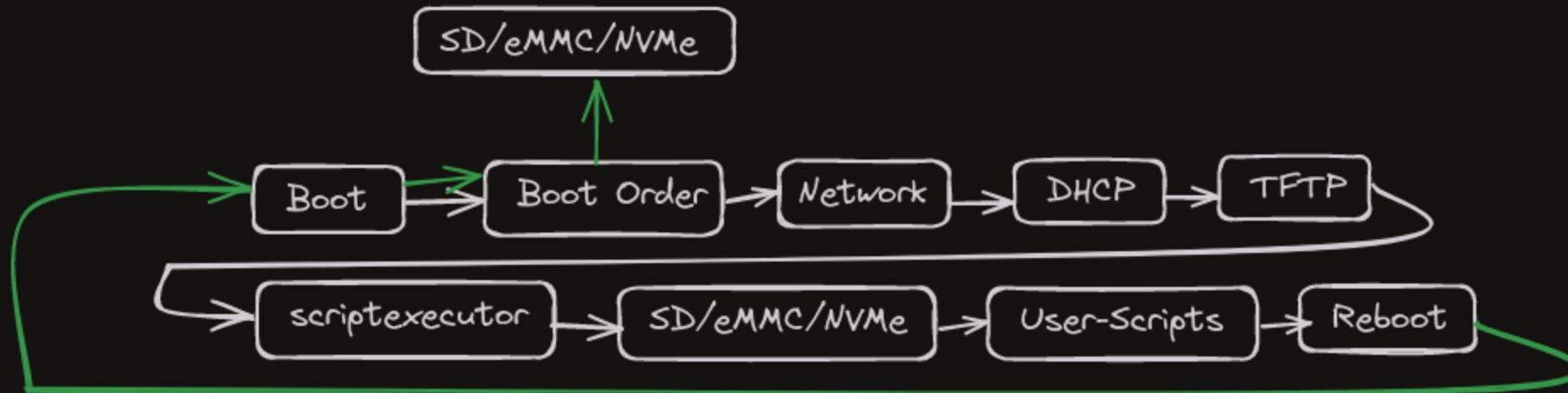
The screenshot displays the 'List of CMs' page in the Raspberry Pi OS management interface. The navigation bar at the top includes 'Dashboard', 'CMs', 'Images', 'Projects', 'Scripts', 'Labels', 'Firmware', and 'Other settings'. The user 'Kim Klotz' is logged in. The page title is 'List of CMs'. A filter dropdown is set to 'raspios (overclocked) (1)'. A table lists one CM with the following details:

CM serial	MAC	Module type	Provisioning complete	Action
1000000065f64098	d8:3a:dd:77:28:8d	Raspberry Pi Compute Module 4 Rev 1.1	2024-04-20 01:40:45	<a href="#">View</a> <a href="#">Delete</a>

An 'Export as CSV' button is located below the table.

# ABLAUF

---





# WEITERE OPTIMIERUNGEN

---

- Provision System API
- VLANs
  - Provision Netzwerk trennen am gleichen Switch
  - Automatisiertes ändern des VLANs nach dem Provisionieren

# WEITERE OPTIMIERUNGEN

---

- Regelmäßiges flashen

```
dd if=/dev/zero of=/dev/mmcblk0 bs=512 count=1
```

# ALTERNATIVE IMPLEMENTATIONEN

---

- Fedora CoreOS
- Uptime-Labs
  - Per EDK2/UEFI Firmware



# KONTAKT

---

Kim Klotz

makandra GmbH (Wir suchen noch Kolleg\*innen)

kim@chno.de