Install IPFire on a Raspberry Pi CM4 on DFRobot Carrier Board over Serial Console

This tutorial covers how to install a IPFire Firewall on to a Raspberry Pi Compute Module 4 that is carried on DFRobot's Router Carrier Board Mini using a **serial console**.

*Disclaimer: all provided links in this article **aren't** sponsored!*

> Tutorial tested against a Raspberry Pi Compute Module 4 (4GB, rev. 1.2) and IPFire Core Update 179. During the setup a second Raspberry Pi 3A with local attached keyboard and monitor was used.

→ IPFire's wiki can be found here.

→ And the DFRobot's wiki here.

Preparation / Requirements

- SD-Card (32 GB) + SD-Card-Reader
- Raspberry Pi Compute Module 4 (4GB RAM recommended)
- Jumper Wires (Female to Female)
- Official Raspberry Pi USB-C Powersupply (CM4 requires 5V **3A**!)
- Configured and running Raspberry Pi (either with SSH-access or working display output)

Depending on your Setup:

- *HDMI-Cable*
- *Keyboard*

Download and flash the Image to the SD-Card

Download the `aarch64` Flash Image from IPFire's webpage: ipfire.org/download. Then flash the Image on another computer to the SD-Card. Therefore you can use Win32DiskImager (Windows), the official Raspberry Pi Imager (Linux, Windows and MacOS) or BalenaEtcher (Web, Linux and Windows).

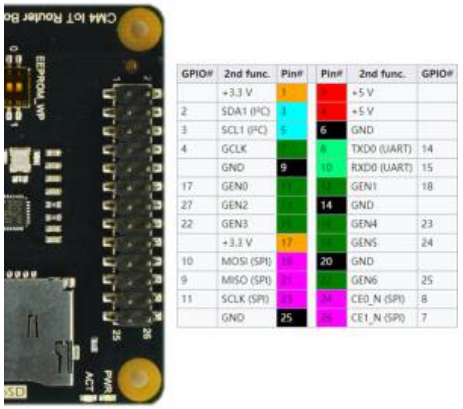
> - **The compressed IMG is required, the ISO image will not work!**
> - If experiencing boot issues when using newer hardware revisions have a look at the official IPFire wiki: wiki.ipfire.org!

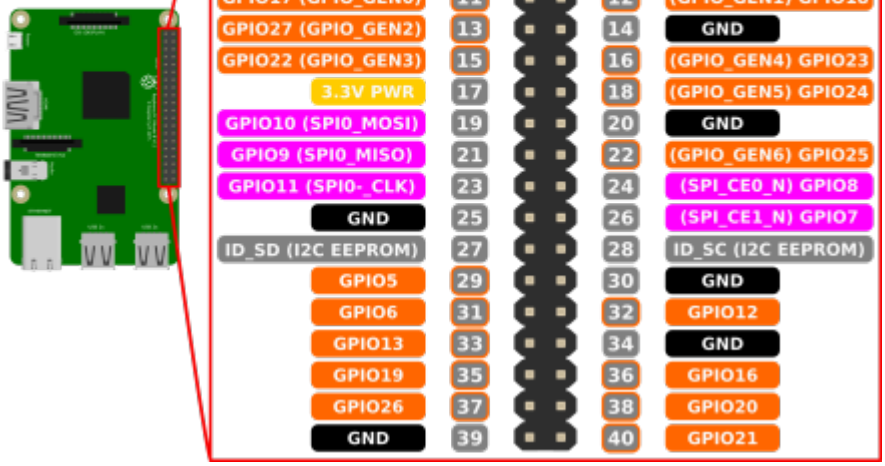
Before ejecting the SD-Card perform the following changes:

→ Enable the serial console: add (if not present) `enable_uart=1` to `config.txt`.

→ Check if `SERIAL-CONSOLE` in `uENV.txt` is `SERIAL-CONSOLE=ON`.

Connect both Pi's with jumper cables





Now connect the following pins on your carrier board's GPIO and your second Pi's GPIO with three jumper wires (female to female):

Carrier Board (CM4)	2nd Raspberry Pi	Use
6	**6**	Ground
10	**8**	Receive and send
8	**10**	Send and receive

When connected properly you can power up the carrier board.

(It is recommended to first power up the second Pi and start the serial console before powering up the carrier board.)

Images sourced from siocours.lycees.nouvelle-aquitaine.pro and wiki.dfrobot.com - CM4 DFRobot Carrier Board

Open serial console using screen

Before you can open a serial connection: serial console must also be enabled on the Pi from which you wish to connect. Therefore check if your `/boot/config.txt` contains `enable_uart=1`. If not, add it at **top (!)** and reboot.

> When using a Raspberry Pi 4B also add the following lines to your `config.txt` to get a human-readable console:
>
> ```
> dtoverlay=pi3-disable-bt
> dtoverlay=pi3-miniuart-bt
> ```
>
> In general there might be issues with newer versions of the Raspberry Pi, therefore consider using an older version as second device. Additionally do not dis- and reconnect to a running console session, otherwise your console might not be readable anymore for this session.

Then you can execute the follwing command from the second Pi to connect to your serial console. It doens't matter if you're using an attached keyboard and monitor or a SSH-connection.

```
screen /dev/ttyS0 115200
```

→ you might install `screen` befire by running the following command:

```
sudo apt install screen
```

Finally perform the setup of IPFire as usual!

With `Ctrl+A` and `D` you can quit the `screen`-session.

Select correct boot method

When booting for the first time, there will be three entries in the grub bootloader.

Select the 3rd option, that contains `serial console`!

Adjusting interfaces (important!)

As described also in this blog post in IPFire's official forum, there are assigment issues with the carrier board's NICs. It seems that the second PCIe NIC gets a self-assignet MAC everytime the device boots up. This is followed by the host OS no longer recognizing the NIC. To solve this issue there is a more or less fancy workaround:

First completely shut down your device! This is important because by doing this, all NICs will be reinitialized!

Then reboot it and figure out which NIC causes the error therefore execute the following command:

```
ifconfig -a
```

It will print all ethernet devices, no matter if active or inactive.

The output should look like anything of this: no matter if selected the red or the green interface to be on the Pi's built-in NIC:

```
eth0:
[...]
lo:
[...]
red0:
[...]
```

```
eth0:
[...]
lo:
[...]
green0:
[...]
```

No matter if selected the red or the green interface to be on the Pi's built-in NIC, you will have an “unassigned” `eth0` interface, which is the second PCIe NIC. To make your now unassigned interface persistent after future reboots, add `eth0` to IPFire's ethernet config:

- **Case 1:** The red interface should be on the second NIC:

Show/Hide

```
echo RED_DEV=eth0 >> /var/ipfire/ethernet/settings
```

- **Case 2:** The green interface should be on the second NIC:

Show/Hide

```
echo GREEN_DEV=eth0 >> /var/ipfire/ethernet/settings
```

Verify your settings by running the following command:

```
cat /var/ipfire/ethernet/settings
```

Have a closer look at following lines:

- GREEN_DEV
- GREEN_DESCRIPTION
- RED_DEV
- RED_DESCRIPTION

The device whose description starts with `pci: Realtek Semiconductor Co., Ltd. RTL8111/8168/8411` should have the `[…]_DEV` set to `[..]_DEV=eth0`.

Example:

→ if GREEN_DESCRIPTION would start with `pci: Realtek Semiconductor Co., Ltd. RTL8111/8168/8411`, then GREEN_DEV should be `GREEN_DEV=eth0`

Apply your changes either by rebooting or reinitializing the network manager:

```
/etc/init.d/network restart
```

Resources used: cyberciti.biz - linux serial console, scribles.net - uart communitation between to Raspberry Pis and wiki.ipfire.org - Raspberry Pi 4 Model B