👋 Dasharo User Group #11 🎉 and Developers vPub 0x10 🍻

Booting TianoCore EDK II on an Odroid M2

A walk-through of porting, building and flashing

Introduction

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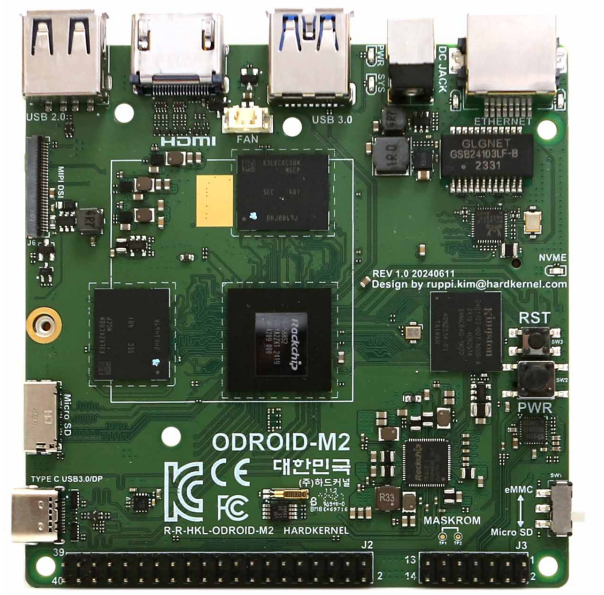
- Firmware Engineer working primarily with coreboot and EDK2 but also Heads and Linux
- Have been at 3mdeb for 4 years now
- Free and open source software enthusiast
- ThinkPad collector

Why EDK II on ARM?

- UEFI: unified boot, platform services, secure boot, etc.
- Historical dominance: x86; ARM traditionally uses U-Boot.
- Trend: high-performance ARM SoCs → need rich firmware → EDK II fills gap.
- Open-source effort: edk2-porting community → Rockchip, Mediatek, etc.

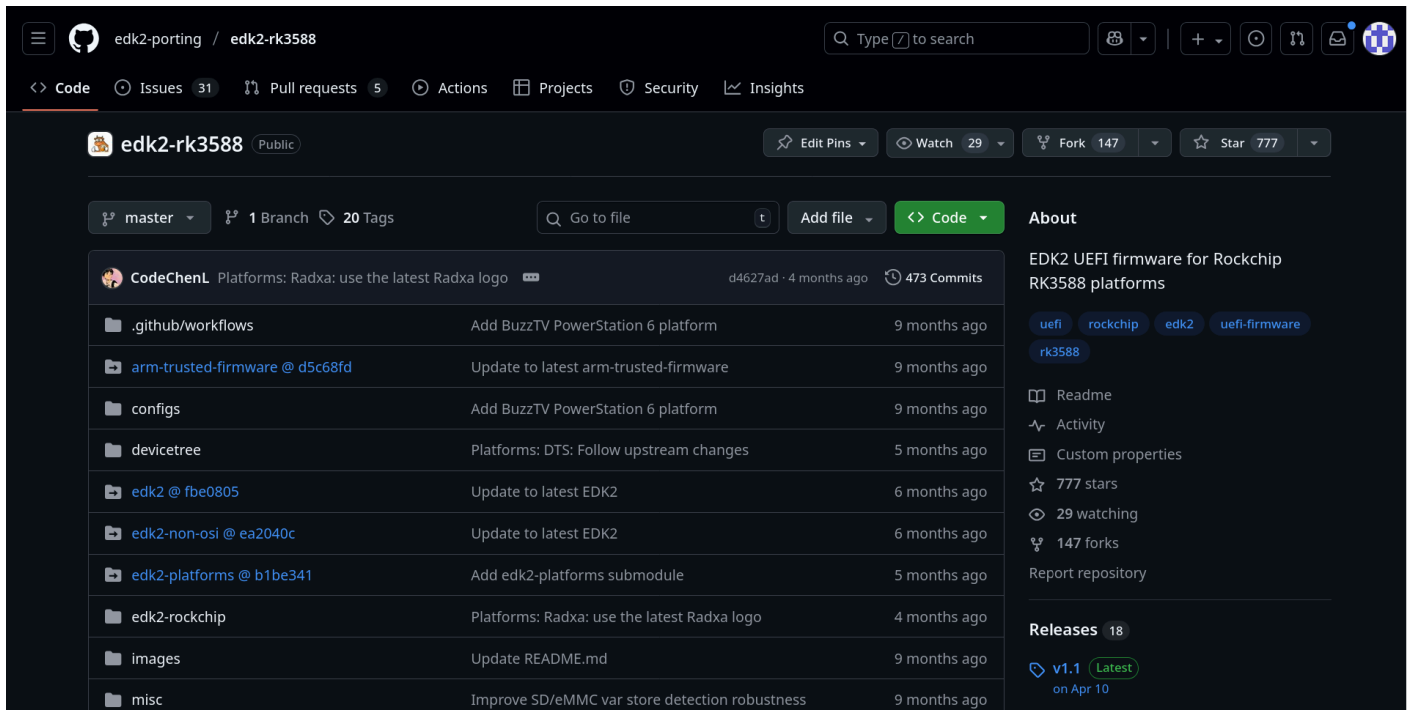
Meet the Odroid M2

- SBC, RK3588 (ARM64, 8-core big.LITTLE)
- 40-pin RPI-like GPIO header, 2×7 additional GPIO header, HDMI, USB-C-DP, MIPI-DSI, Gigabit Ethernet
- Built-in NPU, small 4-pin fan, debug UART
- Runs Ubuntu 25.04 out of the box



The edk2-rk3588 Repository

- Base repo: edk2-porting/edk2-rk3588
- Existing Rockchip ports: OrangePi5, Radxa ROCK5 and more
- Pull-request 218 adds Odroid M2 → Dasharo:odroid-m2



High-Level Porting Architecture

- PAL: Rockchip-specific driver skeleton (GPIO, PWM, I²C, etc.)
- Board-Specific: voltage rails, PCIe init, fan control, LEDs, debug UART, SD-card boot path

Step 1 - Voltage Regulator Configuration

- RK3588 uses regulators for power rails: VDD-CPU, VDD-GPU, VDD-IO, etc.
- Source: RK3588 device tree from upstream Linux
- Code excerpt:

```
static struct regulator_init_data rk806_init_data[] = {
    /* Master PMIC */
    RK8XX_VOLTAGE_INIT(MASTER_BUCK1, 950000),
    RK8XX_VOLTAGE_INIT(MASTER_BUCK2, 950000),
    RK8XX_VOLTAGE_INIT(MASTER_BUCK3, 750000),
    RK8XX_VOLTAGE_INIT(MASTER_BUCK4, 950000),
    RK8XX_VOLTAGE_INIT(MASTER_BUCK5, 900000),
    /* This is not configured in the M2's Linux device tree
    RK8XX_VOLTAGE_INIT(MASTER_BUCK6, 1100000), */
    RK8XX_VOLTAGE_INIT(MASTER_BUCK7, 2000000),
    RK8XX_VOLTAGE_INIT(MASTER_BUCK8, 3300000),
    RK8XX_VOLTAGE_INIT(MASTER_BUCK10, 1800000),
```

Step 2 - PCIe (M.2) Initialization

1. What the existing code tells us:

```
if (Segment == PCIE_SEGMENT_PCIE20L2) {
    GpioPinSetDirection(3, GPIO_PIN_PD1, GPIO_PIN_OUTPUT);
}
```

- Only Reset signal → GPIO PD1
- No Power-Enable on this board

2. Hardkernel schematic findings:

- Reset → GPIO 1 PA7
- Power-Enable → GPIO 0 PC6

Step 2 - PCIe (M.2) Initialization

3. Final M.2-specific code:

```
EFIAPI
PcieIoInit(UINT32 Segment) {
    if (Segment == PCIE_SEGMENT_PCIE20L2) {
        GpioPinSetDirection(1, GPIO_PIN_PA7, GPIO_PIN_OUTPUT);
        GpioPinSetDirection(0, GPIO_PIN_PC6, GPIO_PIN_OUTPUT);
    }
}

VOID EFIAPI
PciePowerEn(UINT32 Segment, BOOLEAN Enable) {
    if (Segment == PCIE_SEGMENT_PCIE20L2)
        GpioPinWrite(0, GPIO_PIN_PC6, Enable);
}

VOID EFIAPI
PciePeReset(UINT32 Segment, BOOLEAN Enable) {
    if (Segment == PCIE_SEGMENT_PCIE20L2)
        GpioPinWrite(1, GPIO_PIN_PA7, !Enable);
}
```

Step 3: Fan control

- Fan wired to GPIO 1 PA2 (PWM0_M2)
- Small fan → low period (50 µs) + 50 % duty → quiet at low speed
- Code:

```
PWM_DATA pwm_data = {
    .ControllerID = PWM_CONTROLLER0,
    .ChannelID    = PWM_CHANNEL0,
    .PeriodNs     = 50000,
    .DutyNs       = 50000,
    .Polarity     = FALSE,
};

VOID EFIAPI PwmFanIoSetup(VOID) {
    GpioPinSetFunction(1, GPIO_PIN_PA2, 0xB);   // PWM0_M2
    RkPwmSetConfig(&pwm_data);
    RkPwmEnable(&pwm_data);
}
```

Additional board-specific tweaks

FEATURE	CURRENT STATE	COMMENTS
LEDs	Not functional	Need to map GPIOs
USB 2.0	Functional	
USB 3.0	Not functional	Works once booted into OS
Booting Windows	Not functional	Need proper ACPI tables

Building the image

- Root of edk2-rk3588 → build.sh
- Command:

```
./build.sh --device odroid-m2

⇒ FIT build done
⇒ Building 8MB NOR FLASH IMAGE
...
Build done: RK3588_NOR_FLASH.img
```

Flashing to MicroSD

- Odroid M2 boots from microSD (no onboard NAND on dev boards)
- Flashing command:

```
sudo dd if=RK3588_NOR_FLASH.img of=/dev/sdb bs=4M status=progress
```

Boot result

- Insert SD card, power on
- Image inserted → board powers up → UEFI splash appears
- Ubuntu 25.04 boots (from FIT image)

Demo

What we still need

- Windows 10/11 – ACPI tables
- USB-3.0 mass storage exposed in UEFI environment
- LED and power-state indicators
- Serial console from UEFI (early-boot debug)
- Full Dasharo release - payload and feature integration

The Pull Request & Community

- Pull-request #218: Odroid M2 port
- Repository: edk2-porting/edk2-rk3588
- Thanks to Hardkernel for schematics

Q&A