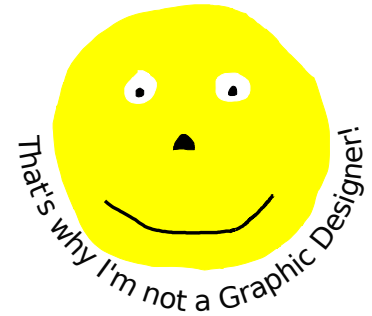


Embedded Linux, why?

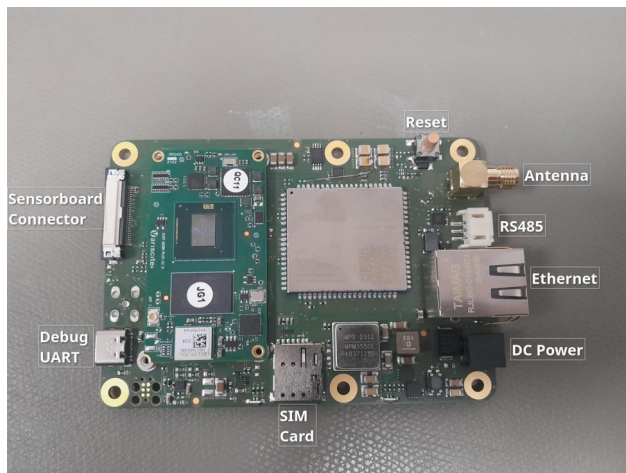
by Thomas Marangoni (DasChaos)

About me

- Embedded Linux Engineer since 2021
- Smart Displays and now Vision Devices
- Areas of expertise:
 - bootloader
 - Linux kernel
 - user-space
 - Yocto



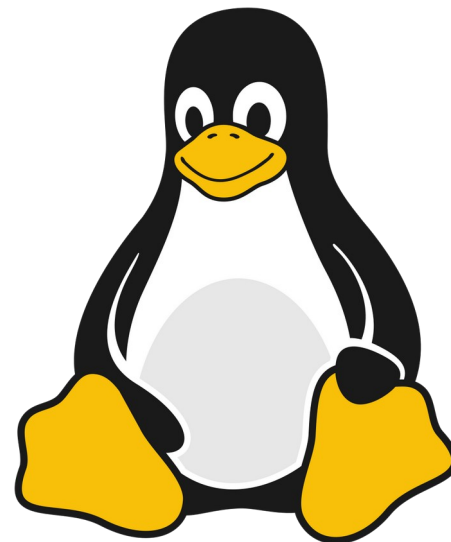
What is embedded?



- embedded != small and low power
- designed for a specific use-case
- RAM: 32MB to 16GB
- CPU: 1C@533MHz to 8C@2GHz
- Storage: 64MB NAND to 128GB NVME
- Architectures: arm64, riscv, x86_64

Why embedded Linux?

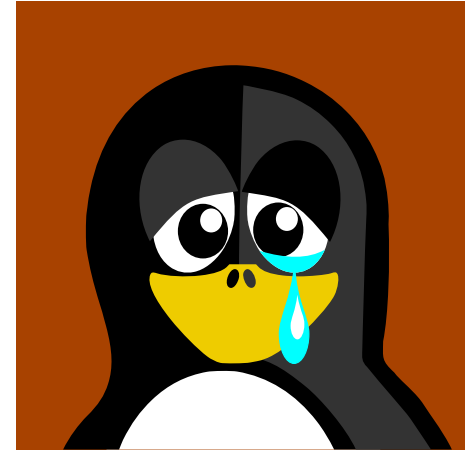
- wide support of hardware components
- large set of excellent tools
- solid OS infrastructure is provided
- Linux and Posix APIs available on different hardware
- similarity to desktop and server Linux
- a lot of documentation exists already



<https://commons.wikimedia.org/wiki/File:TuxFlat.svg>

Why not embedded Linux?

- large software stack
- Microcontroller can be more energy efficient
- plain C/Rust might be faster
- Microcontroller might be cheaper
- proprietary software
- not all Realtime requirements can be met



<https://openclipart.org/178504>

Available Tooling



debian

<https://www.debian.org/>



<https://fedoraproject.org/iot/>



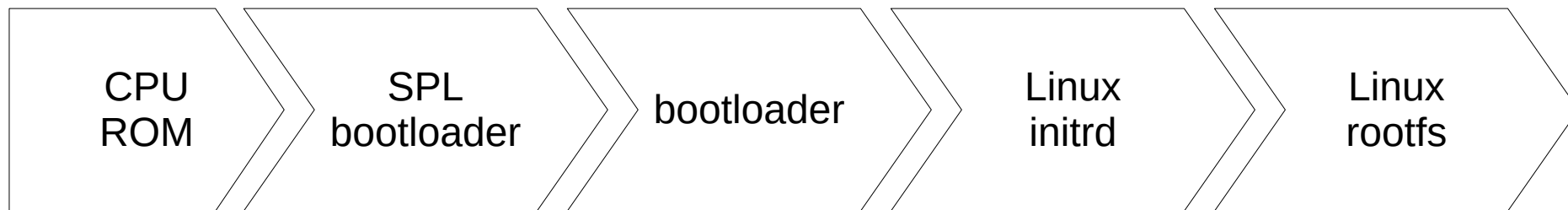
<https://buildroot.org/>



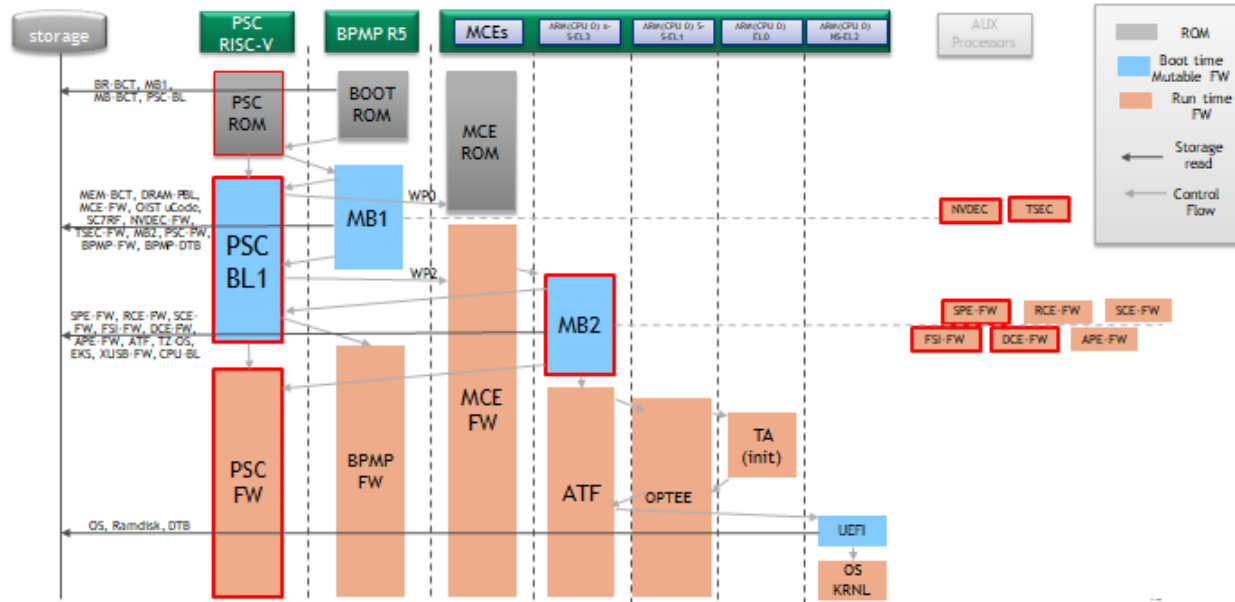
<https://www.yoctoproject.org/>

- custom scripts
- Debootstrap
- generic distributions
- embedded distributions
- Buildroot
- Yocto

Linux Boot Process



Linux Boot Process



<https://docs.nvidia.com/jetson/archives/r36.4.4/DeveloperGuide/AR/BootArchitecture/JetsonOrinSeriesBootFlow.html>

Storage

- SPI-Flash
 - NAND
 - NOR
- EMMC
- UFS
- NVME
- Don't use μ SD Cards

Linux Kernel

- Mainline
 - Not all devices boot
 - LTS is great
- Vendor
 - Always outdated
- Minimal Kernel Config

Root File System

- Two Approaches
 - Atomic File System
 - Versioning (ostree, overlays)
- File Systems
 - Ext4
 - UBIFS, F2FS

Vendors



<http://www.allwinnertech.com/>



<https://www.nxp.com/>



<https://www.qualcomm.com/>



<https://www.rock-chips.com/>



<https://www.nvidia.com/>

Contact

👤 Thomas Marangoni

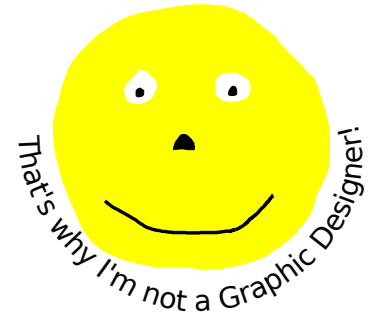
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Questions?