Introduction to Embedded System

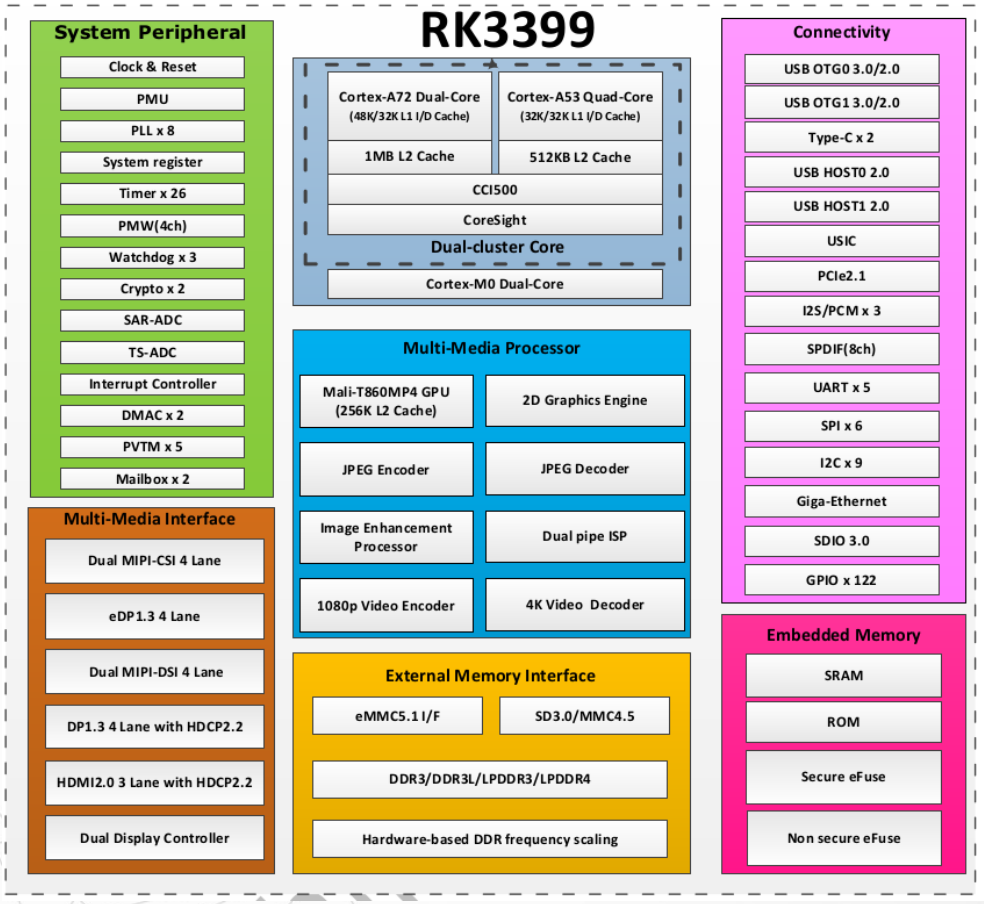
Embedded System

- An embedded system
  - combination of computer hardware and software
  - specifically designed for a particular function
- Applications
  - Mobile phone
  - Digital camera
  - Smart TV
  - Navigation system

Feature

- Designed to do some specific task
  - Low power
  - Small size
  - Special operating ranges
  - Low cost
- Install OS ?

SOC RK3399



http://wiki.friendlyarm.com/wiki/index.php/NanoPi_M4#Diagram.2C_Layout_and_Dimension

Component of embedded system

- Processor

  → ARM, X86, MIPS ….

- RAM

  → 8MB ~ 2 GB

- Storagee

  → Nand, Nor flash

  → SD/MMC/eMMc

- System Bus

  → AMBA, AHB, APB, AXI ...

Component of embedded system

- Communication
  - I2C, I2S, USB, PCI/PCIe ...
- Media system
  - JPEG, H.264 ..
- System component
  - DMA, RTC ..

Embedded Linux ?

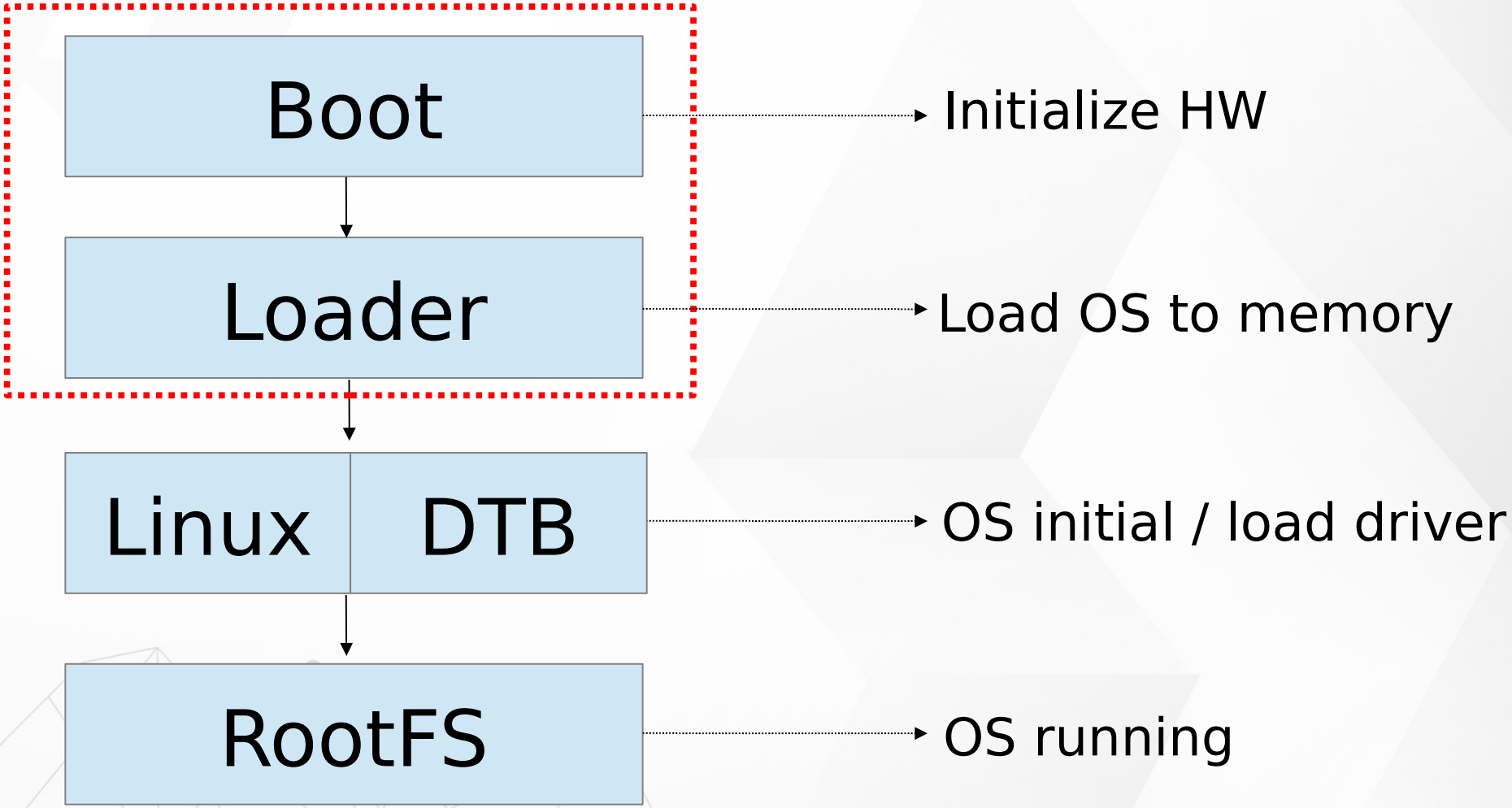
Embedded Linux is the usage of the Linux kernel and various open-source components in embedded systems (from Free Electrons)

Advantages

- Re-use components
- Quickly design and develop complicated products
- No need to re-develop components

  → TCP/IP stack, USB stack, PCI stack ...
- Allow you modify components

Embedded Linux System Booting



Embedded Linux System Software components

- Cross-compilation toolchain
- Bootloader
- Linux Kernel, DeviceTree
- Rootfs
- C library
- Libraries and applications
- BSP (Board Support Package)

Develop Environment

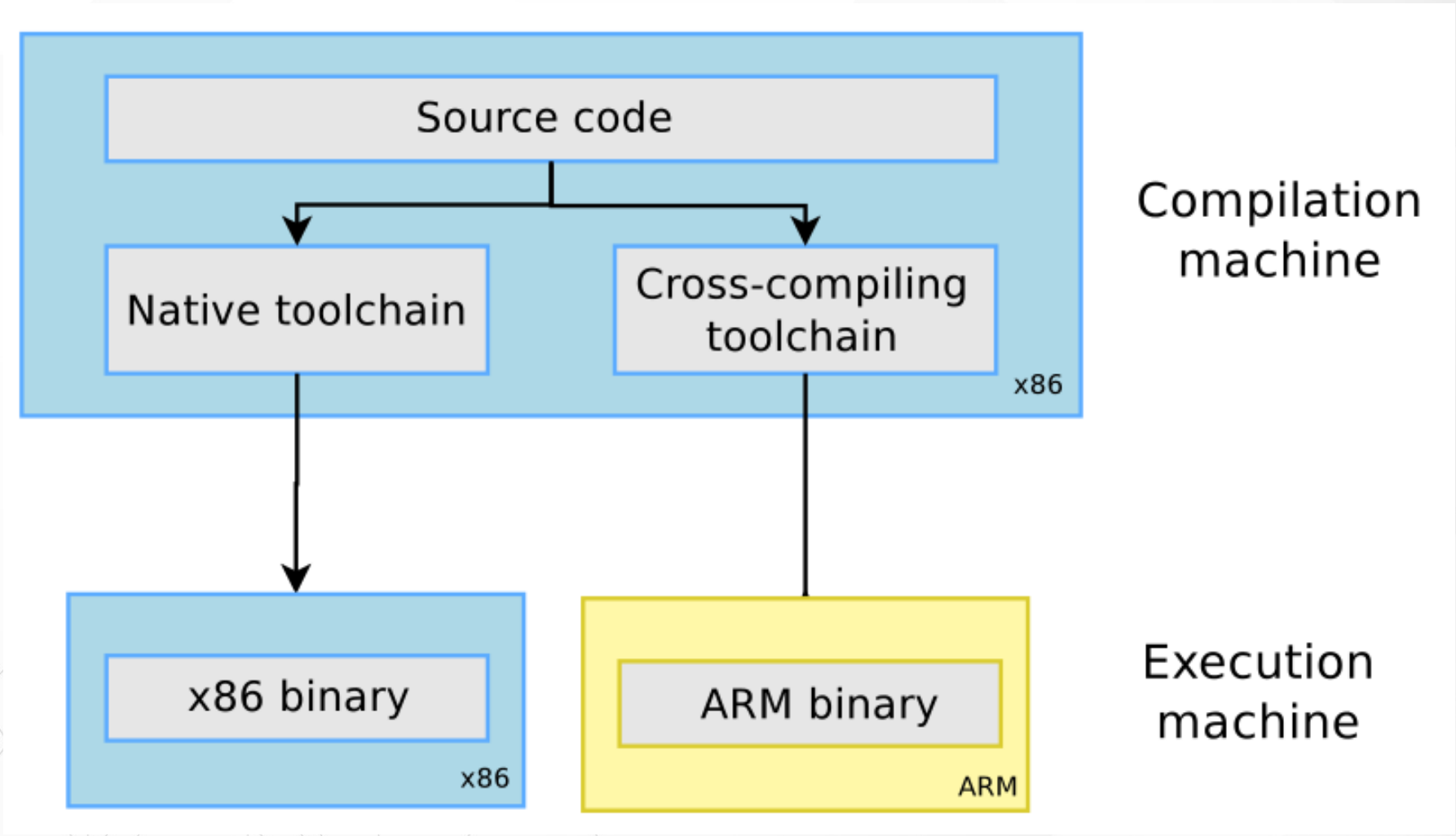
Develop Environment

- Host PC
- Toolchain
- Target EVB (NanoPi M4)
- BSP

BSP

- Board Support Package
- From chip vendor
  - Distribution
    - Bootloader
    - Linux kernel
    - Device driver
    - Rootfs

Cross Compilation toolchain



Just do it!

- Understand NanoPi-M4 EVB
- Build develop environment
  - Terminal Setting
    - Gtkterm, minicom ..
  - Prepare NanoPi-M4 BSP
    - U-boot, Linux kernel, RootFS
  - Setting toolchain
  - Build Network Environment

Setup References - 1

RK3399 環境設定 SDCARD and Toolchain

- https://slashembeddedlinux.blogspot.com/p/rk3399-develop.html

RK3399 環境設定 – 網路

- https://slashembeddedlinux.blogspot.com/p/tmp.html

Debug Port 硬體設定

- https://slashembeddedlinux.blogspot.com/p/debug-port.html

Setup References - 2

- Build U-boot for RK3399
  - → $ cd u-boot-rockchip
  - → $ make nanopi-m4-rk3399_slash_defconfig
- Build Linux Kernel for RK3399
  - → $ cd rockchip-rk3399-nanopi-m4
  - → $ make nanopi4_linux_defconfig