Introduction to Embedded System

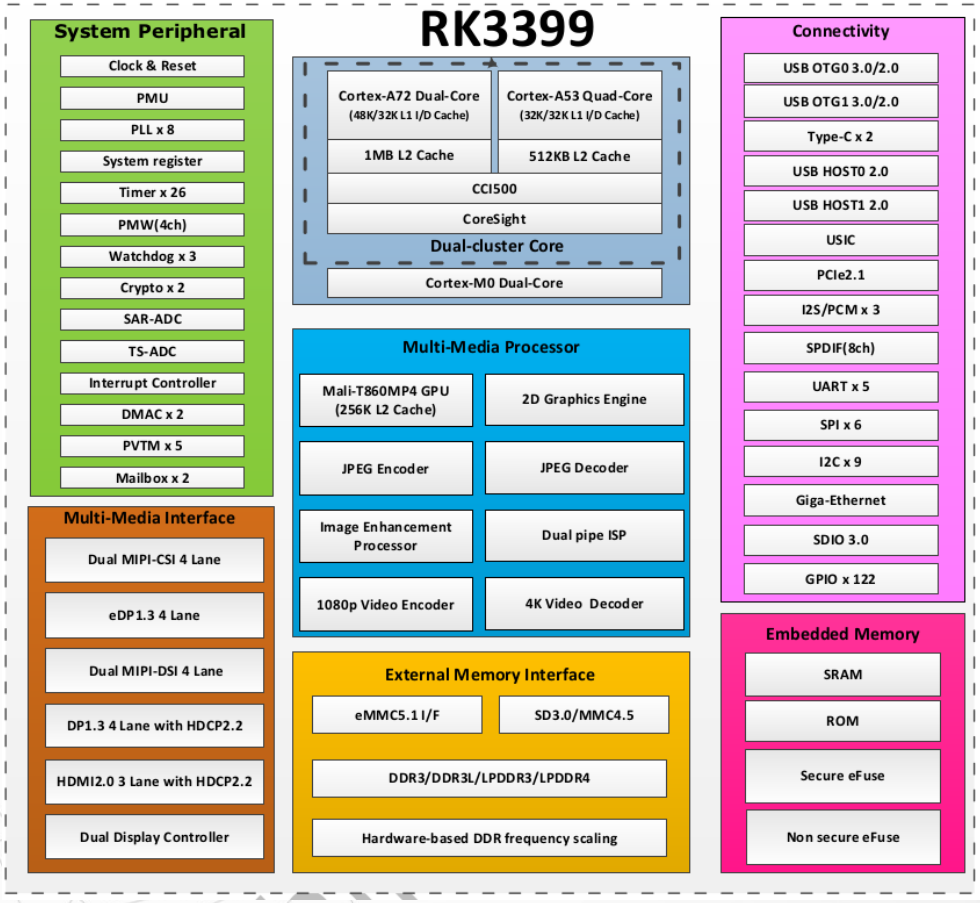
Embedded System

- 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 ?

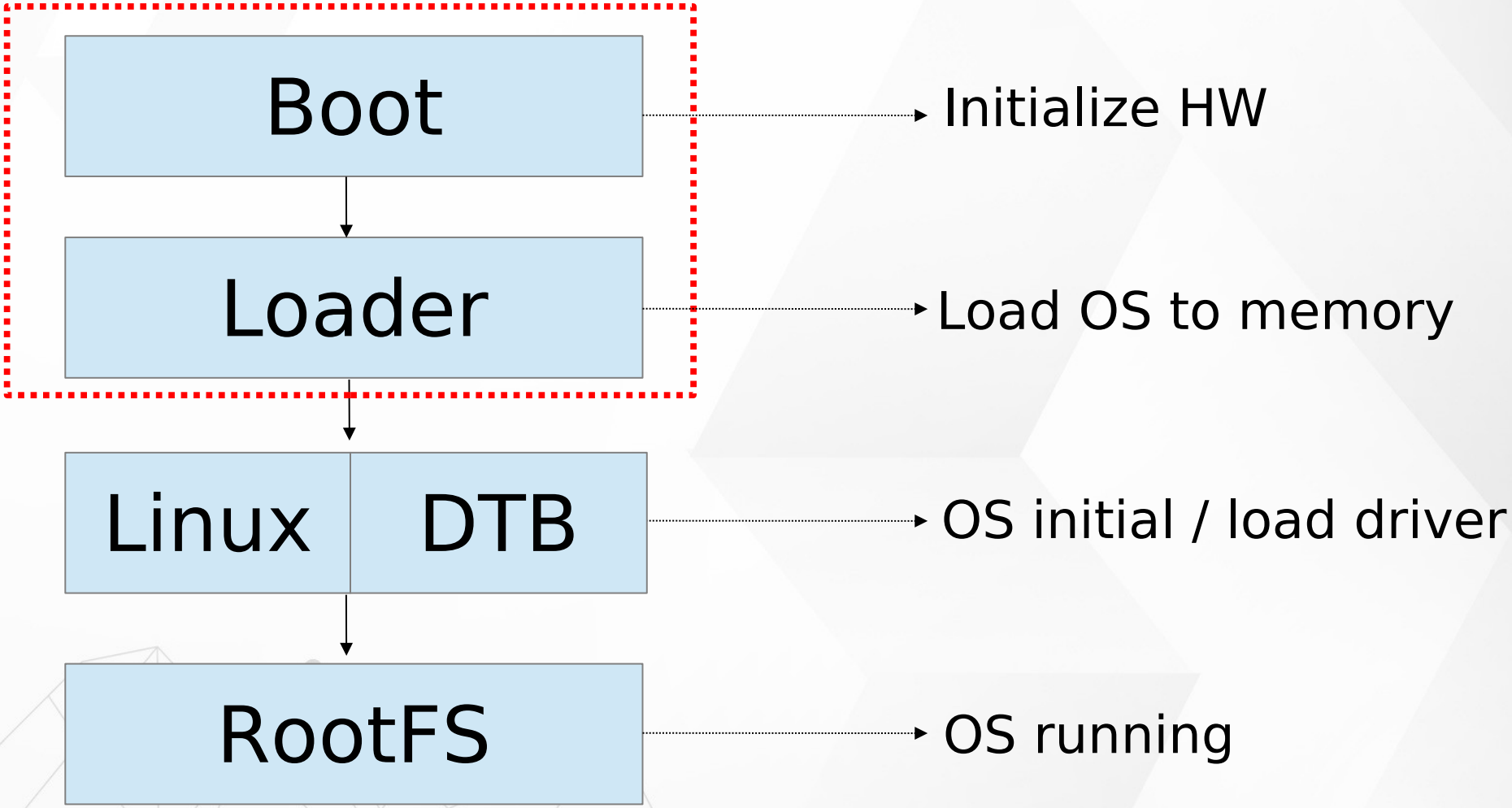
Embedded Linux is the usage of the Linux kernel and various open-source components in embedded systems (from Free Electrons)

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

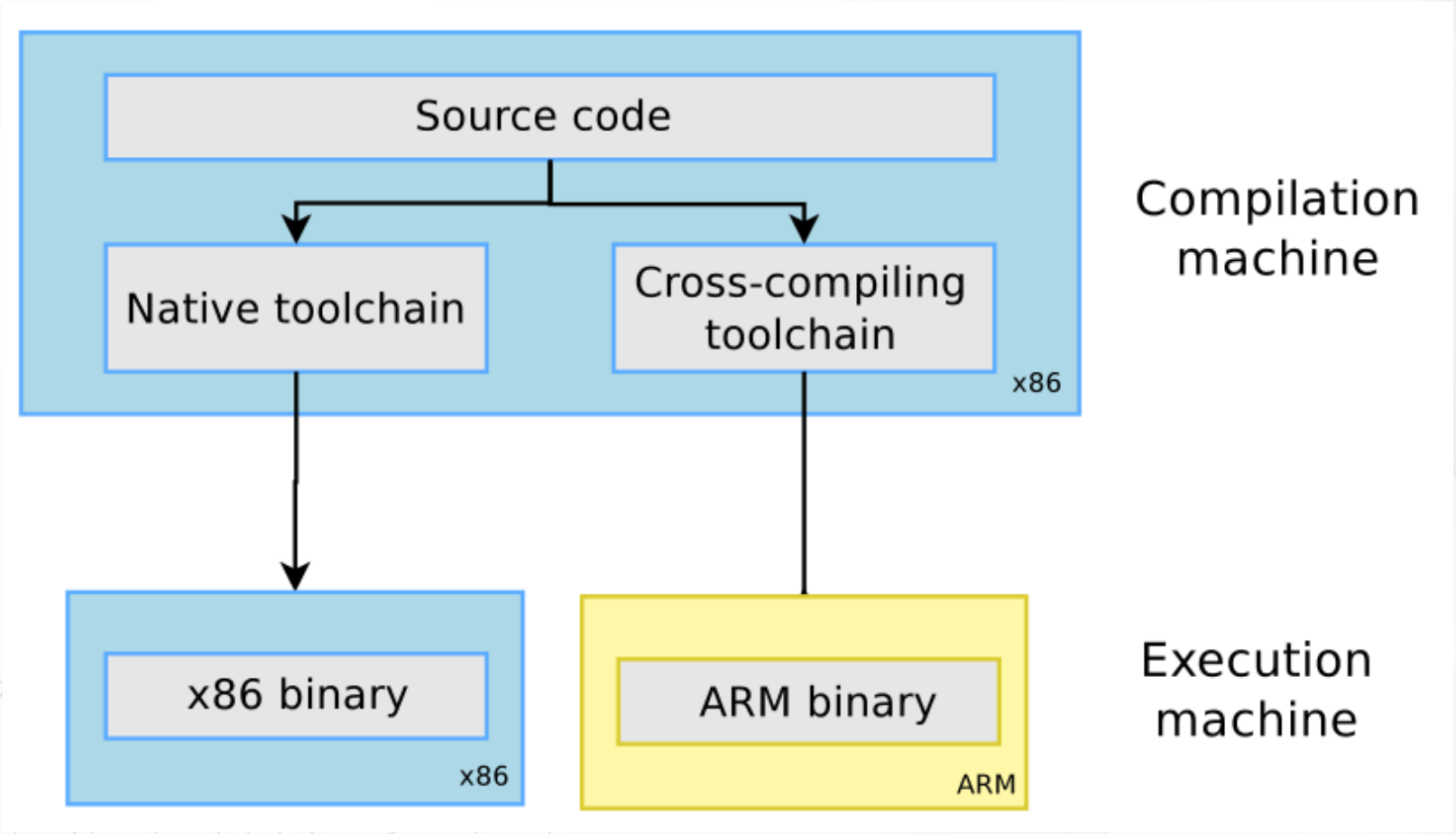
Develop Environment

- Host PC
- Toolchain
- Target EVB (RockPi4)
- BSP

BSP

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

Cross Compilation toolchain



Setup References - 1

Debian Image :
https://github.com/radxa/rock-pi-images-released/releases

Image Write Tool :
https://www.balena.io/etcher/

Install Image to SD Card :
https://wiki.radxa.com/Rockpi4/install/microSD

Setup References - 2

Debug Port :
https://wiki.radxa.com/Rockpi4/dev/serial-console

Linaro ToolChain :
https://releases.linaro.org/components/toolchain/binaries/7.3-2018.05/aarch64-linux-gnu/gcc-linaro-7.3.1-2018.05-x86_64_aarch64-linux-gnu.tar.xz

Install Package :
sudo apt-get install libncurses5 libncurses5-dev build-essential libssl-dev mtools bc python dosfstools liblz4-tool

Setup References - 3

u-boot :	https://wiki.radxa.com/Rockpi4/dev/u-boot
Linux Kernel :	https://wiki.radxa.com/Rockpi4/dev/kernel-4.4
Debian :	https://wiki.radxa.com/Rockpi4/dev/Debian
RockPi4 WiKi :	https://wiki.radxa.com/Rockpi4