From Kickstarter Project
To Linux Distributions
Parallella Technical Conference 2015

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Overview

• Open Source Hardware vs. Open Source Software
• Kernel work
• Linux images
• U-Boot
• Epiphany
• Summary
Open Source
Parallella – Open Source Hardware

• Kickstarter Project
• Small startup company
• Public design files enable collaboration on hardware
  – … and provide insights for working on system-level software
Open Source Software Deliverables

- U-Boot in QSPI flash
- “BOOT” FAT partition on SD card
  - uImage
  - devicetree.dtb
- Ubuntu root filesystem on partition on SD card
- plus Epiphany SDK, FPGA bitstream, etc.
Linux Kernel
Kernel Timeline – Parallella

kernel.org

Xilinx, Inc.

Analog Devices, Inc.

Adapteva, Inc.
Kernel Timeline – Kernel Community

- linux-stable.git
- linux.git
- drivers/pinctrl/
- arch/arm/
- arch/arm/*zynq*
- linux-next.git
Kernel – Downstream Vs. Upstream

• Almost everything works
  – Serial
  – Ethernet
  – QSPI (?)
  – HDMI
  – Epiphany via /dev/mem or driver

• Little updates
  – Community-driven
  – No security process

• Basic enablement
  – Serial, Ethernet

• Still no HDMI

• No QSPI yet
  – Flash not detected?

• Epiphany via /dev/mem
  – Epiphany driver redesign?

• Pinctrl driver – e.g., LED
  – DT patches still missing?
Kernel – How You Can Help

• Testers (Tested-by)
• Reviewers (Reviewed-by)
• Confirmations from the Adapteva side (Acked-by)
• More precise technical information on models
• Feedback on questions raised
• If you have patches, don't forget Signed-off-by!
openSUSE Linux Distribution
From kernel.org To kernel-default

- `linux.git`
- `linux-stable.git`
- `kernel.git`
- `kernel-source.git`
- `openSUSE:Factory:ARM`
- `openSUSE:Factory`
- `Kernel:stable`
- `Kernel:HEAD`
Towards An Official JeOS Image

• Standardized boot.scr U-Boot boot script
  – Instead of dealing with bootargs in flash
  – Load initrd (initramfs) alongside kernel and device tree

• Filesystem that allows symlinks, e.g. ext4
  – Kernel will be symbolic link to latest/chosen version

• zImage instead of uImage – position-independent
  – Requires “bootz” command in U-Boot instead of “bootm”

• Kiwi used to build appliances from packages
Das U-Boot Bootloader
Updating U-Boot

• More commands desired
  – bootz for zImage
  – ext2load (or load) for ext partitions

• Look for boot.scr by default and execute if present

• Flashing not possible from upstream Linux kernel
  – Use binary Xilinx tools, or write QSPI driver for OpenOCD?
Epiphany Tool Support
Epiphany Compiler On openSUSE

• Reuse GCC maintained by SUSE compiler team
  – Cross-compiler support for gcc5 package recently prepared
  – Note: rpmbuild(?) tries to strip target binaries with host tools
  – Still need to submit newlib Base:System → openSUSE:Factory

• Build newlib and e-lib target libraries

• Conventions needed in Makefiles
  – Don't hardcode “e-gcc”, allow for epiphany-elf-gcc or …-x.y
    – Example: $(CROSS_COMPILE)gcc allows “make CROSS_COMPILE=e-”
    – Don't make assumptions about filesystem locations – allow /usr/bin
Epiphany Host Libraries

• When using upstream kernel, stuck with last SDK version to use /dev/mem
  – Userspace software needs to be aware of kernel differences
• Discussion to move configuration data into kernel
• FPGA interface redesign – status?
Summary
Conclusions

• Every software that needs to be manually downloaded from parallella.org is a usability issue
  – Let distros handle software management in their native way
• Offload responsibilities from Adapteva mid-term
  – Let Adapteva focus on the Epiphany and on innovation
• Kernel requires upstreaming of drivers & description
• Distro-updatable kernel may require U-Boot changes
  – No Open Source way to flash U-Boot yet?
• Distro support for Epiphany within reach!
Questions?
Join us on #opensuse-arm or opensuse-arm@opensuse.org!
en.opensuse.org/HCL:Parallella

Thank you.
Have a Lot of Fun, and Join Us At:

www.opensuse.org
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