Upstream First
5 Years of Active Kernel Contribution

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Outline

Overview and History

I/O Device Drivers
    Multimedia
    Storage and DMA
    Serial and Timers

Frameworks and Subsystems
    Multimedia
    Memory Management and Interrupts
    Kernel Boot and Driver Model
    Power Management

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Overview and History

Upstream contributions since 2007:

- ▶ Upstream Drivers: Around 25 new drivers added to upstream
- ▶ Frameworks: Improvements across multiple subsystems
- ▶ Boards: 10+ ARM-based boards, DT enablement work
- ▶ SoCs: 7+ ARM-based Mobile and Automotive SoCs

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Video Out

Video Out:

- ► Upstream Drivers: LCDC, HDMI, MIPI-DSI, VOU
- ► Frameworks: FBDEV, V4L2, Media Controller, DRM*
- ► Collaboration Partners: V4L2 and Media Controller Maintainers
- ► Current State: Leading DRM development for Embedded

* DRM: Direct Rendering Manager

Video In

Video In:

- ► Upstream Drivers: CEU, MIPI-CSI, Camera sensors / encoders
- ► Frameworks: V4L2, SoC-Camera
- ► Collaboration Partners: V4L2 and SoC-Camera Maintainers
- ► Current State: Leading DT binding development for SoC-Camera

Video Encode/Decode, Audio

Video Encode/Decode:

- ▶ Upstream Drivers: UIO Generic Driver
- ▶ Frameworks: UIO, V4L2
- ▶ Collaboration Partners: UIO Driver Author and V4L2 Maintainers
- ▶ Current State: UIO User space stack and V4L2 MEM2MEM

Audio:

- ▶ Upstream Drivers: SIU, FSI, Codecs
- ▶ Frameworks: ALSA, UIO
- ▶ Collaboration Partners: ALSA and UIO Driver Authors
- ▶ Current State: Drivers support PIO and DMA via DMA Engine

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Storage and DMA

Storage:

- ▶ Upstream Drivers: MMCIF, FLCTL
- ▶ Frameworks: MMC, MTD
- ▶ Collaboration Partners: MMC and MTD Driver Authors
- ▶ Current State: Drivers support PIO and DMA via DMA Engine

DMA:

- ▶ Upstream Drivers: DMAC
- ▶ Frameworks: DMA Engine
- ▶ Collaboration Partners: DMA Engine Driver Authors
- ▶ Current State: Participating in DT binding development

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Serial and Timers

Serial:

- ▶ Upstream Drivers: IIC, MSIOF, SCIF, USBHS, SDHI
- ▶ Frameworks: I2C, SPI, Serial/TTY, USB Host/Gadget, MMC
- ▶ Collaboration Partners: Driver Authors
- ▶ Current State: Drivers support PIO and DMA via DMA Engine

Timers:

- ▶ Upstream Drivers: CMT, TMU, MTU2, STI, TPU
- ▶ Frameworks: Clocksource, Clockevent, PWM, LED
- ▶ Collaboration Partners: Driver Authors
- ▶ Current State: Tickless timer and PWM LED output supported

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Multimedia

Framework and Subsystem changes:

- ▶ Video Out: Deferred I/O for FBDEV, DRM for Embedded [1]
- ▶ Video In: V4L2 USERPTR Extension [2], Additional FOURCCs [3]
- ▶ Video Encode/Decode, Audio: Reusable UIO Component [4]

[1] LPC2012 Slides: laurent-pinchart-linux-display-and-video.pdf
[2] V4L2 Zero copy support: http://patchwork.linuxtv.org/patch/991
[3] NV16/61 formats: http://www.spinics.net/lists/vfl/msg40028.html
[4] kernel.org git c767db0ab4bc85f06119f2b42369e31b29991f16

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Memory Management and Interrupts

Framework and Subsystem changes:

- ▶ Memory Management: NUMA for On-chip SRAM
  - ▶ Developed during 2007 to support SoCs with On-chip SRAM
  - ▶ Makes use of existing NUMA kernel infrastructure
  - ▶ Slides available from ELC Europe 2007 [1]
- ▶ Interrupts: IRQ Domain optimizations
  - ▶ Developed during 2012 as part of DT enablement
  - ▶ Implements IRQ Domain optimizations required for INTC [2]

[1] http://elinux.org/images/1/13/ELCE2007-Asymmetric_NUMA.pdf
[2] kernel.org git 98aa468e045a0091a7c34d9f5205a629634fabf4

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Kernel Boot and Driver Model

Framework and Subsystem changes:

- ▶ Kernel Boot: DT-support for ARM in Kexec and Kexec-tools [1]
- ▶ Kernel Boot: Boot Upstream Linux from Mask ROM [2]
- ▶ Driver Model: Early Platform Drivers (Timers / Console) [3]

[1] http://permalink.gmane.org/gmane.linux.kernel.kexec/6537
[2] kernel.org git f45b1149911cc4c3ab50e56c8844ad4ec04a4575
[3] kernel.org git 13977091a988fb0d21821c2221ddc920eba36b79

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Power Management

Framework and Subsystem changes:

- ▶ Device Drivers: Runtime PM Framework for Platform Devices [1]
    - ▶ Linux kernel PM code extended with Platform Device support
    - ▶ Device Drivers updated to support Runtime PM API
- ▶ Power Domains: PM Domain Framework Support [2]
    - ▶ Collaboration with Linux kernel PM maintainer
    - ▶ Runtime PM extended to support Power Domain hardware
- ▶ CPUIdle: CPUIdle for CPU and I/O Device Power Domains [3]
    - ▶ CPUIdle extended to coexist with PM Domains

[1] http://lwn.net/Articles/345007/
[2] http://elinux.org/images/e/e6/Elce11_wysocki.pdf
[3] https://lkml.org/lkml/2012/5/12/22