nouveau

Status Report

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Agenda

- Kernel
  - Re-architecture
- Userspace
  - Mesa
  - Xorg
- Tegra & Maxwell support
- Cooperation with NVIDIA
- Who are we?

Introduction

- Last update was at FOSDEM 2014
- Many improvements since then :)

Kernel

- New core architecture in Linux 4.3
  - Finishes the work started in Linux 3.7, when the core architecture got first introduced
- NVIF
  - Allows the userspace to access some kernel structures and functions
  - Will allow virtualization support with almost no performance impact
- Performance counters
  - Work by Samuel Pitoiset, presented right after this talk
- Reclocking support for more GPUs
- Various proposals from NVIDIA
  - Explicit handling of coherent objects (merged)
  - New submit IOCTL
  - Fixed address allocation for compute support

Mesa

- Compiler:
  - May 2014: Support for the GM107 ISA
  - June 2014: Support for the GK110/GK208 ISA
- OpenGL:
  - NV50: OpenGL 3.3 in Mesa 10.1!
  - NVC0: OpenGL 4.1 in Mesa 11!
  - Extensions:
    - NVC0: GL_AMD_performance_monitor : Exposes performance counters
- Upcoming
  - Graphics-related performance counters for Tesla, Fermi and Kepler
  - Perfkit API to expose performance counters
  - And much more!

xf86-video-nouveau

- September 2015 - Dropping support for glamor
  - Use xf86-video-modesetting instead!

Tegra Support

- GK20A (Tegra K1), released in January 2014
  - Continuous effort by NVIDIA ever since
  - March 2014: support for non-PCI(e)/AGP platforms (Linux 3.15)
  - June 2014: Initial support for 2D/3D rendering (Linux 3.16)
  - July 2014: support for manual reclocking (Linux 3.17)
  - October 2014: Mesa support
  - July 2015: FECS/GPCCS firmware merged into linux-firmware
- GM20B (Tegra X1) currently being upstreamed
  - August 2015: Basic kernel support merged (Linux 4.3)
  - Reclocking, power management in the pipe
  - Advanced features (framebuffer compression, …) also planned
  - “Secure Boot” (using signed firmware) support written
  - Signed firmware release imminent

Applications still require support to display properly on Tegra

GPU and Display Controller Formats

On dGPU, the display and render components are generally the same device. This is not the case on mobile!

- Virtually every KMS application makes this assumption (Weston, X, …)
- Render nodes are around since 2 years, let’s start using them!

Just doing that is not enough to solve the issue:

- Buffer formats supported (or not) by different HW components
- Paged or physically contiguous memory?
- Who should allocate the memory anyway?

Maxwell Support

- GM107 (Released in February 2014)
  - March 2014: Initial support for 2D/3D acceleration using NVIDIA's firmwares (Linux 3.15)
  - June 2014: 2D acceleration supported by the userspace (glamor/dri3)
  - October 2014: Fan management support (Linux 3.18)
  - April 2015: Open Source firmwares released (Linux 4.1)
  - September 2015: Voltage management support (Linux 4.3)

- GM204+ (Released in September 2014)
  - December 2014: Mode setting supported (Linux 3.19)
  - Stalled since then, waiting for the release of signed microcodes from NVIDIA

Maxwell Firmware Release

Starting with GM2XX (both desktop and mobile), FECS and PMU firmwares must be signed and loaded by a high-secure falcon. NVIDIA will provide signed firmwares and code for loading them into Nouveau:

- Submit code to load the signed firmware (working on Tegra, dGPU support in progress)
- Export the NVIDIA firmware into a proper format
- Adapt internal FW policy to public releases (until now, FW and driver closely tied together. Upstream needs a stable FW interface)

Cooperation with NVIDIA

- NVIDIA side
  - Official support of Tegra GPUs
  - Ongoing work to provide generated headers from NVIDIA internal manuals with proper register descriptions
  - Open documentation (download.nvidia.com/open-gpu-doc/)
  - Mailing-list where Nouveau developers can ask questions to NVIDIA engineers

- Nouveau side
  - Usage of NVIDIA's engineering names to avoid confusion (chipsets and engines)

We're still a long way, but hopefully cooperating better

Who are we?

Special thanks to the following Nouveau developers for their work:

- Ben Skeggs (Red Hat) - Main kernel developer and maintainer of nouveau-drm
- Ilia Mirkin - Main developer of the mesa driver, tons of fixes for drm
- And, in alphabetic order:
  - Alexandre Courbot (NVIDIA) - Tegra K1+ development and maintenance
  - Martin Peres - Power and thermal management (drm-side)
  - Samuel Pitoiset - Reverse engineering and implementation of performance counters
  - Roy Spliet and Karol Herbst - Reclocking support
  - Emil Velikov - Fixes and robustness of the mesa code
- You? We are looking for:
  - Compiler developer enthusiasts to write compiler optimisations
  - Quality Assurance contributors - Grab the code from git and test it!

Useful status links

- General news: http://nouveau.freedesktop.org/
- Video decoding: http://nouveau.freedesktop.org/wiki/VideoAcceleration/
- OpenGL status: http://mesamatrix.net/