

Project Overview

Nouveau

Open-source driver for Nvidia graphics card

Overview

- 1 Motivation
- 2 General Facts
- 3 Features
- 4 Reverse Engineering
- 5 Development
- 6 Working with Nvidia
- 7 Biggest Challenges
- 8 Links

Motivation

- How does the hardware work
- Completely open alternative
- To have fun!

General Facts

- MIT licensed
- Started in 2005
- Accepted in 2010 in Linux 2.6.33 as experimental
- Marked Stable in Linux 3.4
- NetBSD Port
- supports most Nvidia GPUs (Riva TNT up to Geforce 10 series and Tegra)
- Envytools for Reverse Engineering

- Kernel Modesetting (KMS)
- APIs
 - OpenGL 4.3 (unofficial: 4.5)
 - OpenGL ES 3.1
 - D3D9
 - XvMC
 - VDPAU
- Hwmon - Linux HW Monitoring
- Various Power Management features
- LED control!!!
- ! not all features on all GPUs

Reverse Engineering - Hardware

- MMIO register
- Engines
 - PDISP (Display Engine)
 - PGRAPH (Rendering Engine)
 - Video Engines
 - PMU
 - many more
- ISAs
 - shaders/CUDA cores
 - f μ c
- GPIO / I²C devices
 - Sensors
 - Fans
 - ...
- Tool: mmiotrace and demmio

- Describes the GPU
- Meaning of Tables
- Changing values and monitoring for runtime changes
- Guessing
- Tool: nvbios

- Nvidias
 - OpenGL
 - VDPAU (Linux API for video acceleration)
 - OpenCL

Implementation

- various Command Line Tools
- Tool: valgrind-mmt

- Object-Oriented C Code
- Implements DRM APIs (Direct Rendering Manager)
 - Display (via KMS - kernel modesetting)
 - Access from Userspace
 - Memory Management (TTM)
 - Rendering
- Hwmon
- Power Management

- package: xf86-video-nouveau
- native 2D hardware acceleration
- OpenGL can be used instead as well (via xf86-video-modesetting)

- OpenGL (ES)
 - Implementation of Gallium API
 - Implementation of new OpenGL(ES) Extensions
 - codegen (Shader Compiler)
 - SSA based backend compiler
 - optimisation passes
 - register allocation
- VDPAU
- OpenCL (WIP)
 - SPIR-V -> nv50ir
- Vulkan (TODO)

- Driver/Backend
- API
- Extensions
- Khronos CTS

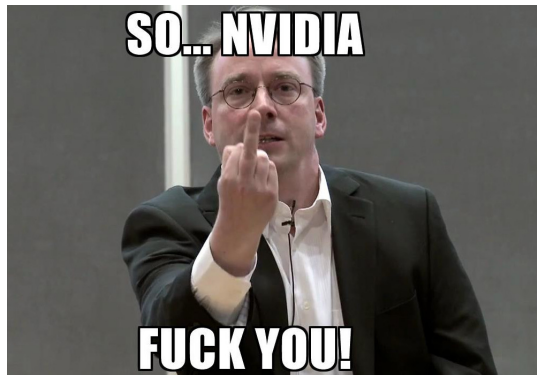
- Announced to provide Documentation for basic features
 - Some register documentation for Tegra K1
 - basic VBIOS specs needed for Displays
 - open-gpu-doc (partly helpful)
- Open-Source Android Driver (will be replaced by Nouveau)
- Help paid Nouveau developer with hardware bugs
- Paid developers for Nvidia Tegra support
- Signed firmware for Maxwell2+

Biggest Challenges

- Pass Khronos CTS for exposing OpenGL 4.4+
- Improving Performance
- Maxwell2+
 - Signed VBIOS
 - Signed Firmware
 - Required for accessing protected Registers
 - Fan control
 - Reclocking (since Pascal)
 - Tons of stuff as well (since Pascal)
 - 128 bit AES key
 - Harder REing of VBIOS and MMIO registers

Biggest Challenges

- Pass Khronos CTS for exposing OpenGL 4.4+
- Improving Performance
- Maxwell2+
 - Signed VBIOS
 - Signed Firmware
 - Required for accessing protected Registers
 - Fan control
 - Reclocking (since Pascal)
 - Tons of stuff as well (since Pascal)
 - 128 bit AES key
 - Harder REing of VBIOS and MMIO registers



- IRC Channel on freenode: `#nouveau`
- Mailing list: <https://lists.freedesktop.org/mailman/listinfo/nouveau>
- Trello Board: <https://trello.com/b/ZudRDiTL/nouveau>