Nouveau

The community & past, current and future developments

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Summary

History: NVIDIA, a new hope

- 1998(?): NVIDIA releases a Linux open-source 2D-only driver(nv)
- 1998: Obfuscation commit (release only pre-processed source)

After we already finalized XFree86-3.3.3 NVIDIA forced The XFree86 Project to replace the sources we had with sources that were partly run through the C preprocessor in order to remove some of the names that NVIDIA thought might give away IP from NVIDIA. This resulted in unreadable and unmaintainable code.

The XFree86 Project is strongly opposed to such obfuscated code. We do not regard this as free software according to our standards. Due to the extremely late date of this decision from NVIDIA we decided to include the code as offered by NVIDIA. We are considering to remove support for the later NVIDIA chips in a future release, though.

Xfree86, commit message from 11/18/98

History: The open-source strikes back

- 2005: Stephane Marchesin improves nv and works on 3D
  - Project named Nouveau after an unfortunate automatic spelling correction
  - Back-port nv updates to Nouveau
- 2008: Open Arena runs on nv40
- 2009: KMS driver based on TTM
- 2010: Merged in Linux 2.6.33
- 2010: Nv is deprecated by NVIDIA, say “use VESA”.

History: The return of the Jedi

"It's so hard to write a graphics driver that open-sourcing it would not help [...] In addition, customers aren't asking for opensource drivers."
Andrew Fear, NVIDIA software product manager, April 2006

Summary

Chipset families

- NV03: RIVA 128
- NV04: RIVA TNT/TNT2
- NV10: Geforce2/4 MX
- NV20: Geforce 3, Geforce 4 Ti
- NV30: Geforce 5/FX
- NV40: Geforce 6/7 (the first real family)
- NV50: Geforce 8/9/100/200/300 (the biggest family)
- NVC0: Geforce 400/500, AKA Fermi
- NVD9: Half-Kepler chipset

Linux module Nouveau

- Kernel Mode Setting
- Command-submission
- Resource allocation

Nouveau DDX

- EXA (2D acceleration)
- X-Video

Mesa: 3D acceleration

- Nouveau_vieux: 3D for NV04,NV10,NV20 (mesa classic)
- NVFX: 3D for the NV30,40 families (gallium)
- Nouveau: 3D for NV50,C0 families (gallium)

NV30/40 microcodes

- HWSQ: very limited use (LVDS), no flow control
- CtxProgs on nv40: Context switching

NV50 microcodes

- CtxProgs: Context-switching microcode
- HWSQ v2 (formerly PMS): memory reclocking
- nv98+ Flexible MicroCode(Fμc): a general-purpose microcode. Broad usage (PCrypt, PDaemon, Vdec, ...)

NVC0-D9

- nvc0: PGRAPH (the rendering engine) is converted to Fμc
- nvd9: some remaining engines are converted to Fμc

Summary

ModeSetting - Done

- NV04: TNT2
- NV10: Geforce2/4 MX
- NV20: Geforce 3, Geforce 4 Ti
- NV30: Geforce 5/FX
- NV40: Geforce 6/7
- NV50: Geforce 8/9/100/200/300 (the biggest family)
- NVC0: Geforce 400/500, AKA Fermi

ModeSetting - WIP

- NVD9: Partially Kepler

3D Drivers and support

- nouveau_vieux (NV04,10,20): classic mesa driver. Unsupported.
- nvfx (NV30,40): gallium driver. Works but no maintainer.
- nouveau (NV50,C0): gallium driver. Supported!

WIP

- add nvc1 support
- improve performance
- crashes with Unigine Tropics & Heaven on some chipsets

Power management

- Readings: Temperature & clocks
- vbios parsing: mostly
- setting clocks: unreliable, potentially dangerous

WIP

- nvc0: setting clocks
- nv40-d9: memory timings (almost ready)
- nv30-c0: reliable clock changes (almost ready)
- AGP/PCIE, clock gating: reverse engineering
- performance counters, dynamic reclocking: WIP

HW video decoding

- MPEG1/2: nv40-98

Why is MPEG4 hw decoding so hard?

- involves at least 4 engines
- different ISAs (Fμc, VPx)
- codecs needs to be implemented

Summary

MPEG1/2 video decoding

- using MPlayer
- Kernel-side: done
- Mesa: merged 3 days ago

Dynamic reclocking

- see clocks changing according to the load
- performance improvements in OpenArena

Summary

The nouveau community

- The largest xorg-related IRC channel
- Composed of:
  - One paid developer
  - Former developers
  - Student developers
  - Enthusiasts

The nouveau maintainer

Nouveau is maintained by Ben Skeggs(darktama):

- Hired by Red Hat in 2009
- Located in Brisbane, Australia (GMT+10)
- Works on almost everything

Gallium's nouveau maintainer

Christoph Bumiller (calim) maintains the nv50-c0 gallium driver:

- Physics master student at the University of Vienna (Austria, GMT+1)
- Main Nouveau Gallium contributor
- nv50/c0 3D support
- performance improvements

Marcin Kościelnicki (mwk)

- Polish master student at the university of Warsaw (GMT+1)
- Implemented most of the GPGPU-oriented PSCNV nouveau fork
- Reversed most of the Fermi's architecture and video decoding

Pekka Paalanen (pq)

- Finnish (GMT+2)
- Worked on mmiotraces, a register DB
- Does some communication-related work

Francisco Jerez (curro)

- Spanish Physics student (GMT+1)
- Worked on page-flipping and nouveau_vieux

Marcin Slusarz (joi)

- Polish SQL/C++/Java developer (GMT+1)
- Fixes software bugs (mesa + kernel), maintains Valgrind-MMT

Emil Velikov (xexaxo)

- Bulgarian student at the University of Nottingham (England, GMT+0)
- Reverse engineering of some PM-related vbios table
- Other PM-related implementation work
- Debugging/Testing

Roy Spliet (RSpliet)

- Dutch master student at the Delft University (GMT+1)
- Memory timings reverse engineering

Martin Peres (mupuf)

- Engineer, Ph.D. student at LaBRI (France, GMT+1)
- Reclocking process
- Thermal-zones & thermal management
- Minor reverse engineering

Maxim Levitsky (MaximLevitsky)

- Student at the Technion University of Haifa (GMT+2)
- Important reverse engineering work on reducing power consumption
- Stability-related reverse engineering
- New-comer

Maarten Lankhorst (mlankhorst)

- Netherlands (GMT+1)
- Implemented XVMC support
- Work towards an open VDPAU
- New-comer