

A love song for gamers with old GPUs

Linux support on SI, CIK GPUs

Timur Kristóf

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Linux Open-Source
Graphics Drivers Group



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AMD kernel drivers recap

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radeon (the old kernel driver)

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The good

Stable, rarely changes, supports SI, CIK well

The bad

No Vulkan, lacking display features (DP MST, scaler, atomic, ...)

The ugly

"stable"...

amdgpu (the new kernel driver)

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The good

Supports Vulkan, DC, better perf, etc.

The bad

Not feature complete

The ugly

DC bugs

amdgpu history for SI, CIK

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- amdgpu announced at XDC 2014
- CIK support since the beginning
- amdgpu mainlined in 2015
- SI support added in 2016
- DC (display driver) mainlined in 2017
- CIK DC support since the beginning
- SI DC support (DCE6) by community in 2020

SI, CLK in amdgpu

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"experimental support"

radeon.si_support=0 amdgpu.si_support=1

radeon.cik_support=0 amdgpu.cik_support=1



Why amdgpu for SI, CIK?

Why amdgpu for SI, CIK?

- Actually useful for gaming
- Vulkan
- DC (the display driver)

Why not radeon winsys in RADV?

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- Bad perf
- Code churn
- uAPI unsuitable for Vulkan
(Fixing that would turn radeon into amdgpu,
which already happened, with amdgpu)

Why amdgpu for SI, CIK?

Better invest time in improving amdgpu and DC

Why now, after all this time?

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- Why not?
- Good learning experience for kernel development
- Wider HW support means more stable drivers for everyone

A wide-angle landscape photograph taken during the "blue hour" of twilight. In the foreground, a dark, gravelly road or path leads from the bottom left towards the center. To the right of the road is a calm body of water, possibly a fjord or a lake, which reflects the colors of the sky. In the background, rugged, snow-dusted mountains rise against a deep blue sky with wispy clouds. The horizon is marked by a thin line of light from the setting or rising sun. The overall mood is serene and expansive.

What work needs to be
done?

What work needs to be done?

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CIK (GFX7)

Hawaii, Bonaire

- DC missing analog connectors
- non-DC issues with DP/HDMI audio

What work needs to be done?

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SI (GFX6)

Tahiti, Pitcairn, Cape Verde, Oland, Hainan

- DC missing analog connectors
- non-DC issues with DP/HDMI audio
- VCE1 support (Video Coding Engine)



How hard can it be?

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Let's add analog connector support to DC!

Boot with `amdgpu.dc=1` and see what happens

How hard can it be?

Let's add analog connector support to DC!

Boot with `amdgpu.dc=1` and see what happens

- Hawaii (R9 390X): DC already the default
- Bonaire (R7 260X): works, just no analog support

How hard can it be?

Let's add analog connector support to DC!

Boot with `amdgpu.dc=1` and see what happens

- Oland (R7 250): flickering
- Oland (520): "unsupported signal"
- Tahiti (R9 280X): initialization fails
- Pitcairn (R9 270X): artifacts

How to diagnose display issues

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Eg. flickering, "unsupported signal", etc. (DCE6)

```
amdgpu.dc=0
```

```
umr -r oland.dce600.* > oland_nodc.txt
```

```
reboot
```

```
amdgpu.dc=1
```

```
umr -r oland.dce600.* > oland_dc.txt
```

```
diff ...
```

How to diagnose initialization failure

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Eg. black screen on boot

```
modprobe.blacklist=amdgpu amdgpu.dc=1
```

```
ssh
```

```
dmesg -wH
```

```
modprobe amdgpu
```

```
NOT module_blacklist=amdgpu
```



Eventually, it started
working!

Eventually, it started working!

- DCE6: PLL programming fixes
- DCE6-10: Don't overclock display clock
- DCE6: interrupt fixes
- DCE6: fix DP audio
- DCE6: scaler disabled
- DCE6-10: Reject too high pixel clocks
- SI power management fixes, hook up DC
- DVI-D/HDMI adapter fixes

Eventually, it started working!

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Benefits to other GPUs

- DCE6-10: Don't overclock display clock
- DCE6-10: Reject too high pixel clocks
- DVI-D/HDMI adapter fixes
- Analog connectors on Hawaii, Tonga
- New bug reports



Mesa support

Mesa support

- RadeonSI (Gallium, OpenGL)
- RADV (Vulkan)

RADV support

Tahiti, Hawaii in CI
post-merge jobs

RADV development for SI, CIK

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- Focus on stability
- New features when feasible

RADV development for SI, CIK

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- ACO (for both RADV, RadeonSI)
- Vulkan 1.3
- Minor optimizations (eg. queue submission code)
- Bug fixes (cache flushes, IB2, etc.)

RADV development for SI, CIK

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Side note:

Troubleshooting issues on old GPUs often also reveals problems on newer GPUs.



What is this useful for?

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What is this useful for?

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- When your GPU is broken, and have an old GPU in the drawer
- When you just need to connect displays
- When you want to try Linux on an old PC
- When this is what you can afford
- Avoid e-waste
- Actually running games...?

What can the old chips do?

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These days, they are held back by small VRAM
(typically 2-3 GiB, sometimes more)

Best are: Tahiti with 6 GiB or Hawaii with 8 GiB

What can the old chips do?

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"Actual" gaming (Tahiti, Hawaii)

Playing games of their era

Some are just display cards in cheap OEM PCs.

Maybe can do retro gaming?

(they can easily overheat - heatsink is too small)



Where is the code?

Where is the code?

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- amd-staging-drm-next, mesa main
- amd-gfx mailing list
- mesa MRs

When will you get this?

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at the earliest, Linux 6.18 + mesa 25.3

- Fixes may be backported to stable
- VCE1 is still an open question



Remaining work

What still needs to be done

- Debug some GPU hangs in Mesa
- Add support for VCE1 in amdgpu
- DRM format modifiers (also for VI, Polaris)

How can you help

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- Daily drive a SI or CIK GPU
- Play games
- Report bugs, talk to us on OFTC in #radeon

Thank you guys

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I couldn't have done this without you.

- Alex Deucher, Christian König (amdgpu devs)
- Harry Wentland, Rodrigo Siquiera (DC devs)
- Marek Olsák, Pierre-Eric Pelloux-Prayer (radeonsi devs)
- Bas Nieuwenhuizen, Samuel Pitoiset (radv devs)
- Tom St Dennis (umr dev)
- Mauro Rossi (DCE6 in DC)
- Leonardo Frassetto (donated HW)
- Roman Elshin and others (testing)
- Pierre-Loup Griffais (Valve)

Thanks

Questions, suggestions, discussion?

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Timur Kristóf

Venemo @ #dri-devel, #radeon, ...

<https://timur.hu>



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