

Open drivers for Arm GPUs

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Open First

The Mali Question

- **Question:** “Open source drivers when?”
 - every Linaro Connect
- **Answer:** A year ago!



Status

- Mali ✓
- Adreno ✓
- Vivante ✓
- VideoCore ✓
- Tegra ✓

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- Tegra ✓
- Imagination ✗
- Apple ✗

The Before Times

- Downstream kernels
- Proprietary userspace
- OpenGL ES only
- No documentation
- Hardware a “guarded secret”
- Devices EOL after 5 years
- Seems like a distant memory...
 - ...we don't work that way anymore!



The Present

- Upstream-first
- Free/open source userspace
- Machine-readable architecture docs (XML)
- Long-term maintenance
- Cross-vendor collaboration
- Full (desktop) OpenGL 3.x

The Present

Open graphics isn't disrupting the status quo...



The Present

Open graphics isn't disrupting the status quo...

...we are the status quo.





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Case study: VideoCore

Before

- OpenGL ES blob with coprocessor running the show
- Initial community reverse-engineering
- Public pressure
- -> Broadcom hires Eric Anholt
- vc4 driver in Mesa for OpenGL ES 2.0



After

- OpenGL ES 3.1, OpenGL 2.1, Vulkan 1.0
- v3d, v3dv **shipping in production** (Raspberry Pi 4)
- Igalia, Broadcom, Raspberry Pi Foundation
- XML architecture description
- Conformant!





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Case study: Freedreno

Before

- OpenGL ES (later Vulkan) blob for Adreno
- Fervent reverse-engineering led by Rob Clark
 - Hobbyist, some support from Red Hat (employer)
 - Some OpenGL ES in Mesa...

After

- OpenGL ES 3.2[*], OpenGL 3.3, Vulkan 1.0
- Led by Google
 - Googlers: Rob, Eric, Kristian Høgsberg...
 - Significant work from Valve, Igalia
- **Freedreno shipping in production Chromebooks**
- We don't need Qualcomm blobs!





Case study: Panfrost

Before

- OpenGL ES (later Vulkan) blob for Mali
- Reverse-engineering: Connor Abbott and myself
 - Some OpenGL ES in Mesa...
 - (A familiar story...)

After

- OpenGL ES 3.0, OpenGL 3.1, and counting
- Led by Collabora (Boris Brezillon and myself)
- Q3'20: “**Arm** are now working together with Collabora to provide us with... **documentation**”
- We don't need reverse-engineering!
- Mali T760+, G71+ well-supported
- Shipping in the-- Pinebook Pro? :-)



Vulkan?

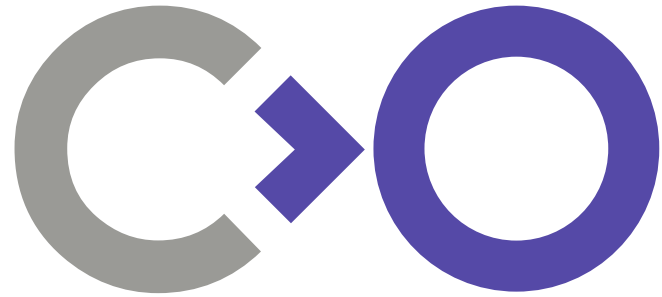
- We can be a serious driver too :-)





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Demo



Thank you!



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