

Graphics: GNOME Meets Panfrost, Rob Clark, and More on Radeon Navi

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Created 27/06/2019 - 5:43am

Submitted by Roy Schestowitz on Thursday 27th of June 2019 05:43:16 AM Filed under [Graphics/Benchmarks](#) [1]

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Bring-up of GNOME required improving the driver's robustness and performance, focused on Mali's tiled architecture. Typically found in mobile devices, tiling GPU architectures divide the screen into many small tiles, like a kitchen floor, rendering each tile separately. This allows for unique optimizations but also poses unique challenges.

One natural question is: how big should tiles be? If the tiles are too big, there's no point to tiling, but if the tiles are too small, the GPU will repeat unnecessary work. Mali offers a hybrid answer: allow lots of different sizes! Mali's technique of "hierarchical tiling" allows the GPU to use tiles as small as 16x16 pixels all the way up to 2048x2048 pixels. This "sliding scale" allows different types of content to be optimized in different ways. The tiling needs of a 3D game like SuperTuxKart are different from those of a user interface like GNOME Shell, so this technique gets us the best of both worlds!

Although primarily handled in hardware, hierarchical tiling is configured by the driver; I researched this configuration mechanism in order to understand it and improve our configuration with respect to performance and memory usage.

Tiled architectures additionally present an optimization opportunity: if the driver can figure out a priori which 16x16 tiles will definitely not change, those tiles can be culled from rendering entirely, saving both read and write bandwidth. As a conceptual example, if the GPU composites your entire desktop while you're writing an email, there's no need to re-render your web browser in the other window, since that hasn't changed. I implemented an

initial version of this optimization in Panfrost, accumulating the scissor state across draws within a frame, rendering only to the largest bounding box of the scissors. This optimization is particularly helpful for desktop composition, ideally improving performance on workloads like GNOME, Sway, and Weston.

- [MSM DRM Adding Snapdragon 835 / Adreno 540 Support In Linux 5.3](#) [4]

Freedreno founder Rob Clark, who is now employed by Google to work on open-source graphics, has sent in the batch of MSM Direct Rendering Manager driver changes to DRM-Next ahead of the Linux 5.3 kernel cycle.

Notable to this feature update is Adreno 540 / Snapdragon 835 support. The Snapdragon 835 has been out since 2016 and has also been found in some of the Snapdragon laptops. The Adreno 540 supports Vulkan 1.1, OpenGL ES 3.2, and its quad-core GPU runs at 710/670MHz with 512 ALUs, 16 TMUs, and 12 ROPs.

- [Radeon Navi Support Pending For RadeonSI OpenGL Driver With 47k Line Worth Of Changes](#) [5]

Last week AMD posted more than 400 patches providing the AMD Navi support within their AMDGPU DRM kernel driver while this week has brought dozens of patches amounting to 4,293 lines as a patch for their RadeonSI Gallium3D driver in order to provide OpenGL support on these next-gen GPUs being introduced next month as the Radeon RX 5700 series.

Well known AMD open-source developer Marek Olšák posted the Mesa patches yesterday for providing this initial Navi (10) support to Mesa. As is the case, AMD's Navi enablement is focused on the RadeonSI Gallium3D driver and not the unofficial/community driven RADV Radeon Vulkan driver also within Mesa. The RADV Navi support will be left up to those "community" contributors from the likes of Red Hat, Google, and yes the independent community members.

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