On-going challenges in the Raspberry Pi driver stack

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Raspberry Pi 5!

- V3D 7.1.6, same VideoCore architecture.
- Higher clock rate, up to 8 RTs, better support for subgroup operations, better instruction-level parallelism (but a bit more register pressure!), ...
- Driver code merged into existing v3d and v3dv drivers in Mesa and Kernel. Upstreaming in progress.
- Same high-level feature support as Raspberry Pi 4:
  - Conformant OpenGL ES 3.1 and Vulkan 1.2 (with some bonuses).
  - Non-Conformant OpenGL 3.1 (more on this later).

CPU job handling in Vulkan

- Recap from XDC22:
  - Some aspects of command buffer execution need to execute in the CPU.
  - Required GPU flushes and CPU stalls.
  - Disallowed SYNC_FD exports.

CPU job handling in Vulkan

- Some jobs could be implemented in the GPU using compute (e.g. events).
- For things that really required CPU execution (e.g. timestamp queries), we created a new CPU kernel queue.
  - Allows CPU job execution using same sync infrastructure as for GPU jobs: no more stalls and flushes in user-space.
  - SYNC_FD exports now available.

OpenGL 3.1

- Not supported by hardware specs, won’t be conformant...

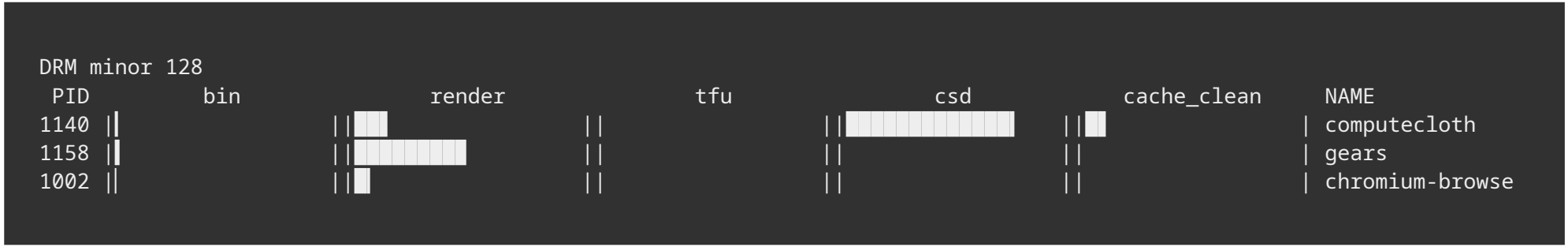
  ...but we can support a very large subset of the required feature set.
- Important for quality of life on Raspberry Pi platform: most apps target desktop OpenGL instead of OpenGL ES.
- Implemented all missing features to get Mesa to expose OpenGL 3.1.
- Multiple bugfixes for OpenGL 3 features from Piglit and CTS tests.

OpenGL 3.1

- Mostly piglit failures
  - New extensions disclosed (tests go from skip to pass/fail)
  - Missing features (as we know right now)
    - 8 RT (Fixed in Raspberry Pi 5, but everyone lying 🙃)
    - Missed required formats (*R{GBA}16*)
    - Non-seamless texture cubemap filtering

Global GPU stats

- Expose the GPU stats per file and globally.
- Due to hardware limitations, we used *local_clock()* to calculate the accumulated amount of active time.
- Use of the standard DRM client usage stats to expose the GPU stats per file.
- Use of sysfs to expose the global GPU stats.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bin
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csd
cache_clean
NAME
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computecloth
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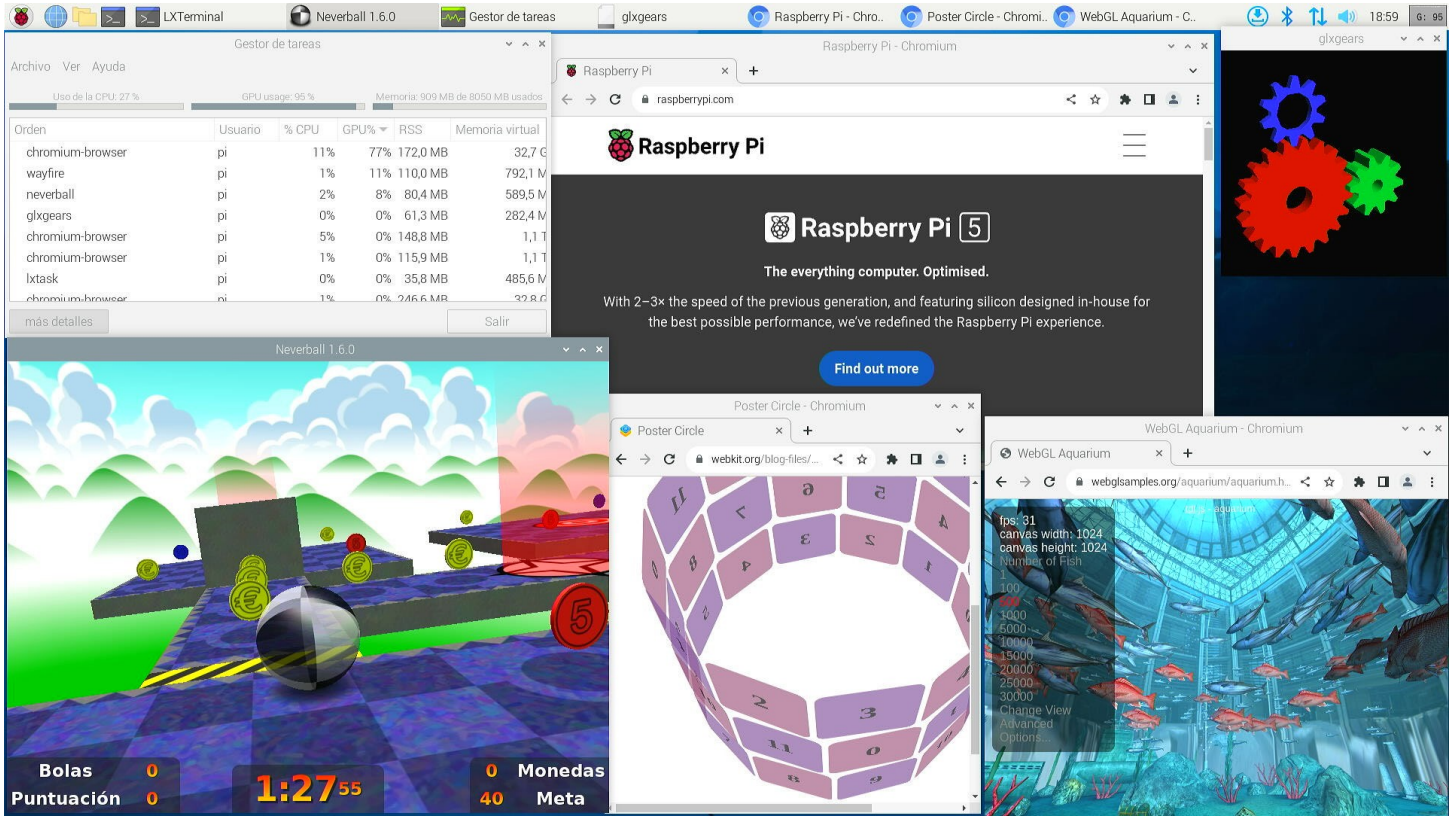
gears
1002
chromium-browse


LXTerminal
Neverball 1.6.0
Gestor de tareas
glxgears
Raspberry Pi - Chro..
Poster Circle - Chromi..
WebGL Aquarium - C..
18:59
Gestor de tareas
Archivo Ver Ayuda
Orden Usuario % CPU GPU% RSS Memoria virtual
chromium-browser pi 11% 77% 172,0 MB
wayfire pi 1% 11% 110,0 MB
neverball pi 2% 8% 80,4 MB
glxgears pi 0% 0% 61,3 MB
chromium-browser pi 5% 0% 148,8 MB
chromium-browser pi 1% 0% 115,9 MB
lxtask pi 0% 0% 35,8 MB
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glxgears
Neverball 1.6.0
Bolas 0
Puntuación 0
1:27 55
0 Monedas
40 Meta
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WebGL Aquarium - Chromium
webglsamples.org/aquarium/aquarium.h...
fps: 31
canvas width: 1024
canvas height: 1024
Number of Fish
Change View
Advanced Options...

Q&A

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