

Year of Turnip

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Since XDC Last Year

- ~586 MRs merged
- Wide variety of changes
 - New device support (both new and old devices)
 - Extension required for D3D12 emulation
 - Tons of fixes
 - Improved debug tooling
 - Improved CI
- Also ...

Turnip shipped on Steam Frame



Highlight of the contributors

- Connor Abbot
- Danylo Piliaiev
- Dhruv Mark Collins
- Emma Anholt
- Job Noorman
- Karmjit Mahil
- Rob Clark
- Valentine Burley
- Žan Dobersek
- And many more!

Some Big Milestones

Improved desktop games

- Sparse binding and residency for feature level 12.0 ([!32533](#), [!32671](#), ...)
- `tu_enable_texel_buffer_emulation` and `tu_enable_ssbo_emulation` as D3D12 allows accessing those with more than `1 << 27` elements ([!41477](#))
 - Fixed games like "Spider-Man Remastered", "Ratchet & Clank: Rift Apart", and a lot of UE5 games
 - [Danylo's blog on the many UE5 fixes](#)
- Driconf option to override uncached allocations as cached ([41323](#)).
- Many more fixes and improvements

Autotuner Rewrite

- Completely overhauled by Mark (!37802).
- New and more refined algorithms:
 - BANDWIDTH
 - PROFILED
- Ongoing refinements to improve the algorithms even further
- Preemption latency mitigation
 - Critical for responsiveness during VR workloads
 - Otherwise VR compositor can miss presentation deadlines

FDM Rendering

- Connor covered this extensively earlier in the day

Concurrent Binning

- Very complex feature that is supposed to improve performance by filling in bubbles in the pipeline
 - Overlap current renderpass binning with previous renderpass(es) rendering/binning
- After implementing it and benchmarking, it actually regressed performance for desktop games
- Disabled by default now ([!41394](#))



Gen8 Support

- Qualcomm's Open Source team brought up initial gen 8 support
 - Refactoring to device tables for gen8 support ([!38515](#))
 - Initial support of Kaanapali/Glymur devices with ([!39167](#))
- Turnip running on several Gen8 Gpus [A810](#), [A829](#), [A830](#), A840
- KgsI UBWC 5 and 6 support ([!40758](#))

Shader cache compatability

- Must be compatible between different builds: AArch64 and x86 (in Proton)
- Reworked the shader cache to avoid unnecessarily invalidating the cache (!43051)
- `tu-build-id` was added as a build option (!41954)
- Reproducible shader assembly between x86 pre-compiled shaders and Aarch64 (!42132, !43051)

Enforce argument evaluation order for builder functions

- Problem:

```
ir_builder(b, ir_builder_a(), ir_builder_b());  
# GCC has different order of execution of ir_builder_a and ir_builder_b
```

- Our solution [!42132](#) is to automatically add special macro to all such builders:

```
#define ir_builder(...) MESA_CALL_WITH_LTR_ARGS(ir_builder, __VA_ARGS__)  
nir_def *_ir_builder(nir_builder *b, nir_def *a, nir_def *b);
```

Match FP constant folding between x86 and ARM

- Issue affects minority of shaders
- **!42157** - Tweaks floating point arithmetic until there is a match between X86 and ARM.
- Other suggestion from Job is to use SW floating point for folding
 - Performance needs to be tested.

Android

- Vulkan conformance on A610 **on Android**
 - First Mesa driver to be conformant on Android
- Valentine added a second emulated graphics queue for SkiaVK/HWUI (MR **!41924**)
- Added CI job for Android + Arm64 + Turnip (MR **!41440**)
- Others worked to enabling Turnip on AOSP **!41518**

CI & Tooling

- Many perfetto fixes & improvements
- Martin added a new a750_vk pre merge pipeline
 - Extensively test on real a750 hardware
 - Pre-merge to catch bugs before they are merged upstream

- These are only some highlights
 - Tons of fixes to LRZ
 - Tons of GPU hang fixes

Discussion

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