Status of the Vulkan Video ecosystem

Charlie Turner
XDC, A Coruña, October 2023
Recap

- A vendor and platform agnostic, stateless, video acceleration API.
- Offers fine-grained control over video processing & scheduling.
- Distribution of stream processing across CPU cores and codec hardware.
- Seamless integration with Vulkan graphics and presentation.
- Application portability from small embedded systems to high performance servers.
- Video texturing, generative models, DLSS, NRD denoising, streaming, post-processing, light fields, XR, ...
2022 was the year of the codec-independent APIs, as well as finalizing the AVC & HEVC decode extensions. Going into 2023 the TSG had a good foundation for future work.

AVC/HEVC have been the initial focus simply due to market share. AV1 and VP9 are on the roadmap.

The CTS was problematic, bitstream parsing is tricky.
  ○ Igalia have tidied this initial version up, and extended the test coverage for AVC and HEVC.

2023's focus has been on finalizing encode APIs for AVC and HEVC, as well as working on other video extensions.
Progress

Status of the Vulkan Video ecosystem
Charlie Turner, 18th October 2023

NVIDIA Sample App
FFmpeg Vulkan
FFmpeg VA-API

Sintel Decode AVC High 1280x546

FPS

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Drivers (decode)

- **AVC/HEVC**
  - `anv` - passing CTS
  - `radv` - nearly passing CTS, just interleaved sessions failing
  - NVIDIA/AMD Pro - passing CTS

- **AV1 Mesa vendor extension**
  - `radv` - 270/275 pass rate on Fluster
  - The KHR version is cooking.
Community

● FFmpeg v6.1
  ○ Released earlier this year with Vulkan Video support for AVC, HEVC and AV1.
  ○ Thank you Lynne!

● GStreamer
  ○ AVC decode hopefully will land in v1.24. MR open since May 2023.
  ○ AVC+HEVC encode is WIP
  ○ Thank you Victor & Stéphane from Igalia!

● WickedEngine: https://wickedengine.net/2023/05/07/vulkan-video-decoding/
Future work

- AV1 KHR, VP9.
- Creating libraries to ease the use of the extension.
- Android declares the extension incompatible
  "[C-1-11] MUST NOT enumerate support for the
  VK_KHR_video_queue, VK_KHR_video_decode_queue, or
  VK_KHR_video_encode_queue extensions."
- And much more!
References

- An concise and Vulkan Video specific overview of video compression topics covering essential background information for working with the extension https://www.rastergrid.com/blog/multimedia/2021/05/video-compression-basics/

- Official Khronos blog post introducing the extension https://www.khronos.org/blog/an-introduction-to-vulkan-video

- Vulkanized 2023: A deep dive into Vulkan Video https://www.youtube.com/watch?v=R5x6_nBRrv4

- https://github.com/nvpro-samples/vk_video_samples

- "Video decoding in Vulkan: A brief overview ofbVK_KHR_video_{queue,decode}" - https://www.youtube.com/watch?v=uvz1GJ8A6ZM