Status of the Vulkan Video ecosystem

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igalia

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, ...

Progress

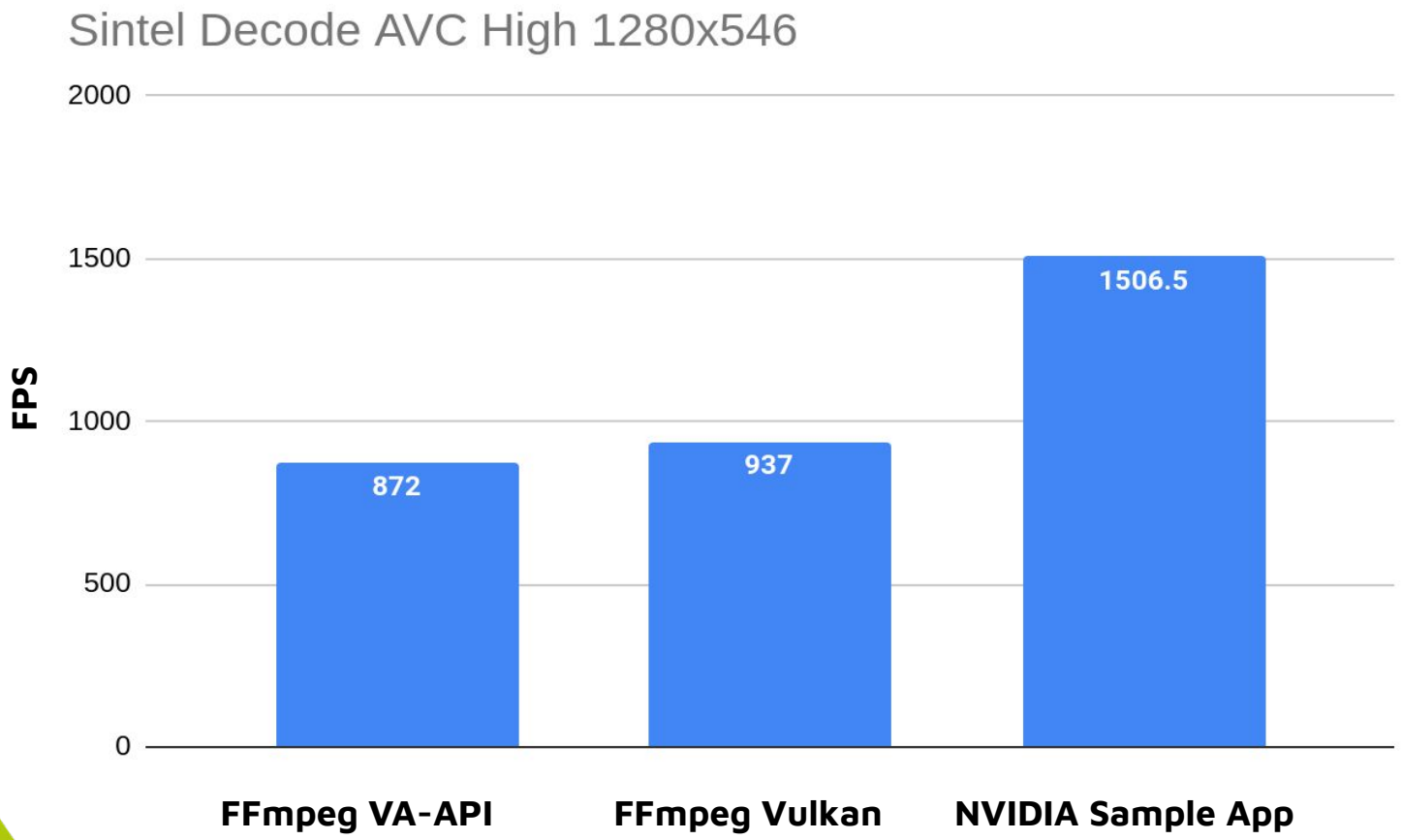
- 2022 was the year of the codec-independent APIs, as well as finalizing the AVC & HEVC decode extensions. Going into 2023 the TSG had a good foundation for future work.

- 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



4.2 ms / frame 2160p

1.2 ms / frame 1080p

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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