



Vulkan Update
Kristofer Rose, The Khronos Group



Vulkanised 2019
#Vulkanised

The Khronos Group

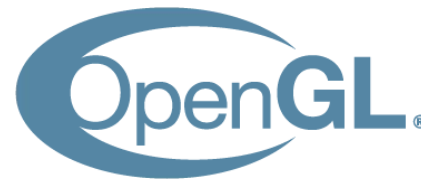
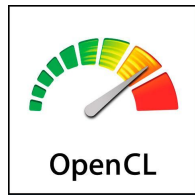
- Over 140 industry leading members
- Open to all companies
- Open, royalty free standards with a robust IP framework
- Individual standards developed & maintained by “Working Groups”



Standards... standards everywhere...



KHRONOS
SAFETY CRITICAL
ADVISORY FORUM





Vulkan 1.1 Ecosystem Evolution

Strengthening Tools and Compilers

- Improved developer tools (SDK, validation/debug layers)
- More rigorous conformance testing
- Shader toolchain improvements (size, speed, robustness)
- Shading language flexibility - HLSL and OpenCL C support

Building Vulkan's Future

- Listen and prioritize developer needs
- Drive GPU technology

Released Vulkan 1.1 Extensions

<https://www.khronos.org/registry/vulkan/specs/1.1-khr-extensions/html/vkspec.html#extension-appendices-list>

Roadmap Discussions

- Reduced precision arithmetic types in shaders
- Detailed driver property queries
- New synchronization primitives
- Memory residency management
- Cross-vendor performance counter queries
- Variable-resolution rendering
- Ray tracing
- Video processing
- Inferencing

Vulkan 1.0 Extensions

Maintenance updates plus additional functionality

- Multiview
- Multi-GPU

- Enhanced Windows System Integration
- Increased Shader Flexibility:
 - 16 bit storage, Variable Pointers
- Enhanced Cross-Process and Cross-API Sharing



March 2018
Vulkan 1.1

Integration of 1.0 Extensions
plus new functionality
e.g. Subgroup Operations

Widening Platform Support

- Pervasive GPU vendor native driver availability
- Open source drivers - ANV (Intel), AMDVLK/RADV (AMD)
- Vulkan Portability to macOS/iOS and DX12



February 2016
Vulkan 1.0

One API to rule them all

Modern architecture | Low overhead | Multi-thread friendly
EXPLICIT GPU access for EFFICIENT, LOW-LATENCY,
PREDICTABLE performance



Non-proprietary, royalty-free open standard 'By the industry for the industry'
Portable across multiple platforms - desktop and mobile

Google Stadia

- AAA Cloud Based Gaming
- Custom AMD GPU
- Vulkan 1.1
- Linux based servers
- Excellent talk from Ubisoft Montreal on Stadia & Vulkan: <https://khr.io/odyssey>



Game Engines

Most modern engines have Vulkan rendering paths



Vulkan AAA Content Shipping on Desktop...

Vulkan AAA Titles on PC



AAA titles on Linux

macOS, SteamOS and PC



...and Mobile



Plus...

Lineage 2 Revolution

Heroes of Incredible Tales

Dream League Soccer...



CODEMASTERS®



Vulkan Apps Shipping On Apple with MoltenVK



Forsaken Remastered was just updated with **Vulkan** support! If you're on Linux, you're probably hitting 60fps with the existing OpenGL renderer, but it's good to be future proof. If you're on a Mac, though, you *definitely* want to switch. On my MacBook, the framerate goes from around 15 to a solid 60!

Initial Vulkan Performance On macOS With Dota 2 Is Looking Very Good

Written by Michael Larabel in Valve on 1 June 2018 at 05:37 PM EDT. 34 Comments



Yesterday Valve released Vulkan support for Dota 2 on macOS. Indeed, this first major game relying upon MoltenVK for mapping Vulkan over the Apple Metal drivers is delivering performance gains.



DOTA 2



ARTIFACT

Valve Releases Artifact As Its Cross-Platform, Vulkan-Powered Digital Card Game

Written by Michael Larabel in Valve on 28 November 2018 at 04:16 PM EST. 29 Comments



Valve managed to ship their latest game today as planned and without any major delays.

Artifact is now available with launch-day support for Linux, macOS, and Windows. Artifact is a competitive digital card game, game is targeting Dota 2 players as well as card gaming enthusiasts. Valve still plans to evolve Artifact and its gameplay mo

We listen!

- **New Extensions and Features**
- **New Vulkan SDK donated by LunarG**
- **Nvidia Nsight Vulkan Support**
- **Education Survey**
- **Developer Relations**

Recently released extensions

VK_KHR_8bit_storage

VK_KHR_create_renderpass2

VK_KHR_depth_stencil_resolve

VK_KHR_draw_indirect_count

VK_KHR_get_display_properties2

VK_KHR_shader_atomic_int64

VK_KHR_surface_protected_capabilities

VK_KHR_swapchain_mutable_format

VK_KHR_vulkan_memory_model

VK_EXT_depth_clip_enable

VK_EXT_filter_cubic

VK_EXT_fragment_density_map

VK_EXT_full_screen_exclusive

VK_EXT_host_query_reset

VK_EXT_separate_stencil_usage

VK_EXT_transform_feedback

VK_EXT_validation_features

VK_EXT_vertex_attribute_divisor

VK_EXT_ycbcr_image_arrays

Extension Spec

<https://KHR.io/vkext>

Useful Learning Materials

Vulkan Spec, Khronos Group - Everything - <https://KHR.io/vkspec>

Khronos YouTube Channel - www.KHR.io/youtube

Vulkan Tutorial, Alexander Overvoorde - www.vulkan-tutorial.com

Sascha Willems Tutorials & Samples - <https://KHR.io/sascha>

2019 Developer Relations Plans

- Creating a unified location for Samples
- Reviewing and refreshing samples
- Vulkan website refresh
- Consolidating learning resources and identifying missing areas
- Increased collaboration with members and active developers on Vulkan blogs, case studies & tutorials
- Shouting about tools, drivers etc.

Join our Slack!

- A place for the developer community
- Over 700 users
- Including active Khronos members
- Ask for help!
- Help others!
- Raise a bug or issue
- Discuss announcements & releases
- Let us know how we are doing



www.khr.io/slack

Today's Schedule

- 10:15 - 11:00 – Vulkan: Live Long and Optimise (Michael Parkin-White and Calum Shields, Samsung Electronics)
- 11:00 - 11:30 – Break
- 11:30 - 12:15 – Vulkan Best Practices for Mobile Developers (Attilio Provenzano, Arm)
- 12:15 - 13:15 – Lunch
- 13:15 - 13:45 – SPIRV-Cross: Taking SPIR-V to the next level (Hans-Kristian Arntzen, SPIRV-Cross)
- 13:45 - 14:15 – Cross-Process Sharing and Direct Mode with Vulkan (Jakob Bornecrantz, Collabora)
- 14:15 - 14:45 – Break
- 14:45 - 15:30 – Optimising a AAA Vulkan Title on Desktop (Lou Kramer, AMD)
- 15:30 - 16:30 – Panel discussion:
Exploring the challenges and opportunities of cross-platform GPU standardisation
Panellists: Alex Smith (Feral Interactive), Hans-Kristian Arntzen (SPIRV-Cross), Jan-Harald Fredriksen (Arm), Lou Kramer (AMD)
Moderator: Alon Or-bach, Samsung Electronics
- 16:30 – Close – Buses leave to go to the [Cambridge Beer Festival](#) for more discussion including a Vulkan pub quiz (and beer!)
- 17:00 – Regroup in the Arm/Khronos marquee at the Beer Festival
- 17:30 – Vulkan Pub Quiz at the Beer Festival



Thank you!

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