

Vulkanised 2024

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MoltenVK and Vulkan Portability Update

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**Portable access to layered
Vulkan functionality**

Vulkan Portability

Portable access to layered Vulkan functionality

<https://github.com/KhronosGroup/Vulkan-Portability>

Encourage layered Vulkan functionality implementations

Enabling Vulkan applications on platforms without native drivers

Khronos Portability Extension

Portable queries for functionality not available through Vulkan layering

Vulkan Conformance Test Development

Handle partial functionality to enable Vulkan Portability conformance

What is present must work!

Enhanced Vulkan SDK, Layers and Tools

Validation and Profile Layers flag or simulate queries for non-present features



Open-Source Layering Projects

Fighting Platform Fragmentation



<i>Layers Over</i>	Vulkan	OpenGL	OpenCL	OpenGL ES	DX12	DX9-11
Vulkan		Zink	clspv + clvk	Angle	vk3d-Proton vk3d	DXVK WineD3D
OpenGL	Ashes			Angle		WineD3D
DX12	Microsoft Dozen	Microsoft 'GLOn12'	Microsoft 'CLOn12'			Microsoft D3D11On12
DX11	Ashes			Angle		
Metal	MoltenVK		clspv + SPIRV-Cross?	MoltenGL Angle		

Vulkan as porting target for multiple APIs

ROWS: Bring more APIs to Platforms

Vulkan functionality available everywhere

COLUMNS: Making APIs available across platforms

Current Vulkan Portability Activities

- MoltenVK Vulkan 1.0 CTS: 195,805 pass / 285 fail (0.15%)
- Reach zero CTS failures for Vulkan 1.0
 - VK_KHR_portability_subset_metal (replaces VK_KHR_portability_subset)
 - Widen CTS thresholds
 - CTS Waivers for Metal bugs
 - MoltenVK/SPIRV-Cross fixes
- Finalize VK_KHR_portability_subset_metal extension
 - Focus on extension per platform, with Metal first.
 - Deprecate general provisional multi-platform VK_KHR_portability_subset
- Vulkan samples available on iOS and macOS
 - Using Loader and conformant Profiles Layers wherever possible

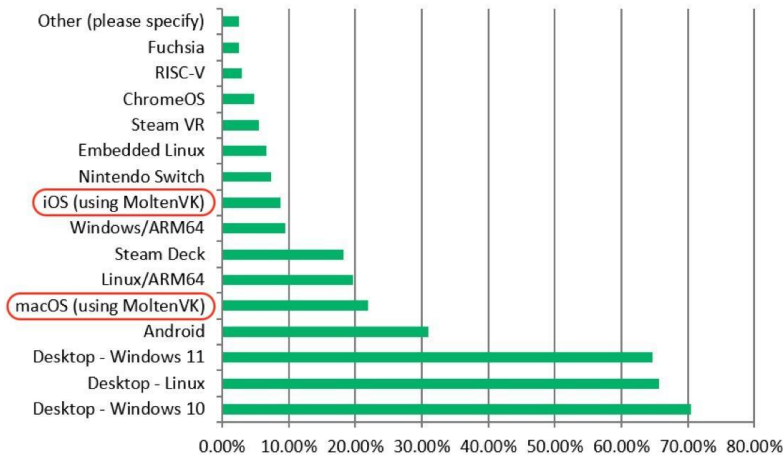




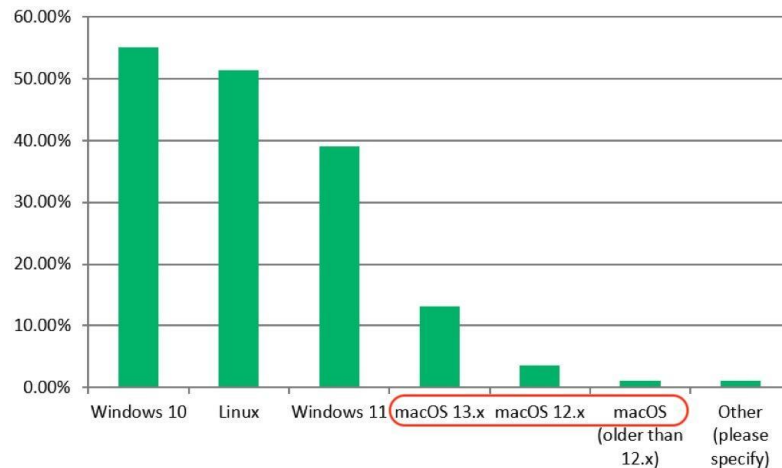
MoltenVK

Vulkan over Metal

Apple platform interest from 30+% of devs



Vulkan Runtime Platforms
(LunarG 2023 Developer Survey)



Vulkan Development Platforms
(LunarG 2023 Developer Survey)

macOS Vulkan SDK about 5,800 downloads per week.
Currently growing faster than other platforms.

Who's Using MoltenVK?

Testing 15 games with MoltenVK support

<https://youtu.be/xDGQcjqpYqI>

• Games shipping with MoltenVK:

- DOTA 2
- Metro Exodus
- Final Fantasy XIV
- Dark Souls: Remastered
- Dark Souls III
- DOTA Underlords
- Aerofly Flight Simulator 2
- Path of Exile
- Raft
- The Elder Scrolls Online
- Celeste
- Transport Fever 2
- Shadow Warrior 2
- Streets of Rage 4
- Jupiter Hell
- Wreckfest
- Victoria 3
- Artifact
- GZDOOM
- vkQuake & vkQuake2

• Games runnable by users via Crossover and MoltenVK:

- Halo: Combat Evolved
- God of War (2018)
- Grand Theft Auto V
- World Of Tanks
- Forsaken Remastered
- Elder Scrolls V Skyrim: SE
- Guild Wars 2
- Battlefield 1
- Battlefield II
- Age of Empires II: Definitive Edition
- Witcher 3

• Applications shipping with MoltenVK:

- Autodesk Fusion 360
- Autodesk Flame

• Engines using MoltenVK:

- Google Filament
- Facebook IGL
- LightweightVK
- Ultra Engine
- Diligent Engine
- Blender Vulkan (PoC)
- Defold
- Clausewitz Engine (Paradox)
- ncn

• Platform emulators using MoltenVK:

- VKD3D (Direct3D 12)
- DXVK (Direct3D 9/10/11)
- Google Android Emulator
- Dolphin (Wii & GameCube)
- Cemu (Wii U)
- Ryujinx (Switch)
- Citra (Nintendo 3DS)
- RPCS3 (PS3)
- PCSX2 (PS2)

MoltenVK Status

- Supports Vulkan 1.2 + extensions
 - Five Vulkan extensions remaining
- Developers can use Vulkan SDK on macOS
 - Deploy onto macOS, iOS, & tvOS
- Coming soon in priority order
 - Optional build support for private Metal APIs (eg. Wide lines)
 - Not available for App Store distribution
 - VK_KHR_maintenance4
 - CTS failure reduction for Vulkan 1.0 Portability conformance
 - Improved functionality/performance for bindless resources via Metal 3 argument buffers
 - VK_EXT_descriptor_buffer
 - Vulkan 1.3 (5 extensions left)
 - Transform Feedback
 - Vulkan Acceleration Structures (initial ray tracing)
 - Faster pipeline caching with Metal Binary Archives
 - CTS failure reduction for Vulkan 1.2 Portability conformance

MoltenVK Vulkan 1.3 Support

Extension	MoltenVK Support	Status Notes
VK_KHR_copy_commands2	✓	
VK_KHR_dynamic_rendering	✓	
VK_KHR_format_feature_flags2	✓	Added (#2108)
VK_KHR_maintenance4		In Dev (#2116)
VK_KHR_shader_integer_dot_product	✓	Added (#2119)
VK_KHR_shader_non_semantic_info	✓	
VK_KHR_shader_terminate_invocation		
VK_KHR_synchronization2	✓	Added (#2021)
VK_KHR_zero_initialize_workgroup_memory		
VK_EXT_4444_formats	✓	
VK_EXT_extended_dynamic_state	✓	Added (#2036)
VK_EXT_extended_dynamic_state2	✓	Added (#2036)
VK_EXT_image_robustness	✓	
VK_EXT_inline_uniform_block	✓	
VK_EXT_pipeline_creation_cache_control	✓	
VK_EXT_pipeline_creation_feedback	✓	
VK_EXT_private_data	✓	
VK_EXT_shader_demote_to_helper_invocation	✓	
VK_EXT subgroup_size_control	✓	
VK_EXT_texel_buffer_alignment	✓	
VK_EXT_texture_compression_astc_hdr	✓	
VK_EXT_tooling_info		
VK_EXT_ycbcr_2plane_444_formats		

MoltenVK Resourcing

- Open-source project with a small team
- Targeted funding from MoltenVK users
 - Improve MoltenVK functionality and conformance
 - Better support for Android Emulator & other apps
 - Exploring ray-tracing funding
- Smaller contributions from other users
- Additional funding & contributions always welcome!

