Vulkan SDK Update

Siggraph Asia 2024 - Tokyo

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LunarG, Inc

About Me

- Been at LunarG for 2+ years
- Vulkan Validation Layer tech lead
- Previously lived in Japan for 2 years
  - Now located permanently back in the USA
- Active member of Vulkan Working Group
- Help maintain various other parts of ecosystem
  - Vulkan-Guide
  - SPIRV-Visualizer
  - SPIRV-Guide
  - SPIRV-Reflect

What drives the Vulkan ecosystem?

What drives the Vulkan ecosystem?

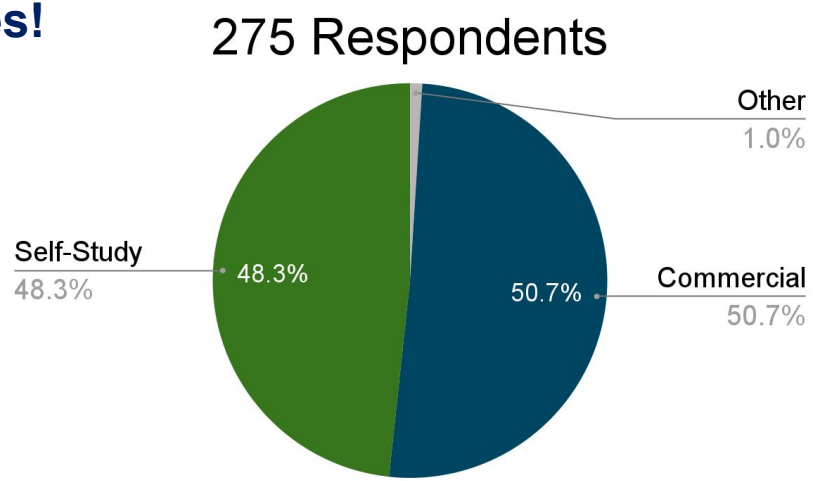
All of you!

Vulkan Developer Ecosystem Survey

Helps drives LunarG Ecosystem Priorities!

What we heard -

- Shader tool chain - needs dev & maintenance
  - 60%+ glsl -> SPIR-V
  - 20% use DXC
- Validation Layers
  - Increase coverage
  - Readability / interpretation of error messages
  - Improve performance
- MoltenVK
  - Move forward faster
- Difficult Tasks
  - Identifying driver defects
  - Debugging layer issues
  - Debugging install & configuration issues



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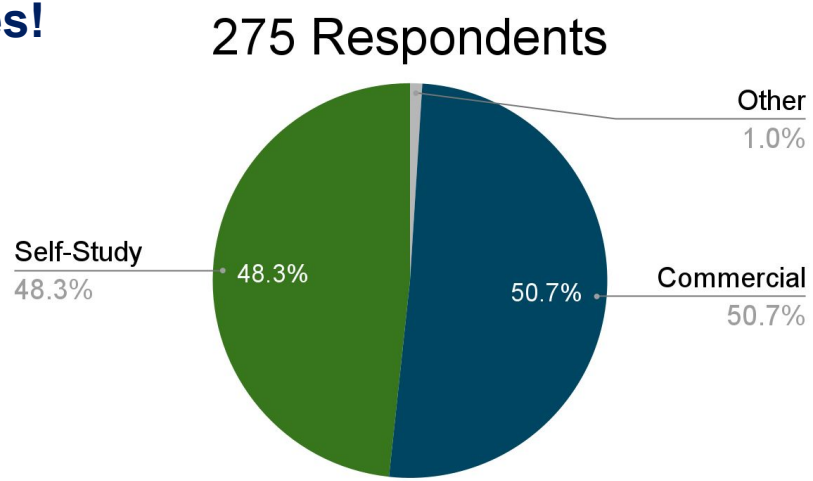

2025 Ecosystem Survey Coming in February!

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Windows

Windows On arm

The Vulkan SDK

Vulkan Loader	vkconfig	Validation Layer	vulkaninfo	
SPIR-V Optimizer	SPIR-V Tools	slang	Crash Diagnostic Layer	Emulation Layers
shaderc	SPIR-V Validator	Profiles Toolset	GPUInfo	VOLK
DXC	SPIR-V Reflect	apidump	GFX Reconstruct	VKVIA
SPIR-V Cross	glslang	Vulkan-HPP	Screenshot	VMA
MoltenVK	SPIR-V Visualizer	SDL	Monitor	GLM

Delivered by LunarG in close coordination with the Khronos Vulkan working group

Benefits

- Pre-built
- Curated
- Integrated
- System Installation
- vkconfig ready for use
- License Registry

SDK Enhancements in 2024

2024

- Addition of Slang compiler (beta)
- Crash Diagnostic Layer
- Windows 11 on ARM Vulkan SDK
- Synchronization validation for Timeline Semaphore
- iOS support added to macOS Vulkan SDK
- Profiles enhancements
- VP_KHR_roadmap_2024
- VK_EXT_layer_settings API

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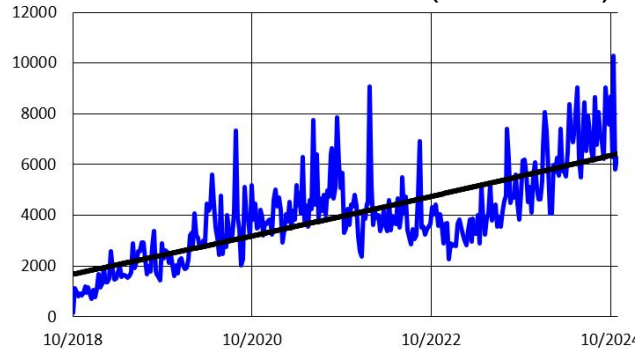
Coming in January

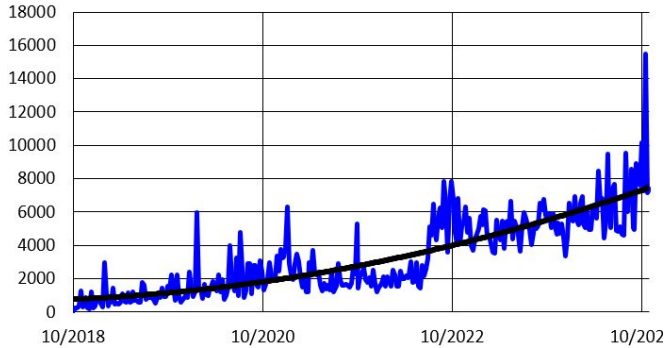
- Vulkan 1.4 support
- vkconfig3
- Automatic update of the Vulkan Runtime (Loader) with the Windows Vulkan SDK installation

SDK Downloads

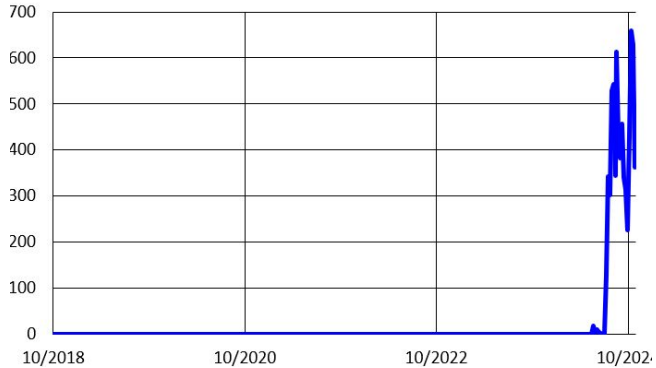
Linux SDK (~6000/wk)



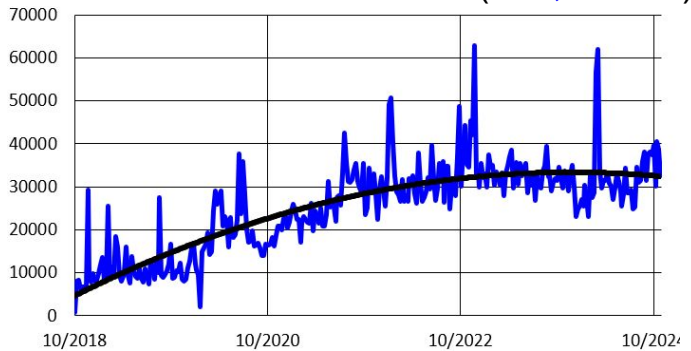
Mac SDK (~6000/wk)



Windows 11 on ARM SDK



Windows x86 SDK (~31,000/wk)



Trends -

- Win x86 - Plateau
- Linux - Slowing
- Mac - Growing
- Win ARM - Too early

★ Polynomial trendlines due to large fluctuations

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Updates for some of the Vulkan SDK components

GFXReconstruct

Key Results

- Can now get draw resources for showing intermediate results
- Can now share initialization data among multiple captures in one session to reduce file sizes
- Experimental OpenXR branch

Needs Work

- Capture overhead improvement
- Android functionality and stability
- Ray-tracing support

Validation Layers

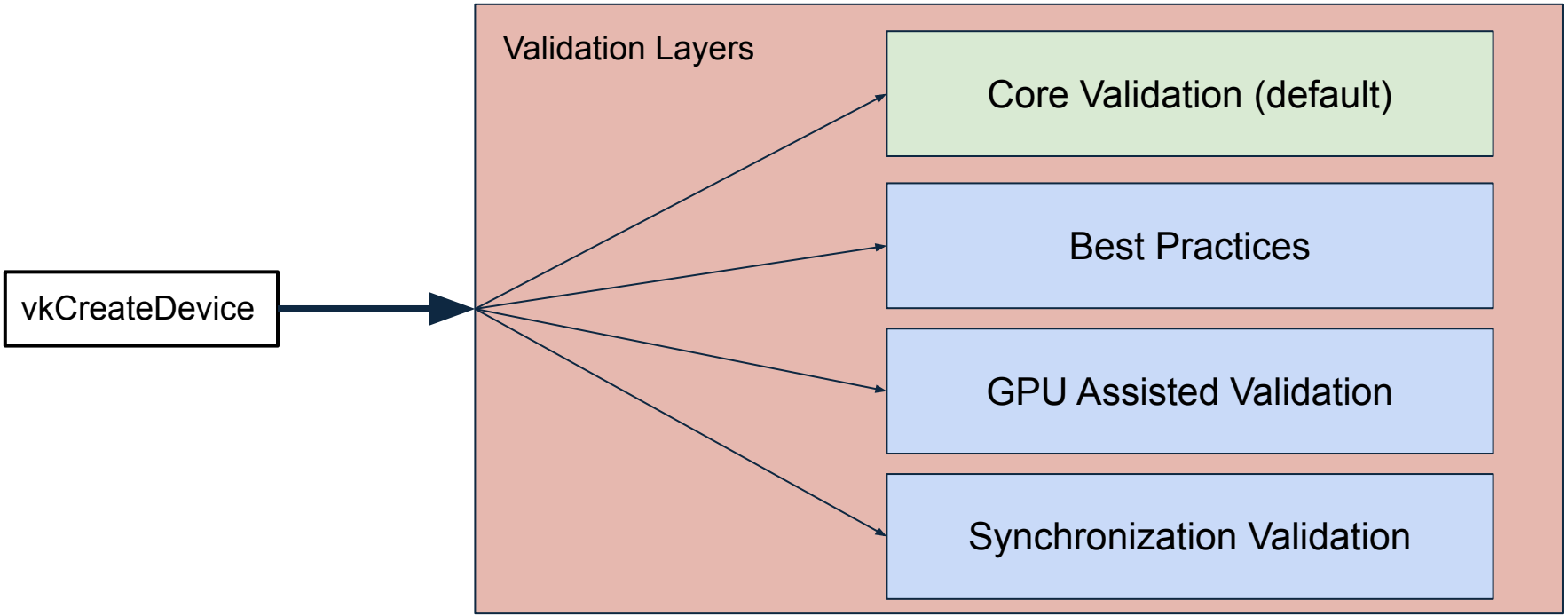
Key Results

- Improved error messages
- More extensions added
- Many issues closed
- **Zero crashing focus**
- **Zero False Positives focused**

Needs Work

- Many Open Issues
- Always new extensions
- Continue performance tuning
- Best practices
  - Lack dedicated engineer
- Error reporting
  - Consistency, completeness, format
  - **Please raise an issue if you find a confusing error message!**

Validation Layers



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GPU-AV (GPU Assisted Validation)

Key Results

- Dedicated engineer!
- Performance improvements
- More accurate results
- New functionality added
- Better error messages

Needs Work

- Still can be painfully slow
- Majority of missing validation checks require GPU-AV
- Errors can still be hard to know where they came from

Synchronization Validation

Key Results

- Timeline Semaphore support (added in 1.3.296)
- Many Github issues closed!
- Improved error reporting in the January 1.4 SDK

Needs Work

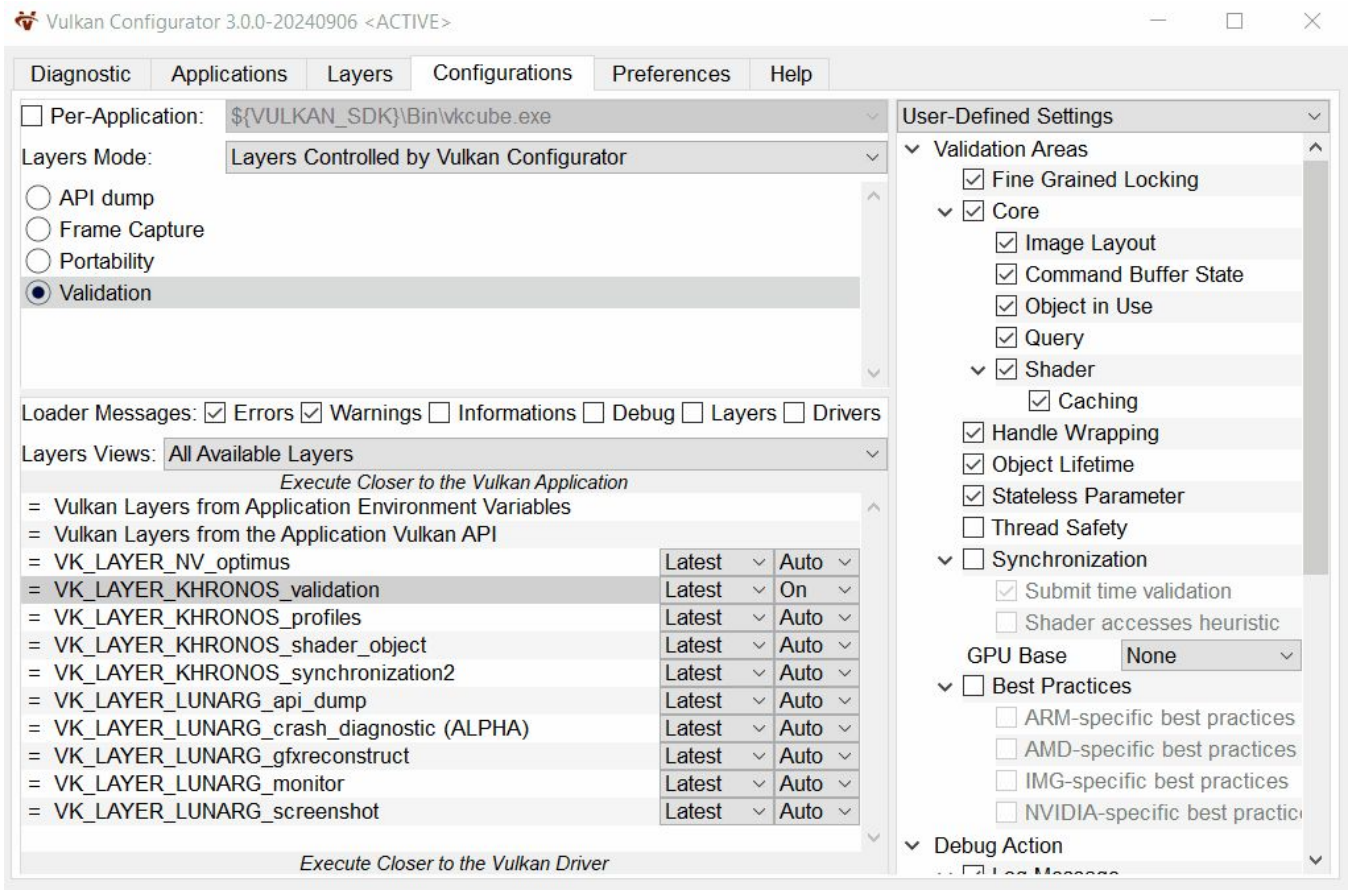
- Performance tuning
- Continue improving error reporting
- Support for memory aliasing
- Better testing
- **GPU-AV integration to track accesses inside shaders**

[Generated from ChatGPT]

Vulkan Configurator 3 (vkconfig3)

- **Vulkan Configurator 2** - in maintenance mode since May 2024 SDK
- **Vulkan Configurator 3** - Targeting January 2025 SDK
  - Implementing Vulkan Loader settings file:
    - Vulkan developer control of all layers using the UI
    - Vulkan Loader logging using the UI
    - Per-executable layer configurations
    - Easier to select a specific layer version
  - Redesigning UI using a tab per use case
    - Improve application launcher with environment variables and multiple options
    - Add a diagnostic tab (checking Vulkan installation)
  - Adding a layer setting type to run and control command lines

Vulkan Configurator 3 - UI Example 1



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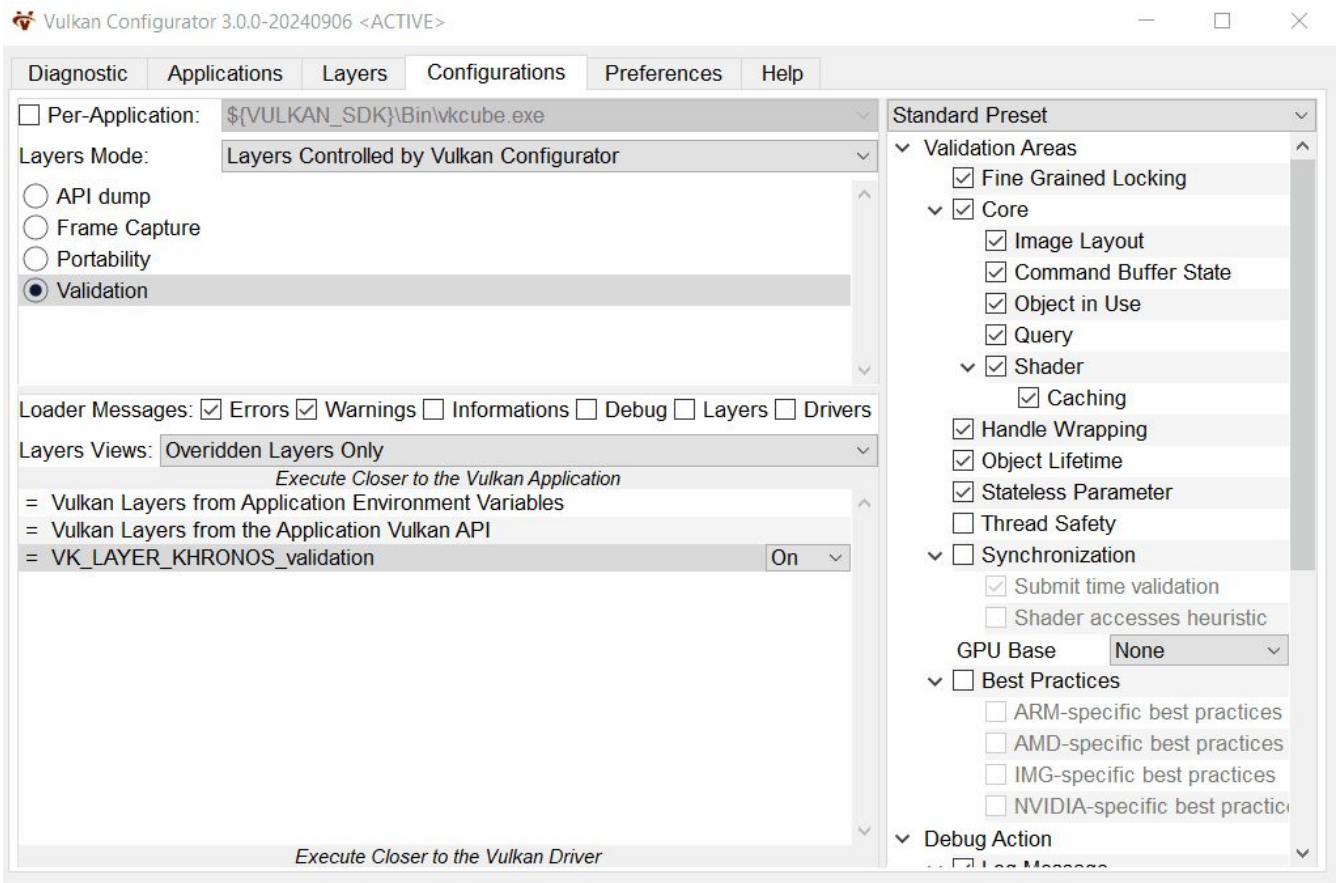
Vulkan Configurator 3 - UI Example 2

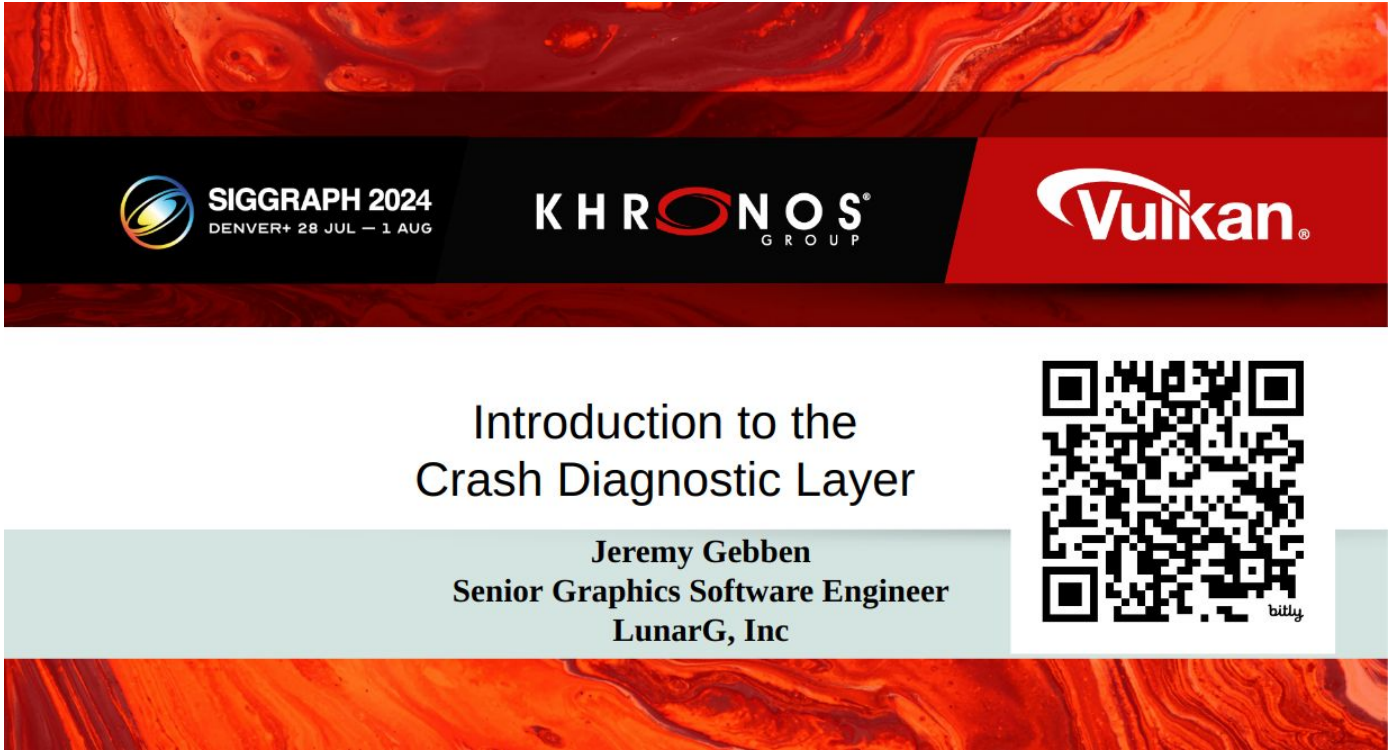


Crash Diagnostic Layer

- Track down and identify the cause of GPU hangs and crashes
  - aka VK_ERROR_DEVICE_LOST
- Instruments command buffers with completion checkpoints
- Generates a dump file
- Strong user demand
  - Debugging Device Lost errors very difficult!
- Still in early development
  - **We would love to get your feedback!**

For more information

https://www.youtube.com/watch?v=h5Ty-o8_pWE



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Vulkan Profiles - Use Cases

- **Roadmap profiles**: express guidance on the future direction of Vulkan devices.
  - Eg: Khronos Roadmap 2024
- **Platform profiles**: express the Vulkan support available on a platform.
  - Eg: Android Baseline 2021
- **Engine profiles**: express some rendering code paths requirements of an engine.
  - Eg: VP_UE_Vulkan_SM6_RT in Unreal Engine.
- **Device profiles**: express the Vulkan support of a single Vulkan driver for a Vulkan device.
  - Eg: GPUinfo.org reports
- **Architecture profiles**: express the Vulkan support of a class of GPUs.
  - Eg: D3D12 Feature Level 12.1

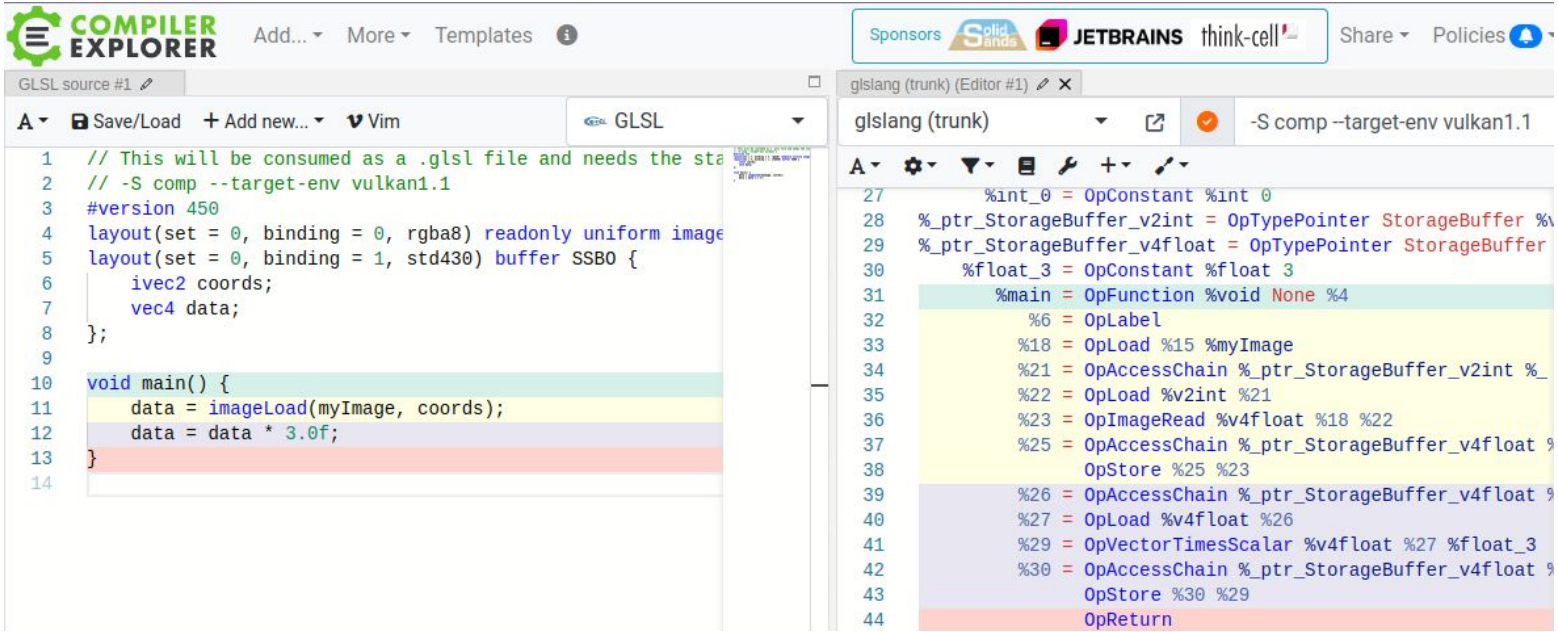
Vulkan Profiles - Tool Set for Developers

- For more information about
  - How to create a Vulkan Profile
  - Vulkan Profiles Layer
  - Vulkan Profiles API Library

"Better Vulkan Application Deployment thanks to Vulkan Profiles"

glslang

- Can now use GLSL, HLSL, and SPIR-V on Compiler Explorer (godbolt)
- https://www.lunarg.com/lunarg-3d-graphics-engineer-adds-glsl-spir-v-as-inputs-to-compiler-explorer/



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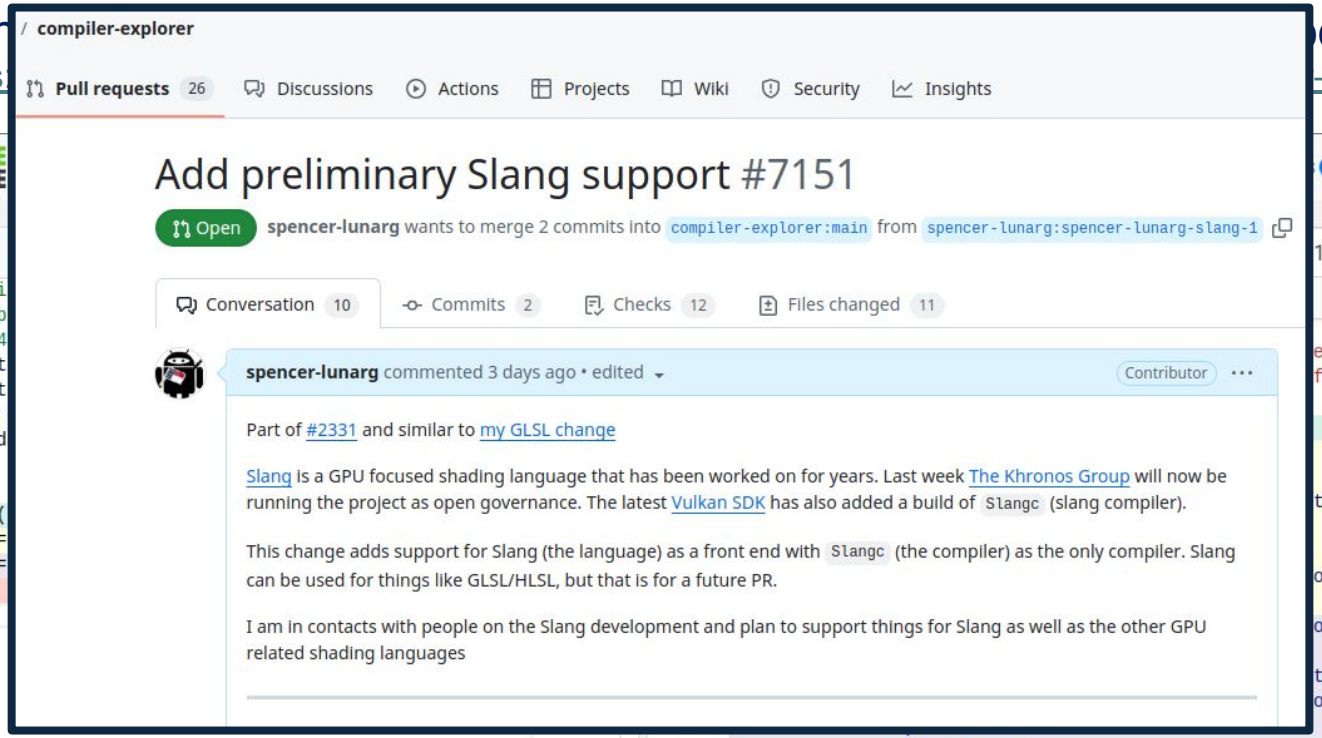
glslang

BREAKING NEWS!

- Can … dbolt)
- https… …-explorer/



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We need your help!


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