Using the Vulkan Configurator
For Daily Vulkan Development

Christophe Riccio
LunarG, Inc.

Presented at the Khronos Vulkanised 2023 Conference
Questions for the audience…

Please, raise your hand if

- You already used Vulkan Configurator?
- You are using Vulkan Configurator on a daily basis?
Vulkan Configurator in a nutshell

- It’s an intuitive GUI application to discover and to configure Vulkan Layers and Vulkan Layer functionalities.
- A component of the Vulkan SDK.
- Vulkan Configurator 2 shipped in August 2020.
Agenda

● Configuring Vulkan Layers with environment variables (skipped!)
● Configuring Vulkan Layers with Vulkan Configurator
● Understanding Vulkan Configurator and few tricks
● Vulkan Configurator 3 : Work in progress
Configuring Vulkan Layers
With Vulkan Configurator
- Layers override: "Validation" configuration
- Vulkan SDK environment variable: E:\VulkanSDK\1.3.236.0
- Vulkan Loader version: 1.3.224
- User-Defined Layers Locations:
  - VK_LAYER_PATH variable: None
  - Per-configuration paths: None
  - VK_ADD_LAYER_PATH variable: None
- `vk_layer_settings.txt` uses the default platform path:
  - C:\Users\Persona\AppData\Local\LunarG\vkconfig\override
- Available Layers:
  - VK_LAYER_NV_optimus
  - VK_LAYER_RENDERDOC_Capture
  - VK_LAYER_VALVE_steeloverlay
  - VK_LAYER_VALVE_steam_fossilize
Overriding Layers by the Vulkan Configurator
Vulkan Configurator 2.5.2

Vulkan Layers Management
- Layers Fully Controlled by the Vulkan Applications
- Overriding Layers by the Vulkan Configurator
  - Apply only to the Vulkan Applications List
  - Continue Overriding Layers on Exit

Vulkan Layers Configurations
- API dump
- Frame Capture
- Portability
- Synchronization
- Validation

Vulkan Application Launcher
- Application: vkcube

Vulkan Development Status:
- Layers override: None
- VULKAN_SDK environment variable: E:\VulkanSDK\1.3.236.0
- Vulkan Loader version: 1.3.224
- User-Defined Layers locations:
  - VK_LAYER_PATH variable: None
  - Per-configuration paths: None
  - VK_ADD_LAYER_PATH variable: None
- 'vk_layer_settings.txt' uses the default platform path:
  - C:\Users\Piranha\AppData\Local\Lunar\vkconfig\override
- Available Layers:
  - VK_LAYER_NV_optimus
  - VK_LAYER_RENDERDOC_Capture
  - VK_LAYER_VALVE_steam_overlay
  - VK_LAYER_VALVE_steam_fossilize
  - VK_LAYER_LUNARG_set廢

Configuration Settings
- VK_LAYER_KHRONOS_validation
- Standard Preset
- Validation Areas
- Debug Action
  - Log Message
    - Log Filename: stdout
    - Debug Filename
    - Break
- Message Severity
  - Info
  - Warning
  - Performance
  - Error
- Limit Duplicated Messages
  - Max Duplicated Messages: 10
  - Mute Message VUIDs

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Vulkan Configurator 2.5.2 <ACTIVE>

Vulkan Layers Management
- Layers Fully Controlled by the Vulkan Applications
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Vulkan Layers Configurations
- API dump
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- Validation

Default Configurations

Validation Settings
- VK_LAYER_KHRONOS_validation
  - Validation Preset
  - Validation Areas
  - Debug Action
    - Log Message
    - Log Filename
      - stdout
    - Debug Output
    - Break
  - Message Severity
    - Info
    - Warning
    - Performance
    - Error
  - Limit Duplicated Messages
    - Max Duplicated Messages: 10
    - Mute Message VUIDs

Vulkan Application Launcher
- Application: vkcube
- Clear log at launch
- Vulkan Loader Messages: none
- Launch

Vulkan Development Status:
- Layers override: "Validation" configuration
- VULKAN_SDK environment variable: E:\VulkanSDK\1.3.236.0
- Vulkan Loader version: 1.3.224
- User-Defined Layers locations:
  - VK_LAYER_PATH variable: None
  - Per-configuration paths: None
  - VK_ADD_LAYER_PATH variable: None
- `vk_layer_settings.txt` uses the default platform path:
  - C:\Users\Piranha\AppData\Local\Lunar\vkconfig\override
- Available Layers:
  - VK_LAYER_NV_optimus
  - VK_LAYER_RENDERDOC_Capture
  - VK_LAYER_VALVE_steam_overlay
  - VK_LAYER_VALVE_steam_fossillize
  - VK_LAYER_LUMETEXapture

LUNAR G12
List of presets created by the Vulkan layer developers.
Vulkan Configurator 2.5.2 <ACTIVE>

Tools Help

Vulkan Layers Management
- Layers Fully Controlled by the Vulkan Applications
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New... Edit... Duplicate... Remove...

Vulkan Application Launcher
- Application: vkcube
- Clear log at launch
- Vulkan Loader Messages:
  - Max Duplicated Messages: 10
  - Mute Message VUIDs

Vulkan Development Status:
- Layers override: "Validation" configuration
- VULKAN_SDK environment variable: E:\VulkanSDK\1.3.236.0
- Vulkan Loader version: 1.3.224
  - VK_LOADER_DEBUG=all
- User-Defined Layers locations:
  - VK_LAYER_PATH variable: None
  - Per-configuration paths: None
  - VK_ADD_LAYER_PATH variable: None
- "vk_layer_settings.txt" uses the default platform path:
  - C:\Users\Piranha\AppData\Local\Lunar\vkconfig\override
- Available Layers:
  - VK_LAYER_NV_optimus
  - VK_LAYER_RENDERDOC_Capture
  - VK_LAYER_VALVE_steam_overlay
  - VK_LAYER_VALVE_steam_fidelity

Validation Settings
- VK_LAYER_KHRONOS_validation
  - Standard Preset
  - Validation Areas
  - Debug Action
    - Log Message
    - Log Filename
      - stdout
    - Debug Output
    - Break
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<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK_LAYER_NV_optimus - 1.3.205 - Implicit layer</td>
<td>Implicitly On</td>
</tr>
<tr>
<td>VK_LAYER_RENDERDOC_Capture - 1.3.131 - Implicit layer</td>
<td>Implicitly On</td>
</tr>
<tr>
<td>VK_LAYER_VALVE_steam_fossilize - 1.3.207 - Implicit layer</td>
<td>Implicitly On</td>
</tr>
<tr>
<td>VK_LAYER_VALVE_steam_overlay - 1.3.207 - Implicit layer</td>
<td>Implicitly On</td>
</tr>
<tr>
<td>VK_LAYER_KHRONOS_validation - 1.3.236</td>
<td>Application-Controlled</td>
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<tr>
<td>VK_LAYER_KHRONOS_profiles - 1.3.236</td>
<td>Application-Controlled</td>
</tr>
<tr>
<td>VK_LAYER_KHRONOS_synchronization2 - 1.3.236</td>
<td>Application-Controlled</td>
</tr>
<tr>
<td>VK_LAYER_LUNARG_preimage - 1.3.203</td>
<td>Application-Controlled</td>
</tr>
</tbody>
</table>

**Execute Closer to the Vulkan Applications**

**Execute Closer to the Vulkan Drivers**

**Add User-Defined Path...**

**Remove User-Defined Path...**

[OK] [Cancel]
Edit Vulkan Layers

Name: Validation SDK 1.2.198
Description: This configuration is a good default validation setting and should serve most needs most of the time.

| VK_LAYER_NV_optimus - 1.3.205 - Implicit layer | Implicitly On |
| VK_LAYER_RENDERDOC_Capture - 1.3.131 - Implicit layer | Implicitly On |
| VK_LAYER_VALVE_steem_fossilize - 1.3.207 - Implicit layer | Implicitly On |
| VK_LAYER_VALVE_steem_overlay - 1.3.207 - Implicit layer | Implicitly On |
| VK_LAYER_KHRONOS_validation - 1.3.236 | Overridden / Forced On |
| VK_LAYER_KHRONOS_profiles - 1.3.236 | Application-Controlled |
| VK_LAYER_KHRONOS_synchronization2 - 1.3.236 | Application-Controlled |

Execute Closer to the Vulkan Applications

Add User-Defined Path...

Remove User-Defined Path

OK Cancel
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<td><strong>Overridden / Forced On</strong></td>
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<td>VK_LAYER_NVAPI_validation - 1.3.205</td>
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<td>Application-Controlled</td>
</tr>
<tr>
<td>VK_LAYER_LUNARG_plugin - 1.3.206</td>
<td>Application-Controlled</td>
</tr>
</tbody>
</table>

**Add User-Defined Path...**
<table>
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<th>VK_LAYER_KHRONOS_validation - 1.2.198</th>
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</tr>
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<tbody>
<tr>
<td>VK_LAYER_KHRONOS_profiles (ALPHA) - 1.2.203</td>
<td>Application-Controlled</td>
</tr>
<tr>
<td>VK_LAYER_KHRONOS_synchronization2 - 1.2.198</td>
<td>Application-Controlled</td>
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### Execute Closer to the Vulkan Applications
- E:\VulkanSDK\1.2.198.1\Bin
  - VK_LAYER_LUNARG_api_dump - 1.2.198
  - VK_LAYER_LUNARG_api_dump2 - 1.3.225
  - VK_LAYER_LUNARG_device_simulation - 1.2.198
Vulkan Configurator 2.5.2 (ACTIVE)

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Vulkan Layers Configurations
- API dump
- Frame Capture
- Portability
- Synchronization
- Validation

Vulkan Application Launcher
- Application: Vkcube
- Clear log at launch
- Vulkan Loader Messages: none

Vulkan Development Status:
- Layers override: "Validation" configuration
- VK_LAYER_KHRONOS_validation
- Validation Areas
- Debug Action
- Log Message
- Log Filename
- Stdout
- Validation Areas
- Debug Output
- Break
- Message Severity
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Vulkan Layers Configurations
- [ ] API dump
- [ ] Frame Capture
- [ ] Portability
- [ ] Synchronization
- [ ] Validation

Vulkan Application Launcher
- Application: vkcube
- Vulkan Loader Messages: all

Vulkan Development Status:
- Layers override: "Validation" configuration
- VULKAN_SDK environment variable: E:\VulkanSDK\1.3.236.0
- Vulkan Loader version: 1.3.224
  - VK_LOADER_DEBUG-all
- User-Defined Layers locations:
  - VK_LAYER_PATH variable: None
  - Per-configuration paths: None
  - VK_ADD_LAYER_PATH variable: None
- 'vk_layer_settings.txt' uses the default platform path:
  C:\Users\Piranha\AppData\Local\Lunar\vkconfig\override
- Available Layers:
  - VK_LAYER_NV_optimus
  - VK_LAYER_RENDERDOC_Capture
  - VK_LAYER_VALUE_steam_overlay
  - VK_LAYER_VALUE Steam Overlay

Validation Settings
- VK_LAYER_KHRONOS_validation
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Vulkan Configurator 2.5.2 <ACTIVE>

Tools | Help

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Vulkan Application Launcher

Vulkan Development Status:
- Layers override: "Validation" configuration
- VULKAN_SDK environment variable: E:\VulkanSDK\1.3.236.0
- Vulkan Loader version: 1.3.224
- User-Defined layers locations:
  - VK_LAYER_PATH variable: None
  - Per-configuration paths: None
  - VK_ADD_LAYER_PATH variable: None
- 'vk_layer.settings.txt' uses the default platform path:
  `${Pirhana/AppData/Local/lunarG/vkconfig/override`
- Available Layers:
  - VK_LAYER_NV_optimus
  - VK_LAYER_RENDERDOC_Capture
  - VK_LAYER_VALVE_steam_overlay
  - VK_LAYER_VALVE_steam_fossilize
  - VK_LAYER_LUNARG_steam

Validation Settings
- VK_LAYER_KHRONOS_validation
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Vulkan Application Launcher
- Application: vkcube
- Clear log at launch
- Vulkan Loader Messages: none
- Launch

Available Layers:
- VK_LAYER_NV_optimus
- VK_LAYER_RENDERDOC_Capture
- VK_LAYER_VALVE_steam_overlay
- VK_LAYER_VALVE_steam_fossilize
- VK_LAYER_LUNARG_api_dump
- VK_LAYER_LUNARG_gfxreconstruct
- VK_LAYER_KHRONOS_synchronization
- VK_LAYER_KHRONOS_validation
- VK_LAYER_LUNARG_monitor
- VK_LAYER_LUNARG_screenshot
- VK_LAYER_KHRONOS_profiles

Physical Devices:
- NVIDIA GeForce RTX 3080 Ti (Discrete GPU) with Vulkan 1.3.205

Validation Settings
- VK_LAYER_KHRONOS_validation
  - Standard Preset
  - Validation Areas
  - Debug Action
  - Log Message
  - Log Filename
  - Debug Output
  - Break
  - Message Severity
  - Info
  - Warning
  - Performance
  - Error
  - Limit Duplicated Messages
  - Max Duplicated Messages: 10
  - Mute Message VUIDs
Understanding Vulkan Configurator and few tricks
Can be created by another application than Vulkan Configurator
{ "file_format_version": "1.1.2", "layer": { "api_version": "1.3.236", "blacklisted_layers": [ ] }, "component_layers": [ "VK_LAYER_KHRONOS_validation" ], "description": "LunarG Override Layer", "disable_environment": { "DISABLE.VK_LAYER_LUNARG_override": "1" }, "implementation_version": "1", "name": "VK_LAYER_LUNARG_override", "override_paths": [ "E:/VulkanSDK/1.3.236.0/Bin" ], "type": "GLOBAL" }
{
  "file_format_version": "1.1.2",
  "layer": {
    "api_version": "1.3.236",
    "blacklisted_layers": [],
    "component_layers": [
      "VK_LAYER_KHRONOS_validation"
    ],
    "description": "LunarG Override Layer",
    "disable_environment": {
      "DISABLE.VK_LAYER_LUNARG_override": "1"
    },
    "implementation_version": "1",
    "name": "VK_LAYER_LUNARG_override",
    "override_paths": [
      "E:/VulkanSDK/1.3.236.0/Bin"
    ],
    "type": "GLOBAL"
  }
}
# VK_LAYER_KHRONOS_validation

# Debug_Action
# ===============
# <LayerIdentifier>.debug_action
# Specifies what action is to be taken when a layer reports information
khronos_validation.debug_action = VK_DBG_LAYER_ACTION_ACTION_LOG_MSG

# Log_FILENAME
# ===============
# <LayerIdentifier>.log_filename
# Specifies the output filename
khronos_validation.log_filename = stdout

# Message Severity
# ===============
# <LayerIdentifier>.report_flags
# Comma-delineated list of options specifying the types of messages to be reported
khronos_validation.report_flags = error,perf,info,warn
$ vkconfig --help
Usage
    vkconfig [[help] | [version] | [gui] | [layers <args>]]

Command:
    help                  = Display usage and documentation.
    version              = Display Vulkan Configurator version.
    gui                  = Launch the Vulkan Configurator GUI.
    layers               = Manage system Vulkan Layers.
    doc                  = Create doc files for layer.
    reset                = Reset layers configurations.

(Use 'vkconfig help <command>' for detailed usage of Vulkan Configurato
or commands.)
$ vkconfig --help
Usage

vkconfig [[help] | [version] | [gui] | [layers <args>]]

Command:

help = Display usage and documentation.
version = Display Vulkan Configurator version.
gui = Launch the Vulkan Configurator GUI.
layers = Manage system Vulkan Layers.
doc = Create doc files for layer.
reset = Reset layers configurations.

(Use 'vkconfig help <command>' for detailed usage of Vulkan Configurator commands.)
$ vkconfig layers
Missing 'layers' command argument...

Name
'layers' - Command to manage system Vulkan Layers

Synopsis
vkconfig layers (--override | -o) <layers_configuration_file>
vkconfig layers (--surrender | -s)
vkconfig layers (--list | -l)
vkconfig layers (--list-verbose | -1v)

Description
vkconfig layers (--override | -o) <layers_configuration_file>
Override the Vulkan layers using <layers_configuration_file> generated by Vulkan Configurator.

vkconfig layers (--surrender | -s)
Surrender the Vulkan layers control to Vulkan applications.

vkconfig layers (--list | -l)
List the Vulkan layers found by Vulkan Configurator on the system.

vkconfig layers (--list-version | -1v)
List the Vulkan layers found by Vulkan Configurator on the system with locations and versions.
$ vkconfig layers --list-verbose

VK_LAYER_LUNARG_api_dump (Explicit) 1.3.236-2
  - LunarG API dump layer
    - $VulkanSDK/1.3.236.0/Bin/VkLayer_api_dump.json
    - $VulkanSDK/1.3.236.0/Bin/VkLayer_api_dump.dll

VK_LAYER_LUNARG_gfxreconstruct (Explicit) 1.3.236-36880
  - GFXReconstruct Capture Layer Version 0.9.16
    - $VulkanSDK/1.3.236.0/Bin/VkLayer_gfxreconstruct.json
    - $VulkanSDK/1.3.236.0/Bin/VkLayer_gfxreconstruct.dll

VK_LAYER_KHRONOS_profiles (Explicit) 1.3.236-1.0.2
  - Khronos Profiles layer
    - $VulkanSDK/1.3.236.0/Bin/VkLayer_khronos_profiles.json
    - $VulkanSDK/1.3.236.0/Bin/VkLayer_khronos_profiles.dll

VK_LAYER_KHRONOS_synchronization2 (Explicit) 1.3.236-1
  - Khronos Synchronization2 layer
    - $VulkanSDK/1.3.236.0/Bin/VkLayer_khronos_synchronization2.json
    - $VulkanSDK/1.3.236.0/Bin/VkLayer_khronos_synchronization2.dll

VK_LAYER_KHRONOS_validation (Explicit) 1.3.236-1
  - Khronos Validation Layer
    - $VulkanSDK/1.3.236.0/Bin/VkLayer_khronos_validation.json
    - $VulkanSDK/1.3.236.0/Bin/VkLayer_khronos_validation.dll

VK_LAYER_LUNARG_monitor (Explicit) 1.3.236-1
  - Execution Monitoring Layer
    - $VulkanSDK/1.3.236.0/Bin/VkLayer_monitor.json
void LogManager::LoadAllInstalledLayers()
{
    available_layers.clear();

    // FIRST: If VK_LAYER_PATH is set it has precedence over other layers.
    const std::vector<std::string> &env_user_defined_layers_paths_set =
        environment.GetUserDefinedLayersPaths(USER_DEFINED LAYERS PATHS_ENV_SET);
    for (std::size_t i = 0, n = env_user_defined_layers_paths_set.size(); i < n; ++i) {
        LoadLayersFromPath(env_user_defined_layers_paths_set[i]);
    }

    // SECOND: Any per layers configuration user-defined path from Vulkan Configurator? Search for those too
    const std::vector<std::string> &gui_config_user_defined_layers_paths =
        environment.GetUserDefinedLayersPaths(USER_DEFINED LAYERS PATHS_GUI);
    for (std::size_t i = 0, n = gui_config_user_defined_layers_paths.size(); i < n; ++i) {
        LoadLayersFromPath(gui_config_user_defined_layers_paths[i]);
    }

    // THIRD: Add VK_ADD_LAYER_PATH layers
    const std::vector<std::string> &env_user_defined_layers_paths_add =
        environment.GetUserDefinedLayersPaths(USER_DEFINED LAYERS PATHS_ENV_ADD);
    for (std::size_t i = 0, n = env_user_defined_layers_paths_add.size(); i < n; ++i) {
        LoadLayersFromPath(env_user_defined_layers_paths_add[i]);
    }

    // FOURTH: Standard layer paths, in standard locations. The above has always taken precedence
    for (std::size_t i = 0, n = countof(SEARCH_PATHS); i < n; i++) {
        LoadLayersFromPath(SEARCH_PATHS[i]);
    }

    // FIFTH: See if thee is anything in the VULKAN_SDK path that wasn't already found elsewhere
    if (!getenv("VULKAN_SDK").isEmpty()) {
        LoadLayersFromPath(GetPath(BUILTIN_PATH_EXPLICIT LAYERS));
    }
}
Vulkan Configurator 3

Work in Progress
Vulkan Configurator 3 work in progress

- Better control of the layers
  - Transparent layers loading
    - Support of multiple versions of a layer.
  - Full ordering of the layers
    - Including implicit layers and layers enabled in a Vulkan application.

- Tab based redesign (PR):
  - Per use-case tabs.
  - Replacing vkvia by a diagnostic tab based on the Vulkan Loader information.

- A Vulkan API extension for generic layer settings
  - With a library to make it easier to add settings to a layer.
<table>
<thead>
<tr>
<th>Layer Name</th>
<th>Version</th>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VK_LAYER_NV_optimus</td>
<td>1.3.205</td>
<td>Implicit On</td>
<td></td>
</tr>
<tr>
<td>VK_LAYER_RENDERDOC_Capture</td>
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<td>1.3.236</td>
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</tr>
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<td>1.3.236</td>
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<tr>
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<tr>
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Full Ordering using drag and drop
### Execute Closer to the Vulkan Application

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### Execute Closer to the Vulkan Driver

<table>
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<tr>
<th>Environment Variable</th>
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<tbody>
<tr>
<td>HKEY_LOCAL_MACHINE\Software\Khrnon\Vulkan\ExplicitLayers</td>
</tr>
<tr>
<td>HKEY_CURRENT_USER\Software\Khrnon\Vulkan\ExplicitLayers</td>
</tr>
<tr>
<td>HKEY_CURRENT_SET\Software\Khrnon\Vulkan\ExplicitLayers</td>
</tr>
<tr>
<td>HKEY_LOCAL_MACHINE\System\CurrentControl\Soft\Control\Class...\VulkanExplicitLayers</td>
</tr>
<tr>
<td>E:\VulkanSDK\1.3.236.0\Bin</td>
</tr>
</tbody>
</table>
Any suggestion for Vulkan Configurator 3?
Are you interested in better integrating Vulkan Configurator to your layer?

Questions?

Feedback welcome!
christophe@lunarg.com
https://github.com/LunarG/VulkanTools/issues
Help Us Improve the Vulkan SDK and Ecosystem

Share Your Feedback
Take the LunarG annual developer’s survey

- Survey results are tabulated
- Shared with the Vulkan Working Group
- Actions are assigned
- Results are reported

Survey closes February 27, 2023

https://www.surveymonkey.com/r/PVM92RH