Configuring Vulkan Layers

March 2026

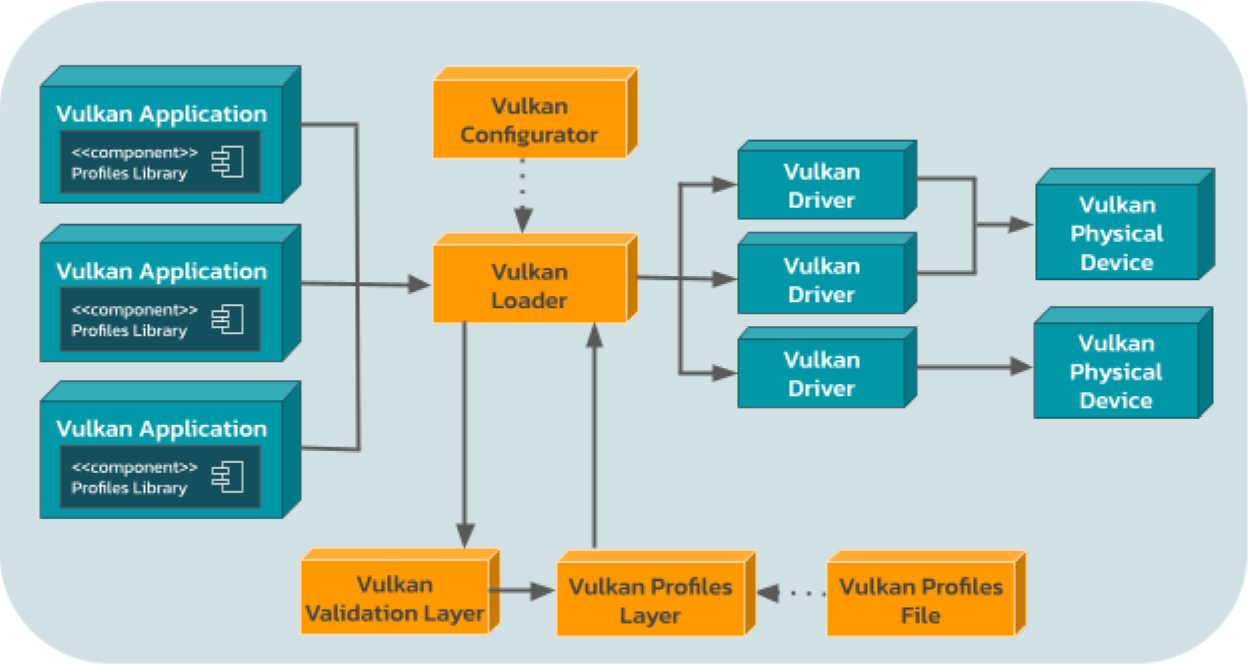
Christophe Riccio, LunarG, Inc.

TABLE OF CONTENTS

Configuring Vulkan Layers approaches

Vulkan supports intercepting or hooking API entry points via a layer framework. A layer can intercept all or any subset of Vulkan API entry points. Multiple layers can be chained together to cascade their functionality.

Vulkan layers allow application developers to add functionality to Vulkan applications without modifying the application itselfitself—for example, validating API usage, dumping API entry points, or generating screenshots of specified frames.



Example: A system configured with enabled and ordered layers on a Vulkan developer's system

Three approaches

A *layers configuration* consists of two operations:

- Selecting and ordering layers for the Vulkan Loader.
- Configuring each layer using layer settings.

Vulkan layers can be configured using three different methods that match different Vulkan development workflows:

- **Environment variables**: Loader environment variables and per-layer settings environment variables.

- **Dedicated Vulkan system files**: via vk_loader_settings.json and vk_layer_settings.txt.
- **Vulkan API, programmatically in the Vulkan application**: vkCreateInstance and the VK_EXT_layer_settings extension.

When a setting is provided via multiple methods simultaneously, the priority order is:

1. Environment variables (highest priority).
2. Dedicated Vulkan system files.
3. Vulkan API (lowest priority).

These three methods are implemented by the *Vulkan Layer Settings library* (part of the *Vulkan-Utility-Libraries* repository). Any layer project using this library supports all three methods, bringing consistency and ease of use of layers across the Vulkan community.

The *Vulkan Layer Settings library* is currently used by the *Vulkan Validation layer*, the *Vulkan Profiles layer*, the *Vulkan Extension layers* and the *LunarG Utility layers*.

Each setting is described in the JSON layer manifest file that ships with the layer binary. When the settings are implemented in a layer using the Vulkan Layer Settings library, all the settings can be configured with all three methods.

Backward Compatibility Guideline

Settings unknown to the layer are ignored, regardless of method. Layer developers are responsible for ensuring backward compatibility with previous layer versions. This keeps the list of layer settings relatively stable across versions and avoids burdening Vulkan application developers with unmanageable compatibility tracking.

Deprecation Notice

This document describes the Vulkan Layers configuration method in Vulkan Loader 1.3.304 and later, relying on the **vk_loader_settings.json** file implemented by *Vulkan Configurator* 3. The previous approach using **VkLayer_override.json** is deprecated.

Configuring Layers using the Vulkan API

Enabling and ordering the layer using vkCreateInstance()

Applications can enable and order layers programmatically when calling **vkCreateInstance().** To do this, set these fields in the **VkInstanceCreateInfo** structure:

- **enabledLayerCount** — number of layers to enable
- **ppEnabledLayerNames** — array of layer names

The order in **ppEnabledLayerNames** determines execution order:

- First layer in the list → closest to the application (called first)
- Last layer in the list → closest to the driver

```C/C++
const VkApplicationInfo app_info = initAppInfo();

const char* layers[] = {
    "VK_LAYER_KHRONOS_validation",
    "VK_LAYER_KHRONOS_profiles"};

const VkInstanceCreateInfo inst_create_info = {
    VK_STRUCTURE_TYPE_INSTANCE_CREATE_INFO, nullptr, 0,
    &app_info,
    static_cast<uint32_t>(std::size(layers)), layers,
    0, nullptr};

VkInstance instance = VK_NULL_HANDLE;
VkResult result = vkCreateInstance(&inst_create_info, nullptr, &instance);
```

Example: the Khronos Validation layer executes before the Khronos Profiles layer

Initializing layer settings using VK_EXT_layer_settings

Layer settings can be configured at instance creation time using the **VK_EXT_layer_settings** extension.

1. Create an array of **VkLayerSettingEXT** structures.
2. Wrap them in a **VkLayerSettingsCreateInfoEXT** structure.
3. Chain it into the **pNext** field of **VkInstanceCreateInfo**.

C/C++

```
const char* name = "VK_LAYER_KHRONOS_validation";

const VkBool32 setting_validate_core = VK_TRUE;
const VkBool32 setting_validate_sync = VK_TRUE;
const VkBool32 setting_thread_safety = VK_TRUE;
const char* setting_debug_action[] = {"VK_DBG_LAYER_ACTION_LOG_MSG"};
const char* setting_report_flags[] = {
    "info", "warn", "perf", "error", "debug"};
const VkBool32 setting_enable_message_limit = VK_TRUE;
const int32_t setting_duplicate_message_limit = 3;

const VkLayerSettingEXT settings[] = {
    {name, "validate_core", VK_LAYER_SETTING_TYPE_BOOL32_EXT,
     1, &setting_validate_core},
    {name, "validate_sync", VK_LAYER_SETTING_TYPE_BOOL32_EXT,
     1, &setting_validate_sync},
    {name, "thread_safety", VK_LAYER_SETTING_TYPE_BOOL32_EXT,
     1, &setting_thread_safety},
    {name, "debug_action", VK_LAYER_SETTING_TYPE_STRING_EXT,
     1, setting_debug_action},
    {name, "report_flags", VK_LAYER_SETTING_TYPE_STRING_EXT,
     static_cast<uint32_t>(std::size(setting_report_flags)),
     setting_report_flags}
    {name, "enable_message_limit", VK_LAYER_SETTING_TYPE_BOOL32_EXT,
     1, &setting_enable_message_limit},
    {name, "duplicate_message_limit", VK_LAYER_SETTING_TYPE_INT32_EXT,
     1, &setting_duplicate_message_limit}};

const VkLayerSettingsCreateInfoEXT layer_settings_create_info = {
    VK_STRUCTURE_TYPE_LAYER_SETTINGS_CREATE_INFO_EXT, nullptr,
    static_cast<uint32_t>(std::size(settings)), settings};

const VkApplicationInfo app_info = initAppInfo();
const char* layers[] = {name};
const char* extensions[] = {VK_EXT_LAYER_SETTINGS_EXTENSION_NAME};

const VkInstanceCreateInfo inst_create_info = {
    VK_STRUCTURE_TYPE_INSTANCE_CREATE_INFO, &layer_settings_create_info,
    0,
    &app_info,
    static_cast<uint32_t>(std::size(layers)), layers,
    static_cast<uint32_t>(std::size(extensions)), extensions
};

VkInstance instance = VK_NULL_HANDLE;

VkResult result = vkCreateInstance(
    &inst_create_info, nullptr, &instance);
```

Example: Configuring Khronos Validation layer settings programmatically

Configuring Layers using Vulkan system files

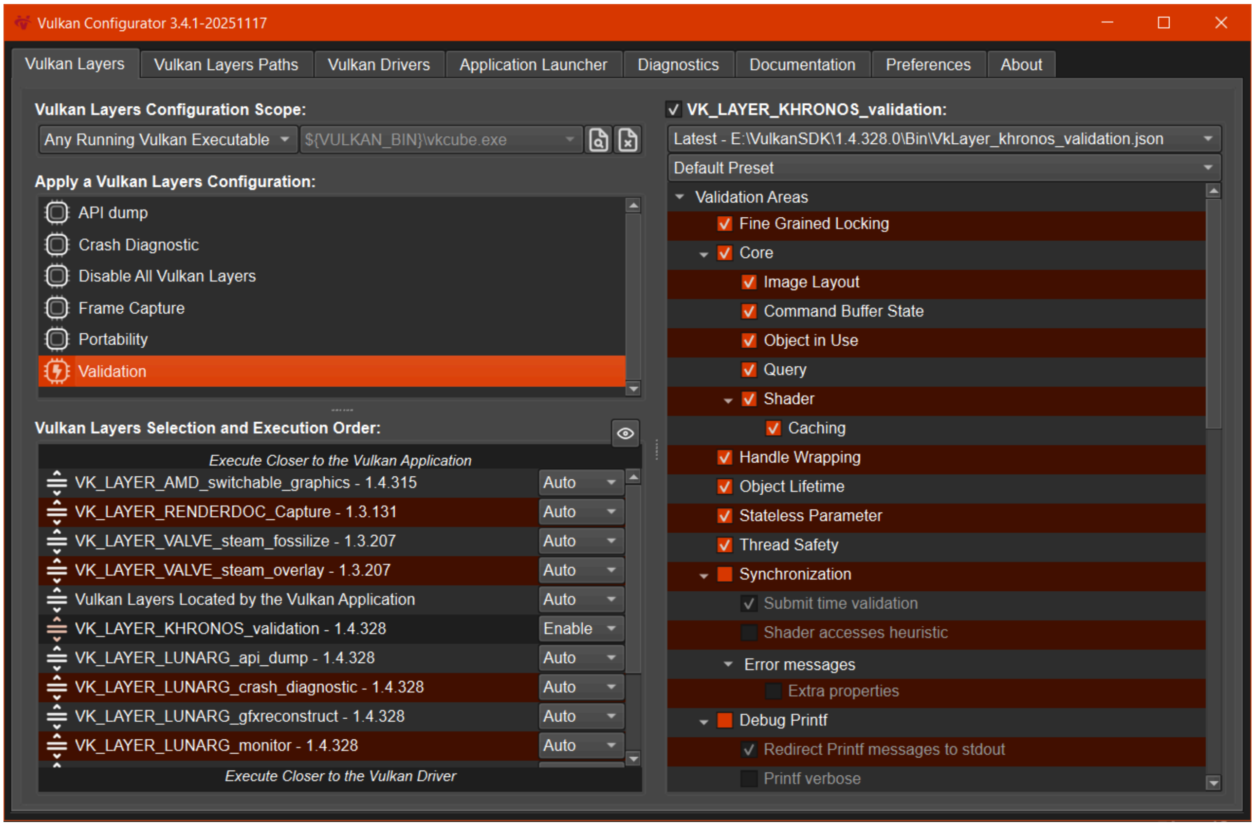
Two system files can be created for persistent layers configuration:

- **vk_loader_settings.json** — read by the Vulkan Loader to enable layers and set their execution order
- **vk_layer_settings.txt** — read by the layers themselves to apply individual settings

Vulkan Configurator also provides functionalities to:

- Generate layer settings files to control layers without Vulkan Configurator
- Select and prioritize physical devices
- Load additional Vulkan drivers
- Generate diagnostic logs

The tool also works from the command line (**vkconfig --help** for details).



Vulkan Layers Configuration Scope: Any Running Vulkan Executable — ${VULKAN_BIN}\vkcube.exe

Apply a Vulkan Layers Configuration:

- API dump
- Crash Diagnostic
- Disable All Vulkan Layers
- Frame Capture
- Portability
- Validation

Vulkan Layers Selection and Execution Order:

Execute Closer to the Vulkan Application

VK_LAYER_AMD_switchable_graphics - 1.4.315	Auto
VK_LAYER_RENDERDOC_Capture - 1.3.131	Auto
VK_LAYER_VALVE_steam_fossilize - 1.3.207	Auto
VK_LAYER_VALVE_steam_overlay - 1.3.207	Auto
Vulkan Layers Located by the Vulkan Application	Auto
VK_LAYER_KHRONOS_validation - 1.4.328	Enable
VK_LAYER_LUNARG_api_dump - 1.4.328	Auto
VK_LAYER_LUNARG_crash_diagnostic - 1.4.328	Auto
VK_LAYER_LUNARG_gfxreconstruct - 1.4.328	Auto
VK_LAYER_LUNARG_monitor - 1.4.328	Auto

Execute Closer to the Vulkan Driver

☑ **VK_LAYER_KHRONOS_validation:**

Latest - E:\VulkanSDK\1.4.328.0\Bin\VkLayer_khronos_validation.json

Default Preset

- Validation Areas
  - ☑ Fine Grained Locking
  - ☑ Core
    - ☑ Image Layout
    - ☑ Command Buffer State
    - ☑ Object in Use
    - ☑ Query
    - ☑ Shader
      - ☑ Caching
  - ☑ Handle Wrapping
  - ☑ Object Lifetime
  - ☑ Stateless Parameter
  - ☑ Thread Safety
  - ☐ Synchronization
    - ☑ Submit time validation
    - ☐ Shader accesses heuristic
    - Error messages
      - ☐ Extra properties
  - ☐ Debug Printf
    - ☑ Redirect Printf messages to stdout
    - ☐ Printf verbose

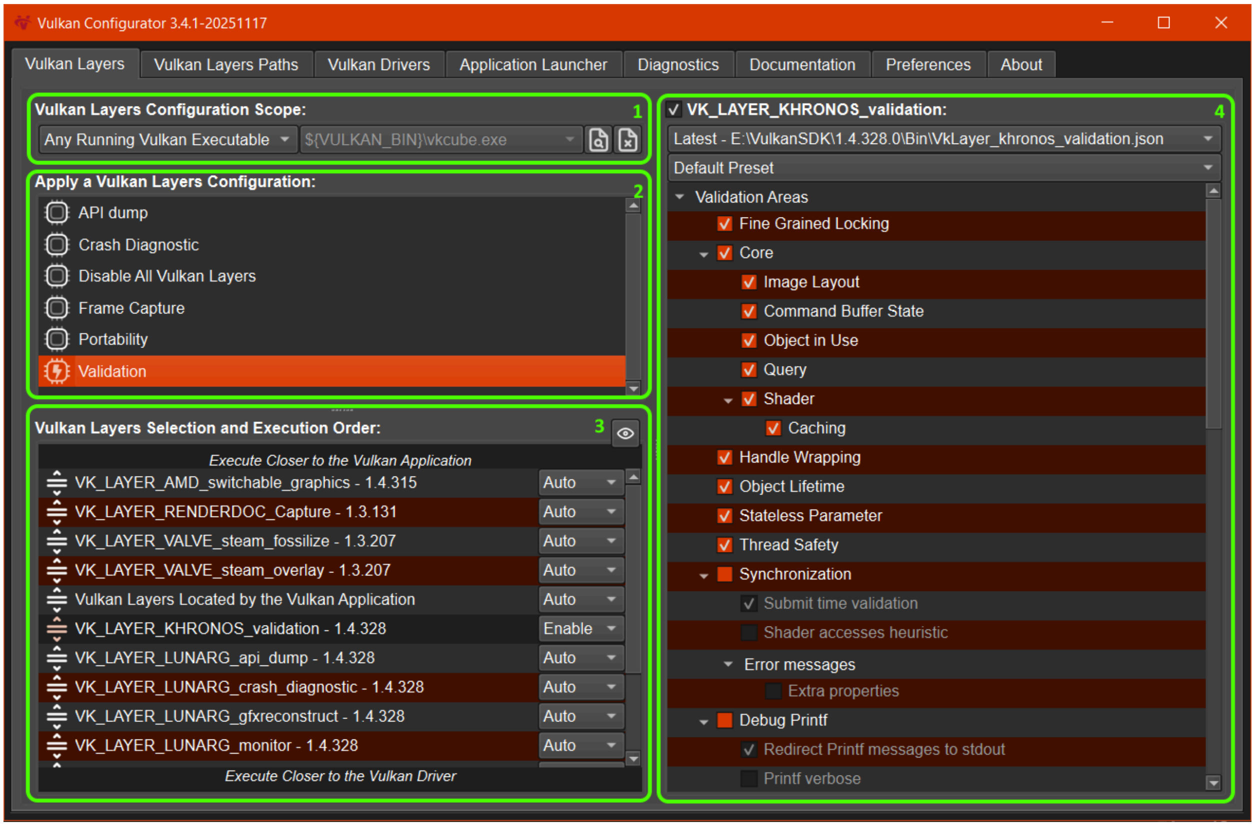
We recommend the *Vulkan Configurator* GUI for Vulkan application developers because It lets you quickly switch configurations, iterate during development, and discover available layers and settings without reading extensive documentation.

The *Vulkan Configurator* interface

Before *Vulkan Configurator* existed, developers had to configure layers either in code or via environment variables listed in each layer's documentation. This created a steep and ongoing learning curve as layers evolved.

Vulkan Configurator solves this issue by providing a visual and intuitive interface to preset the layers and settings for the layers configuration.

Vulkan Configurator tabs description



Vulkan Layers Configuration Scope:
Any Running Vulkan Executable
${VULKAN_BIN}\vkcube.exe

Apply a Vulkan Layers Configuration:
- API dump
- Crash Diagnostic
- Disable All Vulkan Layers
- Frame Capture
- Portability
- Validation

Vulkan Layers Selection and Execution Order:

Execute Closer to the Vulkan Application

VK_LAYER_AMD_switchable_graphics - 1.4.315	Auto
VK_LAYER_RENDERDOC_Capture - 1.3.131	Auto
VK_LAYER_VALVE_steam_fossilize - 1.3.207	Auto
VK_LAYER_VALVE_steam_overlay - 1.3.207	Auto
Vulkan Layers Located by the Vulkan Application	Auto
VK_LAYER_KHRONOS_validation - 1.4.328	Enable
VK_LAYER_LUNARG_api_dump - 1.4.328	Auto
VK_LAYER_LUNARG_crash_diagnostic - 1.4.328	Auto
VK_LAYER_LUNARG_gfxreconstruct - 1.4.328	Auto
VK_LAYER_LUNARG_monitor - 1.4.328	Auto

Execute Closer to the Vulkan Driver

☑ VK_LAYER_KHRONOS_validation:
Latest - E:\VulkanSDK\1.4.328.0\Bin\VkLayer_khronos_validation.json
Default Preset

- Validation Areas
  - ☑ Fine Grained Locking
  - ☑ Core
    - ☑ Image Layout
    - ☑ Command Buffer State
    - ☑ Object in Use
    - ☑ Query
    - ☑ Shader
      - ☑ Caching
  - ☑ Handle Wrapping
  - ☑ Object Lifetime
  - ☑ Stateless Parameter
  - ☑ Thread Safety
  - ■ Synchronization
    - ☑ Submit time validation
    - □ Shader accesses heuristic
    - Error messages
      - □ Extra properties
  - ■ Debug Printf
    - ☑ Redirect Printf messages to stdout
    - □ Printf verbose

The *Vulkan Configurator* "Vulkan Later " tab has four sections:

1) **Vulkan Layers Configuration Scope**: This section controls whether the Vulkan Layers configuration is applied on all Vulkan executables or a specific list of Vulkan executables.
2) **Apply a Vulkan Layers Configuration**: This section contains a list of saved layers

configurations, including built-in configurations for common use cases.

Using the context menu, we can:

- Create new configurations
- Generate environment variable scripts (.sh, .bat files)
- Generate C++ helper code for **VK_EXT_layer_settings** (**.hpp** file)
- Etc.

This code generation allows Vulkan application developers to create and test layer configurations using the user interface and export the configurations for use in environment variables scenarios or use directly in the Vulkan application code.

3) **Vulkan Layers Selection and Execution Order**: This section shows all layers found on the system and their execution order.

4) **Vulkan Layer Settings**: This section provides a tree view of all settings for the selected layers. If the layer provides setting presets, they appear below the layer name.

Enabling and ordering layers using vk_loader_settings.json

Introduced with *Vulkan Configurator 3* and *Vulkan Loader 1.4.304*, the **vk_loader_settings.json** file:

- Controls which layers are enabled
- Sets layers execution order
- Stores custom layer search paths

The default location for the **vk_loader_settings.json** file is:

- Linux/macOS: **$HOME/.local/share/vulkan/loader_settings.d/vk_loader_settings.json**
- Windows: **%HOME%\AppData\Local\LunarG\vulkan\vk_loader_settings.json**

Initializing Layer Settings using vk_layer_settings.txt

To initialize the layer settings, *Vulkan Configurator* generates the **vk_layer_settings.txt** file. This file is read by the layer during **vkCreateInstance** execution in the Vulkan application.

vk_layer_settings.txt location

By default, the Vulkan Layer Settings library requires the settings file to be named **vk_layer_settings.txt** and it will search it in the working directory of the targeted application. If a **vk_layer_settings.txt** file is found in the working directory of the Vulkan application, the **vk_layer_settings.txt** file stored at the global system location is ignored.

The default global location for the **vk_layer_settings.txt** file is:

- On Linux and macOS: **$HOME/.local/share/vulkan/settings.d/vk_layer_settings.txt**
- On Windows: **%HOME%\AppData\Local\LunarG\vkconfig\override\vk_layer_settings.txt**

On Windows, the registry store the default location at the following entry:

- **HKEY_CURRENT_USER\Software\Khronos\Vulkan\Settings**

The global system location of the layer settings can be overridden using the **VK_LAYER_SETTINGS_PATH** environment variable:

- If **VK_LAYER_SETTINGS_PATH** is set to a directory, then the settings file must be a file called vk_layer_settings.txt.
- If **VK_LAYER_SETTINGS_PATH** is set to a full path, the layer settings file can have any filename.

vk_layer_settings.txt syntax

The settings file can be created, modified or generated by the Vulkan application developers or third party tools.

The settings file consists of lines which can be comments or setting initializations. Comment lines begin with the **#** character. Settings lines have the following format:

<LayerName>.<setting_name> = <setting_value>

The list of available settings is available in the layer manifest.

```
None
# The main, heavy-duty validation checks. This may be valuable early in
the
# development cycle to reduce validation output while correcting
# parameter/object usage errors.
khronos_validation.validate_core = true

# Enable synchronization validation during command buffers recording.
This
# feature reports resource access conflicts due to missing or incorrect
# synchronization operations between actions (Draw, Copy, Dispatch,
Blit)
```

```
# reading or writing the same regions of memory.
khronos_validation.validate_sync = true

# Thread checks. In order to not degrade performance, it might be best
to run
# your program with thread-checking disabled most of the time, enabling
it
# occasionally for a quick sanity check or when debugging difficult
# application behaviors.
khronos_validation.thread_safety = true

# Specifies what action is to be taken when a layer reports information
khronos_validation.debug_action = VK_DBG_LAYER_ACTION_LOG_MSG

# Comma-delineated list of options specifying the types of messages to
be
# reported
khronos_validation.report_flags = debug,error,perf,info,warn

# Enable limiting of duplicate messages.
khronos_validation.enable_message_limit = true

# Maximum number of times any single validation message should be
reported.
khronos_validation.duplicate_message_limit = 3
```

Example: **vk_layer_settings.txt** file for the Khronos Validation layer

Configuring Layers using Environment Variables

Locating Vulkan Layers

To enable a layer from the command line, the Vulkan Loader must be able to locate and load it:

1. The layer's Manifest JSON file is found by the Vulkan Loader because it is in:
    - One of the standard operating system install paths
    - It was added using one of the layer path environment variables (**VK_LAYER_PATH** or **VK_ADD_LAYER_PATH**).
    - See the Layer Discovery section of the Vulkan Loader's Layer Interface doc.
2. The layer's library file is able to be loaded by the Vulkan Loader because it is in:
    - A standard library path for the operating system
    - The library path has been updated using an operating system-specific mechanism such as:
        - Linux: adding the path to the layer's library .so with **LD_LIBRARY_PATH**
        - MacOS: adding the path to the layer's library .dylib with **DYLD_LIBRARY_PATH**
3. The layer's library file is compiled for the same target and bitdepth (32 vs 64) as the application

The difference between **VK_LAYER_PATH** and **VK_ADD_LAYER_PATH** is that **VK_LAYER_PATH** overrides the system layer paths so that no system layers are loaded by default unless their path is added to the environment variable.

Windows: (Vulkan SDK is installed in **C:\VulkanSDK\1.3.261.0**)

None

```
C:\> set VK_LAYER_PATH=C:\VulkanSDK\1.3.261.0\Bin
```

Linux: (Vulkan SDK in **/sdk** and **VULKAN_SDK=/sdk/1.3.261.0/x86_64**)

None

```
$ export VK_LAYER_PATH=$VULKAN_SDK/lib/vulkan/layers
$ export LD_LIBRARY_PATH=$VULKAN_SDK/lib:$VULKAN_SDK/lib/vulkan/layers
```

macOS: (Vulkan SDK 1.3.261.0 **/sdk** and **VULKAN_SDK=/sdk/1.3.261/macOS**)

None

```
$ export VK_LAYER_PATH=$VULKAN_SDK/share/vulkan/explicit_layers.d
$ export DYLD_LIBRARY_PATH=$VULKAN_SDK/lib
```

Enabling and ordering layers with VK_INSTANCE_LAYERS

VK_INSTANCE_LAYERS is the environment variable used to enable and order layers when using a console.

Note that the layer names order is relevant, with the initial layer being the closest to the application, and the final layer being closest to the driver. In the following example, the Khronos validation layer will be called *before* the Khronos profiles layer.

On Windows (Command Prompt), the variable should include a **semicolon-separated** list of layer names to activate.

None

```
C:\> set
VK_INSTANCE_LAYERS=VK_LAYER_KHRONOS_validation;VK_LAYER_KHRONOS_profiles
```

On Linux/macOS (shell), the variable should include a **colon-separated** list of layer names to activate.

None

```
$ export
VK_INSTANCE_LAYERS=VK_LAYER_KHRONOS_validation:VK_LAYER_KHRONOS_profiles
```

Enabling layers with VK_LOADER_LAYERS_ENABLE

Vulkan Loader version 1.3.234 introduced the **VK_LOADER_LAYERS_ENABLE** environment variable. It accepts a case-insensitive, comma-delimited list of globs which can be used to define the layers to load.

For example, with **VK_INSTANCE_LAYERS** if we wanted to enable the Profiles layer and the Validation layer, we have to set **VK_INSTANCE_LAYERS** equal to the full name of each layer:

None

```
VK_INSTANCE_LAYERS=VK_LAYER_KHRONOS_validation;VK_LAYER_KHRONOS_profiles
```

With **VK_LOADER_LAYERS_ENABLE**, we simply can use stars where we don't want to fill in the full name:

None

```
C:\> set VK_LOADER_LAYERS_ENABLE=*validation,*profiles
```

Usage on Windows

None

```
$ export VK_LOADER_LAYERS_ENABLE=*validation,*profiles
```

Usage On Linux/macOS

More info about the new layer filtering environment variables can be found in the `Layer Filtering` section of the Loader Layer Documentation.

Warnings: `VK_LOADER_LAYERS_ENABLE` has limitations when interacting with the other methods to enable and order layers (Using `vk_loader_settings.json` or the Vulkan API), hence it is not recommended for such use cases.

Initializing Layer Settings with Environment Variables

Each layer setting can be initialized using environment variables.

If an environment variable is set, it overrides the corresponding value set in the **vk_layer_settings.txt** file or in the Vulkan application code.

There are multiple environment variable names for each layer setting. The naming convention is the following format:

- VK_<LayerVendor>_<*LayerName*><*setting_name*> (highest priority)
- VK_<*LayerName*><*setting_name*>
- VK_<*setting_name*>` (lowest priority)

This allows the same setting name to be shared across layers while still permitting different values when needed.

Example of environment variable variants for a single setting:

- **VK_KHRONOS_VALIDATION_DEBUG_ACTION**
- **VK_VALIDATION_DEBUG_ACTION**
- **VK_DEBUG_ACTION**

Example: Windows usage:

None

```
C:\> set VK_VALIDATION_VALIDATE_CORE=true
C:\> set VK_VALIDATION_VALIDATE_SYNC=true
C:\> set VK_VALIDATION_THREAD_SAFETY=true
C:\> set VK_VALIDATION_DEBUG_ACTION=VK_DBG_LAYER_ACTION_LOG_MSG
C:\> set VK_VALIDATION_REPORT_FLAGS=debug;error;perf;info;warn
C:\> set VK_VALIDATION_ENABLE_MESSAGE_LIMIT=true
C:\> set VK_VALIDATION_DUPLICATE_MESSAGE_LIMIT=3
```

Example: Linux/macOS usage:

None

```
$ export VK_VALIDATION_VALIDATE_CORE=true
$ export VK_VALIDATION_VALIDATE_SYNC=true
$ export VK_VALIDATION_THREAD_SAFETY=true
$ export VK_VALIDATION_DEBUG_ACTION=VK_DBG_LAYER_ACTION_LOG_MSG
$ export VK_VALIDATION_REPORT_FLAGS=debug:error:perf:info:warn
$ export VK_VALIDATION_ENABLE_MESSAGE_LIMIT=true
$ export VK_VALIDATION_DUPLICATE_MESSAGE_LIMIT=3
```

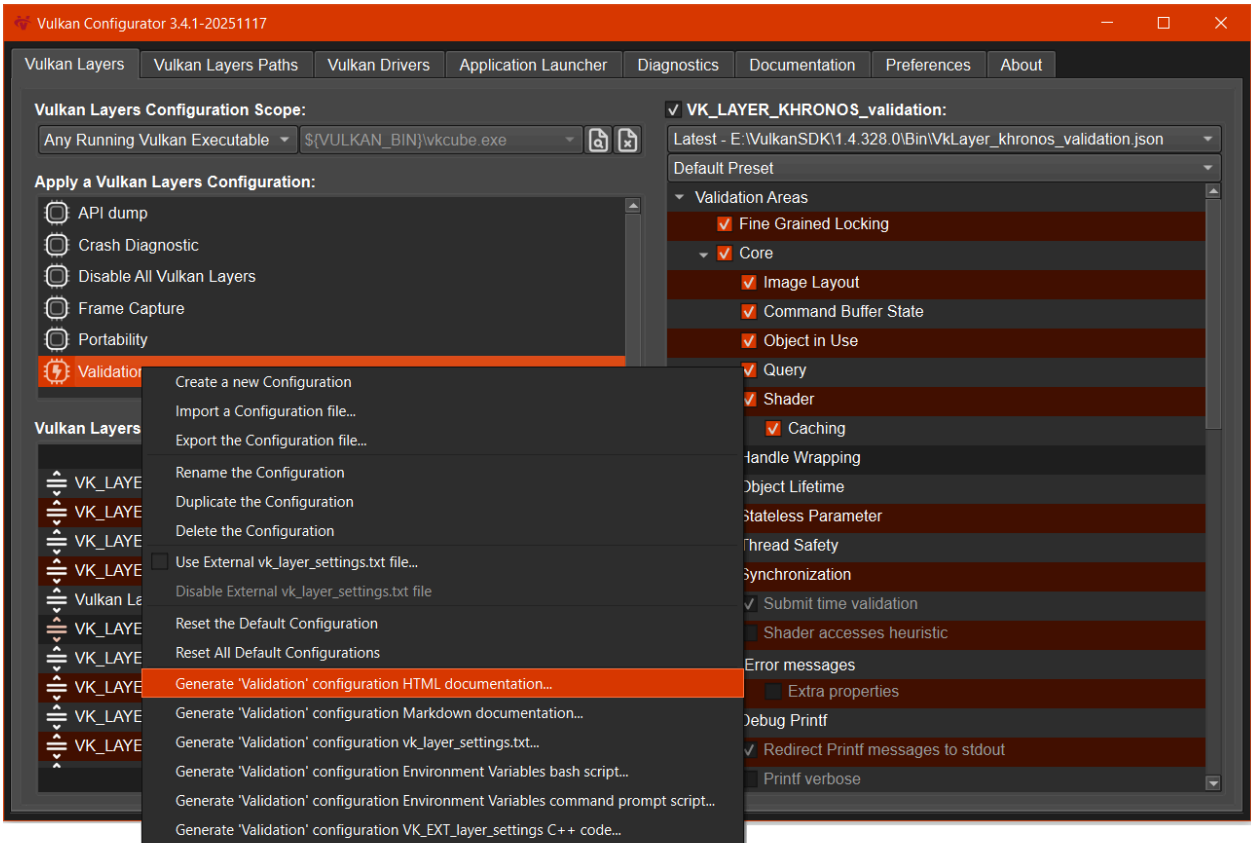
Generating Layer Settings Files

Generating documentation for layer settings

The layer settings reference documentation is generated from the layer manifest. It includes:

- Dependencies
- Sub-settings
- Platform support
- Links to feature documentation
- Code samples showing all three configuration methods (API, files, environment variables)

This documentation can be regenerated using the context menu of a layers configuration, it will be generated using the actual layer settings values selected and stored in this configuration.


Vulkan Configurator 3.4.1-20251117
Vulkan Layers
Vulkan Layers Paths
Vulkan Drivers
Application Launcher
Diagnostics
Documentation
Preferences
About
Vulkan Layers Configuration Scope:
Any Running Vulkan Executable
${VULKAN_BIN}\vkcube.exe
Apply a Vulkan Layers Configuration:
API dump
Crash Diagnostic
Disable All Vulkan Layers
Frame Capture
Portability
Validation
Vulkan Layers
VK_LAYE
Vulkan La
Create a new Configuration
Import a Configuration file...
Export the Configuration file...
Rename the Configuration
Duplicate the Configuration
Delete the Configuration
Use External vk_layer_settings.txt file...
Disable External vk_layer_settings.txt file
Reset the Default Configuration
Reset All Default Configurations
Generate 'Validation' configuration HTML documentation...
Generate 'Validation' configuration Markdown documentation...
Generate 'Validation' configuration vk_layer_settings.txt...
Generate 'Validation' configuration Environment Variables bash script...
Generate 'Validation' configuration Environment Variables command prompt script...
Generate 'Validation' configuration VK_EXT_layer_settings C++ code...
✓ VK_LAYER_KHRONOS_validation:
Latest - E:\VulkanSDK\1.4.328.0\Bin\VkLayer_khronos_validation.json
Default Preset
Validation Areas
✓ Fine Grained Locking
✓ Core
✓ Image Layout
✓ Command Buffer State
✓ Object in Use
✓ Query
✓ Shader
✓ Caching
Handle Wrapping
Object Lifetime
Stateless Parameter
Thread Safety
Synchronization
✓ Submit time validation
Shader accesses heuristic
Error messages
Extra properties
Debug Printf
✓ Redirect Printf messages to stdout
Printf verbose

Context menu to generate the Validation layers configuration files

Generating layer settings code for each method

Manually initializing layer settings with either of the three methods is possible but pretty tedious, error prone and time-consuming. This is due to the large number of settings some layers may have and considering that each new layer version may introduce new layer settings.

Vulkan Configurator solves this by letting us:

- Create and test a layers configuration with a user-interface.
- Generate ready-to-use code/scripts to initialize layer settings.

Vulkan Configurator can generate for a selected layers configuration:

- C++ helper libraries implementing **VK_EXT_layer_settings** to be used in the Vulkan application, working with either **vulkan.h** or **vulkan.hpp**
- Environment variables scripts (for shell or command prompt)
- **vk_layer_settings.txt** files

Using VK_EXT_layer_settings to configure layers programmatically

The generated layer settings code is a self-contained C++ header-only helper library that can be directly included in the Vulkan application code.

The layer settings are initialized by default with the value of layers configuration used to generate the library. These values can be modified during the Vulkan application execution.

Example: Generated C++ helper library example subset:

```
//Khronos Validation Layer (WINDOWS_X86, WINDOWS_ARM, LINUX, MACOS, ANDROID)
// `VK_LAYER_KHRONOS_validation` settings for version 1.4.321
/*
The main, comprehensive Khronos validation layer.

Vulkan is an Explicit API, enabling direct control over how GPUs actually work. By design,
minimal error checking is done inside a Vulkan driver. Applications have full control and
responsibility for correct operation. Any errors in how Vulkan is used can result in a
crash.

The Khronos Validation Layer can be enabled to assist development by enabling developers to
verify their applications correctly use the Vulkan API.
*/
// For more information about the layer:
https://vulkan.lunarg.com/doc/sdk/latest/windows/khronos_validation_layer.html

struct ValidationSettingData {
        static const uint32_t VERSION = VK_MAKE_API_VERSION(1, 4, 321, 0);

        // Core (WINDOWS_X86, WINDOWS_ARM, LINUX, MACOS, ANDROID)
        // Layer setting documentation:
https://vulkan.lunarg.com/doc/sdk/latest/windows/khronos_validation_layer.html#validate_core
        // For more information about the feature:
https://github.com/KhronosGroup/Vulkan-ValidationLayers/blob/main/docs/core_checks.md
        VkBool32 validate_core = VK_TRUE;

        // Image Layout (WINDOWS_X86, WINDOWS_ARM, LINUX, MACOS, ANDROID)
        // Layer setting documentation:
https://vulkan.lunarg.com/doc/sdk/latest/windows/khronos_validation_layer.html#check_image_layout
        // This setting requires ALL of the following values:
        // - VkBool32 validate_core = VK_TRUE;
        VkBool32 check_image_layout = VK_TRUE;

        ...

}

// `LayerSettings` allows initializing layer settings from Vulkan application code.
struct LayerSettings {
        ApidumpSettingData api_dump;
        CrashdiagnosticSettingData crash_diagnostic;
        GfxreconstructSettingData gfxreconstruct;
        ScreenshotSettingData screenshot;
        ValidationSettingData validation;
        ProfilesSettingData profiles;
        ShaderobjectSettingData shader_object;
        Synchronization2SettingData synchronization2;

        // Can be used directly with VkLayerSettingsCreateInfoEXT
        const std::vector<VkLayerSettingEXT>& info();
};
```

Example: Using the Generated C++ helper library:

```
#include “vulkan_layer_settings.hpp”

...
{
        LayerSettings layer_settings;
        layer_settings.validate_core = VK_FALSE;

        std::vector<VkLayerSettingEXT> data = layer_settings.info();

        VkLayerSettingsCreateInfoEXT layer_settings_create_info {
                VK_STRUCTURE_TYPE_LAYER_SETTINGS_CREATE_INFO_EXT, nullptr,
                static_cast<int>(data.size()), &data[0]
        };
}
```

Using environment variables to configure layers

The generated layer settings script is generated either using the Shell syntax (for Linux/MacOS) or Command Prompt syntax (for Windows). It initializes all the layer settings environment variables using the values from layers configuration used to generate the script.

Example: Generated Environment Variables script (example subset):

```
...
#! This code was generated by Vulkan Configurator 3.4.1

#! Khronos Validation Layer
#! ==========================================
#! VK_LAYER_KHRONOS_validation - 1.4.328 (WINDOWS_X86, WINDOWS_ARM, LINUX, MACOS, ANDROID)
#!  The main, comprehensive Khronos validation layer.

#!  Vulkan is an Explicit API, enabling direct control over how GPUs actually
#!  work. By design, minimal error checking is done inside a Vulkan driver.
#!  Applications have full control and responsibility for correct operation. Any
#!  errors in how Vulkan is used can result in a crash.
#! For more information about the layer:
https://vulkan.lunarg.com/doc/sdk/latest/windows/khronos_validation_layer.html

#! Core
#! ------------------------------------------
#! validate_core (WINDOWS_X86, WINDOWS_ARM, LINUX, MACOS, ANDROID)
#!  The main, heavy-duty validation checks. This may be valuable early in the
#!  development cycle to reduce validation output while correcting
#!  parameter/object usage errors.
#! For more information about the feature:
https://github.com/KhronosGroup/Vulkan-ValidationLayers/blob/main/docs/core_checks.md

#! This setting has sub-settings:
#! - export VK_KHRONOS_VALIDATION_CHECK_IMAGE_LAYOUT=true
#! - export VK_KHRONOS_VALIDATION_CHECK_COMMAND_BUFFER=true
#! - export VK_KHRONOS_VALIDATION_CHECK_OBJECT_IN_USE=true
#! - export VK_KHRONOS_VALIDATION_CHECK_QUERY=true
#! - export VK_KHRONOS_VALIDATION_CHECK_SHADERS=true
export VK_KHRONOS_VALIDATION_VALIDATE_CORE=true

#! Shader
#! ------------------------------------------
#! check_shaders (WINDOWS_X86, WINDOWS_ARM, LINUX, MACOS, ANDROID)
#!  This will validate the contents of the SPIR-V which can be CPU intensive
#!  during application start up. This does internal checks as well as calling
#!  spirv-val. (Same effect using VK_VALIDATION_FEATURE_DISABLE_SHADERS_EXT)
#! This setting has sub-settings:
#! - export VK_KHRONOS_VALIDATION_CHECK_SHADERS_CACHING=true
#! - export VK_KHRONOS_VALIDATION_DEBUG_DISABLE_SPIRV_VAL=false
#! This setting requires ALL of the following values:
#! - export VK_KHRONOS_VALIDATION_VALIDATE_CORE=true
export VK_KHRONOS_VALIDATION_CHECK_SHADERS=true
...
```

Generating Files from the Command Line

Vulkan Configurator supports generating files directly from the terminal.

Command help output (vkconfig help settings):

```
$ vkconfig help settings

Name
        'settings' - Command to generate layer settings files

Synopsis
        vkconfig settings
                [(--generate | -g) (html | markdown | txt | bash | bat | hpp)]
                [(--configuration | -c) [<configuration_index> | <configuration_name> | default]]
                [(--layer | -l) [<layer_name> | default]]
                [(--output-dir | -d) <output_dir>]
                [(--output | -o) <output_file>]
                [--dry-run]

Description

        Generate layer settings files either for system configuration or documentation of a layers
        configuration.

Arguments
        `[--generate (html | markdown | txt | bash | bat | hpp)]`
                Specify the layer settings generation mode, the default value is 'txt':
                - 'html' to generate the HTML layer settings documentation, the default filename is
                  'vk_layer_settings.html'
                - 'markdown' to generate the Markdown layer settings documentation, the default filename
                  is 'vk_layer_settings.md'
                - 'txt' to generate the `vk_layer_settings.txt` layer settings file, the default
                  filename is 'vk_layer_settings.txt'
                - 'bash' to generate the environment variables layer settings script for 'Bash', the
                   default filename is 'vk_layer_settings.sh'
                - 'bat' to generate the environment variables layer settings script for
                  'command prompt', the default filename is 'vk_layer_settings.bat'
                - 'hpp' to generate the C++ layer settings helper code, the default filename is
                  'vk_layer_settings.hpp'

          (Run 'vkconfig layers --list' to enumerate the available layers.)

        `[--configuration [<configuration_index> | <configuration_name> | default]]`
                Specify the configuration name or index in the configuration list. If the argument is
                not set or set to 'default', the default layer settings will be used.

          (Run 'vkconfig loader --list' to enumerate the available configurations.)

        `[--layer <layer_name>]`

                Specify the layer name, if the argument is not set or set to 'default', all the found
                layers will be used.

          (Run 'vkconfig layers --list' to enumerate the available layers.)

        `[--output-dir | -d] <output_dir>`
```

```
                Specify the output directory path. The filename used will be the default filename if
                <output_file> is not set

                - If the 'generate' is set to 'html', the default filename is 'vk_layer_settings.html'
                - If the 'generate' is set to 'markdown', the default filename is 'vk_layer_settings.md'
                - If the 'generate' is set to 'txt', the default filename is 'vk_layer_settings.txt'
                - If the 'generate' is set to 'bash', the default filename is 'vk_layer_settings.sh'
                - If the 'generate' is set to 'bat', the default filename is 'vk_layer_settings.bat'
                - If the 'generate' is set to 'hpp', the default filename is 'vk_layer_settings.hpp'

        `[(--output | -o) <output_file>]`

                Specify the output file path. If <output_dir> is set, then <output_file> must be the
                filename only.

                - If the 'generate' is set to 'html', the default filename is 'vk_layer_settings.html'
                - If the 'generate' is set to 'markdown', the default filename is 'vk_layer_settings.md'
                - If the 'generate' is set to 'txt', the default filename is 'vk_layer_settings.txt'
                - If the 'generate' is set to 'bash', the default filename is 'vk_layer_settings.sh'
                - If the 'generate' is set to 'bat', the default filename is 'vk_layer_settings.bat'
                - If the 'generate' is set to 'hpp', the default filename is 'vk_layer_settings.hpp'

        `[--dry-run]`

                Run without affecting the system and Vulkan Configurator files.
```

Vulkan Configurator ‘settings’ command documentation

Vulkan SDK Generated Files

Since Vulkan SDK 1.4.333, the SDK includes pre-generated files with default values:

- vk_layer_settings.txt
- vulkan_layer_settings.hpp — C++ header only helper library located next to vulkan.h
- vk_layer_settings.sh and vk_layer_settings.bat — environment variable scripts

These files are generated using the following commands:

vk_layer_settings.txt

```
$ VK_LAYER_PATH=$VULKAN_SDK_BUILD/build/Bin
$ vkconfig settings --txt default -o ./vk_layer_settings.txt --dry-run
```

vk_layer_settings.sh

```
$ VK_LAYER_PATH=$VULKAN_SDK_BUILD/build/Bin
$ vkconfig settings --bash default -o ./vk_layer_settings.sh --dry-run
```

vk_layer_settings.bat

```
$ VK_LAYER_PATH=$VULKAN_SDK_BUILD/build/Bin
$ vkconfig settings --bat default  -o ./vk_layer_settings.bat --dry-run
```

vulkan_layer_settings.hpp

```
$ VK_LAYER_PATH=$VULKAN_SDK_BUILD/build/Bin
$ vkconfig settings --hpp default  -o ./vulkan_layer_settings.hpp --dry-run
```

Revision History

Revision Date	SDK Release	Comments
March 2026	SDK 1.4.335.0	- Update for *Vulkan Configurator* 3 and Vulkan Loader **vk_loader_settings.json** - Add Vulkan layer settings file generation
April 2024	SDK 1.3.280.0	- Fix **VK_EXT_layer_settings** usage example.
January 2024	SDK 1.3.275.0	- Initial release.