Vulkan Guide

Khronos Group

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Logistics Overview

What is Vulkan?

1. Vulkan is a new generation graphics and compute API
2. Vulkan provides high-efficiency, cross-platform to modern GPUs used in a devices like pc/mobile/ embeded platforms
3. Vulkan provide a way for developers to program their modern GPU hardware
    1. Vulkan is a tool for developers to create hardware accelerated applications
4. The Khronos Group is created and maintains Vulkan.

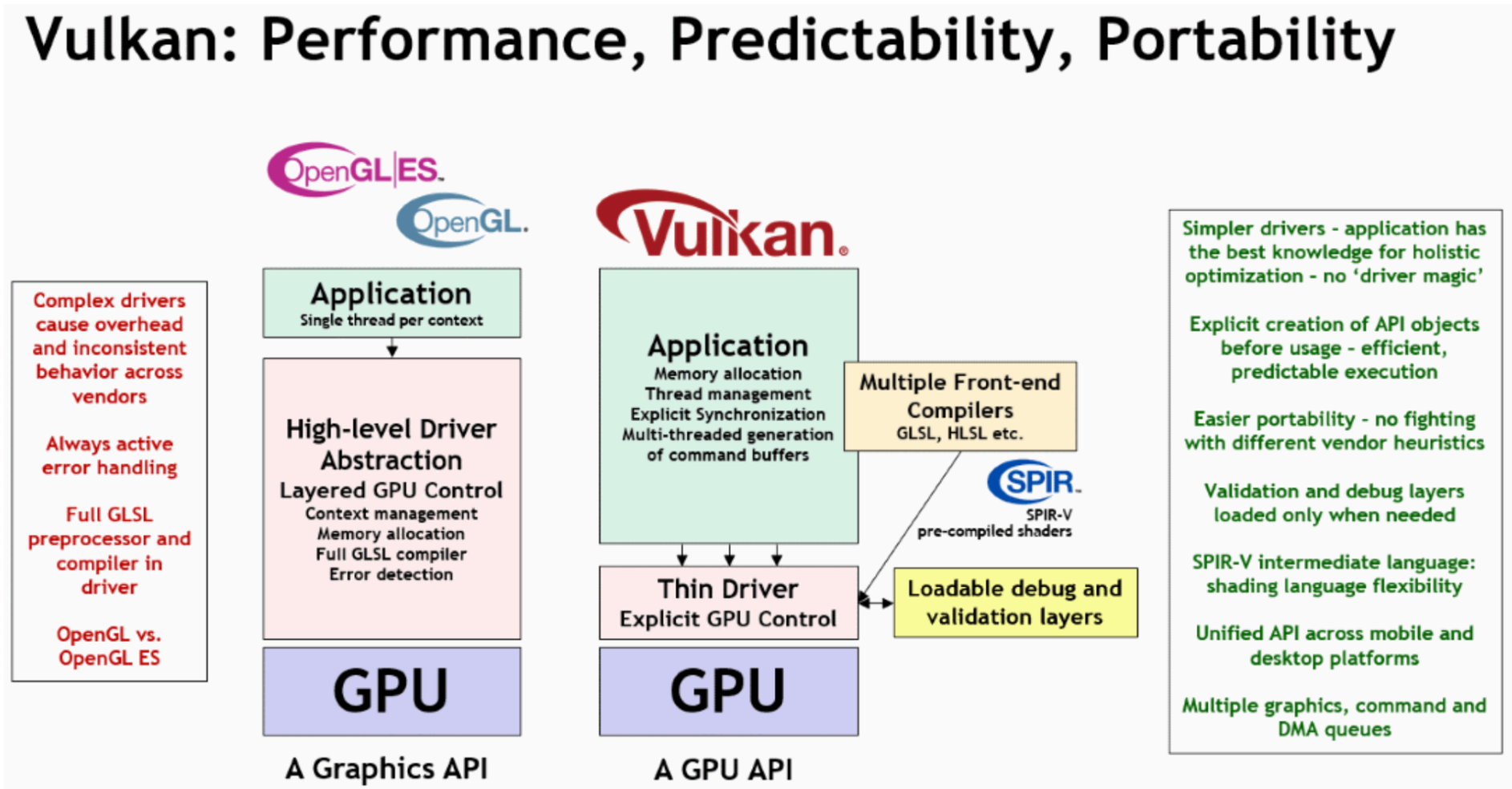
Vulkan and OpenGL

Difference

1. OpenGL is also a 3D Graphics API
2. Vulkan is not a replacement for OpenGL
3. Vulkan is an explicit API allows for more explicit control of the GPU

Feature	OpenGL ES	Vulkan
State management	Global state	State objects
API execution model	Synchronous	Asynchronous
API threading model	Single threaded	Multi-threaded
API error checking	Extensive runtime checks	Only via layers
Render pass abstraction	Inferred render passes	Explicit render passes
Memory allocation	Client-server pools	Shared memory pool
Memory usage	Typed allocations	Typed views

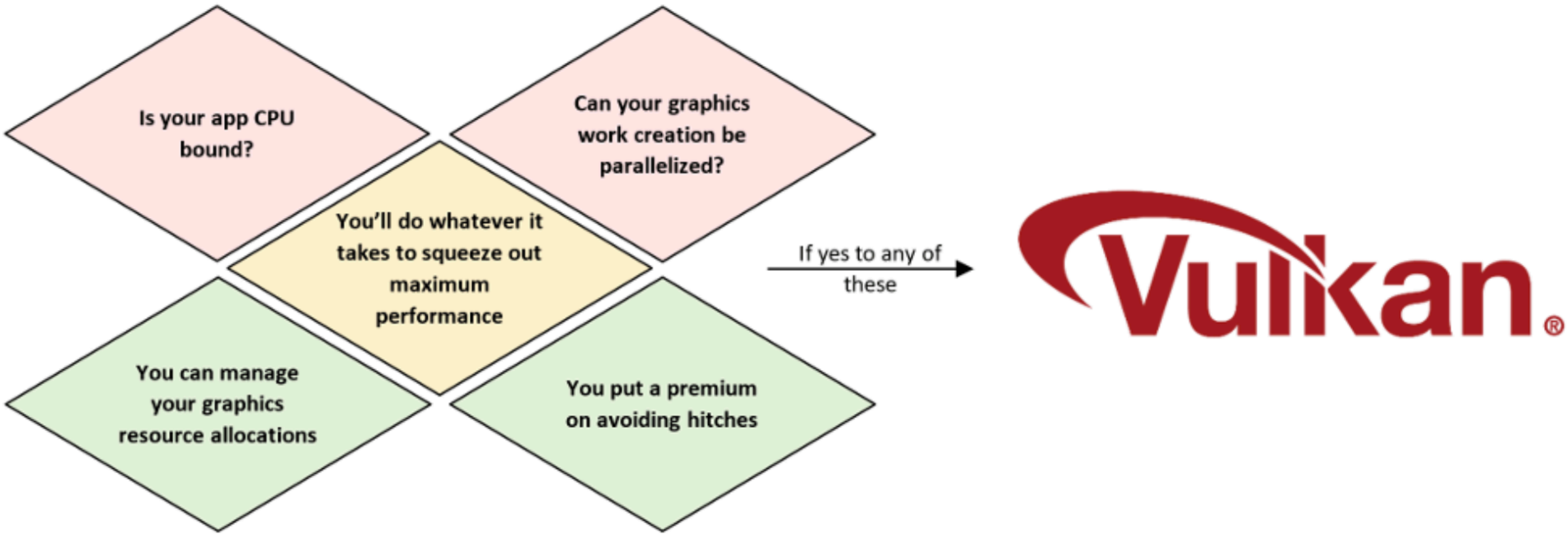
Vulkan and OpenGL



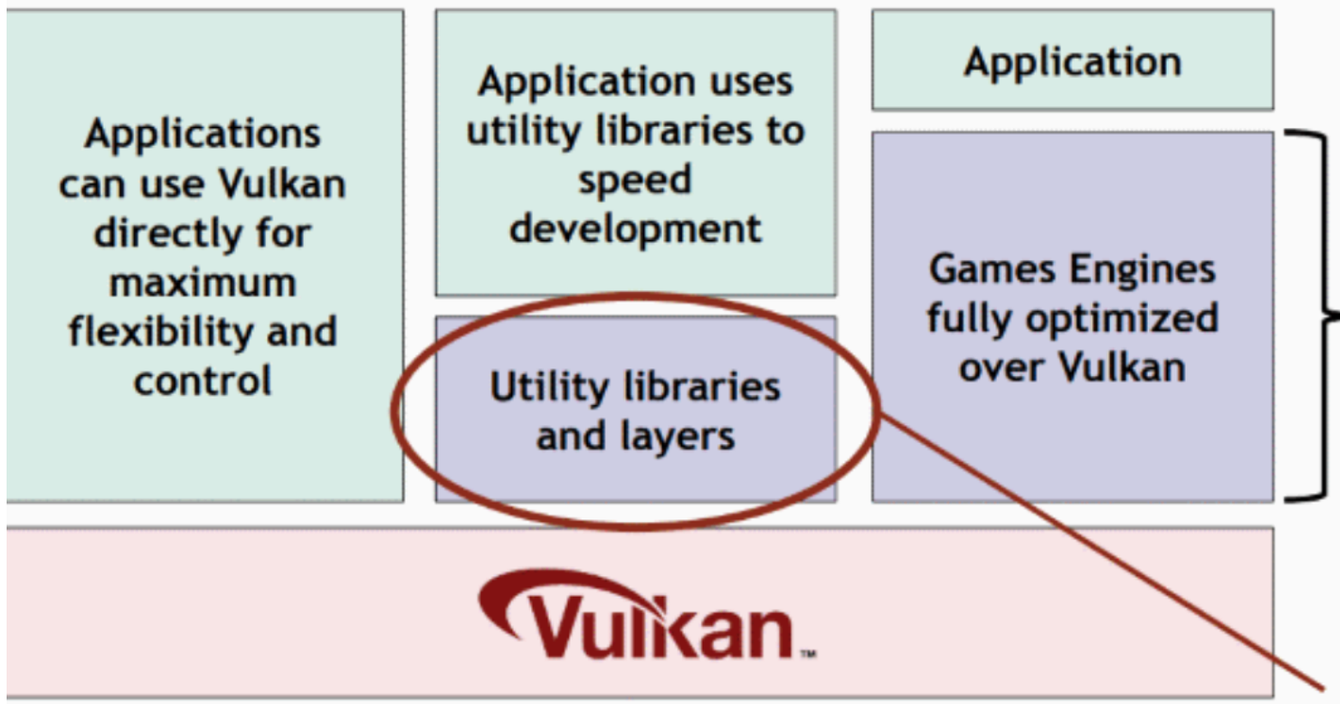
Vulkan and OpenGL

Vulkan puts more work and responsibility into application

1. Why Vulkan put more work and responsibility into application?
    1. For those who use Vulkan correctly can find power and performance improvements



The Power of a Three Layer Ecosystem



The industry's leading games and engine vendors are participating in the Vulkan working group

OXIDE · LUCASFILM Ltd · BLIZZARD ENTERTAINMENT · EA · unity · EPIC GAMES · VALVE

Developers can choose at which level to use the Vulkan Ecosystem

Rich Area for Innovation

- Many utilities and layers will be in open source
- Layers to ease transition from OpenGL
- Domain specific flexibility

The same ecosystem dynamic as WebGL

A widely pervasive, powerful, flexible foundation layer enables diverse middleware tools and libraries

What Vulkan Can Do?

User can use Vulkan to develop application for many use cases

1. Graphics
    1. Developers can create 2D/3D hardware accelerated graphical applications
2. Compute
    1. Vulkan supports compute variation of VkQueues/VkPipelines, so Developer can use Vulkan for general computation
3. Ray Tracing
    1. What is Ray Tracing?
        1. Ray tracing is an alternative rendering technique, based around the concept of simulating the physical behavior of light
        2. Vulkan support VK_KHR_ray_tracing_pipeline
4. Vulkan Video
    1. Vulkan Video provide fine-grained control over video processing scheduling, synchronization, and memory utilization to the application.
5. Machine Learning
    1. Make Vulkan a first class API for exposing ML compute capabilities of modern GPUs.
6. Safety Critical
    1. Bring the graphics and compute capabilities of modern GPUs to safety-critical systems in the automotive, avionics, industrial and medical space.

Platforms

Vulkan runs on many platforms, each has small variations

`DVK_USE_PLATFORM_WIN32_KHX`

`DVK_USE_PLATFORM_MACOS_MVK`

`DVK_USE_PLATFORM_ANDROID_KHX`

`DVK_USE_PLATFORM_WAYLAND_KHR`

`DVK_USE_PLATFORM_XCB_KHR`

Checking for Vulkan Support

Platform support and Device Support

1. How to check if your platform is support Vulkan?
    1. Each platform uses a different mechanism to manage how the Vulkan Loader is implemented
        1. Android: run Vulkan Hardware Capability Viewer app developed by Sascha Willems.
        2. BSD Unix: run vulkaninfo in VulkanSDK.
        3. iOS: Vulkan Hardware Capability Viewer provided by LunarG.
        4. Linux: run Vulkaninfo in VulkanSDK
        5. macOS: run Vulkaninfo in VulkanSDK
        6. Windows: run Vulkaninfo.exe in VulkanSDK
    2. The loader is then in charge of determining if a Vulkan Driver is exposed correctly.