Vulkan Multi-Threading and Performance

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How is Vulkan Different From OpenGL?

Focuses on parallelism and multicore processing:

- Current version of OpenGL cannot handle multiple threads
- High rendering performance programs are limited to a single core = bad performance.
Vulkan's Purpose

Low level graphics API

- This is not new
- Has been used on gaming consoles before

Can be optimized

- With PC's, developers know the hardware being used; can optimize performance

Brings the advantages of console's low level graphics to multiple platforms

Hardware

**Problem:** Large variety of graphics cards that need to be supported

Vulkan can currently support:

- All AMD cards
- All NVIDIA cards

A layer of hardware sits between the code and the main hardware

- Driver
Drivers and OpenGL

OpenGL uses drivers to perform checks and tests.

- Error checks for problems in the developer’s code

Khronos Group believes that it should not be the driver’s responsibility to check for errors - that should be the developer’s job.

Drivers and Vulkan

Removes the driver’s responsibility of checking for errors

- Gives the developer more control - But also more responsibility.

Validation layers are used during development to catch bugs and other errors. They are removed in the final release to not hinder performance.
Performance Test

OpenGL 4.5 vs Vulkan 1.0.2

Two scenes are rendered with high detail and low detail models.

Low Detail Model

1000 Objects
252,000 Vertices
Single and 4 Core Vulkan Performance

Single Core:
After 60 seconds, ~ Frames Per Second of 695
CPU: 21%   GPU: 26%

Four Core:
After 60 seconds, ~ Frames Per Second of 1176
GPU: 46%   CPU: Constantly Fluctuating

OpenGl Performance

OpenGl Single Core:
After 60 seconds, ~ Frames Per Second of 772
CPU: 25%   GPU: 27%
High Detail Model

1000 objects
5032 vertices

Single Core:
After 60 seconds, ~ Frames Per Second of 132
CPU: ~10%   GPU: ~100%

Four Core:
After 60 seconds, ~ Frames Per Second of 143
GPU: ~100%   CPU: Constantly Fluctuating < 30%
OpenGl Single Core

OpenGl Single Core:

After 60 seconds, ~ Frames Per Second of 182

Results

OpenGl's performance was very similar to single core Vulkan when doing low rendering

Vulkan's 4-core performance had a huge lead when rendering low performance

When rendering the high performance:

- OpenGl had 37% more FPS than the single core Vulkan
- OpenGl had 27% more FPS than the 4-core Vulkan
Resources
