

# GPU testing: past, present and the future

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Visual fidelity and accurate computations became even more important with the new arrival of ray tracing techniques. Projects involving realistic graphics and analytics are chasing real world experiences with simulation techniques on the boundary of real-time applications. Most of these technologies are aided with GPUs using the latest graphics and perform API operations with Vulkan.

With the growth rate in applications physically based rendering (PBR) and simulations, development time has increased, challenging the programmers and testing personnel. Most of these projects are based on shorter development and design times and often ends in buggy final products.

Our presentation will cover the results and findings of a pilot project implemented in a startup (Zeno) approaching physically based rendering with photon mapping and developing a GPU shader unit testing and pipeline reflection tool (FrameGraph) architecture for enhancing the development of rendering in real-time simulations [1]. The solution was implemented with the extension of SPIRV-X aided by custom automated toolchain steps to produce graph modules and equivalent shader conversions. Summing up our experiences the generation of explicit API calls and reflection on shader assets with testing almost always can lower the development time in the long run whereas it can assure great quality in visual fidelity.

We present the outline of our solution prototype which executes unit tests on the GPU by harnessing the Vulkan Validation Layer.

[1] *Improving graphics programming with shader tests*. April 2019, Pollack Periodica **14**(1):35-46, DOI:10.1556/606.2019.14.1.4