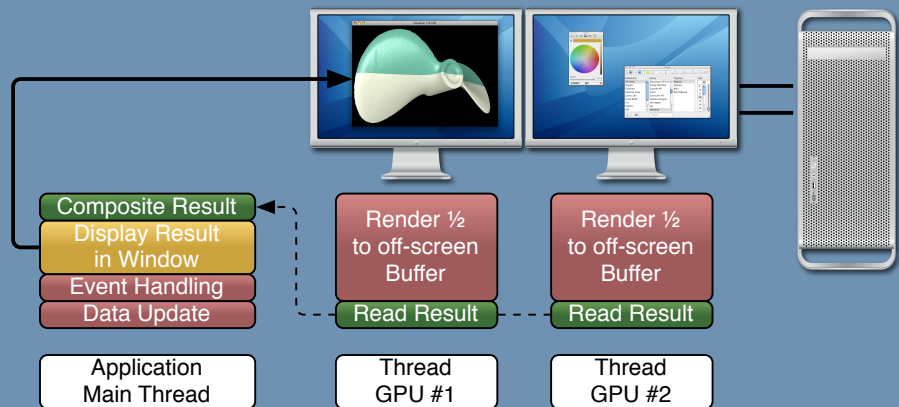


OpenGL Scalability for Multi-GPU Systems

Equalizer helps application providers to fully exploit the power of multi-GPU workstations



Parallel Rendering for OpenGL

Equalizer provides a flexible, scalable rendering framework for parallel OpenGL applications. This White Paper uses Equalizer to provide unparallelled performance for large data sets on a dual-GPU Workstation.

Introduction

Equalizer is a framework for the development and deployment of parallel OpenGL applications. An Equalizer application can run unmodified on any visualization system, from a single-pipe workstation to large scale graphics clusters.

Multi-GPU workstations have become an affordable option for almost all users. Often they are used in a NVIDIA SLI or ATI CrossFire configuration, where the OpenGL driver virtualizes the graphics cards transparently to the application. This has the advantage of requiring no application changes, but has scalability limitations since the application is still single-threaded, and all OpenGL commands are sent to all GPU's.

Parallel Rendering

To fully exploit the capabilities of multi-GPU, multi-core systems, the application has to maximize the usage of the graphics cards and CPU cores. For OpenGL-based rendering, the best way is to use:

- One rendering thread with one off-screen buffer for each graphics card.
- One on-screen window to display the result, not bound to a specific GPU

- A task decomposition assigning a part of the rendering to each off-screen window.

During scalable rendering, the task to render a single view is broken up, and each part is assigned to a different resource. The following decomposition schemes were used in this White Paper:

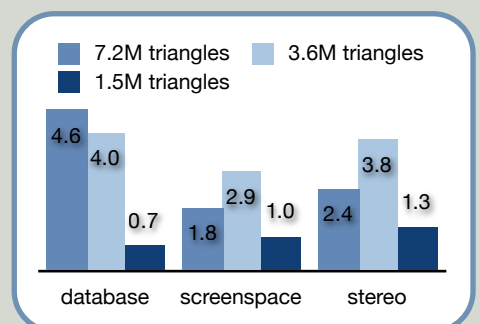
- **Database:** Each resource renders a part of the application's database.
- **Screen-space:** Each resource renders a 2D tile of the result view.
- **Stereo:** Each resource renders one eye pass during stereo rendering.

Conclusion

Equalizer provides the fastest porting path for existing applications. It implements the common execution framework and parallel rendering algorithms, and does not interfere with the application's rendering code.

Equalizer enables application developers to configure their applications to take full advantage of multi-GPU workstations. Equalizer-based applications provide better performance and allow to visualize more complex data sets.

Dual-GPU Benchmark



(relative performance, bigger is better)

The chart shows the relative performance compared to single-threaded rendering. Using multithreaded rendering significantly improves the performance. Super-linear speedup is achieved since less memory is required on each GPU to render a frame.

About

Equalizer is a product of Eyescale Software GmbH. Please visit www.eyescale.ch and www.equalizergraphics.com for more information.

