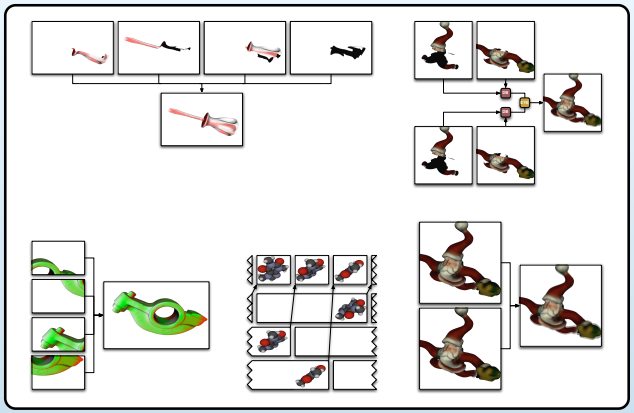
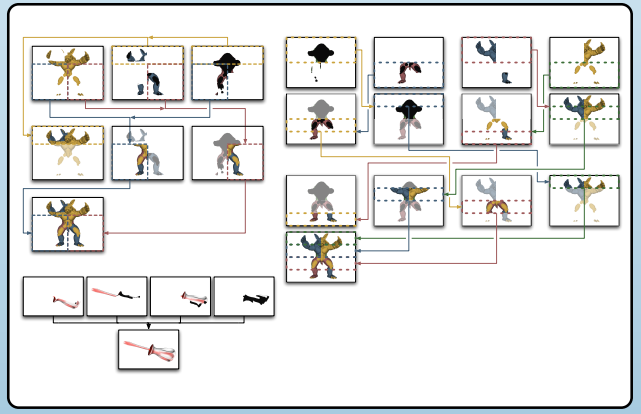


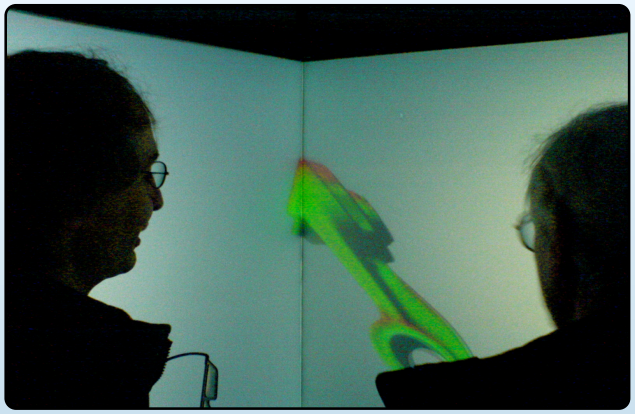


Scalability

Equalizer implements a wide range of algorithms to parallelize the rendering of large data sets. Multiple graphic cards, processors and computers can be combined to render a single view. The Equalizer server distributes the rendering task across the available resources (decomposition) and assembles the results on the final view (recomposition).

For the task decomposition, Equalizer currently supports sort-first (2D), sort-last (DB) and stereo (Eye) compounds. Time-multiplex (DPlex) is planned.

Equalizer supports virtually any recomposition algorithm, for example binary swap or direct send for sort-last, and tile gathering for sort-first rendering.



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Open standard for scalable rendering
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Collaborations welcome
Consulting and support available

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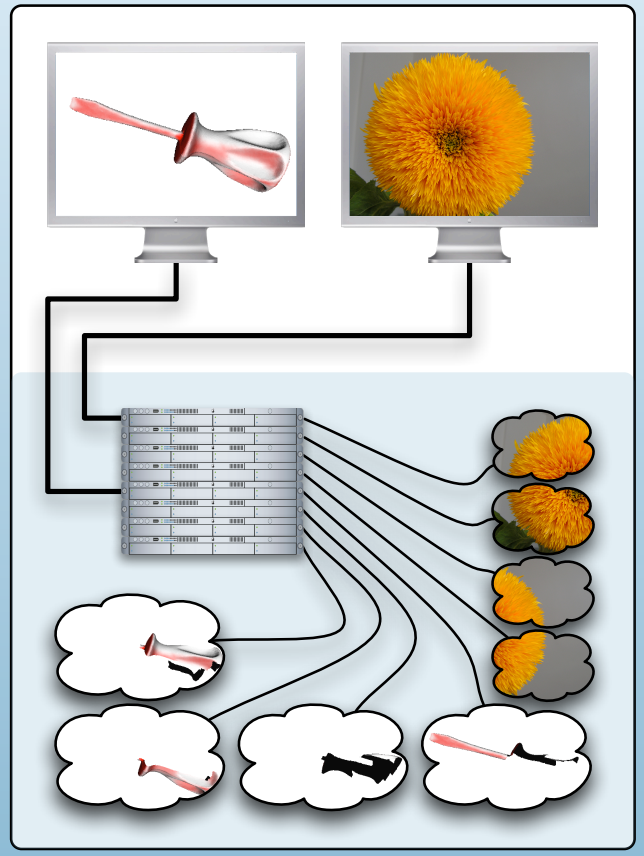
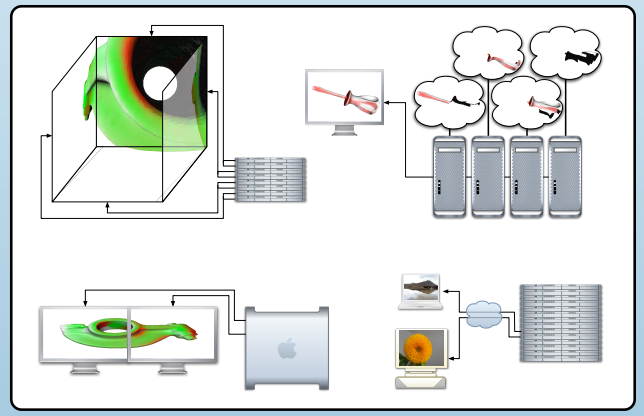
Equalizer

Scalable Rendering



Equalizer is an open source programming interface and resource management system for scalable graphics applications. An Equalizer application can run unmodified on any visualization system, from a singlepipe workstation to large scale graphics clusters and shared memory visualization systems. The foundation of Equalizer is a parallel, scalable programming interface which solves the problems common to any multipipe application.



Use Cases

Equalizer abstracts the configuration from the application code. This allows the same application to be deployed in many different ways, for example:

Display Walls are driven by Equalizer by running an OpenGL execution thread locally on each node.

Immersive Installations use passive or active stereo rendering with head tracking, both supported by Equalizer.

Multipipe Workstations are an affordable way to scale the rendering performance and display size.

Remote Visualization Clusters are a cost-efficient way of centralizing large scale data.

Scalable Rendering is used to parallelize the rendering of a single view across multiple graphic cards and processors.

Programming Interface

Equalizer uses a callback-driven programming model. where the application provides their rendering methods, which are called by the Equalizer framework according to the current configuration. Process and thread creation, task synchronization and network connections are externalized from the application and handled by the Equalizer framework.

The multipipe programming interface follows the natural execution model of any multipipe application. The application needs to separate the rendering routines from the core application to make them distributable. Equalizer abstracts common graphic entities into C++ classes, for example:

- **Node** - a single computer in the cluster
- **Pipe** - a graphics card and rendering thread
- **Window** - an OpenGL drawable
- **Channel** - a viewport within a window

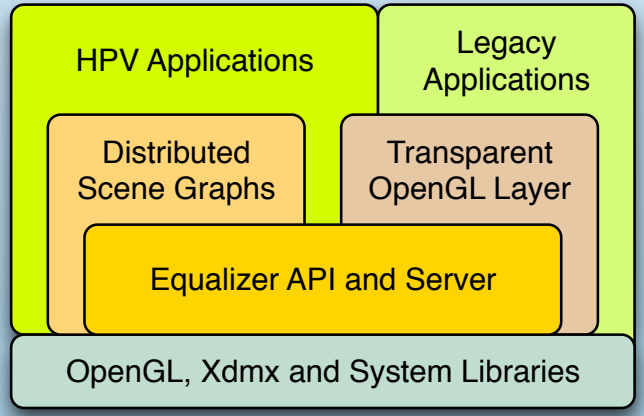
The application subclasses these entities, and overrides methods to provide the application's rendering code. Each method corresponds to a task, and for all of them Equalizer provides a default method which implements the typical use case. This allows a quick start for the developer, which can replace the defaults gradually with his own code. Some of the most important methods are:

- **Channel::draw** - render using the provided frustum, viewport and range
- **Window::init** - initialize OpenGL drawable and state
- **Pipe::startFrame** - update frame-specific data
- **Node::init** - initialize per node application data

Equalizer provides an API to build network-distributed applications. In contrast to other cluster API's, such as MPI or PVM, this API is designed for the development of interactive applications. Certain characteristics of visualization software, e.g. the frame-driven rendering, are exploited for better performance and simpler programming interface.

Resource Management

Equalizer uses a configuration server to optimally allocate and balance the available resources on the visualization system. The server is configured using a hierarchically structured configuration file to describe the available resources, and the combination of the resources for rendering. Equalizer applications can also run without a server, in which case they will automatically configure themselves for the local workstation. The central resource management enables system-wide resource reservation, allocation and scheduling, as well as the integration with other cluster scheduling software.



Transparent OpenGL Layer

A transparent OpenGL layer will enable the execution of unmodified OpenGL applications. It allows a seamless integration of unmodified and scalable applications on the same system.

Distributed Scene Graphs

Equalizer will be integrated with popular scene graphs, such as Coin3D or OpenSceneGraph. Applications using these scene graphs can easily implement parallel, scalable applications, and profit from the current and future feature set of Equalizer.