White Paper

OpenGL Vizserver™

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1.0 Introduction

OpenGL Vizserver is a remote rendering software system. It allows users to take advantage of Silicon Graphics® Onyx2® InfiniteReality® without having to leave their desks. It can be used both transparently and via an API. This white paper will only cover the transparent aspects of OpenGL Vizserver.

OpenGL Vizserver has been designed to work in conjunction with the remote display capabilities of the X window system, where OpenGL Vizserver diverts all OpenGL® rendering to the host machine. By having all rendering done on the host machine, the application can use the power of the InfiniteReality graphics pipe and not be limited by the graphics system of the client. The rendering results are then compressed and transmitted to the client for display. One important distinction to make is that OpenGL Vizserver itself does not do any rendering, it just controls where the rendering occurs and the transport mechanism needed to carry the results to the client.

The integration of OpenGL Vizserver with the X window system is what allows for the transparency of the software system. This means no modification is necessary for an application to work with OpenGL Vizserver. This is one of the most powerful features of OpenGL Vizserver since it allows the user to take any application and immediately start reaping the benefits of remote rendering.

OpenGL Vizserver has been designed to efficiently grab the contents of the framebuffer after rendering has been completed and transport it to the client. Framebuffer retrieval, compression, and network transport are structured into a pipeline architecture, therefore taking advantage of parallelization and the multiple processors available on the Onyx2 system.

This white paper will cover the following topics:

- Basic architecture
- The benefits of OpenGL Vizserver
- OpenGL Vizserver usage scenarios

2.0 Basic Architecture

The two main components of the OpenGL Vizserver architecture are the redirection of the OpenGL rendering to the host machine's graphics pipes and the transport of the rendering results to the client. Under normal circumstances, the application would interface with the client via the X server in the following manner (see Fig. 1):

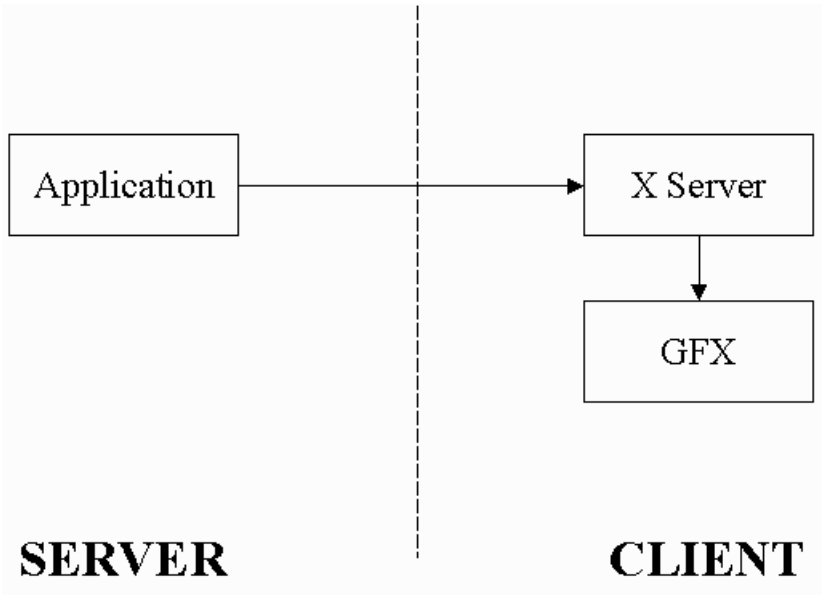

Fig. 1. Normal X application.

With OpenGL Vizserver, the application interfaces with the client X server through an OpenGL Vizserver layer, which redirects all OpenGL calls to the host machine's graphics subsystem. When a frame is done, indicated by either glXSwapbuffers() or glFinish(), the final image is pulled out of the pipe through the OpenGL Vizserver layer, compressed, and sent to the client. The OpenGL Vizserver client then receives and decompresses the framebuffer images from the server and displays them in the correct window. The images are compressed using Color Cell Compression (CCC), which provides an 8:1 compression ratio, and Interpolated Color Cell (ICC) compression, which provides a 4:1 compression ratio. This process is illustrated in Fig. 2:

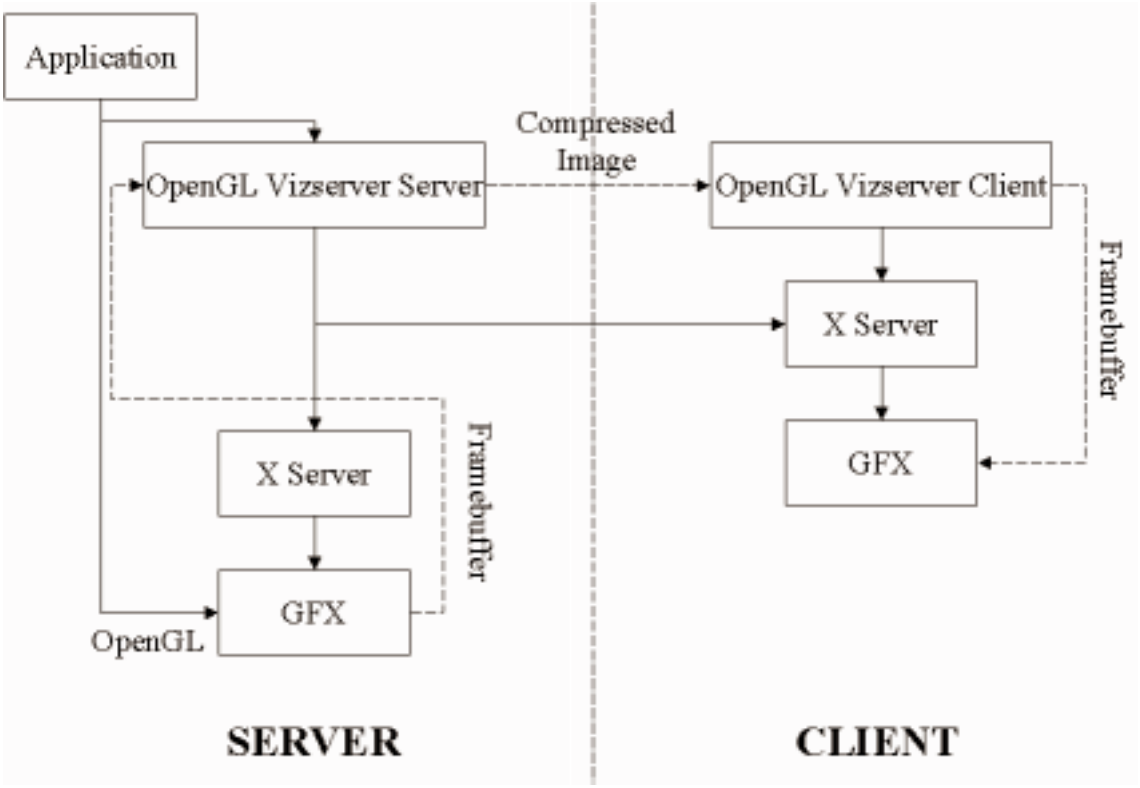

Fig. 2. X application using OpenGL Vizserver.

3.0 The Benefits of OpenGL Vizsever

Many applications require to be or are greatly enhanced when they are run on an Onyx2 InfiniteReality system because of its graphics power and image quality. This is especially true in visualizing extremely large data sets, commonly found in the oil and gas industry and the scientific community. The Onyx2 system architecture is of further benefit because of its CPU scalability, memory resources, and fast disk I/O. Ideally, all users needing to visualize large data sets would have their own Onyx2 system. In cases where this is impractical, OpenGL Vizserver can bring the power of remotely located Onyx2 systems to the desktops of individual users.

By bringing the power of Onyx2 remotely to the desktops of individual users, the necessity for users to physically move from their desks to a different location is removed. This lowers the threshold to usage of the Onyx2 system, resulting in a larger number of Onyx2 users and a corresponding improvement in return on investment in Onyx2 systems.

OpenGL Vizserver can be used across a standard network and therefore does not require a special infrastructure to support it. The use of standard networks allows users to access the server from almost any remote site, giving many users in an organization access to an Onyx2 system and its capabilities from their desktops.

OpenGL Vizserver enables data to be centralized at one server, eliminating the need for it to be copied to remote locations. This is especially beneficial when dealing with very large data sets. Having the mass disk storage system local to the visualization machine allows for easier management of the data and faster visualization.

OpenGL Vizserver is application transparent. No modification is necessary to the application, making it possible to benefit from OpenGL Vizserver's remote visualization capabilities almost immediately.

4.0 OpenGL Vizserver Usage Scenarios

OpenGL Vizserver has many potential applications. The following are three possibilities for how it can be used to increase productivity on an Onyx2 InfiniteReality system. The first is probably the simplest case, in which numerous clients use a multipipe system over a WAN/LAN (see Fig. 3). This provides users with not only the power of InfiniteReality graphics on their desktops, but also the resources with which to process and store the data they are visualizing.

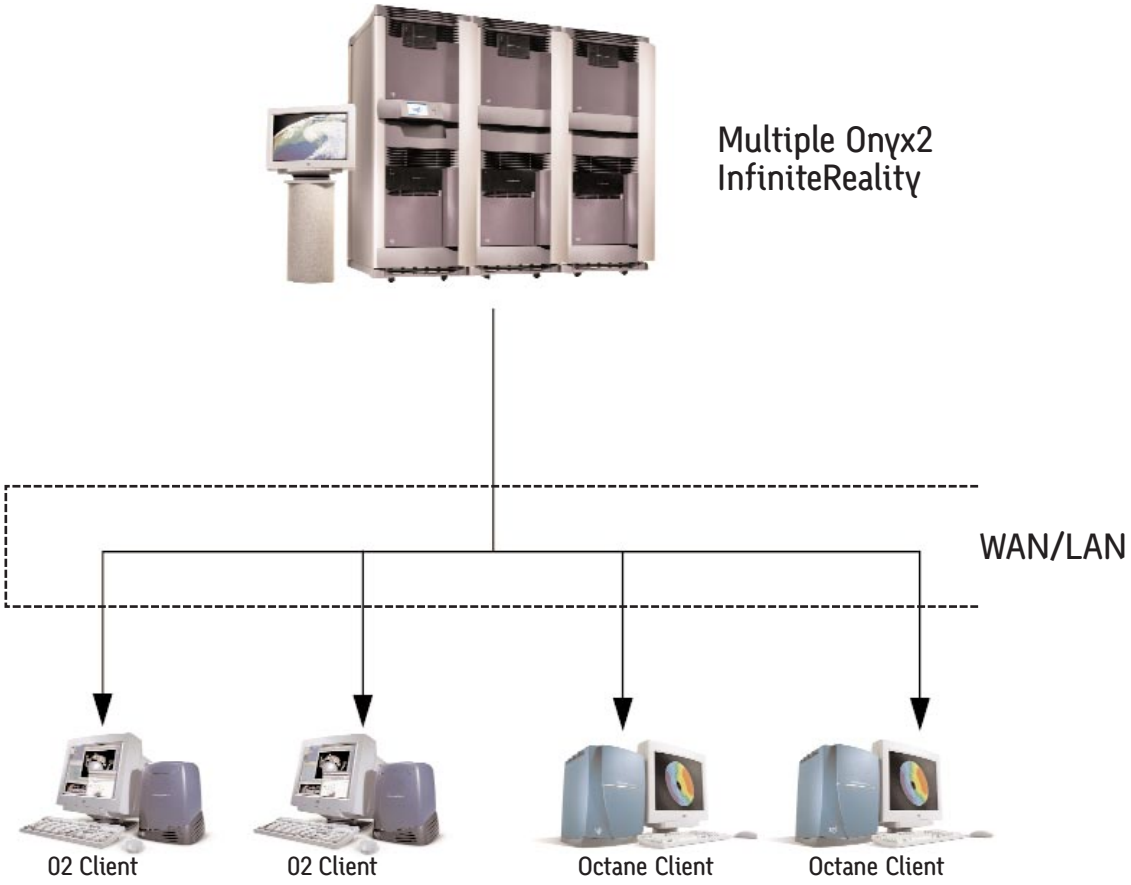

Fig. 3. Multipipe Onyx2 with multiple clients.

The next application for OpenGL Vizserver is almost identical to the first, except that the Onyx2 InfiniteReality system is also driving an SGI™ Reality Center™ immersive display facility (see Fig. 4). In this configuration others can utilize the Onyx2 graphics pipes when the machine is not being used to drive the Reality Center facility.

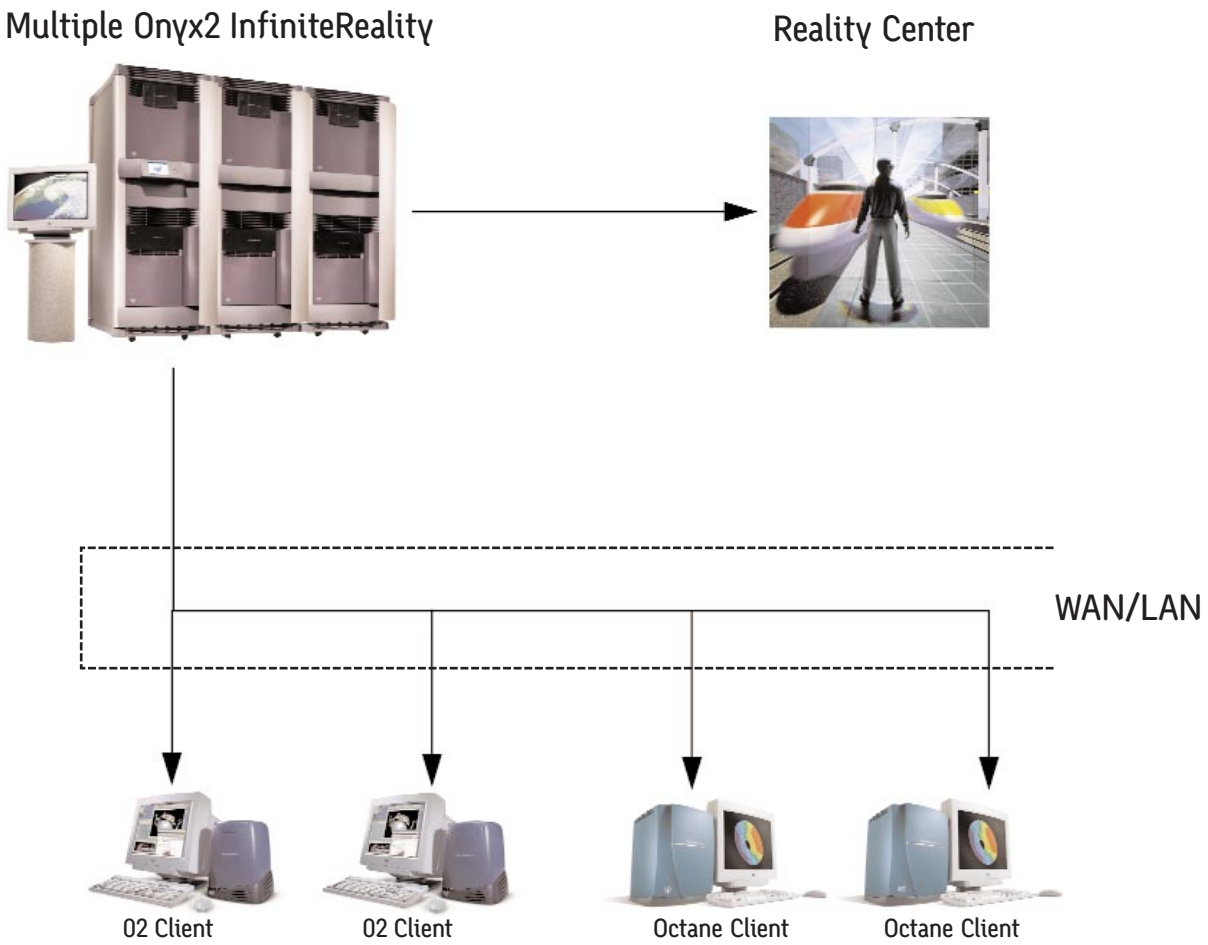

Fig. 4. Multipipe Onyx2 with Reality Center display and multiple clients.

Yet another possibility is to remotely display an entire SGI Reality Center facility (see Fig. 5). This scenario allows clients with Reality Center facilities to visualize large data sets without having to transport all the raw data from the host machines to their own machines. This is of particular interest in environments where very large data sets are visualized, such as the oil and gas industry, where 100GB data sets are common. A further benefit of OpenGL Vizserver in this scenario is that it provides a mechanism for the utilization of expertise located in remote parts of an organization by bringing the visualization of the relevant data to the organization's experts no matter where in the world they are located.

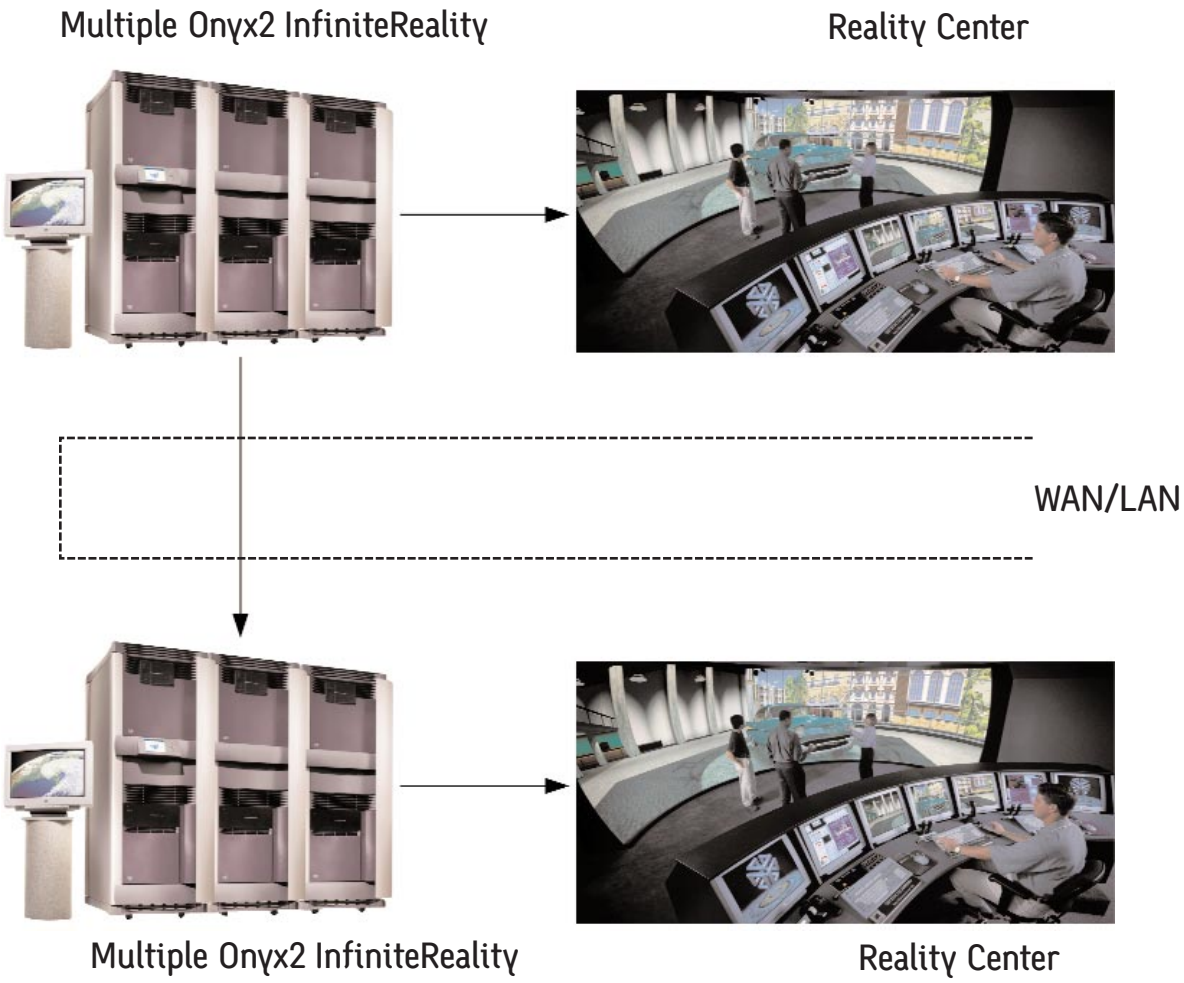

Fig. 5. Multipipe Onyx2 with Reality Center client.

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