Digital Video Multiplexer for Onyx2™

Breakthrough Scalability for Visualization

The Digital Video Multiplexer Option (DPLEX) takes visualization scalability to a new level. DPLEX permits multiple InfiniteReality2™ or InfiniteReality® pipelines in an Onyx2 system to work simultaneously on a single suitable visual application. Moreover, DPLEX provides this capability in hardware, resulting in perfect (100 percent) scaling of both geometry rate and fill rate on some applications. An *n*-pipe system equipped with DPLEX may support up to *n*-times the frame rate of a single-pipe system running the same application, or *n*-times the scene complexity for a given frame rate, provided the rest of the system and application scale.

DPLEX is an optional daughtercard for Onyx2 systems that enables digital multiplexing of two or more pipelines. One DPLEX option is required for each pipeline in the system. The concept is simple: multiple pipelines operate simultaneously on successive frames of an application, which are then digitally multiplexed together before being converted to analog video. Any user seeking greater rendering speed may benefit from this technology. Key applications include distortion correction (required for dome simulators) and interactive large model visualization (required in many manufacturing settings, research institutions, and so on).

In addition to its multiplexing capabilities, DPLEX also provides high-resolution Low Voltage Differential

Signal (LVDS) digital video output to drive next-generation digital displays, hardware-in-the-loop devices, and other custom peripherals.

Distortion Correction

With Onyx2, distortion correction is achieved using an approach in which a flat image is rendered to the frame buffer, copied back into texture memory, and then projected on a grid of polygons that represents an inverse mapping of the required distortion. A single InfiniteReality2 or InfiniteReality pipeline is capable of rendering 1280x1024 distortion-corrected imagery at 30Hz. With DPLEX, two such pipes can be multiplexed together to deliver a 60Hz update rate. And since the distortion correction occurs in the IG rather than in the projection system, the Onyx2 system-based solution can support dynamic distortion correction, in which the relative location of the projector or the shape of the screen changes over time.

Large Model Interactivity

DPLEX allows any full-screen application to achieve higher performance levels. This can be very useful in digital prototyping, where large models are required to maintain visual fidelity. With DPLEX, even the largest, most complex visualizations become manageable because performance can be scaled to meet virtually any challenge.

Application and OS Support

Full-screen applications written to IRIS Performer™ or OpenGL Optimizer™ are most easily adaptable to DPLEX operation. Other OpenGL® applications will require additional modification to enable multipipe support in general and DPLEX support in particular. DPLEX requires IRIX® 6.5.2 or later, and is scheduled to begin shipping by the end of calendar 1998.

DPLEX and MonsterMode Rendering

Underlying DPLEX is a data partitioning scheme known as time-composition: multiple pipelines operate simultaneously on different time-slices of a data set to generate successive frames, which are then composited together by the DPLEX network to form a continuous video stream. Because the composition takes place in dedicated hardware, DPLEX is said to perform hardware-based time-composition.

Onyx2 IR also supports several software-based methods for distributing a data set over multiple pipelines. These methods are collectively known as MonsterMode rendering. Each uses the Onyx2 high-bandwidth memory subsystem rather than special hardware (DPLEX) for the interpipeline transfers required to partition the data and compose the final image. MonsterMode rendering methods include 2D composition for handling polygonal models and 3D composition for handling volumetric models. The latter provides the further benefit of additive texture-mapping resources: an *n*-pipe system using

MonsterMode 3D-composition software effectively has *n*-times the texture memory of a single-pipe system (up to 1GB for a 16-pipe configuration) as well as *n*-times the texture download bandwidth.

The choice of which method to use, DPLEX or MonsterMode, will depend on the nature of the application. Volume visualization should benefit more from MonsterMode, whereas polygonal data may favor DPLEX, MonsterMode, or a combination of the two. Please consult your Silicon Graphics representative for more information.

DPLEX
Technical Specifications

HARDWARE REQUIREMENTS
The following additional components are required to support DPLEX operation:
- Additional graphics pipes
- One node board for each additional pipe

SYSTEMS SUPPORTED
Onyx2 InfiniteReality2 and Onyx2 InfiniteReality rack systems

OPERATING SYSTEM REQUIRED
IRIX 6.5.2 or later

DIGITAL VIDEO FORMAT IN AND OUT
Digital RGB, user accessible, encoded for transmission to LVDS standard

ANALOG VIDEO FORMAT OUT
RGB analog outputs, same format and precision as with standard Onyx2 Display Generator

VIDEO RESOLUTIONS
Any video formats up to the pixel clock frequency of 175MHz, including 1280x1024 60Hz stereo
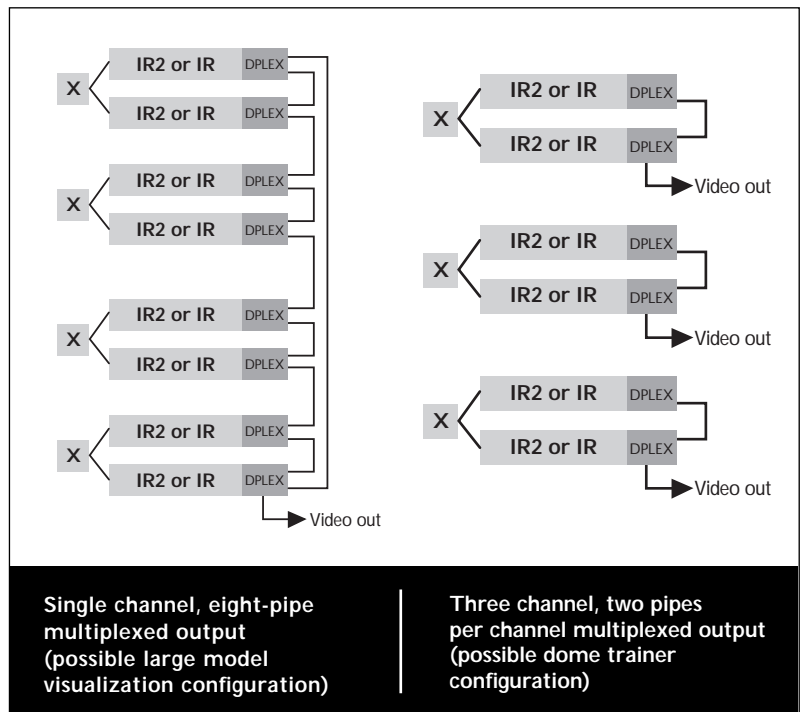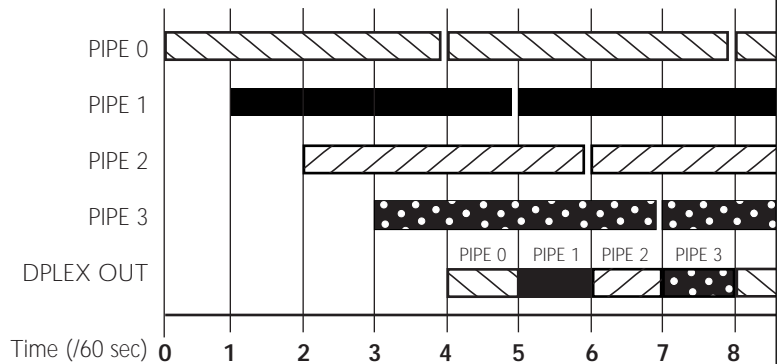
ADDITIONAL LATENCY OF THE SYSTEM
N-1 frame times (where N is the number of DPLEX'ed pipes in the system)

CONNECTORS/CABLING
I2C bus interface to cables, all included

How a Four-Pipe DPLEX System Generates a 60Hz Update Rate from a 15Hz Application

Single channel, eight-pipe multiplexed output (possible large model visualization configuration)

Three channel, two pipes per channel multiplexed output (possible dome trainer configuration)

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