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# Dual Cast in the PEX 86XX Switch Family

## White Paper

October 2007

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## Dual Cast in the PEX 86xx Switch Family Description

The Dual Cast feature of the PLX PEX 8600 family allows the switch to make a copy of a posted write packet and send it to a second address, saving the original source the trouble of transmitting the same data twice, to two different locations. Dual Cast provides very significant performance advantages where data must be copied to multiple locations within a PCIe fabric. In the applications discussed here, Dual Cast is used in the primary data path, arguably allowing application throughput to be doubled.

### Dual-Headed Graphics

In dual-headed graphics, as illustrated in Figure 1, two GPUs are used to paint a single screen. Drawing commands are dual-cast downstream from the CPU to both GPUs. As instructed by these commands, each GPU renders the image for its half the screen. Once each frame, one GPU copies its half of its typically very high resolution image to the other GPU for display using the peer-to-peer transfer capability of the switch.

Dual-headed graphics is a showcase application for PLX PEX 8647. This device has three x16 Gen 2 PCIe ports supported by wide internal data paths to provide fully non-blocking performance with both fan-out and peer-to-peer traffic patterns, both of which are used to good effect in this application..

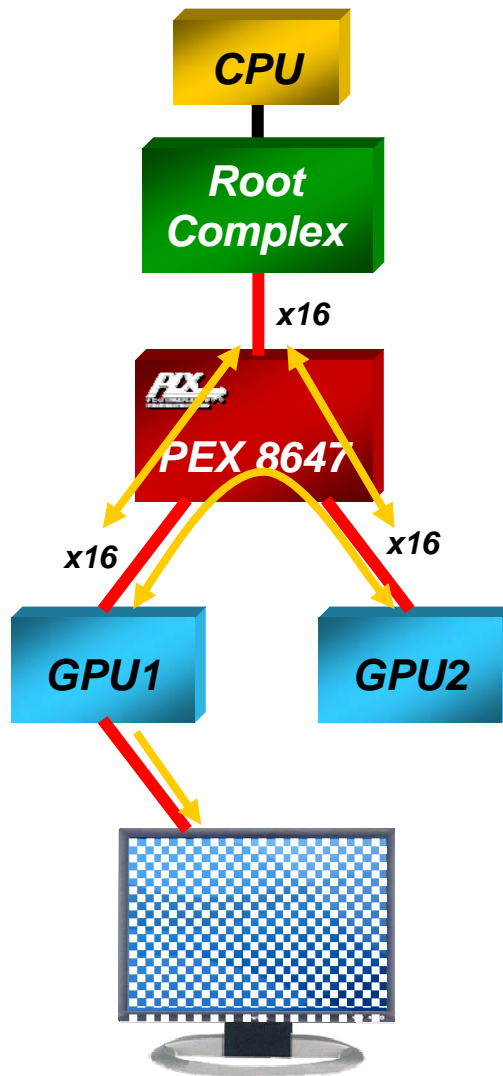


Figure 1. Dual-Headed Graphics Usage Model

### ***Storage Mirroring***

Storage controllers have strong redundancy requirements that are often fulfilled by using a PCIe switch with an internal non-transparent (NT) bridge to link two processor chip sets and sets of storage I/O devices. I/O device DMA is then used to write disk data into the memories of both processors. With Dual Cast in the switch, this replication task can be offloaded from the I/O device and its PCIe link, making it easier to meet ever escalating throughput requirements.

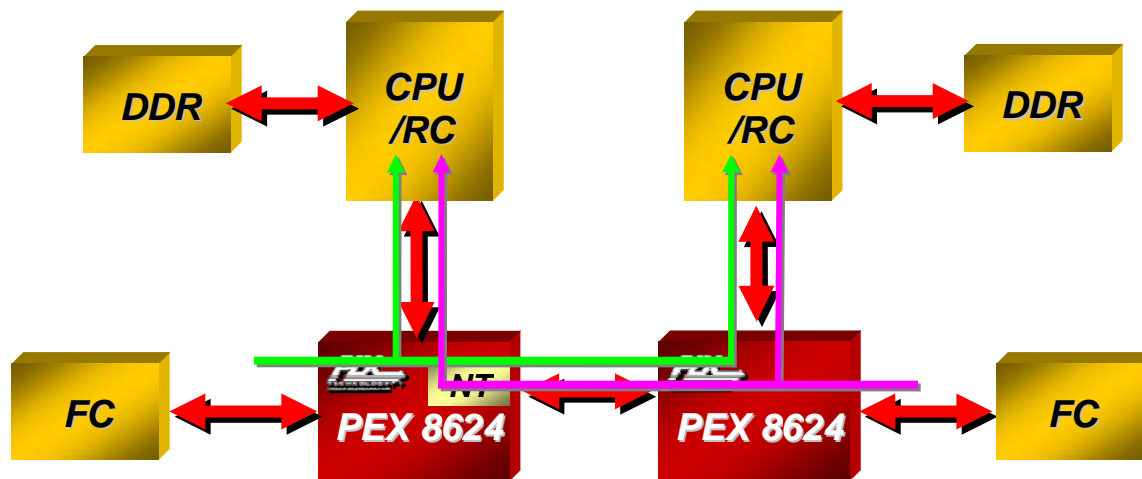


Figure 2. Storage Dual Cast

### ***Dual Hosted Communications Systems***

In dual hosted communications systems, packets can be sent upstream to both hosts. One host processes the packets and informs the other host via host-to-host communications through a non-transparent bridge when it has completed the processing. Each packet normally just resides in the backup processor's memory until its completion message arrives. If the backup processor fails to receive the completion message before a timeout expires, it is able to take over packet processing seamlessly because the packets are already in its memory. Here, Dual Cast in the switch not only provides a large performance benefit but also simplifies the implementation of the fault tolerant capability.

### ***The SW API for Dual Cast***

The address routed nature of PCIe drives the definition of its API. Posted write packets ingress from a specified port that hit in a Dual Cast memory window are forwarded to both the standard address routed destination and to a specified copy port. The copy receives an address translation that allows it to be address routed through the remainder of the fabric to its ultimate destination.

In the PLX 8600 Gen 2 switch family, eight Dual Cast windows are available to provide selectivity as to what is Dual Cast. For each window, the following 64-bit registers are provided:

- Dual Cast Base Address Register
- Dual Cast Translation Address Register
- Dual Cast Setup Register

The setup registers define the size of the window by providing a size mask. The size masks are used to make the offset portion of the base address registers RO so that conventional SW BAR sizing algorithms work. Separate registers define the ingress and copy ports for which Dual Cast is operative.

## ***Conclusion***

Dual Cast greatly increases PCIe's value in the graphics, storage, communications and embedded spaces. By being first to market with a Dual Cast capability in switches, PLX once again has validated its claim to market leadership. PLX is now leading an effort within the PCI-SIG to standardize the implementation of multicast.