

Why PCI Express* Architecture for Graphics ?

Introduction

The evolution of PC graphics interconnects has been on a trend where graphics bandwidth has increased rapidly throughout the years. In the 90's the industry has seen a trend where graphics BW has doubled roughly every 2 years to keep pace with new applications and support future requirements. In the mid to late 90's the Accelerated Graphics Port (AGP) was introduced. This was driven primarily by 3D applications and the need for more bandwidth and faster processing for graphics. Through the evolutions of AGP1x - 2x - 4x and 8x we've seen the bandwidth double each time. Now there is another inflection point.

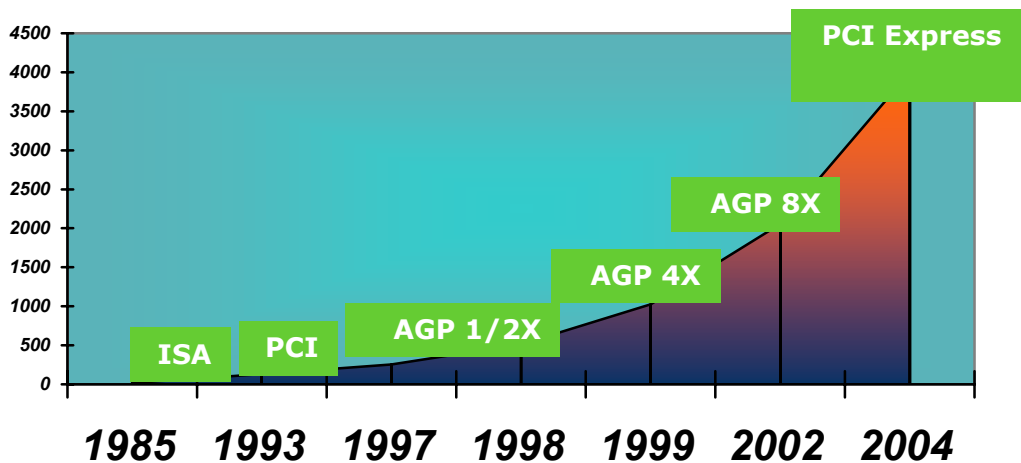


Figure 1: Maximum Bandwidth of Graphics Technologies

New applications are evolving using photo-realism drive BW demands. The Digital Home and next generation GUIs are rapidly evolving and will be driving bigger bandwidth demands for the future. However, continuing on an evolutionary path with AGP to keep up with current demands and future requirements, one which is a parallel point to point interconnect using source synchronous timing, would pose serious limitations. The existing connector would have to be redesigned to accommodate lower inductance and capacitance at higher signaling rates. The timing budget would be significantly reduced with very little margin. An evolutionary approach to AGP is simply not feasible to support future demands. What is needed is a new technology that supports both near and long term platform requirements.

PCI Express is a 2.5 Giga transfers/second serial differential point-to-point high speed interconnect with added flexibility and scalability that is intended to replace AGP and PCI over time. PCI Express is this new technology for graphics, providing enough bandwidth and performance for the next decade.

Benefits of PCI Express

The immediate benefit is increased bandwidth and scalability. PCI Express offers 4GB/s of peak bandwidth per direction for a x16 link and 8 GB/s concurrent bandwidth. This allows for the highest performance in gaming and video capture. In addition, PCI Express is designed for cost parity. The PCI Express x16 connector is expected to be at cost parity to the standard AGP connector at high volume. And with support for multiple market segments including Desktop, Workstation, Mobile, and Communications, PCI Express will no doubt be the inter-connect for the next decade.

PCI Express Graphics Usages

Figure 2 below, shows a general-purpose topology for PCI Express using a x16 PCI Express link for graphics.

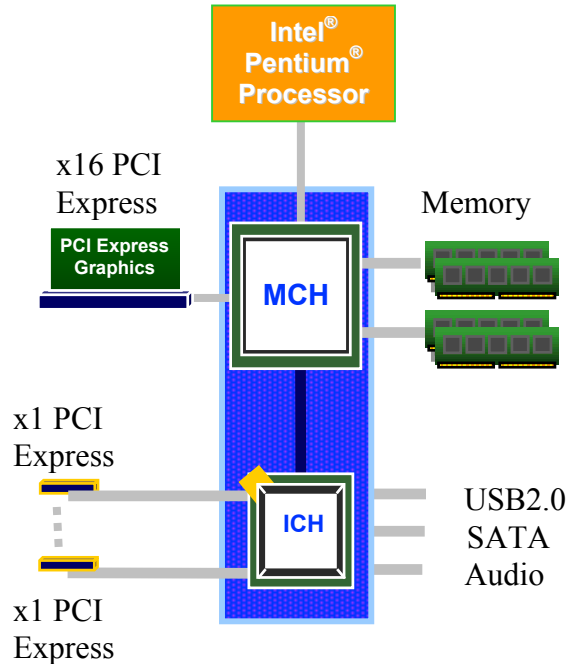


Figure 2: General Purpose PCI Express Topology

PCI Express will allow for new and compelling usage models including immersive gaming and the digital home.

Immersive Gaming with photo-realism will compliment new capabilities in the platform. Application developers can now create life like images to bring the user into a new level of interactivity. Application developers will not be constrained to using small textures and low resolutions. Immersive gaming will expand beyond traditional multi-player online role-playing into a new era.

The Digital Home initiative is an industry initiative that's addressing the convergence of PCs and consumer electronics. The initiative is extending the PC's capability to distribute digital audio, digital photos, and digital video to consumers' existing TVs and stereos with exciting new products and technologies further making use of the graphics interface between the chipset and graphics controller.

Video Capture and Editing with PCI Express will allow for glitchless media by eliminating dropped frames. PCI Express will take advantage of the graphics interface with simultaneous use of both directions in the link to further increase performance.

Next Generation Graphical User Interfaces (GUIs) will also drive bandwidth demands for a richer desktop with real-time capability. With a more natural looking GUI, PCI Express will facilitate a

richer media based architecture creating a new richer user experience with the use of greater animation and imaging.

Conclusion

As the demand for richer application content continues to scale, so must the hardware and processing required to support it. PCI Express will allow for increased performance and scalability for the next decade.