Intel in Communications

Case Study: Emulex Corp.

Emulex Relies on Intel® Bridge to Offer Early-to-Market PCI Express Host Bus Adapters

Summary

Companies throughout the computer and communications industries are turning to the PCI Express interconnect technology as the high-performance successor to PCI and PCI-X. A new generation of system platforms that support the new I/O interface is scheduled to begin shipping in the third quarter of 2004.

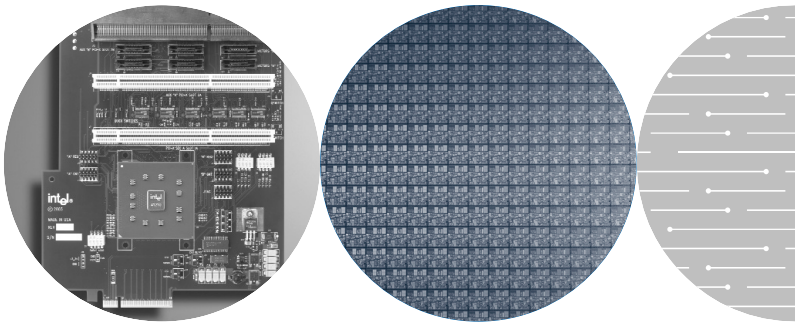
Emulex, which is in the business of connecting servers to networked storage, intends to have PCI Express host bus adapters ready at the same time. Many of the world's leading server and storage providers depend on Emulex host bus adapters, embedded storage switches, and I/O controllers to build reliable, scalable and high-performance storage solutions. In keeping with this reputation, Emulex developers chose the Intel® 41210 Serial to Parallel PCI Bridge to achieve a rapid PCI Express implementation. The Intel 41210 Serial to Parallel PCI Bridge translates from the serial PCI Express I/O architecture to the PCI and PCI-X parallel bus architecture. It offers hardware vendors a quick way to "bridge" their applications to the new technology as an interim product step until native PCI Express device-based applications can be developed.

This case study examines how Intel's PCI bridge chip enabled Emulex developers to significantly shorten their time to market and be one of the first to deliver robust, interoperable host bus adapters for an emerging industry standard.

Background: Storage Networking

The storage networking industry is in an active growth phase, fueled by high levels of adoption in large enterprise environments. As the penetration in this segment approaches 100 percent, networked storage is spreading into the overall population of data centers, growing to encompass mid-size and smaller business sectors as companies of all kinds come to understand the benefits of networked storage.

Storage networking host bus adapters (HBAs) — intelligent expansion cards that connect servers to networked storage — have been Emulex's core business since 1996. This focus has earned the company more than 48 percent market share of Fibre Channel HBAs and the recognition of market research firms such as Gartner and International Data Corp., which rank Emulex as the No. 1 supplier of such products.



New PCI Express Interconnect Technology Spurs Competition

As with all peripheral cards, the standardized form factor and interface that govern host bus adapters take their cue from the server's I/O architecture. This architecture is in transition today, evolving from PCI and its derivative, PCI-X — both parallel interfaces — to high-performance PCI Express interconnect technology. The serial PCI Express architecture offers scalable bandwidth from 2.5 to 80 gigabits per second (Gbps) and advanced features to meet the I/O requirements of next-generation systems, which could support 10GHz-plus CPU speeds, faster memory, higher-speed graphics, gigabit and 10 gigabit Ethernet, Serial Attached SCSI (SAS) and serial enterprise I/O applications.

PCI Express has ratcheted up competition in the hardware industry as multiple suppliers gear up to develop products that support it. Emulex is in the vanguard of hardware developers moving quickly to enable the adoption of PCI Express, recognizing that its compelling speed, reliability and potential to lower costs will appeal to both OEMs and end users.

"PCI Express is a much simpler interface to produce products from, and it has much greater capability for scaling and performance," explains Joe Teolis, senior director of product marketing at Emulex. "PCI Express also has much higher data integrity attributes, which is critical as companies grow increasingly reliant on their data systems and need their servers to run 24/7. Our business is to keep the customer's applications running, and that's a key feature of PCI Express. The RAS [reliability, availability and serviceability] of that interface combined with the performance and ease of implementation will help lower total cost of ownership."

The challenge facing Emulex, however, was developing a new storage networking HBA quickly enough to coincide with shipments of PCI Express-enabled servers in the third quarter of 2004. "Time to market on new technology is very important for us," Teolis says. "As an OEM supplier, we always want to be first in the development labs and hence, first in the marketplace."

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Joe Teolis
Senior Director of Product Marketing, Emulex

A Bridging Solution With Assured Interoperability and Validation

To seize the time-to-market advantage in PCI Express and help ensure the early success of the new architecture, Emulex developers turned to an Intel bridging solution designed specifically for host bus adapters and add-in cards. Emulex capitalized on the new Intel® 41210 Serial to Parallel PCI Bridge to develop its LightPulse* LP10000Ex, one of the industry's first Fibre Channel HBAs designed to be used with PCI Express servers.

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Emulex's LP10000Ex is the newest member of a family of HBAs that offer integrated 2 gigabit-per-second (2Gbps) Fibre Channel connectivity for enterprise-class and mid-range environments. Available in single- and dual-channel models, the standard-height, half-length card is built to deliver state-of-the-art performance by means of "Thor," Emulex's sixth-generation Fibre Channel I/O controller.

Developers of the new HBA chose the Intel 41210 chip as the enabling technology for bridging the PCI Express interface to PCI-X. By doing so, Emulex aims to help accelerate the adoption of PCI Express at the server while continuing to provide a connection to Fibre Channel storage. The Intel 41210 also provides dedicated bandwidth to the PCI Express slot and therefore the HBA.

"Our customers will get the benefit of early deployment of PCI Express while assuming low risk in terms of adopting new technology," Teolis says. "Since the PCI Express interface on the server side was implemented by Intel, using the Intel bridge on our Fibre Channel side assures that everything will be interoperable and provide value to customers right away. The bridge also ensures that we can match Intel in terms of feature content and time to market."

According to Teolis, the Intel bridge was "an easy decision" because it offers quick integration and extensive validation testing with Intel PCI Express server platforms. Also, Emulex, which has an installed base of about 1.6 million HBAs, has used three generations of Intel bridges in its products. Thus, developers were already familiar with Intel bridge capabilities and considered the technology proven. Specific design and development considerations also led Emulex to choose Intel's PCI bridge chip.

"We have a history of a very tight and well-coordinated development relationship with Intel from a support and implementation standpoint," Teolis says. "As you deploy new technology, you need quick response on any questions that come up and an understanding of issues. The support we get from Intel, coupled with the actual implementation of the technology and the availability of solutions, were key for us."

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Emulex developers worked closely with Intel engineering teams to build HBAs to the PCI Express specification and integrate their efforts. The two teams continued to work in parallel throughout the product development process. As a result, developers successfully got cards and servers up and running quickly, with the new Emulex PCI Express HBAs available to launch at the same time as PCI Express servers.

Fast Time to Market Leads List of Benefits

Time to market is critical at Emulex. Teolis explains that creating an I/O controller — the heart of a host bus adapter — can take 18 months to two years. Because a lot can change in that time, a hardware vendor gambles on its ability to interpret what the marketplace wants. With a bridge, Emulex can seize opportunities and minimize its risk by getting to market much faster.

"I would estimate that the Intel bridge has allowed us to cut a year out of our development cycle, in being able to have a product selling in the marketplace," Teolis says. "This is a significant reduction in time to market, which for us is the ability to reduce the amount of resources to start the flow of revenue from a product and start the flow of value to customers."

Time to market also touches other aspects of Emulex's business success. For example, if customers expect a new technology like PCI Express to deliver in two months, but it in fact takes two years, they'll have relatively low confidence in adoption. By contrast, if Emulex can deliver the new interface in a way that seems robust to customers, their confidence will rise, speeding up the transition period. A fast transition has benefits for server and storage suppliers, who are spared from carrying duplicate products, and for end users, who won't end up investing in products based on older technology. Teolis predicts that PCI Express won't suffer a sluggish transition like PCI-X, which took two to three years from its first implementations to wide adoption.

"PCI Express appears to be on an adoption and deployment track that is on the order of a year, or probably a third that of PCI-X," Teolis says. "And a lot of that is because of key enablers like the Intel bridge."

The Intel bridge also proved to be reliable from a design and development perspective. Emulex developers recognize that reliability is a key requirement in the data centers Emulex deploys in, and they've learned to trust in the robustness of Intel bridges and processors, combined with Emulex storage connectivity solutions.

"We have a record in the industry for a high-reliability product," Teolis says. "We would not have earned that without the Intel bridges being reliable as well."

The Intel 41210 bridge chip also made the design job quicker and easier for Emulex developers by supporting broad PCI compatibility. Teolis notes that the bridge is compatible with the highest-performance 133MHz PCI-X interface, all the way down to the 33MHz PCI interface, thus spanning a huge range of previous generations.

As another benefit valued by Emulex, Intel's bridge offers developers seamless integration with the company's Service Level Interface (SLI) driver architecture. SLI, the top level of Emulex's firmware, abstracts the underlying HBA hardware platform from the software interface and the operating system. Thus, for example, Emulex's LP10000Ex HBA for PCI Express servers can use the same drivers, utilities and management tools as Emulex HBAs for PCI and PCI-X systems. This means OEMs and end users can migrate to PCI Express technology seamlessly, and customers experience no disruption associated with the management of storage.

With its SLI architecture enabled for PCI Express, Emulex can use the Intel bridge to immediately apply all the latest feature content that developers have created to the new interface. This flexible firmware-based approach allows for new features and other upgrades without costly changes to the adapter hardware, providing the kind of technical flexibility and investment protection that Emulex considers critical when implementing evolving technology.

Conclusion

The Intel 41210 Serial to Parallel PCI Bridge has helped Emulex develop a robust family of PCI Express Fibre Channel host bus adapters in record time. Full validation, quick integration and assured interoperability shortened the usual HBA development cycle, ensuring that Emulex would have a next-generation storage connectivity solution available in conjunction with the first PCI Express-based server shipments.

Being in the marketplace early with its LP10000Ex product cements Emulex's reputation as a leading developer of storage networking HBAs and allows Emulex to offer OEMs and end users a smooth migration to the scalable, high-performance PCI Express architecture.

For More Information:

About Emulex, visit:
www.emulex.com

About Intel bridges, visit:
http://developer.intel.com/design/bridge/index.htm