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Emulex 16G Fibre Channel HBAs Enhance SSDs in Tiered Storage

New HBAs offer increased performance, lower power usage, full offload for T10-P1 data integrity, more virtual ports, streamlined management and industry-leading reliability

At a Glance

With advanced solid-state disk (SSD) technology and the declining cost of SSDs, the use of SSDs in a tiered storage environment is becoming more widespread. This technology allows a company to better align its storage needs with its business objectives. The Emulex 16Gbps Fibre Channel (16GFC) host bus adapter (HBA) delivers the high performance required for SSDs and 12-core server processors to handle larger workloads while cutting down on power consumption. With the highly reliable, scalable and centrally managed HBAs from Emulex, SSDs and servers can operate at their peak performance.

Product

- Emulex LightPulse® 16GFC HBA (LPe16000 and LPe16002)
- Emulex OneCommand™ Manager
- Emulex OneCommand Vision

Solution Benefits

- Higher link speed allows for faster SSD I/O
- Increased N_Port ID Virtualization (NPIV) virtual ports and the highest number of simultaneous exchanges (XRI) in the industry support scalable servers and prepare customer technology transition
- Backward compatibility with 8GFC and 4GFC infrastructure, with single driver and management solution, ensures highest return on investment (ROI) and flexibility, and minimizes qualification overhead
- GreenState™ power efficiency delivers reduced power footprint to lower operational expense (OpEx)—up to 3x superior Input/Output Operations per Second/Watt (IOPS/W)
- End-to-end data integrity with BlockGuard™ hardware offload supports the T10 Protection Information (T10-PI) standard to protect against silent data corruption, without the 30-40% performance tax incurred by other firmware-based T10-PI solutions

16GFC for SSDs

In 2009, the ANSI INCITS T11 committee completed work on the 16GFC standard. 16GFC accelerates high-density virtualization by doubling the number of ports that can be virtualized. It also improves support for higher-density, multi-processor cores as well as single-root hypervisors and high-speed storage such as SSDs. Emulex delivers the benefits of 16GFC with its LightPulse LPe16000 series Fibre Channel HBAs, built to meet the needs of high performance SSDs.

Higher performance

SSD technology delivers improved storage performance and capacity optimization. By offloading files that have robust IOPS requirements to an SSD, the hard disk drive storage array is freed up to solely meet the capacity requirement. By using the larger, slower hard disk drives, the storage array can handle a larger amount of data for the company at a much lower price. The higher performance of 16GFC is ideal for the typical SSD environment as 16GFC delivers significantly higher IOPS—with Emulex, SSDs can possibly achieve a million IOPS on a single port!

In fact, migrating from 8GFC to 16GFC HBAs delivers many other significant performance advantages. Emulex lab tests comparing 8GFC HBAs with the LightPulse 16GFC HBAs reveal substantial benefits for tiered storage environments with SSDs, including data that shows the LPe16000 delivers a maximum of:

- Up to five times IOPS improvement over 8GFC HBAs
- Twice the data throughput (MB/s) compared to 8GFC HBAs
- Half the application response time compared to 8GFC HBAs

Emulex is the preferred HBA for high performance database environments - eight of the top ten Transaction Processing Performance Council-C (TPC-C) world records have been reached with Emulex!

Emulex proven reliability

In survey after survey, the number one concern of end users is *reliability*. Emulex is synonymous with quality. With over 11 million ports installed worldwide and partnerships with all the leading server and storage vendors, Emulex is the clear choice for SSD environments. In a recent survey of 710 Fibre Channel customers,* greater than 97% of the IT organizations stated that they were either satisfied or very satisfied with the initial product quality and the long-term reliability of Emulex HBAs. Emulex was the first company to deliver a Fibre Channel HBA, is the choice of large enterprise organizations worldwide and has a solid adapter architecture, software stack and industry leading management application.

* Emulex Customer Satisfaction Survey, September, 2011, with participation by 710 companies with Fibre Channel environments.

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End-to-end data integrity

Oracle and Emulex have been leading innovation in end-to-end data integrity. In response to customer and regulatory compliance requirements, most vendors are developing application data integrity solutions around the T10-PI (DIF) standard. Designed to prevent silent data corruption through end-to-end check sums, the full ecosystem of T10-PI enabled storage, HBAs, operating systems (OS) and applications is quickly emerging.

Emulex has implemented the T10-PI standard on its LightPulse 16GFC HBA with its BlockGuard feature. With unique hardware-offload support for T10-PI, Emulex HBAs provide data integrity without the 30-40% performance tax that current firmware-based solutions provide today. With Emulex, Oracle users are future-proofed for the time when they may choose to enable data integrity.

Increased ROI with Emulex

Because each LPe16000 delivers two times the performance compared to 8GFC adapters, fewer HBAs are required to handle the same workload. Furthermore, cable and device management is much easier. Fewer cables are required to support an increased number of applications and virtual machines (VMs). With structured cabling costs up to \$300/port, each cable reduction saves money and reduces OpEx and the amount of infrastructure to manage.

Emulex OneCommand Manager further increases ROI by reducing the overhead of managing multiple generations of HBAs as well as OneConnect™ Universal Converged Network Adapters (UCNAs) running different protocols (FC, Fibre Channel over Ethernet [FCoE], iSCSI, and Ethernet network interface card [NIC]). Through a single console, OneCommand Manager controls all Emulex HBAs and UCNAs within the SSD environment. In the recent Emulex customer satisfaction survey, 60% of the end users who use OneCommand Manager use it at least once a month, if not daily. It is no wonder that OneCommand Manager is so popular, as SSD customers can get twice as much done in half the time compared to other adapter management applications.

Lower power consumption

Power efficiency is an integral part of all Emulex Fibre Channel HBA designs. Emulex has embraced maximum performance through efficient cooling by designing its high performance LightPulse 16GFC HBAs with passive cooling devices for optimum performance in a broad range of server environments. By upgrading to the Emulex 16GFC HBA, data center managers see up to three times improvement in application throughput per watt (IOPS/W). Moreover, 16GFC reduces the number of switch ports required which can also reduce the overall fabric size for greater power savings.

Emulex delivers:

Superior historical HBA performance¹ for faster SSD processing

- 37% better dual-port scalability, delivering the highest data throughput on both channels for optimum server performance, as well as power and cooling efficiency
- Advanced CPU utilization for better application and system performance—chosen to power the #1 fastest database system in latest TPC-C²

Higher availability for reliable application uptime

- Industry's most reliable HBA based on actual field return data
- 30% higher reliability over nearest competitor
- More than 10 million hours mean time between failure (MTBF) with over 11 million ports shipped

Extensive knowledge of security for piece of mind

- End-to-end data integrity with support for the T10-PI standard, protecting against silent data corruption as data traverses the system from the OS all the way to the disk array

¹ Based on competitive tests with the 8GFC HBA. 16GFC HBA testing is underway.

² TPC-C Benchmark Report, December 2010

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Key HBA Features

Table 1 provides a summary of the key features of the Emulex 16GFC HBA and how SSD environments take advantage of the feature.

LPe16000 Feature	SSD Benefit
Focus on speed	High performance —By managing performance, storage traffic can flow at optimum levels, giving any high-speed storage environment, such as cloud storage, maximum system performance.
Reduced latency	High performance —Many high speed applications, such as on-line transaction processing (OLTP), do not have a constant stream of data, but rather bursty segments of data, thus the computer is actually doing multiple things. It's trying to process data, moving data in and out of memory, and it's trying to update it to and from the storage devices. By reducing the time it takes to get data in and out of the storage device, Emulex 16GFC HBAs help the computer spend more time on processing the data, thus helping the overall transactions per second just due to lower latency performance. With Emulex 16GFC HBAs, SSDs can move typical OLTP bursty data much more quickly.
GreenState power efficiency	High availability and reliability —There is a direct correlation between heat and device longevity. Overheated parts generally exhibit a shorter lifespan and lower system performance. The 16GFC HBA enables low power breakthroughs, including GreenState power management, allowing selective dynamic hibernation, advanced thermal and power instrumentation, and a configuration with less than 3 watts per port. Reduced OpEx —Cooling costs are reduced.
Scalable	Investment protection —Most SSD environments with a storage area network (SAN) are dynamic. To that end, Emulex Fibre Channel HBAs, management tools, device drivers and firmware are designed to provide the greatest degree of scalability and flexibility. Increases in the numbers of virtual HBAs and simultaneous transaction contexts (XRLs) provide a safe growth environment for organic growth and cloud transition.
Common driver model	Investment protection and reduced OpEx —A single driver binary works with all supported generations of Emulex LightPulse Fibre Channel HBAs for a given OS platform. This approach simplifies management, requiring IT administrators to only deploy a single driver across Emulex 4GFC, 8GFC and 16GFC HBAs.
Single management console	Reduced OpEx —Through a single console, SAN administrators can manage all Emulex Fibre Channel HBAs, leveraging either in-band (over the Fibre Channel link, an exclusive feature of Emulex) or out-of-band (over the LAN) options and a host of automation features. With support for iSCSI, FCoE and NIC protocols, OneCommand Manager also manages Emulex OneConnect UCNAs for the converged network environment.
Fast deployment	Reduced OpEx —Historical testing on the 8GFC HBAs show that administrators can get twice the adapter management functionality, deploying HBAs in half the time compared to other management solutions. In an enterprise setting with hundreds, or even thousands, of adapters, this productivity advantage is significant.
BlockGuard offload support	High performance data integrity —Emulex's exclusive BlockGuard technology provides end-to-end data integrity with 40% higher performance than typical firmware implementations of T10-P1 due to hardware offload capability.
Certified stack	Investment protection —With certification across all major system vendors, SSD environments are assured of a no-risk, high availability and supported solution.

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Increase SSD I/O Performance and Availability

The award-winning Emulex OneCommand Vision I/O Management application helps SSD environments maintain the highest level of application performance and availability while maximizing utilization of existing resources. I/O Performance and Availability Service (IPAS) takes OneCommand Vision to the next level—essential for SSD environments.



Summary

Tiered storage automates the movement and placement of data across storage resources, such as SSDs, as access needs change over time, enabling continuous optimization of applications by eliminating trade-offs between capacity and performance, while lowering cost and delivering higher service levels at the same time. The LightPulse 16GFC HBA continues Emulex's tradition of delivering reliable, high performance, scalable and manageable connectivity for SSDs. Having won virtually every 16GFC design win at OEMs across the world, data centers will take advantage of the Emulex LPe16000 series Fibre Channel HBAs on any platform in any country. As data centers migrate business critical applications, like databases, into cloud environments, Emulex will ensure maximum performance and reliability.



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