

Comparative Performance Data and Test Results for Emulex and QLogic HBAs

Introduction

In June of 2004, Emulex test engineers conducted comparative testing between Emulex and QLogic HBAs to verify what they already believed to be true: Emulex HBAs carry significant (25-50%+) performance advantages over competing product from QLogic. This brief summarizes the test data, provides an explanation of the test environment and points out the underlying reasons behind the inherent performance advantages in Emulex HBAs.

Increased HBA performance (higher IOPS and bandwidth) delivers tangible benefits for SAN environments that benefit both solution providers and end users:

- *Transactional processing speed increases, which for solutions providers can result in the potential for higher TPC testing scores for their systems*
- *The ability for the HBA to remain transparent to increasing system performance requirements over time is extended, affording investment protection to users as they integrate new generations of speed into their SAN environment*
- *Allows the full potential of the system to be achieved with potentially fewer HBAs or other system hardware*

Test Environment

The tests were conducted using the most current products and firmware available from both companies, and employed broadly accepted industry testing standards designed to isolate HBA performance results. These tests are easily replicated for results verification and have been reproduced in HP labs with HP engineers confirming results. Two Emulex midrange HBA products were individually tested against the most currently available QLogic HBA offering in a common configuration with care taken to use a current HP-recommended server and HBA configuration settings.

It should be noted that Emulex's enterprise HBA products (such as the LP9802 and LP10000) offer even higher performance than the midrange HBAs tested against QLogic's highest performance offering in this report. As such, the performance advantages of Emulex's enterprise HBAs are even more pronounced than the superior performance Emulex's midrange HBAs turned in against QLogic's highest performing HBA.

The three HBAs tested were:

HP HBA Model #	Emulex/QLogic Model #
A7298A (FCA2408)	Emulex LP982
A7388A	Emulex LP1050
FCA2214	QLogic QLA2340

Supporting test equipment and configuration included: HP DL380G3, Windows Server 2003 Enterprise Edition, Texas Memory Systems RAMSAN 300, 7 2Gb/s ports connected to Brocade 3200 switch and 12 1GB LUNs. Iometer 2003.12.16 was used.

Test Results

Both the Emulex LP982 and the LP1050 midrange HBAs significantly outperformed the QLogic QLA2340 across all sequential reads/writes IOPS and throughput (both Half and Full Duplex) tests, consistently logging in performance advantages of between 25% and 55%. The most severely pronounced performance difference amongst these results was seen in sequential writes testing, in which a linear advantage of approximately 120% was maintained by Emulex in block sizes ranging from 512B to 2K. Actual performance data captured in these tests can be seen in Figures 1 & 2 in this report.

Equally compelling were the mixed environment test results, where large and small block data was combined to emulate performance differences that could be expected when a single HBA is used for both transactional disk and streaming tape operations. Figure 3 (**Disk and Tape Performance On a Single HBA**) reveals the significant performance advantages associated with Emulex HBAs in this user application environment. It is important to note that all Emulex HBAs process data at the frame level—the smallest level of data accessible in the Fibre Channel protocol. This exclusive design feature of Emulex’s HBAs allows small block I/O (database transactions) to continue to be executed by interleaving I/O at the frame level, even if a large file is being sent to a tape unit—making Emulex HBAs particularly effective in this application environment.

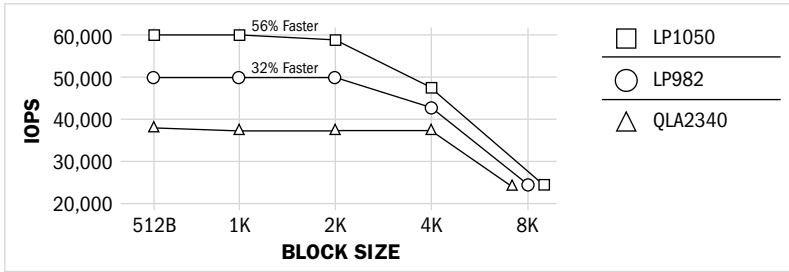


Figure 1: Read sequential IOPS

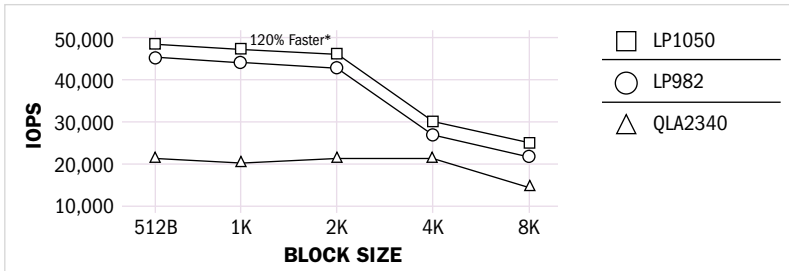


Figure 2: Write sequential IOPS

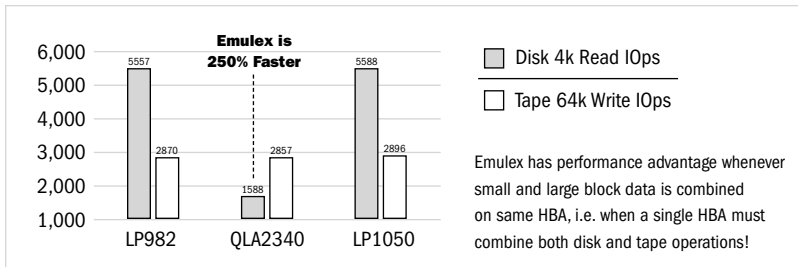


Figure 3: Disk and Tape Performance On a Single HBA.

Disk and Tape workload simulation is an indicator of what can be expected when using a single HBA for simultaneous disk and tape operations. For Mixed Workload testing iometer is set up with two managers. One is used for 4k read operations only, the other for 64k writes only. Each manager has four workers. Each manager is connected to dedicated storage LUNs.

Summary and Conclusions

Central to the consistently superior levels of performance achieved by the Emulex HBAs in this performance testing was a new release of firmware (1.90a4 available for LP98X and LP10XXX series HBAs) that was first announced by Emulex Corporation in February of 2004 while still in its OEM qualification stage. The firmware leverages the unique Emulex firmware-based architecture to deliver enhanced performance levels in all operating environments, including Windows, Linux and Solaris, and for multiple generations of Emulex HBAs dating back to 1995. It should be noted that all Emulex HBAs shipped since 1995 are the beneficiaries of this unique firmware upgradeable architecture as are future HBA product generations. See the section titled *The Unique Advantages of Emulex's HBA Architectural Design* at the end of this report for more detailed explanation of Emulex's firmware-based HBA architecture.

The comparative testing that revealed distinct performance differences between current Emulex and QLogic HBA products is the beginning—but certainly not the end—of the architectural design advantages inherent in Emulex products. Emulex's performance advantages, management tools and implementations of systems upgrades (such as its full, from-the-ground-up implementation of the Microsoft Storport driver) reflect the company's commitment to providing the most robust, yet flexible networking infrastructure for its customers and end users.

Emulex would be pleased to discuss these test results in more depth, and address any questions regarding Emulex products. For more information, or additional copies of this test report, please contact info@emulex.com.

The Unique Advantages of Emulex's HBA Architectural Design

Since 1995, all Emulex HBAs have incorporated a unique firmware-upgradeable Service Level Interface (SLI) based architecture that offers users, OEMs and channel partners distinct advantages over competing HBA products.

Benefits available only to Emulex users include:

- *Seamless non-disruptive firmware upgrades for HBAs while online—with no reboots and no requalification of drivers in any OS*
- *Significant performance upgrades*
- *Simplified upgradeability of features for previously-installed HBAs*
- *Future upgradeability to accommodate OS and standards changes*
- *Investment protection and extended product life*
- *Simplified SAN management*
- *Lower operational and management costs*

At the heart of these benefits is Emulex's Service Level Interface (SLI) based architecture.

What is SLI?

The Emulex SLI provides a consistent interface between the device driver software and the firmware and hardware associated with the HBA. By abstracting the software driver from the hardware/firmware components, the Emulex SLI allows either software or firmware/hardware to be upgraded independently of each other. Using the SLI, any generation of Emulex hardware can operate with any Emulex or third party driver. Multiple generations of Emulex hardware can be run in the same SAN or even server without the need to manage different versions of software drivers.

How End Users, OEMs and Channel Partners Benefit from the Emulex SLI

End users benefit greatly from reduced SAN management costs as a result of the Emulex SLI. Especially in large SANs, managing many separate HBA device drivers for multiple generations of HBAs can be a time-consuming task. Using Emulex hardware based on the SLI, a single device driver binary can be deployed for all generations of HBAs within a given Operating System environment. As a result, end users can take advantage of new generations of hardware, supporting new features, without risking their current hardware investment. In many cases, new features will be available on existing hardware as well with a simple driver or firmware upgrade across the entire SAN. The use of the Emulex HBAAnyware centralized HBA management suite makes this task simple as well.

The numerous benefits from the use of the Emulex SLI extend to third party developers, OEMs and Channel partners as well. Once end users, third party developers, or OEMs have invested time and resources into developing, qualifying, and training staff on solutions, there is little value in repeating this task as newer hardware becomes available. Utilizing the Emulex SLI, investment in one generation of hardware can be leveraged to new generations of Emulex hardware at minimal cost. As a result, OEMs and end users can obtain the benefits of new features, denser formats, and lower costs while optimizing the use of their resources.