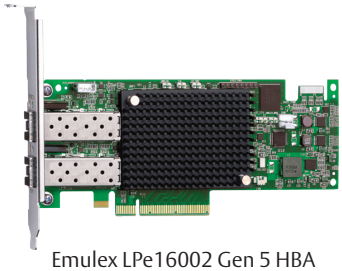
SQL Server Test Report—Gen 5 Fibre Channel HBA Performance Benefits



Emulex LPe16002 Gen 5 HBA

Introduction

Many organizations use database middleware as the backbone for critical business applications. As a result, optimizing database performance is a key priority. One of the likely options is to deploy new servers with higher levels of processor power and memory scalability. To fully leverage these capabilities, the next requirement is a high-performance storage infrastructure. Fibre Channel Storage Area Networks (SANs) have long been the preferred choice for enterprise-class database applications. With the introduction of Gen 5 16Gb Fibre Channel (16GFC) technology, data centers are evaluating when and how to migrate to the next generation of storage networking.

Some data center architects may question the need for additional bandwidth that Gen 5 Fibre Channel upgrades and deployments provide. This is particularly the case when large investments have been made in existing Fibre Channel storage arrays. One of the potential scenarios is to deploy new servers with Gen 5 Host Bus Adapters (HBAs) which are backward compatible with 8Gb Fibre Channel (8GFC) and 4Gb Fibre Channel (4GFC) SANs. This leverages the benefits from new adapters at a small incremental cost and provides the capability to seamlessly upgrade to a full Gen 5 SAN in the future.

With that option in mind, are there performance gains when using the 16GFC host link rate on Gen 5 Fibre Channel HBAs with 8GFC and 4GFC storage arrays?

The first criterion is storage throughput, measured in I/O operations per second (IOPS). Cleary deploying an end-to-end 16GFC infrastructure would double the capacity vs. 8GFC, but next-generation Gen 5 Fibre Channel HBAs should also deliver more throughput with existing 8GFC or 4GFC storage arrays.

Database administrators are also concerned about transaction rates and latency, which directly relate to the experience for users or applications that are waiting for results, the bottom-line for performance.

To answer these questions, Emulex Labs conducted a series of tests comparing throughput, transactions per second (TPS) and average response time for database servers using Gen 5 HBAs running at 16GFC and previous-generation 8GFC HBAs. Both were networked to an 8GFC storage array using a Gen 5 switch. In contrast to many Fibre Channel benchmarks that use solid state storage, these were real-world tests with a shipping array and typical disk drives. Simulations were done with up to 500 simulated users to evaluate a wide range of requirements. This technology brief presents the results.

At a Glance

Database performance tests showed substantial benefits with next-generation Emulex LPe16002 Gen 5 Fibre Channel HBAs running at 16GFC vs. 8GFC HBAs. Key results over a range of 100 to 500 users include:

- 12% higher storage IOPS
- 36% higher database TPS
- 26% faster database response time

Gen 5 Fibre Channel is designed for the virtualization, cloud and database era, taking Fibre Channel SANs to the next level by delivering more than just incredible performance and higher throughput.

Emulex Gen 5 HBAs deliver:

- Increased SAN reliability, data integrity, availability
- Management simplicity
- Reduced operational costs across the data center
- Multi-protocol/multi-speed adapters
- Performance acceleration for virtualization and mission critical applications

EMULEX Gen 5 Fibre Channel

SQL Server Test Report— Gen 5 Fibre Channel HBA Performance Benefits

Test Configuration

Benchmarks were done using the Emulex LPe16002 Gen 5 HBA and the Emulex LPe12002 8GFC HBA with the hardware configuration shown below. Both adapters were tested with 8GFC storage.

HP ProLiant DL380p Gen 8 server:

- 2 Intel Xeon E5-2690 8-core processors
- 32GB RAM
- HP 554FLR-SFP+ integrated FlexFabric adapter provided by Emulex
- 2 local hard drives for operating system and SQL server program files

Brocade 6510 Gen 5 switch

HP 3PAR StoreServ 10000 Storage system:

- 2 array controllers
- 4 8GFC ports per controller
- 48 272GB FC 15K SAS drives
- 32 92GB 150K SSD drives
- 2 virtual disk groups (RAID 1+0)
- 2 virtual LUNS for database files and log files

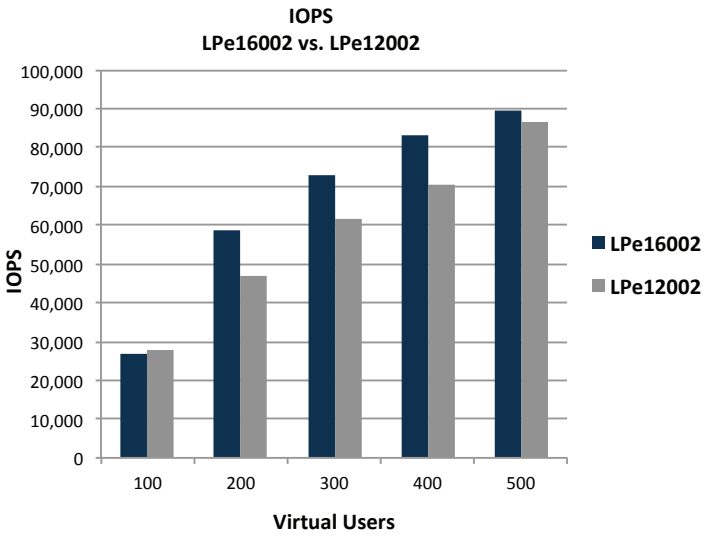
Software test suite:

- Windows Server 2012 with the Microsoft Multi-Path I/O (MPIO) driver
- Microsoft SQL Server 2012 using 4Gb system memory
- Quest Benchmark Factory® for Databases

The evaluation was done using the online transaction performance (OLTP) profile. User latency was eliminated by disabling think or keying time. Tests were started with 10 virtual users and the number of virtual users was incremented by 10 over 2.5 hours to reach a maximum of 500. Iometer and perfmon were used from a remote system to collect data.

Throughput

Throughput was measured as total storage IOPS for both read and write operations using an 8KB data block size, which is typical for SQL Server database applications. The following graph shows results with up to 500 simulated users.

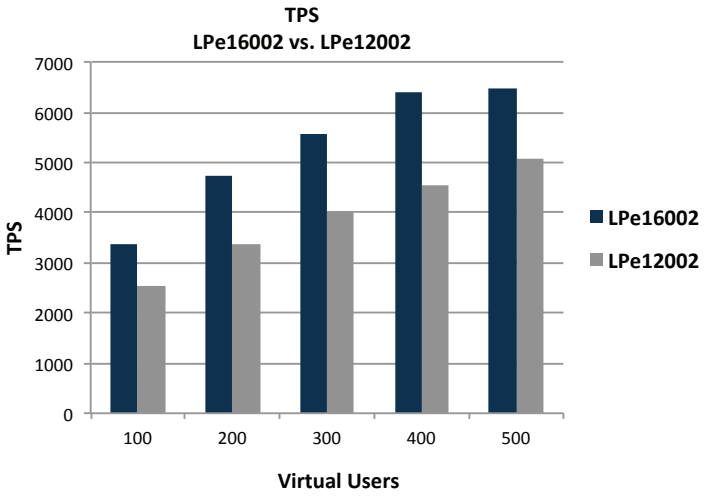


The LPe16002 Gen 5 HBA averaged 12% higher storage IOPS over the range of 100 to 500 virtual users.

Why is this important? The assumption might be that IOPS are limited by the performance of the 8GFC back-end storage array and Gen 5 HBAs would offer no advantage. However, as shown in these results, the Emulex LPe16002 Gen 5 HBA gives higher throughput with a real-world 8GFC SAN.

Transactions per Second

The following graph shows database TPS data over a range of 100 to 500 virtual users:



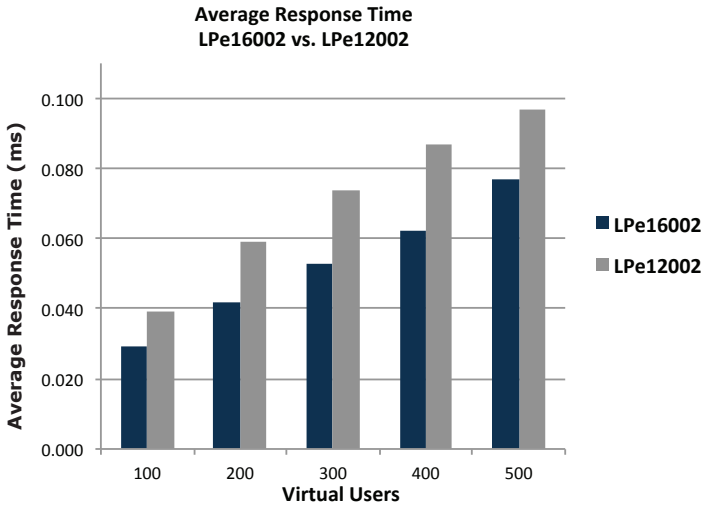
SQL Server Test Report— Gen 5 Fibre Channel HBA Performance Benefits

The LPe16002 Gen 5 HBA averaged 36% higher SQL Server TPS over the range of 100 to 500 virtual users, peaking at 41% higher TPS at 400 users.

Why is this important? TPS tests are a key indicator of the capacity of a database server. By upgrading existing servers with Gen 5 HBAs or deploying new servers with Gen 5 HBAs, database applications can support up to 41% more transactions with an existing 8GFC array. Server administrators may be focused on CPU and memory resources and overlook the critical role of next-generation HBAs in optimizing database performance.

Average Response Time

The following graph shows average SQL Server database response time data measured in milliseconds:



The LPe16002 Gen 5 HBA averaged 26% faster response time over the range of 100 to 500 users.

Why is this important? Database response time directly relates to the performance that actual users will experience. Deploying or upgrading servers with Gen 5 HBAs will lead to increased productivity and better use of server resources.

Conclusions

As shown in these test results, Emulex LPe16002 Gen 5 HBAs provide clear advantages in throughput, transaction rates and response time vs. 8GFC HBAs when used with 8GFC backend storage. Data centers can realize substantial performance improvements with database applications without investing in new storage arrays by upgrading existing servers or deploying new servers with Emulex LPe16002 Gen 5 HBAs.

EMULEX®

World Headquarters 3333 Susan Street, Costa Mesa, CA 92626 +1 714 662 5600
Bangalore, India +91 80 40156789 | **Beijing, China** +86 10 84400221
Dublin, Ireland+35 3 (0) 1 652 1700 | **Munich, Germany** +49 (0) 89 97007 177
Paris, France +33 (0) 158 580 022 | **Tokyo, Japan** +81 3 5325 3261
Wokingham, United Kingdom +44 (0) 118 977 2929

www.emulex.com

13-1342 · 6/13