

# Emulex HBA Performance with Windows Server® 2008 Hyper-V™

*Evaluation report prepared under contract with Emulex Corporation*

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## Introduction

Server virtualization is a key technology that saves costs and reduces power consumption in the data center. New versions of server virtualization software are providing significant performance improvements. New generations of multi-processor, multi-core servers are providing more computing capacity and optimizations for server virtualization. These technologies are enabling virtualization of business-critical applications that require more CPU resources and generate higher I/O.

A storage area network (SAN) based on the Fibre Channel protocol is typically used to provide high-performance, shared storage for virtual server deployments. Organizations can maximize virtualization ratios with business-critical applications by using efficient storage adapters that support high I/O rates with minimum use of CPU resources.

To evaluate storage adapter performance, Emulex Corporation commissioned Demartek to test Emulex® LightPulse® 8Gb/s Host Bus Adapters (HBAs) with Windows Server 2008 Hyper-V. The focus was a comparison of CPU effectiveness for Emulex 8Gb/s HBAs relative to QLogic® and Brocade® 8Gb/s HBAs.

## Evaluation Environment

The evaluation was conducted at Demartek using the following test environment:

Host Server:

- Dell PowerEdge 2900, dual-Intel Xeon E5345 (2.33 GHz, 8 total cores)
- 48GB RAM

Operating System:

- Windows Server 2008 Enterprise x64 Edition SP1 with Hyper-V

Virtual Machines (VMs):

- Eight VMs running Windows Server 2008 Standard x64 Edition

Storage:

- Third I/O storage target using Dell PowerEdge 2900 with 48GB RAM and six 8Gbs Fibre Channel ports, 48 LUNs defined.

Dual-Port 8Gb/s Fibre Channel HBAs:

- Emulex LightPulse LPe12002
  - Driver: 7.2.20.006
  - Firmware: 1.10A5
  - HBAnyware: 4.1a35
- QLogic QLE2562
  - Driver: STOR Miniport 9.1.7.18
  - Firmware: 4.04.00
  - SANsurfer 5.0.1b37
- Brocade 825
  - Driver: 1.1.0.1
  - Firmware: FCHBA1.1.0.1
  - Host Connectivity Manager: 1.1.0.1

The 8Gb/s Fibre Channel HBAs were installed into the PCI-Express 1.0 x8 slot of the host server. Where adjustable, the queue depth for each HBA port on the host server was set to 254.

The Third I/O storage target was used to minimize latency and I/O response time, eliminating the storage device as a potential bottleneck. Tests were done with IOmeter running in each VM. IOmeter is an industry standard, open source I/O load generator that is available from Source Forge at <http://sourceforge.net/projects/iometer/>.

All the host server and storage target ports were connected to one Brocade 300 8Gb/s, 24-port, Fibre Channel switch.

Each of the Hyper-V guest machines was allocated 4GB RAM and 1 virtual processor. The target LUNs were assigned as pass-through disks.

## **Evaluation Summary**

Emulex LightPulse LPe12002 8Gb/s HBAs had 37% to 78% higher CPU effectiveness when compared to 8Gb/s HBAs from QLogic and Brocade. This performance advantage was consistent for sequential and random reads and writes using common block sizes over a range of simulated workloads.

Greater CPU efficiency for I/O enables higher virtualization ratios and provides greater cost savings for virtual server deployments.

## Test Results

A series of IOmeter tests were run with Emulex, QLogic and Brocade HBAs doing sequential and random reads and writes using 4Kb and 8Kb block sizes. Tests were done with four simulated workers for each virtual server. Queue depths (outstanding I/Os) varied from 1-8 for each VM.

Measurements were done of I/Os per second (IOPS) and percent CPU utilization. Tests results are reported as IOPS per percent of CPU utilization. A higher number indicates more efficient use of CPU resources for I/O. The results are summarized for each type of I/O by averaging relative performance (IOPS per % CPU) for all queue depths tested.

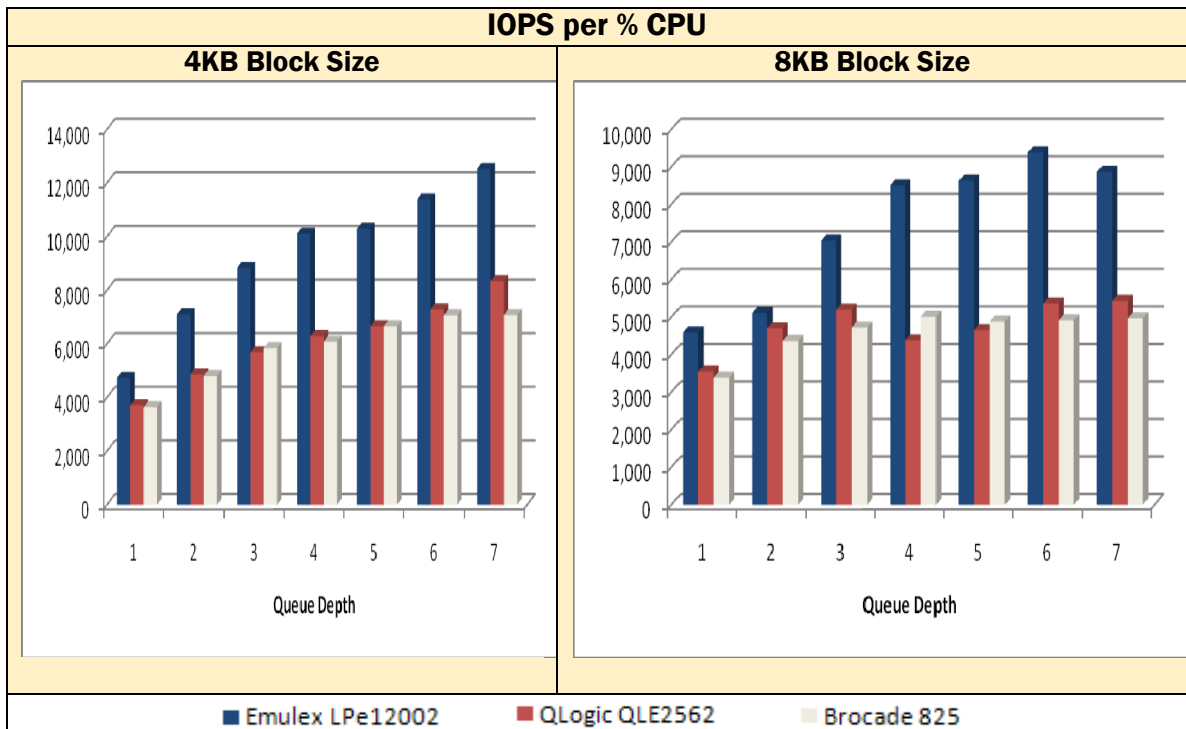
### Sequential Read

4Kb Block Size:

- Emulex LPe12002 50% better than QLogic QLE2562
- Emulex LPe12002 56% better than Brocade 825

8Kb Block Size:

- Emulex LPe12002 56% better than QLogic QLE2562
- Emulex LPe12002 60% better than Brocade 825



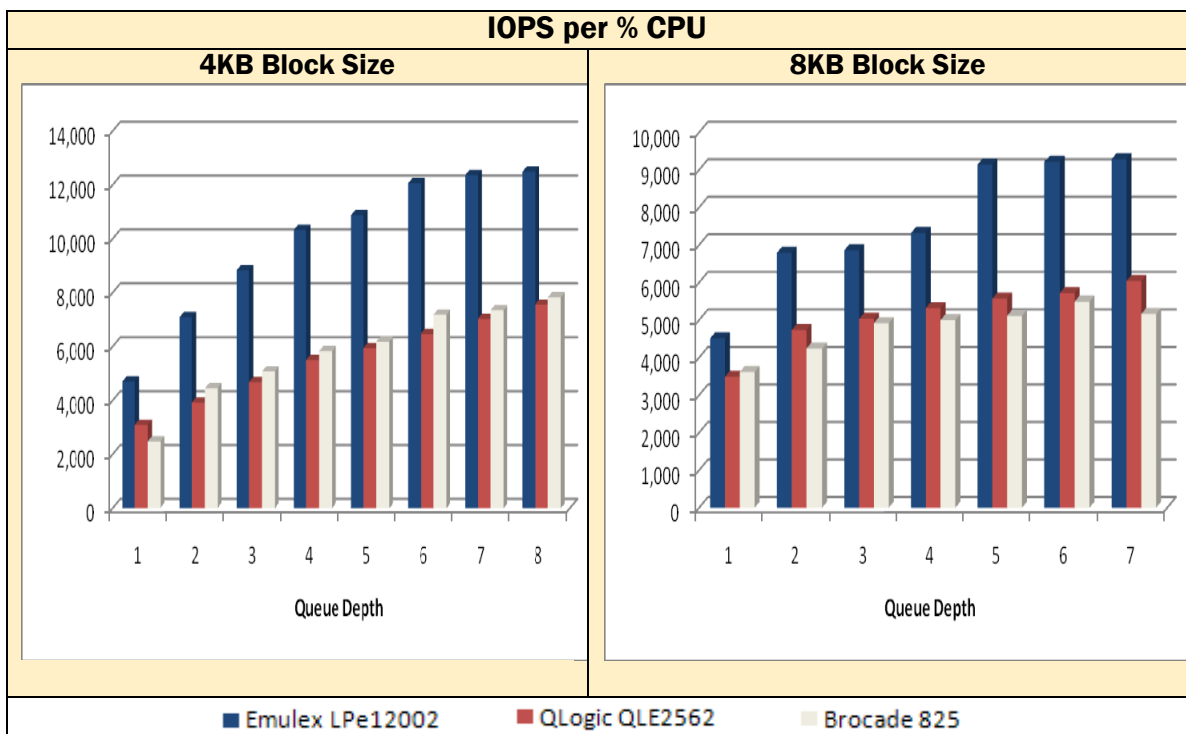
### Sequential Write

4Kb Block Size:

- Emulex LPe12002 78% better than QLogic QLE2562
- Emulex LPe12002 72% better than Brocade 825

8Kb Block Size:

- Emulex LPe12002 47% better than QLogic QLE2562
- Emulex LPe12002 57% better than Brocade 825



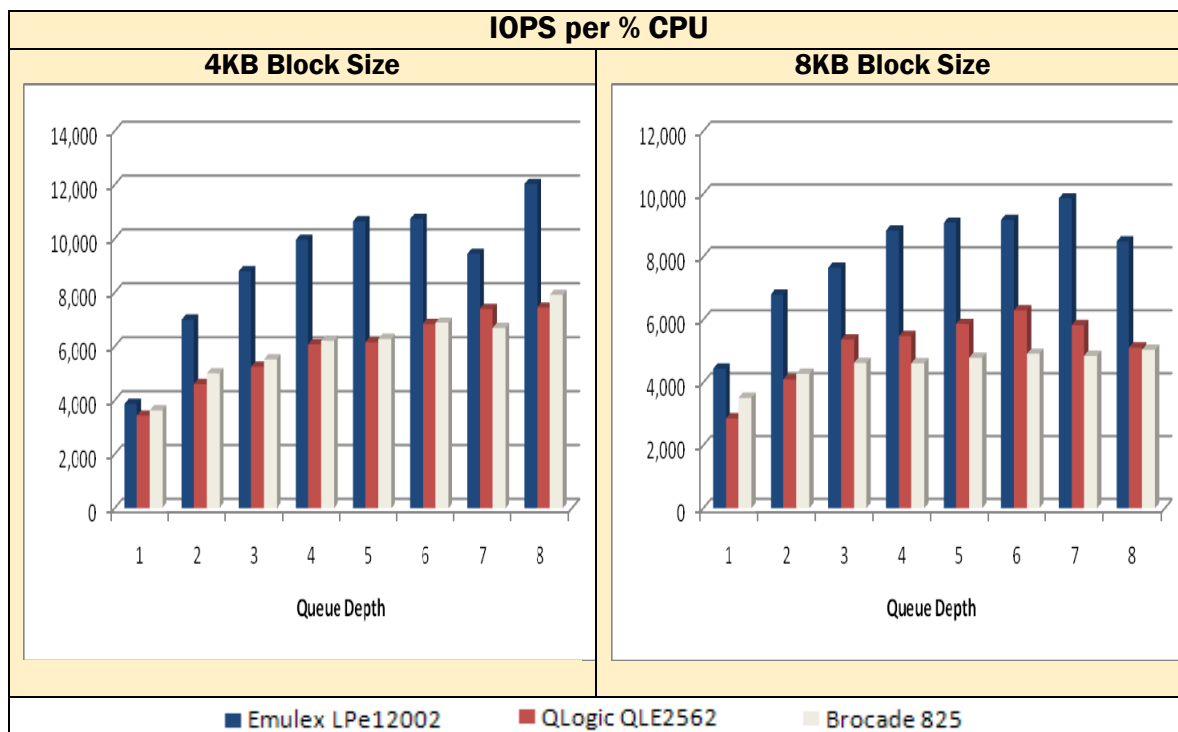
### Random Read

4Kb Block Size:

- Emulex LPe12002 52% better than QLogic QLE2562
- Emulex LPe12002 48% better than Brocade 825

8Kb Block Size:

- Emulex LPe12002 58% better than QLogic QLE2562
- Emulex LPe12002 74% better than Brocade 825



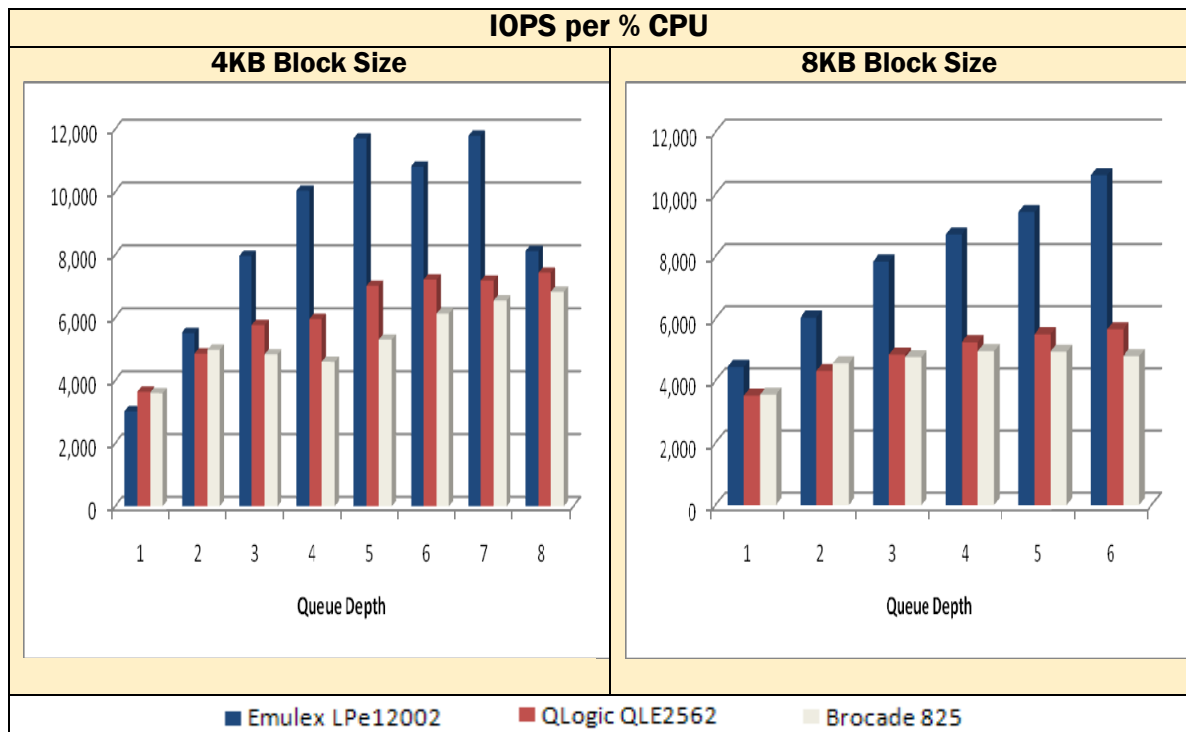
### Random Write

4Kb Block Size:

- Emulex LPe12002 37% better than QLogic QLE2562
- Emulex LPe12002 59% better than Brocade 825

8Kb Block Size:

- Emulex LPe12002 59% better than QLogic QLE2562
- Emulex LPe12002 68% better than Brocade 825



## Summary and Conclusion

Emulex LightPulse LPe12002 8Gb/s HBAs provide significantly better CPU effectiveness with Windows Server 2008 Hyper-V when compared to 8Gb/s HBAs from QLogic and Brocade. This conclusion is based on tests with eight virtual machines running IOmeter, using a range of queue depths to simulate different workloads. Results were consistent for both reads and writes with 4Kb and 8Kb block sizes, which are typical for server applications.

CPU effectiveness with I/O is a key factor in maximizing virtualization ratios for business-critical applications. As shown in these tests, Emulex 8Gb/s HBAs fully optimize virtual server environments, enabling greater costs savings and lower power consumption.

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