

The 8Gb Fibre Channel Adapter of Choice in MS-Exchange Environments

QLogic's 8Gb Adapters Outperform Emulex—QLogic Offers Best Performance and Scalability of MS Exchange Workloads

Key Findings

The QLogic 2500 Series 8Gb Fibre Channel Adapter offers better throughput and IOPS compared to the Emulex 8Gb LightPulse Adapter, and in turn supports the additional demand of MS Exchange e-mail volume and increasing workloads.

- **Driving Microsoft Exchange-like I/O loads in an attempt to saturate the adapters showed 133 percent better IOPS while pushing more than 279 MBps throughput** for the QLogic 2500 Series 8Gb Fibre Channel Adapters versus the Emulex 8Gb LightPulse Adapter.
- **The Emulex LPe12000 fails to keep up with increasing Exchange Workloads** as workloads increased past 16 outstanding I/Os. In addition, the QLogic adapter continued to scale, achieving more than 35 percent better MBps than Emulex with 64 outstanding I/Os.



Executive Summary

It is imperative to deploy a scalable architecture to meet the ever-growing requirements of SANs. With increased demands on the Microsoft® Exchange Server, it is critical to optimize Exchange I/O performance in the SAN. The QLogic 2500 Series 8Gb Fibre Channel Host Bus Adapter meets the need for high performance, measured as throughput (MBps) for large data volumes and data requests (IOPs). QLogic's unique adapter and ASIC architecture is capable of delivering high performance at power levels unprecedented in the industry.

E-mail has grown to be one of the most important communication and collaboration applications for worldwide businesses. According to a report from the The Radicati Group¹, in 2010 Microsoft Exchange

Server will have a total installed base of 301 million mailboxes, which is expected to reach 470 million by 2014. This represents an average annual growth rate of 12 percent.

To help IT decision makers make the best, most informed adapter choice, QLogic has performed a series of head-to-head performance benchmarks showing the I/O performance and scalability advantages of the QLogic 2500 Series 8Gb Fibre Channel Adapter over the Emulex® 8Gb LightPulse® Adapter. QLogic compared the overall performance of the 8Gb adapters when attached to an industry-leading solid state storage array to emulate real-world Microsoft Exchange workloads.

¹ The Radicati Group, Inc.'s latest study, *Microsoft Exchange Server and Outlook Analysis 2010 – 2014*

Exchange Server Benchmark using IOmeter Test

Configuration

The IOmeter tool was used to benchmark the QLogic 2500 Series 8Gb Fibre Channel Adapter versus the Emulex 8Gb LightPulse Adapter in an exchange environment with minimum subsystem latency.

The IOmeter test setup (Figure 1) consisted of the latest 8Gb adapters from QLogic and Emulex, running on current, commercially available drivers,, installed in a 2.93 GHz - Intel Nehalem Quad Core (dual socket) server running the Windows Server® 2008 R2 operating system. The Intel Nehalem server was connected to a Texas Memory System RamSan®-325 (with 32GB total capacity) through a QLogic 5000 Series Stackable Fibre Channel Switch. Using a solid state disk allows removing the latency introduced by a slower disk-driver, and provides the performance benchmark expected from next-generation storage arrays.

One initiator and four target RamSan ports were configured in a zone to the QLogic 5000 Series Stackable Fibre Channel Switch. Eight NTFS-formatted LUNs were created on the RamSan: four for the database and four for log files.

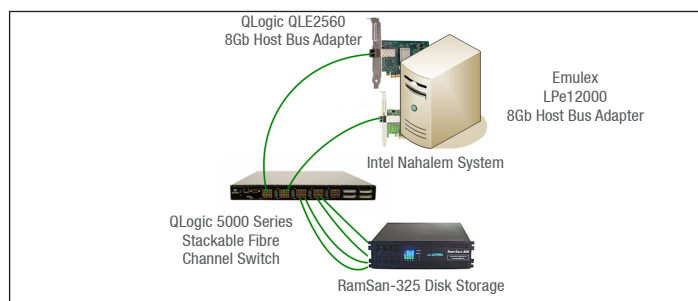


Figure 1. IOmeter Test Setup

When the disk latency is reduced (the disk I/O is striped across an increased number of spindles), a greater I/O load (the number of users is increased) can be driven by Microsoft Exchange. Using the RamSan-325 and the IOmeter load generation tool allowed the emulation of both these conditions, as illustrated in Figure 1.

The tests were performed using the latest commercially available hardware, software, and drivers. All measurements were made with default settings of the adapters from both companies.

Test Procedure

The tests were executed on the configuration described in Figure 1 as follows:

1. A QLogic 8Gb single-channel PCI Express to Fibre Channel Adapter (OLE2560) was installed on the test server using the appropriate miniport driver.
2. Workers were created separately for 8K random read/write to simulate

database access and 4K random reads for log file operations (four workers for 8K files at 35 percent read and 65 percent write reads, and one worker for 4K log file reads to maintain IOPS at a 4:1 DB to Log ratio similar to Exchange 2007). Eight LUNs were created and mapped to four target ports.

- Tests were run for one minute and repeated several times for integrity and the results were averaged.
- These steps were repeated for the Emulex 8Gb single-channel PCI Express to Fibre Channel Adapter (LPe12000).

Test Results

The tests demonstrate that, as the number of users increased and more LUNs were provisioned, the performance gains multiplied with the QLogic 8Gb Fibre Channel Adapter, showing a multifold improvement over the Emulex 8Gb Fibre Channel Adapter in scalability.

Fibre Channel Adapter Scalability in Modeling the Microsoft Exchange I/O Load

The RamSan-325 contributes to very low latencies for I/O completions, while the IOmeter tool contributes by driving large I/O loads through the Fibre Channel Adapter, thus satisfying both conditions for this test. IOmeter replicated the Microsoft Exchange I/O workload against the RamSan-325 and found that the IOPS performance of a QLogic Fibre Channel Adapter with a minimum workload of two outstanding I/Os was 57 percent better than Emulex’s Fibre Channel Adapter (Figure 2). Similarly, the QLogic adapter scaled better, achieving 35 percent more throughput than the Emulex Fibre Channel Adapter (Figure 3).

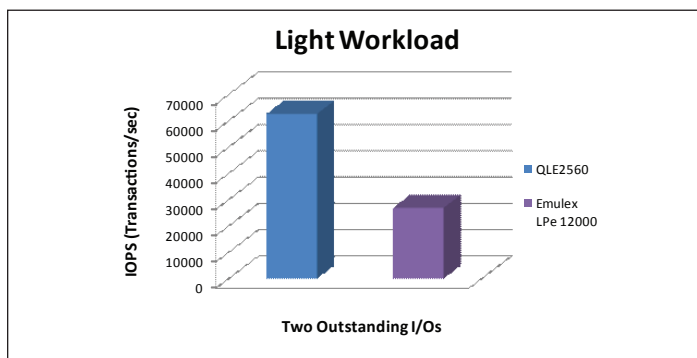


Figure 2. IOPS Comparison

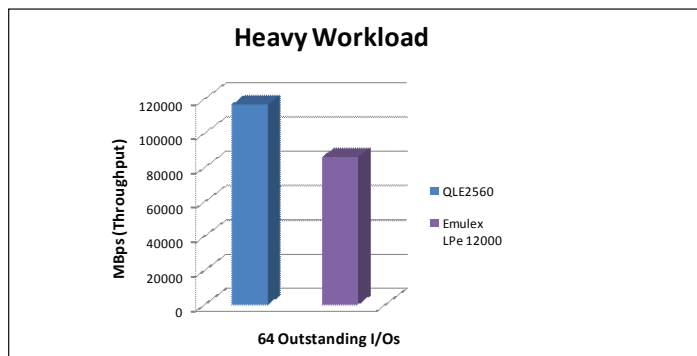


Figure 3. Throughput Comparison

Fibre Channel Adapter Scalability with Outstanding I/O Workloads

Six tests were performed to assess MS exchange workload scalability. Each test included an increase to the I/O workload; test one had a workload of two outstanding I/Os, with increases through test six, which had 64 outstanding I/Os.

The performance benefit of the QLogic 2500 Series 8Gb Fibre Channel Adapter is illustrated in Figure 4. When the outstanding I/O workloads were increased, the QLogic 8Gb adapter scaled to meet the increased workloads. In contrast, the Emulex 8Gb Fibre Channel Adapter could not sustain the performance for the larger workloads.

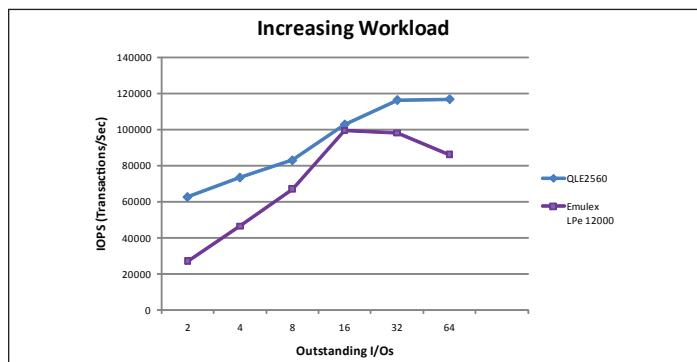


Figure 4. MS-Exchange Workload Scalability

As identified, these tests show that the QLogic 8Gb adapter increased IOPS and performance scaled as the workloads increased. In test four, the Emulex adapter also reached its maximum performance. However, in tests five and six, which provided 32 and 64 outstanding I/O workloads respectively, the Emulex adapter’s performance dropped significantly. In test six, at 64 outstanding I/Os, QLogic displayed a 35 percent performance advantage over the Emulex 8Gb adapter. The QLogic 2500 Series 8Gb Fibre Channel Adapter continues to provide scalability and performance as demonstrated in the aforementioned benchmarks. IOmeter was configured to place the maximum possible load on the QLogic 8Gb and Emulex 8Gb

adapters. As customers purchase and integrate 8Gb adapter technology into 8Gb SANs and infrastructure, they expect optimum throughput and IOPS, as demonstrated by the QLogic 2500 Series 8Gb Adapter.

Summary and Conclusion

QLogic continues to be the industry leader in delivering high-performance I/O solutions to data center customers. The IOPS and throughput of the QLogic 2500 Series 8Gb Fibre Channel Adapter is best in class and provides an unprecedented level of high performance, superior scalability, and enhanced reliability that exceeds the requirements for next-generation data centers. As 2Gb and 4Gb transition to 8Gb, increasing performance is necessary to meet the escalating requirements of Microsoft Exchange Server. The results of the benchmark tests demonstrate the I/O performance and scalability advantages of the QLogic 2500 Series 8Gb Fibre Channel Adapter over the Emulex 8Gb Fibre Channel LightPulse Adapter.

1. Microsoft Exchange is the number one business critical application in small, medium, and large enterprises. Administrators go to great lengths to ensure delivery on the guaranteed uptimes. Scalability and performance are major consideration factors when choosing a Fibre Channel Adapter. The QLogic 2500 Series 8Gb Fibre Channel Adapter has proved its scalability and performance superiority, making it the right choice for exchange administrators.
2. Exchange environments are carefully designed to cater to varying and unpredictable loads. As heavier demands occur in the data centers, the SAN must meet minimum business requirements for higher performance. QLogic 2500 Series Adapters support the scalability in performance required with increasing users and user mailbox sizes, which will make a positive impact an organization's bottom line.

The QLogic 2500 Series 8Gb Fibre Channel Adapter scales to wire speeds as the number and size of I/Os increase. This efficiency is accentuated by QLogic's use of proprietary RISC processors in its ASIC, which is custom built for high throughput, low power, and low latency.

IT managers know that choosing the right adapter for their SAN infrastructure can have a strong impact on the performance, agility, and scalability of their enterprise storage environments. The results of this study demonstrate that QLogic 2500 Series 8Gb Fibre Channel Adapters consistently outperform Emulex LightPulse 12000 Adapters in today's real-world environments and provide significant headroom for future scalability. QLogic continues to meet the following growing SAN infrastructure demands that discerning IT managers must support:

- Increasing use of server consolidation techniques through the deployment of server virtualization technologies such as those from AMD®, HP®, Dell®, IBM®, Intel®, Microsoft®, Oracle®, VMware®, and XenSource™ technologies
- An expected 470 million mailboxes by 2014, an annual growth rate of 12 percent
- Business continuity and compliance requirements that drive the deployment of the following:
 - Backup, remote, replication, and disaster recovery technologies
 - Archiving technologies, indexing, and search technologies

A high performance and scalable Fibre Channel Adapter, such as the QLogic 2500 Series 8Gb Fibre Channel Adapter, will handle the load efficiently without degrading the overall performance of the Microsoft Exchange Server. Storage trends demand higher utilization of bandwidth and throughput from Fibre Channel Adapters, and the QLogic 2500 Series 8Gb Fibre Channel Adapters already deliver on this promise.

Appendix A

Server Configuration

Intel Server	
Processor type and speed	Intel Nahalem Quad Processor (dual socket) – total 8 cores
Memory	24GB RAM
OS type	Windows Server 2008 R2

Fibre Channel Adapter Hardware

Fibre Channel Adapters	
QLogic	QLE2560
Emulex	LPe12000

Fibre Channel Adapter Configuration

QLogic and Emulex Fibre Channel Adapters	
QLogic driver	STOR miniport
QLogic driver version	9.1.8.25
Emulex driver	STOR miniport
Emulex driver version	7.2.32.002

External Storage Configuration

Storage	
Solid state disk	RamSan-325 solid state storage
LUNs	8 LUNs, 4 target ports

Fibre Channel Switch Hardware

Switch	
8Gb switch	QLogic 5000 Series Stackable Fibre Channel Switch

Disclaimer

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