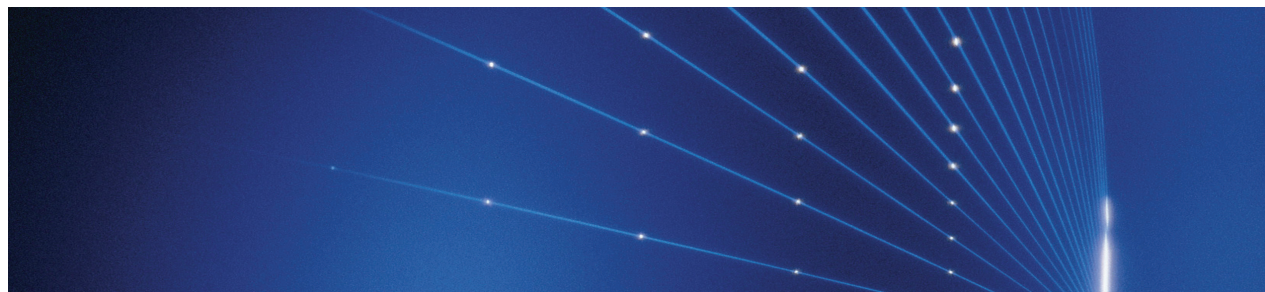




# 8Gb Fibre Channel Adapter of Choice in Oracle® Environments

**QLogic 8Gb Adapter Outperforms Brocade® Out-of-Box**

*QLogic's IOPS Performance Up to 101 Percent Superior to Brocade*



## Executive Summary

It is imperative to deploy a scalable architecture to meet the ever-growing requirements of Storage Area Networks (SANs). The QLogic 2500 Series 8Gb Fibre Channel (FC) Host Bus Adapters (HBAs) meet the need for high performance at power levels that are unprecedented in the industry. Today's mission-critical Online Transaction Processing (OLTP), Online Analytical Processing (OLAP), and Web applications demand the highest levels of performance from their database servers and storage infrastructure.

A critical element of the overall SAN performance is the selection and deployment of an adapter. With the introduction of multi-processor CPUs coupled with host virtualization technologies, high performance Oracle database solutions need to be complemented with high performance and scalable I/O connectivity. Choosing the wrong adapter can complicate SAN management and limit the flexibility of an organization to meet continually evolving business needs.

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 **out-of-box** I/O performance and scalability advantages of the QLogic 2500

Series 8Gb FC adapter over the Brocade 8Gb 815 adapter. QLogic compared the overall performance of the 8Gb adapters, **in a replicable and unconstrained test environment**, to emulate real-world Oracle workloads.

## Key Findings

QLogic has compared the out-of-box performance of its 8Gb FC adapter to Brocade's, using the test setup described in this paper. This setup represents an unconstrained environment with no inherent performance limitations due to deficiencies in the host or the fabric; it has been used extensively by QLogic over the last several product families to benchmark the performance of its FC adapter relative to its competitors. QLogic's test results demonstrate that:

- In high-performance database applications, emulated with Oracle workloads, **QLogic 2500 Series 8Gb FC adapters deliver an average of 98 percent better performance than Brocade's 815 adapters.**
- **OLTP: QLogic 2500 series adapter IOPS are up to 94 percent higher than Brocade**
- **Web application: QLogic 2500 series adapter IOPS are up to 98 percent higher than Brocade**
- **OLAP: QLogic 2500 series adapter IOPS are up to 101 percent higher than Brocade**

## Introduction

The tests discussed in this paper analyzed and compared the I/O performance of QLogic and Brocade 8Gb FC adapters in a representative selection of database-driven workloads such as:

- **An OLTP workload.** OLTP applications are high throughput, insert/update-intensive. This workload is typical for companies that have large transaction processing applications, such as airline ticketing, large order-entry, and banking applications.
- **A Web workload.** Most database-backed Web applications have high throughput requirements and are read-intensive, but not exclusively so. Web workloads mix a variety of content and data-rich applications ranging from e-commerce and banking applications to CRM and self-service intranet applications.
- **An OLAP workload.** The purpose of an OLAP workload is to quickly provide answers to analytical queries that are multi-dimensional and part of the broader category business intelligence. OLAP workloads are typically used in relational reporting and data mining.

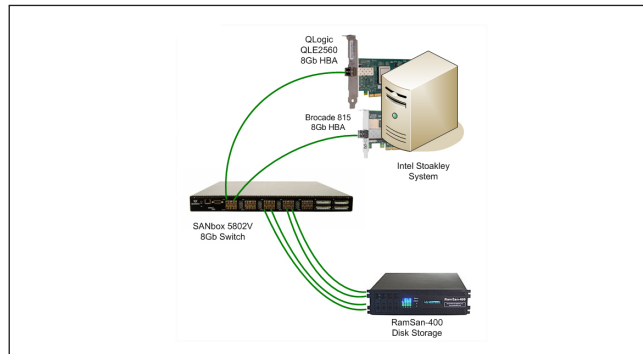
To make the benchmarks relevant to today's businesses, QLogic selected the market-leading **Oracle Relational Database Management System (RDBMS)** running on Microsoft® Windows® 2003 Enterprise Edition with Service Pack 2. This is a very popular, highly scalable enterprise configuration in wide production use for all three workloads described in the previous paragraphs. The tool used for predicting the performance of the Oracle database under-load was Orion from Oracle.

**Testing performance.** To test and compare the I/O performance, QLogic used a Texas Memory Systems RamSan®-400 solid-state storage subsystem as the target. Solid-state storage dramatically reduces the latency that comes from using disk-based storage; this latency reduction allows for measuring the true capability of the adapter.

## Test Setup

The test setup (Figure 1) consisted of the latest 8Gb adapters from QLogic and Brocade, running on current commercially available drivers, installed in a Intel® Stoakley Quad Core (dual socket) server capable of over 550K IOPS, running the Windows Server 2003 operating system. The Intel Stoakley server was connected to a RamSan-400 (with 32GB total capacity) through a QLogic SANbox® 5802V series 8Gbps 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.

Eight LUNs were created on the RamSan, visible through four different ports. The switch was configured with one initiator to the SANbox 5802V in a zone with four target RamSan ports.



**Figure 1. 8Gb Test Setup**

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 in Figure 1 as follows:

1. A QLogic 8Gb single-channel PCI Express to Fibre Channel adapter (QLE2560) was installed on the test server using the appropriate miniport driver.
2. Eight LUNs were created and mapped to four target ports.
3. The Windows device manager was used to verify that the LUN(s) were visible. Each LUN was then formatted and assigned a drive letter that could be used by the Orion tool.
4. The Orion commands were executed to simulate an OLTP workload.
5. These steps were repeated for the Brocade 8Gb single-channel PCI Express to Fibre Channel adapter (Brocade 815).

## Test Results

Performance of the QLogic adapter and Brocade adapter was tested and measured based on critical parameters as part of OLTP testing, Oracle Web applications, and OLAP. The performance was measured against an increasing load on the adapters determined by the number of outstanding I/O requests.

**The results showed that across all three workloads (OLTP, Web and OLAP), QLogic's performance averaged 98 percent better than Brocade.**

**OLTP Workloads.** OLTP is the most common workload in the enterprise, so it provides a good indication of the adapter’s scalability in a production setting. Figure 2 shows up to 94 percent performance advantage of QLogic over Brocade in overall IOPS in the OLTP application environment.

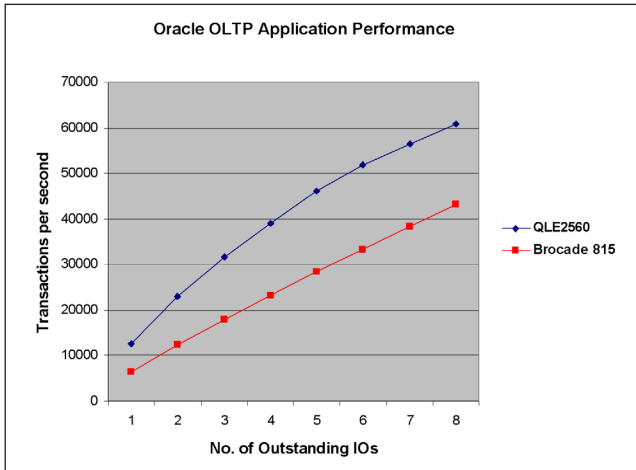


Figure 2. OLTP Application Performance

**Web Workloads.** Most database-backed Web applications have high throughput requirements and are read-intensive, and web workloads mix a variety of content and data-rich applications ranging from e-commerce and banking applications to Customer Relationship Management (CRM) and self-service intranet applications. Figure 3 shows up to 98 percent performance advantage of QLogic over Brocade when supporting higher overall IOPS for Oracle Web applications.

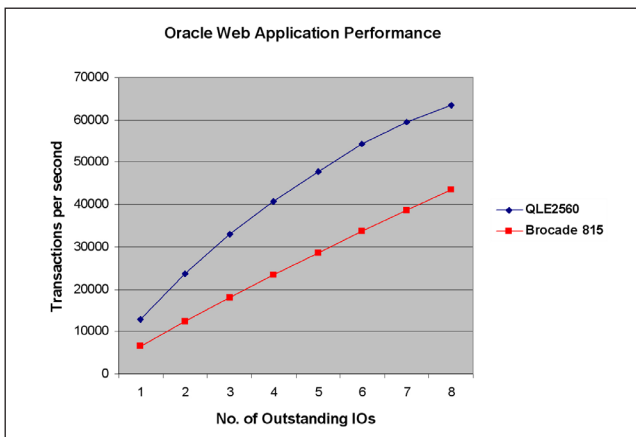


Figure 3. Oracle Web Application Performance

**OLAP Workloads.** Oracle implements OLAP within an Oracle database environment. The typical applications of OLAP are in business reporting for sales, marketing, Business Performance Management (BPM), budgeting and forecasting, and financial reporting and

planning. Figure 4 shows up to 101 percent performance advantage of QLogic over Brocade, with QLogic supporting higher overall IOPS for Oracle Web applications.

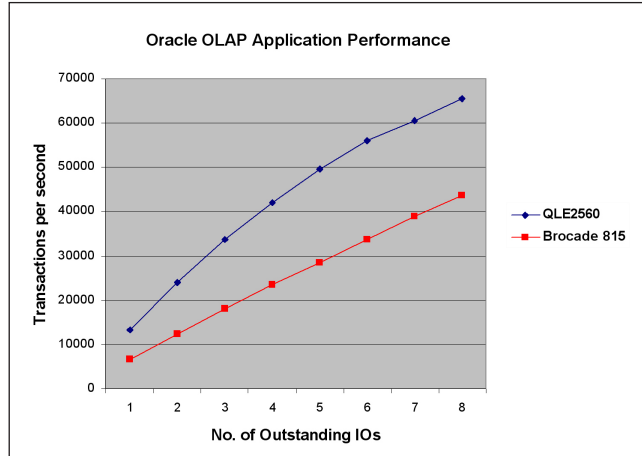


Figure 4. OLAP Application Performance

The QLogic 2500 Series FC 8Gb Adapter demonstrates an average of **98 percent better performance** than the Brocade 8Gb adapter. To satisfy this demand, organizations are making the transition to 8Gb Fibre Channel SANs, and IT decision makers are under pressure to select the right components to ensure a cost-effective and scalable solution. The QLogic 2500 Series 8Gb FC adapter provides a critical element of overall performance in the selection and deployment of the storage solution.

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 FC adapter is the 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 required to meet the ever increasing application requirements in SAN environments.

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 FC adapters consistently out-perform Brocade 8Gb adapters in today’s real-world environments and provide significant head-room for future scalability.

## Appendix A

### Server Configuration

Intel Server	
<b>Processor type and speed</b>	Intel Stoakley Quad Processor (dual socket) — total 8 cores
<b>Memory</b>	4GB RAM
<b>OS type</b>	Windows 2003 Enterprise Server SP2
<b>Version</b>	5.x.xx.xx Service Pack 2

### FC Adapter Hardware

FC Adapters	
<b>QLogic</b>	QLE2560
<b>Brocade</b>	815

### FC Adapter Configuration

QLogic and Brocade FC Adapters	
<b>QLogic driver</b>	STOR miniport
<b>QLogic driver version</b>	9.1.7.16
<b>Brocade driver</b>	STOR miniport
<b>Brocade driver version</b>	1.0.0

### External Storage Configuration

Storage	
<b>Solid state disk</b>	RamSan-400 solid state storage
<b>LUNs</b>	8 LUNs, 4 target ports

### FC Switch Hardware

Switch	
<b>8Gb switch</b>	SANbox 5802V

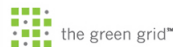
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