

# TPC Benchmark E for IBM® System x™ 3850 M2

Featuring Emulex® LightPulse® LPe12000 Fibre Channel HBA,  
Microsoft® Windows® Server 2008 and Microsoft SQL Server® 2008

## AT A GLANCE

Next generation Storage Area Networks (SAN) are taking advantage of new software and hardware products that improve overall server and storage performance. IT professionals deploying a new SAN or upgrading an existing one will find TPC data very useful for their evaluation, planning and purchasing processes. With the industry's largest compilation of computer performance information, TPC benchmarks can help IT professionals shorten evaluation cycles and support purchasing decisions.

This White Paper provides details on the recently completed TPC Benchmark E featuring IBM System x server platform, configured with Emulex LightPulse LPe12000 single-port Fibre Channel HBAs, running Microsoft Windows Server 2008 and SQL Server 2008. This configuration showed a 14 percent increase in number of transactions performed per second over a similar test conducted in 2007.

## PRODUCTS

### Hardware

- Server Platform: IBM System x platform configured with 3850 M2 servers
- Fibre Channel HBAs: Emulex LightPulse LPe12000 (Emulex 8Gb FC single-port HBA for System x)

### Software

- Operating System: Microsoft Windows Server 2008
- Database Application: Microsoft SQL Server 2008

IT professionals can leverage Transaction Processing Performance Council (TPC) benchmark results when planning for a new SAN deployment or an upgrade to an existing SAN. The published TPC benchmarks provide detailed compatibility and performance information that are accepted throughout the industry. They provide objective data to IT professionals helping to plan, support and justify IT purchasing decisions.

The TPC creates numerous benchmarking tests which are used to calibrate the performance of the latest software and hardware components available to IT professionals. The TPC Benchmark E (TPC-E) is composed of a set of transactional operations designed to exercise system functionalities in a manner representative of complex On-Line Transaction Processing (OLTP) application environments, such as those found at a brokerage firm.

A detailed TPC-E benchmark was completed by IBM in 2007, and in early 2008 another benchmark was conducted using higher performance SAN components. The 2008 TPC-E benchmark resulted in a 14 percent increase in number of transactions completed per second (referred to as "tpsE") over the benchmark completed in 2007 (480 tpsE versus 420 tpsE). This White Paper describes the 2008 TPC-E benchmark of the IBM System x3850 test configuration, its hardware and software enhancements, the results, and explores the decisions to upgrade. Detailed benchmark information is available at [www.tpc.org](http://www.tpc.org).

## Test Configuration

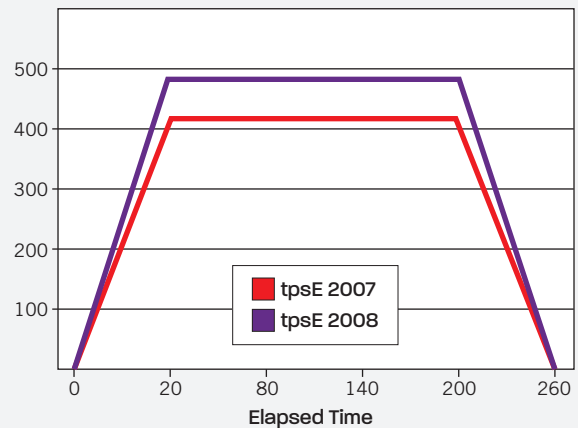
In 2007, IBM sponsored a TPC-E Benchmark that simulated a brokerage firm's business operations with simultaneous transaction executions to process a trade. While the benchmark test focuses on the central database that executes transactions related to the firm's customer accounts, the test design (i.e. database schema, data population, transactions, and implementation rules) is representative of typical Fortune 100 OLTP systems.

The 2007 TPC transactions per second E (tpsE) score was 420. The full 2007 report can be found on [tpc.org](http://tpc.org). In early 2008, another TPC-E benchmark was conducted using upgraded hardware and software components, which yielded a tpsE score of 480. The two benchmarks consisted of the hardware and software components detailed in Table 1 and Table 2, with the core differences highlighted in blue:

## Results

The 2008 TPC-E showed a 14 percent improvement in tpsE score over the 2007 benchmark, a direct result of the upgraded components noted in Tables 1 and 2. Figure 1 shows the measured throughput differences between the two tests during the steady state phase (the horizontal line attained after start-up and before shut-down).

**Figure 1—Measured Throughput (recreated diagram)**



**Table 1—System Information**

	2007	2008
TPC-E Throughput	420	480
Database Manager	Microsoft SQL Server 2005 x64 Enterprise Edt SP2	<b>Microsoft SQL Server 2008 x64 Enterprise</b>
Operating System	Microsoft Windows Server 2003 Enterprise x64 Ent. R2	<b>Microsoft Windows Server 2008 Enterprise x64</b>
Fibre Channel HBAs	4Gb/s dual-port FC HBA for IBM System x	<b>Emulex LightPulse LPe12000 (Emulex 8Gb FC single-port HBA for System x)</b>
Initial Database Size	1,774 (GB)	<b>1,913 (GB)</b>
Memory Size	128 (GB)	128 (GB)
Spindle Count	384	384

**Table 2—Server Information**

	2007	2008
CPU Type	Intel® Xeon® Quad-Core X7350 2.93GHz	Intel® Xeon® Quad-Core X7350 2.93GHz
Total Number of Processors	4	4
Total Number of Cores	16	16
Total Number of Threads	16	16

The increased tpsE (480 versus 420) can be attributed to the increased collaboration between software and hardware vendors which yield better interoperability and better system level performance. For example, the Emulex LightPulse LPe12000 Fibre Channel HBAs for System x provide support for the Message-Signaled Interrupts (MSI) and MSI-X (MSI eXtended) standards, a Windows Server 2008 feature. MSI and MSI-X are interrupt handling mechanisms, which enable improved application performance, reduced host CPU utilization and greater I/O scalability by allocating each Fibre Channel HBA with its own set of interrupts. The LPe12000 is also designed to deliver excellent performance across a wide range of application environments with varying server workloads. High transaction applications, such as Microsoft SQL Server 2008, also benefit from enhanced overall system performance by leveraging the LPe12000's greater data throughput capabilities.

### Upgrade Criteria

The decision to integrate new technologies and products into existing SANs or into new SAN deployments is more a question of "when" than "if". There may always be some level of hesitation when considering upgrades to a SAN's hardware and software components; however, it is important to consider the benefits that can be gained in the form of new functionalities and better system level performance. For example, by integrating Emulex LightPulse LPe12000 Fibre Channel HBAs for System x, the maximum throughput of the SAN is doubled and by upgrading to Microsoft Windows Server 2008, IT administrators will be able to leverage its Hyper-V feature which helps to reduce costs, increase hardware utilization, optimize infrastructure, and improve server availability. These features alone could be the reason to upgrade.

The 2008 TPC Benchmark E shows that definite improvements to throughput can be attained with newly available, higher performance, more efficient SAN elements. If your data and business requirements are quickly outstripping the performance of your SAN, an upgrade path should be explored. New SAN deployments should also consider the latest technology available.

Questions to consider are:

- ▶ How fast are your data and/or throughput requirements growing?
- ▶ Are your business processes stable or growing?
- ▶ What is your budget for upgrading/deploying your SAN?
- ▶ What areas should or can be upgraded first?

Your responses to these and other pertinent questions will help make your upgrade and deployment decisions.

### Summary

When new SAN elements become available, it is often difficult to immediately assess their benefits for a given business environment. The TPC tries to help make upgrade decisions easier through their many benchmark tests. The system configuration for the 2008 TPC-E benchmark leveraged upgrades such as Emulex's LPe12000 Fibre Channel HBAs and Microsoft's Windows Server 2008 and SQL Server 2008. This resulted in a 14% improvement in tpsE score over the previous year's benchmark (480 versus 420), clearly demonstrating that next generation hardware and software can indeed make a difference in the overall throughput performance of a SAN.

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