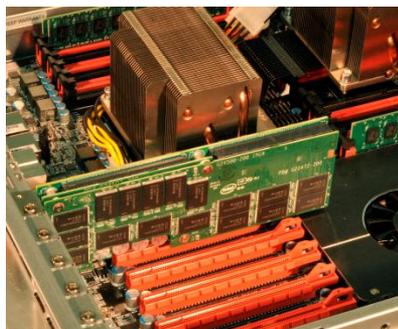




Intel® Solid-State Drive 910 Series

Transactional Processing over XML

Intel's first PCIe SSD provides compelling transactional processing performance



The Intel® Solid-State Drive 910 Series (Intel® SSD 910 Series) delivers high storage performance and 10-drive-writes-per-day endurance for applications requiring fast inserts, queries, updates and deletes, such as database transactions. The ability to service XML database transactions at a high rate requires high performance storage. TPoX benchmark results of an Intel® SSD 910 Series 800GB drive show performance parity and storage simplification vs. 180 arrayed 15K RPM SAS hard disk drives (HDDs).

Single Intel® SSD 910 Series Matches Large HDD Array

A single 910 Series SSD closely matched the transaction rate established by a large array of high-performing hard disk drives in a simulated stock trading environment. The Intel® SSD 910 Series 800GB drive achieved a TPS (transactions per second) score of 13,516. This score closely matched a score using 180 15K RPM SAS HDDs. During this application load, 420 user threads generated query, insert, update and delete requests for stock trading operation. A similar rate was achieved at a lower application level wait time. Both storage options were run on the same quad-CPU, 32-core system. For the 15K RPM SAS HDDs, 12 separate LUNs were used. A 1 TB database compressed to 664 GB was used to generate application traffic.

Intel® SSD 910 Series Reduces Total Cost of Ownership

180 high performance HDDs cost about \$59,000¹ and the storage server, \$14,000. Compare this to a single Intel® SSD 910 Series 800GB drive with a MSRP of \$3,859. The Intel SSD costs 18 times less, saves power and is more reliable. The Intel SSD provides much better TCO.

What is TPoX*?

Transactional Processing over XML* (TPoX) is an XML database benchmarking tool for evaluating database performance. TPoX represents an online financial application scenario in which users query, buy and sell stock. Administrators can compare CPU, storage, and system effects on database performance to optimize a solution. TPoX was originally developed by Intel and IBM and became an open source project on SourceForge in 2007.

Benchmark Transactions

The TPoX benchmark generates an XML database from 10GB to 1PB and fills it with an arbitrary set of data representing a financial application scenario. The benchmark then performs random transactions (mostly 16KB transfer size) on the database, simulating multiple users interacting with the data. The workload transactions per second are calculated as the primary score output. In this test, the database was sized to 664 GB and 420 users, representing a large organization.

Test Parameters	Intel® SSD 910 Series	15K RPM SAS HDDs
Number of drives	1	180
TPS score (steady-state run)	13,516	13,742
Storage Deployed	800GB	~26TB
External Storage Network Used	None	EMC* CX3-80
Users (transaction threads)	420	420
Average Application Wait time (msec)	5.93	7.15
Read IOPs/drive	15,682	88
Write IOPS/drive	5,272	30
%CPU Utilization (Application level)	96%	96%
Cost of Drive(s) ¹	\$3,859	\$59,000
Cost of other storage equipment ¹	0	\$14,000

Note 1: Quote from distributor

Figure 1. System Configurations Used in TPoX Benchmark Tests²



Methodology

Excluding the number and type of drives, all aspects of the test setup² were fixed, including hardware platform, operating system, database application and database configuration. In the Intel® SSD 910 Series configuration, four two-hour runs were executed, with the TPoX transactions per second (TPS) score generated from the second hour of each run. The final score reported in the results was the average score for each of the runs.

Note 2: Tests run with four Intel® Xeon® Processor X7560 (24M Cache, 2.26 GHz, 6.40 GT/s Intel® QPI) platforms with Intel® 7500 Chips et, 256GB (64x4GB), 1066MHz DDR3 memory, SUSE® Linux Enterprise Server (SLES) 10 SP2 operating system, IBM® DB2® 9.7, and TPoX 2.0 using "M" scale factor (1 TB data size). In magnetic storage-based configuration, Hitachi® HUS151P1 CLAR146 146GB SAS 15K RPM drives were used. In Intel® SSD 910 Series configurations, no additional adapter was used; the drive is an add-in card with Intel-provided driver software.

Give Your Organization the Ultimate Data Center SSD

The Intel® SSD 910 Series' high performance, 10-drive-writes-per-day endurance, deployment ease, and proven Intel SSD reliability makes datacenter storage tiering and analytics acceleration easy.

Capacity	400GB and 800GB
NAND Flash Memory	25nm Intel® NAND Flash Memory Multi-Level Cell Compute-Quality Components with High Endurance Technology
Bandwidth	Sequential Performance (up to): Read 1 / 2GB/s (400 / 800GB) Write 0.75 / 1GB/s (400 / 800GB)
4KB Random I/O Operations per Second (IOPS)	Up to: Read 90,000 / 180,000 IOPS (400 / 800GB) Write 38,000 / 75,000 IOPS (400 / 800GB)
Interface	PCI Express* 2.0 X8 Half-Height, Half-Length add-in card
8KB Random Write Endurance	7 / 14 PB (400 / 800GB) (10 drive Writes/day)
Power Consumption	Active: <25W Typical Idle: 8 / 12W Typical (400 / 800GB)
Product Health Monitoring	<ul style="list-style-type: none"> Intel Solid State Drive Datacenter Tool Self-Monitoring, Analysis and Reporting Technology (S.M.A.R.T.) commands SCSI log pages

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