Performance Optimized Information Management

Intel and IBM Collaborate to Double In-Memory Database Performance

Performance optimized information management solutions are the backbone of any competitive IT infrastructure. These mission-critical environments require fast, reliable access to volumes of data, and must be capable of routinely meeting and surpassing service-level agreements. To this end, IBM and Intel have been working together for over 10 years to optimize enterprise solutions that can benefit from the scalability inherent in IBM® Information Management software deployed on Intel® Xeon® processors. Now, with the rise of more complex multi-core, multi-threaded infrastructure, IBM and Intel have introduced new processing, memory, and database innovations that can be combined to significantly accelerate the transformation of volumes of data into useful business insights.

By coupling the IBM solidDB® 6.3 in-memory database with servers based on the Intel® Xeon® processor 5500 series, enterprises can achieve double the performance of previous-generation installations.[1] This new combination can unlock even more value from customer data management investments, and begin to transform static data repositories into dynamic solutions that provide information on demand.

IBM solidDB 6.3: Accelerates Information On Demand

IBM solidDB is relational, in-memory database technology that delivers extreme speed, performing up to 10 times faster than conventional, disk-based databases. An in-memory database exists to meet the performance demands of real-time applications requiring extreme speed and predictable response times. As the name implies, an in-memory database resides entirely in main memory rather than on disk, making data access extremely fast. There are more than 3,000,000 deployments of solidDB in telecommunications networks, enterprise applications, and embedded software and systems. Market leaders such as Cisco, HP, Alcatel, and Nokia Siemens rely on solidDB for their mission-critical applications for reasons such as:

Extreme Speed	Data resides in main memory at all times rather than on disk, enabling hundreds of thousands of transactions per second.
Extreme Availability	Two copies of the data are synchronized at all times allowing sub-second failover capability.
Low Cost	Technology that is easy to deploy, administer, and embed directly into applications runs virtually unattended for lower total cost of ownership.

Information Management software

"IBM and Intel are collaborating to enable performance optimized information management solutions. The Intel® Xeon® processor 5500 series unlocks new performance potential with its memory and processing innovations that, when coupled with the IBM® solidDB® 6.3 in-memory database, can double transactional performance over previous-generation deployments. IBM is pleased to continue working with Intel toward delivering solutions that solve our customers' biggest infrastructure challenges and enable information on demand."

—**Ari Valtanen**
Director & CTO
IBM solidDB
IBM Information Management

Intel Xeon Processor 5500 Series: A New Generation of Intelligent Servers

Enabling the newest generation of high-performance and energy-efficient computing, the Intel Xeon processor 5500 series can automatically adjust server performance and power consumption, or allow manual IT control to meet unique service-level requirements. The new Intel Xeon processor 5500 series delivers up to 9x performance per server over single-core servers, enabling 9:1 server consolidation, up to 90% lower operating costs, and an estimated 8-month return on investment.[2] Factors to consider include:

Intelligent Performance	Intel® Turbo Boost Technology increases processor core speeds for more performance when workload conditions demand it.
Energy Efficiency	Intel® Intelligent Power Technology lowers energy costs by automatically switching the processor and memory into the lowest available power state without sacrificing workload requirements.
High Throughput	Intel® QuickPath Technology significantly lowers system latency and increases transaction processing bandwidth.

Innovations in Memory: The Key to Performance Leadership

The quad-core, eight-thread Intel Xeon processor 5500 series was built for throughput computing leadership. To help maximize application performance, Intel has introduced a completely new memory subsystem with three key innovations to reduce system latency while maximizing processing bandwidth. An advanced, three-tier cache architecture improves on-chip communications efficiency across processor cores and threads. A native DDR3 integrated memory controller significantly accelerates off-chip communications to main memory. Last, Intel® QuickPath Technology introduces a dedicated point-to-point link to main memory and other processors that can deliver over twice the maximum transactional throughput of previous-generation memory bus architectures.

IBM solidDB works under the premise that all data must be accessible with extreme speed, offering two performance advantages over conventional databases. First, because any data requested by an application is already in main memory, the need to transfer data blocks from disk to main memory is eliminated, significantly reducing application response times. Second, because of its optimized data structures and main memory access methods, solidDB transacts in memory significantly faster than disk-based databases, even if those databases cache all their data in main memory.

As the next section will demonstrate, customers who combine these new hardware and software components to fully leverage system memory can significantly accelerate their enterprise information management solutions.

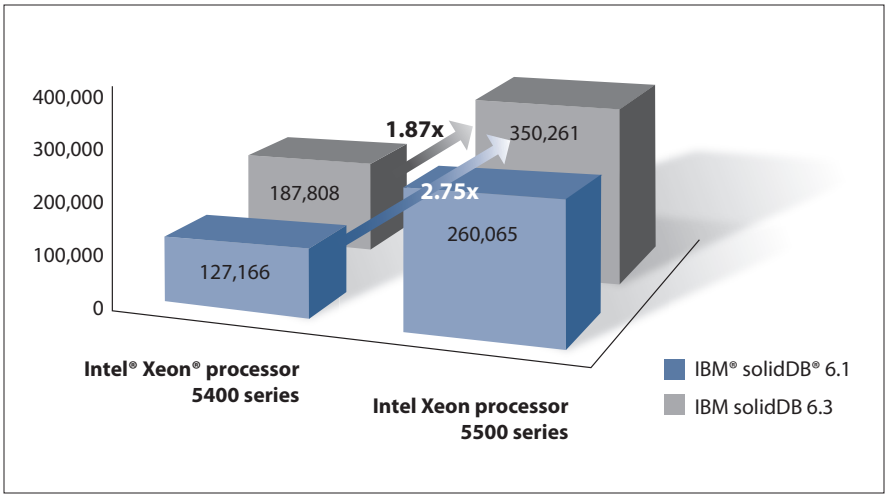

Figure 1. *Transactional performance of IBM® solidDB® 6.3 on the Intel® Xeon® processor 5500 series scales 1.87x more than on previous-generation hardware systems, and 2.75x more than previous-generation hardware and software configurations.*

How to Measure In-Memory Performance: A New Industry Benchmark

As database and microprocessor architectures change, so must the benchmarks that are employed to measure the combined performance of these critical components. While other industry-standard throughput workloads already exist, none was designed specifically to exercise the relationship between in-memory database software and the memory processing subsystem in which it transacts. The Telecommunication Application Transaction Processing (TATP) Benchmark is a new open source workload designed specifically for high-throughput applications, well suited for in-memory database performance analysis and system comparison.

The TATP benchmark simulates a typical Home Location Register (HLR) database used by a mobile carrier. The HLR is an application that mobile network operators use to store all relevant information about valid subscribers, including the mobile phone number, the services to which they have subscribed, access privileges, and the current location of the subscriber's handset. Every call to and from a mobile phone involves lookups against the HLRs of both parties, making it an ideal example of a demanding, high-throughput environment where the workloads are pertinent to all applications requiring extreme speed: telecommunications, financial services, gaming, event processing and alerting, reservation systems, software as a service (SaaS), and so on.

Applying the TATP benchmark, Figure 1 demonstrates for existing customers with solidDB 6.1 deployed on previous-generation Intel Xeon processor–based servers that up to 2.75x more performance can be realized from upgrading to solidDB 6.3 on servers based on the new Intel Xeon processor 5500 series.[1] And for customers who have already deployed solidDB 6.3 on previous-generation Intel processor–based hardware, up to 1.87x more performance is available from the Intel Xeon processor 5500 series on the same software configuration.

Learn More

Enterprises seeking to optimize the performance of their information management solutions must look at the underlying components in a new way. New processing, memory, and database innovations can be leveraged to significantly accelerate the transformation of volumes of data into useful business insights while saving energy costs and meeting customer service level demands.

Solutions that combine IBM solidDB 6.3 and Intel Xeon processor 5500 series–based servers deliver a performance optimized foundation for the future of information management.

- More about Intel Xeon processors: **www.intel.com/xeon**
- More about IBM solidDB products: **www.ibm.com/software/data/soliddb**
- More about the Telecommunication Application Transaction Processing (TATP) benchmark and open source distribution: **http://tatpbenchmark.sourceforge.net**

[1] **Source:** IBM internal measurements as of March 2009. All of the benchmark results presented are derived using the TATP benchmark simulating a HLR application workload including a database populated with 1,000,000 subscribers. The resulting database size was approximately 1.5 GB. In each case the transaction mix was set to 80% read accesses and 20% write accesses. Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments might vary significantly. Users of this document should verify the applicable data for their specific environment.

[2] **Source:** 8-month ROI claim estimated based on comparison between 2S single-core Intel® Xeon® 3.80 with 2M L2 Cache and 2S Intel Xeon X5570–based servers. Calculation includes analysis based on performance, power, cooling, electricity rates, operating system annual license costs, and estimated server costs. This assumes 8kW racks, $0.10 per kWh, cooling costs are 2x the server power consumption costs, operating system license cost of $900/year per server, per-server cost of $6900 based on estimated list prices, and estimated server utilization rates. All dollar figures are approximate. Performance and power comparisons are based on measured SPECjbb2005* benchmark results (Intel Corporation, Feb. 2009). Platform power was measured during the steady state window of the benchmark run and at idle. Performance gain compared to baseline was 9x, while the platform power was 0.8x.

- **Baseline platform:** Intel server platform with two 64-bit Intel Xeon processor 3.80Ghz with 2M L2 Cache, 800 FSB, 8x1GB DDR2-400 memory, 1 hard drive, 1 power supply, Microsoft Windows Server* 2003 Ent. SP1, BEA JRockit* build P27.4.0-windows-x86_64 run with 2 JVM instances
- **New platform:** Intel server platform with two quad-core Intel Xeon processors X5570, 2.93 GHz, 8MB L3 cache, 6.4QPI, 12 GB memory (6x2GB DDR3-1333), 1 hard drive, 1 power supply, Microsoft Windows Server 2008 Ent. SP1, BEA JRockit build P27.4.0-windows-x86_64 run with 2 JVM instances

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