# Give Your Business the Fuel to Grow

IBM® DB2® pureScale™ and IBM System x® Servers Based on Intel® Xeon® Processors Drive Enterprise-Class Transaction Processing

In almost every industry you can name—retail, manufacturing, telecom, government, finance—transactions are the fuel that drives the business. Transactions might include credit-card payments at the mall, sell orders on the stock exchange, hotel bookings, or mobile phone call connections.

More transactions means more money coming in, more orders going out, more communication with customers and suppliers, more activity, and more business. In an increasingly instrumented, interconnected, and intelligent world, transaction volumes will only grow: estimates of the amount of data created each year have been rising exponentially, and that trend shows no sign of abating in the years ahead.

Organizations that master online transaction processing (OLTP) and develop the ability to easily handle growing transaction volumes have the opportunity to differentiate themselves from the competition and stay a step ahead of the market. For businesses ready to take this next step, choosing the right OLTP platform is critical. The platform must not only provide outstanding performance but also deliver that performance every minute of every day, regardless of fluctuating loads or maintenance needs. Moreover, the platform must be easily scalable and adaptable so organizations can respond readily to change.

Intel and IBM have been working for years to create systems that change the economics of x86 computing. One of the results of that collaboration is an OLTP platform for clustered, distributed systems that delivers unprecedented flexibility and scalability.
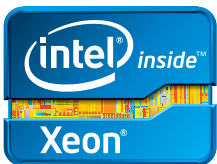
IBM® DB2® pureScale™ provides near-limitless capacity and continuous availability running on IBM System x® servers powered by Intel® Xeon® processors. With this new solution from IBM, organizations can build responsive, highly available OLTP systems that quickly scale in any direction needed, while remaining completely transparent to enterprise applications.

IBM DB2 pureScale

DB2 pureScale takes proven IBM DB2 for z/OS® mainframe technology and combines it with the latest distributed system techniques. This combination provides global caching and locking control, eliminating the challenges and limitations of hosting databases on distributed systems. In a DB2 pureScale cluster, one server provides centralized lock management services, a global cache for data pages, and other services. Members of the pureScale cluster can simultaneously access a shared database for read and write operations; they are also connected directly to the central server through Remote Direct Memory Access (RDMA) and DB2 pureScale technology, running over high-performance InfiniBand* network links (see Figure 1).

The result is a cluster of DB2 systems that looks and acts like a single, incredibly fast server to OLTP applications. DB2 pureScale technology raises the bar for availability and scalability. Downtime can be virtually eliminated because if a cluster host fails, the system automatically fails over to an active host. DB2 provides full access to all pages of data that do not need to be recovered. Interrupted transactions are recovered or rolled back within seconds.

During the recovery, other members of the cluster can continue to process transactions—so the systems and customers that depend on the cluster can continue business as usual. Likewise, planned outages become a thing of the past, as IT can perform rolling maintenance one server at a time, without bringing the entire system down. DB2 pureScale clusters can be easily and quickly scaled up—adding new servers requires just two commands. You can take a building-block approach to database expansion, beginning with two partially populated servers and adding capacity incrementally and without limit as requirements grow.

IBM has also built flexibility into DB2 pureScale licensing: clients can pay for the DB2 and DB2 pureScale they need, when they need it, and only for the period of time in use. That's great news for IT managers who are looking to cut costs.

The great news for developers is that no application changes are needed to take advantage of DB2 pureScale clusters. Applications do not need to be cluster-aware, so there is no need to alter or replace existing code. And because DB2 offers compatibility technologies such as native support for commonly used syntax and the PL/SQL procedural language, organizations can run applications written for other database platforms—such as Oracle and Sybase—with few or no code alterations.

Hardware Performance Powered by Intel and IBM

IBM System x servers powered by Intel Xeon processors are an ideal platform for DB2 pureScale clusters, helping to provide a complete, high-performance solution for OLTP applications. Building on the breakthrough capabilities introduced with the Intel Xeon processor 7500 series, Intel Xeon processor E7 platforms can deliver the performance, scalability, and reliability required to support the most demanding OLTP applications.

Performance
The Intel Xeon processor E7 platforms can provide up to 10 cores, 20 threads, and 30 MB of shared cache per processor. Four advanced, high-bandwidth interconnect links allow multiple
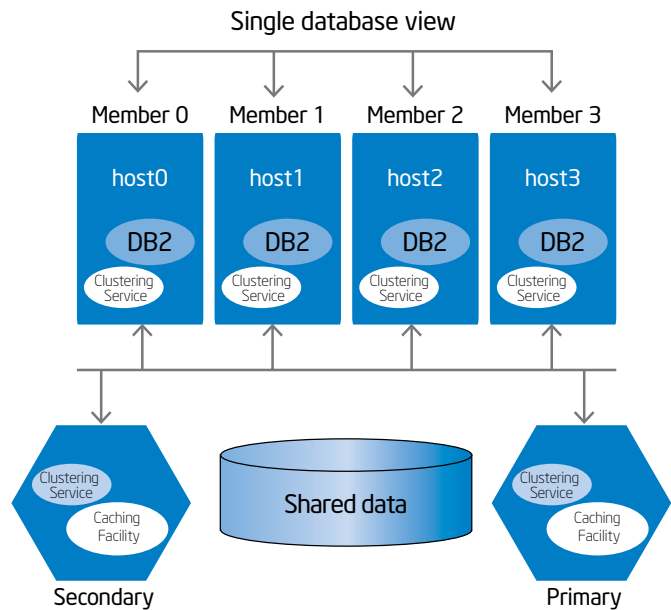

Figure 1: In a DB2 pureScale cluster, each member has remote direct memory access to the centralized locking and caching services of the DB2 pureScale server.

processors to be directly connected to each other to increase performance and reduce latency. Servers equipped with the Intel Xeon processor E7-4800 product family can achieve 29 times the performance of 4-socket servers using single-core processors.[1] Organizations can accelerate database transactions by up to 40 percent compared with the previous-generation 4-socket processors (see Figure 2).[2] As a result, organizations can process transactions faster and in larger volumes than ever before without having to increase the server footprint.

Scalability

The Intel Xeon processor E7 platforms provide the scalability required for expanding transaction workloads. Intel® QuickPath Interconnects allow scaling of processors from 2 sockets to up to 8 sockets when combining two independent IBM eX5 servers to create one larger system. The Quad-Channel Integrated Memory Controller supports up to 16 memory slots per processor socket, enabling administrators to deploy up to 2 TB of memory in a 4-socket server to handle peak demands and leave headroom for database growth. This large-scale memory capacity enables organizations to place an entire database in memory and run queries in real time, speeding the path from data to decision.

Reliability

The Intel Xeon processor E7 platforms include more than 20 features designed to deliver the reliability, security, and availability (RAS) required for mission-critical workloads. For example, Intel Xeon E7 processors support Double Data Device Correction (DDDC), which facilitates recovery from two DRAM device failures, and Partial Memory Mirroring, which enables mirroring of only critical portions of memory to improve reliability while controlling costs. Support for Advanced Encryption Standards–New Instructions (AES-NI) enhances security by significantly reducing the performance penalties usually experienced with pervasive encryption.[3] These and other features help organizations protect data and meet service-level agreements while refocusing resources on innovation.

IBM eX5 servers take advantage of the Intel Xeon processor E7 platforms to provide a powerful foundation for clustered database solutions. With 2-, 4-, and 8-socket configurations available using the Intel Xeon processor E7-2800, E7-4800, and E7-8800 product families, you can build DB2 pureScale clusters that fit your current needs and have plenty of room for future growth. Just as you can easily add servers to a DB2 pureScale

cluster, you can easily scale individual servers to support massive workloads. For example, the 8-socket server configuration provides up to 80 processor cores, 160 threads, and 6 TB of memory, and there is no architectural limit to the number of hosts in a cluster. Also, with the Intel Xeon processor E7 platforms, you won't sacrifice performance as the number of sockets increases.

The architecture of the eX5 enterprise systems represents the largest investment that IBM has ever made in Intel processor–based servers, delivering major improvements in memory capacity, storage flexibility, system reliability, and deployment simplicity. For example, the IBM MAX5 external memory chassis enables memory that can be scaled independently of processors. In a 4-socket configuration, the x3850 X5 can accommodate up to 3 TB of memory with the external MAX5 memory chassis to support faster database performance.

In addition, IBM eXFlash technology provides preconfigured solid-state storage media that can dramatically increase storage performance while reducing space and power requirements. Compared with traditional hard-disk drive storage solutions, eXFlash storage delivers 99 percent greater performance per watt for database-type workloads running on local disks, while maximizing uptime with 64 times better reliability.[4]
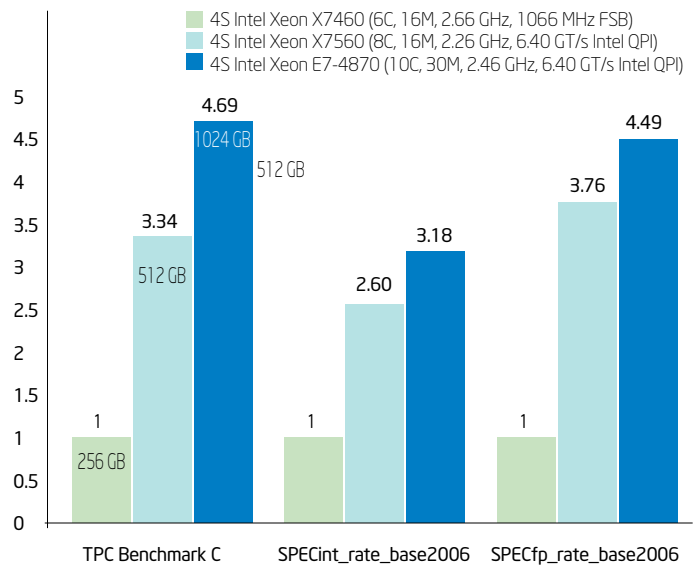

Figure 2: The Intel Xeon processor E7 platforms deliver superior performance on key benchmarks compared with previous-generation processors.[5]

A Well-Oiled Business Engine

IBM DB2 pureScale brings mainframe concepts to the best of distributed computing technology to deliver practically unlimited capacity, continuous availability, and application transparency for transactional database applications. When combined with IBM System x servers powered by Intel Xeon processors, the result is a platform that can help reduce the risk and cost of business growth—and keep your organization's OLTP engine going strong.

Learn More

More about IBM DB2 pureScale:
ibm.com/software/data/db2/linux-unix-windows/ editions-features-purescale.html

More about smarter systems from IBM:
ibm.com/systems/smarter

More about the Intel Xeon processor E7 platform:
intel.com/itcenter/products/xeon

Sign up for a proof of concept by sending e-mail to:
go_db2@ca.ibm.com

Software and workloads used in performance tests may have been optimized for performance only on Intel® microprocessors. Performance tests, such as SYSmark* and MobileMark*, are measured using specific computer systems, components, software, operations, and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products.

[1] Estimated SPECint*_rate_base2006 performance results compare an Intel Xeon processor E7-4870 and a single-core Intel Xeon processor. For more information, visit www.**intel.com**/performance/server.
[2] Up to 40% generational compute-intensive throughput claim based on SPECint*_rate_base2006 benchmark comparing Intel Xeon processor E7-4870 (30 MB cache, 2.40 GHz, 6.40 GT/s Intel QPI, formerly codenamed Westmere-EX) scoring 1,010 (includes Intel Compiler XE2011 improvements accounting for about 11% of the performance boost) to Intel Xeon processor X7560 (24 MB cache, 2.26 GHz, 6.40 GT/s Intel QPI, formerly codenamed Nehalem-EX) scoring 723 (Intel Compiler 11.1). Source: Intel SSG TR#1131. For more information, visit www.**intel.com**/performance/server.
[3] Intel® AES-NI requires a computer system with an AES-NI enabled processor, as well as non-Intel software to execute the instructions in the correct sequence. AES-NI is available on select Intel® processors. For availability, consult your reseller or system manufacturer. For more information, see http://software.intel.com/en-us/articles/intel-advanced-encryption-standard-instructions-aes-ni/.
[4] To operate a 240,000 IOPs database, a client would need 960 spinning disks (300 IOPS/disk). These would be deployed in 80 JBODs (12 disks each). These would require two entry servers (40 JBODs per server using a ServeRAID adapter with cascading feature). Source: www.**intel.com**/performance/server/xeon_mp/scalability.htm.
[5] Performance estimates are based on Intel internal measurements.