



Solution Brief
Intel® Open Source
Technology and MySQL*

The Performance Advantages of Running MySQL on an Intel®-Based Server Platform



Extending Intel's Contribution to Open Source Technology Development

Introduction

The explosion of data is a constant in today's business world, affecting companies of all sizes from the small start-up to the enterprise portal. As organizations experience rampant growth in the volume of data, they see a corresponding rise in the number of users who need access to that data. These escalating demands put pressure on IT departments to deploy a database architecture that meets business needs by providing the highest level of performance and scalability at the lowest possible cost.

An increasing number of organizations are addressing this need by deploying MySQL*, which is widely regarded as the world's most popular open source database software. According to Sun, more than 11 million installations of MySQL are active today, and the latest release of the software, MySQL 5.1, was downloaded more than 250,000 times in the first 10 days after it became generally available in December 2008. Customers around the world have deployed MySQL on a variety of operating systems running on Intel® platforms, including Linux,* Windows* and Solaris.* Recent industry research also indicates continued growth and maturation of the market for open source database management systems (DBMS). For example, Gartner Inc. has projected a 40 percent compound annual growth rate (CAGR) in the open source DBMS segment over the next five years.¹

In keeping with Intel's commitment to advance open source technology development, MySQL has been optimized to deliver best-in-class performance when running on Intel® architecture-based servers. This performance advantage stems from specific hardware and software features designed into two-socket Intel® Xeon® processor platforms. For example, the large cache provided in Intel® processor-based servers is an advantage to large applications, and MySQL benefits extensively from the increased cache size. The performance of MySQL on Intel processor-based servers also benefits from an ongoing collaboration between Intel and Sun Microsystems, which acquired MySQL in 2008.

MySQL also offers advantages to software developers who want to use it as the database for their applications. Optimization and performance analysis tools are available to help facilitate this area of open source software development, including Intel® VTune™ Performance Analyzers and open source Linux tools.

Intel® Open Source Efforts and MySQL Optimization

Intel's effort to advance open source solutions, including Linux, is one of the largest in the industry. This effort, coupled with the joint optimization work between Intel and Sun, has resulted in a complete stack that is well-optimized for Intel architecture.

Intel provides a number of analysis and optimization tools, including VTune analyzers and an Intel® compiler, which are used to build optimized MySQL binaries for Intel-based platforms. The compiler produces code that takes advantage of efficient code-generation for Intel Xeon processor-based systems. MySQL binaries built with this compiler perform well on Intel architecture. Intel's continuing effort to optimize the compiler includes re-tooling it to support newer platform features as they are introduced in systems.

In addition, engineers at Intel performance labs are working with Sun and other industry participants to optimize the LAMP stack and deliver well-performing stacks using online transaction processing (OLTP), decision support/data warehousing and Web 2.0 workloads, among others. Many of the world's leading companies in these market segments have successfully deployed MySQL on Intel processor-based servers.

Intel performance teams work jointly with Sun and MySQL performance engineers in many areas that seek to bring ongoing benefits to users. Examples include optimizing the various storage engines supported by MySQL, such as InnoDB, MyISAM and the Falcon engine being developed by Sun; performance data collection and joint analysis using multiple workloads; internal release performance-regression and defect-resolution; and feature development to enhance performance for current and future versions by taking advantage of unique Intel platform features.

This effort is augmented by Intel's focus on ecosystem development, with Linux being a key example. Intel's Linux effort includes performance validation with MySQL, feature development, changes in key components such as scheduler, memory subsystem and I/O path, continuous performance characterization on upstream kernels with MySQL, and ensuring that community feature inclusion in Linux gets input from the perspective of MySQL performance.

Hardware Benefits + Software Optimization = Superior Performance

IT managers who need utmost performance from their MySQL database will find that an Intel Xeon processor-based server platform is the ideal choice for deployment. The performance advantages of MySQL running on Intel architecture begin at the platform level. Servers based on Intel Xeon processors deliver benefits in three key areas: boosting the performance of existing hardware, providing energy-efficient performance to help reduce data center power requirements, and improving server processor utilization in virtualized environments.

These performance benefits derive from ongoing innovations in Intel processor design. For example, MySQL takes advantage of the additional processing cores and memory support provided by multi-core Intel Xeon processor-based servers, leading to higher cumulative performance. MySQL also benefits from the ultra-high bandwidth designed into the latest Intel-based servers, which enable data to be shared between processors very quickly and efficiently.

Building on those hardware-level performance-enhancing technologies, Intel works in cooperation with Sun to optimize the performance of MySQL from the software perspective. Intel's approach takes into account the entire software ecosystem, including not only the MySQL database itself but also the operating systems, the tuning aspect and the storage engines that MySQL supports.

Intel's optimization work includes obtaining MySQL source code and binaries from Sun as new builds become available, running extensive benchmark tests, collecting and analyzing performance data, and presenting the results to MySQL engineers along with Intel's observations and recommendations. In parallel, Intel software engineers experiment with MySQL code modifications that might lead to performance gains or scalability improvements, and then suggest strong candidates for inclusion in the binaries.

Working together, Intel and Sun engineers have come up with a comprehensive set of optimizations and improvements that enhance MySQL performance on Intel processor-based servers. The optimizations include locking, threading and query-level improvements, among others. The performance improvements reflect a range of joint work, from making direct code modifications to using specialized tools that enable Intel software engineers to pinpoint the exact string of source code causing a performance bottleneck or scalability issue, then work with Sun software engineers to rewrite it.

Intel's efforts also include experimenting with versions of Linux and Microsoft Windows to uncover potential opportunities for MySQL optimization, as well as experimenting with the configuration parameters of the database itself. Results that show promise for better performance or scalability are communicated back to Sun. In addition, Intel proactively tests the performance of new MySQL releases on the newest Intel Xeon processors, and updates Sun on new features supported by Intel processor-based servers. These practices help ensure that future development of MySQL takes advantage of the latest Intel technology.

Conclusion

IT managers seeking to deploy a database solution – or due for a hardware refresh – can feel confident that MySQL has been optimized for Intel architecture, assuring them of superior performance on a leading platform. Besides delivering reliable, top-notch performance for common workloads, MySQL on an Intel Xeon processor-based server can be trusted to run well from a price/performance, energy-efficient performance and server virtualization perspective.

More performance and scalability improvements can be expected over time as Intel and Sun joint engineering efforts continue, and as Sun releases new versions of the MySQL software. Companies that rely on MySQL as their database solution can also expect to see more powerful performance with the latest innovations in Intel processor development, which stem from the more than \$5 billion² that Intel invests annually in research and development.

¹ Sources: Sun white paper "A Guide to Lower Database TCO"; Sun Web site: <http://www.mysql.com/why-mysql/marketshare>; Sun news release: http://www.mysql.com/news-and-events/generate-article.php?id=2008_30; Gartner, Inc.'s "The Growing Maturity of Open-Source Database Management Systems", November 28, 2008.

² Based on previous years' investment and 2009 Intel projections.

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