
The Intel® Xeon® processor E7 v3 family doubles performance¹ for NRI BOS to help businesses become faster, smarter, and more responsive.

As the volume and velocity of enterprise data continue to grow, extracting high-value insight is becoming more challenging and more important. Businesses that can analyze fresh operational data instantly—without the delays of traditional data warehouses and data marts—can make the right decisions faster to deliver better outcomes.

Business Oriented Solution (BOS) software from the Nomura Research Institute (NRI) answers this challenge. Running on enterprise-class servers based on the Intel® Xeon® processor E7 v3 family, BOS turns operational data into a rich source of real-time business insight. There is no need to duplicate, pre-manipulate, or move data. A highly optimized in-memory database schema enables transactions and queries to be performed simultaneously and at high speed on the same data set.

This real-time big data platform is helping businesses in retail, telecommunications, and e-commerce improve and accelerate decision making. Are there problems in the supply chain? New opportunities in the marketplace? Business users can quickly test "what-if" scenarios to determine the best course of action.

“NRI is excited that the Intel® Xeon® processor E7-8890 v3 improved BOS’s NUMA optimized application performance. More CPU cores and Intel® AVX2 really boosted performance to amazing levels compared to the previous-generation processors.”

— Yuzo Ishida, Senior Application Engineer and Architect of BOS, NRI
Doubling Performance with the Intel® Xeon® Processor E7 v3 Family

BOS is optimized for four-socket and larger servers based on the Intel Xeon processor E7 v3 family. With 72 cores, 144 threads, and up to 6 terabytes of memory, a single four-socket server provides a powerful engine for enterprise data processing, without the node-to-node latencies that can slow performance in clustered architectures.

The Intel Xeon processor E7 v3 family provides up to 20 percent more cores, cache, and system bandwidth than the prior-generation Intel® Xeon® processor E7 v2 family. These new processors also support faster memory and Intel® Advanced Vector Extensions 2.0 (Intel® AVX2), which can dramatically improve parallel execution. According to benchmark tests conducted by NRI, BOS queries complete up to two times faster with these processors versus the prior generation, to provide more and faster insights throughout the business.

Scalable, Real-Time Performance

BOS can be used to create a single version of the truth across the enterprise by replacing and consolidating existing databases. To improve performance, consistency, and availability, BOS moves data processing into the application layer and generates optimized, logical views of the data in real time in its on-demand database schema. One or more traditional relational databases can be used as a persistent data layer and as a buffer for disk-based storage systems. This strategy provides mission-critical data protection without slowing performance.

NRI and Intel work closely together, sharing technology information and working with prerelease systems and software to optimize performance on each new Intel® processor generation. Strategies typically focus on increasing parallelism, tuning processor affinity, reducing interconnect traffic, optimizing memory utilization, reducing the impact of database locks, and moving to the most recent Java® Virtual Machine (JVM) version.

Advanced Parallelism for Extreme Performance

Performing online transaction processing (OLTP) and online analytical processing (OLAP) on the same schema requires high performance for both reads and writes, which is not possible using a traditional database. BOS meets this need by normalizing raw data into tables that are highly optimized for the parallel execution resources of the Intel Xeon processor E7 v3 family.

Each table includes a single attribute column and is deployed in a separate database instance. Ordering, stocking, and other transactions can execute simultaneously across large numbers of cores, without blocking each

---

**Figure 1.** Running NRI BOS* on the Intel® Xeon® processor E7 v3 family doubled performance versus a previous-generation server, delivering results for a complex bill of materials query in just 30 milliseconds.¹

**Figure 2.** NRI BOS takes advantage of the parallel processing power of the Intel® Xeon® processor E7 v3 family to deliver extreme performance for high-volume transactions and real-time query processing.
other. This approach is also ideal for query performance, enabling whole categories of data to be read at high speed, without accessing unnecessary columns.

**Memory Optimization for Faster Data Access**

BOS data tables are optimized for the non-uniform memory access (NUMA) architecture of Intel® Xeon® processors. A combination of coarse-grained and fine-grained parallelism helps to ensure that all cores and threads make efficient use of the fast, nearby memory resources within each NUMA node. This not only speeds data access, but also reduces I/O contention to enable greater, overall platform scalability. As a result, larger workloads can be supported with a simpler infrastructure and a smaller data center footprint.

**The Latest Java Virtual Machine for Additional Gains**

BOS applications are built using highly optimized Java subroutines, so JVM performance is critical. Intel works with leading vendors to optimize their JVM software for the latest Intel processor innovations. By always using the latest JVM version, NRI delivers substantial performance gains with each new generation, without requiring customers to recompile their applications.

These advantages are particularly compelling with the Intel Xeon processor E7 v3 family. With Intel AVX2, plus more cores, cache, and bandwidth, performance is dramatically improved for the array and string operations BOS uses to sort and join large data tables.

---

**Sub-Second Performance for Complex BOM Analyses**

To verify the performance advantages of the Intel Xeon processor E7 v3 family, NRI conducted a series of tests using the BOS benchmark model running on two different four-socket servers. One server was configured with the Intel Xeon processor E7 v3 family; the other with the previous-generation Intel Xeon processor E7 v2 family.

The BOS benchmark is designed to assess stocking levels for the materials needed to produce a product. It is based on the industry-standard TPC-H* benchmark and measures performance for bill of materials (BOM) master data management and real-time stock calculations using both operational and historical data. Unlike TPC-H, the BOS benchmark does not contain any pre-manipulated data sources, which typically rely on batch processes and are not appropriate in a real-time business environment.

For the performance tests, the BOM depth was set to 11, and stocking levels were measured for 1,024 raw materials required by a single end product. Calculating the desired results required executing more than 3,000 queries, fetching more than 30,000 rows of data from six million records of an order detail table, and joining another million records distributed across a number of additional tables.

The time required to complete the analysis for the server based on the Intel Xeon processor E7 v3 family was just 30 milliseconds, versus 62 milliseconds for the previous-generation server platform. Both servers met the demanding performance requirements of a real-time, enterprise-scale business platform. By delivering results up to twice as fast, newer servers based on the Intel Xeon processor E7 v3 family can help NRI customers perform more queries with better response times, so they can integrate real-time analytics more pervasively throughout their business.

**Make Your Move to Real-Time Business**

By supporting transactions and queries acting on the same data, NRI BOS and the Intel Xeon processor E7 v3 family eliminate the need for separate data warehouses and data marts. Data management is dramatically simplified, and businesses can make smarter, faster decisions based on up-to-the-minute information. It’s a better way to compete in today’s fast-moving, global marketplace.
LEARN MORE

NRI:

NRI BOS architecture:
http://dl.acm.org/citation.cfm?id=2500715

Intel® Xeon® processor E7 family:
www.intel.com/XeonE7

1 Real-time stock calculation using a normalized TPC-H* benchmark schema with a bill of materials (BOM). A Java Virtual Machine (JVM) and two PostgreSQL* database instances were deployed on each NUMA node of two four-socket servers. Data manipulation was performed on top of the extremely normalized BOS database schema, which includes INSERT ONLY design constraints and does not use UPDATE or DELETE operations. Baseline server configuration: 4 x Intel® Xeon® processor E7-4890 v2 (2.5 GHz, 15 cores), 256 GB DDR3-1333, 2 SAS disks, 10 Gigabit Ethernet network, Red Hat Enterprise Linux® 7. New server configuration: 4 x Intel® Xeon® processor E7-8890 v3 (2.5 GHz, 18 cores), 512 GB DDR4-1600, 2 SAS disks, 10 Gigabit Ethernet network, Red Hat Enterprise Linux 7. Testing conducted by Nomura Research Institute, Ltd (NRI) on February 10, 2015. 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. For more information go to http://www.intel.com/performance

2 Based on Intel internal measurements and processor specifications. The Intel® Xeon® processor E7 v2 family provides up to 15 cores, 37.5 MB of last-level cache, and up to three Intel® QuickPath Interconnect links (each of which provides up to 8.0 GT/s of system bandwidth). The Intel® Xeon® processor E7 v3 family provides up to 18 cores, 45 MB of last-level cache, and up to three Intel QuickPath Interconnect links (each of which provides up to 9.6 GT/s of bandwidth).

All information provided here is subject to change without notice. Contact your Intel representative to obtain the latest Intel product specifications and roadmaps.

Intel does not control or audit third-party benchmark data or the web sites referenced in this document. You should visit the referenced web site and confirm whether referenced data are accurate.

Intel’s compilers may or may not optimize to the same degree for non-Intel microprocessors for optimizations that are not unique to Intel® microprocessors. These optimizations include SSE2, SSE3, and SSSE3 instruction sets and other optimizations. Intel does not guarantee the availability, functionality, or effectiveness of any optimization on microprocessors not manufactured by Intel. Microprocessor-dependent optimizations in this product are intended for use with Intel microprocessors. Certain optimizations not specific to Intel® microarchitecture are reserved for Intel microprocessors. Please refer to the applicable product User and Reference Guides for more information regarding the specific instruction sets covered by this notice.

No license (express or implied, by estoppel or otherwise) to any intellectual property rights is granted by this document.

The products described may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families.

Go to: Learn About Intel® Processor Numbers

Intel, the Intel logo, and Intel Xeon are trademarks of Intel Corporation in the U.S. and/or other countries.

*Other names and brands may be claimed as the property of others. © 2015 Intel Corporation.