



# Intel® Xeon® Processor Boosts Performance of In-Memory Databases

Intel® Xeon® processor E7 v2 family enables CPU stability and improvement of in-memory database performance, particularly under heavy load conditions



## Evaluating Performance of Intel® Xeon® Processor E7 v2 Family for In-Memory Computing

NTT DATA Global Solutions Corporation was established to support the global business operations of Japanese companies as the core SAP solution company among NTT Data Group. Its services cover a wide area, not only SAP\* system consulting, installation, implementation, and operational support but also in-memory computing, mobile, and cloud services.

SAP HANA\* is an in-memory computing solution brought for the growing demand in big data business analytics. NTT DATA Global Solutions Corporation has conducted the performance evaluation of SAP HANA data retrieval using both the latest Intel® Xeon® processor E7 v2 family and previous-generation Intel Xeon processor E7 family. This evaluation has proved the improvement in performance, especially the ability to deliver greater processing performance from SAP HANA under heavy load.

“With its large number of CPU cores and high-speed memory access, we have confirmed that the Intel® Xeon® processor E7 v2 family is ideal for processing large volume of data using SAP HANA. The processors deliver a high level of CPU utilization and stable performance under heavy load.”

– Satoshi Aoki

Head of HANA Business Development Office  
HANA Business Development Office  
NTT DATA Global Solutions Corporation

## SAP HANA Column-Store In-Memory Database Supports Big Data Analytics

SAP HANA is an in-memory database for real-time processing of large volume of data. Developed through collaboration between Intel and SAP, SAP HANA implements a state-of-the-art, multi-core, column-store database. NTT DATA Global Solutions Corporation has been conducting its own performance evaluation of SAP HANA since it was released in 2010. Satoshi Aoki, head of the HANA Business Development Office, explains why the company chose to do this: “We wanted to conduct our own evaluation of SAP HANA, and to convince ourselves of its performance, before offering services to customers.” Based on this reasoning, they conducted further performance evaluation according to the release of the Intel Xeon processor E7 v2 family.

The evaluation was conducted in January and February 2014. The evaluating

systems consisted of dual-socket servers equipped with the Intel Xeon processor E7-4890 v2 (2.80 GHz, 15 cores × 2) and the previous-generation Intel Xeon processor E7-2870 (2.40 GHz, 10 cores × 2), respectively.<sup>1</sup> Testers prepared 50 GB of test data and measured the processing time for queries issued to the database.

## Performance Measurement and Verification Based on Processing Characteristics of SAP HANA

NTT DATA Global Solutions Corporation selected an OLAP analysis scenario from the options available in the TPC-H benchmark tool, which is generally used for database performance evaluation. The scenario was chosen to allow evaluation to be completed within a month. The performance characteristics of SAP HANA are such that processing can be divided into those that use a single CPU core and those that use all CPU cores, so additional evaluation was conducted as Scenario 3 below.

## Intel® Xeon® Processor E7 v2 Family Helps Boost Performance of In-Memory Databases

The evaluation scenarios were:

- **Scenario 1:** Test retrieval performance and processing speed in a single session and measure processing speed and resource usage for a single query from the client.
- **Scenario 2:** Simulate use by a data analysis tool and measure resource use and processing speed for multiple queries.
- **Scenario 3 (additional evaluation):** Analyze TPC-H queries based on CPU usage. Measure the processing speed of each query element.

### Assessment of Improvement in Processing Performance and Stability under Heavy Load

Three results of the performance evaluation are below:

1. **Performance improvement for single CPU core:** 1.2 to 1.8 times faster
2. **Performance improvement for multiple CPU cores:** 2.0 to 2.5 times faster
3. **Behavior under heavy load:** The CPU utilization of the Intel Xeon processor E7-4890 v2 is more stable than that of the previous-generation Intel Xeon processor E7-2870.

The results demonstrated the performance improvement due to faster clock speed, and the greater number of CPU cores. Although it was expected that both the Intel Xeon processor E7-2870 and Intel Xeon processor E7-4890 v2 would have a similar level of CPU utilization, the evaluation found Intel Xeon processor E7-4890 v2 made better use of available CPU resource. The CPU utilization of the Intel Xeon processor E7-2870 varied between 80 to 100 percent at peak workload. In contrast, utilization of the Intel Xeon E7-4890 v2 remained steady at close to 100 percent at peak workload, indicating that the Intel Xeon processor E7 v2 family can make full use of the CPU performance, especially under heavy load (Figure 1).

The evaluation results demonstrated the superiority of the Intel Xeon processor E7 v2 family for SAP HANA compared to previous-

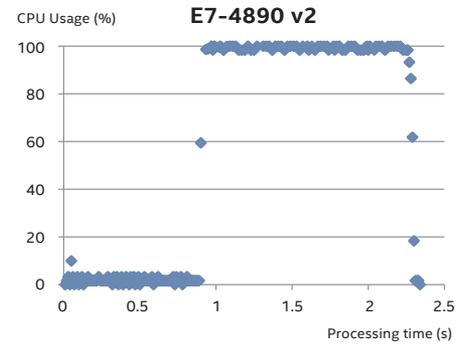
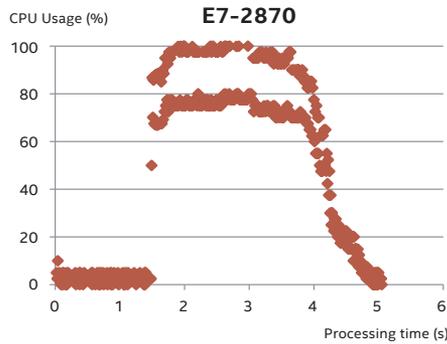


Figure 1. CPU utilization under heavy load

generation processor. Ryuichiro Tomita, a member of the Real Time Computing Platform Group of the HANA Business Development Office at NTT DATA Global Solutions Corporation, explained, "SAP HANA in-memory database is designed to make full use of the CPU. Making full use of the processing performance of the Intel Xeon processor E7 v2 family is very valuable for SAP HANA because of that feature." Similarly, Hiroki Adachi, chief consultant for the Real Time Computing Platform Group of the HANA Business Development Office at NTT DATA Global Solutions Corporation, said, "We confirmed that the Intel Xeon processor E7 v2 family functions effectively for both single- and multi-core processing. With its faster memory access, the Intel Xeon processor E7 v2 family provides ideal processor for in-memory databases."

Further optimization can be expected if the Intel Xeon processor E7 v2 family becomes recognized as the default choice of processor for SAP HANA. Satoshi Aoki said, "This evaluation has given us the confidence to offer SAP HANA solutions to our customers, knowing they can make maximum use of the performance of Intel® processors. By working closely together on the technology, I look forward to further strengthening our collaboration with Intel from now on."

For more information on the Intel Xeon processor E7 v2 family, visit [www.intel.com/content/www/us/en/processors/xeon/xeon-e7-v2-family-details.html](http://www.intel.com/content/www/us/en/processors/xeon/xeon-e7-v2-family-details.html)



Hiroki Adachi (Left)  
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Satoshi Aoki (Center)  
Head of HANA Business Development Office  
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Ryuichiro Tomita (Right)  
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### NTT DATA Global Solutions Corporation

With SAP solutions having become a global standard for enterprise systems, NTT DATA Global Solutions Corporation has become a key provider of installation and operational support. Building on the NTT DATA Group policy of strengthening collaborative arrangements with overseas group companies, the company provides one-stop services for meeting the needs of customers with global strategies based on SAP solutions. [www.nttdata-gsl.co.jp/en/](http://www.nttdata-gsl.co.jp/en/)



<sup>1</sup> Baseline configuration: Intel® Xeon® processor E7-2870 (2.40 GHz, 10 cores x 2), 128G memory (DDR3-1066), 100GB SSD, openSUSE® 11.1, SAP HANA® revision 70. New configuration: Intel® Xeon® processor E7-4890v2 (2.80 GHz, 15 cores x 2), 128G memory (DDR3-1600), 600GB HDD, openSUSE® 11.3, SAP HANA® revision 70. This paper is for informational purposes only. THIS DOCUMENT IS PROVIDED "AS IS" WITH NO WARRANTIES WHATSOEVER, INCLUDING ANY WARRANTY OF MERCHANTABILITY, NON-INFRINGEMENT, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY WARRANTY OTHERWISE ARISING OUT OF ANY PROPOSAL, SPECIFICATION, OR SAMPLE. Intel disclaims all liability, including liability for infringement of any proprietary rights, relating to use of information in this specification. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted herein. 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 [www.intel.com/performance](http://www.intel.com/performance) Intel does not control or audit the design or implementation of third party benchmark data or Web sites referenced in this document. Intel encourages all of its customers to visit the referenced Web sites or others where similar performance benchmark data are reported and confirm whether the referenced benchmark data are accurate and reflect performance of systems available for purchase. Intel, the Intel logo, and Xeon are trademarks of Intel Corporation in the U.S. and other countries. \*Other names and brands may be claimed as the property of others. Copyright © 2014 Intel Corporation. All rights reserved. JPN/14056/PDF/SE/ESS/SO 330535-001US