Hitachi's Database Product Based on Achievement of Collaborative Research by Institute of Industrial Science, the University of Tokyo and Hitachi Obtains the World's First Performance Record for the Largest-Scale Class in the Industry-Standard TPC-H Database Benchmark

Tokyo, October 21, 2013 – Institute of Industrial Science, the University of Tokyo ("IIS") and Hitachi, Ltd. (TSE: 6501, "Hitachi") today announced that Hitachi's database product [1] has recorded the world's first TPC-H [2] benchmark test result in its largest-scale 100 TB [3] class. This database product was developed based on the achievement of research and development of ultrafast database engine technology based on "out-of-order execution principle." The research project was conducted jointly by IIS and Hitachi through the Development of the Fastest Database Engine for the Era of Very Large Database and Experiment and Evaluation of Strategic Social Services Enabled by the Database Engine project. This project is led by a principal investigator, Masaru Kitsuregawa, Professor at IIS and Director-General of the National Institute of Informatics, and supported by the Japanese Cabinet Office's Funding Program for World-Leading Innovative R&D on Science and Technology [4] from March 2010 through March 2014. TPC-H is an industry-standard benchmark for database query performance. Hitachi's database product achieved an excellent performance result of 82,678.0QphH@100 TB [5], and became the first product to be recorded in the performance result list for the 100 TB class. This record clearly and publicly demonstrates the effectiveness of Japanese database technology from IIS and Hitachi under international standards.

(1) Hitachi commercially released the ultrafast database engine in June 2012 as Hitachi Advanced Data Binder Platform, a high-speed data access platform that combines Hitachi's servers and storage systems.
(2) TPC-H is a standard database system benchmark that provides decision support for complex database query processing, and is defined by the Transaction Processing Performance Council, a non-profit organization.
(TPC-H website: http://www.tpc.org/tpch/default.asp)
(3) 100 TB of data is equivalent to the volume of POS data accumulated by a major convenience store operator over a period of 7 years (according to Hitachi research).
(4) The Funding Program for World-Leading Innovative R&D on Science and Technology is a national research and development program. This program was established with the aim of promoting world-class cutting-edge research that bolsters Japan's medium- to long-term international competitiveness and fundamental strengths, while contributing to the welfare of people and society through the application of its results.
(5) The database query-processing performance metric reported by TPC-H is expressed in terms of QphH (TPC-H Composite Query-per-Hour Performance Metric). The size of the database is indicated after the "@" symbol.

In recent years, demand for database products with ultrafast query processing capabilities has been increasing. With developments such as the expansion of cloud computing services and the rapid proliferation of smart devices, there is an ever-growing anticipation for the use of growing volume of data generated in business and social activities to expand business globally, to create new business, and to achieve a smarter, more prosperous society.

Against this backdrop, IIS and Hitachi have conducted joint research and development of the ultrafast database engine technology based on "out-of-order execution principle." In June 2011, the researchers confirmed data query processing speeds that were approximately 100 times [6] faster than conventional database engines when using a storage system configured with standard hard disk drives. Hitachi commercially released this database engine in June 2012 [1]. IIS and Hitachi subsequently conducted performance verification tests in flash storage environments, and in August 2013, again achieved data query processing speeds that were approximately 100 times [6] faster than conventional database engines even in the flash environments. Furthermore, IIS and Hitachi conducted extensive experiments by the use of large-scale testing environment, with the aim of applying this technology to large-scale environments towards 100 TB and more in size.

(6) The tests measured performance of various types of data-analysis requests based on a standard analysis database benchmark. There was some variation in execution speed depending on the type of data analysis request, but a 100-fold increase in speed was confirmed for queries with small selectivity satisfying certain conditions.

Following the results of the performance verification tests, Hitachi tested the performance of its product for the largest-scale database class (100 TB) of the TPC-H benchmark. The aim of this test was to use public standards to confirm the effectiveness of Hitachi's product in a large-scale database environment. With an excellent result of 82,678.0QphH@100TB, Hitachi's product has been listed in the performance results for the 100 TB class. This is the world's first record in the largest class in TPC-H. Previously, TPC-H only accepted database products up to 30 TB in size. The 100TB class was an unexplored area and its result list stayed vacant. This achievement proves that   the superior performance of Japanese ultrafast database engine technology for query processing in a large-scale 100 TB database has been publicly demonstrated according to international standards. IIS and Hitachi will continue to pursue joint research and development to improve performance of the ultrafast database engine and to contribute to innovation through the utilization of big data.

Overview of benchmark evaluation
Database: Hitachi Advanced Data Binder 01-02
Servers: BladeSymphony BS2000 (8 CPU (80 core) configuration, 2 TB memory) × 4
Storages: Hitachi Unified Storage 150 (900-GB 10,000-rpm SAS HDD × 100) × 16

About the joint R&D of the ultrafast database engine by IIS and Hitachi
With the aim of enabling high-speed query processing for big data, IIS and Hitachi have been conducting joint research and development of the ultrafast database engine technology based on "out-of-order execution principle," through the Development of the Fastest Database Engine for the Era of Very Large Database and Experiment and Evaluation of Strategic Social Services Enabled by the Database Engine project. This project is led by a principal investigator, Masaru Kitsuregawa, Professor at IIS and Director-General of the National Institute of Informatics, and supported by the Japanese Cabinet Office's Funding Program for World-Leading Innovative R&D on Science and Technology during a period from March 2010 through March 2014.

Overview and characteristics of "out-of-order execution principle"
"Out-of-order execution principle," which was developed by Professor Kitsuregawa and Kazuo Goda (Project Associate Professor at IIS), is unique in its ability to maximize the use of hardware performance by asynchronously processing data in an order unrelated to the data request order. Using this principle, the ultrafast database engine, being developed by IIS and Hitachi, is enabled to significantly improve the usage efficiency of the storage system and multi-core processors, promising to dramatically increase query-processing speed for big data.

Website for the Development of the Fastest Database Engine for the Era of Very Large Database and Experiment and Evaluation of Strategic Social Services Enabled by the Database Engine project.
http://www.tkl.iis.u-tokyo.ac.jp/FIRST/home.en.php

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