

Using NVDIMM as Storage, In-Memory Database Gains Durability Keeps High Performance

Written by Australian Business

(PRLEAP.COM) Issaquah, WA - October 8, 2013 - In the industry's first test of in-memory database system (IMDS) speed and recoverability using the emerging Non-Volatile DIMM (NVDIMM) technology, McObject® and AgigA Tech, a subsidiary of Cypress Semiconductor Corp. (NASDAQ: CY), announced McObject has successfully benchmarked its eXtremeDB® IMDS using AgigA Tech's [AGIGARAM](#)® NVDIMM as main memory storage. The tests included "pulling the plug" mid-execution, which confirmed the AGIGARAM product's ability to save data persistently in the event of system failure, and to facilitate recovery.

In addition, eXtremeDB's speed managing data in AgigA Tech's NVDIMM proved equal to using conventional memory (DRAM). In contrast, alternative IMDS mechanisms that safeguard data from system failure, such as transaction logging, introduce latency. By delivering peak performance along with full data durability, the combination of eXtremeDB [In-Memory Database](#) System and the AGIGARAM NVDIMM opens the door to a new and powerful approach to managing data in applications that demand both speed and durability, including mission critical systems for telecom/networking, capital markets, aerospace and industrial control.

McObject has published the results of its benchmark tests using eXtremeDB and AgigA Tech's NVDIMM in a report available for free download at <http://www.mcobject.com/imds-nvdimm-paper>

In-memory database systems store records in main memory, leveraging DRAM's superior read/write speed while eliminating the file I/O, cache management, data transfer and other overhead inherent in traditional database management systems (DBMSs) that incorporate persistent storage. As a result, IMDSs perform an order of magnitude faster than their disk-based counterparts.

But some applications require a higher level of data durability than DRAM can provide. As a solution, IMDS vendors offer transaction logging, which keeps a record of changes to the database that can be used to recover after a crash. But this logging requires writes to persistent storage (such as a solid state drive or hard disk), which adds some latency. IMDSs with transaction logging still outperform traditional on-disk DBMSs (by up to 23x, depending on storage devices used, according to McObject's earlier [published findings](#)) but they lag "pure" in-memory database systems deployed in DRAM.

One existing type of [non-volatile RAM](#) uses a battery to maintain data in memory during a power failure. However, disadvantages of this "battery-backed RAM" include restrictive

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temperature requirements, leakage risk, limited storage time, long re-charge cycles, finite battery shelf life, and overall high cost-of-ownership.

AgigA Tech was formed to develop technology that would overcome battery-backed RAM's limitations. Its battery-free AGIGARAM NVDIMM combines standard DRAM with NAND flash and an ultracapacitor power source. When a system operates normally, AGIGARAM provides all the capabilities of high speed DRAM. But in the event of power loss, the ultracapacitor provides a burst of electricity used to write main memory contents to the NAND flash chip, where it can be held virtually indefinitely, with the AGIGARAM NVDIMM restoring data from NAND flash to DRAM upon system recovery.

McObject tested eXtremeDB using AgigA Tech's 4 GB AGIGARAM DDR3 NVDIMM for main memory storage, on an Intel Oak Creek Canyon reference motherboard equipped with a Intel Pentium Dual Core CPU 1407 @ 2.8 GHz processor, as well as 8 GB of conventional memory. The benchmark application measured speed in separate tests of database inserts, updates, deletes, index searches and table traversals. In each test, the AGIGARAM NVDIMM delivered speed comparable to the results obtained using conventional memory.

To test response to failure, the system was re-booted during execution. Upon re-start, the test application launched automatically, accessed the database in its pre-failure state (upon recovery, the AGIGARAM NVDIMM had loaded it from flash into its DRAM), checked for database consistency and resumed operation.

Test application code enabling database recovery leveraged an eXtremeDB feature that supports the IMDS's use with [battery-backed RAM](#). It enables a process to re-connect to an NVRAM-hosted eXtremeDB database, initiate any needed cleanup, and resume normal operation after a system reboots. An application's recovery algorithm assumes that the memory block of the database memory device assigned as MCO_MEMORY_ASSIGN_DATABASE can be re-used after a crash or power failure by re-opening it as an existing database.

"The idea that there must be a tradeoff between performance and persistence/durability has become so ingrained in the database field that it is rarely questioned. McObject's test of the eXtremeDB IMDS with AgigA Tech's AGIGARAM NVDIMM shows that mission critical applications needn't accept latency as the price for recoverability. Developers working in a variety of application categories will view this as a breakthrough, and we look forward to our customers enjoying the benefits of the joint eXtremeDB/AGIGARAM NVDIMM solution," Steve

Graves, McObject CEO, said.

"An in-memory database system is perhaps the ideal application to take advantage of the features of NVDIMMs," said Ron Sartore, CEO of AgigA Tech. "Our AGIGARAM NVDIMMs provide the speed and endurance of DRAM with the persistence of flash. McObject's impressive benchmark reveals the value of this combination."

About AgigA Tech, Inc.

Headquartered in San Diego, California, AgigA Tech is a leading developer of high-speed, high-density, battery-free non-volatile memory solutions. The company's flagship AGIGARAM® product family represents a new class of non-volatile memory created to address the fundamental need for higher-density, higher-performance memory in enterprise-class applications. AGIGARAM integrates NAND Flash, DRAM and an ultracapacitor power source into an innovative, highly-reliable non-volatile memory subsystem that can deliver unlimited read/write performance at the fastest DRAM speeds, while also safely backing up all data when power is interrupted. AgigA Tech is a subsidiary of Cypress Semiconductor Corp. The company's products are available worldwide through the Cypress sales force and its distributor partners. More information on the company is available at www.agigatech.com.

About McObject

Founded by embedded database and real-time systems experts, McObject offers proven data management technology that makes applications and devices smarter, more reliable and more cost-effective to develop and maintain. McObject counts among its customers industry leaders such as BAE Systems, Siemens, Philips, EADS, JVC, Pentair, F5 Networks, CA, Motorola and Boeing. McObject, based in Issaquah, WA, is committed to providing innovative technology and first-rate services to customers and partners. The company can be reached at +1-425-888-8505, or visit www.mcobject.com.

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