



CASE STUDY



Hospital Carves Out New Possibilities in the Medical Sector Through the Implementation of High-speed, Reliable Next-Generation Storage

Solution Focus

- Healthcare
- Big Data
- Data warehouse queries

Summary of Benefits

- 60X improvement in query processing
- High availability
- Low bit error rate

SanDisk Products

- Fusion ioMemory ioDrive2

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**Dr. Eizen Kimura, Deputy Director,
Department of Medical Informatics,
Ehime University Hospital**

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Summary

With the ongoing digitization of medical records, Ehime University Hospital anticipates data volumes to soar to 300TB within the next five years. Not only will data storage needs increase significantly, but also the ability to rapidly search data records will be necessary to ensure timely and accurate medical decision-making. Deploying the Fusion ioMemory™ ioDrive®2 by SanDisk® has enabled the rapid processing of a large volume of data in real time, providing medical professionals with the information they need in critical moments.

Towards the Digitization of Medical Systems

The Ehime University Hospital introduced the electronic health record (EHR) in 2003, and by 2009, the implementation of the EHR system was completed throughout the hospital except in a very few departments. According to Dr. Eizen Kimura, Deputy Director, Department of Medical Informatics, Ehime University Hospital, “In transitioning all medical information in the hospital to electronic health records and medical image management systems, we anticipate a total data volume of 300TB in the next five years for which we have prepared the object storage to consist of 1.5PB of physical volume.”

In addition to digitization of CT and MRI images, past paper health records predating EHRs will be scanned and stored in the new system. Diagnostic images, as well as medical images, are planned to be centrally managed with an expected increase in data of 60TB in one year. The medical sector is characterized by large volumes of data in comparison to other industries.

The Challenge

Now that digitization in the medical institution has progressed, the challenge is in utilizing the large volume of stored data in medical practice. Dr. Kimura discussed the construction of medical systems that can be sustained for decades, includes all data related to medical care, and enables rapid searches. This effort was motivated by a past incident he had encountered. “While giving anesthesia to a patient during a surgery, the patient suffered a shock,” explained Dr. Kimura. “After investigating the cause of the shock, there was a record of this anesthesia resulting in shock a few years prior in another department. However, that case was written on paper and was, therefore, not searchable in electronic health records. It is possible to prevent such cases by saving data from decades of electronic health records, and moreover, by checking for risks through full-text searches using keywords such as ‘shock’ and ‘allergies.’ I felt that information systems could become an area that contributes to patient safety.”

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The Solution

In utilizing IT systems in medical institutions, the large volume of data from the past is expected to play a major role in protecting patients from risks. To achieve this, medical systems call on storage and databases that can process a large volume of data in real time in high speed. It was for these reasons that the Fusion ioMemory ioDrive2 by SanDisk was adopted by the Department of Data Warehouse.

The Results

“For instance, 1,400 outpatients come in each day. For each patient, multiple orders—such as the name of the disease or prescription—are executed. For these orders, we need to prepare 200 types of clinical judgment support rules, and, assuming an average of 50 queries per order, there will be 70,000 queries (1,400 × 50) posted to the Data Warehouse in a three-hour period in the morning. In other words, the system has to return more than six results in one second. Considering that this is the minimum performance requirement, it is extremely challenging for the existing data warehouse to handle the demand. However, deploying the Fusion ioDrive2 enabled this processing, which had been difficult with the previous system,” said Dr. Kimura. A single query, such as referencing all previous history, took three to five minutes with the previous HDD-based system. However, the synergy effect of the Fusion ioMemory ioDrive2 and the DB2 search algorithm resulted in the same query being processed within 3 seconds—a sizable impact.

According to Dr. Kimura, while speed is an essential factor for medical systems, reliability is even more important. “For example, if the “0” and the “1” are reversed due to a bit error, a flag for an allergy could possibly be reversed. For this reason, reliability is as essential as speed.” The Fusion ioMemory ioDrive2 boasts a bit error rate that is 1/1000 to 1/10,000 of other standard drives, illustrating its high reliability. Dr. Kimura was also attracted to the high IOPS—the performance index for input/output operations per second—and better bandwidth. For this reason, IOPS cannot be overlooked for medical systems where ongoing and simultaneous high volume queries are expected. The Fusion ioMemory ioDrive2 was the solution that fulfilled these requirements.

Outlook

“The new system that was introduced has exhibited performance beyond our expectations. The challenge now is how to utilize this system going forward,” said Dr. Kimura who finds possibilities in two main directions. The first is in business intelligence (BI) in medical institutions. In general, health insurance claims summarize information on a monthly basis, but the Ehime University Hospital summarizes information on a daily basis allowing more timely business analysis. In observing the performance of the new system, Dr. Kimura was convinced of the possibility of moving from the analysis of the past day to real-time analysis.

A second opportunity is in the construction of the ecosystem. “Medical systems to this day were used as the basis for medical treatment claims, accounting, and business analysis. However, given the performance, it is now possible to create an ideal system that is geared toward both healthcare professionals and patients, such as medical safety and clinical judgment support.” Dr. Kimura explained that he has already embarked on prototyping a clinical judgment support system.

Dr. Kimura also mentioned hope in the future of new medical systems in light of the excellent maintainability of the Fusion ioMemory ioDrive2. Dr. Kimura pointed out the potential impact on maintainability, the load on the system, and the cost for making the system extremely compact. “The new system occupies only five racks, which includes 150TB of both hierarchical storage and object storage. It is believed that by switching from hierarchical storage to flash storage, and by restructuring the



Fusion ioMemory™ - ioDrive®2

object storage hard disk drives to something with a larger volume, the number of racks can be reduced to half. In addition, operating cost decreases. In the medical field, 99% of storage is files and the remaining 1% is database, so ultimately it may be possible to streamline the architecture by having the database on the flash storage and the object storage hold everything else.”

He expressed his high expectations of the high performance and reliability of the Fusion ioMemory ioDrive2 with a low bit error rate in triggering a major change in medical systems in the future. Dr. Kimura added, “I’d like to work to prevent medical errors by 100%, assuming medical errors can be prevented by having data in electronic health records. In addition, I would also like to construct a system that supports evidence-based medical care that is constructed upon accumulated medical data over 10 years, in addition to the experience of physicians.”

This new system enables high performance that was only possible with a tremendous investment on the existing system, which also enables business analysis and exploration of ecosystem construction. Dr. Kimura’s hope of spreading it as a general-purpose medical system throughout Japan may become a reality in the near future.

About Ehime University Hospital

Located in the city of Tōon in the Ehime Prefecture, the Ehime University Hospital, an advanced treatment hospital, provides care to approximately 1,300 outpatients per day, accomodates hospitalization of 190,000 inpatients days per year, and serves as a medical institution protecting the health of local residents. In accordance with the “Grand Design for Adapting IT in the Healthcare and Medical Sectors” that was initiated by the Ministry of Health, Labour and Welfare in December 2001, the Ehime University Hospital introduced electronic health records in 2003.

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