Case study
KDDI Corporation

» An in-memory database for high-speed processing is essential to our business. Because this means we need a large amount of memory, the Fujitsu M10 was attractive to us for being able to deliver a large memory capacity at a comparatively low cost.«

Dr. Toshio Kato, General Manager, Evolved Packet Core Network Development Department, Network Technical Development Division, Technology Sector, KDDI

The customer

Country: Japan
Industry: Telecommunications business
Founded: 1984
Website: http://global.kddi.com/

The challenge

Content and other services have increased at KDDI. Original expectations were surpassed with the explosive growth of applications such as games that initiate frequent communications in the background. In spite of the fact that the initial system was designed and built with sufficient margin for growth, there was forewarning of insufficient capacity a year after the initial system began operation.

The solution

The requirements fell into three main categories, namely [1] a five-fold improvement in performance over the existing system, [2] the provision for further scalability on top of the five-fold performance improvement, and [3] maintenance of business continuity by establishing a backup site for disaster recovery. The aim was to create a system that could keep up with anticipated future user growth

The customer

As a major telecommunications company making major strides both in Japan domestically and overseas, and with approximately 42 million subscribers, KDDI Corporation places a particular focus on providing content and other services for increasingly popular smartphones and tablets. A feature of many of these services is that they are available to subscribers whenever they want to use or view them, 24 hours a day, 365 days a year. To increase the number of users and views, KDDI has already introduced offers such as "App Torihodai" (all the apps you can use) as a part of its "au Smart Pass" fixed-price app service, a first for Japan.

Among the system platforms that underpin KDDI's business model is the Session Management System that began operation in 2011. The purpose of this system is to check device session information against subscriber contract status in realtime to verify that someone attempting to use a service is the genuine subscriber. By eliminating the risk of device spoofing, the system provides a wide variety of services that are tailored to the verified subscriber.

The challenge

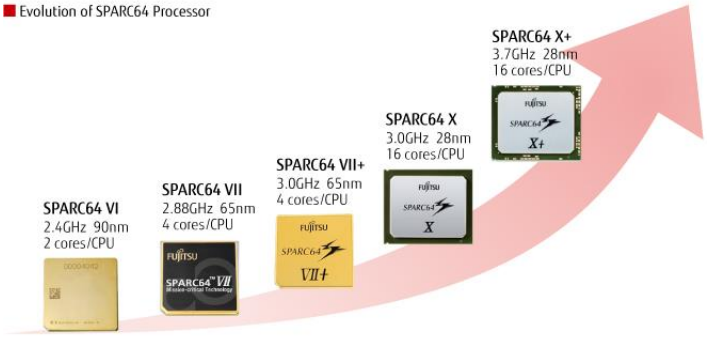
Toshio Kato, General Manager, Evolved Packet Core Network Development Department, Network Technical Development Division, Technology Sector, KDDI, explains the importance of the system as follows. "The system is essential to services that handle subscriber and contract information in realtime. If the system became unavailable, subscribers would no longer be able to access services whenever they wanted, and we would face a business risk due to the loss of opportunity."

"Although we adopted an in-memory database solution (a database that holds data in the server's main memory) as a way of improving response times, we were unable to keep up with the dramatic rise in the number of transactions per second," notes Dr. Kato. It became clear that processor and server capacity would need to be increased if response times were to be kept within a range acceptable to our users.

The solution

In response, KDDI established a team to work on the problem in October 2012. They produced a list of the requirements for a request for proposals from a number of system integration companies.

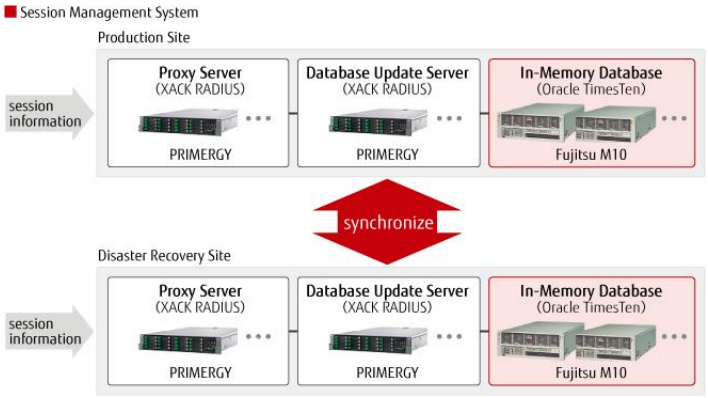
Setting the high target of a five-fold improvement in performance was motivated by the rapid growth in the number of smartphone subscribers. Despite this ambitious target, Dr. Kato says, "This was when the Fujitsu M10 had just been introduced, and we knew that the SPARC64 processors used in the servers had evolved over many years. We believed that we could obtain even higher levels of performance by using Fujitsu M10 SPARC servers."



Fujitsu processor design team has been working on performance and reliability improvements and innovations over many years. The SPARC64 X and SPARC64 X+ processors used in the Fujitsu M10 represent the leading edge of this process.

Regarding scalability, particular importance was placed on the ability to expand the system capacity without stopping the IT resources on the server, even after the system started production operations. As Mr. Enoki explains, "Although designing and building a new system with five times the performance of the old one represented a realistic goal, recognizing the potential for demand growth to exceed expectations, we sought to select a platform that would also be capable of further expansion."

KDDI's aim with building in redundancy by establishing a backup site for disaster recovery was to ensure that the Session Management System could continue to operate even in the event of a major disaster. This required establishing two systems with a master/backup configuration located several hundred or more kilometers apart, and with a synchronization capability that could maintain data consistency between the respective databases. Unfortunately, the delays in exchanging data over the network that arise when sites are physically distant from each other also mean that there is a risk of the master and backup databases not being updated simultaneously. Another possible risk if database updates take too long is the loss of consistency during the switch between master and backup copies of the databases when a disaster strikes. Accordingly, the requirements for the second-generation system included the ability to synchronize databases located several hundred kilometers apart in realtime and without loss of data.



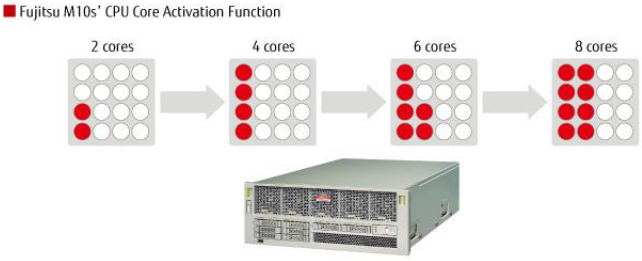
The Fujitsu M10 based Session Management System can respond rapidly to subscriber information requests from update/reference servers using its in-memory database. The system was designed with a backup site for disaster recovery located several hundred or more kilometers away to ensure business continuity in the event of a major disaster.

The benefit

After assessing various tenders, KDDI selected a server hardware configuration that consisted of Fujitsu M10 high-performance UNIX servers and PRIMERGY servers. Having made this choice, KDDI then began system integration, which included software installation of the Oracle TimesTen In-Memory Database, which had already been proven in past applications, and XACK RADIUS to update data in the database.

Running an in-memory database requires a lot of memory. Accordingly, Fujitsu M10 servers with their large memory capacity were used to boost in-memory database performance. A feature of the Fujitsu M10 is its high-speed access to a large memory area with double the speed of the memory bus in conventional servers. This speed advantage is also proven by the Fujitsu M10 holding the world-record on the STREAM benchmark for memory access performance in enterprise servers (as of April 1, 2015).

Dr. Kato also comments on the hardware cost for memory, saying, "An in-memory database for high-speed processing is essential to our business. Because this means we need a large amount of memory, the Fujitsu M10 was attractive to us for being able to deliver a large memory capacity at a comparatively low cost." Mr. Enoki comments that, "Because the Connection Information Management System needs to operate non-stop, 24 hours a day, 365 days a year, we appreciate how the CPU core activation function enables the number of cores to be increased without shutting down the server.



The Fujitsu M10 provides a CPU core activation function for flexible performance upgrades while also optimizing database license costs.

The benefit

- A five-fold improvement in performance over the existing system
- Provision for further scalability on top of the five-fold performance improvement
- Maintenance of business continuity by establishing a backup site for disaster recovery
- Replacement was done without compromising system availability by using CPU core activation
- Fujitsu M10 servers with large memory capacity used to boost in-memory database performance
- High-speed access to a large memory area with double the speed of the memory bus in conventional servers
- Speed advantage is proven by the Fujitsu M10 holding the world-record on the STREAM benchmark for memory access performance in enterprise servers (as of April 1, 2015)

Products and services

- Fujitsu M10-4
- FUJITSU Server PRIMERGY
- Oracle TimesTen In-Memory Database
- XACK RADIUS

The PRIMERGY servers, meanwhile, are used to update connection information. XACK RADIUS runs on a number of PRIMERGY servers and has a system configuration that enables the concurrent updating of the databases running on Fujitsu M10 servers at two physically separate sites, ensuring data consistency and availability even in the event of a major disaster, while still providing high performance processing.

The in-memory database solution on Fujitsu M10 servers was implemented quickly, taking only a year from the initial planning to the start of production. The testing was conducted on a test environment between April and July 2013. Based on the results of this testing, work started on building the production system in July 2013, and it began full operation in September 2013.

Among the reasons the migration was able to be completed so quickly was the convenience of being able to maintain binary compatibility across operating system versions, something that was possible because both old and new systems use Oracle Solaris operating system. As Mr. Enoki comments, "A major reason why we were able to get the new Connection Information Management System up and running without delays was that Fujitsu system engineers and XACK engineers were able to draw on their many years of experience when it came to solving the problems identified during testing and performing the XACK RADIUS installation."

Conclusion

Once in operation, the capacity of the second-generation Connection Information Management System satisfied KDDI's expectations. Dr. Kato says, "After tuning the system, we succeeded in achieving our target of the five-fold performance improvement." The major benefit from a business perspective was that new services could be planned and delivered without any performance concerns. And because access to the Connection Information Management System is extremely fast, even at peak times, subscribers can enjoy content and other services without getting frustrated by slow response times.

To provide more accurate monitoring of in-memory database performance, KDDI developed a new log that monitors and presents information on the number of transactions per second at a glance. This enables a quick notification if an abnormal situation arises.

Mr. Enoki says, "Even though we found ourselves in the need for capacity expansion again not long after the new system commenced operation, we were able to do this without compromising system availability by using CPU core activation."

Dr. Kato says, "The second-generation Connection Information Management System continues to operate reliably and fulfill its role as one of the platforms that supports our business strategy. We have now moved on to the phase of thinking about when and how the system will be upgraded in response to growth in demand and other requirements, and how quickly we can recover it after a fault, disaster, or another problem occurs." He also notes that the knowledge and experience of system scaling obtained through this project will be helpful to KDDI when upgrading other systems.

Contact
FUJITSU
Address: Shiodome City Center
1-5-2 Higashi-Shimbashi Minato-ku, Tokyo
105-7123 Japan.
Phone Tel: +81-3-6252-2220
Website: www.fujitsu.com/sparc
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