Case study

KDDI streamlines data warehouse to improve mobile services

HP Vertica delivers real-time analysis of huge data volumes

Industry
Mobile telecommunications

Objective
Speed up the analysis of increasing volumes of call data to help maintain and improve good customer service

Approach
Re-assessed capability of legacy relational data warehouse then conducted rigorous proof of concept testing to find a faster solution

IT matters
• Reduces database search time from three minutes to just ten seconds for significantly faster resolution of service problems
• Enables 24x7 high-speed data loading with compression rate of up to 90 percent
• Introduces Database Designer features that simplify database tuning and reduce the burden on database administrators

Business matters
• Enables rapid identification and resolution of service problems; improving customer service and helping KDDI to be more competitive
• Introduces a solution that will scale to meet future business needs and at a low cost by leveraging HP Vertica’s capacity-based licensing

“Our mission is to make it possible for customers to use a variety of applications and content on networks and devices that are easy to connect and enjoyable to use. We also aim to continue providing high-quality customer services and we anticipate that HP Vertica will continue to support our mission.”

– Takahiro Yasunaga, Manager, Head of OSS Development Section, Core Network Development Department, Network Technical Development Division, KDDI Corporation

Big Data solution achieves real-time analytical processing
KDDI, Japan’s second largest mobile phone network operator, relies on constant analysis of call data to ensure good customer service. When business growth brought a data explosion, its Oracle relational database could no longer provide the necessary performance. HP Vertica’s column oriented database with real-time analytical processing provided the answer.
Challenge

Data explosion
Tokyo-based KDDI is Japan’s second largest mobile phone network operator with 35 million customers. Already experiencing the pressures of the high-growth mobile market, KDDI faced further rapid business expansion when it launched a new 4G LTE service under its “au” brand.

This brought huge increases in data traffic placing a heavy burden on the company’s communication infrastructure. To maintain service quality, KDDI needed to enhance its support solutions, but with 19,000 mobile base stations logging five billion items of call data a day, the situation was complicated. Having recently grown by 40 percent, this critical data is continually analyzed to pinpoint service problems.

Takahiro Yasunaga, Manager of the Core Network Development Department at KDDI, says, “By doing detailed analysis of logs recorded in mobile base stations and switching equipment, it is possible to clarify issues such as communication delays or disconnects; identifying whether the problem is due to traffic congestion if it occurred in an area of weak signal, or whether the telephone battery just ran out. The results are used to support optimal equipment operation and suggest timely investment decisions.”

The data warehouse used to carry out this analysis is used by approximately 1,000 users, including the Communications Services Operations Department, the Support Department, and the Planning Department for everyday business activities.

New 4G service
“The biggest reason for the 40 percent growth in data was the expanded use of smart phones,” explains Katsumi Kawamura, Manager of the Core Network Development Department. “Our new au 4G LTE service has made it possible to communicate at speeds of up to 75 Mbps, which is approximately eight times the rate of 3G. In fact, at KDDI, we offered tethering right from the service launch, allowing a smart phone to be used as a mobile router. This is what spurred the rapid increase in traffic.

“Certain specific operations — such as displaying current location, searching for an address, or searching for a route — are recorded sequentially in a log. There has been a large increase in the number of devices that perform these types of function and this too was driving the rise in log entries.”

The rapid increase in log data was placing extreme pressure on the data warehouse system.

“Typical search requests were taking two or three minutes,” recalls Kawamura. “To be able to quickly respond to inquiries from customers when there was a communication delay or failure, it was essential that we enhance the data warehouse’s performance and shorten analysis response time. Our objective was to shift to real-time analysis.”

The data warehouse used an Oracle relational database for data analysis and it was clear that it could not deliver the necessary performance and was unable to cope with the rapid increase in data volume.

Solution

Column-oriented searches
“We did a major reassessment of our data warehouse environment based on the assumption that the rapid increase in data volume would continue,” says Ryuta Okano, Assistant Manager of the Core Network Development Department. “Rather than the shortsighted solutions of a hardware upgrade or Relational Database Management System (RDBMS) tuning, we concentrated on new technology and decided to build an analysis infrastructure that we would be able to use for the mid to long term.”

KDDI decided that an HP Vertica column-oriented database was the best solution to deliver real-time performance when handling increasing data volumes and search requests. Compared to typical RDBMS products that read all the data when doing a search, HP Vertica reads only the necessary columns; significantly reducing disk accesses and achieving unparalleled high-speed processing.

From minutes to seconds
“HP Vertica established its unparalleled performance during proof of concept testing,” says Okano. “For example, with a search targeting 1,500 million items of log data, processing that took a conventional system three minutes or more was completed in about ten seconds. We were amazed to see this kind of performance without doing any kind of special tuning.

Hiroyuki Kohira
Assistant Manager
Core Network Development Department
Network Technical Development Division
KDDI Corporation
"In addition to the demand for real-time search processing, there was another important requirement, which was to shorten data load times. Our target was to load 500 million log records in the data warehouse in one hour. The HP system simultaneously handled search requests – including data that had just been loaded – while loading 40 million items or more in five minutes. Test results on HP Vertica revealed a data loading capacity that would more than meet present requirements, and that would have spare room to cope with increasing data volumes."

With nine types of data compression, HP Vertica also achieves data compression rates of 50 to 90 percent. As it is possible to automatically determine the optimal compression method, storage efficiency is also increased and there is a decrease in disk input and output activities that greatly improves loading performance.

Today, KDDI runs HP Vertica on eight HP ProLiant BL460c server blades connected directly to an HP MDS600 storage system. Peripheral systems for delivering and monitoring log data were built alongside to provide support.

Benefits

Future scalability

"When we implemented HP Vertica, we migrated all base station logs that had shown a marked increase in data volumes and those that demanded greater analysis due to the new au 4G LTE service," says Kawamura. "Doing this allowed the burden placed on the Oracle environment to be cut to less than half, and moved high-speed processing and search tasks to HP Vertica."

A benefit for KDDI is that by utilizing inexpensive x86 servers, HP Vertica can linearly increase processing performance. Even if requests for searches and analysis increase, and at the same time with the increase in complex processes, the company can simply deploy more servers. Being able to quickly and easily augment the processing capability enables KDDI to comfortably cope with unpredictable increases in data volume. Also, HP Vertica uses licensing per capacity, which makes it cost efficient as the fee remains the same regardless of how many servers are added."
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Customer solution at a glance

Hardware
- HP ProLiant BL460c server blades
- HP MDS600 Modular Disk System

Software
- HP Vertica

HP services
- Product support

Less administration
HP Vertica is equipped with a function called Database Designer that simplifies database tuning. It eliminates the need to create an index, unlike a typical RDBMS product, and high-speed processing is achieved without having to write a complex SQL (Structured Query Language) statement. The result is a big reduction in the burden imposed on the database administrator.

“Being able to deliver high-performance with only minimal design and tuning is a major advantage. The pace of our business is constantly accelerating, and we are no longer in an era when we can spend several months on database optimization.” says Hiroyuki Kohira, Assistant Manager of the Core Network Development Department.

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HP Vertica has also resolved the issues of identifying the cause of an IT problem and coordinating with multiple vendors. HP provides one-stop support ranging from implementation to operation and maintenance, so it is possible to quickly resolve issues. In that sense, HP Vertica can be regarded as a vertically integrated solution running on industry standard hardware, so there is no fear of being locked in to a proprietary solution.

“Our mission is to make it possible for customers to use a variety of applications and content on networks and devices that are easy to connect and enjoyable to use, and also to continue providing high-quality customer services regardless of any changes,” concludes Yasunaga. “We anticipate that HP Vertica will give us the rapid information analysis capability that is required to continually support that mission.”

KDDI came top in overall satisfaction in the J.D. Power Asia Pacific Japan Mobile Phone Service Customer Satisfaction Survey. Yasunaga commented, “As smart phones became more popular, there was a rapid expansion of various rich content services. The high-speed communication service au 4G LTE accelerated that trend to an entirely new level. Achieving top class customer satisfaction while data traffic is increasing this rapidly shows the success of our efforts to provide top quality service.”

Learn more at http://www.vertica.com/

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4AA4-5075ENW, March 2013