Kyushu University
Customer Success

PRIMEQUEST outstanding performance underpins advanced supercomputing needs

Solution

Industry

Product

Requirement

Benefits

- Replacement of proprietary supercomputing system platforms at Kyushu University with more scalable & cost effective open system infrastructure
- Education (R&D)
- PRIMEQUEST 580 & PRIMERGY open system server clusters plus ETERNUS disk arrays
- Solve growing demands on supercomputing resources with improved scalability and better cost performance
- 50 times performance increase, lower cost of operation (lower power costs) and greater operational flexibility

Overview

The Research Institute for Information Technology (R.I.I.T.) of Kyushu University provides high-level computing services to users in fluid analysis, molecular sciences and other fields. Their former proprietary vector-based system was in need of replacement. They needed to achieve improved performance and scalability and considered open systems and SMP cluster based servers. They chose Fujitsu PRIMEQUEST and PRIMERGY servers and commenced their use in June 2007.

The R.I.I.T. is one of seven in Japan providing calculation resources and a range of supercomputer system support; not only to users within the university but also to users in other universities across Japan. In 2001, it introduced a leading-edge vector processor supercomputer offering users a superior transaction processing service.

However, after several years, it was having difficulty meeting expectations and satisfying the demands from new fields in scientific computing. “For example, in cases such as air flow disruption in jet engine turbine rotation, large scale and complex calculations are necessary. It’s not unusual for 1-2 weeks to elapse after job initiation before the calculation results are produced.

Then at year-end, especially when researchers are writing their thesis, activities peak, system utilization is concentrated and throughput tends to become inadequate.” So said Takeshi Nanri, Associate Professor, Research Institute for Information Technology, explaining the background to system re-examination.

The acquisition of a new system was progressed by comprehensive evaluation of all bids. The center undertook multi-facetted verification including comparison of price efficiency ratios, reliability, expandability and operability, of products from various companies. This resulted in Fujitsu’s proposed solution being adopted.

The new supercomputer system is formed from 32 fully loaded Dual Core Intel® Itanium® Fujitsu PRIMEQUEST 580, open system mission critical servers; giving 2048 cores in a large scale SMP cluster. Similarly 384 industry standard Fujitsu PRIMERGY RX200 S3 servers with 1,536 cores complete the hybrid cluster. In addition, a PRIMEQUEST 580 and ETERNUS8000 model 2100 are installed as a file server. Finally, Parallelnavi high performance computing (HPC) software enables high speed transfer to storage of the various user environments and bulk operational data - without the users needing to be aware of the SMP and industry standard server cluster mix.

“The benefit of the SMP cluster is that access times between each processor and memory within each node is fixed, ensuring stable performance improvement during parallel processing. In addition, the industry standard server cluster answers the requirement for increased calculations, and supports thinking that laboratories inside the university could personally own small-scale clusters that we could use with ease, even if purchased by users.” (Mr.Nanri)

64 bit Red Hat Enterprise Linux was adopted across both clusters, while the existing tool groups (applications and libraries) and research result data properties were ported. “The porting jobs were directly supported by Fujitsu engineers going to the laboratories of every user.
Thanks to that and their past service, this center could progress the migration smoothly,” said Mr.Nanri courteously, evaluating Fujitsu’s technological strengths and support.

In throwing Fujitsu a new challenge, Hirofumi Amano, Associate Professor, Research Institute for Information Technology, at the same department said, “Because of the number of nodes and the unprecedented scale, there are even greater requirements on the robustness and the performance of the file system.”

**Best performance of 7 centers (31.5 *TFLOPS) plus benefits in lower power costs**

Implemented in June 2007, the entire operational performance of the new system - which combines the large scale PRIMEQUEST based SMP cluster and PRIMERGY industry standard server cluster - is 31.5 *TFLOPS. This puts it at the top of the group of 7 nationwide academic supercomputer centers (as of 2007). *TFLOPS – Ability to perform 1 million x 1million floating point operations per second

In addition, one of the characteristics seriously considered during the systems evaluation was power economy. There was substantial reduction in total power consumption from Intel CPUs, low heat server and storage design and lower air conditioning costs. This enabled a tariff revision from a measured rate to a flat annual rate, providing significant savings to the center.

The center has two types of usage plan. One, where the computational resources are shared and allotted to groups of users, and the other where they are monopolized. Right from the start there were full bookings for some services.

“**We are also examining commencement of services for Industry in 2008.**

As a result, this is also our schedule for increasing the number of full-time researchers in charge of technical support. Rather than just offer mere computing infrastructure, we wish to follow the outcomes of research and maximize the use of the center,” revealed Kazuaki Murakami, Professor(add.), Research Institute for Information Technology.

**Research environment creation where architecture is transparent in use (Fujitsu engineer’s comments)**

“The largest task in the recent renovation of the supercomputer system at Kyushu University’s Information Infrastructure R&D center, was improving the level of user satisfaction both inside and outside the university. While CPU architecture innovation can provide high performance, it could also introduce technical, migration and usage problems, with researchers’ software applications. In particular how to design and maintain ease of use of the new system compared to use of the former vector-based supercomputer.

As a specific solution, PRIMEQUEST 580 mission critical IA servers were introduced. Use of the high-speed distributed file system software Parallelnavi SRFS for Linux, made it possible to fast transfer the bulk parallel processed data from both the SMP and industry standard server clusters to storage. The highly reliable storage and management enabled the implementation of an advanced secure and efficient file system optimum for scientific computing.

Furthermore, usability was increased by applying Fujitsu’s HPC solutions everywhere. One of them is “seamless visualization.” This technology enables easy high-speed visualization over the network of large scale computation results output from the supercomputer. Simple user operation enables easy PC based verification of job execution results and memory content during the job.

In addition, the web interface based “Application management portal” reduces the operational management load by providing monitoring and management functions across the entire heterogeneous mix of systems.

In order to deal with the huge calculation volumes, total reliability is needed. To ensure meeting the customer’s requirements, actual use was verified. This fine-grained system development test was carried out at the “Build and Test” center at Fujitsu’s Numazu factory prior to implementation on site.

In the future, Fujitsu wishes to continue contributing to creation of environments that drive research activities through the range of support we can provide to users and management.”