Tokyo Institute of Technology

Sun Builds Japan's Most Powerful Supercomputer for Japanese "MIT"

Customer Success Story

Industry

- Education

Business Issues

- Establish a cost-efficient supercomputer grid environment to support advanced research.
- Provide high-performance computing (HPC) resources to scientists and students.
- Incubate a future generation of world-class researchers by ensuring all students had access to extremely powerful computing resources.

Solution

When Tokyo Tech set out to build the largest supercomputer in Japan, it considered proposals from a number of different vendors. Only Sun's proposal offered the high computing power required, combined with the cost-efficiency and flexibility of a grid architecture.

Business Results

- Created one of the ten-largest supercomputers in the world
- Enabled planned computing performance of 100 teraflops per second
- Created an infrastructure to perform compute-intensive tasks easily and cost-efficiently
- Created a high-density storage grid delivering unprecedented data throughput to support compute-intensive calculations

Products/Services/Solutions

- Sun Fire X4600 server
- Sun Fire X4500 server
- Sun Grid Engine
- Sun N1 System Manager
- Solaris 10 Operating System

URL Reference

sun.com/customers

The Tokyo Institute of Technology—better known as Tokyo Tech—is the largest institute of higher learning in Japan dedicated to studies in science and technology. Founded in 1881 as the Tokyo Vocational School, Tokyo Tech was awarded university status in 1929. Today, it is recognized as one of the most prestigious technical education centers in the world, and is a member of Links to Asia by Organizing Traineeship and Student Exchange (LAOTSE), an international network of leading Asian and European universities.

Success at a glance

Tokyo Institute of Technology (Tokyo Tech) is one of the most prestigious centers of technical research and education in the world. Often referred to as the "MIT of Japan," Tokyo Tech currently operates a number of high-performance computing (HPC) environments to support its educational and research activities.

Tokyo Tech students and researchers investigate some of the world's most pressing problems, including the transmission and mutation of the Avian Flu, the construction of earthquake-resistant structures, and the effects of climate change on the world population. In 2004, Tokyo Tech administrators wanted to take the university's computing power to the next level, and began plans to construct what would become Japan's most powerful supercomputer. Their ultimate ambition was to create one of the top-10 HPC environments in the world.

In addition, Tokyo Tech wanted to incubate a future generation of world-class researchers by ensuring that all Tokyo Tech students—both graduate and undergraduate—had access to the university's extremely powerful computing resources.

Because Tokyo Tech is a publicly supported institution, Japanese law required the university to consider proposals from a number of different vendors. As expected, the biggest names in HPC proposed solutions. Due to regulations Tokyo Tech cannot confirm which companies proposed solutions, but it's likely that IBM, SGI, and Hitachi were among the competing vendors. Most of the proposals were "big box" solutions.

Sun took a different approach by proposing a high-performance computing grid based on 655 Sun Fire™ X4600 servers with powerful AMD Opteron processors, for a total of 10,480 processor cores. In addition, 42 Sun Fire X4500 servers provide storage. The grid solution, managed by the Sun™ N1 Grid Engine and the Sun N1 System Manager, offers a current computing capacity of as much as 85 teraflops (or trillion floating-point operations per second), and Tokyo Tech expects the capacity to rise to 100 teraflops.

By comparison, the HPC environment at the Earth Simulator Project—Japan's other supercomputer, which is consistently ranked as one of the top-10 most powerful computers in the world—can only achieve a performance of 36 teraflops.

The high-performance grid is running on a mix of the Solaris™ 10 Operating System, SUSE Linux Enterprise 9, and Red Hat Enterprise Linux 4. It relies on system and application integration technology from NEC, who ultimately partnered with Sun in the creation of the Tokyo Tech grid. The AMD Opteron processors in the Sun Fire servers are ideal for HPC environments, providing dual-core processing capabilities, but requiring no more power than single-core processors.

The Sun solution also incorporates technologies from ClearSpeed Technology Inc., ClusterFS, and Voltaire. ClearSpeed advance boards installed in Tokyo Tech's HPC grid will be used to accelerate commonly used scientific algorithms; ClusterFS's Lustre parallel file system software allows the servers to communicate with the storage in parallel, speeding access to the ever-increasing amount of scientific data being processed; and Voltaire is supplying high-speed multiprotocol Infiniband switches and host-card adaptors to connect servers and storage.

Tokyo Tech HPC administrators are extremely pleased with the reliability and flexibility of the Sun grid solution, which has proved an ideal alternative to the big-box approach. For example, the grid system, based on x86 architecture, allows users to compile on their laptops or desktops and then transfer that code directly to the grid — something that isn't possible on a traditional HPC solution. Today, Tokyo Tech provides access to its new supercomputer to more than 10,000 researchers, scientists, and students.

Tokyo Tech is proud of its new supercomputing grid, which is destined to become one of the fastest, most powerful computing environments anywhere in the world.

And Sun Microsystems will be right there at the university's side, helping to ensure continued supercomputing success.

"Not only is the performance of the Sun Grid HPC environment extremely impressive today, but the ability of the architecture to scale rapidly is really phenomenal, and will enable us to grow our environment to meet our needs for many years to come—no matter how compute-intensive our projects may be."

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