CASE STUDY

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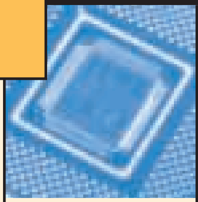
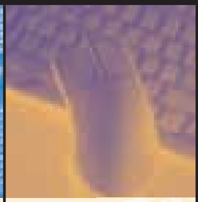




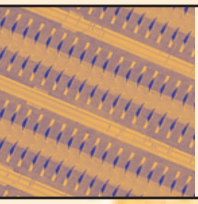
Carnegie Institution Looks to API NetWorks to Help Find Origin of Life

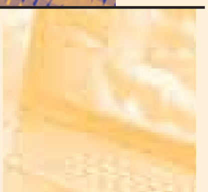
"API NetWorks not only provided the highest performance solution (we tested it here in our labs directly against Intels) but also the most affordable, making it the obvious choice."

In the quest to understand the origins of the planets and how life began, scientists devise highly theoretical mathematical models that attempt to predict real-world phenomena. Calculations such as these are an example of high-performance technical computing (HPTC), that strains even the most powerful supercomputers. Flexing technology from API NetWorks, Inc., researchers at Washington's Carnegie Institution are using a cluster of computers using the powerful Alpha microprocessors to dramatically increase the speed of the mind-boggling calculations that edge them closer to answering these ageless questions.

When the National Science Foundation (NSF) solicited applications for grants specifically for computer clusters, Dr. Gotthard Sághi-Szabó, Carnegie Geophysical Laboratory's senior research scientist, knew they could take advantage of Beowulf clustering — innovative software technology developed at NASA, delivering supercomputer-like higher performance and reliability — by linking a number of computers and leveraging inexpensive, off-the-shelf hardware. For an academic institution watching expenditures, he also knew open-source Alpha-based systems would maximize value and performance. Puget Sound Data Systems, an API NetWorks system vendor based in Washington and a top provider of Alpha systems to government and universities, worked with the Carnegie Institution to provide the Linux Beowulf cluster.

"We needed a fast, 64-bit processor, especially for the memory-bandwidth hungry, floating-point intensive operations our complex computations demand," said Sághi-Szabó."API NetWorks not only provided the highest performance solution (we tested it here in our labs directly against Intels) but also the most affordable, making it the obvious choice. I'm very satisfied with the price / performance ratio, and with the money we spent, we could not have even come close to the cost of a traditional supercomputer."





A fully configured turn-key solution, the Carnegie Alpha Cluster is based on API NetWorks' UP2000 Ultimate Performance Series motherboards, a leading choice for developing Linux-based Beowulf clusters, each with 2 64-bit 667 MHz Alpha processors with 2-to-4 MB cache per processor. Employing the revolutionary Alpha Slot B technology — a CPU module designed specifically for Alpha — the UP2000 delivers x86-style modularity, openness and economy to Alpha server design.

Having thus far incorporated into the cluster only eight of the anticipated 50 dual processors that eventually will be purchased under the three-year NSF grant, the Carnegie team is already taking advantage of both the configuration flexibility and raw processing power of the Alpha solution.

"Our research has been running for 20 years on a variety of platforms, starting with low-end PCs all the way up to the high-end, but it's always been computationally starved," said veteran Carnegie researcher Alan Boss. "Even with the fastest machines available to us, the performance still wasn't what we really needed."

Deep into three-dimensional hydrodynamic equations that attempt to simulate the formation of solar systems and make the link to mass astrobiology, the "origin-of-life", Boss said the computational speed difference with Alpha was obvious and appreciated.

"With the UP2000, we've been able to obtain three or four times the computing power available before, so we're getting a lot more work done and done faster," Boss said. "This additional computing power is important because the equations that I'm computing typically run for months at a time. If I can get something done in a month instead of three months, that makes a big difference."

The Carnegie researchers also like the ability to distribute different jobs over the cluster depending on computational need. This can be far more efficient than with "vectorized" supercomputers that can have their considerable power hamstrung in computational environments that lend themselves to sequential rather than parallel approaches.

"The most important reason for choosing the API NetWorks solution was its performance and reliability. But flexibility was also key," said Sághi-Szabó. "We can make smaller clusters and sub-clusters within the cluster. We run jobs in serial mode or sequential mode and we don't want to pay for proprietary hardware that we cannot, or don't want to use. In terms of administration, space, speed, scalability and price/performance, the API NetWorks UP2000 was the ideal solution."

Sághi-Szabó and his researchers — including post-doctoral fellows of the NASA Astrobiology Institute, a virtual organization connecting government and private academic interests all probing the origins of life — are using the muscle of massively parallel processing (MPP) and often utilize all 16 Alpha processors on the cluster simultaneously. "I can run it about 50-times as fast as when they were on a single processor," he said, and he expects it to only get better and faster with the backing of the open-solutions marketplace and ongoing funding from the NSF.

"If you're an educational institution and don't have a lot of money to support very expensive hardware, then you need something that works well and is based on non-proprietary hardware," said Sághi-Szabó. "API NetWorks makes it possible to build supercomputers based on commodity hardware. They have all the components — excellent hardware, compilers and support of the Linux community — key to providing a solution that met our needs."

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