Brute-force Computing

We began hearing about supercomputers back in the '80s. The name most often associated with them then was Cray Research. What made the Crays so unusual was their speed—a function of vector processing that allowed many operations to run simultaneously instead of in a waiting-line sequence.

Today, IBM dominates the field with supercomputers that achieve giga-and teraflop rates of speed inside massive parallel-processing hardware. The fastest computer on earth is an IBM BlueGene/L supercomputer at Lawrence Livermore National Laboratory. The Cray 1 could handle 80 million operations per second (80 megaflops). The BlueGene screams by comparison at 500 teraflops. That's 500 trillion floating-point operations per second—one teraflop equals a trillion operations.

IBM's BlueGene/L

It has been 10 years since the IBM supercomputer Deep Blue defeated Garry Kasparov, the chess grandmaster who had the highest ratings ever recorded for any player. For whatever reason, computer scientists settled on chess as a benchmark for measuring the progress of machine intelligence. When the match ended with three draws, one win for Kasparov, and two wins for the computer, the event was seen by some as a breech in the firewall between intelligent beings and intelligent machines.

As in the case of Deep Blue, supercomputers often are designed for specific tasks, such as modeling weather patterns or managing animation. Gollum and much of Middle Earth in *The Lord of the Rings* movies were created by a supercomputer cluster of more than 1,000 processors. IBM is currently working on something called Project Kittyhawk. It, too, has a specific goal: "to explore the construction and implications of a global-scale, shared computer capable of hosting the entire Internet as an application." Called BlueGene/P, this global computer will be about the size of a refrigerator, and its single program will be the Internet—a programmable Internet. The supercomputer will be scaled to run continuously at one petaflop, with occasional speeds reaching three petaflops. A petaflop is an almost inconceivable one quadrillion (1×10^{15}) floating-point operations per second.

The idea of gathering up the entire content of the planet's largest network and managing it on a single computer is almost as difficult to imagine as it is to picture a machine executing instructions at the rate of 1,000 trillion in a single second. But that's the rarefied atmosphere in which supercomputers hum. And the future of supercomputers isn't a question of where it will end. It won't. The question is, "Where will it lead?" ■

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