

A Breakthrough in High-Speed Monte Carlo Simulation for Financial Derivative Pricing

Multi-core experts at ET Technology use Impulse C and FPGAs to Accelerate Monte Carlo Simulation by 68X

Newark, DE – November 8, 2007 – ET International, Inc., experts in parallel, multi-core processing solutions, today shared results of a project to accelerate a key Monte Carlo simulation for financial analytics. The results will be exhibited at the International Conference on High Performance Computing being held November 10 to 16, 2007 in Reno, Nevada.

ET International selected this financial analytics algorithm to demonstrate the performance potential of FPGA-based parallel processing. In this case, the FPGA-accelerated algorithm outperforms a conventional processor implementation by a factor of 68X. This acceleration is possible because of the inherently parallel structure of FPGA devices, and because of the ability of the Impulse C-to-FPGA compiler to exploit hardware parallelism during C-language compilation.

Performing Monte Carlo simulations of various extended versions of the Black-Scholes equation is widely accepted as the standard for estimating the future price of stock options. To achieve commercially practical, realistic simulations, the leading Monte Carlo implementations involve extraordinarily short simulation time intervals repeated over many thousands or millions of trials, using random numbers to drive the simulation. ETI has leveraged its proprietary high performance computing technology and its domain expertise to fully utilize the potential of modern FPGA devices. The ETI solution is a simple yet powerful FPGA-based platform that matches these large computational needs. Just as important, ETI's solution has been engineered with versatility in mind, meaning the system is expandable to other applications (financial and otherwise) that rely on Monte Carlo methods.

FPGAs run at slower clock speeds than conventional processors, in most cases less than one tenth the clock rate, but have the ability to be configured for specific types of parallel computations. In the case of a financial analytics algorithm, the optimal configuration involves breaking the computations into multiple parallel processes and generating low-level hardware that runs specific C-code statements in parallel. The slower clock speed of an FPGA also correlates to lower power expenditures, measured as a function of GLOPs per watt, and lower heat. These factors are critical for large scale data centers, in which power and cooling requirements limit the ability to scale.

Because the algorithm was developed using Impulse C™, a C-compatible development environment, it could be validated and benchmarked against a software-only solution (running on an AMD Opteron® server platform) to ensure functional equivalency. Algorithm validation is a critical factor in technology migration, particularly in the financial industry where accuracy of results is of paramount importance.

"Impulse C allowed us to create, verify and optimize a complex, FPGA-accelerated financial application consisting of multiple parallel hardware processes," said Rishi Khan, Research Engineer at ET International. "C-to-FPGA methods also reduced our design time, allowing us to complete this project with just three months of effort."

The ETI solution achieves up to 68X overall application speed up when compared to a software-only solution running optimized C code. This represents at least a reduction of 50% in the total cost of ownership when compared to a cluster of quad-core blades having the same computational capacity.

The ETI solution provides an overall savings of more than 2X over ordinary, commodity based solutions, increasing to a 5X savings as the system is scaled up. This is achieved through the inherently scalable design of the solution which allows additional FPGA devices to be utilized as the workload is increased. For fixed power budgets, ETI's solution allows for more than 20X the computation for the same power expenditure.

About ETI

ETI is a Delaware corporation specializing in high-performance system software and software solutions for parallel/distributed computing systems and devices. ETI has realized since its inception that as multi-core processor-based systems evolve from dual-core to complex large many-core systems, the key to unleashing significant performance enhancements that multi-core architectures offer is software efficiency. For more information about the algorithm and ET International visit www.etinternational.com. For more information on the C-to-FPGA design software used, visit www.impulseC.com.

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