

# DRC Monte Carlo

Overview



Monte Carlo simulations are ideal candidates for DRC's FPGA-based Accelium accelerators. Utilizing the massive parallelism of the accelerators enables acceleration factors of 30 to 50 times versus the same simulations executed in software.



DRC Monte Carlo engine



DRC Monte Carlo appliance with up to 4 Monte Carlo engines

**Background.** Monte Carlo simulations are used in many market sectors to ascertain likely outcomes for specific events. Although used in widely different applications from defense and intelligence to the financial market the underlying algorithms are very similar.

**Solution.** The DRC Accelium accelerator as a massively parallel device is an ideal platform for Monte Carlo simulations as they lend themselves to many processes running in parallel.

**Single Engine or Appliance.** Monte Carlo engines are available as PCIe add-in boards for integration into application servers or storage systems. Also available as integrated inline appliances with each appliance containing up to four Monte Carlo engines packaged in a 1U rack mountable configuration.

**Storage Integrated.** By placing the Accelium PCIe board in the system that generates or stores the data it ensures that Monte Carlo simulations can be executed as close as possible to the data thus minimizing latency and maximizing performance.

**Example 1.** 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. Leveraging proprietary high performance computing technology and domain expertise to fully utilize the potential of modern FPGA devices has achieved very large (30-50x) acceleration factors versus equivalent software applications. The solution is a simple yet powerful FPGA-based platform that matches these large computational needs. And the 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.

**Example 2.** Another Monte Carlo simulation is based on a Markov Chain with embedded Gibbs Sampler. A significant portion of the execution time of this application in software is in 2 routines – a random number generator and a complex analysis routine. Both were coded in DRC Accelium accelerators. Previously the simulations had taken several days to execute in software. They now run in a couple of hours. Initially the routines, because they were so large, were placed in 2 adjacent accelerators. A new version was engineered that places all the routines in a single Accelerator based on the latest FPGA. This results in a 50x acceleration over the original software version.

## The DRC Difference

With over 200 man-years of experience in developing low latency, high capacity solutions DRC has a unique talent in big data applications.

By utilizing a task based architecture DRC has optimized data management/data analysis balance. The key to achieving ultra-high performance is distributing processing capacity so that's its available where its needed rather than centralizing it. Moves the processing to the data versus the data to the processor.

## Made in America

DRC is a US based company with all staff US citizens, and all its engineering and manufacturing conducted in the US.

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