Methodology for Rapid Accelerator Development Applied to Financial Applications

Christian Brugger and Norbert Wehn

Option Pricing in the Heston Model

\[ S_{t+1} = S_t + rS_t \Delta t + S_t \sqrt{V_t} \Delta W^S \]
\[ V_{t+1} = V_t + \kappa (\theta - V_t) \Delta t + \sigma \sqrt{V_t} \Delta W^V \]

Multilevel Monte Carlo

Hybrid CPU/FPGA Architecture

Fast Accelerator Development

Portfolio Optimization

Intel Compute Cluster

17 Nodes
13.9 Minutes
430 kJ
520 W

Custom Computing Systems

4 Nodes
13.9 Minutes
9.2 kJ
11 W

Lines of Code

5035

5x

5x

Implementation Effort

Detailed Comparison

VHDL, FPGA Methodology

Laptop
ML 507, VHDL

HLS, Zynq Methodology

Ubuntu 13.11 (Nov. 2013)

Kernel 3.10 (July 2013)

High-Level Synthesis