Computer Science Seminar

How long will it take? Predicting Computational Physics Code Runtime Through Parallel Discrete Event Simulation Models

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Novel computer architecture concepts, such as massive parallelism at instruction-level and process-level, have led to need for significant refactoring and modification in the operational code base of large-scale computational physics packages in order to access the massive raw computational capacity that modern supercomputers offer. We present a few examples from our Performance Prediction Toolkit (PPT) project that show how relatively simple performance models predict runtimes of physics methods such as Smoothed Particle Hydrodynamics, Implicit Monte Carlo, Molecular Dynamics across a variety of parameterized hardware architectures. Our modeling method is based on the Parallel Discrete Event Simulation (PDES) engine Simian, which serves as an insightful example for the power of Just-in-time compilation tools in easy-to-maintain and rapidly prototyped programming languages.

Bio: Stephan Eidenbenz is a computer scientist at Los Alamos National Laboratory (LANL). His research focuses on cyber security, computational codesign, performance prediction of super computers, novel computing, and process modeling. He has made research contributions in many areas of computer science, including cyber security, computational codesign, communication networks, scalable modelling and simulation, and theoretical computer science. Stephan is also the Director of LANL's Information Science & Technology Institute (ISTI; http://isti.lanl.gov). ISTI enables the LANL's IS&T strategic pillar through recruiting and revitalization in the IS&T area through organization and execution of summer schools, rapid response proposal calls, university sub contracts, a seminar series, and workshop organization. Stephan holds a PhD in Computer Science from the Swiss Federal Institute of Technology, Zurich (ETHZ).

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Time: 9:00 am - 9:50 am

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