

Information Science and Technology Seminar Speaker Series



Robert Fowler

The University of North Carolina at Chapel Hill

An Approach to Productivity and Performance Portability Through Domain-specific Optimization of C++.

Wednesday, December 14, 2016

3:00pm - 4:00pm

TA-3, Bldg. 1690, Room 102 (CNLS Conference Room)

Abstract: Over the past four decades, the "semantic gap" has been growing between conflicting needs to program productively in high-level languages and to simultaneously exploit the performance potential of increasingly complex computing systems. To address this problem, we are developing QUARC, a framework for the optimized compilation of domain-specific extensions to C++. QUARC defines a high-level array language using template meta-programming. The templates instantiate become calls to pseudo-procedures that are then transformed into an abstract intermediate representation suitable for optimization at the object level. Extensions to the back end compiler (CLANG/LLVM) implement code transformations as well as innovative data transformations such as transposition, reshaping, and partitioning for vectorization, parallelism, and memory locality prior to scalarization. This work is driven by the need to propagate "ninja programmer" performance successes on solvers in the US Lattice QCD community to more parts of the QCD applications as well as to a broader group of physicists exploring new physics and methods. A key goal is to accelerate future development on emerging systems.

Biography: Rob Fowler is Director of High Performance Computing at the Renaissance Computing Institute, part of UNC, in Chapel Hill. While at RENCi he has held adjunct professorships in Computer Science at UNC, Duke, and Rice. Prior to UNC he was at the Center for High Performance Software Research at Rice University. He also held positions at the University of Washington, University of Rochester, and the University of Copenhagen. His education includes an A.B. in Physics from Harvard (1971) and M.S. (1981) and Ph.D. (1985) degrees from the University of Washington. His research interests span the area of high performance distributed and parallel computing. Specific interests include compilers and programming environments, architectures, operating systems, performance evaluation, and simulation.

For more information contact the technical host Curt Canada, 505-665-7453, cvc@lanl.gov.

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