Colloquium

Computer Science Department, Oklahoma State University

Dr. Arnold L. Rosenberg
Distinguished University Professor Emeritus, University of Massachusetts Amherst;
Research Professor, Colorado State University
3:25pm - 4:25pm, Thursday, April 23, 2009
310 MSCS, Stillwater; 222 NCB, Tulsa

ACM Distinguished Lecture

IC-Scheduling Theory: A New Scheduling Paradigm for Internet-Based Computing

Abstract

Technological and economic developments have made the Internet a viable platform for a new modality of *Internet-based computing (IC)*. Within this modality, the owner of a large, typically compute-intensive, computation enlists remote clients to "collaborate" in performing the computation. When the computation comprises only independent tasks, the *temporal unpredictability* of IC—communication is over the Internet; computing is by clients who arrive unpredictably and are typically not dedicated to the computation—is at worst an annoying source of slowdown. But, when the computation's tasks have interdependencies that prioritize their execution, then temporal unpredictability can confute attempts to benefit from "parallel" execution of tasks and even cause a computation to stall for lack of unallocated eligible tasks. In a series of papers, we have proposed a new scheduling paradigm that aims to respond to the new challenges of IC. Faced with the impossibility (due to temporal unpredictability) of scheduling to accommodate "critical paths" in a computation, we seek to schedule in a way that always renders as many tasks as possible eligible for allocation to clients. This goal: maximizes the utilization of available clients and minimizes the likelihood of stalling. We have formalized this scheduling problem and, under idealized assumptions, have developed the beginnings of an algorithmic theory for scheduling complex computations for IC. We describe the concepts underlying the new theory and the algorithms that emerge from them, illustrated via several familiar computations and computational paradigms. We describe simulation experiments whose results suggest that the theory's schedules have a measurable benign effect on "real" Internet-based computing.

Biography: Arnold L. Rosenberg is a Research Professor at Colorado State University. He held the rank of Distinguished University Professor of Computer Science at the University of Massachusetts Amherst (now emeritus) until his retirement at the end of 2007. Prior to joining UMass in 1986, Rosenberg was a Professor of Computer Science at Duke University from 1981 to 1986, and a Research Staff Member at the IBM Watson Research Center from 1965 to 1981. He has held visiting positions at Yale University and the University of Toronto; he was a Lady Davis Visiting Professor at the Technion (Israel Institute of Technology) and a Fulbright Research Scholar at the University of Paris-South.

(Refreshments will be served.)

Rosenberg's research focuses on developing algorithmic models and techniques to deal with the new modalities of "collaborative computing." Special recent foci have been scheduling complex computations for Internet-based computing, and novel approaches to coordinating cooperating robots. He is the (co)author of more than 160 technical papers on these and other topics in theoretical computer science and discrete mathematics, in addition to one excursion into linguistics with "The Hardest Natural Languages" (*Linguisticae Investigationes III (1979) 323–339*). In addition to co-editing several books, Rosenberg is the coauthor, with L.S. Heath (Virginia Tech), of the book, *Graph Separators, with Applications*, and has just completed the textbook, *The Pillars of Computation Theory: State, Encoding, Nondeterminism*.

Rosenberg is a Fellow of the *ACM* and of the *IEEE*, and a Golden Core member of the *IEEE Computer Society*. In addition to his Fulbright and Lady Davis Fellowships, Rosenberg has won several other awards: an IBM Invention Achievement Award, and at UMass: the campus-wide Faculty Fellowship Award, and both the Outstanding Teaching Award and the Outstanding Research Award of the College of Natural Sciences and Mathematics.

Information on Rosenberg's publications and other activities can be found at http://www.cs.umass.edu/~rsnbrg/.

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