MISSOURI S&T University of Science & Technology

Distinguished Seminar Comp. Sci. Dept.

A New Scheduling Paradigm for Internet-Based Computing

Dr. Arnold Rosenberg, Colorado State University

Oct 5th Tuesday, 12:30 to 1:30pm

St. Pat's Ballroom B –Havener Center

Abstract - Technological and economic developments have made the Internet a viable platform for a new, "collaborative" modality of Internet-based computing (IC, for short). 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 at unpredictable times and who are typically not dedicated to the computation-- is at worst an annoying source of slowdown. But when the computation's tasks have interdependencies that prioritze their execution, then the temporal unpredictability can confute attempts to benefit from parallel execution of tasks and can lead to a form of gridlock wherein no new tasks can be allocated to remote clients pending completion of already allocated tasks. In recent papers, we have proposed a new scheduling paradigm that aims to respond to the new challenges of IC. Faced with the impossibility of scheduling to accomodate critical paths in a computation, we seek to schedule in a way that always renders as many tasks as possible eligible for allocation to remote clients. This has the dual goal of maximizing the utilization of available clients and minimizing the likelihood of gridlock. We have formalized this scheduling problem and, under idealized assumptions, have developed the rudiments of an algorithmic theory of how to schedule complex computations for IC.

I begin this talk with the concepts underlying the theory and the algorithms that emerge from them. I then describe several familiar computations and computational paradigms that the nascent theory can schedule optimally. I finally describe simulation experiments whose results suggest that the theory's schedules have a measurable benign effect on "real" Internet-based computing.

Brief Bio - Arnold L. Rosenberg is a Research Professor in the ECE Department at Colorado State University and of Distinguished University Professor Emeritus in the CS Department at the University of Massachusetts Amherst. Prior to joining UMass, 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) in 1994, and a Fulbright Senior Research Scholar at the University of Paris-South in 2000. Rosenberg's research focuses on developing algorithmic models and techniques to exploit the new modalities of "collaborative computing" (wherein multiple computers cooperate to solve a computational problem) that result from emerging technologies, especially Internet-based computing. Rosenberg is the author or coauthor of more than 170 technical papers on these and other topics in theoretical computer science and discrete mathematics. He is the coauthor of the research book "Graph Separators, with Applications" and the author of the textbook "The Pillars of Computation Theory: State, Encoding, Nondeterminism"; additionally, he has served as coeditor of several books. Dr. Rosenberg is a Fellow of the ACM, a Fellow of the IEEE, and a Golden Core member of the IEEE Computer Society. Rosenberg received an A.B. in mathematics at Harvard College and an A.M. and Ph.D. in applied mathematics at Harvard University.