Dynamic Robust Resource Allocation in a Heterogeneous Distributed Computing System

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Abstract:
Distributed computing systems are often heterogeneous mixtures of machines, used to execute applications with diverse computational requirements. In this study, we consider how to allocate resources to requests that involve the execution of utility applications on archived satellite data. These requests have soft deadlines and arrive dynamically. Our goal is to maximize the percentage of requests that complete by their deadlines. However, the exact execution time of each request on each machine will depend on the data set being processed, and is not known in advance. This uncertainty can lead to poor allocation decisions. It is important for system performance to be robust against uncertainty. To accomplish this, we define a mathematical model of stochastic robustness appropriate for this deadline-based dynamic environment that can be used during resource allocation to aid heuristic decision making. This model assumes that stochastic (experiential) information is available about application execution times. Our simulation results show the better performance of a heuristic based on this robustness model over several well known resource allocation techniques.

Speaker:
H. J. Siegel is the George T. Abell Endowed Chair Distinguished Professor of Electrical and Computer Engineering at Colorado State University (CSU), where he is also a Professor of Computer Science. He is Director of the CSU Information Science and Technology Center (ISTeC), a university-wide organization for enhancing CSU's activities pertaining to the design and innovative application of computer, communication, and information systems. Before joining CSU, he was a Professor at Purdue University from 1976 to 2001. He received two B.S. degrees from the Massachusetts Institute of Technology (MIT), and the M.A., M.S.E., and Ph.D. degrees from Princeton University. He is a Fellow of the IEEE and a Fellow of the ACM. Prof. Siegel has co-authored over 370 published technical papers in the areas of parallel and distributed computing. He was a Coeditor-in-Chief of the *Journal of Parallel and Distributed Computing*, and was on the Editorial Boards of the *IEEE Transactions on Parallel and Distributed Systems* and the *IEEE Transactions on Computers*.