Title: An Analysis of Stochastic Process Algebra Models of Resource Allocations in Parallel and Distributed Computing

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Abstract:

In a parallel and distributed computing (PDC) environment, optimizing execution performance requires efficient application scheduling and resource allocation for mapping applications to a set of suitable parallel processors. However, such computational environments are often prone to unpredictable variations in application (problem and algorithm) and system characteristics. Given an initial workload, a mapping of applications to resources is considered to be robust if that mapping guarantees a desired level of performance in the presence of unpredictable perturbations at runtime. In this talk, I will present the employment of a stochastic process algebra, Performance Evaluation Process Algebra (PEPA), to analyze resource allocations in PDC systems. The algebra provides modeling of the parallel execution of applications on PDC resources. Further, the PEPA performance model is translated into an underlying mathematical Markov chain model for obtaining performance measures. The numerical analysis of the performance models have confirmed similarity with the simulation results of earlier research available in existing literature. When compared to direct experiments and simulations, numerical models and the corresponding analyses are easier to reproduce, do not incur any setup or installation costs, do not impose any prerequisites for learning a simulation framework, and are not limited by the complexity of the underlying infrastructure or simulation libraries.

Brief Bio of the Speaker:

Dr. Srishti Srivastava is a tenure track assistant professor of computer science at the University of Southern Indiana. Her research work focuses on developing performance models using stochastic process algebra for evaluating the robustness of resource allocations and scheduling in parallel and distributed computing systems with uncertain execution environments. In addition, she is also pursuing educational research to develop teaching modules for parallel computing concepts that can be integrated in an undergraduate computer science curriculum. Her educational research is being funded by the NSF supported Center for Parallel and Distributed Curriculum Development and Educational Resources via the early adopter grant. Dr. Srivastava has authored and co-authored a number of articles published in IEEE and ACM conferences, journals, and book chapters. She also serves as a peer reviewer, and as a member of a number of program committees of renowned IEEE and ACM conferences. She is a professional member of the IEEE computer society, ACM, Society for Industrial and Applied Mathematics (SIAM), Computing Research Association (CRA, CRA-W), Anita Borg Institute Grace Hopper Celebration (ABI-GHC), and an IEEE honor society of Upsilon Pi Epsilon (UPE).