

Keynote Talk

Computing Paradigm: The Next Generation Programming Paradigm for Developing Self* Applications

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Abstract

Grid computing enables scientists to solve large, complex physics problems and provides transparent access to the required computing and storage resources. However, choosing the ideal algorithms and solutions for a Grid application remains an active research area because of the heterogeneity of the Grid resources as well as the dynamism of the application execution phases at runtime. The increased complexity, heterogeneity and dynamism of Large Scale Scientific and Engineering applications make existing programming paradigms and tools ineffective to exploit the Grid as well as the physical properties of applications. Autonomic Computing, that is inspired by biological systems, provides a paradigm shift that will enable us to develop autonomic applications that can self-configure their components and their execution environments to optimally exploit the heterogeneity and dynamism experienced at runtime by both the application and Grid resources. In this presentation, I will introduce the Autonomic Computing Paradigm that models any application as a closed loop control system that is continuously being monitored, analyzed and automatically adapted by changing application algorithms and/or its execution environment to achieve self-optimizing operations. I will also present our preliminary results and experiences in applying the autonomic computing paradigm to several applications including wild fire simulations, partial differential equation transport problems and medical heart simulations.

Categories & Subject Descriptors:

I.m [Computing Methodologies]: MISCELLANEOUS.

General Terms:

Algorithms, Management.

Bio

Salim Hariri is a Professor in the Department of Electrical and Computer Engineering at The University of Arizona. He received his Ph.D. in computer engineering from University of Southern California in 1986, and an MSc from The Ohio State University in 1982. Dr. Hariri is the Editor-In-Chief for the CLUSTER COMPUTING JOURNAL (Springer, <http://www.springer.com/journal/10586>) that presents research techniques and results in the area of high speed networks, parallel and distributed computing, software tools, and network-centric applications. He is the Director of the NSF Center for Autonomic Computing, University of Arizona Site. He is the Founder of the IEEE International Symposium on High Performance Distributed Computing (HPDC) and the co-founder of the IEEE International Conference on Autonomic Computing. His current research focuses on autonomic computing, high performance distributed computing, design and analysis of high speed networks, benchmarking and evaluating parallel and distributed systems, developing software design tools for high performance computing and communication systems, and network-centric applications. He is co-author/editor of four books on parallel and distributed computing: *Autonomic Computing: Concepts, Infrastructure, and Applications* (CRC Press, 2007), *Tools and Environments for Parallel and Distributed Computing* (Wiley, 2004), *Virtual Computing: Concept, Design and Evaluation* (Kluwer, 2001), and *Active Middleware Services* (Kluwer, 2000).