University of Notre Dame
Department of
Computer Science & Engineering
Presents a
SEMINAR

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National Science Foundation

Dynamic Data Driven Applications Systems (DDDAS): The Concept and its Impact

The Data Driven Applications Systems (DDDAS) concept entails “the ability to dynamically incorporate data into an executing application simulation, and in reverse, the ability of applications to dynamically steer measurement processes”, creating “application simulations that can dynamically accept and respond to ‘online’ field data and measurements and/or control such measurements”. Through the DDDAS concept, the application modeling capability, its accuracy and its efficiency, are enhanced over the traditional computational modeling methods, by complementing and augmenting the computational modeling with dynamic data inputs, which can be dynamically incorporated into the computation at runtime. In reverse, the ability of the executing application to steer the measurement processes, and conduct targeted measurements guided by the executing application, can result into more efficient and more effective measurement processes. By integrating the computational and measurement aspects of an application in a dynamic feed-back loop, DDDAS changes the paradigm of the traditionally distinct computational and measurement processes, and leads to a unification of the computing and instrumentation platforms of an application. Together with presenting examples of new capabilities in many important application areas, the presentation will also discuss the DDDAS computational model representing the unification of measurement and computational platforms, the new measurement capabilities enabled through DDDAS, and in particular in architecting and dynamically managing sensor networks, and the systems software needs for supporting the unified measurement and computational platforms in DDDAS environments.

Bio:

Frederica Darema, Ph.D., Fellow IEEE, Senior Executive Service Member Dr. Darema is the Senior Science Analyst in the Office of the Assistant Director of the Computer and Information Science and Engineering Directorate at NSF. Dr. Darema's interests and technical contributions span the development of parallel applications, parallel algorithms, programming models, environments, and performance methods and tools for the design of applications and of software for parallel and distributed systems. Dr. Darema received her BS degree from the School of Physics and Mathematics of the University of Athens - Greece, and MS and Ph. D. degrees in Theoretical Nuclear Physics from the Illinois Institute of Technology and the University of California at Davis, respectively, where she attended as a Fulbright Scholar and a Distinguished Scholar. After Physics Research Associate positions at the University of Pittsburgh and Brookhaven National Lab, she received an APS Industrial Fellowship and became a Technical Staff Member in the Nuclear Sciences Department at Schlumberger-Doll Research. Subsequently, in 1982, she joined the IBM T. J. Watson Research Center as a Research Staff Member in the Computer Sciences Department and later-on she established and became the manager of a research group at IBM Research on parallel applications. While at IBM she also served in the IBM Corporate Strategy Group examining and helping to set corporate-wide strategies. Dr. Darema was elected IEEE Fellow for proposing in 1984 the SPMD (Single-Program-Multiple-Data) computational model that has become the popular model for programming today's parallel and distributed computers. Dr. Darema has been at NSF since 1994, where she has developed initiatives for new systems software technologies (the Next Generation Software Program, and later the Computer Systems Research Program), and research at the interface of neurobiology and computing (the Biological Information Technology and Systems Program). She has led the DDDAS (Dynamic Data Driven Applications Systems) efforts including the synonymous cross-Directorate and cross-agency competition, and has also been involved in other cross-Directorate efforts such as the Information Technology Research, the Nanotechnolgy Science and Engineering, the Scalable Enterprise Systems, and the Sensors Programs. During 1996-1998 she completed a two-year assignment at DARPA where she initiated a new thrust for research on methods and technology for performance engineered systems.

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3:30 p.m.
356-A Fitzpatrick