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Colorado State University's Information Science and Technology Center (ISTeC)

presents <u>two</u> lectures by

Dr. José A.B. Fortes

Professor and Bellsouth Eminent Scholar,
Department of Electrical and Computer Engineering
and Computer and Information Science and Engineering
University of Florida

ISTeC Distinguished Lecture

in conjunction with the Computer Science Department Seminar Series

"Computing Grids: Virtually Yours and At Your Service"

Friday, March 31, 2006
Reception: 3:30 pm
Lecture: 4:10 to 5:00 pm
Lory Student Center, room 224

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Joint Electrical and Computer Engineering Department and Computer Science Department Seminar

sponsored by ISTeC

"Towards Autonomic Virtual Applications and Systems"

Friday, March 31, 2006
10:00 to 11:00 am
Lory Student Center, room 224

To arrange a **meeting with the speaker**, please contact Dr. Sanjay Rajopadhye at (970) 491-7323 or Sanjay.Rajopadhye@colostate.edu

ISTeC (Information Science and Technology Center) is a university-wide organization for promoting, facilitating, and enhancing CSU's research, education, and outreach activities pertaining to the design and innovative application of computer, communication, and information systems. For more information please see ISTeC.ColoState.edu.

ABSTRACTS

"Computing Grids: Virtually Yours and At Your Service"

Significant efforts are currently underway to enable access to computers and software to be as simple and pervasive as access to electricity currently is. Just like electrical grids make it possible for anyone to plug-and-use any appliance, computing Grids will enable individuals and organizations to use computers and software applications on-demand. At the Advanced Computing and Information Systems (ACIS) laboratory of the University of Florida we have pioneered and developed a unique approach to Grid-computing. It relies on the dynamic establishment of virtual grids on which application services are instantiated. The approach and its associated middleware, called In-VIGO, were conceived to enable computational science to take place In Virtual Information Grid Organizations. Having its first version deployed on July of 2003, In-VIGO middleware is currently used by scientists from various disciplines, a noteworthy example being the computational nanoelectronics research community (http://www.nanohub.org). All components of an In-VIGO-generated virtual grid – machines, networks, applications and data – are themselves virtual and services are provided for their dynamic creation. This talk reviews the In-VIGO approach to Grid-computing and overviews the associated middleware techniques and architectures for virtualizing Grid components, using services for creation of virtual grids and automatically Grid-enabling unmodified applications. The In-VIGO implementations of virtual networks and virtual application services are discussed as examples of Grid-motivated approaches to resource virtualization and Web-service creation.

"Towards Autonomic Virtual Applications and Systems"

Grid-computing environments enable users to share non-dedicated resources that lack performance guarantees. This talk describes the design of application-centric middleware components to automatically recover from failures and dynamically adapt to grid environments with changing resource availabilities, improving fault-tolerance and performance. The key components of the application-centric approach are a global per-application execution history and an autonomic component that tracks the performance of a job on a grid resource against predictions based on the application execution history, to guide rescheduling decisions. Performance models of unmodified applications built using their execution history are used to predict failure as well as poor performance. A prototype of the proposed approach, an Autonomic Virtual Application Manager (AVAM), has been implemented in the context of In-VIGO, a grid-computing environment developed at the Advanced Computing and Information Systems (ACIS) laboratory of the University of Florida. The AVAM's effectiveness has been evaluated for applications that generate CPU-intensive jobs with relatively short execution times (ranging from tens of seconds to less than an hour) on resources with highly variable loads -- a workload generated by typical educational usage scenarios of In-VIGO-like Grid environments. A memory-based learning algorithm is used to build the performance models for CPU-intensive applications that are used to predict the need for rescheduling. Results show that In-VIGO jobs managed by the AVAM consistently meet their execution deadlines under varying load conditions and gracefully recover from unexpected failures.

Dr. José A.B. Fortes received the M.S. degree in Electrical Engineering from the Colorado State University and the Ph.D. degree in Electrical Engineering from the University of Southern California. From 1984 until 2001 he was on the faculty of Purdue University. From July 1989 through July 1990 he served at the National Science Foundation as director of the Microelectronics Systems Architecture program. In 2001 he joined the University of Florida where he is a Professor and BellSouth Eminent Scholar. At the University of Florida he founded and directs the Advanced Computing and Information Systems (ACIS) Laboratory.

José Fortes' current research interests are in the areas of distributed computing, digital government, computer architecture, and fault-tolerant computing. He has authored or coauthored over 120 technical papers. His research has been funded by the National Science Foundation, the AT&T Foundation, IBM, Intel, General Electric, the Semiconductor Research Office, the Army Research Office and the Office of Naval Research.

José Fortes is a Fellow of the Institute of Electrical and Electronics Engineers (IEEE) professional society. He was a Distinguished Visitor of the IEEE Computer Society from 1991 till 1995 and is on the Editorial Boards of the IEEE Transactions on Parallel and Distributed Systems, the ACM Journal on Emerging Technologies in Computing Systems, Cluster Computing: The Journal of Networks, Software Tools and Applications, the International Journal on Parallel Programming and the Journal of VLSI Signal Processing.