Colorado State University's
Information Science and Technology Center (ISTeC)
presents two lectures by

Tarek El-Ghazawi
Professor of Engineering and Applied Science
The George Washington University

ISTeC Distinguished Lecture
in conjunction with the
Electrical and Computer Engineering Department Seminar Series
and Computer Science Department Seminar Series

"Advances in High-Performance Computing: The Race to the Top"
February 18, 2013
Reception: 10:30 a.m.
Lecture: 11:00 – 12:00 noon
Location: Computer Science 130

Electrical and Computer Engineering Dept. and Computer Science Dept. Special Seminar
Sponsored by ISTeC

 "Making Heterogeneity a First Class Citizen"
February 18, 2013
3:00 p.m. – 4:00 p.m.
Location: Morgan Library, Room 203

Advances in High-Performance Computing: The Race to the Top

Abstract- In recent years, the world has seen an unprecedented international race for the leadership in supercomputing. Over the past decade or so, the top ranking supercomputer has been moving in circles every several months between the US, Japan and China. In addition, over almost one decade, the speed of the top supercomputer has risen four orders of magnitude and is moving rapidly to be measured in exaflops, or million trillion calculations per second, units that are not used today by industry. The secret behind this international out-of-control race is perhaps because leadership in supercomputing means technological and eventually economic leadership. This talk will provide a quick in-depth characterization to the advances in High-Performance Computing in the past 20 years. In the light of this, it will also provide some projections, future trends, and identify some of the open research issues in High-Performance Computing.

Making Heterogeneity a First Class Citizen

Abstract- In recent years, the top supercomputers in the world were built around the use of heterogeneous architectures where conventional microprocessors are accelerated using specialized ones such as gaming processors, general purpose graphics processors (GPGPUs) and field programmable gate arrays (FPGAs). Such heterogeneous systems did not only achieve unprecedented successes but also often made history. Today, Titan at ONRL, with 18,688 NVIDIA K20 GPUs, achieves 17.59 PFLOPS, i.e. nearly 18,000 trillion calculations per second. In 2008, the Road Runner at LANL, using 12960 of the Cell processor chip, built by IBM/Sony/Toshiba for the Sony PlayStation 3, reached the PetaFLOPs performance. In 2010, China was able to build, also for the first time in history, a supercomputer, Tianhe-1A, that ranked as the top supercomputer in the world. Tianhe-1A major speed boost came from 7000 NVIDIA graphical processing units (GPUs). There are, therefore, obviously substantial performance advantages for such systems. However, there are also enormous productivity and portability challenges. Developing applications for such systems requires heroic programming efforts, often using proprietary tools, and when developed for one system they are not easily portable without additional substantial effort and/or performance loss. In this talk, we examine such challenges for heterogeneous parallel computers and examine how hardware, and the software stack, can integrate heterogeneity in a seamless fashion.

Biography

Dr. Tarek El-Ghazawi (http://hpcl.seas.gwu.edu/tarek/) is director of the GW Institute for Massively Parallel Applications and Computing Technologies (IMPACT) and the NSF Industry University Center for High-Performance Reconfigurable Computing (CHREC), and oversees the GWU program in HPC. El-Ghazawi's research interests include high-performance computing, computer architectures, reconfigurable, embedded computing and computer vision. He is one of the principal co-authors of the UPC parallel programming language and the first author of the UPC book from John Wiley and Sons. El-Ghazawi has published well over 200 refereed research publications and his research has been frequently supported by Federal agencies and industry, including NSF, DARPA, DoD, and NASA to name a few. He served in many editorial roles including an Associate Editor for the IEEE Transactions on Computers, and chaired many international technical symposia. He also serves on a number of advisory boards. Professor El-Ghazawi is a Fellow of the IEEE and a Research Faculty Fellow of the IBM Center for Advanced Studies, Toronto. He is a member of the Phi Kappa Phi national honor society and an elected member of the IFIP WG10.3 and a Fulbright Senior Scholar. Professor El-Ghazawi is a recipient of the 2011 Alexander Schwarzkopf prize for technical innovation.

To arrange a meeting with the speaker, please contact Prof. H. J. Siegel at HJ@colostate.edu.

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