# ICA3PP 2012 Panel on

# Future and Challenges of Parallel and Distributed Computing

**Panel Chair:** Professor Xu Huang, *University of Canberra, Australia*

**Panelists:**

Professor Miroslaw Malek, *Humbold-Universität zu Berlin, Germany*

Professor Stephen S. Yau, *Arizona State University, USA*

Professor Koji Nakano, *Hiroshima University, Japan*

Professor Camille Coti, *University of Paris North (Paris XIII), France*

Today, both parallel and distributing computing have became ubiquitous in the forms of clouds and cyber physical systems. We have witnessed the fast developing technology fundamentally changing the balances and paradigms between cost of computing, communication and programming: At the hardware level, the essential aspect of quickly changing landscape is the difference in growth of network bandwidth, processor speed and memory access times. High speed networks are changing balance on the networking side, because port throughput is more limited by the processor speed than by the network bandwidth, as it was in the past. At the same time, the latency of the networks is fundamentally limited by the speed of light and the distance that the transferred data need to travel. On the other hand, the speed of a processor is growing faster than the access time to the memory (where the technological advances are used to increase the memory chip capacity rather than its speed). The resulting use of buffering to mask the speed differences has led to the multi-memory hierarchy in which registers, primary cache, secondary cache and main memory are typical layers with progressively lower speed but larger capacity.

This panel will discuss the exciting and promising future of parallel and distributed computing. The challenges and future development will be discussed, such as:

- *Energy* - What makes sustainable and green parallel and distributed computing?
- *Hardware* - What is the future of the hardware of parallel and distributed computing? The price of hardware plays a role as cheaper devices are better received by customers.
- *Software* - What are the challenges of software development? No matter the software development paradigm goes centralized or distributed, parallelism is still a key to performance.
- *Security* - As systems become more complex year by year, their role in everyday life gains importance as well. As a result, security and privacy have become the major concern.

Panelists will present their position statements and highlight what they identify as challenges and potential future development in parallel and distributed computing.



**Professor (Dr) Xu Huang**, *University of Canberra, Australia*

*Short Biography*

Dr Xu Huang has received the B.E. and M.E. degrees and Ph.D. in Electrical Engineering and Optical Engineering prior to 1989 and the second Ph.D. in Experimental Physics in the

University of New South Wales, Australia in 1992. He has earned the Graduate Certificate in Higher Education in 2004 at the University of Canberra, Australia. He has been working on the areas of the telecommunications, networking engineering, wireless communications, optical communications, and digital signal processing more than 30 years. Currently he is the Head of the Engineering at the Faculty of Information Sciences and Engineering, University of Canberra, Australia. He is the Course Conveners "Doctor of Philosophy," "Masters of Information Sciences (by research)," and "Master of Engineering." He has been a senior member of IEEE in Electronics and in Computer Society since 1989 and a Fellow of Institution of Engineering Australian (FIEAust), Chartered Professional Engineering (CPEng), a Member of Australian Institute of Physics. He is a member of the Executive Committee of the Australian and New Zealand Association for Engineering Education, a member of Committee of the Institution of Engineering Australia at Canberra Branch. Professor Huang has published about two hundred papers in high level of the IEEE and other Journals and international conference; he has been awarded 9 patents in Australia.

**Professor Miroslaw Malek,** *Humbold-Universität zu Berlin, Germany*

*Short Biography*

Miroslaw Malek is professor and holder of Chair in Computer Architecture and Communication at the Department of Computer Science at Humboldt University in Berlin. His research interests focus on dependable architectures and services in parallel, cloud, distributed and embedded computing environments including failure prediction, dependable architectures and service availability. He has participated in two pioneering parallel computer projects, contributed to the theory and practice of parallel network design, developed the comparison-based method for system diagnosis, co-developed comprehensive WSI and networks testing techniques, proposed the consensus-based framework for responsive (fault-tolerant, real-time) computer systems design and has made numerous other contributions, reflected in over 200 publications and nine books.

He has supervised 26 Ph.D. dissertations and three habilitations (ten of his students are professors) and founded, organized and co-organized numerous workshops and conferences. He served and serves on editorial boards of several journals and is consultant to government and companies on technical and strategic issues in information technology. Malek received his PhD in Computer Science from the Technical University of Wroclaw in Poland, spent 17 years as professor at the University of Texas at Austin and was also, among others, visiting professor at Stanford, Universita di Roma "La Sapienza", Politecnico di Milano, Keio University, Technical University in Vienna, New York University, Chinese University of Hong Kong, and guest researcher at Bell Laboratories and IBM T.J. Watson Research Center.

**Professor Stephen S. Yau,** *Arizona State University, USA*

*Short Biography*

Stephen S. Yau is currently professor of computer science and engineering at Arizona State University (ASU), Tempe. He served as the chair of the Department of Computer Science and Engineering at ASU in 1994-2001. Previously, he was on the faculty of Northwestern University, Evanston, Illinois and the University of Florida, Gainesville. He received the Ph.D. degree in electrical engineering

from University of Illinois at Urbana.

He served as the president of the Computer Society of the Institute of Electrical and Electronics Engineers (IEEE) and American Federation of Information-Processing Societies. He also served as the editor-in-chief of COMPUTER magazine of the IEEE Computer Society.

His current research interests are in cyber security, ubiquitous computing, distributed computing systems, service-based systems and software engineering. He has received many awards and recognition for his accomplishments, including the Tsutomu Kanai Award and Richard E. Merwin Award of the IEEE Computer Society, the IEEE Centennial and Third Millennium Medals, and the Louis E. Levy Medal of the Franklin Institute. He is a Fellow of the IEEE and the American Association for the Advancement of Science.

**Professor Koji Nakano,** *Hiroshima University, Japan*

*Short Biography*

Koji Nakano received the BE, ME and Ph.D degrees from Department of Computer Science, Osaka University, Japan in 1987, 1989, and 1992 respectively. In 1992-1995, he was a Research Scientist at Advanced Research Laboratory. Hitachi Ltd. In 1995, he joined Department of Electrical and Computer Engineering, Nagoya Institute of Technology. In 2001, he moved to School of Information Science, Japan Advanced Institute of Science and Technology, where he was an associate professor. He has been a full professor at School of Engineering, Hiroshima University from 2003. He has published extensively in journals, conference proceedings, and book chapters. He served on the editorial board of journals including IEEE Transactions on Parallel and Distributed Systems, IEICE Transactions on Information and Systems, and International Journal of Foundations on Computer Science. He has also guest-edited several special issues including IEEE TPDS Special issue on Wireless Networks and Mobile Computing, IJFCS special issue on Graph Algorithms and Applications, and IEICE Transactions special issue on Foundations of Computer Science. He has organized conferences and workshops including International Conference on Networking and Computing, International Conference on Parallel and Distributed Computing, Applications and Technologies, IPDPS Workshop on Advances in Parallel and Distributed Computational Models, and ICPP Workshop on Wireless Networks and Mobile Computing. His research interests include image processing, hardware algorithms, GPU-based computing, FPGA-based reconfigurable computing, parallel computing, algorithms and architectures.

**Professor Camille Coti,** *University of Paris North (Paris XIII), France*

*Short Biography*

Camille Coti graduated with a MSc in telecommunications (majoring in parallel and distributed computing) from Telecom SudParis and a PhD in computer science from University of Paris South. She made several visits to the Innovative Computing Laboratory at the University of Tennessee, Knoxville, totalizing 22 months in Knoxville. Then she worked as a post-doctoral

research associate    at Iowa State University. She is now an Assistant Professor at the University of Paris North (Paris XIII). She works on parallel computing on hierarchical memory and highly-distributed systems. Her interests include parallel algorithms, run-time environments and distributed computing on volatile environments.