Virtualization of Computing Resources in Dynamically Reconfigurable Systems for Stream-Processing Applications

Dr. Lev Kirischian

Time: 1:00-2:00 pm, March 24, 2011
Location: ENG-101

Abstract

The recent trend in computing systems was constant increase of their performance and re-orientation towards data-stream processing. However, reduction of dimensions of CMOS transistors made speed of light and power dissipation two main barriers for further utilization of the sequential data processing paradigm. Instead, different aspects of parallelism have been utilized for reaching better performance and cost-efficiency. One of the most promising computing paradigms for different classes of embedded applications became the re-configurable computing. The reconfigurable computing systems (RCS) have shown their greatest benefits for parallel data-stream processing in multimedia, DSP, video/image processing, cryptography, high-speed process control, RF digital communication and broadcasting and in many other sectors of high-tech industry.

This talk will focus on major conceptual aspects of the next generation of “brain type” computer systems – dynamically reconfigurable computers. Virtualization of computing resources similar to virtualization of memory resources in RISC processors became the most powerful instrument for dramatic increase of performance and cost-efficiency of reconfigurable computing platforms. It will be shown how the above virtualization allows run-time adaptation of computer architecture to the multi-task and multi-modal workload, self-healing and run-time recovery from hardware faults as well as dramatic reduction of the design time.

Biography of Speaker

Lev Kirischian received the BEng. and MASc. degrees in electrical engineering from Moscow Institute of Aviation Technology (MAI), Moscow, USSR, in 1976 and 1978 respectively. He received the PhD. degree in computer engineering from Moscow Power Engineering Institute (MPEI), Moscow, USSR, in 1985. He was a member of R&D group developed the first generation of reconfigurable computers for high-level control of nuclear power plants: PS-300 in 1979, PS-2000 in 1982 and PS-3000 in 1984 as well as adaptive control system M64 for low-level control of power plants based on WWR1000 nuclear reactors. He was a project leader in the R&D group
developed the first in North America DAB transmitters in 1997-98 (better known as XM Satellite Radio and Digital Sirius Radio).

Lev Kirischian joined the Department of Electrical and Computer Engineering, Ryerson University in 1998. In 1999 he has established the Embedded Reconfigurable Systems Laboratory (ERSL) for research on dynamically reconfigurable computing platforms. During the last decade the ERL conducted collaborative research projects for different world-leading corporations: MDA Space Missions, ATI-Technologies, UBS Ltd., Alanson International and other. The research projects have been sponsored by NSERC, OCE (Ontario Centres of Excellence), MMO (Material Manufacturing of Ontario), CCIT (Centre of Communication and Information Technology), CMC (Canadian Microelectronic Corporation), Xilinx Corp., Altera and other. Results of the research projects have been used in Phoenix MET, Canada’s contribution to the NASA JPL mission to Mars in 2008, Hubble Space Telescope Robotic Servicing Mission as well as CanadArm robotic program. The concepts and prototypes have been used in development of recent DVB-S/H (Digital Video Broadcasting – Satellite-to-Handheld devices) technology as well as novel immersive stereo-panoramic tele-presence systems. In addition to this, Lev Kirischian is author and co-author of 4 books and manuals, over than 100 papers in technical journals, conferences and workshops. He is serving as a regular reviewer for grant agencies including NSERC Discovery, SPG and CRD programs as well as international journals associated with reconfigurable computing. Lev Kirischian is Professional Engineer of Ontario and Member of IEEE.