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Title: High-Performance Software Development Challenges in the Post-Moore Era



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Abstract: The end of Moore's Law scaling for VLSI technology implies that significant performance increases for future generations of processors cannot derive from increased transistor counts. Instead, hardware customization and more efficient use of hardware resources are expected to be the primary means of performance improvement. Hence, the already challenging task of application software development will get even harder. Advances in software infrastructure such as compilers will be crucial to assist application developers achieve high-performance without loss of productivity and portability.

A very fundamental challenge faced by compilers is data-locality optimization. The cost of data movement far exceeds the cost of performing arithmetic/logic operations on current processors, both in terms of energy as well as execution time. But while the computational complexity of most practically used algorithms is quite well understood, the same is not true of data-movement complexity. There is a need to develop new abstractions and methodologies, and create tools for characterization and optimization of data movement. This talk will discuss challenges and some promising directions in the quest to achieve the three desirables of performance, productivity, and portability in the development of high-performance software.