



## APPLICATION-SPECIFIC ENERGY MODELING OF MULTI-CORE PROCESSORS

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**ABSTRACT:** Recent developments of high-end processors recognize energy monitoring and tuning as one of the main challenges towards achieving higher performance given the growing power and temperature constraints. Our thermal energy model is based on application-specific parameters such as consumed power, execution time, and equilibrium temperature as well as hardware-specific parameters such as half time for thermal rise or fall. As observed with the out-of-band instrumentation and monitoring infrastructure on our experimental cluster with air cooling, the temperature changes follow a relatively slow capacitor-style charge-discharge process. Therefore, we use the lumped thermal model that initiates an exponential process whenever there is a change in processor's power consumption. Experiments with two codes – Firestarter and Nekbone – validate our approach and demonstrate its use for analyzing and potentially improving the application-specific balance between temperature, power, and performance.

**BIOGRAPHY:** An active IEEE Computer Society (CS) volunteer since the mid-1990s, Vladimir Getov is professor of distributed and high-performance computing, research group leader, and postgraduate program director at the University of Westminster, London. He is a member of the IEEE CS Board of Governors (2016–2018), and a member-at-large of both the Publications Board and the Technical and Conference Activities Board. Getov has been Computer's area editor for high-performance computing since 2008 and has served as general and program chair of several IEEE conferences. He is also Standing Committee member and co-chair of publications for IEEE COMPSAC as well as Executive Committee member of the IEEE CS Technical Consortium on High-Performance Computing while also contributing as an active member of the IEEE International Roadmap for Devices and Systems and several other boards and committees. His main research interests include Performance Analysis and Evaluation, Energy Efficient Computing, Parallel and Distributed Computer Architectures, Cloud and Services Computing, Component-oriented Design, Extreme-scale Computer Systems, Autonomous Computing, Message-passing Environments, and Hybrid Programming Models and Paradigms. Vladimir Getov is currently nominated as a Second Vice-President of IEEE CS in the forthcoming 2017 IEEE elections.