



Conference Abstract

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Competing Interest

The authors declare no competing interests.

Additional information is available at the end of the article.

Conference Abstract

ENERGY CONSUMPTION AND MODERN COMPUTING PLATFORMS: A MATCH MADE IN HEAVEN?

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Abstract

The energy efficiency in ICT is becoming a grand technological challenge and is now a first-class design constraint in all computing settings. Accurate energy measurement during an application execution is essential to application-level energy optimization. Energy predictive modelling based on performance monitoring counters (PMCs) or model-based software sensors is the leading method for achieving application-level energy efficiency. In our research, we found that state-of-the-art methods provide highly inaccurate energy profiles. The average error using on-chip hardware sensors can be about 73% (maximum error, 300%). The average error of state-of-the-art models-based software sensors ranges from 14% to 32% (maximum error, 100%). Our research in applications' energy efficiency shows that using inaccurate profiles obtained from existing tools for optimisation can result in up to 84% energy loss (even for highly optimized scientific applications).

Moreover, a sound theoretical framework to understand the fundamental significance of the PMCs to the energy consumption and the causes of the inaccuracy of the models is lacking. We proposed a small but insightful theory of energy predictive models of computing, which formalizes both the assumptions behind the existing PMC-based energy predictive models and properties, heretofore unconsidered, that are basic implications of the universal energy conservation law.

Using our recently developed methods, we can construct accurate and reliable software energy sensors, providing accurate energy profiles. The proposed solution is built using solid research work and published in top journals such as Applied Energy, IEEE TPDS, IEEE TC, JPDC, IEEE Access, Energies, and CCPE. Our

methods employ performance monitoring counters, selected using our theory of energy predictive models of computing.

The presentation aims to provide insights and methodologies on the accurate, reliable, and efficient energy sensors, which can be used for improving the application's energy efficiency in modern computing platforms

Key words: Energy, Consumption. Heaven



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