

Dissertation release

17.4.2018

Can power hungry data centers meet energy efficiency goals?

Title of the dissertation	Energy Measurement and Modeling in High Performance Computing with Intel's RAPL
Contents of the dissertation	<p>The goal of achieving exaflops computation by 2020 set by the high performance computing (HPC) community and the rapid growth in data generated and analyzed in the scientific computing paradigm have paved the way for an unprecedented increase in the number of server systems in data centers. These big numbers of power hungry servers have increased the energy demand of data centers and, as a result, energy efficiency in HPC, scientific computing, and cloud computing is now a big concern.</p> <p>This thesis has extensively studied the energy efficiency of such computing environments using the RAPL energy measurement functionality available in new Intel processors. This dissertation has proposed different strategies for modeling power consumption, analyzed data center energy efficiency through history logs, and performed comprehensive analysis of RAPL to identify its pros and cons. This thesis also presents observations on RAPL use in cloud environments, specifically on Amazon EC2. The results obtained in this thesis can be applied in wider scenarios in data center based computing systems to improve the overall energy efficiency. The particular focus of the work has been the scientific computations for the particle physics analysis at CERN (European Organization for Nuclear Research).</p>
Field of the dissertation	Computer Science
Doctoral candidate	Kashif Nizam Khan, M.Sc. (Tech.) Born in Khulna, Bangladesh, 1984
Time of the defence	27.4.2018 at 12 noon
Place of the defence	Aalto University School of Science, lecture hall T2, Konemiehentie 2, Espoo
Opponent	Professor Jussi Kangasharju, University of Helsinki, Finland
Custos	Professor Antti Ylä-Jääski, Aalto University School of Science, Department of Computer Science
Electronic dissertation	http://urn.fi/URN:ISBN:978-952-60-7892-2
Doctoral candidate's contact information	Kashif Nizam Khan, Department of Computer Science, Aalto University School of Science, kashif.khan@aalto.fi , +358504487044