ENERGY-EFFICIENT CPU FREQUENCY CONTROL FOR THE LINUX SYSTEM

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Concurrency and Computation: Practice & Experience;
tom 28;
numer 2;
strony 420-438;
2016;
John Wiley & Sons, Inc

Efficiency of energy usage in computing systems improves, however, still not at the rate matching the climbing demand for computing capacity. To address this urging problem, computing elements of the latest generation, that is, CPUs/graphics processing units, memory units, and network interface cards, have been designed to operate in multiple modes with differentiated energy consumption levels. Mode switching and high-frequency performance monitoring functions have also been exposed by co-designed abstract programming interfaces. The challenge of energy-efficient computing is to develop hardware control mechanisms taking advantage of the new capabilities. This paper aims at giving an insight into the structure of optimal energy-aware CPU frequency scaling rules. It gives a characterization of solutions to the optimal control problem of energy-efficient real-time packet inspection performed by a Linux server. A class of CPU frequency switching rules, exploiting dynamic voltage and frequency scaling mechanisms, is constructed based on experimentally identified model of server operations. The control rules are demonstrated to outperform the default CPU frequency scaling governor for the Linux kernel, both in terms of achievable power savings and service
quality.

Słowa kluczowe: -

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