

On the Interplay Between Throughput, Fairness and Energy Efficiency on Asymmetric Multicore Processors

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Abstract

Asymmetric single-ISA multicore processors (AMPs), which integrate high-performance big cores and low-power small cores, were shown to deliver higher performance per watt than symmetric multicores. Previous work has highlighted that this potential of AMP systems can be realizable by scheduling the various applications in a workload on the most appropriate core type. A number of scheduling schemes have been proposed to accomplish different goals, such as system throughput optimization, enforcing fairness or reducing energy consumption. While the interrelationship between throughput and fairness on AMPs has been comprehensively studied, the impact that optimizing energy efficiency has on the other two aspects is still unclear. To fill this gap, we carry out a comprehensive analytical and experimental study that illustrates the interplay between throughput, fairness and energy efficiency on AMPs. Our analytical study allowed us to define the *energy-efficiency factor* (EEF) metric, which aids the OS scheduler in identifying which applications are more suitable for running on the various cores to ensure a good balance between performance and energy consumption. We propose two energy-aware OS-level schedulers that leverage the EEF metric; the first one strives to optimize the energy-delay product and the second scheduler can be configured to optimize different metrics on the AMP. To demonstrate the effectiveness of these proposals, we performed

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