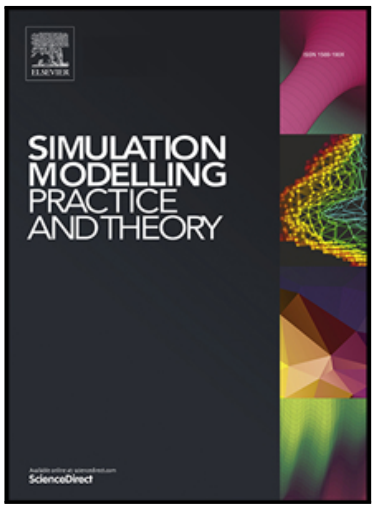


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# The Impact of Workload Variability on the Energy Efficiency of Large-Scale Heterogeneous Distributed Systems

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**Abstract**

Previous studies have shown that the workload variability has a serious impact on the performance of large-scale distributed architectures, since it may cause significant fluctuations in service demands. Energy efficiency is one of the aspects of such platforms that are of paramount importance and therefore it is imperative to investigate how it may also be affected by this factor. Towards this direction, in this paper we investigate via simulation the impact of workload variability, in terms of computational volume and interarrival times, on the energy consumption of a large-scale heterogeneous distributed system. The workload consists of real-time bag-of-tasks jobs that arrive dynamically at the system. The execution rate and power consumption characteristics of the processors are modeled after real-world processors, according to the Standard Performance Evaluation Corporation (SPEC) Power benchmark. Four heuristics are employed for the scheduling of the workload, two commonly used baseline policies and two proposed energy-aware heuristics. The simulation results reveal that the workload variability has a significant impact on the energy consumption of the system and that the severity of the impact depends on the employed scheduling technique.

*Keywords:* Energy Efficiency, Workload Variability, Large-Scale Distributed

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