

# Energy-Aware Lease Scheduling in Virtualized Data Centers

N. Q. Hung<sup>1</sup>, N. Thoai<sup>2</sup>, and N. T. Son<sup>3</sup>

**Abstract:** Energy-efficiency becomes an important metric in virtualized data centers. In this work, we discuss on energy-efficient computational resource provision in teaching and researching needs by applying lease-based model proposed by B. Sotomayor (2010). We also propose several heuristic-based scheduling algorithms in mapping user lease, which includes set of identical virtual machines, on physical resources in a single administrative site, which includes set of homogeneous physical hosts. In contrast to current works, instead of only concerns on single dimension (e.g. only energy consumption, or only performance), our scheduling algorithms concern on trade-off energy-performance. In our energy model, energy is total energy consumption in computing servers, and is estimated by linear model, which is presented by X. Fan et al. (2007) and re-stated by A. Beloglazov et al. (2010), and performance measures in waiting-time, or available resources on time for advanced reservation requests. Using simulated evaluation, our scheduling algorithms reduce significant total energy consumption than non power-aware scheduling algorithm. For example, in case of extracted 30-day workload from San Diego Supercomputer Center (SDSC) Blue Horizon log, our scheduling algorithms decrease 19-percent in energy if each physical host is 16-core CPU. We also discuss on using migration policy in scheduler to save energy by (1) preempting of all leases on any physical host which has resource utilization (e.g. CPU) below a low-threshold, (2) bringing these hosts to energy-saving state (e.g. standby, or turning off) and (3) rescheduling migrated leases into suitable hosts. We draw on effect of these various low-thresholds on total energy consumption.

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<sup>1,2,3</sup> Faculty of Computer Science and Engineering  
Vietnam National University of Ho Chi Minh City  
Ho Chi Minh City University of Technology  
268 Ly Thuong Kiet Street, District 10, Ho Chi Minh City, Vietnam  
{*hungnq2, nam, sonsys*}@cse.hcmut.edu.vn