This paper deals with the design of application-specific energy-aware CPU frequency scaling mechanisms. The proposed customized CPU controllers may optimize performance of data centers in which diverse tasks are allocated to servers with different characteristics. First, it is demonstrated that server power usage can be accurately estimated based on the measurements of CPU power consumption read from the model specific registers (MSRs). Next, a benchmarking methodology derived from the RFC2544 specification is proposed that allows to identify models of CPU workload dynamics. Finally, it is demonstrated how the identified models can be
applied in the design of customized energy-aware controllers that dynamically adjust CPU frequency to the application-specific workload patterns. According to the results of experimental studies the customized controllers may outperform standard general-purpose governors of the Linux kernel both in terms of reachable server performance and power saving capabilities.

**Słowa kluczowe:** Green computing; DVFS; Data centers; Optimal control; System identification; Linux

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