Reducing energy bill of data center via flexible partial execution

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ABSTRACT
Several Demand Response (DR) strategies are emerged recently to modulate the workloads of Data Center (DC) and shave the corresponding energy bill. However, since most of these DR strategies will result in the increase of latency, they can only be used for modulating the elastic workloads, which are delay-tolerant. To improve the flexibility of workload modulation and reduction of energy bill, we propose flexible partial execution for DC, which can be used to handle inelastic workloads. Further, to incentivize users of DC grant flexible partial execution of their workloads, we offer them time-varying price discount, on top of commonly-applied usage-based pricing policy. With real-world data traces, the results show that a DC with our proposed flexible partial execution can shave its peak power consumption and energy bill by 30.9%30.9% and 20.8%20.8% while improving its profit by 18.8%18.8% when comparing against the one with rigid partial execution, i.e., a fixed percentage of requests/workloads can be partially executed, which is commonly employed by today's DCs.

KEYWORD
Demand response (DR); Data center (DC); Flexible partial execution; Time-variying price discount

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