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iBrownout: An Integrated Approach for Managing Energy and Brownout in Container-based Clouds

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Abstract:

Energy consumption of Cloud data centers has been a major concern of many researchers, and one of the reasons for huge energy consumption of Clouds lies in the inefficient utilization of computing resources. Besides energy consumption, another challenge of data centers is the unexpected loads, which leads to the overloads and performance degradation. Compared with VM consolidation and Dynamic Voltage Frequency Scaling that cannot function well when the whole data center is overloaded, brownout has shown to be a promising technique to handle both overloads and energy consumption through dynamically deactivating application optional components, which are also identified as containers/microservices. In this work, we propose an integrated approach to manage energy consumption and brownout in container-based cloud data centers. We also evaluate our proposed scheduling policies with real traces in a prototype system. The results show that our approach reduces about 40%, 20% and 10% energy than the approach without power-saving techniques, brownout-overbooking approach and auto-scaling approach respectively while ensuring Quality of Service.

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