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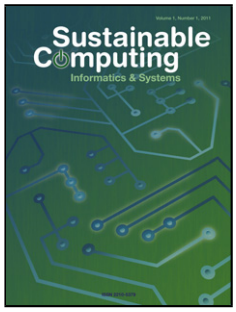

Title: Cloud-SEnergy: A Bin-Packing Based Multi-Cloud Service Broker for Energy Efficient Composition and Execution of Data-intensive Applications

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PII: S2210-5379(18)30039-8
DOI: https://doi.org/doi:10.1016/j.suscom.2018.05.011
Reference: SUSCOM 251

To appear in:

Received date: 31-1-2018
Revised date: 14-4-2018
Accepted date: 21-5-2018

Please cite this article as: Thar Baker, Bandar Aldawsari, Muhammad Asim, Hissam Tawfik, Zakaria Maamar, Rajkumar Buyya, Cloud-SEnergy: A Bin-Packing Based Multi-Cloud Service Broker for Energy Efficient Composition and Execution of Data-intensive Applications, *<![CDATA[Sustainable Computing: Informatics and Systems]]>* (2018), https://doi.org/10.1016/j.suscom.2018.05.011

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Cloud-SEnergy: A Bin-Packing Based Multi-Cloud Service Broker for Energy Efficient Composition and Execution of Data-intensive Applications

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Abstract

The over-reliance of today's world on Information and Communication Technologies (ICT) has led to an exponential increase in data production, network traffic, and energy consumption. To mitigate the ecological impact of this increase on the environment, a major challenge that this paper tackles is how to best select the most energy efficient services from cross-continental competing cloud-based datacenters. This selection is addressed by our Cloud-SEnergy, a system that uses a bin-packing technique to generate the most efficient service composition plans. Experiments were conducted to compare Cloud-SEnergy's efficiency with 5 established techniques in multi-cloud environments (All clouds, Base cloud, Smart cloud, COM2, and DC-Cloud). The results gained from the experiments demonstrate a superior performance of Cloud-SEnergy which ranged from an average energy consumption reduction of 4.3% when compared to Based Cloud technique, to an average reduction of 43.3% when compared to All Clouds technique. Furthermore, the percentage reduction in the number of examined services achieved by Cloud-SEnergy ranged from 50% when compared to Smart Cloud and average of 82.4% when compared to Base Cloud. In term of run-time, Cloud-SEnergy resulted in average reduction which ranged from 8.5% when compared to DC-Cloud, to 28.2% run-time reduction when compared to All Clouds.

Keywords: Multi-cloud; Bin-packing; Service composition; Energy efficiency; Data-intensive application

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