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On The Fundamental Energy Trade-offs of Geographical Load Balancing

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Abstract: Geographical load balancing can optimize the utilization of green energy and the cost of electricity by taking advantage of greenness and price diversities at geographically dispersed data centers. However, higher green energy utilization or lower electricity cost may actually increase the total energy consumption, and is not necessarily the best option. The achievable energy trade-offs can be captured by taking into consideration a defined service efficiency parameter for geo-dispersed data centers.

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Introduction

The demand for online services including web search, online gaming, distributed file systems such as Google File System (GFS), and distributed storage systems such as BigTable and MapReduce is growing exponentially. This explosion of data has led to a multitude of challenges in data center networks (DCNs) from DCN architecture design, congestion notification, TCP Incast, virtual machine migration, to routing in DCNs [1].

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