

Power Management of Online Data-Intensive Services

David Meisner
University of Michigan

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Abstract

Energy consumption of data centers has risen to be a fundamental challenge. In the U.S., electricity consumption of data centers accounts for roughly 2 percent of national use and globally this consumption may be growing even more rapidly. The scale of this consumption imposes a large economic burden on companies and its CO2 footprint has a meaningful impact on the environment. Accordingly data center energy efficiency has quickly become a first-class design consideration and computer system designers have been tasked with engineering more efficient solutions.

Much of data center energy consumption is wasted in under-utilized systems: in typical deployments, server utilization is below 30%, but servers still consume 40-60% of their peak power draw at these levels. This waste stems from a lack of energy proportionality in modern server system. In this talk I will discuss what, if anything, can be done to make these systems more energy-proportional. I will present our study of Google web search as an example of the challenges of power management for Internet-scale services. This study exposes the fundamental difficulty of engineering energy proportional systems while still answering web search queries at the speed expected in modern Internet services.

Faculty Host: Ricardo Bianchini and Thu D. Nguyen