Energy Management and System Analytics in Virtualized Data Centers

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CoRE A (Room 301)

Abstract

Enterprise data centers embrace virtualization and cloud computing due to their dramatic benefits for simplifying and streamlining system provisioning and management, as well as to improve infrastructure energy and resource-use efficiency via consolidation and dynamic, distributed resource management. However, new challenges emerge with the increasing dynamism and scale in these environments. First, existing platform power management techniques remain too sluggish to effectively respond to fine-grain variations in resource demand. Second, traditional systems management operations, such as monitoring, security and compliance scans, become increasingly brittle in matching the ephemeral nature and the scale of computation, resulting in increasing risk and operational cost.

In this talk, I present two approaches that aim to address these challenges in a fundamentally-different way. First, I describe an agile, efficient distributed power management framework for virtualized systems that builds and leverages low-latency server power states. Our real-system prototypes demonstrate the dramatically-favorable power-performance trade-offs achievable with this approach. Our solution achieves comparable overheads as base resource management in virtualized systems, and thus, can benefit from the same level of adoption, while delivering close to energy-proportional power efficiency. Second, I present a new way of managing data centers that is based on two key principles: (1) treating systems as data; and (2) touchless, out-of-band management of virtualized systems. I show that our nonintrusive, out-of-band system analysis technology can approach the fidelity of traditional agent-based solutions, while surpassing those in capabilities, providing always-on and out-of-the-box management in the cloud. Based on this foundation, I discuss how systems can be viewed as documents, enabling the use of data mining and ad-hoc analytics techniques in data center operations.
Bio

Canturk Isci is a Research Staff Member in the Scalable Data Center Analytics Group at IBM T.J. Watson Research Center. His research interests include virtualization, data center energy and thermal management, microarchitectural and system-level techniques for energy-efficient and adaptive computing. Prior to joining IBM Research, Canturk was a Senior Member of Technical Staff at VMware, where he worked on distributed resource and power management, performance and scalability of virtualized systems. He is the recipient of a best paper award in ICAC 2011, best research poster in VMworld 2008 and academic fellowships from British Council, Princeton and Bilkent University. He currently serves as the industry chair in the IEEE Computer Society, Special Technical Community on Sustainable Computing. Canturk has a B.S. in Electrical Engineering from Bilkent University, an M.Sc. with Distinction in VLSI System Design from University of Westminster, and a Ph.D. in Electrical Engineering from Princeton University.

A brief overview of my recent research can be found here: http://www.canturkisci.com/ETC/MYresearch.html

Faculty Host: Abhishek Bhattacharjee