ECE Distinguished Seminar

Thermal Time Shifting: Leveraging Phase Change Materials to Reduce Cooling Costs in Warehouse-scale Computers

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Abstract

Datacenters are rapidly increasing in size and power consumption. However, this growth comes at the cost of an increasing thermal load that must be removed to prevent overheating and server failure. In this talk, we'll look at the use of phase changing materials (PCM) to shape the thermal load of a datacenter, absorbing and releasing heat when it is advantageous to do so. This presents two important opportunities for cost savings. First, in a datacenter with full cooling system subscription, PCM can reduce the necessary cooling system size by up to 12% without impacting peak throughput. Alternatively, we can increase the number of servers by up to 14.6% without increasing the cooling load. In a thermally constrained setting, PCM can increase peak throughput up to 69% while delaying the onset of thermal limits by over 3 hours.

Biography

Dean Tullsen is a professor in the computer science and engineering department at UCSD. He received his PhD from the University of Washington in 1996, where he worked on simultaneous multithreading (hyper-threading). He has continued to work in the area of computer architecture and back-end compilation, where with various co-authors he has introduced many new ideas to the research community, including threaded multipath execution, symbiotic job scheduling for multithreaded processors, dynamic critical path prediction, speculative precomputation, heterogeneous multi-core architectures, conjoined core architectures, event-driven simultaneous code optimization, and data triggered threads. He is a Fellow of the ACM and the IEEE. He has twice won the Influential ISCA Paper Award. He is chair of the IEEE Technical Committee on Computer Architecture.