- **David Meisner**
  - **Title:** PowerNap, CAP, and the future of energy-efficient servers
  - **Abstract:** Data center power consumption is growing to unprecedented levels: the EPA estimates U.S. data centers will con- sume 100 billion kilowatt hours annually by 2011. Much of this energy is wasted in idle systems: in typical deployments, server utilization is below 30%, but idle servers still consume 60% of their peak power draw. Typical idle periods—though frequent—last seconds or less, confounding simple energy-conservation approaches.

    In this talk, I will discuss PowerNap, an energy-conservation approach where the entire system transitions rapidly be- tween a high-performance active state and a near-zero- power idle state in response to instantaneous load. Rather than requiring fine-grained power-performance states and complex load-proportional operation from each system com- ponent, PowerNap instead calls for minimizing idle power and transition time, which are simpler optimization goals. Based on the PowerNap concept, we develop requirements and outline mechanisms to eliminate idle power waste in enterprise blade servers.

    Unfortunately, finding idle periods become increasingly difficult as the number of cores per server increases. To combat this trend, I will introduce Concurrency-Aware PowerNap (CAP), a new approach for request batching, designed for latency-sensitive data center applications, that transforms core-grain idleness to idle time usable for socket-grain and full-system idle power modes. CAP is based on two key concepts: (1) stall execution and nap anytime any core is unoccupied, but (2) constrain the maximum time any request may be stalled. Unlike prior batching approaches, CAP will preempt execution to enter the nap state, maximizing time spent at the systems' most efficient operating point.

    Finally, because PowerNap and CAP operates in low-efficiency regions of current server power supplies, I will introduce the Redundant Array for Inexpensive Load Sharing (RAILS), a power provisioning approach that provides high conversion efficiency across the entire range of PowerNap's power demands.
  - **Bio:** David Meisner is a Ph.D. candidate in the Advanced Computer Architecture Laboratory (ACAL) at the University of Michigan. His research interests include energy-efficient server design, data center architectures, and performance modeling. He received his Sc.B. from Brown University and M.S.E from University of Michigan.