Abstract:
Power consumption of datacenters continues to pose serious economic, societal and environmental concerns. A large datacenter spends millions of dollars in yearly operational expenditures (op-ex) paying its electricity bills. An even larger capital expenditure (cap-ex) goes into provisioning the power delivery network, to accommodate the peak power draw, even if this draw is never or rarely sustained. With consumers demanding more for less, extracting the maximum value out of every provisioned and consumed watt in these datacenters is critical to profitability and sustenance.

In this talk, we will focus on leveraging energy storage such as batteries, ultra-capacitors, flywheels, and even compressed air based energy storage device to reduce cap-ex and op-ex costs. Specifically, we will discuss the challenges and issues in provisioning and harnessing these devices for enhancing datacenter power demand response capabilities. First, we will look at our modeling and optimization framework to figure out which devices to use, where to place them and how much capacity to provision given different cost-benefit trade-offs. Then, we will explore the problem from a practical setting, and discuss system software support for virtualizing datacenter power distribution hierarchy. Finally, datacenter power demand characterization and analysis for these studies will be presented.

Bio:
Di Wang is currently a Ph.D. candidate, advised by Prof. Anand Sivasubramanian, in the Computer Science and Engineering department at Penn State University. He received B.E. in computer science and technology from Zhejiang University of China in 2005 and M.S. in computer systems engineering from the Technical University of Denmark in 2008. He worked for Teklatych (an EDA startup company in Copenhagen) as an R&D engineer in 2008, and interned at IBM Almaden research center in the summer of 2011 as well as Microsoft Research in the summers of 2012 and 2013.

His research interests span the areas of computer systems, computer architecture, VLSI design, software-hardware interface, energy-efficient systems design and sustainable computing. Specifically, he has applied his expertise on these topics to the areas of datacenters, storage systems, fault tolerant systems and electronics design automation tools.

In recognition of his work, he received two Best Paper Awards and one Best Paper nomination. He also won the Best Graduate Research Assistant award at Penn State. His work has also been featured in CACM news and was chosen as IEEE sustainable computing register's pick of the month. He has published in the best of venues (http://www.cse.psu.edu/~diw5108/publication.html).