北京大学高能效计算与应用中心学术报告

Invited Talk, Center for Energy-Efficient Computing and Applications

RESTRUCTURING SYSTEM SOFTWARE FOR ENERGY EFFICIENCY

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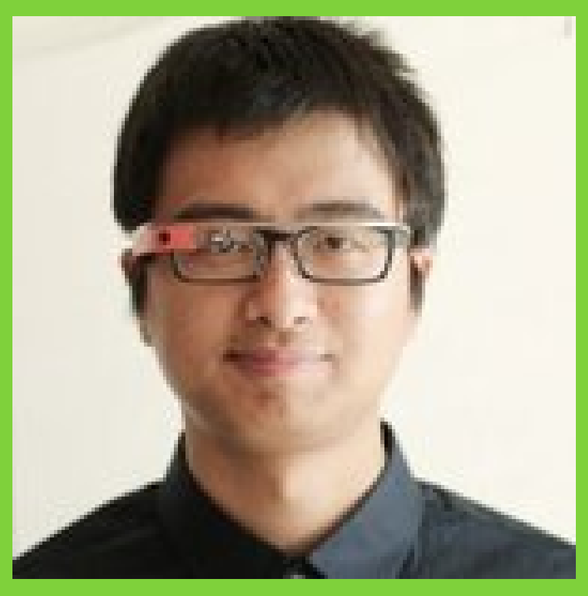
Electrical and Computer Engineering

Purdue University

2014年12月16日 星期二 10:00am

理科五号楼410会议室



ABSTRACT: In response to the power and thermal wall, computer hardware is evolving towards high heterogeneity, loose coupling, and fine granularity. The resulting architectures, while having the potential for high energy efficiency, are complex and challenge multiple fundamental assumptions made by today's system software. We argue that system software should actively embrace the new architectural features; in doing so, it should be restructured, instead of being reinvented. To illustrate the principle, we outline our recent efforts on personal computing systems. For handheld devices, we constructed novel system software 1) to hide memory incoherence from app developers and 2) to remove the burden of power management from device driver developers. For emerging wearable devices, we enable one OS to be vertically specialized for multiple types of workloads while remaining source-compatible with handheld systems. Overall, our experiences demonstrate the viability of our approach for harvesting energy efficiency with reasonable engineering efforts. In the talk, we will highlight our insights, explain the designs, and share the experiences in software hacking. At the end, we will briefly talk about the exciting computer systems research at Purdue ECE.

BIOGRAPHY: Felix Xiaozhu Lin recently joined Purdue ECE as an assistant professor. He cares about low-level software for exploiting emerging hardware features. His past work focuses on mobile and wearable systems --the early adopters of heterogeneous hardware --and strives to meet users' ever-increasing (and sometimes unreasonable) demands: lightning fast UI, always-on devices, and long-lasting battery. One of his recent projects, the K2 mobile OS, is available at www.k2os.org and won the best paper award of ASPLOS'14. He finished his PhD study at Rice University; he received BS and MS from Tsinghua University. During his PhD study, he has worked at Nokia Research Hollywood, IBM Research Austin, and Microsoft Research.