Talk Title: Energy Debugging in Smartphones

Speaker：Y. Charlie Hu
Professor of Electrical and Computer Engineering
Professor of Computer Science (by courtesy)
Purdue University

Time：March 14,2012，星期三：上午 10：00AM-11：00AM，
Place：清华大学东主楼 10 区 101

Abstract：
Despite the incredible market penetration of smartphones and exponential growth of the app market, utility of smartphones has been and will remain severely limited by the battery life. As such, energy has increasingly become the scarcest resource on smartphones that critically affects user experience. In this talk, I will start with a first study that characterizes smartphone energy bugs, or ebugs, broadly defined as an error in the system (apps, OS, hardware, firmware, or external conditions) that results in unexpected smartphone battery drainage and leads to significant user frustrations.

As a first step towards taming ebugs, we built the first fine-grained energy profiler, eprof, that performs energy accounting and hence answers the very question "where was the energy spent in the app?" at the per-routine, per-thread, and per-process granularity. Building eprof in turn requires a fine-grained, online power model which we have developed that captures the unique asynchronous power behavior of modern smartphones using a system-call-based Finite-State-Machine model. Using eprof, we dissected the energy drain of some of the most popular apps in Android Market and discovered ebugs in popular apps like Facebook.

While essential, eprof only provides a semi-automatic tool for energy debugging, as the developer has to be involved in the iterative profiling/debugging process. The “holy grail” in energy debugging in smartphones is to develop fully automatic debugging techniques and tools, which can draw synergies from many areas of computer science including architecture, compilers, PL, HCI, etc. I will present one such automatic detection technique based on static compiler analysis for detecting "no-sleep" energy bugs, the most notorious category of energy bugs found in smartphone apps.

Bio: Y. Charlie Hu is a Professor of Electrical and ComputerEngineering and Computer Science (by courtesy) and a University Faculty Scholar at PurdueUniversity. He received his Ph.D. in Computer Science from Harvard in 1997, and was a research scientist at Rice University and a co-founder of the iMimic Networking, Inc. before joining Purdue in 2002. Charlie received the NSF CAREER Award in 2003, and the 2009 Early Career Research Awardfrom Purdue College of Engineering, and was named an ACM Distinguished Member in 2010. His research interests lie broadly in distributed systems, operating systems, computer networking, wireless networking,and high performance computing.

Homepage：http://www.ece.purdue.edu/~ychu