Multi-channel Interference Management in Low-Power Wireless Networks

Guoliang Xing
Department of Computer Science and Engineering
Michigan State University

Tuesday, October 20, 2009
3:00pm Rm. 110 Purdy-Kresge Library

Abstract:
Interference is a fundamental issue in wireless networks. Due to the broadcast medium, wireless transmissions at the same or adjacent frequencies often interfere with each other resulting low network throughput. The situation is even worsened for low-power wireless networks (LWNs), such as ZigBee based sensor networks, as they only have limited bandwidth. Understanding and mitigating interference is thus critical to explore the potential of such networks. This becomes a pressing issue as LWNs are increasingly deployed for performance-sensitive applications, such as structural health monitoring and home entertainment, which impose stringent requirements on system throughput and delay.

As a promising approach to mitigating interference, nodes may work in different radio spectral sub-ranges called channels. However, commodity wireless platforms only have a small number of orthogonal channels that do not interfere with each other, which hinders the capability of multichannel protocols. In the first part of this talk, I will describe our work on multi-channel interference measurement and modeling in LWNs. We have developed empirical models for characterizing inter-channel interference and applied to both link capacity analysis and channel assignment protocols. We also proposed a novel lightweight multi-channel interference measurement algorithm. Our testbed experiments demonstrated the high accuracy of our measurement and modeling approaches and the significant benefit of using non-orthogonal channels in LWNs protocols. In the second part of this talk, I will briefly describe our projects on low-power MAC design and data fusion in sensor networks.

Biography:
Guoliang Xing is an Assistant Professor in the Department of Computer Science and Engineering at Michigan State University. He received the B.S. degree in Electrical Engineering and the M.S. degree in Computer Science from Xi'an Jiaotong University, China in 1998 and 2001, respectively. He received the Doctor of Science degree in Computer Science from Washington University in St. Louis in 2006. Prior to joining Michigan State University, he was on the faculty of Computer Science Department at the City University of Hong Kong from 2006 to 2008. He has served on the technical program committees of a number of major conferences including MobiHoc, RTSS, Infocom, and ICDCS. He has also held several workshop chair positions including Program Co-chairs of the ACM International Workshop on Heterogeneous Sensor and Actor Networks (2008) and the IEEE Workshop on Wireless Ad hoc and Sensor Networks (2008 and 2009). His research interests include Low-power Wireless and Sensor Networks, Cyber-physical Systems, and Mobile Computing. More information can be found on his homepage at http://www.cse.msu.edu/~glxing/.