Wireless Coexistence in Open Radio Spectrum: Curses and Blessings
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Abstract: The human world is replete with wireless devices. However, by their broadcast nature, wireless transceivers often cause significant interference to each other if they use the same frequency. This becomes a growing issue as the open 2.4GHz frequency band is being populated by numerous wireless devices including Wi-Fi access points and handhelds, ZigBee sensors, Bluetooth headsets, and cordless phones. There is a critical need for supporting the coexistence of these wireless devices in the crowded open spectrum.

In this talk, I will present our recent work on the coexistence of Wi-Fi and ZigBee. Due to the proliferation of Wi-Fi hotspots, ZigBee and WiFi devices often cause significant interference between each other. Our study of real-life Wi-Fi data traces reveals that abundant while space exists in Wi-Fi traffic. We have developed a novel approach that enables ZigBee links to achieve assured performance by exploiting such while space. Our experiments on a wireless testbed show that our approach achieves up to 4x performance gain over the current ZigBee link protocols. Although the coexistence of different wireless technologies has been traditionally considered a curse, in our latest work, we have exploited it as blessings. First, we developed a system called ZiFi that utilizes ZigBee radios to detect Wi-Fi hotspots through the unique interference signatures. As a result, a mobile device can significantly reduce its power consumption by using a low-power radio to detect Wi-Fi coverage, and only wakes up the Wi-Fi interface when Wi-Fi connectivity is available. Second, we developed a new sensor network time synchronization approach called WizSyc where ZigBee sensors can detect and synchronize to the periodic beacons broadcasted by WiFi access points, without resorting to multi-hop message passing. Both ZiFi and WizSyc have been implemented in TinyOS and extensively evaluated on a real wireless testbed.

In the end of this talk, I will briefly discuss our recent projects on cyber-physical systems and smartphone systems.

Bio: 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 Jiao Tong University, China, in 1998 and 2001, respectively, and the D.Sc. degrees in computer science from Washington University in St. Louis in 2006. From 2006 to 2008, he was an Assistant Professor of Computer Science at City University of Hong Kong. He received the NSF CAREER Award and the Best Paper Award at the 18th IEEE International Conference on Network Protocols (ICNP) in 2010. His research interests include wireless sensor networks, smartphone systems, and cyber-physical systems.