ICWS Seminar Series

Towards Energy Efficiency in Resource Constrained Wireless Networks for Extreme Environments

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4:00 – 5:00 pm
Room 4403 Siebel Center

Abstract: Recent events have revealed our limitations in understanding, monitoring and controlling extreme environments. Examples of events range from natural or manmade disasters (e.g., Japan earthquake and tsunami, Hurricane Ike, Haiti Earthquake), to outer space exploration and to underwater operations (e.g., Autonomous Ocean Sampling, Gulf of Mexico Oil Spill). In these events, very large physical areas are involved and due to the harshness of the environment and the scale of the event, it is impractical, if not impossible, to deploy infrastructure that continuously monitors the entire area. Advances in wireless networking and micro-electro-mechanical systems, e.g., wireless sensor networks with sophisticated sensing/actuating technologies, represent enabling technologies that are envisioned to provide us unprecedented capabilities to understand, monitor and control extreme environments. One of the major challenges that hinder our progress, however, is the energy efficient operation required for long term deployments in extreme environments.

In this talk, I will present our recent work on aggressive techniques for improving the energy efficiency in resource constrained wireless networks for extreme environments. First, I will describe a novel approach that combines network coding and duty-cycling, two popular techniques for saving energy. Combining these techniques is particularly challenging because of the conflicting means by which they achieve energy efficiency: network coding saves energy by exploiting overhearing, whereas duty-cycling saves energy by cutting idle listening and, thus, overhearing. Second, due to a preponderance of multicast communication in disaster areas, I will present our work on energy efficient and robust multicast routing, a hybrid protocol that builds on the strengths of existing topology-based, hierarchical and geographic multicast solutions, and addresses their limitations. Finally, I will present our recent work on optimizing placement/distribution of network services, such as intrusion detection, for energy efficient operation of resource constrained wireless networks.

Bio: Radu Stoleru is currently an Assistant Professor in the Department of Computer Science and Engineering at Texas A&M University, and head the Laboratory for Embedded & Networked Sensor Systems (LENSS). His research interests are in deeply embedded wireless sensor systems, distributed systems, embedded computing, and computer networking. He received his Ph.D. in computer science from the University of Virginia in 2007, under Professor John A. Stankovic. While at the University of Virginia, he received from the Department of Computer Science the Outstanding Graduate Student Research Award for 2007. His research has been funded by the National Science Foundation (NSF), Environmental Protection Agency (EPA), and the Institute for Applied Mathematics and Computational Science (IAMCS-KAUST).