Title: Low-energy Sensor Network Protocols and Application to Smart Wind Turbines

Abstract: The Internet of Things (IoT) has shown promise as an enabling technology for a wide variety of applications, from smart homes to infrastructure monitoring and management. However, a number of challenges remain before the grand vision of an everything-sensed, everything-connected world can be achieved. One of these challenges is the energy problem: how can embedded, networked sensor devices be sustainably powered over the lifetime of an application? To that end, this dissertation focuses on reducing energy consumption of communication protocols in wireless sensor networks and the IoT. The motivating application is wind energy infrastructure monitoring and management, or "smart" wind turbines. A variety of approaches to low-energy protocol design are studied. The result is a family of low-energy communication protocols, including one specifically designed for nodes deployed on wind turbine blades. This dissertation also presents background information on monitoring and management of wind turbines, and a vision of how the proposed protocols could be integrated and deployed to enable smart wind turbine applications.