Master Thesis Proposal:
Networking Wireless Sensors Using Smart Antennas

Research Area. Wireless sensor networks (WSNs) combine recent advances in low-power micro-sensors and short-range wireless radios into an exciting new technology. They enable numerous sensing and monitoring applications in areas of vital importance such as industry production, safety and security at home and in traffic, and environmental monitoring. The importance of the field is growing tremendously. For instance, the market analysis company ONWorld estimates that in 2010 168 million nodes could be deployed. They also predict that the market for WSNs will increase from ca. 400 million Euro in 2006 to about 9000 million Euro in 2010.

Thesis Context, Objective, and Content. Because of inherent limitations in WSN hardware and the unreliability of the wireless channel, networking WSN devices poses several challenges to data reliability, latency, and throughput. A solution to the problem may come from the use of "smart" antennas. While traditional antennas spread the transmission power equally in every direction, smart antennas can direct the wireless beam towards specific directions, achieving far better reliability. Nonetheless, these antennas also need efficient algorithms and protocols to decide where and how to point the beam. The networked embedded systems group (NES) at SICS is actively investigating this topic.

The objective of the thesis is to assess the effectiveness of using smart antennas in WSNs. After a brief literature overview on smart antennas and their use in wireless networks, the student will collaborate with researchers at SICS in the development of algorithms and protocols, implement some of them, and evaluate their performance in simulation or using real WSN devices.

Candidate Requirements. NES (`http://www.sics.se/nes`) is one of the leading European research groups in the area of WSNs. NES has developed the well-known Contiki operating system (`http://www.sics.se/contiki`) and the COOJA simulator. We are looking for a top, creative student with a strong interest in wireless networking and sensor networks. Good C programming skills are required. Since the work is performed in an international environment, very good communication skills in English are required.

Starting Date and Application. The thesis work shall start as soon as possible. For the application, please provide us with a CV, your courses and grades. In addition, we appreciate an article, paper, thesis or other relevant documents you have written in order to judge your ability to express yourself in English. Please send your application to `thiemo@sics.se`. If the thesis work is satisfactory, we will pay a one-time fee once the thesis is approved by the university.

Contact Persons.

Thiemo Voigt (`thiemo@sics.se`)
Luca Mottola (`luca@sics.se`)