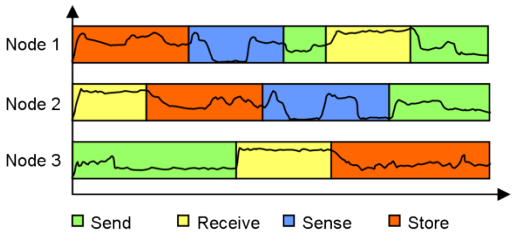
Master's Thesis

« Development Support for Energy-aware Debugging »

Background

Wireless sensor networks consist of small, battery operated sensor nodes, which collaborate on a global sensing task. Sensor nodes measure environmental data like temperature, humidity, or light intensity, may process parts of this data in the network, and transmit the measurements towards data collection nodes, where such data is eventually made available to the end user. Communication towards the destination is done wireless, often using collaborating intermediate nodes for relaying the data to the data sinks.



Wireless sensor networks are supposed to last unattended for years without requiring any battery replacement during that time. For this reason, highly energy-efficient protocols are of paramount importance. Therefore, the issue of energy-efficiency must be considered during the development of software. Since deployment and testing on real hardware is very time consuming, running simulations is the main task during the development process. Unfortunately, not every simulator is energy-aware. This is a large limitation especially for developing energy-aware software.

Work Description

At the Hamburg University of Technology, wireless sensor nodes, such as the XBow Iris nodes, are subject to extensive research. Amongst others they are used for amongst others in a real-world deployment within the research cluster SomSeD (for more information see http://somsed.tu-harburg.de/). Programming of these nodes is performed by using TinyOS, a commonly utilized operating system for different hardware platforms of wireless sensor nodes. TinyOS brings with it a simulation suite, called TOSSIM. Unfortunately, this simulator does not offer support for models of energy consumptions and the Iris platform.

The main goal of this thesis hence is to eliminate these deficiencies. In addition, link-quality information obtained from the SomSeD deployment shall be used to design and implement a realistic radio propagation model for TinyOS. Thus giving rise to an easy to use and feasible simulation test-suite for the ongoing research activities in the SomSeD research cluster. In combination with another thesis at the Institute of Telematics, the integration of power-analysis tools is also possible.

Putting these enhancements of the TOSSIM simulator together allows a deep insight into the energy consumption of the running software over time. The expressiveness of the results developed in this thesis should be validated by investigating the energy-efficiency of existing implementations of routing protocols in TinyOS.

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