Demo Abstract: Low Power Mesh Networking with Telos and IEEE 802.15.4

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Introduction

A family of low power wireless sensor network devices have been built to enable research and deployments. The devices have featured commercial off the shelf (COTS) components integrated together on a platform commonly referred to as a "mote", designed by the University of California, Berkeley. Motes have been used to evaluate wireless sensor network algorithms as well as for environmental monitoring and object tracking deployments. Miniature wireless devices are ideal for high density long term deployments in areas otherwise unsuitable for wired connections or passive devices. We designed and built a new mote platform, Telos (see Figure 1), for use in ultra low power wireless sensor networks [3]. Featuring a TI MSP430 microcontroller, a CC2420 IEEE 802.15.4 compliant radio, and built in sensors, Telos is the lowest power mote to date. IEEE 802.15.4 provides packet handling support and sophisticated channel encoding and encryption not found in previous wireless transceivers. Using these new primitives, we show robust, low power wireless mesh networking using IEEE 802.15.4.

Application, Management, and Self-Organization

We will demonstrate the use of low power IEEE 802.15.4 platforms to perform typical sensor network functionality. By using TinyOS, a network of Telos devices self-organize into a mesh network, report data back through the network reliably, and maintain an average network duty cycle of approximately 1% using Low Power Listening and the B-MAC link protocol [2]. Each node self-organizes using IEEE 802.15.4 link quality indicator (LQI), packet error rate (PER), and received signal strength indicator (RSSI), in a weighted manner to calculate the most reliable path to a base station. To illustrate the ease of deployment and

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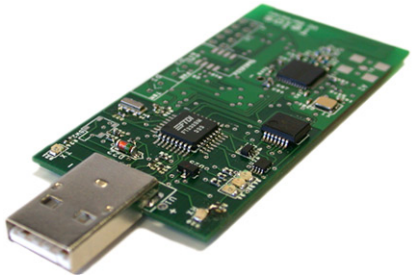

Figure 1: Telos ultra-low power wireless module ("mote") with IEEE 802.15.4 wireless transceiver.

reconfiguration of large TinyOS networks, our software running on IEEE 802.15.4 platforms features a data collection application (Surge), a Sensor Network Management System (SNMS), and a wireless code reprogramming service (Deluge). SNMS provides a general substrate for controlling node power state, duty cycle, group membership, and individual component commands. To gather information about the health and performance of nodes, SNMS also provides a lightweight query system that collects data from the union of attributes exported by individual TinyOS components, and can respond locally or over a multihop data collection tree To allow a network manager to watch for specific node actions, SNMS provides local storage and and remote display of event logs. Deluge [1] is a dissemination protocol for multihop network code distribution and reprogramming. Together, these services form the minimum set of primitives required for the deployment and maintenance of wireless sensor networks.

1. REFERENCES

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