DOT3 Radio Stack

Network Stack implementation on a new platform of wireless sensors

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Motivation

• MICA is not enough for large scale applications.
• DOT3 is a new platform with CC1000 radio chip.
• We aim to have a working network stack for DOT3 in newC harnessing its improved performance of radio.

Design & Implementation

How to decompose and reassemble a packet to and from raw bytes?
• Sending: sends a byte when the byte buffer is empty
• Receiving: detects the start of a packet using preamble and start symbol triggers an event when all the bytes are ready.

State diagram for packet decomposition and reassembly

How to transmit messages reliably?
• Add source address and Ack number to packets.

Evaluation

• The sender sends a number of packets and the receiver counts how many packets it received from the sender as we vary the distance between the nodes 100 through 1200.
• Ratio of successfully received packets is an indicator of effectiveness of each transmission method

Discussion and Future Works

Comparison with MICA
• Pros: Better coverage and reliability
• Cons: Slower transmission (60 sec vs. 9 sec for 512 packets) caused by
  - Slower clock rate of radio (19Kbps vs. 40Kbps)
  - Less efficient interrupt handler
• Modifying interrupt handler (from SPI to timer interrupt) will address this.

Problems with our reliable transmission method
• Effective for moderate collision, but not for high collision.
• Introducing exponential back-off is expected to be helpful.

Using multiple channels
• Reduces collision.
• Currently statically determined, vulnerable to misconfiguration.
• Dynamic frequency allocation is needed.