

SeNDORComm: An Energy-Efficient Priority-Driven Communication Layer for Reliable Wireless Sensor Networks

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Abstract

In many reliable Wireless Sensor Network (WSN) applications, messages have different priorities depending on urgency or importance. For example, a message reporting the failure of all nodes in a region is more important than that for a single node. Moreover, traffic can be bursty in nature, such as when a correlated error is reported by multiple nodes running identical code. Current communication layers in WSNs lack efficient support for these two requirements. We present a priority-driven communication layer, called SeNDORComm, which schedules transmission of packets driven by application-specified priority, buffers and packs multiple messages in a packet, and honors the latency guarantee for a message. We show that SeNDORComm improves energy efficiency, message reliability, and network utilization and delays congestion in a network. We extensively evaluate SeNDORComm using analysis, simulation, and testbed experiments. We demonstrate the improvement in goodput of SeNDORComm over the default communication layer, GenericComm in TinyOS (134.78% for a network of 20 nodes).

Keywords: *Wireless sensor network, reliable message delivery, congestion avoidance, priority driven communication, message aggregation.*