

PluralisMAC: Enabling Multiple Medium Access Control Protocols for Wireless Sensor Networks

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Wireless Sensor Networks (WSNs) consist of tiny devices (so-called nodes), with at least one wireless radio interface, mostly a very slow CPU (4 MHz), a little bit of RAM (10 kB) and one or more sensors to monitor the environment.

We have spotted three trends in WSNs. First, we see a shift from battery-powered nodes to battery-free nodes, powered by energy harvesters (like little solar panels). Second, many services will be deployed on the same WSN infrastructure or network. Third, heterogeneity in hardware platforms, wireless interfaces, and communication stacks.

WSN technology is applied in so many application domains and contexts resulting in many Medium Access Control (MAC) protocols. The MAC protocol determines the way nodes send the monitored data, when they go to sleep mode (in order to save energy), etc. It's clear that one MAC protocol does not fit all requirements.

Therefore, we have designed a novel architecture, PluralisMAC. Now it will be possible to dynamically switch between MAC protocols (so-called maclets) and to separate the implementation of commonly used messages (MAC primitives) from the MAC logic.

We have tested this framework on real nodes (TMote Sky testbed, iLab.t) and for a star network with one sink node and four regular nodes, the reliability was 100% during the ultra-low duty cycle period (maclet 1) and the setup period (maclet 2). During the data collection period (maclet 1 with a higher duty cycle), the reliability was 93% (here we lost 1 packet, because we did not use retransmissions). The average energy consumption showed us that switching between different maclets, based on the application requirements, is both feasible and useful.

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