Routing Tags and Pegs: Two Generic Application Frameworks for Ad-Hoc Mesh Networks

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We present two blueprints of ad-hoc wireless applications implementable on low-cost hardware platforms. For this demo we focus on a combination of MSP430F148 microcontroller with CC1100 RF module. In addition to the actual working hardware, we demonstrate a powerful emulation engine, which allows us to study virtual deployments of wireless ad-hoc networks running our applications. Our objective is to illustrate the main components of Olsonet's framework [2] for practical ad hoc networking.

The two meta-applications are named *RTags* (for *Routing Tags*), and *T&P* (for *Tags and Pegs*). They cover two large classes of applications with different mobility aspects and traffic patterns. They also illustrate how our *Tiny Routing Protocol* (*TARP*) [1], owing to its rule-driven behavior, can be easily optimized to different characteristics of the application.

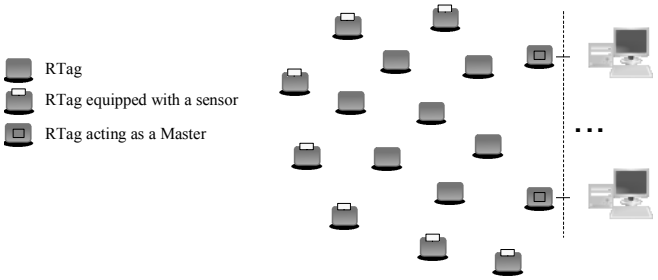

Figure 1. Routing Tags (RTags)

RTags (Figure 1) is characterized by the presence of an "elevated" node type called *Master*. In a typical deployment, Masters send messages to other nodes to solicit replies, or to trigger some actions. The traffic originating or terminating at Masters is "highlighted," which means that some routing parameters are optimized for its presence. In the case of multiple Masters, the network is functionally partitioned (a given group of sensors communicates with a designated Master), without being partitioned physically (the sensors and/or *RTags*-routers can be interspersed geographically and route traffic in a group-transparent fashion).

Masters usually send messages intended to update the context of newcomers, synchronize time-stamped functionality, and repaint fragments of the network topology for the recipients. A typical representative of this application class is an on-demand low-mobility asset monitoring system. The accompanying poster: *"Fuzzy Inferno"* hints at more exotic ideas [3].

The Pegs in *T&P* (Figure 2) are intentionally immobile (compared to Tags). Their primary purpose is to provide a flavor of semi-fixed infrastructure for tracking the location of Tags. Depending on the requirements, the assortment of tools facilitating this tracking may include specialized sensors deployed at Tags (e.g., accelerometers, magnetic sensors) reporting their status to Pegs. The system does not depend on GPS for location (although some GPS-capable nodes can be present and assist other nodes) because of the cost and limited reliability under some conditions (e.g., under the roof).

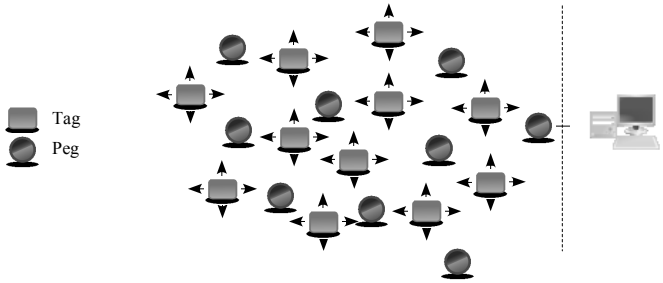

Figure 2. Tags and Pegs (T&P)

We argue that a remarkable degree of location accuracy can be achieved by measuring and correlating the received signal level (RSSI) at multiple Pegs perceiving the same Tag. For example, a gathering of, say, 4+ people with certain attributes in an airport washroom can be easily detected and signaled as an event calling for special attention. The class of applications covered by *T&P* deals with mobile objects (assets, luggage, people, hazardous materials), whose mobility patterns may have to be classified by event-triggering predicates (mutual exclusion, avoidance of certain spots, time restrictions, and so on). One embodiment of the *T&P* blueprint is depicted on the *"Nostalgic Cow"* poster [4].

REFERENCES

[1] P. Gburzynski, B. Kaminska and W. Olesinski. "A Tiny and Efficient Wireless Ad-hoc Protocol for Low-cost Sensor Networks," DATE'07, Nice, France, April 2007, *to appear*.

[2] Olsonet Communications Corporation, www.olsonet.com

[3] Olsonet Communications Corporation, "Inferno Hopping Sensors", www.olsonet.com/HTML/Product.html

[4] Olsonet Communications Corporation, "Nostalgic Cow", www.olsonet.com/HTML/Cow.html