Network Research Group

Routing Protocol for Wake-Up Radio in Internet of Things

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Start / end	ASAP / 1st of July (anticipated - 6 months)
Allowance	≈ 550 euros/month

Context

Wireless sensor networks and the Internet of Things (IoT) have been introduced at the beginning of 2000 as one of the next revolutions in the computer network domain. Due to the physical and electronic constraints of the nodes that compose such networks, the scientific community has proposed a bunch of new communication protocols, operating at key levels of the network stack. Many proposals have focused on MAC and routing layers to provide energy-efficient protocols [1, 2] but at the expense of increased latency. Wake-up radios is a new technology for wireless communications that promises the end of this tradeoff thanks to its ultra-low power consumption [3]. Unfortunately, the sensitivity of the wake-up receiver is very low, resulting in a range mismatch between this technology and more traditional ones (such as 802.15.4). New routing protocols are required to exploit the full potential of this technology.

Subject

In this context, we proposed REFLOOD [4], a reactive routing protocol for wake-up radio networks that tackles the range mismatch problem introduced by wake-up radios while taking advantage of the full range of the main radio. This Master's internship consists in extending REFLOOD to large-scale networks. An implementation of REFLOOD is available for ContikiOS [5], an open-source operating system for the Internet of things devices. The proposed solution should extend this implementation and will be evaluated through an intensive simulation campaign.

References

[1] De gan Zhang, Shan Zhou, and Ya meng Tang. A Low Duty Cycle Efficient MAC Protocol Based on Self-Adaption and Predictive Strategy. Springer Mobile Networks and Applications, 23, 2018.

[2] Hyung-Sin Kim, Jeonggil Ko, David E. Culler, and Jeongyeup Paek. Challenging the IPv6 Routing Protocol for Low-Power and Lossy Networks (RPL): A Survey. IEEE Communications Surveys and Tutorials, 19(4), 2017.

[3] Sebastian Sampayo, Julien Montavont, and Thomas Noël. Is Wake-Up Radio the Ultimate Solution to the Latency-Energy Tradeoff in Multi-hop Wireless Sensor Networks? In proc. of the 14th IEEE International Conference on Wireless and Mobile Computing, Networking and Communications, October 2018.

[4] Sebastian Sampayo, Julien Montavont, and Thomas Noël. REFLOOD: Reactive Routing Protocol for Wake-Up Radio in IoT. Elsevier Ad Hoc Networks, 121, 2021.

[5] Adam Dunkels, Björn Grönvall, and Thiemo Voigt. Contiki - a Lightweight and Flexible Operating System for Tiny Networked Sensors. In proc. of the 29th IEEE International Conference on Local Computer Networks, November 2004.