ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

TIK Institut für Technische Informatik und Kommunikationsnetze
Computer Engineering and Networks Laboratory

Prof. L. Thiele

Semester project or Master Thesis

Is low-power wireless networking a reproducible science?

The ACM badge
'Results Reproduced' [1]

" *An experimental result is not fully established unless it can be independently reproduced.* " [1]

A variety of recent studies, primarily in the biomedical field, have revealed that an uncomfortably large number of research results found in the literature are not reproducible, because of sloppy experimental methods, flawed statistical analyses, or in rare cases, fraud. Computer science is no different.

Experiements on low-power wireless communication are considered very challenging to repeat and reproduce, in part due to their dependance on the RF environment which is hard to monitor and control.

Yes, it is hard – which does not mean we should not try our best!

Part of the low-power networking community is currently pushing for the adoption of a benchmark (see iotbench.ethz.ch) and organized a workshop on the topic earlier this year. In parallel, the ACM (one of the main computer science publishers) has lunched various initiatives to support reproducibility [2], artifact review and badging [1], and data integration into publication repositories [3].

Since 2012, a graduate course from Standford task the students to reproduce results from the Internet networking litterature [4]. This project aims to do something similar but on a larger time frame and for low-power wireless networking (aka the Internet of Things or IoT).

Project description In this project, you will choose one state-of-the-art wireless protocol (*e.g.*, Crystal [5] or TSCH [6]). The goal is to try to replicate and eventually reproduce the results reported in the litterature. Ultimately, you will write and publish a 'reproducibility report' for the chosen protocol. Through this project, you will

- Become familiar with forefront communication protocols
- Understand and master the challenges of wireless communication experiments on real hardware
- Contribute to the IoT community with an independent evaluation on the state-of-the-art.

Requirements You should have good experience in C programming and knowledge about embedded systems and communication protocols. Moreover, you should be interested in experimental studies on real hardware (not only simulators).

[1] Artifact Review and Badging. [Online]. Online.
[2] The ACM Task Force on Data, Software, and Reproducibility in Publication. Online.
[3] ACM Digital Library-Curation Platform Integrations. Online.
[4] L. Yan and N. McKeown, Learning Networking by Reproducing Research Results, SIGCOMM Comput. Commun. Rev., May 2017.
[5] I. Timofei et al., Data Prediction+ Synchronous Transmissions= Ultra-low Power Wireless Sensor Networks, SenSys 2016
[6] T. Watteyne et al., Teaching Communication Technologies and Standards for the Industrial IoT? Use 6TiSCH!, IEEE Communications Magazine, May 2017.

Interested?
Contact me for more details!

Romain Jacob
romain.jacob@tik.ee.ethz.ch