

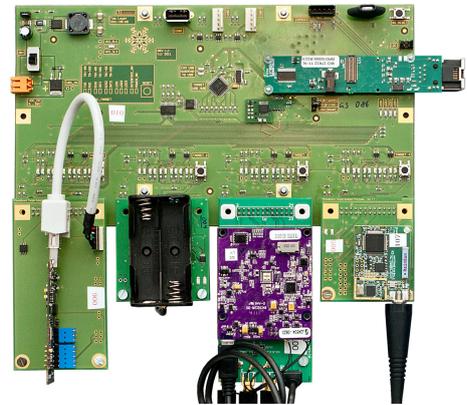
Semester Thesis:

## Distributed Energy Harvesting Emulation

**Motivation** In traditional energy harvesting applications, sensor nodes are able to store any excess energy in a storage device such as battery or supercapacitor for future use. If correctly dimensioned, such a system will guarantee the node's operation during periods of energy unavailability. More recently, a radically different research line has emerged which focuses on batteryless, energy-driven sensor nodes. These nodes are designed to work with transient energy sources, i.e. highly volatile sources which produce small bursts of energy. As a result, the node's operation is highly sporadic, depending entirely on the source's energy availability, making sensing and communication decisions highly complex. In order to evaluate and compare the performance of different communication schemes, a distributed test infrastructure to emulate previously recorded harvesting traces shall be built in this project.

**Task Description** During this project you will develop an energy harvesting emulation extension for our distributed communication testbed FlockLab [1]. The extension shall add the capability of replaying previously recorded energy harvesting traces in a distributed manner.

In a first step you will familiarize yourself with the FlockLab testbed and the energy management unit [2]. Based on the gained experience and overview of the existing FlockLab capabilities, a detailed concept for emulating energy harvesting traces in the FlockLab testbed is developed. You will then implement this emulation concept using a small number of sensor nodes running a "sense and send" application and evaluate the accuracy of the proposed energy harvesting emulation concept by comparing it to an EMU supplied version of the same application.



**Requirements:** Familiarity with low level programming language (C/C++) and a scripting language for data processing (Python/Matlab). Experience in microcontroller programming is an asset.

**Interested? Please have a look at <http://www.tec.ethz.ch/research.html> and contact us for more details!**

### Contacts

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### References

- [1] R. Lim, F. Ferrari, M. Zimmerling, C. Walser, P. Sommer, and J. Beutel, FlockLab: A testbed for distributed, synchronized tracing and profiling of wireless embedded systems, in IPSN, 2013.
- [2] A. Gomez, L. Sigrist, M. Magno, L. Benini, and L. Thiele, "Dynamic Energy Burst Scaling for Transiently Powered Systems," in Proceedings of the DATE Conference, 2016.