ETH
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Swiss Federal Institute of Technology Zurich

TIK Institut für Technische Informatik und Kommunikationsnetze
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Master Thesis:

# Analyzing the Efficiency of Energy Harvesting Circuits

**Motivation** Energy harvesting is generally seen to be the key to power the emerging Internet of Things (IoT) in a low-cost, long term, efficient manner. The emerging class of transiently powered systems explores the most challenging scenario where no battery is present and only a small transducer is used to power the entire system. There are currently two trending architectures for transient systems. The first is direct coupling, where a DC source can be directly attached to the source and a small capacitor [1]. The second is through an Energy Management Unit (EMU), where the source's power/voltage can be decoupled from its load [2]. These architectures have different performance/cost trade-offs.

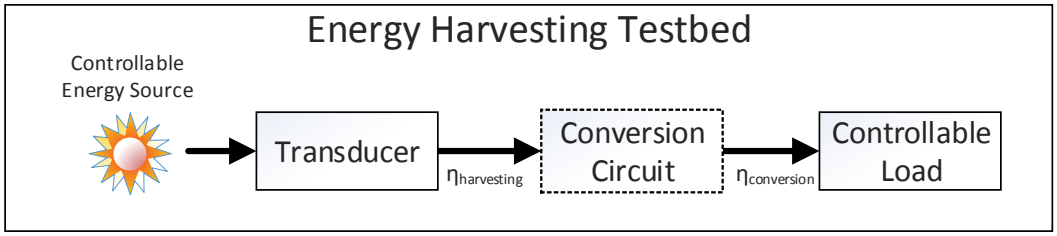


Figure 1: Overview of Energy Harvesting Testbed.

**Your Project** During this project you will use a testbed for solar powered systems. Your main task will be to identify the most efficient architecture for batteryless sensing systems. By extending our current discrete-time models, you will analyze the harvesting and the load efficiency for different current profiles. After understanding how this affects the system's overall efficiency, you will need to validate your approach experimentally, using the testbed for automated data acquisition.

**Requirements:** You should be highly motivated for the topic, and have experience with a scripting language such as python or matlab for simulations.

**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] Energy-Aware Memory Mapping for Hybrid FRAM-SRAM MCUs in Intermittently-Powered IoT Devices. Jayakumar, H. et al. ACM TECS 2017

[2] Dynamic Energy Burst Scaling for Transiently Powered Systems. Gomez, A. et al. Proc. DATE Conf. 2016.