



## Bachelor Thesis

The „Analysis of Nanometric ICs“-Group of the R&D Division Transportation at the Oldenburg-based OFFIS - Institute for Information Technology has an immediate vacancy for the following bachelor thesis:

# MbMpMd - A measurement based microcontroller power model development

or (if work is written in German): **Entwicklung eines messbasierten Verlustleistungsmodells für Mikrocontroller**

### INTRODUCTION:

For the expected wave of upcoming energy autonomous embedded systems in the contexts of I4.0, IoT and IoE, OFFIS wants to develop a power-down aware embedded system simulation tool, helping developers to program their embedded systems for energy and stand-by time. In this context, we offer the following bachelor thesis.

### PROBLEM STATEMENT:

The intention of this work is to augment an existing power state machine and to characterize it by silicon measurement for the example of an ARM Cortex-M4F embedded system. By combining the state machine with an instructions set simulator, it will be possible to pre-determine the power over time behavior as depending on the exact software, running on the embedded system's processing unit. The resulting power over time trace shall then be used to predict the system's overall on-time, when being energy constraint, for instance due to battery or energy harvesting operation.

### CONTENT:

- ▶ Set up of a measurement environment, consisting of a Mageec measurement board, a measurement software, and the M4F target board.
- ▶ Identification of instruction classes (load, store, integer, float, etc.) with similar power consumption.
- ▶ Development of a measurement scheme to describe the target board's frequency and temperature dependence.
- ▶ Optional: Connection to the existing Qemu based execution trace generation.
- ▶ Evaluation of the resulting energy dissipation prediction methodology by comparison between model simulation and real world measurements.

### REQUIREMENTS

- ▶ C++ and basic microcontroller programming skills are mandatory
- ▶ Basic electrical engineering skills are preferred
- ▶ Work can be done completely in English or German language

### VALID;

June 15th – October 31st, 2018

### REVIEWERS:

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