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 / Master Thesis:

Power-Aware Scheduling for Transient Systems

Motivation Energy harvesting is generally seen to be the key to power cyber-physical systems in a low-cost, long term, efficient manner. However, harvesting has traditionally been coupled with large energy storage devices to mitigate the effects of the source's variability. The emerging class of transiently powered systems avoids this issue by performing computation only as a function of the harvested energy, minimizing the expensive and obtrusive storage element. Thanks to an Energy Management Unit (EMU), the source's power/voltage can be decoupled from its load, enabling each to work independently at their optimal point. By accumulating only the necessary energy for a task, the EMU generates short bursts so the load can operate intermittently.

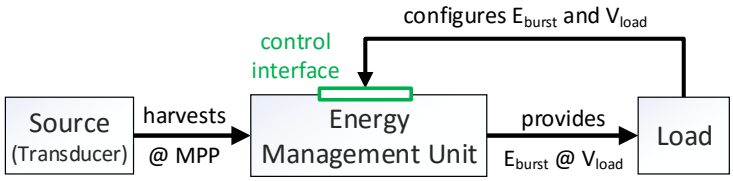

Figure 1: Feebdack Loop for Dynamic Energy Burst Scaling

Your Project During this project you will develop novel power-aware algorithms to maximize the efficiency of the Energy Management Unit. It has already been shown that one of the key parameters affecting the EMUs efficiency is the input power. As transient systems evolve into the multi-core scenario, the power deficit will only get worse. Hence, new scheduling algorithms that take into account the input power, and the energy efficiency of the burst generation scheme need to be developed. Ideally, they should guarantee maximum efficiency during low power harvesting conditions, and best performance during high power harvesting conditions. You will need to validate you approach theoretically and experimentally, using the EMU we have developed and measure relevant metrics such as energy efficiency.

Requirements: You should be highly motivated, have experience with Matlab and embedded system programming in C, and be comfortable working with lab equipment such as oscilloscopes.

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

Contacts

- Andres Gomez: `gomeza@tik.ee.ethz.ch`, ETZ J68.2
- Rehan Ahmed: `rehan.ahmed@tik.ee.ethz.ch`, ETZ G76

References

[1] Dynamic Energy Burst Scaling for Transiently Powered Systems. Gomez, A. et al. To appear, DATE 2016.

[2] Tragedy of the Coulombs: Federating Energy Storage for Tiny, Intermittently-Powered Sensors. Hester, J. et al. SenSys 2015