

# Improving Interaction between Applications and Hybrid Volatile/Non-Volatile Memory Hierarchies

Powering IoT devices via energy harvesting modules such as solar panels can help to develop energy-efficient systems. But battery-less systems may suffer from unstable power supplies, thus losing all volatile memory contents during a power outage, requiring costly backups. While non-volatile memory technologies do exist, their increased write overhead also provides drawbacks. A trade-off is thus realised by a memory hybridisation combining both volatile and non-volatile technologies. However, this requires cache policies to be aware of the different underlying technologies, with decisions suitable to the design objectives depending on the characteristics of the architecture as well as the application.

This thesis aims to close the gap between applications and hybrid memory hierarchies in energy harvesting systems. This can be realised by, e.g., annotations (hints) for the caches in the application code, thus realising transactions or efficiency gains not achievable by heuristics. The system simulator `gem5` ([gem5.org](http://gem5.org)) shall be used, and if necessary extended, with the modular OS `Unikraft` ([unikraft.org](http://unikraft.org)) compiling applications into unikernels.

Prerequisites: Knowledge in C/C++ and Python, basic knowledge about caches

Type of Work: Theory (20%), concept (30%), implementation (50%)

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