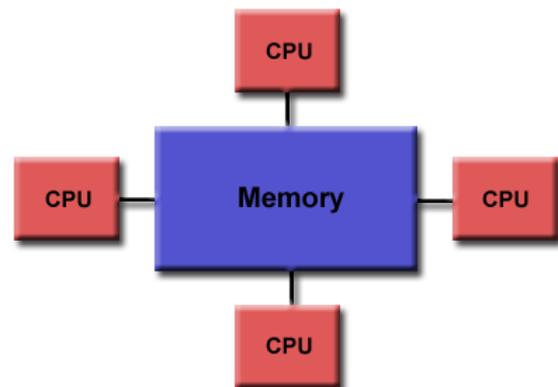


Master Thesis:

## CPU & Memory Co-Scheduling for Predictable Execution

**The Problem:** Commercial computing platforms become increasingly multi-core, featuring up to tens or hundreds of processing cores, see e.g., the Kalray MPPA-256, the Tiler TILE64, or the Adapteva Epiphany chip. Most parallel architectures are based on a shared-memory model. Although increasing the core number increases the overall computational power, the shared memory can be a severe bottleneck for performance and timing predictability due to the parallel access from several cores. This is particularly crucial for real-time safety-critical applications, such as the software of an aircraft or a medical device, where predictable execution times for all tasks are required. To tackle this problem, one possible solution is to co-schedule the CPU cores and shared memory, such that only one core can access the memory at a time. This way there is no contention among cores, and execution becomes predictable. However, how to co-schedule the CPU cores and shared memory efficiently remains an open problem...

**The Thesis:** The goal of this thesis is to explore scheduling algorithms for real-time tasks on shared-memory multi-core architectures. The student will need to (i) study existing algorithms for CPU/memory co-scheduling, (ii) propose his/her own algorithms or improvements, and (iii) implement them on a state-of-the-art massively multi-core architecture, in particular the Kalray MPPA-256. More emphasis can be paid on the theoretic or the practical part of the thesis depending on own interest. The student will get a deep insight into real-time scheduling for modern architectures and will have a unique opportunity to get proof-of-concept for his/her ideas by implementing them on a platform with more than 256 CPU cores.



### Requirements:

- Embedded Systems lecture.
- Interest in algorithms and real-time scheduling.
- Interest in computer architecture.
- Low-level C programming skills.

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

### Contacts

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