

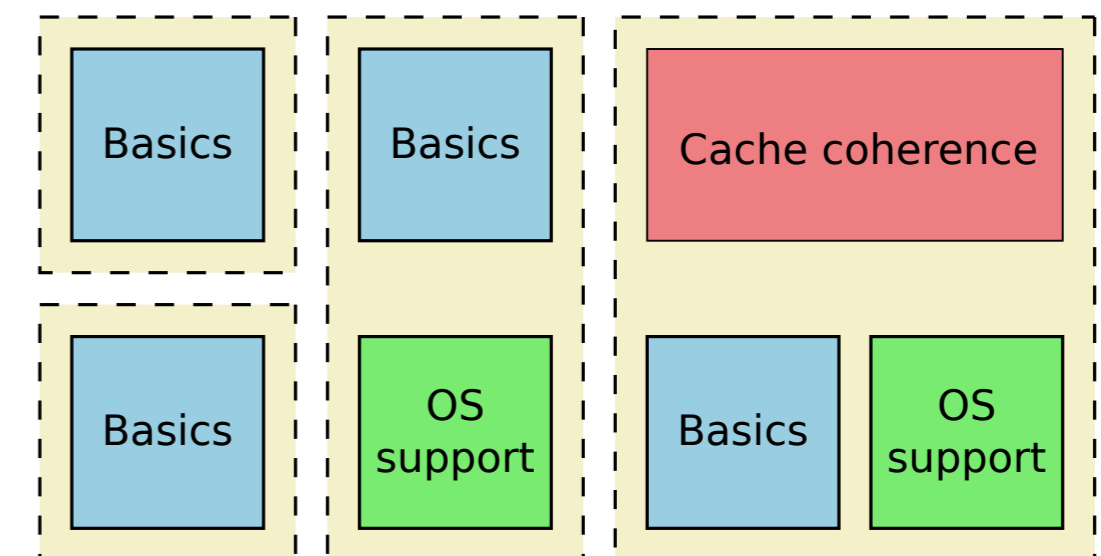
The IMData Approach to Accelerate Data Intensive Workloads

M.Sc. Nils Asmussen and Dr.-Ing. Marcus Völz

IMData is a young researcher group supported by ESF that seeks to develop new hard- and software mechanisms for accelerating data intensive workloads in heterogeneous many-core systems.

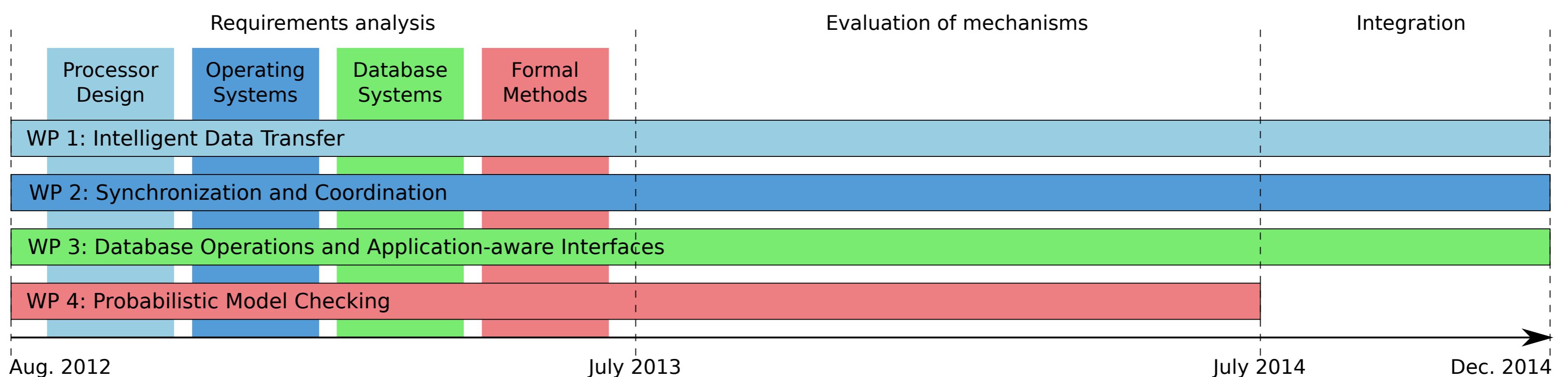
Observation and Motivation

- Accelerator architectures (GPGPUs, DSPs, ...) achieve high performance with simple and specialized cores.
- Adding OS support (interrupts, exceptions, MMU, ...) or cache coherence to a core increases the chip area by nearly 100%.
- Thus, getting by without it allows much more parallelism.

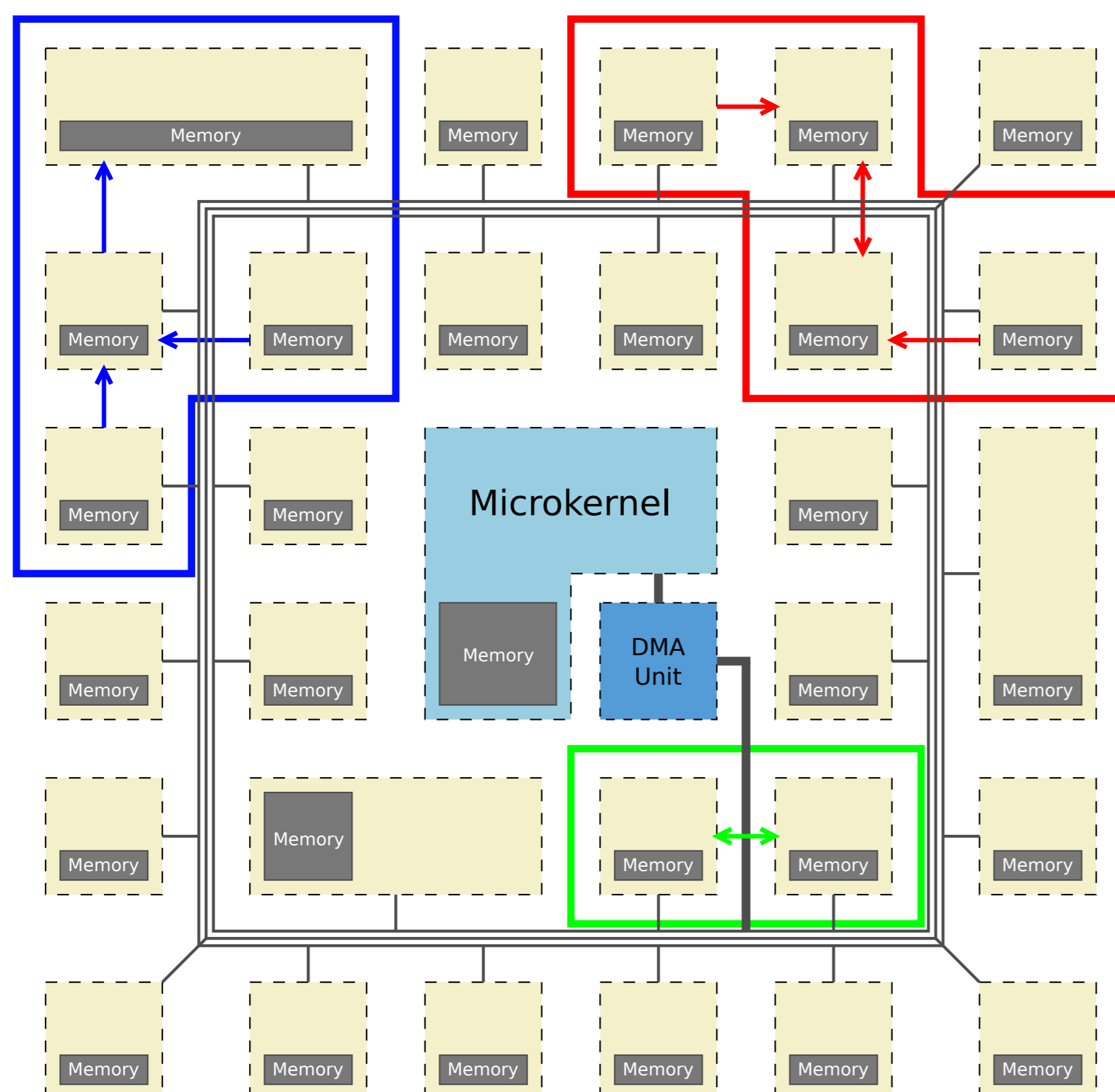


Influence of features on chip area size

Work Plan



Vision of a Microkernel for a Heterogeneous Manycore System



The envisioned system consists of many simple and heterogeneous cores, as displayed on the left. Each of them has a small amount of local memory which can be accessed from a bus connected to an intelligent DMA unit. This unit allows data transfer and isolation between the cores. The "big core" (with OS support) runs the kernel which is responsible for controlling the DMA unit, distributing work to cores, establishing communication channels and enforcing isolation between them. The research questions that the Operating System Group in IMData wants to address are:

- How can we control applications without having full hardware support for running an operating system kernel beneath them?
- How can applications on different cores interact with each other?
- How can they synchronize on shared data and communicate results?
- How can critical parts of applications be isolated?
- How can all this be achieved without reintroducing the area-expensive hardware mechanisms of general purpose architectures?

Participants

Prof. Dr. Christel Baier, Algebraic and Logic Foundations of Computer Science, Prof. Dr. Gerhard Fettweis, Vodafone Chair Mobile Communications Systems, Prof. Dr. Hermann Härtig, Operating Systems, and Prof. Dr. Wolfgang Lehner, Database Systems.