

Energy-Aware Applications

Enabling Fine Grained Energy Management



Typically, data centers are analysed as a whole

- heat production and energy consumption of the whole system is measured
- adjustments occur slowly and according to the total net load
- the goal is to reduce cooling, energy provisioning etc.

> Examples: CoolEmAll



Current approaches aim at individual applications

- applications are energy “black boxes”
- relationship between resource configuration and application wide energy efficiency
- adjustments occur with job provisioning
- Identify the best machine setup for a given application

> Examples: GAMES



Applications however do consist of typical algorithms, functional components or services

- these individual modules have their own energy profile
- make specific use of resources
- the configuration not only impacts on performance, but also on energy consumption
- but:
 - > difficult to identify the appropriate cores
 - > difficult to adjust the hardware (fast and efficient)
 - > almost impossible to develop code accordingly
- extended automated support is needed

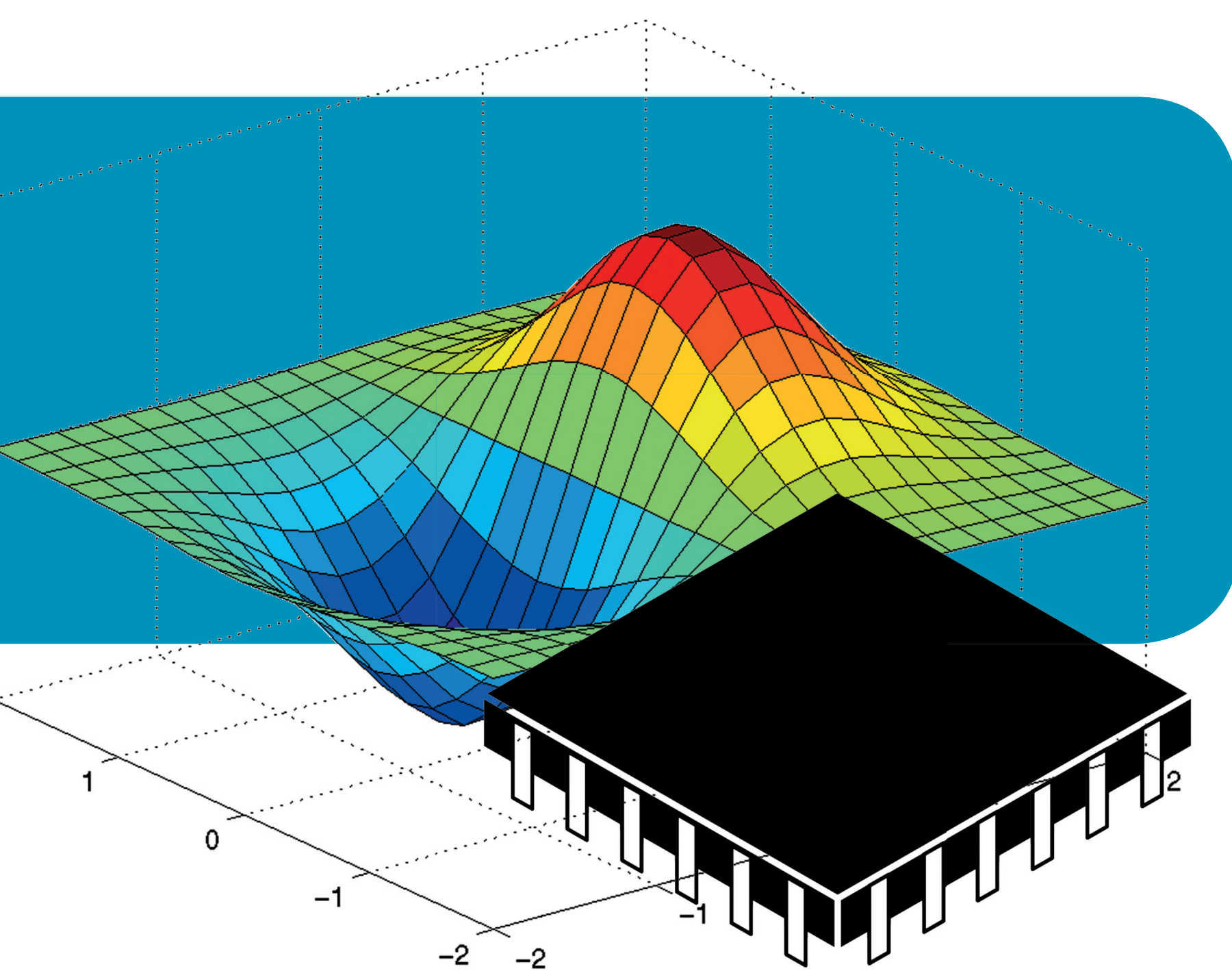
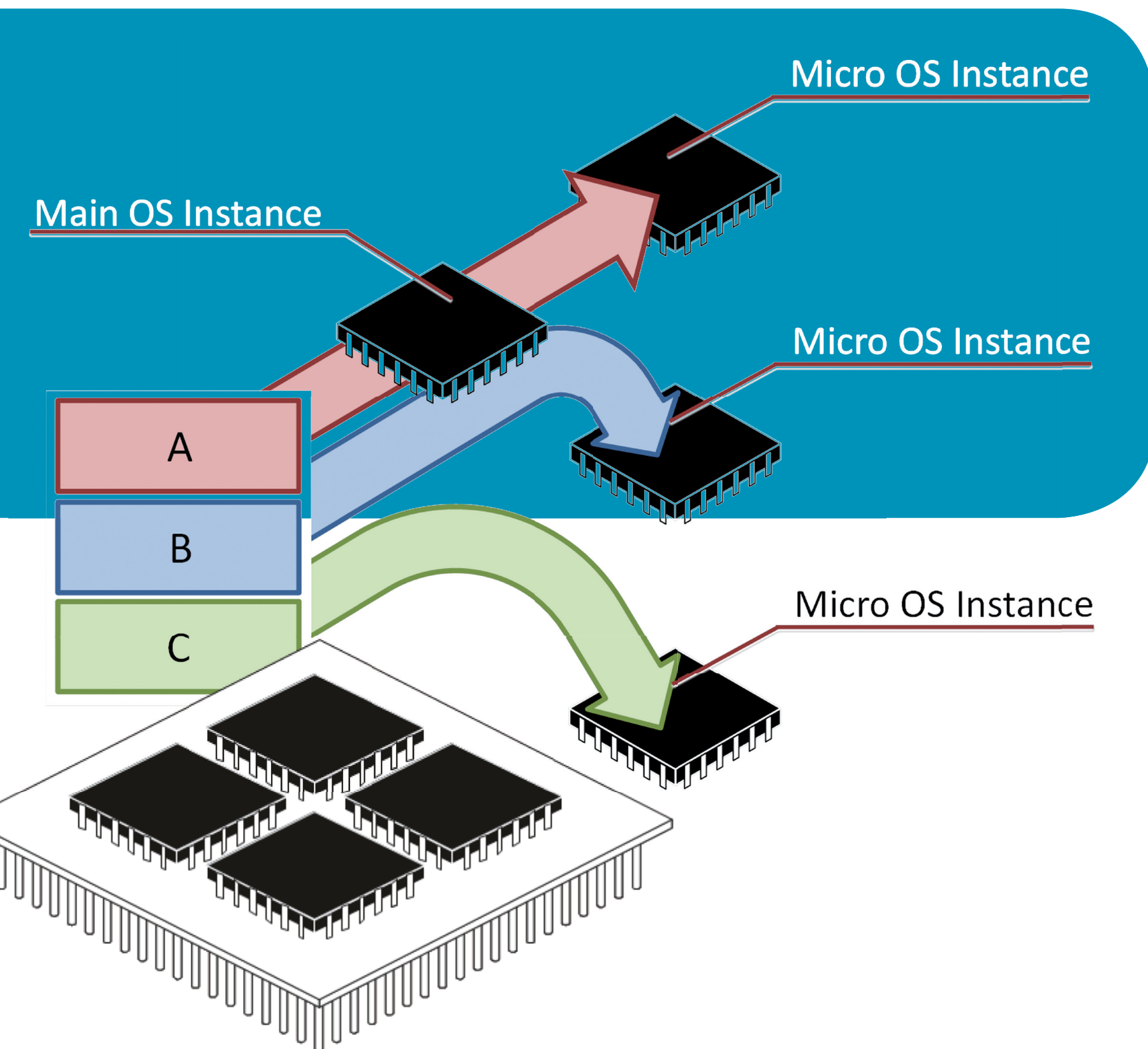
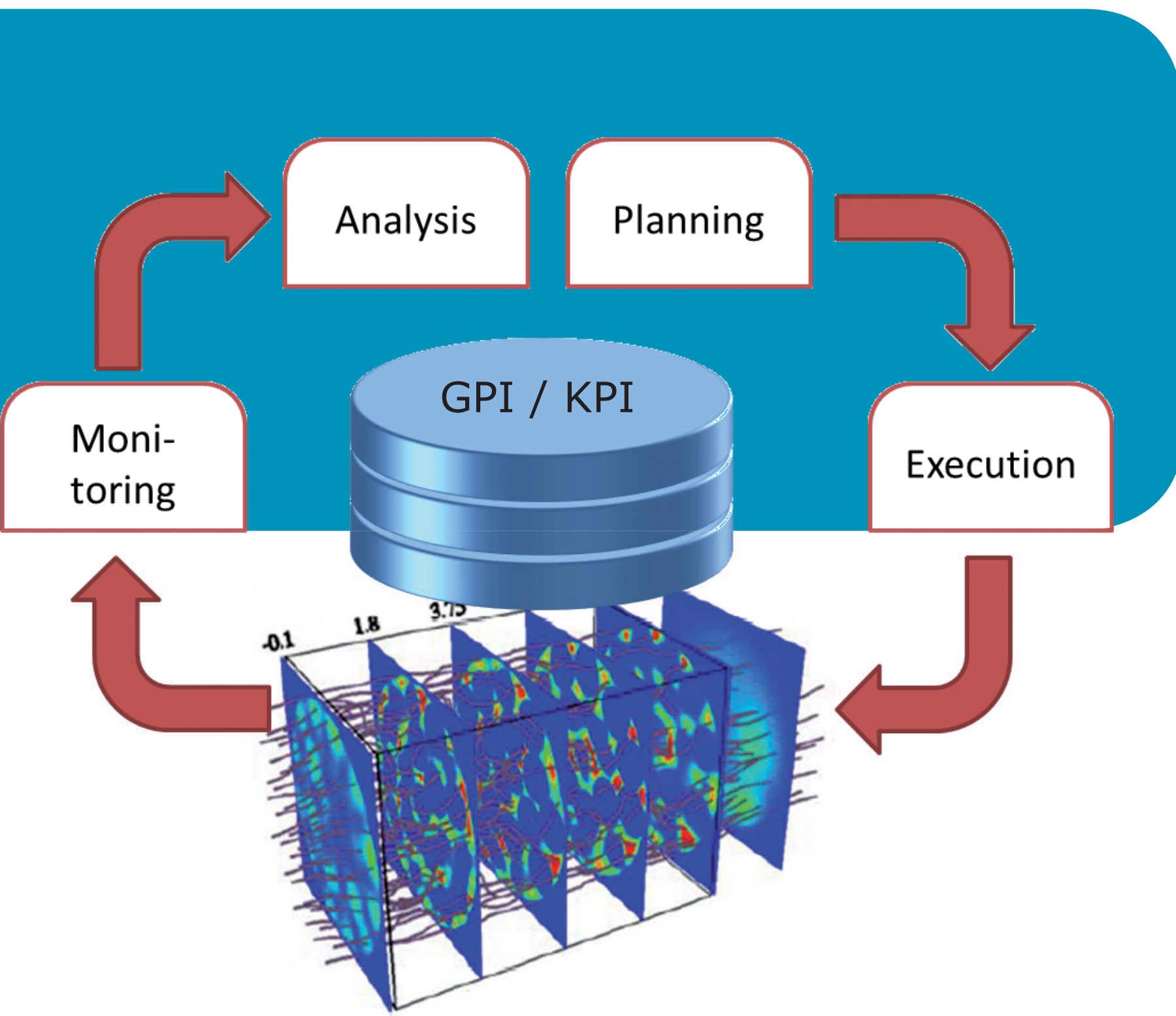
> Tendencies: S(o)OS



Even the individual cores can be further segmented into subset of operations

- reflect the direct resource need and thus energy consumption
- reconfiguration of the hardware according to current usage can reduce energy need
- must be very fast, typically only solved on hardware level
- the hardware can be agnostic of the overall application goal

> Examples: Intel Atom, TI OMAP 5



Software based solutions



Hardware based solutions