Cost and Environmental Cost System-Technology Co-Optimization

The fundamental principle of CMOS scaling has led to dramatic improvements in computing power and performance while reducing manufacturing costs. As we are approaching limits in achievable devices and interconnect sizes, the complexity of the processes lead to increasing cost and environmental cost of fabrication. At the same time severe power, thermal, and speed roadblocks are reached at system level.

Scaling is now entering a new era of System-Technology Co-Optimization, where increasing functions per unit cost will be reached by other routes than pure dimensional scaling. System-on-a-Chips are vastly heterogeneous systems. Large advances in 2.5D and 3D technologies allow to split SoCs into multiple dies, potentially offering benefits in performance, power, cost, environmental cost. Complex memory hierarchies, multi-core, and multi-threading as well as core specialization (xPUs…) on a single system-on-chip (SoC) or in chiplets are opening a new avenue to partition systems and co-optimize them on different requirements. This can only go hand in hand with a revision of system design practices and introducing fundamentally novel architectures and devices.

What you will do

This PhD focuses on cost and environmental cost modelling and optimization in the context of STCO. You will study different system architectures and model them. You will use and expand a powerful in-house modelling software already developed by imec to assess cost and environmental cost, combining technologies under development at imec or in industry (logic, DRAM, NAND, 2.5D, 3D, packaging, photonics interconnect, …). You will explore opportunities to reduce cost and environmental cost while maintaining system performance on different system configurations.

Who you are

You hold a master’s degree in engineering or equivalent.

You combine a strong interest in engineering and scientific research with a desire to see your work applied in industrial and academic collaborations. You are able to learn quickly and independently. You aspire to become an expert in your field, while simultaneously collaborating with other researchers and senior staff to efficiently generate state-of-the-art results.

Type of work

30% literature, 70% modelling/design

Supervisors

Bertrand Parvais (VUB, imec), Marie Garcia Bardon(imec)

Daily advisors

Dwaipayan Biswas, Job Soethoudt (imec)