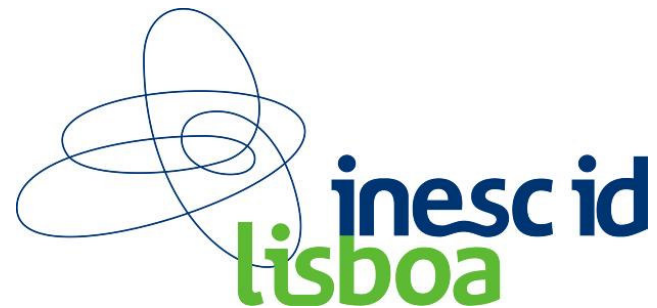


Parallel and distributed computing in the multi-core and chip multi-processor system era

Leonel Sousa, TU Lisbon



- **Idea:** increase the overall performance by introducing “small cores” in a processor to accommodate (hardware) multithreading
- **Idea:** divide the "transistor budget" of the processor between a number of "large cores" (improve both single thread performance and multithread performance)
 - Put more pressure on the software side (hardware already provides plenty of resources to use)

- **But:** Lack of innovation at the micro-architecture level since the middle 90's (e.g. P6 microarchitecture)
- We had bad experiences in the past with parallel processing systems:
 - e.g. in Europe, in the late 80's to early 90's, the transputer concurrent computing microprocessor was not only a commercial failure but had also a negative impact in research funding
- Without going to the discussion of homogeneous versus heterogeneous multi-cores and CMPs
 - I think the embedded systems will always have different characteristics from the computer systems

- Distribute the effort through all aspects
 - Algorithms, programming models, runtime systems, and architectures for scalable parallelism
- Transactional memory is an important issue
 - Software transactional memory (software runtime library) or transactional memory hardware
- Support heterogeneity at different levels
 - Without requiring users to use different programming languages, libraries...(e.g CPU+GPU, but also multi-cores/multi-processors/multi-computers)

- Not only to focus the attention on absolute parallel efficiency
 - focus on easy to use, for the programmer
- Look to the requirements of the **emerging class of applications**
 - e.g. some work has been done in the Pervasive Parallelism Laboratory, PPL Stanford: Virtual Worlds Application, Autonomous Vehicles, Domain Specific Languages (SQL, MATLAB, Ruby/Rails...)
- **Adapt courses** in computer architecture, computer systems and programming, to this new era

[ISPDC 2009](http://www.ispdc.org)
<http://www.ispdc.org>

technology
from seed

