



UPPSALA  
UNIVERSITET

# UPMARC

Uppsala Programming for  
Multicore Architectures  
Research Center

UPMARC is a Center of Excellence for basic research to address the software development challenges brought by the multicore revolution. Basic funding for UPMARC is provided through a so-called "Linnaeus grant" from the Swedish Research Council (VR).

## Research Areas

**Algorithm construction** in key application areas, e.g.,

- simulation of climate, molecular dynamics, ...
- communication protocols,
- embedded control systems.

Considering new tradeoffs for multicores (these are different from e.g., SMPs).

**Programming language constructions:**

- message-passing vs. shared memory
- Contracts and types, which can be checked for reliable programming
- Infrastructure for code transformations for efficient program development

**Resource management:** for efficient use of cores, memories, communication bandwidth, etc. to

- understand impact of architectural features
- detect performance bottlenecks
- realize predictable execution

**Verification:** for analyzing vital correctness properties

- combining formal verification, static analysis, testing.
- detecting concurrency bugs (races, deadlocks, etc.)
- analyzing complicated concurrent programs

## UPMARC VISION

- The important performance metrics of software for future multicore platforms are delivered computations per programmer hour and per watt, rather than CPU-cycles per second.
- Software production must be performed at a level of abstraction much closer to the application than to the hardware platform; it will be supported by powerful automated tools that bridge the gap between application and platform.
- Sweden is well-positioned to have a leading role in producing such tools.



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