
Application and Systems Performance: FY06 Priorities and Strategies

LACSI Priorities and Strategies
Workshop 2005

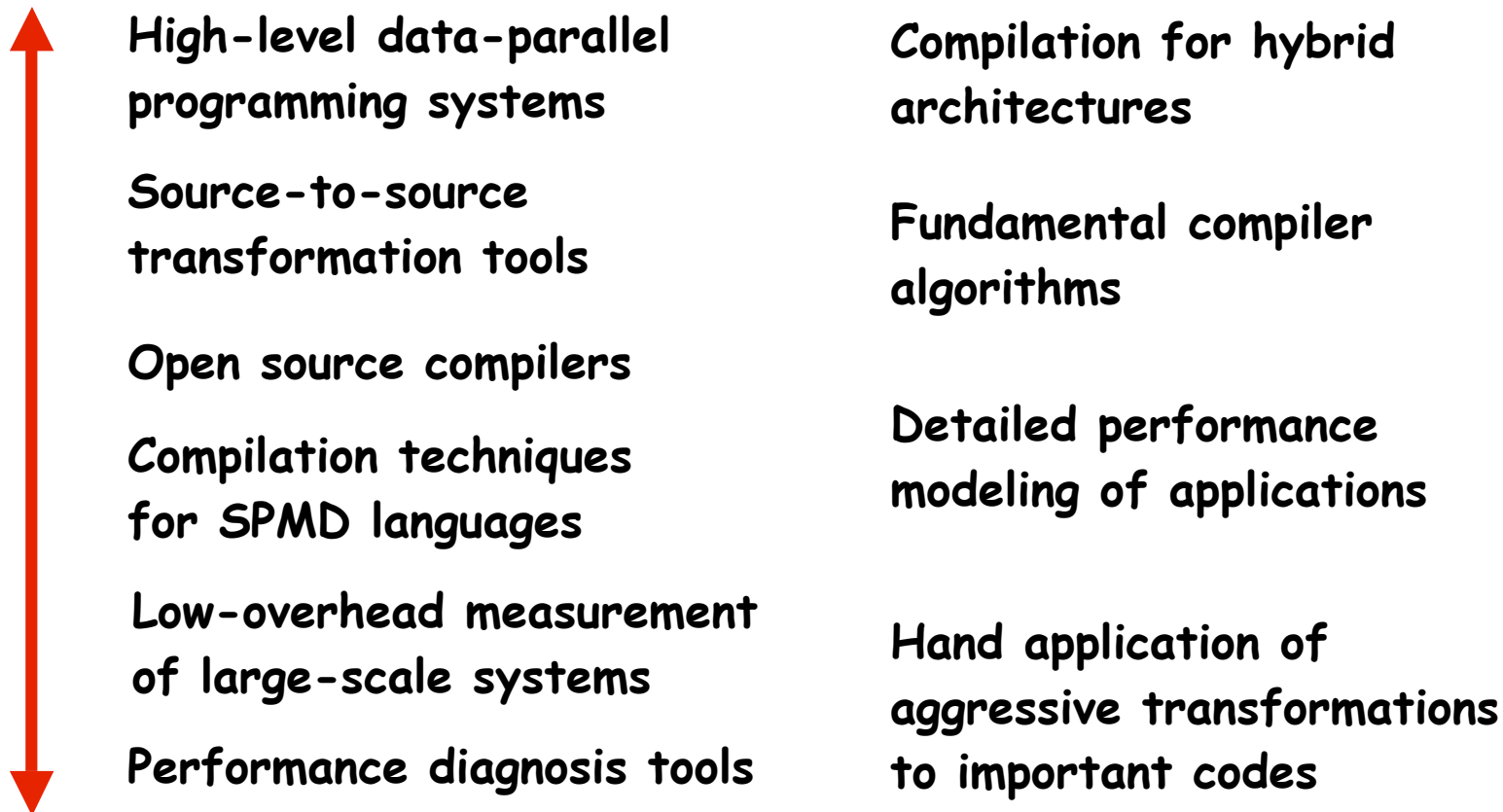
Application and System
Performance Subgroup

New Directions for FY06

- Evaluate the performance potential for multi-core chips
 - understand memory hierarchy sharing issues
 - compiler technology for targeting multi-core effectively
 - hardware support for monitoring multi-core?
- Evaluate potential for hybrid architectures
 - extend node modeling to analyze potential for attached processors
- Evaluate potential for on-line adaptation
 - assess growing # of communication partners
 - assess diminishing locality as application data structures adapt
- Investigate architecture/application/data structure interaction
 - role of compiler technology for ameliorating bottlenecks
- Coping with power requirements: modeling, scheduling, ...

Academic Compiler and Tools Research

Long Term Research Affecting Future HPC Systems



Immediate Impact in Support of ASC Mission Goals

Analytical Performance Modeling

- Continue expanding the scope of modeling to new applications
 - include tri-lab workload in modeling portfolio
- Emphasize tool R&D for simplifying the modeling process
 - tools for characterizing applications
 - e.g.
 - communication partners
 - call graphs
- Look at emerging architectures
 - BG, Red Storm, Purple
- μ proc modeling: LANL, Rice, Cornell, Intel, IBM

High-level Programming Models (HPM)

Software productivity is a key goal

- Need to cope with an ever-changing landscape of high performance architectures
 - streaming processors
 - distributed memory machines
 - hybrid architectures
 - shared and distributed memory
 - attached processors
- HPM: only feasible long-term direction for portable applications
- Performance portability is very important
 - want to exploit full capabilities of any class of target system

Monitoring & Analysis of Large-scale Systems

- Can't monitor everything: too much data
- Monitoring perturbs execution
- How to choose what to monitor?
- On-line and offline analysis strategies
- On-line monitoring to drive fault tolerance and dynamic adaptation