Evaluation

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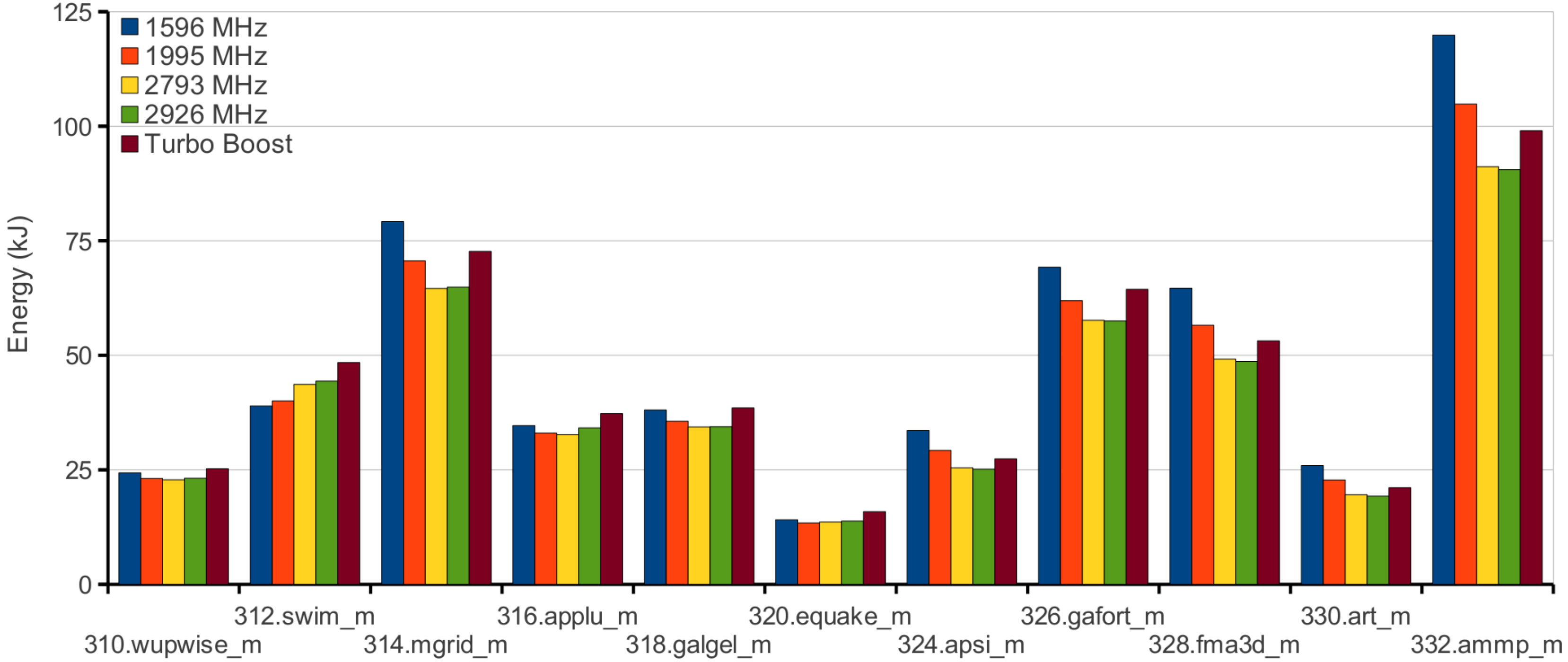
Timo Minartz

University of Hamburg

Research Group Scientific Computing

Bundesministerium für Bildung und Forschung

Spec OMP2001



Sensitiveness of selected Spec OMP 2001 benchmarks to the processing frequency

informatik die zukunft

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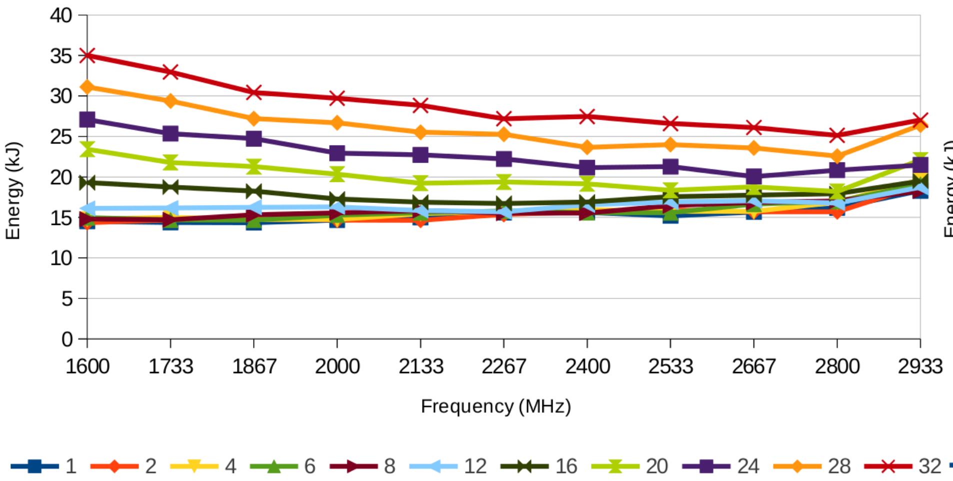
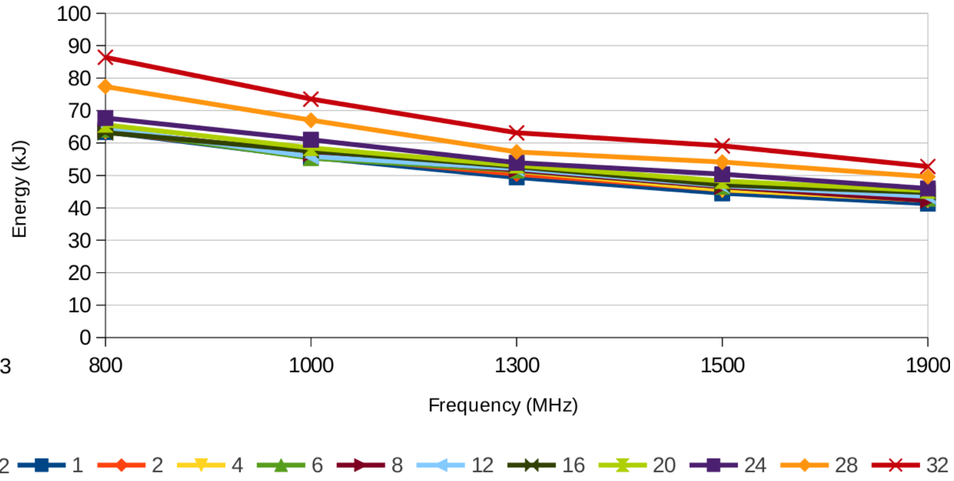
Approach

- Measure different memory-bound eeMark compute setups
  - Different P-States and D-States
- Measure different IO and communication setups
  - Different P-States and D-States
- Define strategies for mode switching
  - Ops-per-Byte for compute operations
  - Packet/block size for IO/communication operations
  - Type of operation
  - …

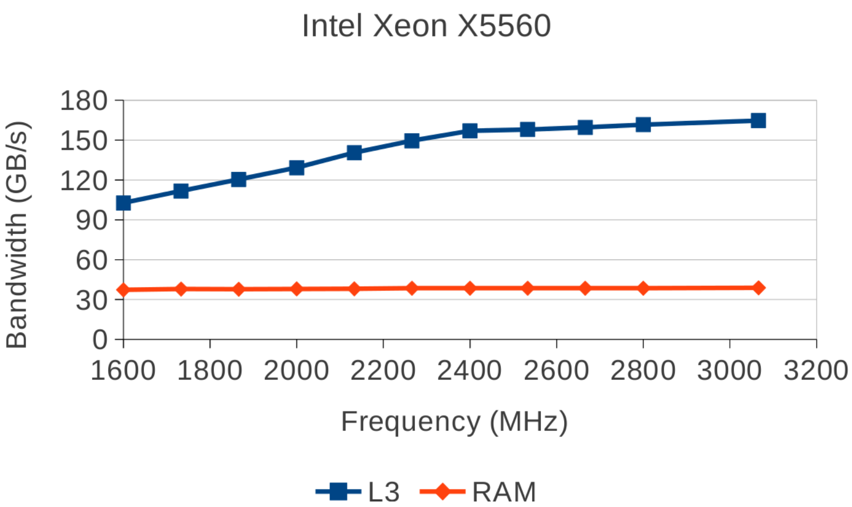
eeMark OPB Measurements

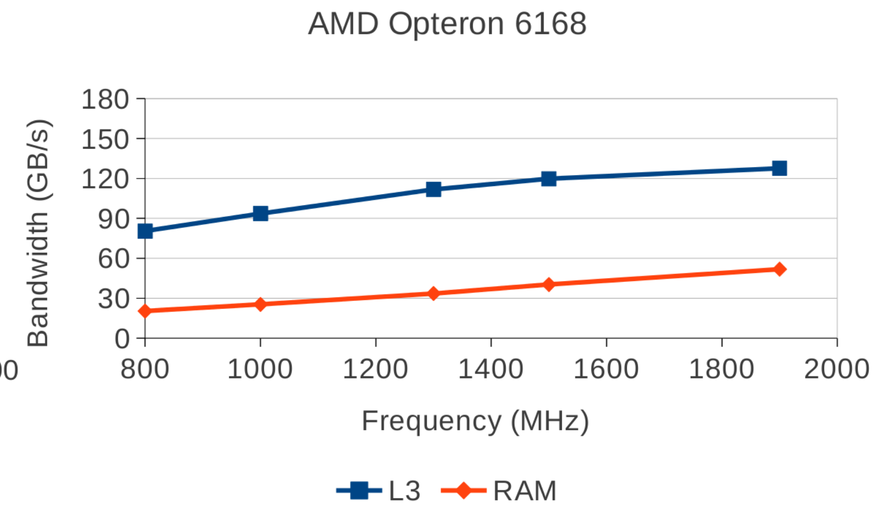




- Intel Xeon nodes
- AMD Opteron nodes

Memory BW Measurements



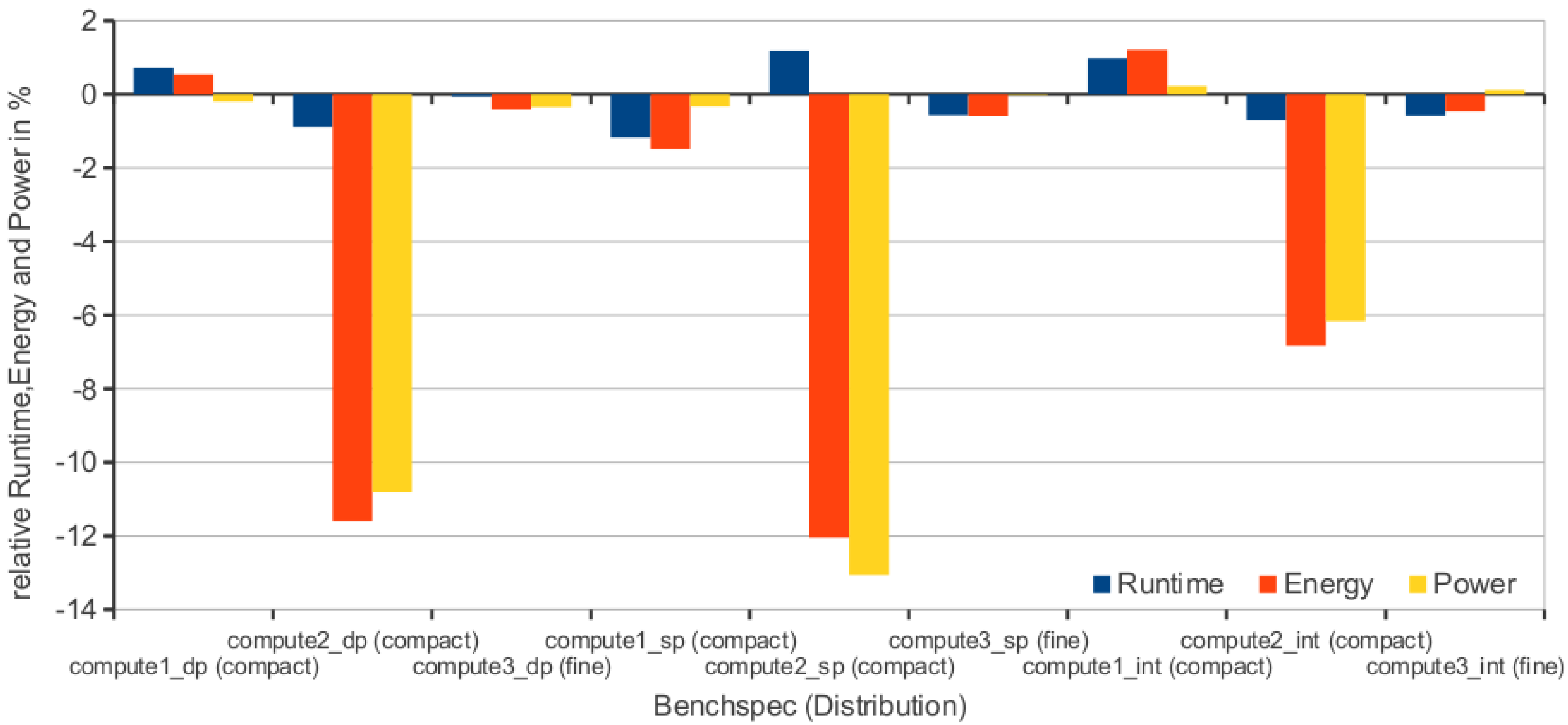


- Intel Xeon nodes
- L3 bandwidth scales with frequency
- RAM bandwidth scales NOT with frequency

- AMD Opteron nodes
- L3 bandwidth scales with frequency
- RAM bandwidth scales with frequency

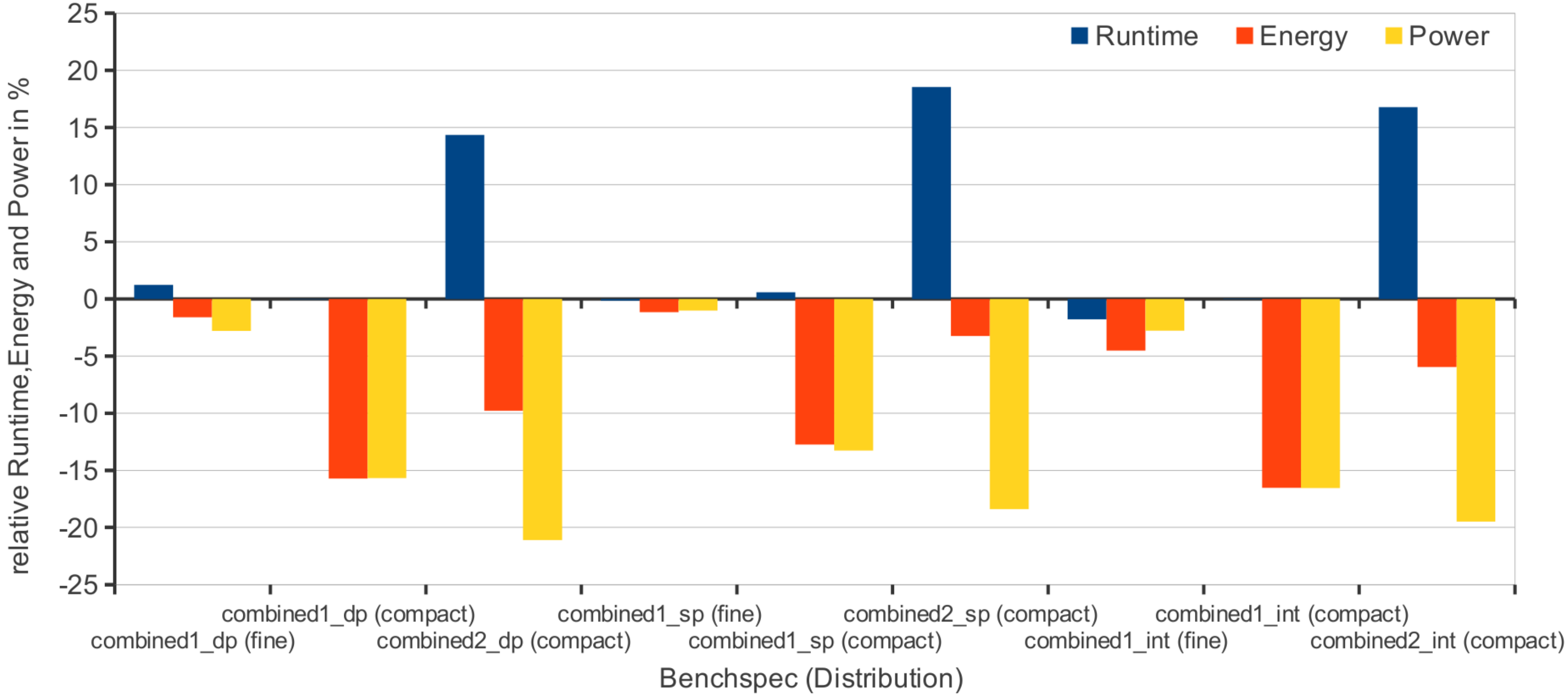
Schöne et. al: Memory Performance at Reduced CPU Clock Speeds: An Analysis of Current x86_64 Prozessors (HotPower '12)

eeMark compute Results



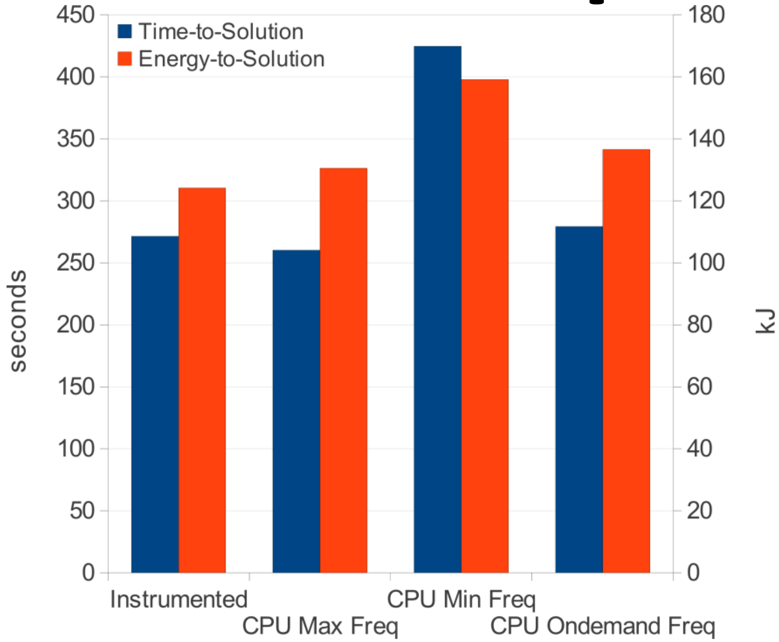
Instrumented eeMark compute reference run.

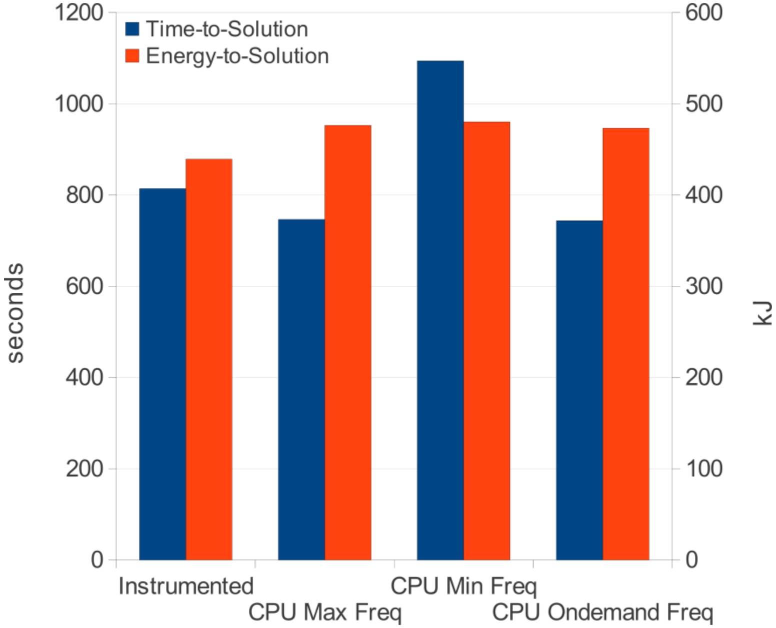
eeMark combined Results



Instrumented eeMark combined reference run.

Application: Partial Differential Equation solver





- Intel Xeon nodes
- 5 % savings in Energy-to-Solution
- Time-to-Solution increase of 4 %

- AMD Opteron nodes
- 8 % savings in Energy-to-Solution
- Time-to-Solution increase of 9 %

Minartz et. al: Managing Hardware Power Saving Modes for High Performance Computing (IGCC'11)

Conclusion

- Applications are sensible for power saving modes
- Code instrumentation results in savings
  - Power and Energy (up to 8% for real applications)
  - Requires tools / mechanisms to detect promising phases
- Manual instrumentation might be too course granular
- But potential for reuse of concepts in
  - Energy-optimized Libraries
  - Automatic phase detection approaches