Reduzindo o Consumo Energético por Controle Dinâmico de Paralelismo em Roubo de Tarefas

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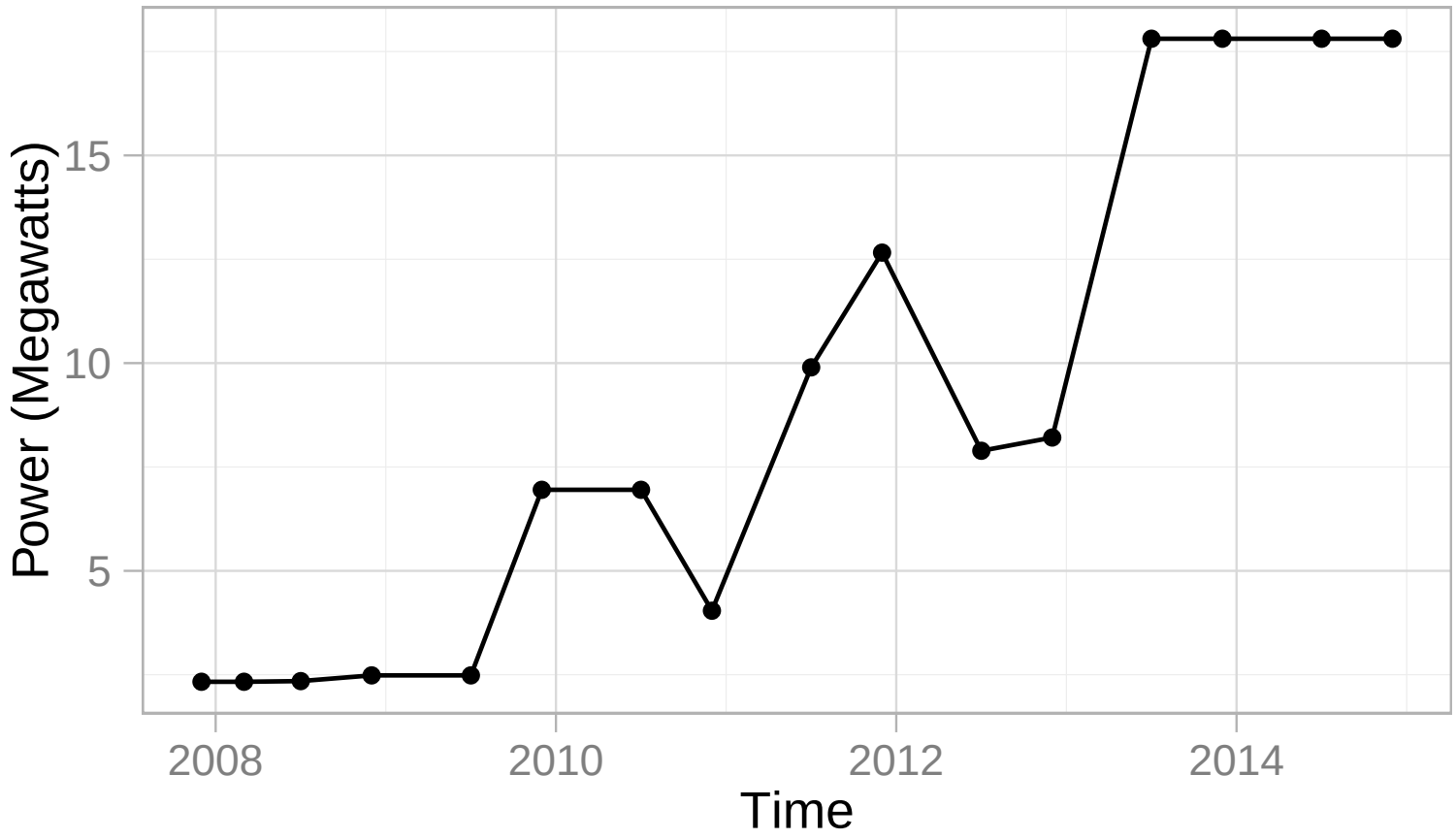
Outline

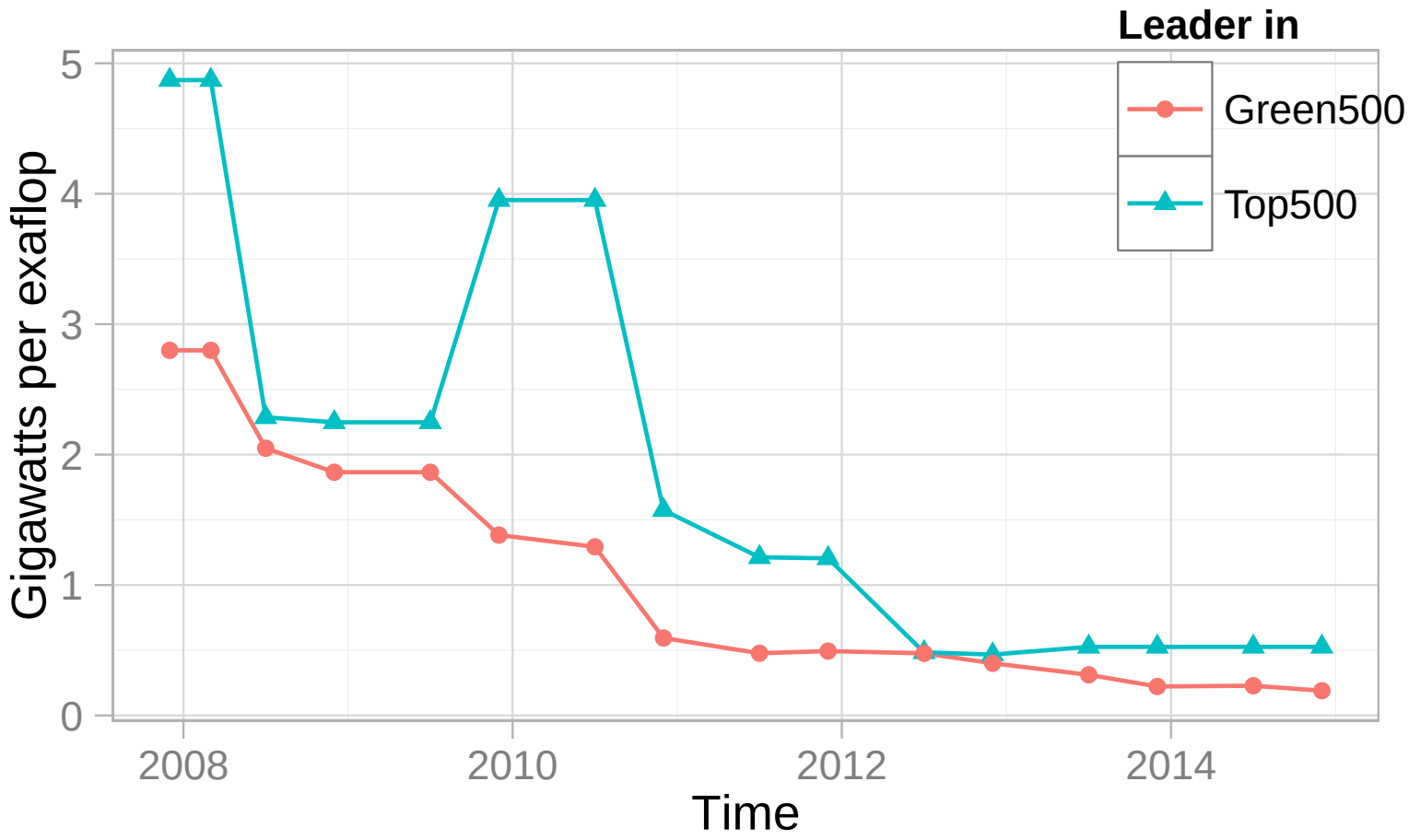
What is the relevance of energy in HPC?

- The energy cost of supercomputers is going up [1]
- High power is a performance-limiting factor [2]
  - Heat
  - $
- Energy is one of the major challenges in the path towards exascale computing [3]

Top500 [4]



Extrapolating to Exascale [4, 5]



How can we improve energy-efficiency?

- Dynamic Voltage and Frequency Scaling [6]
- Dynamic Concurrency Throttling [7]

Technique

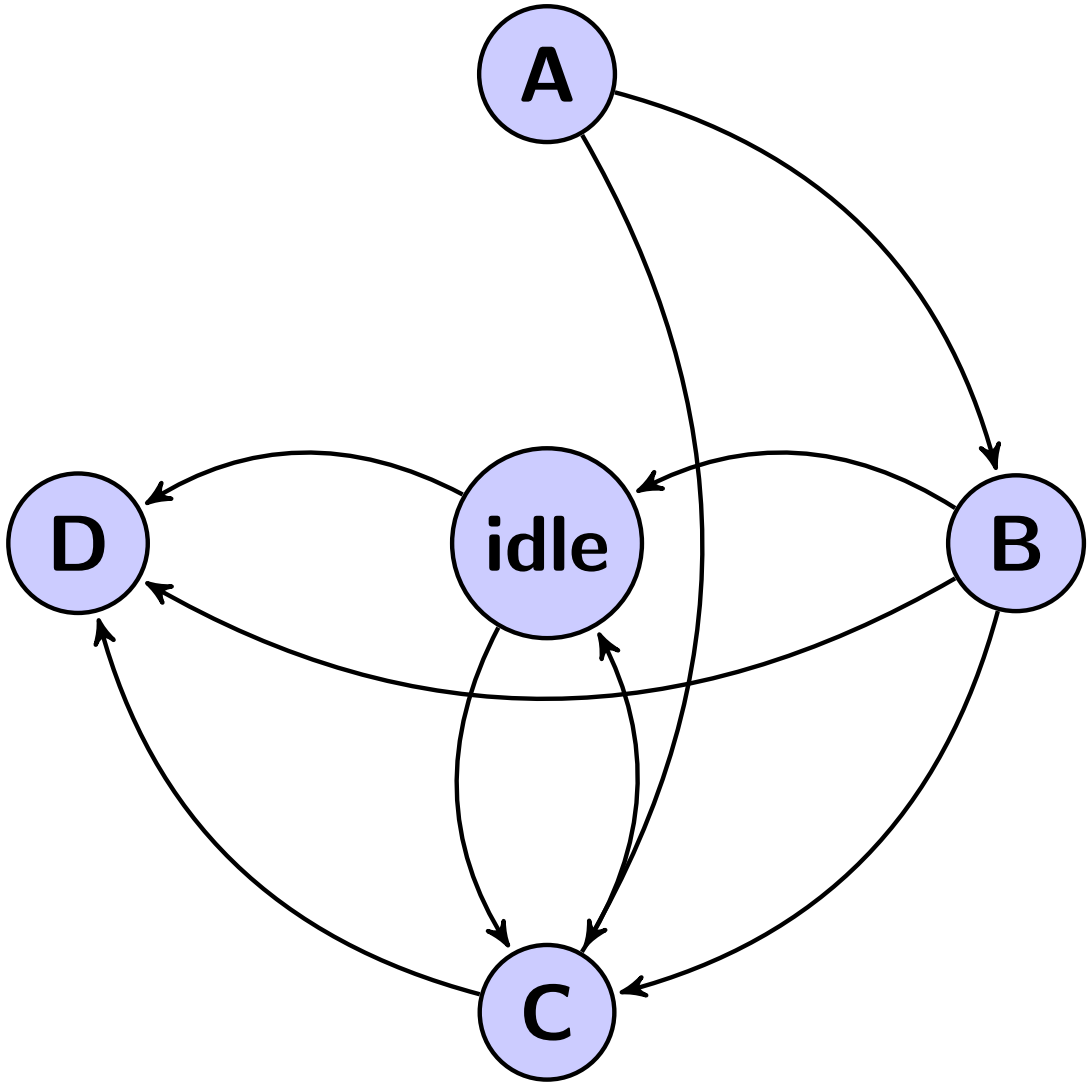
- User selects code regions to be optimized
- Build an execution profile
- Use profiling data to control clock speed

Technique

Cilk [8]

- Loops
- Tasks

Technique



Benchmarks

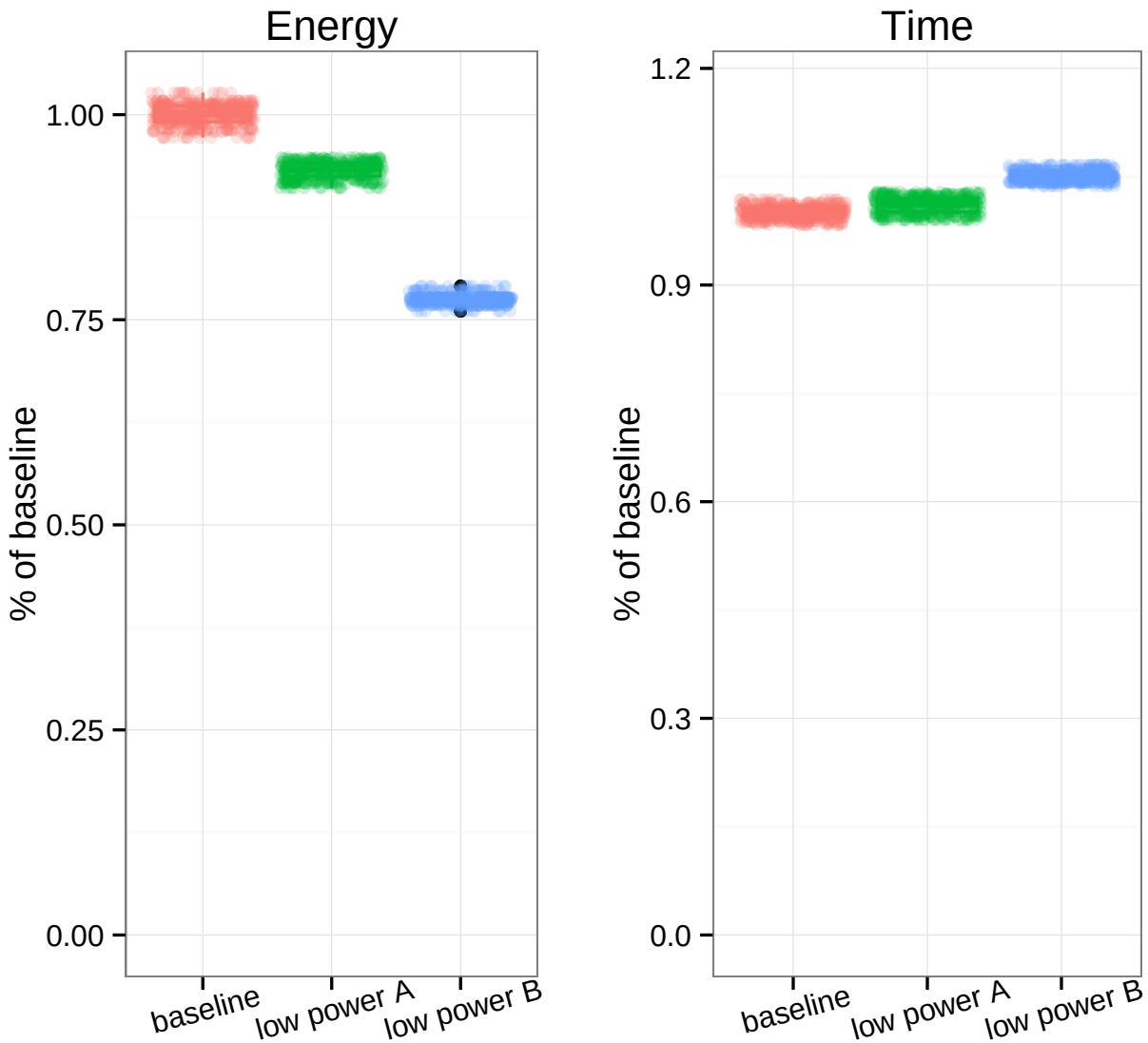
Benchmark Suite: PBBS [9]

Experimental Environment

2× Intel(R) Xeon(R) CPU E5-2630
24 cores
32GB Memory

Results

Benchmark: Delaunay Refinement



Conclusion

- Improved energy-efficiency
- Low overhead
- Energy-efficiency gains limited to memory-bound problems

Future Work

- Reduce number of disadvantageous frequency changes
- Experiment with different runtimes
- Use other techniques like DCT

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Questions?

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