Insight, Analysis, and Advice on Signal Processing Technology

Benchmarking Multithreaded, Multicore and Reconfigurable Processors

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The Need for Good Benchmarks

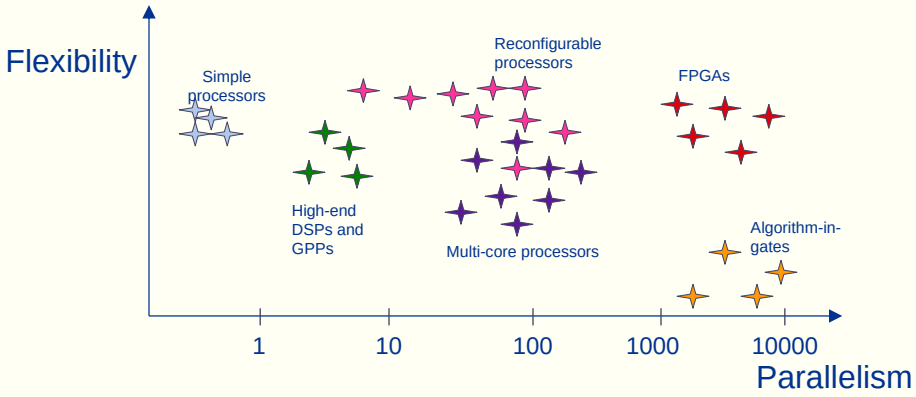
Assess key processor metrics accurately…

- Speed/throughput
- Cost efficiency
- Energy efficiency
- Memory efficiency

…to quickly evaluate processors

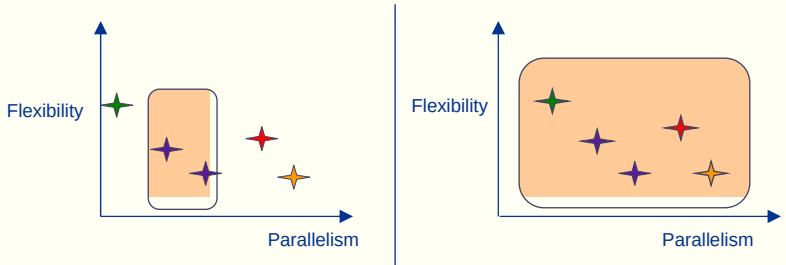
- Use limited engineering resources effectively
- Evaluate processor options
- Inform application partitioning
- Guide processor design, marketing, and investment

Processor Architectures



Principles for Good Benchmarks

Principle 1: Architecture Independence

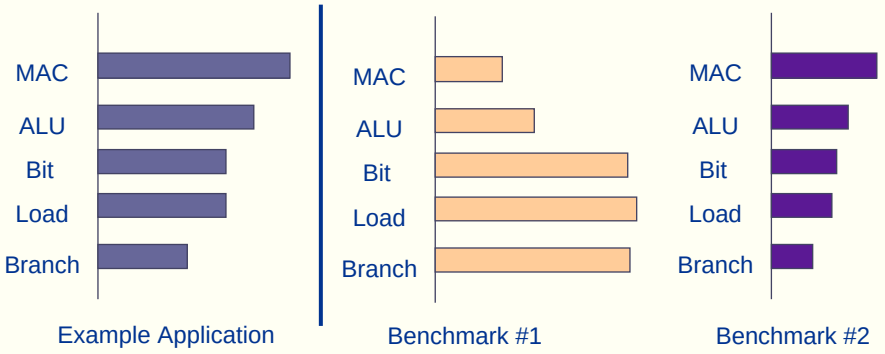


A thread-based benchmark

An implementation-independent benchmark

Principle 2: Application Relevance

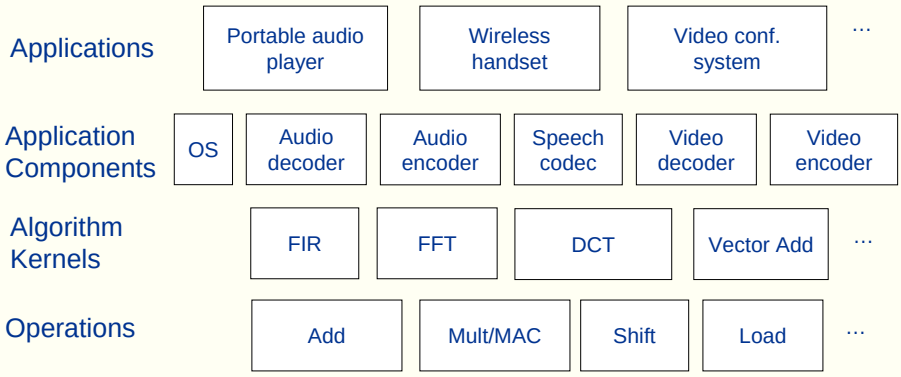
Benchmarks must accurately model the application



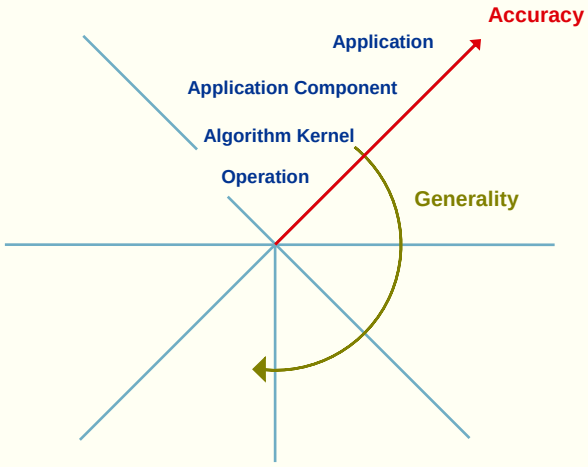
Principle 3: Appropriate Granularity

The right size of benchmark is necessary to:

- Evaluate the desired hardware scope
- Trade off generality vs. accuracy

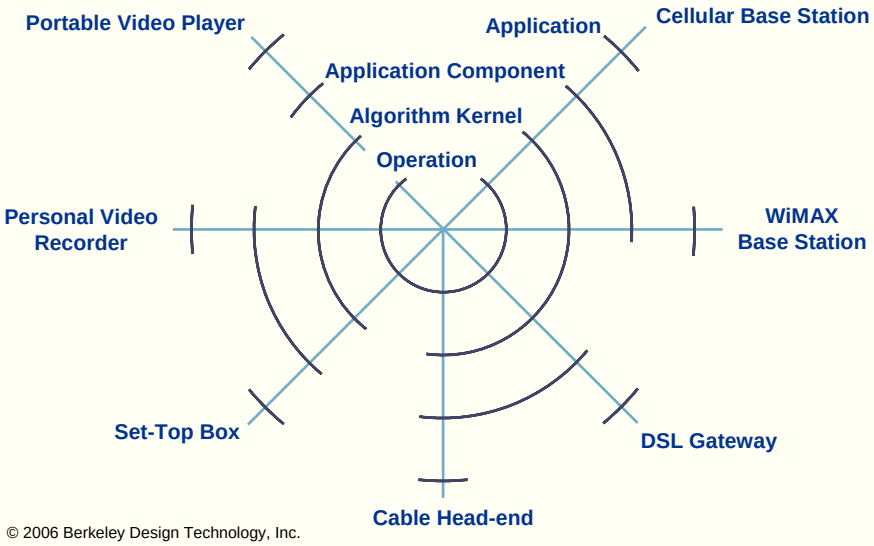


Principle 3: Appropriate Granularity



Generality vs. Accuracy

Principle 3: Appropriate Granularity



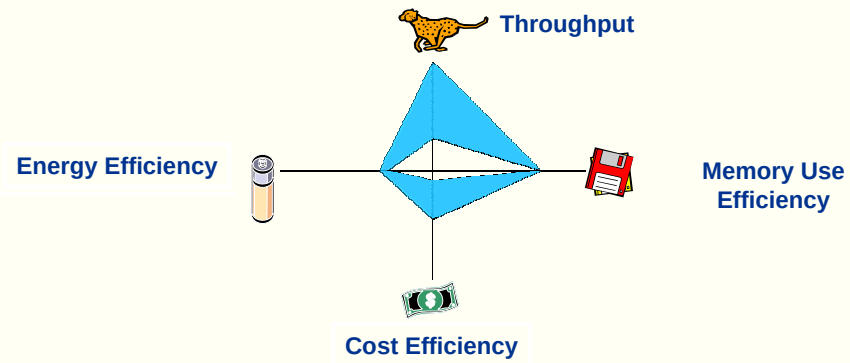
Principle 4: Appropriate Methodology

Benchmark implementation methodology must reflect application development practices

- Choice of design-entry language
- Required/permitted degree of optimization
- Types of allowable optimizations
  - Algorithm transformations
  - Data types
  - Scheduling

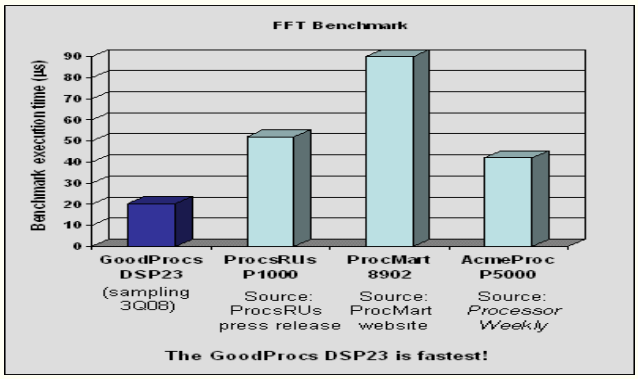
Principle 5: Appropriate Metrics

- A complete set of metrics is needed to capture trade-offs
- Metrics must reflect the needs of the application



Principle 6: Independence

- Benchmarks must be independently designed
- Results must be independently verified
- Use of results must be monitored



Doubtful Claims

- 15 threads = 15x speed
- Peak conditions = average conditions

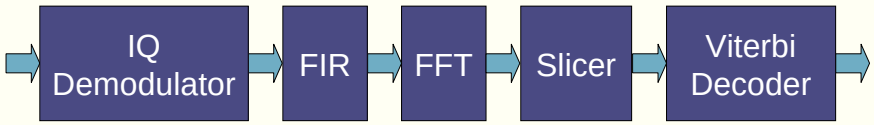
Common Biases

- Inconsistent workload
- Implementation method
- Projection, overestimation
- Cherry picking

Example Application Component

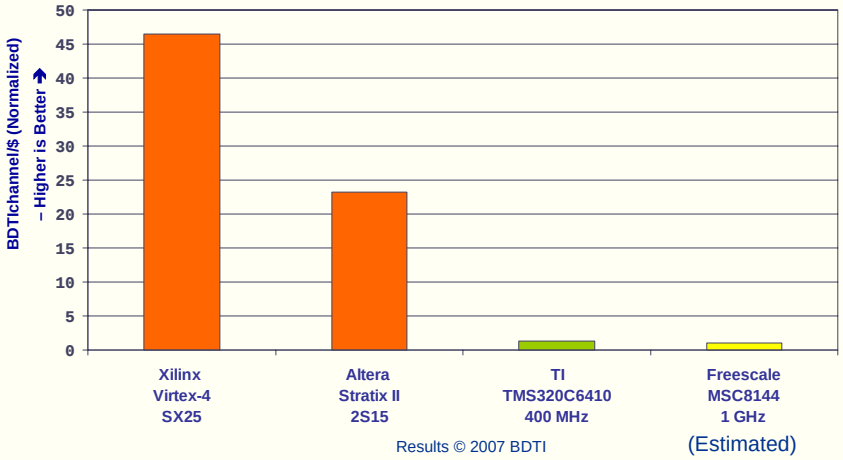
BDTI Communications Benchmark™ (OFDM) is based on a simplified 10 Mbps OFDM receiver

- Closely resembles a real-world task
- Simplified to enable optimized implementations
- Constrained to ensure consistent, reasonable implementation practices



BDTI Communications Benchmark (OFDM)™

New BDTI-Certified Cost-Performance Optimized Results



Results © 2007 BDTI

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Conclusions

- Relevant, meaningful benchmark results are essential
- Benchmarks should be designed for applications, not for processors
  - Especially not for one class of processors
- Consider all relevant metrics; fastest doesn't mean best
- Independently designed and certified benchmarks are most reliable
- Beware of the many benchmarking pitfalls
  - Understand the benchmarks and the results
- Non-quantifiable factors are always important

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For More Information…

www.BDTI.com

Inside [DSP] newsletter and website

Benchmark scores for dozens of processors

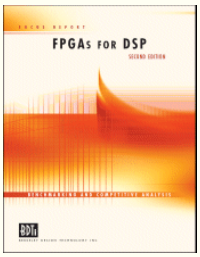
Pocket Guide to Processors for DSP

- Basic stats on over 40 processors

Articles, white papers, and presentation slides

- Processor architectures and performance
- Signal processing applications
- Signal processing software optimization

comp.dsp FAQ



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