

Benchmarking H.264 Hardware/Software Solutions

Insight, Analysis, and Advice on Signal Processing Technology



Benchmarking H.264 Hardware/Software Solutions

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About BDTI

BDTI helps companies develop, market, and use signal processing technology

BDTI is a trusted industry resource for:

- Independent benchmarking and competitive analysis
- Expert product development advice
- Industry and technology seminars and reports
- Optimized DSP software development services

BDTI helps system designers:


- Make confident business and technology decisions
- Reduce risk in product development

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Video Processor Types

<i>Processor Type</i>	<i>Chips</i>	<i>IP Cores</i>
PC CPU	✓	
Embedded RISC CPU	✓	✓
Application processor	✓	
DSP (generic or specialized)	✓	✓
Media processor	✓	
Heterogeneous multiprocessor	✓	
Customizable processor		✓
ASIP		✓
Reconfigurable processor	✓	✓
FPGA	✓	
Fixed-function engine	✓	✓
ASSP (incorporating one or more processor types)	✓	

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Challenges in Evaluating Solutions

Distinguishing production-ready solutions from vaporware

Deciding how to measure performance

- Algorithm configurations
- Test streams
- Test conditions
- Performance metrics

Vendor data provides little help

- No distinction between real solutions and vaporware
- Varying and often unrealistic configurations, test streams, test conditions, and metrics

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The Problem with Vendor Data

Vendor performance claims are difficult to use and compare...

“Hantro’s H.264 player for series 60 handsets is based on the 6100 software decoder and PlayEngine middleware. Running on the Nokia 7610 handset, full screen video (208x176 resolution) at 15 frames per second can be achieved.”

“We’re shipping today, running a 90-MHz processor and delivering 20-frame per second QCIF video, which is a very acceptable level.”
– Agere

“H.264 player on 600 MHz Blackfin, CIF (360 x 240) at 30 fps: 111 MHz” – ADI



BDTI Solution Certification™

Standardization:

- Operating points (codec parameters)
- Test streams
- Metrics
- Instrumentation guidelines

Independent verification of:

- Functionality
- Performance
- Fair comparisons



BDTI H.264 Decoder Solution Certification™

Primary operating point:

- Baseline profile
- D1 resolution (720 × 480)
- 30 frames per second
- 1.5 Mbit/second test stream (*proprietary*)

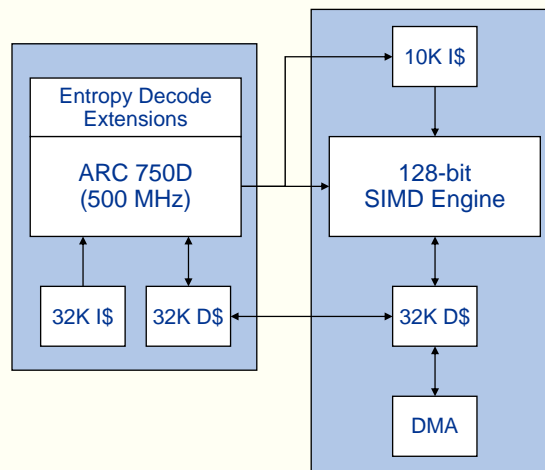
Other “secondary” operating points are characterized to provide a complete performance picture


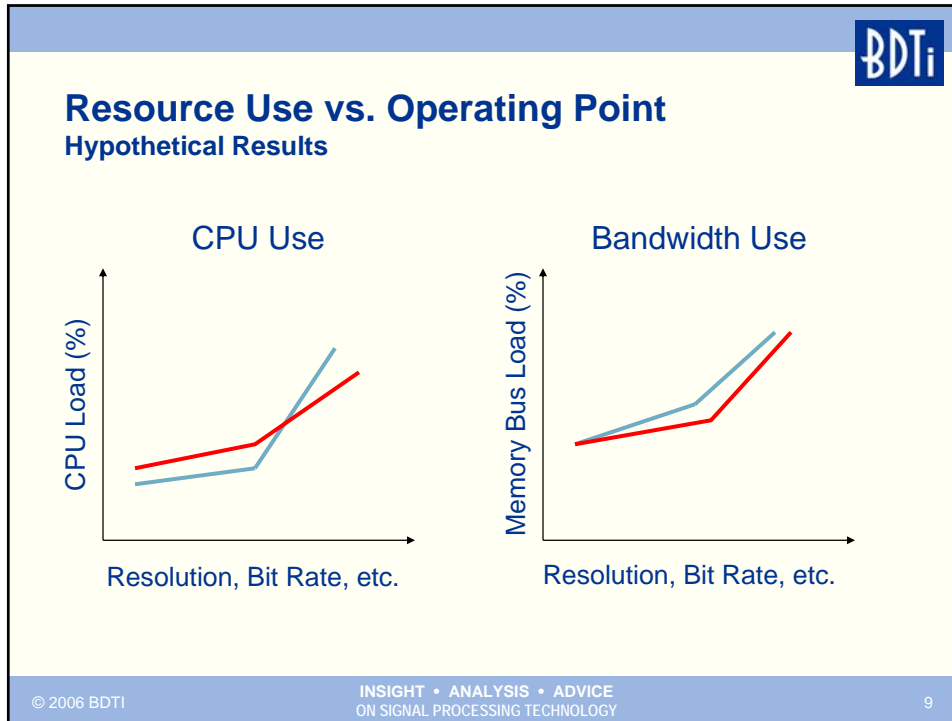
Metrics:

- CPU use (MHz, % loading)
- Memory bandwidth use (Mbit/second, % loading)
- Energy consumption (mJ/frame)
- Die area or cost (mm² or \$)
- Program and data memory use (Mbytes)



Example: ARC Media Subsystem (Results Pending)





Future Work

Performance certification for:

- Other solutions
- Other operating points
 - Different profiles, resolutions, bit rates, etc.
- Other video and audio codecs
 - WMV (VC-1), MPEG-4, etc.
 - AAC, MP3, etc.

“Light” Solution Certification

- Verifies functionality but not performance
- Enables quick certification of a large library of codecs
- Most useful in combination with performance certification for representative codecs

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Conclusions

Choosing a video-processing solution is difficult

- Many solutions to choose from
- Suitability is difficult to assess
- Vendor performance data is unreliable

Use BDTI Solution Certification to:

- Quickly *and* accurately assess suitability of candidate solutions
- Separate real solutions from vaporware
- Save time and reduce risk



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