

Contribution Video Compression Technologies



Choosing a Solution

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The Bandwidth Crunch!

- Increasing amount of content
 - More channels
 - Increased bandwidth: HD, 3G, 3D
- Strain on available bandwidth & budgets
- How do we optimize transport networks in order to reduce costs and maximize revenues?
- How do we meet our technical and quality requirements?

- Common compression technologies:
 - MPEG-2
 - H.264/MPEG4-AVC
 - JPEG 2000

**What's the difference?
How do I choose?**

The Compression Dilemma...

Pick 2 out of 3...

Higher
Quality

Low
Delay

More Compression

- DCT based, interframe coding
 - Compression by reduction in spatial and temporal redundancy
- Limited to 8 bit and HD
- 4:2:2 capable
- Moderate latency: 300-600ms
- Common contribution bit rates:
 - HD: 20-40Mb/s and higher
 - SD: 10-15Mb/s and higher



- Most common and developed codec in broadcast: commodity products, interoperability
- Asymmetrical encode/decode processing complexity
- ASI or IP transport stream
- Doesn't do well with "killer content" (lots of motion): artifacts are hard to hide

- DCT based codec, similar to MPEG-2 with some improvements
 - Improved motion estimation
 - Improved spatial prediction
 - Better sub-block resolution
 - Deeper buffer/longer GOPs
- 4:2:2 and 10 bit capable, 3G
- Longer latency 500ms-1000+ms
- Common contribution bit rates:
 - HD: 12-40Mb/s and higher (100Mb/s in JPEG2000 quality range)
 - SD: 5-10Mb/s and higher

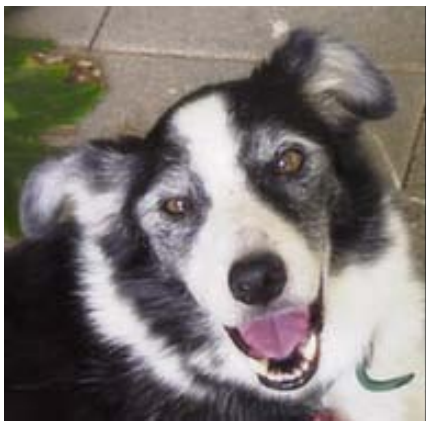
- Newer codec technology, interoperability efforts ongoing
- ASI or IP transport stream
- Asymmetrical encode/decode processing complexity
- Improved quality and motion artifact performance compared to MPEG-2, or half the bandwidth for equivalent performance



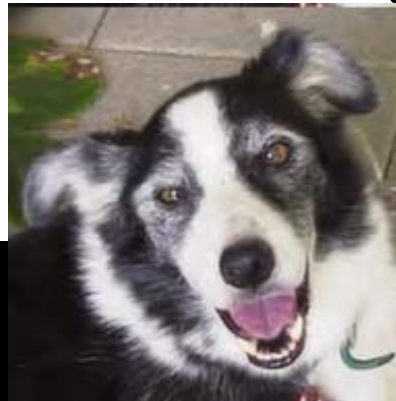
- Wavelet based codec
 - Intraframe coding only
 - Spatial compression by reducing psychovisual redundancies
- 4:2:2 and 10 bit capable, 3G
- Low latency – 55ms: ideal for live events, interviews
- Symmetrical encode/decode complexity



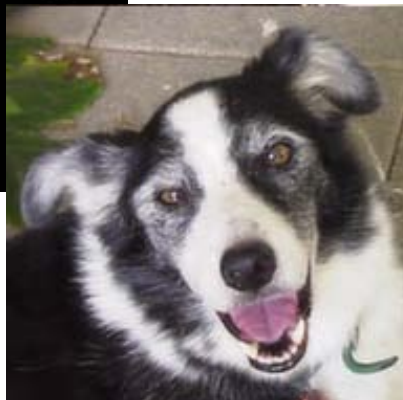
- Operates on a whole frame as opposed to blocks
 - Graceful degradation (no blocking)
 - Softening of edges/blurring
 - Less perceptible than blocking



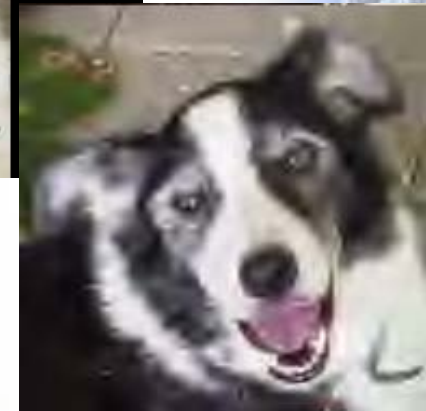
1:1



1:20



1:10



1:100

Images by Shlomi Tal

- Established technology for contribution applications
- Encapsulation to ASI, IP, SDI or SDTI
 - Not yet standardized, must use encode/decode from same vendor
 - Standardization efforts underway by SMPTE, VSF, JPEG2000 Alliance

	SD	HD
Minimum	20 Mb/s	50 Mb/s
Mid	35 Mb/s	80 Mb/s
Visually Near Lossless	50 Mb/s	120 Mb/s
<u>Subjective Compressed Bitrates</u>		

The Compression Dilemma...

Pick 2 out of 3...

Higher
Quality

JPEG
2000

Low
Delay

H.264

MPEG-2

More Compression

MPEG-2 When to Use?

- ✓ Low capital cost
- ✓ Common equipment, proven technology
- ✓ Lower image quality requirements
- ✓ Moderate latency requirements
- ✓ Limited bandwidth, cost savings over time
- ✓ Available transport media are satellite or low bandwidth telecom links (e.g. DS3/E3, OC3/STM1), low bandwidth IP



MPEG-2

H.264 When to Use?

- ✓ Less sensitive to capital cost
- ✓ Benefit from new technology
- ✓ Moderate/high image quality requirements – compression flexibility
- ✓ Higher latency not an issue
- ✓ Limited bandwidth, cost savings over time
- ✓ Available transport media are satellite, low bandwidth telecom links (e.g. DS3/E3, OC3/STM1) or low bandwidth IP



JPEG2000 When to Use?

- ✓ Low capital cost
- ✓ Proven technology
- ✓ High image quality requirements
- ✓ Low latency
- ✓ Higher bandwidth availability
- ✓ Available transport media are higher bandwidth telecom links (e.g. OC12/STM4 to OC192/STM64) or high bandwidth IP (GbE)



Compression – Evertz Involvement

- Evertz has been providing JPEG2000 codecs for over 6 years



- MPEG-2 and H.264 encoders and decoders for contribution applications



- Point to point and point to multipoint signal transport networks over SONET/SDH and/or IP



Thank You!

