

# HIGH THROUGHPUT BLOCK CODING IN THE HTJ2K COMPRESSION STANDARD

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## INTRODUCTION

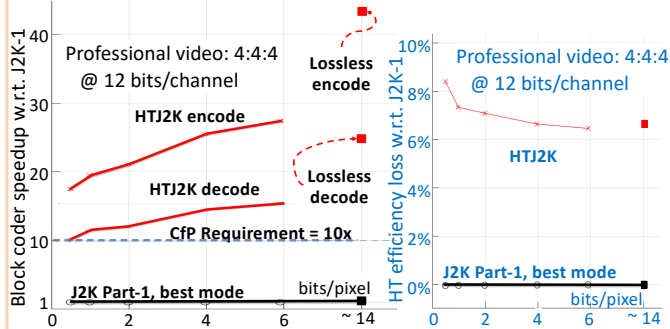
- HTJ2K defines an alternate block coding algorithm for J2K
  - HT ("High Throughput") block coder
  - Drop-in replacement for the J2K-1 block coder
  - Block coder itself is 10-40 times faster in typical workloads
  - Supports reversible transcoding to/from J2K-1 bit-streams
- Small loss in coding efficiency relative to J2K-1
- Sacrifices quality scalability
  - Can get this back on-demand by transcoding
- HT & J2K-1 technologies can be mixed → best of both worlds

### Purpose of this paper:

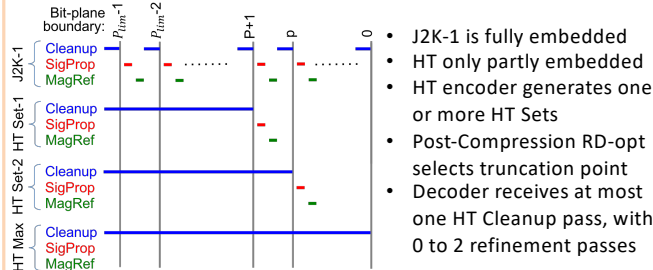
- Provide an overview of the HT block coding algorithm
- Demonstrate end-to-end performance in software

## HTJ2K STANDARDIZATION

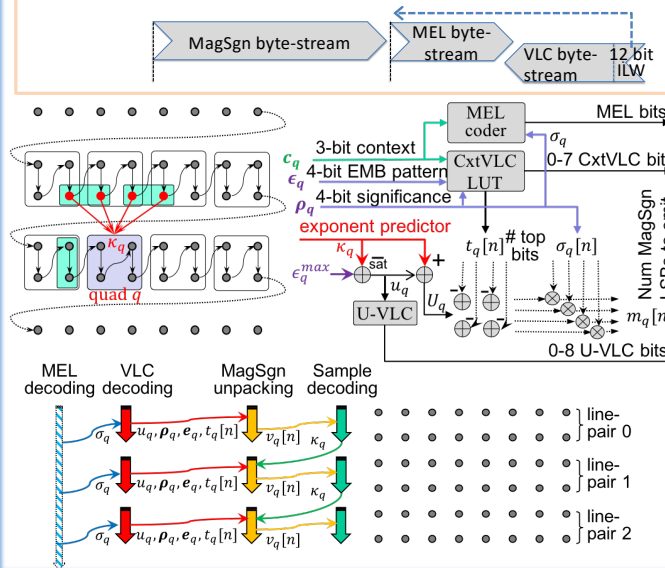
- Example applications:
  - Transcode media repositories → lower complexity format
  - Low complexity encode/decode → contribution & streaming
  - Low energy capture and preview of images and video
- Requirements: preserve J2K features; offer reversible transcoding
- Call for Proposals issued in June 2017
  - Goal: 10x block coder speed-up with < 15% avg efficiency loss
- Published 27/8/2019** by ITU and ISO/IEC as JPEG2000 Part-15



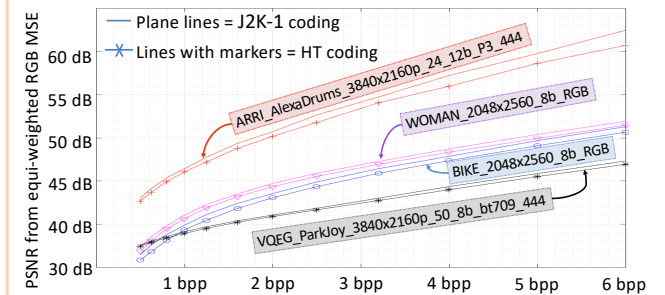
## CORE IDEA



- HT SigProp and HT MagRef passes:
  - Code same data as J2K-1: origin of reversible transcodability
  - Bits emitted as raw data as in J2K-1 BYPASS mode
- HT Cleanup triple-stream structure



## PSNR RESULTS



## SOFTWARE THROUGHPUT RESULTS

4K 4:4:4 RGB video @ 36bits/pel – Skylake i7 4 core CPU @ 3.4GHz

Conditions	ENC:J2K-1	DEC:J2K-1	ENC:HT	DEC:HT
2bpp vis i5/3 (32x128 blocks)	10.1 fps = 251 MS/s	17.6 fps = 438 MS/s	96 fps = 2.4 GS/s	156 fps = <b>3.9 GS/s</b>
2bpp vis i9/7	9.7 fps	17.1 fps	87 fps	126 fps
2bpp mse i5/3	8.9 fps	17.5 fps	91 fps	135 fps
2bpp step i5/3	15.8 fps	17.4 fps	123 fps	126 fps
<b>Lossless r5/3</b>	2.11 fps	2.10 fps	<b>78 fps</b>	<b>66 fps</b>

## CONCLUSION

- HTJ2K offers exceptionally high throughputs
  - with high coding efficiency
- Preserves virtually all features of JPEG 2000
  - region of interest accessibility
  - resolution scalability, HDR and multispectral support
  - virtually unlimited precision, num. components, etc.
- Block-by-block reversible transcoding
  - supports media migration and responsive interaction