High Efficiency Video Coding – Will It Do Enough?

DEVELOPMENT OF A 4K MAIN 10 PROFILE HEVC/H.265 ENCODER

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History of Video Standards

- **MPEG-2/H.262** (1994)
  - 480p (SD)

- **AVC/H.264** (2003)
  - 1080p (HD)

- **HEVC/H.265** (2013)
  - 2160p (UHD)

All standards achieve a 50% reduction in size for the same quality.
Differences with AVC/H.264

Input
Frame

Residual

Transform & Quantization

Rate Control

Inv. Transform Inv. Quantization

Bits Info

Entropy Encoding (CABAC) And Formatting

High throughput CABAC; and Higher bit rates

Bigger Blocks (64x64)
Bigger transform (32x32):

Transform Skipping: for Screen Content

Hierarchical Structures:

35 modes Intra Prediction:

More complex Inter Prediction:

Sample adaptive offset filter (SAO): and Lower artifacts

Intra Prediction

Mode Decision

Motion Compens.

Motion Estimation

Motion Vector Info and Block Mode Data

Reconstructed Image

Frame Buffer

Filter analysis

Deblocking and SAO Filter

Decoder Blocks

Qp

Prediction And Mode Info

Prediction

Block Mode Info
HARDWARE IMPLEMENTATION CHALLENGES
Hardware implementation challenges

- Being able to do 4K cost effectively (Multi-core)
Hardware implementation challenges (II)

- Larger Blocks/Mode decision/Block partitioning
Hardware implementation challenges (II)

- Intra prediction

![Diagram showing Intra prediction for HEVC and AVC]
Hardware implementation challenges (III)

- Support for 10-bit bit-depth to enable BT.2020
## Encoder implementations (1080p60)

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1U form factor

[ibc.org](http://ibc.org)
Conclusions on HEVC

- 2013 trials, 2014 commercialization
- OTT 1st Application, UHD essential
- Diversity of encoder solutions
- Very challenging to deliver 50%
Thank you – Q&A - Downloads

Slides

Free HEVC bit streams/Demo

http://ngcodec.com/ibc2013

http://ngcodec.com/hevc-bitstreams

ibc.org