Understanding the Significance of HEVC

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Agenda

- What is HEVC
- Key Features
- Encoding/decoding status
- Market status
- Royalty Issues
- Crystal ball
What is HEVC

- Successor to H.264
  - January 2013 – “first stage approval”
  - Essentially cleared for sale
- Key benefits
  - Same quality as H.264 at 50% data rate:
    - Cut bandwidth costs
    - Send HD through smaller pipes
  - Enable Ultra HD videos (UHD)
  - (technical links at the end of the article)
Exploring HEVC

- Quality side – does it deliver on the promise?
- Playback side – what’s it take to play?
Quality Side

- Encodes prepared by Rovi (using their MainConcept encoder)
- Two scenarios; 720p/1080p
- Questions:
  - Does HEVC deliver same quality at 50% data rate?

Handout available at www.streaminglearningcenter.com
First Comparison

- 720p at 400/800 kbps
- For perspective:
  - ESPN/YouTube distributes 720p @ 2.5 mbps
- Why test at 800 kbps?
  - Because at 2.5 mbps, everything looks good
  - One promise of HEVC is bandwidth savings (let’s see how low it can go)
720p Comparisons

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720P Comparisons

HEVC – 400 kbps

H.264 – 400 kbps
720P Comparisons

HEVC – 400 kbps

H.264 – 800 kbps

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720p Comparisons

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720P Comparisons

HEVC – 400 kbps

H.264 – 800 kbps

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720p Comparisons

HEVC – 400 kbps

H.264 – 800 kbps
720p Comparisons

HEVC – 400 kbps

H.264 – 800 kbps
At 720p

- While it’s scene dependent:
  - In many scenes, HEVC can deliver equivalent quality (or better) at half the data rate
  - In some scenes, it’s a draw; in others H.264 wins (but either way, the difference isn’t dramatic)
- So, a producer distributing at 720p could cut bandwidth costs significantly distributing via HEVC
Second Comparison

- 1080p at 2 mbps for HEVC/4 mbps for H.264
- For perspective:
  - Most 1080p podcasts delivered at 1080p @ 4.1 mbps
  - Apple TN2224 recommends 8.5 mbps
- Why test at 2/4 mbps?
  - Realistic use case
1080p Comparisons
1080p Comparisons

HEVC – 2 mbps

H.264 – 2 mbps
1080p Comparisons

HEVC – 2 mbps

H.264 – 4 mbps
1080p Comparisons

HEVC – 2 mbps

H.264 – 4 mbps
1080p Comparisons

HEVC – 2 mbps

H.264 – 4 mbps
At 1080p

- While it’s scene dependent:
  - In most scenes, HEVC can deliver equivalent quality (or better) at half the data rate
- A producer distributing at 1080p could probably cut bandwidth costs by 50% with HEVC
But, Will it Play?

- Limited sample
  - 720p HEVC should play on most 2-core computers
  - 1080p will only play on 4/8 core and above
  - (I’m guessing that) by far, the bulk of video streamed today is 720p or smaller (at least non-OTT)
What About Playback?

I7-based Notebook

1080p H.264

1080p HEVC
Decoding HEVC

- Horsepower exists
  - New iPad and many other tablets s/be HEVC capable (tablet demo time permitting)
  - Qualcomm Snapdragon and other HEVC capable clips shipping soon
- Multimedia Research Group
  - 2.4 billion HEVC capable devices by 12/2013
What About Playback?

- Streaming to computers
  - Opportunity for bandwidth savings for 720p
  - 1080p may exclude too many older computers

- Streaming to mobile
  - Only the most recent generations

- Streaming to OTT
  - OTT controls the playback platform
  - Greater flexibility for 1080p or UHD playback
What About Infrastructure

• Encode
• Decode
Encoding HEVC

- Will not be a bar to most mainstream applications
- Many vendors have announced and are either shipping or close to shipping
  - Elemental - Live 4Kp30 for Osaka Marathon
    - Obviously, this means live at lower resolutions
  - Thomson - French Open demonstration
  - Rovi/DivX – DivX 10 with HEVC encode
  - Telestream – in Vantage by end of 2013
Software Players

- DivX 10 with HEVC decode shipped – 9/2013
- VLC Player with HEVC – 11/15/2013
- Others:
  - Flash – nada
  - Apple – not a peep
  - Google – quiet on the matter (and pushing VP9)
  - HTML5 – LMAO
What’s Holding Things Up?

- Royalties not been set; market evolving much faster than H.264
  - For perspective: H.264 rollout
    - Spec approved March 2003
    - Royalties announced by MPEG-LA November 2003 (cohesive royalty group)
    - Apple QuickTime with H.264 – April 2005
    - Adobe Flash – March 2008
    - Microsoft Silverlight – July 2009
Basic H.264 License Terms

- Encoder/Decoder
  - Encoder vendors pay fee
  - Decoder vendors pay fee
  - ($6.5 million per company, per year cap)
  - So:
    - Adobe pays $6.5 million for Flash, FMLE, Adobe Media Encoder
    - Apple pays $6.5 million for all iDevices, QT Player, Compressor and other tools
    - Microsoft pays $6.5 million for IE, Silverlight, Expression Encoder, Azure cloud encoding
Basic H.264 License Terms

- Publishers
  - Some potential fees for subscription/PPV
    - Multiple exceptions for small size
  - No royalty for free internet video
    - Networks make billions of advertising revenue from H.264 streams, no royalty to patent group
    - Corporations stream H.264 internally, no royalty to patent group
  - Reportedly, H.264 patent holders (many who also contributed to HEVC) feel short changed
HEVC Rollout

- Spec approved January 2013
- As of today
  - MPEG HEVC group is being formulated, and expect finalization soon
  - Not clear if all IP owners will be represented
  - Significantly, Nokia went their own way on licensing H.264 to Google for VP8/9
    - Is suing Google around the globe
    - May not join MPEG LA consortium (This is me talking, no word from Nokia or MPEG LA)
What’s Expected

- Encoder/Decoder fees – certainty
- Publisher
  - Subscription/PPV – virtual certainty
  - Free internet video
    - My estimate – 90% plus probability
      - Lots of exceptions for smaller publishers
  - Corporate/Intranet video
    - My estimate – 50% chance
      - Again, lots of small company exceptions
Will HEVC Royalties Spawn Competition?

- Google VP9
  - Slightly behind HEVC in quality
  - Google licensed H.264 patents from MPEG-LA
  - But, Nokia has sued Google on video related patents in GB, Germany and US
    - Will likely cast a pall on VP9 usage
- VP9 could win in WebRTC, but probably not in other markets
Impact of HEVC Royalty Status

- High end encoding tools
  - Minimal – cost of doing business
  - Will pass along cost to customers
- Integrated circuits for encode/decode
  - Same
Impact of HEVC Royalty Status

- Playback side
  - DivX/VLC are nice, but not ubiquitous
  - Other decoders (Flash/Apple/Google)
    - Like Rovi, whatever royalty will be, it will be necessary cost of doing business
    - Probably haven’t shipped because there is minimal demand for HEVC decode and no real competition
    - Would expect all to announce plans/products by mid-2014
Impact of HEVC Royalty Status

- Content publisher – Here’s the rub
  - Huge issue
  - 50% bandwidth reduction appears likely
    - Tough to implement if you don’t know what the royalty cost will be (and there will be a royalty)
  - Costs won’t be known until 3/2014 at earliest (my guess)
What About HEVC for UHD?

- Projects are pretty uninspiring
  - Installed base of under 3 million by 1/2015
- Ergonomics don’t warrant faster adaption
  - At normal living room viewing distance (~10’)
  - Need 77” screen to see difference between 1080p and 4K
- Will be driven by TV manufacturers, not consumers

Analyst - DisplaySearch
Content Side

- Many current movies shot in 4K
- Films can be rescanned
- Very little TV content currently shot in 4K
  - Buying a 4K set to watch up-scaled 1080p content is a poor value proposition
4K Market Development

- Will poke along, driven by TV manufacturers trying to create reason to buy newer TV sets
- On the other hand:

  “Streaming 4K video will happen long before linear TV supports 4K video.”
  - Reed Hastings, CEO Netflix
So, where will HEVC appear first?

- Closed systems (where one party controls both encoder and player)
  - Where savings are significant and clearly evident
  - Expensive products that can absorb royalty
Primary Distribution

- Primary distribution
  - Studio to local affiliate
  - Both sides HEVC
  - Then transcoded to H.264/MPEG-2 for delivery to existing STBs
New IPTV/OTT Installations

- Particularly those that extend reach of DSL-based cable
- Much slower to replace existing STBs
Video Conferencing - Telepresence

- High-end telepresence systems
  - When real-time encode silicon available
- Bandwidth savings clear
- Royalty can be absorbed
General Purpose Streaming?

- Royalty settled first (3/2014?)
- Then general purpose players
  - Flash, iOS, Android, OTT
  - 2Q 2014
- Then adaption by high volume streamers for general distribution to computers and mobile
  - Networks, etc.
  - 12/2014?
What to Do?

- If bandwidth is a major cost factor, HEVC could dramatically lower costs
  - So, encode some content, understand the potential bandwidth savings with your content
  - Run some playback trials, and make sure HEVC plays on the bulk of your target platforms
- If bandwidth is not a major cost factor
  - You probably wasted the last 40 minutes
Resources

- What is HEVC? (bit.ly/whatisHEVC)
  - Lots of links to technical resources
- The Future of HEVC: It's Coming, but with Plenty of Questions (bit.ly/HEVC_when)
- When Will the HEVC Royalty Picture Clear Up: Apparently No Time Soon (bit.ly/HEVC_royalties)
- VP9 Is Almost Here, But a Nokia Patent Fight Might Have it DOA (bit.ly/VP9_patent)
Questions