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H.265/HEVC streaming evaluation

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Agenda & Introduction

- #1. HEVC streaming over RTP/UDP (Real-time Transport Protocol)
  - Based on UDP transport protocol
  - Lost/corrupted packets are **NOT** retransmitted
  - Impaired picture quality but smoother playback
- #2. HEVC streaming with DASH (Dynamic Adaptive Video Streaming over HTTP)
  - Based on TCP transport protocol
  - Lost/corrupted packets are retransmitted
  - Nearly perfect picture quality but freezing/pause occur

#1. HEVC streaming over RTP/UDP

- Existing HEVC subjective studies have not evaluated the impact of network impairments.
- This work has
  - Quantified the effects of packet loss in HEVC on perceptual quality:
    - Packet loss rate of 3% or more caused high levels of user dissatisfaction
    - PSNR results correlate MOS scores reasonably well, though MOS match QoE better
  - Showed the relative importance and relationship between factors:
    - Packet loss, video sequence content, error concealment method, spatial resolution and encoded bitrate
  - More details in

J. Nightingale, Q. Wang, C. Grecos, and S. Goma, "The Impact of Network Impairment on Quality of Experience (QoE) in H.265/HEVC Video Streaming", *IEEE Transactions on Consumer Electronics*, Vol. 60, No. 2, May 2014.

#1. HEVC streaming over RTP/UDP

- Follow-up work on H.265 QoE modeling:
  - New method to determine the content type of a video sequence from semantic data contained within an encoded HEVC bitstream
  - Leverage the relationship between an HEVC encoder's partitioning and prediction mode decision making processes and the spatio-temporal features within the video stream

- More details in

(Invited paper) J. Nightingale, Q. Wang, C. Grecos, and S. Goma, "Deriving Video Content Type from H.265/HEVC Bitstream Semantics", Proc. SPIE Photonics Europe 2014: Real-Time Image and Video Processing (Conference EPE115), Brussels, Belgium, Apr 2014. (doi:10.1117/12.2051757)

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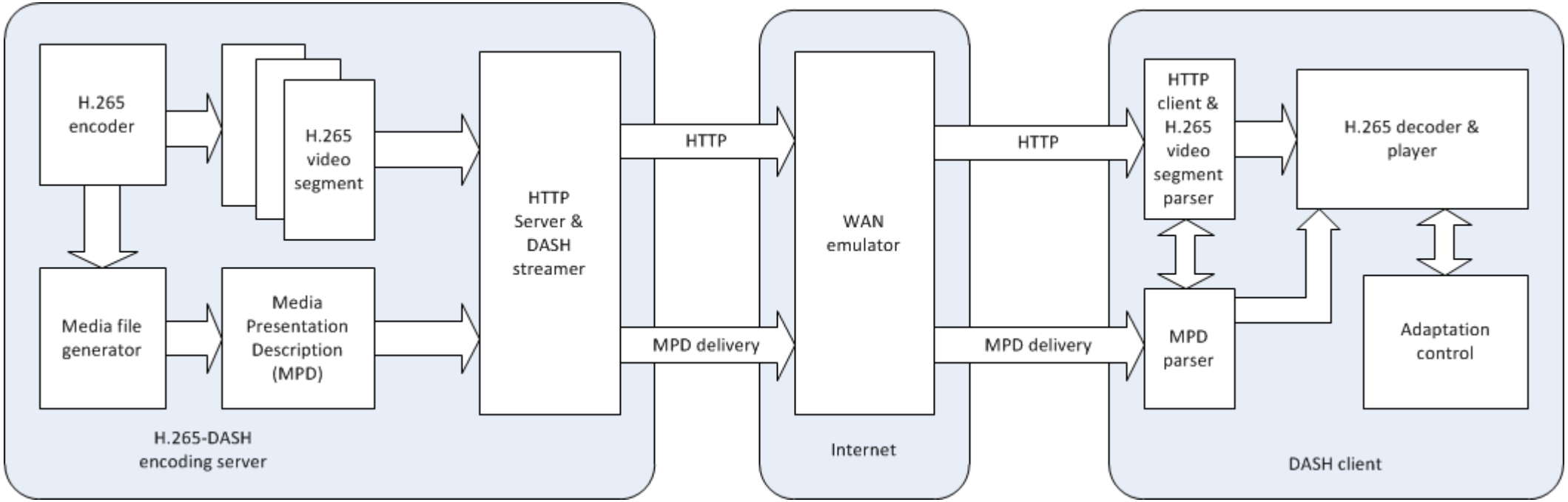
#2. HEVC streaming with DASH



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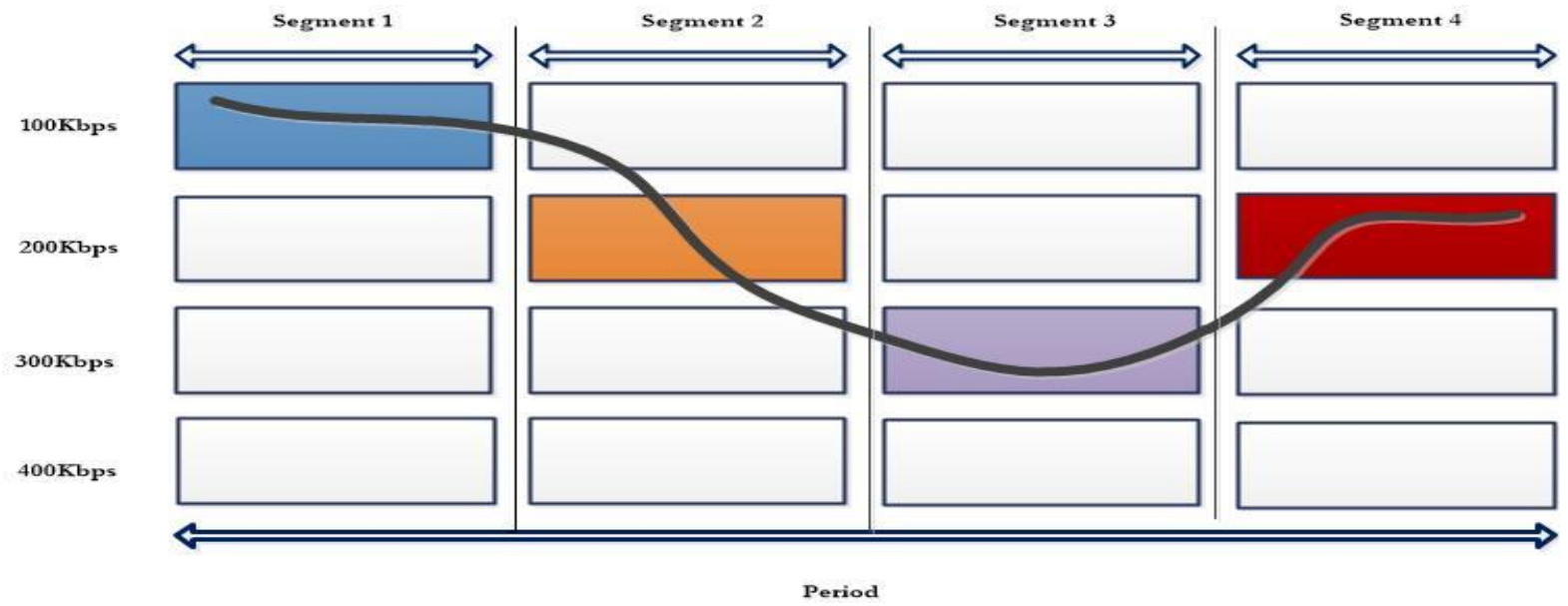

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#2. HEVC streaming with DASH

- Previous studies in DASH have focused on H.264/AVC based streaming
- This preliminary work has
  - Presented an experimental HEVC-DASH testbed for adaptive streaming of HEVC video over an HTTP/TCP paradigm
  - Demonstrated PSNR results under various scenarios:
    - Different HEVC encoding modes, network packet loss (1%, 3%, 5%) and delay (50ms, 100ms, 150ms), and DASH video segment sizes (2s, 10s)
    - Video sequence duration: 60s (concatenated HEVC sequences)
  - More details in

I. Irondi, Q. Wang, and C. Grecos, “Empirical Evaluation of H.265/HEVC Based Real-Time Dynamic Adaptive Video Streaming over HTTP (HEVC-DASH)”, Proc. SPIE Photonics Europe 2014: Real-Time Image and Video Processing (Conference EPE115), Brussels, Belgium, Apr 2014.

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Remarks & Questions

- Subjective test plan for HEVC-DASH is underway
  - Suggestions welcome:
    - Optimal/adequate video sequence duration
    - Common test sequences (not concatenated ones)
    - Beyond MOS

- Keen to collaborate with VQEG colleagues for this and other projects (including EU Horizon 2020, UK etc. projects), joint publications, joint PhD supervision etc.

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