Datasets for AVC (H.264) and HEVC (H.265) for Evaluating Dynamic Adaptive Streaming over HTTP (DASH)

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Motivation

- Provide researchers with a sufficiently diversified dataset
  - number of clips and genres
- Encoded for both H.264 (AVC) and H.265 (HEVC)
  - HEVC dataset with low data-rate video suitable for evaluation networks with limited bandwidth
- Faciltate both experimental and real testbed evaluation of DASH.
- Supporting advanced objective video quality metrics (e.g., VQM)

Outline

- Dataset Overview
- A closer look
- A use case
- Conclusion and Future Work

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Dataset Overview

- Twenty three clips
  - 20 16-min + 3 ~10-min
- Six genres
  - Action, comedy, sci-fi, documentary, animation, thriller
- Two encoders
  - H.264 (AVC) and H.265 (HEVC).
- Five segment durations
  - 2-, 4-, 6-, 8-, and 10-second.

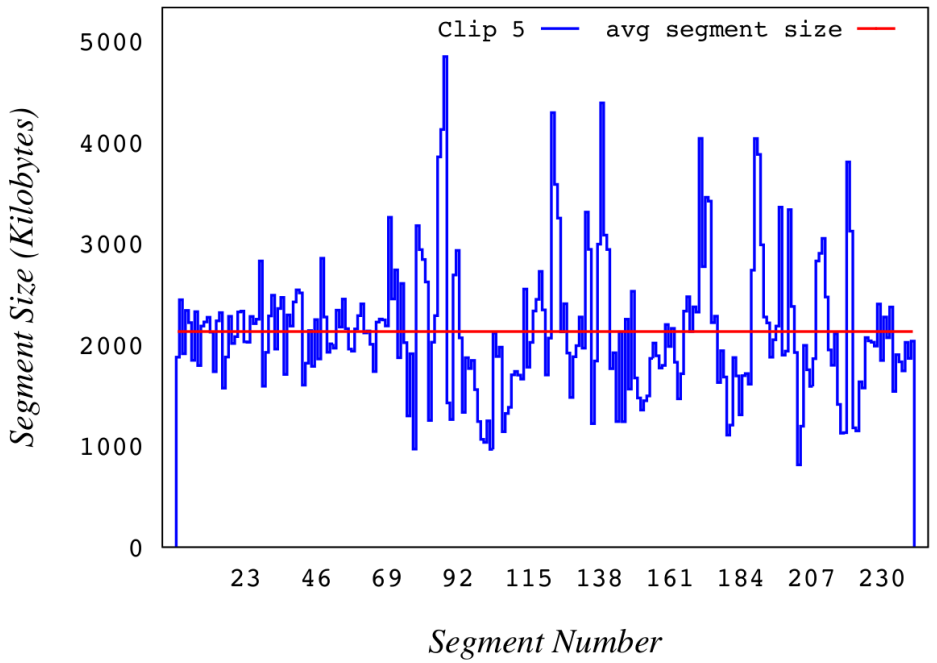
Dataset Overview

- Encoding configurations comparative to the representations and resolutions matching those used by content distribution provider.

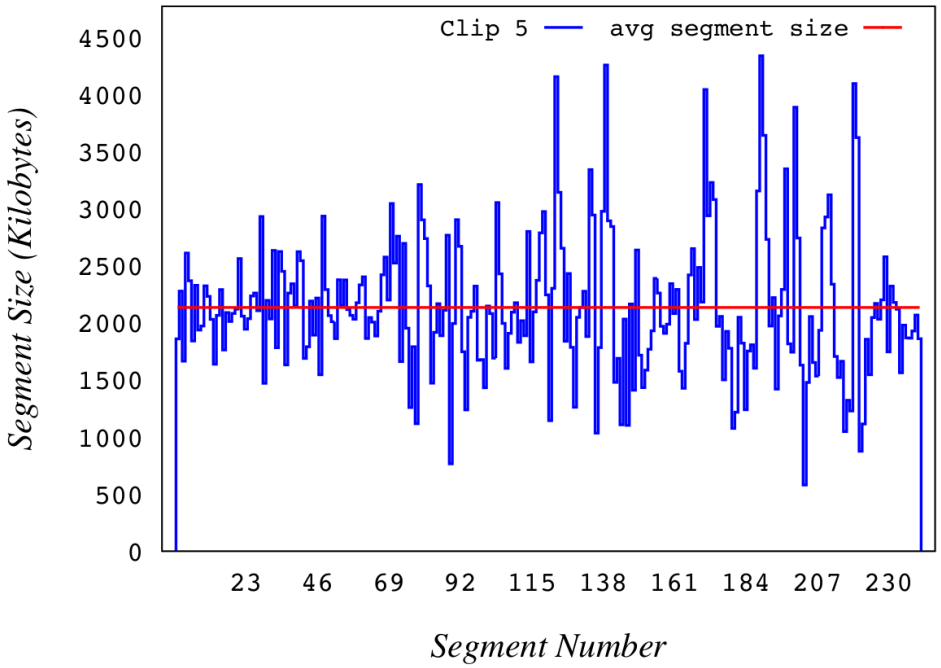
Resolution	Encoding Rate	Quality Level
320x240	235 kbps	very low quality
384x288	375 kbps	low quality
512x384	560 kbps	VHS-ish quality
512x384	750 kbps	better VHS-ish quality
640x480	1050 kbps	analog TV quality
720x480	1750 kbps	DVD-ish quality
1280x720	2350 kbps	720p low quality
1280x720	3000 kbps	720p high quality
1920x1080	3850 kbps	1080p low quality
1920x1080	4300 kbps	1080p medium quality

H.264 v H.265 Comparison

Highest representation rate for clip 5 with a 4-second segment duration



H.264



H.265

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Types of Datasets

- **Content Dataset**
- **Trace-Based Dataset**
- **Compressed Header Dataset**

Content Dataset

- Based on ***three*** well-known open-source animated videos
  - Big Buck Bunny (BBB) - 9 minutes 46 seconds
  - Elephant Dreams (ED) - (10:54) and
  - Sita Sings the Blues (SSTB) - (16:00)
- This dataset provides all DASH content.
- Can be used with any DASH compatible player

Trace-Based Dataset

- Additional 20 video clips.
- Extracted from High Definition (HD – 1920 x 1080) Blu-Ray content.
- Offering clips with a mixture of fast and slow action and with static and dynamic scenes.
- All clips 16 minutes in length.
- Can be used to drive trace-based evaluations,
  - Simulators (NS3, OPNET,...etc)
  - Experimental clients (e.g. scoot player, ..)

Clip_5	seg_Dur	4267	3818	2976	2328	1734	1038	740	552	370	232
x264		1920	1920	1280	1280	720	640	512	512	384	320
		1080	1080	720	720	480	480	384	384	288	240
0		820	820	820	820	820	820	820	820	820	820
1	4	1878426	1645796	1264115	950941	695637	403209	279730	205976	137267	83929
2	4	2445453	2218132	1775801	1424383	1088997	662920	483338	359490	242483	150508

Compressed Header Dataset

- The header of every segment is typically composed of
  - the Movie Fragment Box ‘moof’, which is the segment meta data, and
  - the Media Data Box ‘mdat’, which contains the video and audio content.
- For every segment
  - GPAC is used to determine the header structure of the segment
  - we store the ‘moof’ and a part of the ‘mdat’ data.

Compressed Header Dataset

- Per clip, compressed header dataset offers
  - MPD file
  - the header information for the MP4 file, and
  - the compressed header information per segment
  - Reduces our entire dataset of 464GB to 518MB.
- We combine the segment size information, from our trace-based dataset, and the stored actual data to reconstruct the compressed dataset. (script is released)
- Tested with GPAC@Rawmode
- Can be also used with experimental players

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Evaluation Setup

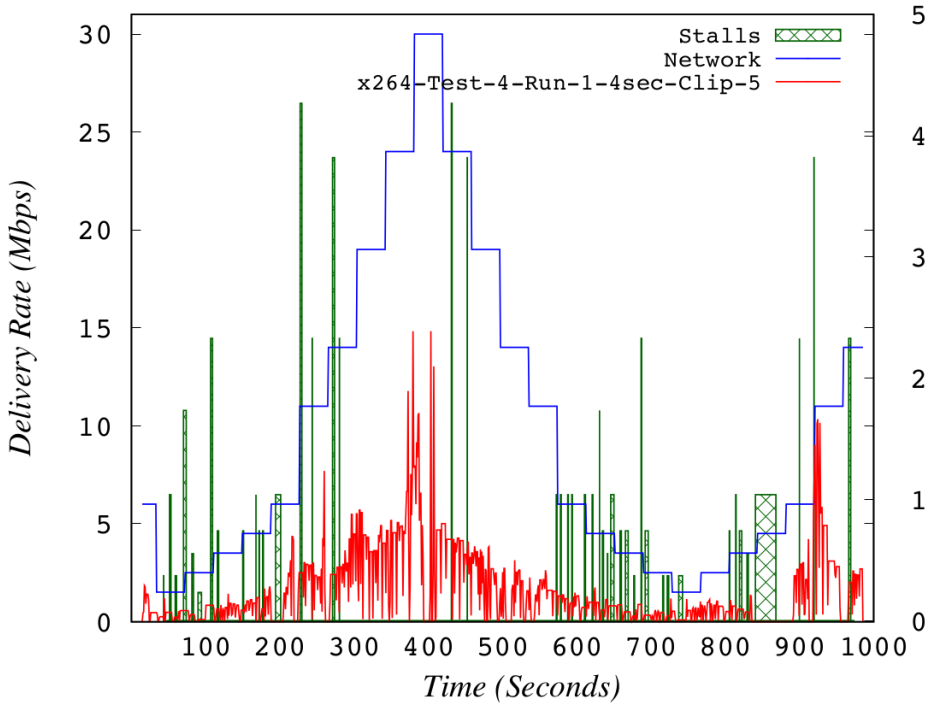
- We evaluate our datasets with GPAC in a real testbed

- Experiment
  - 6 streaming clients
  - sharing a link with a variable bandwidth
  - running default GPAC adaptation algorithm

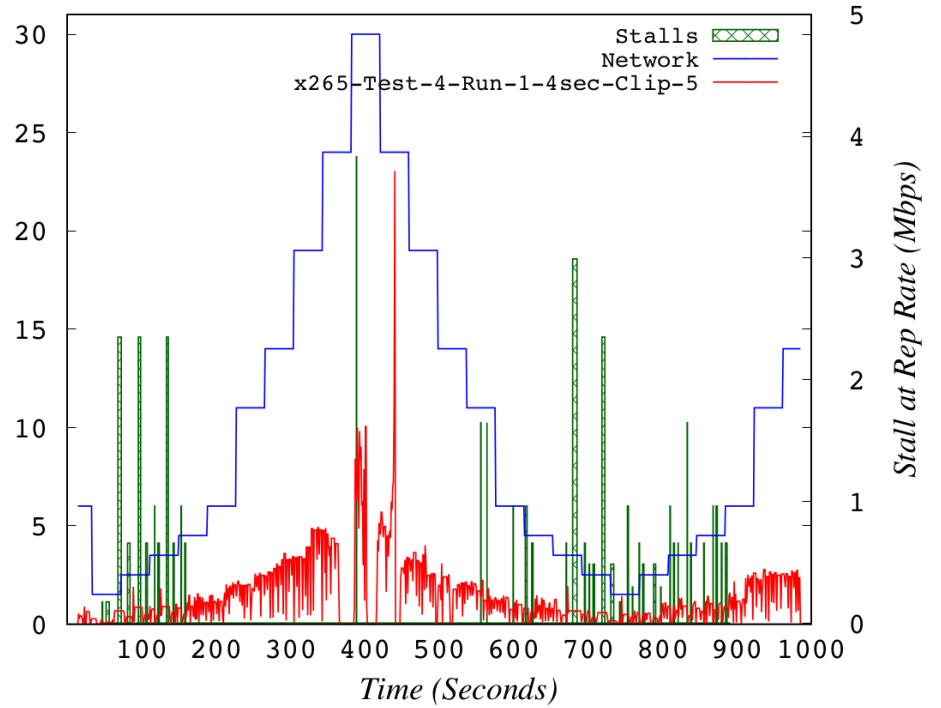
- We determine per segment, the arrival time (ms), delivery time (ms), stall duration (ms), representation rate and buffer level (in seconds) at the client.

Evaluation Results

H.264



H.265



Objective Quality Assessment

- We complement our data set with
  - PSNR for each segment to enable the comparison of the encoding efficiency of H.264 and H.265
  - VQM (in progress)

Clip_5	seg_Dur	4267	3818	2976	2328	1734	1038	740	552	370	232
x264		1920	1920	1280	1280	720	640	512	512	384	320
		1080	1080	720	720	480	480	384	384	288	240
0											
1	4	45.17	44.84	41.38	41.02	37.17	36.36	34.99	34.59	32.77	31.29
2	4	45.47	45.28	41.75	41.53	37.52	36.86	35.52	35.24	33.37	31.92

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Conclusions

- We present datasets for both trace-based simulation and real-time testbed evaluation of (DASH).
- Available in both H.264 and H.265.
- Encoded rates comparative to the representations and resolutions of popular content distribution providers.
- We offer twenty three different clips across a range of genres.
- Across five different segment durations.
- Our header-only compressed dataset offers a means of streaming our entire dataset locally.

Dataset Website

- Links to all MPD files for the Content Dataset.
- Download link for trace-based Dataset.
- Download link for PSNR values.
- The Compressed Dataset and build instructions.
- Instruction for building GPAC, and its dependencies.
- A VirtualBox VM of a fresh install of Ubuntu 14.04, complete with all required dependencies for H.264 and H.265 decoding and streaming using GPAC and our datasets.

Future Work

- Supplementing the existing datasets with a Scalable Video Coded version of both H.264 and H.265.
- Developing a Server side segment generator
  - create segments in real-time based on the requested segment, the header data in the “Compressed Dataset” and the actual segment size from traces

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http://www.cs.ucc.ie/misl/research/current/ivid_dataset

http://tinyurl.com/ivid-dataset

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Related Work

- The Dynamic Adaptive Streaming over HTTP Dataset is the first of the publicly available DASH datasets:
  - Stefan Lederer, Christopher Muller, and Christian Timmerer. Dynamic Adaptive Streaming over HTTP Dataset. In Proceedings of the 3rd Multimedia Systems Conference, MMSys '12, pages 89-94, New York.
- Ultra High Definition HEVC DASH Data Set
  - J. Le Feuvre, J-M. Thiesse, M. Parmentier, M. Raulet, and C. Daguet. Ultra High Definition HEVC DASH Data Set. In Proceedings of the 5th ACM Multimedia Systems Conference, MMSys '14
- Further expanded by the Scalable Video Coding (SVC) Dataset
  - Christian Kreuzberger, Daniel Posch, and Hermann Hellwagner. A scalable video coding dataset and toolchain for dynamic adaptive streaming over http. In Proceedings of the 6th ACM Multimedia Systems Conference, MMSys '15, pages 213-218